

8-2013

Dammed Arkansas: Early Developments in How Arkansas Came to Be a Dammed State, 1836-1945

Mary Suter

University of Arkansas, Fayetteville

Follow this and additional works at: <http://scholarworks.uark.edu/etd>



Part of the [United States History Commons](#), and the [Water Resource Management Commons](#)

Recommended Citation

Suter, Mary, "Dammed Arkansas: Early Developments in How Arkansas Came to Be a Dammed State, 1836-1945" (2013). *Theses and Dissertations*. 891.

<http://scholarworks.uark.edu/etd/891>

This Dissertation is brought to you for free and open access by ScholarWorks@UARK. It has been accepted for inclusion in Theses and Dissertations by an authorized administrator of ScholarWorks@UARK. For more information, please contact scholar@uark.edu, ccmiddle@uark.edu.

DAMMED ARKANSAS: EARLY DEVELOPMENTS IN HOW ARKANSAS
CAME TO BE A DAMMED STATE, 1836-1945

Dammed Arkansas: Early Developments in How Arkansas
Came to Be a Dammed State, 1836-1945

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in History

by

Mary C. Suter
Indiana University at South Bend
Bachelor of Arts in History, 1979
The George Washington University
Master of Arts in Museum Studies, 1981

August 2013
University of Arkansas

This dissertation is approved for recommendation to the Graduate Council.

Dr. Jeannie M. Whayne
Dissertation Director

Dr. Elliott West
Committee Member

Dr Patrick Williams
Committee Member

ABSTRACT

The need to manage the rivers of Arkansas has been a driving force in developments that have resulted in dramatic changes to the geographical “face” of Arkansas over the last 200 years. These changes are the creation of man-made lakes throughout the state, where before, there had been none. The many lakes that dot the Ozarks and the Ouachitas were created by dams. There are 1,251 dams over 25 feet in height, or that impound more than 50 acre-feet of water, in Arkansas, and uncounted smaller dams. No matter their size, dams were constructed to manage the rivers and streams of the state for flood control, power development, navigation, municipal water supply, recreation, irrigation, and for other uses. Between 1836, when Arkansas became a state, to 1945, there were 112 dams constructed in the state. This study examines the historical context of dams that were built before 1945, when the construction of dams was more local, less politicized, and less complicated. It examines the purposes for which dams were constructed, who built them, and why. It is based on the National Inventory of Dams database, which records all dams in the United States and territories that are over 25 feet in height, or that impound more than 50-acre-feet of water. While the NID is not an exhaustive list of all the dams in Arkansas, it is an invaluable tool for identifying dams by year completed, primary purpose, owner type and owner name, all of which are an entry point for discussing the history of dams in Arkansas.

ACKNOWLEDGEMENTS

I would especially like to thank Dr. Jeannie Whayne for her patience with me, her guidance and suggestions, her patience, her encouragement and support, and her patience. I would like to thank my committee, Dr. Elliott West and Dr. Patrick Williams, for their valuable comments and suggestions.

I would also like to thank all the fine folks who let me quiz them about dams they have known: Bobby Pharr, Jonathon and Troy at Russellville, Ken Sullivan, Charles Booth, Donnie Kilgore, Pat Mullen, and Jim Johnson. You were all immensely helpful.

On a personal level, I owe a big ‘thank you’ to Marie Imus for timely assistance, valuable suggestions, and for letting me bounce thoughts and questions off her. I would like to thank Dr. Katie Cleek for her material assistance, support, and encouragement, and Dr. Nancy McCartney for her support and encouragement.

I would like to thank my Mom, my sisters, especially Martha and Suzanne, my brothers, and all my friends, especially Marie, Rimke Haringsma and Diann Berger, and the late Dr. Williard Gatewood, for believing in me – that I could and would eventually complete this study.

Thanks also go to the staff of the Arkansas Archeological Survey, especially Lela Donat, for their assistance, support, and encouragement. And I can’t forget the very helpful staff in the Interlibrary Loan Department of Mullins Library. Some days, I think they went above and beyond to honor my requests. Also at Mullins, a big thank you to Geoff and everyone in Special Collections, who were truly helpful.

But mostly, this is for my Dad, who taught me to appreciate dams.

TABLE OF CONTENTS

CHAPTER 1: INTRODUCTION	1
CHAPTER 2: FLOOD CONTROL DAMS	21
CHAPTER 3: POWER DAMS	67
CHAPTER 4: NAVIGATION DAMS	96
CHAPTER 5: MUNICIPAL WATER SUPPLY DAMS	108
CHAPTER 6: RECREATION DAMS	140
CHAPTER 7: IRRIGATION DAMS	162
CHAPTER 8: CONSEQUENCES	170
CONCLUSION	184
A NOTE ON METHODOLOGY	186
A NOTE ON THE NATIONAL INVENTORY OF DAMS DATABASE.....	190
TABLES	192
BIBLIOGRAPHY	202

CHAPTER 1: INTRODUCTION

Managing the rivers of Arkansas was a driving force in developments that have resulted in dramatic changes to the geographical “face” of Arkansas over the last 200 years. These changes should be obvious every time the Arkansas Department of Parks and Tourism runs a “Things to Do in Arkansas” advertisement featuring jet skiers and fishermen on beautiful, scenic lakes. Recreation is just one of the many uses of lakes in Arkansas. Arkansas lakes also provide water for cities, for irrigation of farm land, and for navigation pools to facilitate the movement of ships and barges through locks on the rivers. But there is irony in featuring Arkansas lakes in ads touting “The Natural State.” Because there is nothing “natural” about those lakes.

Most of the lakes in Arkansas, particularly the scenic lakes in the Ozarks and Ouachitas, are man-made. The lakes are really reservoirs, waters impounded by dams. Dams and their impounded reservoirs are usually discussed in relation to their purpose. Those purposes include flood control, the generation of electricity, navigation, municipal water supply, recreation, and irrigation. Many dams are multiple-purpose dams, built for a primary purpose such as flood control, but with secondary purposes such as for hydropower, water supply, and recreation. Most of the large reservoirs that have changed the landscape of Arkansas were built after World War II. They are the large, multiple-purpose dams built by the federal government, recreation and fish and wildlife ponds built for the state, and municipal water supply dams built by local governments, and irrigation dams built by private individuals. But before the post-war dams were built, the pattern of damming the rivers and streams of the state was set in the 19th and early 20th century.

This study is an investigation of the patterns that developed in the construction of dams in Arkansas in those early years, from statehood to World War II. It is not so much concerned with

the types of dams that were constructed, be they earth, rock-fill, masonry, or concrete, nor in how small or large they are, as it is in why they were built and who built them. It starts by placing the construction of dams in a national and historical context, which is especially important in relation to flood control, hydroelectric, and navigation dams. Then it steps back in time to examine how Native Arkansans dealt with some of the problems that dams were later designed to remedy. It then looks at local and regional developments and problems with water that set Arkansans on a course that led to the construction of dams to solve those problems. In the process, it surveys the major purposes for which dams were built, and discusses the consequences to the state of those dams. It is not comprehensive. It is intended to show the patterns of dam building that had emerged by 1945, because after World War II the federal government became a major, and in some cases dominant, participant in funding and constructing dams. At that point, the story becomes less local, less personal, and much more complicated. I therefore present the years 1836-1945 as a period in which dams were built for a specific local purpose through the efforts of local people, but which set the precedent for dams that are being constructed to this day.

There is no definitive count of the number of dams in Arkansas. There are three sources where a figure for the number of dams can be found: The National Inventory of Dams (NID), the Geographic Names Information System (GNIS); and the Arkansas Natural Resources Commission (ANRC) database. The NID is maintained by the U.S. Army Corps of Engineers. It tracks dams that equal or exceed 25 feet in height and exceed 15 acre-feet in storage, and dams that equal or exceed 50 acre-feet storage and exceed 6 feet in height.¹ The GNIS is maintained by the United States Geological Survey and it tracks dams as features on U.S. Geological Survey

¹ National Inventory of Dams (www.geo.usace.army.mil/)

topographic maps.² Since 1957, Arkansas has tracked dams that are over 25 feet high and impound 50 acre-feet or more of water.³

There are numerous small dams that are not recorded on any of these databases. In Washington County alone some examples are the mill dam at War Eagle, the city lake dam in Elm Springs, and the old water supply dam in downtown West Fork. For convenience if not accuracy, dams not in the NID database will be referred to as “small dams.”

Because the NID database tracks by far the greatest number of dams in Arkansas, in this survey statistics relating to number, owner, and purpose of dams will be from the NID database, unless otherwise noted. In addition, the NID database tracks date of completion for recorded dams and is therefore an indispensable guide to the chronology of Arkansas dams.

The National Inventory of Dams lists 1251 dams in Arkansas,⁴ 555 that equal or exceed 25 feet in height, 693 under 25 feet, and 3 with no height recorded. The number of dams storing 50 acre-feet of water or more is 1222, leaving only 26 storing less than 50 acre-feet, and 3 with no storage amount recorded.

All of the major types of dams are represented in Arkansas. Earth dams are by far the most numerous. Of the NID dams, 1137, or 91%, are earth dams. The next most numerous type is rockfill. There are 29 rockfill dams, or 2% of the total number of dams in the state. Twenty are concrete dams, or 2% of the total. From there, the percentages are negligible. There are 10 gravity dams, 3 arch, 2 masonry, and 1 buttress dam. There are 3 listed as “other,” and 47 (4%) with an “unknown” type of construction.

² U.S. Board on Geographic Names/Search Domestic Name/USGS: Geographic Names Information System (GNIS) (www.geonames.usgs.gov)

³ Arkansas Natural Resources Commission, Water Resources Management Division, Dam Safety (www.anrc.arkansas.gov/water-resources-management/dam_safety.html)

⁴ As of June 4, 2013.

The large, federal, multiple-purpose dams constructed in Arkansas from the 1940s to the 1970s, primarily for flood control, receive the most attention from the public and in the press, and deservedly so. The NID lists 22 dams that store more than 100,000 acre-feet of water. The primary purpose of 15 of the dams that impound over 100,000 acre-feet of water is flood control. The primary purpose of five of the dams is navigation, two are municipal water supply dams, (Little Rock and Fort Smith), one is a hydroelectric dam (Carpenter), and one is a recreation dam (Lake Erling Dam). The NID also lists a secondary purpose of dams in Arkansas, and for those impounding over 100,000 acre-feet of water, the secondary purposes include hydroelectricity, water supply, fish and wildlife pond, and recreation.

Of all the dams in Arkansas, including those with impoundments over 100,000 acre-feet, the primary purpose is listed as power (9), flood control (222), water supply (71), irrigation (97), navigation (17), and for debris control, fire protection, fish and wildlife ponds, tailings (105), and unknown or other (72). But by far the greatest number of dams – 658 – have been constructed primarily for recreation purposes. Recreation dams account for 53% of the total number of dams built in Arkansas.⁵

Given the great variety of types and purposes of dams just in Arkansas, dams become a very broad subject when viewed historically or nationally. Engineers and scholars writing about dams have therefore necessarily established some limits to their discussions. The earliest studies of dams were manuals or technical treatises written by civil engineers describing methods of dam construction. The first general hand book, or “how to” book on dam construction was written by James Leffel in 1874. Leffel built turbines for water wheels at his plant in Springfield, Ohio, which is still in business today, still manufacturing hydraulic turbines. As a service to mill

⁵ All figures from the National Inventory of Dams. Users must apply to the Army Corps of Engineers for a user name and password to access the database.

wrights, he published *The Construction of Mill Dams*, which described ways from quick and inexpensive to massive river dams for powering mills.⁶ Leffel does not discuss water storage or flood control dams.

In 1888, Edward Wegmann, a Swiss-American engineer, published *Design and Construction of Dams*, “a treatise of 106 pages,” discussing masonry dams. By 1899, he had enlarged the scope of the book to include “masonry, earth, rock-fill, timber and steel dams.” By 1922 “so many important dams (had) been built in late years,” that Wegmann published the seventh edition, a tome of 480 pages with 13 appendices, that included information on “dams of all kinds.” Wegmann was very thorough; he discusses the engineering principles behind the construction of various types of dams, and he surveys the major dams built throughout the world.⁷

While Wegmann tried to cover all types of dams, James Dix Schuyler limited his 1902 discussion of dams to *Reservoirs for Irrigation, Water-Power, and Domestic Water-Supply*. Schuyler’s book covers dams throughout the world, but his main examples in the United States are from the arid west, where water storage for irrigation and water supply was much more critical at that time than it was in the midwest.⁸ Schuyler’s book was followed in 1934 by Earle Lytton Waterman’s textbook, *Elements of Water Supply Engineering*, which dealt specifically

⁶ J. Leffel & Co., *The Construction of Mill Dams* (Springfield, Ohio: J. Leffel, 1874).

⁷ Edward Wegmann, *The Design and Construction of Dams* (New York: John Wiley & Sons, 1922), Preface to the Seventh Edition; David P. Billington and Donald C. Jackson, *Big Dams of the New Deal Era: A Confluence of Engineering and Politics* (Norman: University of Oklahoma Press, 2006), 33, 71.

⁸ James Dix Schuyler, *Reservoirs for Irrigation, Water-Power, and Domestic Water-Supply* (New York: John Wiley & Sons, 1902).

with all aspects of municipal water supply projects, including a chapter on the construction of impounding reservoirs.⁹

As more and more dams were constructed in the first third of the 20th century, it became impossible to write general manuals to suit all purposes, especially as dams came to be designed and constructed by civil engineers. Instead, scholars began to look at the history of dams. One of the earliest histories is Norman Smith's simply named, *A History of Dams*. Published in 1972, Smith's book covers dams from "Antiquity" to "The Last Twenty Years." The dams Smith discusses are the innovative ones that set a new design standard, or incorporate new technology, or solve a uniquely vexing problem of water control. But along the way he discusses the purposes for which dams are built, construction materials and methods, and the relative effectiveness of the dams.¹⁰

In 1997, *Dams: Studies in the History of Civil Engineering*, edited by Donald C. Jackson, was published. With contributions from numerous authors, including Norman Smith, *Dams* also surveys the history of dam building, but with an emphasis on the structural and engineering problems of dams.¹¹ And for the most focused study, one need only look to Richard White's *The Organic Machine*. Though nominally about the Columbia River in Washington and Oregon, a reader interested in dams can see the environmental effects of Bonneville and Grand Coulee Dams as the climax of the story.¹²

Dams as the purview of civil engineers, as epitomized by the U.S. Army Corps of Engineers, is the subject of David Billington and Donald C. Jackson's study, *Big Dams of the*

⁹ Earle Lytton Waterman, *Elements of Water Supply Engineering* (New York: John Wiley & Sons, 1934).

¹⁰ Norman Smith, *A History of Dams* (Secaucus, New Jersey: The Citadel Press, 1972).

¹¹ Donald C. Jackson, ed., *Dams: Studies in the History of Civil Engineering* (Aldershot, Hampshire, Great Britain: Ashgate Publishing Limited, 1997).

¹² Richard White, *The Organic Machine* (New York: Hill and Wang, 1975).

New Deal Era: A Confluence of Engineering and Politics. Billington and Jackson use the Tygart Dam in West Virginia, which the Corps began constructing in 1933, as an example of the learning curve that even the Corps experienced in the building of large, multiple-purpose dams. Billington and Jackson also discuss the large irrigation and water supply dams built by the Bureau of Reclamation in the arid west in the 1930s.¹³

Closer to home, sources on Arkansas dams tend to center on dams built for a particular purpose. The Goodspeed county histories mention many grist, saw, and manufacturing mills, frequently mentioning the associated mill dam. Locally published county histories often mention if a dam is built as part of a water supply system. Bill Worthen, in his fine article on “Municipal Improvements in Little Rock” in *The Arkansas Historical Quarterly* mentions Fourche Dam and the Little Rock water supply reservoir. But his article is primarily about Little Rock’s sewage disposal woes and serves to illustrate that water supply and sewage removal were approached as two separate municipal systems well into the 20th Century.¹⁴ And very recently, Sherry Laymon has written about the construction of locks and dams on the Arkansas River in “John McClellan and the Arkansas River Navigation Project.”¹⁵

Laymon’s article discusses the role of the U. S. Army Corps of Engineers in constructing the locks and dams on the Arkansas. The role of the Little Rock District of the Corps of Engineers in constructing dams in Arkansas is given comprehensive treatment in Mary Yeater Rathburn’s *Castle on the Rock: The History of the Little Rock District U.S. Army Corps of Engineers*, published by the Corps in 1990 to celebrate 165 years of service in Arkansas. The Little Rock District is responsible for dams in the White River drainage and on the Arkansas

¹³ Billington and Jackson, 92ff.

¹⁴ William B. Worthen, “Municipal Improvement in Little Rock – A Case History,” *The Arkansas Historical Quarterly* 46, no. 4 (Winter 1987).

¹⁵ Sherry Laymon, “John McClellan and the Arkansas River Navigation Project,” *The Arkansas Historical Quarterly* 69, no. 2 (Summer 2010).

River. Rathburn covers Corps activities in Arkansas from the early years of improving the rivers for navigation to construction and management of the big, multiple purpose dams encompassing flood control, hydropower, water supply, and recreation that loom so large in the public's perception of Arkansas dams. These are the dams that are covered widely in the press, in county histories, and in articles relating to Arkansas history. In a less-dense, more-readable format, Gary B. Mills wrote a history of the Vicksburg District, Corps of Engineers, in 1978.¹⁶ The Vicksburg District is responsible for dams in the Ouachita River drainage basin.

Dams built for specific local purposes were not built in a vacuum. National events and trends very much influenced local dam building, beginning with the Northwest Ordinance of 1787. The Northwest Ordinance provided procedures by which new territories could become part of the United States, and it established general government policies toward the western territories. One of those policies was that “the navigable waters leading into the Mississippi . . . shall be common highways, . . . (free) to the Inhabitants of the said territory.”¹⁷ This provision in turn was based on United States law which held that navigable water-courses were public rivers, and “in that sense may be considered as public *highways*.” As such, they were to be kept clear of “nuisances and impediments” that would interfere with their free use by the public. United States

¹⁶ Mary Yeater Rathburn, *Castle on the Rock: The History of the Little Rock District U. S. Army Corps of Engineers, 1881-1985* (Little Rock: U. S. Army Engineer District, Little Rock, 1990); Gary B. Mills, *Of Men and Rivers: The Story of the Vicksburg District* (Vicksburg, MS: U. S. Army Engineer District, Vicksburg, 1978).

¹⁷ “An Ordinance for the government of the territory of the United States North West of the river Ohio,” in Peter S. Onuf, *Statehood and Union: A History of the Northwest Ordinance* (Bloomington, IN: Indiana University Press, 1987), 63; Jay A. Barrett, *Evolution of the Ordinance of 1787* (New York: Arno Press, 1981, 1971), 41.

law regarding public rivers was in turn based on English common law and a tradition that extended back at least to the 17th century.¹⁸

The Supreme Court's interpretation of the Commerce Clause of the U.S. Constitution in *Gibbons vs. Ogden* gave the federal government the power to regulate navigable interstate water-courses. The question of jurisdiction over navigable rivers arose from disputes between the various states over control of river traffic.¹⁹ The federal government's jurisdiction over interstate waters included the Mississippi River and all of its tributaries, including the Arkansas, White, St. Francis, Ouachita, Red, and their tributaries.²⁰ These rivers, like all navigable rivers of the United States, could not be obstructed, such as by dams, without the express permission of Congress. The first federal general dam legislation was passed in 1906 to codify use that had previously been based solely on court rulings, and to give the Corps of Engineers authority over reviewing and approving the plans for dams that crossed navigable streams.²¹ Today, all of the dams that cross the navigable sections of Arkansas's rivers are locks and dams built by the U. S. Army Corps of Engineers.

Throughout the United States, the free navigation of water-courses affected mills and mill dams particularly. Mill owners were frequently admonished not to allow their mill dams to

¹⁸ Joseph K. Angell, *A Treatise on the Common Law, in Relation to Water-Courses* (Boston: Wells and Lilly, 1824), 15; Geoffrey Binnie, "The Evolution of British Dams," in *Dams*, ed. Donald Jackson (Aldershot: Ashgate Publishing Limited, 1997), 89.

¹⁹ Herbert A. Johnson, *Gibbons v. Ogden: John Marshall, Steamboats, and the Commerce Clause* (Lawrence, Kansas: University Press of Kansas, 2010), 111ff.

²⁰ Jack Bauer, *A Maritime History of the United States* (Columbia, SC: University of South Carolina Press, 1988), 52-53. The definition of navigable waters is "waters of the United States that have been used historically or are now used for interstate commerce or foreign commerce, including, but not limited to, interstate waters, interstate wetlands, intrastate lakes, rivers, and streams." In Arkansas, "recreational use such as fishing or canoeing may result in a waterbody being classified as navigable." Publications No. 102, p. 1, and 109, p. 2, respectively of the University of Arkansas Division of Agriculture, Public Policy Center (Fayetteville: Printed by the UA Cooperative Extension Service Printing Services, June 2008).

²¹ *General Dam Act*, Public Law 262, 59th Cong., 1st sess., *U. S. Statutes at Large* 34 (1906): 386.

interfer with the passage of “boats, rafts, and logs,” as well as the passage of fish. Mill dams also could not “divert, obstruct, or poison a water-course,” or cause the impounded water to flood or damage a neighbor’s land, thereby making it unavailable for farming. And yet, a mill was beneficial to a community, and they often “held a special and favored position in the eyes of government.” Louis Hunter, in his study of water power, *A History of Industrial Power in the United States, 1780-1930*, says this often led to conflicts between mill owners and farmers over use of the land,²² although there is little evidence of such conflicts in Arkansas.

As planters and settlers began to move in to the territory opened up by the Louisiana Purchase, the federal government’s claim to jurisdiction over navigable rivers brought with it the obligation to keep those rivers navigable. The Mississippi River had long been the highway for southern cotton planters and midwestern farmers to move their produce to markets in New Orleans. When steamboats became common on the river after 1815, those who traveled the river and those who sent goods by river importuned the federal government to clear the natural debris, primarily logs and tree limbs, that impeded river traffic or rammed and sank boats. In response, Congress appropriated funds in 1824 to clear snags, sawyers, and floaters from the Mississippi River, and eventually more funds were appropriated to clear the tributaries.²³ Dredging the

²² Angell, p. 27; Louis C. Hunter, *A History of Industrial Power in the United States, 1780-1930, Vol. One: Water Power in the Century of the Steam Engine* (Charlottesville: University Press of Virginia, 1979), 140.

²³ This story is told in many sources, including: Edith McCall, *Conquering the Rivers: Henry Miller Shreve and the Navigation of America’s Inland Waterways* (Baton Rouge: Louisiana State University Press, 1984), 180ff.; Todd Shallat, *Structures in the Stream: Water, Science, and the Rise of the U.S. Army Corps of Engineers* (Austin: University of Texas Press, 1994), espec. 144-145; Diana Sherwood, “Clearing the Channel: The Snagboat in Arkansas” in *The Arkansas Historical Quarterly* 3, no. 1 (Spring 1944), espec. 53, 55. For planters and farmers, see Jeffrey Alan Owens, *Holding Back the Waters: Land Development and the Origins of Levees on the Mississippi, 1720-1845* (PhD diss., Louisiana State University, 1999), espec. 591ff.

Mississippi came later, in 1837.²⁴ These efforts and the attendant Congressional appropriations affirmed the federal government's responsibility for making the rivers navigable, a responsibility that eventually manifested itself in the construction of locks and dams on many western rivers, including the White and Ouachita rivers in Arkansas.

While the federal government accepted responsibility for the *navigation* of the rivers, it did not take responsibility for flooding of the rivers, since flooding did not actually interfere with navigation. The federal government, especially during President Andrew Jackson's administration, considered flooding to be a local or state problem. The debate over federal assistance to flood-prone areas was part of the larger congressional debate over internal improvements, as were roads and canals. Improved navigation passed the Jacksonian litmus test of being a general improvement for the benefit of the nation, whereas flood control did not. The planters who lived along both banks of the Mississippi delta were those who would benefit most from controlling floods. Their crops were destroyed by the periodic inundations of the Mississippi and its tributaries, and they were expected to remedy the situation themselves. They were also the people most able to pay for the remedies. Louisiana planters had started building levees along the Mississippi as early as 1720. As planters moved north along the river, so too did the levees.²⁵

In 1849 and 1850, Congress finally accepted some responsibility for relieving flooding. It passed a series of Swamp Land Acts to aid the states, especially the Southern states, in their efforts at flood control through levees. Through these acts, Congress deeded to the states along the Mississippi the federal lands that were periodically overflowed. The states could then levee and drain the land, and sell the reclaimed land to recoup their expenses. This helped the states,

²⁴ John M. Barry, *Rising Tide: The Great Mississippi Flood of 1927 and How It Changed America* (New York: Simon & Schuster, 1997), 70.

²⁵ Owens, 591ff.

but not completely. The extent and expense of levee-building was so great that levees were far from continuous along the river when the entire length of the river was surveyed by Captain A. A. Humphreys and Lieutenant Henry J. Abbott of the U.S. Corps of Topographical Engineers in 1861. The use of dams to control floods on the Mississippi had been suggested in an 1852 report by Charles Ellet, Jr., a civil engineer, but the Corps of Engineers, which by then was responsible for river improvements, “seldom judged (dams) practical from either an engineering or economic standpoint.”²⁶

If Humphreys and Abbott found the condition of the levees along the Mississippi to be substandard in 1861, then they would have been appalled at their condition after the Civil War. The levee system that had been built up along the Mississippi since before statehood was purposely destroyed by both the Union and Confederate armies, or the levees had washed away in floods because of a lack of upkeep. One historian states, “The levee system offered less protection in 1869 than it had in 1858.”²⁷ Mills fared little better. Both armies burned or damaged mills during the war, especially after 1862 when the Union army claimed much of Arkansas and southern loyalists resorted to guerrilla warfare. Confederate armies burned mills in northwest Arkansas to prevent the advancing Union troops from acquiring flour and other

²⁶ Joseph L. Arnold, *The Evolution of the 1936 Flood Control Act* (Fort Belvoir, VA: Office of History, U.S. Army Corps of Engineers, 1988), espec. 6-7; see also Robert W. Harrison and Walter M. Kollmorgen, “Land Reclamation in Arkansas Under the Swamp Land Grant of 1850,” *The Arkansas Historical Quarterly* 6, no. 4 (Winter 1947), 369-373; A. A. Humphreys and Henry J. Abbot, *Report Upon the Physics and Hydraulics of the Mississippi River* (Washington: Government Printing Office, 1861; Reprinted with additions, 1876), 151-152; and Charles Ellett, Jr., *The Mississippi and Ohio Rivers: Containing Plans for the Protection of the Delta from Inundation; and Investigations of the Practicability and Cost of Improving the Navigation of the Ohio and Other Rivers by Means of Reservoirs* (Philadelphia: Lippincott, Grambo, and Co., 1853), 205ff.; and Martin Reuss and Paul K. Walker, *Financing Water Resources Development: A Brief History* (Washington, D.C.: U.S. Army Corps of Engineers, 1983), 4ff.

²⁷ Harrison and Kollmorgen, 405.

supplies.²⁸ The War Eagle Mill, for example, “was burned by order of a Confederate general, to keep it from being used to supply the Union soldiers.”²⁹ The Union army burned mills in retaliation for Confederate guerrilla raids on federal outposts and supply lines. Union commanders also destroyed mills that were meeting places for the guerrilla irregulars, although they were not as apt to burn mills as the Confederates were. Neither army had any reservations about appropriating grain and other provisions from area mills.³⁰

The war left the South impoverished. Arkansas began to recover after 1875 when Reconstruction ended and the effects of the panic of 1873 were passing, the economy began to rebound. As with many American cities in the last quarter of the 19th Century, Arkansas cities saw an increase in population and business ventures. Citizens began to demand increased services from their municipal governments, “such as securing safe drinking water, waste disposal, protection from fire, public safety, and transportation.” For safe drinking water and protection from fire, Southerners looked to municipal improvements in the North for ideas and expertise,³¹ such as to the successful completion of water projects in New York, Philadelphia, Boston, and St. Louis. Between 1880 and 1929, numerous cities in the state built, or contracted with private developers to build, water supply systems. Many of these systems included an impounded water supply reservoir.³²

²⁸ Michael A. Hughes, “Wartime Gristmill Destruction in Northwest Arkansas and Military-Farm Colonies,” *The Arkansas Historical Quarterly* 46, no. 2 (Summer 1987), 171.

²⁹ Blanche H. Elliott, “The Water Mills of War Eagle Go Back to 1838,” *The Ozark Mountaineer* 7, no. 5 (May 1959), 9.

³⁰ Robert R. Mackey, “Bushwackers, Provosts, and Tories: The Guerrilla War in Arkansas,” in *Guerrillas, Unionists, and Violence on the Confederate Home Front*, ed. Daniel E. Sutherland (Fayetteville: The University of Arkansas Press, 1999), 173, 179, 182; Hughes, 175-176.

³¹ Carl H. Moneyhon, *Arkansas and the New South, 1874-1929* (Fayetteville: The University of Arkansas Press, 1997), 4, 23, 54.

³² Little Rock, Hot Springs, Fort Smith, Van Buren, Fayetteville, Eureka Springs, Paris, Nashville, and Charleston all had water supply reservoirs by 1929.

One of the services urban residents and businesses began to demand after 1880 was access to electricity. After 1886, when systems that could provide reliable electrical current over long distances became available, hydroelectric dams were some of the earliest electrical generating plants to come on line, the prime example being Niagara Falls Power plant in 1896. Little Rock was electrified, barely, in 1883. But the potential and interest was there, if not the financing. Little Rock did not have a reliable source of electricity until 1926, when the city was “linked to an interconnected, central station electric system.”³³ One of the links in that system was Arkansas Power & Light’s Rammel Dam, the first of two hydroelectric dams built by the company. By 1929, the second one was under construction.

In the 1880’s, citizens in the lower Mississippi Valley, including Arkansas, also began to ask more of the federal government, especially for flood control, a service that was beyond the financial capabilities of states, municipalities, and local levee districts to provide. In 1879, the federal government took a first tentative step toward assisting with flood control on the Mississippi when it created the Mississippi River Commission. The Commission adopted the “levees only” plan proposed by Humphreys and Abbott in their 1861 report on the Mississippi. With the Commission’s backing, the federal government began to appropriate monies for the construction of levees under the guise of improving navigation. The U.S. Army Corps of Engineers was tasked with completing the levee and other improvement projects. Federal aid helped, but the local levee districts still continued to spend more on levees and drainage than the federal government did.³⁴ And levees had to be built if flooding was to be controlled, since the “levees only” policy of the Corps and the Mississippi River Commission precluded the use of dams to impound the waters of tributary streams to lessen the flow of the Mississippi itself.

³³ E. F. Chestnutt, “Little Rock Gets Electric Lights,” *The Arkansas Historical Quarterly* 42, no. 3 (Autumn 1983), 239.

³⁴ Joseph Arnold, pp. 8-9, 14; Barry, 90-92.

The Corps of Engineers finally abandoned the levees only policy after the great Mississippi flood of 1927. Parts of eight states along the Mississippi flooded when the levees gave way and flood waters rushed out, spreading across the flat expanses of the Delta. Congress called upon the Corps to look again at a comprehensive flood control plan for the lower Mississippi. The Corps responded with the Jadwin Plan, which called for a combination of levees to channel the river and floodways to serve as outlets for floodwaters. That same year, but before the flood had occurred, Congress had authorized the Corps to study 180 rivers across the nation and report on their suitability for hydroelectric development and flood control. At the time the reports were authorized, Congress was more interested in the potential of rivers for hydroelectric development. After the flood, flood control gained equal or greater importance. Philosophically, the real importance of the reports, called the 308 reports, was that Congress accepted the principle of multiple-purpose development of the rivers. The practical importance of the reports was they “represented the most comprehensive and detailed body of data and planning ideas on multipurpose river development to date.”³⁵

Congress had specifically exempted the Colorado River “and its problems” from the 308 surveys.³⁶ The government agency responsible for development of the Colorado River was the Bureau of Reclamation in the Department of the Interior. The Bureau of Reclamation had been planning a reservoir project on the Colorado at Boulder Canyon since the early 1920s, and in 1928 President Coolidge signed the legislation approving construction. Originally conceived as a storage dam to conserve water for irrigation, the Boulder/Hoover Dam came to include hydroelectric and municipal water supply purposes, with both of those additional uses being

³⁵ Joseph Arnold, pp. 18-17; there are a number of sources on the flood, the Jadwin Plan, and the 308 reports, including Barry, Reuss, and Rathburn.

³⁶ River and Harbor Act of 1925, Public Law 585, § 3, 68th Cong., 2^d sess., *U. S. Statutes at Large* 49 (1925): 1190.

developed to serve the Los Angeles metropolitan area. When construction of the dam began in 1931, it served yet another purpose, as a work relief project for many men thrown out of work by the Depression.³⁷

The Depression, or rather the Roosevelt administration's response to it, brought new opportunities for building dams. The Public Works Administration (PWA) made monies available for infrastructure projects, including water works, as part of a program of work relief.³⁸ Arkansas cities jumped at the opportunity to upgrade their existing water works or build new ones. The city of Paris, for example, used PWA funds to enlarge its water supply reservoir. Fort Smith used PWA funds to build a completely new water supply reservoir. The PWA provided funds to build some of the massive, multiple-purpose dams that had been recommended in the 308 reports, including Bonneville and Grand Coulee on the Columbia River in Oregon and Washington and Fort Peck on the Missouri in Montana.³⁹ Another work relief program, the Civilian Conservation Corps (CCC), constructed recreation dams, such as the one that impounded Lake Sylvia in Perry County, most of which are now under the control of the U. S. Forest Service.

Not all dams were built with PWA funds. The U. S. Army, and Tennessee Valley Authority, and the Department of the Interior constructed 143 flood control dams nationally, and a total of 862 for all purposes, between 1930 and 1945. Many of these dams were constructed through direct Congressional appropriations, such as the flood control dams built by the Army Corps of Engineers in Arkansas. Local communities and the states contributed 30 per cent

³⁷ Billington and Jackson, pp. 102ff.

³⁸ Jason Scott Smith, *Building New Deal Liberalism: The Political Economy of Public Works, 1933-1956* (Cambridge: Cambridge University Press, 2006), 78, 89, 94; William E. Leuchtenburg, *Franklin D. Roosevelt and the New Deal, 1932-1940* (New York: Harper & Row, 1963), 133.

³⁹ Billington and Jackson, 22-23, 206; Marc Reisner, *Cadillac Desert: The American West and its Disappearing Water* (New York: Penguin Books, 1987), 118-119, 162-163.

toward the cost of the Corps projects by purchasing lands and rights-of-way for the dams. While not developed as work relief projects, the Corps dams built in the 1930s were *defacto* work relief projects, just as Boulder Dam had been.⁴⁰ The Tennessee Valley Authority (TVA), an independent agency of the federal government, built a series of multiple-purpose dams on the Tennessee River, funding construction with direct Congressional appropriations, with continued operations funded through the sale of electricity generated by the dams. At one point in the 1940s, TVA sold electricity to Harvey Couch's Arkansas Power & Light for distribution in Arkansas.

Government-owned hydroelectric dams are another legacy of the Roosevelt administration. Under Coolidge and Hoover, the Corps of Engineers looked to private companies to develop the hydroelectric plants in flood control dams that they contemplated building.⁴¹ The Federal Power Commission was in agreement with this policy, especially since the chairman of the FPC was the Chief of Engineers. When Roosevelt was elected to the presidency, he brought into the executive branch a group of socially-conscious administrators who believed the electric utilities charged so much for their services that businesses, cities, and especially farms could not afford to take full advantage of the benefits of electrification.⁴² This was the group of administrators who shepherded through Congress the Public Utilities Holding Company Act, which broke up the large utility holding companies, and the Rural Electrification Act, which provided low-cost electricity to rural areas. They were men like Harold Ickes,

⁴⁰ *Arkansas Democrat*, June 10 and 17, 1938; Billington and Jackson, 170, 177, 206.

⁴¹ See, for example, H. Doc. 102, 151: "While income might be derived from reservoir water at the practical water-power sites (on the White River), it is thought that the sites should be left for development by private enterprise." (House Committee on Rivers and Harbors, *White River, Missouri and Arkansas*, 73^d Cong., 1st sess., 1933, H. Doc. 102.)

⁴² See, for example, Secretary of the Interior Harold Ickes referring to the electric utilities, 'I'll have nothing to do with the sons-of-bitches.' as quoted in D. Clayton Brown, *Electricity for Rural America: The Fight for the REA* (Westport, Connecticut: Greenwood Press, 1980), 40.

Secretary of the Interior, Morris Cooke, first director of the Rural Electrification Administration, and Dr. Arthur Morgan, first director of the Tennessee Valley Authority, as well as Roosevelt himself. The Roosevelt administration had no interest in having private utilities control the power from federal dams. One of the administrators of Roosevelt's policies was Leland Olds, formerly with the New York Power Authority, and, in 1940, chairman of the FPC. It was when Olds was FPC chairman that Arkansas Power & Light lost its bid to install hydroelectric capabilities in a dam at Blakely Mountain on the Ouachita River. Nationally, it became apparent that the federal government was going into the power business.⁴³

Other dams constructed through the 1930s were irrigation and water supply dams. Irrigation dams began to appear when deep wells could no longer reach the aquifer under the Grand Prairie. The impoundments for early municipal water supply dams and mill ponds were turned into recreational lakes as municipalities began to draw their water supply from the impoundments of the big multiple-purpose dams and mill ponds were no longer needed. Recreation dams were another category of dam that received attention from the Roosevelt administration.

The progress made by the PWA, the CCC, and other government agencies in the construction of water-retention reservoirs can be seen in the number of dams built nationally between 1930 and 1945 as compared to the number of dams that had been built previously. Between 1640, when the first NID-recorded dam was built in Massachusetts, and 1929, the NID shows 9,013 dams built, or an average of 21 dams a year. Between 1930 and 1945, the NID

⁴³ D. Clayton Brown, 41; Leuchtenburg, 156-157; David E. Nye, *Electrifying America: Social Meanings of a New Technology* (Cambridge, MA: The MIT Press, 1992), 308-309; Moses, C. Hamilton, *Memoirs of C. Hamilton Moses*, MS M852 24 Moses, Vol. 3, Version 2, Special Collections, Mullins Library, University of Arkansas, Fayetteville, 125 (hereafter, Moses). Senator Norris of Nebraska, one of the principle advocates for TVA, had proposed government ownership of dams and reservoirs in June, 1938 (*Arkansas Democrat*, June 9, 1938).

shows 6,073 dams built nationwide, or an average of 404 dams a year. In Arkansas, 33 dams were built between 1881, when the NID shows the first dam was constructed in the state, and 1929. Between 1930 and 1945, 79 dams were constructed.

The federal government's dam-building projects were seriously curtailed during World War II as men and materials were prioritized for the war effort. After the war, Congress continued to appropriate funds for flood control projects that had been approved in the 1930s. It is the large and numerous dams that have been constructed after 1945 that have truly changed the geographical face of Arkansas. Dams continue to be built. The most recent dams listed on the NID were completed in 2012.

This study is about the dams built between 1836 and 1945. It is about dams built by individuals, by utility companies, by municipalities, by the state, and by the federal government; dams across the White River and its tributaries that drain the Ozark Plateau; dams across the Ouachita River and its tributaries that drain the Ouachita Mountains; dams built to power machines, to control floods, to generate electricity, to improve navigation, to provide cities with water, to irrigate crops, and as a venue for recreational activities. These are the public services that dams provide. In exchange for the advantages that dams provide, Arkansans accepted permanently flooded valleys, submerged towns, damaged or altered ecosystems, and the occasional controlled flood at draw-downs. Enumerating the pros and cons of dams does not change the fact that the primary goals of the dams has been achieved: the semi-annual inundations of the bottomlands have either been eliminated or drastically curtailed, ships and barges can navigate the Arkansas River to the port of Catoosa near Tulsa, crops are irrigated, electricity is generated, and everybody can go boating and fishing.

My discussion starts with flood control dams as they are the most obvious in terms of size and, if you will, notoriety. Many flood control dams have hydroelectric capabilities, which is what I discuss next. The third chapter discusses navigation dams, which are some of the earliest, and latest, dams built in the state. Municipal water supply dams are rarely studied as a class of dams. They are generally mentioned as a local municipal improvement. In chapter four I discuss municipal water supply dams as part of a national trend in municipal improvements, and as a much-needed local improvement. Chapter five discusses recreation dams. Recreation, of course, is one of the purposes for which multiple-purpose dams are used. However, there are numerous public and private dams built for the sole purpose of recreation, and these, like municipal water supply dams, usually receive only local or regional treatment. In chapter six I cover irrigation dams, a somewhat new class of dams for Arkansas. Dating to the early 1900s in the arid west, irrigation dams did not make an appearance in Arkansas until 30 years later. In a chapter I have called "Consequences," I discuss what these dams meant to the people of a town, a region, and the state at the time they were built. Accustomed as we are in the present day to look at dams as harmful to the environment and eyesores in a pristine wilderness, we tend to forget how much people really favored the construction of these dams.

CHAPTER 2: FLOOD CONTROL DAMS

The rivers were going to be a problem. That was apparent from the earliest Anglo-American explorations of the Louisiana Territory. William Dunbar, exploring the lower reaches of the Louisiana Purchase in 1804, referred to the annual flood, or “inundation,” of the Ouachita River as an “inconvenience.”¹ In 1806, Thomas Freeman also explored the southern Louisiana Purchase lands, this time along the Red River. Freeman noted that the valley of the river “cannot be exceeded either in fertility or beauty,” and except for “a few days in the year it is all elevated above the rise of the water in the river.”² Thomas Nuttall, voyaging up the Arkansas River from Arkansas Post in 1819, noted that “in consequence of the unrestrained dominion of the inundation, no settlements yet appeared” along the banks of the river.³ Henry R. Schoolcraft, traveling along the White River in northeast Arkansas in the winter of 1818-1819, commented that, except for the semi-annual inundations, the lands situated along the river were well-suited to agriculture and commerce.⁴ George Featherstonhaugh, examining the geology of Arkansas in 1834, reported on the propensity of the Arkansas River in central Arkansas to inundate the countryside, and that “millions of acres of rich bottom land . . . are thus rendered useless, and can never be brought to their intrinsic value.”⁵

¹ Trey Berry, Pam Beasley, and Jeanne Clements, eds., *The Forgotten Expedition, 1804-1805: The Louisiana Purchase Journals of Dunbar and Hunter* (Baton Rouge: Louisiana State University Press, 2006), 18.

² Dan L. Flores, ed., *Southern Counterpart to Lewis & Clark: The Freeman & Custis Expedition of 1806* (Norman, OK: University of Oklahoma Press, 1984), 176.

³ Thomas Nuttall, *A Journal of Travels into the Arkansas Territory During the Year 1819* (Philadelphia: Thos. H. Palmer, 1821), 66.

⁴ Bill Dwayne Blevins, ed., *Along the Osage Trace: “Schoolcraft in the Ozarks”* (Mountain Home: the author, 2001), 154.

⁵ George W. Featherstonhaugh, *Geological Report of an Examination Made in 1834 of the Elevated Country between the Missouri and Red Rivers* (Washington, D.C.: Gales and Seaton, 1835), 84.

These early explorers were witnessing the effects of the seasonal flooding of the bottomlands of what would eventually become the state of Arkansas. Until the large flood control dams were constructed in the 1930s, Arkansans would contend seasonally with these flood waters. To Euro-Americans, the seasonal inundations were a major obstacle to developing the rich bottomlands for agricultural purposes. The seasonal flooding did not seem to hinder the Native Arkansans in their successful agricultural pursuits. The earliest European inhabitants of the state either avoided flooded areas by locating on high ground, or they made feeble and generally useless attempts to hold back the rivers, or, as with the hunters, they simply didn't seem to care. But when planters moved into Arkansas to take advantage of the rich bottomlands for growing cotton, solving the problem of the floods came to be a major consideration. Starting first with remedies that were within their grasp in terms of knowledge, time, and resources, the planters built levees along the Mississippi and Arkansas rivers to prevent the flood waters from entering their lands. The local resources, however, were never enough, and the planters, farmers, and businessmen of the Arkansas Delta turned to the federal government for assistance. From 1879 to the great flood of 1927, the federal government began gradually and incrementally to offer Arkansans more and more help in their battle against the flood waters. By the 1930s, the federal government finally turned to dams to ameliorate the problem of the floods. The dams created storage reservoirs with extra capacity to catch and hold excess waters during the wet seasons, and to release it during dry seasons. The release of water allowed the government to develop the flood control dams as multiple-use projects for hydroelectric power generation, navigation, water supply, and recreation. Today, these flood control dams are a major feature of the Arkansas landscape.

Native Arkansans did not seem to have the same adversarial relationship with seasonal high water as did the Euro-Americans. The indigenous peoples utilized the land differently from Europeans and they never tried to dam back the water. During the Mississippi period (c. 900 AD – 1500 AD) the population of Arkansas was about 75,000,⁶ and many of these people lived along the Mississippi and St. Francis Rivers, both of which overflowed their banks seasonally. The archeological evidence suggests that to adapt to seasonal flooding villages in eastern Arkansas were situated on the natural levees of both active meanders⁷ and remnant meanders.⁸ Natural levees form when silt and sediment deposits are left behind after a river overflows its banks. Over time, these deposits build up to form a ridge along the sides of the river. Sites located on the natural levees of active meanders would generally be clear of high water, as the rising river would flow over low spots or through breaks in the natural levees and inundate the backswamp

⁶ Dan F. Morse and Phyllis A. Morse, “The Spanish Exploration of Arkansas,” in *Columbian Consequences: Archaeological and Historical Perspectives on the Spanish Borderlands East, Vol. 2* (Washington, D.C.: Smithsonian Institution Press, 1990), 199.

⁷ Margaret J. Guccione, Robert H. Lafferty III, and L. Scott Cummings, “Environmental Constraints of Human Settlement in an Evolving Holocene Alluvial System: The Lower Mississippi Valley,” *Geoarchaeology* 3: 81; John W. Cottier and Gregory A. Waselkov, “Environmental Parameters of Mississippian Settlement Strategy,” *The Missouri Archaeologist*, 38 (Dec. 1977): 20; Fidalgo of Elvas, *True Relation of the Vicissitudes That Attended the Governor Don Hernando De Soto in Narratives of the Career of Hernando de Soto in the Conquest of Florida, as told by a Knight of Elvas and in a Relation by Luys Hernandez de Biedma, factor of the Expedition*, Vol. I, ed. Edward Gaylord Bourne, trans. Buckingham Smith, (New York: A.S. Barnes and Co., reprinted New York: Allerton Book Co., 1922), 117; and Dan F. Morse, “The Nodena Phase” in *Nodena: An Account of 90 Years of Archeological Investigation in Southeast Mississippi County, Arkansas* (Fayetteville: Arkansas Archeological Survey, 1989), 107. Morse’s soil assessment seems to indicate that Upper Nodena is located on a natural levee (p. 105), yet he “suspects” that “the permanent sites were located along sloughs back from the river” without giving a reason for this suspicion (p. 107).

⁸ Philip Phillips, James A. Ford, and James B. Griffin, *Archaeological Survey in the Lower Mississippi Alluvial Valley, 1940-1947* (Cambridge, Massachusetts: Peabody Museum of American Archaeology and Ethnology, 1951), 299-300; Tristram R. Kidder, “Perspectives on the Geoarchaeology of the Lower Mississippi Valley,” *Engineering Geology*, 45 (1996): 318; Charles E. Pearson, “Geomorphology and Prehistoric Settlement Patterns in the Great Bend Region,” in *Contributions to the Archeology of the Great Bend Region*, ed. Frank F. Schambach and Frank Rackerby (Fayetteville: Arkansas Archeological Survey, 1982), 16.

area behind the levee,⁹ rather than submerging the village site. Should a site flood, the villagers may simply have moved to higher ground until the flood waters subsided.¹⁰ Sites on remnant meanders, most often ox-bow lakes, would be less apt to flood, and they would continue to be suitable village and garden locations so long as the lake remained an open body of water.¹¹ In either case, the backswamp created by high water would not affect the villages or the agricultural lands situated on the levees or on a back slope of the levees.

The Mississippian peoples of eastern Arkansas were just as aware as the Euro-Americans of the fertility of the sandy loam soils deposited by the rivers,¹² and they used their environmental advantage to grow enough corn, beans, and squash and other indigenous crops to support the relatively large populations living in towns and villages.¹³ The Indians tended to farm the natural levees, and to a lesser extent the prairies, which not only had tillable soil, but were the only areas in northeast Arkansas that were likely to be dry year-round.¹⁴ The annual yield of corn could be substantial,¹⁵ as evidenced by Hernando de Soto's expedition in the trans-

⁹ R. Barry Lewis, *Mississippian Exploitative Strategies: A Southeast Missouri Example* (Columbia, MO: College of Arts and Science, University of Missouri – Columbia and The Missouri Archaeological Society, 1974), 14-15. See cross-section diagram of flood plain topography in Lewis, 13.

¹⁰ Guccione, 81. There is no archeological evidence that burial or platform mounds were built to raise a village above flood level.

¹¹ Phillips, 300; Kidder, 314.

¹² Phillips, 296; Morse, 107, 111; Guccione, 81; Elvas, 132.

¹³ Morse and Morse, 199. Towns could have as many as 2,000 people.

¹⁴ Stephen Williams, "Settlement Patterns in the Lower Mississippi Valley," in *Prehistoric Settlement Pattern in the New World*, ed. Gordon R. Willey (New York: Wenner-Gren Foundation for Anthropological Research, Inc., 1956), 54-55; Charles Hudson, *Knights of Spain, Warriors of the Sun: Hernando de Soto and the South's Ancient Chiefdoms* (Athens, GA: The University of Georgia Press, 1997), 276-277; Morse and Morse, 198.

¹⁵ Phyllis A. Morse, "The Parkin Site and The Parkin Phase," in *Towns and Temples Along the Mississippi*, ed. David H. Dye and Cheryl Anne Cox (Tuscaloosa: The University of Alabama Press, 1990), 125; Elvas in Bourne, 132, 134; Schambach, 82. In 1674, Louis Jolliet reported that the tribes along the Mississippi harvested corn "three times a year." Yves F. Zoltvany, *The French Tradition in America* (Columbia, SC: University of South Carolina Press, 1969), 102.

Mississippi west in 1541-1543. De Soto relied on the native peoples' stores of grain to see his *entrada* through two years in Arkansas,¹⁶ and his route was determined more by where he could find the most plentiful stores of grain than by rumors of where he might find gold or other precious metals.¹⁷

The indigenous peoples of eastern Arkansas did make one purposeful alteration to the landscape, but it was not a dam. They constructed defensive moats around a village by channeling river water into an artificial canal.¹⁸ Coupled with a surrounding palisade, the moats were intended to protect the village inhabitants from their enemies,¹⁹ and had the added benefit of delivering a myriad of fish from the river directly to the village.²⁰ The artificial moats are currently the only archeological evidence of man-made alterations to the landscape designed to control or direct flowing water.

¹⁶ Elvas in Bourne, 141; Fernandez de Oviedo y Valdés, Gonzalo, *A Narrative of De Soto's Expedition Based on the Diary of Rodrigo Ranjel, His Private Secretary*, in *Narratives of the Career of Hernando de Soto in the Conquest of Florida, as told by a Knight of Elvas and in a Relation by Luys Hernandez de Biedma, Factor of the Expedition*, Vol. II, ed. Edward Gaylord Bourne, trans. Buckingham Smith, (New York: A.S. Barnes and Co., reprinted: Allerton Book Co., 1922), 146-147.

¹⁷ Ann M. Early, "Finding the Middle Passage: The Spanish Journey from the Swamplands to Caddo Country," in *The Expedition of Hernando de Soto West of the Mississippi, 1541-1543*, ed. Gloria A. Young and Michael P. Hoffman (Fayetteville: The University of Arkansas Press, 1993), 68; David H. Dye, "Reconstruction of the de Soto Expedition Route in Arkansas: The Mississippi Alluvial Plain," in *The Expedition of Hernando de Soto West of the Mississippi, 1541-1543*, ed. Gloria A. Young and Michael P. Hoffman, (Fayetteville: The University of Arkansas Press, 1993), 51.

¹⁸ P. Morse, 123; Elvas in Bourne, 123. Parkin is an example of a Mississippian town that has been shown both archeologically and historically to have had a moat. The Upper Nodena site in Mississippi County may also have had a moat, although Robert C. Mainfort, Jr., in his Introduction to *Archeological Investigations at Upper Nodena: 1973 Field Season*, (Robert C. Mainfort, Jr., ed., Fayetteville: Arkansas Archeological Survey, 2010, p. 3) is cautious about accepting this interpretation of the site.

¹⁹ Lewis H. Larson, "Functional Considerations of Warfare in the Southeast During the Mississippi Period," *American Antiquity* 37, no. 3 (July 1972): 384; Fernandez de Oviedo y Valdés in Bourne, 139-140.

²⁰ Elvas in Bourne, 123-124.

The Caddoan people, living in the Gulf Coastal Plain and the Ouachita Mountains of southwestern Arkansas, constituted another large native population in Arkansas in the Mississippi period. Unlike the Delta tribes that lived in large towns, the Caddo tended to live in small villages or on individual farmsteads. The villages were usually unfortified clusters of buildings that included homes and grain storage facilities or a civic ceremonial center.²¹ Farmsteads were “scattered” along the arable land of active meanders of the Red and Arkansas rivers and their tributaries. Farmers cultivated the available arable land²² of the river bottoms, the bluffs overlooking the bottoms, alluvial terraces, and the natural levees on the margins of relict meanders of the rivers.²³

Permanent habitations on bluffs, natural levees of oxbow lakes, and on alluvial terraces are generally safe from high water so they did not need dams. For habitations that were located on an active meander, sites on cutbanks and point bars were favored. Point bars, on the inside curve of a meander, are the more “safe” location. The river will deposit its load of sediment on a point bar, building up the land, whereas it will erode away a cutbank.²⁴ And while habitations along an active meander would be subject to inundation, the Caddo were capable of rebuilding a settlement quickly, as DeSoto’s men found when in October, 1542, they returned to the village of

²¹ Daniel J. Rogers and George Sabo III, “Caddo,” in *Handbook of Native American Indians No. 14: Southeast* (Washington, D.C.: Smithsonian Institution, 2004), 626; Frank E. Schambach, “The Archeology of the Great Bend Region in Arkansas,” in *Contributions to the Archeology of the Great Bend Region* (Fayetteville: Arkansas Archeological Survey, 1982), 7.

