

University of Nevada, Reno

Making the Desert Blossom: The Salt River Valley

A thesis submitted in partial fulfillment of the
requirements for the degree of Master of Science in
Geography

By

Katherine J. Heslop

Dr. Paul F. Starrs, Thesis Advisor

May 2012

Copyright by Katherine J. Heslop 2012
All Rights Reserved



University of Nevada, Reno
Statewide • Worldwide

THE GRADUATE SCHOOL

We recommend that the thesis
prepared under our supervision by

KATHERINE J. HESLOP

entitled

Making The Desert Blossom: The Salt River Valley

be accepted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE

Dr. Paul F. Starrs, Advisor

Dr. Jane Davidson, Committee Member

Dr. Victoria Randlett, Committee Member

Mr. Peter Goin, Graduate School Representative

Marsha H. Read, Ph. D., Dean, Graduate School

May, 2012

Abstract

“Making the Desert Blossom: The Salt River Valley” analyzes a 1928 mural of the Salt River Valley, a location near Phoenix, Arizona, that was painted by plein aire artist Frank J. MacKenzie. This dramatic painting illustrates the glories and collective experiences found in a productive desert environment reclaimed by intense human handiwork. The Bureau of Reclamation commissioned the mural for the 1929 Ibero-American Exhibition in Seville, Spain. *Making the Desert Blossom* is by twenty-first century views a paradox, displaying modern reclamation technology, supported by federal subsidies, seeking reinvigoration of the Jeffersonian ideal, bringing yeoman farmers and homemakers to lay claim and settle yet another so-called last frontier in the American West. The American agrarian ideal was never put through a more trying test as it confronted western aridity. Indisputably, irrigation established Phoenix. Amerindian and Anglo cultures each exploited the Salt River to solve the environmental challenges of the vast Valley of the Sun. Although one of the most successful Reclamation Service projects, by the 1950s the Salt River Project had outgrown its primary purpose. The Salt River Project therefore, may be considered an intermediate landscape, providing the framework for transforming arid western lands to a modern American urban society.

Dedication

To my family: John, Joanne, and Christopher

and

To my parents: Alex and Gladys

Acknowledgements

The road that led to the completion of this text started with the discovery of the U.S. Department of Interior, Bureau of Reclamation's "The American Artist and Water Reclamation" Fine Arts collection that presented approximately 200 impressions of western reclamation projects on canvas. During my two years of research, I collected material from the Smithsonian Archives of Art, Washington D.C.; The National Archives at College Park, Maryland; the U.S. Department of Interior, Washington D.C.; and The Bureau of Reclamation, Denver Archives. Field work and visitation of dam sites included Hoover Dam and Boulder City; Phoenix, the Salt River Valley, the Apache Trail, and the Theodore Roosevelt Dam, Arizona; Glen Canyon Dam and Page, Arizona; and the windy trail to the infamous Hell's Canyon Dam on the Idaho-Oregon border.

I offer particular thanks to Daniel Dzurek of International Boundary Consultants in Washington, D.C., for his archival work at National Archives at College Park, Maryland. Mr. Dzurek retrieved the research materials from the National Archives files related to the 1929 Ibero-American Exhibition in Seville, Spain. This material included the still photographs of the forty-acre homestead model displayed at the exhibition. Mr. Dzurek also photographed the mural, *Making the Desert Blossom*, displayed at the Department of the Interior Building in Washington D.C.

I would like to acknowledge: Ms. Rochelle Bennett and Benjamin Reko, Bureau of Reclamation, Denver; Ms. Lauren Lambert, Department of Interior, Washington D.C.; Brit A. Storey, Senior Historian, Bureau of Reclamation; Ms. Marisa Bourgoïn, Smithson-

ian Archives of American Art, Washington D.C.; Patrick Colegrove, Mark Lucas, and Pat Ragains, University of Nevada, Reno; and all the other people who have offered assistance along the way. I would especially like to acknowledge the help and patience of my family, John, Joanne, and Christopher. Finally to Dr. Paul Starrs, my advisor, committee members Dr. Jane Davidson, Dr. Victoria Randlett, and Prof. Peter Goin who patiently guided me through the entire academic venture.

Table of Contents

Abstract.....	i
Dedication.....	ii
Acknowledgements.....	iii
Table of Contents.....	v
List of Maps.....	viii
List of Figures.....	ix
List of Plates.....	x
Chapter One: Introduction – Stories on Canvas.....	1
Overview of the Project.....	3
The Salt River Project and Its Physiography.....	5
Water Reclamation and the American Artist.....	10
Chapter Two: The Culture & Art of Water Control.....	15
Beginnings	15
Setting the Stage for Federal Reclamation.....	19
Changing the Face of the West.....	23
Notions of Liberty.....	24
The Big Dam Era.....	28

“Promoting the General Welfare”	33
“Dam Building Still Had Some Magic Then”	41
Extreme Machines in the Garden	47
Chapter Three: A Challenge-Response-Challenge Spiral	52
The Pre-contact: The Hohokam	54
Pre-contact Irrigation.....	57
Climate Changes.....	60
The Spanish and the Period of Exploration 1540-1848	72
Promoters and Speculators	77
Anglo Settlement in the Salt Valley	80
Chapter Four: Salt River Valley Mural,.....	91
Stories on Canvas	91
<i>Ten Acres and Independence</i>	91
Showcasing Reclamation	92
“The Desert Shall Blossom as the Rose”	100
Technology Transforms the Salt River Valley	107
Differences of Opinion	113
Tempe and Consolidated Canal Systems	120

Building the Roosevelt Dam.....	123
Conversion to a Multi-Purpose Project	129
Sowing the Seeds of Agribusiness.....	131
Making the Desert Bloom: A Paradoxical View	134
Chapter Five: Epilogue: Remaking	139
Plates: Chapter Two	150
Plates: Chapter Three	182
Plates: Chapter Four	183
References	187
Artwork and Photographs.....	187
Maps.....	191
References	192

List of Maps

Map 1: <i>Untitled Map: Salt River Project (1934)</i> . By Cartographer T.A. Hayden.....	6
Map 2: <i>Map of the Salt River Watershed, Arizona USA (2011)</i>	8
Map 3: <i>Prehistoric Irrigation Canals, Phoenix, AZ (1929)</i> . By Cartographer Omar A. Turney.....	59
Map 4: <i>Yavapai and western Apache Groups and Territories</i> . By Cartographer S.M. Whittlesey.	70
Map 5: <i>Bird's Eye View of Phoenix, Maricopa Co., Arizona (1885)</i> . By Cartographers C.J. Dyer and W. Byrnes.	85

List of Figures

Figure 1: <i>Making the Desert Blossom</i> (1928). Mural by Frank J. MacKenzie.	3
Figure 2: <i>Umatilla Project Development League</i> (1910).....	26
Figure 3: <i>Deciduous Fruit Farming and Vegetable Gardening on the Chandler Ranch: Under the Roosevelt Dam, Salt River Valley, Arizona</i> (1917).....	26
Figure 4: <i>Dam Construction</i> (1938). By William Gropper.	34
Figure 5: <i>Glen Canyon Dam</i> (1969). By Norman Rockwell.	47
Figure 6: <i>Navajo Generation Plant at Glen Canyon</i> (2012). By K. Heslop.	50
Figure 7: <i>Example of Yavapai Upland Desert Territory</i> (2012). By K. Heslop.	72
Figure 8: <i>Confluence of Salt and Verde Rivers</i> (2012). By K. Heslop.....	72
Figure 9: <i>Lower Salt River Habitat</i> (2012). By K. Heslop.....	74
Figure 10: <i>Energy – the Victor aka Fountain of Energy</i> (1915). Sculpture by Alexander Stirling Calder.....	94
Figure 11: <i>Making the Desert Blossom</i> (1928). Mural by Frank J. MacKenzie.	97
Figure 12: <i>A prehistoric Hohokam canal has been incorporated into the Consolidated Canal in the eastern Salt River Valley</i> (1906). Hand-tinted glass slide. Courtesy: Bureau of Reclamation	122
Figure 13: <i>Roosevelt Dam, Centerpiece of Salt River Valley Project</i> (1911).	126
Figure 14: <i>New Theodore Roosevelt Dam, Apache Trail</i> (2012). By K. Heslop.	149

List of Plates

- Plate 1: Top:** *The Schuylkill Chained aka the River Enchained (1825).* **Bottom:** *The Waterworks aka the River Freed (1825). Sculptures by William Rush.....* 150
- Plate 2:** *Arid Region of the United States: Showing Drainage Districts Part II. Plate LXIX. (1890-91). Illustrating hydrographic basins.....* 151
- Plate 3:** *Hermiston, Umatilla Project Development League (1910).....* 152
- Plate 4:** *Commemorating the Dedication of American Falls Dam (1927).* 153
- Plate 5:** *Commerce Agriculture Arizona: The Salt River Valley (1929).* 154
- Plate 6:** *A King among Date Trees in the Salt River Valley postcard (Pre-1930).* 155
- Plate 7:** *Salt River Valley, Arizona: The Land of Sunshine, Health and Prosperity (1907).* 156
- Plate 8:** *Sunset Route California Southern Pacific Line Roosevelt Dam Apache Trail (1923).* 157
- Plate 9:** *The Roosevelt Dam (1911). Artist: B. Towles.* 158
- Plate 10:** *Roosevelt Dam Dixon Pencil Advertisement (1920).* 159
- Plate 11:** *Boulder Dam across the Colorado River (1942). Photographer: Ansel Adams.* 160
- Plate 12:** *Construction Nears Completion, Boulder Dam.....* 161
- Plate 13: Top:** *The Upstream Face of the Dam and Appurtenant Works as Seen from High Point Upstream on the Arizona Rim of Black Canyon. Water Surface*

<i>Elevation 790 Feet (1925). Bottom: Hoover Dam (1972). Photographer: Alan Band.</i>	162
Plate 14: <i>Smelting Furnace (1917). Artist: Tony Garnier.</i>	163
Plate 15: <i>Aerial View Waterdam (1917). Artist: Tony Garnier.</i>	164
Plate 16: <i>Aerial View the Embankment over the Valley (1917). By Tony Garnier.</i>	165
Plate 17: <i>Power Plant Città Nuova (1914). Artist: Antonio Sant' Elia.</i>	166
Plate 18: <i>Promote the General Welfare (1939). Artist: Roy Grossman.</i>	167
Plate 19: <i>Irrigation Mural Study Fresno California Post Office and Court House (1939).</i>	168
Plate 20: <i>Four Men: three standing on top and one standing inside, riding on large casing section of pipe suspended by cable as it is moved into position by a crane, reservoir in the background during construction of the Grand Coulee Dam, Washington.</i>	169
Plate 21: <i>Sketch for Interior Department Mural (1937). Artist: William Gropper.</i>	170
Plate 22: <i>Norris Dam Workers (1936).</i>	171
Plate 23: <i>Taking Boulder Dam to the Market.</i>	172
Plate 24: <i>Montana Castle, Fort Peck Dam (1936). Photographer: Margaret Bourke-White.</i>	173
Plate 25: <i>Olympus Dam: Colorado Big-Thomas Project (1970). Artist: Xavier Gonzales.</i>	174
Plate 26: <i>Hungary Horse - the Shoreline, the Reservoir, the Dam Flathead River, Montana (1970). Artist: Michael Frary.</i>	175

Plate 27: <i>Birds at Topock Marsh (Egrets in Flight over Topock Marsh, Lower Colorado)</i> (1970). Artist: Chen Chi.	176
Plate 28: <i>Irrigated Fields: Central Valley Project, California (1970). Artist: John W. McCoy.</i>	177
Plate 29: <i>Lower Colorado #8 (Patterns of Irrigated Fields and Canals on the Lower Colorado Basin) (1970). Artist: Richard Diebenkorn.</i>	178
Plate 30: Top: <i>Construction at Grand Coulee (Construction Workers at Third Power Plant, Grand Coulee Dam) (1970). Artist: Anton Refregier. Bottom: Grand Coulee Workers (Construction Activities at Grand Coulee Dam Third Powerplant) (1970).</i>	179
Plate 31: Top: <i>Coulee Construction Forms (1970). Bottom: #4 Coulee Constructions (1970). Artist: Lamar Dodd.</i>	180
Plate 32: <i>Spillway: Shasta Dam (1976). Artist: John Button.</i>	181
Plate 33: <i>Location of Southwestern Pre-contact Civilizations;</i>	182
Plate 34: <i>Making the Desert Blossom, forty-acre model of ideal irrigation homestead (1928). Model by John H. Pellen for Ibero-American Exhibition, Seville, Spain.</i>	183
Plate 35: <i>Close-up of Making the Desert Blossom by Frank MacKenzie</i>	184
Plate 36: <i>"The Roosevelt and the Salt River Project." (1908). Phoenix: Dwight Heard Real Estate and Loan</i>	185
Plate 37: <i>"Central Arizona Phoenix Historic Landuse-1912 and 1934"(1999).</i>	186

Chapter One: Introduction – Stories on Canvas

As our plane glided down into the immense canyon landscape, I could see from afar this “plug” in the river, the place where Glen Canyon [Dam] stands. As I look around at their incredibly beautiful and creative work, it occurs to me this is a new kind of writing on the wall; a kind that says proudly and beautifully – man was here.

— Lady Bird Johnson, *Glen Canyon Dam Dedication Speech*
September 20, 1966

Places in the West rise and recede from the ecological realities of their space. The harsh realities of the American West’s deserts require humans to bind together to survive – a rule that has applied from pre-contact societies to the massive urban aggregations of today (Logan 2006:6). The changeover involving a shift from bare survival in the arid Southwest to living well required raising levels of comfort, wealth, and prosperity, and those altered community settlement patterns were inescapably shaped by the irrigation advocate’s fervent embrace of reclamation. Converting that doctrine from the enthusiasm of a few believers to a nearly universal faith required a forceful spreading of the gospel of irrigation, and to make that happen demanded a sophisticated campaign that depicted the story of irrigation as progressive and essential. Pictorial art was a sizable element of that campaign, and this thesis is an examination of how that propagandistic proselytizing came to be institutionalized in Southwestern thought and federally supported action.

Water reclamation and dams transformed an early culture of frontier individualism to shared regional enterprise, arguably initiating a new society in the American

West and a landscape necessarily reshaped for survival and success in the early twentieth century. Phoenix and the Salt River Valley, Arizona, exemplify a region where water has been central to history. Without the Salt River, the region's main river and riparian ecosystem, no permanent urbanized human society — and certainly not a metropolitan area of 3.2 million people (2011) — would have been able to sustain itself on this desert landscape. The pre-contact Amerindians and Anglo cultures exploited the Salt River watershed in accordance with their own suitable cultural concepts (Logan 2006:4). The Salt River Valley displays fundamental patterns of human use of nature, a fragile alliance subject to constant adjustment that speaks to a mutualistic nature-culture presence. Despite physical restraints, the Salt River provided an opportunity for agricultural development through technology, which permitted the conversion of a desert environment into an agrarian landscape, and exactly that was accomplished by cultures from pre-contact Hohokam to latter-day Anglo-American societies.

In the end, it can be stated boldly: Irrigation established Greater Phoenix, in the Valley of the Sun. Federal reclamation subsidies, authorized by the Reclamation Act of 1902, enabled the aggressive Anglo-American transformation of the Salt River Valley into the Salt River Project, through the construction of the Theodore Roosevelt Dam, establishing the first federal multi-purpose reclamation project, and building a framework for the development of metropolitan Phoenix.

Overview of the Project

My thesis project, “Making the Desert Blossom: The Salt River Valley,” analyzes *Making the Desert Blossom*, a 1928 mural of the Salt River Valley painted by plein aire artist Frank J. MacKenzie (Figure 1). The mural is a snapshot of the social and cultural responses to the new challenges presented by cultivation of arid-land soils. The large panorama, reminiscent of the nineteenth century American grand landscapes of the Hudson River School genre, offers the Salt River Valley as the representation of a transcendent landscape, illustrating the vast glories and collective experiences found in a productive desert environment reclaimed by the hand of man.



Figure 1: *Making the Desert Blossom* (1928). Mural by Frank J. MacKenzie.

The mural encompasses the “big ideas” of Progressive reform implemented in the arid West, using the Salt River Valley as a backdrop to dramatize the outlines of the reclamation vernacular. It communicates the ways in which a desert wilderness can be plausibly transformed into the Jeffersonian pastoral ideal – a Garden of Eden in its de-

sert form – establishing a modern culture of civilized nature. *Making the Desert Blossom* was commissioned by the Bureau of Reclamation for the 1929 Ibero-American Exposition in Seville, Spain; to ice the argument, accompanying the painting to southern Spain was a three dimensional model of the ideal American forty-acre irrigated farm.

My research and analysis identifies individual elements, some iconic, depicted in the MacKenzie mural, *Making the Desert Blossom*. I establish its relationship to historical texts, documenting the cultural and social context and narrative brought forward by this artwork. The techniques embraced are hardly revolutionary; art historian Barbara Novak explains that in reading or analyzing an art piece, there is always a need to demonstrate “how the history of ideas flows freely through the membranes that compartmentalize the various disciplines comprising a culture” (Novak 2007:xxv). My methodology, patterned after Erwin Panofsky’s iconography-iconology theory, analyzes the MacKenzie mural using thematic identifications and cultural histories in an interdisciplinary approach, progressing from reading the artwork, to the culture that produced it, in the process tracking responses from that culture, in this case principles and attitudes about irrigation and reclamation in the Salt River Valley.

The following questions guided and focused my approached to this project on the Salt River Valley mural:

- (1) What are the overall the motives and arguments for federal reclamation, and the contentious shifts in these policies? What encompasses the culture of water reclamation? How is that manifested in water reclamation artwork?

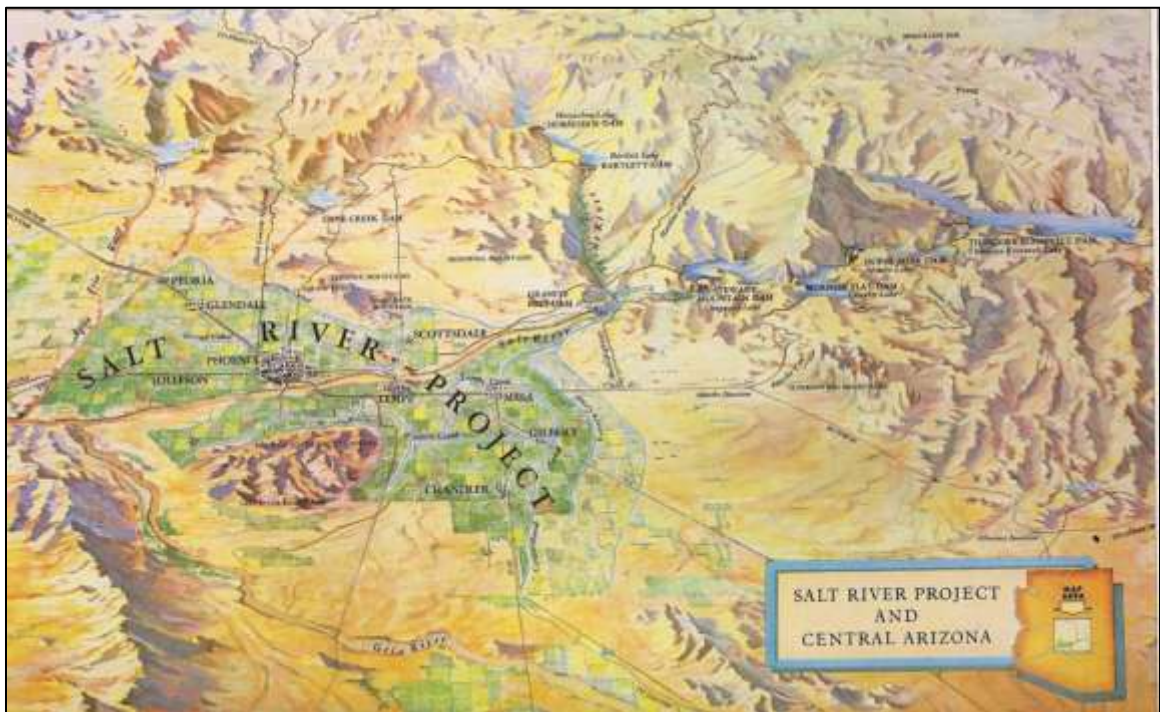
- (2) What is the relationship of the visual image to text? Does this influence the interpretation of the landscape in the artwork? How does the image and text work together to advance the story?
- (3) What are the layers of landscape in the *Making the Desert Blossom* mural? How do they interrelate to demonstrate some overall principles and attitudes of early reclamation in the Salt River Valley? What are the overall message(s) portrayed in the mural?

The Salt River Project and Its Physiography

The Salt River Project (SRP) has a water service area of approximately 375 square miles and an electric service area covering 2,900 square miles covering portions of Maricopa, Gila, and Pinal Counties in central Arizona (BuRec 2011; Map 1). Water supplies are from the Verde-Salt watersheds, controlled by six storage dams and one diversion dam – the Theodore Roosevelt (1911), Horse Mesa (1927), Mormon Flat (1925), Steward Mountain (1930), Bartlett (1939), Horseshoe (1949) and the Granite Reef (1908) diversion dam. The C.C. Cragin Dam and reservoir (formally the Blue Ridge Dam) located on East Clear Creek near Payson, Arizona, was acquired by the SRP in 2005 as part of the Gila River Indian Water Rights settlement.

Four storage reservoirs on the Salt River form a continuous sixty-mile chain of lakes – the Roosevelt (Roosevelt Dam), Apache (Horse Mesa Dam), Canyon (Mormon Flat Dam), and Saguaro (Steward Mountain Dam). Irrigation flow today is regulated by the Bartlett Dam on the Verde River and the Steward Dam on the Salt River. The Granite

Reef diversion dam, located on the Verde and Salt River confluence below the Bartlett and Steward Mountain Dams, diverts water into the Project's two main canals, the Arizona and Southern. The Bureau of Reclamation services 1,300 miles of canals, laterals, and ditches that wind across 240,000 acres of land within the boundaries of the project (BuRec 2011). The total hydroelectric capacity is 238-megawatts (BuRec 2011).

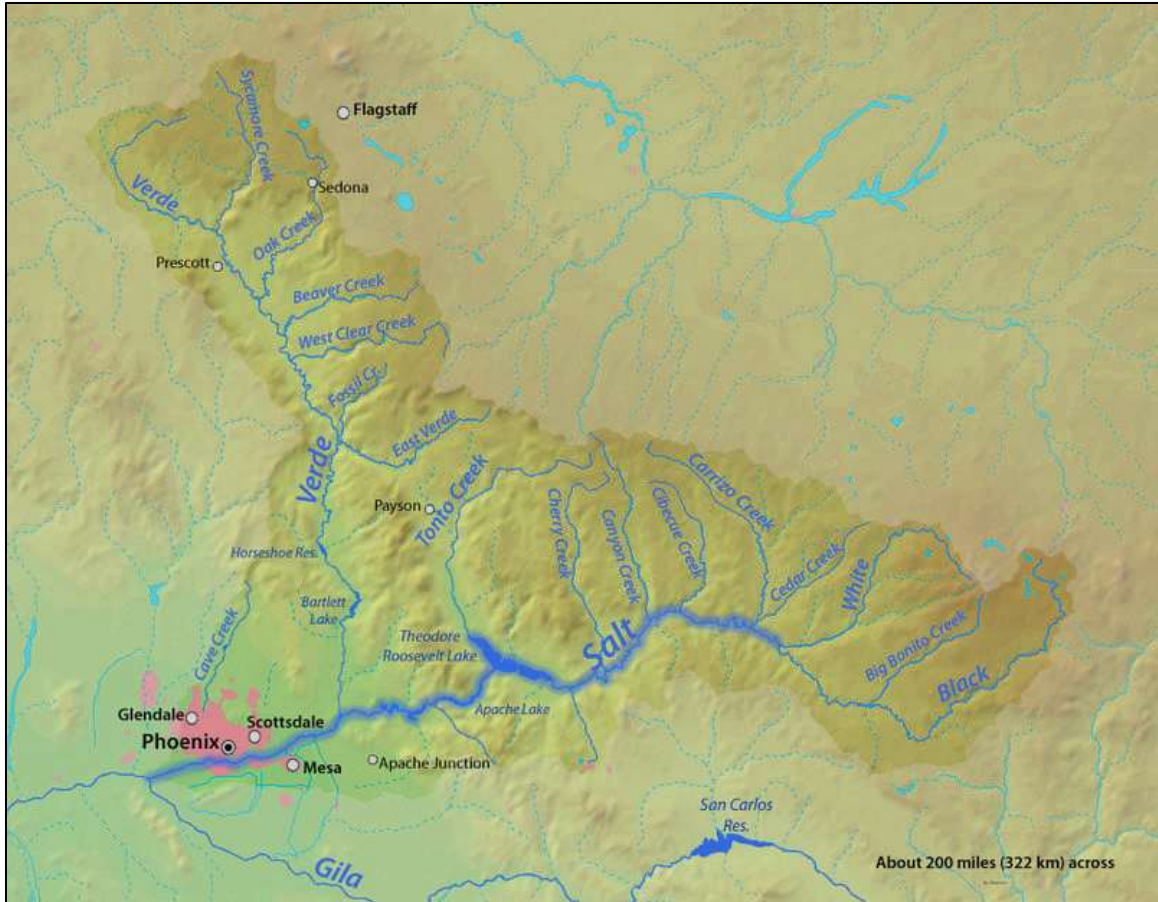


Map 1: *Untitled Map: Salt River Project* (1934). By Cartographer T.A. Hayden.

The Salt River drains a watershed of approximately 12,700 square miles (Logan 2006:12; Map 2). The extensive watershed area is derived from a general uplift in the eastern Arizona terrain, reaching to the east-northeast of the Salt River Valley basin, first to the Mazatzal and Sierra Ancha mountains, the Mogollon Rim region (elevation

3,000–5,000 feet) and beyond to portions of the flatter Colorado Plateau (5,000–6,000 feet). The Salt River drainage flow is southwest to west. Its tributary, the Verde River, drains the north-northeast watershed. The river's flow originates from the precipitation that falls both as winter snow and summer monsoonal rainfall on the mountains, canyons, valleys, and mesas, taking on its unique character from the terrain that gave its birth.

To understand the Salt River, it helps to grasp the larger circumstances of the watershed's geomorphic or physiographic development. The local mountains of central Arizona were uplifted, at the edge of the Colorado Plateau, some fifty million years ago, and the mountains replaced a previous landscape of subtropical swamps that lurked at the margins of ancient seas. The rising Sierra Nevada of modern-day California and Nevada formed a montane climatic barrier to the west, allowing both the creation of an enormous inland sea and a rain shadow effect that radically dried regions that lay downwind to the east. During the next tens of millions of years, the inland sea ultimately evaporated; mountains rose from uplifted blocks of rock in sharp, craggy eruptions, then erosion progressively scoured the rugged mountains forming basins and valleys. In a succession of similar events, mountains rose, only later to erode, washing down sediment to fill the valleys with alluvium that accumulated in some places to depths of ten thousand feet (Logan 2006:18). When valleys filled with this sediment began to be saturated by eons of rain, runoff initiated flowing streams and rivers.



Map 2: Map of the Salt River Watershed, Arizona USA (2011).

Salinity in central Arizona has always been a natural process attributable to erosion from its geological formations. Natural minerals – sodium, calcium, potassium, chloride, and carbonate ions – do yield particles in the form of sediment to surface and ground water sources (PBS&J in Salinity 2003:122). Besides the natural sources of salinity, irrigation traditions, water treatment practices, and the importation of Colorado River through the Central Arizona Project (CAP) have all contributed to altering the historical mineral balance in the Salt River Valley. In historic journal entries, Father Eusebio Kíno called the river *salado* or *salinas*. Lieutenant A.W. Whipple of the United States

Corps of Topographical Engineers surveying the region in 1851 named the river the Salt despite his “surprise at its not being salt to the taste” (Barnes 1988:379).¹

The streams and rivers in this watershed exist only because of the precipitation from summer monsoons and winter snows that saturate the land, in events that are both variable and unpredictable. Whereas seven inches of precipitation may fall annually in the Salt River Valley, thirty inches or more rain and rain-equivalent in snowfall may accumulate in the mountains of its watershed. The Salt River, classified as a tributary, flows into the Gila River, which is considered the main stem. Curiously, though, by flow volume the Gila on average carries just one-third the flow of the Salt River (Logan 2006:16). What entitles the Gila to primacy over the Salt is the sheer fact of the Gila’s length, and a geographic determination of the “order of streams” made by the Spanish in the 1600s.

The route of the Salt River transverses the central Mazatzal Mountains into the Salt River Valley, cutting through several narrow canyons that created a dramatic upland desert landscape, enshrining sacred ritual sites of the pre-contact and historic Amerindians, many told in story by ancient petroglyphs on canyon walls. To Anglo-Americans, the Salt River’s geomorphology provided almost flawless industrial dam sites, an aptness most attractive to Reclamation Service engineers in the early twentieth century that arguably provided the criterion for social, economic, and cultural growth for metropolitan Phoenix (Logan 2006:17). The Salt River enters what is the Valley of the Sun from the

¹ Father Kíno also referred to the Salt River as “Río Asunción” (Barnes 1988:379). See footnote nineteen.

east, debouching into a catchment that is itself subdivided into smaller basins. With gauges recording just a trickle of water during dry seasons and droughts, the river can become a torrent during heavy monsoon. The perennial river naturally supports a riparian ecosystem with cottonwoods and willows that line the riverbanks. Six species of ungulates, three types of carnivores, twenty-nine varieties of rodents, five types of rabbits, sixteen species of bat, forty types of birds – ducks, herons, doves, swallows, owls, and hawks – reptiles, and amphibians inhabit the river's ecosystem (Logan 2006:19). Today, the Salt River no longer has a perennial flow below the Granite Reef Diversion Dam.

Water Reclamation and the American Artist

Historically, since Julius Caesar's "Crossing the Rubicon," romantic renderings of artists have depicted rivers as relatively detailed landscape features with physical, even human qualities; at other times, rivers were presented as untapped or underutilized resources – raw materials waiting to be harnessed, managed, and exploited for human benefit (Billington et al. 2006:5). Following on early paintings of the Hudson River School came depiction of panoramic western landscapes by Albert Bierstadt and Thomas Moran, who provided often grand landscape scenes that could be used to market the idea of a robust North American continent. These and other landscape painters of the fast-expanding territorial United States suggested that here was a continent essentially without limit in its riches and potential. Large oil paintings on monumental canvases glorified and idealized the vastness of the American West with scenes meant to boost

the beauty and primeval perfection of native-American peoples and subdue any argument for the inherent superiority of Europe.

Water in the West is a symbol of regional identity, as watersheds ultimately join disparate areas into a powerful whole. Fresh water is a precious resource and an economic boon. Essential for human health, water fills a variety of domestic purposes: transportation, irrigating farms, manufacturing, and power generation. Yet fresh water in the American West is scarce and ill distributed. Physically, precipitation in the West is not evenly available. Surface water, which infiltrates quickly, originates from either seasonal rainfall/snowmelt or infrequent torrential rainstorms on the desert over a short period. Such a precipitation pattern makes human settlements dependent on artificial means of controlling water (Billington et al. 2005:8). Although groundwater can be extracted by windmill and deep-well pumping technology, the bulk of western irrigated agriculture, mining, municipal growth, and hydroelectric power evolved to depend on water diverted from rivers and transported by canals, aqueducts, flumes, and pipelines.

The American artist and water reclamation art portrays the efforts made by the Bureau of Reclamation to conquer the arid West through construction and management of large water projects. Technological, industrial, and managerial innovations are all fine and well, but dams manifest the close ideological relationships of their creators and builders to a given landscape, and additionally dams amplify social and moral associations (Fraser 1988:119). Just as artists of the Renaissance reflected life by picturing the human body, modern industrial artists project human reason as it seeks *co-operatively* to harness the power of nature (Fortune 1940).

Modern dams are skillfully constructed landscapes uniting utility and art in works of functional engineering. Similarly, there are sufficient examples of dams that have failed to prove what happens when the engineering is less than sound. Dams reflect a human aspiration to control nature, and ultimately are constructed with engineering and hydrological considerations tailored to meet the requirements specific to a given landscape. Some dams are simple and uninviting. Most loom as static technological structures that dominate nature through sheer immensity and elegant design as examples of the geometric sublime (Nye 1994:77). They forge a new historical relationship between humans and environment. The goal of the artist becomes conveyance of the meaning of reclamation programs to the public through a filter of the artist's own perceptions of the western landscape. Little wonder that there is a considerable pictorial, poetic, and narrative archive exalting (but sometimes excoriating) the technology of reclamation structures within important (and now historic) watersheds in the western United States.

The analysis and critique of reclamation images need to be placed in historical and cultural context. Chapter Two, "The Culture & Art of Water Control," surveys the economic, social, political, and cultural circumstances of water project enthusiasm, offering an understanding of the motives and arguments for federal reclamation, and tracing the shifts and contention inherent in these policies. This second chapter is divided into four periods: the pre-reclamation era and Westward expansion (1850–1902), the early Reclamation Service reinvigorating the Jeffersonian ideal (1902–1929), the Big Dam Era: modernity and its nature-culture relationship (1930–1950), and the post-war

demobilization eventually ending the Big Dam Era (1950–1972). This chapter includes representative artwork illustrating ideology corresponding to dogma from each reclamation period.

Chapters Three and Four are devoted to the Salt River Valley and the layers of landscapes represented in the Frank MacKenzie's mural *Making the Desert Blossom*. Chapter Three, "A Challenge-Response-Challenge Spiral," surveys the framework for the four historical landscapes that have occupied the Salt River Valley and the Phoenix Basin. The beginning of this chapter discusses the pre-contact Hohokam peoples and their irrigation (AD 200–AD 1500). The Hohokam culture was linked to water playing a dynamic role that contributed to the structure of their landscape, exemplifying nature's challenges, shaping human inventiveness to recognize and adapt to surrounding resources. There is a gap in knowledge after the Hohokam's immediate disappearance from the Phoenix Basin in 1500 and it is presumed that the region became an abandoned landscape. During this transition to the historic era (AD 1500–1848), the Akimel O'odham (river people) and the Tohono O'odham (desert people) are deemed to have a linkage to the Hohokam people, and settled in the outlying regions of the pre-contact civilization. Evidence shows the historic Yavapai and western Apache migrated to the Salt River watershed after the abandonment by the Hohokam civilization; the Yavapai were established by the late 1600s, and the western Apache sometime after the 1750s.

The Spanish (and soon after Mexican colonial arrivals) explored this region, yet never settled in the Salt River Valley, leaving Phoenix, a major Southwestern city, without an historic Spanish landscape. The Mexican-American War of 1848 opened the

southern Arizona region to U.S. military and civilian expeditions leading to the Anglo settlement of Phoenix in 1868. Chapter Four, “The Salt River Valley Mural: a Story on Canvas,” specifically examines the Frank MacKenzie mural, *Making the Desert Blossom*. This chapter splits into two sections: the background on the commission of the mural by the Bureau of Reclamation for the 1929 Ibero-American Exposition in Seville, Spain, and the stories that represent the individual elements that construct the grand, sublime landscape, displaying 1928 American modern reclamation technology in a paradox with preserving the patriotic Jeffersonian ideal.

In the final chapter, Chapter Five: Epilogue, I contend that humans continue to challenge the desert, using technology as a deceptive yet forceful tool, to impose concepts of space and time onto a seemingly malleable environment. Water is the dominant resource in the critical culture-nature relationship within desert urban areas. More, more, more continues to be the ethos of the arid water planner. Reclamation projects have created an illusion of water abundance, while in reality, there is not enough water to support twentieth-first century population growth, and in that regard, the Salt River Valley is absolutely no exception.

Chapter Two: The Culture & Art of Water Control

*Uncle Sam took up the challenge in the year of 'thirty-three,
For the farmer and the factory and all of you and me,
He said, "Roll along, Columbia, you can ramble to the sea,
But river, while you're rambling, you can do some work for me."*

— Woody Guthrie, 1941

Beginnings . . .

Utilizing rivers for a perceived public good is an act that extends back to our nation's beginnings. The first President, George Washington, was a proponent of civil engineering, initially lobbying for a system of canals that would drain marsh lands to open the Potomac River for navigation. Ironically during this era, confining waters within an enclosed canal or conduit was a notion of liberty, demonstrating neoclassic ideals of aesthetic order (Seelye 1991:8). Curiously, in 1825 William Rush carved two figurines for the Schuylkill waterworks in Pennsylvania, entitled *The River Enchained* and *The River Freed* exemplifying neoclassic ideals of aesthetic order and implied water control will "free" water to run easily, serving all people's needs (Seelye 1991:8; Plate 1).

²Management of rivers and inland waterways arguably was part of a republican plan, promoting ideology to balance scenic natural beauty with neoclassic utilitarian considerations upon the landscape. In other words, early American culture ordained that rivers were at their most attractive when they yielded bounties to assist with humanity's needs.

² Plates appear at the end of the document, so they can be reproduced at a larger size; they are numbered sequentially throughout the document.

Federal dam building slowly evolved out of the 1824 U.S. Supreme Court ruling in *Gibbons v. Ogden* that established “great thoroughfares of inland navigation were [under] federal jurisdiction” (Billington et al. 2006:299). Rivers enhanced westward migration and inland river transportation. Yet profound changes inaugurated by the rise of the Industrial Revolution, and a desire to make widespread economic use of our nation’s natural resources always concerned state and federal governments. Under the auspices of the Commerce Clause in the U.S. Constitution, the federal government drew upon its jurisdiction over interstate commerce, increasing its involvement in the physical restructuring of the nation and construction of a national infrastructure including roads, canals, and dams. Over the course of the nineteenth century, mastery of nature and its resources became inseparable from the desire for progress. The ability to manipulate nature was becoming a cultural custom and an American habit — if not an addiction.

The common-law doctrine and cultural practice of giving ownership of water privilege with the land bordering the two banks of the stream, known as *riparian water rights*, framed water law in the humid Eastern states, while in the arid West, the mining economy and Spanish-Mexican practice shaped early western water law. Until the nineteenth century, water legislation mainly dealt with water rights or right-of-way (Carlson 1968:44). When Anglo-American settlers arrived in the West, neither land nor water right issues had been openly defined. Early western water law “rarely looked beyond its immediate economic needs” in determining water rights (Pisani quoted in Billington et al. 2005:8). The California Water Doctrine, developed 1851–1886, provided the foundation for the western water practice of *prior appropriation* (Billington et al. 2005:8). Prior

appropriation water rights, a “first in time, first in right” principle, applied in theory to early California gold-rush mining claims (Billington et al. 2005:8). Since water was essential to gold mining, water rights were allocated according to the ranking order of the miner’s claim so long as the miner continued to work that claim. The system worked when water was abundant. However, when water was scarce, prior appropriation became a source for lawsuits and confusion, giving no preference to communities or individuals. The California State Court upheld the prior appropriation principle in 1855, and in 1866, federal action endorsed prior appropriation, thus acknowledging states’ power to regulate water rights (Billington et al. 2005:8-9). During the 1880s, Colorado invalidated riparian rights, relegating prior appropriation as the sole state water right to be enforced under Colorado state authority. The *Colorado Doctrine* dominated water right claims in the Rocky Mountain region except Wyoming. The *Wyoming Doctrine* gave power to the state constitution to declare title to all water, regulating all water rights and apportionments in the state.

This piecemeal approach to western water law benefitted large corporations creating monopolies from prior appropriation water rights, initiating western battles over irrigation, farming and ranching, mining, and demands for urban growth. The small-farmer and homesteader were being ignored, positioning water and its utilitarian use at the forefront of western issues, exacerbating the western boom-to-bust culture with little resolution in sight. This hampered the establishment of national water policy. Further, the federal government and its twentieth century commitment to construct federal dams in major watersheds conflicted with many western states’ water laws, compli-

cating roles in apportionment of western water. According to the property clause of the United States Constitution (Article 4, Section 3), “the federal government had the legal authority to accept, manage, and dispose of public domain lands, and this provided the basis for subsequent laws and regulations pertaining to public lands and other resources” (Billington et al. 2005:10). Theoretically, this designates the federal government the possessor of enormous amounts of water in the American West, based on the federal government’s claim to be the earliest formal landowner in the region (Billington et al. 2005:10). That claim and suppositions inherent in it have long been bitterly contested.

