

streams of life

Water in the American West

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Introduction to 1st Edition of Complete Text

Here it is. Hopefully more will be coming in the future.

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7/16/1999

Geography of the American West

Contrary to popular opinion, the American West (between the 100th meridian and the Pacific Coast) is almost entirely barren desert. West of the 100th meridian line, also known as the 20-inch line, there are only a handful of locations which receive more than twenty inches of rain a year. The West is made up of large open plains and long mountain ranges and compared to the East Coast, is relatively new, geologically speaking.

On the Pacific Coast there are many large population centers and prosperous farms. The rain is seasonal—a downpour in the winter, with little or no rain in the summer. Farmers depend upon this seasonal rain. For instance, in the Central Valley, lettuce farmers loathe it when it rains during the summer because the rain is so hot that it burns the leaves of the plants. While this sounds like the “Mediterranean paradise” that California is made out to be, the Golden State, like its name suggests, was quite dry before we began to “reclaim” the land; originally during the summer months the hills would completely dry out and become golden. While most people are fooled by the mirage of verdant San Francisco, which is entirely man-made (when the Spanish arrived they found absolutely no trees on the Peninsula), most of the state is in fact a semi-desert. Southern California is even closer to a desert.

Most of the West is considerably more arid, though. As weather fronts move in from the coast they run into the Sierra Nevada and the Cascades. They are forced to release their heavy loads of water before continuing over the mountains. On the west side of the Sierra-Cascade crest there are places where 150 inches of precipitation is normal during a year. Just miles away on the other side of the crest the level of moisture drops and there can be as little as four inches of precipitation a year. These mountain ranges effectively stop any rain from making it into the Great Basin.

Past the Sierras and the Cascades there are only desolate plains. Once in a while there are contradictions, though. The Great Salt Lake is one of the few landmarks in the scorched thousands of millions of square miles of desert. The remnant of a prehistoric lake that covered the entire northwestern part of Utah, the Great Salt Lake is surrounded by a cluster of cities. Outside of the relatively small enclave of human communities, there are only plains of salt and other minerals left by the lake. Before the arrival of irrigation with the Mormons in the mid-19th century the area was completely barren. The Bonneville Salt Flats, surrounding the Great Salt Lake, are utterly desolate with few plants or animals in sight.

The Southwest is similar except for one important fact; it contains the largest river west of the Rocky Mountains, the Colorado. The Colorado River starts just west of the continental divide. From there it flows southwest until it takes a bend south and heads through Mexico to the Gulf of California, its outlet. The Colorado is the sole reason that people live, work, and farm in the southwest. Almost all of Southern California and Arizona completely depend on the river for life. Today it is so overused that rarely does any water reach the Gulf of California.

How could we possibly live in the American West? We can't, at least by natural means. While humans have lived in the West for thousands of years, our civilization is much more demanding. Fly over Las Vegas and you will see thousands of swimming pools. The water that fills those swimming pools and allows people to live and create huge resorts in the desert is not there naturally. It is piped from the Colorado River for the sole purpose of allowing us to inhabit the desert. Throughout the West we are trying to defy nature and conquer the open land. This has all come at a horrible cost though...

First Explorers

Lewis and Clark

President Thomas Jefferson commissioned the Lewis and Clark expedition for many reasons. Jefferson had just purchased the Louisiana territory from France for \$15,000,000. At that time, the territory spanned approximately 800,000 square miles, and Jefferson wanted to map the new territory. He also wanted to find an overland route to the Pacific and find out more about the wildlife in the area. Jefferson also wanted to hold land negotiations and trade with the Native Americans in the frontier territories.

William Clark left Camp Dubois on May 14, 1804, and joined Meriwether Lewis in St. Charles soon after. They traveled with their crew on foot as well as on a 55-foot keelboat. Clark supervised the navigation and Lewis made notes about the journey. The Native American guide, Sacajawea, helped guide the travelers down the Missouri River, Marias River, Yellowstone River, Columbia River, and across the Continental Divide.

The expedition yielded helpful botanical information and also set the stage for further negotiations with the Native Americans. It also helped map out a large portion of the newly acquired territory and the Oregon country. This journey also pioneered the way for other explorers to further discover the great American West.

Pike

Lieutenant Zebulon Montgomery Pike led two expeditions that added to the geographical knowledge of Louisiana. He led one north from 1805 to 1806 and also one south from 1806 to 1807. His mission north was to find the source of the Mississippi River, which he believed to be Leech Lake after his trip on the Kansas and Osage Rivers. In his expedition south, he was ordered to avoid Spanish territory, but secretly, he may have had other orders to do so. In any case, he traveled the Arkansas and later was captured by the Spanish as he entered New Mexico, but later released. Pike kept careful notes, which helped establish the myth of the Great American Desert.

