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# ESSEX COUNTY'S SPECTACULAR GREAT SALT MARSH
# LECTURE TRANSCRIPT

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## Description

An audio recording at the Cape Ann Museum in Gloucester, MA of the February 6, 2016 program by lecturer and freelance magazine writer Doug Stewart presenting an illustrated lecture on Essex County's spectacular Great Salt Marsh.

The Marsh stretches from Cape Ann to New Hampshire and is a biological engine whose nutrients sustain fish stocks and bird life. It also protects shore towns from flooding and storm surges, but despite its necessity, the Marsh is poorly understood and under-appreciated. Stewart will explore the Great Marsh's past as valuable real estate for farming salt hay, its unique success over much of the

past century in dodging the nation's swamp-filling mania, and its uncertain future as sea-level rise accelerates.

Photographs by Dorothy Kerper Monnelly of the Great Salt Marsh were on view during the lecture.

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**Transcription**

Kate LaChance 0:00

Good afternoon, everyone. My name is Kate LaChance. I'm the Program Coordinator here at the Cape Ann Museum. First things first, this turnout is amazing. And we want you all to come back. So, please pick up a membership brochure on your way out. This truly was a community collaboration today.

Doug Stewart is a resident of Ipswich and was recommended to me by one of our docents, John Huss. We also have photography on view today by Dorothy Kerper Monnelley, another resident of Ipswich and collaborator with Stewart on "Between Land and Sea, The Great Marsh," which I saw some of you flipping through on the table outside. We're all familiar with the Marsh. But I'm so happy to have Doug here with us today to delve even further into its value, and how we can value it. So I hope now that you'll help me in welcoming Doug Stewart to the podium and we can get started.

Doug Stewart 1:10

I'm just gonna hold the microphone in my hand so I don't knock the computer on the ground. Can you hear me okay?

Audience 1:18

No.

Doug Stewart 1:21

No? Okay. Do you think it's off?

Kate LaChance 1:24

I can turn it up more.

Doug Stewart 1:27

Okay. How about now? Is that sounding better? Okay.

1:32

Well, as Kate said, I live in Ipswich. I'm a freelance magazine writer and I had the wonderful opportunity to be asked by Dorothy Kerper Monnelly to write an essay in her book of photographs, "The Great Marsh" published about 10 years ago. I wouldn't say that I was her collaborator, it's Dorothy's book. She's a spectacular photography—photographer. You can see some of her pictures here. She has been called the Ansel Adams of America's coastal wetlands.

And a big part of what is important here is salt marshes, and especially our Great Marsh, which extends from here to the New Hampshire border and actually beyond, has often been very much misunderstood and underestimated. And raising the profile of the Great Marsh and learning to appreciate its scenic beauty and its ecological value would go a long way toward helping protect the Great Marsh.

And the Marsh is important not only for wildlife, and not only for its scenic splendor, but also as it turns out, it's a vital buffer protecting human communities in coastal Massachusetts, from coastal storms, which are poised to become more frequent and more severe with climate change. This is part of a big research effort that's going on right now. And I also wrote an article last year for National Wildlife Magazine about this research project that Congress has authorized $3 million for with Hurricane Sandy funds. So it's all part of the same subject.

Now, the Great Marsh is an area of salt marsh that is the largest salt marsh in the United States north of Long Island. And it's considered to be the most pristine salt marsh that still remains in the United States.

3:40

It is a place that really looks very much like it did 1,000 years ago, which you can't say about most parts of the Atlantic or Pacific coasts, mainly because of human

development. And you know, it's an amazing gem we have here. It's nearly 20,000 acres of not just salt marsh, but marsh islands, barrier beaches, and estuaries. That is our true wilderness within commuting distance of Boston. And it's definitely worth appreciating.

4:22

And even though it has looked this way for 1,000 years, that doesn't mean it's going to look like this in 1,000 years. There are now a number of threats to the Marsh—even this Marsh, pristine as it remains for the most part. And that's something that scientists now—environmental groups are looking at.

This is a section of the Marsh. You can see the Parker River which divides Rowley and Newbury. And one of the threats to marshes generally, and the Great Marsh, is encroaching development, but also pollutants from human activity. And, you know, once upon a time in the United States, there was so much salt marsh that it covered an area the size of California. And now drastically, San Francisco Bay has lost 95% of its salt marsh. Galveston's lost 85%. So again, it's another reason we should really value what we have.

5:27

So you can probably recognize this is Venice. And you might also recognize the Grand Canal was once a tidal creek going through the salt marsh. And this is one of many cities that have been built on marshes around the world. Every continent in the world has had marshes, except for Antarctica. And often people looked at them as you know, virgin real estate to build on because it's accessible and flat. And if you put fill on top, you can put a city on it like Amsterdam, Buenos Aires, large parts of Boston, Philadelphia, and New York were also built on marsh.

