To Quench a Thirst

a brief history of water in the San Diego region
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.
Foreword

Water, quite simply, is the San Diego region’s most precious natural resource. Its value is immeasurable, sustaining and growing our economy, and supporting this region’s enviable quality of life. Ensuring a safe, reliable water supply has been a consistent challenge for San Diego (and for the rest of California, for that matter) for centuries. Many times while in public office I saw up close the highs and lows connected with how well our taps were flowing.

While serving as mayor of San Diego, the region enjoyed strong economic growth and began to emerge as a diverse business hub as a steady stream of imported water flowed to the region. Later, in my last years as a U.S. Senator and in my first years as governor, I saw San Diego and many other parts of the state suffer severe blows to their economies and livelihoods as California weathered a six-year drought.

That drought was a fundamental turning point for San Diego County, as this book later describes. Out of that crisis came a unified regional resolve to use visionary planning and smart investments to ensure San Diego’s water supplies would be much more resilient to shortages. In 1998, I was privileged to play a role in helping San Diego diversify its water supplies by signing into law a bill that provided essential funding and authorizations that enabled the Water Authority to obtain its own Colorado River water supplies through a historic water conservation and transfer agreement, and two major canal-lining projects. It was a major milestone that will benefit San Diegans for generations. But the challenge of providing a safe, reliable water supply has increased since then, owing to population growth, climate uncertainties, and the needs of our modern, diverse and complex economy.

The public needs to be knowledgeable and engaged in water issues to ensure our great communities will continue to thrive. A critical component of that knowledge is an understanding of our water history and the forces that shaped our current water supplies and infrastructure.

This book, inspired and developed by the Water Authority and generously funded by the Hans and Margaret Doe Charitable Trust, improves that understanding. It is an easy-to-read overview of the development of the region’s water resources, and how it has been affected by politics, personalities and landmark events. I hope you enjoy reading this book, and that it inspires you to be involved in water issues of vital importance to our region.
To Quench a Thirst
a brief history of water in the San Diego region

Book Concept and Development
Ivan Golakoff
Education Programs Supervisor (retired)

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

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

Updates Written by
Mike Lee
Public Affairs Representative II
Media Relations

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, Jason Foster, Dana Friehauf, Deborah Hack, Daniel Hentschke, Laura Kitchen, Kim Laru, Gina Molise, Kelly Mooney, Donna Nenow, Mark Stadler and James Taylor.

and

Bob Friedgen
Former General Manager, Helix Water District

Cheryl Hinton
Barona Museum and Cultural Center

© 2013, 2005, 2003 by The San Diego County Water Authority. All rights reserved.
# Table of Contents

**Preface**

**Part 1**  **Living with the Region’s Water Supply**

<table>
<thead>
<tr>
<th>Introduction</th>
<th>Managing an Extreme Climate</th>
<th>Page 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 1</td>
<td>Ancient Days</td>
<td>pre-1769</td>
</tr>
<tr>
<td>Chapter 2</td>
<td>Spanish Missions</td>
<td>1769 to 1820</td>
</tr>
<tr>
<td>Chapter 3</td>
<td>Mexican Period</td>
<td>1821 to 1848</td>
</tr>
<tr>
<td>Chapter 4</td>
<td>Early American Period — Using Local Water</td>
<td>1848 to 1870s</td>
</tr>
<tr>
<td>Chapter 5</td>
<td>Creating Water Companies</td>
<td>1870s to 1920s</td>
</tr>
<tr>
<td>Chapter 6</td>
<td>Pueblo Water Rights</td>
<td></td>
</tr>
</tbody>
</table>

**Part 2**  **Developing the Next Generation of Water Supplies**

<table>
<thead>
<tr>
<th>Introduction</th>
<th>Over the Next Hill</th>
<th>Page 33</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chapter 7</td>
<td>Colorado River Water</td>
<td>1920s and on</td>
</tr>
<tr>
<td>Chapter 8</td>
<td>Water from the North</td>
<td>1950s and on</td>
</tr>
<tr>
<td>Chapter 9</td>
<td>Reliability Through Diversification</td>
<td>1990s and on</td>
</tr>
<tr>
<td>Chapter 10</td>
<td>A Long-term Commitment to Reliability</td>
<td>21st Century</td>
</tr>
</tbody>
</table>

*Notes*  
*Maps and Charts*  
*Index*  

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

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 3.1 million people and a $188 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 became almost entirely dependent on imported water and then implemented a long-term strategy to create a more diversified and reliable water supply portfolio.

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

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 counties 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. 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.

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...
Introduction: Managing an extreme climate

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.”

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 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.

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.

In short, water is one of this region’s most formidable challenges, requiring community cooperation and engineering ingenuity.
Chapter 1: Ancient Days pre-1769

The world in the beginning was a pure lake. The Sky came down upon the Earth. Tu-chai-pai, the Maker, and Yu-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

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 Luiseno near Oceanside, the Cahuilla, 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.

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.
Chapter 1: Ancient Days

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 soil 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.

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 bags 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.

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. 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
Chapter 1: Ancient Days

Chapter 1: Ancient Days

Chap 1REV_Chap 1.qxd  6/19/2013  9:43 AM  Page 5

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.

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

Luiseño huts (or ramadas) at Cabrillo Celebration 1892
The San Diego Historical Society
Chapter 1: Ancient Days

decayed, 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 Spaniards, 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
Campus, 1918
The San Diego Historical Society
Chapter 2: Spanish Missions 1769 - 1820

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.

Sixty years later, in 1602, Sebastián Vizcaíno explored the region and found it good for settlement.

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. Luckily, the natives they encountered steered them to pools and springs, where the explorers noted "well made" pots (ollas) storing water.

Back at the harbor, another padre, Father Juan Crespi 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. Later he wrote again with what must have been both disappointment and astonishment:

… We 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.

THE "UPSIDE-DOWN" RIVER

Father Crespi 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." 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.

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
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.”

**Chapter 2: Spanish Missions**

**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 1835, 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
Chapter 2: Spanish Missions

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.

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

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.

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.

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.

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

World events seemed to pass the San Diego region by in the early 1800s. The Spanish authorities were pre-occupied with a growing rebellion in Mexico and they largely ignored the under-populated northern outpost, California. 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.”

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.

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 Diego Ranch 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.

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

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

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.

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

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 ruined.

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. Nevertheless, the missionaries left a legacy of communal water law that would eventually color the way water was distributed throughout the county.
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. 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.
Chapter 3: Mexican Period

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

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!

Most of the county’s water supply, however, was still meager. The people in the back-country 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.

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.

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...
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.

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.” 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.”

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

Chapter 4: Early American Period

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

Alonzo E. Horton portrait both from The San Diego Historical Society
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." Water was 25 cents a bucket — a private in the U.S. Army earned only $13 a month.8

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."12

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."12 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.  

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.

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). 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 1890s, 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.
Chapter 5: Creating Water Companies 1870s - 1920s

THEBoom 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.” 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.

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

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.

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 16 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.²

Left: Flume at east side of Chocolate Creek, 1887-1888
Right: Construction of Los Coches, “Sweetwater” Trestle
The San Diego Historical Society
Chapter 5: Creating Water Companies

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. 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.”

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.

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. 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,
Chapter 5: Creating Water Companies

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.”

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.

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.”

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 from the San Diego Historical Society
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." 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." 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.
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.

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.

Damaged bridge at Old Town after the 1916 flood
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.”

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 Waitford.) 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 1948.18

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**

<table>
<thead>
<tr>
<th>Year</th>
<th>Company Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1869</td>
<td>Kimball Brothers Water Company</td>
<td>Supplied by the Sweetwater Reservoir on the Sweetwater River. Sold water to irrigators.</td>
</tr>
<tr>
<td>1873</td>
<td>San Diego Water Company</td>
<td>First water company in the city of San Diego. Sold water from the San Diego River to the city’s urban and domestic use.</td>
</tr>
<tr>
<td>1886</td>
<td>San Diego Flume Company</td>
<td>Formed by Theodore Van Dyke and others to set 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.</td>
</tr>
<tr>
<td>1894</td>
<td>Southern California Mountain Water Company</td>
<td>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.</td>
</tr>
<tr>
<td>1901</td>
<td>Consolidated Water Company</td>
<td>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.</td>
</tr>
<tr>
<td>1910</td>
<td>Cuyamaca Water Company</td>
<td>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 Capon Valley in 1968 under Harry Griffin’s direction. Renamed Helix Water District in 1973, as the former agricultural area became totally urban.</td>
</tr>
<tr>
<td>1918</td>
<td>San Dieguito Mutual Water Company</td>
<td>Built Hodges Dam and Reservoir.</td>
</tr>
<tr>
<td>1920</td>
<td>San Diego County Water Company</td>
<td>Formed to build Lake Henshaw and Henshaw Dam.</td>
</tr>
<tr>
<td>1944</td>
<td>San Diego County Water Authority</td>
<td>Formed as a public agency to develop, import and distribute water that originated outside of the county.</td>
</tr>
</tbody>
</table>
Chapter 5: Creating Water Companies

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. 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. 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 24 member agencies.
Chapter 5: Creating Water Companies

