

## Is Your Community Climate Resilient? Bylaws and Best Practices

University of Southern Maine, SNEP

DATE: 02.16.22

TIME: 12:00-1:30 p.m.

Karasch & Associates

Captioned by: Chevelle

"This text is being provided in a rough draft format. Communication Access Realtime Translation (CART) is provided in order to facilitate verbatim record of the event."

SPEAKER: The webinar will begin shortly, please remain on the line.

SPEAKER: The broadcast is now starting. All attendees are in listen only mode.

SPEAKER: Hey everyone. On behalf of the Southeastern Program Network, welcome to our training on community climate resilience, bylaws and best practices are brought to you by Mass Audubon, SRPEDD and the Blackstone Watershed Collaborative.

I will be assisting with the logistics for today's program, along with my colleague from Syracuse University, financial center.

Before we begin, there are a few logistics to keep in mind.

First, everyone will be on mute to ensure audio quality. You will be able to ask questions by typing them into the question box on the go to webinar control panel. We look forward to answering questions, so please type them

in at any time.

Additionally, you can request a certificate of attendance. Information on how to do so will be available in the follow up email after the webinar.

Today, we also have closed captioning available for the webinar. To view the closed captions, please click the link that Tess will put in the chat.

Also, over in the control panel under handouts we will have the presentation available for you to download.

Now, for a little bit about the SNEP Network. Here you can see a network of the south's new England program. The SNEP's Network to achieve healthy watershed and long term climate resilience through mangle of storm water and restoration projects. We focus on building low capacity, providing web narcs and technical -- if you want to learn more, visit the website SNEP Network for more information.

And on that note, I will hand things over to Heidi.

**SPEAKER:** Thank you!

Good morning -- or good afternoon, and welcome everyone.

Thank you for joining the webinar on community resilience. I know that climate change can be an overwhelming herb to tackle for many people, because it is so global and so vast. However, there is so many things that can be done at the local level and that is what whether he focus on today. We have a large number of people signed up for this webinar! That is very exciting. We have well over 200 people signed up. Folks not only from municipal officials from cities and towns all across Massachusetts, but also state officials, some federal government folk, original planning agency,

planning consultants, and also I see that there are some folks here from other states, other regions, and we welcome you all. Most of the informing that we are presenting here today is applicable across other state, not just Massachusetts.

And I want to thank the SNEP Network for the support of this work and all of the partners in the great speakers that we have here today to share their expertise.

I also want to thank the look out foundation that provided support to Mass Audubon for this work as well.

Next.

I will just quickly review what we will go over during the webinar today. We have a packed agenda, a lot of information, but we do have our contact information at the end, as well as the handout is available and there are additional resources available.

I am Heidi Ricci with Mass Audubon, I will do this introduction and a follow up at the end. And then Stephanie will give an overview of the challenges and solutions before communities today. Danika from SRPEDD will give an overview of the role of local bylaws and regulations and Mass Audubon review tool. Mark VOORHEES from EPA region one will present more technical information about the avoided cost that communities can accrue through use these methods.

And then Tim PASKARNIS -- I always mispronounce that, please excuse me, and Tara Lewis have a case study that they did with four communities around shared resources.

We will save some time towards the end for some Q and A, but you can type your questions in the chat throughout the program. And Tara is monitoring the questions if there are any quick clarifying questions she will answer them in the chat during the program and more detailed questions for the speakers that we will take near the end and provide some next steps and resources.

This is an introductory webinar and we will do more in depth, perhaps, hopefully in person later this year with the bylaw tool.

Next.

So we have several learning objectives for this webinar. We hope that by the end of the program everyone attending will better understand the linkages between climate change impacts and land use. You will be able to define key terms, nature based solution, green infrastructure, low impact development and understand how they are interrelated. You will understand the role of local regulations in introducing the costs and impact, not only in climate change but other areas as well, such as water quality. And you will have access to the bylaw review tool and ore resources for utilizing it and understand how it can be used to prioritize local updates of your, um, municipal regulations.

And then finally, we will share some examples and additional resources.

Next.

So just real quickly, a little about Mass Audubon. Mass Audubon is an independent Audubon organization, not affiliated with national Audubon, although we do work with them on many issues of national significance. We

were founded in 1896 by two very forward thinking women who worked to stop the indiscriminate slaughter of birds and ever since then, we have been doing add slow coo circumstance conversation, and education to protect the nature of Massachusetts. We have about 140,000 members.

Next.

Mass Audubon also just recently released our new exciting action agenda and we can go to the next slide and just real quickly I will mention the three top line goals, because they relate to the program we are presenting today. And these goals are interrelated recognizing the role of land in both addressing climate through carbon see sequestration, but also the many other functions and values that land provides for us, not just wildlife habitat, but also clean air and water, and many other important functions and values. We recognize the need for inclusive and equitable access to nature and all of its benefits for all people, and then we recognize also that climate change is the biggest issue that is affecting both people and nature, and that we all need mobilize to act to address that. And of course these things are interrelated because getting everyone involved and recognizing the role of nature and land in climate resilience and mitigation.

Next.

So from here I will hand it off to Stephanie!

SPEAKER: Thank you, Heidi.

So my name is Stephanie Covino, and the manager of the Blackstone Watershed Collaborative. So we are a pretty new organization we started in September of the last year. And we work in the Blackstone watershed which

is in both Massachusetts and Rhode Island. So Heidi faced one of the challenges, climate change, and the other one I will give that to you up front, development and how we can think about how we can make them climate resilient.

So, overall, we know that our climate is changing it. It is not just a future problem, that is something this the municipalities are facing right now. So since 1915 we have seen nearly a 3-degree rise in temperature, and to put that into context, when there was a mile of ice overhead here in Massachusetts, that was only 9 degrees cooler. So not really thinking like, oh, this morning, you know, here in Worcester it was like 11. Which then later it will be 42 degrees -- that is a big change! But if I have a fever, the temperature is 98, and to 101 that is a few degrees but a really big difference.

We have also seen an increase in our strong storms. So instead of getting rain a little here and there, we are getting a lot more rain at once. So those strong storms are about 55 percent more than they used to be and we are increasing the growing season. So our winters shorter, our spring and fall are longer by 11 days right now, as measured since 1960. And we also have nearly a foot of sea level rise as measured in Boston harbor since 1922. Moving forward, these will continue increasing. So by 2100 looking at 11 degrees Fahrenheit, almost a 5 week growing season, and about a 47 percent increase on where we're on those strong storms. And to think about that, especially you know, how it effects the infrastructure, if we have less snow and more rain and more of a freeze, thaw structure so here in Massachusetts we have a lot of potholes and I know we are known for that,

but a lot of that is with that freeze thaw cycle. So it getting really warm, really cold, and that impacts the infrastructure.

So if we go to the next slide here, we will see that the climate change is hitting us hard, but those impacts are exacerbated by the land use patterns.

So this is Massachusetts and we have about a (INAUDIBLE) of the land, 21 percent of it is developed. About a quarter is protected, 27 percent and then over half, 52 percent of that land that is neither developed or protected. So that is our opportunity. What we do with that land will change how climate change is impacting us in the future and this is from Mass Audubon's recent document of losing ground.

