



APPENDIX E

OTHER SUPPORTING INFORMATION

Table of Contents

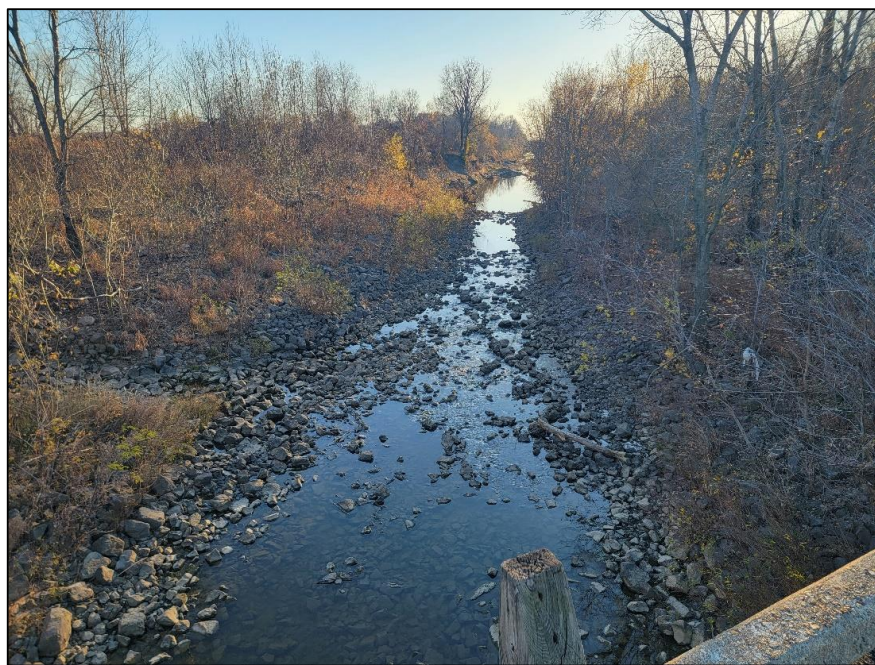
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Section 106 Architectural History Report_revised	E-171

DRAFT Waters of the U.S. Delineation and Threatened and Endangered Species Assessment

for Lick Creek and Dudley Main Ditch Watersheds Stoddard County, Missouri

**Prepared for
USDA Natural Resources Conservation Service**

**Prepared by
Conservation Works Joint Venture (CWJV) Partner
Prairie Engineers**



Lick Creek, looking downstream.

April 2024



Table of Contents

1. Introduction	1
2. Methodology.....	3
2.1. Resource Data Review	3
2.1.1. Threatened and Endangered Species	3
2.1.2. Migratory Birds and Bald Eagles	6
2.2. Field Methods	8
2.2.1. Waters of the U.S.	8
2.2.2. Threatened and Endangered Species	9
3. Project Setting.....	10
3.1. Ecoregions.....	10
3.2. USGS Topography	10
3.3. Water Quality.....	11
3.4. National Wetland Inventory	11
3.5. Floodplain Mapping	12
3.6. Soils	12
4. Results.....	14
4.1. Waters of the U.S.	15
4.1.1. Streams	15
4.1.2. Wetlands	16
4.2. Threatened and Endangered Species	17
4.3. Bald Eagle.....	17
4.4. Other Wildlife.....	18
5. Conclusion.....	19
5.1. Waters of the U.S.	19
5.2. Threatened and Endangered Species	19
5.3. Bald Eagle Permitting	20
6. References	21



Table of Contents

Figures

Figure 1-1. Project Location

Figure 3-1. NWI Map of the Project Area 3

Tables

Table 2-1. Threatened and Endangered Species Listed in the Project Area

Table 2-2. State-Ranked Species near the Watershed

Table 2-3. Migratory Birds Listed in the Project Area

Table 3-1. Water Quality Conditions of Streams in the Project Area

Table 3-2. NWI-Mapped Features in Project Area 3

Table 3-3. Soils within Project Area 3

Table 4-1. WOTUS Features Identified in the Project Area

Table 4-2. Threatened and Endangered Species Listed in the Project Area and Findings

Table 4-3. Wildlife Species Observed in the Project Area

Table 5-1. Activity Specific Guidelines for Work near Nesting Bald Eagles

Table 5-2. Nesting Bald Eagle Activities, Timeframes, and Sensitivity Magnitudes

Appendices

Appendix A Agency Correspondence Results and Reports

Appendix B Wetland Determination Data Forms

Appendix C Photographs

Abbreviations and Acronyms

BGEPA	Bald and Golden Eagle Protection Act
CFR	Code of Federal Regulations
CWA	Clean Water Act
dbh	diameter at breast height
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
GIS	geographical information system
GPS	global positioning system
MBTA	Migratory Bird Treaty Act
MDC	Missouri Department of Conservation
MDNR	Missouri Department of Natural Resources
NHD	National Hydrography Dataset
NWI	National Wetland Inventory
NRCS	Natural Resources Conservation Service
msl	mean seal level
OHWM	ordinary high water mark
PEM	palustrine emergent wetland
PFO	palustrine forested wetland
PBRT	potential bat roost tree
T&E	threatened and endangered
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WOTUS	waters of the U.S.

1. INTRODUCTION

In support of the Natural Resources Conservation Service (NRCS), an agency of the U.S. Department of Agriculture (USDA), Prairie Engineers, P.C. (Prairie), a partner of Conservation Works Joint Venture (CWJV), conducted a waters of the U.S. (WOTUS) delineation and threatened and endangered (T&E) species assessment for the Lick Creek and Dudley Main Watershed Project in southeast Missouri. As project sponsor, Drainage District 12 proposes a Watershed and Flood Prevention Operations Public Law (PL) 83-566 project to address agricultural water management in the watershed. This watershed resides in Stoddard County, Missouri.

The purpose of the proposed project is to prevent damage from erosion, floodwater, and excessive sediment deposition in and adjacent to drainage canals (ditches) within Drainage District 12 (DD12) that support agricultural cropland. The primary PL 83-566 authorized purpose is agricultural water management improvements which would benefit local landowners, farmers, and communities as well as fulfill the general purposes of PL 83-566. The need of the project is to address flood damages and aged infrastructure:

Structural and non-structural erosion, flood, and sediment control and reduction alternatives are currently being evaluated for the project. Potential improvement reaches of drainage canals within the watershed as well as a potential wetland development area were designated as project areas for the watershed planning project. The overall project includes six individual project areas as identified on Figure 1-1.

This report provides the results of the WOTUS delineation and T&E assessment of the proposed project areas. The purpose of the study was to delineate potential WOTUS features as well as potentially suitable habitat or the presence of federal- and state-listed T&E species within the project area. Results of the study will be used for resource analysis for the project's Watershed Plan – Environmental Assessment (Plan-EA), including consultation with U.S. Army Corps of Engineers (USACE), U.S. Fish and Wildlife Service (USFWS), Missouri Department of Conservation (MDC), and Missouri Department of Natural Resources (MDNR) to help determine potential impacts to identified resources. Further, the findings of this report will allow for avoidance and minimization efforts and assist in potential permitting needs for the selected alternative(s). For more information regarding the watershed planning project or details regarding WOTUS or T&E species for the entire watershed, please refer to the project's Plan-EA.

Waters of the U.S. are those waters subject to federal jurisdiction under the Clean Water Act (CWA) and may include wetlands, streams, lakes, ponds, or other water features that are hydrologically connected to traditional navigable waters. New and amended definitions of "waters of the United States" were published in 2023 and can be found at 33 CFR Part 328 (Department of the Army) and 40 CFR Part 120 [U.S. Environmental Protection Agency (USEPA)]. Determining whether a water feature would be considered WOTUS requires an evaluation in accordance with current regulations, case law, and clarifying guidance. Prairie has provided its opinion of WOTUS status for the water features identified in the project area; however, the USACE and the USEPA have the ultimate authority as to which water features would be considered federally jurisdictional WOTUS and subject to CWA Section 404/401 permitting.

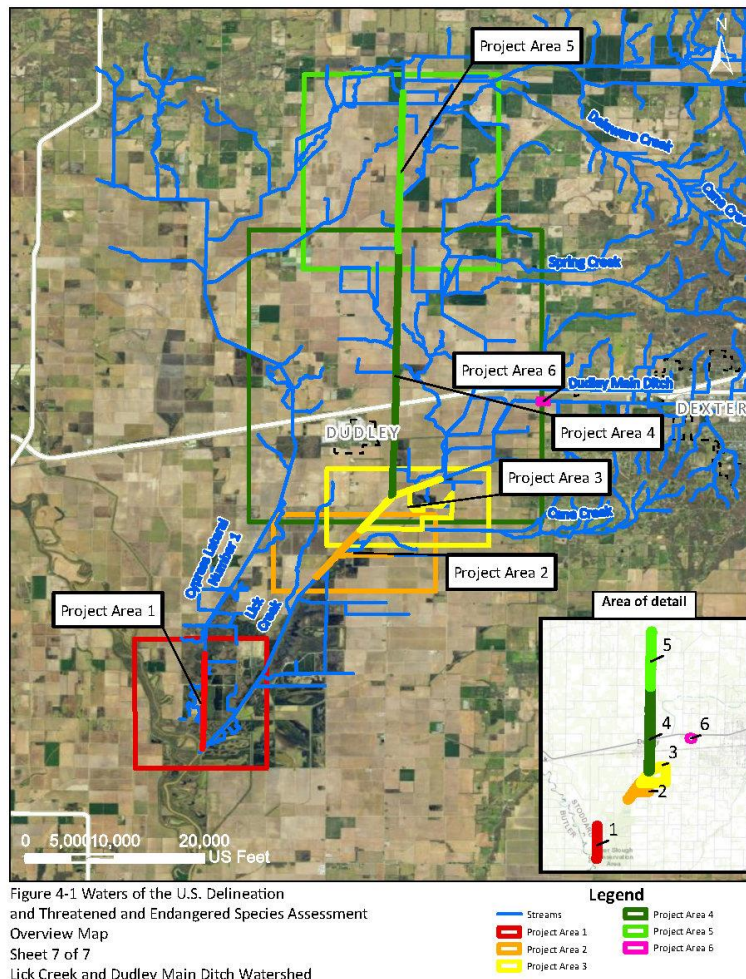


Figure 1-1. Project Location.

2. METHODOLOGY

2.1. Resource Data Review

Several resource data sources were reviewed as planning tools prior to field reconnaissance. These include but are not limited to the following:

- National Wetland Inventory (NWI) maps
- National Hydrography Dataset (NHD)
- U.S. Geological Survey (USGS) topographic maps
- Federal Emergency Management Agency (FEMA) maps
- Recent and historical aerial imagery
- NRCS soil survey
- USFWS Information for Planning and Consultation (IPaC)
- Client-provided previous data and reports
- Interagency scoping responses

2.1.1. Threatened and Endangered Species

Both the overall Lick Creek and Dudley Main Ditch Watershed and the project areas were reviewed through USFWS IPaC to obtain federally listed T&E species that are protected under the Endangered Species Act (ESA) (see Table 2-1). The two queries resulted in the same species. Critical habitat for listed species was not identified in the IPaC reports. Further, the state status of listed species was reviewed on MDC's *Missouri Species and Communities of Conservation Concern Checklist* (MDC 2022). The state status of each listed species is also identified in Table 2-1 below.

Through interagency scoping for the project, MDC provided a Natural Heritage Review Report (NHRR) for the overall Lick Creek and Dudley Main Ditch Watershed on October 5, 2023. According to the NHRR, the St. Francis River and its tributaries support many federal- and state-listed aquatic species of concern, including fish, mussels, and crayfish. The NHRR indicates that the federally protected bald eagle (*Haliaeetus leucocephalus*) occurs in the project area and that the following listed species occur near the watershed: alligator snapping turtle (*Macrochelys temminckii*), rabbitsfoot (*Quadrula cylindrica cylindrica*), pink mucket (*Lampsilis abrupta*), and American bitterns (*Botaurus lentiginosus*) (MDC 2023). MDC indicated that state-ranked species occur near the watershed (see Table 2-2). Note that no current regulatory requirements are associated with these state-ranked species other than voluntary stewardship. The IPaC reports and NHRR are included in Appendix A.

Table 2-1. Threatened and Endangered Species Listed in the Project Area

Scientific Name	Common Name	Federal Status	State Status
Mammals			
<i>Myotis grisescens</i>	gray bat	E	E
<i>Myotis sodalis</i>	Indiana bat	E	E
<i>Myotis septentrionalis</i>	northern long-eared bat	E	T
<i>Perimyotis subflavus</i>	tricolored bat	PE	N/A
Reptiles			
<i>Macrochelys temminckii</i>	alligator snapping turtle	PT	N/A
Clams			
<i>Quadrula cylindrica cylindrica</i>	rabbitsfoot	T	E
<i>Epioblasma triquetra</i>	snuffbox mussel	E	E
<i>Cyprogenia aberti</i>	western fanshell	T	N/A
Insects			
<i>Danaus plexippus</i>	monarch butterfly	C	N/A

Sources: USFWS 2023b and MDC 2022

E = endangered, T = threatened, C = candidate species; PE = proposed endangered; PT = proposed threatened

Table 2-2. State-Ranked Species near the Watershed

Scientific Name	Common Name	State Rank	Proximity to Watershed	Primary Habitat
Amphibians				
<i>Ambystoma talpoideum</i>	mole salamander	S2	< 1 mile	forest bottomland, wetland matrix
<i>Amphiuma tridactylum</i>	three-toed amphiuma	S2	< 2 miles	aquatic matrix, shallow oxbow/slough, pond/lake/deep oxbows and slough
Reptiles				
<i>Farancia abacura reinwardtii</i>	western mudsnake	S2	< 1 mile	forest bottomland, wetland matrix
Birds				
<i>Coturnicops noveboracensis</i>	yellow rail	SU	< 2 miles	wet prairie/meadow, marsh
<i>Porzana Carolina</i>	sora	S2	< 1 mile	marsh, moist edge/mudflat
<i>Ixobrychus exilis</i>	least bittern	S3	< 1 mile	marsh
<i>Lanius ludovicianus</i>	loggerhead shrike	S2	< 2 miles	grassland matrix, old field/shrub, savanna pasture/orchard, savanna
<i>Rallus limicola</i>	virginia rail	S2	< 1 mile	marsh, moist edge/mudflat
Crustaceans				
<i>Creaserinus fodiens</i>	digger crayfish	S2S3	< 2 miles	wetland matrix, river/stream
Mollusks				
<i>Cyclonaias nodulata</i>	wartyback	S3	< 2 miles	river/stream
<i>Leaunio lienosus</i>	little spectaclecase	S3	< 3 miles	river/stream
<i>Arcidens confragosus</i>	rock pocketbook	S3	< 2 miles	river/stream
<i>Utterbackiana</i>	flat floater	S2	< 2 miles	river/stream, pond/lake/deep oxbows and

Waters of the U.S. Delineation and
Threatened and Endangered Species Assessment
Lick Creek and Dudley Main Ditch Watersheds

4

April 2024

Scientific Name	Common Name	State Rank	Proximity to Watershed	Primary Habitat
<i>suborbiculata</i>				sloughs
<i>Cyprogenia aberti</i>	western fanshell	S2	< 3 miles	river/stream
Fish				
<i>Lepomis symmetricus</i>	bantam sunfish	S2	< 1 mile	swamp, shallow oxbow/slough
<i>Notropis texanus</i>	weed shiner	S3	< 4 miles	river/stream
<i>Opsopoeodus emilae</i>	pugnose minnow	S4	< 2 miles	river/stream, pond/lake/deep oxbows & slough, swamp, shallow oxbow/slough
<i>Centrarchus macropterus</i>	flier	S3	< 1 mile	pond/lake/deep oxbows and slough, river/stream, swamp
<i>Erimyzon sucetta</i>	lake chubsucker	S2	< 2 miles	river/stream, swamp, pond/lake/deep oxbows and slough
<i>Fundulus dispar</i>	starhead topminnow	S2	< 1 mile	swamp, pond/lake/deep oxbows and slough, shallow oxbow/slough
Mammals				
<i>Neogale frenata</i>	long-tailed weasel	S3	< 2 miles	forest matrix, habitat generalist
<i>Corynorhinus rafinesquii</i>	Rafinesque's big-eared bat	S1	< 2 miles	cave, forest matrix, urban low density vegetated, wetland matrix
<i>Sylvilagus aquaticus</i>	swamp rabbit	S2	< 1 mile	forest bottomland, wetland matrix
Insects				
<i>Paroxya hoosieri</i>	Hoosier grasshopper	S1	< 1 mile	wetland matrix, moist edge/mudflat, marsh
<i>Inscudderia taxodii</i>	bald cypress katydid	S1	< 2 miles	swamp, shallow oxbow/slough, forest bottomland
<i>Catocala pretiosa Texarkana</i>	precious underwing moth	S3?	< 2 miles	marsh, shrub swamp, swamp
<i>Euphyes dukesi</i>	Duke's skipper	S1	< 1 mile	shrub swamp, shallow oxbow/slough, swamp
Plants				
<i>Eupatorium semiserratum</i>	a thoroughwort	S1S2	< 1 mile	forest matrix, roadside/railroad
<i>Hottonia inflata</i>	featherfoil	S2	< 2 miles	swamp, shallow oxbow/slough, sinkhole pond, sand/gravel bars
<i>Hydrocotyle ranunculoides</i>	floating pennywort	S1S2	< 2 miles	pond/lake/deep oxbows and slough, moist edge/mudflat
<i>Cynoscadium digitatum</i>	finger dogshade	S2	< 1 mile	wetland matrix, forest bottomland
<i>Hypericum lobocarpum</i>	a st. john's wort	S1	< 1 mile	forest upland, fen/seep
<i>Justicia ovata var. lanceolata</i>	a water willow	S2	< 2 miles	wetland matrix, forest bottomland
<i>Limnobia spongia ssp. Spongia</i>	American frogbit	S2	< 2 miles	moist edge/mudflat, wet ditches, swamp
<i>Limnoscadium pinnatum</i>	pinnate dogshade	S1	< 2 miles	glade complex, grassland native prairie, roadside/railroad
<i>Ludwigia leptocarpa</i>	primrose willow	S2	< 2 miles	wetland matrix
<i>Carex buxbaumii</i>	brown bog sedge	S2	< 2 miles	grassland matrix, fen/seep, forest bottomland

Scientific Name	Common Name	State Rank	Proximity to Watershed	Primary Habitat
<i>Carex reniformis</i>	reniform sedge	S1	< 2 miles	forest bottomland
<i>Carex triangularis</i>	triangular sedge	S2	< 1 mile	swamp, forest bottomland, roadside/railroad
<i>Mecardonia acuminata</i>	water hyssop	S1	< 2 miles	shallow oxbow/slough, moist edge/mudflat, wet prairie/meadow
<i>Peltandra virginica</i> ssp. <i>virginica</i>	arrow arum	S2	< 2 miles	wet ditches, shallow oxbow/slough, moist edge/mudflat
<i>Platanthera flava</i>	rein orchid	S2	< 5 miles	forest bottomland, woodland, grassland native prairie
<i>Plectomerus dombeyanus</i>	bankclimber	S3	< 2 miles	rivers/streams
<i>Pycnanthemum muticum</i>	blunt mountain mint	S2	< 2 miles	forest bottomland, wet ditches, swamp, fen/seep
<i>Satyroides appalachia leeuwi</i>	Appalachian eyed brown	S1	< 2 miles	woodland, swamp
<i>Steinchisma hians</i>	gaping panic grass	S3	< 2 miles	swamp, forest bottomland, moist edge/mudflat, spring/spring branch, wet ditches
<i>Tettigidea armata</i>	spined grouse locust	S2S3	< 2 miles	swamp
<i>Thalia dealbata</i>	water canna	S2	< 2 miles	swamp, wet ditches, pond/lake/deep oxbows & slough
<i>Wolffia columbiana</i>	columbia water-meal	SU	< 2 miles	pond/lake/deep oxbows & slough, rivers/streams, wet ditches
<i>Wolffiella gladiata</i>	wolffiella	S1	< 1 mile	pond/lake/deep oxbows & slough

Source: MDC 2023

State Rank Definitions: S1 = Critically imperiled in the state because of extreme rarity of or because of some factor(s) making it especially vulnerable to extirpation from the state. Typically, 5 or fewer occurrences or very few remaining individuals (<1,000). S2 = Imperiled in the state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state (6 to 20 occurrences or few remaining individuals). S3 = Vulnerable in the state either because rare and uncommon, or found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extirpation. Typically, 21 to 100 occurrences or between 3,000 and 10,000 individuals. S4 = Uncommon but not rare and usually widespread in the nation or state. Possible cause of long-term concern. Usually more than 100 occurrences and more than 10,000 individuals. SU = Currently unrankable due to a lack of information or due to substantially conflicting information about status or trends.

2.1.2. Migratory Birds and Bald Eagles

Both the overall Lick Creek and Dudley Main Ditch Watershed as well as the project areas were reviewed via USFWS IPaC to obtain migratory bird species protected by the Migratory Bird Treaty Act (MBTA) or the Bald and Golden Eagle Protection Act (BGEPA). Fifteen bird species are listed for the watershed and fourteen bird species are listed for the project areas. Protected bird species within the project areas are listed in Table2-3. The IPaC reports are included in Appendix A.

Table 2-3. Migratory Birds Listed in the Project Areas

Scientific Name	Common Name	Breeding Season
<i>Pluvialis dominica</i>	American golden-plover	Breeds elsewhere
<i>Haliaeetus leucocephalus</i>	bald eagle	Breeds September 1 to July 31
<i>Chaetura pelagica</i>	chimney swift	Breeds March 15 to August 25
<i>Ammodramus henslowii</i>	Henslow's sparrow	Breeds elsewhere
<i>Oporornis formosus</i>	Kentucky warbler	Breeds April 20 to August 20
<i>Rallus elegans</i>	king rail	Breeds May 1 to September 5
<i>Tinga flavipes</i>	lesser yellowlegs	Breeds elsewhere
<i>Egretta caerulea</i>	little blue heron	Breeds March 10 to October 15
<i>Calidris melanotos</i>	pectoral sandpiper	Breeds elsewhere
<i>Dendroica discolor</i>	prairie warbler	Breeds April 1 to July 31
<i>Protonotaria citrea</i>	prothonotary warbler	Breeds April 1 to July 31
<i>Melanerpes erythrocephalus</i>	red-headed woodpecker	Breeds May 10 to September 10
<i>Euphagus carolinus</i>	rusty blackbird	Breeds elsewhere
<i>Hylocichla mustelina</i>	wood thrush	Breeds May 10 to August 31

Source: USFWS IPaC 2023b.

2.1.2.1. Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle (*Haliaeetus leucocephalus*) is a North American raptor species with a historic range extending from Alaska and Canada to northern Mexico. The staple food of bald eagles is fish, and this species lives near rivers, lakes, and wetlands where this food source is plentiful. Habitat for the bald eagle includes estuaries, large lakes, rivers, and open water sources with large trees for perching and nesting. Bald eagles typically use the same nest each year, simply enlarging the nest each year. They will also use one or more alternate nests. Bald eagle nests can reach ten feet in width and weigh up to 1,000 pounds. This species may live 15 to 25 years and usually returns to breeding grounds within 100 miles of where they were reared (USFWS 2021).

The BGEPA was enacted in 1940 and prohibits anyone from “taking” bald or golden eagles without a permit. The BGEPA provides criminal penalties to person known to “take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or in any manner any bald eagle commonly known as the American eagle or any golden eagle, alive or dead, or any part, nest, or egg thereof the foregoing eagles...” 50 CFR 22.6 further defines “take” as “pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, or disturb.” Disturb is defined as “to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, 1) injury to the eagle; 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior; or

3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.”

A victim of the effects of the popular 1940s persistent organic pollutant dichloro-diphenyl-trichloroethane (DDT) which contaminated its food source, along with habitat destruction and degradation as well as illegal killings, bald eagle populations had significantly declined, and the species was listed under the Endangered Species Preservation Act of 1966. Following enactment of the ESA in 1973, the bald eagle was officially listed as endangered in 1978. Due to the recovery of the species, in part due to the banning of DDT use and other related pesticides in 1972, the bald eagle was removed from the ESA in 2007. However, this species, our national symbol, continues to be protected under the BGEPA and the MBTA (USFWS 2021).

2.2. Field Methods

Fieldwork was conducted in November 2023 following desktop review to verify mapped resources. The field survey team consisted of two biologists with training and expertise in WOTUS delineations and T&E habitat assessments and specific knowledge and expertise in local flora and fauna. Sampling points, features, and boundaries were located using global positioning system (GPS) devices, which were subsequently downloaded into ArcGIS geographical information system (GIS). The GIS information collected during desktop review and fieldwork was used to refine feature boundaries as well as generate feature measurements and report figures. Data and features presented herein are intended to provide an overview of potential resource concerns within the project areas. Once design plans are completed, additional delineation efforts may be needed to supplement Section 404/401 permitting, should it be needed for the selected alternative(s).

2.2.1. Waters of the U.S.

2.2.1.1. Wetlands

Potential wetland areas were evaluated in general accordance with the *Corps of Engineers Wetlands Delineation Manual* (USACE 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region* (Version 2.0) (USACE 2010). Areas were identified as wetlands if current conditions met specific criteria identified in the *Manual* regarding the presence of dominant wetland vegetation, hydric soils, and a source of hydrology to support these two criteria.

2.2.1.2. Streams

Streams meeting WOTUS criteria typically exhibit an ordinary high-water mark (OHWM) as the lateral jurisdictional limits. 33 CFR 328.3(c)(4) defines OHWM as “that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.” Streams and drainage canals were observed for evidence of an OHWM as well as general stream and riparian corridor characteristics.



2.2.2. Threatened and Endangered Species

The T&E field survey entailed documenting general observations of the project area for potentially suitable habitat and evidence of listed species. Trees within and adjacent to the project area were observed in accordance with USFWS’s 2023 *Range-Wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines* (March 2023). Suitable summer habitat for the Indiana, northern long-eared, and tricolored bats includes trees within or near forested habitat that exhibit specific characteristics as described in the *Guidelines*. The gray bat occupies cave or cave-like structures year-round. Further, the listed bat species may also be found in anthropogenic structures such as bridges, culverts, buildings, and barns. In addition to field surveys for potentially suitable habitat and evidence of listed species, Prairie biologists reviewed the project area for other protected species such as the bald eagle.

3. PROJECT SETTING

The Lick Creek and Dudley Main Ditch Watershed are located in the “bootheel” of southeast Missouri which is comprised of vast Mississippi River floodplain and is a natural basin for flooding. Historically, the area was subject to overflow flooding from the Mississippi and Ohio Rivers as well as from Ozark highland streams that flow to the vast floodplain. These historical flooding events resulted in extensive deposition of nutrient-rich and fertile soil, and what was once nearly uninhabitable swamp was transformed into agricultural land through a vast network of drainage canal infrastructure. Today, the land cover in the watersheds is predominately comprised of cultivated crops (60.2%), deciduous forest (13.8%), and hay/pasture (13.6%) (NLCD 2019).

The project areas consist of reaches of man-excavated drainage canals and are integral infrastructure within the regional drainage system in addition to an approximate 675-acre tract of cropland at the location of the historical Glade Swamp that includes partially reconstructed emergent and forested wetlands. The level, uniform landscape consists of cultivated crop fields which are highly manipulated with ditches, berms, irrigation systems, and pump systems. Primary crops observed include corn, soybeans, cotton, rice, and peanuts. The levees of the drainage canals provide topographic relief. Farming practices occur generally to the top of bank and unmanaged lands are limited to conservation areas (CAs), wetland mitigation banks, and waterfowl hunt clubs that are scattered throughout the region.

3.1. Ecoregions

The project area is primarily situated in the Bluff Hills ecoregion. This region is comprised of a disjunct series of loess-capped low hills with more relief than the surrounding region. This formation may be the result of movement on the New Madrid seismic zone. The geology is diverse, containing sands, gravel, clays, and bedrock from several geologic formations. On lower slopes and in gravely areas, spring fed streams and seep areas can be found. The soils tend to be well drained, loamier, and more eroded than those of the surrounding Mississippi Alluvial Plain. Land cover is mainly comprised of pasture and woodland, with limited portions of row crop agriculture (Chapman et al. 2002).

3.2. USGS Topography

According to USGS quadrangle maps, topography of the overall watershed is highly variable due to the contrast between the floodplain that makes up the majority of the watershed, averaging around 300 feet msl (mean sea level) and Crowley’s Ridge in the northeast, which provides increased relief up to approximately 580 feet msl. However, the project area consists of a flat floodplain landscape drained by canals (ditches) with little sinuosity. Relief within the project area is provided by levees created by the construction and maintenance of these ditches. Elevation of the top of ditch levees range from approximately 315 feet mean sea level (msl) in downstream reaches near the confluence with the St. Francis River to approximately 325 feet msl in upstream reaches. The manmade canals are depicted in early historical topographic maps dating back to the 1930s. Drainage canals in the project area are depicted on USGS quadrangle maps as perennial blue-line streams (USGS multiple years).

3.3. Water Quality

Current water quality conditions of the streams in the project area were reviewed through MDNR and USEPA resources. The water quality of the streams in the project area is currently either in good or unknown condition and none are listed on Missouri’s 2020 303(d) list of impaired waters. See Table 3-1.

Table 3-1. Water Quality Conditions of Streams in the Project Area

Stream Name	State Waterbody ID	Listed on Missouri 2020 303(d) List ¹	Waterbody Condition ²
Cypress Lateral Number 1	MO_2982.00	no	good
Cypress Lateral Number 1	MO_2981.00	no	unknown
Dudley Main Ditch	MO_2977.00	no	unknown
Lick Creek Ditch	MO_2980.00	no	unknown
Spring Creek Ditch	MO_2979.00	no	unknown
Cane Creek	n/a	no	unknown

¹ MDNR. 2020.

² USEPA. 2023.

3.4. National Wetland Inventory

According to the NWI Wetlands Mapper, the three main streams within the project area (Lick Creek, Dudley Main Ditch, Cypress Lateral Number 1) are depicted as a permanently flooded, lower perennial riverine habitat with an unconsolidated bottom that was excavated by humans (R2UBHx). Cane Creek is identified as a seasonally flooded intermittent riverine streambed that was excavated by humans (R4SBCx). Tributary 1 , an unnamed tributary of Lick Creek within Project Area 4, is depicted as a seasonally flooded intermittent riverine streambed (R4SBC). Project Area 3 has been mapped with three types of wetland features as listed in Table 3-2 illustrated in Figure 3-1.

Table 3-2. NWI-Mapped Wetlands Features in Project Area 3

Wetland Type	NWI Code	Description
Forested	PFO1Ax	temporary flooded broad-leaved deciduous forested wetland with an excavated bottom
Emergent	PEM1A	temporary flooded persistent emergent wetland

Source : USFWS 2023d.

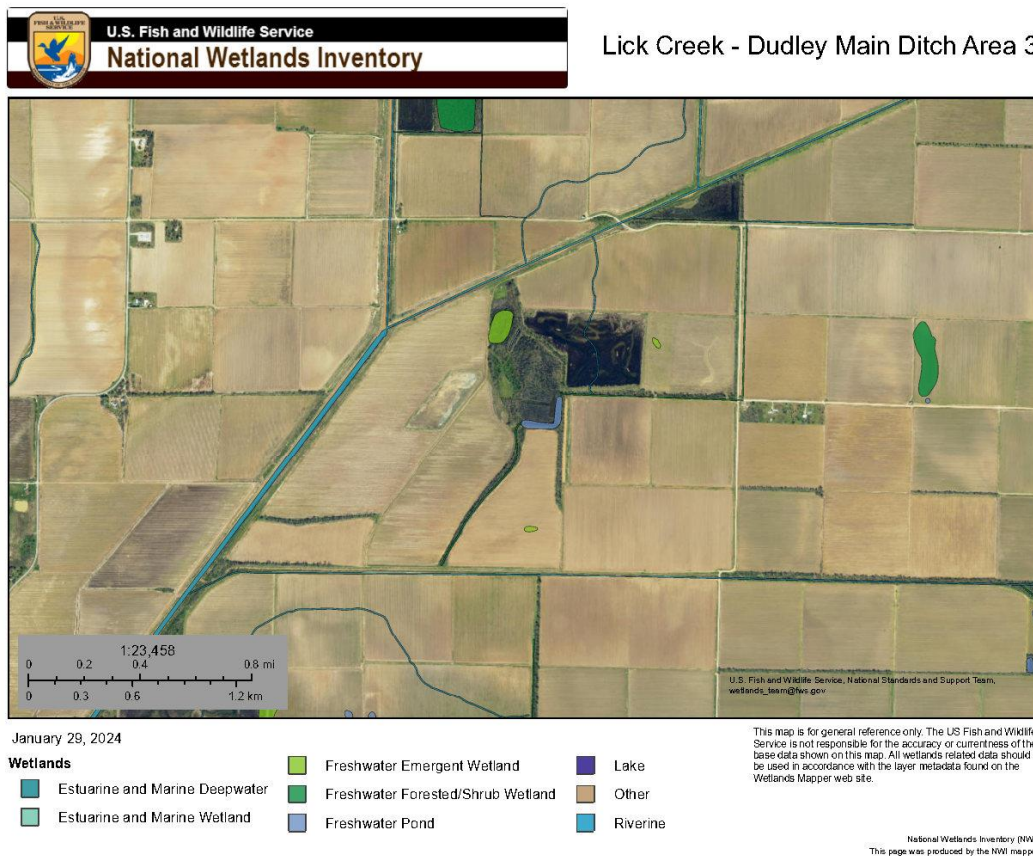


Figure 3-1. NWI Map of Project Area 3

3.5. Floodplain Mapping

According to available FEMA Flood Insurance Rate Maps of the project area [Community Panel Number (CPN) 2908450075B, effective date October 18, 1983; CPN 2908450150B, effective date October 18, 1983; CPN 2908450175B, effective date October 18, 1983; and CPN 2908450225B, effective date October 18, 1983] the project area exists in flood hazard areas (FEMA 2023).

3.6. Soils

According to the NRCS Web Soil Survey, the project area has been mapped with 14 soil types, most of which characterized as having a relatively high hydric rating. NRCS defines hydric soils as those “formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part.” Hydric soils are an indicator of potential wetlands. Project Area 3 is the only of the six project areas that exhibited potential wetlands. Table 3-3 lists Project Area 3 soils and pertinent characteristics.

Table 3-3. Soils in Project Area 3

Map Unit Symbol	Map Unit Name	Hydric Rating	Natural Drainage Class	Depth to Water Table
99038	Levees-Borrow pits complex, 0 to 25 percent slopes	40	Somewhat poorly drained	more than 80 inches
86115	Overcup silt loam, 0 to 1 percent slopes, occasionally flooded	100	Poorly drained	~ 0 to 15 inches
86003	Amagon silt loam, 0 to 1 percent slopes, occasionally flooded	94	Poorly drained	~ 0 to 15 inches
90309	Calhoun silt loam, 0 to 3 percent slopes	100	Poorly drained	~ 0 to 9 inches
90310	Falaya silt loam, 0 to 3 percent slopes	9	Somewhat poorly drained	~ 12 to 24 inches

Source: USDA-NRCS. 2023.

4. RESULTS

Prairie Engineers, PC conducted a WOTUS delineation and field assessment of potentially suitable habitat of T&E listed species for the project area in November 2023. Results of these studies are summarized herein. Representative photographs are included in Appendix B. During the delineation, including the desktop review of the project area, five streams (drainage canals) were observed. The project area includes the drainage canals, their banks, and adjacent top of bank areas. Generally, the top of bank slopes are 10 to 25 feet above the OHWM, disconnecting the ditches from their floodplain and providing an upland habitat.

Wetlands were observed both adjacent to and within the project area in floodplains with retained hydrological connection. A delineation was performed which identified a 2.5-acre forested wetland within Project Area 3.

Scattered potentially suitable summer bat roosting trees (PBRTs) were observed in the project area as well as several bald eagles. Bald eagles and various waterfowl were observed utilizing the drainage canal system, developed wetlands, and adjacent conservation areas. Throughout the project area, mainly on the drainage canals' upper slopes and tops of bank, were scattered populations of common milkweed (*Asclepias syriaca*) as well as other flowering plants providing a vital food source of the monarch butterfly (*Danaus plexippus*). The monarch butterfly is a candidate species for listing under the ESA, the larvae of which rely on milkweed as a primary food source, while adult monarchs feed on nectar from a wide variety of flowering plants.

4.1. Waters of the U.S.

The project area includes reaches of five streams (drainage canals) and one wetland within Project Area 3, as identified in Table 4-1.

Table 4-1. WOTUS Features Identified in the Project Area

Project Area (s)	Feature	Type	Measure	
	Streams		Miles	Linear Feet (LF)
3,6	Dudley Main Ditch	Perennial	1.1	5,625
2,3,4,5	Lick Creek	Perennial	10.7	56,470
1	Cypress Lateral Number 1	Perennial	2	10,571
3	Cane Creek	Perennial	1.5	8,183
2	Tributary 1	Perennial	0.9	4,910
	Total		16.3	85,759
	Wetlands		Acres	
3	Wetland 1	Forested	2.5	
	Total		2.5	

4.1.1. Streams

Five streams totaling approximately 16.2 miles [85,759 linear feet (LF)] were identified in the project area, including Lick Creek and four of its tributaries.

Lick Creek is a perennial stream that flows north to south before shifting to southwest with 10.7 miles occurring within the project area. It ranges from 20 to 40 feet wide at the OHWM with 100 to 120 feet between the tops of bank. The top of bank is approximately 15 to 20 feet above the OHWM. Bank cover ranges from grasses and forbs in some areas to shrubs and trees, typically less than 12-inch diameter at breast height (dbh), in others. Most portions of the stream's banks exhibit some level of erosion and sloughing. Sedimentation within the channel was apparent throughout the stream.

Dudley Main Ditch is a perennial stream that flows west-east before turning southwest and joining Lick Creek with 1.1 miles occurring within the project area. Dudley Main Ditch is approximately 30 feet wide at the OHWM with 75 feet between the tops of bank. On average, the top of bank is 10 feet above the OHWM. Banks are incised and typical cover is herbaceous and shrubby.

Cane Creek is a perennial stream, approximately 1.5 miles of which occurs within the project area, that flows east-west and joins Lick Creek just downstream of the confluence with Dudley Main Ditch. Cane Creek is approximately 20 feet wide at the OHWM with 45 feet between the tops of bank. On average, the top of bank is 10 feet above the OHWM.

Tributary 1 is an unnamed tributary of Lick Creek, of which approximately 0.9 miles occurs within the project area, that flows east-west along County Road 642 and joins Lick Creek just downstream of the confluence with Cane Creek. This tributary is ranges from 8 to 10 feet wide at the OHWM with approximately 40 feet between the tops of bank. The top of bank is approximately 8 feet above the OHWM. The banks are mostly herbaceous with some scattered shrubs.

Cypress Lateral Number 1, of which approximately 2 miles is within the project area, flows north-south and enters Lick Creek just upstream of the terminus at the St. Francis River. It is approximately 40 feet wide at the OHWM and 100 feet between the tops of bank. The top of bank ranges from 15 to 25 feet above the OHWM. The lower stretches of this stream exhibit some of the heaviest erosion within the project area with large sections of bank sloughing.

4.1.2. Wetlands

One wetland was identified in the project area, specifically within Project Area 3. This wetland is in an area that is labeled on a historic quadrangle map as “The Glades Swamp” (USGS 1934). This wetland lies between 3 streams including Dudley Main Ditch to the north, Lick Creek to the west, and Cane Creek to the south.

Wetland 1 is a 27.4-acre palustrine forested wetland (PFO), of which 2.5-acres falls within the project area. This wetland is dominated by trees and shrubs including Shumard’s oak (*Quercus shumardii*), willow oak (*Quercus phellos*), silver maple (*Acer saccharinum*), honeylocust (*Gleditsia tricanthos*), black willow (*Salix nigra*), and buttonbush (*Cephalanthus occidentalis*). Areas with thinner canopy cover also had an herbaceous component comprised of Pennsylvania smartweed (*Persicaria pennsylvanica*), a sedge (*Carex sp.*), and panicked aster (*Symphyotrichum lanceolatum*). The adjacent upland areas had a distinct change in topography. The upland areas exhibited many of the same species, with the addition of Eastern red cedar (*Juniperus virginiana*) and autumn olive (*Eleagnus umbellate*).

4.2. Threatened and Endangered Species

During the field assessment, scattered trees exhibiting characteristics of potentially suitable habitat for the Indiana, northern long-eared, and tricolored bats were observed in and adjacent to the project area. Habitat for migratory birds was observed and several shorebirds were observed along the drainage canals in the project area. Portions of the Project Area 1 near the confluence with the St. Francis River exhibited potentially suitable habitat for two species of endangered mussels, the pink mucket and rabbitsfoot. Both species require small to medium streams with substrate comprised of sand, gravel, or cobble as well as suitable habitat for the host fish that facilitate the mussels' reproduction. Table 4-2 lists the findings of the T&E assessment for the project area.

Table 4-2. Threatened and Endangered Species Listed in the Project Area and Findings

Scientific Name	Common Name	Federal Status	State Status	Findings – Potential Habitat or Population Present
Mammals				
<i>Myotis grisescens</i>	gray bat	E	E	Caves are not present in the project area; therefore, this species is unlikely to occur.
<i>Myotis sodalis</i>	Indiana bat	E	E	Potentially suitable habitat observed in the project area.
<i>Myotis septentrionalis</i>	northern long-eared bat	E	T	Potentially suitable habitat observed in the project area.
<i>Perimyotis subflavus</i>	tricolored bat	PE	N/A	Potentially suitable habitat observed in the project area.
Reptiles				
<i>Macrochelys temminckii</i>	alligator snapping turtle	PT	N/A	Species unlikely to occur in the project area due to the degraded condition of the heavily sedimented drainage canals.
Mollusks				
<i>Lampsilis abrupta</i>	pink mucket	E	E	Potentially suitable habitat observed in the project area.
<i>Quadrula cylindrica cylindrica</i>	rabbitsfoot	T	E	Potentially suitable habitat observed in the project area.
Birds				
<i>Botaurus lentiginosus</i>	American bittern	N/A	E	Suitable habitat occurs adjacent to but not within the project limits.
Insects				
<i>Danaus plexippus</i>	monarch butterfly	C	N/A	Although habitat for this species exists throughout the project area and areas beyond, this species is currently not legally protected.

Sources: USFWS 2023a and MDC 2022

E = endangered, T = threatened, C = candidate species; PE = proposed endangered; PT = proposed threatened

4.3. Bald Eagle

Several bald eagles were observed within and near the project area, typically within adjacent conservation areas or near open water features with ample food sources.

4.4. Other Wildlife

During the field assessment, several species of wildlife were observed utilizing the drainage canals as well as surrounding land. These species can be found in Table 4-3.

Table 4-3. Wildlife Species Observed in the Project Area

Scientific Name	Common Name
Mammals	
<i>Odocoileus virginianus</i>	white-tailed deer
Birds	
<i>Haliaeetus leucocephalus</i>	bald eagle
<i>Anas platyrhynchos</i>	mallard
<i>Anas acuta</i>	northern pintail
<i>Spatula clypeata</i>	northern shoveler
<i>Fulica americana</i>	American coot
<i>Anas carolinensis</i>	green-winged teal
<i>Mareca strepera</i>	gadwall
<i>Aix sponsa</i>	wood duck
<i>Anser caerulescens</i>	snow goose
<i>Anser albifrons</i>	greater white-fronted goose

5. CONCLUSION

5.1. Waters of the U.S.

Each drainage canal proposed for improvement will likely be considered jurisdictional WOTUS and be subject to Section 404 and 401 permitting. However, regarding canal or ditch improvements, the project may meet the Section 404(f)(1)(C) exemption for maintenance of drainage ditches and therefore not be subject to permitting by the USACE. The USACE has the final determination as to which actions fall under Section 404 jurisdiction.

Proposed improvements would entail placing rock materials below the OHWM for a volume exceeding nationwide permit (NWP) thresholds. Therefore, if the project does not meet Section 404(f)(1)(C) exemptions, an individual Section 404 permit may be required. Should an individual Section 404 permit be required, an individual Section 401 Water Quality Certification from MDNR may also be required.

As the only known water quality condition of the ditches in the project area is good and the ditches are not listed on Missouri's 303(d) list, individual review of the project by the MDNR will not likely be necessary for acquisition of the project's Section 401 Water Quality Certification.

5.2. Threatened and Endangered Species

Trees are present along the edge of the project limits throughout much of the project area, especially in Project Areas 2 and 3, as well as a large, forested stand within Project Area 3. In portions of the Project Area where project boundary is limited to 25 feet from the top of bank, trees are expected to be removed. Several existing mature trees within the Project Area exhibited characteristics of potentially suitable summer habitat for the three T&E listed bat species. We recommend further assessment be conducted once design plans are prepared. Should trees exhibiting potential bat habitat need to be cleared as part of the final alternative(s), we recommend incorporating conservation measures by clearing these trees during the winter months of November 1 through March 31.

5.3. Bald Eagle Permitting

Due to presence of several bald eagles within the project area, an incidental take permit may be needed from the USFWS, even if nests will be avoided and undisturbed. Table 5-1 outlines the distance, time of year, activities, and recommendations for eagle permitting and Table 5-2 outlines bald eagle breeding season timeframes.

Table 5-1. Activity Specific Guidelines for Work near Nesting Bald Eagles

Distance	Time of Year	Activity	Recommendation
> 660 feet	Any time	All (except blasting and other extremely loud activities)	No incidental take permit.
330 to 660 feet (if similar activity within 660 feet)	Breeding Season	All	Incidental take permit may not be recommended if eagles tolerant of past disturbance. Contact USFWS.
330 to 660 feet (no similar activity within 660 feet)	Breeding Season	All	Incidental take permit recommended. Contact USFWS.
330 to 660 feet	Outside of breeding season	Activity that will not be noticeable when the eagles return (tree trimming, pipe installation, etc.)	Incidental take permit likely not recommended. Contact USFWS.
< 330 feet	Outside of breeding season	Tree clearing, building structures	Incidental take permit likely recommended. Contact USFWS.
< 330 feet	Breeding season	All	Incidental take permit recommended. Contact USFWS.

Source: USFWS 2007.

Table 5-2. Nesting Bald Eagle Activities, Timeframes, and Sensitivity Magnitudes

Reproductive Activity	Timeframe for Northern U.S., including Missouri	Sensitivity to Human Activity
Courtship and nest building	November through March	Most sensitive period; likely to respond negatively
Egg laying and incubation	January through May	Very sensitive period
Egg hatching and young rearing	February through July	Very sensitive period
Nestling period, 4 to 8 weeks	February through July	Moderately sensitive period
Nestling 8 weeks through fledging	May through August	Very sensitive period

Source: USFWS 2007.

6. REFERENCES

- Chapman, S.S., Omernik, J.M., Griffith, G.E., Schroeder, W.A., Nigh, T.A., and Wilton, T.F. 2002. Ecoregions of Iowa and Missouri (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,800,000).
- Cowardin, L.M., Carter, V., Golet, F.C., and LaRoe, E.T. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Fish and Wildlife Service, Washington DC.
- Federal Emergency Management Agency (FEMA). 2023. FEMA Flood Map Service Center. <https://msc.fema.gov/portal/home>. Accessed November 2023.
- Google Earth Pro. 2023. Current and historical aerial images.
- Missouri Department of Conservation (MDC). 2022. Missouri Species and Communities of Conservation Concern Checklist. January 2022.
- MDC. 2023. Natural Heritage Review Report. MDC, Jefferson City, Missouri. Prepared by Shelly Colatskie. October 23, 2023.
- Missouri Department of Natural Resources (MDNR). 2020. Missouri Integrated Water Quality Report and Section 303(d) List, 2020. MDNR Water Protection Program, Jefferson City, Missouri. June 23, 2020.
- U.S. Army Corps of Engineers (USACE). 1987. "Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1. U.S. Army Engineer Waterways Experiment Station. Vicksburg, MS. January 1987.
- USACE. 2010. Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region (Version 2.0). USACE Engineer Research and Development Center. Vicksburg, Mississippi. November 2010.
- U.S. Department of Agriculture - National Resources Conservation Service (USDA-NRCS). 2022. Web Soil Survey for Stoddard County, Missouri, Version 25, August 23, 2023. <https://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>. Accessed November 2023 and January 2024.
- U.S. Environmental Protection Agency (USEPA). 2023. How's My Waterway? <https://www.epa.gov/waterdata/how-s-my-waterway>. Accessed January 2024.
- U.S. Fish and Wildlife Service (USFWS). 2007. National Bald Eagle Management Guidelines. USFWS Division of Migratory Bird Management, Arlington, Virginia. May 2007.
- USFWS. 2021. Bald Eagle *Haliaeetus leucocephalus* factsheet. USFWS Migratory Bird Program, Falls Church, Virginia. February 2021.
- USFWS. 2023a. Information for Planning and Consultation (IPaC) resource list for Lick Creek – Dudley Main Ditch Watershed. <https://ipac.ecosphere.fws.gov/>. Accessed November 2023.
- USFWS. 2023b. IPaC resource list for Lick Creek and Dudley Main Ditch Watershed project areas. <https://ipac.ecosphere.fws.gov/>. Accessed November 2023.
- USFWS. 2023c. Range-Wide Indiana Bat and Northern Long-Eared Bat Survey Guidelines. USFWS, Region 3, Bloomington, Minnesota. 76pp. March 2023.
- USFWS. 2023d. National Wetland Inventory. <https://www.fws.gov/wetlands/data/mapper.html>. Accessed November and December 2023.

*References*

- U.S. Geological Survey (USGS). 1934. Puxico, Missouri Quadrangle Map. 1:62,500 scale.
- USGS. 2021a. Acorn Ridge, Missouri Quadrangle Map. 7.5-Minute Series. 1:24,000 scale.
- USGS. 2021b. Bloomfield, Missouri Quadrangle Map. 7.5-Minute Series. 1:24,000 scale.
- USGS. 2021c. Broseley, Missouri Quadrangle Map. 7.5-Minute Series. 1:24,000 scale.
- USGS. 2021d. Dexter, Missouri Quadrangle Map. 7.5-Minute Series. 1:24,000 scale.
- USGS. 2021e. Dudley, Missouri Quadrangle Map. 7.5-Minute Series. 1:24,000 scale.
- USGS. 2021f. Powe, Missouri Quadrangle Map. 7.5-Minute Series. 1:24,000 scale.



APPENDIX A

AGENCY CORRESPONDENCE RESULTS AND REPORTS

*Waters of the U.S. Delineation and
Threatened and Endangered Species Assessment
Lick Creek and Dudley Main Ditch Watersheds*

A-1

April 2024

*Watershed Plan-EA
Lick Creek and Dudley Main Ditch Watershed*

E-27

November 2025

IPaC

U.S. Fish & Wildlife Service

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Stoddard County, Missouri



Local office

Missouri Ecological Services Field Office

☎ (573) 234-2132

📠 (573) 234-2181



101 Park Deville Drive
Suite A
Columbia, MO 65203-0057

NOT FOR CONSULTATION

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Gray Bat <i>Myotis grisescens</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6329	Endangered
Indiana Bat <i>Myotis sodalis</i> Wherever found There is final critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat <i>Myotis septentrionalis</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat <i>Perimyotis subflavus</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Reptiles

NAME	STATUS
Alligator Snapping Turtle <i>Macrochelys temminckii</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4658	Proposed Threatened

Clams

NAME	STATUS
------	--------

Rabbitsfoot *Quadrula cylindrica cylindrica* Threatened

Wherever found

There is **final** critical habitat for this species. Your location does not overlap the critical habitat.

<https://ecos.fws.gov/ecp/species/5165>

Snuffbox Mussel *Epioblasma triquetra* Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/4135>

Western Fanshell *Cyprogenia aberti* Threatened

Wherever found

There is **final** critical habitat for this species. Your location does not overlap the critical habitat.

<https://ecos.fws.gov/ecp/species/6895>

Insects

NAME

STATUS

Monarch Butterfly *Danaus plexippus* Candidate

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/9743>

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act¹ and the Migratory Bird Treaty Act².

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats³, should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the ["Supplemental Information on Migratory Birds and Eagles"](#).

Additional information can be found using the following links:

- Eagle Management <https://www.fws.gov/program/eagle-management>
- Measures for avoiding and minimizing impacts to birds
<https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds>
- Nationwide conservation measures for birds
<https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>
- Supplemental Information for Migratory Birds and Eagles in IPaC
<https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action>

There are bald and/or golden eagles in your project area.

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle <i>Haliaeetus leucocephalus</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Sep 1 to Jul 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read ["Supplemental Information on Migratory Birds and Eagles"](#), specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

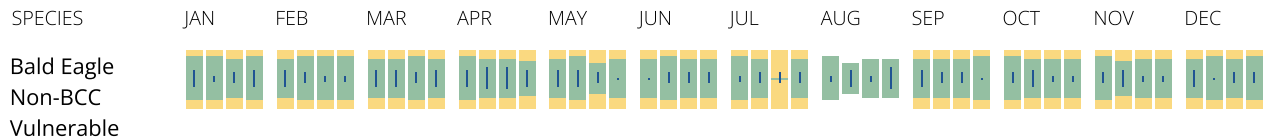
No Data (—)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort — no data



What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply). To see a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

What does IPaC use to generate the probability of presence graphs of bald and golden eagles in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the [Eagle Act](#) should such impacts occur. Please contact your local Fish and Wildlife Service Field Office if you have questions.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats³ should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the ["Supplemental Information on Migratory Birds and Eagles"](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Eagle Management <https://www.fws.gov/program/eagle-management>
- Measures for avoiding and minimizing impacts to birds
<https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds>
- Nationwide conservation measures for birds <https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>
- Supplemental Information for Migratory Birds and Eagles in IPaC
<https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Golden-plover <i>Pluvialis dominica</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Bald Eagle <i>Haliaeetus leucocephalus</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.	Breeds Sep 1 to Jul 31

Chimney Swift <i>Chaetura pelagica</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25
Henslow's Sparrow <i>Ammodramus henslowii</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/3941	Breeds elsewhere
Kentucky Warbler <i>Oporornis formosus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 20 to Aug 20
King Rail <i>Rallus elegans</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8936	Breeds May 1 to Sep 5
Lesser Yellowlegs <i>Tringa flavipes</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Little Blue Heron <i>Egretta caerulea</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 10 to Oct 15
Pectoral Sandpiper <i>Calidris melanotos</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Prairie Warbler <i>Dendroica discolor</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 1 to Jul 31
Prothonotary Warbler <i>Protonotaria citrea</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker <i>Melanerpes erythrocephalus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10

Rusty Blackbird *Euphagus carolinus*

Breeds elsewhere

This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA

Wood Thrush *Hylocichla mustelina*

Breeds May 10 to Aug 31

This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read ["Supplemental Information on Migratory Birds and Eagles"](#), specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

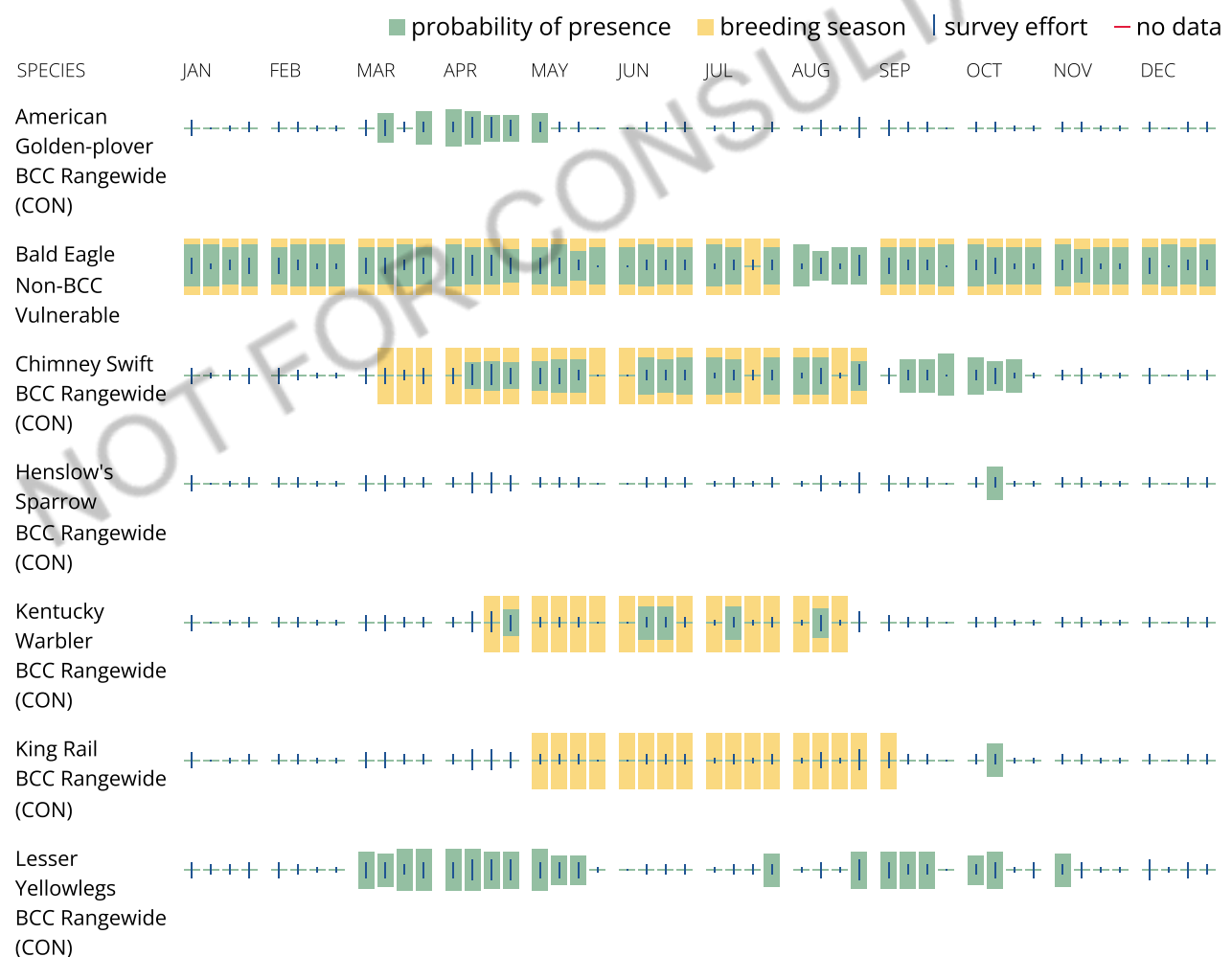
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

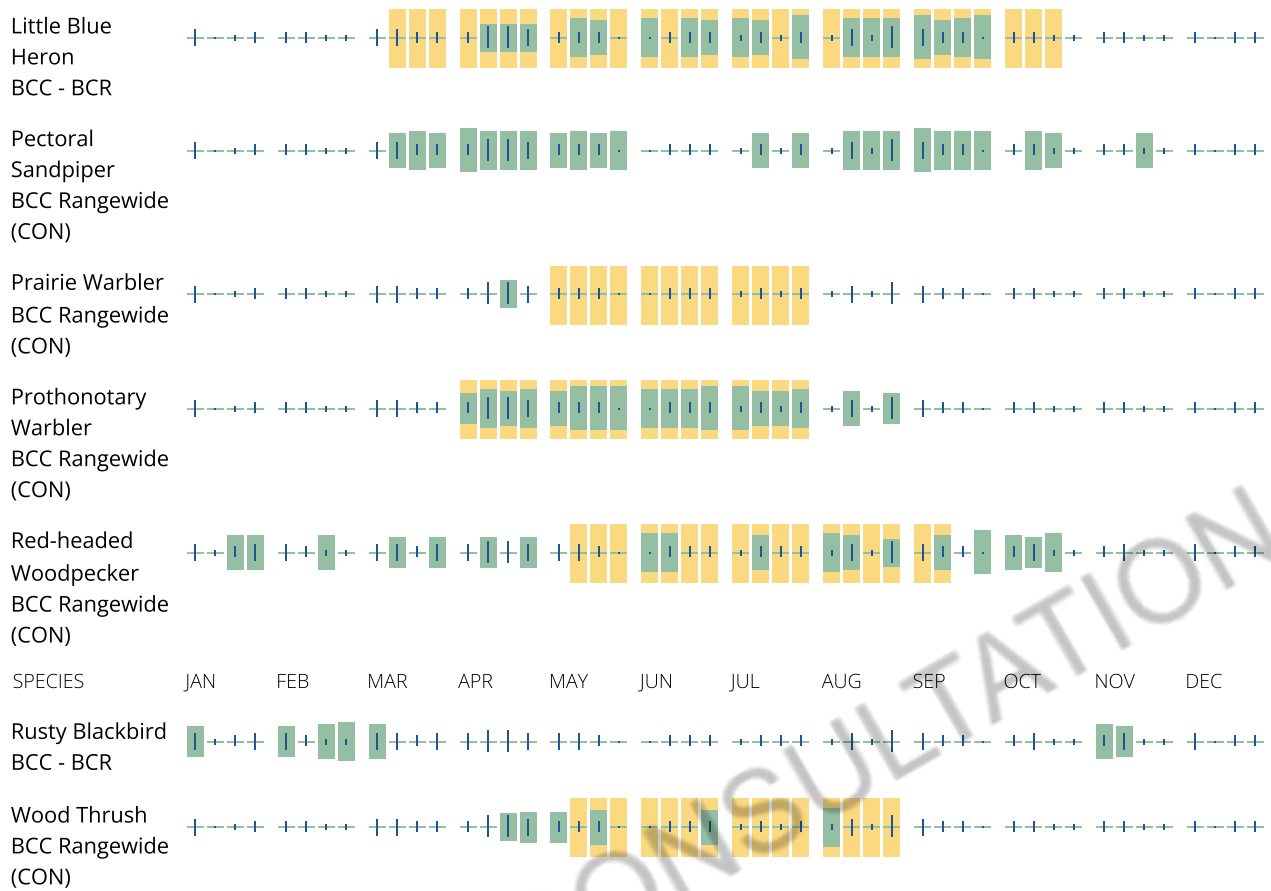
No Data (—)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.





Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the [RAIL Tool](#) and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Wetland information is not available at this time

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the [NWI map](#) to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and

nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

NOT FOR CONSULTATION

IPaC

U.S. Fish & Wildlife Service

IPaC resource list

This report is an automatically generated list of species and other resources such as critical habitat (collectively referred to as *trust resources*) under the U.S. Fish and Wildlife Service's (USFWS) jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

Location

Stoddard County, Missouri



Local office

Missouri Ecological Services Field Office

☎ (573) 234-2132

📠 (573) 234-2181



101 Park Deville Drive
Suite A
Columbia, MO 65203-0057

NOT FOR CONSULTATION

Endangered species

This resource list is for informational purposes only and does not constitute an analysis of project level impacts.

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species¹ and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries²).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

-
1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information. IPaC only shows species that are regulated by USFWS (see FAQ).

2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

Mammals

NAME	STATUS
Gray Bat <i>Myotis grisescens</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/6329	Endangered
Indiana Bat <i>Myotis sodalis</i> Wherever found There is final critical habitat for this species. Your location does not overlap the critical habitat. https://ecos.fws.gov/ecp/species/5949	Endangered
Northern Long-eared Bat <i>Myotis septentrionalis</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/9045	Endangered
Tricolored Bat <i>Perimyotis subflavus</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/10515	Proposed Endangered

Reptiles

NAME	STATUS
Alligator Snapping Turtle <i>Macrochelys temminckii</i> Wherever found No critical habitat has been designated for this species. https://ecos.fws.gov/ecp/species/4658	Proposed Threatened

Clams

NAME	STATUS
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Rabbitsfoot *Quadrula cylindrica cylindrica* Threatened

Wherever found

There is **final** critical habitat for this species. Your location does not overlap the critical habitat.

<https://ecos.fws.gov/ecp/species/5165>

Snuffbox Mussel *Epioblasma triquetra* Endangered

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/4135>

Western Fanshell *Cyprogenia aberti* Threatened

Wherever found

There is **final** critical habitat for this species. Your location does not overlap the critical habitat.

<https://ecos.fws.gov/ecp/species/6895>

Insects

NAME

STATUS

Monarch Butterfly *Danaus plexippus* Candidate

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/9743>

Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

There are no critical habitats at this location.

You are still required to determine if your project(s) may have effects on all above listed species.

Bald & Golden Eagles

Bald and golden eagles are protected under the Bald and Golden Eagle Protection Act¹ and the Migratory Bird Treaty Act².

Any person or organization who plans or conducts activities that may result in impacts to bald or golden eagles, or their habitats³, should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the ["Supplemental Information on Migratory Birds and Eagles"](#).

Additional information can be found using the following links:

- Eagle Management <https://www.fws.gov/program/eagle-management>
- Measures for avoiding and minimizing impacts to birds
<https://www.fws.gov/library/collections/avoiding-and-minimizing-incidental-take-migratory-birds>
- Nationwide conservation measures for birds
<https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>
- Supplemental Information for Migratory Birds and Eagles in IPaC
<https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action>

There are likely bald eagles present in your project area. For additional information on bald eagles, refer to [Bald Eagle Nesting and Sensitivity to Human Activity](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
Bald Eagle <i>Haliaeetus leucocephalus</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read ["Supplemental Information on Migratory Birds and Eagles"](#), specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

To see a bar's survey effort range, simply hover your mouse cursor over the bar.

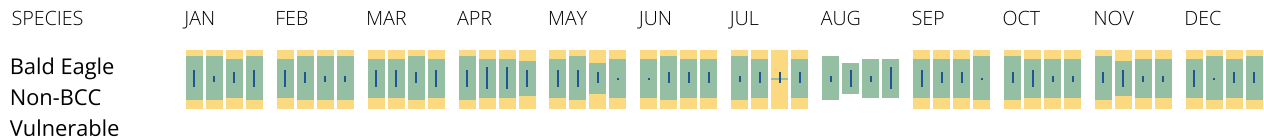
No Data (—)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.

■ probability of presence ■ breeding season | survey effort — no data



What does IPaC use to generate the potential presence of bald and golden eagles in my specified location?

The potential for eagle presence is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply). To see a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

What does IPaC use to generate the probability of presence graphs of bald and golden eagles in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to obtain a permit to avoid violating the [Eagle Act](#) should such impacts occur. Please contact your local Fish and Wildlife Service Field Office if you have questions.

Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act¹ and the Bald and Golden Eagle Protection Act².

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats³ should follow appropriate regulations and consider implementing appropriate conservation measures, as described in the links below. Specifically, please review the ["Supplemental Information on Migratory Birds and Eagles"](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Eagle Management <https://www.fws.gov/program/eagle-management>
- Measures for avoiding and minimizing impacts to birds
<https://www.fws.gov/library/collections/avoiding-and-minimizing-incident-take-migratory-birds>
- Nationwide conservation measures for birds <https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf>
- Supplemental Information for Migratory Birds and Eagles in IPaC
<https://www.fws.gov/media/supplemental-information-migratory-birds-and-bald-and-golden-eagles-may-occur-project-action>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, see the PROBABILITY OF PRESENCE SUMMARY below to see when these birds are most likely to be present and breeding in your project area.

NAME	BREEDING SEASON
American Golden-plover <i>Pluvialis dominica</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Bald Eagle <i>Haliaeetus leucocephalus</i> This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities. https://ecos.fws.gov/ecp/species/1626	Breeds Sep 1 to Jul 31

Chimney Swift <i>Chaetura pelagica</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Mar 15 to Aug 25
King Rail <i>Rallus elegans</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/8936	Breeds May 1 to Sep 5
Lesser Yellowlegs <i>Tringa flavipes</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska. https://ecos.fws.gov/ecp/species/9679	Breeds elsewhere
Little Blue Heron <i>Egretta caerulea</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds Mar 10 to Oct 15
Pectoral Sandpiper <i>Calidris melanotos</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds elsewhere
Prothonotary Warbler <i>Protonotaria citrea</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds Apr 1 to Jul 31
Red-headed Woodpecker <i>Melanerpes erythrocephalus</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Sep 10
Rusty Blackbird <i>Euphagus carolinus</i> This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA	Breeds elsewhere
Wood Thrush <i>Hylocichla mustelina</i> This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.	Breeds May 10 to Aug 31

Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read

["Supplemental Information on Migratory Birds and Eagles"](#), specifically the FAQ section titled "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any week of the year. The relative probability of presence on week 12 is $0.25/0.25 = 1$; at week 20 it is $0.05/0.25 = 0.2$.
3. The relative probability of presence calculated in the previous step undergoes a statistical conversion so that all possible values fall between 0 and 10, inclusive. This is the probability of presence score.

To see a bar's probability of presence score, simply hover your mouse cursor over the bar.

Breeding Season (■)

Yellow bars denote a very liberal estimate of the time-frame inside which the bird breeds across its entire range. If there are no yellow bars shown for a bird, it does not breed in your project area.

Survey Effort (|)

Vertical black lines superimposed on probability of presence bars indicate the number of surveys performed for that species in the 10km grid cell(s) your project area overlaps. The number of surveys is expressed as a range, for example, 33 to 64 surveys.

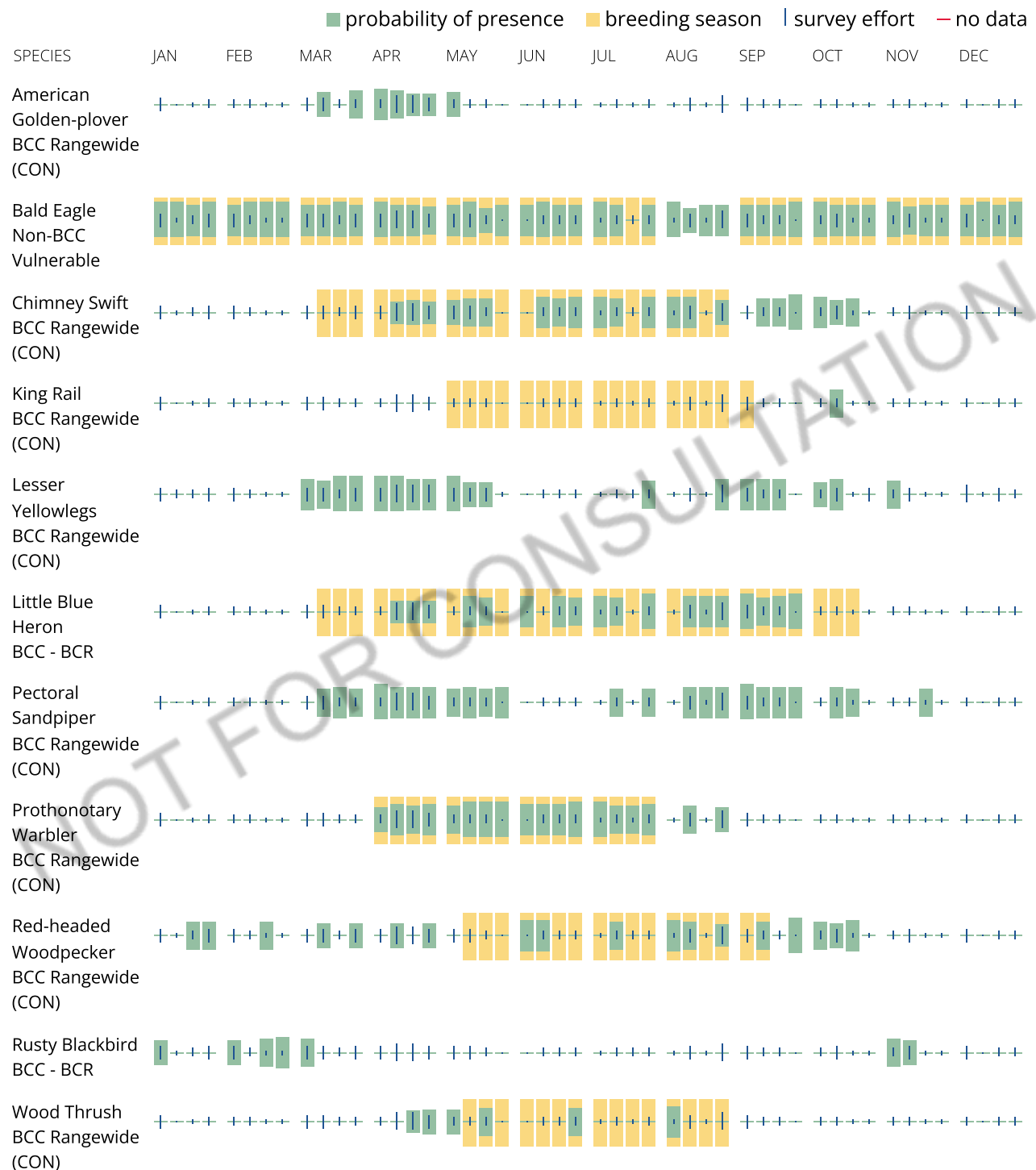
To see a bar's survey effort range, simply hover your mouse cursor over the bar.

No Data (—)

A week is marked as having no data if there were no survey events for that week.

Survey Timeframe

Surveys from only the last 10 years are used in order to ensure delivery of currently relevant information. The exception to this is areas off the Atlantic coast, where bird returns are based on all years of available data, since data in these areas is currently much more sparse.



Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

What does IPaC use to generate the list of migratory birds that potentially occur in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [Rapid Avian Information Locator \(RAIL\) Tool](#).

What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

How do I know if a bird is breeding, wintering or migrating in my area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may query your location using the [RAIL Tool](#) and look at the range maps provided for birds in your area at the bottom of the profiles provided for each bird in your results. If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);

2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

Facilities

National Wildlife Refuge lands

Any activity proposed on lands managed by the [National Wildlife Refuge](#) system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuge lands at this location.

Fish hatcheries

There are no fish hatcheries at this location.

Wetlands in the National Wetlands Inventory (NWI)

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

Wetland information is not available at this time

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the [NWI map](#) to view wetlands at this location.

Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate Federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.



Missouri Department of Conservation Natural Heritage Review Report

October 23, 2023

Science Branch
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NHR ERT ID:		NHR ERT Level:	
Project type:	Water Use		
Location/Scope:	Site 1: T24NR08ES25, T24NR08ES24, T24NR08ES13		
County:	Stoddard		
Project Title:	Lick Creek and Dudley Main Watershed Project		
Query received:	10/5/2023		

This NATURAL HERITAGE REVIEW is not a site clearance letter. Rather, it identifies public lands and records of sensitive resources located close to and/or potentially affected by the proposed project. If project plans or location change, this report may no longer be valid. Because land use conditions change and animals move, the existence of an occurrence record does not mean the species/habitat is still present. Therefore, reports include information about records near but not necessarily on the project site. Lack of an occurrence record does not mean that a sensitive species or natural community is not present on or near the project area. On-site verification is the responsibility of the project. These records serve as one reference and additional information (e.g. wetland or soils maps, on-site inspections or surveys) should be considered. Look for additional information about the biological and habitat needs of records listed to avoid or minimize impacts. More information is at [Natural Areas | Missouri Department of Conservation \(mo.gov\)](#) and [Missouri Fish and Wildlife Information System \(MOFWIS\)](#).

Level 3: Records of federal-listed (also state-listed) species or critical habitats near the project site:

- **St. Francis River:** The St. Francis River and its tributaries are home to many aquatic species of concern, including fish, mussels, and crayfish of state and/or federal status. Freshwater mussels are important indicators of water quality and stream degradation, with many in serious decline. These species must be assumed to be present in appropriate habitats in this part of the St. Francis River and some of its tributaries. Every effort should be made to avoid introducing pollution, sediment, or higher volumes of stormwater runoff from the project site, both during construction and after development.
 - Terrestrial projects that manage construction and include operation plans to avoid runoff of sediment or pollutants are unlikely to affect the aquatic species.
 - Regulations enforced by other agencies to protect water quality and human health are generally adequate to protect the needs of wildlife as well.
 - Projects that place fill in or discharge water to the river are subject to federal permits, and strict observance of conditions required in those permits is important to minimize risk of damage to endangered species.
 - See General Recommendations for additional information on ways to minimize impacts to aquatic resources.
- **Bald Eagles:** Bald Eagles (*Haliaeetus leucocephalus*) nest near streams or water bodies in the project area. Nests are large and fairly easy to identify. While no longer listed as endangered, eagles continue to be protected by the federal government under the Bald and Golden Eagle Protection Act. Work managers should be alert for nesting areas within 1500 meters of project activities, and follow federal guidelines at: [Do I need an eagle take permit? | U.S. Fish & Wildlife Service \(fws.gov\)](#) if eagle nests are seen.
- **Loud, Intermittent Noises May Cause the Incidental Take of Bald Eagles:** To avoid the Incidental take of eagles or their young, USFWS recommends that you avoid blasting or other activities that produce extremely loud noises within ½ mile of active nests (or 1 within 1 mile in

Prepared October 23, 2023; Hefner_Stoddard_Water Use_Lick Creek and Dudley Main Watershed Project Page 1 of 6

open areas), unless greater tolerance to the activity (or similar activity) has been demonstrated by the eagles in the nesting area.

- **Alligator Snapping Turtle:** The project site is within 1 mile of known range of Alligator Snapping Turtle (*Macrochelys temminckii*), a turtle on the state's Species of Conservation Concern List and recently proposed for listing under the Endangered Species Act. Maintenance and restoration of sloughs and oxbow lakes, as well as riparian corridors along the rivers are critical for the survival of many species, including the Alligator Snapping Turtle. Please see [Best Management Practices for Construction and Development Projects Alligator Snapping Turtle \(mo.gov\)](https://www.mo.gov/best-management-practices/alligator-snapping-turtle).

Natural Heritage records identify Pink Mucket within 3 miles of the project, and Rabbitsfoot within 2.05 mile of the project site.

- **Mussels:** Mussels are relatively immobile animals that are vulnerable to pollutants, sediment discharges, channel alterations and other activities destructive to mussel habitat. Activities that alter or destabilize stream bottoms or banks or introduce silt, chemical or organic pollutants should be avoided. Avoid crossing flowing water but, if unavoidable, minimize crossing distance and use temporary crossings that do not restrict water flow. Please see [Best Management Practices for Construction and Development Projects Freshwater Mussels \(mo.gov\)](https://www.mo.gov/best-management-practices/freshwater-mussels).

FEDERAL LIST species/habitats are protected under the Federal Endangered Species Act. **Contact U.S. Fish & Wildlife Service** (101 Park Deville Drive Suite A, Columbia, Missouri 65203-0007; 573-234-2132) for Endangered Species Act coordination and concurrence information).

Level 2: Records of state-listed (not federal-listed) endangered species AND / OR state-ranked (not state-listed endangered) species and natural communities of conservation concern. The Department tracks these species and natural communities due to population declines and/or apparent vulnerability.

Natural Heritage records identifies American Bittern less than 1 mile from project site.

- **American Bitterns** (*Botaurus lentiginosus*) nest in permanent wetlands with tall, emergent vegetation such as bur-reed and bulrush. Breeding occurs between April and July. Protection and restoration of quality wetlands are important for many species, including the American Bittern. Project activities should not occur within 100 feet of wetland habitat between April 1 and July 31 to prevent disturbing nesting birds. Erosion and sediment controls should be implemented, maintained and monitored for the duration of the project. Disposal of wastes and garbage should be done in designated areas far from wetlands. Draining or destroying permanent, emergent wetland habitat should be avoided. See <https://mdc.mo.gov/sites/default/files/2020-06/AmericanBitternBMP.pdf> for best management practices regarding this species.

Natural Heritage records indicate the following state-ranked species near the project area: ®

Scientific Name	Common Name	State Rank	Proximity (miles)	Primary Habitat
<i>Ambystoma talpoideum</i>	Mole Salamander	S2	<1	Forest bottomland, Wetland matrix
<i>Amphiuma tridactylum</i>	Three-toed Amphiuma	S2	<2	Aquatic matrix, Shallow oxbow/slough, Pond/lake/deep oxbows & slough
<i>Farancia abacura reinwardtii</i>	Western Mudsake	S2	<1	Forest bottomland, Wetland matrix

Prepared October 23, 2023; Hefner_Stoddard_Water Use_Lick Creek and Dudley Main Watershed Project Page 2 of 6

<i>Coturnicops noveboracensis</i>	Yellow Rail	SU	<2	Wet prairie/meadow, Marsh
<i>Porzana carolina</i>	Sora	S2	<1	Marsh, Moist edge/mudflat
<i>Ixobrychus exilis</i>	Least Bittern	S3	<1	Marsh
<i>Lanius ludovicianus</i>	Loggerhead Shrike	S2	<2	Grassland matrix, Old field/shrub, Savanna pasture/orchard, Savanna
<i>Rallus limicola</i>	Virginia Rail	S2	<1	Marsh, Moist edge/mudflat
<i>Creaserinus fodiens</i>	Digger Crayfish	S2S3	<2	Wetland matrix, River/stream
<i>Cyclonaias nodulata</i>	Wartyback	S3	<2	River/stream
<i>Leaunio lienosus</i>	Little Spectaclecase	S3	<3	River/stream
<i>Arcidens confragosus</i>	Rock Pocketbook	S3	<2	River/stream
<i>Utterbackiana suborbiculata</i>	Flat Floater	S2	<2	River/stream, Pond/lake/deep oxbows & slough
<i>Cyprogenia aberti</i>	Western Fanshell	S2	<3	River/stream
<i>Lepomis symmetricus</i>	Bantam Sunfish	S2	<1	Swamp, Shallow oxbow/slough
<i>Notropis texanus</i>	Weed Shiner	S3	<4	River/stream
<i>Opsopoeodus emiliae</i>	Pugnose Minnow	S4	<2	River/stream, Pond/lake/deep oxbows & slough, Swamp, Shallow oxbow/slough
<i>Centrarchus macropterus</i>	Flier	S3	<1	Pond/lake/deep oxbows & slough, River/stream, Swamp
<i>Erimyzon sucetta</i>	Lake Chubsucker	S2	<2	River/stream, Swamp, Pond/lake/deep oxbows & slough
<i>Fundulus dispar</i>	Starhead Topminnow	S2	<1	Swamp, Pond/lake/deep oxbows & slough, Shallow oxbow/slough
<i>Eupatorium semiserratum</i>	A Thoroughwort	S1S2	<1	Forest matrix, Roadside/railroad
<i>Hottonia inflata</i>	Featherfoil	S2	<2	Swamp, Shallow oxbow/slough, Sinkhole pond, Sand/gravel bars
<i>Hydrocotyle ranunculoides</i>	Floating Pennywort	S1S2	<2	Pond/lake/deep oxbows & slough, Moist edge/mudflat
<i>Cynoscium digitatum</i>	Finger Dogshade	S2	<1	Wetland matrix, Forest bottomland
<i>Hypericum lobocarpum</i>	A St. John's Wort	S1	<1	Forest upland, Fen/seep
<i>Justicia ovata</i> var. <i>lanceolata</i>	A Water Willow	S2	<2	Wetland matrix, Forest bottomland
<i>Limnobium spongia</i> ssp. <i>spongia</i>	American Frogbit	S2	<2	Moist edge/mudflat, Wet ditches, Swamp
<i>Limnoscium pinnatum</i>	Pinnate Dogshade	S1	<2	Glade complex, Grassland native prairie, Roadside/railroad
<i>Ludwigia leptocarpa</i>	Primrose Willow	S2	<2	Wetland matrix
<i>Carex buxbaumii</i>	Brown Bog Sedge	S2	<2	Grassland matrix, Fen/seep, Forest bottomland
<i>Carex reniformis</i>	Reniform Sedge	S1	<2	Forest bottomland
<i>Carex triangularis</i>	Triangular Sedge	S2	<1	Swamp, Forest bottomland, Roadside/railroad

Prepared October 23, 2023; Hefner_Stoddard_Water Use_Lick Creek and Dudley Main Watershed Project Page 3 of 6

<i>Mecardonia acuminata</i>	Water Hyssop	S1	<2	Shallow oxbow/slough, Moist edge/mudflat, Wet prairie/meadow
<i>Peltandra virginica ssp. virginica</i>	Arrow Arum	S2	<2	Wet ditches, Shallow oxbow/slough, Moist edge/mudflat
<i>Platanthera flava</i>	Rein Orchid	S2	<5	Forest bottomland, Woodland, Grassland native prairie
<i>Plectomerus dombeyanus</i>	Bankclimber	S3	<2	River/stream
<i>Pycnanthemum muticum</i>	Blunt Mountain Mint	S2	<2	Forest bottomland, Wet ditches, Swamp, Fen/seep
<i>Satyrodes appalachia leeuwi</i>	Appalachian Eyed Brown	S1	<2	Woodland, Swamp
<i>Steinchisma hians</i>	Gaping Panic Grass	S3	<2	Swamp, Forest bottomland, Moist edge/mudflat, Spring/spring branch, Wet ditches
<i>Tettigidea armata</i>	Spined Grouse Locust	S2S3	<2	Swamp
<i>Thalia dealbata</i>	Water Canna	S2	<2	Swamp, Wet ditches, Pond/lake/deep oxbows & slough
<i>Wolffia columbiana</i>	Columbia Water-meal	SU	<2	Pond/lake/deep oxbows & slough, River/stream, Wet ditches
<i>Wolffiella gladiata</i>	Wolffiella	S1	<1	Pond/lake/deep oxbows & slough
<i>Neogale frenata</i>	Long-tailed Weasel	S3	<2	Forest Matrix, Habitat Generalist (close to site 4)
<i>Corynorhinus rafinesquii</i>	Rafinesque's Big-eared Bat	S1	<2	Cave, Forest matrix, Urban low density vegetated, Wetland matrix
<i>Sylvilagus aquaticus</i>	Swamp Rabbit	S2	<1	Forest bottomland, Wetland matrix
<i>Paroxya hoosieri</i>	Hoosier Grasshopper	S1	<1	Wetland matrix, Moist edge/mudflat, Marsh
<i>Inscudderia taxodii</i>	Bald Cypress Katydid	S1	<2	Swamp, Shallow oxbow/slough, Forest bottomland
<i>Catocala pretiosa texarkana</i>	Precious Underwing Moth	S3?	<2	Marsh, Shrub swamp, Swamp
<i>Euphyes dukesi</i>	Duke's Skipper	S1	<1	Shrub swamp, Shallow oxbow/slough, Swamp

State Rank Definitions:

- S1: Critically imperiled in the state because of extreme rarity of or because of some factor(s) making it especially vulnerable to extirpation from the state. Typically, 5 or fewer occurrences or very few remaining individuals (<1,000).
- S2: Imperiled in the state because of rarity or because of some factor(s) making it very vulnerable to extirpation from the state (6 to 20 occurrences or few remaining individuals).
- S3: Vulnerable in the state either because rare and uncommon, or found only in a restricted range (even if abundant at some locations), or because of other factors making it vulnerable to extirpation. Typically 21 to 100 occurrences or between 3,000 and 10,000 individuals.
- S4: Uncommon but not rare, and usually widespread in the nation or state. Possible cause of long-term concern. Usually more than 100 occurrences and more than 10,000 individuals.
- S#S#: Range Rank: A numeric range rank (e.g., S2S3) is used to indicate the range of uncertainty about the exact status.
- ?: Denotes inexact or uncertain numeric rank.

- SU: Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

There are no regulatory requirements associated with this status, however we encourage voluntary stewardship to minimize the risk of further decline that could lead to listing.

STATE ENDANGERED species are protected under the Wildlife Code of Missouri (3CSR10-4.111).
See the [Missouri Species And Communities Of Conservation Concern Checklist \(mo.gov\)](#) for a complete list.

General recommendations related to this project or site, or based on information about the historic range of species (unrelated to any specific Natural Heritage records):

- **Water Use, Transfer and Channel Activities:** Potential impacts to fish, forest and wildlife resources can be minimized or avoided by placing new lines in areas that have already been developed or disturbed, using existing utility line easements, or placing lines along existing roads. Maintenance activities that occur within the existing footprint of the water line are less likely to affect fish, forest, and wildlife resources. Following best management practices and Clean Water Act Permit conditions, if required, also help minimize potential for significant habitat effects. Stream and drainage crossings are concerns, and every effort should be made to avoid erosion, silt introduction, petroleum or chemical pollution, and disruption or realignment of stream banks and beds during maintenance activities. Please see [Best Management Practices for Construction and Development Projects Affecting Missouri Rivers and Streams \(mo.gov\)](#).
 - Revegetation is an important part of managing utility corridors and can have significant resource impacts depending on the techniques used. Revegetation of disturbed areas is recommended to minimize erosion; use native plant species compatible with the local landscape and wildlife needs. Annuals like ryegrass may be combined with native perennials for quicker green-up. Avoid aggressive, exotic perennials such as crown vetch and *sericea lespedeza*. Maintenance of ground cover in utility corridors can have significant implications for sensitive resources. Native plant species typically require low maintenance over the long term, and provide more benefits to native wildlife. Utility corridors can provide wildlife travel corridors, food sources, and types of low-growing plant diversity sometimes rare in adjoining land. Mowing and maintenance schedules should consider nesting seasons, and diversity in plant composition.
- **Contact Area Manager:** This project (site 1) is within Otter Slough Conservation Area and near Oak Ridge Conservation Area (site 4). Please contact area manager, Ryan Dirnberger (573-222-3337 Ext. 1035) if project activities will impact this CA.
- **Conservation Opportunity Areas:** The project is within the Otter Slough Wetland Complex Conservation Opportunity Area (COA). COAs are key landscapes that represent the greatest opportunities for sustainable conservation of the Missouri's diverse flora and fauna and the natural communities they depend upon, including: grasslands (including prairie and savanna), glades, forests and woodlands, wetlands, caves and karst, and rivers and streams. COAs have been identified based on several factors, including the diversity and rarity of species and natural communities present, and the comparative likelihood/importance of projects to maintain them in the area over time. COAs have no regulatory role, but do reflect interest as a planning tool from multiple government agencies, non-governmental organizations and citizen groups to facilitate conservation in the area. Maintenance of high quality natural terrestrial and aquatic communities will help provide important habitat for the COA's biodiversity. Funding might be available to

Prepared October 23, 2023; Hefner_Stoddard_Water Use_Lick Creek and Dudley Main Watershed Project Page 5 of 6

manage for important habitats within the COA. Please contact Missouri Department of Conservation for more information.

- **Indiana Bats and Northern Long-eared Bats:** If this project has the potential to alter habitat (e.g. tree removal, projects in karst habitat) or cause direct mortality of bats, please coordinate directly with U.S. Fish and Wildlife Service (Ecological Services, 101 Park Deville Drive, Suite A, Columbia, Missouri 65203-0007; Phone 573-234-2132 Ext. 100 for Ecological Services) for further coordination under the Endangered Species Act.

Though Indiana and Northern Long-eared bats are not known to occur in the project area, these species should be assumed present wherever habitat exists could occur in the project area. Indiana Bats (*Myotis sodalis*, federal and state-listed endangered) and Northern Long-eared Bats (*Myotis septentrionalis*, federal-listed endangered) hibernate during winter months in caves and mines. During the summer months, they roost and raise young under the bark of trees in riparian forests and upland forests near perennial streams. During project activities, avoid degrading stream quality and where possible leave snags standing and preserve mature forest canopy. Do not enter caves known to harbor Indiana Bats and/or Northern Long-eared Bats, especially from September to April.

- Invasive exotic species are a significant issue for fish, wildlife and agriculture in Missouri. Seeds, eggs, larvae, and aquatic plant material may be moved to new sites on boats or construction equipment, so inspect and clean equipment thoroughly before moving between project sites.
- ◆ Remove any mud, soil, trash, plants (or plant material) or animals from equipment before leaving any water body or work area.
 - ◆ Drain water from boats and machinery that has operated in water, checking motor cavities, live-well, bilge and transom wells, tracks, buckets, and any other water reservoirs.
 - ◆ When possible, wash and rinse equipment thoroughly with hard spray or HOT water ($\geq 140^{\circ}$ F, typically available at do-it-yourself carwash sites), and dry in the hot sun before using again.

These recommendations are ones project managers might prudently consider based on a general understanding of species needs and landscape conditions. Natural Heritage records largely reflect sites visited by specialists in the last 30 years. Many privately owned tracts have not been surveyed and could host remnants of species once but no longer common.





APPENDIX B

WETLAND DETERMINATION DATA FORMS



U.S. Army Corps of Engineers WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R	OMB Control #: 0710-0024, Exp: 11/30/2024 Requirement Control Symbol EXEMPT: (Authority: AR 335-15, paragraph 5-2a)
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Project/Site: Lick Creek - Dudley Main Ditch City/County: Stoddard County Sampling Date: 11-28-2023
Applicant/Owner: Drainage District 12 State: MO Sampling Point: S-1
Investigator(s): Trevor Cunningham, Robin Ledford Section, Township, Range: S21 T26N R9E
Landform (hillside, terrace, etc.): shelf Local relief (concave, convex, none): none Slope (%): 0
Subregion (LRR or MLRA): LRR O, MLRA 131A Lat: 36.878576 Long: -90.077964 Datum: NAD83
Soil Map Unit Name: Levees-Borrow pits complex, 0-25 percent slopes NWI classification: n/a
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation , Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes No X
Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u>X</u> No <u> </u>	Is the Sampled Area within a Wetland? Yes <u> </u> No <u>X</u>
Hydric Soil Present? Yes <u> </u> No <u>X</u>	
Wetland Hydrology Present? Yes <u> </u> No <u>X</u>	
Remarks: Upland sampling point taken on a shelf approximately 10 feet above the ordinary high water mark of Lick Creek. Apparent wetland characteristics were observed at the tow of the slopes and within the ditch itself. As such, a sampling point was observed to determine whether these wetland conditions continued up the slope where proposed future work may occur. Soils are manipulated for drainage infrastructure and hydrology in the area is routinely manipulated for agricultural purposes.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <u> </u> Surface Water (A1) <u> </u> Aquatic Fauna (B13) <u> </u> High Water Table (A2) <u> </u> Marl Deposits (B15) (LRR U) <u> </u> Saturation (A3) <u> </u> Hydrogen Sulfide Odor (C1) <u> </u> Water Marks (B1) <u> </u> Oxidized Rhizospheres on Living Roots (C3) <u> </u> Sediment Deposits (B2) <u> </u> Presence of Reduced Iron (C4) <u> </u> Drift Deposits (B3) <u> </u> Recent Iron Reduction in Tilled Soils (C6) <u> </u> Algal Mat or Crust (B4) <u> </u> Thin Muck Surface (C7) <u> </u> Iron Deposits (B5) <u> </u> Other (Explain in Remarks) <u> </u> Inundation Visible on Aerial Imagery (B7) <u> </u> Water-Stained Leaves (B9)	<u>Secondary Indicators (minimum of two required)</u> <u> </u> Surface Soil Cracks (B6) <u> </u> Sparsely Vegetated Concave Surface (B8) <u> </u> Drainage Patterns (B10) <u> </u> Moss Trim Lines (B16) <u> </u> Dry-Season Water Table (C2) <u> </u> Crayfish Burrows (C8) <u> </u> Saturation Visible on Aerial Imagery (C9) <u> </u> Geomorphic Position (D2) <u> </u> Shallow Aquitard (D3) <u> </u> FAC-Neutral Test (D5) <u> </u> Sphagnum Moss (D8) (LRR T, U)
Field Observations: Surface Water Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u> Water Table Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u> Saturation Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u> (includes capillary fringe)	Wetland Hydrology Present? Yes <u> </u> No <u>X</u>
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	



VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: S-1

Tree Stratum	Absolute % Cover	Dominant Species?	Indicator Status
(Plot size: <u>30</u>)			
1. <u>Morus alba</u>	<u>30</u>	<u>Yes</u>	<u>FACU</u>
2. <u>Acer saccharinum</u>	<u>20</u>	<u>Yes</u>	<u>FAC</u>
3. <u>Gleditsia triacanthos</u>	<u>20</u>	<u>Yes</u>	<u>FAC</u>
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
	<u>70</u> =Total Cover		
50% of total cover: <u>35</u>	20% of total cover: <u>14</u>		
Sapling Stratum (Plot size: <u>15</u>)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
	_____ =Total Cover		
50% of total cover: _____	20% of total cover: _____		
Shrub Stratum (Plot size: <u>15</u>)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
	_____ =Total Cover		
50% of total cover: _____	20% of total cover: _____		
Herb Stratum (Plot size: <u>5</u>)			
1. <u>Chasmanthium latifolium</u>	<u>50</u>	<u>Yes</u>	<u>FAC</u>
2. <u>Elymus virginicus</u>	<u>30</u>	<u>Yes</u>	<u>FAC</u>
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____
	<u>80</u> =Total Cover		
50% of total cover: <u>40</u>	20% of total cover: <u>16</u>		
Woody Vine Stratum (Plot size: <u>30</u>)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
	_____ =Total Cover		
50% of total cover: _____	20% of total cover: _____		
Remarks: (If observed, list morphological adaptations below.)			

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 5 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 80.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species <u>0</u>	x 1 = <u>0</u>
FACW species <u>0</u>	x 2 = <u>0</u>
FAC species <u>120</u>	x 3 = <u>360</u>
FACU species <u>30</u>	x 4 = <u>120</u>
UPL species <u>0</u>	x 5 = <u>0</u>
Column Totals: <u>150</u> (A)	<u>480</u> (B)
Prevalence Index = B/A = <u>3.20</u>	

Hydrophytic Vegetation Indicators:
1 - Rapid Test for Hydrophytic Vegetation
☒ 2 - Dominance Test is >50%
3 - Prevalence Index is $\leq 3.0^1$
 Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:
Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.
Shrub - Woody Plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Woody Vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes X No



VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: S-1

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
_____ = Total Cover			
50% of total cover: _____ 20% of total cover: _____			
Sapling/Shrub Stratum (Plot size: _____)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
_____ = Total Cover			
50% of total cover: _____ 20% of total cover: _____			
Herb Stratum (Plot size: _____)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____
12. _____	_____	_____	_____
_____ = Total Cover			
50% of total cover: _____ 20% of total cover: _____			
Woody Vine Stratum (Plot size: _____)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
_____ = Total Cover			
50% of total cover: _____ 20% of total cover: _____			

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)
Total Number of Dominant Species Across All Strata: _____ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)
Prevalence Index = B/A = _____	

Hydrophytic Vegetation Indicators:
____ 1 - Rapid Test for Hydrophytic Vegetation
____ 2 - Dominance Test is >50%
____ 3 - Prevalence Index is $\leq 3.0^1$
____ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:
Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.
Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.
Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.
Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: S-1

[illegible]



U.S. Army Corps of Engineers WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R	OMB Control #: 0710-0024, Exp: 11/30/2024 Requirement Control Symbol EXEMPT: (Authority: AR 335-15, paragraph 5-2a)
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Project/Site: Lick Creek - Dudley Main Ditch City/County: Stoddard County Sampling Date: 11-29-2023
Applicant/Owner: Drainage District 12 State: MO Sampling Point: S-2
Investigator(s): Trevor Cunningham, Robin Ledford Section, Township, Range: S34, T25N, R9E
Landform (hillside, terrace, etc.): depression Local relief (concave, convex, none): concave Slope (%): 0-1
Subregion (LRR or MLRA): LRR O, MLRA 131A Lat: 36.771328 Long: -90.073870 Datum: NAD83
Soil Map Unit Name: Amagon silt loam, 0 to 1 percent slopes, occasionally flooded NWI classification: PUBGx
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation , Soil , or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes No X
Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u>X</u> No <u> </u>	Is the Sampled Area within a Wetland? Yes <u>X</u> No <u> </u>
Hydric Soil Present? Yes <u>X</u> No <u> </u>	
Wetland Hydrology Present? Yes <u>X</u> No <u> </u>	
Remarks: Wetland sampling point taken in a depression within a forest stand in Project Area 3 in an area shown on historic maps as "The Glades Swamp". Altered natural topography apparent by berms used as roads. Wooded area within wetland is predominately flat, aside from berms and this depression. Wetland identified as Forested Wetland 1. Hydrology in portions of this wetland are routinely manipulated with water control structures to provide waterfowl habitat.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <u>X</u> Surface Water (A1) <u> </u> Aquatic Fauna (B13) <u> </u> High Water Table (A2) <u> </u> Marl Deposits (B15) (LRR U) <u>X</u> Saturation (A3) <u> </u> Hydrogen Sulfide Odor (C1) <u> </u> Water Marks (B1) <u> </u> Oxidized Rhizospheres on Living Roots (C3) <u> </u> Sediment Deposits (B2) <u> </u> Presence of Reduced Iron (C4) <u> </u> Drift Deposits (B3) <u> </u> Recent Iron Reduction in Tilled Soils (C6) <u> </u> Algal Mat or Crust (B4) <u> </u> Thin Muck Surface (C7) <u> </u> Iron Deposits (B5) <u> </u> Other (Explain in Remarks) <u> </u> Inundation Visible on Aerial Imagery (B7) <u>X</u> Water-Stained Leaves (B9)	<u>Secondary Indicators (minimum of two required)</u> <u> </u> Surface Soil Cracks (B6) <u> </u> Sparsely Vegetated Concave Surface (B8) <u> </u> Drainage Patterns (B10) <u> </u> Moss Trim Lines (B16) <u> </u> Dry-Season Water Table (C2) <u> </u> Crayfish Burrows (C8) <u> </u> Saturation Visible on Aerial Imagery (C9) <u> </u> Geomorphic Position (D2) <u> </u> Shallow Aquitard (D3) <u>X</u> FAC-Neutral Test (D5) <u> </u> Sphagnum Moss (D8) (LRR T, U)
Field Observations: Surface Water Present? Yes <u>X</u> No <u> </u> Depth (inches): <u>1</u> Water Table Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u> Saturation Present? Yes <u>X</u> No <u> </u> Depth (inches): <u>0</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <u>X</u> No <u> </u>
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	



VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: S-2

Tree Stratum	(Plot size: <u>30</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1.				
2.				
3.				
4.				
5.				
6.				
		=Total Cover		
50% of total cover: <u> </u>		20% of total cover: <u> </u>		
Sapling Stratum	(Plot size: <u>15</u>)			
1.				
2.				
3.				
4.				
5.				
6.				
		=Total Cover		
50% of total cover: <u> </u>		20% of total cover: <u> </u>		
Shrub Stratum	(Plot size: <u>15</u>)			
1.	<i>Cephalanthus occidentalis</i>	<u>5</u>	<u>Yes</u>	<u>OBL</u>
2.				
3.				
4.				
5.				
6.				
		=Total Cover		
50% of total cover: <u>3</u>		20% of total cover: <u>1</u>		
Herb Stratum	(Plot size: <u>5</u>)			
1.	<i>Persicaria pensylvanica</i>	<u>50</u>	<u>Yes</u>	<u>FACW</u>
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
		=Total Cover		
50% of total cover: <u>25</u>		20% of total cover: <u>10</u>		
Woody Vine Stratum	(Plot size: <u>30</u>)			
1.				
2.				
3.				
4.				
5.				
		=Total Cover		
50% of total cover: <u> </u>		20% of total cover: <u> </u>		
Remarks: (If observed, list morphological adaptations below.)				

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species <u>5</u>	x 1 = <u>5</u>
FACW species <u>50</u>	x 2 = <u>100</u>
FAC species <u>0</u>	x 3 = <u>0</u>
FACU species <u>0</u>	x 4 = <u>0</u>
UPL species <u>0</u>	x 5 = <u>0</u>
Column Totals: <u>55</u> (A)	<u>105</u> (B)
Prevalence Index = B/A = <u>1.91</u>	

Hydrophytic Vegetation Indicators:
1 - Rapid Test for Hydrophytic Vegetation
☒ 2 - Dominance Test is >50%
☒ 3 - Prevalence Index is ≤3.0¹
 Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:
Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.
Shrub - Woody Plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Woody Vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes ☒ No ☐



VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: S-2

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
_____ = Total Cover			
50% of total cover: _____ 20% of total cover: _____			
Sapling/Shrub Stratum (Plot size: _____)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
_____ = Total Cover			
50% of total cover: _____ 20% of total cover: _____			
Herb Stratum (Plot size: _____)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____
12. _____	_____	_____	_____
_____ = Total Cover			
50% of total cover: _____ 20% of total cover: _____			
Woody Vine Stratum (Plot size: _____)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
_____ = Total Cover			
50% of total cover: _____ 20% of total cover: _____			

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)
Total Number of Dominant Species Across All Strata: _____ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)
Prevalence Index = B/A = _____	

Hydrophytic Vegetation Indicators:
____ 1 - Rapid Test for Hydrophytic Vegetation
____ 2 - Dominance Test is >50%
____ 3 - Prevalence Index is $\leq 3.0^1$
____ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:
Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.
Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.
Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.
Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: S-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-7	10YR 5/2	95	7.5YR 4/6	5	C	M	Loamy/Clayey	silt clay
7-10	10YR 5/2	70	7.5YR 4/6	30	C	M	Loamy/Clayey	Prominent redox concentrations
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.								
² Location: PL=Pore Lining, M=Matrix.								
Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)						Indicators for Problematic Hydric Soils³:		
___ Histosol (A1)			___ Thin Dark Surface (S9) (LRR S, T, U)			___ 1 cm Muck (A9) (LRR O)		
___ Histic Epipedon (A2)			___ Barrier Islands 1 cm Muck (S12)			___ 2 cm Muck (A10) (LRR S)		
___ Black Histic (A3)			___ (MLRA 153B, 153D)			___ Coast Prairie Redox (A16)		
___ Hydrogen Sulfide (A4)			___ Loamy Mucky Mineral (F1) (LRR O)			___ (outside MLRA 150A)		
___ Stratified Layers (A5)			___ Loamy Gleyed Matrix (F2)			___ Reduced Vertic (F18)		
___ Organic Bodies (A6) (LRR P, T, U)			X Depleted Matrix (F3)			___ (outside MLRA 150A, 150B)		
___ 5 cm Mucky Mineral (A7) (LRR P, T, U)			___ Redox Dark Surface (F6)			___ Piedmont Floodplain Soils (F19) (LRR P, T)		
___ Muck Presence (A8) (LRR U)			___ Depleted Dark Surface (F7)			___ Anomalous Bright Floodplain Soils (F20)		
___ 1 cm Muck (A9) (LRR P, T)			___ Redox Depressions (F8)			___ (MLRA 153B)		
___ Depleted Below Dark Surface (A11)			___ Marl (F10) (LRR U)			___ Red Parent Material (F21)		
___ Thick Dark Surface (A12)			___ Depleted Ochric (F11) (MLRA 151)			___ Very Shallow Dark Surface (F22)		
___ Coast Prairie Redox (A16) (MLRA 150A)			___ Iron-Manganese Masses (F12) (LRR O, P, T)			___ (outside MLRA 138, 152A in FL, 154)		
___ Sandy Mucky Mineral (S1) (LRR O, S)			___ Umbric Surface (F13) (LRR P, T, U)			___ Barrier Islands Low Chroma Matrix (TS7)		
___ Sandy Gleyed Matrix (S4)			___ Delta Ochric (F17) (MLRA 151)			___ (MLRA 153B, 153D)		
___ Sandy Redox (S5)			___ Reduced Vertic (F18) (MLRA 150A, 150B)			___ Other (Explain in Remarks)		
___ Stripped Matrix (S6)			___ Piedmont Floodplain Soils (F19) (MLRA 149A)					
___ Dark Surface (S7) (LRR P, S, T, U)			___ Anomalous Bright Floodplain Soils (F20)					
___ Polyvalue Below Surface (S8)			___ (MLRA 149A, 153C, 153D)			³ Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.		
___ (LRR S, T, U)			___ Very Shallow Dark Surface (F22)					
___ (MLRA 138, 152A in FL, 154)								
Restrictive Layer (if observed):								
Type: _____								
Depth (inches): _____						Hydric Soil Present? Yes <u>X</u> No _____		
Remarks:								



U.S. Army Corps of Engineers WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R	OMB Control #: 0710-0024, Exp: 11/30/2024 Requirement Control Symbol EXEMPT: (Authority: AR 335-15, paragraph 5-2a)
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Project/Site: Lick Creek - Dudley Main Ditch City/County: Stoddard County Sampling Date: 11-29-2023
Applicant/Owner: Drainage District 12 State: MO Sampling Point: S-3
Investigator(s): Trevor Cunningham, Robin Ledford Section, Township, Range: S34, T25N, R9E
Landform (hillside, terrace, etc.): flat woods Local relief (concave, convex, none): none Slope (%): 0
Subregion (LRR or MLRA): LRR O, MLRA 131A Lat: 36.771494 Long: -90.073882 Datum: NAD83
Soil Map Unit Name: Amagon silt loam, 0 to 1 percent slopes, occasionally flooded NWI classification: n/a
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation , Soil , or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes No X
Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u>X</u> No <u> </u>	Is the Sampled Area within a Wetland? Yes <u>X</u> No <u> </u>
Hydric Soil Present? Yes <u>X</u> No <u> </u>	
Wetland Hydrology Present? Yes <u>X</u> No <u> </u>	
Remarks: Wetland sampling point taken just outside of the depression sampled at point S-2 to determine if wetland characteristics continue outside of the depression. Topography is relatively flat, aside from the adjacent depression and the berms that form the border of the wetland. Point falls within Forested Wetland 1. Hydrology in portions of this wetland are routinely manipulated with water control structures to provide waterfowl habitat.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <u> </u> Surface Water (A1) <u> </u> Aquatic Fauna (B13) <u> </u> High Water Table (A2) <u> </u> Marl Deposits (B15) (LRR U) <u>X</u> Saturation (A3) <u> </u> Hydrogen Sulfide Odor (C1) <u> </u> Water Marks (B1) <u> </u> Oxidized Rhizospheres on Living Roots (C3) <u> </u> Sediment Deposits (B2) <u> </u> Presence of Reduced Iron (C4) <u> </u> Drift Deposits (B3) <u> </u> Recent Iron Reduction in Tilled Soils (C6) <u> </u> Algal Mat or Crust (B4) <u> </u> Thin Muck Surface (C7) <u> </u> Iron Deposits (B5) <u> </u> Other (Explain in Remarks) <u> </u> Inundation Visible on Aerial Imagery (B7) <u> </u> Water-Stained Leaves (B9)	<u>Secondary Indicators (minimum of two required)</u> <u> </u> Surface Soil Cracks (B6) <u>X</u> Sparsely Vegetated Concave Surface (B8) <u> </u> Drainage Patterns (B10) <u> </u> Moss Trim Lines (B16) <u> </u> Dry-Season Water Table (C2) <u> </u> Crayfish Burrows (C8) <u> </u> Saturation Visible on Aerial Imagery (C9) <u>X</u> Geomorphic Position (D2) <u> </u> Shallow Aquitard (D3) <u> </u> FAC-Neutral Test (D5) <u> </u> Sphagnum Moss (D8) (LRR T, U)
Field Observations: Surface Water Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u> Water Table Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u> Saturation Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u> (includes capillary fringe)	Wetland Hydrology Present? Yes <u>X</u> No <u> </u>
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	



VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: S-3

Tree Stratum (Plot size: <u>30</u>)		Absolute % Cover	Dominant Species?	Indicator Status
1.	<u>Salix nigra</u>	<u>5</u>	<u>No</u>	<u>OBL</u>
2.	<u>Acer saccharinum</u>	<u>70</u>	<u>Yes</u>	<u>FAC</u>
3.	<u>Gleditsia triacanthos</u>	<u>5</u>	<u>No</u>	<u>FAC</u>
4.	<u>Quercus phellos</u>	<u>5</u>	<u>No</u>	<u>FACW</u>
5.				
6.				
		<u>85</u>	=Total Cover	
50% of total cover: <u>43</u>		20% of total cover: <u>17</u>		
Sapling Stratum (Plot size: <u>15</u>)				
1.				
2.				
3.				
4.				
5.				
6.				
			=Total Cover	
50% of total cover: _____		20% of total cover: _____		
Shrub Stratum (Plot size: <u>15</u>)				
1.				
2.				
3.				
4.				
5.				
6.				
			=Total Cover	
50% of total cover: _____		20% of total cover: _____		
Herb Stratum (Plot size: <u>5</u>)				
1.	<u>Carex</u>	<u>40</u>	<u>Yes</u>	
2.	<u>Symphytotrichum lanceolatum</u>	<u>5</u>	<u>No</u>	<u>FACW</u>
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
		<u>45</u>	=Total Cover	
50% of total cover: <u>23</u>		20% of total cover: <u>9</u>		
Woody Vine Stratum (Plot size: <u>30</u>)				
1.				
2.				
3.				
4.				
5.				
			=Total Cover	
50% of total cover: _____		20% of total cover: _____		
Remarks: (If observed, list morphological adaptations below.)				