Powell

John Wesley Powell, a Union officer, was wounded at Shiloh in 1862, which led to him losing his arm. Powell loved geology and became a professor of geology at the University of Illinois. His class made exploratory field trips in the Trans-Mississippi west. Powell decided that he wanted to follow the Colorado system from Green River to where it joined the Virgin River, near present day Lake Mead. He commissioned three oak boats, one pine boat, bought scientific equipment, drew from Army surplus supplies, and raised a crew of nine. He set out on May 24, 1869.

He had already lost two men and one boat at Disaster Falls and by mid-August he was at the Grand Canyon. On August 28, three men deserted because they were low on rations and the journey seemed far from over. Native Americans killed them. On August 30, they exited Lo'Dore Canyon and saw a Mormon fishing with his son. The expedition gained good knowledge of the topography of the west and also went to help disprove the saying, "rain follows the plow."

Los Angeles: The City That Had No Right to Exist

Introduction

Los Angeles is located in the middle of a desert. While other cities are located near mineral deposits, rivers, harbors—natural resources that are useful for humans—Los Angeles

has none of these nearby. Most importantly it has no water. The story of Los Angeles is the story of unimaginable growth and the ruthless hunt for water.

The Spanish settled in Los Angeles because it was in a convenient place not far from Mexico. In addition, the Spanish did not know of San Francisco Bay, one of the best ports in the world. The Spanish saw Los Angeles as a good location to farm with irrigation. In 1848, Los Angeles had a population of about sixteen hundred—mostly Spanish and Indian, yet there were a few Americans in the town. San Francisco, which was only half the size of Los Angeles in 1848, soon outpaced the southern city. When gold was found in the north, San Francisco became one of the hottest destinations in the world. The only advantage that Los Angeles offered was a place to escape from one's past. After the Civil War many veterans moved across the continent and established themselves in Los Angeles. The city was not destined to remain a haven for the unscrupulous; water would change everything.

The Path to a Metropolis

Soon after the Mormons—widely known as some of the best irrigators in the world—established themselves in Utah they sent an exploratory party to the Pacific Coast. A group of Mormons set up a large establishment in the Los Angeles basin. They were able to do quite well and provided most of the valley with food. When federal troops arrived in Utah all of the Mormon settlements were shut down and the Mormons in Los Angeles returned home. They had a lasting effect, though. Soon a number of communities sprouted up to replace the Mormon establishment. They included Presbyterians, Quakers, and Germans. The warm coastal climate allowed almost anything to be grown in the basin—from corn to oranges. Soon the San Franciscan capitalists noticed and the Southern Pacific built a spur from San Francisco down to Los Angeles. Los Angelinos went to the 1884 World's Fair in New Orleans and hawked the basin to amazed onlookers. No one could imagine oranges and dates being grown in the United States.

Hordes began arriving in Los Angeles. A competitor of the Southern Pacific built a line connecting Kansas City and Los Angeles. Soon a fare war erupted and the cost of traveling west dropped to an amazingly low amount. A huge real estate boom began. Fraud followed the boom, though. Unknowing people bought lots that lay in the bed of the Los Angeles River, which is only a trickle during most of the year— however, during the winter it overflows its banks. Some people unwittingly bought property on the summit of the San Gabriel Ridge. The boom died down soon and population dropped by half, but soon an oil boom followed. By now Los Angeles was the size of San Francisco. But how could the city provide the water to sustain all these people?

The Three Leads

Modern Los Angeles owes its existence to three men--Harrison Gray Otis, Harry Chandler, and William Mulholland—who arrived along with all the others who came to Los Angeles to make it big. After returning from a military post in the Aleutian Islands, Harrison Gray Otis became the editor of a Santa Barbara newspaper. He hated the privileged people of the city and the fact that the city wanted to remain small. He soon moved to Los Angeles, which, despite its small size, boasted a number of newspapers. He became the editor of the *Times and Mirror*. Gambling his family's entire savings, he bought a share of the newspaper with the intentions of eventually forcing the paper's eastern financier out.

While at Dartmouth College, Harry Chandler accepted a challenge and dove into a vat of starch. He almost destroyed his lungs in the process. Upon the recommendation of his doctors, he moved to Los Angeles to recuperate. He eventually moved in with a doctor who owned an irrigated farm in the area. He took a job picking fruit. The doctor was not interested in money and let Chandler sell most of what he picked. Chandler managed to make a small fortune selling the fruit—\$3,000. With the money he began to purchase newspaper circulation routes, which, back then, were owned independently of the newspapers.

While Chandler was buying up circulation routes, Otis had bought the other owner out of the *Times*. Just as soon as he was bought out, though, the financier established a rival paper, the *Tribune*. By chance, Otis found Chandler. The two teamed up and soon, with the help of Chandler's outlaw tactics, the *Tribune* was dead. Chandler was as smart as villainous and bought the *Tribune* printing plant. Otis, embodying similar traits, soon came to a deal with Chandler: Chandler became the *Times* circulation manager and Otis's son-in-law.