So if we do to the next group ground the develop is sprawling. So for those of you in new England you will see that cross hatched area, this is where we are developing the fastest. So as we grow, we are not growing just within the own community, but taking up large lot, a lot of pavement and that is impacting our communities.

So the next slide, we will be putting together both climate change and development and thinking how this impacts us. So when water falls in the fors, that soakings up in the ground, goes to ground water supply, and that is okay. But as we have more impervious service and was more of that water is going to those surfaces that is running off and gathering nutrients so we will click through this ... so this is impervious service, gives those nutrients coming down and as climate change we have increased temperatures and warmer water, so that is exacerbating this, and then also we have a lot of extreme per acceptation, so we get a lot of flash systems. When water run us off a lot of

impervious surface, once we get to about 10 percent, we are effecting water quality. Or storm water is the number one source of water pollution in Massachusetts. We are also seeing a lot of increased draught, which seems counter intuitive, but water is not coming a little at a time. It is nothing, and then all at once. And with that we are increased water drinking shortages and that is becoming a problem for the municipalities that is not only dangerous but that can be quite expensive to purchase water somewhere else.

So on the next slide we get to solutions.

We will put away the bad stuff, no more gloom and doom, let's focus on what we can do. So we are calling them nature based solutions. These protect, restore, and manage an existing ecological system or mimic natural process, to protect public health and clean water, increase natural hazard resilience, and/or sequester carbon.

So about 52 percent of Massachusetts is left unprotected and unpolluted. So we can conserve natural systems that are already providing natural ecosystem. They are making educate cooler, conserving water, keeping that water table where it should be so we have drinking water.

The next thing we can do is integrate these nature based solutions that is protecting the land is most important and manage the land within new or redevelopment.

And lastly, if you are in a city, still things you can do. You can restore resilience in urban area. So when we look at green -- sorry, nature based solutions, looking at two different things. You may have heard some of these terms. Green infrastructure, that is more natural side. That reenforcing

conversation of natural features and processes that are already providing those benefits and then there is low impact development. That is other side which officer more of the engineered solutions to mimic that green infrastructure. This includes things like bio soils and rain garden expert witness make your storm water go to an area to a depression where you can fill They are that in, the plants offer nutrient removal and then that goes onto your ground watershed for.

So the next slide here. Some examples of nature based solutions, if you are replacing some of the culverts if they are under side and flooding, that is an issue for infrastructure and for aequat egg habitat.

If you replace that with something that meets Massachusetts stream crossing standards you have natural substrate on the bottom, a bank on each side which will improve the water quality a because that allows the water to be filtered.

Bio soils, this is in a parking lot in a university in Massachusetts. Planting street trees is a really simple thing. That can reduce urban heat effect, take out some of the storm water to soak that in. Depending on where you put them, you are reducing impervious surfaces.

A wetland restoration would count as a nature based solution, getting those natural features back and the benefits that provide.

Permeable pavement, so instead of having a full 20 feet wide of pavement, they had a narrower area, and then permeable pavement that allowed still fire truckings and other emergency equipment to get through, but the water was able to filter through that area.

So a lot of different nature based solution, this is only a small example of them.

On the last slide here, overall what I want to make the point is that nature based solutions can address hazards and offer a lot of community benefits.

So first, keeping in mind what some of those hazards are, the nutrients the warmer water, flash systems and draught and water shortages. Thinking about these that we just discussed. Keeping the watershed healthy and the community health can really benefit recreation and tourism, when we are near water we are more relaxed, we also are going to be maintaining the built infrastructure for keeping water off of the road ways, reducing that flood, reducing that freeze/thaw. It also is really important for transportation system, also emergency transportation, making sure that the roads aren't flooded and that people can get where they need to go, and reducing the need for municipal services. So we don't want to have to save people in a flood or worry when there's a power outage to get to the most vulnerable citizens who need that power.

So overall, we will click once more, we are avoiding cost, we will talk about that a little later with mark as well, enhancing safety, especially as we mentioned the most vulnerable systems and over burdened communities and overall improving the resilience.

So I will hand that over to Danika and she will talk a bit more about how we do this. Because if we don't have these prioritized or important in our regulations, we are not going to be able to build them. Thanks, Danika!

SPEAKER: Thank you, Stephanie. Good afternoon everyone. My name is Danika BELKNAP, I am in SRPEDD. We're the the regional planning agency for Southeastern Massachusetts and provide planning assistance and technical services to communities throughout our region, including among other things planning for nature based solutions.

So I am going to focus on some ways that communities can utilize nature based solutions, particularly through local land use planning and regulations.

So, how can communities ensure that nature based solutions are utilized in local development?

In Massachusetts, municipalities do have a reasonable amount of control over how development happens in their communities and I will just point out that as Heidi mentioned earlier, especially for this portion of the conversation, I will focus on how things work in Massachusetts, but a lot of the ideas that I talk about are definitely applicable elsewhere throughout the region and things might be similar in Rhode Island and elsewhere in new England, so just keep that in mind.

Okay. So the short story of how local governments control land use is that local zoning and subdivision rules and regulations are the key to what's going to determine where and how development happens in your community. The long story is that it is a lot more complicated than that (laughs). There are a number of different boards and commissions that control different aspects of development in your community, and even between communities how these different departments manage development can vary as well. So it

is pretty complicated, but what we hope to do today through this webinar is to provide you with some tools and resources and general concepts that apply to most communities that you can then adapt to your local community, because you know how your local community works and even though there is no, like, one applies to all situation or solution, you can use some of these ideas that we will talk about today, and you know how they might be able to work within the system of your community.

So I am going to take -- walk you through a quick example about storm water. So how does storm water get regulated within the local community? So as I mentioned, all of those different board and commissions will have different roles to play in regulating development and how they might have a say in how storm water is regulated.

So in Massachusetts, our planning board they will set the regulations for how sub decisions happen, they can establish design standards for how a development happens, including how storm water is managed, for example. And they will review a number of projects ask approve permits that come through for larger scale developments typically.

Zoning board will have a say in what types of uses are allow id on different properties throughout the town, they also set lot dimension, sizes and requirements for how parcels can be developed. Conservation commissions will review projects that may have impacts on wetlands, so not all project will necessarily get reviewed by a conversation commission, but projects that are on a site that has wetlands or within a certain distance of a wetland will typically be reviewed. Board of health typically review and manage water

supplies and how waste water is managed in communities so they may or may not have a say, depending on your community and what types of development get approved.

Building commissioners will approve all local building permits, so they might get a say in some projects that don't meet some of those other larger scale reviews so that is something to keep in mind.

And then lastly, storm water commit took into consideration not every community has one. Some communities typically if you have a bylaw A storm water bylaw or require a storm water permit, so of these will include a storm water committee that may involve representatives from these different board in your community and of course ha is best if you include representatives from each of these board and committees from each board in your community.

Because, what is key to making sure that, um, those nature based solutions and those resilience goals that you want to see implemented in your community, the key to making that happen are that always of the different departments that have a troll play are on the same page and have the same things in mind. So just as an example, something that comes up a lot in the region is mosquito -- the health effects of the mosquito populations and how that relating to storm water. So a lot of the conventional ways that we handle storm water from a site into these centralized retention ponds.

