Estimating Trends in the Abundance of Threatened Bull Trout across the Pacific Northwest

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Effective conservation of at-risk species requires an understanding of trends in abundance over time, but in many cases the data necessary to estimate population trajectories are often quite noisy and incomplete. State-space models allow us to address these shortcomings by incorporating information from multiple locations and different survey types while accounting for missing data. Bull Trout (*Salvelinus confluentus*) within the coterminous United States were listed as threatened under the Endangered Species Act in 1999 owing to a variety of causes including habitat loss and modification. As part of a legally mandated species status assessment conducted by the U.S. Fish and Wildlife Service, biologists in Montana, Idaho, Washington, and Oregon collated data on counts of juveniles and adults from 1991-2020 obtained from a variety of surveys including red counts, snorkel surveys, electrofishing, and weir counts. I then used a hierarchical state-space model to estimate trends over time for 242 populations located in 62 core areas spread across the Pacific Northwest. Approximately 60% of the core areas showed a decreasing trend over time, but only 5% of the core areas had significant declines. Of the roughly 40% of core areas that showed an increasing trend, only about 8% of them were significant. Much of the uncertainty in the estimated trends was due to rather sparse data, but there was no relationship between either the number of populations within a core area or the survey type, and whether a trend was deemed significant. These results will help inform the larger effort to determine whether a change in listed status is warranted at this time.