This is an illustration from Manhattan, which a book that came out a few years ago. And on the left is an imaginary photo illustration of what Manhattan seen from the north looking south might have looked like 500 years ago, if you had drone photography then. Plumes of smoke would be Native American campfires. You can see some salt marsh in the foreground on the left, and there would have been lots of marsh on the Hudson River and elsewhere.

And this is a photograph on the right actually, unlike so many marshes that have been obliterated by development here, and I'm afraid I don't know if this is the Bronx or Harlem. I think it's Harlem, maybe the Harlem River in the foreground—the marsh is still there. I mean, it's severely degraded. It's really a mud flat, but it hasn't been completely topped.

7:00

But most marshes have disappeared. And one reason is marshes do have a pretty bad reputation. They're generally like other wetlands. They're considered a swamp, and swamp is a pejorative word. This is an early 20th century illustration—I really took illustrations from the internet and I apologize to their creators.

This is an illustration of John Bunyan's classic Puritan work, *Pilgrim's Progress*. And this is the slew of the spawn that started to show the way some people thought of wetlands in the Middle Ages and later, for so often. A wetland was a place—it was a low area where noxious liquids from settlements would flow and collect. And these are treacherous, useless, ill-smelling places that would trap you if you weren't careful. Like these sinners, this would be a metaphor for what happens to sinners. The guy on the right is clawing his way out. The guy in the middle, I think, is probably done for.

And this may be the first detailed map of the New England coast published in 1624 by John Smith, of Pocahontas fame. So this was published four years after the pilgrims came, possibly Smith did his navigating even before that.

8:21

And let me just, I need at least three hands here. I want to read a quote from John Smith's book, which is aimed at his English audience where he's trying to build up interest in North America. And he said he saw no unwholesome marshes when he explored the Hudson River and coastal Virginia. And those marshes he did see were more profitable than hurtful. He thought he had to reassure people that these weren't treacherous slews of despond.

And one thing that's interesting here is that many of the first permanent settlements in New England were actually built in places that have very expensive

salt marshes, like Ipswich, Duxbury, Plymouth, Saugus, Newbury, of course, and Portsmouth. And I think it's probably not a complete coincidence because I have read that when the first settlers arrived with livestock and would let their cows and horses munch on the native grasses, to their surprise, the grasses didn't grow back. Turns out when you mow your lawn and it grows back or let cattle or sheep graze, that's because the plant has adapted over thousands of years to grow back. The native grasses didn't do that. The settlers had to import seeds from Europe. They could do it, in the meantime, they could keep their cattle alive and let them graze on the marsh at low tide. And so it stands to reason that that's one reason a town like Ipswich was one of the first settlements here, because you keep your cattle alive.

Now one of the most important products of the Marsh, of course, are clams. This is an old Ipswich clam shack, a vintage photograph. Apparently that's just several days worth of shells—I guess there were a lot of people shucking. Now before English settlement, the Native Americans who lived in this area depended very much on the bounty of the salt marsh of the Great Marsh. They did shell-fishing. Archaeologists have found shell middens in the Great Marsh going back more than 1,000 years. They also did fishing, and marsh areas are always part of their nomadic lifestyle. In summer, they would come and take advantage of what was available.

10:49

A marsh is an amazingly productive system. It produces much more organic material in a year, than say, a field with carefully tended and cultivated wheat. It's really an engine that drives a whole complex food chain. So these are little sticklebacks from a marsh. Typical of small fish that live in any salt marsh. And these are, they use the small fish to feed on you know, sea worms and sand shrimp, algae growing on the creek banks, and then also they're hiding from predators 'til they get bigger and go out to sea. It's been estimated that something like 90% of commercial fisheries in this country depend on organic material and food from salt marshes.

11:51

It's no coincidence Stellwagen Bank off Gloucester is offshore from the Great Marsh, or that the Gulf Coast—Gulf of Mexico fishery has a whole huge amount of salt marsh there, because the little fish are eaten by bigger fish, and bigger fish are eaten by birds. This is a great blue heron. This is one of the ospreys, which I hope you have seen at the Cox Reservation.

This is a still from Essex County Greenbelt's Osprey Cam. Have people looked at the Osprey Cam? Good. You should try it, not until about May. These are also osprey; these are also known as "fish eagles." It's one of the many species that can be found in or around salt marsh because of the abundance of food available. And there are some rare birds like this Virginia rail and a least bittern.