So -- and -- sometimes those -- that type of management can result in standing water that unintentional may create a breeding habitat for mosquitoes. So whereas the board of health may have that in mind, the board that has that -- may not be thinking about mosquitoes when they think

about storm water management in a subdivision management. So that is important that you are communicating between departments and then as the planning board to consult the board of health on projects like that, for example, then they might be able to alert them to that unintentional consequence of some types of storm water control.

And then another thing to note is that if your regulations are outdated, they might not even allow some alternative methods that avoid unintended consequences, such as that.

So that brings me to my next point of bylaw review, or ordinance review. So it is really important to make sure that the resilience goals that you have for your community are reflected in your local regulations. Because as we just learned, your local regulations will be the final say in what type of development is allowed to happen.

So if your local rules and regulations and the bylaws or ordinance are not allowing nature based solution, then the developers are not going to be able to implement them. And even where they are allow id, developers still may not utilize them if they are not the easiest permanent option in your community. So if something requires a special permit, for example, that is an extra step that a developer would need to take in order to implement that type of project. So if there is an alternative option that is easier for them to get permitted they may be more than likely to take that path. So you want to make sure that not only are you allowing and encouraging nature based solutions in your local regulation, but you also want to make sure that that is the, um, the path of least resistance for developers to easily adopt. And there

are a number of ways that communities might unintentional be discouraging nature based solutions locally. So a lot of zoning bylaws require minimum lot sizes in order for development to happen and they will have strict dimensional standards and requirements that a developer must follow, which could result in that sprawling development that Stephanie was talking about earl jerk result in more impervious cover, which would increase the storm water impacts.

It could also discourage developers from taking more innovative and lower impact development approaches, like with cluster developments, for example. And another common thing is minimum width requirements for roads that, again, will result in more impervious cover, requires curbing along roads is pretty common. A lot of communities will require street trees or some type of vegetative buffer along roads. And those areas can be utilized to help manage storm water run off from the roads and the sidewalk. But if you require curbing along the entire road way, then there is not going to be a way for the road to access that, the planted vegetated area.

Another example is requiring non native species. If a plant is not specifically adapted to our climate here in new England, that may not be as capable of surviving without a little extra help, which requires more energy, more work and often more watering to keep that plant alive. So that won't necessarily help, especially considering future climate change and how the climate is changing.

Lastly, a lot of regulations and bylaws just in general don't mention or specify low impact development or nature based solutions. So they are not encouraging it, and they are not -- notifying developers that it is something that

is allowed. And neither -- they won't always require the prez vague of natural feature, which kind of goes against what we want to implement be low impact development.

So, if you want to be sure that your goals for resilience for your community are able to be implemented within your community, then the best way to do that is to kind of do a thorough review of all of your local bylaws or ordinances and make sure that what you want to see happen in development is enabled in the development and be on the look out for my potential barriers for adopting those. And once you do identify where you want to make change examination amendments to your regulations, there are a number of different ways that those can be implemented in your community. So for general bylaws in Massachusetts, they require a vote at town meeting or by city council. Typically need a simple majority vote to get those type of changing passed. Zoning bylaws are slightly more strict they require a 2/3 majority vote. In general, there are some exceptions to that, but by town meeting again or city council.

Rules and regulations there is more flexible. Here, because they don't need to go to town meeting necessarily, they can be amendments can be passed by a simple majority vote of which ever board is overseeing those regulations. So those have a little more flexibility for updates as needed.

And because this can be complicated, we just want you to be aware that there are tools out there and resources that can help you to kind of under take and review of your local bylaws and to help prioritizing where you -- where you can make impactful amendments and where you might be able to get those

passed. So now we will talk a little more specifically about Mass Audubon bylaw review tool.

This tool is an excel baited tool that you can download on Mass Audubon's website at [massaudubon.org/bylaw review](https://massaudubon.org/bylaw-review). And just a note that we will be sharing -- or you can download the PDF of this presentation now and it will have links to this website as well as other resources that we will talk about a little bit later on. So anyone can download this tool and use it. It is a series of excel sheets. So the tabs along the bottom walk you through what the tool is, give you an overview of the goals, how it works, and step by step kind of instructions on how to use it.

So this page is what the first page or the first tab in the tool looks like.

And then I will go through just a couple of the actual analysis tabs quickly so you can all see how it works.

So as I mentioned, it has all of these tabs which are different sheets. The first few are kind of overview, instructional, resources, what to look for. And then tabs 5 and 6 are where the analysis happens. So this is what tab five looks like (indicating) this is specifically focused on a type of development called open space resident shall design. And some communities have a bylaw that allows this, other communities don't. But if you did want to analyze this specific type of bylaw, then this tab kind of walks you through and you can see how there on the left hand side there is the different kind of regulations that you would be looking for within your bylaw and then three columns that have conventional, better and best practice. So for each regulation that kind of outlines what the conventional practice is, what a better way of doing it

might be, and then what the recommend best practice is. So the blank column all of the way on the right is where you would fill in for each of those rows and each of those regulations you would look at what your bylaw or ordinance requires, and put it in that column. And you can fill that out and then you can compare yours to what the conventional better and best practices are, so that you can kind of see where you align and this can help you identify where updates are needed.

So that is the open space one.

This is tab 6 which focuses on zone, subdivision rules and regulation, site plan review, and if your community has a storm watershed for or some sort of low impact bylaw.

So again, the same general idea. You would look through each of these bylaws and the tool focus on these type of bylaws and regulations, because that is where we see the biggest impact and the amount -- the level of control over storm water management -- not just storm water management, of course storm water manage system a big focus of low impact development, but this tool is focused on all sorts of low impact development in general. So preserving natural areas and just in general having fewer negative consequences on the environment as you develop.

So, again, for each bylaw, it has its own column and you would fill in your regulations and then you can look at how they compare to the conventional, better, and best practices. And this section of the tool is organized into deferent goals related to low impact development. So the five goals that the tool focuses on is: One, protecting natural resources and open

space. Two, promoting efficient compact development patterns in infill.

Three, smart designs that reduce overall imperviousness.

Four, is to adopt green infrastructure storm water provisions, like low impact development practices. This is probably the largest portion of the tool, and it is most focused on storm water management and I will just note as well that Cape Cod Commission, they will talk about this a little later on in the presentation, but added some updates to that section that specifically look at storm water management with regards to the MS 4 permit. So not that it is like a one for one direct comparison, but if you were following the best management practices recommended in the tool, then that will likely also help you to conform with comply with the MS 4 permit so, that is something to keep in mind if you are an MS 4 community.

And section five, to encourage efficient parking.

So once you have kind of gone through and filled in your local regulations, you have this final result where you can compare to the conventional, better, best, and actually color code the each individual cell based on how close you are, which type of practice your local practice is most in line with. And this is the really useful portion of the tools, when you are done you have this color-coded matrix that can help you to flag where the most impacts are needed.

So if you see a lot of yellow, like in each column, if you see a lot of orange and yellow, then that is a good hint that maybe that that is -- that particular bylaw or ordinance is where you should be focusing your efforts. The color coding also helping by pointing out if there are inconsistent simple

majorities between the different bylaws. So one bylaw might encourage low impact development. But a separate bylaw hasn't been updated, that might still reflect the older and more conventional practices. So that is really important to make sure that not only are you encouraging it in individual bylaws but that all of the bylaws are in agreement with each other.