William Mulholland, who was born in Dublin, Ireland, came to Los Angeles for no particular reason. He did various work in Pittsburgh and Michigan before he became a seaman and traveled to Panama. In order to save money, he walked the Isthmus. After miscellaneous jobs in the southwest, Mulholland joined a well-drilling crew. He became curious and soon decided to become an engineer. In 1878 he joined the city's private water company as a ditch-tender. He rose through the ranks. In the Los Angeles City Water Company, Mulholland met Fred Eaton. Eaton liked Mulholland so much that he chose him to be his successor. When Eaton left the company to become a politician—he became the mayor of Los Angeles—Mulholland became superintendent of the dilapidated system.

A City Consumes a River

On a Quest for Water

Between the efforts of the railroad and the industrious Chamber of Commerce, Los Angeles soon grew to over 100,000 people. By 1903 the city's sole source of water, the meager Los Angeles River, was almost gone. Mulholland tried to convince the city to conserve water, yet his attempts were to no avail. As he would say years later in a speech, the city was condemned to grow. As soon as the city would obtain a surplus of water, people would move in and the city would have to search for more water.

The former mayor of Los Angeles and long-time friend of Mulholland's, Fred Eaton told Mulholland of the Owens Valley. The Owens Valley, nestled in the Sierra Nevada, over 200 miles across the desert from the city, contained a small river. Despite the fact that a range of mountains is between the Owens Valley and the ocean, a small break in the range allowed storms to enter the valley. While the valley itself is a desert—it is in the rain shadow of the surrounding mountains—the Owens River runs through the middle of it. The river, which is fed from the snow in the mountains, drains into Owens Lake. Unfortunately, the river no longer drains into the lake. The lake is the remnant of a giant prehistoric lake. Because of the high evaporation rate and the fact that there is not much inflow, Owens Lake is—was—extremely salty. Brine shrimp, which lived in the salty waters, attracted thousands of birds on their migratory routes. Sometimes birds would cover the skies of the valley for hours or even days.

The Owens Valley

The Paiute Indians learned irrigation from the Spanish and began to irrigate the valley. When whites arrived they began to push the successful Indians away. Soon violence broke out and the whites murdered over 150 Paiutes. The Indians were eventually forced out of the valley and the whites took over. A prosperous community established itself in the valley. The United States Reclamation Service—now known as the Bureau of Reclamation—had been started a few months before and wanted to prove itself to a skeptical Congress. It began surveying the Owens Valley with the intention of building its first project there. The residents were very supportive and with talk of building a railroad spur to the Owens Valley they were bound to get rich, or so they thought.

Los Angeles Steals the River

Eaton and Mulholland had other plans for the valley. Those plans did not include the Reclamation Service, but instead, the city. The two drove 250 miles over the desert by car to reach the valley. When Mulholland saw the luscious valley, he suddenly changed. Before he had preached conservation, but after seeing all that water and realizing what it could mean to Los Angeles, he saw himself as a builder and a conqueror. He realized that water—the river—could flow to Los Angeles in an aqueduct by gravity alone. He and Eaton faced a big challenge though. The current residents of the valley had been there a long time and owned all the water rights. It would be challenge, not to mention illegal. By doing consulting work for the Reclamation Service, whose manager of the California area, J.B. Lippincott, was a Los Angelino, Eaton gained access to the archive of water and land rights in the county courthouse. In addition, Los Angeles hired Lippincott as a consultant. His job was to determine what the city's options in water sources were. In return for his work, Lippincott was paid \$2,500, an amount high enough to be more of a bribe than a payment. Eaton, using his own money, began buying up as much of the lower valley as possible. After much work, he managed to convince the owner of the only dam site in the valley to sell. He secretly bought that site for himself. Soon the city owned most of the water rights in the lower valley. Otis and Chandler were big promoters of the plan, but they were forced to keep it secret. They could not keep it to themselves though and soon the plan was announced on the front page of the *Times*. The people of Owens Valley found out, but it was too late. Not only was it too late for them to stop the aqueduct, but it was also too late to save the valley—it had already begun its spiraling descent toward oblivion.

With help from Eaton and Mulholland's friends in the federal government, the Reclamation Service project in the Owens Valley was forgotten. Theodore Roosevelt, one of their big supporters, placed a national forest around Owens Valley, preventing any new development in the area. Despite the fact that it is a national forest, Inyo National Forest hardly has any trees within its boundaries.

All Mulholland and Eaton had to do now was get the support of the Los Angeles voters. Rumor had it that Mulholland had his employees dump water from the city's reservoirs into the ocean at night. Whether or not it actually happened, an artificial shortage was not necessary. A mixture of amazingly high temperatures and a big drought coerced the voters into approving the aqueduct. It passed ten-to-one and was highly approved by all—at least all the Los Angelinos.