This is another organism—I wouldn't say she depends on the Marsh—which is sort of the top of the pyramid of things that certainly enjoy the Marsh. This is a birder at Parker River National Wildlife Refuge. For people come from all over North America and, I'm sure Europe, to look at birds, including rare birds that have touched down in the Marsh as they travel the Atlantic Flyway. I used to live a half mile from there near Newbury, and I remember bicycling or running down there and you'd see these knots of really excited adults looking at some tidal pool. I'm not a birder, I confess, but I remember the excitement of these groups of up to 100 people. So again, an amazing resource. It's worth learning more about.

13:40

I'll just mention a few mammals. Otters, and this is a harbor seal at Joppa Flats in Newburyport. Harbor seals don't swim in the Marsh, but again, this would be an animal that feeds on fish. They feed on fish that maybe come from a marsh. The marsh can be a spawning ground for fish or sort of a nursery for young fish.

Now the grasses that grow in the low marsh are supremely adaptive to very, what for most plants would be, very harsh conditions. This is smooth, smooth cordgrass or *Spartina alterniflora*, which I'm sure you all recognize. It's the dominant plant of the low marsh. Usually biologists talk about biodiversity as being a good thing. When you look at Dorothy's pictures, for example, one thing that makes them so majestic is there isn't a lot of biodiversity. It's mostly one plant, which is good in a marsh. And there's only one plant in the low marsh because these plants have to survive being pickled in seawater twice a day. And how many plants can do that?

And not just a certain amount of salt, it's got to be some salt. Not too much. Some fresh, not too much. It has to be adapted to the oscillation of the tides.

And the second plant is marsh hay, salt hay, or *Spartina patens*, which is adapted to slightly drier ground. *Spartina alterniflora* would be, would have its roots soaking in seawater maybe half the time. Salty hay, less, has a distinctive cowlick and this is the plant that salt hay farmers would harvest. And both these plants decay and form, when they die back, they form a mulch that is used, that decays into the peaty thatch that the tangle of very thin, dense roots of marsh grasses hold together to form marsh soil, or the substrate. And it grows over time, takes in, you know, silt coming in on the tides, nutrients coming from freshwater streams and uplands. And little by little the marsh builds up. And because there's so little oxygen in marsh soil, things don't rot—including the roots themselves. And that soil doesn't really change. It's, you can see it on the beach sometimes, these clumps of peat. And that lets the marsh keep growing. They found marsh deposits in Boston 10 feet deep, it just keeps going up.

16:31

And you know, when you think of the last Ice Age, when there was a glacier a mile thick here, the water came up, I think, between one and 200 feet in a relatively short time, like 20,000 years. And the Marsh was able to keep up with this fast sea level rise, which would be you know, less than an inch a year, a lot less than an inch a year, but, and the Marsh would have to retreat. There might, if there would have been a marsh at Stellwagen Bank, and there was forest in Boston Harbor, and so a retreat, that's a lot harder for a marsh to do today, if it needed to, because now we have human settlements. Getting everybody to move off the coast is pretty tough when a very sizable minority of American citizens live within three miles of a coast.

So this is salt hay, an old vintage picture, in the Great Marsh. The hay would be stacked up on these staddles of cedar posts in a ring. And then on an especially high tide, one of the full moon tides in August or September, it would be collected on gundalows and brought in as near as landing to be where it would be used for thatching houses or insulating houses—this is going way back—or fodder for cattle. But the salt hay industry was really, now it's more of a gourmet business. It's not a real going concern. People aren't interested anymore in owning salt marsh for commercial reasons.

This by the way, is a luminous painting by Martin Johnson Heade, from the 1800s, which I really love. It's a picture of the Great Marsh. He did a lot of paintings of the Newbury marsh. And I love it because it's like a Hudson River School painting showing majestic, wild America on the one hand, but at the same time there's also a picture of industrious American farmers at work. You know, America is the land of plenty, as the horn of plenty, with the haystacks, and you can't quite see it, but there's farmers that are gathering hay—not used to be the way people would see a marsh as a desirable piece of property.

But with the demise of salt hay, people didn't really want to own marsh. They thought of a marsh as a sort of a drab, useless kind of terrain to try to build on unless you were going to spend a lot of money on landfill; too wet to navigate; generally too flat to be very interesting. That's one reason marshes have been obliterated so widely, especially in the first half of the 20th century. And I show this picture just to remark on the ditches. You might wonder why there are so many ditches in the Great Marsh. There's actually several thousand miles of these things. It was mostly a Make Work program in the Depression where Civilian Conservation Corps workers were paid to scrape ditches for mosquito control, which was, it proved to be useless, but it did provide work for the CCC workers.

