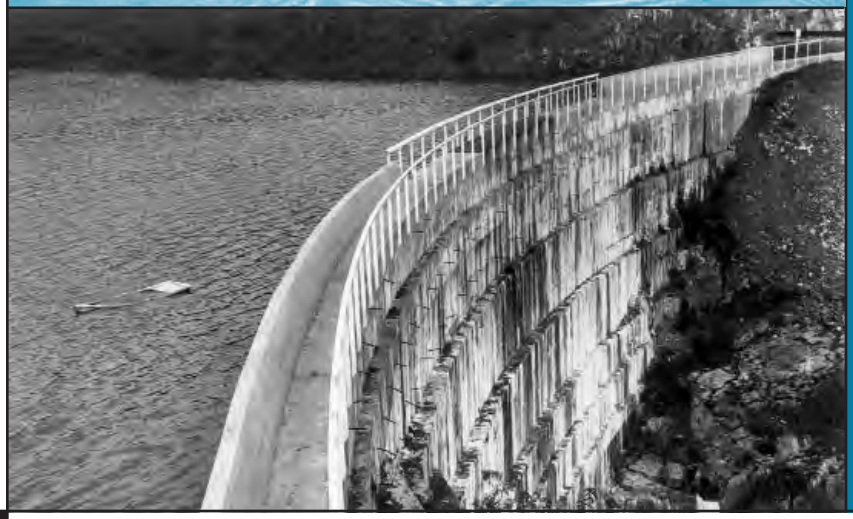


To Quench a Thirst

a brief history of water in the San Diego region

This book was made possible by a grant from The Hans and Margaret Doe Charitable Trust

Hans Doe
1903-1988

A native Norwegian, Hans Doe moved to Vista in San Diego County in 1946 for a career change, and became a successful avocado and macadamia nut grower. As a farmer, he understood and respected the importance of water to society.

By 1951, he had become involved in local water politics, and stayed active until just before his death. He was elected to the Vista Irrigation District board, where he served for 33 years (1951-1984). He also served on the Board of the San Diego County Water Authority for 31 years (1956-1987), the Board of the Metropolitan Water District of Southern California for 27 years (1959-1986), and was granted a lifetime membership to the Board of the Association of California Water Agencies after serving two terms (four years) as its president. He served two terms on the State Soil Conservation Commission, chaired the Southern California Water Conference for 10 years and as an original organizer of the Agua Buena Soil Conservation District, he helped protect Vista from flooding. Because of his long career in the water industry, he was also known as "Mr. Water."

At his behest, the Hans and Margaret Doe Charitable Trust was established in 1990, two years after his death. It supports and promotes water-related education to the people of Vista, San Diego County and California. In the words of the Trust, it operates:

> To educate the public regarding the utilization of water resources in the State of California, including the historical development of water resources as well as the planning for present and future development.

The San Diego County Water Authority is grateful to the Hans and Margaret Doe Charitable Trust for its generous contribution.

Cover photographs:
Upper image — Water Wagon, 1904. The San Diego Historical Society.

Lower image — Olivenhain Dam, completed 2003, is the first dam constructed by the San Diego County Water Authority. At 318 feet, the Olivenhain Dam is the tallest roller-compacted dam in North America. Photo by John Alexanders

Foreword

The idea for this book grew from questions asked by high school and middle school teachers attending San Diego County Water Authority-sponsored water testing workshops. Since 1994, the Water Authority has offered workshops to enable teachers to include water quality testing as part of their science curriculum.

During the workshop, a presentation is made on the history of the county's water supplies, and it inevitably results in a barrage of questions: "Where does our water come from?" "When was this-or-that dam built and how does it tie into the rest of the system?" "Do we have enough water for the future?" "Will we ever see widespread desalination?" These questions soon revealed a need. There were no short, easy-to-read materials that presented a quick overview of the historical water supply situation in San Diego County. Thus, the idea for this book was formed, and it came to fruition with the financial help of the Hans and Margaret Doe Charitable Trust.

In writing the book, every thought relating to the present and the future seemed to have a strong link to the past. As a result, we have created a brief history that we hope sheds light on the region's water development, with its nuances, its politics, its personalities and landmark events.

Ivan Golakoff
Education Programs Supervisor
San Diego County Water Authority

To Quench a Thirst

a brief history of water in the San Diego region

Book Concept and Development
Ivan Golakoff
Education Programs Supervisor

Book Layout & Design and Project Manager
Steve Hubert
Public Affairs Representative – Graphic Design

Written by
Kenneth W. Mirvis, Ed.D.
Cathryn M. Delude
The Writing Company

We would like to give special thanks to the many Water Authority staff members that assisted us with their valuable comments and insights during the development of this book:

Elizabeth Berg, Susan Bohlander, Janice Collins, Dennis Cushman, Vickie Driver, Dave Fogerson, Dana Friehauf, Deborah Hack, Daniel Hentschke, Laura Kitchen, Kim Laru, Gina Molise, Kelly Mooney, Mark Stadler and James Taylor.

and

Bob Friedgen
Former General Manager, Helix Water District

Cheryl Hinton
Barona Museum and Cultural Center

Table of Contents

Preface

Part 1 **Living with the County's Water Supply**

Introduction	Managing an Extreme Climate		Page 1
Chapter 1	Ancient Days	pre-1769	Page 3
Chapter 2	Spanish Missions	1769 to 1820	Page 7
Chapter 3	Mexican Period	1821 to 1848	Page 11
Chapter 4	Early American Period — Using Local Water	1848 to 1870s	Page 15
Chapter 5	Creating Water Companies	1870s to 1920s	Page 19
Chapter 6	Pueblo Water Rights		Page 29

Part 2 **Moving Beyond the County for Water**

Introduction	Over the Next Hill		Page 33
Chapter 7	Colorado River Water	1920s and on	Page 35
Chapter 8	Water from the North	1950s and on	Page 43
Chapter 9	Unexpected New Sources	1990s and on	Page 47
Chapter 10	Vulnerability and Emergencies	21st Century	Page 55
Notes			*Page 57*
Maps and Charts			*Page 63*
Bibliography			*Page 71*
Index			*Page 75*

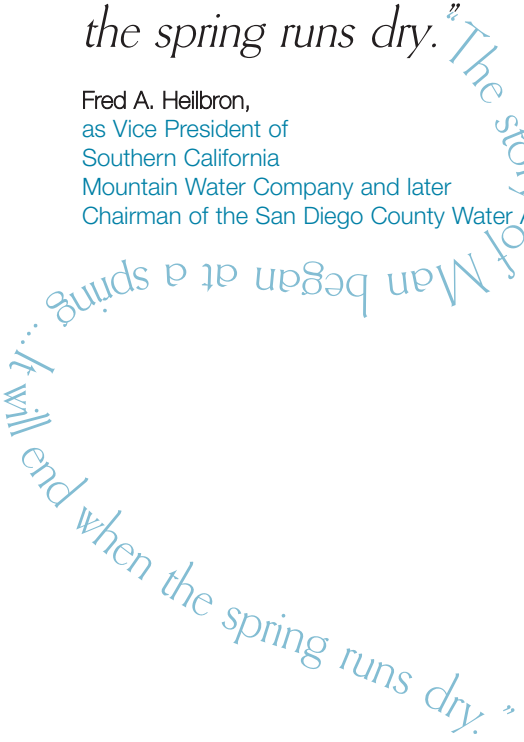
Photo credits

All photos property of the San Diego County Water Authority unless otherwise designated.

Preface

"The story of Man began at a spring ... It will end when the spring runs dry."

Fred A. Heilbron,
as Vice President of
Southern California
Mountain Water Company and later
Chairman of the San Diego County Water Authority[1]



Imagine a place that basks in sunshine and warmth and has everything needed to support diverse wildlife and a small population of people. Wild grasses full of grain cover the valleys and hillsides. Fragrances of wild poppies, sage and roses waft in the air. Native grapes and berries hang from vines. Morning breezes come from the ocean in the West, and an evening breeze blows from the mountains in the East. The temperature is never too hot or too cold; there is little worry about food or shelter. Streams flow from natural artesian springs; willow trees and sycamores line the banks of rivers that flow into a beautiful protected harbor where fish abound. Although the rivers may dry up in the rain-free summer, the people have learned how to store enough water for drinking, bathing and watering their small agricultural plots.[2]

This utopian scene may seem like a far off land compared to the San Diego region today, with its booming population, dense development and farms supported by massive works that import water from distant mountains and watersheds. It is not, though; it is the San Diego region as it was just over 300 years ago.

This book tells a story of change, from early times when the sparse inhabitants managed the natural water resources without substantially changing the landscape, to a more recent time marked by the building of an elaborate network of dams, reservoirs and pipelines that support more than 3 million people and a $142 billion economy. The story has two parts: the first tells how the early residents lived with their existing local resources; the second, which begins in the 1920s, tells the story of how the region has become up to 90-percent-dependent on imported water.

We hope this brief history of water development will interest you and inspire you to be a careful guardian of the San Diego region's most basic and essential resource: water.

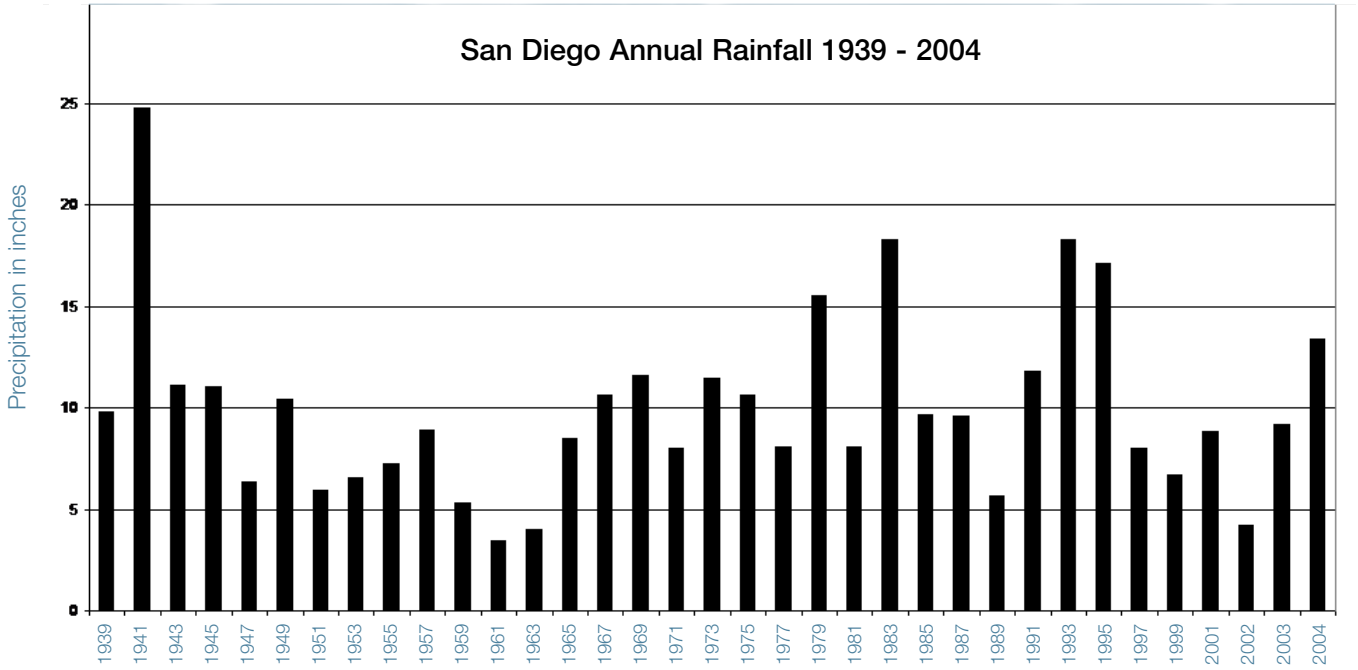
Part 1: Living with the Region's Water Supply
Introduction - Managing an Extreme Climate

"Water. It's about water."

Wallace Stegner,
when asked about California.
Author and Professor at Stanford University

San Diego County lies in the southwestern corner of the continental United States and California. Its boundaries today stretch 70 miles inland from the Pacific Ocean and extend south from Orange and Riverside County to the Mexican border. In earlier times, the county was larger. It included all of today's Imperial County, touching on the Colorado River. It extended north to encompass much of today's Riverside and San Bernardino counties. The region's geography — bounded as it was by a desert, a mountain range and the Pacific Ocean — isolated it from the rest of the continent. This isolation, coupled with its arid climate, impacted the culture and development of the region throughout its history.[1]

Limited rainfall and abundant sunshine define the climate. What little rainfall the county receives does not coincide with its need: almost no rain falls during the hot summer. The county's coastal plains receive an average of just 10 inches of rain a year, while the mountains receive an average of 30 inches. Yet the region seldom sees an average year. Instead, yearly precipitation tends to fluctuate greatly from year to year.[2]



The county is so arid that its entire 4,207 square miles has just seven principal rivers, all of which go dry in the summer. As a result, the county's residents cannot count on them for reliable year-round water. Although the mountains can get ample rain, their steep slopes and proximity to the coast make capturing their runoff difficult. In the words of William Jennings, a prominent water lawyer in

the early 20th century, "It's hard to stop (the water) and there are very few dam sites."[3]

Together, the peculiar geology and hydrology give this region the greatest variability in runoff between the wettest and driest years of anywhere in the United States. At the low end, runoff may amount to only five percent of an average year, while at the high end, it can be seven times more than the average. One of the driest years on record was 1899–1900, when the El Capitan dam site on the San Diego River received only 980 acre-feet of runoff. The same site received 200,400 acre-feet in 1915–1916, the year of the Hatfield flood (Chapter 5). This extreme variability makes storage reservoirs a necessity, yet it also makes planning their capacity and building flood-proof dams particularly challenging. Historically, the storage requirements were often underestimated; floods broke dams all too frequently. To make room for the occasional flood, most reservoirs in the county are sized so they are filled to only about 40 percent of capacity during normal years.[4]

AN ACRE-FOOT

Large amounts of water are measured in acre-feet.

- 1 acre-foot = 325,581 gallons
- It covers a football field to the depth of approximately one foot.
- It is the amount of water used by two typical households in a year.
- An average person uses 125 gallons per day, or one-eighth of an acre-foot per year.

To complicate matters, not all of the rainfall results in runoff. If the yearly average of 10 inches falls in two or three major storms, much of the water runs into streams and makes its way to reservoirs. If, however, that 10 inches falls as frequent sprinkles, which is often the case, it seeps into the ground and evaporates without producing any real runoff.[5]

In short, water is one of this region's most formidable challenges, requiring community cooperation and engineering ingenuity.

San Diego's seven principal rivers

Chapter 1: Ancient Days pre-1769

Rosa Nejo carrying an olla
Campo, 1918
The San Diego Historical Society

The world in the beginning was a pure lake. The Sky came down upon the Earth. Tu-chai-pai, the Maker, and Yo-ko-mat-is, his younger brother, sat stooped together, bowed down by the weight of the sky. Tu-chai-pai said, "We-hicht, we-hicht, we-hicht." He rubbed tobacco in his hand and blew upon it three times. Every time he blew, the heavens rose higher and higher above their heads.

Then he placed North, South, East and West. The Maker said, "Men are coming from the East and from the West. Now I am going to make hills and valleys and little hollows of water."

"Why are you making all these things?" asked Younger Brother. The Maker explained, "When men walk back and forth in the world, they will need to drink water or they will die." So he made little water places for the people. Then he made the forests so they would have wood to burn. He dug in the ground for mud to make the first people, the Indians. He made the Sun and Moon, and then he created nothing more. Still, he was always thinking how to make Earth and Sky better for all the Indians.

Kumeyaay Story[1]

This is a creation story of the Kumeyaay of San Diego County, whom the later Spanish settlers called Diegueños. The Kumeyaay were a Yuman-speaking people that included the Lipay bands in the north and the Tipay bands in the southern part of the county. They shared the region with bands of Luiseño near Oceanside, the Cáhuilla, found mostly in Riverside County, and the Cupeño, near Warner Hot Springs. Over the centuries, these groups blended many cultural characteristics and generally lived peacefully.[2]

As the creation story says, the Maker had indeed made earth and sky good for the people in San Diego County. The geography provided coastal estuaries and a warm, sunny climate. A native grain, now extinct and unidentified, once covered the valleys and hillsides.

While rainfall was limited and unpredictable, the coastal plain was "filled to the brim" with fresh groundwater: it overlay a large artesian system that spurted forth springs and even fountains. There were reeds, rushes and willows for housing, clothing and baskets. Berries, roots, nuts, acorns, big horn sheep, antelope, deer, quail, rabbits and fish provided plenty to eat.[3]

MANAGING THE LAND AND WATER

The people, like their Maker in the story, looked for ways to make their world better for themselves — and to help them survive the long droughts. They broadcast seeds for grasses in freshly fired fields that increased the fertility of the grain and reduced the danger of spontaneous fires. They transplanted grapevines, onions, bulbs and tubers. They cleared land for planting and cultivated a network of small agricultural plots in different areas for different seasons. Chaparral plantings on steep slopes reduced erosion and provided food and medicine. Corn, beans and squash were sown near running springs, wet meadows or places dampened by runoff from summer rains.[4]

In addition to land management, they also practiced water management. Groups cooperated to build small dams and levees, diverting water to places where they wanted plants to grow — thus practicing the art of irrigated agriculture, which has played a crucial role in the development of San Diego County. They placed rows of rocks across drainage channels to slow the storm runoff and allow more water to seep into the ground. Rock alignments on slopes spread out the runoff and trapped fine silt above, making fertile plots for crops. At places where the streams narrowed into small rock passages, they placed large boulders and brush to retain water in the wider, upstream portions, creating small bogs and wet meadows. After large storms, people organized to repair any damage to the dams. As a result of these efforts, springs and pools existed in the valleys and water was close to the surface even in dry years.[5]

To safeguard water resources in the hotter, drier regions, people cleared the brush away from springs and planted shade trees alongside the springs to reduce evaporation. They gouged basins in rocks to catch rainwater. They also placed huge pottery "ollas" — native versions of 55-gallon drums that were often more than four feet tall — along trails in the desert where they could be filled with water from nearby springs and runoff.[6] Thus began the county's water storage system.

Small villages of extended families dotted the countryside, with an average population density of three to four people per square mile in the desert and five to seven people per square mile on the coastal plains. A village typically controlled a territory ranging from 10 to 30 square miles along a stream bed and extending upwards from the valley to the

Pottery "ollas" were native versions of 55-gallon drums
Barona Band of Mission Indians

drainage divide, with homesteads dispersed throughout. As such, each territory included several ecological zones (riverbed, meadows and mountains) with various resources for hunting, gathering, fishing and trading. One of the larger villages, Cosoy, was located at what would become Old Town in San Diego.[7]

All together, 20,000 to 30,000 Native Americans were living in San Diego County when the Spanish arrived to establish missions in 1769.

Luiseño huts (or ramadas) at Cabrillo Celebration 1892
The San Diego Historical Society

THE YEARS TO COME

When they arrived after long and arduous land and sea journeys, the Spaniards were sick, starved and dehydrated. The native people who met them were friendly and hospitable. Father Junípero Serra described them as "fine in stature and carriage, affable and gay. They brought fish and mollusks to us, going out in their canoes just to fish for our benefit."[8] As the historian H.C. Hopkins commented:

> Had the Indians been other than kind and helpful, that sick little party who arrived in 1769 could never have survived. History should never overlook the fact that the little hospital on the beach of San Diego Bay was furnished with water from the San Diego River, brought to those parched and dying lips by the hands of the friendly Indians.[9]

The Spanish settlement, however, was not good for the native population. Natives built the Spanish missions and pueblos, usually against their will. They carried the tiles on their backs for the Spanish irrigation systems. They died of disease and abuse. By the time the Mexicans transferred the missions to civilian authority in 1833 and the native people were free to go their own way, their numbers had

declined, and their precious springs, streams and hunting grounds were controlled by privately owned ranchos. When the United States gained California in 1850, they drafted treaties to set aside tribal lands — but never ratified them. Between 1875 and 1939, eighteen reservations were established and the native populations began to revive.[10]

Their land, however, was vastly different. The Spanish, Mexicans and Americans had introduced cattle, sheep and goats to the grassy fields. The livestock ate the grasses to the roots and the newcomers did not re-seed the fields. European plants crowded out the native grasses, which were extinct by the mid-1800s. The new landowners did not practice fire maintenance, or maintain the rock alignments or small dams below the bogs. Erosion resulted; soil fertility declined; and the wet meadows and springs began to disappear.[11]

Today, roughly 20,000 Native Americans live in San Diego County. They represent the original stewards of the county's precious natural resources.

Mariquita Cuero showing a method of making ollas
Campo, 1918
The San Diego Historical Society

Chapter 2: Spanish Missions 1769 - 1820

MILESTONES IN THE SPANISH MISSION PERIOD

1542	Juan Rodriguez Cabrillo claimed San Diego Bay and surroundings for Spain.
1602	Sebastián Vizcaíno explored the region and found it good for settlement.
1769	Father Junípero Serra founded the Mission at Presidio Hill in San Diego.
1773	Mission San Diego de Alcalá moved to Mission Valley.
1784	Ranchos were established.
1791	Presidio soldiers began farming at the foot of Presidio Hill (later known as the pueblo of San Diego and Old Town).
1798	Mission San Luis Rey founded in what is now Oceanside.
1813	Construction completed on the Old Mission Dam (Padre Dam).

> His Grace orders as a hold trust upon your conscience … to administer this concession and royal grant to the water in this arroyo referred to for the common benefit … who dwell today or in the future in the province of the Mission of San Diego de Alcalá. This concession and the fruits also shall be held as to these children and their children and successors for all time forever …"

Spanish Viceroy in Mexico City under the rule of King Charles III to Father Serra, December 17, 1773

When Juan Rodriguez Cabrillo explored San Diego Bay in 1542 to search for fresh water, he claimed the land for Spain. The Spaniards, however, were not ready to establish a settlement in an area so remote from Mexico and New Mexico, so they left.

Father Serra and a companion
The San Diego Historical Society

Sixty years later, in 1602, Sebastián Vizcaíno returned and noted a good port with an estuary that extended inland, friendly Indians (whom he viewed as a potential work force and as potential converts to Catholicism) and "sweet and good water" in the sands near the river. With those notations, the Spaniards left again, this time for 165 years.

By 1769, Spain was ready for San Diego. Father Junípero Serra and Gaspar de Portolá arrived by overland trail from Baja California, and Captain Vicente Vila and Juan Perez sailed into what is now San Diego Harbor. Their purpose was to set up a series of Catholic missions — each a day's horseback ride apart and a day's ride from one water source to the next — in preparation for the Spanish settlement of a new colony. The missions were to convert the native tribes to Catholicism and prepare them for life in Spanish society.

When that task was completed, the missionaries would move on to another place of need, turning the mission into an Indian pueblo and a parish church. First, though, they had to find suitable sites for settlement — sites with water.

De Portolá led an expedition inland to identify such sites. Imagine his despair when he

wrote, "There was no water." They had to explore the land slowly "so as to regulate the marches, according to the distance to watering places." When they failed to find water, they prayed fervently.[2] Luckily, the natives they encountered steered them to pools and springs, where the explorers noted "well made" pots (ollas) storing water.[3]

Back at the harbor, another padre, Father Juan Crespí wrote about the body of water now known as the San Diego River.

