Scientists analyzing crayfish impacts on Tahoe

By Tom Lotshaw

Researchers with UNR are working to better understand the impacts that a small but voracious non-native freshwater crustacean is having in Lake Tahoe and Crater Lake, two of America's deepest, clearest lakes.

Public agencies deliberately introduced signal crayfish into Lake Tahoe and Crater Lake in the early 1900s to help feed stocked sport fish popular with fishermen. The crayfish may be doing more than altering food webs in the two lakes; they may be affecting their famed water clarity.

An omnivore that can feed on plants and animals, signal crayfish rapidly established themselves throughout Lake Tahoe's near shore waters, negatively impacting native invertebrate and non-game fish species.

At Crater Lake, signal crayfish did not start to expand beyond a couple of sites until the mid-2000s. They are now spreading and taking over the habitat of the Mazama newt, an endemic amphibian found nowhere else in the world. It was the top predator in Crater Lake before fishes and crayfish were introduced into its waters.

"From 2008 to 2014 crayfish increased their range in Crater Lake. We are now finding crayfish where we used to find Mazama newts," said John Umek, UNR freshwater ecology researcher.

The spread of crayfish and the corresponding decline in newt populations raised questions for researchers: Is there competition between the two species for habitat or food? Or are crayfish eating newts when they can?

“Turns out it is all of the above,” Umek said. “We found they prefer the same substrate areas, rocky boulder areas where there is protection to hide from predator fish and ultraviolet light. They are also eating similar food sources, so we do see competition for food and habitat.”

Researchers suspect climate change is helping crayfish expand in Crater Lake. Increased water temperatures give crayfish more energy to forage and reproduce, and as crayfish populations reach their maximum in one site, they head out to colonize new areas.

“As crayfish populations expand in nearshore areas in Crater Lake, we see the area for newts getting smaller and smaller. There’s a lot of discussion about what we can do to impede or slow down crayfish in the nearshore and hopefully provide refuge for these newts,” Umek said.

One potential area of refuge for the newts is the small seasonal pools around the shore of the lake, formed by rock slides and avalanches. “We have not found crayfish in any of those pools, so one idea is to do more research into how newts are using those pools and make sure we keep crayfish out of those areas,” Umek said.

Crayfish are impacting more than newts at Crater Lake. Researchers have seen a seven- to eight-fold decrease in benthic (deep water) invertebrate densities in the areas where crayfish have expanded. As crayfish reduce those populations, researchers are seeing an increase in algae biomass along the shoreline, a result of invertebrates no longer consuming algae at the normal rate.

Umek is also working to understand how crayfish are impacting benthic invertebrate populations and algae growth at Lake Tahoe, as well as how crayfish are impacting non-game nearshore fishes such as the redside shiner, Tahoe sucker, and Tui chub, since they also compete for food sources and

habitat.

“From other research in our laboratory at the University of Nevada we’ve seen a reduction in benthic invertebrates in Lake Tahoe, almost a 60 percent decline from research done in the 1960s and 1970s compared to research done in 2009-10,” Umek said. “So we’re curious how the reduction in benthic invertebrates may increase algae on rocks and sand in the near shore. Are crayfish helping increase the amount of algae as they reduce invertebrates that eat the algae? Or maybe the increase of algae comes from the addition of nutrients to the nearshore that increase the numbers of crayfish as they graze on this plant material in the nearshore environment.”

Understanding the impacts that signal crayfish are having and managing the impacts is a goal for both lakes.

Now that crayfish are well-established in the lakes, it would be extremely difficult to eradicate them. That’s in part because young crayfish hide in rock crevices for their first year to avoid predation, making them difficult if not impossible to trap. “Even if we went in and trapped heavily, we may remove certain age classes, so we would need to have a continual removal of crayfish,” Umek said.

A few years ago, California and Nevada changed their policies to allow the private harvest of crayfish from Lake Tahoe. Working with private business and encouraging them to remove crayfish could be an opportunity to facilitate the continual removal over time.

“Visitors expect to see clear, blue nearshore areas at Tahoe, and if crayfish are impacting algae biomass in those areas, that could have impacts not only for the ecology of the lake, but the economy as well. People don’t want to see these large algae blooms,” Umek said.

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In Depth.