

United States Department of the Interior
National Park Service

National Register of Historic Places
Registration Form

LISTED
5-2-88

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See Instructions in Guidelines for Completing National Register Forms (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

1. Name of Property

historic name Marked Tree Lock and Siphons

other names/site number St. Francis River Lock and Siphons

2. Location

street & number on the St. Francis River

N/A not for publication

city, town Marked Tree

vicinity

state Arkansas

code 05

county Poinsett

code 111

zip code 72356

3. Classification

Ownership of Property

- private
- public-local
- public-State
- public-Federal

Category of Property

- building(s)
- district
- site
- structure
- object

Number of Resources within Property

Contributing	Noncontributing
<u>2</u>	<u> </u> buildings
<u> </u>	<u> </u> sites
<u>3</u>	<u> </u> structures
<u> </u>	<u> </u> objects
<u> </u>	<u> </u> Total

Name of related multiple property listing:

N/A

Number of contributing resources previously listed in the National Register

N/A

4. State/Federal Agency Certification

As the designated authority under the National Historic Preservation Act of 1966, as amended, I hereby certify that this nomination request for determination of eligibility meets the documentation standards for registering properties in the National Register of Historic Places and meets the procedural and professional requirements set forth in 36 CFR Part 60. In my opinion, the property meets does not meet the National Register criteria. See continuation sheet.

Catherine St. Porfand
Signature of certifying official

3-12-88
Date

Arkansas Historic Preservation Program

State or Federal agency and bureau

In my opinion, the property meets does not meet the National Register criteria. See continuation sheet.
N/A

Signature of commenting or other official

Date

State or Federal agency and bureau

5. National Park Service Certification

I, hereby, certify that this property is:

entered in the National Register.
 See continuation sheet.

determined eligible for the National Register. See continuation sheet.

determined not eligible for the National Register.

removed from the National Register.

other, (explain:)

Signature of the Keeper

Date of Action

6. Function or Use

Historic Functions (enter categories from instructions)

Transportation/water-related

Government/public works

Other: flood control

Current Functions (enter categories from instructions)

Government/public works

Other: flood control

7. Description

Architectural Classification (enter categories from instructions)

Other: lock

Other: siphon

Materials (enter categories from instructions)

foundation Concrete

walls N/A

roof N/A

other Metal/steel

Concrete

Describe present and historic physical appearance.

SUMMARY:

The Marked Tree Lock and Siphons are located approximately nine miles north of Marked Tree, in Poinsett County. The lock sits on an abandoned artificial channel of the St. Francis River, at the intersection of the Right Hand Chute of Little River Floodway with the St. Francis River Floodway. The siphons are located approximately 646 feet northeast of the lock, on the river and astride a closing levee or dam. The lock is constructed primarily of cast concrete, with a brick operating house. Basins and footings for the siphons are also concrete, and the siphon tubes are steel. Designed to function as an interrelated system, the lock and siphons represented both traditional and unconventional solutions to the problem of maintaining the St. Francis River as a navigable stream, while protecting habitable and productive lands from floods. The siphons' design is also, in part, a compromise with and adaptation to the topography of the St. Francis River Basin and is a unique application of an engineering structure of its type.

ELABORATION:

The Marked Tree Lock is a reinforced concrete trench or trough 130 feet long, twenty-four feet wide, and thirty feet deep. Designed by Pride and Fairley of Blytheville, Arkansas, and Elliott and Harmon Engineering Company of Memphis, Tennessee, the lock was built by the McWilliams Construction Company of Memphis for approximately \$149,000. Located on an old artificial channel of the St. Francis River, the lock was completed in 1926 to allow passage from the St. Francis River Floodway to the original channel of the river after a sluiceway and closing levee were constructed. Four reinforced concrete gates and four vertical lift head gates regulated flow through the lock. The lock's operating house is a small, square, load-bearing brick, one room structure with a hip roof sheathed with composition shingles. On the north elevation, a door is centered and flanked on the west side of the elevation by a six pane casement window. On the east elevation, three six pane casement windows stretch across the side and overlook the lock. Only a single window of the same type is located on the west end of the south elevation. A single six pane casement window is centered in the west elevation. Curved rafter ends represent the only architectural details and reflect Craftsman influences. The lock is no longer used and, by December 1971, the lock gates were removed, its old channel was filled, the levee was extended across the trench, and the roadbed was continued across the lock fill.

