
Graduate Seminar Paper Award

**Cheyenne Bottoms Wildlife Area:
A Historical Perspective**

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From the point of view of the great flocks of migratory waterfowl which traverse North and South America every year, the Cheyenne Bottoms ecosystem is an essential stopover. For some, it is a wintering ground. Since the late Pliocene Era, Cheyenne Bottoms has provided refuge for the many species of ducks, geese, cranes, and terns; as well as mammals and reptiles who live off of large populations of migratory waterfowl. The prehistory of Cheyenne Bottoms provides insight into the geological development of the Central Plains region. The story of Cheyenne Bottoms since the arrival of Euro-Americans reflects the attitudes of those who have partaken of its bounty, worked for the perpetuation of a dependable waterfowl habitat, as well as those who have worked toward its destruction.

Cheyenne Bottoms is a wetland created by a two hundred and thirty-five square mile drainage area. Surrounded by Cretaceous rocks rising up to one hundred feet above it, the basin itself is approximately sixty-four square miles or forty-one thousand acres. The twenty thousand acres in the southeast corner of this drainage area, which has historically been too wet to farm, is now managed by the Kansas Department of Wildlife and Parks as a game refuge. This "wildlife area" is centrally located on the network of migratory waterfowl routes, and while each species has its own pattern and timing of migration, there are two main groups. Semiannual migrants are those which use the bottoms every spring and fall, some of these breeding as far north as the Arctic Circle in the summer, returning to their wintering quarters near the equator. Loop migrants use one of the other flyways for

one leg of their semiannual journey, either the Pacific or Atlantic coastal routes.¹

A number of theories have been put forth by natural scientists to explain the origin of Cheyenne Bottoms. In 1897, Erasmus Haworth argued that stream erosion was the primary cause of the Bottoms. W. D. Johnson posited in 1901 that subsidence due to the dissolution of underground salt was the main factor in its formation. N. W. Bass in 1926 and Bruce Latta in 1950 both showed evidence for a combination of these two factors. Charles K. Bayne however, published a paper attempting to resolve disagreement over the origins of the Bottoms. Drawing upon the geological records created by oil drilling activities in the area, Bayne provides the best explanation to date for the origins of this great sink. Cheyenne Bottoms had been alternatively elevated and submerged beneath the great inland sea which covered most of the Great Plains up through the Cretaceous era. Sometime between late Cretaceous time to the latest of the Pliocene times, some disturbance in the Pre-cambrian bedrock created a shallow depression in this formation. Over the eons, hundreds of feet of marine deposits and silt covered the rock. During Tertiary and Pleistocene times, the Ice Ages of the last several hundred thousand years or so, much of the surface topography was formed. This topography reflects the disturbance which caused the bedrock to sink millions of years ago.

The most recent major event in this process, it is believed, was the diversion of the waters of the Smoky Hill river drainage away from Cheyenne Bottoms. This was caused by an extended dry period in which waters ceased to flow abundantly enough to continue cutting stream channels. These channels then became clogged, forcing the water to find another route, which it did, several miles to the north. Cow Creek, to the southeast of Cheyenne Bottoms, and Blood and Deception Creeks to the northwest and north, are the remnants of that ancient streambed.²

Historical accounts of Cheyenne Bottoms are relatively scarce during the nineteenth century. The earliest reference to it is in the journals of Captain Zebulon Pike, U.S. Army, which he kept while conducting a reconnaissance of the Great Plains region. In 1806, Pike and his men were marching in a steady drizzle, searching for the Indian trace which followed the Arkansas

¹John Zimmerman, *Cheyenne Bottoms: Wetland in Jeopardy* (Topeka: University of Kansas Press, 1990), 99.

²Charles K. Bayne, "Geology and Structure of Cheyenne Bottoms Barton County, Kansas," *Kansas Geological Survey Bulletin* 211, part 2 (1977), 1-2, 4.

