SITE #2 TRIANGLE PARK

Fourche Bayou Mitigation Bank

Applied Land Restoration

July 2024

EXHIBIT A-2
12-Element BANK DEVELOPMENT PLAN
Site #2 Triangle Park
FOURCHE BAYOU MITIGATION BANK

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12-Element BANK DEVELOPMENT PLAN
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Introduction

The following is the 12-Element Bank Development Plan ("BDP") for the Triangle Park, Site #2, of the Fourche Bayou Mitigation Bank ("FBMB"). The FBMB instrument was approved by USACE in 2017 with the enrollment of Site #1, located at the confluence of Fourche Bayou and the Arkansas River (Figure 1). The proposed Triangle Park is the second site within Fourche Island to be incorporated into the Bank. This project is an exciting collaborative effort to restore critical migratory bird habitat within the Little Rock Port Authority (LRPA) while creating a unique opportunity for the public to discover the value of wetland restoration. Unless otherwise indicated, capitalized terms herein are defined in the approved Mitigation Banking Instrument (MBI) (Attachment 1) document to which this Exhibit A-2 will be attached.

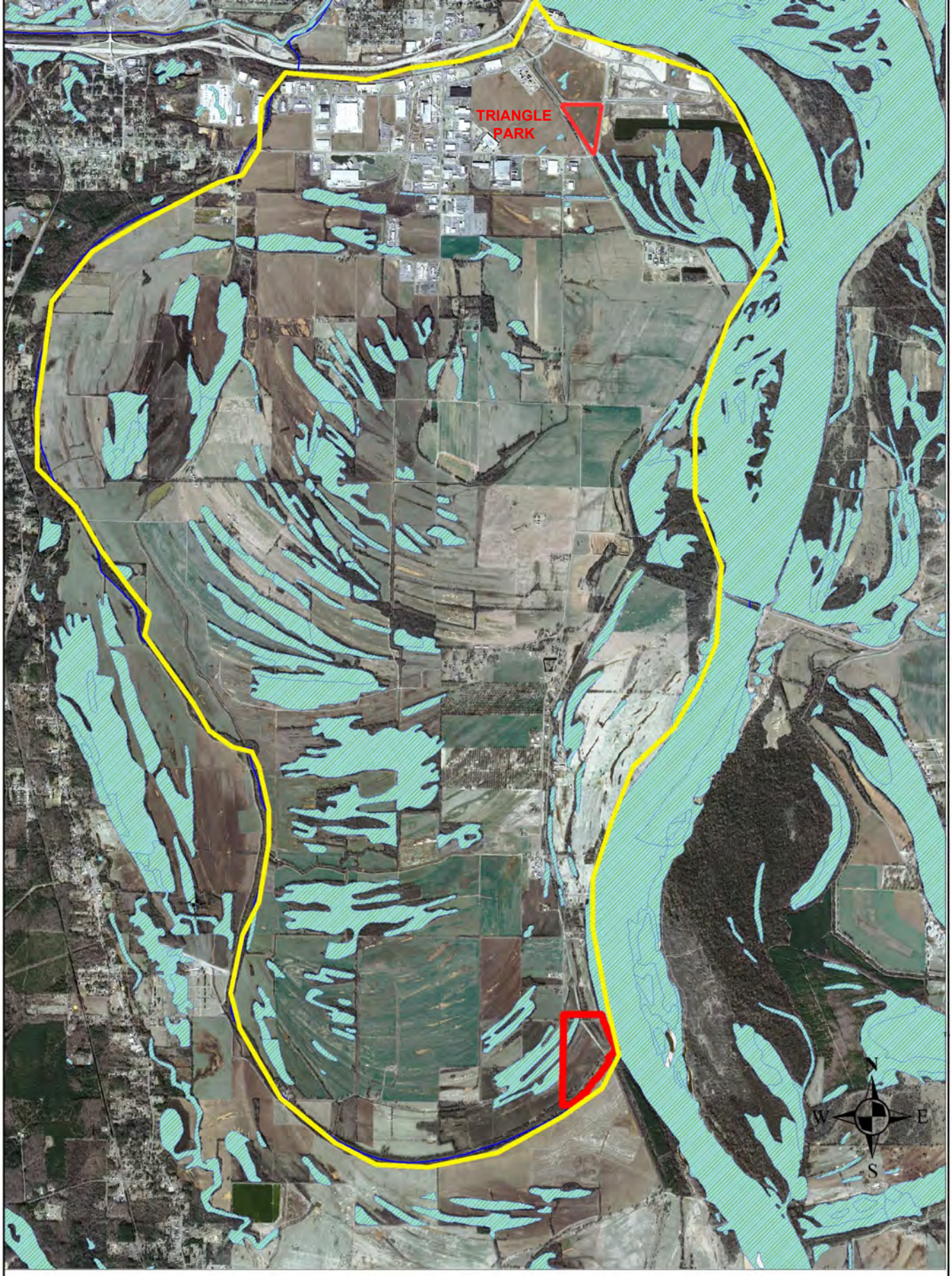
1.0 Project Objectives

There are two primary goals of the project: 1) create an educational greenspace within the LR Port industrial park, and 2) provide ecological lift through the development of a stream and wetland mitigation site in the Lower Arkansas-Maumelle watershed (HUC 8) watershed through restoration and enhancement of wetlands, streams, and associated buffers along Old Fourche Creek Channel. This will be accomplished through achieving the following objectives:

- Restore the floodplain connectivity of Old Channel Fourche Creek through Priority I stream restoration;
- Restore and enhance historical and existing wetland areas within the Old Fourche Creek Channel floodplain;
- Improve existing riparian habitat corridor for waterfowl and other wildlife through native plantings and invasive species removal/control;
- Construct a 2500ft elevated boardwalk along the east side of the project area with informational signs and ADA access; and,
- Permanently protect, monitor, and manage the resulting high quality stream/wetland function and riparian habitat of the Old Fourche Creek Channel in perpetuity through an appropriately restrictive conservation easement.