²² Frank E. Schambach, “The End of the Trail: Reconstruction of the Route of Hernando de Soto’s Army through Southwest Arkansas and East Texas,” in *The Expedition of Hernando De Soto West of the Mississippi, 1541-1543*, ed. Gloria A. Young and Michael P. Hoffman (Fayetteville: The University of Arkansas Press, 1993), 91, and Schambach, “The Archeology of the Great Bend,” 7.

²³ Pearson, 27-28; James A. Brown, Robert E. Bell, and Don G. Wyckoff, “Caddoan Settlement Patterns in the Arkansas River Drainage,” in *Mississippian Settlement Patterns*, ed. Bruce D. Smith, (New York: Academic Press, 1978), 181-183.

²⁴ Pearson, 14, 28; Phillips, 299.

Nagatex on the Red River, and found it rebuilt after they had destroyed it in mid-August of that year.²⁵ The same coping strategy could have been used in the event of a flood.

For both the Caddo in southwestern Arkansas and the Mississippian peoples in eastern Arkansas, flooding may not have been as severe as it can be today. Between 840 AD and 1540 AD, the climate was considerably drier²⁶ than it is presently, and floods less frequent, making habitation of lowland sites more of a possibility.²⁷ With drier conditions, living closer to, and relying on, water resources was more important for subsistence.²⁸ Additionally, the land surrounding the towns and agricultural fields was more heavily forested, resulting in less run-off from the spring and fall rains. Deforestation and intensive farming in the 19th and 20th centuries has caused more run-off and therefore, more intense flooding.²⁹

In the Ozark Mountains of northwest Arkansas habitation was in “semipermanent or permanent settlements, (and) temporary campsites”³⁰ along the White River drainage. Recorded sites in the Ozarks are in bluff shelters or along stream terraces. The dry rock shelters were used for habitation and crop storage, while crops such as corn, beans, and squash, as well as chenopodium and sunflowers were grown on the arable land along the river valleys and alluvial

²⁵ Schambach, “The End of the Trail,” 92.

²⁶ George Sabo III, “Prehistoric Culture History,” in *Human Adaptation in the Ozark and Ouachita Mountains* (Fayetteville: Arkansas Archeological Survey, 1990), 82-83.

²⁷ Walter E. Klippel, “The Hearnes Site: A Multicomponent Occupation Site and Cemetery in the Cairo Lowland Region of Southeast Missouri,” *The Missouri Archaeologist* 31 (December 1969): 10-11. Dates for the drought in eastern Arkansas are given as 1250 A.D. to 1450 A.D.

²⁸ Ann M. Early, “Prehistoric Culture History,” in *Human Adaptation in the Ozark and Ouachita Mountains* (Fayetteville: Arkansas Archeological Survey, 1990), 110.

²⁹ Roger T. Saucier, *Quaternary Geology of the Lower Mississippi Valley* (Fayetteville: Arkansas Archeological Survey, 1974), 10. Saucier’s mapping of the meander belts of the Mississippi ends at c. 2,500 years ago, making it not useful for discussing Mississippian meanders of the river.

³⁰ Sabo, 102. There is a paucity of data on sites in northwest Arkansas that are not bluff shelters. Therefore, there is very little data on how people adapted to flooding in the Ozarks.

terraces.³¹ In the river valleys, flooding was always a possibility, but with a growing season of 180 to 200 days, and high water generally occurring between mid-October and mid-June,³² crops could be planted and harvested between high water episodes.

Europeans, almost from the time they began to settle in Arkansas, viewed the seasonal inundations quite differently than did the Native Arkansans, seeing in them a major obstacle to development. For example, in 1776, the commandant of Arkansas Post, Captain Balthazar de Villiers, lamented that his dream “of creating a stable agricultural community,” on the Arkansas River could not be realized if flooding prevented inhabitants from producing a reliable crop.³³ After de Soto, the next Europeans to visit Arkansas were the French, when Jacques Marquette and Louis Joliet explored the Mississippi River Valley in 1673.³⁴ The French did not establish a permanent presence in Arkansas until Henri de Tonti founded a trading post in 1686 on the Arkansas River,³⁵ about twenty-seven miles above its confluence with the Mississippi.³⁶ To escape the seasonal inundations, de Tonti followed the Native Arkansans’ example and situated his post on the north bank of the Arkansas River, on a “little rise of ground” that was 175 feet above sea level, and “therefore ten feet and more above the crest of the highest floods.”³⁷

³¹ Gayle J. Fritz, *Prehistoric Ozark Agriculture: The University of Arkansas Rockshelter Collections* (PhD diss., University of North Carolina at Chapel Hill, 1986), 31-32; 209 passim.

³² Scott A. Hodge. and Gary D. Tasker, *Magnitude and Frequency of Floods in Arkansas*, (Little Rock: United States Geological Survey, 1995), 1-10 e.g. for White River figures.

³³ Morris S. Arnold, “The Relocation of Arkansas Post to Écores Rouges in 1779,” *The Arkansas Historical Quarterly* 42 no. 4 (Winter 1983): 319.

³⁴ Jeannie M. Whayne, Thomas A. DeBlack, George Sabo III, and Morris S. Arnold, *Arkansas: A Narrative History* (Fayetteville: The University of Arkansas Press, 2002), 28-29.

³⁵ Roger E. Coleman, *The Arkansas Post Story: Arkansas Post National Monument* (Santa Fe, NM: Southwest Cultural Resources Center, 1987), 12.

³⁶ Morris S. Arnold, *Unequal Laws Unto a Savage Race: European Legal Traditions in Arkansas, 1686-1836* (Fayetteville: The University of Arkansas Press, 1985), 5.

³⁷ Stanley Faye, “The Arkansas Post of Louisiana: French Domination,” *The Louisiana Historical Quarterly* 26, no. 3 (July 1943): 633-634.

The trading post established by de Tonti lasted until 1698, when the French government required all posts in the interior of the continent to cease fur trading in an effort to concentrate the fur trade along the St. Lawrence River.³⁸ The French edict was not entirely successful, as fur traders continued to hunt and trade along the Arkansas River. Possibly because of the removal of the French garrison, the post was essentially abandoned by 1699.³⁹ Later realizing they did need to maintain a trading relationship with the Indians of the Mississippi Valley, lest the English co-opt the trade from across the Mississippi River, the French re-established a presence on the Arkansas in 1721. This time, however, the settlement included a contingent of two officers and twelve soldiers, making the site on the Arkansas for the first time a military as well as a trading post.⁴⁰

The military post was established near the site of de Tonti's former trading post, but unfortunately it was situated "down past" the safe "160-foot elevation" on a plain with "no elevation above 155 feet." In this location, the post flooded so frequently that the commander, Montchervaux, "found it necessary to enclose the area of his fort with a parapet levee" that was at least four feet high. Montchervaux's levee is the first recorded effort by Europeans to manage Arkansas's rivers. However, these early inhabitants of Arkansas Post did not have the resources to build bigger levees, and to dam the creeks to keep them from overflowing.

The Quapaw had the sense to locate themselves near, but "some distance above" the post,"⁴¹ indicating a location above the flood plain. Even so, the Quapaw did not escape the

³⁸ William J. Eccles, *France in America* (New York: Harper & Row, 1972), 86, 99.

³⁹ Morris S. Arnold, "Indians and Immigrants in the Arkansas Colonial Era," in *Arkansas: A Narrative History* (Fayetteville: The University of Arkansas Press, 2002), 8

⁴⁰ Faye, 666. Coleman, p. 20, used Bernard De La Harpe's figure of 17 soldiers. Ralph A. Smith and Benard De La Harpe, "Exploration of the Arkansas River by Benard De La Harpe, 1721-1722: Extracts from His Journal and Instructions," *The Arkansas Historical Quarterly* 10, no. 4 (Winter 1951), 346.

⁴¹ Faye, 681.

ravages of the spring floods. In 1748 they relocated their village even further upstream, on higher ground called *Écores Rouges*, thirty-six miles from the mouth of the Arkansas. The following spring, for pretty much the same reason, and to be within the protective orbit of the Quapaw, Arkansas Post was rebuilt on the bluffs near the Quapaw village.⁴²

Seven years later, for strategic reasons related to the Seven Years War, the Post was moved to nine or ten miles above the mouth of the Arkansas River.⁴³ Militarily, this was a logical decision. The garrison would be closer to the Mississippi River traffic it was tasked with protecting, controlling, and re-provisioning. For the civilians at the Post, it was not. The settlement was located “about two hundred yards from the water-side,”⁴⁴ a guarantee that the site would be flooded annually.⁴⁵ At this iteration of Arkansas Post, it was the Post storekeeper, Étienne Layssard, who made an effort to hold back the water. Layssard built levees around his house and garden that were “five and six feet broad at the base and from 12 to 18 inches high.” Layssard’s levees were only partially effective. In the flood of 1758, Layssard’s garden was spared while water stood up to five feet deep in the fields behind the settlement.⁴⁶ Layssard’s house stood in ten to fifteen inches of water but the house itself was spared flooding because he, like some of the other inhabitants of the Post, built the house on posts, raising it six feet off the ground.⁴⁷

⁴² Arnold, *Unequal Laws*, 33.

⁴³ Arnold, *Unequal Laws* (p. 34) and “Relocation of Arkansas Post” (pp. 319-320), has Arkansas Post moving to the mouth of the Arkansas in 1756 when the post was under French control. Faye, in “Spanish Domination” (pp. 640-641), has the Post moving to the mouth of the Arkansas in 1766, when the fort came under Spanish control. Mattison, 32-33, and Coleman, 43-45, agree with Arnold, as does this account. (Note: French and Indian War in America.)

⁴⁴ Philip Pittman, *The Present State of the European Settlements on the Mississippi*, ed. Frank Heywood Hodder (Cleveland, OH: The Arthur H. Clark Co., 1906), 82.

⁴⁵ Arnold, “Relocation. . .,” 320, 323

⁴⁶ Faye, “French Domination . . .,” 718-719.

⁴⁷ Arnold, *Unequal Laws*, 35; Faye, “French Domination,” 717

The constant inundations made it difficult, if not impossible, for Arkansas Post to become a thriving agricultural community.⁴⁸ Given this limitation, and the fact that the Post was so far away from the Quapaw villages, on which the inhabitants depended for protection and trade, the post commandant, Captain de Villiers, pleaded with his superiors to allow him to move the Post to higher ground.⁴⁹ Permission granted, De Villiers scouted locations and discovered yet another difficulty Arkansas rivers presented to development in that they changed course. The Post could not be relocated to the spot de Tonti had selected for his trading post because the Arkansas River had since changed its course, and that site was no longer on the river. So in 1779 De Villiers moved the settlement back to the high ground of *Écores Rouges*, where a community remained until the 1930s.⁵⁰

Although flooding was seriously detrimental to growing crops, in truth, most of the residents of Arkansas Post were hunters and not much interested in becoming agriculturalists.⁵¹ Every fall, the hunters would leave the Post for their cabins on the Arkansas, White, and St. Francis Rivers, returning in the spring to trade their catch downriver for supplies, dry goods, and other commodities sent up from New Orleans.⁵² The hunters appear to have not been overly concerned about their hunting camps being overflowed in the seasonal high waters, for they almost uniformly located their camps on the river banks, within easy reach of canoes and keel boats⁵³ and flood waters. The greater convenience of ready access to the river overrode the

⁴⁸ Arnold, *Unequal Laws*, 34, and “Relocation,” 317-318.

⁴⁹ Arnold, “Relocation . . .,” 318, 321; Faye, “Spanish Domination,” 659.

⁵⁰ Arnold, “Relocation . . .,” 321, 323-324; Arnold, *Unequal Laws*, 217.

⁵¹ Coleman, 25; Arnold, *Unequal Laws*, 34; James, 279; Nuttall, 99

⁵² Arnold, “Relocation . . .,” 319; Pittman, 82; Dunbar’s comments in Berry, 49, show this was also the practice on the Ouachita.

⁵³ Berry, 63, 73, 80; Schoolcraft (p. 37 in Blevins). Dunbar, Hunter, and Schoolcraft each make numerous references to hunting camps located on the river banks. Sometimes, as in Hunter (Berry, p. 73), it is possible to interpret the hunting camp as being on the cliffs of *Ecore de Fabri* and out of reach of the floods, but the camp was still located within sight of the river.

inconvenience of cleaning up after high water. Dam construction would have held little appeal to them.

More permanent settlement followed the early explorers of Arkansas territory. It is no coincidence that early commentators remarked on the rich, fertile bottomlands of the river valleys and their potential for settlement and agriculture. The Jeffersonian ideal envisioned an America of small farms and yeoman farmers, and early commentators almost uniformly evaluated the land in terms of its agricultural potential.⁵⁴ William Dunbar and Thomas Freeman, both of whom explored the southwestern lands of the Louisiana Purchase at the behest of President Thomas Jefferson, were even instructed to record “with great pains and accuracy” the latitude and longitude of significant points along the rivers they were traveling, and to make notes of “the soil and face of the Country” they were passing,⁵⁵ which would allow cartographers to map the rivers and adjacent lands to provide valuable information to prospective settlers. But early explorers also realized the semi-annual inundations would make settlement difficult, if not impossible. Thomas Nuttall saw little hope for improvement in the prospects for cultivation of the country “without recourse to the same industry which has redeemed Holland from the ocean,”⁵⁶ referring to the system of dikes and levees the Dutch had been constructing since at least 1000 A.D.⁵⁷

Planters, not yeoman farmers, were some of the earliest permanent settlers in Arkansas. Plantations, farms, and businesses began to dot the river banks in increasing numbers after

Schoolcraft, who cut cross-country on one leg of his journey, found a plantation, but not one hunting camp, that was not on the river (p. 44 in Blevins).

⁵⁴ Norman K. Risjord, *Thomas Jefferson* (Madison, Wisconsin: Madison House, 1994), 49, 83; Flores, x-xi; Berry, xviii, and Dunbar’s comments on 15.

⁵⁵ Jefferson to Thomas Freeman, April 14, 1804, in Flores, 320-321; Berry, xii.

⁵⁶ Nuttall, 69.

⁵⁷ Audrey M. Lambert, *The Making of the Dutch Landscape: An Historical Geography of the Netherlands* (New York: Seminar Press Inc., 1971), 81.

1820.⁵⁸ Floods represented a real loss to farmers if their crops were “destroyed and swept away,” their cattle drowned,⁵⁹ their “houses swept off and their farms almost washed away or covered with sand.”⁶⁰ Equally frustrating was all the fertile alluvial land “subject to be overflowed,”⁶¹ and so “drowned” it was “unfit for survey,”⁶² let alone for planting. The amount of inundated land in Arkansas was variously estimated at between 8,000,000 and 9,600,000 acres,⁶³ which, by 1836, was potentially prime cotton-growing land,⁶⁴ rendered useless by Mississippi and Arkansas River overflows.

⁵⁸ Schoolcraft, 44 in Blevins; Nuttall, 124, 132. See also Chapter 7 “Preconditions for Levee Expansion: The Migration of Planters to Chicot County, Arkansas, and the Flood of 1840” in Owens, 591ff. The population of Arkansas Territory more than doubled between 1820 and 1830, from 14,273 to 30,388 (U.S. Census figures for 1820 and 1830).

⁵⁹ James, 273

⁶⁰ *Arkansas Gazette*, June 26, 1833.

⁶¹ “Inundated Lands-Mississippi and Arkansas,” *Arkansas Gazette*, May 17, 1836.

⁶² “Reclaiming of Inundated Lands in Arkansas and Louisiana,” *Arkansas Gazette*, March 5, 1836. These lands were “designated in the books of the land office as ‘swamp lands – wet and unfit for cultivation’.” (*Arkansas State Democrat*, August 25, 1848).

⁶³ *Arkansas Gazette* articles for May 17, 1836 and March 5, 1836, respectively. By the 1840s, estimates of drowned lands were 5,000,000 acres for the Mississippi, St. Francis, White, and Arkansas River valleys, and for the Saline, Ouachita, Black and Red River valleys, an “exact number of acres could not be so readily ascertained” (“To the Senate and House of Representatives in Congress Assembled, *Arkansas State Democrat*, May 26, 1848).

The number of acres of inundated land was at issue when Louisiana asked Congress to grant her the swamp and overflowed lands within her borders to compensate the state for internal improvements made to drain the land. The representative from Ohio, Mr. Vinton, argued that since Louisiana could not say exactly how many acres of lands were swamp and overflowed, then Congress could not know how much of a give-away it was committing to. The representative from Louisiana, Mr. Harmanson, pointed out that he could and did supply the number of acres of surveyed swamp land to the General Land Office, but that the total amount of overflowed lands could not be determined because, being swamps, the land was inaccessible and could not be surveyed. The following year, when Arkansas requested a similar grant of swamp and overflowed lands, the Arkansans knew even less about how much land they were talking about, but by then the precedent of giving land in lieu of funding for internal improvements had been set. U. S. Congress, *The Congressional Globe*, 31st Cong., 2^d sess., 20 (1851): 591 and 32^d Cong., 1st sess., 21 (1852): 1848.

cf. Harrison and Kollmorgen, 412: in October 1880, the State Land Commissioner reported that 8,652,432.93 acres had been claimed by the state, of which “‘7,627,812.14 acres had been approved to the State up to (that) date.’”

⁶⁴ *Arkansas Gazette*, March 15, 1836.

Despite the possibility of flooding, the high price of cotton encouraged gentlemen farmers to invest in cotton plantations in Chicot and Desha Counties in increasing numbers in the 1830s. Planters very quickly came to realize that their plantations would never be profitable if their crops were periodically ruined by overflows from the Mississippi River.⁶⁵ Flood control in the 1830s and '40s centered on the construction of levees “for the general protection of the lands and property of the citizens” from overflows, and to reclaim the inundated lands.⁶⁶ Levees are designed to keep the river in its channel during high water. The water still flows in its normal course. Dams block the water from flowing in its normal course and cause the water to back up behind the dam. The planters at this point did not need dams, they needed levees to keep the water from overflowing its banks. They did use the levees to dam the creeks that flowed into the Mississippi River, but that was to keep the levee continuous along the banks of the river. Had they left an outlet in the levees for the streams to pass through, that outlet would have become a crevice during a flood, and the entire section of the levee would have washed away. Damming the flow of the creeks was a side effect of building a continuous levee along the river. It was not a deliberate attempt to build a dam.

For example, planters in the Snow Lake community of Desha County constructed private levees on their land, which were eventually connected to make the Laconia Circle levee.⁶⁷

Planters in Chicot County also constructed private levees, although some of these may have been

⁶⁵ Owens, 620. Owens’s thesis is that in the 1830s, planters migrated to the Arkansas Delta in ever-increasing numbers to profit from high cotton prices, supplanting the economies of hunters and subsistence farmers.

⁶⁶ “The Levee Law,” *Arkansas State Gazette*, March 28, 1838.

⁶⁷ Jim Merritt and B. Gill Dishongh, Sr., “The Levee System of Desha County, Arkansas,” *Programs of the Desha County Arkansas Historical Society* 14 (Spring 1988), 12; Rachel M. Miller, “Laconia Circle Levee” in *Encyclopedia of Arkansas History & Culture*, accessed May 31, 2011.

little more than “mere ridges thrown up with a plow.”⁶⁸ Chicot County planters, increasingly aware that mere ridges and individual effort would not hold back the Mississippi, were among the first Arkansans to successfully lobby for a state-sanctioned program of levee building.⁶⁹

State support came in the form of an Act passed in 1840 that authorized the Chicot county court to order and “enforce the construction of levees along the bank of the Mississippi river,” and to assess a tax on landowners to fund their construction. Establishing a pattern that would be followed in the creation of levee districts throughout the 19th century, the county court was authorized to appoint a commissioner or commissioners to determine where levees should be built, to specify their dimensions, and to oversee their construction and repair, all to be funded by a levee tax. A jury of disinterested landowners in the county was appointed to determine the levee tax to be assessed landowners in proportion to how much they would benefit from the levee.⁷⁰ Thus the levee district system allowed the state to support and sanction levee building without committing state funds to the project.

Over the same years that Chicot County planters were successfully lobbying the state legislature for authority to enforce construction of levees, planters and farmers in other Delta counties were lobbying the U.S. Congress for assistance in constructing levees along the west bank of the Mississippi and the south bank of the Arkansas from its mouth to Pine Bluff.

⁶⁸ E. C. Tollinger, “The Levees in the Upper Tensas District in Arkansas,” in *Riparian Lands of the Mississippi River: Past-Present-Pro prospective* (Chicago: A. L. Swift and Co., 1901), 319. The Arkansas State act of 1840 authorizing the construction of tax-supported levees implies that private levees did exist in Chicot County, as the act specifies that a “person completing (a) levee at his own expense,” may recoup the cost through the levee tax (Acts . . . of the State of Arkansas, 1840, p. 25). See also Humphrey and Abbott, *Report on the Mississippi River*, 1864, reprinted with additions in 1876, 152.

⁶⁹ Owens, 707.

⁷⁰ Construction of levees. . ., *Acts of Arkansas*, 1840: 25-28; Charles S. Bolton, *Arkansas, 1800-1860: Remote and Restless* (Fayetteville: The University of Arkansas Press, 1998), 64. Chicot, Lafayette, and Hempstead County planters had tried to get a similar bill passed in the Arkansas Legislature in 1838, but Governor Conway vetoed it (*Arkansas State Gazette*, March 28, 1838).

Lobbyists argued that levees were the most efficacious way to “reclaim and bring into market and cultivation, *millions of acres* of land, which otherwise (would) never be worth a cent.”⁷¹ The reclamation of overflowed lands, according to editorialist “Pea Jacket,” was “a subject second only to the great contemplated California Railroad.”⁷² However, asking the U.S. Congress for appropriations to complete levees that lay solely within the state of Arkansas was a tricky proposition when Congress and the administration were controlled by Jacksonian Democrats who opposed federal appropriations for internal improvements that were local in nature.⁷³ One hundred years later Arkansans would still be arguing the when it came to dams on Arkansas’s rivers that those dams were not local in nature, that the dams helped on a national level, too.

Still, the Arkansas state legislature sent a memorial to Congress in 1845 in which they argued that levees along the Mississippi and Arkansas Rivers were not an internal improvement local in nature, but instead were of national significance because they would render government-

⁷¹ *Arkansas Gazette*, March 15, 1836. Petitioners from Arkansas were John J. Bowie, elected in 1835 to represent Phillips County in the House of Representatives of the General Assembly of the Territory of Arkansas; William Strong, elected Sheriff of St. Francis County in 1830 and a significant landowner in 1836 (Wm. Strong was the contractor on the Memphis to Little Rock road in 1837); Thomas J. Lacy, of Jackson County, elected a Judge of the Supreme Court in 1836; Joel Johnson, of Chicot County, appointed an Appraiser of Land for the Real Estate Bank of Arkansas in 1836; De La F. Roysdon, elected to the House of Representative from Chicot County in 1836; and Frederick Notrebe, “a prominent merchant, planter, and land speculator at Arkansas Post, Arkansas County” (see *Encyclopedia of Arkansas History & Culture* entry for “Notrebe, Frederick.”). The petition was presented to the U.S. Congress by Ambrose Sevier, Arkansas Territorial Representative in the U.S. House of Representatives in 1836.

See also “Memorial to the Congress of the United States, by the General Assembly of Arkansas,” *Acts, Memorials and Resolutions passed at the Fifth Session of the General Assembly of the State of Arkansas* (Little Rock: Borland & Farley, 1845), 151. The memorialists claimed three million acres subject to overflow.

⁷² Pea Jacket, “Inundated Lands on the Arkansas and Mississippi Rivers,” *Arkansas State Democrat*, June 29, 1849.

⁷³ Glyndon G. Van Deusen, *The Jacksonian Era, 1828-1848* (Prospect Heights, IL: Waveland Press, Inc., 1992), 51. Andrew Jackson (1829-1837) and the Jacksonian Democrats Martin Van Buren (1837-1841) and James K. Polk (1845-1849) opposed federal funding for internal improvements that they deemed to be primarily state or local in nature.

owned land saleable. Millions of acres of land in the public domain, they argued, could not be sold to settlers as productive farmland because the seasonal inundations destroyed existing crops and discouraged cultivation of additional farm land. Thus it was the general government, and the states with whom they shared the proceeds from the sale of public land, that would benefit from levees that just happened to be solely in Arkansas. The memorialists further proposed that if Congress could not bring itself to vote an appropriation for the construction of levees, then they could allow the states to collect the proceeds from the sale of public lands, and to use those proceeds to fund internal improvements.⁷⁴

Using the sale of public lands to fund internal improvements in the states was an idea proposed by Senator Thomas Hart Benton of Missouri in 1826,⁷⁵ and picked up by Henry Clay as part of his American System, which called for the expenditure of federal funds on projects that promoted economic development and advanced the public welfare.⁷⁶ Congress experimented with the proposal in 1841 by granting 500,000 acres of public land to each of twelve states, including Arkansas, that bordered on the Mississippi River. The states were to sell that land and use the proceeds “for purposes of internal improvement.”⁷⁷ For Arkansas, the proceeds from this first grant of public lands were so dispersed among all the counties in the state as to be ineffectual for their intended purpose.⁷⁸ The western states – those bordering on the Mississippi River – continued to agitate the general government, such as in the form of Arkansas’s Memorial of 1845, for some assistance or compensation for the internal improvements, particularly levees, that the states had funded or would fund. Louisiana in particular argued that if Louisiana

⁷⁴ “Memorial to the Congress. . .” (1845), 153-154.

⁷⁵ U. S. Congress, *The Congressional Globe*, 31st Cong., 1st sess., 1850, 19.

⁷⁶ Van Deusen, 51. Clay’s American System was an issue in the 1832 presidential campaign.

⁷⁷ Sale of Public Lands, Chpt. 16, *U. S. Statutes at Large* 5 (1841): 455

⁷⁸ Harrison and Kollmorgen, 373.

reclaimed lands that were “unfit for cultivation” by constructing levees, then “the General Government (should) give them to the State, by way of compensation for the cost of reclaiming them.”⁷⁹ Partly on the strength of this argument, partly on the knowledge that the overflowed lands never could be sold, Congress passed in 1849 the first of a series of Swamp Land Acts when it donated to the state of Louisiana the swamp and overflowed lands in the public domain.⁸⁰ Having set the precedent with Louisiana, the next year Congress voted to donate to the state of Arkansas “public lands remaining unsold, on account of overflow, in that State.”⁸¹

The Swamp Land Act of 1850 gave Arkansas the right to identify and sell millions of acres of overflowed and inundated lands in the public domain and to use the proceeds to finance internal improvements, principally levees and drainage ditches.⁸² To implement the provisions of the Swamp Land Acts, in 1851 the state legislature created the Board of Swamp Land Commissioners responsible for “fixing the price of the swamp and overflowed lands; determining the location, extent, and dimensions of the necessary levees and drains to reclaim these lands; . . . and letting the contracts for building the levees” at low bid.⁸³ While the Board of Swamp Land Commissioners did build some levees,⁸⁴ they were not well-made, being “deficient in height and base,” and subject to caving into the river.⁸⁵ Even so, the Swamp Land

⁷⁹ U. S. Congress, *The Congressional Globe*, 31st Cong., 2^d sess., 1851, 20: 592; U. S. Congress, *The Congressional Globe*, 32^d Cong., 1st sess., 1852, 21, pt. 2: 1849.

⁸⁰ *Louisiana Swamp Land Act*, Chpt. 87, *U. S. Statutes at Large* 9 (1849): 352-353.

⁸¹ *The Congressional Globe* 21, pt. 2: 1191. The story of how the levee law was passed has yet to be told. Harrison and Kollmorgen do mention the continued lobbying by the western states. Humphreys and Abbott do not address the issue. John Barry in *Rising Tide* credits the flood of 1849, which was especially serious. A more complete look at the issue would require a reading of the 1848 report of the Congressional Committee on Public Lands and all of the Congressional testimony preceding and proceeding from the Commission’s report.

⁸² *Swamp Land Act*, Chpt. 84, *U. S. Statutes at Large* 9 (1850): 519. The date was September 28, 1850.

⁸³ Harrison and Kollmorgen, 374.

⁸⁴ 109 miles as of 1852 (Harrison and Kollmorgen, 379).

⁸⁵ Harrison and Kollmorgen, 404, 391, 375.

Act and the Board of Swamp Land Commissioners signaled the start of a state-wide program of flood control.

Given their poor performance in getting the levees built, the Board of Swamp Land Commissioners was replaced in 1856 by a Swamp Land Secretary who was responsible for overseeing the construction and maintenance of levees. Seven swamp land districts were created;⁸⁶ land sold in each district went to building the levees in that district. Contracts could be let to close the gaps in the levees, and for “ditching, draining, and reclaiming swamps and overflowed land,” whenever a levee district had accumulated \$5,000 from the sale of donated land.⁸⁷ Although “considerable progress was made” under the Swamp Land Secretaries,⁸⁸ in 1861, when Captain A. A. Humphreys and Lieutenant Henry Abbott published their massive study of the Mississippi River, *Report Upon the Physics and Hydraulics of the Mississippi River*, they reported that Arkansas had constructed a nearly-complete line of levees from the Missouri border to Old Town, but that from Old Town to Cypress Creek Gap (near present-day Lake Chicot), the levees had extensive gaps or were non-existent. From Cypress Creek Gap to south of New Orleans Humphreys and Abbott reported that the levees were continuous. Even where levees did exist, Humphreys and Abbott criticized the Arkansas levees for being “too small, and, upon the whole . . . quite inadequate to effect the object for which they were intended.”⁸⁹

Humphreys and Abbott’s study of the Mississippi River was undertaken at the behest of Congress and was conducted under the purview of the U.S. Army Corps of Engineers. It was widely believed that the report would provide direction for federal navigation and flood control policy relating to the Mississippi. The completeness and adequacy of the levees was extremely

⁸⁶ Harrison and Kollmorgen, 397-398.

⁸⁷ Humphreys and Abbot, 162.

⁸⁸ Harrison and Kollmorgen, 403.

⁸⁹ Humphreys and Abbott, 153.

relevant to Humphreys and Abbott; their report recommended that “an organized levee system must be depended upon for protection against floods in the Mississippi valley.”⁹⁰ But by the time the report came out, Arkansas and the southern states were embroiled in the Civil War. The construction of levees very quickly became instead a problem of saving the levees from deliberate destruction by Union troops, and then rebuilding the damaged and destroyed levees after the war. Finally, in 1879, Congress did adopt a unified approach to navigation and flood control on the Mississippi River by creating the Mississippi River Commission to “control the entire river.” The Commission in turn adopted Humphreys and Abbott’s recommendations for a levees-only approach to flood control in the lower Mississippi River Valley, from Cape Girardeau to the Head of Passes.⁹¹ With some modifications, levees remain today the principle means of flood control along the Mississippi, the Arkansas, and other river systems that flow through the flat lands of the Arkansas Delta. The Commission did not consider Charles Ellet’s proposal for dams on the headwaters of the Mississippi to control floods.

Arkansas planters did not yet have the will or the resources to use dams to hold back the water. Levees were still the flood control method of choice in the Delta. But in 1846 planters in Pulaski County did turn to dams as an alternate method of flood control. Land owners in the Fourche bottoms east of Little Rock petitioned the state government to approve construction of a dam across Fourche bayou.⁹² The Fourche dam would not be the first dam in Arkansas. One of the provisions of the 1840 law authorizing Chicot County to enforce the construction of levees allowed the commissioner to stop “all large creeks and bayous running out from the Mississippi

⁹⁰ Humphreys and Abbott, 417.

⁹¹ Barry, 54, 88, 90-91.

⁹² Arkansas General Assembly, *Journal of the House of Representatives*, 6th Session, 1846, 103; “The Dam Across the Fourche,” *Arkansas State Democrat*, Feb. 19, 1847.

river” that overflowed and inundated the land⁹³ – in effect, damming the creeks and bayous so that the Mississippi did not back up into the creek beds and overflow the land. These dams were part of the levee system, and they did not serve a flood-control function separate from the levees. The Fourche dam would stand alone. And so began the use of dams as a strategy for flood control in Arkansas.

Fourche Bayou is an old cut-off of the Arkansas River⁹⁴ southeast of Little Rock. It is also the outlet for Fourche Creek. Fourche Creek heads in Saline County, just over the Pulaski County line, and flows east toward the Arkansas River. Fourche Creek empties into Fourche Bayou. Fourche Bayou flows south in a great arc, starting at its northern outlet on the Arkansas River about 5 miles southeast of Little Rock, to its southern outlet on the Arkansas, about 10 miles below the city.⁹⁵ Fourche Creek enters the bayou where the left-hand channel – the north channel of the bayou – is about 2 miles from the river.⁹⁶ When the Arkansas River flooded during the annual spring rise, the river backed up into the bayou, which also overran its banks, inundating the Fourche bottoms, and thereby rendering “some of the most valuable lands in the State” unfit for cultivation. The standing water left behind was said to contribute to sicknesses in Little Rock, providing yet another reason to stop the overflow.⁹⁷

⁹³ Construction of levees . . . , *Acts of Arkansas*, 1840: 27-28.

⁹⁴ *Biographical and Historical Memoirs of Pulaski, Jefferson, Lonoke, Faulkner, Grant, Saline, Perry, Garland and Hot Spring Counties, Arkansas* (Chicago: The Goodspeed Publishing Co., 1889), 362 (hereafter: Goodspeed, *Central Arkansas*). Goodspeed calls Fourche Creek by Fourche Bayou, and that the Bayou “empties into a bayou or cut-off.” However, the 1857 Survey map and the 1986 USGS Map both call the cut-off “Fourche Bayou” and the waterway that heads in Saline County and empties into it “Fourche Creek.”

⁹⁵ Audubon Arkansas, “Fourche Creek Information,” www.fourchecreek.org/Information_description.html (accessed August 13, 2011); Department of the Interior USGS Map “Sweet Home Ark;” “On City Expansion,” *Arkansas Democrat*, September 5, 1899.

⁹⁶ 1857 Survey map of Township 1 North Range 11 West and 1855 Survey map of Township 1 North Range 12 West; “On City Expansion,” *Arkansas Democrat*, September 5, 1899.

⁹⁷ Letter to the Editor, *Arkansas Democrat*, August 14, 1846. See also Worthen, 320-321.

The proposed solution to these difficulties was a dam across the left-hand branch, or fork, of the bayou to prevent the lands south and east of the dam from being overflowed. For these reasons, some residents of Little Rock had been calling for a dam across the Fourche since at least 1841.⁹⁸ The subject resurfaced periodically⁹⁹ until, on November 21, 1846, Richard Fletcher, Representative from Pulaski County, presented a petition in the House on behalf of Chester Ashley and “other citizens of the County of Pulaski praying” for construction of a dam across the Fourche.¹⁰⁰ Chester Ashley owned property on the north side of Fourche Creek just before it entered the bayou,¹⁰¹ but more importantly he was politically powerful. Richard Fletcher also owned land in the bottoms, “on the Arkansas, at the mouth of Fourche Creek.”¹⁰² After presenting the petition, Fletcher introduced legislation to enable “certain citizens” to erect “a levy or dam across the left hand fork of Bayou la Fourche” on November 28. The bill passed the House December 11, the Senate on December 16, and was signed into law by Governor Thomas S. Drew on December 21, 1846.¹⁰³

The bill established a procedure for funding construction of the dam based on the method used to pay for levees. The “free white male inhabitants over the age of twenty-one years residing in Big Rock Township” of Pulaski County were to elect three commissioners who

⁹⁸ Classified Ad, *Arkansas State Gazette*, October 16, 1844.

⁹⁹ W. Byrd Powell, “To The Citizens of Little Rock,” *Arkansas State Gazette*, May 31, 1843; Classified Ad, *Arkansas State Gazette*, October 16, 1844; Letter to the Editor signed “Fourche Dam,” *Arkansas Democrat*, August 14, 1846.

¹⁰⁰ Notes for the House Journal, November 21, 1846, Secretary of State’s Office.

¹⁰¹ U.S. Department of the Interior, Bureau of Land Management, General Land Office Records for Township 1 North, Range 11 West; Arkansas Land Records, <http://searches.rootsweb.ancestry.com/cgi-bin/arkland/arkland.pl>, accessed Apr. 18, 2011. According to Rootsweb, Ashley owned 465 acres in Township 1 North, Range 11 West.

¹⁰² Goodspeed, *Central Arkansas*, 369; Survey Map, 1857.

¹⁰³ Arkansas General Assembly, *Journal of the House of Representative*, 6th Session, 143-144, 229; Arkansas General Assembly, *Journal of the Senate*, 1846: 252; An Act . . . to build a dam across the bayou La Fourche, *Acts of Arkansas, 1846* (Little Rock: B. J. Borden, 1846), p. 180.

would assess a tax on all residents who benefitted from the dam, select the dam site, and oversee construction and maintenance of the dam. Under the law, the tax base could be quite large, since Big Rock Township included the city of Little Rock, and that three criteria for assessing who benefitted from the dam were included in the bill. These were any persons whose land was directly affected by the overflow, any persons whose land or health was “evidently” affected by the overflow, and any persons “whose free ingress, and egress to their lands and homes, to and from the city of Little Rock” will be affected. Since the proposed dam site was where the public highway crossed the bayou, a not insubstantial number of residents could conceivably be assessed the dam tax.¹⁰⁴

The three commissioners elected as the Board of Commissioners for the dam were the Reverend William W. Stevenson, Elijah A. More, and Gordon N. Peay.¹⁰⁵ None of the commissioners owned land in Township 1 North, Range 11 West, where the dam would be located.¹⁰⁶ If nothing else, this would demonstrate their impartiality in the assessment of taxes. Each man was also a respected member of the community. The Reverend Stevenson was a minister of the Christian Church¹⁰⁷ and was active in community affairs. He served as President of the Board of Health, as a director of the Real Estate Bank, and was active in the Odd Fellows.¹⁰⁸ Elijah A. More served as mayor of Little Rock in 1834 and later served as

¹⁰⁴ *Acts of Arkansas*, 1846: 180.

¹⁰⁵ “The Dam Across the Fourche,” *Arkansas State Democrat*, February 19, 1847.

¹⁰⁶ General Land Office Records.

¹⁰⁷ Walter Moffatt, “Transportation in Arkansas, 1819-1840,” *The Arkansas Historical Quarterly* 15, no. 3 (Autumn 1956), 194.

¹⁰⁸ *Arkansas Gazette*, June 5, 1833; *Arkansas State Gazette*, February 27, 1839 and April 13, 1842.

Commissioner of Public Buildings.¹⁰⁹ Gordon N. Peay was the Clerk of the Circuit Court of Pulaski County.¹¹⁰

The board of commissioners, represented by President W. W. Stevenson, advertised for bids for construction of the dam in August, 1847. The commissioners had finalized the site as “at or near the . . . old bridge across the bayou,”¹¹¹ which was also, coincidentally, “at, or near the farm and residence of Richard Fletcher.”¹¹² The board specified a dam “of earth, with a base 150 feet, 40 feet wide on the top, and at least one foot higher than the banks on either side” of the bayou. The commissioners were essentially building a levee that crossed the stream, rather than running parallel to it. However, the commissioners were not adhering to state regulations for the construction of levees, which required “ ‘for every foot in height, 1 foot wide on top, and, in addition, 7 feet base.’ ”¹¹³ The specifications published by the commissioners would presume a dam 40 feet high, but with a base narrower by 130 feet than state regulations would seem to require.

In the end, the Fourche Dam board of commissioners did not get the dam built, probably due to a lack of funds. Although the enabling legislation did not specify that the funds needed to be raised before construction could begin, it was common practice in the building of levees to have the funds on hand before construction began.¹¹⁴ The same may have held true for Fourche Dam. At any rate, the dam did not get built until after 1851 when Colonel Creed Taylor, Swamp Land Commissioner for the Middle District, used funds from the 1850 Congressional land donation to construct the dam and levees along the Arkansas River. Taylor specified a dam 30

¹⁰⁹ *Arkansas Gazette*, January 8, 1834; *Arkansas State Gazette*, November 21, 1838.

¹¹⁰ *Arkansas State Democrat*, July 24, 1846.

¹¹¹ “Proposals for Fourche Dam,” *Arkansas State Democrat*, August 26, 1847.

¹¹² *Acts of Arkansas*, 1846: 180.

¹¹³ Quoted in Humphreys and Abbott, 167.

¹¹⁴ Harrison and Kollmorgen, 374.

feet wide at the top and 240 feet wide at the base,¹¹⁵ conforming more closely to state regulations for the construction of levees. The dam was in place by 1857,¹¹⁶ but by 1869 it was in the news again, this time depicted as a detriment to the health of Little Rock. It would seem that even as the dam kept the waters of the Arkansas from backing up into the bottoms, the dam also kept the waters of Fourche Creek from flowing swiftly and cleanly to the river, thereby causing sewage to stagnate in pools south of the city.¹¹⁷ Fourche Dam is therefore a harbinger of both flood control methods and the environmental consequences of those methods.

No flood control dams were constructed in Arkansas from 1861, when Humphreys and Abbot recommended a “levees only” approach to flood control on the Mississippi, until 1940, when the Little Rock District of the Army Corps of Engineers began construction of Nimrod Dam. However, during those 79 years, the role of the federal government in flood control evolved considerably from one of no direct involvement to one of acceptance of primary responsibility for flood control. Landmarks in the evolution of government involvement in flood control in Arkansas start in 1879 when the U.S. Army Corps of Engineers became the government agency that carried out federal flood control programs in Arkansas. The Corps built some levees for the Mississippi River Commission, which had adopted the “levees only” approach called for in Humphreys and Abbot’s *Report Upon . . . the Mississippi River*, although most levees were still built by “local interests.” The federal government as yet did not see a role for itself in internal improvements except for navigation projects. The Corps could assist local groups in the construction of levees only if the levees were justified as aids to navigation.

The “levees only” policy is an important concept in the eventual construction of dams. In levees-only, the levees are intended to channel the river water in its course. In theory, the river,

¹¹⁵ *Arkansas State Gazette*, November 7, 1851.

¹¹⁶ 1857 Survey Map.

¹¹⁷ *Daily Arkansas Gazette*, July 22, 1869.

confined between the levees, would rush faster to the Gulf. Because the river was moving faster, it would scour the bottom of the river, keeping the channel deep and clear of debris. Humphreys and Abbot thought this method would suffice to keep the Mississippi from flooding. Charles Ellet thought otherwise. He thought that dams should be constructed across the headwaters of the major tributaries of the Mississippi, especially in Ohio. In times of floods, the dams would hold back the excess water and keep it from adding to the high water already in the main river channel. By not adding to the flood water, the water in its leveed channel would not rise high enough to overtop the levees. Humphreys and Abbot specifically rejected Ellet's argument and it would take until the 1930s for the Corps of Engineers to re-evaluate Ellet's proposal in terms of their comprehensive plans for the Mississippi River alluvial valley.

The eventual construction of dams to store excess waters so they would not overflow the land was a response to floods. Such dams are discussed by historians in terms of the floods they are intended to prevent. Therefore, a discussion of flood control dams is a history of the effort at flood control. Numerous historians have described the steps by which the Corps became the government agency responsible for the federal government's flood control program. The first was Arthur Frank with his examination of *The Development of the Federal Program of Flood Control on the Mississippi River*, published in 1930, just after the massive flood of 1927 and the government's immediate response to that flood. Frank discusses the contemporary arguments for and against federal flood control of the Mississippi, the various plans for controlling the river, and the roles of the Mississippi River Commission and the Army Corps of Engineers in carrying out those plans. Frank gives more emphasis to the role of the Mississippi River Commission than do subsequent authors, stating that its creation "put the United States definitely into flood-control work, and (is) probably . . . the most important piece of flood-control legislation in all of

our history.”¹¹⁸ Frank does acknowledge that the Commission was “since its creation dominated by the Corps,” and subsequent developments would place more importance on the role of the Army Corps of Engineers and the Flood Control Acts of 1928 and 1936 then Frank could from his perspective.¹¹⁹

In reality, the Mississippi River Commission did not have a large role in the eventual construction of flood control dams in Arkansas, but the U.S. Army Corps of Engineers did. The role of the Corps of Engineers, or simply, the Corps, in flood control efforts on the lower Mississippi is recounted by Martin Reuss in his study *Designing the Bayous: The Control of Water in the Atchafalaya Basin, 1800-1995*. Reuss looks primarily at how the Flood Control Acts of 1928 and 1936 made an impact on the Mississippi River, and especially the incorporation of the Atchafalaya floodway into the Corps’ flood control plan. For a study of the Corps’ role in Arkansas there is Mary Yeater Rathburn’s detailed and precise work, *Castle on the Rock: The History of the Little Rock District, U.S. Army Corps of Engineers, 1881-1985*. While both these studies focus on the Mississippi River and its tributaries, Joseph Arnold’s brief history, *The Evolution of the 1936 Flood Control Act*, describes the evolving and growing role of the Corps in flood control efforts not only on the Mississippi and its tributaries, but nationwide.

The federal government’s first direct involvement in flood control came in 1917 after a series of disruptive floods in the late 19th and early 20th centuries led Congress to pass legislation authorizing the Corps to “expedite” levee construction on the Mississippi for flood control rather than solely for navigation.¹²⁰ The levees, if built to the highest Corps standards, were expected to hold the river in its channel. They weren’t and they didn’t. The most serious failure of the levees resulted in the massive flood of 1927. In April, 1927, after months of heavy rains fell in

¹¹⁸ Frank, 42

¹¹⁹ Frank, 121.

¹²⁰ Reuss and Walker, 27-28.

Arkansas, the levees on the Mississippi gave way. At the same time, the St. Francis, Arkansas, and White rivers, swollen from the rains, overflowed their banks. Flood waters covered 27,000 square miles in parts of eight states. In Arkansas, 6,600 square miles were flooded, an area that stretched from the Mississippi River to Pine Bluff, and from Missouri to Louisiana. An estimated 330,000 people were forced from their homes, 40,000 of them Arkansans. Surprisingly, only 250 people died, 127 of them in Arkansas. According to Bruce A. Lohof, whose doctoral dissertation was about the flood, “fully thirteen per cent of the state was under water and total losses were reported to be \$14,936,000.” Total damages for the flood were estimated at \$246,000,000.¹²¹

The second piece of legislation that affected the federal government’s role in flood control was the River and Harbor Act of 1925, which eventually influenced its construction of dams. This piece of legislation included a provision for the Corps of Engineers to coordinate with the Federal Power Commission to prepare a cost estimate for surveying all navigable streams in the United States on which “power development appears feasible and practicable.”¹²² In preparing the cost estimates, the Corps was to consider the streams “with a view to the formulation of general plans” for improvements encompassing not just power and navigation, but also flood control and irrigation, and any other beneficial purpose. The estimate was to include the cost to survey the rivers to identify potential sites for dams and reservoirs suitable for generating hydroelectric power and regulating stream flow.¹²³ The legislation freed the Corps

¹²¹ John Barry, in *Rising Tide*, states that “no official figures summarize the deaths and flooding . . .” These figures are from Barry, 285-286; Bruce Lohof, “Herbert Hoover’s Mississippi Valley Land Reform Memorandum: A Document” *The Arkansas Historical Quarterly* 29, no. 2 (Summer 1970): 112-113; Wilson, 75; and Arnold, 18.

¹²² *River and Harbor Act of 1925*, § 3: 1190.

¹²³ House Committee on Rivers and Harbors, *Estimate of Cost of Examinations, Etc., of Streams Where Power Development Appears Feasible*, 69th Cong., 1st sess., 1926, H. Doc. 308, 2.

from considering river projects solely from the point of view of improving navigation. But the real importance of the River and Harbor Act of 1925 is that Congress recognized and accepted the principle that navigation projects “might be coordinated with other water projects,”¹²⁴ and it reflected the growing influence of “advocates of multiple use development” to lobby Congress to look at multiple-purpose development of rivers as one part of a more comprehensive program of conserving the nation’s natural resources.¹²⁵

In the wake of the 1927 flood, Congress finally adopted legislation that put the federal government firmly in the business of flood control. The Flood Control Act of 1928 adopted the Jadwin Plan, named for the Chief of Engineers, Major General Edgar Jadwin. The Jadwin plan abandoned the “levees only” policy of Humphreys and Abbot and called instead for a combination of outlets and improved levees to control floods on the lower Mississippi from Cape Girardeau, Missouri, to Head of Passes, including “diversion works and outlets.”¹²⁶ It established a three-man committee of engineers to approve flood control plans and ensure cooperation between the Corps of Engineers and the Mississippi River Commission. It authorized the Corps to build or rebuild levees damaged in the flood of 1927 and to do so without requiring monetary contributions from local levee districts or from the states where the improvements were made. In return, the states and/or levee districts would maintain the levees once built. Martin Reuss sums up the federal government’s financial commitment to flood control on the Mississippi:

The law authorized \$325 million for Mississippi River flood control. . . It is easy to forget that the *entire* federal budget in 1930 was \$3.3 billion. . . Of this money, 25 percent went to veteran’s services and benefits, 22 percent to national security, and 21 percent to interest

¹²⁴ Arnold, 16.

¹²⁵ O’Neill, 138.

¹²⁶ Reuss, 121; *Flood Control Act of 1928*, § 10, Public Law 391, 70th Cong., 1st sess., *U. S. Statutes at Large* (1928): 534ff.

on the national debt. That left about \$1 billion for all other government functions. Even given the fact that Congress expected to spend the \$325 million over a ten-year period, the size of the federal commitment is impressive. Probably no other water project involved as great a percentage of the federal budget at the time of its authorization as did Mississippi valley flood control.¹²⁷

The discussion of the personalities, politics, and science involved in the debate over “levees only” versus “floodways” can be found in John M. Barry’s readable if somewhat cynical account, *Rising Tide: The Great Mississippi Flood of 1927 and How It Changed America*.

According to Barry and others, the Flood Control Act of 1928

set a precedent of direct, comprehensive, and vastly expanded federal involvement in local affairs. In the broadest sense, this precedent reflected a major shift in what Americans considered the proper role and obligations of the national government . . .¹²⁸

Arkansas benefitted directly from the Flood Control Act of 1928 through the federal government’s commitment to construct or reconstruct levees along the Mississippi. But just as important to Arkansans was the provision in the law for the Army Corps of Engineers to conduct surveys to determine the feasibility of “further flood control of the lower Mississippi River to be attained through the control of the flood waters in the drainage basins of the tributaries by the establishment of a reservoir system.” The Arkansas, White, St. Francis, and Red Rivers and their tributaries were specifically mentioned in the Act. Through the surveys, the Corps was to examine the benefits of “reservoired waters” – waters retained behind a dam – not only for flood control, but also for navigation, soil conservation, irrigation, and hydropower, indicating that any

¹²⁷ Reuss, 121

¹²⁸ Barry, 407.

reservoirs that might be created as a result of these studies would be impounded by multiple-purpose dams.¹²⁹

Arkansans had lobbied for the inclusion of these studies in the flood control bill.¹³⁰ Barry says the lobbying began in September, 1927, when the ad-hoc Tri-State Flood Committee met with Herbert Hoover at the residence of Col. John Fordyce in Hot Springs to discuss the impending flood control legislation. Hoover at the time was the federal government's point man on flood relief. Representatives from Mississippi, Louisiana, and Arkansas were on the Tri-State Flood Committee. The Arkansas representative was Governor John Martineau. At the Hot Springs meeting Martineau argued that "many of his state's problems came not from the Mississippi itself but from its tributaries," and that Arkansas would not be content with any bill that did not address the problem of the tributaries.¹³¹ The Tri-State Committee met again on March 15, 1928, in Memphis. At this meeting, Arkansas representatives Martineau and Fordyce were joined by Harvey C. Couch, president of AP&L, and R. R. Rice, who served as executive secretary of the committee. Martineau, whose term as governor of Arkansas had ended the day

¹²⁹ *Flood Control Act of 1928*, Sec. 10: 538.

¹³⁰ Interestingly, the 1927-28 Congressional debates over surveys of the tributaries did not mention that surveys of the Arkansas and White Rivers and their tributaries had already been proposed in 1926 and authorized in the River and Harbor Act of 1927. In all, three survey documents relating to rivers in Arkansas were submitted to Congress. House Document No. 798, *Control of Floods in the Alluvial Valley of the Lower Mississippi River*, was authorized by Sec. 10 of the Flood Control Act of 1928, included studies of the Arkansas and White Rivers, and was submitted to Congress on March 3, 1931. The second report, H. Doc. 102. H. Doc. 102 was a plan for multiple-purpose reservoirs on the White River. It was authorized by the River and Harbor Act of 1927 and by the Flood Control Act of 1928. Congress may have authorized two separate surveys, but with this document, the Corps combined the two studies. The third report also combined the two authorized surveys of the Arkansas River and submitted it to Congress on August 24, 1935, as H. Doc. 308, *Arkansas River and Tributaries*, was also a plan for multiple-purpose reservoirs on the Arkansas River in Oklahoma and Arkansas, and on several Arkansas River tributaries. (House Committee on Rivers and Harbors, *Arkansas River and Tributaries*, 74th Cong., 1st sess., 1935, H. Doc. 308.)

