NERRS Science Collaborative Progress Report for the Period September 1, 2012 through February 28, 2013

Project Title: Collaborative Planning for Climate Change Adaptation: A Case Study in Great Bay National Estuarine Research Reserve (now known as the Climate Adaptation Planning for Exeter (CAPE) project)
Principal Investigator(s): Paul Kirshen, Semra Aytur, David Burdick, Michele Holt-Shannon, Steve Jones, Bruce Mallory, Robert Roseen, Paul Stacey, Cameron Wake
Project start date: September 1, 2012
Report compiled by: Paul Kirshen
Contributing team members and their role in the project: Semra Aytur (Collaboration Lead), Michele Holt-Shannon (Stakeholder Assessment Lead, Phase 1)

A. Progress overview: State the overall goal of your project, and briefly summarize in one or two paragraphs, what you planned to accomplish during this period and your progress on tasks for this reporting period. This overview will be made public for all reports, including confidential submissions.

Great Bay National Estuary Research Reserve (GBNERR) is located in southeastern New Hampshire (NH) and includes 20,172 acres of open water, wetlands, and upland. The watershed that drains into the Reserve of 1,084 square miles is heavily forested with wetlands but also has 9 % of its area urban, which is increasing. The major climate change stressors in the region include increases in air and water temperatures, the frequency of extreme hot days, and sea levels, and changes in precipitation and runoff patterns, and more intense storms. GBNERR has clearly articulated its concern about the impacts of climate change on local communities whose activities impact the watershed. The UNH team is undertaking a collaborative planning effort to develop an integrated climate change adaptation plan for the land area with a range of land uses on a major tributary and estuary to Great Bay where climate change will exacerbate its present challenges with 1) storm water, 2) non point source pollution, 3) land use, and 4) the protection and restoration of downstream marshes and fisheries. These climate change stressors also have the potential to impact public health. Because the stressors in the case study area are intertwined, they can be most efficiently and effectively managed in an integrated fashion.

The case study area is the portion of the Town of Exeter, NH in the Exeter/Squamscott River Basin, which includes most of the town's area and is just upstream of Great Bay as shown in Figure 1. However, because portions of other towns reside in the watershed upstream of Exeter, we are assessing their contributions to the impacts on the river system to provide a comprehensive analysis and management strategy. **Our project goals are to:** 1. Develop a science-based, integrated climate change adaptation strategy for this section of Exeter NH with a focus on the four intertwined problems, and 2. Implement, evaluate, and document the collaborative planning process and share the project results as a model for the region and nation.

The original proposed overall project schedule in Table 1. Our major short-term goal is to have carried out a vulnerability assessment for Exeter by the end of August 2013. This includes an assessment of the biophysical and socio-economic impacts on the community if no adaptation

actions are taken but also an understanding of the viewpoints and values of the multi-level sets of stakeholders in the community so that impacts can be displayed with meaningful metrics for them. Given this August 2013 goal, our scheduling challenge during this first reporting period

	Year 1				**Year 2**			
List the project's objectives, products, and activities.	**Q1** Ends Nov 30, 2012	**Q2** Ends Feb 28, 2013	**Q3** Ends May 31, 2013	**Q4** Ends Aug 31, 2013	**Q1**	**Q2**	**Q3**	**Q4** Ends Aug 31,2014
NH Listens dialogues with organized stakeholders and intended users; open to public	X							
Process Evaluations	X	X		X		X		X
NH Listens Neighborhood Meetings with groups that are not normally involved in town decision making; vulnerable populations; neighborhood residents	X	X						
Town Meeting to review results of previous two sets of meetings, set up Citizen Working Group (CWG), Start Vulnerability Assessment		X						
Impact Metrics based upon Stakeholder Values			X					
Downscaling of GCMS and Climate Change Scenarios	X	X						
Modeling Field Work	X	X	X	X	X	X		
Modeling Data Collection	X	X	X	X	X	X		
Model Calibration and Verification (HSPF (and WQ), Flooding/Dam Removal, SMWW(Q and WQ))		X	X					
Socio-Economic Scenarios (Land Use, Water Use, Population, Exeter, Basin)		X	X					
Modeling for Vulnerability Assessment and Critical Thresholds and Times			X	X				
Complete Vulnerability Assessment and Present at Public Meeting, Receive Feedback				X				
Neighborhood Meetings on Adaptation					X			
Modeling for Adaptation Plans					X	X		
Present Draft Adaptation Plan at Exeter						X		

Town Hall								
Revise Adaptation Plan						X	X	X
Present Final Adaptation Plan to Selectmen or Planning Board								X

Table 1. Project Schedule

was to start the collaborative planning process, to refine the applied science technical approach, and assess existing data. As described more fully in Section B, we adjusted the collaborative process to meet separately with Communities of Interest before holding a large public event, and this revised process has been started. The Applied Science workplan remains the same and is on schedule.