River. They came across an area "[b]etween Kansas and Arkansas Rivers . . . crossed the low prairie which was nearly all covered with ponds."³ A bit later in his journal Pike again refers to the "swampy low prairie" which was north of the Great Bend of the Arkansas.⁴

Legend has it that in 1825 there was a great battle fought near Cheyenne Bottoms between the Cheyenne Indians and either the Pawnee or the Kiowa. This battle, allegedly for territorial rights to the area, resulted in the naming of Blood Creek, the site where it was said to have been fought.⁵ Indian annuities were often brought down the Santa Fe trail, and in 1867 these payments for Indian lands were delivered to Indians camped at Cheyenne Bottoms.⁶

The journal of the German explorer Dr. Frederick Wislizenus is the next written reference to Cheyenne Bottoms. In October of 1839, Dr. Wislizenus was travelling in the area and became lost in foggy weather. He found himself wading through a great swamp, abounding with birds, "Never have I seen together such quantities of swans, cranes, pelicans, geese, and ducks as were here." As he waded across the Bottoms, he found that the water did not reach higher than his chest.⁷

In 1856, surveyors in the area remarked at the extent of the muck and mire. The field notes show that they believed the area was too wet for plowing, but it had good grass. They also noticed that there was no outlet to the east. "A lake or swamp with about 2" to 3" of water and mud bears NE and SW."⁸

The American Coursing Club, a nationwide greyhound racing-group, held its first Cheyenne Bottoms meet in 1886. The ACC was active throughout

³Francis Coues, ed., *The Expeditions of Zebulon Montgomery Pike*, vol. II (New York: Harper, 1895), 424.

⁴*Ibid.*, 517.

⁵*Great Bend (Kans.) Tribune* Special Edition, August 12, 1936, 179-80.

⁶Marvin Schwilling, "Cheyenne Bottoms," *The Kansas School Naturalist* (December, 1985), 4.

⁷*Ibid.*

⁸*Surveyor's Field Notes*, vol. 63m T.11-20S/R9-16W (Washington, D.C.: Government Land Office, 1856), 111, 115. Cheyenne Bottoms was typically found in different states of wetness and abundance by people at different times. Attempting to mediate between the extremes is the basis for development at Cheyenne Bottoms.

the U.S. and apparently represented a major influx of "civilized" culture to the region when the club arrived to hold their race in October of that year. People and dogs from all over the country were present for two meets, one a "free for all," which meant any age class could enter. The Grand Prize of a cup and one hundred dollars in cash was won by "Midnight" for his owner, a Colonel Taylor of Emporia.⁹

The 1880s was a boom period in Kansas history. Rainfall was good, markets were good, people were forming towns throughout western Kansas, believing they were possibly building the next St. Louis, Memphis, or Omaha. The Preemption, Homestead and Timber Claim Acts had renewed the westward migration after the Civil War. The Indian Wars were won by the advancing Anglo-Americans, and the feeling that one could achieve great things in this new land filled the air. Land grant companies forced the railroads to put their lands on the market, so with a very small amount of capital, anyone from back east or even Europe could find a new start on the Great Plains.¹⁰ This unflagging optimism was confronted by the realities of Plains weather in the 1890s. In what has been described as the mini-Dust Bowl, the rains deserted the farmers' fields which had been left open and susceptible to the omnipresent Plains wind with the practice of "dust-mulching." As a result, soil and seed were carried off along with the hopes of many of the new settlers.

During this time, a group of farmers got together and decided to try to irrigate using Cheyenne Bottoms as a reservoir to store water brought from the Arkansas River. To dig the canal necessary to bring the water, they hired F.B. Koen, who had achieved some fame and notoriety digging irrigation canals in southwest Kansas and southeast Colorado. The Grand Lake Reservoir Company was formed, and the purchase of easement rights for the canal was begun. After its completion in 1898, a significant rainfall, which also washed out the new diversion dam on the Arkansas River, filled the canal and flowed into the southwest corner of the basin in a thirty-foot waterfall. Cheyenne Bottoms was now filled with water, and the optimism characteristic of plains settlement returned, albeit a bit contrived. Kansas City businessmen became interested in investing in the area, Koen and his backers formed the Lake Koen Navigation, Reservoir, and Irrigation Company, and individuals were sought to buy stock in the company. The

⁹"Cheyenne Bottoms Site of Early Day Greyhound Racing," Barton County Clippings, vol. 2, 161, Kansas State Historical Society, Topeka.