¹³¹ Barry, 400-402.

before the Memphis meeting, called on the committee to take a “united stand” and be ready to “compromise” on the question of local contributions to flood control.¹³²

Martineau was referring to the most controversial aspect of the flood control bill, the provision for local contributions. By the time the bill came up for debate, three factions had formed: those who wanted local or state contributions toward the cost of flood control; those who believed the locals had already contributed over \$282,000,000 to flood control in the valley and it was therefore the federal government’s turn to step up and provide funding; and a third group “made up of representatives from the states which are subject to flood from the tributaries,” who wanted the legislation to address the effect that tributary rivers had on Mississippi River floods. This third group, called the ‘tributaries bloc,’ included Arkansas’ representatives, led by Senator Thaddeus Caraway, and representatives from Oklahoma, Kansas, Nebraska, and Colorado.¹³³ Caraway insisted the “government take action to protect tributaries” and that the flood control bill include “provisions . . . to take care of their situations.”¹³⁴ In the House, Representative Heartsill Ragon of Clarksville echoed Caraway’s position, arguing that “88 per cent” of the 1927 flood damage in Arkansas was caused by flooding on the Arkansas River. The Jones Bill, Ragon said, did not address the “destructive flood waters of the tributaries,” specifically the Arkansas, White, and St. Francis rivers.¹³⁵

Ragon joined fellow Arkansas Representative William Driver, Democrat from the 1st District, in calling for reservoirs on the tributaries. Driver, who also served on the House flood control conference committee, argued that reservoirs on the headwaters of the tributaries were just as economical a method of flood control as diversion works on the main stem of the

¹³² *Arkansas Democrat*, March 15, 1928.

¹³³ U. S. House, *Congressional Record*, 70th Cong., 1st sess., 1928, 69, pt 3: 2807-2808.

¹³⁴ *Arkansas Democrat*, Mar. 2, Mar. 3, and Mar. 4, 1928. “Tributaries bloc” April 1, 1928.

¹³⁵ *Arkansas Democrat*, Mar. 25, 1928.

Mississippi. Reservoirs would allow land that would otherwise be set aside for floodways to be put into “fruitful service,” they would “forever remove the dread fear of the valley from recurring flood,” and during periods of low precipitation, water released from the reservoirs would “guarantee navigation” and “furnish to the areas where high freight rates prevail adequate transportation facilities at the cheapest possible cost.”¹³⁶ Both Ragon and Driver cited studies by the Corps of Engineers, the Mississippi River Commission, and private engineering firms to bolster the argument that reservoirs on headwaters were an effective method of flood control.¹³⁷

Arkansas’s congressional representatives and senators knew there was no possibility that President Coolidge, a fiscal conservative, would sign a flood control bill that incorporated reservoirs at the headwaters of the tributaries as well as construction of levees and floodways on the main stem of the Mississippi. The cost, at \$325,000,000 for the work on the Mississippi plus an estimated additional \$445,000,000 for a program of “comprehensive reservoir control,” was prohibitive.¹³⁸ Which is why the Arkansas delegation lobbied so hard for the surveys of the tributaries. Everyone in Congress understood that when the Corps of Engineers completed the surveys, the results would be presented to Congress, and Congress would be expected “to develop these flood-control projects” as soon as they were presented.¹³⁹ By authorizing the surveys, Congress was tacitly committing to a reservoir program on the tributaries, even though Arkansas might have to wait five to ten years to realize this undertaking.

¹³⁶ *Congressional Record* 69, pt. 3: 3262.

¹³⁷ *Congressional Record* 69, pt. 3: 3260; *Arkansas Democrat*, March 25, 1928. Although the Mississippi River studies of Charles Ellett were not mentioned, Ellett had proposed reservoirs on the headwaters of the Mississippi as early as 1853. However, the headwaters Ellett had considered were the rivers of the Alleghany River valley and Rocky Mountains. Ellett, 220.

¹³⁸ *Arkansas Democrat*, April 3, 1928; President Calvin Coolidge’s Fifth Annual Message, October 6, 1927; See Driver’s report in the *Congressional Record*, p. 3262, for reservoir figure.

¹³⁹ *Congressional Record* 69, pt. 7: 7115.

And so, on May 15, 1928, after Coolidge signed the flood control bill, the Corps of Engineers embarked on a “giant task in engineering” to design floodways on the Mississippi and to survey the tributaries. Congress had allotted \$5,000,000 of the \$325,000,000 appropriation for the Corps to survey “the Red, Yazoo, Arkansas, Missouri, Illinois, White, St. Francis and Ohio rivers and their tributaries.”¹⁴⁰ Three years later, on March 3, 1931, the Corps presented to Congress its report on the “Control of Floods in the Alluvial Valley of the Lower Mississippi River.” The Corps’ proposed plans for the White and Arkansas River did not call for any reservoirs in Arkansas on the Red or St. Francis rivers.

The plan did call for four reservoirs on the main stem of the White River, at Beaver, Table Rock, Wild Cat Shoals, and Penters Bluff near Batesville, and four reservoirs “on tributaries of the upper White River as follows: near Galena, Mo., on the James River; near Norfolk, Ark., on the North Fork; and at Mill Creek and Lone Rock, Ark., on the Buffalo Fork,” and one reservoir on the Little Red River at Greers Ferry.¹⁴¹ The plan also called for four additional reservoirs on the Eleven Point, Current, and Black Rivers in Missouri. Of these 13 proposed dam sites, the Corps concluded that the eight reservoirs located at Table Rock, Wild Cat Shoals, Norfolk, Mill Creek and Lone Rock on the Buffalo in Arkansas, Mill Creek and Hargus Ferry on the Current River in Missouri, and Greers Ferry on the Little Red would have been most effective in “lowering flood heights” during the 1927 flood.¹⁴²

For the Arkansas River and its tributaries, the plan called for one flood control dam on the Petit Jean River, two on the Fourche LaFave River, and one across the main stem of the Arkansas River at Little Rock. Blue Mountain dam was proposed for the Petit Jean River, and

¹⁴⁰ *Arkansas Democrat*, May 15, 1928.

¹⁴¹ House Committee on Flood Control, *Control of Floods in the Alluvial Valley of the Lower Mississippi River*, 71st Cong., 3^d sess., 1931, H. Doc. 798, 1292.

¹⁴² H. Doc. 798, 1300.

the Cedar Mountain and Nimrod dams were proposed for the Fourche LaFave River. In the report, the Corps assessed how these three tributary reservoirs, when combined with an additional 39 tributary reservoirs in Oklahoma, would have ameliorated the flood of 1927. Of the three proposed Arkansas River tributary reservoirs, the Corps report concluded that Nimrod, when combined with a select 27 Oklahoma reservoirs, would be the most effective in controlling floods. These 28 reservoirs, the Corps said, would have “ample capacity to have completely controlled the flood flows of 1927.”¹⁴³

The Corps also considered the effect on the flood of 1927 of a dam on the main stem of the Arkansas “at Big Rock, about 2.5 miles northwest of Little Rock.” The Little Rock Reservoir would have a capacity of “about 28,980,000 acre feet,” as compared to 750,000 for Nimrod, 225,000 for Cedar Mountain, and 500,000 for Blue Mountain. The Little Rock Reservoir, according to the Corps’ calculations, would “render unnecessary all of the reservoirs considered in . . . this report.” It also would have submerged Conway, Dardanelle, Danville, and “thirty towns, villages, and settlements,” and require the relocation of 209 miles of railroad lines and 277 miles of highways.¹⁴⁴

Cost was another very important consideration in the report. The Corp estimated that the cost of the 28 tributary reservoirs – which included Nimrod Reservoir – would be \$137,000,000, “or an average of \$10.76 per acre-foot capacity.” The Little Rock Reservoir would be more economical, at \$267,000,000, “or an average of about \$9.20 per acre-foot of capacity.” To provide a yardstick for cost effectiveness of reservoirs, the Corps also included in the report the average cost per foot of lowering the 1927 flood. For example, the 28 reservoirs on the Arkansas River would cost “about \$42,700,000 per foot of stage reduction,” while the Little Rock

¹⁴³ H. Doc. 798, 1364.

¹⁴⁴ H. Doc. 798, 1413.

reservoir on the main stem of river would cost “\$2,400,000 per foot of reduction in Mississippi River 1927 flood stage,” thereby proving by another means that the Little Rock reservoir would be most economical.¹⁴⁵

Despite the expectations of Arkansas’ Congressional delegation, submission of the Corps’ plans to Congress did not result in immediate authorization and funding of the projects. Instead, Congress continued to debate the relative merits of reservoirs versus floodways for flood control.¹⁴⁶ So Arkansans began another lobbying campaign to convince Congress to approve the reservoirs on the Arkansas and White Rivers. Several events helped catalyze this lobbying effort. One was creation of the Tennessee Valley Authority (TVA), which set an example for the multiple benefits that could be realized from a comprehensive river basin program. Another was the effort by Arkansas Senator Joseph Robinson and Representatives David Terry and John Miller to create an Arkansas River Valley Authority based on the TVA model. The effort to create an Arkansas River Valley Authority failed, but the idea of comprehensive river basin planning continued to appeal to Congress and especially to President Franklin Roosevelt. And finally, Arkansas experienced another disastrous flood in March of 1935. As Mary Rathburn describes the flood, “The White, Black, Current, Little Red, and Fourche LaFave joined the Arkansas in a rampage reminiscent of 1927.” Thirteen counties in Arkansas and Missouri were flooded, and 15,030 people were forced from their homes.¹⁴⁷

¹⁴⁵ H. Doc. 798, 1383

¹⁴⁶ *Arkansas Democrat*, July 18, 1935.

¹⁴⁷ Rathburn, 51. Rathburn says Robinson initially “refused” Roosevelt’s suggestion of an Arkansas River Valley Authority, but that he eventually changed his mind because in November 1934, Robinson, Terry, and Miller “led a drive to create an Arkansas River Valley Authority.” She goes on to say this initiative may have been “motivated by the Arkansas congressional delegation’s awareness that the Public Works Administration (PWA) planned no major Arkansas River works,” and an Arkansas River Valley Authority (ARVA or AVA, both acronyms are used in different sources) would be one way to have PWA money go to Arkansas (Rathburn, p. 51). Joe T. Robinson’s biographer, Cecil Edward Weller, Jr., does not mention Robinson’s efforts on

In July 1935, Little Rock Mayor R. E. Overman called a meeting of representatives of 16 counties on the Arkansas River that were affected by the flood. The representatives formed the Arkansas River Valley Association, whose goal was to push for adoption of a plan of flood control for the Arkansas River valley. Overman promised that, “ ‘when a plan is adopted, we are going to push it to completion so that Arkansas will not be in danger from high water on the Arkansas river.’ ”¹⁴⁸ The valley association was joined in its lobbying efforts by H. H. Tucker, representing the Little Rock Chamber of Commerce, James A. Fox of the Mississippi Valley Association, and “others taking an active interest” in flood control projects in Arkansas. Those “others” came to include representatives from “the valleys of the White, Black and Little Red rivers.” Fred Isgrig, United States district attorney in Little Rock and member of the valley association, noted that the purpose of the association was for “ ‘all communities in this (flood control) problem’ ” to co-operate so that any plan would benefit all the interested parties.¹⁴⁹ Mayor Overman, Tucker, and William Parkin, retired U.S. Army engineer associated with the Arkansas River Valley Association, “urged that a determined effort be made to secure action on

behalf of an AVA, but he does say that Robinson supported Roosevelt on almost every piece of New Deal legislation, including voting for the Tennessee Valley Authority Act and the Rural Electrification Administration Act (Weller implies Robinson voted for the REA by saying, “Robinson loyally supported the president” when the REA legislation was before Congress, p. 152). On whether Robinson would vote against public utility projects because he was general counsel and friend of Harvey Couch, Weller notes that Robinson had resigned from the law firm that represented AP&L in 1932 (p. 133). Cecil Edward Weller, Jr., *Joe T. Robinson: Always a Loyal Democrat* (Fayetteville: The University of Arkansas Press, 1998). Leuchtenburg says Henry Wallace, Secretary of Agriculture, opposed the effort to create an AVA and six other regional valley authorities because such authorities would take too much control of river basin, soil conservation, forestry, and other interests of the Agriculture Department out of the hands of other government agencies, including Agriculture, the Corps of Engineers, the Bureau of Reclamation, and the Soil Conservation Service. Wallace successfully lobbied Roosevelt to support legislation that defined the valley authorities as “planning” agencies, not management agencies. The bill was eventually “buried” in the House Rivers and Harbors Committee (p. 440). William E. Leuchtenburg, “Roosevelt, Norris and the ‘Seven Little TVAs’,” *The Journal of Politics* 14, no. 3 (August 1952): 425ff.

¹⁴⁸ *Arkansas Democrat*, July 10, 1935.

¹⁴⁹ *Arkansas Democrat*, July 11, 1935.

the (flood control) measure before Congress.” In response to Tucker’s urging, the members of the Arkansas River Valley Association sent “a barrage of telegrams to members of the Arkansas delegation” urging passage of the flood control legislation then before Congress.¹⁵⁰

Arkansas’s congressional delegation needed little urging. Arkansas Representatives David D. Terry, John L. McClellan, and John E. Miller supported the plan for reservoirs. John Miller envisioned an industrialized Northwest Arkansas if the reservoirs proposed for the White River were constructed. McClellan said he “would support the reservoir plan as an additional factor of safety for the lower Mississippi valley.” David Terry pressured the Corps of Engineers to release a river survey report that was needed for writing flood control legislation. Terry argued that “publication of the report would also assist in securing public works funds for Arkansas river development.” In the Senate, Joseph T. Robinson “planned to throw all his influence and strength behind” an omnibus flood control bill. Both Robinson in the Senate and Terry in the House also pushed for additional funding for more levees in Arkansas.¹⁵¹

The piece of legislation the Arkansas River Valley Association and Arkansas’s congressional delegation supported was the Wilson flood control bill, introduced in the House on July 13, 1935, by Congressman Riley Wilson of Louisiana. Wilson’s bill substituted reservoirs on the headwaters of the Mississippi tributaries for two of the three floodway projects proposed by the Corps of Engineers. The Jadwin Plan had called for floodways at Morganza, Eudora, and the Boeuf River basin, but no reservoirs on the headwaters of the tributaries. Wilson’s bill called for elimination of the Eudora and Boeuf floodways, and inclusion of 26 dams and reservoirs on

¹⁵⁰ *Arkansas Democrat*, August 4, 6, 7, 1935.

¹⁵¹ *Arkansas Democrat*, July 6, 1935, July 14, 1935, July 22, 1935, August 23, 1935.

the Arkansas and White rivers and their tributaries.¹⁵² Wilson's proposal was based on a new set of river surveys that the Corps had recently completed.

These new surveys of the Arkansas River and its tributaries were the ones based on the cost estimates that had been required by Section 3 of the River and Harbor Act of 1925, and that had been funded by the Rivers and Harbor Act of 1927 and Flood Control Act of 1928. Whereas the surveys released in 1931, which had included the plan for the big reservoir at Little Rock, had considered only flood control projects on Arkansas's rivers, the new, more intensive, river basin surveys contained "a general plan for the improvement of Arkansas River and tributaries, for the purposes of navigation and efficient development of its water power, the control of floods and the needs of irrigation," as required by the 1925, 1927, and 1928 legislation. These purposes would be realized by construction of dams across the main stem of the rivers and their tributaries.

The plan for the Arkansas River and tributaries was presented to Congress as House Document No. 308, *Arkansas River and Tributaries*, dated August 24, 1935. In the 308 report, the Corps rejects the plan for the Little Rock reservoir on the main stem of the Arkansas River as cost-prohibitive and "economically unsound" at an "average rate of \$123.04 per acre" saved from flood losses when the "average annual flood loss per acre" is \$7.40. The Little Rock reservoir had also not been met with favor by the Arkansas State Planning Board because of the large number of roads and railroads that would need to be relocated, and of the "vast area in the heart of Arkansas" that would be inundated.¹⁵³ The Corps report also eliminated from consideration the Cedar Mountain Reservoir on the Fourche LaFave River. It did assess the effectiveness of Nimrod Dam on the Fourche LaFave and Blue Mountain Dam on the Petit Jean

¹⁵² *Arkansas Democrat*, July 13, 1935

¹⁵³ Arkansas State Planning Board, *Arkansas Water Resources* (Little Rock, Arkansas: State Capitol, 1939), p. 19.

for local and downstream flood control. The document concluded that there was no benefit from either of these two dams for flood control for the Mississippi River, and no local benefit for flood protection, water power, navigation, or irrigation.¹⁵⁴

The 308 report for the White River and tributaries was presented to Congress as House Document No. 102, *White River, Missouri and Arkansas*, dated March 30, 1932.¹⁵⁵ In the 102 report, the Corps concluded that the only flood control works justified were the levees authorized in the Flood Control Act of 1928. The Corps concluded that levees only, not dams on the headwaters, were sufficient. The Corps did identify potential water power sites at Beaver, Table Rock, and Wild Cat Shoals on the White; Mill Creek, Rush Creek, and Lone Rock on the Buffalo Fork; and Norfork on the North Fork of the White River. Reservoirs at all or some of these sites, the Corps believed, would incidentally contribute to flood control, but that the federal government was not justified in contributing resources toward these projects and that they should be developed by private interests.¹⁵⁶ Naturally, the Corps' conclusions on development of the White River and tributaries were not well-received in Arkansas.¹⁵⁷

Although Congress debated the Wilson flood control bill throughout July and August, no agreement was reached on the floodways provisions of the bill before Congress adjourned, and therefore, no agreement on the reservoirs. The flood control legislation that did get passed in 1935 did little more than call for additional Corps surveys of the White River in Arkansas, the Arkansas River in Arkansas and Oklahoma, and the Black River in Arkansas and Missouri. The Chief of Engineers was authorized to conduct "such additional study or investigation as . . .

¹⁵⁴ H. Doc. 308 (1935), title page, 103, 105, 625-626, 722.

¹⁵⁵ This was one of the surveys Congress had so far failed to act upon.

¹⁵⁶ H. Doc. 102, 2, 3, 154, 155

¹⁵⁷ *Arkansas Democrat*, March 31, 1932.

necessary to take into account important changes in economic factors as they occur, and additional stream-flow records, or other factual data.”¹⁵⁸

The Wilson bill was reintroduced in the House in the 1936 session, but with significant changes affecting Arkansas. The 1936 version of Wilson’s bill, which came to be referred to as the “\$384,000,000 omnibus flood control bill,” proposed 200 project throughout the U.S.¹⁵⁹ None of those proposed projects were for reservoirs in Arkansas. Levees, yes. Reservoirs in Colorado, New Mexico, Kansas and Oklahoma, yes. Reservoirs in Arkansas, no. In the same Congressional session as Wilson’s bill was reintroduced, flood control legislation was also introduced in the Senate by John H. Overton of Louisiana. Overton was primarily interested in getting the floodways along the lower Mississippi built and determining fair compensation for land owners who lost property to the floodways, and his proposed measure reflected that bias.¹⁶⁰

Unhappy with the omnibus and Overton bills, Representative John Miller introduced an amendment to the Overton bill in the House calling for authorization of 26 reservoirs on the White and Arkansas Rivers. Miller’s amendment was supported by representatives from Oklahoma, Kansas, and “other Mississippi Valley tributary states” that would gain reservoir projects if the Miller amendment succeeded. Miller’s amendment was opposed by Representative Wilson and Arkansas Representative William Driver. Driver believed the amendment would “kill” the bill, thereby derailing east Arkansas levee projects.¹⁶¹ The Miller amendment was approved by the House; however, it did not survive in the House-Senate

¹⁵⁸ *Flood Control Act of 1935*, Public Law 409, *U. S. Statutes at Large* 48 (1935).

¹⁵⁹ *Arkansas Democrat*, May 12, 1936.

¹⁶⁰ *Arkansas Democrat*, May 6, 1936.

¹⁶¹ *Arkansas Democrat*, May 22, 1936.

conference committee.¹⁶² The Overton bill as passed by both Houses and signed by Roosevelt did not include provision for reservoirs in Arkansas.¹⁶³

The Wilson omnibus bill likewise passed, and when signed by Roosevelt became the Flood Control Act of 1936. Although the Act did not provide for reservoirs in Arkansas, it was extremely important for later developments. The 1936 act acknowledged for the first time the federal government's responsibility for flood control. Senator Joseph Robinson explained the importance of the bill, stating that "until about 20 years ago flood problems were dealt with by the states only and regarded primarily as of local concern" but "their relation to national economic and social conditions was . . . recognized in the 1936 flood control act."¹⁶⁴ Martin Reuss, in his study of flood control in the Atchafalaya Basin of Louisiana, concurs, writing, "the omnibus legislation . . . marked the formal acceptance by the federal government of nationwide flood control responsibilities, previously confined to the lower Mississippi and Sacramento rivers."¹⁶⁵

Even though Miller's amendment was removed from the Overton Act, and reservoirs were not included in the Flood Control Act of 1936, Arkansans did not give up on flood control reservoirs on the White and Arkansas rivers. Miller vowed that the fight for reservoirs was not over. He said, "It is only a question of time until reservoirs will be substituted for all other forms of flood control."¹⁶⁶ The Arkansas state Flood Control Commission "adopted a formal declaration of policy" that included the statement, "flood control should begin on the headwaters . . . we should go upstream and hold back the waters . . . reservoirs are the first approach to the

¹⁶² *Arkansas Democrat*, June 1, 1936.

¹⁶³ *Flood Control Act of 1936*, Public Law 406, *U. S. Statutes at Large* 49 (1936): 1577-1580.

¹⁶⁴ *Arkansas Democrat*, July 26, 1936.

¹⁶⁵ Reuss, 187.

¹⁶⁶ *Arkansas Democrat*, July 3, 1936.

problem.” The Arkansas Valley Association stayed active, meeting with, among others, the “farmers, business and professional men of the Petit Jean and Fourche la Fave valleys” to discuss flood control and the proposed reservoirs at Blue Mountain and Nimrod.¹⁶⁷

In the 1937 legislative session, McClellan submitted a bill for “a comprehensive national plan for the prevention and control of floods of all the major rivers of the United States,”¹⁶⁸ perhaps in the hope that Roosevelt and Congress would look more favorably on a comprehensive natural resources plan than on yet another plan for reservoirs on Arkansas rivers. Congress did pass the bill, but Roosevelt vetoed it, saying it interfered with his plan to create national planning authorities that involved all federal agencies, not just the Corps of Engineers. The flood control measure that Roosevelt did sign in 1937 was mostly for projects in the Ohio river valley and more surveys.¹⁶⁹

The surveys had been requested by President Roosevelt in his letter of transmittal of the Corps report, *Comprehensive Flood Control Plan for Ohio and Lower Mississippi River*, to the House Committee on Flood Control in June 1937. The comprehensive plan had recommended for the 1937 legislative session that the works authorized for the Ohio River be funded, but that the works authorized for the lower Mississippi River receive a more complete assessment.¹⁷⁰ In truth, the Corps could not move ahead with its flood control plans for the lower Mississippi because it could not acquire options on the land in the proposed Eudora Floodway. The 1936 omnibus flood control bill had called for the construction of three floodways: the Morganza, the

¹⁶⁷ *Arkansas Democrat*, May 20, 1936, July 1, 1937.

¹⁶⁸ House Committee on Flood Control, *Authorizing the Submission to Congress of a Comprehensive National Plan for the Prevention and Control of Floods of all the Major Rivers of the United States, and for Other Purposes*, 75th Cong., 1st sess., 1937, H. Rep. 798.

¹⁶⁹ *Arkansas Democrat*, August 14, 1937, August 27, 1937; *Flood Control Act of 1937*, Public Law 406, *U. S. Statutes at Large* 50 (1937): 878.

¹⁷⁰ House Committee on Flood Control, *Hearings on Levees and Flood Walls, Ohio River Basin*, H. R. 7393 and H. R. 7646, 75th Cong., 1st sess., 1937, 3.

West Atchafalaya, and the Eudora. The Morganza and West Atchafalaya floodways ran along the east and west banks, respectively, of the Atchafalaya River in Louisiana. The Eudora floodway ran west from the Mississippi then south from Eudora, Arkansas. After the floodways were authorized, the Corps had difficulty acquiring the land and flowage rights for the floodways from local landowners. While the land for the Morganza and West Atchafalaya floodways was eventually acquired and the floodways were eventually built, local landowners continued to resist construction of the Eudora floodway. The landowners, the Corps, and Senator Overton on the Senate Commerce Committee and Representative Whittington of the House Committee on Flood Control could not agree on just compensation to the landowners for flowage rights.¹⁷¹

Overton and Whittington reached a compromise on compensation for the Morganza Floodway in June 1938. With that difficulty out of the way, Congress passed the Flood Control Act of 1938 incorporating the Corps' comprehensive flood control plan for the Mississippi alluvial valley.¹⁷² One part of that plan called for the construction of seven flood control dams in Arkansas: the Blue Mountain Dam and Nimrod Dam on tributaries of the Arkansas, and Lone Rock, Norfolk, and two other dams on tributaries of the White in Arkansas, and Greer's Ferry Dam on the Little Red. The second feature of the bill that favored Arkansans was a provision that local interests would be required to contribute just 30 per cent to the project costs instead of 50 per cent, as previous acts that authorized flood control projects had required. The state's contribution to the project was generally through acquisition of land and rights-of-way. Both Congress and the Corps of Engineers agreed "that little progress can be obtained in the construction of an extensive reservoir system so long as the local communities must pay a heavy

¹⁷¹ Reuss, 178-179, 193-194, 199. The Eudora floodway was eventually cancelled in 1941

¹⁷² Reuss, 194.

share,” hence, the reduction in local contributions.¹⁷³ While the 1938 legislation authorized only seven dams, Arkansans expected “that as soon as funds authorized now” for these dams “near exhaustion, Congress will act to provide for the balance” of the original 26 reservoirs surveyed for the Arkansas River in Arkansas, Oklahoma, Kansas, and Colorado.¹⁷⁴ It should be noted that Congress was funding the construction of reservoirs to catch and hold excess waters so they would not become flood waters. Those reservoirs were created by placing a dam across a stream, a creek, or a river to stop the flow of water and store it for later release when the downstream rivers were not so high. In this regard, the words “dam” and “reservoir” can be used interchangeably. If there’s a reservoir, there’s a dam.

Authorization having been secured, construction on Nimrod Dam began in April of 1940 and was completed in March of 1942 at a cost of \$3,773,000.¹⁷⁵ The dam site “includes 453 acres acquired from private owners on the north bank of the river, and a smaller area of National Forest land on the south side of the river.” The area was “sparsely” populated and “quite rugged,” but the dam site was accessible from Arkansas Highway 7, which runs from Russellville to Hot Springs. When construction began, the sole purpose for the dam was “immediate flood protection to the lowlands of the Fourche La Pave Valley downstream from the

¹⁷³ *Arkansas Democrat*, May 8, 1938; Flood Control Act of 1936, June 22, 1936, 1571. The provisions for reservoirs in the Flood Control Act of 1936 were based on House Flood Control Committee, *Comprehensive Flood Control Plan for Ohio and Lower Mississippi Rivers*, 75th Cong. 1st sess., 1937, H. Doc. 1, which recommended “a system of seven reservoirs on the Arkansas and six on the White. . .” These were the reservoir sites identified, but previously rejected as ineffective, in H. Doc. 308 (1935) and H. Doc. 102, respectively. The Corps was not immune to political persuasion.

¹⁷⁴ *Arkansas Democrat*, May 12, 1938.

¹⁷⁵ “Nimrod Dam,” U.S. Army Corps of Engineers, Little Rock District, [http://www.swl.usace.army.mil/Missions/Recreation/Lakes/NimrodLake/DamandLake Information.aspx](http://www.swl.usace.army.mil/Missions/Recreation/Lakes/NimrodLake/DamandLake%20Information.aspx), accessed May 2, 2013.

site and . . . (it) will assist in controlling floods on the Arkansas and Mississippi Rivers.”¹⁷⁶ By the time the dam was completed in 1942, penstocks had been added for potential future power use (never realized), and two years later Congress authorized recreational use of the reservoir, making it a multiple-purpose dam.¹⁷⁷

Although construction of reservoir projects slowed during World War II as men and especially materials were appropriated for the war effort, projects did continue. Blue Mountain Dam was also started in 1942, but due to war time shortages of materials, the Corps realized that both Blue Mountain and Nimrod could not be completed on schedule. The Corps decided to complete Nimrod, as it was further along.¹⁷⁸ Blue Mountain was finished in 1947, after the war. Construction on Norfolk dam was actually started before Nimrod, in 1941, but again, because of war time shortages, it did not become “operational” until 1944.¹⁷⁹ No flood control dams were constructed in Arkansas to regulate the flood waters of the Red River until Millwood Reservoir was completed in 1966 on Little River, a tributary of the Red. Only 5 of Arkansas’s 222 flood control dams were completed before 1945, but the effort to hold back the water continues. The most recent flood control dam in Arkansas was completed in 2008.

¹⁷⁶ *Nimrod Dam and Reservoir Project* (Little Rock: War Department U.S. Engineer Office, February 1940), 2-3.

¹⁷⁷ *Nimrod Dam and Reservoir Project, Arkansas* (Little Rock: Little Rock District, Corps of Engineers, Department of the Army, July 1948), 6.

¹⁷⁸ Rathburn, 57.

¹⁷⁹ Scott Branyan, “Norfolk Dam,” *Encyclopedia of Arkansas History & Culture*, <http://www.encyclopediaofarkansas.net/encyclopedia/entry-detail.aspx?entryID=3529>, accessed May 2, 2013.

CHAPTER 3: POWER DAMS

If flooding was the down side of an abundance of water in Arkansas, then the use of water for power, navigation, municipal water supplies, recreation, and irrigation were the ways in which Arkansans could make their water resources work for them. But the water had to be controlled to make it useful. Beginning with the earliest settlements in the 1820s, water was controlled by damming creeks and channeling water through mill races to power water wheels to grind grain and saw timber. Mid-century, after steam mills had become the primary source of power, dammed mill ponds still served to float logs and provide a ready source of water for other industrial uses. One hundred years after mill pond dams had first become common place in Arkansas, dams were once again used as a source of power through the construction of hydroelectric dams for the generation of electrical power.

The presence of mills in early Arkansas signaled the advent of a way of life much different from that of fur traders and Native Americans. Mills were an indication of permanent settlement and the promise of economic development in a county. A short time after 1812, “a new era of prosperity set in” in Lawrence County as soon as mills were constructed.¹ The earliest recorded mill dam dates from 1817, when Captain William Thompson built a gristmill on Mill Creek in Sharp County, near the present town of Evening Shade. Thompson “harnessed the power of Mill Creek by constructing a dam and a mill building with a waterwheel.” Thompson later added a sawmill to his milling operation.² Construction of a water-mill in 1818 on a bayou in Faulkner County “was the signal for a mighty rush of immigrants, and improvements of all

¹ *Biographical and Historical Memoirs of Northeast Arkansas* (Chicago: The Goodspeed Publishing Co., 1889), 763 (hereafter: Goodspeed, *Northeast Arkansas*).

² “Arkansas Listings in the National Register,” *The Arkansas Historical Quarterly* 45, no. 4 (Winter 1986): 343; Mrs. Caruth S. Moore, “Don Draper’s Painting of Pioneer Evening Shade Mill,” *The Ozarks Mountaineer* 7, no. 1 (December 1958): 9.

kinds were speedily seen; the wilderness began to assume a civilized aspect . . .”³ By 1838, Sylvanus Blackburn had constructed “a wooden dam, made from massive timbers” on War Eagle River in Benton County and George Hill had constructed a mill dam on Bayou Saline in Sevier County.⁴ In Independence County, “the great improvement” in 1839 was a project “to build a splendid mill on Poke Bayou – one that will . . . manufacture about twenty barrels of flour per day.”⁵ Even as late as 1859 in Perry County, a farmer just arrived “found the country in a wild condition and just as nature had left it. Saw and grist-mills were almost unknown . . .” In Columbia County, one writer was quite direct, commenting, “The mills made towns.”⁶ Otto Rayburn called mills “an institution necessary to the life of the mountain people.”⁷

The Goodspeed county histories, which were designed to promote the advantages of each region of the state, invariably note the type and number of mills in a town. Typically, in the cotton-producing areas of Arkansas, a cotton gin was constructed first, then a grist mill, then a saw mill. In other areas of the state, sometimes grist and sometimes saw mills were constructed first. The county histories record the presence of many mills before 1846, and indeed the 1840 Census records a state-wide total of 10 flouring mills, 292 grist-mills, and 88 saw-mills. But the county histories do not always specify, and the census does not distinguish, whether the mill was a water-mill, a horse-mill, or a steam-powered mill.⁸ Steam mills were in use early on, with the

³ Ted Worley, “Story of an Early Settlement in Central Arkansas,” *The Arkansas Historical Quarterly* 10, no. 2 (Summer 1951): 128.

⁴ *Acts of Arkansas*, 1838, 68; Blanche H. Elliott, “The Water Mills of War Eagle Go Back to 1838,” *The Ozarks Mountaineer* 7, no. 5 (May 1959): 9.

⁵ Ted R. Worley, “Glimpses of an Old Southwestern Town,” *The Arkansas Historical Quarterly* 8, no. 2 (Summer 1949): 159.

⁶ Goodspeed, *Central Arkansas*, 693; *Biographical and Historical Memoirs of Southern Arkansas* (Chicago: Goodspeed Publishing Co., 1890), 460 (hereafter: Goodspeed, *Southern Arkansas*).

⁷ Rayburn, 24.

⁸ See reference to the grist- and saw-mills at Cadron noted by Nuttall in 1819 (p. 245); the Standlees and Thomas Burrows built a water-powered saw mill in 1818 in Faulkner County

first one in Arkansas Territory being a sawmill operating in Helena in 1826.⁹ If the mill was a water-mill, the records do not always indicate whether it had an associated mill-dam. In all likelihood, however, a mill dam was constructed at the site of most water-powered mills.¹⁰ By 1880, the Tenth Census recorded 149 water mills that produced flour, lumber, and woolen and cotton goods. By then, steam-powered mills had largely replaced water-powered mills, as there were 580 flouring, sawing, and manufactory mills using steam power.¹¹

Despite the prevalence of steam-mills, in the 1890s communities still promoted not only the mills they did have, they promoted the dam sites on rivers where mills *could* be built. The Goodspeed histories are replete with notations of potential water resources. Goodspeed's for Northwest Arkansas, for example, notes that "Benton County has the great advantage of having many springs . . . some of which produce a stream large enough to furnish good water-power, if properly utilized." Fulton County in northeast Arkansas could boast of "many good mill sites" on local rivers and streams. In Scott County in western Arkansas, "water is abundant for all

(Russell W. Benedict, "Story of an Early Settlement in Central Arkansas," ed. Ted Worley, *The Arkansas Historical Quarterly* 10, no. 2 (Summer 1951): 128); Bollinger's Mill at Fourche de Thomas, with Bollinger settling at Brockett in Randolph County in 1797 (Lawrence Dalton, "Fourche Dumas Creek and the 'Settlement of Fourche de Thomas,'" *The Arkansas Historical Quarterly* 4, no. 4 (Winter 1945): 361); the De Munn mill, a water-powered grist- and saw-mill in Randolph County, dated to 1822 (Goodspeed, *Northeast Arkansas*, 364); in 1824 Captain Johnson had a saw mill on Little River in Hempstead County (J.B. Nunn, "Early Days of Camden, Arkansas," *The Arkansas Historical Quarterly* 5, no. 4 (Winter 1946): 332); the first steam saw-mill in Arkansas is recorded at Helena in 1826 (Ted R. Worley, "Helena on the Mississippi," *The Arkansas Historical Quarterly* 13, no. 1 (Spring 1954): 12); *Compendium of the enumeration of the inhabitants and statistics of the United States*, 6th Census, 1840, (Washington, D.C.: Thomas Allen, 1841): 332-333.

⁹ Dallas T. Herndon, *Annals of Arkansas*, Vol. 1 (Hopkinsville, Ky. : Historical Record Assn., 1947?), 343.

¹⁰ Fred W. Leach, "Old Ozark Water Mills – How They Were Built and Operated," (*The Ozarks Mountaineer* 8, no. 2 (March 1960): 6); Charles Howell and Allan Keller, *The Mill at Philipsburg Manor, Upper Mills and A Brief History of Milling* (Tarrytown, New York: Sleepy Hollow Restorations, 1977): 47; Binnie, 87. Water mills could be powered by water directly from a spring, a waterfall, or a swift stream flowing through a narrow defile in the channel.

¹¹ *Compendium of the Tenth Census, (June 1, 1880) Part II* (Washington, D.C.: Government Printing Office, 1880); 1219-1226.

purposes, including manufacturing.” Union County in southern Arkansas claimed to have many sites for water-powered mills available.¹²

Laws governing the erection and use of mill dams predates statehood. Statutes governing mill dams were among the body of codified law the first General Assembly of Arkansas adopted and/or revised from territorial law. According to the revised statutes, any person could “erect a dam across any water course not being a navigable stream,” if he owned the land on both sides of the water course. If he did not own both sides of the water course, or if his dam was likely to overflow lands not his, he was required to file a petition in the circuit court of the county to demonstrate:

1st. What will be the amount of damage to each proprietor by reason of inundation consequent upon the erection of the dam as proposed. 2d. Whether the mansion house of any such proprietor, or the outhouses, curtilages or gardens thereunto immediately belonging, or orchard, will be overflowed thereby. 3d. Whether, and to what extent, ordinary navigation and fish of passage will be obstructed by such erection, and whether and by what means the same may be prevented or diminished. 4th. Whether the health of the neighborhood will be materially endangered in consequence of such erection.

Once the petition was filed, it was the duty of the sheriff to summon a jury “touching (on) the matter contained in the petition.” If the jury found that “none of the evils provided against . . . are likely to ensue,” the court would decide whether “permission to erect the dam as prayed for, should be given.”¹³ Arkansas law, in turn, was based on English common law as brought to the

¹² *History of Benton, Washington, Carroll, Madison, Crawford, Franklin, and Sebastian Counties, Arkansas* (Chicago: The Goodspeed Publishing Co., 1889), 4 (hereafter: Goodspeed, *Northwest Arkansas*); Goodspeed, *Northeast Arkansas*, 261; *Biographical and Historical Memoirs of Western Arkansas* (Chicago: The Southern Publishing Company, 1891), 387 (hereafter, Goodspeed, *Western Arkansas*); Goodspeed, *Southern Arkansas*, 822.

¹³ Chapter 98: Mills and Mill Dams, *Revised Statutes of the State of Arkansas*, revised by William McK. Ball and Sam. C. Roane, (Boston: Weeks, Jordan and Company, 1838) 571-573.

colonies, and on the U.S. government's claims to jurisdiction over navigable streams.¹⁴ The body of legislation governing dams in Arkansas today is based on the laws governing mill dams.¹⁵

The place of mills, mill dams, and millers was so essential to community life that in 1846 millers were declared exempt from “serving on juries, working on roads, and in the performance of military duty,” except in times of civil unrest or war.¹⁶ Mill dams were protected in the law, too. The Revised Statutes of the State of Arkansas made it a misdemeanor to “willfully and maliciously cut down, break, injure or destroy any bridge, or mill-dam, or other dam, or levee.” The perpetrator could be “fined in any sum not exceeding five thousand dollars.”¹⁷

Because river travel was so important, free navigation of the rivers was as essential as milling, which is why mill dams had to be erected on streams that were not navigable. In 1838, the Arkansas legislature approved a law declaring Bayou Saline navigable, and enjoining all persons against obstructing the navigation “of said bayou.” Any person found guilty of obstructing the bayou “shall be deemed guilty of a misdemeanor, ... shall be fined, ... and the obstructions may be removed by any person.” This law did not affect an existing dam, as Bayou Saline was declared navigable only “from the mill-dam of George Hill to Little River.”¹⁸ In 1846, the legislature approved a mill dam across the White River, “about three miles below the mouth of War Eagle River,” but required that the mill owner, John Hardwick, build the dam so that “there shall be a slope, or passway left, at least thirty feet wide, and so constructed that flat-boats and other crafts can pass down the river.” On the other hand, in approving William Franks' mill dam across the L'Anguille River, which had been declared navigable earlier in the

¹⁴ Hunter, 140; Henry Philip Farnham, *The Law of Waters and Water Rights* (Rochester: The Lawyers' Co-operative Publishing Company, 1904), 1729ff.; Bauer, 156.

¹⁵ *Water Law in Arkansas*, Arkansas Natural Resources Commission (Little Rock: Arkansas Natural Resources Commission, 2011), 22.

¹⁶ *Acts of Arkansas*, 1846: 46.

¹⁷ *Revised Statutes*: 256.

¹⁸ *Acts of Arkansas*, 1838: 68.

1846 session, the legislature did not include a proviso for allowing boats to pass.¹⁹ In 1848, the legislature was more direct when it declared the Cadron River a navigable stream by stating that it “shall not be lawful for any person to erect any dam across said river.”²⁰

Unlike flood control dams, which impede the flow of water, the purpose of a mill dam was to raise the water level “to a more or less fixed level,” sufficient to create a constant fall, or head, of water powerful enough to turn a water wheel, thereby generating the power to grind corn, saw wood, or power looms. If possible, the water wheel was turned directly by the fall of water. If not, the water was diverted into a chute or a mill race at one end of the dam, which created the necessary head of water to turn the wheel.²¹ The dam could also be constructed in such a way as to force a head of water, such as by placing the dam diagonally across the stream. This forces the water to the narrow angle between dam and stream bank, creating a stronger flow at the angle than over the central part of the dam. Osage Mills dam in Benton County is placed across the stream in this manner, but the directional flow was to send water through the mill race.²²

Early mill dams were generally simple log or “brush and timber” dams, especially since timber was so plentiful in Arkansas. Otto Ernest Rayburn, the unofficial folklorist of the Arkansas Ozarks, described early Ozark mill dams as “crude” timber and rock dams, where

one of the methods of constructing a dam was to build pens of logs and fill them with stones. Some of the early dams were lashed with strips of bark when wire was not available. The structure was weighted down with large rocks which held it in place in times of immense floods. The dam was usually twelve or fifteen feet

¹⁹ *Acts of Arkansas*, 1846: 33 for L’Anguille River, p. 155 for Hardwick, p. 167 for Franks.

²⁰ *Acts of Arkansas*, 1848: 35.

²¹ Leach, 6; Binnie, 87. Mill dams might more accurately be called “weirs,” but the term is seldom, if ever, used in the literature. Binnie defines the difference as “a weir raises the water level in a stream or river to a more or less fixed level,” while “a structure may also be built across a stream for the purpose of storing water. It has to be designed so as to allow a large variation in water level, . . . These structures are referred to as dams, . . .”

²² Leffel, 9; personal observation, February 4, 2012.

in depth. The logs were laid pig-pen style and fitted closely together. Gates or crude openings were provided to release the surplus water in flood-time.²³

A mill dam had to be sturdy enough to withstand the seasonal flooding of the stream or river on which it was built. The mill at War Eagle, for example, was swept away by a flood about 10 years after it was first built. The top of McFerrin's Mill in Boone County, south of Harrison, washed away in a "big flood" in 1915.²⁴

By the late 1860s, stone and masonry dams began to replace log dams for mills. The first recorded stone dam in Arkansas was constructed in 1867 at Spring Mill, north of Batesville in Independence County, by Colonel J.A. Schnabel, who had immigrated from Germany in 1848.²⁵ The log dam at War Eagle Mill was upgraded when "masonry work encased the old wooden dam," probably around 1872.²⁶ The most well-known masonry mill dam in Arkansas is at Mammoth Spring. The "huge dam" was constructed at the spring in 1887-1888 by the Mammoth Spring Improvement Company, "thus forming a reservoir, completely submerging the spring." The water from the falls was "enough to turn all the mills and factories that can be built adjacent to it."²⁷ Shortly after construction of the dam, a cotton mill and roller mill were operating in town. Mammoth Spring Dam was converted to hydropower in 1927 and it provided electricity for Mammoth Spring until 1972, when hydropower operations stopped and the dam

²³ Otto Ernest Rayburn, *Rayburn's Ozark Guide* 47 (Winter, February 1956): 24. This excerpt was originally published in Rayburn's *Ozark Country* (1941): 132-138.

²⁴ Elliott, 9; Steele T. Kennedy, "Old Sims, Deep in The Hills, Most Unique of Ozarks Water Mills," *The Ozarks Mountaineer* 7, no. 9 (December 1959): 9.

²⁵ E. A. Holcombe, "Spring Mill," *The Arkansas Historical Quarterly* 20, no. 2 (Summer 1961): 183; Mrs. J. A. Lytle, "Scenic Spring Mill, Ninety Years Old, Still Grinds On," *The Ozarks Mountaineer* 7, no. 10 (October 1959): 5; The Arkansas Historic Preservation Program, "Arkansas Listings in the National Register," *The Arkansas Historical Quarterly* 45, no.4 (Winter 1986): 344.

²⁶ Elliot, 9.

²⁷ Goodspeed, *Northeast Arkansas*, 265.

was donated to Arkansas State Parks.²⁸ Mammoth Spring Dam is listed on the National Inventory of Dams as a recreation dam, reflecting its current use.

Grist and flouring mills performed an essential civic function for a community. Manufactory mills, while not essential, were a sign of the growth, progress, and development of a community. The Mammoth Spring dam provided the power for the Calumet Cotton Factory. The town was proud of the mill, and noted that the factory workers and their families “add much to the population of the place.” North of Batesville, the Arkansas Woolen Mills produced “all kinds of woolen goods.” The mills bought wool for processing from area farmers, which resulted in sheep being an important local industry. Unfortunately, the mills were “washed away and destroyed in a flood” in 1882. Evening Shade in Sharp County had two shingle mills and two wool-carding mills. The Bentonville Mills ran a carding mill along with a flouring mill on the spring branch of the creek below town.²⁹

In addition to grist mills and manufactories, saw mills operated in all parts of the state. Until the large lumbering concerns moved into the Ouachitas after 1899, most saw mills were small, local businesses that “cut lumber for home use only.”³⁰ The sawmills were powered by water backed up behind a mill pond dam. Saw mills were most likely to be converted to steam, so that the mills did not have to depend on stream flow to operate: in dry months or during floods water mills might have to cease operations due to low water.³¹ Even with the mill pond dam, the water might not be high enough to create a sufficient head of water to power the mill. Steam power could also drive more saws faster than water-power. Even if the sawmill was steam-

²⁸ “Mammoth Spring,” National Register of Historic Places, Arkansas Historic Preservation Program. http://www.arkansaspreservation.com/historic-properties/national-register/results.aspx?county=Fulton&city=&historic_name=Mammoth%20spring&description=Goodspeed, *Northwest Arkansas*, 89, 265, 626, 733.

²⁹ Goodspeed, *Northwest Arkansas*, 89, 265, 626, 733.
³⁰ Smith, 31; Goodspeed, *Southern Arkansas*, 526.

³¹ James Waller Leslie, *The Arkansas Lumber Industry* (master’s thesis, University of Arkansas, 1938), 24-25.

powered, mill ponds were still used “to float the logs to be maneuvered from one point of the mill to another.”³² At the Caddo River Lumber Company at Rosboro in Pike County, “logs were pulled from the pond up . . . into the second floor of the mill.”³³ Lumber was also floated in the pond to “keep (it) viable for a longer time.” The pond formed by Mill Pond Dam at Rosboro no longer floats logs, and although classified as a water supply dam by the NID, it is not used for anything in particular today.³⁴ Another example of a mill pond dam owned by a lumber company, in this case International Paper Company, is Gurdon Pond 1 Dam, constructed in 1915 on Caney Creek in Gurdon, Clark County, and today classified as a recreation dam.³⁵

In the 1880’s, water power was quickly being adapted by the nascent electrical power industry to generate electricity. Duncan Hay discusses technological, social, and economic advances in the development of hydropower in his succinct survey, *Hydroelectric Development in the United States, 1880-1940*. The first hydroelectric plant in the United States was in Grand Rapids, Michigan. The Grand Rapids Electric Light and Power Company utilized water from a canal to power several businesses in that city beginning in July, 1880. The first hydroelectric plant that used technology developed by Thomas Edison was operational in Appleton, Wisconsin, in 1882. However, it wasn’t until 1895 that the hydropower installation at Niagara Falls demonstrated the “technical and economic viability of generating electricity in enormous quantities,” making it a successful commercial enterprise.³⁶

³² Telephone interview with Joanna Sutton, owner, Mill Pond Dam, Rosboro, Arkansas, February 19, 2013.

³³ Kenneth L. Smith, *Sawmill: The Story of Cutting the Last Great Virgin Forest East of the Rockies* (Fayetteville: The University of Arkansas Press, 1986), 25, picture caption, 48.

³⁴ Sutton interview.

³⁵ Duncan Hay, *Hydroelectric Development in the United States, 1880-1940* (Washington, D.C.: Edison Electric Institute, 1991): 13-14, 25.

Enterprising businessmen were quick to realize the potential of Arkansas' rivers for generating electricity. In 1898 a businessman from Peoria, Illinois, proposed to a group of Little Rock businessmen a plan to construct a hydroelectric dam across the Ouachita River at Rockport to supply power to Little Rock. A similar plan had recently been proposed by businessmen at Hot Springs to supply power to that resort.³⁷ At Batesville, in 1906, where the U.S. Army Corps of Engineers had constructed three locks and dams on the White River in 1903 for navigation purposes, the city of Batesville used one of the dams to power a hydroelectric plant.³⁸ In 1909, the Pike County Water Power Company of Little Rock surveyed the Little Missouri River near Murfreesboro to assess its potential as a water power site.³⁹ In 1913, the Dixie Power Company proposed a hydroelectric dam on the White River at Cotter, Arkansas.⁴⁰ In 1916, a company organized as the Arkansas Hydro-Electric Development Co., proposed constructing a dam on the Little Red River near Heber Springs. The dam would provide power for Little Rock and Memphis. The company further contemplated construction of two more dams on the Little Red, with the other two installations being at Pangburn and Hall's Shoals.⁴¹

Along with recognizing the potential of the swift-flowing streams of the Ozark and Ouachita mountains as a ready source of hydropower, utility companies realized that hydropower dams could address the flooding and navigation concerns of area farmers and businesses.

³⁷ *Arkansas Democrat*, July 2, 1898. Rockport is at I-30 and the river, about 5 miles downstream from the current site of Remmel Dam.

³⁸ Canal and Power Stations at Lock and Dam No. 1, Upper White River, Arkansas, Public Law 313, 59th Cong., 1st sess., 536; Jerome G. Kerwin, *Federal Water-Power Legislation* (New York: Columbia University Press, 1926): 88-89.

³⁹ W. H. Gladson, *Water Powers of Arkansas: A Preliminary Report on White River and Some of Its Tributaries* (Fayetteville?: The Geological Survey of Arkansas, 1911): i.

⁴⁰ *The Baxter Bulletin*, April 18, 1913.

⁴¹ "A \$5,000,000 Hydro-Electric Development in Arkansas," *Engineering and Contracting* 45 (June 28, 1916): 594.

Envisioning a system of multiple purpose dams on the White River, the president of the Dixie Power Company explained how such dams would work:

It is absolutely necessary for power plans of the hydro-electric type to have an even flow of water, even if they have to create it by artificial means. If they do not get this even flow their power fluctuates too much. This is done by building a big storage reservoir above each power dam. During the extreme wet weather in the spring the gates in these big reservoir dams are closed and immense bodies of water are confined. Later when hot weather and low water comes this water is released, gradually giving a steady and regular flow in the river.⁴²

The first dam in Arkansas constructed solely for hydroelectric purposes was built in 1905 by Alphonse Brewster on the Illinois Bayou at Russellville. Originally constructed as an earthen dam that went straight across the stream, it proved incapable of withstanding the floods on the bayou. The dam gave way in 1915. AP&L acquired the electrical plant in 1916, but the company did not rebuild the dam until 1923. The new dam was a concrete arch dam, making it better able to resist the force of the water. In 1946, the Russellville electric lines were tied into AP&Ls integrated system and the hydro plant was no longer useful. The company sold the installation, including the dam, to the Russellville Water Company.⁴³ The reservoir was used as a municipal water supply until 1993, when a new dam and reservoir were constructed on Huckleberry Creek, about 5 miles above the old reservoir.⁴⁴ The NID lists the Russellville dam as a recreation dam, but by virtue of its location on the water works property, it is inaccessible to the public.⁴⁵

⁴² *The Baxter Bulletin*, April 18, 1913.

⁴³ J. C. Park, and Irvin Emmert, "The Electric Industry History of Russellville and Pope County, Arkansas," in *History of Pope County, Arkansas* (Winston-Salem, North Carolina: Pope County Historical Association and Hunter Publishing Company, 1979), 48-49.

⁴⁴ "Huckleberry Creek Reservoir Informational Fact Sheet," June, 1996.

⁴⁵ Visit and interview with Jonathan Shipley, WTP Lead Operator, Russellville Water & Sewer System, June 11, 2013.

The state and the federal governments were just as interested as businessmen in the water power potential of the state's rivers. As transmitting power over long distances became more practical, the state followed a national trend in surveying its rivers for potential water power sites.⁴⁶ In 1911, the Arkansas Geological Survey commissioned Professor W. H. Gladson of the University of Arkansas to "locate by section, township, and range, with as much accuracy as was practicable, the principal water power sites" on the White River and its tributaries. Gladson identified potential sites on the White, Buffalo Fork, North Fork, and Little Red Rivers. Gladson did consider the potential of these sites for controlling floods. He concluded that flood waters would need to be controlled if the sites were to operate constantly, but he offers no recommendations on how to accomplish this. Rather, he seems to believe that "an occasional shut-down, for high water to pass, would not seriously interfere with the (hydroelectric) enterprise." Several of the sites he identified, such as at Beaver and Cotter on the White, and Norfork on the North Fork, would eventually be developed as hydroelectric projects.⁴⁷

The federal government, through the Army Corps of Engineers, surveyed the Ouachita and tributaries for potential water power sites the same year Gladson surveyed the White. The Corps surveyed the river "for a proposed storage reservoir . . . designed for the reduction of floods, the development of water power, and the improvement of navigation." The Corps' report concluded that an ideal site for a dam was "about 12 miles northwest of the Hot Springs," where the river "cuts through Blakely Mountain and forms a narrow gorge." A dam in this location would reduce flood heights on the Ouachita, improve navigation below Arkadelphia, and generate power. The federal government was willing to support that part of the project designed

⁴⁶ Hunter, 513.