Here's my two nieces and my sister-in-law years ago. It's a lot of fun to run around in the upper Marsh in the winter, or cross country ski.

19:54

And so a lot of, when you think about the first half of the 20th century and some of the big developments, not just cities are built on marshes, but airports—you know, Logan. The Meadowlands in New Jersey—why would it be called the Meadowlands do you think? And shopping centers and just, you know, always considered you were doing a good deed, actually to fill a marsh in. San Francisco Bay. It's not as quite as bad as it looks; these are actually old salt ponds, but it used to be a marsh. And it is no longer. And sometimes, I visited my brother in Palo Alto and he's taken me to see his marsh a few miles away, in Mountain View on the Bay. To me, it's the most pathetic looking marsh. I'm so surprised he's proud of it. Because you compare it to this… but, I mean, I don't mean, don't think of me snooty, it is hard to compare.

20:50

This is Galveston, another marsh indignity. This is a new picture of a [husky].

Now, we have a Wetlands Protection Act, and there are people here that probably understand this better than I do. But even though there is a Wetlands Protection Act, and you're not freely allowed like you once were, to fill in wetlands, it continues to happen. The amount of wetlands in this country continues to shrink year by year.

And here's another example of marsh fillings. This is Tuckerton, New Jersey. It looks like one developer went in and, probably not really recently, but not really long ago either, and got permission to build this—all these waterfront homes, you know, by scraping ditches in the marsh. And this waterfront, when you ever look at a newspaper photograph of some coastal town's Main Street that's been flooded in a hurricane for you know, a video news report... watching cars floating—it's instructive to go to Google Maps/Google Earth and fly down to that block to see what kind of town it was because Main Street flooded in the storm. Often, it's a town like this where, you know, it's two feet above sea level or something. And it's a problem when you have this kind of development.

I don't want to, you know, bore you with horror photos, but I have to show you the Louisiana Delta today. This is a recent satellite picture, the southernmost part of the Mississippi Delta. You can see it was salt marsh, there's not much left of it. It's sort of like moth eaten cloth. This is an aerial view of the same area. And one reason, I mean, a big problem there is the land is subsiding. You know, it's just the land is sinking, so water would seem to be coming up, even if it wasn't actually. But another problem is petroleum companies in the Mississippi Delta, have been free for many years to just dig ship channels and pipeline channels, and it's like an infection. You start the erosion and it spreads. And that has been a huge problem. We don't have that problem in the Great Marsh, even though Hampton, New Hampshire, in the 30s did have a written plan that they voted on to put in a 10,000 car parking lot on top of the Marsh.

23:14

It was voted down, as you probably know, but this is the north end of the Great Marsh in the same town, Hampton, New Hampshire. And you can see, this is, so some of the problems marshes like the Great Marsh face—they're not direct

problems like trying to put an oil refinery right on top of one. It's more runoff from people's lawns or from businesses or oil from cars on roadways. He says, oh, there's a pretty busy looking road right by the Marsh, and then backyards right on the Marsh. And that's generally not a good thing. Fertilizer is a known pollutant, and I imagine, I look at that lawn in the middle is greener than the rest. He's clearly using fertilizer. And in my imagination the little section of Marsh behind his house seems a little more [muddled] than the rest, although I don't really think pollution would be so local.

This is Seabrook, New Hampshire, and I'm including a picture because not to point a finger at nuclear power, or anything. It's more that when they built this, they built a lot of parking lots and roofs, and tanks and other impermeable structures. And that is another kind of pollutant that we don't usually think of, which is freshwater. And when you're talking about a salt marsh, freshwater, in fact, is a pollutant. You've got these plants, and animals, and organisms that are adapted to a very fine-tuned balance between salt and freshwater. It swings with the tides. And suddenly as a rainstorm, all the rain hits these impermeable surfaces, flashes into the creeks and into the marsh. It doesn't necessarily poison the animals, but if they're already stressed by other things, this can be the thing that will do them in, or at least hurt them so invasives can get a foothold.

25:14

And here is a key invasive that I bet you recognize. This is a picture I took in West Gloucester a couple months ago. This is *Phragmites*, also known as a common reed, although I've never heard anyone call it that. And it's, I believe it's from Europe, and it is really taking over. You can practically see it moving. Behind my house on the Ipswich River there used to be cattails, and just in the last few years, I've noticed that cattails are gone, it's all *Phragmites*. And it's sort of a pleasant looking plant, but it grows to be very, very dense and it's just poor habitat. You know, it's very dark in there. You see red-wing blackbirds for some reason. All these

Unknown Speaker 26:00

You want me to hold that for you?

Doug Stewart 26:02

No, that's ok.

