Why is Grant Lake A Reservoir? A Brief Geological and Human History, From the Pleistocene to the Present

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Cover Page Footnote
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Robert B. Marks

Grant Lake today is a large fresh-water reservoir operated for the City of Los Angeles by its Department of Water and Power (the LADWP as it is known), located in the June Lake Loop, a well-known year-round recreation area (Map 1). Visitors to the Mono Basin Scenic Area quickly learn that the extraordinary land- and waterscape of Mono Lake came about because in 1940 Los Angeles started taking nearly all the fresh water that had flowed into the lake. The diversion of Mono Basin water to Los Angeles begins at Grant Lake reservoir. But there is a much longer story behind Grant Lake and how, when, and why it became a reservoir. The L.A. part of the story is just the latest chapter in a much longer natural and human history.

Map 1. Grant Lake in the June Lake Loop

Source: Fly Fishing the Sierra, https://flyfishingthesierra.com/june.htm

Grant Lake sits on the eastside of the Sierra Nevada mountains about 30 miles as the crow flies east of Yosemite National Park. Less than 10 miles south of the small town of Lee Vining, it is easily accessed off US highway 395 by California State Route 158, locally known as the June

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1 That ecologically disastrous act and its consequences have been well documented. See especially John Hart, Storm Over Mono: The Mono Lake Battle and the California Water Future (Berkeley and Los Angeles: University of California Press, 1996).

2 The diversion actually begins at Lee Vining Creek, but that water flows by diversion and conduit into Grant Lake.
Lake Loop (Map 1). To understand Grant Lake, we need to place it first in the context of the orogeny and natural history of the Sierra Nevada Mountains.

Google Earth Images of Grant Lake (July 13, 2023)

Mountains Come First. Then Glaciers. Then Grant Lake

The Sierra Nevada mountains have a multi-million-year geologic history. About 200 million years ago as the Pacific and North American tectonic plates crushed into each other, molten rock flowed out of faults and cooled to form what became the granitic core of the Sierras. By 140 million years ago the region was covered by sea, laying down layer after layer of sedimentary rock. Tectonic pressure continued. According to Mary Hill, “the pressure…twisted and folded the rocks, lifting them up into mountains…the Ancestral Sierra Nevada.” Erosion then stripped cover from granitic rock, and as that was happening, about 30 million years ago violent volcanic activity added lava, pumice, and tuff to the Sierra Nevada mountains.

The Sierra Nevadas were not tallest in the neighborhood. To the east had been the Nevadaplano which began subsiding and ultimately created the Great Basin stretching from the Great Salt Lake in the east to Mono Lake in the west. About 2.6 million years ago, Earth entered a long-term cooling period that we are still in. Over that time there have been 40 cycles of cold glacial periods separated by warm interglacial periods. Glaciers formed in the Sierra Nevada and elsewhere, sometimes covering much of North America. Melting snow and ice eroded the Sierra Nevada and water flowed into the Great Basin, periodically forming massive inland lakes. Without outlets to the ocean, these terminal lakes became increasingly saline as evaporation left

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dissolved minerals in their waters. The movement of tectonic plates created slip fault zones and earthquakes, lifting and tilting the Sierra to its current height and westward tilt.\(^5\)

The last glacial period began about 60,000 years ago, with glaciers forming in the upper elevations and then snaking down valleys to the inland lakes. At the time, Mono Lake was much larger than at present, taking up much of its drainage basin. First reconstructed by geologist Isaiah Russell in the 1880s and mapped by his topographer W. D. Johnson, the Quaternary-era Mono Lake has been renamed Lake Russell in his honor, distinguishing it from the much smaller Holocene-era Mono Lake.

Russell also showed the location of the last glaciers to come out of the Sierras toward Mono Lake (Map 2). For our purposes, the most important of those was the Rush Creek Glacier (outlined in red in lower left quadrant of the map). That glacier was part of larger glacier coming out of the Ritter Basin. The Rush Creek glacier spilled through what is now the basin holding Gem and Agnew Lakes. When it reached the bottom of the scarp (where the Rush Creek hydropower plant now is) the granitic outcrop that Russell aptly named Division Butte (now Reverse Peak) divided the glacier into an eastern fork he called the Reversed Creek Glacier (flowing through what is now June and Gull Lakes) and the western fork he called the Rush Creek Glacier. The latter is the one we are most interested in for that is where Silver and Grant Lakes are, connected by Rush Creek flowing out of the Sierra Mountains.

\(^5\) Ibid., 66-67.
Map 2. The Mono Basin in Quaternary Time
Russell’s map shows the Rush Creek Glacier terminating at the Quaternary-era Mono Lake. He thought that the lake halted the further movement of the Rush Creek Glacier, with icebergs breaking off and flowing into the lake. When that “ice-stream,” as Russell called it, began to melt and recede beginning about 15,000 years ago and ending about 10,000 years ago, the debris left behind “built up the magnificent morainal embankment now enclosing Grant Lake…The main walls of debris enclosing this lake are 1,000 feet high near the gateway to the gorge and have an inner slope of from twenty to twenty-five degrees.”

