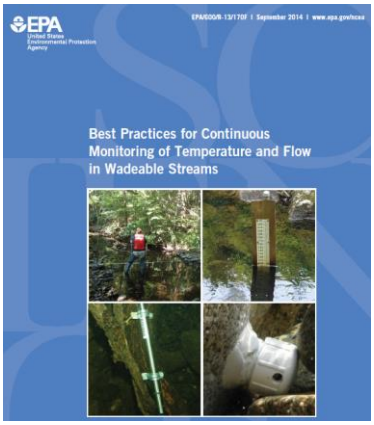
Climate-Aquatics Bonus Blog #60: New report describes data collection protocols for continuous monitoring of temperature & flow in wadeable streams

More stream-climate data is the most efficient way to decrease uncertainties…



Hi Everyone,
Just a quick bonus blog this time to highlight a significant new EPA report that describes protocols for establishing continuous temperature and flow monitoring stations in wadeable streams (report accessible here: http://cfpub.epa.gov/ncea/global/recordisplay.cfm?deid=280013). It's a topic I think about a lot at this time of year as my labmates & I wander around the northern Rockies downloading temperature data from our NoRRTN network (Blog #24). The lack of annual, long-term stream and river temperature data is something we've touched on in previous blogs (Blog #23); as is the lack of spatially dense flow monitoring networks (Blog #21). Those deficiencies are the largest single source of the uncertainties we currently have with regards to understanding the effects of climate, and climate change, on aquatic environments. The information contained in the new report makes it easier to begin addressing those deficiencies; and it won't cost an arm and a leg because the current generation of miniature digital sensors are relatively inexpensive ($40 - $170 for a temperature sensor; $300 - $1,000 for a flow sensor). Coupled with recent advances in stream geostatistics and sampling design theory for data on networks, it's now possible to design very efficient monitoring arrays that provide maximum information for the lowest cost (see Som & colleagues, study attached).

Even where the resources don't exist to maintain big monitoring networks, getting even a few more stream people to commit to monitoring a site or two over a long period of time will prove to be very useful. Those individual datasets can later be aggregated across the aquatics army to add up to something pretty significant. Not only will those crowd-sourced databases contain the massive amounts of information we need for decision making, but the process of developing them builds and strengthens the human social networks that are needed to conserve aquatic biodiversity this century (Blog #25, Blog #40).

Until next time, best regards,
Dan

Now Tweeting at [Dan Isaak@DanIsaak]

Welcome to the Climate-Aquatics Blog. For those new to the blog, previous posts with embedded graphics can be seen by clicking on the hyperlinks at the bottom or by navigating to the blog archive webpage here: (http://www.fs.fed.us/rm/boise/AWAE/projects/stream_temp/stream_temperature_climate_aquatics_blog.html). The intent of the Climate-Aquatics Blog is to provide a means for the 8,564 (& growing) field biologists, hydrologists, anglers, students, managers, and researchers currently on this mailing list across North America, South America, Europe, and Asia to more broadly and rapidly discuss topical issues associated with aquatic ecosystems and climate change. Messages periodically posted to the blog highlight new peer-reviewed research and science tools that may be useful in addressing this global phenomenon. Admittedly, many of the ideas for postings have their roots in studies my colleagues & I have been conducting in the Rocky Mountain region, but attempts will be made to present topics & tools in ways that highlight their broader, global relevance. I acknowledge that the studies, tools, and techniques highlighted in these missives are by no means the only, or perhaps even the best, science products in existence on particular topics, so the hope is that this discussion group engages others doing, or interested in, similar work and that healthy debates & information exchanges occur to facilitate the rapid

dissemination of knowledge among those concerned about climate change and its effects on aquatic ecosystems.

If you know others interested in climate change and aquatic ecosystems, please forward this message to them. If you do not want to be contacted again in the future, please reply to that effect and you will be de-blogged.

Previous Blogs…

Climate-Aquatics Overviews

Blog #1: Climate-aquatics workshop science presentations available online
Blog #2: A new climate-aquatics synthesis report

Climate-Aquatics Thermal Module

Blog #3: Underwater epoxy technique for full-year stream temperature monitoring
Blog #4: A GoogleMap tool for interagency coordination of regional stream temperature monitoring
Blog #5: Massive air & stream sensor networks for ecologically relevant climate downscaling
Blog #6: Thoughts on monitoring air temperatures in complex, forested terrain
Blog #7: Downscaling of climate change effects on river network temperatures using inter-agency temperature databases with new spatial statistical stream network models
Blog #8: Thoughts on monitoring designs for temperature sensor networks across river and stream basins
Blog #9: Assessing climate sensitivity of aquatic habitats by direct measurement of stream & air temperatures
Blog #10: Long-term monitoring shows climate change effects on river & stream temperatures
Blog #11: Long-term monitoring shows climate change effects on lake temperatures
Blog #12: Climate trends & climate cycles & weather weirdness
Blog #13: Tools for visualizing local historical climate trends
Blog #14: Leveraging short-term stream temperature records to describe long-term trends
Blog #15: Wildfire & riparian vegetation change as the wildcards in climate warming of streams
Blog #23: New studies describe historic & future rates of warming in Northwest US streams
Blog #24: NoRRTN: An inexpensive regional river temperature monitoring network
Blog #25: NorWeST: A massive regional stream temperature database
Blog #26: Mapping thermal heterogeneity & climate in riverine environments
Blog #40: Crowd-sourcing a BIG DATA regional stream temperature model