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species <u>5</u>	x 1 = <u>5</u>
FACW species <u>10</u>	x 2 = <u>20</u>
FAC species <u>75</u>	x 3 = <u>225</u>
FACU species <u>0</u>	x 4 = <u>0</u>
UPL species <u>0</u>	x 5 = <u>0</u>
Column Totals: <u>90</u> (A)	<u>250</u> (B)
Prevalence Index = B/A = <u>2.78</u>	

Hydrophytic Vegetation Indicators:
1 - Rapid Test for Hydrophytic Vegetation
2 - Dominance Test is >50%
X 3 - Prevalence Index is $\leq 3.0^1$
 Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:
Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.
Shrub - Woody Plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Woody Vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes X No



VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: S-3

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
=Total Cover			
50% of total cover: _____ 20% of total cover: _____			
Sapling/Shrub Stratum (Plot size: _____)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
=Total Cover			
50% of total cover: _____ 20% of total cover: _____			
Herb Stratum (Plot size: _____)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____
12. _____	_____	_____	_____
=Total Cover			
50% of total cover: _____ 20% of total cover: _____			
Woody Vine Stratum (Plot size: _____)			
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
=Total Cover			
50% of total cover: _____ 20% of total cover: _____			

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)
Total Number of Dominant Species Across All Strata: _____ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)
Prevalence Index = B/A = _____	

Hydrophytic Vegetation Indicators:
____ 1 - Rapid Test for Hydrophytic Vegetation
____ 2 - Dominance Test is >50%
____ 3 - Prevalence Index is $\leq 3.0^1$
____ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:
Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.
Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.
Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.
Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: S-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-7	10YR 5/2	70	7.5YR 4/6	30	C	M	Loamy/Clayey	silt clay
7-10	10YR 5/2	95	7.5YR 4/6	5	C	M	Loamy/Clayey	silt clay
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. ² Location: PL=Pore Lining, M=Matrix.								
Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)						Indicators for Problematic Hydric Soils³:		
☐ Histosol (A1)			☐ Thin Dark Surface (S9) (LRR S, T, U)			☐ 1 cm Muck (A9) (LRR O)		
☐ Histic Epipedon (A2)			☐ Barrier Islands 1 cm Muck (S12)			☐ 2 cm Muck (A10) (LRR S)		
☐ Black Histic (A3)			☐ (MLRA 153B, 153D)			☐ Coast Prairie Redox (A16)		
☐ Hydrogen Sulfide (A4)			☐ Loamy Mucky Mineral (F1) (LRR O)			☐ (outside MLRA 150A)		
☐ Stratified Layers (A5)			☐ Loamy Gleyed Matrix (F2)			☐ Reduced Vertic (F18)		
☐ Organic Bodies (A6) (LRR P, T, U)			☒ Depleted Matrix (F3)			☐ (outside MLRA 150A, 150B)		
☐ 5 cm Mucky Mineral (A7) (LRR P, T, U)			☐ Redox Dark Surface (F6)			☐ Piedmont Floodplain Soils (F19) (LRR P, T)		
☐ Muck Presence (A8) (LRR U)			☐ Depleted Dark Surface (F7)			☐ Anomalous Bright Floodplain Soils (F20)		
☐ 1 cm Muck (A9) (LRR P, T)			☐ Redox Depressions (F8)			☐ (MLRA 153B)		
☐ Depleted Below Dark Surface (A11)			☐ Marl (F10) (LRR U)			☐ Red Parent Material (F21)		
☐ Thick Dark Surface (A12)			☐ Depleted Ochric (F11) (MLRA 151)			☐ Very Shallow Dark Surface (F22)		
☐ Coast Prairie Redox (A16) (MLRA 150A)			☐ Iron-Manganese Masses (F12) (LRR O, P, T)			☐ (outside MLRA 138, 152A in FL, 154)		
☐ Sandy Mucky Mineral (S1) (LRR O, S)			☐ Umbric Surface (F13) (LRR P, T, U)			☐ Barrier Islands Low Chroma Matrix (TS7)		
☐ Sandy Gleyed Matrix (S4)			☐ Delta Ochric (F17) (MLRA 151)			☐ (MLRA 153B, 153D)		
☐ Sandy Redox (S5)			☐ Reduced Vertic (F18) (MLRA 150A, 150B)			☐ Other (Explain in Remarks)		
☐ Stripped Matrix (S6)			☐ Piedmont Floodplain Soils (F19) (MLRA 149A)			³ Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.		
☐ Dark Surface (S7) (LRR P, S, T, U)			☐ Anomalous Bright Floodplain Soils (F20)					
☐ Polyvalue Below Surface (S8)			☐ (MLRA 149A, 153C, 153D)					
☐ (LRR S, T, U)			☐ Very Shallow Dark Surface (F22)					
☐ (MLRA 138, 152A in FL, 154)								
Restrictive Layer (if observed):								
Type: _____						Hydric Soil Present? Yes ☒ No ☐		
Depth (inches): _____								
Remarks:								



U.S. Army Corps of Engineers WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R	OMB Control #: 0710-0024, Exp: 11/30/2024 Requirement Control Symbol EXEMPT: (Authority: AR 335-15, paragraph 5-2a)
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Project/Site: Lick Creek - Dudley Main Ditch City/County: Stoddard County Sampling Date: 11-29-2023
Applicant/Owner: Drainage District 12 State: MO Sampling Point: S-4
Investigator(s): Trevor Cunningham, Robin Ledford Section, Township, Range: S34, T25N, R9E
Landform (hillside, terrace, etc.): depression Local relief (concave, convex, none): none Slope (%): 0
Subregion (LRR or MLRA): LRR O, MLRA 131A Lat: 36.769674 Long: -90.071120 Datum: NAD83
Soil Map Unit Name: Amagon silt loam, 0 to 1 percent slopes, occasionally flooded NWI classification: n/a
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation , Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes No X
Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u>X</u> No <u> </u>	Is the Sampled Area within a Wetland? Yes <u>X</u> No <u> </u>
Hydric Soil Present? Yes <u>X</u> No <u> </u>	
Wetland Hydrology Present? Yes <u>X</u> No <u> </u>	
Remarks: Sampling point taken in an inundated area several feet from the toe of a constructed berm. According to historic aerial imagery, this site was in row crop agriculture until at least 2015 before being converted for waterfowl habitat. It is likely that soils were heavily manipulated during this conversion. Hydrology appears to be seasonally manipulated through inlets and drains. Wetland identified as Emergent Wetland 1.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <u>X</u> Surface Water (A1) <u> </u> Aquatic Fauna (B13) <u> </u> High Water Table (A2) <u> </u> Marl Deposits (B15) (LRR U) <u>X</u> Saturation (A3) <u>X</u> Hydrogen Sulfide Odor (C1) <u> </u> Water Marks (B1) <u> </u> Oxidized Rhizospheres on Living Roots (C3) <u> </u> Sediment Deposits (B2) <u> </u> Presence of Reduced Iron (C4) <u> </u> Drift Deposits (B3) <u> </u> Recent Iron Reduction in Tilled Soils (C6) <u> </u> Algal Mat or Crust (B4) <u> </u> Thin Muck Surface (C7) <u> </u> Iron Deposits (B5) <u> </u> Other (Explain in Remarks) <u> </u> Inundation Visible on Aerial Imagery (B7) <u> </u> Water-Stained Leaves (B9)	<u>Secondary Indicators (minimum of two required)</u> <u> </u> Surface Soil Cracks (B6) <u> </u> Sparsely Vegetated Concave Surface (B8) <u> </u> Drainage Patterns (B10) <u> </u> Moss Trim Lines (B16) <u> </u> Dry-Season Water Table (C2) <u> </u> Crayfish Burrows (C8) <u> </u> Saturation Visible on Aerial Imagery (C9) <u> </u> Geomorphic Position (D2) <u> </u> Shallow Aquitard (D3) <u> </u> FAC-Neutral Test (D5) <u> </u> Sphagnum Moss (D8) (LRR T, U)
Field Observations: Surface Water Present? Yes <u>X</u> No <u> </u> Depth (inches): <u>1</u> Water Table Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u> Saturation Present? Yes <u>X</u> No <u> </u> Depth (inches): <u>5</u> (includes capillary fringe)	Wetland Hydrology Present? Yes <u>X</u> No <u> </u>
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	



VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: S-4

Tree Stratum	(Plot size: <u>30</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1.				
2.				
3.				
4.				
5.				
6.				
		=Total Cover		
50% of total cover: _____		20% of total cover: _____		
Sapling Stratum	(Plot size: <u>15</u>)			
1.				
2.				
3.				
4.				
5.				
6.				
		=Total Cover		
50% of total cover: _____		20% of total cover: _____		
Shrub Stratum	(Plot size: <u>15</u>)			
1.				
2.				
3.				
4.				
5.				
6.				
		=Total Cover		
50% of total cover: _____		20% of total cover: _____		
Herb Stratum	(Plot size: <u>5</u>)			
1.	<i>Persicaria hydropiper</i>	40	Yes	OBL
2.	<i>Persicaria pensylvanica</i>	10	No	FACW
3.	<i>Eleocharis palustris</i>	10	No	OBL
4.	<i>Juncus scirpoides</i>	40	Yes	FACW
5.	<i>Lemna minor</i>	5	No	OBL
6.				
7.				
8.				
9.				
10.				
11.				
		105 =Total Cover		
50% of total cover: <u>53</u>		20% of total cover: <u>21</u>		
Woody Vine Stratum	(Plot size: <u>30</u>)			
1.				
2.				
3.				
4.				
5.				
		=Total Cover		
50% of total cover: _____		20% of total cover: _____		
Remarks: (If observed, list morphological adaptations below.)				

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species <u>55</u>	x 1 = <u>55</u>
FACW species <u>50</u>	x 2 = <u>100</u>
FAC species <u>0</u>	x 3 = <u>0</u>
FACU species <u>0</u>	x 4 = <u>0</u>
UPL species <u>0</u>	x 5 = <u>0</u>
Column Totals: <u>105</u> (A)	<u>155</u> (B)
Prevalence Index = B/A = <u>1.48</u>	

Hydrophytic Vegetation Indicators:
1 - Rapid Test for Hydrophytic Vegetation
☒ 2 - Dominance Test is >50%
☒ 3 - Prevalence Index is $\leq 3.0^1$
 Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:
Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.
Shrub - Woody Plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Woody Vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes ☒ No ☐



VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: S-4

Tree Stratum (Plot size: _____)		Absolute % Cover	Dominant Species?	Indicator Status
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
		_____	=Total Cover	
50% of total cover: _____		20% of total cover: _____		
Sapling/Shrub Stratum (Plot size: _____)				
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
		_____	=Total Cover	
50% of total cover: _____		20% of total cover: _____		
Herb Stratum (Plot size: _____)				
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____
11.	_____	_____	_____	_____
12.	_____	_____	_____	_____
		_____	=Total Cover	
50% of total cover: _____		20% of total cover: _____		
Woody Vine Stratum (Plot size: _____)				
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
		_____	=Total Cover	
50% of total cover: _____		20% of total cover: _____		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)
Total Number of Dominant Species Across All Strata: _____ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)
Prevalence Index = B/A = _____	

Hydrophytic Vegetation Indicators:
____ 1 - Rapid Test for Hydrophytic Vegetation
____ 2 - Dominance Test is >50%
____ 3 - Prevalence Index is $\leq 3.0^1$
____ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:
Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.
Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.
Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.
Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: S-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-5	10YR 5/2	80	7.5YR 4/6	20	C	M	Loamy/Clayey	silt clay
								saturation prevented deeper probing
¹ Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.							² Location: PL=Pore Lining, M=Matrix.	
Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)							Indicators for Problematic Hydric Soils³:	
☐ Histosol (A1)			☐ Thin Dark Surface (S9) (LRR S, T, U)				☐ 1 cm Muck (A9) (LRR O)	
☐ Histic Epipedon (A2)			☐ Barrier Islands 1 cm Muck (S12)				☐ 2 cm Muck (A10) (LRR S)	
☐ Black Histic (A3)			(MLRA 153B, 153D)				☐ Coast Prairie Redox (A16)	
☒ Hydrogen Sulfide (A4)			☐ Loamy Mucky Mineral (F1) (LRR O)				(outside MLRA 150A)	
☐ Stratified Layers (A5)			☐ Loamy Gleyed Matrix (F2)				☐ Reduced Vertic (F18)	
☐ Organic Bodies (A6) (LRR P, T, U)			☒ Depleted Matrix (F3)				(outside MLRA 150A, 150B)	
☐ 5 cm Mucky Mineral (A7) (LRR P, T, U)			☐ Redox Dark Surface (F6)				☐ Piedmont Floodplain Soils (F19) (LRR P, T)	
☐ Muck Presence (A8) (LRR U)			☐ Depleted Dark Surface (F7)				☐ Anomalous Bright Floodplain Soils (F20)	
☐ 1 cm Muck (A9) (LRR P, T)			☐ Redox Depressions (F8)				(MLRA 153B)	
☐ Depleted Below Dark Surface (A11)			☐ Marl (F10) (LRR U)				☐ Red Parent Material (F21)	
☐ Thick Dark Surface (A12)			☐ Depleted Ochric (F11) (MLRA 151)				☐ Very Shallow Dark Surface (F22)	
☐ Coast Prairie Redox (A16) (MLRA 150A)			☐ Iron-Manganese Masses (F12) (LRR O, P, T)				(outside MLRA 138, 152A in FL, 154)	
☐ Sandy Mucky Mineral (S1) (LRR O, S)			☐ Umbric Surface (F13) (LRR P, T, U)				☐ Barrier Islands Low Chroma Matrix (TS7)	
☐ Sandy Gleyed Matrix (S4)			☐ Delta Ochric (F17) (MLRA 151)				(MLRA 153B, 153D)	
☐ Sandy Redox (S5)			☐ Reduced Vertic (F18) (MLRA 150A, 150B)				☐ Other (Explain in Remarks)	
☐ Stripped Matrix (S6)			☐ Piedmont Floodplain Soils (F19) (MLRA 149A)					
☐ Dark Surface (S7) (LRR P, S, T, U)			☐ Anomalous Bright Floodplain Soils (F20)					
☐ Polyvalue Below Surface (S8)			(MLRA 149A, 153C, 153D)				³ Indicators of hydrophytic vegetation and	
(LRR S, T, U)			☐ Very Shallow Dark Surface (F22)				wetland hydrology must be present,	
			(MLRA 138, 152A in FL, 154)				unless disturbed or problematic.	
Restrictive Layer (if observed):								
Type: _____								
Depth (inches): _____							Hydric Soil Present? Yes ☒ No ☐	
Remarks:								



U.S. Army Corps of Engineers WETLAND DETERMINATION DATA SHEET – Atlantic and Gulf Coastal Plain Region See ERDC/EL TR-10-20; the proponent agency is CECW-CO-R	OMB Control #: 0710-0024, Exp: 11/30/2024 Requirement Control Symbol EXEMPT: (Authority: AR 335-15, paragraph 5-2a)
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Project/Site: Lick Creek - Dudley Main Ditch City/County: Stoddard County Sampling Date: 11-29-2023
Applicant/Owner: Drainage District 12 State: MO Sampling Point: S-5
Investigator(s): Trevor Cunningham, Robin Ledford Section, Township, Range: S34, T25N, R9E
Landform (hillside, terrace, etc.): Berm Local relief (concave, convex, none): convex Slope (%): 0 to 2
Subregion (LRR or MLRA): LRR O, MLRA 131A Lat: 36.769594 Long: -90.071204 Datum: NAD83
Soil Map Unit Name: Amagon silt loam, 0 to 1 percent slopes, occasionally flooded NWI classification: n/a
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)
Are Vegetation , Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes No X
Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <u>X</u> No <u> </u>	Is the Sampled Area within a Wetland? Yes <u> </u> No <u>X</u>
Hydric Soil Present? Yes <u> </u> No <u>X</u>	
Wetland Hydrology Present? Yes <u> </u> No <u>X</u>	
Remarks: Upland sampling point taken on a berm that is 1 to 2 feet higher than the adjacent Emergent Wetland 1. Soils and hydrology were likely manipulated during the development of the wetland. This berm also separates Emergent Wetland 1 from Forested Wetland 1.	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <u> </u> Surface Water (A1) <u> </u> Aquatic Fauna (B13) <u> </u> High Water Table (A2) <u> </u> Marl Deposits (B15) (LRR U) <u> </u> Saturation (A3) <u> </u> Hydrogen Sulfide Odor (C1) <u> </u> Water Marks (B1) <u> </u> Oxidized Rhizospheres on Living Roots (C3) <u> </u> Sediment Deposits (B2) <u> </u> Presence of Reduced Iron (C4) <u> </u> Drift Deposits (B3) <u> </u> Recent Iron Reduction in Tilled Soils (C6) <u> </u> Algal Mat or Crust (B4) <u> </u> Thin Muck Surface (C7) <u> </u> Iron Deposits (B5) <u> </u> Other (Explain in Remarks) <u> </u> Inundation Visible on Aerial Imagery (B7) <u> </u> Water-Stained Leaves (B9)	<u>Secondary Indicators (minimum of two required)</u> <u> </u> Surface Soil Cracks (B6) <u> </u> Sparsely Vegetated Concave Surface (B8) <u> </u> Drainage Patterns (B10) <u> </u> Moss Trim Lines (B16) <u> </u> Dry-Season Water Table (C2) <u> </u> Crayfish Burrows (C8) <u> </u> Saturation Visible on Aerial Imagery (C9) <u> </u> Geomorphic Position (D2) <u> </u> Shallow Aquitard (D3) <u> </u> FAC-Neutral Test (D5) <u> </u> Sphagnum Moss (D8) (LRR T, U)
Field Observations: Surface Water Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u> Water Table Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u> Saturation Present? Yes <u> </u> No <u>X</u> Depth (inches): <u> </u> (includes capillary fringe)	Wetland Hydrology Present? Yes <u> </u> No <u>X</u>
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:	
Remarks:	



VEGETATION (Five Strata) – Use scientific names of plants.

Sampling Point: S-5

Tree Stratum	(Plot size: <u>30</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1.				
2.				
3.				
4.				
5.				
6.				
		=Total Cover		
50% of total cover: _____		20% of total cover: _____		
Sapling Stratum	(Plot size: <u>15</u>)			
1.				
2.				
3.				
4.				
5.				
6.				
		=Total Cover		
50% of total cover: _____		20% of total cover: _____		
Shrub Stratum	(Plot size: <u>15</u>)			
1.				
2.				
3.				
4.				
5.				
6.				
		=Total Cover		
50% of total cover: _____		20% of total cover: _____		
Herb Stratum	(Plot size: <u>5</u>)			
1.	<u>Festuca</u>	<u>100</u>	<u>Yes</u>	<u>FAC</u>
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
		<u>100</u>	=Total Cover	
50% of total cover: <u>50</u>		20% of total cover: <u>20</u>		
Woody Vine Stratum	(Plot size: <u>30</u>)			
1.				
2.				
3.				
4.				
5.				
		=Total Cover		
50% of total cover: _____		20% of total cover: _____		
Remarks: (If observed, list morphological adaptations below.)				

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 1 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species <u>0</u>	x 1 = <u>0</u>
FACW species <u>0</u>	x 2 = <u>0</u>
FAC species <u>100</u>	x 3 = <u>300</u>
FACU species <u>0</u>	x 4 = <u>0</u>
UPL species <u>0</u>	x 5 = <u>0</u>
Column Totals: <u>100</u> (A)	<u>300</u> (B)
Prevalence Index = B/A = <u>3.00</u>	

Hydrophytic Vegetation Indicators:
1 - Rapid Test for Hydrophytic Vegetation
☒ 2 - Dominance Test is >50%
☒ 3 - Prevalence Index is $\leq 3.0^1$
 Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Five Vegetation Strata:
Tree – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and 3 in. (7.6 cm) or larger in diameter at breast height (DBH).
Sapling – Woody plants, excluding woody vines, approximately 20 ft (6 m) or more in height and less than 3 in. (7.6 cm) DBH.
Shrub - Woody Plants, excluding woody vines, approximately 3 to 20 ft (1 to 6 m) in height.
Herb – All herbaceous (non-woody) plants, including herbaceous vines, regardless of size, and woody plants, except woody vines, less than approximately 3 ft (1 m) in height.
Woody Vine – All woody vines, regardless of height.

Hydrophytic Vegetation Present? Yes ☒ No ☐



VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: S-5

Tree Stratum (Plot size: _____)		Absolute % Cover	Dominant Species?	Indicator Status
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
		=Total Cover		
50% of total cover: _____		20% of total cover: _____		
Sapling/Shrub Stratum (Plot size: _____)				
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
		=Total Cover		
50% of total cover: _____		20% of total cover: _____		
Herb Stratum (Plot size: _____)				
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____
11.	_____	_____	_____	_____
12.	_____	_____	_____	_____
		=Total Cover		
50% of total cover: _____		20% of total cover: _____		
Woody Vine Stratum (Plot size: _____)				
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
		=Total Cover		
50% of total cover: _____		20% of total cover: _____		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)
Total Number of Dominant Species Across All Strata: _____ (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)
Prevalence Index = B/A = _____	

Hydrophytic Vegetation Indicators:
____ 1 - Rapid Test for Hydrophytic Vegetation
____ 2 - Dominance Test is >50%
____ 3 - Prevalence Index is $\leq 3.0^1$
____ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:
Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.
Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.
Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.
Woody Vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No _____

Remarks: (If observed, list morphological adaptations below.)

SOIL

Sampling Point: S-5

[illegible]

APPENDIX C PHOTOGRAPHS

	Photo 1. Lick Creek looking downstream from County Road 420 in Project Area 5 showing erosion of sandy soils from the bank. November 28, 2023
	Photo 2. Lick Creek looking upstream (North) from County Road 442 in Project Area 5 showing erosion/sloughing of the right bank. November 28, 2023

	Photo 3. Lick Creek looking downstream from County Road 488 in Project Area 4 showing sedimentation partially obstructing the channel. November 28, 2023
	Photo 4. Dudley Main Ditch looking upstream (East) from County Road 657 in Project Area 6. Potential Bat Roosting Trees (PBRTs) can be seen in the background. November 28, 2023

	Photo 5. Lick Creek looking upstream (North) from County Road 624 in Project Area 4. November 28, 2023
	Photo 6. Looking East toward Lick Creek approximately 1/10 mile upstream of County Road 642 in Project Area 2 showing a large portion of sloughing/eroded bank. Lick Creek can be seen in the background. November 28, 2023

	Photo 7. Lick Creek looking upstream from County Road 642 in Project Area 2 showing previous bank armoring. November 28, 2023
	Photo 8. Lick Creek looking downstream from County Road 642 in Project Area 2. The southern limit of this project area is approximately 1/2 mile South of this location. This is also the northern border of Otter Slough Conservation Area. November 28, 2023

Appendix C – Photographs

	Photo 9. Unnamed ditch parallel to County Road 642 in Project Area 2 looking upstream (East) from the entrance of Legacy Duck Club, approximately 700ft upstream of the confluence with Lick Creek. November 28, 2023
	Photo 10. Cypress Lateral Number 1 along County Road 691 in Project Area 1 approximately 2/3 mile south of County Road 679 showing heavy erosion/sloughing of the east bank. November 29, 2023

Appendix C – Photographs

	Photo 11. Cypress Lateral Number 1 along County Road 691 in Project Area 1 approximately 1 mile south of County Road 679 showing heavy erosion/sloughing of east bank. November 29, 2023
	Photo 12. Confluence of Cypress Lateral Number 1 with Lick Creek in Project Area 1. November 29, 2023

Appendix C – Photographs

	Photo 13. Dudley Main Ditch looking upstream (East) from County Road 624 in Project Area 3 approximately ¾ mile upstream of confluence with Lick Creek. November 29, 2023
	Photo 14. Standing water in a forested wetland within Project Area 3. November 29, 2023



September 30, 2025

Conservation Works JV, LLC
3116 N Dries Lane, Suite 100
Peoria, Illinois 61604-1279

Attn: Mr. Scott R. Hobart
E: srhobart@mstutz.com
P: (309) 693-7615

RE: Cultural Resources Report
NRCS MO Lick Creek Ditch Project
Liberty Township, Stoddard County, Missouri
Terracon Project No. 15237400

Dear Mr. Hobart:

Please find the report of the cultural resources investigation for the Lick Creek Ditch Project attached to this letter.

The fieldwork was conducted from December 5 to 8, 2023. A total of approximately four miles of pedestrian survey transects was covered, resulting in documentation of no new archaeological sites.

Please let us know if you have any questions or comments regarding the information presented in the report.

Sincerely,
Terracon



Cori Hertfelder, M.S., RPA
Environmental Department Manager



Jane Lybarger, M.A., RPA
Group Manager – Cultural Resources

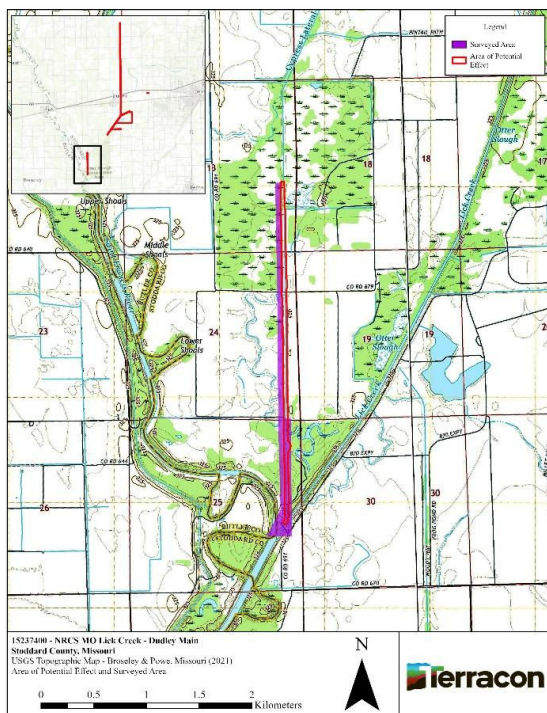
Attachments: Cultural Resources Report

Cultural Resources Survey Report

Lick Creek Ditch Project Liberty Township, Stoddard County, Missouri

September 2025

Terracon Project No. 15237400



Prepared for:
Conservation Works JV, LLC

Prepared by:
Eli Schuck
Cori Hertfelder, M.S., RPA
Jane Lybarger, M.A., RPA
Gwyn Vollman, M.S.
Terracon Consultants, Inc.

Explore with us



ABSTRACT

On behalf of Conservation Works JV, LLC, Terracon Consultants, Inc. (Terracon) conducted an archaeological review of literature and pedestrian survey for the Missouri Lick Creek – Dudley Main (Project), throughout portions of Drainage District 12 (DD 12) in Stoddard County, Missouri. The Project consists of proposed measures to ensure the vitality of aging drainage district infrastructure (i.e., ditches, and levees) located across approximately 16 miles. This may include the deployment of an efficient pumping station, establishment of native grasses on drainage ditches, or installation of drop pipe structures to control gully erosion on drainage ditches. Ditch repairs and maintenance will occur primarily in areas of previous ground disturbance and may include dredging, spreading soils along the ditch banks, and seeding these soils with native vegetation. **The proposed Project is funded through Drainage District 12 (DD 12) with supplemental funding from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) (44 FR 50579).**

NRCS programs must comply with the provisions of Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations, 36 CFR Part 800 – Protection of Historic Properties (54 USC Section 306108). The project activities meet the definition of an Undertaking, per 36 CFR § 800.16(y), and is the type of activity that has the potential to cause effects on historic properties. Therefore, the proposed project is subject to review under Section 106 of NHPA.

The Area of Potential Effect (APE) for direct effects covers a total distance of roughly 16 miles consisting of 392 acres of ditch improvements in Stoddard County, Missouri. The cultural resources investigation for the Project included a desktop review of archaeological records and archival sources, plus field investigation via pedestrian archaeological survey of select areas of the APE. The objectives of this investigation were to 1) identify those areas of the APE with the highest probability of yielding significant cultural resources; 2) conduct field investigations within high probability portions of the APE to identify and delineate the extent of cultural resources, if present; and 3) evaluate the significance of each resource to determine its NRHP eligibility (as applicable). Archaeological fieldwork was conducted from December 5 to 8, 2023, by Bryce Lowry (Project Archaeologist) and Eli Schuck (Archaeological Field Technician).

Project areas that were targeted for field investigation, comprising approximately 27-acres of the APE, were determined in consultation with staff from NRCS and the Missouri State Historic Preservation Office (MO SHPO). Areas that were targeted for field investigation consisted of those portions of the APE that are located within 250 feet of previously recorded archaeological sites as identified in the MO SHPO

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i



Archaeology Viewer. Additional survey areas were identified in portions of the APE that will be subject to extensive ground disturbance associated with the placement of rip rap.

The review of literature identified a large portion of the APE has been subject to previous archaeological surveys and two archaeological sites (23SO413 and 23SO411) have been documented. Eleven additional sites have been recorded within a 1-mile (mi.) radius of the APE. A review of historical maps and aerial photographs revealed no historic period structures (Historic Point of Interest [HPOI]) within the APE.

None of the survey areas near previously recorded archaeological sites or NRHP-listed archaeological areas yielded cultural materials. No new archaeological sites or isolated finds were documented during this survey.

Based upon the findings of the literature review and targeted pedestrian survey for the Project, Terracon recommends a finding of *No Historic Properties Affected*. However, if undiscovered cultural resources are encountered during Project construction, all work in the vicinity of the discovery should cease pending evaluation by a qualified archaeologist who can provide guidance on how to proceed in accordance with applicable regulations.



Table of Contents

ABSTRACT	i
INTRODUCTION	5
Project Description	6
ENVIRONMENTAL BACKGROUND.....	12
Climate	12
Ecology and Physiology.....	13
Geology and Soils	13
CULTURE HISTORY	16
Paleoindian Period	16
Archaic Period.....	17
Woodland Period	17
Mississippian Period.....	18
Post-Contact Period	20
Early Statehood.....	20
Industrialization and the Civil War.....	22
The Great Depression and World War II.....	24
METHODS	25
Cultural Resources Survey	26
Site Definition.....	26
RESULTS	27
Desktop Review.....	27
Previous Investigations and Previously Recorded Cultural Resources...	27
Map and Aerial Photograph Review.....	29
Cultural Resources Survey	31
CONCLUSIONS AND RECOMMENDATIONS	37
REFERENCES CITED.....	38
APPENDIX A: ARCHAEOLOGICAL SURVEY MAPS.....	49
APPENDIX B: CURRICULUM VITA	58

List of Figures

Figure 1. Project location map.....	7
Figure 2. Project location map.....	8
Figure 3. Project location map.....	9
Figure 4. Survey Location.....	10

Explore with us

iii



Figure 5. Project location map.....	11
Figure 6. Soil series within the Survey Area.	15
Figure 7. 1930 plat of Township 24N, Range 8E, Sections 24 and 25.	30
Figure 8: Evidence of disturbance to previously recorded site 23SO411 (bisected by road), facing N/NE, taken from intersection of split of Co. Rd. 691 and campsite turnoff.	32
Figure 9: Evidence of disturbance to previously recorded site 23SO413 (modern campsite), facing SW, taken from intersection of split of Co. Rd. 691 and campsite turnoff.	32
Figure 10. Overview of ditch system, facing S, taken from the terminus of the eastern berm of Cypress Lateral Number 1 in right foreground, Lick Creek in left foreground, St. Francis River in center background.	33
Figure 11. Overview of ditch system, facing N/NE, taken from near the southern terminus of Cypress Lateral Number 1 in center foreground, Co. Rd. 691 in left background.	34
Figure 12. Overview of land adjacent to the ditch, facing S/SW, taken from the middle surveyed portion of APE.....	34
Figure 13. Overview of land adjacent to the ditch, facing S/SE, taken from the middle-surveyed portion of APE.	35
Figure 14. Overview of heavy vegetation and tree cover in southeast portion of the APE, facing N/NW, taken from east berm of drainage ditch.	35
Figure 15. Co. Rd. 679 bisecting the APE in the northern surveyed portion of the APE, facing S, taken from Co. Rd. 679 bridge.	36
Figure 16. Co. Rd. 691 bridge across Lick Creek at southern end of the APE, facing NW, taken from bridge.....	36

List of Tables

Table 1. Soil Survey Data in the APE.	13
Table 2. Summary of Archaeological Chronology.....	16
Table 3. Previous Investigations and Archaeological Sites within the Review Area.	27

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

INTRODUCTION

On behalf of Conservation Works JV, LLC, Terracon Consultants, Inc. (Terracon) conducted an archaeological review of literature and pedestrian survey for the Missouri Lick Creek – Dudley Main, henceforth referred to as the Project, throughout portions of Drainage District 12 (DD 12) in Stoddard County, Missouri. The proposed project measures have been designed to ensure the vitality of approximately 16 miles of aging drainage district infrastructure. This may include the deployment of an efficient pumping station, establishment of native grasses on drainage ditches, or installation of drop pipe structures to control gully erosion on drainage ditches. Ditch repairs and maintenance will occur primarily in areas of previous ground disturbance and may include dredging, spreading soils along the ditch banks, and seeding these soils with native vegetation. **The proposed Project is funded through Drainage District 12 (DD 12) with supplemental funding from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) (44 FR 50579).**

NRCS programs must comply with the provisions of Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations, 36 CFR Part 800 – Protection of Historic Properties (54 USC Section 306108). The project activities meet the definition of an Undertaking, per 36 CFR § 800.16(y), and is the type of activity that has the potential to cause effects on historic properties. Therefore, the proposed project is subject to review under Section 106 of NHPA.

The Area of Potential Effects (APE) covers a total distance of roughly 16 miles, consisting of 392 acres of including drainage ditches, access points, rights-of-way, and staging areas along Lick Creek and Dudley Main Ditch. The cultural resources investigation for the Project included a desktop review of archaeological records and archival sources, plus field investigation via pedestrian archaeological survey of select areas of the APE. The objectives of this investigation were to 1) identify those areas of the APE with the highest probability of yielding significant cultural resources; 2) conduct field investigations within high probability portions of the APE to identify and delineate the extent of cultural resources, if present; and 3) evaluate the significance of each resource to determine its NRHP eligibility (as applicable). Archaeological fieldwork was conducted from December 5 to 8, 2023, by Bryce Lowry (Project Archaeologist) and Eli Schuck (Archaeological Field Technician).

The proceeding report sections include an overview of the environmental and cultural setting of the APE, the methods employed for the investigation, a discussion of the field observations and results, and management recommendations based on the data

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

collected. Appendix A contains additional maps, while Appendices B contains resumes of project personnel.

PROJECT DESCRIPTION

The proposed project measures have been designed to ensure the vitality of approximately 16 miles of aging drainage district infrastructure. This may include the deployment of an efficient pumping station, establishment of native grasses on drainage ditches, or installation of drop pipe structures to control gully erosion on drainage ditches. Ditch repairs and maintenance will occur primarily in areas of previous ground disturbance and may include dredging, spreading soils along the ditch banks, and seeding these soils with native vegetation.

Organized in 1909, within Stoddard County, Missouri, Drainage District (DD) 12 manages drainage ditches constructed in the early 1900s to transform nearly inhabitable land into a productive region. As a result, the 100-year-old watershed infrastructure in this region serves as both the lifeblood to the region and allows for the production of a wide array of agricultural commodities.

Drainage District 12 (DD 12) proposes to ensure the vitality of aging infrastructure, provide benefits to downstream watersheds, ensure landscape scale resilience, and improve drainage ditches from two HUC- 10 watersheds, Lick Creek and Dudley Main Ditch. The Lick Creek Ditch Watershed receives runoff in the headwaters from Crowley's Ridge and transfers it to an outlet into the St. Francis River. Dudley Main Ditch also drains into the St. Francis River and adjoins west of Lick Creek Watershed. Likewise, Cypress Lateral No. 1 joins Lick Creek and Dudley Main ditches at the confluence with the St. Francis River.

The Area of Potential Effect (APE) encompasses the entirety of the Project area as depicted in Figure 1 and includes drainage ditches, access points, rights-of-way, and staging areas. An archaeological survey focused on areas of ground disturbance, in which riprap armoring and engineer rock riffle construction would take place. This targeted archaeological survey was conducted along the southern 4-miles of the APE and included a pedestrian survey at 5-meter intervals, within 60-feet of the centerline of the ditch. Additionally, two previously recorded archaeological sites (23SO411 and 23SO413) were revisited to determine if cultural material was present. The remaining portions of the APE were excluded from survey as the proposed maintenance in these areas consist of non-ground disturbing or previously determined (MOSHPO-USDA NRCS Prototype Programmatic Agreement) exempted actions of soil spreading and re-seeding.

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NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri

September 2025 ■ Terracon Project No. 15237400

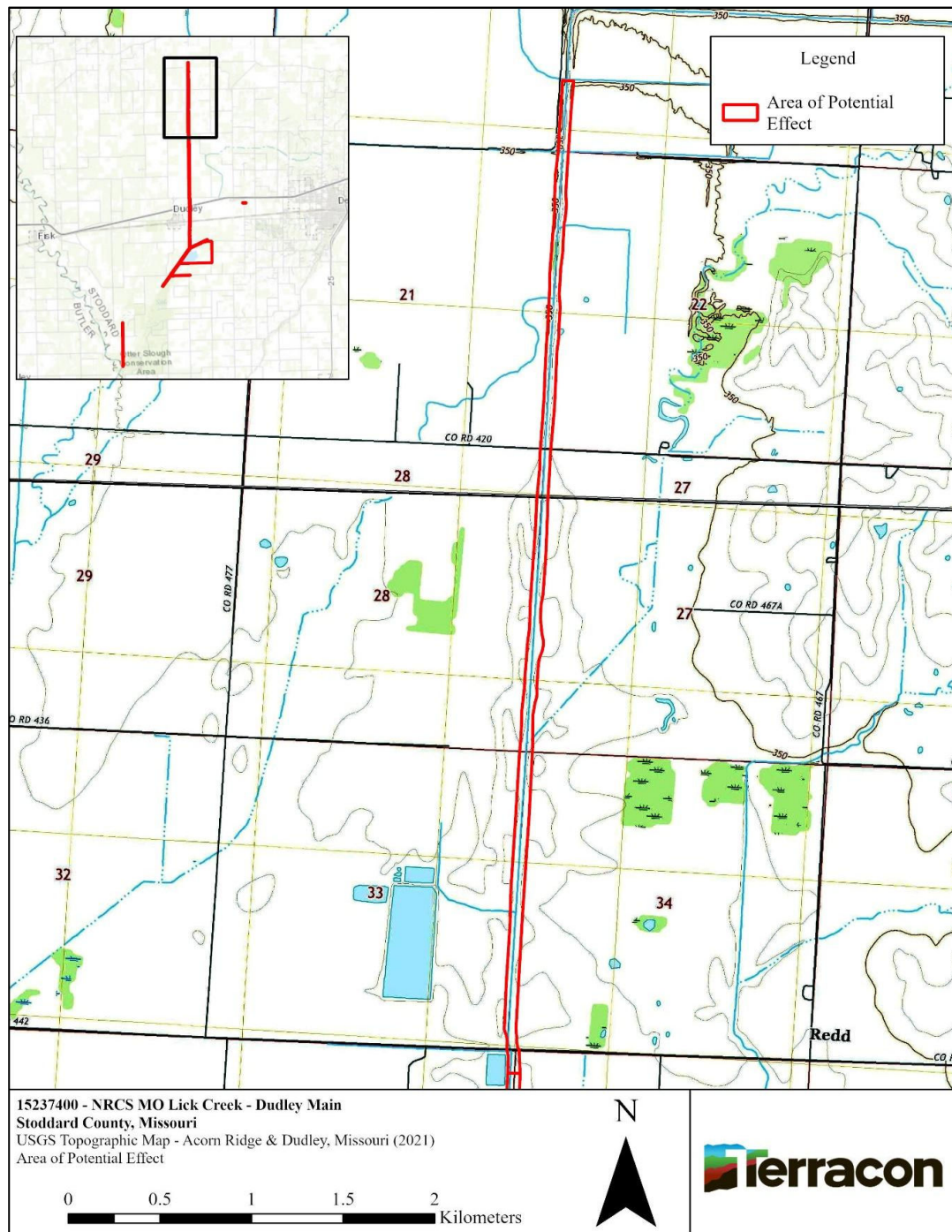


Figure 1. Project location map.

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September 2025 ■ Terracon Project No. 15237400

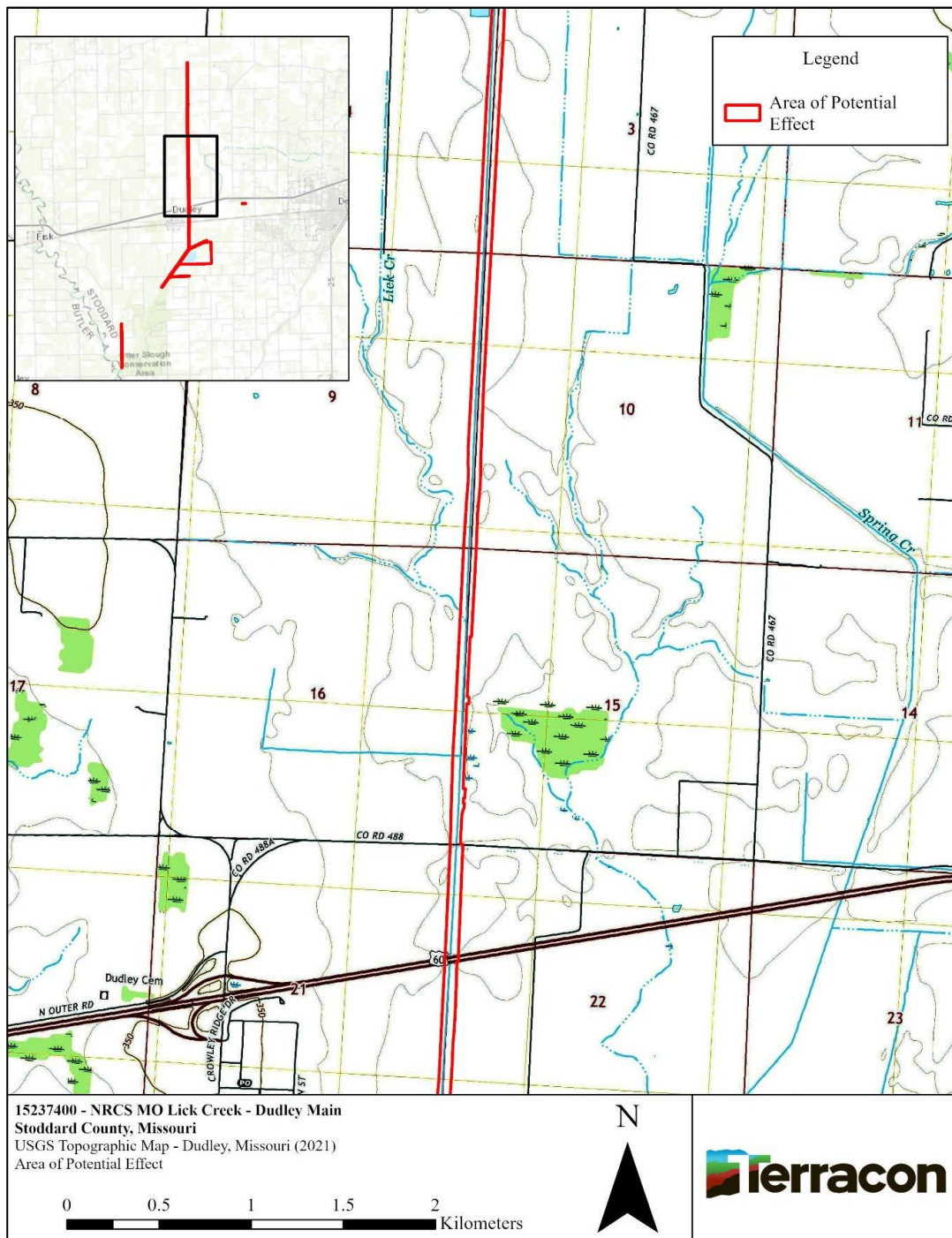


Figure 2. Project location map.

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September 2025 ■ Terracon Project No. 15237400

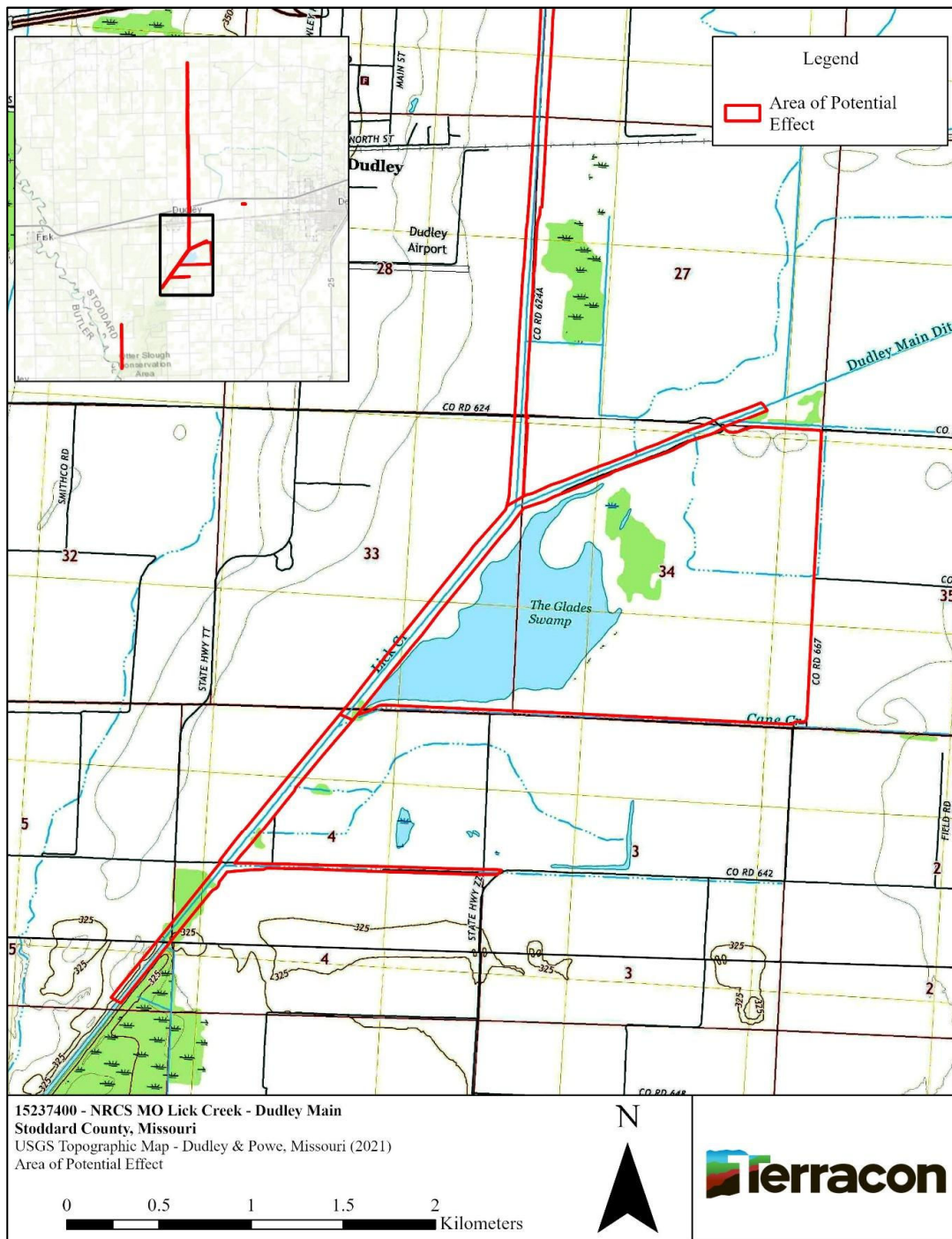


Figure 3. Project location map.

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September 2025 ■ Terracon Project No. 15237400

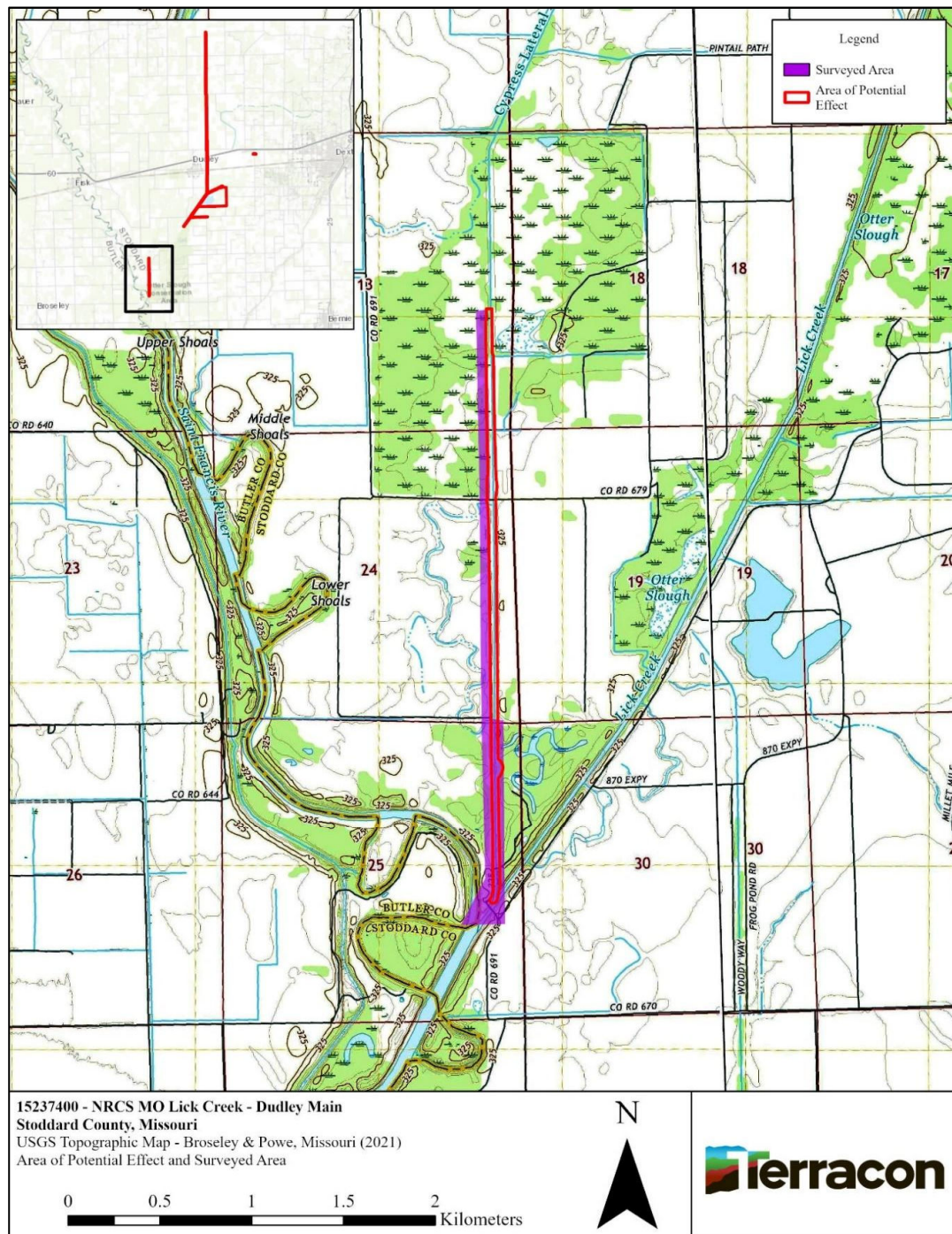


Figure 4. Survey Location.

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NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

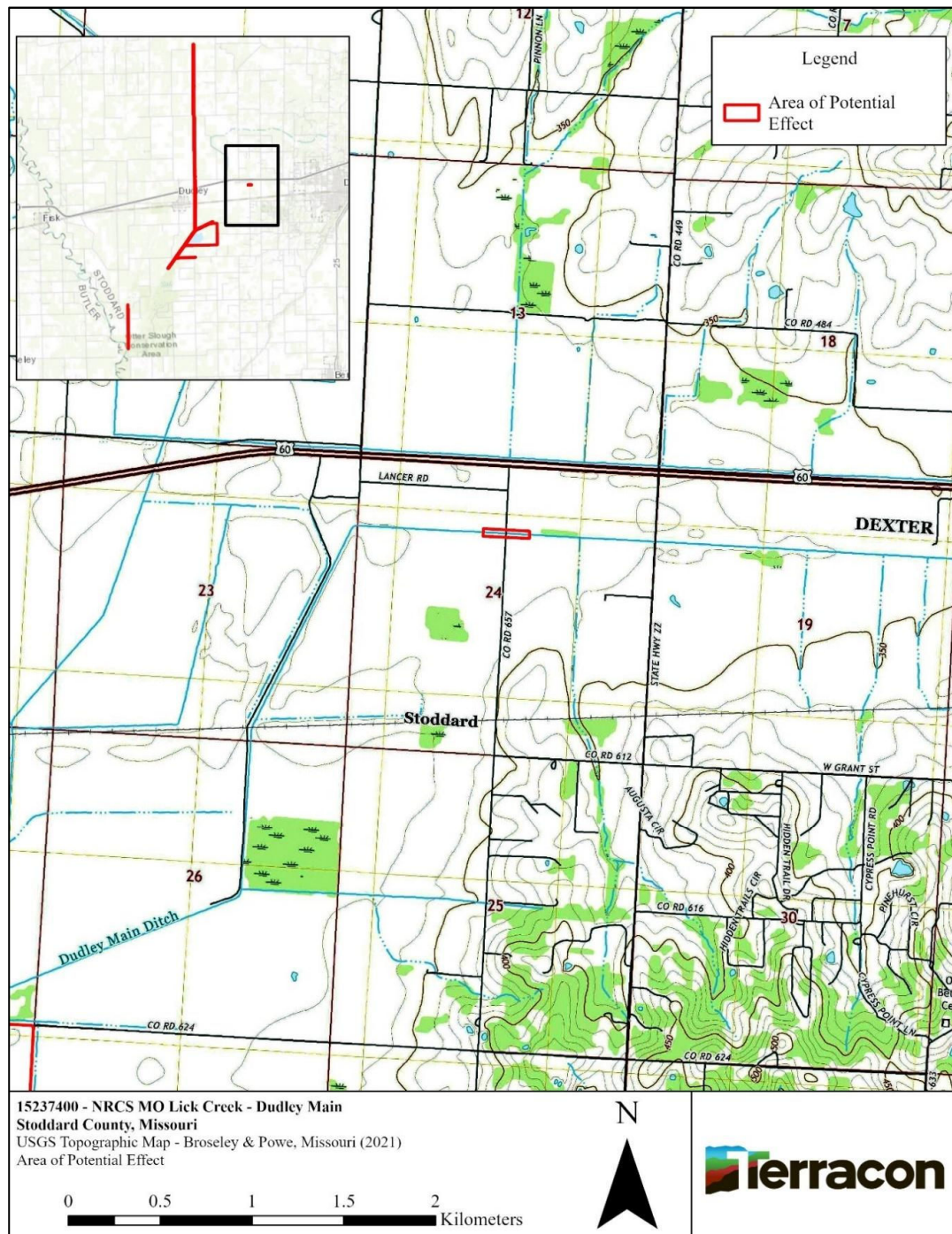


Figure 5. Project location map.



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NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

ENVIRONMENTAL BACKGROUND

As illustrated on the Broseley, MO United States Geological Survey (USGS) 7.5-minute quadrangle map, the APE occupies ditched and leveed farmland surrounded by previously natural swampland areas (see Figures 1- 5). The APE, which is located in Stoddard County, occupies an elevation of approximately 307 – 337 ft. above mean sea level (amsl). The surveyed portion of the APE is situated within Missouri Township 24N, Range 8E, Sections 13, 24, and 25 (Figure 9). Stoddard County is situated within the Saint Francis River watershed (Missouri Department of Conservation 2024a). The Saint Francis River originates in Iron County in southeast Missouri and flows 225 miles to the Missouri/Arkansas border (Missouri Department of Conservation 2024a).

CLIMATE

Stoddard County is characterized by a humid subtropical climate with hot, humid summers and mild winters (Best Places 2024). Temperatures range from 24 to 90 ° F and are generally more modest in the spring and fall. Annual precipitation averages 48 inches (in.) per year, while snowfall typically totals 7 in. (Best Places 2024). The number of extreme weather events in the region has increased in recent years, including high-intensity rains, protracted droughts, heat waves, cold waves, ice storms, windstorms, and tornadoes; in turn, these events lead to floods, fires, landslides, and abrupt changes in plant and animal populations and distributions (Decker 2023).

The climate across the state was cooler than present-day at the end of the Pleistocene epoch (approximately 12,000 years before present [B.P.]). Spring and summer were shorter and annual snowfall was greater, as much of North America was covered in glacial ice (Missouri Department of Transportation 2023). Holocene warming trends and glacial retreat at the beginning of the Holocene led to the extinction of megafauna around 10,000 B.P. Between 8000 and 5000 B.P., the warmer and dryer environment across the midcontinent made Missouri, which contained biotic provinces that included tallgrass prairies and hardwood forests by that time, a crucible of human adaptations to fluctuating plant and animal resource availability (O'Brien and Wood 1998). A cooler, wetter climate followed, enabling mesic vegetation (present across the state today) to flourish (Andresen et al. 2012). Current climatic conditions were generally established in the Late Holocene around 3000 B.P., although fluctuations including the Medieval Warm Period and the subsequent Little Ice Age continued as recently as 500 B.P. These climatic changes resulted in varied resource availability and diversity through time (Andresen et al. 2012).

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

ECOLOGY AND PHYSIOLOGY

The APE is located within the Pleistocene Valley Trains (73b) subregion of the Mississippi Alluvial Plain ecoregion defined by Chapman and colleagues (2002). The Pleistocene Valley Trains, a broad, flat, alluvial plain, was formed from Pleistocene glacial outwash deposits from the Mississippi and Ohio Rivers and subsequently covered with fertile, thick, alluvial and eolian deposits. Sand dune fields and eolian deposits also occur in the plain between the Bluff Hills (Crowley’s Ridge) and the Ozark Highlands to the west, and along the eastern border of Sikeston Ridge, which is the center of the New Madrid Seismic zone. Historically, most of the area was covered with bald cypress (*Taxodium distichum*), tupelo swamp forest (*Nyssa sylvatica*), and mixed deciduous bottomland forest. Natural grasslands occupied sandy terraces. Today, row crop agriculture dominates the landscape with primary production in soybeans, cotton, and rice (Chapman et al. 2002).

GEOLOGY AND SOILS

The Mississippi Alluvial Plain ecoregion is a mostly flat, broad, alluvial plain with major elements of relief provided by levees and river terraces. This region is the northern biotic limit for many coastal plain species. Other than select areas of sandy soils within the region, its soils tend to be poorly drained. Extensive clearing and drainage for agriculture began in the early 20th Century and removed most of the natural bottomland deciduous forest (Chapman et al. 2002). The APE is underlain by the Cretaceous age McNairy Formation (Km) (Missouri Department of Natural Resources [DNR] 2024). This area of the McNairy Formation consists of alluvial deposits clay, silt, sand, and gravel (Missouri DNR 2024).

According to the USDA NRCS (2024), the targeted survey area of the APE contains variations of four soil series (Figure 6; Table 1). Roughly half of the APE (48.6 percent) contains the Levees-Borrow pits complex which in this case is made up of the Arents and Aquents. These soils commonly occur on levees and natural levees (USDA NRCS 2024). The complex is concentrated around the Ditch that marks the center line of the APE. Amagon silt loam comprises roughly 31.3 percent of the soils mapped within the APE. These soils are found throughout the APE surrounding the borders of the Levees-Borrow pits complex.

Table 1. Soil Survey Data in the APE.

