EXECUTIVE SUMMARY

The long-term data set collected on the Lake Tahoe ecosystem by the University of California, Davis, and its research collaborators is an invaluable tool for understanding ecosystem function and change. It has become essential for responsible management by elected officials and public agencies tasked with restoring and managing the Tahoe ecosystem, in part because it provides a basis for monitoring of progress toward reaching Tahoe's restoration goals and desired conditions.

This annual Tahoe: State of the Lake Report presents data from 2011 in the context of the long-term record. While the focus is on data collected as part of our ongoing, decades-long, measurement programs, this year we have also included summarizing current research on detailed sections summarizing current research on lake color, near-shore attached algae (periphyton), Angora Fire, gyres and currents in Lake Tahoe, boat traffic in Emerald Bay, forest health, and progress on the efforts to control Asian clams. This year's report also includes data about changes in the algae composition and abundance, lake clarity, and the current effects of climate change on precipitation, lake water temperature and density stratification.

The UC Davis Tahoe Environmental Research Center (TERC) has developed sophisticated computer models that help scientists predict and understand how Lake Tahoe's water moves and how the entire ecosystem behaves. Long-term data sets are essential to refine the accuracy of those models and to develop new models as knowledge increases and new challenges arise. In times of rapid change, reliable predictive models are indispensable tools for Lake Tahoe Basin resource managers. This report is available on the UC Davis Tahoe Environmental Research Center website (http://terc.ucdavis.edu).

In many respects 2011 was an unusual year for Lake Tahoe. From the point of view of weather, precipitation and air temperature were extreme—the winter of 2010-2011 was one of the wettest on record and the temperatures were some of the coldest on record. More of the precipitation occurred as snow than has been the trend lately, and the spring snowmelt timing was relatively late.

Lake level was a little more than a foot above the natural rim in early 2011, but during the massive snowmelt it rose by 3.9 feet. The annual average surface water temperatures increased by 0.6 deg. F this year, even though winter surface temperatures were some of the coldest on record and the July water temperatures were also cool. The stability (the energy needed for mixing) of the upper 330 feet of the lake was calculated for the first time this year, and it was found that this index had remained relatively constant over the last 43 years. What was noticeable, however, was that the length of time that the upper waters remain stratified has increased by almost 20 days in this same period, a likely outcome of climate change.

(CONTINUED ON NEXT PAGE)

[1]*"Previous year" for some parameters means data collated in terms of the water year, which runs from October 1 through September 30; for other parameters, it means data for the calendar year, January 1 through December 31. Therefore, for this 2011 report, water year data are from Oct. 1, 2010 through Sept. 30, 2011. Calendar year data are from Jan. 1, 2011 through Dec. 31, 2011.*

EXECUTIVE SUMMARY

(CONTINUED FROM PAGE 2.1)

A factor different to last year was the depth of mixing. This year the entire 1645-foot depth of the lake mixed.

Despite these extreme weather conditions, the annual average lake clarity showed a marked improvement over 2010, increasing by 4.5 ft. Such large year-to-year fluctuations are not unusual in the long term record, and are part of the reason we advocate focusing on the long term changes rather than annual or even shorter term changes when trying to evaluate effectiveness of management programs.

On careful examination it can be seen that there are actually two underlying trends in the annual Secchi data. First there is an actual improvement in winter clarity, something that has been occurring for a decade. In 2011 winter clarity improved 11.9 feet over 2010. At the same time there is the continued decline in summer time clarity. In 2011, summer clarity was the second worst value on record. The improvement in winter clarity may be due to recent efforts to reduce urban stormwater flows to the lake. However, an independent, comprehensive urban stormwater monitoring program is needed to establish reliable data to substantiate this hypothesis. The decline in summer clarity may be related to the impacts of climate change. In the last few years lake conditions are strongly favoring the growth of *Cyclotella*, a tiny (4-10 micron) diatom-algae cell. Numbers of Cyclotella have grown exponentially in the last five years, particularly in the surface layers where Secchi depth would be impacted. These small cells strongly scatter light, producing lower Secchi disk values. It is evident from the data that the times of maximum Cyclotella concentration coincide with the lowest summer Secchi depths. While some of the conclusions presented herein are still working hypotheses, they serve to remind us of the importance of controlling both inorganic particles and nutrients to Lake Tahoe. This is a focus of the recently enacted clarity TMDL for Lake Tahoe.

Asian clams, a non-native species that has flourished in Lake Tahoe in the last few years has been the subject of Agency control efforts, and research has played an important role in this work. Continued monitoring of a half acre treatment site in Nevada, has shown that 12 months after treatment was completed, Asian clams are only returning in very small numbers. On the opposite side of the lake in Emerald Bay, research has played an important role in testing and designing for the unique needs of an Asian clam control program at the sill separating the bay from the lake. Researchers identified sub-surface flows that transported oxygen to clams and are now working with agencies on implementing a new treatment strategy to take place this fall.