> We found there a good-sized river which the ships use as a watering station. This river has a very large, broad plain on its banks, which seems to be of very good soil, with many willows, some poplars and some alders … If the river is permanent it may prove in time to be the best of those discovered in all California.[4]

Later he wrote again with what must have been both disappointment and astonishment:

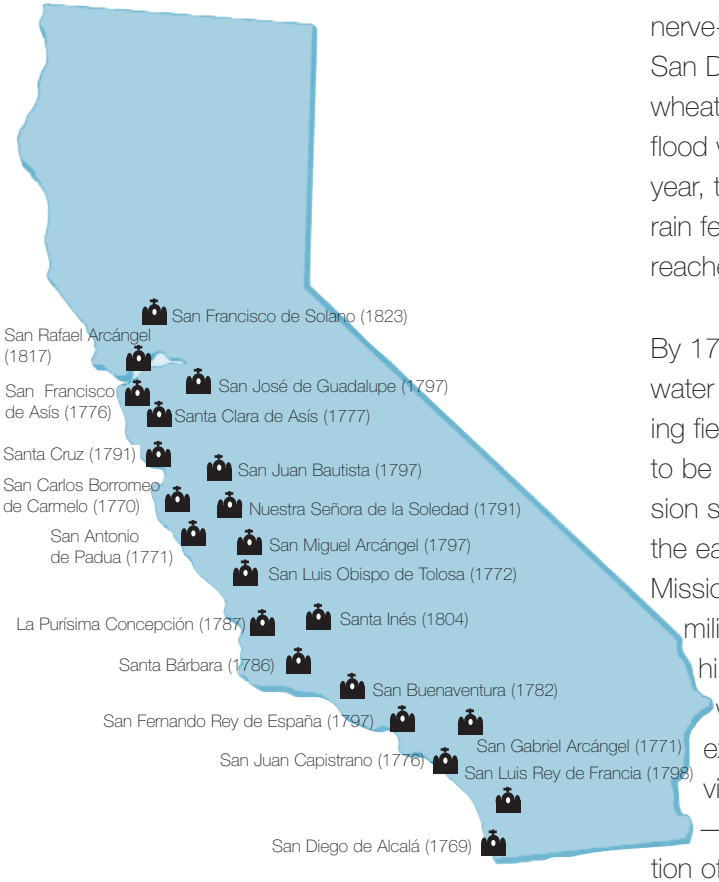
> … [W]e are much troubled because the river, which flows through the plain and which has very good, clear water, as we have observed every day, is diminishing to such a degree that although two weeks ago when we arrived we saw it flowing with an abundant stream, it has now diminished so that it hardly runs at all and they say that they can cross it dry shod. If this continues it will be necessary to look for another place to establish the mission and obtain irrigation.[5]

THE "UPSIDE-DOWN" RIVER

Father Crespí was soon to observe that the San Diego River became an "upside-down river." As a later resident explained, "It runs upside down in the summer with the sand on top."[6] The Fathers dug wells in the sands of the river bed and carried their drinking water in skins up to the slope where they established Mission San Diego de Alcalá on Presidio Hill.

Cave Couts drawing of Mission San Diego de Alcalá, 1846
The San Diego Historical Society

The first order of business for the mission was to produce food, since they were too remote to import even bare essentials. Having come from Spain's arid climate, they knew the importance of planting crops near a reliable water supply ... which proved to be a



Missions of California

nerve-wracking, trial-and-error experiment in San Diego. The first year, the mission planted wheat in the bed of the San Diego River. A flood washed out all the seeds. The second year, they planted farther from the banks. Little rain fell that summer and the water never reached the fields.

By 1773, they had grown tired of bringing water up to Presidio Hill and they were cultivating fields farther up river where there seemed to be more rain. The priests moved their mission six miles upstream to the eastern end of today's Mission Valley, leaving the military fort behind on the hill. This new location was the site of an existing Kumeyaay village called Nipaguay — and a new population of natives to convert. Father Serra wrote, "The place is much more suitable for a population on account of the facility of obtaining the necessary water and on account of the vicinity of good land for cultivation."[7]

HARNESSING THE WATER SUPPLY

Droughts and food shortages continued to plague the mission. In 1792, the missionaries built a canal to bring water from springs to Mission Valley. Still, that was not enough. In 1803, they hunted for a place to build a dam. Upstream at Mission Gorge, they found a convenient outcrop of bedrock where water flowed over the surface rather than through sand. There they built the county's first masonry dam, which we now call Old Mission Dam or Padre Dam, to hold water and release a reliable, year-round flow. Unfortunately, too much of the released water percolated into the sandy riverbed between the dam and the mission. Over the next decade, they built a tile flume two-feet wide and one-foot deep on a bed of cobblestones and cement — the county's first aqueduct! They also built a settling basin with sand traps to clear the water before

Flume – Old Mission Aqueduct, 1929
The San Diego Historical Society

it entered the flume. A four-inch sluice (a gate to control the flow of water) off the flume powered a gristmill for grinding grain. Irrigation ditches led to fields of imported olive and pepper trees. As agriculture flourished, the mission became a thriving enterprise.[8]

By that time, Mission San Diego de Alcalá was no longer alone. Eighteen other missions were connected by El Camino Real (the Royal Road), each with walled gardens, palm trees, fountains, olive groves, vineyards and orchards.[9]

In addition to the missions, the Spaniards established ranchos (communally operated farms) and pueblos (communally operated towns). In 1784, the first ranchos were set up at today's National City and Chula Vista near Otay Mesa. They served to assert physical control over the greater region and supply agricultural goods for the mission.[10] In 1791, soldiers started farming at the foot of Presidio Hill, at the site where the pueblo of San Diego was established in 1823, which is now called "Old Town."

SAN LUIS REY: KING OF THE MISSIONS

The largest and most elaborate mission was north of San Diego de Alcalá near today's Highway 101 in Oceanside, built by the Luiseño Indians. Mission San Luis Rey de Francia, founded in 1798, had a church designed to hold scores of worshippers and an intricate water works system that was worthy of its title, King of the Missions.

The mission diverted water from the San Luis Rey River system to a storage reservoir. Pipes from the reservoir led to a fountain where the inhabitants could draw their drinking water. A charcoal filter cleaned the water. From the fountain, the water ran to a bathhouse and then to a pool for laundry. From there, the water ran into gardens and was lifted by waterwheels to higher-ground orchards. Before it was released into fields, it powered five granaries and a sawmill. As an ultimate sign of power, wealth, and technical sophistication, there was even a faucet in the church.[11]

This system not only shared the water wealth, but also showcased the abundance derived from careful management and recycling of a limited precious resource.

WATER FOR THE COMMON GOOD

The water works at San Luis Rey Mission reflected the value the Spaniards placed on water in an arid land. Life in Spain had stressed the importance of water for the survival of a community. In fact, water was too important to be left to the control of individuals. It was controlled by a royal authority and distributed according to the good of the community.

Everyone in the community was entitled to water, and no one was entitled to waste it. In San Diego County, these principles applied directly to the missions. The missions typically built a water supply and an irrigation system before building a church or housing. Everyone who was to receive their benefits was to work on them.[12]

Chapter 3: The Mexican Period 1821 - 1848

"Wherever there was water there was a ranch, from the coastal mesas, which are cut here and there by the intermittent streams of California, to the broad upland valleys, which are enriched by mountain snows."

Richard R. Pourade
Author of The Silver Dons[1]

World events seemed to pass the San Diego region by in the early 1800s. The Spanish authorities were preoccupied with a growing rebellion in Mexico and they largely ignored the under-populated northern outpost, California.[2] In Mexico, revolutionary troops were fighting against the Spanish government and eventually won independence from Spain in 1821.

In the San Diego area, however, the transition from Spanish to Mexican control was peaceful. Daily life and customs changed only gradually. The soldiers and their families stationed on Presidio Hill began to view their little settlement on the bay as a permanent civilian town. In 1822, they began building homes on the flat lands west of the hill and that settlement eventually came to be known as "Old Town."[3]

Lithograph of Rancho Guajome, east of Oceanside, 1883
The San Diego Historical Society

After Mexico became a republic in 1824, it opened California's ports to ships from the United States for the hide trade. The principal customers were shoe manufacturers from Boston, which provided the only real contact with the U.S. That trade gave San Diego more revenue than any other port in California and San Diego eventually became a center of social and political life. Still, the U.S. knew virtually nothing about California. Daniel Webster, a senator from Massachusetts, thought the San Francisco Bay was nice, but reportedly would not pay a dollar for the rest of California.[4]

Mexico began breaking up mission lands by distributing large land grants for ranchos involved in the cattle-grazing operations that supported the lucrative hide trade. The 8,824-acre San Dieguito Rancho is now known as Rancho Santa Fe. The richest grazing ground of the San Diego Mission became the 48,799-acre El Cajon Rancho. Rancho Tia Juana covered the area from south of San Diego Bay to the Mexican border. The biggest of them all, Rancho Santa Margarita y las Flores, had 113,440 acres and extended from the coast of today's Oceanside north to Orange County and inland to Fallbrook. As people moved from the city to the ranchos, the population of the city of San Diego dropped from 500 in 1834 to only 150 in 1841.[5]

THIRSTY RANCHOS

The larger ranchos of the Mexican era began a trend for intensifying the land use and

agriculture that demanded ever more development of the meager water resources. Local water supplies were impounded, pumped and diverted to where they were needed. Soon, ranchos claimed just about every spring and perennial stream. For the most part, however, these water-rich locations were already occupied by Indian rancherías (villages), which had to relocate to ever-drier lands.[6]

During this period, Southern California struggled through a severe 10-year drought, interrupted only by a flood in 1825. As pumping and diversions continued, the water table dropped and the springs dried up. Today, there are few, if any, traces left of the region's once numerous artesian springs, most of which are so long dry that most current residents are unaware they ever existed.[7]

THE BEGINNING OF SAN DIEGO'S WATER DISPUTES

The pueblo of San Diego began with an independent municipal government. It was later incorporated under the laws of Mexico in 1834. Those laws, which were derived from Spanish law, became pivotal in San Diego's 20th century water disputes.

Under Spanish and Mexican law, the inhabitants of pueblo lands and ranchos were entitled to a certain amount of land for their use and benefit. These land rights included water rights, since land without water is worthless in arid climates.

The first house of Juan Osuna, Rancho Santa Fe
The San Diego Historical Society

THE MISSIONS' DEMISE

As the ranchos increased in prominence, the missions declined. They had partially fulfilled their "mission" of establishing a Spanish Catholic community in this distant land. Mexico shifted the missions to secular control in 1842. Shortly thereafter, Mission San Diego de Alcalá, the former center of Spanish culture in Mission Valley, was in disrepair and ruins.

Another intended "mission" was not fulfilled, however. The missionaries had planned for the mission Indians to inherit the buildings and enough land and water to assure their well being. Only a few Indian pueblos were actually established, including the small towns of San Dieguito, San Pasqual and Las Flores from Mission San Luis Rey.[8] Nevertheless, the missionaries left a legacy of communal water law that would eventually color the way water was distributed throughout the county.

MILESTONES IN SAN DIEGO'S MEXICAN PERIOD

- 1821 Mexico won independence from Spain.
- 1822 Town or "pueblo" (later to be called "Old Town") was developed at the base of Presidio Hill.
- 1824 Mexico became a republic and distributed large land grants. Hide traders with Boston shoemakers were the only real contact with the U.S.
- 1834 The population of the town of San Diego was 520 and 7,294 Native Americans were counted in the region. The town of San Diego received pueblo status.
- 1841 Town population dropped to 150 as people received land grants for ranchos.
- 1842 Missions were secularized.
- 1846 U.S.-Mexican War began (U.S. fought Mexico for control of Texas, New Mexico, Arizona and California.)

Old Town — view from Presidio Hill, 1874 *The San Diego Historical Society*

Townspeople from San Diego took advantage of their right to the water of the San Diego River. They drew their drinking water from the river — or from under it when it ran upside down — and they planted gardens in Mission Valley using water from the river for irrigation.

THE END OF THE MEXICAN ERA

Mexico ceded California and the southwest territory to the United States following the U.S.-Mexican War (1846-1848), with the Treaty of Guadalupe Hidalgo. Again, in spite of bloodshed elsewhere, the changeover in the San Diego region was generally peaceful. Former Mexican citizens stayed on for the most part, although many of them lost title to all or part of their land.

As part of the Treaty, the city of San Diego took claim to 47,323 acres of pueblo land from Mexico — the largest tract of land claimed by any city in California.[9] The Treaty specifically referred to the historical land and water rights of the pueblo. Eventually, the city would pay great attention to that language (Chapter 6). In the beginning, however, the new Americans had to deal with other more immediate water supply problems.

Old Town — Early view from Presido Hill, 1869
The San Diego Historical Society

21. Casa de Juan Antonio Aguirre
24. Casa de Jose Antonio Estudillo
25. Casa de Juan Bandini
29. Little Brick Court House
30. Colorado House
31. Franklin House
41. Residence of James W. Robinson (also known as the "Railroad Block"). Later renamed the Rose Building when owned by Louis Rose, and then the Masonic Hall.

Chapter 4: Early American Period — Using Local Water 1848 - 1870s

"We boiled it; we screened it; we boiled it again; and then we drank something else."

Standing joke about the city of San Diego's well water, 1873[1]

In 1846, while the Americans were still fighting the Mexican War for control of California, Captain Samuel F. Dupont raised the 27-star American flag over the town plaza of San Diego and declared, "A more miserable and naked sight I never saw." He must have wondered what his country was fighting for. Nevertheless, others saw possibilities.

Another army officer, a Major Canby, followed the San Diego River upstream past the ruined mission and found the dam and aqueduct still in fair shape. He thought that at least 300 to 400 people could live in Mission Valley![2]

Most of the county's water supply, however, was still meager. The people in the backcountry got by with small-scale, privately installed irrigation ditches, wells and windmills. The townspeople bought water by the bucket and barrel from private water vendors who hauled it from the river, stored it in cisterns and delivered it by wagon. Some homes channeled rainwater from their roofs into private cisterns.[3]

In 1850, when California became the 31st state, San Diego County stretched from the Colorado River to the coast and from the Mexican border to today's San Bernardino County. Within a month, the city of San Diego incorporated. The original city census counted just 650 residents.[4]

A CITY TAKES FLIGHT

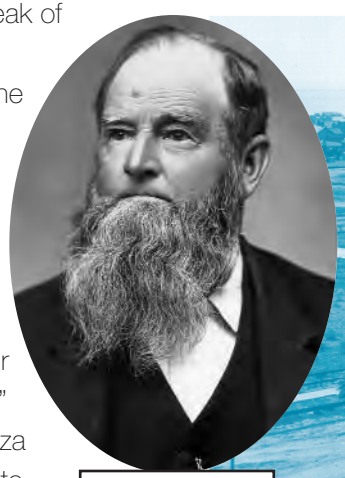
As the American period began, the county's economy was shifting away from ranchos to commercial ventures in the new "city" of San Diego. Civic leaders saw the need for a municipal water supply, perhaps using water from the mountains. With so few inhabitants, however, the city had no money for such a

Right: Water works — tower and wagon at southwest corner of Front and B Streets
Below: San Diego street scene — Fifth Street south of Broadway
The San Diego Historical Society

massive undertaking. Unfortunately for the city, the Butterfield Stage Coach line did not reach it, passing instead through the Warner Hot Springs area in the north of the county. The city of San Diego waited eagerly for a link to the transcontinental railway to break its isolation and bring more people. The outbreak of the Civil War in 1860 stalled any railway expansion though, and the economy of the San Diego region remained slow.[5]

After the Civil War, the pace of economic development and population growth quickened. In 1867, Alonzo E. Horton, a "Connecticut Yankee" who had settled in San Francisco, saw San Diego's harbor and thought it must be "heaven on earth." He thought the existing town near the plaza was a bit shabby, however, and decided to develop a new subdivision, which he called "Horton's Addition." As people moved in, they began calling the new area "New Town," and the existing area "Old Town."[6] Thus began the trend of developing land to attract more people — and needing more water to keep them there.

Even with their limited water supplies, some San Diego citizens started creating lush landscapes. In 1869, a homeowner dug a well in his yard, installed a windmill and created the first irrigated garden for a private home in the city. A fad had begun. Horton followed suit with a garden that the newspaper heralded as "the most imposing edifice in San Diego, [taking water from] a never-failing well of pure water on the premises [which is] carried all over the building by means of machinery."[7]



Alonzo E. Horton

San Diego skyline view looking southwest from 24th and MarketStreet, Sherman House at 22nd and Market Street, 1888

Alonzo E. Horton portrait

both from The San Diego Historical Society

In 1873, the city of San Diego sank a new well, but citizens were repulsed by its poor quality. Some used its water for bathing, but none used it for drinking. Townswoman Hattie Dougherty described the brackish water at the corner of Twelfth and K: "When you put soap in

MILESTONES IN THE EARLY AMERICAN DAYS

1848	End of the U.S.-Mexican War; California (including San Diego) became a U.S. military province.
1850	California became the 31st state.
1854	Irrigated agriculture developed in the San Pasqual Valley and elsewhere.
1862	First citrus crops planted in San Diego County.
1867	Horton's Addition founded at New Town.
1869	Irrigated landscaping for private homes began; Kimball Brothers Water Company formed to build Sweetwater Dam and Reservoir.
1870	Census figures showed the county population at 4,324 with 2,300 in the city of San Diego. San Diego Water Company supplied water to the city.

it and tried to mix it, it turned into a kind of chalk." She described the hubbub that ensued when her brother-in-law dug a well on J Street between 14th and 15th streets that actually yielded sweet water. "People came for blocks to carry water ... You could see them going in all directions in the morning, carrying a bucket of fresh water to drink."[8] Water was 25 cents a bucket — a private in the U.S. Army earned only $13 a month.[9]

Two women viewing Sweetwater Dam, 1895
The San Diego Historical Society

In spite of the dubious water quality, the city's early water supply relied on wells. The city looked forward to the day when it could impound water from the San Diego River, which still offered the best quality. In anticipation, the townspeople began to protest against settlements along the river because they interfered with this potential permanent supply of good water. The town trustees listened and they "resolved that all permanent water within the limit of the City be reserved for public use in general."[10]

In the early 1870s, the first private water company was formed in the city of San Diego: the San Diego Water Company. Under contract to the city, it dug 12 wells in the San Diego River, pumped the water to a 75,000-gallon open reservoir in University Heights and piped it downhill to individual homes. Soon after, another well was sunk in Pound Canyon near 11th Avenue and A Street and pumped to two reservoirs.[11]

These wells and reservoirs seemed to provide an inexhaustible supply of water for any city that might be built.[12] "There is sufficient water to meet the demands of the population when San Diego has grown to be a large city," the Chamber of Commerce pronounced. "The San Diego Water Company has solved the problem satisfactorily. The wells are now completed and they are prepared to supply good artesian water in unlimited supply."[13] The city's population had just passed the 2,000 mark.

THE BACKCOUNTRY CREATES ITS WATER SUPPLY

Meanwhile, another 2,000 people lived in the backcountry, where cattle ranching remained the

main economic activity through the 1870s. All too often, however, the cattle succumbed to drought. Many ranchers started raising sheep instead, but the sheep died, too. The ranchers' need for water was acute.

As early as 1853, some farmers throughout the region started making the transition from dry land farming and ranching to irrigated agriculture — and lucrative citrus crops. In 1862, 25,000 orange trees were imported from Mexico. In 1873, Brazilian naval orange trees arrived. With the prospect of large profits from citrus crops, farmers scrambled to develop local water supplies for irrigation. First, they used up their surface supplies and then they drilled ever-deeper for groundwater.[14]

A pair of enterprising brothers stepped in to fill the increasing demand for water in the backcountry. They organized the Kimball Brothers Water Company in 1869, bought rights to the Sweetwater River and then built a reservoir with a 90-foot-high dam and distribution pipes. Their water supply spurred the development of National City and Chula Vista.[15]

To the north, similar enterprises were developing. For example, in 1853, an agricultural canal was built to divert water from the San Dieguito River system to the San Pasqual Valley near today's Escondido. The San Pasqual Water District built a second canal in 1887 to connect the valley to a potential dam site at Pamo Valley (which has never been built).[16] This developing water supply and delivery system would later spawn several dams and reservoirs that the city of San Diego would acquire in the 1920s.

CITY AND BACKCOUNTRY NEED MORE WATER

At the dawn of the 1880s, the county had a water supply company for the city and several for the backcountry. They served different constituencies: urban/domestic users and agricultural irrigators. As the county population grew with the coming of the railroad and the "boosterism" that followed, each constituency needed more water.

To meet those growing needs, water development began in earnest. It started a transition from depending on well water to impounding river water in the mountains. With this larger-scale development in the 1890s, urban and agricultural interests began to clash. The next few decades were characterized by dueling water companies and overblown promises for water delivery, as well as the usual extreme cycles of drought and flood.

Laying water pipe, 1911/1915
The San Diego Historical Society

Chapter 5: Creating Water Companies 1870s - 1920s

"There is probably no greater duty that can be undertaken by a man or men than in the creation of a pure and wholesome water supply for mankind."

Fred A. Heilbron,
Vice President of Southern California Mountain Water Company, 1910[1]

THE BOOM OF THE 1880s LEADS TO WATER WOES

When the railroads came to San Diego — first the Southern Pacific in 1877 and later the Santa Fe in 1885 — the county thought it had arrived. Now it could rival Los Angeles and San Francisco in power and prestige. Real estate boomed and people flooded into the county. In the period from 1870 to 1887, the population of the city of San Diego grew from 2,300 to 40,000. Then the bubble burst.

Farmers wanted to grow more of the highly profitable citrus crops, like they were doing in Orange County to the north. However, the water demands of citrus farming overwhelmed small water companies. William Jennings, the future attorney for the Water Authority, grew up on his family's farm near Lakeside. He wrote, "A good farm depended on having a good water supply and with … very few water distributors of any kind, everyone was dependent upon their own ability to develop water."[2] Being a farmer in San Diego County in those days also meant being a dam builder, and the unpredictability of the rainfall made such engineering nearly impossible. Jennings' father never built his dams high enough because he could never predict the ferocious flooding that sometimes occurred.

City folk, in the meantime, wanted green lawns and tree-lined streets. The San Diego Water Company was simply unprepared to meet the demand. With no planning tools in place for dealing with growth, the land boom went "bust" in the 1890s and the population plummeted from 40,000 in 1887 to a more manageable 16,000 in 1890. By that time, several new and larger water companies had been formed, paving the path for the county's modern water supplies.

