

The Battle for Mono

Mono Lake is a fascinating place for people of all interests and expertise to visit. Surrounded by mountains, it harbors some of the most unique and fascinating wildlife around. But inside the pristine waters of Mono Lake lies a clash between human's needs and environmental safety. The flows of the waters here have been distorted significantly in an effort for Los Angeles to provide for its citizens, resulting in a fierce battle that has changed water policy in California forever.

Mono Lake lies on the western margin of the Great Basin in Central Eastern California. *(See Map Below)* The Great Basin is a 3 to 4 million year old area between the Rocky Mountains and the Sierra Nevada, mostly through the state of Nevada, covering over 500,000 kilometers ([Great Basin, Mojave Desert Region p 1](#)). It is a land of parallel mountain ranges and vast valleys. The common theory is that this was created over 215 million years ago when the Farallon sea floor plate collided with the North American Plate. The collision was convergent, the two continental masses collided into each other breaking the surface of the North American Plate and creating mountains, while subducting the less dense sea floor plate. When the Farallon plate was completely submerged under the North American Plate, the Sea Floor plate was next to collide, except that this time it sheared against the plate, creating stress in diagonal directions. The sheering pulled apart the continent, breaking along the cracks that were created earlier, and letting magma, from the Farallon plate generally, ascend to the surface and create vast plains along large cracks between mountain ranges.

Due to the lands unique structure, much of the snow and other precipitation that falls ends up draining into large depressions or desiccated playas and stays put, never

reaching the ocean. Mono Lake is one of the many salt lakes that were formed this way. The reason that Mono Lake has survived so long is because it is located high where the elevation is cooler, which in turn reduces evaporation. It is also located underneath the snowy Sierra Nevada, devouring all the water that melts and eventually makes its way there (Hart).

Though Mono Lake could be as much as three million years old, Geologists can conclude that it is at least 750,000 years old by dating volcanic rock (Hart). Mono Lake currently spans over 66 square miles, 12-13 miles in length, by 2-3 miles across. It is relatively shallow, its deepest point being 150 feet. During the ice age, when this body of water was technically called Lake Russell, it once was 60 times larger than it is today ([Mono Lake website](#)). Inside Mono Lake lie two distinct islands: Negit and Paoha, which are both volcanoes, and a third lesser island named Gaines (fieldbook). Negit is a smaller island made up of many flows of blocky lava formed mostly 1,700 to 300 years ago. Paoha is larger and formed sometime in the 17th century. The then rising submerged lava tunneled into the lake bottom and pushed the sediments upward. The islands we see today above water are in fact made up of the lake bottom, after years of this process. (Hart)

Mono Lake gets its water almost entirely from the melted snow of the Sierra Nevada Mountains. Each bit of snow water picks up a tiny amount of salt and sediment on its journey to Mono and deposits it inside. There is not outlet for Mono; it does not flow into any other outgoing streams, lakes or oceans. The water sits there, and is emptied only by the process of evaporation. Since evaporation takes only fresh water, the minerals that are dissolved there stay there, building and building, and make up an

estimated 285 million tons of chemicals that are dissolved in Mono right now (Hart).

John Hart describes the composition and flavor of Mono Lake as such:

“Take a gallon of pure water. Add ten tablespoons of table salt. Add eighteen tablespoons of baking soda. Add a pinch or so of laundry detergent and borax, and you’ve about got it.”

John Hart, taken from p 14 of his book, “Storm over Mono”

The first settlers found that the Lake washes grease from the hands more easily than hot water and soap and washes dirt and grime off of clothes. Because of its high salt content one stay afloat very easily, but the salt water irritates eyes and nicks. The Mono Lake water is known to chemists as a triple water lake: it is saline, alkaline, and due to volcanic surroundings, sulfurous. Minerals include fluoride, boron, arsenic, uranium, thorium, and plutonium (Hart).

Little tiny organisms called brine shrimp (*See pic below*) feed off the algae. These creatures are approximately half an inch long, translucent, and are usually tinged red. These little guys are pure protein, each adult containing a whopping 13 calories if eaten (fieldbook). When in their annual peak, there can be an estimated seven trillion shrimp in Mono alone (Hart). They are hatched in two waves: the first hatching occurs in spring from cysts of the previous fall. When the lake cooled the shrimp died, and their partially developed embryos fell to the floor. After these develop in the spring, they mate and produce a second generation of shrimp that are born live in early summer.

