THE SAN DIEGO RIVER: AN ARCHAEOLOGICAL, HISTORICAL, AND APPLIED ANTHROPOLOGICAL PERSPECTIVE

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DEDICATION

This thesis is dedicated to the people of San Diego with aspirations of creating a sustainable future for generations to come. By examining the past, we can shape the future.
Whiskey is for drinking. Water is for fighting over.
--Mark Twain
ABSTRACT OF THE THESIS

The San Diego River: An Archaeological, Historical, and Applied Anthropological Perspective
by
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This thesis provides an examination of the archaeology and history of the San Diego River, and how it shaped the modern perceptions of those living in San Diego. The use of applied anthropological theory will provide a general framework for the future of study for the San Diego River by using history, archaeology, and modern ethnography to draw conclusions about changing perceptions of water. The main focus of this study includes archaeological evidence of water use along the San Diego River, the subsequent development of the river in the form of irrigation, storage, and transport, and the future of water use for San Diegans. These topics are presented from various theoretical perspectives, ranging from historical ecology to capitalist and Marxist theory and path dependency in an effort to explain culture change over time. Case studies in archaeology and applied anthropology from various geographic regions are included to demonstrate parallel themes and perspectives to the San Diego River. The concluding discussion focuses on successful water use from prehistoric practices to modern technology and how a combination of these factors provides suggestions for the future of water policy and use in San Diego. The goal of this thesis is to provide a background and solid framework on which to build a more comprehensive understanding of water use in the San Diego region, and how to use applied anthropology to shape water policy with a greater understanding of the changing culture of water in the San Diego region.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>SECTION</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>xi</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>xii</td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>xiii</td>
</tr>
<tr>
<td>CHAPTER</td>
<td></td>
</tr>
<tr>
<td>1 INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Outline of the Thesis</td>
<td>1</td>
</tr>
<tr>
<td>Theoretical Perspective</td>
<td>3</td>
</tr>
<tr>
<td>Historical Ecology</td>
<td>4</td>
</tr>
<tr>
<td>Marxist Theory</td>
<td>5</td>
</tr>
<tr>
<td>Path Dependency</td>
<td>10</td>
</tr>
<tr>
<td>2 METHODOLOGICAL APPROACH</td>
<td>11</td>
</tr>
<tr>
<td>Literature Review</td>
<td>11</td>
</tr>
<tr>
<td>Data Collection</td>
<td>14</td>
</tr>
<tr>
<td>Geographic Information Systems (GIS)</td>
<td>15</td>
</tr>
<tr>
<td>Archaeological Site Data</td>
<td>15</td>
</tr>
<tr>
<td>Introduction to Themes and Research Questions</td>
<td>17</td>
</tr>
<tr>
<td>Water Unreliability</td>
<td>17</td>
</tr>
<tr>
<td>Cultural Change and Adaptation to the Environment</td>
<td>19</td>
</tr>
<tr>
<td>Research Questions</td>
<td>19</td>
</tr>
<tr>
<td>3 PREHISTORY OF THE SAN DIEGO RIVER</td>
<td>22</td>
</tr>
<tr>
<td>San Diego River Background</td>
<td>22</td>
</tr>
<tr>
<td>The Early Kumeyaay</td>
<td>22</td>
</tr>
<tr>
<td>Ethnographic Evidence</td>
<td>24</td>
</tr>
<tr>
<td>Evidence of Resource Manipulation</td>
<td>24</td>
</tr>
<tr>
<td>Early Spanish Influence on the Kumeyaay</td>
<td>26</td>
</tr>
<tr>
<td>Archaeological Evidence</td>
<td>27</td>
</tr>
</tbody>
</table>
Noteworthy Prehistoric Archaeological Sites Along the San Diego River.................................................................................................................33
  CA-SDI-35.................................................................................................33
  CA-SDI-203 .............................................................................................34
  CA-SDI-5669 ...........................................................................................34
  CA-SDI-8251 ...........................................................................................35
  CA-SDI-9243 ...........................................................................................35

4  HISTORY OF THE SAN DIEGO RIVER.................................................................37
  Spanish Period .............................................................................................38
    Mission Dam and Aqueduct........................................................................41
    Archaeology of the Spanish Period............................................................41
      CA-SDI-6658 ........................................................................................41
      CA-SDI-6660 ........................................................................................43
  Mexican Period .............................................................................................43
    History of the Mexican Period.................................................................44
    Archaeology of the Mexican Period ..................................................................45
  American Period ...........................................................................................46
    Derby Dike ...............................................................................................46
    Development of a City ...............................................................................47
    San Diego Water Company .......................................................................48
    San Diego Flume Company ......................................................................49
      The San Diego Flume ............................................................................49
      Company History ..................................................................................51
    Cuyamaca Water Company ......................................................................52
    Southern California Mountain Water Company ....................................53
    The Hatfield Flood of 1916 ......................................................................55
    Urban Versus Agricultural Water Use ....................................................55
    Hydrologic Study of San Diego, 1935 .......................................................58
    The San Diego Aqueduct ...........................................................................60
    Archaeology of the American Period ......................................................60
      CA-SDI-11296 .......................................................................................61
      CA-SDI-20233 .....................................................................................61
5 WESTERN WATER LAW AND WATER USE .................................................................63

Western Water Law ...............................................................................................63
  California’s Common Law System ..................................................................64
  Spanish Water Rights .......................................................................................64
  California Water Law ......................................................................................64

City of San Diego v. Cuyamaca Water Company ..................................................66

  San Diego’s Pueblo Rights ..............................................................................66
  El Capitan .........................................................................................................67
  Paramount Rights .............................................................................................69

A Forged Document? .......................................................................................71

Summary of the Legal Battle ...........................................................................73

6 CASE STUDIES AND APPLIED ANTHROPOLOGY .............................................75

The Archaeology of Water .....................................................................................75

  Jamestown, Virginia ........................................................................................75
  American Southwest ........................................................................................77
  Yucatán Peninsula, Mexico .............................................................................79

San Diego, California .......................................................................................81

An Applied Anthropology of Water ......................................................................82

  Cotahuasi Valley, Peru .....................................................................................83
  Washington, D.C. .............................................................................................84
  Stour River Valley, United Kingdom ..................................................................86

7 DISCUSSION ..............................................................................................................88

Water Unreliability and Cultural Change ..............................................................88

Historical Ecology .................................................................................................89

Marxist Theory .......................................................................................................89

Path Dependency ...................................................................................................91

Research Questions Revisited ...........................................................................93

8 SUMMARY AND CONCLUSION ............................................................................98

Summary ................................................................................................................98

Hope for the Future? .........................................................................................100

Limitations .............................................................................................................101
LIST OF TABLES

Table 1. Archaeological Sites within 500 Meters of the San Diego River ..........................30
LIST OF FIGURES

PAGE

Figure 1. Map of the San Diego River. ...............................................................23
Figure 2. Mission Dam (CA-SDI-6658) in 1908. ..............................................42
Figure 3. Mission Dam (CA-SDI-6658) in 2013. ..............................................42
Figure 4. Double well for irrigation at the San Diego Mission. ..................44
Figure 5. Map of the lands controlled by the San Diego Flume Company.. 50
Figure 6. Los Coches Trestle, 1889. .................................................................51
Figure 7. Map of the proposed El Capitan Dam and Reservoir site, 1927. 68
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CHAPTER 1

INTRODUCTION

This thesis has been largely influenced by a previous anthropological study in the United Kingdom. In 2004, Anthropologist Veronica Strang published a comprehensive study of the culture of water along the Stour River in the United Kingdom (Strang 2004). The story of the river followed a similar course to thousands of other developed rivers across the globe, but presented an in-depth cultural examination focused on an extensive ethnographic study of the Stour River region. Strang (2004) began with a discussion of the earliest uses of the river, how cultures changed to conform to advances in technology in the development of the river, how those living along the Stour River view the river, water, and nature, and concluded with a discussion of why successful water use policies should include the cultural perspectives of those people living along and using the river.

OUTLINE OF THE THESIS

Natural parallels can be drawn between the Stour River and the San Diego River in southern California, particularly concerning cultural shifts in water use over time. As the history of the Stour River shaped the way people view the river today, development of the San Diego River region over hundreds of years has affected contemporary beliefs of the river for those living in San Diego today. This study examines the San Diego River from an anthropological perspective and examines the ways in which the history of the river has changed the culture of water use in southern California.

As presented in Strang’s study, knowledge of the first water users along the Stour River is derived from archaeological sources and historical manuscripts. The prehistoric inhabitants living along the San Diego River left evidence of temporary and permanent settlements along the banks of the river, as described in Chapter 3. In addition to archaeological evidence, early ethnographers, including Florence Shipek (1981; 1993) and others, collected stories and data from living descendents of these prehistoric groups regarding Kumeyaay water use. This data also describes cultural reactions to changes in
environmental conditions, including water shortages and resource stress. Shipek describes successful strategies used by the Kumeyaay to manage water in the semi-arid climate of southern California, and how these were restricted and discouraged as the San Diego Mission gained increasing influence over the region.

Chapter 4 moves into the historic period of missionization and development of the San Diego River. Much of the narrative history is derived from translated journals, personal letters, and correspondence, including those of the early Spanish missionaries in San Diego. Use of the San Diego River is crucial at this point in time, as the mission needed a reliable water source to support the growing settlement and neophyte population. The goals of the mission were seemingly at odds with the culture of the native population, especially concerning the river and water use. The subsequent relatively short Mexican period, beginning in the 1820s, did not dramatically change the landscape of the river, except for the creation of large ranchos and a new focus on cattle ranching. The American period in the 1840s saw an increase in agriculture, water storage, and water transportation to support urban development. The focus of those developing the San Diego River at this time and into the early 20th century had changed dramatically from the views of the early Kumeyaay, prioritizing capital gain at the expense of sustainability and efficiency. The narrative history is followed by corroborating archaeological evidence as available to support these cultural shifts over time.

Following the historical background of the San Diego River, Chapter 5 delves into a discussion of American water law, water use studies, and some general themes of water use. The defining court case between the City of San Diego and the Cuyamaca Water Company will be discussed in this chapter, as it represents a major turning point in the history of water law and water rights in San Diego and southern California. These topics present additional structure for the discussion of cultural change related to water development. Chapter 6 includes relevant case studies in archaeology and applied anthropology to provide parallels to the San Diego River and cultural perspectives on water use. The case studies range from sites in the United States to Central and South America, with examples from the archaeology of agriculture to an ethnography of water use. This study concludes with a comprehensive discussion of the archaeology and history of the San Diego River in Chapter 7, including the effectiveness of applying anthropological theory to the creation of water use policy. Research
questions will be revisited and analyzed. Chapter 8 presents an overall summary of the study, limitations faced during research, and future avenues of study. Final parallels will be presented between Strang’s study along the Stour River and the San Diego River, including a discussion of the feasibility of future study along the San Diego River. The future of San Diego’s success as a city is tied to water, and suggestions to create successful policies and strategies will be focused on the integration of cultural understanding, technology, and historical perspectives.

Methods and research questions that focused the data collection for this study are provided in Chapter 2. The theoretical framework for this study is described below, in an effort to structure the following discussion of the San Diego River.

**THEORETICAL PERSPECTIVE**

Bruce Trigger (1989) provided a history of the development of archaeological theory, from 18th century thinkers to more contemporary theorists. Middle-level theory and high level theory are best used in conjunction to provide a comprehensive view of archaeological situations. Middle-level theory is typically defined as a series of generalizations that account for regularities occurring between two or more sets of variables in many situations (Trigger 1989:21). These theories tend to include environmental determinism and others that incorporate ethnographic data to establish valid relationships between archaeological data and unobservable human behavior. High-level theory includes Marxism (historical materialism), cultural materialism, and cultural ecology models (Trigger 1989:22). These models attempt to relate concepts rather than account for specific observations and are therefore difficult to confirm or contradict. In other words, artifacts are used to interpret specific human behaviors and the connection to overall beliefs and cultural trends over time. As Trigger claims, “[M]ost successful scientific theory-building involves a combination of both approaches [middle-level and high-level theory]” (1989:24). Trigger does warn, however, that specific views about the past often persist into contemporary thinking, and can influence archaeological interpretation long after the reasoning leading to their formation has been discredited and abandoned (Trigger 1989:19).

Archaeologist Matthew Johnson (2010) further summarized the history of archaeological theory, providing a more contemporary perspective on topics important in
archaeological studies today. Johnson described the evolution of theoretical thought from culture history, to a focus on the scientific method in archaeology, to post-processual theory and culminating in the multi-pronged approach many archaeologists take today including general anthropological theory combined with gender studies, ethnography, political economy, history, and other fields. The take-away message from Johnson’s (2010:232) study reveals that archaeology is more comprehensive and successful in describing the past using a variety of theories and drawing from multiple scientific and social fields of study, incorporating different viewpoints and input from diverse perspectives. Understanding the history of archaeological theory is critical to selecting the best perspectives to utilize for a particular project. Knowing how the varied fields of biology, ecology, geography, geology, history, sociology, psychology, political economy, and others can contribute to archaeology makes for a more meaningful and comprehensive study.

Many current archaeological studies incorporate aspects of other fields to explain culture change or to simply add depth to the research results. This includes incorporating special studies into the overall project design, from radiocarbon dating to Geographic Information Systems (GIS) spatial analysis to ethnobotanical studies of ancient plant remains. In turn, studies in other fields can be enhanced by incorporating an anthropological perspective, which is a minor aim of this study. The benefits of anthropology and archaeology in relation to policy-making efforts will be discussed in the concluding chapters of this study.

Each archaeological project has a unique set of research questions to be answered by the data (artifacts) recovered, and every archaeologist decides what theoretical perspectives will best suit the research design. This thesis takes the perspective of historical ecology and elements of Marxist theory to examine variations in cultural responses and behaviors to environmental change over time. Each overall theory is described below.

**Historical Ecology**

Historical Ecology is an important perspective and theoretical lens through which to consider the San Diego region. Charles Redman’s (1999) summary, *Human Impact on Ancient Environments*, provided support for the need to consider a deeper historical perspective than traditionally examined. The main tenets of historical ecology include the
idea that humans and the environment are inextricably linked, and incorporate concepts of human ecology, social ecology, and cultural ecology. Human ecology concentrates on the systematic and evolutionary aspects of human communities. Social ecology tends to emphasize human behavior, while cultural ecology focuses on the adaptive strategies of humans from a cultural perspective. There is typically a lack of a historical perspective in ecological studies, and it is important to recognize that culture and the environment have developed together over a very long period of time (Braje 2010:3-5; Redman 1999:4, 13).

Archaeology is incorporated into historical ecology studies to provide the deep-time perspective, as the field is inherently integrative and comparative. Archaeology focuses on temporal, spatial, and cultural dynamics over time, and is well-suited to balance ecological studies. Additionally, historical ecology tends to be forward thinking, as the past ultimately shapes the future, and contemporary problems or questions can be addressed or answered with a strong historical and archaeological understanding of the past.

In application to the San Diego River, the historical ecological perspective will provide an alternate lens to viewing the past. It is important to not only examine the immediate historical record, but to include influences from the more distant past, particularly through the prehistoric period. If there is evidence of human behavioral, social, and evolutionary adaptation to fluctuations in rainfall and water availability, there can be not only parallels to the historical record, but implications for the future as well. Archaeological evidence of water manipulation, settlement patterns, artifact types and materials, or other cultural constituents linked to water can provide important insight to our traditional knowledge of the past. Decisions made to address past water shortages have shaped our present situation of unsustainability, and understanding why these decisions were made, including the social and cultural context of the time, can help determine the course for the future.

**Marxist Theory**

Elements of Marxist theory focus on society and social structure, particularly status differences and power dynamics within and between societies, which can be difficult to observe in the archaeological record. For Marxist archaeologists, interpretation of artifacts and past human behavior is based on the idea that technology is based within culture.
According to Trigger, “…technological change itself must be understood in a social context. While new technologies bring about social and political changes, they themselves are the products of specific social contexts that influence what innovations are likely or unlikely to occur” (1989:221). This view also encourages the examination of how ‘ordinary’ people or laborers lived, instead of the traditional focus on the elite and those housed in more monumental architectural features. Marx focused his career on studying capitalist societies and how they developed from more feudal societies. The influence of capitalism is important when considering the motives of private water development along the San Diego River, and the power dynamics between those attempting to control the flow.

Karl Wittfogel (1957) embraced Marxist thought, and developed a theory of a “hydraulic society” to describe despotic societies of the past and present. The San Diego region would not quite be described as a despotic society, but the focus on water as the prime creator of a society is a strong parallel. Historically, sedentary civilizations began to require more food to support growing populations, resulting in the origins of agriculture and the subsequent origins of water diversion. The ensuing surplus of goods led to the creation of individual wealth and domination of power. The ability to control wealth (water), according to Wittfogel (1957:12), results in the development of a despotic hydraulic society that controls the population by strict top-down government strategies.

The hydraulic society is based on water and on the manipulation of water to maintain social structure, often with a very prominent governmental role. This can be seen in the American West, and along the San Diego River. Key components of a hydraulic society include the division of labor, including those individuals devoted to irrigation and flood control, and cooperation between the two, a clear parallel to the United States Bureau of Reclamation and the United States Army Corps of Engineers, for example. In San Diego, local irrigation districts were created to control distribution of water for agriculture by region, and ultimately the San Diego County Water Authority (SDCWA) was formed with the construction of the San Diego Aqueduct to obtain water from the Colorado River (San Diego County Water Authority [SDCWA] 2003). Further discussion of irrigation districts and water distribution companies is provided in Chapter 3.

Heavy water works and industry are another requirement for Wittfogel’s hydraulic society, including networks of canals, ditches, large-scale farming, and irrigation systems
located along waterways. The more ancient regimes, including the Maya in Mexico and early Chinese cultures, used calendar-making and astronomy to control water systems and maintain a regulated time-keeping standard (Wittfogel 1957:22). In the United States, an established calendar and time system already existed by the time major water development projects began. A new sense of time-keeping was established in the West due to irrigation, determining work hours (and rate of pay), crop seasons, and harvest schedules.

Another component of Wittfogel’s (1957:45) hydraulic society included the need to provide drinking water to the masses, which was often provided by the government. Along the San Diego River watershed, there were stark differences in opinions regarding domestic use of water versus use for irrigation and agriculture (Courtemanche 1982). The City of San Diego primarily used water provided by John Spreckels’ system, the Southern California Mountain Water Company on the Sweetwater River, for domestic use, while leaving the irrigation districts in the backcountry to sort out water distribution from Ed Fletcher’s Cuyamaca Water Company on the San Diego River (Courtemanche 1982). Fletcher naturally wanted a share of the domestic supply market, as the growing city required increasingly more water. The City of San Diego, however, refused to significantly utilize the Cuyamaca Water Company’s supply in favor of Spreckels’ established system, limiting Fletcher’s ability to expand the water supply.

Wittfogel discussed government attempts to limit private property, weakening the power of private ownership. This is reflected in the American West, as individuals were encouraged to control their own water system within the pre-determined legal limits. National, state, and local agencies imposed acreage limits for farmers, requiring the use of State engineers for irrigation development projects, and more contemporary environmental regulations. This resulted in varying degrees of autonomy, allowing individuals to believe they had some power or influence, especially in relation to others. Wittfogel discussed different concepts of government-controlled and private property, society, and the development of personal property. Small private property owners were offered (by the government) considerable economic incentives, but virtually no political power (Wittfogel 1957:294). However, according to Wittfogel, when societal and cultural values include favoring private property ownership and individual accumulation of wealth, the lack of political power or sway is not necessarily a deterrent to owning property.
Donald Worster (1985) followed Wittfogel in his ideas of control over water and the need for humans to conquer nature. Worster discussed the ideas of freedom, individuality, and innovation as major motivating factors for the development of the American West. Humans, according to Worster, are determined to dominate nature, an idea reflected magnificently in irrigation canals running counter to natural topography. He argued, “[The West] is, first and most basically, a culture and society built on, and absolutely dependent on, a sharply alienating, intensely managerial relationship with nature” (Worster 1985:5). Worster continues, “Quite simply, the modern canal, unlike a river, is not an ecosystem. It is simplified, abstracted Water, rigidly separated from the earth and firmly directed to raise food, fill pipes, and make money” (1985:5).

Worster discussed the history of the settling and development of the West, touching on Wittfogel’s hydraulic society, and claiming that the most telling history was not written, but observed in nature. In other words, past human behavior and values can be observed in the ways in which humans have altered the natural environment. This is also reflected in the archaeological record, as significant material and physical remains of environmental alterations are still apparent in the landscape. Some of these alterations will be discussed in the following case studies, as prehistoric groups began controlling water, managing resources, and creating indelible changes to the surrounding environment. Changes in irrigation systems, agricultural fields, and methods of collecting and distributing water during the historic period in San Diego will also be described, reflecting the ways in which values and cultural systems changed over time.

Worster developed his own categories (and opinions) of water control systems, including control on a local subsistence level, the agrarian state, and a capitalist state (the American West) (1985:31). The local subsistence system included mainly temporary water diversion structures and small-scale controls, minimal interference with the natural flow of the waterway, and the use of water for personal consumption. The organization of power was loose and unconsolidated, with no social or economic class distinctions (Worster 1985:31).

The agrarian state interfered with the natural water flow on a massive scale, forcing water out of its path with a complex risk of environmental degradation. This system required vigilant management. The state provides an adequate and dependable supply of water, while demanding payment of tribute as money or crops in an attempt to redistribute the economy.
Historically, a large percentage of wealth remained in city centers, building the wealth of an elite class. As canals extended into new territories, it became impossible to provide steady and reliable water to outlying areas, resulting in more ambitious irrigation systems (Worster 1985:37). Worster points out that there is a critical moment when societies could have decided against expanding irrigation systems, but once the decision was made, it could not be undone. This is likely due to drought, impending starvation, and simply too many groups struggling to use a limited resource (Worster 1985:47).

The capitalist state water system has no ruling class as described with the agrarian system, but instead a bureaucratic group retains control over the system. There is a focus on capitalism as the driving force, and the free market system differentiates this system from the agrarian model. The capitalist mode has two roughly equivalent centers of power, including private sector agriculturalists and (elected) public sector representatives that generally work together to achieve total control over the water (Worster 1985:51). The most fundamental aspect of the capitalist state system is the attitude toward water. Water is viewed as a commodity to be bought and sold by the private sector, and to use to make products for the marketplace (Worster 1985:52).