Moreover until 1877, during the Civil War and Reconstruction eras, many Southern states and territories of the Far West were unrepresented in the United States Congress. This allowed the Union Congress to pass several legislative acts affecting the future of the West, generally laying the legal infrastructure for rabid expansion into western territories, facilitating hasty industrial capitalist growth, and binding regions firmly into an economic, political, and cultural national framework (Huntley 2011:131). The Union Congress, in theory, focused on western lands as places to espouse the Jeffersonian vision of farmers and miners, where slavery could not take root or spread. The Homestead Act of 1862, the Timber and Stone Act of 1878, and Constitutional amendments passed during the Civil War and Reconstruction eras not only reaffirmed the power of the federal government over the states, it promoted the swift expansion and consolidation of large-scale monopolies (Huntley 2011:130). There was intense interest how to develop the natural resources of the West, including water, reinforcing the im-

age of the West as the land of economic opportunity and growth. Land ownership, leading to an exploitation of resources associated with economic and social progress, continued to support the American cultural notion of liberty. Water provides the means of progress, subsequent opportunities, and wealth fulfilling the image of America *the bountiful*. The nation grounded its future in western romanticism, and its preconceived vision of an untapped wealth, which allowed frontier individualism to claim it all.

Setting the Stage for Federal Reclamation

Leader of one of the Great Surveys, and later head of the U.S. Geological Survey, John Wesley Powell understood the West's single unique quality – aridity – voicing its harsh reality. Powell recognized the West could not be settled using Eastern water rights, and he maintained that reclaimed lands, when utilized profitably, would ultimately provide more success for rural western expansion. Water law and ideology had to change, and Powell was challenging nineteenth century American convention. In his landmark 1878 *Report of the Lands of the Arid Region of the United States*, Powell contends that an acre of arid western land is practically worthless without irrigation; scientific management of water can double or triple yield from such lands. Proper redemption of arid lands is profitable with capital and labor. Consequently, Powell was calling for an agricultural revolution in the West, a remake of traditional western settlement and expansion.

“Institutions for the Arid Lands” the final article in the 1890 series published by Powell in *Century Magazine*, presents his thesis arguing that the entire arid west should be organized into hydrographic districts (Plate 2). A hydrographic basin is a unit of

brooks, creeks, and streams that unite to form one drainage system bounded by heights of land that rise to crests and divide the waters; irrigable lands are below the pasturage hills and mountains, where the forests and water sources are found (Powell 1890c). The federal government, being the owner of most of the western lands, would then distribute irrigable lands as homesteads, retaining possession of forests, pasturage, and mining lands, but allow local laws to be established for resource usage. Federal and state governments would relegate distribution of water as well as settle interstate litigation. Cooperative labor was essential because each district must generate its own capital to survive as a community. Benefits would be distributed fairly among people, so corruption would be at a minimum. Powell had confidence every human in the basin would be interested in conservation and management of the water supply because the populace would be interdependent in all their industries and needs. Yet, frontier individualism and a period of free enterprise principle worked against acceptance of Powell's ideas.

All the foregoing to the contrary notwithstanding, John Wesley Powell did in fact envision the potential of harnessing of the Colorado River to irrigate the rich agricultural lands of Nevada and California, comparing the area to Egypt, visualizing date palms and fruits flourishing in abundance. Powell said "great works" must be constructed to harness the potential of the Colorado River, reclaiming an area larger than any area cultivated in Egypt (Powell 1890a). Still, John Wesley Powell's 1893 speech to the Second Irrigation Congress held in Los Angeles insisted that even with full development of western water resources, there would be insufficient water to irrigate more than a small portion of the arid western lands (Carlson 1968:46).

Economic downturns coupled with the calamity of the 1890s drought on the Great Plains, and capped by the failure of the Philadelphia and Reading railroads, plunged the United States into a severe depression in 1893. During the bleakest months, unemployment neared twenty percent; strikes, farm foreclosures, and large numbers of vagrants signified a faltering economy (Pisani 1992:248). This stalled western economic development, yet ironically set the platform for federal reclamation and passage of the Reclamation Act of 1902. Irrigation advocate William E. Smythe declared only reclamation could provide the western region with a stable society and sustainable economic growth. Smythe regarded irrigation as a social tool for re-adoption of the small farm unit supporting the Jeffersonian ideology, while recapturing the democracy, cooperation, order and unity of village life, proposing a national policy for “a new birth of freedom” (Pisani 1992:236; Carlson 1968:42). He averred that “[the] moment had come for the rise of a new cause which should take hold of the popular heart and go on, by a process of gradual unfoldment, until it became perhaps the greatest constructive movement of its time” (Smythe 1907:265). There was fear America was losing a great class of small-land proprietors, and only sub-dividing arid lands into small farms could maintain the status quo. Smythe was convinced irrigation would provide a foundation for a “new and wonderful civilization,” the salvation of our institutions, and the mighty potential to confer “millions of men a blessing of a free home” (Smythe quoted in Carlson 1968:42).

Economics compelled politicians to deliberate and confront the aridity of the West. Smythe lobbied for one comprehensive government reclamation policy, using methods of private enterprise to reclaim lands under strict rules and regulations, op-

tions for public ownership of canals, reservoirs, and other works, while denouncing any unfair tributes that may be sought by Eastern capitalists (Carlson 1968:43). Regardless of John Wesley Powell's assessment of insufficient water, the Second Irrigation Conference of 1893 produced key reclamation themes, later adopted by early Progressives and carried into the twentieth century, championing the motto "Irrigation: Science, not Chance" (Pisani 1992:249). Smythe echoed these themes addressing the Congress as if the future of American civilization was at stake:

We meet here not merely to extend our country's frontiers, but to widen the boundary of civilization itself. The seed which we shall plant in the soil of the desert will bear the fruit of industrial independence for millions of the freest men who ever walked on earth . . . We will lay the superstructure of this edifice by the plumb-line of justice and equity . . . We will write upon its [irrigation's] white cornerstone, "Sacred to the Equality of Men" . . . We will inscribe upon its massive arch those two synonymous terms, "Irrigation and Independence." (Smythe quoted in Pisani 1992:249)

The assembled conference delegates obsessed over the gravity of the moment, adopted an *Address to America* deferential to the current economic realities of the nation:

"[an]alarming disappearance humid public lands, pressure of surplus population, [and] an alarming increase in the class of homeless people within the borders of the United States" (quoted in Pisani 1992:249). Advocates were convinced irrigation would solve the nation's economic and social problems by decentralizing populations from urban areas. Backed by the National Irrigation Congress led by Smythe and National Irrigation Association Director George H. Maxwell of California, Congressmen Francis Newlands of

Nevada authored *The Federal Reclamation Act of 1902*, establishing the Reclamation Service (later changed to the Bureau of Reclamation in 1923).³

Changing the Face of the West

Theodore Roosevelt in a 1901 speech declared, “The western half of the United States would sustain a population greater than that of our whole country today if the waters that now run to waste were saved and used for irrigation” (quoted in Reisner 1993:112). Reclamation was the largest public works program launched in American history. In theory, the scheme would use funding from the sale of public land to build dams and canals in the West luring “a landless man to the manless land” (Pisani 2002:393). At the arrival of the twentieth century, there was little doubt that land hungry Americans would flock to the government’s irrigated, bringing the nation’s population growth to forever sustain demand for desert homesteads. To oppose the Reclamation Act was essentially to threaten a shutting off of western migration: It was unpatriotic.

Reclamation began with great confidence, assuming all problems were matters of engineering. Government could turn nature into a productive machine, “just as the assembly line had rationalized the manufacture of factory goods” (Pisani 2002:xvi). *Harper’s Weekly* proclaimed, “in the true analysis its [the Reclamation Act’s] significance is national not local. . . A hundred million [irrigated] acres will give homes to millions of families, and afford sustenance for many times that number” (quoted in Pisani

³ The National Irrigation Association largely was financed by railroad and mining interests (Smith 1986:17).

2002:393). *The New York Times* considered this legislation the last phase in the conquest of a continent, “[t]he irrigation plan is adding to the general resources of the nation in furtherance of the impulse which has carried our vigorous race from the little fringe along the Atlantic to the shores of the Pacific and far into the Asian waters” (quoted in Pisani 2002:393-94). In some circles, the passage of the Reclamation Act was considered more notable than Roosevelt’s determination to build the Panama Canal.

Notions of Liberty

Early reclamation art reflects elements of cultural American identity, principally the encountering and colonizing of the wilderness, connecting reclamation with freedom. The myth of Manifest Destiny was rooted in a view of the North American land as inexhaustible. Irrigation promised transformation of an arid, scenic, but largely unusable land into an Edenic pastoral landscape; assuredly an Old World English conception of “welcoming” rather than a vision borrowed from Mediterranean or Near Eastern experience. Frederick Jackson Turner’s 1893 *Frontier Thesis* insists that the conditions favoring western settlement advancing against a wilderness served to generate fresh concepts of liberty (quoted in Cusack 2010: 51). Even so, “[t]he wilderness revealed the work of the hand of God [but] the domestication of the landscape represented the American people working out God’s plan on the continent” (Baigell quoted in Cusack 2010:51).

Dam and reclamation images of this era presented America as a utopian land of opportunity and plenty with the idealism and romanticism of nineteenth century Westward expansion. The idea of liberty and the American identity became increasingly allied

with economic advancement and individual social progression. The Hudson River School's motif of Christianity was the foundation for the construction of nationalism, dominated by white Anglo-Americans, championing the masculinity of the pioneer controlling the savage nature of the native-Americans and surrounding wilderness. *Hermiston (1910)*, a reclamation brochure cover promoting the Umatilla Project in Oregon, exemplifies the neoclassic theme of water control – human domination over nature (Plate 3). *Dedication of American Falls Dam (1906)* shows the rugged dynamic male American laborer using technology to tame the wild river to a pastoral landscape, identifying the pioneer as an entrepreneur and developer (Plate 4). Land, liberty, and property became cornerstones of masculine progress into the wilderness, symbols of the nation's future, securing independence from Europe, and modeling for a modern nationalism (Cusack 2010:22).

Many early reclamation images focus on vegetation – its exoticism, luxuriance, and abundance – as epitomizing the utilitarian purpose of water, establishing the icons of pioneer valor and general Christian resilience. Anglo-Americans believed the western landscape was awaiting revitalization by the white man, a hopeful bounty to supplant the desert scrub (Cusack 2010:35-6,45; Figures 2 and 3). Images are able to 'sing the praises' of irrigation, suggesting reclamation provides a pleasurable and wealthy place to live and visit (Plates 5 and 6). Railroads and local commerce exploited this impression of wealth to attract the settler and tourist alike; even the elite were enticed (Plates 7 and 8). Dams were presented as an allegory connecting the future, particularly in advertisements, heralding modernity and becoming hegemonic on the landscape to forge the

nation ahead seeking an autonomous identity (Plates 9 and 10). Between 1902 and 1915, the Reclamation Service, under the direction of Frederick H. Newell, constructed 100 dams, 25 miles of tunnels, and 1,300 miles of canals and ditches including the Shoshone Dam in Wyoming, Roosevelt Dam on the Salt River in Arizona, and Arrowrock Dam in Idaho – supplying water to nearly 20,000 farmers in the West (Pisani 2002:394).



Figure 2: Umatilla Project Development League (1910).

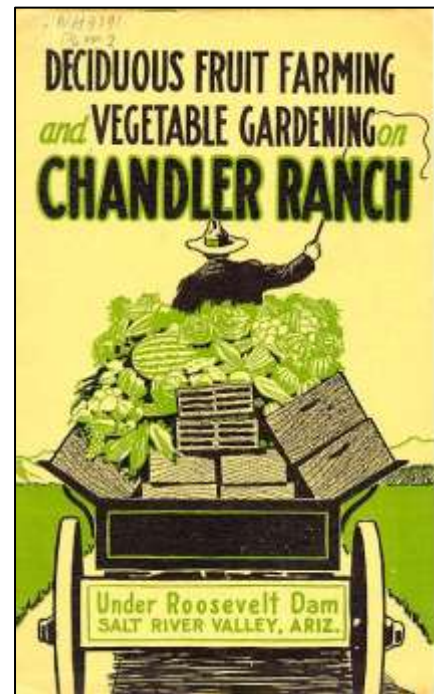


Figure 3: Deciduous Fruit Farming and Vegetable Gardening on the Chandler Ranch: Under the Roosevelt Dam, Salt River Valley, Arizona (1917).

Nonetheless, there were underlying socio-economic problems with the federal reclamation program from the beginning. According to *Water for the West* written in 1979 by Michael Robinson, “[i]nitially, little consideration was given to the hard realities of irrigated agriculture. Neither aid or direction was given to the settlers in carrying out the difficult and costly work of clearing nor leveling the land, digging irrigation ditches,

building roads and houses, and transporting crops to remote markets” (quoted in Reisner 1993:114). Soil science, agricultural economics, and drainage were problems; mineralized alkaline and drainage was so poor that fields turned into saline swamps. By 1910, Reclamation funds were expended and many an effort bankrupt; sixty percent of farmers were defaulting on their repayment obligations back to the Bureau (Reisner 1993:116; Pisani 2002:391).

The promise of irrigation was unable to sustain small western farmers and transplant the Jeffersonian ideal across the continent. During this era, American culture was experiencing a major transition. Post-World War One urban society began celebrating the virtues of technology and capitalism, while rural regions saw decline in population and economy. Reclamation did add 100 million acres to the nation’s farmland, which depressed crop and land values (Winter 1978:337; Pisani 2002:396). The Bureau of Reclamation had a hard sell, particularly in pre-Depression years, to maintain an image of prominence needed for political and economic support. Smythe’s belief that irrigation was a crux of the nation’s “rebirth” gave way to vast migrations to growing cities. The Bureau of Reclamation and federal irrigation projects sought to redefine themselves, setting their sights on the Colorado River, with the oversight of political and business interests tied to Southern California (Billington et al. 2005:129-30). The Colorado River drains one of the more arid regions in the world, so in its day reclamation appeared to offer a surrounding environment and citizenry significant social and economic promise. Until the 1920s, utilization of the waters of the Colorado River was thought of only as a possibility; early twentieth century technology brought damming the Colorado into the

realm of reality. Boulder (Hoover) Dam was the major first structure completed in 1935. The placement of this enormous structure, with its great technological challenges, into the riparian landscape of the lower Colorado River not only initiated a mammoth seven state political jockeying for resources, it brought reclamation and big dam projects of age, thrusting water control forward as a major contender in American national politics.

The Big Dam Era

Similar circumstances that gave rise to the 1893 Depression, drought in the Great Plains, and serious national financial problems, curiously repeated themselves in the 1929 Wall Street Stock Market Crash and the 1930s Dust Bowl of the Southern Plains. These circumstances positioned the Bureau of Reclamation to reinvent itself, generating the Big Dam Era. The Great Depression itself was a socially complex era. The cultural belief America was a utopian land of opportunity and plenty was shattered (Baer 1983:1). Author Karal Anne Marling contends “Depression America believed passionately in a verifiable usable past of happiness and plenty, and a future that would once again fulfill the primal needs of the forgotten man” (Marling quoted in Baer 1983:4). The Great Depression and New Deal thinking fostered how the federal government should interact with a modern economy in crisis, and Big Dam Era projects manifested this relationship. Reclamation projects were no longer simple local units, but became broad-ranging regional plans centered on major rivers and their associated watersheds. Boulder Dam, later renamed Hoover Dam, is the most notable Depression-era project that

completed a symbolic cultural transformation from nineteenth century frontier individualism to collective modern enterprise.

Hoover Dam was a “symbol of hope” for the future, a representation of public pride and self-renewal, epitomizing the Progressive iconic motif of futurology. Author Joseph Stevens refers to Hoover Dam as tangible evidence that the American Dream might live on, interconnecting New Deal policies with traditional American enterprise values of initiative, ingenuity, and risk that eventually would lead to the betterment of all (Stevens 1988:244). Boulder Dam created additional economic potential for Southern California and its adjoining desert, with power and water supplies promising industry atop agriculture, and Boulder Dam’s success demonstrated to other western states that large reclamation projects could provide future economic growth and independence. The great dams of the Big Dam Era changed vast areas of the continent, transforming the living standards of millions of Americans. The “children of Boulder Dam” – Grand Coulee, Shasta, Bonneville and Fort Peck – became icons of modernization and centralization of national power over national resources (Stevens 1988:259; Pisani 2002:xi).

“Hoover Dam is one of the few structures built in a scale with the vast landscapes of the West” (Wilson 1985:492; Plate 11). The surreality of Hoover Dam underscores the incongruity such a project could ever be built in the desert. It may be argued the application of art and architecture to this dam construction enlightened and influenced Americans to accept fundamental themes and myths of American modernism, using abstract and ahistorical images to emphasize beneficial results some

struggled, even to this day, to understand. The futuristic project brought a new feeling of patriotism to the American public, supporting a new national interest in a frontier shaped by infrastructure construction (Plate 12). Such were the symbols of a new age. Hoover Dam's main architectural consultant was Gordon Kaufmann, who had no prior experience as a dam architect. Kaufmann succeeded in interjecting modern perspectives into construction. Architect Richard Wilson suggests Kaufmann both knew and was influenced by a 1929 book published by architectural illustrator Hugh Ferriss, *The Metropolis of Tomorrow*, and by Fritz Lang's 1927 film *Metropolis*. Those, Wilson believes, conceivably explain Kaufmann's imaginative emphasis on the technological nature of the dam, which especially drew the attention of visitors to the dam's machinery, aglow in futuristic night lights (Wilson 1985:479-80; Plate 13). By drawing inspiration from prominent American and European avant-garde artists, Kaufmann arguably advanced public acceptance of reclamation through complimenting pure engineering with inventive progressive design (Wilson 1985:478).

Utopian urban planners renouncing the traditional study of antiquities were the new thinking for the modern twentieth century. Futurist Tony Garnier's *Une Cité Industrielle* published in 1917, modeled a utopian-socialist industrial city centering its urban energy source on a hydroelectric station and dam (Plates 14, 15, 16). Intriguingly, the location of Garnier's futurist city was determined by the location of water, preferably on a plain at the confluence of a main river and its tributary (Wiebenson 1969:28,107). Garnier's whole concept was based on regionalism, developing relationships among the industries, occupations, and customs of surrounding areas,

creating an interdependence among residents while promoting equality and governmental decentralization. Much of this ideology espouses the general philosophy of John Wesley Powell's defense of hydrographic basins as the most reasonable units for organization in the American West. An emphasis on sanitation and cleanliness, promoting a "revulsion against dirt and waste," placed hydroelectric power as a clean energy source, and the solution to problematic pollution of nineteenth century manufacturing (Wienbenson 1969:30). Very much capturing the spirit of the era, Garnier intended structures be amalgamated to accommodate future mastery of machines, in the process emancipating humans from mechanical labor (Wienbenson 1969:30). Aesthetically, Garnier embraced simplicity of structure based on long horizontal and vertical lines, favoring monolithic units constructed of reinforced concrete, all flowing together with no clear separation of parts. In preliminary drawings, Garnier set factory complexes against a natural backdrop of natural mountains and the dam, in the act welding technology into a partnership with nature. The Italian futurist Antonio Sant'Elia, also influential in the futurist movement, developed drawings for his *Cittá Nuova*, integrating power plants to provide the new energy, light and heat for the industrial city (Plate 17).

These innovative architectural concepts, especially Tony Garnier's futurism, had matured by the 1920s, setting up the state-of-the-art as a new doctrine for Progressives of the interwar era (Wienbenson 1969:7). Simplified architecture, flowing monolithic masses of reinforced concrete, and clean power were modern trends for industrial times. Early twentieth century American culture and media sought to emphasize

America's acknowledged industrial and technical leadership, abdicating the nineteenth century grand transcendental landscapes to a modernized industrial national identity of *machine aesthetics* (Vilander 1995:103-04). High modernism, as argued by James Scott, is a "supreme self-confidence about continued linear progress, the development of scientific and technical knowledge, the expansion of production, the rational design of social order, the growing satisfaction of human needs, and, not the least, an increasing control over nature (including human nature) commensurate with scientific understanding of natural laws" (Scott quoted in Wehr 2004:826).

It is society that ascribes meanings to dams. Industrial artists tend to share an ideology that limitless natural resources are best harnessed by human-built machines (Vilander 1995:105). Early 1920s to 1930s federally-sponsored Reclamation Service exhibits and models fostered themes of humans disciplining a landscape that lies before them. Photographer Ben Glaha created iconic images of Hoover Dam for a pre-television age public, proving the efficacy of the first Big Dam Era project. Gordon Kaufmann worked together with artist-consultant Allen True on the Boulder Dam project furthering the modernist beauty of the structure, and proclaiming that "it no longer suffices that a hydroelectric plant which serves millions of people be encased in a mere building – its housing must express the new understanding of functional form and satisfy in every respect the pride and esthetic joy that man finds in his accomplishments" (quoted in Wilson 1985:488). Yet, in 1935, the journalist Theodore White pondered Hoover Dam as its construction near completion stating, "It is a beautiful tantalizing thing. It is complex. It has a meaning, not to be grasp in weeks, or

years. It is subtle, sometimes cruelly obvious” (quoted in Wilson 1985:465). If dam-building involved jousting with nature in a teasing courtship with the sublime, the product was at times an ugly beauty.

“Promoting the General Welfare”

The Bureau of Reclamation has been acknowledged as one of the essential agents trying to bolster public welfare during the 1930s (Lowitt 1984:93). Author Richard Lowitt maintains during the Great Depression period, Bureau of Reclamation programs and policies were aimed at broadening food supply, strengthening and backing industry, establishing self-supporting homes, and expanding and modernizing the Nation’s transportation system (Plate 18). However, the increasing engineering complexities of multipurpose dams generated more expensive projects, necessitating the utilization and control of entire river systems. The social climate of the time period was technology can make arid lands green – so arid lands should be made green (Plate 19). By 1936, the Bureau of Reclamation had nineteen dams under construction, employing thousands of workers, developing new machinery and technology that stimulated economies, stabilized unstable regions, and facilitated domestic infrastructure that proved crucial during World War Two (Lowitt 1984:93-4). By 1940, one-fifth of the nation’s hydroelectric capacity was located in the West, with then-Bureau of Reclamation Commissioner John C. Page boasting the Bureau was “approximately at the halfway point in the development of the West by irrigation” (quoted in Lowitt 1984:93,98-9).

Attention-grabbing dam building portraits attracted the public's interest, delivering dramatic impact of the scale, power, and importance of "critically needed water management" (Vilander 1995:146). The Section of Fine Arts Depression-era mural *Dam Construction* (1939) painted by William Gropper for the Department of Interior Building in Washington D.C. served to publicize the central concepts of Big Dam Era projects (Figure 4):

[T]he construction of a great dam . . . [are] vitually contributing factors in the immensely important work of relamation carried on by the Department of Interior . . . The right hand panel shows workers putting together steel frame work. . . the center we see a large conduit held by steel frame work while a crane lifts it high above the canyon. At the top of this dramatically suspended form a man stands waving directions as the crane prepares to ease this section of the work into its destined position. This human touch add human drama to a dizzying operation . . . on the sides of the steep rocky slopes of the canyon, underterred by perilous positions, men are seen working with air drills. . . portrays so imaginatively and lucidly the drama of what to many is one of the most impressive engineering work of modern times, awakens the observer to a conception of the measureless value of the great dam which transforms a wide territory into giving it power, light, and the means of irrigation. It is the characteristics. . . for this artist [to] be sympathetic of the problems of labor. . . makes us aware of the dignity, the courage and the strength of labor. (Section of Fine Arts 1939)



Figure 4: *Dam Construction* (1938). By William Gropper.

The art of water control has key aesthetic and political links with the American worker, especially during the Depression years. There is an iconographic celebration of wage earners as heroic, dynamic, and rugged individuals identifiable with the Great Depression, used to help deflate anxieties about the severe unemployment and the cultural melancholy of the period. New Deal art evolved out of the 1920s Mexican mural movement led by Diego Rivera, José Orozco, and David Siqueiros transforming walls of government buildings into a celebration of the Mexican Revolution and its ideals, mixing images of native cultures and icons associated with Marxism (Lembeck 2008:29). Philadelphia artist George Biddle wrote to then-President Franklin Roosevelt:

The younger artists of America are conscious as they have never been of the social revolution that our country and civilization are going through; and they would be eager to express these ideals in a permanent art form if they were given the government's co-operation. They would be contributing to and expressing in living monuments the social ideals that you [Roosevelt] are struggling to achieve. (Biddle quoted in Lembeck 2008:29)

Franklin Roosevelt's New Deal's policies sought to reform capitalism, and public art could be used to communicate civic values and ennoble a populace discouraged by the Great Depression (Lembeck 2008:29). The *People's Art* showed a yearning for the simple, cultural myths of the past while displaying deeper interests for political notice and participation. It was an era when artists were returning to the life of the people, absorbing the richness, vitality and "lusty healthiness inherent in the people" (Guglielmi quoted in American Scene 2010). An "American Renaissance" emerged democratizing labor and production as an important component in modern American culture (Baer 1983; Harris 1995:34). Dam building was part of this picture. Laborers were shown promoting

the general welfare – happiness, prosperity, and well-being – being emblematic of production, as well as providing a technical renewal which New Deal planners had envisioned essential for a better tomorrow (Doss 1997:58). Images of Hoover Dam workers offered portrayals of manly wage earners untouched by the economics of the era. They were supposed heroes who dominated machinery and tools, and united in purposeful labor against a backdrop of the harsh realities of nature (Plates 20 and 21). Themes of social realism paid homage to technology and teamwork, glorified industrial sites and large scale production, propagandizing that government and labor could pursue a national enterprise (Plate 22). Hoover Dam is exemplary of the New Deal partnership then-President Franklin Roosevelt was trying to accomplish: social change through the worker.

Labor makes wealth. The use of materials makes wealth. To employ workers and materials with private employment has failed is to translate into great national possession the energy that would otherwise be wasted. Boulder Dam is a splendid symbol of that principle. (Roosevelt 1935)

Imageries staged a faith in work and a belief in technology. Furthermore, depictions projected a “sense of dynamism” symbolizing energy and motion, bringing the resources of nature together for change, mediating the “dialogue between machine and source” (Maroney 1999:50, Plate 23). To many, dams and reclamation projects of the Big Dam era were representing modern frontier spirit found in the Depression-era West (Stinger et al. 1999:50).

Montana Castle (1936), an iconic New Deal public works image, demonstrates a spirit and power of contemporary technology reshaping the face of modern America

(Plate 24). Photographer Margaret Bourke-White inaugurated Henry Luce's Depression-era enterprise, *Life Magazine*, with a powerful cover photograph of the Fort Peck Dam spillway gate structure in Montana as the structure appeared in 1936. Bourke-White portrayed the crenulated turrets as sublime, cathedral-like sculptures against the backdrop of a clouded-sky, producing almost a religious experience, and providing a spiritual emblem of hope and strength, designed to foster hope in hard times to a nation that had all but lost faith in itself. The figures in the foreground of the photograph are dwarfed by the spillway, and characterize the dehumanizing motif of technology. The Fort Peck project put 11,000 laborers to work, establishing shanty towns on an otherwise raw frontier in eastern Montana. Bourke-White correspondingly documented the cultural and social life of workers on the Fort Peck Dam project, reflecting overall portrayals of the common man regaining hope, a cultural identity, and a sense of place lost in Depression America. This was of course the same species of glorification that Bourke-White and Charles Ebbets would capture in portrayals of New York's Chrysler Building or steel workers lunching on a girder at the Empire State Building.

Despite the promise of technological progress, a moral dilemma inevitably emerged during the machine-age and declared its presence with authority: should technology, with its potentially dehumanizing nature, be promoted as the social and economic salvation of the United States? Certainly, dams during the mid-century era were powerful American symbols, many making claim to being harbingers of change and promises for a bright future. It was the contention of many observers that dams meant

jobs, financial security for various agricultural interests, and offered to bring stable and plentiful water supplies to several cities – “a cornerstone of social policy extending well beyond cheap electricity” (Billington et al. 2005:384). President Franklin Roosevelt, dedicating the Bonneville Dam in 1937, lauded the Columbia River as providing “the widest possible use of electricity [to create] more wealth, better living and greater happiness” (Billington et al. 2005:191). Further, world tensions in Europe prominently stoked by aggressive Nazi ambitions during the later half of the Great Depression generated an air of war that threatened the United States and its allies. Just as much as Germany, the United States and Great Britain were looking for images of national power, and big multi-purpose dams and modern industries satisfied this notion in part, manifesting a “cosmic order” over nature, exhibiting human control over energy, growth, and time (Maroney 1999:33).

Early big dams had critics. Jim Marshall in 1937 published an article in *Collier's* magazine, “Dam of Doubt,” reflecting recurrent worries of critics that big government was building useless monuments to itself in an era of economic hardship (quoted in Billington et al. 2006:163-64). Arguments persisted that dams, especially in the Northwest, were not needed as industry would not settle in the region, initial cost estimates for big dam projects were given as deviously low, therefore great labor was being wasted (Billington et al. 2005:203). In 1941, the United States entered World War Two. With the 1942 completion of Grand Coulee Dam, the United States had a huge stock of hydroelectric power, with more available energy than any other country, and that surplus is

today deemed a crucial factor aiding in the Allied victory against Germany and Japan in World War Two (Reisner 1993:158).⁴

Big Dam Era structures conceivable evolved to respond to specific Depression-era socio-cultural demands calling for efforts to improve American regional economies. Federal dams were the symbolic achievements of the 1930s era, replacing the great capitalist skyscrapers of the Roaring Twenties – the Empire State Building, the Chrysler Building, the Bank of Manhattan building – losing their luster with the disillusioning 1929 Stock Market Crash. Perhaps, the Big Dam era was beginning to mirror technology encompassed and demanded by a growing energy-dependent American society. Modernization and urbanization generated changes in the American standard of living, significantly growing per capita energy demands. Many advancing societies have, and continue to turn to, forms of hydroelectric power as an inexpensive and arguably a clean domestic alternative for growing energy consumption (Sternberg 2006:185). During the Great Depression through World War II, big dams had claim in American socio-economic culture to provide needed energy better than any other available source of the period. It may be plausible to speculate the time required to seek alternative, cost-effective solutions was limited by economic pressures of the era. Several hydropower, irrigation, and

⁴ By 1939, Franklin Roosevelt knew that American would probably be going to war against the Axis; Germany at the time had the greatest industrial capacity in Europe and Japan, technically the most superior in the Far East. Energy production was the key for the Allies victory. Aluminum, critical to aircraft manufacturing, and plutonium were both products of high-energy consumption. Scholars contend the Axis powers lost the war because they were out-produced.

flood control schemes had a purpose in America, making economic sense during the twenty-eight year period of 1928–1956 (Reisner 1993:165-68).

The post-war demobilization era began to dampened enthusiasms for the Great Depression Big Dam Era programs. While opposition would acknowledge big dams had hydroelectric power capacity necessary in Cold War defense, their hostility toward expansion of federal “Tennessee Valley Authority” style river basin planning for the West, demonstrated by the 1948 Republican Party platform, opposing the creation of “an all-powerful Federal socialist valley authority” (Pisani 2002:405). Political culture of the period changed, allowing dams to become unsubtle symbols of pork barrel politics. There were Americans who failed to witness the benefits from the Big Dam Era; some were displaced and saw their properties drowned under the backed-up waters of big dam projects. And unsurprisingly, the displacements of local populations prior to dam construction or inundation affected most often people who could muster little political or economic influence. Native Americans in particular were affected by projects on the Colorado and Columbia Rivers (Billington et al. 2005:384). Many small farmers, who originally enjoyed early benefits from reclamation, were forfeiting water resources to agribusiness and urban development (Billington et al. 2005:384). An increasingly educated and urbanized society began to focus on recreation, environmental preservation, and water quality. In 1963 an article in *Natural History* magazine said, “[the] whole concept of ‘the big dam,’ with its concomitant hydroelectric power, water supply, and flood control is beginning to appear archaic, as well as too destructive of natural resources” (quoted in Billington et al. 2005:410).

“Dam Building Still Had Some Magic Then”

President John F. Kennedy’s 1960 “New Frontier” campaign publically made commitments to renewed traditional dam building. To carry out this mandate, Kennedy engaged the “youth and masculine vigor” of former U.S. Congressional Representative from Arizona, Stewart L. Udall as Secretary of the Interior, the sole westerner in Kennedy’s Cabinet (Dean 1997:85; Udall 1970/2:37). Privately, the Kennedy Administration had little interest in the West other than to establish political links to western water developers (Udall 1970/2:34, 37).⁵ Big dams and reclamation projects lay at a crossroads during this decade. The era began with the grand Pacific-Southwest Water Plan (PSWP), a scheme to channel water from the Columbia River to the Southwest, yet ended abruptly in a 1968 political compromise that finished federal big dam building, spurred passage of major environmental legislation, and initiated advocacy for energy production derived from fossil fuels and nuclear power. During his tenure, Udall had as one of his major tasks negotiating a reconciliation between the contradictions of Kennedy’s political assurances made to western water developers including campaign promises for more western dams, with the Secretary’s own personal ambitions for a conservation program that would satisfy the burgeoning Sixties preservationist movement (Dean 1997:85). That was a challenge.

⁵ In Udall’s oral history, he is of the opinion the Kennedy promise for more dams in the West was a campaign strategy “dramatizing the Republican indifference to the West” (Udall 1970/7:138). Udall is also of the opinion Kennedy may have been indifferent to the West as a reaction to losing the West in the general Presidential election.

From one point of view, as told in his book *The Quiet Crisis*, Udall held firm to the principle that untamed nature was part of the nation's deeply rooted frontier heritage adopting Teddy Roosevelt's belief the frontier was vital to the creation of manliness and hardihood of its citizenry. Udall stated, "[t]he whole character of the American people has been shaped by living on a virgin continent where men could test themselves against the wilderness" (Udall quoted in Dean 1997:85-6). Udall espoused to the ideal preservation of wild lands offered much needed spiritual relief from the oppressions of modern industrial society, protecting nature as a "recreational amenity, valuable because of its relative scarcity" (Dean 1997:86).

More and more Americans see, as [John] Muir did, that in this increasingly industrial commercial civilization there must be more natural sanctuaries where commercialism is banned, where factories, subdivisions, billboards, power plants, dams, and all forms of economic use are completely and permanently prohibited, where every man can enjoy the spiritual exhilaration of the wilderness. (Udall 1963:104)

Conversely, Udall still had strong connections to the Pinchot-Newell school of scientific land management, its heritage of commodity conservation, and an express belief in western water reclamation, arguing in the process that wise resource stewardship was in the best economic interests for the nation. Shortly after his appointment, Udall publicly affirmed that both he and the Kennedy administration were "committed to the expansion of the reclamation program, including development of more hydroelectric power" (Udall quoted in Dean 1997:86).

Environmentalism was not a prevalent movement entering the decade of the 1960s, nor had the science of ecology explaining biodiversity been developed much beyond a small core of scientists. Udall and other Americans recognized there was a crisis

developing from industrialism, yet the decade yielded inconsistent environmental policies trying to preserve nature while concurrently expanding western economic growth. Secretary Udall had initial faith traditional dams still could be built. New dams as part of the Pacific Southwest Water Plan – which included the Central Arizona Project’s proposed Bridge and Marble Canyon dams at either end of the Grand Canyon – in his opinion were justified. Even with the well-documented challenges and opposition occurring at Glen Canyon, Udall accepted the PSWP faced stiff resistance, but at the time, trusted opposition would be overturned. Conservation groups conceded there was a necessity for large-scale western water development projects. Conversely, preservationists of the era generally insisted dams had become “subsidy machines” designed to produce revenue-generating hydroelectricity, preferring coal-fire or nuclear power generating options (Dean 1997:94).⁶

Bureau of Reclamation Commissioner Floyd Dominy in the mid-1960s insisted the meaning of reclamation no longer signified only the value of reclaiming arid lands in the West. Dominy declared, “[t]oday’s meaning of reclamation is the reclaiming and expansion of the economy of the West and through it that of the nation. The single ingredient which every segment of the western economy must have for growth and survival

⁶ Preservationists who advocated for coal-fired and nuclear-powered electrical generation plants claimed that such facilities were less expensive and had a longer life than dams that would eventually fill with silt. Nuclear fusion power was preferred. Hopi and Navajo reservations in Arizona and New Mexico had coal and uranium deposits. According to author Robert Dean, the root of the preservationists’ argument was the belief that consumption of a resource found on a less-scenic land not under the National Park Service protection was justified by the preservation of a more valuable aesthetic resource elsewhere (Dean 1997:94).

is water” (Dominy quoted in Pisani 2002:406). In 1966, spearheaded by an alliance of Arizona legislators, the Bureau of Reclamation launched an intense lobbying and public relations campaign to recapture the high ground of conservation, advancing the Teddy Roosevelt utilitarian conservation idea: resource stewardship was for national commodity production. In the meantime, Secretary Udall began to realize there were too many political obstacles and physical limitations in the 1960s to build more dams.

The flaw in this [Kennedy’s dam building] as an idea and as a concept – and this became increasingly clear to me in ’61, ’62, ’63 - the big dam building era was over. There just weren’t that many dam sites to be built. There were some big and important things [water management projects] to be done, but they were not going to make our record by building more dams than they built in the 1930’s. And as conservation forces, those who were interested in Preservation rather than in building dams, began gathering strength, as I began to encounter more and more of the conflicts, it was clear to me that we needed not only to build additional dams – and thereby keep President Kennedy’s promise – but begin a complementary idea that became the scenic and wild rivers bill. (Udall 1970/7:138)

The Bureau of Reclamation utilized art to revive notions of western romanticism and motifs of a habitual Eden, boasting the same “awesome” western backdrop remains after generations of “mutual adjustment with human need and will” (AA Catalog 1973:5). The Bureau’s Visual Arts program, authorized in 1969, attempted to familiarize the public, particularly segments of the public not easily reached by other means, about the underlying mission and accomplishments of the Bureau, conveying “a feel of the emerging west of the twentieth century” to present and future generations (DeWitt SBRAP). Project Director John DeWitt sought publicity to change the negative perceptions of reclamation during the period to a positive image, participating in the conservation effort and working for the good of the people, countering the “continual

attempts by the Sierra Club and other preservationist groups to bloody our nose” (DeWitt BRAP). The National Gallery of Art in Washington, D.C. exhibited a selection of paintings in 1972, *The American Artist and Water Reclamation*, commissioned by The Bureau of Reclamation, in part to soft-pedal Reclamation’s effects on the environment “as seen through the vision of the artists” (Press Release 1972). Motifs and themes in the artwork attempted to reconnect with America’s heritage and primal landscape, *incorporating* rather than dominating notions of technology, economics and ecology. Although the Bureau of Reclamation relinquished control how artists represented its projects, a juried process selected the final portrayal of projects, in part controlling the message to the general public about dams, reclamation projects, and hydroelectric power, and its positive contribution to American progress fitting the landscape.

The exhibit expounds the modern role of water in the West – the natural, the conveyance, the technical and the sublime. *Olympus Dam in Estes Park (1970)* by Xavier Gonzalez places the dam within the context of rock and river, communicating a motif of mutuality, human and nature respecting each’s presence, resulting in nature providing a dependable water supply essential for life and growth (Plate 25). *Hungary Horse – The Shoreline, The Reservoir, The Dam (1970)* by Michael Frary (Plate 26) exhibits a theme of duality or multi-use technology – flood control and hydroelectric power – having minimum human intrusiveness. *Birds at Topock Marsh (1970)* by Chen Chi exhibits the pastoral serenity of egrets, demonstrating support to environmental conservation on the lower Colorado River, a friend of nature and recreation (Plate 27).

