Groundwater Influences on Aquatic Plants of Lake Tahoe

Scientists from Desert Research Institute and University of Nevada-Reno are conducting research to assess possible linkages between groundwater discharges to the bed of Lake Tahoe and the distribution and abundance of undesirable aquatic plants including attached algae and rooted macrophytes. Compared to runoff from surface sources, not much is known about nutrient loading from groundwater discharge to Lake Tahoe. Groundwater flow into a lake is difficult to measure because the water discharges up into the lake from the bed. Estimates of nutrient loading from groundwater to the lake vary from 10% to the entire Lake up to 50% from some watersheds. The research uses two recently developed thermal measurement techniques to identify areas of groundwater discharge to the Lake. The research is being done in midsummer when there is a large difference between lake temperature and the cooler groundwater (Figure 1). Studies In rivers and lakes have revealed strong associations between groundwater seepage and concentrated accumulations of aquatic plants. The objective of this pilot research project is to determine if such a relationship between groundwater and aquatic plants occurs in Lake Tahoe.

A fiber-optic distributed temperature sensing (DTS) system will be deployed along half a mile of the shallow near-shore zone at Lake Tahoe to measure temperature at thousands of points throughout its length. The temperature field produced by the DTS will be examined for areas of unusually cold-water that are indicative of groundwater discharge (~7-8° C) into a warmer near-shore zone (~20° C). Vertical profiles of temperature in the lakebed will also be measured using thin (1 cm diameter) probes that will be driven into the lakebed. When measured over a few days, the temperature profile provides data that can be used to measure the rate of water exchange between the lake and its bed. Samples of porewater chemistry in the lake bed will be collected using probes that are similar to the thermal profilers except they are hollow inside with a screened area on the bottom. The attached algae and submersed aquatic vegetation will be sampled by scraping or hand removing vegetation from a known area. The temperature data can be used to estimate the amount of groundwater flowing in to the lake at the point of measurement. We plan to focus our data collection on areas where attached algae and invasive aquatic vegetation are present.

This pilot study will serve as the basis for developing a cost-effective approach for evaluating linkages between land use, catchment characteristics, groundwater discharge, and aquatic plant growth in the near-shore zone that could be applied to the entire Lake. Provided the

Figure 1. Crystal Bay at Lake Tahoe

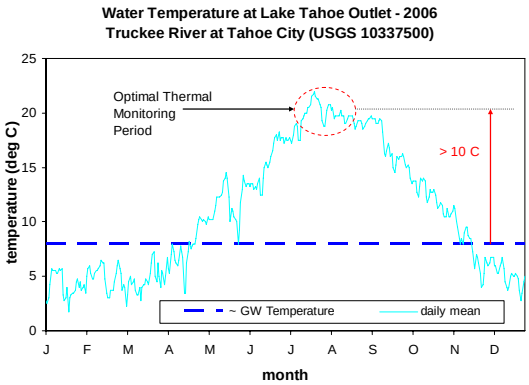

Figure 2. Water temperature at Lake Tahoe outlet during 2006. The estimated regional groundwater temperature is shown as a dashed blue line.

Figure 3. The invasive aquatic plant Eurasian Water Milfoil is prevalent in protected areas of Lake Tahoe such as marinas.

seepage fluxes prove to be significant, the proposed research would lay the groundwork for the design and placement of future monitoring devices for characterizing seasonal variation in groundwater flow and nutrient loading to the near-shore zone of Lake Tahoe.