Once you have this kind of prioritized list of where updates are needed then this can help you think next about like, where -- which changes would be easier to like get past. So for example, administrative changes like we talked about rules and regulations don't need to pass a vote at town meeting, they can be passed by the board overseeing that regulation. So that might be a good way to prioritize changes that could happen more easily.

And then in general, you want to prioritize the issues that are important to your community, especially if it comes to -- down to a town meeting vote. You want to making sure you have the support of your community in what you are doing.

And just a last tip, you don't have to reinvent the wheel by rewriting an entire bylaw. There are resources out there available to you, in particular this smart growth and smart energy tool kit. Which is available on the state of Massachusetts website and we have a link for this at the end of the presentation as well. But they have model bylaw, modules that will walk you through how to, um, how to identify and what best practices are. So there are a lot of really great resources that are available to you.

And then lastly, I will just walk through a quick example, a case study in the town of Natick who under took bylaw review with the grant from the Metro

West Foundation. Natick is a relatively urban town, an MS 4 regulated community and they have had several local water body impairments within the town. And they also had minimal controls on storm water that they wanted to address to help improve local water quality.

So they undertook a bylaw review to see where and how their local regulations were contributing to cleaner and safer water bodies so they could improve water quality in the future and looked for opportunities to include nature based solution into storm water management that would be in line with the MS 4 permit.

So the bylaw review indicated there were a number of barriers to low impact development in by laws and while the town did have a storm water bylaw that was passed in 2006, that didn't address a lot of the, um, best practices that were recommended in the tool. And they found that the storm water bylaw that they did have was only regulating -- or was missing 90 percent of private properties in Natick. So not doing as good of a job as they wanted it to to regulate for water development.

So following this review they received a new missal MVP program grant to update their storm water bylaw, which they did. And then Mass Audubon did another review of the updated bylaw and found significant improvements in the bylaw in promoting low impact development and that gave them more control over storm water development.

So I am going to quickly show this is the new updated storm water bylaw that they implemented. Had a new previously only parcels that resulted in greater than 4,000 square feet of disturbance were regulated. So the new

storm water permit includes a minor permit and a major permit category with smaller flesh holds so that fewer projects with were falling through the cracks. So the minor permit was 3,000 up to 20,000. Whereas the major permit, which is more thorough and and a little more detailed applies to properties or projects with over 20,000 square feet of land disturbance. So they were able to have much greater control over storm water impacts of more developments as a result of this newer bylaw, and that also allowed flexibility for implements low impact development and nature based solutions that also helped them comply with their MS 4 permit.

So at this point now, I am going to pass it over to Mark Voorhees and he will talk a little about how implementing some of these nature based solutions can help avoid the impact of water quality impact and associated treatment cost. So take it away, Mark!

SPEAKER: Thank you, Danika!

Hi everyone. I am Mark Voorhees, an environment engineer in EPA region one, and I think what I will provide today is some quantification of a lot of what has been discussed so far in terms to solutions and impacts.

I will provide some quantification for that.

And just quickly, I have been involved with water quality restoration, development in the last, you know, 15 to 20 years or so in the storm water realm because of the need to address existing storm water impacts and directly involved in putting the foster slow reduction requirements in the MS 4 permit inform and in doing so we have been working on tools and investigations and research to quantify what is the best, most cost effective

way to deal with existing infrastructure? And as we go out and think about that and the challenging involved in trying to fix problems after the fact in restoration, we have learned that it is very challenge, very cost effective by doable. But as we start working with communities and realize that a lot of that hard work to restore water can be under mined or offset or made more complicated as a result of new development activity. So it shifted focus recently to look at what is the right level of control needed for new development activity to not cause impairment to watershed for quality, or to make sure that water resources are healthy snuff to recharge so that the two were working to giver, the restoration activity will make progress, and the new develop. Activities will not cause further exacerbate problems or create new problems.

Next slide, please.

So I wanted to give that background because it feelings there is a very important nexus between new development and ending with water resource challenges from impervious cover.

So my focus today is on impervious cover. The coverage of natural lands, and looking at the impacts and looking at the management solutions that could minimize those impact or offset them completely, at least some of them examine the way we have done this is looking at thing, again, reinforcing the whole concept of nature based solutions, LID and try to mimic nature and trying to mimic the natural process of nature. We need to look at it through a cumulative standpoint. How does that stand for all conditions, not just a single design. So we developed these tools to look at this, this, we based it

calibrated modeling and calibrated all of the data, a lot of quality data, control measured data to develop tools to help us understand both the impacts and the solutions.

Next slide, please.

And in doing so, as we -- in doing so, we can then start projects what are the potential cost impacts if we don't be more proactive and more protective at the team of the development.

So hoar is just a quick summary -- and what I will show today is really an overview of a lot of detailed information and really to introduce to you that this information is being developed and it is available, in case this is helpful.

I think that this reinforces what Stephanie and Dan calibrated highlight as the solutions to providing resiliency.

So from a hydro logic assistant point and this is based on historic land fall of looking at hourly rain fall and daily term sure, seeing the hydrology is substantially impacted when you take natural land and move it to impervious cover. Annual run off volumes increase from 300 to 10,000 percent over the natural condition. Ground water is alleviated in impervious cover and we are losing on the order of 300,000 -- 300 to 500,000 gallons per acre, for year for every acre of impervious cover. So major hydrologic impacts just in those two impacts.

And then on the nutrient side, which has been mentioned before is a significant cause of water quality problems, not supporting swimming, fish, boating, all of those things that. Is something that will also be further exacerbated with climate change, warmer temperatures. We have not been

able to quantify the difference between the natural land and impervious cover. And we see that a major cause of nutrient impairment and especially the primary nutrient for fresh water is increasing by 300 to a thousand percent, so I will show you more detail. And for nitrogen, similar magnitude, increasing the load. So from 500 percent to 13,000 percent compared to natural conditions.

Next, please.

And to show you a little more detail on the recharge, this is -- this chart is looking at recharge comparing the natural predevelopment condition to an impervious cover. So what is shown is the lighter green is a natural area with a highly permeable soils and moving to the darker green which is lower impermeable soil. Calibrated what we often refer to as -- with D, often associated with wet lands or dense soil.

So on the light green, there is sandy soil. And in between, the intermediate is different impermeability of soil.

So this is taking a wide range of soils and putting them into those groups.

But on the far right, there is 0 and a little gray block, that is impervious cover recharge, so that is essentially 0. So the area courthouse numbers are indicating what is lost when you, you know, convert different types of natural lands to impervious cover. These are expressed in inches of depth. So inches of depth. So for example, for the permeable soil we have 211-inches on average of recharge that occurs per year, which roughly is about 500 to 600,000 acres per year going into the ground. And then so forth when you go

down to that D soil, that is about 25 percent. So a significant amount of the rain fall, by the way T rain fall until this case is about 43-inches in this particular record that. Is becoming recharged.

Next slide, please.

So I want to just give you that perspective when we look at it more closely.