Worster summarized the history of the development of the West, from the first Mormon settlers diverting rivers and streams for subsistence, to the National Reclamation Act of 1902 and the creation of the Bureau of Reclamation for government-sponsored irrigation projects, to the construction of more contemporary dams, reservoirs, and massive canal systems. There is an element of warning and concern for the future while questioning the wisdom of creating the irrigated Western Empire and the lack of foresight during construction. Although a crisis of survival can mean different things to different people, in the American West the lack of water “…was a threat to an established standard of living, to a margin of wastefulness, and to a future of unrestrained economic growth” (Worster 1985:312).

In the San Diego River region, the development of companies focused on collection and distribution of water included overall goals of creating individual capital. The application of tenets of Marxist theory will be evident in not only the data collected for this project, but in the history of the development of the river and power struggles between individuals and groups. Attempts to control the River and distribute water in an effort to earn personal wealth
and power are apparent throughout the history of San Diego, all of which will be described in detail in the following chapters.

**Path Dependency**

In addition to the main theoretical perspectives described above, the concept of path dependency is included as part of this study. Martin Melosi (2000), in his study of the historical development of urban sanitation systems in the United States, proposes the concept that individuals planning and creating city-wide sanitation systems were limited by technology available at the time to account for future growth and further advances in technology. In general, path dependency, although largely derived from application in economics, refers to the “…serviceable life of technologies…and the constraint of choices available to later generations of decision-makers” (Melosi 2000:10). In other words, decisions and choices made by individuals historically had significant effects on the ability of others to make successful decisions in the future. According to Melosi, “…decisions made about sanitary systems in the nineteenth century had a profound impact on cities more than 100 years later” (2000:10).

New technologies in urban development, including sanitation systems, water distribution, and public transportation, were often limited by existing systems. Removing and replacing an entire system was often cost prohibitive for most cities, so attempts to create more permanent systems slowed the process of urban development (Melosi 2000:11). This perspective is applicable to the city of San Diego, as early water development projects, including the San Diego Flume Company’s redwood water transportation system and others, effectively shaped the way people obtained water, stored water, and distributed water. Once a system became established, despite its ineffectiveness or inefficiency, choices for water distribution in the future were limited by the existing systems. This idea will be explored in detail in the following chapters, including a discussion regarding the reasons behind decision-making and water use in San Diego. Many of the decisions can be arguably traced to political and economic motivators, as discussed in the previous section, and will be examined further.
CHAPTER 2

METHODOLOGICAL APPROACH

As briefly described in the previous chapter, each archaeologist must decide the theoretical framework that shapes a specific research project. Similarly, the methodological framework must be carefully selected to maximize the significance of the expected results and data for the project. The ways in which data are collected, sampled, and reported are imperative to the overall project goals. For this project, the research methods and data collection strategies are discussed below, followed by the general themes and research questions shaping the study.

LITERATURE REVIEW

This study examined both current and historical sources of information related to the San Diego River, all of which were available in print or digital format. References were selected based on relevance to the overall theme of the project, or those containing specific facts, dates, or descriptions of archaeological and historical sites of interest. Primary sources ranged from translated Spanish diaries and journals from the early missionaries (Engelhardt 1920), to archaeological site recording forms, to annual reports (Van Etten 1935), to newspaper articles from the San Diego Union (1886; 1914), to original court documents (City of San Diego v. Cuyamaca Water Company, City of El Cajon, and La Mesa, Lemon Grove and Spring Valley Irrigation District, 1926-1928). Secondary sources included ethnographic reports (Shipek 1981; 1983), non-fiction books (Redman 1999; Reisner 1993) including historical narratives (Smythe 1908), other dissertations and theses (Courtemanche 1982; Fowler 1953; Pham 2011; Strathman 2005), and anthropological and historical journal articles.

Translations of Spanish diaries and journals were found in Zephyrin Engelhardt’s description of the history of Mission San Diego from 1920, in which he described the living conditions and lifestyle of the missionaries. This information provided detail regarding the
missionaries’ efforts to transform the surrounding landscape to suit the needs of the expanding mission industries.

Archaeological site records were obtained from the South Coastal Information Center (SCIC), the local repository for archaeological data for San Diego and Imperial Counties. Site records were examined to determine the function and composition of the site, and how each resource contained evidence suggesting an overall use of the San Diego River. The majority of the sites were prehistoric in age, representing the depth of time necessary to establish long-term use of the River. Descriptions of historical archaeological sites near the River, including the Whaley House well at Old Town, were examined through published excavation summary reports (Mallios et al. 2011).

Historical hydrological studies of the San Diego River were available at the San Diego State University library, providing significant detail regarding the development plans for the River, and recommendations for the future. Annual statistics for rainfall, catchment areas, and urban and rural population were reported in multiple sources (Fowler 1953; Van Etten 1935). These numbers and figures were subsequently used to corroborate historical narratives and historical archaeological evidence (Courtemanche 1982; Pham 2011; Shipek 1981; Strathman 2005). The hydrological studies additionally provided a basis for decisions made by the City Council and by private companies and irrigation districts. Plans for dam and reservoir sites provided in these studies demonstrated the need for water development projects to boost population and economic growth.

Newspaper articles were most often accessed via microfiche at the San Diego State University Library, as the extensive collection of San Diego Union editions extends back into the late 19th century. The newspaper articles included descriptions of upcoming development projects, including the noteworthy San Diego Flume Company’s redwood water conveyance system (San Diego Union 1886), articles describing opinions about particular projects, and arguments for or against different bond measures that would fund water development (Courtemanche 1982). The newspaper provided an often biased opinion regarding development projects, subject to the whim and personal interests of the current editor at the time. These articles provided a unique perspective toward water development and use of the San Diego River, reflecting political and economic pressure and influence on public knowledge.
Original court documents from the decade-long battle between the Cuyamaca Water Company and the City of San Diego were also readily available at the San Diego State University Library in Special Collections. Multiple storage boxes contain the thousands of pages of documents from the legal challenge, including the local Superior Court case to the State Supreme Court decision. These documents provided significant background data regarding the development of El Capitan Dam and Reservoir, including maps, diagrams, and charts (City of San Diego v. Cuyamaca Water Company, City of El Cajon and the La Mesa, Lemon Grove and Spring Valley Irrigation District, Box 24(8), CA State Supreme Court Collection, No. 18417 [1928]). The court documents included filings by the City for paramount rights over the San Diego River based on pueblo water rights, and a copy of an 18th century letter from a Spanish viceroy to Junipero Serra to demonstrate that the mission, not the struggling pueblo of San Diego, had control over the River (City of San Diego v. Cuyamaca Water Company, City of El Cajon and the La Mesa, Lemon Grove and Spring Valley Irrigation District, Box 24(8), CA State Supreme Court Collection, No. 18417 [1928]). These court documents provided an invaluable source of information, particularly the lengths to which the City of San Diego and the Cuyamaca Water Company and the La Mesa, Lemon Grove, and Spring Valley Irrigation District would go to claim rights to water in the San Diego River for future use.

Ethnographic research, mainly data collected by Florence Shipek in the 1960s-1970s and the major ethnographic study of the Stour River by Veronica Strang (2004), provided evidence for early human behavior along the San Diego River and a framework for examining behavior and attitudes toward water, respectively. Other ethnographic data are presented in the following chapters as case studies to support the application of anthropological theory and method to the San Diego River (Blanton 2000; Scarborough 1998; Trawick 2001; Williams 2001). The portion of Shipek’s data used for this thesis includes ethnographic research related to environmental management by the Kumeyaay, as well as cultural behavior in response to resource stress (Shipek 1981; 1993). Strang’s (2004) ethnography will be discussed in the following chapters, and includes current and past attitudes related to water use for those living along the Stour River.

Books and historical narratives ranged from Smythe’s description of the history of San Diego up to 1908, to texts regarding archaeological and applied anthropological theory
(Johnson 2010; Redman 1999; Trigger 1989), to general non-fiction describing water in the western United States (Diamond 2005; Fiege 1999; Reisner 1993; Walker 2004; Wittfogel 1957; Worster 1985). The selections utilized from this large body of literature focused on past and present water use, water resources management, and political and cultural decisions and behaviors that ultimately shaped the course of water development. Sources such as Reisner (1993) and Diamond (2005) are widely available to the public, and have produced some harsh critics. The information from these sources was used mainly as background and provided useful insight related to contemporary views on the situation of water use in the Western United States (Reisner 1993) as well as ideas about environmental change and human behavior in response to resource stress (Diamond 2005). Although inherently biased by his social standing and cultural background, Smythe’s (1908) historical summary appears to be based on historical facts and reflects ideas about San Diego history typical of the early 20th century.

The final set of resources used in this thesis includes journal articles from various historical and anthropological sources. Many of the journal articles represent summaries of specific studies or archaeological projects (Braje et al. 2007; Damp et al. 2002), as well as those providing detail related to historical events (Papageorge 1971; Reich 2000; Sholders 2002). The anthropological articles often contained reports of original data gathered at archaeological sites (Blanton 2000; Damp et al. 2002) or from studies in applied anthropology (Orlove and Caton 2010; Williams 2001). Most of these articles are presented in the following chapters as case studies or as supporting documents to archaeological evidence.

**Data Collection**

The data collected for this thesis, in addition to the archival research described above, includes detailed archaeological site descriptions and locational information. One of the goals for this research included generating a list of prehistoric archaeological sites in the immediate vicinity of the San Diego River to demonstrate long-term use of riverine resources. The methods for collecting this data are presented below.
**Geographic Information Systems (GIS)**

The use of Geographic Information Systems (GIS) in archaeological research is well-documented and widely practiced (Brodie 2010; Conolly and Lake 2006; Mallios et al. 2011; Wescott and Brandon 1999), and will not be discussed in detail in this study. One of the benefits of using spatial analysis for archaeology, however, includes providing the researcher with an opportunity to observe patterns and links in spatial data. This particular aspect of GIS was utilized to observe prehistoric site locations within a specific distance to the San Diego River in an effort to determine the range of use of the river. This information would provide evidence of riverine resource use prior to the historic period in addition to spatial distribution of archaeological sites along the river.

The alignment of the San Diego River and its main tributaries was downloaded as a shapefile from the San Diego Association of Governments (SANDAG) website (San Diego Association of Governments [SANDAG] 1999), which provides public access to widely used data files (GIS Data Warehouse). Using analysis tools within the GIS software (ArcGIS 10.1), a 500-meter arbitrary buffer around the San Diego River was created to limit the search radius for prehistoric sites. The buffer distance was selected to highlight only those archaeological sites within the immediate vicinity of the river, and those with the highest likelihood for containing evidence of riverine resource utilization. Only the main alignment of the river was used for the buffer, excluding tributaries and other creeks and streams. The data obtained from this exercise was used as a sample of representative resources and the limited area was considered suitable for this purpose. This buffer was then compared to existing data housed at the SCIC, including locations of prehistoric archaeological sites. The site location data was restricted to those archaeological resources located within the 500-meter buffer along the main alignment of the San Diego River.

**Archaeological Site Data**

The South Coastal Information Center (SCIC) is a repository for archaeological data for San Diego and Imperial Counties, and is part of the California Historical Resource Information System (CHRIS). There are ten regional repositories throughout California, often associated with a local museum or university. These storage facilities are crucial to the management of historical and cultural resources within California, as new resources are
continuously recorded, documented, updated, and mapped. As new archaeological sites are observed and recorded, during a pedestrian survey for a development project, for example, locational data is provided to the Information Center (IC) for their records and to keep in perpetuity. This site data is then made available to researchers, professional archaeologists, historians, and others with appropriate qualifications. Site information, particularly confidential locations of potentially culturally significant resources, is not available to the general public. Special requests are made to each IC to obtain site data and to gain access to these sensitive records. The records can include maps, photographs, and descriptions of artifacts and features, and the level of detail can vary dramatically based on the individual or group recording the resource. Each IC maintains its collection of data, which can include site records, topographic maps, historical maps, historical aerial photographs, project reports, historical accounts of local events, and any additional data related to the history or archaeology of the region. SCIC is one of the few ICs with GIS capabilities and digital versions of site records and project reports.

For this thesis, these digital records and GIS files were examined to determine the number and type of prehistoric archaeological sites within a 500 meter radius around the main alignment of the San Diego River. The 500-meter radius was selected both for ease of analysis, and to represent only those sites located in the immediate vicinity of the river. An industry standard search distance, for cultural resource management purposes for example, is generally at least one-quarter mile up to one mile. For this study, however, that larger distance was determined to be excessive for the primary goal of the research. The arbitrary 500-meter buffer was compared to GIS files maintained by SCIC, particularly the locational data of recorded archaeological sites. This large file, pinpointing the locations of all recorded sites in San Diego County, was essentially clipped to the 500-meter buffer to show only those sites within the buffer. A list of these sites was generated, and individual site records were examined to determine if the site was prehistoric in age, and if there was any evidence of water use or utilization of riparian resources. The data collected identified a representative sample of the types of archaeological sites located in the immediate vicinity of the San Diego River. This information can be extrapolated to apply to other river systems in the region, and is likely representative of archaeological sites located along creek and stream corridors.
throughout the County. This data set was used for a relatively small portion of this thesis, however, and the results of the research are presented in Chapter 3.

**INTRODUCTION TO THEMES AND RESEARCH QUESTIONS**

The goal of this section is to outline and define the two major themes throughout this study, and to list the main research questions guiding the research. As discussed previously, the development of an appropriate research design and application of appropriate theories will successfully shape the study, and provide the researcher with a more useful set of data for analysis.

**Water Unreliability**

An overarching theme for the San Diego River is the idea of fluctuation and unreliability. From season to season, the level and flow of the river can and does change dramatically, alternating between extreme flood to extreme drought. When considering the development of a village, town, or eventual city, the reliability of water is paramount, particularly in an arid environment. Agriculture required reliable water to support a growing population, and rivers, creeks, and streams were diverted to provide adequate supplies. The Hohokam of western Arizona, for example, developed an extensive irrigation system in order to maintain permanent settlements and as a response to growing populations in a very marginal environment (Redman 1999). Water was necessary for drinking and cleaning, as diseases became more prevalent with increases in population density and close proximity to livestock. Alternatively, different populations have managed this constraint by remaining mobile and traveling in relatively small bands to places where resources are sufficient even in dry years (Shipek 1981; Redman 1999).

Prehistoric populations responded to fluctuations in rainfall and water reliability by utilizing alternative, and often less desirable resources during times of shortage or extreme stress. The unreliability of the San Diego River certainly affected the Native American groups in the region, and likely never in the same ways from season to season. Shipek (1981) suggested that certain resources became unavailable or overexploited during times of stress. Archaeological and historical ecology studies reveal situations of overexploitation of certain resources, which can indicate seasonal availability. Archaeological examples from the Channel Islands of California indicated the use of different species of abalone as a response
to the unavailability or overexploitation of more preferable species (Braje et al. 2007). Fluctuations in the density of resources obtained either by using fresh water for processing or those from riverine or riparian areas reflect changes in the environment and changes in availability. Other responses to water unreliability include attempts at more dramatic manipulation, such as creating channels or ditches to irrigate agricultural fields, particularly in the American Southwest (Redman 1999:81-126). Some of these developments were successful, while others ultimately failed.

The history of the development of the San Diego River contains accounts regarding the unreliability of the flow and local rainfall (Hill 2002; Sholders 2002; Smythe 1908). In a particularly dry season, the river was observed as “upside down” with the water below the sand in the river bottom (Papageorge 1971:1). Spanish soldiers at the Presidio reflected a positive attitude toward the strength and quality of the water, encouraging further settlement of the region. The Franciscan friars, with little knowledge of the rainfall patterns along the San Diego River, built a water diversion system modeled after traditional Spanish design to support the growing neophyte population and agricultural endeavors (Papageorge 1971). The initial ineffectiveness of the irrigation ditch resulted in the building of a more significant aqueduct system that expanded over a number of miles in an effort to obtain sufficient water for rapidly failing crops.

The San Diego River has never been a water source suitable for a large population. The surrounding watershed, in addition to all other rivers and waterways in the county, could not support more people than the population of the county in 1940 (Van Etten 1935). The river minimally supported the prehistoric population, and even then, drought was not uncommon, resulting in self-imposed restrictions on population growth and severe reductions in resource availability. The fluctuations in the river flow shaped the perceptions of water reliability and accessibility, resulting in cultural and behavioral shifts. The Native American populations had thousands of years of knowledge and practice that shaped cultural practices, while incoming European and Anglo-American settlers, many from places with more reliable water and rivers, attempted to enhance the reliability of the river over a relatively short period of time. The results of these attempts at water manipulation to change the perceptions of water reliability varied from total disaster to marginal success.
Cultural Change and Adaptation to the Environment

The development of cultures, behaviors, and practices can be seen as a response to the changes in the surrounding environment. Thriving cultures have managed to continually adapt to changing environments by maintaining a sense of cultural flexibility. In other cultures, attempts are often made to change environmental conditions, such as diverting water courses, or overexploiting particular resources, often with less than optimal results (see Chapters 3 and 6). In the San Diego area, prehistoric groups incorporated cultural practices and actions to respond to changing environmental conditions, in an effort to maintain both environmental and population balance (Shipek 1981). This system survived for thousands of years through major and minor environmental changes and fluctuations in resource availability. The arrival of the Europeans and subsequent Anglo-Americans marked a pivotal time in the history of the river, leading to the alteration of the river and surrounding environment.

Incoming Anglo-American settlers brought East Coast and European ideas of water management and water development to the West, despite the obvious difference in rainfall amounts and severe lack of available water. Individuals simply altered the natural environment to serve their own purposes, backed by American ideals of expansion, success, and manifest destiny. As suggested by Melosi (2000), many of the early cities were planned and organized based on English systems and designs, which did not account for the different environmental factors in North America. The archaeological record demonstrates this idea, providing historical data reflecting both the realization of water unreliability and the focus on development for the sake of development (capitalism). The historical record of the San Diego River reflects the American ideals of population growth and creation of individual wealth, despite significant environmental damage and without long-term planning. Local government, in conjunction with the federal government (Bureau of Reclamation), led the way in water development projects and the creation of new bureaucratic organizations to manage water.

Research Questions

The idea that the San Diego River does not provide enough water for the region is not a new or unknown concept. The vast majority of the water used in the City of San Diego
comes from outside the county, including the Colorado River and the State Water Project (Central Valley/Feather River in northern California). Much of this study focuses on a general overview of water usage in the past, present, and future. The goals of this thesis include examining the cause of the current population’s lack of dependence and reliance on the San Diego River, how archaeology and history inform these ideas, what role applied anthropology can play in determining water use policy, and what the future ramifications of this imbalance may be. Some of the major research questions shaping this study are listed below:

- Are prehistoric archaeological sites located along the river temporary or large-scale permanent villages?
- Is there any archaeological evidence of riverine or riparian resources at sites away from the San Diego River?
- Do freshwater fish, turtles, or frogs appear in archaeological contexts? Does this reflect a reliance on riparian resources?
- How does the local archaeology support the idea of knowledge of water shortages or unreliability?
- How does the archaeological record in other arid or semi-arid locations reflect the idea of knowledge of water shortages, or how does the archaeological record demonstrate the cultural shifts or problems related to over-exploitation of water and resources?
- How were early attempts by the Native Americans (Kumeyaay) to control water different than the Spanish and Europeans?
- Is there any evidence of Native American dependence on resources from the San Diego Mission?
- Was there a series of droughts during initial mission occupation that may have drawn the Native Americans to the mission for necessary resources?
- How did the ability to manipulate water change perceptions of water reliability? Were people less inclined to believe water shortages were a problem if enough dams, reservoirs, or flume systems could be developed?
- When did the City of San Diego come to the conclusion that water supplies would be difficult to maintain for a skyrocketing population?
- Was importing water from the Colorado River via the San Diego Aqueduct the only option?
- Was it easier to simply add pipelines to import more water than to encourage maintaining sustainable population growth and development?
• How does the history of development of the San Diego River reflect changes in public sentiment regarding water use?
• How did policy-makers respond to increasing demand for water?
• How can policy-makers use applied anthropology to create a successful plan for water use in San Diego?
• Can the current population of San Diego accept a cultural shift to better utilize the available resources?
CHAPTER 3

PREHISTORY OF THE SAN DIEGO RIVER

As described in Strang’s study, the Stour River had been used by local populations for thousands of years, represented by the earliest Britons followed by the Romans in 55 B.C. (2004:11). This long period of use is crucial to the understanding of cultural change in the Stour River valley, as major historical events led to the dramatic development of the river over a relatively short period of time. A similar sequence of events is apparent in regards to the San Diego River, as prehistoric inhabitants of the river valley subsisted over thousands of years, and adapted to the changing river environment over time. This chapter discusses the early inhabitants of the San Diego region, their efforts and strategies to manipulate the environment despite extreme unreliability of the River, and archaeological evidence to support these environmental adaptations.

SAN DIEGO RIVER BACKGROUND

The San Diego River watershed encompasses 278,938 acres and traverses 135 miles of terrain (SANDAG 1999). From the headwaters in the Cuyamaca Mountains to the ocean outlet at Mission Bay, the river winds its way through canyons and valleys, now paralleling housing tracts and an interstate highway, fed by tributaries and creeks, deterred by dams and reservoirs before reaching the Pacific Ocean (Figure 1). The San Diego River has shaped the southern portion of San Diego County, providing water to plants, animals, and a growing human population.

THE EARLY KUMEYAAY

Native American groups living along the San Diego River for thousands of years before Europeans set foot in the dry riverbed had become accustomed to the fluctuations of rainfall and river flow. Archaeological evidence suggests some of the earliest inhabitants lived on the San Diego coast at least 8,000-9,000 years ago, subsisting largely on marine resources supplemented by terrestrial plants and animals (Carrico 2008; Gallegos 1986; Shumway et al. 1961). Inland areas, including those along the San Diego River,
appear to have been occupied somewhat later, by about 4,000-5,000 years ago (Cooley and Mitchell 1992; True and Pankey 1985), although other river systems in San Diego County have significantly older deposits. The Harris Site, for example, is located on the San Dieguito River in northern San Diego County and has yielded radiocarbon dates of up to 7,000 to 9,000 years B.P. (Warren 1966). Regardless of the location, however, resource availability was limited largely by rainfall, which varied, sometimes dramatically, year to year. The river and other fresh water sources were fundamental resources to the prehistoric population, as groups camped, collected, and hunted near creeks, rivers, and springs. Water was crucial to the preparation of a staple food, acorns, as the tannins must be leached prior to consumption. In the archaeological record, evidence of habitation and resource processing occurs in close proximity to waterways and natural springs.

