

Applying Resilience Analysis to a Transboundary River System: Developing Surrogates for Governance

Principal Investigator – Dr. Ryan Plummer, Brock University, 2012-2015

Challenge

Uncertainty and complexity has prompted movement towards a complex adaptive systems viewpoint. Social-ecological resilience is conceptually concerned with the amount of change a system can withstand, the degree of self-organization possible, and the ability to learn and adapt. Understanding thresholds and regimes shifts are critical to adaptability and transformations. Methodologically, resilience analysis and measurement has involved pathways or frameworks for modeling the system of interest and developing resilience surrogates. Application of resilience and its analytical processes have primarily been developed for ecosystems. Application of resilience to the social world is unique and requires additional considerations. An opportunity thus exists to focus on aspects of governance and to build upon initial works addressing the resilience of river systems.

Project

This research aimed to: 1) conceptually explore resilience in relation to social aspects (governance of a river system), 2) conduct a resilience analysis on a transboundary river system with a specific focus on governance, and 3) identify resilience surrogates from the analysis with potential transferability to other transboundary river systems.

To achieve these aims, experts in the area of water governance and resilience were identified from a scan of the literature and invited to participate in an online Delphi study to identify surrogates for resilience with a focus on governance. A social-ecological inventory in the Saint John River Basin of New Brunswick was conducted, focused on perceptions of, and activities that influence, river health. Finally, a resilience analysis was conducted in two watersheds: Hammond River (NB) and Cowichan (BC). This analysis provided an opportunity to explore resilience analysis (in a workshop format) in the context of a transboundary river system.

Outputs

This research has resulted in scholarly journal publications and end-user reports:

- Plummer, R., Baird, J., Moore, M-L., Brandes, O., Imhof, J., & Krievins, K. (2014). Governance of aquatic systems: what attributes and practices promote resilience? *International Journal of Water Governance*, 4, 1-18. doi:10.7564/14-IJWG51
- Krievins, K., Plummer, R., Baird, J. (2014). Resilience: an annotated bibliography. Environmental Sustainability Research Centre Working Paper Series 2014-01.
- Baird, J., Plummer, R., Moore, M.-L., and Brandes, O. (in press). Introducing resilience practice to watershed groups: What are the learning effects? *Society and Natural Resources*

- Plummer, R., Baird, J., Krievins, K., & Mitchell, S.J. (in press). Improving river health: insights into initiating collaboration in a transboundary river basin. *International Journal of River Basin Management*.
- Plain language primer. End user handbook for resilience and watershed governance (translating academic research findings) with research partners and with input from end users. Released by Brock University's ESRC, <http://poliswaterproject.org/publication/854>
- Blog entries by WWF Canada describing the project work in NB. <http://blog.wwf.ca/blog/2013/01/14/update-from-the-st-john-river-what-were-working-on-in-the-new-year/> and <http://blog.wwf.ca/blog/2013/04/22/spring-update-from-the-st-john-river/>
- Plain language primer. Plummer, R., Baird, J., Moore, M-L., Brandes, O.M., Krievins, K. 2013. Resilience: a brief introduction from a watershed perspective. Environmental Sustainability Research Centre, Brock University. In *Watersheds 2014 Readings and Research*.

Additionally, this research has been disseminated through several presentations:

- Krievins, K., Plummer, R., Baird, J. (2014). Nurturing governance for resilience of aquatic systems. Canadian Water Resources Association Congress, Hamilton, Ontario, June 2-4, 2014.
- Mitchell, S., Baird, J., Krievins, K., Maas, T. & Plummer, R. (2013). Social-ecological inventory as a way to understand river health – St. John River. Building Nations – Sustaining Peoples: 7th Canadian River Heritage Conference, Charlottetown, Prince Edward Island. June 16-19, 2013.
- Plummer, R., Baird, J., Krievins, K., Maas, T. & Mitchell, S. (2013). Deliberative processes and the potential for emergence in a transboundary Canadian Heritage River. *Water in the Anthropocene: Challenges for Science and Governance*, Bonn, Germany. May 21-24, 2013.
- Krievins, K., Plummer, R., & Baird, J. (2013). Governance of Transboundary Water Systems: What Characterizes Resilience? *Water in the Anthropocene – Challenges for Science and Governance* conference, Bonn, Germany, May 21-24, 2013.
- Presentation of research results by partner Simon Mitchell “WWF Living Rivers Initiative - St. John River Project” at inaugural St. John River Summit – two day event held in Oromocto, New Brunswick, June 2013.
- Public seminar “Perspectives on Watersheds” at UNB Fredericton in May, 2013 as part of the WEPGN partner meeting where partners presented their work and perspectives on watershed issues / governance.
- Keynote presentation by Ryan Plummer at “Watersheds 2014” conference held in BC in January, 2014.

This research project has held several key end-user oriented meetings and workshops:

- Two-day resilience analysis workshops held in New Brunswick and BC in April and June, 2013 with watershed groups. Introduced resilience concepts and worked through activities to identify areas of strength and weakness, as well as strategies to increase resilience. <http://poliswaterproject.org/publication/762>
- Research team hosted a series of webinars to mobilize research efforts and work to partners and their communities.

Outcomes

The main outcomes of this research project were:

- Strengthened relationships with partners. Through consistent and meaningful exchanges with research partners in this project, stronger relationships have been built with them. This has resulted in increased opportunities to collaborate on other projects and a master's student project, as well as increased opportunities for future research.
- Increased knowledge:
 1. Conceptual advancement of governance attributes that confer and restrain resilience in relation to river systems.
 2. Insights into transboundary water governance.
 3. Insight and experience for applying resilience analysis in aquatic systems.
 4. Methodological/analytical advancement within water resources management and resilience analyses/measurement
- Increased knowledge. The resilience analysis workshops resulted in learning and increased knowledge about resilience concepts by end users.
- Change in attitudes or opinions. Participation in the resilience analysis workshops resulted in a measured change in attitudes towards watershed governance by end users.
- Increased ability to adapt to changes. Firstly, through the resilience analysis workshops, a change in participants in terms of their attitudes, norms and values, as well as relational aspects including new relationships and stronger existing relationships indicates an increased ability to adapt to change. Secondly, the development of an end-user primer identifies governance attributes that build resilience, situates them within a watershed context and provides some real-life examples of these attributes. This primer is presently being widely distributed to end users.

Research Team and Partners:

Research Team:

Dr. Ryan Plummer, Professor, Brock University

Dr. Julia Baird, Postdoctoral Fellow, Brock University

Partners:

WWF Canada

POLIS Project on Ecological Governance

Meduxnekeag River Association

Canadian Rivers Institute

Stockholm Environment Institute

Trout Unlimited Canada

WIGG Lab (University of Victoria)

Highly Qualified Personnel (HQP):

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