⁴⁷ Gladson, 3, 85. The Corps of Engineers had surveyed the White and its tributaries as far back as 1838, but with a view to improving it for navigation, not for its potential water-power.

for navigation, but not the part for power generation. However, the Corps could not interest local electric companies in the project, so it was not recommended.⁴⁸

At the time these projects were proposed, regulation of hydropower plants rested with the states, or with three different departments of the federal government. Before 1919, the Arkansas state agency that approved power projects was the Railroad Commission. After 1919, it was the Public Service Commission. The Arkansas Public Service Commission regulated “telegraph and telephone companies; pipeline companies for the transportation of oil, gas and water; gas companies; electric lighting companies; hydro-electric companies for the generation and transmission of light, heat or power; and water companies, furnishing water,” as well as railroads and express companies.⁴⁹ The three different departments of the federal government were War, Interior, and Agriculture. The Department of the Army, Corps of Engineers, was the federal agency that had to approve projects on navigable rivers. The Department of the Interior had to approve power projects on public lands. After 1905, when the forest reserves were transferred from the Department of the Interior to the Department of Agriculture, Agriculture had

⁴⁸ House Committee on Rivers and Harbors, *Ouachita River, from Camden to Arkadelphia, Ark.*, 62^d Cong., 2^d sess., 1912, H. Doc. 588, 3, 10, 13, 18.

⁴⁹ Arkansas Public Service Commission website (<http://www.apscservices.info/commission-history.asp>) accessed May 17, 2013. See, for example, page 136 of the *Third Annual Report of the Federal Power Commission*, (1923) in reference to the sale of Caddo River Power & Irrigation to Arkansas Light & Power: “. . . the sale and assignment of rights have been approved by the railroad commission of Arkansas.” Note that the FPC report uses the old name for the state agency. The Arkansas Public Service Commission had a checkered history as a state agency. It started as the Railroad Commission in 1899. In 1919 the Arkansas Corporation Commission was created as the successor to the Railroad Commission. In 1921 the Corporation Commission was abolished and the Railroad Commission re-established. In 1933 the Corporation Commission was re-established. In 1935 the Department of Public Utilities within the Arkansas Corporation Commission was established. The influence of the agency does not appear to have loomed large in the development of hydroelectric power in Arkansas.

responsibility for approving projects on Forest Service land. By the 1910s, nationwide agitation for a single agency to regulate hydroelectric projects grew as the number of projects grew.⁵⁰

To solve the difficulties of regulation, Congress passed the Federal Water Power Act of 1920, which created the Federal Power Commission (FPC). Milton Conover's precise little history, *The Federal Power Commission: Its History, Activities and Organization*, details the sphere of influence of each of the federal agencies involved in water power regulation and the legislative history that gradually transferred control to the FPC. One of the responsibilities of the new agency was to grant licenses for non-federal hydroelectric power projects. In the application for a license, the licensee had to demonstrate that there was a market for the power, that the state in which the project was located had approved the project, and "a statement must be included as to the effect of the project upon the normal flow of the stream and of its relation, if any, to navigation, irrigation, reclamation, flood control, and water supply."⁵¹

In the first year after it was established, the FPC reviewed the application for a license from the Arkansas Hydro-Electric Development Co. to "develop water power on the Little Red River, in White and Cleburne Counties, Ark., by building a dam near Judsonia," and by "building a second dam near Higdon and Edgemont." The proposed dams, the Commission found, "might so modify conditions as to reduce the navigable capacity of the stream below their location." Since no project could be approved that interfered with navigation, the application was denied.⁵² The company appealed the decision, arguing that the Little Red River was not navigable at Judsonia, and that "the dams will have no appreciable effect on the navigable

⁵⁰ Milton Conover, *The Federal Power Commission: its History, Activities and Organization* (Baltimore, MD: The Johns Hopkins Press, 1923), 24, 29, 39.

⁵¹ *Ibid.*, 65-66.

⁵² Federal Power Commission, *First Annual Report of the Federal Power Commission* (Washington, D.C.: Government Printing Office, 1921), 103.

capacity of the river.” The FPC agreed with these findings, and approved the project.⁵³

Arkansas Hydro-Electric then constructed a hydroelectric plant on Big creek near Pangburn.⁵⁴

The Pangburn plant was noted in a 1932 Corps of Engineers study of the power potential of the White River and its tributaries as one of a “multiplicity of small plants” in southeastern Missouri and northeastern Arkansas supplying a local market.⁵⁵

The FPC issued its very first preliminary permit, “project No. 1,” to the Dixie Power Company of St. Louis. The Dixie Power Co. proposed to build a hydroelectric plant on the White River above Cotter in Baxter and Marion Counties. Preliminary engineering work on this project had been underway since 1919.⁵⁶ The preliminary permit was issued with the following provisos:

1. That the permit extend to the 1st day of March, 1923.
2. That the permittee make full studies of flood, medium, and low stages of the river in the vicinity of the project, and the relation of such stages to navigation.
3. That if license be issued for the project it be for a period of 50 years and subject to the rules and regulations in force at the date of issuance of permit.⁵⁷

As required by the legislation creating the FPC, Dixie Power Company had considered the flood control and navigation potential of the dam. The dam would aid navigation by “releasing water during dry periods,” thereby maintaining a more even stream flow for year-round navigation of the river below the dam, and “by catching the flood water, will alleviate disastrous floods”

⁵³ Federal Power Commission, *Second Annual Report of the Federal Power Commission* (Washington, D.C.: Government Printing Office, 1922), 53-54.

⁵⁴ *Arkansas Gazette*, July 21, 1925.

⁵⁵ H. Doc. 102, 65-66.

⁵⁶ Tom Shiras, “Hydroelectric Development in Arkansas,” *Popular Mechanics* 37 (April 1922): 574.

⁵⁷ *First Annual Report*, 111.

downstream, while the lake created by the dam would “afford transportation for a large inland territory now dependent on rough mountain roads.”⁵⁸

In 1922, the FPC granted another preliminary permit to the Dixie Power Company, this one for construction of a hydroelectric dam at the mouth of the north fork of the White River (project no. 214). To receive the permit, the company had demonstrated that it had the financial resources to conduct the engineering studies and to complete the project, and that the project could be developed as a multiple-purpose project just as the dam at Cotter would be.⁵⁹ By 1928, the Dixie Power Company had been acquired by the White River Power Company of Little Rock, which proposed combining the Cotter and North Fork projects with a third hydro dam to be constructed on the Buffalo Fork of the White River near Rush. When combined into one integrated system, the three projects would be able to deliver more power than each dam alone. The project, designated project no. 654 by the FPC, was approved with some caveats: the projects had to allow for navigation of the river both above and below the dam and for the safe passage of water craft past the dam, and the company had to be prepared to “construct and operate” any navigational facilities, such as locks and dams, that the Army Corps of Engineers might specify.⁶⁰

The same year the FPC issued a permit to Dixie Power Company, it issued a preliminary permit to the Caddo River Power & Irrigation Company of Little Rock for project no. 271. The project was for a hydroelectric dam on the Ouachita River. The Caddo River Power Co. proposed to build “three dams and power houses” on the river, with the upper dam creating “a reservoir approximately 72 square miles in area.” The dams were to be located on a stretch of

⁵⁸ Shiras, 575.

⁵⁹ *Second Annual Report*, 113.

⁶⁰ Federal Power Commission, *Eighth Annual Report of the Federal Power Commission* (Washington, D.C.: Government Printing Office, 1928), 180-181; Tom Shiras, “Waterpower Developments in Arkansas and Missouri,” *Manufacturers’ Record* 98 (October 30, 1930): 36.

the river “approximately 1 mile below its confluence with High Springs Creek to a distance of 25 miles upstream,” in Garland County.⁶¹ The Caddo River Power & Irrigation Company had been organized in 1921 “with a capital stock of \$1,000,000.” The president of the company was H. L. Rimmel and the secretary was H. C. Couch.⁶² H. L. Rimmel was a Little Rock businessman primarily engaged in insurance and banking.⁶³ Harvey C. Couch was president of Arkansas Light & Power (AL&P) of Pine Bluff. Arkansas Light & Power was the largest electrical utility company in Arkansas at the time. As of June, 1923, AL&P had a transmission network of over 500 miles that reached into 16 Arkansas counties, and a “net income (of) \$254,228.”⁶⁴

⁶¹ *Second Annual Report*, 285; *Electrical World* 79, no. 13 (April 1, 1922): 649.

⁶² *Electrical World* 79, no. 2 (January 14, 1922): 114.

⁶³ Todd E. Lewis, “Rimmel, Harmon Liveright” in *Encyclopedia of Arkansas of History & Culture*, accessed May 18, 2013.

⁶⁴ *Arkansas Gazette*, June 3, 1923; Stephen Wilson, *Harvey Couch: An Entrepreneur Brings Electricity to Arkansas* (Little Rock: August House, 1986), 51. The account in Wilson of how Rimmel helped Couch get a license for the first Ouachita River dam is a little ingenuous. Wilson recounts that Couch spent a day in Washington trying to identify the committee or person who could approve his permit for the dam. Couch finally realized he had to see Secretary of War Weeks, but Weeks was not available. Wilson doesn’t say this, but as Secretary of War, Weeks was also Chairman of the FPC. Wilson continues: Returning to his hotel, Couch ran into Rimmel. “Couch then told him (Rimmel) his story . . .” Rimmel thereupon presented his card to Weeks, and both being good Republicans, Weeks promised to review and approve Couch’s permit the following Monday. Wilson does not note that Rimmel wasn’t just helping Couch out – he had a stake in the transaction as well. The permit was preliminary, and it was issued on Friday, April 21, 1922, to Caddo River Power & Irrigation, not to AL&P.

Stephen Wilson takes this story almost verbatim from an earlier biography of Couch, *Harvey Couch: The Master Builder*, by Winston P. Wilson (Nashville, TN: Broadman Press, 1947). Neither biography is footnoted. It may be assumed that the story originated with Couch himself. However, on September 23, 1922, Couch wrote Rimmel that being associated with Col. Rimmel helped to “pave the way” in securing the license for the dam.

A letter in the Rimmel Papers in the University of Arkansas Special Collections seems to contradict the story in Wilson. Harvey Couch wrote Rimmel on October 17, 1922, informing him that the original location chosen for the dam would have to be changed. They couldn’t get the land they wanted west of Hot Springs, so they changed the dam location “to a smaller site that will not flood quite so much land.” The company would have to go back to the Power Commission to have the new location approved. Couch tells Rimmel he will call the new site “The Rimmel Site.” Rimmel writes back on October 18, 1922, “I certainly appreciate the honor you are conferring on me by naming the first dam the Rimmel Dam.” These letters are dated 6 months after the FPC issued the preliminary permit. Rimmel Papers, MC 605, Folder 15,

In order to receive the preliminary permit, Caddo River had to demonstrate that it had: a market for the electricity to be generated; funding for the surveys, engineering work, and the project itself; approval of the state regulatory agency; approval of the forest service since part of the project was in the Arkansas National Forest; and published its intentions in Garland, Montgomery, and Hot Springs Counties so that “all interested parties” could comment on the project.⁶⁵ The company satisfied all the requirements for the application. Couch was able to demonstrate that there was sufficient demand for power in central Arkansas to justify construction of the smallest of the three dams planned. As the population of Little Rock grew from 86,751 in 1910 to 109,464 in 1920, and industries such as bauxite mining around Benton and the railroad shops at Pine Bluff became established, the demand for electricity had increased 13% by 1920.⁶⁶ Funding came from New York investors, especially John H. Nickerson, and from a number of prominent Arkansas businessmen including Rimmel and C. Hamilton Moses of Little Rock, J. L. Lonigan of Pine Bluff, John Fordyce of Hot Springs, and Flave Carpenter and Pete Couch (Harvey’s brother) of Arkadelphia, and from “400 other citizens of Arkansas” who were stockholders in AL&P.⁶⁷ Surveys and specifications for the dam were completed by the engineering firm Ford, Bacon & Davis. And after several false starts and omissions, the

Special Collections, Mullins Library, University of Arkansas, Fayetteville (hereafter, Rimmel Papers).

⁶⁵ *Second Annual Report*, 116.

⁶⁶ Thirteenth and Fourteenth Census, 99 and 1329, respectively; Moneyhon, 100-101; *Arkansas Gazette*, June 3, 1923.

⁶⁷ *Arkansas Gazette*, June 3, 1923; Wilson, 60. Nickerson was an independent broker. See *United States Investor* 31, Issue 2 (October 16, 1920): 2516 (116). Couch put him on the Board of Directors of another of his companies, Southern Power & Light (Couch to Rimmel, June 10, 1923, Rimmel Papers, Folder 18). Nickerson went with Electric Bond & Share in 1923. In 1925, Electric Bond & Share acquired a controlling interest in AP&L.

proper notices had been published in Garland, Montgomery, and Hot Springs county newspapers.⁶⁸

AL&P did not meet with too much difficulty in acquiring the land for Rempel Dam. The company was “delayed and rather discouraged over the land situation just West of Hot Springs,” but when the dam site was moved to a “smaller site that will not flood quite so much land,” he had more success in acquiring the necessary property. It was when the site was moved that it became known as “the Rempel Site.” Couch relied upon the favorable influence of FPC Chairman General John Weeks to help AL&P obtain the permissions to use Forest Reserve lands. The Businessmen’s League of Hot Springs was supportive of the project, and Couch had entered into an agreement with the M. D. & G. Railroad to purchase the tracks to Hot Springs and “about forty acres of land.” In all, Couch was able to make satisfactory arrangements for all of the Hot Springs properties that he needed.⁶⁹

As president of AP&L, Harvey Couch was interested in constructing a hydroelectric dam. The Federal Power Commission, on the other hand, was charged with considering the comprehensive uses of the nation’s water resources.⁷⁰ To meet these needs, Couch developed the specification for the dam so that in the opinion of the Commission, Rempel Dam could be “adapted to a comprehensive scheme of improvement and utilization for the purposes of navigation, of water-power development, and of other beneficial public uses,” while not “unreasonably” interfering with navigation “lower down the river.”⁷¹ Couch, who was acutely aware of the power of print media and radio to influence public opinion, included these

⁶⁸ *Ibid.*; Federal Power Commission, *Third Annual Report of the Federal Power Commission* (Washington, D.C.: Government Printing Office, 1923), 142.

⁶⁹ Couch to Rempel, October 17, 1922; Elbert L. Smith to Mr. Couch, November 25, 1922; Couch to Rempel, August 15, 1922; C. M. Conway to Rempel, July 27, 1922. Rempel Papers. Memphis, Dallas & Gulf Railroad.

⁷⁰ Conover, 40.

⁷¹ *Third Annual Report*, 142.

considerations in publicity about the dam, releasing a statement to the periodical *Water Resources and Electric Utilities* asserting that,

“in addition to development of water power, installation of the dams will completely regulate the flow of the Ouachita River, prevent floods in the lower reaches of the valley and improve navigation between Camden and Arkadelphia.”⁷²

In 1923, the FPC granted Caddo River Power Co. a license to build three dams on the Ouachita, the first to be completed by 1925, the second by 1931, and the third by 1933.⁷³ That same year, Caddo River transferred “all the rights granted . . . by license for project no. 271” to Arkansas Light & Power Company of Pine Bluff. The Commission approved the transfer of the license. Couch engineered the buy-out of Caddo Power stock by AL&P because AL&P had established standing in the investment markets of New York, whereas Caddo Power had not. Thus, AL&P was in a better position to attract the funding needed to build the dam.⁷⁴ With the license, funding, in place, Arkansas Light & Power could now start construction of the first of the three dams. Construction began on Rammel Dam, located at Jones Mill, approximately 10 miles southwest of Hot Springs, in early 1923. The dam was completed and began hydroelectric

⁷² *Water Resources and Electric Utilities* 2, no. 6 (November 1922): 24; see also Wilson, p. 52 for Couch and the media. Couch was being generous in touting the flood control capabilities of Rammel Dam; the dam had only 2 feet of freeboard, which could accommodate an additional 4,000 acre-feet of water above the dam’s normal operational height. “Freeboard” is the distance between the water level and the height of the dam. Rammel was considered multiple-purpose by the Corps, and Corps future studies of the Ouachita built that 4,000 acre-feet figure into their calculations for flood control on the Ouachita (Lt. Col. Raymond G. Moses, Vicksburg District Engineer, COE, to The Chief of Engineers, in a letter dated July 16, 1938, in House Doc. No. 69, 76th Cong., 1st sess., January 3, 1939). That Rammel Dam was not designed for flood control is confirmed by Bobby N. Pharr, Process Superintendent, Entergy Arkansas, Inc., Hydro Operations Support. Rammel is a run-of-the-river dam, meaning the same amount of water has to be discharged as enters the reservoir (telephone conversation, June 10, 2013).

⁷³ *Second Annual Report*, 285; *Third Annual Report*, 135-136, 257.

⁷⁴ Rammel to Couch, October 18, 1922; Couch to Rammel, and attachments, April 18, 1923, Rammel Papers, Folder 15 and Folder 17 respectively.

generating operations in December 1924, ahead of the schedule set with the Federal Power Commission.⁷⁵

AL&P, by now renamed Arkansas Power & Light (AP&L), began construction of the second dam on the Ouachita in 1929. Named Carpenter Dam after Couch's friend Flave Carpenter, the dam was located just south of Hot Springs, 10 miles upriver from Rammel Dam. Couch had designed the three dams so that the end of one reservoir reached to the toe of the next dam. The reservoir for Rammel Dam was named Lake Catherine after Couch's daughter, and the reservoir for Carpenter Dam was name Lake Hamilton for Couch's business associate, C. Hamilton Moses. Construction on Carpenter Dam was completed in 1931, right on schedule.

Rammel and Carpenter dams are run-of-the-river dams, dependent on the stream flow to maintain full operations. The dams are tied in to AP&L's integrated system that includes the company's large steam plant at Sterlington, Louisiana, and other facilities.⁷⁶ Power generated by the dams supplements these other sources of power during peak periods, primarily in summer when the reservoir is full.⁷⁷ As with mill dams, hydroelectric dams cannot operate during low water. In supplying peaking power, the dams are "useful 25% of the time."⁷⁸ By releasing water at a steady rate, the dams also improve navigation downriver by creating an even stream flow.

In construction of the third dam on the Ouachita at Blakely Mountain, developments on the national level conspired against Couch and AP&L, resulting in the third dam being constructed by the federal government instead of the electric utility. The first development was completion of the Corps of Engineers river basin studies for flood control and power

⁷⁵ Wilson, 60.

⁷⁶ "Hydro-electric Developments in Arkansas," *Professional Engineer* 14, no. 11 (December 1929), 14.

⁷⁷ "Carpenter Dam, Hot Springs, Garland County," Arkansas Historic Preservation Program, http://www.arkansaspreservation.com/historic-properties/_search_nomination_popup.aspx?id=1462

⁷⁸ Moses, 125.

development. In 1934, the Corps reported back to Congress on the combined flood control and power potential of the Ouachita River. Because AP&L already had dams at the Rempel and Carpenter sites, the Corps looked specifically at the Blakely Mountain site. Given that AP&L also had a license from the Federal Power Commission to build a hydroelectric dam at Blakely, the Corps concluded that the AP&L installation would be sufficient to provide flood control benefits. The report read, “a combined project for the development of water power and flood control, including a reservoir at Blakely Mountain on the Ouachita River . . . would give complete flood protection” downstream from the Blakely and Rempel reservoirs as far as Arkadelphia. The Corps assigned the expense of construction of a combined flood control-water power dam to “the interests receiving the benefits of flood protection with those who would construct the combined project,” that is, the State of Arkansas and AP&L.⁷⁹ As with Rempel and Carpenter dams, Harvey Couch was interested in building a hydroelectric dam. Couch was prepared to include flood control in the specifications for the dam; how to pay for them was the problem.

The Depression was the second development that affected Couch’s ability to build Blakely. AP&L’s funding was in place for Carpenter Dam by the time the Depression started in 1929, so that project was not affected. But by the time Couch tried to secure funding for Blakely, he had difficulty securing the necessary backing. In testifying before the U.S. Army Board of Engineers for Rivers and Harbors in 1938, Couch explained that the Depression “struck” AP&L in 1932. Demand for power had dropped off and “we were all at a standstill.” The FPC license had lapsed because Couch had been unable to start the project by 1933, as specified in the permit. Couch had applied to renew the license, but now, in 1938, as a condition

⁷⁹ House Committee on Rivers and Harbors, *Ouachita River and Tributaries, Arkansas and Louisiana*, 73^d Cong., 2^d sess., 1934, H. Doc. 196, 164.

for renewal, the Corps wanted AP&L to build the dam to at least 160 feet, and preferably 171 feet, to accommodate the flood control purposes outlined in the 1934 survey report. Couch felt he could get funding for a 120 foot dam, and possibly to 135 feet, but “we pass (the) 120 foot level our dollars are not earning us any more than at the 120 foot level.” Bankers, he argued, were “not going to put more dollars in the till” to raise the height of the dam from 120 to 135 feet for such a slight return on their investment.⁸⁰

This exchange over the height of the dam highlights a basic problem with dams intended for both flood control and water power. As explained by General Julian L. Schley, Chief of Engineers, U.S. Army, “the two are essentially in conflict to this extent, that the flood-control reservoir should be emptied as promptly as possible to make capacity for the next flood. For power . . . the water is impounded and the reservoir is kept full to the greatest possible extent.”⁸¹ Essentially, the Corps of Engineers wanted AP&L to build their dam to 135 feet for power purposes, then add at least 25 feet, and preferably 35, to the dam – resulting in 525,000 acre-feet additional storage capacity – to capture excess water that would otherwise flood lands downstream. AP&L had secured a \$2,000,000 investment from the federal government toward the addition of the flood control capabilities of Blakely in the Flood Control Act of 1938, but according to the Corps’ own figures, the flood water storage part of the reservoir would cost

⁸⁰ Report of Testimony and Statements on Blakely Mountain Dam, Board of Engineers for Rivers & Harbors, War Department, July 25, 1938, National Archives, Records of the Office of the Chief of Engineers, Record Group 77, Report 5695 (hereafter, RG 77); Gen. M. C. Tyler to The Chief of Engineers, July 25, 1938, in House Committee on Flood Control, *Ouachita River and Tributaries, Arkansas and Louisiana*, 76th Cong., 1st sess., 1939, H. Doc. 69, 6.

⁸¹ House Committee on Flood Control, *Hearings Before the Committee on Flood Control*, 75th Cong., 3^d sess., 1938, 24.

\$2,445,900. The Corps was essentially asking AP&L to contribute \$445,900 toward the flood-control purposes of the Blakely project.⁸²

Couch agreed to these terms, and AP&L's license for Blakely was approved. However, AP&L did not begin work on the dam. In 1939, the company asked for an indefinite extension of time for starting the project. The company had concluded that there would not be a market for the power until at least 1946, and that construction of the dam did not need to start until 1944 or 1945. In light of AP&L's plans to delay construction of the dam, and desirous to see the project built as a flood control project as outlined in the comprehensive plan, the House of Representatives Committee on Flood Control adopted a resolution on May 12, 1941 on the "advisability of undertaking the construction of the Blakely Mountain Dam as a Federal flood control project." Leland Olds, chairman of the FPC during the hearings on Blakely, was one of the conservationists in the Roosevelt administration who favored public power over private power development. Under Olds' chairmanship, "the Commission held that this project (Blakely) should be constructed by the Federal Government," and on Sept. 1, 1941, the Federal Power Commission cancelled AP&L's license.⁸³

Despite, or because of, cancellation of AP&L's license, local community leaders lobbied the Corps to proceed with construction of the dam for flood control and power purposes, either through renewing AP&L's license, or under the auspices of the federal government. Adolph Felsenthal, President of the Arkansas Assessors Association, was opposed to AP&L building the

⁸² Moses, p. 124; Sherry Lamon, "Arkansas's Dark Ages: The Struggle to Electrify the State," *The Arkansas Historical Quarterly* 71, no. 3 (Autumn 2012): 291; H. Doc. 69, 26-27; see also, *Flood Control Act of 1938*, § 4, Public Law 761, *U. S. Statutes at Large* 52 (1938): 1216. The \$2,000,000 federal contribution was included in the Flood Control Act of 1938.

⁸³ Oren Hatch to Colonel Sturgis, Dec. 12, 1941, RG 77, Box 813, Report 6421, Folder: Appendix H; General John J. Kingman to The Chief of Engineers, November 12, 1943, RG 77, Box 813, Report 6421, Folder: Reports of the Chief of Engineers and the Board of Engineers for Rivers and Harbors, 1; Moses, 123.

dam and urged the government to take on the project. The Chamber of Commerce of Arkadelphia favored having AP&L build the dam. Representative Clyde Ellis asked rhetorically, “Do we want the Blakely Mountain Dam? My answer is ‘yes’ – ‘yes’.” But Ellis was desirous of having Blakely included in an Arkansas Valley Authority, and he lobbied for the federal government to construct the dam. Representatives of the Seventh District of Arkansas felt that if the FPC was not going to renew AP&L’s license, then “it is to the best interest of the people of this Nation, for the Federal Government to proceed with this development.”⁸⁴

In 1941, however, the war interfered, and the Corps took no action on the dam. With the Corps not interested, or unable, to build Blakely in wartime, the Federal Power Commission evidently inquired of AP&L whether the company was still interested in building the dam. However, “AP&L showed no disposition to proceed on Blakely.”⁸⁵ By 1943, AP&L, Mississippi Power and Light, and Louisiana Power and Light had constructed an interconnected system to provide power to war industries in Arkansas. Given this capacity to generate power in the region, the Corps found that Blakely Mountain Dam was not economically feasible. The Chief of the Army Corps of Engineers and the Federal Power Commission determined “actual construction shall not be undertaken until . . . an adequate market for the power exists or is reasonably to be expected in the near future.”⁸⁶

Finally, in 1944, the year predicted by Harvey Couch, the Chief of Engineers determined that “the power output of the Blakely Mountain Dam development could be utilized to carry peak loads in the early future,” and that “it is advisable to adopt a project for development of this

⁸⁴ Testimony at a public hearing held at Hot Springs on December 12, 1941, RG 77, Box 813, Report 6421, Appendix H.

⁸⁵ Memo to file, n.d., c. 1941, Clyde Ellis Papers, MS EL5 258, Series 2 Box 5, Folder 34, Special Collections, Mullins Library, University of Arkansas, Fayetteville (hereafter, Ellis Papers); *Arkansas Gazette*, December 3, 1941.

⁸⁶ Kingman to The Chief of Engineers, 6.

site for the combined purposes of flood control and water power production.”⁸⁷ In 1946, Congress appropriated funds, and construction of Blakely Mountain Dam began in 1948 and was completed in 1953. The dam is 231 feet high, more than meeting the Corps’ initial specifications for a flood control and hydroelectric project. In the meanwhile, the Corps had constructed the Narrows Dam on the Little Missouri River, which was authorized by the Flood Control Act of 1941, as part of the Corps’ comprehensive plan for flood control and power development of the Ouachita River and tributaries.⁸⁸ Construction of Narrows Dam began in 1948 and the project was completed in 1950.

AP&L experienced similar difficulties with Congressional and Corps of Engineer plans for comprehensive development of the White River as it did with Blakely. AP&L’s interest in the White River stemmed from its subsidiary interests in the White River Power Company. The White River Power Company, which had proposed three hydroelectric dams on the White, North Fork and Buffalo Fork of the White (project no. 654), had been unable to complete construction of the three proposed reservoirs by 1936. The company applied to the FPC for an extension of the license.⁸⁹ By this time, Congress had authorized and funded the comprehensive river basin surveys and was considering which projects to fund. There had also developed a general prejudice against large utility holding companies as monopolies that kept the price of power unreasonably high. The Roosevelt administration had taken several steps to make power more affordable, such as the Rural Electrification Administration (REA) and enactment of the Public Utilities Holding Company Act, which broke up the large utility holding companies. AP&L was controlled by Electric Bond & Share, one of the major utility holding companies that had been a

⁸⁷ House Committee on Flood Control, *Ouachita River and Tributaries, Arkansas and Louisiana, Blakely Mountain Dam*, 78th Cong., 2^d sess., 1944, H. Doc. 647.

⁸⁸ H. Doc. 196, 85.

⁸⁹ *Arkansas Democrat*, May 1, 1936.

target of this New Deal legislation.⁹⁰ The federal government also had plans to generate power on the White River and sell that power to the REA co-ops at a lower rate than they could buy power from AP&L. The license held by White River Power would prevent the federal government from proceeding with the planned flood control and hydroelectric development of the White River and its tributaries.

Subsequently, about the time Congress was considering the Flood Control Act of 1938, the Federal Power Commission revoked AP&L's license to build dams on the White and its tributaries.⁹¹ With AP&L's control of the potential power sites on the White cleared, Congress authorized construction of Norfolk Dam on the North Fork of the White River. Norfolk Dam as authorized in the Flood Control Act of 1938 did not call for immediate installation of hydropower capabilities, just that the penstocks be installed for future power development. To convince the federal government to include power capabilities in the dam, the citizens of northcentral Arkansas expressed their desire to have hydroelectric capabilities installed at the dam at a hearing conducted by the Corps of Engineers at Harrison on January 10, 1938.⁹² Faced with an intense lobbying effort on the part of U.S. Representative Clyde Ellis of Arkansas' 3rd district, and the citizens of northcentral Arkansas, Congress voted funds to include the hydroelectric facilities in the dam.⁹³

Not everyone in the region that was to be affected by Norfolk Dam was happy that the dam was to be constructed. Rex Bodenhamer of Mountain Home reported to Clyde Ellis that he had heard several of the people that own resorts "up around Hollister . . . do not want the dams

⁹⁰ Leuchtenburg, 156-157.

⁹¹ *Arkansas Democrat*, May 23, 1938; Corps of Engineers Report 6347, RG 77, Box 799, Folder S-302-82-2, no date, 5.

⁹² *Arkansas Democrat*, January 11, 1938.

⁹³ See, for example, Ellis to C. W. Kellog, May 15, 1941, and "Summary of Arguments" for hydropower at Norfolk, n.d., c. 1941, Ellis Papers.

built for fear it would cause a sharp slump in their business.”⁹⁴ Ellis also noted that the Conservation Federation of Missouri opposed the dam. But, Ellis commented, the Federation was “an organ of the . . . Missouri power-trust and speaks the voice only of that gang.” In his district, he said, “there is not a single person opposed to these projects that I know of.”⁹⁵ Ellis could also point to correspondence from constituents such as Charles F. Huff, who wrote,

“The reservoir created by the dam will give the Ozark region in which it is situated its rightful and deserved heritage in the form of a nationally known resort area. The cheap electric rates that will follow the installation of power-generating facilities will do much to pave the way for developing the natural resources of the state and, as a consequence, a higher plane of living will result.”⁹⁶

Brooks Blevins, in *Hill Folks: A History of Arkansas Ozarkers and their Image*, discusses some of the contemporary effects of Norfolk Dam, and the later Bull Shoals Dam, on local communities. The dams attracted retirees from out-of-state to the region, making it more of a resort area than it was before the dams, which has caused the region to lose its local Ozark heritage and character.⁹⁷

Norfolk Dam was completed in 1945.⁹⁸ Construction of two of the other dams authorized by the Flood Control Act of 1938 – Bull Shoals and Table Rock – was delayed by the war. The installation at Bull Shoals replaced the dam proposed for the Wild Cat Shoals, “where

⁹⁴ Rex Bodenhamer to Clyde Ellis, July 15, 1941. Ellis Papers.

⁹⁵ “Statement of Clyde T. Ellis, Member of Congress from Arkansas,” attachment to a letter from Ellis to the Clerk, Senate Commerce Committee, July 18, 1941. Ellis Papers.

⁹⁶ Charles F. Huff to Clyde Ellis, October 20, 1941. Ellis Papers.

⁹⁷ Brooks Blevins, *Hill Folks: A History of Arkansas Ozarkers and Their Image* (Chapel Hill, NC: The University of North Carolina Press, 2002), 192-193.

⁹⁸ Little Rock Engineer District, *Norfolk Dam and Reservoir Project: Arkansas and Missouri* (Little Rock: Little Rock District, Corps of Engineers, 1948), 1-2; Frances Shiras, “Norfolk Dam,” *The Arkansas Historical Quarterly* 4, no. 2 (Summer 1945): 151; *Arkansas Democrat*, January 10 and 11, 1938.

the foundation conditions were found to be unfavorable.”⁹⁹ Bull Shoals was completed in 1951 and Table Rock was completed in 1958.

In his history of AP&L, John Clark states that the Blakely and North Fork controversies “confirmed in Arkansas what was becoming clear throughout the country – the Federal Government, not private companies, would in the future develop the nation’s water resources.”¹⁰⁰ Today, of the 19 hydroelectric plants in Arkansas, nine are operated by the Corps of Engineers. Three are operated by the Arkansas Electric Cooperative Corporation, which is a consortium of the rural electric co-operatives created and funded by the Rural Electrification Administration. Three are owned by private companies, and four are owned by cities or counties.¹⁰¹

⁹⁹ Little Rock Engineer District, *Bull Shoals Dam and Reservoir Project: Arkansas and Missouri* (Little Rock: Little Rock District, Corps of Engineers, 1947), 2.

¹⁰⁰ John Clark, *A History of Arkansas Power & Light Co.* (Dissertation, Harvard University, 1960), 101

¹⁰¹ Jerry Reynolds, “Hydroelectricity,” *Encyclopedia of Arkansas History & Culture*, accessed May 27, 2013.

CHAPTER 4: NAVIGATION DAMS

The rivers were as useful for transportation as they were for power. Throughout the first half of the 19th century, rivers were the principle means of transportation into and out of the backcountry of the trans-Mississippi southeast. The problem in Arkansas was that the flow of the rivers was not always of sufficient depth to allow passage of boats on the river. Locks and dams were a way to raise the level of the river so that steamboats could travel up and down stream. The dams pool water above and below the dam to maintain an even, navigable depth of water throughout the year. The locks fill with water to raise or lower boats over the dam. Locks and dams on the White and Ouachita rivers would be the means by which the federal government made these two rivers in the first half of the 20th century. Late in the 20th century, the McClellan-Kerr Arkansas River Navigation System on the Arkansas River and the Ouachita-Black Rivers Navigation Project on the Ouachita make these rivers navigable year-round.

Hunters used canoes and keel boats to transport hides to market.¹ The early explorers had, of necessity, used the rivers for transportation into what was then the largely unexplored and unmapped interior of the southern Louisiana Purchase, including the territory that would become Arkansas. Settlers, like the hunters before them, accessed the interior of Arkansas via the rivers, as boats were more efficient and economical for transporting men and matériel than were men on foot or horse via paths and trails.² And for cotton planters and non-subsistence farmers, navigable streams and rivers were essential for sending agricultural products to market, and for bringing consumer goods from urban centers to frontier communities.

The federal government recognized the importance of navigable streams early on and claimed for itself jurisdiction over them by virtue of its constitutional right to regulate interstate

¹ Bauer, 156.

² George Rogers Taylor, *The Transportation Revolution, 1815-1860* (New York: Rinehart & Company, Inc., 1951), 5; Flores, 67, 101; Nuttall, 101.

commerce. In 1787, Congress established through the Northwest Ordinance “a definite policy for the general government with regard to freedom of navigation” on western waters. Article IV of the Ordinance stated that “the navigable waters leading into the Mississippi and St. Lawrence, and the carrying-places between the same, shall be common highways and forever free, . . . without any tax impost, or duty therefor.”³ In the case of *Gibbons v. Ogden* in 1824, the Supreme Court used a broad definition of commerce and confirmed that the Commerce Clause of the Constitution did give the federal government primary jurisdiction over the states in regulating interstate commerce, .⁴

For the western territories, the implication was, that if the federal government had jurisdiction over inland waterways, then the federal government was responsible for improving those waterways. By the early 1810’s, with the advent and growth of steamboat traffic on the Mississippi and its tributaries, the improvement most desired by the western states and territories was the removal of sandbars and of such “ ‘planters, sawyers, or snags’ as may be found in the current” of the Ohio and Mississippi rivers.⁵ However, the question of river improvements was entangled in the question of internal improvements. The building of roads and canals were considered internal improvements. The rivers, defined as ‘common highways’, fell in the category of “roads.” Therefore, improving navigation on the rivers was an internal

³ Jay A. Barrett, *Evolution of the Ordinance of 1787* (New York: G. P. Putnam’s Sons, 1891), 41, 88.

⁴ Herbert A. Johnson, *Gibbons v. Ogden: John Marshall, Steamboats, and the Commerce Clause* (Lawrence, KS: University Press of Kansas, 2010), 111.

⁵ *An Act to improve the navigation of the Ohio and Mississippi rivers*, Chpt. 139, *U. S. Statutes at Large*, 1824, 32; Edith McCall, *Conquering the Rivers: Henry Miller Shreve and the Navigation of America’s Inland Waterways* (Baton Rouge: Louisiana State University Press, 1984), 183.

improvement, and the power to effect internal improvements was not specifically granted to the Congress by the Constitution.⁶

Proponents of federal support for internal improvements advanced five constitutional arguments “in favor” of internal improvements:

“ . . . it is to be found in the grant to ‘regulate commerce;’ another, from the consent of the States; a third, from the right to ‘erect needful buildings;’ a fourth, from the military power; a fifth, from ‘common defence, and general welfare’ . . . ”⁷

And indeed, in 1824, “the climate of opinion shifted in favor of federal assistance,” and Congress accepted some responsibility for improving navigation on the Ohio and Mississippi by passing legislation to fund the clearing of planters, sawyers, and snags from these rivers.⁸ The General Assembly of the Territory of Arkansas may have had the connection between federal assistance and inland waterways in mind when it passed an act in 1829 declaring the Little Missouri river a navigable stream. The legislation used some of the same language – “That the Little Missouri river . . . shall be . . . declared a navigable stream, and a common highway, free to all the people of this territory. . . .”⁹ – as was used in the Ordinance of 1787. The federal government assisted Arkansas by sending Captain Henry Shreve and his snagboats to clear the Arkansas river. Shreve arrived in Little Rock in February, 1834, seven months after having cleared out two-thirds of the Great Raft on the Red River. By the time he reached Little Rock,

⁶ U. S. Senate, *Annals of Congress*, 18th Cong., 1st sess., 1824: 542.

⁷ *Ibid.*

⁸ An Act to improve the navigation of the Ohio and Mississippi rivers, Chpt. 139; U.S. Army Corps of Engineers, *The History of the U.S. Army Corps of Engineers* (Alexandria, VA: U.S. Army Corps of Engineers, 1998), 39. Chapter 139 appropriated funds to make improvements that were authorized by the General Survey Act of April 30, 1824.

⁹ *Acts Passed at the Sixth Session of the General Assembly of the Territory of Arkansas*, 1829 (Little Rock, 1830), 102-103.

Shreve had been “at work for the past three or four weeks in removing snags, sawyers and other obstructions of our noble river,” declared the newspaper.¹⁰

In seeking continued federal assistance for improving navigation on the rivers of Arkansas, the state legislature favored the military and general welfare arguments, as well as appealing to the general government’s pecuniary interests. In 1838, the Arkansas General Assembly passed three Resolutions directing the state’s senators and representative in congress “to procure, if practicable,” appropriations to improve navigation on the Arkansas and Ouachita Rivers and Bayou Bartholomew. The argument for clearing the Arkansas was military, insofar as the United States had purchased a site at Fort Smith for “a large and extensive fort.” Improving navigation of the river by removing “numerous rafts and other lodgements of timber” would “greatly facilitate . . . the movement of troops, arms, munitions of war, and intercourse with the different tribes of Indians now settled west of the state of Arkansas.”¹¹ Clearing the Ouachita of “rafts and other obstructions” would “redound greatly to the commercial advantage of the people,” and thus, to the general welfare of the state, and by extension, the nation.¹² And by “cutting out the trees that have fallen in from the banks,” the navigation of Bayou Bartholomew could be so enhanced that “a large body of the best cotton lands” could be brought under cultivation. The State appealed to the pecuniary interests of the general government by arguing that the expense of these improvements would be “trifling” compared to “the benefits to be derived from the immediate . . . sale of a large body of the richest of the public lands.”¹³

Both Arkansas and Missouri had an interest in improving navigation on the White River.

When Missouri sought to improve the White, the state of Arkansas cooperated by giving

¹⁰ Diana Sherwood, “Clearing the Channel: The Snagboat in Arkansas,” *The Arkansas Historical Quarterly* 3, no. 1 (Spring 1944): 57-58.

¹¹ “Resolutions,” *Acts of Arkansas*, 1838: 139.

¹² *Ibid.*, 128-129.

¹³ *Ibid.*, 130.

Missouri permission to improve the river within the border of Arkansas. Permission was in the form of an act passed by the Arkansas General Assembly in 1849. The Act stated:

It shall be lawful for the State of Missouri to cause dams to be built across White river, from the Buffalo shoals on said river to the north boundary line of this State, for the purpose of improving the navigation thereof, and to build abutments for said dams on either bank thereof, and locks to pass said dams, and other works necessary and proper to improve the navigation of said river

14
...

Having secured permission from Arkansas to improve the White River, the Missouri legislature petitioned Congress in 1850 for a donation of federal lands near the river, so that the state could sell the lands and use the proceeds to improve the river. The state proposed to remove “overhanging branches and shoals,” and construct “a few locks and dams,” which, the legislature argued, would make the river “navigable at all seasons of the year.” The state legislature used the same arguments that had been used before, that it would promote development of both Missouri and Arkansas, that it would allow the easy transit of the military to western posts, and that it would increase the value of the public lands.¹⁵

Missouri’s negotiations to improve navigation of the White River were the first time locks and dams were suggested as a way to accomplish that goal. The Topographical Bureau of the U.S. Army had surveyed the White and Black rivers of Missouri and Arkansas in 1837, and established that the White River was navigable by steamboats to Batesville, and by keel boats and flat boats above there. The Topographical engineer did not recommend dams, specifically wing dams, to improve navigation above Batesville. Wing dams extend only part way into the river, forcing a narrower channel and therefore deeper water at the constriction. The Topographical engineer felt wing dams would just push around the sand and gravel bars that

¹⁴ *An act respecting the White River, Acts of Arkansas* (1849): 68-69.

¹⁵ Committee on Public Lands, *Memorial of the Legislature of Missouri*, 31st Cong., 1st sess., 1850, S. Misc. Doc. 18.

obstructed the river at low water, so were not worth the expense. Instead he recommended clearing snags, and removing offending rocks at the various shoals on the river.¹⁶

Missouri was interested in building its dams at one of those shoals, called Elbow Shoals, nearly on the Missouri-Arkansas state line. A Corps of Engineers surveyor on the White River in 1871 saw the remains of these dams and pronounced them inadequate for the purpose for which they were intended. They were “built with open cribs, and were entirely too low to overcome the fall before the water passed over them.” By 1871 they had nearly washed away. Instead of dams, as Missouri had tried, the surveying engineer recommended a series a wing dams on the White River at the various shoals from Forsythe, Missouri, to Batesville, including at Elbow Shoals, Bull Shoals, and Buffalo Shoals, among others. He also recommended dredging and removing loose rock and gravel from the shoals.¹⁷

With the wing dams and rock excavation, the Corps of Engineers was trying to create and maintain a channel over the shoals that would allow a boat with a three-foot draft to pass over the shoals “when the river was five feet or more above extreme low-water stage,” that is, with two feet of water to spare.¹⁸ Fall through early summer (November to June) travel was the norm because the rivers were too low and shallow to allow a boat passage in the summertime.¹⁹ Even so, seasonal travel did not guarantee the traveler would avoid river hazards, such as rapids, ripples, and shoals.²⁰ It was these hazards, as well as snags, the Corps was trying to alleviate.

¹⁶ Senate Committee on Roads and Canals, *Report from the Secretary of War*, 25th Cong., 2^d sess., 1838, S. Doc. 132.

¹⁷ House Committee on Commerce, *Engineer's Report of Certain Rivers and Harbors*, 41st Cong., 3^d sess., 1871, H. Doc. 60, 13; Elmo Ingenthron, “The Dubuque-Forsyth Road,” *White River Historical Quarterly* 1, no. 6 (Winter 1962): 10. The surveyor, Alonzo Livermore, mistakenly says these dams were built by the state of Arkansas.

¹⁸ *Ibid*, 11.

¹⁹ Flores, 181, n. 14; Hodge, 4; Nuttall, 118, 137; James, 258, 319; Featherstonhaugh, 90

²⁰ Berry, 57

There was little doubt that improving navigation on the White would be beneficial to farmers in southern Missouri and north-central Arkansas. Overland roads were still poor, and as George Taylor demonstrates in *The Transportation Revolution*, moving goods by water was so much more efficient and economical than moving goods over land.²¹ The region was growing, with a 32% increase in population from 1880 to 1890 in the six counties through which the White River flowed between Forsythe, Missouri and Batesville, Arkansas.²² For farmers in this region, the river was the best means of sending farm produce to market. Timber was moved down river and shipped by rafts and barges through Batesville and Jacksonville. There was the potential for zinc and lead mining in the area. Better access to the lands along the rivers would also serve to encourage further development of the region.²³

To meet these needs, the Corps concluded in 1895 that the “proper method of improving all of it (the White River) . . . is by means of locks and fixed dams.”²⁴ In her history of the Little Rock District of the Corps of Engineers, Mary Rathburn details the steps by which the Corps convinced Arkansans and Congress that locks and dams were necessary. According to Rathburn, in 1891 the District Engineer suggested to the citizens of Batesville that they “urge their representatives and senators to secure the necessary appropriations” for the locks and dams. A new District Engineer was assigned to the White River project in 1894, and he successfully shepherded the river surveys and the plans for the dams through to approval by the Chief of

²¹ Taylor, 70.

²² *Abstract of the Eleventh Census* (Washington, D.C.: Government Printing Office, 1894). The six counties are Ozark and Taney in Missouri, and Baxter, Independence, Izard, and Marion in Arkansas.

²³ Rathburn, 33.

²⁴ Committee on Rivers and Harbors, *Examination of the Upper White River, Arkansas*, 54th Cong., 1st sess., 1895, H. Doc. 98, , 5.

Engineers and Congress. The Corps originally planned 10 locks and dams, but with subsequent developments, only three would be constructed.²⁵

The locks and dams were authorized in the River and Harbor Act of 1899, but construction was slow because the Corps could not find anyone to bid on the project for the amount of money allocated. In considering legislation to address this situation, the House Committee on Rivers and Harbors issued a report to the Whole House stating, “It is thought that if the provision is changed so as to authorize the Government engineers to proceed with this work, making separate contracts for labor and materials, the improvement can be accomplished within the limit provided.”²⁶ Congress responded by amending the 1899 river and harbor act to allow the Secretary of War, through the Corps, to construct the dams “by contract or in any manner that in his judgment may be most economical and advantageous to the Government,” but not to exceed the appropriated amount.²⁷ The Corps constructed three locks and dams on the White River at Batesville. Lock and Dam No. 1 was completed in 1903, No. 2 in 1905, and No. 3 in 1908.²⁸

Ironically, almost as soon as the dams were completed, the White River Railroad reached Batesville. The railroad tracks, completed in December 1905, ran next to the White River from Batesville to Cotter, where they turned east to Yellville and the Rush mining district, then turned north again, crossing the White at Branson, Missouri, then continuing on to the end of the line at Carthage, Missouri.²⁹ The railroad was more expensive than steamboat travel, but it was also faster, more dependable, and operated year-round. George Taylor notes that, “travelers and

²⁵ Rathburn, 32-33.

²⁶ Committee of the Whole House, *River and Harbor Emergency Bill*, 56th Cong., 1st sess., 1900, H. Rep. 1517, 3.

²⁷ River and Harbor Emergency Bill of 1900, 56th Cong., 1st sess. (June 6, 1900).

²⁸ Rathburn, 41

²⁹ James R. Fair, *The North Arkansas Line: The Story of the Missouri & North Arkansas Railroad* (Berkeley, CA: Howell-North Books, 1969).

shippers alike, becoming habituated to using the rails (during low water) often found small differences in cost insufficient to tempt them back to the rivers.”³⁰ With the railroad providing more efficient shipment of goods, river traffic was reduced, and the locks and dams on the White did not see the high volume of traffic originally anticipated. Only three of the 10 dams originally planned were built. The federal government stopped maintaining them in 1951.

The other river in Arkansas improved with locks and dams was the Ouachita, and the process of getting them built was similar to that for the locks and dams on the White. The Corps of Engineers first surveyed the Ouachita from Trinity, Louisiana, to Camden, Arkansas, in 1871. Camden was the main shipping point for cotton from the Gulf Coastal Plains region. The year of the survey, 157,100 bales of cotton were shipped from the region.³¹ The river between Trinity and Camden made transporting the cotton downriver, and bringing equipment and supplies upriver, difficult. There were 65 shoals on the river between the two cities, making low-water transport “a virtual impossibility.”³²

The surveyor for the Corps recommended construction of five locks and dams on the river. The dams would allow boats to pass over them when the water was high, and the locks would provide lift during low water.³³ The dams were not built at that time because in the opinion of the District Engineer, the benefits to be gained did not justify the cost, especially since the Cairo and Fulton Railroad served the same region. Planters found that they could ship their cotton to New Orleans on the Cairo and Fulton Railroad “at rates sufficiently cheap, compared to

³⁰ Taylor, 71.

³¹ House Committee on Commerce, *Survey of Certain Rivers in the Southern States*, 42^d Cong., 2^d sess., 1872, H. Ex. Doc. 252, 4-5.

³² Gary B. Mills, *Of Men and Rivers: The Story of the Vicksburg District* (Vicksburg, MS: U. S. Army Engineer District, Vicksburg, 1978), 49.

³³ H. Ex. Doc. 252, 2.

river-rates.”³⁴ Instead, the District Engineer recommended a system of wing dams to narrow the channel to increase its depth. The wing dams were built beginning in 1877, but with the District Engineer’s attention shifted to his work with the Mississippi River Commission after 1879, improvement of the Ouachita was neglected.³⁵

The surveys and consideration of locks and dams resumed in 1897 with a new District Engineer, Major Joseph H. Willard, who again recommended a series of locks and dams on the river to aid in low-water navigation.³⁶ The Major enjoyed the support of the business communities of Camden and Monroe, Louisiana. In Camden, Col. John C. Ritchie, “the big lumber man of Camden,” organized a committee to go before Congress and request an appropriation for locks and dams on the Ouachita. Although a lumber man, Ritchie sought to enlist New Orleans’ commercial interests in the project to improve the river by pointing out that “if they open the upper Ouachita thousands and thousands of bales of cotton would come direct to New Orleans by steamer that now go elsewhere.”³⁷ In Monroe, W. B. Reily, president of the Monroe Board of Trade, called a “mass convention” of all those interested in improving the Ouachita “for the purpose of memorializing congress in aid of this great work.”³⁸ Col. Asa Morgan of Camden, president of the Ouachita and Black River Improvement Association, presided over the convention. The object of the participants was to make “a systematic effort” to convince Congress to vote “the necessary appropriations to perfect an all-the-year-round navigation in the Ouachita River and its tributaries.”³⁹

³⁴ House Committee on Commerce, *Ouachita River*, 43^d Cong., 1st sess., 1874, H. Ex. Doc. 259, 7.

³⁵ Mills, 49, 51.

³⁶ Senate Committee on Commerce, *Movable Dams*, 54th Cong., 2^d sess., 1897, S. Doc. 136,

1
³⁷ *Arkansas Democrat*, July 31, 1899.

³⁸ *Arkansas Democrat*, October 12, 1899.

³⁹ *Arkansas Democrat*, November 13, 1899.

The Corps of Engineers issued a final report on improvement of the Ouachita in 1902. The report recommended a system of nine locks and dams between Camden and the junction of the Ouachita with the Red river, although the report also stated that four of those locks could be omitted.⁴⁰ Two of the dams that were recommended, and two that could be omitted, were in Arkansas. The remainder were in Louisiana. Congress approved four of the locks and dams in the River and Harbor Act of 1910, called Lock and Dam No. 6, at Felsenthal, and Lock and Dam No. 8, at Calion, and the two in Louisiana. In 1911, Congress voted additional sums to complete construction of the locks and dams.⁴¹ In assessing the lock and dam projects, Gary B. Mills, historian for the Vicksburg District of the Corps of Engineers, writes:

The results of the completed project were gratifying. In the calendar year immediately prior to the opening of the last of the locks and dams, the commerce of the Ouachita below Camden amounted to \$1.8 million. In the year following the project's completion, commerce rose to \$9.2 million.⁴²

No other locks and dams were constructed on Arkansas rivers between 1913 and 1964. In 1964 Congress authorized the Ouachita-Black River Navigation Project. Four locks and dams were built, replacing the earlier lock and dam nos. 6 and 8 in Arkansas, and four other "antiquated" locks.⁴³ In 1967, the Corps of Engineers completed construction of Norrell Lock and Dam at Arkansas Post as the first project in the McClellan-Kerr Arkansas River Navigation System. A history of the navigation system can be found in Sherry Laymon's fine article, "John

⁴⁰ House Committee on Rivers and Harbors, *Final Report on Survey of Ouachita and Black Rivers, Arkansas and Louisiana*, 57th Cong., 1st sess., 1902, H. Doc. 448, 4.

⁴¹ River and Harbor Act of 1910, Public Law 264, 61st Cong., 2^d sess. (June 25, 1910), 650; River and Harbor Act of 1911, Public Law 425, 61st Cong., 1st sess. (February 27, 1911).

⁴² Mills, 92. Lock and dam No. 8 at Calion has since been placed in the Historic American Engineering Record (HAER No. AR-1).