You see red-winged blackbirds using the *Phragmites*, they flirt around. But other birds, no. And deer will go in and sort of bed down in it, I guess because it's a hiding place. But other than that, it's kind of a barren thing.

Like melaleuca in the Everglades, it's just this—they can grow 20 feet tall and nearly impenetrable. And the worst thing about it from the point of view of the health of the Great Marsh, is, and it doesn't grow usually in the open marsh. This is a plant found on the fringes where there's more fresh, less salt, but those fringes are getting thicker.

And this is a big problem, is the roots. I mentioned the roots of the salt, the native grasses and the marsh create the peat. They hold together the muck and the sediments in the silt that form the foundation of Marsh. Well, *Phragmites*'s roots are like air filled carrots or something. They're sort of these fat things that act like wood splitters, they go down into the Martsh and they crack the soil. They break it apart, causing this kind of erosion indirectly when the tide goes by, and also the marsh grass itself. I mean, *Phragmites grass*, it's a grass but it doesn't really… I mean I guess it's technically biodegradable, but it doesn't rot away. It's more like bamboo. Some of the stalks in that last picture could have been a couple of years old, it just stays there. So it doesn't form peat; it doesn't form soil. It's, you know, an undesirable invasive on the point of view of marsh health.

This is a picture from last year, I think was probably from data in 2014. It's already out of date. It shows a couple different kinds of invasives in the Salisbury portion of the Great Marsh. That's, Merrimack is the bottom, New Hampshire border in the top or near it. And the blue dots are perennial pepper weed, which is one of the invasives and the yellow areas are *Phragmites*. And one of the things that concerns scientists is the yellow dots in the middle of the marsh. Because now, just recently, for the first time you see eruptions of *Phragmites* right in the middle of healthy marsh. I mean, imagine one of Dorothy's pictures with a bunch of *Phragmites* stands popping up. And it's not clear why this has been happening.

One theory is that the salinity of the soil has changed the soil, because it's not as salty as what it used to be. And that's giving a foothold to *Phragmites*. Now the reason this is important—I don't want to lose track of this—this isn't... a salt marsh is a vital natural buffer to coastal damage from storms and actually, from

sea level rise. When Hurricane Sandy hit the Mid Atlantic, it was 2012. It caused about $60 billion in damage, I think, in insurance claims. And Congress authorized $100 million in resiliency funds to look at ways to build in a resiliency in coastal towns, so towns could prepare for surging seas, more storms. Better to spend 100 million on that than to spend 60 billion to replace all the damaged structures in places like lower Manhattan. And they decided, Congress authorized a $3 million grant to study the Great Marsh as a sort of pilot program, a way to look at green infrastructure, which would be instead of building sea walls and jetties to soften the blow of storms, which are, as I said, going to be getting worse, no doubt in the years ahead.

30:02

You let nature do what nature does best. And one way to do that is to deal with some of these inroads, some of these assaults on the Marsh. Help the native plants be healthier. And so the aliens don't make inroads and so marsh doesn't disappear. And one thing, by the way, about the Marsh, you might wonder, well, how does it prevent storm surges? It doesn't prevent it. But as one scientist explained to me when I was doing the National Wildlife story, you know, one blade of grass isn't very strong, but when you have a big storm coming in, the worst damage isn't from land—except when there are tornadoes from water—when you have a storm surge coming in on a high tide, especially a very high tide. Well, if it's going over marsh, the friction of all those billions of stalks of marsh grass actually do dampen the force of the storm. And of course also all that flat ground is a sink for floodwater. Instead of piling up in a town, it can spread the water out temporarily. So that's useful.

So one of the, I guess a low hanging fruit in terms of fixing a marsh, is making culverts wider is one of the problems. This is a picture I took in Rowley of a typical old culvert. It may look like a big pipe to you, but this can have water pile up. Where the tide is, in your primeval times, it would sort of come right in where they wanted to go. Now they're being blocked by some 1500 different man-made structures in the greater Great Marsh ecosystem, including not just culverts, but dams, including old broken down dams that are no longer in use, and jetties, and sea walls and so on.

And I, about 15 years ago I volunteered to measure the water on the side of culverts along [?] road in Ipswich as part of a web agency's study. I remember

going out every three hours and the culvert right by Crane's Castle—the Castle Neck River I think it was—I think the level between tides is about four feet different from one side from the other. You know, the water just wasn't getting through the culvert and as a result, you can see these birch trees and other things are growing up on one side, just looked like incipient woods. Well right after that, the money was shaken loose to put in a big new culvert and within a year, there was salt marsh on both sides, the trees were poisoned by the tides. And it went back to the way it happened.

