

## Cory Riley

*Reserve Manager Great Bay National Estuarine Research Reserve* 

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#### **COLLABORATIVE SCIENCE FOR ESTUARIES** WEBINAR SERIES

Buffer Options for the Bay: An in-depth look at the use of vegetated buffers in New Hampshire

## **Summary Points:**

Cory Riley is the manager of the Great Bay National Estuarine Research Reserve (GBNERR) in southeastern New Hampshire, a partnership between the NH Fish and Game Department (NHF&G) and NOAA. She oversees planning and implementation of the reserve's education, research, stewardship, and coastal training programs and works closely with partners in the Great Bay region to promote clean water and healthy coastal habitats.

Before joining NH Fish and Game, Cory spent ten years working for NOAA in the Estuarine Reserves Division.

Cory holds an undergraduate degree in Biology from the College of William and Mary and a graduate degree in Environmental, Coastal and Ocean Sciences from the University of Massachusetts, Boston.



# Buffer Options for the Bay

NERRS Science Collaborative Webinar



**Summary Points:** 



## **Summary Points:**

Great Bay NERR is located in southern New Hampshire. The state has a small coastline, which presents a particular set of challenges and opportunities. One benefit is that Cory works closely with a tightly networked group of partners in southeastern New Hampshire.

## Context







Preparing New Hampshire for Projected Storm Surge, Sea-Level Rise, and Extreme Precipitation





These images are screenshots from three publications that have been released by natural resource managers in New Hampshire over the past few years. They provide context for what is happening in the region:

- Left "State of our Estuaries" Report released in December, 2017 by the local National Estuary Program, PREP (Piscataqua Region Estuaries Partnership);
- Center (NHF&G) Wildlife Action Plan; and
- Right New Hampshire Coastal Risks and Hazards Commission report. This was a legislatively-directed effort to prepare NH for sea level rise, storm surge, and extreme weather events.

Cory and the staff at GBNERR were involved with all of these efforts: Cory works for NHF&G, is the Chair of the NEP Management Committee, and was NHF&G's representative on the NH Coastal Risks and Hazards Commission. She is involved with issues of water quality, habitat, and flooding at both the state and reserve level. As Cory knew that it is expensive and inefficient to manage these stressors separately, she started thinking about identifying a simple solution that could address all of these problems: buffers.



## What is a Buffer?



## **Summary Points:**

Buffers are naturally vegetated segments of land directly upslope of a water resource, such as a stream, lake, river, pond, estuary, or other wetland type.

For the purposes of this project, buffers were defined as vegetated areas adjacent to Great Bay and its tributaries.

## Why do we care about buffers?

Promote water quality



#### Reduced flood risk



#### Reduce Erosion



### Promote fish and Wildlife Habitat



## **Summary Points:**

Buffers are simple solutions that can address multiple threats, including those shown here, and are a proactive, inexpensive option compared to restoration activities that attempt to restore these functions one by one.

## Buffer Options for the Bay

**What:** A grant-sponsored collaboration of public, academic, and nonprofit organizations

**Purpose:** To enhance the capacity of NH stakeholders to make informed decisions about buffer restoration and protection in the Great Bay region

## **Summary Points:**

When discussing the health of Great Bay at a meeting Cory, and others in attendance, agreed that if there was one thing they could all do to improve the overall ecosystem of Great Bay, they would buffer it.

They discussed how they might work collaboratively to promote the use of buffers in the state, acknowledging a few things:

- There were many debates about the science and policy of buffers at the state level;
- There was considerable confusion at the local level about science and the intersection of state and local policy; and
- While people in NH take great pride in their natural resources, they are also concerned about preserving individual landowner rights.

The group wrote a proposal for a NERRS Science Collaborative Integrated Assessment grant, with the explicit goal of pulling information together to enhance capacity - NOT creating new science. The project was funded in 2015.