⁴³ Ouachita River Valley Association, "Facts About the Ouachita-Black Navigation Project," <http://www.orva.org/wwfacts.htm>

McClellan and the Arkansas River Navigation Project” in *The Arkansas Historical Quarterly*.⁴⁴

In 1983, lock and dam no. 8 at Calion was replaced by the H. K. Thatcher Lock and Dam. The lake created by lock and dam no. 8 was transferred to the Arkansas Game and Fish Commission and is now used as a recreation area.⁴⁵

⁴⁴ Sherry Laymon, “John McClellan and the Arkansas River Navigation Project,” in *The Arkansas Historical Quarterly* 69, no. 2 (Summer 2010): 140ff.

⁴⁵ Steve Teske, “Calion (Union County)” *The Encyclopedia of Arkansas History & Culture*, last updated 3/26/2012.

CHAPTER 5: MUNICIPAL WATER SUPPLY DAMS

Communities that were first established along the water courses of Arkansas took advantage of that water to provide food and shelter through the use of mills to grind grain and saw timber for houses. As the populations of those communities grew, they depended on their water resources to provide drinking water and protection from the fires that periodically destroyed businesses and residences. Initially, the nearby rivers, streams, and springs supplied clean drinking water. But as towns grew, and residences were built further away from water sources, citizens looked for ways to bring the water to them. They sank wells, built cisterns, and transported water pumped into water wagons. When urban centers outgrew these water systems, they began to look to their local governments to provide a better source of clean water for their daily use and an abundant supply for fire emergencies. The difficulty for municipalities was that while their citizens wanted inexpensive, clean, and abundant water, the systems that could meet those demands were more complex and more expensive to construct. Municipalities did respond though, often through agreements with private companies, by installing more cisterns, building water towers, and ultimately, constructing water supply dams, which were the most expensive and most complex of all the alternatives. As municipal water supply dams began to dot the landscape, rivers were no longer thought of as a source of drinking water, but as a resource for filling the reservoirs.

From the first settlements until the 1880s, Arkansans drew their drinking water from either natural sources such as rivers, streams, and springs, or from man-made wells and cisterns. Rivers and streams were potable only so long as they were not polluted by animal and human wastes. Free-flowing rivers or streams were considered the most healthful, if one relied on them for a water supply, as wastes and organic matter did not accumulate in stagnant pools or sluggish

currents. Springs, however, were considered the most “wholesome” source of natural waters, and springs could be found throughout Arkansas. Lonoke County boasted of “springs of cool and clear water.” Clark County had “excellent fresh water springs throughout the county.” Pope County in western Arkansas had “fine chalybeate springs, valuable for the health-producing qualities of their waters.”¹ Chalybeate springs have iron-rich water, which would make one feel better if one had an iron-poor diet, as was common in rural Arkansas. Sebastian County in northwest Arkansas was also blessed with chalybeate springs, “from which pure, sparkling waters flow.” In northeast Arkansas, around Batesville, there were “numerous springs in (the) vicinity, all producing cold, clear and pure water unexcelled in quality,” while on Crowley’s Ridge “a number of good springs . . . are found.”²

Despite an abundance of clear springs, not everyone lived in close proximity to one. Most farm families relied for their water supply on wells or cisterns. Throughout Arkansas, “good well water” could generally be obtained from a depth of twenty to thirty-five feet, often times “without blasting through rock.” Some wells produced at fifteen feet, while for some in south Arkansas it was “necessary to bore 180 feet for water.”³ Well water was used to water livestock, and for domestic purposes such as for drinking water, washing clothes, and for cooking. In Little Rock, well water was used for domestic purposes until 1878.⁴ However, in the opinion of many, “for culinary purposes, cistern water (was) generally preferred and considered the most healthful.”⁵

¹ Goodspeed, *Central Arkansas* – Lonoke County, 580; *Southern Arkansas* – Clark County, 114; *Western Arkansas* – Pope County, 197.

² Goodspeed, *Northwest Arkansas* – Sebastian County, 679; *Northeast Arkansas* – Batesville, 730, Crowley’s Ridge, 310.

³ Goodspeed, *Northeast Arkansas*, 114; *Southern Arkansas*, 114.

⁴ *Daily Arkansas Gazette*, February 22, 1877.

⁵ Goodspeed, *Northwest Arkansas*, 679.

In towns, cisterns were used to store water for municipal purposes, especially as a ready source of a large quantity of water for fighting fires and for cleaning the streets. Cisterns in towns were filled by pumping water from the nearby water source, as, for example, in Little Rock, where water was pumped from the Arkansas River to fill the cisterns. While relatively inexpensive to construct, cisterns were difficult and expensive to keep in repair. For example, in 1866 the Little Rock City Council contracted with a Mr. Murphy to repair the cistern at the corner of Cumberland and Elizabeth (Sixth) streets for \$150.⁶ In an 1871 report to the City Council, the city engineer noted that 4 of the cisterns were “leaking badly.” Poorly maintained cisterns meant there might not be enough water available in case of a fire, such as the December 29, 1871, fire that engulfed an entire city block of Little Rock’s business district. By 1871 Little Rock had 12 cisterns that held between 500 and 800 barrels of water and the cost for maintaining and repairing them was estimated at \$8,000 a year.⁷

Fire was a real and present danger. Houses, businesses, warehouses, and stables were built of wood. Wood was plentiful, inexpensive, and at least in framing a building, did not require specialized skill. Homes and businesses were heated by wood or coal stoves, and a spark from an ill-tended fire could easily get out of control. Once started, a fire could spread quickly to neighboring buildings. Like the 1871 fire in Little Rock, the commercial districts in many Arkansas towns suffered disastrous fires before adequate water works were constructed. An arsonist started a fire in Helena in 1874 that destroyed several stores and two residences. A fire that started in a Hot Springs bath house in 1876 spread to two banking houses, a doctors’ office, and a federal building. Texarkana residents lamented the death of the six-year-old daughter of

⁶ *Daily Arkansas Gazette*, September 19, 1866.

⁷ *Daily Arkansas Gazette*, December 15, 1871; December 18, 1871; and January 4, 1872; March 14, 1872.

Mr. Whitaker, president of the Texarkana and Northern railroad, from a fire that “totally destroyed” the family’s home in 1886. “Water works,” the local paper opined, “would not only have saved the building and furniture, but the life of the little darling whose bright smile will only be seen hereafter in the Spirit land.”⁸

Fire companies did exist to fight these fires, but they were often handicapped in their organization, equipment, and available water resources. Until the advent of professional fire departments in the latter part of the 19th century, fire companies were voluntary organizations. Local men paid an initiation fee to join a fire company, and local businesses and property owners subscribed funds to support it. The members of the fire company supplied their own equipment, although it was generally felt that the town should provide the more expensive equipment such as fire engines and hoses. A fire company had formed in Little Rock by 1846, and the company had a fire engine, but it had difficulty mustering the men for drills, and local businesses were remiss in paying their subscriptions. The equipment the men did have at their disposal was often in poor repair, such as hoses that were “now useless, having burst in exercising,” that is, in drills. And with no subscriptions coming in, and no support from the municipality, there were insufficient funds to purchase new hoses.⁹

Even if the fire companies drilled, had equipment in working order, and were sufficiently funded, they still needed water to fight fires. Fire engines were designed to pump water out of the river or cisterns, sending a hosed stream onto the fire. River water was only useful if the hoses reached both the river and the fire. As a town like Little Rock grew further and further away from the river, the river as an immediate water source became less of a possibility, which is why the city came more and more to rely on cisterns. Cisterns could be filled with river water,

⁸ *Daily Arkansas Gazette*, Dec. 29, 1871, November 9, 1876; *Daily Texarkansas Independent*, January 13, 1886.

⁹ *Arkansas Democrat*, May 21, 1846.

but if the cistern was leaking, or wasn't kept full, or its contents were discharged onto a fire without completely extinguishing it, they were not very effective.

It was for fighting fires that townspeople first began to expect municipal leaders to provide an adequate water supply. The 1871 fire in the Little Rock business district gave added urgency in that town to the need for water works. The fire had spread rapidly through the wooden frame buildings partly from being fanned by a strong breeze, and partly from an “inadequate” water supply.¹⁰ The local paper described the scene:

Let the reader imagine an acre of buildings in a perfect blaze of fire, two engines on the spot, the most energetic men of the state present, and their hands tied from the fact that THE CISTERN HAD NO WATER, and he may imagine how the spectators looked and felt. . .

The paper went on to say that the lesson from the fire was to build more cisterns, keep them full, and provide more hoses for the fire companies. And it issued a challenge: “We want to see the councilman who will vote against giving the fire department anything that may be asked for.”¹¹ Texarkana, which was platted in 1873 after the railroad came, felt the urgent need for a water works later than Little Rock did. But the need for a water works was soon felt. After a series of three “disastrous” fires “within a space of six or eight months” in 1885, the Texarkana newspaper “appealed to the city authorities . . . to do something *at once*.” The paper took to opening the local news section with the one line admonition, “Give us water works.”¹²

At some point between 1874 and 1877, the performance standards for city water works shifted from being an abundant supply of water for fighting fires to being both an abundant supply of water for fighting fires *and* a clean, pure supply of water for drinking and other

¹⁰ *Daily Arkansas Gazette*, December 29, 1871.

¹¹ *Daily Arkansas Gazette*, December 30, 1871.

¹² Goodspeed, *Southern Arkansas*, 186; *Daily Texarkansas Independent*, August 21, 1885, August 26, 1885.

domestic purposes. The 1874 standards are reflected in a proposed contract for a water works in Little Rock. In that year, the Little Rock City Council considered a contract granting the Capital City Water and Supply company the “exclusive privileges . . . to lay down pipes, conduits and aqueducts through and under all the streets and alleys. . .” of the city. In exchange for these privileges, the Capital City Water and Supply company was “to supply the inhabitants and the corporate authorities of the city of Little Rock with an abundant supply of pure water.” Most of the contract dealt with the requirement to supply water to combat fires, taxes, expenses and whether the company or the city was to pay them, the cost of water for the city, the cost of water to the inhabitants, and so. The quality of the water was mentioned one other time in the contract, where the company agreed to provide “pure and wholesome water” for the city.¹³ The contract was never signed, and this effort at forming and sustaining a water company came to naught.

Three years later, a new water company formed, and this time the Little Rock City Council did sign a contract with the company.¹⁴ While the greater part of the 1877 contract with the Little Rock Waterworks dealt primarily with costs and performance standards in the event of a fire, it also contained a more specific stipulation concerning the quality of the water to be supplied to the city. The water was to be not only “wholesome,” but also “well-filtered through the most approved machinery used for the purpose.” Although committing to the Little Rock Waterworks, the city was still not prepared to give up its cisterns and use a more efficient method of water supply, such as a water supply dam, as a safeguard against fires. The waterworks contract specified that the company would “fill and keep full the public cisterns of the city, to be used for extinguishing fires.”¹⁵

¹³ *Daily Arkansas Gazette*, September 23, 1874.

¹⁴ *Daily Arkansas Gazette*, November 11, 1877.

¹⁵ *Daily Arkansas Gazette*, September 25, 1877.

Two developments occurred in the 1870s that might have caused the shift in standards. The first development was new knowledge of the cause of infectious diseases. Between 1870 and 1890, the miasmatic theory of disease, which held that sickness was spread by filthy environmental conditions, especially stagnant water or water contaminated with human waste, began to give way to the germ theory, which held that microscopic organisms caused contagious illnesses.¹⁶ The miasmatic theory of disease held that “bad air” caused people to be susceptible to all manner of ailments, including fevers, agues, “bilious derangement, lassitude and unfitness for business,” and diseases that we now know to be communicable, such as yellow fever. Miasmas arose from dead and decaying vegetable matter, human and animal wastes, and any place in “low latitudes, particularly in the vicinity of lakes, swamps, and large water-courses,” any place that smelled of “putrification” and “decomposition.” Miasmas appeared and “behaved like smoke or mist” and fog. They were on the air and of the air.¹⁷ In Little Rock, miasmas that caused sickness were suspected of arising from the Town Branch, the creek that ran through town and was, in effect, an open sewer.¹⁸ If sickness came from the foul-smelling Town Branch, then it was not impure drinking water that made people ill, and so long as the drinking water was palatable, the source was not so much an issue in the 1874 water works contract.

However, that reasoning had begun to change. The city of Little Rock had been introduced to the germ theory of disease by at least 1874, when a local paper ran an article on “Epidemic Diseases: Fermentation, and the Germ Theory of Disease.” The germ theory of disease maintains that contagious diseases are spread by microscopic organisms carried by hosts,

¹⁶ Melosi, 46-47, 110.

¹⁷ *Arkansas Gazette*, May 9, 1832; Conevery Bolton Valenčius, *The Health of the Contry: How American Settlers Understood Themselves and Their Land* (New York: Basic Books, 2002), 114-117.

¹⁸ *Daily Arkansas Gazette*, February 10, 1870, March 28, 1871, November 2, 1871. For a complete discussion of the Town Branch as an open sewer, see Worthen’s article, 317-347.

such as the mosquito for malaria, or by some other means of transmission, such as tainted water for cholera. The article in the papers, based on a lecture, explained, “the burden of the lecture was to show that all epidemic diseases, such as the smallpox, diphtheria, and cholera, were propagated by parasitic germs” which were “the eight-thousandth of an inch in diameter and the one forty-thousandth of an inch in length.”¹⁹ Germs as a new concept were necessarily introduced to the audience as cells that could be measured and quantified. By 1877 it was “a well known fact . . . that cholera, typhoid and other fevers and dysentery are frequently communicated” by “impure water . . . contaminated by having organic matter in the water.”²⁰

Water-borne contagious diseases were more of a threat in Arkansas than a reality. It wasn't just hyperbole when the Goodspeed histories of Arkansas reported on the “healthful” waters of the state. The rivers, streams, and springs around the state remained pure late into the nineteenth century.²¹ Even Little Rock remained free of outbreaks of typhoid, cholera and yellow fever. The eastern counties of the state had experienced outbreaks of yellow fever, but during the major yellow fever outbreak in Memphis and Shreveport in 1878, county health officials had acted quickly to close down all river traffic to and from those commercial hubs and put in place strict sanitation measures. While the regional quarantine was a hardship for business people in Little Rock and Hot Springs, two major urban centers at the time, the self-imposed isolation did protect the populace from a yellow fever outbreak.²² The most prevalent disease plaguing Arkansans was malaria, found principally in the delta regions.²³ The spread of malaria was attributed to standing water in swamps and bayous more so than to bad drinking water.

¹⁹ *Little Rock Daily Republican*, April 15, 1874. Melosi, 46.

²⁰ *Daily Arkansas Gazette*, September 26, 1877.

²¹ E.g. Goodspeed, *Central Arkansas*, 47, 320, 388.

²² Goodspeed, *Central Arkansas*, 48; *Daily Arkansas Gazette*, August 7, 1878; *Daily Arkansas Gazette*, November 2, 1871; *Little Rock Daily Republican*, September 20, 1873.

²³ Goodspeed, *Central Arkansas*, 47.

To remove germs from the water, it had to be filtered. By the 1870s water was filtered either by “natural filtration,” also called sedimentation, or by mechanical filtration, or some combination of both. In natural filtration, water was pumped into a reservoir where it was let to stand until the sediments had settled to the bottom of the reservoir. Mechanical filtration was most likely a sand filter, where the water was percolated through a settling basin, then a gravel filter, and then a sand filter. Rapid-sand filters were also coming into use, where mechanical devices sped up the process of water filtering through sand.²⁴ Rapid-sand filters would have been “the most approved machinery used for the purpose.” A method of filtering water was a necessary improvement before a municipality to could develop a water supply system based on a water supply dam.

The Little Rock City Council would have known this was the most approved machinery because they had been advised of such by Col. Henry Flad, an “eminent and celebrated engineer” from St. Louis. Col. Flad was invited by the City Council to visit the city and advise them on “the feasibility of establishing waterworks in Little Rock.” The Colonel’s visit to Little Rock in February, 1877,²⁵ was the second development that caused a shift in water works standards between 1874 and 1877. Col. Flad was particularly interested in filtration, having himself designed and patented a method of rapid-filtration that had been installed at several locations in St. Louis.²⁶ Flad made the city aware of the importance of filtered water.

Still, filtering was hardly proof against impurities reaching end users so the source of water to feed into a water works system was of particular concern. Two considerations prevailed: quantity and quality. Spring water for most cities was too far removed from end users

²⁴ Melosi, 86, 140-141.

²⁵ *Daily Arkansas Gazette*, February 10, 1877.

²⁶ M. N. Baker, *The Quest for Pure Water: The History of Water Purification From the Earliest Records to the Twentieth Century* (New York: The American Water Works Association, Inc., 1949), 181.

to be practical. Well water was too likely to be polluted with seepage from sewers, privies, and stagnant streams. Rain water was considered “the best and most wholesome” source of water but it had to be delivered by gravity feed to end users. A gravity feed system required a reservoir located on a height so that the water could flow downhill with enough head of pressure to supply the water mains and meet the demands of users. The reservoir had to be large enough to supply the city even in times of drought.²⁷ The fourth option was a river, a ready source of water for most Arkansas cities. River water had its own problems. The water could become turbid and full of sediment in times of a rise in the river. The intake pipes had to be located upstream from where a city dumped its sewage. And the water had to be palatable, a quality even the best filters of the time could not improve.²⁸ Once a source of water had been identified, it remained to determine the most economical water works system to install.

Municipalities had three options for a water works system. One was the Holly System, with direct pumping from a river or other water source. The second was a standpipe or water tower. The third was a water supply dam impounding a reservoir. The water works system considered the most affordable for providing water for domestic purposes and fire protection was the Holly System of Direct Pressure Water Supply and Fire Protection for Cities, Towns and Villages, or, as it was usually referred to, the Holly System. The Holly System was developed in 1863 by Birdsill Holly of Lockport, New York, and it had two advantages over other systems. One was that “under this system you require no expensive and elevated reservoir,” instead pumping water directly from “a lake or river at hand,” as theoretically in the case of Little Rock, the Arkansas River.²⁹ With the Holly System, the pumping machinery was located in a building

²⁷ *Daily Arkansas Gazette*, March 7, 1877.

²⁸ *Daily Arkansas Gazette*, February 22, 1877 and October 3, 1877.

²⁹ *Daily Arkansas Gazette*, January 4 and 16, 1872.

close by the water supply. Steam- or water-powered machinery drew water from the water source, filtered it,³⁰ and pumped the water through a network of water mains.

The second advantage of the Holly System was that the pumping machinery, patented by Holly, was capable of maintaining “a uniform and steady stream of water” as it was pumped through the mains for domestic or emergency use. Holly had designed a pressure regulator that allowed the pumps to respond to the amount of pressure in the mains. The pressure regulator conserved water under normal conditions, as water was not wasted by coursing through the pipes at a pressure suitable for, say, fighting a fire, but the water supply could be immediately increased when the mains were opened in the event of a fire. By attaching hoses to fire hydrants connected to the water mains, fire fighters could then send a stream of pressurized water directly onto the fire.³¹ This relieved the city and the fire department of the need to keep cisterns in repair and full, it eliminated the need for fire engines to pump water from the cisterns onto the fire, at least where hydrants were available, and a pressurized stream of water was available the year round, so long as the water source was not completely frozen. An opinion piece by “Fireman” in the *Daily Arkansas Gazette* proposed the Holly System for Little Rock, but the city did not purchase it, opting instead for more cisterns³² and, eventually, a water tower. Camden and Texarkana did purchase the Holly System, with Texarkana drawing water directly from 10 artesian wells sunk specifically for this purpose.³³ Texarkana did not have a water supply reservoir until 1929, when a dam was constructed across Clear Creek in Bowie County, Texas.³⁴

³⁰ Baker, 181.

³¹ Madelynn P. Fredrickson, *The Life and Times of Birdsill Holly* (master’s thesis, State University College at Buffalo, 1996), 89, 96-98.

³² *Daily Arkansas Gazette*, September 25, 1877.

³³ “Water-works. Statistics of New Construction,” *Engineering News-Record* 18 (December 17, 1887): 445; Goodspeed, *Southern Arkansas*, 187, 647-648. Texarkana’s Holly System dates to 1886.

³⁴ *Arkansas Democrat*, March 11, 1928.

Standpipes, or as they are called today, water towers, were the next affordable system of water works after the Holly System. Water towers placed on a height near a city or town were more economical as water could be released by gravity feed rather than by pumping. Standpipes had their drawbacks. One was keeping the water in the tank and pipe clean. Sediments in the standing water in the tank settled out onto the bottom of the tank and pipe, causing the water for domestic use to be discolored or foul. Standpipe manufacturers recommended that the tanks be emptied and cleaned once a year, but this was a costly operation and not always done. Around 1883 sediment discharge pipes became available, where the tanks could be cleaned without being emptied, but again, this added to the expense of maintaining the system. The second drawback to water towers was the tanks could burst or wear out. Tanks could be made of wood, cast iron, or steel, any of which, if not constructed properly, could burst. The wooden tank at Newport, Arkansas, burst, with “great damage resulting.” Cast iron was the metal of choice, as the technology for making non-brittle steel had not yet been perfected and the stability of steel could not be trusted.³⁵ Little Rock’s standpipe, constructed in 1878, was cast iron.³⁶ The disadvantage of cast iron structures was that, exposed to the elements, they had an expected life span of 12 to 25 years,³⁷ which, in the life of a city under constant financial constraints, was not a long time.

The third and most expensive storage method was the water supply dam to impound a body of water for use the city’s water supply. Dams impounded reservoirs that were filled by pumping water from a river or by damming a spring, river or stream. Arkansans did not want for precedents or examples of water works dams. By the mid-1870s, there were at least 55 man-

³⁵ B.F. Stephens, “Stand-Pipes for Water Works,” *Report of Proceeding of the Eighth Annual Meeting of the American Water Works Association* (Hannibal, Missouri: Standard Printing Co., 1888), 105-106; *Daily Arkansas Gazette*, Jan. 7, 1872.

³⁶ *Daily Arkansas Gazette*, April 25, 1878.

³⁷ Stephens, 103.

made water-supply reservoirs in the United States.³⁸ Boston had had a private reservoir for supplying the city with drinking water and for fire protection since 1652, and a municipal water works reservoir since 1848. Philadelphia had a water works reservoir since 1801, and had constructed the larger Fairmont dam project for an improved water supply in 1822. Cincinnati's water works, the first in the western states, had begun operations in 1819. And most notably, New York City had completed construction of the Croton dam, reservoir, and aqueduct in 1842 to provide the city with an adequate supply of fresh water for "the public health" and "the public safety."³⁹ The Croton project was notable because of its scale; at the time, it included the largest masonry dam in the United States and "the largest modern aqueduct in the world" that carried water from the reservoir 42 miles to the city.⁴⁰ Arkansans were certainly aware of the Croton project. The *Arkansas Gazette* carried news items announcing its construction and completion.⁴¹ Closer to home, St. Louis had constructed a water-supply reservoir with a capacity of sixty million gallons in 1871.⁴²

In the first legislative session after passage of the new state constitution in 1874, the state legislature provided the legal basis for municipalities to contract for or construct a water works. Section 14 of the *Revised Statutes*, which defined the privileges of cities and towns, provided that municipalities "shall have power to provide a supply of water by the construction and

³⁸ As of 1875. Man-made reservoirs for municipal water supply date to the seventh century B.C. (Smith, *History of Dams*, pg. 12.)

³⁹ Jasper O. Draffin, *The Story of Man's Quest for Water* (Champaign, Illinois: The Garrard Press, 1939), 149-153; *History of Fire Protection in New York City*, 362; Smith, *Man and Water*, 125. The oldest water supply dam still in use is the Old Oaken Bucket Pond Dam in Scituate, Massachusetts, which was completed in 1640 (NID database).

⁴⁰ Smith, *A History of Dams*, 183; Melosi, 83.

⁴¹ *Arkansas Gazette*, May 19, 1835; June 2, 1835; November 16, 1842.

⁴² G. E. Beach, "Should Storage Reservoirs Be Open or Closed?" *Proceedings of the Annual Convention of the American Water Works Association 7* (Hannibal, MO: Standard Printing Co., 1887), 74.

regulation of wells, pumps, cisterns, reservoirs, or water works . . .”⁴³ Otherwise, the construction of dams was governed by the legislation for mill dams.

In his 1877 report to the city of Little Rock, Col. Flad recommended the city build a reservoir to either capture rain water, or to serve as a storage and settlement facility for water pumped from the Arkansas River. Col. Flad considered rain water to be the “best and most wholesome” source of water, and he believed it could be collected and stored in sufficient quantity in a natural or artificial reservoir to answer Little Rock’s 1877 need of 240,000 gallons a day. But rain water would have to be delivered to the city in a gravitation feed system, and Flad admitted that the city or a private water works company would probably find the high initial cost of a gravitation feed system unacceptable.⁴⁴ As the second-best alternative, Flad believed “the next best source of supply is the Arkansas River.” He continued,

the best method, to secure tolerably pure and clear water at all times, would, in my opinion, consist in pumping the water into a storage reservoir.

A reservoir filled by pumping would not have to be on as great a height, and therefore further away from the city, as a gravitation feed reservoir would have to be. The distance accounted for the greater expense. Flad estimated the initial cost of a gravitation system to be \$135,000 as compared to \$101,000 to \$105,000 for a pumping system.⁴⁵

Cost was an issue for any city considering a water works project. Technically, municipalities would not fund the construction of the water works. A city would instead award a contract to a private company to build the works. Water works contracts were exclusive, free from competition. Were they not, the water company would not be able to attract the capital

⁴³ Municipal Corporations, *Acts of Arkansas*, 1874: 9.

⁴⁴ *Daily Arkansas Gazette*, March 7, 1877.

⁴⁵ *Ibid.*

needed to construct the works. Investors needed assurance of a reasonable return on their investment, which included installing pumps, water mains, fire hydrants, meters, constructing reservoirs if needed, and maintaining the system. The water works contract was usually for a specified number of years, in the case of Little Rock, 25 years, so that the water company could amortize its expenses over an extended period of time rather than charge higher rates for water to recoup expenses over a shorter period of time.⁴⁶ Water works systems constructed in Arkansas in the 1870s and 1880s, including in Little Rock, Hot Springs, Fort Smith, Texarkana, Camden, and Rogers, were all built and maintained by private companies.

In exchange for supplying water and the means of distributing the water through the city, the water works company was guaranteed a specified income from the city for municipal water use, as well as income from water used by private residents and businesses for an amount established in the contract. In addition to paying for water for daily use, the city also paid a contracted amount yearly for each fire hydrant installed. The city specified in the contract how many hydrants the company needed to install, and they often prescribed where the hydrants would be located. A city had to be prepared to pay this fee to the water company. Local officials paid considerable attention to initial construction costs because they would be indirectly responsible for reimbursing the company for the cost of the hydrants. And for Little Rock, at least, “the limit of taxation was so low that it was almost impossible for the city to do anything in the way of improvements.”⁴⁷

A low rate of taxation was not just a problem for Little Rock. The Arkansas Constitution written by conservative Democratic redeemers and approved by the voters in 1874 limited the

⁴⁶ Henry Philip Farnham, *The Law of Waters and Water Rights*, Vol. I (Rochester: The Lawyers’ Co-operative Publishing Company, 1904), 702-703; *Daily Arkansas Gazette*, September 25, 1877.

⁴⁷ *Daily Arkansas Gazette*, January 3, 1877 and September 25, 1877.

taxing powers of municipal governments. Municipalities could not “levy any tax on real or personal property to a greater extent, in one year, than five mills on the dollar of the assessed value” of property. Furthermore, municipalities could not “authorize any contract,” such as for water works, that would cost “in excess of the revenue from all sources for the fiscal year in which said contract . . . is made.”⁴⁸ This meant cities could not go into debt to fund municipal improvements, and in the case of water works, the city had to be able to pay its yearly obligations to the water works company for hydrants and water use out of that year’s revenues. To make funding issues even more challenging for city aldermen, in the mid-1870s local citizens were beginning to demand more and more improvements and services from the city. Aldermen were under increasing pressure to contract not only for water works, but also for a sewer system, a street railway, paved streets, and professional police and fire departments.⁴⁹ The accruing investments in improvements might be why municipal leaders in Little Rock, arguably the Arkansas city most in need of a reliable water supply because of the growth in population after 1870, seemed determined to avoid the expense of building a reservoir.

Little Rock finally did sign a contract in 1877 with the Little Rock Waterworks Company to provide a water works system for \$100,000. The Waterworks Company, however, did not build a reservoir as recommended by Col. Flad. It built and managed a standpipe system instead. The standpipe, boiler house to produce the steam to run the pumps, the pumps, and six miles of water mains began operations in April, 1878.⁵⁰ But the new system did not perform well at all. The standpipe leaked and had “river mud and sand accumulated at its bottom,” water mains burst, the water that was delivered to end users was “red-hued, semi-fluid” mud, and the entire

⁴⁸ Arkansas Constitution of 1874, Article 12, Section 4.

⁴⁹ Moneyhon, 54. See also *Daily Arkansas Gazette*, August 18, 1880, as one example of pressure from citizens for local improvements.

⁵⁰ *Daily Arkansas Gazette*, November 1, 1877 and April 25, 1878.

works were not completed by the time specified in the contract.⁵¹ The source of water itself was a problem. The water for the works was pumped from the Arkansas River which was “in such a state of fermentation” ever since the works began operation that all of the dirt could not be filtered out. And worse, the water was “taken from the foot of Ringo street, which is just below the mouth of Rose (misnomer) Creek, for that creek is but a sewer for not only the slops and privies of the railroad depot, but . . . of the State Penitentiary” as well, prompting one local pundit to comment sarcastically that the water company delivered “*rose water*.”⁵²

“Wrangling over the waterworks” ended in November, 1880, when the Little Rock Waterworks Company was reorganized as the Home Waterworks Company.⁵³ The president of the Home Water Company was Colonel Zeb Ward, a businessman with numerous interests in the city. He owned a cotton plantation and cotton gin west of town, held the contract to run the penitentiary, supplied coal to the city and local businesses, manufactured bricks, and he contracted to build segments of local railroads.⁵⁴ When Ward took control of the water works in November, he immediately began to raise the capital to improve the works by selling subscriptions (i.e., stock) in the company. The company’s goal was to raise \$60,000 from local sources.⁵⁵ In 1881, funded by these local subscriptions, Col. Ward took on the task of building a reservoir for the water works system for the city of Little Rock, and “as is well known to everybody in Little Rock, when Col. Ward takes hold of an enterprise its success is assured.”⁵⁶

⁵¹ *Daily Arkansas Gazette*, November 27, 1878 and November 6, 1880.

⁵² *Daily Arkansas Gazette*, November 11, 1877 and November 6, 1880.

⁵³ Worthen, 344; *Daily Arkansas Gazette*, December 1, 1880. The company is referred to as both the Home Water Company and the Home Waterworks Company.

⁵⁴ *Daily Arkansas Gazette*, August 14, 1873, October 29, 1874, January 16, 1879, January 9, 1880, April 16, 1881.

⁵⁵ *Daily Arkansas Gazette*, November 30, 1880 and December 1, 1880.

⁵⁶ *Daily Arkansas Gazette*, June 14, 1881.

That the funding for his enterprise came from *local* sources was important to Col. Ward. In November 1877, the Little Rock Water Company had contracted with Dennis Long & Co. of Louisville, Kentucky, “leading manufacturers of cast-iron pipe for water and gas works,” to construct the water works. The works were to include the mains and hydrants, but also a reservoir, probably a standpipe.⁵⁷ In August 1878, before the works were tested, Dennis Long & Co., the Little Rock Waterworks Company, and the City of Little Rock disagreed on whether Long & Company had completed the terms of the contract. Long & Company said they had; the Waterworks Company and the city said they had not. The Company, in turn, pointed out that the City had not paid for the water that had been, and was being, delivered. Three years and one lawsuit later, Zeb Ward acquired a controlling interest in the works.⁵⁸ Given this experience, Col. Ward was quite understandably not interested in involving non-local contractors or investors in the reorganized water works company.

There was no such prejudice against non-local consultants. The Home Water Company invited Col. Flad to return to Little Rock and “give the company the benefit of his experience and scientific knowledge” for “calculating a sure supply of water, location of dams, reservoirs, etc.” The work was completed under the direction of Major George P. C. Rumbough, a local man who had served without compensation as the city engineer and as Secretary of the Little Rock Water Works Company and then in the same capacity for the reorganized Home Water Company.⁵⁹ Flad and Rumbough represented the growing field of professional hydraulic engineers. Flad was a member of the American Water Works Association and Rumbough of the Arkansas Society of Engineers, Architects, and Surveyors.

⁵⁷ *Daily Arkansas Gazette*, November 1, 1877; *Inter Ocean*, May 25, 1877.

⁵⁸ *Daily Arkansas Gazette*, August 9, 1878; June 15, 1880; November 30, 1880.

⁵⁹ *Daily Arkansas Gazette*, March 17, 1881; *Morning Republican*, December 1, 1869; *Daily Arkansas Gazette*, February 22, 1877 and December 1, 1880.

The reservoir was created by constructing a dam across a “deep dell” about three miles west of the city. The reservoir covered an area of 400 acres and was spring-fed, providing a “bountiful supply of water . . . the only pure water in (the) vicinity.” The local paper described the setting and the water:

The main branch of the basin stretches between high ridges, timbered with oak, hickory and the hill growth. The water, pure as crystal, leaps from rock to rock, . . . when suddenly it passes between high walls of stone twenty-five feet high, not more than twenty feet distance between the walls and a fall of fifteen feet.

The dam would be a masonry dam “as high as the standpipe in the city.”⁶⁰

This reservoir still being of insufficient capacity, in 1887 Col. Ward “built, owned and operated by himself” a second reservoir “over the old one.” The new reservoir was built in two sections, with a masonry wall between the two sections. This project was not completed without complications. On November 2, 1887, just hours before the reservoir was to be opened, the wall between the sections gave way, sending “the vast body of water thus freed from its enclosure . . . down the hill in massive waves.” The wall was “said to have been poorly constructed,”⁶¹ but Rumbough, the secretary of the water works and a civil engineer himself, defended the works. He claimed the wall gave way because the eastern part of it rested on a rock ledge made unstable by dynamite blasts from construction of the reservoir. When the water in the reservoir pressed against the wall, the unstable rock below the wall gave way like “a strong man resisting a heavy

⁶⁰ *Daily Arkansas Gazette*, March 17, 1881; Official Map of Little Rock, Arkansas, compiled by James A. Martin, City Engineer (Little Rock: Arkansas Democrat Co., Publishers, 1893). Today, the “deep dell” is in Knoop Park and the reservoirs are still there, although one in a covered tank and the other is a treatment plant.

⁶¹ Campbell, Charles H. “Dam Failures/Reservoir Failures,” *Report of the Proceedings of the Twenty-Second Annual Meeting of the American Water Works Association* (Hannibal, MO: Standard Printing Co., 1902), 18-28.

thrust when standing upon ice.” Col. Ward rebuilt the dam at his own expense, and on May 4, 1888, “the water was turned on.”⁶²

The experience of Hot Springs was similar to that of Little Rock, with an early false start on a water works before a project was successfully completed. Water works projects in Hot Springs were slightly complicated by the fact that the federal government owned Hot Springs Reservation (now Hot Springs National Park). Federal ownership meant Congressional approval was needed to construct a water works dam on Reservation land. The first, unsuccessful, attempt to construct a water works for Hot Springs was made in 1878 by the Hot Springs Mountain Water Company, which planned to construct a dam to create a reservoir on Hot Springs Mountain to supply “cold or hot water, or both, to the citizens of the city of Hot Springs.”⁶³

Hot Springs Mountain was owned by the federal government. To gain approval for the Water Company to construct the reservoir, Arkansas Senator Stephen Dorsey tacked an amendment onto a Hot Springs land claims bill that would have given the H.S.M.W. Company the right to lease water privileges on the Reservation for 99 years. Senator Dorsey’s amendment would essentially have given the Water Company a monopoly on the hot and cold water supply of Hot Springs Mountain in perpetuity.⁶⁴ Existing legislation for the Reservation provided that the Secretary of the Interior could “lease to any person or persons . . . sites for the building of bath-houses for the term of five years.” And further, “to prevent monopoly,” bath-houses were limited in the number of tubs they could supply with hot water.⁶⁵ With these restrictions imposed upon other water-users in the community, Dorsey’s amendment was an egregious

⁶² George P. C. Rumbough, “Municipal Improvements in Little Rock,” in *Transactions of the Arkansas Society of Engineers, Architects and Surveyors*, II (November 1888), 88, 92; *Arkansas Democrat*, November 2, 1887; Herndon, *Annals of Arkansas*, Vol. 22.

⁶³ *Arkansas Daily Gazette*, March 15, 1878

⁶⁴ *Arkansas Daily Gazette*, March 23, 1878.

⁶⁵ *Hot Springs Commission*, Chapt. 5, 45th Cong., 3^d sess., *U. S. Statutes at Large* 20 (1878): 258.

attempt to circumvent the regulations already in place. Dorsey's bill was not popular locally, state-wide, or nationally. With such negative publicity, Dorsey withdrew the amendment.⁶⁶

It was not long before a second, successful water works project was completed. The Hot Springs water works are an example of a water system financed and managed by out-of-state interests. The works were originally contracted for on December 15, 1881, by Judge Samuel T. Bleyer of St. Louis, who had formed the Hot Springs Water Company. The contract between Judge Bleyer and the city of Hot Springs called for Bleyer to construct the works for \$150,000.⁶⁷ Shortly after signing the contract with the city, Bleyer turned it over to Mr. Carroll E. Gray of St. Louis.⁶⁸ Gray was in the water works business, being the "director-in-chief of the St. Charles (Missouri) waterworks enterprise," and a contractor for waterworks in Vincennes, Indiana, and Danville, Illinois.⁶⁹ Gray constructed a water works reservoir a few miles northeast of Hot Springs on land purchased from Samuel Fordyce. Construction of the rock and masonry dam was supervised by William Bethel.⁷⁰ Now located in De Soto City Park on National Park Service land, the dam is known as the Ricks Estate Dam for its proximity to the Fordyce-Ricks estate.⁷¹ Gray demonstrated the capabilities of the Hot Springs waterworks on October 13, 1882, "to the great satisfaction and delight of all concerned."⁷²

A year later, the city outgrew the reservoir, and the Hot Springs Water Company constructed a new dam and reservoir on Hot Springs Mountain. The dam was called Bethel after

⁶⁶ *Arkansas Daily Gazette*, June 28, 1878.

⁶⁷ *St. Louis Globe-Democrat*, December 16, 1881.

⁶⁸ Francis J. Scully, *Hot Springs Arkansas and Hot Springs National Park: the Story of a City and the Nation's Health Resort* (Little Rock: Hansen Co. and Pioneer Press, 1966), 149.

⁶⁹ *St. Louis Globe-Democrat*, February 23, 1881; November 16, 1881; April 24, 1882.

⁷⁰ Bert Hanor, "Hot Springs Water System, 1881-1971," in *The Record*, Vol. 13, Inez E. Cline and Bobbie J. McLane, co-editors (Hot Springs: Hot Springs-Garland County Historical Society, 1972), 21-11

⁷¹ Personal communication from Donnie Kilgore, Garland County Historical Society, June 12, 2013.

⁷² *Daily Arkansas Gazette*, October 14, 1882.

the engineer who constructed it. The water impounded by the dam was “soft and pure, being rain and spring water” in a protected watershed. The protected watershed kept the water free from “contamination and pollution.”⁷³ The Hot Springs water-supply system was augmented in 1903 and 1925 with Dillon and Sanderson dams, on Hot Springs Mountain, and in 1949 by Ricks Dam, which impounds Hot Springs Reservoir.

In Fort Smith, Bailey Hill Reservoir was completed in 1884.⁷⁴ The reservoir was filled with water pumped from the Poteau River. In addition to storing water for daily or emergency use, the reservoir served as a settlement basin for the sediments in the river water, and the water was filtered to make it potable. In 1894, the city council was obliged to investigate claims that the water company was pumping water directly from the river rather than “to the reservoir for purification.”⁷⁵

Fort Smith’s experience with its private water works company illustrates one point in what was an on-going debate about whether municipal utilities should be privately or publicly owned. One of the principal arguments in favor of private ownership of municipal water works was that private companies were of necessity better managed than public companies. Private companies had incentive to “conduct the works in the most prudent and economical manner, in order to insure the greatest possible return” on investment capital.⁷⁶ Publicly owned companies, on the other hand, were viewed as frequently mismanaged because political, not business, considerations drove management decisions. The most cited general argument against municipal

⁷³ Hanor, 22; Scully, 259. The watershed is still protected; one can hike to the reservoir, but not drive up to it.

⁷⁴ F. Fred Patton, *The History of Fort Smith, 1817 through 1992* (Little Rock: Heritage Press, Inc., 1992) 11.

⁷⁵ Phillip Wayne Russell, *Fort Smith City Government and the Progressive Era in Urban Reform* (master’s thesis, University of Arkansas, 1981), 26.

⁷⁶ M. N. Baker, “Water Works,” in *Municipal Monopolies*, ed. Edward W. Bemis, (New York: Thomas Y. Crowell & Company, 1899), 40

ownership of utilities was the “supposed political corruption of American city governments,” with an example of a specific charge being that city officials might hire untrained political supporters to run the water plant instead of hiring more qualified personnel.⁷⁷

Writers on the subject, such as M. N. Baker, Associate Editor of *Engineering News* out of New York City, believed that if a city drafted a proper franchise agreement with a private water company, the company would operate efficiently and provide a fair rate of return for investors. However, he did acknowledge that private water works were subject to mismanagement, especially if the water company tried to reduce expenses or raise rates so that investors could realize larger dividends on their investment, or if the company had simply over-extended itself and was unable to meet its franchise obligations and it ran into financial difficulties.⁷⁸ But it was generally recognized that whether the water utility was privately or publicly held, the utility would need to be the sole purveyor of water the water system in order to realize a return on its investment.

The water works for the City of Fayetteville illustrates both mismanagement of a privately-owned water works and public ownership of a water works. In 1889 a private company constructed a water plant, including an impounding reservoir on the west side of East Mountain (Mount Sequoyah). The Reese Brothers, who built the plant and constructed the reservoir, did run into financial difficulties. They were obliged to sell the water works to a group of local investors that included J. H. McIlroy.⁷⁹ In 1906 several citizens began to agitate for municipal ownership of the water works. L. A. Palmer, in an opinion piece in the local paper in favor of municipal ownership, argued that public ownership of the utility would result in lower water

⁷⁷ Park Woodward, “Municipal Ownership,” in *Proceedings of the Thirtieth Annual Convention of the American Water Works Association* 30 (Hannibal, Missouri: Publication Committee of the American Water Works Association, 1910), 124, 126; Baker, 37, 41.

⁷⁸ Baker, 31.

⁷⁹ Campbell, 31.

rates, which would lead to increased use of water, resulting in still lower rates as the expenses of the water works were spread among more consumers.⁸⁰

A water works had three basic expenses: initial construction costs, normal operating expenses, and retirement of debt. If the population of the city was growing, water mains would need to be extended and more hydrants added, which was an additional expense. A water works company could expect to pay these expenses out of revenues earned. If a private company owned the water works, the terms of the franchise allowed the company to charge rates that covered the expenses of operating the plant, and realize a reasonable profit that could be paid out as dividends to the investors who had funded the original construction of the water plant and reservoirs. In theory, if a city purchased the water works, water rates could be lower since the city did not need to pay dividends to investors. However, the city still needed to make enough money from the water works to pay for ordinary labor and maintenance, and for extension of the lines and improvement in service, if necessary. The problem for cities was funding the initial construction costs or, as in the case of Fayetteville, purchase price, of the water works given the state constitutional provision that limited real or personal property taxes to five mills per year.

State legislators were not unaware of the financial difficulties cities faced in funding the municipal improvements their citizens were demanding, such as paved streets, sewers, electric and gas service, and water works. In 1881, the Legislature gave cities of the first class – those with a population over 2,500 – the authority to assess an additional tax on real estate in order to pay for municipal improvements. An improvement district could be formed, and the tax assessed, if at least 10 people petitioned the city government for the formation of such a district.⁸¹ Once the improvement district was in place, the city could issue bonds against the

⁸⁰ *Arkansas Sentinel*, Sept. 19, 1906.

⁸¹ Acts of Arkansas, 1881, No. 84, 161-162.

future tax receipts. In giving cities the authority to take on bonded indebtedness, the Arkansas legislature reflected the national trend toward “growing cooperation between large cities and state legislatures in the development of expansion of services.”⁸² Fayetteville financed the purchase of the local water works by forming Water Improvement District No. 1 after “a majority of value of property owners having signed the petition . . . to do so.”⁸³

In 1907 the city of Fayetteville did purchase the water works from McIlroy’s group. As owner of the works, the city did not escape criticism, especially during the drought of 1909 when the water supply very nearly dried up completely. In response to fears of another water shortage and a growing population, the city constructed four small dams on the West Fork of the White River, and in 1925 an additional reservoir, now called Lake Wilson, was built “just south of the old” one.⁸⁴

Even with the funding option of improvement districts, most of the water works in Arkansas at the turn of the century continued to be privately owned. According to an 1897 survey of water-works by M. N. Baker, there were 20 water works in Arkansas. Of those, four were owned by a municipality, 15 were privately owned, and 1 the ownership was unknown. This ran counter to Baker’s findings that the national trend was toward publicly-owned water works, especially in the northeast and midwest.⁸⁵ In a study examining why water works and sewers in the latter half of the 19th century were more likely to be publicly owned than were other utilities, such as electricity, gas, and street railways, Scott E. Masten found that water works with larger investments in infrastructure such as filters and reservoirs were more likely to be privately

⁸² Melosi, 120.

⁸³ Campbell, 31.

⁸⁴ William S. Campbell, *One Hundred Years of Fayetteville, 1828-1928* (Fayetteville, Ark.: Washington County Historical Society, c. 1928), 31-32.

⁸⁵ Baker, 22-23, Melosi, 120.

held.⁸⁶ This did hold true for Arkansas, as the four water works reservoirs constructed before 1897 were all owned by private companies.

Martin Melosi in his study of sanitary systems in the U.S. identifies 1880 – 1920 as the period in which water supply became a municipal enterprise. Nationally, the number of water works rose from 244 in 1870 to approximately 9,850 works by 1924.⁸⁷ Of those water works that included reservoirs as the source of water, 675 were owned by local governments and 59 were owned by private utilities. These numbers are low, as they represent only reservoirs created by dams over 25 feet in height or that store more than 50 acre-feet of water. By 1920 in Arkansas, only two dams – both serving Hot Springs City – are included in those numbers.⁸⁸ Four other cities, Little Rock, Fort Smith, Fayetteville, and Eureka Springs, had smaller reservoirs that are not included in those figures. But the numbers do give an idea that cities in Arkansas continued to depend on private investors for their water works and on deep wells, cisterns, springs, direct pumping from creeks and rivers, and water towers for their water supply. As late as 1927, in a survey of the water works of 80 Arkansas cities, the source of water for 58% of the cities reporting was wells, followed in order by springs, rivers or creeks, and lakes or reservoirs.⁸⁹

Booneville and Nashville were two cities that contracted for water supply dams as part of new water works projects in the 1920s. For both cities, their physical location in the Ouachitas made construction of a dam to impound a reservoir economically feasible because they took

⁸⁶ Scott E. Masten, “Public Utility Ownership in 19th-Century America: The “Aberrant” Case of Water,” *Journal of Law, Economics, & Organization* 27, no. 3 (2010): 633.

⁸⁷ Melosi, 117

⁸⁸ Note that in current usage a “public utility” is a privately-owned company operating a utility for the public’s benefit. “Private” ownership in the NID database signifies industrial or individual use and benefit.

⁸⁹ Harrison Hale, “City Water Supplies in Arkansas,” *Journal of the American Water Works Association* 17 (Baltimore, Md.: The Waverly Press, 1927), 262

advantage of the regional topography. The Ouachitas were suitable for reservoirs because they had what E. L. Waterman described as ideal terrain for them:

The most favorable site for an impounding reservoir is where the shortest dam will give the desired volume of storage. This is usually found where the stream valley breaks through a ridge, the valley under such conditions being narrow at the site but broadening out upstream. . . Sites which include much swampy area within the reservoir or which will involve a large amount of shallow flowage are objectionable.⁹⁰

Even today, there are no water supply dams east of Pulaski County with one exception in White County, or none south of Howard County with the exception of one in Columbia County. All other water supply dams are located in the Ouachitas or the Ozarks.

In his textbook on the *Elements of Water Supply Engineering*, Waterman also noted that next to narrow valley streams, “sanitary reasons” should be the second consideration of a dam site for a water works reservoir. The site should have “a small density of population per square mile on the drainage area above the reservoir.”⁹¹ As noted, this was a consideration in locating Bethel Dam above Hot Springs City, in an unpopulated, protected watershed. It would soon be a consideration when Fort Smith built a new water supply dam outside of Mountainburg. The dam site included “1,200 acres of land which included the lake and land adjacent to protect the lake and sources of supply from pollution.”⁹²

The third consideration that made sites in the Ouachitas and Ozarks ideal for impounding reservoirs was the heights on which the reservoirs could be located. Since towns were located in the river valleys, small streams exiting the mountains could be dammed at a much higher elevation than the town. The site for Booneville’s dam, for example, was built forty two feet

⁹⁰ Waterman, 122-123.

⁹¹ *Ibid.*

⁹² Patton, 348.

above “the top of Edith Heights, which is the highest point in the city.”⁹³ Gravity could then provide the pressure to force the water through the water mains. Gravity feed reservoirs were more economical to build and operate than pumped reservoirs.

In addition to taking advantage of the terrain, Booneville city officials took advantage of an Arkansas law that made it easier for municipalities to acquire the land for water works reservoirs. In 1895 the legislature gave municipal water works the right to acquire land through eminent domain. The same law gave municipalities the right to construct, or to contract for the construction of, dams and “in general, do any other act necessary and convenient in accomplishing” construction of its water works.⁹⁴ Booneville found it necessary to press two suits in circuit court “for property at the dam site, which will condemn and set a price on certain lands in the vicinity, needed for the artificial lake.” Work on the dam could start as soon as the suits were settled. Work did start by November 1, 1928, and was completed May 7, 1929.⁹⁵

In the case of the city of Nashville, the problem was not acquisition of land, it was acquisition of a reliable water supply.⁹⁶ Through the 1920s, Nashville’s drinking water was supplied by a deep well, and the city water that was used to fight fires and flush sewage was pumped from Mine Creek. In the spring of 1929, with several cases of typhoid in the city, doctors advised residents not to drink the city water “so long as the water is taken partly from the creek . . . and the doctors are unanimous in their belief that it is unsafe to drink this water at any time.” To make matters worse, by late summer, the drought caused the creek to have “gotten so

⁹³ *Booneville Democrat*, August 16, 1928.

⁹⁴ *Local Improvement Tax Act*, No. 84, *Acts of Arkansas* (April 18, 1895): 183.

⁹⁵ *Booneville Democrat*, August 23, 1928, Nov. 1, 1928, and May 9, 1929.

⁹⁶ *Arkansas State Water Plan*, 39.

low that only a small amount of water [could] be secured from that source each day.” The fire chief requested that residents not use the city water “on the lawns and flowers.”⁹⁷

City officials had recognized that the water situation needed attention. In late 1928 the City Council signed a contract with the Southwestern Gas and Electric Company to drill a new deep well to supply the city with water.⁹⁸ Southwestern Gas and Electric drilled several test wells around town, but the company was unsuccessful in finding a source of water “sufficient to meet the city’s needs.” By Spring of 1930, the City Council and Southwestern Gas had determined that a dam across Mine Creek north of town was the best option for obtaining a water supply for the city. Bids were let in April, the contract was signed in July, and construction began in October. The dam was completed and the reservoir started filling in January, 1931. Southwestern Gas financed the dam, the purification system, and the pumps to distribute the water to the city mains. The city would repay Southwestern Gas over a period of 25 years through water receipts.⁹⁹ Today, Nichols Lake, named for the man who was the local manager of Southwestern Gas and Electric Company at the time the dam was built, still supplies the city of Nashville with drinking water.

Very few cities that constructed water works reservoirs through the 1920s cited population growth as a primary reason. Instead, city officials believed a municipal water works would lead to municipal growth and development. A letter to the editor in the *Arkansas Sentinel*, writing specifically in favor of municipal ownership of the Fayetteville water works, claimed that municipal ownership was “the first step toward making Fayetteville a city instead of a town.”¹⁰⁰ The *Nashville News* opined that “good water is the only thing lacking to make living in Nashville

⁹⁷ *Nashville News*, March 6, 1929, September 3, 1929.

⁹⁸ *Nashville News*, November 21, 1928.

⁹⁹ *Nashville News*, April 25, July 18, October 3, 1930; January 31, 1931.

¹⁰⁰ *Arkansas Sentinel*, September 19, 1906.

all that it should be, and it is certain that with this improvement (the water works) the growth of the city will go forward on a most satisfactory basis.”¹⁰¹ The *Booneville Democrat* editorialized that Booneville’s new water works “means the dawning of a new day for the city’s development.”¹⁰² The *Southwest American* gushed about Fort Smith’s new water works, completed in 1936,

“The year ends on a high note of promise . . . The 1936 symphony began with the chug-chug of machinery piling up dirt in a mountain valley 25 miles away, to store up water to replace the slush we had been forced to drink for years on end. It ended with the deep-throated roar of mountain water over the spillway of a completed water project. . . It began with vague hopes of other civic improvements . . . It ended on a record of fine achievement in public facilities which will be useful and valuable over the long years ahead.”¹⁰³

The dynamics of funding water supply systems changed dramatically after 1932 when the federal government began to fund public works projects, including for water works dams, to relieve unemployment during the Depression. One of the first water works dams constructed with federal assistance was for the State Tuberculosis Sanatorium at Booneville, which was completed in June 1933. Funded through Herbert Hoover’s Reconstruction Finance Corporation (RFC), the Sanatorium project was “the largest project sponsored by the Reconstruction Finance corporation in Western Arkansas and one of the largest projects in the state.” In 1933, Roosevelt’s Civil Works Administration (CWA) continued and expanded on public works projects begun under the RFC. The CWA completed repairs on the Paris water works dam by

¹⁰¹ *Nashville News*, April 25, 1930.

