

The Central Arizona Project

Jennifer E. Zuniga
Bureau of Reclamation
2000

Table of Contents

Central Arizona Project	2
Project Location	2
Historic Setting	6
Project Authorization	17
Construction History	31
Pre-Construction	31
Construction	34
Post-Construction	45
Settlement of Project Lands	50
Project Benefits and Uses of Project Water	51
Conclusion	52
About the Author	53
Bibliography	54
Archive and Manuscript Collections	54
Government Publications	54
Articles	54
Books	55
Internet Resources	55
Unpublished Works	56
Index	57

Central Arizona Project

The most expensive Bureau of Reclamation project ever constructed, and perhaps the most controversial, the state of Arizona considers the Central Arizona Project critical element in its future survival. The project represents nearly a century of determination by Arizona political and civil leaders to create the massive water diversion system. Testimony to this is reflected in the names of project features, Hayden-Rhodes and, named after men who spent the majority of their lives making the Central Arizona Project a reality.

Project Location

Located in Maricopa, Pima, and Pinal counties, the original purpose of the Central Arizona Project (CAP) was to supply diverted Colorado River water for nearly one million acres of agricultural land in the south-central corridor of Arizona then dependent upon groundwater. Reliance on groundwater resulted in accelerated overdrafts and soil subsidence throughout the area. Additional functions of the project included water for municipal and industrial(M&I) use in the metropolitan areas of Phoenix and Tucson. The project also provided power generation, flood control, outdoor recreation, sediment control, and fish and wildlife conservation.

During project construction the urban population of central Arizona expanded rapidly. Rapid urbanization into agricultural areas, increased construction costs and increased operation and maintenance (O&M) costs shifted the focus of CAP from an agricultural project to a M&I project. Project water comes from the Colorado River and is transported to project lands through a series of pumps, tunnels, and aqueducts. Essentially a 300 plus mile conveyance system, CAP transports Colorado River water from a diversion intake on Lake Havasu behind Parker Dam as far as the San Xavier Indian Reservation just south of Tucson.

Project features are subdivided into several divisions: Hayden-Rhodes, Regulatory

Storage, Fannin-McFarland, Tucson, Indian Distribution System, and Colorado River. The names of two divisions were changed during project construction. Initially called the Granite Reef Division, it was designated the Hayden-Rhodes Division by Public Law 100-345, 100th Congress, June 24, 1988. Originally called the Salt-Gila Division, the division was designated the Fannin-McFarland Division by October 30, 1992. Division name changes were in honor of Arizona congressional members who spent much of their political careers lobbying for the CAP.

The Hayden-Rhodes Division begins at the intake channel and pumping plant on the south side of the Bill Williams River arm of Lake Havasu. Diverted water is pumped up more than 800 feet from the lake to the inlet portal of the Buckskin Mountains Tunnel. After passing through the tunnel, water enters the open channel of the Hayden-Rhodes Aqueduct. The aqueduct transports the water to Phoenix. The Fannin-McFarland Division begins at the terminus of the Hayden-Rhodes Aqueduct south of the Salt River Siphon in the greater Phoenix metropolitan area.. The Tucson Division begins at the end of the Fannin-McFarland Aqueduct and carries water in a southeasterly direction for about 81 miles. Project water is delivered to southern Pinal and eastern Pima counties, including the Tucson metropolitan area. During division pre-construction planning and construction, the aqueduct was separated into Phase-A and Phase-B to facilitate evaluation of alternative routes and maintain level construction funding. Phase-A of the aqueduct begins at the end of the Fannin-McFarland Aqueduct and continues southward toward the town of Rillito. Phase-B conveys water to Tucson, ending near the southern boundary of the San Xavier Indian Reservation fourteen miles south of the city.

The Indian Distribution Division of CAP is divided into two systems: the Indian Distribution System and the Non-Indian Distribution System. The former consists of facilities necessary to deliver CAP water allocated by the Secretary of the Interior to twelve central

Arizona Native American Communities. Project water has been identified for agricultural and/or tribal homelands use; classification of the water depends on the community. Seven of the tribes are served directly from CAP aqueducts. The five remaining communities located upstream from the aqueducts require water exchanges with downstream water right holders. The twelve communities are scheduled to receive 52,810 acre feet of water per year until 2005, after which allocations will be based on a “shared priority” between Indian users and M&I users throughout the remainder of the project life. During shortage years users will share available water proportionally.¹

The Non-Indian Distribution System is composed of all non-Indian water users who received allocations of CAP water for agricultural uses. All of the irrigation districts which form the non-Indian Distribution system receive their water from the Central Arizona Water Conservation District, the principal agricultural contractor with the United States Government. Under the provisions of project authorization no new non-Indian land can be brought under cultivation using CAP water.

The Regulatory Storage Division of the project includes New Waddell Dam and Camp Dryer Diversion Dam located on the Agua Fria River, a tributary of the Gila River; and modified Roosevelt and Stewart Mountain Dams on the Salt River. All the dams predate the project and have been modified for safety and increased storage capacity. New Waddell Dam is located about thirty-five miles above the Gila Confluence on the Agua Fria River. The Camp Dryer Diversion Dam lies downstream of the former. Roosevelt Dam is located on the Salt River seventy-six miles northeast of the Phoenix metropolitan area. Also on the Salt River, the Stewart

1. National Archives and Records Administration, Rocky Mountain Region, Records of the Bureau of Reclamation, Record Group 115, “Project Histories: Central Arizona Project,” 1980, 1. (Hereafter cited as “Project History” with year and page.)

Mountain Dam forty-one miles northeast of the urban area. The modified dams of the Regulatory Storage Division provide increase flood control for the Phoenix area.

The distance and elevation project water is conveyed requires a tremendous amount of energy. The Navajo Steam Generating Plant, located near Page, Arizona, provides pumping power for the project. Provisions of the Colorado River Basin Project Act allowed Reclamation to participate in the non-Federal Navajo Project. Reclamation is entitled to approximately 24 percent of the energy produced at Navajo. Power generated at the plant is used to power the pumps throughout the CAP.

The 309 mile transmission system supplies power to the pumping plants and check structures along the Hayden-Rhodes Aqueduct. About 250 miles consists of the 230-kV line which interconnects the delivery portion of the transmission system. The radial transmission line to the pumping plants consists of about 51 miles of 115-kV and eight miles of 230-kV lines. The 230-kV transmission line begins at the McCullough Switching Station in Clark County, Nevada, interconnecting with Davis Switchyard, Parker Switchyard, and Liberty Substation in Arizona. Harcuvar Substation was constructed in LaPaz County, Arizona, and the Hassayampa Tap Substation in Maricopa County, Arizona.² Nearly 51 circuit miles of radial 115-kV transmission line supply power to Bouse Hills and Little Harquahala Pumping Plants and about eight circuit miles of radial 230-kV transmission line supply power to the Havasu and Hassayampa Pumping Plants.

The Fannin-McFarland Pumping Plant uses the existing Federal transmission system. The Spook Hill Substation is located in Maricopa County, Arizona, on the existing Mesa-Coolidge 230-kV line. Six miles of 69-kV line was built to supply power to the Fannin-

2. "Project History", 1986, 6.

McFarland Pumping Plant. Approximately 40 miles of existing transmission lines were reconstructed and the addition of increased power capacity to the Coolidge Substation provides power to the Tucson Aqueduct Pumping Plants. The need for a power source for the pumping plants near Picacho Mountain required the construction nearly 25 miles of new 115-kV transmission line.³

The project region is arid with scorching summers and very mild winters. The dry climate enables an annual growing season of more than 300 days. However, a lack of significant precipitation and overuse of limited surface water resources made the area dependent upon groundwater pumping to supply water for agricultural as well as M&I use. The average annual precipitation is 7.66 inches, but extremes of 15.23 and 3.16 inches have occurred. Years with rare high rainfall often result in flooding that unleashes havoc on the region. During years of minimal precipitation, drought kills crops and leads to increases in groundwater overdraft. Temperatures also serve as indicators of the extreme climate variations of the region. The annual mean is 72.4 degrees Fahrenheit, but the maximum and minimum temperatures recorded are 122 degrees and 17 degrees respectively. In order for agriculture and urban populations to exist, the region must have a reliable water supply.

Historic Setting

Human occupation of central Arizona dates back to prehistoric times when nomadic and semi-nomadic bands of hunter-gathers roamed through the region. Occasionally these people planted crops along the streams and rivers of the area, but the success of their agricultural endeavors remained totally dependent upon the whims of nature. Not until the available water resources of the region, such as the Gila and Salt Rivers, were applied to the land in a controlled

3. *Project Data*, 303.

fashion could a semi-sustainable agricultural society develop.

Around 300 B.C. irrigation agriculture developed in the Salt River Valley. Five hundred years later, about 200 A.D., a band of farmers from the valley moved south and settled along the Santa Cruz and Rillito Rivers in southern Arizona. These pioneers of irrigation agriculture have been named the Hohokam, a Pima Indian word which means “the dead” or “those who have vanished.”⁴

The Hohokam constructed complex systems of ditches dug with wooden sticks and stone axes. Simple bush dikes and diversion dams controlled water flows enough for the Hohokam to develop an irrigation empire. In the Salt River Valley, the total length of the irrigation works are estimated at 150 miles.⁵ Hohokam society revolved around the community unit, with individual families living in villages. Community water supply formed an elemental part of Hohokam life for the society’s survival depended on the success of their irrigation systems.⁶ The best surviving examples of Hohokam culture are the Pueblo Grande Ruins in downtown Phoenix. For reasons that are not clear, Hohokam civilization essentially disappeared around 1400 A.D. Though several theories exist about the decline of the Hohokam, such as over-cultivation of the land and drought, no conclusive evidence supports a single premise. The only decisive evidence about the demise of the Hohokam culture is that the civilization ended some 200 years before the Spanish arrived.

When the Spanish arrived in Central Arizona in the mid-sixteen century, they encountered the Pima and Maricopa Indians using Hohokam irrigation canals to irrigate crops. The first extensive Spanish exploration of the project region occurred in the 1540 when

4. Odd S. Haleseth, “Arizona’s 1500 Years of Irrigation History,” *The Reclamation Era*, Dec. 1947, 251-4.

5. *Ibid.*

6. T. Lindsay Baker, et. al., *Water For the Southwest: Historical Survey and Guide to Historic Sites*, New York: American Society of Civil Engineers Historical Publication No. 3, 1973, 7.

Francisco Vasquez de Coronado and his party crossed the desert southwest. More than a hundred years passed between the Coronado expedition and settlement of the region.

In 1691, Father Eusebio Francisco Kino, a Jesuit missionary entered the Santa Cruz Valley initiating European colonization of the area. Father Kino introduced the Native Americans in the region to Catholicism, new crops, and livestock. Unfortunately, the Spanish also introduced new diseases which decimated the local populations. Through his missionary endeavors, Father Kino helped establish missions at Guevavi, San Xavier del Bac, and smaller missionary posts at San Agustin del Tucson and Tumacacori.⁷ Father Kino's missionary efforts also lead him to the Gila River Basin, where he observed the Pima and Maricopa Indians practicing irrigated agriculture. However, aside from occasional missionary ventures in to the region, the Spanish never colonized the region above the Gila. European development of the Salt River Valley did not occur until the nineteenth century.

Spanish settlement of central Arizona entailed development of river systems for agricultural and municipal uses. Originating from the dry Iberian Peninsula of Europe, Spanish settlers understood the importance of irrigated agriculture in an arid region. As a result, Spanish settlements sprang up near rivers and streams. Simple irrigation ditches, called acequias, diverted water from streams to fields and were constructed along with brush and earth diversions.⁸

Spanish missionaries brought to the region new crops and animals which significantly altered the lifestyle of the Native Americans they encountered. For example, the introduction of winter wheat to the area enabled Native Americans to cultivate land year round and the entry of domesticated livestock allowed them to develop a sedentary lifestyle with a steady source of

7. Barbara Tellman, Richard Yarde, Mary G. Wallace, "Arizona's Changing Rivers: How People Have Affected the Rivers," Water Resources Research Center, College of Agriculture, The University of Arizona, March 1997, 7.

8. Baker, et. al., *Water for the Southwest*, 21.

meat. Water intensive crops such as peaches, oranges, and pecans indentured Spanish and Native American farmers to irrigated agriculture. Agricultural development paired with Catholic missionary work to the region formed the core Spanish attempts to “civilize” the Indians.