And even this I have two different scientists insist that this is an obstacle too. This is the Plum Island drawbridge between Plum Island Sound and the Merrimack. And because of the volume of water that should be getting through here, this is considered a serious obstruction.

32:55

And this is the kind of thing that one of the main components of this Hurricane Sandy study is to study the hydrology of the Great Marsh to study how water moves around and how that can be fixed. So as far as getting rid of invasive aliens, sounds like a small thing when you think about the big issues with climate change, but in fact, the old mantra is, think globally—act locally. These people are acting very locally; they're pulling out pepper weed by hand, which is a tough way to go, although they seem to be enjoying themselves. That's the Plum Island bridge in the background. That's a student volunteer on the left and Parker River National Wildlife Refuge officer on the right.

This is gonna be a quicker way, which is, this is a picture of Michigan, but this has been done in the Great Marsh too... burning *Phragmites* is surprisingly effective. You burn it, and the native grasses have seeds everywhere and they come right back. In fact, this has been a temporary problem—the amount of *Phragmites* in treated areas has just really greatly diminished. This is a couple of guys spraying *Phragmites* in Salisbury, I watched a year ago. Very cool vehicle called a "marsh master"—doesn't kill the marsh grass. I asked him to drive down into a ditch and drive back up out of the ditch like, you know, Patton in North Africa, but they're done with that. There's so little *Phragmites* in that area now—it's the backpack sprayers.

34:28

You know, it's like Fenway Park. I had a story once where I interviewed the groundskeeper and asked how much weed killer you use in Fenway. He said zero... if you have healthy grass, the dandelions don't stand a chance.

This is yet another technique which is feed it to goats. This is a test, not here, this is in Maryland, but you could presumably release goats to eat the *Phragmites.* Though sheep have been released on Hog Island to eat poison ivy.

I'll just mention a couple other techniques that have been tried. This is a test years ago in Newburyport where people would spray fertilizer on a section of degraded marsh. And again if you really help the native plants be healthier—in this place they weren't so healthy—the plants themselves will use their natural defenses to be robust and not give entrée to invasives like *Phragmites*.

I should just mention briefly the importance of barrier beaches, and this is to the existence of salt marshes. You can have marshes and estuaries, but mostly they're behind barrier islands. This is Plum Island. Without Plum Island, and Crane Beach, and Wingaersheek Beach there would be no Great Marsh. It wouldn't be able to withstand the force of ocean waves, even without storms. And Dorothy's book has fabulous studies of barrier islands of the Great Marsh.

This is a screengrab I made of the website and several of these you can look at where you can pick a place and then dial in the amount of sea level rise you want to look at. I picked five feet and that's what the Great Marsh would look like if the ocean came up five feet. You can see Plum Island is very, very thin. A lot of Ipswich and Rowley are just islands. In Newbury, all that one is is just a causeway. So sea level rise is a more obviously long term danger to the Marsh, and I won't get into a lot of discussion of sea level rise, but just to say can you think globally act locally? It's hard to see a connection between turning off the lights in your house or driving a smaller car and protecting the Great Marsh. But that's like saying it's hard to see the connection between voting and political results. You just have to try to do it on faith.

37:08

And I mentioned that when the after the last Ice Age, the Marsh was able to keep up, which is encouraging to think. The problem here is if the Marsh could keep up with sea level rise, you'd still have to have what's known as managed retreat, or

humans would have to keep backing away, backing away from the coast, which is probably not feasible. But the other problem is a marsh can only grow about six millimeters a year. That's an estimate, that's about an inch every four years. And that's actually pretty fast. But sea level rise, you know, we think we're seeing it now—we're not really seeing it yet—but we're starting to see it and it may well be a lot more than 6 millimetes a year. So, [?] turn down your thermostat. You might say, well, why not help the Marsh keep up with sea level rise? Why not do this—this is called thin layer deposition. This is a test that was first done in Louisiana 1999 where they dredge the channel and you have a big industrial sprayer on a barge that moves and then you spray a slurry of silt and water all over the marsh evenly. They did that to a depth of one inch in a section of Louisiana marsh and it worked fine. It knocked down the marsh hay, just knocked it flat, but it bounced back. And it didn't smother the marsh. And then this is a picture taken just a couple of years ago in Delaware, where they sprayed six inches down. And that didn't kill the marsh either.

38:48

But as you can imagine, this is not exactly green infrastructure. This is a very expensive way to deal with this problem. It costs a lot to run the pump. You're burning a lot of greenhouse gas to do it… a lot of labor. The Great Marsh is 20,000 acres. You know, if you could ever get the money to do this, as soon as you're finished you'd have to start again, because it'll be a whole new season. Plus when you spray the dirt like this, it can wash away in the rain—it's an issue.