## **Summary Points:**

The project team was large and included representatives from The Nature Conservancy (TNC), Great Bay NERR, NHDES, and the local NEP.

The team also asked a number of local experts to join the team, including an economist from Clark University, a hydrologist and a social scientist from University of New Hampshire, a GIS specialist from TNC and GBNERR, and others with experience in project management, communications, and collaborative research.

The team wanted the project to result in research that could be used by others who provide technical assistance to communities, work on land protection, and study how buffers work.

The project was unique in that it was created by end users. It came from the people who needed the information and then they recruited the scientists who they wanted.

The team also includes a 15-person Advisory Committee. Both the Advisory Committee and project team had experts and end users intertwined. Actual title: Exploring the trends, the science, and the options of buffer management in the Great Bay Watershed



### **Summary Points:**

The title shown here is the actual title of the project. However, article titles like these are often too long for people to remember and if you want to get a lot of people involved, they need a name to hold onto. While projects are often called by the PI's last name, it was important in this project that there was a shared sense of ownership over the project.

Realizing that they were going to need to create a newsletter and talk about the project in a consistent way with their partners, the team used an acronym to refer to the project: "BOB" (Buffers on the Bay).

## What did our team do?

We summarized the existing best available information

We have <u>not</u> proposed a solution or a right answer to this problem, rather we pulled information together so stakeholders can do that for themselves



## **Summary Points:**

Integrated Assessment (IA) projects differ from traditional research projects because they pull together existing information, rather than creating new science. This graphic summarizes this difference.

The project's goal was to synthesize the best available information regarding buffers in the Great Bay watershed, rather than to provide specific recommendations for action. The team hopes the synthesis of their collective work offers a strong foundation for those looking to develop tactics aimed at effectively managing buffers and the services they provide in coastal New Hampshire.

IAs intentionally engage stakeholders in every step of the process.

# Buffer Options for the Bay

**What:** A grant-sponsored collaboration of public, academic, and nonprofit organizations

**Purpose:** To enhance the capacity of NH stakeholders to make informed decisions about buffer restoration and protection in the Great Bay region

### **Summary Points:**

BOB, which was a collaboration among public, academic, and nonprofit organizations, was dedicated to enhancing the capacity of New Hampshire stakeholders to make informed decisions that make the best use of buffer lands to protect water quality, guard against storm surge and sea level rise, and sustain fish and wildlife in the Great Bay region.

The team worked throughout the project to summarize the best available science, simplify how to find and use good technical and policy information, and understand how and why communities implement buffers.

# What do we mean by "enhanced capacity"?



Increased use of vegetated buffers in strategic places

Practitioners have access to the right information;

People understand the value of buffer protection;

A clear, well-coordinated regulatory framework is in place;

The best available science is used.

## **Summary Points:**

The team quickly realized that people had different ideas about what "enhanced capacity" meant. For the purposes of this project, they defined 'enhanced capacity' as increased use of vegetated buffers in strategic places due to:

- 1. Practitioners having access to the right information about buffers;
- 2. People understanding the importance of buffer protection;
- A clear, well-coordinated regulatory framework being in place; and
  Best available science being used.

# How did we attempt to integrate science and stakeholder perspectives?

- Diverse experts and management perspectives on the team
- Interviews and surveys to assess community values and barriers associated with buffer management
- Peer review of our plan and our products
- Active engagement of an Advisory Committee along the way

#### Public comment

## **Summary Points:**

The team engaged stakeholders in every step of the project:

- GBNERR's Coastal Training Program Coordinator led a community assessment, conducting interviews with 30 people in one of the subwatersheds of Great Bay. After coding the results, they ground truthed the results with a watershed-wide survey.
- The Advisory Committee, whose members represented 15 different organizations, let the project team know who they trusted as sources for information about buffers, reviewed the project's midpoint work, scoped work for the second year of the project, and provided input on how the website and maps should look.
- The team had a peer review process to provide input on their work plans for each component of the project early-on, and the draft products were also peer-reviewed at the end of the project to ensure that they were credible.
- The team ensured that their products and action plan included content that was important to the citizens by hosting two public comment meetings, interviews and surveys, and having community members participate in the Advisory Committee.

