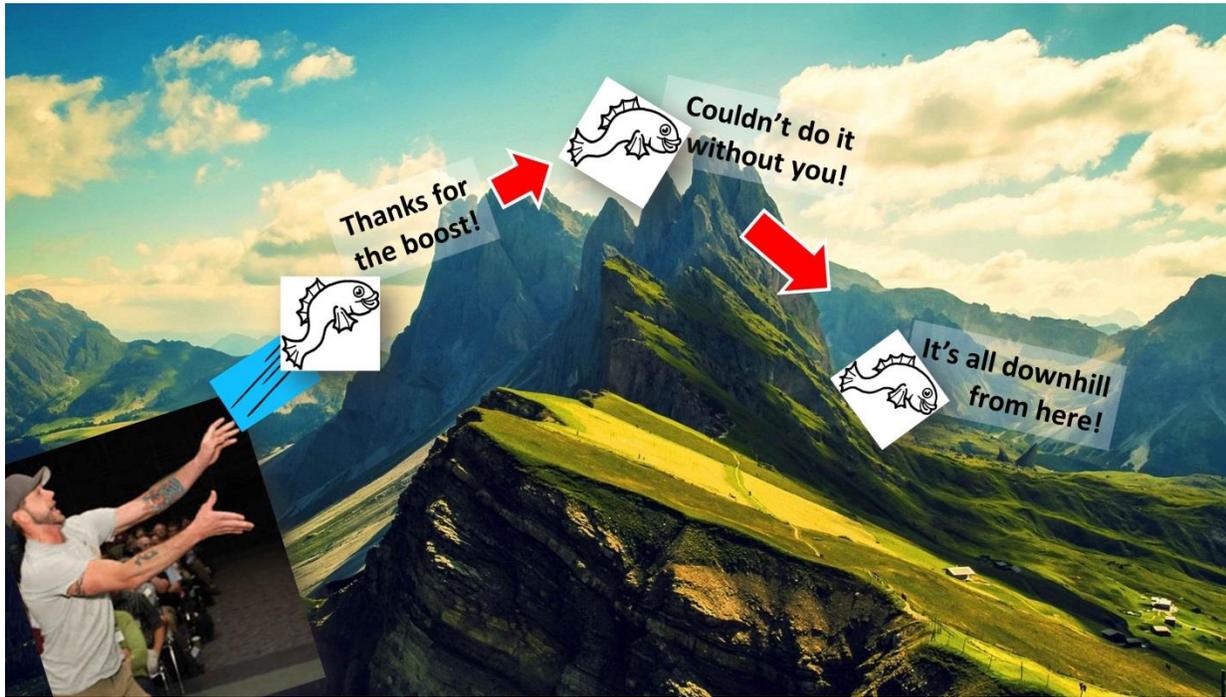


Climate-Aquatics Blog #67: Managing with climate change, part 6: Assisted migration (Helping fish flow to where they otherwise can't go...)



Hi Everyone,

Last time we looked at managing fish flows across landscapes through the placement/removal of barriers ([Blog #66](#)). Inherent to that approach is the assumption that fish can move their finny selves through the network to find suitable habitats. But what about instances where it's impossible for fish to reach certain areas (e.g., habitats separated by a watershed divide or broad areas of inhospitable streams) or where the climatically suitable habitats are shifting faster than their dispersal rates? In those instances, another fish flow option is simply picking them up and moving them via people power into climatically suitable habitats. This is called 'assisted migration' in the literature & there are big debates at present about its pros & cons as a longterm conservation strategy (see bibliography below & article attached to this blog).

But it's not much of a debate for fish people. We love to move fish. Always have, always will. For hundreds (maybe thousands?) of years we've moved fish as we dispersed our way bipedally around the globe. Most of the time we do it on purpose, some of the time we do it by accident, and sometimes it has unintended consequences ([Blog #49](#))—regardless, it's in our blood. That's good because climate change presents the next great era of, & rationale for, moving fish sometimes. In previous decades, we have perfected the technologies for bombing them out of airplanes, shooting them from water cannons, and hauling them in hatchery trucks and the humble bait bucket (graph 1). There is no doubt we have the means of putting fish into new environments very efficiently. The question that remains & we'll turn to next time is "whither to shall we assist the fish during the climate change era?"

Until then, best regards. Dan

Hewitt & colleagues. 2011. Taking stock of the assisted migration debate. *Biological Conservation* 144:2560–2572.

https://www.researchgate.net/publication/232361203_Taking_stock_of_the_assisted_migration_debate

Thomas. 2011. Translocation of species, climate change, and the end of trying to recreate past ecological communities. *Trends in Ecology & Evolution* **26**:216-221.
<http://post.queensu.ca/~biol310/thomas%202011%20translocations.pdf>

Dunham & colleagues. 2011. Assessing the feasibility of native fish reintroductions: A framework applied to threatened bull trout. *North American Journal of Fisheries Management* **31**:106-111.
<http://www.cfr.msstate.edu/students/Wfpages/wfd/wf8273/dunham%20et%20al%20feasibility%20of%20native%20bull%20trout%20reintro.pdf>

Anderson & colleagues. 2014. Planning Pacific salmon and steelhead reintroductions aimed at long-term viability and recovery. *North American Journal of Fisheries Management* **34**: 72-93. Study attached



Tweeting at [Dan Isaak@DanIsaak](https://twitter.com/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 9,214 (& 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](#)

Blog #60: [Bonus Blog: New report describes data collection protocols for continuous monitoring of temperature & flow in wadeable streams](#)

Blog #61: [Significant new non-American stream temperature climate change studies](#)

Blog #62: [More Bits about the How, What, When, & Where of Aquatic Thermalscapes](#)

Blog #63: [Navigating stream thermalscapes to thrive or merely survive](#)

Blog #64: [Building real-time river network temperature forecasting systems](#)

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](#)
Blog #65: [The Fish Jumble as they Stumble along with the Shifting ThermalScape](#)

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 \(beaverin' up the bottoms\)](#)
- Blog #66: [Part 5, Managing with climate change: Placement & removal of barriers to facilitate fish flows across landscapes](#)