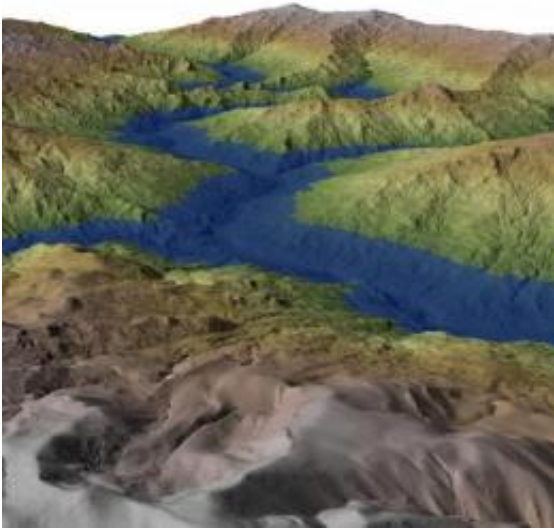


# Evidence of ancient lake in California's Eel River emerges

November 14 2011

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This is how the ancient lake likely appeared after being formed by a landslide, based on LiDAR technology. Credit: Image courtesy of Benjamin Mackey

A catastrophic landslide 22,500 years ago dammed the upper reaches of northern California's Eel River, forming a 30-mile-long lake, which has since disappeared, and leaving a living legacy found today in the genes of the region's steelhead trout, report scientists at two West Coast universities.

Using remote-sensing technology known as airborne Light Detection and Ranging (LiDAR) and hand-held global-positioning-systems (GPS) units, a three-member research team found evidence for a late

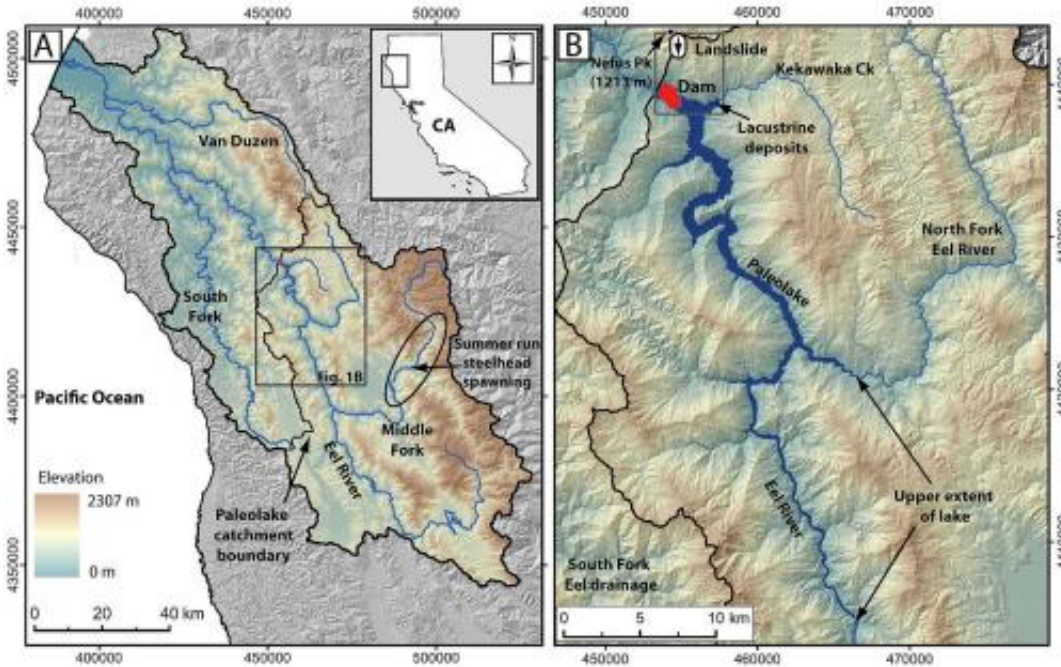
Pleistocene, landslide-dammed lake along the river, about 60 miles southeast of Eureka.

The river today is 200 miles long, carved into the ground from high in the California Coast Ranges to its mouth in the Pacific Ocean in Humboldt County.

The evidence for the ancient landslide, which, scientists say, blocked the river with a 400-foot wall of loose rock and debris, is detailed this week in a paper appearing online ahead of print in the [Proceedings of the National Academy of Sciences](#).

The National Science Foundation-funded study provides a rare glimpse into the geological history of this rapidly evolving mountainous region.

It helps to explain emerging evidence from other studies that show a dramatic decrease in the amount of sediment deposited from the river in the ocean just off shore at about the same time period, says lead author Benjamin H. Mackey, who began the research while pursuing a doctorate earned in 2009 from the University of Oregon. He is now a postdoctoral researcher at the California Institute of Technology.



This graphic shows the Eel River system in northern California, where researchers found evidence for an ancient lake. Credit: Image courtesy of Benjamin Mackey

"Perhaps of most interest, the presence of this landslide dam also provides an explanation for the results of previous research on the genetics of steelhead trout in the Eel River," Mackey said, referring to a 1999 study by U.S. Forest Service researchers J.L. Nielson and M.C. Fountain. In their study, published in the journal *Ecology of [Freshwater Fish](#)*, they found a striking relationship between two types of ocean-going steelhead in the river -- a genetic similarity not seen among summer-run and winter-run steelhead in other nearby rivers.

An interbreeding of the two fish, in a process known as genetic introgression, may have occurred among the fish brought together while the river was dammed, Mackey said. "The dam likely would have been impassable to the fish migrating upstream, meaning both ecotypes would

have been forced to spawn and inadvertently breed downstream of the dam. This period of gene flow between the two types of steelhead can explain the genetic similarity observed today."

Once the dam burst, the fish would have reoccupied their preferred spawning grounds and resumed different genetic trajectories, he added.

"The damming of the river was a dramatic, punctuated affair that greatly altered the landscape," said co-author Joshua J. Roering, a professor of geological sciences at the University of Oregon. "Although current physical evidence for the landslide dam and paleo-lake is subtle, its effects are recorded in the Pacific Ocean and persist in the genetic make-up of today's Eel River steelhead. It's rare for scientists to be able to connect the dots between such diverse and widely-felt phenomena."

The lake's surface formed by the

landslide, researchers theorize, covered about 12 square miles. After the dam was breached, the flow of water would have generated one of North America's largest landslide-dam outburst floods. Landslide activity and erosion have erased much of the evidence for the now-gone lake. Without the acquisition of LiDAR mapping, the lake's existence may have never been discovered, researchers say.

The area affected by the landslide-caused dam accounts for about 58 percent of the modern Eel River watershed. Based on today's general erosion rates, researchers theorize the lake could have been filled in with sediment within about 600 years.

"The presence of a dam of this size was highly unexpected in the Eel River environment given the abundance of easily eroded sandstone and mudstone, which are generally not considered strong enough to form long-lived dams," Mackey said.

He and his colleagues were drawn to the Eel River -- among the most-studied erosion systems in the world -- to study large, slow-moving landslides. "While analyzing the elevation of terraces along the river, we discovered they clustered at a common elevation rather than decrease in elevation downstream, paralleling the river profile, as would be expected for river terraces. This was the first sign of something unusual, and it clued us into the possibility of an ancient lake."

Provided by University of Oregon

Citation: Evidence of ancient lake in California's Eel River emerges (2011, November 14)  
retrieved 25 April 2024 from

<https://phys.org/news/2011-11-evidence-ancient-lake-california-eel.html>

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