Name	Approximate Percent of APE	Percent Slope	A-horizon Thickness	Drainage	Associated Landforms
99038: Levees-	49	0 to 25 percent	0 to 18 centimeters	Somewhat poorly drained	levees/ natural levees

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

Name	Approximate Percent of APE	Percent Slope	A-horizon Thickness	Drainage	Associated Landforms
Borrow pits complex		slopes	(7 inches)		
86003: Amagon silt loam	27	0 to 1 percent slopes	0 to 8 centimeters (3 inches)	Poorly drained, occasionally flooded	backswamps/ stream terraces/ drainageways
99001: Water	19	N/A	N/A	N/A	N/A
86112: Amagon silt loam	4	0 to 1 percent slopes	0 to 8 centimeters (3 inches)	Poorly drained, frequently flooded	floodplains/ terraces/ drainages/
86115: Overcup silt loam	1	0 to 1 percent slopes	0 to 20 centimeters (8 inches)	Poorly drained, occasionally flooded	stream terraces

The remaining soil mapped within the APE is Overcup silt loam (1.4 percent). This soil occupies stream terraces but comprises a very small portion of the APE. Overall, soils mapped within the APE have incredibly shallow A-horizons, ranging from 8 to 20 centimeters below surface (cmbs) in depth (USDA NRCS 2024). Based on these data, Terracon archaeologists anticipated that cultural resources (if present) would be very shallowly buried or expressed at the ground surface throughout the APE.

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NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri

September 2025 ■ Terracon Project No. 15237400

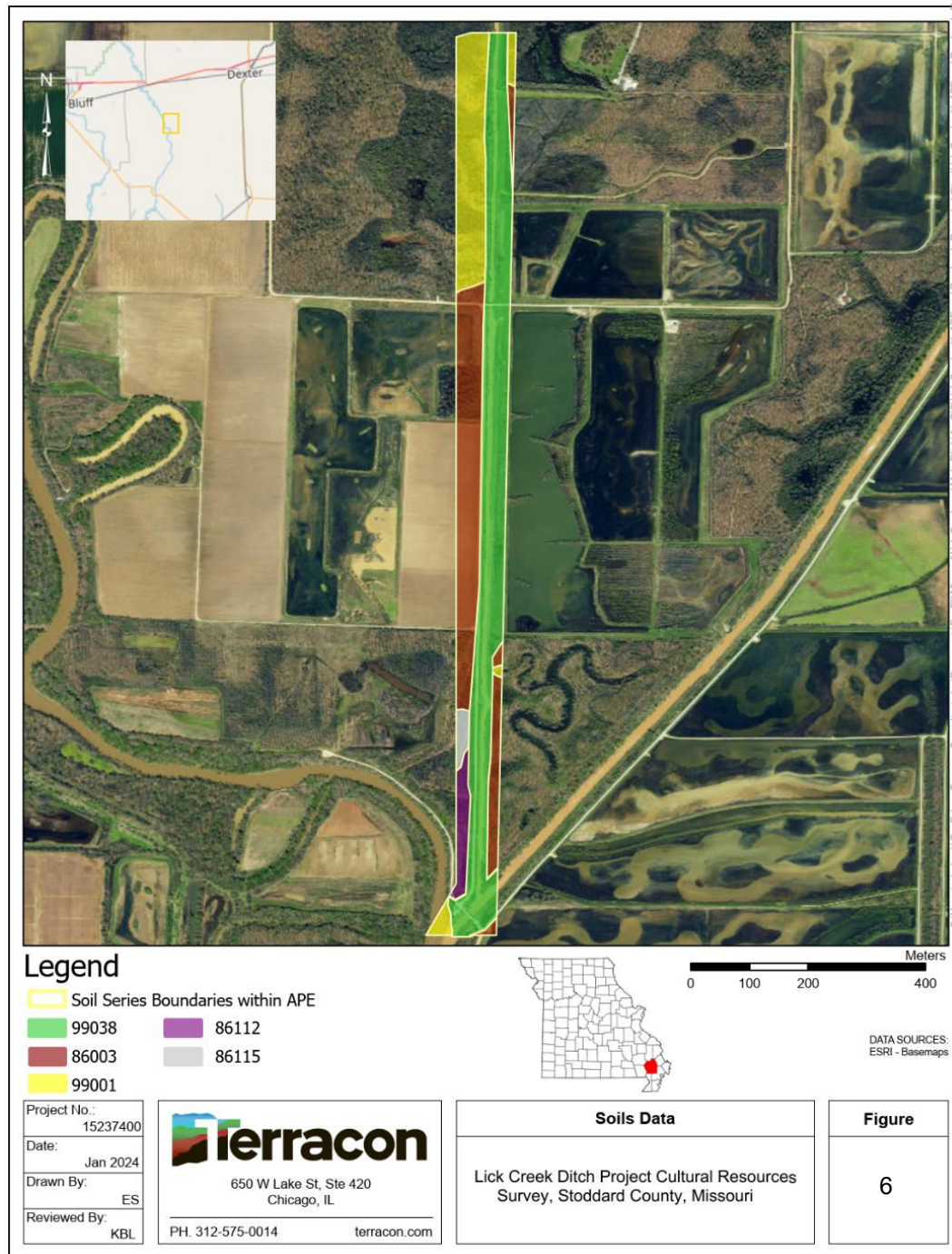


Figure 6. Soil series within the Survey Area.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

CULTURE HISTORY

Following the chronological framework established by O’Brien and Wood (1998) and the Missouri SHPO Statewide Historic Preservation Plan (2018), the archaeology of Missouri is divided into five main periods that are further subdivided into various subperiods, phases, traditions, and horizons based on differences in observed artifact assemblages and inferences about past lifeways. Broadly, shifts between the periods correlate to climatic and environmental changes (Table 2). For example, the onset of the Holocene epoch and shifts in available resources due to the changing climate catalyzed technological adaptations. However, notable cultural changes that occurred from at least Woodland times onward are also associated with key innovations and other social and/or cultural events or decisions made by different social groups that are not necessarily adaptive responses to environmental changes.

Table 2. Summary of Archaeological Chronology.

Period	Date Range	Environmental Period
Post-Contact	300 B.P. to Present	Anthropocene
Mississippian	900 to 300 B.P.	Anthropocene
Woodland	3000 to 900 B.P.	Late Holocene to Early Anthropocene
Archaic	10,000 to 3000 B.P.	Early to Late Holocene
Paleoindian	>13,500 to 10,000 B.P.	Late Pleistocene to Early Holocene

An important objective for investigations across the region is to link archaeological sites accurately and meaningfully with respective social and cultural histories from documented groups that inhabited those areas. To help achieve this goal, standard archaeological literature summarizing important trends and developments is synthesized with social histories compiled by Native scholars and historians that draw on oral histories and cultural knowledge. The latter dataset is recounted by Dr. Andrea Hunter, Tribal Historic Preservation Officer of the Osage Nation (2013), as well as members of the Sac and Fox Nation of Missouri in Kansas and Nebraska (SFNMKN 2023) and complements traditional archaeological data to provide a more robust understanding of the movements and experiences of peoples across the landscape.

PALEOINDIAN PERIOD

The origin of the earliest inhabitants of North America is the subject of much debate, but the geographic distribution of Clovis projectile points across the continent suggests that Clovis peoples were not the original colonizing population of the region (Erlandson 2014). While Clovis technology was relatively widespread, pre-Clovis deposits are scarce (or submerged on continental margins by rising sea levels), and consequently remain largely unstudied (Erlandson 2014). A possible pre-Clovis

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

component is present at the Shriver site (23DV12) in Daviess County, Missouri, where archaeologists uncovered flakes in strata below fluted points. However, absolute dates returned suspiciously wide ranges (13,250 B.P. $\pm$ 2400 and 44,650 B.P. $\pm$ 7000) (O'Brien and Wood 1998).

In general, Paleoindian sites are distinguishable by the presence of lanceolate, sometimes fluted projectile points, end and side scrapers, and beveled knives. Paleoindian groups likely consisted of small bands of highly mobile hunters; these may have come together periodically at large-scale aggregation sites (Missouri Archaeological Society [MAS] 2023). Based on excavations at the Kimmswick site (23JE334), archeologists have concluded that Paleoindian diets included a wide array of fauna including mastodon, peccary, white-tailed deer, ground sloth, amphibians, reptiles, birds, fish, rabbits, and rodents (Tankersley 1998). Plants were presumably gathered as well, but little archaeological evidence of plant consumption is preserved in the Missouri archaeological record (Lopinot et al. 1998). These data suggest that Paleoindian campsites were occupied for brief (perhaps seasonal) periods. The Paleoindian period is divided into early and late subperiods, with Clovis and Dalton technologies typifying the divisions, respectively.

ARCHAIC PERIOD

The Archaic is distinguished from the preceding Paleoindian period by intensified hunting and gathering of more diverse, local resources as Missouri became warmer and dryer (O'Brien and Wood 1998). Group mobility continued to decrease, and territorial ranges shrank (Missouri SHPO 2018). The onset of the pre-Boreal episode transformed northeastern Missouri from mixed pine, spruce, and fir forests to a combination of tallgrass prairies and deciduous forests (Darwent 2005). Lithic technology (including groundstone use) consequently expanded to accommodate plant processing and woodworking, and locally produced stemmed and notched projectile points replaced the Dalton toolkit to exploit smaller fauna, including deer, squirrels, and turkeys (Darwent 2005; Harl 2009; Sievert and Pope 2014). Grooved axes, basketry, cordage, and animal bone artifacts are also found in Archaic assemblages (MAS 2023). The Archaic period of Missouri is divided into early, middle, and late subperiods, though additional horizons/phases/complexes are also documented within each subperiod across the state.

WOODLAND PERIOD

The transition from the Archaic to Woodland period (3000 to 900 B.P.) is characterized by rapid, regionalized changes in technology (i.e., the production of

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

ceramic vessels and adoption of the bow and arrow), social organization, and resource exploitation (Martin 2007). Woodland groups became more sedentary, as evidenced by the construction of earthworks and establishment of expansive trade networks spanning the Great Lakes region to the Rocky Mountains. The Woodland period is subdivided into three categories: Early (3000 to 2500 B.P.), Middle (2500 to 2150 B.P.), and Late (2150 to 900 B.P.); these shorter intervals generally correlate with these various developments.

MISSISSIPPIAN PERIOD

The social and political landscape of Missouri transformed once again, marking the onset of the Mississippian period (900 to 300 B.P.). Population clusters grew larger and centered around the monumental architecture that reemerged, leading to hierarchical social organization, ethnic diversity, and the development of new political and religious symbols (Missouri SHPO 2018). The complex of over 200 mounds known as Cahokia (11MS2) developed near St. Louis and became a center of religious and political life, introducing many of the changes described above. Additionally, technological innovations included adoption of stone hoes and digging sticks to cultivate maize, crafting small notched triangular arrow points, as well as the production of shell-tempered ceramics with a greater variety of vessel forms (Kathryn M. Buder Center for American Indian Studies [CAIS] 2021; MAS 2023). Stabilized food supplies were achieved through cultivation, enabling more settled lifeways. Storage pits encountered at Mississippian sites suggest surpluses of foodstuffs were extant.

At Cahokia, satellite mound centers, hamlets, and villages surrounded the main site, implying spatially segregated religious and political leaders occupied the main population center and were supported by farming families who occupied the surrounding area (Pauketat 2004). Approximately one-third of the population of Cahokia came from other regions, with the population peaking around 20,000 residents (CAIS 2021). In general, Mississippian population centers contained platform temple, residential, storage, and burial mounds, some in the shape of animals or cones, distributed around a central plaza (Young et al. 2000). The most prominent mound at Cahokia, Monks Mound, is over 30 meters (m.) tall (Schilling 2012). Plazas were surrounded by neighborhood clusters. Structures within the neighboring hamlets were constructed from upright poles interwoven with branches and covered with thatching.

Historically and archaeologically, the Mississippian period may be best understood as consisting of a series of different cultural groups who shared common subsistence

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

and economic practices while potentially maintaining their distinct ethnic and linguistic identities. While material culture and settlement/subsistence practices of the period may share certain similarities and are often divided into archaeological phases, from a linguistic or ethnohistoric perspective these regional settlement systems likely represent different social histories of historically known Native groups. For this reason, making connections between Mississippian and later occupations of the region is of critical importance to demonstrate cultural continuity for many culture groups. Mississippian phases are not monolithic cultural phenomena, and evidence of diffusion between separate entities has been identified (Trubitt 2012; Wiewel 2014).

Cahokian beliefs and lifeways are known from stone figurines, pipes, copper personal adornments, ceramics, and marine shell engravings, which depict the community's appearance and views of fertility, warfare, and significant iconography (Emerson and Lewis 2000). Woodhenge at Cahokia is likewise interpreted as a calendar to chart solstices and equinoxes, which may have had ceremonial or cultural significance (CAIS 2021). While many mounds near St. Louis were destroyed by later development, the Sugar Loaf Mound was reclaimed by the Osage Nation in 2009 (CAIS 2021).

In Missouri, the Dampier site (23SL2296) is remarkably similar to Cahokia. The site contains shell-tempered Powell Plain jars, some with effigy lugs, triangular arrow points, and a comparable faunal assemblage of fish, waterfowl, and deer (Harl and Machiran 2013). The site also contains evidence that songbirds, hawks, and owls were collected for their feathers to be utilized for personal adornment. While mounds in Missouri are generally concentrated in the American Bottom (e.g., the Campbell [23PM5], Murphy Mound [23PM43], and Twosahgy [23MI2] sites), some sites like Cloverdale (23BN2) are recorded in the northern half of the state and contain Mississippian ceramics.

Around 1350, Oneota groups migrated southward into Missouri (MAS 2023). The Utz (23SA2) and Old Fort (23SA104) sites were occupied by the tribe from about that time into the 1700s; the former contains European trade goods (beads, brass rings, copper, etc.), possibly from interactions with the residents of neighboring Fort D'Orleans (NPS 2005; O'Brien and Wood 1998). Likewise, the Missouria inhabited the Big Bend region of the Missouri River valley. However, large chiefdoms declined after 1400 and densely populated areas were abandoned during a time of societal reorganization (Rees and Saunders 2021). It is unclear when Dhegiha-speaking peoples sundered, but it is likely to have occurred during the Mississippian Period.



Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

Based on oral histories, following a coalescence in habitation by A.D. 900 in the St. Louis area (likely attracted by the emergence of Cahokia), the Omaha, Ponca, and Kaw all left the region of present-day east-central Missouri, heading up the Mississippi River toward Iowa or west following the Missouri River. This sequence left the Osage as the remaining Dhegiha speakers in the area around eastern Missouri/western Illinois (Hunter 2013; Rollings 1995). Following the dissolution of the Cahokia metropolis, remaining Osage populations dispersed across Missouri, northern Arkansas, and adjacent areas of eastern Kansas and Oklahoma to inhabit what had been traditional hunting and trading territories, where they remained until the early 1800s when land cessions began.

POST-CONTACT PERIOD

The Post-Contact period in Missouri begins with the arrival of the first European explorers in the region, denoting consistent contact between European and indigenous peoples. The Illinois—a loose confederacy of Algonquin speaking tribes including the Kaskaskia, Cahokia, Peoria, Michigamea, Moingwene, and Tamaroa—inhabited what is now eastern Missouri at the time of European exploration in the region (Aron 2006). Some of the Illinois groups relocated to the area after being displaced from Canada and the Great Lakes region by European colonization and the Iroquois War (1641 to 1701) (Wood 2013). Southwest and central Missouri was also home to Chiwere and Dhegiha-speaking peoples in the 17th century, including the Oto, Iowa, Quapaw, Missouri, and Osage. While the fur trade (primarily bison and beaver) between indigenous and European groups was well-established in Canada, Michigan, and Wisconsin by the mid-17th century, the French did not venture southwestward into Missouri until the latter half of the century (Gilman 1974).

In 1673, French explorers led by Canadian fur trader Louis Jolliet and Jesuit priest Jacques Marquette charted the path of the Mississippi River from present-day Michigan through Missouri to Arkansas (Aron 2006). The pair, motivated by dual economic and religious interests, aimed to extend French influence into new territory and identify a route from the Great Lakes region to The Gulf of Mexico in order to expand existing trade networks. Jolliet and Marquette documented the Oneota at the Utz site on maps produced based on interviews with individuals they met during the journey. Subsequent interactions between Native and Euro-Americans would alter the physical, social, and political landscape of Missouri.

Early Statehood

In 1804, President Thomas Jefferson directed Meriwether Lewis and William Clark to lead a contingent of soldiers and volunteers to search for the “Northwest Passage”

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

from the Missouri River to the Pacific Ocean and take inventory of the land, its inhabitants, vegetation, and resources within the newly acquired Louisiana Territory (Missouri State Archives [MSA] 2023a). The group departed from St. Charles, Missouri and proceeded up the Missouri River, eventually making their way to Fort Clatsop, Oregon. The same year, the District of Louisiana was organized north of the 33rd parallel and placed under the administration of the governor of the Indiana Territory established by the Northwest Ordinance (1787). The region retained the five district boundaries (later counties) established under Spanish rule; the District of Arkansas was established in 1806. By that time, the District of Louisiana dissolved, and the Louisiana Territory (later the Missouri Territory in 1812) was self-governed from St. Louis. Meriwether Lewis became the governor of the territory shortly thereafter, followed by William Clark in 1813 (Buckley 2012).

In 1811 and 1812 the New Madrid Earthquakes caused Otter Slough, Fish Slough, Lick Creek and the Glades Swamp to combine into the large wetland now visited by thousands of migrating waterfowl and is one of only a few examples of a cypress/tupelo swamp left in Missouri (Missouri Department of Conservation 2024b).

Native American groups in the region (including the Sac and Fox, who had been excluded from previous treaty negotiations) signed the Treaty of St. Louis in 1804, which ceded most of their land in Missouri, Illinois, and Wisconsin to the United States in exchange for goods and annual payments. The treaty was the first in a series of such agreements signed between 1804 and 1825; these transactions often occurred under duress and without an understanding of private property ownership (ISM 2018). Treaties signed in 1808, 1818, and 1825 forced the Osage to relinquish vast portions of their territories as well (Sabo 2022). Fort Bellefontaine (1804) and Fort Osage (1808) were constructed in Missouri to control the region.

Although the Missouri Territory petitioned the U.S. government to request statehood in 1818, debate over the gradual abolition of slavery as a contingency for admittance to the Union ensued between Northern and Southern congressmen (Parrish et al. 1992). The “Missouri Crisis” ended with the Missouri Compromise in 1820, which established Maine as a free state and Missouri as a slave state. The legislation also prohibited slavery in the remainder of the Louisiana Territory north of Missouri to ensure a balance of free and slave states in Congress (Parrish et al. 1992). Accordingly, Missouri officially became a state in 1821. The temporary capital at St. Charles was moved to Jefferson City in 1826.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

Following admission to the Union, white settlers (particularly slave owning farmers) flocked to Missouri in the spirit of Manifest Destiny. A large contingent of Germans also established the “Missouri Rhineland” from St. Louis to Hermann in the 1830s. The state was likewise viewed as the “Gateway to the West” by travelers along the Oregon Trail and became a staging point for farther expansion (Parrish et al. 1992). Created January 29, 1841, Adair County was named for the Honorable John Adair of Kentucky (HMDB 2023). These population movements again put white settlers at odds with Native Americans, and the Indian Removal Act of 1830 further agitated existing hostilities. In 1832, Black Hawk led members of the Sac, Fox, and Kickapoo in a battle to reclaim lands that were surrendered to the U.S. government in the 1804 Treaty of St. Louis by unauthorized members of the groups. The Black Hawk War, as it was known, was fought across neighboring Illinois and Wisconsin and resulted in the removal of the Native groups from Illinois. The later Treaty of Chicago (1835) with the Potawatomi and a Treaty with the Iowa and Sauk and Fox (1836) enabled Missouri to annex lands in what is now the northwestern corner of the state as the Platte Purchase (1837). The Cherokee passed through the state on the Trail of Tears while relocating to Indian Territory in 1838.

Stoddard County overwhelmingly voted Democrat at this time (the 1860 election) with the votes divided among the three candidates. John Bell received the most votes (385) with his middle of the road “Union and Constitution as they are” stance. Steven A. Douglas, Lincoln’s political rival and champion of popular sovereignty tallied 230 votes, while John Breckenridge collected 198. Abraham Lincoln did not garner a single vote in the county (McGhee 1995; Stoddard County History 2024a).

Industrialization and the Civil War

At the outbreak of the Civil War, Missouri was divided by a slaveholding minority population and Northern and foreign-born anti-slavery immigrants. Central Missouri, along the Missouri River, was known as “Little Dixie” at the time, settled by Anglo-Americans from the South who brought their slaves with them (Stone 2006). River plantations formed in the region, which had the densest slave populations in the state by 1860. A meeting of the state’s General Assembly failed to elect any pro-secession delegates, and Missouri ultimately voted to stay within the Union (Parrish et al. 1992). The battle of Kirksville in 1862 solidified Union control of northern Missouri (Stevens Publishing 1887). In 1861, the polarization of Missouri culminated in the Camp Jackson Affair, where Union and Confederate troops clashed over a planned raid on the federal arsenal at St. Louis. The fight led to riots and the establishment of martial law in the city. Pro-Confederate Governor Claiborne Fox Jackson—who had partially instigated the affair—abandoned the capital prior to the arrival of Union

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

forces in Jefferson City, and the State Convention subsequently vacated the official's position. In response, Jackson declared Missouri a free republic. He then signed an alliance with the Confederacy, making Missouri the 12th state of the breakaway republic (Parrish et al. 1992). Jackson's exiled government was headquartered in Marshall, Texas.

There are many conflicting and contradicting reports and sources when studying Union organization in Southeast Missouri and Stoddard County is no exception (Stoddard County History 2024b). A report by historian Jim McGhee put the number of Union soldiers from Stoddard County as high as 200. It appears the actual number may be much lower though when looking at the official history of the Missouri State Militia and Enrolled Missouri Militia, there are no reference to a company raised in Stoddard County (Stoddard County History 2024b). Instead, it seems that the men of Stoddard County overwhelmingly chose the side of the Confederacy during the war, and those who didn't either left the county to join in other place or managed to hide from recruiting authorities (Stoddard County History 2024b).

In the aftermath of the war, modernization continued to transform the frontier state into an urban center. In the years leading up to the war, Missouri's population boom catalyzed the urbanization of St. Louis and establishment of major steamboat, railroad, telegraph, and mail routes. In 1856, the North Missouri Railroad was laid through Audrain County, followed by the Wabash (1858) and Alton (1872) lines (Audrain County Missouri 2023). Industrial developments across Missouri were not without casualties; the Mississippian "Big Mound" in St. Louis was destroyed in 1869 for railroad construction, and over 40 mounds near the city were eventually razed (MSA 2023b). Kansas City also emerged as a major population center and key producer of flour and meat processing (Parrish et al. 1992). Advances in railroad transportation and refrigeration encouraged large cattle drives from Texas to Kansas, and from there to Kansas City. Mining of zinc, coal, limestone, and other resources was enabled across the state by the ever-expanding railroad network, and the U.S. Army Corps of Engineers was established in St. Louis in response to concerns about river management.

Low wages, unsafe workplaces, and long hours plagued the urban labor force, who responded by unionizing (Parrish et al. 1992). Strikes and riots soon followed, and an agricultural crisis emerged in Missouri in tandem. Speculative land purchases, drought, and sharecropping led discontented farmers to form the Missouri Farmers' Alliance in 1890. The group, along with other labor organizations collectively known as the Populists, championed the abolition of child labor, equal pay for men and

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

women, eight-hour workdays, establishment of income tax, and crop-lien system reforms (particularly for cotton) (Parrish et al. 1992).

Another farm protest organization, The Agricultural Wheel, was especially active in Stoddard County. It was formed to expose and reform problems such as unfair practices by merchants, grain elevators, and railroads taking advantage of small farmers such as themselves. The Agricultural Wheel supported many populist ideas but did not support the party itself with an endorsement (Stoddard County History 2024c).

Members of this group supported such ideas as: regulation or nationalization of railroads, telephones, and telegraphs, income tax on high incomes, election of senators through popular vote instead of legislature, limit of the purchasing of public lands to American's only, closure of national banks, and expansion of currency through silver. The first established group within Southeast Missouri was in Poplar Bluff in 1887, but the Agricultural Wheel had met in formally as early as 1886. By 1888 it held its first state convention in Dexter Missouri, the state president being one H.W. Hickman from Stoddard County. Later, the Agricultural Wheel and the Farmers' Alliance merged to become the Farmers and Laborers Union (Southern Alliance). Hickman remained president (Stoddard County History 2024c).

The Great Depression and World War II

In 1910 much of the land west of Dexter toward the St. Francis River was owned by the Connecticut Mutual Life Insurance Company, who used four large dredge boats to ditch over 70,000 acres of land. In association with this they also built roads, cleared fields, and built homesteads with fences so they could offer them as "easy terms, on long time, with small payments, and low rates" as stated by *The Dexter Statesman* newspaper. In 1900 this land sold for \$1.50 an acre but with these improvements land was selling as high as \$25 an acre in 1910, and land that had established farms could go as high as \$50 an acre (Stoddard County History 2024d).

Prior to the Great Depression (1929 to 1939), Missouri's economy boomed as the state supplied lumber, zinc, lead, shoes, and clothing to the World War I (1914 to 1918) effort (Parrish et al. 1992). The State Highway Commissioner's office was also established in 1913, and as automobiles became more affordable, the state looked to expand its highway system. However, Missouri was not immune to the effects of the Great Depression. As railroads and mines slashed their payrolls with the down turning economy, droughts plagued rural parts of the state. In response to the bleak economic conditions, New Deal programs—such as the Public Works Administration,

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

Works Progress Administration, and Civilian Conservation Corps—employed Missourians to build public schools, courthouses, roads, bridges, state parks, and other infrastructure throughout the state (University of California Berkeley 2023). Notable projects in northeastern Missouri include the Audrain Medical Center Nurses Home, Columbia Municipal Airport Hangar, Moberly Municipal Auditorium, and Callaway County Courthouse.

The land that now makes up Otter Slough Conservation Area was acquired in three different land purchases beginning in 1944 with the acquisition of the 244-ac. Bradyville tract and ended in 1988 with a 3,500-ac. Purchase from Gaylon Lawrence. The middle purchase (1978) was perhaps the most historic, as the Missouri Department of Conservation purchased the 1,244-ac. Greenhead Hunting Club from the Charles Miller family, which contains seven historic waterfowl hunting blinds still maintained by the Department on what is now Otter Lake (formerly the Cypress-Tupelo swamp) (Missouri Department of Conservation 2024c).

New Deal programs were unable to totally counteract the effects of the Great Depression, but World War II (1939 to 1945) accelerated agricultural production with an influx of federal troops stationed at training camps, such as Fort Leonard Wood, Camp Crowder, and the Jefferson Barracks (Parrish et al. 1992). The state became a leader in aviation as well. While Missourians experienced increased purchasing power, the wealth was not enjoyed universally. The state’s Black population—largely concentrated in St. Louis and Kansas City—experienced discrimination throughout the mid-20th century. The social and cultural landscape of Missouri continues to evolve, as do the challenges facing the diverse and expansive population.

METHODS

Terracon consulted the Missouri Cultural Resources Inventory Archaeology Viewer (Viewer) and Historic Districts and Sites Map (Missouri SHPO 2024b, 2024c) to determine if National Register of Historic Properties (NRHP) properties, NRHP districts, or archaeological sites were previously documented within the APE. Furthermore, Terracon reviewed historical maps and aerial photographs available from Google Earth (2024), Nationwide Environmental Title Research Online (NETR 2024), the Missouri Geological Survey (2024), State Historical Society of Missouri (SHSMO 2024), Missouri Secretary of State (2024), and the USGS (2024) to document historic habitation of the APE (if evident), including the locations of previous historic-age structures. Contemporary maps and imagery of the APE were also consulted to identify recent disturbances to the APE that may have impacted the

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

integrity of cultural resources (if present). Findings from this pre-field review helped determine areas of APE that would require pedestrian survey

CULTURAL RESOURCES SURVEY

The objectives of the cultural resource investigation were to 1) identify cultural resources present within the APE; 2) delineate the extent of identified resources (if present); and 3) evaluate the significance of each resource as possible based on survey-level data to determine its NRHP eligibility (as applicable). Terracon archaeologists conducted a pedestrian survey of the APE in accordance with the Missouri SHPO Guidelines for Phase I Archaeological Surveys and Reports (2023a).

The type and extent of disturbance related to the proposed ditch improvements, coupled with the results from the review of the Missouri Archaeological Viewer, helped determine areas of the APE that would require pedestrian survey. Pedestrian survey was limited to the southern portion of the Project, in areas where extensive bank disturbances were proposed and in areas within 250-feet of previously recorded archaeological sites. The survey area was also limited to 60-feet from the centerline of the ditch to avoid trespassing. Taking these limitations into account, a total of 29 acres of the project were surveyed. Areas not surveyed were limited to the northern half of the APE. These areas omitted had been previously subject to archaeological survey. Additionally, the ditch maintenance in these areas included spreading soils and reseeding, which would have no subsurface disturbances along the ditch bank. Pedestrian survey across the targeted survey area of the APE was conducted along transects on both sides of the ditch at 5- meter intervals.

Feature, artifact, and photographic logs were maintained as needed. Additionally, artifacts, if present, were recorded and photographed, using representative photos where large numbers of similar artifacts were found. Artifact photographs included the obverse and reverse sides of the artifact. Additionally, ceramic sherd photographs included the profile paste and temper when applicable. Terracon maintained a no collection strategy for the project. Non-collected artifacts were documented and replaced where they were discovered and mapped utilizing a handheld GNSS receiver capable of sub-meter accuracy.

Site Definition

Newly recorded archaeological sites are defined as a concentration of at least three artifacts greater than 50 years of age observed within a 20-meter (m.) radius. Observed structures, structural remains, or archaeological features (e.g., wells, cisterns, petroglyphs, rock cairns, earthworks, etc.) greater than 50 years of age are

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

also defined as a site, as well as temporally diagnostic isolated finds (except for ubiquitous historic artifacts like bottle glass), if present. When a potential archaeological site is identified, the horizontal and vertical limits of the site are delineated with respect to the limits of the APE. Site boundaries are determined based on surface artifact density. Historic-age structures within the APE (if present) are not delineated by associated surface artifact density, but rather photographed from the cardinal and ordinal directions. Site forms are completed in the field and submitted to the Missouri SHPO to obtain trinomials for newly recorded archaeological sites, when applicable.

RESULTS

DESKTOP REVIEW

Previous Investigations and Previously Recorded Cultural Resources

The Viewer (Missouri SHPO 2024b) indicates that portions of the APE and surrounding one-mile review buffer area have been previously surveyed for cultural resources. Two archaeological sites have been previously recorded within the APE and 11 more are within the review area. These surveys and findings are summarized in Table 3, below. Based on Missouri SHPO guidelines and *Section 304 of the National Historic Preservation Act of 1966* site forms and site maps are confidential and are only included in report copies presented directly to the SHPO, thus figures showing the exact locations of archaeological sites mentioned below are redacted in Appendix A of this report.

Table 3. Previous Investigations and Archaeological Sites within the Review Area.

ID	Year	~Acres	Project Sponsor	Investigating Firm	Associated Sites (all trinomials start with 23)	Title
BU-28	1979-09	43	Corps of Engineers	Iroquois Research Institute	S0411** , S0413** , S0414	A Survey Level Report of the Sappapelo to Crowleys Ridge Channel Improvement and Scour Repair Project, St. Francis River, Stoddard and Butler Counties, Missouri
SO-19	1988-08	4,991	Missouri Department of Corrections	Triad Research Services	S0129, S0411, S0413, S0414, S0522*, S0523, S0524, S0525, S0526*, S0527*, S0528*, S0529*, S0530*, S0532, S0533, S0535, S0539*, S0618*	A Phase I Cultural Resources Survey and Evaluation of the Otter Slough Wildlife Management Area, Stoddard County, Missouri

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

ID	Year	~Acres	Project Sponsor	Investigating Firm	Associated Sites (all trinomials start with 23)	Title
SO-24	1990-05	1.5	Missouri Department of Corrections	Center for Archaeological Research	SO539*	Historical and Architectural Evaluation of Two Log Cabins in the Missouri Department of Conservation Otter Slough Wildlife Management Area, Stoddard County, Missouri
SO-29	1993-09	28.5	COE and FWS	Environmental Research Center	SO522*, SO523, SO534, SO525, SO527*, SO528*	Cultural Resource Investigations, Phase II Testing and NRHP Evaluation, Otter Slough C.A. Stoddard County, Missouri
SO-31	1995-01	334	Corps of Engineers	Prentice, Thomas, and Associated, Inc.	SO413	Cultural Resources Survey of Dudley Ditch / Lick Creek, Stoddard County, Missouri
SO-36	1998	198	Federal Highway Administration	Missouri Department of Transportation/ Missouri Highway and Transportation Department	SO592, SO593	Phase I Cultural Resources Survey of a Proposed Wetland Mitigation in Stoddard County, Missouri. MoDOT Job. NO. J0S0792
SO-74	2009-01	5.5	Missouri Department of Corrections	Environmental Research Center of Missouri, Inc.	SO192, SO531, SO532	Cultural Resource Investigations, Phase II Testing, Otter Slough Conservation Area, Stoddard County, Missouri

* Site numbers with asterisks are associated with the survey but not within the APE or review area

****Site numbers in bold are within the direct APE**

23SO411 and 23SO413

The two previously recorded sites that overlap the direct APE are sites 23SO411 and 23SO413. These sites were originally recorded in September of 1979 during a survey for the Corps of Engineers by the Iroquois Research Institute. They also fall within the range of survey SO-19 so were likely revisited in August of 1988 as well.

Site 23SO411 is a historic surface scatter



(see Figure 8: Redacted). Original recording of this site noted a burnt stump with a coil of wire, bottles, cans, and ceramics with above 75% ground surface visibility. No eligibility determination is on file at MO SHPO for this site.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

Site 23SO413 is a prehistoric isolated find

(see Figure 8: Redacted). Site 23SO413 originally contained a single lithic artifact (biface) which was collected at the time of discovery. No eligibility determination is on file with MO SHPO for this site.

Map and Aerial Photograph Review

In addition to the Viewer, Terracon archaeologists reviewed historical plat and topographic maps (1919, 1930, 1940, 1956, 1957, 1960, and 1984) of the APE, as well as aerial photographs (1955, 1978, 1984, 1996, 2003, 2007, 2009, 2010, 2012, 2014, 2016, 2018, and 2020) to identify Historic Points of Interest (HPOIs) or evidence of recent disturbances to the APE that may have impacted the integrity of cultural resources (if present) (Missouri Geological Survey 2024; Missouri Secretary of State 2024; NETR 2024; SHSMO 2024; USGS 2024).

The survey area is situated within Missouri Township 24N, Range 8E, Sections 13, 24, and 25 (Figure 9). In 1930, the majority of the southern half of the APE was owned by Richard Michel, while W.E. Edmund owned a small portion. The whole northern half of the APE was owned by Connecticut Mutual Life Insurance Company (Missouri Secretary of State 2024). Both historically and currently the APE has been part of southeastern Missouri's intricate ditch system, containing a stretch of Cypress Ditch that conjoins with Dudley Main Ditch and Lick Creek at its southern terminus. There are no HPOI's within the APE on any of the reviewed materials from 1919 to 2020.

The earliest map information available, a 1919 Stoddard County plat map, does not show details such as structures, roads, and ditches (SHSMO 2024). A 1930 Stoddard County plat map, however, shows the ditch in the APE labeled as 'DITCH' (Missouri Secretary of State 2024). This plat map also does not show roads and structures but does contain parcel ownership information along with the river and ditch systems. The earliest available historic topographic map (1940) shows the same ditch labeled as 'CYPRESS DITCH.' In 1940 neither of the two roads within the project area (County Road 679 and County Road 691) had been built yet. By 1956 County Road 679 had been built but did not follow its current route. County Road 679, in 1956, went from paved to unpaved and terminated at two structures just east of the northern half of the APE (NETR 2024). These are likely hunting cabins from when this was the Greenhead Hunting Club (see above Cultural History). Between 1957 and 1978 County Road 679 was changed to its current route (NETR 2024) Also during this time County Road 691 was constructed but it ran west of where it runs today. Between

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

1960 and 1978 a motor vehicle bridge was built across Dudley Main Ditch which is part of County Road 691 and by 1984 it was rerouted to the configuration it is in today (NETR 2024). There are no HPOI's within the APE on any of the reviewed materials from 1919 to 2020.

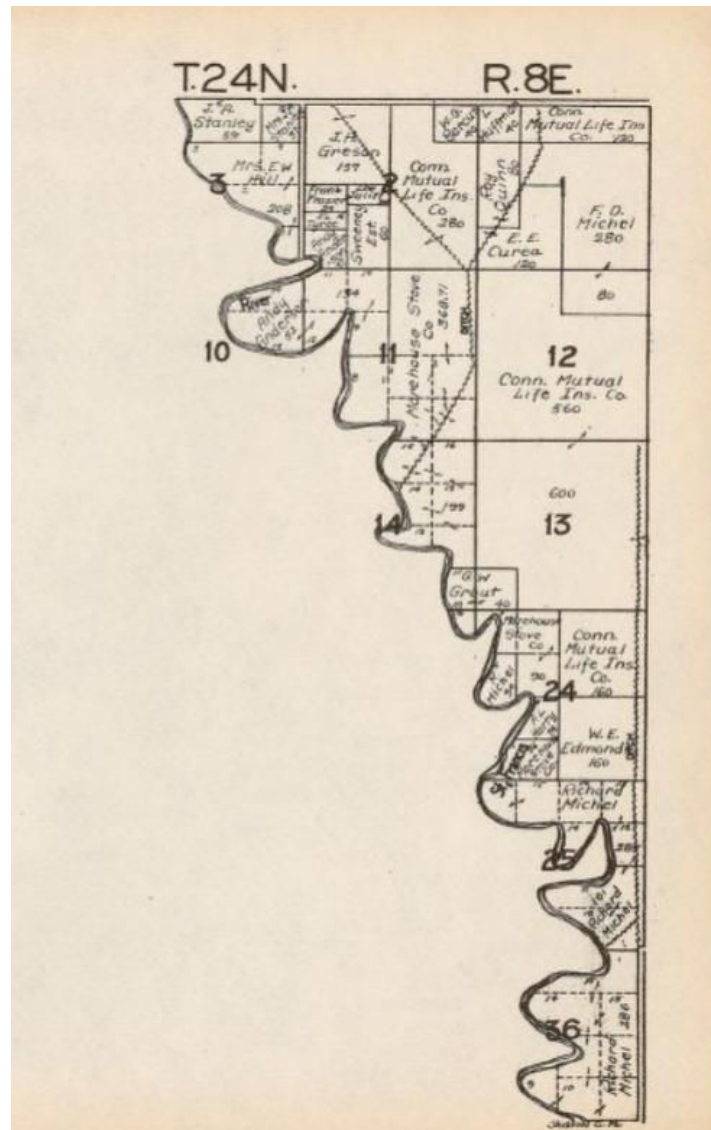


Figure 7. 1930 plat of Township 24N, Range 8E, Sections 24 and 25.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

CULTURAL RESOURCES SURVEY

Terracon archaeologists conducted a pedestrian survey of the APE from December 5 to 8, 2023. A majority of the APE was excluded from survey as the proposed maintenance in these areas consist of non-ground disturbing or previously determined (MOSHPO-USDA NRCS Prototype Programmatic Agreement) exempted actions of soil spreading and re-seeding. Pedestrian survey across the targeted survey area of the APE was conducted along transects on both sides of the ditch at 5- meter intervals. The surveyed area had slight vegetation on some areas of the berms of the ditch between the ditch and the adjacent agricultural fields but were mostly clear (~30% ground surface visibility). The southeast section of the APE was forested and wetland areas bordering the ditch had heavy vegetation along the berm. Undergrowth cleared up where heavy tree cover started near the edge of the surveyed area (Figure 12). The original construction, use, and maintenance of the ditch could have impacted surface deposits within the APE, displacing cultural materials (if present) from their original context and compromising their integrity of setting and location.

Terracon archaeologists re-visited the mapped site locations within the APE and photographed the areas. No artifacts or archaeological features were found at either location. There was also heavy modern disturbance at both locations: County Road 691 bisects 23SO411 (Figure 7), and there is a modern campsite in the area of 23SO413 (Figure 8). When 23SO413 and 23SO411 were revisited during Terracon's survey of the area, no culturally significant materials were identified. The artifacts that make up 23SO411 and 23SO413 lack depositional integrity and associated cultural features. Furthermore, the highly fragmentary and ubiquitous nature of the artifacts observed limits the potential for the sites to contribute new data to our understanding of Stoddard County history or pre-history. Therefore, Terracon archaeologists recommend that these sites are *not eligible* for listing in the NRHP.

Terracon archaeologists totaled approximately 4 miles, consisting of 29 acres of pedestrian survey transects at 5- meter intervals. While surveying this portion of the Project APE and no cultural materials were discovered.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400



Figure 8: Evidence of disturbance to previously recorded site 23S0411 (bisected by road), facing N/NE, taken from intersection of split of Co. Rd. 691 and campsite turnoff.



Figure 9: Evidence of disturbance to previously recorded site 23S0413 (modern campsite), facing SW, taken from intersection of split of Co. Rd. 691 and campsite turnoff.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400



Figure 10. Overview of ditch system, facing S, taken from the terminus of the eastern berm of Cypress Lateral Number 1 in right foreground, Lick Creek in left foreground, St. Francis River in center background.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400



Figure 11. Overview of ditch system, facing N/NE, taken from near the southern terminus of Cypress Lateral Number 1 in center foreground, Co. Rd. 691 in left background.



Figure 12. Overview of land adjacent to the ditch, facing S/SW, taken from the middle surveyed portion of APE.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400



Figure 13. Overview of land adjacent to the ditch, facing S/SE, taken from the middle-surveyed portion of APE.



Figure 14. Overview of heavy vegetation and tree cover in southeast portion of the APE, facing N/NW, taken from east berm of drainage ditch.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400



Figure 15. Co. Rd. 679 bisecting the APE in the northern surveyed portion of the APE, facing S, taken from Co. Rd. 679 bridge.



Figure 16. Co. Rd. 691 bridge across Lick Creek at southern end of the APE, facing NW, taken from bridge.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

CONCLUSIONS AND RECOMMENDATIONS

On behalf of Conservation Works JV, LLC, Terracon conducted a cultural resources survey for the Lick Creek Ditch Project in western Stoddard County, Missouri. The Project consists of efforts to upgrade aging floodwater management infrastructure that consists of ditches, and levees. The goal for the project is to complete these upgrades without expanding the original footprint of the approximate 16 miles (392 acre) Project.

The Project will occur on privately-owned land; however, the use of supplemental funding from the NRCS, administered by the USDA, necessitates compliance with Section 106 of the NHPA. Therefore, the Project proponent (Client) must make a reasonable and good-faith effort to identify historic properties within the APE and take into account direct or indirect effects the proposed undertaking could have on properties listed or considered eligible for listing in the NRHP. Additionally, the Project complied with the Missouri SHPO archaeological survey standards.

The proposed Project consists of 16 miles (392 acres) of ditch improvements and maintenance. However, pedestrian survey was limited to the southern portion of the Project, in areas where extensive bank disturbances were proposed and in areas within 250-feet of previously recorded archaeological sites. The survey area was also limited to 60-feet from the centerline of the ditch to avoid trespassing. Taking these limitations into account, a total of 29 acres of the project were surveyed at 5-meter intervals. Areas previously surveyed or requiring no ground disturbing maintenance activities (re-seeding) were excluded from this archaeological survey.

No HPOIs were identified on historical maps and aerial photographs within the APE. No new sites were discovered during the survey of the APE by Terracon archaeologists.

Terracon recommends a finding of *No Historic Properties Affected* for the Project, as currently defined. However, if undiscovered cultural resources are encountered during Project construction, work in the vicinity of the discovery should cease pending evaluation by a qualified archaeologist who can provide guidance on how to proceed in accordance with applicable regulations. Records generated for the Project and collected artifacts will be held at the Terracon St. Louis laboratory.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

REFERENCES CITED

Andresen, J., Steve Hilberg, and Ken Kunkel

2012 Historical Climate and Climate Trends in the Midwestern USA. In *U.S. National Climate Assessment Midwest Technical Input Report*. J. Winkler, J. Andresen, J. Hatfield, D. Bidwell, and D. Brown, editors. Great Lakes Integrated Sciences and Assessments Center, Ann Arbor.

Aron, Stephen

2006 *American Confluence: The Missouri Frontier from the Borderland to Border State*. Indiana University Press, Bloomington.

Audrain County Missouri

2023 History of Audrain County.

<https://www.audraincounty.org/history#:~:text=The%20County%20of%20Audrain%2C%20the,two%20early%20settlers%2C%20James%20H.> Accessed December 2023.

Baumann, Timothy, John Peterson, and Michael Dickey

2015 The War of 1812 on the Missouri Frontier: The Search for Fort Osage and Sibley's Fort. In *Archaeology of the War of 1812*, edited by Michael T. Lucas and Julie M. Schabutsky, pp. 252-272. Left Coast Press, Inc., Walnut Creek.

Best Places

2024 Stoddard County, MO Climate.

<https://www.bestplaces.net/climate/county/missouri/stoddard>. Accessed January 2024.

Bray, Robert T.

1980 Bourgmond's Fort d'Orleans and the Missouri Indians. *Missouri Historical Review* 75(1):1-32.

Buckley, Jay H.

2012 *William Clark: Indian Diplomat*. University of Oklahoma Press, Norman.

Burns, Louis F.

2023 Osage. Oklahoma Historical Society.

<https://www.okhistory.org/publications/enc/entry.php?entry=OS001>. Accessed December 2023.

Chapman, Shannen S., James M. Omernik, Glenn E. Griffith, Walter A. Schroeder, Tim A. Nigh, and Thomas F. Wilton

2002 Ecoregions of Iowa and Missouri. <https://www.epa.gov/eco-research/ecoregion-download-files-state-region-7>. Accessed January 2024.

Darwent, John

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

2005 Late Paleoindian-Period and Early Archaic-Period Projectile-Point Phylogeny in the Salt River Valley, Northeastern Missouri. Ph.D. Dissertation, University of Missouri-Columbia.

Decker, Wayne L.

2023 Climate of Missouri. Missouri Climate Center. University of Missouri.
<http://climate.missouri.edu/climate.php>. Accessed December 2023.

Emerson, Thomas E., and Barry Lewis (editors)

2000 *Cahokia and the Hinterlands: Middle Mississippian Cultures of the Midwest*. University of Illinois Press, Urbana.

Erlandson, Jon M.

2014 After Clovis-First Collapsed: Reimagining the Peopling of the Americas. In *Paleoamerican Odyssey*, pp. 127-132. Texas A&M University Press, College Station.

Esarey, Duane

2004 French Illinois: Between Canada and Louisiana. Illinois Periodicals Online.
<https://www.lib.niu.edu/2004/ih1110409.html>. Accessed December 2023.

Ford, Thomas

1995 *History of Illinois: From its Commencement as a State in 1818 to 1847*. University of Illinois Press, Champaign.

Gilman, Rhoda R.

1974 The Fur Trade in the Upper Mississippi Valley, 1630-1850. *The Wisconsin Magazine of History* 58(1):2-18.

Google Earth Pro

2024 Historical Imagery. Accessed January 2024.

Green, William, and David J. Nolan

2000 Late Woodland Peoples in West-Central Illinois. In *Late Woodland Societies: Tradition and Transformation across the Midcontinent*, edited by Thomas E. Emerson, Dale L. McElrath, and Andrew C. Fortier, pp. 357-386. University of Nebraska Press, Lincoln.

Harl, Joseph H.

2009 Archaic Period of East-Central Missouri. In *Archaic Societies: Diversity and Complexity Across the Midcontinent*, edited by Thomas E. Emerson, Dale L. McElrath, and Andrew C. Fortier, pp. 377-400. State University of New York Press, Albany.

Harl, Joe, and Robin Machiran

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

2013 *Prehistoric Cultures of the City of Wildwood, St. Louis County, Missouri*.
Research Report No. 688B. Archaeological Research Center of St. Louis, Inc.,
St. Louis.

HMDB: Historical Marker Database

2023 Early Days of Adair County Missouri. HMdb.org LLC.
<https://www.hmdb.org/m.asp?m=144764>. Accessed December 2023.

Hoard, Robert J.

2000 Late Woodland in Central Missouri: The Boone Phase. In *Late Woodland Societies: Tradition and Transformation across the Midcontinent*, edited by Thomas E. Emerson, Dale L. McElrath, and Andrew C. Fortier, pp. 211-240. University of Nebraska Press, Lincoln.

Hoard, Robert J., and Aaron A. Anglen

2008 *The Stauffer Site, 23CO499: A Late Archaic Campsite and Late Woodland Residential Site in Central Missouri*. Missouri Department of Transportation, Jefferson City.

Hunter, Andrea A.

2013 Culture History. The Osage Nation.
<https://www.osageculture.com/culture/cultural-history> Accessed December 2023.

Illinois State Museum (ISM)

2000 Museum Link Illinois.
https://www.museum.state.il.us/muslink/nat_amer/pre/index.html. Accessed December 2023.

2018 The Illinois Territory (1776-1818). Illinois Bicentennial: The Story of Illinois.
<https://story.illinoisstatemuseum.org/time-period/illinois-territory-1776-1818>. Accessed December 2023.

Jung, Patrick J.

2012 Toward the Black Hawk War: The Sauk and Fox Indians and the War of 1812.
Michigan Historical Review 38(1):27-52.

Kathryn M. Buder Center for American Indian Studies (CAIS)

2021 *Indigenous Land, Peoples and History of Missouri Brief*. Washington University in St. Louis.

Kay, Marvin

1975 Social Distance among Central Missouri Hopewell Settlements: A First Approximation. *American Antiquity* 40(1):64-71.

Kennedy, Jocelyn

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

1964 *Why Illinois was French*. The National Society of the Colonial Dames of America in the State of Illinois, Chicago.

Koldehoff, Brad, and Thomas J. Loebel

2009 Clovis and Dalton: Unbounded and Bounded Systems in the Midcontinent of North America. In *Lithic Materials and Paleolithic Societies*, edited by B. Adams and B.S. Blades, pp. 270-287. Blackwell Publishing, Hoboken.

Koldehoff, Brad, and John A. Walthall

2009 Dalton and the Early Holocene Midcontinent: Setting the Stage. In *Archaic Societies: Diversity and Complexity Across the Midcontinent*, edited by Thomas E. Emerson, Dale L. McElrath, and Andrew C. Fortier, pp. 137-151. State University of New York Press, Albany.

Library of Congress (LOC)

2023a The Northwest and the Ordinances, 1783-1858. Pioneering the Upper Midwest: Books from Michigan, Minnesota, and Wisconsin, ca. 1820 to 1910. <https://www.loc.gov/collections/pioneering-the-upper-midwest/articles-and-essays/history-of-the-upper-midwest-overview/northwest-and-ordinances/>. Accessed December 2023.

2023b The Louisiana Purchase. Louisiana: European Explorations and the Louisiana Purchase. <https://www.loc.gov/collections/louisiana-european-explorations-and-the-louisiana-purchase/articles-and-essays/the-louisiana-purchase/>. Accessed December 2023.

Lohse, Jon C., Don G. Wyckoff, and Marjorie Duncan

2021 The Calf Creek Horizon: Mid-Holocene Adaptations in North America. In *The Calf Creek Horizon: A Mid-Holocene Hunter-Gatherer Adaptation in the Central and Southern Plains of North America*, edited by Jon C. Lohse, Don G. Wyckoff, and Marjorie Duncan, pp. 3-15. Texas A&M University Press, College Station.

Lopinot, Neal H., Jack H. Ray, and Michael D. Connor

1998 *The 1997 Excavations at the Big Eddy Site (23CE426) in Southwest Missouri*. Special Publication No. 2. Southwest Missouri State University Center for Archaeological Research, Springfield.

Martens, Richard E.

2008 A Late Archaic Titterington-Phase Site in St. Louis County, Missouri: The Schoettler Road Site (23SL178/1105). *Missouri Archaeological Society Quarterly* 25(4):12-22.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

Martens, Richard E., Brad Koldehoff, Juliet E. Morrow, and Toby A. Morrow
2004 The Surface Collection from the Martens Site, 23SL222. *The Missouri Archaeologist* 65:1-43.

Martin, Terry
2007 Early Woodland Black Sand Occupation in the Lower Missouri Valley, Western Missouri. *Plains Anthropologist* 52(201):43-61.

2009 Middle Woodland Settlement Patterns in the St. Louis Vicinity. *The Missouri Archaeologist* 70:89-111.

2016 Middle Woodland Settlement Patterns in Westcentral Missouri. *The Missouri Archaeologist* 77:40-77.

McCormic, John Edward
1993 *The Mine La Motte Lead Deposit, Madison County, Missouri*. OFR-93-94-GS. Missouri Department of Natural Resources, Rolla.

McGhee, James E. and James R. Mayo
1995 *Stoddard Grays: Confederate Soldiers of Stoddard County, Missouri 1861-1865*. Two Trails Publishing, Independence MO.

Meinkoth, Michael C.
2000 The Late Woodland Period in Northeast Missouri. In *Late Woodland Societies: Tradition and Transformation across the Midcontinent*, edited by Thomas E. Emerson, Dale L. McElrath, and Andrew C. Fortier, pp. 241-261. University of Nebraska Press, Lincoln.

Missouri Archaeological Society (MAS)
2023 Archaeology in Missouri.
<https://www.missouriarchaeologicalsociety.org/archaeology-in-missouri/>.
Accessed December 2023.

Missouri Department of Conservation
2024a Watershed Inventory. <https://mdc.mo.gov/community/watershed-inventory>.
Accessed January 2024

2024b Otter Slough Conservation Area. <https://mdc.mo.gov/discover-nature/places/otter-slough-conservation-area>. Accessed January 2024

2024c Places to Go. <https://mdc.mo.gov/magazines/conservationist/2015-04/places-go#:~:text=The%20land%20that%20is%20now,acre%20purchase%20from%20Gaylon%20Lawrence>. Accessed January 2014.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

Missouri Department of Natural Resources (DNR)

2024 GeoSTRAT. Missouri Geological Survey.

<https://modnr.maps.arcgis.com/apps/webappviewer/index.html?id=3ac3a61da4af4834811503a24a3cb935>. Accessed January 2024.

Missouri Department of Transportation

2023 *Archaeology in Missouri*. Missouri Department of Transportation Historic Preservation Section, Jefferson City.

Missouri Geological Survey

2024 Maps, Data and Research. <https://dnr.mo.gov/land-geology/maps-data-research>. Accessed January 2024.

Missouri Secretary of State

2024 Missouri Digital Heritage. https://www.sos.mo.gov/mdh/browse?id=12_5. Accessed January 2024.

Missouri State Archives (MSA)

2023a The Lewis & Clark Expedition. Missouri Office of the Secretary of State. <https://www.sos.mo.gov/archives/resources/lewisclark.asp>. Accessed December 2023.

2023b Timeline of Historic Missouri.

<https://www.sos.mo.gov/archives/history/timeline/3>. Accessed December 2023.

Missouri State Historic Preservation Office (SHPO)

2018 Our Sense of Place: Preserving Missouri's Cultural Resources. Missouri Department of Natural Resources, Jefferson City.

2024a *Guidelines for Phase I Archaeological Surveys and Reports*. Missouri Department of Natural Resources, Jefferson City.

2024b Archaeology Viewer.

<https://modnr.maps.arcgis.com/apps/webappviewer/index.html?id=9a91136c6340497b96fd7a198a0b886e>. Accessed January 2024.

2024c Historic Districts and Sites Map.

<https://www.arcgis.com/apps/mapviewer/index.html?layers=05d4c3540bd84ac882cd6505de9a3195>. Accessed January 2024.

Moen, John

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

2001 John Law and the Mississippi Bubble: 1718-1720. Mississippi History Now.
<https://www.mshistorynow.mdah.ms.gov/issue/john-law-and-the-mississippi-bubble-1718-1720>. Accessed December 2023.

Morrow, Juliet E.

2014 Clovis-Era Point Production in the Midcontinent. In *Clovis: On the Edge of a New Understanding*, edited by Ashley M. Smallwood and Thomas A. Jennings, pp. 83-108. Texas A&M University Press, College Station.

Morse, Dan F. (editor)

2018 *Sloan: A Paleoindian Dalton Cemetery in Arkansas*. The University of Arkansas Press, Fayetteville.

National Archives

2023 Louisiana Purchase Treaty (1803). Milestone Documents.
<https://www.archives.gov/milestone-documents/louisiana-purchase-treaty>. Accessed December 2023.

National Park Service (NPS)

2005 Utz Site, Missouri. Survey of Historic Sites and Buildings.
https://www.nps.gov/parkhistory/online_books/explorers/sitec35.htm. Accessed December 2023.

2023 Midwest Regional Context. Archaeology Program.

<https://www.nps.gov/archeology/publications/nhleam/e-midwest.htm>. Accessed December 2023.

Nationwide Environmental Title Research (NETR) Online

2024 Historic Aerials. <https://www.historicaerials.com/>. Accessed January 2024.

Nolan, David J., and Richard L. Fishel

2009 Archaic Cultural Variation and Lifeways in West-Central Illinois. In *Archaic Societies: Diversity and Complexity Across the Midcontinent*, edited by Thomas E. Emerson, Dale L. McElrath, and Andrew C. Fortier, pp. 401-490. State University of New York Press, Albany.

O'Brien, Michael J., and W. Raymond Wood

1998 *The Prehistory of Missouri*. University of Missouri Press, Columbia.