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

<table>
<thead>
<tr>
<th>Dam</th>
<th>Completed</th>
<th>Capacity in acre-feet</th>
<th>Built by/Owned by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweetwater</td>
<td>1886</td>
<td>30,079</td>
<td>Kimball Brothers Water Company/Sweetwater Authority</td>
</tr>
<tr>
<td>Cuyamaca</td>
<td>1886</td>
<td>8,196</td>
<td>San Diego Flume Company/Helix Water District</td>
</tr>
<tr>
<td>Lower Otay</td>
<td>1897</td>
<td>49,849</td>
<td>Southern California Mountain Water Company/City of San Diego</td>
</tr>
<tr>
<td>Morena</td>
<td>1912</td>
<td>50,684</td>
<td>Southern California Mountain Water Company/City of San Diego</td>
</tr>
<tr>
<td>Escondido</td>
<td>1895</td>
<td>6,506</td>
<td>Escondido Mutual Water Company/City of Escondido</td>
</tr>
<tr>
<td></td>
<td>(Lake Wohlford)</td>
<td>1924*</td>
<td></td>
</tr>
<tr>
<td>San Dieguito</td>
<td>1918</td>
<td>883</td>
<td>Santa Fe Irrigation District/San Dieguito Water District &amp; Santa Fe Irrigation District</td>
</tr>
<tr>
<td>Murray</td>
<td>1918</td>
<td>4,664</td>
<td>La Mesa, Lemon Grove and Spring Valley Irrigation District/City of San Diego</td>
</tr>
<tr>
<td>Hodges</td>
<td>1918</td>
<td>30,251</td>
<td>San Dieguito Mutual Water Company/City of San Diego</td>
</tr>
<tr>
<td>Barrett</td>
<td>1922</td>
<td>34,806</td>
<td>San Diego County Water Company/City of San Diego</td>
</tr>
<tr>
<td>Henshaw</td>
<td>1922</td>
<td>51,774</td>
<td>San Diego County Water Company/Vista Irrigation District</td>
</tr>
<tr>
<td>El Capitan</td>
<td>1934</td>
<td>112,807</td>
<td>City of San Diego</td>
</tr>
<tr>
<td>San Vicente</td>
<td>1943</td>
<td>89,312</td>
<td>City of San Diego</td>
</tr>
<tr>
<td></td>
<td>2013*</td>
<td>240,791</td>
<td>Expanded capacity (152,000 AF) owned by San Diego County Water Authority</td>
</tr>
<tr>
<td>Loveland</td>
<td>1945</td>
<td>25,400</td>
<td>California Water and Telephone Company/Sweetwater Authority</td>
</tr>
<tr>
<td>Sutherland</td>
<td>1954</td>
<td>29,508</td>
<td>City of San Diego</td>
</tr>
<tr>
<td>Miramar</td>
<td>1960</td>
<td>6,682</td>
<td>City of San Diego</td>
</tr>
<tr>
<td>Ochre Hartt (Lake Jennings)</td>
<td>1962</td>
<td>9,790</td>
<td>Helix Water District</td>
</tr>
<tr>
<td>Dixon</td>
<td>1970</td>
<td>2,606</td>
<td>City of Escondido</td>
</tr>
<tr>
<td>Poway</td>
<td>1971</td>
<td>3,330</td>
<td>City of Poway</td>
</tr>
<tr>
<td>Turner</td>
<td>1971</td>
<td>1,612</td>
<td>Valley Center Municipal Water District</td>
</tr>
<tr>
<td>Red Mountain</td>
<td>1985</td>
<td>1,335</td>
<td>Fallbrook Public Utility District</td>
</tr>
<tr>
<td>Ramona</td>
<td>1988</td>
<td>12,000</td>
<td>Ramona Municipal Water District</td>
</tr>
<tr>
<td>Olivenhain</td>
<td>2003</td>
<td>27,774</td>
<td>San Diego County Water Authority</td>
</tr>
</tbody>
</table>

*Rebuilt  *When completed in 2013
Chapter 6: Pueblo Water Rights

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

Principle of traditional Spanish water law

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.

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.” 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 individual.” These exceptions to the absolute rights of pueblos acknowledged the complexity of life-and-death water issues in an arid land.

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. 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. 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*
Chapter 6: Pueblo Water Rights

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.

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.

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.”

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.
Part II: Developing the Next Generation of Water Supplies

Introduction—Over the Next Hill

Even during the struggle over who could develop the San Diego River in the 1920s, people were beginning to look beyond the county’s footprint for water resources. The optimists believed that just one more water development project would solve their needs—but that goal proved elusive. An increasingly large group of residents came to realize that San Diego County would have to go the way of Los Angeles County and start importing water to meet the needs of a growing population and economy.

Gradually, the San Diego region would look “over the next hill” to the Colorado River and then to Northern California rivers fed by the abundant snows of the Sierra Nevada. During the last half of the 20th century, the county became increasingly dependent on imported supplies and almost every drop of drinking water came from distant sources.

Droughts, regulatory restrictions on water sources and the fear of a major earthquake severing imported water supply lines helped remind county leaders about the need to find new imported supplies they could better control—and to develop new local sources that could avoid some of these risks altogether. Starting in the early 1990s, far-sighted and creative thinking by the Water Authority turned those opportunities into a diversified and much more reliable water supply portfolio with few equals.

Part Two looks at how the county has succeeded in acquiring and maintaining a reliable water supply.
Chapter 7: Colorado River Water 1920s and on

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. 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.

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 1929 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.

\[\text{COLORADO RIVER COMPACT}\]

\[\text{Chapter 7: Colorado River Water 1920s and on}\]

\[\text{FROM LOCAL ISSUES TO REGIONAL PROJECT}\]

\[\text{COLORADO RIVER COMPACT}\]
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.

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).
Chapter 7: Colorado River Water

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.1

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.2
Chapter 7: Colorado River Water

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. 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, then State Senator Ed Fletcher introduced a bill in 1943 for the formation of the San Diego County...
Chapter 7: Colorado River Water

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. 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 66,000 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. 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
Chapter 7: Colorado River Water

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. 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.
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.”

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.

#### 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

#### 24 CURRENT WATER AUTHORITY MEMBERS (2013)

- 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
- Lakeside Water District
- National City
- Olivenhain Municipal Water District
- Otay Water District
- Palomar Dam Municipal Water District
- Pendleton Military Reservation
- Rainbow Municipal Water District
- Ramona Municipal Water District
- Pinecrest del Osoado Municipal Water District
- San Dieguito Water District
- South Bay Irrigation District
- Valetteos Water District
- Valley Center Municipal Water District
- Vista Irrigation District
- Yuima Municipal Water District
Chapter 7: Colorado River Water

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.
1907  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  Seven Party Agreement in California agreed upon priorities for dividing Colorado River water within the state.
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.
1946  All-American Canal delivered water to the Imperial Valley.
1946  Senator Fitchett introduced bill to create the San Diego County Water Authority.
1946  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.
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.
2006  Coachella Canal completed.
2010  All-American Canal completed.

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:

<table>
<thead>
<tr>
<th>Service Area</th>
<th>Population</th>
<th>Est. for 2000</th>
<th>Actual 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Diego</td>
<td>2,845,000</td>
<td>725,000</td>
<td></td>
</tr>
</tbody>
</table>

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."
"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)

Chapter 8: Water From the North 1950s and on

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.

The environmentally sensitive San Francisco Bay/Sacramento-San Joaquin River Delta is the source of water for the State Water Project
Chapter 8: Water From the North

**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.

**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 several Northern California rivers, 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 State Water Project proposal launched a bitter north-south controversy. Northern Californians asked, “Why should 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, Gov. Goodwin Knight assembled a Water Lawyers Committee that was equally divided among Northern Californians and Southern Californians, Democrats and Republicans, and legislators and outsiders. William H. 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.”

Under the leadership of Gov. Edmund G. “Pat” Brown, the State Water Project eventually 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 plan, a “Peripheral Canal” around the environmentally sensitive Bay-Delta, was never built as it was defeated in a statewide referendum in 1982. As a result, the State Water Project never delivered as much water as originally intended. The effort to find an alternative method to reliably deliver the water continues to this day.

Environmental degradation in and around the Delta caused additional complications. During
the 1990s, Gov. 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 would restore the Bay-Delta as both a reliable water source and a healthy habitat for fish and wildlife. This collaborative body became known as the CalFed Bay-Delta Program. In 2000, CalFed completed a comprehensive management plan, which was embodied in a Record of Decision endorsed by state and federal agencies.

In the decade since CalFed released its plan, there has been intense conflict on how to move water from, through or around the Bay-Delta to users elsewhere. The state Legislature created the California Bay-Delta Authority to implement CalFed’s plan. After the release of an independent report by the Little Hoover Commission that found CalFed’s plan to be “costly, underperforming, unfocused and unaccountable,” the state Legislature dissolved the California Bay-Delta Authority and moved all Bay-Delta-related funding to the Office of the Secretary of Resources (later the California Natural Resources Agency). Meanwhile, populations of fragile species in the Bay-Delta continued to decline.