X See continuation sheet

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The Marked Tree Siphons replaced a concrete sluiceway which provided flow for navigation on the St. Francis River between Marked Tree and Wittsburg from 1926 to 1936. The siphons were designed and constructed by the Corps of Engineers Memphis District Office. Concrete basins and footings were constructed by List and Weatherley of Kansas City. Placed in operation on June 7, 1939, the siphons include the following structures: intake basin, siphon tubes, operating house, outlet basin, and trash barrier. The closing levee and the relative elevations of all structures are also essential elements in the function and operation of the siphons.

The intake basin is a 45.3 foot long submerged reinforced concrete box. The basin narrows from sixty-eight feet wide upstream to sixty feet wide at the siphon tubes and is supported on a sheet piling cell. Elevation of the basin floor is 198.3 feet above Mean Gulf Level (MGL), or five feet below the intake end of the siphon tubes. The trash barrier is located upstream from the intake basin and is constructed of timber pilings and wales. Because of deterioration, it is no longer effective.

The original levee, completed in 1926, was constructed under War Department permit at the point of intersection with the St. Francis River. Damaged in 1938, it was repaired and replaced with a closing levee composed of rolled fill. The levee crown was set at El. 229.0 MGL.

The outlet basin is also a reinforced concrete box constructed similar to the intake basin. The distance between the intake and outlet basins, or the base width of the levee, is 172.3 feet. The basin widens from sixty feet at the tubes to ninety-six feet downstream. Set at El. 190.0 MGL, the floor of the 75.5 foot long basin is nine feet below the outlet of the siphon tubes. The difference in elevation between the floor of the intake basin and the outlet basin floor is 4.3 feet.

The three siphon tubes are each nine feet in diameter and 228 feet long. Assembled in eight foot lengths and electronically welded to reduce friction, the completed tubes conform to the shape of the levee. The nine foot sections are three-eighths inch thick, while the flared intake and outlet ends are one-half inch thick. Structural steel angles are employed as reinforcing bands to prevent the tubes from collapsing under high vacuum. The tubes are anchored at the summit of the levee, with additional footings located at twenty foot intervals. Except for the summit foundation, the footings have sliding seats to allow for expansion and contraction of the tubes with temperature changes. The tube ends are supported on the back wall of each basin. The tubes are air tight and the ends submerged in water in the outlet and intake basins. A wooden trestle bridge spans the siphon tubes.

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The siphons are primed by exhausting the air from the three tubes with a vacuum pump in an operating house. As the air is removed through valves located at the highest point of each tube, water flows in at each end until the tube is filled. The vacuum pump is then stopped. Because hydrostatic force due to gravity is greater on the longer leg of the siphon, the water moves toward the lower vessel, or the outlet basin. After the flow is begun, it is self-sustaining. The flow of water can only be regulated by operating one or more pipes at a time.

Machinery for operating the vacuum pumps is housed in a one room, rectangular, frame building located adjacent and to the west of the siphon tubes and south of the trestle bridge. The hip roof of the operating house is sheathed with composition shingles and the walls are sheathed with novelty siding. Rafter ends are exposed. Set on the levee slope, the building's concrete slab foundation rises from ground level on the north end to approximately three feet high on the south end. The single door is located on the north edge of the facade, or west elevation. Two double-hung, six-over-six windows, presently boarded over, frame a centrally fixed Corps of Engineers plaque on this elevation. On the north and south elevations, single, centrally located double-hung, six-over-six windows are the only features. They are also boarded over. Identical windows on the rear, or east, elevation flank three, six inch diameter vacuum pipes which lead to the automatic valves on the siphon tubes. Only the window on the north end of this elevation is boarded over. A six inch diameter exhaust discharge pipe also pierces the wall below the window located on the south end of the elevation.