The terminal moraine kept the waters of what became Grant Lake impounded until Rush Creek began to erode a way out of the moraine at about 7400’ in elevation, cutting down through 300’ of debris to a discharge elevation of 7060’ when Russell did his 1883 survey. The result of those very long-term geological processes creating Grant Lake can be seen in Russell’s map of “Morainal Embankments of Parker and Bloody Cañons.” This map shows lateral moraines enclosing Grant Lake, and the terminal moraine that had formed on the shore of the Quaternary-era Mono Lake (Map 3). After exiting Grant Lake through the cut in the terminal moraine, Rush Creek continued down through the former Quaternary-era lakebed to the post-glacial Mono Lake.

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Grant Lake in Historic Times

The First Period: U. S. Government Agencies’ Maps, 1857-1901

1857. Isaiah Russell was not the first U.S. government official to survey Grant Lake. A. W. von Schmidt had a contract to survey much of the new state of California, and in 1856-57 he and his small team were hard at work in the Eastern Sierra, including the Mono Basin. Figure 1 shows his 1857 survey plat of Township 1 South, Range 26 East, Mount Diablo Meridian, showing the location of Grant Lake, then called Gull Lake. The land survey plotted all land into unique plats defined by their location on a north-south and east-west laid out from a particular starting point (in the case of California those starting meridians were located on Mount Diablo south of San Francisco). The basic sections were 36-square mile Townships, six miles on a side, and each square mile called a section. Sections in turn were divided into four 640-acre quarter sections, and each of those could be further divided. The point was to make it possible to transfer land from government hands to private ownership, with each “land patent” so given having a specific spatial location.

Neither the Mono Basin nor California were devoid of people, and von Schmidt’s survey was an administrative net cast over the land. The transfer of that land into the hands of Euro-American settlers dispossessed the native people of their homeland, in the case of the Mono Basin the Kootzaduka’a people. The first land patent in the Mono Basin was registered in 1872, and by the turn of the twentieth century much of the land in the Mono Basin was in the hands of Euro-American settlers. In the process of making the surveys and transferring the land, natural features such as Grant Lake and Rush Creek were also plotted and are the first maps showing the precise location of Grant Lake. Below is an enlarged view of Grant Lake from von Schmidt’s survey.

Figure 1 Grant Lake in 1857

What I’d like to point out is the location of the outlet of Rush Creek from Grant Lake, just west of the southwest corner of the 160-acre northwest quarter of Section 15. Not shown on this survey is Section 16, which shares the same boundary line as the west side of Section 15 and will be shown on later surveys and maps. My reason for focusing on this point is that it can be used as common reference point for later maps to see changes to the shape and size of Grant Lake.

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The next land survey plat is from 1879 after another surveyor filled in the blank spaces from von Schmidt’s original 1857 map (Figure 2). This map shows the Rush Creek outlet in the same place (just west of the Section 15 boundary), but the shape of Grant Lake has changed and the area in Section 21 to the southwest of the lake (shaded in light blue) is labeled “Swamp and Overflow Land,” or what we now call a “wetland.” Wetlands are vital hydrological parts of many rivers and lakes. Basically, they are like lungs which expand when there is excess water in the system and shrink when that water flows out. Most wetland ecosystems are catchment basins for flood waters, and that is what the Grant Lake wetland was.
The Sierra Nevada mountains receive large amounts of snow (averaging 400,” but sometimes vastly exceeding that, as in the 2022-23 winter) which begins melting in the spring. The resulting flood water in Rush Creek could not get through the narrow outlet and so backed up forming the wetland. Von Schmidt’s 1857 map shows the wetland mostly as part of Grant Lake, where the 1879 plat map shows a lake that has receded somewhat. Perhaps the 1856-57 winter was a heavy one and much flood water was in the Grant Lake basin, or perhaps the 1879 map depicts a
situation after one or more dry years. Periodic droughts are common in California and the Mono Basin.

Besides its role in the Rush Creek hydrological system, the Grant Lake wetland had an important ecological role as well. The area called “swamp” on the 1879 and 1896 plat maps would have what is now called a “wet meadow” and the “overflow” was a “seasonally wet meadow,” each having different vegetation complexes. The riparian corridor of Rush Creek and its various channels in the delta would have been bordered by willows, creek alder, black cottonwoods, lodgepole pine, and Jeffrey pine. In places, aspen too likely would have been present, with Jeffrey pines in drier parts of the meadow (see the snags in the photo below). A 1991 field survey found 116 species along Rush Creek and its tributaries: “The highest mammal species richness was encountered in riparian willow scrub habitats” such as that in the photo below, and over 100 bird species. Small rodents such as chipmunks, squirrels, woodrats, and field mice, along with mule deer were prey for predators such as ermine, bobcat, and coyote. And birds had vast swarms of mosquitos and a hundred other insects to feast on. These were species-rich ecosystems.