The River is Stolen

In 1905, construction was begun. Twelve foot wide steel pipes were shipped from Germany and around Cape Horn for construction of the aqueduct. The scorching heat of the desert—110 degrees—prevented all but a small number of workers to work at the same time. During the night, though, the temperature would drop considerably, sometimes even eighty degrees. Mulholland all but lived in the desert, overseeing all aspects of the construction. The aqueduct had to cover 223 miles with 53 miles of tunnels. Because of the lack of water along the route, electrically powered equipment—which had only been invented months before—was necessary. Despite the heat, the project was finished before schedule and under budget.

The aqueduct was dedicated on November 5, 1913. Somewhere between thirty and forty thousand people attending the dedication. Mulholland, who, after working for six years on *his* project, was sleep-deprived, unfurled an American flag and declared to the mayor of Los Angeles, motioning to the water beginning to role down the aqueduct, "there it is, take it." A city had just acquired an entire river.

While Mulholland's projections indicated that the city had fourtimes as much water as it needed, he was far off in his estimation of future growth. The capture of the waters of the Owens River had started a golden age in construction in Los Angeles, which would continue through the 1920s and 1930s. Hollywood began to grow once the city got water. Soon Los Angeles was growing eleven times faster than New York City. By 1922 the city had reached a population of one million people.

Doomed to Success

Mulholland was right that there was more than enough water in the beginning. As any westerner knows, if you do not take the water, someone else will. Contrary to what the residents of the Owens valley believed, Mulholland planned to suck the entire valley dry.

The path of the aqueduct passed through the San Fernando Valley, an entirely arid piece of desert. For no apparent reason, Chandler had been touting the 'fertility' of the valley in the *Times*. In the original article that ended the secret of the aqueduct, Chandler began by talking of how the aqueduct would break the bonds that tied the valley to the desert. How were the San Fernando Valley and the Owens River aqueduct related?

It was discovered that a large real-estate syndicate of the most powerful residents of Los Angeles had bought up the entire valley. The city would not need all the water from the aqueduct for a long time—it was up for grabs. If the San Fernando Valley could be irrigated the value of the land would skyrocket and the members of the syndicate would become millions of dollars richer. It went just as planned.

In the West, water equals power. Ergo Los Angeles was now the most powerful city in Southern California. It began offering water to communities that began popping up around the city-proper. In exchange, the towns became part of the city. Los Angeles was growing amazingly fast in its geographic boundaries. Its huge size has made its residents entirely dependent on cars for transportation. Los Angeles is the only huge, sprawling American city, similar to the likes of Mexico City.

A Place to Store the Water

The aqueduct pretty much diverted the river to Los Angeles. Because it was only a diversion, the aqueduct followed the pattern of the river. If the river was not that large, the aqueduct was not that large. While Mulholland did not believe in aboveground water storage—he thought that too much water would evaporate—he was eventually forced to build a large reservoir to hold the water from the Owens River. Fred Eaton owned the only dam site in the Owens Valley. He was demanding one million dollars for the land. It would have made a wonderful site for a dam. It was off in a side canyon of the valley where it would not disturb the residents of the valley and would allow the city to share the water with the town. But a million dollars was too much for Mulholland. He attempted to bargain with Eaton, but got nowhere. The two longtime friends began to fall out.

Mulholland began looking for another site to store water. He eventually chose to enlarge a dam the city was constructing in San Francisquito Canyon, just outside the city. Despite the fact that his engineers thought it would be a really bad idea, Mulholland went ahead with his plan.

Just as the reservoir reached its full capacity in March of 1928, it began to leak. Most dams leak when they are full for the first time. They leak clear water. The fact that the water is clear shows that it is from the reservoir. But the dam was leaking brown water. That could only mean one thing—the water was breaking apart the canyon walls. Mulholland inspected the dam, but pronounced that everything was all right. He decided that the brown water was run-off from the wet mud near the construction site. How could *his* dam be structurally unsound anyway?

That night one of the worst disasters in peacetime United States history occurred. It is guessed that somewhere around 450 people died. The reservoir tore the dam apart. A 200-foot high wall of water began gushing down the canyon, destroying and then carrying away everything in its path. Blocks of concrete rode the waves of water. After killing virtually all the inhabitants of the area just below the dam, the waves turned to a semi-solid form. When they crashed into towns further down stream they would throw houses and concrete blocks from upstream into anything they found. There was no warning system—no one knew of the coming flood.

It was discovered that the two other dams in which Mulholland was involved also collapsed. Mulholland's career was completely destroyed. The savior of Los Angeles was shattered. When he resigned in November of 1928 his reputation was ruined beyond repair.

Conclusion

The city bought Fred Eaton's dam site for \$650,000 after he lost everything in the collapse of the Owens Valley bank. The dam was built for considerably less than the city spent to settle the San Francisco dam failure. Mulholland and Eaton—both broken men—finally resolved their differences and became friends again.