Moreover, reclamation art has a purpose to prompt reflection of experience not limited to the canvas, but as projections into the physical and natural world. *Irrigated Fields (1972)* by John W. McCoy displays reclamation's role in change (Plate 28). Patterns form a landscape of irrigated fields, neatly ordered by humans, restructuring nature efficiently to suit. Motifs of a tamed pastoral landscape, change perceptions of a dry, barren worthless lands. *Lower Colorado #8 (1970)* by Richard Diebenkorn confirms patterns from technology and human order assimilating the desert and forcing a new sense of place (Plate 29). Former open and abundant earthen soils are reduced to decorative patches, remarkably absent of a horizon, creating allegories that indicate a closure to Manifest Destiny. Other images focus on the humans crafting change, repeating themes of Depression-era social realism. *Construction at Grand Coulee* by Anton Refregier and Depression muralist William Gropper's caricatures of workers at Grand Coulee captures the sense of vitality, personifying men and machine – heroic figures – making a contribution selling modern progress, possibly rendering Westerners would rather control nature rather than adapt to the arid environment (Plate 30). Many artists of this era captured the sublime technology, focusing on the drama construction projects have undertaken. *Coulee Construction Forms* and *#4 Coulee Constructions* by Lamar Dodd (Plate 31) represent a nucleus theme embracing Grand Coulee and its Third Powerplant construct, championing hydroelectric power "to meet the [early 1970s] energy-crisis by the generation of pollution-free hydroelectric power" (DeWitt BRAP). Yet, *Spillway: Shasta Dam (1976)* by John Button captures a former technical sublime, recreating a motif characterizing this technology is an American vintage (Plate 32).

Extreme Machines in the Garden

Artist Norman Rockwell's controversial painting *The Glen Canyon Dam* (1969) could be considered a symbolic discourse questioning America's nineteenth-century western cultural convictions in an idealized nature, immeasurable resources, and imagined unhindered freedoms in an infinite frontier (Figure 5). The painting was commissioned as the featured showpiece for the Senator Carl Trumbull Visitor's Center at Glen Canyon.

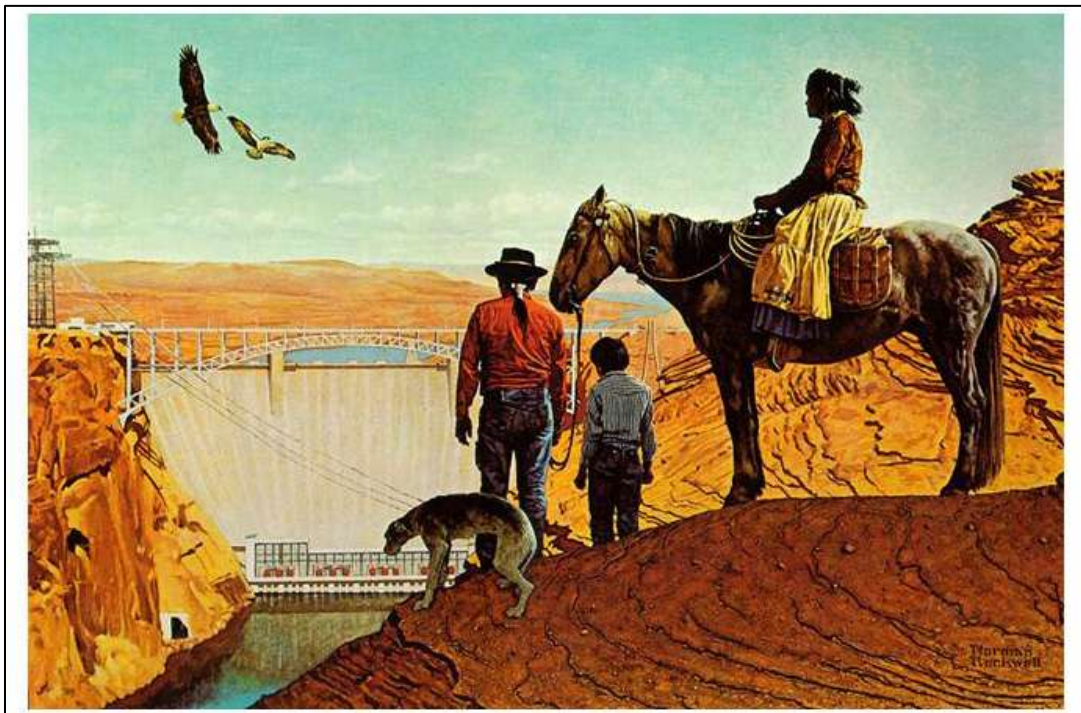


Figure 5: *Glen Canyon Dam* (1969). By Norman Rockwell.

The background story of this painting as told by W.L. (Bud) Rusho, Public Affairs Officer for the Bureau of Reclamation, originates in 1969 at the Glen Canyon field site with Norman Rockwell modestly introducing himself to Rusho, "I'm not an artist; I'm just

an illustrator” (Rusho 2008:122). Rusho remembers acknowledging Rockwell, admittedly recognizing that Rockwell’s niche was his unusual ability to project human interest by way of illustration, and he recalled Rockwell’s first view of Glen Canyon:

At the fenced viewpoint of the dam, Norman first looked in silence, and then walked out onto the rough sandstone rim itself, where he could perhaps obtain more than a three-dimensional view. Still, he kept his silence, until finally he asked John DeWitt, “Do you want me to paint that? It’s nothing but a mechanical drawing!” Yet Norman was not angered, nor dismissive, yet seeming to ask how John and I were going to add a human element to the scene. (Rusho 2008:123).

Rusho suggested a Navajo family might be the humanizing element. Driving Rockwell and his wife, Molly, to the south side of the canyon onto Navajo Reservation just south of Page, Arizona, Rusho stopped apparently at random at a traditional Navajo hogan. A man greeted Rusho, at first speaking only in native tongue until the man recognized Norman Rockwell. The Navajo man, John Lane, was delighted to agree to pose with his family for the famous artist. While posing his subjects – John Lane, Lane’s wife, daughter, son, and horse – near a corral among the shade of various trees, Rockwell asked Lane’s wife to sit on the horse, while Molly, Rockwell’s wife, photographed the scene. Rusho confesses he does not remember if the family had a dog, as no dogs are present in his personal photographs. However, Rusho did recall in conversation Rockwell mentioned strategies he employed to humanize his paintings, “[i]f the painting doesn’t seem to work, add a small dog, and if necessary, add a dog with a bandaged foot” (Rusho 2008:122).

Rockwell’s fifty-one inch by seventy-seven inch oil painting arrived at the visitor’s center in Page early in 1970, displaying the dam from the canyon rim as requested.

However, the John Lane family dominated the painting, backs to the audience, including a horse, a sad and slinking dog, and an eagle and a hawk. The daughter of the family was not included in the final version. The Navajo family appears to be in shadow, just the way Rusho remembers Rockwell posed his subjects, the dog and eagle flying overhead were inventions of artist added to the painting (Rusho 2008:126). Disappointed by the results, Bureau of Reclamation Visual Arts Director John DeWitt was later quoted, “No, it’s not a great painting. It’s an illustrator’s view of the dam with an attempt to humanize it by including the Navajo family” (Rusho 2008:129). It is not the scope of this thesis to speculate on Rockwell’s motives. Rockwell biographer Laura Claridge wrote, “The government had not been as happy about Rockwell’s exposure to the land, since they meant for the illustration to further the cause of the Glen Canyon Dam, not to elicit sympathy for those being dispossessed of their sacred lands. The finished oil, with a sad, dignified Indian-Mexican family occupying the foreground of the otherwise impersonal industrial vista, appears subversively at odds with the commission Rockwell had been given” (Claridge 2001:465).

During this same period, the *Colorado River Basin Project Act of 1968* was brokered by Secretary Udall. It was a compromise appeasing most Southwest water interests. This legislation did include several new low benefit-cost-ratio water projects for the upper Colorado Basin, yet it kept the big dams out of the Grand Canyon. Arizona obtained the Central Arizona Project (CAP), California received increased water allocations from the Colorado River, and implementation of any of the Northwest water importation studies (PSWP) was deferred. In spite of the immediate victories, several adverse

social and environmental effects not anticipated during this debate have since then become apparent, solidifying what was seen even then as an ambiguous legacy.

Coal-fired plant alternatives to placate preservationists, preventing the construction of the Grand Canyon dams, resulted in new huge strip mines that scarred Navajo and Hopi reservations (Dean 1997:98). The solutions that emerged to avoid construction of the Bridge and Marble Canyon dams at the Grand Canyon included mining and production of fossil-fuel energy on Native American lands, using reservation water allocations. Navajo coal mined from Black Mesa, New Mexico, is now burned at the Navajo Generating Station on the Navajo Reservation (east of Page, Arizona, near Glen Canyon) in order to pump water from the Colorado River into the Central Arizona Project (Fradkin 1996:172-78). Fifty-thousand acre-feet of Colorado River water originally allocated to the Navajo Tribe is used by the Navajo Generating Station (Dean 1997:98). Work on the generating plant began in 1970, bringing a second round of boom times to Page. Then, it sounded like good economic sense. However, jobs promised to Navajos were not awarded to the Amerindians.



Figure 6: *Navajo Generation Plant at Glen Canyon (2012).* By K. Heslop.

Curiously, the Salt River Project (SRP) was selected to build and operate the Navajo Generating Station in Page on behalf of a consortium of the other regional utilities and the U.S. Department of Interior (SRP History; Figure 6). This initiated construction of fossil-fuel generating plants in the Southwest, placed in areas deemed not populated or scenic, to fill the region's void from reduced available hydroelectric power and, with growing population, an increasing overall energy demand. Emissions from these plants generate air-pollution in the formerly pristine Four Corners regions and surrounding areas, arguably adding to atmospheric greenhouse gasses (Dean 1998:98). Fundamentally, this agreement transformed the Navajo Reservation and its resources to benefit the Anglo population.

Reclamation artwork does embody the varying and conflicting views of dams as a visible symbol of the human society that created them, playing witness to the accelerated social change in the American West. In early instances, the artwork presents a transcendent landscape, illustrating vast glories found in a productive desert environment reclaimed by the hand of man. Uses of resources, political, economic, social and environmental context now differed greatly from those early beginnings. Using artwork in relationship with historical text can demonstrate, as well as document, a cultural and social narrative endorsing a set of views that might indicate a dictum of content versus the free will of expression of the act of bearing witness to attitudes about irrigation and reclamation.

Chapter Three: A Challenge-Response-Challenge Spiral

“Origin of Irrigation”

Pima Legend

Spoken by Juan Smith and William Smith Allison

Translated by William Smith Allison

For Archaeologist Julian Hayden

Snaketown, Gila River Reservation, Arizona

1935

From then on, old man Siuuhu turned himself into a small child and sat someplace by the seaside. He made a hole there, and said he was going to bring all the water from the sea and put it in the hole. He also told that the rains would not come all over the earth very often, only once in a while. And the crops that people would raise would be irrigated evermore by rainwater.

The people saw that the rain wasn't coming down often as it used to, so they gathered to plan how they would make the canals in order to irrigate their crops. They finally decided they would make a canal right below "Suik."⁷ They dug with pointed sticks and used their hands to throw out the dirt.

Being of one mind, they thought they would complete this work, but when they completed it and tried to make water run in it, the water wouldn't run. Seeing this, they got one of the medicine men and asked him to draw water in the canal. He went down and walked there, singing:

*There lie the ditches
And among them*

⁷ "Suik" means 'Red', the name of a mountain north of today's Granite Reef Dam near the Verde River.

*I am walking.
And among them I am breathing,
Leading the water.*

*The water acted like it was going but it didn't go. This
medicine man couldn't do it. So they got another
medicine man, and he went down and stood in the
canal and sang:*

*There lie the ditches
And I stood in the midst
I'm making the wind blow (dust devils)
I'm making the water go.*

*The water acted like it was going, but it stopped and
turned back to where it started from. This man
couldn't do it. So they got another medicine man
and told him to try. He sang:*

*By the side of a river
There lies a canal.
In that canal
The water is making signs of a pretty decoration.*

*This man made the water go, but not enough. They
got another medicine man and told him to put some
more water in the canal. He went down and
stood in the canal and sang:*

*There lies the canals
And in the midst of those
I stand
Making water-hair snakes.*

*The water flowed some more, and they had plenty
of water in the canal. From there on, the people
learned how to build canals in order to irrigate their
farms.⁸*

⁸ This is a man-over-nature Pima myth. It is believed the Pima (Akimel O'odham) are ancestors of the Hohokam, a name borrowed from Pima mythology meaning "finished-ones" (Bahr 1994:1). The god-like figure Siuuhu predicted the earth was going to "burn

Historian Donald Worster regards nature as “participating in an unending dialectic with human history . . . intertwined in an ongoing spiral of challenge–response–challenge, where neither nature nor humanity ever achieves absolute sovereign authority, but both continue to make and remake each other” (Worster 1985:22). He contends nothing can be abstracted from its context or be said to have made itself in “splendid isolation” (Worster 1984:53). Humans encountering aridity are prompted by necessity to enact vital survival processes creating ditches, aqueducts, artificial rivers, and dams to shape and reshape their arid environments. Aridity bestows its mark on those people, community, and landscape.

The Pre-contact: The Hohokam

An aboriginal people known as Hohokam, a desert culture that existed approximately from AD 200 to AD 1500 preceded modern dwellers in Arizona’s Sonoran desert (Dean 1991:92-4). The Hohokam are not identified as a “tribe” or “chiefdom” nor did they leave any evidence of a written language. The culture is defined by the use of pottery,

up and the water in the sea was going to be dried up,” suggesting for Siuuhu to put all the water from the sea into a hole so humans can channel water into canals (Bahr 1994:130). When the people noticed a decrease in rain, they started to dig a canal believed to be at the same starting point the longest canal in the Hohokam irrigation system had its tap into the Salt River, near the ‘Suik.’ This is approximately the same place where the water from the current Granite Reef Dam, part of the Salt River Project, diverts water to metropolitan Phoenix, Arizona. The author also describes a series of medicine men trying to make the water flow through the dug channel as comparable to modern-day engineers devising schemes to control the flow of the waters (Bahr 1994:124).

shells and stone, irrigated agriculture, and a settled way of life (Johnson 1997:6). Fundamentally, the term Hohokam is “a label for a phenomena of the archaeological record i.e., the material culture, its variation, and its relationship to the landscape” (Wilcox quoted in Gumerman 1991:6–7). Current consensus recognizes the Hohokam origins are attributed to internal developments within western Archaic nomadic hunters and gatherers groups occupying the Sonoran Desert as early as 7000 BC (Gumerman 1991:8; Doyel 1991b:236; Feinman 1991:463). Later evidence shows many of the hunter-gatherers groups began migrating and settling in Sonoran upland desert hamlets by 1000 BC, demonstrating primitive irrigation practices of directing rainwater to raise corn (maize) and squash on small plots. Some archaeologists refer to this latter upland desert group as Cochise, linked to the Hohokam ancestry.

By AD 1, many small Cochise groups migrated to the lowland riverine environments of central Arizona, including the Salt River Valley/Phoenix Basin riverine environments, subsisting on farming that most likely engaged in irrigation, building primitive diversion dams, ditches, and levees (Doyel 1991a:5-7). There is no single Hohokam landscape, but a vast mosaic of river valleys and intervening mountain ranges, both distinctive in some way from the other drainages and riverine systems, yet unified by certain elements of Hohokam material, culture, economy, social organization, and ritual life. The Phoenix Basin is acknowledged as the Hohokam core with recognized riverine and desert periphery branches located along the Agua Fría, Verde, and Santa Cruz river systems, the Tonto Creek-Salt River basin, and Gila-Salt River basin (Whittlesey 1997:620-21). Two key determinants established markers for the Hohokam physical region: loca-

tion in the northeastern Sonoran Desert, and with few exceptions, in an elevation range below 3,500 feet (Gumerman 1991:8; Doyel 1991a:6-7; Fish and Nabhan 1991:30). The Hohokam chronological sequence is generally divided by three periods: the Formative Period (AD 1–700), Late Formative Period (AD 700– 1100), and the Classic Period (AD 1100–1450).

Some scholars dispute the archaic-Cochise origins of the Hohokam, insisting there is substantial evidence supporting linkage to the pre-contact cultures of the central and south Americas. Preeminent University of Arizona anthropologist Emil Haury vehemently disagrees with any claim that the Hohokam were descendants from archaic tribes, contending evidence linked to Mesoamerican traits suggests other interpretations (Haury 1991:72-3).

While some scholars insist there are overall connections among the pre-contact cultures in the American Southwest and Mexico with Mesoamerican cultures, there are also cultural dissimilarities to be reconciled. Mesoamerican archaeologist Gary Feinman denotes there are clear distinctions between the Hohokam and the pre-contact populations of Central Mexico, Oaxaca, and the Mayan lowlands. He finds strikingly similar ritual systems shared by Southwest and Mesoamerican populations. Yet, Feinman questions if technological innovations like canal irrigation should even be considered a Mesoamerican trait linked to Hohokam culture in view of the fact that some Mesoamerican populations did not use or used only sparingly specific Hohokam canal irrigation methods for water control. Archaeologist David Doyel emphasizes the Hohokam positioned themselves geographically and culturally on trade routes between Mesoamerica, the

Great Plains, the Pacific Coast, and Rocky Mountains, playing “a unique role in the evolution of pre-contact southwestern societies” (Doyel 1991b:4). This supports archaeologist Colin Renfrew’s observations that connections between the pre-contact Southwest and Mesoamerica may be the result of a network of indirect linkages rather than direct contact, accounting for similar generic beliefs, practices, and patterns involving open, family-to-family to prestige-chain exchanges (quoted by Feinman 1991:466). What is clear and undisputed among scholars is that despite the parameters of nature’s physical restraint, the Hohokam became irrigators, developing an innovative culture to build a thriving civilization in the midst of a harsh Sonoran Desert (See Plate 33).⁹

Pre-contact Irrigation

Significance of water is deep-seated in the ideology and cosmos of all desert peoples.

Water and earth are strong elements of ceremonialism, and land tenure is a primary element in cultural organization. Michael Meyer writes:

As the only weapon in the constant battle against aridity, water exerted a tremendous influence on the history of . . . the Greater Southwest. It actuated and dominated an amazing variety of social and economic relationships. It dictated growth patterns, precipitated conflict, influenced the form of governmental institutions, and helped define another . . . it came to occupy a unique place in the southwestern psyche. Because of its cardinal role in the daily struggle for survival it was also afforded a telling reverence in southwestern religion, mythology, and lore. (quoted in Whittlesey 1997:705)

⁹ It is acknowledged that the Ancient Pueblo people of Chaco Canyon share similarities with the Hohokam. However, it is beyond the scope of this thesis to explore the Hohokam-Anasazi relationship.

The most vital landmarks of the pre-contact Hohokam landscape center on water and land. Agriculture and food production space were most essential. Topographical elements distinguishing territorial rights were bounded by the land and water features of drainage systems, valleys, and river basins. Ethnobotanist Suzanne Fish and anthropologist Paul Fish observe that the difference between Southwestern pre-contact- and historical-period Amerindian lifestyles was the importance of agriculture:

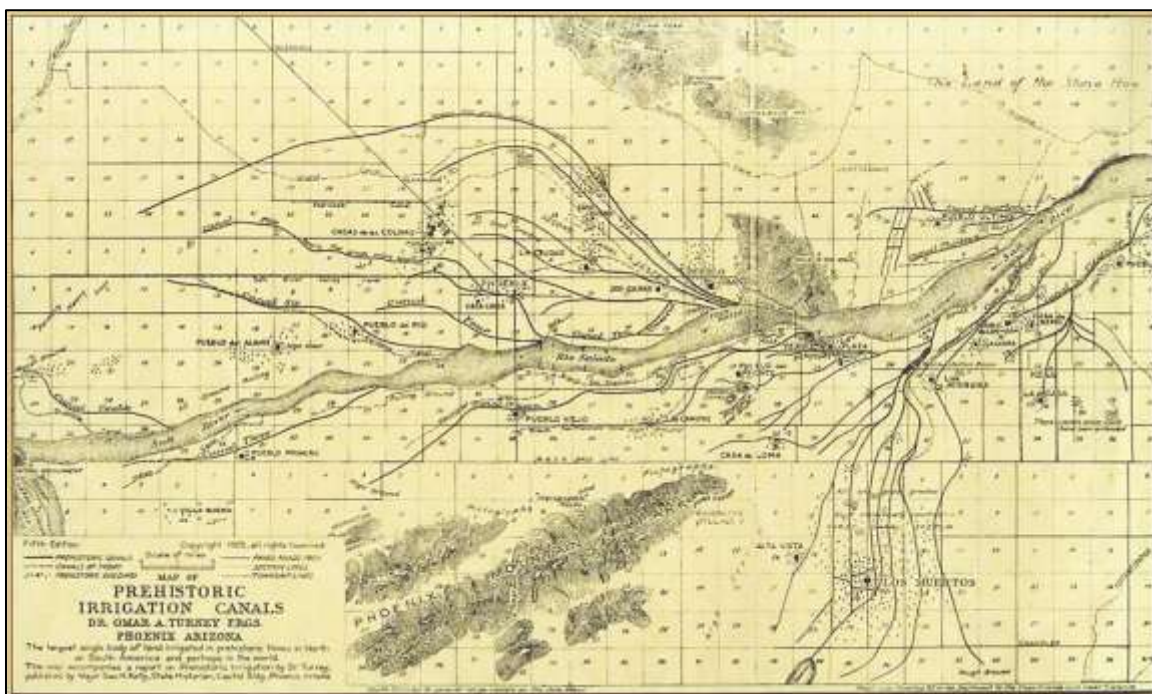
The rudimentary cultivation of the Yavapai¹⁰ cannot serve as a model for the more sophisticated agriculture of prehistoric groups [Hohokam] whose techniques included substantial canals and water control devices. The investment of time and effort apparent in the construction of at least the larger architectural remains argues for the stability and agriculturally oriented economy without parallel in the later historic period. (quoted by Whittlesey 1997:704)

There is no question that the Hohokam became skilled farmers developing systems of water control. Irrigation meant more intense agriculture production (Map 3).

Although recognized for their canal irrigation techniques, the Hohokam became successful agrarians by developing and using other farming methods insuring that if one strategy failed, others would still produce food. Stratagems of locating fields on alluvial fans to utilize flashflood waters (arroyo-mouth or *ak-chin* farming) crossed with check dams and terraces, to scattering rocks across agricultural plots positioned to catch and conserve the smallest amounts of moisture demonstrated knowledge of the desert ecosystem, its physiographic features, local stream hydraulics, and arid-land agronomy among the Hohokam. Their pre-contact agricultural fields represented “a complex micro-landscape

¹⁰ The historic Yavapai and the western Apache occupied the lower Verde River region within three hundred years after Hohokam abandonment (Whittlesey 1997:143).

that reflects an integrated set of agricultural strategies . . . developed to balance the vagaries of a dynamic environment” (Travis quoted by Whittlesey 1997:706).¹¹



Map 3: *Prehistoric Irrigation Canals, Phoenix, AZ (1929).* By Cartographer Omar A. Turney.

Control and the allocation of the irrigation waters from such a complex network of canals required a form of social structure and organization for support suggesting, at least in the Phoenix Basin, political control over land and water was above the level of kinship clans or individual ownership (Whittlesey 1997:707). Wilcox argues that beginning in AD 500, social organization and religious beliefs among the Hohokam emerged correspond-

¹¹ The Sonoran Desert provided multi-seasonal abundance for pre-contact gathers. Arboreal and succulent perennials as well as a variety of seedy annuals and small animals provided subsistence in riparian borders of perennial rivers. Cultural landscape modifications around settlements augmented food supplies with gathered species and small game.

ing with significant technological innovations and subsequent population increases. By AD 700, the core Phoenix Basin Hohokam factions underwent social reorganization forming *supra-households communities*. “Suprahouseholds were corporate[-like] land-holding groups who controlled the inheritance of valuable irrigated land and marked their social identities in a series of ceremonies with ball game and death rituals” (Wilcox 1991:51). Further, the Hohokam populace began concentrating in the Phoenix Basin, superseding the Gila River region by AD 1000 as the primary population center in Salt River Valley (Wilcox 1991:56).

Climate Changes

As noted by author Stephen LeBlanc, AD 900–1150 was a salubrious interval for the Hohokam people and an exceptional time for peace and cultural efflorescence. Little stress was being put on natural resources leading to a wide range of habitats farmed, leaving a negligible incentive for warfare (quoted by Abbott et al. 2007:478). Irrigated cultivation in the river valleys was at its greatest extent; surpluses generated a buffer against agricultural shortages. Exchanging excess agricultural commodities through barter networks created a regional geographic variability providing a platform for social and economic connectivity throughout the Hohokam core and periphery areas. At the pinnacle of Hohokam civilization, the irrigation system was estimated to have encompassed a total of five-hundred miles of canals providing water to approximately 50,000 pre-contact inhabitants (SRP History). The rapid progress that brought a range of accomplishments and societal change happens to have coincided with the warming climatic

conditions known as the Medieval Warm Period (MWP), an environmental phenomenon from AD 900–1300 responsible for elevated temperatures in the Northern Hemisphere (Woodhouse et al. 2010:21283).¹² During the early years of the MWP, the corn-bean-squash agricultural base thrived in the Salt River/Gila River Valley regions, as well as lands at the edge of these agricultural spans, increasing the overall land's carrying capacities. Tree-ring proxy records during AD 1000–1070 demonstrate the Salt River provided a steady, dependable, and predictable source of irrigation water, sustaining large and intense agricultural production, sufficient to maintain a significant, geographically stable population (Graybill quoted by Abbott et al. 2007:478). Yet during this favorable era, did the Hohokam unknowingly exceed their reliance on irrigation technology, forming unsustainable resource dependencies among its populations?

For reasons not clearly understood, the Hohokam began a slow and mysterious decline in AD 1250, vanishing entirely from the central Arizona region by AD 1450. Traditional hypothesis speculates crop failure, perhaps due to alkalinity and salt built-up in the desert soils or waterlogging from over irrigation (Hurt 1987:23). Other scholars speculate a range of causes – drought, erosion, cultural and social practices, shifting political powers and domination by the Casas Grandes,¹³ or warfare with hostile neighbors

¹² The Medieval Warm Period climatic event was caused by an increased solar irradiance coupled with a low point in earth's volcanic activity that created an extended interval of La Niña-like conditions in the Pacific Ocean. Climate models constructed for the Colorado River watershed from AD 950–1150 show decadal maximum mean temperatures were estimated to be 0.2°C to 0.4°C above the 1850–2006 decadal maximum mean temperatures for the same area (Woodhouse et al. 2010:21284).

– all may have contributed to the pre-contact Amerindian society’s failure. Scholars allude to a crisis in the Hohokam society sometime during AD 1100s, as notably “Snaketown” near present-day Chandler, Arizona, and other Hohokam settlements were abandoned during this period (Wilcox 1991:58-9). Emil Haury agrees it is “necessary to draw a line between [AD] 1100 and 1200” speculating that some sort of crisis disrupted the Hohokam society (Haury 1991:70). Before AD 1100, Haury argues Hohokam village houses were dispersed, and adobe was not used as a building material. After AD 1200, Haury refers to evidence that Hohokam villages built compound structures of solid adobe walls, many closely packed and multi-storied. Haury asserts the change in structures can be indications of a foreign intrusion from outside cultures. The intruders, he maintains, later abandoned the Hohokam villages, leaving those people that remained reverting back to their old, fragile former village structures (Haury 1991:70).

Ongoing research has open new thought into the Hohokam disappearance. The societal collapse was neither sudden nor disastrous, but a slow-moving process demonstrating change in the societal resilience to cope with a host of socioecological challenges. It is believed a ridged hierarchy political system coupled with religious and cultural

¹³ Casas Grandes were multi-story compound/towers, built between AD 1130 – 1300, housing settlements of up to 2500 people, consisting of clusters of houses and plazas all enclosed by a surrounding wall. These compounds were located in Northern Mexico and the Southwest. A four-story Casa Grande compound was built in the Gila River Valley during the fourteenth century; the tower being built as astronomical observatory to be used by the elite priests to set the calendar scheduling ceremonial events, thus mediating between the people and their deities (Doyel quoted in Wilcox 1991:58). Others speculate the tower was built for defense. Emil Haury argues the building of Casa Grande maybe evidence of outside invaders (Haury 1991:70).

factors put a society under intense strain when facing dynamic climatic environmental changes (Renfrew and McGuire quoted in Lawler 2010:907,909). The Medieval Warm Period did exhibit persistent and extensive aridity over western North America. Models show the driest decade in southwestern North America was AD 1146–1155 with extreme drought conditions extending over 65.5% of the Colorado River watershed area (mean maximum temperature 15.65°C) reducing stream flows to a moderate-low flow, lacking any high flow (Woodhouse et al 2010:21286). The change to a drier climate, associated with reduced river and canal surface-water flow possibly prompted a transformation in social, political, and economic organization impacting Hohokam civilization during this era as a whole (Redman et al. 2005:7).

Anthropologist Michael Waters concurs that changing environmental variables had a role in the Hohokam cultural collapse, insisting after a period of climatic and environmental stability “high-frequency discharge events and droughts occurred,” putting too much strain on developed cultural and environmental systems that were operating at maximum carrying capacity during the peak of the Hohokam civilization (Waters 2006:45). According to Waters, from AD 1250 to 1298, the Salt River had a very predictable streamflow – ideal for canal irrigation – attracting Amerindian immigration to the region from the Colorado Plateau during the Great Drought of AD 1276–1300,¹⁴ creating

¹⁴ Anthropologists have proposed five hypotheses for migration from the Colorado Plateau: (1) raiders from an external source, (2) inter-pueblo warfare, (3) diseases from sanitation problems, (4) tree-ring data indicates a major drought on the Colorado Plateau between AD 1276-1299, and (5) a lowering of the water table during this drought caused erosion of farmlands (Reid 2011).

a new settlement pattern and social order dependent on irrigation agriculture in the Salt River Valley and Tonto Basin regions. During the period of AD 1298–1317, the Salt River Valley experienced intervals of severe flooding impacting irrigation on its floodplain (Waters 2006:41). Evidence shows the canal systems were severely damaged, possibly making some canals inoperable for part, or even all of the irrigation season. It is believed intervals of catastrophic flooding occurred over the next fifty years damaging canal systems, reducing harvest yields, and prompting future uncertainty (Waters 2006:41). This created stress on a population dependent on irrigation farming, and as Waters suggests, created conflict among the Amerindian groups. Along the Salt River Valley where the Salt River flows out of its mountainous watershed, flooding would have been the most severe than on any other stretch of the river. Here the river leaves its confine rock gorge, and spills out onto its broad alluvial basin, possibly explaining one reason for Hohokam abandonment in this area and a near absent of any human occupation until the mid-nineteenth century Anglo-American settlements. A seventy year period of stability returned to the region (beginning the latter half of the fourteenth century) allowing for pre-contact population growth and settlement for 3.5 generations until AD 1454. Still, this period of stability was disrupted by periodic cycles of drought and flooding common to the Salt River watershed, leading to the speculation of a Hohokam migration and abandonment by AD 1495 (Waters 2006:44). Changing environmental variables, possibly climatic influence from the *Little Ice Age*, ultimately affected the pre-

contact food supply, intensified stress and quite possibly brought underlying hostilities to the surface contributing to the eventual Hohokam cultural collapse.¹⁵

While the Hohokam are acknowledged as being capable irrigationists, there is question on their societal response to flooding and changes of river flow patterns. Increased river flows are believed to be of sufficient strength and volume to have damaged Hohokam gate heads, washed out canal banks, and alter the flow pattern of the water in the riverbed (Doyel 1991a:234). Researchers point to evidence indicating that torrential river flows in AD 899 and 1352 had “devastating effects, resulting in system disuse, abandonment, and population location” (Nials et al. quoted in Doyel 1991a:234-35).¹⁶ Wilcox writes:

Between AD 1356 and 1382, heavy winter flows in the Salt and Gila rivers may have had catastrophic effects on the Hohokam canal systems. Other evidence suggests that the civic authority of the platform-mound elites was destroyed, and it seems likely that profound changes in religious systems also occurred. Abandonment soon followed. By 1694, when we next have data to work with, Piman-speaking people lived in the Gila Valley, and the Salt was a wilderness. . . [t]he

¹⁵ The Little Ice Age has been cited for change in Northern Hemisphere climate during this period. The NOAA Paleoclimatology website dates the period from AD 1350 to 1900 when temperatures in the Northern Hemisphere were 1.0°C to 2.0°C cooler than present. NASA’s computer model demonstrates lower solar activity during the 1400 to 1700s that could have changed the Northern Hemisphere atmospheric circulation, triggering the cooler temperatures in the Europe and North America. Current literature terms this climate period as the Neoglacial Period, emphasizing mountain glacial advances and retreats, representing variability in climate and the interaction with societal dynamics. Many regions were punctuated with intermittent periods of warm (Mann 2002:504-509). Starting in AD 1315, there were documented periods of torrential rains recorded in Europe.

¹⁶ Doyel obtained independent verification of pre-contact flooding in the Phoenix Basin through geological research by J. Partridge and V. Bake and J.E. Fuller (Doyel 1991a:235).

enormous fluctuations of a desert environment thus finally caught up with human pretensions to omnipotence. (Wilcox 1991:59)

The mysterious disappearance of the Hohokam is linked to water, and the dynamic role water contributes to the structure of the landscape. Wherever people settle, nature's challenges shape "human inventiveness and skills in recognizing, adapting to, and utilizing surrounding resources . . . [t]hese adaptations made a direct impact on the nature and development of culture "(Haury 1991:69). The Hohokam people are unique by inhabiting one of the most inhospitable environments of the Southwest, utilizing the few available water resources through innovation with extensive irrigation canal systems, allowing the Hohokam culture to be rooted in the soil. Regardless of discrepancies, it can be agreed the Hohokam achieved an early balance between the available desert's natural resources and the demands the environment placed on their society to support a successful way of life over many centuries.

Using and adapting the desert's few rivers for irrigation and gaining an understanding of the desert ecology, these pre-contact people continued to thrive until the mid-twelfth century. Nonetheless, nature and human history is an ongoing spiral of challenge–response–challenge. Speculation about the Hohokam population collapse now centers on the vulnerability of their primitive irrigation system to high and low water. As long as flood or drought periods were short-lived, their society survived. During AD 1130–1153, the Colorado River had the lowest flow of any twenty-five year period since AD 762 (Powell 2008:32). Further, climate patterns around AD 1190 became unsettled as flood-drought cycles became dynamic with less periods of stability disturbing the

Hohokam's nature-culture balance (Powell 2008:33). Responding to this societal distress by impounding more water, planting more crops, and building more canals are only short-term remedies. When drought conditions are too long, there is no more water to impound. Therefore, a society will have no choice but to reduce its consumption or migrate. The Hohokam's cultural collapse did not occur overnight, and possible explanations for the Hohokam breakdown are varied and complex. Yet arguably, water control, climate change, and the resultant environmental pressures placed upon the Hohokam society were major contributors to the cultural failure. Can Anglo-Americans learn lessons from the fate of this desert pre-contact culture?

Transition to the Historic Era

There is a gap in knowledge regarding any northern Sonoran Desert inhabitants after AD 1450 and before the Spanish arrival in the seventeenth-century. It is assumed the Salt River Valley and the Phoenix Basin were abandoned landscapes during that period. The first Spanish arrivals did discover the O'odham, an Amerindian group living in many of the periphery regions once populated by the Hohokam. The O'odham divide themselves into two regional populations: the Akimel O'odham or river people living along the Salt and Gila rivers and tributaries, and the Tohono O'odham or desert people, denoting those living on the outlying areas southwest of the Akimel O'odham. Many scholars insist there is a Hohokam to O'odham relationship; however, this Hohokam-O'odham linkage is not without question. Emil Haury states, "To assert that there was no connection between the Pima [Akimel O'odham] and the Hohokam requires the removal of the

latter from the area about AD 1450 and the introduction of the Pima [Akimel O'odham] with an impressively similar lifeway almost immediately. Contacts in the sixteenth and seventeenth centuries by Europeans indicate that the Pima [Akimel O'odham] were comfortably adjusted to their desert habitat, a 'fit' that bespeaks a long residence rather than exceptional cultural adaptability" (quoted in Johnson 1997:18). Haury also admits that with his "long involvement with the Hohokam . . . and the Pima [Akimel O'odham] leads one into a gray area of subjectivity in thinking about their kinship" (quoted in Johnson 1997:18). William Doelle has found evidence in journals of Spanish Captain Juan Matheo Manje and Father Kino revealing some of the Akimel O'odham did not build irrigation canals along the lower Gila River, but were more dependent on gathering wild edible plants than is acknowledged contributing to the debate about the assumed linkage (quoted in Johnson 1997:18). Regardless, there is more archaeological and anthropological evidence for a Hohokam to O'odham continuum pointing to numerous parallels connecting similar irrigation practices, ceramic types, subsistence, and burial practices between the two cultures. Modern-day Akimel O'odham are convinced their ancestors are the ancient "Hoo-hoogam – those who have gone" (SR Pima-Maricopa).

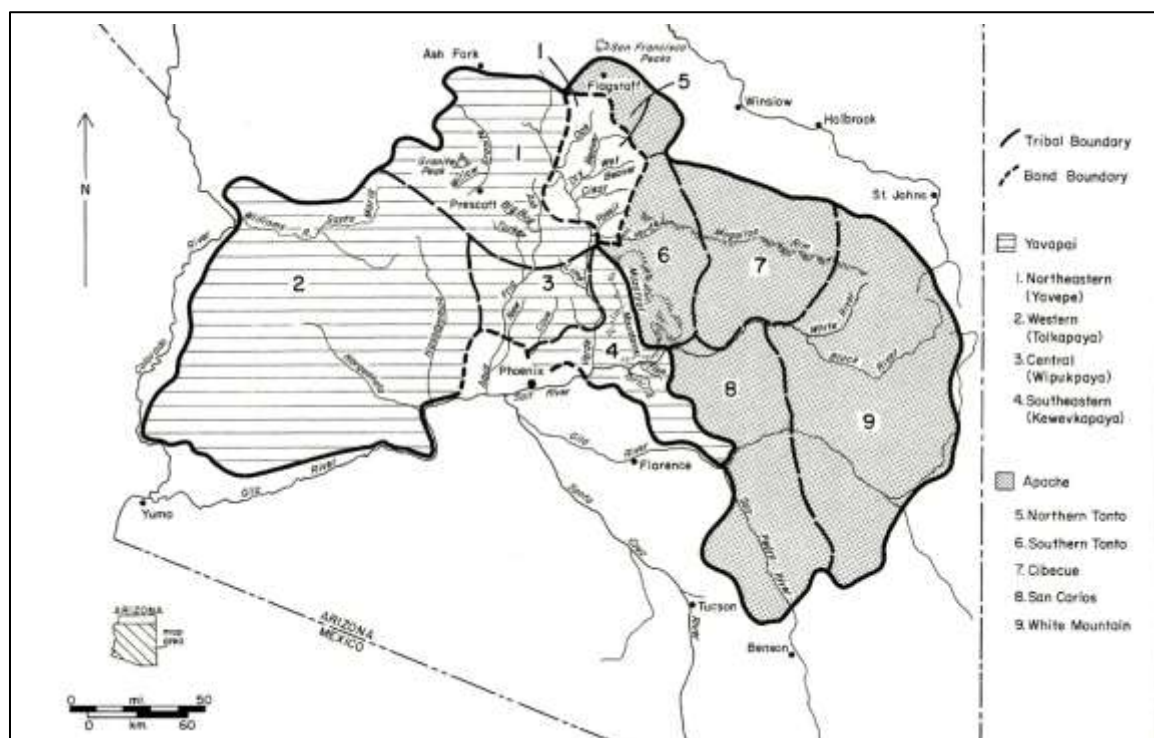
Within three hundred years after the abandonment of the pre-contact Hohokam regions, the historic Yavapai and western Apache people re-occupied portions of the Salt River watershed and Hohokam periphery. According to Albert Schroeder, the Yavapai established themselves in central Arizona by the late 1600s settling in the Mazatzal Mountains/Tonto Basin and the north, northwest regions of the Salt and Gila rivers to the Gila-Colorado River confluence (quoted in Whittlesey 1997:144-6). The western

Apaches moved north, northwest from the Río Grande Valley sometime after 1750, probably under pressure from the Spanish military, putting them in contact with the Yavapai tribes and territories (Whittlesey 1997:144-6). The western Apache territories encompassed east of the Mazatzal Mountains, extending north to Flagstaff, along the Mogollon Rim, and south through the mountain ranges southeast of Tucson (Map 4). Both the western Apache and Yavapai shared the same economic system – a blend of gathering, hunting, farming and raiding – forming small groups of extended families that were seasonally and technically mobile, and clustering in politically autonomous bands (Whittlesey 1997:143). Generally, the Yavapai borrowed from other Amerindian cultures, adapting a means of survival as their environment dictated. They did practice agriculture more than the western Apache, but being a mobile people, the Yavapai did not practice extensive irrigation methods. The Yavapai did raid, however it was not an important subsistence component.