This is taking and shifting over to looking at a nutrient phosphorous in this case. We have similar information for nitrogen. So again, the groups are based from left to right on the more permeable, natural conditions to the less permeable soils and the green represents -- the so called predevelopment condition. Looking at again based on long term cumulative impact or estimates. And then above that is the increase in phosphorous loading results from impervious cover. And this is showing you that there is very large increases in nutrient load and that occurs from impervious cover. That is primarily due to the big increase in run off and the lack of any kind of attenuation that impervious cover treats so this has no treatment, no management to it. Okay. Next slide, please.

So, what we can do with our tools, with the tools that we have and the models that we have developed and calibrated to data is look at what we get from different levels of management. So this chart will be showing a couple different levels of management come parred to predevelopment conditions which is light green there on the left of each of those groups and then also just also in there for reference is the miss -- oh, sorry, this is a recharge, looking at recharge. What will our management solutions do for achieving the

predevelopment recharge, the natural amount of recharge that occurs on an annual basis.

So the green is the the predevelop., gray is the impervious, the 0, and then the two bars, the yellow and the blue are two different levels of management.

I talking about the first one, the yellow one being equivalent to applying in Massachusetts the existing recharge standards and/or meet ago 60 percent phosphorous reduction as is required in the MS 4 permit construction.

So what we're seeing here, this is for recharge, for the A soils, the recharge is being met. We meet the predevelopment using the MS 4--i will call that the MS 4 scheme, the yellow. But for the other soils there is a deficit. There is not as much occurring in predevelopment. So a bit of a did I have of deficit there so I want to highlight that.

But we developed, with our tools we were able to quantify and estimate what level of control would be needed if we wanted to match the recharge to the predevelop. And that is the blue bar here. So what it is showing here is a level of control that would satisfy predevelopment recharge on a cumulative basis and that translates into a 1 inch retention standing, which a lot of the techniques that Stephanie and Dan calibrated were showing you are the methods best achieved, and also best achieved in the lowest impact as possible without having a lot of maintenance burden and things like that.

So I will show you another slide, the next one please, to look at the impact on nutrients.

So here is looking at phosphorous, again, the predevelopment is green,

and that is showing what the natural conditionings do for these different soil groupings and then the impervious soil jacked up -- untreated. And then we apply different levels of control. The yellow being the MS 4, either the recharge standard, and/or the 60 percent phosphorous. In some cases, the recharge will far exceed, which is the case for the higher permeable soils here on the left. You can see that there's quite a bit of reduction occurring from compared to the untreated. But still, not quite getting to the predevelopment conditionings.

When we apply that one inch retention standard that I mentioned in recharge, we are able to get down to that predevelopment which is very good.

So that is difference defense of looking at this in a cumulative way and what happens in the effect of all rain events that happen, versus just taking a look at a single design storm.

So this is good thinks the. There is a method and that is in the reining in the type of certainly the technologies are there, and certainly that size is not ridiculously large.

Okay, next slide, please.

So all of this help us to help to think about costs inform in this slide I apologize for having this busy table on the right and I kind of put that in there thinking it might be just a useful reference to you if this is something that you are interested in, but again, just to reinforce that increasing nutrient levels is a threat. And as waters become more sensitive and more vulnerable to nutrient loading we are likely to experience a greater nutrient loading if we don't

address the nutrients at the time of the development activity. So one of the big things is that it is a lot easier to implement protect of controls that will not have this impact, nutrients and the seam goes for recharge at the time of development than trying to come in after the fact and trying to restore through retrofits or implementing controls to treat existing development.

There -- it is very -- it is a lot more expensive because you are now working in a developed environment that is constrained. You will not be able to necessarily put in the size controls that you could have done at the time, or integrated the LED and the nature based solutions as part of the development. So that is much more expensive, usually about 2 to 3 times per type of control. And it is much more difficult. There is less opportunities and the retrofit also may require in certain cases you know, paying for land or buying land and certainly adds to a maintenance burden that a community would have to deal with.

So, the next slide, and my last slide will show you a summary kind of a summary of those costs that are reflected in this table. And this is just sort of, um, looking at the three scenarios that we have talked about. No management, which was the gray bark impervious cover untreated, unmanaged. And then the yellow bar. I am calling that an intermittent mangle so, the MS 4 post construction, plus existing mass recharge standards.

And then the last scenario that actually meets the recharge standards -- meets the recharge goals and targets and also no net increase of nutrients.

So starting with the cost, what here is referred to as a cost burden, if you don't do the management, and that nutrient load contributes in the future to impairments to water quality impairments and through our mechanisms which we are required under the clean water act to address, we have to start coming in and have permit requirements then the cost per acre of not dealing with it at this time and this is in 2020 would be \$68,000 of phosphorous to match --or offset would be about that, per acre of impervious cover.

And for nitrogen, a similar magnitude. Fifty to 40,000.

So then we can move over and look at the intermittent level ask see that reduces that burden, that reduces some of the load, but not all of it we still have a pretty substantial cost for phosphorous, about 50,000 to 60,000. And then for nitrogen, 8,000 to 35,000. There is always a range, some controls are effected. A lot of methods are effective and that really depends on the type of conditions and soils and so forth.

But the good news is, the final scene we're is one inch retention standard, which would do a great job with phosphorous and nitrogen and there for a 50-dollar burden. So no burden there! So, this is stuff we are, working on. Right now this is based on an existing climatic pattern, we have done some calculation for future conditions and seeing that this one inch level still looks good, but there is more to be done.

And that wraps what I was hoping to share with you and grateful for this opportunity. So I will turn that over to Tim, who will give you a great example of the work they have done on the Cape. Thanks!

SPEAKER: Great, thank you, Mark!

Good afternoon everyone, I am Tim PASAKARNIA with the cape code in addition. Also joined by my colleague that a Lewis, so even though I will do the talking I want to acknowledge that she did all of the actual b law reviews and put a ton of careful and detailed work into this project and so I want her to get due credit for all of that work.

So we can jump ahead to the project that we did was a regional bylaw review. That was in the area of pleasant bay. So if we look at the inset map in upper righting we are talking about the elbow area of Cape Cod. Pleasant Bay is shown -- that is the largest coastal in Cape Cod, that is very, um, you know, that is hydro dynamically complex in terms of the water body itself, that has a very large watershed, almost 12,000-acres, and as you can see, it is, you know, pretty largely most of what can be developed is developed, but it is largely resident shall and kind of large lot sizes, so it's mostly developed, but also not very densely developed. There are lots of important resources within that watershed that drains to Pleasant Bay over 40 fresh water ponds, 30 tidal rivers, the drinking water supply for the area are located within that watershed as well. And then, you know, as we have sort of broken outs here, that watershed is split among four different towns. So when you are talking about trying to manage or, you know, look at how storm water is managed for Pleasant Bay as a whole, that is a fantastically complex sort of exercise to go through. So next slide please. So one of the benefits we had for doing that is the Pleasant Bay alliance, which is four town intermunicipal organizations between the town of Orleans, Chattam, (INAUDIBLE) which all share the Pleasant Bay watershed. That was started in the late 1890's really focused

under the Pleasant Bay management plan, which looks at a whole bunch of different ways that the towns could work together to protect this really critical resource that they shared.

