The NorWeST Regional Stream Temperature Database and Model for High-Resolution Climate Vulnerability Assessments

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Anthropogenic climate change is warming the Earth's rivers and streams and will have profound consequences for aquatic biotas this century. Effective resource stewardship will require unprecedented levels of interagency coordination and development of datasets and models for accurate downscaling of climate change effects to important habitat parameters and species distributions at local scales. Many broad-scale bioclimatic assessments have been done for salmon and trout in the Rocky Mountains but most rely on imprecise surrogates for stream temperature such as air temperature or elevation. Here, we report on a project funded by the Great Northern Landscape Conservation Cooperative to develop a comprehensive interagency stream temperature database and model for all streams across the Northwest U.S. (~350,000 stream kilometers). The NorWeST database consists of stream temperature data contributed by > 60 state, federal, tribal, and private resource agencies across Oregon, Washington, Idaho, Montana, and Wyoming. NorWeST may be the world's largest database of its kind; consisting of >45,000,000 hourly temperature recordings and >45,000 summers of monitoring effort at >15,000 unique stream sites. These data are being used with a new type of spatial statistical model for stream networks to develop accurate, regionally consistent sets of stream temperature climate scenarios at 1 km resolution. More than 9,000 summers of data across 40,000 stream kilometers in the Salmon and Clearwater river basins of central Idaho have so far been modeled with good accuracy (R^2 = 90%; RMSE < 1 ˚C). The temperature data and stream climate scenarios from this project are available as ArcMap geospatial products for download through the NorWeST website (http://www.fs.fed.us/rm/boise/AWAE/projects/NorWeST.shtml). A series of related projects are being developed that use NorWeST spatial data, including: 1) biological vulnerability assessments, 2) definition of species' thermal niches, 3) improvement of bioclimatic models, 4) development of decision support tools, and 5) refinement of temperature and biological monitoring programs.