2.0 Site Selection

The proposed Bank Site (Triangle Park) is a 26-acre site located on Fourche Island along Old Fourche Creek Channel. The project area is uniquely situated as an alluvial depression partially confined by three levees: Fourche Island Drainage District No. 2 Levee, Slackwater Harbor Road, and the LR Port Railway. It is approximately five miles north of Site #1(2017), six miles south of the Little Rock National Airport and 0.5 mile west of the Little Rock Port Authority (LRPA), a rapidly growing industrial area (Figure 1).



Fourche_Island

Site#1_ Fourche Bayou

Site #2_Triangle Park

AR_Wetlands (http://www.fws.gov/wetlands/data/).

ALR
APPLIED LAND RESTORATION

The Port of Little Rock opened the Arkansas River Resource Center in July 2014 and has undergone tremendous growth during the last decade. “Over the past three years, the Port of Little Rock has experienced unprecedented job growth—a trend that shows no signs of abating, with a projected total revenue of about $4.1 million for 2024 and international businesses choosing the Port for production” (LRPA 2024). Given the rapid expansion of this industrial area, restoration of this site is an integral part of habitat connectivity and wildlife conservation. The Triangle Park, located in the middle of the Port industrial park, is host to migratory birds as a refuge along the Mississippi Flyway. Urban expansion and growth throughout the Lower Arkansas-Maumelle watershed continues and the FBMB sites are designed and intended to offset these impacts to ensure a more sustainable aspect to growth.

Table 1: Summary information for Site#2 Triangle Park

BACKGROUND INFORMATION	
Project Name	Triangle Park - Site #2 Fourche Bayou Mitigation Bank
Project Sponsor	Applied Land Restoration, Inc
Site Location	Section 15, Township 1N, Range 15W
Counties within the watershed	Pulaski, Saline, Jefferson, Lonoke, Perry, Faulkner
HGM Classifications	Freshwater forested/ shrub wetland
8-digit HUC	Lower Arkansas - Maumelle 11110207
10-digit HUC	Fourche Creek - Arkansas River 1111020704
12-digit HUC	Fourche Creek - Arkansas River 111102070404
Primary Stream Service Area	Lower Arkansas - Maumelle 11110207
Secondary Stream Service Area	Bayou Meto 08020402 Lower White-Bayou DesArc 08020301 *Mississippi River Alluvial Valley ecoregion only
Ecoregion	Mississippi Alluvial Valley
Protection Mechanism	Conservation easement
Monitoring Frequency	Annually
Anticipated Date of Final Monitoring	2030
Size of Project Area	~26 acres
Wetland Area	~17.2 acres
Stream Length and Riparian Buffer	~3,125 LF and 7-acres

2.1 Watershed Approach

There are several organizations and conservation groups actively working in the Lower Arkansas-Maumelle watershed. Audubon Arkansas is a sponsor of the Fourche Creek Watershed Initiative. The group has identified non-point source pollution threats to the watershed, including those from agriculture and urban sprawl/ development (NAS 2014).

Currently, Audubon operates a Motus antennae array tracking tagged birds passing through Central Arkansas. On October 4, 2022, the tower detected its first tagged bird, a Swainson's Thrush. The thrush was fitted with a transmitter in British Columbia in August 2022 and passed through the Port on its way to winter in Costa Rica. Fourche Creek, defined as critical habitat, is home to “over 50 species of fish (one fourth of all Arkansas fish species), stands of three-hundred-year-old bald cypress, and a diverse population of migratory bird species” (NAS 2014). Most notably among these efforts is a long-standing commitment to protecting 1,750-acres of the Fourche Bayou Basin through a decade’s long, multi-agency effort. Because so many acres of the Lower Arkansas-Maumelle watershed have been

irreversibly converted to urban land use, restoring agricultural areas is imperative to protecting this critical habitat. The proposed Triangle Park site is currently in agricultural production, primarily soybeans. Restoration of this site will increase connectivity to the adjacent forests of the Old Fourche Creek and restore much needed habitat for migratory and shoreline birds.

3.0 Site Protection Instrument

The property is owned by the Little Rock Port Authority. The mitigation acreage will be placed in a conservation easement (CE) with the Arkansas Land Trust and filed at the courthouse in Pulaski County. The CE will prohibit activities on the Bank Site that are inconsistent with preserving and protecting wetland habitat in perpetuity. The CE will run with and be a burden on the land in perpetuity for landowners, their heirs or assigns, and all subsequent owners or purchasers. The Land Trust will annually monitor the site to ensure that the easement restrictions are being followed. Absent the establishment of the Triangle Park, the Port Authority would be free under its current zoning to pursue more intensive development of the property, including industrial development.

4.0 Baseline Information

The Triangle Park is located within the Mississippi Alluvial Plain (73); subsection 73h – Arkansas/Ouachita River Holocene Meander Bends ecoregion (AWAP 2004). This ecoregion is characterized by “flat to nearly flat floodplains containing the meander belts of the present and past courses of the lower Arkansas and Ouachita rivers.” (Woods et al. 2004). The native vegetation for the area is bottomland hardwood forest/woodland containing cottonwood (*Populus deltoides*), hackberry (*Celtis occidentalis*), pecan (*Carya illinoinensis*), black willow (*Salix nigra*), green ash (*Fraxinus pennsylvanica*), cherrybark oak (*Quercus pagoda*), Shumard oak (*Quercus shumardii*), swamp chestnut oak (*Quercus michauxii*), water oak (*Quercus nigra*), willow oak (*Quercus phellos*), overcup oak (*Quercus lyrata*), sweetgum (*Liquidambar styraciflua*), sycamore (*Platanus occidentalis*), and water hickory (*Carya aquatica*). This ecoregion contains small streams flowing in abandoned courses of the Arkansas River. These small streams are “usually underfit compared to the older channels and have small watersheds”, which fit the profile for Old Channel Fourche Creek. Old Channel Fourche Creek was a forested riverine corridor bisecting the property (Figure 2) until it was cleared and ditched in 2002 (Figure 3). Today, the straightened channel enters the site along the northern property border and flows 1900LF south parallelling Fourche levee until it exists through a culvert under Slackwater Harbor Rd. At this point Old Channel Fourche Creek drains approximately 0.3mi^2 with a 2-year flood volume of 88ft^3/sec. The stream then reconnects with the original Old Channel Fourche Creek before entering the Arkansas River approximately 1.5 miles downstream (Wagner 2014).