So the first of the plans was developed in 1998, that is updated every five years. And if you can click ahead, so this is all sort of laying kind of the a little bit of the background and regulatory context for all of the things that are going on in Pleasant Bay. So Pleasant Bay was studied the Massachusetts estuary project in 2006 what this did was exam men the health of the you know, Pleasant Bay itself, the water quality, and connected the nutrient inputs on land and in the watershed to that water body condition and health and the MEP report came to a TMDL which required a certain nitrogen reduction.

And we can click ahead and layered on top of that work this is the 2016 Massachusetts small MS 4 permit all for Pleasant Bay alliance towns are MS 4 communities. So they are dealing with all of the MS 4 permit requirements on top of the TMDL for Pleasant Bay. And then most recently the Pleasant Bay alliance was the recipient of the forest watershed permit issued in the common bath of Massachusetts. We can click ahead, just for a look at what the cover of that looks leek as well. And really, what this amounted to was the four towns have New York as part of an enforceable permit have committed to the nitrogen reductions that were required based on the MEP report, and that totals to almost 18,000 kilograms of nitrogen per year that the towns have collectively committed to remove. So that -- that is a really big complex under taking that will happen over the next 20 to 30 years. But, you know, really there is a lot of study and informing in this area and there is also a huge

history of these towns working together which made it a really good opportunity to explore what original storm water management could look like and maybe what some of the obstacles to that might be. So we can move to the next slide.

And this, the bylaw review that we did was part of a larger technical assistance project. So again, just to provide more context for how this fits in to the larger effort. You know, really we wanted to take advantage of a couple of things that I have already mentioned that there is this long established working relationship between the four towns that we know. There are areas of overlap between the watershed permit and the MS 4 permit, and knowing that towns will be required to do certain things under one permit or the other identifying if there are were any obstacles to them basically getting credit in both permits for required activity and not having to duplicate effort, expend extra time, communities, et cetera.

And of course, we always want to short of minimize cost, maximize impact, be as efficient as possible and you know, very coastal town, measure cant bay towns especially finding ways to improve the towns climate resilience is always top of mind so, that is an underlying theme throughout all of the work we do.

Next slide, please.

All right. So hopefully, you know, I shouldn't even have to go through this slide any measuring because of all of the previous presenters did such a good job of it. But what is the role of by law review in the larger effort that we took to look at regional storm water management. And within Pleasant Bay,

only about 40 percent of impervious cover can be directly influenced by the town. So talking about things like roadway, municipal properties but the majority of the surface that generally runs off and storm water, the town doesn't have control over. So how does the town influence on what is happening? So everyone hopefully knows that is through the local bylaws and ordinances so that is important if we want to click, obviously that is important just for management of run off volumes and water quality. But that is also important from a cost perspective, and Mark went in to far more detail about this just before. But, um, really one of the big concepts that we wanted to reinforce is that these future retrofit costs are largely going to be born by the town and its taxpayer those can be avoided through, you know, administration of improved local regulations and better storm water management at the outset of storm water projects.

Next slide, please.

All right. So how do we actually go about doing this regional bylaw review? We utilized Mass Audubon's bylaw tool, which is super important as you will see for just being able to do things in a consistent and repeatable manner and then tracking down and identifying the local bylaws and regulations in each town. And evaluating each town individually. And once we had done that, taking a step back and it was an interesting process because, you know, what we found is the earlier reviews that we did after having done four reviews you kind of had to take another look at them, um, within, you know, with what you had listened of doing subsequent reexpress have a different perspective. So once we had done all of the individual

reviews we stepped back and said, what can we say about the entire region as far as good examples, opportunities for improvement, et cetera.

Next slide, please.

As Danika teased before, because all four towns are MS 4 communities we added a separate goal to manage storm watershed for for MS 4 compliance. So there are a couple goals that show up in the spreadsheet if we click through. You can see that it shows up as an additional goal, that looks the same as the others but we just wanted to add that so that we could identify where there may be any deficiency or just to make sure that if changes or updates to by laws are being made for other reasons, that they are done, um, you know, mindful that they also are done in a manner that meets the requirements of the MS 4 permit.

All right! So we can move onto the next slide and show everyone what it looks like to do a original bylaw review. And again, you can see that it gets just with the number of specific things that are looked at and the number of different places that these regulations can show up. It can get pretty complicated, so that is why it is really helpful to have a consistent way to both just work your way through things and then a consistent way to evaluate them. And really need to have this color coding system so that that when you Zoom out like this, you can really at a glance say, hey, there's a lot of green here, and that's really good! That is indicative of certainly forward thinking storm water management regulations already. But also, you know, the green may go and may go in one column, but not in one row. So just like Danika talked about, that may show you where either due to the timing of ordinance adoption

or consideration, or you may have some conflicts and you can help use this to target how you would iron those out.

So next slide, please.

So again, local fiend, we found that all four of the communities already had some good examples within their regulations already. And that's really helpful for, you know, making the case to make these updates is if there are building blocks to work with that already existed, and so you don't have to create, you know, new concepts. That can make adoption an easier sell.

We can go to the next slide.

But we also found some common areas where there were opportunity for improvement. And again, just the scattering of storm water regulation throughout different ordinances, different departments and then the associated responsibility of that means that interdepartmental communication can be really critical and if that -- if that is a problem, either the communication or the staffing, then that may be an opportunity for improvement. Sometimes just, you know, if you think about for -- from the applicant side of things, if the regulations are different depending on whether you are talking, you know, to zoning versus subdivision, versus board of health, that can get confusing. So streamlining or just increasing consistent simple majority is better for everyone.

And then there were just some kind of very simple changes where preferred design types were not the easiest permitting option, or not preferred or maybe not even permissible. So some simple changes might make -- even just language changing were available to improve the types of

projects that you are likely to get.

So we will move onto the next slide.

And then once we had done all of those individual analyses, then we kind of stepped back, you know, took a break, and then said, all right, what does this mean for the entire region kind of following this pattern again? So we will move onto the next slide.

And, you know, the regional finds in some way they mirrored the local findings a little bit. But one thing that we found was that not all of the towns the con suspect of having higher standards that apply to critical resource areas already exist. So you may find this if you have a watershed for protection district a drink water protect you may have a district around a surface water body or any of the critical resource area and that may be as simple as just taking the protections applied to those areas and broadening them to a larger area or defining an additional area. All four towns that we looked at had open space residential design built in to their existing regulations. And that seemed like a common opportunity where just with some improvements in language or incentives that we could encourage these low impact designs. And then just again, making sure that consistent review and enforceable and if you are an MS 4 community, making sure that the responsibilities under your storm water management plan match the responsibilities everywhere else in your regulations just make operations much smoother, and again, minimize confusion.

Next slide, please.

All right. So here are some challenges that we ran into and this is a

mixture of challenges to doing the bylaw review, as well as challenges to take bylaw review and turning that into updated local regulations. So as far as doing the bylaw review the accessibility to the relevant regulations that varied. Some were available online, some were searchable, some were in code 360, these are all things from a mechanic standpoint can make it easier or hard to do this review.

