TAHOE: STATE OF THE LAKE REPORT 2010

PHYSICAL PROPERTIES

UCDAVIS
TAHOE ENVIRONMENTAL
RESEARCH CENTER

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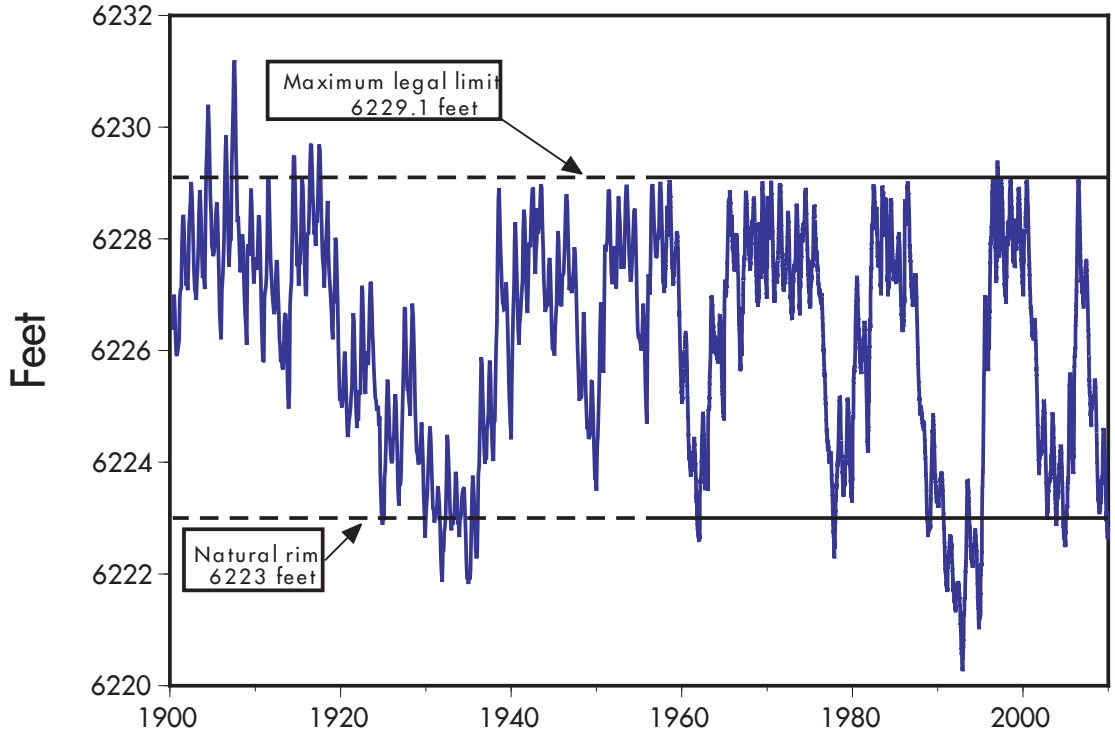
PHYSICAL PROPERTIES

Lake surface level

Daily since 1900

Lake surface level varies throughout the year. It rises due to high stream inflow, groundwater inflow and precipitation directly onto the lake surface. It falls due to evaporation, in-basin water withdrawals, and outflow via the Truckee River at Tahoe City. Despite the near-average precipitation, lake level generally fell in 2009. In 2009, the lake level rose by only 16.8 inches during snowmelt, compared with several feet in normal runoff years. The highest lake level was 6224.61 feet on June 15, and the lowest was 6222.76 feet on December 31, almost three inches below the natural rim. From October 28 to the end of the calendar year, there was no outflow from Lake Tahoe into the Truckee River.