Rush Creek flowing through the Grant Lake wetland

Source: Courtesy David Carle

10 EIR D-8, 9.
11 Ibid., Table D-4.
Trout were not native to the Eastern Sierra, so there were none in Rush Creek or Grant Lake until Euro-American miners or settlers brought them. William Maule, the Mono National Forest Supervisor wrote that “Prior to 1858 the waters of Mono Basin were barren of trout. In that year placer miners diverted a portion of Virginia Creek near a point at Conway Summit into the Mill Creek drainage which allowed the trout native to the former stream to run into the latter. The diversion was made for placer purposes.”\textsuperscript{12} The Mill Creek drainage was isolated, so those early trout did not get into the Lee Vining and Rush Creek drainages. Brown and Lahontan trout were in Grant Lake perhaps as early as 1880, having been planted there by Euro-American settlers.\textsuperscript{13} By the early twentieth century there so many trophy-size trout in Silver Lake and the Rush Creek drainage that Carson’s Camp was established in 1917. Sometime in the 1920s, a “Rush Creek trout egg taking station” was installed between Silver and Grant Lake.\textsuperscript{14} Whether the trout caused any ecological change to the lakes and streams where they were introduced is unknown. Trout are aggressive predators (and cannibals too), so either they occupied an open ecological niche or displaced some other species. But once introduced, trout fishers took note of local insect hatches and used either the real thing on their hooks or tied flies to imitate them. One source lists nearly two dozen insects and charts their annual life cycles.\textsuperscript{15}

1896. This colored plat map is in the office of the Mono County Assessor (Figure 3). It is a very-large format plat and was used as a visual record of land ownership, as well as land ownership changes, in the Mono Basin until the 1920s.

This plat shows Grant Lake in the same shape as the 1879 plat, but records who owned the land around the lake. Somewhat surprisingly, the wetland to the southwest of the lake records three successive owners, starting with Louis Samman in 1880 who then sold it to Archie Farrington (date uncertain) and then the final owner in 1921 (Walter Goldberg) who bought the land from Farrington.

Why settlers would want to own a wetland is unclear. But Archie Farrington had become one of the largest landowners in the Mono Basin and was reported to own over 4000 acres by 1908, and he was buying up as much land as he could. His brother owned another 2000 or so acres. The 1896 plat shows that in 1907 Archie Farrington bought all the land in Section 16 (or 640 acres), and his son James owned land straddling Rush Creek to the north of Grant Lake. As we will see in a later section, the Farringtons were interested in locking up water rights in the Mono Basin, and Rush Creek and Grant Lake were key to those plans.

\textsuperscript{13} Draft EIR, 3D-9.
\textsuperscript{14} David Carle and Don Banta, Images of America: Mono Lake Basin (Charleston, SC: Arcadia Publishing, 2008), 81.
\textsuperscript{15} Fly Fishing the Sierra, “Hatch Chart with Insect Identification,” https://flyfishingthesierra.com/hatchEast.htm
Figure 3 Grant Lake in 1896

Source: 1896 Plat Map of Township 1 North 26 East
This map is an extract from Russell’s 1889 published map, which he surveyed in 1883. To see it more clearly, I’ve enlarged it and rotated it to be oriented like the plat maps. Three features stand out. First, the shape of Grant Lake is different from the others, more like a horseshoe. Second, it also shows Rush Creek flowing into the lake in three channels, indicating a delta. And third, Russell names it Grant Lake (most likely after U.S. President Ulysses S. Grant), even as the local plat maps continued to call it Gull Lake as late as 1896.

Figure 4 Grant Lake in 1883
1898. The U.S. Geological Survey published its first topographical map of the area, the Mt. Lyell Quadrangle in 1901 based on surveys it did in 1898. Figure 5 is from that map. The lake is rounded again much like in the 1857 plat, signifying possible changes to the amount of flood water entering the Grant Lake basin. The wetland is shown as a delta with Rush Creek flowing in numerous channels with three entering Grant Lake from the south. The lake level is set at 7060’, and a benchmark at 7068’ was placed just to the west of the Rush Creek outlet. A dirt road ran along the west side of the lake (much as SR 158 now does), northwards to the state highway and south to Silver Lake.

**Figure 5 Grant Lake in 1898**

Summary. Other than documenting the change in name from Gull to Grant Lake, the changes to the lake and its wetland as shown in the series of six maps were the result of natural hydrological fluctuations. But the plat maps also show that Grant Lake had been surrounded by land owned by Euro-American settlers. And their plans for the use of the land and water in the Mono Basin caught up Grant Lake and Rush Creek in battles over who owned and could use Rush Creek and its water and for what purposes. That story opens and unfolds in the first three decades of the twentieth century.
The Second Period: Grant Lake as an Object of Struggle Over Water Rights, 1902-1933

The Euro-Americans who settled in the Mono Basin were not just farmers or ranchers. A few had grander visions that saw the basin, in particular the fresh waters flowing down from the mountains in Mill, Lee Vining, and Rush Creeks, as a resource ripe for fueling economic development. The U.S. government also had the economic development of the West high on its agenda and provided much support for those who wanted development. In particular, the land and water of the West were basically free for the taking. The Homestead Act of 1862 encouraged pioneers to claim up to 160 acres of land and to get title to it after they had “improved” it by farming or ranching. In the arid West, the Desert Land Act of 1877 granted 640 acres to claimants after they developed the land by bringing water to the acreage. The federal government set the rules for land ownership so that there would not be constant and violent disputes over whose land was whose. As discussed above, the land survey system addressed the problem of who owned which land by giving every plot of land its particular, and legally enforceable, location and description. Water was a more slippery question, especially in California, where gold and water intermixed.

The State of California was born in 1850 out of the Gold Rush. As the Sierra Nevada mountains formed, geologic processes deposited gold in various cracks in the rock, and as erosion whittled away the rock, gold could be found very near the surface or in mountain streams. One place on Earth where these processes concentrated and then revealed the gold was on westside of the Sierra Nevada, in particular in a geologic formation known as the Smartsville block, a belt about 25 miles wide that runs on the western slope between the towns of Auburn and Oroville. That’s where the Gold Rush began.

