Massive Air and Stream Temperature Sensor Networks for Studying Microclimatic Variation in Mountain Landscapes of the Northwest United States

Daniel J. Isaak[1], Zachary A. Holden, Brett B. Roper and Charles H. Luce
[1]U. S. Forest Service-Rocky Mountain Research Station
322 E. Front Street, Suite 401
Boise, ID 83702
(208) 373-4385
disaak@fs.fed.us

Climate change is motivating extensive research to understand potential responses in terrestrial and aquatic ecosystems. Ongoing efforts to downscale climate models are improving the resolution at which climate data are available, but outputs from even the latest regional climate models are coarse relative to the scales at which ecological processes operate and landscapes and natural resources are managed. Inexpensive digital temperature sensors and remote sensing technology now facilitate collecting large amounts of information for a variety of environmental attributes. Efforts are underway to coordinate and develop massive regional air and stream temperature sensor networks to understand climatic variation more precisely in mountainous landscapes. At present, air temperatures are being monitored at more than 1,000 sites and full-year stream temperatures are being monitored at more than 1,500 sites in Montana, Idaho, Oregon, and Washington. Especially dense sensor networks have been deployed in the upper Boise River basin to build on previous stream temperature research in this area. Numerous agencies are collecting these data and have contributed their site locations and data to the development of this emerging regional network. Planned site installations may add another 500 stream temperature sites to the regional network in 2011. The collection of full year data at these sites, as well as the density and complimentary nature of the air and stream sensor networks, enables a range of research questions about fine-scale climate variation to be addressed. This research will provide valuable insights regarding aquatic and terrestrial ecosystem responses to climate change and contribute to a basic understanding of material and energy fluxes through river basins and mountain landscapes.