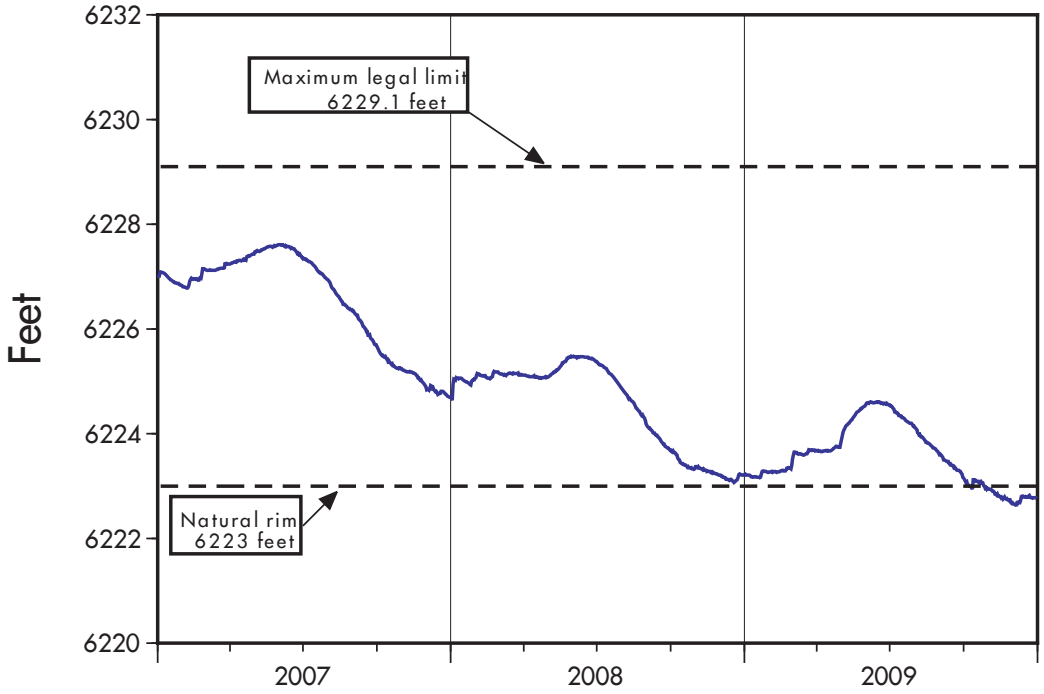


PHYSICAL PROPERTIES

Lake surface level

Daily since 2007

Identical data as used on page 8.1 except the period of record is shortened to 2007-2009. This more time resolved presentation of recent lake level data allows us to see the seasonal patterns in higher definition. Data clearly show the drop in lake level below the natural rim in the last quarter of 2009 as well as the annual periods of highest lake level (generally in June).