Similarly, language. So different terms used to mean the same thing. Storm water, whether it is one word, two words, run off, or drainage and they are all used in the same way, but they can make doing a review a little more cumbersome. So consistent terms can make that easier to assess -- to go back and assess how bylaws are doing later on.

And as far as adoption. I outlined earlier what the kind of the nutrient environment is within Pleasant Bay. And it is really focused on that watershed permit and the nitrogen reductions. And Pleasant Bay storm water is only responsible for about 10 percent of that nitrogen load and the majority of it comes from waste water disposal via septic systems.

So you know, knowing what the priorities of your communities are, this may not -- this may not be an immediate priority to deal with some of these, you know, storm water management issues because there is such a huge load coming from septic systems. But, as those septic systems and waste water loads are taken care of, this may rise to be a higher priority.

So again, that will -- the impact of this is going to vary locally and depending on the local condition and environment, so just be aware of that and think about that if you are considering undertaking one of these reviews.

All right. Next slide.

And again, just some reminders after having done through a few of these is ha the storm water management isn't always going to be obvious. You will have to figure out what the best way to review the by laws is and that will depend on how accessible they are, and things like word searches and word choices play a much bigger role in that than I think we thought initially. And then also just the language can be very nuanced. So even though word searching with help you navigate through things natural processer a lot of the time you just end up having to read and it that is -- there is ultimately no substitute for that.

So we have one more slide, I think? And then -- and then we can take questions.

So what did we learn from the individual and the original look at local bylaws and ordinances? Well certainly -- if you are trying to get multiple towns to work together and establish coalitions and relationships are key to doing that. And then really just looking at ways to, you know, make the minimize the effort required. So look for effective examples that already exist, look for opportunities to just modify language, and if we can utilize a consistent review method for multiple towns within a region, that helps the towns figure out what their neighbors are up to. That can reduce the impression that, um, that making standards higher in your own town may, you know, may drive develop. Elsewhere, because, you know, because that is harder to develop that really being consistent just reduces confusion for everyone on, you know, both sides of the permit desks.

And with that, I think we are ready for Q and A!

SPEAKER: Okay.

SPEAKER: So welcome all of the rest of the panel is back up then.

SPEAKER: Great. So I have a number of questions here. One of them is pertains to open -- actually several of them are pertaining to open space requirements and if you have suggestion for dense urban communities trying to have affordable dwelling as well as accessible units on small lots.

So -- Stephanie?

SPEAKER: I can take a first stab at that. So thank you, I think it was Richard who is asking that question. So that depends on what the community is amenable to. So if you have small lots that is -- you would haven't an open space on a single family or on a couple homes but on a larger subdivision where you are working with a larger land use or larger parcel of land so more opportunity to protect those open space areas. But really, the OSRD comes down to following a really specific four step process. And the most important first step there is identifying law review the most sensitive environmental features are on the site and protecting those and working away from them.

So even if you work on a one house lot if you are on a wetland or a storm drain you want to work away from that and have natural vegetation to make sure you are not directing storm water -- sorry I have a cat that is really trying to say hi here.

But hopefully that helps to answer the question a little bit? And in terms of what the tool is, I believe that 52 percent is a goal. But obviously, you know, what works within your community is better than nothing.

SPEAKER: And if Heidi or Danika don't have a follow up to that, I would like to follow up with these additional questions that are on the same topic of open space. And this question relates in how did you define open space? This means does it allow per -- permeable pavement or not paving or even paved paths as counting towards percent open space requirements? And I this I this came up during your talk, Mark? So not sure if you can answer this how you defined open space?

SPEAKER: Yeah -- or I can answer that in relation to the State's model bylaw?

So, generally, open space would be more areas that are either left natural or they may be like, open grass area like a shared common for a subdivision. There are provisions in the model for up to, I think 10 percent of the open space to be used for things like storm water management, or even waste water if there is sometimes if there is not a suer in the area you may have to do something like a shared septic system and have to have a shared leeching system. So than that field is also a common park or space on top of it. But not generally things like, um, permeable pathways, except if it was a pathway through an area that was designated as open space and like a trail system? But not so much for things like, just sidewalks or that type of thing.

And I also just want to comment on the accessory dwellings I think that is really important and every community should make sure that you allow accessory dwellings as much as possible. I think there is more and more of a need for it with people having extended family, or people getting older and wanting to stay in their homes, but wanting to have the additional income or

someone else on the property with the maintenance of the property, that is a benefit for affordable housing as well. That is a good way to get more housing on the same amount of land.

SPEAKER: You don't have to respond, Mark.

SPEAKER: I was just going to say that for watershed, the calculation we did, we basically assumed a combination of me dough and posted and natural condition. But we have -- and I just want to throw this out there because I think that fits in with a lot of what you have been and I go emphasizing the nature based solutions. We have quantified the benefits of safely diverting impervious covered area and what that accomplishes which which is kite a bit. So that has to be mindfully done. But those are a lot of LID opportunity that can be done, as long as it is allowed for. So I thought I would mention that. Thank you.

SPEAKER: It was Gregory Chard. Do you find pervious permeable pavement to be more (INAUDIBLE) and not so prone to being plugged or broken down as in the past?

SPEAKER: I can take a shot at that. So permeable pavements are a super opportunity that have sort of been getting some bad press because of the clogging. So they do get clogged but there is maintenance that can be done. And even the maintenance they tend to be more cost effective than other controls, so there is more to be done on that. But the good news is that, yes. They do work but they do need that management nans and that does require special machinery. So unfortunately, that is not quite there. So there was a recent substituted did and I will add that to the chat the I can. But

the University of New Hampshire did a study and it is very eye opening but that is a huge opportunity! And one that ky mention the resiliency. That I have tremendous storm capacity in terms of flooding and things like that. So they are a very powerful tool. Thanks.

SPEAKER: And if I jump in there, this is Stephanie. One other thing about permeable pavements why they used to get a bad rap is people didn't understand that maintenance. So they would continue to salt or sand that pavement, which would clog it and then require maintenance more often.

So, when people understand that they shouldn't salt or sand that permeable pavement, they can save that money by not spending that on the salting and sanding. But that does require a change in how you are managing your parking lot or whatever it is and having the people who are working on it understand that change.

So that has becomes more poplar that is functions better because we are treating it how it is supposed to be treated.

SPEAKER: And Stephanie, if I just add to that, and that is a really great point, because the salting is huge. Because salt chloride has become such a huge problem and getting in the way of some of the LID techniques so the fact that you need so much less salt on permeable pavement could solve the pavement ochre deucing that application. So besides the cost saving, that is also just avoid messing up the receiving waters too. Thanks.

SPEAKER: I have another question here from Mark. That this commenter who -- this question -- the woman who posed this had to leave. But I think it is a good question anyway. I have some places in the country

where retention requirement is beyond one inch. Are you also suggesting that one inch is the sweet spot for achieving what we need to achieve for ground water recharge and pollution control and going beyond one inch is in the a good use of resources?

SPEAKER: So the one inch retention standard I use that word retention intentionally, that include embedded in it recharge targets to meet calculated average annual recharge amounts. Which we use, again, these climate data and this precipitation and modeling to come up with those numbers.