At first gold was discovered in or near streams, and “placers” panned a stretch of stream they claimed as theirs. Soon gold was found further away from existing streams but to separate it from the surrounding dirt and rock water was needed, so flumes were built to carry the stream water to where the gold was. Then powerful hydraulic cannons were developed that washed away complete portions of mountains, so the gold be gotten that way. But in all cases water was necessary for getting at the gold. To protect these miners’ claims to stream water and the right to move it from the stream to where gold was, the doctrine of “appropriation” developed and became part of California’s water rights law. Basically, this doctrine gave anyone the right to “appropriate” water by posting a notice where the water would be taken and registering that notice with a county land and water recorder. Disputes were resolved by the doctrine “first in place, first in right.” That doctrine held throughout the State of California, including the Mono Basin, where gold was found in 1857 and mines opened at the west end of Lundy Lake and most spectacularly in Bodie, just a few miles north of Mono Lake.

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18 Hill, Geology of the Sierra Nevada, 213-231.
In 1902-03, wealthy Bodie financier and gold mine owner J. S. Cain posted and registered water appropriation notices on six Sierra Nevada lakes and their streams in the Mono Basin. Two of Cain’s appropriations were for Agnew and Gem Lakes, and for the water that flowed out of them in Rush Creek, cascading in magnificent waterfalls down to the base of the Sierra Nevada scarp, through Silver Lake and then into Grant Lake. Cain was not looking for gold: he intended to use the falling water to get richer by generating hydroelectric power. To get a better deal from the federal government, he claimed that he was going to use the water not to generate power but for irrigation purposes, a claim that led to much investigation and litigation.

The Tussle over Grant Lake, 1913-15. In 1913 Cain and his partner William Metson posted a notice of appropriation of Grant Lake, and a year later so too did W. D. McPherson, setting off a contest between Cain and McPherson over who controlled the waters of Rush Creek and Grant Lake, and for what purposes.

Ultimately Cain won, but not without much legal and financial wrangling. That is a long story that I have told elsewhere. Briefly, Grant Lake got wrapped into that struggle, and it first became a dammed reservoir to solve a legal problem that Cain and Metson had gotten themselves into when they first appropriated the Gem and Agnew Lakes and sought federal permits to use the water.

Those lakes were in a national forest reserve, and Congress had given authority over the use of water on public land to the General Land Office in the Department of Interior. The Irrigation Act of 1891 allowed rights to use water from public sources for irrigation purposes, and the Power Act of 1901 granted rights to the water for the development of hydroelectric plants. Cain wanted to use the water for hydroelectric power generation but applied for the permit to use the water under the terms of the 1891 Irrigation Act. He clearly wanted the water for power generation, so why apply for a permit to use the water for irrigation? The reason was because water rights granted under the 1891 act were irrevocable, whereas the rights granted under the 1901 Act could be revoked at the discretion of the Secretary of Interior.

The various federal agencies that examined Cain and Metson’s application concluded that their application was to use the water for power generation and not irrigation. But they also thought that hydroelectric power, not the more lowly and less profitable irrigation for farming or ranching, was “the higher use” for the water. But to Cain and Metson irrevocable water rights were the same as private ownership, and that’s what they wanted, so they applied under the terms of the 1891 Irrigation Act. After first having their application denied in 1912, they reapplied in 1914 and made a deal with the Interior Department to get the permit. They would get the right to the water “for irrigation,” and their hydroelectric power company would be able to build a hydroelectric powerplant on Rush Creek on the condition that it would ensure “secondary use” of the water for irrigation purposes further downstream. They got the water permit in 1915 and immediately began building the Rush Creek hydro project which included damming Gem and

Agnew lakes to make them into reservoirs that supplied water under high pressure to the hydroelectric plant. The Rush Creek hydro plant is now owned by SCE and is still operating.

To prepare for the hydro project, Cain and his various companies bought up nearly 9,000 acres of land in the Mono Basin through which Rush Creek flowed to obtain additional riparian rights to that water, including much of Archie Farrington’s land. In 1913 Farrington had brought a lawsuit against other landowners to clarify water rights in the Rush Creek drainage. By purchasing Farrington’s land, Cain became the successor plaintiff in that lawsuit. His main target was W. D. McPherson.

McPherson had worked on a survey crew for Cain, but in 1912 left to form his own venture, the Rush Creek Mutual Ditch Company. That company sold shares to Desert Land Act applicants with the promise that they would get water (and hence title to their land) from ditches diverting water from Rush Creek. McPherson thought he had the appropriative right to that water because he bought the ditch from the original developers who had appropriated and diverted the Rush Creek water in 1902. In addition to the Rush Creek diversion, in 1914 he filed an appropriation notice for Grant Lake and applied for a permit to build a 128’ dam below it on Rush Creek, creating a reservoir containing nearly 100,000 acre-feet of water. As noted above, Cain already had appropriated Grant Lake in 1913, and in 1915 he filed an amendment to that application to transform Grant Lake into a reservoir by damming its Rush Creek outlet.