The Native Americans undoubtedly were the initial water manipulators of the San Diego River, as they were also the first to modify the environment to increase yields of
heavily utilized plants and seeds. Useful plants were deliberately planted within or near village areas, as evidenced by particular species observed in areas outside their natural range. Anthropologist Richard Carrico (2008:13) remarked on the presence of elderberry trees located in village settings in areas not typically suitable for elderberry. Water use for food processing and storage through the use of ceramic vessels reflects the importance of water for the earliest inhabitants of the San Diego region. This cultural knowledge of the environment and how to manipulate water resources reflects some of the first attempts to control the river in the last 6,000 years. Evidence of such efforts is reported in ethnographic and historical accounts and substantiated in the archaeological record.

**Ethnographic Evidence**

Water is necessary for nearly all aspects of life, and the early Kumeyaay developed a significant relationship with rivers, lakes, springs, and streams. Villages were often located near fresh water, as previously discussed, including a major village, *Cosoy*, of at the mouth of the San Diego River (Kroeber 1925; Luksic and Kendziorski 1999). At least six major villages were located in the vicinity of the San Diego River in 1790, including *Nipaguay* (location of the San Diego Mission), El Corral, *Quepetehua*, *Equilsh Amakh*, *Kwellyemak* (Capitan Grande), and *Elcuanam* (Santa Ysabel) (Carrico 2008:12).

In addition to developing large settlements near the river, the Kumeyaay used existing natural features, such as granitic boulder outcrops and narrow canyons, for food processing and creating water storage features. Large boulders near rivers and streams were used for processing acorns and other seeds and plants. Acorns in particular required fresh water to leach toxic tannins from the meat to yield an edible food source (Strathman 2005:34). Surface water was captured behind small brush and rock dams created at narrow points along drainages, providing storage water for drier seasons (Shipek 1993). Water was also stored in large ceramic vessels, or ollas, particularly in dry desert areas to the east (SDCWA 2003:4).

**Evidence of Resource Manipulation**

Another example of the Kumeyaay manipulating water along the San Diego River includes the use of water management and erosion control methods. In addition to providing water storage, brush dams along streams created wet meadows and bog environments for growing specific plants, and the dams maintained regular levels of ground water allowing
springs to remain consistent (Shipek 1993:385). The management of springs and streams allowed for controlled burning to enhance plant husbandry. Native grains were planted near springs, streams, and wet meadows, and harvested after maturation. The plant stubble was burned and some of the collected seed was broadcast across the burn area (Shipek 1993:380). New plants sprouted with the first rain of the season. In addition to native grains, other annual grasses and plants were also broadcast in the burned areas. Oak trees were purposefully planted on the edges of valleys, and annual burns occurred after the acorn harvest in the fall (Shipek 1993:380). Erosion control features varied from alignments of rocks placed along topographic contours of valley slopes to deliberately planting certain vegetation to reduce soil run-off. The broadcasting of seed in newly exposed soil after burning also prevented soil erosion during rain events.

These systems of environmental management reflect an underlying and specialized knowledge of the region, and required a labor force for regular maintenance. Dams and rock alignments would require repair following heavy rains and flooding, and grain fields and oak groves needed controlled burning to maintain sufficient productivity (Shipek 1993). Intimate understanding of climate and environment allowed for a distributed maintenance schedule throughout the year, supported by cultural practices and social structure conducive to such activities. Inter-tribal trade and relationships provided opportunities to utilize alternative locations when conditions were dry and resources depleted (Shipek 1981:297). Affiliated groups could move across ethnic and tribal boundaries to access more abundant resources, supported by alliances and inter-ethnic marriages (Shipek 1981:297). The Kumeyaay maintained a flexible social structure allowing for shifting clan and band membership to obtain protection from relatives in distant locations, providing greater access to resources. This social flexibility, in particular, enabled use of multiple resource locations and subsistence techniques. The Kumeyaay would utilize resources from the ocean to the mountains, and all areas between, using plant husbandry (described above) and agricultural practices to raise and harvest plants to supplement hunting, fishing, and collecting activities (Shipek 1981:297).

An additional cultural response to resource stress was population control. In times of severe drought or food shortages, a number of culturally acceptable responses included induced abortions, infanticide, and the use of contraceptives (Shipek 1981:299). These
practices continued into the period following the establishment of the mission, but dwindled among the missionized Kumeyaay population. In an effort to reduce the effect of resource stress, families or bands would disperse away from village locations, and during a prolonged drought described by Father Lausen at the San Diego Mission in 1779, away from the mission (Shipek 1981:299; Engelhardt 1920:103). The Kumeayaay had created a cultural system of adapting to the environment that was successful for thousands of years, through manipulating and altering the environment to increase plant and animal productivity for food while establishing social practices to respond to fluctuations in rainfall and resource availability.

**EARLY SPANISH INFLUENCE ON THE KUMEYAAY**

As the conquering Romans altered the traditional practices of water use among the early Britons along the Stour River (Strang 2004), the Spanish systems of irrigation and agriculture not only severely affected Kumeyaay subsistence methods but indelibly changed the environment along the San Diego River. The broad pastures of native grass observed by the Spanish settlers appeared natural suitable for grazing animals, and cattle and sheep were unleashed into valleys around rivers and streams (Shipek 1993). During low rainfall years, scarce resources led the Spanish to send cattle to pasture away from the mission to the east, well into El Cajon Valley and Soledad Valley to the north (Carrico 2008:27). Grazing activities severely depleted remaining grasses and plants for the Kumeyaay to collect and process. The Kumeyaay system of collecting seed after harvest to maintain grain fields by re-broadcasting seed over burned areas came to an end, as no seed was collected by the Spanish in the pasture lands. Without establishing erosion control, farmers plowed the wet meadows and drained the bog areas to expose the silty soil for planting exotic fruits and vegetables. The underlying sterile sand was exposed within a few short seasons, exhausting the soil and proving unsuitable for agriculture (Shipek 1993:387).

The creation of irrigation systems, including dams and aqueducts to transport and divert water to the mission agricultural fields, contributed to the depletion of available surface water in outlying areas. In addition to altering the local hydrology, new irrigation systems and livestock transported invasive non-native plants into valleys and canyons that choked out many traditional Kumeyaay plant foods (Lightfoot 2005:86). Coincidental
drought and low rainfall exacerbated the effects of the mission agricultural system on the native resource availability. Dry conditions and changes in sea temperatures dramatically reduced the productivity of terrestrial and marine resources, further limiting available food sources (Lightfoot 2005:87). Local drought and resource scarcity during the initial Spanish settlement period likely contributed to the willingness of some Kumeyaay to enter the mission at San Diego to avert starvation.

**Archaeological Evidence**

In order to substantiate some of the ethnographic data for this study, a focused analysis of archaeological sites along the San Diego River was performed. One of the goals of this initial analysis of archaeological sites along the river is to identify evidence of continuous use of the river over an extended period of time, and to determine the extent of use of the river during prehistory. Using GIS, a 500-meter buffer was selected to provide a representative subset of recorded archaeological sites adjacent to the San Diego River (see Chapter 2 for an additional description of the GIS and data collection methods used in this study).

After obtaining a list of recorded archaeological sites within the 500-meter buffer from SCIC, each site record was examined for age, site type, evidence of water use, distance to the San Diego River, and any other unique or interesting data. The age of the site, for this study, was either historic (Spanish period or later, 1770s to 1950) or prehistoric (prior to the Spanish period). The age of the site demonstrates the cultural shift in water use strategies, as those of the Spanish and the Kumeyaay differ markedly. The historic-age sites will be further divided into Spanish (1770s to 1830s) and American (1848 to present) in the following chapter in an effort to illustrate additional cultural differences in water use methods in the archaeological record.

Site types included villages, temporary habitation area/camps, or single-use areas, such as bedrock milling features. Villages, for the purposes of this study, describe a permanent or semi-permanent occupation area, typically characterized by multiple artifact types, distinct activity areas, evidence of long-term use by multiple families or groups, hearths or cooking features, unique or exotic artifacts, and/or the presence of burials. Habitation areas, in contrast, represent either seasonal or temporary camp locations
containing limited or few artifact types, sparse hearth cooking features, and were likely occupied by individuals or small groups. Single-use sites, for the purposes of this study, contain evidence of limited activities, such as food processing or tool creation, and rarely have evidence of camping or further occupation. Single-use sites include isolated bedrock milling features with few associated artifacts, lithic scatters resulting from tool creation activities, or other areas with limited archaeological evidence. The distinction of site types provides information related to population density, duration of occupation, the variety of activities performed in each locale, and which of these activities may have been directly associated with water use.

Based on the ethnographic evidence above, features and artifacts indicative of water use or manipulation include bedrock milling features (processing acorns or seeds), ceramics (water storage), or significant stands of oak and elderberry trees. Grinding, drying, and processing acorns to make an edible flour or mush required a fresh water source to leach toxins (Luomala 1978:600). Bedrock outcrops conveniently located near rivers and streams provided the necessary abrasive grinding surface for nut and seed processing. The presence of ceramics in an archaeological context does not exclusively suggest water storage, as pottery vessels were also used for cooking and food storage. As anthropologist and ethnographer A. L. Kroeber mentions, among the Kumeyaay, “Cook pots and water jars are the common forms [of pottery]” (1925:722). In addition to ceramic jars, dried and hollowed out gourds were also used for water storage, although are rarely preserved in the archaeological record (Luomala 1978:600). Oak and elderberry trees, as previously discussed, were often deliberately planted in specific areas to increase productivity, so large groupings of the trees may indicate human intervention. These trees also tend to occur near permanent water sources, and would likely have been placed in areas with sufficient water to ensure survival. Oak, elderberry, and sycamore trees located in areas with little visible surface water may also indicate the location of a prehistoric archaeological site, or reflect the past location of a more significant stream or waterway.

Additional evidence of riparian resource use could include freshwater turtle bone/carapace, freshwater fish or amphibian remains, or tools associated with fishing such a bone gorges or hooks. Other evidence could include pollen or phytoliths associated with riparian plants, or tools associated with basket-making and weaving or for processing reeds
and riparian plants, such as bone awls, grinding implements, or cutting and scraping tools. Freshwater shellfish may also be observed within archaeological contexts, demonstrating further riparian resource use.

The distance of each site in relation to the river was considered important data to gather, particularly in the event of a future study based more directly on spatial distribution of sites associated with the river. For this study, however, the overall distance between the site and the river was assumed to signify a correlation for more or less dependence upon riverine resources. It is anticipated that sites closer to the river would generally reflect a heavier use of riparian resources and/or water, while those further away would likely contain evidence of limited use. The search buffer was set at 500 meters, or 250 meters on either side of the river, a distance that would not likely discourage intensive use of the river for villages and larger camps. It may, however, limit individuals or those groups traveling through the river corridor to a less intensive use of the river, which should be reflected in the archaeological record via site types.

All sites within 500 meters of the San Diego River main alignment are listed in Table 1. Isolated artifacts and sites recorded by the San Diego Museum of Man (SDMOM) are not included in the table. Site records for the resources recorded by SDMOM do not have searchable and accessible forms as yet at SCIC, and were excluded from the analysis. These sites are only those that have been formally recorded by archaeologists with records on file at SCIC. Additional sites are inevitably located along creeks and tributaries to the San Diego River, and in areas that have yet to be surveyed by professional archaeologists.

In each row of the table, the site number is listed in standard CHRIS format, using a three-letter county code (SDI for San Diego County) following the state abbreviation (CA for California), and the assigned number of the official record of the site. The site type is listed based on the categories described above (Village, Habitation, Single-Use), followed by the main features or artifacts (bedrock milling features, ceramics, lithics, stands of oak, etc.), the distance to the San Diego River (if a specific distance is listed on the site record), and whether the site record indicates any evidence of water use (Yes or No). The purpose of this table is to represent a series of continuous occupation along the San Diego River, and to demonstrate the importance of the river during prehistory. This is not an exhaustive list of all
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<td>CA-SDI-35*</td>
<td>Both</td>
<td>Village (Mission San Diego)</td>
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<td>Habituation</td>
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<tr>
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<td>Habitation</td>
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<td>1889 Flume</td>
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</table>

Note. * Noteworthy site; **BM= Bedrock Milling; GS= Groundstone. (table continues)
<table>
<thead>
<tr>
<th>Site Number</th>
<th>Age</th>
<th>Type</th>
<th>Features or Artifacts</th>
<th>Distance to River</th>
<th>Water Use</th>
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</tbody>
</table>

Note. * Noteworthy site; **BM= Bedrock Milling; GS= Groundstone.
Table 1. (continued)

<table>
<thead>
<tr>
<th>Site Number</th>
<th>Age</th>
<th>Type</th>
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<td>Dam</td>
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</tbody>
</table>

Note. * Noteworthy site; **BM= Bedrock Milling; GS= Groundstone.
archaeological sites with evidence of riparian use, but is merely a sample of the variety of archaeological sites within the immediate vicinity of the river.

Based on records from SCIC, a total of eighty-six archaeological sites have been recorded within 500 meters of the main alignment of the San Diego River. Of these, seventeen are historic in age, sixty-five are prehistoric in age, and four contain both historic and prehistoric elements. Thirty-one sites do not appear to have archaeological evidence of water use, and the remaining fifty-four sites contain at least one element related to water use. All of these sites are within 250 meters of the river, potentially representing a significant connection to water. Noteworthy sites, marked with an asterisk (*) in the table above, include those containing multiple elements related to water use, contain unique or important artifacts or features, or represent a significant event in history. These sites will be discussed below to demonstrate the impact of the San Diego River on the region as a whole. Historical archaeological sites of note will be discussed in Chapter 4.

**Noteworthy Prehistoric Archaeological Sites Along the San Diego River**

The following prehistoric archaeological sites represent significant village locations, contain unique or exotic artifacts suggesting use of riparian resources, or those that played a crucial role in the prehistoric use of the San Diego River.

**CA-SDI-35**

This site represents not only the location of the San Diego Mission, including the existing buildings and grounds, but includes the prehistoric village of Nipaguay. This village was described in historical accounts by the Spanish missionaries as a place to relocate the mission, further away from the presidio and closer to a more reliable water source (Engelhardt 1920:56). The site was originally recorded in 1949 by the Museum of Man, and limited subsequent excavations have yielded mainly historical mission period artifacts. Some Native American ceramics have been observed, but often in association with historical artifacts, likely representing the neophyte occupation of the mission. A thorough investigation of the prehistoric component of the site, pre-mission period, has not been completed and may no longer be possible. This village, along with Cosoy (CA-SDI-41) at the base of the hill below the Presidio, was likely one of the first Kumeyaay villages to endure
the effects of Spanish colonization and agricultural practices. The location of the site adjacent to the San Diego River may also reflect the significance of the river to the prehistoric population, or represent a long-term occupation.

**CA-SDI-203**

This site is located within Mission Trails Regional Park, east of the Mission Dam location on the north site of the San Diego River. Three canyons drain into the river at this location, including Oak Canyon, Spring Canyon, and Little Sycamore Canyon. The site record lists this site as a village, and contains at least 27 discrete bedrock milling features. Limited testing at the site yielded thousands of artifacts including ceramics, lithic tools and projectile points, groundstone, and unique items such as mineral pigments and abrading stones. The site encompasses over 150,000 square meters and likely represents a typical large Kumeyaay village along the river. Multiple activities occurred at this site, including food processing, hunting, gathering, tool production, and potentially ceremonial activities based on the recovered artifacts.

**CA-SDI-5669**

Located on the north bank of the San Diego River north of Santee, site CA-SDI-5669 is one of the only sites with mention of a possible prehistoric irrigation feature. The site was originally recorded in 1978, and listed significant features such as fire hearths, potential cremations/burials, and a “prehistoric water course.” Artifacts included lithic tools, bone awls, pottery, groundstone such as manos and metates, arrow shaft straighteners, shell beads, and faunal remains. Interesting potentially ceremonial artifacts including pipes, a steatite “comale” and a wand tip were also observed at the site. No additional details are provided related to the water course feature, although it could indicate either an erosion control feature as described above, or an irrigation ditch to direct water from the river to a small agricultural field. Given the proximity to the river, this site may represent one of earliest water control features during the prehistoric period. The most recent examination of the site occurred in 1983.
CA-SDI-8251

This large village site is situated just north of the San Diego River near the community of Lakeside. The site contains at least 93 discrete bedrock milling features, ceramics, lithic tools, shell and stone beads, hearth features, rockshelters, and multiple grinding implements. In addition to the extensive prehistoric component, the site encompasses a historic-age adobe building, associated mining debris, and multiple mines and adits throughout the landscape. Mining activities typically require significant amounts of water for processing rock and ore, and tend to be located near rivers or streams (Kelley 1956). Imported olive trees are also located within the site boundary, representing agricultural use of the area. The site overall represents intensive use of the river prehistorically and likely during historic times, due to the presence of bedrock milling features and historical mining debris. A formed concrete water catchment basin constructed on top of bedrock milling feature further signifies the need for water for the mining operations occurring on-site. The nearby olive grove would have also been in need of irrigation during occupation of the site. There is no mention of water diversion features at this site, however.

CA-SDI-9243

This site represents another large village located just south of the San Diego River, containing bedrock milling features, hearths, cooking platforms, ovens, and potential kilns. Testing of the site in 1985 and 1992 yielded over 84,000 artifacts, ranging from lithic tools, projectile points, groundstone, ceramics, shell beads, and bone awls. Artifacts of note include a stone net weight, antler fragments, asphaltum, ochre, and daub, and turtle carapace. The presence of turtle remains, along with fish and reptile bone, indicates use of riparian resources, and were likely collected in the immediate vicinity. Human remains were also recovered, representing multiple cremated individuals. Radiocarbon dates from the site suggest the area had been occupied for at least 5,000 years, and well into the Spanish period based on the recovery of a glass bead. The site was recorded as eligible for listing on the National Register of Historic Places given the extent of occupation, diversity of recovered artifacts, and the potential for additional important information. Based on the site map,
however, the southern portion of the site extends under what is now State Route 52 and has largely been destroyed.

In addition to CA-SDI-9243, at least four of the sites, CA-SDI-100, CA-SDI-4594, CA-SDI-13611, and CA-SDI-19370, have been destroyed or damaged, reflecting the potential for loss of archaeological sites along the river. CA-SDI-100 was inundated under El Capitan Reservoir, and the bedrock milling features at CA-SDI-4594 were moved or destroyed during construction. At least one of the milling features at CA-SDI-13611 has been removed. Artifacts collected from CA-SDI-19370 represent the remnants of a habitation area, as the site has been entirely destroyed by grading and leveling activities. Many more have likely been lost to development, road construction, dams, and reservoirs.
CHAPTER 4

HISTORY OF THE SAN DIEGO RIVER

The history of the river is fraught with controversy as individuals, cities, and corporations attempted to stake a claim to portions of or the entirety of the waterway in an attempt to secure an enduring source of water. One of the core issues in the region, however, is the fact that the San Diego River has never been reliable, fluctuating between massive flood and dire drought on an irregular schedule. This chapter discusses the history of the development of the San Diego River and significant cultural shifts over time, beginning with the Spanish missionaries (1770s to the 1820s), followed by the Mexican period (1820s to the 1850s), and culminating with the American period (1850s to present). The Spanish and American periods, in particular, reflect very different cultural views on water use and water development strategies.

Early historians of the San Diego and southern California region often described the initial development of cities and communities, including the roles of individuals, corporations, and natural features such as lakes, rivers, and oceans. William E. Smythe was a San Diego historian and wrote a detailed history of the region in 1908, describing the area from initial Spanish contact in the sixteenth century through the early twentieth century. He noted that,

The San Diego River rises in the Volcan Mountains 60 miles from the city. It flows through the El Cajon and ex-mission ranchos, the pueblo lands of San Diego and into False Bay. At Capitan Grande, 35 miles from its mouth, it is joined by a branch rising to the southeast of the Cuyamaca Mountains. Fed by numerous springs on its course, it flows to Capitan Grande all year, then it sinks into the sands and disappears in the curious manner of California rivers. (Smythe 1908:693)

The “curious manner” of the San Diego River is representative of many of the rivers in southern California. From a unique combination of climatic, geologic, and hydrologic characteristics, the volume of water is drastically reduced as it flows downstream. The San Diego region has a defined rainy season and low average rainfall resulting in fluctuations of precipitation reaching the riverbed. The river gains and loses stream flow as it travels across
sand and gravel and sinks into the soil (Danskin et al. 2006). Because the water table varies drastically from tens to hundreds of feet deep, the flow essentially disappears in some areas to reappear downstream when shallow groundwater exceeds the slope of the underlying geologic landform (Danskin et al. 2006: 16). Shallow bedrock can also encourage the water to resurface in the stream bed, effectively causing the stream or river to be defined as perennial and ephemeral. The groundwater for the San Diego River likely discharged into estuaries during the early twentieth century, resulting in an even more dramatic disappearance as it approached the mouth of the river (Wes Danskin, personal communication, December 14, 2012). Smythe’s comment captures the essence of the San Diego River, as it appears strong and consistent at the start, but gradually diminishes as it reaches the ocean. This concept is important to understanding the nature of the river, and how the early settlers reacted, suffered, adapted, and attempted to control an uncontrollable river.

**SPANISH PERIOD**

The Spanish Period in California generally begins with the establishment of the first mission at San Diego in 1769, although other explorers had visited the region by the late 16th and early 17th centuries. The voyage of Vizcaino in 1602 led the Spanish crew to San Diego Bay, where a tent was pitched on a nearby sandbank likely near the mouth of the river to give the sailors respite and to say mass. According to the diary of one of the sailors, Torquemada, the crew dug wells into the sandbank, and “…when the sea was high, the pools contained sweet and good water, but when the tide went out the water was brackish” (Engelhardt 1920:6). This was likely the first introduction of the Spanish to the habits of the river, and the subsequent colonists experienced great frustration with the fluctuations in water availability.