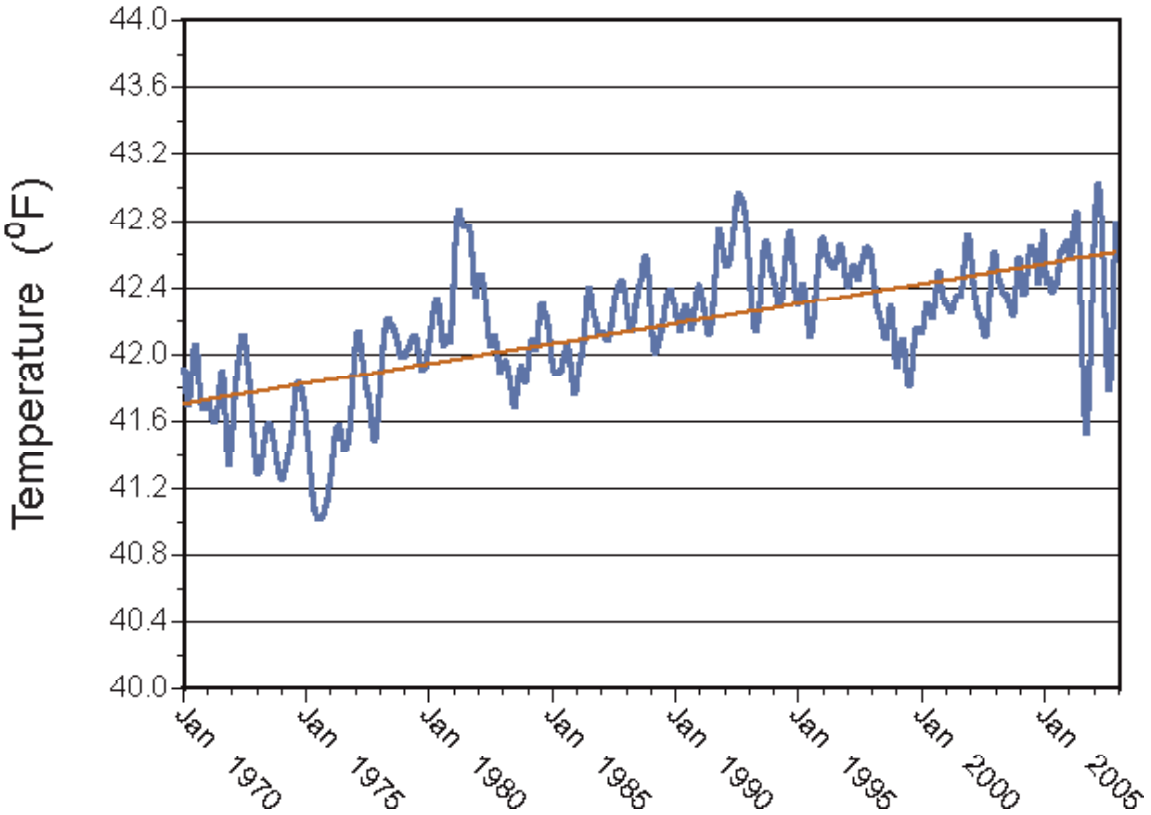


PHYSICAL PROPERTIES

Average water temperature

Since 1970

The volume-averaged temperature of Lake Tahoe has increased nearly a full degree since 1970, from 41.7 degrees F to 42.6 degrees F. (The monthly temperature profile data from the lake has been smoothed and deseasonalized to best show the long-term trend.)



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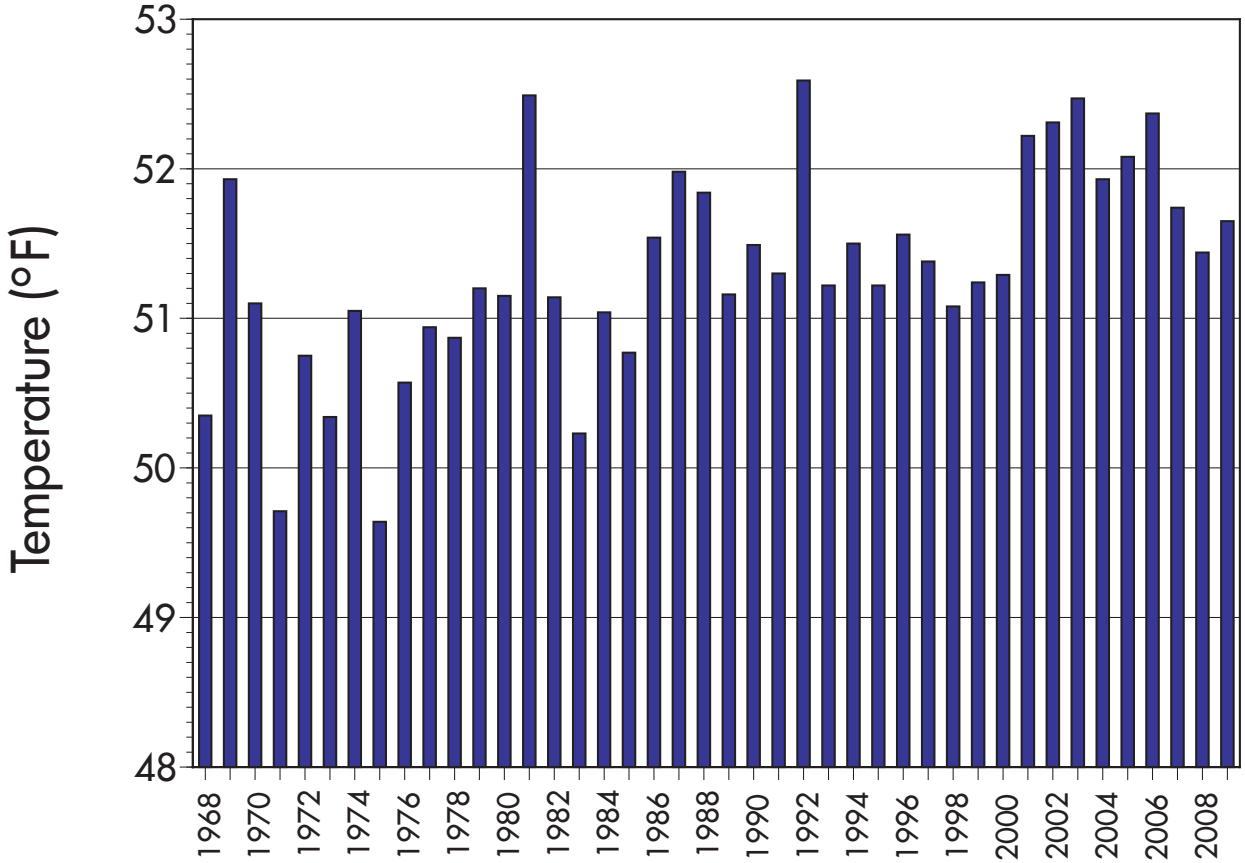
Surface water temperature

Yearly since 1968

Surface water temperatures have been recorded at the mid-lake station since 1968. Despite year-to-year variability, water temperatures show an increasing trend. The average temperature in 1968 was 50.3 degrees F. For 2009, the average surface water temperature was 51.65 degrees F.