**MILESTONES IN STATE WATER DEVELOPMENT**

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930s</td>
<td>Central Valley Project proposed, but put on hold because of lack of funds during the Depression.</td>
</tr>
<tr>
<td>1937-</td>
<td>1940 Central Valley Project built by the U.S. Bureau of Reclamation.</td>
</tr>
<tr>
<td>1957</td>
<td>Feather River Project (State Water Project) proposed.</td>
</tr>
<tr>
<td>1960</td>
<td>State Water Project approved by voters (Governor Pat Brown).</td>
</tr>
<tr>
<td>1978</td>
<td>MWD delivered State Water Project water from Northern California to the San Diego region.</td>
</tr>
<tr>
<td>1982</td>
<td>Statewide referendum defeated Peripheral Canal portion of SWP.</td>
</tr>
<tr>
<td>1994</td>
<td>CalFed formed to resolve issue of transporting SWP water through the Delta.</td>
</tr>
<tr>
<td>2000</td>
<td>CalFed published plan to fix Delta and address challenges over the next 50 years.</td>
</tr>
<tr>
<td>2002</td>
<td>The state created the California Bay-Delta Authority to oversee implementation of CalFed’s plan, but CBDA had no authority to regulate or coordinate the state and federal agencies activities required under the plan.</td>
</tr>
<tr>
<td>2005</td>
<td>Little Hoover Commission found CalFed to be “costly, underperforming, unfocused and unaccountable.”</td>
</tr>
<tr>
<td>2006</td>
<td>The Office of the Secretary of Resources (now the California Natural Resources Agency) absorbed CBDA functions.</td>
</tr>
<tr>
<td>2009</td>
<td>The Bay-Delta Conservation Plan, an effort among state, federal, and stakeholder groups, is a conservation strategy aimed at protecting species of fish, plants, and wildlife, while permitting reliable operation of the State Water Project and Central Valley Project. The BDCP includes aspects of the CalFed plan.</td>
</tr>
<tr>
<td>2013</td>
<td>State Legislature adopted the Delta Reform Act of 2009, which created the Delta Stewardship Council to create a Delta Plan that achieves the state mandated coequal goals for the Delta and dictated that the BDCP be integrated into the Delta Plan.</td>
</tr>
<tr>
<td>2013</td>
<td>Administrative drafts of BDCP released.</td>
</tr>
</tbody>
</table>
In 2008, a federal judge issued a ruling that exacerbated the challenges of water deliveries from the Bay-Delta by invalidating biological opinions that had guided operations of the State Water Project and the Central Valley Project for years. The judge’s decisions and new biological opinions called for more protections of imperiled fish species. Subsequent new biological opinions severely limited the availability of water that may be exported from the two projects. Later, the same judge decreed that the new biological opinions did not adequately explain the link between project operations and the decline of fish species and, further, failed to consider the impacts of water export restrictions on human activity and the economy. As a result, restrictions on project water exports remain in place, but they are not as stringent as the 2008 restrictions.

In 2009, the Legislature created the Delta Reform Act of 2009 that established the co-equal goals of providing a more reliable water supply for California and protecting, restoring and enhancing the Bay-Delta ecosystem. Another outcome of the act was the establishment of the Delta Stewardship Council, tasked with developing and implementing a comprehensive management plan known as the Delta Plan. The Legislature also passed an $11.1 billion bond measure to fund new water projects around the state. The measure was deferred twice and eventually planned for the 2014 ballot. Additionally, the Delta Reform Act dictated that the Bay Delta Conservation Plan, a joint state and federal effort focused on balancing water supply reliability and ecosystem health, be integrated into the Delta Plan crafted by the Delta Stewardship Council if it meets the standards in state and federal environmental restoration laws.

In 2012, Gov. Jerry Brown and U.S. Interior Secretary Ken Salazar outlined a framework for the proposed BDCP, intended to achieve the “co-equal goals.” Rather than proposing a Peripheral Canal, they proposed the construction of two large tunnels to carry water under the Bay-Delta.

The Water Authority’s Board of Directors supports securing a long-term fix for the Bay-Delta, with the assurance that the project can be paid for and maintained by all stakeholders. Seeking to ensure a “business case” could be made for the project, the Water Authority in 2013 joined a group of urban water agencies, environmental organizations and business groups seeking an alternative “portfolio” approach be thoroughly evaluated in the BDCP. The portfolio approach called for building a smaller, single tunnel and investing in an
array of local water supply projects to reduce reliance on imported water. The BDCP process is expected to conclude in 2013. Whatever the outcome, the fate of the Bay-Delta will influence the state’s water policies and politics for the foreseeable future.

**RELIANCE ON AFAR**
Since the State Water Project supplemented water supplies from the Colorado River, San Diego County now relied on imported water for 75 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.
Chapter 9: Reliability Through Diversification

“San Diego’s experience demonstrates that for communities reliant on imported water from vulnerable ecosystems, diversifying their supply portfolios with an emphasis on local sustainability is the smart path forward.”

Carpe Diem West
A nonprofit organization of water managers, scientists and conservationists (2013)

FOSTERING RESILIENCY

San Diego County blossomed in the decades following World War II, watered by cheap and seemingly endless supplies delivered first through the Colorado River Aqueduct and eventually through the State Water Project. Universities sprang up. The defense industry boomed. Major League Baseball arrived. Horton Plaza gave the fast-growing legions of suburbanites a downtown destination after San Diego’s then-Mayor Pete Wilson and developer Ernest Hahn helped resurrect the city’s center. The county’s population more than tripled between 1940 and 1960, then nearly doubled again by 1980.² Thanks to the big investments in pipes and canals a generation earlier, the region didn’t lack access to water for its fast-growing economy.

But a dark cloud loomed on the horizon and steadily became more menacing. San Diego County had become far too reliant on one supplier of imported water: The Los Angeles-based Metropolitan Water District of Southern California provided up to 95 percent of the San Diego region’s water. To compound the problem, the water rights to more than half of the water that San Diego County purchased each year actually “belonged” to other MWD member agencies that weren’t using the amount reserved for them. That over-reliance put the region’s economy and quality of life at risk – and eventually resulted in an ambitious new strategy to secure San Diego County’s future. Today, the visionary approach to diversify the region’s water supplies adopted by the Water Authority is a national example of how regions can take control of their water resources through sound investments and a tenacious commitment to reliability.

The situation was far different in the late 1980s. Confidence in San Diego County’s water supply system was starting to crumble.
as drought squeezed California. One dry year turned into two, and two into four so that by late 1990, San Diego County was in crisis. In November of that year, MWD instituted the first stage of its shortage allocation plan—small-scale reductions that would have amounted to little more than an annoyance.

But conditions continued to deteriorate, and in February 1991 MWD imposed a 20 percent cut to the San Diego region’s urban water users and a 50 percent cut to its agricultural water users for an overall supply reduction of 31 percent.

While such severe cuts presented a huge challenge for the region, things soon became worse when MWD announced plans to slash urban water deliveries to San Diego County by 50 percent. That reduction would have hit the region disproportionately hard, fundamentally altering life for nearly 2.5 million residents. The situation was even worse for the county’s $1 billion agricultural sector. Farmers faced reductions of 90 percent in water supplies—an unthinkably low number that would have devastated one of the region’s economic engines.

Headlines of the era tell the story: “Companies cringe at 50 percent cut in water,” said one. “50% Water-Delivery Cut Will Be Blow to San Diego,” screamed another. “Water Dependence Bodes a Dry San Diego Future,” predicted a third. Just as MWD’s deeper cuts were about to take effect, it started raining. And raining. And raining some more. It rained so much that month that “Miracle March” entered the local lexicon and MWD-enforced cutbacks were held to “only” 31 percent. Even though the worst threats didn’t materialize, the supply allocations continued for 16 months, dealing a strong blow to San Diego County and its economy.

Such painful restrictions in the water supply chain galvanized the region’s business and
Chapter 9: Reliability Through Diversification

community leaders. Why, they demanded, did the Water Authority depend on a single supplier for virtually all of its water? What kind of investment strategy relies 95 percent on a single source of supply, they asked. The rallying cry boiled down to a few words that still resonate: “Never again! No more water shortages!”

While the concept of diversification crystallized quickly, the actual strategy was complicated and time-consuming to put in place. Imported supply options other than the Colorado River and the State Water Project – say, the Columbia River or Alaskan icebergs – were just too far away to be practical. Worse still, access to existing water sources was becoming more restricted. Environmental laws made managing water supplies more complex, while water pollution, swelling demand for water across the Southwest, droughts and interstate legal battles added stress.

As these challenges mounted, the Water Authority carefully charted a new course for meeting the region’s water needs through a variety of sources – the water supply equivalent of a diversified stock portfolio. The multi-pronged approach relied on billions of dollars of regional investment. Progress also required rethinking the way things had always been done and challenging notions of what is possible. The blueprint – which continues to evolve two decades later – includes long-term water transfers, conservation, water recycling, groundwater development and seawater desalination.

Over time, that strategy radically reduced San Diego County’s reliance on any single water supply. The Water Authority trimmed dependence on MWD to about 45 percent by 2012, and by 2020 the region is expected to get just 30 percent of its water from MWD.

