Final Deliverables

Model Conservation Bylaw for Climate Change Adaptation

Funding for this project is provided by the
Department of Housing and Community Development's
District Local Technical Assistance program
through the Cape Cod Commission

APCC
Association to
Preserve Cape Cod

January 10, 2019

Hillary Greenberg-Lemos
Health and Conservation Agent
Town Hall
300 Main Street
Wellfleet, MA 02667

Re: Final deliverables for DLTA grant to the Town of Wellfleet
"Model Conservation Bylaw for Climate Change Adaptation"

Dear Hillary:

On behalf of the Association to Preserve Cape Cod (APCC), I am pleased to provide you with our final deliverables for the above-referenced project. It has been our great pleasure to work with you and the Conservation Commission on this important and challenging project.

Our approach to this project was to search for relevant information (including examples of relevant bylaws and ordinances) and to utilize the information to suggest changes to Wellfleet's existing environmental bylaw that will enable development of implementing wetland regulations later. We feel we have identified many of the leading-edge policies and regulations that may be utilized, but it is apparent that this area is rapidly evolving; therefore, we recommend continuing to track the principal policies that we have utilized.

Tasks which were completed included:

Task 1: Meetings with the Conservation Commission to review the scope of work, obtain comments for priorities.

Task 2: Information collection, including interviewing experts (Task 2A), literature review and identification of existing policies and measures which may be utilized or modified (Task 2B), preparation of a gap analysis (Task 2C), and

Task 3: Assembly of draft policies and measures, development of a bylaw, and preparation of recommendations for next steps and implementation.

Deliverables included: three meetings with the Conservation Commission, annotated literature review and list of policies and measures which may be utilized, gap analysis, development of a model bylaw, and recommendations for next steps and implementation.

Thank you, and we greatly look forward to assisting the Conservation Commission with next steps.

482 Main Street, Dennis, MA 02638
Ph: 508-619-3185 Email: info@apcc.org Website: www.apcc.org
A non-profit organization. Dues and contributions tax-deductible as provided by law.

Sincerely,

Andrew Gottlieb, Executive Director

Attachments:

- Model bylaw for climate change adaptation (clean copy and "track changes" versions);
- Task 1 deliverables (meetings with the Conservation Commission)
- Task 2 deliverables (Information collection and gap analysis)
- Task 3 deliverables (model bylaw, recommendations)

cc: Heather McElroy, Cape Cod Commission

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Notes on 8/1/18 kickoff meeting with the Wellfleet Conservation Commission

Purpose of meeting: To present the draft Scope of Work, obtain feedback and make revisions to the SOW, and to solicit the Commission's current difficulties in protecting wetland resources given coastal development and ongoing climatic and coastal change.

Present: Jo Ann Muramoto and Andrew Gottlieb (APCC), Heather McElroy (Cape Cod Commission), Hillary Greenberg-Lemos (Conservation and Health Agent), John Portnoy, Barbara Brennessel and Michael Fisher (Conservation Commission members). Members of the audience included Tim Famulare (Provincetown Conservation and Health Agent) who was invited by Hillary, a member of the Board of Selectmen, and others.

Introduction: Jo Ann summarized the project goals. This project is intended to address climate change adaptation, not just coastal adaptation. APCC received the Powerpoint presentation ("Adaptation in Outer Cape Towns and Cape Cod National Seashore", Spring 2018) which describe some of the coastal adaptation issues. APCC has already identified some examples of bylaws that may be useful (e.g., Chatham floodplain bylaw, Black Beach-Great Sippewissett Marsh District of Critical Planning Concern bylaws and regulations).

Scope of Work (SOW): Copies of the draft SOW were provided to Commission members. During the meeting there were no comments from the Commission and no revisions requested.

Input from Commission on their current difficulties in protecting wetland resources given coastal development and ongoing climatic and coastal change: This portion of the meeting included Commission input that identified issues, questions (Q), answers (A) and comments (C), and input from members of the audience.

Issue: Coastal armoring. Commission members said the Town has a legacy of coastal armoring. Existing regulations do not give the Commission the ability to improve and protect the resource areas from the impacts of coastal armor. In particular, coastal armoring is problematic because it causes erosion of adjacent beaches, yet the state Wetlands Protection Act regulations allow the repair of coastal armor installed after 1978 (when the WPA regulations were passed) and construction of coastal armor on properties developed before 1978. The Commission tries to mitigate the impacts of coastal armoring projects by requiring beach nourishment as part of the Order of Conditions. However beach nourishment is problematic, because it is often not maintained by the owner, there are many properties with conditions placed on their permits, it is not really successful in mitigating impacts of armoring, it does not provide habitat value, the sand washes away quickly, and beach nourishment prevents the coast from naturally retreating. Hillary said the model bylaw should contain a better way to do beach nourishment and deal with coastal armoring.