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efforts to reclaim the fertile land. The Basin's drainage problems were intensified by the New Madrid Earthquakes of 1811-1812, as caved banks and felled trees along the St. Francis and other rivers created vast rafts which inundated large portions of the area and convinced observers of the disaster's aftermath that the region had subsided.

In 1836, a report to the Senate Committee on Commerce described the course of the St. Francis River from Cape Girardeau to Helena: "The greater part of the area . . . is covered by an immense morass, inundated by the overflowing of the 'Father of Waters,' or submerged by the rushing torrents from the neighboring hills. . . . These streams . . . spread over the country, giving it the appearance of a vast Lake over which magnificent forests of Cypress and other gigantic trees wave their branches in gloomy solitude." Only the "lost hills" of Crowley's Ridge dominated a region "annually covered by water, and at all seasons by a heavy growth of timber [and] thick cane-breaks closely interwoven by many plants . . ."

In 1840 and 1842, original surveyors of these lowlands encountered broad expanses submerged under three to four feet of water much of the year. In addition, timber and other growth often extended from one to one-and-a-half miles into the flooded areas. Confounded in their attempts to establish section lines, the surveyors instead meandered along the edges of the impassable reaches and listed large portions of the St. Francis Basin as lakes or "Sunk Lands" on survey plats. The largest such area in Poinsett County was Lake St. Francis, which reached depths of up to fifteen feet as the river bed was neared. The lake, which began six miles north of Marked Tree, extended a distance of twenty-four miles and broadened to a width of twelve miles.

Most of the St. Francis River Basin was patented under the 1850 Swamp Land Act. Designed to help Arkansas and other states retrieve their lowlands from flood waters and impaired drainage, the act granted the states all unsold federal lands judged "swamp and overflowed lands, unfit thereby for cultivation." The intent of the legislation was to allow the states, by sale of the swamp lands, to raise revenue exclusively for the construction of levees and drains to reclaim the lands. The Surveyor-General initially approved 428,620 acres of swamp lands in Poinsett County, the fifth largest amount in any Arkansas county. Land patented as swamp land was sold and auctioned for fifty cents to \$1.25 per acre.

Early efforts at flood and drainage control were sporadic and largely futile. The fragile levees, derided as "mud pies," were virtually useless during Mississippi River floods which occurred with relentless frequency in 1858, 1862, 1867, 1882, 1884, and 1890. Organized levee construction in the Basin began in 1893 with the formation of the St. Francis Levee District, which was unable to control an equally disastrous flood only four years later. The

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1897 flood prompted some engineers to suggest to the Senate Committee on Commerce that the still largely unsurveyed St. Francis Basin be depopulated and divided into a series of reservoirs. In the justification for this suggestion, Mississippi River Commission Engineer J. A. Ockerson explained: "We know, in a general way, that [the Basin] is filled with sloughs, swamps, and ridges, and that only about 15 per cent of it is cleared land."

The Commerce Committee rejected Ockerson's plan as impractical and continued to rely on the inconstant system of levees. Floods continued to occur, also, most notably in 1903, 1912, 1913, 1915, and 1916. With the accumulation of disaster, Congress finally responded. The Ransdell-Humphreys Flood Control Act of 1917 reaffirmed the Federal government's commitment to flood prevention and control, although the \$45 million appropriation was insufficient. Local interests were encouraged by a provision of the act which reduced their contribution to one-half the cost of flood prevention works in their area, from the two-thirds previously required.

