**Title:** Using hierarchical models to estimate management reference points for coastal steelhead populations in Washington.

**Presenter**: Thomas Buehrens1, 2

**Coauthors:** Dan Rawding1, Daniel Schinder2

**Affiliations:**

1Washington Department of Fish and Wildlife

2University of Washington, School of Aquatic and Fishery Sciences

**Abstract:**

Stock and recruitment relationships provide essential biological information which may be used to estimate extinction risk and manage exploited species. Although stream-rearing anadromous Pacific Salmon, such as steelhead, are well-studied as a group, the marine phase of their anadromous life history, during which survival is often density-independent, adds considerable noise to the stock and recruitment relationship. Therefore stock-recruit models using juvenile recruits provide a useful alternative to traditional models; however juvenile abundance data are often limited, necessitating meta-analytic approaches. We used hierarchical stock-recruit models to estimate reference points for coastal steelhead populations in Washington State using juvenile (smolt) abundance as our measure of recruitment. We re-parameterized the hockey-stick function so that carrying capacity was a function of habitat quantity and tested models of five such measures of habitat in order to satisfy the assumption of exchangeability in carrying capacity among populations. Model selection criteria suggested stream surface area best explained variability among populations in carrying capacity, yet models incorporating habitat quantity without spawner and recruit data produced considerable uncertainty in the estimation of reference points. Preliminary comparisons suggest our estimates of smolt capacity may compare favorably with previous studies, whereas our estimates of spawner abundances producing maximum recruitment and our estimates of the minimum smolt to adult return rates required for population viability appear to be lower than previous estimates. Our modeling approach illustrates the utility of simultaneously estimating population parameters while providing an empirical basis for determining which habitat factors best explain their variability.