Missionaries experienced early success with Native Americans, but relations inevitably turned sour. Water played a critical role in the deteriorating relations between the two groups. Meeting the growing needs of water for crops and livestock for the Spanish military and settlers required the reduction of Indian water rights. Though there was plenty of land for both the Spanish and Indians, an obvious water scarcity existed. Water distribution favoring the missions, presidios, and colonists often lead to disputes between colonists and Native Americans.⁹ Inequality of the water disbursement between Indian and Non-Indian users remains a problem even today.

In 1821, Mexico won independence from Spain and the region became a part of the new nation. However, Mexican control of Arizona was short-lived. The treaty of Guadalupe Hidalgo formally ended the war between Mexico and the United States in 1848. Treaty provisions ceded land above the Gila River to the United States. Five years later, the United States acquired the remainder of Arizona in the Gadsden Purchase.

Contemporaneous to the Mexican Republic’s appropriation of Arizona, Anglo-American fur trappers entered the region to hunt beaver in the area’s rivers. After the region became a territory of the United States in 1863, settlers entered Arizona for reasons connected to three economic activities, farming, ranching, and mining.

Following the discovery of gold in California in 1849, thousands of people crossed the area on the way to California but few wished to stay in the harsh, unforgiving desert

9. Michael C. Meyer, *Water in the Hispanic Southwest: A Social and Legal History 1550-1850*, Tucson, Arizona: The University of Arizona Press, 1984, 55-7.

environment. Mining in Arizona did not develop extensively until the discovery of gold in the Gila River in 1850. However, regional gold reserves were limited and copper mining proved the more plentiful and profitable mineral resource in the region. Copper mines discovered in the late 1880s are still open today and receive allocations of CAP water.¹⁰

Copper mining developed into lucrative enterprise during the late nineteenth century, and ranching and farming drew additional settlers to the region. Ranching, which emerged during Spanish settlement, dramatically changed the scenery. Prior to introduction of domesticated animals such as cattle and sheep to the region, large grazing animals did not exist in the area. Following in the footsteps of Spanish ranchers, Mormon settlers tried their hand at ranching in central Arizona. Large ranching operations soon replaced the Mormons as the industry developed during the last three decades of the nineteenth century. During the 1870s and 1880s, above average rains and arrival of the railroad facilitated increased interest in the region and the industry boomed with thousands of cattle and sheep grazing in the watersheds of central Arizona.¹¹

Drought during the last decade of the nineteenth century and complaints from farmers about livestock causing severe soil erosion and flooding problems, contributed to a reduction of the great number of domesticated animals in the region. The development of the mining and ranching industries in central Arizona contributed much to the development of the region, but neither had the same economic, social, and cultural impact nor used as much water as farming.

Cultivation of the land in central Arizona can be traced back thousands of years to the previously mentioned Hohokam. With the introduction of water-dependent crops by the Spanish, irrigation agriculture became a mainstay in the development of the region. The first

10. Tellman, Yarde and Wallace, "Arizona's Changing Rivers: How People Have Affected the Rivers," 52.

11. Tellman, Yarde and Wallace, "Arizona's Changing Rivers," 56.

Anglo-American farmers settling in the central region of Arizona quickly obtained land near river basins. By the 1860's, these settlers began redeveloping the land along the Salt River that the Hohokam once farmed. Sometimes farmers used the prehistoric canals, but usually they built their own following the paths of the ancient ones.¹²

Yet, despite advances in technology, nineteenth century farmers encountered problems similar to those the Hohokam and their predecessors experienced. Without large dams on the rivers to provide flood control and store water for later use during drought years, agricultural success still depended upon the whims of nature. When the rivers swelled with runoff, meager diversion works failed, fields flooded and crops washed away. By the time that farmer's rebuilt their waterworks, river flows usually dropped to a trickle and remaining crops withered and died in the desert heat.

In addition, nineteenth century farmers faced an ever- increasing problem, competition for water resources. As more settlers poured into the Salt River, Gila River, and Santa Cruz River Basins, the demand for the rivers' water increased. Individuals and ever increasing numbers of ditch companies all grappled for the same resource; a resource not plentiful enough to serve all those who desired it. By the 1890s, further development of the Salt River Valley seemed unlikely and water demand for agricultural uses started to exceed supply of the Salt and Gila Rivers.¹³

In 1891, unprecedented rain fell during the first two months of the year and resulted in the flooding the Salt River Valley. For twelve years following the great flood, a devastating

12. David M. Introcaso, "Water Storage and Hydroelectric Development in Central Arizona," Ph.D. diss., Arizona State University, 1995, 19.

13. Introcaso, "Water Storage and Hydroelectric Development in Central Arizona," 2.

drought held the region in its grip.¹⁴ Settlers watched as the desert reclaimed their fields and orchards, and many left in search of better climates. Valley residents congregated in different locations with the same urgent concern, a need for action to stop the damaging effects of the drought. During the next ten years, local farmers developed a plan to build a dam on the Salt River above the valley which could hold flood water releasing it for use during periods of water shortage. However, the estimated costs of the project exceeded what valley residents could afford. Realizing that a big dam was essential for the future of the valley, central Arizona leaders joined forces with leaders from other western states to campaign for a federal program to fund needed water development programs.¹⁵

Following passage of the Newlands Act in 1902, and the subsequent formation of the United States Reclamation Service, water users created the Salt River Valley Water Users Association. In 1904, the association and the United States Government entered into a contract for the construction of the long needed dam, as part of the Salt River Project (SRP).¹⁶ The project entailed construction of a dam, named Roosevelt Dam after the President, in a canyon on the Salt River about 80 miles upstream of Phoenix and a water delivery system to the town and the surrounding agricultural area. Completed in 1911, Roosevelt Dam marked the beginning of the development of the central Arizona from an inhospitable desert into an agricultural oasis. Following the completion of SRP, agricultural production in the Valley bloomed as the new water works provided a steady water supply and protection against all but the worst natural disasters.

14. Jack L. August, Jr., *Vision in the Desert: Carl Hayden and the Hydropolitics of the American Southwest*, Fort Worth: Texas Christina University Press, 1999, 18-9.

15. Rich Johnson, *The Central Arizona Project, 1918-1968*. Tucson, Arizona: The University of Arizona Press, 1977, 3.

16. Robert Autobee, "Salt River Project," second draft, Bureau of Reclamation History Program, 1993, 8, and Johnson, *The Central Arizona Project*, 3.

Concurrently, Anglo-American farmers along the Gila River began pushing Pima and Maricopa Indians off the most productive land in the basin. A scenario similar to what occurred along the Salt River unfolded as farmers and irrigation companies competed against each other for river water and often left communities downstream with little or no water. In 1887, farmers around the town of Florence built a canal which diverted the entire flow of the Gila leaving the Pima without any water.¹⁷ In order to secure additional land for cultivation, settlers drained the lagoons and cleared the land along the river, converting it to farm land. Again, flooding and climatic extremes often foiled efforts to fully control the land and river. Settlers of the region sought a water project to control the Gila.

The San Carlos Irrigation Project, a Bureau of Indian Affairs endeavor, was authorized in 1928. Though publicized as a water project which would benefit the Pima Indians, the San Carlos Irrigation Project also provided water to non-Indian farmers. The primary feature of the project, Coolidge Dam, never functioned as intended and more often than not the Anglo-American farmers received their water allotments before the Pima.¹⁸ In addition to Coolidge Dam, other dams were constructed on the Gila for the benefit of farmers. The Ashhurst-Hayden Dam, also a part of the San Carlos Project, diverted most of the low flow of the water of the Gila to fields enabling an expansion in agricultural growth.¹⁹

Agrarian development of the land along the Santa Cruz River also occurred in a similar manner to that of the Gila and Salt Rivers, but with one notable exception. Until the authorization of CAP, no federal water projects were constructed in the south end of central Arizona. There farmers relied heavily upon the use of groundwater to irrigate their crops. At

17. Tellman, Yarde and Wallace, "Arizona's Rivers," 100-1.

18. Tellman, Yarde and Wallace, "Arizona's Rivers," 102-3.

19. Tellman, Yarde and Wallace, "Arizona's Rivers," 103.

first, the marginal power of wind powered pumps limited agricultural growth. In 1890, woodburning pumps were first introduced to the area, but they were also inefficient and needed wood to operate, a scarce commodity in the desert.²⁰ However, a few years later an invention in engineering changed the course of agricultural development and production in central Arizona.

The evolutionary advancement was combustion engine powered pumps. Suddenly farmers were no longer forced to cultivate land located only in the immediate vicinity of a river. In areas like the Santa Cruz Valley, the advent of combustion pumps proved to be a burden in disguise. The efficiency of the groundwater pumping and the lack of significant water storage facilities on the watersheds quickly made the farmers and villagers in the region dependent upon groundwater. The precariousness of such a dependency surfaced early in the twentieth century as the groundwater table dropped and the surface flow of the Santa Cruz River disappeared.²¹ The disappearance of the river because of the drop in the groundwater table foreshadowed the agricultural dilemma which currently threatens central Arizona.

While the combustion pump allowed agricultural production beyond the immediate vicinity of the regions rivers and permitted large scale development of water intensive crops, the real agricultural boom did not begin until after the first World War. Then agricultural production expanded further away from the storage and irrigation projects on the Gila and Salt Rivers, becoming entirely dependent upon groundwater. This boom strengthened the Arizona economy and enticed more people to relocate into the region. In a perfect world, such growth would be nothing more than a blessing, but as cultivation and the population of central Arizona expanded dependence on groundwater also increased. As the groundwater table dropped, leaders of central Arizona realized the necessity of securing an additional source of water for future development.

20. Tellman, Yarde and Wallace, "Arizona's Changing Rivers," 20.

21. *Ibid.*

The source they sought lay beyond the mountains to the west and was coveted by other states as well, the Colorado River.

As the only major river west of the Rocky Mountains which flows through the desert southwest, development of the Colorado River was necessary for the successful development of the western United States. Historically unruly and unpredictable, the Colorado thwarted the earliest attempts of settlers to live in harmony with the river. Federally funded development of the Colorado began soon after the creation of the Reclamation Service starting with the Yuma Project in 1904. However, control of the river in the lower basin required construction of a large dam or disastrous events such as what occurred in 1905 would occur again. That year a swollen Colorado jumped its banks, changed course, and filled the, and threatened to flood the entire Imperial Valley before the river was forced back to its previous course two years later.

The need for development of flood control devices on the lower Colorado River was made only more apparent after the 1905 flood. Creation of large flood control facilities on the river also entailed the diversion of water stored behind the dam for agricultural, industrial, and urban uses. Rapidly growing southern California was the obvious recipient of the water and Colorado, New Mexico, Utah, and Wyoming opposed construction of a dam on the lower reaches of the river.²²

In 1919, concern over the development of the Colorado River lead to creation of the by the river basin states; Arizona, California, Colorado, New Mexico, Nevada, Utah, and Wyoming. The solitary purpose of the League, to promote the development of the river, soon faced difficulties as each state sought reclamation projects that would benefit their state fully, often to the disadvantage of the others. Fierce rivalries emerged as basin states competed amongst

22. Central Arizona Project, "About CAP," <http://www.cap-az.com>, July 1999 and Johnson, *The Central Arizona Project*, 6.

themselves for rights to the waters of the river.

However, all of the basin states saw the Colorado as the key to growth and development and all jockeyed for allocations of water. California, in particular, exhibited fierce determination in its pursuit of water resources for agricultural and urban development. California viewed the Colorado River as an untapped resource essential for continued growth. Only two years after the creation of the League of the Southwest, the United States Congress authorized the basin states to enter into a Colorado River Compact.

The Colorado River Compact divided the waters of the Colorado River proportionately among the basin states ensuring that each would have an adequate water supply for future growth. The interstate treaty also divided the basin states into two categories, the Upper Basin States and the Lower Basin States. Colorado, New Mexico, Utah and Wyoming were designated as Upper Basin States, and Arizona, California, and Nevada as Lower Basin States. After months of preliminary community meetings and much debate, representatives from each state met at Santa Fe, New Mexico. On November 24, 1922, negotiators reach an agreed version of the compact. However, the Arizona legislature refused to ratify the compact, an action which marked the beginning of a battle over Arizona's claims to Colorado River water and hostilities with California over the appropriation of the river by the two states.