Not only were the lives of Mulholland and Eaton destroyed, but also the lives of the residents—former residents—of Owens Valley. The lake dried up completely and was replaced by more open desert plains. Mineral deposits from the old lakebed are blown up into the air. At one point the Owens Valley had the worst air pollution in the country. An oasis in the desert was gone forever.

Los Angeles's story is not over, though. The city was only able to spend a few years gloating before it was forced to continue its search for water. It was doomed to succeed.

Reaching its Tentacles Even Further

The search for water continued. Soon, the Hoover Dam was built on the Colorado. With the federal government's help, Los Angeles began taking water from the Colorado, a feat which it could only dream of before.

In 1964 the Metropolitan Water District began to recommend diverting the Columbia River in the northwest. There were plans to bring water down from the Yukon and dam San Francisco Bay. No one ever thought of conservation. The remains of the Los Angeles River were cemented over and a dam was built in Central Los Angeles. The dam eventually broke.

In the 1970s Los Angeles began to divert the Feather River—600 miles away from the city. An additional aqueduct, according to Mulholland's plan, was built to supplement the existing one from the Owens Valley.

Mono Lake

Back in the 1930s, Los Angeles began to move north from the Owens Valley. It found Mono Lake, another pristine remnant of an inland sea. The city began diverting the four streams that fed the lake—just like it did in the Owens Valley.

The level of the lake began to drop dramatically. Unlike in the Owens Valley, this time there were conservationists that fought back. David Gains, one of those conservationists, along with a group of college students began a study of the lake in the 1970s. They found that if the diversions continued, the million-year-old lake would completely disappear. The lake has a unique ecosystem because it is three times saltier than the ocean. It supports brine shrimp that live off algae. Thousands of migrating birds stop in at the lake, much like they did in the Owens Valley, and feast on the billions of brine shrimp. Public opinion began to change and in the 1980s the California Supreme Court limited the amount of water the city took from the streams flowing into the lake. Finally, the conservationists were victorious.

Conclusion

Today, Los Angeles reaches over 200 miles to the Owens Valley, twice, hundreds of miles to the Colorado, and 600 miles to the Feather River. They are changing though. The city has finally begun to institute water conservation. But for now, the city is an octopus with a permanent hold on the Southwest.

The Dust Bowl

The Dust Bowl contributed greatly to the movement towards the west. The Dust Bowl extends from the Canadian line to central west Texas, covering Nebraska, North Dakota, South

Dakota, and large parts of Montana, Wyoming, Colorado, and New Mexico. Around the 1870s, people began settling in the Dust Bowl area. The work was very hard at the beginning and people barely made it from one harvest to the next. Most of the people survived until the grasshopper invasion of 1873, in which clouds of grasshoppers "so thick that they obstructed the view of the sun" descended on the land and left the ground bare. The entire population had to vacate with the motto, "In God We Trust-In Kansas We Bust." But by 1886 and 1887, the land was taken up once again. In 1899 a severe drought struck the area and people had to leave once more. Another grasshopper invasion in 1919 destroyed the area. The Dust Bowl area was also affected by the Great Winds season, which lasts from February to April with winds up to 30-40 miles per hour lasting from ten to one hundred hours. The dust killed people who already had difficulty breathing and created low visibility areas.

In the 1920s and 1930s farmers settled the area and wheat production was well underway. However, more and more farmers entered the area, driving up production and driving down the prices. The price dropped to 65 cents a bushel and in 1931, it dropped to 25 cents a bushel, which was below production cost. This forced many farmers into bankruptcy. In addition to this, the winds attacked the soil, blowing dust everywhere and spraying the seed. This situation forced many people to flee west.

The black blizzards, large dust storms, in the Dakotas region during 1930 and in 1932 in Kansas, forced thousands to leave on doctors' orders. The government estimated about 50,000 leaving the Dust Bowl each month in 1936. Many people went on foot; most went to California, Oregon, Arizona, Washington, and Idaho. Between June 15, 1935 and December 31, 1937, 221,000 entered California for labor on motor vehicles. Of the 221,000, 84 percent were from drought states. The dust storms killed livestock, birds, and humans. Half a billion dollars worth of crops were burned up in the drought of 1936 and 1600 people died of dust and heat. Between 1934 and 1938, thousands sought relief and refuge from the dust, drought, and heat. The dust, heat, and hard living of the Dust Bowl forced many families to move west.

Agribusiness

Agribusiness is the wholesale food industry, including petrochemical industries, seed, equipment manufacturers, grain, livestock feed, pet food industries, pharmaceuticals, corporate farms, and contract growers. It is an eighty billion dollar a year industry.