Increasing demands across the southwest for Colorado River water was one of many factors leading to supply diversification.
Chapter 9: Reliability Through Diversification

GROWING WATER TRANSFERS

Long-term water transfers were among the first diversification options developed by the Water Authority after the 1987-92 drought, and today they form the cornerstone of the region’s reliability strategy. The notion is simple: Move water from regions where it is abundant – oftentimes far away from population centers – to places where users are willing to pay for increased supplies. In practice, however, water transfers are complicated by decades of court processes and legal agreements that stipulate where water can be used and who can use it.

In 1995, the Water Authority began negotiations with the Imperial Irrigation District for the transfer of up to 500,000 acre-feet of water per year from the fertile farming area in the southeastern corner of California. In 1998, the Water Authority and IID signed an agreement that provided for the transfer of between 130,000 and 300,000 acre-feet per year, depending on the exercise of certain options. Despite legislation signed in 1998 by then-Gov. Pete Wilson to encourage the transfer, its actual implementation took five more years to materialize.

Faced with the prospect of reduced sales to its largest customer, MWD responded to the Water Authority-IID deal with an all-out battle to protect its monopoly. In late 2003, pressure from the Legislature and the governor forced MWD to back down. It joined the Water Authority, IID, the Coachella Valley Water District, the state of California and the U.S. Department of the Interior in signing the historic Colorado River Quantification Settlement Agreement. The QSA created a plan for limiting the state’s use of Colorado River water to its basic annual apportionment of 4.4 million acre-feet, instead of continuing to rely on surplus supplies that belonged to other fast-growing states in the Southwest.

The linchpin of the deal was a long-term schedule for transferring conserved water from the Imperial Valley to San Diego County. It

MILESTONES FOR CONSERVATION & WATER TRANSFERS

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
</table>
| 1986 | Agricultural water conservation undertaken, reducing water consumption by 20 to 30%.
| 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. |
| 2006 | Coachella Canal lining completed. |
| 2010 | All-American Canal lining completed. |
called for conveying up to 200,000 acre-feet of conserved Colorado River water annually to San Diego County for up to 75 years, if both parties agree to extend the arrangement after the first 45 years. The water is delivered to the San Diego region through MWD’s Colorado River Aqueduct. In addition to the transfer, the QSA provides for lining portions of the All-American and Coachella canals that traverse Imperial and Riverside counties, then transferring the water conserved by the projects to San Diego County.

Beginning in 2003, QSA-related supplies began flowing into the San Diego region. They quickly provided a major reliability benefit, and transfers are scheduled to grow so that by 2020 they will meet one-third of the region’s water demand. Over 110 years, the QSA could provide the Water Authority with 21 million acre-feet of water – a huge victory for regional water-supply reliability.

EMBRACING CONSERVATION

As the Water Authority helped craft the QSA, it also expanded its conservation initiative – a critical element of the diversification strategy that relied both on county residents and state lawmakers. Conservation got a jump-start from the 1987-92 drought, when emergency conditions quickly drove down water consumption. Nonetheless, regional leaders realized that it would take a comprehensive and coordinated approach to make water-use efficiency a way of life. The Water Authority’s long-term strategy included financial incentives, education campaigns and new state legislation aimed and driving down per-capita water use.

In the early 1990s, the Water Authority helped launch the California Urban Water Conservation Council, which sets standards for conservation programs and helps spread best management practices statewide. Water agencies provided customers with free on-site

Mediterranean landscapes are beautiful and water-efficient
water-use evaluations to identify specific measures for improving water-use efficiency. They also offered vouchers to help pay for low-flow faucets, showerheads and toilets, along with water-efficient appliances. It was a strategic approach – water-smart appliances and plumbing retrofits create permanent water savings that don’t require people to alter their habits – and an approach that turned out to be very popular. Since 1990, more than 1.2 million conservation devices such as high-efficiency clothes washers and water-saving showerheads have been installed in San Diego County.

In Sacramento, the Water Authority played a leadership role in the state’s efforts to promote water conservation by sponsoring legislation that set new efficiency standards for toilets (1.6 gallons per flush) and for metering water use at all homes statewide. The Water Authority also sponsored AB 1561 in 2002 that set water conservation standards for high-efficiency clothes washers sold in California and helped boost market acceptance of the technology.

In addition, the Water Authority championed efforts to make water-efficient landscapes the norm by sponsoring legislation requiring up-to-date water-efficient landscape ordinances for every city in California. And in 2009, the Water Authority supported the passage of SBX7-7, which established a statewide goal of a 20 percent reduction in per capita water use by 2020.

The Water Authority also took its conservation message to the streets. In 2006, it convened the region’s first Water Conservation Summit at the University of San Diego. “The idea that we can keep building pipe and (that) water will be at the end of that pipe is not true any longer,”

**The region’s first Water Conservation Summit was in 2006**
Water Authority General Manager Maureen Stapleton said at the time. The summit helped focus attention on climate-appropriate landscaping and efficient irrigation. More than half of the water used at the typical home is used outdoors, creating an opportunity for major savings with the adoption of plants that don’t demand a lot of water, and the installation of “smart” irrigation systems that minimize water use by accounting for soil and weather conditions.

In response to drought and water-shortage conditions between 2007 and 2011, the Water Authority rolled out conservation campaigns such as the 20-Gallon Challenge. That highly successful program inspired residents around the region to reduce their water use by 20 gallons per person, per day. It was eventually replaced by the WaterSmart initiative, a comprehensive program that embraces water-efficiency as a way of life rather than just a response to drought conditions.

The coordinated, multifaceted conservation strategy produced dramatic results and put the region on track to meet its 2020 water-efficiency target. Per capita water use in the San Diego region plummeted by more than 30 percent between 2007 and 2012, and total regional water use remains below 1990 levels despite the addition of roughly 600,000 people. Not only have residents embraced conservation activities, but 95 percent of respondents to a 2012 opinion survey said it’s their civic responsibility to use water as efficiently as possible. With that kind of public support, the Water Authority expects to meet 13 percent of its projected water demand in 2020 through conservation.

**RECYCLING WATER SUPPLIES**

Another local water source that grew over the years was water recycling, a process that involves capturing wastewater, treating it and reusing it. Recycled water is distributed around the region in distinctive purple pipes for industrial purposes, and for landscape irrigation at golf courses, business parks and other large sites. In 2012, roughly 27,000 acre-feet of recycled water annually...
was beneficially reused within the Water Authority’s service area. The Water Authority’s member agencies plan to use almost 40,000 acre-feet of recycled water per year by 2020.

In addition, the Water Authority’s largest member agency, the city of San Diego, thoroughly investigated a more novel approach to water recycling that involves using highly treated recycled water to augment surface water supplies. The city’s concept is to pipe highly purified water 22 miles from a proposed treatment plant to San Vicente Reservoir, where it would mix with other supplies before being treated again to meet all state and federal drinking water standards, and then distributed to customers. In 2009, San Diego embarked on a demonstration project that supported the technology’s promise, and the City Council is expected to evaluate the potential for full-scale “indirect potable reuse” in 2013. If the city moves ahead and state regulators give the green light, it would take approximately 10 years to build the plant and pipeline.

While the prospect of recycling wastewater into drinking water faced public skepticism in the 1990s and early 2000s, opinion polls showed that the process has become increasingly palatable to the public. More than 7 in 10 respondents to the Water Authority’s 2012 survey believed it’s possible to make recycled water pure and safe for drinking – up from 28 percent in 2005.

**TAPPING GROUNDWATER**

Unlike Los Angeles and Orange counties, groundwater in San Diego County is constrained by the region’s geology. However, even limited groundwater is a valuable local source.

Many local groundwater basins contain water that is too salty for drinking – some are naturally salty, as settlers discovered in the 1800s, and others have become salty because of irrigation and seawater intrusion due to
over-pumping. To overcome those challenges, two groundwater desalination facilities operate in San Diego County. Oceanside’s Mission Basin Groundwater Purification Facility provides 15 percent of the city’s water supply using reverse osmosis to treat brackish groundwater by reducing salt concentrations. The facility started in 1992 with a capacity of 2 million gallons per day and expanded to its current capacity of 6.4 mgd in 2002.7 The Sweetwater Authority also has developed local groundwater supplies. Its Richard A. Reynolds Groundwater Demineralization Facility opened in 1999, creating drinking water from a source considered useless a few decades earlier.8 Sweetwater – as its name implies – also draws from deep freshwater wells.

Some local water providers have tapped the U.S. Geological Survey to map groundwater supplies in hopes that an integrated assessment will lead to an uptick in pumping. With careful management and the development of additional capacity, water agencies in San Diego County could withdraw close to 27,000 acre-feet annually from groundwater basins by 2020.

Developing Desalination Plans

With roughly 70 miles of coastline in San Diego County, removing salts from ocean water seems like a natural way to boost drinking water supplies, especially since reverse osmosis technology is used successfully to do that around the world. The Water Authority officially recognized that potential in 2003, when it adopted a facilities master plan that identified seawater desalination as a priority. At the time, improving membrane technology made large-scale desalination operations increasingly economical, and a local project started to come together – on paper, at least. By locating a proposed desalination project next to the Encina Power Station in Carlsbad, developers could
save money because they didn’t have to build new seawater intake and discharge infrastructure.