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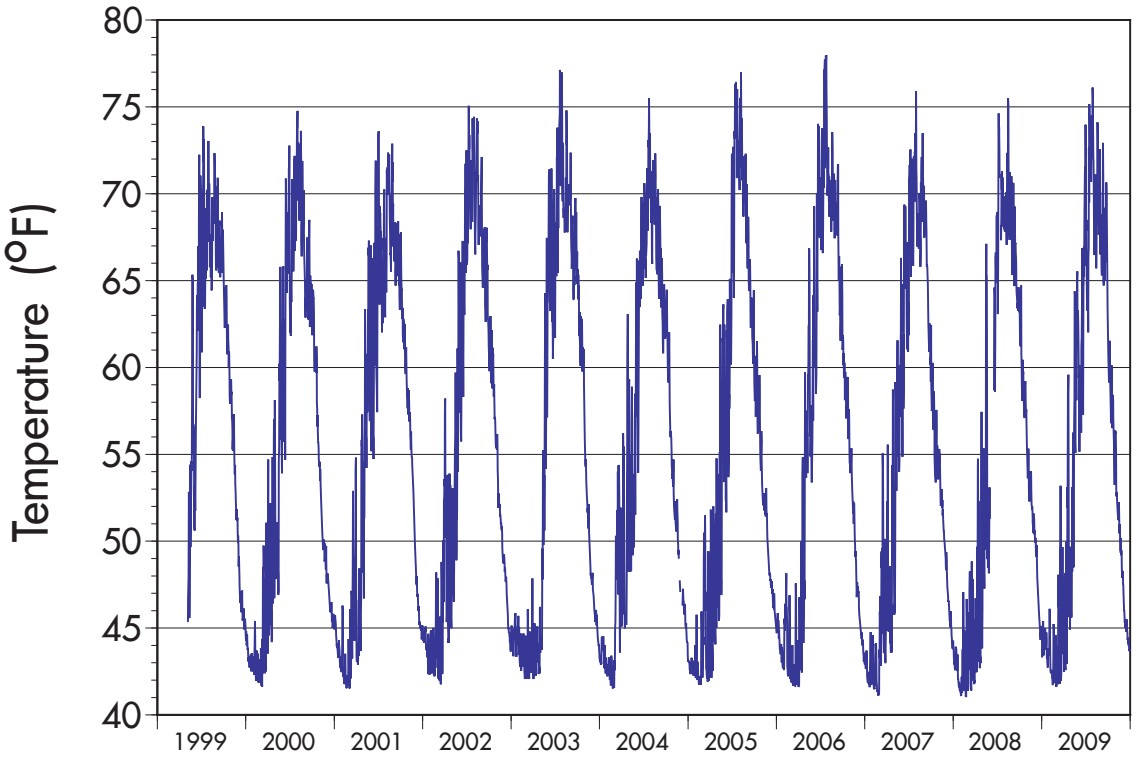
Maximum daily surface water temperature

Every 15 minutes since 1999

Maximum daily surface water temperatures were similar in 2009 to the 2007 and 2008 values, although summer surface water temperatures continue to show a long- term increase. Since May 1999, the highest maximum daily surface temperature was 77.99 degrees F on July 26, 2006. The lowest maximum daily surface water temperature was 41.02 degrees F on Feb. 25, 2008. In the last decade, the 28 lowest maximum daily surface water temperatures occurred in 2007 and 2008. This may be attributable to the deep mixing that occurred in both those years. Surface water temperatures in winter were warmer in 2009 because of the absence of deep mixing. These data are collected by NASA and UC Davis from a buoy located near the center of the lake.