¹⁰James C. Malin, "The Kinsley Boom of the Late Eighties," *Kansas Historical Quarterly* (February, 1935), 23.

company's prospectus showed hotels surrounding a grand lake with sailboats and swimming beaches. Oral history, via old newspaper interviews, indicates that the sale of stock was the primary concern of the principles, not development. Problems began to arise. Farmers unhappy with the original easement agreements and settlements sought redress in the courts. The canal had leaked badly in a number of locations, inundating farmers' fields as well as the Bottoms, leading to more litigation. Finally, in 1904 the company folded.¹¹

During the period from the 1880s through the early years of the twentieth century, commercial duck hunting was routinely practiced at the Bottoms. The game was salted, put on refrigerated rail cars, and taken to the East for sale. Prices ranged from eight dollars per dozen for canvasbacks, six dollars for redheads, three for mallards, and one and a half dollars for a dozen "mixed ducks."¹² Concerns about declining duck populations led the Kansas State Legislature to enact laws attempting to regulate this practice. Prior to 1897, the only law regulating hunting of any kind in Kansas dealt with obtaining permission to hunt on private property. In that year, however, an act was passed "providing at what seasons birds may be shot, to prohibit the sale and shipment of birds, [and] prescribing a punishment" for violation of the new law.¹³ This law was amended in 1901, 1903, and again in 1905. The 1905 act followed a particularly brutal year for the duck population at Cheyenne Bottoms. Culminating in 1904, the traditional practice had been for suppliers to come out to the hunting camps, sell ammunition and buy ducks. The new act of 1905 gave the warden unprecedented powers to inspect the area where the game was being sold and placed a bag limit on game birds. The limit on grouse was fifteen birds, likewise with prairie chickens. Quail, plovers, and ducks taken were limited to twenty each; the limit on geese and wild brant was ten. For all practical purposes, this brought an end to commercial hunting at Cheyenne Bottoms.¹⁴

Marvin Schwilling, in his brief history of Cheyenne Bottoms, points out other factors that were detrimental to duck populations in the Bottoms.

¹¹Schwilling, "Cheyenne Bottoms," 4-5; "Cheyenne Bottoms is Biggest Game Refuge in Country," *Great Bend (Kans.) Daily Tribune 75th Anniversary Edition*, August 10, 1951, 9.

¹² Schwilling, "Cheyenne Bottoms," 6.

¹³State of Kansas, *Session Laws*, 1897 (Topeka: State Printing, 1897), 293.

¹⁴State of Kansas, *Session Laws*, 1905 (Topeka: State Printer, 1905), 416-18.

These include periodic drying, use of pesticides, and a die off in 1916 which he mentions must have been due to fowl cholera. Another event in this same year which negatively impacted duck habitat was the advent of the search for oil. Sooeey #1, drilled in the heart of Cheyenne Bottoms, made a modest strike, but not significant enough to be developed. Again in February of 1923, oil was struck in the area, and for a short time it seemed as if Cheyenne Bottoms might become the first oilfield in Kansas west of Butler County. But the hole was "a bad job," and the lack of funds prevented oil production in the area, most likely because of more accessible oil elsewhere.¹⁵ Also, high demand for oil dictated high-production wells, which led to market saturation and depressed prices. The resulting narrow profit margins had to be made up in volume.¹⁶

Another source of stress for migrating and wintering waterfowl were farmers' efforts to drain the Bottoms in order to put the land into production. Early efforts to drain the area began in 1899 and continued up through the 1930s when the battle to create a game refuge was finally won, which will be addressed below. The legal course of action for draining swampland was outlined by the Kansas legislature in 1879 in "An Act providing for the drainage of swamp, bottom, or other low lands."¹⁷ This type of legislation was common in the U.S. in the late nineteenth century. Increased population, improved market accessibility due to the railroads, and increased prices as a result of booming metropolitan areas led many state legislatures to create a legal mechanism for the formation of drainage districts.¹⁸

According to the legislation, a petition must be filed, a bond paid, notice given to affected land owners, and costs dispersed equitably among the beneficiaries.¹⁹ It included a process by which aggrieved persons could

¹⁵*Hoisington (Kans.) Dispatch*, August 13, 1936.

¹⁶Michael P. Malone and Richard W. Etulain, *The American West: A Twentieth Century History* (Lincoln: University of Nebraska Press, 1989), 35-36. The Midcontinental field, which included Butler, Montgomery, and Wilson Counties in Kansas, produced much shallower and richer oil strikes. The increased demand on oil from burgeoning automobile use created a response in production much greater than the market could absorb. Malone and Etulain lament the waste of oil, which sold barely over cost during this period.

¹⁷State of Kansas, *Session Laws of 1879* (Topeka: Kansas Publishing, 1879), 197.

¹⁸Mary R. McCorvie and Christopher L. Lant, "Drainage District Formation and the Loss of Midwestern Wetlands, 1850-1930," *Agriculture History* 4 (1993), 25.