However, a desalination project would not move forward overnight. Nearly a decade of environmental reviews, legal challenges and exploring alternative project concepts would occur before the region was ready to move ahead with this element of the diversification plan. By 2012, the region’s residents were committed to the concept: More than 80 percent of respondents to an opinion poll said seawater desalination is important to the region’s water supply reliability, and more than two-thirds of them said they would be willing to pay more in their water bills each month to add desalination to the region’s water supply portfolio.9

The vision for “water from the West” took a major step toward reality in November 2012, when the Water Authority’s Board of Directors approved a 30-year Water Purchase Agreement with Poseidon Resources for the company to build and operate a seawater desalination plant on the shores of Agua Hedionda Lagoon in the city of Carlsbad. The $1 billion project includes a facility designed to produce up to 50 million gallons a day of potable water, along with a 10-mile, 54-inch diameter pipeline to deliver the supplies to San Marcos, where it connects with the Water Authority’s regional water delivery system. The Water Authority will have the option to buy the plant for $1 at the end of the agreement period.

**DE Salination 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, 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 H2O from the molecules that are dissolved or suspended in it. The Carlsbad Desalination Project will rely on the reverse-osmosis treatment.

*Public meetings for providing input on the proposed Water Purchase Agreement in 2012 drew large crowds*
When it’s operational in 2016, the Carlsbad Desalination Project will be the largest seawater desalination plant in the nation, delivering between 48,000 and 56,000 acre-feet of water a year, or roughly a third of all locally produced water. The Water Authority expects desalination to meet about 7 percent of overall demand in 2020. Not only will the Carlsbad plant provide a drought-proof source, it will reduce San Diego County’s water supply vulnerability to natural disasters and regulatory restrictions. Initially, water produced by the plant and delivered to the Water Authority system will cost about twice as much as less reliable imported supplies from MWD. However, the cost of MWD’s water has risen rapidly in recent years, and water from the Carlsbad plant is expected to cost about the same as supplies from MWD by the mid-2020s.

While that project takes shape, the Water Authority also is evaluating other potential sites for desalination plants, including Camp Pendleton in northern San Diego County and Baja California, Mexico.

STRIKING THE RIGHT BALANCE
It’s been said that the story of San Diego County is the story of the search for water. That search has taken several monumental turns. Prior to 1947, the county relied solely on local resources. Then, the arrival of cheap and abundant imported water facilitated a complete change of direction. For nearly half a century, access to supplies imported through MWD fueled incredible growth in San Diego County’s economy and helped make its communities among the most enviable places to live. It also made the development of more expensive, locally controlled supplies appear less important – for a while.

Since the early 1990s, the price of MWD’s supplies has risen dramatically, while the reliability of those supplies has become increasingly...
This success has not gone unnoticed. In May 2013, the San Diego County Grand Jury issued a report that said the Water Authority “has made substantial progress in diversifying water supply sources” that bolster the region’s economy and quality of life. It concluded that the Water Authority should “continue to pursue a vigorous policy to lessen dependence on imported water by continued conservation, reuse and reclamation, additional emergency storage projects and new desalination projects.”

San Diego County Water Authority Water Supply Diversification 2020
Chapter 10: A Long-term Commitment to Reliability

The Emergency Storage Project “Represents an insurance policy that safe, reliable water will be available to support the region’s economy, the job base, and the quality of life for the more than three million residents, even if the primary water supply lines are temporarily disrupted.”

The San Diego County Grand Jury, 2007

Making Major Investments

While Water Authority leaders looked near and far to diversify water supplies, they realized that new sources couldn’t reach their potential for boosting regional water supply reliability without a coordinated set of major investments in treatment plants, pipelines and reservoirs. Only with those pieces in place would the region have the kind of robust and resilient system that would allow it to make the most of the wet years and survive the dry ones. Beginning in 1989, the Water Authority set its sights on making significant investments in major new water facilities to increase overall system reliability and flexibility. It was a complicated endeavor: Not only did the Water Authority aim to improve its emergency water storage and delivery system, but it needed to add or upgrade facilities that deliver, store and treat water day in and day out.

The commitment evolved and grew over the years, culminating in what became a $3.6 billion Capital Improvement Program, or CIP, by early 2013 that addressed water storage, new pipeline connections, pumping and treatment facilities, and maintenance. The CIP also embraced new opportunities such as facilitating water transfers and generating hydroelectric power.

Mitigating the Threats

Earthquake faults present the most potentially catastrophic vulnerability for Southern California’s water supplies. The aqueduct from Northern California to the Metropolitan Water District of Southern California travels 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. And San Diego County’s location at the end of the pipes means that it will be affected by any major disruption upstream – a situation that prompted the Water Authority to build an emergency storage system south of the Elsinore Fault to provide a secure, local water supply.

But earthquakes aren’t the only threat. The Water Authority also is preparing for potential impacts from a changing climate. As temperatures rise, snowfall and snowmelt patterns are shifting in the Sierra Nevada and the Colorado River Basin. The California Department of Water Resources
Chapter 10: A Long-term Commitment to Reliability

Resources has projected that by 2050, the Sierra snowpack will decline by up to 40 percent of its long-term historical average.\(^1\) Rising sea levels could damage water treatment and water recycling plants, and cause saltwater intrusion in the Sacramento-San Joaquin Bay-Delta. A major levee failure in the Bay-Delta could interrupt critical water supplies from that region. Droughts may become more frequent and more intense. If they do, demand for water likely would rise at the same time that supplies waned.

Given the magnitude of the potential problems, the $1.5 billion Emergency Storage Project is perhaps the most important element of the Water Authority’s OP. It provides a network of new and enlarged reservoirs, pipelines and facilities designed to store and move water if a natural disaster or drought cuts off imported supplies. After a decade of planning, construction of the first facilities began in 2000. When completed, the project will provide up to 90,100 acre-feet of local emergency storage, enough to meet the county’s needs for up to six months.

**BUILDING NEW FACILITIES**

The Capital Improvement Program touched all parts of the county, modernizing and expanding virtually every aspect of the water delivery system. While each element of the program is impressive in its own right, the net effect is greater than the sum of the parts. Together, the investments provide an unprecedented amount of flexibility for storing, treating and distributing water regardless of how weather conditions affect water availability.

The first major new piece of water infrastructure to come online was Olivenhain Dam, situated in the Elfin Forest Recreational Reserve between the cities of Escondido and Encinitas. Completed in 2003, it was the region’s first big dam in 50 years and the first roller-compacted concrete dam built in California. It resulted from...
collaboration between the Water Authority and one of its member agencies, the Olivenhain Municipal Water District, which had considered building a dam at the site for decades because it’s away from development and the topography would allow for a relatively small lake surface area to minimize evaporation. “This is truly an excellent example of interagency cooperation,” former Olivenhain General Manager David McCollom told The San Diego Union-Tribune when the project wrapped up.

To complete the dam, more than 1.4 million cubic yards of concrete were placed at rates as high as 16,000 cubic yards per day during round-the-clock construction. The resulting structure stands nearly 320 feet tall and roughly a half-mile long. It holds back 24,000 acre-feet of water – 18,000 acre-feet for use in regional emergencies and another 6,000 acre-feet for operational use. As part of the Emergency Storage Project, Olivenhain Dam was designed to remain fully functional during and after a magnitude 7.25 earthquake. The reservoir is connected to the Water Authority’s Second Aqueduct, allowing its stored water to be used around the county.

The next really big piece of the CIP to take shape was the Twin Oaks Valley Water Treatment Plant near the city of San Marcos. By the early 2000s, it became clear that growing demands for treated water would soon outstrip the region’s treatment capacity and become a threat to regional water reliability, particularly during the hot summer months. This spurred development of a regional water treatment facility to alleviate the bottleneck. The need for the new plant became obvious to everyone by the mid-2000s, when peak demands bumped up against treatment capacity and led to urgent calls for conservation.

When completed in 2008, the Twin Oaks facility was the largest “submerged membrane”
Chapter 10: A Long-term Commitment to Reliability

plant in the world. It can treat up to 100 million gallons of water per day, enough water for almost 1 million people each year. The plant’s location allows treated water to flow by gravity to the distribution system, without using the energy needed for pumping. Membrane technology mechanically separates contaminants – including viruses and bacteria – from water molecules. The process is so efficient that virtually every drop of raw water entering the plant leaves as high-quality drinking water.

As the Twin Oaks Valley Water Treatment Plant took shape, another remarkable project was advancing in the southeastern corner of the state: lining two major canals that run through Riverside and Imperial counties. As part of the Colorado River Quantification Settlement Agreement of 2003, the Water Authority secured the right to conserved water from lining the All-American and Coachella canals – approximately 80,000 acre-feet per year for 110 years. The Water Authority helped construct approximately 58 miles of concrete-lined canals adjacent to the existing earthen channels. That reduced the amount of canal water that seeped into the ground, making the conserved water available for use in San Diego County. The Coachella project was finished in 2006 and the All-American Canal lining was completed in 2010, giving the San Diego region an invaluable and highly reliable new source of supply.