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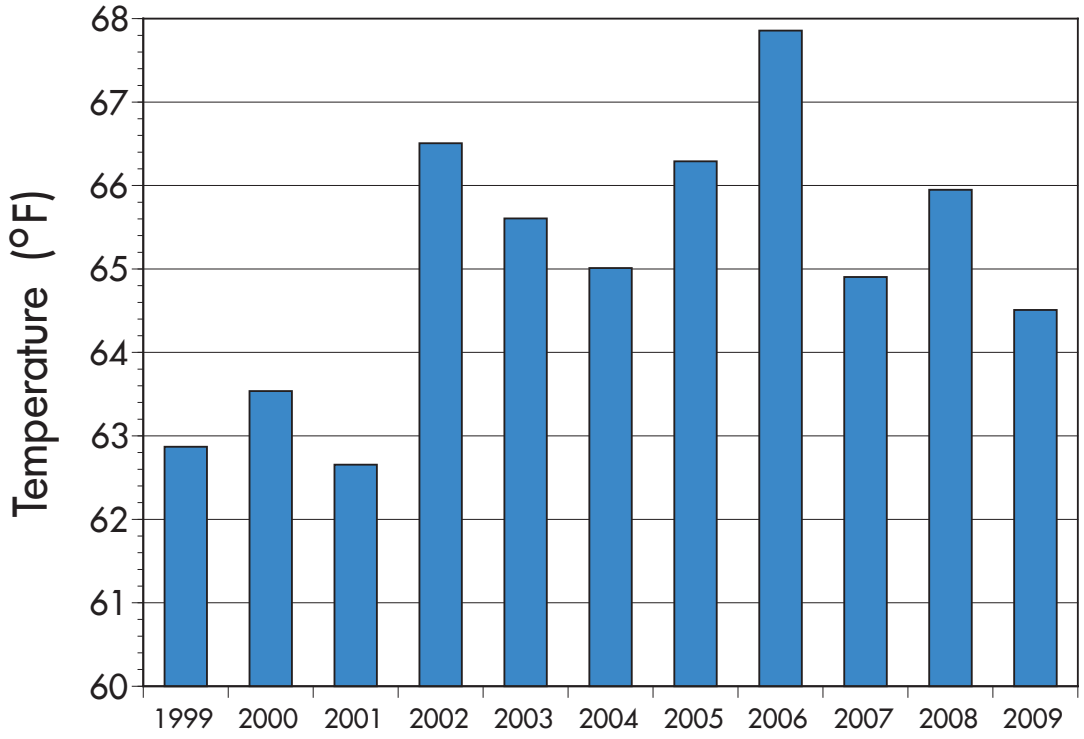
July average surface water temperature

Since 1999

Since 1999, surface water temperature has been recorded every two minutes from four NASA/UC Davis buoys. Shown here are 11 years of average surface water temperatures in the month of July when water temperatures are typically warmest. In 2009, July surface water temperature averaged 64.5 degrees F, 1.5 degrees cooler than in 2008.