Climate-Aquatics Hydrology Module

Blog #16: Shrinking snowpacks across the western US associated with climate change
Blog #17: Advances in stream flow runoff and changing flood risks across the western US
Blog #18: Climate change & observed trends toward lower summer flows in the northwest US
Blog #19: Groundwater mediation of stream flow responses to climate change
Blog #20: GIS tools for mapping flow responses of western U.S. streams to climate change
Blog #21: More discharge data to address more hydroclimate questions
Blog #22: Climate change effects on sediment delivery to stream channels

Climate-Aquatics Cool Stuff Module

Blog #27: Part 1, Spatial statistical models for stream networks: context & conceptual foundations
Blog #28: Part 2, Spatial statistical models for stream networks: applications and inference
Blog #29: Part 3, Spatial statistical models for stream networks: freeware tools for model implementation
Blog #30: Recording and mapping Earth's stream biodiversity from genetic samples of critters
Blog #53: DNA Barcoding & Fish Biodiversity Mapping

Climate-Aquatics Biology Module
Blog #31: Global trends in species shifts caused by climate change
Blog #32: Empirical evidence of fish phenology shifts related to climate change
Blog #33: Part 1, Fish distribution shifts from climate change: Predicted patterns
Blog #34: Part 2, Fish distribution shifts from climate change: Empirical evidence for range contractions
Blog #35: Part 3, Fish distribution shifts from climate change: Empirical evidence for range expansions
Blog #36: The "velocity" of climate change in rivers & streams
Blog #37: Part 1, Monitoring to detect climate effects on fish distributions: Sampling design and length of time
Blog #38: Part 2, Monitoring to detect climate effects on fish distributions: Resurveys of historical stream transects
Blog #39: Part 3, Monitoring to detect climate effects on fish distributions: BIG DATA regional resurveys
Blog #41: Part 1, Mechanisms of change in fish populations: Patterns in common trend monitoring data
Blog #42: BREAKING ALERT! New study confirms broad-scale fish distribution shifts associated with climate change
Blog #56: New studies provide additional evidence for climate-induced fish distribution shifts
Blog #43: Part 2, Mechanisms of change in fish populations: Floods and streambed scour during incubation & emergence
Blog #44: Part 3, Mechanisms of change in fish populations: Lower summer flows & drought effects on growth & survival
Blog #45: Part 4, Mechanisms of change in fish populations: Temperature effects on growth & survival
Blog #46: Part 5, Mechanisms of change in fish populations: Exceedance of thermal thresholds
Blog #47: Part 6, Mechanisms of change in fish populations: Interacting effects of flow and temperature
Blog #48: Part 7, Mechanisms of change in fish populations: Changing food resources
Blog #49: Part 8, Mechanisms of change in fish populations: Non-native species invasions
Blog #50: Part 9, Mechanisms of change in fish populations: Evolutionary responses
Blog #51: Part 10, Mechanisms of change in fish populations: Extinction
Blog #52: Review & Key Knowable Unknowns

Climate-Aquatics Management Module
Blog #54: Part 1, Managing with climate change: Goal setting & decision support tools for climate-smart prioritization

Blog #55: Part 2, Managing with climate change: Streams in channels & fish in streams
Blog #57: Identifying & protecting climate refuge lakes for coldwater fishes
Blog #58: Part 3, Managing with climate change: Maintaining & improving riparian vegetation & stream shade
Blog #59: Part 4, Managing with climate change: Keeping water on the landscape for fish (beaverin' up the bottoms)

Future topics…
Climate-Aquatics End Game

Dan Isaak - Fisheries Research Scientist
Rocky Mountain Research Station; U.S. Forest Service
322 E. Front St., Suite 401; Boise, ID 83702
Phone: (208) 373-4385; Fax: (208) 373-4391; Email: disaak@fs.fed.us
Websites: Climate-Aquatics Blog, Stream Temperature Monitoring/Modeling, Scientist Webpage, NorWeST Regional Stream Temperature, SSN/STARS – Spatial Statistics on Stream Networks

Google Scholar Profile: http://scholar.google.com/citations?user=mnzmXpUAAAAJ&hl=en

ResearchGate Profile: https://www.researchgate.net/profile/Daniel_Isaak/contributions/?ev=prf_act

---