Parrish, William E., Charles T. Jones, Jr., and Lawrence O. Christensen

1992 *Missouri: The Heart of the Nation*. Harlan Davidson, Inc., Arlington Heights.

Pauketat, Timothy R.

2004 *Ancient Cahokia and the Mississippians*. Cambridge University Press, Cambridge.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

Primm, James Neal

1998 *Lion of the Valley: St. Louis, Missouri, 1764-1980*. Missouri Historical Society Press, Saint Louis.

Ray, Jack H., and Neal H. Lopinot

2019 To the Point: Calf Creek. Missouri Archaeological Society.
https://www.missouriarchaeologicalsociety.org/wp-content/uploads/2019/06/Calf_Creek.pdf. Accessed December 2023.

2021 Calf Creek on the Eastern Horizon. In *The Calf Creek Horizon: A Mid-Holocene Hunter-Gatherer Adaptation in the Central and Southern Plains of North America*, edited by Jon C. Lohse, Don G. Wyckoff, and Marjorie Duncan, pp. 209-220. Texas A&M University Press, College Station.

Rees Mark A., and Rebecca Saunders

2021 Mississippian Culture. 64 Parishes.
<https://64parishes.org/entry/mississippian-culture>. Accessed December 2023.

Rollings, Willard H.

1995 *The Osage: An Ethnohistorical Study of Hegemony on the Prairie-Plains*. University of Missouri Press, Columbia.

Sabo III, George

2022 Osage Nation. <https://encyclopediaofarkansas.net/entries/osage-551/>. Accessed December 2023.

Sac and Fox Nation of Missouri in Kansas and Nebraska (SFNMKN)

2023 History of the Tribe. <https://www.sacandfoxks.com/>. Accessed December 2023.

Schilling, Timothy

2012 Building Monks Mound, Cahokia, Illinois, A.D. 800-1400. *Journal of Field Archaeology* 37(4):302-313.

Sievert, April K., and Melody K. Pope

2014 Lithic Technology and Tool Use in the North American Archaic: Bridging Technologies, Plants, and Animals. In *International Conference on Use-Wear Analysis: Use-Wear 2012*, edited by João Marreiros, Nuno Bicho, and Juan F. Gibaja, pp. 294-301. Cambridge Scholars Publishing, Newcastle upon Tyne.

Smallwood, Ashley M., Thomas A. Jennings, and Charlotte D. Pevny

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

2018 Expressions of Ritual in the Paleoindian Record of the Eastern Woodlands: Exploring the Uniqueness of the Dalton Cemetery at Sloan, Arkansas. *Journal of Anthropological Archaeology* 49(2018):184-198.

State Historical Society of Missouri (SHSMO)

2024 Map Collection.

<https://digital.shsmo.org/digital/collection/Maps/id/155/rec/1>. Accessed January 2024.

Stoddard County History

2024a The Civil War. <http://www.stoddardcountyhistory.com/the-civil-war.html>. Accessed January 2024.

2024b Union Stoddard County. <http://www.stoddardcountyhistory.com/union-stoddard-county.html>. Accessed January 2024.

2024c Post Reconstruction Stoddard County.

<http://www.stoddardcountyhistory.com/post-reconstruction.html>. Accessed January 2024.

2024d Swamp Drainage. <http://www.stoddardcountyhistory.com/swamp-drainage.html>. Accessed January 2024.

Stone, Jeffrey C.

2006 *Slavery, Southern Culture, and Education in Little Dixie, Missouri, 1820-1860*. Routledge, London.

Stevens Publishing Co.

1887 History of Lewis, Clark, Knox, Scotland Counties, Missouri. Stevens Publishing Co. <https://web.archive.org/web/20060525103032/http://www.rootsweb.com/~moadair/BattleofKville/CountyHistories.PDF>. Accessed December 2023.

Tankersley, Kenneth B.

1998 Variation in the Early Paleoindian Economies of Late Pleistocene Eastern North America. *American Antiquity* 63(1):7-20.

Tankersley, Kenneth B., and Juliet E. Morrow

1993 Clovis Procurement and Land-Use Patterns in the Confluence Region of the Mississippi, Missouri, and Illinois Rivers. *Illinois Archaeology* 5:119-129.

Trubitt, Mary Beth

2012 Caddo in the Saline River Valley of Arkansas: The Borderlands Project and the Hughes Site. In *The Archaeology of the Caddo*, edited by Timothy K.

Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

Perttula and Chester P. Walker, pp. 288-312. University of Nebraska Press, Lincoln.

U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS)
2024 Web Soil Survey. <http://websoilsurvey.nrcs.usda.gov/>. Accessed January 2024.

United States Geological Survey (USGS)
2024 Historical Topographic Map Explorer.
<https://livingatlas.arcgis.com/topoexplorer/index.html>. Accessed January 2024.

University of California Berkeley
2023 The Living New Deal. Department of Geography.
<https://livingnewdeal.org/us/mo/page/2/> . Accessed December 2023.

VanDerwarker, Amber M., Gregory D. Wilson, and Dana N. Bardolph
2013 Maize Adaptation and Intensification in the Central Illinois River Valley: An Analysis of Archaeobotanical Data from the Late Woodland to Early Mississippian Periods (A.D. 600-1200). *Southeastern Archaeology* 32:147-168.

Walthall, John A.
1998 Rockshelters and Hunter-Gatherer Adaptation to the Pleistocene/Holocene Transition. *American Antiquity* 62(2): 223-238.

Walthall, John A., and Thomas E. Emerson
1991 French Colonial Archaeology. In *French Colonial Archaeology: The Illinois Country and the Western Great Lakes*, edited by John A. Walthall, pp. 1-13. University of Illinois Press, Urbana.

Wiewel, Rebecca
2014 Constructing Community in the Central Arkansas River Valley: Ceramic Compositional Analysis and Collaborative Archeology. Ph.D. dissertation, University of Arkansas, Fayetteville.

Wolverton, Steve
2005 The Effects of the Hypsithermal on Prehistoric Foraging Efficiency in Missouri. *American Antiquity* 70(1):91-106.

Wood, W. Raymond
2013 Ethnohistory and Euro-American Contact in Missouri. *The Missouri Archaeologist* 74:7-35.



Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

Young, Biloine W., Melvin Leo Fowler, and Melvin J. Fowler
2000 *Cahokia, the Great Native American Metropolis*. University of Illinois Press,
Urbana.





Cultural Resources Survey

NRCS MO Lick Creek Ditch Project ■ Liberty Township, Stoddard County, Missouri
September 2025 ■ Terracon Project No. 15237400

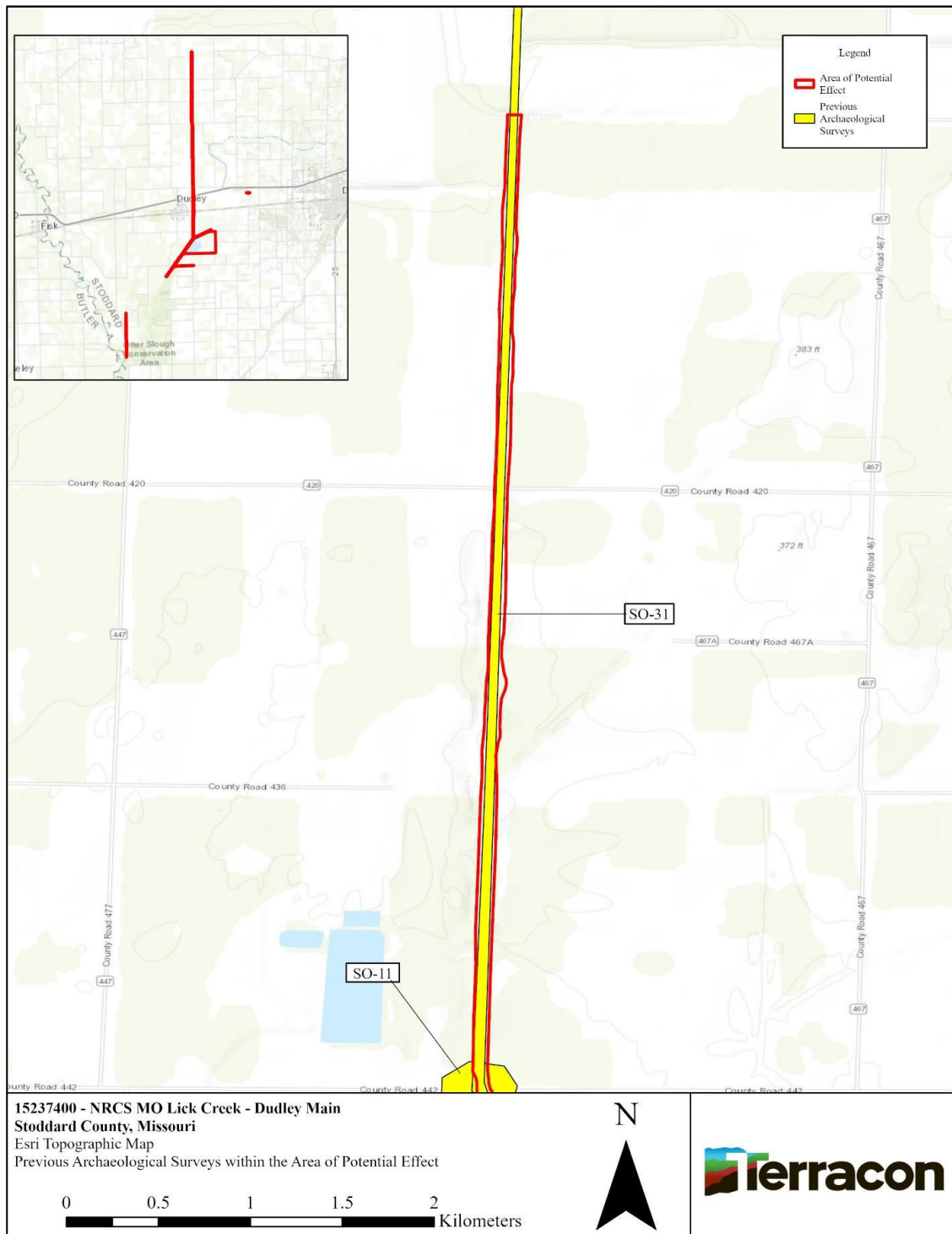
APPENDIX A: ARCHAEOLOGICAL SURVEY MAPS



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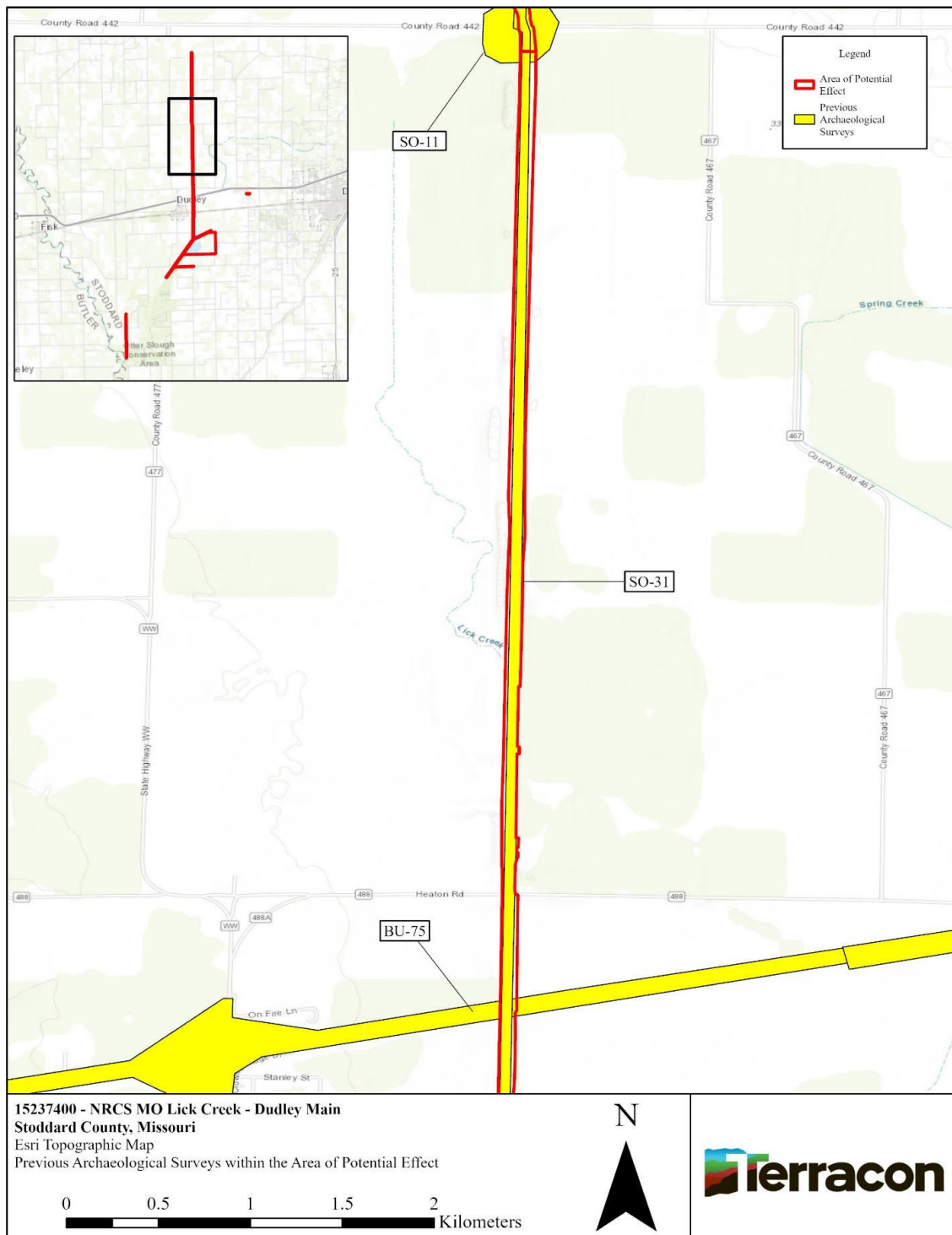
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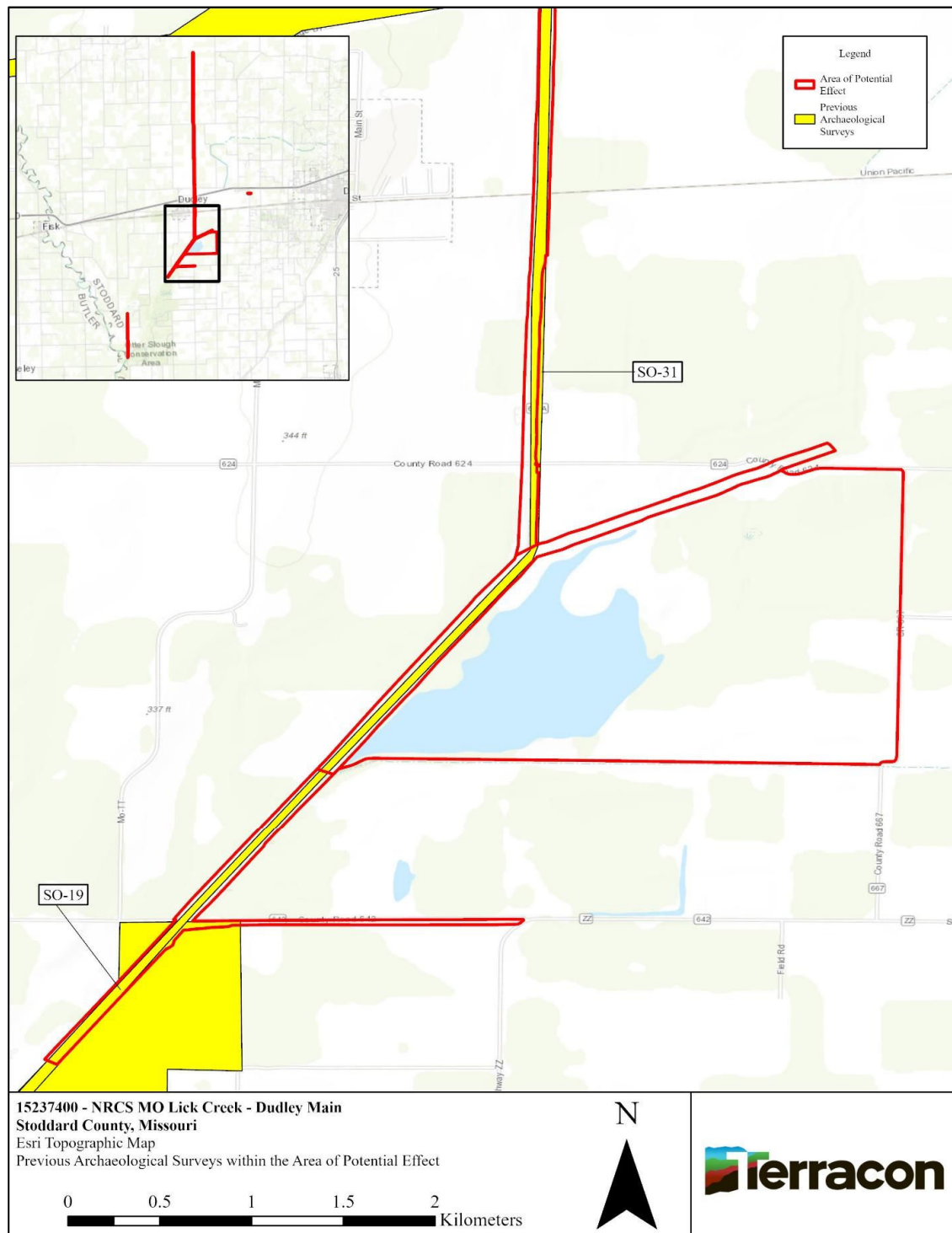
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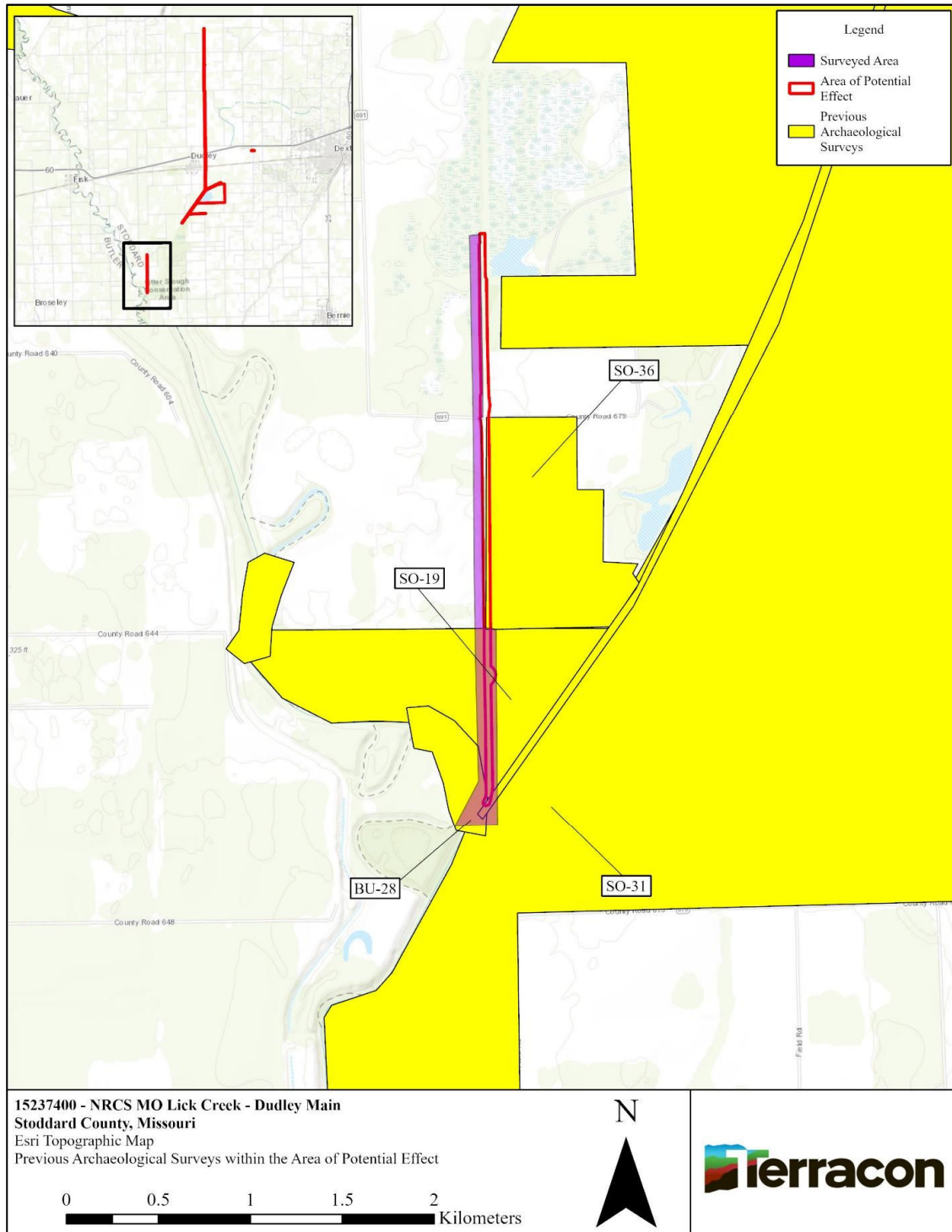
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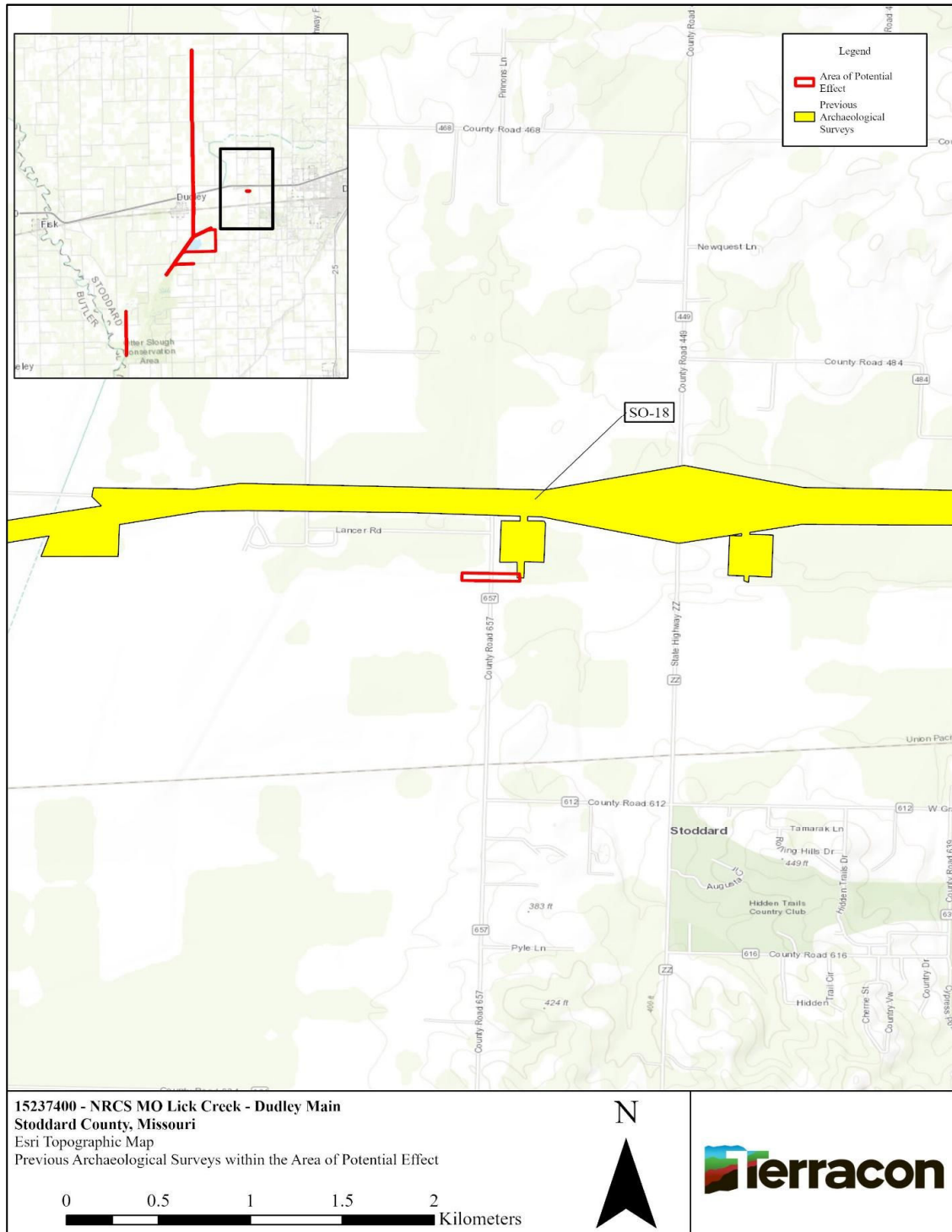
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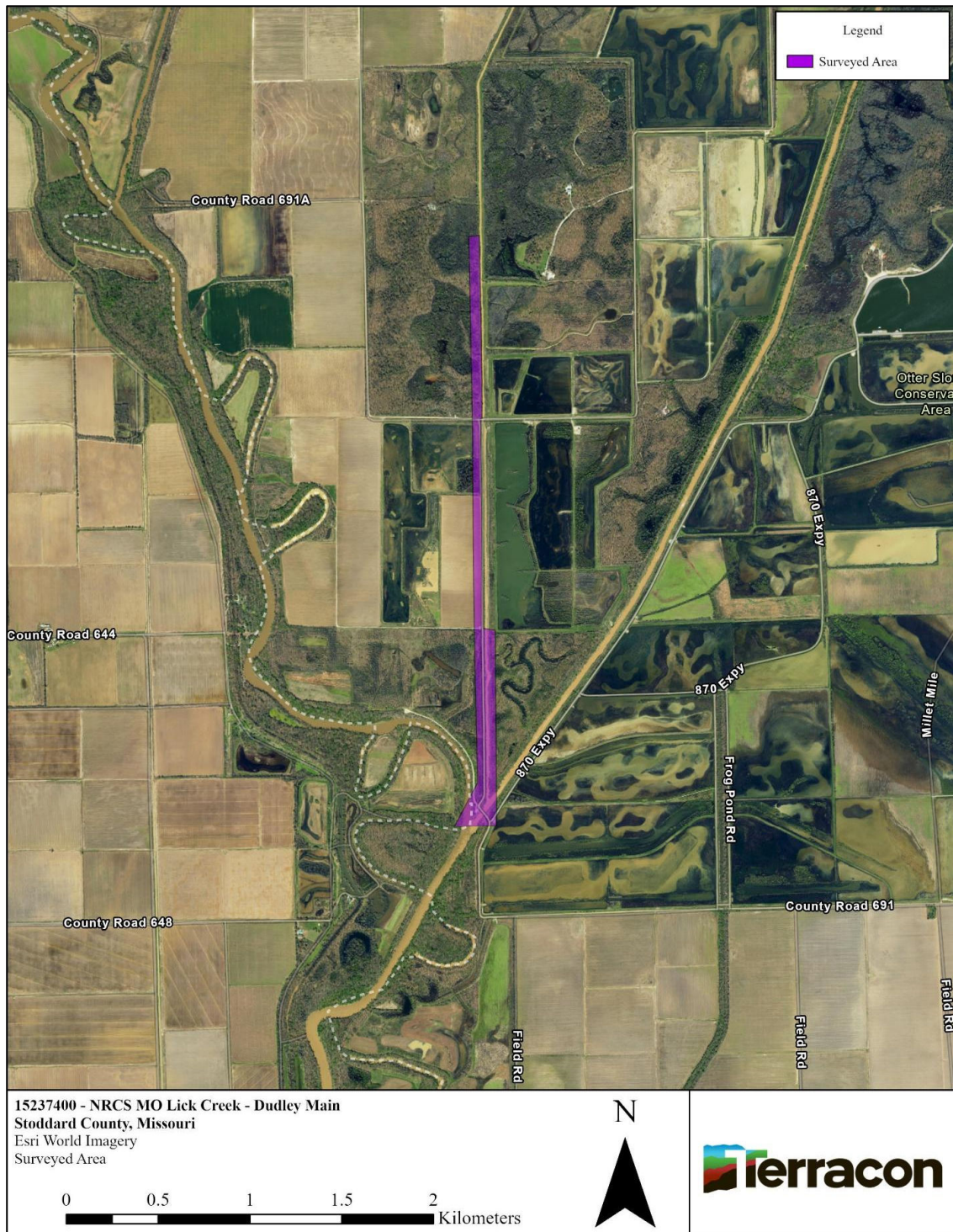
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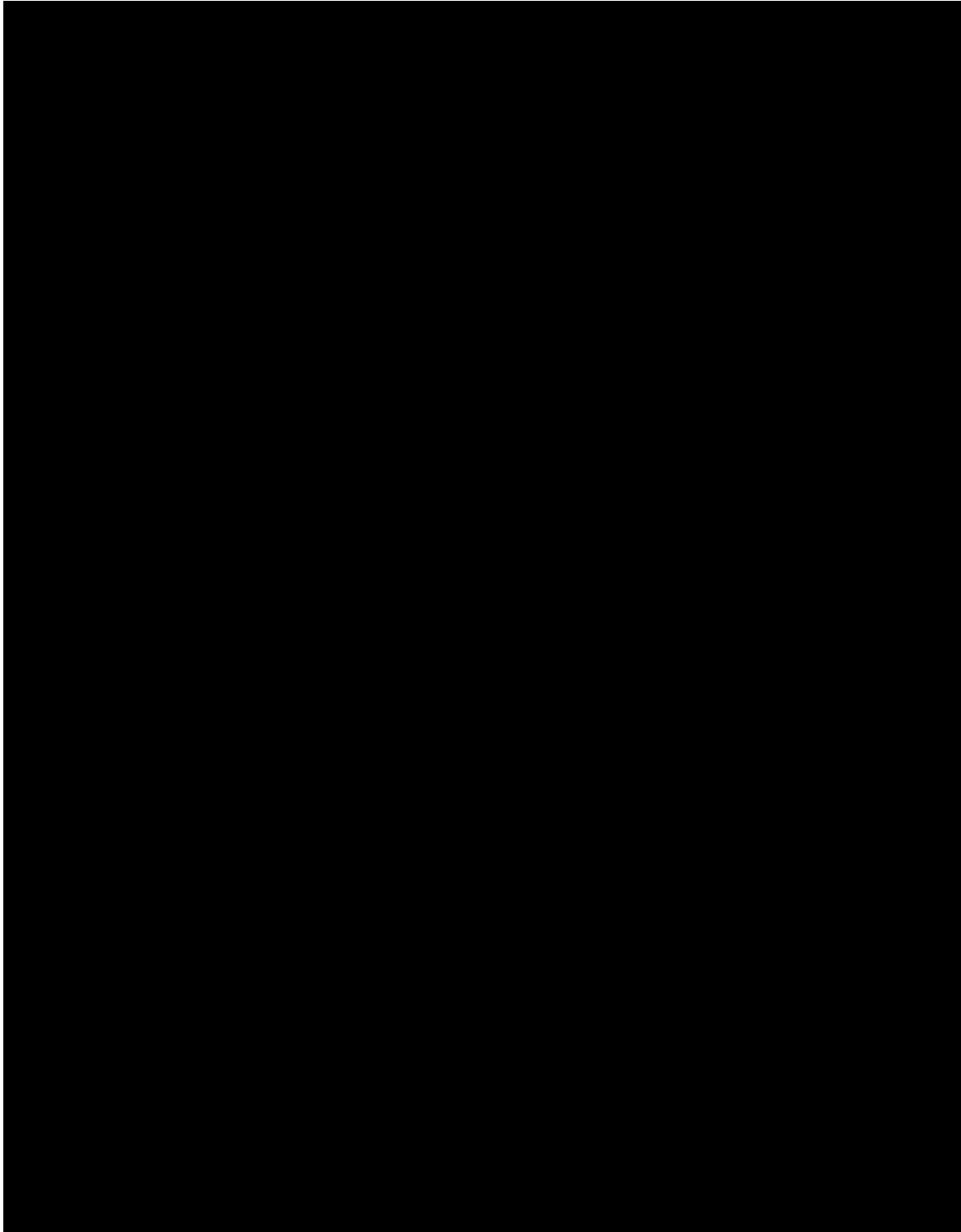
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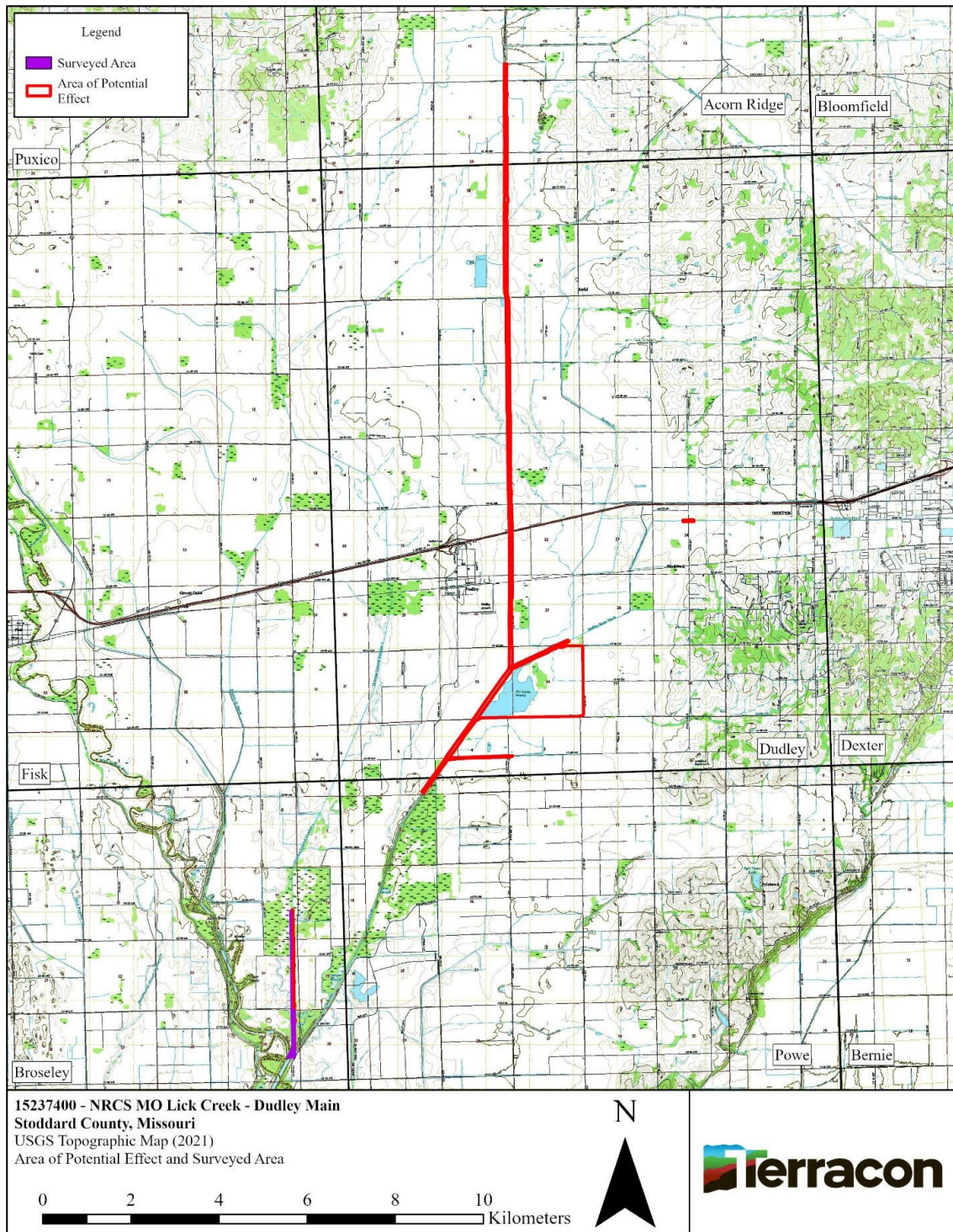
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APPENDIX B: CURRICULUM VITA



Eli D. Schuck

Senior Archaeological Technician

PROFESSIONAL EXPERIENCE

Mr. Schuck is a Senior Archaeological Technician in Terracon's Chicago, IL. Office. Eli supports archaeological projects as a technician performing survey methods in the field as required by project as well post-field processing support such as report writing and lab analysis, and pre-planning for future endeavors by means of proposal writing and archaeological database and area historical research assessments.

Mr. Schuck has nearly six years of archaeological experience and has worked on projects in support of the United States Forest Service, National Park's Service, and private consulting firms in the West, Midwest and Southeast regions of the US. This work has focused on prehistoric and historic site delineation and recording during Phase I surveys, and associated report writing and data presentation in compliance with Section 106 of the National Historic Preservation Act (NHPA), the National Environmental Policy Act (NEPA), and the Programmatic Agreement among the U.S.D.A. Forest Service, Pacific Southwest Region (Region 5), California (CA) State Historic Preservation Office (SHPO), Nevada SHPO, and the Advisory Council on Historic Preservation. Mr. Schuck also has supervisory experience leading archeological crews in Phase I surveys in remote backcountry areas of the Sierra Nevada's where he had to innovate techniques to satisfy multiple state and national recording standards, as well as train new crew members with no previous cultural resource management experience in proper survey and recording techniques, and served a point person for logistical planning between his crew, the United States Forest Service, the National Parks Service, and company leadership.

SELECTED PROJECT EXPERIENCE

TurningPoint Energy Solar Proposal – Central and Northern Illinois

Mr. Schuck completed the proposal for this project which includes seven different sites across central and northern Illinois. The proposal writing included estimated level of effort at each site, associated costs, and time frames. This proposal lead to the successful acquisition of this project.

Adelite Solar Project – Galesburg, Illinois

Serving as an archaeological technician on the approximate 162-acre solar project, Eli assisted with Phase I survey of rural agricultural fields including pedestrian survey, shovel testing, and site delineation and recording. Survey methods were created in accordance to satisfy both Illinois SHPO and local (Osage Nation) tribal requirements. Transects and shovel tests were pre-plotted on GIS devices to yield results with accurate data and increase efficiency. After Fieldwork was completed, Mr. Schuck assisted by completing lab analysis and curation of collected artifacts and the writing of Cultural Resource Survey Reports.



EDUCATION

Bachelor of Arts, Anthropology and Classics, University of Missouri, Colombia MO, 2017

REGISTRATIONS/ CERTIFICATIONS

2017, Multicultural Studies Certification, University of Missouri

2017, TEFL Certification, Council on International Educational Exchange

PROFESSIONAL TRAINING

Wilderness First Aid, 12 Hour Intensive Backcountry, Sierra Rescue

WORK HISTORY

Terracon, Senior Archaeological Technician, 2022-Present

Great Basin Institute, Archaeology Crew Lead, 2022

Great Basin Institute, Cultural Resources Technician, 2021-2022

WSP, Field Archaeologist, 2020-2021

Illinois District 207, Substitute Teacher, 2019-2020

EPIK English Teacher, Poongyang Elementary, 2018-2019

Amec Foster Wheeler, Archaeological Technician, 2017

**Experience prior to Terracon*

CHI07 Auxiliary Laydown Yard Project– Schaumburg, Illinois

Serving as the only archaeological technician for the project Mr. Schuck carried out a Cultural Resources Phase IA Review and Field Visit for a potential future warehouse location in the suburbs of Chicago. Eli's efforts on this project included all necessary areas of background research such as cultural and environmental contexts, database reviews and Illinois SHPO file searches. After surveying the small project area, Eli finalized the report with conclusions and recommendations to exempt further survey of the site should it be recommended by IL SHPO.

Birch Creek Solar Projects – Southwest Missouri to Central Illinois

Serving as an archaeological technician in support of six (Altona [210-ac.], EARP [223-ac.], Envoy [288-ac.], Kimmel Road [272-ac.], Richland [220-ac.], and Salt Creek [370-ac.]) solar projects across Missouri and Illinois, Mr. Schuck assisted with Phase I survey of rural agricultural fields and their surrounding undeveloped environments. This included such tasks as: pedestrian survey and shovel testing, field artifact photography and recording, site delineation and recording, and historic standing structure photography. Survey methods were created in accordance to satisfy both Illinois and Missouri SHPO and local (Osage Nation) tribal requirements. Transects and shovel tests were pre-plotted on GIS devices to yield results with accurate data and increase efficiency. After Fieldwork was completed, Mr. Schuck assisted by completing lab analysis and curation of artifacts and the writing of Cultural Resource Survey Reports.

Grant Grove Sequoia Protection – Kings Canyon National Park, California*

This emergency fuels reduction project was a response to reduce the threat of fire to a giant sequoia grove in the National Park. Due to the urgent nature of the project, Mr. Schuck was required to coordinate complicated logistics on short notice with multiple agencies to create a viable plan for completing the 164-acre survey area. Eli led a three-person crew along with a member of the Wuksachi Tribe acting as a cultural monitor to finish the survey and follow up with an archaeological reconnaissance preliminary report to be approved by CA SHPO and allow the fuels reduction (vegetation removal) to begin all within a very short window.

Freeman Creek Area Replanting – Sequoia National Forest, California*

Mr. Schuck led a three-person crew on Phase I pedestrian survey consisting of 805 acres in the Freeman Creek Sequoia Grove for the United States Forest Service in preparation of a replanting project in the area after damage from the Sequoia Forest (SQF) Complex Fires of 2020. After completion of the survey he and the crew authored a preliminary report for approval by CA SHPO for the allowance of the replanting project to move forward.

Windy Fire Area Reforestation – Sequoia National Forest, California*

Mr. Schuck served as a crew lead for a four-person crew on a Phase I pedestrian survey consisting of 412 acres in the multiple Sequoia Groves impacted by the Windy Fire of 2021 for the United States Forest Service in preparation of a reforestation project in the area. After completion of the survey he and the crew authored a preliminary report for approval by CA SHPO for the allowance of the replanting project to move forward.

Sequoia Castle Fire Roadside Hazard Tree Removal – Sequoia National Forest, California*

Mr. Schuck was a member of an eight-person crew tasked with completing multiple roadside hazard tree removal project areas made up of a 300-foot buffer area on either side of many roads within the Sequoia National Forest, that had to be surveyed via pedestrian survey (for the United States Forest Service). In total approximately 3,000 acres were surveyed, and Mr. Schuck then supported the writing of a preliminary report for approval by CA SHPO for the allowance of the removal project to move forward.



Jane Lybarger, M.A., RPA

Group Manager for Environmental Services

PROFESSIONAL EXPERIENCE

Jane Lybarger is a Group Manager for Environmental Services in Terracon's St. Louis, MO, office. She brings over 15 years of experience in cultural resources management (CRM) to Terracon, including roles as Project Archaeologist, Historian, Principal Investigator, and Cultural Resources Project Manager.

Jane meets the Secretary of the Interior's Professional Qualification Standards for both Archaeology and History. While her primary area of specialization is in historical archaeology, her years of experience in CRM have afforded her the opportunity to work on a wide variety of site types—both precontact and historical—throughout the Midwestern U.S. Her professional interests include the archaeology of 19th century industrial landscapes in the American West, urban archaeology in the City of St. Louis, MO, the archaeology of gender and ethnicity, and public archaeology and education.

Jane's diverse skillset includes archival research, technical writing for cultural resources, developing historical and cultural contexts, National Register of Historic Places (NRHP) eligibility evaluations, cultural resources project management, public outreach, training and education in CRM, curation of archaeological artifacts, and SHPO/THPO consultation.

SELECT PROJECT EXPERIENCE

Phase I Cultural Resources Survey of Shepherd Mountain Bike Park, Federal Highways Administration Recreational Trail Program Project / City of Ironton, Iron County, MO —Project Manager for the Phase I cultural resources survey of 5 miles of proposed multi-use trails to be constructed by the City of Ironton in the Shepherd Mountain Bike Park. Responsibilities included developing the proposal and scope of work (SOW) for client approval, developing the SOW for archaeological field investigations, field survey for identification and documentation of historic iron mining features on Shepherd Mountain, conducting archival research to identify cultural resources within the project's area of potential effects (APE), writing determinations of eligibility and findings of effects for newly recorded historic properties (precontact and historic archaeological sites and a historic dam/spillway/lake) within the APE, final report formatting and production, QA/QC for all deliverables, and submittal of the final report to the Missouri State Historic Preservation Office (MO SHPO) for review.



EDUCATION

Master of Arts,
Anthropology,
University of Nevada, Reno

Bachelor of Science,
Anthropology,
Southern Illinois University
Edwardsville

REGISTRATIONS/ CERTIFICATIONS

Register of Professional
Archaeologists (RPA), #16597

AFFILIATIONS

Missouri Archaeological Society,
Society for Historical
Archaeology, State Historical
Society of Missouri

WORK HISTORY

Lochmueller Group, Section 106
Specialist III, 2023

Trileaf Corporation, Cultural
Resources Project Manager
from 2021-2023 and Senior
Project Archaeologist from
2020-2021

St. Louis Veterans Curation
Program, Artifacts Laboratory
Manager, 2014-2016

Missouri State Parks,
Archaeologist, 2010-2014



Jane Lybarger, M.A., RPA

Phase IA Archaeological Survey of the Proposed South Bend Chocolate Company (SBCC) Factory and Museum, USDA Rural Development Project / SBCC, City of South Bend, St. Joseph County, Indiana — Served as the Principal Investigator for the Phase I cultural resources survey in advance of the development of a new South Bend Chocolate Company Factory and Museum in South Bend, St. Joseph County, Indiana. Responsibilities included developing the proposal and SOW for client approval, performing background research and archaeological literature review, developing the SOW for archaeological and architectural field investigations, developing the historical context and background for the project area, conducting QA/QC for archaeological fieldwork and architectural survey results for the project's APE, final report production and submittal to the Indiana Division of Historic Preservation and Archaeology (DHPA).

Cultural Resources Surveys for 5G Small Cell Build Out in Indianapolis, Carmel, Fishers, and Greenwood, Indiana / Verizon Wireless, Indiana – Served as Principal Investigator and Field Director for more than 75 cultural resources investigations of proposed 5G small cell structure installations throughout the Indianapolis Metropolitan Area. Responsibilities included performing archaeological literature reviews, archival research, identifying above ground resources within the projects' APE, conducting all Phase Ia archaeological field surveys, conducting all photography of NRHP-eligible and listed architectural resources, completing IN DHPA Archaeological Short Reports, as well as completing E106 and FCC Form 620/621 submittals with attachments.

Cultural Resources Surveys for 5G Small Cell Build Out in St. Louis City, Missouri / Verizon Wireless, Missouri – Served as Principal Investigator and Field Director for more than 30 cultural resources investigations of proposed 5G small cell structure installations throughout the City of St. Louis, including the historic downtown area and historic St. Louis neighborhoods such as Holly Hills, Debaliviere Place, Lafayette Square, Midtown, Soulard, Tower Grove, Forest Park, Old North St. Louis, and The Ville. Responsibilities included performing archaeological literature reviews, archival background research, identifying above ground resources within the projects' APEs, conducting all Phase I archaeological field surveys, conducting all photography of NRHP-eligible and listed architectural resources, preparing MO SHPO Cultural Resources Reports, as well as completing E106 and FCC Form 620/621 submittals with attachments.

Collection Management Project and Report for Harry S. Truman Reservoir 1961–1993 “Empty Bags” / Veterans Curation Project (VCP), U.S. Army Corps of Engineers (USACE), Kansas City District Archaeological Collections – Served as Artifacts Laboratory Manager and lead report author for the Harry S. Truman Reservoir 1961–1993 “Empty Bags” (Empty Bags) curation management project. Prior to this project, VCP staff were informed that the original artifact bags from archaeological investigations at Harry S. Truman Reservoir (1961-1993) had been dissociated from the artifact collections. Therefore, the Kansas City District of USACE requested that the St. Louis VCP create a catalog of bag labels only. However, upon further investigation, St. Louis VCP staff found that more than half of the eight (8) boxes from the collection contained bags with artifacts that included precontact lithic tools, fire cracked rock, precontact ceramics, and botanical samples.

WORK HISTORY (cont.)

Missouri Department Transportation, Historian from 2008-2010 and Archaeologist from 2006-2008

United States Forest Service, Humboldt-Toiyabe National Forest, Archaeological Technician, 2004-2005

Illinois State Archaeological Survey, Archaeological Technician, 2000-2002

ADDITIONAL TRAINING

Section 106 Advanced Seminar, Advisory Council on Historic Preservation, 2013

Section 106 Essentials, Advisory Council on Historic Preservation, 2006

Section 4(f) Workshop, Federal Highway Administration, Section 4(f) Workshop, 2006

Section 106 Principles and Practice, SRI Foundation, 2005



Jane Lybarger, M.A., RPA

Based on these findings, Ms. Lybarger trained and supervised a team of recently separated military veterans in the identification, cataloging, and photography of archaeological artifacts, as well as the curation and initial report preparation for the collection. QA/QC of all laboratory work and writing of the final report was also performed with Ms. Lybarger.

Archaeological Testing to Identify the “Fort Africa” at the Toothman Farm, Battle of Island Mound State Historic Site \ Missouri State Parks, Butler, Bates County, Missouri – Missouri State Parks (MSP) Archaeologist and organizer for archaeological investigations at the Battle of Island Mound State Historic Site. Responsibilities included approval of research proposal, consultation regarding field methodology, supervision of all field and lab work, participation in excavations, and QA/QC for the final report deliverable to MSP. Along with Drs. Ann and Mark Raab and a team of volunteer archaeologists, excavations were conducted in two areas of the Battle of Island Mound State Historic Site, which were intended to identify the Toothman Farm and location of “Fort Africa.” The Battle of Island Mound represents the first time that African American troops engaged in combat in the Civil War. Ms. Lybarger and Drs. Ann and Mark Raab presented the results of this investigation during a fall symposium of the Missouri Archaeological Society.

Route 66 Welcome Center on I-44 in Conway, Missouri / Missouri Department of Transportation, Environmental and Design Division – As MoDOT’s Historian, Ms. Lybarger served as the lead on a project to develop and design of historical exhibits for a new Route 66-themed Welcome Center on I-44 near Conway, Missouri. Along with MoDOT Architectural Historians, Karen Daniels and Dr. Toni Prawl, Ms. Lybarger selected special topics on the history of Route 66 through Missouri and identified archival research needs to visually illustrate each topic. She visited numerous archival repositories, interviewed long-time business owners along old Route 66, and collaborated with the Missouri Route 66 Association to collect photographs, maps, memorabilia, and oral accounts to display at the Welcome Center. She also authored informational pamphlets and copy for the display panels, as well as supervised design, fabrication, and installation of the exhibits.

Archaeological Excavation of Two Residential Lots in the Hyde Park neighborhood of North St. Louis – Lead archaeologist for data recovery excavations within an excess right-of-way parcel in the Hyde Park neighborhood of North St. Louis. Responsibilities included conducting archival research on the Bremen/Hyde Park area, developing the excavation strategy for data recovery for deep yard features (cisterns and privies), and supervising field investigations. Additional responsibilities included artifact identification, cataloging, photography, and curation. Preliminary results of this investigation were presented at meetings of the Society for American Archaeology (SAA), Midwest Archaeological Conference, and the Missouri Archaeological Society.



K. Bryce Lowry

K. Bryce Lowry, PhD, RPA **Principal**
Investigator, Project Scientist

PROFESSIONAL EXPERIENCE

K. Bryce Lowry serves as a Principal Investigator for Environmental Planning and Environmental Services Group, working out of the Chicago office. Dr. Lowry is a career archaeologist, having worked as an industry Field Technician starting in 2002, to earning his doctorate in Anthropology from the University of Chicago, which focused on the political economy of Bronze and Iron Age (ca. 1500 BCE – 200 CE) nomads in Mongolia. He has worked for a variety of private firms in the Southwest, Plains, and Midwestern United States, on projects that included Phase I surveys, Phase II testing, and Phase III data recovery at both prehistoric and historic sites. Moreover, Dr. Lowry meets or exceeds qualifications for the *Secretary of the Interior's Standards and Guidelines* for Prehistoric and Historic Archaeology under 36 CFR 61. During his previous post as a Public Service Archaeologist, he managed and completed a variety of solar, wind, and telecommunications projects. As a Principal Investigator at Terracon, Dr. Lowry is involved with proposal preparation, project execution, client-facing consultation and marketing, agency coordination, and report completion.

PROJECT EXPERIENCE

Listed below is a short selection of Cultural Resource Management projects Dr. Lowry was involved with during the past year (all prior to Terracon).

Archaeological Reconnaissance of a 1.6-acre Residential Contruction Project in Dupage County, Illinois

Cultural Resource Investigations of the Proposed 780-acre Ivanhoe Village in Lake County, Illinois

Archaeological Resources Suvey of the Proposed Whitney Way and Beltline Fiber Line in Dane County, Wisconsin

Archaeological Reconnaissance of the 52.0-acre Lily Creek Solar Development in Stephenson County, Illinois

Archaeological Resources Survey of the Proposed Boscobel Telecommunications Facility in Grant County, Wisconsin

Phase Ia Archaeological Reconnaissance of the Proposed Kendallville Telecommunications Facility in Noble County, Indiana



EDUCATION

Doctor of Philosophy, Anthropology,
The University of Chicago, 2020

Master of Arts, Social Sciences,
University of Chicago, 2008

Bachelor of Science, Classics,
University of Arizona, 2005

REGISTRATIONS and AFFILIATIONS

2023, Register of Professional
Archeologists-ID 5640

NOMAD Science, Staff Member

IU Mongolia Society

American Center for Mongolian
Studies

SUBJECT MATTER EXPERTISE

Cultural Resource Compliance
GIS/Spatial Analyses
Section 106
Bioarchaeology
Social/Archaeological Theory

Cori Hertfelder, M.S., RPA

Environmental Department Manager

PROFESSIONAL EXPERIENCE

Cori Hertfelder serves as the Environmental Department Manager in Terracon's Saint Louis, Mo., office. Ms. Hertfelder is a Secretary of the Interior (SOI) qualified archaeologist and a member of the Register of Professional Archaeologists (RPA) with 10 years of archaeological experience. She specializes in managing and performing Phase I, II, and III historical archaeological investigation review and assessment.

Ms. Hertfelder has applied knowledge of Section 106 of the National Historic Preservation Act (NHPA) and National Environmental Policy Act (NEPA). Through her work experience, Ms. Hertfelder has worked closely with State Historic Preservation Offices (SHPO) and Tribal Historic Preservation Offices (THPO) to ensure projects meet and exceed regulatory and compliance standards.

Ms. Hertfelder has managed over 5,000 Cultural Resource Management (CRM) projects, authored and served as Principal Investigator on over 300 technical reports, and has over 1,400 hours of fieldwork experience. She has experience developing and managing a national CRM program serving both Telecommunication and non-telecommunication industries in 43 different states, Puerto Rico, and the U.S. Virgin Islands. Non-telecommunication industry experience includes Recreational Trails Projects (RTP), Land and Water Conservation Fund (LWCF), Community Development Block Grant (CDBG), USDA Rural Development (RD), and Clean Water State Revolving Fund (CWSRF).

PROJECT EXPERIENCE

Various Fiber Projects – California

Managed project startup for multiple California fiber projects for various clients. Ensured the client was kept up to date throughout the records request and report production process.

Professional Services Completed: 2023

Fee: Varies

Phase I Cultural Resources Survey for the Proposed Kiwanis Park Project (LWCF) - Moberly, Randolph County, Missouri

Managed the successful completion of this project for the City of Moberly. This Land and Water Conservation Fund (LWCF) project was completed on time and within budget. The project met the Osage Nation Historic Preservation Office Archaeological Survey Standards and received clearance.

Professional Services Completed: 2022

Fee: \$1,865



EDUCATION

Master of Science,
Archaeology,
Illinois State University
Normal, IL

Bachelor of Arts,
Anthropology and Sociology,
Adams State University
Alamosa, CO

REGISTRATIONS/ CERTIFICATIONS

Registered Professional
Archaeologists: 32215268

AFFILIATIONS

Register of Professional
Archaeologists

Missouri Archaeological Society

Society of Historical
Archaeology

PRESENTATIONS/ PUBLISHED ARTICLES

"CRM: The Good, The Bad, The Ugly, The Fun, and The Money. Ya Dig?" Presented at Illinois State University, October 2021.

"Can You Hear Me Now? Establishing an Archaeological Connection in the World of Telecommunication" Paper presented at the Annual Society for Historical Archaeology Conference, January 2018.



Phase I Cultural Resources Survey Proposal for the Proposed “City of Poplar Bluff Water Retention Project” - Poplar Bluff, Butler County, Missouri

Managed the successful completion of this project for the City of Poplar Bluff. This Community Development Block Grant (CDBG) project was completed on time and within the proposed budget. This project was also completed in accordance with the archaeological survey standards of the Missouri State Historic Preservation Office (MO SHPO) and received SHPO clearance allowing construction to proceed.

Professional Services Completed: 2022

Fee: \$3,950

Phase I Cultural Resources Survey for the Proposed Elsberry Page Branch Park Project (LWCF) located on 5th Street - Elsberry, Lincoln County, Missouri.

Managed the successful completion of this project for the City of Elsberry. This Land and Water Conservation Fund (LWCF) project was completed on time and within the proposed budget. The project met the Osage Nation Historic Preservation Office Archaeological Survey Standards and received clearance.

Professional Services Completed: 2022

Fee: \$1,765

Phase I Cultural Resources Survey for Improvements to the Paul A. Schroeder Park Playground -Manchester, St. Louis County, Missouri.