But work still wasn’t done in San Diego County – not by a long shot. While looking for ways to optimize the region’s water-delivery system, Water Authority engineers realized the potential to link the new Olivenhain Reservoir with the existing Lake Hodges just to the east. Not only would connecting the lakes by a pipeline facilitate...
Chapter 10: A Long-term Commitment to Reliability

movement of Lake Hodges’ water through the regional distribution system, but the Water Authority could capitalize on a rare opportunity to generate electricity in the process. The resulting pipeline rises 770 feet from Lake Hodges to the Olivenhain Reservoir. Moving water uphill requires two 28,000-horsepower pumps that sit 10 stories underground. When water flows downhill through the same pipeline, however, it generates up to 40 megawatts of electricity, enough for 26,000 homes. The Water Authority generates power during the day when energy prices are highest. It pumps water back uphill at night when energy costs are lower, creating revenues in the process.

Completed in 2012, the Lake Hodges Projects include a 1.25-mile underground pipeline, a pump station and an electrical switchyard. The facilities allow water stored in Lake Hodges to be delivered to the Twin Oaks Valley Water Treatment Plant prior to distribution to a majority of the county. They also will give the Water Authority the ability to store 20,000 acre-feet of emergency water at Lake Hodges when the entire Emergency Storage Project is finished.

The final major component of the CIP involved raising San Vicente Dam near Lakeside from 220 feet to 337 feet, nearly tripling the reservoir’s capacity to 242,000 acre-feet. The project started as a bid to boost emergency storage reserves by 52,000 acre-feet, then was “super-sized” to include 100,000 acre-feet of additional water storage for dry years. Work was done in cooperation with the city of San Diego, the Water Authority’s largest member agency and owner of San Vicente Dam. The dam reached its full height in 2012, becoming the tallest dam raise of its type in the world and increasing storage capacity in the county more than any other single project in history. The project also includes an 11-mile, 8.5-foot-diameter pipeline capable of moving vast

THE EMERGENCY STORAGE PROJECT

- New reservoir at Olivenhain with 318-foot-high dam, which is linked by pipeline to Hodges Reservoir for a combined total capacity of 28,000 acre-feet of emergency storage
- Pipelines from Olivenhain Reservoir to the Second San Diego Aqueduct and water transfer pump station
- Raising San Vicente Dam by 117 feet to provide 52,100 acre-feet of emergency storage plus 100,000 acre-feet of storage available during times of scarcity
- Pipeline from the San Vicente Reservoir to the Second Aqueduct
- Six new pump stations

The final major component of the CIP involved raising San Vicente Dam near Lakeside from 220 feet to 337 feet, nearly tripling the reservoir’s capacity to 242,000 acre-feet. The project started as a bid to boost emergency storage reserves by 52,000 acre-feet, then was “super-sized” to include 100,000 acre-feet of additional water storage for dry years. Work was done in cooperation with the city of San Diego, the Water Authority’s largest member agency and owner of San Vicente Dam. The dam reached its full height in 2012, becoming the tallest dam raise of its type in the world and increasing storage capacity in the county more than any other single project in history. The project also includes an 11-mile, 8.5-foot-diameter pipeline capable of moving vast

The final major component of the CIP raised San Vicente Dam from 220 feet to 337 feet
amounts of water in either direction between the reservoir, the Water Authority’s Second Aqueduct and distribution facilities to the north and south. A new and larger marina will be constructed to replace the former marina, and all phases of the dam raise project are expected to be completed by 2015.

PROTECTING THE AQUEDUCTS

As the region’s water system grew, so did the need for aggressive efforts to ensure these vital facilities remain in top working condition. The Water Authority adopted new approaches to taking care of what would become a $5 billion portfolio of assets, including 300 miles of large-diameter pipe.

In the early 1990s, for instance, the agency developed a cutting-edge Aqueduct Protection Program to rehabilitate dozens of miles of major underground pipeline that showed signs of premature decay. This process usually involves workers excavating and removing 40-foot-long sections of pipe at entry points, or portals, roughly 1,500 feet apart. Using specialized equipment, they push steel liners inside the existing pipes on either side of entry portals. The technique is less intrusive to the surrounding community than other approaches and costs about 40 to 60 percent less than pipeline replacement. By mid-2014, this multi-decade effort is on track to reline 39 miles of pipeline. When the program is complete, the Water Authority will have lined 82 miles of large-diameter prestressed concrete cylinder pipelines in the county.

In 2006, the Water Authority became the first water agency in the country to adopt acoustic fiber-optic technology for monitoring its prestressed concrete cylinder pipelines, and the first to adopt local 24-hour monitoring of water pipelines. Seven
years later, the fiber-optic warning system had been installed in more than 44 miles of pre-stressed concrete cylinder pipes. Water Authority engineers and software experts also developed a new asset management program that significantly increased the agency’s ability to forecast and respond to potential problems. Within its first few years, the process resulted in the deferral of $210 million in pipeline and facility projects because detailed condition reports showed they still had years of life left and other projects were a higher priority.

SEEING THE BENEFITS

Through its capital projects and asset management programs, the Water Authority established a reputation for prudent long-term investments and strategic spending to keep its treatment and delivery system working at the highest level of reliability at the least possible cost. That work was supported by other agencies’ projects so that by 2013, there was approximately 590,000 acre-feet of surface storage capacity in San Diego County, mostly in reservoirs owned by the Water Authority’s member agencies. In addition, MWD filled Diamond Valley Lake near Hemet in 2000, and about half of that massive reservoir is earmarked for emergency supplies. At 800,000 acre-feet, it is the largest man-made lake in Southern California and an important buffer against multiple dry years.

Much like the Water Authority’s supply diversification program, its capital program also received favorable reviews. The San Diego County Grand Jury said in 2007 that the Emergency Storage Project “represents an insurance policy that safe, reliable water will be available to support the region’s economy, the job base, and the quality of life for the more than three million residents, even if the primary water supply lines are temporarily disrupted. The members of the Board of Directors and staff involved with this project deserve a vote of thanks for following through on addressing a decades old
Chapter 10: A Long-term Commitment to Reliability

Concern. The Grand Jury’s follow-up report in 2013 revisited some of the same themes, praising the Water Authority’s work and encouraging the agency to continue expanding local water storage capacity. It was a reminder that needs change over time and the job of enhancing water reliability is never done.

Looking Ahead
San Diego County residents have always been creative and determined in their quest to find enough water to keep the county vibrant and prosperous. For more than a century, solutions once thought extreme have turned into reality to meet the region’s water needs. From building wooden flumes through rugged canyons to creating hundreds of miles of modern aqueducts that transport water from remote sources, water users have benefited from stunning projects that have re-engineered water in San Diego County and throughout the West.

Foresight and long-term planning will help the Water Authority carry out its mission of ensuring a reliable water supply to sustain the county’s more than 3 million residents and its $185 billion economy. Water officials are making history with unprecedented agreements to transfer water around Southern California and maintain the economic health of an entire state. Water industry professionals also are pioneering local resource development with seawater desalination to augment conservation, groundwater recovery and water recycling.

Throughout the San Diego region’s history, every resident has depended on water to prosper. Providing that water has not always been easy, and new challenges surely will continue to emerge, requiring new thinking and new solutions. But one thing is certain: with a clear vision and strong community support, the region’s water agencies are united and effective in their purpose: to quench a thirst.
Notes

Preface


Part 1: Living with the County’s Water Supply

Introduction - Managing an Extreme Climate


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: Digueños,” (Native American Lore Index Page, Web, Nov. 2000).


CHAPTER 2: SPANISH MISSIONS 1769-1820


4 Quoted in Hopkins, 40.

5 Quoted in Hopkins, 41.


11 “Missions,” Water at the Mission, 17-20; Hundley, 28, 43-44.

12 Hundley, 36-41.

CHAPTER 3: MEXICAN PERIOD 1821-1848


2 Jennifer Lukic and Nick Kendziorski, “The Use of Presidio Hill,” The Journal of San Diego History Vol. 45, No. 3 (Summer 1999); (online pagination) 5.

Luksic and Kendziorski, 6; “Missions of California (1769-1834),” (Kidport Reference Library, Web, April 2001).

Pourade, *The Silver Dons*, xi.


History and First Annual Report For The Period Ending June 30, 1938 (Los Angeles, California: Metropolitan Water District, 1939), 13, 17.

Pourade, *The Silver Dons*, 16-17; Crane, 3.

**CHAPTER 4: EARLY AMERICAN PERIOD – USING LOCAL WATER 1848-1870s**


Engstrand, 37.

Engstrand, 43.


Quoted in Hopkins, 268.

Fowler, 43-44.

Hopkins, 272.

San Diego’s Quest for Water (San Diego, California: Metropolitan Water District and San Diego County Water Authority, 1947), 2-3.

History and First Annual Report For The Period Ending June 30, 1938 (Los Angeles, California: Metropolitan Water District, 1949), 13, 17.

Fowler, 19, 29-30.