B. Working with Intended Users:

- Describe the progress on tasks related to the integration of intended users into the project for this reporting period.
- What did you learn? Have there been any unanticipated challenges or opportunities?
- Who has been involved?
- Has interaction with intended users brought about any changes to your methods for integration of intended users, the intended users involved, or your project objectives?
- How do you anticipate working with intended users in the next six months?

Progress on Intended User Integration and Revised Approach

An integral part of this project is a structured collaboration process to engage with stakeholders representing town government, community residents, and other key sectors (e.g., business, non-profit groups). During this initial 6 month reporting period, we originally planned to hold 2-3 large, public stakeholder meetings at the Exeter Town Offices and to conduct targeted outreach with specific "Communities of Interest" (e.g., business owners, senior citizens, youth (e.g., high school and middle school students and teachers), sports groups, neighborhoods and resident owned communities, and clubs focused on outdoor activities).

The goals of these meetings included: (1) Introducing the project and discussing the expectations for the collaborative vulnerability/adaptation planning process; (2) identifying participants' core values, priorities, and climate change concerns; (3) deliberating core values around climate change and adaptation (identifying both common ground and divergent views); (4) sharing available data on climate history, challenges, and projects; (5) drafting central framing questions to be addressed in subsequent community-wide conversations, and (6) raising awareness about opportunities for stakeholders to participate in a Citizens' Working Group during the technical modeling process. We are using a developmental evaluation approach (Patton, 2010, M., *Developmental Evaluation: Applying Complexity Concepts to Enhance*

Innovation and Use, http://www.guilford.com/excerpts/patton.pdf) to iteratively inform the process and to accommodate adaptation of goals, inputs, and outputs.

In accordance with developmental evaluation, we modified our engagement approach slightly during the initial 6 months to better align with scheduled town meetings (e.g., Board of Selectmen, River Committee) and to respect Exeter's preferences for initial public engagement through smaller groups. We attended an initial meeting with the Board of Selectmen on October 15, 2012 prior to engaging the public, to allow Town officials to meet our team and understand the purpose of the project. We updated them several weeks later on November 19, 2012.

Before we began the formal collaboration process, we took advantage of the Exeter Fall Festival on October 20, 2012 to host a booth to describe our project and ask people to map their favorite places in Exeter. Not surprising, many of the favorite places related to the river and the downtown area. Some observations noted by participants included climate change phenomenon such as "More bird species overwintering here", "Hail storms", "Flooding in favorite recreation areas", and "Weird winters- more perennials dying and annuals living to the next season."

On December 12, 2012, we met with stakeholders representing town staff (e.g., planning, conservation committee, public works) to provide them with a more detailed presentation including available data on climate history, challenges, and focus areas such as ecosystem services, infrastructure, and human health impacts. They provided input regarding the effectiveness and relevance of our presentation so that we could make improvements and modifications for upcoming presentations with different audiences. Our project team members networked with key stakeholders to discuss ways of reaching out to Communities of Interest and other organizations.

On January 17, 2013, our project team was invited to attend a meeting of the River Study Committee of Exeter, which oversees the management of the river in Exeter. The Committee is currently involved in a process to determine whether the town should remove or modify an existing dam. They have conducted extensive research which they have agreed to share with us, and we agreed that our technical outputs and engagement process could also help further their goals by raising public awareness. We are scheduled to meet with them again in March, 2013.

In January 2013, we also met with several members of the board at the Exeter River Coop, a resident-owned community. Some of our questions included:

- What changes have you seen in the area in the last 10 years when it comes to issues related to weather, the health of this community, pollution, wildlife?
- Do you know your neighbors and keep in touch regularly? Are there other neighborhoods in Exeter you think are more or less connected to one another?
- What kinds of issues and decisions are you facing personally or in your work or neighborhood when it comes to planning for extreme weather or dealing with pollution or making decisions about capital projects?
- Map: Anything you notice or thoughts about assets and deficits in the Exeter community?
- What is your understanding of climate change and where do you look to for information about this kind of issue?

