Abstract

Bennett, S. J., A. Simon, J. M. Castro, J. F. Atkinson, C. E. Bronner, S. S. Blersch, and A. J. Rabideau. 2011. The Evolving Science of Stream Restoration. Page 1 *in* A. Simon, S. J. Bennett, and J. M. Castro, editors. Stream Restoration in Dynamic Fluvial Systems: Scientific Approaches, Analyses, and Tools. AGU, Washington, DC.

1. Define stream restoration?

Stream restoration is the implementation of active or passive approaches to restore/improve the functionality (hydrologic, geomorphic, ecological and biological) of a stream.

2. What are the leading sources of impairment of US rivers and streams?

The leading sources of impairment of US rivers and streams are nutrient loading, riparian disturbance and stream bed sediment.

3. What are the major legislative drivers of stream and river conditions in the US?

The major legislative drivers of stream and river conditions in the US are the Clean Water Act and the Endangered Species Act.

4. What are the major acknowledged sources of conflict within the stream restoration community?

The major acknowledged sources of conflict within the stream restoration community are 1) the lack of knowledge sharing and technology transfer, and 2) resistance to setting universal goals and evaluation.

5. What are two major shifts in the evolving science of stream restoration?

The two major shifts in the evolving science of stream restoration are that freshwater systems are dynamic and changing, and that stream corridors provide valuable services to society and ecosystems.

Browse the Chapter four in Washington State Stream Restoration Guidelines 2012 (this takes time to download, so save it for easier reference). It may be helpful as you think about stream habitat issues and problem solving. From that chapter, what are the four major categories of stream habitat restoration strategies s prioritized by Roni et al. (2002).

1. Protect Habitat
2. Connect Habitat
3. Restore Habitat-Forming Processes
4. Create or enhance habitat

Roni, P., T. J. Beechie, R. E. Bilby, F. E. Leonetti, M. M. Pollock and G. R. Pess. 2002. A review of stream restoration techniques and a hierarchical strategy for prioritizing restoration in Pacific Northwest watersheds. North American Journal of Fisheries Management 22: 1-20.

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Reflection on Bennett et al. 2011

Bennett et al's (2011) article made me reflect on four non-related issues: the cost to society of not monitoring or evaluating stream restoration, the limits of scientific results to the real world, the evolving paradigm of stream restoration, and the overwhelming relations one is expected to know. Below I expand on each of these.

One of the acknowledged sources of conflict within the stream restoration community is lack of knowledge sharing and technology transfer between practitioners and academics of stream restoration. While there might be informal discussions within practitioners of what worked and did not, disclosure of these issues is not required or expected. What strikes me is that practitioners might see academics on the ivory tower, researching topics of stream restoration that are of little use to practitioners. If this is the case, then there are no incentives for practitioners to share results or experiences with academics. For society, however, not monitoring and evaluating the practices of stream restoration is costly.

Bennett et al. (2011) reminded me of a talk I heard in 2009 of a Venezuelan scientist that said "We have done the research, published scientific articles, books, newspaper articles and documentaries, and taught classes yet nothing has been accomplished in the real world". The exact subject she was talking about escapes my mind, but her struggle as a scientist in a country where science is not a voice of authority is alarming. You've felt like you´ve done your job right, getting to some world-changing conclusions, and nothing is done. Even in places where science is regarded as a voice of authority, not all scientific outcomes result in the real world. For example, we can figure out flood frequency statistics and tell people living on the floodplain about these cycles, but they continue living in the floodplain and get flooded time and time again. I guess as scientist we also have to realize – as hard as it might be – that having the science down is not the whole story.

The evolving paradigm of stream habitat management is ironic. Dr. Bob Giles (former Wildlife Professor a FIW, VT) lent me a series of manuscripts/magazines on flooding from the 60s and 70s. I reviewed a 1975 publication from the University of Massachusetts at Amherst's Water Resources Research Center entitled "Flood plain land-use management: an application of operations research methodology" that started with how the flood management paradigm of constructing dams, levees and dikes had changed. The new focus was on territorial planning and flood-plain regulations since big storm events had shown that these structures once they reach capacity, flooding was inevitable. A paper published by Trout Unlimited on grey versus green infrastructure to control floods documented how Little Schoharie Creek in Middleburgh, NY was dredged, channelized and over-widened after Tropical Storm Irene in August 2011. The irony is of changing paradigms is about who writes them and from what perspective.

Bennett et al. (2011) constantly stress over the interdisciplinary nature of stream restoration, but applying this to my short-life's exposure to aquatic ecosystems and flooding, I am overwhelmed by the number of things I have to know! I feel that I have to have a very clear mental map of streams – from hydrology (water cycle, flood pulses), to geomorphology (sediment movement through space and time), to the biology (aquatic macroinvertebrates, fish fecundity), and the spatial and temporal variability. In

addition, one would have to understand the economic and social realities surrounding these dynamic fluvial landscapes.