¹⁹*Session Laws of 1879*, 197.

appeal to probate court. Disputes would be settled by a jury of six "disinterested freeholders."²⁰ Drainage districts were defined as organized efforts to drain five hundred or more acres. The formation of these districts was prompted by the inability of individuals to provide the needed capital, and to facilitate professional construction of drainage canals. Common law was considered to be an insufficient legal power to drain swamplands, hence the passage of the act. There were three considerations which defined the legal basis for the districts: 1) the premise of natural flow of the waters, which usually restricted the powers of the districts; 2) the common enemy principle, which gave drainage districts fairly broad leeway; and, 3) the reasonable use principle, which fell between the first two in the amount of power drainage districts had in altering water flow.²¹

In the late 1920s, when heavy rains filled Cheyenne Bottoms to overflowing, some area farmers formed a drainage district to build a canal to the Arkansas River east of Ellinwood. Other farmers opposing the attempt hired Frank Robl, a long time Bottoms advocate and duck-bander, to raise funds to fight the drainage district. When the citizens of Hutchinson, Kansas, got wind of the plan to drain the Bottoms, they opposed drainage on the grounds that it created an unnecessary flood hazard for their city, which it did.²² Regardless of this opposition, bonds were organized to be sold by the drainage district, and when the money was raised a contract would be let and construction of a drainage canal would begin. Most people had given up on saving the Bottoms. However, a group of attorneys, including Coe Russell, Messrs. Tinchler and Malloy of Hutchinson "collaborated in concocting some sort of legal brew of such potency that the district court at Barton County granted a temporary restraining order" against the drainage district.²³ This gave pro-refuge forces time to secure funding from Washington, thus rescuing the future preserve from destruction.

²⁰Ibid., 199.

²¹McCorvie and Lant, "Drainage District Formation," 34.

²²Frank W. Robl, "The Story of Cheyenne Bottoms," in *The Duck Man Writes about Cheyenne Bottoms* (n.p., n.d.). This document also includes research data partially provided by Robl as well as minutes of an April, 1928, meeting of the local Izaak Walton League.

²³State of Kansas, *Third Biennial Report of the Forestry, Fish and Game Commission* (Topeka: Kansas State Printing, 1930).

The momentum to preserve and perpetuate Cheyenne Bottoms as an annually dependable stopover for migratory fowl began picking up, albeit quietly, with the activities of Frank Robl of rural Ellinwood. In 1923, Robl began banding ducks and geese as a hobby in his spare time. Robl's hobby became the primary source of information on the habits of the migrating birds who used the Bottoms. The return of Robl's bands from nineteen states, Alaska, four Canadian provinces, and Mexico helped ornithologists to establish that Cheyenne Bottoms lay on the Central Flyway, one of the four major waterfowl migration corridors in the western hemisphere.²⁴ As Robl was banding his ducks through the 1920s, the Kansas legislature was turning its attention to conservation activities, as well.

The mood in the country at this time was one of rising concern over maintaining natural resources for future generations. The conservation movement, which had accompanied the Progressive movement into national prominence, still found advocates in such organizations as the Izaak Walton League and the Sierra Club. While Kansas scenery was not deemed dramatic enough for the attention of groups like the Sierra Club, hunter groups like the IWL knew of the game that existed on the Plains but was in need of assistance after a half-century of intense hunting. Responding to this need, the Kansas legislature created the Kansas Forestry, Fish and Game Department in 1927.

In fact, a commission of forestry, fish and game had been set up in 1925 consisting of the governor, the fish and game warden (an office created in the hunting act of 1905), and three others to be appointed by the governor and the state senate. This commission had no authoritative power in the field, but could use fish and game funds to secure title to lands deemed suitable for state parks. Surplus funds from hunting licenses as well as an expected increase in the number of state parks were fundamental in the decision by the legislature to establish a broader Forestry, Fish and Game Department two years later.²⁵

The year 1927 was a fateful one for Cheyenne Bottoms. Not only was there now an official organ in government with a vested interest in preserving game and fish habitat, but in August of that year, over fourteen inches of rain fell in a matter of hours to the west and northwest of the

²⁴Robl, "The Story of Cheyenne Bottoms," 1-2; Schwillig, "Cheyenne Bottoms," 7; Frederick C. Lincoln, "Banded Birds," *Literary Digest*, November 28, 1931, 46.

²⁵Edwin O. Stene, *The Development of Wildlife Conservation Policies in Kansas* (Topeka: State Printer, 1946), 27-28.

Bottoms. For the first time in living memory, water was flowing out of the Bottoms through Little Cheyenne Creek. A lake with sixty-four square miles of surface area had been created overnight.²⁶ This event set the stage for what would be last major hurdle in establishing a game refuge at the new "Lake Cheyenne."