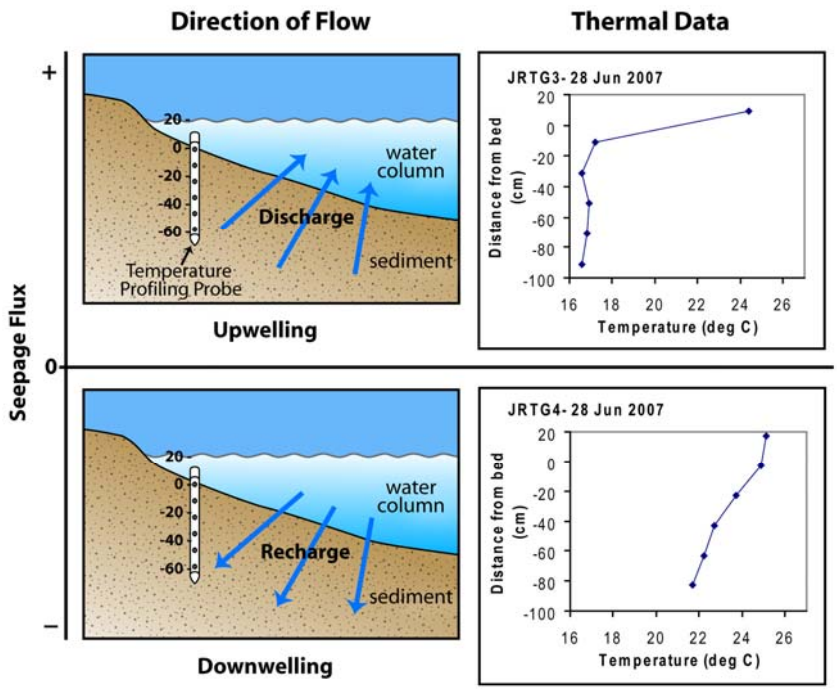

Figure 4. Temperature can be used to indicate gaining (upwelling) and losing (downwelling) areas of a water body, as illustrated by these thermal profiles from the Truckee River.

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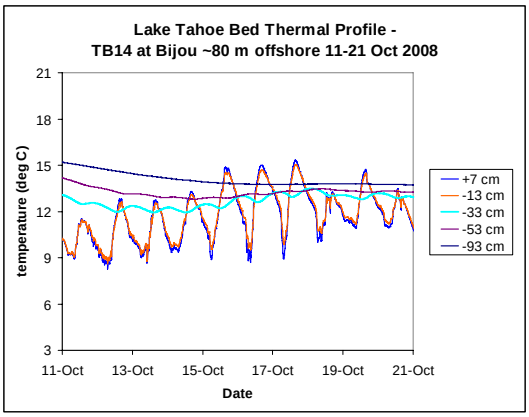

Figure 5. Groundwater tends to have a differing thermal signature compared to surface water, with the groundwater more constant temperature compared to surface water.

PONDEROSA AVE
PINION DR
LODGEPOLE DR
CRYSTAL PEAK RD
LAKESHORE BLVD
TAHOE BLVD
CRYSTAL ROCKS DR
25
24
8
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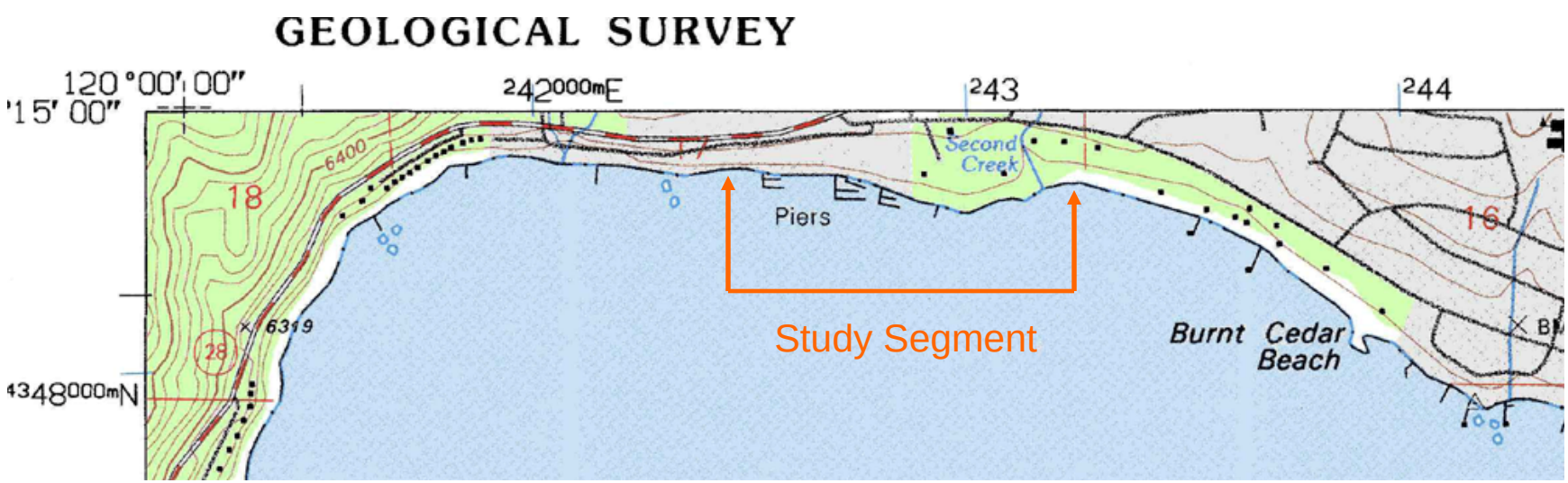
4
Study Segment


GEOLOGICAL SURVEY
120°00'00"
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243
244
6400
18
Second Creek
Piers
16
6319
28
Study Segment
Burnt Cedar Beach
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