¹⁰² *Booneville Democrat*, March 22, 1928.

¹⁰³ *Southwest American*, January 1, 1937.

April 1934.¹⁰⁴ Lake Fort Smith dam was constructed in 1937 by the Public Works Administration (PWA), a successor program to the CWA.¹⁰⁵

The PWA also funded Lake Winona Dam across the Alum Fork of the Saline River to provide a new water supply for the city of Little Rock. The Little Rock newspapers closely followed the proposals, plans, and construction of the first and second Little Rock water supply reservoirs, keeping the community apprised of progress, of the financial and logistical difficulties encountered, and of the successfully completed steps in the projects. Lake Winona Dam was completed in August 1937, and the reservoir filled by May of the following year.¹⁰⁶ As the Alum Fork reservoir for Little Rock neared completion, the Garden Clubs of Little Rock paid a visit to the works, where they heard plans for landscaping of the reservoir grounds, held their business meeting, and had a picnic lunch. Six days after the Garden Clubs visited, the Little Rock Water Commission and the Little Rock Chamber of Commerce held an Open House at the new reservoir. The Little Rock community was “invited to visit the beautiful lake that provides Little Rock with its new water supply.” Families were encouraged to “bring picnic lunches and make an outing of the visit.” Waterworks employees were on hand to assist the visitors and show them around.¹⁰⁷

In all, the National Inventory of Dams records six municipal water works dams completed in the 1930s, as compared to five in the previous five decades.¹⁰⁸ When the New

¹⁰⁴ *Booneville Democrat*, April 19, 1934.

¹⁰⁵ Patton, 347-348.

¹⁰⁶ *Arkansas Democrat*, July 15, 1936, February 18, 1938, and May 26, 1938.

¹⁰⁷ *Arkansas Democrat*, May 20, 1938, May 26, 1938.

¹⁰⁸ The NID database has a completion date for Nichols Lake Dam, serving the city of Nashville, as 1928, but the *Nashville News* reports the dam was not completed until 1931. However, the Nashville dam was not constructed with federal assistance so I have included it in the 5 dams completed between 1880 and 1930. Also note that these are only NID dams, and smaller dams, such as those for Little Rock, Fort Smith, Fayetteville, Van Buren, and Eureka Springs are not included in these figures.

Deal federal assistance programs ended, so too did federal assistance for municipal water works. Near the end of World War II, as the federal government contemplated a return to a civilian footing, Congress looked again at funding for municipal water projects. In 1939, Congress included “municipal or miscellaneous water supplies” in the Reclamation Project Act for “the Great Plains and arid and semiarid areas of the United States.”¹⁰⁹ With that precedent set, in the Flood Control Act of 1944 Congress included municipal water supply as one of the uses of multiple-purpose dams the Corps of Engineers was building on the tributaries of the Mississippi River, including on the White and Ouachita Rivers. Since 1945, 55 municipal water supply dams have been constructed in the state.

¹⁰⁹ *Water Conservation and Utilization Projects in the Great Plains*, Public Law 848, 76th Cong., 3^d sess., *U. S. Statutes at Large* 54 (1940): 1119-1120; Melosi, 220-221.

CHAPTER 6: RECREATION DAMS, AND DAMS USED FOR RECREATION

Lakes and recreation have gone together since at least the time of the Romans. In the middle of the first century A. D., the emperor Nero built the first dam known to have been constructed solely for recreational purposes “to add to the attractions of his villa.”¹ By the 18th century, lakes were a common feature in English country landscapes.² By the mid-19th century, particularly after William H. H. Murray published a guidebook to the Adirondack Mountains in 1869,³ Americans began to enjoy lakes for fishing, boating, swimming, and other water-related activities. By the 20th century, lakes became a common and expected feature of parks and recreational areas. Unfortunately for Arkansans, there were not very many lakes in Arkansas. This notable lack of aquatic recreational facilities was remedied through the construction of purpose-built recreation dams, and by the use of water supply, hydroelectric, and flood control dams for recreational purposes.

When and how people came to associate lakes with recreation is unclear. In their study of *The Invention of the Park*, Karen R. Jones and John Wills point to Frederick Law Olmstead and his design for Central Park as a seminal step in the development of parks in America. “In Olmstead’s view,” they write, “a ‘fine park’ needed turf, foliage and water.”⁴ The ‘fine park’ Olmstead created for New Yorkers was centered, literally and figuratively, on the Croton Receiving Reservoir. Central Park was both a city park and a nature park, a place where people could go to enjoy the natural environment, no matter that in this case it was very precisely

¹ Smith, *A History of Dams*, 26.

² Karen R. Jones and John Wills, *The Invention of the Park: Recreational Landscapes from the Garden of Eden to Disney’s Magic Kingdom* (Cambridge, UK: Polity Press, 2005), 25.

³ Tony Perrottet, “Birthplace of the American Vacation,” *Smithsonian Magazine* 44, no. 1 (April 2013): 70.

⁴ Jones and Wills, 6, 4.

planned nature. Central Park is also a recreation area, a place where New Yorkers could engage in individual or organized sporting activities.

In the latter half of the nineteenth century, many other cities followed New York's example. Parks were a public space where urban residents could escape the bustling, noisy streets and residential neighborhoods of the city. With increased population growth, urbanization, and industrialization, the need for areas of refuge in the city became more important. In the park, people could exercise, walk, read, listen to music, visit, and other "genteel pursuits," as well as play tennis, baseball, croquet, go boating, and other sports and games. While theoretically democratic, accessible to all city residents, city parks were originally designed primarily with the middle class in mind, but they became more open and "family friendly" toward the end of the century. Whittington Lake Park in Hot Springs conformed to this ideal.⁵

Like Central Park, Whittington Lake Park is centered on a reservoir, the difference being Whittington Lake was purpose-built as a recreation lake, whereas the Croton Receiving Reservoir was a water supply reservoir. Because of Hot Springs' unique situation as a government Reservation, the federal government built the first city park. The Department of the Interior determined that the city of Hot Springs needed a city park to add to the attractions of the resort. The federal government had established the Hot Springs Reservation, managed by the Department of the Interior, in 1832 to preserve the mineral hot springs for public use. The area was a popular health and recreation resort throughout the 19th century. The railroad came to Hot Springs in 1876, making the Reservation accessible to even more people. To develop and improve the Reservation, the Department of the Interior built bath houses, facilitated the delivery of hot water to private baths, paved the streets, and added other amenities "to improve and

⁵ Jones and Wills, 52-55.

beautify the grounds.” One of those amenities was Whittington Lake Park. The Park was part of an ambitious landscaping project that “encouraged exercise as well as relaxation in a setting of both natural and structural beauty.” The park featured a tennis court, walking paths with bridges across the town creek, two park pavilions, and two artificial lakes for boating.⁶

The lakes were not easy to construct. The work crews ran into solid rock before the lake bed was deep enough for boating. Then, before the lakes were completed, a particularly heavy rain in March, 1897, caused the town creek to overtop its banks. The resultant flood filled the two lake beds with “gravel, sand, mud, and other debris, which had to be removed at considerable expense.” The creek was dammed to prevent this happening again. The lakes were finally completed in 1898. They were used for boating, and to provide a park-like atmosphere for visitors. Unfortunately, mosquitos enjoyed the lakes as much as visitors, and when the Arlington Hotel burned in 1923, rubble from the building was used to fill in the lakes, eliminating the mosquito nuisance.⁷

The park superintendent at Hot Springs found it necessary to create a lake at the center of the new city park because nature did not conveniently form a depression in the center of town and fill it with rain water and storm run-off. The superintendent was obliged to improve on nature in that regard. Given the realities of Arkansas’s geography, almost every other city in the state that wanted a public lake would be forced to follow the superintendent’s example. There are no natural lakes in the highlands of the Ouachitas or the Ozarks. There are two natural lakes in northeast Arkansas, Wapanocca and Big Lake, that were formed by tectonic activity in the

⁶ House, *Report of the Secretary of the Interior*, 49th Cong., 2^d sess., 1886, H. Exec. Doc. 1, pt. 5, v. 2, 1068; House, *Annual Reports of the Department of the Interior for the fiscal year ended June 30, 1897. Miscellaneous Reports*, 55th Cong., 2^d sess., 1897, H. Doc. 5, part 3, 764; Sharon Shugart, *When Did It Happen?: A Chronology of Events at the Hot Springs of Arkansas* (Hot Springs: Eastern National, 2009), 2.

⁷ H. Doc. 5, pt. 3, 762; Personal communication from Donnie Kilgore, Garland County Historical Society, June 11, 2013.

New Madrid region. Almost all the other lakes in Arkansas are oxbows, remnants of rivers, left behind when the river changed course. Oxbow lakes are found in the flat floodplains of the river channels, along the Arkansas, Mississippi, lower White, and lower Ouachita,⁸ areas used intensively for agriculture and inconvenient to population centers. As such, the opportunities to use the oxbow lakes for recreation were limited. The only oxbow lake the state promoted as a venue for recreational activities was Lake Chicot in southwest Arkansas.⁹

Promotional brochures put out by the Tourist Division, Arkansas Bureau of Mines, Manufactures and Agriculture, c. 1925, provide additional evidence that lakes were not common in Arkansas. The brochure lists just about every publicly-accessible spring in Arkansas, and has photographs of people swimming and fishing in rivers throughout the state. “Swift flowing,” or “clear, spring-fed, mountain-born” streams are mentioned frequently, but only six lakes are mentioned, and five of these are artificial lakes created by dams at summer resorts, Whittington Lake, Bella Vista Lake, Cave Springs, Sulphur Springs, and Monte Ne. The sixth was Lake Chicot.

A lack of lakes did not stop the Tourist Division from promoting them. The title of their promotional brochure was *Playgrounds in Arkansas: A Tourist’s Guide to the Mountains, Lakes & Streams of a Nearby Vacation Land*.¹⁰ Evidently, the traveling public was attracted to lakes, and state tourism promoters emphasized them any way they could. Other states also noticed

⁸ Henry W. Robison and Thomas M. Buchanan, *Fishes of Arkansas* (Fayetteville: The University of Arkansas Press, 1988), 35.

⁹ In a dispute with the Chicot County Drainage District, which wanted to lower the level of Lake Chicot, the state sued the District to have a permanent dam constructed to control the water level of the lake, which was an important recreational resource for the state. Two dams were eventually constructed (in 1942), one to control inflow to the lake, the other to control outflow. See “State Files Suit to Save Lake Chicot,” *Arkansas Gazette*, September 15, 1929.

¹⁰ Jim G. Ferguson, *Playgrounds in Arkansas: A Tourist’s Guide to the Mountains, Lakes & Streams of a Nearby Vacation Land* (Little Rock: Bureau of Mines, Manufactures and Agriculture, c. 1924), 17, 26. The 1926 date that Mullins Library assigns to this brochure is not correct.

Arkansas did not have much in the way of lakes. Tourism promoters in Minnesota ran ads in the *Arkansas Gazette* inviting fishermen to “Come to Minnesota: The Land of Ten Thousand Lakes,” subtly implying that if Arkansans wanted to enjoy good fishing lakes, they would have to travel elsewhere.¹¹

One category of lake the Arkansas tourism brochure did not advertise was municipal water supply reservoirs. In the late 1880s, municipal reservoirs were, unfortunately, off-limits to the general public. Until effective filters became commonplace after 1930, municipalities preserved the purity of their water supply by placing the reservoirs in protected watersheds. Boating, fishing, and hunting were not permitted on protected watersheds.¹² The Hot Springs municipal water supply reservoirs, for example, were in a sheltered spot on Hot Springs Mountain. Also, after 1930, treating municipal water with chloride came into general use, so it was not as important to protect a watershed. Cities readily adopted practices to take advantage of the recreational opportunities their lakes offered. For example, when the City of Charleston completed its water supply reservoir in 1937, fishing was permitted on the lake, but not until May 1939, after “15,000 game fish placed in Lake Charleston have had plenty of time to multiply.” Proud of its new water supply, the city posed local junior champion fly casters by the new lake to hint at the possibilities for fishing yet to come.¹³

The pattern for many early municipal water supply lakes followed that of Eureka Springs. The Eureka Springs water supply dam was constructed through assessment of a municipal improvement tax, much as had Fayetteville. “Citizens voted for the real estate tax” in 1889, and by 1893 enough revenue had been generated to select a site for the dam at Oil Spring Gulch,

¹¹ Advertisement, *Arkansas Gazette*, May 3, 1925.

¹² Helman Rosenthal, “The Protection of Impounded Reservoirs,” *Journal of the American Water Works Association* 21, 1929, 1054; Melosi, 145.

¹³ *Southwest American*, January 5, 1937.

“taking in two mountain sides and a narrow hollow between them.” The reservoir, sometimes called Black Bass reservoir, was spring-fed. In 1914, the dam was enlarged and a new filtering system installed. It was not until the 1930s, however, that the reservoir was known as an excellent place to fish. After World War II the city experienced a “mild boom,” which necessitated that the water supply be augmented in the early 1950s with a deep well that was sunk near the reservoir. That served as the city’s source of water until the 1970s, when Eureka Springs started buying Beaver Reservoir water from the Carroll-Boone Water District. The old municipal water supply dam, now called Eureka Springs City Lake Dam, is now a city park with trails and non-motorized fishing in the reservoir.¹⁴

The connection between outdoor recreation and lakes was so taken for granted that, upon construction of a new park, one commentator remarked, “a lake and a playground is being placed where one was much needed.”¹⁵ No explanation as to why the lake was needed is given. The developers of the Bella Vista resort community must have felt the same way. Bella Vista Lake was developed in the 1910s when the railroad, and later in the decade, the automobile, made it easier for people to travel to recreational destinations to escape the busyness of the cities. Summer resorts, where visitors were expected to stay for two weeks or more, became popular travel destinations, as a cabin on the lake would be today. Bella Vista, Arkansas, and Branson, Missouri, were two resorts that attracted visitors from across the United States to the Ozarks. The trend continued, and accelerated, in the 1920s as more and more people traveled by

¹⁴ “History of Black Bass Dam and the City Waterworks,” kiosk text, Eureka Springs Parks & Recreation Commission; Otto Ernest Rayburn, *The Eureka Springs Story* (Eureka Springs, Arkansas: The Times-Echo Press, 1954), 58; *Eureka Springs Flashlight*, July 24, 1930; email from Bruce Levine, Director, Eureka Springs Parks & Recreation Commission, June 14, 2013. In 1885, Powell Clayton’s company, the Eureka Improvement Company, had acquired the franchise to lay water pipe, but it is unclear whether his company received the improvement district tax monies to construct the water works (Goodspeed, *Northeast Arkansas*, p. 381).

¹⁵ Edwin P. Hicks, “Recreation Center Being Built in Northwest Arkansas,” *Southwest-times Record*, June 28, 1936.

automobile. One estimate had 30,000,000 people taking vacations in 1925. Tourist camps and summer resorts were popular destinations for the motoring public.¹⁶

Taking advantage of this trend, a Presbyterian minister in Bentonville, the Reverend William S. Baker, and his wife, “visualized a popular summer resort with cabins and recreational facilities” on land he had inherited in what is now Bella Vista. Baker “built a small dam across Sugar Creek,” named the area Bella Vista, and began to sell lots for summer homes. In 1916, Baker sold the enterprise to the Linebarger brothers of Dallas, Texas. The Linebargers “enlarged the dam and with it, the lake.” They added a lodge, a dance pavilion, a golf course, and later, a large swimming pool. The Linebargers advertised the resort widely, including in their promotional literature this florid description of the lake and dam:

Bella Vista Lake is formed by an immense dam across Sugar Creek and the valley. It ranges in depth from ankle deep to nearly twenty feet, and receives its supply of pure, fresh, cool, Spring water from Sugar Creek and its spring fed tributaries . . . This fresh sparkling water spreads out and is warmed to a delightful bathing temperature, circulates through the Lake, and runs out over the spillways, affording a constant supply of pure, fresh, spring water.

By 1928 there were 450 occupied cabins and summer homes at the resort.¹⁷

City parks and summer resorts were two vacation destinations. Recreation areas were a third possible destination. Outdoor recreation areas are defined by the National Recreation and Park Association as “primarily for such activities as picnicking, unorganized and tourist camping, winter sports, nature study, and if there is a stream or lake in the park, as is frequently

¹⁶ Ellen Shipley, “The Pleasures of Prosperity, Bella Vista, Arkansas,” *The Arkansas Historical Quarterly* 37, no. 2 (Summer 1978): 125; Lynn Morrow and Linda Myers-Phinney, *Shepherd of the Hills Country: Tourism Transforms the Ozarks, 1880s-1930s* (Fayetteville: The University of Arkansas Press, 1999), p. 36; Harden Colfax, “America on Vacation Spends Money Freely,” *Arkansas Gazette*, September 6, 1925.

¹⁷ The Bella Vista Historical Society, *The Bella Vista Story* (Bella Vista: Bella Vista Historical Society, 1980), 15-16; Shipley, 100, 102; Linebarger, F. W., *Bella Vista: Nature’s Gem of the Ozarks* (Dallas: Linebarger Brothers, c. 1918), 3.

the case, for boating and swimming.”¹⁸ Fishing can easily be added to that list. Recreation areas are defined by C. Frank Brockman and Lawrence C. Merriam, Jr., as “*activity-oriented*” areas, as opposed to undeveloped, wild and scenic areas, which are “*resource-oriented*.” In their study, *Recreational Use of Wild Lands*, Brockman and Merriam explain that the major emphasis of developed recreation areas is “on providing physical conditions and facilities necessary to featured activities,” for example, lakes for boating and fishing with boat ramps, parking areas, camp grounds, and the like. Recreation areas can be scenic, in an “attractive setting,” but that is an accident of location, and “a minor concern.”¹⁹ Fortunately for Arkansans, most dams were located in the scenic Ouachita and Ozark mountains.

Recreation areas are generally located near population centers, readily accessible, used for short periods of time by a large number of people, and “they are well-adapted to recreational interests and activities.”²⁰ Lake Catherine was the first recreation area in Arkansas “well-adapted” to water-based activities that was created by a dam. Recreation, of course, was not the primary purpose of Rempel Dam; generating hydroelectric power was. Harvey Couch encouraged recreational activities on the Rempel Dam impoundment as soon as the lake filled. Couch himself was one of the first people to enjoy the fishing on Lake Catherine – he built his vacation home, Couchwood, on the shores of the lake.²¹

With hydroelectric reservoirs, there was not the same concern with clean drinking water that municipal water supply reservoirs had. Instead, aesthetics could be an issue. As a precondition of using hydroelectric reservoir for recreational purposes, in 1926 the Federal

¹⁸ National Recreation and Park Association, *County Parks: a Report of a Study of County Parks in the United States* (Washington, D. C.: McGrath Publishing Company and National Recreation and Park Association, 1930), 2.

¹⁹ C. Frank Brockman and Lawrence C. Merriam, Jr., *Recreational Use of Wild Lands* (New York: McGraw-Hill Book Company, 1979), 14.

²⁰ *Ibid.*

²¹ Wilson, 91-92.

Power Commission required utility companies to remove “all trees and brush that would project above the level of the lowest drawdown, and the complete clearing of the entire margin between highest and lowest water.” The FPC recognized that hydropower reservoirs would become more and more popular as recreation areas, and dead trees protruding from the water would “mar the landscape for generations.”²² Lake Catherine was completed before the FPC rule was made, but it would have applied to Lake Hamilton, Couch’s second hydroelectric project on the Ouachita.

Lake Catherine was mentioned in the next iteration of the state’s tourism brochure as “one of the most beautiful lakes to be found anywhere.” Activities enjoyed on the lake were swimming, boating and fishing. Hot Springs, usually known as a winter retreat, could now advertise itself as a summer resort.²³ The Izaak Walton League, State Game Commission, and the Federal Bureau of Fisheries cooperated in stocking the lake with fish.²⁴ Lake Hamilton joined Lake Catherine in 1932 as one of the premier lakes in Arkansas. In 1935, Couch donated land along the reservoir for a state park. Lake Catherine State Park was the first of several state parks that would be developed on artificial reservoirs.²⁵ By 1936, the lakes were developed enough that the state’s centennial edition of the tourism brochure could list canoeing, power boating, and fishing as activities visitors could enjoy at them.²⁶

²² Federal Power Commission, *Sixth Annual Report of the Federal Power Commission*, (Washington, D.C.: government Printing Office, 1926), 12.

²³ W. N. Wilkes, *Summer and Winter Health & Pleasure Resorts in Arkansas* (Little Rock: Bureau of Mines, Manufactures and Agriculture, c. 1926), 7.

²⁴ Roy H. Noel, “Private Utility Company is Public Benefactor,” *Public Service Magazine* 60 (June 1936): 172.

²⁵ Arkansas Department of Parks and Tourism, “Lake Catherine State Park,” in *Encyclopedia of Arkansas History & Culture*, <http://www.encyclopediaofarkansas.net/encyclopedia/entry-detail.aspx?search=1&entryID=1228> (accessed July 1, 2013).

²⁶ Arkansas Centennial Commission, *Arkansas: A Natural Playground, Rich in Natural Resources* (Little Rock: Arkansas Centennial Commission, c. 1936), 19. The Centennial Commission produced this brochure with two different covers. One with the “A Natural Playground,” theme, and one with the title, “Arkansas Invites You” The contents of the two brochures is identical.

First and foremost, Rammel and Carpenter dams were hydroelectric dams. Recreational use of the reservoir, like use of the dam for flood control, were ancillary to AP&L's purpose in constructing the reservoir. For the vacationing public, though, the lakes created by the dams were a place to enjoy nature and outdoor recreational activities. The use of Lake Catherine for outdoor recreation fits neatly with national trends and social forces that Paul Sutter describes in *Driven Wild*, his study of the modern wilderness movement. Sutter points out, in the years after World War I, three developments – advertising, the automobile, and “the government’s commitment to road building and recreational development” – came together to produce in Americans a need to “know nature through leisure.”²⁷ The state’s tourism brochures were the advertising and Lake Catherine State Park was an example of the state’s commitment to recreational development.

Arkansans purchased automobiles on a pace with all other Americans, but good roads were another matter. The highway construction program in the state was highly localized, in debt, and inefficient.²⁸ Nevertheless, roads did get built. The road from Little Rock to Hot Springs was “the longest concrete road in Arkansas” when it was completed in June, 1925.²⁹ The Spring Lake highway, when completed, opened a road “to Little Rock’s playground district,” where the Echo Valley Country Club, Spring Lake Club, Lakeside, “and other private pleasure resorts,” were located.³⁰ If decisions on road building projects were determined by local elites, clearly access to recreation was a priority. By 1936 the state’s centennial brochure could

²⁷ Paul Sutter, *Driven Wild: How the Fight against Automobiles Launched the Modern Wilderness Movement* (Seattle: University of Washington Press, 2002), 29.

²⁸ Jeannie M. Whyne, “Reasonable Progress: Limits of Progressive Reform,” in *Arkansas: A Narrative History* (Fayetteville: The University of Arkansas Press, 2002), 296-297, 317-318.

²⁹ “First Cars Travel on New Highway,” *Arkansas Gazette*, June 9, 1925.

³⁰ “Playground Pike Almost Finished,” *Arkansas Gazette*, June 7, 1925.

suggest driving tours to recreational areas, many of which had artificial lakes impounded by a dam, on numbered state and federal highways that reached all corners of the state.

The motoring public did not just travel to distant resorts or recreation areas. They also traveled to suburbs. Automobiles freed people from having to live near a street car line or within walking distance of their place of business, shops, and services. They could move farther from the city center, which was another way to escape the noise and bustle of the city. They might even purchase a home in a planned community, where one of the common areas was a recreational lake. Such a neighborhood is Lakewood, in North Little Rock.

The Lakewood subdivision is best known as the site of the Old Mill, the *faux-bois* concrete mill in T.R. Pugh Memorial Park, a woodland park set on a gently-sloping hillside. The hill slopes down to Lakewood Lake Number 2, impounded by Lakewood Lake No. 2 Dam, one of six recreational lakes created for the benefit of the residents of Lakewood. The Lakewood lakes are not filled by damming a stream. Instead, they are filled through run-off from rain and drainage ditches.³¹ The lakes have served as the catchment basin for water run-off from the time the subdivision was laid out in 1925. Lakewood was planned by real estate developer Justin Matthews to provide suburban homes for people who worked in Little Rock.³²

Lakewood is an example of a private neighborhood. Private neighborhoods are characterized by the collective ownership of community property. Property owners in a private neighborhood join a homeowners association which acts like a local government for that neighborhood. While individual residents own their homes and yards, the homeowners association “enforces neighborhood covenants with respect to the allowable uses and

³¹ Interview, Ken Sullivan, Executive Director, Lakewood Property Owners Association, July 2, 2013.

³² Cheryl G. Nichols, “Pre-Depression Houses and Outbuildings of ‘Edgemont in Park Hill’,” National Register of Historic Places Nomination, March 30, 1992.

modifications of homes and properties.” In return, the homeowners association is responsible for “maintaining recreational facilities, open spaces, and other common elements” of the development.³³

Restrictive covenants were placed on the Lakewood properties at the time Matthews was selling the lots, most notably a ‘whites only’ clause. In the 1940s, the Lakewood Property Owners Association (LPOA) was formed to manage the public spaces of the subdivision, including the six lakes and Pugh Park. The LPOA is a non-profit organization governed by a three-member board appointed by the mayor of North Little Rock. In the 1970s, the community formed a recreation improvement district to generate revenue through a real estate tax on Lakewood properties. The revenue raised allows the LPOA to maintain the dams, the lakes, the parks and other public spaces of the district. The city of North Little Rock contributes 30% toward the cost of maintaining the dams because the lakes are the drainage basin for the city, and the city recognizes it has an obligation toward the upkeep of those basins. The recreational uses of the lakes are skiing, boating, and fishing, and two of the lakes are reserved for “unpowered watercraft.”³⁴ Hot Springs Village is another private neighborhood in Arkansas that maintains recreational dams. The Village maintains 12 dam impoundments constructed between 1967 and 2004. The Bella Vista Property Owners Association maintains seven dams and lakes constructed between 1968 and 1981.

The series of Wingfield Dams in Union County were originally constructed for a social purpose of a different kind. Mr. Wingfield was a wildcatter in El Dorado who made a fortune in oil during El Dorado’s boom years. He purchased some land on the Caledonia Road to develop a

³³ Robert Nelson, *Private Neighborhoods and the Transformation of Local Governments* (Washington, D.C.: Urban Institute Press, 2005), 29, 32.

³⁴ Sullivan interview; Lakewood Property Owners Association website, <http://www.lakewoodpoa.com/lakes.html> (accessed June 24, 2013).

private retreat for himself and his friends. He put up a series of five, spring-fed dams on the property to create lakes for fishing and boating. Local rumor has it that during Prohibition, Mr. Wingfield and his friends retreated to a “clubhouse” on the property to enjoy a few adult beverages. Mr. Wingfield eventually went broke, and the property was sold to a Mr. Paul Mattocks. In the 1960s, the De Soto Area Council of the Boy Scouts of America organized a capital campaign to raise the money to purchase part of the Wingfield property. They acquired about 635 acres, almost a whole section, on the south side of the Caledonia Road around 1965.³⁵

The part of the property the BSA now owns has three of Wingfield’s five lakes, officially known as Wingfield Dams No. 1, 2, and 3. The other two lakes are on the north side of Caledonia Road, with the road itself being one of the dams. The Boy Scouts improved the property, with reforestation and conservation measures, and now the camp has a shooting range, skeet range, staff cabins, a dining hall, and a Junior Olympics-size swimming pool. The lakes are used for fishing, boating, and canoeing. They are not open to the public for fishing, but Arkansas Game and Fish occasionally restocks the lakes with fish.³⁶

As with water supply dams, the number of recreation dams increased dramatically with the advent of New Deal programs. There were four private recreation dams constructed between 1836 and 1929 – the three Lakewood Dams and the Bella Vista Lake Dam – and no public recreation dams. Between 1930 and 1943, there were 21 public recreation dams constructed. Most of the recreation dams built in the 1930s and early ‘40s were constructed as part of the New Deal programs designed to unemployed people back to work during the Depression. The Works Progress Administration, Resettlement Administration, and Civilian Conservation Corps built dams on federal, state, and municipal lands for recreation, soil conservation, and fish propagation

³⁵ Interview, Charles Booth, former Field Director, De Soto Area Council, Boy Scouts of America, July 2, 2013.

³⁶ Booth interview.

purposes. The first work relief dam project started in Arkansas was at Wedington in Washington County.

The University of Arkansas College of Agriculture recommended the Wedington project to the Agricultural Adjustment Administration in late 1934.³⁷ The University proposed to develop an area of submarginal agricultural land as a demonstration project in land rehabilitation. The project area was in north-central Washington County, about 16 miles west of Fayetteville. The site was chosen “for the suitability of its natural declivities for a lake basin, the dependability of the water sources that drain them, and the beauty of the surrounding mountains.”³⁸ The project was approved and on January 11, 1935, C. B. Wiggans, an horticulturalist on the faculty of the UA College of Agriculture, was appointed project manager.³⁹ Wiggans’ first challenge was to obtain options to purchase the proposed project lands. In preparation, he submitted to Dr. B. M. Gile, assistant regional director of the Agricultural Adjustment Administration (AAA), “the income and financial record(s) of a ‘typical’ farm operator residing on lands proposed for purchase in connection with the project.”⁴⁰

The AAA was created on May 12, 1933, with passage of the Agricultural Adjustment Act. One of the purposes of the Act was to reduce agricultural surpluses by taking up to 30% of farm land out of production. The Wedington project aimed to take submarginal land out of production by purchasing the land from local farmers and repurposing its use. On the local level,

³⁷ Edwin P. Hicks, “Land Project Dedicated at Wedington,” *Southwest-Times Record*, May 1, 1938.

³⁸ “Lake Wedington Historic District; Ozark-St. Francis National Forest,” National Register Nomination, September 20, 1993.

³⁹ Edwin P. Hicks, June 28, 1936, May 1, 1938.

⁴⁰ Letter and attachment, C. B. Wiggans to Dr. B. M. Gile, January 29, 1935, Folder B. M. Gile – 1935-1936, 1937 (Wedington) Project Files, Site Records for the 1982 Wedington Unit Archeological Survey, University of Arkansas Museum, Fayetteville. (Hereafter, Site records.)

the Agricultural Adjustment Act was administered by Agricultural Extension Service agents since they had been working closely with farmers since the Extension Service was formed in 1887, and theoretically the agents would be able to convince farmers to accept the program.⁴¹ The Wedington project was connected to the Agricultural Extension Service through Dan T. Gray, dean of the UA College of Agriculture and director of the Agricultural Extension Service at the U of A. Gray also served as the Sixth District regional director for the Agricultural Adjustment Administration.

The official name of the Wedington Project was “Northwest Arkansas Forestry, Pasture Making, Grazing and Recreation Project, and was designated A-2 by the Adjustment Administration.⁴² As project manager, Wiggans was to purchase 60,000 acres of submarginal land for the project⁴³ from local farmers, relocate the families, clear the land of existing houses and barns, construct the project facilities, and rehabilitate the vacated farmlands through reforestation, planting grass, and creating wildlife habitats. On June 14, 1935, Wiggans submitted the appraised values and options on the land designated for the project, and plans for the proposed use to be made of each parcel of land.⁴⁴ Wiggans was also expected to know which farmers wanted to move to “resettlement lands available nearby.”⁴⁵

The project was proposed for the top of Wedington Mountain, the Moore Creek area to the south, and those flat parts of the mountain that families would be most likely to sell. This was the land least suitable for farming, and Wiggans felt the flat land could be purchased for \$20

⁴¹ Jeannie M. Whayne, “Darker Forces on the Horizon: Natural Disasters and Great Depression,” in *Arkansas: A Narrative History* (Fayetteville: The University of Arkansas Press, 2002), 323; Leuchtenburg, 49. There is no obvious provision in the Agricultural Adjustment Act that would indicate the AAA would sponsor resettlement activities (Agricultural Adjustment Act, Public Law 10, 73^d Cong., 1st sess. (May 12, 1933)).

⁴² Wiggans to Gile, April 17, 1935, site files.

⁴³ Gile to Wiggans, January 31, 1935, site files.

⁴⁴ Wiggans to Gile, June 14, 1935, site files.

⁴⁵ Gile to Wiggans, July 23, 1935, site files.

an acre, and the lands on top of the mountain for \$12 an acre. With 40% of the families in the the project on relief, Wiggans felt that these families would accept the offer to sell. Wiggans had anticipated that the “better improved farms” would not be for sale, and he planned the project around these properties. Wiggans worked around farmers who were opposed to the project. For example, Mr. Layne was “a very radical enemy of the project,” even though his farm did not yield a crop. Wiggans optioned all of the land surrounding Mr. Layne’s 80-acres anyway.⁴⁶ By December 1935 Wiggans had acquired options on half of the lands in the project area.

In August 1935, federal administration of the Wedington project had been transferred to the Resettlement Administration, with no change in local personnel.⁴⁷ President Roosevelt set up the Resettlement Administration (RA) in April, 1935, “to meet the problem of rural poverty.” As William Leuchtenburg explains, “the RA took over the rural rehabilitation and land programs that . . . had been initiated with the FERA” (Federal Emergency Relief Administration). FERA provided relief for unemployed men by putting them to work on construction projects, such as building bridges, clearing streams, and dredging rivers. FERA also provided loans to farmers to as a way of aiding rural communities.⁴⁸ Evidently, administrators in Washington felt the AAA resettlement projects also fit better with RA programs than with AAA’s cropland management programs. The Wedington project was placed in the Land Utilization Division of the Resettlement Administration⁴⁹ and given the designation LD-AK 2, with the same project title as before.

Beginning in November, 1935, federal funds for RA projects, including the Wedington project, came from a special relief allotment controlled by Roosevelt, the Works Progress

⁴⁶ Wiggans to Gile, June 11, 1935.

⁴⁷ Gile to Wiggans, August 3, 1935.

⁴⁸ Leuchtenburg, 140, 123.

⁴⁹ Memorandum to Project Directors in Districts VI and X, August 5, 1935, site files.

Administration (WPA), and the Resettlement Administration.⁵⁰ Workers on the project were “about equally divided between Works Progress administration forces and land utilization clients.”⁵¹ In a short history of the CCC in Arkansas, *Manmade Elements in Natural Settings: The CCC in Arkansas*, Frank Burggraf and Karen Rollet say that for CCC projects “all labor was done with hand tools, with the exception of tractors.”⁵² This was certainly not true of the Wedington project, which was not a CCC project. The local paper reported that the list of equipment “ran something like this:

eight dump trucks; two pick-up trucks; four stake body trucks; a concrete mixer; centrifugal pump; three caterpillar tractors; several horse-drawn scrapers; two tractor scrapers; and one road grader; and a rock-crusher (was) on the way.”⁵³

By March 19, 1936, the workers had cleared land for the dam and lake site. However, progress was held up because the owner of “one of the key tracts over which the dam must go” had “steadfastly refused to sign the deed” until he was paid for his land. Wiggins was still hopeful the land could be secured for the project soon.⁵⁴

The land was not secured soon enough. When work on the dam was delayed because of “the unwillingness of a land owner to permit work on about one-half the dam site prior to payment for his land,” Wiggins reported that, “the delay was very costly in point of time because rains occurred before the cut-off trench and wall were completed.” Washington’s inability to make timely payments to farmers for their land was a constant source of aggravation for Wiggins. In project correspondence, he continually requests that funds be released to pay the

⁵⁰ Resettlement Office to Gile, November 13, 1935, site files.

⁵¹ Hicks, June 28, 1936.

⁵² Frank Burggraf and Karen Rollet, *Manmade Elements in Natural Settings: The CCC in Arkansas* (S.I.: s.n., c. 1989), 19.

⁵³ Hicks, June 28, 1936.

⁵⁴ Wiggins to Gile, March 19, 1935, site files.

farmers for their land. In a May 1, 1937, report on the project, Wiggans wrote, “the dam would be finished and the lake filled” were it not for this delay. The May 1st report also shows that the dam was the most expensive part of the project in terms of man-hours and dollars expended.⁵⁵

The completed project consisted of the dam, a 100-acre lake stocked with fish, an artificial beach, a diving tower, bathhouses, picnic areas, and rental cottages. The Lake Wedington project was dedicated on April 30, 1938. All the appropriate dignitaries spoke at the dedication. Dr. John Futrall, president of the University of Arkansas, pointed out, among other things, “the need for lakes in the Arkansas Ozarks.” Wiggans spoke of the project as a demonstration of “the multiple use of land for the best public interest.” Visitors attending the dedication enjoyed the new recreational facilities, and “Miss Zilla Peel gave a demonstration in water sports.”⁵⁶

When the Lake Wedington project was completed, so too was the role of the Resettlement Administration in the project. Federal government oversight of the project was temporarily assigned to the Bureau of Agricultural Economics (BAE). The BAE was established in 1922 as the research arm of the Department of Agriculture (USDA). In 1938, to cope with New Deal programs, the Department of Agriculture “designated the BAE as the USDA’s economic and social planning agency.” In this capacity, the BAE was to work with local land-grant colleges to develop grassroots land-use planning policies.⁵⁷ This would have been the BAE’s role at Wedington. The BAE was not a management agency, so by March 22, 1939, actual management of Lake Wedington had been assigned to the Department of Agriculture’s

⁵⁵ LD-AK-2: Master Development Plan, site files.

⁵⁶ Hicks, May 1, 1938.

⁵⁷ Olaf F. Larson and Julie N. Zimmerman, “The USDA’s Bureau of Agricultural and Sociological Studies of Rural Life and Agricultural Issues, 1919-1953,” *Agricultural History* 74, no. 2 (Spring 2000): 227, 231.

Soil Conservation Service. Some time later, management of Lake Wedington was turned over to the Ozark-St. Francis National Forest.

The Resettlement Administration had five other projects in Arkansas, three of which included construction of recreation dams. The Mt. Magazine project was in Logan and Yell counties, one was simply designated “Eastern Arkansas, Lee and Phillips counties,” and the third was the Boston Mountain project in Madison, Franklin, Crawford, and Johnson counties. Each project very much followed the same pattern of development as Wedington. The Mt. Magazine project had actually received its project number before Wedington; Mt. Magazine was project A-1. Two dams were constructed as part of the Mt. Magazine project, one impounding Cove Lake in Logan County and the other impounding Spring Lake in Yell County, both of which were primarily recreation dams. The Eastern Arkansas project also created two impoundments, Bear Creek Lake in Lee County, and Storm Creek Lake in Phillips County, which were primarily fish and wildlife ponds, or fishing lakes. The Boston Mountain project has a small recreation dam, not listed on the NID, called Cold Springs, in Crawford County. All of the Resettlement projects were supported with WPA funding and all of the dams were completed in either 1938 or 1939. The projects were administered first by the Resettlement Administration, then by the Bureau of Agricultural Economics, then the Soil Conservation Service, and now all are under the purview of the U. S. Forest Service.⁵⁸

The Civilian Conservation Corps (CCC) is the more well-known of the New Deal relief programs that built dams in Arkansas. There are three short studies of the CCC in Arkansas.

⁵⁸ Resettlement Administration, *Resettlement in Region Six (Arkansas, Mississippi and Louisiana)* (Washington, D.C.: The Administration, c. 1936), 15-16; “Memorandum of Understanding Between the Forest Service and the Soil Conservation Service,” March 17, 1939, site files; William Hale Graham, “Historic Mt. Magazine Will Become Summer Resort,” *Southwest-Times Record*, April 19, 1936; Email, James Whalen to Mary Suter, June 10, 2013; “Boston Land Use Project Program Plans Completed,” *Southwest-times Record*, April 17, 1938.

Sandra Taylor Smith's study, *The Civilian Conservation Corps in Arkansas, 1933-1942: A Historic Context*, provides the background for the creation of the CCC, and the impact and legacy of the program. Her report is intended to assist state and local historic preservation groups seeking to place CCC-constructed building or parks on the National Register.⁵⁹ Frank Burggraf and Karen Rollet, in *Manmade Elements in Natural Settings: The CCC in Arkansas*, discuss the rustic style of architecture employed by the CCC, and they look in-depth at the construction of Petit Jean, Devil's Den, and Mt. Nebo state parks.⁶⁰ Joey McCarty, in his master's thesis, *Civilian Conservation Corps in Arkansas*, looks at the overall CCC program in the state, not just the park facilities. McCarty also looks at how the CCC influenced the development of state programs in parks, forestry, soil conservation, and other conservation measures.⁶¹ In addition, most of the CCC sites in Arkansas have been listed on the National Register of Historic Places, and their nomination forms can be found at the Arkansas Historic Preservation Program web site.

In Arkansas, the CCC worked mostly with and through the U.S. Forest Service in Ouachita and Ozark-St. Francis national forests. Some of the facilities they constructed stayed under Forest Service control, such as Camp Ouachita, where Lake Sylvia is located.⁶² Other recreational areas developed by the CCC are the foundation of the current Arkansas State Parks

⁵⁹ Sandra Taylor Smith, *The Civilian Conservation Corps in Arkansas, 1933-1942: A Historic Context* (Little Rock: Arkansas Historic Preservation Program, 1991).

⁶⁰ Burggraf and Rollet.

⁶¹ Joey McCarty, *Civilian Conservation Corps in Arkansas* (master's thesis, University of Arkansas, 1977).

⁶² "Camp Ouachita Girl Scout Camp Historic District, Lake Sylvia, Perry County," National Register Nomination, http://www.arkansaspreservation.com/historic-properties/_search_nomination_popup.aspx?id=74 (accessed July 4, 2013); John Salmond, *The Civilian Conservation Corps, 1933-1942: A New Deal Case Study* (Durham, NC: Duke University Press, 1967), 123.

system,⁶³ with dams, lakes, and park facilities constructed at Petit Jean, Devil's Den, Crowley's Ridge, and Woolly Hollow, among others. The dams were constructed to create lakes for recreational purposes, such as swimming and boating, and for fishing. By 1938, the *Arkansas Democrat* could boast of the state's "enlarged and improved state park system" that had become "a model for southern and southwestern states the past 10 years."⁶⁴

City parks also benefitted from the activities of New Deal work programs. The Works Progress Administration provided funding for the construction of dams that impounded Lake Atalanta in Rogers in 1936 and Leatherwood in Eureka Springs in 1939. While the general public could use the private Lakewood and Bella Vista lakes, the CCC lakes, and in the 1930s the municipal water supply lakes for recreational purposes, Atalanta and Leatherwood were the first two impoundments developed specifically as municipal public parks.⁶⁵ The construction of city parks had gained in popularity in the 1920s to the point that the National Recreation and Park Association could assert that parks were "public necessities" that municipalities should provide for their residents because "it was not possible for individuals to provide their own outdoor recreational facilities."⁶⁶ Whereas the construction of outdoor recreation areas had previously been an added benefit of public and private common spaces, now they were considered a "necessity."

Quite without their encouragement, the development of recreation areas became a necessity for the Corps of Engineers as well. As had happened at Lakes Catherine and Hamilton, outdoor recreation enthusiasts began immediately to use the big flood control reservoirs for

⁶³ McCarty, 21.

⁶⁴ "State Parks System, Finest in Southwest, Will Attract Vast Numbers This Summer," *Arkansas Democrat*, June 19, 1938.

⁶⁵ Lake Newport had opened in a Newport city park in 1933, but it was developed from one of the "many lakes" in Jackson County ("Lake Newport Is Under City Supervision," *Arkansas Democrat*, May 7, 1933).

⁶⁶ National Recreation and Park Association, 6.

boating, fishing, and other water sports. The Flood Control Act of 1944 recognized this use of the reservoirs and authorized the Corps “develop its reservoirs for recreational purposes.”⁶⁷

Since then, recreation areas have been developed on each of the large Corps reservoirs.

Between 1836 and 1945, 66 public and private recreation dams were constructed in Arkansas. Between 1946 and 2013, 591 recreation dams were constructed. Of the recreation dams created after 1945, the vast majority – 256, or 43% – were built between 1960 and 1969. One area of investigation would be to determine why so many recreation dams were built in the 1960s. Meanwhile, it is safe to say that because of dams, outdoor enthusiasts in every corner of the state do not now have far to drive to enjoy water-based recreational activities.

⁶⁷ Rathburn, 75.

CHAPTER 7: IRRIGATION DAMS

Irrigation dams in Arkansas were constructed for the same reason as irrigation dams in the arid west, to store water year-round for seasonal use. There are two major differences between western irrigation dams and Arkansas irrigation dams, size of reservoir and date of construction. The first Anglo-European irrigation reservoirs in the arid west appeared in Utah in 1847, and by 1945 there were 380 irrigation reservoirs in Utah alone.⁶⁸ The National Inventory of Dams records only two irrigation dams built in Arkansas before 1945, Strohl Reservoir Dam in 1937 and Peckerwood Lake Dam in 1942. Western irrigation dams range in size from a three-foot dam impounding 1 acre-foot of water to the Bureau of Reclamation's Owyhee Reservoir that impounds 1,200,000 acre-feet behind a 417-foot dam. Strohl Reservoir impounds 700 acre-feet of water behind a 16-foot dam, and Peckerwood Lake is a 28,000 acre-foot impoundment behind an eight-foot dam. Of all the 97 NID irrigation dam impoundments in Arkansas, Peckerwood Lake is still the largest.

The history of irrigation in Arkansas is documented in several articles in *The Arkansas Historical Quarterly*. The first irrigated farmlands were on the Grand Prairie of eastern Arkansas for the cultivation of rice. Florence L. Rosencrantz's 1946 article describes how rice farming started, how rice cooperatives were established to mill and market the rice, how the crop is grown, and how it is irrigated. At the time she was writing, most of the water for irrigation came from pumped wells. But she notes that farmers were starting to experiment with surface

⁶⁸ Ralph Hess, "The Beginnings of Irrigation in the United States," *The Journal of Political Economy* 20, no. 8 (October 1912): 811. For Native American and Spanish irrigation dams, see Smith, *A History of Dams*, 130ff. For the 9 most western states (Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming), the NID lists a total of 3,891 irrigation dams.

water reservoirs, and that those reservoirs attracted ducks, allowing for a duck hunting season in the region.⁶⁹

In 1986, D. Brooks Green wrote about “Irrigation Expansion in Arkansas: A Preliminary Investigation,” based largely on agricultural census records. Green demonstrates that the rice industry was largely responsible for the expansion of irrigation in Arkansas. Beginning in the 1940s, farmers began to irrigate additional crops, such as cotton, soybeans, “corn, oats, hay, and vegetables.” Green writes, “as the price of rice has increased or decreased, so has the number of irrigated acres in the state,” and he concludes “irrigation expansion, therefore, is tied to the economy.” He does mention water pumped from wells, and the increasing use of reservoirs as a water supply.⁷⁰

Most recently, John Gates examined “Groundwater Irrigation in the Development of the Grand Prairie Rice Industry, 1896-1950,” a study of how the aquifer that underlies the Grand Prairie is being depleted by irrigation practices in the rice fields. Farmers recognized as early as the mid-1920s that groundwater pumped from the aquifer under the Grand Prairie was being depleted at a rate faster than it was being replenished. By the 1930s, groundwater levels fell over 9 inches a year.⁷¹ Farmers, the state, and the federal government proposed or implemented several methods to address the problem of a lowered water table.

One plan for funneling water to the Grand Prairie that did not materialize was the federal government’s proposal to construct a canal from the proposed Greers Ferry Reservoir on the Little Red River to the rice-growing region. The Greers Ferry dam was one of the dams on the

⁶⁹ Florence L. Rosencrantz, “The Rice Industry in Arkansas,” *The Arkansas Historical Quarterly* 5, no. 2 (Summer 1946): 134-135.

⁷⁰ D. Brooks Green, “Irrigation Expansion in Arkansas: A Preliminary Investigation,” *The Arkansas Historical Quarterly* 45, no. 3 (Autumn 1986): 265, 268.

⁷¹ John Gates, “Groundwater Irrigation in the Development of the Grand Prairie Rice Industry, 1896-1950,” *The Arkansas Historical Quarterly* 64, no. 4 (Winter 2005): 404, 408.

headwaters of tributaries of the Mississippi that the Corps of Engineers had proposed in 1932 for controlling floods in the lower Mississippi river valley. The canal would have to divert water from the Little Red, as the diversion of water directly from the White River would require pumping and it would “be detrimental to the interests of navigation and, therefore, would not be permitted.” Water from a reservoir on the Little Red could be gravity-fed to the Grand Prairie, which would reduce costs and not interfere with navigation. The plan was never adopted, probably due to its high cost, estimated at \$8,600,000, including construction of Greers Ferry reservoir.⁷² Greer’s Ferry dam was eventually completed in 1963 as a flood control and hydroelectric project.

In a 1931 report on ground-water supplies in the Grand Prairie region, the U. S. Geological Survey advanced several other methods for addressing the problem of the gradual lowering of the water table. One possibility was to drill even deeper wells into the aquifer. The second was to recharge the aquifer. The third was to limit the amount of water that farmers could withdraw from the aquifer. The fourth was to grow more crops with dry farming. The fifth was to create artificial reservoirs by constructing impounding dams.

The USGS identified two geologic formations that held water, the Pleistocene beds and the Tertiary beds. The Pleistocene beds were at a depth of 100 to 250 feet, and provided most of the ground water used for irrigation through the 1930s. The Tertiary beds were at a depth “of about 1,000 feet.” Deep wells could be drilled to reach the Tertiary beds. The difficulty was in the expense. In 1929, deep wells cost “at least \$7,000, as compared to \$1,000 or \$2,000 for a well drawing from the Pleistocene beds.”⁷³

⁷² H. Doc. 102, 144-143.

⁷³ U. S. Geological Survey, “Ground-water supplies for rice irrigation in the grand Prairie Region, Arkansas,” (Washington, D.C.: GPO, 1931), 1, 19

A second possibility was artificial recharge of the aquifer. In this method, water would be reintroduced into the water-bearing beds by means of pumping from wells, streams or rivers. This method was deemed too expensive, and there was no guarantee that recharging would work in the Grand Prairie region. Another method, one that was sure to be unpopular with farmers, was to restrict consumption of water for irrigation. At best, this method would not prevent a loss of water from the aquifer, but it would “protect the present irrigators from overdraft at an increased rate.”⁷⁴ The fourth possibility was to encourage farmers to put more of their land into dry crop farming. Farmers were already rotating their rice crops with oats and soy beans, and the USGS report suggested that other appropriate crops, such as cotton, corn, and fruit, could be grown to advantage.⁷⁵

The last possibility, the substitution of surface water for ground water, was already being used by area farmers. In 1908, rice farmer Arthur Tindall dammed a creek to pool water which he then pumped onto his fields. This reservoir did not become a permanent feature on the landscape. In 1912, John Voss created the first permanent artificial reservoir for irrigation by damming Poplar Creek.⁷⁶ In 1926, Tindall created the first “level land” shallow reservoir by building levees around a low spot in a wooded area to capture rain water during the winter months to use in irrigating his fields during the planting season.⁷⁷ Small reservoirs became more common as a response to the lowered water table. By 1937, when Strohl Reservoir was

⁷⁴ *Ibid.*, 17, 19.

⁷⁵ *Ibid.*, 19-20.

⁷⁶ The NID has the “year completed” date for Voss Lake Dam as 1965. It is listed as an irrigation dam.

⁷⁷ Spicer, J. M., *Beginnings of the Rice Industry in Arkansas* (Stuttgart: Arkansas Rice Promotion Association, 1964), 22-23; Keith Sutton, *Arkansas Wildlife: A History* (Fayetteville: The University of Arkansas Press, 1998), 112; Steve Bowman and Steve Wright, *Arkansas Duck Hunter's Almanac* (Fayetteville: Ozark Delta Press, Inc., 1998), 131. There are discrepancies in these accounts. Sutton has Arthur Tindall building the first reservoir in 1925, Spicer has A.A. Tindall building the first reservoir in 1926, while Bowman and Wright have Verne Tindall building the reservoir in 1927. I have used Sutton, as his source is the earlier reference.

constructed, there were “twenty-four enclosed reservoirs encompassing 5,964 acres and a minimum irrigation capacity of 7,300 acres of rice.”⁷⁸

These shallow reservoirs were filled with rain water, as Tindall’s was, “from surface runoff or by pumping water into them from the adjacent bayous during the winter and spring.”⁷⁹

Shallow reservoirs were all that were needed. Agricultural Experiment Station studies found that the reservoir needed to store “2 acre-feet for each acre irrigated,” plus 6 to 12 inches additional depth to cover loss to evaporation. The Experiment Station found that farms planted an average of 165 acres in rice.⁸⁰ The average farm, then, would need to store 320 acre-feet of water. And, in fact, a 1939 study showed that the most economical size for reservoirs was from 250 to 650 acres, with a depth of 6 to 7 feet.⁸¹

Costs associated with reservoirs included the price of land, construction of dams, and construction of canals to channel the water to the fields.⁸² Even with these expenses, reservoir water cost less per acre-foot than well water. One estimate puts the cost of water from reservoirs at “50 percent less than the cost of water from wells.”⁸³ And a farmer could make extra cash by selling water from his reservoir to neighboring farms or through selling duck-hunting rights.⁸⁴

⁷⁸ Deane G. Carter and Kyle Engler, *Problems of Water Resources for Rice Irrigation*, Agricultural Experiment Station, Bulletin No. 371 (Fayetteville: University of Arkansas, 1939), 24-25.

⁷⁹ Arkansas State Planning Board, 89

⁸⁰ Orville J. Hall, *Rice Farming in Arkansas With Financial Results for 1927*, Agricultural Experiment Station, Bulletin No. 260 (Fayetteville: University of Arkansas, 1931), 51; B. S. Clayton, *Cost of Pumping and Duty of Water for Rice on the Grand Prairie*, Agricultural Experiment Station, Bulletin No. 261 (Fayetteville: University of Arkansas, 1931), 44.

⁸¹ Carter and Engler, 28.

⁸² *Ibid.*, 26.