Burt Doze, the State Game Warden, was not shy about his advocacy of the bottoms. Invoking biblical references, Doze reminded everyone that "it is possible to create and maintain a sea 64 miles in area, exactly the size of the Sea of Galilee."²⁷ Those who came together to oppose drainage and to lobby for perpetuation included area farmers who enjoyed duck and geese hunting at the Bottoms; 7th District Congressman Clifford Hope; Senator Charles Curtis, soon to become Herbert Hoover's Vice-President; Henry Allen, who replaced Curtis as Senator; former governor Arthur Capper; the area Izaak Walton League locals; and the new Kansas Forestry, Fish and Game Department. Economically, the Bottoms was a good idea. Barton County merchants knew that hunters at the Bottoms brought more into the local economy than could another eighteen thousand acres of wheat. This brought the backing of the Great Bend and Hoisington Chambers of Commerce.²⁸

Responding to pressure from the activities of the drainage district, the Forestry, Fish and Game Commission requested that the U.S. Bureau of Biological Survey come to Barton County to see the new lake and recommend what actions could be taken to get federal funding for its perpetuation. It should be recalled that this was during the era of big water projects in the American West. Hoover Dam construction was underway, and major irrigation projects had been constructed in California, Arizona, Wyoming and elsewhere. Utilitarian conservation, as popularized by Gifford Pinchot in the early years of the twentieth century, advocated land use and hunting was considered land use.²⁹ In addition, the Bear River Marsh in

²⁶State of Kansas, *Second Biennial Report of Kansas Forestry, Fish and Game Department* (Topeka: State Printing, 1928), 32-35; Schwillig, "Cheyenne Bottoms," 5; "Cheyenne Bottoms is Biggest Game Refuge in Country," 9.

²⁷"Cheyenne Bottoms is Biggest Game Refuge in Country," 9.

²⁸Ibid.; "Cheyenne Lake Inspected," *Topeka Journal*, October 28, 1927, Kansas Fish and Game clippings files, vol. 1, 77, Kansas State Historical Society, Topeka.

²⁹Joseph E. Stevens, *Hoover Dam: An American Adventure* (Norman: University of Oklahoma Press, 1988), 27; Robert Gottlieb, *Forcing the Spring: The Transformation of the American Environmental Movement* (Washington, D.C.: Island Press, 1993), 22.

Utah was applying for funding for similar reasons, giving the federal government incentive to establish funding guidelines for game preserves. In many ways, this was the ideal time to seek federal funding.³⁰

The Biological Survey sent Orin Steele to investigate the situation, and when Steele saw the lake supporting a mass of waterfowl arriving on their fall trek south, he reported favorably to his superiors at the Bureau. At that point, Survey attorney Talbot Dalmead and Izaak Walton League executive director Seth E. Gordon came to the Bottoms to do a follow-up inspection of the lake. On a very windy day in April, they were escorted to the Bottoms, where incredible numbers of migrating birds were on the water. They recommended persistently urging the federal government for legislation. The ball was in the Fish and Game's court, and it was time to mobilize.³¹

At this point, the FF&G sent Giles Atherton, Lee Larabee, and Warden Doze to New York to seek support from the American Game Protection Association. Back in central Kansas, area Izaak Walton League members wrote the central office asking for advocacy in their lobbying efforts. After their appeals in New York, the warden's entourage went to Washington to consult with the Kansas delegation. Rep. Hope and Sen. Curtis had introduced funding measures into the House and Senate, respectively. The FF&G gathered further data on "Lake Cheyenne," which included an engineering study, and prepared to testify before the House Agriculture Committee. R. C. Russell, a Great Bend engineer, and Warden Doze argued for funding before the committee, as did Kansas Congressman Homer Hoch of Marion and W. A. Ayers of Wichita. Also testifying before the committee was Paul G. Redington, Chief of the Bureau of Biological Survey, Survey lawyer Mr. Denmead, and John B. Burnham of the American Game Protection Association. The Kansas delegation was asking for \$350,000, but no action was taken on appropriations for the proposed game reserve. The committee offered to recommend \$250,000, but this total was deemed inadequate. Congress subsequently adjourned, the recommendations of the Agriculture Committee did not go to the Director of the Budget, but the Kansans left Washington optimistic. After all, an almost identical appropriation had recently been approved for the Utah reserve, thus establishing a precedent. The Secretary of Agriculture approved of wildlife refuges and was in favor of developing the Bottoms. Another bill in

³⁰State of Kansas, *Second Biennial Report*, 34.