Arizona and the Upper Basin States voice a similar objection, they claimed that a disproportionate allotment of water would enable California to establish a senior water right leading to continued growth of the state that would demand additional diversions from the river. If unable to appropriate water rights beyond the amount allocated in the compact, Arizona maintained it would experience little or no growth. Opponents of the compact argued that because nearly half of the river flowed along the western boundary of or within Arizona, the

State had superior rights to the river.²³ In an attempt to coerce Arizonan authorization of the compact, the United States Government refused to authorize any federal water projects on the river. The tactic proved futile. Only six years after the creation of the compact, a provision was written into the Boulder Canyon Project Act which allowed the passage of the Colorado River Compact without ratification by Arizona.²⁴

The passage of the Boulder Canyon Project Act negated the need for Arizona's ratification of the compact for development of the Colorado River. In fact, the Boulder Canyon Project signaled the beginning of reclamation projects which did not benefit or promote development in Arizona. Though Arizona opposed development along the river which diverted river water to California, state leaders eventually realized the necessity of ratifying the compact in 1944. Ratification of the compact would guarantee Arizona an allotment of Colorado River water before the flow of the river was completely divided up with none for Arizona.

Project Authorization

The first serious proposals for a water project to bring Colorado River water into central Arizona developed in 1920s. The promoters of these earliest schemes were two of Arizona's strongest opponents of the Colorado River Compact, George H. Maxwell and Arizona state representative Fred T. Colter. Both men made money developing irrigation systems in central Arizona and both realized that continued growth of the region required additional water development projects.

In 1922, the same year that negotiators of the Colorado River Compact met in Santa Fe, Maxwell busily promoted a plan to bring Colorado River water into the agricultural lands of

23. Johnson, *The Central Arizona Project*, 15.

24. United States Department of the Interior, Bureau of Reclamation. Section 4 (a), Boulder Canyon Project Act, Act of December 21, 1928, ch. 42, 45 Stat. 1057, in *Federal Reclamation and Related Laws Annotated: Volume I of Three Volumes Through 1942*, Washington: United States Government Printing Office, 1972, 419.

Central Arizona. Called the “Arizona High Line Canal,” the proposed project would irrigate approximately 2,500,000 acres of farm land in central Arizona. Project water diverted from the construction of a storage reservoir in the Boulder Canyon- Black Canyon area would be transported hundreds of miles to project lands via a series of pumping stations, aqueducts, and tunnels.²⁵ Though Maxwell succeeded in raising enough money to finance a preliminary geological survey of the proposed project area, the survey declared the project infeasible.²⁶ Two additional surveys conducted in the early 1920s, one by Reclamation and the other independently financed, arrived at the same conclusion. At the time called a “mad man’s dream,” Maxwell’s idea for a state canal for Arizona reemerged twenty years later with earnest support from political leaders in Arizona as the proposed Central Arizona Project.²⁷

Fred Colter’s plan for irrigating the agricultural land of central Arizona was similar to that of Maxwell, but his position was more resolute. Credited as the one man force who prevented Arizona’s ratification the Colorado River Compact, Colter maintained a steadfast belief that the state had sole proprietary rights to the waters of the Colorado.²⁸ Colter’s plan for the Colorado called for the construction of a reservoir above Lee’s Ferry with a storage capacity of sixteen million acre feet. Water could then be conveyed through a delivery system nearly 150 miles long to agricultural lands in central and southwestern Arizona. Under Colter’s plan, six million acres of land would be irrigated by transported Colorado River water.²⁹ With negotiation of the Colorado River Compact, which limited Arizona’s water rights, Colter began a campaign to prevent its ratification. Throughout the remaining twenty-two years of his life, Colter spent

25. Norris Hundley, Jr., *Water and the West: The Colorado River Compact and the Politics of Water in the American West*, Berkeley, Los Angeles, London: The University of California Press, 1975, 159 and Johnson, *The Central Arizona Project*, 13-4.

26. Hundley, *Water and the West*, 159.

27. Johnson, *The Central Arizona Project*, 14.

28. Johnson, *The Central Arizona Project*, 16-7.

29. Johnson, *The Central Arizona Project*, 16.

his time, money, and life blocking any action which threatened Arizonan development of the Colorado River. Colter unwaveringly maintained the belief that as long as Arizona did not ratify the compact, the state had no legal obligation to follow its provisions. Ironically, Arizona ultimately ratified the Colorado River Compact in 1944, the year of Colter's death.

During the years of the Colter campaign for state sovereignty over the Colorado River, relations between Arizona and Californian became increasingly tense. In addition to refusing to ratify the Colorado River Compact, Arizona opposed authorization of the Boulder Canyon Project Act in late 1928 and used the Arizona National Guard in an attempt to stop the construction of the Parker Dam in 1934. The failure of these endeavors to halt the development of the Colorado River and diversion of water to southern California set the stage for dispute between the two states over who received what allocations from the river.

In 1938, Arizona made the first serious effort to develop the Colorado River. The Committee of Fourteen, composed of business and political leaders who represented the seven Colorado River Basin States, organized to consider Arizona's application for a federal license to build Bridge Canyon Dam. The license was denied. A proposed project in northern Arizona on the Colorado River, the dam would provide much needed hydroelectric power for the growing urban area of Phoenix. The following year, the Bureau of Reclamation began a study of potential water projects in the Lower Colorado River Basin including a Central Arizona Project. Specific preliminary investigations of the Central Arizona Project by Reclamation began in late 1940. The conclusions of any study involving the Colorado River and Arizona were contingent upon Arizona's ratification of the Colorado River Compact and acceptance of the allocation of 2.8 million acre feet of Colorado River water as specified in the Boulder Canyon Project Act of 1928.

Meanwhile, after nearly forty years of negotiations involving the appropriation of the Colorado, Rio Grande, and Tijuana Rivers the United States and Mexico agreed upon a settlement. In 1944, the two nations entered into a treaty which reserved 1.5 million acre feet of water from the Colorado River annually for Mexico. With the passage of the agreement, fear of Mexico and California establishing prior appropriative rights of the flow of the river persuaded Arizona to ratify the Colorado River compact and to sign a contract with the Secretary of the Interior for an annual delivery of 2.8 million acre feet a year. Upon entering into the contract, the Arizona state legislature appropriated \$200,000 for a cooperative study, conducted by Reclamation, of potential uses of Colorado River water. Finally, the dream of a Colorado River water development project for central Arizona had the interest of Reclamation.

In 1946, the Central Arizona Project Association (CAPA) was organized. A nonprofit organization, CAPA promoted and educated the public of Arizona and elsewhere about the importance and necessity of a Central Arizona Project.³⁰ The following year the association organized and coordinated efforts which culminated in Arizona Senator E.W. McFarland's introduction of S. 1175 to authorize CAP. On December 19, 1947, shortly after the congressional hearings on CAP Authorization Bill S. 1175, Reclamation submitted its report on the project to Secretary of the Interior Julius A. Krug.

The report included information produced in two prior preliminary draft reports which played an elemental role in the final proposed project. The first draft "Comparison of diversion routes, central Arizona project, Ariz.", completed in 1945, narrowed down possible routes for an aqueduct system of the proposed project to two alternative routes. The first option called for the employment of the Bridge Canyon Route or "gravity route" and the other for the Parker (where

30. W. S. Gookin, "Central Arizona Project, Part One—History of Development" in *Reclamation Era* vol 35, no 1 (January 1949), 7; and Johnson, *The Central Arizona Project*, 30.

water would be diverted above Parker Dam on the Colorado River) or “pumping route.”³¹ The other key draft report, issued in early 1947, “Report of the Feasibility, Bridge Canyon route, Central Arizona project” included supplemental information on the Parker route. After comparing the two options, the report concluded that the Parker route was the most feasible.³² Subsequently, despite many modifications to other features of the CAP plan, the Parker route remained the basis of planning and construction.

As presented in Reclamation’s 1947 report, CAP encompassed many features. In addition to the Parker route, proposed project features included pumping plants at Lake Havasu to lift water to the point where water could flow by gravity through the Granite Reef Aqueduct (now known as the Hayden-Rhodes Aqueduct) to the Granite Reef Dam; the McDowell pumping plant and a potential McDowell Dam on the Salt River; the Fannin-McFarland Aqueduct; Buttes Dam in Arizona and Hooker Dam in New Mexico on the Gila River; and the Charleston Dam on the San Pedro River with a pipeline transporting water from the dam to the Tucson area.³³ Additional features included improvement of the irrigation system in the Safford Valley of Arizona and enlargement of Horseshoe Dam. During the following twenty years leading to project authorization, many of the features originally proposed by Reclamation were eliminated from the project for various reasons. The 1947 CAP plan presumed 1.2 million acre feet would be imported into central Arizona and used on existing agricultural lands. Approximately 80,000 acre-feet of water was designated for M&I use in the Phoenix area. This early plan did not

31. U.S. Congress, House, *Central Arizona Project, Letter From the Secretary of the Interior Transmitting A Report and Findings on the Central Arizona Project* (Washington, D.C.: Government Printing Office, United States Congress. House. *Central Arizona Project, Letter From the Secretary of the Interior Transmitting A Report and Findings on the Central Arizona Project*. 81st Congress, 1st sess., 1949. House of Representatives 136

32. *Ibid.*

33. House, *Central Arizona Project, Letter From the Secretary of the Interior Transmitting A Report and Findings on the Central Arizona Project*, 144-82; and Gookin, “Central Arizona Project, Part Two: Plans for the Future,” *The Reclamation Era*, 28-40.

propose to convey Colorado River water to Tucson. The agricultural area to be served by CAP included only land north of the Gila River.

On February 5, 1948, Secretary Krug approved Reclamation's CAP plan report. By the middle of September of 1948, Reclamation submitted the report to Congress for approval and the battle for CAP authorization began. During 1949, both the House of Representatives and Congress held hearings on bills to authorize construction of CAP. Also that year, Arizona ratified the Upper Colorado River Basin compact appropriating 50,000 acre feet of Upper Basin water to the state. Ratification of the compact did not aid efforts to authorize CAP. In 1950, CAP Bill S. 75 passed in the Senate but not in the House.

On April 18, 1951, after another failed authorization attempt, the House Committee on Interior Affairs indefinitely postponed further action on CAP until resolution of the controversy over Arizona's entitlement of Colorado River water. A core issue of the conflict involved Arizona and California's contradictory views of what comprised the former's allocation of Colorado River Water, in particular whether Arizona's appropriation of 2.8 million acre feet included the flow of the Gila River and if California's legal limit on water appropriation was 4.4 million acre feet. Arizona maintained that the Gila flowed entirely within the state and therefore did not count as part of the 2.8 million acre feet allotted to Arizona in the Colorado River Compact. California, on the other hand, argued that since the Gila is a tributary of the Colorado River, its flow should be incorporated as part of Arizona's entitlement.

As if the debate over the flow of the Gila River did not provide enough problems, Arizona and California held different positions on the correct amount of California's appropriation of the Colorado. Conflict arose regarding the two states' different interpretations of a California state law. In 1929, the California enacted the California Limitation Act, limiting

its allotment of Colorado River water to 4.4 million acre feet. Arizona claimed the 1929 legislation and the Boulder Canyon Project Act limited California's consumption to 4.4 million acre feet. Arizona also postulated that the larger state violated its own ordinance by constructing diversion works and entering into contracts for the delivery of 5,362,000 acre feet annually.³⁴ Arizona feared California's blatant violation of federal and state restrictions on water use jeopardized Arizona's guaranteed allotment of water.

California's position on the issue also relied on previous legislation regarding the Colorado River. The state claimed it had a right to beneficial consumptive use of 5,362,000 acre feet under the provisions of the Colorado River Compact, Boulder Canyon Project Act and contracts made with the Secretary of the Interior. Additionally, California argued, Arizona's previous hostility toward any development of the river in the lower basin, such as its refusal to ratify the Colorado River Compact for more than twenty years and attempts to stop the Boulder Canyon Project and Parker-Davis Projects (then known as the Parker Dam Power Project), made Arizona's water rights dependent upon California's water delivery contracts. Above all, California maintained that its appropriative rights to beneficial consumptive use of the river were senior and superior to Arizona's.³⁵ California believed that authorization of CAP would result in a limitation of water deliveries, an action it considered a violation of state rights. Controversy over water allocations was the impetus behind the failure of any CAP bill to pass through the House during the 1940s and 1950s. Through political maneuvering, the California delegation succeeded in blocking each CAP proposal.