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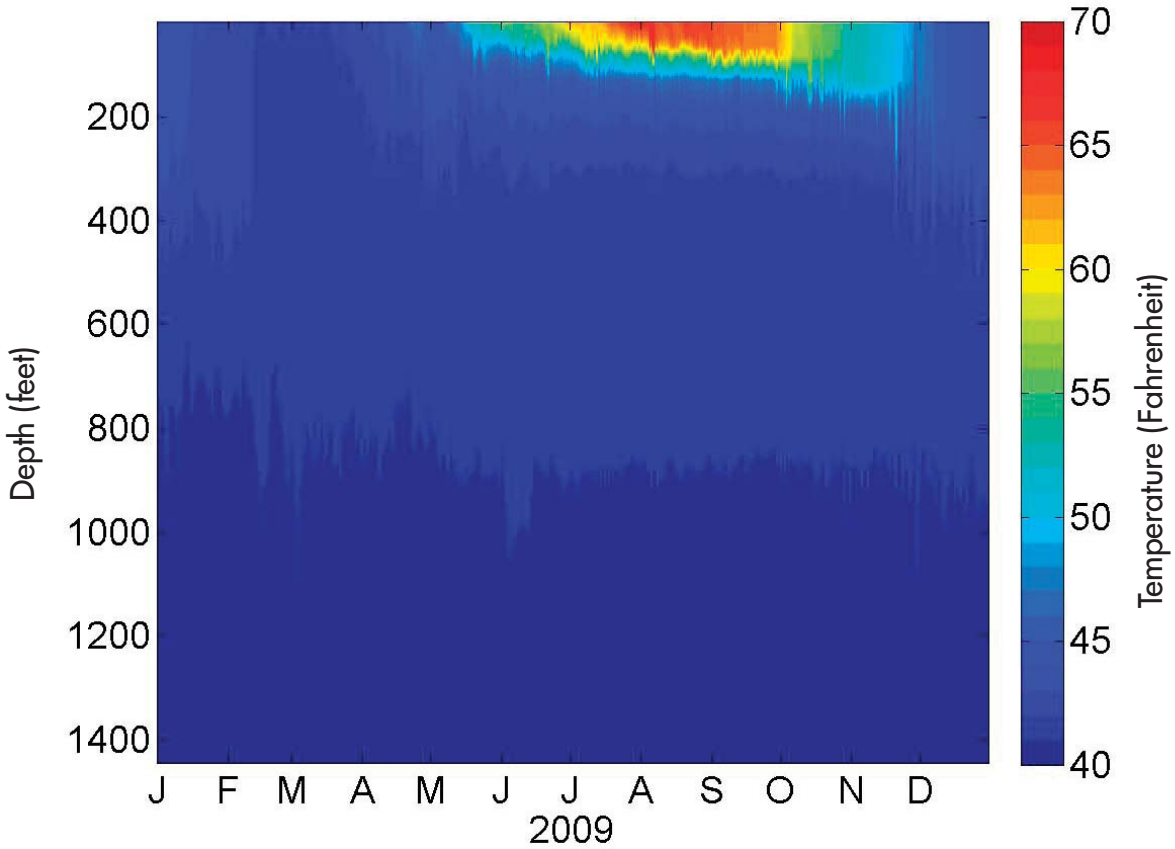
Water temperature profile

In 2009

Water temperatures are measured continuously in the lake by a set of 20 thermistors, which are positioned on a taut, vertical mooring line from the lake bottom to the surface. These instruments record temperature to an accuracy of 0.005 degrees F every 2 minutes. Here the temperature is displayed as a color contour plot. The fluctuations at the junction between two color bands are evidence of internal waves. These represent large scale oscillations that continually move through the lake with amplitudes in excess of 200 feet. In 2009, the lake temperature followed a typical seasonal pattern. In early March, the lake surface was at its coldest. However, the lake did not mix throughout its depth (as evidenced by the color banding). The maximum depth of mixing was approximately 700 feet, well short of the lake's maximum depth of 1645 feet.



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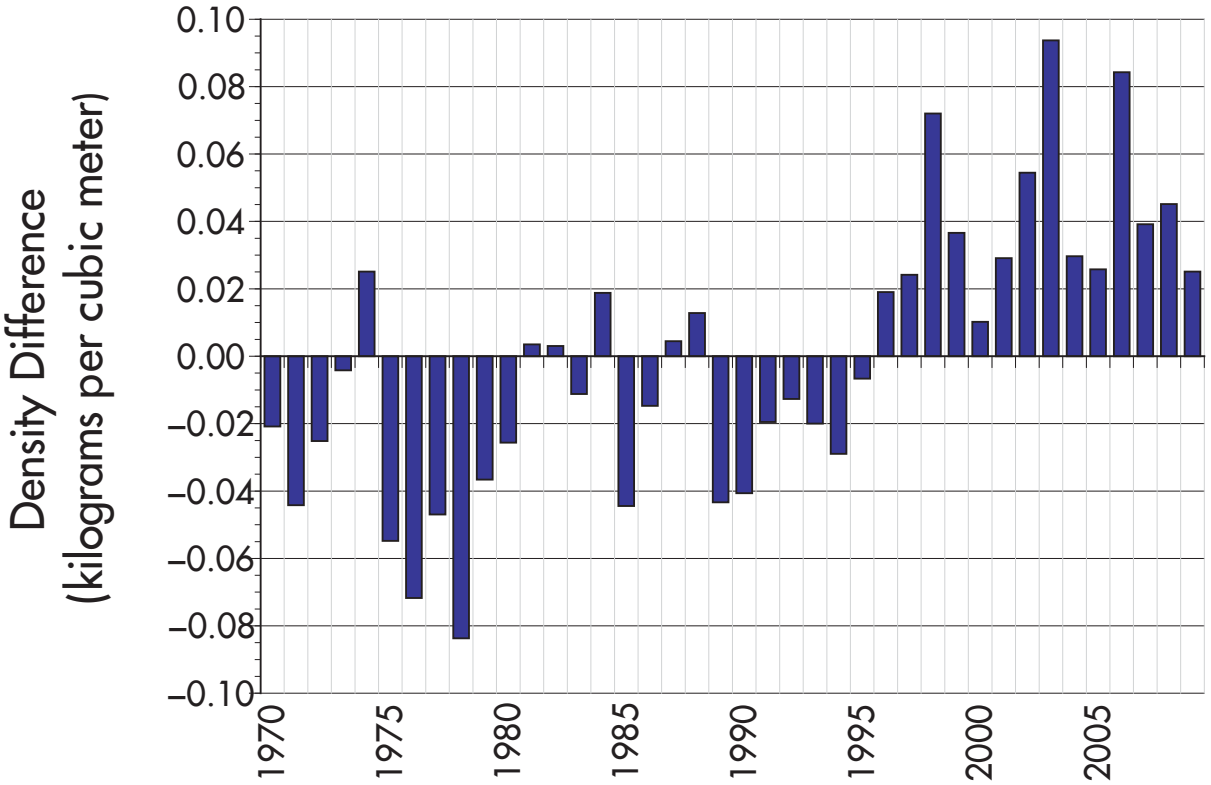
Density stratification