⁸³ House Committee on Public Works, *White and Arkansas Rivers and tributaries, Grand Prairie region, Arkansas*, 81st Cong., 1st sess., 1949, H. Doc. 255, 21.

⁸⁴ Rosencrantz, 135.

Given these advantages, the Arkansas State Planning Board felt that “the continued and increased use of small, local reservoirs is assured.”⁸⁵

Interestingly, for information on the Grand Prairie irrigation reservoirs themselves, the best sources are found in publications related to duck hunting. The NID lists “recreation” as a secondary purpose for only 31 of the irrigation reservoirs, although many are very much used by ducks. According to Steve Bowman and Steve Wright in *Arkansas Duck Hunter’s Almanac*, Tindall was “astonished when wintering ducks congregated on his 450 acres of flooded timber.” The Arkansas State Planning Board had recognized the “concentration of waterfowl flyways” in the lower Mississippi river basin, which included the Grand Prairie, and that duck hunting offered “a material source of revenue to the people of the basin and to the State.” As such, the Planning Board recommended that reservoirs be constructed as wildlife refuges and as retention basins for flood waters.⁸⁶

Peckerwood Lake Dam was definitely built to attract waterfowl. The dam was built by Edgar Monsanto Queeny on his Wingmead property in Prairie County, located between Stuttgart and De Valls Bluff. Wingmead was listed on the National Register of Historic Places in May, 2011, and as such, the home and the grounds are well documented. Queeny was president of the Monsanto Chemical Company, and he started coming to Arkansas in the 1930s to go duck hunting. He eventually decided to buy land in the county, but create the reservoir he intended to build, he had to form an irrigation company. He formed the Arkansas Irrigation Company so that he could take advantage of a 1909 state law that gave irrigation companies the right to acquire by eminent domain private property “to carry out the purposes and objects of said

⁸⁵ State Planning Board, 89.

⁸⁶ State Planning Board, 78, 90.

corporation.”⁸⁷ The irrigation company “purchased or contracted for” 4,500 acres of land for the reservoir. A number of families that were forced to sell land to the irrigation company did not do so willingly.⁸⁸ There are still hard feelings in the area over these transactions.⁸⁹

Queeny created Peckerwood Lake in 1942 by building a dam to impound the waters of LaGrue bayou. Arkansas Irrigation Company, Queeny’s company, still owns Peckerwood Lake Dam. During farming season, the lake is used to irrigate the Wingmead’s farmland, and during the winter, as a rest area for waterfowl, where visitors can enjoy duck hunting in season.⁹⁰

Strohl Reservoir and Peckerwood Lake Dam are not coincidentally located in the triangle formed by Stuttgart, Ulm, and Slovac. A 1931 USGS survey of the Grand Prairie Region identified this area as having the greatest loss of groundwater in the rice growing region. The survey suggested this was the area that could most benefit from damming “certain areas that lie slightly lower than the general level of the prairies and receive drainage from them.”⁹¹ From 1931 to 1945, a number of small reservoirs had been created, plus the two large ones listed on the NID. Since then, 42 NID irrigation reservoirs have been constructed in the three counties of the Grand Prairie: Arkansas, Prairie, and Lonoke Counties. Irrigation reservoirs are not confined to the Grand Prairie. They can also be found in 33 counties in the state, some as far from the Grand Prairie as Washington County to the north, Little River County to the west, and Columbia County to the south. By far the greatest number of reservoirs (68) were constructed between 1950 and 1969, with the latest one built in 2009 in White County. All the irrigation reservoirs

⁸⁷ General Assembly of Arkansas *Right of Eminent Domain to Irrigation Corporations*, Act 87 (March 26, 1909): 234.

⁸⁸ A. G. Meehan to Heber Core, January 24, 1941, MC 1380, Core Family Papers, Box 47, File 4, Special Collections, Mullins Library, University of Arkansas, Fayetteville.

⁸⁹ Telephone interview with Mr. Patrick Mullen, Director, Prairie County Conservation District, June 11, 2013.

⁹⁰ National Register Nomination for Wingmead, Arkansas Historic Preservation Staff, 2010. Accessed at <http://www.arkansaspreservation.com/historic-properties/>

⁹¹ *Ground-water supplies for rice irrigation in the Grand Prairie Region, Arkansas*, 12, 18.

except two are privately-owned. The publicly-owned ones are Park Lake Dam, owned by the U.S. Forest Service, and Cedar-Piney Site 1, owned by the City of Danville.

Given the limitations on the types of dams recorded by the NID – dams over 25 feet or dams over 6 feet impounding more than 50 acre-feet of water – the national database gives only a partial picture of reservoired waters on the Grand Prairie. A more accurate idea of the number of reservoirs in the region comes from the Arkansas State Water Plan published by the Arkansas Natural Resources Commission in 1981. The Commission report, *Lakes of Arkansas*, lists 401 irrigation reservoirs impounding 5 acres of water or more in the Grand Prairie counties, Arkansas, Lonoke, and Prairie. Of these, only 2, Peckerwood and one in Arkansas County, are larger than the economical maximum of 650 acres. And much more so than on the NID, all but a few of the irrigation reservoirs on the state list are also identified as recreation reservoirs,⁹² pointing to the importance of the reservoirs as waterfowl habitat.

⁹² Arkansas Soil & Water Conservation Commission, *Arkansas State Water Plan: Lakes of Arkansas*, (Little Rock: Department of Commerce, 1981). Lastest data available. The Arkansas Soil & Water Conservation Commission has been renamed the Arkansas Natural Resources Commission.

CHAPTER 8: CONSEQUENCES

Of late, Arkansans have come to assign negative connotations to dams. Dams are viewed as destroying wild rivers and scenic beauty, as ecological disasters, as being unnecessary for their intended purposes and therefore an unnecessary expense to taxpayers. Conservationists have been successful in stopping construction of flood control and hydroelectric dams on the Buffalo River, the Strawberry River, a tributary of the White, and on the Cossatot, a tributary of Little River. From this perspective, it can be hard to remember how important many of these dams were to the state at the time they were built.

When dams were first constructed in the state, residents of cities that would benefit from water supply dams, farmers in the valleys that suffered from periodic floods, rural peoples who would receive inexpensive electricity generated by hydroelectric dams, fishermen who fished for lake fish, all of these people appreciated how dams could improve their communities. Improvement in people's daily lives came when dammed reservoirs could offer safe, readily available drinking water, or when hydroelectric dams provided cheap, reliable electricity. Farmers downstream, while not spared all flooding, were spared most of the time, enough that they could reliably plant crops each year and expect them not to be destroyed by a flood. Communities benefitted from the increased tourism that lakes created by recreation dams brought. And fishermen enjoyed new venues for fishing, even trout fisherman who could take advantage of fishing for introduced trout in the tailwaters of the hydroelectric dams.

At first, dams were a necessity. They powered the mills that ground corn and wheat, sawed logs for houses and barns, and powered simple machines, primarily for making woolen goods. A mill, whether water, steam, or horse-powered, was an important local business. In Elm

Springs the water-mill was “the nucleus of the village.”¹ Captain Thompson’s mill in Evening Shade “became famous as a camping spot for wagon trains, travelers, and a place to ‘get breadstuff’.”² Settlers who erected mills were seen as industrious and civic-minded.³ Mill dams also signified the economic development of a city and county, as the woolen mills at Mammoth Spring and Batesville did. While water-powered mills were soon replaced by steam mills, they continued to be an important symbol of personal and municipal progress.

Progress was equated with economic development and growth. When the transmission of electrical current over long distances became logistically and economically possible in the 1890s, electricity began to supplant water as the source of power to drive development. Hydroelectric dams combined the two sources of power, with the water serving to generate the electricity. The White River of the Ozarks provided an excellent and ready source of water for the generation of electricity. Tom Shiras, a newspaper editor and civic booster from Mountain Home, described the potential of the White and its tributaries to act “as a gigantic engine,” supplying power to cities in Arkansas, Missouri, and Tennessee. Proposed hydroelectric dams on the river would develop, “on a commercial scale, the gigantic power that was running to waste in the Ozarks.”⁴

Shiras was echoing an argument that was taking place on the national level by conservationists such as Theodore Roosevelt and Gifford Pinchot. In the 1920s, “conservation” referred to preserving natural resources, such as land, forests, and water, for the betterment of local communities and the nation as a whole. To not use these natural resources for economic development was seen as a waste of resources.⁵ This message was not lost on Harvey Couch. In building Rammel Dam, Couch emphasized the “service the Arkansas Light and Power Company

¹ Goodspeed, *Northwest Arkansas*, 262.

² Moore, 9.

³ See, for example, Goodspeed, *Western Arkansas*, 458.

⁴ Shiras, “Hydroelectric Development in Arkansas,” 574-575.

⁵ Kerwin, 124.

is performing in this development of the state's water power resources to meet the need for more economical and efficient power."⁶ The movement to conserve water resources eventually led to the 308 Reports, an inventory of the nation's rivers by the Army Corps of Engineers assessing their usefulness for generating hydroelectric power.

Water resources were also important for domestic and municipal water supplies. When municipal water supply dams came into use in the 1880s, townspeople looked to the water impounded by the dams as a much-needed source of clean, potable water. Residents of Little Rock, Hot Springs, and other municipalities were thoroughly tired of having muddy or foul-tasting water pumped from rivers or streams come from the taps, especially during the dry months when the rivers and creeks were low. Some communities, which could boast of "chalybeate springs" found the springs better for their health ("especially effective in various chronic diseases")⁷ then for quenching their thirst. Chalybeate waters are iron-rich waters. The iron made the quality of the water "poor."⁸

Although the iron, mud, and most bacterial organisms could be filtered out, filtering did not compensate for lack of water at the source. Navigation and water supply dams were built to create reservoirs to store water during periods of low water flow. Before the Army Corps of Engineers straightened, dredged, and constructed locks and dams on the Arkansas River, it was notorious for becoming shallow in dry months. Locks and dams created navigation pools to maintain a sufficient depth of water for boats to navigate upriver in all seasons. The Ouachitas had a very low water table, making deep wells ineffectual. Water supply dams created a ready supply of water for domestic and industrial purposes. Ground water was readily available in the

⁶ *Arkansas Gazette*, June 3, 1923.

⁷ Goodspeed, *Western Arkansas*, 197.

⁸ *Arkansas Water Plan*, 47

Ozarks, but growing cities, like Fayetteville and Eureka Springs, needed storage reservoirs to have a sufficient quantity of water on hand during dry seasons.

Pollution of surface water sources was not one of the reasons water supply reservoirs were built, although pollution from human wastes was recognized as a problem as early as the 1880s. For cities and towns that relied on well water, pollution from sewage was not an issue. For cities and towns that drew their water from rivers and creeks, both pollution and high mineral content of the water could be a problem. Little Rock, North Little Rock, and Fort Smith all discharged raw sewage into the Arkansas River, but this was not given as a reason not to drink the water. The Arkansas River was “unfit for human consumption” due to the salinity of the water, especially during low flows. The unfit river water was not a problem for Little Rock and Fort Smith after they built water supply reservoirs.⁹ Sewage in the water was not considered a problem when the rivers and creeks were flowing normally. Cities could count on the water to dilute the sewage and flush it downstream. Water supply reservoirs eliminated the concern of polluted drinking water when the rivers were not flowing strongly enough to flush away wastes..

In 1939, the Arkansas State Planning Board cautioned that pollution would become more of a issue as population increased, and more industries came to the state. Industrial wastes were already a problem in Malvern, Arkadelphia, and Camden from paper mills, bauxite mining, and oil fields. The Planning Board advised that it would “prove far simpler and less expensive” to address the problem of pollution before “permitting serious pollution to occur and then attempting to correct it.”¹⁰ The state did not take the advice of the Planning Board. The general assembly did not address the problem of pollution until 1949, after the federal government passed the Water Pollution Control Act of 1948. The federal statute provided funds to the states

⁹ State Planning Board, 55.

¹⁰ State Planning Board, 37.

to assist in assessing and mitigating pollution, and enactment of the state law would allow Arkansas to receive a share of those funds.¹¹

Construction of a municipal water supply reservoir was a source of civic pride. It showed a city to be progressive and interested in development. Industries were more likely to locate in cities that had a ready supply of water for domestic and industrial use, for fire protection, and for sanitation (specifically, water to flush the sewers). For example, when the City of Nashville completed its water supply dam and reservoir, “several hundred people” attended the formal opening. They were “shown the entire operation of the plant.” Waterworks and city officials, as well as the sanitary engineer of the state Board of Health, were on hand to greet them and explain the workings of the plant. The state sanitary engineer noted that “other engineers who have visited the plant have declared it one of the best in the entire South.” The local paper celebrated the “excellent quality” of the water now available to the citizens of Nashville. The mayor ran for re-election on the strength of civic improvements he brought to the city, including paved streets, a lighting system, a telephone system, and for securing “an adequate supply of good water for the city.”¹² Likewise, when the new Booneville water works was completed, the local newspaper crowed, “Do you want a drink of the best dam water in Arkansas, Mister? If you do drop in and see us sometime. We’ve got the best dam water in Arkansas.”¹³

Arkansans showed just as much interest in the hydroelectric dams being constructed in the state. In the *History of Pope County, Arkansas*, published by the Pope County Historical Association, there is a photograph of people promenading past the Russellville Dam as it was

¹¹ An Act to Control, Prevent and Abate Pollution, Act 472, *Acts of Arkansas*, 1949: 1324; *Water Pollution Control Act*, Public Law 845, *U. S. Statutes at Large* 62 (1948): 1155ff.

¹² *Nashville News*, January 28, 1930, April 7 and April 28, 1931.

¹³ *Booneville Democrat*, October 11, 1934.

being built.¹⁴ Harvey Couch brought investors and national dignitaries, including President Franklin D. Roosevelt, to Arkansas to view Carpenter Dam. At the formal completion of the dam, Couch organized a “mammoth double header celebration” for the closing of the dam gates and the inauguration of Hot Springs’ new “white way” (electrical) system. “All Hot Springs and hundreds of citizens from 30 neighboring towns” attended the ceremonies, as did Governor Harvey Parnell and other state officials, Captain Flave Carpenter, for whom the dam was named, and AP&L company officials. A “queen of the ceremonies” was named, and it was she who “touched the magic button which sealed the water gates to impound the lake waters.”¹⁵

The dams were equally appreciated as employment opportunities, especially in the 1930s. Harvey Couch testified in hearings before the Federal Power Commission that the Blakely Dam project would give employment “to our people down there,” many of whom were on relief.¹⁶ Clyde Ellis received numerous letters from constituents looking for work on the Norfolk Dam project.¹⁷ The Paris, Booneville, Nashville, Fort Smith, and Little Rock dams all received Public Works Administration monies to hire the unemployed. The Civilian Conservation Corps employed people in Arkansas to build or improve recreation areas. With a 40 per cent unemployment rate, the work was sorely needed in Arkansas.¹⁸

The economic value of the reservoirs for recreation was also recognized. Bella Vista Lake brought a “boom” as resort owners and casual visitors purchased fishing equipment, shopped in local markets and stores, and hired local men to build their summer homes, serve as guides, and work at the resort.¹⁹ The three dams on the Ouachita turned Hot Springs into “a

¹⁴ *History of Pope County, Arkansas*, 49.

¹⁵ *Nashville News*, December 16, 1930.

¹⁶ RG 77, Entry 500, Box 622, Report 5695, 5.

¹⁷ Ellis Papers, Folder 31.

¹⁸ Whayne, “Darker Forces . . . ,” 320.

¹⁹ Shipley, 107-108.

summer resort, as well as a winter health resort.”²⁰ When completed, the lakes created by Remmel and Carpenter dams were the only lakes of any size in the state. They were “excellent” for fishing, boating, bathing, camping, and other summer activities. At the time, there was no methodology for computing the “monetary value of attracting tourists to the region,”²¹ but the impact could be estimated. A study by the United States Travel Bureau estimated that in 1937 tourists spent \$31,450,000 on recreational activities in Arkansas.²²

Dams even influenced state politics. In 1938 Clyde Ellis challenged incumbent Claude Fuller for Arkansas’ Third Congressional District seat. Fuller was a well-respected Eureka Springs lawyer and politician, and his seat in congress seemed secure. Ellis opposed Fuller on the grounds that Fuller had not done enough to help electrify Arkansas’ rural homes and farms. Ellis strongly supported the New Deal’s rural electrification program, which provided low-cost loans to electric cooperatives to run power lines to distant and sparsely-settled rural areas. The Rural Electrification Administration (REA) administered the loans. REA was constantly looking for inexpensive ways to supply power to the co-ops for transmission over the rural lines. Cheap power meant farmers were more likely to join the co-op, and to use more electricity for improving their lives and livelihoods. Ellis, and many conservationists, looked to hydroelectric dams to supply that cheap power. As an example, Ellis needed only to point to the White River, running through the Third District, with all that undeveloped power going to waste.²³

According to Ellis, Fuller was opposed to hydroelectric development of the White River and tributaries. Fuller was friends and a political supporter of Senator Joseph T. Robinson.

Robinson was friends with Harvey Couch, and had been general counsel for Arkansas Power &

²⁰ *Arkansas Gazette*, June 3, 1923.

²¹ Noel, 172-173.

²² Marguerite Jane Gavere, *Tourist Promotion in Arkansas* (master’s thesis, University of Arkansas, 1939), 30.

²³ Clyde Ellis, *A Giant Step* (New York: Random House, 1966), 30-31.

Light before starting his senate career. Robinson was opposed to federal hydroelectric development of the White River because the utility companies were. Couch was opposed to federal development of the river because he believed private capital, not the government, should build the power dams. Ellis believed the federal government should build the dams. He reasoned that if the utility company produced and sold the power, the costs would be too high for farmers to afford. If the government built the dams, the cost of power would be much lower.²⁴

Running on this platform of support for REA and government-owned hydroelectric dams, Ellis defeated Fuller in the congressional elections. In Congress, Ellis successfully pushed for hydroelectric capabilities to be added to Norfolk Dam. Ellis went on to a distinguished career as general manager of the National Rural Electrical Cooperative Association (NRECA) after his defeat by John McClellan in the 1942 senate race. James Trimble, who replaced Ellis as the Third District's representative in the House, learned from Ellis's example and became a strong supporter of hydroelectric development on the White River.

The need for hydropower as a source of low cost electricity became less important almost as soon as Norfolk Dam was completed in 1944. In 1943, President Roosevelt issued an executive order creating the Southwestern Power Administration (SPA) to sell the power generated by Norfolk, Denison Dam in Texas, and Pensacola Dam in Oklahoma to rural electric cooperatives and other public bodies. By connecting the three dams into one system, the SPA created an integrated transmission system that could distribute power to load centers as needed, much as Harvey Couch had done with AP&Ls transmission system two decades earlier. The dams in the SPA system, however, could only generate reliable power when the water was high. When the water was low, "SPA needed to acquire power from other sources in order to guarantee a steady supply of energy, or 'firm power,' to its customers." To overcome this

²⁴ *Ibid.*

difficulty, the SPA signed cooperative agreements with private utilities in Texas, Oklahoma, and eventually AP&L in Arkansas. Through these agreements, the SPA gave “surplus energy to the utilities if they would supplement the hydroelectric dams during the dry months.” The overall effect of the integrated system was lower electrical costs for both public and private utilities.²⁵ The use of hydropower to generate electricity peaked in 1985. As of 2006, “only three percent of Arkansas’s electrical energy . . . was from hydroelectric sources.”²⁶

The value of the dams for flood control is less evident. The dams have regulated stream flow on the major rivers. A report by the U.S. Geological Survey in cooperation with the Arkansas State Highway and Transportation Department shows diminished discharge on the Petit Jean, Fourche La Fave, Ouachita, North Fork, and White Rivers after the dams were built. The dams have not stopped downstream flooding completely, as evidenced by the overflows in 2010 and 2011, but they have lessened the severity of floods. The dams are not as effective for controlling local flooding on tributaries without dams and on the smaller streams.²⁷ The 2010 and 2011 floods would likely have been even less severe if the Corps had been allowed to construct the Eudora floodway.

If empirical data on the decrease in the severity of flooding is hard to come by, development of resort, residential, and farming communities along the flood plains offers material proof that people have perceived a decrease in flooding since the dams went in. Farmers were much more likely to cultivate the floodplains of the White and Ouachita Rivers after the dams eliminated the threat of yearly flooding. Resort and real estate developers quickly discovered that retirees and suburbanites sought out lake-front property. These developments in

²⁵ D. Clayton Brown, 103, 105, 110.

²⁶ Jerry Reynolds, “Hydroelectricity,” in *The Encyclopedia of Arkansas History & Culture*, last updated October 17, 2012 (accessed May 27, 2013).

²⁷ Hodge and Tasker, Part 3.

Arkansas followed national trends, with ironic results. As Luna Leopold and Thomas Maddock point out in their study, *The Flood Control Controversy*, “when a project is installed, . . . a sense of security” results in floodplain development. Yet dams are *flood control* projects, not flood elimination projects. The rivers will still flood; just not as frequently or as extensively. In a pattern that surely includes Arkansas, when the rivers do flood, the economic and physical damage is so much greater due to agricultural, residential, and industrial development of the flood plain.²⁸ Karen O’Neill, in her study of managed river systems, *Rivers By Design*, agrees. O’Neill argues that “lack of coordination” between private, state, and federal interests in river management is one of the persistent problems of flood control projects. She writes,

Floodplain use is under the purview of local and state governments, which historically have imposed few restrictions on property owners. Congress has approved federal flood control systems without requiring that local and state governments restrict building on nearby floodplains. These lands remain vulnerable to flooding even after levees are built. What is more, many residents and farmers who live or work in floodplains – and even in emergency floodways – in turn demand additional federal levee and pumping projects.”²⁹

The dams have had an effect on Arkansas wildlife as well, especially fish and waterfowl. Hydroelectric dams in particular change the ecology of streams. Hydroelectric dams draw water from the bottom of the river to turn the turbines which generate electricity. The cold water is then discharged downstream. Native fish needed warm water to reproduce. Not long after the dams went in, the constant flow of cold water disrupted the habitat of native fish, which were soon extirpated from the tailwaters of the dams. No fish in the water meant no fishermen spending tourist dollars in local towns and resorts. To address this issue, the Arkansas Fish and

²⁸ Luna Leopold and Thomas Maddock, Jr., *The Flood Control Controversy: Big Dams, Little Dams, and Land Management* (New York: The Ronald Press Company, 1954), 131; Rathburn, 79

²⁹ Karen O’Neill, *Rivers by Design: State Power and the Origins of U. S. Flood Control* (Durham, N.C.: Duke University Press, 2006), 173. This statement is equally true of dams.

Game Commission (AGFC) began stocking trout in the tailwaters of Norfolk dam in 1948. In 1957, AGFC established a trout fish hatchery at Norfolk to ensure a plentiful supply of fish in the tailwaters of the reservoirs, which now included Bull Shoals as well as Norfolk. Joel William Helmer ably demonstrates the close connection between recreation, dams, and fishing in his study of trout fisheries in Northwest Arkansas, *Float Trips, Dams, and Tailwater Trout*.³⁰

In the lakes created by the dams, smallmouth bass have been widely introduced. White and largemouth bass are native to Arkansas, as are crappie. Crappie, which like slow moving or still waters, are normally found in Arkansas' bayous and backwaters. Their range has actually increased as they moved into the now-still river waters backed up behind the dams. Sunfish, buffalo fish, and other native species are still prevalent in the lower White River, below the effects of the tailwaters of the dams. There is not as much diversity among the fish found in the rivers. There used to be about 40 species of fish in the rivers. Now, since the dams have gone in, there are about 15 species. Native fish that were once common in the upper White River are not in danger of extinction from the ecological changes brought about by the dams. Their distribution is so broad across the midwest and central states that they survive and thrive in the undammed tributaries and streams of major rivers throughout their historic range. The only native species currently threatened by river development are river sturgeon and paddlefish, mostly because the series of navigation locks and dams on the Arkansas River have made it difficult for these fish to swim upriver to spawn.³¹

³⁰ Joel William Helmer, *Float Trips, Dams, and Tailwater Trout: An Environmental History of the White River of Northern Arkansas, 1870-2004* (PhD diss., Oklahoma State University, 2005), 57, 61, 70. The Arkansas game conservation program had actually begun stocking Ozark rivers with game fish (trout, black bass, crappie, and others) in 1929 to guarantee a plentiful supply of fish for the many anglers visiting the region (*Nashville News*, May 27, 1930). The state and federal fisheries established in the '50s institutionalized the practice.

³¹ Interview with Dr. James E. Johnson, former director of the U.S. Fish and Wildlife Cooperative, University of Arkansas, Fayetteville, June 28, 2013; Robison and Buchanan, 381.

Fishing in Arkansas is a multi-million dollar industry. So is duck hunting. Waterfowl have greatly benefitted from the irrigation and recreation ponds constructed throughout the Grand Prairie and along the Mississippi Flyway. The irrigation ponds that started to be created in the 1920s were a material assist to increasing the numbers of migrating ducks. According to Keith Sutton of the Arkansas Game and Fish Commission, the duck population in Arkansas was “200 million in the 1920s but had dropped to 30 million in the 1950s.” Habitat loss, drainage ditches that eliminated standing water and stream backwaters, and modern farming methods were all to blame for the decrease in the number of ducks using the Flyway. Irrigation ponds, private refuges such as Peckerwood Lake, state refuges such as the Bayou Meto Wildlife Management Area, and federal refuges such as the White River National Wildlife Refuge, have all contributed to major increases in the breeding populations of ducks and other waterfowl.³²

Lost to the dams, or more precisely, to their lakes, are numerous archeological sites. The area covered by Norfolk Lake was not surveyed or tested before the lake filled. Sites found along the current shoreline indicate that late archaic and prehistoric sites are covered by the reservoir waters.³³ A partial survey of the area covered by Nimrod reservoir was conducted in 1978 during a Corps drawdown of the lake. One hundred and eighty seven new sites were recorded on land exposed during the drawdown. Archaic, Woodland, and Caddoan sites were identified, indicating at least 1300 years of continuous occupation of the region. While these findings are consistent with other sites in the Ouachitas, the relative significance of the Nimrod sites cannot be determined without further surveys of the inundated areas.³⁴ Lake Ouachita covers several significant Caddoan sites, such as the Adair Site and Poole Place. Sam Dellinger,

³² Sutton, *Arkansas Wildlife*, 217ff.

³³ AMASDA (accessed June 28, 2013).

³⁴ Thomas L. Leatherman, *Nimrod Lake: An Archeological Survey of a Reservoir Drawdown* (Fayetteville: Arkansas Archeological Survey, 1980), 59, 69.

director of the University of Arkansas Museum, collected artifacts in the Ouachita River bottoms in the 1920s, and the Works Progress Administration conducted excavations at the Adair site in 1939 before the lake filled, so more is known about these sites than those at Nimrod and Norfolk. However, the total significance of the complex of sites around Adair will never be known as long as the lake is there.³⁵

Lost, too, were the shoals and rapids that had characterized the White River as it descended 1,565 feet over 390 miles from its source in the Ozarks to the flatlands of the Delta at Batesville. The Bull Shoals, encountered by Schoolcraft, and Wild Cat Shoals, are now localities, not features on the landscape. Corps of Engineers surveys described the river before the dams went in:

Though the White River and its tributaries are upland streams in the part of their courses (the Ozarks), they are as crooked as streams flowing over flood plains. Most of the streams are swift and flow in deep, narrow, canyonlike valleys. The run-off is rapid and the streams are flashy. . . The descent to the streams on the outside of the bends is everywhere steep and at most places vertical.³⁶

The Ouachita River was not as “flashy,” but it did have a rapid average descent of 12 feet per mile from its headwaters near Mena to 40 miles above Malvern. From there to Malvern, the descent averaged 3.3 feet per mile. The river was described as “crooked” and lying in “a valley closely bounded by mountains to the north and south.”³⁷ The rivers have since become managed streams, with stream flow regulated and rapids tamed. It was just this loss of the wild in the river that prompted Dr. Neil Compton to launch a campaign to save the Buffalo River from a similar fate. Since Compton’s “Battle for the Buffalo,” dam projects on the Strawberry and Cossatot

³⁵ Joanne DeMaio, *The Adair Site: Ouachita River Valley Relations Through Ceramic Analysis* (master’s thesis, University of Arkansas, 2013), 2-3.

³⁶ H. Doc. 102, 14.

³⁷ H. Doc. 196, 16

rivers have been stopped by the simple expedient of the state refusing to pay its share of the costs. Without that local cost-share, the project could not go forward. With that, virtual control of these rivers returned to the states, where it had rested for 100 years, from statehood to the Flood Control Act of 1936.

CONCLUSION

Arkansas is endowed with a multitude of navigable rivers and lesser rivers and tributaries that feed into them. Those rivers are a blessing and a curse. In the early years of statehood, the rivers provided a means of transportation to the interior when roads were poor or non-existent. They were a ready source of pure water for domestic and farm purposes. But to really take advantage of the rivers, they needed to be managed. Dams were employed to make the rivers useful as a source of power to turn mill wheels to grind corn, saw wood, and manufacture textiles. Locks and dams were built to improve navigation on the rivers. As communities grew, the rivers were no longer suitable as a source of potable drinking water, and dams were used to create artificial reservoirs so that an ample supply of clean water could still be supplied to those communities. Patterns of water management through dams were set in the period 1836 to 1945, and the same patterns prevail today, though on a much larger scale. For example, Fort Smith recently enlarged its water supply reservoir, Lake Fort Smith, to accommodate that city's growing population. Hydropower dams provide electricity to run today's electrified homes, cities, and large industries. Navigation systems move huge barges up and down river to deliver goods by the ton to the interior.

Recreation dams were always seen as a way to attract tourists, and tourist dollars, to local communities. In that, they have been quite effective. Arkansans promote the reservoirs as fishing lakes and as a place to go boating. The reservoirs are used extensively for these and other water-based activities. Irrigation reservoirs also serve a secondary purpose as recreational reservoirs, attracting ducks and duck hunters, and fishermen. In many of the state parks, they provide a focus for leisure time activities.

The success of recreation reservoirs insures that the pattern of providing lakes for recreational use will continue.

The disadvantage of the rivers was flooding. At first, the rivers were channeled with levees to keep them from overflowing their banks. When that method of flood control proved to be insufficient, Arkansans turned to dams to hold back the flood waters. Flood control is perhaps the one pattern that has been broken. Arkansans now believe the dams do not accomplish their purpose, or at least, that there are currently enough flood control dams already built to manage flood waters. So, with the possible exception of flood control dams, the dams have performed as their builders predicted, and they continue to be a valuable and useful resource for Arkansas.

A NOTE ON METHODOLOGY

This study started as a chronological examination of the environmental and social forces that influenced the construction of dams in Arkansas. The idea was to sort the Arkansas dams in the National Inventory of Dams database by year completed, and proceed methodically down the list explaining how each dam came to be built. It soon became apparent that this would not be a useful approach. The reason dams were constructed had more to do with their primary purpose than their year of completion. The organizing principle of this study was subsequently revamped to discuss dams first on the basis of primary purpose, then by year completed.

Public interest in dams was specific to the primary purpose, or purposes, for which dams were built. Flood control dams addressed a national problem on the federal level. The contribution of Arkansans to the flood control debates cannot be considered separately from the efforts being made by flood control proponents from Ohio, Mississippi, Louisiana, and all the other states subject to flooding by the Mississippi River. Water supply dams were a local improvement and were considered in the press and in technical reports with other civic improvements such as electrification, sewer systems, paved streets, and street railways. Recreation dams and their impounded reservoirs were one of the amenities tourists expected to find in public parks and recreation areas, along with such other facilities as baseball diamonds, picnic tables, camping areas, or boat docks. Irrigation dams are an agricultural concern, and often very local in nature.

The literature and sources on dams is likewise specific to their primary purpose. Literature on flood control dams, for example, does not particularly discuss water supply dams, at least not until after the Flood Control Act of 1944 added water supply as one of the purposes of multiple-purpose dams. Flood control was such a major concern for all areas of the nation

that local and congressional consideration and federal construction of flood control measures were followed closely in the contemporary press. The amount of information that can be found in the U. S. Army Corps of Engineers reports on the Mississippi River and its tributaries is just as extensive and can be overwhelming. A large body of historical literature has been produced on flood control, examining the subject from the perspective of federal involvement, engineering, the role of the U. S. Army Corps of Engineers, and the environmental repercussions of controlling the rivers. There is little in the way of primary sources and government documents that has not found its way into flood control studies by Mary Rathburn, Martin Ruess, Karen O'Neill, John Barry, and others. The massive system of flood control dams, levees, and floodways on the Mississippi is the second largest federal infrastructure program after the federal highway system, so it is little wonder it has received so much attention.

The literature on hydroelectric dams tends to cross into studies of rural electrification, federal regulation of public utilities, conservation of natural resources, and regional planning, especially during the Progressive and New Deal eras. During the Progressive era, electrification was an urban concern, one of the services city governments were expected to provide, either through contracts with private utilities or through publicly-owned utilities. Water supply was the same, a city service urban residents expected of their local government. Electricity and water supply became the concern of the federal government with the authorization and construction of the large, multiple-purpose dams of the New Deal era. Literature on both these subjects tends to be specific to one era or the other. Discussions of the development of hydroelectric power can be found in studies of water power, such as *Water Power: A History of Industrial Power in the United States* by Louis Hunter, or in studies of rural electrification, such as *Electricity for Rural America: The Fight for the REA* by D. Clayton Brown.

There is actually very little in the way of historical studies on the development of water supply. The primary source of information for water supply systems during the Progressive era can be found in contemporary technical manuals and journals. The most comprehensive history of water supply can be found in Martin Melosi's *The Sanitary City*, which also discusses the development of sewer systems. Beyond the manuals, journals, and Melosi's study, the best source of information on water supply is local newspapers and county histories. Municipalities were proud of their water supply systems, so mention of them was usually included in the chapters on civic improvements in local history publications.

Information on recreation dams is to be found in literature on tourism, recreation, fishing, and studies of federal agencies like the Civilian Conservation Corps and U. S. Fish and Wildlife Service. The only other publication found that mentions pretty much all the dam impoundments in Arkansas is Keith Sutton's book on fishing, *Fishing Arkansas*. Sutton has surely visited, and fished at, every public lake in Arkansas. Which brings up the problem of finding any information on the 853 private dams in Arkansas. These have to be researched individually, with the first difficulty being in locating the owner of the dam. While the NID gives the owner's name, it does not provide contact information, and the information provided can be obsolete. For example, Joe Maxey is listed as the owner of Mill Pond Dam, but Joanne Sutton is the actual current owner. For the most part, this study does not include information on private dams due to the amount of time necessary to locate dam owners through public records.

In the end, this study is more of a survey of Arkansas dams and a discussion of the social, environmental, and economic forces that led to their construction. It does not provide any general conclusions as to why dams were built outside of their specific purpose. But hopefully it broadens the discussion, and draws attention to the many types and purposes of dams other than

the big flood control dams. Especially since water supply and recreation dams have contributed so much to the geographic and environmental changes that have occurred in Arkansas over the past 130 years.

THE NATIONAL INVENTORY OF DAMS DATABASE (NID)

Much of the foregoing research was an experiment in using the National Inventory of Dams (NID) as a primary source of information on dams in Arkansas. The NID is an electronic database of all dams in the United States that meet at least one of the following criteria:

- 1) High hazard classification - loss of one human life is likely if the dam fails,
- 2) Significant hazard classification - possible loss of human life and likely significant property or environmental destruction,
- 3) Equal or exceed 25 feet in height and exceed 15 acre-feet in storage,
- 4) Equal or exceed 50 acre-feet storage and exceed 6 feet in height.

The NID is managed and maintained by the U. S. Army Corps of Engineers. A brief history of the NID is given on its website, “Congress authorized the Corps to inventory dams in the United States with the National Dam Inspection Act of 1972. The NID was first published in 1975.” To query the database, “you must request a username and password” from the NID Data Team. The database is periodically updated, most recently in February, 2013. Twenty two Arkansas dams were added to the database at that time. Data is gathered from “the most reliable data sources, which are the many federal and state government dam construction and regulation offices.”¹ Arkansas’s state office is the Arkansas Natural Resources Commission.

As a non-government user, I can create an interactive report, sort, and search the NID database, but I cannot download data. Table 1 lists the primary datafields that I used in writing this paper. Using the NID database, I can compile all the specifications on any dam – height, length, storage capacity, surface area – except cost. I generally chose not to include this type of information in my narrative, unless using it to make a comparison or some other point, because the data is so readily available from this source, and from specific dam web sites.

¹ Corps Map: National Inventory of Dams website. Accessed on average once a week for the past year. When I started this project, there were 1229 Arkansas dams listed on the NID; now there are 1251.

The NID database made it possible to identify many of the dams mentioned here. The Corps of Engineers dams are obvious features on the landscape. A relatively small municipal water supply dam is not. That the NID gives a “year completed” date made it possible to narrow the scope of my research to 1836-1945.

There are problems with the database. The most obvious is missing or inaccurate data. For example, the database does not list a primary purpose for Beaver Lake Dam and Bull Shoals Dam, two important Corps of Engineers flood control dams. Ownership information is sometimes inaccurate or obsolete. But the data has generally been reliable, and it has been an indispensable sorting and organizing tool. Tables 2, 3, and 4 are examples of the kinds of data that can be compiled using the NID database.

TABLES

TABLE 1

Dam Name	
Other Dam Name	
NID ID	
Inspection Date	
Owner Type	
Options are:	
Federal	
State	
Local Government	
Public Utility	
Private	
Owner Name	
Dam Height (Ft.)	
Dam Length (Ft.)	
Surface Area	
Storage (Max and official)	
Primary Purpose	
Options are:	
Irrigation	Fish and Wildlife Pond
Hydroelectric	Debris Control
Flood Control	Tailings
Navigation	Grade Stabilization
Recreation	Other
Fire Protection, Stock, Or Small Farm Pond	
All Purposes (any combination of the above)	
Dam Type	
Options are:	
Earth	Arch
Rockfill	Concrete
Gravity	Masonry
Buttress	Other
River	
County	
State	
Year Completed	

TABLE 2: Distribution of Dams by County, 1836-2013

	water supply	irrigation	recreation	flood control	fire protection	fish and wildlife	tailings	debris control	other	hydroelectric	navigation	none given	total
no county									1				1
Arkansas	3	24	32	5		4			2		2		72
Ashley		1	7						1		1		10
Baxter			4	1								1	6
Benton			15	1		1			3				20
Boone			1						1				2
Bradley			3		3								6
Calhoun	2		4		1						1		8
Carroll			8	1								2	11
Chicot			5	2									7
Clark	1	1	6	3						1			12
Clay			10										10
Cleburne			12	2		1			4				19
Cleveland	2	1	5						1				9
Columbia	2	1	6	1	6				1				17
Conway	2	1	10	7	1	11			7		1		40
Craighead		1	7	19	1								28
Crawford	2	2	7	3	1					1			16
Crittenden			1										1
Cross			8	7									15
Dallas			3										3
Desha			2								1		3
Drew		3	5	2									10
Faulkner	1	6	14	3	11				3		1		39
Franklin	2	2	3	12	1						1		21
Fulton			22			2			1				25
Garland	9	1	16		2		1		3	2			34
Grant			8						1				9
Greene			8	4									12
Hempstead	2	2	11	13	2				3				33
Hot Spring	3		2	1						1			7
Howard	2	1	5	3	1		3						15
Independence		1	6	1	1					3			12

TABLE 2: Distribution of Dams by County, 1836-2013 (con't.)

	water supply	irrigation	recreation	flood control	fire protection	fish and wildlife	tailings	debris control	other	hydroelectric	navigation	none given	total
Izard			7										7
Jackson			2										2
Jefferson			20	1		1			3		3		28
Johnson			5			1							6
Lafayette		1	8		1								10
Lawrence			3	13					1			1	18
Lee			1			1							2
Lincoln		1	9										10
Little River	3	1	2	3	3				2				14
Logan	4	1	4	12		2			1				24
Lonoke		8	13						2				23
Madison	1			1		1			1				4
Marion													
Miller	2		22	1	2								27
Mississippi													
Monroe		3	2										5
Montgomery		3	2	2		1							8
Nevada	2		8										10
Newton			5						1				6
Ouachita	1	1	14		2								18
Perry			12	12					2				26
Phillips			2			1							3
Pike	1		3	3		1							8
Poinsett			9	25									34
Polk	2		15	1	3				1				22
Pope	1	2	4	9					2				18
Prairie	2	10	6	1									19
Pulaski	9	2	64	2	10	2			4		2		95
Randolph			11	7	1				1				20
Saline	7	1	36		3				6			3	56
Scott	1		5	15	1					1			23
Searcy			2										2
Sebastian		1	13		2	2		1			1		20

TABLE 2: Distribution of Dams by County, 1836-2013 (con't.)

	water supply	irrigation	recreation	flood control	fire protection	fish and wildlife	tailings	debris control	other	hydroelectric	navigation	none given	total
Sevier			4	6	3								13
Sharp			19	2	2								23
St. Francis		1	8										9
Stone		2	3										5
Union			13		1						2		16
Van Buren		1	4	5					1				11
Washington		3	13	4		2			1				23
White	1	4	24	1		1			3				34
Woodruff													
Yell	1	3	5	5					1		1		16
	71	97	658	222	65	35	4	1	65	9	17	7	1251
Percent of total	6%	8%	54%	18%	5%	3%	0%	0%	5%	1%	1%	1%	102%

TABLE 3: Distribution of Dams by County, 1836-1945

	water supply	irrigation	recreation	flood control	fire protection	fish and wildlife	tailings	debris control	other	hydroelectric	navigation	none given	total
no county									1				1
Arkansas			1	1									2
Ashley											1		1
Baxter				1									1
Benton			2										2
Boone													0
Bradley			1										1
Calhoun	2		2								1		5
Carroll			3										3
Chicot			1										1
Clark			2										2
Clay													0
Cleburne													0
Cleveland													0
Columbia													0
Conway			2										2
Craighead					1								1
Crawford	1												1
Crittenden													0
Cross													0
Dallas			1										1
Desha													0
Drew													0
Faulkner				1	2								3
Franklin			1										1
Fulton			1			1							2
Garland	3		1							1			5
Grant									1				1
Greene													0
Hempstead									1				1
Hot Spring										1			1
Howard	1												1
Independence										3			3

TABLE 3: Distribution of Dams by County, 1836-1945 (con't.)

	water supply	irrigation	recreation	flood control	fire protection	fish and wildlife	tailings	debris control	other	hydroelectric	navigation	none given	total
Izard													0
Jackson													0
Jefferson			2			1							3
Johnson													0
Lafayette													0
Lawrence			1										1
Lee			1			1							2
Lincoln			1										1
Little River													0
Logan	1		1			2							4
Lonoke			2										2
Madison													0
Marion													0
Miller													0
Mississippi													0
Monroe													0
Montgomery													0
Nevada			2										2
Newton													0
Ouachita			3										3
Perry			1	1									2
Phillips						1							1
Pike	1												1
Poinsett													0
Polk	1		2										3
Pope			1										1
Prairie	1	2											3
Pulaski	2		15		2								19
Randolph													0
Saline	2		5										7
Scott	1												1
Searcy													0
Sebastian			2										2

TABLE 3: Distribution of Dams by County, 1836-1945 (con't.)

	water supply	irrigation	recreation	flood control	fire protection	fish and wildlife	tailings	debris control	other	hydroelectric	navigation	none given	total
Sevier				1									1
Sharp													0
St. Francis													0
Stone			1										1
Union			6										6
Van Buren													0
Washington			1			1							2
White													0
Woodruff													
Yell			1	1									2
	16	2	66	6	5	7	0	0	3	5	2	0	112

TABLE 4: Distribution of Dams by Year Completed, 1836-1945

	1836-1889	1890-1899	1900-1909	1910-1919	1920-1929	1930-1939	1940-1945	Totals
no county		1						1
Arkansas						1	1	2
Ashley				1				1
Baxter							1	1
Benton				1		1		2
Boone								0
Bradley							1	1
Calhoun				1			4	5
Carroll		1				1	1	3
Chicot							1	1
Clark				1		1		2
Clay								0
Cleburne								0
Cleveland								0
Columbia								0
Conway			1				1	2
Craighead							1	1
Crawford						1		1
Crittenden								0
Cross								0
Dallas							1	1
Desha								0
Drew								0
Faulkner						1	2	3
Franklin						1		1
Fulton	1					1		2
Garland	1		1		1	2		5
Grant			1					1
Greene								0
Hempstead							1	1
Hot Spring					1			1
Howard					1			1
Independence			3					3

TABLE 4: Distribution of Dams by Year Completed, 1836-1945 (con't.)

	1836-1889	1890-1899	1900-1909	1910-1919	1920-1929	1930-1939	1940-1945	Totals
Izard								0
Jackson								0
Jefferson							3	3
Johnson								0
Lafayette								0
Lawrence							1	1
Lee						2		2
Lincoln						1		1
Little River								0
Logan					1	3		4
Lonoke							2	2
Madison								0
Marion								0
Miller								0
Mississippi								0
Monroe								0
Montgomery								0
Nevada							2	2
Newton								0
Ouachita					1		2	3
Perry						2		2
Phillips						1		1
Pike				1				1
Poinsett								0
Polk					1	2		3
Pope				1				1
Prairie						1	2	3
Pulaski					4	9	6	19
Randolph								0
Saline				1		2	4	7
Scott							1	1
Searcy								0
Sebastian							2	2

TABLE 4: Distribution of Dams by Year Completed, 1836-1945 (con't.)

	1836-1889	1890-1899	1900-1909	1910-1919	1920-1929	1930-1939	1940-1945	Totals
Sevier			1					1
Sharp								0
St. Francis								0
Stone							1	1
Union				1	4	1		6
Van Buren								0
Washington						1	1	2
White								0
Woodruff								
Yell						1	1	2
Total	2	2	7	8	14	36	43	112
Percent of total	2%	2%	6%	7%	13%	32%	38%	

BIBLIOGRAPHY

INTERVIEWS

- Booth, Charles. Former Field Director, De Soto Area Council, Boy Scouts of America. July 2, 2013.
- Johnson, James E. Former Director, U. S. Fish and Wildlife Co-op, Department of Biological Sciences, University of Arkansas. June 28, 2013.
- Kilgore, Donnie. Volunteer, Garland County Historical Society. June 12, 2013.
- Mullen, Patrick. Director, Prairie County Conservation District. June 11, 2013.
- Pharr, Bobby. Process Superintendent II, Entergy Hydro Operations Support. June 10, 2013.
- Shipley, Jonathan. WTP Lead Operator, Russellville Water & Sewer System. June 11, 2013.
- Sullivan, Ken. Executive Director, Lakewood Property Owners Association. July 2, 2013.
- Sutton, Joanna. Owner, Mill Pond Dam, Pike County. February 19, 2013.

NEWSPAPERS

Arkansas Democrat
Arkansas Gazette
Arkansas Sentinel
Arkansas State Gazette
Baxter Bulletin
Booneville Democrat
Daily Arkansas Gazette
Daily Texarkana Independent
Gurdon Times
Morning Republican
Nashville News
St. Louis Globe-Democrat
Southwest American

UNPUBLISHED MANUSCRIPTS

- Core Family Papers. MC 1380, Special Collections, Mullins Library, University of Arkansas, Fayetteville.
- Ellis, Clyde T., Papers. MS E15 258, Special Collections, Mullins Library, University of Arkansas, Fayetteville.
- Lake Wedington Site Files. The University Museum Collections, University of Arkansas, Fayetteville.
- Moses, C. Hamilton. Unpublished manuscript. MS M852, Special Collections, Mullins Library, University of Arkansas, Fayetteville.
- Office of the Chief of Engineers, Records. Record Group 77, National Archives, College Park.
- Rommel, Harmon Liveright, Papers. MC 605, Special Collections, Mullins Library, University of Arkansas, Fayetteville.

PUBLISHED SOURCES

- Angell, Joseph K., *A Treatise on the Common Law, in Relation to Water-Courses*. Boston: Wills and Lilly, 1824.
- Anderson, Letty Donaldson. *The Diffusion of Technology in the Nineteenth Century American City: Municipal Water Supply Investments*. PhD diss., Northwestern University, 1980.
- Anthony, Isabel Burton, ed. *Garland County, Arkansas: Our History and Heritage*. Hot Springs: Garland County Historical Society and Melting Pot Geneological Society, Publisher, 2009.
- Arkansas Centennial Commission. *Arkansas: A Natural Playground, Rich in Natural Resources*. Little Rock: Arkansas Centennial Commission, c. 1936.
- Arkansas Game and Fish Commission, *A Survey of Arkansas Game*. Little Rock: Arkansas Game and Fish Commission, 1951.
- Arkansas General Assembly. *Journal of the House of Representatives for the 6th session of the General Assembly of the State of Arkansas*. Little Rock: B.J. Borden, 1846.
- . *Journal of the Senate for the 6th session of the General Assembly of the State of Arkansas*. Little Rock: B.J. Borden, 1846.
- Arkansas Historic Preservation Program. "Arkansas Listings in the National Register," *The Arkansas Historical Quarterly* 45, no. 4 (Winter 1986): 342-345.
- . *Carpenter Dam, Hot Springs, Garland County*.
http://www.arkansaspreservation.com/historic-properties/_search_nomination_popup.aspx?id=1462.
- . *Mammoth Spring Dam and Lake, Mammoth Spring, Fulton County*.
http://www.arkansaspreservation.com/historic-properties/_search_nomination_popup.aspx?id=2474.
- . *Rommel Dam, Jones Mill, Hot Spring County*.
http://www.arkansaspreservation.com/historic-properties/_search_nomination_popup.aspx?id=1948.
- . *Ruddell Mill Site, Address Restricted, Independence County*.
http://www.arkansaspreservation.com/historic-properties/_search_nomination_popup.aspx?id=2349.
- . *Spring Mill, Batesville Vic., Independence County*.
http://www.arkansaspreservation.com/historic-properties/_search_nomination_popup.aspx?id=1539.

- . *Wingmead, Roe Vic., Prairie County*. http://www.arkansaspreservation.com/historic-properties/_search_nomination_popup.aspx?id=2574
- Arkansas Natural Resources Commission. *Water Law in Arkansas*. Little Rock: Arkansas Natural Resources Commission, 1988.
- Arkansas Public Service Commission. “Commission History.” <http://www.apscservices.info/commission-history.asp> (accessed May 17, 2013).
- Arkansas Soil and Water Conservation Commission. *Arkansas State Water Plan: Lakes of Arkansas*. Little Rock: Department of Commerce, 1981.
- Arkansas State Planning Board. *Arkansas Water Resources*. Little Rock: State Capital, 1939.
- Arnold, Joseph L. *The Evolution of the 1936 Flood Control Act*. Fort Belvoir, Virginia: Office of History, U.S. Army Corps of Engineers, 1988.
- Arnold, Morris S. “Indians and Immigrants in the Arkansas Colonial Era,” in *Arkansas: A Narrative History*. Fayetteville: The University of Arkansas Press, 2002.
- Arnold, Morris S. “The Relocation of Arkansas Post to Ecores Rouges in 1779,” *The Arkansas Historical Quarterly* 42, no. 4 (Winter 1983): 317-331.
- . *Unequal Laws Unto a Savage Race: European Legal Traditions in Arkansas, 1686-1836*. Fayetteville: The University of Arkansas Press, 1985.
- Audubon Arkansas. “Fourche Creek Information.” <http://www.fourchecreek.org/Information.html> (accessed August 13, 2011).
- Audubon, John James, *Selected Journals and Other Writings*, Ben Forkner, ed., New York: Penguin Books, USA, Inc., 1996.
- Baker, M. N. *The Quest for Pure Water: The History of Water Purification From the Earliest Records to the Twentieth Century*. New York: The American Water Works Association, Inc., 1949.
- . “Water-Works” in *Municipal Monopolies: A Collection of Papers by American Economists and Specialists*, ed. Edward W. Bemis. New York: Thomas Y. Crowell & Company, 1899.
- Banks, Wayne. *History of Yell County, Arkansas*. Van Buren, AR: The Press-Argus, 1959.
- Barrett, Jay A. *Evolution of the Ordinance of 1787*. New York: Arno Press, 1891 (reprinted in 1971).

- Barry, John M. *Rising Tide: The Great Mississippi Flood of 1927 and How It Changed America*. New York: Simon & Schuster, 1997.
- Bauer, Jack K. *A Maritime History of the United States*. Columbia, South Carolina: University of South Carolina Press, 1988.
- Beach, G. E. "Should Storage Reservoirs Be Open or Closed?" *Proceedings of the Annual Convention of the American Water Works Association* 7, 74-82. Hannibal, MO: Standard Printing Co., 1887.
- Bellamy, E. C. "Mammoth Spring Hydroelectric Plant," *Electrical Review and Western Electrician* 68, no. 4 (January 22, 1916): 144-145.
- Benedict, Russell W. "Story of an Early Settlement in Central Arkansas," *The Arkansas Historical Quarterly*, ed. Worley, Ted, 10, no. 2 (Summer 1951): 117-137.
- Bennett, Richard and John Elton. *History of Corn Milling, Vol. II: Watermills and Windmills*. New York: Burt Franklin, 1898 (reprinted USA 1980).
- Berkman, Richard L. and W. Kip Viscusi, *Damming the West: Ralph Nader's Study Group Report on the Bureau of Reclamation*. New York: Grossman Publishers, 1973.
- Berry, Trey, Pam Beasley, and Jeanne Clements, eds. *The Forgotten Expedition, 1804-1805: The Louisiana Purchase Journals of Dunbar and Hunter*. Baton Rouge, Louisiana: Louisiana State University Press, 2006.
- Billington, David P. and Donald C. Jackson. *Big Dams of the New Deal Era: A Confluence of Engineering and Politics*. Norman: University of Oklahoma Press, 2006.
- Binnie, Geoffrey. "The Evolution of British Dams," in *Dams*, ed. Donald Jackson. Aldershot: Ashgate Publishing Limited, 1997.
- Biographical and Historical Memoirs of Northeast Arkansas*. Chicago: The Goodspeed Publishing Co., 1889.
- Biographical and Historical Memoirs of Pulaski, Jefferson, Lonoke, Faulkner, Grant, Saline, Perry, Garland and Hot Springs Counties, Arkansas*. Chicago: The Goodspeed Publishing Co., 1889.
- Biographical and Historical Memoirs of Southern Arkansas*. Chicago: The Goodspeed Publishing Co., 1890.
- Biographical and Historical Memoirs of Western Arkansas*. Chicago: The Southern Publishing Company, 1891.

