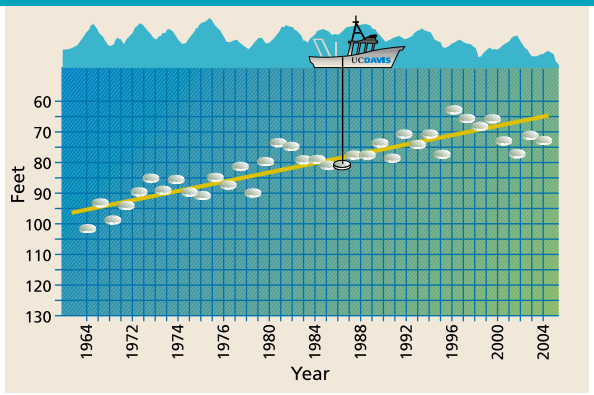
John Stumbos

Historically, erosion into Lake Tahoe has been low because of the high percentage of granite and granitic soils in the watershed.



Above, **Using the white Secchi disk to measure water transparency, UC Davis scientists have documented a decline in Lake Tahoe's clarity.** ***Right,*** **Brant Allen (middle) of TERC and Jeremy Sokulsky (top) of the Lahontan water board lower the Secchi disk into Lake Tahoe. While visibility is sometimes as deep as 130 feet, the trend is toward declining clarity.**

8-inch white disk until it can no longer be seen by the naked eye, yielding annual averages based on more than 30 measurements taken regularly over the course of each year (see figure).

The two main culprits in the clarity decline are excess nutrients and sediments. Nutrients — particularly phosphorus but also nitrogen — increase the growth of algae, which in turn absorb and scatter light. The growth rate of algae near the lake surface has quadrupled over the last 35 years (see figure, page 46). Sediments both carry nutrients and scatter light themselves, and more than 10 tons of sediment are added to the lake each year from sources including erosion from development, road dust and engine exhaust.

Contaminants enter the lake in streamflow and fall directly onto its surface from the air — and then they persist because the lake has such limited outflow that water stays for an average of 700 years.

Lake Tahoe: From research to policy

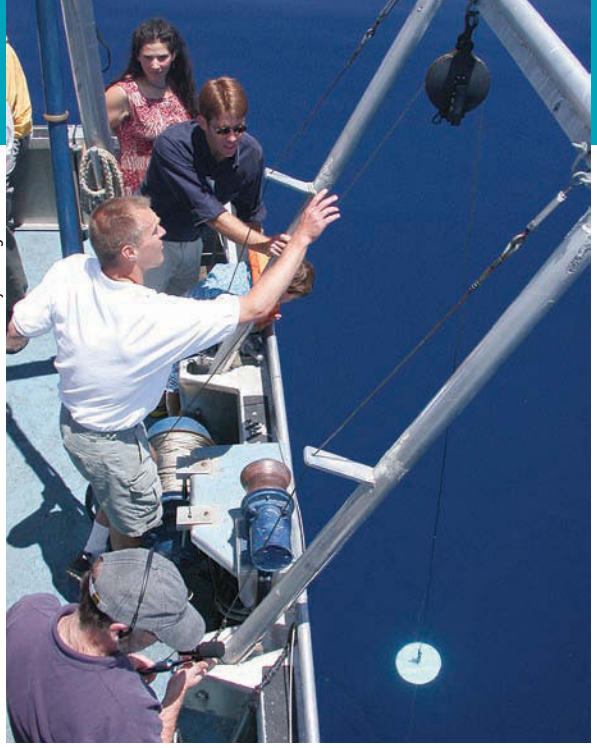
Nearly 40 years after UC Davis limnologist Charles Goldman established the Tahoe Research Group, concern over the lake's diminishing beauty culminated in the Lake Tahoe Presidential Forum. "This place is amazing. It's a national treasure that must be protected and preserved," Vice President Gore told the forum on July 26, 1997. President Clinton then announced that he had just signed an executive order to ensure greater cooperation among the many groups working to protect the lake. Today, UC Davis and 10 affiliated research institutions as well as 19 federal, state and local agencies are participating in a concerted effort to restore Lake Tahoe's clarity.