So the one inch retention based on existing climatic data appears to be the sweet spot in terms of nutrient export and the existing recharge.

We have done the numbers for a future climatic -- excuse me, a future estimated per acceptance and that one winch still holds. Because as Stephanie said, the rain fall patterns are changing, but by and large, we are having more intense events that have a lot of impact.

So, but, I would not want to say don't go further than that, because one thing that I haven't -- that we have not evaluated is how this effects peak flow, which is part of the equation that is out there when people are dealing with storm watershed for and regulate situations.

So I think that these one inch retention or higher value, that is going to go a long way to deal with the flooding issues.

So I guess I would not say anything bad about it, because I think that is protective. I do -- just in terms of complete transparency, you know, is different than what the natural system is seeing that amount of recharge.

Although, and I am going on, but not everything is regulated so maybe that is because you are not regulating the other coverage. Soar sorry, not a great answer, but I think more to be determined on that in the future.

SPEAKER: And if I also can just jump on quickly, thinking about your nature based solutions they don't necessarily have to be the only thank you are using, right? So maybe you can use that, those nature based solutions to be able to capture the first flush, which is the dirtiest part, when it starts raining and running off of the impervious cover. To to be able to capture that dirty first flash is important. And then from there being able to capture the storm water that you need to, maybe you need to do underground retention, you know, vortex unit, et cetera. But nature based solutions can be pretty important as that first line of defense.

SPEAKER: And another question here. Future costs are notes typically calculated in local budgets. Could the bylaw analysis include questions on how the town plans to address future costs?

SPEAKER: The bylaw tool does include a mention about requiring maintenance and operations within all development plans and permits. It doesn't include a specific calculation of future costs. But certainly, you know, maintenance is something that often gets neglected and so, you know, more communities are now adopting methods of making sure that developments are following through with their maintenance, or if the town is taking that on on their MS 4 permit they have to take that on as part of their future costs. And maintenance costs for the low impact design is generally going to be actually less than for your more traditional approaches. It is different, but it can be

less.

SPEAKER: Um, Heidi, can I mention that on the watershed we are working on a project and projecting a future build out there. We will project that, you know, that is all assumption but we can estimate potential increase of impermeable coverage and potential costs associated with those different levelings of management and I wonder if that will be help for a town to see that and the -- I wonder if that would help them to realize, again, you know, why not try to avoid them, you know, try to do that. We did that for one town, although that will be updated and it is pretty scary numbers when you start looking at it in terms of taking on a burden. Should MA, you know, come up with a permit and say no, where you to reduce that load.

So more to come on that. But if this is a way to streamline that information for you all for sharing that so people have at least an idea of what that means for specific locations that is something that I would liking to look into more. And that is really a GAS analysis at this point because the tools are pretty well developed to apply that. Thanks.

SPEAKER: That has there been progress with aligning the Mass to EPA with MS 4 requirements?

SPEAKER: I think I am supposed to know the answer to that.  
(laughter).

SPEAKER: Yeah. So the EPA is working on that now, they have been working on updates to the handbook and to the wetlands regulation, both for consistent simple majority with MS 4, and for more climate resilience updating the precipitation standards. So we have heard that that is going to

be coming out for final public review very, very soon.

SPEAKER: Hey all, I just wanted to let you know that Margaret is here and she has asked to chime in on a question. Margarita, you can unmute.

SPEAKER: Thank you. Can you hear me?

SPEAKER: Yes.

SPEAKER: Okay.

So actually, Mark sort of got at my question, which I did not artfully create, but I was thinking that in many instances, you know, the people that are in charge of making the budget decisions don't want to look like they are raising, you know, people's tax, raising costs. And so having something in line and what Mark was describing was the ability to see what those future costs would be in the absence of better management. That is sort of what I was getting at. And if there is a way that your tool could actually talking about that, that there is some sort of a way of, um, capturing even -- I know in the past, you know, when people were looking for low impact develop. As part of their local ordinance, just showing the amount of space and the town that was designated for development went out. So that was a big motivator to do things a little differently. Unfortunately that led to use ugh larger lot sizes rather than using the existing inputs better. But if there was a way to sort of standardize, at least an initial cost estimate of what happens in the event that your existing build out occurs, this is what you would have to pay for it, not just the cost of maintaining the new kind of management that you are thinking of putting in. So that is what I was getting at with my question.

SPEAKER: Margarita, I think there is huge opportunity for us to

provide information now and over the course of this year we will have a lot more. And I think what we need to do is think about how to expand that or -- so that a town can go through that exercise. Or, I know towns have their hands so full. But so that the towns readily have the information to have the number and understand where it came from.

SPEAKER: Yeah , that would be great. And I think that gives sort of advocates in the town, you know, the ability to speak knowledgeably about costs too. Because they can access the same kind of calculations that presumably that the town managers are using. So I think that would be great help. Thanks.

SPEAKER: Well I will bring up this presentation again because we do have a few final wrap up slides.

SPEAKER: We are a few minutes over. So I appreciate everyone who stuck around for all of this and the recording will be available and you will have the presentation handout.

This really is an introductory program here. And Mass Audubon and our partners here and over partners are working on a more detailed curriculum that will actually include hands on, hoping to do this in person in a couple of locations in the SNEP region this summer and fall where there will be, you know, actual working workshops where you not only get presentations, but also have an opportunity to play with the bylaw tool and then come back and discuss it and ask questions and explore how really to apply it.

So, we hope that we will answer all of these questions for you, this gives you a sense of some of what will be in that larger curriculum. And then I think

we have a slide with additional resources.. Yeah. So this is in the PDF that you have, there is lots of great resources here in addition to Mass Audubon LID tool and fact sheet. We have losing ground, we have value of nature, fact sheets based on the eco sim services literature that is available, the state smart growth tool kit, which include model bylaws and presentations and other resources the metropolitan planning council has developed new tool kit that includes a lot of examples of what community has done this or that so you can find actual language of communities that have done this. If you -- you know, it costs money to do these reviews, there are some grants available including the EEA planning grants and the municipal vulnerability program of preparedness program action grants.

The University of New Hampshire storm water center has tremendous resources available, and fact and general informing for sharing.

And because the SNEP region also covers Rhode Island I wanted to make sure to include some resources here so that the Rhode Island has the non point information for municipal efficiencies program. There is also the Rhode Island Green Infrastructure Coalition which is a partnership of a bunch of different groups, and then of course the SNEP Network itself. And we include all of our contact info on the final slide if you have specific questions for any of the speakers. And if you are in the RPA regions of SRPEDD, they also provide planning services to their municipalities.

So I want to thank everyone again for attending and all of the speakers for their hard work and great presentations today, and thank the SNEP Network for handling this and all of the logistics.

And I don't know if Tess or anybody has any final words?

SPEAKER: Nothing from me!

SPEAKER: All right, great!

Well everyone --

SPEAKER: Thank you so much.

SPEAKER: Yes, thank you all. Have a great day and I hope that you found this information helpful! You will be receiving a survey and we really appreciate your feedback. And if you are not from the municipality and you are from a larger group but still interested in continuing the work you can let us know there in the survey too. Thanks!

SPEAKER: Thank you.

(webinar ended at 1:38 p.m.)

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