Efforts to control the river upstream only intensified the severity of floods in the unprotected areas downstream. In 1917, Senator Thaddeus R. Caraway warned the "prominent men in Eastern Arkansas" that Missouri intended to divert the overflow from the Ozarks and "turn the entire column loose on Arkansas." Caraway counseled Arkansans to seek an injunction against the Missouri improvement districts until the United States government canalized or dredged the St. Francis River to control the increased volume of water. A solemn editorialist for the Marked Tree Tribune agreed and warned that, if the Missouri projects were completed, "the entire St. Francis basin will become a wilderness of water . . ."

In the same year, with the renewed interest in flood prevention, the Arkansas General Assembly passed Act 193, which created Drainage District Number Seven in Poinsett County. The District boundaries, which originally encompassed the lands between Crowley's Ridge and the St. Francis River and Lake, were amended in 1919 to eventually include 190,000 acres in eastern Poinsett County. In 1919, the District, one of the largest in the country, began a series of ambitious, interrelated projects designed to reclaim "the lands therein by drainage ditches and levees." The first concern was management of waters which entered Poinsett County from adjacent counties. On the north boundary of the county, levees which enclosed Lake St. Francis were continued from Craighead County, and, in the northeast, Mississippi County's Drainage District Number Seventeen floodway was extended into the Lake St. Francis floodway. Even before this influx of additional water, in flood periods the St. Francis River left its channel near the foot of Lake St. Francis and flowed unchecked through Sand, Willow, and Flag Sloughs, periodically flooding much valuable agricultural land before it reentered its channel near Wittsburg.

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District Engineer Pride and Fairley of Blytheville, Arkansas, and Consulting Engineers Elliott and Harmon Engineering Company of Memphis, Tennessee, were instructed to draft a comprehensive drainage plan for the district. To stabilize and control the tortuous St. Francis, Drainage District Number Seven planned to strictly regulate the river's flow north of Marked Tree and divert overflow water to the Steep Gut Floodway, a one mile wide artificial, 20,000 acre channel which would be constructed from the foot of Lake St. Francis to the Poinsett-Cross county line. The district proposed to dam the river about nine miles north of Marked Tree and preserve a normal flow--2,600 c. f. s. --in the original channel. A second channel and a lock would maintain navigability at the point a closing levee was established. Finally, a sill would be constructed across the floodway entrance at a height of 210.25 feet above Mean Gulf Level. The only outlet for waters below that level was the sluiceway, while levees channeled waters in excess of that level down the floodway.

The St. Francis River was designated navigable to Wappapello, Missouri, and carried a considerable traffic of lumber, log rafts, and boats. On January 4, 1924, the War Department granted a permit to construct sluices, a lock and its approaches, and a floodway sill on the condition that Drainage District Number Seven maintain the normal flow of the river in the original channel. On September 21, 1923, the McWilliams Construction Company of Memphis was awarded a contract to build Improvement Number 89--a sluiceway, or gated concrete box which contained four barrels eight feet by six feet in diameter, two hundred feet long. The sluiceway, which cost approximately \$50,000, regulated the volume of river flow through the closing levee. On March 25, 1924, McWilliams also received the contract for Improvement Number 88, a lock which would allow river traffic to continue around the sluiceway. The Steep Gut Floodway, lock, and sluiceway were completed in 1926, just prior to the flood of 1927, which destroyed many of the Drainage District's levees.

In 1928, in response to the previous year's devastating overflow, Congress approved the Flood Control Act, which formalized the Jadwin Plan for flood control in the Mississippi Valley. The plan, espoused by Edgar Jadwin, Chief of the Corps of Engineers, again rejected the revived scheme for converting the St. Francis Basin into a reservoir. Instead, Jadwin recommended raising the Basin's levees an average of three-and-one-half feet above their current grade and increasing the width of the Steep Gut Floodway to two miles. The improvements were completed by 1934 and enabled the floodway to carry twice its previous flow at the same stage.