The United States uses the most water of any country in the world for food production, including the raising of animals for consumption. The U.S. uses 85 percent of the total water supply. Per capita, each person indirectly uses 2500 gallons of water a day (a vegetarian uses 300 gallons). Agribusiness has led to the increase in the number of areas that are harmed by livestock. Examples of the impact of livestock on the land include livestock trampling cottonwood seedlings at the Missouri River. Livestock can also poison water supplies because of the use of toxaphene. Between forty and one hundred million pounds of toxaphene are used annually by farmers to rid livestock of external parasites. It is a chemical that is related to DDT, aldrin, and dieldrin. The toxin causes liver cancer in laboratory mice and thyroid cancer in rats and has killed cattle. Toxaphene has been found in water supplies, fish-eating birds, milk, market-basket food, catfish and other commercial fish. Livestock also add to ground water depletion.

The use of water for irrigation agriculture has tripled since 1940. Groundwater now supplies about 25 percent of all water in the US and forty percent of irrigation water.

Federally supplied water has been a creator and catalyst for agricultural wealth. 60 million acres of land is irrigated in the United States, five sixths of this is in the seventeen western states and twenty percent of that is irrigated directly by the Bureau of Reclamation. Most of California's \$16 billion in agricultural wealth is due to irrigation which helps winter wheat and livestock as well as other crops.

Tulare Lake was the largest body of fresh water west of the Mississippi. Now, all that remains is cropland because the Corp of Engineers dammed the four rivers flowing into the river. As more cropland appeared and more irrigation appeared, farmers grew rich off the federally subsidized irrigation and added more land by pumping water using their newfound wealth.

The majority of water consumption in the west is used for watering lawns and crops. In California, agriculture uses about ninety percent of the water supply and Los Angeles uses about eight percent. Though the west is strained water-wise, population growth will not stress the water supply because the amount agriculture uses is enormous compared to urban usage. Water use in the west is mainly for low-value crops.

In California, the crop using the most water is pasture, but pasture lands only generate a gross value of \$93 million. Next is alfalfa, using around 4.1 million acre-feet (one acre-foot is the amount of water one acre large with a depth of one foot – 325,851 gallons -- glossary) and generating \$570 million. Cotton uses 3.4 million acre-feet and only generates \$824 million. These figures are out of a \$480 billion dollar state economy. In comparison, grapes use only 1.6 million acre-feet of water and are worth \$1.5 billion. These crops grown in a state with more rainfall would free up enough water for 70 million new Californians while shrinking the state economy by only one quarter of a percent.

Politics

When the city of Sacramento flooded in 1850 and again in 1862, the politicians at that time decided that something must be done to control the water. This was the beginning of many water projects to try to tame Mother Nature.

In the 19th century, United States law allowed anyone to claim land in which he could sail in a boat. Henry Miller, a former butcher boy, sailed around claiming land in the San Joaquin Valley. By the time he was done, he had claimed 1,090,000 acres of land. He was the first person to build a significant sized dam.

Cheap labor from the people fleeing the Dust Bowl and cheap water led to rapid expansion of the west. Congressmen, governors and farmers fought to bring water to the Central Valley with the world's most expensive water project to an area drier than North Africa. President Franklin Delano Roosevelt, under the New Deal, authorized the Central Valley Project, CVP. Its purpose was to catch the snowmelt from the Sierra-Nevadas and dole out the water during the summer using an extensive grid of canals and aqueducts. During this time, many people believed that the government should not undertake projects such as these. In this way, FDR's politics helped California out by providing many construction jobs and also providing water for the Central Valley, which had been rapidly depleting its groundwater sources.

These types of projects were made possible by the Reclamation Act of 1902 which was created to prevent another Henry Miller incident and also allow new 160 acre small farms for families.

Everyone wanted land with water, rather than land without water, and now every senator wanted a water project in his area. This led to political "pork barrel," the quid-pro-quo arrangement in which politicians agreed that "if I endorse your project, you endorse mine."

The Army Corps of Engineers and the Bureau of Reclamation continued to compete for resources. They continually built more and more projects and Congress could not keep up with the demands for cash. All of the money was coming from the Federal Treasury.

In the 1950s, Governor Edmund G. Brown of California decided that an expensive project to carry water from Northern California to Southern California was necessary. Many did not like the idea, but Brown was a popular governor and he was able to push the project through. In the 1950s and 60s, the California state government approved many parts of the California Water Project, one of the largest construction projects in the history of the United States. The goal of the project was to capture water at the right time and place and transport it to the places of need when it was needed.

More than 70% of the water in California is in the northern one-third, whereas 77% of the need for water comes from the southern two-thirds of the state. This project required billions of dollars in funds. It was the most important and controversial project during Governor Brown's term of office. The project was opposed by tax-conscious groups; Northern Californians were furious because they were spending money to send their water "to fill pools" south, and the San Francisco Chronicle hated his plan. Brown had to fight his way through the political system to finally get approval for the project.

The California Water Project helped avert a Sacramento Valley flood worse than the one in 1955, which killed 36 people and damaged 400 homes in Yuba City. The project cost more than the Manhattan Project and issued the largest bond issue of any state. When Pat Brown ran for re-election, he continued talking about water.