Figure 2: Triangle Park area in 1994, prior to construction of Slackwater Harbor Road.

Figure 3: 2023 image of the Triangle Park showing clearing and ditching of Old Fourche Creek Channel.

FIGURE 4: Photo Points

Point where Old Channel Fourche Creek enters the Triangle Park site.

Snowy egret utilizing the wetland area

View of soybean rows from the NE corner of the site

Depressional area along the east boundary

View of recently mowed riparian area adjacent to Old Channel Fourche Creek.

Area where the relic channel reconnects with Old Channel Fourche Creek (ditch)

Forested reference of Old Channel Fourche Creek south of the Triangle Park

Slackwater Harbor Rd

Slackwater Harbor Rd

Google Earth

Image Landsat / Copernicus

400 ft

Most of the Lower Arkansas-Maumelle watershed is in Pulaski and Jefferson counties of Central Arkansas, with smaller portions in Saline, Lonoke, Perry and Faulkner counties. The valley slope within the project area is flat, with elevations ranging from 240 MSL along the northern portion of the site to 235 MSL along the outflow of Old Fourche Creek Channel, with the majority of the project site around 235-326 MSL (Figure 5). The Fourche Bayou area receives an average of 50.9 inches of rainfall per year (USGS 2014). The hydrology for the site is primarily precipitation driven and it falls into the HGM classification of alluvial depression.

Regarding soils, Norwood silty clay loam is the predominant soil type making up 96% of the site. These soils consist of very deep, somewhat poorly drained, very permeable soils that formed in clayey alluvium of Permian Red Bed origin. In this depressional location, the aquent subclass is dominant consisting of thick clays which are considered hydric at this location. Bruno fine sandy loam makes up 1% of the site at the northeastern corner. The remaining three acres are listed as a borrow pit. Native vegetation for these soils was bottomland hardwood forests. These are poorly drained hydric areas that have a low permeability (Figure 6).

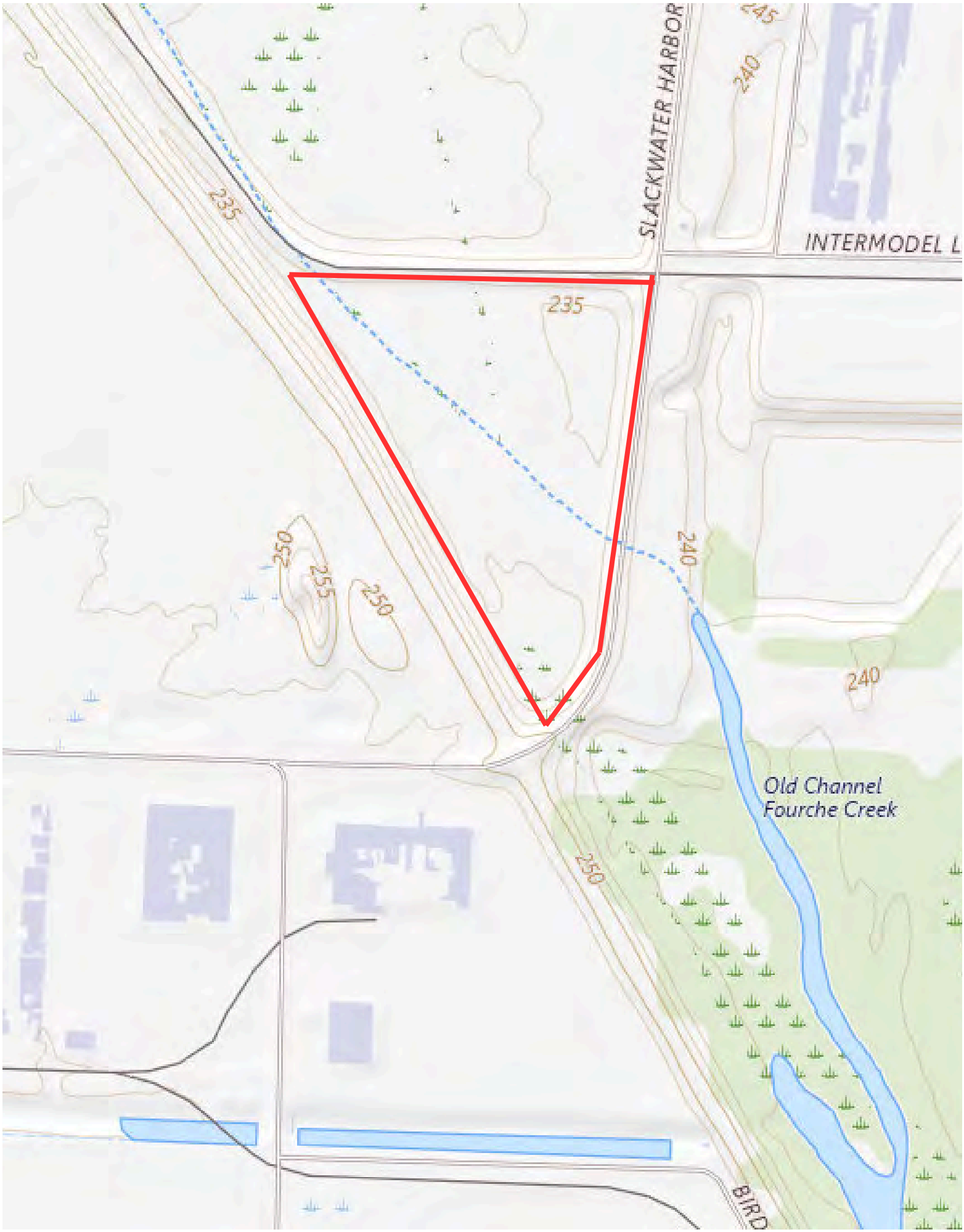


Figure : Topographic map of Site #2 Triangle Park (USGS 1984)

