New Analysis Shows Important Slowdown in Lake Tahoe Clarity Loss

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For the first time since researchers began continuously measuring Lake Tahoe's famed water clarity 40 years ago, UC Davis scientists reported today that the historical rate of decline in the lake's clarity has slowed considerably in recent years.

Scientists at the UC Davis Tahoe Environmental Research Center say that by using new, more sophisticated models for detecting trends and, by factoring out the effects of annual precipitation, they have concluded that the historic rate of decline in the lake's clarity has slowed since 2001.

"From 1968 to 2000 there was a near-continuous decline in lake clarity. There were several years at a time when things seemed to improve, but invariably we returned to the same trend," said Geoffrey Schladow, a UC Davis professor of civil and environmental engineering who directs the Tahoe research center. "But since 2001, we have had seven years in which the clarity has consistently been better than the long-term trend would have predicted. This is unprecedented."

Schladow cautioned that the data do not pinpoint a specific cause for the recent improvements, but noted that new modeling results show that runoff of fine particles from both urbanized areas and roadways around the lake are the primary factors that influence clarity levels. Fine particles scatter light and limit how far into the lake we can see.

In addition, Schladow and his UC Davis colleagues cautioned that it is

difficult to use data from a small number of years (2001 to 2007) to draw conclusions about when the trend might change from a slowdown in clarity decline to an improvement in clarity. "Only with the commitment to long-term monitoring can we truly evaluate environmental changes over time," he said.

Even so, the report was welcomed by the Tahoe Regional Planning Agency and other agencies charged with protecting the lake, who suggested that the data provide evidence that years of investments in reducing runoff may now be paying off.

Federal, state and local agencies, as well as local homeowners and businesses, have invested more than $500 million in a coordinated effort to reduce runoff through Tahoe's Environmental Improvement Program, which was launched in 1997 by President Clinton and other officials.

"Our entire community shares the credit for these very encouraging new findings," said John Singlaub, executive director of the Tahoe Regional Planning Agency. "Years of investments in reducing runoff to the lake have slowed the clarity decline. Now we must continue those efforts to clearly reverse the decline and to meet our long-term clarity goals."

Today's clarity findings are also striking in light of recent evidence that global climate change has increased air and lake temperatures in the Tahoe basin. Scientists are concerned that rising air and lake temperatures could increase runoff and the potential for algal blooms.

UC Davis reported last summer that the percentage of precipitation falling as snow decreased from 52 percent to 34 percent since 1911, and that lake waters in July have warmed by almost five degrees since 1999.

"Climate change poses a very real threat to the Tahoe basin's environment and economy," Schladow said. "But the new data that we

are presenting today, and other models, suggest that the lake's clarity can be improved, even in the face of gradually warming temperatures."

UC Davis researcher Charles Goldman, who pioneered scientific studies of Lake Tahoe in 1959, today stressed the importance of simultaneously looking at the impacts of climate change and other localized factors, such as fire, on lake clarity.

How the new data were produced

The UC Davis research team produced the new data by using a more sophisticated statistical approach for evaluating the 40-year clarity record. Schladow said the new approach "provides a more realistic picture of current conditions."

The statistical technique allows the trend analysis during recent years to be more reflective of clarity measurements taken in those years and less by historic conditions, said John Reuter, associate director of the UC Davis Tahoe Environmental Research Center.

UC Davis' Tahoe research center scientists also developed and published a "time series" model that incorporates current scientific understanding of the year-to-year variation in clarity; in particular, this model allows researchers to consider important lake processes such as the amount of annual precipitation and depth to which the lake mixes each year.

Here is what those new models and approaches showed: Between 1968 and 2000, the rate of decline in clarity of the lake waters (approximately one foot per year) remained constant with virtually no suggestion of a significant change.

However, during the 2001-2007 time period, scientists detected a noticeable decrease in the rate of decline.

UC Davis researchers measure the lake's clarity every 10 to 14 days using the same instruments at two fixed locations. One key measure is the Secchi depth -- the depth at which a white disk, the size of a dinner plate, disappears from sight.

Reuter said the new analyses underscore the importance of considering the Lake Tahoe clarity trend over time and avoiding over-emphasis on a single year's average Secchi depth.

History of clarity efforts in the Tahoe basin

When UC Davis' Goldman first began studying Lake Tahoe in 1959, he introduced novel techniques for measuring the ecological health of the lake and was the first scientist to warn that Tahoe's famous cobalt blue color was threatened.

Today, many academic institutions and public agencies are working together to restore and preserve the Tahoe basin ecosystem. Some of the most active research programs are at: UC Davis; the Lahontan Region of the California Regional Water Quality Control Board (which helped fund this new trend study); Nevada Department of Environmental Protection; California Air Resources Board; U.S. Forest Service; Tahoe Regional Planning Agency; University of Nevada, Reno; Desert Research Institute; and NASA.

In 1997, the Tahoe Regional Planning Agency launched the Environmental Improvement Program as part of its strategy to achieve the environmental threshold goals for the Lake Tahoe basin by healing past environmental damage.

The planning agency and other agencies' top priorities became reducing the amount of fine sediment in stormwater discharges from state and local roads and other urbanized areas, restoring key watersheds, and

capturing runoff from homes and businesses.

In 2002, the states of California and Nevada cooperatively began to develop a water-clarity restoration plan for Lake Tahoe, known as the Total Maximum Daily Load or TMDL. TMDLs are required by the U.S. Environmental Protection Agency nationwide to improve impaired bodies of water.

Now the agencies are in the process of completing the TMDL, as well as a 10-year update to the Environmental Improvement Program and a new regional plan for the Tahoe basin.

As part of those efforts, the California Lahontan Regional Water Quality Control Board and the Nevada Division of Environmental Protection recently issued a Clarity Challenge that calls for an improvement in clarity to between 77 and 80 feet in 15 years. (In 2007, the waters of Lake Tahoe were clear to an average depth of 70.2 feet; in 1968, the depth was 102.4 feet.)

A recent report for the TMDL program demonstrates that this challenge is achievable, said Harold Singer, executive officer of the Lahontan Water Board.

Current best practices implemented through the Environmental Improvement Program and aggressive implementation of more innovative water quality treatment will continue to be the basis for clarity improvement.

"Source-control measures are the most effective means to reduce fine sediment reaching Lake Tahoe," Singer said. "Such efforts include restoring disturbed lands to increase infiltration and minimize soil erosion, along with more attention to the nature and amount of applied road abrasives. Efforts to treat storm water runoff also need to focus on

removing these very fine particles."

UC Davis scientists, in cooperation with California and Nevada water-quality protection agencies, have developed one further restoration tool known as the Lake Clarity Model. This approach can simulate the lake's response to various combinations of pollution types and amounts. This tool is currently being used to evaluate management strategies as part of the TMDL program.

Source: UC Davis