On August 13, 1952, realizing the graveness of the situation and potential scrapping of

34. John Upton Terrell, *War for the Colorado River, Volume One: The California-Arizona Controversy*, Glendale, California: The Arthur H. Clark Company, 1965, 279.

35. Johnson, *The Central Arizona Project*, 94.

CAP, Arizona filed an interstate suit in U.S. Supreme Court against California over the division of the waters of the Colorado River.³⁶ By January of the next year, the Supreme Court granted Arizona's motion to file complaint against California and authorized federal intervention. The interstate tension which had festered for more than twenty years boiled over when the trial of *Arizona V. California* opened in San Francisco in 1956.

For seven years, the case dragged on and progressed through the Federal court system with little resolution. Each state held steadfastly to its position. Arizona claimed that the state's survival depended upon the authorization of CAP which in turn depended upon enforcement of the legal limitation of 4.4 million acre feet of Colorado River water allocation to California. California argued its allocation of Colorado Water river water was not limited to 4.4 million and Arizona would receive its allotted share of Colorado River water because the flow of the Gila constituted part of its water right.

On June 3, 1963, the Supreme Court handed down its opinion. For the most part, the decision favored Arizona, paving the way for new round of authorization attempts for CAP. The court ruled that Arizona's 2.8 million acre foot entitlement of Colorado River Water did not include the flows of the Gila and that California's legal right to water was limited to 4.4 million acre feet. The Supreme Court issued a decree on March 9, 1964, formalizing and finalizing its ruling on the matter. Decree provisions laid the foundation for all future action regarding CAP by solidifying all previous laws concerning division of the river. The decree established Arizona's annual entitlement at 2.8 million acre feet from the mainstream of the Colorado River; and created a contingency plan for the division of water in times of extreme drought whereupon the Secretary of the Interior would decide how much would be allocated to claimants. The court

36. Terrell, *War for the Colorado River*, 278.

also specified that Native American water rights superceded all others when it ruled that water appropriations made prior to creation of the Colorado River Compact must be satisfied first, and maintained that the Mexican Treaty obligation superceded all domestic interstate divisions.³⁷

Following resolution of the Arizona-California controversy, renewed efforts for authorization of CAP received increased support. In 1964, the same year that the Supreme Court handed down its decree, Secretary of the Interior Stewart Udall, an Arizonan, unveiled the Pacific Southwest Water Plan. The regional water plan called for integration of all water resources in the Southwest thus eliminating the perennial battle for water among neighbor states. Udall's proposal called for construction of water projects in Arizona, California, New Mexico, Nevada, and Utah with water supplied by diversion of the Trinity River in northern California to the southern part of the state. The plan also included provisions for the diversion of the Columbia River in Washington and Oregon to Colorado River Basin States, and diversion of the Colorado River into Central Arizona for CAP. Two hydro-dams, Bridge Canyon and Marble Canyon, on the Colorado River between Glen Canyon and Hoover Dams, would produce power needed for the massive water transportation and pumping proposed in the plan. Surplus power generated at the two dams would be sold and the proceeds used to pay for project construction and operation costs. Though the plan proposed projects for several states, the focal point was CAP, Bridge Canyon, and Marble Canyon Dams.³⁸ However, Udall's Pacific Southwest Water Plan proved too grand and failed to receive needed support. In its stead new CAP bills, which included Bridge Canyon and Marble Canyon Dams, were introduced in Senate by Arizona Senators Carl Hayden and Barry Goldwater, and in the House by Arizona and California

37. Johnson, *The Central Arizona Project*, 14 and Marc Reisner, *Cadillac Desert: The American West and Its Disappearing Water*, New York: Penguin Books, 1993, 261.

38. Robert Dean, "Dam Building Still Had Some Magic Then": Stewart Udall, the Central Arizona Project, and the Evolution of the Pacific Southwest Water Plan, 1963-8," *Pacific Historical Review* 66, no. 1 (February 1997), 83-4 and Reisner, *Cadillac Desert*, 273-8.

representatives. Inclusion of the two dams led to a storm of controversy regarding actual need and potential environmental damage in one of the most beloved natural landscapes in the region, the Grand Canyon.

Controversy surrounding the construction of Bridge and Marble Canyon Dams marked a pinnacle moment in Reclamation history and the authorization of CAP. From the moment of their unveiling, the Grand Canyon Dams met serious opposition. The first opponent of the dams was the (NPS), which expressed concern that the dams would cause irreconcilable damage to Grand Canyon National Park. After the Department of Interior informed the NPS about the effects of the dams in the Canyon, the NPS dropped its protest. The proposed dams would only back up water through Grand Canyon National Monument and a minimal distance into Grand Canyon National Park. Reclamation claimed the reservoirs created behind the dams would enhance recreational opportunities in the canyon, in addition to supplying hydroelectricity needed for CAP and the growing urban areas of southern California and Arizona. However, by this time, other groups had raised concern about the proposed dams and were unwilling to accept the dams' construction.

Led by the Sierra Club and its president, David Brower, a coalition of environmental organizations started a nationwide campaign to prevent construction of Bridge Canyon and Marble Canyon Dams. Campaign tactics included the Sierra Club taking out full page advertisements against the dams in the *Washington Post*, the *New York Times*, the *San Francisco Chronicle*, and the *Los Angeles Times*. The environmental group attacked Reclamation's contention that the dams would only enhance visitors experience in the canyon.³⁹ Opponents also criticized Reclamation's claims that the dams were the most cost-efficient way to generated

39. Reisner, *Cadillac Desert*, 286.

energy needed to power CAP and urbanization of the region. Instead the environmental coalition promoted alternatives such as the construction of a thermal or nuclear power plant to produce the energy needed for CAP. Groups opposed to the dams maintained that they understood Arizona's need for CAP but could not allow the dams' construction.⁴⁰

To combat the attack against Bridge Canyon and Marble Canyon Dams, Reclamation Commissioner Floyd Dominy asked engineers to construct a model which could be used as a guide explaining the ramifications of the proposed dams.⁴¹ Designed for travel, the model made appearances at the congressional hearings on the dams in Washington in 1965 and several meetings in Arizona thereafter. Despite some initial curiosity about the model and the efforts of Reclamation to educate people that the dams would not flood the Grand Canyon, the campaign against Bridge Canyon and Marble Canyons Dams proved more successful in swaying public opinion.

As a result of the national campaign to prevent construction of the dams, congressional members felt pressure from their constituents not to vote for the authorization of CAP as long as the project included the controversial dams. Without support from other congressional members, Arizona Congressmen would never see the passage of a federal CAP bill which included Bridge and Marble Canyon Dams. Determined not to let the project die, proposals were made to authorize CAP as a state project. Reclamation, on the other hand, could not understand why the American public, in general, did not want any portion of the Grand Canyon inundated by a

40. Dean, "Dam Building Still Had Some Magic Then," 93 and Johnson, *The Central Arizona Project*, 167.

41. Larry D. Morton, ORAL HISTORY INTERVIEW, transcript of tape-recorded Bureau of Reclamation Oral History Interviews conducted by Brit Allan Storey, Senior Historian, Bureau of Reclamation, during 1996 in the Phoenix Area Office, transcription by TechniType Transcription of Davis, California, edited by Brit Allan Storey, repository for the record copy of the interview transcript is the National Archives and Records Administration in College Park, Maryland, 193.

reservoir.⁴² Supporters of the dams failed to realize that a significant change in public perception about environmental preservation had occurred within the American psyche and the proposed construction of dams in an American icon, the Grand Canyon, did not fit into this new awareness. By 1967, most Reclamation supporters finally realized CAP authorization would occur not unless the dams were eliminated from the project. Arizona congressmen introduced new CAP legislation which included a coal fired thermal plant, in place of the hydroelectric dams. However, during the battle over the Grand Canyon Dams a new obstacle had emerged in the path of CAP authorization, one with the potential to destroy the decades-long battle to authorize the project.

As chair of the House Interior Committee, Colorado Congressman Wayne Aspinall had the power to kill any Reclamation project considered for authorization. Increasing development of the Lower Colorado River Basin greatly concerned Aspinall, especially the proposed CAP. Aspinall worried that the only way CAP could conceivably work was if the project used some of the Upper Basin States' water allotment. Additionally, Chairman Aspinall worried that authorization of CAP would use the last of the river's unappropriated water leaving nothing for future Reclamation projects in western Colorado. And the projects Aspinall coveted for his home state were among the least practicable or justifiable ever investigated by Reclamation.⁴³ Aspinall realizing the urgency of the situation thwarted congressional efforts to authorize any CAP bill until the western Colorado Projects were combined with CAP into a single Reclamation bill. Eventually, Aspinall succeeded in crafting the Colorado River Basin Project (CRBP) which included CAP; Central Utah (Unitah Unit) Project; and a series of western Colorado projects

42. Dean, "Dam Building Still Had Some Magic Then," 93-6; Morton, ORAL HISTORY INTERVIEW, 196; and Reisner, *Cadillac Desert*, 287.

43. Stephen C. Sturgeon, "Operation Blackmail- Upper Basin Reaction to the Central Arizona Project", an abridged excerpt from the doctoral dissertation "Wayne Aspinall and the Politics of Western Water," University of Colorado-Boulder, paper presented at the American Society of Environmental History Conference, April 15, 1999.

including the Animas-La Plata, Dolores, Dallas Creek, West Divide, and San Miguel Projects. He did so by constructing a fragile interstate coalition of congressmen who sought the authorization of the projects.

On February 16, 1967, Senators Carl Hayden and Paul Fannin introduced S. 1004 calling for construction of CRBP, including CAP. In January, Congressman Aspinall had introduced H.R. 3000 to authorize CRBP. After months of hearings, the Senate passed S. 1004, but passage of H.R. 3000 failed during House hearings. In early 1968, the House Committee on Interior and Insular Affairs reported favorably on an amended version of H.R. 3000 which replaced the Grand Canyon Dams with a thermal power plant. The amended bill passed through both the House, on September 5, and the Senate on September 12, 1968. On September 30, 1968, President Johnson signed H.R. 3000. Nearly twenty-two years transpired from Senator McFarland's introduction of S. 1175 in 1945 to President Johnson's signature authorizing CAP construction as part of CRBP.

The Central Arizona Project was authorized on September 30, 1968, as part of the Colorado River Basin Project Act, Public Law 90-537 (82 Stat. 885). While "Title V— Upper Colorado River Basin: Authorization and Reimbursements," provided for construction of Animas-La Plata, Dolores, Dallas Creek, West Divide, San Miguel, and Central Utah (Unitah Unit) Projects, CRBP was largely legislation that actualized the long pursued dream of diverting Colorado River water to central Arizona.

The authorized plan of CAP differed from Reclamation's originally proposed plan of the 1940s. The 1968 version included pumping facilities, canals, and conduits to transport water diverted from Lake Havasu to the proposed Orme Dam or suitable alternative; Orme Dam and Reservoir and a power pumping plant or suitable alternative; Buttes Dam and Reservoir; Hooker

Dam and Reservoir or suitable alternative; Charleston Dam and Reservoir; Tucson aqueducts and pumping plants; Fannin-McFarland aqueducts; related canals, regulating facilities required the operation of said principal work; related water distribution and drainage works; and appurtenant works.⁴⁴ The twenty-year congressional battle for authorization required changes to project design and specific legislation emphasizing that project water diversions did not supercede prior water allocations, both nationally and internationally. Under provisions of the CRBP Act, the Mexican Treaty Obligation, Native American water rights, and all prior water usage authorized under Federal Reclamation Laws superseded Arizona's allocation of water for CAP.

Authorizing legislation also provided an alternative for the controversial Grand Canyon Dams. In place of the hydroelectric dams, the Secretary of the Interior was allowed to enter into an agreement with non-Federal power interests for entitlement to 24.3 percent of the power produced at the non-Federal Navajo Generating Plant. CAP would be powered by steam rather than hydroelectric power. Additionally, section 303 of the CRBP Act placed limitations on any future hydroelectric studies for CAP stating "[t]hat nothing in this section in this Act contained shall be construed to authorize the study or construction of any dams on the main stream of the Colorado River between Hoover Dam and Glen Canyon Dam."⁴⁵ Nevertheless, the project had been authorized and many Arizonans saw it as a ray of salvation for the future.