³¹*Ibid.*, 33.

Congress, the Game Refuge and Marsh Land Act, would provide an annual appropriation of \$1,000,000 for projects like Cheyenne Bottoms. The Senate had already passed this bill, and all the major conservation organizations in the country supported it. The perpetuation of Lake Cheyenne seemed certain, especially since it appeared that flood hazards would foil the drainage district's efforts. The Department of Agriculture acknowledged that the land was much more valuable as a wildlife refuge than farmland; the "nation will be enriched through creation of an inland sea and a magnificent refuge for water fowl."³²

The Kansas Forestry, Fish and Game Department's optimism was premature. The wheels of government slowed to a crawl from FF&G's perspective during this time. In 1930, about the time the temporary restraining order was granted against the drainage district, the Commission gave \$1,000 to its Secretary Alva Clapp to take a delegation to Washington and resume lobbying efforts. Clapp and ex-Congressman J. N. Timber of Hutchinson went on the grant money; Will Townsly of Great Bend paid his own way, and Seth Gordon, one of the Executive Directors of the Izaak Walton League, made a special trip from Chicago. Special hearings were arranged by Congressman Hope and Senator Allen before the Director of the Budget and the Senate Agriculture Committee. The Norbeck-Andreson Bill, synonymous with the Game Refuge and Marshland Act, had not been passed and legal action was needed to prevent the efforts of the drainage district. Special legislation would be required to save "Cheyenne Lake." Finally, what was now called the Hope-Allen bill was signed by President Herbert Hoover on June 6, 1930, allocating special funds for the perpetuation of Cheyenne Bottoms. The Kansas legislature also passed a bill allowing a federally established game refuge when the Norbeck-Andreson bill would finally be passed. But the actual appropriations were still elusive: while Kansas was the first state to adopt a law permitting a federal game preserve within its borders, the funding needed to fully develop the Bottoms was still not forthcoming.³³

Much of this ambiguity can be attributed to the conflicting interests assailing Congress. One lobby group represented support for game preserves, But others were working hard in opposition to this concept.

³²Ibid., 34.

³³State of Kansas, *Third Biennial Report*, 11-12; "A Cheyenne Bottoms Survey," *Kansas City Times*, June 27, 1935, in Kansas Fish and Game Clippings file, vol. 1, 108, Kansas State Historical Society, Topeka.

These included commercial hunting interests, still active on the eastern flyway, the gun lobby, and the farm lobby, the former for open hunting and the latter for wetland drainage. The push and pull of these groups combined with the deepening depression to delay funding for Cheyenne Bottoms and other areas like it.³⁴

Though the early years of the Great Depression had significantly tightened the federal government's purse strings, \$50,000 eventually was secured from Congress for the study of the Cheyenne Bottoms and surrounding drainage to determine what was needed to perpetuate the lake. Nature was in her now well-known if ill-understood Great Plains fickleness in 1930 with the beginnings of the drought that helped create the notorious "Dirty Thirties" in the central and southern Plains. At Cheyenne Bottoms, the rainy years had brought a proliferation of catfish and carp in the brimming wetland. However, one of the disadvantages of a shallow lake on extremely flat terrain is the percentage of water that can evaporate in even a single day in the hot, dry Plains summers. The consequences of these circumstances were predictable enough, and a fish kill of unprecedented proportions struck the Bottoms in 1930.³⁵ By 1931, Cheyenne bottoms had virtually dried up. This may have helped motivate the game preserve forces to still further action. Rudolph Diffenbach, in charge of land acquisition at the Biological Survey, wrote the secretary of the Izaak Walton league that they still intended to pursue a refuge at Cheyenne Bottoms.³⁶ The study went ahead in 1933 under the supervision of George Knapp, Chief Engineer of the Division of Water Resources, and veteran of the battles with Colorado over Arkansas River water.³⁷ The goals of the study were to determine the amount of water needed to maintain a lake at Cheyenne Bottoms, what tolerances could be permitted in area and capacity of the lake, and the

³⁴ Jay N. Darling, "The Story of the Wildlife Refuge Program," *National Parks Magazine* 28 (January-March, 1954), 6. In this article, Darling, a well-known cartoonist and former Chief of the U.S. Biological Survey, tells the story of how the absence of Senator Peter Norbeck's false teeth rendered inarticulate his appeal on the Senate floor to attach a rider worth \$6 million in game preserve-bound funds to the Duck Stamp Act. The fact that no one knew what he was attaching to the bill led directly to its passage and to the first funds allocated for game preserves.