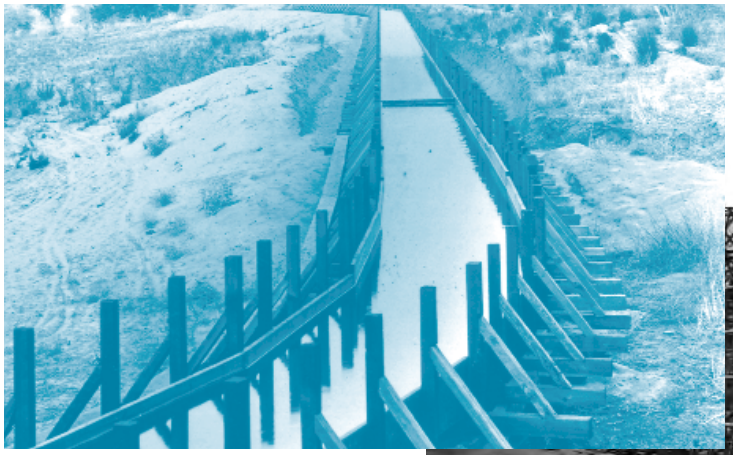
ENTREPRENEURIAL PLANNING AND INNOVATION

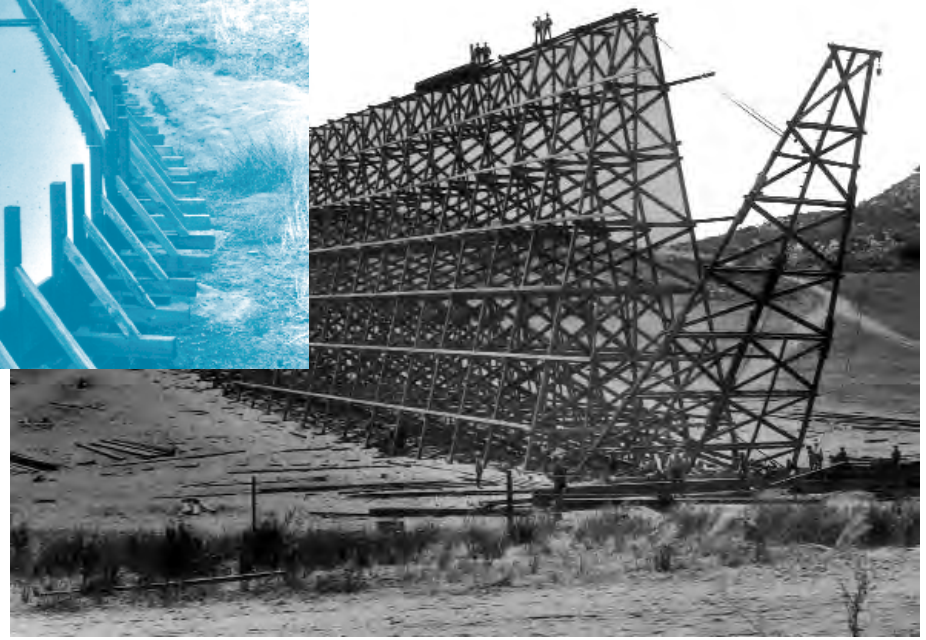
The first major water company was formed in 1886, inspired by Theodore Van Dyke. Van Dyke was, among other things, a writer and artist from Minnesota who loved to hike in the mountains. He came to the San Diego area for health reasons and realized the incredible impact a reliable water supply would have on the region. While hiking in the Cuyamaca Mountains, he envisioned a large lake that could feed water into the lowlands and the city

Fourth Avenue and Elm Street following the real estate collapse, 1887
The San Diego Historical Society

of San Diego. He organized a group of investors to form the San Diego Flume Company and build the Cuyamaca Dam on Boulder Creek in the headwaters of the San Diego River. At first, the company faced ridicule because the system seemed utterly excessive. Yet time was on its side. It was not long before even this impressive water project could not meet the demand for water.

The most famous feature of this water project was a remarkable wooden flume, a unique and wondrous engineering achievement of its time, consisting of many trestles over ravines hundreds of feet long, as well as tunnels and siphons. Water was released from Cuyamaca Dam, where it ran 18 miles down Boulder Creek to a diverting dam at its confluence with Boulder Creek and the San Diego River, upstream of today's El Capitan Reservoir. At the diverting dam, the water entered the flume, which was 6 feet wide and 16 inches high. It ran approximately 33 miles down the south side of the river to El Cajon Valley and into the city of La Mesa, where the water flowed into the La Mesa Ditch and then through pipes to the City Heights area of San Diego. The exact length changed over the years with route alterations. Later repairs also added some height to the flume so it could carry up to 18 inches of water. Eucalyptus Reservoir and a small diverting dam in Grossmont were added in 1892 to provide storage at the end of the flume line.





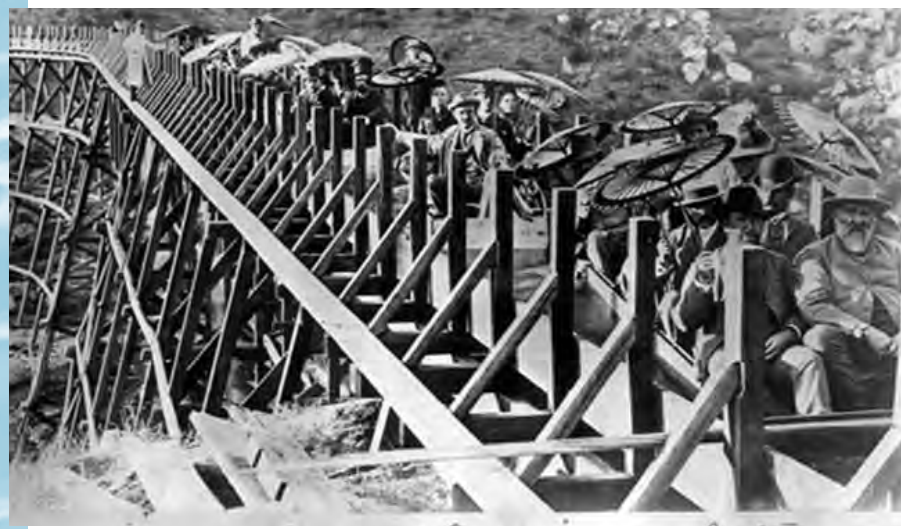
Later, the La Mesa Ditch carried water from the storage area in Eucalyptus Reservoir to a larger storage reservoir formed by the La Mesa Dam (now covered by Lake Murray) and then into the city's water main system.[3]

Left: Flume at east side of Chocolate Creek, 1887-1888
Right: Construction of Los Coches "Sweetwater" Trestle
The San Diego Historical Society

MILESTONES AS SAN DIEGO GROWS

1870	County population reached 4,234, with 2,300 in city of San Diego.
1873	San Diego Water Company formed.
1877	Southern Pacific Railroad extension connected to San Diego.
1880	County population reached 8,618, with 2,637 in city of San Diego.
1885	Santa Fe Railroad extension completed.
1886	Van Dyke organized the San Diego Flume Company.
1886	City of San Diego population hit 40,000 during a real estate boom.
1890	City of San Diego population dropped to 16,159 after a real estate bust.
1894	Spreckels formed the Southern California Mountain Water Company.
1900	County population rose to 35,090, with 17,770 in the city of San Diego
1901	City of San Diego formed the Consolidated Water Company.
1910	Fletcher bought the Flume Company to form the Cuyamaca Water Company.
1915	City of San Diego population: 56,000.
1916	"Hatfield Flood" caused death and destruction throughout the county.
1920	All water in the county still developed locally. City of San Diego population numbered 74,683.
1923	Every major drainage area in the county (except Santa Margarita) had at least one reservoir.
1924	El Capitan Dam approved. (Not built until 1935.)

San Diego Flume Company, opening day, 1888
The San Diego Historical Society



Along the way, the flume supplied farmers served by local water districts. Ranchers built connecting pipes to their own storage reservoirs and a gauge box measured how much water they used.[4] The flume ran directly through the Jennings' farm. Jennings recalled:

> It was a rickety-appearing wooden structure. Because it was entirely a gravity flow, it was built on contours and it went up every canyon and back down the other side of the canyon except where we had a real long canyon reach. At those places, the builders had built a skeleton trestle that carried the flume across to the other side. The water was always deep enough in the flume and it was running at a rate so you could launch a small raft in it and run it downhill. All the kids in the county that lived along the flume spent a great deal of their idle time either riding in the flume or swimming in the water.[5]

While the children delighted in its recreational possibilities, the city of San Diego rejoiced in receiving "pure mountain water." The city staged a celebration the day the water arrived; nozzles on street corners sprayed fountains 125 feet high.[6]

The San Diego Flume Company sold water to the city until its president, Joseph W. Sefton, became locked in a feud with two prominent businessmen, John D. Spreckels and E. S. Babcock, who resolved to develop their own water supply for the city.[7] They united several small water companies to create the Southern California Mountain Water Company in 1894. Spreckels was a millionaire sugar magnate whose family dominated financial and political life in San Diego. Now he was building the largest irrigation project in the United States,

John D. Spreckels

starting with Lower Otay Dam and Reservoir in 1897. Over the next decade, the Southern California Mountain Water Company began building the Morena and Barrett Dams on Cottonwood Creek, a tributary of the Tijuana River. It also began building the Dulzura Conduit, a flume connecting the Barrett and Cottonwood water supplies to Lower Otay Reservoir, which was in turn connected by the Otay Pipeline and the Bonita Pipeline to the city's water distribution system.

ENTHUSIASM AND EXAGGERATION

Today, dam construction evokes mixed feelings in many people because of the environmental impact of such massive projects. A century ago, however, large dams were a sign of progress and prowess, and people celebrated them as "titanic miracles of engineering."[8] With its Southern California Mountain Water Company and San Diego Flume Company, San Diego County was the nation's dam-building hub — and proud of it. By 1923, every major drainage system in the county, except the Santa Margarita in the north, included at least one reservoir.[9]

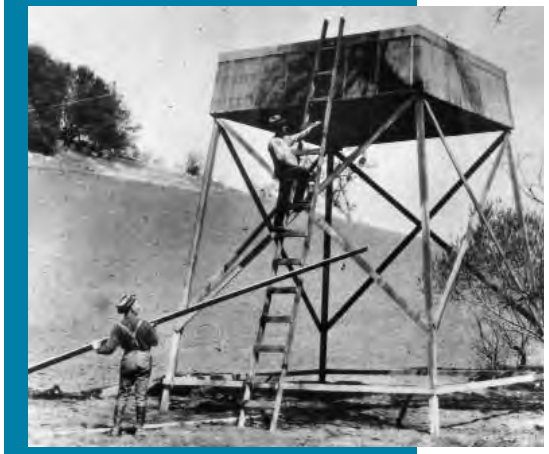
Spreckels owned The San Diego Union and he used the newspaper to promote his Mountain Water Company's projects and to deride those of his competitor, the San Diego Flume Company. His water company also published the book The Story of Water in San Diego in 1909, which contained breathless descriptions of the "stupendous" water works as a "miracle beneficent." The book gushed over the Morena Dam: "Here, in this awful rift the dam is building — as if the pygmy, Man, defied the Titan, Nature." It claimed Morena would hold enough water for seven years without a drop of rain, while New York City only had storage for six months. "What this means to the future of San Diego it would be impossible to overestimate … No other city 50 times her size has anything comparable with this great water system, not half a dozen cities on earth have anything better."[10]

Crossing the San Diego River at the foot of Eagle Peak Grade, 1907
Ed Fletcher, driver;
George Marston, front seat;
John Nolen, back seat

John D. Spreckels portrait

both fromThe San Diego Historical Society

HATFIELD THE RAINMAKER AND THE 1916 FLOOD



Rainmaking tower of Charles Hatfield, 1916
The San Diego Historical Society

The county has never recorded a wetter two-week period before or since.

Rainmakers were held in great esteem by the Kumeyaay in the days before the Spaniards. At the beginning of the 1900s, they still were called upon in desperate times. In spite of all the magnificent new dams in the county, the county was held hostage by a 10-year drought. Along came Charles M. Hatfield, the rainmaker. He mixed two dozen secret chemicals (in a formula he took to his grave), aged it, poured it into pans and placed it on top of towers. There, the formula evaporated and brought rain — according to Hatfield. The odors from this concoction were said to resemble limburger cheese. Skeptics said the stink was so bad that it rained in self-defense. In December of 1915, the city of San Diego hired Hatfield for $10,000 on a "no rain, no pay" basis with the promise that he would fill Morena Reservoir. He placed his potion in the mountains around the reservoir. From January 15 to 20, 1916, it rained throughout the county, with more than 17 inches falling in the mountains. The San Diego River rose six feet and covered Mission Valley under a mile-wide raging flood from cliff to cliff. The Tijuana River washed away a colony at Little Landers, just north of the Mexican border. Roads and bridges were wiped out throughout the county.

People wanted Hatfield to stop making rain, but the City Council refused to pay him because Morena was not full. The *San Diego Union* wrote that the value of the water in the reservoirs offset hundred-fold the damage to property. "[T]he runoff into reservoirs will also continue giving the city and the county a wealth of water for future use and bringing with it the happiness and prosperity that is only possible through such a bountiful water supply."[11] Hatfield vowed to earn his pay and fill the reservoir, so he continued his rainmaking activity.

From January 25 to the 30, it rained another 14 inches in the mountains. The flooding damaged the Sweetwater Dam by breaking new abutments to the original dam, and utterly swept away Lower Otay Dam, demolishing everything below. Bridges, railroads and highways were gone and 14 people died. The Fallbrook railway station and station master's house were carried away down the Santa Margarita River. In the San Luis Rey Valley, a historic adobe bell tower fell off the Pala Mission church. The *San Diego Union* lamented that the telephone line was washed out before Hatfield could be ordered to turn off his rainmaking plant.

Hatfield never collected his fee, because he refused to sign a contract assuming responsibility for the damage. Historian Thomas Patterson wrote, "Scars permanently changed the contour of the hills … Springs previously unknown to the backcountry flowed for years afterwards."[12] The county has never recorded a wetter two-week period before or since. Perhaps Hatfield really did make it rain, or perhaps this was just a great coincidence. Because his secret formula was buried with him, no one will ever know for sure.[13]

Morena Dam also attracted the attention of the national magazine *Harper's Weekly*. In the issue of January 8, 1898, H. H. Gardiner raved that it was a new wonder of the world and would "not only furnish water to the city of San Diego, but would also 'reclaim' over 100,000 acres of farm or ranch land that are now absolutely worthless."

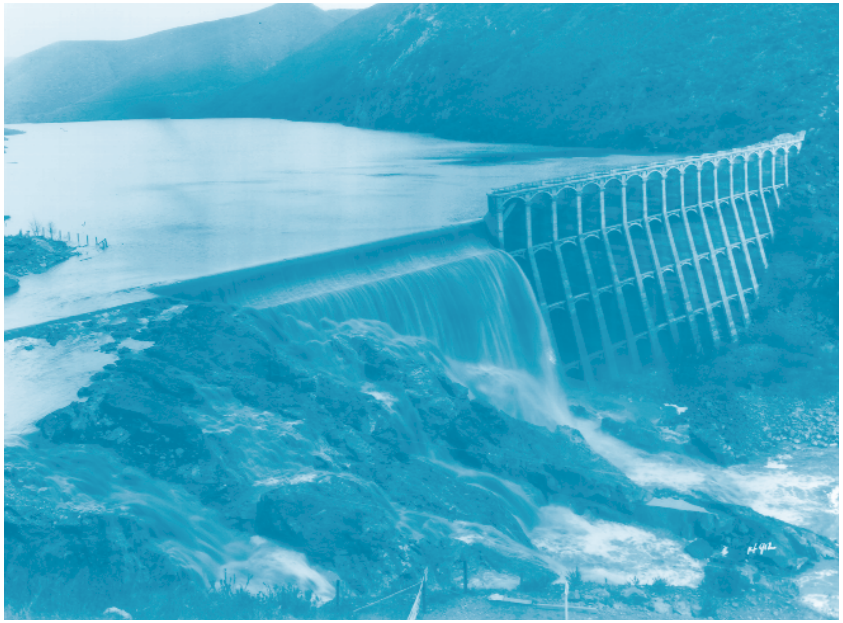
This claim was in fact exaggeration. The water from Morena Reservoir would irrigate only 6,000 acres, not 100,000, when completed. Furthermore, it held only 5 billion of its 15 billion-gallon capacity until the devastating "Hatfield flood" of 1916.[14]

URBAN & AGRICULTURAL WATER USES

During this time, the city of San Diego was organizing municipal ownership of its water supply. In 1901, it formed the Consolidated Water Company. The new company bought the entire delivery system of the San Diego Water Company and that portion of the Southern California Mountain Water Company's delivery system that was within the city. The financial burden of those investments prevented the company from buying any new water supply assets for more than 10 years. In the meantime, the city bought water from the Flume Company, but when a prolonged drought hit the county, the Flume Company could not deliver the promised water. It lost both credibility and good will, and the city began buying water wholesale from the Mountain Water Company.

Just before World War I, the city bought the Cottonwood and Otay systems from the Southern California Mountain Water Company (Upper and Lower Otay, Morena, Chollas and the then-incomplete Barrett Dam and Dulzura Conduit). It was not until 1909, though, that the city could sell bonds to raise enough cash to complete the Barrett Dam and Dulzura Conduit and to undertake the ambitious El Capitan Dam.[15]

Damaged bridge at Old Town after the 1916 flood
The San Diego Historical Society



Lake Hodges Dam with spillway, 1927
The San Diego Historical Society

Meanwhile, in 1910, two businessmen, Edward Fletcher and James Murray, bought the San Diego Flume Company and formed the Cuyamaca Water Company. Fletcher came to San Diego from Massachusetts to seek his fortune and he eventually became known as the "water seeker" for leading the push to develop water systems in the north of the county. He said, "Water is king and the basis of all value in the county is water."[16]

At this time, a water-related urban-rural shift began to take place. Fletcher believed that irrigated agriculture should hold firm against the ever-more demanding claims of cities. Under his leadership, the Cuyamaca Water Company, which began as a supplier to the city, was now supplying the agricultural backcountry. On the other hand, Spreckels' Southern California Mountain Water Company, which began as a collection of small irrigation companies, was mainly focused on providing water to the city of San Diego. Fletcher and Spreckels became rivals, with the city caught in the middle.

WATER IN THE NORTH

The main dam in the northern part of the county, Escondido Dam on Escondido Creek, dated back to 1895. (It was later rebuilt and renamed Wohlford.) Fletcher controlled a dam site at the future Lake Hodges and he helped convince the Santa Fe Railroad to finance the construction of Hodges Dam in 1918, as well as a distribution line to the coast. The railroad owned land from Del Mar to Carlsbad that became more valuable as water became available for colonies.

The Lake Hodges system was owned by a new subsidiary of the railroad, the San Dieguito Mutual Water Company, which had Fletcher as president. This company organized the Santa Dieguito and Santa Fe irrigation districts and sold water to them under contract. The city of San Diego was soon interested in buying some of the Lake Hodges water, but the Santa Fe Railroad did not want its subsidiary selling water to a city. Instead, Fletcher acted as a middleman for the water sales to the city.

By 1926, the city needed more water, and it wanted to buy the San Dieguito water system. Spreckels wrote in his newspaper that buying this system would solve San Diego's water supply problems. Fletcher opposed that plan, however. He urged the people of the Irrigation Districts to "free" themselves of "city domination and act for themselves." Eventually, an entirely different company, the San Diego County Water Company, bought the system.[17]

The San Diego County Water Company was formed to develop Lake Henshaw in the San Luis Rey watershed — with Fletcher as a director. Built in 1922, Lake Henshaw supplied water to Escondido Mutual Water Company and Vista Irrigation District, with little left over for the city of San Diego. The Lake Henshaw system was acquired by the Vista Irrigation District in 1946.[18]

The city of San Diego still needed more water and was claiming water rights to the San Diego River. The city filed for a dam site on the river. Fletcher proposed a dam site he owned at Mission Gorge. This time, Spreckels used his newspaper to turn public opinion against Fletcher's proposal and lobbied instead for a dam farther north at El Capitan, a site that Fletcher's Cuyamaca Water Company also owned.

MAJOR WATER PROVIDERS IN SAN DIEGO COUNTY

1869 Kimball Brothers Water Company Supplied by the Sweetwater Reservoir on the Sweetwater River. Sold water to irrigators.

1873 San Diego Water Company First water company in the city of San Diego. Sold water from the San Diego River to the city's urban and domestic use.

1886 San Diego Flume Company Formed by Theodore Van Dyke and others to sell water impounded in the Cuyamaca Mountains to the city of San Diego. Bought by Edward Fletcher and James Murray in 1910 and renamed Cuyamaca Water Company.

1894 Southern California Mountain Water Company Formed by Adolph B. Spreckels and E. S. Babcock, uniting several small water companies into the largest irrigation system in U.S. at the time. Later promoted urban water use.

1901 Consolidated Water Company Formed by city of San Diego, as the first municipally owned water system. Bought water from San Diego Flume Company and Southern California Mountain Water Company.

1910 Cuyamaca Water Company Formed after Edward Fletcher and James Murray bought the San Diego Flume Company. Promoted the use of water for irrigation. Assets purchased by La Mesa, Lemon Grove and Spring Valley Irrigation District, which became an operating district in 1926. Renamed Helix Irrigation District when it annexed El Cajon Valley in 1956 under Harry Griffen's direction. Renamed Helix Water District in 1973, as the former agricultural area became totally urban.

1918 San Dieguito Mutual Water Company Built Hodges Dam and Reservoir.

1920 San Diego County Water Company Formed to build Lake Henshaw and Henshaw Dam.

1944 San Diego County Water Authority Formed as a public agency to develop, import and distribute water that originated outside of the county.

According to historian Carl Courtemanche, the battle over water acquisition was controlled by political machinations that completely confused the city's population. The power elite believed the common people could not be entrusted with decisions about water development, but they could be entrusted with paying for the projects.[19]

In 1924, after a long and confusing debate, the city chose Spreckels' project at El Capitan over Fletcher's at Mission Gorge. By then, the city of San Diego was involved in another long battle with the Cuyamaca Water Company over its pueblo rights to the San Diego River. Fletcher made several offers to sell the Cuyamaca Water Company to the city, but again and again Spreckels discouraged the purchase. In the end, Fletcher sold the company to the La Mesa, Lemon Grove and Spring Valley Irrigation District. The Irrigation District acquired ownership of 10,000 acre-feet of water per year in the El Capitan Reservoir, allowing it to abandon the expensive maintenance of the old flume line.[20] In a sense, all parties were winners.

The true losers in the Spreckels/Fletcher dispute were the Capitan Grande Indians, who had little power to affect the outcome. They had moved to the El Capitan area from earlier territories and were granted land under a trust patent enacted in 1891. Now they had to move again as their land once more became valuable to others. The land was flooded under the reservoir and they were relocated to areas without water rights.

UNIFYING THE COUNTY

Fletcher may have lost the battle for the Mission Gorge Dam, but he learned something important. A county with such limited local water resources needed to rise above warring water companies. He became a state senator and in 1943 he introduced a bill that had been proposed by Phil D. Swing to create the San Diego County Water Authority. Swing also co-authored the Boulder Canyon Project Act, which would eventually bring Colorado River water to San Diego County.

The County Water Authority Act enabled the county to acquire water outside its boundaries and distribute it throughout the county. The San Diego County Water Authority was formed in 1944 with nine member agencies. The Water Authority now has 23 member agencies.

MAJOR DAMS IN SAN DIEGO COUNTY (IN CHRONOLOGICAL ORDER OF CONSTRUCTION)

Dam	Completed	Capacity in acre-feet	Built by/Owned by
Sweetwater	1886	30,079	Kimball Brothers Water Company/Sweetwater Authority
Cuyamaca	1886	8,195	San Diego Flume Company/Helix Water District
Lower Otay	1897 1918+	49,510	Southern California Mountain Water Company/City of San Diego
Morena	1912	50,206	Southern California Mountain Water Company/City of San Diego
Escondido (Lake Wohlford)	1895 1924+	6,506	Escondido Mutual Water Company/City of Escondidio
San Dieguito	1918	883	Santa Fe Irrigation District/San Dieguito Water District & Santa Fe Irrigation District
Murray	1918	4,818	La Mesa, Lemon Grove and Spring Valley Irrigation District/City of San Diego
Hodges	1918	30,321	San Dieguito Mutual Water Company/City of San Diego
Barrett	1922	37,947	Southern California Mountain Water Company/City of San Diego
Henshaw	1922	51,774	San Diego County Water Company/Vista Irrigation District
El Capitan	1934	112,807	City of San Diego
San Vicente	1943	89,312	City of San Diego
Loveland	1945	25,400	California Water and Telephone Company/Sweetwater Authority
Sutherland	1954	29,684	City of San Diego
Miramar	1960	7,184	City of San Diego
Chet Harritt (Lake Jennings)	1962	9,790	Helix Water District
Dixon	1970	2,606	City of Escondido
Poway	1971	3,330	City of Poway
Turner	1971	1,612	Valley Center Municipal Water District
Red Mountain	1985	1,335	Fallbrook Public Utility District
Ramona	1988	12,000	Ramona Municipal Water District
Olivenhain	2003	27,774	San Diego County Water Authority and Olivenhain Municipal Water District, a 1/6th partner.