Following the same conquering strategy employed throughout Latin America, the Spanish selected a locally important location, the Kumeyaay village at the hill at the mouth of the San Diego River on the edge of the bay, for the new presidio in 1769. The selection of the location of the military outpost and chapel reflected the effort to demonstrate cultural and religious dominance over the native population (Luksic and Kendziorksi 1999). One of the primary goals of the Spanish was to convert the indigenous inhabitants to Catholicism, as both religious duty and as a control mechanism (Luksic and Kendziorksi 1999). Spanish
soldiers built adobe fortifications and a small church to serve as the mission for conversion of the Kumeyaay. Soon after more permanent structures had been constructed, and the intent to build a colony at San Diego became a reality, the lack of resources familiar to the Spanish limited the intended rapid expansion of territory and agriculture.

The successful establishment of the presidio and mission at San Diego was heavily dependent upon available resources, particularly water. Fr. Juan Crespí, during a 1769 expedition along the length of the river to find areas suitable for agriculture, remarked on the lack of water overall:

> We followed the course of the river which runs through a cañada of much level land, in places extending from a quarter to half a league. The soil seems to be good for raising corn and wheat. In some parts there seem to be marshes or humid soil. All along the river bed there are poplar [likely cottonwood], willow, and alder trees. We found it dry in many places. In some spots there were pools with water, and in other places there was only a streamlet. We walked about three leagues up the river bed and the valley; but conditions were the same until we reached the sierra, when the bed narrowed; but there was no running water. We do not know whether any irrigation could be done from it. (Engelhardt 1920:15-16)

The location of the mission and presidio at the mouth of the river as it emptied into the bay proved to be problematic due to the simple lack of water. As in other Spanish colonies in California, tension grew between the missionaries and the soldiers at the San Diego presidio as provisions ran short, crops failed, and conversion rates of the local population were alarmingly low (Lightfoot 2005). The soldiers did not follow the spiritual rules of the mission, particularly in regards to the Native American converts, which further frustrated the mission fathers. Troops accused the Kumeyaay of stealing and followed them into the mission to demand revenge and repayment, disregarding the wishes of the missionaries (Engelhardt 1920). By 1773, Father Luis Jayme wrote to Father Serra that the mission should be moved further inland due to the scarcity of water and the proximity of the military outpost:

> …toward the northeast beyond this cañada of San Diego, there is an abundance of pine timber, of live oak…[and] much grass or hay [so] water must be plentiful there and flowing all the time…We tell you this because it seems that as long as the mission is here [at the presidio], it will never have a firm basis. Nor should there be a mission here, on account of the scarcity of water; for we see that this year there are little hopes for wheat…it seems that if the mission stays here, the prospects will be poor; and it will be a constant source of affliction for the fathers who are stationed here. (Engelhardt 1920:54-56).
In 1774, Fr. Jayme received orders to move the mission and the meager neophyte population five miles further northeast up the San Diego River, at the location of another Kumeyaay village (Nipaguay). This location was full of potential converts, closer to a more secure water source, and far away from the influence of the military establishment (Luksic and Kendziorski 1999).

The new mission location proved to be slightly more productive, but conversion numbers remained low compared to other missions in Alta California, and food shortages still limited growth (Engelhardt 1920). In an effort to convert the local Native Americans, the mission fathers provided food and goods in exchange for labor and religious devotion. This practice was more successful at other missions in Alta California (Lightfoot 2005), but at San Diego, the lack of adequate resources and water could not support the agricultural endeavors of the mission. Therefore, the missionaries could not supply enough food for the neophyte population within the mission walls. During times of particular resource scarcity and crop failure, the neophytes were permitted to return to their native villages and fend for themselves (Engelhardt 1920:103; Lightfoot 2005:65).

The relocation of the mission to the existing village of Nipaguay allowed the missionaries to reach a larger population of Native Americans, which also led to an increase in conflict between the two groups. Father Jayme’s intentions to strategically and gradually convert the local Kumeyaay resulted in growing resentment toward the Spanish by the Kumeyaay. In addition to the intrusion of the missionaries into villages to perform baptisms, Spanish soldiers were known to have raped and murdered local Kumeyaay women (Carrico 1997). This conflict culminated in November of 1775, when a group of Kumeyaay from fifteen different villages surrounded and set fire to the mission, killed a carpenter and Father Jayme (Carrico 1997). The remaining missionaries found it difficult to continue the work of conversion immediately following the revolt, but no further trouble or major conflict ensued.

The growing season of 1778-1779 was particularly insufficient, as available provisions could not support the entire mission population (Engelhardt 1920:101). The mission at San Diego struggled in its existence, unable to support a large population which in turn limited the number of converts from local tribes. Engelhardt mentions, “Many may have been willing to join Mission San Diego in order to be away from the irresistible allurements and to receive the coveted Baptism; but unfortunately the mission could feed only one-half of
its own convert population” (1920:135-136). It is also likely that a portion of the overall diet for the inhabitants at the mission included wild-caught food and game provided by the Native Americans, as supplemental food was often needed (Lightfoot 2005:79).

**Mission Dam and Aqueduct**

In order to increase the productivity and yields of the agricultural ventures at the mission, initially the padres depended on wells in the bed of the San Diego River. Years of drought led to the construction of a rock and concrete dam six miles to the east, built by neophytes from the mission between 1813 and 1816 (Engelhardt 1920:165). The dam was conveniently located along the river at a significant rock outcrop, allowing for surface water to be stored behind the dam (Fowler 1953:199). Water flowed through a wooden sluice at the dam and traveled the distance to the mission in a tile-lined aqueduct. Mission agriculture flourished with the new water source, yielding familiar Old World imported crops such as chickpeas, melons, and barley, in addition to supporting vineyards and orchards (Papageorge 1971:3; Strathman 2005:42). The success of the irrigation system was short-lived, however, as Mexico gained independence from Spain in the early 1820s, effectively ending Spanish control over the mission. The mission property, buildings, and the agricultural fields fell into disrepair following secularization, as Mexican landowners used the land primarily for grazing cattle and little else (Luksic and Kendziorski 1999:5).

**Archaeology of the Spanish Period**

Much of the archaeological evidence of occupation along the San Diego River during the Spanish Period is limited to the remains of the mission and the presidio. Excavations at the mission over the last fifty years have yielded interesting data related to the daily lives of the inhabitants, but as mentioned in the previous chapter, not much data associated with the Kumeyaay village occupied prior to the mission. Of particular interest for this study, the mission dam and aqueduct system represent a significant event in the history of the development of the river. These two features will be discussed below.

**CA-SDI-6658**

This site represents the location of the original dam constructed by the mission fathers and Native American laborers in the early 19th century (see Figures 2 and 3). The dam

Figure 3. Mission Dam (CA-SDI-6658) in 2013.
measures approximately 224 feet long by 13 feet thick by 13 feet high, and is composed of river cobbles, square stones, Spanish tiles, and local cement. The site was originally recorded in 1978, and no associated artifacts have been recorded near the dam. Portions of the original dam are missing due to erosion and flood events. The dam represents the first Spanish modification of the San Diego River, and the first large-scale water diversion scheme. The dam was registered as a California Historical Landmark (Number 52) in 1932.

**CA-SDI-6660**

This site is associated with CA-SDI-6658 and represents the mission flume and aqueduct system between the dam and the mission agricultural fields. The flume originally extended along the north side of the San Diego River for a distance of approximately six miles. Remnant segments of the aqueduct have been recorded, although very few artifacts have been observed in association with the exception of clay tiles that lined the interior. The flume, as originally constructed, was composed of three tiles, two flat side tiles with an inverted curved tile along the bottom. The bottom tile was supported by a platform of cemented cobbles with additional embankment support as needed (Fowler 1953:201). The flume was approximately two feet wide at the top, allowing for about one foot in depth (Ferguson and Hanna 1978). Water was transported to the mission for domestic and irrigation use, and may have been stored in a brick and mortar double well as observed in 1920 (see Figure 4).

Significant excavations have occurred at the presidio for decades, but a thorough synthesis of all the recovered data has yet to be produced. Archaeology has played a significant role in the recreation of the layout of the presidio structures and fortifications and changes over time. However, despite detailed maps, digital and spatial analyses, and excavations of walls and foundations, no evidence of a water source, either well, cistern, or flume, has been reported (see Williams 2004). Fowler (1953:202) suggests that a ditch or flume may have run along the south side of the river to supply the presidio and pueblo, but no archaeological evidence has been observed.

**MEXICAN PERIOD**

The relatively short period following Mexican independence in 1821 until the signing of the Treaty of Guadalupe Hidalgo in 1848 had additional impacts on the landscape
of the San Diego River. The small pueblo at the base of the hill below the Spanish presidio grew slowly with Mexican settlers and cattle ranchers. Secularization of the mission allowed for Mexican control over the associated agricultural endeavors, and multiple rancherias and vineyards were established in the river valley (Papageorge 1971). Reports of flooding and property damage were also reported during these early years, as well as the changing course of the river. The river typically turned southward at Presidio Hill to empty into San Diego Bay, paralleling the town of San Diego on the western edge, but major flood events caused the river to change course and discharge into False Bay (Mission Bay), as in 1821 (Papageorge 1971). As a whole, the growing population of the pueblo at San Diego utilized the river for small-scale agriculture, cooking, and drinking (Papageorge 1971).

**History of the Mexican Period**

The Mexican government divided the old mission lands into large ‘ranchos,’ or land grants, to allow for widespread cattle ranching for the extremely lucrative hide and tallow trade. By 1824, Mexico began allowing foreign (including American) ships into the port at San Diego for trade and exchange of hides and other goods (SDCWA 2003:11). Each ranch district required significant water and pasture for large herds of cattle, and irrigation systems, including ditches and impound reservoirs became common across the landscape. Nearly all
available springs and streams in the San Diego River watershed were claimed by Mexican
ranchos by the 1830s, and an extended drought, combined with continuous pumping and
water diversion systems, caused the springs to dry up and the water table to drop dramatically
(SDCWA 2003:11-12).

The town of San Diego received pueblo status from the Mexican government in 1834,
which replaced the interim independent municipal government of the 1820s. With pueblo
status came all the rights and laws of Mexico, including water rights and regulations based on
earlier Spanish law. The most basic interpretation of water rights during this period simply
stated that each pueblo could use water from the closest river or stream to the maximum
benefit of all inhabitants on a roughly equal basis (Strathman 2005:39). This system was
overall successful, as the pueblo used water from the San Diego River, the ranchos used
water from springs, streams, and the river, and devastating drought was still years away. The
signing of the Treaty of Guadalupe Hidalgo in 1848 between the American and Mexican
government included a transfer and recognition of these water rights, although American
rules and water rights were in direct conflict with Spanish law (Strathman 2005:42). Spanish
water law and its impact on San Diego’s water rights will be discussed in detail in Chapter 5.

Archaeology of the Mexican Period

Unfortunately, due to the short duration of the Mexican period and lack of reporting,
very little archaeology from this period has been described in relation to the San Diego River.
No archaeological sites specific to the Mexican period have been recorded in the immediate
vicinity of the river, and none were reflected in the GIS analysis for this study. The Mexican
period, however, is characterized by an expansion of cattle ranching for the tallow and hide
trade, and archaeological evidence may be associated more with farming and ranching
activities than water use. Extensive archaeological excavations have occurred at Old Town
San Diego State Historic Park, revealing evidence of the early Mexican inhabitants of the
area (see Farris 2006; Felton 2006; Jordan and Carrico 2006; Sampson and Bradeen 2006;
and Schulz, et al. 1987 for a sample of discussions on Mexican period archaeological
investigations). Very little archaeological evidence, however, has been discussed in relation
to water systems, wells, or other water transportation methods. Irrigation systems, wells, and
other water features may be located farther away from the San Diego River, reflecting alternative water development near springs and streams.

It may also be possible that water was transported to the town of San Diego via bucket or pot directly from the river, which would not be particularly evident in the archaeological record. Any pumps or wells in the banks of the river would also not have survived into the material record. Additionally, archaeological investigations at Old Town San Diego may not be specifically focused on water use during the Mexican period, and evidence of those activities may have been unnoticed during excavation and analysis. More permanent wells, catchment basins, and cisterns visible in the archaeological record, appear to have been constructed at Old Town during the American historical period beginning in the 1850s-1860s.

**AMERICAN PERIOD**

The Americans brought unique ideas regarding politics, economics, and society to San Diego in the 1850s. American views on water use contrasted to those of the Spanish and Mexican governments, which became readily apparent. This section describes the major water development projects along the San Diego River, the subsequent creation of water distribution systems and companies, and the overarching views and values of the residents of San Diego as seen through water use.

Although the Mexican government was no longer in control of San Diego, the water supply for the pueblo and surrounding areas depended on small-scale diversions from the river through ditches and wells. People living in the town purchased water by the bucket from vendors collecting water from the river and transporting it by wagon (SANDAG 2005:15). Additionally, the townspeople dug wells and used windmills to power pumping systems to pull water from underground aquifers. The Whaley House in Old Town, built in 1857 for example, had a 25-foot deep well to provide water for the household (Mallios et al. 2011).

**Derby Dike**

After the United States gained control of the region in 1848, more attention was given to San Diego including an effort to create a robust economy as a port city. The San Diego River was problematic, as flood events deposited silt and debris into the bay which restricted
the landing of ships loaded with goods and supplies. A visitor to San Diego in 1842, M. Duflot de Mofra, attaché of the French legation to Mexico, described the port at San Diego:

Certain areas are shallow, and some parts are so covered with sand banks that ships can easily run aground on the silt that the tiny San Diego River brings down from the mountains in the rainy season. Within the last few years, the river, through the negligence of the inhabitants…now empties into the water of San Diego Harbor. (Papageorge 1971:3-4)

Without additional effort to solve the siltation problem in the bay, economic opportunities for San Diego would be limited. An assessment provided by the United States Coast Survey in 1851 by A.D. Bache described the need for permanently altering the course of the San Diego River, as the siltation of the Bay could lead to its closure (Papageorge 1971:4).

A plan to divert the river into False Bay (Mission Bay) was enacted by Lieutenant George Horatio Derby of the U.S. Army Corps of Engineers in 1853, later to become known as the Derby Dike. Derby’s original plan as recommended included a two-mile channel leading to Mission Bay, with the south side of the channel to be enhanced with a constructed embankment (Pourade 1963). This plan was not approved by the Board of Engineers, and Derby was instructed to simply deepen the existing remnant channel into Mission Bay from previous flood events. The excavated sand was piled as a levee on the south side, a soil and timber bulkhead was created where the channel originally turned into the bay, directing the river into Mission Bay. Derby warned that the sand would not support the barrier, and undermining of the entire structure was imminent with any measurable rain events (Pourade 1963). The dike was destroyed by heavy rains in 1855 and the river emptied back into San Diego Bay (Papageorge 1971:4-5). An improved design was implemented in 1875, along with a Congressional appropriation of $80,000, resulting in a more permanent channel (Hill 2002:3).

Development of a City

As the San Diego River no longer threatened to flood the city, a new focus was placed on increasing the population of the port city, including expansion into the surrounding areas. Those living in the town of San Diego (Old Town) attempted to obtain secure sources of water, resulting in the digging of wells and building of cisterns to store the scarce rainwater and river water (Pham 2011; SDCWA 2003:15). Thomas Whaley, an influential
and long-time resident of San Diego, had constructed a well on his property by the late 1850s, followed by a cistern in later years, reflecting the need for reliable water (Mallios, et al. 2011; Pham 2011). Others installed windmills to pump water from deep wells, while cisterns stored water from rooftop systems (Walker 2004:6). As individuals struggled to collect and store sufficient water supply, a major drought during the mid-1860s in the region rendered wells essentially useless (Walker 2004:7).

The City of San Diego was incorporated in 1850, and plans for city infrastructure and water supply developed slowly. Alonzo Horton, unimpressed by the meager community at Old Town, developed a new subdivision further south along the edge of the bay in the late 1860s, called “Horton’s Addition” (SDCWA 2003:16). Horton’s development (New Town) attracted more settlers, and soon the desire for private gardens, landscaping, and water for domestic use outgrew the capacity of the few wells located around the city. By the late 1860s, fresh water in San Diego was becoming increasingly unreliable on a public and individual scale. The potential for capitalizing on distributing water, however, was a major impetus to the creation of San Diego’s first water companies. Four will be discussed below, including the San Diego Water Company, the San Diego Flume Company, the Southern California Mountain Water Company, and the Cuyamaca Water Company, each contributing to the development of the San Diego River watershed and the growth of the region. These pioneering water companies additionally provided the basic structure for the city’s eventual municipal water supply by constructing storage, transportation, and distribution facilities around the city.

**San Diego Water Company**

An effort to create a large-scale distribution system resulted in the formation of the San Diego Water Company in 1872 (Papageorge 1971). Artesian wells, or deep wells drilled into rock to reach the underlying water table, in the river and reservoirs next to the river represented the humble beginnings of the San Diego Water Company. A deep well was drilled near 11th and B Streets in New Town, and supplied the city’s first piped water directly to homes at a rate of 50,000 gallons per day (Fowler 1953:43). The quality of the water, however, was severely lacking. It was during the 1870s that the standing joke about San Diego’s water quality first appeared: “We boiled it; we screened it; we boiled it again; and
then we drank something else” (Fowler 1953:44). As water of higher quality was necessary, and the demand for water overall increased, additional wells were sunk by the San Diego Water Company into the San Diego River with associated pumps and a storage facility in University Heights, just above the river valley north of the city (Fowler 1953:44). Additional distribution lines were constructed to the ever-growing number of private homes and businesses, and these pipelines soon became the standard for water supply throughout the city. By 1877, the San Diego Water Company began construction for a steam engine-powered pumping station and transportation of water from the bed of the San Diego River.

Other water companies established wells and pumps in the San Diego River, and in the drought years of the 1880s, the San Diego Water Company, with its extensive distribution system, purchased water from the San Diego Flume Company (described below) to supplement its own water supply (Fowler 1953:45). The San Diego Water Company was additionally ill-prepared for the housing boom in the 1880s, and the lack of water likely contributed to the ‘bust’ in the 1890s (SDCWA 2003:19). In 1901, the City of San Diego passed a bond measure to purchase the entire San Diego Water Company system within the city limits, including its land holdings in Mission Valley, all the pumps, reservoirs, pipelines, and associated machinery (Fowler 1953:45).

**San Diego Flume Company**

As water needs for the city grew, other companies capitalized on the growing water market. The San Diego Flume Company was incorporated in 1886, with capital of one million dollars and a grand scheme to transport water from the Cuyamaca Mountains into the City of San Diego (Fowler 1953: 93). The goal of the Flume Company, in an effort to ensure a more reliable water supply, was to establish a number of storage reservoirs in addition to the lengthy transportation system (see Figure 5).

**THE SAN DIEGO FLUME**

The initial headwaters dam for the San Diego Flume was constructed at Boulder Creek in 1887. The ambitious project was constructed of redwood planks, a total of 9,000,000 board feet, and was lined with Portland cement (San Diego Union 1886). The entire length of the gravity-flow flume was nearly 35 miles, the majority of which was a ditch cut into hillsides, but trestles and tunnels were necessary to carry water over some
Figure 5. Map of the lands controlled by the San Diego Flume Company. Source: The San Diego Union. “The San Diego Flume Company.” August 19, 1886.

canyons and crossings (see Figure 6). The Los Coches crossing, for example, required 1,800 feet of trestle length and was 80 feet above Los Coches Creek (Fowler 1953:94). Tunnels and siphons carried water through mountains and over ravines, reflecting a major engineering feat (SDCWA 2003:20).

Water released from the dam at Cuyamaca flowed 18 miles through Boulder Creek to the diverting dam at the junction with the San Diego River. The flume began here, measuring six feet wide and 16 inches high, carrying water approximately 33 miles along the south side of the river to the La Mesa Ditch and into distribution pipes through City Heights on the east side of San Diego (SDCWA 2003:20). The Eucalypus Reservoir and diverting dam were added near Grossmont (La Mesa) to provide storage at the flume terminus in 1892 (SDCWA 2003:20).

The grand flume project did indeed provide a more reliable source of water for the city, although droughts in the region caused minor shortages. The redwood flume structure also lost nearly fifty percent of the water due to evaporation and leakage, leading to more
frequent shortages (Hennessey 1978:1). The San Diego Flume Company recognized the need for additional water supplies, and raised the Cuyamaca dam and drilled wells into the San Diego River near El Cajon to add to the existing supply (Fowler 1953:97).

COMPANY HISTORY

The San Diego Flume Company provided water to the City of San Diego in addition to agricultural irrigators in the eastern part of the county. An eleven year drought between 1895 and 1905 drained the flume’s reservoir at Cuyamaca and forced the pumping of brackish water from the river into the city. The San Diego Flume Company had to reduce water availability to agricultural irrigators in the eastern part of the county, urging farmers to find an alternative supply of water (Courtemanche 1982:10). The city required strict conservation of water within city limits, and irrigators were forced to haul water via wagon directly from irrigation ditches. The inability for the San Diego Flume Company to deliver a steady supply of water or to maintain the redwood flume system led to major sections of the flume to fall into disrepair (Fowler 1953:98). Additionally, estimates for the flow of water through the redwood flume were sorely overestimated, from the projected 100 cubic feet per second to the actual 27 cubic feet per second (Fowler 1953:94). By the early 1900s, the
public began to lose faith in the ability of the San Diego Flume Company to provide reliable water to the city.

The San Diego Flume Company sold water to the San Diego Water Company for distribution into the city for nearly 25 years, turning a marginal profit. The Southern California Mountain Water Company, however, vied for a portion of the San Diego water market in 1895 by presenting a municipal water plan to the city of San Diego (Hennessey 1978:1), and in 1896, San Diego voters approved an agreement to purchase some of the city’s water from the Southern California Mountain Water Company (Fowler 1953:98). The San Diego Flume Company continued to sell water to back country irrigators, but revenues were too low to properly maintain the system, and private agricultural irrigators often built their own water diversion systems directly from the river. The near total loss of their main client, the City of San Diego, in 1906, forced the San Diego Flume Company to fold by 1910. In the same year, the entire crumbling flume system and insufficient infrastructure originally valued at over one million dollars in 1886, was sold to Ed Fletcher and J.A. Murray for $150,000 (Fowler 1953:99).

**Cuyamaca Water Company**

Fletcher and Murray purchased the flume system, but did not keep the name. The Cuyamaca Water Company replaced the San Diego Flume Company, intent on once again becoming the main supplier of water to the City of San Diego. At the time of purchase, the flume system was still providing water to 30,000 people in the city and to 10,000 acres of irrigated land, so replacing or removing the extant system was not an option (Courtemanche 1982:28). With Fletcher and Murray at the helm, significant investment capital, and an existing transportation, pumping, and storage system, the Cuyamaca Water Company attempted to change the face of water distribution in San Diego for the 20th century.