The Alkali flies are an important food source in Mono. Though there are far less flies than shrimp by mass, they are actually a more desired food source to the birds (Hart). When pregnant, the mother fly will actually emerge herself in a bubble that will last her at least five minutes, and lays the egg underwater in algae mats. In Spring the

larvae hatch from their eggs and feed off algae while living on a submerged rock. After two or three months they pupate, and emerge as adults one to three weeks later. These flies pose no threat to humans. In fact, to the Paiute Indians, who lived around Mono Lake, flies were eaten as their main food source. They would catch the pupae; dry them, roll off the shell, and eat a kind of cereal named 'kutsavi' made entirely of them. The food was immensely important, and Indians far away coveted Mono's pupae ([Flies of Fancy website](#)).

The lake is so salty that only a few species of adapted saltwater birds can stomach the diet Mono has to offer. The California Gull is a relative of the Seagull, and is one of the birds that rely on Mono for a food and breeding ground. Mono is their second most important stop, aside from Salt Lake. Every year, an estimated 50,000 Gulls grace the water (fieldbook). They nest on islets and on Negit when available.

The eared grebe is the most common bird, with over a million incoming every year. They are a highly adapted saltwater bird, and together eat over sixty tons of brine shrimp a day. They arrive tired and weathered, and feed until it is cool. Most are actually too fat to fly and have to work off their weight before they go airborne. For some unexplained reason they only feed and are active at night, and during the day hide in the nearby forest (Dave Marquardt, fieldbook).

The phalaropes are fly-eating birds that stop at Mono to feast. There are two species that feed here, the red-necked phalarope and the Wilson's phalarope. The red-necked phalarope breed in the far north and spends the winter in the subtropical oceans (Hart). About 60,000 Wilson's phalaropes stop in Mono after breeding in North

America. They feast on flies, usually doubling their weight, and then head off for their amazing 3,000 mile nonstop flight to saline lakes in Bolivia, Chile and Argentina.

These are the three main birds that depend on Mono for their survival. There are more species that rely on Mono Lake for a safe breeding, eating and resting ground between flights. The food chain at Mono is relatively simple. Brine shrimp and Alkali flies feast on algae, the birds feast on them, and the waste from the birds, particularly nitrogen, produces an excellent breeding ground for the algae (Hart).

In the early 20th century Los Angeles started growing. To ensure future growth Fred Eaton, an officer of the Los Angeles Department of Water and Power (L.A.D.W.P), among others, began buying up land and water rights around Owens Lake. Owens River was used for a time, until around 1919 when it could not sustain the dry weather or population increase in L.A. At this time L.A. and the U.S. Reclamation Service made a deal to prepare plans, survey and cost estimates for an aqueduct running to the Mono Basin, and to keep the results secret. During this time most of the Land surrounding Mono Lake was bought out from private persons and made federal. Outrage over L.A.'s policies prompted lawmakers in 1930 to pass the "County of Origin" statute, stating that "if water was exported the area must have their economic needs served first" (Hart). However, the statute failed to include Mono and Owens counties, leaving them at the mercy of L.A.

Mono is fed by a group of streams, the three main being Mill, Lee Vining, and Rush. By 1935 California built a diversion dam on Lee Vining Creek, a Grant Lake reservoir on Rush Creek storing the waters from northern creek and Rush itself, and a buried pipeline taking Rush Creek tributary creeks Parker and Walker.

In 1937 California legislature added a new requirement to new or old dams, “all dams, old or new, equipped with fishways or not, must let enough water to pass to maintain ‘in good condition’ the fish in the streams below.” (Hart p 45) Too compensate for the fish that were being destroyed by their misuse of the streams, the L.A.D.W.P built a hatchery on Hot Creek in Long Valley, but the water it was supposed to release could not as easily be evaded. The “solution” came from chairman of the Fish and Game Commission Nate Milnor, who signed an agreement to let the city off the hook, declaring that no water needed to be let through. Milnor was out of his jurisdiction to do so, and the agreement was partially illegal, but became an unchallenged California Law nonetheless.

Los Angeles began taking water from Rush creek, and the years from 1947 to 1951 were dry. L.A. took all the water, leaving only 2.5 cubic feet of flow per second, not enough to let the fish survive. As the fish population died, marshes and duck ponds were going dry as well. The second major stream that L.A. tapped was Lee Vining Creek. The more northerly creek saw no water after 1947, as pines, cottonwoods and willows died. A harsh fire destroyed what was left of the dry vegetation and turned it into a dry desert.