Q (Andrew): Would the Commission go so far as to remove riprap? Should the bylaw be stricter than the WPA regulations?

A (Hillary): The Commission can't be stricter than the WPA regulations. (I thought towns could be more strict, but not more lenient than State law?)

Issue: Protecting restricted tidal wetlands: As with coastal armoring, John said the existing regulations do not provide enough protection for restricted tidal wetlands (Mayo Creek, Herring River). They are not receiving the seawater and sediments needed to maintain healthy salt marsh, and water quality also suffers as a result.

Issue: Buffer strip and development. Wellfleet has a two-part buffer zone, consisting of an outer 50'-100' discretionary zone and an inner 0'-50' no-build zone adjacent to the resource area. Applicants often want to build up to the edge of the 50-foot no-build buffer strip limit. This does not adequately protect the resource area. The model bylaw should be restructured to increase protection, taking into account future sea level rise, backed by scientific information on the value of buffer strips to protect resource areas. Jo Ann thought that MACC may be working on a project to update the scientific basis for buffer strips. The rate of shoreline change should be built into the buffer strip setback.

Issue: Rare species habitat protection. The state has revised their maps of Priority Habitat and Estimated Habitat of rare species based on records of observations, and these areas have decreased, yet the habitat still exists. How should rare species habitat be protected locally to improve resilience of rare species? Hillary invited the Provincetown Conservation Agent as the Outer Cape towns share common issues. Tim Famulare described how Provincetown addresses rare species habitat – they added protection of NHESP estimated and priority habitats to their bylaw, as well as protecting groundwater quality and quantity.

C (Heather): Education and incentives as tools. Heather said this SOW doesn't include education and incentives to promote adaptation. Hillary said the town received a grant from the Schoodic Institute to work on climate change messaging. This coupled with the recent MVP grant that Wellfleet and Truro received will help to raise public awareness of climate change and the need to adapt.

Q (Andrew): Do you have climate change issues in non-coastal settings?

A (Hillary, John, Barbara): Yes, there are climate change issues away from the coast. Here are some (described below).

Issue: Rising groundwater will cause freshwater wetlands to expand. As climate changes, groundwater levels will rise and freshwater wetland boundaries will expand. This will affect not only the area and delineation of freshwater wetlands but also septic systems that need separation from groundwater and from wetlands in order to avoid water pollution. The model bylaw should address future changes in wetland delineation and tighten Board of Health regulations around ponds and wetlands. Routine septic system inspections are needed, not just when properties change hands.

Q (Andrew): Are there more septic systems in coastal areas or near freshwater systems?

A (Barbara): There are more septic systems in coastal areas because more houses are built near the coast.

Q (Andrew): How tolerant is the Commission to having the applicant or individual shoulder the burden of the studies needed to inform the permit conditions?

A (Hillary): The Commission prefers to have their own consultant do the study as they can be assured that the consultant is working to address the Commissions' goals and interests.

Q (Jo Ann): Wetland regulations and permitting focus on individual parcels where projects are proposed. Has the Commission considered a regional approach to addressing some of these issues that occur over larger areas involving multiple parcels?

A (Hillary): Yes, an example is Lieutenant's Island, where residents who have armoring projects pay mitigation fees into a fund instead of doing beach nourishment on their own. The fund is used to conduct beach nourishment across several parcels. She has a spreadsheet of approximately 100 pre-1978 properties (i.e., properties that were developed prior to 1978 where coastal armoring would be allowed). She will send that to APCC.

Q (Jo Ann): What is the Town's timeframe for the Municipal Vulnerability Preparedness (MVP) planning grant project, and will this project to create a model bylaw precede the MVP project?

A (Hillary): Yes, the MVP planning grant will not get to the stakeholder workshop stage before this project is completed.

Q (Andrew): What is the Commission's ability to modify an existing Order of Conditions in order to improve them?

A (Hillary): Newer Orders can be modified, but older ones generally don't have ongoing conditions.

Q (Jo Ann): For example, would you be able to modify an existing Order for a groin on a beach to require that the beach between two groins be filled to capacity? That is one of the performance standards for coastal beaches. (The discussion that followed suggested that this performance standard is not known).