As the growth of big agribusiness continued, small farms disappeared. There was an iron triangle of the local sponsors, the local legislature, and the Bureau of Reclamation. The triangle would work together and receive grants from Congress to build projects and receive water. Political pork barrel continued as more and more projects were passed by Congress.

The presidents all had a list of projects to approve. Both Nixon and Ford said “no” to all of them because they knew what was going on inside Congress. However, when Jimmy Carter came into office, he was an outsider and he cut off the funds to 19 water projects. He said that they were too expensive and bad for the environment. He was the first politician to do this and this instigated a lot of debate. In the end, after all of the debates and congressional hearings, Carter could not stop the majority of the projects.

The 160-acre farm had disappeared and now there were alliances between the local farmers, the local cattle association, the cotton growers, and the local chamber of commerce in every town, to receive federal funding to irrigate and to receive water.

The Bureau tried to end the strongholds held by large agribusiness combines by bestowing large amounts of capital on a small group of large farms in return for their breaking up. However, the farms found loopholes in subsidizing, double dipping, and other evasion techniques and were able to continue their monopolies.

Ronald Reagan wanted to conserve and clean water. However, he did not want to interfere with commercial businesses, industries, and other business enterprises. He believed that corporate profit is the great motivating force for the solution to society’s problems, and not the government.

Every time a politician, presidential candidate, or gubernatorial faced an election, he would visit the Central Valley and receive a hefty donation. The donation was intended to persuade the politician to vote the way the growers wanted on any bills that would increase water prices, change water rights laws, or affect agribusiness in any way. When Carter was trying to reform water laws, re-election time came up and he did nothing in order to avoid provoking agribusiness interests.

George Bush won votes in the Central Valley in 1988, but the feelings of the nation slowly shifted towards conservation and environmentalism and so, during the elections of 1992, George Bush signed a bill to increase the price of water.

Missouri River

On May 31, 1805, the Lewis and Clark expedition sailed down the Missouri River. They observed the natural beauty of the sandstone walls and the wonderful wildlife in the area. This majestic river, once named, “Big Muddy,” is neither big, nor muddy anymore. It has been dammed, diked, and dredged since the 1930s to control floods and float cargo barges. Rock and concrete walls hold back flooding and protect the one half million acres of farmland. The wonderful wildlife is gone too as habitats disappear with the receding waterline and non-existent floods which used to create marshland habitats and cottonwood trees die out with the trampling cattle and dam building. The river is in such a dire state that the lower third of it is called “The Ditch.”

Changes are occurring to help the Missouri River. Legislation introduced by Senator Bob Kerry (D-Neb.) will help add protection of fish and wildlife habitat to the list of primary missions of the Army Corps of Engineers, the organization that regulates water flow and flood control for the Missouri River. The Corps is also proposing its own plan which includes protecting the local Native American tribes, the recreation businesses and uses, traditional uses, and the interests of eight states. The Army Corps of Engineers is also considering declaring a moratorium on permits to stabilize undeveloped riverbanks. Millions of dollars are being spent to transform small pockets of land and water by restoring cottonwood seedling habitats and reconnecting downtown Omaha to its riverfront with parks and trails.

Disagreements have arisen about what should happen to this area. Developers and farmers using rocks to try to stop soil erosion clash against environmentalists wishing to preserve the river's natural characteristics. Compromise needs to occur between the recreation users, dams, farms, barges, water supply, tribes, environmentalists, and others. If no compromise can be reached, the Fish and Wildlife Services could decide to enforce tougher measures to protect rare species of fish, like the pallid sturgeon, and also birds, such as the piping plover and least tern. Forms of agreement between the groups are still murky and unclear, but the barge operators have already offered to decrease or suspend operations during dry years if they are allowed enough water for navigation during harvest time. Conservation groups want the Corps to release springtime "rise," a surge of water below dams, to mimic what the river used to do: scour sandbars and flood side channels, chutes, and marshes. This could disrupt farmers upstream, but would restore habitats and breeding grounds. Programs to buy and restore riverfront wetlands are now underway, and, in order to help restore habitats, levees that have been breached are not being repaired. Farmers are also selling fields to government agencies and holes are being punched through manmade embankments to reconnect oxbows, chutes, and former wetlands to the flow of the river. However, farmers near restoration areas fear their crops will suffer from wildlife habitats. The results of these changes will not be visible for at least ten to fifteen years.

Teton Dam

Teton River, a tributary of Henry's Fork of the Snake River, drops from an oval basin at the west foot of Teton peaks.

Teton Dam was built with unanimous support from Idaho politicians. The \$103 million dam was built to hold 288,250 acre-feet of water. Construction was just completed in 1976 when the right abutment ruptured. A fury of mud poured out and the dam was destroyed from the inside out. Waves 20 feet in height killed 11 people, destroyed 100,000 acres of farms, thousands of buildings, 16,000 heads of livestock, flushed toxic chemicals from the soil and spread it, and forced 25,000 people to leave their homes. The waters were finally contained at American Falls Dam. Parts of the dam still remain as a monument to the wreckage.