The General Land Office held off ruling on those dueling applications until the local Rush Creek lawsuit was settled. That ruling came in July 1916 with the judge awarding the rights to nearly all the water of Rush Creek to Cain, and denying McPherson’s claim that he was the successor to appropriative rights to Rush Creek water. The judge ruled that Cain’s riparian rights on Rush Creek trumped McPherson’s later appropriation claim. If that ruling were to stand, McPherson’s Rush Creek Mutual Ditch Company would be destroyed.

McPherson fought back by alleging that Cain had gotten his water rights by fraud, claiming he wanted the water for irrigation when he really wanted it for power. McPherson filed written protests to the General Land Office, which launched an internal investigation. If McPherson’s challenges were upheld, Cain could have lost the rights to water for hydroelectric power generation, and the handsome profits that flowed from it. To head that off, Cain rushed to show that he was upholding his part of the bargain with the government that his power company would provide secondary storage for irrigation further downstream. In 1915, construction began to dam Rush Creek at the outlet to Grant Lake, turning it into a reservoir to be used for irrigating land from a ditch system his Cain Irrigation Company would (and did) build.

The contest between Cain and McPherson yielded two additional sources for looking at Grant Lake. McPherson’s application to make Grant Lake a reservoir was in the form of a very detailed survey map, portions of which are copied below. And the Cain companies’ 1915-16 construction of the Grant Lake dam was documented in numerous photographs.
Although McPherson’s dam was not approved and hence not built, the detailed survey is important for analyzing Grant Lake. Comparing his 1914 survey map with the five previous maps, the shape of Grant Lake (on the left) is similar to von Schmidt’s 1857 plat and the 1898 survey in the 1901 USGS topographic map. The Rush Creek outlet is also in the same location as the earlier maps, and the lake level is recorded at 7060’, the same as the 1901 USGS map records. McPherson’s 1914 survey also shows Rush Creek as a delta with four channels into Grant Lake, compared with three in the USGS 1901 map and Russell’s 1883 topographical map.

McPherson’s proposed dam was not at the natural outlet of Rush Creek, but further downstream where the surrounding moraine is at the 7180’ contour, sufficiently high to accommodate a 128’-high dam. The Table of Capacities below the dam cross section (on the right above) shows that at its natural 7060’ level, Grant Lake’s area was about 215 acres, or a third of a square mile. If the dam had been built and the reservoir created, it would have been more than six times as large (1442 acres, or 2.25 square miles). This 1914 survey can also be used to make some calculations regarding the dam and reservoir that Cain’s companies actually built in 1915-16.

The First Grant Lake Dam

The first Grant Lake dam, built by Cain companies in 1915-16, was forced on them because of McPherson’s accusations of fraud that were being investigated by the General Land Office. To prove that they were meeting the terms of the agreement with the Interior Department and to

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21 Source: James B. Clover and Katherine M. Clover Papers, Huntington Library, Box 10 (7).
maintain their irrevocable Irrigation Act permit, they had to provide for secondary storage of Rush Creek water. Under the supervision of Cain’s can-do chief hydroelectrical engineer Charles Poole, men and resources that had been brought in to build the Gem and Agnew Lake dams were redirected to build a dam at the outlet of Rush Creek from Grant Lake, turning Grant Lake into a reservoir ostensibly to be used for irrigation. The red arrow in the photo below shows the location of the planned dam, and that in 1915 at least part of the Grant Lake basin was being used as a pasture. Just beyond the cattle was the meadow. This photo also shows riparian woodlands on both the east and west sides of Grant Lake. Whether those were cut down or submerged in the reservoir is not known.

Grant Lake Reservoir and Dam Site Looking North (Photo #117)\(^\text{22}\)

\(^{22}\) All of the photos in this section on the building of the Grant Lake dam are from a photo album in the Huntington Library Digital Collection, California Electric Power Corp.-Southern Sierras Power Corp. https://hdl.huntington.org/digital/collection/p16003coll2/id/75469.
The photo below, dated September 10, 1915, shows the dam work site from the other direction, looking west upstream. Rush Creek and its riparian system lies below Grant Lake, and the rock fill and spillway are visible (rock fill on either side of the spillway in the center).

Grant Lake Looking toward the Gorge (Photo #84)

The photos below show rock fill being cut (left) and transported on a tram to the dam site (right).
Then wood-plank facing was put on (left photo) and covered with a non-permeable surface to keep water from seeping through the dam and weakening it by erosion (right photo).

Once completed the reservoir was filled. The red arrow on Photo #85 shows the same tree as in Photo #11 above. What had been the Grant Lake wetland was being inundated by the impounded water in the new reservoir, with the riparian stands of trees still there before the reservoir was filled.

By 1916 Cain companies had completed the dam and the reservoir was filled (photo on right above; the posted sign says “Property of Cain Irrigation Company”). The dam was 20 feet high and the crest was 490 feet across. Estimates and calculations from McPherson’s 1914 survey can be used to estimate the area and capacity of the reservoir. The natural lake had been 200

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24 Ibid., photo 28.
acres, and the 1916 Cain Irrigation reservoir about 500 acres. The shoreline cannot be reconstructed because it was later submerged by the much higher 1940 LADWP dam and reservoir (see below).