The first step for the new company was to upgrade and improve the dilapidated flume, as again, the leakage amount was equal to the amount transported to the Grossmont reservoir. The flume was patched and lined with asphalt roofing paper, reducing the amount lost through leaks to three percent, and four miles of the wooden flume located on trestles above canyons were replaced with concrete and steel inverted siphons (Fowler 1953:99).
The Cuyamaca Water Company was focused on the San Diego River system, but Fletcher and Murray developed systems throughout the county. Fletcher convinced the railroad to finance construction of the Hodges Dam in 1918, in addition to a distribution line to the coast, as the Santa Fe Railroad owned property along the coast from Del Mar to Carlsbad (SDCWA 2003:25). Fletcher also helped to develop Lake Henshaw on the San Luis Rey River in the mid-1920s (SDCWA 2003:26).

The City of San Diego still purchased water from the Cuyamaca Water Company, although less than the amount obtained from the Southern California Mountain Water Company. By 1914, the Cuyamaca Water Company supplied 4,500,000 gallons of water per day to the city (Courtemanche 1982:30). Fletcher, however, was more interested in the development of real estate than the water business, and attempted to sell the entire system to the city, enabling municipal use of the existing transportation, storage, and distribution system. In 1914, Fletcher offered his company to the City of San Diego, but was rejected based on the strong opinion of a local and influential judge, L.L. Boone, that the system was worthless and inadequate (Courtemanche 1982:31). Fletcher made offers to the city three more times between 1916 and 1923, with no success. The system was eventually sold to the La Mesa, Lemon Grove, and Spring Valley Irrigation District in 1925 (Courtemanche 1982:101).

The Cuyamaca Water Company played a critical role in the development of the city’s water supply, not only as an original supplier from the 1890s, but as a defending party in the legal battle over rights to the San Diego River in the 1920s. This landmark case in water rights for the City of San Diego will be discussed in Chapter 5.

**Southern California Mountain Water Company**

The Southern California Mountain Water Company, although concentrated on the watersheds of the southern part of the county, supplied water to the City of San Diego to supplement the available resources of the San Diego Flume Company. The Southern California Mountain Water Company was created in 1895 between E. S. Babcock and John Spreckels, incorporating the portions of the Otay Water Company and the Mount Tecarte Land and Water Company (Fowler 1953:48). The company controlled storage,
transportation, and distribution systems on the Otay River, the Sweetwater River, and Cottonwood Creek (Fowler 1953:51).

The Cottonwood Creek system included the construction of Morena Dam in 1896, although not completed until 1912, Barrett Dam in 1897, and the Dulzura Conduit in 1907, which transported water from Cottonwood Creek to the Otay system (Fowler 1953:53). In 1901, an additional impound dam and reservoir was constructed along Las Chollas Creek as the terminal storage for the Lower Otay reservoir and the main water source for the growing city of Coronado (Fowler 1953:53). Additional pipelines from the reservoirs in the southern part of the county fed into San Diego’s distribution system.

Overall, the Southern California Mountain Water Company provided water for the city well into the 1920s. Initial distribution to the city began in the late 1890s, and by 1906, San Diego purchased a large portion of its necessary water from the Southern California Mountain Water Company, combined with water from the San Diego Flume Company (Fowler 1953:54). Spreckels additionally offered to construct reservoirs in University Heights and at Old Town, including new pipelines from the wells in Mission Valley to further entice the city to sign a long-term agreement, culminating in a ten year agreement with the City of San Diego beginning in 1905 (Courtemanche 1982:23-24).

Spreckels was a tireless promoter of the Southern California Mountain Water Company, publishing books and articles in his own local newspaper in support of his water company. The printed support of the Southern California Mountain Water Company often derided the development projects of his direct competitor, the San Diego Flume Company, while extolling the wonders of the Morena Dam and other system components. One book, *The Story of Water in San Diego*, published by the Southern California Mountain Water Company in 1909, claimed the Morena Dam was the storage solution to all San Diego’s water problems and could hold enough water for seven years without rain (SDCWA 2003:22). Spreckels compared his system to that of the booming urban city of San Francisco, and that he could supply up to 400,000 people across the region (Courtemanche 1982:26). As with other promotional material, including newspaper articles supporting the grandeur of the San Diego Flume Company's system, these overestimates provided the public with a false sense of security and optimism, allowing for extensive water development projects funded with easily approved bond measures while lining the pockets of water company owners.
The Southern California Mountain Water Company was purchased in total by the City of San Diego in 1914, including the Barrett-Dulzura-Otay portion and the Morena Dam and reservoir system for $1,500,000 (Fowler 1953:55).

**The Hatfield Flood of 1916**

No story of San Diego is complete without a mention of the largest flood in the region’s history in 1916, which destroyed the Lower Otay Dam and broke the Sweetwater Dam, formerly the very recent property of the Southern California Mountain Water Company. The San Diego River rose to its greatest height in recorded history and washed out all development in Mission Valley, including roads, farms, and bridges.

Charles Hatfield was a self-proclaimed rainmaker, and claimed to reliably produce significant rainfall from his unique concoction of chemicals placed on top of tall towers. As the mixture evaporated into the atmosphere, rain followed. In December of 1915, in the midst of a ten-year drought, the City of San Diego hired Hatfield for $10,000 on the condition that the Morena Reservoir would be filled (SDCWA 2003:23). Seventeen inches of rain fell between January 15 and 20, 1916, and an additional 14 inches accumulated in the mountains between January 25 and 30, 1916 (SDCWA 2003:23). The San Diego River rose six feet and washed out Mission Valley, while the flooding destroyed railroads and highways, and killed 14 people (SDCWA 2003:23). The City failed to pay Hatfield, as he refused to claim responsibility for the extensive property damage (Papageorge 1971:8).

This event followed the city’s recent purchase of the Southern California Mountain Water Company, with the intent to create a municipal water system. Without the need to purchase water from private companies, the city could regulate transportation and distribution as the city council saw fit. The 1916 flood, however, forced a reevaluation of the region’s water supply, in addition to causing significant damage to the city’s existing systems. For the city, decisions over the distribution of water became difficult, as controlling an entire water system meant delivering water to urban users as well as to agricultural irrigation districts, each party arguably more deserving than the other.

**Urban Versus Agricultural Water Use**

Because the earlier Spanish and Mexican settlements along the San Diego River contained relatively low populations, the conflict over urban water use versus water for
irrigation is a uniquely American problem. San Diego, as other cities in the arid west, has struggled between water use priorities, namely agriculture and suburban users competing with the needs of the urban city and the role of city government in shaping policy for an entire region (Strathman 2005). In San Diego, two key players represented this major conflict between urban water use and agricultural use: John Spreckels of the Southern California Mountain Water Company and Ed Fletcher of the Cuyamaca Water Company.

In the 1890s, despite the obvious need for a city-wide water distribution system, doubts lingered in regards to investment in water development projects. The San Diego Water Company and the San Diego Flume Company were not turning record profits by any means, and further investment in water projects without the required demand appeared questionable at best (Courtemanche 1982:14). Many at the time believed the railroad was critical to the development of a city, as rail lines expanded the range of available markets and economic opportunities. Railroads tended to follow agriculture to transport goods and produce to wider markets, therefore, for isolated San Diego, arguably more investment should be made on irrigation systems (Courtemanche 1982:14). Additionally, the number of urban water customers was simply too low to justify selling water to the city for little to no profit (Strathman 2005:51).

John Spreckels was no stranger to turning profits, and at this initial stage of the development of San Diego, more profit could be obtained by supporting irrigation development. Spreckels also saw the railroad as a successful measure of the quality of a city, and if irrigation projects were viewed as important to the railroad, then his investment dollars would be placed into such systems despite his belief in the importance of urban development (Courtemanche 1982:15).

Spreckels and the Southern California Mountain Water Company focused on general water projects that could be used for irrigation purposes or urban water use. The drought between 1897 and 1904, however, encouraged city dwellers to demand more water for urban use, and higher use rates could be charged. The current rate for irrigation water to rural irrigation districts and agricultural users was $0.04 per 1,000 gallons, while domestic and urban use was $0.20 per 1,000 gallons (Courtemanche 1982:22). The Southern California Mountain Water Company soon offered to build additional storage facilities and distribution lines for the City of San Diego. The intention of the Southern California Mountain Water
Company to become the sole supplier of water to the City of San Diego marked a turning point in the history of urban water development, and put the company at odds with its direct competitor, the San Diego Flume Company/Cuyamaca Water Company. Spreckels and Fletcher, both shrewd businessmen, approached the distribution of water with similar goals, namely to provide a steady supply of water to the end user and to make money doing it. Subsequent competition between Fletcher and Spreckels continued for decades, as each man strove to become a primary supplier of water to the San Diego region.

Ed Fletcher was a pioneering individual intent on developing not only a steady water supply for San Diego but also creating real estate and property around available water (Strathman 2005). The Cuyamaca Water Company provided a significant portion of urban water for the City of San Diego, but also supplied the entire La Mesa, Lemon Grove, and Spring Valley Irrigation District by the 1920s. Fletcher believed that water for irrigation and agriculture should not be reduced to allow for continuous urban growth and higher demands (SDCWA 2003:25). In Fletcher’s view, irrigated land was profitable land, and provided opportunities for agricultural and economic growth for the region (Strathman 2005:18).

It became clear that a combination of water development projects for both agricultural use and for domestic consumption would be necessary for the successful growth of San Diego. Urban users, however, outnumbered rural water customers, and city-wide bond measures to fund water development projects heavily favored urban use (Courtemanche 1982:29). Once the City filed for ownership and use of the dam site for El Capitan in 1915, Fletcher and others argued that the city’s use of that site on the San Diego River would inhibit development of irrigation systems and agricultural development, as it was the sole source of water for the La Mesa, Lemon Grove, and Spring Valley irrigation district. According to an editorial in the San Diego Herald, the irrigation districts and the city should work together to develop all the available water, not prevent backcountry water development (Courtemanche 1982:38). By the 1920s and early 1930s, domestic water use skyrocketed due to population growth and the establishment of Camp Kearny, placing severe strain on the city’s water supply (Courtemanche 1982:38). Additional sources of water needed to come from somewhere in a hurry.

Several city council members advocated the full development of the San Diego River watershed before financing a massive aqueduct and distribution system from the Colorado
Regardless, the City of San Diego preemptively filed for water rights from the Colorado River in 1926, although the construction of Hoover Dam and the Colorado River Aqueduct through Riverside County were still years away. Other attempts to bring water to San Diego included a plan to divert the All-American Canal in Imperial County and raise the water over the mountains east of the city. The residents of San Diego voted to ratify an agreement to obtain water from the All-American Canal in 1934, and a citizen’s fact-finding commission in 1938 recommended participation in the construction of the All-American Canal and the building of San Vicente Dam. The City rejected that strategy, however, choosing instead to purchase Colorado River water from the Metropolitan Water District in Los Angeles (Courtemanche 1982:136, 142, 144).

Hydrologic Study of San Diego, 1935

The recognition of the need for a reliable water system in San Diego in the early twentieth century prompted hydrological studies in an effort to understand rainfall, watershed capacities, and river dynamics. One such study conducted in the 1930s reflected the need for overall water conservation and a more conservative urban and suburban development strategy for the San Diego region. The prospects of developing the San Diego River were described as limited, and the watershed could not support a very high population without importing additional water. This information is imperative to understanding the nature of the river, the future of development prospects, and ultimately the limits of sustainability for the region.

The Division of Water Resources of the State of California completed a hydrologic study of the San Diego region in 1935 as part of a state-wide assessment. The San Diego County Investigation provided critical information related to the amount of water used for agriculture and hydroelectric power generation (Van Etten 1935). It provided predictions and estimates of water use, and population statistics useful for planning future water development projects. Senior Hydrological Engineer for the State of California, P. H. Van Etten, claimed, “[T]he future increase in irrigation development and population is dependent upon adequate and reliable water supplies being available, for if they are not available the growth cannot occur” (1935:6). By the 1930s, it was increasingly apparent to State, local, and regional authorities that there was a limit to the amount of water development that can occur within a
given watershed. Other sources of water had to be secured in order to continue to provide successful economic opportunities for an ever-increasing population, particularly in southern California.

The term “safe yield” appears in the 1935 study, and, as others have argued, was the crucial measurement essential to the economic development of water in San Diego (Fowler 1953). The safe yield is the maximum amount of water which could have been supplied seasonally without deficiency from a given source over a critical period of dry years. For example, in 1953 the average water use per person per year in San Diego was 0.14 acre-feet. (One acre-foot is roughly the equivalent to 325,000 gallons). Citrus groves used 2.5 acre-feet per acre per year. The average annual rainfall, again, in 1953, was 12 inches. The average water for irrigation purposes was 1.4 acre-feet per acre per year. This amount (1.4 acre-feet) is the average annual requirement for 10 people, therefore the safe yield of 1000 acre-feet per year would provide water for 7000 people or a citrus grove of 700 acres. The maximum safe yield for the San Diego River is 32,500 acre-feet per year, according to Fowler (1953). In 1935, the estimate of the maximum safe yield from all watersheds in the county was 160,000 acre-feet, yet the water requirements for all available irrigated land exceeded 300,000 acre-feet (Van Etten 1935:15). According to Van Etten, “…the ultimate development of San Diego County is definitely limited unless the local water supply of the county is augmented by importation of water from other sources” (1935:119).

Overall, the 1935 San Diego County Investigation called for caution, planning, and critical thinking when developing the San Diego River watershed. Much of the 1935 report read like a warning to local government, describing the maximum safe yield of the San Diego River watershed and the amount of development necessary to provide water to all users. According to the Investigation, local sources could not meet irrigation and domestic use to support an urban population of greater than 500,000, and floods comparable to the 1916 flood should be expected to occur once every 30-40 years. The Senior Hydrological Engineer commented that, “…[P]ractically the entire valley floors of the major stream basins are subject to overflow and that permanent improvements in these areas will be subject to serious damage during major floods” (Van Etten 1935:19-20). This put limits on the extent of development in the San Diego River valley (Mission Valley), as floods were to be expected, and volume could not be accurately estimated.
The report suggested the additional development of two dams and reservoirs on the San Diego River, including San Vicente and Mission Gorge, which would prohibit industrial and agricultural development of the valley (Van Etten 1935:22). The Mission Gorge site was never developed, in favor of the location at El Capitan, but the San Vicente Reservoir and dam was completed in 1943 by the City of San Diego (Fowler 1953:205). The completion of the dam at El Capitan in 1935 allowed for extensive development of Mission Valley into a landscape of dairy farms, vegetable farming, and sand and gravel businesses (Papageorge 1971:9).

**The San Diego Aqueduct**

Despite words of warning and caution from State authorities, local government agencies opted to continue private and public water development projects in addition to importing water from such exotic locales as the Feather River in northern California (the State Water Project) and from the Colorado River via Riverside County (San Diego Aqueduct) (Walker 2004).

The construction of the San Diego Aqueduct was largely in response to the water demands of San Diego during World War II. Local military leaders, in conjunction with local community leaders, claimed the lack of reliable water for the City and the numerous military facilities in the area was a threat to National Security (SDCWA 2005:38). The importation of water became necessary to the safety of local military installments, and local leaders encouraged the Federal Government to assist in the cost of building the lengthy aqueduct from Riverside County. The Navy, with President Roosevelt’s recommendation, would pay for the construction of the aqueduct and lease the aqueduct to the City of San Diego, with the expectation of repayment over 30 years (Walker 2004). The San Diego Aqueduct was completed in 1947, despite major set-backs as material such as cement and rebar were in short supply during the war. The delivery of water in 1947 came just as water rationing plans were imminent in San Diego (Papageorge 1971:9).

**Archaeology of the American Period**

Based on the results of the GIS analysis for this study, seventeen archaeological sites from the American period are located in the immediate vicinity of the San Diego River, three of which are described below. These sites represent significant development events in the
history of the river. The remaining fourteen sites represent single-use areas, trash scatters, and informal water storage features. Additional archaeological resources are located farther from the river, and some have yet to be formally recorded.

**CA-SDI-11296**

This site represents a segment of the 1889 flume system as constructed by the San Diego Flume Company. This flume originally extended from the Cuyamaca Reservoir to a storage facility near Grossmont (La Mesa). A tunnel is located at this location on the south side of the river, and was labeled “Cape Horn Tunnel” on the 1903 USGS topographic map of the area. This segment of the flume is nearly one-quarter mile in length and runs through the slope of the canyon. The tunnel material consists of local granitic rocks and mortar, and the tunnel opening includes a decorative façade and metal grate. Deep cuts in the slope along the alignment of the flume are visible in this location. The redwood flume was later replaced by a redwood pipeline bound in wire, and subsequently by concrete pipe in the 1950s.

The significance of the flume cannot be understated as it represents one of the first characteristically American water development features in the landscape of the San Diego River watershed. The flume signified a major attempt to control the river, capture the water, and transport it to areas in need.

**CA-SDI-20233**

This site represents the location of a brick cistern likely constructed in 1875 by the San Diego Water Company as part of the system to pump water to Old Town. This system would have included the cistern, a single well in the river bed, a steam-powered pump, and a reservoir on Presidio Hill. The pump would have lifted the water to the reservoir, which would be distributed to Old Town via wood pipes. The brick cistern was associated with other historical artifacts and extended 27 feet below the street level. The cistern was partially removed for a sewer line manhole. This feature indicates another attempt to provide water to San Diego, and a component of one of the earliest water companies in the region.

**P-37-031888 (EL CAPITAN DAM)**

The dam at the west end of El Capitan Reservoir was officially recorded as a historical archaeological site in 2009. El Capitan Reservoir is the largest storage facility
along the San Diego River with a maximum capacity of 112,800 acre-feet. The site includes the concrete fill dam, the retaining reservoir, and the concrete spillway on the north side of the dam. The dam and reservoir site has been recommended as eligible for listing on the National Register of Historic Places due to its critical role in supplying drinking water to San Diego during the 1930s.
CHAPTER 5

WESTERN WATER LAW AND WATER USE

This chapter describes a brief background of western water law and water use, followed by a discussion of the major legal battle over water rights in San Diego, and how this has shaped the way citizens view the water system today. This chapter also discusses the foundations of California’s water laws, as early attempts to settle conflicts over water rights became commonplace in courtrooms throughout the state, and a state-wide system to handle such disputes was necessary and desirable.

WESTERN WATER LAW

As settlers and immigrants began to move westward in the late nineteenth century in search of economic opportunities and a more agrarian lifestyle, it became apparent that efforts to create agricultural landscapes in the arid west would be challenging. This was the information prospectors, promoters, and developers failed to communicate to those settlers purchasing land and farms sight unseen (Fiege 1999; Reisner 1993). The reality of the situation in the west was one of very little rainfall, dry rivers and streams, and remarkably short growing seasons, particularly in the northern states, including Idaho and Montana (Fiege 1999). The great effort to draw people west included promotional material extolling the abundance of water, newspaper articles claiming that “rain follows the plow,” and other economic benefits and incentives tapped into the American sense of adventure and manifest destiny (Fiege 1999; Reisner 1993). Thousands of people began the trek across the central plains to stake a claim in the new, developing west with the promise of an agrarian paradise of flowing rivers and green pastures clouding their vision.

With increases in population and increasing use of water for purposes other than irrigation, particularly in urban areas, the American West became a region to ‘conquer,’ to bend simply to the will of cities and newly created irrigation districts. Conflict arose between urban users and agricultural users, both claiming rights to water in rivers and streams.
California’s Common Law System

California adopted the common-law system of water rights early in the state’s development, and incorporated both riparian and appropriative rights in order to recognize ownership of waterways. Riparian rights are those given to the inhabitants of an area adjacent to an existing river or waterway. The primary right to use water from a given river or stream for irrigation and agriculture defaults to the first person to claim the right who lives next to the river or stream. Appropriative rights are based on legal claims unrelated to land ownership, and can be purchased or traded like property. This system briefly held precedence in California, until the population grew so substantially as to require an alternative to settle major disputes over water rights.

Spanish Water Rights

Questions of ownership of water in streams, rivers, and creeks have caused relentless conflict since the beginning of development in the west. In San Diego, beginning with the mission, Spanish water laws accompanied the friars to the new location upstream. Spanish water law, although shaped by Moorish and Roman precedents, focused on community use and benefit, and quickly became the rule for all the new Spanish lands in the New World (Strathman 2005:38). This “Plan of Pitic” in 1783 regulated the water use for all new Spanish pueblos with the goal of apportioning water justly and fairly to all users to prevent unnecessary conflict (SDCWA 2003:29). This law also allowed individuals to claim a specific amount of water, and water rights granted with land grants included the understanding that owners could only use what was required for domestic use and for watering livestock. Essentially, under Spanish law, no individual had a superior right over another to use the pueblo’s water source (SDCWA 2003:29). This framework is in major contrast to later American practice, which granted superior prior appropriation rights for individuals in water claim disputes (Strathman 2005:40).

California Water Law

Initially, prior appropriation laws seemed to more clearly define water rights, but an early legislative declaration in California that English common law should be used to govern water rights forced the recognition of riparian rights (Kanazawa 1998). The adoption of English common law in 1850 by the California legislature was an attempt to dissolve the
earlier vestiges of Spanish and Mexican laws (Kanazawa 1998:160-161). In practice, however, it became increasingly difficult to rule in favor of riparian users, especially as many other Spanish and Mexican laws shaped the way people viewed water. Economist Mark Kanazawa (1998) provides examples of various legal battles between riparian users and those claiming prior appropriation and the turning point in the legal system to recognize prior appropriation rights, which were typically inconsistent with Spanish, Mexican, or English systems. Courts across the state ruled inconsistently, often favoring the system that was most influential in local politics, or had the greater economic potential for the region (Kelley 1956).

By the late nineteenth century, however, the California State Supreme Court established yet another system of water rights recognition. The Supreme Court reverted to Spanish and Mexican water laws in the late nineteenth century by developing the water law doctrine known as the “pueblo water right” (Reich 2000). Judges decided that American cities succeeding a Spanish or Mexican pueblo had an absolute and exclusive right to use a stream or river within the original municipal boundaries, although this was in conflict with the previous water sharing agreements. Rogue judges chose to spur local urban development by attempting to link laws to early Spanish and Mexican laws, despite evidence that Spanish and Mexican municipalities did not have exclusive rights to water (Reich 2000:131).