³⁵ *Hoisington (Kans.) Dispatch*, August 13, 1936, in Barton County Clippings, vol 2., 163, Kansas State Historical Society, Topeka.

³⁷ Kansas Engineering Society, *Yearbook* (Manhattan: Kansas Engineering Society, 1935), 18; James Earl Sherow, *Watering the Valley: Development along the High Plains Arkansas River, 1870-1950* (Lawrence: University Press of Kansas, 1990), passim.

frequency of water replenishment needed to prevent salinization. The only records at his disposal were rainfall and stream flow measurements from 1922 up to the time of the study. Most of these years had been wet years, and as is widely understood now, any study done over a twelve-year period on the Great Plains is woefully inadequate for long range planning. Indeed, it could be argued that one hundred years is insufficient. At any rate, Knapp had to use the information available.

The obvious sources of a supplemental water supply were an Arkansas River diversion, as had been done by Koen and company. Knapp added to this the possibility of a Walnut Creek diversion, which represented another 1900 square mile drainage area. Water losses were expected to come from evaporation in the canals, overflow in wet weather, evaporation in the lake, and seepage into the groundwater. Among the problems Knapp faced beyond an inadequate timespan of record-keeping was the fact that the Arkansas River gauge was at Larned above the mouth of Pawnee Creek. Pawnee Creek added a watershed two-thirds the size of the Walnut, yet it had gone unrecorded. The problem of determining the flow of Pawnee Creek was remedied by calculating water volume using data from the Walnut Creek gauge and multiplying by 0.67. Also, the gauge on Walnut Creek had only been read in the summer months of April to September. Knapp opted to plot a curve using these records and then extrapolate the winter data by simply extending the curve from September to April. The end result of the study was that a canal from the Arkansas River with a 200 cfs capacity, and one from Walnut Creek with a 500 cfs capacity would be necessary to sustain the desired water level at the Bottoms. In addition, Knapp calculated that during a twelve-year period the water in the Bottoms would have been replenished five times with the proposed canal set up.³⁸

The problem with funding proved to be more elusive than anyone expected. It was not until the Pittman-Robertson Act was signed into law in 1937 that a reliable source of federal funding became available.³⁹ And even then, the prolonged depression of the 1930s delayed action until 1942. It was on October 8 of that year that the Kansas Forestry, Fish and Game Department began to purchase land; 6800 acres were acquired for \$54,000. Over the next fourteen years, FF&G bought up property in the bottoms until

³⁸Kansas Engineering Society, *Yearbook*, passim.

³⁹"The Jewel of the Prairie," *Kansas Wildlife and Parks* 45 (July/August, 1988), 35.

they reached their goal of 19,840 acres (including inlet and outlet canals) in 1956.⁴⁰

In October of 1948, Wilson and Company Engineers proposed a development and operation plan for the Bottoms.⁴¹ In April of 1950, the FF&G reported that the inlet canal from Walnut Creek and the bridges over it were almost completed. The next step was to be the outlet canal.⁴² In 1956, Fish and Game reported on the details of the inlet canals and the particulars of the diversion dams on the Arkansas River and the Wet and Dry Walnut Creeks. The bulk of canal construction was from Dundee Diversion Dam on the Arkansas to the north fork of Dry Walnut Creek, a seven mile run. The water would then flow through Dry Walnut to another diversion dam sending it into a canal and down to Wet Walnut Creek. Another diversion dam and another canal would bring the water to the Bottoms. Fourteen thousand feet of the canals were to be open ditch; concrete conduit pipe varying from sixty to seventy-two inches would run for twenty-five thousand feet; the usually dry creek beds would be used for ten thousand feet. Dundee Diversion Dam, the biggest of the three diversion dams would be two hundred and seventy feet long with six radial gates. Canal capacity was estimated at eighty cubic feet per second; enough to cover twenty thousand acre feet per year. The added diversion from the Arkansas River would supplement the Walnut Creek water, which was thought to be adequate but for evaporation.⁴³

The total cost of the project was estimated at this time to be \$3,000,000. Three-fourths of this total was paid for by the Pittman-Robertson Federal Aid-to-Wildlife Act, funds of which were derived from an 11% excise tax on firearms and ammunition. One-fourth would come from State Fish and Game funds.⁴⁴

By 1956, development was approaching completion. The work included: dike-roadways which formed the five lakes of the Bottoms, structures to control water in all areas, duck blinds in two public shooting area, the headquarters building and manager's house, an outlet canal, the Wet

⁴⁰Schwillig, "Cheyenne Bottoms," 7.