+Rebuilt

San Vicente Reservoir, completed 1943

Chapter 6: Pueblo Water Rights

"To apportion water justly and fairly to each user and to prevent conflict."

Principle of traditional Spanish water law

MILESTONES IN WATER RIGHTS DECISIONS

1783	Plan of Pitic defined the basis for water rights in Spanish pueblos.
1784	Ranchos established with some rights to communal water.
1870	City of Los Angeles sued landowner of former rancho to prevent diversions from the Los Angeles River.
1870s	City of San Diego complained about diversions upstream on San Diego River.
1895	Los Angeles won state Supreme Court decision against Vernon Irrigation District over rights to the Los Angeles River.
1930	City of San Diego won State Supreme Court decision against the La Mesa, Lemon Grove and Spring Valley Irrigation District over rights to the San Diego River.
1935	El Capitan Dam and Reservoir completed.

The struggle over El Capitan Dam involved more than a conflict between the leaders of two rival water companies. It also involved a fundamental question:

Did the city of San Diego have to pay the Cuyamaca Water Company for the water the company had developed on the San Diego River, or did the city have "prior and paramount" rights to the water?

This question emerged from a tradition of pueblo water rights that stretched back to the Spanish settlement — and would have consequences for state Supreme Court decisions in the second half of the 20th century. Until this question was settled, the construction of El Capitan was stalled and the city saw its dreams of growth and economic expansion put on hold.

FLETCHER FILES CAPITAN PAPERS

Union Feb 5-32

Col. Ed Fletcher yesterday sent to city hall signued copies of an agreement transferring his holdings at El Capitan to the city for $40,000.

Approximately 252 acres are involved. Of this total 34 acres were included in an old option given La Mesa, Lemon Grove & Spring Valley irrigation district some time ago. The water agreement between the city and the district turned over all Capitan lands and options to the city.

Col. Fletcher said that the agreement deeds everything his family owns at El Capitan.

Excerpt from The San Diego Union-Tribune, February 5, 1932

At issue was the 1783 Plan of Pitic, which was a guideline to founding Spanish pueblos in California. It was based on the Spanish principle that the governing authority had to "apportion water justly and fairly to each user and to prevent conflict."[1] All residents should share a pueblo's water and no one had a superior right to this common good.

The Plan also distinguished between private rights (such as those of the ranchos that transformed into irrigation districts) and community rights (such as the pueblos that transformed into the cities). Privately owned rancho rights were usually "inferior" to those of a pueblo community which protected the "common good." Even for water that originated on its property, the pueblo's rights were not absolute. It could not maliciously deny water to others or withhold water from a town without an adequate supply. Likewise, some private rights were protected against community abuse. The test of fairness was "equity and justice," and new towns were admonished that "there shall not result in injury to any private individuals." These exceptions to the absolute rights of pueblos acknowledged the complexity of life-and-death water issues in an arid land.[2]

Pueblo water rights became little more than an interesting footnote for most of California water

development. However, they were pivotal in the development of California's two largest cities: Los Angeles and San Diego.

In 1870, Los Angeles claimed that a landowner on the former Rancho Los Feliz was encroaching on the city's ancient pueblo water rights that had been granted by the King of Spain in the Plan of Pitic.[3] The city argued that it inherited the status of pueblo in the Treaty of Guadalupe-Hidalgo and therefore could prevent a private landowner from using water from the Los Angeles River. The rancho had begun diverting water after the pueblo was founded, but no one had objected at the time. By 1870, however, Los Angeles wanted to safeguard its rights to the river for the future, so it sued the Vernon Irrigation District that was supplying the landowner. The city lost two cases because the courts upheld that the landowner's location by the river (riparian rights) and long-standing use of the water (appropriative rights) could not be denied. Los Angeles appealed to the state Supreme Court in 1895 and submitted statements about the Plan of Pitic. The irrigation district did not submit any materials supporting the exceptions to a pueblo's absolute rights, because it was confident the court would base its opinion on its undeniable riparian and appropriative rights. The irrigation district's assumption was wrong. The Supreme Court took the city's assertion of exclusive pueblo rights at face value and ruled in the city's favor.[4]

In the 1920s, the city of San Diego based a case against the Cuyamaca Water Company on the Los Angeles precedent. The city argued that because it also had pueblo status, it could prevent the La Mesa, Lemon Grove and Spring Valley Irrigation District's upstream diversions. The Supreme Court ruled for the city in 1930, thus allowing the El Capitan Dam to go forward.

The city's ability to increase its water supply came at a time when urban areas were starting to contribute more to the economic strength of the state — and urban populations continued to grow. Soon, the city would outgrow even the supply created by the El Capitan Dam. By that time, the city and county were jointly searching for new supplies outside the county's boundaries, and the new, imported water would benefit both urban and agricultural users.

People walking on top of dam at El Capitan dedication, February 1935
The San Diego Historical Society

Edward Fletcher

The San Diego Historical Society

THE 1930 SUPREME COURT DECISION

THE PRACTICAL AFTERMATH

In theory, the Cuyamaca Water Company's successor, the La Mesa, Lemon Grove and Spring Valley Irrigation District, lost its water following the 1930 state Supreme Court Decision. In practice, however, it only lost its right to the water; it still owned all the dams and facilities.

The city of San Diego gained the right to the water, but it could not afford to buy the facilities to receive it. The irrigation district needed water; the city needed a distribution system. Neither group liked the idea of annexing the water district to the city, and the irrigation district was not willing to sell because it needed water more than money. Thus, they worked out a compromise: the city let the irrigation district have some water and the irrigation district let the city use its distribution system.[5]

THE LEGAL AFTERMATH

The question of pueblo water rights had another day in court. In 1955, Los Angeles sued communities in the San Fernando Valley to assert its prior and paramount water rights. After 13 years of examining historical documents and questioning experts, the court ruled against Los Angeles and refuted a pueblo's successor's absolute right to water at the expense of other users. It reduced Los Angeles' share of water in the San Fernando Valley by one-third. The decision read, "The so-called 'pueblo water right' had no support in Spanish or Mexican law and … its statement in some of the [earlier] cases was based solely upon erroneous translation, incomplete and inaccurate citations and unsupported conclusions drawn therefrom."[6]

That seemed a definitive blow to the city of Los Angeles' assertion of paramount pueblo rights, but it was not. Los Angeles appealed to the state Supreme Court, which overturned the lower court ruling in 1975. Although it acknowledged that pueblo rights remained inconclusive, it upheld the notion of letting prior decisions stand, especially older ones that would have far-reaching effects if overturned.[7]

Part II: Moving Beyond the County for Water

Introduction — Over the Next Hill

"Well, that's all the water we're going to need."

A typical comment of San Diego water development[1]

"When it's used up, there is more of the same over the next hill."

Another refrain[2]

Even during the struggle over who could develop the San Diego River in the 1920s, people were beginning to look beyond the water resources of San Diego County. The typical optimists in San Diego always believed that just one last water project would solve their needs, only to realize that they needed double the capacity. Nevertheless, a few realists were looking the situation in the face. There are only so many times you can double capacity in a county as dry as San Diego. Eventually, they thought, the county might have to follow the model of Los Angeles, which had started importing water.

Gradually, the San Diego region would look "over the next hill" to the Colorado River and then to the rivers in Northern California. From the 1950s on, the county became increasingly dependent on imported water, until up to 95 percent of its delivered water originated outside the county.

The fear of droughts and water shortages turned the county inward to discover new sources of water that were either local or available through clever water conservation practices. This improved use of local water increased the county's self-reliance for the near term. Future population growth with increased water demands, however, will continue to add stress to the system. Likewise, the threat of earthquakes that could disrupt water deliveries is also being addressed.

Part Two looks at how the county has struggled to acquire and maintain a reliable water supply.

Chapter 7: Colorado River Water 1920s and on

"Nobody owns water, nobody wants to steal anybody's water — just stop it from wasting and going to the ocean. God has given us resources, and it's up to us to develop them."

Hans Doe,
President of Vista Irrigation District[1]

FROM LOCAL ISSUES TO REGIONAL PROJECT

The seeds of the idea to import water from the Colorado River were planted long ago. In 1856, Thomas H. Blythe, a developer from San Francisco, diverted water from the river to the Palo Verde Valley and then filed a claim to irrigate 40,000 acres. In 1900, the California Development Company built the Alamo Canal to divert Colorado River water through Mexico to the Imperial Valley. (At that time, San Diego County stretched east to the Colorado River, but it became separated from that water source when Imperial County was established in 1907.) The parched Imperial Valley had previously been called the Valley of the Dead, but water would change that image. Within four years, 700 miles of canals were irrigating 75,000 acres of the Imperial Valley for 8,000 settlers. While the Imperial Valley now had water, it had no flood control. Flood waters devastated the area when a temporary diversion levy broke its channel in 1905. Over the next two years, water from the Colorado River filled the ancient Salton Sink, creating the Salton Sea.[2]

Hans Doe

Residents organized the Imperial Irrigation District and began a campaign for the All-American Canal, which was soon attached to a larger initiative: the Boulder Canyon Project. The U.S. Congress saw the concerns of the lower Colorado River as part of a problem that covered the entire seven-state region of the Colorado River Basin (Colorado, Wyoming, New Mexico, Arizona, Utah, Nevada, and California), and that required permanent federal oversight. This expansion from local to national concern began with the Swing-Johnson Bill of 1922, which addressed issues of river regulation, flood control, water storage for irrigation and power generation.[3]

COLORADO RIVER COMPACT

In 1922, representatives of the seven basin states signed the central piece of the Boulder Canyon Project, the Colorado River Compact, and sent it to the states for ratification. California ratified the compact in 1925 because it wanted the Boulder Canyon Dam and the All-American Canal for flood control, storage and reliability, which were benefits it could not achieve on its own.

Colorado River Aqueduct

The other states would ratify the compact only if California agreed to abandon its claim to an extra-large share of the water from the Colorado River. California reasoned that it had already been using the river's water in the Imperial Valley, while the other states had barely tapped it. The other states argued that they had greater riparian rights than California, which contributed virtually nothing to the river's flow. In 1929, California compromised. It signed the California Limitation Act, accepting 4.4 million acre-feet of the water, with not more than half of any surplus water after the other states received their allotments. Arizona still refused to ratify, so the deal became known as the Six State Compact. (Arizona eventually signed the compact in 1944.)

After California accepted the California Limitation Act, water agencies from the state agreed on a plan in 1931 to divide water among themselves in a negotiation called The Seven Party Agreement. The irrigation districts to the east received first priority to the water of the Colorado River because they had already been using it. According to one tenet of Western water law, it was "first come, first served" for established users, as long as they were using the water "beneficially."

The newly formed Metropolitan Water District of Southern California (MWD), which represented the interests of Los Angeles and the surrounding region, was fourth and fifth on the priority list for Colorado River water. It was created in 1928 by an act of the State Legislature to wholesale imported water to its member agencies.

Imperial Valley irrigation canal

THE SEVEN PARTY AGREEMENT: Priorities and Allotments within California

The Boulder Canyon Project Act limited California's use of the water from the Colorado River to 4.4 million acre-feet per year plus one-half of the annual surplus left after the other parties had received their full allotments. However, this surplus can only be declared by the Secretary of the Interior. Furthermore, it did not provide for the allocation of this water within California. That agreement came about three years later, in 1931, when California's cities and agricultural interests entered into the Seven Party Agreement.

The agreement created a system of "priorities." The first three priorities went to agricultural interests — the Palo Verde Irrigation District, the Yuma Project, and the Imperial Irrigation District/Coachella Valley Water District. Their combined total use was limited to 3.85 million acre-feet per year. The fourth priority went to the Metropolitan Water District of Southern California for the use of 550,000 acre-feet per year.

These first four priorities were by far the most important because the Boulder Canyon Project Act (as intended by Congress and interpreted by the Supreme Court) guaranteed California only 4.4 million acre-feet per year. The remaining priority rights would come from surplus water.

The city of San Diego held a fifth priority right, along with Metropolitan and the city of Los Angeles. Metropolitan and Los Angeles received a total of 550,000 acre-feet, and San Diego was entitled to 112,000. In 1946, when the San Diego County Water Authority annexed into Metropolitan, the city of San Diego assigned its water rights to Metropolitan as a condition of annexation. Today. Metropolitan holds rights to 1.2 million acre-feet of Colorado River water, 550,000 as a fourth priority allotment, and 662,000 acre-feet as a fifth priority allotment (only if a surplus is declared).

Imperial Valley produce farm.

SAN DIEGO'S PIECE OF THE PIE

In 1926, as the Colorado River Compact looked like it would become a reality — five years before the Seven Party Agreement — the city of San Diego decided to stake its official claim for some of the river's water. Shelly J. Higgins, the city attorney, recounted this process:

> We were going to stake San Diego's claim, and file on the river just the way an individual — say, a miner — would do … I remember asking the councilmen how much water we should claim, and Councilman Fred Heilbron said not less than 112,000 acre-feet.
>
> … With what amounted to secrecy, … my deputy and I went by auto over the then-unpaved mountain and desert highway and onto the plank road through the sand dunes to Yuma. This was in midsummer, mind you. Early one morning — the sun was working itself into a white-hot rage at us creatures daring to venture across the desert — we went for a distance up river and piled rocks into a cairn and in the middle we placed our legal notices of filing for water and power, stuffed into a tin can.[4]

The 112,000 acre-foot claim-in-a-can became official in a 1933 contract with the U.S. Department of Interior. But there were conditions. First, the 1933 contract provided that San Diego's water was allocated to the "City of San Diego and/or the County of San Diego" and that the water "shall be used within the County as the City and the County may agree …" In other words, the County now had a voice in allocation of San Diego's Colorado River water. Second, San Diego shared a fifth priority for California's share of Colorado River water with Metropolitan, and it would receive the water if there was surplus water after the six upstream states received their allotments. Furthermore, San Diego was the most remote of the parties, as it lies physically (as well as figuratively) at the end of the pipeline.

Indeed, San Diego had no means for receiving the Colorado River water. Metropolitan was building the Colorado River Aqueduct to take delivery of its water. San Diego wanted to build an extension from the All-American Canal to take delivery of its share. The city of San Diego signed another contract with the Interior Department in 1933 to build a diversion from the All-American Canal, partly for economic reasons and partly to remain independent of Metropolitan.

With the City and the County both having rights under the federal water delivery contract and both wanting access to imported water, distribution of that water would eventually require a change in structure: the creation of a county water authority to import water to the region.

THE WAR YEARS: THE NAVY INFLUENCES WATER SUPPLIES

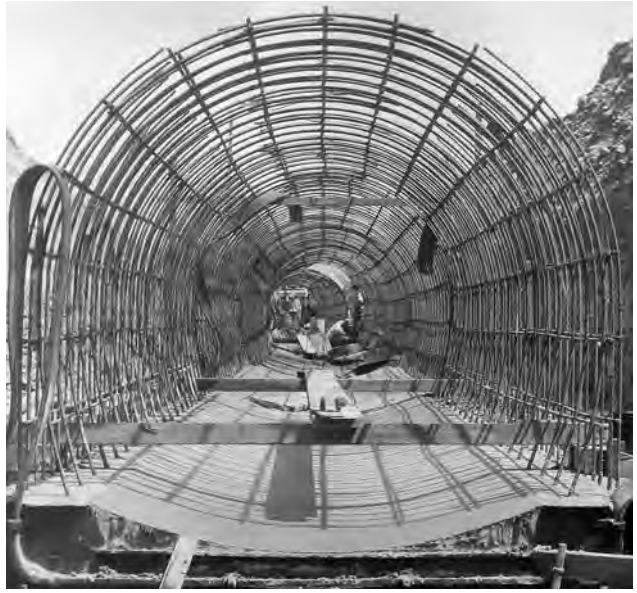
The need for a county water authority to distribute imported water still seemed far off in 1940. With a population of 290,000 and the new El Capitan Reservoir, the city thought it had enough water. In addition, there was still no aqueduct for receiving the imported water. That sense of contentment changed when the Japanese bombed Pearl Harbor and the United States entered World War II.

San Diego became a hub of Naval activity, with military and construction workers flocking to the area. The city's population nearly doubled in two years, to 500,000. Water use also doubled, but luckily the rainy years before the war left the reservoirs brimming. Still, it was clear that the city — and the Navy — would soon need the water from the Colorado River. An aqueduct for bringing water to San Diego became a top priority.

The Navy was willing to help build an aqueduct and let the city pay it back later. The Navy thought the fastest way to get Colorado River water to San Diego was to build a pipeline from Metropolitan's Colorado River Aqueduct, which had already started delivering water to Los Angeles. San Diego saw its hope for a diversion from the All-American Canal in jeopardy, and the city worried that the Navy's plan called for an aqueduct that was only half the capacity the city would eventually need. The city reasoned that adding just another foot to the planned six-foot-diameter pipe would increase capacity by 50 percent but add only 4 percent to the cost.[5] The Navy, however, needed a fast solution to an immediate problem and was not in the business of promoting the city's long-term interests. President Roosevelt settled the issue in an executive order, directing the Navy to build a six-foot-diameter pipeline from Metropolitan's aqueduct — rather than one from the All-American Canal. San Diego would get neither the additional capacity nor independence from Metropolitan.

As these negotiations progressed, Ed Fletcher, now a state senator, introduced a bill in 1943 for the formation of the San Diego County

Reinforcing steel for the cut and cover section of the first San Diego Aqueduct, April 1947



Fred Heilbron

Water Authority to distribute the pending Colorado River water. The San Diego County Water Authority was formed with nine original members on June 9, 1944, just three days after D-Day.

San Diego stood on the brink of a water crisis that threatened the war effort. The new Water Authority, with Fred Heilbron at its helm, was poised to help — but the pipeline was not yet complete, and it still had no water to sell as the war came to an end in 1945. As William Jennings noted, the Water Authority was still a humble, homemade organization, with his own wife taking minutes of the meetings.

The new San Diego County Water Authority joined the Metropolitan Water District in 1946 so it could receive water deliveries when the pipeline from the Colorado River Aqueduct was complete.[6] Upon joining Metropolitan, San Diego's 112,000 acre-foot share of the Colorado River was added to Metropolitan's allotted share.

On November 26, 1947, the first Colorado River water finally flowed south from the Colorado River aqueduct's western end in Riverside County for 71 miles into the city of San Diego's San Vicente Reservoir near Lakeside via the San Vicente Aqueduct (later renamed Pipeline 1 of the First San Diego Aqueduct). It ran over some of the most rugged country ever crossed by a water line and could deliver about 65,000 acre-feet per year. "At a time when the whole area of San Diego County had less than three week's water supply remaining, it was just in time," recalled Jennings.[7] The reservoirs that stored local water were dry.

MORE PIPELINES

Most experts expected the population of San Diego to decrease after the war, but that was not the case. The people stayed and as some predicted, Pipeline 1 proved inadequate to meeting their needs. A drought in 1950 and 1951 increased concerns about water shortages in the county.

The Water Authority appealed to the Navy to help build a second pipeline for the aqueduct. The Navy was willing, but its hands were tied. It had not actually built the first pipeline; the Bureau of Reclamation had. The Bureau was more than willing to build a new pipeline, but it could not. It could only fund agricultural projects. An exception had been made for the

WATER AUTHORITY

At the beginning of the 20th century, counties had not been in the position to develop water. Water development had been accomplished by private individuals, cities or local districts. County or regional water authorities, such as had been created in San Diego and Los Angeles, were an aggregate of separate, independent agencies united under an act that gave them a voice in managing, operating and sharing water resources based on their assessed value.

Water authorities have the explicit job of providing water to their customers, but they do not have the power to control the growth that increases their customers' demand for water. Land-use decisions rest with the local governments.

first pipeline because of the wartime emergency. Since the country was no longer at war, the Bureau of Reclamation could not fund a project that would provide urban water use — unless Congress ordered the Navy to request them to do so. The Water Authority embarked upon the arduous task of creating a united front from a group of skeptical parties to appeal to Congress.

This effort to create consensus was spearheaded by Fred Heilbron, the first chairman of the Water Authority. He first had to convince the city of San Diego, which had enough water at the moment, to stand behind something that would benefit the county at large. Then, he went to work to garner Metropolitan's support: he and Jennings, the counsel to the Water Authority, learned about a breakfast meeting between the Secretary of the Navy and the president of Metropolitan's board of directors, Joseph Jensen. Though not invited, Heilbron and Jennings appeared anyway and took seats directly across from the Secretary. Jennings jumped into conversation with the Secretary, fervently explaining why San Diego needed the pipeline and needed Metropolitan to pay half the cost. The Secretary turned to Jensen and said, "I presume that Metropolitan recognizes this situation and is willing to go along with it," and then left before Jensen could object. After that victory, Heilbron enlisted three people to lobby Congress: two United States senators from California, William Fife Knowland and Richard M. Nixon, as well as a young congressman from San Diego County, Clinton McKinnon.[8] The Water Committee of the San Diego Chamber of Commerce put together an impassioned book, For the Want of a Nail, to further plead the cause.

The effort paid off. In 1954, the second pipeline of the San Vicente Aqueduct, which is parallel to and the same size as the first, began delivering water. Even this doubling of capacity was insufficient. The Water Authority now had 18 member agencies and four times the service area it had when it was formed.

In 1961, a third pipeline, called Pipeline 3, was built in a second aqueduct along a different course, this one much closer to the coast. Almost three-times larger than the first pipe, it delivered an additional 170,000 acre-feet per year. The Water Authority's service area had increased 30 percent in population from the 1950s. Now it served 95 percent of the county's residents.

"AQUEDUCTS" AND "PIPELINES"

In the parlance of San Diego water, the words "aqueduct" and "pipeline" can be confusing. "Aqueduct" is used to mean the land through which the pipelines run, rather than the pipes themselves. Thus, the First San Diego Aqueduct actually carries two separate and distinct pipes, Pipeline 1 and Pipeline 2. At the present time, Colorado River and Northern California water flows to San Diego through five pipelines in two different aqueducts.