## What did we produce?

A website with helpful summaries, maps, graphics, and copies of....

- Executive summary
- Coastal science literature review
- Policy analysis
- Community assessment
- Economic valuation of Great Bay ecosystem services
- Mapping products
- Economic literature review
- Social science literature compilation
- Action plan

## **Summary Points:**

At the outset of the project, the team knew they wanted stand-alone products that summarized the best available science about buffers, policy analysis, and the community assessment.

They self-organized into small teams to tackle different products. They made sure they were sharing information and focusing on the same key questions.

The team also compiled a detailed list of potential actions that could be taken to advance the effectiveness of buffer management in the watershed. The nearly 50 items identified in this Action Plan encompass recommendations for community outreach and education, conservation, economic assessment, enforcement, mapping, policy, and further research. Some of these actions were met through the BOB project, however, many were beyond the scope of the project and remain possible future targets for collective action.

## **Overview of findings**

- People in the Great Bay watershed, and in NH as a whole, value the provision of ecosystem services and are willing to invest resources to maintain and improve them
- Buffers are an effective means of maintaining these valued services including water quality, wildlife habitat, and flood risk reduction
- There are certain widths and vegetative compositions needed within buffers in order to maintain ecosystem services at a specified level

## **Summary Points:**

Previous surveys found that NH residents rank water quality as their top environmental concern in the state. In BOB, the team conducted a willingness to pay (WTP) study, which reinforced and refined the value residents place on water quality in the Great Bay watershed. WTP is the amount of money that a household would be willing to give up (i.e. in taxes or fees) to prevent loss of a benefit or for a specified gain.

The WTP study focused on the Great Bay Estuary (not including tributaries) and generated WTP to maintain current water quality levels and achieve water quality improvements. The team found that annual household WTP increases as the size of the water quality improvement increases for all focal water bodies. When these household values are adjusted for the entire region, the aggregate WTP for water quality improvements for the seven communities that surround Great Bay would be \$1.5-\$2.8 million dollars annually (in 2016 dollars).

## Socio-Economic Analyses: What are costs and benefits of protecting buffers?

- The costs and benefits associated with maintaining buffers are distributed unequally
- Private landowners feel the burden of maintaining buffers
- The public at-large reaps the benefits provided by buffers
- This leads to a sense of "injustice" and dis-incentivizes the maintenance of buffers

## **Summary Points:**

The team also conducted an economic literature review related to buffers and water quality. These reviews are not region-specific and would be of interest to anyone who works on buffers around the country.

These reviews emphasize the importance of understanding the distribution of costs and benefits associated with maintaining buffers. Private landowners often feel the burden of maintaining buffers (i.e. limited development potential), while the public at-large receives the benefits provided by buffers (i.e. higher property values associated with better water quality). Community Assessment: What are the challenges and opportunities from the perspective of our municipalities?

- We discovered an issue of competing values at the community scale
  - Many see inherent tradeoffs between buffer conservation and economic growth
  - There are also tradeoffs reflected in competing community values

## **Summary Points:**

The BOB community assessment reflected the fact that there are many tradeoffs that people in community leadership positions face.

Interviewees included people on volunteer boards (i.e. Conservation Commissions), people who work for the community (i.e. city councilmen and planners), and developers and consultants who work on wetland issues.

A common thread between interviewees was that although they understood the value of protecting natural resources, they saw it as competing with economic growth. Community Assessment: What are the challenges and opportunities from the perspective of our municipalities?



## **Summary Points:**

After analyzing the results from the community assessment, the project team developed a summary of findings and a framework for those who do technical assistance around buffers.

This image is from a conceptual model that the team put together to help people understand the importance of building trust with communities and community leaders and emphasizes the need to acknowledge the context of buffer management.