⁴¹Ibid.

⁴²"The Cheyenne Bottoms," *Kansas Fish and Game* 7 (April, 1950), 1.

⁴³"Water from Arkansas River Will be Diverted into Cheyenne Bottoms," *Kansas Fish and Game* 12 (January, 1955), 18.

⁴⁴Ibid., 19.

Walnut diversion dam and canal into the bottoms.⁴⁵ Still to be constructed were the Dundee Diversion Dam and twelve bridges over Wet Walnut Creek.

In the fall of 1957, thirty years nearly to the day since Talbot Denmead and Seth Gordon had recommended pursuing federal assistance, Cheyenne Bottoms Game Preserve was ready to be dedicated. On October 13, the multitude assembled together with Gov. George Docking, Lt. Governor Joseph Hunkle, Senator Frank Carlson, and a number of former governors including Edward Arn and Arnold Kapper. Robert Rutherford of the Department of the Interior gave the dedication speech. The completed Cheyenne Bottoms was now "one of the foremost game refuges on the waterfowl migratory route between the Canadian border and the Gulf area."⁴⁶

Unfortunately, problems developed almost immediately. As is well-known now in the central plains, water is a feast or famine proposition. The design of the new, highly-managed Cheyenne Bottoms included five pools, of which Pool #1 was the main water storage area. This pool represented 3300 acres of water four to five feet deep. The Kansas wind caused the turbidity in the pool to reach such proportions that the water would no longer sustain vegetation or invertebrates essential to the waterfowl to which the Bottoms was supposed to cater. Fluctuation of water levels throughout the various pools need relatively clear water to succeed. Various studies were done in the 1960s to try and find ways to reduce turbidity and the increasing problem of wave erosion on the dikes. The drawdown of the water in the outer pools in the spring followed by aerial seeding of millet was found to be a sufficient stop-gap measure, which also provided food for local invertebrates as well as the migratory fowl population. In good years, the arrival of migrating waterfowl testified to an environment of "astounding abundance."⁴⁷

No significant changes were made until the 1980s, when the Kansas Department of Wildlife and Parks contracted with engineering firms and other agencies to develop a renovation plan for the Bottoms. A plan was developed which would take approximately ten years to implement at a cost

⁴⁵"Canal to Cheyenne Bottoms Takes Shape," *Kansas Fish and Game* 13 (January, 1956), 1.

⁴⁶"Cheyenne Bottoms Dedicated," *Kansas Fish and Game* 15 (January, 1958), 6.

⁴⁷Schwillig, "Cheyenne Bottoms," 8.

of \$16-18 million. Divided into four stages, the first stage called for a new hydrology study and general evaluation of the situation at the Bottoms. This was undertaken by Thomas McClain and others for the Kansas Geological Survey.⁴⁸ The pipeline part of the canal was expanded to reduce blockage problems which sometimes caused inlet water to flood farmers' fields and never make it to the Bottoms, the same kind of problem the Koen ditch had suffered. Construction of floodwater distribution systems and a flow gauging station at the inlet and outlet canals rounded out the second stage of the plan. Stages three and four called for dividing pool 1 into 1A and 1B. This would reduce turbidity and allow fresh water to be maintained with a smaller inlet requirement. Rip rap on the new dike in pool 1 would greatly reduce erosion due to wave action. The last part of the plan would be to construct a mitigation marsh to replace the area lost to the new dike.⁴⁹

Now, in the spring of 1997, the project is virtually complete. In a recent interview with the manager of the Bottoms, Karl Grover, he expressed satisfaction at having the renovation project finally coming to an end. His reservations however, are the reservations of everyone who lives in this part of the country: will there be enough water? This question will exist on the Great Plains as long as people are here and the Rocky Mountains continue to act as a rain shadow over the region.⁵⁰

⁴⁸Thomas McClain, J. P. Allen MacFarlane, and Munir A. Butt, *Surface Water Supplies Available for Cheyenne Bottoms Wildlife Area* (Lawrence: Kansas Geological Survey, 1981), passim.

⁴⁹"Cheyenne Bottoms Renovation," *Kansas Wildlife and Parks* 49 (March/April, 1992), passim.

⁵⁰Karl Grover, Manager, Cheyenne Bottoms Wildlife Area, interview with author, April 22, 1997.