Managed the successful completion of this project for the City of Manchester. This Land and Water Conservation Fund (LWCF) project was completed on time and within the proposed budget. The project met the Osage Nation Historic Preservation Office Archaeological Survey Standards and received clearance.

Professional Services Completed: 2022

Fee: \$1,195

Collection System Improvement - Sangamon County, Illinois

As the Group Manager, overseeing this project, Cori was responsible for completing the Scope of Work and proposal. She ensured the team executed the project timely, communicated with the client on the project status, and offered technical review of the final report. This project was a State Revolving Fund (CWSRF) Project for the Sangamon County Water Reclamation District, Sugar Creek CSO – Collection System Improvement, Sangamon County, Illinois. The team completed the Phase I archaeological investigation of this project for our Client, Crawford, Murphy & Tilly. This project was completed on time, within budget, and to the Osage Nation Historic Preservation Office Archaeological Survey Standards and the Illinois State Historic Preservation Office Guidelines for Archaeological Reconnaissance Surveys and Reports.

Professional Services Completed: 2021

Fee: \$3,700

PRESENTATIONS/ PUBLISHED ARTICLES (continued)

“Hey Girl, I See You: Identifying Women Within Household Assemblages” Paper presented at the Annual Society for Historical Archaeology Conference January 2017.

“Putting Historical Archaeology to Work in a Me Generation” •Paper presented at the Three Rivers Archaeology Meeting April 2016.

“Historical Archaeology at Work: Rehabilitation Our Past and Present to Secure Our Future” Paper presented at the Annual Society for Historic Archaeology Conference, January 2016.

“Identifying the visible: A Look at How Economic Class and Ethnicity Influence Women’s Visibility within a Household” • Paper presented at the Annual Society for Historic Archaeology Conference, January 2015.

“Identifying the visible: A Look at How Economic Class and Ethnicity Influence Women’s Visibility within a Household” Thesis Defense-Illinois State University, May 2014.

“French Hegemony in Spanish Louisiana and the Collapse of Mercantilism; by: Rob Mann, PhD” Paper presented at the Annual Society for Historic Archaeology Conference, January 2014.

“Small Things Remembered: A Look at Identity in the Nolichucky Valley Through Beads and other Small Items” Poster presented to Cherokee Tribal Elders and Community Members, August 2013.



Cedar Lake Water Main and Water Tower Replacement and Improvement -Lake County, Indiana

Managed the Phase I cultural resources investigations for the new water main, new water tower, and replacement water main in Cedar Lake, Lake County Indiana. This project was completed for NEIS Engineering, Inc. and funded by the Clean Water State Revolving Fund (CWSRF). The project was completed early and under budget.

Professional Services Completed: 2021

Fee: \$15,500

Telecommunications Projects – Nationwide

As a Principal Investigator, Project Manager, and Group Manager, I have been responsible for all aspects of completing NEPA and Section 106 projects for telecommunications projects in 43 different states, Puerto Rico, and the U.S. Virgin Islands. As a Principal Investigator I was responsible for completing background research, fieldwork, site assessments, eligibility determinations, cultural resources reports, and 621/620 forms for Phase I Archaeological Investigations. I ensured projects were completed within a 2-to-3-week turnaround time and met State, Tribal, and Federal standards. I have authored over 300 technical reports and completed fieldwork in AR, CO IN, IL, KS, KY, MO, NE, PA, TN, and WV.

Professional Services Completed: 2017 - 2023

Fee: Varies

Managed a nationwide cultural resources team made up of Secretary of the Interior Qualified (SOI) archaeologists, SOI qualified architectural historians, SOI Qualified historians, archaeological technicians, and GIS specialists. This team was responsible for completing Phase I archaeological surveys, archaeological monitoring, writing and executing Memoranda of Agreements to mitigate adverse effects findings, preparation of architectural Condition Assessment Reports (CAR), Permanent Archival Records (PAR), and windshield-level historic architectural resources survey. Managed and assisted in the completion of roughly 5,000 cultural resources projects in 43 states, Puerto Rico, and the U.S. Virgin Islands since 2017.

Professional Services Completed: 2017 - 2023

Fee: Varies

Managed a team of tribal consultation experts, these individuals completed the tribal consultation process on over 10,000 projects nationwide. Built and maintained positive working relationships with Tribal Historic Preservation Offices (THPO). Aided clients in the consultation process to achieve timely project clearance.

Professional Services Completed: 2017 - 2023

Fee: Varies

Archaeological Monitoring Project – Nationwide

Monitored construction sites for archaeological resources, provided monitoring reports, and recommended project clearances to SHPO and THPO offices. Managed incoming monitoring projects from Tillman Infrastructure, Verizon Wireless, Crown Castle, Eco Site, and other telecommunications providers. Ensured these projects were properly staffed, deliverables completed and provided to THPO and/or SHPO and communicated any issues to the client. Over 180 projects cleared to final stages of construction with no delays related to archaeology.

Professional Services Completed: 2017 - 2023

Fee: Varies



Tyler Michael Mantia

Environmental Technician

PROFESSIONAL EXPERIENCE

Tyler is an environmental technician/archaeological technician in Terracon's St. Louis, Missouri office. Tyler is responsible for creating environmental reports, conducting Phase I environmental site assessment (ESA) site visits, and conducting archaeological Phase I surveys.

Tyler has acquired over two years of professional experience in conducting archaeological field work along with acquiring a Master of Science degree in Anthropology. Tyler has maintained an interest in environmental science throughout this time and has further embraced this passion starting in September 2023 when Tyler took on an environmental role alongside the archaeological role at Terracon.

NOTABLE TERRACON PROJECT EXPERIENCE

Truck Terminal Properties – Cape Girardeau, MO (2023)

Hired by Sutton Transportation, Inc. to provide a transaction screen. Conducted a site visit of a 6,580-square-foot truck terminal with 18 overhead doors, office space, truck terminal loading bays, and small maintenance shop space. Exterior areas of the site consisted of gravel parking areas and landscaped areas. Wrote report, which was delivered to the client following the site visit.

Project Spicy – St. Louis, MO (2023)

Hired by JRN, Inc. to conduct a Phase I environmental site assessment. Conducted a site visit at two KFC restaurants, one in Effingham, Illinois and one in Robinson, Illinois. Interior and exterior areas of the site were examined including grease trap underground storage tanks (USTs), pad mounted transformers, interior grease trap aboveground storage tanks (ASTs), floor drains, and sewer accesses. Wrote reports, which were delivered to the client following the site visits.

Granger Archaeology – Granger, IA (2023)

Phase I archaeological survey within agricultural land and lowland floodplains in November 2023. Project area was located in Granger, Iowa and contained areas which were pedestrian surveyed when ground surface visibility was higher than 25%, shovel tested when ground surface visibility was lower than 25%, and seven soil cores were collected from differing fields throughout the project area to determine overall soil profiles.

NEARNG GTS Archaeological Survey – Hastings, NE (2023)

Phase I archaeological survey at the Army National Guard base within Hastings, Nebraska. The area was once home to a naval ammunition depot in World War II. Work was done in two separate fields utilized for ammunition testing, storage, and



EDUCATION

Master of Science,
Anthropology, Illinois State
University, 2022

Bachelor of Science,
Anthropology, Missouri State
University, 2019

WORK HISTORY

Terracon Consultants, Inc.
Environmental Technician, June
2023-present

Washington University,
Anthropology Assistant, July
2022-May 2023

Archaeological Research Center
of St. Louis, Archaeological
Field Technician, 2019-2020,
2021, 2022

Illinois State University;
Research, Teaching, and
Writing Assistant; 2020-2022

Missouri State University, the
History Museum on the Square,
Intern, 2019



Tyler Mantia, Credentials (continued)

bunker construction in the past and partially in the present. Pedestrian survey was conducted on each of the two fields within project area with shovel testing conducted within or nearby historic points of interest. One historic archaeological site was discovered within the project area which contained several categories of historic artifacts including ceramics, coinage, glass (bottle and window), metals, and nails.

ADDITIONAL PROJECT EXPERIENCE

Cape Girardeau Airport Fence Monitoring (2020)

Archaeological Phase I and II Monitoring of new airport border fence.

Lemay House Demolition Monitoring (2019)

Archaeological Phase II Monitoring of historic residences.

Collinsville Water Main Replacement (2019)

Cultural Resource Survey for Water Main Replacement

Gwyneth Vollman, M.S.

GIS Analyst

PROFESSIONAL EXPERIENCE

Gwyneth Vollman is a GIS Analyst for Environmental Services in Terracon's St. Louis, MO, office. She has over five years of professional experience in cultural resource management and geographic information systems.

Gwyneth is responsible for creating graphics for environmental and cultural resource reports, creating usable data for in field collection and proposals, and collecting historical data. Gwyneth also assists with cultural resource fieldwork when needed.

Prior to Terracon, Gwyneth worked as a GIS Specialist in the Telecommunications sector of Cultural Resource Management and assisted with archaeological investigations across the Midwest. These archaeological investigations gave her the opportunity to gain experience in both precontact and historical sites while also affording her the ability to garner knowledge in mound identification, human burials, and artifact identification.

PROJECT EXPERIENCE

Cultural Resource Surveys for Telecommunication Towers -

Served as the GIS Specialist for more than 2200 cultural resource investigations for proposed telecommunication towers in 38 states and 1 U.S. Territory including Missouri, Illinois and Iowa. Responsibilities included creating graphics for cultural resource reports that include aerials, topographic maps, and architectural & archaeological resource maps.

Phase I Cultural Resource Survey of Shephard Mountain Bike Park - Ironton, Missouri

GIS Specialist for the Phase I cultural resource survey of 5 miles of proposed multi-use bike trails within the Shepherd Mountain Bike Park in Ironton Missouri. Responsibilities included creating shapefiles and maps for field investigations, creating graphics for the cultural resource report, and assisted with the completion of the fieldwork.

Cultural Resource Survey of the Proposed East Locust Creek Reservoir - Sullivan County, Missouri

GIS Specialist and field technician for the cultural resource survey of over 15,000 acres for the North Central Missouri Regional Water Commission and NRCS for the proposed East Locust Creek Reservoir. Responsibilities included creating shapefiles and maps for field investigation, creation of graphics for the cultural resource reports and site forms and assisting with the completion of fieldwork.



EDUCATION

Master of Science,
Geographic Information
Systems & Atmospheric
Sciences,
St. Louis University,
St. Louis, Missouri

Bachelor of Arts,
Anthropology/Archaeology,
Lindenwood University,
St. Charles, Missouri

WORK HISTORY

Trileaf Corporation, Cultural
Resources GIS Specialist,
2021-2024

Archaeological Research Center
of St. Louis
Field Technician & GIS
Specialist
2019-2021

Iowa Department of
Transportation
Cultural Resource Intern
2017

Lindenwood University
Archaeology Lab
Lab Manager & Lab Assistant
2015-2019

PRESENTATIONS/ PUBLISHED ARTICLES

"Whispers from the Past: A
Study of Artifacts from Pythian
Castle." Paper presented at the
Annual Missouri Archaeological
Society Conference April 2019.



Gwyneth Vollman, M.S.

Phase II Testing of Site 23WN1166 – Innsbrook, Warren County, Missouri

GIS Specialist and field technician for the Phase II cultural resource survey of a multi-component archaeological site on the original Schnucks Family property in Innsbrook, Missouri. Responsibilities included creating graphics for the cultural resource report and updated site forms and assisted with completing test units within the site.

Data Recovery Investigations of Ruins of the Servant's Hall for Proposed Improvements to the Campbell House Museum – St. Louis, Missouri

GIS Specialist and field technician for the Phase III mitigation of the Campbell House archaeological site for the necessary improvements to the Campbell House Museum. Responsibilities included assisting with the recovery of artifacts during backhoe removal of soil and the deconstruction of two cisterns located within the site. Was also tasked with creating sketch maps in the field based off measurements of identified structures within the site that included two cisterns, an outhouse and old servants' quarters. Also created graphics for the cultural resource report.

Phase I Archaeological Investigation for Project F-FG-92-6(2)-24-63 Mitigation Site – Marion County, Iowa

Assisted with the phase I survey conducted by the Iowa Department of Transportation to identify any possible archaeological sites and evaluate the parcel for future bat and wetland mitigation. Hand augers were conducted between 150-200 cm below the surface to try and locate any precontact artifacts.

Iowa Department of Transportation Historic Sites Management Plan - Iowa

Assisted with the evaluation of 20 archaeological sites that contain human burials located within the Right of Way (ROW) of Iowa highways. The Iowa DOT is responsible for evaluating these sites every 3-5 years to identify any new erosion or possible looting and to determine whether mitigation of the burials is required.

Phase II Testing of Site 23SC730 – St. Charles, Missouri

Assisted with the excavation of this archaeological site previously believed to be the location of the first French Church of St. Charles. During the excavation, human remains were located and believed to be associated with the first cemetery of St. Charles. Was responsible for the excavation of several test units, one of which was the burial. Was also responsible for the washing, identification and historical research, and curation of the artifacts that were located within the site.

PRESENTATIONS/ PUBLISHED ARTICLES (continued)

"A Socio-Economic Study of Artifacts of 322 South Main Street, St. Charles, Missouri." Paper presented at the Annual Society for Historical Archaeology Conference January 2019

"Analysis of Unidentified Ceramic and Childrens Toys at a Site in Historic Saint Charles, Missouri." Poster presented at the Annual Missouri Archaeological Society Conference April 2018

"An Analysis of Ceramics Found at Two Sites in Saint Charles, Missouri." Paper presented at the Annual Society of Historical Archaeology Conference January 2018

"Human or Machine? An Analysis of Saw Marks on Animal Bones from Two Sites in Saint Charles, Missouri." Paper presented at the Annual Society for Historical Archaeology January 2017

Tyler, Holladay, B.S.

Architectural Historian

PROFESSIONAL EXPERIENCE

Tyler is an Architectural Historian in Terracon's St. Louis, Missouri, office. Tyler brings over 6 years of experience in Architectural History to Terracon through his experience while working at the Federal Transit Administration (FTA) and the Missouri Department of Transportation (MoDOT). Tyler meets the Secretary of the Interior's Professional Qualifications Standards for Architectural History.

Tyler's main responsibilities at the FTA Regional Office VII were to ensure environmental compliance for sponsors looking to use grant money for public transportation projects. The types of projects the FTA provided funding for were public bus facilities, bus maintenance facilities, bus transfer stations, and pedestrian pathways. Tyler provided oversight to local transit agencies to ensure their project was in compliance with Section 106, Section 4(f), and other applicable environmental laws.

Tyler's main responsibilities at MoDOT were the identification of historic properties through the Section 106 process, writing reports to summarize findings, developing agreement documents to ensure MoDOT's compliance in Section 106, and completing the Section 4(f) process. Tyler served as lead architectural historian for various projects across Missouri and worked with MoDOT's archeologists to ensure historic preservation compliance.

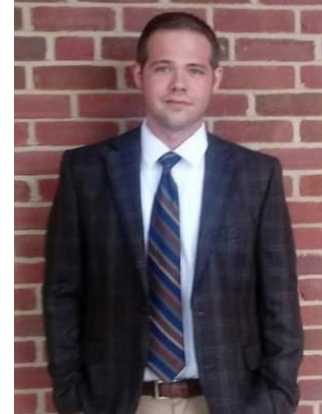
PROJECT EXPERIENCE

StarTran Bus Transfer Facility – Lincoln, Nebraska

The City of Lincoln, Nebraska, sought federal funding from the FTA to create a new bus transfer facility with bus maintenance capabilities for the city's local transit agency, StarTran. Tyler was responsible for initiating tribal consultation and providing Section 106 oversight to the city and their consultants. Tyler initiated Section 106 consultation with the Nebraska State Historic Preservation Office (SHPO), reviewed the Section 106 report, and submitted the report to the Nebraska SHPO for their concurrence. The Iowa SHPO concurred and the project was allowed to proceed to the next phase.

CAMBUS Facility Expansion – Iowa City, Iowa

The University of Iowa's campus public transit system (CAMBUS) sought federal funding from the FTA to expand their existing maintenance and operations facility. Tyler was responsible for providing Section 106 oversight for the project along with other environmental considerations. Tyler initiated Section 106 consultation with the Iowa SHPO, reviewed the Section 106



EDUCATION

Bachelor of Science, Historic Preservation, Southeast Missouri State University, Cape Girardeau, MO

PROFESSIONAL TRAINING

Section 106 Agreements Seminar, Advisory Council on Historic Preservation, 2024

Purpose and Need and 4(f), Federal Highway Administration, 2024

Section 4(f) Compliance for Historic Properties, National Preservation Institute, 2023

Streetscape Design: Strategies for Historic Districts, National Preservation Institute, 2021

The Importance of Mapping Cultural Resources, National Preservation Institute, 2021

Section 106 Training, Missouri State Historic Preservation Office, 2021

Coordinating NEPA and Section 106, Advisory Council on Historic Preservation, 2019

Basics of NEPA and Section 106 Integration, Advisory Council on Historic Preservation, 2019.

Tyler, Holladay, B.S. (continued)

report, and submitted the report to the Iowa SHPO for their concurrence. The Iowa SHPO concurred, and the project was allowed to proceed to the next phase.

Futures Unlimited Facility Rehabilitation– Wellington, Kansas

Futures Unlimited, Inc., is a community-based support for people with disabilities in Sumner County, Kansas. Futures Unlimited also provided general public transportation and sought funding from the FTA to purchase and rehabilitate an existing building. Tyler, in cooperation with the U.S. Department of Transportation VOLPE Center, completed a Section 106 report for both archeological and architectural resources for Futures Unlimited. The project received concurrence and the project was allowed to proceed to the next phase.

St. Louis County Route 267 Sidewalk Improvements – St. Louis, Missouri

MoDOT identified a 3.8 mile stretch of Route 267 that required sidewalk improvements. The improvements started at the Adelia Ave and Route 267 intersection, moved south along Route 267, and terminated at the Route 50 and Route 267 intersection. The improvements would reconstruct sections of sidewalks, construct sections of new sidewalk, and correct sections of sidewalks that were not ADA compliant. Tyler served as the lead architectural historian for the project. Tyler planned and conducted fieldwork, wrote the Section 106 report and submitted the report to the Missouri SHPO. The field survey was designed to meet standards set forth by both MoDOT and the Missouri SHPO Guidelines for Architectural Surveys and Reports.

Buchanan County Route 59 Improvements – St. Joseph, Missouri

MoDOT identified the intersection at Route 59 and Route 752 for improvements. The improvements would reconfigure the Route 59 and Route 752 intersection, improve a railroad crossing, and modify the Route 59 and W Valley Street intersection. Tyler served as the lead architectural historian for the project and worked with a MoDOT Archeologist to submit the project. The field survey was designed to meet standards set forth by both MoDOT and the MO SHPO Guidelines for Phase I Archaeological Surveys, Architectural Surveys, and Reports.

Wilson’s Creek National Battlefield Roundabout – Republic, Missouri

MoDOT identified the intersection at Route ZZ and W Farm Road 182 for improvements. The improvements included a roundabout at the intersection to prevent traffic collisions and reduce congestion, and the construction of a sidewalk to the south of the roundabout to provide pedestrian access to Wilson’s Creek National Battlefield. Wilson’s Creek was previously listed in the National Register of Historic Places (NRHP) as a historic district and was identified early in the project planning process. Tyler conducted fieldwork for the project and wrote a Section 106 report that included an effects assessment to Wilson’s Creek National Battlefield. The project resulted in a

PROFESSIONAL TRAINING (continued)

What is Section 106, Advisory Council on Historic Preservation, 2019.

Successfully Navigating Section 106 Review, Advisory Council on Historic Preservation, 2019

The Secretary of Interior’s Standards: Treatment Considerations, National Preservation Institute, 2019

Beyond Compliance: Historic Preservation in Transportation Project Development, National Highway Institute, 2019

PRESENTATIONS/ PUBLISHED ARTICLES

A Guide to Missouri’s Roadside Parks, Missouri Preservation Conference held in Joplin, MO

National Register Documentation: Thinking Through the Long-Term Implementation of Listing on the NRHP, Missouri Preservation Conference held in Jefferson City, MO

Work History

Federal Transit Administration, Environmental Protection Specialist, 2024-2025.

Missouri Department of Transportation, Senior Historic Preservation Specialist, January 2019-2024.



Tyler, Holladay, B.S. (continued)

“no adverse effect” determination. The MO SHPO concurred with the determination and construction activities were scheduled to proceed.

Buchanan County Bridge W0444 and Y0010 Replacements – Buchanan County, Missouri

MoDOT identified bridges W0444 and Y0010 for replacement due to structural deficiencies identified in a bridge inspection survey. Tyler completed a field survey for both bridges and completed a Section 106 report for submittal to the Mo SHPO. Tyler, on behalf of MoDOT, made the determination that both bridges were recommended as eligible for listing in the NRHP due to the bridges being good examples of the Luten style arch bridge on the state highway system. Tyler also made the determination that the removal of the bridges would result in an adverse effect. Tyler completed the remaining Section 106 and Section 4(f) process so the project could advance to construction.

Historic Resources Survey Report

**NRCS-MO: Lick Creek — Dudley Main,
Stoddard County, Missouri**

July 12, 2024 | Report Number: 15237400



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FINAL REPORT
HISTORIC RESOURCES SURVEY REPORT
NRCS-MO: Lick Creek — Dudley Main, Stoddard County,
Missouri

Prepared for:

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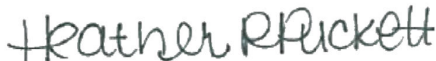
Principal Investigators

Heather R. Puckett, PhD; S. Elizabeth Valenzuela

Report Contributors

Heather R. Puckett, PhD, Eli D. Schuck, and Cait Parish

July 12, 2024



Heather R. Puckett, PhD

Senior Architectural Historian



S. Elizabeth Valenzuela

Authorized Project Reviewer

ABSTRACT

Project Location	Lick Creek Ditch and Dudley Main Ditch (Project) in Liberty Township, Stoddard County, Missouri
Lead Agency	United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS)
Other Involved Agencies	Missouri State Historic Preservation Office (SHPO)
Applicable Regulations	Section 106 of the National Historic Preservation Act (NHPA), as amended
Description of Project/ Undertaking	Measures to ensure the vitality of aging infrastructure (i.e., canals, ditches, and levees) without expanding the footprint of the original designs
Location	Approximately 100 acres (ac.) of land located along the ditch running north to south (along County Road [CR] 691) beginning at the confluence of Lick Creek and the Saint Francis River and terminating approximately 11,000 feet north of that point, within Drainage District 12
Project Area/ Area of Potential Effects (APE)	The APE for direct effects is commensurate with the extent of proposed ground-disturbing activities for the Project, totaling 392 ac. in size.
Land Jurisdiction	Publicly and Privately Owned
Terracon Project Number	15237400
Date of Fieldwork	December 5–8, 2023
Previously Determined NRHP Eligible or Listed Historic Properties in APE	0 NRHP Eligible or Listed Properties
Recommended NRHP Eligible Properties in APE	1 NRHP Individual Eligible Property

Table of Contents

ABSTRACT	i
1.0 INTRODUCTION	1
1.1 Project Description	1
1.2 Area of Potential Effects	7
1.3 Regulatory Framework	8
2.0 HISTORICAL BACKGROUND	9
2.1 Previous Surveys	9
2.2 Water Resources of the United States	11
2.3 USDA NRCS Publications	12
2.4 Historical Background	14
3.0 METHODOLOGY	28
3.1 Archival Research	28
3.2 Fieldwork	29
3.3 Architectural Descriptions	31
4.0 SURVEY RESULTS	31
4.1 Identification of Historic Properties within the Area of Potential Effects	31
4.2 Reconnaissance Survey Results	32
4.3 NRHP Evaluation of Surveyed Resources	43
5.0 SUMMARY AND RECOMMENDATIONS	46
6.0 REFERENCES CITED	47

Appendices

Appendix A	SHPO Correspondence
Appendix B	Project Photographs
Appendix C	Missouri SHPO Site Form
Appendix D	Additional Figures and Tables

Figures

Figure 1. Topographic Map Showing Location of Lick Creek and Dudley Main Ditches, Associated Creeks, and Laterals within Stoddard County, Missouri (Source: Terracon 2024).	2
Figure 2. Topographic Map Showing Location of Lick Creek and Dudley Main Ditches, Associated Creeks, and Laterals within Stoddard County, Missouri (Source: Terracon 2024).	3
Figure 3. Topographic Map Showing Location of Lick Creek and Dudley Main Ditches, Associated Creeks, and Laterals within Stoddard County, Missouri (Source: Terracon 2024).	4
Figure 4. Topographic Map Showing Location of Lick Creek and Dudley Main Ditches, Associated Creeks, and Laterals within Stoddard County, Missouri (Source: Terracon 2024).	5
Figure 5. Topographic Map Showing Location of Lick Creek and Dudley Main Ditches, Associated Creeks, and Laterals within Stoddard County, Missouri (Source: Terracon 2024).	6
Figure 6. USGS Watershed Hydrologic Unit Classification System.	12
Figure 7. Thomas Hart Benton paints a celebration of the state’s historical timeline in his mural, A Social History of Missouri, in the State Capitol’s House Lounge (MO State Archives 1936).	14
Figure 8. Construction of a Drainage Ditch in the Little River Drainage District (Stephens et al. 2008).	22
Figure 9. Paddling along the Little River Drainage District Corporation (Stephens et al. 2008).	22
Figure 10. Digging Drainage Ditch in SE Missouri (P0352-005589), State Historical Society of Missouri Digital Collections, Photograph Collection, available online at https://digital.shsmo.org/digital/collection/imc/id/27379/rec/1	25
Figure 11. Flood Control Planning (Source: The Daily Standard, 26 AUG 1996:1).	26
Figure 12. Cypress Lateral No. 1, the Historic-Age Resource Identified During the Reconnaissance Level Survey.	37
Figure 13. Irrigation-Related Features along the Cypress Lateral No. 1, the Historic-Age Resource Identified During the Desktop and Checked During the Reconnaissance Level Survey.	38

Figure 14. Cypress Lateral No. 1 Fields Associated with Features A, B, C, and L (Google Earth Pro, USGS 1996).	39
Figure 15. What About the Supply of Ground Water in Missouri? (P0030-3314), State Historical Society of Missouri Digital Collections, Photograph Collection.....	40
Figure 16. Overview of Cypress Lateral No. 1, View South from the Concrete Bridge (Structure No. 21905) at County Road 679 (Source: Terracon 2023).....	41
Figure 17. Junction between Cypress Lateral No. 1 and Sublateral Ditch near Feature K.....	43

Tables

Table 1: Types of Irrigation Features (based on Knight 2009).....	11
Table 2: Types of Irrigation Features Associated with Ditches within Survey Area	31
Table 3: Historic-age Resources Documented within the Project APE.....	33
Table 4: Historic-age Features associated with Cypress Lateral No. 1	33
Table 5: Summary of NRHP Recommendations for Resources Within the Project APE.....	47

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



1.0 INTRODUCTION

This report presents the results of a reconnaissance-level historic resources survey of the Lick Creek – Dudley Main Ditches (Project) in Liberty Township, Stoddard County, Missouri (**Figures 1-5**). The Project consists of proposed measures to ensure the vitality of aging infrastructure including constructed canals, ditches, and levees located along 16 miles of the Lick Creek and Dudley Main ditches. **The proposed project is funded through Drainage District 12 with supplemental funding from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) (44 FR 50579).**

NRCS programs must comply with the provisions of Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations, 36 CFR Part 800 – Protection of Historic Properties (54 USC Section 306108). The project activities meet the definition of an Undertaking, per 36 CFR § 800.16(y), and is the type of activity that has the potential to cause effects on historic properties. Therefore, the proposed project is subject to review under Section 106 of NHPA, as amended, and its implementing regulations.

A reconnaissance-level historic resources survey of historic-age buildings, structures, and site features within the project area of potential effects (APE) was performed under supervision of the Principal Investigator, who meets the *Secretary of the Interior's (SOI) Professional Qualifications in History and Architectural History*. Supporting documentation for the historic resources survey report is provided as attachments:

- SHPO Correspondence is located in **Appendix A**.
- Photographs of the surveyed resources are provided as **Appendix B**.
- Missouri SHPO Site Forms are provided in **Appendix C**.
- Additional figures, including project maps, historical photographs, topographic maps, and historic aerials are included as **Appendix D**.

1.1 Project Description

Based on information provided by Terry L. Feldmann, P.E., Conservation Works JV, LLC (Client), on behalf of NRCS, the Area of Potential Effects (APE) consists of an approximate 392-acre project area containing Lick Creek (*see Figures 1-5*). Closer inspection reveals that the survey APE is located along Cypress Lateral No. 1 from its confluence with Lick Creek and the St Francis River.

Organized in 1909, within Stoddard County, Missouri, Drainage District (DD) 12 manages drainage canals constructed in the early 1900s to transform nearly inhabitable land into a productive region. As a result, the 100-year-old watershed infrastructure in this region serves as both the lifeblood to the region and allows for the production of a wide array of agricultural commodities.

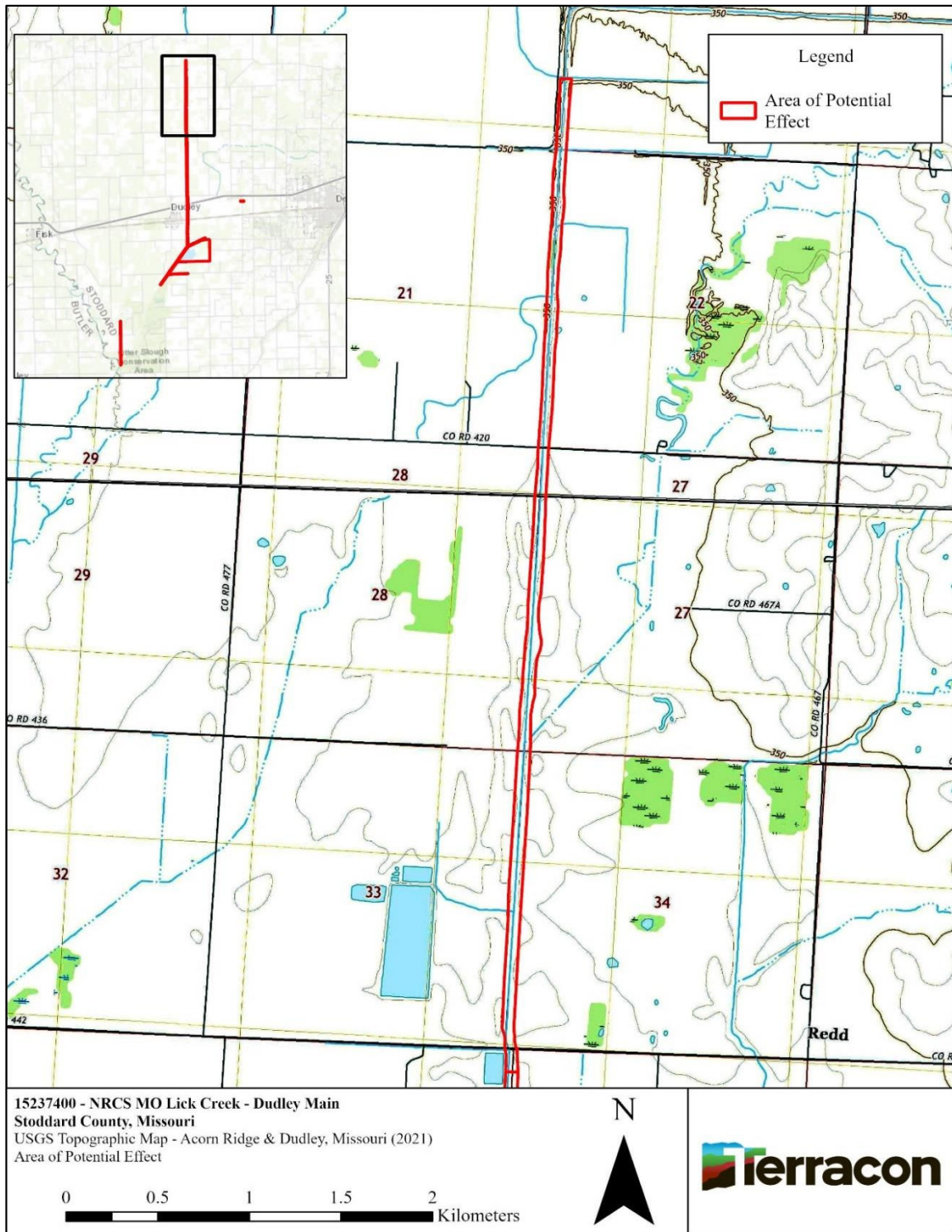


Figure 1. Topographic Map Showing Location of Lick Creek and Dudley Main Ditches, Associated Creeks, and Laterals within Stoddard County, Missouri (Source: Terracon 2024).

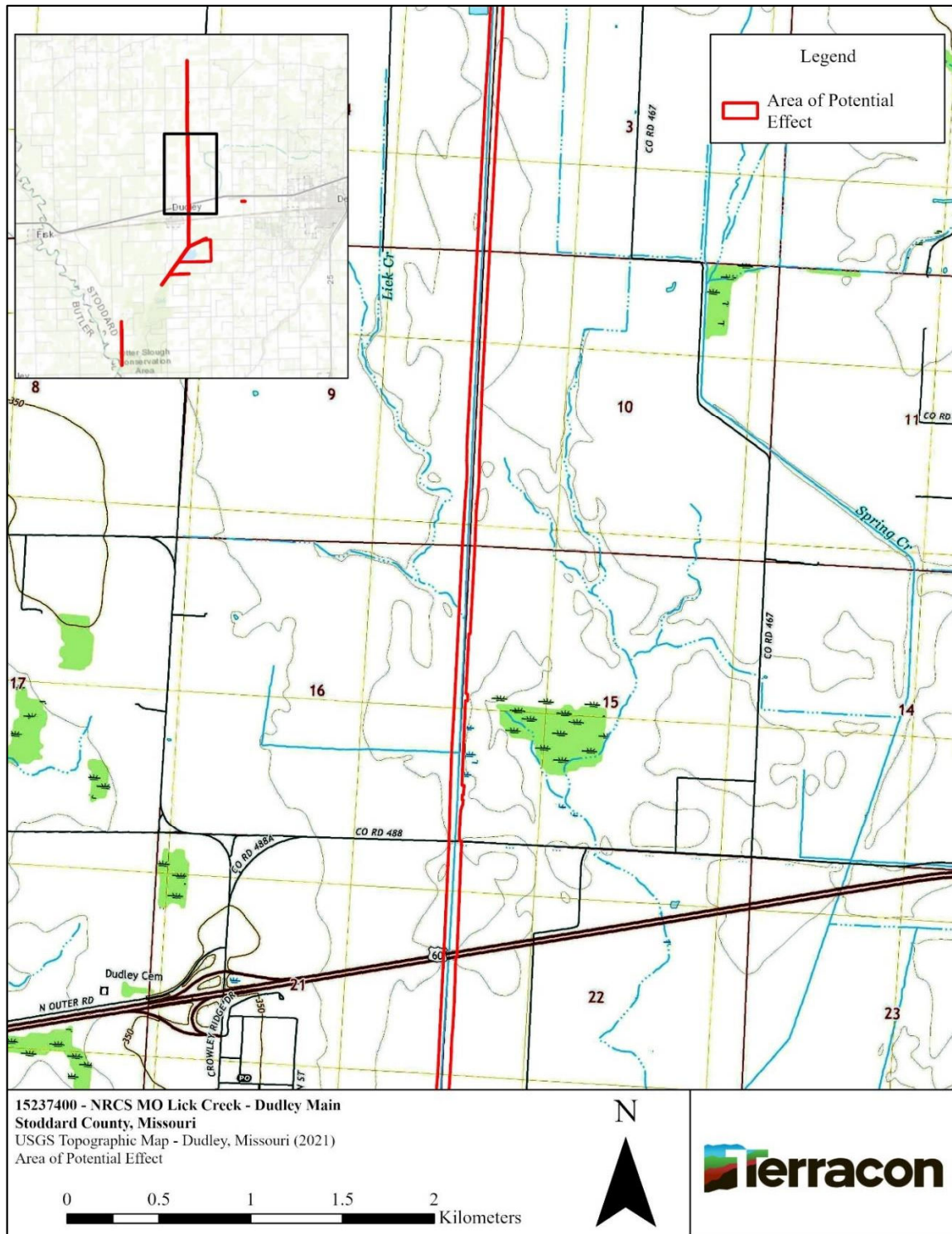


Figure 2. Topographic Map Showing Location of Lick Creek and Dudley Main Ditches, Associated Creeks, and Laterals within Stoddard County, Missouri (Source: Terracon 2024).

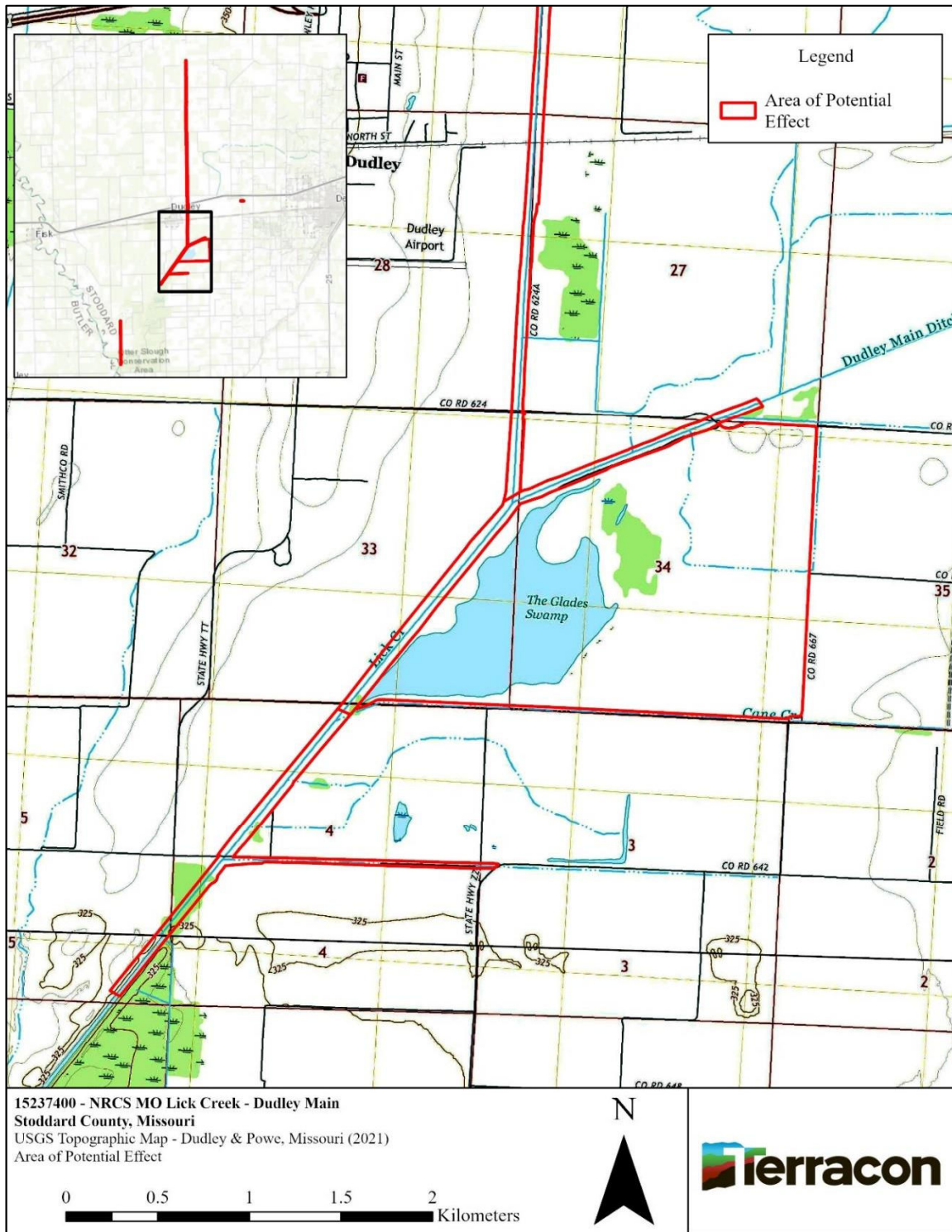


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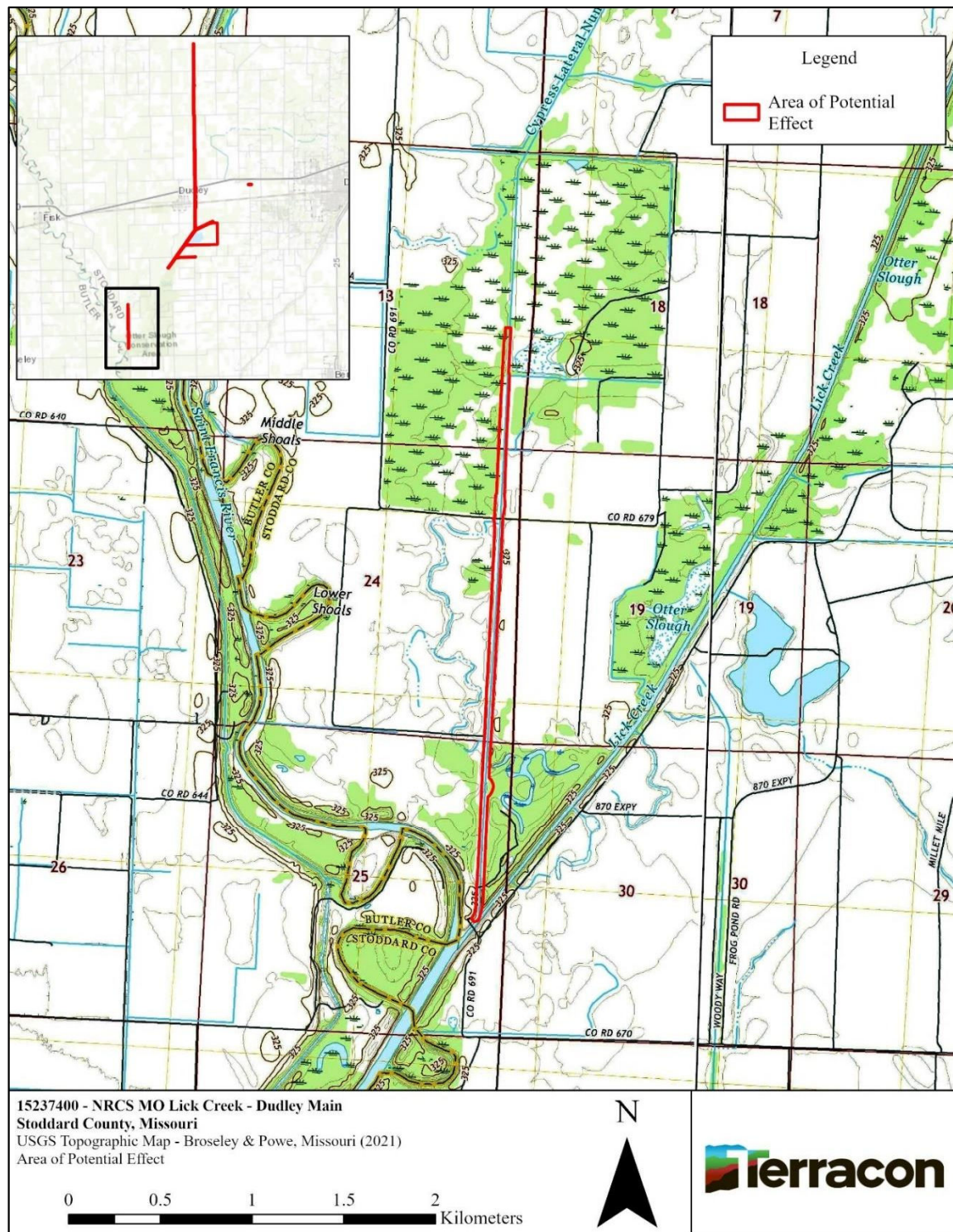


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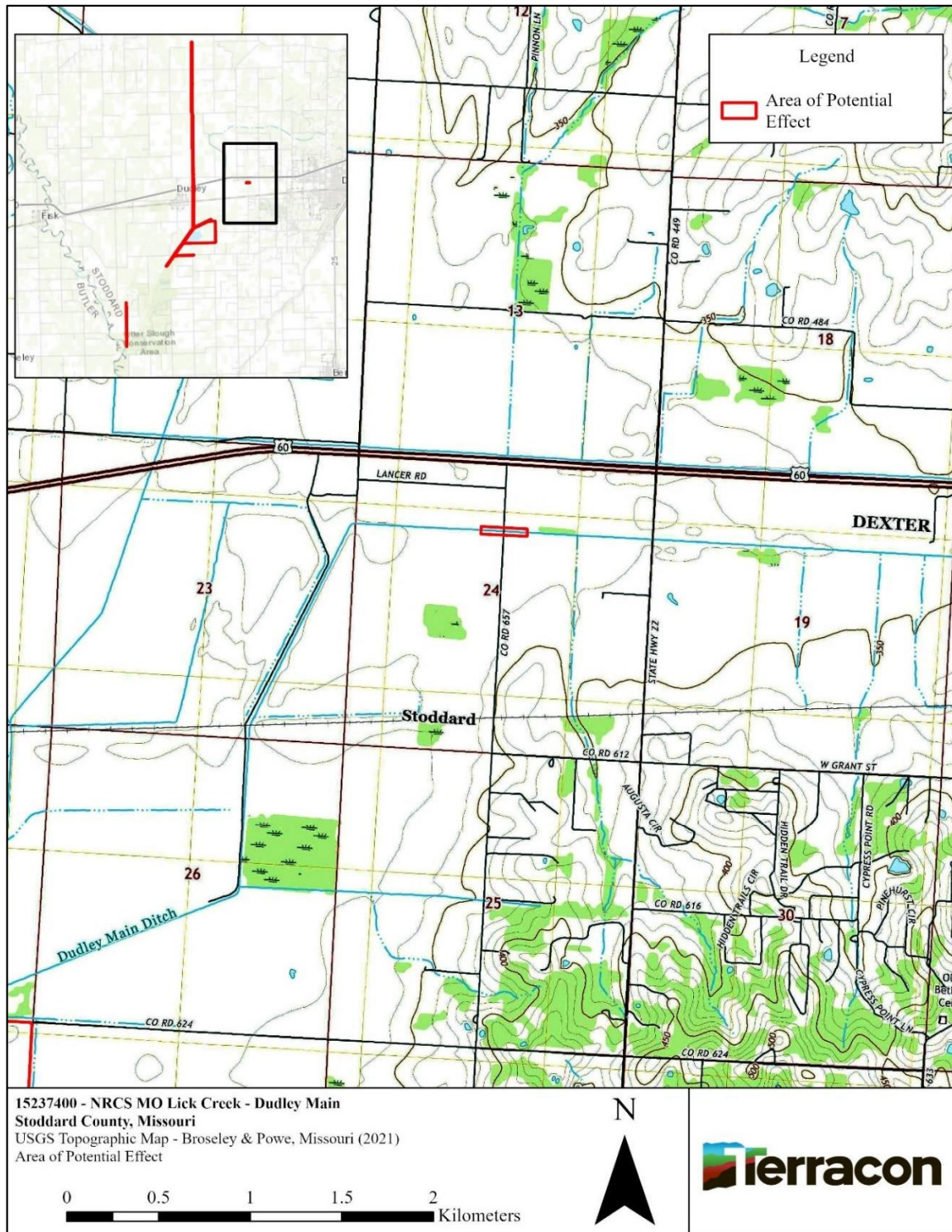


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Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



DD 12 proposes to ensure the vitality of aging infrastructure, provide benefits to downstream watersheds, ensure landscape scale resilience, and improve drainage canals from two HUC-10 watersheds, Lick Creek and Dudley Main Ditch. The Lick Creek Ditch Watershed receives runoff in the headwaters from Crowley’s Ridge and transfers it to an outlet into the St. Francis River. Dudley Main Ditch also drains into the St. Francis River and adjoins west of Lick Creek Watershed. Likewise, Cypress Lateral No. 1 joins Lick Creek and Dudley Main ditches at the confluence with the St. Francis River.

Federal funds, specifically those from USDA NRCS will be utilized for the proposed improvements. Since the existing watershed infrastructure was constructed more than 45 years ago, and the proposed project was identified as an Undertaking in accordance with the NHPA, USDA NRCS policy requires an SOI-qualified architectural historian evaluate resources within the APE for their historic significance and architectural merit and to make a recommendation regarding their eligibility for inclusion on the NRHP.

Project areas targeted for field investigation comprised roughly 392-acres of the APE, as determined in consultation with staff from NRCS and the Missouri State Historic Preservation Office (MO SHPO). These included portions of the APE that are located within 250 feet of previously recorded historic properties as identified in the MO SHPO Archaeology Viewer. Areas of the APE nearest to the fifteen previously recorded historic properties were subject to pedestrian survey. Field investigations were limited to a 60-foot area extending from the top of the ditch bank, as this is the boundary for proposed improvements by Drainage District 12. Additional survey areas were identified within portions of the APE that will be subject to extensive ground disturbance associated with the placement of rip rap. No areas beyond the 60-foot designated work area were surveyed.

1.2 Area of Potential Effects

The APE is defined as, “the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties,” per 36 CFR § 800.16 (d). The APE for the Undertaking was defined to include the extent of proposed ground-disturbing activities for the Project; this correlates to approximately 16 miles (392 acres) of ditch improvements through Stoddard County, Missouri.

The Lick Creek Ditch Watershed, Dudley Main Ditch, and Cypress Lateral No. 1 all drain into or adjoin with the St. Francis River. Within this APE are the drainage ditches, laterals, canals, and other water-related features, access points, rights-of-way, and staging areas (*see Figures 1-5*). The majority of the adjacent land is dominated by agricultural use, some recreational use, and a few residential properties.

Areas targeted for field investigation were determined in consultation with staff from NRCS and the MO SHPO. These included portions of the APE that are located within 250 feet of previously recorded historic properties as identified in the MO SHPO Archaeology Viewer (per MO SHPO), along with a desktop review and comparison of modern and historic maps and aerials. Areas identified as potentially containing a high probability of historic-age resources

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



were identified from the desktop review, mapped in a KMZ file, and then subsequently verified by field personnel.

A pedestrian and windshield survey of the APE were used to determine the nature, extent, condition, and possible significance of historic properties; the survey was performed in tandem with the archaeological investigations for this project. Both pedestrian and windshield surveys across the targeted survey area of the APE were conducted along both sides of the ditch. The pedestrian survey was limited to the southern portion of the Project, in areas where extensive bank disturbances were proposed, but was limited to 60-feet from the centerline of the ditch to avoid trespassing. Taking these limitations into account, a total of 29 acres of the project were surveyed. Areas not surveyed were limited to the northern half of the APE. These areas omitted had been previously subject to archaeological survey and based on comparisons to historic and modern maps and aerials, was determined a low probability for historic-age resources. Additionally, the proposed ditch maintenance in these areas was limited to spreading soils and reseeding, which posed no visual impacts to historic age resources.

1.3 Regulatory Framework

The NHPA (36 CFR 800.5) outlines the framework used to evaluate the undertaking's potential to impact historic properties in the project APE and defines the meaning of "effect." A finding of **No Effect** is made when there are no historic properties present within the APE, or if there are historic properties within the APE, but the proposed project or undertaking will not have a direct impact on them.

In cases where historic properties are located within the APE and the effects of an undertaking do not compromise the historic fabric of the property or the associative qualities for which the historic property is considered eligible for inclusion on the National Register of Historic Places (NRHP), through consultation with the State Historic Preservation Office (SHPO), an agency may have a finding of **No Adverse Effect**. Typically, design projects that follow the Secretary of the Interior's Standards for the Treatment of Historic Properties (the Standards) result in a finding of No Adverse Effect.

A finding of **Adverse Effect** typically occurs when an undertaking either directly or indirectly alters the characteristics of a historic property that qualifies the property for inclusion on the NRHP. Examples of adverse effects include whole or partial demolition of a historic property; removing a property from its historic location; introducing visual, atmospheric, or audible elements that have the potential to diminish the property's significant historic features; changing the character of the property's use or physical features or setting that contribute to its historic significance; or altering a property in a manner that is not consistent with the Standards. This might include insensitive efforts in the restoration, rehabilitation, maintenance, repair, or stabilization of the building; remediation of hazardous materials; providing access in accordance with the Americans with Disabilities Act (ADA), or even neglect that results in the full or partial demolition of character-defining features of the historic property. Even the transfer, lease or sale of a property out of Federal ownership could result in an adverse effect finding by SHPO.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



If an adverse effect is anticipated, Section 106 of the NHPA requires project alternatives be considered that would avoid, minimize or mitigate the adverse effects. A Memorandum of Agreement (MOA) is developed in consultation with SHPO and consulting parties to document the mitigation measures that would resolve the adverse effect.

2.0 HISTORICAL BACKGROUND

The following section provides an overview of previous surveys related to agricultural properties in Missouri; information on water resources; references and guidance from USDA NRCS publications; and a historical context for the project.

2.1 Previous Surveys

In 1993, Roger Maserang of the Show-Me Regional Planning Commission prepared a report detailing an agricultural survey within the Columbus Township in Johnson County, Missouri. While not within the APE for the current project location, the report does provide a standardized typology of agricultural-related properties within Missouri which may be used for comparison to resources identified during the field work:

- *Cribs or Granary Barns*, the oldest type of barn used in the U.S., of varying sizes and shapes, clad with vertical siding with gable roofs, finished foundations (wood, stone, concrete), and open layouts for the storage of machinery and produce rather than animals
- *Appalachian Barns*, the most common of barns noted in Missouri, rectangular-shaped, clad with vertical siding with gabled roofs, varied layout of cribs and stalls, and a hay hood located above a loft door
- *Bank Barns*, less common in Missouri, but constructed along a hillside with double wagon doors along the upslope elevation and an opening facing south, up to 2.5-stories in height, with the lower levels clad with stone or concrete and topped with gable roofs
- *Traverse Frame Barns*, rectangular-shaped, 1.5- to 2-story multipurpose barn, with gable roof and hay hood above loft door, including stalls or cribs and clad with wood siding or hewn logs, and may vary into three subtypes:
 - *Subtype 1*: Barn is expanded with one- to two-flanking aisles along the main axis for machinery storage
 - *Subtype 2*: Barn has gambrel (dual-pitched) roof
 - *Subtype 2a*: Barn with gambrel roof and one- to two-flanking aisles along the main axis

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



- *Pole Barns*, constructed after World War II, consisting of poles set into the ground with gable roofs, often set on poured concrete foundations, sometimes with metal cladding for storing machinery or hay
- *Unique Barns*, identified in Missouri with transverse frames, unusual wings, truncated clipped gables, or other variation
- *Milk Houses*, one-story, small, rectangular, buildings with gable roofs found in association with dairy barns or feature cattle doors for milking
 - Early milk houses are clad with wood
 - Following government requirements, modern milk houses are constructed of concrete blocks or tile
- *Poultry Houses*, rectangular-shaped, one-story, frame buildings with gable roofs which double as hay storage or insulation, and low window openings for ventilation
- *Privies*, also called outhouses, comprised of standard, square or rectangular wood frame building with single entry (typically with crescent or other cutout design), with gable or shed roof
- *Root Cellars*, depressions or earthen mounds with finished sides (concrete block, stone, brick, or poured concrete), offering underground or semi-subterranean storage with frame or gable entrance, ventilation pipe, but no windows
- *Silos*, typically associated with livestock barns, often with exterior ladders or chutes for accessibility
 - Early silos are either pits or square or rectangular in shape and constructed of wood with gable roofs
 - Other early variations include hexagonal or octagonal silos
 - Later circular silos are constructed of brick, tile blocks, concrete, steel, or fiberglass-coated steel with dome-shaped roofs
- *Windmills* feature a narrow three- or four-leg steel ladder tapered framework topped by a blade mechanism (rudder) to lift water from a well either for livestock or other consumption
- *Others (Garages, Utility, Unidentified Buildings)* include all types of buildings that do not fit the other categories, such as ice houses, wash houses, smokehouses, summer kitchens, hog houses, poultry houses, utility buildings, garages, machinery sheds, enslaved or tenant housing, or other agricultural storage

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



In 1992 and 1993, Dr. Bonnie Steppenoff conducted a survey documenting rural architecture within Butler County, Missouri; Butler County is just west of Stoddard County. Her context considered properties in Missouri associated with exploration and settlement, agriculture, community development, transportation, commerce, industry, education, entertainment, and recreation and produced a typology for certain properties. Steppenoff (1993) identified the following as the “most representative of the life and culture of Butler County:” pioneer log cabins and farmsteads, open-gable and Craftsman Bungalow dwellings, twentieth-century barns, false-front commercial buildings, small rural and Works Progress Administration (WPA) schoolhouses.

*Irrigation-related features were compared to Lila Knight’s field guide related to the Lower Rio Grande Valley (2009); Knight (2009:95) offers a typology for certain types of irrigation resources, such as diversion, conveyance, distribution, delivery, and related infrastructure (**Table 1**).*

Table 1: Types of Irrigation Features (based on Knight 2009).