The affect on Mono was more gradual but certainly prevalent. In 1941 the lake stood at 6,417 feet above sea level (well down from its high of 6,428 in 1919). By 1955 the lake plummeted to 6,405 ft. To clearly see the fall of Mono, check out the Tufa towers shown here. Made almost entirely of Calcium Carbonate, every tower was built underwater by an underwater spring, and the water level was once higher than them! (*See Tufa Pic*) As the lake fell below the 6,400 ft mark, more and more salt and dissolved

minerals were left on the surrounding beaches. As the lake shrank more and more, strong winds stirred them up in huge swirling dust clouds. The clouds are harmful to people, both long and short term. The particles are so fine that they slip right through nose and lung hairs, and contain traces of arsenic that may warrant concern.

L.A.'s devouring of Mono's streams did not fall onto deaf ears. Many people were noticing the decline of Mono Lake and the impact it was having on the environment, but to this point there were not legal argument that could refute L.A.D.W.P's misuse of the land. There had also been no real scientific research or bird-counting done on Mono. In 1972 a dozen students from the University of California, headed by David Gaines, started active research of and around Mono Lake and its wildlife. They found more birds than anyone had expected. They monitored each bird's diet and how far the food eaten at Mono would sustain them. They also found that Mono shrimp could not live in very salty waters as their counterparts in other salt lakes can, which led them to be declared a separate species.

As the fresh streams were being diverted for Los Angeles's use, Mono water became increasingly saltier. Diversion of the streams left Mono with no real incoming water, and evaporation lowered the lake level while leaving the sediments inside. Before Los Angeles diverted water, Mono Lake was one-third as salty as the sea; afterwards the salinity was three times as much. Later research found that brine shrimp could probably not live when the level of the water was below 6,360 ft, and definitely not when it was below 6,350.

Together two of the students, Gaines and Winkler, after countless attempts to convince other organizations to establish an agency for Mono, founded the Mono Lake

Committee themselves. At this time in the spring of 1979, the National Guard had tried to destroy the land bridge to the Mono Island Negit, where many Gulls bred. Despite their efforts coyotes easily crossed the bridge, the birds panicked, and as Gaines puts it, “Not a chick survived.” (Gaines, *the Troubled Waters of Mono Lake*)

It was around this time that Mono Lake started to attract outside attention. Soon such publications as *Audubon*, *Outside*, *Smithsonian*, *Sports Illustrated*, and *National Geographic* were publishing many articles about the battle. A picture of the tufa towers even beat the marriage of Prince Charles and Lady Diana off the cover of *Life* (Hart).

Gaines and his colleagues had plenty of evidence that Mono was in danger. They also had much evidence that recurring dust storms might, and will be an increasingly prevailing problem to the people’s health. The air pollution laws were not enough to save Mono though, they needed something more concrete. That idea came from Tim Such, a former law school dropout (Bartshe, field book). After countless nights researching in the Harvard Library, he came up with an idea that he broadly called the “public trust.” The idea was that all government land was owned by the people, for the people, and that the government had an inescapable duty to manage the properties well (Hart). This idea’s roots go all the way back to the Roman Empire, and have since been built in Anglo-American Law. After convincing a San Francisco law firm named Morrison and Forrester to back him, they immediately filed suit against the L.A.D.W.P under the Audubon Society.

The next three years were vital for Mono’s survival, both in and out of the courtroom. While the battle over the level of Mono was going on, Mono was suffering, as were the birds. In 1981, they found only 15 chicks on Negit and 11,698 on the

remaining islands, which were considerably lower than earlier, and the next month it was found that over 90% of those had died. There were two theories to explain this occurrence. The first blamed the low hatch of brine shrimp in the spring hatching, and the second blamed the hot weather. Though it was not known what for certain caused this, it could be seen that Mono was dying, and only getting worse.

In 1983 the California Supreme Court declared that the public trust policy could be applied to Mono Lake, and that now L.A.'s water rights were to be revised. Their exact words were, "*The public trust is an affirmation of the duty of the state to protect the people's common heritage in the streams, lakes, marshlands, and tidelands...* (California Supreme Court, 1983, taken from [Mono Lake Committee website](#))

This did not put any sort of limit on the level, or how much the city could take, but did give the Mono advocates a strong leg to stand on.