Although the western Apache did practice some farming and small scale irrigation, Michael Graves notes “that [the] Apache made use of the same mixture and portion of resources [as others] . . . [however] each [band] had to seek an appropriate balance, and adjust the size of their logistical territories . . . [bands] who farmed less intensively tended to hunt and raid more” (quoted in Whittlesey 1997:712). The western Apache and Yavapai did share close cultural patterns because of intermarriage between the Yavapai and Tonto-San Carlos Apache bands (Whittlesey 1997:182). Historical documents do reveal a possible confused identity between the Yavapai and western Apache

on the part of the Spanish (and later chroniclers) using the term *apache* to include all nomadic people in this region (Schroeder quoted in Whittlesey 1997:144-6).

What is of significance is that the Yavapai and western Apache did migrate to and settled in the abandoned pre-contact regions, yet in spite of the same river, topography, and geographical features utilized by the Hohokam, the Yavapai and western Apache established divergent cultural practices and dissimilar lifestyles from their pre-contact Amerindian predecessors (Whittlesey 1997:710). The Hohokam were people of the river and the valley, while the Yavapai and western Apache became people of the upland deserts and mountains (Figure 7). The Verde River and its confluence with the Salt River was the geographical life-blood for the pre-contact Hohokam, while the same



Map 4: Yavapai and western Apache Groups and Territories. By Cartographer S.M. Whittlesey.

region for the Yavapai and western Apache was little more than an access route during seasonal migration or passage for raiding parties (Figure 8). Nature challenged the inventiveness and skills of the western Apache and Yavapai to recognize, adapt, and utilize surrounding resources in differing ways than did the Hohokam, demonstrating a varied challenge-response to nature over the pre-contact Amerindians. A rationale for the western Apache and Yavapai having a missing presence in the Salt River Valley may be attributed to both of these cultures did not engage in the communal-based practice of irrigated agriculture. The western Apache's knowledge, identity, and wisdom were found in mountain lands, therefore adapting social patterns and behavior accordingly. The Salt River Valley was outside western Apache traditional territory. The riverine resources that were utilized by the Hohokam and Akimel O'odham were avoided by the western Apache. "[T]hey [the Apache] disliked living 'alongside the water,' saying they were a people who had been born and bred in the high mountains" (Porter quoted in Whittlesey 1997:716). Likewise, the Yavapai were culturally unsuited to survive in the Salt River Valley region possessing farming methods described as a feeble, sporadic, and inefficient (Gifford quoted in Whittlesey 1997:717). The Yavapai were a high-desert and mobile people, ranging freely over a vast stretch of upland desert territory in search for subsistence. Therefore, each Amerindian culture that inhabited the Salt River Valley watershed constructed a landscape utilizing their own experience of place, exemplified by the varied and necessary responses for survival in arid conditions resultant from the outcomes of gained knowledge and advancing interests.



Figure 7: *Example of Yavapai Upland Desert Territory* (2012). By K. Heslop.



Figure 8: *Confluence of Salt and Verde Rivers* (2012). By K. Heslop.

The Spanish and the Period of Exploration 1540-1848

The legendary expedition of Spaniard Francisco Vázquez de Coronado seeking the Seven Cities of Cibola in 1540 brought the Southwest's pre-contact era to a close. In a succes-

sion of Spanish expeditions characterized as quests for glory, gold, and God, parties led by Coronado, Antonio de Espejo, Juan de Oñate, and Marcos Farfán de los Gados traversed areas north of the Salt River. The expansion of New Spain's northern frontier in Arizona was confined to the region south of the Gila River, the Pimería Alta region, where the early Jesuit and later Franciscan missionaries were established (Whittlesey 1998:34). Throughout the Hispanic era, the Santa Cruz River Valley and the Tucson Basin were the centers of social activity in Arizona. From the time the first Akimel O'odham came to live and farm in the Santa Cruz River Valley after the disappearance of the Hohokam, the community of Tucson has been continuously inhabited for nearly five hundred years (Logan 2006:28). Tucson's history is deep in Akimel O'odham, Hispanic, Amerindian, and Anglo-American cultures.

By contrast, Central Arizona and the Salt River Valley had no towns or settlements, no ranches or mines occupied or worked by the Spanish, therefore becoming nonessential to the historic Hispanic economic and population centers of southern Arizona.¹⁷ This would be significant in the future of the Salt River Valley, Phoenix in particular, because any cultural landscape between the Hohokam settlements and mid-

¹⁷ It has been questioned whether the western Apache raids discouraged settlement north of the Tucson Basin and the Salt River Valley more than acknowledged. Successful settlement in the Salt River Valley required diverting the Salt River flowing out of the Red Mountains (the area where the current Granite Reef Dam is located) to canals and ditches for distribution to serve the water needs of the Valley. As noted, above the confluence of the Salt and Verde Rivers was the lifeblood of the Hohokam. The Hohokam and later Euro-American settlers (after U.S. military intervention) were able to access then divert water in this geographical area; however, the Yavapai and western Apache deterred the Spanish possibly from establishing irrigation infrastructure hence settlement in the same region.

nineteenth Anglo-American century was absent, resultant in a major southwestern region without a Hispanic past (Logan 2006:36).¹⁸ The artifacts of the Hohokam were recognized by the first Anglo-American settlers in the early nineteenth century, yet the Spanish landscape that so predominate in the rest of the Southwest was missing. Some exploration did take place by the Spanish in the Salt River Valley evident by labeling the “Río Salado,” conferring the salty and bitter characteristic of the water to its namesake (Figure 9). Gold was eventually discovered in the mountains surrounding the Salt



Figure 9: *Lower Salt River Habitat* (2012). By K. Heslop.

¹⁸ Phoenix’s early promoters used its “white culture” as a selling mechanism promoting the city as modern, “[p]eopled by a progressive, American class, on every side are to be noted evidences of thrift and enterprise. Here are none of the sleepy, semi-Mexican features of the more ancient towns of the Southwest” (Logan 2006:36).

River Valley vicinity, sending small groups of Spaniards into central Arizona seeking their golden treasure. The Verde River, a well-timbered and green-banked tributary flowing into the Salt River at the Tonto Basin was named by Spanish gold-seekers (Whittlesey 1997:717).¹⁹

Father Kino and Captain Manje in 1697 traveled down the San Pedro River, to the Gila River, and back up the Santa Cruz River providing an expansive picture of the regional environment. Manje described the San Pedro River Valley as “a humid, fertile valley with the lands full of reed-grass” and plains for pasturing livestock . . . a canal at the Casa Grande encircled the site, providing a defensive moat, a reservoir, and water for irrigation (quoted in Whittlesey 1997:39). The Gila River had extensive cottonwood groves and abundant fish. Jesuit priest Jacobo Sedelmayr in 1744 explored the Pima villages along the Gila River describing wheat being raised by the Akimel O’odham through irrigation. Padre Diego Miguel Bringas de Manzaneda in 1795 traveled to the Gila River north of Tucson reporting “in the whole distance, only 13 leagues are without permanent water, even during the driest season . . . the banks of the river are covered with cottonwoods and willows . . . [t]he river abounds in the fish of various species . . . [t]he river can fertilize these beautiful tracts of land with its waters . . . can be easily conducted anywhere for farming” (quoted in Whittlesey 1997:39-40).

¹⁹ The Salt River has been known by other geographic names: Spaniard Juan Jarmillo from the Coronado expedition recorded the Salt river as “Río de las Balsas” (River of Rafts) in 1539 because of the means of transport on the river; Spanish missionaries Father Francisco Garcés and Father Kino called the river “Río de la Asunción;” and Spaniard Marcos Farfán (and Father Kino) referred to the river “Río Azul” (Barnes 1988:379).

The Spanish brought Christianity and Anglo culture to the Southwest, as well as a permanent presence to the southern Tucson region. The military and the clergy marked the larger regional landscape, thus leaving significant cultural impacts. They brought domesticated cattle and ranching to the southern Arizona vicinity, a mixed benefit and scourge for the natives. Grazing cattle often stomped on local fields, as well as placing serious demands on water supplies (Logan 2006:27). Introduction of cattle has been held indirectly responsible for the destruction of the Gila River riparian zones (Rea quoted in Whittlesey 1997:39). Anglo diseases and conflicts reduced the population levels of pre-contact Amerindian cultures, particularly the Tohono O'odham in the Tucson Basin. Raiding western Apaches caused Spaniards and Amerindians alike to seek the protection of the Spanish army and colonial government, concentrating settlement in the local presidio near Tucson. Although evidence shows the Spaniards in the eighteenth century built a diversion dam to feed irrigation canals including some acequías in Tucson, no early Spaniard irrigation was practiced in the Salt River Valley (Mabry et al. 1995:3). The Spanish would eventually venture further and deeper into central Arizona, encountering differing perspectives from the Amerindians, particularly over water, water rights, and its use. The Anglo concept of concentrating settlements in towns straining water supplies was a means of power over native-American populations by the Spanish in the Southwest. The Anglo idea of landowners retaining water and controlling water rights was a cultural practice that had a monumental impact on the future management of water resources in the Southwest (Meyer quoted in Whittlesey 1997:718).

Promoters and Speculators

Central Arizona – an area bounded by the Agua Fría, Verde, and Salt Rivers – was largely unexplored by Anglo-Americans during the early nineteenth century. Southern Arizona, the regions south of the Gila River, and the Tucson vicinity continued to entice the initial American frontiersmen.²⁰ Trails established in southern Arizona along the Gila River during the Mexican-American War of 1848 were used regularly by the U.S. military and civilian expeditions. Likewise, the southern overland routes across Arizona to California followed forged trails along the Gila River (Whittlesey 1997:287). First impressions written in journals of early American military men and explorers – Colonel Stephen Kearny, Lt. Colonel Philip St. George Cooke, and Topographical Engineer William Emory – gave the prevalent assessment that Arizonian lands were barren, unversed, and harsh. Dr. John Griffin, the medical doctor accompanying the 1848–53 William Emory Topographical Survey of the American-Mexican Border described the terrain at the confluence of the Gila and San Pedro Rivers as “worthless,” bare of vegetation except for giant Saguaro cacti (Wagoner 1975:264-65). Emory himself remarked, “[n]ot an animal, vegetable, or mineral in the area had anything in common with the products of the United States” (Wagoner 1975:265). During the first half of the nineteenth century, the Salt River Valley as well as most of the central Arizona region essentially remained unchanged. Other

²⁰ In 1821, Mexico won independence from Spain – after a decade of war – halting Spanish colonial silver mining operations, curtailing settlement activity at missions and presidios, and near abandonment of Southwestern trade routes with little available military protection for the region. The Mexican-American War resulted in the 1848 Mexican Cession of the territory north of the Gila River to the United States. The Gadsden Purchase of 1854 closed the Mexican period in Arizona.

than a few scattered native-American settlements and a lesser number of frontiersmen and explorers, the arid Salt River Valley and vicinity sported a reputation of little potential for the future.

The preliminary Anglo-American settlements in Arizona were located along the old Butterfield Overland Mail route that skirted southern riverine drainage basins (Whittlesey 1997:288). Much of the motivation for the Anglo-American migration and settlement into early Arizona came from its potential mineral and mining wealth. In 1860, there were no mining camps north of the Gila River. Prompted by the Arizona Organic Act of 1863 approving the creation of the Arizona Territory by the Union Congress, mining expanded universally attracting eager fortune-seekers to stake their claim²¹ Rich mineral deposits near Prescott in northern Arizona, attracted “an aggressive community of miners, merchants, and territorial officials [that] sprang up in the middle of Yavapai and Apache country . . . one bonanza generated ripples of exploration that led to other bonanzas . . . [s]oon mines tunneled into some of the driest country in North America, names like Hassayampa, Harquahala, and Castle Dome entered the legendary geography of the mining frontier” (Sheridan 1995:70-1). The gold on Lynx Creek would be the single richest placer drainage in Arizona (Greeley 1987:19).

²¹ In 1850, Arizona originally formed part of the Territory of New Mexico until southern New Mexico seceded from the Union in 1861, and acknowledged as the Confederate Territory of Arizona by Jefferson Davis in 1862. In 1863, the western half of the Territory of New Mexico was recognized by the Union as Arizona Territory, roughly the same boundaries of the current state.

As mining opportunities declined in California and word spread about the magnitude of gold and silver deposits in Prescott, more miners came to Arizona, unfortunately exasperating tensions amongst native-Americans. Aggressive Anglo-Americans were insistent on controlling lands and resources within the boundaries of the central Arizona native-American domains. The most affected were the western Apache. Early pioneer Charles D. Poston, deemed Father of Arizona, expressed the anti-native American sentiment that swept through the territory in an 1865 address to the U.S. House of Representatives:

The history of man is here distinctly marked by the struggle between civilization and barbarism . . . The Spanish explorers found a very interesting race of Indians . . . a people bearing evidences of European origin and practicing many arts of its civilization . . . In antagonism to these interesting people we have the barbarous Apaches . . . [From] Time immemorial their hand has been against every man and every man's against them . . . For three centuries they have stayed the progress of civilization . . . Their subjugation would open to our hardy miners an unexplored gold field north of the Gila . . . A sickly sympathy for a few beastly savages should not stand in the way of the development of our rich gold fields, or the protection of our enterprising frontiersmen. (quoted Whittlesey 1997:288-89)

According to Arizona historian-anthropologist Thomas Sheridan, both the Apache and American societies were aggressive and expansionistic, however both groups were radically divergent in political, social, and cultural structure (Sheridan 1995:66). American private property and trade exchange values were at odds with Apache kin-based sharing and limited wealth accumulation: "a kin-ordered society confronted a market-ordered society in a region ideally suited for guerilla warfare" (Sheridan 1995:66-7). Sheridan contends the main cause behind the repetitious American-Apache conflict was the vicious cycle between battling parties – the more Apache patterns of seasonal migration

for hunting and gathering were disrupted, the more raiding on Anglo-American interests to compensate. “Accustom to preying off their enemies for the good of their kin, Apaches were not about to accept restrictions on raiding imposed by invaders” (Sheridan 1995:67). Native American cultural identity was intimately connected with survival on the landscape. Conversely, Anglo-Americans were individualistic, seeking fresh lands for a new beginning and the potential of wealth and prosperity. While Amerindian people created landscapes rich and meaningful in story, Americans viewed “[l]and was something to be divided up and exploited for the production of commodities, whether it was hay and beef to sell to the military posts or precious metals for the international financial markets” (Sheridan 1995:67). Neither the Native Americans or for that matter the environment, could withstand American progress (Logan 2006:40).

Anglo Settlement in the Salt Valley

The precursor to the settlement of Phoenix was Camp McDowell, established in 1865 on the Verde River seven miles above the confluence of the Salt River. The First Cavalry of California was sent under the leadership of Lt. Colonel Clarence Bennett with orders to control the Yavapai to the north and the western Apache in the east, protecting the central district mining and the overland routes across the region (Mawn 1977:208). Camp McDowell’s impact was more than just military operations. The “urban” needs at the Vulture Mine in Wickenburg, Arizona, some fifty miles to the northwest, and the Camp McDowell military reserve opened new agricultural market opportunities, attracting settlers to “revitalize” the Salt River Valley and market provisions to Wickenburg, Camp

McDowell, and other U.S. military outposts in the region. Originally, the First Cavalry was authorized to conduct experimental farming on the military reservation in attempt to solve the problem of expensive overland procurements. By summer's end in 1866, the soldiers had cleared two hundred acres, planted the crops, and constructed a small acequía from the Verde River to the military farmlands four miles away.²² Still civilian personnel had to be contracted to grow hay as far as fifty miles from the encampment, engaging the military to escort hay-wagon trains back to the camp. Upon inspection from Brevet Brigadier General James Rusling, the Camp McDowell agricultural experiment was consider a failure, emphasizing that the military troops "are enlisted and paid to scout and fight Indians – not to dig ditches and farm" (quoted in Mawn 1977:209).

Historians are unclear to the Anglo-American origins of commercial cultivation in the Salt River Valley, yet by 1867, the military and the mining boom unquestionably had created a prospering market for agricultural production (Logan 2006:49). In June 1867, four mining prospectors – Joseph Green, Peter McCannon, George Roberts, and Abraham Peeples – located the first Anglo "exclusive" water diversion right on the Salt River near McDowell Crossing for farming and milling prospects (Mawn 1977:209). The next day, three military officers and one interpreter – George Sanford, Charles Smart, Camillo Carr, and T.J. Barnes – also claimed a water diversion right at the same location as the miners the previous day (Mawn 1977:209). The water-rights document filings were rec-

²² The acequía was the "Government Ditch" which was one of two important canals that supplied water to the camp. Evidence showed that, as with other irrigation canals built by Anglo-Americans in the Gila-Salt region, the Government Ditch followed the path of a pre-contact Hohokam canal (Whittlesey 1997:310).

orded in Prescott, Yavapai County, and recognized as the beginning of modern irrigation agriculture in the Salt River Valley (Mawn 1977:209). The Joseph Green group abandoned their plans amidst claims pressures from the competing McDowell officers' group and on-going Yavapai and Apache problems. The McDowell group had grand plans to contract provisions for the military camps, but the results of their scheme are unknown. Yet, historian Geoffrey Mawn views the first recorded plans to irrigate along the Salt River important because it fostered the agricultural possibilities for the Salt River Valley.

Scholars agree John William (Jack) Swilling, an ex-Confederate wagonmaster, promoted the first modern irrigation ditch in the Salt River Valley in 1868. Notions for irrigation were not new to the Valley in the day as prospectors, soldiers, travelers, and freighters could not miss the indications of ancient Hohokam canals, habitation sites that dotted the river, and mounds of trash as much as forty feet high above the Valley floor (Logan 2006:49; Mawn 1977:212). Swilling and his twelve associates seized upon the potential the abandoned Hohokam ditches held for productive irrigation farming. Investing ten thousand dollars in capital, the Swilling Irrigation and Canal Company dredged the first community ditch in the Salt River Valley, following the outlines of north riverside pre-contact canals (Smith 1986:4). "Swilling's Ditch," later renamed the Salt River Valley Canal, irrigated an initial crop of one hundred acres of wheat, barley, and corn, harvested and shipped to the Wickenburg market in Arizona (Mawn 1977:214). A Prescott newspaper reported in April 1868 that "Swilling's little canal supplied enough water to irrigate four thousand acres . . . and the whole enterprise was

destined for great profits” (quoted in Logan 2006:49). The news of opportunity in the Phoenix Basin was spreading.

The importance of Swilling’s Ditch was symbolic of early irrigation ventures in the Salt River Valley, defining new and changing community interests, rights, and obligations among the people and their contributions to building and maintaining irrigation ditches. Normally, one’s share in the irrigation community was proportionate to land served by the ditch. The more land served by the irrigation ditch, the more work or capital the owner of the land contributed to the canal’s maintenance. Assessments were levied in the forms of cash or labor against the shares of each owner to meet infrastructure expenses. While building and maintaining the ditch was a cooperative effort among Swilling’s users, the Swilling Ditch Association was not a communal irrigation enterprise. The doctrine of prior appropriation, first in time, first in right, was now accepted practice. While standard practice of communal irrigation associations arranged sharing provisions during water shortages, Swilling’s Association did not, exploiting the water shortage situation for personal gain. Generally, Swilling and other canal associations became more concerned with individual rights and economic gains than group obligations or community water benefits (Smith 1986:5).

As more land in the Salt River Valley was brought under cultivation during the 1870s and 1880s, more irrigation and canal companies became corporate associations issuing capital stocks. As the population increased, the canal corporations offered more business opportunities than irrigation water to agricultural fields. Water certificates became common currency traded by individuals who were not landowners, and used by

many lenders as a means to collect defaulted loans (Smith 1986:5). Therefore, the agricultural purpose of water supply and distribution in the Salt River Valley shifted to water stock investment shares, securing financial profits particularly in land sales with water shares (Smith 1986:5).

Jack Swilling quickly sought to establish a local settlement, naming it Phoenix – a new civilization rising on the ruins of the pre-contact Hohokam. When United States Surveyor Wilfred F. Ingalls arrived to run the township lines in the Salt River Valley in 1868, Ingalls counted fifty settlers living in a somewhat scattered settlement (Mawn 1977:214). Dissent however, began rising among the new Phoenix settlers and shareholders, particularly along Swilling's Ditch. Suspicion, dissent, and dispute over water were common among neighbors in the Salt River Valley. It was as much a part of the early Phoenix atmosphere as the dry air. Unable to reach a resolution with Swilling, disgruntle farmers formed the Phoenix Ditch Company in 1870 excavating their ditch alongside Swilling's ditch.

The Phoenix settlement continued to prosper regardless of its disputes. The 1870 census population count tallied two-hundred thirty-five residents and approximately 1,500 acres under cultivation (Mawn 1977:214). Incoming settlers began to farm west of the town center and other groups initiated plans to dig canals north and south of the Salt River. Salt River Valley residents were very fortunate to afford several advantages unlike other Arizonians: protection from Amerindian raids by the military presence at Camp McDowell, growing military and mining agricultural markets, and new and improved transportation routes for delivering their products to the market. Yet, as farm-

land was expanding, Phoenix was still an unorganized settlement with no central trading center. In 1873, three-hundred twenty acres known as the Original Townsite were purchased by John T. Alsap, acting as a trustee for the inhabitants of the Town of Phoenix. This plot was at the geographical center of the Salt River Valley, and had a gentle sloping contour, was easily able to accommodate buildings and roads, few vestiges of the pre-contact Hohokam ruins, and little vegetation other than an area of thick mesquite brush



Map 5: *Bird's Eye View of Phoenix, Maricopa Co., Arizona* (1885). By Cartographers C.J. Dyer and W. Byrnes.

on the west side of the tract making it suitable for a business district. The federal government proceeded to issue a formal land township patent in 1874 for Phoenix, and

formal deeds were issued in 1875 for the land holdings within the Phoenix townsite, completing incorporation for township in 1881 (Mawn 1977:224; See Map 5).

There was no shortage of ambitious projects in an attempt to provide water within the perimeters of the Salt River Valley. William J. Murphy became the backer of longest and most extensive irrigation system yet to be constructed, the Arizona Canal. The mammoth Arizona Canal was excavated across the northern portion of the Valley in 1885. Measuring fifty-eight feet wide at its mouth, tapering to thirty-six feet wide at its terminus, nearly forty-seven miles long, supporting an overall one hundred thirty-one mile water distribution system, the canal company promised 100,000 acres of “unproductive desert of no land value for any purpose” would bloom under its waters (Whittlesey 1997:300, SRP History, Sheridan 1995:200). Murphy sold bonds to investors in Chicago and New York, even traveling overseas to raise the capital for the project. The Arizona Canal Company built a state-of-the-art diversion dam, a significant structure of the era, below the confluence of the Salt and Verde Rivers (forerunner to the Granite Reef Diversion Dam) to siphon off water into the large canal. In addition, the massive canal infrastructure network created new real estate investment opportunities for Murphy. While promoting the advantages of Phoenix to new immigrants from the Midwest and beyond, Murphy personally stand to gain large profits from tracts of land he owned adjacent to the Arizona Canal project (Logan 2006:57). Other impressive irrigation projects – the Grand Canal project of 1878 crossed the northern Phoenix Basin to New River, and A.J. Chandler brought Salt River water through the Consolidated Canal in the late 1880s to his southern ranchlands – sanctioned a phenomenal growth and expansion of agricul-

ture in the Phoenix Basin and Salt River Valley. By 1900, two hundred sixty-four miles of canals networks had been excavated in the Valley with the potential of irrigating 161,360 acres of farmland (Whittlesey 1997:300). Accordingly, the population of the Salt River Valley expanded from 235 inhabitants in 1870 to a population of nearly 20,000 by 1900. (Fryman quoted in Whittlesey 1997:300).

Irrigation agriculture as a communal enterprise led to the success of several Mormon settlements along the Salt River; Mesa being founded in 1877 by pilgrims from Utah and Idaho. "Nothing short of Providential was considered the finding of the canal, dug by pre-contact people into the edge of the mesa," guiding the Mormon settlers in their construction of the Utah Ditch, incorporating the eleven-mile-long pre-contact Montezuma Canal (McClintock quoted in Whittlesey 1997:300). Mormon agricultural prosperity was mainly due to cotton, a stable crop of the Mesa region. The Akimel O'odham also found initial prosperity with Anglo-American settlements, selling their crops to the federal government troops. As more and more settlers arrived, however, conflicts over water and water rights along the Gila River left the Akimel O'odham with little. The construction of Swilling's Ditch and other canals used large amounts of water, diverting the precious resource upstream on the Salt River. Copper mines on surrounding upper watersheds likewise consumed significant quantities. Unfortunately, politics and economic competition hampered any resolution of native-American water rights during this early era.

It is important to note the racial and ethnocentric prejudices that were present in the early Southwest. The white character and culture of Phoenix, and a good portion

of the Salt River Valley, stems from the lack of Spanish and Mexican settlements during the early periods. Phoenix was founded by Anglos determined to transplant familiar white cultural patterns to their new home. Early Phoenix followed the Anglo status quo, exhibiting anti-Mexican and anti-black sentiment. Much of the segregation in the Salt River Valley was shaped by the river itself. The original Phoenix settlement was established away from the river, avoiding periodic flood damage and pushing township expansion northward. The irrigated fields were closest to the Salt River, and most of the agricultural workers, mainly Mexican and native-American, were residents along the canals and ditches. The turn-of-the-century elites of Phoenix mocked the Mexican and other minorities, pushing them to live in those neighborhoods most likely to be flooded. Anglos built on higher ground (Logan 2006:89). During the Progressive Era, to be an American was to be modern, progressive, enterprising, and white (Logan 2006:85). References to Gilded-Age prejudice based on nativistic Social Darwinism and white superiority appeared in local Phoenix reclamation booster publications, equating Anglo culture and society with modernism (Logan 2006:84-5). Advocate William E. Smythe pointed to early Phoenix prospering through reclamation, "Tucson and Yuma, though thriving and populous, are Mexican in architecture and habits . . . [b]ut Phoenix is distinctly modern, and almost wholly the offspring of irrigation" (Smythe 1907:249).

Despite all, the Salt River Valley at the end of the nineteenth century was thriving. With a splendid climate, extensive canal networks, and railroad transportation connecting to major markets, it made it obvious the only element missing to take charge of the desert was a reliable water supply and protection from devastating desert flash

floods; the Salt River needed to be dammed. Water – the struggle to control and use it, its lack of, and its destructive forces – is central to the Salt River Valley story. The pre-contact Hohokam and Anglo-Americans sought the waters of the Salt River Valley to make the land prosper but amidst differing cultures and values. Michael Meyer sums it up well:

While the native American populations of the desert viewed the previous liquid as the medium of life, the conquerors, missionaries, and settlers viewed it as an instrument of control, a source of power, and most importantly as the fount of accumulated wealth. Even in the aftermath of the physical subjugation of the Indian there was only mixing, never blending of ideas concerning the accommodation man ultimately must make with the earth's bounty. (quoted in Whittlesey 1997:721)

Manifest Destiny would continue, driving the transformation of the desert regardless of cost. Nothing would stand in the way, not the native-Americans or the exorbitant costs of building storage-dam facilities and control and dispersal infrastructure, let alone impacts upon the environment. The Hohokam respected water resources that could be used, yet not tamed. In contrast, nineteenth century settlers, farmers, speculators, investors, and dreamers exploited desert lands to create an agricultural paradise, made possible using technology to domesticate water resources.

Early irrigators of the Salt River Valley began to believe in an illusion that the desert was subject no longer to environmental restraints and immune to the impacts of drought or flood. The dichotomy of nature and culture and its distinction was dissolving. Nineteenth century irrigators began to demonstrate nature was no longer a significant obstacle in the economic and political development of the West. Still, the historian Donald Worster reminds us nature is “participating in an unending dialectic with human his-

tory . . . intertwined in an ongoing spiral of challenge–response–challenge” (Worster 1985:22). Early irrigation will challenge nature . . . but to what response?

Chapter Four: Salt River Valley Mural, Stories on Canvas

Ten Acres and Independence

[W]hat more ideal or pleasant picture could be presented to the ordinary man than the one in which we attempt to describe to you as owner of a five or ten-acre orchard in the Glorious Salt River Valley –

Where social conditions are the highest;

Where the sun shines the brightest;

Where nature eternally wears her most fetching costumes;

A life that combines profit with independence, produced by work that is not laborious but healthy;

A life in the open air, free from noxious gases of the city; free from the drudgery of office life and the gimlet eye of the man higher up; free from the gulped-down breakfast, the strap-hanging trip to your daily labor, the fifteen-minute unfletcherized lunch and the return home on the overcrowded street or L car.

That's not life, brother – it's HELL.

*– The Arizona Securities and Investment Company
Phoenix, Arizona (1913)*

“COMING EVENTS CAST THEIR SHADOWS BEFORE, and it was undoubtedly foretold by the stars, thousands of years ago, that the Salt River Valley some day would have the wonderful future it now possess” (AZ Securities 1913:4). The Salt River Valley located in Maricopa County, Arizona, encapsulated the early themes irrigation advocate William E. Smythe believed would be the rebirth of the American way and the return to a Jeffersonian way of life. “Win wealth with water” was symbolic of early reclamation. Irrigation was vital to western prosperity, providing a sense of place that meant home, health, and happiness (Chandler 1917:3). The Salt River Valley was ballyhooed as “the opportunity

of the hour” (Chandler 1917:9). Early twentieth-century pamphlets offered a boast that Mother Nature had herself endowed the region with a rich, responsive soil and an incomparable climate. That language brandished the technical achievement of the Theodore Roosevelt Dam, which presumably allowed the federal government to take credit for providing such a wonderful and presumably inexhaustible supply of water. With the investment of a modest amount of capital and rather more considerable industry and labor, ten acres of Salt River Valley land was assumed ready to yield an independent life. The key was technology. Stories of heroism and of innovative engineering feats filled the interior of newspapers, revealing how western farmers produced crops where once only cactus grew. Early irrigation and reclamation projects were modern marvels “stir[ring] the blood and mak[ing] you feel you are proud to be an American” (Connor 1908:7). The miracles of modernity – progressive, cutting-edge knowledge of the day – were making the West livable beyond the hundredth meridian. The “stupendous engineering tasks” involved in building dams, coupled with an enthusiasm for conservation of natural resources led to possibilities of “converting almost valueless waste spaces into highly productive farm lands” and, for a time, struck the imagination and held the attention of America contributing to the transformation to a *New West* (Sill 1924:25).

Showcasing Reclamation

The Bureau of Reclamation has since its inception been eager to exhibit the power of science, engineering, and technology to modify nature to serve the needs of humankind (Rowley 2006:92). At the 1915 Panama-Pacific International Exposition in San Francisco,

honoring the completion of the Panama Canal, the Reclamation Service sought connections to themes demonstrating the power of civilization to alter nature and its geography through government-initiated great projects that were beyond the resources of private enterprise (Rowley 2006:92). Set against the backdrop of the Shoshone Dam Project in Wyoming, the reclamation exhibit featured an idyllic forty-acre farmstead with rural and pastoral scenes created by federal reclamation to build a society around home, hearth, and family. Hydroelectric power at the time was secondary, deemed a modern convenience to provide assistance completing household tasks.²³ Then-Reclamation Commissioner Elwood Mead believed Reclamation projects should be represented abroad to explore peaceful relations and economic development. Quoting portions of a 1927 memo, Mead's reference to attending a Pan-Pacific Conference stated,

“It will be an unusual opportunity . . . to exchange experiences with other countries around the Pacific in regard to the methods by which unpeopled land may be reclaimed and settled and the prosperity of the people on these reclaim lands promoted . . . What the United States Government is doing in reclamation by irrigation will be shown by exhibits and explained by its representatives. THE ACCOMPLISHMENTS OF PRIVATE IRRIGATION SHOULD BE FULLY PORTRAYED. (quoted Rowley 2006:260)

²³ This arguably was a backwards vision, failing to connect with a progressive cultural future. In contrast, *Energy – The Victor*, a sculpture conveying the ideals of energy, a motif that created the great isthmian waterway between oceans, greeted visitors at the Scott Street Exposition entrance. Created by A. Stirling Calder, the official description refers to the sculpture depicts a youth mounted on a spirited horse, “steadily advancing through the waters of the [barrier] dam” (Critcher 1915:41). Winged attendants, *Valor and Fame*, form an encircling crest (Figure 10). Energy, industry, and urbanization were the motifs of the early twentieth century. Other interpretations refer to the sculpture, *The Fountain of Energy*, celebrating the power of water to hydroelectric energy (Rowley 2006:92).



Figure 10: *Energy – the Victor aka Fountain of Energy* (1915). Sculpture by Alexander Stirling Calder.

There was no shortage of exposition venues; many domestic and overseas opportunities were available to display and promote irrigation. World expositions during the early twentieth century period focused on state-of-the-art technology and science, promoting industrial-age inventions and advancements. The 1926 Sesquicentennial Exposition in Philadelphia, 1929 Ibero-American International Exposition, 1931 Paris Colonial Exposition, 1936 Third World Power Conference, Second Conference on Large Dams, National Museum in Washington, DC, and the California-Pacific Exposition offer

just a sampling of venues where boosters could present reclamation and Big Dam technology.

The Ibero-American Exposition of 1929 in Seville, Spain, gave the United States a political platform to exhibit “the development and activities of the American people, especially phases which will be particularly of interest to Spain” (Ormsbee 1928:60). The Spanish organized the Seville exhibition for the purpose of improving international relationships, particularly with the Americas, many of which were former colonies, while presenting Spanish social and economic. Portugal was also a host-participant. President Calvin Coolidge appointed the Seville Exposition Commission in 1926, selecting former Arizona Governor and Reclamation Fact Finding Commissioner Thomas E. Campbell of Phoenix to serve as General Commissioner. The Sixty-eighth United States Congress appropriated \$700,000, building three exhibition halls to display America’s modern Progressive spirit represented by “twenty-three departments and sub-departments of the United States Government,” led by the Departments of Commerce, Agriculture, and Interior (Ormsbee 1928:60).²⁴ There were no private or commercial displays attached to

²⁴ The United States constructed three buildings on Spanish territory for this exposition, developing one building as a permanent “model” American consulate, cost placed at \$200,000 (Ormsbee 1928:60). Documents support the United States’ intention to convert one building into a permanent American consulate was a surprise to the Spanish Exposition Commission who believed the building would revert to the Spanish at the end of the Exposition. An agreement was reached; the American consulate remained. The Spanish colonial-style consulate contained all the latest modern conveniences as well as sporting an American research library accessible to students and other visitors. The Seville Exposition, planned for nineteen years, many times postponed, was held concurrently with the Barcelona Exposition (Time 1929).

the United States exhibit and, keeping with the spirit of international fair, the United States War Department did not participate.

John H. Pellen, exhibit designer for the Bureau of Reclamation throughout this period, prepared and planned several exhibits including the 1929 exhibit sent to Seville. The Ibero-American Exposition featured the key irrigation projects accomplished by the Bureau of Reclamation since 1902: the Roosevelt Dam on the Salt River project, Arizona; the Arrowrock Dam on the Boise project, Idaho; Elephant Butte Dam on the Río Grande project, New Mexico; the Pathfinder Dam on the North Platte project, Wyoming; the Shoshone Dam also on the North Platte project, Wyoming; and the Owyhee Dam under construction on the Owyhee project, Oregon and Idaho (Exhibit Pamphlet 1929).

Twelve color transparencies and eight hand-colored bromide prints depict aspects of the modern western irrigation projects complementing the centerpiece of the exhibit, a fifteen-foot mural painting, *Making the Desert Blossom* by plein aire painter Frank J. MacKenzie (Figure 11) enhanced by a three dimensional model of an American ideal forty-acre desert homestead (Mechlin 1929:11; Plate 34). It is unclear how or why MacKenzie was selected for the Bureau of Reclamation commission, although research reveals that his wife, Florence Bryant MacKenzie, was the head artist for the Bureau of Exhibits and United States Forest Service in the Department of Interior at the time.

The Salt River Project was the most successful undertaking of the early Reclamation Service, validating the idealism espoused by early irrigation advocates. Although there is no clear evidence on the decision to feature the Salt River Project as the centerpiece of this exhibit, yet it is understandable to conclude the success of Salt River Pro-

ject, identifiable arid features akin to the Spanish agricultural landscape, and the historical connections of the Spanish with the Southwest may have been contributing factors. There is no clarification on sources used by MacKenzie when composing the painting – photographs or working on-site – however, it is reasonable to conclude both possibly and even likely were utilized. A January 1929 issue of the *New Reclamation Era* states the mural “representing a typical irrigation project in an arid part of our great Southwest, depicts conservation of water in the mountains for irrigation and electric power by the use of storage dams, a diversion dam and a distributing system of canals and laterals, a scene designed somewhat after the Salt River irrigation project in the State of Arizona” (Mechlin 1929:11).



Figure 11: *Making the Desert Blossom* (1928). Mural by Frank J. MacKenzie.

The Frank MacKenzie mural, *Making the Desert Blossom*, is an overarching snapshot of the social and cultural responses observed to the new challenges presented by arid soils (See Figure 11; Plate 35). The large panorama, reminiscent of the nineteenth

century American grand landscapes of the Hudson River School genre presents the representation of the Salt River Valley as a transcendent landscape, illustrating the vast glories and collective experiences found in a productive desert environment reclaimed by the hand of man. The mural collectively encompasses the “big ideas” of Progressive reform implemented in the arid West, using the Salt Valley backdrop to draw the contours of the reclamation dialect. It communicates the efficacy a desert wilderness can be plausibly transformed into the Jeffersonian pastoral ideal – a desert Garden of Eden – establishing a modern culture of civilized nature. MacKenzie’s mural displays changes irrigation brought to the desert, fulfilling domestic needs, while creating picturesque characteristics of a new, distinct American countryside, rendering reclamation safe and with no ill effects. It reveals progression to a practical utilitarian landscape, continuing the neoclassical traditions of an aesthetic order, and reflecting turn-of-the-century America becoming increasingly bureaucratized.

Making the Desert Blossom is a contrast in notions of *old* nature and *new* nature. The foreground of the mural, suggesting a view from the Tempe Buttes shadowed by Phoenix South Mountain over the town of Mesa at sunset, features elements identified with the natural northern Sonoran desert – a piece of primordial landscape – giving way to a vast, ordered, Eastern-style green idyllic valley, made to bloom through the marvels of technology. It exemplifies the march of civilization, “[w]herever the waters of seed and irrigation have moistened the desert, and man has planted seed of grass, flower, or tree, the most luxuriant vegetation has sprung from the soil to revolutionize

the appearance of the country” (Smythe 1907:249). The name Tempe²⁵, as suggested by English immigrant Darrell Duppa, hints to the reminiscence of a beautiful vale in Thessaly as described by ancient Greek poets. The Greeks (and later the Romans) embraced the glory found in plains and foothills that supported agricultural beauty, contrasting surrounding mountains as barren and infertile (Farmer 2008:144).