Diversion	Conveyance	Distribution	Delivery	Other
Headwaters or Head Gates	Canals	Dams	Sublaterals or Tertiary laterals	Levees, Roads, and Bridges
	Laterals	Gates: Turn Out; Check; or Head Gates	Surface Pipes	Drainage Ditches or seepage
Pumping Plants	Pipelines			
Inlets	Flumes	Weirs or Sluices	Spray Pipes or Sprinkler Systems	Pump houses
	Reservoirs			Siphons, Flumes, or Culverts
Lift Stations	Drainage Basins	Division Boxes	Private Pipelines or Standpipes	
Well Heads		Valves	Furrowed Fields	Gauging Stations
	Water Towers or Tanks			Windmills

2.2 Water Resources of the United States

According to the USGS, watersheds in the United States are delineated through a system of surface hydrologic features including 22 regions, 245 subregions, 405 basins, 2,400 subbasins, 19,000 watersheds, and 105,000 sub-watersheds (Seaber et al. 1987). Hydrologic units are subdivisions of these categories and are defined by a classification system based on a unique two- to eight-digit code (HUC) (**Figure 6**).

The APE is located within the Lower Mississippi Watershed, identified as HUC 08. This area is defined as:

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



- The drainage of the Mississippi River below its confluence with the Ohio River, excluding the Arkansas, Red, and White rivers basins above the points of highest backwater effect on the Mississippi River in those basins; and,
- Coastal streams that ultimately discharge into the Gulf of Mexico from the Pear River Basin boundary to the Sabine River and Sabine Lake drainage boundary.
- Includes parts of Arkansas, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee (Seaber et al. 1987:33).

Within HUC 08, the APE falls within the Lower Mississippi–St. Francis subregion (0802), as part of accounting unit 080202, which refers to man-made diversions within the St. Francis River Basin in Arkansas and Missouri, an area amassing roughly 9,040 square miles (Seaber et al. 1987:33).

Wetland drainage, timber clearing, and flood control projects have converted the lower [St. Francis] subbasin from an immense swampland forest to a vast agricultural area. Eight percent of the lower subbasin is now used for crop land, followed by 7 percent woodland, and 3 percent grassland (Boone 2001).

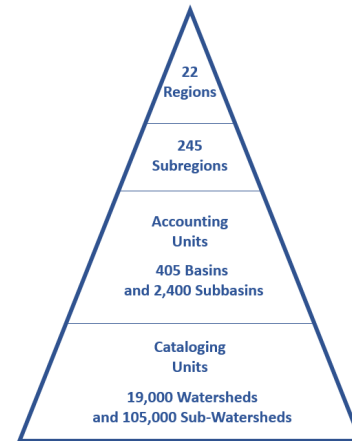


Figure 6. USGS Watershed Hydrologic Unit Classification System.

2.3 USDA NRCS Publications

The USDA NRCS offers definitions and other information regarding irrigation-related features. The NRCS has a series of Conservation Practice Standards (CPS), or technical guides, that relate to irrigation and water control (see **Appendix D**).

Irrigation canals or laterals are used to convey water from the water source to one or more areas, such as a farm irrigation system. Canals and their related features are designed as a system to support a single farm or a group of farms while helping facilitate conservation practices. Parts of the system include the canal or lateral, inlets, outlets, turnouts, checks, crossings, and other features. Over the life of its operation, an irrigation canal or lateral requires routine maintenance activities (USDA NRCS 2020a).

Surface drains, mains, or laterals, are open drainage ditches which receive and convey water from other drainage features in order to intercept and control water, dispose of excess water, or provide leaching of soils (USDA NRCS 2015). The use of water-control structures to manage water from surface or subsurface agricultural drainage systems is identified as drainage water management (USDA NRCS 2023). Water can be regulated so that it is available at certain times and limited in capacity. It may vary based on “the time and stage of water held in drains, pumping schedules, and coordination of these items with rainfall, season, crop needs, and soil requirements” (USDA NRCS 2023).

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



NRCS defines irrigation ditches as features designed to convey water from supply sources to fields as part of an irrigation system to improve both uniform distribution and efficient irrigation (USDA NRCS 2020b). In some practices, an irrigation ditch, canal or lateral, may have a lining made of chemical treatments or impervious materials to reduce water loss or seepage of the conveyance system (USDA NRCS 2020c). Similarly, irrigation pipelines are used to help convey water as part of a system. Types of materials used for conduits are steel, aluminum, corrugated metal, ductile iron pipe, plastic, or concrete. When galvanized materials¹ are used, they are generally between 20- and 24-gauge (USDA NRCS 2020c). Irrigation pipes are used with pressure reducers or relief valves, check valves, surge tanks, and other equipment. Typically, irrigation pipes have a lifespan of 20 years. Furrowed or fallowed fields (field rows indicating farming that relied on water or areas flooded by water) are associated with irrigation practices. Other evidence includes standpipes, flumes, culverts, diversions, aqueducts, channels, weirs or check dams, generators, gates, docks, bridges, dry-docks, siphons, retaining walls, tunnels, headgates, or headworks, as well as valves (some have valve keys for water and flow control).

Irrigation field ditches and elevated ditches are open channels used to convey water rapidly (e.g., 25 cubic feet per second or less). Constructed of earthen materials such as clay, the ditches carry water without seepage. Typically, field ditches are part of a system that requires proper design and layout to allow for irrigation to the surface of a field, while also taking into account soil salinity, ground water, or downstream water. Banks of a field ditch may be closed and reopened to accommodate tillage, harvesting, or other purposes; irrigation field ditches also require routine maintenance (USDA NRCS 2020d). Irrigation field ditches are used in conjunction with culverts, diversions, erosion control structures, or other related features.

Dikes and levees are earthen barriers designed to prevent flooding and regulate waters; in some instances, they may be constructed of manufactured materials. The height, width, side slopes, construction material, and maintenance requirements are variable.

They are used to prevent or reduce flood damage to human life and property; for flow control in conjunction with floodways; to impound or regulate water for fish and wildlife management; to manage water for production of seasonally flooded crops such as rice or cranberries; or for wetland maintenance, improvement, restoration, or construction (USDA NRCS 2022).

Catchments may be used to collect and store water for livestock, fish, or other uses. Typically, these features are used for storing runoff from precipitation or rain events, but may include diversions (e.g., curbs, rock outcrops, pavement) to increase the yield of water (USDA NRCS 2020e). Other examples include dams (including diversion dams), dikes, holding ponds, basins, cisterns, reservoirs, locks, culverts, aqueducts, channels, or retaining walls.

In some instances, irrigation features may include cleaning or protection systems, such as sand traps, spillways, waste gates, or overflows. For instance, the use of baffles sometimes helps to slow water flow.

¹ Modern galvanized metal is required to meet ASTM A653/A653M, "Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process" (USDA NRCS 2020c).

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Other related irrigation features considered as part of the present study include water sources and other ancillary features not typically considered part of the irrigation system:

- *Water Sources*
 - Wells (vertical, turbine, centrifugal etc.), pumping equipment, drive shafts, transfer pumps, intake sumps, windmills, generators
 - Associated irrigation canals to Lick Creek and Main Ditch, as well as feeders or features extending off or connected to these
- *Other Ancillary Features*
 - Other ancillary features such as maintenance access roads (often running parallel to the canals), or related communication lines.

2.4 Historical Background

Missouri is known as the Gateway to the West, epitomized by “The Arch” in St. Louis near the confluence of the Mississippi and Missouri rivers. The symbol recognizes the opening of North America to westward expansion resulting from the 1803 Louisiana Purchase, and in accordance with what has been called Frederick Jackson Turner’s “manifest destiny.”² In recent years, New Western Historians have challenged Turner’s thesis as uniquely American, arguing that the settlement of the west was the result of collaboration of a myriad of ethnicities, cultural diversity, and included contributions by all genders (Limerick 1987). This new perspective is reflected in the history of Missouri (**Figure 7**).

2.4.1 Missouri Precontact and Colonization

Missouri’s precontact era spans 13,000 years, with evidence of Clovis and PaleoIndian occupation sites being identified in Jefferson, Cedar, and Montgomery counties. Climate change affected both flora and fauna as evidenced by artifacts associated with permanent and semipermanent settlements of the hunting and foraging cultures of the Archaic



Figure 7. Thomas Hart Benton paints a celebration of the state’s historical timeline in his mural, *A Social History of Missouri*, in the State Capitol’s House Lounge (MO State Archives 1936).

² Coined in 1845, Manifest Destiny argued that the territorial expansion to the western United States was a justifiable, inevitable, and divinely ordained right and emphasizes the story of white Americans.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Period (7,000 to 1,000 BCE) and fired clay producing cultures of the Woodland Period (1,000 BCE to 900 CE) (MDNR 2018).

The earliest evidence of a Village-Farmer culture emerged during the Mississippian Period (900 to 1700 CE) which relied upon the cultivation of crops such as corn to supplement their diets. Settlements included large permanent mound complexes, fortified towns, and villages, which centered on a ranked society with large religious and commercial centers such as Cahokia, Illinois, and smaller satellite communities (MDNR 2018).

In 1673, the first Europeans in the region including Canadian Fur Trader Louis Jolliet, Jesuit Priest Jacques Marquette, and French explorers, encountered the Illinois—a loose confederacy of Algonquin speaking tribes including the Kaskaskia, Cahokia, Peoria, Michigamea, Moingwene, and Tamaroa—inhabiting present-day eastern Missouri following displacement during European colonization and the Iroquois War (1641-1701) (Aron 2006; Wood 2013). Native to present-day southwest and central Missouri in the 17th century were Chiwere- and Dhegiha-speaking peoples, including the Oto, Iowa, Quapaw, Missouri, and Osage (Gilman 1974). Subsequent interactions between Native and Euro-Americans would alter the physical, social, and political landscape of Missouri (MDNR 2018).

By 1700, Jesuit missionaries established a basecamp in a swampy location at the Mission of St. Francis Xavier near present-day Des Peres. Around 1717, the French constructed what is believed to be the first levee along the Mississippi River near present-day New Orleans (USACE n.d.). By 1720, lead and silver mining began at Mine la Motte, employing enslaved laborers for manual excavation. A series of temporary forts and settlements were built and abandoned by the French throughout Missouri through the 1760s. In 1762, French Louisiana was transferred to the King of Spain through the Treaty of Fontainebleau. The Spanish assumed control of the Louisiana Territory in 1770, and the pattern of establishing forts and settlements continued; although, a few French remained in the area and ultimately organized a French-Canadian trading post Cape Girardeau. Members of the Shawnee and Delaware would receive land grants and hunting rights through the French and Spanish prior to 1800, when Spain returned the territory to France in accordance with the Third Treaty of San Ildefonso (MO State Archives n.d.).

In April 1803, France and the United States signed the 828,000 square mile Louisiana Purchase; subsequent treaties were signed with members of the Sac [Sauk] and Fox ceding lands to the U.S. government. By 1804, the Corps of Discovery, led by William Clark, Meriwether Lewis, and a Shoshone woman, Sacagawea³, who served as an interpreter. The expedition departed St Louis, traveling through the Pacific Northwest from 1804 to 1806 (National Women’s Hall of Fame 2024).

³ Sacagawea also carried her newborn son, Jean-Baptiste Charbonneau, fathered by fur trader and French-Canadian Toussaint Charbonneau, on the expedition (National Women’s Hall of Fame 2024).

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



At the same time, the District of Louisiana formed with five districts in Missouri, operating under the auspices of the Governor of the Indiana Territory, William Henry Harrison. The districts included Cape Girardeau, New Madrid, St. Charles, St. Louis, and St. Genevieve. The main government seat organized at St. Louis. Over the next few years, counties were carved from the original districts.

2.4.2 Statehood and Agricultural Potential

When the U.S. granted Missouri statehood in 1821, new emigrants arrived from the south and southeastern states (i.e., Kentucky, North Carolina, Tennessee, and Virginia), taking advantage of river access and natural resources, slavery, and agricultural potential (MDNR 2018). Industrialization and mining prompted rapid growth in urban areas of Missouri, but reliance upon agriculture maintained, with hemp being a primary product, initially. The enslaved population grew from 3,011 in 1810, to 114,509 by 1860, with Blacks supporting agriculture, mining, riverboats, docks, and labor supply. In 1860, there were 3,500 Free Blacks, mostly residing in St. Louis, Missouri. At the same time, a large influx of German immigrants arrived between 1820 and 1860, establishing settlements along the Missouri and Mississippi rivers in St. Charles, Franklin, Cole, Gasconade, and St. Louis counties (MO State Archives n.d.).

Pro-slavery support of the Kansas-Nebraska Act of 1854 resulted in armed conflict with Missourians calling for Kansas to be open to enslavement. During the Civil War, Missouri did not secede from the Union, but its citizens took part on both sides of the conflict, including roughly 1,000 skirmishes, fights, and battles on its soil. In 1865, Missouri became the first slave state to free its enslaved population (MO State Archives n.d.).

Flatboats, keelboats, and later steamboats relied upon the waters of the Missouri and Mississippi rivers. The navigation of the waterway led to creation of the river towns of Jefferson City, Brunswick, St. Joseph, and Cape Girardeau. In the years leading up to and following the Civil War, the railroad supplemented river transportation. The main emphasis for transportation was on exports of state manufactured and agricultural goods. As a result, a transportation revolution allowed for the expansion of the agricultural economy in the state, including a switch from hemp and cotton to a transition to livestock (e.g., cattle, hogs, horses, and mules).

In 1870, the University of Missouri's College of Agriculture and Mechanical Arts opened and in 1888, the university opened its first agricultural experiment station to expand scientific farming practices. Missouri's first Grange offices were formed in 1873.

Much of the landscape was dominated by swamplands or historic pine range (e.g., shortleaf pine). After the arrival of miners, early settlement (1800-1880), and the timber boom (1880-1920), the need for additional land led the state of Missouri to convert swampland into habitable, agricultural land by 1907. The massive undertaking involved the digging of more

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



than 1,000 miles of ditches, 300 miles of levees, the organization of Drainage Districts, and reclamation of nearly 1.2 million acres of land (MO State Archives n.d.). With the onset and end of World War I, Missouri saw an increase in food production and the transition of the Bootheel from swampland into a large cotton producing area.

The entire Bootheel region of Missouri (which includes the lower subbasin of the St. Francis River) has undergone a total landscape transformation from an immense swampland forest, with intermingled streams, lakes, swamps, bayous, and sloughs, to a vast agricultural area.

This conversion to agriculture required more than 200 years and three extensive land disturbances: drainage, clearing, and flood control. Major drainage and flood control projects were aided by direct and indirect government involvement in planning and construction. This included levees, Wappapello Lake [c. 1936–1941] and other storage reservoirs, Headwater Diversion Channel, floodways, cutoffs, ditches, pump stations, and mainstem channelization. Clearing was dependent on successful drainage and flood control programs. Reclamation clearing was accomplished by private enterprise (logging followed by agriculture) on drained lands, with government encouragement through land grants, land promotions, price supports, liberal allotments, and special subsidies. Land reclamation was, at first, a slow and difficult process. In 1912, just four percent of the Bootheel forests had been cut (MDC 1989). By 1989, however, only 10 percent of the forests remained and 96-percent of the wetland areas had been drained (USCOE 1991). The development of modern machinery greatly accelerated land reclamation, especially between 1950 and 1970 (Boone 2001).

While the Mississippi and Missouri rivers served as a source of transporting agricultural products, the addition of the railroad prompted Missouri’s development into a hub of commercial growth (UMSL 2024). The first railroad chartered in Missouri was the Hannibal and St. Joseph Railroad (1847). By 1850, the Pacific Railroad of Missouri offered a line between St. Louis and Kansas City, with goals of expansion westward to the California coast. The Northern Missouri Railroad (1855) offered a link to the farmlands, while the St. Louis and Iron Mountain Railroad (1851) linked the rich iron deposits of the state. Additional lines of the 1870s, such as the Missouri, Kansas, and Texas Railroad (1872) provided opportunities to join with the cattle trade (UMSL 2024).

Draining swamplands also led to a population increase as more land was available for settlement and malaria rates declined (Fisher 2017:88). For instance, between 1890-1900 and 1910-1920, the population of Stoddard, Mississippi, New Madrid, and Butler counties increased between 25 and 39% per square mile, while Scott, Pemiscot, and Dunklin counties saw an increase between 56 and 62% per square mile (Fisher 2017:88).

Gary McDowell identified the economic impact of Missouri drainage ditches and its role in the “national drainage movement” of 1900 to 1920, referring to the swamplands as the “frontier

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



behind the frontier” (McDowell 1966). Examples of the movement included the development of big dams, reservoirs, reclamation projects, as well as the creation of National Parks, Monuments, Forests, and preserves.

‘The people of the United States were more conscious of the problems of resource conservation and use in the first two decades of this century [twentieth] than they ever had been previously.’ The idea of draining the swampland in southeast Missouri did not occur in isolation or just as a local concept away from national trends. It fits into the national narrative of the time that not only was conservation important, but development of resources unusable in their present condition was an equally important part of conservation (McDowell, as cited by Fisher 2017:96-97).

The *Report of the National Conservation Commission* (1908) to the Franklin D. Roosevelt administration touted that the draining of 75-million acres of swampland would produce enough land for the construction and housing of more than 10-million people (Fisher 2017:98). A result of the commission was the formation of the National Drainage Congress and National Irrigation Congress, both of which sought to construct levees, drainages, reservoirs, and dams, with goals to irrigate the arid western US (Fisher 2017:99). Statistics for the effect of the national drainage movement between the 1800s to 1930 indicate that the majority of Missouri’s drainage efforts were in the southeast part of the state, such as the Little River District, and resulted in more than 56% of improved acreage between 1920 and 1930 alone. The height of the drainage movement in Missouri took place between 1905 and 1909 (Fisher 2017:99).

Probably no state in the Union has done more to develop consistent, scientific, comprehensive, and practicable drainage laws than Missouri, and a study of the progress of drainage legislation in that state is inspiring (Fisher 2017:103).

Newspapers touted the success of drainage, which drew southern cotton planters to the area; northern farmers sought to grow wheat, corn, alfalfa, and oats. In 1922, it is estimated that approximately 1,500 new settlers arrived daily as a direct result of the publicity given to Missouri (Fisher 2017). Real estate firms, railroads, and others promoted the availability of land through their coverage on improved drainages. As a result, a wave of settlers arrived in Missouri for agricultural opportunities utilizing newly timbered and cut-over lands. Farmers devastated by the boll weevil saw Missouri as a new opportunity, as the insect was not prevalent there at that time. Cotton gins flourished and the economy began supporting a new influx of both white and Black sharecroppers and a farm tenancy system. Ultimately this would lead to political, religious, social class, and racial conflict in southern Missouri (Fisher 2017).

In the 1930s and 1940s, the Farm Security Administration (FSA) began implementing loans to improve the living condition of Missouri farmers. The Delmo Labor Homes included ten communities with permanent homes.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Construction began on these homes in 1940. Each house consisted of three bedrooms, kitchen, living-dining area, closet, and pantry, and a concrete lined cellar under the house accessed from the living-dining area, closet, and pantry, and a concrete lined cellar under the house accessed from the living-dining area. Electrical wiring was provided in each house for lighting only with no outlets provided. A concrete lined sanitary privy was constructed for each house along with a well equipped with a pitcher pump. Each location had a central public building equipped with hot and cold running water, flush toilets, and shower and laundry facilities. There was also space at each house for a garden and some of the remaining land was farmed cooperatively. The communities were racially segregated, and each community varied between 50 and 80 units (Fisher 2017:199-200).

Communities were centered on Stoddard, Dunklin, New Madrid, Mississippi, and Pemiscot counties. Residents of the Delmo Labor Homes paid monthly rent (\$3), worked four hours per week to support the camp, and offered other social services. While the Delmo Housing Corporation still operates in Missouri, the communal pattern and architectural styles utilized in these camps are distinguishable today.

In summary, the changes resulting from drainage and clearing of the lowlands can be seen as the convergence of events over the first half of the twentieth century. Interest in the vast timber resources of the region did not peak until a network of railroads were built... Logging brought new settlers to the area as families and individuals came to find jobs in the bustling lumber industry. Timber removal left thousands of acres in need of drainage and clearing at a time when there was a favorable attitude nationally toward the drainage of wetlands so they could be used more productively. Planning and construction on the Little River project began as the Panama Canal was being completed, which meant engineers with drainage expertise were readily available and dredging contractors were looking for the next big project. Invention of the floating steam dipper dredge in the late 1800s made available for the first-time equipment with the capability of eating its way through the tangled mass of vegetation to dig the ditches in the lower district (Fisher 2017:213).

For these reasons, the drainage district also represents Missouri's changing social structure, the assimilation of immigrants and cultures, and the opportunity for diversified farming (Fisher 2017).

2.4.3 Stoddard County

Stoddard County, Missouri, formed in 1829, having been carved from neighboring Wayne and Cape Girardeau counties. It was named for Major Amos Stoddard [aka Stoddart], Veteran of the American Revolution and the War of 1812, as well as the Commandant of the Louisiana Territory in 1804. Stoddard County remained under the auspices of Cape Girardeau County until January 1835, when it organized a new county government with Bloomfield serving as the county seat (Forister 1996).

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



2.4.4 Irrigation

The U.S. Congress passed the Swamp Land Act of 1850 allowing states to reclaim swamp lands, draining lands for agricultural or other productive uses. Two years later, the Missouri Legislature voted a measure transferring a majority of swampland to its counties and in 1868, the counties were required to implement the act immediately, thereby devising plans to reclaim the land and drain swamp areas (RSMO Chapter 241). Since the passage of the state act, the Legislature has made several revisions (1868, 1909, 1919, 1929, 1939, and 1959).

Between 1858 and the 1870s, a levee system was designed, but poorly implemented as a whole. A series of floods threatened fledgling towns and by 1882, the Mississippi River Commission formed with a goal of creating a single continuous levee rather than unconnected segments (USACE n.d.). It would not be until 1917, that Congress would authorize \$45 million dollars for a 10-year plan invested in flood control, levee construction, and protecting local interests, setting precedent for additional funds for repairs due to continued flooding events (USACE n.d.). Since 1928, there have been additional reviews of the levee program including 1941, 1956, and 1973; additional concern arose following the aftermath of Hurricane Katrina.

In 1896, Butler County, Missouri farmer, D.K. Williams began clearing his land and developing ditches. The *Poplar Bluff Republican* (31 DEC 1896:8) provides an overview of the process.

For several weeks, D.K. Williams has been carrying on a systematic work of ditching his farm just southeast of town. Most of this time he has had twenty-five men employed. He has constructed a main ditch thirty feet wide and some four feet deep, and into this a network of smaller ditches are let. The main ditch is a mile long and the smaller ones will aggregate about four miles. It does not require much figuring to see that to complete these ditches is a big undertaking, as it requires the moving of about 30,000 cubic yards of dirt (*Poplar Bluff Republican*, 31 DEC 1896:8).

The Bloomfield Vindicator (4 MAY 1900:1; 11 MAY 1900:1; 25 MAY 1900:1) provides an excellent account of the creation of drainage ditches throughout the state of Missouri.

An Act to enable the owner of swamp and marshy lands to drain and reclaim them, when the same cannot be done without affecting the lands of others, prescribing the duties of county courts and other officers in the premises, and to prepare for the repair and enlargement of such drains (*The Bloomfield Vindicator*, 4 MAY 1900:1).

The Act, which was passed in March 1897, further explained that lands would be drained, and ditches established if they were “conducive to the public health, convenience or welfare, or where the same will be of public utility or benefit” (*The Bloomfield Vindicator*, 4 MAY 1900:1). Prior to the creation of a ditch, drain or watercourse, one or more landowners would approach the county clerk with the request, providing such information as the beginning or terminus of each ditch, by which a court appointed surveyor (i.e., qualified Civil Engineer) would complete a survey and stake the alignment. The survey team would include the Engineer, a chainman, rodman, and an axman (*The Bloomfield Vindicator*, 8 JUN 1900:1). The surveyor would be responsible for estimating costs for the construction, with a share of the costs being defrayed by the county road funds or railroads; landowners also were assessed for construction of the

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



ditches or received compensation if the creation of the drainages damaged rather than improved the land (*The Bloomfield Vindicator*, 11 MAY 1900:1).

Each county published requests for bids for the construction, which was awarded to the lowest bidder; each of the projects were let in sections of not less than one-half mile in length. Where feasible, the ditches were proposed along property division lines, townships, county lines, road crossings, or other logical landforms, with attempts to avoid diagonal lines bisecting landowner property. The Act also set forth “sufficient distances” from which the public ditch could be constructed to the center line of established roadways (*The Bloomfield Vindicator*, 4 MAY 1900:1).

Sec. 35. The county court of any county in the state of Missouri is hereby authorized at any regular session to cause to be located and constructed, straightened, widened, altered or deepened any ditch, drain or watercourse of the length of five miles or upward as hereinafter provided, when the same is necessary to drain any lots, lands, public or corporate roads or railroads, or will be conducive to the public health, convenience or welfare. The word ‘ditch,’ as used in this act, shall be held to include a drain or watercourse, or any drain or watercourse heretofore constructed. The petition for any such improvement shall be held to include any side, lateral spur or branch ditch, drain or watercourse, the lowering of any lake or other work necessary to secure fully the object of the improvement petitioned for (*The Bloomfield Vindicator*, 25 MAY 1900:1).

In cases where landowners utilized the water from the ditch for personal uses, the landowners were responsible for keeping the ditch and its banks free from dense vegetation or willows. “The planting of willows, hedges and trees along the edge of a public ditch, or permitting the same to grow, shall be deemed an obstruction of said ditch” (*The Bloomfield Vindicator*, 8 JUN 1900:1).

In 1904, the St. Francis Valley Drainage Association organized and developed a formal flood plan by 1911 (Boone 2001). Concurrently, local citizens began constructing inadequate levees and ditches along the tributaries of St. Francis River. As a result, by 1936, Congressional intervention resulted in the passage of the Flood Control Act (June 15, 1936); it included proposals for Wappapello Lake and Dam, as well as channelization of the St. Francis River (Boone 2001). Starting in 1999, a series of improvement projects were performed along streams within the St. Frances basin aimed at restoration of aquatic habitat, streambank stabilization, and revegetation for erosion control (Boone 2001). **Figure 8** provides an overview of drainage ditch construction.

A review of the land records from 1777 to 1969 indicated a total of 98 Swampland Patents within Stoddard County (see **Appendix D**). The patents are filed within the Office of the Secretary of the State for Missouri and include those associated with lands in southeast Missouri which were granted under the 1850 Act of Congress to drain swamps.

In 1918, ditches were being used for “floating logs, poles, piling and ties” which damaged the banks and violated state law (“see Laws 1913 page 282”) (*The Bloomfield Vindicator*, 15 FEB

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



1918:3). “The ditches were not dug to afford an easy means of logging but were dug to drain the land. The best of care should be taken to see that they are preserved and not abused” (*The Bloomfield Vindicator*, 15 FEB 1918:3). **Figure 9** provides an overview of the types of watercrafts and paddling that happened along the ditches in Missouri.



Figure 8. Construction of a Drainage Ditch in the Little River Drainage District (Stephens et al. 2008).



Figure 9. Paddling along the Little River Drainage District Corporation (Stephens et al. 2008).

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



2.4.4.1 Lick Creek Ditch

In 1906, *The Bloomfield Vindicator* (14 DEC 1906:1) announced that the County Court called for the digging of Lick Creek Ditch. Spoils from the digging would be used to create a maintenance road and a levee road topped with gravel (*The Bloomfield Vindicator*, 14 DEC 1906:1). The following year, Stoddard County proposed the construction of additional drainage ditches which would be wider and deeper than previous ditches in Missouri (*Dunklin Democrat*, 24 MAY 1907:1). Civil Engineer A.C. Spiker along with Mr. Grojean, Mr. Tatum, and Mr. Ramsey were responsible for planning the Lick Creek Drainage Project (*The Bloomfield Vindicator*, 9 APR 1909:2). During excavation, initial work involved cutting the creek banks within the right-of-way for over a mile, while straightening the drainage channel; plans included opening the channel near railroad lines for ease of transporting produce. As a result, the success of Lick Creek Ditch was predicted as significant (*The Bloomfield Vindicator*, 12 JUN 1908:5).

This is one of the most important ditches in the county and when once completed will be of almost inestimable [sic] value to the lands adjacent. This will be the largest system of ditches in the county (*The Bloomfield Vindicator*, 3 MAY 1907:5).

The Lick Creek ditch is expected to revolutionize farming on nearly a hundred thousand acres of fine land (*The Bloomfield Vindicator*, 20 SEP 1907:1).

The new Lick Creek ditch and its laterals will completely change the face of nature along that stream which will be reduced over half in length and the whole valley will be fully drained. Property in the district so drained will be increased in value five dollars an acre on the average (*The Bloomfield Vindicator*, 1 NOV 1907:8).

While assessments made the following spring and favorable to landowners on both the south and east laterals of Lick Creek Ditch, several property owners were affected by costs of the work (*The Bloomfield Vindicator*, 31 JAN 1908:5; *Scott County Kicker*, 3 APR 1909:1). Property along the ditch was destroyed by the excavation and farmland was destroyed; in some cases, the value of the land decreased, and local citizens called for the County Court to intervene for a compromise (*The Bloomfield Vindicator*, 13 MAR 1908:5). In all cases, everyone agreed with the need for the ditch (*The Bloomfield Vindicator*, 13 MAR 1908:5). *The Bloomfield Vindicator* in turn, filed suit against Stoddard County to recoup fees for publication notices (*Scott County Kicker*, 3 APR 1909:1).

By the fall of 1908, the Lick Creek Ditch had been excavated roughly one-half-mile west of the St. Louis & San Francisco Railroad with plans to dig south of the town of Aid to the St. Francis River (*The Bloomfield Vindicator*, 16 OCT 1908:5). In October 1908, County Engineers wrongly constructed an iron bridge across Lick Creek Ditch instead of the road line (*The Bloomfield Vindicator*, 30 OCT 1908:4).

In 1909, Stoddard County assessed the railroad with \$1,000 in taxes based on improvements made to the railroad in conjunction with the Lick Creek Ditch. The roadbed, the St. Louis & San Francisco Railroad ditches, and rights-of-way were improved as a result of the ditch work associated with Lateral Ditch No. 1 of Little Lick Creek main ditch (*The Bloomfield Vindicator*,

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



9 APR 1908:11)⁴. An additional \$1,000 was assessed against the St. Louis, Iron Mountain & Southern Railway Company for its crossing of the main Lick Creek Ditch in multiple locations⁵. Some of the improvements were necessary to allow dredging equipment to pass beneath the railroad bridges.

By this time, Lick Creek Ditch was referred to as “Drainage District No. 12.” Multiple districts were conducting similar work along their drainage ditches to render the lands “highly valuable,” reclaiming the lands for both habitation and cultivation, and improving the health of the Stoddard County (*The Bloomfield Vindicator*, 9 APR 1909:2). Drainage District No. 12 encompassed 54,000 acres of land, ultimately draining into the St. Francis River. According to *The Blomfield Vindicator* (4 JUN 1909:8), the district was divided into five management sections, which were described but no map accompanied the article:

- *Section Number One*: Big Lick Creek Main Ditch and Lateral Ditches Number One and Four
- *Section Number Two*: Lateral Ditch Number Five and Side Ditch of Lateral Ditch Number Five of Big Lick Creek Main Ditch
- *Section Number Three*: Lateral Ditch Number Two and Lateral Ditch Number Three or Side Ditch of Lateral Ditch Number Two of Big Lick Creek Main Ditch
- *Section Number Four*: Little Lick Creek Main Ditch and Lateral Ditch Number One of Little Lick Creek Main Ditch; and the County Line Ditch; and Otter Slough Ditch
- *Section Number Five*: Bridges (*The Bloomfield Vindicator*, 4 JUN 1909:8).

As of 1912, more than three million acres in southeast Missouri had been drained (*The Morning Sun*, 26 AUG 1919:2).

By 1917, newspapers made references to the “old Lick Creek” and “new ditch” as well as ditches by private names, such as Ezzell Ditch (*The Bloomfield Vindicator*, 5 OCT 1917:2). Undoubtedly the irrigation system continued to rely on the Lick Creek Ditch, but also had expanded to include additional laterals as adjoining land was divided or sold. **Figure 10** provides an overview of the types of dredging boats used for clearing the ditches in Missouri.

⁴ The St. Louis & San Francisco Railroad crossing was at Station 254+89, located in the SE ¼ of the NW ¼ of Section 21, Township 24N, Range 9E (*The Bloomfield Vindicator*, 9 APR 1908:11).

⁵ The St. Louis, Iron Mountain & Southern Railway Company’s first crossing was at Station 327+92, along the section line of Sections 27 and 28, Township 25N, Range 9E. The second crossing was over Lateral Ditch No. 5, at Station 380+49, in the NE ¼ of the NW ¼ of S29, T25N, R9E. The third crossing was over Lateral Ditch No. 2 at Station 280+40, in SW ¼ of the SE ¼ of S23, T25N, R9E. The fourth crossing was over Lateral Ditch No. 3 (or side ditch of Lateral Ditch No. 2) at Station 191+00, in the NE ¼ of the NE ¼ of S27, T25N, R9E.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Figure 10. Digging Drainage Ditch in SE Missouri (P0352-005589), State Historical Society of Missouri Digital Collections, Photograph Collection, available online at <https://digital.shsmo.org/digital/collection/imc/id/27379/rec/1>.

Newspapers acknowledged the routine maintenance of the Lick Creek Ditch over time, as well as the upgrade of bridges along the drainage; generally, the maintenance involved the use of a dredge boat (*The Dexter Statesman*, 1 APR 1927:1; *Gasconade County Republican*, 16 AUG 1956:9). Other features ultimately added to the Lick Creek Ditch included concrete box culverts (*Stanberry Herald-Headlight*, 23 AUG 1956:8). Stoddard County's Drainage District No. 12 let contracts in December 1964, to remove willows, trees, brush, silt and other debris from four ditches and associated laterals including Main Ditch, Cypress Lateral, County Line, and Dexter Ditch (*The Daily Standard*, 3 DEC 1964:13).

In 1966, Wappapello Dam (1941) at the St. Francis River was increased to allow for greater volume of water during flood events; at the same time, Bert Chamness of Cartersville, Illinois, made improvements to DD 12 in Dunklin County, Mingo Ditch, Lick Creek, and Dudley Ditch (*The Daily Standard*, 26 AUG 1966:1). **Figure 11** demonstrates the flood control plan within DD 12 and the St. Francis River basin.

In 1979, DD 12 proposed clearing two-feet of silt along a 6.5-mile stretch on the south side of Lick Creek Ditch at a cost of \$50,000. The plans included clearing and dredging the bottom of the ditch to 20-feet wide; due to increased flooding, the ditch was reportedly 10 to 12 feet wide in some places (*Daily American Republic*, 5 SEP 1979:17).

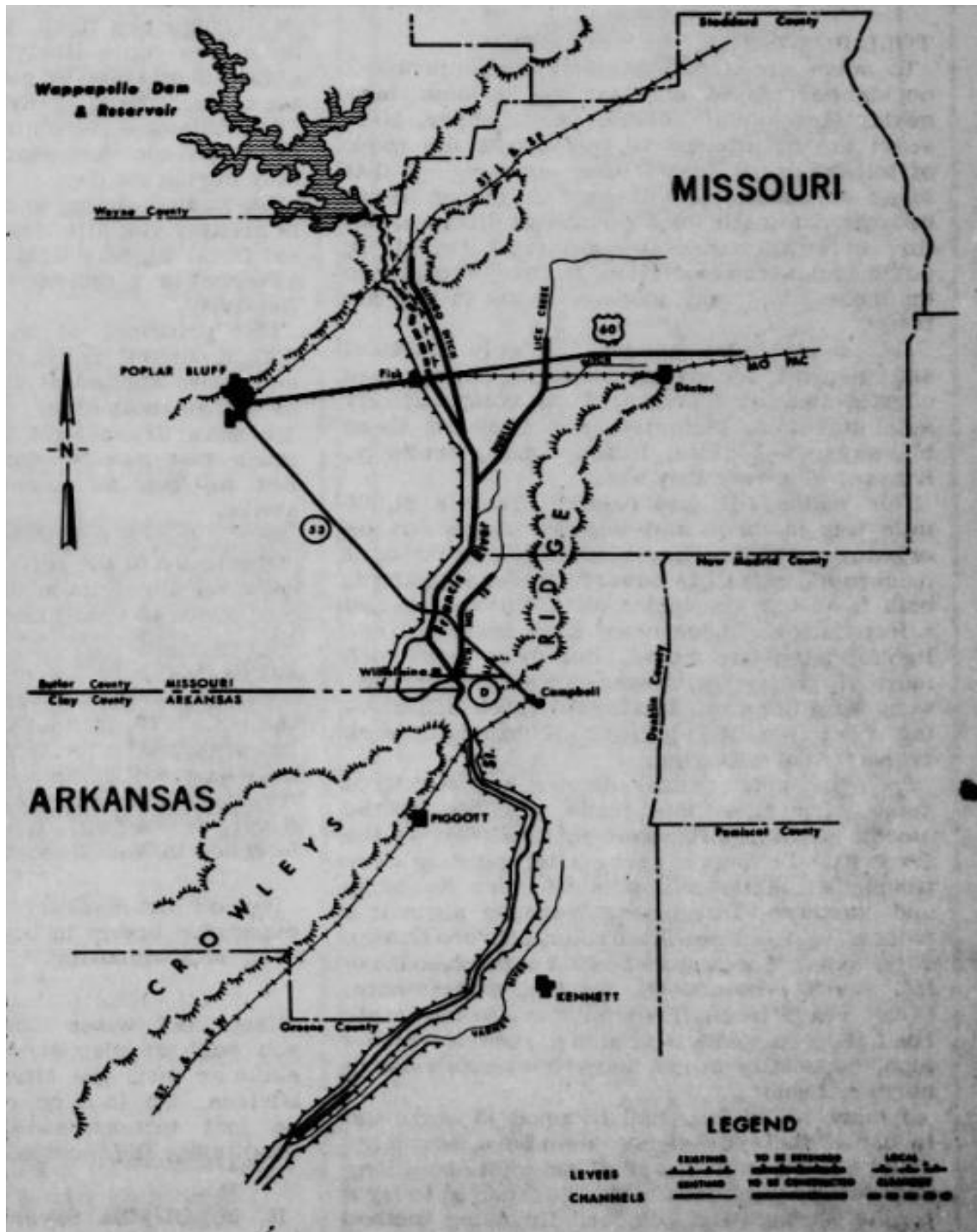


Figure 11. Flood Control Planning (Source: The Daily Standard, 26 AUG 1996:1).

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



2.4.4.2 Cypress Lateral No. 1

In 1900, the Johnston Land Company proposed digging a canal from glade ditch to the main cypress ditch, a distance of five miles (*Portageville Southeast Missourian*, 27 SEP 1900:8). It is unclear if the ditch was constructed at that time.

By 1908, seven men within DD 12 submitted a petition to the Stoddard County Court asking for the deepening, enlarging, widening, and cleaning out of the lateral ditches (*The Bloomfield Vindicator*, 22 JAN 1909:8). Among those who filed it were J. Hoopingarner, J.W. Harkrider, John Fletcher, Chas. D. Matthes, John N. Miller, George W. Larwrence, and Rudolph Weber. Engineer A.C. Spiker, along with W.T. Arnold, S.L. Ramsey, and John F. Rice were selected as surveyor and viewers for the project. They provided a description of the lands, the locational information (Township, Range, Section) as well as the benefits, damages, and general cost per tract. Benefits ranged from \$75 upwards of \$300 with costs per tract ranging from \$41.25 up to \$165 (*The Bloomfield Vindicator*, 22 JAN 1909:8).

For the construction, the Stoddard County Clerk, J.N. Punch, noted that land for the rights-of-way would be condemned on either side of the ditch up to sixty feet on either side of the center line (*The Bloomfield Vindicator*, 22 JAN 1909:8).

In 1915, the Stoddard County Court appointed T.C. Higgins, J.N. Long, D.E. Grojean, and engineer A.C. Spiker to construct the second creek ditch or Cypress Ditch as a lateral to the Lick Creek Ditch as part of Stoddard County Drainage District No. 12 (*The Bloomfield Vindicator*, 5 MAR 1915:8).

A report in 1923 suggests that portions of Cypress Lateral No. 1 were dry or “had no running water in it” (*The Dexter Statesman*, 14 SEP 1923:5). Just two years later, members of the General Baptist Church, led by Elder Riley Hurd and Deacon J.B. Rodgers baptized congregants in the Cypress ditch (*The Twice-a-Week Dunklin Democrat*, 18 SEP 1925:3).

In 1955, a 97.5-foot-long concrete slab bridge crossed Cypress Lateral No. 1 via US Route 60 through Stoddard County (*Union Labor Record*, 13 JAN 1955:3).

In 1961, Jerry Dean Montgomery was on a boat on Cypress Lateral No. 1 as part of a survey crew with C.R. Trotter, Stoddard County Surveyor. When the boat sank, Montgomery perished. The two other men were able to reach safety and attempted to revive Montgomery without success (*Daily American Republic*, 31 MAR 1961:1).

2.4.4.3 Prairie Creek Ditch

Prairie Creek Ditch was located within Drainage District No. 15. As early as June 1911, plans were made to reclaim land between Prairie Creek and the St. Francis River by establishing a drainage ditch. S.B. Tatum, T.C. Higgins, J.H. Pucket, and A.C. Spiker were charged with digging the ditches. The goal was to allow water to flow between Main Ditch near Open Lake via Prairie Creek; Lateral Ditch No. 1 near Barnhart Cypress draining to Open Lake; Lateral Ditch No. 2, also in cypress; Lateral Ditch No. 3, from the main channel of Brushy Fork toward Prairie Creek Main Ditch, and to construct a levee (*The Bloomfield Vindicator*, 16 JUN 1911:12).

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



In 1912, locals Joseph Andrew (J.A.) Reed and James Jackson began constructing a dredge boat near the community of Fisk. The dredge boat would be used for silt and debris removal along Prairie Creek Ditch (*The Dexter Statesman*, 6 NOV 1912:3).

In 1955, plans were made to construct a 75-foot continuous concrete slab bridge across Prairie Creek Ditch (*Union Labor Record*, 13 JAN 1955:3).

3.0 METHODOLOGY

Professional staff meeting the SOI *Professional Qualifications* in Architectural History supervised a reconnaissance-level survey of historic-age resources within the project area to determine if historic properties are present. Historic properties, as defined in 36 CFR § 800.16(l)(1), are “any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in, the National Register of Historic Places.” The NRHP Criteria for Evaluation were used to assess the significance of the surveyed historic-age resources. The SOI-determined Seven Aspects of Integrity were used to evaluate the physical characteristics and associative qualities of the resources and determine their ability to convey their historical and/or architectural significance. Data analysis and development of conclusions and recommendations were completed by Heather R. Puckett, PhD, and S. Elizabeth Valenzuela, architectural historians meeting the SOI Professional Qualifications Standards for architectural history, history, and historic architecture. Cait Parish provided assistance with architectural history. Project Archaeologist Bryce Lowry, and Field Technicians Tyler Mantia, Eli Schuck, and Sophie Molloy conducted fieldwork and photography of resources. Ruben Castillo prepared the report maps.

3.1 Archival Research

Historical and archival research was conducted to support NRHP-eligibility recommendations. Research for the project occurred during December 2023 and included review of historical collections and secondary source materials available online through the Library of Congress, newspapers.com, and genealogical and census databases accessed through ancestry.com. The research included a review of the following:

- U.S. Geological Survey (USGS) topographic maps (Broseley, MO, 2021, 1:24,000 scale; Bloomfield, MO, 1934, 1:62,500; Bloomfield, MO, 1934 revised to 1950, 1:62,500; Puxico, 1934, 1:62,500; Puxico, MO, 1934, 1:62,500; Puxico, MO 1934, revised to 1950, 1:62,500; Puxico, MO 1939, printed 1942, 1:62,500; Poplar Bluff, MO, 1957, 1968 print, 1:250,000; Poplar Bluff, MO, 1957, 1979 print, 1:250,000; Poplar Bluff, MO, 1959, 1:250,000; Poplar Bluff, MO, 1962, 1963 print, 1:24,000; Poplar Bluff, MO, 1983, 1:100,000; and Dudley, MO, 1962, 1977 print, 1:24,000)
- Google Earth Pro (aerials), from 1985 to 2022
- USGS National Water Dashboard

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



- The USDA Natural Resources Conservation Service National Water and Climate Center [digital map]
- The State Historical Society of Missouri Digital Collections

3.2 Fieldwork

Fieldwork complied with field procedures that are accepted as industry standard and followed the SOI's *Standards for Preservation Planning standards and guidelines; Identification; Evaluation; Historical Documentation standards and guidelines; including the guidelines for architectural and engineering documentation;* and Professional Qualifications Standards. Additionally, the project complied with the MO SHPO's Standards for Architectural History. A reconnaissance-level survey was undertaken for historic-age resources within the project APE. Reconnaissance-level survey consisted of confirming the location of a resource in the field, digital photography, and documenting physical characteristics and integrity using a digital survey form.

To comply with the NHPA, as amended (54 U.S.C. § 300101 et seq.), field investigations adhered to guidelines set forth in National Register Bulletin 15 – *How to Apply the National Register Criteria for Evaluation*. The existing condition of the historic-age resources was evaluated and documented using standard survey forms and digital photography. Professional staff maintained clear field notes, sketches, and field maps, for use in the analysis of the fieldwork for the subject site(s), noting locations, distinctive landscape features, and other relevant non-archaeological resources.

The following steps were undertaken to record the current condition of the extant historic-age resources:

1. Documented the condition of physical character-defining features and other associative qualities according to the *Seven Aspects of Integrity* defined in National Register Bulletins 15, 18, 30, and 38, as applicable to each resource. Assessed physical changes that have occurred since the original construction of the resource.
2. Performed photographic documentation to record historic-age resources within the project APE. This work included digital photography according to National Park Service (NPS) standards as defined in National Register Bulletin 23 and subsequent Photograph Policy Expansion in 2005 and Photograph Policy Updates in 2008 and 2013. Digital photograph files were saved in JPEG format and meet minimum NPS resolution standards. A photo log was maintained for each recorded resource noting direction camera is facing for each photograph.
 - a. A minimum of two photographs of the historic-age resources were taken. Photographs incorporated both detailed views of the surveyed historic resources and overall contextual views placing the resource within its broader context.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



- b. For locations with more than one related resource on the site, multiple photographs were taken to illustrate historic-age resources and their overall relationship to each other.

Terracon adjusted its recordation for the canal as a linear feature based on correspondence with Dr. Jeffrey S. Alvey, Archaeologist and Review, Compliance & Records Section Chief at the MO SHPO:

Recording Linear Resources. Because there is considerable variation in linear resources and how undertakings might affect such resources, MO SHPO recommends that the best approach to determining how to record linear resources is for the consultant to discuss the issue with the federal agency or agencies involved and MO SHPO. We recommend that this consultation occur prior to beginning field investigations. The goal of this consultation should be to eliminate, as much as possible, the likelihood that recording linear resources would require an additional field visit after the completion of fieldwork. Prior to this consultation, the consultant should make use of as much background research as possible including historical maps (e.g., GLO plat maps, USGS topographic quadrangle maps, NRCS soil survey maps, county atlases, etc.), aerial photographs, and any other pertinent records to identify any potential linear resources in the project area.

Recording of linear resources need only address the portion of the resource that exists within the particular study area, although the larger context or network of which it was a part should be acknowledged and investigated through background research but would not require field investigation. Documentation of linear resources should record the physical dimensions and attributes of the resource including a description of the materials used to construct the feature. Multiple photographs from different locations should be taken of the resource.

A single state trinomial will be assigned to each linear resource regardless of whether it crosses multiple counties. Which county to associate the linear resource with will have to be determined on a case-by-case basis but will likely be determined by factors such as which county contains the largest portion of the resource or simply where it was first identified. In most instances where linear resources are segmented, a single state trinomial will be assigned to the resource and the different segments will be treated as expressions of the individual "site." The key issue for determining whether or not to assign separate numbers to segmented expressions of a linear site is degree of variability, rather than simply whether or not they are spatially associated. If two expressions of a site share the same function, date of construction, etc., they can be grouped under a single number. If they differ in these variables, then should be recorded separately. This should be based on what was learned of the linear resource through background research.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



3.3 Architectural Descriptions

Resources anticipated during the field survey included a variety of irrigation related features. Additionally, the survey included the preparation of architectural descriptions which supported both the evaluation process via architectural significance and historical background. Where applicable, McDowell (1965), Maserang (1993), Steppenoff (1993), Knight (2009), Fisher (2017), and a variety of NRCS guides (see **Appendix D**) were used to develop the engineering details of the irrigation systems and time periods of construction in the following section. **Table 2** provides an overview of the variety of features present.

Table 2: Types of Irrigation Features Associated with Ditches within Survey Area

Type of Feature	Subtypes	Present Along Main Ditch
Diversion	Headwaters or Head Gates; Pumping Plants; Inlets; Lift Stations; Well Heads	☒
Conveyance	Canals; Laterals; Pipelines; Flumes; Reservoirs; Drainage Basins; Water Towers or Tanks	☒
Distribution	Dams; Gates (Turn Out; Check; or Head Gates); Weirs or Sluices; Division Boxes; Valves	☒
Delivery	Sublaterals or Tertiary laterals; Surface Pipes; Spray Pipes or Sprinkler Systems; Private Pipelines or Standpipes; Furrowed Fields	☒
Other	Levees, Roads, and Bridges; Drainage Ditches or seepage; Pump houses; Siphons, Flumes, or Culverts; Gauging Stations; Windmills	☒

4.0 SURVEY RESULTS

The project area includes irrigation resources associated with historic agricultural and logging activities. The historical land use of this region of Missouri ranged from mining to timber harvesting, agricultural planting, and livestock grazing. Reviews of historic aerials and topographic maps indicate the resources within the project area have undergone minimal alterations since their original construction. The following narrative provides additional information related to the historic-age resources identified within the project area.

4.1 Identification of Historic Properties within the Area of Potential Effects

Terracon’s architectural historians performed a limited literature and agency file review to identify the occurrence of previously identified historic properties within the project area. The search included a review of historic-age resources previously listed as National Historic Landmarks (NHLs), and NRHP individual properties and/or historic districts. There are no

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



NRHP-eligible or listed historic properties within a one-mile radius of the survey area. The nearest NRHP-eligible or listed historic properties are over 1.7 miles northeast (Dexter Gymnasium, 301 S. Park Lane, Dexter, MO 63841) or a greater distance.

4.2 Reconnaissance Survey Results

Terracon conducted a reconnaissance-level survey on December 5–8, 2023. Field investigations adhered to guidelines set forth in National Register Bulletin 15 – *How to Apply the National Register Criteria for Evaluation* and National Register Bulletin 22 – *Guidelines for Evaluating and Nominating Properties that Have Achieved Significance Within the Past Fifty Years*.⁶

The survey resulted in the recording of one historic-age resource, Cypress Lateral No. 1 (**Table 3**). Cypress Lateral No. 1, as a whole, consists of a main drainage ditch with associated laterals, canals, and other water-related features, access points, rights-of-way, and staging areas (**Table 4**). Note that Cypress Lateral No. 1 does adjoin Lick Creek near the confluence of the St. Francis River, to the north of this location, Lick Creek merges with Dudley Main Ditch. The relationship of these waterways is depicted in **Figure 12**.

Terracon evaluated the existing condition of the historic-age resources within the project area and documented the site and its associated resources using digital survey forms and photography. A total of 28 photographs were taken of potential historic-age resources and site features identified along the survey area (*see Appendix B*).

Terracon maintained clear field notes, sketches and field maps for use in the analysis of the fieldwork for the subject site(s), noting building/structure locations, distinctive landscape features, and other relevant non-archaeological resources.

Only one historic-age resource was documented during the reconnaissance level survey: Cypress Lateral No. 1. **Table 3** provides a summary and thumbnail image of the historic-age resource from the desktop review to best show their relationship to the drainage ditch. Some of these features were readily visible, while others were not noted due to vegetation, erosion, slope, or inaccessibility due to being outside the narrow survey corridor of the project area. **Figure 12** provides a map location of Resource 1, Cypress Lateral No. 1. **Figure 13** provides an overview of the features associated with Resource 1, Cypress Lateral No. 1.

⁶ Andrus, 1997; Sherfy and Luce 1996

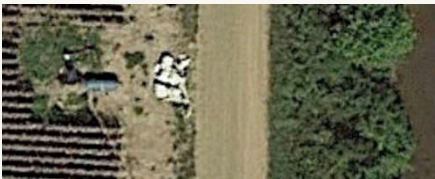
Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Table 3: Historic-age Resources Documented within the Project APE

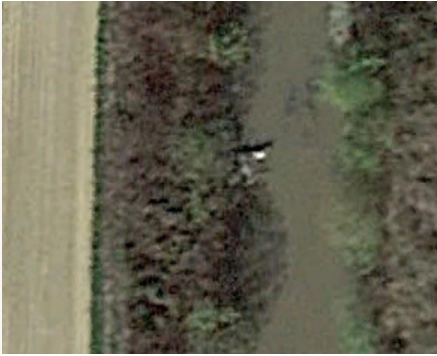
Thumbnail	Resource ID [Temp ID]	Location	Property Type (sub-type)	Date Built (Additions)
	1	Cypress Lateral No. 1	Agricultural (Water Conveyance)	1915

Table 4: Historic-age Features associated with Cypress Lateral No. 1

Thumbnail	Feature	Description
	CL-1A	Two Standpipes on the west edge of the lateral. Associated with Features B, C, and L as a swamp and on the same agricultural property.
	CL-1B	Above-ground water or diesel storage tank associated with a pumping system on a flat earthen pad on the edge of the agricultural field west of the lateral. The feature is associated with Features A, C, and L.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Thumbnail	Feature	Description
	CL-1C	Large diameter concrete pipe placed horizontal to the ditch. The feature is associated with Features A, B, and L. It was not readily visible based on vegetation and the limits of the survey area.
	CL-1D	Horizontal concrete pipe in the east bank of the Cypress Lateral ditch, used to transfer water to a larger holding pond/reservoir on the east. The pipe connects to an irrigation feature on the pond/reservoir. It was not readily visible based on vegetation and the limits of the survey area.
	CL-1E	Horizontal irrigation pipe reinforced by concrete fragments for erosion control on the west bank of the Cypress Lateral No. 1. It was not readily visible based on vegetation and the limits of the survey area.
	CL-1F	Steel Stringer Bridge topped with cast-in-place concrete deck, crossing over the ditch at the junction of CR 691 and CR 679 (Structure No. 21905, constructed 1999) Associated with Feature G.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Thumbnail	Feature	Description
	CL-1G	Above-ground water or diesel storage tank associated with a pumping system and is associated with a subterranean horizontal concrete pipe on the east bank of the lateral and a partially buried concrete pipe on the east. Also associated with Feature F. This feature was not accessible during the field survey due to its location off a private farm road.
	CL-1H	Horizontal concrete pipe in the east bank of the Cypress Lateral Ditch, forming a short sublateral which drains to a holding pond/reservoir. Divided by a field division from Feature I. It was not readily visible based on vegetation and the limits of the survey area.
	CL-1I	Two horizontal pipes in the bank of the Cypress Lateral Ditch and a square concrete box (possibly gate valve or weir), draining to a holding pond. Divided by a field division from Feature I. It was not readily visible based on vegetation and the limits of the survey area.
	CL-1J	Horizontal concrete pipe and lateral to a group of buildings c. 1985-1996. It was not readily visible based on vegetation and the limits of the survey area.

Historic Resources Survey Report | USDA NRCS Sec 106
 Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
 Revised July 2024 | Terracon Report No. 15237400



Thumbnail	Feature	Description
	CL-1K	Horizontal concrete pipe in west bank of lateral ditch, connecting to a sublateral ditch. It was not readily visible based on vegetation and the limits of the survey area.
	CL-1L	Feature L is both a concrete pipe and a sublateral. The concrete pipe placed horizontal in sublateral ditch on the west bank of the lateral. Associated with Features A, B, and C.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400

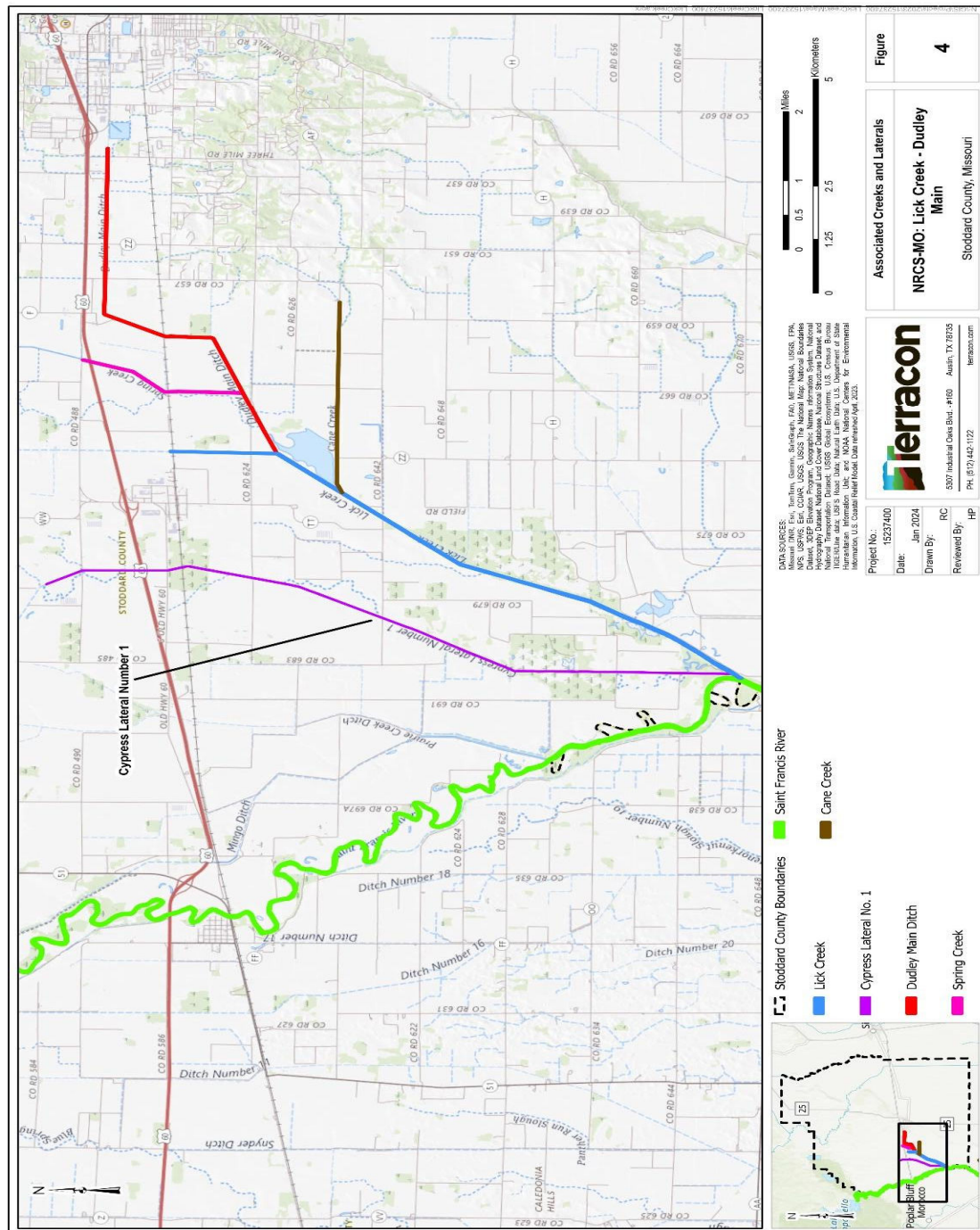


Figure 12. Cypress Lateral No. 1, the Historic-Age Resource Identified During the Reconnaissance Level Survey.