# Policy Analysis: How are buffers regulated and how could they be?

- Compared to other northeastern states, New Hampshire's approach to wetland buffer regulation is decentralized.
- State regulation is limited, so for many streams and rivers, buffers are not mandated by the state.
- New Hampshire's existing regulations represent a compromise between a suite of competing values, and different values in different communities.

We can look to other states for new ideas.

## **Summary Points:** There were two goals for conducting the policy analysis: 1. To simplify information about current state and federal regulations about buffers; and 2. To learn what other states, including Rhode Island, Vermont, Maryland, and Washington, are doing and create case studies to assess transferable lessons.

## Non-regulatory approaches: *How can buffers be encouraged without regulation*?

- The regulatory framework within the state does not resolve issues related to the unequal distribution of costs and benefits surrounding buffer maintenance
- Various non-regulatory approaches can be used to more fully compensate private landowners for the cost of conserving or restoring buffers
  - Conservation (easements or fee purchase)
  - Tax incentives
  - Trading?

## Summary Points:

The team also looked for non-regulatory approaches for managing buffers, focusing specifically on land restoration and conservation opportunities.

At the outset of the project, they hoped to research different, creative ways to incentivize buffers but were not able to do as much of this as they hoped.

## Literature Review: What does the best available science say?

Reviewed recommendations from the scientific literature regarding appropriate situations for the use of buffers, and appropriate buffer widths



### **Summary Points:**

The literature review was an important component of the project and was largely driven by interactions that Cory had with a local community member who said that they did not have access to any current documents that explained what the best available science was saying about buffers. This is important information for communities to have as they consider developing and implementing buffer protection ordinances.

After looking at recommendations from the scientific literature for appropriate buffer widths and the situations for which buffers are most important in maintaining water quality, the team summarized the best available science in a large report with graphics.

They acknowledged that people were really looking for a standard response to the question 'How wide should a buffer be?' However, given the range of factors that can vary spatially and temporally in natural and built environments, it is not surprising that published science provides some nuance regarding the efficacy of any buffer.

## Appropriate buffer widths: How wide should they be?

Several methods can be used to assign buffer widths

- Single width that should maintain the majority of ecosystem services under most circumstances
  - 100 feet is a good target
- Different widths assigned to specific groups of identified resource values

Different widths assigned based on fine-scale factors

## Summary Points:

The literature review revealed that there are several different approaches to assigning buffer widths.

The simplest approach is to implement a **single buffer width** that should maintain the majority of ecosystem services under most circumstances. For this purpose, scientists largely agree that a 100foot wide buffer is a good target.

**Different buffer widths** can also be assigned to specific groups of identified resource values. For instance, the BOB project's prioritization maps utilized 160-foot buffers for first- and second-order streams and their associated wetlands, 650-foot buffers for third- and higher-order streams and their associated wetlands, and a 6-foot vertical buffer with a 650-foot horizontal buffer for tidal areas.

The most complex option involves assigning a **buffer width based on fine-scale input factors** such as slope, topography, pollutant loading, and soil type. This allows the buffer width to be tailored to site-specific circumstances.



#### Summary Points:

Identifying options for addressing these concerns necessitates revisiting the lessons learned from each aspect of the BOB project, as well as looking beyond New Hampshire's borders.

A logical first step, given evidence of inadequate buffering for water quality, is to look at recommendations from the scientific literature for appropriate buffer widths and the situations for which buffers are most important in maintaining water quality.

For example, different buffer widths may be needed to provide specific services at a given target level, and the extent to which a buffer can help promote a water quality target will be influenced by the amount of pollution ("loading") entering the system and site characteristics such as soil type and slope.