The defining case for the pueblo water right was the 1895 decision in *Vernon Irrigation Company v. City of Los Angeles*. The trial judge, Lucien Shaw, held that Los Angeles was “…the exclusive owner of the water flowing in the [Los Angeles] river…together with the right to control, divert, use, sell and dispose of the whole thereof for any and every purpose either inside or outside of said city (Reich 2000:132).” Additionally, the judge claimed the rights to the Los Angeles River had belonged to the city from “time immemorial.” This allowed the City of Los Angeles to control and therefore provide water to areas outside city boundaries, resulting in increased revenue for the city. It also provided opportunities for Los Angeles to expand its reach and develop water projects throughout the region. This pueblo right helped set the stage for the City of San Diego in its attempts to gain control over the San Diego River, as the City argued for the rights to develop the entire watershed for its own purposes.
City of San Diego v. Cuyamaca Water Company

No other court case in the history of San Diego has had such far reaching implications for development of the river than the City of San Diego v. Cuyamaca Water Company legal battle. At the center of the challenge was the property around the proposed site for the El Capitan Reservoir and dam, which was owned by the Cuyamaca Water Company and provided water to the city and to the La Mesa, Lemon Grove, and Spring Valley Irrigation District. The City of San Diego saw the property as the most desirable location for a dam and reservoir, would end the need for the city to purchase water from a private water company, and could provide revenue for the city by selling water to backcountry irrigators.

San Diego’s Pueblo Rights

After exhaustive research into how to develop a sustainable and municipal water system for the city, in 1914, San Diego’s City Attorney presented the City Council with a statement claiming that the San Diego River belonged to the city as it fell within the boundaries of the original Spanish and Mexican pueblo (San Diego Union 1914:5). City Attorney Cosgrove’s claim was based on a map of pueblo property drawn by Captain Fitch at Old Town that had been approved by Pio Pico, the last Mexican governor of California, in May of 1846. This map showed the San Diego River as included within the limits of the pueblo land. Under the Vernon Irrigation Company precedent, he claimed the river belonged to the city (San Diego Union 1914:5). An article in the San Diego Union from 1914 reporting on Cosgrove’s statement concludes with a foreshadowing statement: “Backed by the opinion that the city has the right to the San Diego River waters, Councilman Fay said yesterday that the explorations of the river for water development could be undertaken with much more certainty” (San Diego Union 1914:5).

Prior to this statement from the City Attorney, many believed the city would simply be dependent upon their own small municipal system and on private water providers. This conclusion regarding the ownership of the river by the city allowed a renewed sense of autonomy for the city. In other words, following Cosgrove’s claim, residents of the city felt more confident about the future of growth for San Diego. If the entire San Diego River could be managed by the city, more effort would be spent on developing reliable urban water distribution systems.
El Capitan

Shortly following the opinion given by City Attorney Cosgrove to the City Council, explorations of the river began in earnest to find potential reservoir sites along the river. The city began purchasing property throughout the county for future development, much of which included parcels adjacent to the river. In the initial legal challenge with the Cuyamaca Water Company, the City of San Diego claimed that it intended to construct and maintain a dam and reservoir in the El Capitan valley as part of a municipal water system. The City needed the remaining parcels around the El Capitan reservoir site that the Cuyamaca Water Company then owned (City of San Diego v. Cuyamaca Water Company, Box 23(13), CA State Supreme Court Collection, No. 18417 [1926]:2-9).

Below is the map (Figure 7) submitted by the City for the lawsuit showing the lands owned by the City and those owned by the Cuyamaca Water Company, including the Cuyamaca Water Company’s El Monte Pumping Plant (City of San Diego v. Cuyamaca Water Company, Box 23(2), CA State Supreme Court Collection, No. 18417 [1927]:2-9). This pumping plant provided much of the water to irrigators in the La Mesa, El Cajon, and Spring Valley area. These users became wary of the city’s plan to purchase the property for the reservoir and dam as it threatened their continued use of the pumping plant.

The city’s original complaint filed against the Cuyamaca Water Company included the proposed action of condemning those remaining parcels as necessary for the greater good of the city.

…[D]eclaring the intention of The City of San Diego to acquire said lands, properties and rights under eminent domain proceedings, and directing the City Attorney of The City of San Diego to commence an action in the Superior Court of the County of San Diego, State of California, for the purpose of condemning and acquiring said properties, adopted on the 16th day of April, 1924, and approved by the Mayor of said City on the 16th day of April, 1924, determined and declared that the public interest convenience and necessity of said The City of San Diego, and the inhabitants thereof, for public use and for the impounding, conserving and delivering of water to said The City of San Diego for municipal purposes, required the construction of a dam and reservoir… (City of San Diego v. Cuyamaca Water Company, City of El Cajon, and La Mesa, Lemon Grove and Spring Valley Irrigation District, Box 23(13), CA State Supreme Court Collection, No. 18417 [1926]):3)

The Cuyamaca Water Company argued over the ambiguity of the original legal challenge, claiming that the City did not have prior rights to the San Diego River, and
there was not enough demonstrated need to build a dam at the El Capitan site. However, as early as 1915, the City filed a claim for additional pipelines and a dam site on the San Diego River stating the current system provided water for only 90,000 people, despite having just purchased the Southern California Mountain Water Company’s system that was estimated to serve at least one million people (Courtemanche 1982:35).

Fletcher contended that building a dam and reservoir at El Capitan would be cost prohibitive, with the unknown expenditure to relocate the Capitan Grande Indian Reservation and the unknown cost to build the dam without knowing how deep the bedrock foundation extended below the surface (Courtemanche 1982:37). Fletcher suggested the development of a dam at the Mission Gorge Site No. 3 (as recommended in the 1935 San Diego County Investigation), which would allow the La Mesa, Lemon Grove, and Spring Valley Irrigation District to continue using the pumping plant at El Monte, and could provide additional revenue to the Cuyamaca Water Company (Courtemanche 1982:37). The development of the dam at El Capitan by the City of San Diego would undermine the rights to the river and the future development plans of the Cuyamaca Water Company.
Paramount Rights

The City fired back with an amendment to their original claim, adding that the City technically owned all the water in the river as it was the city that succeeded the earlier Mexican pueblo, mirroring the *Vernon Irrigation Company v. City of Los Angeles* (City of San Diego v. Cuyamaca Water Company, Box 23(3), CA State Supreme Court Collection, No. 18417 [1927]:3). Fletcher warned that all the riparian owners and river appropriators would fight the City’s claim to all the water in the river, arguing that the Cuyamaca Water Company and others had used the San Diego River for over 30 years without complaint from the City (Courtemanche 1982:46). Additionally, the Cuyamaca Water Company had spent over one million dollars on a system to supply water to the city and to irrigation districts and provided water at lower cost than any other system, so the City should have no desire to acquire all the water and rights to the river (Courtemanche 1982:46).

The City introduced the earlier opinion presented in 1914 by the City Attorney that the river was included in the original pueblo lands and therefore belonged to the city. According to the legal brief:

That about the year 1834 there was founded, and until about the year 1850 there continued to exist, upon what is now the site of The City of San Diego, a certain Mexican pueblo, then designated and ever since known as the Pueblo of San Diego; that the location and site of said Mexican Pueblo of San Diego at the time the same was founded, was, ever since has been, and now is situated and located upon the banks of a certain unnavigable river or stream then, ever since and now known as the San Diego River; that said stream at the time of the organization of said Pueblo of San Diego and at all times thereafter during its existence flowed into and through said Pueblo, and the banks and bed of said stream from its mouth to the easterly territorial limits of said Pueblo, a distance of approximately five miles, were located and lay entirely within the territorial boundaries, and formed a part of the lands and waters of said Pueblo of San Diego. (*City of San Diego v. Cuyamaca Water Company*, Box 23(3), CA State Supreme Court Collection, No. 18417 [1927]:3)

The City of El Cajon and the La Mesa, Lemon Grove, and Spring Valley Irrigation District, as Fletcher predicted, joined the fight against the City’s acquiring the El Capitan Reservoir property, as the control over its main water source, the El Capitan Pumping Plant, was in jeopardy. The Irrigation District additionally passed a bond measure to purchase the Cuyamaca Water Company system from Fletcher in 1924, and applied to pump water from their new holdings on the San Diego River (Courtemanche 1982:79). The City vowed to fight
any company trying to appropriate water from the river, forcing the La Mesa, Lemon Grove, and Spring Valley Irrigation District into the lawsuit. The Irrigation District did not trust the City to provide the same amount of water as they were receiving from the Cuyamaca Water Company and argued that the city would limit the amount of water currently appropriated to them, effectively stifling the growth of agriculture in the eastern parts of the county (Courtemanche 1982:68). The City continued to argue that it had paramount rights to the San Diego River, and a rousing speech given by City Attorney Higgins suggested that private interests were trying to take water that rightfully belonged to the people of San Diego and sell it back to them for a hefty profit (Courtemanche 1982:84).

In an exhaustive search to find historical documents and other legal cases that refuted the claims of the city, the Cuyamaca Water Company compiled a collection of documents effectively proving that the City had no paramount right over the river. These documents were examined in Mexico City and other mission-era collections at the University of California, Berkeley. An example of one of the historical documents found by the Cuyamaca Water Company is as follows: “As soon as the territory was occupied by Spain in 1769, the absolute title vested in the King. No individual ownership of lands by usufructory titles of various classes existed in California in Spanish times” (City of San Diego v. Cuyamaca Water Company, et al. 1928:535). This document continued, adding the fact that the King owned the newly established presidio. The document found by the Cuyamaca Water Company regarding the awarding of the San Diego River to the mission in 1773 by the Viceroy of New Spain, they argued, only applied to the mission (City of San Diego v. Cuyamaca Water Company, City of El Cajon and the La Mesa, Lemon Grove and Spring Valley Irrigation District, Box 24(8), CA State Supreme Court Collection, No. 18417 [1928]:534-535). Because the city succeeded the presidio, not the mission, the city could not claim all the rights to the river.

Additional arguments introduced by the Cuyamaca Water Company included the fact that technically, the Indians living at and developing the mission were to be given lands and water, as discussed in historical Spanish documents regarding mission laws (City of San Diego v. Cuyamaca Water Company, City of El Cajon and the La Mesa, Lemon Grove and Spring Valley Irrigation District, Box 24(8), CA State Supreme Court Collection, No. 18417 [1928]:619; Engelhardt 1920). The Cuyamaca Water Company even went so far as to argue
that the water in the San Diego River belonged to the State of California, and should therefore be used for the public good, not necessarily for an individual city. Even if the city had been granted rights to the water in the river, although it had not, the Cuyamaca Water Company argued that it had failed to act upon those rights in the 80 years since the incorporation of the city, and therefore relinquished the rights. This argument recalls the earlier discussions of prior appropriation, in that the city could not claim rights to the water after other users had been using the river for years.

Additionally the lack of evidence of a “pueblo right” in historic Spanish or Mexican water law strengthened the Cuyamaca Water Company’s arguments. Further, if the city wanted to claim ownership of the river based on the original mission and pueblo boundaries, the Cuyamaca Water Company showed that the City of La Mesa and City of El Cajon were all within the jurisdiction of the mission and had equal rights to the river (*City of San Diego v. Cuyamaca Water Company, City of El Cajon and the La Mesa, Lemon Grove and Spring Valley Irrigation District*, Box 24(8), CA State Supreme Court Collection, No. 18417 [1928]:705).

The Cuyamaca Water Company, in summary, claimed that the City of San Diego had no prior and paramount rights to the San Diego River and had no support of such rights in any Spanish or Mexican law, or any precedent in Spanish or Mexican history. The State Supreme Court, however, was not swayed by the Cuyamaca Water Company’s arguments. The decision by the Supreme Court in 1930 upheld the pueblo right for the City of San Diego, using similar language to the Los Angeles pueblo right case. The City of San Diego was, “the owner in fee simple of the prior and paramount right to the use of all the water (surface and underground) of the San Diego River, including its tributaries, from its source to its mouth, for the use of the said city of San Diego and its inhabitants for all purposes” (Reich 2000:134-135).

**A Forged Document?**

One of the important documents used in the legal battle between the City of San Diego and the Cuyamaca Water Company included a letter from 1773 from Spanish Viceroy Bucareli to Father Serra in San Diego regarding moving of the mission further upstream. An article published in 1969 by Rev. Maynard Geiger calls into question the validity of the 1773
document that, as claimed by the Cuyamaca Water Company, granted rights of the San Diego River to the mission. This historic document was examined by six different scholars, each with extensive experience working with historical Spanish documents, and was determined to be fraudulent. A rough translation of the 1773 document includes instructions to the missionaries at San Diego, including Father Junipero Serra,

…to acquire and administer, by means of this royal concession and privilege, the waters of stream [San Diego River], for the common benefit of all the people, both gentiles and converts, who now reside, or in future may reside within the jurisdiction of the Mission San Diego de Alcalá. This concession, and the benefits thereof, is to be held for their sons, and the sons of their sons, and successors, for all time, forever. (Geiger 1969:213)

A signature of one Julla Ramón Mendoza, of the office “Segunda Secretario de la Castillo,” follows the seven-page manuscript, including a signature of Antonio María Bucareli y Ursúa, Viceroy of New Spain. Geiger discusses multiple grammatical errors in the document, including the disagreement between genders as shown above in Mendoza’s office title. At least seventy-two grammatical errors are present in this document, according to the Geiger, with regard to the misuse of singular and plural and gender agreement. Geiger added, “this writer has gone over the document many times and despite the fact that since 1933 he has done research in more than 125 archives and libraries in the United States, Mexico, Spain, Italy and Puerto Rico, he can declare with assurance that he has never seen a Spanish document so stupidly and inanely expressed” (Geiger 1969:217).

Additionally, Geiger could not find the original document in the Bucareli correspondence in the national archives in Mexico City. Researchers hired by the Cuyamaca Water Company in the 1920s legal challenge also could not locate the document in Mexico City, but discovered it at the Bancroft Library at the University of California at Berkeley (City of San Diego v. Cuyamaca Water Company, City of El Cajon and the La Mesa, Lemon Grove and Spring Valley Irrigation District, Box 24(8), CA State Supreme Court Collection, No. 18417 [1928]:694). Geiger assumed that the document must have been forged during the 19th century, likely in California to present a claim to the Private Lands Commission in the 1850s. During this time, land disputes following the signing of the Treaty of Guadalupe Hidalgo resulted in subsequent property rights issues between Mexican and U.S. landowners. Alternatively, Geiger argued, it could have been written by someone in San Diego concerned
for the future of a secure water source. He provides no further speculation regarding who may have written the document, or for what purpose.

In 1928, the Cuyamaca Water Company attorneys used this document to argue that the mission owned the ultimate rights of all the water in the San Diego River. The City of San Diego could have used the document to demonstrate a continuation of use from the 1770s for the benefit of the mission and pueblo at the time. The true origin of the document is questionable, but provided evidence for the Cuyamaca Water Company to prove that the water rights to the San Diego River belonged to the mission and not to the City of San Diego.

**Summary of the Legal Battle**

This nearly decade-long legal battle over urban or agricultural water users influenced the way the San Diego River has been used historically. In the 1930s, for example, nearly 70 percent of all water in San Diego County was used for irrigation and agriculture (Van Etten 1935:12). This court case also reflected contemporary ideas about local government and private companies, in that the city ultimately had more political power over the Cuyamaca Water Company. Both sides of the case had valid arguments and the history of use along the river ultimately shaped the outcome. From a historical perspective, however, the decision granting rights to the entire San Diego River to the City by the State Supreme Court set a precedent by establishing the idea of a “pueblo right” for control over municipal waterways.

In *City of San Diego v. Cuyamaca Water Company, City of El Cajon and the La Mesa, Lemon Grove and Spring Valley Irrigation District*, the city was granted a monopoly over the local water source, which expedited urban expansion (Reich 2000:135). In addition to urban growth, agriculture and suburban development led to the necessity to import water from outside the County by World War II. The influx of military installations and residents spurred the urban growth of the city, and the San Diego River projects could not have supplied sufficient resources.

This case also reflects the attitude at the time among the public and urban and rural water users. While agricultural users required water for crops to feed the masses, urban users argued that their need was greater. In the end, the greater number of urban users (voters) tended to beat out the farmers and private companies in the degree of influence on local politics. In the *City of San Diego v. Cuyamaca Water Company, City of El Cajon and the La*
Mesa, Lemon Grove and Spring Valley Irrigation District, and the Vernon Irrigation Company v. City of Los Angeles, the Supreme Court judges reflected these attitudes in the decisions made. Some have argued, however, that the judges were deliberately misrepresenting Hispanic water laws to justify urban water monopolization (Reich 2000:136). One could argue that the judges’ attitudes reflected the public view of a greater need for urban water from a cultural perspective. The public failed to see the necessity for agricultural water use when urban economic growth and home landscaping held higher cultural value. Unfortunately for irrigators, farmers, and in this case, the privately owned Cuyamaca Water Company, their role in economic growth was not seen as equal to that of urban contributions.
CHAPTER 6

CASE STUDIES AND APPLIED ANTHROPOLOGY

The following case studies are provided to present various perspectives on both archaeological and applied anthropological examinations of water use. The theories described in Chapter 1 will be applied to these examples in an effort to support the efficacy of application to the San Diego River.

THE ARCHAEOLOGY OF WATER

As archaeology provides physical data and a unique perspective to corroborate the historical written record, interpretation and interpolation of artifacts and features within a given culture provides information that reflects ideas, beliefs, and behaviors. The following case studies represent situations in which access to water, control over water, overdevelopment of water, or lack of water have dramatically affected the populations involved. Each of these situations, Jamestown, Virginia (Blanton 2000), the American Southwest (Damp et al. 2002; Fish and Fish 1994; Redman 1999), the Yucatán Peninsula in Mexico (Scarborough 1998), and San Diego, California (Pham 2011; Mallios et al. 2011) contain elements parallel to the past and recent history of the San Diego River. Access to fresh water, the control of access to the San Diego River, the overdevelopment and overexploitation of the San Diego River, and the overall lack of water in the southern California region are all facets of the San Diego story.

Jamestown, Virginia

Recent archaeological investigations at Jamestown, Virginia, the first permanent English settlement in the Americas, pinpointed tree-ring dates from baldcypress trees to support and substantiate the dates of significant environmental events mentioned in early colonists’ dairies and records (Blanton 2000). Of importance were the dates of floods, droughts, and cases of massive illnesses among the colonists. Also of significance was the location of the new colony, namely in poorly drained swamp land. The presence of hostile Spanish explorers presented a major threat to the new British colonists, and establishing a
colony at the outskirts of the swamp represented a strategic location upriver to avoid the Spanish. Additionally, the local Native American chief presented the marginal swamp location to the British, allowing them to build a community. This location in a tidally-influenced wetland yielded very little potable (non-brackish) water and bred disease-carrying insects, resulting in sickness and death for nearly 60 percent of the original colonists (Blanton 2000:78).

The new colonists had planned to rely on the local Native American groups to provide them with food and water when resources were scarce, but soon realized the Native Americans often did not store surplus food for even their own families beyond the typical growing season. Blanton (2000) suggested this indicates a local knowledge of and reliance on the natural rainfall cycle, and the understanding of droughts and where to obtain resources in times of great scarcity. Droughts would have severely restricted available resources for the Native Americans and for the colonists. Earlier Spanish accounts and those of the British colonists revealed the problems in finding sufficient food and water during the drought between 1606 and 1612, and the baldcypress tree-ring dates corroborate this massive drought event (Blanton 2000). Had the colonists known how to survive in the new environment under stressful drought conditions, as the local indigenous groups did, perhaps the mortality rates of the British colonists would have been lower. It could also be argued that knowledge of tidal fluctuations in estuarine environments such as the location of the Jamestown colony could have prevented problems with water quality and disease.

The application of multiple theoretical perspectives aids in our understanding of the situation at Jamestown. From a historical ecology perspective, the knowledge of past conditions and local Native American groups’ adaptations to resource stress provide information critical to understanding behavior and culture, and how the colonists could have changed water collection and use strategies. Using methods such as dendrochronology to identify flood and drought events supports the idea that environmental changes had disastrous effects on the colonists. The colonists brought pre-conceived notions of water availability and resource procurement, which limited the ability to adapt to a new and changing environmental situation.

This directly parallels the predicament of the Spanish settlers and missionaries along the San Diego River, as common practices in Spain for collecting water, growing crops, and
building towns were not transferable in southern California. Archaeological evidence including the mission dam and flume system, including remnant buildings and orchards reflects the attempts of the Spanish to impose a Spanish system of subsistence on the San Diego River environment. Additional archaeological evidence of the prehistoric Kumeyaay reveals their different and more diversified system of use of the river, and how the Spanish could have benefited from adapting similar strategies. Ethnographic and historical evidence, discussed in Chapters 3 and 4 (Shipek 1981, 1993; Engelhardt 1920), corroborate these ideas. Shipek also suggests that the San Diego Mission was established at the end of a relatively wet period, based on dendrochronological records in the area (1981:296). Prior to the Spanish arrival, the record reflects abundant rainfall cycled with drought (Shipek 1981:296).

**American Southwest**

In the mostly arid southwest, much like the conditions in San Diego, the Zuni of New Mexico responded to resource stress and fluctuations in rainfall in innovative ways. Damp et al. (2002) suggested that a response to resource scarcity was the development of basic irrigation canals to supply water to growing crops near the ancient Zuni Pueblo in New Mexico between 3,000 and 1,000 years ago. Archaeological features and residential areas are located near the prehistoric irrigation canals, in addition to pollen from early maize cultivars (Damp et al. 2002). Soil samples, geomorphology of irrigation channel stratigraphy, and pollen analysis yielded results strongly indicating the deliberate creation of canal features. Radiocarbon dates for samples from two archaeological sites associated with the irrigation features indicate that irrigation technology and maize agriculture had spread to the Colorado Plateau by 5000 years BP and continued until at least 1000 years BP (Damp et al. 2002).

This study related directly to the beginnings of agriculture on the Colorado Plateau, an activity that is often adopted to support growing sedentary populations. The main component of successful agriculture is water reliability. Often societies begin with dry farming, or using only rainfall to water crops. This type of farming can only support a relatively small population, unless the diet is supplemented with sufficient alternative resources (see Redman 1999:117-126). Manipulation of water is subsequently required in an effort to support even higher populations, resulting in the creation of irrigation ditches and
diversion dams. Irrigation allows for increases in population, and often cultural changes in response to excess water (see Wittfogel 1957 for further discussion of hydraulic societies).