Remember earlier the law that all dams need to maintain a flow of water reasonable to sustain fish? This finally caught up to the L.A.D.W.P, and Judge Otis sought after studies to see just how much water the fish in Rush Creek needed. What ensued was a six year debate between judges, the Committee, and the L.A.D.W.P. What was happening to the lake at this time? The new fresh water that was flowing into the lake was not mixing well. The saltier water stayed on bottom, the fresh water on top, and one winter the top layer actually froze over. Finally in 1988 researchers saw that the six year state of meromixis (the separation of fresh and salt water) was finally coming to an end. The birds were doing well with the changing lake, and algae and brine shrimp were flourishing.

In 1990 the California Water Board decided, after reviewing an extensive environmental impact report, that Rush, Lee Vining, Parker and Walker Creek must be restored to maintain good fisheries. This was a milestone in the fight to save Mono, since much of the water to restore the lakes would naturally run into it. In 1994, after years of court battle and over 30,000 pages of transcripts, the Water Board decided that the acceptable level for the lake was going to be 6,392 ft within 20 years. Their reasoning to not let the level go lower were the very real threat of dust storms, and the reason for not going any higher was that the tufa towers national monument would be entirely underwater.

Bartshe Miller, a member of the Mono Lake Committee, believes that the reason they were so successful was because they were rational and tried to work with the L.A.D.W.P, not against them. They proposed ideas that could help L.A. live without Mono as a significant water source. For instance, they were instrumental in the campaign to install new, water friendly toilets in all residential houses. The toilets use around 6 gallons of water a flush compared to the whopping 16 gallons/flush toilets used before. The goal, as Bartshe put it, was not to give L.A. a good excuse to take Mono's water. Together through conservation and delicate planning of future water sources, it seems that advocates of Mono Lake and L.A. have found a healthy compromise. Conservation is L.A.'s best idea for the future. As Hart puts it, "Plainly, we have enough water in California for a vast system of agriculture...industry...all necessities and a great many luxuries." (Hart, p182) What has changed is our perception of the abundance. It cannot be thought of as an unlimited source that we can waste, instead of as an important element that should be watched over and taken care of.

The story of Mono Lake is an amazing and unique one. Scientific data and politics united together to fight one of the most historic environmental battles of our time. Mono lake is saved, for the time being, because a few thoughtful, persistent people decided to act and accomplish something nobody thought possible. It is an inspiration to us all to achieve the unattainable and reach for the stars!

Bibliography

- Great Basin, Mojave Desert Region:
<http://biology.usgs.gov/s+t/SNT/noframe/gb150.htm>
- Mono Lake website: <http://www.yosemitegold.com/yosemite/Mono.html>
- Hart, John. "Storm over Mono." University of California Press, Berkeley and Los Angeles, California, 1996.
- Adam Schau's Sierra Nevada Fieldbook
- Mono Lake, "Flies of Nancy" website:
<http://www.thesierraweb.com/sightseeing/Monolake/flies.html>
- Young, Gordon. "The Troubled Waters of Mono Lake" National Geographic Senior Staff, (handout in class, no more info given)
- Mono Lake Committee website: <http://www.Monolake.org/index.html>

All pics are hyperlinked...



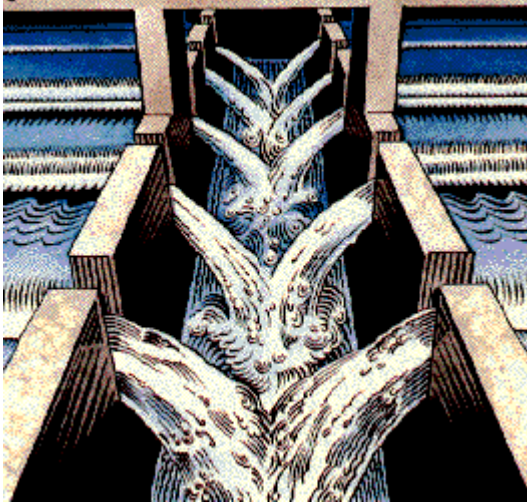
David Gaines



California Gull



On of Mono Streams (website
doesn't say which one)



GOOD PIC FOR INTRO PAGE!! (Call Liquid Gold??)



Tufa Towers



A pair of mating brine shrimp, *Artemia monica*

- Map of Mono