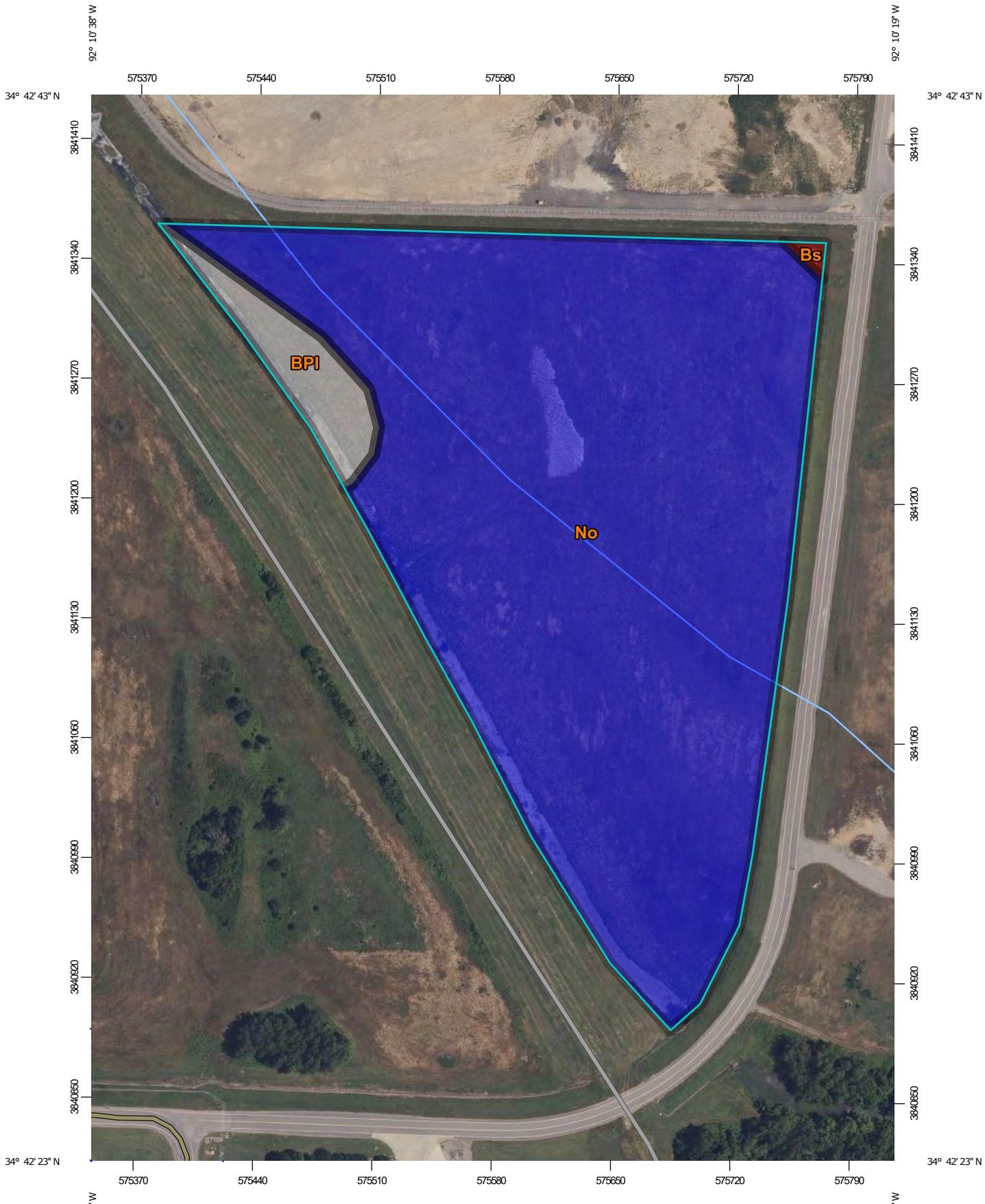


Figure : Map of Site #2 Triangle Park (USGS 1984)

Audubon Arkansas regularly visits the site and records sightings data in the eBird database operated by the Cornell Lab of Ornithology and sponsored by the Arkansas Game and Fish Commission. In 2024 alone, the group has recorded over 150 species in the area (Table 2). Restoration of the site and habitat improvement will encourage additional species to utilize the area.

Table 2: List of bird species Audubon Arkansas has recorded at the Port in 2024.