- Is there anything we need to know as we get started engaging folks in Exeter?
- Is there anything you are interested in knowing more about?

We answered questions, such as "what is an estuary?" and had an engaging conversation with participants about their neighborhood, including several challenges with flooding, surrounding development, and decisions about the wetlands in the center of their community.

Focused outreach to the business community is beginning in partnership with Roger Stephenson, whose work with the business community aligns with our goals and objectives. We decided to combine efforts to reduce redundant outreach. Additional meetings are scheduled in March with other Communities of Interest.

Our outreach to Exeter High School is intended to involve youth in general, as well as training youth facilitators for the April community conversation described below. We are working with the Exeter High School Student Government and the student staff of The Talon, the school newspaper. Our facilitator training will be held in March, 2013. In addition, two members of the social science team appeared on the television show "Hawk Talk" to discuss the project. This show will air in late February or early March on the Exeter Cable Access Channel.

Our entire team, including the Applied Scientists, Collaboration/Social Science Team, and the Exeter Town Planner, met almost every week from September-December 2012 and now meet monthly. The weekly meetings allowed us to learn about each other's disciplines and to understand what we each bring to the process. We agreed to form a subcommittee that focuses specifically on the Engagement process, as well as assigning a team member who would be responsible for managing day-to-day internal communication, website, meeting schedules, etc. We also formed an Applied Science team (discussed in Section C).

To ensure compliance with University research protocols, we also met with an Institutional Review Board (IRB) representative, who advised us on which aspects of the process will require Human Subjects approval if we wish to publish the information shared by participants in the engagement and evaluation process. We are completing the necessary documents to submit for IRB review in March, 2013.

Engagement for Next 6 Months

Based on information and feedback from these meetings, we updated our Engagement and Outreach schedule for the next 6 months as follows:

1. Technical Outreach: January through April 2013

In these meetings, members from the science team meet with groups and organizations in Exeter whose mission and work will be directly related to project work. This includes the Select Board, Planning Board, Conservation Commission, Municipal Offices, etc.

2. Communities of Interest: January through March 2013

This outreach recognizes the need to both learn about a variety of perspectives and experiences in Exeter and to enfranchise participation from across the community. The primary focus of these meetings will be to meet with people who might not normally be involved in the hopes that we can increase overall engagement at larger community events and with the Citizen Working Group.

In these meetings, the outreach team will meet with groups and individuals to explain the project, build relationships, and encourage engagement by a broad array of community members. This includes groups such as business owners, senior citizens, youth (e.g., high school and middle school students and teachers), sports groups, and clubs focused on outdoor activities, health and recreation, etc. Some groups will have an opportunity to do photo projects and other activities to illustrate community strengths and assets, perceived vulnerabilities to extreme weather events, etc.

3. Broad Community Conversation Event: April 10, 2013

This event will be advertised widely to the whole community and involve small, facilitated groups. Exeter residents will be asked to talk about their priorities and recommendations to decision makers regarding preparing for extreme weather events, vulnerabilities and perceived priorities and concerns. Everyone welcome!

These community conversations will be organized by *New Hampshire Listens*, led by Dr. Bruce Mallory and Michele Holt-Shannon at the Carsey Institute. NH Listens facilitates and supports civil, informed public deliberation of complex social and environmental issues. These deliberative dialogues are intended to structure the process to enable diverse stakeholders to participate in the planning processes.

4. Citizen Working Group ("CWG"): April – through the end of the project

The Applied Science team will meet regularly with a Citizen Working Group to grapple with complex issues and insure the information is based on local knowledge. We anticipate this group will meet monthly and we will be seeking participants throughout events related to 1, 2 and 3 above.

5. Communities of Place: To be scheduled

We have already seen significant interest by Exeter residents to have access to the technical team for advice and information specific to their neighborhood or area of town. It is likely that the information compiled will be useful for particular communities and we will work to host conversations and information sessions for these places. For example, downtown business owners may benefit from talking with one another about the decisions they face, or the Exeter River Coop or Phillips Exeter Academy may have areas of land that are particularly impacted and in need of exploration of options.