Satisfaction with the new improvements was tempered by fatal problems experienced with the sluiceway in the previous year. In 1933, forty feet of the outlet end of the sluiceway broke and dropped to a thirty degree angle, which caused a portion of the levee to collapse. A row of piles constructed

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to protect the levee from further caving permitted the continued operation of the damaged sluiceway until 1936. In that year, the Flood Control Act was amended to include the St. Francis and Little Rivers in its protection, and an inspection of the sluiceway by the Corps of Engineers in October revealed the levee had seriously eroded. Flow was stopped and navigation of sixty-four miles of the St. Francis River from Marked Tree to Rittsburg was effectively halted.

The District's levees and other projects sustained damage in the 1937 flood and, in April 1938, the Jadwin Plan was amended to include the \$21,700,000 St. Francis River Basin Flood Control Project in Missouri and Arkansas. The project, under the direction of U. S. District Engineer Major Daniel Noce, was designed to protect one million acres in Arkansas, and in Poinsett County included repair and strengthening of existing levees and construction of new levees on the St. Francis and Little Rivers.

Flow of the St. Francis River between Marked Tree and Rittsburg remained interrupted and river traffic disrupted, however. Before the damage to the sluiceway, lockings through the companion lock averaged 750 per month. Logging interests threatened a lawsuit if navigation, halted since October 1936, was not restored. In December 1937, the Corps of Engineers began what were intended to be permanent repairs to the sluiceway. On May 7, 1938, as Corps and Drainage District personnel worked to repair the sluiceway, high waters crevassed the levee and washed out a ninety foot gap. The sluiceway settled and was damaged beyond repair, the District's hydroelectric plant was destroyed, and nearly 2000 acres were flooded. Over the next two weeks, up to eight hundred men, many from the National Re-employment Service, worked desperately to stabilize the levee and prevent further damage. By October, the break was finally repaired, the remains of the sluiceway removed, and the river dammed, its flow again diverted down the floodway.

According to Corps Engineers, the sluiceway and levee failed because they were constructed on an underlying strata of fine sands which tended to become "quick" when saturated. The only satisfactory sluiceway replacement employed cellular sheet piling in the foundation, which was judged prohibitively expensive. Because of the cost, as well as concern for the safety of the levee and any structure on the uncertain foundation, the Memphis District Corps of Engineers Office announced it would permanently dam the levee gap, but, "instead of passing water under or through the dam, water will be siphoned over it."

From December 1938 to June 1939, Memphis District Engineers Noce, Major James D. Andrews Jr., Capt. F. J. Wilson, George C. Ross, and Lt. C. L. Evans designed and installed the Marked Tree Siphons. In addition, A. B. Wood and Wade Barnett of the Sewerage and Water Board of the City of New Orleans served as

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consulting engineers. Constructed in the Memphis District shops under the supervision of Ross, the three, nine foot diameter, 228 feet long, electronically welded steel tubes were among "the largest in the world." At a cost of \$215,000, the siphons were \$72,000 cheaper than a satisfactory culvert. Because of the size of the siphons, there was little existing data on their probable action or effectiveness. According to Andrews, "the hydraulic design became one of a pioneer nature largely based on sound reasoning rather than precedent." At least one engineer expressed reservations about the Corps' reasoning. At a meeting of the Board of Directors of Drainage District Number Seven, L.L. Ridinger, Chief Engineer for the District stated his past experience with siphons had proven they were not satisfactory.

On June 7, 1939, the siphons were placed in operation. On June 8, hundreds of spectators, including engineers from Washington, D.C., and Vicksburg, Mississippi, attended the dedication barbecue and fish fry. As Peggy Wilson, daughter of Capt. Wilson, christened the Marked Tree Siphons with champagne, Curtis Dewey, president of the board of directors of the drainage district, pulled the switch to start the flow. A correspondent for the Marked Tree Tribune who witnessed the dedication incredulously reported: "A whole river was lifted 30 feet across a dam and deposited on the other side." In his address, Noce described the project as the only siphons of their type in the world and as "unique in the annals of engineering."

