Spatio-Temporal Movement Patterns of Sub-Adult Adfluvial Bull Trout

Abstract:

Bull Trout in the Yakima River basin of Washington are primarily adfluvial, often using managed lakes as habitat. Kachess Lake, composed of Big and Little Kachess Lakes, is managed by the Bureau of Reclamation (BOR) for water storage. BOR plans to build a structure that can withdraw an additional 200,000 acre-feet of water in drought years, which would disconnect the two basins for multiple years. This study examined the spatio-temporal movement of sub-adult Bull Trout in Kachess Lake to understand distribution patterns and the effects of environmental variables. We sought to answer 1) does week of the year, diel period, water surface elevation, precipitation, or surface temperature explain fish depth? and 2) Where are the home ranges and core use areas of individual fish? Yakama Nation biologists rescued Bull Trout fry from Kachess River, a tributary of Little Kachess that dewaters yearly, and reared them in captivity for about twelve months. Once fish attained a suitable weight, a subset were surgically implanted with Vemco V9 temperature pressure sensor tags. Fish were transported and released into Kachess Lake, where a passive array of thirteen acoustic receivers were set. Eight fish had at least 500 detections and were detected 30+ days in the lake, fitting the criteria for analysis. A generalized linear mixed model was used to model depth distribution and home ranges were calculated using Autocorrelated Kernel Density Estimation (AKDE). Results showed depth increases with higher surface temperature, and during the day. Fish depth was greatest during weeks in late Summer and Fall. Home range estimates were variable among individuals with a maximum 95% AKDE of 18.4 km² and a minimum of 1.69 km². Understanding the distribution of different life stages of Bull Trout allows managers to make conservation driven decisions in the face of climate change and over-obligated water resources.