

Using acoustic biotelemetry to improve lake trout suppression in Yellowstone Lake, Yellowstone National Park

Fishery biologists and managers are increasingly consumed with the recovery and restoration of native trout and salmon throughout the western United States. These fish historically inhabited a variety of freshwater habitats, but have declined due to habitat degradation, fragmentation, and introductions of nonnative species. Introduced fishes constitute a major threat to the persistence of native trout across the continent. For example, the introduction of lake trout (*Salvelinus namaycush*) into Yellowstone Lake, which has not evolved with a native predator, impacts the entire Greater Yellowstone Ecosystem. Yellowstone Lake once supported what was believed to be the largest genetically unaltered population of Yellowstone cutthroat trout (*Oncorhynchus clarkii bouvieri*) in the world. Introduced lake trout were initially reported in Yellowstone Lake in 1994, and subsequently, Yellowstone cutthroat trout have become the major prey of lake trout. Recent evidence suggests that this aggressive predator has substantially altered the abundance and demography of Yellowstone cutthroat trout in the lake and currently threatens its long-term presence.

The National Park Service has been actively attempting to reduce the numbers of lake trout in Yellowstone Lake since 1996, primarily by passive capture using gill nets. Although gill nets may remove substantial numbers of lake trout, there are concerns that Yellowstone cutthroat trout may also be caught in the gillnetting operations. One effective alternative, electrofishing, has been used to capture lake trout as they migrate into shallow water to spawn, but safety concerns limit this approach. Research has also been initiated to develop techniques specifically for destroying lake trout embryos on spawning grounds, such as controlled electricity and suction technology. All of these efforts to increase direct removal and utilize innovative techniques for destroying lake trout embryos and larvae require knowledge regarding lake trout movement patterns and accurate information concerning the location of spawning areas.

Research has been initiated by the USGS and their partners from the Illinois Natural History Survey, University of Massachusetts, University of Illinois, Urbana-Champaign, and Carleton University to utilize acoustic transmitters implanted in adult lake trout to document movement patterns in Yellowstone Lake. This will assist with active netting activity and identification of spawning areas that can subsequently be targeted for embryo destruction. These data are critical for expanding management options for suppressing invasive lake trout. The study will be conducted in close collaboration with the USDI National Park Service and the USDI Fish and Wildlife Service.



Research Approach

Year 1: An array of 50 stationary VEMCO VR2-W receivers will be strategically distributed in Yellowstone Lake and deployed below the lake surface to preclude interference with boating and fishing by park visitors. These receivers have a listening radius of approximately 500 m and receivers will be distributed at areas currently believed to have lake trout spawning activity. Also at this time, acoustic transmitters will be implanted in approximately 140 prespawning lake trout. Data collected by the receivers will be regularly downloaded throughout the year. After 1 year of data collection, areas of Yellowstone Lake frequently inhabited by lake trout will be documented and potential spawning shoals will be identified based on movement patterns and congregations of fish during the fall.

Year 2: The stationary receivers will be repositioned for two main purposes: (a) receivers will be removed from areas of the lake that show no lake trout presence during fall spawning periods, and (b) receivers will be moved to suspected spawning shoals and arranged in a way that generates a small degree of overlap in the listening radius of each receiver. In this way, researchers will be able to use the 3-dimensional positioning capabilities of the hydrophone array to accurately quantify the movement, activity, and presence of tagged lake trout over suspected spawning areas. This approach will not only verify the presence of lake trout at suspected spawning areas identified in Year 1 of the study, but will also quantify movement and activities of lake trout involved in spawning to verify reproduction.

Year 3: Activity will consist of a combination of (a) additional fine-scale monitoring, potentially involving re-positioning of the array around suspected spawning areas, and (b) targeted night gillnetting activities to remove adults from spawning areas, coupled with snorkeling and/or SCUBA to document the presence of lake trout eggs and larvae.



For more information contact:

Bob Gresswell, Research Biologist
Phone: 406-994-7085
Email: bgresswell@usgs.gov



The Northern Rocky Mountain Science Center is located in Bozeman, Montana and includes three field stations in Montana and one duty station in Wyoming. For more information on NOROCK's research, please visit <http://nrmsc.usgs.gov> or contact the Center Director: Jeff Kershner 406-994-5304 or jkershner@usgs.gov