Black-bellied Whistling-Duck	Belted Kingfisher	Ring-billed Gull
Snow Goose	Red-headed Woodpecker	gull sp.
Greater White-fronted Goose	Red-bellied Woodpecker	Double-crested Cormorant
Canada Goose	Downy Woodpecker	American White Pelican
Wood Duck	Pileated Woodpecker	Little Blue Heron
Blue-winged Teal	Northern Flicker	Snowy Egret
Northern Shoveler	American Kestrel	Green Heron
Gadwall	Peregrine Falcon	Western Cattle Egret
Mallard	Eastern Wood-Pewee	Great Egret
Northern Pintail	Eastern Phoebe	Great Blue Heron
Green-winged Teal	Great Crested Flycatcher	White Ibis
Canvasback	Western Kingbird	Glossy Ibis
Ring-necked Duck	Eastern Kingbird	White-faced Ibis
Lesser Scaup	Scissor-tailed Flycatcher	Black Vulture
Common Goldeneye	White-eyed Vireo	Turkey Vulture
Ruddy Duck	Warbling Vireo	new world vulture sp.
Northern Bobwhite	Loggerhead Shrike	Osprey
Pied-billed Grebe	Blue Jay	Mississippi Kite
Rock Pigeon	American Crow	Northern Harrier
Eurasian Collared-Dove	Fish Crow	Sharp-shinned Hawk
White-winged Dove	American/Fish Crow	Cooper's Hawk
Mourning Dove	Crow sp.	Bald Eagle
Greater Roadrunner	Carolina Chickadee	Red-shouldered Hawk
Yellow-billed Cuckoo	Tufted Titmouse	Broad-winged Hawk
Common Nighthawk	Horned Lark	Red-tailed Hawk
American Coot	Tree Swallow	Great Horned Owl
Black-necked Stilt	Purple Martin	Lincoln's Sparrow
American Avocet	Northern Rough-winged Swallow	Swamp Sparrow
American Golden-Plover	Barn Swallow	Eastern Towhee
Killdeer	Cliff Swallow	Yellow-breasted Chat
Semipalmated Plover	Swallow sp.	Bobolink
Upland Sandpiper	Ruby-crowned Kinglet	Eastern Meadowlark
Short-billed Dowitcher	Sedge Wren	Orchard Oriole
Long-billed Dowitcher	Carolina Wren	Baltimore Oriole
Wilson's Snipe	Bewick's Wren	Red-winged Blackbird
Spotted Sandpiper	European Starling	Brown-headed Cowbird
Solitary Sandpiper	Gray Catbird	Rusty Blackbird
Lesser Yellowlegs	Brown Thrasher	Brewer's Blackbird
Willet	Northern Mockingbird	Common Grackle
Greater Yellowlegs	Eastern Bluebird	Great-tailed Grackle
Lesser/Greater Yellowlegs	Hermit Thrush	blackbird sp.
Stilt Sandpiper	American Robin	Prothonotary Warbler
Buff-breasted Sandpiper	Cedar Waxwing	Tennessee Warbler
Sanderling	House Sparrow	Common Yellowthroat
Baird's Sandpiper	American Pipit	Yellow Warbler
White-rumped Sandpiper	House Finch	Yellow-rumped Warbler
Least Sandpiper	American Goldfinch	Black-throated Green Warbler
Pectoral Sandpiper	Field Sparrow	Northern Cardinal
Western Sandpiper	Dark-eyed Junco	Blue Grosbeak
Semipalmated Sandpiper	White-crowned Sparrow	Indigo Bunting
peep sp.	White-throated Sparrow	Painted Bunting
shorebird sp.	Savannah Sparrow	Dickcissel
Bonaparte's Gull	Song Sparrow	

5.0 Determination of Credits

The method of credit determination will be a combination of wetland and stream channel restoration and riparian buffer creation. The number of stream mitigation credits is determined by linear feet of restoration and the corresponding credits for those activities outlined in the Little Rock Stream Method (USACE 2011). The number of wetland mitigation credits created by development of this Bank is determined by a combination of land area and restoration type following the Charleston Method (USACE 2002) (Attachment 2). Stream and buffer segments that overlay with wetland restoration areas will not be stacked for mitigation credits.

Table 3: List of stream reaches, types, associated lengths and credit production.

Stream Name	Classification	Length (LF)	Credits
Old Channel Fourche Creek	Perennial	3,125	34,531

Table 4: List of wetland types, associated acreage, and credit production.

Wetland	Classification	Acres	Credits
Restoration	Freshwater Emergent Wetland and Freshwater Forested/Shrub Wetland	17.2	95.4

6.0 Mitigation Work Plan

The following mitigation work plan focuses on restoring the lost ecological functions of Old Channel Fourche Creek, the adjacent wetland areas, and the associated riparian and buffer zones. Primary components of the work plan include a Priority I stream restoration activity that reconnects degraded and disconnected hydrology and subsequent wetland functions to the floodplain, restoration of wetland/riparian vegetation, and exotic species eradication. The wetlands and riparian buffers of the project area will be re-vegetated in a succession of native trees, shrubs, grasses, and forbs designed to represent the natural system and encourage ecological diversity, specifically migratory bird habitat.

Another aspect to the project is the unique collaboration with Audubon Arkansas and EDG (Ecological Design Group) to establish an educational and outreach opportunity for visitors to the Port. Audubon routinely surveys the site and has created a list of known species found in the area. They have also developed a list of species the restoration project will attract. The site is within the radius of their MODUS monitoring station. EDG has designed a 2500LF elevated boardwalk for observation of wildlife, stream, and wetland ecology. Informational signs will be placed along the path and in the parking areas along Slackwater Harbor Rd (Figure 7).

Table 5: Phases and associated activities for the Triangle Park

Phase	Activity
I	Invasive species treatment/control
II	Priorty I channel construction
	Placement of boardwalk footers
III	Revegetation and hardwood plantings
	Boardwalk complete and signage posted

FIGURE 7: SITE PLAN

Table 6: Timeline of mitigation activity for the proposed Bank

Mitigation Activity	Timeframe
Initial site survey and planning	
Baseline documentation	
Geomorphological assessment	2024
Design	
Conservation easement	
Permitting	
Restoration activity	Winter 2025
Riparian buffer planting	Winter 2025
Monitoring Year 1	May-September 2025
Monitoring Year 2	May-September 2026
Monitoring Year 3	May-September 2027
Monitoring Year 4	May-September 2028
Monitoring Year 5	May-September 2029
Monitoring Years 5+	May-September 2030

6.1 Old Channel Fourche Creek

From north to south, Old Channel Fourche Creek is a perennial channel flowing approximately 1,900LF within the Triangle Park before exiting and realigning with the original channel and entering the Arkansas River. This section of stream has been ditched and manipulated for decades. Habitat loss, reduction of species diversity, and overall land degradation are the results of historic management practices. Assessments reveal a stream channel in varying degrees of degradation. Since the channel was cleared of vegetation and ditched in 2002, there is no longer any bedform complexity (riffle -pool sequences) or riparian habitat. Old Channel Fourche Creek is currently a Rosgen F channel type (Rosgen 1996). However, the slope and geomorphic parameters should actually be more akin to an E-channel type. Preliminary analysis of the geomorphic data highlights excellent opportunities for restoration, specifically new channel construction (Priority I) and reconnection to the historic floodplain (Table 6). The existing floodplain width is only available on the left descending bank, while the right floodplain is confined by the levee. These features will be remediated through stream and wetland restoration activities including:

a. Reconnection of Old Channel Fourche Creek to the historic floodplain through Priority I restoration;
b. Diversification of stream bedform complexity through the installation of constructed riffles, deepened pools, and revegetation of streambanks;
c. Control of invasive species; and,
d. Re-vegetation of the wetlands and riparian corridor with native forbs, grasses, shrubs, and trees (Figure 8).

