

Title: Water Resources and Climate Change

Project Leader: Christine Hatch

Project Overview

Predictions for future climate in Massachusetts include two parameter shifts that are likely to have a significant impact on how water resources are managed in the state: 1) the entire northeast region is likely to receive more total precipitation, more of which will come as rain instead of snow, and 2) summers are likely to be warmer and drier. Both of these phenomena have already been observed in the climate record. Municipalities and managers are interested in planning for the future, and UMass Extension will assist by establishing a link between policy decisions and academic science. Rather than attempt to address every possible link between water resources and climate change, this project will be focused on three areas where the issues are timely, actionable, and have great potential for impact and benefit to Massachusetts. The following programmatic emphases are each associated with a set of independent activities, but there is also a significant degree of overlap among them.

1. Establishing a Fluvial Geomorphological Assessment (FGM) Protocol in Massachusetts: Learning how to give rivers room to be rivers while living beside them.
2. Communities Facing Change: Think watershed, manage locally.
3. Maintaining Resilient Stream Ecosystems in a Changing Climate: from surface-water groundwater interactions to stream temperature.

Activity Summary – 2015

- Bi-annual RiverSmart Advisory board meetings (2)
- Design and construction of Seepage Flume for investigation of surface water-groundwater interactions and stream temperature applications (1)
- Fluvial Geomorphology workshop(3)
- Represent UMass and RiverSmart Communities at the Deerfield/Franklin Regional Council Of Governments (FRCOG) “Creating Resilient Communities” group meetings(4)
- Serve as liaison for Water and Climate Science issues between UMass (including Northeast Climate Science Center (NECSC - DOI), the New England Climate Center (UMass), and the Climate System Research Center (Geosciences), stakeholders and the community(23)
- Stream Temperature and Flow Monitoring Workshop(1)
- Meetings with collaborators to coordinate complimentary projects (12)

- Mini-report: RiverSmart Across New England’s Diverse States and Towns (1)
- Public Meeting to distribute RiverSmart Educational Toolkit (2)
- Print and distribute Riversmart fact sheets (9)
- Maintain and Update RiverSmart Project Website (1)
- Scholarly articles in hydro-geologic, geomorphology and watershed restoration journals (2)

Total Educational contacts

| | Youth Contacts | Adult Contacts |
|--|-------------------|-------------------|
| In Person | 90 | 931 |
| Indirect Contacts (Print, Web, etc...) | | 20 |

Narrative Summary and Impact

During FY15 I have made significant advances in all three programmatic areas within my Water Resources and Climate change work.

Together with colleagues, collaborators and our community counterparts, we have made great progress toward area (1), Establishing a Fluvial Geomorphological Assessment (FGM) Protocol in Massachusetts: Learning how to give rivers room to be rivers while living beside them. Through the efforts of our interdisciplinary, multi-agency volunteer task force, we have begun the process of defining what should be included in the river corridor, what is the core mission of the FGM Task Force, and what our vision is for a river-smart Massachusetts. After exhaustive research on methods for delineating river corridors, we presented the task force with a selection of the best of these during a targeted work session, and will parse the results of this out into both a peer-reviewed publication (in preparation) as well as guidance for the next step: clearly defining a methodology for Massachusetts river corridors. Combining this research activity with our service to the commonwealth has added significant value to the resulting research and buy-in to the outreach activity, and highlights the advantage of integrated research and extension activities. After a warm reception for these ideas at many public outreach events, and at the recommendation of the task force, we’ve generated a draft vision presentation. This presentation will eventually be paired with printed material (a four-page fact sheet) to be presented to politicians and planners, who we hope to engage at the very early stages of development of this initiative. Finally, we are in the process of developing tools to assess erosion and deposition hazards, which we are piloting in the Deerfield River watershed in Massachusetts and Vermont. This assessment takes the form of a GIS model and delineates fluvial hazard levels from one reach to the next across the watershed. This map is currently being used as an educational tool for agricultural service providers, producers, and other riverfront stakeholders and planners. Ultimately, we will integrate our knowledge developed through our prediction analysis with the basin’s agricultural and riverfront stakeholders in an effort to provide them with needed tools and support, including factsheets and kits for flood preparedness, strategies for riparian land management to maximize overall

watershed/river health and minimize damages, sources for relief and post-disaster assistance, and proactive measures for riverfront property management (and potential for profit). While we focus on a single bi-state basin as a test bed, these techniques are readily transferrable throughout New England.

Initiative (2), Communities Facing Change: Think watershed, manage locally, is tightly-coupled with initiative (1). We are working toward educating our constituents to think of their rivers on the watershed scale rather than the single reach of river that passes their riverfront or road crossing. Understanding some of the larger-scale geomorphic processes throughout the watershed allows stakeholders to make better sense of what to expect, and how to interpret what may happen in a large flood and why. We've developed a number of fact sheets that address these topics, and are currently in the final stages of expert and stakeholder review of these materials before their release to the public, and there is already a great deal of positive feedback and excitement about these much needed resources. These will be available on our RiverSmart website as well. In addition, we've included an entire background science chapter into a sister project's final report, that we think will be an excellent educational tool when completed next year. Together with partners at the Massachusetts EEA, Deerfield Resilient Communities and the Massachusetts Geological Survey, we've applied to a large HUD grant fund for a project which we hope will provide lasting tools for some of our economically disadvantaged communities hardest hit by flooding disasters to be empowered to make good future planning choices for increased resiliency.

The third component of my Water Resources and Climate change program is (3) Maintaining Resilient Stream Ecosystems in a Changing Climate: from surface-water groundwater interactions to stream temperature. This year we made significant progress toward the laboratory surface water-groundwater flume construction. Due to conditions beyond my control, the flume could no longer reside at the Turner's Falls USGS Conte Anadromous Fish Lab where construction began (and for whose collaboration we owe a debt of gratitude!), and we had to look for a new home. However, this has the potential to become a fortuitous situation: with the flume re-located to UMass campus, it has opened greater possibility for student training, direct integration into course laboratory activities, and allows for facilitation of future outreach activities including water manager and Holyoke girls inc. hands-on workshops. I submitted an NSF CAREER proposal to support this work this year. In the stream temperature realm, I gave an invited presentation at the USGS/ EPA organized stream temperature resilience workshop, and continue to advise stakeholders and participants about stream temperature, surface water-groundwater interactions and these connected resources. Putting these concepts into practice, I helped train agency representatives and consultants in techniques for streamflow and stream temperature monitoring as part of a WRRC and USGS workshop. This was another nice example of the continuum between research, outreach/ extension, and on-the-ground practice for the benefit of resilient ecosystems facing climate change.

Collaborating Organizations

- **Deerfield Resilient Communities**
- **Turner's Falls USGS Conte Anadromous Fish Lab**
- **Massachusetts Geological Survey**
- **Massachusetts EEA**