9 ORIGINAL WATER AUTHORITY MEMBERS (1944)

City of Chula Vista
City of Coronado
City of Oceanside
City of San Diego
Fallbrook Public Utility
Lakeside Irrigation District
La Mesa, Lemon Grove & Spring Valley Irrig. Dist.
City of National City
Ramona Irrigation District

23 CURRENT WATER AUTHORITY MEMBERS (2005)

Carlsbad Municipal Water District
City of Del Mar
City of Escondido
City of Oceanside
City of Poway
City of San Diego
Fallbrook Public Utility District
Helix Water District
National City
Olivenhain Municipal Water District
Otay Water District
Padre Dam Municipal Water District
Pendleton Military Reservation
Rainbow Municipal Water District
Ramona Municipal Water District
Rincon del Diablo Municipal Water District
San Dieguito Water District
Santa Fe Irrigation District
South Bay Irrigation District
Vallecitos Water District
Valley Center Municipal Water District
Vista Irrigation District
Yuima Municipal Water District

By the early 1970s, the population of the Water Authority's service area exceeded 1,250,000. As William Jennings recalled, "That growth took place so rapidly, and was really unexpected … that in the efforts to keep up with the growth … everyone was just about half a jump behind the demands for water."[9] In 1973, a fourth pipeline, this one capable of carrying as much water as the first three pipes combined, was added to the Second San Diego Aqueduct. It was extended to the city of San Diego's Alvarado Treatment Plant near La Mesa in 1978. By 1980, the population had grown to 1.8 million, and the Water Authority now served 99 percent of the county's residents. A fifth pipeline, this one even bigger than the fourth, was added to the Second Aqueduct at a point north of San Marcos in 1982. It brought the Water Authority's total pipeline capacity to about 1 million acre-feet per year, roughly 15 times more than the capacity of the first pipeline alone, which had been built only 35 years earlier.[10]

REDUCING DEPENDENCE ON THE COLORADO RIVER

In spite of the long and meticulous negotiations for the Colorado River Compact, there were still disputes to be settled. The first involved differing interpretations by California and Arizona over what constitutes surplus water and the precise amount of Arizona's allotment. The Colorado River Compact had allotted 7.5 million acre-feet (MAF) to the lower basin states, with Arizona receiving 2.8 MAF, California receiving 4.4 MAF and Nevada receiving 300,000 acre-feet. Any amount of water over that was considered "surplus."

In 1964, the U.S. Supreme Court ruled that California and Arizona must share the surplus Colorado River water equally. However, California could continue using more than its share as long as Arizona did not need the surplus water. When Arizona completed its Central Arizona Project in 1985, it began to claim its share of the surplus water. Thus, California had to reduce its dependence on Arizona's share of the surplus water. That reduction would hit the Metropolitan Water District — and hence, the Water Authority — especially hard, because of its low priority to receive Colorado River water. Since the Water Authority was receiving about 20 percent of Metropolitan's deliveries, it anticipated reductions as well. Luckily, by the 1970s there was a new source for imported water: water from Northern California.

MILESTONES FOR THE DEVELOPMENT OF THE COLORADO RIVER

1856 First diversions created from the Colorado River to irrigate 40,000 acres in the Palo Verde Valley.

1900 Alamo Canal through Mexico to Imperial Valley completed.

1905-7 Floodwaters broke the channel into the Salton Sink, creating the Salton Sea.

1911 The Imperial Irrigation District initiated the campaign for the Boulder Canyon Dam Project.

1922 Colorado River Compact signed; Boulder Canyon Project Act introduced to Congress (Swing-Johnson Bill).

1923 Six basin states ratified Colorado River Compact. (Arizona did not ratify, so the agreement became known as the Six State Compact.)

1926 City of San Diego filed for rights to the Colorado River Water.

1928 Metropolitan Water District (MWD) formed.

1929 California agreed to a limitation of 4.4 million acre-feet, plus one-half of the surplus water.

1931 Seven Party Agreement in California agreed upon priorities for dividing Colorado River water within the state.

1933 City of San Diego signed contract with U.S. Department of Interior for storage and delivery of Colorado River water.

1936 Boulder Canyon Dam (Hoover Dam) completed.

1941 Metropolitan's member agencies first received water from the Colorado River Aqueduct.

1941 Naval activity boomed in San Diego as part of the buildup for World War II.

1942 All-American Canal delivered water to the Imperial Valley.

1943 Senator Fletcher introduced bill to create the San Diego County Water Authority.

1944 San Diego County Water Authority formed. Arizona signed the Colorado River Compact.

1946 Water Authority joined the Metropolitan Water District.

1947 San Diego Aqueduct completed; Colorado River water flowed into San Vicente Reservoir.

1954 Pipeline #2 of the First San Diego Aqueduct completed, running parallel to Pipeline #1.

1961 Pipeline #3 in the Second San Diego Aqueduct to a new storage reservoir at Miramar completed, increasing the Water Authority's water delivery capacity by 80 percent.

1973 Pipeline #4 in the Second San Diego Aqueduct completed.

1978 Water from Northern California arrived via the State Water Project.

1982 Pipeline #5 in the Second San Diego Aqueduct increased water delivery capacity to one million acre-feet per year.

1993 Pipeline #6 planned.

2000 Water Authority sales to member agencies totaled 589,062 acre-feet of water.

2003 Quantification Settlement Agreement is signed. Water Authority and Imperial Irrigation District implement water transfer agreement. Water Authority acquires additional water conserved from lining of the All-American and Coachella canals.

PREDICTIONS AND REALITY

In its First Annual Report in 1946, the Water Authority predicted the water needs for the urban population by the year 2000. The reality is quite different:

	Est. for 2000	**Actual 2000**
Service Area Population	725,000	2,845,000
Needed Water	91,000 acre-feet	695,000 acre-feet

The Water Authority did qualify its predictions back in 1946, saying: "It is quite possible that the population of San Diego County will exceed the 725,000 estimated for the year 2000. Such an increase would require the conversion of some land formerly used for agricultural purposes to urban use, since only such lands will have water available."[11]

Chapter 8: Water From the North 1950s and on

"We got along fairly well except we all became occasionally impassioned and a little bit emotionally aroused when we were thinking of the terrible things that the others were trying to do to us."

William Jennings, on the negotiations for the Feather River Project (State Water Project)[1]

The ink had not been placed on the Colorado River Compact when another large water project was percolating in California. This new project, which evolved into the Central Valley Project, foretold a profound change in the way water would be distributed in the state — and in San Diego County.

A SHIFT IN THINKING ABOUT WATER

During the 1920s, the state of California became increasingly concerned about the imbalance between the sources of water in the state and the areas of greatest demand for water. It first focused on the shortage of water in the agricultural Central Valley by planning the Central Valley Project to distribute water from the Sacramento River to the San Joaquin Valley. The Great Depression of the 1930s left the state without the means to fund the project, so the federal government, through the Bureau of Reclamation, built the project.

This project reflected a transition in the way the state thought about its role in managing water resources. When California became part of the United States, water was owned and controlled according to individual rights. Those individuals began to organize and pool their rights into mutual water companies, which were private corporations made up of landowners. This private ownership of water led to abuses of people who had no access to water, prompting William H. Jennings, the water lawyer, to write, "The public and the Legislature began to see water as essential to life, the same as air, and that one could, by mere happenstance, be in the position to prevent his neighbors from having a correlative right with him in this absolute necessity of life." As that thought relates, the state had started to adopt a position that would not allow one individual or company to deprive others of the water needed to survive.

Gradually, this concept was extended to cover public water agencies and irrigation districts. One agency should not take away water from another. Jennings explained, "You can't take the last drop of water and dry up an area without replacing it in some way or other." From there, the concept of making surpluses available "to areas of deficiency" was applied to regional and even national water rights.[2]

The environmentally sensitive San Francisco Bay/Sacramento-San Joaquin River Delta is the source of water for the State Water Project.

WHAT GOES AROUND…

Back in 1848, the U.S. gained control of San Diego County and replaced the Spanish concept of communal rights to water with the principle of individual, private ownership. Now, about a hundred years later, water agencies were revisiting the discarded Spanish concept as they began to deliver water to places that did not have it and had not been using it.

In San Diego County, the Water Authority had initially been formed as a way to distribute supplemental water to agencies with existing water supplies. Much of the county lacked local water resources, though, so the Water Authority now took on the role of creating a supply for new areas. One voice adamantly opposed such a commitment: Arthur Marston, a board member of the Water Authority and an important merchant of the day. He believed that future demands upon the supply would greatly exceed what the Water Authority could deliver, creating a dangerous situation for the county.[3]

Meanwhile, the members of the Metropolitan Water District were in the same frame of mind as the Water Authority. They passed the Laguna Declaration at a meeting in Laguna Beach in the early 1950s, establishing Metropolitan as a regional water importer responsible for providing water to the district it served. Originally, Metropolitan supplemented local supplies with Colorado River water, but it opened the door to the future by defining its mission: "When and as additional water resources are required to meet increasing needs … , the Metropolitan Water District of Southern California will be prepared to deliver such supplies."[4]

That short statement enabled the development of lands throughout the district regardless of the availability of adequate local water supplies.

William Jennings commented, "Now, this was a very pious declaration, but of course, it was another matter to implement it."[5] In saying that, he referred to some of the problems that would follow. Where would they find more water for more people? From the north, it was hoped.

California aqueducts

MILESTONES IN STATE WATER DEVELOPMENT

1930s	Central Valley Project proposed, but put on hold because of lack of funds during the Depression.
1937-	1940 Central Valley Project built by the U.S. Bureau of Reclamation.
1957	Feather River Project (State Water Project) proposed.
1960	State Water Project approved by voters (Governor Pat Brown).
1978	MWD delivered State Water Project water from Northern California to the San Diego region.
1982	Statewide referendum defeated Peripheral Canal portion of SWP.
1994	CalFed formed to resolve issue of transporting SWP water through the Delta.

THE STATE REDISTRIBUTES WATER

On a statewide level, the new commitment to redistribute water to places of need came to life in the State Water Project. It would capture water from the Feather River, funnel it south through the Sacramento/San Joaquin Bay-Delta, feed it into the California Aqueduct, pump it over the Tehachapi Mountains, and deliver it to reservoirs near the Antelope Valley north of Los Angeles.

The Harvey O. Banks Pumping Station marks the beginning of the 444-mile California Aqueduct.

The State Water Project proposal launched a bitter north-south controversy. Northern Californians asked, "Why should the Southern Californians be allowed to steal our water?" Southern Californians countered, "It's not their water; it's California's water and we're all Californians. Why should the precious water that we desperately need run wasted into the sea?" In 1957, Governor Goodwin Knight assembled a Water Lawyers Committee that was equally divided among Northern Californians and Southern Californians, Democrats and Republicans, and legislators and outsiders. Jennings, who was part of that group, stated, "In fact, it was so evenly divided that its sessions finally wound up in a rather well-edited and well-prepared statement that half of the group agreed to sign and the other half refused to sign. This was presented to the Legislature as the final report of the committee."[6]

Eventually, under the leadership of Governor Edmund G. "Pat" Brown, the State Water Project was built, and it started delivering water to Southern California. With that new resource, both the Water Authority and the Metropolitan Water District could make good on their commitments to provide water to new areas — for a while. One controversial component of the original plan, a "Peripheral Canal" around the environmentally sensitive Delta, was never built. As a result, the State Water Project has never delivered as much water as originally intended. The effort to find an alternative method to deliver the full contracted amount continues to this day. Concern over environmental and

ecological degradation in and around the Delta complicates the problems. During the 1990s, Governor Pete Wilson and President Bill Clinton initiated an unprecedented collaboration of state and federal agencies, as well as urban, agricultural and environmental groups, to develop a long-term solution that restores the Bay-Delta as both a reliable water supply and a healthy habitat for fish and wildlife. This collaborative body became known as the CalFed Bay-Delta Program. San Diego County hopes to benefit from that solution with a more reliable water supply and higher-quality drinking water.

RELIANCE ON AFAR

Since the State Water Project supplemented water supplies from the Colorado River, San Diego County now relies on imported water for from 75 to up to 90 percent of its total supply. This ratio represents a big shift from the 1920s when people thought that local water from the county's own watersheds could meet the needs of any city that might ever grow there.

The California Aqueduct

Chapter 9: Unexpected New Sources 1990s and on

"The [Red] Queen went so fast that it was all [Alice] could do to keep up with her: and still the Queen kept crying 'Faster! Faster!'... The most curious part of the thing was, that the trees and the other things round them never changed their places at all: however fast they went, they never seemed to pass anything."

Lewis Carroll
"The Garden of Live Flowers,"
Through the Looking Glass

RUNNING TO STAY IN PLACE

The faster the water projects brought water into San Diego County in the second half of the 20th century, the faster it was consumed. As the population grew, all of the new households — with their newly landscaped lawns — used water. The water agencies were like Alice in the Red Queen's chess game: the faster they ran, the faster the background moved with them. They could not get ahead in the water delivery game; they could only hope not to fall behind.

Water-efficient front-loading washing machines

To compound the problem, by the late 20th century, the practice of looking over the next hill for more water had become impractical. Options for tapping new water sources were bold but extreme: the Columbia River, the Canadian Great Lakes and Alaskan icebergs. The Water Authority saw that it could not expect a big new supply in the foreseeable future.

Worse, the available sources were being restricted. Imported water supplies were being reduced, while water quality problems, interstate legal battles, environmental protection, and intermittent droughts, all placed stresses on the county's water.

For decades, California relied on "surplus" water from the Colorado River. As the populations of other basin states grew, however, less and less of this "surplus" water became available. In late 2003, four water agencies and the state of California signed a historic document, the "Quantification Settlement Agreement," or "QSA," that created a plan for limiting the state's use of Colorado River water to its basic annual apportionment of 4.4 million acre-feet and for restoring the environmentally sensitive Salton Sea.[1]

With the QSA in hand, the Water Authority is continuing to diversify its water supply options and is finding new sources in its own backyard.

CONSERVATION

In the late 1980s, Southern California discovered that a gallon of water saved was as good as a gallon of water delivered — and it was environmentally beneficial and less

expensive, too. As opportunities to build new reservoirs grew scarce, people in San Diego County and elsewhere adopted a new ethic: water conservation. Water, they realized, is a precious natural resource that must be used wisely.

Low-flow showerheads create permanent "passive" water savings.

Water agencies offered vouchers to help pay for low-flow faucets and showerheads, ultra-low-flush toilets, water-efficient washing machines, watertight plumbing and the like. Water agencies asked their customers to reduce water use by 20 to 30 percent, and they complied.[2]

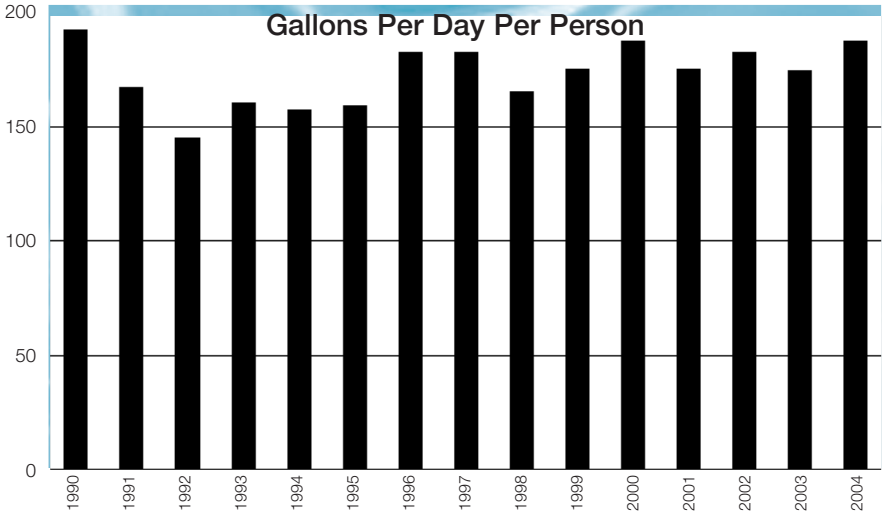
In the early 2000s, the region used the same amount of water as it had in 1990, even though the population had grown by 300,000 people.

The catch is that many conservation practices require people to change their habits, and people tend to conserve more actively during droughts. Fortunately, water-efficient appliances and plumbing retrofits create permanent, "passive" water savings. Changes in the plumbing code for all new installations have now made water conservation a requirement.

Though many homeowners still landscape with water-thirsty lawns and plants, a growing number have started using less water in their irrigation. However, not enough are fully embracing drought-tolerant landscaping, which uses water-frugal plants and specific gardening techniques to reduce water use. Water agencies are encouraging homeowners to understand that landscaping can account for a substantial portion of household water — and careful landscaping can yield substantial water savings.

Harry C. Griffen, long known as "Mr. Water" for his advocacy of the wise use of water resources, explained the economic importance of

Harry C. Griffen



Countywide municipal and industrial water use. Per capita usage varies among individual water agencies.

PROJECTED ANNUAL WATER SUPPLIES FROM CONSERVATION BY 2030	
Plumbing Retrofits	8,100 acre-feet
Efficiency Standards	32,323 acre-feet
Water Efficient Toilets	23,616 acre-feet
Commercial/Industrial/Institutional	10,272 acre-feet
Landscape	30,718 acre-feet
High-Efficiency Clothes Washers	1,672 acre-feet
Other Efficiency Improvements	1,693 acre-feet
TOTAL	**108,394 acre-feet**

These conservation figures represent water savings associated with regional conservation programs. Additional water savings from local conservation programs and ordinances are not included.

water conservation for the region when he said: "Imported water is expensive … It takes … five barrels of oil to deliver one acre-foot of water to Southern California. When we save water, we save energy."

GROUNDWATER

Groundwater supplies in San Diego County are limited by both the geology and semi-arid climate of the region. Many of the groundwater basins contain water that is too salty to use for drinking. Some basins are naturally salty, as the residents of the 1800s discovered. Others have become salty because of two factors: irrigation and over-pumping. Agricultural irrigation water from the Colorado River is quite salty, and the salts seep down into the aquifers where they become increasingly concentrated. Historically, over-pumping of coastal groundwater basins has allowed seawater to intrude, which has also raised the salt level of the groundwater. Fortunately, desalination can restore some of these groundwater basins. There are two such groundwater desalination facilities operating within the county, with more planned for the future.

Recycled water is used for lawn and landscape irrigation and other non-potable (non-drinking) uses.

Groundwater basins can also store water, serving as underground reservoirs. Water agencies recharge the basins with runoff or imported or recycled water, and then they recover the water when it is needed. With careful management, the county could safely withdraw 30,000 to 45,000 acre-feet from its groundwater basins by 2015.[3]

The use of groundwater, however, is not trouble-free. Most watersheds are served by several water agencies, and they contain numerous unregulated private wells. Water rights and water quality issues must be resolved before the resources can be fully developed.

WATER RECYCLING

Just as we can recycle plastics, glass and paper, we can recycle water. Water recycling

entails capturing wastewater, treating it to a high degree of purity and reusing it. With 10 cycles of reuse, one gallon of water becomes 10 gallons, increasing the available water supplies 10-fold, without tapping a new supply.

Recycled water is currently used for lawn and landscape irrigation and other non-potable (non-drinking) uses. By 2004, 23 recycling facilities were producing 13,000 acre-feet of non-potable water for reuse in the county. The Water Authority's member agencies plan to use almost 50,000 acre-feet of recycled water per year by the year 2020, mostly for irrigation.[4] Recycled water can be piped to new subdivisions, industrial parks and municipal buildings by a secondary water delivery system marked by distinctive purple pipes.

Expanding the water supply through recycling seems like a good idea. Like many good ideas, though, water recycling has a problem: salts. In water treatment, salt levels are referred to as salinity or Total Dissolved Solids (TDS). The Metropolitan Water District has set a salinity limit for delivered water of 500 parts per million (ppm). At 1,000 ppm, water is considered "brackish" and is no longer useful for irrigation and industry.

Water treatment for recycled water removes bacteria and other impurities, but the natural salts in the water remain and eventually become concentrated. Each cycle of water reuse adds 200 to 300 ppm of salt to the recycled water. If households use water softeners to reduce the hardness of their water, they may add another 60 to 100 ppm of salts to the water.[5] After several cycles, the water becomes too salty to use.

Olivenhain Recycled Project Southeast Quadrant

Unfortunately, much of the region's imported water comes from the Colorado River, which is already salty before it ever enters the aqueduct. The river dissolves salts and minerals as it travels across 1,000 miles of desert soils. Sometimes, the Colorado River water exceeds the 500 ppm salinity target; thus, recycling

DESALINATION METHODS

Distillation involves heating water until it evaporates, leaving the salts and other minerals behind. Collection of the evaporated water provides fresh water.

Membrane filtration techniques, such as reverse osmosis (RO), involve pushing saltwater under pressure through a membrane that allows water molecules to pass through, but not the larger molecules of salts and other minerals. In effect, it mechanically separates H_2O from the molecules that are dissolved or suspended in it.

Both processes use large amounts of energy. New, more cost-efficient and energy-efficient desalination technologies are being explored, such as low-pressure membranes that use half the energy of RO.

MILESTONES FOR CONSERVATION & WATER TRANSFERS

- 1986 Agricultural water conservation undertaken, reducing water consumption by 20 to 30%.
- 1987- 1992 Prolonged drought.
- 1995 Water Authority and Imperial Irrigation District agree to explore potential for agriculture-to-urban water transfer.
- 1996 Water Authority and Mexico agree to study a binational pipeline from the All-American Canal to San Diego to transfer water.
- 1998 Water Conservation and Transfer agreement signed between Imperial Irrigation District and Water Authority.

  Water Authority and Metropolitan sign Water Exchange Agreement to transport the IID water to San Diego.
- 1999 Principles for California's Colorado River Water Use Plan finalized.
- 2003 Historic Quantification Settlement Agreement approved by the U.S. Secretary of the Interior.

causes salt levels to increase even more quickly when Colorado River water is involved.

Currently the Water Authority is investigating various methods to manage recycled water salinity.

DESALINATION

Samuel Taylor Coleridge's words, "Water, water, everywhere, Nor any drop to drink" rang true for his ancient mariners on the salty seas, but today's desalination — or demineralization —technology might bring relief. With its nearly 70 miles of coastline, San Diego County has an inexhaustible supply of water lapping at its shores. Building desalination plants that remove the salts from seawater seems like a natural solution.

Desalting facility

While the technology of separating fresh water from saltwater is not new, the true potential for this operation in the San Diego region has not been economically feasible until recently. Seawater desalination has historically cost far more than other water sources.

However, new reverse osmosis membrane technology, combined with the advantages of locating a desalination facility next to a power plant and the availability of financial incentives, makes the cost of desalinated seawater competitive with other new water supply options. Furthermore, state and federal legislation supports seawater desalination as a means of promoting water resource diversity. These developments have prompted the Water Authority to engage in a serious examination of several options that could make seawater desalination a reality in San Diego County in the near future.

In 2003, the Water Authority, working with the cities of Carlsbad and Oceanside, began work on a feasibility study for a seawater desalination plant located adjacent to the Encina Power Plant in Carlsbad. If developed, the 50-million-gallon-per-day facility could supply enough high-quality potable water to serve more than 100,000 families as early as 2010.

The plant would produce 56,000 acre-feet of water annually, or 50 million gallons per day.[6]

The proposed site in Carlsbad is not the only place in San Diego County for a seawater desalination facility. The Water Authority is researching and evaluating other sites, such as San Onofre in northern San Diego County, the South Bay, and Baja California, Mexico.

Desalination technology is also used in the treatment of brackish groundwater and recycled water. Currently, the city of Oceanside operates the Mission Basin Desalting Facility that recovers and desalts about 2,200 acre-feet of water per year. Eventually this facility will produce 6,400 acre-feet of water per year — enough to meet 22 percent of the city's annual needs. A second-phase expansion will increase the facility to more than 10 million gallons per day to supply 22,400 households, which will serve one-third of Oceanside's projected population in 2015. In addition, Oceanside's desalination facility also treats recycled water from the San Luis Rey Wastewater Treatment Plant, increasing the amount of recycled water from less than one million gallons to five million gallons per day.

Throughout the county, similar projects linking groundwater development and desalination could add new, reliable supplies of local water for the San Diego region. Using desalinated groundwater and recycled water can reduce the region's growing demand for imported water. As an added benefit, these local supplies do not cross earthquake fault lines, so they provide a more dependable emergency supply.

