Assessing Distribution and Abundance Patterns of Cutthroat and Brook Trout Using Thermal Data Coupled with Physiological Models of Fish Growth

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Distributions and abundances of native westslope (*Oncorhyncus clarkii lewisi*) and Yellowstone cutthroat trout (*O.c.bouvieri*) have declined in Montana during the last century. Nonnative salmonids and habitat and climate change have been implicated in this decline. Cutthroat trout in Montana are currently restricted primarily to higher elevation stream habitats, where mountain ranges appear to function as island refuges, especially within the upper Missouri basin. Preliminary analyses indicate restriction of cutthroat trout to upper elevation refuges might be partially explained by thermal gradients. Competitive interactions between cutthroat and nonnative salmonids may be partially regulated by temperature. We explored methods for evaluating whether temperature might help explain distribution and abundance patterns of cutthroat and brook trout at over 1000 sites we sampled throughout the Northern Rocky Mountains. Patterns of cutthroat trout occupancy appeared associated with elevation and air temperature predictions at various scales, from state-wide to the stream

scale. We used an existing thermal model to predict daily water temperatures. We linked thi model with relationships between fish growth and water temperature developed in laboratory studies to integrate the potential influence of the thermal regime on fish at each sample site. We collected water temperature data at over 100 sites through several years to develop, validate, and calibrate this thermal model. If thermal information significantly contributes to our understanding of the current distributional patterns of these species, managers can use these relationships to target areas for cutthroat trout conservation that have the be t likelihood for success. Managers could also use these models to locate and conserve stream for future cutthroat trout conservation under the assumption of continued global warming.