A lush, balanced and aesthetically pleasing agricultural setting encompassed by the harsh desert, highlighted against the seemingly unproductive, yet grand and sublime backdrop of the Mazatzal and Superstition mountains, is an embodiment of the ancient Tempe namesake. Cumulus and stratocumulus clouds tinted orange by a setting sun, hints at the content of elemental water, hovering over the surrounding mountains poised to liberate its moisture into a series of dam structures, to be controlled, manipulated, and expended by human beings. Respectively, the Salt River Valley mural implies a therapeutic geography, providing the health benefits of clean air attributed to the “peculiar climatic conditions and physical environment . . . [having] the same embracing and exhilarating qualities as the air of the Great Sahara Desert in northern Africa, or the desert about Mt. Sinai, in Arabia” (Reid quoted in Smythe 1907:248). The Valley’s climate is one of extremes, approaching Darwinian severity at times, but beckoning a place for practical men, throwing down the challenge to adapt and survive (Round 2008:37). Valley temperatures fluctuate from 20°F to 120°F, and the annual precipita-

²⁵ The city of Tempe, Arizona, is located in the same southeastern Salt River Valley quadrant depicted in the MacKenzie mural, at the eastern foot of the Tempe Buttes. Although geographic markers suggest the town of Mesa is represented in the mural, the name-sake of Tempe is embodied and symbolized in the overall painting.

tion averages 7.7 inches; a long growing season of 304 days lures farmers to plant almost any crop (Autobee 1993:3).

A series of five dams – the Granite Reef, Steward Mountain, Mormon Flat, Horse Mesa, and Roosevelt – are set back in the mountains, treated as small, unobtrusive structures, barely noticeable in an “industrialized, new version of the pastoral ideal” controlling the flow of the Salt River (Novak 2007:149). The narrow channel at the base of the dammed Salt River disseminates its aqueous abundance implying an unfolding of nature’s bounty here for human use. The manmade canals – the Tempe and Consolidate branch off the Southern Canal – take charge of the direction of water flow, orderly dividing and distributing the valued resource to checkered fields that delineates a rich, green landscape from a sandy-yellow desert terrain. MacKenzie is declaring a unique hydraulic problem is solved, thanks to a splendid mechanical triumph, all the while leaving intact an orderly assembly of grandeur, poetry, and beauty within nature. More significantly, the mural asserts that water, the missing element to take control of the desert, was now a reliable commodity. Humans, advancing progress and order, could now mediate water resources – the use of it, the lack of it, and the control of it.

“The Desert Shall Blossom as the Rose”

The Salt River Project furnished an innovation that became the basis for the expansion of agriculture and ultimately urban-suburban population growth in the Phoenix Metropolitan area. The Roosevelt Dam was the vital component, supporting auxiliary dams, canals, and hydroelectric power plants, providing services to the greatest number of

people, both in agricultural and urban conditions and circumstances. The reforms of the Progressive Era championed principles for the conservation of natural resources, stressing development without waste by “the application of common sense to common problems for the common good” (Pinchot quoted in Smith 1986:2). Federal reclamation at the time was viewed as both a physical and engineering problem, a vision for people who believed government scientists and engineers could manage the nation’s streams and public lands more “democratically” than politicians (Smith 1986:155-56). There are four reasons for the success of Salt River Project: (1) an established irrigation community familiar with the landscape; (2) an excellent dam site for the Roosevelt Dam providing an exceptional reservoir storage site; (3) an effective water users’ association with knowledge of financing, urban growth, and potential in hydroelectric power for future energy and growth; and (4) a federal government policy that agreed to build reclamation facilities serving both privately held as well as public lands (Rowley 2006:10). Supporters of reclamation reasoned irrigation would enrich every region within the country, not only opening up the West for settlement, but create increased demand for manufactured goods from the East, while opening up Asian markets to the surplus from the increased food production (Smith 1989:3). The nation would not only profit from reclamation through economic growth, it would also protect and reinforce the Jeffersonian ideal, “successful homemaking is but another name for the upbuilding of the nation” (T. Roosevelt quoted in Smith 1986:3).

Henry A. Wallace, a senior student at Iowa State College and reporter for his family journal, *Wallaces’ Farmer*, traveled throughout the western states to examine

and report on the status of irrigated agriculture in 1909.²⁶ *On the Trail of the Corn Belt Farmer* chronicled migrating midwesterners and their adjustments to western irrigation methods, discovering conditions faced by prairie farmers were vastly different to farming “under the ditch” (Lowitt et al. in Wallace 1991:22). During this early period, irrigation agriculture practiced intensive farming methods that stressed cooperation rather than competition, bringing individuals closer together in social and business relationships. Local Salt River Valley real estate pamphlets advertised irrigated land plots available in sizes of up to forty acres, boasting the potential of financial independence to intelligent and industrious farmers, promising visions of profit, leisure, and social associations. Notably, Henry Wallace’s writings do present a detailed picture of the underlying social and cultural values of reclamation entrenched in the foundation of the MacKenzie mural.

In “The Salt River Valley,” an article published in *Wallaces’ Farmer*, July 23, 1909, Henry Wallace vividly describes the social and cultural impressions of “the most wonderfully productive sections in the world” (Wallace 1991:53)

The soil is fertile and the climate most favorable for vegetable growth. The valley is about forty miles long and width varies from fifteen to thirty miles. It is evidently much like California of fifteen years ago. Nearly everyone in the valley has come here of his health, or for the health of some member of the family. It is filled with “lungers,” “t.b.’s,” or “con’s [confederates].” Because of the dryness of the climate and the abundance of sunshine, conditions are most favorable for those suffering from tuberculosis. It is interesting to note that Phoenix has about the same latitude as Jerusalem, and I fancy that conditions here are very similar to the land around

²⁶ Henry A. Wallace became Secretary of Agriculture (1933–1940), the thirty-third Vice-President of the United States (1941–1945), and Secretary of Commerce (1945–1946).

Palestine. Water has the same precious value as David places in his Psalms, while about Phoenix, as about Jerusalem, "The mountains ever stand." (Wallace 1991:53)

Wallace explained how Salt River Valley farmers raised alfalfa as the main pasture for dairy cows, noting the flooding practices for this crop were between the ridges; fruits, vegetables, and corn flourished under the furrow irrigation system.²⁷ Curiously, he claimed an acre of irrigated western land is worth two acres of the best rain-watered Eastern plot.

Wallace generally presented irrigation farming as an analogy to manufacturing: the farmer must lay out a field as a company would plan its factory floor. Land had to be leveled with a uniform slope, ditches and head gates placed just right, while the irrigator himself required good judgment knowing when, what, where and how much water was necessary for each crop. Wallace was of the opinion irrigation agriculture "takes more brains" than traditional prairie farming reasoning "if the crop suffers from drouth or are drowned, it is the fault of the irrigator, not the result of Divine Providence" (Wallace 1991:221). He tagged irrigation farming as a paradigm for modern agriculture that increased the local populace, generated new schools, developed co-operative marketing, brought good roads and modern conveniences home resulting in better social conditions. Reclamation according to Wallace, renders benefits to citizens as a whole, "[i]n this way the government is irrigating millions of acres of land which could not have been

²⁷ Alfalfa was also grown to build up the low nitrogen and humus content in the local soil.

reached for years to come save through the strong arm of the government” (Wallace 1991:208).

Contrasting the irrigated landscape to the desert’s native vegetation, Wallace remarked it was entirely different from anything in the corn belt.

There were many cacti of different kinds, such as Saguar[o] or Giant cactus, which looks like green fluted telegraph pole, and the different kinds of cacti and prickly pears. No grass was to be seen anywhere. Mesquite brush was scattered all over the plains. It looks like a bush locust tree and varies in height from one to ten feet . . . There are numerous lizards and rabbits . . . [o]ccasionally I could hear a bird from the top of a Giant cactus. (Wallace 1991:73)

Initial descriptions of soils in the Salt River Valley emphasize a “deep rich sandy loam soil” that along with abundant sunshine and irrigated water make the region the “most attractive location for the fruit-raiser and gardener” (Chandler 1917:2). Henry Wallace was surprised by the light yellowish or buff colored sandy soil, proclaiming the West lacks the humus found on the prairie and in the East. Rich alluvium soils are characteristic of desert floodplains. Yet, Wallace insists western soils are more productive over the Eastern fields when water is added. Although a bit of western myth, Wallace explains due to the little rain in the West, “nearly all the fertility that was in the original rock is still in the soil . . . [n]one [fertile elements] have been washed into the sea to be lost forever . . . [o]ur humid soils have been leached by the rains of a thousand years, and millions of tons of their best fertility have been carried to the ocean” (Wallace 1991:213). Wallace points out soluble phosphorous and potassium make western soils unique, producing a superior plant food available to growing vegetation. Still at the same time, Wallace notes arid soils are deficient in supplies of nitrates, requiring alfalfa to be grown,

cycling nitrogen from the air to deposit in the land. “Supply water and add nitrogen and humus by growing alfalfa, and you have in the arid soil of the [W]est one of the most productive soils in the world” (Wallace 1991:207).

Early Salt River Valley farmers had a heavy reliance on grain crops – wheat and barley – alfalfa, and clover. Crop variability as recorded in the 1880s noted fruit trees – peach, apricot, fig, and citrus trees – next to alfalfa and the grain crops; pears, olives, and almonds flourished (Smith 1986:5). Mesa supported two wineries from grapes grown in the vicinity. The first orange groves were planted in the northern Salt River Valley during the 1890s when “the Arizona Canal was ‘still an infant’. . . [but] today [1913] the Salt River Valley raises the highest-priced oranges in the world” (Arizona Securities 1913:8). *Agriculture Arizona: the Salt River Valley* boasted impressive returns from grapefruit and oranges, averaging \$500-600 per acre (Miller quoted in Commission 1929:8).

Most towns had their own packinghouses, shipping immense quantities of produce to other states. However, there was an imperative need in Arizona for scientific approaches to agriculture as new arrivals to the Salt River Valley were grappling with old, humid farming techniques. Robert H. Forbes assumed a joint appointment in 1899 as Dean of the College of Agriculture at the University of Arizona and Director of the Agricultural Experiment Station (AES), a program under the federally funded Hatch Act of 1887. Forbes’s philosophy was one for adaptation rather than imposition, advocating new residents should accustom themselves to the local climate and conditions (Salazar 1997). Under Forbes’s direction, the AES took the lead in research with native plants and

crops derived from parallel climates and soil types in the Old World, particularly olives, cotton, and dates (Salazar 1997). The most successful crop was the development of Pima cotton established at the Cotton Research Center (about 1907) on the Pima Indian Reservation in Sacaton, fifty miles southeast of Phoenix. By 1917, cotton became a major agricultural crop in Arizona. Nonetheless, in 1929 alfalfa, winter lettuce, short staple and long staple cotton, citrus fruits, cantaloupe, and opportunities for dairy farming, date production, fruit orchards, and sheep herds were the principal agricultural products in the Salt River Valley (Commission 1929:2,8).

Could irrigation waters from the Salt River provide and sustain the agricultural paradise as promoted? Many of the same irrigation troubles that plagued the pre-contact Hohokam came back to haunt the early Salt River Valley irrigators. Dissolved mineral constituents in the Salt River water gradually placed physical restrictions on the Valley's irrigated agriculture due to the limited salinity tolerance of many crops (Salinity 2003:11).²⁸ Sodium content and mineral intolerance are two principle drawbacks of irrigated agriculture that progressively decrease potential crop yields. Irrigation practices in the Salt River Valley diverted saline water from the Salt River, flooding fields to irrigate crops, needing extra irrigation water to flush or leach the mineral salts to soil depths below the root-zone of the crop, keeping root-zones at salt tolerable levels. Mineral

²⁸ Crops grown in the Salt River Valley in the early twentieth century with low salt tolerance ranges included fruit trees – peach, apricot, apple, pear, and citrus. High salt tolerance crops included cotton, date trees, some vegetable crops – garden beets, spinach, and kale, and barley hay and western wheat grass (Salinity 2003:12).

salts in solution compete with the crop plant for available water. Good field drainage therefore, is required for the irrigation process. Soil depths vary greatly in the Valley, some areas having depths of five hundred feet while other places have shallow soil depths due to hardpan and bedrock layers, preventing seepage into the water table causing fields to become waterlogged (Autobee 1993:16). The Tempe Irrigation Canal Company fields became waterlogged and unusable by the early 1920s from fifty years of continuous irrigation (SRP History).²⁹

Remarkably, Henry Wallace crusaded for reclamation to “continue during the rest of this twentieth century redeeming the desert land of the [W]est until the entire water supply has been used . . . [i]n that day the arid [W]est will be as important in its productivity and its civilization as the humid [E]ast” (Wallace 1991:211). Wallace maintained an enthusiasm for early reclamation in the West trusting it would establish a legacy to be “thought by most western people fifty years from now” (Wallace 1991:214)

Technology Transforms the Salt River Valley

Calls for providing a stable water supply in the Salt River Valley began in the early 1880 and continued unabated. Farmers and landowners realized that a water storage system was essential to meet the impending Valley growth. Although some Salt River Valley landowners were sensitive to any control of the region’s water supply, and others were

²⁹ The Tempe Irrigation Canal Company remained independent from the Salt River Valley Project and Water Users Association until their fields became waterlogged. In 1925, the Tempe irrigators merged with the SRV Water Users Association in exchanged for the Water Users’ Association pumping the excess water off the Tempe fields (SRP History).

skeptical and even suspicious of what might be construed as federal government interference with private enterprises, a consensus of Valley residents would conclude that individual irrigation efforts were inadequate to satisfy future agricultural and domestic needs (Smith 1986:2). In 1889, Arizona's Maricopa County Board of Supervisors hurriedly authorized a committee of surveyors to find and collect data for a proposed local water storage site to present to Senator William M. Stewart of Nevada's Subcommittee on Irrigation and Arid Lands scheduled visit to Phoenix that same year. The survey committee selected a location near the confluence of the Salt River and Tonto Creek reporting the Tonto Creek basin site offered several advantages.

There was a narrow canyon for the dam, in hard rock of advantageous stratification, furnishing the best of building material. Above was a wing-shaped double valley, within which storage was the capacity for all floods on an average season (McClintock quoted in Smith 1986:7).

Then-federal hydraulic engineer Arthur P. Davis wrote on the Tonto site, "[t]here can be no doubt that in this reservoir lies one of the most important possibilities for the future of agriculture in southern Arizona," giving local residents encouragement for government support (quoted in Smith 1986:14). The cost for the Salt River-Tonto Creek storage reservoir in 1889 was estimated to be between two to five million dollars (Autobee 1993:5). Yet any talk of western federal reclamation projects or the cost of western infrastructure improvements immediately sparked tensions between the underdeveloped West and the developed East. The independent spirit of the West did not want to be told what to do, while the East, not in particular fancy to grant tax contributions to

build-up the West, saw perceived irrigation as an incipient rebellion and a threat to Eastern economic predominance.

In 1893, easterner Wells Hendershott filed a claim in the name of the Hudson Reservoir and Canal Company to start construction on a water storage facility at the Salt River-Tonto Creek basin confluence, proposing to irrigate Salt River Valley land east of the town of Mesa (Smith 1986:8). Thanks to the national economic downturn of the 1890s, the Hudson Reservoir Company was unable to secure sufficient outside investment capital for the project. Mr. Henry Man, a primary project investor from New York, reluctantly concluded before the project would be remunerative the entire Valley's acreage would have to be consolidated and irrigated, charging water rates double the prevailing tariffs (Smith 1986:8-9). The Old Settlers' Protection Association formed in 1898 as a resistance group to consolidating Salt River Valley lands, fearing water rights protected under prior appropriation would not be safe under the Hudson Reservoir Company plan or any other proposal offered by a private investment company. Members of the Old Settlers Association also demonstrated apprehension and suspicion towards new settlers in the Valley, insisting newcomers should not benefit from any potential increase in Valley water supplies.

A new citizen's group, The Water Storage Committee of Phoenix and Maricopa County was formed by the Maricopa County Board of Trade. This committee published a report in April 1900 advocating a three-step plan: (1) securing the Tonto Creek Basin water-storage site from the Hudson Reservoir Company, (2) construct a storage-dam facility on the Salt River-Tonto Creek Project site, and (3) purchase the entire Valley canal

distribution system, all to be financed through the issuance of Maricopa County bonds (Smith 1986:14). Optimistic plans proposed by the Water Storage Committee presumed 500,000 acres of Salt River Valley land would be brought under irrigated cultivation servicing one million residents (Smith 1986:15). Arizona was still a federal territory and required U.S. Congressional approval for Maricopa County's plan to issue county bonds to finance this water-storage project, further complicating the Salt River-Tonto Creek scheme.³⁰ In the fall of 1900, the Water Storage Committee expanded membership to thirty-six people representing every canal, section, and industry in the Salt River Valley. Yet enthusiasm waned for the Salt River-Tonto Creek water storage project as old rivalries and conflicts surfaced, many divergent self-interests developed, and the rains came to the Valley breaking the then-current drought.

There was talk, talk, talk, and inaction . . . and grumbling accusations. Motives were impugned and cliques were being formed and some determined if the plan they advocated [was] not adopted no plan would be. (*Arizona Republic* in Smith 1986:15)

Nevertheless, the Water Storage Committee solicited Phoenix newcomer Benjamin Fowler, a well-educated Massachusetts-born book publisher to travel immediately to Washington D.C. to lobby on the behalf of The Water Storage Committee and Maricopa County, presenting the Salt River Valley's financial dilemma for financing the Salt River-Tonto Creek water storage project. In Washington D.C., Fowler joined forces with National Irrigation Association Director George Maxwell. The duo consulted Fredrick H. Newell, then-chief of the hydrographic branch of the United States Geological Survey to

³⁰ Arizona became a state on February 14, 1912.

assist with lobby efforts in Congress on behalf of Arizona as well as for a national reclamation policy. Through 1901, all attempts to pass a national reclamation act failed, recognizing the fundamental differences between the West and East negated any strong enthusiasm and support for any irrigation schemes (Smith 1986:22). U.S. Forest Service Chief Gifford Pinchot joined the endeavors of Fowler and Maxwell, personally lobbying on Capitol Hill for national reclamation legislation. It was now only a matter of time before some form of irrigation legislation would become national policy.

In a turn of political events, President William McKinley was assassinated on September 14, 1901 in Buffalo, New York, and succeeded by then-Vice President Theodore Roosevelt, a strong advocate for conservation of natural resources and of reclamation policies. This brought renewed and energized bids to re-introduce the Newlands Reclamation Act by proponents in Congress. Meanwhile, in January 1902, Fowler continued to lobby unrelentingly for passage of legislation to enable Maricopa County to issue the county bonds essential to finance the Salt River-Tonto Creek storage reservoir project. Unfortunately, this enabling legislation seemingly remained unceasingly stalled in Congressional Committees. According to historian Karen Smith, it may be feasible to assume that the Arizona Territory's Salt River-Tonto Creek water storage project was on the table in reclamation negotiations between the Theodore Roosevelt Administration and the U.S. Congress as indicated in the President's December 1901 message to the Fifty-seventh Congress:

Whatever the nation does for the extension of irrigation should harmonize with and tend to improve the condition of those now living on irrigated land . . . Our aim should not be simply to reclaim the largest area of land and provide homes for the

largest number of people, but to create for this new industry the best possible social and industrial conditions (quoted Smith 1986:23).³¹

Persisting, Maxwell, Newell, and the other lobbyists pushed hard during the Spring of 1902 for a national reclamation act, witnessing the opposition slowly surrendering to the persuasiveness of President Teddy Roosevelt. Finally on June 17, 1902 Congress passed the Newlands National Reclamation Act of 1902.

The Salt River was an ideal prospect for producing banner results for the new Reclamation Service and irrigation enthusiasts in general. At the time of the passage of the Newlands Act, nearly 20,000 Valley farmers cultivate nearly 130,000 privately owned acres in the Salt River Valley (Powell 2008:52).³² The Salt River Project itself fitting the federal engineering profile as defined under the Newlands Reclamation Act, still had two obstacles to overcome before the dam construction could begin: fulfilling the financial provisions stipulated under the Reclamation Act and the adjudication of water rights among Valley irrigators. The long held traditions of prior appropriation, individual determinism on the duty of water, and the reluctance of the Old Settlers Association to yield heritage vested water rights had to be overcome. The Newlands Reclamation Act

³¹ Gifford Pinchot was a friend of Theodore Roosevelt and committed to a natural resources policy. Pinchot advocated Roosevelt in his first message to Congress the reintroduction of the Newlands Bill. Maxwell and Newell, friends of Pinchot, therefore had a connection to Theodore Roosevelt (Smith 1986:22).

³² The Newlands Act was intended so that farmers would settle and reclaim public lands. This was not the case in the Salt River Project, as not a single square foot under the project was public lands.

and its federal financial generosity to the western arid lands came with obligations. Reclamation projects meant the jurisdiction of the project was centralized under federal control. Local water practices would be judged against the new Progressive's conservation dogma of the greatest good for the greatest number of people over the longest period. While a hard sell to key Salt River Valley irrigators, this was the best opportunity the Salt River Valley landowners had to build their long planned and long awaited Salt River-Tonto Creek water storage project.

Differences of Opinion

Dwight B. Heard, one of the largest landowners in the Salt River Valley and local financier had investment partners in Chicago, and political connections in Gifford Pinchot and Theodore Roosevelt. More important, Heard was a principled man who believed the community's interests and well-being depended upon his own success. Challenging Benjamin Fowler for leadership of the Salt River-Tonto Creek Project, Heard was determined to present his own well-published proposal to secure government approval for his Tonto Basin project. Heard's plan involved local landowners to secure the Tonto Basin site, turning over the site to the federal government, asking a federal engineering commission to determine stream flow in order to adjudicate the priority of receiving water for lands under cultivation.³³ Fowler, understanding the government requirements as out-

³³ During the Progressive Era, scientists and engineers in some cases assumed that the *duty of water* was a calculable measurement determined by stream flow (Logan 2006: 68).

lined in the Reclamation Act, insisted the water-users had to unite, settle differences, and establish local regulations governing water rights in accordance with the reclamation legislation. Therefore, Fowler initiated a mass meeting for all citizens in the Valley who were interested in the Salt River-Tonto Creek water storage project, and organized a new Water Storage Conference Committee to arbitrate compromise, hoping that would meet reclamation guidelines required by Salt River Valley residents for federal project participation. Sensing confusion among Valley landowners, Fowler asked his Washington D.C. reclamation colleague George Maxwell, National Irrigation Association Director, to advise the Water Storage Committee on how to proceed (Smith 1986:29).

Maxwell's message to the Salt River Valley landowners was simple: (1) gain control of all irrigation systems; (2) other than farmers, eliminate profiteers; and (3) form one association of all the landowners to put the project on an economically sound basis and to settle disputed water rights. He also advocated a landowners' cooperative so that "men who own the land and till the soil control the irrigation systems" (Smith 1986:30). This was a revolutionary concept for the West. The western frontier was a land apart, fiercely independent, seeking innovation by making radical adaptations to bend and control nature just to exist beyond the hundredth meridian. To ask Westerners to come together collectively was a departure from the prevailing culture in the West. Landowners in the Salt River Valley had to change. Electing a Board of Governors to make decisions on behalf of community members, controlling the management of water resources for a common interest was groundbreaking. Uniting all the landowners in the Salt River Valley would prove difficult. Maxwell warned farmers to have patience:

“the man who tries to find a short cut and leaves out of sight difficulties which will arise up and confront him when half-way across . . . he ought to have foreseen and got out of the way at the beginning” (quoted in Smith 1986:30). Directed at Dwight Heard and his self-interests, Maxwell reiterated that irrigation farming under the Reclamation Act was a shared venture – a new doctrine for the West.

All Salt River Valley landowners desirous to hold vested water rights in the Salt River-Tonto Creek storage reservoir were required to become members of a proposed association, the Salt River Valley Water Users’ Association. The general framework for membership in this proposed association was based on land ownership, eliminating the existing Salt River Valley canal companies from Salt River Project. Salt River Valley water users would relinquish control of all issues pertaining to common landowners’ water interests to the Association’s Board of Governors. This would include such matters as construction and operation of water pump plants, protection of water supply, and prevention of appropriations on the Salt or Verde rivers above the canal companies systems. The proposed Water Users’ Association would not have the authority over individual water distribution or separate company canal systems. Water would be delivered from the storage reservoir to each water users’ canal head gate, proportion in accordance to their allotted water rights. Allotted rights to each landowner would be fixed in proportion to his purchased acreage shares, reserved for the farmer’s discretionary use until the end of the reservoir year, and subject to each canal distribution plan. A water entitlement could not be carried over into the next reservoir year; unused water allotment rights would be lost to the landowner. The Water Storage Committee recom-

mended the capacity of the Salt River-Tonto Creek Project storage facility to be constructed to 1.5 million acre-feet, irrigating no more than 200,000 acres (Smith 1986:30-1). Initially, association members were to be charged at a flat price of \$12.50 per acre due in ten annual installments (Smith 1986:30-1).³⁴ The federal Reclamation Act specifically limited use of federally stored water to 160 acres for land in private ownership of any one landowner residing on the land or in the neighborhood of the land. It did not mention if the landowner must till the soil. Terms of residency to receive federal stored water were not clearly defined in the initial Reclamation Act legislation (Smith 1986:30-1). This framework did not address or provide adjudication of existing water rights for landowners in the Salt River Valley.

Articles of Incorporation had to be drawn by the Salt River Valley Users' Association to demonstrate to the federal government compliance with reclamation requirements stipulated in the legislation for project selection. The Users' Association sought to merge reclamation law with territorial vested rights:

- (1) The association should include all water users with vested rights;
- (2) Those with vested rights included the following conditions:
 - a. The basis of an appropriation from public sources – the Salt and Verde rivers – is land ownership and residency;
 - b. Beneficial use of the water shall be measured and limit of the appropriation;
 - c. The right to the appropriation are appurtenant to the land;

³⁴ This did not include the initial subscription charge of ten cents an acre to the Water-Users' Association. This rate was substantially higher than the average one dollar fifty cents per acre charge under vested rights of delivery by natural flow (Smith 1986:31,35,43). Revised estimates for repayment increased to forty-five dollars per acre in 1909 (Smith 1986:96).

- d. The rights of appropriation are severally prior – first in time is first in right.
- (3) The natural flow of the Salt and Verde rivers should be under the same rules of use and distribution as stored water, uniform and subject to priority;
 - (4) The proportionate costs of the government works, and the cost of operation and maintenance, should be equal to all;
 - (5) The powers of the administration should be centralized in the association, although the water-users' members should provide as much supervision and direction as possible, subject to approval by the Secretary of the Interior;
 - (6) The powers of the association should be so distributed that there is a maximum of responsibility and a minimum of peculiar personal benefit;
 - (7) Ample security should be provided for the government by making the assessment charge a lien on the land. (Kibbey quoted in Smith 1986:34)

The Articles of Incorporation conceded local water interests to a national authority; the water user would be now subjected to the rules and regulations of Congress and any Executive Department of the federal government. Nonetheless, the Articles of Incorporation was an extraordinary document lacking any precedent to draw upon. The document attempted to address possible problems that might arise between local irrigation customs and federal reclamation policy. Water for beneficial use was given a definition, having a limit and measure of water rights, preventing *wasting* water through restricting the possibilities landowners with prior appropriation to natural sourcing, accessing both the natural supply and federal water supply. Therefore, the Articles of Incorporation attempted to shifted water appropriations from rights of priority to conditions of equality among old and new settlers when federal water was available to be de-

livered in sufficient quantities to fields requiring irrigation. However, if federal water sources were not available, the Articles of Incorporation provided for prior appropriation rights to govern for the cases of natural flow. This change to address co-operative rights was revolutionary for the West, establishing models for other reclamation projects (Smith 1986:35). The Articles of Incorporation of the Salt River Valley Water Users' Association would also radically alter the local water-practices culture. Lost were the individual rights and powers associated with prior appropriation, and the idea that an individual farmer could determine his own beneficial use of water.

A minority in the Water Storage Conference Committee led by Dwight Heard, disagreed with the Articles of Incorporation, believing reclamation was about "getting more for less" (Smith 1986:36). Essentially, the minority of dissenters wanted irrigation in the Salt River Valley to remain status quo under the new Salt River-Tonto Creek Project, advocating landowners should share expenses on a costs-benefit basis, and not lose individual control over their ditches. Progressives split on the rationale lying behind reclamation. One faction regarded reclamation as social reform conforming to ideals of protecting the small farmer from the land speculators and water monopolies by centralizing authority, while others contended that reclamation was a better opportunity to distribute water for higher crop yields, limiting "waste" on marginal fields using local storage authority. These conflicting notions on the Progressive conservation ideology plagued early modern western development. Still, Heard's minority views were voted down by the Water Storage Conference Committee, and under Arizona law, the Salt River Valley Water Users' Association was incorporated on February 9, 1903. By June

1903, approximately 4,800 initial individual landowners pledged sufficient acreage as collateral to the federal government to obtain funding for the Salt River-Tonto Creek Project (Smith 1986:39,45; Autobee 1993: 6). Typical subscribers to the Salt River Valley Water Users' Association in 1903 were cautious, small-acreage farmers fulfilling the Reclamation Service's image of the Jefferson's agrarian ideal.³⁵ Seventy-seven percent of the subscribers were individual landowners, solidly in possession of their acreage (Smith 1986:46).

Yet, the landowners on the south side of the Salt River still were hesitant to merge with the Water Users' Association. Although most Tempe landowners agreed with the values and opportunities available under the Water Users' Association, the Tempe Canal region decided to opt out, refusing to join the Water Users' Association. In the end, most Tempe Salt River Valley residents held the belief their district was in least need of the benefits of the stored water in the Valley. In addition, Dwight Heard and other minority project dissenters did own substantial shares in the Tempe Canal system (Plate 35)³⁶

³⁵ Early subscribers to the project were primarily farmers, between the ages of twenty and forty, married, originally from the Midwest and north central states. They lived in the rural areas of the Salt Valley, outside of the limits of Phoenix and Mesa. Fifty-eight per cent in Phoenix subscribed sixty acres or less, sixty-five per cent were sixty acres or less, while eighty per cent of Chandler-Gilbert landowners subscribed more than one hundred twenty acres each. Many landowners subscribed to increase the value of their land; without water rights the land had a lower value. Thirty-three women signed up for initial stock, most from the Midwest, thirty-fifty years in age, married to farmers, subscribing on average to acreages between ten and twenty acres (Smith 1986:46-7).

Tempe and Consolidated Canal Systems

Frustrations from Tempe's refusal to join the Salt River Valley Water Users' Association did not discourage the Association from moving forward with the water storage project. The Board of Governors of the Water Storage Committee was anxious to bring the Tempe Canal region into the project given that Tempe landowners held approximately 20,000 acres of vested water rights to the natural flow of the Salt River (Smith 1986:50). If the Water Users' Association were to acquire those rights, it would simplify determination of irrigated acreage and water distribution for the project. Compounding the problem, the Reclamation Service put pressure on the Water Users' Association to pledge as much land as possible to the project, which is to say, to try and persuade the Tempe Canal District to enroll in the Salt River Project helping to insure federal government costs would be reimbursed. Regardless, many Tempe landowners continued to side with Dwight Heard's arguments, choosing to remain in their own closed water canal system. Although subscription enrollments had closed, Reclamation Commissioner Frederick Newell insisted a waitlist be created by the Water Users' Association, holding out hope farmers in the Tempe region would reconsider.

³⁶ Others that opposed the Salt River Project selection were farmers in Pinal County south of Phoenix who strongly supported the San Carlos Project on the Gila River. This project would benefit the Gila River Akimel O'odham and open up homesteads on public lands in the project area. The San Carlos Project proposal was relegated to a list of secondary federal projects.

Tempe residents had a staunch belief that in the entire Salt River Valley, they alone resided in the best location, and were owners of the region's most productive and valuable farmland (Lewis 1965:238). Settler Charles Trumbull Hayden, considered the "Father of Tempe," arrived in 1871 establishing roots by building a flour mill and running a ferry service across the Salt River. That same year, groups of new settlers were handed tools and provisions to help facilitate the construct a low earthen dam stretching over a mile in length, located at approximately the same place the pre-contact Hohokam had diverted water from the Salt River for a southern flowing canal (Lewis 1965:231). The Tempe Canal was the only means by which farmers could get the Salt River water to the southeastern Valley fields to irrigate their crops. By the end of 1872, the Canal delivered water to more than 5,600 acres of farmland; by 1920, the Tempe Canal served more than thirty-eight square miles of Salt River Valley agricultural lands (SRP History). As per custom the Tempe Canal Company, as well as other Valley canal companies, employed a *zanjero*, or water master. The word "zanjero" is derived from the Spanish word "zanja" meaning *deep ditch* or *irrigation ditch* and "zanjon" meaning *ditch rider* or *overseer*. The *zanjero* marshaled men and tools for emergency repairs, collected assessments, and supervised the most critical obligation of the company, the equitable division and distribution of water (SRP History).



Figure 12: A prehistoric Hohokam canal has been incorporated into the Consolidated Canal in the eastern Salt River Valley (1906). Hand-tinted glass slide. Courtesy: Bureau of Reclamation

Veterinarian Alexander John Chandler arrived in the Salt River Valley in 1887, and immediately began to acquire desert lands in the southern region of the Salt River Valley. Backed by investment capital from Detroit, Chandler developed the Consolidated Canal Company by enlarging the Mesa Canal in 1895, subsequently controlling most of the early Salt River water distribution to the southern Valley (Figure 12). By 1900, Chandler Ranchlands had developed several thousand acres of southern Salt River Valley agricultural lands, acquiring almost 18,000 acres of farmlands south of Phoenix. Chandler's land holdings would be eventually incorporated as part of the Salt River Project, thus becoming a wealthy beneficiary when the federal government purchased his canal system as part of a unified water distribution plan specified by the Articles of Incorporation

in 1908 (SRP History).³⁷ After completion of the Roosevelt Dam and a stable water supply in place, Chandler was able to subdivide his land in 1911, developing a townsite that took his name in 1912, and a health resort hotel, the Hotel San Marcos in the southern Salt River Valley (Logan 2006:74).

Building the Roosevelt Dam

On June 25, 1904, an agreement was officially signed between the Salt River Valley Users' Association and the federal government, solidifying the 1903 federal authorization for selection of the Salt River Valley as a project site in accordance with the Reclamation Act of 1902. Once the torchlight parades ended and the celebratory mood of congratulations stopped reverberating through the Valley, the task to carve a dam out of rock and riverbed began (Autobee 1993:7). The Salt River-Tonto Creek water storage project was a reality, officially named the Theodore Roosevelt dam and reservoir, in honor of the President who signed the Reclamation Act of 1902 into law. In charge of the project was Louis C. Hill, supervising engineer; Arthur Powell Davis, chief engineer of the Reclamation Service; and Fred Teichman, design engineer. John O'Rourke's Construction firm

³⁷ The north side Salt River canal systems were acquired by the Salt River Valley Users' Association as agreed by the association's Articles of Incorporation, and approved for federal purchase in 1906. The Arizona Canal, its infrastructure and vested rights, along with the controlling interests of the Grand, Salt River, Maricopa, and Water Power Canal Companies and all vested water rights became incorporated in the SRP with financial outlays accessed by the federal government to be included in the total project costs. Repayment was part of the reimbursement agreement by the Users' Association members to the federal government (Smith 1986:58-67).

from Denver, Colorado, builders of the Galveston Texas Sea Wall segment completed in 1904, submitted the winning bid (Smith 1986:72; Autabee1993:7,10).

Reclamation Service Commissioner Frederick Newell commented that few reservoir sites had been chosen where natural conditions were so favorable, but the access so meager (Smith 1986:72). The solid, fine-grained sandstone cliffs with which the dam would abut provided the necessary masonry for erecting the dam. Surrounding raw materials provided onsite manufacturing for needed cement, a government sawmill could be constructed to cut timber from the nearby Sierra Ancha Mountains, and available water resources afforded hydroelectric energy to power machinery, avoiding freighting expensive fuel oil. Despite all, the Tonto Creek Basin reservoir site was sixty miles away from Mesa and forty miles southeast of the mining town of Globe, offering no good safe roads to accommodate dam site access, or secondary roads to link nearby available natural resources. Since the freight charges would dramatically increase supply budgets, the Reclamation Service proposed building their own wagon road supply line to the dam site from Mesa, a railhead for two competing rail lines.

The Mesa-Roosevelt Road began near Goldfield, Arizona on October 1903 on the Salt River Valley side, whilst in December, construction commenced on the upper end of the road in the Salt River Canyon just below the proposed Roosevelt dam site. The route followed was known locally as the ancient Apache Trail, shadowing the southern rim of the Salt River Canyon below the dam site, continuing the next thirty miles south on sheer cliffs and a ten percent grade, diverting at Mormon Flat to Goldfield with a final leg east to Mesa (Autabee 1993:8). With only three miles of the road completed, con-

struction was temporarily halted near Goldfield, pending the outcome of a plan by nearby communities to issue bonds financing the completion of the trail. Local town boosters were convinced they should shoulder the road construction costs assessing the possible economic benefits from the dam construction site. Phoenix and Mesa residents believed they would profit more from the freight route than the Salt River Valley Users' Association, thus insisting the road must be built as soon as possible. Congress gave approval for Phoenix, Mesa, and Tempe to sell the road construction securities (although Tempe did not take the trouble to sell any bonds). By June 1904, the Mesa-Roosevelt Road project had sufficient finances in place to increase the work force to four hundred men, many Apache, resuming construction when the temperatures were much warmer and where the terrain was more difficult. Freight began to move over the sixty-four mile Apache Trail route in December 1904. Early in 1905, spring floods followed by more fall flooding heavily damaged the road, washing away any attempted repairs. "[F]lood followed flood, each succeeding one greater than that before it, with hardly enough time intervening to permit repairs to be made before work was swept away again," delaying completion until 1909 (Smith 1986:75). The Reclamation Service reported in its *Third*

Annual Report to the Congress of the United States, 1904-1905:

The construction is expensive as heavy railroad work, the cost of some short portions reaching \$25,000 per mile; in others it fell as low as \$500 per mile (quoted in Smith 1986:76).

The final cost to complete the Apache Trail freight road was over \$200,000 (Autobee 1993:8).³⁸

Roosevelt’s curved, traditional gravity dam structure would become the Reclamation Service’s signature design, creating a motif of permanence and stability as a sublime state-of-art structure that symbolized modernity and the future (Figure 13). The aesthetics communicate grandeur and workmanship, imagery the early Reclamation Service sought to represent. Twenty-six immigrant Italian stonemasons, known as *rockmen*, arrived from Pittsburg in 1905 to carve the symbolic limestone masonry blocks



Figure 13: Roosevelt Dam, Centerpiece of Salt River Valley Project (1911).

³⁸ Some scholars claim the name “Apache Trail” was coined by E.E. Watson, a Southern Pacific railroad agent. Sometime after 1915, Southern Pacific’s *Sunset Limited* had the franchise on a special side trip in Arizona for its passengers to the Roosevelt Dam (Kollenborn 1989). The trail is still promoted as an historic byway trail.

that comprises the original face the Roosevelt Dam. Nearly 350,000 cubic yards of limestone were cut out of the nearby mountains to erect the dam structure (Autobee 1993:10). Each hand-hewn stone propounds a distinguished appearance giving the dam its iconic characteristics. Large boulders and mortar filled in between the limestone block faces of the dam. Although concrete replaced Roosevelt's block masonry in other future dam constructs, the simple gravity structural design and its curved form was the most conservative and permanent design yet devised, and the least problematic (Billington et al. 2006: 41).