Construction History

Pre-Construction

Five years passed between authorization of CAP and starting construction on the project.

44. United States Department of the Interior, Bureau of Reclamation, Section 301 (a) [Central Arizona Project authorized— Features— Limitations.], Colorado River Basin Project Act, Act of September 30, 1968, Public Law 90-537, 82 Stat. 885, in *Federal Reclamation and Related Laws Annotated*, vol IV, 1967-82, Washington: Government Printing Offices, 1989, 2398.

45. Section 303, p 2403.

During that period project planning was finalized, including preliminary investigations to determine the environmental and cultural resource impact of the project. Unlike previous Reclamation endeavors, the construction of CAP required compliance with newly created environmental legislation which obligated Reclamation to consider factors other than technical issues and costs in project design. Passage of the National Environmental Policy Act of 1969, one year after the authorization of CAP, placed both the Environmental Protection Agency (EPA) and Reclamation officials in the unique position of creating documents which would establish a precedent in the protection of the environment. Reclamation no points of reference from which to begin their studies and reports, therefore their initial results were considerably less thorough than later environmental studies.⁴⁶ Additionally, a growing awareness and appreciation for past and present indigenous cultures and the National Preservation Act of 1966 required archaeological and social and cultural investigations of the project area prior to construction. As a result, project costs rose and construction slowed.

The size of the project and the various interests seeking CAP water allocations mandated creation of an agency to manage water distribution. In January of 1969, public meetings were held in Phoenix to initiate establishment of such an agency. At the meetings, Secretary of the Interior Stewart L. Udall stressed the importance of the state of Arizona supervising the allocation of CAP water supplies between competing uses and interests. Even at this early stage, preconstruction planning anticipated requests for water would exceed available supply, thus the need for careful planning in distribution of CAP water. Otherwise, project water would be tied up in litigation for years as different interests battled over who had prior appropriative rights. Following the meetings, Arizona established an advisory board on water allocation and initiated

46. Morton, ORAL HISTORY INTERVIEW, 418-47.

studies to assure the most effective use of the State's remaining entitlement to Colorado River Water.⁴⁷ (Some of the entitlement was already in use along the Colorado River.)

In 1970, Congress appropriated \$1.2 million to begin CAP construction, but the U.S. Office of Management and Budget (OMB) refused to release the funds until a repayment contract between water users of Arizona and the Secretary of the Interior was negotiated. To ensure that advanced planning on CAP continued, the State of Arizona advanced Reclamation \$685,000 so while Arizona representatives, Reclamation, and Interior officials met in Las Vegas, Nevada, to create a repayment contract, project development could continue.

Resulting from the Las Vegas meeting, the Arizona state legislature authorized formation of a multi-county water conservation district to contract with the United States Government for CAP construction. The Board of Supervisors for Maricopa, Pinal, and Pima counties petitioned the state Water Commission for the formation of a three-county water district. The Central Arizona Water Conservation District (CAWCD) was organized and named on June 19, 1971. On July 21, 1971, Secretary of the Interior Rogers C.B. Morton received official notification of the establishment of CAWCD and the district's readiness to negotiate a contract for CAP water.⁴⁸

The Arizona state legislation which authorized CAWCD granted it the power to contract with the Secretary of the Interior to repay all construction, operation, maintenance, and replacement costs of CAP; to subcontract with potential users of project water for delivery at rates established in the subcontracts; to establish and collect water charges consistent with Federal Reclamation Law and contracts between the district and the Secretary of the Interior; and to levy a property tax not exceeding \$0.10 per \$100.00 of the assessed value on all taxable

47. Project History, 1972, 8.

48. Central Arizona Project, "Central Arizona Water Conservation District: A Miracle of Unity," by Earl Zarbin, <http://www.cap-az>, July 1999.

property within district boundaries.⁴⁹ Within in a year of the creation of CAWCD, the master repayment contract for water delivery and project construction costs was executed. In 1982, CAWCD received additional power including ability to contract with the United States to operate and maintain CAP, to maintain the completed portions of the project, and to legally acquire real and personal property and electricity or other forms of energy need for project operation.⁵⁰

The repayment obligation of CAWCD was divided into two categories: an interest-bearing account and non-interest bearing account. Revenues generated from the sale of project water for irrigation purposes was applied to the non-interest account. All remaining project profits were applied to the interest account until the repayment of the interest bearing account. Then income would be applied to the non-interest account until the full project repayment. The terms of the contract between CAWCD and the Federal Government provided that reimbursable project costs allocated to water supply are suballocated to irrigation and M&I uses based on a percentage of total water used by each purpose annually. This agreement provided for equitable distribution of the expenses of the facilities used by both M&I and irrigation users.⁵¹ The contract also provided for reanalysis every seven years of water deliveries. If deviations from project deliveries occurred then new suballocations of costs and adjustments of annual payments would be made to insure total repayment within the 50-year project restitution period.

A provision written into the CRBP Act conditionally limited the amount of water Arizona could divert for CAP during drought. In the event of reduction in the flow of the Colorado

49. Project History, 1986, 186.

50. Project History, 1986, 187.

51. Project History, 1972, 96.

River, California would receive its full allotment of 4.4 million acre feet before CAP could take any water from the river. Because CAP has low priority in allocation of Colorado River water, Reclamation hydrologists conducted a series of studies to determine project functionality under the worst shortage conditions possible. Results of the studies determined that under the worst of circumstances CAP will receive an allotment of 450,000 acre feet of water after all other water rights are fulfilled.⁵² Therefore, project canals will not run dry in the event of drought.

Construction

Groundbreaking ceremonies at Havasu Springs Resort Area on May 6, 1973, marked the start of CAP construction. Secretary of the Interior C.B. Morton and Arizona Governor Jack Williams detonated an explosive charge on the site of the Havasu Pumping Plant excavation site.⁵³ Actual construction of CAP began in late August with construction of the intake channel dike on the Bill Williams River Arm of Lake Havasu as part of the Hayden-Rhodes Division.

Construction of the Hayden-Rhodes division included four pumping plants, Havasu, Bouse Hills, Little Harquahala, and Hassayampa; three tunnels, the Buckskin Mountains, Burnt Mountain, and Agua Fria Tunnels; six siphons under pre-existing waterways, Centennial Wash, Jackrabbit Wash, Hassayampa River, Agua Fria, New River, and Salt River; and the 173.6 mile long Hayden-Rhodes Aqueduct. All division pumping structures and the aqueduct were completed in 1985.

On May 22, 1985, the first water deliveries to the non-Indian Distribution System were made. An initial delivery of 50 cubic feet per second was delivered to the Harquahala Valley Irrigation District about sixty miles west of Phoenix.⁵⁴ CAP water reached the Phoenix

52. Morton, ORAL HISTORY INTERVIEW, 227.

53. Project History, 1973, 32.

54. Project History, 1985, 82.

metropolitan area in November of that year.

Construction of the Fannin-McFarland Division of CAP began in 1981 with the excavation of the Fannin-McFarland Pumping Plant and the Fannin-McFarland Aqueduct.⁵⁵ Division features constructed included the pumping plant, the Gila River Siphon, and the 57.4 mile Fannin-McFarland Aqueduct. All division features were essentially completed in 1987.

Construction of the Tucson Division of CAP commenced in 1984 with excavation of the Brady and Picacho Pumping Plant and the Tucson Aqueduct.⁵⁶ Features constructed as part of the Tucson Division include nine pumping plants, Black Mountain, Brady, Brawley, Picacho, Red Rock, San Xavier, Sandario, Snyder Hill, and Twin Peaks; the Tucson Tunnel; and the 37.7 mile long Tucson Aqueduct. Because of the rugged, mountainous terrain which through which the final stages of the Tucson Aqueduct passed through the final reaches of the Tucson Aqueduct were constructed using precast concrete pressure pipe. Substantial completion of division features and the first deliveries of water to Tucson in 1993 also signaled substantial completion of CAP.

Throughout the construction of CAP, efforts were taken to ensure minimal impact on the environment and wildlife in the project area. Environmental impact studies to determine the best way to minimize effects of the project on the surrounding area preceded commencement of construction activities. An extensive vegetation relocation program allowed for the removal of plant life in construction zones, and revegetation of the areas followed conclusion of construction activities.

To ensure minimal impact on the wildlife of central Arizona, Reclamation constructed several features along project aqueducts, rerouted canal routes, and revised project features. The

55. Project History, 1981, 84, 86.

56. Project History, 1984, 97-8.

construction of wildlife fences and bridges along the main canal were designed to keep larger animals such as deer and desert bighorn sheep from drowning. Construction of wildlife oases turnouts were designed to attract wildlife to suitable crossings.⁵⁷ Construction of escape ramps in the distribution canals provided the opportunity for larger animals who fell into the aqueducts to escape. Wildlife fence design also included clearance for smaller animals such as desert rodents and reptiles to pass under and drink water from the aqueducts. The sides of the aqueducts were terraced, enabling smaller animals to drink from the canals and safely return to the desert. During construction of the Tucson Aqueduct, after wildlife mitigation studies determined the proposed canal would pass through the migration path of the endangered desert tortoise, Reclamation purchased 2,157 acres of land to ensure the protection of the tortoise and other animal and plant life.⁵⁸

Throughout the construction of the water conveyance system, other project features were built, though often not as specified in the authoring legislation of CAP. Construction on the Navajo Steam Generating Plant began in 1970 and was accepted as essentially complete in December of 1976, with all three units of the plant producing power.⁵⁹ Until CAP facilities needing power produced at Navajo Steam Plant were operational, Reclamation sold its portion of energy to private utility companies. As a part of construction of the transmission system connecting division features to the electricity from the Navajo Steam Generating Plant were built. Once Reclamation and individual irrigation districts signed contracts for the delivery of water, Reclamation built each district's water distribution works. The Secretary of the Interior made initial allocations of water for the Indian Distribution systems and Reclamation constructed

57. Project History, 1984, 105.

58. Central Arizona Project, "About CAP: Frequently Asked Questions (FAQs)," http://www.cap-az.com/about_CAP, July 1999.

59. Project History, 1976, 68.

the necessary water facilities. After controversy, further investigations, and more controversy, construction on a revamped Regulatory Storage Division began with construction of New Waddell Dam in 1985.

Throughout its construction period, CAP encountered opposition and controversy, often leading to litigation and revision of the project. Only two years after groundbreaking ceremonies at Havasu Resort, the first of many suits was filed against Reclamation and the Department of the Interior. On June 11, 1975, the nonprofit organization, Citizens Concerned About the Project (CCAP), filed suit in US District Court to halt the construction of the Agua Fria, New River, and Salt River Siphons.⁶⁰ During the hearings held on July 14, CCAP attempted to show that construction of the siphons would mandate construction of Orme Dam as the flood control and regulatory storage part of CAP, thereby excluding investigation of any possible alternative to Orme.⁶¹ Defendants to the suit, Reclamation and Interior, denied that construction of the siphons would preclude any future investigations of alternatives to Orme. The court dismissed CCAP's request for a temporary restraining order to halt construction. Litigation continued for two more years until the court issued an "Opinion and Order" on August 3, 1977. In its statement, the court concluded that the plaintiffs, CCAP, failed to substantiate any claims against construction and that the defendants had successfully refuted all claims. Following issuance of this statement the plaintiffs continued to pursue litigation until the Federal District Court of Arizona dismissed the case on March 9, 1978.⁶²

By the time that CCAP's suit was terminated, a new situation involving Orme Dam and the Regulatory Storage Division developed involving the deletion of project features from CAP.