- Bird, Ronald. *Where Ozark Tourists Come From and Their Impact on Local Economy*. Columbia, MO: Missouri Agricultural Experiment Station and Farm Economics, Division of Economic Research Service, U.S. Department of Agriculture, Cooperating, 1962.
- Blake, Nelson M. *Water for the Cities: A History of the Urban Water Supply Problem in the United States*. Syracuse, NY: Syracuse University Press, 1956.
- Blevins, Bill Dwayne, ed. *Along the Osage Trace: "Schoolcraft in the Ozarks."* Mountain Home: the author, 2001.
- Blevins, Brooks. *Hill Folks: A History of Arkansas Ozarkers and Their Image*. Chapel Hill, NC: The University of North Carolina Press, 2002.
- Board of Engineers for Rivers & Harbors. *Report of Testimony and Statements on Blakely Mountain Dam*. Washington, D.C.: War Department, 1938.
- Bolton, S. Charles. *Arkansas, 1800-1860: Remote and Restless*. Fayetteville: The University of Arkansas Press, 1998.
- Borneman, Walter R. *Polk: The Man Who Transformed the Presidency and America*. New York: Random House, 2008.
- Bourne, Edward Gaylord, ed. *Narratives of the Career of Hernando de Soto in the Conquest of Florida*, Vols. I and II, trans. Buckingham Smith. New York: Allerton Book Co., 1904.
- Bowman, Steve and Steve Wright. *Arkansas Duck Hunter's Almanac*. Fayetteville: Ozark Delta Press, 1998.
- Brockman, C. Frank, Lawrence C. Merriam, Jr., William R. Catton, Jr., and Barney Dowdle. *Recreation Use of Wild Lands*, 3rd edition. New York: McGraw-Hill Book Company, 1979.
- Brown, D. Clayton. *Electricity for Rural America: The Fight for the REA*. Westport, Connecticut: Greenwood Press, 1980.
- Brown, James A., Robert E. Bell, and Don G. Wyckoff. "Caddoan Settlement Patterns in the Arkansas River Drainage," in *Mississippian Settlement Patterns*, ed. Bruce D. Smith. New York: Academic Press, 1978.
- Burggraf, Frank and Karen Rollet. *Manmade Elements in Natural Settings: The CCC in Arkansas*. S.I.: s.n., c. 1989.
- Burgis, Mary J. and Pat Morris. *The Natural History of Lakes*. Cambridge: University of Cambridge Press, 1987.

- Burkett, Bennie Frownfelter, ed. *That's the Way it Was on the Grand Prairie*. Stuttgart, Arkansas: Farmers and Merchants Bank of Stuttgart, 1976.
- Campbell, Charles H. "Dam Failures/Reservoir Failures," *Report of the Proceedings of the Twenty-Second Annual Meeting of the American Water Works Association*. Hannibal, MO: Standard Printing Co.?, 1902.
- Campbell, William S. *One Hundred Years of Fayetteville, 1828-1928*. Fayetteville: Washington County Historical Society, c. 1928.
- Carter, Deane G. and Kyle Engler. *Problems of Water Resources for Rice Irrigation*. Agricultural Experiment Station Bulletin No. 371. Fayetteville: University of Arkansas, 1939.
- Cech, Thomas V. *Principles of Water Resources: History, Development, Management, and Policy*. New York: John Wiley & Sons, Inc., 2003.
- Chestnutt, E. F. "Little Rock Gets Electric Lights," *The Arkansas Historical Quarterly* 42, no. 3 (Autumn 1983): 239-253.
- Clark, James W. *The Tourist Industry in Arkansas*. MA thesis, University of Arkansas, 1938.
- Clark, John. *A History of Arkansas Power & Light Co.* PhD diss., Harvard University, 1960.
- Clayton, B. S. *Cost of Pumping and Duty of Water For Rice on the Grand Prairie of Arkansas*. Agricultural Experiment Station Bulletin No. 261. Fayetteville: University of Arkansas, 1931.
- Clayton, Lawrence A., Vernon James Knight, Jr., and Edward C. Moore. *The De Soto Chronicles: The Expedition of Hernando De Soto to North America in 1539-1543*, Vol. II. Tuscaloosa: The University of Alabama Press, c. 1993.
- Coleman, Roger E. *The Arkansas Post Story: Arkansas Post National Monument*. Santa Fe, NM: Southwest Cultural Resources Center, 1987.
- Compton, Neil. *The Battle for the Buffalo River: The Story of America's First National River*. Fayetteville: The University of Arkansas Press, 1992.
- Conover, Milton. *The Federal Power Commission: Its History, Activities and Organization*. Baltimore: The Johns Hopkins Press, 1923.
- "Construction News." *Electrical World* 79, no. 2 (January 14, 1922): 114.
- "Construction News," *Electrical World* 79, no. 15 (April 15, 1922): 763-764.

- Coolidge, Calvin. *Fifth Annual Message*. December 6, 1927. The American Presidency Project. <http://www.presidency.ucsb.edu/ws/?pid=29568> (accessed July 4, 2013).
- Cottier, John W. and Gregory A. Waselkov. "Environmental Parameters of Mississippian Settlement Strategy," *The Missouri Archaeologist* 38 (December 1977): 13-48.
- Crumpler, Gus H. "Reminiscences About the Old Lowry Water Mill That Is No More," *The Ozarks Mountaineer* 8, no. 11 (December 1960): 5.
- Culver, John C. and John Hyde. *American Dreamer: A Life of Henry A. Wallace*. New York: W. W. Norton & Company, 2000.
- Daffin, Jasper O. *The Story of Man's Quest for Water*. Champaign, IL: The Garrard Press, 1939.
- Dale, E. E. "Arkansas: The Myth and the State." *The Arkansas Historical Quarterly* 12, no. 1 (Spring 1953): 8-29.
- Dalton, Lawrence. "Fourche Dumas Creek and the 'Settlement of Fourche de Thomas'," *The Arkansas Historical Quarterly* 4, no. 4 (Winter 1945): 353-362.
- DeMaio, Joanne. *The Adair Site: Ouachita River Valley Relations Through Ceramic Analysis*. MA thesis, University of Arkansas, 2013.
- Dewhurst, J. Frederick and Associates. *America's Needs and Resources: A Twentieth Century Fund Survey which includes estimates for 1950 and 1960*. New York: Twentieth Century Fund, 1947.
- . *America's Needs and Resources: A New Survey*. New York: Twentieth Century Fund, 1955.
- Division of Agriculture, University of Arkansas. Public Policy Center Publication No. 102. Fayetteville: UA Cooperative Extension Service Printing Services, 2008.
- . Public Policy Center Publication No. 109. Fayetteville: UA Cooperative Extension Service Printing Services, 2008.
- Doty, Don Darrel. *The Justification for Including Recreational Benefits in Federal Water Project Benefit-Cost Analysis: An Empirical Test*. PhD diss., University of Arkansas, 1963.
- Dougan, Michael B. *Arkansas Odyssey: The Saga of Arkansas from Prehistoric Times to Present*. Little Rock, Arkansas: Rose Publishing Company, Inc., 1994.
- Dunbar, William. *The Exploration of the Red, the Black, and the Washita Rivers*. Boston and New York: Houghton, Mifflin & Company, 1904.

- Duncan, David Ewing. *Hernando De Soto: A Savage Quest in the Americas*. New York: Crown Publishers, Inc., 1995.
- Dye, David H. "Reconstruction of the de Soto Expedition Route in Arkansas: the Mississippi Alluvial Plain," in *The Expedition of Hernando De Soto West of the Mississippi, 1541-1543*, eds. Gloria A. Young and Michael P. Hoffman. Fayetteville: The University of Arkansas Press, 1993.
- Early, Ann. "Finding the Middle Passage: The Spanish Journey from the Swamplands to Caddo Country," in *The Expedition of Hernando de Soto West of the Mississippi, 1541-1543*, eds. Gloria A. Young and Michael P. Hoffman. Fayetteville: The University of Arkansas Press, 1993.
- Early, Ann. "Prehistoric Culture History," in *Human Adaptation in the Ozark and Ouachita Mountains*. Fayetteville: Arkansas Archeological Survey, 1990.
- Eccles, William J. *France in America*. New York: Harper & Row, Publishers, 1972.
- Ellett, Charles, Jr. *The Mississippi and Ohio Rivers: Containing Plans for the Protection of the Delta from Inundation; and Investigations of the Practicability and Cost of Improving the Navigation of the Ohio and Other Rivers by Means of Reservoirs*. Philadelphia: Lippincott, Grambo, and Co., 1853.
- Ellis, Clyde T. *A Giant Step*. New York: Random House, 1966.
- Elliott, Blanche H. "The Water Mills of War Eagle Go Back to 1838," *The Ozark Mountaineer* 7, no. 5, (May 1959): 9.
- Fair, James R. *The North Arkansas Line: The Story of the Missouri & North Arkansas Railroad*. Berkeley, CA: Howell-North Books, 1969.
- Farnham, Henry Philip. *The Law of Waters and Water Rights*. Rochester, NY: The Lawyers' Co-operative Publishing Company, 1904.
- Faye, Stanley. "The Arkansas Post of Louisiana: French Domination," *The Louisiana Historical Quarterly* 26, no. 3 (July 1943): 633-721.
- . "The Arkansas Post of Louisiana: Spanish Domination." *The Louisiana Historical Quarterly* 27, no. 3 (July 1944):
- Featherstonhaugh, George W. *Geological Report of an Examination Made in 1834 of the Elevated Country Between the Missouri and Red Rivers*. Washington, D.C.: Gales and Seaton, 1895.
- Federal Power Commission. *Eighth Annual Report of the Federal Power Commission*. Washington, D.C.: Government Printing Office, 1928.

- . *First Annual Report of the Federal Power Commission*. Washington, D.C.: Government Printing Office, 1921.
- . *Power Market Study: Projects on Grand (Neosho) River, Oklahoma and White River, Missouri and Arkansas*. Washington, D.C.: Government Printing Office, 1937.
- . *Twentieth Annual Report of the Federal Power Commission*. Washington D.C.: Government Printing Office, 1941.
- . *Second Annual Report of the Federal Power Commission*. Washington, D.C.: Government Printing Office, 1922.
- “Federal Power Commission Issues Licenses and Permits.” *Electrical World* 79, no. 13 (April 1, 1922): 649.
- Feldman, Jay. *When the Mississippi Ran Backward: Empire, Intrigue, Murder, and the New Madrid Earthquakes*. New York: Free Press, 2005.
- Ferguson, Jim G. *Playgrounds in Arkansas: A Tourist’s Guide to the Mountains, Lakes & Streams of a Nearby Vacation Land*. Little Rock: Bureau of Mines, Manufactures and Agriculture, c. 1924.
- Fernandez de Oviedo y Valdés, Gonzalo. “A Narrative of de Soto’s Expedition Based on the Diary of Rodrigo Ranjel, His Private Secretary,” in *Narratives of the Career of Hernando de Soto in the Conquest of Florida, as told by a Knight of Elvas and in a Relation by Luys Hernandez de Biedma, Factor of the Expedition*, ed. Edward Gaylord Bourne, trans. by Buckingham Smith, vol. 2. New York: Allerton Book Co., 1922.
- Fidalgo of Elvas. “True Relation of the Vicissitudes that Attended the Governor Don Hernando de Soto,” in *Narratives of the Career of Hernando de Soto in the Conquest of Florida, as told by a Knight of Elvas and in a Relation by Luys Hernandez de Biedma, Factor of the Expedition*, ed. Edward Gaylord Bourne, trans. by Buckingham Smith, vol. 1. New York: Allerton Book Co., 1922.
- Fisher-Carroll, Rita Louise. *Environmental Dynamics of Drought and Its Impact on Sixteenth-Century Indigenous Populations in the Central Mississippi Valley*, PhD diss., University of Arkansas, 2001.
- Fisher-Carroll, Rita and Robert C. Mainfort, Jr. “Taxa Represented by Fish Effigy Ceramic Vessels in the Midsouth,” *Southeastern Archaeology* 31, no. 1 (Summer, 2012): 1-16.
- “A \$5,000,000 Hydro-Electric Development in Arkansas,” *Engineering and Contracting* 45 (June 28, 1916): 594.
- Flores, Dan L., ed. *Southern Counterpart to Lewis & Clark: The Freeman & Custis Expedition of 1806*. Norman, Oklahoma: University of Oklahoma Press, 1984.

- Frank, Arthur DeWitt. *The Development of the Federal Program of Flood Control on the Mississippi River*. New York: Columbia University Press, 1930.
- Fredrickson, Madelynn P. *The Life and Time of Birdsill Holly*. MA thesis, State University College at Buffalo, 1996.
- Fritz, Gayle J. "Prehistoric Ozark Agriculture: The University of Arkansas Rockshelter Collections." PhD diss., University of North Carolina at Chapel Hill, 1986.
- Fuller, Myron L. *Bulletin 494: The New Madrid Earthquake*. Washington, D.C.: Government Printing Office, 1912.
- Fuller, Myron L. *The New Madrid Earthquake*, reprint edition. Washington, D.C.: U.S. Government Printing Office, 1966.
- Garcilaso de la Vega. *La Florida*, in *The De Soto Chronicles: The Expedition of Hernando De Soto to North America in 1539-1543*, Vol. II. Eds. Lawrence A. Clayton, Vernon James Knight, and Edward C. Moore. Tuscaloosa, AL: The University of Alabama Press, 1993.
- Gates, John. "Ground Water Irrigation in the Development of the Grand Prairie Rice Industry, 1896-1950," *Arkansas Historical Quarterly* 64, no. 4 (Winter 2005): 395-413.
- Gavere, Marguerite Jane. *Tourist Promotion in Arkansas*. MA thesis, University of Arkansas, 1939.
- Gay, William. *From Family Farm to Big Business: the Evolution of the Arkansas County Rice Industry, 1920-1994*. MA thesis, University of Arkansas, Fayetteville, 1998.
- Gerstaecker, Frederick. *Wild Sports in the Far West*. Boston: Crosby, Nichols and Company, 1859.
- Ginsberg, Stephen. *History of Fire Protection in New York City, 1800-1842*. PhD diss., New York University, 1968.
- Gladson, W. N. *Water Powers of Arkansas: A Preliminary Report on White River and Some of Its Tributaries*. Little Rock: The Geological Survey of Arkansas, 1911.
- Green, D. Brooks. "Irrigation Expansion in Arkansas: A Preliminary Investigation," *The Arkansas Historical Quarterly* 45, no. 3 (Autumn 1986): 261-268.
- Guccione, M. J., Robert H. Lafferty III, and L. Scott Cummings. "Environmental Constraints of Human Settlement in an Evolving Holocene Alluvial System, The Lower Mississippi Valley," *Geoarchaeology* 3, no. 1 (1988): 65-84.
- Gudmestad, Robert H. *Steamboats and the Rise of the Cotton Kingdom*. Baton Rouge: Louisiana State University Press, 2011.

- Hale, Harrison. "City Water Supplies in Arkansas," *Journal of the American Water Works Association* 17, (1927): 261-262.
- Hall, Orville J. *Rice Farming in Arkansas With Financial Results For 1927*. Agricultural Experiment Station Bulletin No. 260. Fayetteville: University of Arkansas, 1931.
- Hanor, Bert. "Hot Springs Water System, 1881-1971," *The Record* 13, ed. Inez E. Cline and Bobbie J. McLane. Hot Springs: Hot Springs-Garland County Historical Society, 1972.
- Harrison, Robert W. and Walter M. Kollmorgen. "Land Reclamation in Arkansas Under the Swamp Land Grant of 1850," *The Arkansas Historical Quarterly* 6, no. 4 (Winter 1947): 369-429.
- Harvey, Ernest C. *The Arkansas Tourist Industry*. Fayetteville: Institute of Science and Technology, University of Arkansas, 1950.
- Hay, Duncan. *Hydroelectric Development in the United States, 1880-1940*. Washington, D.C.: Edison Electric Institute, 1991.
- Helmer, Joel William. *Float Trips, Dams, and Tailwater Trout: An Environmental History of the White River of Northern Arkansas, 1870-2004*. PhD diss., Oklahoma State University, 2005.
- Herndon, Dallas T., ed. *Annals of Arkansas, 1947: A Narrative Historical Edition*. Hopkinsville, KY: Historical Record Association, c. 1947.
- Hess, Ralph. "The Beginnings of Irrigation in the United States," *The Journal of Political Economy* 20, no. 8 (October 1912): 807-833.
- Hill, Veronica Jo. *A Case Study of the Wedington Project: A Description of a Public Park/Interdisciplinary Learning/Research Laboratory Through the Perceptions of its Stakeholders*. EdD diss., University of Arkansas, 2005.
- History of Benton, Washington, Carroll, Madison, Crawford, Franklin, and Sebastian Counties, Arkansas*. Chicago: The Goodspeed Publishing Co., 1889.
- Hodge, Scott A. and Gary D. Tasker. *Magnitude and Frequency of Floods in Arkansas*. Little Rock: U.S. Geological Survey, 1995.
- Holcombe, E. A. "Spring Mill," *The Arkansas Historical Quarterly* 20, no. 2 (Summer 1961): 182-186.
- Howard County Heritage Club. *Howard County Heritage: Appreciating the Past, Anticipating the Future*. Dallas, TX: Taylor Publishing Company, 1988

- Howell, Charles and Allan Keller. *The Mill at Philipsburg Manor, Upper Mills and A Brief History of Milling*. Tarrytown, NY: Sleepy Hollow Restorations, 1977.
- Hudson, Charles. *Knights of Spain, Warriors of the Sun: Hernando de Soto and the South's Ancient Chiefdoms*. Athens, GA: The University of Georgia Press, 1997.
- Hull, Clifton E. *Shortline Railroads of Arkansas*. Conway, AR: UCA Press, 1988.
- Humphreys, A. A. and Henry J. Abbot. *Report Upon the Physics and Hydraulics of the Mississippi River*. Washington: Government Printing Office, 1861. Reprinted with additions, 1876.
- Hunter, Louis C. *A History of Industrial Power in the United States, 1780-1930, Volume One: Waterpower in the Century of the Steam Engine*. Charlottesville: University Press of Virginia, 1979.
- Hughes, Michael A. "Wartime Gristmill Destruction in Northwest Arkansas and Military-Farm Colonies," *The Arkansas Historical Quarterly* 46, no. 2, (Summer 1987): 167-186.
- "Hydro-Electric Developments in Arkansas," *Professional Engineer* 14, no. 12 (December 1929): 14-15.
- Ingenthron, Elmo. "The Dubuque – Forsyth Road," *White River Valley Historical Quarterly* 1, no. 6 (Winter 1962): 10.
- "Investment Bankers at Boston," *United States Investor* 31, no. 2 (October 16, 1920): 2516.
- Jackson, Donald C., ed. *Dams: Studies in the History of Civil Engineering*. Aldershot, Hampshire, Great Britain: Ashgate Publishing Limited, 1997.
- James, Edwin. *Account of an Expedition from Pittsburgh to the Rocky Mountains, Vol. II*. Ann Arbor, MI: University Microfilms, Inc., 1966.
- Johnson, Herbert A. *Gibbons v. Ogden: John Marshall, Steamboats, and the Commerce Clause*. Lawrence, Kansas: University Press of Kansas, 2010.
- Jones, Karen R. and John Wills. *The Invention of the Park: Recreational Landscapes From the Garden of Eden to Disney's Magic Kingdom*. Malden, MA: Polity Press, 2005.
- Jones, Ruth Irene. "Ante-Bellum Waterplaces of Arkansas," *The Arkansas Historical Quarterly* 18, No. 3 (Autumn 1959); 213-222.
- Kanneberg, Adolph. "The Financial Relationship between the Municipality and the Water Utility," *Journal of the American Water Works Association* 21, no. 4, (April 1929): 453-464.

- Kennedy, Steele T. "Old Sims, Deep in the Hills, Most Unique of Ozarks Water Mills," *The Ozarks Mountaineer* 7, no. 9 (September 1959): 9.
- . "Whitely Mill Still Stands, Ready to Grind Again," *The Ozarks Mountaineer* 7, no. 7 (July 1959): 13.
- Kerwin, Jerome G. *Federal Water-Power Legislation*. New York: Columbia University Press, 1926.
- Kidder, Tristram R. "Perspectives on the Geoarchaeology of the Lower Mississippi Valley," *Engineering Geology* 45 (1996): 305-323.
- Klippel, Walter E. "The Hearnest Site: A Multicomponent Occupation Site and Cemetery in the Cairo Lowland Region of Southeast Missouri," *The Missouri Archaeologists* 31 (December 1969):
- Lambert, Audrey M. *The Making of the Dutch Landscape: An Historical Geography of the Netherlands*. New York: Seminar Press, Inc., 1990.
- Laymon, Sherry. "Arkansas's Dark Ages: The Struggle to Electrify the State," *The Arkansas Historical Quarterly* 71, no. 3 (Autumn 2012): 283-300.
- Laymon, Sherry. "John McClellan and the Arkansas River Navigation Project," *The Arkansas Historical Quarterly* 69, no. 2 (Summer 2010): 140-169.
- Larson, Olaf F. and Julie N. Zimmerman. "The USDA's Bureau of Agricultural And Sociological Studies of Rural Life and Agricultural Issues, 1919-1953," *Agricultural History* 74, no. 2 (Spring 2000): 227-240.
- Larson, John Lauritz. *Internal Improvement: National Public Works and the Promise of Popular Government in the Early United States*. Chapel Hill: The University of North Carolina Press, 2001.
- Larson, Lewis H., Jr. "Functional Considerations of Warfare in the Southeast During the Mississippi Period," *American Antiquity* 37, no. 3 (July 1972): 383-392.
- Leach, Fred W. "Old Ozark Water Mills – How They Were Built and Operated," *The Ozarks Mountaineer* 8, no. 2 (March 1960): 6.
- Leatherman, Thomas L. *Nimrod Lake: An Archeological Survey of a Reservoir Drawdown*. Fayetteville: Arkansas Archeological Survey, c. 1980.
- Leffel, J. & Co. *The Construction of Mill Dams: Comprising also the building of race and reservoir embankments and head gates, the measurement of streams, gauging of water supply, etc.* Springfield, Ohio: J. Leffel, 1874.

- Leopold, Luna B. and Thomas Maddock, Jr. *The Flood Control Controversy: Big Dams, Little Dams, and Land Management*. New York: The Ronald Press Company, 1954.
- Leslie, James Waller. *The Arkansas Lumber Industry*. MA thesis, University of Arkansas, 1938.
- Leuchtenburg, William E. *Franklin D. Roosevelt and the New Deal, 1932-1940*. New York: Harper & Row, 1963.
- . “Roosevelt, Norris and the “Seven Little TVAs,” *The Journal of Politics* 14, no. 3 (August 1952): 418-441.
- Lewis, R. Barry. *Mississippian Exploitative Strategies: A Southeast Missouri Example*. Columbia, MO: College of Arts and Science, University of Missouri – Columbia and The Missouri Archaeological Society, 1974.
- Linebarger, F. W. *Bella Vista: Nature’s Gem of the Ozarks*. Dallas, TX: Linebarger Brothers, c. 1918.
- Logan County Historical Society. *Logan County: Its History And Its People*. Dallas, TX: Taylor Publishing Company, 1987.
- Lohof, Bruce A., ed. “Herbert Hoover’s Mississippi Valley Land Reform Memorandum: A Document,” *The Arkansas Historical Quarterly* 29, no. 2 (Summer 1970): 112-118.
- Louisiana Legal Archives. *The Civil Codes of Louisiana: Civil Law Commentaries* 1, no. 1 (Winter 2008).
- Lytle, Mrs. J. A. “Scenic Spring Mill, Ninety Years Old, Still Grinds On,” *The Ozarks Mountaineer* 7, no. 10 (October 1959): 5.
- Mackey, Robert R. “Bushwackers, Provosts, and Tories: The Guerrilla War in Arkansas,” in *Guerrillas, Unionists, and Violence on the Confederate Home Front*, ed. Daniel E. Sutherland. Fayetteville: The University of Arkansas Press, 1999.
- Mainfort, Robert C., Jr. “Introduction,” in *Archeological Investigations at Upper Nodena: 1973 Field Season*, ed. Robert C. Mainfort, Jr. Fayetteville: Arkansas Archeological Survey, 2010.
- Masten, Scott E. “Public Utility Ownership in 19th-Cenury America: The ‘Aberrant’ Case of Water,” *The Journal of Law, Economics, & Organization* 27, no. 3 (January 22, 2010): 604-654.
- Mattison, Ray H. *Report on the Historical Investigations of Arkansas Post, Arkansas*. Omaha, Nebraska: National Park Service Region Two, 1957.

- Maury, Dabney. "Water Works Reservoirs," *Journal of the American Water Works Association* 3, 622-627. Baltimore, MD: The Waverly Press, 1916.
- McCall, Edith S. *Conquering the Rivers: Henry Miller Shreve and the Navigation of America's Inland Waterways*. Baton Rouge: Louisiana State University Press, 1984.
- McCarty, Joey. *Civilian Conservation Corps in Arkansas*. MA thesis, University of Arkansas, 1977.
- McElroy, Samuel. "Reservoirs," *Report of the Proceedings of the Eighth Annual Meeting of the American Water Works Association*, 72-77. Hannibal, MO: Standard Printing Co., 1888.
- McKenzie, Evan. *Privatopia: Homeowner Associations and the Rise of Residential Private Government*. New Haven: Yale University Press, 1994.
- McNeill, J. R. *Something New Under the Sun: an Environmental History of the Twentieth-Century World*. New York: W.W. Norton & Company, 2000.
- Melosi, Martin V. *The Sanitary City: Urban Infrastructure in America from Colonial Times to the Present*. Baltimore: The Johns Hopkins University Press, 2000.
- Merritt, Jim and B. Gill Dishongh, Sr. "The Levee System of Desha County, Arkansas," *Programs of the Desha County Arkansas Historical Society* 14 (Spring 1988):
- Mills, Gary B. *Of Men and Rivers: The Story of the Vicksburg District*. Vicksburg, MS: U. S. Army Engineer District, Vicksburg, 1978.
- Mississippi River Commission and U.S. Army Engineer Division, Lower Mississippi Valley. *Flood Control in the Lower Mississippi River Valley*. Vicksburg, Mississippi: U.S. Army Corps of Engineers, 1970.
- Moffatt, Walter. "Transportation in Arkansas, 1819-1840," *The Arkansas Historical Quarterly* 15, no. 3 (Autumn 1956): 187-201.
- Moneyhon, Carl H. *Arkansas and the New South, 1874-1929*. Fayetteville: The University of Arkansas Press, 1997.
- Monkkonen, Eric H. *America Becomes Urban: The Development of U.S. Cities and Towns, 1780-1980*. Berkley and Los Angeles: University of California Press, 1990.
- Moore, Mrs. Caruth S. "Don Draper's Painting of Pioneer Evening Shade Mill," *The Ozarks Mountaineer* 7, no. 1 (December 1958): 9.
- Morrow, Lynn and Linda Myers-Phinney. *Shepherd of the Hills Country: Tourism Transforms the Ozarks, 1880s-1930s*. Fayetteville: The University of Arkansas Press, 1999.

- Morse, Dan F. "The Nodena Phase" in *Nodena: An Account of 90 Years of Archeological Investigation in Southeast Mississippi County, Arkansas*, ed. Dan F. Morse, 97-113. Fayetteville, Arkansas: Arkansas Archeological Survey, 1989.
- Morse, Dan F., and Phyllis A. Morse. "The Spanish Exploration of Arkansas," in *Columbian Consequences: Archaeological and Historical Perspectives on the Spanish Borderlands East*, ed. David Hurst Thomas, vol. 2. Washington, D.C.: Smithsonian Institution Press, c. 1989.
- Morse, Phyllis A. "The Parkin Site and The Parkin Phase," in *Towns and Temples Along the Mississippi*, eds. David H. Dye and Cheryl Anne Cox. Tuscaloosa: The University of Alabama Press, 1990.
- Moses, C. Hamilton. *Memoirs of C. Hamilton Moses*, Vol. 3, Version 2, c. 1963. Unpublished manuscript. Special Collections, Mullins Library, University of Arkansas, Fayetteville.
- National Recreation and Park Association. *County Parks: A Report of a Study of County Parks in the United States*. Washington D.C.: McGrath Publishing Company, 1930.
- Nelson, Grace Benton. "History of the Gurdon Lumber Company (1923-1974)," *The Clark County Historical Journal* 1, no. 2 (Spring 1974): 15-20.
- Nelson, Robert H. *Private Neighborhoods and the Transformation of Local Government*. Washington, D.C.: Urban Institute Press, 2005.
- Nichols, Cheryl G. *Pre-Depression Houses and Outbuildings of 'Edgemont in Park Hill'*. National Register of Historic Places Nomination, National Park Service, March 30, 1992.
- Noel, Roy H. "Private Utility Company is Public Benefactor," *Public Service Magazine* 60 (June 1936): 172-174.
- Nunn, J. B. "Early Days of Camden, Arkansas," *The Arkansas Historical Quarterly* 5, no. 4 (Winter 1946): 330-340.
- Nuttall, Thomas. *Journal of Travels into the Arkansas Territory, During the Year 1819*. Philadelphia: Thos. H. Palmer, 1821. Reprinted 1966.
- Nye, David E. *Electrifying America: Social Meaning of a New Technology, 1880-1940*. Cambridge, MA: MIT Press, 1992.
- Official Map of Little Rock*, comp. by James A. Martin. Little Rock: Arkansas Democrat Co., Publishers, 1893.
- O'Neill, Karen M. *Rivers by Design: State Power and the Origins of U.S. Flood Control*. Durham, NC: Duke University Press, 2006.

- Onuf, Peter S. *Statehood and Union: A History of the Northwest Ordinance*. Bloomington, Indiana: Indiana University Press, 1987.
- Owen, David Dale. *First Report of a Geological Reconnoissance [sic] of the Northern Counties of Arkansas, Made during the Years 1857 and 1858*. Little Rock: Johnson and Yerkes, 1858.
- . *Second Report of a Geological Reconnoissance [sic] of the Middle and Southern Counties of Arkansas, Made during the Years 1859 and 1860*. Philadelphia: C. Sherman and Sons Printers, 1860.
- Owens, Jeffrey Alan. “Holding Back the Water: Land Development and the Origins of Levees on the Mississippi, 1720-1845.” PhD diss., Louisiana State University, 1999.
- Park, J. C. and Irvin Emmert. “The Electric Industry, History of Russellville and Pope County, Arkansas,” in *History of Pope County, Arkansas*. Winston-Salem, N. C.: Pope County Historical Association and Hunter Publishing Company, 1979.
- Patton, F. Fred. *The History of Fort Smith, 1817 through 1992*. Little Rock: Heritage Press, Inc., 1992.
- Penick, James Lal, Jr. *The New Madrid Earthquakes*. Revised Edition, Columbia, Missouri: University of Missouri Press, 1981.
- Pearson, Charles E. “Geomorphology and Prehistoric Settlement Patterns in the Great Bend Region,” in *Contributions to the Archeology of the Great Bend Region of the Red River Valley, Southwest Arkansas*, ed. Frank Schambach and Frank Rackersby. Fayetteville: Arkansas Archeological Survey, 1982.
- Perrottet, Tony. “Birthplace of the American Vacation,” *Smithsonian Magazine* 44, no. 1 (April 2013): 68-75.
- Person, H. L. *Little Waters: A Study of Headwater Streams and Other Little Waters, Their Use and Relations to the Land*. Washington D.C.: Government Printing Office, revised 1936.
- Perttula, Timothy K. “The Long-Term Consequences and Effects of the de Soto Entrada on Aboriginal Caddoan Populations,” in *The Expedition of Hernando De Soto West of the Mississippi, 1541-1543*, ed. Gloria A. Young and Michael P. Hoffman. Fayetteville, Arkansas: The University of Arkansas Press, 1993.
- Pfeifler, Anna Ruth. *River of Conflict: the White River During the Civil War*. MA thesis, University of Arkansas, 2010.
- Phillips, George H., ed. *The Bella Vista Story*. Bella Vista: Bella Vista Historical Society, 1980.

- Phillips, Philip, James A. Ford, and James B. Griffin. *Archaeological Survey in the Lower Mississippi Alluvial Valley, 1940-1947*. Cambridge: The Peabody Museum, 1951.
- Pittman, Captain Philip. *The Present State of the European Settlements on the Mississippi*, ed. Frank Heywood Hodder. Cleveland, OH: The Arthur H. Clark Company, 1906.
- Pope County Historical Association, *History of Pope County, Arkansas*. Winston-Salem, NC: Pope County Historical Association and Hunter Publishing Company, 1979.
- Public Affairs Office, Mississippi River Commission and U.S. Army Engineer Division, Lower Mississippi River Valley, U.S. Army Corps of Engineers, *Flood Control in the Lower Mississippi River Valley*, Vicksburg, MI: U.S. Army Corps of Engineers, 1970.
- Randolph County Museum. *Randolph County History Page*. <http://randolphcomuseum.Org/history.html> (accessed December 31, 2011).
- Rathburn, Mary Yeater. *Castle on the Rock: The History of the Little Rock District, U.S. Army Corps of Engineers, 1881-1985*. Little Rock: U.S. Army Engineer District, Little Rock, 1990.
- Rayburn, Otto Ernest. *The Eureka Springs Story*. Eureka Springs, AR: The Times-Echo Press, 1954.
- . *Rayburn's Ozark Guide* 47 (Winter 1956)
- Reisner, Marc. *Cadillac Desert: The American West and its Disappearing Water*. New York: Penguin Books, 1987.
- Reynolds, Terry S. "Cisterns and Fires: Shreveport, Louisiana, as a Case Study of the Emergence of Public Water Supply Systems in the South," *Louisiana History: The Journal of the Louisiana Historical Association* 22, no. 4 (Fall 1981): 337-367.
- Reuss, Martin. *Designing the Bayous: The Control of Water in the Atchafalaya Basin, 1800-1995*. Alexandria, VA: Office of History, U.S. Army Corps of Engineers, 1998.
- Reuss, Martin and Paul K. Walker. *Financing Water Resources Development: A Brief History*. Washington, D. C.: U. S. Army Corps of Engineers, 1983.
- Rider, William B. "Reservoir Dams," *Report of Proceedings of the Twelfth Annual Meeting of the American Water Works Association*, 57-60. Elmira, NY: Advertiser Association Print, 1892.
- Risjord, Norman K. *Thomas Jefferson*. Madison, WI: Madison House, 1994.
- Robinson, Michael C. *The Mississippi River Commission: An American Epic*. Vicksburg, MI: Mississippi River Commission, U.S. Army Corps of Engineers, 1989.

- Robison, Henry W. and Thomas M. Buchanan. *Fishes of Arkansas*. Fayetteville: The University of Arkansas Press, 1988.
- Rogers, J. Daniel and George Sabo III. "Caddo," in *Handbook of Native American Indians, No. 14: Southeast*, 616-631. Washington, D.C.: Smithsonian Institution, 2004.
- Rollings, Willard H. "Living in a Graveyard: Native Americans in Colonial Arkansas," in *Cultural Encounters in the Early South: Indians and Europeans in Arkansas*. Fayetteville: The University of Arkansas Press, 1995.
- RootsWeb. "Arkansas Land Records." Ancestry.com. <http://searches.rootsweb.ancestry.com/cgi-bin/arkland/arkland.pl> (accessed April 18, 2011).
- Rosencrantz, Florence L. "The Rice Industry in Arkansas," *The Arkansas Historical Quarterly* 5, no. 2 (Summer 1946): 123-137.
- Rosenthal, Helman. "The Protection of Impounded Reservoirs," *Journal of the American Water Works Association* 21, (August 1929): 1054-1062.
- Rothrock, Thomas. "Congressman James William Trimble," *The Arkansas Historical Quarterly* 28, no. 1 (Spring 1969): 76-85.
- Rumbough, George P. C. "Municipal Improvements in Little Rock," in *Transactions of the Arkansas Society of Engineers, Architects and Surveyors* II (November 1888): 88-95.
- Russell, Phillip Wayne. *Fort Smith City Government and the Progressive Era in Urban Reform*. MA thesis, University of Arkansas, 1981.
- Sabo, George, III. "Prehistoric Culture History," in *Human Adaptation in the Ozark and Ouachita Mountains*. Fayetteville: Arkansas Archeological Survey, 1990.
- Salmond, John A. *The Civilian Conservation Corps, 1933-1942: A New Deal Case Study*. Durham: Duke University Press, 1967.
- Saucier, Roger T. *Quaternary Geology of the Lower Mississippi Valley*. Fayetteville: Arkansas Archeological Survey, 1974.
- Saunders, John L., and G. A. Billingsley. "Surface-Water Resources of Arkansas," in *Arkansas Crops and Livestock, 1947 and Statistical Summaries, 1938-1947*. University of Arkansas Bureau of Research in cooperation with the U.S. Department of Agriculture, research series no. 17, Little Rock: Arkansas Resources and Development Commission, June 1950.
- Schambach, Frank E. "The Archeology of the Great Bend Region in Arkansas," in *Contributions to the Archeology of the Great Bend Region of the Red River Valley*,

- Southwest Arkansas*, ed. Frank F. Schambach and Frank Rackerby. Fayetteville: Arkansas Archeological Survey, 1982.
- . “The End of the Trail: Reconstruction of the Route of Hernando de Soto’s Army through Southwest Arkansas and East Texas,” in *The Expedition of Hernando De Soto West of the Mississippi, 1541-1543*, ed. Gloria A. Young and Michael P. Hoffman. Fayetteville: The University of Arkansas Press, 1993.
- Schoolcraft, Henry R. *Schoolcraft in the Ozarks: Reprint of Journal of a Tour into the Interior of Missouri and Arkansas in 1818 and 1819*, ed. Hugh Park. Van Buren, Arkansas: Press-Argus Printers, 1955.
- Schuyler, James Dix. *Reservoirs for Irrigation, Water-Power, and Domestic Water-Supply*. New York: John Wiley & Sons, 1902.
- Scully, Francis J. *Hot Springs, Arkansas, and Hot Springs National Park: the Story of a City and the Nation’s Health Resort*. Little Rock: Hansen Co. and Pioneer Press, 1966.
- Seigenthaler, John. *James K. Polk*. Henry Holt and Company, New York: Times Books, 2003.
- Shallat, Todd. *Structures in the Stream: Water, Science, and the Rise of the U.S. Army Corps of Engineers*. Austin: University of Texas Press, 1994.
- Sherwood, Diana. “Clearing the Channel: The Snagboat in Arkansas,” *The Arkansas Historical Quarterly* 3, no. 1 (Spring 1944): 53-62.
- Shipley, Ellen Compton. “The Pleasures of Prosperity, Bella Vista, Arkansas, 1917-1929,” *The Arkansas Historical Quarterly* 37, no. 2 (Summer 1978): 99-129.
- Shipman, Martha Virginia. *The Mississippi River Commission*. M.A. Thesis, The University of Arkansas, 1937.
- Shiras, Frances. “Norfolk Dam,” *The Arkansas Historical Quarterly* 4, no. 2 (Summer 1945): 150-158.
- Shiras, Tom, “Hydroelectric Development in Arkansas,” *Popular Mechanics* 37 (April 1922): 574-575.
- . “Waterpower Developments in Arkansas and Missouri,” *Manufacturers’ Record* 98 (October 30 1930): 36-37.
- Shugart, Sharon. *When Did It Happen?: A Chronology of Events at the Hot Springs of Arkansas*. Hot Springs: Eastern National Region, 2009.
- Simpson, Ernest E. “Half a Century on Grand Prairie,” *The Arkansas Historical Quarterly* 14, no. 1 (Spring 1955): 32-37.

- Smith, Jason Scott. *Building New Deal Liberalism: The Political Economy of Public Works, 1933-1956*. Cambridge: Cambridge University Press, 2006.
- Smith, Kenneth L. *Sawmill: The Story of Cutting the Last Great Virgin Forest East of the Rockies*. Fayetteville: The University of Arkansas Press, 1986.
- Smith, Norman. *A History of Dams*. Secaucus, NJ: The Citadel Press, 1972.
- . *Man and Water: A History of Hydro-Technology*. Great Britain: Charles Scribner's Sons, 1975.
- Smith, Ralph A. and Benard De La Harpe. "Exploration of the Arkansas River by Benard De La Harpe, 1721-1722: Extracts from His Journal and Instructions," *The Arkansas Historical Quarterly* 10, no. 4 (Winter 1951): 339-363.
- Smith, Sandra Taylor. *The Civilian Conservation Corps in Arkansas, 1933-1942: A Historic Context*. Little Rock: Arkansas Historic Preservation Program, 1991.
- Spicer, J. M. *Beginnings of the Rice Industry in Arkansas*. Stuttgart: Arkansas Rice Association, 1964.
- Stahle, David W., Malcolm K. Cleaveland, and John G. Hehr. "A 450-year drought reconstruction for Arkansas, United States." *Nature* 316 (August 8, 1985): 530-532.
- Stearns, Frederic P. "The Selection of Sources of Water Supply," *Journal of the Association of Engineering Societies* 10 (1981): 485-487.
- Stephens, B. F. "Stand-pipes for Water Works," in *Report of Proceedings of the Eighth Annual Meeting of the American Water Works Association*, 102-113. Hannibal, MO: Standard Printing Co., 1888.
- Suggs, George G., Jr. *Water Mills of the Missouri Ozarks*. Norman, OK: University of Oklahoma Press, 1990.
- Summers, Mark Wahlgren. *The Gilded Age: or, The Hazards of New Functions*. Upper Saddle River, NJ: Prentiss-Hall, 1997.
- Sutton, Keith. *Arkansas Wildlife: A History*. Fayetteville: The University of Arkansas Press, 1998.
- . *Fishing Arkansas: A Year-Round Guide to Angling Adventures in the Natural State*. Fayetteville: The University of Arkansas Press, 2000.
- Sutter, Paul S. *Driven Wild: How the Fight against Automobiles Launched the Modern Wilderness Movement*. Seattle: University of Washington Press, 2002.

- Taylor, George Rogers. *The Transportation Revolution, 1815-1860*. New York: Rinehart & Company, Inc., 1951.
- Taylor, Mrs. Wayne E. "Gurdon: Its Beginning," *The Clark County Historical Journal* 1, no. 1 (Winter 1973): 25-26.
- Terrill, Edward, ed. "Power Project on Ouachita Planned," *Water Resources and Electric Utilities* 2, no. 6 (November 1922): 24.
- Territorial Papers of the United States, Vol. XIV: The Territory of Louisiana-Missouri, 1806-1814*. Compiled and edited by Clarence Edwin Carter. Washington, D.C.: Government Printing Office, 1949.
- Tollinger, E. C. "The Levees in the Upper Tensas District in Arkansas," in *Riparian Lands of the Mississippi River: Past-Present-Prospective*. Chicago: A. L. Swift & Co., 1901.
- U. S. Army. Corps of Engineers. *The History of the U. S. Army Corps of Engineers*. Alexandria, VA: U.S. Army Corps of Engineers, 1998.
- . *A History of the U.S. Army Corps of Engineers Hydroelectric Design Center, 1938-2005*. Washington, D.C.: U. S. Army Corps of Engineers, 2005.
- . *Improvement of the Lower Mississippi River and Tributaries, 1931-1972*. Vicksburg, Mississippi: Mississippi River Commission, 1972.
- U. S. Army. Corps of Engineers, Little Rock District. *Blue Mountain Dam and Reservoir Project: Petit Jean River, Arkansas River Watershed*. Little Rock, Arkansas: U. S. Army Engineer District, 1940, Revised 1941.
- . *Blue Mountain Dam and Reservoir Project, Arkansas: Petit Jean River, Arkansas River Watershed*. Little Rock, Arkansas: U. S. Army Engineer District, 1948.
- . *Bull Shoals Dam and Reservoir Project, Arkansas and Missouri, White River, White River Watershed*. Little Rock, Arkansas: U. S. Army Engineer District, 1947.
- . *Clearwater Dam and Reservoir Project, Black River, White River Watershed*. Little Rock, Arkansas, U.S. Army Engineer District, 1940, revised 1941.
- . *Nimrod Dam and Reservoir Project: Fourche La Fave River, Arkansas River Watershed*. Little Rock, Arkansas: U. S. Army Engineer District, 1940.
- . *Nimrod Dam and Reservoir Project, Arkansas: Fourche La Fave River, Arkansas River Watershed*. Little Rock, Arkansas: U. S. Army Engineer District, Revised 1948.
- . *Norfolk Dam and Reservoir Project: North Fork River, White River Watershed*. Little Rock, Arkansas: U. S. Army Engineer District, 1940.

———. *Norfolk Dam and Reservoir Project, Arkansas and Missouri, North Fork River, White River Watershed*. Little Rock, Arkansas: U. S. Army Engineer District, 1948.

U. S. Board on Geographical Names. Geographic Names Information System. United States Geological Survey. www.geonames.usgs.gov.

U. S. Congress. *Congressional Globe*. Vol. 21, pt. 2.

U. S. Congress. *Congressional Record*. 70th Cong., 1st sess., 1928. Vol. 69, pt. 3.

———. *Congressional Record*. 70th Cong., 1st sess., 1928. Vol. 69, pt. 7.

U. S. Congress. House. *Survey of Certain Rivers in the Southern States*. 42^d Cong., 2^d sess., 1872. H. Ex. Doc. 252.

———. *Ouachita River*. 43^d Cong., 1st sess., 1874. H. Ex. Doc. 259.

———. *Improvement of White, Saint Francis, and L'Anguille Rivers, Arkansas*. 45th Cong., 3^d sess., 1879. H. Ex. Doc. 57.

———. *Report of the Secretary of the Interior*. 49th Cong., 2^d sess., 1886. H. Ex. Doc. 1, pt. 5, v. 2.

———. *Engineer's Report of Certain Rivers and Harbors*. 41st Cong., 3^d sess., 1871. H. Doc. 60, pt. 3.

———. *Examination of the Upper White River, Arkansas*. 54th Cong., 1st sess., 1895. H. Doc. 98.

———. *Annual Reports of the Department of the Interior for the Fiscal Year Ended June 30, 1897. Miscellaneous Reports*. 55th Cong., 2^d sess., 1897. H. Doc. 5, pt. 3.

———. *Final Report on Survey of Ouachita and Black Rivers, Arkansas and Louisiana*. 57th Cong., 1st sess., 1902. H. Doc. 448.

———. *Ouachita River, from Camden to Arkadelphia, Ark.* 62^d Cong., 2^d sess., 1912. H. Doc. 588.

———. *Estimate of Cost of Examinations, etc., of Streams Where Power Development Appears Feasible*. 69th Cong., 1st sess., 1926. H. Doc. 308.

———. *Control of Floods in the Alluvial Valley of the Lower Mississippi River, Vol. 2*. 71st Cong., 3^d sess., 1931. H. Doc. 798.

———. *White River, Missouri and Arkansas*. 73^d Cong., 1st sess., 1933. H. Doc. 102.

- . *Ouachita River and Tributaries, Arkansas and Louisiana*. 73^d Cong., 2^d sess., 1934. H. Doc. 196.
- . *Arkansas River and Tributaries*. 74th Cong., 1st sess., 1935. H. Doc. 308.
- . *Comprehensive Report on Reservoirs in Mississippi River Basin*. 74th Cong., 1st sess., 1935. H. Doc. 259.
- . *Ouachita River and Tributaries, Arkansas and Louisiana*. 76th Cong., 1st sess., 1939. H. Doc. 69.
- . *White River, Mo. And Ark.* 76th Cong., 1st sess., 1939. H. Doc. 98.
- . *Ouachita River and Tributaries, Arkansas and Louisiana, Blakely Mountain Dam*. 78th Cong., 2^d sess., 1944. H. Doc. 647.
- . *White and Arkansas Rivers and Tributaries, Grand Prairie Region, Arkansas*. 81st Cong., 1st sess., 1949. H. Doc. 255.
- . *River and Harbor Emergency Bill*. 56th Cong., 1st sess., 1900. H. Rep. 1517.
- . *Authorizing the Submission to Congress of a Comprehensive National Plan for the Prevention and Control of Floods of All the Major Rivers of the United States, and for Other Purposes*. 75th Cong., 1st sess., 1937. H. Rep. 798.
- . *Granting Certain Authority to Batesville, Ark.* 57th Cong., 2^d sess., 1903. H. Rep. 3707.
- . *Canal and Power Stations at Lock and Dam No. 1, Upper White River, Arkansas*. 59th Cong., 1st sess., 1906. H. Rep. 4930.
- . *Lock and Dam Near Lock No. 3, White River, Arkansas*. 59th Cong., 1st sess., 1906. H. Rep. 4931.
- . *To Declare a Certain Portion of White River Unnavigable*. 59th Cong., 1st sess., 1906. H. Rep. 5084.
- . *Comprehensive Flood-Control Plans and Works for Reservoirs, Levees, and Floodwalls*. 75th Cong., 3^d sess., 1938. H. Rep. 2353.
- . *Committee on Flood Control. Comprehensive Flood Control Plan for Ohio and Lower Mississippi Rivers: Hearings before the Committee on Flood Control*. 75th Cong., 1st sess., June 1937.

- . Committee on Flood Control. *Comprehensive Flood-Control Plans: Hearings before the Committee on Flood Control*. 75th Cong., 3^d sess., 1938.
- U. S. Congress. Senate. *Report from the Secretary of War*. 25th Cong., 2^d sess., 1838. S. Doc. 132.
- . *Movable Dams*. 54th Cong., 2^d sess., 1897. S. Doc. 136.
- . *In the Senate of the United States*. 53^d Cong., 2^d sess., 1894. S. Rep. 344.
- . *Construction of Certain Public Works on Rivers and Harbors for Flood Control*. 74th Cong., 2^d sess., 1936. S. Rep. 1963.
- U. S. Geological Survey. *Ground-water Supplies for Rice Irrigation in the Grand Prairie Region*. Washington, D.C.: U.S. Geological Survey, 1931.
- University of Arkansas, Fayetteville campus. *Two Proposals for the Organization of an Arkansas Tourist Council*. Fayetteville: University of Arkansas, 1951.
- University of Oklahoma. *An Analysis of the Tourist Industry in the Selected Counties of the Ozark Area Prepared for the National Park Service by the Institute of Community Development*. Norman: University of Oklahoma, 1953.
- Valenčius, Conevery Bolton. *The Health of the Country: How American Settlers Understood Themselves and Their Land*. New York: Basic Books, 2002.
- VanBuskirk, Kathleen. "Powersite Dam," in *White River Valley Historical Quarterly* 8, no. 8 (Summer 1984): 5-6.
- Van Deusen, Glyndon G. *The Jacksonian Era, 1828-1848*. Prospect Heights, IL: Waveland Press, 1992.
- "Water-works. Statistics of New Construction," *Engineering News-Record* 18 (December 17, 1887): 445.
- Waterman, Earle Lytton. *Elements of Water Supply Engineering*. New York: John Wiley & Sons, Inc., 1934.
- Warren, Lee G. "Carpenter Dam and Power House Built Within Two Coffers on Ouachita River, Arkansas," *Construction Methods* 13 (October 1931): 34-37.
- Wegmann, Edward. *Design and Construction of Dams*. New York: John Wiley & Sons, 1922.
- Weller, Cecil Edward, Jr. *Joe T. Robinson: Always a Loyal Democrat*. Fayetteville: The University of Arkansas Press, 1998.

- Whayne, Jeannie M. "Darker Forces on the Horizon," in *Arkansas: A Narrative History*, 303-335. Fayetteville: The University of Arkansas Press, 2002.
- . "Reasonable Progress: Limits of Progressive Reform," in *Arkansas: A Narrative History*, 272-302. Fayetteville: The University of Arkansas Press, 2002.
- White, Richard. *The Organic Machine*. New York: Hill and Wang, 1975.
- Wilkes, W. N., compiler. *Summer and Winter Health & Pleasure Resorts in Arkansas*. Little Rock: Bureau of Mines, Manufactures and Agriculture, c. 1926.
- Williams, Stephen. "Settlement Patterns in the Lower Mississippi Valley," in *Prehistoric Settlement Patterns in the New World*, ed. Gordon R. Willey. New York: Wenner-Gren Foundation for Anthropological Research, 1956.
- Wilson, Stephen. *Harvey Couch: An Entrepreneur Brings Electricity to Arkansas*. Little Rock: August House, 1986.
- Wilson, Steve N. *Arkansas Wildlife, A History*, ed. Keith Sutton. Fayetteville: The University of Arkansas Press, 1998.
- Wilson, Winston P. *Harvey Couch: The Master Builder*. Nashville, TN: Broadman Press, 1947.
- Woodward, Park. "Municipal Ownership," in *Proceedings of the Thirtieth Annual convention of the American Water Works Association* 30, 123-127. Hannibal, MO: Publication Committee of the American Water Works Association, 1910.
- Workers of the Writers' Program of the Work Projects Administration in the State of Arkansas with a new Introduction by Elliott West. *The WPA Guide to 1930s Arkansas*. Lawrence: University Press of Kansas, 1987.
- Worley, Ted R. "Glimpses of an Old Southwestern Town," *The Arkansas Historical Quarterly* 8, no. 2 (Summer 1949): 133-159.
- Worley, Ted R. "Helena on the Mississippi," *The Arkansas Historical Quarterly* 13, no. 1 (Spring 1954): 1-15.
- Worthen, William B. "Municipal Improvement in Little Rock: A Case History," *The Arkansas Historical Quarterly* 46, no. 4 (Winter 1987): 317-347.
- Zoltvany, Yves F. *The French Tradition in America*. Columbia, SC: University of South Carolina Press, 1969.