

Science

BRIEFING

February 24, 2014

CLIMATE CHANGE AND SPAWNING HABITAT

BACKGROUND

Snowmelt-dominated basins in northern latitudes provide critical habitat for salmonids. As such, these systems may be especially vulnerable to climate change because of potential shifts in the frequency, magnitude, and timing of flows that can scour incubating embryos.

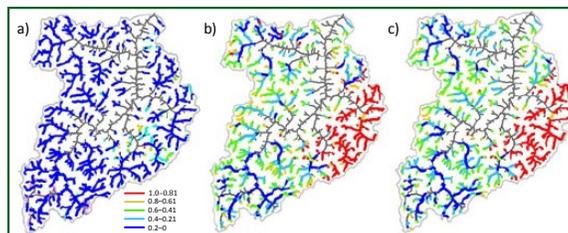
RESEARCH

Research Activity: Scientists at RMRS present a general framework to examine this issue, using a series of physical models that link climate change, streamflow, and channel morphology to predict the magnitude and spatial distribution of streambed scour and consequent risk to salmonid embryos at basin-scales. The approach is demonstrated for the Middle Fork of the Salmon River, a mountain catchment in central Idaho.

Management Implications: A nested physical model provides a means to evaluate the magnitude and spatial distribution of streambed scour and consequent risk to salmonid embryos as a result of climate-related changes in flow regime. Although monitoring of biological and physical parameters is needed to validate model predictions, this framework provides a first-order assessment of the relative vulnerability of salmonids to climate-related increase in streambed scour and identifies critical refugia (predicted to occur in unconfined portions of the stream network) within river networks that may be important for conservation efforts. Furthermore, it is predicted that confined valleys will likely exacerbate climate-driven changes in flow and scour. This approach can be used to prioritize management strategies according to relative risk to different species or spatial distributions of risk and can be used to predict temporal shifts in the spatial distribution of suitable spawning habitats. Increased understanding of the potential impacts of climate change on incubating salmonids will aid in prioritizing management options and promoting species persistence in a changing climate.



Climate change is altering the amount, timing, and quality of water received from winter snow pack. Higher flood peaks in fall and winter will elevate the risk of redd scour while decreased base flows in summer and early fall will reduce rearing and spawning habitat and water quality.



Predicted distribution of critical scour probability for suitable spawning segments for bull trout under: a) current conditions, b) 2040s, and c) 2080s A1B climate change scenarios.

KEY FINDINGS

- Climate change is projected to alter the flow regimes of streams and rivers, with consequences for physical processes and aquatic organisms.
- Salmonid redds are susceptible to damage from scour during a critical period of early development - these areas are vital to identify.
- Risk of redd scour varies as a function of species and life history and is modulated by local variations in lithology and channel confinement.
- Scour risk for all species is reduced when changes in channel morphology (width, depth, and grain size) keep pace with climate-driven changes in streamflow.
- A critical unknown issue is whether biological adaptation can keep pace with rates of climate change and channel response.

MORE INFORMATION

For more information, please contact **John Buffington**, USFS Research Geomorphologist, (208)373-4384 or jbuffington@fs.fed.us