60. Project History, 1975, 54-5.

61. See pages 31-2 for information about the authorization of the Regulatory Storage Division.

62. Project History, 1978, 139.

In February of 1977, newly elected President Jimmy Carter announced a review of Federal Water Projects in conjunction with preparation of the 1978 fiscal budget. The Department of the Interior along with other agencies and groups reviewed certain ongoing and authorized water projects, including CAP, emphasizing economic, safety, and environmental factors. CAP was identified as one of eight Reclamation projects initially deleted from the 1978 Presidential budget. Reinstatement depended upon reevaluation to determine whether to continue project construction, seek project modification, or request project deauthorization by Congress.⁶³ The Operations Division of CAP assisted a departmental project review team by providing information used in the review team's report. In April of 1977, after consulting the review team's report, President Carter recommended that Orme, Hooker, and Charleston Dams be deleted from CAP because the proposed dams were too expensive, inefficient (Charleston Dam), and alternatives existed that caused less environmental, social, and cultural harm.⁶⁴ The President reestablished project funding for 1978, excluding funds for the storage units. Congress agreed to the funding deletions but refused to deauthorize the units.

Following the presidential modification of CAP, additional studies about the need for Hooker and Charleston Dams led to the removal of both from the project. In the case of Hooker Dam, Reclamation concluded that no real need existed in extreme western New Mexico for a storage reservoir and the environmental impact was too detrimental.⁶⁵ In December of 1982, Hooker Dam was deleted from CAP.

Charleston Dam was designed to provide storage on the San Pedro River in southern Arizona and supply supplemental water to Tucson. However, as the city's population increased

63. Project History, 1977, 27.

64. Morton, ORAL HISTORY INTERVIEW, 395-401 and Project History, 27.

65. Morton, ORAL HISTORY INTERVIEW, 399.

the relatively small amount of water which the dam would supply to the city no longer outweighed construction and environmental costs. When Tucson and Reclamation entered into a contract for the delivery of diverted Colorado River via aqueducts, the increased capacity of the Tucson Aqueduct nullified the need for Charleston Dam. Though never officially deauthorized, Charleston Dam was dropped from the project.⁶⁶

Removal of Hooker and Charleston Dams occurred rather unceremoniously, but the processes which lead to the official deletion of the Orme storage unit and its replacement plan was highlighted with conflict. Following recommendation of Orme's removal from the project, Secretary of the Interior Cecil D. Andrus notified Reclamation in February of 1978, that all alternatives to the proposed regulatory unit had been investigated.⁶⁷ The Secretary's request lead to the creation of the Central Arizona Water Control Study (CAWCS) in 1979 to find a suitable alternative to the Orme storage unit. By the end of 1980, CAWCS recommended the deletion of any regulatory storage alternatives proposed on the Gila River, including Buttes Dam.⁶⁸ Investigations continued and flooding in the CAWCS area in 1980 lead to expansion of the study to include possible construction of structures which could provide flood control as well as regulatory storage in central Arizona.

After three years of investigations and development of several alternative plans, Reclamation and the Arizona Governor's Advisory Committee reached an agreed upon alternative to Orme. Known as Plan 6, the revised plan called for the construction of New Waddell Dam on the Agua Fria River; Cliff Dam on the Verde River; new or enlarged Roosevelt and Reconstructed Stewart Mountain Dam on the Gila River. On November 6, 1981, Secretary

66. Morton, ORAL HISTORY INTERVIEW, 395.

67. Project History, 1978, 36-7.

68. Project History, 1980, 31.

of the Interior James Watt announced Plan 6 as the proposed action for CAWCS contingent upon a completion of an Environmental Impact Statement (EIS) on all the proposed features.⁶⁹

In April of 1984, Plan 6 was approved with contracts for further studies on the Cliff Dam component. One year after approval, another lawsuit was filed in US District Court against the Department of the Interior and the Bureau of Reclamation to halt construction of the Regulatory Storage Division of CAP. On September 19, 1985, several environmental groups called the Environmental Coalition to Stop Cliff Dam filed suit against Plan 6 because they believed that construction would jeopardize endangered bald eagles nesting at the proposed site of Cliff Dam.⁷⁰ The plaintiffs' suit charged that Reclamation's issuance of the final EIS for the Regulatory Storage Division of CAP without first circulating a draft EIS containing an adequate description of alternatives to Cliff Dam and Plan 6 and proposed plans for mitigating adverse environmental impacts violated Reclamation's obligation under the National Environmental Policy Act (NEPA). Additionally, the plaintiffs viewed Cliff Dam as the most environmentally destructive and controversial component of the proposed project and refuted governmental reports which suggested otherwise.⁷¹

The suit against Plan 6 continued for two years until June of 1987, when an Arizona Congressional Delegation and the Environmental Coalition reached an agreement to eliminate Cliff Dam from Plan 6. The provisions of the agreement authorized the Secretary of the Interior to study alternatives to replace the flood control, water supply, and safety of dams benefits which Cliff Dam would have provided.⁷² Unfortunately, alternative plans recommended by Reclamation included higher water costs, and although cities could afford the new price, farmers

69. Project History, 1981, 36.

70. Project History, 1985, 70.

71. A U.S. Fish and Wildlife Report Issued in August of 1985 concluded that construction of Cliff Dam would not adversely affect bald eagle nesting sites. Project History, 1985, 10.

72. Project History, 1989, no page number.

could not. Thus, farmers continued to use groundwater to irrigate their fields or sold their land to developers.

Despite the suit against Plan 6 and Cliff Dam, construction began on other features of the Regulatory Storage Division. New Waddell Dam construction began in 1985, with excavation of the dam's foundation. Activities proceed with the construction of water delivery tunnels, a diversion tunnel, and a pipeline to carry water releases from the existing Waddell Dam and Waddell Canal. Breaching of Waddell Dam followed completion of the new dam.⁷³ The canal diverts water from the Hayden-Rhodes Aqueduct, about five miles south of the dam, to New Waddell Dam. Water pumped from the canal into the dam's reservoir, Lake Pleasant, through a pumping-generating (P/G) plant and released back through the P/G plant generates hydroelectric power. In 1994, the first hydroelectric power generation occurred at New Waddell.⁷⁴

The construction of New Waddell Dam released large amounts of silt that deteriorated the original masonry structure of Camp Dryer Diversion Dam directly downstream of New Waddell. Located 35 miles northwest of Phoenix on the Agua Fria River, construction of Camp Dryer Diversion was completed by Reclamation in 1926. Modification of Camp Dryer Diversion Dam occurred in 1992. Modifications included consolidation grouting of the existing dam and foundation to improve structural integrity and reduce seepage.⁷⁵

Modification of Roosevelt Dam on the Salt River, built as part of Reclamation's Salt River Project, to mitigate safety of dams issues began in 1986. Work on the historic dam included raising the existing dam by 76 feet, constructing a top-seal radial-gated spillway on each abutment, and construction of a lake-tap river outlet works/power penstock through the left

73. United States Department of the Interior, Bureau of Reclamation, Lower Colorado Region, Phoenix Area Office, "Waddell Dam Fact Sheet, October 1995," <http://www.apo.lc.usbr.gov>, July 1999.

74. Central Arizona Project, "Timeline of Historic Events," http://www.cap-az.com/about_CAP, July 1999.

75. United States Department of the Interior, Bureau of Reclamation Data Web, "Camp Dryer Diversion Dam," <http://www.dataweb.usbr.gov/dams/az00113.htm>, June 1999.

abutment.⁷⁶ Dam modification was designed as a single-curvature, uniform thickness mass concrete arch dam covering the original stone masonry of the dam.⁷⁷ The top-seated radial spillways and river outlet works were designed to regulate flood releases, normal releases, and reservoir evacuation. Modification of Roosevelt Dam as specified under Plan 6 was completed in 1996.

Construction of Stewart Mountain Dam on the Salt River 41 miles northeast of Phoenix was completed in 1930. Modification of Stewart Mountain Dam to mitigate dam safety issues associated with overtapping of the dam due to flooding and possible arch collapse resulting of an earthquake began in 1988.⁷⁸ Stewart Mountain Dam modification was completed in 1992.

While construction of the delivery system features of CAP commenced in the 1970s, creation of the project's computerized operating system did not begin until the 1980s. The reason for the delay in development resulted from Reclamation's decision to wait for technological advances.⁷⁹ In preparation for creation of the operating system, Reclamation officials toured and investigated aqueduct systems similar to CAP in California, Spain, and France where computerized systems regulated the water projects. After viewing contemporary systems, Reclamation began designing software for the CAP computerized control system. Software design allowed for upgrading the system as technology advanced. Development of the Programmable Master Supervisory Control System (PMSC) began in 1982. The PMSC was designed to perform full automated operation of project aqueducts from a centralized control

76. United States Department of the Interior, Bureau of Reclamation, "Theodore Roosevelt Dam," <http://borworld.usbr.gov/cdams/dams/theodoreroosevelt.html>, August 1999.

77. *Ibid.*

78. United States Department of the Interior, Bureau of Reclamation, "Stewart Mountain Dam," <http://borworld.usbr.gov/cdams/dams/stewartmountain.html>, August 1999.

79. Morton, ORAL HISTORY INTERVIEW, 236.

room located in Phoenix.⁸⁰ Completed a few years later, PMSC is the backbone of CAP, without it the project delivery system would fail, leaving water users in a precarious situation.

Like the controversy over the construction of the Regulatory Storage Division features of CAP, the allocation of project water rights provided its own drama to project development and construction. A significant result of the Arizona-California water controversy and litigation was the ruling that all water rights established prior to creation of the Colorado River Compact received water first. As a result of the court decree, the Indian Distribution System was included in the authorizing legislation of CAP.

On April 15, 1975, Secretary of the Interior Rogers Morton made public his proposed annual allocation of 257,000 acre feet of water to five central Arizona Indian Tribes, an action which triggered an ongoing dispute over which tribes receive CAP water and discontent among non-Indian water rights holders who contend that Native Americans received disproportionate allocations of project water.⁸¹ Secretary Morton finalized his plan for water allocations in 1976, which led to additional Native American Tribes petitioning the federal government for an appropriation of CAP water. In October 1979, Secretary of the Interior Cecil Andrus stated that Native American water allocations needed to be readdressed, an action which resulted in restructuring of the Indian Distribution System Division.⁸² On December 1, 1980, Secretary Andrus announced his final allocations of water to individual reservations. The new allocations included the addition of seven new Native American communities and increased total annual water allocations by 52,801 acre feet.⁸³ The 1980 allocation plan stipulated that after 2005 no reduction in tribal water rights would occur, as the 1976 plan did, instead allocations would be

80. Project History, 1982, 115.

81. Project History, 1975, 12.

82. Project History, 1979, 37.

83. Project History, 1980, 26.

based on a “shared priority” between Indian users and M&I users through the remainder of project life and that water users will share water proportionally during shortage years. This new provision in the distribution of project water instantly faced opposition.

The same day that Secretary Andrus announced the final allocations, the State of Arizona filed suit in Federal District Court seeking a temporary restraining order and preliminary injunction against the Secretary’s allocations and efforts to enter into water contracts with Native American communities covered by the new allocations.⁸⁴ The principle objection of the plaintiffs was the “shared priority” concept placing 90 percent of Indian agricultural water and non-Indian M&I water on an equal basis during shortage years. Plaintiffs claimed that M&I water users, particularly urban residents, would disproportionately experience adverse effects in the event of a drought. The court denied the request for a restraining order and sixteen days later, issued a “Finding of the Facts and Conclusions” which included the preliminary injunction.⁸⁵ Meanwhile, Interior entered into contracts with eleven of the twelve Native American entities and the suit went before the ninth circuit court of appeals. Resolution of the dispute occurred after much negotiation and the issuance of final water allocations to Indian and non-Indian water users in the Federal Register on March 24, 1983.⁸⁶ However, disputes over the settlement of Indian and non-Indian water rights continue to this day.

Post-Construction

On October 1, 1993, Reclamation declared the Central Arizona Project substantially complete and a new series of problems began.⁸⁷ Previously speculated upon concerns of cost, management, need, and usages of the project developed into real issues. Once heralded as the

84. Project History, 1980, 41.

85. *Ibid.*

86. Project History, 1986, 3.

87. Dean, “Dam Building Still Had Some Magic Then,” 81.

savior of agriculture in central Arizona, CAP appeared to force a rapid abandonment of agriculture. CAP seems to support of urbanization in central Arizona as more water is transferred to M&I uses each year.