In July and August 1939, tests of the new siphons proved all reservations about their operation were groundless. The tests, conducted by the Memphis District Office and the U.S. Waterways Experiment Station, revealed the siphons operated 20 percent more efficiently than anticipated. Model tests of the "pioneer" project were not conducted until 1941, by Richard A. Markey Jr. at the Massachusetts Institute of Technology.

Constructed by the Corps of Engineers for Drainage District Number Seven, the siphons have been operated and maintained by the District since 1939. Emphasizing the experimental nature of the siphons, operating and maintenance procedures were never formalized and have been the subject of some controversy. The lock is no longer used. In 1971, its old channel was filled and the levee extended across the lock.

The St. Francis River is no longer navigated by log rafts and steamboats and the original justification for the lock and siphons is no longer valid. In 1983, however, a Corps of Engineers justification report on the repair of the siphons recognized a number of additional benefits provided by their continuance. Because abandonment of the siphons would permanently divert the St. Francis River down its floodway, they provide for preservation of the old channel. The siphons also facilitate control of the St. Francis Lake for

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recreational purposes, such as sport fishing and hunting, and for commercial fishing. They also have a role in flood control, providing some "flood fight capability" in emergency operations for relief of the floodway, and benefit "lake farming" in the floodway, delaying the lake rise and prolonging the short crop season in the affected area.

The Marked Tree Lock and Siphons were essential elements in the St. Francis River Basin Flood Control Project, a major component in the U.S. Army Corps of Engineers flood control plan for the Mississippi River Valley. The Marked Tree Siphons are also a unique engineering achievement and, according to Corps engineers, the only siphons of their type in the United States.

9. Major Bibliographical References

Previous documentation on file (NPS): N/A

- preliminary determination of individual listing (36 CFR 67) has been requested
- previously listed in the National Register
- previously determined eligible by the National Register
- designated a National Historic Landmark
- recorded by Historic American Buildings Survey # _____
- recorded by Historic American Engineering Record # _____

See continuation sheet

Primary location of additional data:

- State historic preservation office
- Other State agency
- Federal agency
- Local government
- University
- Other

Specify repository:

Memphis District Office, Corps of Engineers
Drainage District Seven of Poinsett Co.

10. Geographical Data

Acres of property 5.25

UTM References

A 15 732880 3940890
 Zone Easting Northing

C _____ _____ _____

B _____ _____ _____
 Zone Easting Northing

D _____ _____ _____

See continuation sheet

Verbal Boundary Description

The boundary of the Marked Tree Lock and Siphons is shown as the solid line on the accompanying map entitled "General Plan, Marked Tree Lock and Siphons."

See continuation sheet

Boundary Justification

The boundaries of the nominated district contain the structures and buildings most closely associated historically with navigation and flood control of the St. Francis River: the lock, the siphons and their basins, the operating houses for both structures, and the closing levee connecting the structures.