The aerial photograph (left) and ca.1933 map (right) below show how much larger the first Grant Lake reservoir was than the natural lake and its wetland. The aerial photo on the left also shows that Rush Creek then entered the reservoir in a single riparian channel (traced in green), with no delta or wetland. The 1933 property map shows the outline (in blue) of Grant Lake as it was in the 1879 and 1896 plat maps, and the additional post-1916 area covered by the Grant Lake Reservoir (in red). Note that the location of the the Rush Creek outlet is in the same place (just west of the Section 15 boundary). The first Grant Lake Dam had created a reservoir that eliminated its natural wetland. In its stead, in the shallow water on the east side of the reservoir extensive underwater plant beds grew. Fish included chubs and a dominant population of large brown trout.

Figure 6. Grant Lake Reservoir ca. 1930

The first Grant Lake dam and reservoir had been built for the stated purpose of irrigation. W. D. McPherson had planned to use Rush Creek water to irrigate up to 60,000 acres of arid land surrounding Mono Lake, transforming it into a productive agricultural region. By the terms of the 1916 Rush Creek water rights case, McPherson got no rights to Rush Creek water. Cain only

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22 I think these reconstructions of the acreage of the natural lake and the first reservoir are accurate because the “Table of Capacities” for the 7130’ level, which was the level of the post-1940 LADWP reservoir, computes out at 1000 acres which comports with official figures for the post-1940 reservoir. Draft EIR 3D-9.


built the dam and reservoir to avoid being prosecuted for fraud and losing the rights to the water he was using for hydroelectric purposes. So after 1916 Cain had a reservoir and stored water, and his company had an extensive system of irrigation ditches (see Figure 7).

Figure 7. Cain Irrigation Company Ditch System ca. 1930


Cain Irrigation Ditch with Headgate
(Probably Ditch-A Forebay)
But he did not sell any water to McPherson. There were farmers and ranchers in the Mono Basin and some of those got their irrigation water from Cain. But Cain had bought up most of the land riparian to Rush Creek. His Cain Irrigation Company then lavished the water upon that land, turning it not into farmland but into pasture for about 1600 head of his company’s cattle. The Cain Irrigation Company was using so much water that it was investigated twice to determine whether the water was being wasted (both concluded it was).28 As one investigator said, the only thing Cain’s irrigation ditches accomplished was flooding the land and killing off sage brush.

But even ranching was a cover for what Cain’s companies were really interested in, and that was profit. Owning so much Mono Basin land, the Grant Lake reservoir, and rights to Rush Creek water, in late 1923 Cain and the “associated companies” that built and operated the Rush Creek hydroelectric plant and the Grant Lake dam and reservoir made an offer to sell their Mono Basin holdings—but reserving the right to use Rush Creek water for continued generation of electricity—to the one entity that had the financial means and the interest in obtaining water from the Mono Basin: The City of Los Angeles.

The Los Angeles Department of Water and Power at the time was run by William Mulholland who had engineered the aqueduct that brought water from the Owens Valley to Los Angeles. His operatives had been nosing around the Mono Basin to see if they could augment the supply of fresh water to Los Angeles. So the “Associated Companies” in 1923 offered to sell their land and water rights to The City for $5.5 million.29 But being more interested then in what was called the Boulder Canyon project on the Colorado River (later the Hoover Dam and Lake Mead), The City turned down the Associated Companies’ 1923 offer. But The City’s gaze returned to the Mono Basin a few years later.

The Third Period: Grant Lake in the Grasp of the LA-DWP, 1933-1994

The story of what The City called “the Mono Extension” of its Owen Valley aqueduct into the Mono Basin has been told elsewhere.30 It is sometimes assumed that The City used its power of eminent domain to snatch the land and water resources from Mono Basin hands, and that is partially true with regard to the littoral rights of landowners whose properties were on Mono Lake.31 But as noted in the previous section, Cain and the various associated companies that built the Mono Basin hydroelectric projects had bought up 80 percent of the land in the Mono Basin,

29 “Proposal of Cain Irrigation Company, the Southern Sierras Power Company, the Nevada-California Power Company for the Sale of Certain Properties to the City of Los Angeles,” November 23, 1923. For discussion and analysis of this offer, see Marks, “Before Mulholland.”
31 Hart, Storm over Mono, 39.
and their water rights were fixed not just in the 1916 Rush Creek water rights decision, but also in perhaps a more important legal decision that went all the way to the U. S. Supreme Court in 1923. That case affirmed that a public utility—i.e. The City’s Department of Water and Light as it was then called—could not use eminent domain to obtain the property of a privately held public utility—which is what one of the Associated Companies, the Southern Sierras Power Company, was. So the only way The City could obtain all the land and water rights these companies owned in the Mono Basin was to buy them. After several years of negotiations, the terms of the sale for $7.5 million were finalized in 1933. The City then owned and controlled the land and water of the Mono Basin.

Of course, what Los Angeles wanted was not the water rights, but the water. In 1928 the lawyer for the Southern Sierras Power Company, Henry Coil, made the legal argument that they owned not just the water rights in the Mono Basin, but the water itself, and could do with it whatever they wanted. So when the Associated Companies sold their land and water rights to the LA-DWP, they sold the water itself. It became a commodity like any other.