Figure 8: Triangle Park conceptual stream design

Old Channel Fourche Creek	Length (LF)	Stream Segment	Restoration Activity
Reach I	215	STATION 0+00-0+215	Priority II stream enhanhacment of existing channel, riparian revegetation and control of non-native species.
		STATION 0+185	Plug existing channel and begin Priority I Restoration along Reach II
Reach II	985	STATION 0+215 -1+205	Priority I restoration begins. Install instream structures to mimic reference riffle/pool sequencing. Revegetate riparian corridor along entire reach.
Reach III	1,080	STATION 1+205- 2+285	Continue Priority I restoration. Install instream structures to mimic reference riffle/pool sequencing.Revegetate riparian corridor along entire reach.
Reach IV	545	STATION 2+285-2+830	Priority I restoration and floodplain grading where necessary. Invasive species control and revegetation.
Reach V	310	STATION 2+830- 3+135	Reconnect new stream to the existing channel / outflow. Enhance ditched segment with riparian plantings and instream structures.
Total	3,135		

The following serves as guidance for general construction:

- Avoid and minimize disturbance to potential and existing habitat. Disturbed areas will be stabilized using appropriate BMPs.
- Enhance areas of existing degraded habitat through weed control, spot-seeding of native and high-quality forage species, and riparian plantings.
- All seed will be either hand broadcast or seed drilled, and no motorized equipment will be permitted in the area after planting/seeding except for mowing the mesic prairie areas.

6.2 Wetlands

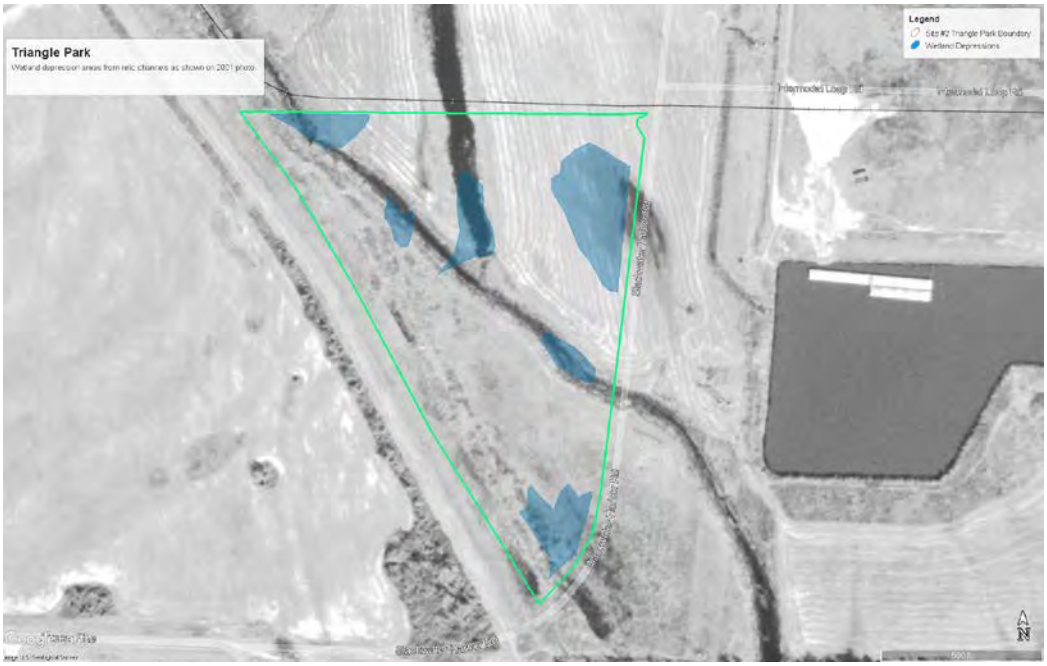
A formal wetland delineation was conducted in June 2024 (Attachment 3). The entire 26-acre project area displays indicators of hydric soils and hydrology. The vegetation is classified as problematic due to the current row crop plantings, abundance of invasive species, and lack of diversity. Portions of the site remain classified as a Freshwater Forested/ Shrub wetland (PF01AH).

During mid-summer the wetland area is planted with soybeans where possible. Post harvest, the area is routinely mowed to bare dirt. Invasive species such as *Sorghum halepense* (Johnson grass), *Vicia americana* (American Vetch), and *Alternanthera philoxeroides* (alligator weed) are prevalent throughout the site in the early growing season. Prior to new channel construction and revegetation, the invasive species will be treated both chemically and mechanically.

Existing wetland stressors include altered hydrology and managed vegetation (haying/ mowing/ crops). Addressing the invasive species is the first activity scheduled. Next, is the reconnection of Old Channel Fourche Creek to the floodplain by placing a plug in the existing ditch and constructing a new stream channel that will provide hydrologic connectivity to the existing depressional areas. The abandoned ditch

will remain open to serve as flood storage and wetland habitat. The result will be a rewetting of the hyporheic zone along the new channel while improving water storage, flood attenuation, and support of reptile and waterfowl habitat.

The wetlands will be managed in two sections: mesic prairie along the descending left bank of the channel and bottomland hardwood forest along the right. Currently, there are six distinct depressional areas formed by the relic channels which historically flowed through the property.



These micro topographical features will be restored and incorporated into the design in order to encourage habitat diversity for migratory birds (Figure 8). The half-mile elevated boardwalk will impact approximately 0.3 acres of wetlands. These estimated impacts are calculated in the Wetland Delineation Report Attachment II and will be deducted from the total number of credits produced. Along Slackwater Harbor Road will be an ADA accessible parking space and signage. In addition to stairs down to the boardwalk, there will be an ADA accessible path sloped at 5% grade (Figure 7).