See continuation sheet

11. Form Prepared By

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 city or town Little Rock

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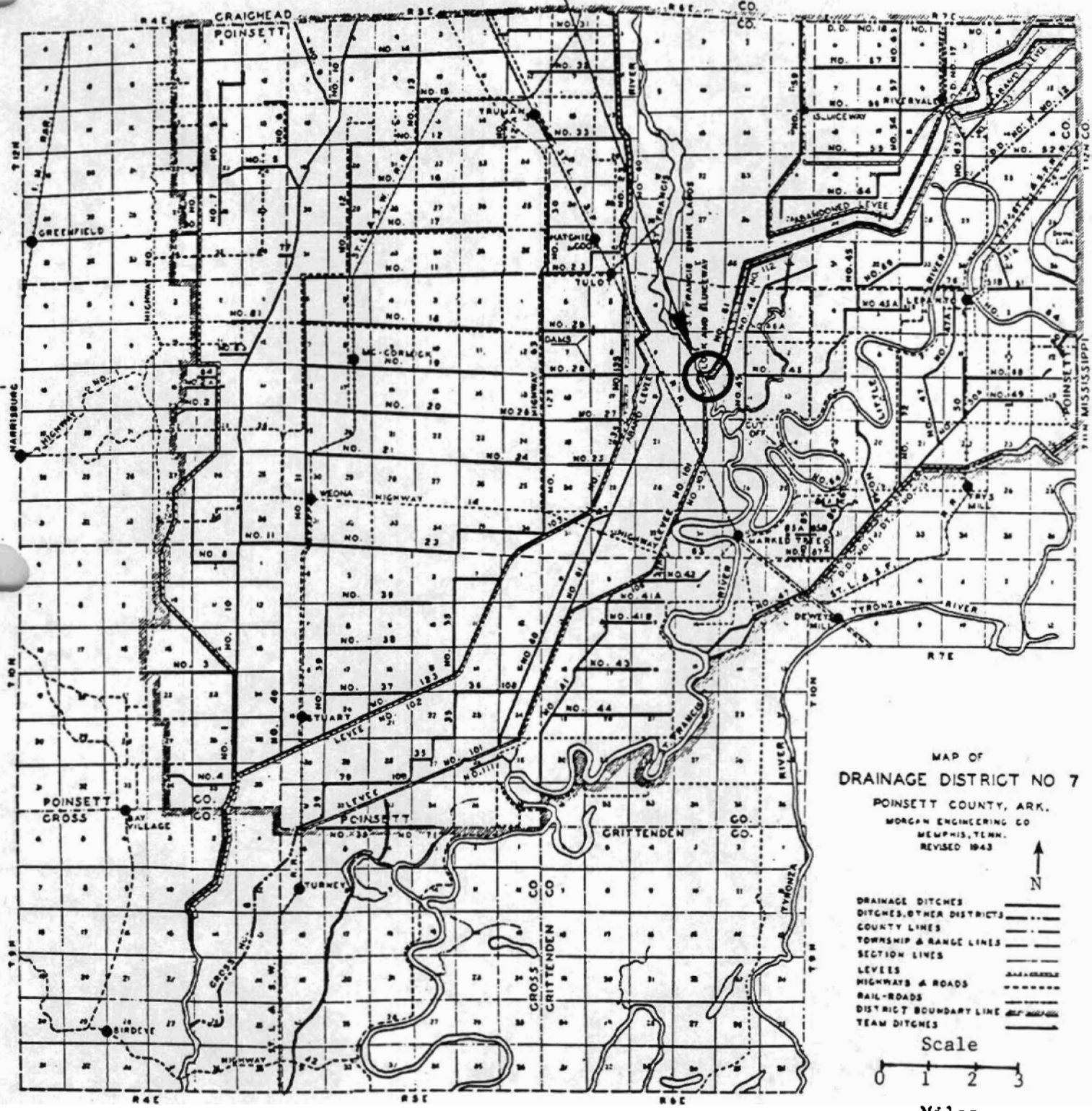
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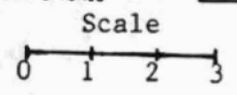
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Marked Tree Lock and Sluiceway



MAP OF
DRAINAGE DISTRICT NO 7
 POINSETT COUNTY, ARK.
 MORGAN ENGINEERING CO
 MEMPHIS, TENN.
 REVISED 1943

- DRAINAGE DITCHES
- DITCHES, OTHER DISTRICTS
- COUNTY LINES
- TOWNSHIP & RANGE LINES
- SECTION LINES
- LEVEES
- HIGHWAYS & ROADS
- RAIL-ROADS
- DISTRICT BOUNDARY LINE
- TEAM DITCHES



Miles

Marked Tree Lock and Siphons

VIC. MARKED TREE, POINSETT COUNTY

QUADRANGLE: Marked Tree, Arkansas

Scale: 25'

UTM Ref: 15/732880/3940890

