Using Modern Mapping Tools to Explore Past Conditions

Pluvial Lake Modoc
(ca. 2.5 MYA - 11,700 YA)

Rhett (Tule) Lake
(ca. 1873 CE)

This map displays the approximate extents of **Pluvial Lake Modoc** on the left and the former **Tule Lake** on the right.

These representations are shown at the highest estimated water level for Lake Modoc (4,240ft) and the estimated water level circa 1873 for Tule Lake (4,055ft).

Due to changes in the landscape from seismic and volcanic activities, some landforms present today may not have existed at the same time as the lake levels shown here.

Pluvial Lake Modoc was a massive waterbody that existed during the Pleistocene Epoch (circa 2.58 million to 11,700 years ago; commonly referred to as the Ice Age).
"Pluvial" is a term that refers to high levels of precipitation and is used in naming lakes of the Pleistocene to distinguish them from lakes that currently exist in a warmer and drier climate.
It is believed that the drying climate plus a shift in fault blocks are what led to the demise of this ancient lake, allowing it to drain at modern-day Keno.
At its highest water level, the lake covered approximately 700,950 acres (1,095 square miles).

Tule Lake was originally named "Rhett Lake" by John C. Frémont during his mapping expedition of the area in 1846.
The lake is a remnant of the former Pluvial Lake Modoc and is believed to have formed after 11,000 years ago when the earlier, larger lake had drained enough to create land divisions between Tule and both Klamath lakes. The extent shown here is the estimated water level around the time of the Modoc War of 1872–1873 and would have been what early settlers had encountered and grown accustomed. At this level, the lake spanned approximately 93,250 acres (146 square miles).

Creating the digital representations of the lakes required the use of powerful geographic information system (GIS) software and various sets of data. The first step was to create contour lines from a digital elevation model (DEM) of the entire Klamath and Tule basins. A DEM is a raster (image) data type that contains elevation information for each pixel comprising the image. Pixel dimensions (i.e., "resolution") can vary between different DEMs but are typically 10x10 meters in size, which is the type of resolution used in this analysis.

The next steps involved a painstaking process of creating a polygon from the contour lines that would mimic the water level for each lake. Because land does not rise or fall along a continuous straight line, this step introduced hundreds of polygons that ranged in size from thousands of square meters to less than 10. These polygons were manually inspected for relevancy and either incorporated into the primary shape or deleted—a process that took several hours to complete. The final results are shown here but because of the rate of error, these should only be viewed as approximations and not the literal shorelines.

Approximation or not, having the ability to visualize the geospatial extent of these historical and ancient lakes allows researchers to explore the past in new ways. Archaeologists can use these data to address questions related to where people may have likely lived in relation to the lakes. Soil scientists can better answer questions of soil fertility and geologists can better understand land formation processes. And local landowners can get a clearer picture of where their property is situated in relation to the footprint of these ancient waterbodies.

Sources

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March 2025