Mitchell Barner, 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

7 Ed Fletcher, Memoirs of Ed Fletcher (San Diego, California: Pioneer Printers, 1952), 161.
8 Adams, [unpaginated].
10 Adams, [unpaginated].
12 Patterson, 12.
14 Fowler, 9; Patterson, 15.
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, 1966), 186-188; Fletcher, 255-256; Pryde, 126-128.
18 Fletcher, 244, 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

2 Hundley, 30-48.
3 History and First Annual Report For The Period Ending June 30, 1938 (Los Angeles, California: Metropolitan Water District, 1949), 11.
4 Hundley, 126-131.
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

CHAPTER 7: COLORADO RIVER WATER 1920s AND ON

2 First Annual Report (San Diego, California: San Diego County Water Authority, 1946), 17-18; Shelley J. Higgins, as told to Richard Mountains, Hans Doe, City of San Diego: Public Policy History (San Diego, California: City of San Diego, 1994), 208.
4 Shelley J. Higgins, as told to Richard Mountains, This Fantastic City: San Diego (San Diego, California: City of San Diego, 1956), 186-192; Fletcher, 220-225; Pryde, 200-210.
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.
10 1994 Annual Report, 22-23; Dave Fogerson, Senior Civil Engineer, San Diego County Water Authority, Conversation with authors, August 2001.
CHAPTER 8: WATER FROM THE NORTH 1950s AND ON

CHAPTER 9: RELIABILITY THROUGH DIVERSIFICATION
2“San Diego City and County Population from U.S. Census Bureau,” (San Diego History Center, Web, June 2013).
5“Water Purification Demonstration Project,” (San Diego, California: City of San Diego, Web, June 2013).
8“Groundwater Desalination,” (San Diego, California: Sweetwater Authority, Web, June 2013).

CHAPTER 10: A LONG-TERM COMMITMENT TO RELIABILITY
1Lester Snow, Climate Change Impacts on California’s Water, Sacramento, California: Department of Water Resources, Fall 2008) 2.
**YEAR 1946 - 1948**

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

*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
Miles of Pipeline = 67.5
### YEAR 1960

<table>
<thead>
<tr>
<th>SDCWA Member Agencies</th>
<th>Population</th>
<th>Area*</th>
<th>SDCWA Water Deliveries**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bueno Colorado M.W.D.</td>
<td>31,500</td>
<td>50,540</td>
<td>3,735</td>
</tr>
<tr>
<td>Carlsbad M.W.D.</td>
<td>10,000</td>
<td>20,668</td>
<td>3,588</td>
</tr>
<tr>
<td>City of Escondido</td>
<td>18,600</td>
<td>4,061</td>
<td>2,142</td>
</tr>
<tr>
<td>Fallbrook, P.U.D.</td>
<td>10,000</td>
<td>15,469</td>
<td>8,106</td>
</tr>
<tr>
<td>Helix I.D.</td>
<td>122,100</td>
<td>30,958</td>
<td>14,176</td>
</tr>
<tr>
<td>City of National City</td>
<td>32,300</td>
<td>4,781</td>
<td>5,306</td>
</tr>
<tr>
<td>City of Oceanside</td>
<td>24,700</td>
<td>17,060</td>
<td>3,528</td>
</tr>
<tr>
<td>Otay W.D.</td>
<td>5,400</td>
<td>49,841</td>
<td>639</td>
</tr>
<tr>
<td>Poway M.W.D.</td>
<td>4,800</td>
<td>22,980</td>
<td>1,567</td>
</tr>
<tr>
<td>Rainbow M.W.D.</td>
<td>2,800</td>
<td>40,040</td>
<td>5,662</td>
</tr>
<tr>
<td>Ramona M.W.D.</td>
<td>5,600</td>
<td>29,900</td>
<td>322</td>
</tr>
<tr>
<td>Rincon del Diablo M.W.D.</td>
<td>14,000</td>
<td>20,271</td>
<td>2,244</td>
</tr>
<tr>
<td>Rio San Diego M.W.D.</td>
<td>25,500</td>
<td>27,655</td>
<td>2,138</td>
</tr>
<tr>
<td>City of San Diego</td>
<td>557,200</td>
<td>125,827</td>
<td>93,892</td>
</tr>
<tr>
<td>San Dieguito I.D.</td>
<td>15,000</td>
<td>4,948</td>
<td>1,448</td>
</tr>
<tr>
<td>Santa Fe I.D.</td>
<td>7,700</td>
<td>10,132</td>
<td>1,346</td>
</tr>
<tr>
<td>South Bay I.D.</td>
<td>64,300</td>
<td>15,315</td>
<td>5,350</td>
</tr>
<tr>
<td>Valley Center M.W.D.</td>
<td>5,000</td>
<td>53,160</td>
<td>1,358</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td></td>
<td>271</td>
</tr>
</tbody>
</table>

*Acres  **Acre Feet

---

Total Population = 956,400
Total Acreage = 543,606
Total Water Deliveries = 156,858
Miles of Pipeline = 161
**SDCWA Member Agencies Population Area**

<table>
<thead>
<tr>
<th>Member Agencies</th>
<th>Population</th>
<th>Area (Acres)</th>
<th>Water Deliveries (Acre Feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bueno Colorado M.W.D.</td>
<td>51,000</td>
<td>20,067</td>
<td>7,402</td>
</tr>
<tr>
<td>Costa Real M.W.D.</td>
<td>31,500</td>
<td>20,369</td>
<td>12,223</td>
</tr>
<tr>
<td>City of Del Mar</td>
<td>5,040</td>
<td>1,082</td>
<td>1,283</td>
</tr>
<tr>
<td>De Luz Heights M.W.D.</td>
<td>225</td>
<td>11,830</td>
<td>1,097</td>
</tr>
<tr>
<td>City of Escondido</td>
<td>64,100</td>
<td>13,333</td>
<td>8,749</td>
</tr>
<tr>
<td>Fallbrook P.U.D.</td>
<td>18,700</td>
<td>16,104</td>
<td>12,174</td>
</tr>
<tr>
<td>Helix Water Dist.</td>
<td>203,500</td>
<td>31,663</td>
<td>19,800</td>
</tr>
<tr>
<td>City of National City</td>
<td>47,200</td>
<td>5,431</td>
<td>1,593</td>
</tr>
<tr>
<td>City of Oceanside</td>
<td>77,800</td>
<td>25,383</td>
<td>19,326</td>
</tr>
<tr>
<td>Olivenhain M.W.D.</td>
<td>23,000</td>
<td>27,367</td>
<td>5,313</td>
</tr>
<tr>
<td>Otay W.D.</td>
<td>51,600</td>
<td>64,788</td>
<td>11,782</td>
</tr>
<tr>
<td>Padre Dam M.W.D.</td>
<td>89,000</td>
<td>54,082</td>
<td>13,721</td>
</tr>
<tr>
<td>Pendleton Military Res.</td>
<td>33,150</td>
<td>134,625</td>
<td>0</td>
</tr>
<tr>
<td>Poway M.W.D.</td>
<td>36,600</td>
<td>22,809</td>
<td>7,052</td>
</tr>
<tr>
<td>Rainbow M.W.D.</td>
<td>7,800</td>
<td>46,764</td>
<td>27,040</td>
</tr>
<tr>
<td>Ramona M.W.D.</td>
<td>16,000</td>
<td>46,939</td>
<td>6,239</td>
</tr>
<tr>
<td>Rincon del Diablo M.W.D.</td>
<td>13,800</td>
<td>16,370</td>
<td>4,799</td>
</tr>
<tr>
<td>City of San Diego</td>
<td>849,600</td>
<td>204,945</td>
<td>92,996</td>
</tr>
<tr>
<td>San Dieguito Water Dist.</td>
<td>30,900</td>
<td>5,637</td>
<td>5,732</td>
</tr>
<tr>
<td>San Marcos C.W.D.</td>
<td>24,200</td>
<td>28,548</td>
<td>6,855</td>
</tr>
<tr>
<td>Santa Fe I.D.</td>
<td>14,700</td>
<td>10,200</td>
<td>6,258</td>
</tr>
<tr>
<td>South Bay I.D.</td>
<td>99,200</td>
<td>15,533</td>
<td>1,500</td>
</tr>
<tr>
<td>Valley Center M.W.D.</td>
<td>15,600</td>
<td>62,061</td>
<td>32,681</td>
</tr>
<tr>
<td>Yuima M.W.D.</td>
<td>1,820</td>
<td>12,813</td>
<td>1,601</td>
</tr>
<tr>
<td>Others</td>
<td>2,560</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total Population = 1,806,035
Total Acreage = 898,733
Total Water Deliveries = 309,756
Miles of Pipeline = 210
## SDCWA Member Agencies History