AGRICULTURE: "GROWING" WATER THROUGH TRANSFERS

The new water supply created by conservation practices since 1985 has been plagued by some of the same issues that haunt California's entire water landscape: the supply is not where the people are. The largest supply of conserved water comes from agriculture, but the growing need is in urban areas. To that end, water officials have encouraged and often helped farmers convert to micro-irrigation and other progressive conservation measures. Statewide, agricultural efficiencies are saving hundreds of thousands of acre-feet per year of water. Some of that water can be "banked" in reservoirs and aquifers and then "transferred" to urban users.

Transfers of Colorado River water from agricultural agencies to urban agencies are key to the success of the Quantification Settlement

The largest supply of conserved water comes from agriculture.

SAN DIEGO COUNTY WATER FACTS (2004)

75 to 90 percent of the water used in San Diego County is imported via Metropolitan from the Colorado River and Northern California.

Imported Water Sources :

- 66% from Colorado River Aqueduct (242-mile aqueduct)
- 34% from State Water Project (444-mile California Aqueduct)

Local Water Sources:

3% surface	2% wells
2% recycled	5% conservation

*Differences in percentage total due to rounding

Water Use (Annual Average 2004):

55% residential	22% industrial/commercial
16% agricultural	7% other

The Quantification Settlement Agreement signing on October 16, 2003

Agreement, or QSA. This historic agreement was crafted by the San Diego County Water Authority, the Metropolitan Water District, the Imperial Irrigation District, the Coachella Valley Water District and the California Department of Water Resources. A transfer agreement made between the Water Authority and the Imperial Irrigation District is the linchpin of its success.

This Water Authority-IID agreement calls for the transfer of 200,000 acre-feet of conserved Colorado River water per year to San Diego County for up to 75 years (if both parties agree to extend the life of the term after the first 45 years).[7] The water will be transferred to the San Diego region by routing it through Metropolitan's Colorado River Aqueduct.

Accomplishing such a massive redistribution of water required years of planning and legal authorizations. Complicated issues had to be resolved, such as equitable funding mechanisms and questions about use. The planning began in 1995. Then in 1997, Governor Pete Wilson signed legislation encouraging the transfer. The transfer of water began in 2003.

In addition to the Water Authority-IID transfer agreement, the QSA also calls for lining the All-American and Coachella canals to prevent groundwater seepage. These projects will yield 77,700 acre-feet annually for a span of 110 years, which will provide another reliable water supply to San Diegans for generations.[8]

These water transfer agreements provide ripples of benefits across the west. San Diego gains needed diversification at a reasonable cost. The Imperial Valley receives an infusion of $50 million annually to help diversify its economy. Southern California will not need to seek replacement supplies from Northern California's strained resources. The entire state will be able to live within its 4.4 million acre-foot basic annual apportionment from the Colorado River.

A BINATIONAL COLORADO RIVER AQUEDUCT

With the economies of San Diego and Tijuana closely linked, the Water Authority is committed to finding binational water supply development opportunities that can provide reliability to both communities. Indeed, the Water Authority and the Mexican water agencies that serve Tijuana share a common mission: providing a reliable supply of water to their respective regions. These agencies have partnered on the

Regional Colorado River Conveyance Feasibility Study, the Regional Water Facilities Master Plan, and a South County/Tijuana Region Seawater Desalination Feasibility Study.

The Regional Colorado River Conveyance Feasibility Study evaluated the feasibility of constructing additional conveyance capacity to deliver Colorado River water to San Diego and Tijuana, including costs and permitting and the legal requirements of several potential aqueduct alignments. Working through the International Boundary and Water Commission, the water agencies completed the study in 2002, and it now serves as an excellent example of cooperative binational planning.

The Regional Water Facilities Master Planning effort led the Water Authority Board of Directors to decide that seawater desalination was the superior option and the most cost-effective and reliable means of meeting future demands. The South County/ Tijuana Region Seawater Desalination Feasibility Study, completed in March 2005, identified potential sites in Mexico and the United States for seawater desalination facilities.

In addition to these initiatives, an emergency connection currently exists between the water facilities in San Diego and Tijuana, which allows the United States to deliver Mexico's Colorado River Treaty water to Tijuana.[9]

BACK TO THE (LOCAL) FUTURE?

Together, locally controlled water supplies like conservation, recycling, seawater desalination, groundwater management and water transfers could greatly enhance the reliability of the county's water supplies. They also represent a shift in the county's efforts to supply water. Prior to 1947, the county relied solely on local resources. The Water Authority was created explicitly to distribute the imported water that the San Diego region would begin to depend upon. Today there is a shift back to developing local resources. The Water Authority recently established a goal to reduce the region's heavy reliance on imported water from Metropolitan to no more than 32 percent of the total supply by the year 2030. It is estimated that local supplies, which in 2001 accounted for only 16 percent of the total water mix, could account for as much as 42 percent of the region's water by 2030.[10]

Seawater desalination has become a viable local water resource for San Diego.

Chapter 10: Vulnerability and Emergencies 21st Century

"Until the providence of man shall have wrestled with the water problem, Southern California's permanent prosperity will remain problematical."

H.H. Gardiner, *Harper's Weekly*, 1898[1]

A CRAZY PLACE TO LIVE?

If you stand beside one of the massive water works in San Diego County, you are probably awed by its power and size. The Southern California Mountain Water Company's accolades over the Morena Dam in 1909 —"... as if the pygmy, Man, defied the Titan, Nature"[1] — makes sense. If you fly in a plane over that construction, however, you will be struck by how miniscule it looks in relation to the rest of the landscape. All of the rock, steel and concrete edifices built by humans seem frail when compared to the forces of nature.

The aqueducts from Northern California to the Metropolitan Water District travel over seismic faults, including the infamous San Andreas Fault. All of the major pipelines from Riverside County to San Diego County cross the Elsinore Fault zone. Earthquakes and other natural disasters could wreak havoc on the region's water supply infrastructure, possibly leaving some communities without water for an extended period of time.

San Diego County is particularly vulnerable to the failure of these pipelines. Because it lies at the end of the lines that carry water from the north and from the Colorado River, it will be affected by any disruption that happens upstream. In light of this situation, the Water Authority is building an emergency system south of the Elsinore Fault to provide a secure water supply in case of a disruption in water deliveries from the north.

Emergency Storage Project: The Olivenhain Dam, topped out at 318 feet tall, was completed in 2003.

EMERGENCY PLANNING

The Emergency Storage Project provides a network of new and enlarged reservoirs, pipelines and facilities. This interconnected system is designed to store and move water in the event imported supplies are interrupted by natural disaster or drought. The Water Authority embarked on the plan in 1989 and began construction in 1998, with an expected completion date of 2011. The project will provide 90,100 acre-feet of emergency storage. This additional water, combined with the capacity already reserved for emergency use, should be sufficient to meet the county's emergency needs through 2030.[2]

In addition, the Metropolitan Water District completed filling Diamond Valley Lake near Hemet in 2000, with half of the reservoir earmarked for emergency supplies. It is the largest man-made lake in Southern California, capable of holding 800,000 acre-feet, doubling Southern California's reservoir storage capacity. In addition to Metropolitan's reservoirs, San Diego County has 560,000 acre-feet in reservoir capacity, mostly in reservoirs owned by the city of San Diego.

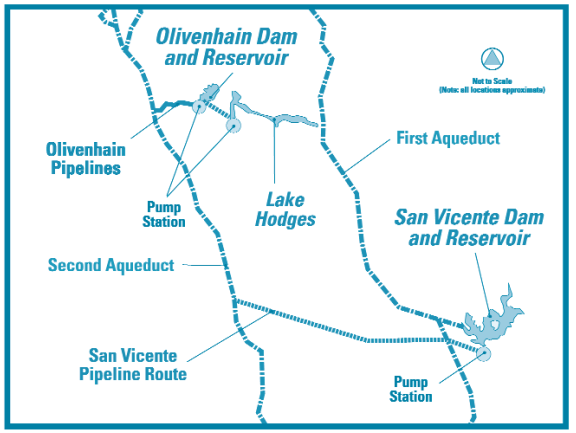
The Water Authority's $939 million Emergency Storage Project is part of its larger Capital Improvement Program (CIP). The CIP is the largest-ever effort to enhance the county's water infrastructure and to diversify the water supply mix that serves the region. This $3.25 billion investment will meet the region's needs through 2030. It includes projects to remove bottlenecks, increase water treatment capacity, develop seawater desalination facilities and add more operating flexibility to the aqueduct system. The net result will be a significant increase in water supply reliability and self-reliance.

LOOKING AHEAD: OUR FUTURE SUPPLY

San Diegans have always been creative and stubborn in their quest to find enough water to keep the county vibrant and prosperous. Citizens have resorted to extreme solutions, such as building wooden flumes through rugged canyons. They have benefited from stunning projects that have re-engineered water in the West, with hundreds of miles of aqueducts that transport water from its source to urban and agricultural areas.

Foresight and long-term planning will help the Water Authority maintain its mission of ensuring a reliable water supply for the county's more than 3 million residents and $142 billion economy. Water officials are making history with unprecedented agreements to transfer water from one region to another to maintain the health of an entire state and its economy. Engineers are pioneering local resource development with seawater desalination, conservation, groundwater recovery and water recycling. From the first inhabitants, who managed water by building small dams and levees, residents of San Diego County have demonstrated ingenuity, resourcefulness, collaboration and vision for the region's future needs.

San Diego County is frequently touted as an ideal place to live. The number of sunny days is often the barometer for comparisons with other regions in the nation. The proximity to beaches, mountains and desert provide ample recreational opportunities, and the region supports an array of cutting-edge industries. Through its history, everyone has depended on water to prosper. Supplying water continues to challenge the best planners today, as it has for centuries. All are united in their purpose: to quench a thirst.



The Emergency Storage Project's network of new and enlarged reservoirs, pipelines and storage facilities.

THE EMERGENCY STORAGE PROJECT

- New reservoir at Olivenhain with 318-foot-high dam, which will be linked by pipeline with Hodges Reservoir for a combined total capacity of 38,000 acre-feet
- Pipelines from Olivenhain Reservoir to the Second San Diego Aqueduct
- Raising San Vicente Dam by 54 feet to provide 52,100 acre-feet of storage
  Note: A study is evaluating an option to raise San Vicente Dam further, by a total of 123 feet. This would meet the region's need for emergency *and* operational storage through 2030
- Pipeline from the San Vicente Reservoir to the Second Aqueduct
- Six new pump stations (to be built in four phases by 2010)

Notes

Preface

[1] Austin Adams, The Story of Water in San Diego (San Diego, California: Southern California Mountain Water Company, 1909 or 1910), (unpaginated) preface.

[2] Richard F. Pourade, The Explorers (San Diego, California: The Union-Tribune Publishing Company, 1960), 107-108, 125; Florence Connolly Shipek, "Kumeyaay Plant Husbandry: Fire, Water, and Erosion," from Before the Wilderness: Environmental Management by Native Californians, edited by Thomas C. Blackburn and Kat Anderson (Menlo Park, California: Ballena Press, 1993), 385.

Part 1 : Living with the County's Water Supply
Introduction - Managing an Extreme Climate

[1] Iris H. W. Engstrand, San Diego: California's Cornerstone (Tulsa, Oklahoma: Continental Heritage Press, 1980), 10, 39.

[2] 2000 Urban Water Management Plan (San Diego, California: San Diego County Water Authority, 2000), 1-9; Maureen A. Stapleton, "From the General Manager: Planning needed for reliable supply," *Water Talk*, (San Diego, California: San Diego County Water Authority, Summer 1996), 2.

[3] Gregg R. Hennessey, "The Politics of Water in San Diego," *The Journal of San Diego History* Vol. 24, No. 3 (Summer 1978): 367; Thomas Joseph Adema, Our Hills and Valleys: A History of the Helix-Spring Valley Region (San Diego, California: San Diego Historical Society, 1993), 80; "William H. Jennings, Water Lawyer," Oral History Program Interview by Tom Hall, May and June, 1965 (Los Angeles, California: University of California, 1967), 11.

[4] Philip R. Pryde, "The Most Essential Resource: Water Supply for the County," Chapter 8 in San Diego: An Introduction to the Region 3rd ed., (Dubuque, Iowa: Kendall/Hunt Publishing Co., 1992), 119-121; Lloyd C. Fowler, "A History of the Dams and Water Supply of Western San Diego County," Masters Thesis, University of California, 1952, 2-7; First Annual Report (San Diego County Water Authority, 1946), 39.

[5] The San Diego Water Supply (San Diego, California: City of San Diego Water Utilities Department, 1982), 1.

Chapter 1: Ancient Days pre-1769

[1] Adapted from "The Story of Creation: Diegueños," [Online] Available at Native American Lore, http://www.ilhawaii.net/~stony/lore63.html, 11/6/00.

[2] Florence Connolly Shipek, Pushed into the Rocks: Southern California Indian Land Tenure 1769-1986 (Lincoln and London: University of Nebraska Press, 1986), Note: Shipek stated that she interviewed Kumeyaay elders who ranged in age from 80 to 110 between 1959 and 1965 who described traditional methods of land and water management, and that this information was corroborated in the written accounts of Spanish, Mexican and American settlers. 3; Richard F. Pourade, The Explorers (San Diego, California: The Union-Tribune Publishing Company, 1960), 8-9; Iris H.W. Engstrand, San Diego: California's Cornerstone (Tulsa, Oklahoma: Continental Heritage Press, 1980), 12.

[3] Norris Hundley, The Great Thirst: Californians and Water, 1770s-1990s (Berkeley and Los Angeles, California: University of California Press, 1992), 8; Florence Connolly Shipek, "Kumeyaay Plant Husbandry: Fire, Water, and Erosion," from Before the Wilderness: Environmental Management by Native Californians, edited by Thomas C. Blackburn and Kat Anderson (Menlo Park, California: Ballena Press, 1993), 380-384; Robert F. Heizer, Handbook of North American Indians Vol. 8 California (Washington, DC: Smithsonian Institution, 1978), 550-552; 599-601.

[4] Shipek, Pushed into the Rocks, 11-13; Jennifer Luksic and Nick Kendziorski, "The Use of Presidio Hill," *The Journal of San Diego*

History Vol. 45, No. 3 (Summer 1999): (online pagination) 3; Shipek, "Kumeyaay Plant Husbandry," 380-384.

5 Shipek, "Kumeyaay Plant Husbandry," 384-385.

6 Shipek, "Kumeyaay Plant Husbandry," 386; "Living in Harmony: The San Diego Kumeyaay," [Online] Available at Pacific Bell Knowledge Network, http://www.kn.pacbell.com/wired/kumeyaay/, 11/6/00; Richard F. Pourade, The Explorers (San Diego, California: Union Tribune Publishing Co., 1960), 133-135; Cheryl Hinton, Museum Curator at Barona Reservation, Conversation with Kim Laru, Librarian at San Diego County Water Authority, April, 2001.

7 Shipek, Pushed into the Rocks 8; Luksic and Kendziorski, 3-4; Kathy Hughart, "The Silvas Family: Another Chapter in Old Town History," [Online] Available at History at University of San Diego, http://history.acusd.edu/gen/projects/silvas/page1.html, 11/6/00.

8 "The Kumeyaay (Diegueño) of San Diego County and Baja," DesertUSA: Native American Desert Peoples, [Online] Available at http://www.desertusa.com/mag99/july/papr/kumeyaay.html, 11/6/00.

9 H. C. Hopkins, History of San Diego: Its Pueblo Lands and Water (San Diego, California: San Diego City Printing Company, 1929), 132.

10 "The Kumeyaay (Diegueño) of San Diego County and Baja."

11 Shipek, "Kumeyaay Plant Husbandry," 387-388.

Chapter 2: Spanish Missions 1769-1820

1 Quoted in H. C. Hopkins, History of San Diego: Its Pueblo Lands and Water (San Diego, California: San Diego City Printing Company, 1929), 269-270.

2 Norris Hundley, Jr., The Great Thirst: Californians and Water, 1770s-1990s (Berkeley and Los Angeles, California: University of California Press, 1992), 20-31.

3 Richard F. Pourade, The Explorers (San Diego, California: The Union-Tribune Publishing Company, 1960), 133-135.

4 Quoted in Hopkins, 40.

5 Quoted in Hopkins, 41.

6 "Ann Margaret Woods," Oral History Program Interview by Bob Wright, November 9, 1974, (San Diego, California: San Diego Historical Society), 5.

7 Richard F. Pourade, The Time of the Bells (San Diego, California: The Union-Tribune Publishing Company, 1961), 23; Nan Taylor Papageorge, "The Role of the San Diego River in the Development of Mission Valley," *The Journal of San Diego History* Vol. XVII, No. 2 (Spring 1971): 15.

8 Philip R. Pryde, "The Most Essential Resource: Water Supply for the County," Chapter 8 in San Diego: An Introduction to the Region 3rd ed., (Dubuque, Iowa: Kendall/Hunt Publishing Co., 1992), 121; Papageorge, 15; Water at the Mission (San Diego, California: San Diego City Schools, 1936), 10-13.

9 "Missions," [Online] Available http://www.kidport.com/RefLib/UsaHistory/Missions/Missions.htm, 11/6/00; Florence Connolly Shipek, Pushed into the Rocks: Southern California Indian Land Tenure 1769-1986 (Lincoln and London: University of Nebraska Press, 1986), 24-25.

10 Hundley, 47-48; Susan Annette Painter, "Otay Mesa – A Study of the Impact of Water in Land Use Changes," Master's Thesis, San Diego State University, 1988, 44.

11 "Missions"; Water at the Mission, 17-23; Hundley, 28, 43-44.

12 Hundley, 39-41.

Chapter 3: Mexican Period 1821-1848

1 Richard F. Pourade, The Silver Dons… and the Pioneers who Overwhelmed California (San Diego, California: Union Tribune Publishing Company, 1963), 62.
2 Jennifer Luksic and Nick Kendziorski, "The Use of Presidio Hill," *The Journal of San Diego History* Vol. 45, No. 3 (Summer 1999): (online pagination) 5.
3 Iris H. W. Engstrand, San Diego: California's Cornerstone (Tulsa, Oklahoma: Continental Heritage Press, 1980), 22, 25.
4 Luksic and Kendziorski, 6; "Missions," [Online] Available http://www.kidport.com/RefLib/UsaHistory/Missions/Missions.htm, 4/19/01; Pourade, The Silver Dons, xi.
5 Thomas Joseph Adema, Our Hills and Valleys: A History of the Helix-Spring Valley Region (San Diego: San Diego Historical Society, 1993), 11; Pourade, The Silver Dons, 63-65; Clare B. Crane, "The Pueblo Lands" The Journal of San Diego History Volume 37, No 2 (Spring 1991): (online pagination) 3; Iris H. W. Engstrand, San Diego: California's Cornerstone (Tulsa, Oklahoma: Continental Heritage Press, 1980), 28-30.
6 Susan Annette Painter, "Otay Mesa – A Study of the Impact of Water in Land Use Changes," Master's Thesis, San Diego State University, 1988, 45-52.
7 History And First Annual Report For The Period Ending June 30,1938 (Los Angeles, California: Metropolitan Water District, 1939), 10.
8 Pourade, The Silver Dons, 16-17; Crane, 3.
9 Crane, 4.

Chapter 4: Early American Period – Using Local Water 1848-1870s

1 Lloyd C. Fowler, "A History of the Dams and Water Supply of Western San Diego County," Masters Thesis, University of California, 1952, 44.
2 Nan Taylor Papageorge, "The Role of the San Diego River in the Development of Mission Valley," *The Journal of San Diego History* Vol. XVII, No. 2 (Spring 1971): 17.
3 Susan Annette Painter, "Otay Mesa – A Study of the Impact of Water in Land Use Changes," Master's Thesis, San Diego State University, 1988, 70.
4 Iris H. W. Engstrand, San Diego: California's Cornerstone (Tulsa, Oklahoma: Continental Heritage Press, 1980), 37.
5 Engstrand, 43.
6 Jennifer Luksic and Nick Kendziorski, "The Use of Presidio Hill," *The Journal of San Diego History* Vol. 45, No. 3 (Summer 1999): (online pagination) 7; Engstrand, 44-45.
7 Quoted in H.C. Hopkins, San Diego: Its Pueblo Lands and Water (San Diego, California: City Printing Company, 1929), 268.
8 "Hattie Dougherty," Oral History Program Interview by Edgar F. Hastings, July 24, 1958, (San Diego, California: San Diego Historical Society).
9 "City of San Diego Water History," [Online] Available at http://www.sandiego.gov/water/gen-info/history.shtml, 5/18/01.
10 Quoted in Hopkins, 268.
11 Fowler, 43-44.
12 Hopkins, 272.
13 San Diego's Quest for Water (San Diego, California: Metropolitan Water District and San Diego County Water Authority, 1947), 2-3.

14 History and First Annual Report For The Period Ending June 30, 1938 (Los Angeles, California: Metropolitan Water District, 1949), 13, 17.
15 Fowler, 19, 29-30.
16 Mitchell Berner, Executive Director, San Pasqual Agricultural Association and former Chief of Policy to San Diego Mayor Susan Golding, Email correspondence with Cathryn M. Delude, May 1, 2001.

Chapter 5: Creating Water Companies 1870s-1920s

1 Preface to Austin Adams, The Story of Water in San Diego (San Diego, California: Southern California Mountain Water Company, 1909 or 1910).
2 "William H. Jennings, Water Lawyer," Oral History Program Interview by Tom Hall, May and June, 1965 (Los Angeles, California: University of California, 1967), 5.
3 "William H. Jennings, Water Lawyer," 2-4; Ed Fletcher, Memoirs of Ed Fletcher (San Diego, California: Pioneer Printers, 1952), 151, 160-161; Robert Friedgen, Former General Manager, and Katharine A. Breece, Public Affairs, Helix Water District, Email correspondences with Cathryn M. Delude, July 3, 2001.
4 Thomas Joseph Adema, Our Hills and Valley: A History of the Helix-Spring Valley Region (San Diego, California: San Diego Historical Society, 1993), 80.
5 "William H. Jennings, Water Lawyer," 3.
6 Iris H. W. Engstrand, San Diego: California's Cornerstone (Tulsa, Oklahoma: Continental Heritage Press, 1980), 77.
7 Fletcher, 161.
8 Adams, [unpaginated].
9 Philip R. Pryde, "The Most Essential Resource: Water Supply for the County," Chapter 8 in San Diego: An Introduction to the Region 3rd ed. (Dubuque, Iowa: Kendall/Hunt Publishing Co., 1992), 121.
10 Adams, [unpaginated].
11 Quoted in Nan Taylor Papageorge, "The Role of the San Diego River in the Development of Mission Valley," *The Journal of San Diego History* Vol. XVII, No. 2 (Spring 1971): 20.
12 Patterson, 12.
13 Sources for this story include: Norris Hundley, Jr., The Great Thirst: California and Water, 1770s – 1990s (Berkeley and Los Angeles, California: University of California Press, 1992), 107; Thomas W. Patterson, "Hatfield the Rainmaker," *The Journal of San Diego History* Vol. 16, No. 1 (Winter 1979), 16-18; Lloyd C. Fowler, "A History of the Dams and Water Supply of Western San Diego County," Masters Thesis, University of California, 1952, 59; Robert Friedgen, Former General Manager, Helix Water District, Email correspondence with Cathryn M. Delude, May 17, 2001.
14 Fowler, 53; Patterson, 15.
15 Carl Joseph Courtemanche, "The Utilization of Water in San Diego from 1890-1940: A Cultural Analysis," Master's Thesis, San Diego State University, 1982, 22, 6-8; The San Diego Water Supply (San Diego, California: City of San Diego Water Utilities Department, 1982); Philip R. Pryde, "The Most Essential Resource: Water Supply for the County," Chapter 8 in San Diego: An Introduction to the Region 3rd ed. (Dubuque, Iowa: Kendall/Hunt Publishing Company, 1992), 123.
16 Quoted in Fowler, 1.
17 Shelley J. Higgins, as told to Richard Mansfield, *This Fantastic City: San Diego* (San Diego, California: City of San Diego, 1956), 186-192; Fletcher, 220-225; Pryde, 123-124.