The Italian rockmen represented one of many ethnic groups working on the dam, living in three separate camps surrounding the dam site. The O'Rourke's, Government Hill, and Roosevelt Camps offered some insight to the prevailing social attitudes of early twentieth century Arizona. Broad accounts describe an amalgam of ethnic cultures who broke rock, built roads, and drove teams across the Salt River Valley, yet were mostly segregated by position and living quarters. The O'Rourke's Camp was the contractors' accommodations, offering housing to its contract laborers. General statistics given by historian Robert Autobee indicate forty-two percent of contract workers were Anglos, fifteen percent Spanish emigrants, eleven percent African Americans, three percent Mexican nationals, and two percent Chinese. Records indicate no Amerindians or Mexican-Americans were boarded at the O'Rourke's Construction camp; approximately two hundred contract workers were employed at any one time by the construction company (Autobee 1993:11). Government Hill was the Reclamation Service's Camp, housing one hundred sixty-eight people, eighty percent Anglos and ten percent Italians;

the remaining ten percent were not identified or listed. The Roosevelt Camp housed government-hired laborers, supporting a worker-resident population of 2,000 in 1906 amid an ethnic mix that included native-Americans, Mexican-Americans, Mexican nationals, and Anglos (Autobee 1993:11). According to historian Robert Autobee, Roosevelt Camp's worker-residents built a water-sewage system, had a refrigerator plant, electricity and telephone lines, a vegetable garden, and a common bathhouse. The camp sported a jail, built to remind, as well as hold workers in violation of the Reclamation Service temperance laws. Engineers lived in cottages while workers lived in tents. Common laborers of all types were paid two dollars a day; drillers, two dollars seventy-five cents a day; carpenters, three dollars fifty cents to five dollars a day; and subforeman, three dollars fifty cents a day (Autobee 1993:10). The year before the dam's dedication in 1911, the 1910 census lists Roosevelt Camp's population as only 707 residents, with total abandonment of all three camps by 1912. Thirty workers died during the construction of the project, "one of the unforeseen costs of the Roosevelt Dam project" (Autobee 1993:11). Project engineering supervisor Louis Hill referred to many of the Anglo workers as hobos, while taking a paternalistic view of Apache laborers. Hill said of the Apache, "I do not know of any better class of workmen or unskilled laborers than these Apache proved to be. They were especially valuable to us in view of their ability to maintain themselves without an elaborate camp in some out-of-the-way-place" (Autobee 1993:11).

Conversion to a Multi-Purpose Project

The Salt River Project's original plans intended to build only the Roosevelt Dam structure to create water storage and flood control facilities. Unplanned revisions and supplementary structures to the overall storage dam project sharply increase pre-construction cost estimates. Construction on the Granite Reef diversion dam that began in 1906 was a negotiated addendum replacing the original auxiliary Arizona Canal diversion dam due to damage sustained by the 1905 winter floods. Cost-cutting measures to reduce the exorbitant freighting of fuel oil to the Roosevelt dam construction site triggered more changes: a single dam-building venture became a multi-purpose reclamation project to accommodate facilities to generate cost-saving hydroelectric power. Commissioner Frederick Newell now agreed with George Maxwell's earlier assessment that "every atom of electric power" should be developed to power infrastructure in the Salt River Valley by tapping into to nature's inexpensive power resource (Smith 1986:79). Modern dam building not only meant conducting the activity of irrigation, it was predestined to collaborate with the twentieth century's age of electricity. Historian David Nye observes hydroelectric power is an intriguing paradox, capable of producing the large quantities of inexpensive energy, quieter, serene, and in harmony with nature than smoke-billowing coal-fired steam energy, capturing some of the qualities of the old pastoral mill (Nye 1996:133).

Initially, the conversion of the Roosevelt dam construct to a multi-purpose project was touted as a source of additional revenue for the Salt River Valley Water Users' Association, selling inexpensive hydroelectric energy to consumers in the Globe-Miami-

Superior mining triangle and Phoenix township. This would allow the Salt River Project to apply the energy profits to repayment of the pending reclamation construction costs (Rowley 2006:152). The original Reclamation Act of 1902 did not make provisions for hydroelectric power, therefore Congress passed the Town Site and Development Act of 1906 allowing for the utilization of revenue from the production and sale of electricity to the construction of reclamation projects. In 1909, both the Salt River Valley Users' Association and the Reclamation Service envisioned additional power plants to "materially reduce the cost . . . of our irrigation works" (Kibbey quoted in Smith 1986:99). The Reclamation Service was persuaded to allow the Salt River Valley Water Users' Association time to complete the power plants and collect revenue to help pay the first remuneration payment. This delayed the opening the Salt River Project until 1911. The Users' Association assessed themselves two dollars per acre for two years to expand their hydroelectric power system (Smith 1986:102).

Finally, after much trial and tribulations, a telegram was sent to Africa informing former President Theodore Roosevelt that America's latest technological achievement was ready for its dedication. On March 18, 1911, the former President was greeted by an eleven-gun salute as he marched down the roadway followed by "some hundreds [sic] of his escorts, servants, employees, and workmen, including a phalanx of Apache Indians" (quoted in Autabee 1993:14). After completing his address to the large crowd, Roosevelt pressed the button releasing the mighty gush of water down the Salt River Canyon. Roosevelt Dam Project Supervisor Louis C. Hill told the gathered audience to think of the water in the reservoir as money in the bank, "Conserve your water as the

careful man does his bank account accumulated by years of self-denial” (quoted in Autobee 1993:14).

Sowing the Seeds of Agribusiness

Federal reclamation was a dual engineering problem – structural and human. The Roosevelt Storage Dam and water-distributing infrastructure brought some resolution to the physical limitations presented by the desert environment. As explained by historian Karen Smith, Commissioner Frederick Newell perceived the human element as “the wheels and ball bearings of the [irrigation] machine” (Smith 1986:156). Physical engineering problems could be eventually solved; the human element turned out to be not so predictable. As the Roosevelt Dam neared its dedication in 1911, and the federal obligation to the Salt River Project was nearing completion, western reclamation politics were in transition. Capital investments to irrigate crops grew one hundred percent between 1900 and 1910, and two-hundred twenty-six percent from 1910 to 1920 (Smith 1986:94). This rise in irrigation costs did not increase acres under cultivation. Western water users began organizing and challenging the federal government to grant greater subsidies for reclamation projects to meet these rising costs. Further, many nationally considered the federal government’s western reclamation scheme as building domestic infrastructure, insisting Washington should pay at least costs the Reclamation Act of 1902 failed to specify. In the Salt River Valley, disputes continued between old vested water rights and appropriation issues raised initially by Dwight Heard and the Tempe Canal irrigators. Salt River Valley landowners with well-established water rights

maintained they should pay lower project assessment rates than water users with no previous water rights. The J.W. Steward family of Mesa had a forty-acre irrigated farm and wrote then-President Theodore Roosevelt in 1908:

We think as do hundreds of others that we ought not to have to pay the same price for the Roosevelt Dam as do those who have no water rights, or that our ditches and rights shall be thrown into the common fund and we will pay whatever Mr. Hill thinks the canals are worth at the present. (quoted in Smith 1986:94)

At the 1909-projected repayment charge of forty-five dollars per acre,³⁹ costs to the Stewards for the federal reclamation project apportioned equally among water users meant approximately 1800 dollars in project repayments over a ten-year period to the federal government and the Salt River Water Users' Association annual dues of fifty dollars to one-hundred dollars. In addition, the Stewards had normal irrigating expenses, farm labor wages, and taxes to budget (Smith 1986:95-6). The initial purpose of federal irrigation expounded by early reclamation crusader William Smythe and others was for the yeoman farmer and homemaker to return to the land and practice the Jeffersonian ideal. In reality, this came with an unanticipated cost. Farmers on irrigated lands faced higher overhead costs than non-irrigated farms, yet both farmers sold their crop at the same price. Although the average crop value in the Salt River Project was one-thousand six hundred ninety-nine dollars per farm, the highest average crop value among all the early reclamation projects, there was little profit to be made for the small farmer after project repayments and farming expenditures (Smith 1986:111). Consequently, the small landowner holding vested water rights in the Salt River Valley had more to lose

³⁹ Autabee cites repayment of sixty dollars per acre (1993).

with federal reclamation than without. In contrast, speculators with large land holdings, such as A.J. Chandler, saw the value of their arid lands increase with reclamation selling off valuable surplus lands to make a tidy profit. In 1911, seventy-two per cent of the total irrigable land in the Salt River Project was available, however only fifty percent was actually irrigated (Smith 1986:95). Overall, Newell and the Reclamation Service paid little attention to economic development within the project and the income producing capacity of the land, focusing rather on the feasibility of the project from the perspective of the land's market value (Smith 1986:121). Mormon agriculturalist John Widstoe wrote, "Colonization, social development, and all other needs of the irrigated West depend on a readjustment by which the farmer can meet the obligations from his land income and yet live as men should" (quoted in Smith 1986:121).

The promise in the revival of Jeffersonian idealism espoused by Progressive era technology was beginning to be questioned. National reclamation authority had conflicts with local farmer interests. The turn-of-the century reclamation optimism and communal spirit evolved into negotiation where compromise ensued, making the vision of the original Jeffersonian ideal of individual rights at odds with the Progressive social democratic crusade. What was initially reform, eventually created red-tape bureaucracy as the federal government was seeking to placate the individual difficulties and demands of the small farmer. The Salt River Project, as did other reclamation projects of the era, did reach a compromise extending the burdensome repayments to the federal government over twenty years, somewhat easing the load for the small farmer. Yet by 1915, federal reclamation had shifted its policies. Gone were the enthusiasms for the

Jeffersonian philosophy and the Roosevelt conservation ethics, reliance on the scientific experts making all the decisions, and the devout irrigation crusaders and their crusades. The Reclamation Act of 1902 begetting change to re-introduce the Jeffersonian principles for a new social class instead fell victim itself to change introduced by the new, complex twentieth century economy. By 1917, world politics had redirected resources, labor, and energy away from national Progressive reform movements such as reclamation, to methods of increasing the nation's food and cotton fiber supply. Goodyear Rubber Company in 1917 pioneered corporate farming in the Salt River Valley, planting twelve-thousand-acres of cotton west of Phoenix (Logan 2006:78; Plate 36). That same year, Interior Secretary Alexander Vogelsang suggested the federal government draw up a contract turning over the operations of the Salt River Project to the Water Users' Association in part, to stem the tide of controversy concerning repayment of the general project debt. During the period between 1925 and 1930, the Users' Association through private funds built several more dams on the Salt River primarily to increase hydroelectric capacity of the project. The Mormon Flat (1925), Horse Mesa (1927), and Steward Mountain Dam (1930) were built during this era.

Making the Desert Bloom: A Paradoxical View

Making the Desert Blossom proclaims machine-age culture has enabled humans to tame nature under any conditions, creating a new world of abundance and prosperity. The individual elements found in MacKenzie's mural – the physiography, the Roosevelt supporting dams, canal systems and their stories – exemplify the nature-culture struggle

that epitomizes the new values of the modern world. Early irrigators deemed nature was no longer a significant obstacle in the economic development of the West, curiously amidst the image and romance of the old western frontier. It can be questioned however, that MacKenzie's mural implies a false, paradoxical view of the 1928 Salt River Project, conveying reclamation can sustain the notion of a Jeffersonian ideal created from the miracles of modernity.

Muralist Frank MacKenzie portrays the Salt River Project as the ideal, a romanticized version of Reclamation Service paradigms that were more than a decade too late. The mural attempts to extract a landscape gently shaped by new, technological progresses resulting in environmental change for the better. It illustrates an agrarian idyllic model of modernity, reaching out to evoke a feeling of nostalgia, reminiscing for the Jeffersonian ideal, a patriotic American nationalistic symbol. The painting displays new strains of farming, suggesting traditional western frontier values can still be practiced by the yeoman farmer and homemaker in a modern 1920s world. Water can be carefully controlled to perform its *duty* as an extension of human will, exemplifying the reasoning and intellect of the Anglo-American work ethic, stirring the imagination with possibilities of wealth and prosperity. Raw natural resources were there for the taking to be used for the betterment of humankind, i.e. for the Anglo-Americans.

The mural landscape illustrates aspects of continuity with Anglo agricultural practices with no indication of other cultural landscapes. There is no indication of the pre-contact Hohokam, or their canal infrastructure as the first major irrigators of the landscape, besides being devoid of other ethnic cultural evidence. Human figures are

absent from the canvas leaving only an assembly of an orderly modern scene engineered by the federal government for the good of its citizens. Progress erases the primitiveness of the desert, allowing nature to yield a bountiful harvest to the hard working farmer. Notably, the mural celebrates the broader American culture of “the engineer,” achieving heroic status during the early twentieth century, helping erect an American material empire both nationally and internationally (Round 2008:57). Was the Bureau of Reclamation paying tribute to its own enterprise?

Author David Teague recounts how Americans absorbed deserts into the national myth of progress and destiny:

First, deserts challenged the country to fulfill its obligation to spread Anglo-Saxon industrial civilization. The nation wouldn't have its continental house in order until the deserts were “reclaimed.” Second, the deserts, because they were some of the harshest landscapes on the continent, became the ultimate place in which to pursue the “strenuous life” to work against perceived moral values and racial decay that Americans such as Roosevelt had begun to feel followed directly on the heels of civilization. Third, the desert, strange and different looking as it was, did not lend itself to immediate aesthetic appreciation. It became a challenge to not only the strength, practicality, and grit of white Americans who came to it; it challenged their higher sensibilities. (Teague 1997:98-9)

Phillip Round maintains Anglos saw the desert in terms of race; the heroic whites pitted against unwashed and uncivilized natives (Round 2008:10). In 1902 journalist and social reformer Ray Stannard Baker interestingly expressed his viewpoint insisting “the Southwest is peopled by the very best Americans” because the deserts had not attracted immigration by “Italians, Russians or the lower class of Irish, most of whom are city dwellers” (quoted in Teague 1997:103). The desert landscape by some, cried out for racial as well as technical reclamation (Round 2008:11).

MacKenzie's mural is a charming portrait, on its face. But it is simultaneously a chronicle of cultural struggles, an account of battle of positions, in a sense, raising the question of who has the right to tell a story at the time that best suits self-interests, economics, and culture. MacKenzie's mural relates these western American themes using a humid Eastern palette of pastoral romance in desert reclamation. With a "mental imposition of order, a parcelization of the earth's surface," MacKenzie's mural demonstrated the power to transform "space – an abstraction – into something more specific and limited" (Round 2008:14). No matter how elemental or how timeless foundational landscapes tend to be, the imposition of modernity leaves the impression of change. Reclamation is a landscape of change and evident migration, a characterization of "betweenness of place" as well as a struggle within place (Round 2008:14).

The American "pilgrim" imagery, sending settlers out to the frontier to do God's work, now included the desert. Humans had religious faith in technology, accepting nature and the natural landscape as a laboratory waiting for America to reinvent itself. Irrigators had the technology, the cockiness, and belief there were no longer any obstructions to conquer the arid West. Modernity was the future. The American inventiveness to reclaim the arid West was in engineering, and not in the cultural reawakening of the yeoman farmer and homemaker. Desert reclamation came with a hefty price tag, beyond the economic resources of most small time farmers. Failure could be found in the Reclamation Services policies that focus on the engineering viability of the project and increasing land values, rather than the projected income producing capability of the

homestead. Reclamation Service engineer Frank Hanna wrote to Frederick Newell in 1913:

The farmers on the Salt River [P]roject are generally in the best financial condition of any the projects of the Service I have thus far inspected, [but] the wealth of the farmers are not evenly distributed and there are some people on the project who are in hard financial circumstances. (quoted in Smith 1986:120)

The Jeffersonian ethic was renascent in the Reclamation Service. But in its embrace of a hundred-year-old mystique, the agency demonstrated it was out of touch with the twentieth century cultural and economic realities.

Chapter Five: Epilogue: Remaking . . .

*Way out West in alfalfa land,
 where waters 'rest fit to be dammed
 is good enough for me.
 If you miss me when the blizzard blow,
 for you know where I am.
 And you can join me down in Phoenix
 where Teddy built the dam.*

– *Unknown SPR History*

Places in the West rise and recede from the ecological realities of their space. Many people are desirous to inhabit localities that are warm and dry – a notion incongruent with sustaining a population in an arid desert region. Paradoxically, metropolitan Phoenix boasts over three hundred days of sunshine and scores of well-manicured golf courses. Yet, with an annual precipitation average of only seven inches, the City of Phoenix's "Water Resources Plan: 2005 Update" is avoiding the inevitable: modeling for a scenario for climate change. On the one hand, the City of Phoenix agrees that climate changes may trigger water shortages, and on the other, declares it would be "difficult to predict the exact impact" (quoted in Powell 2008:239). In the first decade of the twenty-first century, agencies from the federal Bureau of Reclamation to local governments seemingly dodged efforts to confront the realities of climate change and society's increasing demands for water. Although Colorado River Basin models forecasts a warmer climate for the Southwest, models do not foresee an increase in precipitation for the immediate future (Powell 2008:180). Warmer temperatures will reduce the mountain

snowpack, snowmelt will occur sooner, and evapotranspiration rates from snow, soils, and vegetation will increase, ultimately decreasing runoff in the Colorado River Basin. Consequently, the American Southwest will be facing a new twenty-first century climate quandary: producing a razor sharp balance between supply and demand for water, especially in arid regions.

Environmental writer James Powell in the book *Dead Pool: Lake Powell, Global Warming, and the Future of the Water in the West* creates an imaginary, possibly far-fetched scenario for Phoenix, the Salt River Valley, and the general Colorado River Basin, based on assumption climate change will reduce the flow of the Colorado River by ten per cent by 2050. Powell's timeline begins in October 2007, using modeled data from two sources: (1) historic Colorado River flow-cycle patterns starting in 1950, and (2) regional climate predictions forecasting overall rising temperatures for the Colorado Basin region (Powell 2006:231). For over forty years, Phoenix and its metropolitan region experienced astounding population growth from 330,000 in 1950 to nearly four million in 2007 (Powell 2008:238). During these boom years, central Arizona used its groundwater resources to augment Salt River Project supplies, drawing water so rapidly that in some places, the water table fell 300 to 400 feet (Powell 2008:238). Despite the Arizona Groundwater Management Act enacted in 1980 to reduce groundwater usage, developers found loopholes in the water laws, continuing to draw down groundwater supplies while all along trusting that the federal Central Arizona Project (CAP) would fulfill impending future water needs. Based on these present trends, Powell projects by 2020, the population of metropolitan Phoenix could well surpass the six million people,

sprawling out on the raw desert in an area larger than the state of New Jersey (Powell 2006:238). Further as temperatures rise, Powell visualizes Phoenix would become a 'mad-dash culture,' seeking refuge from one air-conditioned location to the next, creating energy demands that would exceed supply. Although his scenario envisions water conservation measures lowering per capita consumption to 210 gallons per day, Powell predicts water supplies would still be inadequate to meet demand (Powell 2006:238). The Salt River Valley's once-famous pristine air would continue to suffer the effects from degrading air quality caused by increasing air pollution enhanced by escalating regional forest fires, dust from the dried Salton Sea, and other climate-related sources. Powell continues his treatise on the demise of Phoenix and its impending doom, creating a *Grapes of Wrath*-like exodus with long lines of vehicles clogging the freeway heading "east toward the Mississippi and north towards Oregon and Washington . . . [b]urning hot, parched, and broke, the city that rose from the ashes achieves its apogee and falls back towards the fire" (Powell 2008:240). While a hypothetical, almost preposterous picture, Powell recognizes the West has to change the way it manages and utilizes water, ending government subsidies to agribusiness, and intensifying inventiveness for greater water efficiency-use—measures which could possibly save millions of additional acre-feet of water per year, and may give the West time to adjust to the new climate of rising temperatures.

"Phoenix is a place, like much of the West that has been built on population growth as the goal . . . [a]ll of the tax structures, all of the infrastructure, everything," said Grady Gammage Jr., former board member of the Central Arizona Project (CAP),

expressing his insecurities about Arizona's future growth (quoted in Jenkins 2005).

Gammage continued:

Arizona has always felt insecure about its image as a place that was so dry, people couldn't live here . . . [t]he standard equation people do on [*sic*] Phoenix says that we have enough water supply for 10 to 15 million people here . . . I think that is a bad idea. I think we should use whatever management tools we have to flatten the horizon of a place like Phoenix at something like 5 to 7 million. (quoted in Jenkins 2005)

The current Phoenix metropolitan area relies on a mix of water sources – CAP, the Salt River Project, and groundwater – that in the short-term may be sufficient water sources but in the long-term outlook may not be so good. Predictions are droughts could be more frequent, more prolonged, more severe, and more widespread. Phoenix has traditionally planned for seven- or eight-year droughts, longest experienced in the Salt River Project during the past century, but a University of Arizona study “is showing us that 20 to 30 year droughts can happen,” suggesting current contingencies may be inadequate for the future (Jenkins 2005).

Arizona's CAP allotment in the hierarchy of Colorado River water leaves the state at the tail end of the list. Many in Arizona still have not forgotten the “promise of augmentation” from the pipe-dream Pacific-Southwest Water Plan (PSWP) to take water from the Columbia River proposed in the 1960s (Jenkins 2005). Although Arizona has been banking surplus CAP water in groundwater aquifers as mandated by the 1980 state legislation that created the Central Arizona Groundwater Replenishment District, the data from 2002 says the Phoenix Active Water Management Area used approximately 200,000 more acre-feet of groundwater than it recharged (Jenkins 2005). Further, the

Arizona Department of Water Resources has forecasted, “[A]ll credible projections for the year 2025 indicate that we will still be in a [water] overdraft situation” (Jenkins 2005).

Traditionally, the operative principle behind water management in Arizona was faith that water would remain a relatively stable resource, grounded on development pattern schemes converting desert to reclaimed farmland, followed then by building residential and urban centers on the former farm acreage. In theory this ideology promoted the logical progression of replacing agricultural lands with homes and businesses in order to redistribute the region’s water supply, leaving a false impression that more allocations for water were available, allowing for future growth (McKinnon 2005). This proved to be a reasonable notion until developers began increasing the regional density by squeezing more homes per acre, eventually leading to a higher water consumption rate per acre than the previous agricultural land practices (McKinnon 2005). “We’re actually seeing even greater density on [Salt River] project lands [than expected]” said Bruce Hallin, SRP manager, “With more apartments or high-rise buildings, water use per acre could rise in the future” (quoted in McKinnon 2005). New urban growth and expansion in the Phoenix Basin and the Salt River Valley now builds on raw desert. Few agricultural acres remain available to be converted to urban-suburban uses in Maricopa County. Water will have to be allocated to new future developments where it has not been used before, forcing the region to plunge into water reserves, which is to say, tapping groundwater storage. Officials have faith the small remaining SRP agricultural and CAP

allotments still can cover the Phoenix metropolitan area for a decade or more, but cannot say for certain what lies in the future (McKinnon 2005).

The historian Donald Worster rightly regards nature as “participating in an unending dialectic with human history . . . intertwined in an ongoing spiral of challenge–response–challenge, where neither nature nor humanity ever achieves absolute sovereign authority, but both continue to make and remake each other” (Worster 1985:22). Humans continue to challenge the desert by using its environment deceptively, forcing its concepts of space and time onto a seemingly malleable environment, transitioning an arid geography into a new sense of place.

American attitudes have had limited relevance for arid lands. As explained by author Patricia Limerick, pioneers initially feared and disliked nature in the form of wilderness. Nature and wilderness overpowered the early pioneers. Fear and powerlessness in the wilderness was transitioned into a struggle for mastery of nature, gradually shifting the balance to the side of humans, by that very fact making them no longer pioneers. The completion of the conquest of nature made it possible to appreciate nature, creating national parks and wilderness reserves on human’s terms (Limerick 1985:172).

Yet, this model is illusionary in the desert, as final mastery can only remain limited. The basic scarcity of water allows only conditional, even partial appreciation of the overall desert environment. Albeit groundwater mining and reclamation technology have allowed temporary transformation of arid landscapes to advance the interests of agriculture, urban growth, and recreation, nature still controls the elemental water and thus has the upper hand. Eventually, the depletion of aquifers, excessive demands on

rivers, and the new climatology will provide a clear conclusion about the culture-nature desert dynamism. Nineteenth century territorial expansion merged with twentieth century economic development left few limitations on American territory with the exception of deserts, in which nature seems to draw a line in the sand with humans. Can the line be held?

Irrigationists deny the final reality of the desert. Large-scale manipulation of water temporarily makes the desert suitable for agrarian life. There was a paradox to use modern technology, supported by federal subsidies, to reinvigorate the Jeffersonian ideal bringing yeoman farmers and homemakers to lay claim and settle the so-called last frontier. It may be asserted reclamation expansion dissolved the human-nature boundary in the desert over time, but only temporarily. Fundamentally, nature and the annual precipitation in the desert does not change; it was the impetus from reclamation that changed the character of the landscape. Cost overruns and federal repayment schemes caused disillusionment among the small early farmer, making small farming more costly with federal reclamation than farming with vested water rights. Historian Karen Smith maintains Newell and the Reclamation Service paid little attention to economic development within the project and the income producing capacity of the land, focusing rather on the feasibility of the project from the perspective of the land's market value (Smith 1986:121). Perhaps federal reclamation was a step to finish the Manifest Destiny. For those mastering the continent, the desert was an irrational environment, a deception to the promise fulfilled elsewhere in the Union. The American agrarian ideal was never put through a more trying test as it confronted the aridity of the West. Still, early

twentieth century reclamation may be considered the intermediate landscape, providing the framework for transforming western arid desert to a modern American urban society.

The Salt River Project has outgrown its primary purpose of constructing federal reclamation infrastructure in the Salt River Valley for agricultural irrigation. Harnessing the desert's natural resources to make the arid land fruitful by men and plows was a shorted-lived concept. Taming the central Arizona desert was about economics maintaining a steady growth. Control of the Salt River providing a reliable source of water began the initial land rush to Arizona; however, it was quickly realized early in the twentieth century that energy in the form of hydroelectric power, a by-product of reclamation delivered to businesses, mines, and homes, was the key to sustained growth. As the population grew, more dams were constructed by the SRP to deliver the growing demand for water and electricity. The critical decade of the 1930s and depression-era brought transformation to Phoenix and the Salt Valley economy with the construction of the Bartlett Dam on the Verde River. This dam expanded the economic base of Phoenix, not only providing needed jobs and resources to critical to World War Two industries, but created a new era of prosperity and growth from those military-industrial enterprises that continued into the post-War era, re-energizing the Sun-Belt migration. Air-conditioning was the last technology that finally conquered the desert environment. Encased and insulated, residents of Phoenix could ignore the harsh desert climate, and local boosters were ready to attract world-class industry and their employees. Amidst this manufacturing transformation, agricultural lost its prominence in the region by the

1950s; manufacturing was the leading source of income in Phoenix and surrounding areas. Agriculture slipped to second while tourism occupied the third place as main sources for income (Logan 2006:148). Phoenix was in a sharp boom cycle, and there was no looking back.

Today, the vestiges of the Salt River Project augment water supplies for the Phoenix metropolitan area, irrigate remaining agricultural fields, provide needed flood control, and create recreational facilities. The “Scottsdale Waterfront” on the south side of the Arizona Canal is adapted SRP infrastructure turned shopping pedestrian mall; jogging and hiking trails line the old canals, and reservoirs provide outdoor recreation opportunities accommodating historic culture with the present-day landscape. After the floods in the winter of 1980, the Roosevelt Dam has been restructured seventy feet taller, increasing its capacity by twenty per cent (Figure 14). Yet, I do not believe the Reclamation Service engineers envisioned the Salt River Project sowing the seeds for this contemporary urban industrial economy. Nathaniel Southgate Shaler, dean of the Lawrence Scientific School, in 1898 suggested that Americans learn to see their continent as an aesthetic resource rather than an economic resource. As a critic of the massive post-Civil War resource exploitation, Shaler wrote:

The habits of civilized life tend to separate men from the charm of the world around them . . . [t]he insistent activities which are the price of success, in the effort to win harvests of and immediate profitable kind, fix attention on certain limited fields of the environment, and necessarily exclude all recognition of the larger features of nature. (quoted in Teague 1997:113)

Shaler makes a further argument for nature, warning the tendency to ignore nature

[represents] no new state of man; by the demands of economic life, the primitive savage and the barbarian have ordinarily followed in path of the prehuman species whence they came, giving no more heed to scenes about them than needs called for. Now and then, in moments of poetic exaltation, the beauty of the natural realm has forced itself on their attention, but only rarer spirits see there is a great field to be won for the profit of man. The art of appropriating landscape is not a lost art, but one which is yet to be invented and applied to the profit of our kind. (quoted in Teague 1997:113)

Western Americans, and for that matter their eastern brethren who governed the disorderly occupation of the American West, have never learned to value nature in and of itself, other than for its economic potential. Shaler saw need for a progression in society, a social evolution, as the next and necessary steps in the nature-culture relationship, and a precondition needed to advance nature's aesthetics. To understand the arid lands, in Shaler's view, required an advance in American sensibilities.

Desert lands are to survive, not to conquer. Yet, as Teague points out, "The very devices that make the desert wilderness accessible to our aesthetic sensibilities also makes them accessible to industrial capitalism and recreational tourism" (Teague 1997:125). The Americans of 1902 had a scheme to bring a nation seemingly to heel, and their way of looking at the arid lands was a function of that task. But fully a century later, there is a lesson to learn from those early tamers that we would do well to take notice.



Figure 14: *New Theodore Roosevelt Dam, Apache Trail* (2012). By K. Heslop.

Plates: Chapter Two



Plate 1: Top: *The Schuylkill Chained aka the River Enchained* (1825). **Bottom:** *The Waterworks aka the River Freed* (1825). Sculptures by William Rush.



Plate 2: Arid Region of the United States: Showing Drainage Districts Part II. Plate LXIX. (1890-91). Illustrating hydrographic basins.

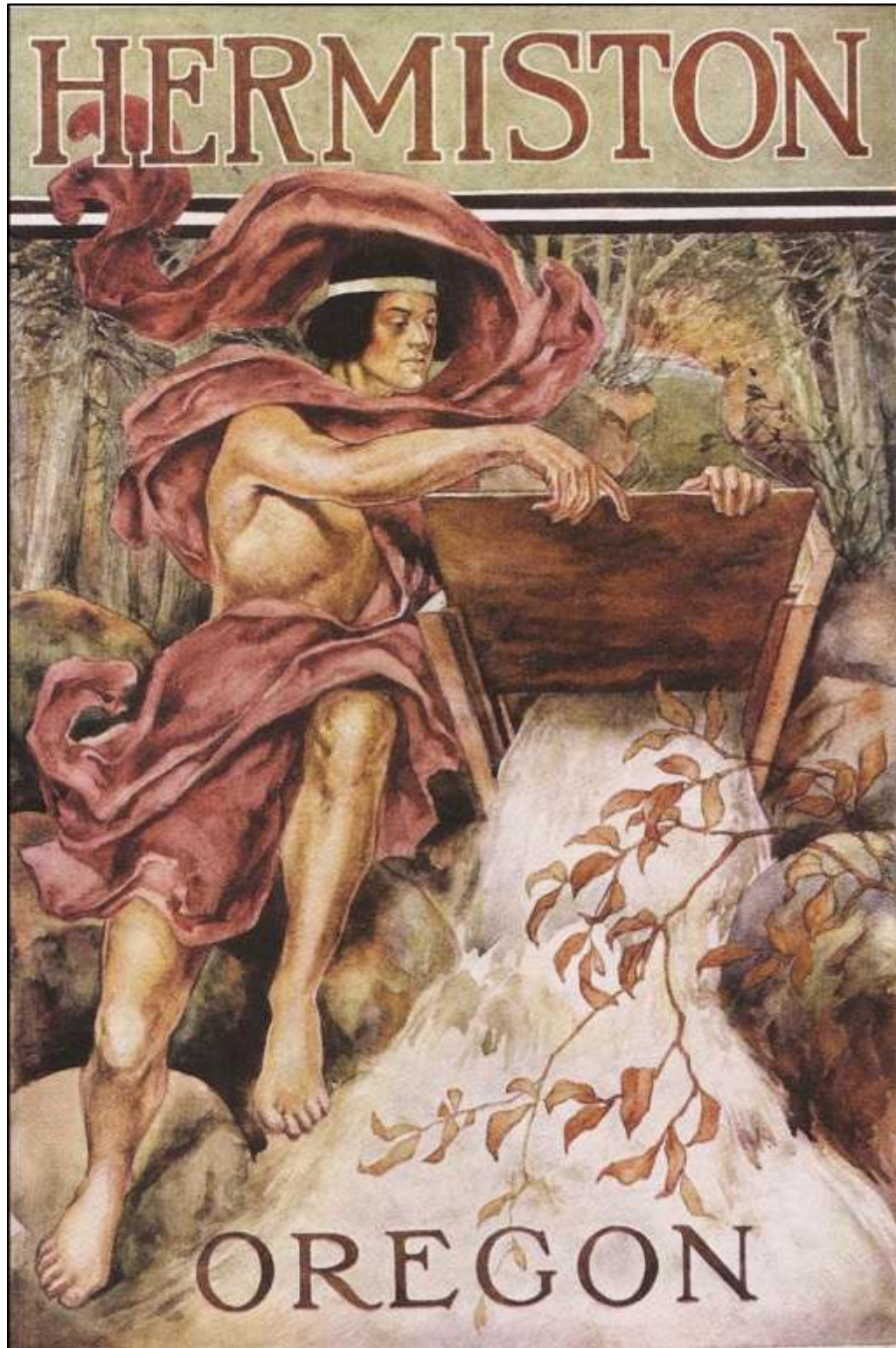


Plate 3: *Hermiston*, Umatilla Project Development League (1910).

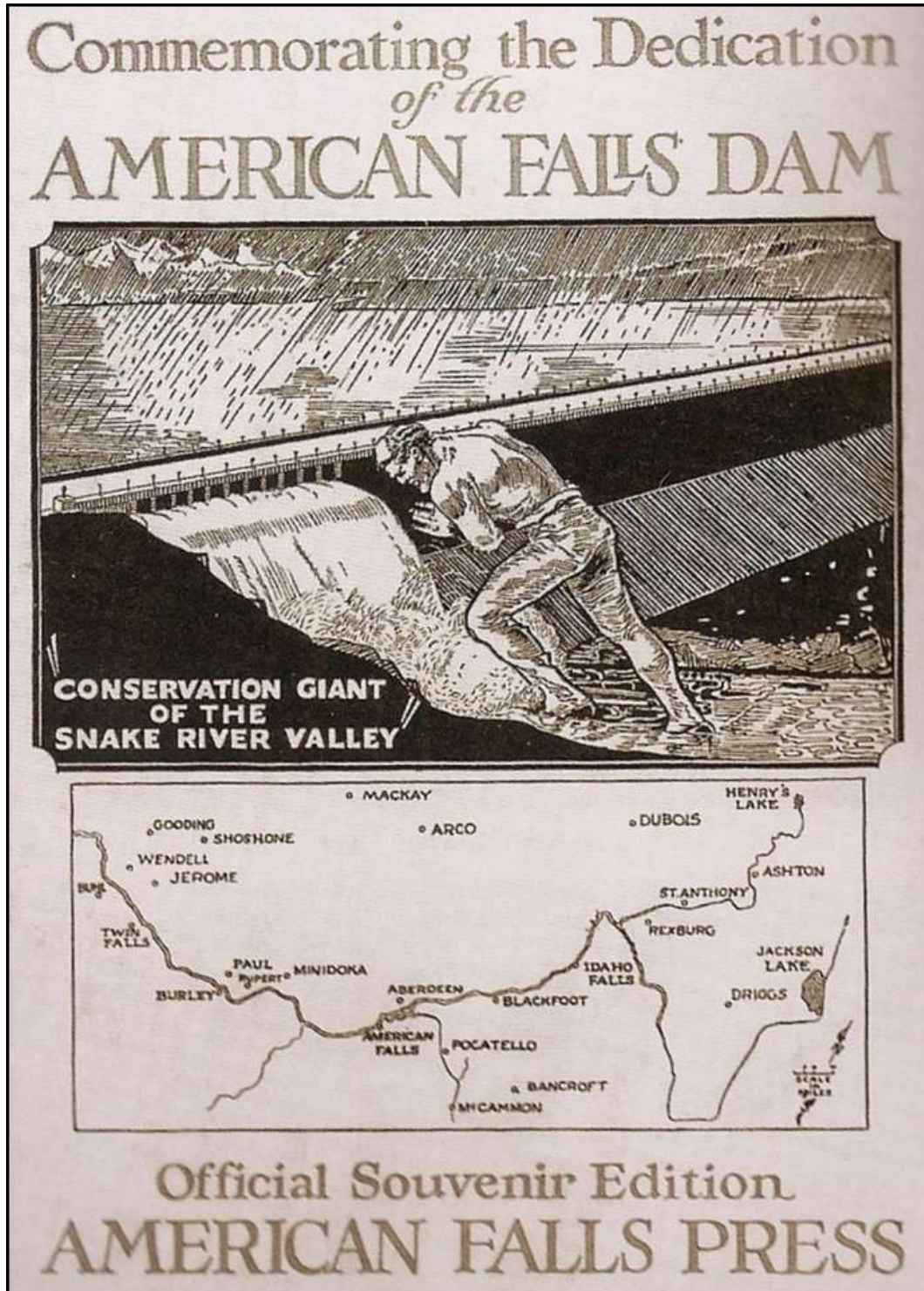


Plate 4: Commemorating the Dedication of American Falls Dam (1927).




Plate 5: Commerce Agriculture Arizona: The Salt River Valley (1929).



Plate 6: A King among Date Trees in the Salt River Valley postcard (Pre-1930).

Salt River Valley, Arizona

The Land of Sunshine, Health and Prosperity :: No Snow, Ice or Cyclones



THIS Valley offers the greatest inducements to the capitalist, the homeseeker, the laborer and the tourist. The mild winter climate brings great relief to those who are tired of cold winds, snow and ice. The fertile lands of this famous valley will grow to perfection wheat, barley, oats, alfalfa, cantaloupes, watermelons, figs, grapes, strawberries, oranges, grapefruit, olives, dates, sugar beets, and all kinds of vegetables. The lands have doubled in value during the past six months, owing to the great progress being made by the U.S. government in building the great Tonto dam and reservoir which will supply these lands.

For illustrated booklet send four cents to any of the following :

COMMISSIONER OF IMMIGRATION
Phoenix, Arizona

BOARD OF TRADE
Phoenix, Arizona

CHAMBER OF COMMERCE
Mesa, Arizona

Plate 7: Salt River Valley, Arizona: The Land of Sunshine, Health and Prosperity (1907).



*Apache Trail
Highway
and Roosevelt Dam*

STOP in Arizona on your "Sunset" way to California and view the wonders of the Apache Trail Highway. A glorious automobile side trip among the crags and canyons once the strongholds of the marauding Apache.

Beautiful Roosevelt Lake, like a mirror in a mountain bowl—Roosevelt Dam that fairly staggers you by its magnitude, out rivaling Niagara in height—time-worn cliff dwellings, old as Babylon—and everywhere, over fertile mesa and towering peak, color, vivid, prosy, amazing in its many tones. A unique blending of the fascinating and awe-inspiring. Don't miss it!

SUNSET LIMITED

New Orleans San Antonio El Paso Tucson
San Diego Los Angeles San Francisco

Operated daily over a mild, sunny route all the way. Observation Car, Through Dining Car and other comforts of modern travel. Daily Through Tourist Sleeping Car Service between Washington, D.C. and San Francisco.

Tri-weekly sleeping car between New Orleans and Globe, for the 120-mile detour by automobile over the APACHE TRAIL Highway also between New Orleans and San Diego via the San Diego and Arizona Railway for San Diego through the CARIBISO GORGE.

For information and business address
SOUTHERN PACIFIC LINES
New York New Orleans
105 Broadway Pacific American Bank Bldg.
Houston El Paso
Southern Pacific Bldg. Texas Bldg.
San Francisco, Southern Pacific Bldg.

Take the
Sunset Route
to California
Every mile a scene worth while



Plate 8: Sunset Route California Southern Pacific Line Roosevelt Dam Apache Trail (1923).