Table 8: General summary and description of wetland areas, acreages, and description of restoration activities.

Type	Acres	Activity	Description
Bottomland Hardwood	**8.5**	Restoration	Augment species composition through strategic plantings of native trees, shrubs, and herbs to increase species variability.
			Eradicate noxious species. This will entail both manual and chemical efforts with specific consideration to effects on existing species.
			Reconnect channel to the floodplain and to the disconnected wetland areas.
Mesic Prairie	**9.5**		If necessary, grade excess sediment deposits to floodplain elevations. As a result, these wetland zones will be rewetted and restored.
			Realign channel planform with appropriate dimension and pattern to access former wetland zones and enhance existing wetlands.
			Revegetate with native gramminoids and forbs.

In the event the Bank Sponsor decides that modifications must be made to the restoration plan to ensure successful development of habitat within the Bank, the Bank Sponsor will submit a written request for such modification to the SWL for approval.

6.3 Riparian Buffer

The entire mitigation area will be re-vegetated through seeding herbaceous species and hand planting native woody species at a density of 302 stems/acre. A minimum 100-ft buffer will be maintained where property boundaries are allowed. During the dormant season, black willow (*Salix nigra*), bald cypress (*Taxodium distichum*), water tupelo (*Carya aquatica*), box elder (*Acer negundo*) and Sycamore (*Platanus occidentalis*) stakes will be placed along the streambanks of both the new Old Channel Fourche Creek and the existing channel. Tree seedlings will be planted in winter 2025-2026. The floodplain will consist of the appropriate floodplain/wetland species. No soil material will be removed from the mitigation site and construction activity will be modified to reduce impacts to the any archaeological areas, if defined. Depending on availability of seedlings, restored bottomland and riparian hardwoods shall consist of, but not be limited to, a combination of the following species:

Table 9: Depending on availability, species to be planted at the Bank may include, but are not limited to, those selected from the table below.

GRAMINOIDS			
Carex lupulina	Hop Sedge	*Helianthus angustifolius*	Swamp Sunflower
Carex lurida	Shallow Sedge	*Iris prismatica*	Slender Blue Iris
Carex Pendula	Nodding Sedge	*Verbesina alternifolia*	Wingstem
Panicum rigidulum	Red top panicum	**TREES AND SHRUBS**	
Panicum clandestinum	Deer tongue grass	*Nyssa aquatica*	Water tupelo
Andropogon virginicus	Broom-Sedge	*Taxodium distichum (L.) Ric*	Bald Cypress
Agrostis perennans	Upland bentgrass	*Quercus nigra*	Water oak
Juncus effusus	Lamp Rush	*Quercus palustris*	Pin oak
Scirpus cyperinus	Wool grass	*Quercus nuttallii*	Nuttall oak
Elymus virginicus	Virginia Wild Rye	*Quercus phellos*	Willow oak
FORBS		*Carya aquatica*	Water hickory
Pycnanthemum virginianum	Virginia Mountain-Mint	*Juglans nigra*	Black walnut
Asclepias incarnata	Swamp Milkweed	*Betula nigra*	River birch
Penstemon digitalis	Foxglove Beardtongue	*Salix nigra*	Black willow
Tradescantia ohiensis	Bluejacket	*Celtis laevigata*	Sugarberry
Liatris spicata	Dense Gayfeather	*Cornus drummondii*	Rough-leaf dogwood
Silphium perfoliatum	Cup-Plant	*Acer negundo*	Ash-leaf maple
Verbena hastata	Simpler's-Joy	*Prunus mexicana*	Wild plum
Bidens aristosa	Bearded Beggarticks	*Diospyros virginiana*	Persimmon
Eupatorium fistulosum	Joe-Pye weed	*Ilex decidua*	Deciduous holly
Helenium autumnale	Fall Sneezeweed	*Sambucus canadensis*	Elderberry
Mimulus ringens	Allegheny Monkey-Flower	*Platanus occidentalis*	Sycamore
Vernonia lettermannii	Narrow-Leaf Ironweed	*Fraxinus pennsylvanica*	Green ash

7.0 Operation and Maintenance Plan

The project will be developed and implemented by the Bank Sponsor in accordance with guidelines set forth in Section IV of the FBMB MBI (2017). The site will be maintained and monitored annually by the Bank Sponsor with reports submitted to the SWL for review following guidelines set forth in Section 9.0 below. Site monitoring will take place quarterly and following high flow events. Wetland and vegetative monitoring will be conducted during the growing season following parameters outlined in Section 8.0. Geomorphic data will be collected during leaf-off. Maintenance activities such as invasive species control and re-vegetation will be conducted as needed. The mesic prairie will require seasonal mowing to support prairie conditions.

8.0 Performance Standards

The overall performance standard and success criteria for stream and wetland compensation is demonstrable ecological lift. This lift will be measured through vegetative monitoring, geomorphic monitoring, biological surveys (where applicable) and qualitative stability indices. The performance standards will follow guidelines from the USEPA and USACE (2008) Compensatory Mitigation for Losses of Aquatic Resources, Final Rule and approved by the IRT and SWL.

The overall goal of the wetland restoration is to ensure that the soils, vegetation, and hydrology exhibit bottomland hardwood and mesic prairie characteristics. Wetland success criteria shall be evaluated using vegetative criteria, hydric soil indicators, and hydrology. Vegetative surveys will be conducted during the growing season with both planted seedlings and natural regenerative species documented.

