

## ***Saltwater marshes can be tool for coastal resiliency***

**By John Stanton**

*July 11, 2019*



Contributing Writer Jennifer Karberg, Ph.D., is standing on an old railway bed, where a century ago the Nantucket Railroad once ran. She is talking about what needs to be done between today and the end of the century to save the salt marsh here and why saving it will help protect the areas behind it from flooding.

“Just standing here and looking out at the Creeks, I would say one of the best things the town could do right here is maybe take down some of the grade and find a way to connect the salt marsh closest to the harbor to the area on the other side of the path, so that this salt marsh could migrate back,” she said.

Research now being done indicates that salt marshes have the capacity to migrate backward, so that making sure there is open area behind them might be a good first step in building resiliency.

“The next thing to do would be to elevate this path and build a bridge that would allow everything to move underneath it and enlarge the salt marsh. Not enough saltwater gets back here now so there is no connection between the two sides. There’s been a lot of talk about this for awhile. There is just one small culvert and that’s just not enough to let the water flow all the way back.”

There are salt marshes on Coatue, and bordering Polpis and Madaket harbors, but this one is the biggest.

The phrase “once upon a time” often seems like the right way of thinking about the changes facing this island. Once upon a time Brant Point was a salt marsh, as was a great deal of what we now know as downtown.

“Salt marshes serve a whole suite of functions, both ecologically and commercially,” Karberg said. “They are nursery grounds for most of our shellfish-fishery species, and habitat for birds and insects.”

Their value to coastal resiliency is that they exist between the harbor and the uplands. The vegetation and the kind of soils that form salt marshes make them able to take the brunt of flood waters from a storm surge and hold onto it. They are natural retention basins, knocking down the power of a storm and releasing the water slowly enough so it goes back into the harbor or the aquifer. The more salt marshes you have, the more of a buffer you have against storm surge and sea-level rise.

“After those storms two winters ago (including Winter Storm Grayson) that big salt marsh up past the dump that connects Long Pond to Hither Creek was full of water,” Karberg said. “But it wasn’t coming up over the road.

“There was definitely a concern of flooding, but when I looked at it that salt marsh was doing what it was supposed to do. It was full of water and it may have taken a couple of weeks, but it held that water and slowly released it back out instead of flooding the uplands, which is what would have happened if those salt marshes weren’t in place.”

“The worry is that as sea levels rise, the water will exceed what the salt marshes can handle, and this will eventually force the marshes to die off. If the salt marsh in front of the old railbed died off, the area around Consue Spring and beyond would see its vulnerability to flooding increased.

Karberg has ideas about what might be done at salt marshes all around the island. The best bet is to protect a salt marsh and help it survive where it is. The next best move is to give it a place to migrate to. Then there is the idea of creating habitat in place, which is called a living shoreline and provides a natural buffer.

She points to the Easy Street basin as a place where building a living shoreline would absorb the water before it hit the bulkhead.

## **Building a natural living shoreline**

“Looking at town, where we built the bulkhead behind the Dreamland Theater on Easy Street, we could find a way to build a natural living shoreline in front of that bulkhead,” she said. “You’d essentially be building a natural marsh that would absorb some of that water before it hit the bulkhead. Even with that bulkhead in place we are seeing some storm events that come over that. You would mitigate some of that.” She also pointed to Folger’s Marsh on Polpis Road.

“On one side of the road there is a big wetland and some of it is salt marsh,” she said. “On the harbor side of the road there is a ton of water getting backed up and the salt marsh is essentially dying from too much water. What needs to be done is a bridge on that part of Polpis Road to allow the water to move freely.”

Standing with Karberg on the old railroad bed and listening to her ideas, is the difference between a general, anecdotal understanding of Nantucket’s coastal vulnerability and a viewpoint based on science. It is, in a small way, the next step in how the town is gathering the momentum to address the potential climate change problems it faces.

Karberg is a realist when it comes to the calculus between what ought to be done and what it will take to get it done.

“Anything we’re going to do will cost a ton of money,” she said. “So, we need to look at the island as a big picture.

We need to look not just at where there are hazards right now, but where they will be in the future and what are the key things and steps that need to be done. Then we need to break them out and see what effective changes we can actually make right now.”

## **Lessons from the Boston Green Ribbon Commission**

In 2016 a group called the Boston Green Ribbon Commission began to do just that in Boston. The first step was putting together a team of engineers and scientists from local universities to pull together the best science available, then find a way to see those predictions through a Boston lens. The work from what was called the Boston Research Advisory Group (BRAG) became the basis of a report called Climate Ready Boston.

“What they did was reanalyze and pull together existing work,” Green Ribbon Commission director Amy Longsworth said. “And they made a report particularly focused on Boston. It was not regional New England or the East Coast of the U.S.”

Longsworth suggested that the next step Nantucket might consider is reaching out to the Woods Hole Oceanographic Institute, which supplied BRAG with its data.

“Nantucket is relatively small so I would imagine you could get Woods Hole to put together a report. By 2030 we’re looking at this, by 2080 this. And here are the incursion points,” she said.

According to Longsworth, the idea is to use the best available science to create a picture of what can be reasonably expected to happen, to explain it in a way that is palatable and

understandable. Sometimes that understanding requires finding a way to communicate beyond extrapolated numbers, scientific models and reports.

“Another piece of what I am doing is organizing the cultural institutions of the city,” she said. “Encouraging them to become more aware of their role in communicating to the community what is happening. A lot of people do not communicate through a science report. Getting the science right and then waking up your voters and taxpayers is what we ultimately need to do to get the kind of government we need to deal with this going forward.”