Since 1970

Density stratification in Lake Tahoe has generally increased since 1970, as shown by the trend below. Each bar represents the annual average density difference between deep (100 to 165 feet) and shallow (0 to 33 feet) water, subtracted from the mean density. Density differences increase as Lake Tahoe's surface waters warm, making them less dense or lighter. Increasing density stratification makes deep mixing of the lake occur less frequently. Density stratification is an indicator of resistance to deep lake mixing.

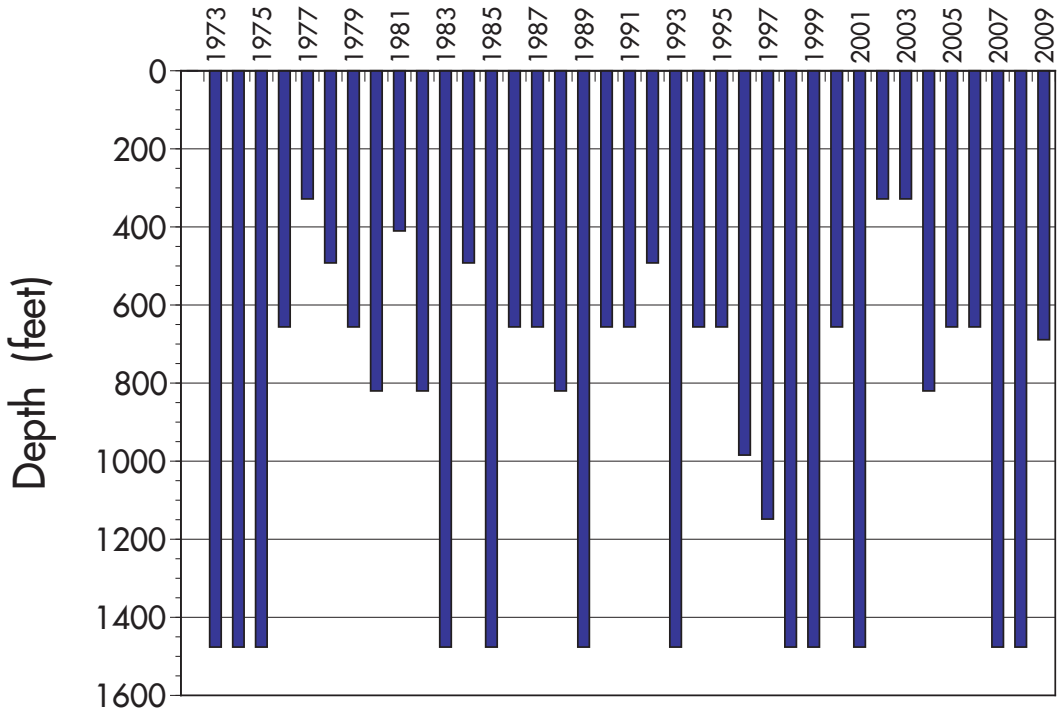


PHYSICAL PROPERTIES

Depth of mixing

Yearly since 1973

Lake Tahoe mixes each winter as surface waters cool and sink downward. In a lake as deep as Tahoe, the wind energy and intense cooling of winter storms helps to determine how deeply the lake mixes. Mixing depth has profound impacts on lake ecology and water quality. Deep mixing brings nutrients to the surface, where they promote algae growth. It also moves oxygen to deep waters, promoting aquatic life throughout the water column. The deepest mixing typically occurs in late February to early March. In 2009, Lake Tahoe mixed to a depth of approximately 700 feet.