Mono Lake

Mono Lake is a saline remnant of a vast inland sea that covered an estimated 316 square miles of the Mono Basin and neighboring Aurora Valley more than thirteen thousand years ago. Now, the lake is approximately 85 square miles due to receding glaciers. The level of the lake constantly fluctuates, even by 100 feet, continuously due to Los Angeles' water diversions.

The lake lacks an outlet and this has caused concentrations of carbonates, sulfates, and chlorides to form. The lake is not as rich as Owens Lake to the south due to its lack of resources and also its harsh climate and remote location.

There is lots of wildlife in the area. In the 1970s, bills were introduced to end the diversion of Mono Lake. Environmental groups and people condemned Los Angeles' thirst and joined the cause. In 1978, the Resources Agency of California assembled a special task force to draw up a plan for the preservation of natural resources of Mono Basin.

In 1978, a land bridge to Negit Island appeared due to the receding water level. People put their efforts behind the California National Guard to blast open a temporary channel. When the bridge was blown, the birds took off and the bridge settled back. A second attempt in April of 1979 proved unsuccessful. By the summer of 1979, all adult breeding gulls had left the island. Only 12,500 gulls settled on other islands in the lake compared to the 46,700 in 1978.

The state task force published a report at the end of 1979. It gave nineteen alternatives, one of these was a plan for the immediate reduction of the withdrawal of water from 100,000 to 15,000 acre-feet of water a year. To make up for the loss, it suggested stepping up wastewater reclamation and continuing water conservation efforts. The Department of Water and Power did not endorse the conclusions and it felt ill treated since it had already spent \$100 million to build an aqueduct to Mono Lake and had to rights to build it and take water.

The Los Angeles city council unanimously voted to oppose implementing the suggestions because less water from Mono Lake meant less water and less electric power. The State said that losses could be made up by purchases from other sources, but the city decided that it would increase the cost for water and power. The city believed that implementing these suggestions would not be worthwhile because they estimated a two billion dollar cost and people would not conserve enough. The state wanted Los Angeles to implement the suggestions because it believed it would only cost \$250 million to implement and most of it was recoverable due to reduced energy use.

Mono Lake is one of the most challenging water controversies because it is one of the least refined, least tractable, and least likely to allow any compromises.

Conservation

Sprinklers that spray downward can be used to cut back on evaporation by using sprinklers in large fields. This uses only one-third of the water used by regular systems. It is better than furrows, or ditches, because it is cheaper, faster, and saves soil. Sprinklers save from two to five acre-feet of water per acre.

Other methods of conservation include the following:

- Eliminating canal leaks, which account for 25% of diversion.
- Scheduling irrigation and switching to sprinklers.
- Gated ditches and lined pipes
- Lining canals is expensive and concrete cracks.
- Hydromet, a computerized network of weather stations to allow better irrigation and reservoir task scheduling.
- Making water cost more makes farmers want to save.
- Drip irrigation, tubing at the roots, has virtually no evaporation and also reduces weeds, which means less herbicide.
- Better furrow irrigation by controlling the amount of water flowing in by using surge valves and shorter furrows will save hundreds of gallons per minute on a regular field and save water by 10-40%.
- Recycling tailwater faster by using a pond.
- Soil Moisture Monitoring so that water can be applied at the right times. The system costs only about two dollars an acre and can save \$50 an acre in water.
- Saving a gallon is the same as supplying a gallon.
- Installing water meters at homes make people more water conscious.
- Cash payments to businesses for efficiency.
- Reclaiming water from coolant systems and rinse cycles as well as ice factories.
- Selecting native or low water plants for gardens.
- Changing people's attitudes towards water and saving it not only during droughts.
- Recapturing surface runoff.
- Using low-flow toilets.

The Future

Some approaches to address the future include:

- Better drip irrigation systems with no water loss.
- Subsidized federal water should be phased down. Surplus crops discouraged, and "double-dipping" outlawed. Double dipping is a farmer already using subsidized water and also using federal offers for agricultural price supports.
- Growing higher value crops.
- Reforming rates to discourage irrigation.
- Programs to encourage switching to desert crops like jojoba.

- Pursuing nonstructural solutions to drainage and salinity problems by practicing conservation and growing crops that are adapted to water that has been recycled several times.
- Addressing environmental issues caused by water diversions
- Streamlining water transfer laws and policies to help increase efficiency in water transfer and making sure that water transfers are not wasted.
- Promoting water conservation and salvage.
- Discounts and drought support for farmers who participate in water conservation programs.
- Educating people and creating the ethic of not destroying our own environment.

Little Ending Thing for Complete Text

Don't forget to check out the website (<http://library.thinkquest.org/27419/>) for forums, teacher guides, neat projects, and more.