Climate change, algae lessen Lake Tahoe's clarity

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(PhysOrg.com) -- Lake Tahoe clarity dropped in 2010, but the rate of decline in clarity over the past decade remains slower compared with previous decades, according to UC Davis scientists who have monitored the lake for more than 40 years.

Researchers say the findings underscore the need for increased monitoring and continued collaborative management of the lake by both California and Nevada.

In a study released today by the UC Davis Tahoe Environmental Research Center and the Tahoe Regional Planning Agency, scientists report that water clarity dropped from 68.1 feet in 2009 to 64.4 feet in 2010, a 3.7-foot decline that resulted in the second-lowest clarity level ever recorded at Lake Tahoe.

“Taken alone, that decline in clarity is unusual but it is within the range of normal fluctuations,” said Geoffrey Schladow, director of the UC Davis Tahoe Environmental Research Center.

“However,” he added, “an analysis of other key variables makes us think that the transparency of the lake’s water may be now influenced by a new set of factors.” Those factors likely include climate change and tiny algae, according to the report.

“While we’re still maintaining the decade-long trend of slowing the decline in clarity, the new forces of climate change and the unusual

concentrations of algae have us concerned," said Joanne S. Marchetta, executive director of the Tahoe Regional Planning Agency. She said this year's research findings underscore the urgency of environmental restoration work at Lake Tahoe.

"TRPA is committed to addressing the challenges highlighted in the report by continuing our leadership role in the Tahoe basin to bring together all who have a role to play in the lake's preservation," Marchetta said.

Clarity is measured by the depth to which a Secchi disk monitoring device remains visible when dropped beneath the water surface.

The rate of decline in clarity has slowed overall in recent years, but with year-to-year fluctuations. In more than 50 percent of the 43 years for which Secchi depth measurements have been taken, researchers have seen differences (both positive and negative) as great or greater than this year's drop. Schladow noted that lake clarity has been improving during winter for the last decade, but deteriorating summer conditions have outweighed some of those gains.

The report, "State of the Lake Report 2011," suggests that climate change may have produced conditions that favored the proliferation of Cyclotella, a single-cell, free-floating algae, which in large concentrations can diminish clarity.

"The numbers of Cyclotella have grown significantly in recent years," said John Reuter, associate director of the UC Davis Tahoe Environmental Research Center. "This year, in particular, these single-cell algae were concentrated very close to the surface, strongly scattering light and thereby impacting lake clarity."

The researchers speculate that the improvements in winter clarity

measurements may be due to recent efforts to reduce urban stormwater flows into the lake. They point to the need to obtain funding for a comprehensive urban stormwater-monitoring program in the Tahoe basin, to further test this hypothesis.

For the first time, clarity data derived from remote sensing via satellite images of the entire lake are included in the report. This information reveals that, for most of the year, clarity on the eastern shore is significantly lower than on the western shore. It also indicates that clarity is better at one mile offshore than it is within a half-mile of the shore, highlighting the importance of better managing near-shore water quality.

While the research team concluded that the trajectory of the Secchi clarity measurements into the future is uncertain, the UC Davis scientists also consider that the investment to date in water quality control projects cannot be underestimated.

Reduction in nutrients and fine sediment load is clearly in the best interest of lake clarity, according to the report's authors.

"There is every reason to believe that if it were not for the decades of watershed management, development policy and water quality restoration projects, the lake's transparency would be worse than it is today," Schladow said.

In addition to an analysis of lake clarity, this year's report presents information on new efforts being made to control the aquatic invasive species — Asian clam — that was first observed in Lake Tahoe in 2002 and has now reached large densities in certain portions of the lake. Additional topics include algae composition and concentration, the current impact of climate change on precipitation, changes in lake water temperature and the effect of lake warming on circulation.

More information: The full report is available online on the UC Davis Tahoe Environmental Research Center website: terc.ucdavis.edu/stateofthelake/ .

A list of Lake Tahoe clarity levels, measured in Secchi depths from 1968 through 2010 is available online: terc.ucdavis.edu/research/SecchiData.pdf .

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