Now called the Tahoe Environmental Research Center (TERC), the research group Goldman founded is part of the UC Davis John Muir Institute of the Environment, which is dedicated to solving environmental issues by bringing together researchers, regulatory agencies and the public. Besides serving as an umbrella for UC Davis's Tahoe research, TERC facilitates collaboration with researchers elsewhere, notably the University of Nevada, Reno; the Desert Research Institute in Reno; and the Scripps Institution of Oceanography in La Jolla. A biennial science conference on Lake Tahoe met last in 2004; five of the many studies presented are published in this issue of California Agriculture (see pages 53-82). Its next meeting is in October 2006.

TERC is currently housed in a former fish hatchery in Tahoe City, Calif., an outdated facility

Heather M. Segale, UC Davis TERC

Alan Heyvaert (left) of the Desert Research Institute and John Reuter of the UC Davis Tahoe Environmental Research Center (TERC) monitor construction of a new 45,000-square-foot Tahoe Center for Environmental Sciences in Incline Village. The wetland site of the old facility, a former fish hatchery in Tahoe City, will be restored.



Sylvia Wright/ UC Davis

Role of lake mixing

Equally important is where all the contaminants go once they are in the lake. "The muck we see is in the top 300 feet," Swift says.

The destination of contaminant-laden streamflow depends on its temperature relative to the lake: when the streamflow is warmer, it shoots across the surface; when the streamflow is colder, it plunges toward the bottom. While contaminants can also settle to bottom, it takes years for the smallest particles to get there. And even then, they can come back up.

The analysis of satellite data has revealed that water jets rise from the depths and go shooting across the lake. The jets are several miles wide and "can go clear across the lake in half a day," says Geoffrey Schladow, a UC Davis environmental engineer who directs the Tahoe Environmental Research Center (TERC). "It took us by surprise." Driven by winter winds, these water jets typically mix the lake only about three-fifths of the way down, but every few years they mix it completely to the bottom.

Contaminants and visibility

The next step is determining how the contaminants affect visibility in the surface waters of Lake Tahoe. Swift and colleagues developed an optical model of the lake that predicts Secchi depths based on factors including algae and sediments (Aquatic Sciences, in press). The model showed that sediments account for more than half of the lake's clarity loss, and that the smallest particles (less than 8 microns) have the biggest impact.

In addition, the optical model accurately predicts seasonal dips in clarity that are observed in

For more info:

Pathway 2007 factsheet:
www.tiims.org/tiimswebsite/ContentProjects/Pathway2007/factsheets/Pathway2007.pdf

Tahoe Environmental Research Center:
http://terc.ucdavis.edu/index.html

For the first time, agencies are now coordinating their 20-year plans for Lake Tahoe

that has only 1,000 square feet of laboratory and office space. "Charles Goldman used to say, 'We're doing first-class research in a third-class facility'," says Heather Segale, TERC education and outreach coordinator.

But soon the researchers will also have a first-class facility, the Tahoe Center for Environmental Sciences, a joint project between UC Davis and Sierra Nevada College that is scheduled to be completed in August 2006 in Incline Village, Nev. Designed to be environmentally friendly, with features including plenty of natural light and solar panels, the 45,000-square-foot center also has ample common space to foster collaboration and the exchange of ideas among researchers.

To help inform policy, UC Davis and its affiliated institutions formed the Tahoe Science Consortium, which in August 2005 signed an agreement to work more closely with the federal and state resource-management agencies responsible for protecting Lake Tahoe. "At the science end, all the scientists will report to a representative board; the same is true at the policy end," Segale says. "Then the two boards will get together so the policymakers can ask key management questions, and the scientists can provide answers and direct research."

The agencies are also working more closely with each other, in a process called Pathway 2007. The main agencies overseeing Lake Tahoe are the Tahoe Regional Planning Agency, which was created by Congress in 1969 to regulate development on both the California and Nevada sides of the lake; the USDA Forest Service; the Lahontan Regional Water Quality Control Board, which is responsible for water quality on the California side; and the Nevada Division of Environmental Protection, which is responsible for water quality on the Nevada side.

Adding to the mix, this spring UC will hire a Cooperative Extension natural resource advisor to conduct programs in the basin.

"For the first time, agencies are now coordinating their 20-year plans for Lake Tahoe," Segale says. — *Robin Meadows*