Buffer Options

www.bufferoptionsnh.org

#### **30 FT** Influence Water Temperature

- 98 FT Remove Pollutants. Habitat for Aquatic Macroinvertebrates & Fish
- **164 FT** Reduce Runoff & Stabilize Channel Bank

**330 FT** Habitat for Terrestrial Wildlife

## Where should they be?



#### Buffer Options for the Bay Co-Occurring Ecosystem Services within Riparian Buffers

Durham, NH

#### Legend **Buffers Likely to Protect:** Single Benefits Water Quality Flood Storage & Risk Mitigation High Quality Wildlife Habitat Multiple Benefits Water Quality & Flood Storage Water Quality & Wildlife Habitat Flood Storage & Wildlife Habitat Water Quality, Flood Storage, & Wildlife Habitat Other Riparian Buffer Surface Water or Wetland Prime Wetland Estuary Freshwater Wetland Open Water Conservation Land -, Municipal Boundary (clipped to coastal watershed) 0.75 1.5 Miles Map created 9/22/2017 by

## **Summary Points:**

A key aspect of the BOB project proposal was not only to think about how to create a buffer that was going to be effective in terms of width but also to consider where to put buffers and where to focus restoration and protection efforts related to buffers.

The team took recent analyses and GIS layers and compiled them into a series of co-occurrence maps. They created maps for each of the 42 towns in the watershed that show where buffers are likely to protect water quality, habitat, and flood storage, therefore helping people understand where they can receive benefits from protecting buffer areas.

The green polygons indicate protected land but, as is clear on the map, there are often restoration opportunities on these properties as well. So, these maps can help public land owners further focus their restoration efforts.

## Bottom line....

- Policy- It is always about trade-offs
- Science- Always can do more, there are different approaches, at some point the biophysical science needs to intersect with community values and economics.
- Overarching –We have a tremendous opportunity to be proactive in NH; engaged partners, great knowledge base, undeveloped land that can be protected.

## **Summary Points:**

There are clearly tradeoffs as to how individuals and communities value buffers and this is a central issue to buffer management. Although people are looking for a single answer or solution, there isn't one.

- Policy People who are managing buffers need to start from acknowledging what they value about buffers and have a clear goal for managing a buffer before trying to develop or advocate for a policy or ordinance.
- Science The science around buffers can be approached in different ways, and there will always be opportunities to improve this body of work and make it more relevant to NH.
  People taking that science on should be aware of the community values, political context and economic tradeoffs associated with management options that are derived from the science.

Despite the complexity of understanding and managing buffers, there are great opportunities in New Hampshire. The Great Bay watershed has many buffer corridors that are undeveloped, and protecting and restoring buffers is a way to apply nature's ability to mitigate multiple stressors to work. NH also has many people dedicated to and knowledgeable about buffers, and now there are documented examples of how other states have approached buffer management that people can draw from.

## Explore the website

#### www.bufferoptionsnh.org

## **Summary Points:**

Digital copies of all of the products produced during the BOB project can be found on the BOB project's website. The website also organizes content from across the individual reports around common questions related to buffer management and buffer science.

This information can provide guidance to those looking to increase the use of buffers as a tool for addressing issues related to water quality, wildlife habitat, and other ecosystem services in the Great Bay watershed.

Home About Buffer Basics How to Maps Reports Contact 🔎

**Buffer Options** 

## What's next?

## Buffer Options

#### **ACTION PLAN**

(Actions prioritized by our Advisory Committee highlighted in yellow.)

#### Actions

Website and associated products

Create a photo gallery on the website that shows before and after buffer restoration pictures, that demonstrate what a healthy vs. degraded buffer look like, etc.

Create a success story section of the website that highlights different types of buffer protection, regulation, management or restoration projects that have happened in NH. Include major players and funders.

Create a robust case study section to the website: include local case studies of approved ordinances, case studies of failed ordinances, case studies that include assessment of if development is deterred by strict setback ordinances etc.

Create a graphic or way of showing the range of options for dealing with buffers- a spectrum from conservative to reformist with associated benefits and or a "rating".

Create a graphic that compares NH buffer regulation with other NE states

Consider if additional distillation of any of the reports would be valuable for public or municipal audiences (two page summaries, etc.).