[18] Fletcher, 224, 236, 250; Paul Engstrand, former attorney for San Diego County Water Authority, correspondence with authors, November, 2001.
[19] Courtemanche, 146-48.
[20] Fletcher, 173-176.

Chapter 6: Pueblo Water Rights

[1] Quoted in Norris Hundley, Jr., The Great Thirst: Californians and Water 1770s-1990s (Berkeley and Los Angeles, California and Oxford, England: University of California Press, 1992), 28. [From: Thomas E. Glick, Irrigation and Society in Medieval Valencia (Cambridge, Massachusetts: Harvard University Press, 1970), 4, 5, 207.]
[2] Hundley, 39-48.
[3] History and First Annual Report For The Period Ending June 30,1938 (Los Angeles, California: Metropolitan Water District, 1949), 11.
[4] Hundley, 126-135.
[5] "William H. Jennings, Water Lawyer," Oral History Program Interview by Tom Hall, May and June, 1965 (Los Angeles, California: University of California, 1967), 12-15
[6] Quoted in Hundley, 331.
[7] Hundley, 331.

PART 2: Moving Beyond the County for Water
Introduction - Over the Next Hill

[1] A typical comment of people who were soon caught by surprise as the population outgrew the water supply. Quoted in "Linden Burzell," General Manager of Vista Irrigation District, Oral History Program Interview by Vince Ancana, April 29, 1992, San Diego Historical Society.
[2] Quoted in Robert H. Boyle, John Greeves, and T.H. Watkins, The Water Hustlers (San Francisco, California: Sierra Club, 1971), 10.

Chapter 7: Colorado River Water 1920s and on

[1] Quoted in Kyle Emily Ciani, "A Passion for Water: Hans Doe and the California Water Story," reprint from *The Journal of San Diego History* Vol. 39, No. 4 (Fall, 93) by San Diego Historical Society, 1994. [From: Interview in *Escondido Times-Advocate,* 1978].
[2] First Annual Report (San Diego, California: San Diego County Water Authority, 1946), 17-18; Shelley J. Higgins, as told to Richard Mansfield, This Fantastic City San Diego: Official City Policy History (San Diego, California: City of San Diego, 1956), 209.
[3] First Annual Report, 20-22.
[4] Shelley J. Higgins, as told to Richard Mansfield, *This Fantastic City: San Diego* (San Diego, California: City of San Diego, 1956), 186-192; Fletcher, 220-225; Pryde, 209-210.
[5] First Annual Report, 32-33.
[6] 1994 Annual Report: 50 Years of Service to San Diego (San Diego, California: County Water Authority, 1994), 18-22.

7 "William Jennings, Water Lawyer," Oral History Program Interview by Tom Hall, May and June, 1965 (Los Angeles, California: University of California, 1967), 47.
8 "William H. Jennings, Water Lawyer," 62-79.
9 "William H. Jennings, Water Lawyer," 84.
10 1994 Annual Report 22-23; Dave Fogerson, Senior Civil Engineer, San Diego County Water Authority, Conversation with authors, August 2001.
11 First Annual Report; 2000 Urban Water Management Plan, (San Diego, California: County Water Authority, 2000) 1-10.

Chapter 8: Water from the North 1950s and on

1 "William H. Jennings, Water Lawyer," Oral History Program Interview by Tom Hall, May and June, 1965 (Los Angeles, California: University of California, 1967), 108.
2 "William H. Jennings, Water Lawyer," 175-192.
3 "William H. Jennings, Water Lawyer," 89.
4 "Laguna Declaration," December 15, 1952.
5 "William H. Jennings, Water Lawyer," 90-91.
6 "William H. Jennings, Water Lawyer," 106.

Chapter 9: Unexpected New Sources 1990s and on

1 "QSA Fact Sheet" (San Diego, California: San Diego County Water Authority, 1995), 24.
2 1994 Annual Report (San Diego, California: San Diego County Water Authority, 2004).
3 2000 Urban Water Management Plan (San Diego, California: San Diego County Water Authority, 2000) 3-7.
4 2005 Urban Water Management Plan (scheduled publication Fall 2005)
5 *Water Talk,* (Summer 1997): 5, 2000 Urban Water Management Plan 4-8 to 4-21.
6 "Seawater Desalination Fact Sheet" (San Diego, California: San Diego County Water Authority, 2003).
7 2000 Urban Water Management Plan (San Diego, California: San Diego County Water Authority, 2000) 4-13.
8 "Colorado River Water Transfer Agreements Fact Sheet" (San Diego, California: San Diego County Water Authority Fact Sheet, 2005).
9 2005 Urban Water Management Plan (scheduled publication Fall 2005).
10 Preliminary 2030 Sales Forecast (San Diego, California: San Diego County Water Authority, 2005).

Chapter 10: Vulnerability and Emergencies 21st Century

1 Quoted in Lloyd C. Fowler, "A History of the Dams and Water Supply of Western San Diego County," Masters Thesis, University of California, 1952, 1.
2 2000 Urban Water Management Plan (San Diego, California: San Diego County Water Authority, 2000) 6-2; *Water Talk* (Fall, 1997): 1-2.

YEAR 1946 - 1948

SDCWA Member Agencies	Population	Area*	SDCWA Water Deliveries**
City of Chula Vista	11,100	3,238	1,800
Fallbrook Public Utility District	3,000	1,856	691
Lakeside Irrigation District	1,300	320	0
La Mesa, Lemon Grove and Spring Valley Irrigation District	24,500	19,008	4,256
City of National City	17,700	2,950	1,837
City of Oceanside	10,700	5,536	0
Ramona Irrigation District	1,000	659	0
City of San Diego	362,700	61,139	32,461
		*Acres	**Acre Feet

NOTE: City of Coronado was one of the original nine members; however, they withdrew their membership.

Total Population = 432,000

Total Acreage = 94,706

Total Water Deliveries = 41,093 (acre feet)

Miles of Pipeline = 67.5

YEAR 1960

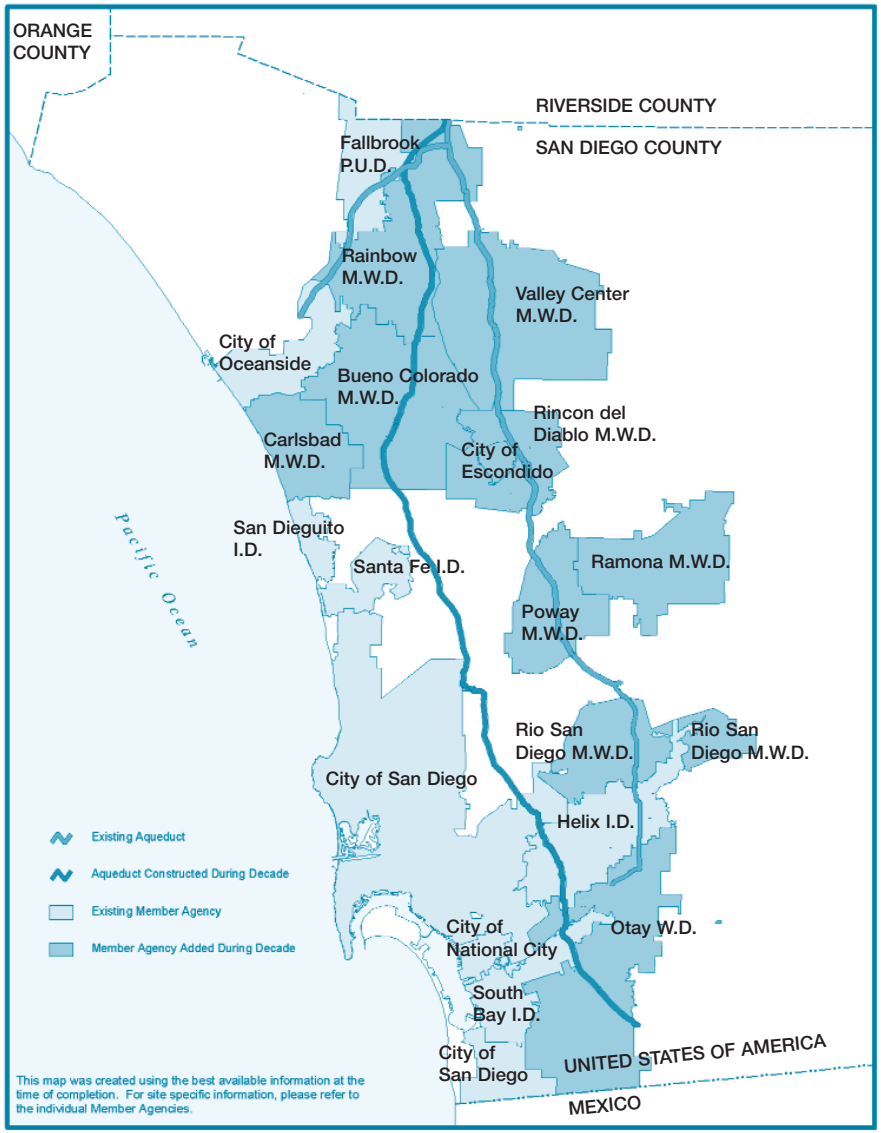
SDCWA Member Agencies	Population	Area*	SDCWA Water Deliveries**
Bueno Colorado M.W.D.	31,500	50,540	3,735
Carlsbad M.W.D.	10,000	20,668	3,588
City of Escondido	18,500	4,061	2,142
Fallbrook, P.U.D.	10,000	15,469	8,106
Helix I.D.	122,100	30,958	14,176
City of National City	32,300	4,781	5,306
City of Oceanside	24,700	17,060	3,528
Otay W.D.	5,400	49,841	639
Poway M.W.D.	4,800	22,980	1,567
Rainbow M.W.D.	2,800	40,040	5,662
Ramona M.W.D.	5,600	29,900	322
Rincon del Diablo M.W.D.	14,000	20,271	2,244
Rio San Diego M.W.D.	25,500	27,655	2,138
City of San Diego	557,200	125,827	93,892
San Dieguito I.D.	15,000	4,948	1,488
Santa Fe I.D.	7,700	10,132	1,346
South Bay I.D.	64,300	15,315	5,350
Valley Center M.W.D.	5,000	53,160	1,358
Others			271
		*Acres	**Acre Feet

Total Population = 956,400

Total Acreage = 543,606

Total Water Deliveries = 156,858 (acre feet)

Miles of Pipeline = 161



YEAR 1980

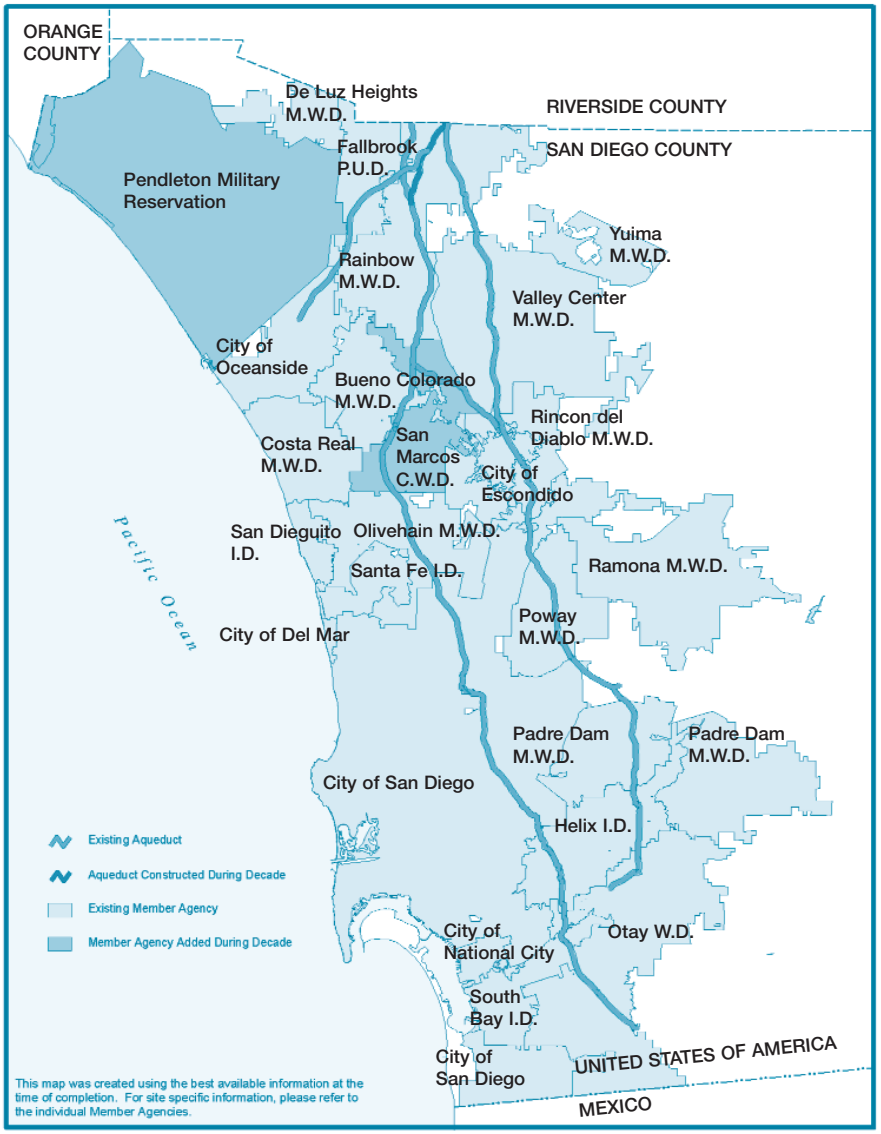
SDCWA Member Agencies	Population	Area*	SDCWA Water Deliveries**
Bueno Colorado M.W.D.	51,000	20,067	7,402
Costa Real M.W.D.	31,500	20,369	12,223
City of Del Mar	5,040	1,082	1,283
De Luz Heights M.W.D.	225	11,830	1,097
City of Escondido	64,100	13,333	8,749
Fallbrook, P.U.D.	18,700	16,104	12,174
Helix Water Dist.	203,500	31,663	19,800
City of National City	47,200	5,431	1,593
City of Oceanside	77,800	25,383	19,326
Olivenhain M.W.D.	23,000	27,367	5,313
Otay W.D.	51,600	64,788	11,782
Padre Dam M.W.D.	89,000	54,082	13,721
Pendleton Military Res.	33,150	134,625	0
Poway M.W.D.	36,600	22,809	7,052
Rainbow M.W.D.	7,800	46,754	27,040
Ramona M.W.D.	16,000	46,939	6,239
Rincon del Diablo M.W.D.	13,800	16,370	4,789
City of San Diego	849,600	204,945	92,986
San Dieguito Water Dist.	30,900	5,637	5,732
San Marcos C.W.D.	24,200	28,548	6,855
Santa Fe I.D.	14,700	10,200	6,258
South Bay I.D.	99,200	15,533	1,500
Valley Center M.W.D.	15,600	62,061	32,681
Yuima M.W.D.	1,820	12,813	1,601
Others			2560
		*Acres	**Acre Feet

Total Population = 1,806,035

Total Acreage = 898,733

Total Water Deliveries = 309,756 (acre feet)

Miles of Pipeline = 210



YEAR 2000 & Beyond

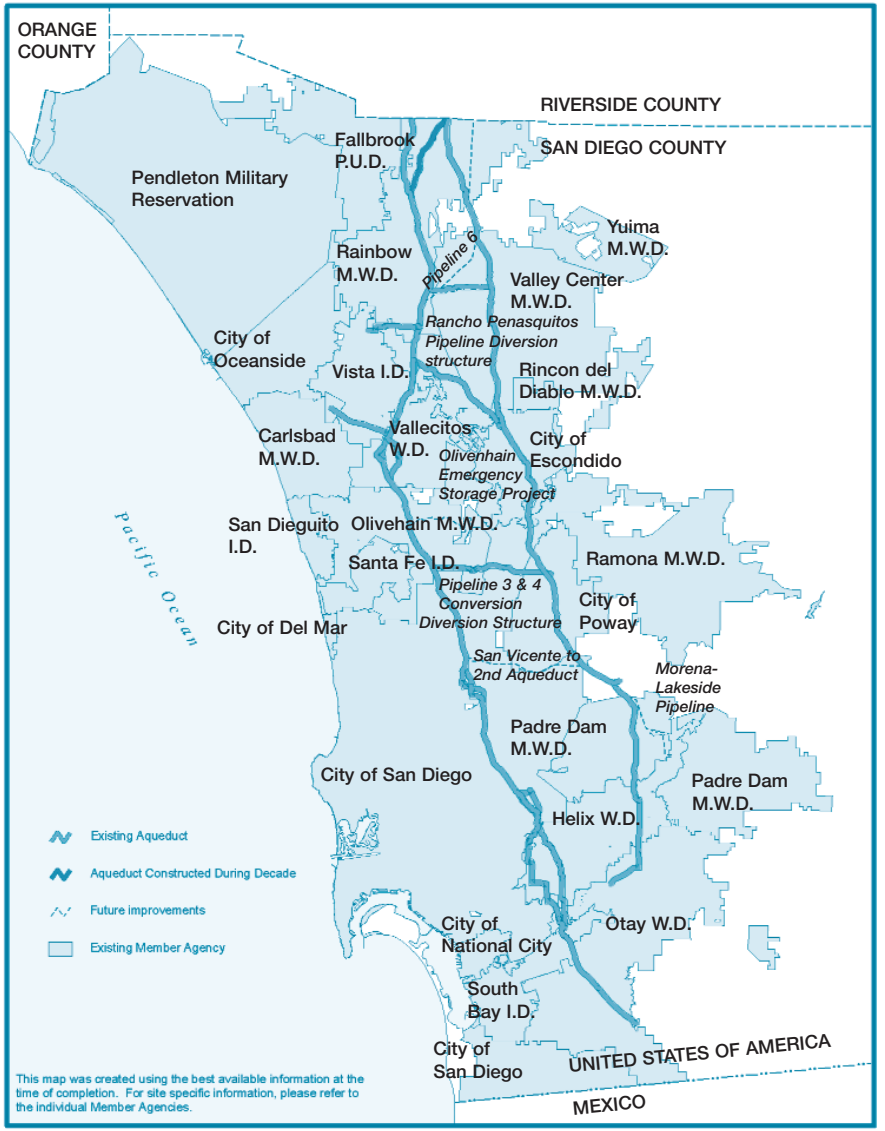
SDCWA Member Agencies	Population	Area*	SDCWA Water Deliveries**
Carlsbad M.W.D.	67,627	20,640	19,952
City of Del Mar	5,365	1,159	1,556
City of Escondido	128,000	21,569	26,977
Fallbrook, P.U.D.	32,000	27,988	16,824
Helix Water Dist.	234,166	31,350	38,483
City of National City	54,420	5,838	1,128
City of Oceanside	157,869	28,160	32,073
Olivenhain M.W.D.	45,900	30,942	19,432
Otay W.D.	123,420	63,155	29,901
Padre Dam M.W.D.	134,600	54,370	21,824
Pendleton Military Res.	50,000	134,625	105
Poway M.W.D.	49,287	23,214	15,625
Rainbow M.W.D.	18,000	47,260	29,928
Ramona M.W.D.	36,000	46,524	8,267
Rincon del Diablo M.W.D.	25,900	10,596	9,119
City of San Diego	1,277,168	210,726	206,433
San Dieguito Water Dist.	37,180	5,653	5,112
Santa Fe I.D.	20,509	10,179	8,056
South Bay I.D.	120,200	20,411	4,392
Vallecitos Water Dist.	60,000	28,644	16,409
Valley Center M.W.D.	23,000	61,022	48,550
Vista I.D.	112,000	21,311	2,849
Yuima M.W.D.	1,870	12,792	17,123
		*Acres	**Acre Feet