After twenty years of construction, project costs significantly increased from the original estimate of \$832,800,000 to 4.4 billion dollars. Though the CAWCD has no obligation under its contract with Reclamation to repay the entire amount incurred during construction, the actual amount of the district's repayment obligation remains in dispute. In January of 1994, Reclamation transferred operation and maintenance (O&M) of project facilities to CAWCD and the relationship between the two agencies deteriorated rapidly.⁸⁸ Two years prior to CAWCD assuming O&M responsibilities for project facilities, the district went to court seeking to limit and restructure their repayment contract with Reclamation. CAWCD maintained that they could not afford to pay for the project, especially if charged for repairs made to project facilities which raised project costs.⁸⁹ The most extensive and expensive project repairs are the replacement of siphons made of prestress concrete cylinder pipes (PCCPs). Many PCCPs deteriorated after installation and were in danger of failing. As a result, Reclamation is currently replacing the PCCPs and has included estimated repair costs in their bill to CAWCD.

The district argued that under the terms of its contract with Reclamation, it is not required to pay more than \$1.8 billion, whereas Reclamation's stance is that CAWCD owes \$2.3 billion. CAWCD based its stance upon the terms in the 1988 contract with Reclamation which set the repayment ceiling at \$1.781 billion. CAWCD stated if the amount spent on the project was expected to exceed the established cap then a new limit needed to be negotiated or project

88. Morton, ORAL HISTORY INTERVIEW, 715.

89. Morton, ORAL HISTORY INTERVIEW, 719.

construction stopped.⁹⁰ An attempt to negotiate a new repayment agreement failed when Secretary of the Interior Bruce Babbitt declined to sign it, an action which lead to CAWCD filing the suit.

In late 1998, U.S. District Judge Earl Carroll ruled in favor of CAWCD because project construction costs had risen since the negotiation of the 1988 contract and Reclamation did not cease project construction.⁹¹ Judge Carroll also ruled that Reclamation could not prevent CAWCD from using CAP facilities. However, the 1998 ruling only represents a part of the lawsuit. Litigation continues on whether the costs of CAP were allocated correctly.

The primary reason that CAWCD maintains it cannot meet its repayment obligations is that the small irrigation districts that CAWCD sells CAP water to cannot afford it. Upon project completion central Arizona farmers found themselves in a precarious situation; for their farms to survive they needed to supplement their dwindling groundwater with CAP water. However, the aqueduct water is too expensive, especially when farmers also have to pay for the construction of diversion works from the main CAP canals to their fields. In 1993, the Arizona state government established the Governor's Central Arizona Project Advisory Committee to study critical issues associated with CAP. Among those issues was the agricultural irrigation and conservation district's inability to repay Reclamation for the construction of CAP related diversion systems. The Advisory Committee concluded, "[i]t is reasonable to assume that at some point most or all of the irrigation districts may choose or feel compelled to seek the protection of federal bankruptcy court."⁹² Furthermore, drought and decreasing agricultural profits led to the restructuring of Reclamation's program with water subcontractors. In October

90. Central Arizona Project, "Judge Carroll Rule in CAWCD Lawsuit," <http://www.cap-az.com>, June 1999.

91. *Ibid.*

92. State of Arizona, Governor's Central Arizona Project Advisory Committee, *CAP Irrigation District Default and Bankruptcy Issues*, April 16, 1989, 27.

of 1993, the revised program allowed subcontractors to waive their rights to receive CAP water under their long term contracts in exchange for cheaper water rates.⁹³ Changes in and concern regarding agricultural irrigation districts' ability to pay for project water and construction costs signified that the success of CAP no longer depended upon sustaining the agricultural corridor between Phoenix and Tucson, but rather upon supplying CAP to growing urban areas.

Ironically, the Tucson metropolitan area, after a series of problems, decided not to use CAP water for municipal uses resulting in additional woes for CAP. Following completion of the aqueduct in 1993, the city used its allocation to supply water to half of its residents. Within weeks of transition from groundwater to CAP water, residents in older parts of the city complained that the water was foul colored, had a poor taste and smell, and was corrosive to household appliances. These problems resulted from a combination of factors, including old plumbing and how Tucson treated CAP water. Nevertheless, in August of 1994, a Tucson City Council vote stopped deliveries to the most-affected areas. In January of 1995, the Tucson City Council voted to halt residential delivery of CAP until resolution of the problems.⁹⁴ Since 1995, Tucson has limited the use of CAP water for domestic household purposes until the year 2000 except in the event of a severe water crisis; dictating that the water may only be used for agricultural and mining purposes; to replace water supplies used for parks and golf courses, and for groundwater recharges but only if the water is treated to Avra Valley groundwater standards.⁹⁵ Meanwhile, Tucson continued its overdraft of groundwater and refused to use its allocation of CAP water, an action which threatens the city's ability to meet state regulations limiting groundwater use and led to the establishment of the Arizona Water Bank.

93. Central Arizona Project, "CAP Subcontractors," <http://www.cap-az.com/about-CAP/customers/>, July 1999.

94. University of Arizona, Department of Hydrology and Water Resources, "Central Arizona Project Fact Sheet, "CAP Water and Tucson – What Happens Now?", <http://www.hwr.arizona.edu/cap-factsheethtml>, July 1999.

95. *Ibid.*

Approved by the state legislature in 1996, the Water Bank was designed to bring Arizona's unused entitlement of Colorado River Water, i.e., CAP water, into central and southern Arizona by storing it in underground aquifers.⁹⁶ The idea of the program is that stored water will recharge declining groundwater supplies creating a reserve which can be used in times of surface water shortage. The Pima Mine Road Recharge Project, part of the Arizona Water Bank program, over the course of two years will pump approximately 10,000 acre feet in to the water table near Tucson recharging the city groundwater supply.⁹⁷ The instigation of the Arizona Water Bank represents how the purposes and use of CAP water have changed as originally-intended functions lose their viability.

In addition to irrigation district repayment default, the deterioration of project facilities, and the ensuing necessity of using project water for groundwater recharge, settlement of Indian water rights claims continue. No final resolution has been reached regarding the amount of water that will be given to the federal government for settlement of Indian water rights claims. Indian water rights claimants face a problem similar to that of the non-Indian water users. The increasing cost of CAP water may prove too high for profitable farming operations.⁹⁸ Also, the remoteness of the CAP aqueducts from many Indian Communities and Tribes and the high construction costs of delivery systems outside of the three county project area may make water exchanges either impracticable or impossible. Part of the proposed settlement between the Department of the Interior and CAWCD includes provisions which could resolve the Indian water rights issues. Under the terms of settlement, the federal government would receive an

96. Central Arizona Project, "CAP and State Sign Arizona Water Bank Contract," <http://www.cap-az/press/releases/1997>, June 1999.

97. Central Arizona Project, "CAP Construction Start 25 Years Ago This Month," <http://www.cap-az/press/releases/1998>, June 1999.

98. State of Arizona, Governor's Central Arizona Project Advisory Committee, "Issue, Problems, and Concerns: Solution Elements", April 16, 1993, 11.

additional 200,000 acre feet of water for use in settling Indian rights claims. Indian tribes with final water rights settlements will receive CAP water for on-reservation use at a discounted rate until 2047. Upon failure of the federal government to use the additional 200,000 acre feet to settle claims within three years, the water rights would return to non-Indian users. Indian communities would be able to participate in the CAP rate-setting process and develop individual water delivery agreements with CAWCD and the United States.⁹⁹ However, no settlement has been reached.

Currently, CAP serves as an example of how a well-intentioned plan could have benefitted an arid region, but turned into a troubled project. Until recently, CAWCD made little or no effort to fulfill its repayment obligation to Reclamation. However, in January of 1999, the district's Board of Director's voted to send \$38.4 million in cash to Reclamation as part of its 1999 payment.¹⁰⁰ While CAWCD has repaid \$489 million for project construction, the district still has a long way to go. Pending the outcome of litigation between Reclamation and CAWCD, settlement of Indian water rights claims, restructuring for repayment agricultural irrigation districts, and success of the Arizona Water Bank program, the true successes and failures of the project cannot be determined.

Settlement of Project Lands

The original concept of CAP was that the project water would fuel additional agricultural development in central Arizona. By the time CAP was authorized, the project was touted as the only way to save the state's agricultural industry from ruin. Less than ten years after authorization and commencement of construction activities, the anticipated future needs for CAP

99. Central Arizona Project, "CAP Settlement Talks Continue, April 14, 1998," <http://www.cap-az.com/press/releases/1998>, June 1999.

100. Central Arizona Project, "CAWCD Payment for CAP Exceeds \$68 Million, January 8, 1999," <http://www.cap-az.com/press/releases/1999>, June 1999.

water switched from largely agricultural to largely M&I. Throughout the investigation, authorization, and construction of CAP, the population of central Arizona became increasingly urbanized while the agricultural population declined. The metropolitan Phoenix and Tucson areas have grown from roughly 1.5 million in 1968, to an estimated six million in 1997.¹⁰¹

Irrigated farmland acreage decreased about 1.5 percent in the years between the first deliveries of water in the mid-1980s and project completion in the early 1990s.¹⁰² Given the current financial situation facing agricultural irrigation districts, continued decrease in agricultural use of CAP water is anticipated. Continued urbanization of central Arizona will require increased utilization of CAP water for M&I use. Thus, the basic premise of CAP to supplement groundwater overdraft with diverted Colorado River Water may be fulfilled by injecting CAP water into the groundwater table. The unresolved settlement of Indian water rights claim may play a decisive factor in the continued urban development of the project region, as settlement of claims will reduce the amount of water available to non-Indian users. Because of a multitude of factors, including recent project completion, the lasting effect of CAP on settlement of project land has yet to be determined. However, CAP has provided supplemental water supply to existing farms and helped promote urban growth.

Project Benefits and Uses of Project Water

CAP provides an estimated 1.3 million acre feet of water annually to Maricopa, Pima and Pinal counties in central Arizona in 1998.¹⁰³ More than eighty customers currently receive project water, 75% of which are M&I users, 13% agricultural, and 12% Native American.¹⁰⁴

101. Eric Rasmussen, "The Pipes Sound Off," *Civil Engineering*, June 1997, from <http://proquest.umi.com>, June 1999.

102. David Mauro, "The Central Arizona Project: Overview and Case Study," <http://www.geocities.com/NapaValley/8339/CAPbody.html>, July 1999.

103. Central Arizona Project, "About CAP," http://www.cap-az.com/about_CAP, July 1999.

104. Central Arizona Project, "CAP Facts," http://www.cap-az.com/about_CAP, July 1999.

Presently agricultural needs account for roughly half of project water usage. In 1992, an estimated 142,574 acres of land were cultivated using CAP water.¹⁰⁵ Though current statistics are unavailable, it is anticipated that acreage under cultivation using CAP water declined as irrigation costs increased. In 1997, the delivery rate charge for agricultural water averaged more than thirty dollars an acre foot with an anticipated increase of a dollar a year.¹⁰⁶ In addition to increased irrigation costs, declining agricultural profits resulted from pest infestation of crops played a critical role in decrease usage of project water. Farmer's unable to cultivate a profitable crop could not afford the high price of project water.

Even though agricultural demand for project water declined, M&I still only accounts for roughly one quarter of CAP water usage. While the city of Tucson declines to use its allotment of CAP water for domestic use, project water accounts for more than one fourth of the drinking water in the Phoenix metropolitan area.¹⁰⁷ Until M&I usage increases, groundwater recharge programs using project water will continue. About 21% of CAP water is currently pumped into central Arizona's aquifers.¹⁰⁸

For all of the ongoing controversy over Native American allocations, those appropriations account for less than 10 percent of the annual CAP usage. Unless settlement of additional claims significantly increases Native American water rights, this appropriation will not factor significantly into the overall usage of project water.

Project features also provide several recreational opportunities. Lake Pleasant, expanded by the construction of New Waddell Dam, has facilities for boating, camping, and fishing.

105. United States Department of the Interior, Bureau of Reclamation, *1992 Summary Statics: Water, Land and Related Data*, (Denver: U.S. Government Printing Office, 1995), 205.

106. Central Arizona Project, "About CAP," http://www.cap-az.com/about_CAP, July 1999.

107. University of Arizona, Department of Hydrology and Water Resources, "Central Arizona Project Fact Sheet: CAP Water and Tucson – What Happens Now?", http://www.hwr.arizona.edu/cap_factsheet.html, July 1999.

