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Effect of global climate change on the hydrology and salmonid abundance of three Klamath River basin watersheds

Global climate change is expected to alter the flow patterns of rivers in temperate latitudes by increasing winter runoff, decreasing spring and summer runoff, and increasing the occurrence of winter flooding and summer drought conditions (Knox and Scheuring 1991, Field et al. 1999, CDWR 2006). These changes can affect the nutrient, sediment and chemical properties of streams to the extent that they are no longer suitable for cold-water adapted fish such as Pacific salmon (*Oncorhynchus* spp.; Knox and Scheuring 1991, Van Winkle et al. 2003, CDWR 2006). Throughout the United States, the suitability of rivers to support salmon and trout is expected to decrease by a range of 4 to 20% by 2030 and by as much as 42% by 2090, with the greatest loss projected for California (O'Neal 2002). Studies of the effects of global climate change on California streams are particularly interesting because these streams are at the southern end of the geographic range of several Pacific salmon (Moyle 2002). Therefore, changes in salmon abundance due to global climate change may be more apparent in California streams.

In 2003, the National Research Council cited climate change as a major threat to salmon and trout in the Klamath River. Population trends of salmon and trout suggest that river conditions in the Klamath River basin are not suitable for salmon production. High water temperatures in particular have been cited as negatively impacting freshwater fisheries in the Klamath River (California State Water Board Resolution No. 2006-0079). In addition to directly affecting habitat conditions, global climate change also is expected to aggravate factors already stressing salmon and trout populations such as intensive land use (O'Neal 2002). The Klamath River basin offers the unique opportunity to compare the impact of global climate change on three watersheds: the Salmon, Scott and Shasta River watersheds. Although these watersheds are similar in size, approximately 490,000 acres, they are characterized by different land use practices.

I propose to compile all available information that describes changes to physical parameters associated with global climate change for each of the three watersheds. Stream flow and water temperature data would be analyzed for change in trends over time (years on record) and inter- and intra-annual variability. One goal would be to complete an initial comparison of the three watershed's response to global climate change. A second goal is to propose how salmonid populations may respond to changing conditions such as those associated with global climate change, land use and conservation efforts. To my knowledge, the proposed study would be the first to analyze the impacts of global climate change on salmonid productivity in the Klamath River basin in association with land use practices. I expect that information resulting from the study will facilitate informed decisions concerning resource management and promote habitat restoration and salmonid conservation in the Salmon River, Scott River and Shasta River watersheds.