- 1/10th acre randomized sample plots for wetland vegetation will be established within all planted tracts to determine the survival rate of planted species.
- The wetland vegetation dominance will be defined as a vegetation community where more than 50% of all dominant species are facultative or wetter.
- The positive indicators of hydric soils must be demonstrated within 12 inches of the soil surface. Soil samples, IRIS tubes, or other appropriate measures may be used as the positive indicator for hydric soils.
- Planted tracts must exhibit characteristics of viable Arkansas River alluvial valley wetlands and communities.
- Where trees are planted, a survival rate of 150 trees/acre of planted species at the minimum planting density of 302 trees/acre by Year 3.
- Adequate mid-story and ground cover will become established within 5 years. Establishment of 175 stems/ acre after five consecutive growing seasons. This figure will include natural recruitment but will not include exotic species. Natural recruitment is expected of green ash, persimmon, sycamore, elm, red maple, and other light-seeded species.
- Exotic vegetative species shall not comprise more than 20% of the stem density after 5 years of growth.

The overall goal for the stream compensation is to ensure that the dimension, pattern, and profile of the stream enhancement and restoration areas:

a. Remain within the natural range of variability for the desired stream type
b. Remain stable
c. Exhibit appropriate habitat diversity
d. Maintain healthy viable riparian buffers

The analysis of the streambank from the top of the bank to the ordinary high-water mark shall indicate a significant amount of natural protection to prevent streambank erosion that could jeopardize the stability of the streambank or the stream reach. The following measurements will be used to aid in making this determination each monitoring year:

- Where streambank plantings were undertaken: The numbers of live stakes, planted, or volunteer woody species providing bank stabilization from the top of bank to ordinary high-water mark shall be at least one living stem per 100 square feet per cross-section.
- Beginning Year 2, the individual Index Values of the Bank Erodibility Hazard Index (BEHI) rating for any identified reach shall be equal to or less than the previous year's Index Value. In addition, the Total Score shall be equal to or less than the previous year's Total Score and shall have a Total Score of "Moderate" by Monitoring Year 3, and a Total Score of "Low" by Monitoring Year 5.
- The U.S. Forest Service Stream Reach Inventory and Channel Stability Evaluation (Pfankuch, 1975) rating shall be "Good" each monitoring year, beginning with Year 2.
- The analysis of representative riffle cross-section shall indicate that it has neither aggraded, degraded, widened, nor narrowed to the point where it has become unstable or will cause instability. The measurements that will be used to aid in making this determination each monitoring year can be found in Table 10.
- The analysis of the plan-view survey or field measurements shall indicate that the stream is not migrating significantly to the point where it will cause significant bank erosion and cause instability. Since portions of these channels are restored passively, it is expected that some erosion will take place as a new stream channel is formed.
- The sinuosity of the stream does not increase or decrease by an amount greater than 0.5 of the approved as-built pattern.
- The thalweg of each channel cross-section does not move by more than 20% of the width of the approved as-built channel width in any given year.
- The analysis of the longitudinal profile shall indicate that the bed elevation has neither aggraded nor degraded to the point where it will cause instability.
- The analysis of the longitudinal profile does not indicate significant alterations in the locations, depths, and slopes of stream features.
- The analysis of the pebble count data shall not show a significant change in streambed materials to the point that indicates a shift in bedload material due to stream instability. The D50 size particle shall remain within its approved as-built size class (silt, sand, gravel, cobble, or boulder).

Table 10: List of stream and wetland function monitoring parameters measured in the Triangle Park

STREAM MONITORING		WETLANDS
Cross-section Parameters	**Longitudinal Parameter**	**Vegetation**
Dimension	**Pattern**	tree seedling survival
Bankfull Width (ft)	Channel Beltwidth (ft)	live stake count
Floodprone Width (ft)	Radius of Curvature (ft)	facultative herbaceous vegetation
BF Cross-sectional Area (ft^2)	Meander Wavelength (ft)	% coverage within plot
BF Mean Depth (ft)	Meader Width Ratio	photo reference
BF Max Depth (ft)	**Profile**	**Hydric Soils**
Width/Depth Ratio	Riffle Lenth (ft)	soil pits/redox tube percentages
Entrenchment Ratio	Riffle Slope (ft/ft)	photo reference
Wetted Perimeter (ft)	Pool Length (ft)	**Hydrology**
Hydraulic Radius (ft)	Pool Spacing (ft)	photo reference
Substrate		visual observations
d50(mm)	**Additional Reach Parameters**	HGM classification
d84(mm)	Valley Length (ft)	
	Channel Length (ft)	
	Sinuosity	
	Rosgen Classification	

9.0 Monitoring Requirements

Monitoring will be conducted by the Bank Sponsor for five years or until the SWL determines the project is complete. Monitoring reports will be submitted annually to SWL for five years or until the Bank is closed. Permanent cross-sections, longitudinal feature parameters, and wetland monitoring stations will be established following the guidelines set forth in the Little Rock Stream Method (USACE 2011) and Section 8.0 above. The reports will include specific details of mitigation activities, a summary of the monitoring results, and a summary of maintenance and monitoring actions implemented.

10.0 Long-term Management

Long-term management will be conducted by the Bank Sponsor following the guidelines set forth in Section V(H). At a later time, and with approval from the SWL, the Bank Sponsor may designate a long-term steward or an entity to act as steward. The primary goal of the Bank is to create a self-sustaining natural aquatic system that achieves the intended level of aquatic ecosystem functionality with minimal human intervention, including long-term site maintenance. Natural changes to the vegetative community that occur after all Bank performance standards have been met are not expected to require remediation.

11.0 Adaptive Management

Upon a determination by the SWL that performance standards have not been met or the compensatory mitigation project is not on track to meet those standards, the monitoring period may be extended. The SWL may also revise monitoring requirements when remediation and/or adaptive management are required. In the event that the success criteria have not been met, remedial action will be taken within the first growing season. The approved Adaptive Management Plan will be implemented by the Sponsor to address each identified deficiency. The Adaptive Management Plan will identify specific measures to be taken and a timetable to complete the work to correct deficiencies.

12.0 Financial Assurances and Responsibilities

The Bank Sponsor will be responsible for securing USACE approved financial assurance mechanism for the monitoring and maintenance associated with the Bank and to monitor and maintain the Bank throughout its operational life in accordance with Section III(C) of the MBI.

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