What we have learned as well as unanticipated challenges or opportunities.

Many of our initial lessons learned have been summarized above, pertaining to the Collaboration and Engagement process. We learned that key Town stakeholders, such as the Board of Selectmen and the River Study Committee, expressed interest in the project and are supportive of the process.

Additionally, we learned that many are interested in the economic impacts as well as in the potential 'co-benefits' of adaptation strategies than may simultaneously enhance ecosystem health, protect human health, and sustain the local economy. We have added an Engagement Committee member with experience reaching out to the business sector.

Evaluation forms collected after our meeting with town staff in December indicated that, on a five-point Likert scale (1 (strongly disagree) to 5 (strongly agree)), most stakeholders reported making new connections between climate variability, water quality, land use, biodiversity, health, and economic impacts (mean 4.67 (sd 0.49)); and formed new community-academic partnerships (mean=4.63 (sd 0.52)).

Due to the aforementioned changes in our Engagement Plan, we have not yet met with small groups of neighborhood residents or communities of interest, but these are being scheduled. Our broad Community Conversation is scheduled for April 10, and the Citizen Working Group will be convened shortly thereafter.

One challenge that our team has discussed is the inherent tension regarding soliciting people's values and beliefs about the environment and climate change as a first step, versus communicating scientific information that may conflict with people's beliefs and assumptions. We agreed that the initial 6 months are primarily about "listening" and collecting information about values, but that the remainder of the project will transition into two-way communication in which members of the team will dialogue with stakeholders.

C. Progress on project objectives for this reporting period:

- Describe progress on tasks related to project objectives for this reporting period.
- What data did you collect?
- Has your progress in this period brought about any changes to your methods, the integration of intended users, the intended users involved or the project objectives?
- Have there been any unanticipated challenges, opportunities, or lessons learned?
- What are your plans for meeting project objectives for the next six months?

Progress in collaboration with intended users is described in Section B. Here we present progress on the Applied Scientific objectives.

The Applied Science team has met every two weeks starting in January. Topics in the meeting have been approaches to land use scenarios, climate change scenarios, integration of the

modeling and analysis, and review of existing discharge, ecosystem, and water quality data. We have decided to consider the use of two land use scenarios. The first will essentially be a "business as usual scenario" and the second will be chosen by the intended users after reviewing the first scenario. Climate change scenarios will cover the plausible range of climate futures up to the end of the century. We will use the climate change scenarios to develop scenarios of mean monthly flows, pollutant loads and water quality (parameter goals are P, N (all species), Ecoli Bacteria, Salinity/Conductivity, TSS, dissolved oxygen, temperature); low flows and associated water quality; peak flows, flood durations, and floodplains; duration and extent of local drainage flooding; and elevations of water surrounding wetlands downstream of the Great Dam. We are presently reviewing the applicability of the models we proposed to carry out these tasks. The only one in question is the use of HSPF for estimating seasonal flows and loads. We have also met several times with the Town of Exeter concerning data availability for the town's infrastructure.

During the next six months the Applied Science team plans to install some water quality monitors, calibrate and verify the models, develop the land use and climate change scenarios, and carry out the vulnerability assessment.

We also plan to continue to work closely with the Engagement Committee to understand values and concerns of stakeholders so results of analyses can be displayed with appropriate metrics. In addition, we plan to start involving the Citizens Working Group in the technical analyses.

The entire project is also planning a meeting of the project Advisory Committee (high level experts in participatory planning) in May.

D. Benefit to NERRS and NOAA: List any project-related products, accomplishments, or discoveries that may be of interest to scientists or managers working on similar issues, your peers in the NERRS, or to NOAA. These may include, but are not limited to, workshops, trainings, or webinars; expert speakers; new publications; and new partnerships or key findings related to collaboration or applied science.

Products

- Paul Kirshen and Sylvia von Aulock were interviewed by seacoast-area media: http://www.seacoastonline.com/articles/20130210-NEWS-302100336
- Abstract submitted to the American Public Health Association Annual conference (October, 2013): Aytur, Kirshen, Becker, Von Aulock, et al. *Community engagement for climate-ready communities: The role of Community Based Participatory Research (CBPR) in local climate adaptation planning and evaluation.*
- http://www.accesstv98.com/ to search schedule for Exeter High School "Hawk Talk" program.
- Website being set up

E. Describe any activities, products, accomplishments, or obstacles not addressed in other sections of this report that you feel are important for the Science Collaborative to know.