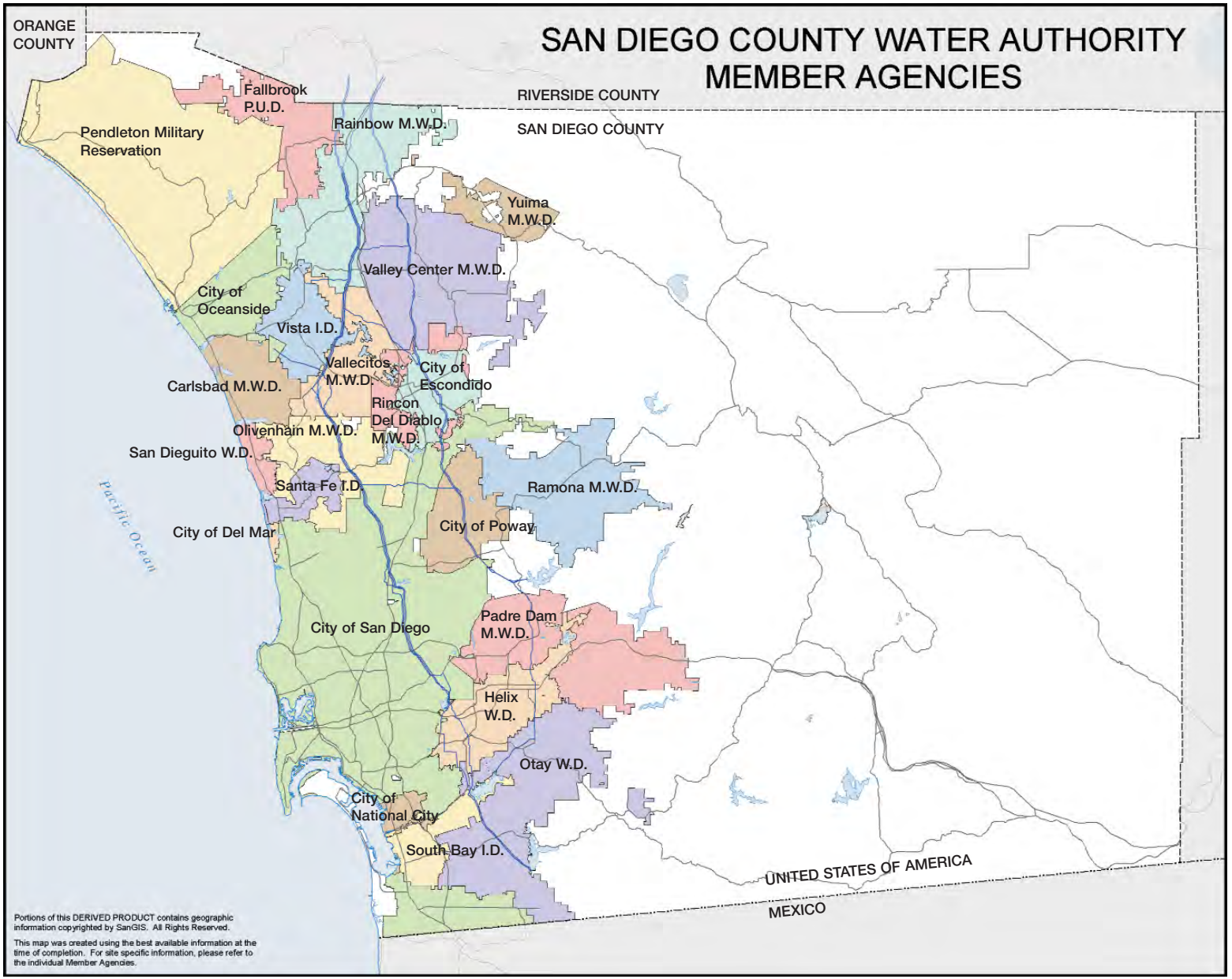
Total Population = 2,814,481

Total Acreage = 918,128

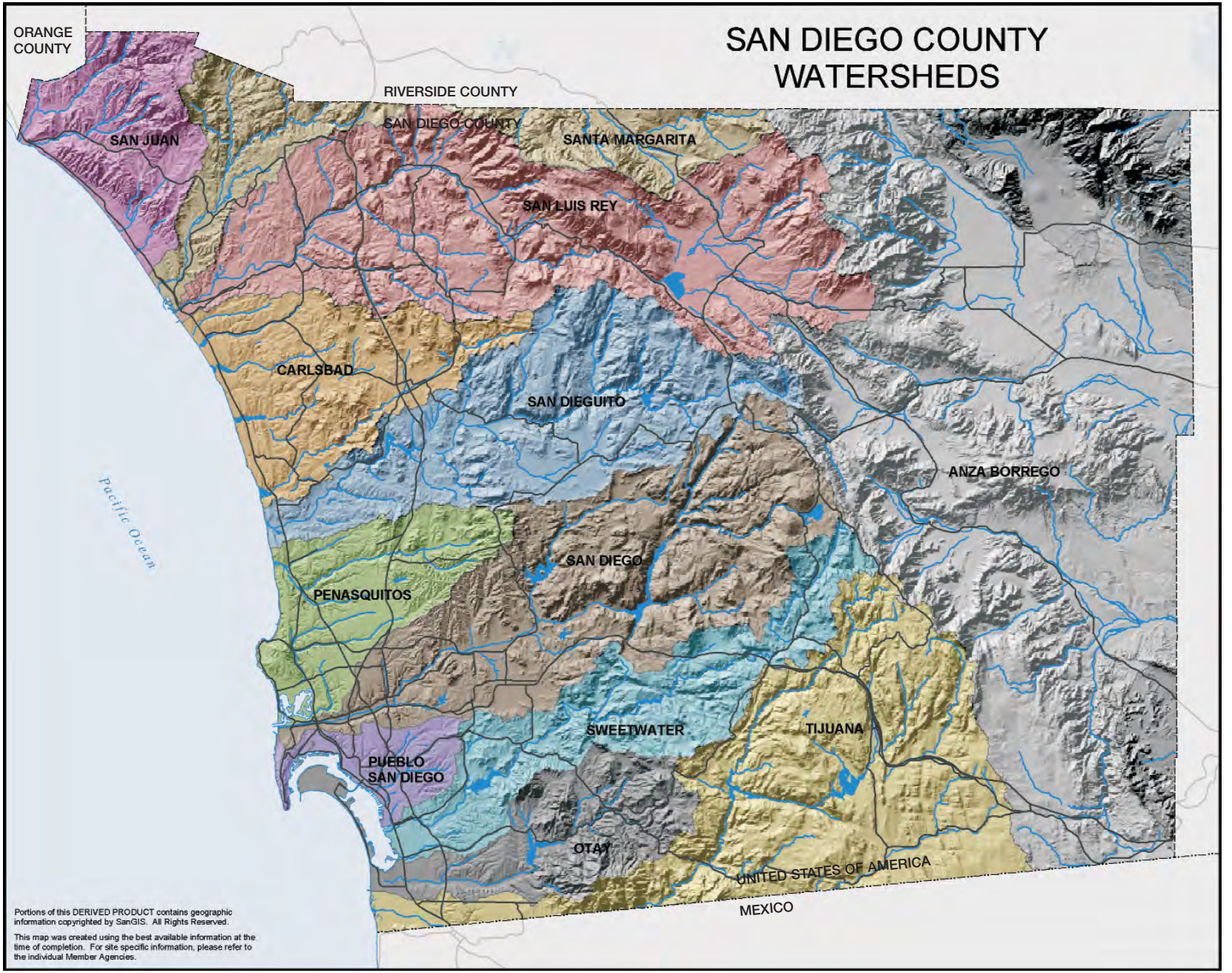
Total Water Deliveries = 580,118 (acre feet)

Miles of Pipeline = 274



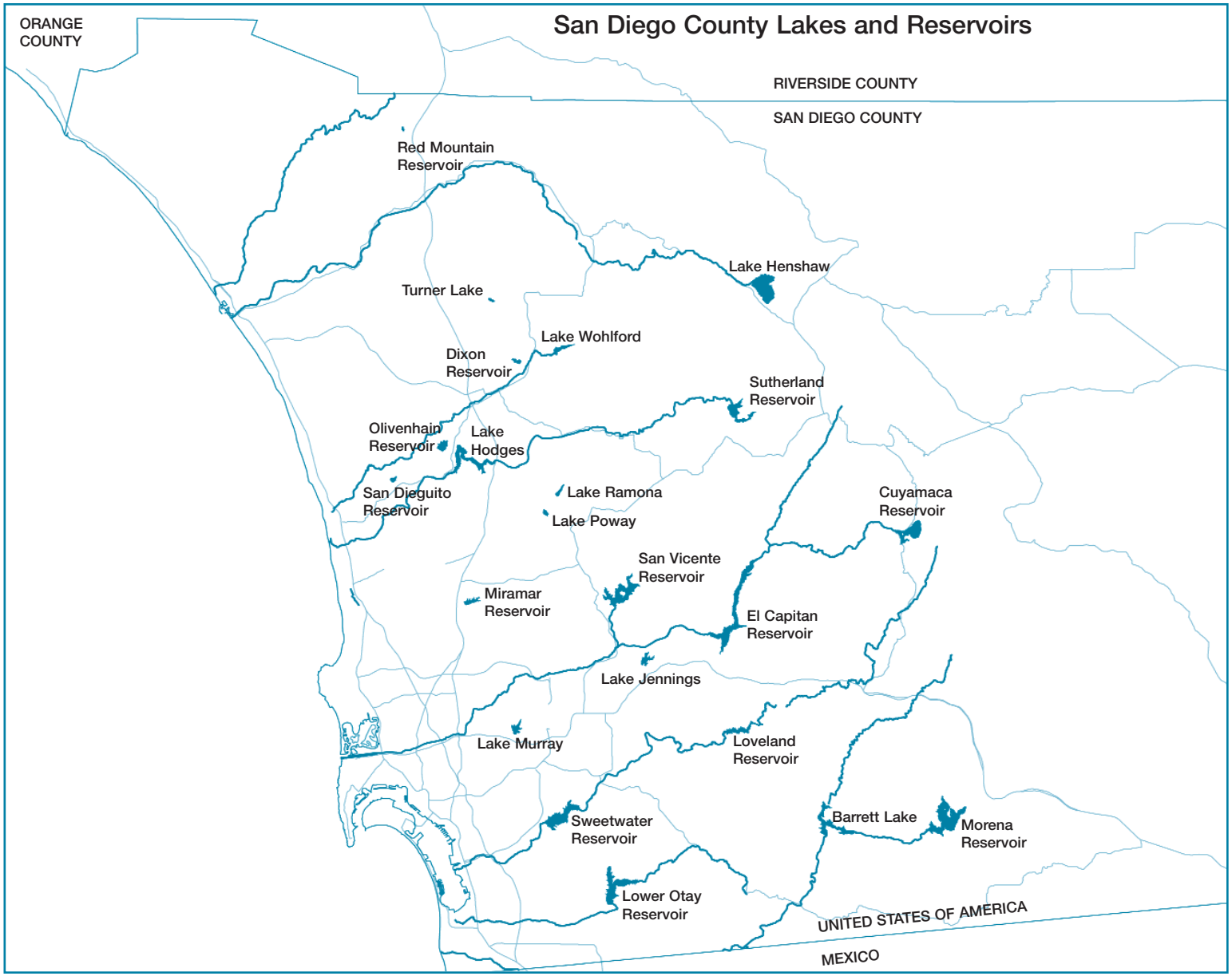

SAN DIEGO COUNTY WATER AUTHORITY
MEMBER AGENCIES
ORANGE COUNTY
RIVERSIDE COUNTY
SAN DIEGO COUNTY
Fallbrook P.U.D.
Rainbow M.W.D.
Pendleton Military Reservation
Yuima M.W.D.
Valley Center M.W.D.
City of Oceanside
Vista I.D.
Vallecitos M.W.D.
City of Escondido
Carlsbad M.W.D.
Rincon Del Diablo M.W.D.
Olivenhain M.W.D.
San Dieguito W.D.
Santa Fe I.D.
Ramona M.W.D.
City of Poway
City of Del Mar
Pacific Ocean
City of San Diego
Padre Dam M.W.D.
Helix W.D.
Otay W.D.
City of National City
South Bay I.D.
UNITED STATES OF AMERICA
MEXICO
Portions of this DERIVED PRODUCT contains geographic information copyrighted by SanGIS. All Rights Reserved.
This map was created using the best available information at the time of completion. For site specific information, please refer to the individual Member Agencies.

San Diego County Watersheds 2001



SAN DIEGO COUNTY WATER AUTHORITY AREA, POPULATION & WATER USE (1948-2004)

Year	Area Acres	Population	Total Water Deliveries (acre-feet)	Miles of Pipeline
1948	94,706	432,000	41,093	67.5
1950	119,213	434,777	58,612	67.5
1955	349,493	702,300	98,972	102
1960	543,606	956,400	156,858	161
1965	718,900	1,150,000	230,911	161
1970	753,200	1,255,000	245,678	166
1975	761,678	1,527,520	376,286	204
1980	898,733	1,806,035	309,756	210
1985	902,702	2,047,000	436,201	222
1990	908,945	2,435,903	674,993	222
1995	908,964	2,622,948	386,560	250
2000	918,128	2,814,481	589,062	274
2004	920,463	2,867,237	643,961	281


San Diego County Lakes and Reservoirs
ORANGE COUNTY
RIVERSIDE COUNTY
SAN DIEGO COUNTY
Red Mountain Reservoir
Lake Henshaw
Turner Lake
Lake Wohlford
Dixon Reservoir
Sutherland Reservoir
Olivenhain Reservoir
Lake Hodges
San Dieguito Reservoir
Lake Ramona
Lake Poway
Cuyamaca Reservoir
San Vicente Reservoir
Miramar Reservoir
El Capitan Reservoir
Lake Jennings
Lake Murray
Loveland Reservoir
Sweetwater Reservoir
Barrett Lake
Morena Reservoir
Lower Otay Reservoir
UNITED STATES OF AMERICA
MEXICO

Bibliography

Adams, Austin. The Story of Water in San Diego. San Diego, California: Southern California Mountain Water Company, 1909 or 1910.

Adema, Thomas, Joseph. Our Hills and Valley: A History of the Helix-Spring Valley Region. San Diego, California: San Diego Historical Society, 1993.

"Ann Margaret Woods." Oral History Program Interview by Bob Wright, November 9, 1974. San Diego, California: San Diego Historical Society.

Bokovoy, Matthew F. "Inventing Agriculture in Southern California." *The Journal of San Diego History,* Spring 1999, Vol. 45, No 2.

Boyle, Robert H., Greeves, John, and Watkins, T. H. The Water Hustlers. San Francisco, California: Sierra Club, 1971.

Ciani, Kyle Emily. "A Passion for Water: Hans H. Doe and the California Water Industry." *The Journal of San Diego History,* Fall 1993, Vol. 39, No 4.

"Chronology of the Indigenous Peoples of San Diego County." [Online] Available at History at USD, http://www.sandiego.edu/nativeamerican/chronology.html.

"City of San Diego Water History." [Online] Available at http://www.sandiego.gov/water/gen-info/history.shtml, 5/18/01.

Crane, Clare B. "The Pueblo Lands." *The Journal of San Diego History,* Spring 1991, Volume 37, No 2.

Courtemanche, Carl Joseph. "The Utilization of Water in San Diego from 1890-1940: A Cultural Analysis." Master's Thesis, San Diego State University, 1982.

Engstrand, Iris H. W. San Diego: California's Cornerstone. Tulsa, Oklahoma: Continental Heritage Press, 1980.

First Annual Report. San Diego, California: San Diego County Water Authority, 1946.

Fletcher, Edward. Memoirs of Ed Fletcher. San Diego, California: Pioneer Printers, 1952.

Fowler, Lloyd C. "A History of the Dams and Water Supply of Western San Diego County." Masters Thesis, University of California, 1952.

"For the Want of a Nail…A concise report of a water shortage that jeopardizes the national defense activities in the vital San Diego area." Undated, 1940s.

"Harry Griffen." Helix Water District 1976-77 Annual Report. La Mesa, California: Helix Water District, 1977.

"Hattie Dougherty." Oral History Program Interview by Edgar F. Hastings, July 24, 1958. San Diego, California: San Diego Historical Society.

Heizer, Robert F. Handbook of North American Indians, Vol. 8 California. Washington, DC: Smithsonian Institution, 1978.

Hennessey, Gregg R. "The Politics of Water in San Diego." *The Journal of San Diego History,* Summer 1978, Vol. XXIV, No. 3.

Higgins, Shelley, J., as told to Mansfield, Richard. This Fantastic City: San Diego. San Diego, California: City of San Diego, 1956.

History and First Annual Report For The Period Ending June 30, 1938. Los Angeles, California: Metropolitan Water District, 1939.

Hopkins, H. C. San Diego: Its Pueblo Lands and Water. San Diego, California: City Printing Company, 1929.

Hughart, Kathy. "The Silvas Family: Another Chapter in Old Town History." [Online] Available at History at University of San Diego, http://history.acusd.edu/gen/projects/silvas/page1.html, 11/6/00.

Hundley, Jr., Norris. The Great Thirst: Californians and Water, 1770s-1990s. Berkeley and Los Angeles, California: University of California Press, 1992.

Jacques, Terri Elizabeth. "History of the Monte Vista Ranch of Rancho Jamacha." Master's Thesis, University of San Diego, 1980.

"Kumeyaay." [Online] Available at http://www.kumeyaay.com, 11/6/00.

"The Kumeyaay (Diegueño) of San Diego County and Baja." [Online] Available at DesertUSA: Native American Desert Peoples, http://www.desertusa.com/mag99/july/papr/kumeyaay.html, 11/6/00.

"Kumeyaay Elementary." [Online] Available at http://kumeyaay.sdcs.k12.ca.us/Kumeyaay.Indian.Infor/Kumeyaay.Ind.frame.html, 11/6/00.

Serra Museum looking East over Mission Valley, c.1930
The San Diego Historical Society

"Linden Burzell." Oral History Program Interview by Vince Ancana, April 19, 1992. San Diego, California: San Diego Historical Society, Fall, 1993, Vol. 39, No 4.

"Living in Harmony: The San Diego Kumeyaay." [Online] Available at the Pacific Bell Knowledge Network, http://www.kn.pacbell.com/wired/kumeyaay/, 11/6/00.

Luksic, Jennifer and Kendziorski, Nick. "The Use of Presidio Hill," *The Journal of San Diego History,* Summer 1999, Vol. 45, No. 3.

"Missions." [Online] Available at http://www.kidport.com/RefLib/UsaHistory/Missions/Missions.htm, 4/19/01.

Painter, Susan Annette. "Otay Mesa – A Study of the Impact of Water in Land Use Changes." Master's Thesis, San Diego State University, 1985.

Papageorge, Nan Taylor. "The Role of the San Diego River in the Development of Mission Valley." *The Journal of San Diego History,* Spring 1971, Vol. XVII, No. 2.

Patterson, Thomas W. "Hatfield the Rainmaker." *The Journal of San Diego History,* Winter 1979, Vol. 16, No. 1.

Pourade, Richard F. The Explorers. San Diego, California: The Union-Tribune Publishing Company, 1960.

Pourade, Richard F. The Silver Dons … and the Pioneers who Overwhelmed California. San Diego, California: The Union-Tribune Publishing Company, 1963.

Pourade, Richard F. The Time of the Bells. San Diego, California: Coply Press, 1961.

Pryde, Philip R. "The Most Essential Resource: Water Supply for the County." Chapter 8, San Diego: An Introduction to the Region. 3rd edition, Dubuque, Iowa: Kendall/Hunt Publishing Company, 1992.

San Diego's Quest for Water. San Diego, California: Metropolitan Water District and San Diego County Water Authority, 1947.

The San Diego Water Supply. San Diego, California: City of San Diego Water Utilities Department, 1982.

"The Story of Creation: Diegueños". [Online] Available at Native American Lore, http://www.ilhawaii.net/~stony/lore63.html, 11/6/00.

Shipeck, Florence Connolly. "Kumeyaay Plant Husbandry: Fire, Water, and Erosion," from Before the Wilderness: Environmental Management by Native Californians. Ed. Blackburn, Thomas C. and Anderson, Kat. Menlo Park, California: Ballena Press, 1993.

Shipeck, Florence Connolly. Pushed into the Rocks: Southern California Indian Land Tenure, 1769-1986. Lincoln and London: University of Nebraska Press, 1986.

"Timeline of San Diego History." [Online] Available at San Diego Historical Society, http://www.sandiegohistory.org/timeline/timeline.htm, 11/6/00.

Trafzer, Clifford, E. and Carrico, Richarch L. "American Indians: The County's First Residents." Chapter 4, San Diego: An Introduction to the Region 3rd edition. Dubuque, Iowa: Kendall/Hunt Publishing Company, 1992.

"Viejas Band of Kumeyaay: Tribal History." [Online] Available at http://www.viejasbandofkumeyaay.org, 11/6/00.

Water at the Mission. San Diego, California: San Diego City Schools, 1936.

Water Talk. San Diego, California: San Diego County Water Authority, Summer 1996 and Summer 1997.

"William H. Jennings, Water Lawyer." Oral History Program Interview by Tom Hall, May and June, 1965. University of California, Los Angeles, 1967.

1994 Annual Report: 50 Years of Service to San Diego. San Diego, California: San Diego County Water Authority.

2000 Urban Water Management Plan. San Diego, California: San Diego County Water Authority, 2001.

2005 Urban Water Management Plan. San Diego, California: San Diego County Water Authority, 2005.

Index

Crouch Well, Emerald Hills Country Club, 1920's
The San Diego Historical Society

Acre-feet: 2

All-American Canal: 35, 37, 38, 42, 51, 53

Alvarado Treatment Plant: 41

Babcock, E.S.: 21, 26

Barrett Dam: 22, 24, 28

Bay-Delta: 45, 46

Blythe, Thomas H.: 35

Bonita Pipeline: 22

Boosterism: 18

Boulder Canyon Project: 27, 35, 36, 42

Brown, Govenor Edmund G. "Pat": 45

Bureau of Reclamation: 39, 40, 43, 45

Cabrillo, Juan Rodriguez: 7

California Limitation Act: 36

Capital Improvement Plan: 56

Central Valley Project: 43, 45

Chula Vista: 10, 18, 41

Colorado River: 1, 15, 33, 35, 36, 37, 38, 39, 40 41, 42, 43, 44, 46, 47, 49, 50, 51, 53, 54, 55

Colorado River Compact: 35, 37, 41, 42, 43

Consolidated Water Company: 21, 24, 26

Cuyamaca Dam: 20, 28

Cuyamaca Water Company: 21, 25, 26, 27, 29, 30, 31

Desalination: 50, 51, 52, 54

Diamond Valley Lake: 55

Doe, Hans: 35

Dulzura Conduit: 22, 24, 28

El Capitan Dam: 2, 21, 24, 28, 29, 30

Emergency Storage Project: 55, 56

Eucalyptus Reservoir: 20

Fletcher, Edward: 21, 22, 25, 26, 27, 29, 31, 38, 42

Griffen, Harry C. : 26, 48

Groundwater: 3, 49, 52, 54

Hatfield, Charles: 23

Hatfield flood: 2, 21, 23, 24

Heilbron, Fred A. : iv, 19, 37, 39,40

Helix Irrigation/Water District: 26, 28, 41

Horton, Alonzo E.: 16

Horton's Addition: 16, 17

Imperial Irrigation District: 35, 36, 42, 53

Jennings, William: 1, 19, 21, 39, 40, 41, 43, 44, 45

Jensen, Joseph: 40

Kimball Brothers Water Company: 17, 18, 26, 28

Kumeyaay: 3, 9, 23

La Mesa Ditch: 20

La Mesa, Lemon Grove and Spring Valley Irrigation District: 26, 27, 28, 30, 31

Lake Henshaw: 26, 28

Lake Hodges/Hodges Dam: 25, 26, 28

Lake Murray/Murray Dam: 20, 28

Los Angeles: 19, 29, 30, 31, 33, 36, 38, 39, 44, 45

Lower Otay Dam/Reservoir: 22, 23, 28

Marston, Arthur: 44

Marston, George: 22

Metropolitan: 36, 37, 38, 39, 40, 41, 42, 44, 45, 50, 51, 53, 54, 55

Mexican War: 13, 15, 17

Mission Gorge: 9, 26, 27

Mission Valley: 7, 9, 12, 13, 15, 23

Morena Dam/Reservoir: 22, 23, 24, 28

Murray, James: 25, 26

National City: 10, 18, 41

Native Americans (Indians, Native): 5, 6, 7, 9, 12, 13, 27

New Town: 16, 17

Oceanside: 10, 11, 41, 51, 52

Old Mission Dam (Padre Dam): 7, 9

Old Town: 5, 7, 10, 11, 13, 14,16

Olivenhain Municipal Water District: 28, 41

Ollas: 4, 6, 8

Padre Dam (Old Mission Dam): 7, 9

Peripheral Canal: 45

Plan of Pitic: 29, 30

Presidio Hill: 7, 8, 9, 10, 11, 13

Pueblo: 5, 7, 10, 12, 13, 29, 30, 31

Ranchos: 6, 7, 10, 11, 12, 13, 15, 29

Salinity: 50

Salton Sea: 35, 42

San Diego Aqueduct: 38, 39, 41, 42

San Diego County Water Authority: 26, 27, 28, 36, 38, 39, 40, 41, 42, 44, 45, 47, 50, 51, 52, 53, 54, 55, 56

San Diego County Water Company: 26, 28

San Diego de Alcalá: 7, 8, 9, 10, 12

San Diego Flume Company: 20, 21, 22, 25, 26, 28

San Diego River: 2, 5, 8, 9, 13, 15, 17, 20, 23, 26, 27, 29, 33

San Diego Water Company: 17, 19, 21, 24, 26

San Dieguito Mutual Water Company: 25, 26, 28

San Luis Rey: 7, 10, 12, 23, 52

San Pasqual Water District: 18

San Vicente Aqueduct: 39, 40

Serra, Father Junípero: 5, 7, 9

Sefton, Joseph W.: 21

Seven Party Agreement: 36, 37, 42

Southern California Mountain Water Company: 21, 22, 24, 25, 26, 28

Spreckels, John D.: 21, 22, 25, 26, 27

State Water Project: 42, 43, 45, 46

Sweetwater: 17, 18, 23, 26

Swing-Johnson Bill: 35, 42

Treaty of Guadalupe-Hidalgo: 13, 30

U.S. Department of Interior: 37, 42

Upside-down river: 8

Van Dyke: 19, 21, 26

Vista Irrigation District: 35, 41

Water conservation: 33, 47, 48, 49, 51, 54

Water recycling: 49, 50, 51, 52, 53, 54