One of the goals of BRAG was to bring the discussion to a new level, Longworth said. “The idea was to put behind us any questions and arguments about how bad a problem this will be,” she said. “Get to a place we can all agree on and then let’s move forward from there.”

For many coastal communities, including Nantucket, the opening round of coastal resiliency efforts often looks at problems in a general way, from what is sometimes called the 10,000-foot view. Most discussions of Nantucket’s vulnerability and potential resiliency have so far centered on what anybody who has lived on this island for any length of time can tell you about flooding and erosion.

Town, Polpis Harbor and Madaket are the low-lying areas, and that is where we’re going to get sea-level-rise flooding. We are already seeing huge erosion in Sconset, along Sheep Pond Road and at Cisco Beach. Having a general idea of the problem areas is one thing, having enough information to make long term and costly decisions requires a more granular approach. It requires bringing that 10,000-foot view down to the view of individual parcels. Kirk Bosma, a coastal engineer with the Woods Hole Group, suggests that finding the right map is key to that step.

“Sea-level-rise maps, where you get the little slider and you can move it and see the map get wet. That’s a real, first-order, basic way to see it. It is typically based on what is called that bathtub approach. It is really simplistic. It in no way represents a coastal-storm event,” he said.

When making decisions on where to spend municipal dollars, which projects should be prioritized, a map that shows the way water really moves during a flood is important, Bosma stressed.

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*– Jen Karberg Scientist Nantucket Conservation Foundation*

“How water flows, gets down streets, how it floods and how it gets back out, provides a much better idea of how best to build resiliency,” he said.

“A lot of time communities, when we work with them, will have this sense of despair. It can be hard to envision how you’re going to battle sea-level rise and climate change. But if you look at it based on how water actually moves, it’s a little bit easier to understand that you don’t have to solve everything at one time.”

Bosma was part of a team that put together a map, based on what he called the physics of water, for Climate Ready Boston. A map of the entire Massachusetts coast, including Nantucket, that is based on the same science, is being created for the Department of Transportation and expected to be completed and available to the public later this summer, he said.

“You live some where and you probably already have a pretty good idea where water comes in at least today,” he said, explaining the thought process. “But what you don’t know is how that’s going to change as a function of sea level rise and changing climate. And also, maybe not the exact extent of how you would mitigate it. If you cut off the water here, does it flood in a different way that you’re not thinking about?”

Climate Ready Boston brings that data, that viewpoint, down to the level of both individual parcels in different neighborhoods and in socially-vulnerable populations. It focused on what were identified as the eight most vulnerable parts of the city, including South Boston, Charlestown, the Seaport District and East Boston.

Teams were sent to each neighborhood to look at where they might rebuild and raise a road, where they might put revetments, where they might put a sea wall, where creating a salt marsh or a living coastline might work. They also asked what needed to be saved from an everyday life standpoint.

In one East Boston neighborhood, for example, a flood pathway has been defined. The report offers engineering solutions based on the understanding of that flood pathway, including a deployable flood wall, road elevation and creating a living coastline. Equally as important to decision- makers, it estimates costs.

“Full implementation of near- and long-term measures would protect over 13,200 residents, at least 130 businesses and many critical facilities, including first-responder facilities and the East Boston Neighborhood Health Center,” according to the report. “At this maximum level of protection, from a single event, these measures would prevent an estimated \$620 million in losses.”

### **Nantucket Data Platform at work on sea-level rise**

Alan Worden is the founder of the Nantucket Data Platform. The work being done by the Green Ribbon Panel and Climate Ready Boston is a model for the work he wants to do on Nantucket.

The process, he said, is to aggregate reliable hyperlocal data, run it through a series of proven and reliable methodologies, with the goal of getting deeper insights into each area of the island. Those insights include the impact of flooding and storms in both a dollar value and of a social and cultural value.

“We don’t need to debate the facts,” he said. “We need to figure out what we’re going to do, but we can’t if we don’t have the basic baseline data. Some of that will come from the town, some from the Woods Hole Group, some of it is census-based. Aggregate all that data and curate it and then visualize it.”

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Similar work to Climate Ready Boston is being done in a number of cities, both in the United States and Europe. The best of that work is evidence-based and presented in a way that leads to public policy, Worden said.

“That doesn’t exist in a wholesale way on Nantucket,” he said. “But it could. Our proposal is let’s go take those best practices from cities making evidence-based decisions and bring them to Nantucket. Use the best national data but lean heavily on reliable hyperlocal data. Develop new methodologies but lean on proven ones.”

“The last thing is you need to show it. All the coastal-resiliency stuff needs to be shown in a really easy way so everybody can see the problems and everybody can be part of decision. And you need a repository for that.”

At some point, all the public awareness and the science will lead to a series of decisions. Prioritizing decisions, Worden said, will require dependable and in-depth understanding of the consequences of those decisions.

“It’s not just a flooded street, or the loss of a business for a month, or wires that get fried,” he said. “It is also people who get affected. There needs to be a cultural-resource inventory. Who’s impacted? And all of it needs to be constantly and automatically updated.”

Worden is not sure whether funding for the work will come from the town, the state, a philanthropist or from a combination. The Nantucket Data Platform is looking for enough money to break even, rather than make a profit, he said.

“It’s not science-fiction anymore,” he said. “What excited me is it’s doable. It’s being done. If we don’t do it the question will at some point become why aren’t we doing it? The town has to start. If we start, in a year we’ll be much smarter. If we delay for a year, we’ll be two years behind.”