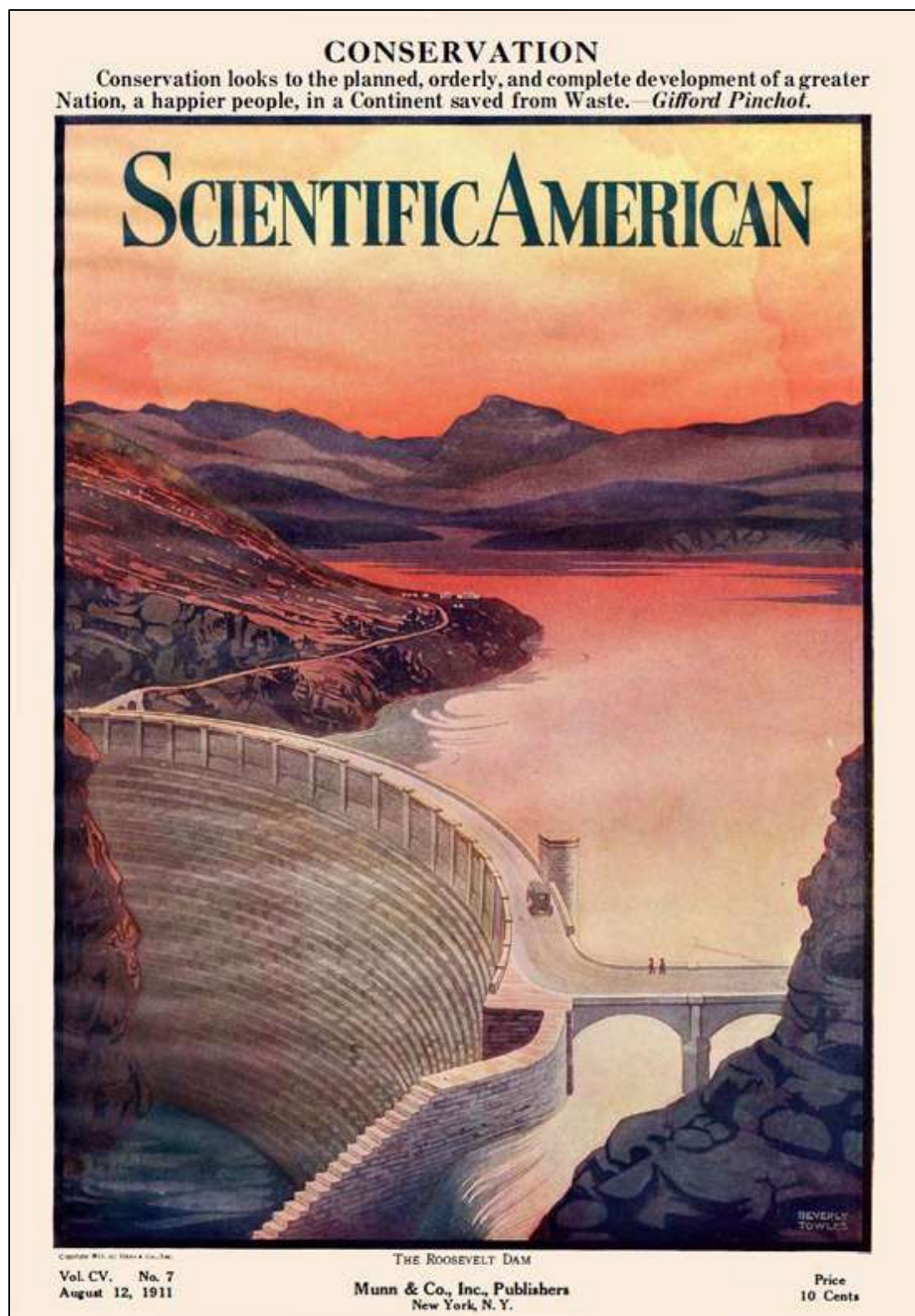


Plate 9: *The Roosevelt Dam* (1911). Artist: B. Towles.



There is but one master drawing pencil. Some day you will try it, and then forever after, one name will come quickly to your mind when you think of the best pencil you have ever used. And that name is

**DIXON'S
ELDORADO**
"the master drawing pencil"

JOSEPH DIXON CRUCIBLE COMPANY, Pencil Dept. 119-J, Jersey City, N. J.
Canadian Distributors:—A. R. MacDougall & Co., Ltd., Toronto

 **SAMPLE OFFER**
Made in 17 leads—one for every need or preference. Tell us the kind of work you do, and we will mail you full-length free samples of the best pencils for your particular needs. Also write for booklet—"Fixing Your Pencil."

Plate 10: Roosevelt Dam Dixon Pencil Advertisement (1920).



Plate 11: *Boulder Dam across the Colorado River* (1942). Photographer: Ansel Adams.



Plate 12: *Construction Nears Completion, Boulder Dam.*

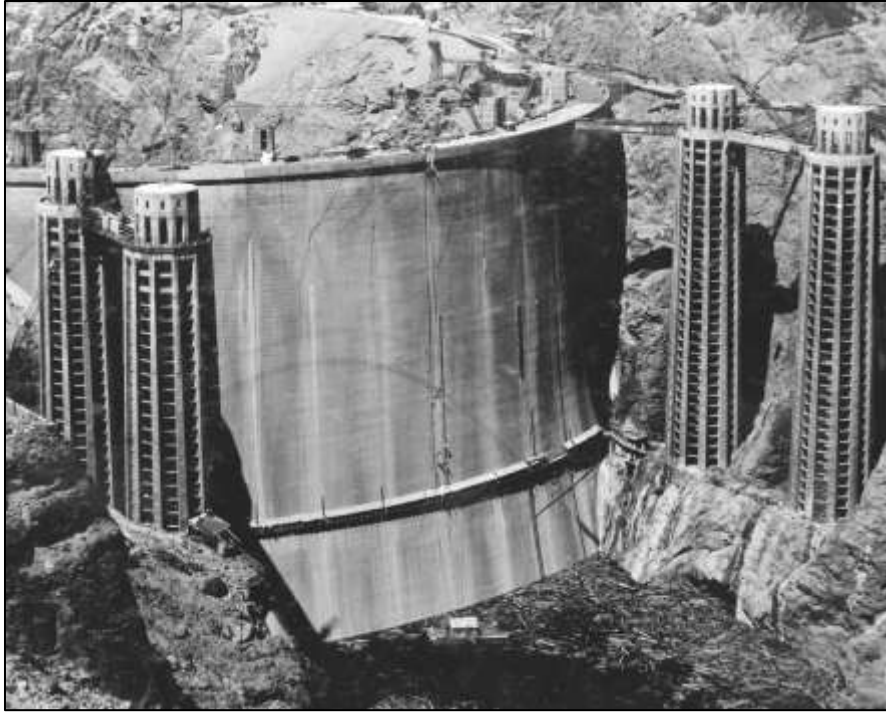


Plate 13: Top: *The Upstream Face of the Dam and Appurtenant Works as Seen from High Point Upstream on the Arizona Rim of Black Canyon. Water Surface Elevation 790 Feet (1925).* **Bottom:** *Hoover Dam (1972).* Photographer: Alan Band.

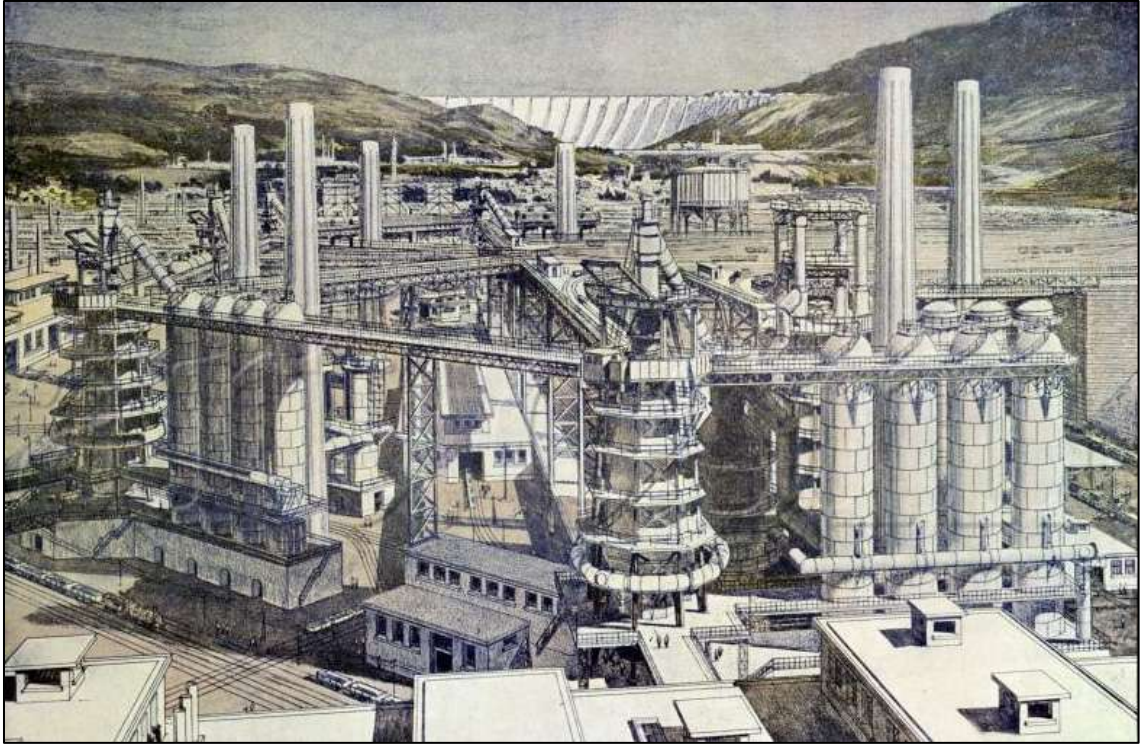


Plate 14: *Smelting Furnace* (1917). Artist: Tony Garnier.



Plate 15: *Aerial View Waterdam* (1917). Artist: Tony Garnier.



Plate 16: *Aerial View the Embankment over the Valley* (1917). By Tony Garnier.



Plate 17: *Power Plant Città Nuova* (1914). Artist: Antonio Sant' Elia.

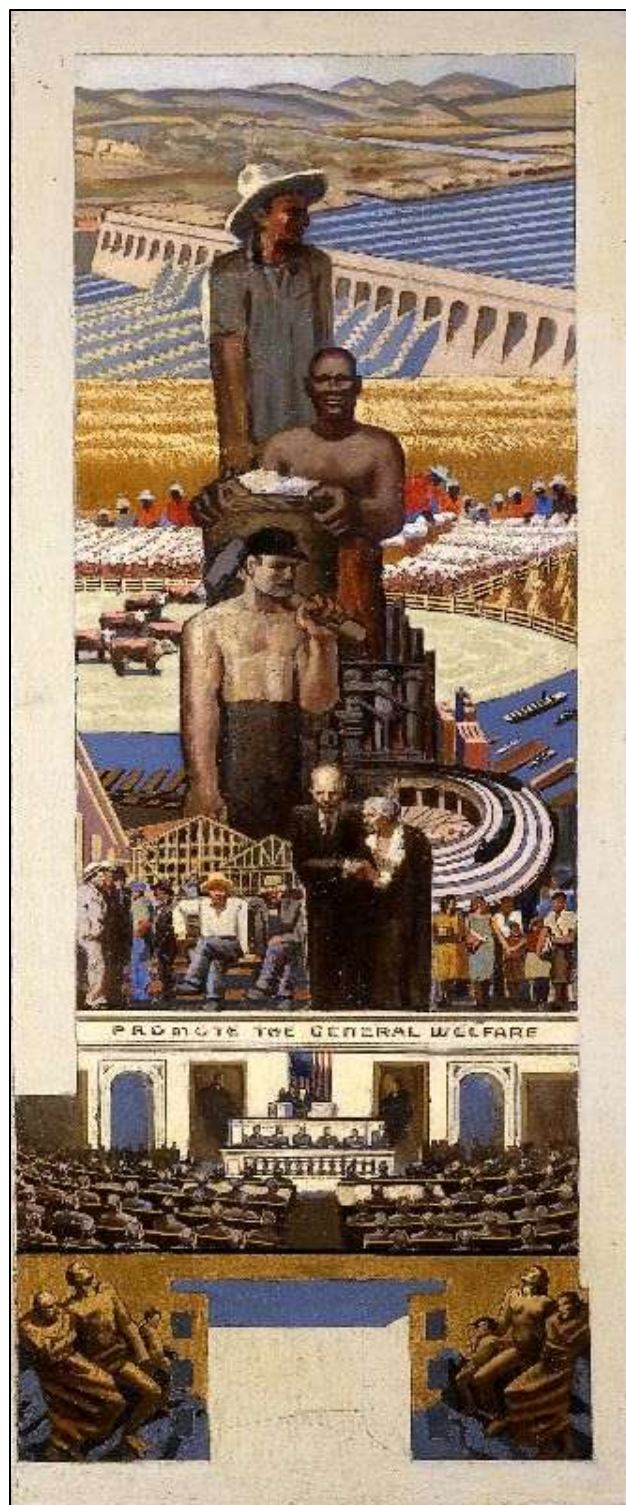


Plate 18: *Promote the General Welfare* (1939). Artist: Roy Grossman.



Plate 19: Irrigation Mural Study Fresno California Post Office and Court House (1939).
Artist: Margarite Zorach.



Plate 20: *Four Men: three standing on top and one standing inside, riding on large casing section of pipe suspended by cable as it is moved into position by a crane, reservoir in the background during construction of the Grand Coulee Dam, Washington.*

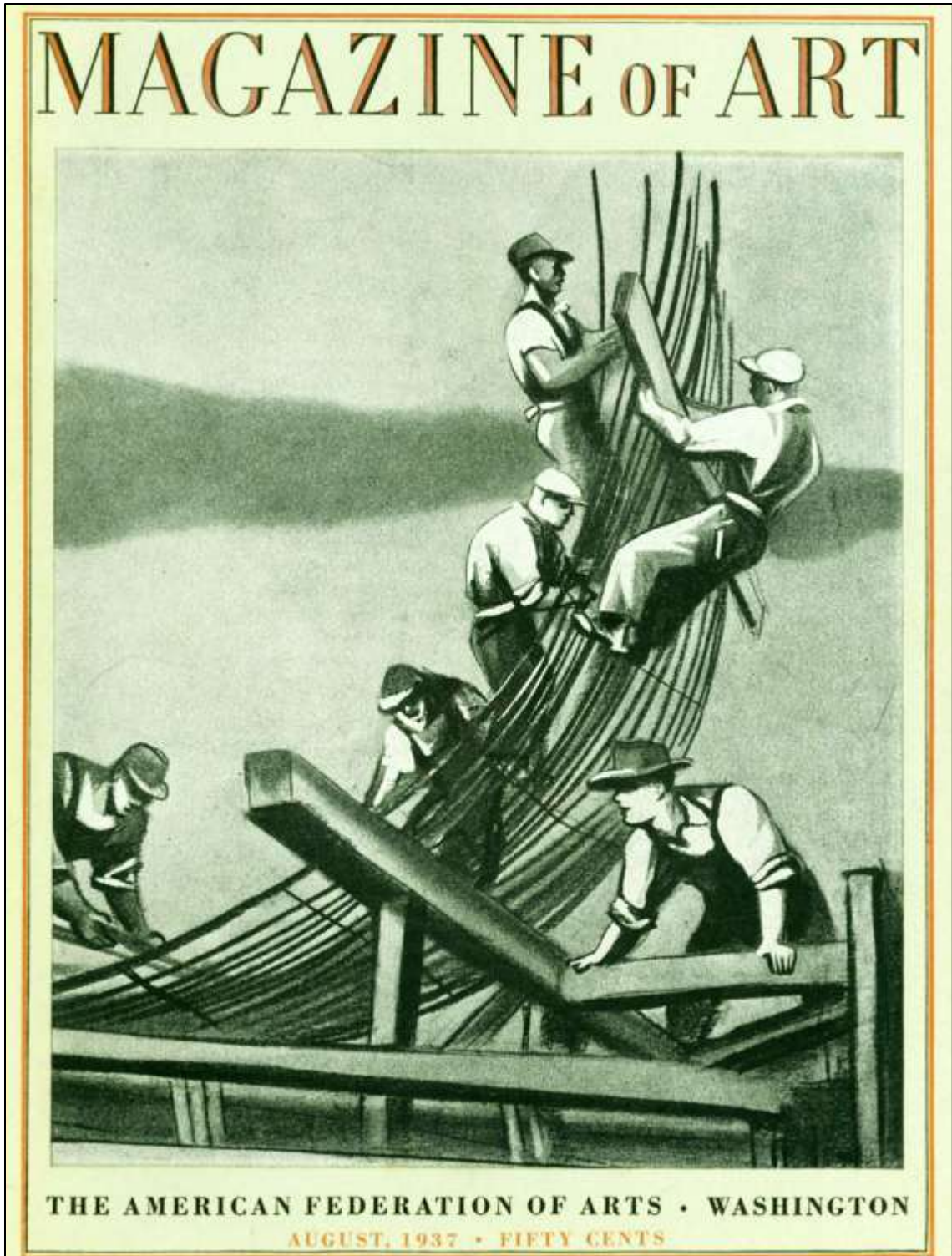


Plate 21: Sketch for Interior Department Mural (1937). Artist: William Gropper.

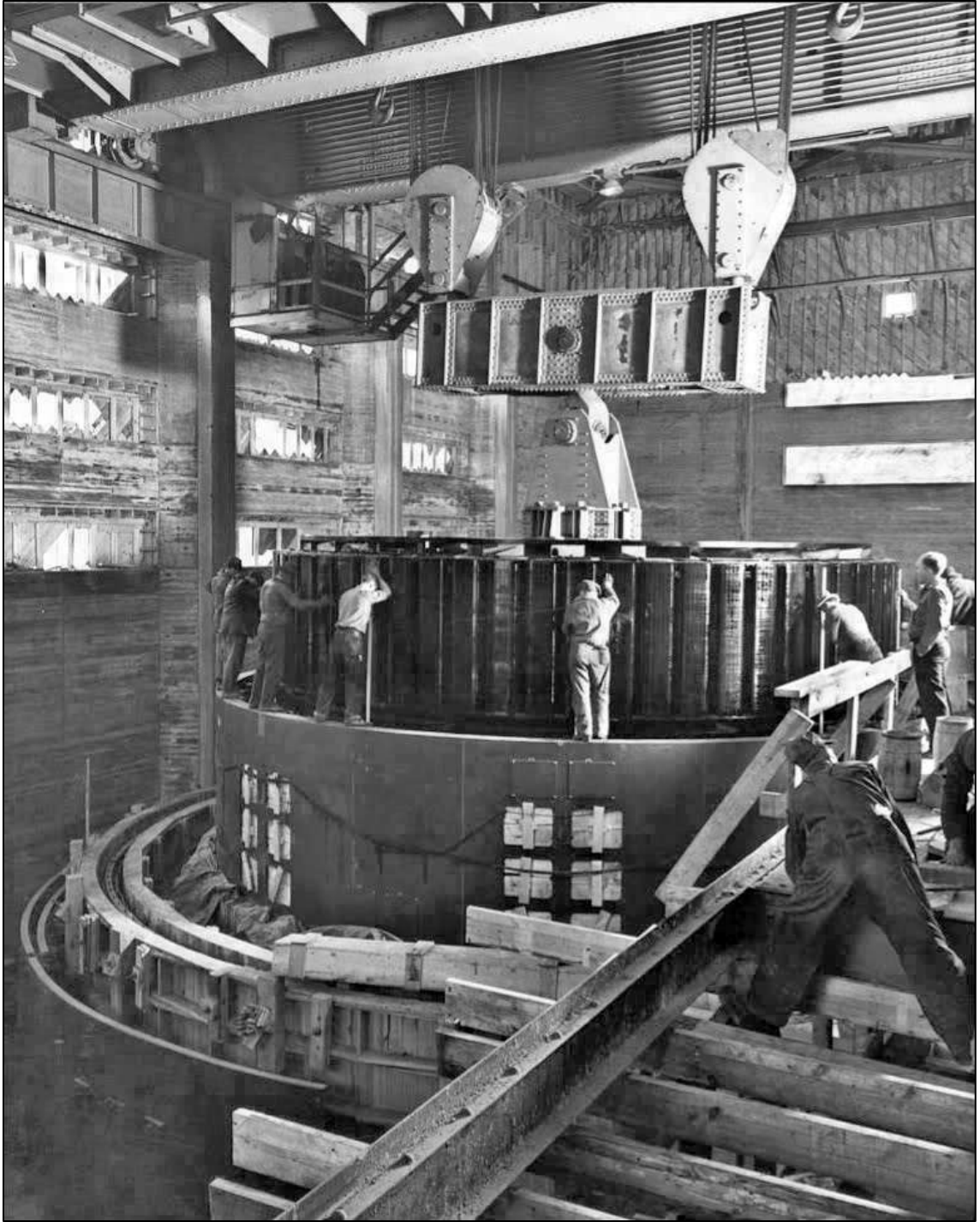


Plate 22: *Norris Dam Workers* (1936).

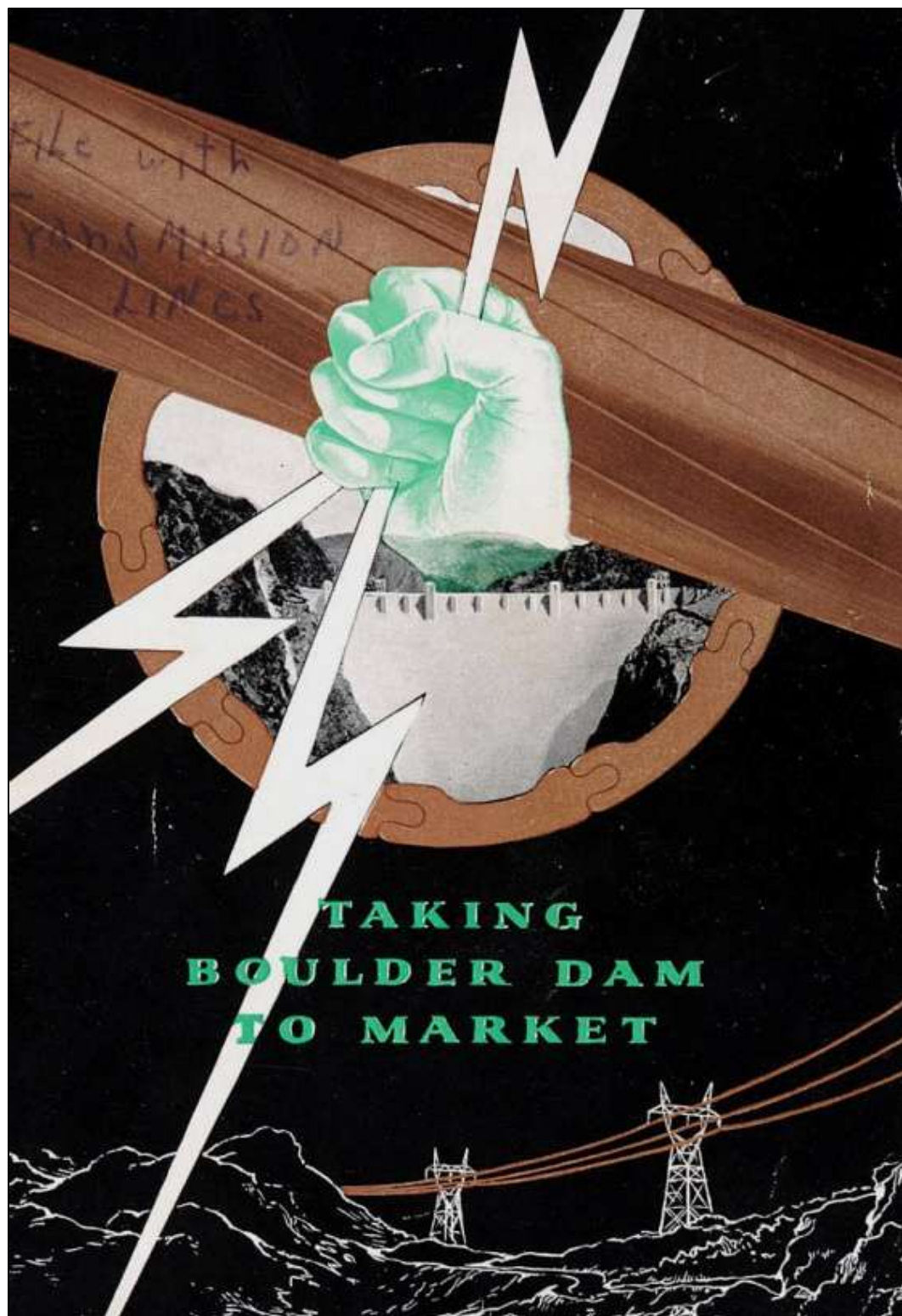


Plate 23: Taking Boulder Dam to the Market.

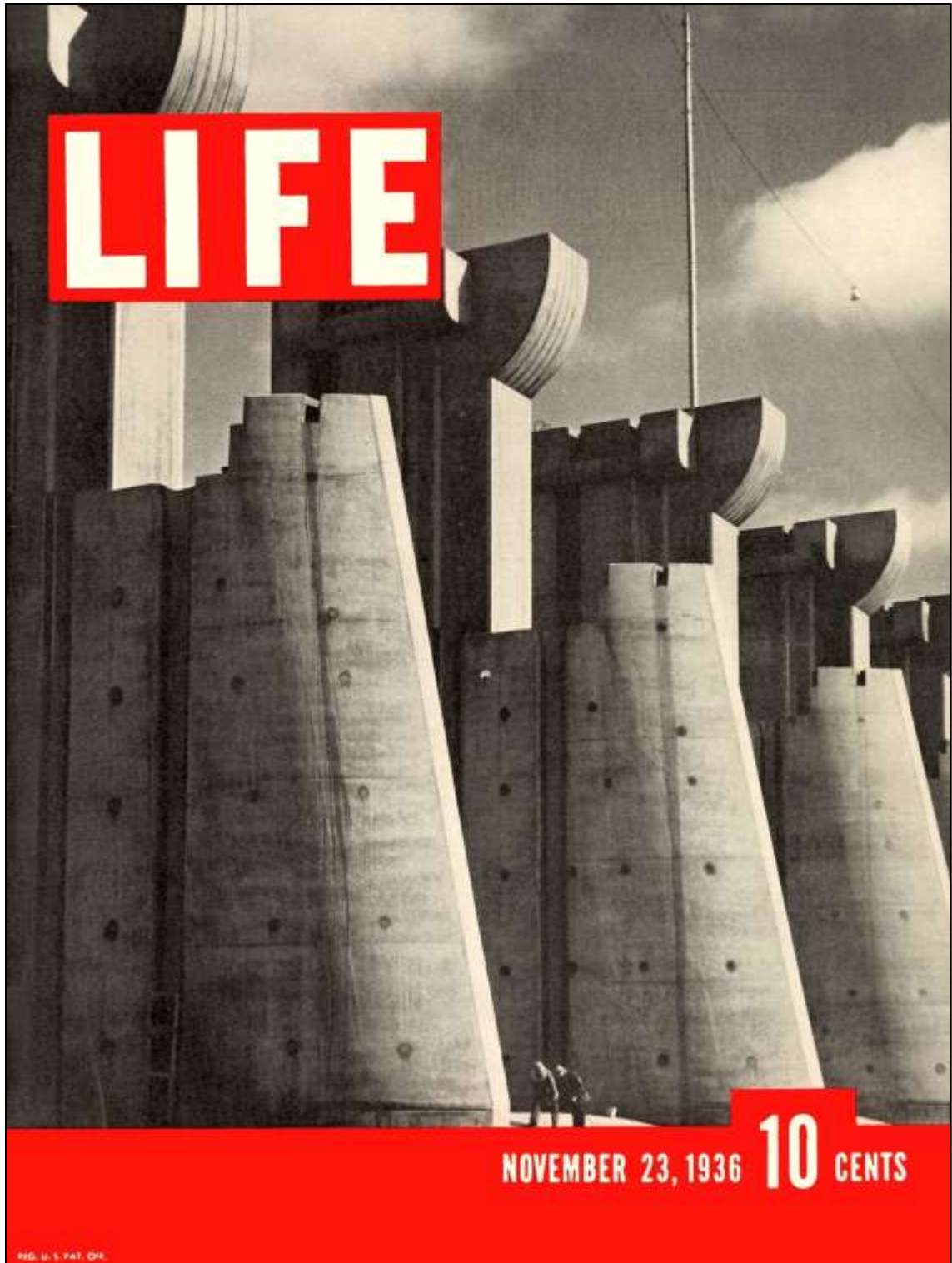


Plate 24: *Montana Castle, Fort Peck Dam* (1936). Photographer: Margaret Bourke-White.



Plate 25: *Olympus Dam: Colorado Big-Thomas Project (1970)*. Artist: Xavier Gonzales.



Plate 26: *Hungary Horse - the Shoreline, the Reservoir, the Dam Flathead River, Montana* (1970). Artist: Michael Frary.



Plate 27: *Birds at Topock Marsh (Egrets in Flight over Topock Marsh, Lower Colorado)* (1970). Artist: Chen Chi.



Plate 28: *Irrigated Fields: Central Valley Project, California* (1970). Artist: John W. McCoy.



Plate 29: *Lower Colorado #8 (Patterns of Irrigated Fields and Canals on the Lower Colorado Basin)* (1970). Artist: Richard Diebenkorn.

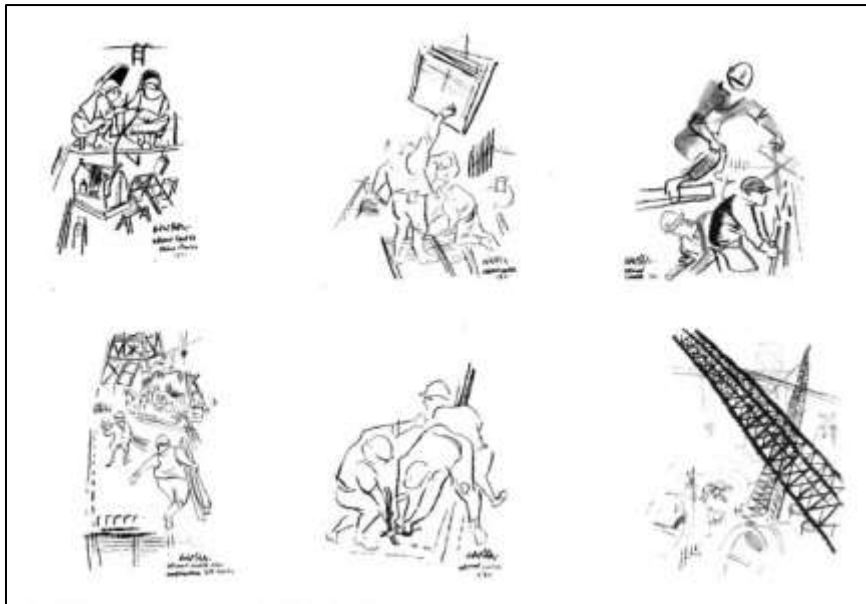


Plate 30: Top: *Construction at Grand Coulee (Construction Workers at Third Power Plant, Grand Coulee Dam)* (1970). Artist: Anton Refregier. **Bottom:** *Grand Coulee Workers (Construction Activities at Grand Coulee Dam Third Powerplant)* (1970). Artist: William Gropper.



Plate 31: **Top:** *Coulee Construction Forms* (1970). **Bottom:** *#4 Coulee Constructions* (1970). Artist: Lamar Dodd.



Plate 32: *Spillway: Shasta Dam* (1976). Artist: John Button.

Plates: Chapter Three

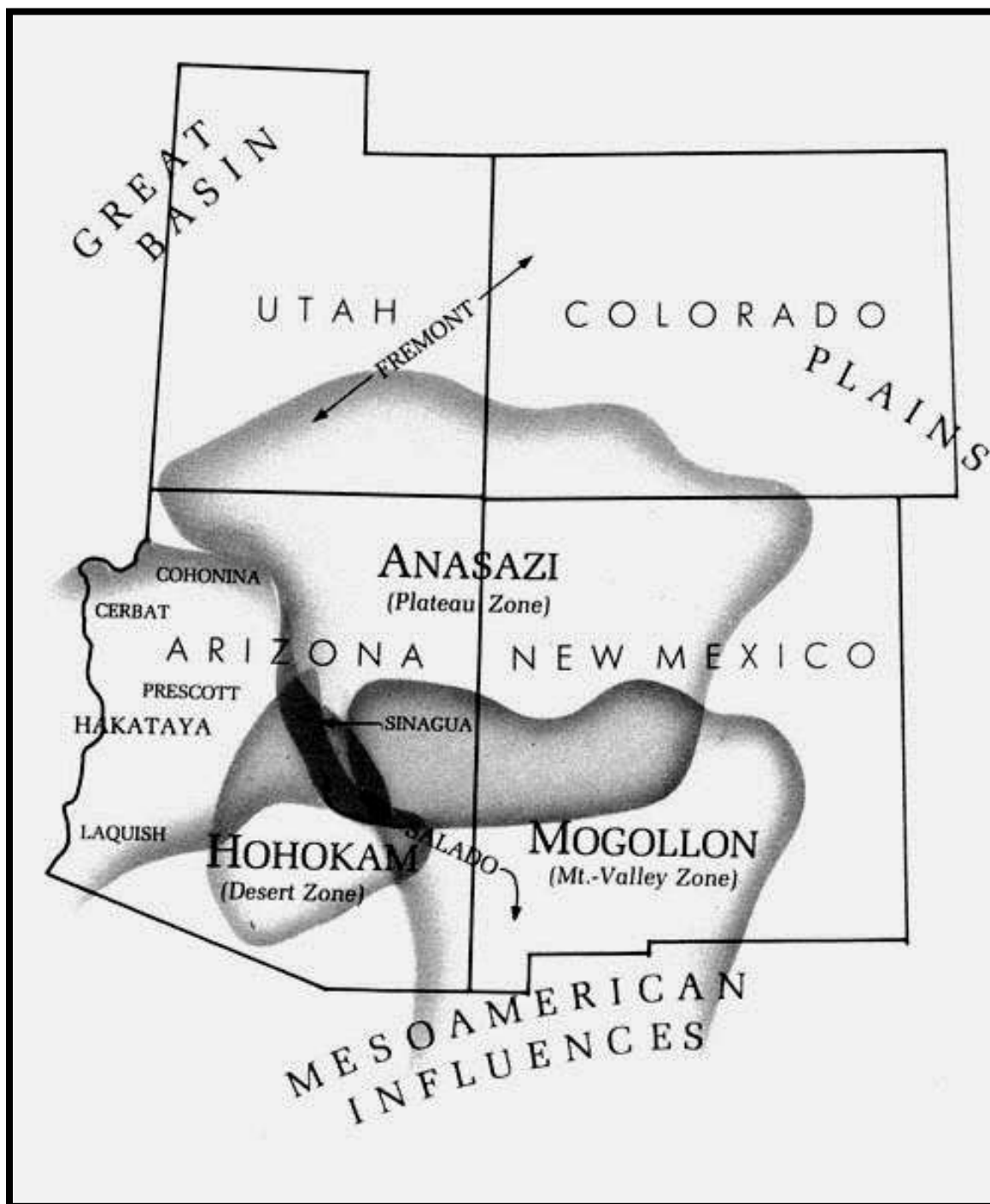


Plate 33: Location of Southwestern Pre-contact Civilizations;
Credit: Google Images

Plates: Chapter Four



Plate 34: Making the Desert Blossom, forty-acre model of ideal irrigation homestead (1928). Model by John H. Pellen for Ibero-American Exhibition, Seville, Spain.



Plate 35: Close-up of *Making the Desert Blossom* by Frank MacKenzie

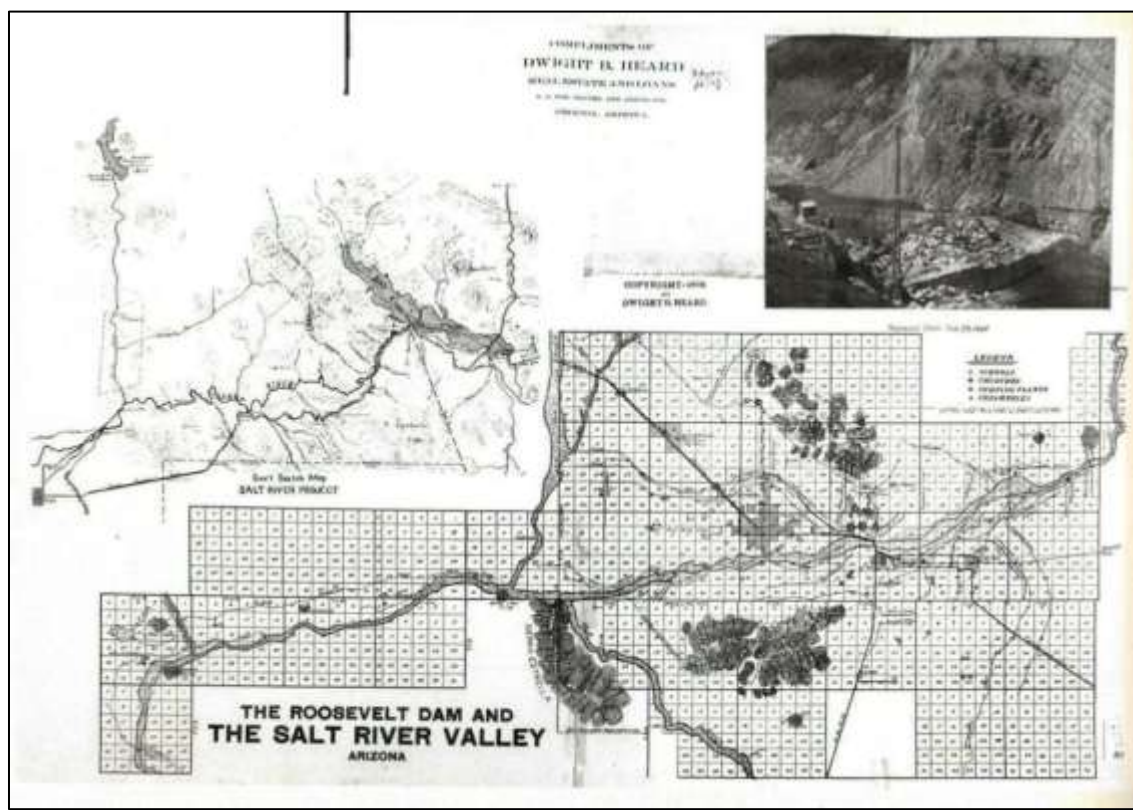


Plate 36: "The Roosevelt and the Salt River Project." (1908). Phoenix: Dwight Heard Real Estate and Loans.