The Hohokam of the American Southwest were some of the first irrigation farmers in North America, diverting the Salt and Gila Rivers into channels to transport water to waiting agricultural fields (Redman 1999:148). The Hohokam diet included these irrigated crops supplemented with collecting resources and hunting game. The rivers ran year-round, but the flow was controlled by snow melt and runoff from rainfall, resulting in an unreliable amount of water per season (Redman 1999:148). Occasional floods reinvigorated the soil by depositing nutrient-rich silt, which was crucial to the success of the crops. The Hohokam culture was remarkably successful in the harsh desert environment, and sustained society for thousands of years. However, once the decision was made to irrigate crops to increase yields, the Hohokam became dependent upon the whims of the river, through floods and droughts.

Fish and Fish (1994) present ways in which to view the relationship between prehistoric cultures and the advent of agriculture. Studies of archaeological pollen samples and cave deposits have revealed the development of corn farming among prehistoric populations in the southwest, suggesting a variety of ways for transporting, planting, and storing seed and harvesting and growing plants. Irrigation was necessary for nearly all areas of the southwest, as the majority of the region did not receive sufficient rainfall for the successful harvest of maize (Fish and Fish 1994). Development of irrigation and agriculture also suggest the development of more sedentary populations and territorial delineations. Changing cultural patterns can also be attributed to environmental and climatic shifts in association with new irrigation and agricultural practices (Fish and Fish 1994). Additionally, the preconceived notion that prehistoric groups were in continual environmental balance with their surroundings is called into question. Intensive agricultural practices to increase available resources and sedentary lifestyles more often resulted in environmental degradation and eventual resource scarcity (Fish and Fish 1994: 92).

From a historical ecological perspective, the decisions made by individuals to irrigate crops, utilize a single crop for the majority of the caloric intake (maize, which is not high in protein or nutrients in comparison to Old World cereals), and create cultural preferences for particular resources resulted in environmental degradation, extreme resource stress, and eventual societal collapse, particularly among the Anasazi and Hohokam on the Colorado
Plateau (see Diamond 2005: Chapter 4 for further discussion). As the environment degraded, or as arable soil eroded, irrigation canals silted over, and crops were less productive, it becomes clear that the environment, as modified by humans, became increasingly hostile to the inhabitants of the Colorado Plateau. In San Diego, and around the world today, there is strong evidence of these extreme environmental conditions, including water shortages, and overuse of water and products requiring water, resulting in unsustainable situations.

The situation among the Hohokam and others in the southwest is in contrast to the Kumeyaay living along the San Diego River, but demonstrates the potential for extreme environmental degradation. The Kumeyaay did practice small-scale agriculture by planting plots of land with native grasses and other edible plants, yet much of their subsistence could be described as dry farming. Some water diversion features were present to create more suitable conditions for particular plants, but there is no archaeological or ethnographic evidence for extensive irrigation systems or large tracts of irrigated land. It is possible that the aridity of San Diego, although similar to the environmental conditions in other locations in the southwest, severely limited the population of the Kumeyaay. Other cultural practices (see Shipek 1981) may have also contributed to the relative underpopulation of the region along the San Diego River. Nevertheless, the case study of the American Southwest has further implications for San Diego and predicts what may have happened with the Kumeyaay had the Spanish not colonized the region.

**Yucatán Peninsula, Mexico**

The management of water and land among the ancient Maya in the Yucatecan Lowlands remains relatively poorly known, but recent field and archival studies of artificial (human-made) and natural depressions reveal some clues regarding water storage and control over distribution (Scarborough 1998). Concerns over reliable sources of water and the consumption and distribution of water were likely at the forefront of public discourse and among the elite social classes even thousands of years ago. The archaeology of the ancient Maya over the past century has revealed much about the social system, but lacks a good explanation of water use, control, and distribution.

Large-scale “cities” were established by the Maya elite, who in turn had to provide a large labor force to develop the natural landscape. Scarborough (1998) argues the elite
classes regulated water consumption to centralize and control power. The ability of the elite to manage and control a scarce and unreliable resource such as water also represented a powerful organizational structure. Water systems were constructed to concentrate water in cities and towns, with controls for management located where the elite resided. Because the elite town centers relied on large labor forces for the consumption of other resources, water had to be distributed to the lower classes in some semblance of regularity (Scarborough 1998). Scarborough (1998) also theorizes the possibility of elite members of society using water and distributing water to the commons in a highly ritualized fashion. These rituals would reinforce the value, scarcity, and significance of water to the lower classes, while maintaining the social structure. According to Scarborough, “Controlling water access and the manner by which land was developed to accommodate the use of water typifies aspects of Maya political economy through time” (1998:138). This overall idea roughly parallels Wittfogel’s concept of the hydraulic society, using water to control the population.

The Maya developed and manipulated the surrounding natural environment in such a way as to maximize use of scarce resources, including water. The presence of landscaping around monumental architecture revealed a concern for water runoff and efficient water use through canals and swales. Fresh water would have been necessary during structure construction, and sources for workers would have to have been engineered in the pre-construction stage (Scarborough 1998). Some of the natural and altered depressions in the landscape could have been used to store water for such construction use, and likely served as storage or reservoirs after structures were erected. The elite class designed the location of monumental architecture in such a way as to maximize the efficiency of water use through the natural topography (gravity). The creation of large reservoirs and water storage locations helped relieve stress among all community members during times of drought or prolonged scarcity. The link between elite control over water and a highly ritualized distribution system maintained the social system and ultimately elite control over the common population (Scarborough 1998:145).

As the previous study of the Colorado Plateau suggested, the Maya case reflects an extreme manipulation of available water as a response to growing populations and unpredictability of natural rainfall. The Maya advanced further, however, to develop a very complex social structure remarkably similar to Wittfogel’s hydraulic society. The control of
water led to the control of the masses, which resulted in an ultimately unsustainable system. The desire of individual wealth and power by the elite determined the decisions and responses to times of resource stress. Decisions were apparently not made for the greater good, although it may have appeared to be altruistic in an effort to avoid massive protest. The overall collapse of the Maya occurred over thousands of years, although environmental factors such as widespread drought may have accelerated the process (Diamond 2005). It becomes apparent that environmental factors, human decision-making, particularly the decisions of the cultural elite, in combination determined the outcome of a highly advanced society. This combination of perspectives reflects the situation in San Diego today, and predicts a possible outcome resulting from refusing to change a cultural paradigm. The rapid pace of development along the San Diego River during the 20th century parallels that of the Maya, to a degree, reflecting the desire of a select few to dominate the landscape for personal gain under the guise of common good.

**San Diego, California**

In San Diego County, anthropologist Angela Pham (2011) presented archaeological data related to water use systems, including the use of wells and cisterns for agricultural and residential purposes. Pham (2011) discussed the cultural variation in cistern and well designs, reflecting the variety of immigrants and residents of the San Diego area. Additionally, the gradual shift from wells to cisterns throughout the county suggests the realization of water unreliability and the need for conservation (Pham 2011). This behavioral and cultural shift in the early 20th century demonstrates a potentially successful adaptation to the natural environment and the understanding of what it means to live in an arid environment. This adaptation is clearly demonstrated at the Thomas Whaley House in Old Town San Diego. Excavations of the water feature reflect a change in use from the original brick-lined well to a rectangular cistern over time, suggesting an adaptation from collecting water from the ever-lowering water table beneath the ground, to collecting available rainfall (Mallios et al. 2011).

The decision to construct a cistern or water storage feature suggests a positive cultural shift in understanding the immediate environment. While many immigrants originally excavated wells to obtain water, the recognition of the futility of the endeavor resulted in the creation of cisterns. The subsequent creation of a city-wide water distribution system allowed
for more intensive residential and commercial development, while companies and individuals capitalized on the system. Water reliability increased despite the extreme fluctuations in local rainfall, as the environment and climate played a smaller role in the development of the city.

**AN APPLIED ANTHROPOLOGY OF WATER**

An application of anthropological theory to the study of water is not new or unique but has become a more urgent topic as anthropologists contribute to discussions involving policy and programs for creating sustainable and reliable water use and distribution. Case studies from contemporary Peruvian villages (Trawick 2001), the Anacostia River in Washington, D.C. (Williams 2001), and the Stour River Valley in the United Kingdom (Strang 2004) represent current anthropological investigations examining water use of the past and present across cultures. The data collected provides support of the idea that water can be studied as a social system that extends across all dimensions of society and culture. Although it is relatively easy to reduce water to simply a biological fact, it is essential for nearly all aspects and institutions of society (Orlove and Caton 2010:402). The meaning of water is extremely variable across cultural groups and within different groups. Water can be viewed as crucial to personal hygiene, or as part of a social ritual, or key to the irrigation of crops and trees.

A key nuance in the social study of water is in its connectivity, or the connection between individuals with regard to water. The nature of water as fluid, or as part of a river or stream, shapes the experience of individuals physically located at different points along the waterway. The way in which one person uses water will affect the way in which another person receives the water. This is not only true along rivers or regarding water quality, but in the social realm as well. As applied anthropologists, Ben Orlove and Steven Caton remarked, “...[W]ater connects different domains of social life to each other in ways that are not haphazard or accidental because they depend on each other” (2010:402). For example, the act of turning on a spigot to fill a can with water requires a previously established infrastructure and bureaucracy of local and national design. The management of water includes legal systems, oversight agencies, and a court system for disputes and regulation.

The variable uses of water for multiple purposes add to the complexity of creating sustainable water use programs. Initial studies in different communities must be conducted to
better understand the cultural framework of a given location. Anthropologists are suited to conduct these studies with sensitivity to unique cultural views, values, and practices. Every person uses water in multiple arenas every day from bathing, drinking, cooking, to irrigating crops for consumption or export. The connections between the spheres of water use are termed a “waterworld,” as described by Hastrup (Orlove and Caton 2010:403). A waterworld consists of the connectivity and materiality of water and the total connections related to water in a given society.

Orlove and Caton (2010) provide a useful framework with which to develop anthropological studies focused on water emphasizing the themes of value, equity, governance, politics, and knowledge. The comprehensive and holistic approach of these themes provides anthropologists studying water use, water policy, and the cultural significance of water with tools to generate meaningful data and ethnography. A better understanding of the role water plays within a cultural group in different spheres of interaction, such as personal hygiene, irrigation, cooking, politics, etc., can provide invaluable insight to the best ways in which to manage the increasingly scarce resource. Culturally acceptable and economically feasible management of water will provide the best possible outcome for all societies facing any type of water insecurity.

**Cotahuasi Valley, Peru**

The study of irrigation techniques and the ethnography of irrigation allow anthropologists to study water use habits. A series of small villages in the Cotahuasi Valley in the Peruvian Andes were the focus of an ethnographic study of irrigation and water regulation (Trawick 2001). The villages are located in a typically arid location, and water reliability is a constant factor in the daily lives of the inhabitants. Irrigation systems were established likely in prehistoric times to control the unreliable flow of local streams and springs for early farming endeavors. A sustained population decrease during the colonial period led to a reduction in land use and a temporary abundance of water for the remaining population. During more recent periods, the local populations have recovered, and a new way in which to use water had to be established (Trawick 2001:363). The resulting privatization of water has created conflict over a scarce resource and has changed the social structure of different villages. Individuals with greater capital have created large agricultural estates and a
heavy demand on the water to be shared among all members of the community, generating political and social conflict.

The manner in which water is distributed varies widely and individuals are unsure when irrigation will occur. Trawick (2001) suggested the greater influence of Spanish leaders in the villages led to the establishment of an unequal system of water distribution, as social hierarchy takes precedence over the needs of the community. The question of morality is culturally contingent in this study, as different villages and communities view the right to water in different ways and for different reasons. More egalitarian villages may view water as a communal resource, necessary for the entire group, and the equal distribution of water results in less conflict. Other villages may attempt to maintain social hierarchies that result in unequal distribution, as those in a higher class may view water as more important for them than for the community as a whole.

The villages where some individuals see water control as personal gain, overall conflict is relatively high. Uncertainty over water distribution is also high, creating overall stress among those living in certain villages. From a Marxist perspective, the idea of individual capital gain plays a very strong role in determining the distribution of water. In those villages with more egalitarian distribution of water, conflict is low and uncertainty over distribution is diminished, as presented in Trawick’s (2001) study. This study raises the question of whether a purely capitalist society can successfully manipulate and control water. This idea is crucial to understanding how to proceed with water distribution in San Diego. Equally important is the theme of morality as an underlying factor in the water story, and the decision regarding who ‘deserves’ water and who does not. This element played out historically as the conflict between urban and agricultural water users in San Diego, culminating in the City of San Diego v. Cuyamaca Water Company, City of El Cajon and the La Mesa, Lemon Grove and Spring Valley Irrigation District. The influence of individual political players affected the outcome, as personal views on the value of water shaped local policies.

Washington, D.C.

The once-thriving Anacostia River currently flows through Washington, D.C., and is full of industrial run-off, debris, and trash. A handful of industries, residential locations,
hospitals, and the Washington, D.C. jail line the banks of the river, and have polluted the
water for decades (Williams 2001). Interest in the quality and health of the river has waned
over the years, as the deplorable condition of the river has been accepted by the surrounding
population. However, a recent push to restore the Anacostia to its former glory has begun to
courage local residents to take action in an effort to reshape the ways in which the
populace views the river.

Williams (2001) described the role of the Anacostia through history, from the
indigenous use of the river over thousands of years to the British invasion, drastically
reducing the population of native inhabitants through smallpox, measles, whooping cough,
and a demand for beaver pelts. By the 18th century, Europeans had replaced the native
Nacotchtank, and had established a productive British colony based on tobacco cultivation
and the creation of a capital accumulation system. As the wealth increased among the new
groups established along the Anacostia River, the focus on the quality of the river
diminished. Increased residential development, military complexes, and industry, all with the
intention of meeting the goals of the new capitalist society, polluted and ruined the thriving
natural conditions of the Anacostia (Williams 2001). The development of roads, highways,
and bridges led to an even further disconnect between residents and the Anacostia. High-rise
buildings, hospitals, power generating facilities, and water and sewage treatment plants were
established on the river, creating a toxic soup in the water driving away any semblance of a
natural, healthy riverine environment.

Nonetheless, according to Williams (2001), people living along the Anacostia have
increasingly become concerned over the health and quality of the river. Environmental
justice programs initiated by groups such as the Seafarers Yacht Club now focus on the
Anacostia, organizing river clean-ups and community involvement. Residents now view the
river as a source of recreation, boating, relaxing, bird-watching, and gathering, despite the
fact that developers and state-level agencies had created a commercial and industrial
capitalist-based river economy directly at odds with the values of the residents (Williams
2001:427).

This study reflects the disconnect between the local economy and the views of
individuals. The Anacostia River, while recognized as important to local economic success,
is important to area residents as a source of recreation and connection to the natural
environment. According to one resident who lives on the eastern shore of the Anacostia, “When I’m on the water I’m directly where I want to be. I’ve loved water for as far back as I can remember…Water is a healing thing, it always has been, it stays with you throughout your life, it’s a tranquilizer” (Williams 2001:409). Decisions made by policy makers and businesses, even two hundred years ago, affected the individuals living along the river today. This is a good example of path dependency, and there is a clear parallel to the San Diego River, as people wishing to use the river for recreation are faced with the results of multiple decisions made over two hundred years ago. The decreased flow of the San Diego River is due to massive dams and reservoirs, one of which, the San Vicente Dam, is currently being raised to increase storage capacity. Concepts of progress and personal gain are highly valued in the local economy, while the cultural value of the San Diego River appears to be dwindling.

**Stour River Valley, United Kingdom**

Anthropologists studying water management use small or regional ethnographic studies to better understand cultural attitudes toward water. The study of the Stour River Valley in the United Kingdom is also the basis of this thesis. The main goal of anthropologist Veronica Strang’s (2004) study was to provide historical information regarding water in the Stour River Valley, how the local communities view the river, and how that information can be used by local governments to create more effective, efficient, and comprehensive water use policies. The ethnography on the meaning of water in a region of the United Kingdom provides information regarding the community around Dorset and the vital role water has played through history and into the present. Her findings suggest that individuals in the countryside have a deep connection to water and rivers in the area, and the economy of the region has been affected by changing water policy (Strang 2004).

Strang’s (2004) study of the United Kingdom provides powerful parallels for the study proposed here regarding the meaning of water in San Diego. Her discussions with residents, the historical background of the Stour River, how policies have changed access to water, and how individuals now view water and water conservation, are imperative to creating sustainable strategies for water use in the future. This model study describes not only the decisions made by individuals, but also the influences of the collective community
on water use and distribution. While Strang’s (2004) study pointed out the poor decisions, bad policies, and failures of the water system along the Stour River, the situation was not ultimately doomed or regarded as hopeless. While San Diego’s past is full of poor decisions, such as the 35-mile redwood flume that lost nearly 50 percent of water volume due to evaporation and leakage over the journey, bad policies such as the “pueblo water right,” and failures of the City’s distribution system, there is still hope for positive change. By understanding how individuals feel, think about, and view water in San Diego, in addition to a careful examination of the past, successful policies can be implemented to ensure not only water reliability, but an overall appreciation for the connectivity of people to the natural environment. As Strang suggests, the benefit of incorporating an ethnographic and anthropological perspective in policy-making enables people to, “…consider how the qualities and values which characterised [sic] earlier arrangements might be carried into a modern context to inform policy decision and thus to enable more collaborative and ecologically sustainable arrangements of water ownership, use, and management” (2004:252).
CHAPTER 7

DISCUSSION

This chapter presents reflections on the themes and theoretical perspectives presented earlier, including discussions of connectivity between case studies and the archaeology and history of the San Diego River.

WATER UNRELIABILITY AND CULTURAL CHANGE

As discussed earlier, water fluctuation and unreliability characterize the environment along the San Diego River. Archaeological evidence from the immediate vicinity of the river reflects use and dependence on the river, as well as an understanding of the effects of water fluctuations through the use of erosion control systems and dams (Shipek 1993). Historical Spanish and mission documents reflect the heartbreak of losing entire crops during a season due to a massive flood or drought, and attempts to harness the river for more successful harvests (Engelhardt 1920). The unreliability of water from the San Diego River led to the construction of the San Diego flume and other attempts to transport, store, and distribute water in the late 19th and early 20th centuries.

Drought between 1897 and 1903 resulted in water rationing for the city of San Diego, and water was reduced for urban users but not to the back country irrigators. The citizens of San Diego were angered by severe damage to orchards, lawns, and landscaping and blamed the water companies for the loss (Courtemanche 1982:20). This sentiment was incorporated into arguments for the paramount rights of the City for the San Diego River, reflecting an “us versus them” mentality to bolster public support for costly bond measures to continue legal battles over water rights. The City promoted the idea that public control over water would serve the citizens of San Diego better than purchasing water from the private sector from companies intent on simply making money. Between 1910 and 1920, people in the city appeared generally opposed to private ownership of the public water supply (Courtemanche 1982:150). This idea fostered additional disconnect and conflict between users of the river.
and controllers of the river, resulting in distrust and ideas about mismanagement of resources as discussed in relation to the Stour River (Strang 2004:130-146, 222-240).

The inability to change cultural perspectives on water use and of the San Diego River has led to a growing chasm between the public and the river. Prehistorically, the Kumeyaay incorporated cultural practices to respond to fluctuations in resource availability. This practice did not carry over into the Spanish and subsequent American periods in San Diego history. Preconceived ideas about water resources shaped the way the region developed over the last two hundred years, resulting in an ultimately unsustainable way of life.

**HISTORICAL ECOLOGY**

The prehistoric archaeological record and ethnographic record provide significant insight to the ways in which cultures adapted to changes in the environment. The Kumeyaay had thousands of years to develop a successful system of water management, as evidenced by remnant rock alignments (erosion control features), bedrock milling features, and other technologies visible in the archaeological record. Based on evidence from the deep past, suggestions for what may be successful today become apparent. Conservation efforts in marine preserves along the Channel Islands, for example, have been strengthened by archaeological investigations and provide suggestions applicable to other regions (Braje 2010).

Archaeological and historical evidence from the more recent past, too, can provide clues regarding unsuccessful strategies. The development of the mission flume and dam did provide water to the mission, yet the mission never flourished the way other missions in northern California did (Lightfoot 2005). The environmental damage resulting from non-native crops, grasses, and livestock grazing left the river valley unable to support additional methods of subsistence, particularly those of the Kumeyaay. The responses of the Spanish and Americans to unfamiliar conditions along the San Diego River do not reflect successful adaptations to the environment, but attempts to impose familiar strategies on an unfamiliar landscape.

**MARXIST THEORY**

Power struggles between private companies, individuals, and local governments heavily influenced by capitalism shaped many of the development projects along the San
Diego River during the American Period. Any carryover from the earlier periods all but disappeared, particularly the roots of Spanish and Mexican water rights laws. Regional authorities during the Spanish and Mexican periods did not allow towns to monopolize water for their own expansion, apportioning water between pueblos and consumers (missions and farmers, for example) (Reich 2000). The King of Spain, who ultimately had rights over all new water sources in New Spain, could grant the right of a community to use water in a particular river, but no single town, pueblo, or presidio could claim an exclusive right to the water (Strathman 2005:40). The City of San Diego’s declaration of paramount rights to the river based on Spanish water law, does not reflect the original intent of the new Spanish colonies. The idea of the “pueblo water right” is best described as a capitalistic bastardization of Spanish and Mexican water law, developed by Anglo-Americans in an attempt to control water rights and make financial gains. Although arguably the City of San Diego was acting in the best interest of the voting public by preventing the Cuyamaca Water Company from building a dam at El Capitan, it continued purchasing water from Fletcher and Spreckels.

The costly, lengthy, and ultimately faulty redwood flume built in the 1880s signified an American ideal of conquering and controlling nature for financial gain. The flume system was marketed to the public as the endless supply of water to stimulate the growth of the city, creating prosperity for all its inhabitants. Water was transported to holding reservoirs for the city, but nearly fifty percent of the volume was lost during transport due to evaporation and leakage (Hennessey 1971:1). The flume is representative of the folly of the early development of the river, lacking planning and execution. Individuals capitalized on the investment and the potential for the system to satisfactorily provide a long-term solution to a persistent problem of water security.

