VULNERABILITY OF CALIFORNIA GOLDEN TROUT AND THEIR HABITAT TO CLIMATE WARMING (7B)

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The California golden trout (CGT), Oncorhynchus mykiss aguabonita, is one of the few native high-elevation fishes in the Sierra Nevada. They are imperiled because of exotic trout, genetic introgression, and degraded habitat, and now face further stress from climate warming. Their native habitat on the Kern Plateau meadows mostly in the Golden Trout Wilderness (GTW) currently includes stream areas impacted by cattle grazing. As a result, some areas have reduced streamside vegetation (willows or sedge) and widened channels with shallow stream depths that often lead to warmer water temperatures. Climate change may further compromise CGT and their habitat in stream areas still being grazed, because the warmer water temperatures predicted under most warming scenarios could increase to lethal levels. One important management response to climate warming will be to ensure that habitats are more resilient to predicted changes in water temperature. My CGT study is determining the climate change resiliency of golden trout habitat by conducting a spatially explicit analysis of stream temperatures in GTW meadows. Preliminary data from 2009 to 2012 indicate that stream temperatures often reached 25oC during the summer. These high temperatures are reportedly lethal for salmonids, but may affect CGT in more subtle ways such as growth, condition, or long-term survival. Moreover, CGT experienced an extremely high diel range of temperatures (+ 15oC) which will further stress the CGT. Shade and solar input measurements indicated that only a few areas had adequate streamside shade. Restoring streams from shallow and wide to narrower and deeper, and increasing streamside vegetation and shade will make streams more resilient to climate warming. As temperatures warm in native trout habitat, research is necessary to determine how fish respond and whether CGT long-term survival will be impacted. In the Sierra Nevada, there is great opportunity to increase resiliency of high elevation aquatic habitats because most of it is within federally designated Wilderness set aside by U.S. Congress to "to preserve its natural conditions and which generally appears to have been affected primarily by forces of nature" (Kloepfer et al. 1994). Wilderness areas could be used as refuges, i.e., the freshwater version of marine preserves. In these preserves, managers could eliminate or minimize activities that are currently allowed, such as cattle grazing, but are lowering the resiliency of freshwater habitats to increased warming. Understanding vulnerability of meadow stream ecosystems to increased warming is crucial so that restorative management can improve their long-term resiliency.

Key words: California golden trout, water temperature, Sierra Nevada meadows