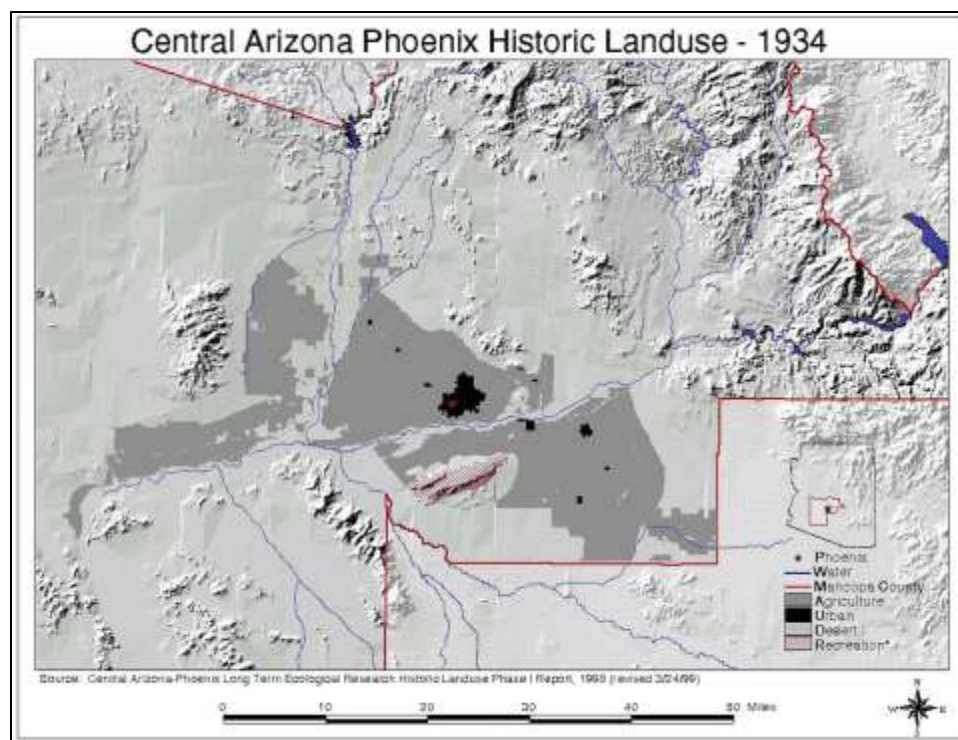
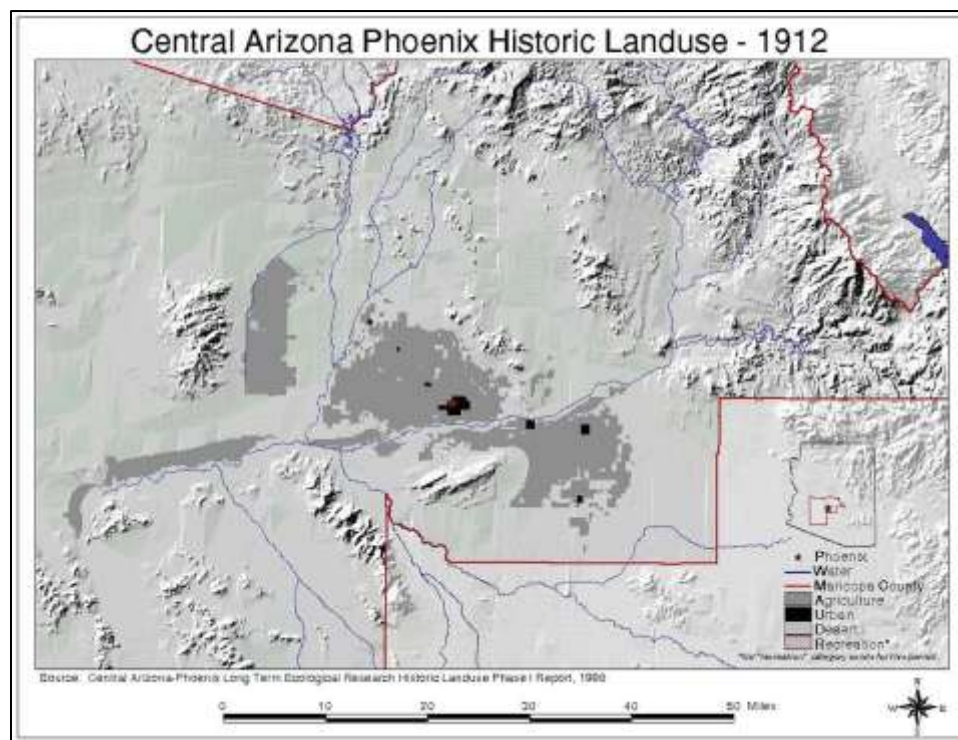


Plate 35: "Central Arizona Phoenix Historic Landuse-1912 and 1934"(1999).

References

Artwork and Photographs

- "A King Among Date Trees in the Salt River Valley." Pre-1930. Postcard. Obtained from <http://www.ringbrothershistory.com/alsprojects/pdfs/State%20Postmarks%20DF/17%20%20Pre%201930%20Coll%20Section%209%20R%20to%20S%20compressed.pdf> (last accessed 23 October 2011).
- "Agricultural Arizona: the Salt River Valley." 1929. Pamphlet ed. by Agricultural Committee, Phoenix Chamber of Commerce. Phoenix: Immigration Commissioner Maricopa County. Obtained from <http://www.library.arizona.edu/exhibits/pams/jpgs/fruit2.jpg> (last accessed 23 November 2001).
- "Aerial View the Embankment over the Valley." 1917. Watercolor. Artist: Tony Garnier. In *Une cité industrielle: étude pour la construction des villes*, Princeton Architectural Press 1989:21.
- "Aerial View Waterdam." 1917. Watercolor. Artist: Tony Garnier. In *Une cité industrielle: étude pour la construction des villes*, Princeton Architectural Press 1989:19.
- Birds at Topock Marsh (Egrets in flight over Topock Marsh, lower Colorado River)*. 1970. Watercolor. Artist: Chen Chi. Courtesy of Bureau of Reclamation, Denver.
- "Boulder Dam Across the Colorado River." 1942. Photographer: Ansel Adams. Obtained from http://upload.wikimedia.org/wikipedia/commons/thumb/d/d9/Ansel_Adams_-_National_Archives_79-AAB-01.jpg/1279px-Ansel_Adams_-_National_Archives_79-AAB-01.jpg (last accessed 23 October 2011).
- "Commemorating the Dedication of American Falls Dam." 1927. Newspaper Advertisement. In *Historical Atlas of the American West* ed. by Derek Hayes 2009:162.
- Construction at Grand Coulee (Construction Workers at Third Power Plant, Grand Coulee Dam)*. 1970. Oil on canvas. Artist: Anton Refregier. Courtesy of Bureau of Reclamation.
- Coulee Construction Forms*. 1970. Oil on canvas. Artist: Lamar Dodd. Courtesy of Bureau of Reclamation.

- "Construction Nears Completion," n.d. Photograph. Photographer unknown. Obtained from <http://web.mst.edu/~rogersda/h Hoover dam/index.htm> (last accessed 16 February 2012).
- #4 Coulee Constructions*. 1970. Watercolor. Artist: Lamar Dodd. Courtesy: Bureau of Reclamation.
- Dam Construction*. 1938. Mural. Artist: William Gropper in United States Department of Interior Building. Obtained from <http://americanart.si.edu/collections/search/artwork/?id=9643> (last accessed 16 February 2012).
- "Delicious Fruit Farming and Vegetable Gardening on the Chandler Ranch: Under the Roosevelt Dam, Salt River Valley, Arizona." 1917. Pamphlet. Mesa: Mesa Improvement Company.
- "Energy – the Victor" aka *Fountain of Energy*. 1915. Sculpture. Artist: Alexander Stirling Calder for the 1915 San Francisco Panama-Pacific Exposition. Obtained from <http://www.moah.org/exhibits/archives/1915/> (last accessed 20 October 2012).
- "Four men, three standing on top and one standing inside, riding on large casing section of pipe suspended by cable as it is moved into position by a crane, reservoir in the background during construction of the Grand Coulee Dam, Washington." n.d. Photograph. Photographer unknown. Credit: Library of Congress. Obtained from <http://www.loc.gov/pictures/item/2008676662/> (last accessed 17 February 2012).
- Glen Canyon Dam*. 1969. Oil on Canvas. Artist: Norman Rockwell. Courtesy of Bureau of Reclamation.
- "Grand Coulee Workers" (Construction Activities at Grand Coulee Dam Third Power plant). 1970. Pen and ink sketches. Artist: William Gropper. Courtesy of Bureau of Reclamation.
- Hermiston, Umatilla Development League*. 1910. Pamphlet cover. Oregon Historical Society Historical Project. Obtained from http://www.ohs.org/education/oregonhistory/historical_records/dspDocument.cfm?doc_ID=00083045-8A02-1E30-925B80B05272006C (last accessed 16 February 2012).
- "Hoover Dam." 1972. Photograph. Photographer: Alan Band. Obtained from <http://photoblog.msnbc.msn.com/news/2011/10/07/8207007-a-look-back-at-the-hoover-dam-built-75-years-ago> (last accessed 16 February 2012).

Irrigated Fields (Central Valley Project, California). 1970. Watercolor. Artist: John W. McCoy. Courtesy of Bureau of Reclamation.

"Irrigation, mural study Fresno California post office and courthouse." 1939. Artist: Margarite Zorach. Credit: Smithsonian American Art Museum.

Lower Colorado #8 (Patterns of irrigated fields and canals on the Lower Colorado Basin). 1970. Acrylic on paper. Artist: Richard Diebenkorn. Courtesy of Bureau of Reclamation.

Making the Desert Blossom. 1928. Mural. Artist: Frank J. MacKenzie. Commissioned by the Bureau of Reclamation, U.S. Department of Interior, Washington D.C.

"Making the Desert Blossom: forty-acre model of ideal irrigation homestead." 1928. Model by John H. Pellen, Bureau of Reclamation. Courtesy of the National Archives, College Park, Maryland, 48-EXS-704-63.

"Montana Castles, Fort Peck Dam." 1936. Photograph (Cover) *Life Magazine*. Photographer Margaret Bourke-White. Obtained from <http://images.google.com/hosted/life/l?imgurl=3ba787753d260f12> (last accessed by 18 February 2012).

"Norris Dam Workers." 1936. Photograph. Photographer unknown. Obtained from http://www.currentsofchange.net/lessons/lesson_photo.php?cat_id=39§ion_id=1&lesson_id=4 (last accessed 17 February 2012).

Power Plant *Cittá Nuova*. 1914. Watercolor. Artist: Antonio Sant' Elia. Obtained from <http://www.plataformaarquitectura.cl/2009/05/14/recordando-a-antonio-sant%E2%80%99elia/> (last accessed 18 December 2011).

Promote the General Welfare. 1939. Artist: Roy Grossman for World's Fair. Wolfson-Florida International University, Miami, Florida, The Mitchell Wolfson, Jr. Collection. Obtained from <http://www.wolfsonian.org/explore/collections/promote-general-welfare-produced-1939-new-york-worlds-fair-us-government-buildin#> (last accessed 18 February 2012).

"Roosevelt Dam, Centerpiece of Salt River Project" 1911. Photograph. Photographer unknown. Obtained from <http://www.azcentral.com/business/articles/2012/02/06/20120206biz-centennial-turning-points-in-arizonas-economy.html> (last accessed 16 February 2012).

- "Roosevelt Dam" Dixon Pencil advertisement. 1920. Obtained from http://www.amazon.com/Roosevelt-Drawing-Pencils-Dixon-Eldorado/dp/B005DGT1GU/ref=cm_cr_pr_product_top (last accessed 16 February 2012).
- "Salt River Valley, Arizona: The Land of Sunshine, Health, and Prosperity" advertisement. 1907. Obtained from <http://www.ebay.com/itm/1907-Ad-Salt-River-Valley-Arizona-PHOENIX-Land-Sunshine-Health-Prosperity-/320810477903> (last accessed 16 February 2012).
- "Sketch for Interior Department Mural." 1937. Artist: William Gropper, *Magazine of Art* 30 (8):cover. Obtained from <http://library.syr.edu/digital/exhibits/g/Gropper/case2.htm> (last accessed 17 February 2012).
- "Smelting Furnace." 1917. Watercolor. Artist: Tony Garnier. Obtained from <http://www.art.com/products/p12061908-sa-i1504651/smelting-furnaces-designed-by-tony-garnier-from-la-cite-industrielle-1917.htm> (last accessed 17 February 2012).
- Spillway: Shasta Dam*. 1976. Oil on canvas. Artist: John Button. Courtesy: Department of Interior, America 1976: A Bicentennial Exhibition sponsored by the United States Department of Interior.
- "Sunset Route California Southern Pacific Line Roosevelt Dam Apache Trail" advertisement. 1923. Obtained from <http://www.amazon.com/Sunset-California-Southern-Pacific-Roosevelt/dp/B006CZUGUG> (last accessed 16 February 2012).
- "Taking Boulder Dam to the Market." n.d. Poster. Courtesy Bureau of Reclamation. Obtained from http://www.usbr.gov/lc/region/g5000/photolab/gallery_detail.cfm?PICIDTYPE=48454 (last accessed 17 February 2012).
- "The Roosevelt Dam." 1911. Watercolor. Artist: B. Towles. *Scientific American* 105 (7):cover. Obtained from <http://blogs.scientificamerican.com/anecdotes-from-the-archive/2011/03/18/happy-100th-roosevelt-dam/> (last accessed 20 January 2012).
- "The Schuylkill Chained" aka *The River Enchained*. 1825. Sculpture by William Rush. United States Department of Interior, National Park Service Historic American Engineering Record. Obtained from <http://memory.loc.gov/pnp/habshaer/pa/pa0800/pa0837/photos/138189pv.jpg> (last accessed 16 February 2012).

"The Schuylkill Waterworks" aka *The River Freed*. 1825. Sculpture by William Rush. Obtained from <http://upload.wikimedia.org/wikipedia/commons/thumb/2/27/AllegoricalFigureWaterworks.jpg/640px-AllegoricalFigureWaterworks.jpg> (last accessed 16 February 2012).

"The upstream face of the dam and appurtenant works as seen from high point upstream on the Arizona rim of Black Canyon. Water surface elevation 790 feet." 1935. Photograph. Photographer unknown. Bureau of Reclamation, Boulder Dam Photograph Gallery. Obtained from http://www.usbr.gov/lc/region/g5000/photolab/gallery_detail.cfm?PICIDTYPE=7926 (last accessed 16 February 2012).

"Umatilla Project Development League." 1910. Pamphlet back cover. In *Historical Atlas of the American West* ed. by Derek Hayes 2009:165.

Maps

"Arid Region of the United States: Showing Drainage Districts Part II, Plate LXIX." 1890. Edited by USGS in *Eleventh Annual Report U.S. Geological Survey*, 1890-91. Obtained from <http://www.npr.org/programs/atc/features/2003/aug/water/powell/aridmap.html> (last accessed 12 October 2011).

"Bird's Eye View of Phoenix, Maricopa Co. Arizona." 1885. Cartographers: C.J. Dyer and W. Byrnes. Courtesy of the Library of Congress, G4334.P5A3 1885 .D9.

"Central Arizona Phoenix Historic Landuse-1912." 1999. In *Historic Land Use: Phase I Report on Generalized Land Use* edited by Central Arizona-Phoenix Long-Term Ecological Research: Contribution No.1. Tempe: Center for Environmental Studies, Arizona State University.

"Central Arizona Phoenix Historic Landuse-1934." 1999. In *Historic Land Use: Phase I Report on Generalized Land Use* ed. by Central Arizona-Phoenix Long-Term Ecological Research: Contribution No. 1. Tempe: Center for Environmental Studies, Arizona State University.

"Location of Southwestern Pre-contact Civilizations." n.d. Obtained from Google Images <http://members.wap.org/edgar.durbin/SantaFe2006/Images/AnasaziMogollonHohokam.jpg> (last accessed 6 May 2012).

- "Map of the Salt River Watershed, Arizona USA." 2011. Edited by Shannon. Obtained from http://en.wikipedia.org/wiki/File:Salt_River_Map.jpg (last accessed 17 March 2012).
- "Prehistoric Irrigation Canals." 1929. Cartographer: Dr. Omar A. Turney. Phoenix: Arizona State Historian, Capitol Building. Courtesy of Arizona Historical Foundation, Arizona State University, Tempe, Arizona.
- "The Roosevelt and the Salt River Project." 1908. Phoenix: Dwight Heard Real Estate and Loans. In *Historical Atlas of the American West* by Derek Hayes 2009:162.
- Untitled Map of Salt River Project. 1934. Cartographer: T.A. Hayden. Courtesy Arizona State University Map Library in *Historical Atlas of the American West* by Derek Hayes 2009:163.
- "Yavapai and western Apache Groups and Territories." 1997. Cartographer: S.M. Whittlesey modified from Gifford and Goodwin Maps. In *from Vanishing River: Landscapes and Lives of the Lower Verde Valley* by S.M. Whittlesey 1997:145.

References

- "\$60,000,000 to Make Desert Places Bloom." 1910. *New York Times* 1 May:SM3. Obtained from <http://proquest.umi.com/pqdweb?did=104932149&> (last accessed 16 July 2011).
- AA Catalog. 1973. *Catalog of Exhibition Circulated by the Traveling Exhibition Service Smithsonian Institution*. Washington D.C.: US Government Printing Office.
- Abbott, David R., Alexa M. Smith, and Emiliano Gallaga. 2007. "Ballcourts and Ceramics: The Case for Hohokam Marketplaces in the Arizona Desert." *American Antiquity* 72 (3):461-484.
- Arid Waters: Photographs from the Water in the West Project*. 1992. Edited by Peter Go-in and text by Ellen Manchester. Reno: University of Nevada Press.
- "Arizona Ordinance of Secession" presented by Colonel Sherrod Hunter. 2007. Obtained from <http://azrebel.tripod.com/page9.html> (last accessed 10 February 2012).
- Arrigo, Anthony F. 2010. "Imagining the Dam: The Visual Rhetoric of Hoover (Boulder) Dam in Popular and Public Print Media, 1920-1975." (Dissertation) University of Minnesota.

- Autobee, Robert. (1993?). "Salt River Project," In *Research of historic reclamation projects*: Bureau of Reclamation. Obtained from http://www.usbr.gov/projects//ImageServer?imgName=Doc_1305577664538.pdf (last accessed 20 December 2012).
- AZ Securities. 1913. "Fruit, Berries and Truck Farming in the Salt River Valley, Maricopa County," ed. by Arizona Securities and Investment Company, Phoenix.
- Baer, Lynne. 1983. "William Gropper's 'Construction of a Dam': A Case Study of a Mural." (Thesis) University of California, Davis.
- Bahr, Donald, Juan Smith, William Smith Allison, and Julian Hayden. 1994. *The Short Swift Time of Gods on Earth: The Hohokam Chronicles*. Berkeley: University of California Press.
- Barnes, Will Croft. 1988. *Arizona Place Names*. Forward by Bernard L. Fontana. Tucson: University of Arizona Press.
- Berkes, Howard. 2003. "The Vision of John Wesley Powell: Explorer foresaw water issues that would plague the West." NPR Broadcast 26 August. Obtained from <http://www.npr.org/programs/atc/features/2003/aug/water/part1.html> (last accessed 16 February 2012).
- Berkman, R., and W.K. Viscusi. 1973. *Damming the West*. New York: Grossman Publishers.
- Billington, D., D. Jackson, and M. Melosi. 2005. *The History of Large Federal Dams: Planning, Design, and Construction*. Denver: United States Department of Interior: Bureau of Reclamation.
- Billington, David P., and Donald C. Jackson. 2006. *Big Dams of the New Deal Era: A Confluence of Engineering and Politics*. Norman: University of Oklahoma Press.
- Bonnell, Victoria E. 1997. *Iconography of Power*. Berkeley: University of California Press.
- BuRec. 2011. "Salt River Valley Project." Bureau of Reclamation Website. Obtained from http://www.usbr.gov/projects/Project.jsp?proj_Name=Salt+River+Project (last accessed 27 February 2012).
- Carlson, Martin E. 1968. "William E. Smythe: Irrigation Crusader." *Journal of the West* 7: 41-7.

- Chandler. 1917. "Chandler Ranch Acreage under Roosevelt Dam, Salt River Valley, Arizona," ed. by Company Mesa Improvement. Los Angeles: Newitt.
- City of Phoenix Official Website. 2012. "South Mountain." Obtained from <http://phoenix.gov/parks/trails/locations/south/hiking/index.html> (last accessed February 2012).
- Claridge, Laura. 2001. *Norman Rockwell: a life*. New York: Random House.
- Commission. 1929. "Agricultural Arizona: The Salt River Valley." Edited by Phoenix Chamber of Commerce Agricultural Committee. Phoenix: Immigration Commissioner Maricopa County, Arizona.
- Cotton Arizona-Egyptian. 1913. Edited by Phoenix The Board of Trade, Arizona. Phoenix: R.A. Watkins Printing Co.
- Conner, Eliza Archard. 1908. "Making the Desert Blossom as the Rose." *The Mansfield News* 14 March:7. Obtained from <http://0-ac-cess.newspaperarchive.com.innopac.library.unr.edu/Viewer.aspx?img=30756799&firstvisit=true&src=search¤tResult=0¤tPage=0&fpo=False> (last accessed 12 October 2011).
- Contreras, Belisario R. 1983. *Tradition and Innovation in the New Deal Art*. Cranbury, New Jersey: Associated University Presses, Inc.
- Critcher, Edward Payson. 1915. "Sculpture and Sculptors: Pan-Pacific International Exposition." *Fine Arts Journal* 32 (2):39-49. Obtained from <http://www.istor.org/stable/25603468> (last accessed 25 January 2012).
- Cusack, Tricia. 2010. *Riverscapes and Their National Identities*. Syracuse: Syracuse University Press.
- Daniels, S. and D. Cosgrove. 1988. "Introduction: Iconography and Landscape." In *Iconography of Landscape: Essays on Symbolic Representation, Design and Use of Past Environments*, ed. by Denis Cosgrove and Stephen Daniels. Cambridge: Cambridge University Press:1-10.
- Dean, Jeffrey. 1991. "Thoughts on Hohokam Chronology." In *Exploring the Hohokam: Prehistoric Desert Peoples of the American Southwest*, ed. by George J. Gumerman. Albuquerque: University of New Mexico Press:61-150.

- Dean, Robert. 1997. "Dam Building Still Had Some Magic Then": Steward Udall, the Central Arizona Project, and the Evolution of the Pacific Southwest Water Plan, 1963-1968." *Pacific Historical Review* 66 (1):81-98.
- DeWitt, John. n.d. "Art Exhibition for Spokane World Expo '74." Personal Communication. Obtained from the John DeWitt Papers 1962-1979, Smithsonian Archives of American of Art, Washington D.C. (last accessed March 2011).
- _____. DeWitt BRAP. n.d. "Benefits of the Reclamation Art Program." Personal Communication. Obtained from the John DeWitt Papers 1962-1979, Smithsonian Archives of American of Art, Washington D.C. (last accessed March 2011).
- _____. DeWitt SBRAP. n.d. "Summary of Bureau of Reclamation Art Program." Personal Communication. Obtained from the John DeWitt Papers 1962-1979, Smithsonian Archives of American of Art, Washington D.C. (last accessed March 2011).
- DeWitt, John, and John Arthur. 1976. *America 1976: A Bicentennial Exhibition Sponsored by the United States Department of Interior*. The Hereward Lester Cooke Foundation.
- Doss, Erika. 1997. "Toward an Iconography of American Labor: Work, Workers, and the Work Ethic in American Art, 1930-1945." *Massachusetts Institute of Technology Design Issues* 13 (1):53-66.
- Doyel, David E. 1991a. "Hohokam Cultural Evolution in the Phoenix Basin." In *Exploring the Hohokam: Prehistoric Desert Peoples of the American Southwest*, ed. by George J. Gumerman. Albuquerque: University of New Mexico Press:231-70.
- _____. 1991b. "The Hohokam: Ancient Dwellers of the Desert." In *The Hohokam: Ancient People of the Desert*, ed. by David Grant Noble. Santa Fe: School of American Research Press:3-15.
- Else, J. 1997. "Cadillac Desert: An American Nile." Video. Homevision/KTEH/PBS/Columbia.
- Exhibition Pamphlet. 1929. "A Brief Description of the Irrigation Work Accomplished by the Department of the Interior in the Arid and Semi-Arid Regions of the United States of America." Pamphlet edited by Bureau of Reclamation United States Department of the Interior: Department of the Interior, Washington D.C. Obtained from National Archives, College Park, Maryland, RG 43, ARC 1432943, A1 1314, Records of International Conferences, US Commission to the International Exposition at Seville, Pamphlets, 1921-1929.

- Feinman, Gary M. 1991. "Hohokam Archaeology in the Eighties: An Outside View." In *Exploring the Hohokam: Prehistoric Desert Peoples of the American Southwest*, ed. by George J. Gumerman. Albuquerque: University of New Mexico Press:461-80.
- Fish, Paul K., and Suzanne K. Fish. 1991. "Hohokam Political and Social Organization." In *Exploring the Hohokam: Prehistoric Desert Peoples of the American Southwest*, ed. by George J. Gumerman. Albuquerque: University of New Mexico Press:151-76.
- Fish, Suzanne K. 1991. "The Desert World of the Hohokam." In *The Hohokam: Ancient People of the Desert*, ed. by David Grant Noble. Santa Fe: School of American Research Press:17-26.
- Fish, Suzanne K., and Gary P. Nabhan. 1991. "Desert as Context: The Hohokam Environment." In *Exploring the Hohokam: Prehistoric Desert Peoples of the American Southwest*, ed. by George J. Gumerman. Albuquerque: University of New Mexico Press:29-60.
- Fogel, Jared A., and Robert L. Stevens. 2001. "The Canvas Mirror: Painting as Politics in the New Deal." Obtained from <http://0-www.jstor.org.innopac.library.unr.edu/stable/pdfplus/25163482.pdf> (last accessed 8 April 2011).
- Fradkin, Philip L. 1996. *A River No More*. Berkeley: University of California Press.
- Frasier, D. 1988. "Fields of Radiance: The Scientific and Industrial Scenes of Joseph Wright." In *Iconography of Landscape: Essays on Symbolic Representation, Design and Use of Past Environments*, ed. by Denis Cosgrove and Stephen Daniels. Cambridge: Cambridge University Press:119-41.
- Greeley, Michael N. 1987. "The Early Influence of Mining in Arizona." In *History of Mining in Arizona*, ed. by J.M. Canty and M.N. Greeley. Tucson: Mining Club of the Southwest Foundation:13-50.
- Gumerman, George J. 1991. "Understanding the Hohokam." In *Exploring the Hohokam: Prehistoric Desert Peoples of the American Southwest*, ed. by George J. Gumerman. Albuquerque: University of New Mexico Press:1-28.
- Harris, Jonathan. 1995. *Federal Art and the National Culture: The Politics of Identity in the New Deal America*. New York: Cambridge University Press.

- Logan, Michael F. 2006. *Desert Cities: The Environmental History of Phoenix and Tucson*. Pittsburgh: University of Pittsburgh Press.
- Lowitt, Richard. 1984. *The New Deal and the West*. Bloomington: Indiana University Press.
- Lyman, Ray. 1931. "Irrigation: Miracle of the Arid West." *The New York Times* 28 June:SM5. Obtained from ProQuest ID-99330554 (12 October 2012).
- Mabry, Jonathan, and J. Homer Thiel. 1995. "A Thousand Years of Irrigation in Tucson." *Archaeology in Tucson* 9 (4):1-6.
- Mann, Michael E. 2002. "Little Ice Age." In *The Earth System: Physical and Chemical Dimensions of Global Environmental Change*, ed. by Michael C. MacCracken and John S. Perry. Chichester, United Kingdom: John Wiley and Sons, Limited:504-09.
- Marling, Karal Anne. 1982. *Wall-to-Wall American: A Cultural History of Post Office Murals in the Great Depression*. Minneapolis: University of Minnesota Press.
- Maroney, James H. 1999. "Charles Sheeler Reveals the Machinery of His Soul." *American Art* 13 (2):26-57. Obtained from <http://www.jstor.org/stable/3109298> (last accessed 26 October 2010).
- Martin, Percy A. 1931. "The Ibero-American Exposition at Seville." *The Hispanic American Historical Review* 11 (3):373-386. Obtained from <http://www.jstor.org/stable/2506617> (last accessed 16 January 2012).
- Marx, Leo. 1964. *The Machine in the Garden: Technology and the Pastoral Ideal in America*. New York: Oxford University Press.
- McKinnon, Shaun. 2005. "Farms Swallowing Most of the Arizona's Water: Agriculture Helped Prevent State from Exhausting Supply." *The Arizona Republic* 3 January. Obtained from <http://www.azcentral.com/specials/special26/articles/0103conserve-main03.html?&wired> (last accessed 25 March 2012).
- Mechlin, Leila. 1929. "The Exhibit of the Bureau of Reclamation at Seville, Spain." *New Reclamation Era* 20 (1):11.
- Meredith, H.L. 1968. "Reclamation in the Salt Valley, 1902-1917." *Journal of the West* 7 (1):76-83.

- Nash, Roderick F. 2001. *Wilderness and the American Mind*. New Haven: Yale University Press.
- "NOAA Paleoclimatology." 2010. NOAA Satellite and Information Service: National Climatic Data Center Website. Obtained from <http://www.ncdc.noaa.gov/paleo/ctl/resource1000.html> (last accessed 5 December 2011).
- Novak, Barbara. 2007. *Nature and Culture: American Landscape and Painting*. New York: Oxford University Press.
- Nye, David E. 1994. *American Technological Sublime*. Cambridge: The MIT Press.
- Ormsbee, Helen. 1928. "Model Consulate Planned in Spain." *The New York Times* 22 April:60.
- PBS&J. 2003. "Salinity in the Salt River Valley, Arizona: A Historical Perspective." In "Central Arizona Salinity Report: Phase I, Technical Appendix:117-133. Obtained from <http://phoenix.gov/WATER/cassph1tec.pdf> (last accessed 4 May 2012).
- Pisani, Donald J. 2002. "Federal Reclamation in the American West in the Twentieth Century." *Agricultural History* 77 (3):391-419.
- _____.1992. *To Reclaim a Divided West: Water, Law, and Public Policy, 1848-1902*. Albuquerque: University of New Mexico Press.
- Powell, James Lawrence. 2008. *Dead Pool: Lake Powell, Global Warming, and the Future of Water in the West*. Berkeley: University of California Press.
- Powell, John Wesley. 1879. *Report on the Arid Region of the United States with a More Detailed Account of the Lands of Utah*. Washington D.C.: Government Printing Office.
- _____.1890a. "The Irrigable Lands of the Arid Lands." *Century Magazine* 39 (5):766-76.
- _____.1890b. "The Non-Irrigable Lands of the Arid Region." *Century Magazine* 39 (6): 915-22.
- _____.1890c. "Institutions for Arid Lands." *Century Magazine* 39 (7):111-16.
- "Power: Portfolio of Charles Sheeler." 1940. *Fortune: Selected Commission Illustrations*. Obtained from <http://www.fulltable.com/vts/f/fortune/menud.htm> (last accessed 1 November 2010).

- Press Release National Gallery of Art. 1972. "Press Release: Selection of Pictures Commissioned by U.S. Interior Department Reclamation Bureau Exhibited at National Gallery." 25 March 1972. Obtained from the John DeWitt Papers 1962-1979, Smithsonian Archives of American of Art, Washington D.C. (last accessed March 2011).
- Redman, Charles L., and Anne P Kinzig. 2005. "Water Can Flow Uphill: A Narrative of Central Arizona Draft Version 5.0." *Arizona State University, Central Arizona-Phoenix Long Term Ecological Research Project*, Arizona State University, Tempe.
- Reid, J. Jefferson. 2011. "Chapter 7 - "The Anasazi" *The Archaeology of Ancient Arizona*. Obtained from <http://www.ic.arizona.edu/~mmap/corresp/corresp/mod06pr.htm> (last accessed 18 February 2012).
- Reisner, Marc. 1993. *Cadillac Desert: The American West and Its Disappearing Water*. New York City: Penguin Books.
- Roosevelt, Franklin D. 1935. "Address at the Dedication of Boulder Dam." Edited by Gerhard Peters and John T. Woolley: The American Presidency Project, 30 September 1935. Obtained by <http://www.presidency.ucsb.edu/ws/?pid=14952> (last accessed 30 December 2011).
- "Roosevelt Opens Gates of Great Dam." 1911. *The New York Times* 19 March:16. Obtained from ProQuest ID-97203933 (19 October 2011).
- Round, Philip A. 2008. *The Impossible Land: Story and Place in California's Imperial Valley*. Albuquerque: University of New Mexico Press.
- Rowley, William D. 2006. *The Bureau of Reclamation: Origins and Growth to 1945*. Vol. 1. Denver: Bureau of Reclamation.
- Rusho, W.L. (Bud). 2008. "Oral History Interview. Transcript of Tape-Recorded Bureau of Reclamation Oral History Interviews conducted by Brit Allan Storey, Senior Historian, Bureau of Reclamation during 1995 in Salt Lake City, Utah," ed. by Brit Storey, College Park, Maryland. Repository for the record copy of the interview transcript is the National Archives, Maryland.
- Salazar, Theresa. 1997. "Southwest Wonderland." University of Arizona Library: Special Collections. Obtained from <http://www.library.arizona.edu/exhibits/pams/intro.html> (last accessed 21 February 2012).

- "Salinity and Total Dissolved Salts." 2003. In "Central Arizona Salinity Report: Phase I, Technical Appendix:4-15. Obtained from <http://phoenix.gov/WATER/cassph1tec.pdf> (last accessed 4 May 2012).
- "Salt River Pima-Maricopa Indian Community." 2011. Website. Obtained from http://www.srpmic-nsn.gov/history_culture/pima.asp. (last accessed 20 January 2012).
- SRP History. Salt River Project. n.d. "A History of the Salt River Project." Website. Obtained from <http://www.srpnet.com/about/history/default.aspx> (last accessed 4 February 2012).
- Scott, Hugh A. 1987. "Hugh Scott on the Bonneville Dam and the Boom Era." *Oregon Historical Quarterly* 88 (3):258-84.
- Section of Fine Arts. 1939. Description of *Dam Construction* mural by William Gropper. Department of the Interior, Washington, D.C.: Federal Works Agency, Public Building Administration.
- Seelye, John. 1991. *The Beautiful Machine: Rivers and the Republican Plan*. New York: Oxford University Press.
- Sheridan, Thomas E. 1995. *Arizona: A History*. Tucson: University of Arizona Press.
- Sill, Philip L. 1924. "Roosevelt Dam Makes the Desert Bloom." *The New York Times* 16 November:XX5. Obtained from ProQuest ID-103328450 (26 February 2012).
- Smith, Juan, and William Smith Allison. 1935. Pima Legend: Origin of Irrigation. In *The Short Swift Time of Gods on Earth: The Hohokam Chronicles*, ed. by Donald Bahr, Juan Smith, William Smith Allison, and Julian Hayden. Berkeley: University of California Press:123-26.
- Smith, Karen L. 1986. *The Magnificent Experiment : Building the Salt River Reclamation Project, 1890-1917*. Tucson: University of Arizona Press.
- Smythe, William E. 1907. *The Conquest of Arid America*. Norwood, Mass.: Norwood Press.
- "Spain Invites World to a Fair." 1928. *The New York Times* 5 August:117. Obtained from ProQuest ID-104334603 (1 April 2012).

- "Spain: Seville Exposition." 1929. *Time Magazine*, 20 May. Obtained from www.time.com/time/magazine/article/0,9171,723639,00.html (last accessed 26 March 2012).
- Stegner, W.E. 1954. *Beyond the Hundredth Meridian: John Wesley Powell and the Second Opening of the West*. Boston: Houghton Mifflin.
- Steinberg, Theodore. 1991. *Nature Incorporated: Industrialization and the Waters of New England*. New York: Cambridge University Press.
- Sternberg, R. 2006. "Damming the River: A Changing Perspective on Altering Nature." *Renewable and Sustainable Energy Reviews* 10 (3):165-97.
- Stevens, Joseph E. *Hoover Dam*. 1988. Norman: University of Oklahoma Press.
- Stinger, L., and B. Ferguson. 1999. "Portraits of Reclamation." Obtained from <http://www.usbr.gov/museumproperty/art/borart.pdf> (last accessed 12 August 2011).
- Teague, David W. 1997. *The Southwest in American Literature and Art*. Tucson: The University of Arizona.
- "The American Scene." 2010. In "Life of People: Realistic Prints and Drawings from the Ben and Beatrice Goldstein Collection, 1912-1948." Library of Congress website. Obtained from <http://www.loc.gov/exhibits/goldstein/> (last accessed 4 May 2012).
- "The Sun's Chilly Impact on Earth." n.d. NASA Website ed. by Horace Mitchell. Obtained from http://svs.gsfc.nasa.gov/stories/iceage_20011207/ (last accessed 3 December 2011).
- "To Exhibit Novel Smoker." 1928. *The New York Times* 15 July:N23. Obtained from ProQuest ID-104324631 (12 March 2012).
- "Tonto Apache Indian History." n.d. Access Genealogy Website. Obtained from <http://www.accessgenealogy.com/native/tribes/apache/tonto.htm>. (last accessed 11 February 2012).
- Udall, Steward L. 1970. "Recorded Interview by W.W. Moss, no. 2," 12 February. Obtained from John F. Kennedy Library Oral History Program, <http://www.jfklibrary.org/Search.aspx?nav=N:4294913663> (last accessed 3 January 2012).

- _____.1970. "Recorded Interview by W.W. Moss, no.7," 6 July. Obtained from John F. Kennedy Library Oral History Program
<http://www.jfklibrary.org/Search.aspx?nav=N:4294913663> (last accessed 3 January 2012).
- _____.1963. *The Quiet Crisis* (Uncorrected Proofs). Obtained from John F. Kennedy Library <http://www.jfklibrary.org/Asset-Viewer/Archives/JFKPOF-080-007.aspx> (last accessed 9 February 2012).
- Veregge, Nina. 1993. "Transformations of Spanish Urban Landscapes in the American Southwest, 1821-1900." *Journal of the Southwest* 35 (4):371-459.
- Vilander, Barbara Ann. 1995. "The Hoover Dam photographs of Ben Glaha completed under the auspices of the United States Bureau of Reclamation." (Dissertation) University of California, Santa Barbara.
- Wagoner, Jay J. 1975. *Early Arizona History: Prehistory to Civil War*. Tucson: University of Arizona Press.
- Wallace, Henry A. 1991. *Henry A. Wallace's Irrigation Frontier: On the Trail of the Corn Belt Farmer, 1909*, ed. by R. Lowitt and J. Fabry. Norman: University of Oklahoma Press.
- Waters, Michael R. 2006. "Prehistoric Human Response to Landscape Change in the American Southwest." In *Environmental Change and Human Adaption in the Ancient American Southwest*, ed. by David E. Doyel and Jeffrey S. Dean. Salt Lake City: The University of Utah Press:26-45.
- Wehr, Kevin C. 2002. "Damnation: The State of Nature and the Nature of the State in the American West." (Dissertation) The University of Wisconsin, Madison.
- Whittlesey, Stephanie M. 1997. "Landscapes and Lives Along the Lower Verde River." In *Vanishing River: Landscapes and Lives of the Lower Verde Valley*, ed. by Stephanie M. Whittlesey. Tucson: SRI Press:703-22.
- _____.1997. "Rethinking the Core-Periphery Model of the Pre-Classic Period Hohokam." In *Vanishing River: Landscapes and Lives on the Lower Verde Valley*, ed. by Stephanie M. Whittlesey. Tucson: SRI Press:597-628.
- Whittlesey, Stephanie M., and Su Benaron. 1997. "Yavapai and western Apache Ethnohistory and Material Culture." In *Vanishing River: Landscapes and Lives of the Lower Verde Valley*, ed. by Stephanie M. Whittlesey. Tucson: SRI Press:143-84.

- Wienbenson, Dora. 1969. "Tony Garnier: The Cité Industrielle." In *Planning and Cities*, ed. by George R. Collins. New York: George Braziller, Inc.
- Wilcox, David R. 1991. "Hohokam Religion: An Archaeologist Perspective." In *The Hohokam: Ancient People of the Desert*, ed. by David Grant Noble. Santa Fe: School of American Research Press:47-59.
- Wilson, Richard Guy. 1985. "Machine-Age Iconography in the American West: The Design of Hoover Dam." *Pacific Historical Review* 54 (4):463-93.
- "Winning the Fight to Reclaim the Desert." 1907. *New York Times* 31 March:SM6. Obtained from ProQuest ID-96701564 (1 April 2012).
- Winter, William L. 1978. "Is Technology-Ridden U.S. Agriculture in a Long-Run Decline?" *The American Journal of Economics and Sociology* 37 (4):337-48.
- Woodhouse, Connie A. et al. 2010. "A twelve-hundred year perspective of twenty-first century drought in Southwestern North America." *Proceedings of the National Academy of Sciences* 107 (50):21283-88.
- Worster, Donald. 2001. *A River Running West: The Life of John Wesley Powell*. New York: Oxford University Press.
- _____. 1984. "History as Natural History: An Essay on Theory and Method." *Pacific Historical Review* 53 (1):1-19.
- _____. 1985. *Rivers of Empires: Water, Aridity, and the Growth of the American West*. New York: Pantheon Books.