And one of the things, sort of related, I'll mention that this new Sandy money project is doing. It's a small scale project but it's interesting, that is planting eelgrass, which is an aquatic plant. This is an underwater picture. Eelgrass is a plant that used to be common all around here— Cape Ann, south and north Cape Ann— and it's disappeared probably because of changes in water quality. And eelgrass will actually, like marsh hay, it dampens the energy of waves. So waves coming into shore will be slowed down or just sort of softened by lots of eelgrass, which is a native plant. And it also causes silt to precipitate, and having cloudy water in storms or after storms, called turbid water, is actually a big problem because it changes the conditions. The aquatic life, the sunlight doesn't get in the water anymore... it's a whole host of new problems. So eelgrass—three beds that people are transplanting from in this area are right here on Niles Beach, on

Eastern Point. You might have seen people in waders out there digging up these sprouts, also Annisquam and Manchester Harbor in Manchester-by-the-Sea. And they're planting beds like this in Essex Bay.

40:37

And the beautiful thing about green infrastructure is just the—that's Dr. Elisa Novak and a couple helpers and then a bunch of volunteer students. They just plant some beds, this is about an acre and a half, and then it'll, if it likes the conditions it'll spread. It's like ladybugs in an orchard... just start with a few and pretty soon they've eaten all the aphids... that's the ideal way to do things. This you may recognize—this is the idea of having driveways and roadways, for example, of perforated concrete. So you have permeable structures instead of ones where when rain falls, it just flashes right off into a wetland. The other thing I should mention, by the way about this kind of thing, is a marsh, like any green plant is a great carbon sink. You know, it sucks in CO2 from the atmosphere in order to grow.

41:29

So, that is another important natural value, the Great Marsh—it's pulling a lot of CO2. And finally, part of this whole Great Marsh project, particularly in the uplands... I mentioned there are 1500 more or less structures that are impeding the flow of freshwater and saltwater in the Great Marsh. And that's a problem because marsh, the Great Marsh, needs silt being brought in with the tides as part of its whole way of operating. It also needs sediments being carried downstream by creeks and rivers like the Ipswich River, and the Essex River, and the Parker River and so on. And we have dams like this is—this is the Ipswich Dam right downtown, historic Mill Dam where EBSCO is today.

42:21

It's causing a problem for fish that used to migrate up the river, but it's also obstructing the natural flow of these—of water and of sediments. And I asked somebody, I mean I've lived in the area 35 years, we've been talking about getting rid of this dam since I got here. And Wayne Castonguay of the Ipswich River

Watershed Association said the problem is this thing's been trapping sediment for centuries. There are so many toxins behind this dam that if you know, dynamited it and all those poisons and heavy metals flow down into Ipswich Bay, into the saltmarsh. And who knows how many people, animals you poison. So it's not quite a super fun sight, but it's a problem, but it will I'm sure be gotten rid of.

The general thing—I hope I haven't depressed you talking about sea level rise—I think what I'd like to leave you with is this idea that this is a really wonderful system, a true wilderness that we have right here. And one way to appreciate it is to look at the way artists have looked at marshes. This is a picture of the Ipswich Marsh, by Arthur Wesley Dow, the late 19th century early-20th century painter and teacher. Painting the same view over and over of the Marsh in Ipswich. And if people could learn to see the Marsh as beautiful and not as a smelly, buggy, sticky, wasteland, I think that would help protect the Marsh. Where people don't just think of ocean views as the most desirable view; you've a choice of where to live. Maybe a marsh view is more interesting than just a blue line.

44:18

And the other thing is to go out and enjoy the Marsh, you know, kayak in it. You can swim in the Marsh. You know, my family is always in the Marsh.

Somebody told me, I think the old Ipswich town clerk said, "We townie's don't swim in the Marsh." This was in the early 80s. Well, the water is warmer than the ocean, it's really a lot of fun. And so is kayaking. And so is cross country skiing. And so I hope I've left you on a sort of uplifting note. I noticed there's a scary number of marsh experts in the audience. This is your chance to raise your hand and correct me or call me out on exaggerations or fairy tales. So if you've any questions?

Yes.

Unknown Speaker 45:07

I live on the Annisquam River. And in the summertime, you know, it overlooks the Jones's Creek area, and boaters pull up on the beach. And I'm continually saying to people, "Don't walk in the marsh area; don't walk." And you know, they look at you like, "Who are you?"

Doug Stewart 45:25

Yeah

Unkown Speaker 45:36

[?] Yeah, and I grew up on the river. And it's receding and receding. Is there any way to put up signs around the marsh areas to let people know that it's delicate? A lot of people don't know.