Create a one-page pdf that summarizes key economic findings from the project.

#### Mapping and spatial analysis

Create a map that has specific community by community information about what water bodies and buffers are protected and how that relates to impaired waters, etc.

Work with modelers to create and visualize different buffer options and how they influence ecosystem services a the parcel or site level.

Use aerial maps to assess historical trends in buffers, enforcement of current regulations, and map trends moving forward.

Show build out analysis of GB communities under current regulation vs. stricter buffer regulation to assess impact on land owners and tax base.

Coordinate the maps and resources created for BOB with maps and resources used by DES in permitting decisions.

Create interactive map products that show how different buffer widths and/or variable widths and vegetative cover would influence water quality, influence taxable property, etc.

#### **Summary Points:**

Throughout the project, the project team worked on creating an Action Plan that detailed issues that need to be addressed but couldn't be addressed within the scope of the project or other gaps that they identified relating to buffer management.

They ended up with a list of 240 potential actions at the end of the project, and spent the last few months of BOB categorizing these into 40 key actions. The project team and Advisory Committee helped prioritize those actions and set up teams of people who were interested in working on those actions beyond the life of BOB.

GBNERR has committed to meeting every six months with the group to talk about how they can help move these action items forward.

## For more information:



Cory Riley cory.riley@wildlife.nh.gov

## Visit www.bufferoptionsnh.org

#### **Questions:**

How many of the project partners were municipal staff versus people from agencies or organizations? What has been the response from municipalities using the resources you have produced?

Municipal staff were embedded in the project in a few ways. One of the technical reviewers was a town planner and there were three municipal staff on the Advisory Committee. The community assessment was done with the help of people working for municipalities and some of these people also helped review subproducts. As far as how municipalities are using the resources, there is not much immediate feedback to share since the website was rolled out just three weeks ago. However, the team has since received a few requests to speak about their work to a few local/municipal groups.

#### How much adaptive management took place over the course of the project?

Adaptive management was very much embedded into every step of the project. When the project started, all of the subteams had to write a project plan that restated what they said they would do in the proposal and the team used their outside technical reviewers and Advisory Committee to review these. At the end of the first year of the project, subteams had completed draft products that went through a similar type of review process. At that point, the team met with the Advisory Committee and discussed where they should focus their efforts in the remaining year of the project. While the project team initially thought they would be able to create a decision tree or some other product that made it easy for people to evaluate buffer options, they realized it was much more complicated so their method of integrating information across reports evolved quite a bit over the course of the project.

## For more information:



Cory Riley cory.riley@wildlife.nh.gov

## Visit www.bufferoptionsnh.org

#### **Questions:**

How have you dealt with reticence from policymakers and stakeholders to stick with buffer regulations when the positive effects of buffers are often not visible for years or decades, especially with regards to nutrient management? When the team asked people what they cared about in their communities during the community assessment, many people had more immediate concerns about protecting drinking water resources or maintaining a recreational access point. So they certainly saw that it is difficult to get people to think beyond the short term concerns and impacts. But if you're talking about restoration or protection, people have many reasons for wanting to do it. And that's why working with buffers is gratifying - they have so many different benefits to things that people really connect with, include water quality, wildlife, habitat preservation, etc. The hope is the long-term benefits will come but there are some immediate benefits citizens can see with when it comes to flood protection or drinking water protection.

#### You mentioned the economic analysis did not result in what the team expected in terms of costs and benefits. Can you explain why this was?

As PI, Cory went to Clark University and asked for their help in figuring out what the value of buffers are. However, natural resource economists need to have a lot of data and make many assumptions to answer this question and, with the data that was available and the need to embed a lot of assumptions into answering the question since the data was not primary, the research question became much more narrow. However, the study was excellent and what was produced was a range of numbers: \$1.5-2.8 million in willingness to pay for increase in water quality in Great Bay.