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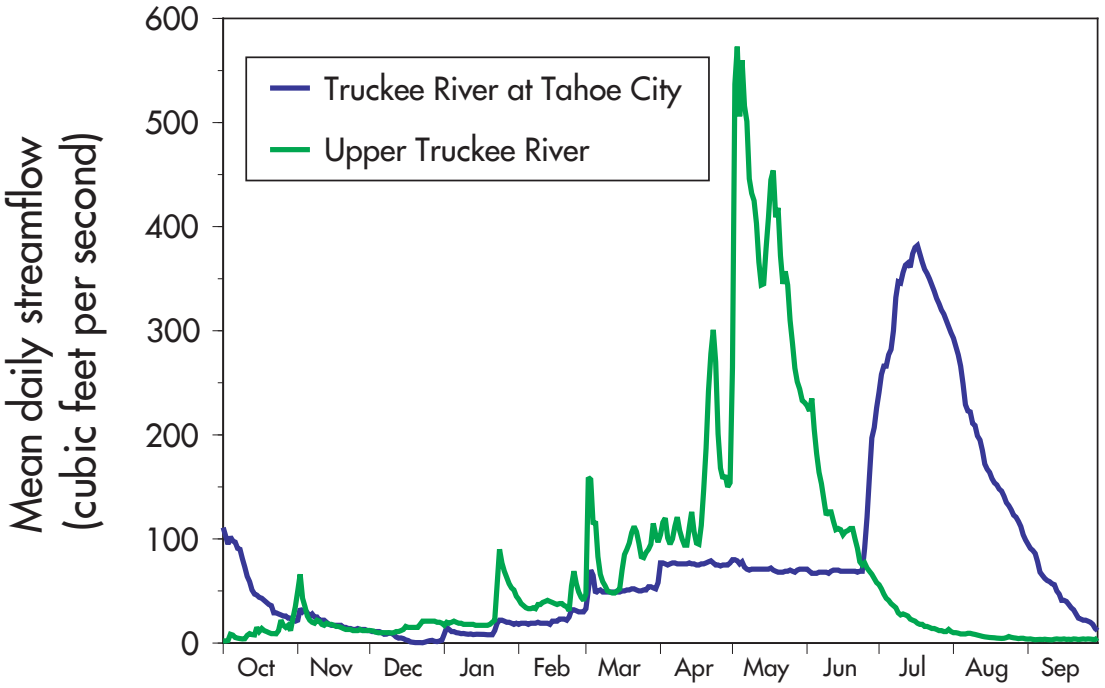
Mean Daily Streamflow of Upper Truckee River vs. Truckee River

Water Year 2009

The Upper Truckee River, the largest stream to flow into Lake Tahoe, has a natural annual hydrograph for a snow-fed stream. The small peaks in the hydrograph represent rain events or short warm periods. The major peak in the hydrograph represents the peak in the spring snowmelt. The peak in 2009 was 573 cubic feet per second on May 3. The Truckee River is the only outflow from Lake Tahoe. The streamflow in the Truckee River is a regulated flow, with release quantity controlled by the Federal water master. The release rates are set according to downstream demands for water. The maximum discharge in 2009 was 382 cubic feet per second on July 17. Streamflow data are collected by the Lake Tahoe Interagency Monitoring Program (LTIMP).



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Annual streamflow for Upper Truckee River and Truckee River

Since 1980

Flow into Lake Tahoe (e.g. Upper Truckee River) and discharge out of Lake Tahoe (Truckee River at Tahoe City) have shown considerable variation since 1980. The large peaks in discharge from the lake correspond to years when precipitation (and therefore total inflow) was the greatest, e.g. 1982-1983, 1986, 1995-1999. Similarly, the drought-like conditions in the early 1990s and the low precipitation years in the beginning of the 2000s also stand out. Since many of the pollutants of concern for Lake Tahoe's clarity enter along with surface flow, year-to-year changes in clarity are influenced by precipitation and runoff.