One challenge is the Applied Science Team not getting ahead of the stakeholders. One of the major pillars of our collaborative approach is close involvement of the Intended Users in the technical analyses. The project management team is working to prevent this by trying to get the CWG quickly established. If this is delayed, we will develop alternatives.

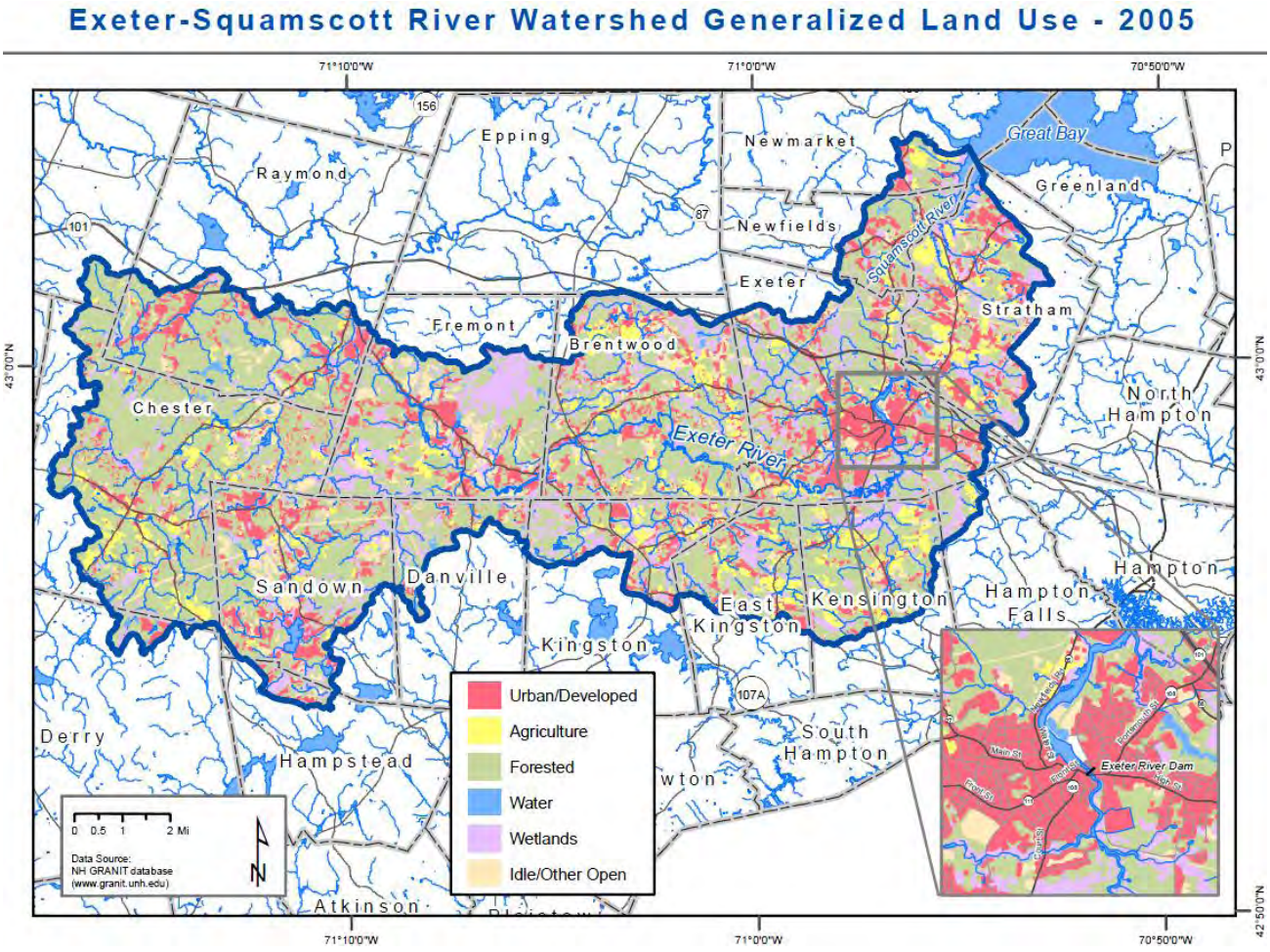

Figure 1. Project Site.