The City of Los Angeles had no doubt that it wanted the Mono Basin water to slake the thirst of its growing residential and farming population. What it planned and engineered was a system that would move the stored water from an enlarged Grant Lake reservoir and send it via an eleven-mile tunnel underneath the Mono Craters, into the Owens River to a newly constructed Long Valley (Crowley Lake) reservoir, and thence through its aqueduct all the way to L.A. (see Figure 7, Mono Basin Extension, below). The plan required much construction work, including not just the tunneling through the Mono Craters, but building a new and higher dam on Rush Creek to enlarge the Grant Lake reservoir. In addition to a crew of over 2000 assembled in a new temporary town called West Portal to dig the tunnel, a camp for 165 more was put up at the Cain Ranch Clubhouse (which still serves as a LADWP maintenance facility) to build the new dam.

32 “Agreement of the Sale and Purchase between The Southern Sierras Power Company and Associated Companies, and Department of Water and Power of the City of Los Angeles,” October 23, 1933.
Cain Ranch Clubhouse ca. 1925


Figure 7

Source: City of Los Angeles Department of Water and Power, *Mono Basin Geology and Hydrology* (March 1987), n. p. Figure 4.
The LADWP Grant Lake Dam. Work on the Mono Craters tunnel began on September 25, 1934, and on the new dam for the Grant Lake reservoir in May 1935. Construction of the whole Mono Basin extension took another four years to complete.  

To accommodate a much larger earth embankment dam spanning 700 feet and 87 feet high, the site selected was about a quarter of mile further down Rush Creek from the first Grant Lake dam, called by the DWP the “Old Dam.” The Old Dam was left in place, but an irrigation diversion gate just below it was removed. A by-pass ditch diverted Rush Creek around the construction site. The loose moraine debris had to be stripped away to more stable abutments and was piled up for later use as backfill. Gravel and sand for concrete was sourced at or near the site, and a portable screening and crushing plant was brought in requiring the construction of a new 20-ton bridge across Rush Creek to handle the loads. While this prep work was going on, excavation for the outlet tunnel from Grant Lake to the West Portal was completed. Once stripped down to a stable footing, filling and compacting began. The new dam as completed stood at 7147’.

By early 1940, the outlet and conduit from Grant Lake to the Mono Craters tunnel was completed and on April 24 a test sent 65 cubic feet per second (cfs) of Rush Creek water to the

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34 See the Annual Reports for 1935-1941 of the Los Angeles Board of Water and Power Commissioners. I think David Carle for sharing these with me.

Owens River. “This marked the first Mono Basin water to be made available to the Los Angeles Aqueduct,” H. L. Jacques of the Major Construction Division of the LA-DWP crowed in a report to the Los Angeles Board of Water and Power Commissioners.36 The new dam was completed in late 1940, a cut through the Old Dam allowed water to be impounded against the new dam, and on January 1, 1941 the whole system was turned over to the Los Angeles Aqueduct Division for operation. It was reported that Grant Lake Reservoir then stored 33,267 acre feet of water (full capacity was nearly 48,000 acre feet),37 placing the 1941 reservoir lake level at about the 7110’ elevation contour. When the 1986 USGS June Lake topographic quadrangle was published (Map 4 below), the lake level was at 7131’ and filled the Grant Lake basin all the way from the gorge at its southern end to the Grant Lake dam at the north end, covering at least 1000 acres. The Old Dam was submerged under about 60 feet of water, and its remains are presumably still there. The approximate area added to the reservoir by the 1940 dam is outlined in red (Map 4). To prepare for this additional inundation, aspens, cottonwoods, and lodgepole pines in the mile-long Rush Creek riparian corridor that had remained after the first reservoir had been filled were “destroyed by chain saws and bulldozers, piled and burned by the City of L. A. clearance crews.”38 Hydrologist Scott Stine estimated that the inundation resulted in the loss of about 50 acres of aspen woodland and 40 acres of wet meadow and cottonwood-willowland.39 Natural habitat was destroyed, and while no species went extinct, they were exiled from the Grant Lake basin.

The City’s construction of the new Grant Lake dam and diversion of Rush Creek water into the aqueduct was accompanied by the diversion of water from Lee Vining Creek water into Grant Lake. It will be recalled that the construction of the first Grant Lake dam had also seen a diversion of Lee Vining Creek water to Grant Lake. That diversion let enough water continue down Lee Vining Creek to Southern Sierra Power Company’s No. 3 hydropower plant just below US 395. The City constructed a new and larger diversion that took all the water from Lee Vining Creek into Grant Lake. Water from Parker and Walker Creeks also was diverted into the Lee Vining conduit. Lee Vining Creek below the diversion went dry. As John Hart summarized the situation, “lower Lee Vining Creek had no significant springs…the creek saw no water after the spring of 1947. Pines, cottonwoods, and willows died. In the early 1950s a fire completed the

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40 Draft EIR 3A-15
destruction of the riparian woodland. The creek became a desert gulch.\footnote{Ibid., 49.} Additionally, all the water from two smaller creeks, Parker and Walker, was also diverted into Grant Lake, and they too went dry.

Most of the time the full flow from Grant Lake went to Los Angeles, averaging 54,800 acre feet annually. Those exports increased by 70 percent to an average of 91,000 acre feet in 1970 when The City enlarged the capacity of the Owens Valley Aqueduct.