108. Central Arizona Project, "About CAP," http://www.cap-az.com/about_CAP, July 1999.

Hiking and bikes are also popular activities at Lake Pleasant. The Surrounding Westworld Recreation Area has banquet, equestrian, and camping facilities. Westworld holds several annual events including the Thunderbird Hot Air Balloon Classic, an Arabian Horse Show, and Barrett Jackson Car Show.¹⁰⁹

Conclusion

The Central Arizona Project represents the culmination of Reclamation's large scale construction efforts in the Western United States to provide water, flood control, and hydroelectric power to agricultural and urban areas. Following authorization of CAP under the CRBP Act, no substantial reclamation projects have been authorized. The massive size of the project led to its prolonged construction period and astronomic cost. The need for CAP also revealed the precariousness of settling in the arid region of central Arizona. Without CAP, overdraft in groundwater supplies during the last century virtually exhausted groundwater supplies, jeopardizing continued settlement in the region.

The original idea for a water diversion project in Arizona, the Arizona Highline Canal, paved the way for the authorization of CAP, because the idea would not die. Though the originally intended beneficiaries of the project, farmers, cannot afford project water, CAP water has found other uses. Groundwater recharge programs afford some insurance against possible water shortages and water deliveries to urban areas provide a catalyst for growth.

Ultimately the test of time will determine whether CAP is a success or failure. CAP is ultimately a major renewable source of water which can meet the needs of Arizona's rapid growth.

109. United States Department of the Interior, Bureau of Reclamation, "Westworld," <http://www.recreation.gov>, June 1999.

About the Author

Jennifer E. Zuniga received a B.A. in history from Loyola University-New Orleans in 1996 and a M.A. in history from New Mexico State University in May of 2000. She is currently pursuing a Ph.D. in history at the University of Wisconsin-Madison.

Bibliography

Archive and Manuscript Collections

National Archives and Records Administration, Rocky Mountain Region. Records of the Bureau of Reclamation. Record Group 115, "Central Arizona Project," 1972-97.

Government Publications

State of Arizona, Governor's Central Arizona Project Advisory Committee. *CAP Irrigation District Default and Bankruptcy Issues*. April 16, 1989.

State of Arizona, Governor's Central Arizona Project Advisory Committee. *Issues, Problems, and Concerns. Solution Elements*. April 16, 1989.

United States Congress. House. *Central Arizona Project, Letter From the Secretary of the Interior Transmitting A Report and Findings on the Central Arizona Project*. 81st Congress, 1st sess., 1949. House of Representatives 136.

United States Congress. House. *Colorado River Basin Project*. 89th Congress, 2nd sess., 1966. House of Representatives 4671.

United States Congress. House. *Colorado River Basin Project*. 90th Congress, 2nd sess., 1968. House of Representatives 3300.

United States Department of the Interior, Bureau of Reclamation. *Technical Record of Construction, Buckskin Mountains Tunnel, Granite Reef Division, Central Arizona Project*. Phoenix, Arizona: Arizona Projects Office, 1983.

United States Department of the Interior, National Park Service , T. Lindsay Baker, et. al. *Water For the Southwest: Historical Survey and Guide to Historic Sites*. American Society of Civil Engineers. ASCE Historical Publication No. 3. 1973.

Articles

Dean, Robert. "Dam Building Still Has Some Magic Then": Stewart Udall, the Central Arizona Project, and the Evolution of the Pacific Southwest Water Plan, 1963-1968." *Pacific Historical Review* 66, no. 1 (1997): 81-98.

Gookin, W. S. "Central Arizona Project, Part One-- History of Development." *The Reclamation Era* 35, no. 1(1949): 5-8.

_____. "Central Arizona Project, Part Two- Plans for the Future," *The Reclamation Era* 35, no 2 (1949): 28-30, 40.

Haleseth, Odd S. "Arizona's 1500 Years of Irrigation History." *The Reclamation Era* 33, no 12(1947): 251-4.

Books

August, Jack L., Jr. *Vision in the Desert: Carl Hayden and Hydropolitics in the American Southwest*. Forth Worth: Texas Christian University, 1999.

Johnson, Rich. *The Central Arizona Project, 1918- 1968*. Tucson, Arizona: The University of Arizona Press, 1977.

Meyer, Michael C. *Water in the Hispanic Southwest: A Social and Legal History 1550-1850*. Tucson, Arizona: The University of Arizona Press, 1984

Reisner, Marc. *Cadillac Desert: The American West and Its Disappearing Water*. New York: Penguin Books, 1993 (1st ed New York: Viking Books, 1986).

Tellman, Barbara, Richard Yarde, Mary G. Wallace. *Arizona's Changing River: How People Have Affected the Rivers*. Tucson, Arizona: Water Resources Research Center, College of Agriculture, the University of Arizona, 1997.

Terrell, John Upton. *War for the Colorado River. Volume One: The California-Arizona Controversy. Volume Two: Above Lee's Ferry- The Upper Basin*. Glendale, California: The Arthur H. Clark Company, 1965.

Walsh, Robert and William Jenkins. *Central Arizona Project Photographic Survey*. Tucson: Center for Creative Photography, 1986.

Internet Resources

Central Arizona Project, "Central Arizona Project." <http://www.cap-az.com>, July 1999.

Mauro, David. "The Central Arizona Project: Overview and Case Study." <http://www.geocities.com/NAPAValley/8339/CAPbody.html>, July 1999.

University of Arizona, Department of Hydrology and Water Resources "Central Arizona Project Fact Sheet: CAP Water and Tucson – What Happens Now?" <http://www.hwr.arizona.edu/cap-factsheet.html>, July 1999.

United States Department of the Interior, Bureau of Reclamation, "Stewart Mountain Dam," <http://borworld.usbr.gov/cdams/dams/stewartmountain.html>, August 1999.

United States Department of the Interior, Bureau of Reclamation, "Theodore Roosevelt Dam," <http://borworld.usbr.gov/cdams/dams/theodoreroosevelt.html>, August 1999.

United States Department of the Interior, Bureau of Reclamation Data Web, "Camp Dryer Diversion Dam," <http://dataweb.usbr.gov/dams/az00113.htm>, June 1999.

United States Department of the Interior, Bureau of Reclamation, Lower Colorado Region, Phoenix Area Office, "New Waddell Dam Fact Sheet, October 1995," <http://www.apo.lc.usbr.gov>, July 1999.

Unpublished Works

Autobee, Robert. "Salt River Project (second draft)." Bureau of Reclamation History Program, Denver, Colorado, 1993.

Gookin, William S., Arizona State Water Engineer. "The Central Arizona Project." TMS. Bureau of Reclamation Library, Bureau of Reclamation, Denver, Colorado, n.d.

Introcaso, David M. "Water Storage and Hydroelectric Development in Central Arizona." Ph.D. diss, Arizona State University, 1995.

Morton, Larry D. ORAL HISTORY INTERVIEW. Transcript of tape-recorded Bureau of Reclamation Oral History Interviews conducted by Brit Allan Storey, Senior Historian, Bureau of Reclamation, during 1996 in the Phoenix Area Office. Transcription by Technitype Transcription of Davis, California. Edited by Brit Allan Storey. Repository for the record copy of the interview transcript is the National Archives and Records Administration in College Park, Maryland.

Sturgeon, Stephen C. "Operation Blackmail Upper Basin Reaction to the Central Arizona Project." An Abridged excerpt from the doctoral dissertation "Wayne Aspinall and the Politics of Western Water." Paper presented at the American Society for Environmental History Conference. Tucson, Arizona. April 15, 1999.

Index

Agua Fria River	4
Arizona	32
Bridge Canyon Dam	25
Marble Canyon	25
Arizona Governor's Advisory Committee	40, 47
Arizona High Line Canal	18, 53
Arizona v. California	22, 24, 43
Arizona Water Bank	48
Aspinall, Wayne	28
Bill Williams River	3, 34
Boulder Canyon Act	19
Boulder Canyon Project	
Hoover Dam	25
Boulder Canyon Project Act	17, 20, 23
Bridge Canyon Dam	19
Bureau of Reclamation	5, 19, 36
Office of Management and Budget (OMB)	32
Buttes Dam and Reservoir	30
California	9, 15, 17, 19, 34
Carter, President Jimmy	38
Central Arizona Project (CAP)	2, 18, 19, 21, 24, 29, 38, 45
Bridge Canyon Dam	26
Marble Canyon Dam	26
Operations Division	38
Programmable Master Supervisory Control System (PMSC)	43
Central Arizona Project Association	20
Central Arizona Water Conservation District (CAWCD)	4, 32, 33, 45, 49
Central Arizona Water Control Study (CAWCS)	39
Charleston Dam and Reservoir	30
Citizens Concerned About the Project (CCAP)	37
Colorado	15
Colorado River	2, 15, 30, 32
Colorado River Basin Project (CRBP)	29
Animas-La Plata	29
Central Arizona Project	29
Central Utah (Unitah Unit) Project	29
Dallas Creek	29
Dolores	29
San Miguel	29
West Divide	29
Colorado River Basin Project Act	5, 29, 34
Animas-La Plata	30
Central Utah (Unitah Unit) Project	30

Dallas Creek	30
Dolores	30
San Miguel	30
West Divide	30
Colorado River Compact	16, 17, 19, 23
Lower Basin States	16
Upper Basin States	16
Colorado River Division	3
Colter, Fred T.	17, 18
Committee of Fourteen	19
Copper Mining	10
Dominy, Floyd	27
Environmental Coalition to Stop Cliff Dam	40
Environmental Protection Agency (EPA)	31
Fannin, Paul	29
Fannin-McFarland Division	3, 30, 35
Pumping Plant	35
Salt River Siphon	3
Fannin-McFarland Pumping Plant	5
Gadsden Purchase	9
Gila River	4, 6, 10, 11, 13, 14, 22
Gila River Basin	8
Glen Canyon Dam	25
Goldwater, Barry	26
Grand Canyon	26, 28
Granite Reef Division	3
Hayden, Carl	26, 29
Hayden-Rhodes Division	2
Aqueduct	3, 5
Buckskin Mountains Tunnel	3
Havasu Pumping Plant	34
Transmission System	5
Hohokam Indians	7, 11
Hooker Dam and Reservoir	30
Imperial Valley	15
Indian Distribution System Division	3, 37, 43, 44
Indian Distribution System	3, 49
Non-Indian Distribution System	3, 35
Lake Havasu	2, 3, 30, 34
Maricopa County	2, 51
Maricopa Indians	7, 13
Maxwell, George H.	17
Mexico	9, 20
National Environmental Policy Act (NEPA)	31, 40
National Preservation Act of 1966	31

Navajo Steam Generating Plant	5, 36
New Mexico	15
Orme Dam	30, 37
Pacific Southwest Water Plan	25
Bridge Canyon Dam	25
Marble Canyon Dam	25
Page, Arizona	5
Parker Dam	2, 19
Parker-Davis Project	23
Phoenix, Arizona	2-4, 7, 32, 35, 52
Pima County	2, 3, 51
Pima Indians	7, 13
Pinal County	2, 3, 51
Plan 6	40
Ranching	10
Regulatory Storage Division	2, 4, 37, 38, 43
Buttes Dam	39
Camp Dryer Diversion Dam	4, 41
Charleston Dam	38, 39
Cliff Dam	40, 41
Hooker Dam	38, 39
Lake Pleasant	41, 52
New Waddell Dam	4, 37, 40, 41
Orme Dam	38
Roosevelt Dam	40, 42
Stewart Mountain Dam	40, 42
Westworld Recreation Area	52
Rillito River	7
Roosevelt Dam	4, 12
Salt River	4, 6, 11
Salt River Project (SRP)	12
Salt River Valley	7, 8, 12
Salt River Valley Water Users Association	12
Salt-Gila Division	3
San Carlos Irrigation Project	13
Ashurst-Hayden Dam	13
Coolidge Dam	13
San Pedro River	39
San Xavier Indian Reservation	2, 3
Santa Cruz River	7, 11, 13
Santa Cruz Valley	8, 14
Sierra Club	26
Spanish explorers and settlers	7
Coronado	8
Kino	8

Spanish Missions	8
Stewart Mountain Dam	4
Treaty of Guadalupe Hidalgo	9
Tucson Division	3, 30, 35
Aqueduct	3, 35, 36, 39
Pumping Plant	6
Tucson, Arizona	2, 39, 47, 51
Utah	15
Wyoming	15
Yuma Project	15