### YEAR 2012

<table>
<thead>
<tr>
<th>SDCWA Member Agencies</th>
<th>Population</th>
<th>Area*</th>
<th>SDCWA Water Deliveries**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carlsbad M.W.D.</td>
<td>84,838</td>
<td>20,640</td>
<td>16,179</td>
</tr>
<tr>
<td>City of Del Mar</td>
<td>4,161</td>
<td>1,442</td>
<td>1,083</td>
</tr>
<tr>
<td>City of Escondido</td>
<td>141,788</td>
<td>21,569</td>
<td>17,330</td>
</tr>
<tr>
<td>Fallbrook, P.U.D.</td>
<td>35,000</td>
<td>27,988</td>
<td>12,115</td>
</tr>
<tr>
<td>Helix Water Dist.</td>
<td>267,922</td>
<td>31,350</td>
<td>24,072</td>
</tr>
<tr>
<td>Lakeside W.D.</td>
<td>35,500</td>
<td>11,488</td>
<td>3,374</td>
</tr>
<tr>
<td>City of National City</td>
<td>58,586</td>
<td>4,812</td>
<td>1,235</td>
</tr>
<tr>
<td>City of Oceanside</td>
<td>167,943</td>
<td>26,982</td>
<td>23,773</td>
</tr>
<tr>
<td>Olivenhain M.W.D.</td>
<td>81,701</td>
<td>30,942</td>
<td>19,355</td>
</tr>
<tr>
<td>Otay W.D.</td>
<td>208,000</td>
<td>80,320</td>
<td>30,542</td>
</tr>
<tr>
<td>Padre Dam M.W.D.</td>
<td>96,589</td>
<td>54,402</td>
<td>11,457</td>
</tr>
<tr>
<td>Pendleton Military Res.</td>
<td>79,600</td>
<td>134,626</td>
<td>850</td>
</tr>
<tr>
<td>Poway M.W.D.</td>
<td>48,382</td>
<td>25,047</td>
<td>11,138</td>
</tr>
<tr>
<td>Rainbow M.W.D.</td>
<td>19,611</td>
<td>47,260</td>
<td>20,465</td>
</tr>
<tr>
<td>Ramona M.W.D.</td>
<td>33,360</td>
<td>45,868</td>
<td>6,020</td>
</tr>
<tr>
<td>Rincon del Diablo M.W.D.</td>
<td>29,955</td>
<td>10,596</td>
<td>5,950</td>
</tr>
<tr>
<td>City of San Diego</td>
<td>1,376,173</td>
<td>213,121</td>
<td>164,337</td>
</tr>
<tr>
<td>San Diego Water Dist.</td>
<td>38,593</td>
<td>5,652</td>
<td>2,563</td>
</tr>
<tr>
<td>Santa Fe I.D.</td>
<td>19,400</td>
<td>10,359</td>
<td>5,577</td>
</tr>
<tr>
<td>South Bay I.D.</td>
<td>125,174</td>
<td>13,836</td>
<td>4,269</td>
</tr>
<tr>
<td>Vallecitos Water Dist.</td>
<td>94,871</td>
<td>29,630</td>
<td>16,082</td>
</tr>
<tr>
<td>Valley Center M.W.D.</td>
<td>25,453</td>
<td>64,253</td>
<td>27,722</td>
</tr>
<tr>
<td>Vista I.D.</td>
<td>126,244</td>
<td>21,167</td>
<td>12,353</td>
</tr>
<tr>
<td>Yuma M.W.D.</td>
<td>1,870</td>
<td>13,460</td>
<td>1,198</td>
</tr>
</tbody>
</table>

*Acres **Acre Feet

Total Population = 3,201,714
Total Acreage = 946,812
Total Water Deliveries = 542,438
Miles of Pipeline = 299

---

[Map of SDCWA Member Agencies and Projects]
### SAN DIEGO COUNTY WATER AUTHORITY AREA, POPULATION & WATER USE (1948-2010)

<table>
<thead>
<tr>
<th>Year</th>
<th>Area Acres</th>
<th>Population</th>
<th>Total Water Deliveries (acre-feet)</th>
<th>Miles of Pipeline</th>
</tr>
</thead>
<tbody>
<tr>
<td>1948</td>
<td>94,706</td>
<td>432,000</td>
<td>41,093</td>
<td>67.5</td>
</tr>
<tr>
<td>1950</td>
<td>119,213</td>
<td>434,777</td>
<td>58,612</td>
<td>67.5</td>
</tr>
<tr>
<td>1955</td>
<td>349,493</td>
<td>702,300</td>
<td>98,972</td>
<td>102</td>
</tr>
<tr>
<td>1960</td>
<td>543,606</td>
<td>956,400</td>
<td>156,858</td>
<td>161</td>
</tr>
<tr>
<td>1965</td>
<td>718,900</td>
<td>1,150,000</td>
<td>230,911</td>
<td>161</td>
</tr>
<tr>
<td>1970</td>
<td>753,200</td>
<td>1,255,000</td>
<td>245,678</td>
<td>166</td>
</tr>
<tr>
<td>1975</td>
<td>761,678</td>
<td>1,527,520</td>
<td>376,286</td>
<td>204</td>
</tr>
<tr>
<td>1980</td>
<td>896,733</td>
<td>1,806,035</td>
<td>309,756</td>
<td>210</td>
</tr>
<tr>
<td>1985</td>
<td>902,702</td>
<td>2,047,000</td>
<td>436,201</td>
<td>222</td>
</tr>
<tr>
<td>1990</td>
<td>908,945</td>
<td>2,435,903</td>
<td>674,993</td>
<td>222</td>
</tr>
<tr>
<td>1995</td>
<td>908,964</td>
<td>2,622,948</td>
<td>386,560</td>
<td>250</td>
</tr>
<tr>
<td>2000</td>
<td>918,128</td>
<td>2,814,481</td>
<td>589,062</td>
<td>274</td>
</tr>
<tr>
<td>2005</td>
<td>922,381</td>
<td>2,977,337</td>
<td>553,625</td>
<td>279</td>
</tr>
<tr>
<td>2010</td>
<td>947,289</td>
<td>3,167,171</td>
<td>491,924</td>
<td>300</td>
</tr>
</tbody>
</table>
Index

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

20-Gallon Challenge: 55
Acoustic Fiber-Optic Technology: 66, 67
Acre-feet: 2
Agua Hedionda Lagoon: 58
All-American Canal: 35, 37, 38, 42, 51, 53
Alvarado Treatment Plant: 41
Aqueduct Protection Program: 66
Babcock, E.S.: 21, 26
Barrett Dam: 22, 24, 28
Bay-Delta: 45, 46, 62
Bay Delta Conservation Plan: 47, 48
Baja, California: 59
Blythe, Thomas H.: 35
Bonita Pipeline: 22
Boosterism: 18
Boulder Canyon Project: 27, 35, 36, 42
Brown, Governor Edmund G. “Pat”: 45
Brown, Governor Jerry: 47
Bureau of Reclamation: 39, 40, 43, 45
 Cabrillo, Juan Rodriguez: 7
CalFed Bay Delta Program: 46
California Bay-Delta Authority: 46
California Department of Water Resources: 61, 62
California Limitation Act: 36
California Urban Water Conservation Council: 53
Camp Pendleton: 59
Capital Improvement Project/CIP: 56, 61, 62, 65
Carlsbad Desalination Project: 59, 60
Carpe Diem West: 49
Central Valley Project: 43, 45
Chula Vista: 10, 18, 41
Clinton, President Bill: 46
Coachella Canal: 53, 64
Coachella Valley Water District: 52
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
Colorado River Quantification Settlement Agreement: 52, 53, 64
Conservation: 53, 54, 55, 60
Consolidated Water Company: 21, 24, 26
Cuyamaca Dam: 20, 28
Cuyamaca Water Company: 21, 25, 26, 27, 29, 30, 31
Delta Reform Act: 47
Delta Stewardship Council: 47
Desalination: 50, 51, 52, 54
Diamond Valley Lake: 55
Doe, Hans: 35
Drought: 50, 51, 52, 53, 55, 59
Dulzura Conduit: 22, 24, 28
El Capitan Dam: 2, 21, 24, 28, 29, 30
Emergency Storage Project: 55, 56, 61, 63
Encina Power Station: 57
Eucalyptus Reservoir: 20
Fletcher, Edward: 21, 22, 25, 26, 27, 29, 31, 38, 42
Griffen, Harry C.: 26, 48
Groundwater: 3, 49, 52, 54
Hahn, Ernest: 49
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, 52, 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, 65
Lake Murray/Murray Dam: 20, 28
Legislation: 54
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
McCollom, David: 63
Metropolitan Water District of Southern California/MWD: 36, 37, 38, 39, 40, 41, 42, 44, 45, 49, 50, 51, 52, 53, 54, 55, 59, 60, 67
Mexican War: 13, 15, 17
Mission Basin Groundwater Purification Facility: 57
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 Dam: 63, 64
Olivenhain Municipal Water District: 28, 41, 63
Ollas: 4, 6, 8
Padre Dam (Old Mission Dam): 7, 9
Peripheral Canal: 45, 47
Plan of Pitic: 29, 30
Poseidon Resources: 58
Presidio Hill: 7, 8, 9, 10, 11, 13
Pueblo: 5, 7, 10, 12, 13, 29, 30, 31
Quantification Settlement Agreement/QSA: 52, 53
Ranchos: 6, 7, 10, 11, 12, 13, 15, 29
To Quench a Thirst

A Brief History of Water in the San Diego Region