The dam at El Capitan was a source of conflict not only over the best use of the location, but related to who would make the most money from the development of the site. Some members of the city council and the mayor argued against the site at El Capitan as it was too expensive and unnecessary (Courtemanche 1982:85). The Mission Gorge site would be more cost effective, flood less property, and not require the removal and relocation of the Capitan Grande Indians. Yet influence on the city council by individuals such as Spreckels, Heilbron, and Attorney Cosgrove manipulated the public through biased newspaper articles, misleading evidence, and forced bond measures to continue costly and lengthy legal battles
with the Cuyamaca Water Company over El Capitan. The eventual development of Mission Valley would have also been prevented had a reservoir and dam been constructed.

In the early 20th century, Spreckels wanted water to be used for domestic purposes, creating a viable city of prominence in the United States. Spreckels pushed the city to purchase exotic plants, create elaborate landscaping, and to maintain a reliable, city-wide water distribution system. His political influence forced the City to use Southern California Mountain Water Company’s system for years over the San Diego Flume Company and the Cuyamaca Water Company. Fletcher wanted water to be used for irrigation and agricultural use, as availability of water increased land value and provided food and resources to the city and region. The power dynamics between these two individuals and their associated companies reflected the sentiment of the time, as there was a constant struggle between urban and agricultural water users.

**Path Dependency**

The redwood flume system also reflects the tenets of path dependency, as the expenditure of resources to design, build, and transport water ultimately shaped how water was moved for decades. Fletcher purchased the decaying and dilapidated system with hopes of restoring it to its original capacity and then some. Efforts to line the flume with concrete or roofing tar, repair trestles, bridges, and tunnels effectively prevented the construction of a better or more efficient system. A flume or tunnel to carry water from the mountains to the city was seen as the only way to provide water to the growing city, limiting the ability of others to develop alternatives. Individual wells and cisterns were utilized for a short period of time, but too many people drawing on limited groundwater depleted the aquifer relatively quickly, and the diversion of water along the river in the mountains deterred the recharging of subsurface water sources.

Additional delays in construction for different projects during the 1890s led to the creation of more costly development in the future (Courtemanche 1982:14). Investors were unsure about the future of water development and regional or city-wide distribution systems, and failed to act upon suggestions for such projects. In 1894, Judge George Puterbaugh suggested that the City purchase the San Luis Rey reservoir site, construct a dam, and transport the water through irrigated orchards along the route into the city’s distribution
system. Puterbaugh also recommended installing generators at the dam location to generate electricity to sell locally and recoup the initial expenditure for the project (Courtemanche 1982:9). The City refused Puterbaugh’s proposal, implying even the idea of such a scheme was unreasonable and ridiculous, and favored the plan to develop the Mount Tecarte system as suggested by Spreckels, of the Southern California Mountain Water Company, and Sefton, of the San Diego Flume Company. This refusal further limited the available water development projects for San Diego by alienating Puterbaugh and others who supported the plan.

The city attempted to develop water distribution projects, but remained dependent upon existing systems such as the Cuyamaca Water Company’s storage and distribution facilities. The decade-long legal challenge over the El Capitan reservoir site and eventually over ultimate water rights to the San Diego River stagnated water development projects by the city during the 1920s. The city, therefore, continued purchasing water from Spreckels’ system in lieu of creating a new system. Fletcher offered the Cuyamaca Water Company’s system to the City of San Diego multiple times, but heavy influence by Spreckels and others on the city council forced the City to decline the offers. After the court case, the city had to invest in the development of the dam and reservoir at El Capitan and pay to relocate the Capitan Grande Indian Reservation at great cost.

The Cuyamaca Water Company, too, failed to develop a new system upon purchasing the San Diego Flume Company. Most of the redwood flume was in total disrepair and could easily have been dismantled to make way for a new and innovative system, yet Fletcher simply re-lined and repaired the flume.

In addition to the redwood flume system, the idea that water could be simply transported from somewhere else limited the development of alternative ideas such as conservation measures, landscaping choices, and the cultural connection to water. The construction of the San Diego Aqueduct from the Colorado River effectively removed any remaining hope for the future development of a sustainable water distribution and transportation system in San Diego. When more water was needed, another pipeline was added to the existing system to simply draw more water from the Colorado River (Sholders 2002). It became more efficient and cost-effective to simply build another pipeline from the existing system than to create, design, or imagine a new way of obtaining water for the city.
Even now, instead of examining alternatives to water development projects, exploring additional conservation measures, the dam at San Vicente is being raised to increase the storage capacity. Adding to the existing dam and using public funding to complete the project has limited the potential for other systems or programs.

The decisions made by the city and private water companies in the past have limited opportunities to encourage conservation and create new systems of water storage and development. The availability of water made possible by importing has resulted in a disconnect between San Diego residents and the source of water. The lack of reasonable attempts to limit water consumption has led to the current situation of overuse and waste, which has become culturally acceptable.

**RESEARCH QUESTIONS REVISITED**

The following section summarizes the initial research questions posed in Chapter 2, and how the data collected for this thesis has addressed each question.

Are prehistoric archaeological sites located along the river temporary or large-scale permanent villages?

Is there any archaeological evidence of riverine or riparian resources at sites away from the San Diego River?

Do freshwater fish, turtles, or frogs appear in archaeological contexts? Does this reflect a reliance on riparian resources?

The archaeological research performed for this study does reflect the presence of permanent or semi-permanent prehistoric villages located adjacent to the San Diego River. Although the prehistoric archaeological sites were limited to those located in the immediate vicinity of the river, enough evidence has been recorded to conclude that the early Kumeyaay established significant villages next to the river to take advantage of the resources available there (sites CA-SDI-203, CA-SDI-5669, CA-SDI-8521, and CA-SDI-9243, for example). Artifactual evidence indicative of water use, including the presence of ceramics for water storage, groundstone, and bedrock milling features suggest the intensive use of the river as a major subsistence strategy. Evidence of freshwater turtles, fish, and terrestrial animals at CA-SDI-9243 suggest the use of riverine resources. Not enough data was collected to determine if there was a specific reliance upon these resources, or if their use was linked to ease of capture based on the location of the village. Additionally, no sites were examined at any
significant distance from the river to determine if riparian resources were used farther away from the San Diego River.

How does the local archaeology support the idea of knowledge of water shortages or unreliability?

How does the archaeological record in other arid or semi-arid locations reflect the idea of knowledge of water shortages, or how does the archaeological record demonstrate the cultural shifts or problems related to over-exploitation of water and resources?

How were early attempts by the Native Americans (Kumeyaay) to control water different than the Spanish and Europeans?

There is very little archaeological evidence to suggest an inherent knowledge of water shortages among the Kumeyaay, but ethnographic evidence does suggest cultural responses and adaptations to fluctuations in water availability via descriptions of erosion control features, controlled burning, the creation of dams at narrow places in the riverbed, and the deliberate planting of specific vegetation to maximize water use and efficiency (Shipek 1993). These attempts to control water contrast to the Spanish and Americans, as thousands of years of joint adaptation between the Kumeyaay and the environment yielded moderately positive results. The Spanish and American colonists did not have the advantage of evolving with the local environment, and attempts to control the San Diego River were based on previous cultural adaptations to different environments in Spain or in England.

Shipek discusses cultural adaptations of the Kumeyaay to resource stress through abortion, infanticide, abstinence, and contraception to reduce population growth (1981). Again, ethnographic research, archival research of mission records, and correlations in the dendrochronological record suggest the Spanish colonized the San Diego River valley during a very dry rainfall cycle (Shipek 1981:296). The Kumeyaay had strategies to combat the negative effects of drought, many of which were likely deemed barbaric by the Spanish and thwarted upon acceptance to the mission. This would have resulted in the loss of culturally acceptable practices to curb population growth in times of extreme resource stress which occurred during the Spanish period.

The archaeological evidence of adaptation to drought in other areas in the American Southwest and among the ancient Maya includes the creation of large-scale irrigation systems, agricultural endeavors, and the creation of complex social networks. Additionally, these adaptations ultimately failed, as a combination of environmental change in the form of
further reductions in rainfall, exponential population growth, and decimation of the available local resources led to major cultural collapse.

Is there any evidence of Native American dependence on resources from the San Diego Mission?

Was there a series of droughts during initial mission occupation that may have drawn the Native Americans to the mission for necessary resources?

Archaeological evidence suggests contact between the mission and the Kumeyaay, through the presence of glass trade beads and other European goods at prehistoric villages (CA-SDI-9243) and the presence of Kumeyaay artifacts at the mission (CA-SDI-35) and in Old Town San Diego (see Chapter 4). The mission was established at the location of the prehistoric Kumeyaay village of Nipaguay, but no extensive archaeological research has been completed to demonstrate the length of prehistoric occupation at the site (Carrico 2008).

Historical evidence, in the form of Spanish diaries from the mission, indicates the need of the Kumeyaay to obtain food from the mission, and that the neophytes provided a portion of the diet for the missionaries (Engelhardt 1920; Lightfoot 2005). It is possible that the missionaries and the Kumeyaay depended on each other during different times of the year or from season to season. Shipek does report periods of drought during the initial mission period, as the Spanish attempted to establish sustainable crops and resources for the mission and the dependent population (1981:296). There is limited evidence, however, that overall resource shortages forced the Kumeyaay to seek refuge at the mission.

How did the ability to manipulate water change perceptions of water reliability? Were people less inclined to believe water shortages were a problem if enough dams, reservoirs, or flume systems could be developed?

When did the City of San Diego come to the conclusion that water supplies would be difficult to maintain for a skyrocketing population?

Was importing water from the Colorado River via the San Diego Aqueduct the only option?

How does the history of development of the San Diego River reflect changes in public sentiment regarding water use?

Beginning with the Spanish missionaries, the sentiment at the time regarding water availability was simply to build a dam or a diversion feature to create a reliable water source. Wells dug into the riverbed quickly dried up in the summer, forcing the Spanish to develop another source of reliable water from the San Diego River. Popular thinking among the Spanish was that once a secure water source could be obtained, crops would flourish, the
overall population would grow, and more gentiles could be converted (Engelhardt 1920). The building of the dam by the missionaries and the Native American neophytes should have solved the problem of water unreliability, according to the Spanish. Yet the San Diego mission remained one of the most poorly performing missions, and still suffered from extreme drought and massive floods that destroyed portions of the dam and flume system, requiring maintenance and repair.

Promises made by speculators, promoters, and later private company officials provided hope for the new inhabitants of the city of San Diego. The San Diego Water Company and the Southern California Mountain Water Company both sorely overestimated the capabilities of their respective systems, yet the public supported massive development projects and publicly funded water distribution systems. The creation of a municipal water system was a response to attracting more people to the city rather than to the local demand at the time. The decision to pursue obtaining water from the Colorado River was made early in the history of San Diego, in 1926, although the San Diego Aqueduct was not constructed until 1947. Alternatives to the Colorado River were available, and members of the city council suggested the development of the region’s water before taking water from the Colorado River (Courtemanche 1982:130). Additional dam sites in Mission Gorge, and the further development of other watersheds were suggested in the 1935 study of San Diego’s water resources, yet ideas for more lucrative property development in Mission Valley took precedence.

How did policy-makers respond to increasing demand for water?

Was it easier to simply add pipelines to import more water than to encourage maintaining sustainable population growth and development?

How can policy-makers use applied anthropology to create a successful plan for water use in San Diego?

Can the current population of San Diego accept a cultural shift to better utilize the available resources?

Naturally, with increased population growth came a higher demand for water. After the construction of the first San Diego Aqueduct in 1947, additional pipelines could be relatively easily added to the original. Restrictions on water use, incentives for water conservation, and other strategies for sustainable water use were never suggested by policy-makers, irrigation districts, or local water authorities. Only recently have these ideas been
suggested by policy-makers, likely in response to the overdevelopment of the region’s water resources. San Diego now imports between 75 to 90 percent of its water from the Colorado River and Northern California, with only up to 10 percent coming from local sources (SDCWA 2003:53). Over 50 percent of the water used in San Diego County is for residential and domestic use, while only 17 percent is used for agriculture (SDCWA 2003:53). This suggests the possibility for reductions in domestic use, as personal and individual conservation measures, landscaping choices, and other strategies can be implemented to reduce consumption.

By fully examining the culture of water use in San Diego through an applied anthropological lens, policy-makers can better understand the reasons behind excessive water use by consumers. This focus on applied anthropology also requires some self-introspection, and policy-makers can examine how their past strategies have helped create the current cultural views of water in San Diego. More data is necessary, however, to determine the extent and depth of the ways in which people value water.
CHAPTER 8

SUMMARY AND CONCLUSION

SUMMARY

This thesis has roughly paralleled Veronica Strang’s anthropological examination and history of the Stour River in the United Kingdom in an effort to describe the current situation of water use along the San Diego River. As discussed in Strang’s (2004) study, anthropology can be used to inform policy and educate the public in an effort to alleviate the problem of water uncertainty. The history of the San Diego River has been examined from an applied anthropological perspective, including selected ethnographic studies and archaeological investigations to demonstrate the complexity of development in the river’s watershed. By using ethnography and archaeology as part of a larger applied anthropological approach, the contemporary issue of water unsustainability can be examined in a comprehensive manner. An applied anthropology of the San Diego River could ultimately play a critical role in developing sustainable strategies for water use for the entire region. Different theoretical perspectives have been applied to the research data obtained for this study, reflecting not only the author’s personal interest, but to aid in the understanding of the water culture of San Diego. The themes of water reliability and cultural change are discussed as an integral part of the San Diego River story. A final, brief summary of the main ideas of this study is presented below.

The role of the prehistoric inhabitants of the San Diego River valley has been examined, in addition to the first efforts to manipulate the river and the surrounding environment to maximize the efficiency of subsistence strategies. The detrimental effects of the colonizing Spanish missionaries have been discussed through archaeological and ethnographic studies, including the impact of changes in agricultural methods. Imported Spanish crops, combined with the raising of livestock to provide sufficient food to the mission and the presidio, permanently altered the surrounding landscape. The native grasses utilized by the Kumeyaay were decimated and soon replaced with non-native pasture grasses for cattle and sheep. The fertile fields along the river margins were filled with European
grains and wandering livestock, promoting erosion of the topsoil and loss of soil productivity. The presence of the Spanish intensified the effects of drought and starvation of the local Kumeyaay population (Shipak 1981:307). This may have encouraged some Native Americans to seek refuge at the mission.

The Spanish period is characterized by new technologies to manipulate the San Diego River, including the construction of a dam and aqueduct system to divert and transport water to the mission. Large agricultural tracts planted with wheat and orchards of olives and other European plants required significant amounts of water for a sufficient yield to support the mission and the presidio. Little effort was made by the Spanish to understand or learn about the subsistence strategies of the local Kumeyaay, who had been living in the area for thousands of years. The missionaries saw the local inhabitants as barbarians, non-Christian and backward, and therefore not worthy of further investigation in regards to their traditional practices. This may have contributed to the inability of the Spanish to develop a sustainable and successful mission enterprise in San Diego (Lightfoot 2005).

American settlers in San Diego arrived with pre-determined ideas about water use and development, and applied these strategies to the San Diego River with limited success. Early attempts to control the river, including the building of the first ‘Derby Dike’ to re-align the river to empty into False Bay, and the construction of the San Diego flume, merely reflected the limited effectiveness of American and English ideas of water use. American ideals of personal gain and economic development are demonstrated through the creation of private water companies, and the conflict between urban and agricultural water users. This conflict ultimately resulted in the drawn out legal battle between the City of San Diego and the Cuyamaca Water Company and the La Mesa, Lemon Grove, and Spring Valley Irrigation District in the 1920s.

Archaeological examinations of other cultures living in arid environments demonstrated parallels to the San Diego River case, and presented implications for the future of water use in southern California. The application of general anthropological theory to studies of water use was also discussed, and case studies ranging from South American to the United Kingdom presented important perspectives to consider while discussing the culture of water use in San Diego.
HOPE FOR THE FUTURE?

John Spreckels described the Morena Dam in *The Story of Water in San Diego* (published by the Southern California Mountain Water Company in 1909) as a testament to the human ability to conquer nature. The book proclaimed, “Here, in this awful rift the dam is building-as if the pygmy, Man, defied the Titan, Nature” (SDCWA 2003:22). Public sentiment during the early part of the 20th century reflected not only a desire but a need to dominate the landscape and to serve humankind (Worster 1985). Water flowing down rivers and into the ocean was described as “wasted,” as its true potential was unrealized as an energy source or for use in agriculture (Reisner 1993). Popular sentiment today, however, has changed, with a renewed focus on the importance of free-flowing rivers, reductions in water pollution, and a renewed sense of communion with nature. In San Diego, local community organizations such as the San Diego River Park Foundation, Think Blue, and the Surfrider Foundation, have attempted to reconnect the public with water, promoting personal responsibility for water conservation, and recognizing the source for San Diego’s limited water supply. These organizations foster a sense of community, encouraging the public to reacquaint themselves with the San Diego River, and become active participants in local policy creation.

The earliest inhabitants of the San Diego River valley also promoted an understanding of the environment, utilizing systems that increased the efficiency of the limited water availability of the region. Some of these strategies or elements of them can carry over into future plans for San Diegans. Using native plants or plants better suited for arid environments can help individuals reduce water consumption without losing attractive landscaping for homes and gardens. Focusing on erosion control and reducing soil run-off in agriculture can benefit not only the environment as a whole, but can also help soil retain nutrients necessary for successful productivity. As observed during the early American period, individuals dug wells and built cisterns at their homes to collect and store water for later use. The increasing availability of rainwater collection and storage options for households has allowed some residents to use less of the municipal water supply.

Additionally, cultural expectations and adaptations to the actual limitations of water availability in San Diego will help to limit overconsumption and increase awareness of the real cost of importing water from the Colorado River and from northern California. This
parallels suggestions by Worster (1985) to “relearn the old technique” of dry farming, using less water-dependent crops, and raising cultivars better suited to an arid environment. This method has the potential to yield a population forced to understand and adapt to their own ecological conditions and to restrain their own lives through direct responsibility (Worster 1985:333).

It is also possible that overarching western water laws cannot be applied to San Diego, as it represents a unique situation, location, and environmental conditions. General application of laws in other parts of California is also not applicable, as other, large, California cities like Los Angeles and San Francisco developed water in a different way, and interacted with the environment differently. San Diego initially attempted to stay within the County, with available watersheds, but branched out the Colorado River only under pressure to claim an allotment of water while it was available, not out of necessity. Once that decision was made, however, water distribution appeared limitless, as additional pipelines could easily be added. There has since been no real effort to fully develop the San Diego River watershed or look to alternative sources of water such as desalinization, water recycling, or more effective conservation methods. A combination of all types of water utilization, from individual collecting and storage, conservation methods on a larger scale, including businesses and industrial use, to the development of emergency storage facilities is the only way to create a sustainable future for the citizens of San Diego.

**LIMITATIONS**

This thesis represents an initial study of the archaeology and history of the San Diego River, and not all the desired data could be found or examined. Time constraints and considerations of efficiency limited the number of sources examined for this study, and additional data is known to exist in other archives and repositories. Very limited data from the San Diego Historical Society was reviewed for this study, and significant collections of photographs, maps, letters, and other documents are located at their facility in Balboa Park. The GIS analysis for this study was also limited to a specific search area for purposes of efficiency and to gain a preliminary understanding of the types of data available for future research. This limited the number of sites that have been recorded along the river showing evidence of water use, which resulted in a relatively small data set for comparison.
There was an overall lack of available archaeological data related to the Spanish and Mexican periods along the San Diego River. This is likely due to both the actual paucity of archaeological data from those periods and the lack of published data available to researchers. No comprehensive reports have been published on archaeological investigations of the presidio or the mission, and later studies of Old Town are limited in scope and depth due to insufficient funds or basic project goals.

There are effectively no limits to the available historical data related to the development of the San Diego River, as much of the history has been published or summarized in multiple sources (see especially Courtemanche 1982; Strathman 2005). For this study, however, limits were imposed to prevent redundancy and improve readability of the thesis.

**FUTURE RESEARCH**

This study has presented a preliminary examination of the history and archaeology of the San Diego River, and is hardly complete. The preceding chapters supply a framework for which additional studies and research can be applied in the future. Some of these additional studies and research are listed below, mainly due to interest by the author. Other studies are obviously possible, and should be pursued in an effort to fully understand the cause of the current population’s lack of dependence and reliance on the San Diego River, how archaeology and history inform these ideas, and what the future ramifications of this imbalance may be.

To truly parallel Strang’s (2004) study on the Stour River, a more thorough investigation and ethnographic study of the San Diego River is necessary. This could include full ethnographic research, including interviews with residents of San Diego, and those living along the river, using the river, members of irrigation districts, and conservation organizations (San Diego River Park Foundation, Think Blue San Diego, or Surfrider Foundation). Questions about the value of water, cultural perceptions of water, and uses of water should be incorporated into the study.

From an archaeological perspective, it would be beneficial to conduct additional research for the San Diego Flume and other water conveyance, storage, and transportation systems located farther away from the river (more than 500 meters), including the previously
recorded sites discussed in Chapter 4. The nature of current archaeological practices generally does not allow for a thorough examination of all historical data or for additional subsurface excavations. The well/cistern feature at the Whaley House at Old Town is an exception, as excavation was made possible through collaboration between San Diego State University, California State Parks, and the Save Our Heritage Organisation. Collecting this type of data may require incorporating research questions related to water use into archaeological investigations and research designs to allow for additional research. Local cultural resource management firms could be encouraged to look for data related to water use and to report their findings in formats available to the public.

Anthropological comparisons to other large coastal cities including Los Angeles and San Francisco could provide additional details regarding successful water development strategies for large populations. These cities reached well outside the city limits to procure water at great cost, and the ultimate success or failure of these decisions has yet to be determined. The role of local government played a significant part in water procurement strategies in Los Angeles, San Francisco, and San Diego, and the relationships between irrigation districts, water authorities, and city councils could provide further insight related to power dynamics and decision-making.

If this eventual large-scale anthropological study is successful for San Diego, particularly if sustainable strategies are implemented, it would be interesting to apply the knowledge to other river systems in need, such as the Tijuana River watershed along the Mexican border. The results of these studies could provide significant information to the general public, empowering local communities to regain a connection to the natural environment and resources necessary for sustainable growth.
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