The storage capacity of the new Grant Lake reservoir was 47,600 acre feet which was sufficient to capture 50 percent of the average annual flow of Rush Creek. When run-off exceeded capacity water spilled over the dam into the dry Rush Creek streambed, as it did a couple times in the 1940s, again spectacularly in a 1967 flood, and then again in 1980, 1982, and 1984.

As the photo below shows, no water was intentionally allowed to escape the clutches of Los Angeles and to flow into Rush Creek below the dam. In 1984, the discovery of trout in spring-fed ponds in the bottomlands below the Rush Creek Narrows led a state court to issue a temporary restraining order and a requirement that LA-DWP allow a minimum of 19 cfs to flow into Rush Creek to maintain the trout habitat. How did LA comply with that order?

As the dam was constructed in 1940, a combination of three structures regulated the flows out of Grant Lake reservoir: a half-mile concrete-lined outlet tunnel from near the bottom of the reservoir, a control valve located 78 feet above the outlet, and another diversion at what was called Mono Gate No. 1 (for locations see Figure 7). The No. 1 Gate had a device called a “stop log” that could allow some of the 350 cubic feet per second (cfs) flowing to it to be diverted into what was called the Rush Creek Return Ditch. Those small diversions continued intermittently until 1970 when an enlarged aqueduct enabled the LADWP to send all of the Grant Lake south to Los Angeles. Then, after years of disuse and to comply with the 1984 court order, the stop log in the Mono Gate No. 1 creaked open and some water started flowing again into the Rush Creek Return Ditch, and from there into the creek’s dry streambed and down to Mono Lake.
The Fourth Period: 1994-Present

Within a decade, that trickle became a larger and more sustained stream. Several court cases and State Water Resources Control Board (SWRCB) Decision 1631 of September 28, 1994, compelled The City to allow sufficient water to flow into Mono Lake to raise its level to what it was in 1960, or 6392 feet above sea level. To reach that level, Decision 1631 specified the water flows from Rush, Lee Vining, Parker, and Walker Creeks necessary to protect fisheries and the public trust resources in the Mono Lake Basin.\(^\text{42}\) In dry years, Decision 1631 directed water to be released from Grant Lake reservoir until it dropped about 40’ to a water volume of 11,500 acre-feet,\(^\text{43}\) to the 7130’ contour level (70 feet above the natural lake level of 7060 feet). With some water refilling the recently dried creek channels and a 2013 State Water Board order, the

\(^{42}\) Ibid., 84.

Mono Lake Committee developed plans for restoration of the streambeds and scientifically based stream restoration work began in 2013 (and continues to the present). With SWRCB Decision 1631, Grant Lake Reservoir was no longer to be used solely to slake the thirst of Los Angeles. It was also to contribute to raising Mono Lake to an ecologically sustainable level, and to serve the water needs of the flora and fauna of the Mono Basin. Tragically, Mono Lake has never recovered to its mandated 6392’ level, and the struggle led by the Mono Lake Committee to get sufficient water from the clutches of the City of Los Angles to put the Mono Lake basin on an ecologically sound footing continues.

Conclusion: The History and Future of Grant Lake, Its Dam and Reservoir

Grant Lake has existed since the end of the last glacial age, predating humans in the Mono Basin. Its transformation by two successive dams (in 1916 and 1940) into a reservoir to satisfy human needs and wants happened only in the last century of its natural history. Given the vast environmental damage that the dams creating those reservoirs have caused—from the submerging of the Grant Lake wetlands to the desiccation of the Mono Basin and endangering the very existence of Mono Lake—the question has to be asked as to whether, when, and how the Grant Lake dam will be removed, and its basin environmentally restored. As the recent removal of four dams along the Klamath River in northern California shows, the century-long spate of damming nearly every river in North America to supply fresh water for various purposes, including hydroelectric power generation, flood prevention, irrigation, and urban consumption, is coming to an end. The rationale for the City of Los Angeles to keep the Grant Lake dam and reservoir in place to supply it with but one percent of its needs is wearing very thin. Sooner or later that rationale will evaporate as the environmental needs of Mono Lake and its Basin supersede those of Los Angeles, and the Grant Lake dam and reservoir will give way to a natural lake that will be very much like the one that once existed. Whether that would meet the recreational desires of trout fishers, wind surfers, and dog walkers no doubt would be contentious.

Perversely, the removal of the LADWP dam is unlikely because the restoration of Rush Creek below the dam is dependent on the continued existence of the dam and its operation by LA DWP. To mimic variations in annual and yearly water flows requires the DWP to release water according to flows determined by court orders and decisions by the State Water Resources Control Board. Without the dam those flows could not be managed. All Rush Creek water is impounded further up Rush Creek in the other dam system now owned and operated by Southern California Edison for the generation of hydroelectric power. That requires a steady flow of water into the Rush Creek hydropower station, and without Grant Lake dam the SCE use of Rush

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44 “Stream Restoration Order 2021-86,” Mono Lake Committee [https://www.monolake.org/whatwedo/restoration/streams/streamrestorationagreement/]. Full implementation of the SWB order will require altering the structure of the dam to allow required water flows directly from the dam into the still-dry Rush Creek streambed below the dam. LA-DWP has delayed that work for a decade, but recent reports indicate it might begin in April 2024.

Creek water would flatten out annual and yearly flows, obviating plans and attempts to restore Rush Creek below the Grant Lake dam to anything like its pre-1940 condition.