Doug Stewart 45:40

I know. I shouldn't be casual about this. It's one thing to go skiing in the winter, but, and also there's a big difference… I don't know. You know, it's like Boston Harbor Islands. You know, people in some cases, have been camping out there and even bringing their lawn mowers to mow grass because they've been doing it for generations. And a park ranger, it's a National Park now, can say, "You can't do that. You're not even allowed to stay overnight." "Well, my grandfather did it." But I don't know what to say. It's the same thing as dune jumping in Ipswich, which used to be a very popular activity. You run off the top of the dune and jump.

Unkown speaker 46:23

Well I'd be glad to maintain signs on the Annisquam River.

Doug Stewart 46:27

Yeah, well that's an idea.

Unknown speaker 46:28

People are not educated about it. And even, I have friends that they're encroaching, encroaching, encroaching. They go over across the river from me and every weekend, and they keep sitting in the eelgrass, sitting in the eelgrass—

and these are people who should know better. And they don't. And I don't have the authority to say no, you shouldn't be doing that.

Doug Stewart 46:47

And you know, you should talk to, like the Conservation Commission in Gloucester and see about what can be done. Because obviously, it's best to be positive and educate people, but more than a sign, how about a public meeting or article in the paper or something.

Any other questions? Yes, way over there.

Unkown Speaker 47:08

Yes, I was wondering if you wanted to comment on the green crab invasion which is [similar to] the marsh and causing a great deal of damage right now.

Doug Stewart 47:17

Yeah, that's true. Although I heard that last winter was so cold, that the population of green crabs actually diminished. I've considered talking about it, but it seems a little peripheral to my subject in that it's not related to climate change, really. Green crab is an animal that, I think it came from Europe also like *Phragmites,* and it exploded in numbers in recent years. And it devastated a lobster crop in Maine and it looked like it was going to take over here. And one thing green crabs do is they tunnel into the bluffs along the sides of tidal creeks and that kills the marsh. And there are some great pictures of this, but it's kind of a scary thing. The thing about a marsh is when you kill a marsh—when a clump of marsh just drops into a creek, it doesn't grow back. It's not like, you know, the branch of a tree that comes off and the rest of the tree keeps growing... that marsh is gone. And then you have open water or a mud flat that then has nothing to consolidate. So I'm not sure what's going on. I mean, one thing to have is bounties on green crabs, which might have been effective, but it's a little bit like pulling pepper weed. We wish there was a natural [?] like lady bugs. It would be great to find a green crab predator. So far there isn't one here.

48:45

But in the meantime, a bounty is one idea. And a friend of mine, Roger Warner wrote a cover story in the Globe Magazine last year about trying to talk Legal Seafoods into making green crab chowder. I don't know how he came up with that.

49:03

Any other questions? Yes.

Unknown Speaker 49:06

I'm just wondering about the first gentleman's question and your response about going to the Commission... who owns the marsh? Is this a mix of public and private you know, and how does that relate to the possibilities of protection?

Doug Stewart 49:22

Right, I'm sort of sorry you're asking that, because I don't... I've been unclear on that. In the old days people would, it would be in their deeds—I think it's still in people's deeds that they own marsh. A great majority of it is owned by, you know, conservation groups or towns. It's not private property, but a lot of it is private property. We're not really sure. And you know, that's the eminent domain question. You know, where Plum Island is, the state took it, or the Feds too. And you were able to live there until the last member of the family died and then they brought in the bulldozers. I don't really know how it works. I'm sure it's a pretty good legal tangle.

And as I say, the overarching thing is we have a Wetlands Protection Act and there's a lot of things we're not allowed to do in a marsh. But you know, what the rules say and what people do... I mean, in Salisbury the agency guy of the Coastal Zone Management commission said they piled up a big dune, the state piled a big dune right in the center of Salisbury Beach to be a sort of sacrificial dune so that town wouldn't get wallopped in the next storm. During the night, the town fathers brought in bulldozers and flattened it, because they've been getting so many complaints from people who for generations, you know, at dawn with a cup of coffee sat in their cars and watched the sunrise. Now, I don't know, I can't

really criticize that. I mean, it's sort of, it's the kind of thing that makes some people hate government. You know, they've been doing it a long time, just like they’ve been mowing the grass on the Boston Harbor Islands. I'm not going to say take that lawn mower away, but it's tricky and we have to think about the psychology of it. You know, the idea that people shouldn't be walking and damaging dunes and shouldn’t be walking and damaging the Marsh.

51:24

If we all learn to appreciate the Marsh more, maybe we won’t cause that kind of damage.

51:32

Okay, well thank you all for coming.