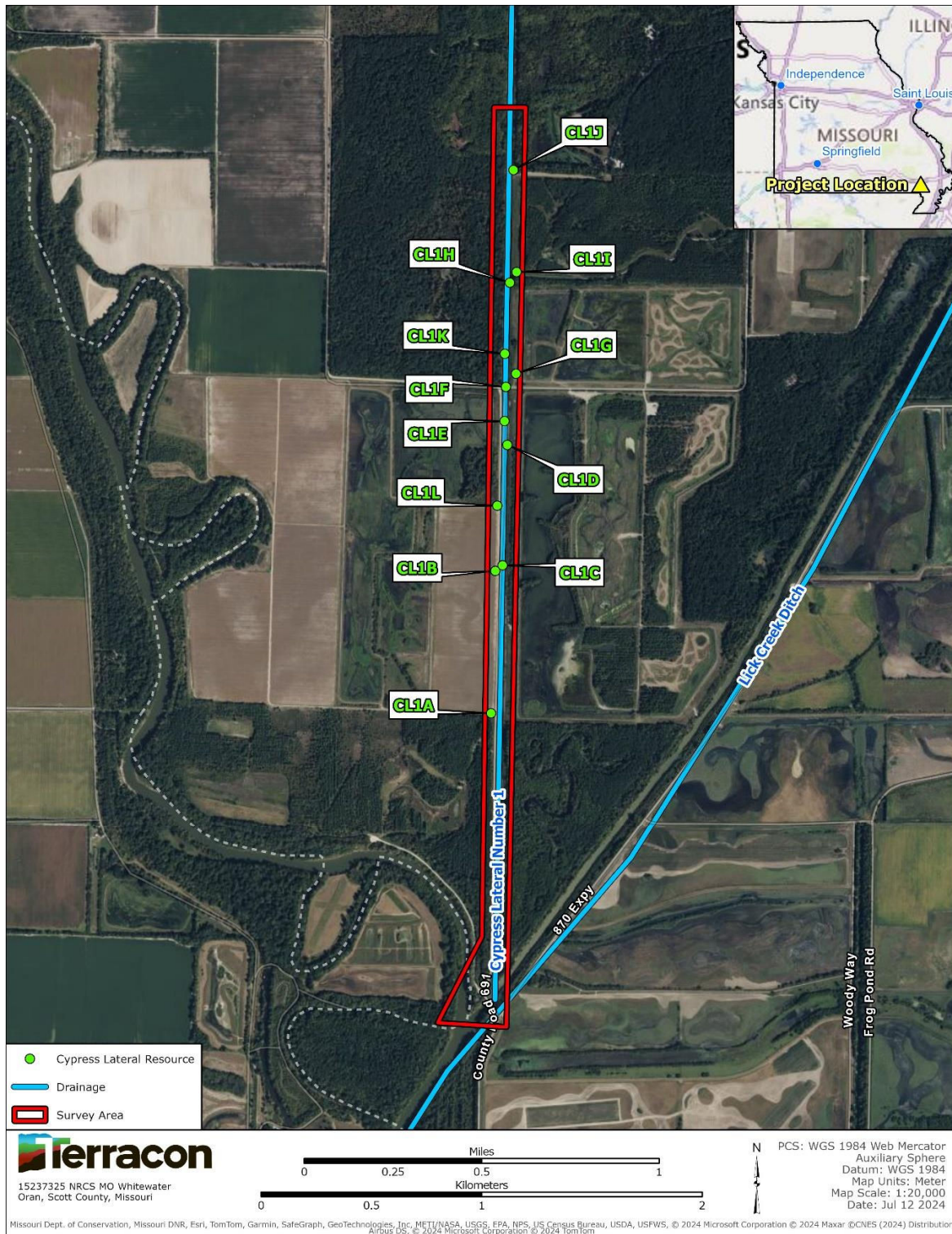


Figure 13. Irrigation-Related Features along the Cypress Lateral No. 1, the Historic-Age Resource Identified During the Desktop and Checked During the Reconnaissance Level Survey.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



4.2.1 Resource 1: Cypress Lateral No. 1

Constructed in 1915, Cypress Lateral No. 1 is located immediately west-southwest of the town of Dudley, Missouri, and extends approximately 13.1 miles in length spanning from the St. Francis River on the south, northward along the west side of Dudley, and then north-northwest where it appears to terminate near the junction of CR 491 and CR 442. The ditch is approximately 29.66 feet wide, although in some locations the width varies based on siltation and erosion. While archival research revealed that adjacent property owners were responsible for removing vegetation along the ditch banks, segments of the ditch do have dense vegetation.

Terracon conducted a survey of 92.3 acres along Cypress Lateral No. 1. The survey area began at the south end of the ditch, near its intersection with Lick Creek, CR 691, and the St. Francis River. The confluence contains fragmented concrete and rip rap stone, likely added for erosion control; at this location, the ditch is roughly 20 to 29 feet wide. The lateral, itself, consists of a drainage ditch with earthen banks, topped with vegetation. The lateral runs in generally straight lines along county roads, property divisions, or county and section boundaries; in some instances, the natural terrain was used for the alignment during its construction at the turn of the century.

The present bridge crossing at CR 691 dates from 1999 (Stoddard County, Missouri, County Highway Agency 2023); it consists of a steel stringer with a monolithic concrete support, topped by a cast-in-place concrete deck. It replaced an earlier 129-foot-long I-beam bridge over Lick Creek and the 97.5-foot-long continuous slab bridge across the Cypress Lateral Ditch No. 1, both constructed in 1956 (*Gasconade County Republican*, 16 AUG 1956:9).

Twelve irrigation-related features were identified either within the ditch or immediately adjacent of the survey area; there is a potential for additional, similar irrigation features along the northern extent of the lateral ditch outside of the survey area.

The irrigation features along Cypress Lateral No. 1 identified as Features A, B, C, and L appear to be associated with the same agricultural property (Figure 14). A handwritten notation



Figure 14. Cypress Lateral No. 1 Fields Associated with Features A, B, C, and L (Google Earth Pro, USGS 1996).

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



on the Broseley, Missouri USGS topographic map (2021) identifies the parcel containing Features A, B, C, and L as a swamp.

Feature A originally consisted of two standpipes along the west edge of the lateral, on the north and south edges of a dirt road. The feature is approximately 103.5 feet from the west bank of the lateral and encompasses an area 53 feet long by six feet wide. It is roughly 0.62 mile north of the junction of Cypress Lateral No. 1 and Lick Creek. Between 2015 and 2020, the two standpipes were improved. A rectangular concrete pad surrounds each of the two standpipes and the two pipes are joined by a pipe.

Feature B is situated along the west edge of the lateral in the middle of a fallow field. The feature encompasses an area roughly 0.03 acres (1,456 square feet) and is approximately 80 feet west of the west bank of the lateral and 0.32 mile north of Feature A. The feature consists of an above-ground water or diesel storage tank associated with a pumping system on a flat earthen pad on the edge of the agricultural field. A similar example of this type of feature is noted in **Figure 15**. Fred Vollenweider used a deep well on his orchard near Seymour in South Missouri (State Historical Society 1954). There is a pile of fragmented concrete on the east side of the tank at Feature B and may serve as erosion control.

Feature C is approximately 85 feet to the northeast of Feature B (diagonal) and is located within the west bank of the lateral ditch. It consists of a large diameter concrete pipe (estimated at 48-inch diameter or greater) placed horizontal to the ditch. The visible portion of the pipe extends approximately 7 feet east into the ditch.



Figure 15. What About the Supply of Ground Water in Missouri? (P0030-3314), State Historical Society of Missouri Digital Collections, Photograph Collection.

Feature L is approximately 0.14 mile north of Feature C. Located roughly 70 feet west of the west bank of the lateral, Feature L is located on the west side of CR 691. It consists of a concrete pipe, placed horizontally in a sublateral ditch extending west from Cypress Lateral No. 1. The sublateral runs west for approximately 730 feet where it intersects with a south trending dirt road bordering the agricultural field. It is possible that a culvert is located at the dirt road, as the sublateral does continue westward for an additional 160 feet before turning south. The sublateral trends south, then west, then south, east, south, and then east where it terminates near Feature A.

Cypress Lateral No. 1 Feature D is approximately 736 feet northeast of Feature L. It consists of a horizontal concrete pipe located on the east bank of the Cypress Lateral ditch. It was used to transfer water between the ditch and a larger holding pond or reservoir located

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



roughly 200 feet east, on the east edge of a levee road. The Broseley, Missouri, USGS topographic map (2021) also has a handwritten notation indicating this area is swampland. The horizontal pipe is connected to a square irrigation feature located within the holding pond or reservoir. Overall, the holding pond or reservoir spans 205 acres of land and is divided into at least four sections; it is located between Cypress Lateral No. 1 on the west and Lick Creek Ditch on the east. Comparison to historical maps depicted a small boat or watercraft in the pond, suggesting a navigable depth.

Feature E is located in the west bank of Cypress Lateral No. 1 roughly 0.11 mile north of Feature D. It consists of a horizontally placed irrigation pipe that has been reinforced by concrete fragments for erosion control.

Cypress Lateral No. 1 Features F and G are related. Feature F is 0.16 mile north of Feature E. It consists of a steel stringer bridge topped with a cast-in-place concrete deck, crossing over the ditch and is the junction of CR 691 with CR 679 (**Figure 16**). The bridge is supported by a monolithic concrete support and steel girder. measures 2.74 meters long by 0.73 meters wide and offers two-way traffic. According to the Stoddard County, Missouri, County Highway Agency, the bridge crossing at County Road 679 was constructed in 1999 (Structure No. 21905) by the County Highway Agency. During the last bridge survey (January 2023), the surveyor noted that the bank along the ditch at the bridge was “beginning to slump. River control devices and embankment protection have widespread minor damage. There is minor stream bed movement evident. Debris is restricting the channel slightly.”



Figure 16. Overview of Cypress Lateral No. 1, View South from the Concrete Bridge (Structure No. 21905) at County Road 679 (Source: Terracon 2023).

Because of the erosion, the ditch narrows at the southern edge of the bridge and then widens to the north; over the last five years, there have been attempts to excavate siltation from the

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



ditch (Google Earth Pro 2020). Along the footings of the bridge, rip rap stone has been added for erosion control. There is a concrete culvert south of the bridge; it is located in the west bank of the ditch. There are two horizontal concrete standpipes on the levee and field road on the east side of the bridge, on the terrace above the ditch, parallel to CR 679. Comparison to aeriels from the last ten years indicates that the standpipes were part of a sublateral that ran parallel to the north and south sides of CR 679; it appears that these drained into the large holding pond or reservoir to the south, or an additional holding pond to the north. What appears to be a metered system is located approximately 0.5 mile to the east along this sublateral.

Feature G is northeast of the bridge at CR 691 and CR 679. The feature is 0.05-mile (282 feet) north of CR 679 and 0.3-mile (143 feet) east of the east bank of the Cypress Lateral No. 1. It encompasses an area of roughly 0.10 acre (5,220 square feet) containing an above ground water storage tank or diesel storage tank associated with a pumping system (*see Figure 14*). The tank appears to be associated with a subterranean horizontal concrete pipe that is barely visible on the east bank of the lateral. It also connects to a partially buried concrete pipe on the east that correlates with the holding pond on the north side of CR 679.

Cypress Lateral No. 1 Feature H is located 0.21 mile north of Feature G. It consists of a horizontal concrete pipe located on the east bank of the Cypress Lateral ditch. The pipe is buried beneath the levee and appears to form a short sublateral (200-foot long) on the east side of the levee road. The sublateral joins a north-south trending subterranean pipe that drains into the holding pond or reservoir immediately south; this pipe is visible on aeriels but is now partially obscured by dense vegetation.

There is a field division between Features H and I, which are just 135 feet apart. Feature I consists of two horizontal pipes located in the banks of Cypress Lateral No. 1 and a square concrete box which may correlate with a control feature (possible gate valve or weir). The two pipes are 50 feet apart; the southernmost is located on the east bank, while the northernmost is on the west bank. The southernmost pipe is connected to the control feature, approximately 67 feet to the east. The control feature has a horizontal pipe extending east into a holding pond.

Cypress Lateral No. 1 Feature J is on the east bank of the lateral ditch, approximately 0.23 mile north of Feature I. It consists of a horizontal concrete pipe that transfers water east along a sublateral to a group of buildings that appear to have been constructed between 1985 and 1996.

Cypress Lateral No. 1 Feature K is located 266 feet northwest of Feature G. It is a horizontal concrete pipe located on the west bank of the lateral ditch. It connects to a west trending sublateral ditch that is obscured by dense vegetation (*Figure 17*). A small two-track dirt road runs north to southwest between the sublateral and the concrete pipe.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Figure 17. Junction between Cypress Lateral No. 1 and Sublateral Ditch near Feature K.

4.3 NRHP Evaluation of Surveyed Resources

Field survey and research indicates that there are no previously recorded historic resources located adjacent to or within the project APE. As outlined in *Section 3.0—Methodology*, professional staff conducted archival research to document the historical significance of the historic-age resources within the project area. Fieldwork was completed to identify the noteworthy architectural/engineering and landscape elements of resources within the project APE. The evaluation of the historic-age resources included an assessment of the physical integrity and associative qualities of the resource, in accordance with National Register Bulletin 15, *How to Apply the National Register Criteria for Evaluation*. The following historic property evaluations rely on observations taken in the field and information collected as part of archival research efforts.

In accordance with the terminology and management guidance offered by the NRCS publications, open canals or ditches may be identified as conveyance ditches that do not have any covering but convey water. In some instances, open canals may be replaced by subterranean pipes, which are noted visually in the field by the broken continuity of the canal for any length. Breaks in a main irrigation canal do not mean the rest of the canal is not NRHP eligible, because the main irrigation canal may still be interpreted in context within the overall irrigation system (i.e., demonstrating its role in irrigating a region). Lateral breaks also do not render the system ineligible, as they may demonstrate the role in irrigating areas (versus regions) within the larger context.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



If sublateral ditches are broken, the sublateral segment is considered not eligible because it is a feature of the larger irrigation system. In context, it would need to be tied to the main canal or be a lateral and the separation would be a loss in integrity of design.

In some cases, a historic-age irrigation ditch may not be associated with a larger irrigation district, but may divert water to irrigate a single property, farm, landholding, or field (such as from a spring, creek, river, lake, etc.). Irrigation ditches also may represent the end of a delivery ditch, such as the end of the line delivering water to a single property, field, or parcel of land (i.e., from a lateral or sub-lateral). If this is the case, the irrigation ditch/feature should be evaluated in the context of the property it irrigated (e.g., farmstead, ranch, etc.) and not as part of the larger irrigation district. In context, the farmstead, ranch, etc., could not operate without use of the water, thus making the irrigation feature significant.

Resource 1: Cypress Lateral No. 1

Cypress Lateral No. 1 is an open canal or ditch that extends southward to its junction with Lick Creek and Dudley Main Ditches and the confluence of the St. Francis River. Terracon documented the ditch systems which are bordered directly by agricultural fields, wetlands, and forested areas. Within the APE, portions of the ditch banks (or berms) and areas between the ditches and adjacent agricultural fields are covered with sparse vegetation; however, many of the fields were either fallow or had limited vegetation. The southern extent of the Cypress Lateral No. 1 has segments of wetland areas that are overgrown or densely forested, although portions of the ditch banks are cleared of undergrowth. It does appear that some property owners do conduct routine maintenance within their parcels adjoining the ditch. In some locations along the ditch, the banks have sloughed or collapsed due to erosion. A comparison of aerial photographs depicts the locations of subterranean pipe or standpipes in the same locations over long periods of time, although the disposition of the pipes varies over time. In some instances, the pipes are clearly visible, but others, pipes have been covered by soil or even displaced. Piles of broken concrete, rip rap, or other materials are present, suggesting that property owners also work to prevent erosion as well. Paved and unpaved roads run parallel to, or bisect, portions of the drainage ditch including CR 679, CR 691, and several unnamed roads.

Twelve associated irrigation related features were identified adjacent to or within the banks of Cypress Lateral No. 1 through desktop review; many of these locations were field verified, although not all of these features were readily visible, due to vegetation, erosion, slope, or inaccessibility due to being outside the narrow survey corridor of the project area.

Overall, Cypress Lateral No. 1 does not appear to have been altered from its original alignment, constructed in 1915. The irrigation system includes the canal, banks, and a series of associated features, ranging from laterals, subterranean pipes, control features, as well as pumps and distribution features. Historically associated with timber clearing and agricultural activities, Cypress Lateral No. 1 and other ditches in this portion of Missouri are bound by forested areas and farmlands. As a result, Cypress Lateral No. 1 retains integrity of location, setting, feeling, and association.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Primarily Cypress Lateral No. 1 was constructed using dredges and manual labor to prepare its canal and banks; it is unknown if any reinforcing materials from its original construction remain intact. The ditch has been subject to routine maintenance, although there is evidence of erosion in some segments of the alignment. Cypress Lateral No. 1 does retain a high degree of integrity of design, materials, and workmanship.

The development of Cypress Lateral No. 1 was a direct result of the U.S. government's passage of the Swamp Land Act of 1850 and the mirroring legislation adopted by the Missouri Legislature in 1868 (and revised 1868, 1909, 1919, 1929, 1939, and 1959). Further, Cypress Lateral No. 1 was constructed during the period of a "national drainage movement" (1900-1920) (McDowell 1966) and the draining and clearing of lowlands triggered or culminated with a series of greater events within Missouri's history: development of the timber industry, expansion of railroads, increased settlement, assimilation of immigrants and cultures, new technology, diversified farming, and the introduction of FSA's Delmo Labor Housing (Fisher 2017). As a result, Cypress Lateral No. 1 played a role in the development of centers of commerce (Community Planning and Development) and represents a vital aspect of Social History of the region that has been overlooked as inconsequential.

Cypress Lateral No. 1 retains its integrity of location, design, setting, materials, workmanship, feeling, and association to convey its significance under NRHP Criterion A in the area of Agriculture at a local level during the period 1915 to 1974. The ability to drain lands for further agricultural development through the use of Cypress Lateral No. 1, Lick Creek, Dudley Main ditches, and many other man-made canals was a vital element to the region's agricultural-based economy.

The drainage ditches were constructed through court-appointed contractors who, often, were local to Stoddard County. Survey teams included an Engineer, a chainman, rodman, and an axe man; A.C. Spiker frequently served as the Engineer for the ditches in Stoddard County. Little information could be located for Mr. Spiker and although newspapers offer names of individuals associated with ditch improvements for the county for financial purposes, the newspapers do not always indicate what role they had, or on which ditches they worked. As a result, Cypress Lateral No. 1 does not appear to possess historical significance under Criterion B.

Each of these drainages operate as part of a larger system of irrigation and reclamation, as such, they are works of engineering design. In addition to the ditch, or lateral, there are sublateral ditches extending off Cypress Lateral No. 1 within the survey area. Subterranean pipes also feed from the canal or ditch to the sublateral ditches or other irrigation-related features as part of the overall irrigation system. Each of these features are necessary for the larger irrigation system to work as designed to drain inundated lands and provide a ready water source for crop watering.

While there are segments of Cypress Lateral No. 1 that appear narrow, such as at bridge crossings, the lateral does not appear to be broken and still conveys its association with the greater context of irrigation, water conveyance, and reclamation of Stoddard County. The intent of the drainages was to have a means to convey water, but also to offer options for

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



routine maintenance, including dredging and cleaning. As a result, Cypress Lateral No. 1 has the ability to convey its integrity of design, materials, and workmanship as a functioning part of a larger irrigation system. Unfortunately, the present study precludes an opportunity to document the Cypress Lateral No. 1 in relation to the other ditches. It is recommended potentially NRHP Eligible under Criterion C.

In terms of Criterion D, there is a potential for additional irrigation related features to be present in association with Cypress Lateral No. 1. For example, vegetation obscures several of the sublateral junctions, standpipes, and potential weirs or gate valves that may be present based on comparison to earlier aerial photographs, archival images (**Appendix D**), and information gleaned from the NRCS guides. As a result, Cypress Lateral No. 1 does have potential to yield additional information regarding irrigation systems in southern Missouri; as a result, it is recommended NRHP Eligible under Criterion D.

5.0 SUMMARY AND RECOMMENDATIONS

The period of significance identified for the Cypress Lateral No. 1 spans from c.1915 to 1974. The resource is associated with drainage, conservation, logging, and agricultural activities in Missouri. Based on the evaluation of historic resources within and surrounding the project area, Terracon recommends a finding of **Historic Properties Present** within the project APE. As noted in the introduction, the NHPA (36 CFR 800.5) provides guidance on the application of the criteria of adverse effects to historic properties within the APE.

Cypress Lateral No. 1 reflects the historical development and both Federal and County plans for reclamation of swamplands. It is recommended **NRHP-eligible under Criterion A** for its ability to convey its significance under Agriculture, Community Planning and Development, as well as Social History.

Cypress Lateral No. 1 is associated with local laborers and engineers. Many of these individuals remain unnamed and as a result, the lateral does not possess historical significance under Criterion B.

In terms of the design and function of Cypress Lateral No. 1, it is an engineering feat when combined with other irrigation ditches throughout Missouri, which lends itself NRHP-eligible under both Criteria C and D. Unfortunately, the survey area captured only a fraction of the Cypress Lateral No. 1 alignment and the APE for the project did not accommodate the visibility of agricultural features which likely relate to the irrigation system as a whole. For instance, the irrigation system works in tandem with agricultural fields, farm properties, potential residential properties, as well as supporting infrastructure. Those elements, in general, were not located adjacent to the ditch or maintenance roads based on safety and the potential for flooding or were at a distance that prevented an accurate evaluation. Likewise, not all of the agricultural fields were under cultivation at the time of the survey and associated irrigation equipment, such as sprinkler systems. This precluded the opportunity to develop a typology of irrigation related features in Stoddard County. Further, only a portion of Lick Creek and

Historic Resources Survey Report | USDA NRCS Sec 106
 Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
 Revised July 2024 | Terracon Report No. 15237400



Dudley Main ditches were included in the survey APE; a comprehensive survey would be needed to finalize the NRHP recommendations under Criteria C and D.

Since construction in 1915, Cypress Lateral No. 1 has been subject to routine maintenance including dredging, vegetation removal, bank stabilization, and erosion repair. Further, over the lifetime of the alignment, local farmers have replaced irrigation pipes, wells, standpipes, and other elements of the irrigation system. As a result of these ongoing changes since its original construction, Terracon recommends a finding of **No Adverse Effect to Historic Properties** for Resource 1.

Table 5 provides a summary of the NRHP eligibility recommendation of each surveyed resource, as well as an effects recommendation.

Table 5: Summary of NRHP Recommendations for Resources Within the Project APE.

Thumbnail	Resource ID	Location	NRHP Recommendation	Effects Assessment
	1	Cypress Lateral No. 1	NRHP-eligible (Criterion A)	No Adverse Effect

6.0 REFERENCES CITED

- Aron, Stephen
 2006 *American Confluence: The Missouri Frontier from the Borderland to Border State*. Indiana University Press, Bloomington.
- Bloomfield Vindicator, The* [Bloomfield, MO]
 1900 Lands, Swamp: Drainage. *The Bloomfield Vindicator*, Friday, 4 May 1900, page 1.
 1900 Lands, Swamp: Drainage. *The Bloomfield Vindicator*, Friday, 11 May 1900, page 1.
 1900 Lands, Swamp: Drainage. *The Bloomfield Vindicator*, Friday, 25 May 1900, page 1.
 1900 Lands, Swamp: Drainage. *The Bloomfield Vindicator*, Friday, 1 June 1900, page 1.
 1900 Lands, Swamp: Drainage. *The Bloomfield Vindicator*, Friday, 8 June 1900, page 1.
 1906 Untitled. *The Bloomfield Vindicator*, Friday, 14 December 1906, page 1.
 1907 Local Happenings. *The Bloomfield Vindicator*, Friday, 3 May 1907, page 5.
 1907 Untitled. *The Bloomfield Vindicator*, Friday, 20 September 1907, page 1.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



- 1907 Untitled. *The Bloomfield Vindicator*, Friday, 1 November 1907, page 8.
- 1908 Local Happenings. *The Bloomfield Vindicator*, Friday, 31 January 1908, page 5.
- 1908 Local Happenings. *The Bloomfield Vindicator*, Friday, 13 March 1908, page 5.
- 1908 Local Happenings. *The Bloomfield Vindicator*, Friday, 12 June 1908, page 5.
- 1908 Pleasant Grove Items. *The Bloomfield Vindicator*, Friday, 16 October 1908, page 5.
- 1908 A Liar and Ignorant Ass. *The Bloomfield Vindicator*, Friday, 30 October 1908, page 4.
- 1909 Notice of Pendency of Ditch Proceedings, Lateral Ditch No. 1 of Drainage District No. 2. *The Bloomfield Vindicator*, Friday, 22 January 1909, page 8.
- 1909 In the Matter of Drainage District No. 12, in the County of Stoddard and State of Missouri. *The Bloomfield Vindicator*, Friday, 9 April 1909, pages 3, 10-12.
- 1909 Lick Creek Drainage. *The Bloomfield Vindicator*, Friday, 9 April 1909, page 2.
- 1909 Notice of Sale of Construction of Ditches and Bridges in Drainage District Number Twelve of Stoddard County, Missouri. *The Bloomfield Vindicator*, Friday, 4 June 1909, page 8.
- 1910 County Court Proceedings. *The Bloomfield Vindicator*, Friday, 25 November 1910, page 4.
- 1911 Notice of Pendency of Ditch Proceedings, Drainage District No. 15, in the County Court of Stoddard County, Missouri, May Term 1911. *The Bloomfield Vindicator*, Friday, 16 June 1911, page 12.
- 1912 County Court Proceedings. *The Bloomfield Vindicator*, Friday, 26 April 1912, page 8.
- 1913 County Court Proceedings. *The Bloomfield Vindicator*, Friday, 16 May 1913, page 6.
- 1914 County Court Proceedings. *The Bloomfield Vindicator*, Friday, 16 January 1914, page 3.
- 1914 County Court Proceedings. *The Bloomfield Vindicator*, Friday, 13 March 1914, page 7.
- 1915 Notice of Sale of Construction of Ditches and Bridges in Drainage District No. 17 of Stoddard Co., Missouri. *The Bloomfield Vindicator*, Friday, 5 March 1915, page 8.
- 1915 Notice of the Pendency of the petition and preliminary report of the Viewers and Engineer for a Drainage District. *The Bloomfield Vindicator*, Friday, 5 March 1915, page 8.
- 1915 Notice of Sale of Drainage Bonds in Drainage District No. 23, of Stoddard Co., Missouri. *The Bloomfield Vindicator*, Friday, 5 March 1915, page 8.
- 1917 Proceedings Castor Twp. Board, Saturday, Sept 29. *The Bloomfield Vindicator*, Friday, 5 October 1917, page 2.
- 1918 Preserve the Ditches is Being Urged. *The Bloomfield Vindicator*, Friday, 15 February 1918, page 3.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Boone, Mark

2001 St. Francis River Watershed Inventory and Assessment. Fisheries Management, Southeast Regional Headquarters, Cape Girardeau, Missouri, available online at <https://mdc.mo.gov/sites/default/files/mdcd7/watersheds/StFrancisWatershed380.pdf>, accessed January 2024.

Daily American Republic [Poplar Bluff, MO]

1961 Youth, 18, Drowns in Ditch when Boat Sinks. *Daily American Republic*, Friday, 31 March 1961, page 1.

1979 Dexter Council Agrees to Help Pay for Cleaning Ditch. *Daily American Republic*, Wednesday, 5 September 1979, page 17.

Daily Standard, The [Sikeston, Scott County, MO]

1964 Public Notices. *The Daily Standard*, Thursday, 3 December 1964, page 13.

1966 Flood Control Job Awarded. *The Daily Standard*, Friday, 26 August 1966, page 1.

Dexter Statesman, The [Dexter, MO]

1912 Local News. *Dexter Statesman*, Wednesday, 6 November 1912, page 3.

1927 Who's Who, - What's What and When in 1910. *Dexter Statesman*, Friday, 1 April 1927, page 1.

Dunklin Democrat [Kennett, Dunklin County, MO]

1907 Southeast Missouri. *Dunklin Democrat*, Friday, 24 May 1907, page 1.

Fisher, John C.

2007 *Southeast Missouri from Swampland to Farmland: The Transformation of the Lowlands*. McFarland & Company, Inc., Publishers, Jefferson, North Carolina.

Forister, Robert H.

1996 History of Stoddard County, Missouri. Stoddard County Historical Society, Missouri.

Gasconade County Republican [Owensville, MO]

1956 Highway Commission Issues Bid Call. *Gasconade County Republican*, Thursday, 16 August 1956, page 9.

Gilman, Rhoda R.

1974 The Fur Trade in the Upper Mississippi Valley, 1630-1850. *The Wisconsin Magazine of History* 58(1):2-18.

Knight, Lila

2009 A Field Guide to Irrigation in the Lower Rio Grande Valley. Texas Department of Transportation, Environmental Affairs Division, Historical Studies Branch, Historical Studies Report No. 2009-01, available online at <https://ftp.dot.state.tx.us/pub/txdot-info/env/toolkit/420-07-gui.pdf>, accessed January 2024.

Limerick, Patricia Nelson, PhD

1987 *The Legacy of Conquest: The Unbroken Past of the American West*. W.W. Norton & Company.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Little River Drainage District

n.d. The Little River Drainage District: Flood Control & Drainage, Since 1907, available online at https://sema.dps.mo.gov/earthquake_preparedness/docs/2023/the-little-river-drainage-district.pdf, accessed January 2024.

2021 From a Swamp to a Thriving Community. The Little River Drainage District, available online at <https://www.thelrdd.org/map-and-resources/>, accessed January 2024.

Maserang, Roger

1993 Final Report, Agriculture Survey (Columbus Township, Johnson Co.), June, Show-Me Regional Planning Commission, Project No. 29-92-70127-224, Warrensburg, Missouri, available online at <https://mostateparks.com/sites/mostateparks/files/Columbus%20TAS%20Report.pdf>, accessed December 2023.

McDowell, Gary Lane

1965 Local Agencies and Land Development by Drainage: The Case of "Swampeast" Missouri. Columbia University ProQuest Dissertations Publishing, No. 6510217, available online at <https://www.proquest.com/openview/ab0a175c519e7e22302b8ad31b71e5dd/1?pq-origsite=gscholar&cbl=18750&diss=y>, accessed February 2024.

Missouri Department of Natural Resources (MDNR)

2018 Our Sense of Place: Preserving Missouri's Cultural Resources, Missouri's Comprehensive Statewide Historic Preservation Plan, 2018-2024. Missouri Department of Natural Resources, Division of State Parks, State Historic Preservation Office, Jefferson City, Missouri, available online at <https://mostateparks.com/sites/mostateparks/files/Our%20Sense%20of%20Place%20Preserving%20Missouri%27s%20Cultural%20Resources.pdf>, accessed December 2023.

Missouri Secretary of State

2024 Missouri Digital Heritage, [Patent information], available online at <https://s1.sos.mo.gov/records/archives/archivesdb/land/Results.aspx>, accessed January 2024.

Missouri State Archives

n.d. Timeline of Historic Missouri: 1900-1949, available online at <https://www.sos.mo.gov/archives/history/timeline>, accessed January 2024.

Missouri State Legislature

1868 Missouri Revisor of Statutes, 241.010. Reclamation of swamplands by counties. Revised 1909, 1919, 1929, 1939, and 1959, available online at <https://faolex.fao.org/docs/pdf/us191759.pdf>, accessed January 2024.



National Women's Hall of Fame

2024 Sacagawea / Sacajawea / Sakakawea, available online at
<https://www.womenofthehall.org/inductee/sacagawea-sacajawea-sakakawea/>,
accessed January 2024.

Scott County Kicker [Benton, MO]

1909 About Common Justice. *Scott County Kicker*, Saturday, 3 April 1909, page 1.

Seaber, Paul R., F. Paul Kapinos, and George L. Knapp

1987 Hydrologic Unit Maps. US Geological Survey Water-Supply Paper 2294. US
Department of the Interior, US Geological Survey, US Government Printing Office,
Federal Center, Denver, Colorado.

Stanberry Herald-Headlight [Stanberry, MO]

1956 Stoddard County Work. *Stanberry Herald-Headlight*, Thursday, 23 August 1956,
page 8.

Stepenoff, Bonnie, Ph.D.

1993 Butler County, Missouri: Historical and Architectural Survey. August, History and
Archives Consultants. Prepared for Ozark Foothills Regional Planning Commission,
available online at
<https://mostateparks.com/sites/mostateparks/files/Butler%20Towns%20and%20Rural%20Props%20Report.pdf>, accessed December 2023.

Stephens, Sarah; Eric Wallace; Deanna Statler and Ethan Adams

2009 Guide to the Little River Drainage District Records, Group IV: Administrative Files;
Series I: Numeric Files: 1908-1980, [1914-1919]. Special Collections and Archives,
Kent Library, Southeast Missouri State University, Cape Girardeau, Missouri.

Stoddard County, Missouri, County Highway Agency

2023 Bridge Inspection Records, County Road 679 Over [Cypress Lateral No. 1] Drainage
Ditch, Bridge 21905, available online at [https://data.news-
journalonline.com/bridge/missouri/stoddard/county-rd-679-over-drain-dtch/29-
21905/](https://data.news-journalonline.com/bridge/missouri/stoddard/county-rd-679-over-drain-dtch/29-21905/), accessed January 2024.

2023 Bridge Inspection Records, County Road 691 Over [Cypress Lateral No. 1] Drainage
Ditch, available online at [https://data.news-
journalonline.com/bridge/missouri/stoddard/county-rd-679-over-drain-dtch/29-
21905/](https://data.news-journalonline.com/bridge/missouri/stoddard/county-rd-679-over-drain-dtch/29-21905/), accessed January 2024.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Union Labor Record [Springfield, MO]

1955 State Highway Commission Issues Its Largest Bid Call for Construction, Improvement. *Union Labor Record*, Thursday, 13 January 1955, page 3.

United States Army Corps of Engineers (USACE)

n.d. Mississippi River and Tributaries Project: MRL and MR&T Levees.

United States Department of Agriculture (USDA)

2023 Natural Resources Conservation Service, National Water and Climate Center, available online at <https://www.nrcs.usda.gov/wps/portal/>, accessed January 2024.

2020a Natural Resources Conservation Service, Conservation Practice Standard Irrigation Field Ditch, Code 388. Conservation Practice Standard 388-CPS-1, available online at https://www.nrcs.usda.gov/sites/default/files/2022-09/Irrigation_Field_Ditch_388_CPS_10_2020.pdf, accessed December 2023.

2020b Natural Resources Conservation Service, Conservation Practice Standard Irrigation Canal or Lateral (Code 320), available online at https://www.nrcs.usda.gov/sites/default/files/2022-09/Irrigation_Canal_or_Lateral_320_Overview_10_2020.pdf, accessed December 2023.

2020c Natural Resources Conservation Service, Conservation Practice Standard Irrigation Ditch Lining, Code 428, available online at https://www.nrcs.usda.gov/sites/default/files/2022-09/Irrigation_Ditch_Lining_428_Overview_10_2020.pdf, accessed December 2023.

2020d Natural Resources Conservation Service, Conservation Practice Standard Irrigation Field Ditch, Code 388, available online at https://www.nrcs.usda.gov/sites/default/files/2022-09/Irrigation_Field_Ditch_388_Overview_10_2020.pdf, accessed December 2023.

2001 Natural Resources Conservation Service, Part 650 Engineering Field Handbook, National Engineering Handbook, Chapter 14, Water Management (Drainage), available online at <https://www.wcc.nrcs.usda.gov/ftpref/wntsc/Drainage/Drainmod/References/EFH14.pdf>, accessed December 2023.

Wood, W. Raymond

2013 Ethnohistory and Euro-American Contact in Missouri. *The Missouri Archaeologist* 74:7-35.



Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
April 6, 2024 | Terracon Report No. 15237400



APPENDIX A – SHPO CORRESPONDENCE

Facilities | **Environmental** | Geotechnical | Materials



Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



APPENDIX B – PROJECT PHOTOGRAPHS



Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



APPENDIX C – MISSOURI SHPO SITE FORMS



Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



APPENDIX D – ADDITIONAL FIGURES AND TABLES

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400

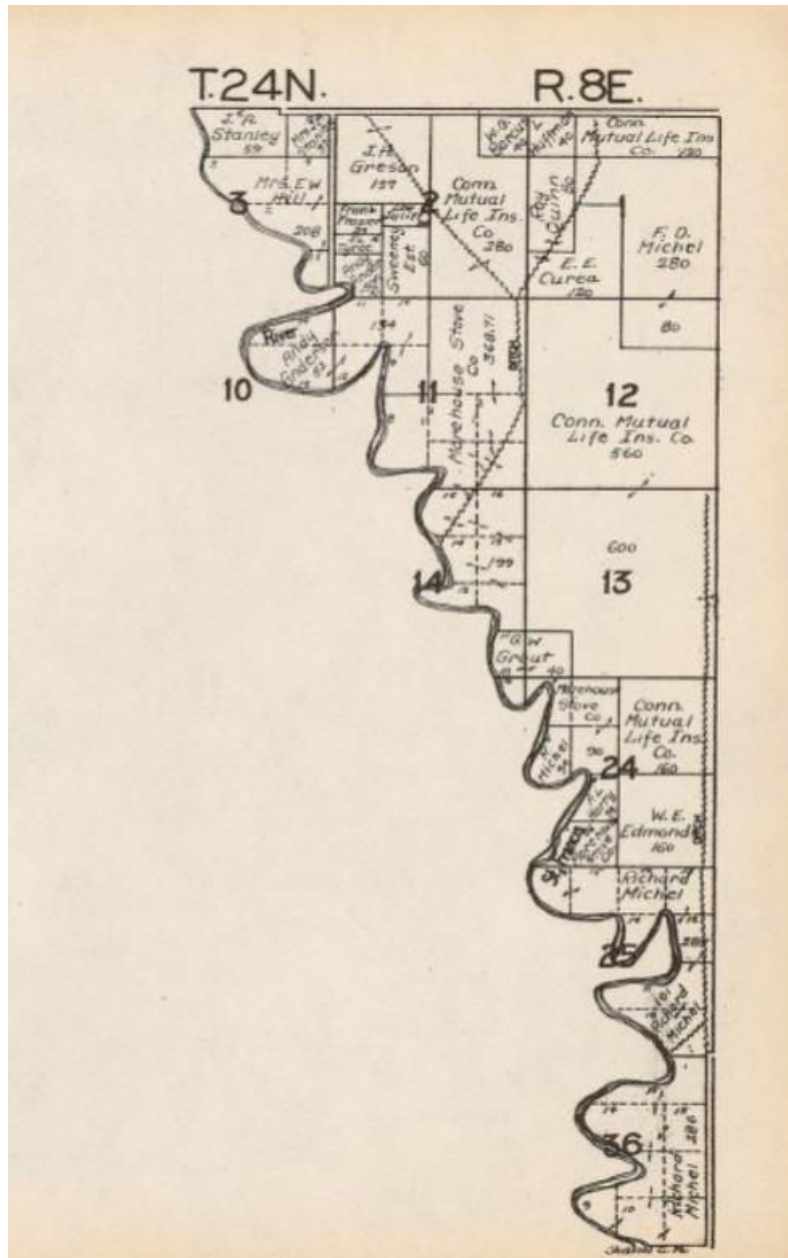


Figure D-1. 1930 plat of Township 24N, Range 8E, Sections 24 and 25.

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Table D-1.
NRCS Guidance for Irrigation and Water Control

Conservation Practice Standard (CPS) Title	Code
Irrigation Canal or Lateral	320
Dike and Levee	356
Irrigation Field Ditch	388
Irrigation Ditch Lining	428
Irrigation Pipeline	430
Irrigation Storage Reservoir	436
Irrigation Systems, Micro-Irrigation	441
Sprinkler or Sprinkler System	442
Surface and Subsurface	443
Irrigation Water Management	449
Pumping Plant	533
Drainage Water Management	554
Structures for Water Control	587
Subsurface Drain	606
Surface Drain, Field Ditch	607
Surface Drain, Main or Lateral	608

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Conservation Practice Standard (CPS) Title	Code
Water Well	642
Vertical Drain	630
Water Harvesting Catchment	636
Water and Sediment Control Basin	638

Table D-2.
Swampland Patents in Stoddard County, Missouri between 1777 and 1969
based on the Office of the Secretary of the State for Missouri

Name and Role	Certificate No.	T/R/S	Acres	Purchase Date	Certificate Date	Cost
Allen, Gusham – Purchaser	1777	26N/9E/13 SW/SW	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Allen, Gusham – Purchaser	1775	26N/9E/14 SE1/4 SE1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Allen, Gusham – Purchaser	1776	26N/9E/23 NE1/4 NE1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Babb, Andrew J. – Purchaser	2003	27N/11E/33 NE & SE1/4 of SW1/4	80	10/13/1857	4/12/1859	\$1/acre, \$80.00
Bartlett, Orson – Purchaser; Wilson, Michael A. – Purchaser	1785	23N/10E/9 NW1/4 SW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Bartlett, Orson – Purchaser	2465	26N/10E/14 SE1/4 NW1/4	40	10/30/1854	3/20/1867	\$1/acre, \$40.00
Black, Thomas – Purchaser	2052	26N/8E/22 NW1/4 NW1/4	40	4/27/1855	6/10/1859	\$1/acre, \$40.00

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Name and Role	Certificate No.	T/R/S	Acres	Purchase Date	Certificate Date	Cost
Black, William – Purchaser; Strong, Isom – Purchaser	1770	27N/9E/22 SW1/4 SW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Bobb, Stephan P. – Purchaser	2084	26N/11E/4 E1/2 Lot 2 NE1/4	42.77	10/13/1854	2/10/1860	\$1/acre, \$42.77
Boyd, William L. – Purchaser; Wasson, Hiram – Purchaser	1815	24N/10E/8 SE1/4 SW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Brodfehrer, John C. – Purchaser	3932	27N/11E/12 E1/2	320	9/3/1868	9/21/1868	\$1.25/ac, \$400.00
Carlisle, Washington – Purchaser; Cuff, Ewell – Purchaser	1829	25N/10E/23 SW1/4 SE1/4	40.61	10/13/1857	9/1/1858	\$1/acre, \$40.00
Crumb, De Stark – Purchaser	4377	28N/9E/12 E1/2 Lot 1&2 NE1/4 S3; W1/2 Lot 1 NW1/4; SE1/4 SE1/4 & W1/2 SW1/4 S2; NE 1/4	616.25	3/12/1868	2/17/1869	\$1/acre, \$616.25
Crumb, De Stark – Purchaser	4378	28N/10E/18 W1/2 S7 & N1/2 Lot 1&2 NW1/4 & N1/2 NE1/4	482.9	3/13/1868	2/17/1869	\$1/acre, \$482.09
Crytes, William F. – Purchaser	1773	26N/9E/36 NE1/4 NE1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Duffers, Barnny – Purchaser	2017	27N/10E/15 SW1/4 SE1/4	40	10/13/1857	4/12/1859	\$1/acre, \$40.00
Fletcher, John B. – Purchaser; Wasson, Hiram – Purchaser	1792	24N/10E/27 NW1/4 SW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Griffith, Daniel – Purchaser; Griggs, Joseph S. – Purchaser	1833	25N/10E/25 NW1/4 SW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Harris, Thomas S. – Purchaser	2018	27N/10E/2 NE1/4 SE1/4	40	10/13/1857	4/12/1859	\$1/acre, \$40.00



Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Name and Role	Certificate No.	T/R/S	Acres	Purchase Date	Certificate Date	Cost
Harty, Jacob – Purchaser	1778	26N/9E/4 NW1/4 SE1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Hibbs, James – Purchaser; Wells, James – Purchaser	2009	26N/11E/2 NE1/4 SE1/4	32.9	10/13/1857	4/12/1859	\$1/acre, \$32.09
Hill, Mariah – Purchaser	1918	25N/11E/3 W1/2 Lot 1 SW1/4	40	10/13/1857	11/25/1858	\$1/acre, \$40.00
Hodges, Francis M. – Purchaser; Wasson, Hiram – Purchaser; Wood, Burnwell, D.K. – Purchaser	1802	24N/10E/22 SW1/4 SW1/4	40	10/13/1857	9/13/1858	\$1/acre, \$40.00
Holmes, Samuel – Purchaser	2011	25N/11E/29 SW1/4 SW1/4	40	10/13/1857	4/12/1859	\$1/acre, \$40.00
Holmes, Samuel – Purchaser	2007	25N/11E/32 SW1/4 SW1/4	40	10/13/1857	4/12/1859	\$1/acre, \$40.00
Holmes, Samuel – Purchaser	2200	25N/11E/32 N1/2 & SE1/4 SW1/4	120	10/13/1857	4/3/1860	\$1/acre, \$120.00
Howell, Lexy – Purchaser	2083	25N/9E/36 SE1/4 NW1/4	40	10/13/1857	2/10/1860	\$1/acre, \$40.00
Jenkins, Elijah – Purchaser; Jenkins, Jacob – Purchaser	2001	28N/11E/31 SW1/4 NW1/4	40	10/13/1857	4/12/1859	\$1/acre, \$40.00
Jenkins, Jacob – Purchaser	4549	28N/11E/31 SW1/4 NE1/4	40	10/13/1857	8/24/1925	\$1/acre, \$40.00
Johnson, Jonathan – Purchaser	1772	27N/9E/18 SW1/4 SE1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Johnson, Laura E. – Purchaser	3931	28N/11E/11 SE1/4 SW1/4 & W1/2 SE1/4	120	7/3/1868	9/21/1868	\$1.25/acre, \$150.00
Kinders, Elizabeth – Purchaser	2008	26N/11E/32 SE1/4 SW1/4	40	10/13/1857	4/12/1859	\$1/acre, \$40.00



Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Name and Role	Certificate No.	T/R/S	Acres	Purchase Date	Certificate Date	Cost
Kitchen, Solomon G. – Purchaser	1390	27N/10E/7 NE1/4 NW1/4	73.82	2/2/1854	7/1/1858	\$1/acre, \$73.82
Kitchen, Solomon G. – Purchaser	1381	25N/11E/14 SW1/4 NE1/4	40	12/6/1854	7/1/1858	\$1/acre, \$40.00
Kitchen, Solomon G. – Purchaser	1370	25N/10E/23 NE1/4 SE1/4	40.61	12/7/1854	7/1/1858	\$1/acre, \$40.61
Kitchen, Solomon G. – Purchaser	1371	25N/10E/26 NW1/4 NE1/4	40	12/7/1854	7/1/1858	\$1/acre, \$40.00
Kitchen, Solomon G. – Purchaser	1402	24N/6E/1 W1/2 Lot 2 NW1/4	40.26	1/1/1855	7/1/1858	\$1/acre, \$40.26
Kitchen, Solomon G. – Purchaser	1394	25N/11E/4 E1/2 Lot 1 NW1/4	40	8/16/1855	7/1/1858	\$1/acre, \$40.00
Kitchen, Solomon G. – Purchaser	1382	25N/11E/5 NW1/4 SE1/4	39.25	8/16/1855	7/1/1858	\$1/acre, \$39.25
Kitchen, Solomon G. – Purchaser	1392	27N/10E/6 S1/2 Lot 1 & S1/2 Lot 2 SW1/4	80	2/24/1855	7/1/1858	\$1/acre, \$80.00
Kitchen, Solomon G. – Purchaser	1360	26N/11E/32 SE1/4 SE1/4	40	4/6/1855	7/1/1858	\$1/acre, \$40.00
Kitchen, Solomon G. – Purchaser	1337	27N/9E/15 SW1/4 NW1/4	40	6/12/1857	7/1/1858	\$1/acre, \$40.00
Lain, James – Purchaser	1768	27N/9E/27 SW1/4 NW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Lain, James – Purchaser	1767	27N/9E/28 SE1/4 NW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Leach, John W. – Purchaser	1811	24N/10E/9 SW1/4 SW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00



Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Name and Role	Certificate No.	T/R/S	Acres	Purchase Date	Certificate Date	Cost
Miller, D.B. & Kitchen, S.G. – Purchaser	1357	26N/11E/2 E1/2 Lot 1 NW1/4	40	12/7/1854	7/1/1858	\$1/acre, \$40.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1334	24N/10E/3 SE&SW1/4 SW1/4	80	11/20/1854	7/1/1858	\$1/acre, \$80.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1362	26N/11E/3 NE1/4 SE1/4	40	12/15/1854	7/1/1858	\$1/acre, \$40.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1330	24N/10E/4 SE1/4 SW1/4	40	11/20/1854	7/1/1858	\$1/acre, \$40.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1375	24N/10E/7 SE1/4 SW1/4	40	11/20/1854	7/1/1858	\$1/acre, \$40.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1331	24N/10E/8 NE&NW1/4 NE1/4	80	11/20/1854	7/1/1858	\$1/acre, \$80.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1333	24N/10E/9 NE&NW1/4 NE1/4	80	11/21/1854	7/1/1858	\$1/acre, \$80.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1346	24N/10E/10 SW1/4 NW1/4	40	11/20/1854	7/1/1858	\$1/acre, \$40.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1380	26N/10E/11 SE1/4 SE1/4	40	10/30/1854	7/1/1858	\$1/acre, \$40.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1361	26N/11E/12 SW1/4 NW1/4	40	12/7/1854	7/1/1858	\$1/acre, \$40.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1379	26N/10E/13 NW1/4 NW1/4	40	10/30/1854	7/1/1858	\$1/acre, \$40.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1378	26N/10E/14 NW&NE1/4 NW1/4	80	10/1/1854	7/1/1858	\$1/acre, \$80.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1349	26N/10E/15 NE NW1/4 NW1/4	80	11/20/1854	7/1/1858	\$1/acre, \$80.00

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Name and Role	Certificate No.	T/R/S	Acres	Purchase Date	Certificate Date	Cost
Miller, D.B. & Kitchen, S.G. – Purchaser	1356	24N/10E/21 NE1/4 NE1/4; NE1/4 SE1/4	80	11/20/1854	7/1/1858	\$1/acre, \$80.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1354	24N/10E/22 NW1/4 NW1/4	40	11/20/1854	7/1/1858	\$1/acre, \$40.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1355	25N/10E/27 SW1/4 SE1/4	40	11/21/1854	7/1/1858	\$1/acre, \$40.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1363	26N/10E/29 SE1/4 NW1/4	40	10/31/1854	7/1/1858	\$1/acre, \$40.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1389	26N/10E/30 NE1/4 NW1/4 NE1/4	80	10/1/1854	7/1/1858	\$1/acre, \$80.00
Miller, D.B. & Kitchen, S.G. – Purchaser	1372	25N/10E/34 NW&SW1/4 NE1/4	80	11/21/1854	7/1/1858	\$1/acre, \$80.00
Miller, D.B. – Purchaser	1774	26N/9E/24 NW1/4 NW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Miller, Daniel B. – Purchaser	1781	24N/10E/3 NW1/4 NW1/4	38.61	10/13/1857	9/1/1858	\$1/acre, \$38.61
Miller, Daniel B. – Purchaser	2005	27N/11E/21 NW1/4 SE1/4	40	10/13/1857	4/12/1859	\$1/acre, \$40.00
Miller, Daniel B. – Purchaser	2004	27N/11E/29 NW1/4 SE1/4; NE&NW1/4 SW1/4	118.33	10/13/1857	4/12/1859	\$1/acre, \$118.33
Miller, Frederick W. – Purchaser	1795	24N/10E/30 S1/2 Lot 1 NW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Miller, John C. – Purchaser	1830	24N/10E/15 NE1/4 SW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Miller, John C. – Purchaser	1832	25N/10E/26 NW1/4 SW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00

Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Name and Role	Certificate No.	T/R/S	Acres	Purchase Date	Certificate Date	Cost
Miller, John C. – Purchaser	1831	25N/10E/27 NE1/4 SE1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Miller, John C. – Purchaser; Nulle, Adam – Purchaser	1809	24N/10E/10 NE1/4 SW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Nations, James – Purchaser	1782	23N/10E/10 SE1/4 NW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Norman, Elijah M. – Purchaser	1780	25N/9E/25 SE1/4 SW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Norman, Elijah M. – Purchaser	1779	25N/9E/36 NE1/4 NW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Nulle, Adam – Purchaser; Nulle, Andrew – Purchaser	1818	24N/10E/10 NE1/4 NW1/4	40	10/1/1857	9/1/1858	\$1/acre, \$40.00
Owens, Adrian B. – Purchaser	3732	26N/10E/32 S1/2 SW1/4 and S1/2 SE1/4 S29 and NE1/4 NE1/4	200	10/10/1867	6/22/1868	\$1/acre, \$200.00
Owens, Adrian B. – Purchaser	4223	28N/11E/13 W1/2 NE1/4	80	9/19/1868	1/23/1869	\$1.25/acre, \$100.00
Perry, John C. – Purchaser	2016	28N/10E/12 NE1/4 NW1/4	40	10/13/1857	4/12/1859	\$1/acre, \$40.00
Rhodes, George W. – Purchaser	2015	28N/10E/14 NW1/4 SW1/4	40	10/13/1857	4/12/1859	\$1/acre, \$40.00
Smith, John D. – Purchaser	2006	26N/11E/33 NW1/4 SW1/4	40	10/13/1857	4/12/1859	\$1/acre, \$40.00
Stuart, William W. – Purchaser	1796	24N/10E/28 SE1/4 SE1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Taylor, James M. – Purchaser	2082	25N/11E/36 S1/2 NW1/4; and N1/2 SW1/4	160	10/13/1857	9/1/1859	\$1/acre, \$160.00



Historic Resources Survey Report | USDA NRCS Sec 106
Lick Creek - Dudley Main Ditches | Stoddard County, Missouri
Revised July 2024 | Terracon Report No. 15237400



Name and Role	Certificate No.	T/R/S	Acres	Purchase Date	Certificate Date	Cost
Warren, Thomas B. – Purchaser	2013	25N/11E/26 SW1/4 SE1/4	40	10/13/1857	4/12/1859	\$1/acre, \$40.00
Warren, Thomas B. – Purchaser	2010	25N/11E/35 NW1/4 NE1/4	40	10/13/1857	4/12/1859	\$1/acre, \$40.00
Wasson, Hiram – Purchaser	1808	24N/10E/21 SE1/4 SE1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Wasson, Hiram – Purchaser	1793	24N/10E/34 NW1/4 NW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Wasson, Hiram – Purchaser	1820	24N/10E/34 NW1/4 NW1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Webb, Willis R. – Purchaser	1791	25N/10E/14 NE1/4 SE1/4	41.25	10/13/1857	9/1/1858	\$1/acre, \$41.25
Webb, Willis R. – Purchaser	1821	25N/10E/14 SE1/4 SE1/4	40.25	10/13/1857	9/1/1858	\$1/acre, \$40.25
Whitehead, John – Purchaser	2012	25N/11E/27 NW1/4 NW1/4	40	10/13/1857	4/12/1859	\$1/acre, \$40.00
Whitehead, William A. – Purchaser	2014	25N/11E/15 SW1/4	160	10/13/1857	4/12/1859	\$1/acre, \$160.00
Wilson, Michael A. – Purchaser	1765	23N/10E/8 SE1/4 SE1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Wilson, Michael A. – Purchaser	1827	26N/10E/09 SE1/4 SE1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Wilson, Michael A. – Purchaser	1825	26N/10E/10 SW1/4 SE1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00
Wolforng, Peter – Purchaser	1828	26N/10E/98 NE1/4 SE1/4	40	10/13/1857	9/1/1858	\$1/acre, \$40.00