Q (Jo Ann): Are there any hot spots in Town? These are areas where there is a concentration of problems or concerns about resource areas being impacted.

A (John): Mayo Creek is an example because the tidal restriction prevents sediment and seawater from entering the wetland thereby causing damage to the salt marsh. Properties located on barrier beaches may be hot spots. Hillary said there are areas with localized flooding (e.g., Commercial Street, others). The Hall property required elevation of the structure. John said areas where private wells intersect with groundwater close to the surface are going to experience more flooding. My point was more that wells that are already screened near the salt/fresh groundwater interface may become more salty as sea level and the salt/fresh interface rise; areas of Town that are especially sensitive are islands and peninsulas with a small area for freshwater recharge. Most people are still on private wells (e.g., Indian Neck, Lieutenant's Island).

Issue: Vista pruning impacts. Hillary asked if we have any thoughts about the impacts of vista pruning. The Commission receives many applications to allow vista pruning. Examples include the Cumberland Farms project where large basswood trees were removed. Jo Ann said that trees and vegetation help to mitigate the effects of climate change by taking up carbon dioxide (a greenhouse gas). Trees and plants also take up nitrogen thereby protecting water quality. Cape-specific studies of N-uptake by plants are needed. There are two: an older study by Marilyn Fogel of N-uptake by pine trees at the Falmouth wastewater station, and a recent study by Ivan Valiela of N-uptake by trees on Cape Cod. We will look into these references and others, particularly those that look at the value of vegetated buffer strips. Andrew said the town could adopt a separate shade tree bylaw to protect trees.

Q (Jo Ann): Does the Wellfleet bylaw address the same interests as the state Wetlands Protection Act? If so, would you consider adding additional interests?

A (John): Yes to both. What are some examples of additional interests? Jo Ann said the Black Beach-Sippewissett Marsh DCPC implementing regulations may have an additional interest.

Q (Michael): What is the NOAA Adaptation Toolbox that is referred to in the SOW?

A (Heather): The Commission received a NOAA grant to develop a coastal adaptation tool. The tool is intended to help communities and municipalities to identify suitable coastal adaptation approaches to deal with coastal impacts. The Commission held workshops throughout the Cape to obtain input on the tool and the workshop in Wellfleet was well attended, and the ConCom's participation is appreciated. To develop the tool, 44 strategies were identified by APCC and the Commission. For this project, some of these strategies may be useful.

A (Michael): Would the Selectmen make a decision on using a tool, or the ConCom?

A (Heather): The NOAA Adaptation Toolbox is a resource for communities to use, and some tools may be of interest to the community or stakeholders. It does not define who makes the decisions.

Comment (Michael): There is much coastal erosion on the Atlantic side.

Q (Jo Ann): Coastal erosion is an important issue. Are there any examples where buildings, houses, have been moved back from the tops of coastal banks or dunes?

A (Hillary): Yes, there are several examples of retreat in Wellfleet where the owner has voluntarily moved their house back (e.g., Drohan, Simpson). In some cases they moved the houses back for a year or several years at a time.

Comment (Janet Drohan, audience member): She is on the Board of Health, and this project should involve coordination with the Board of Health as there are common issues and concerns (e.g., wetlands, climate change, water, conservation). Hillary said yes, she is also the Health Agent and there will be coordination with the Board of Health.

Q (Andrew): How will the model bylaw from this project be received by Town Counsel? We don't want to get far down the road developing something that the Commission likes and then have it shot out of the water by legal counsel.

A (Hillary): She will talk to the Town Administrator (Daniel Hoort) to see how legal review will be coordinated. The Town's legal firm is Coppelman and Page.

Issue: Use of chemicals. Barbara said chemicals (e.g., pesticides) are a concern because they are widely used and they impact water resources. What can be done to protect water resources? Jo Ann said the County did a study of pesticide use and found residential use of pesticides was the main pesticide use rather than utilities. There are pluses and minuses of pesticide use to consider, for example the National Seashore uses pesticides to control invasive plants such as Phragmites in order to protect native species and enable herring migration. We'll consider how to address this in the model climate change bylaw.

C (John): A DCPC could potentially be a useful tool for protecting an area or areas of town. Some possibilities to consider are Mayo Creek and other tidally-restricted wetlands. Hillary said the Town did not support the proposed Fertilizer DCPC, but that was then. One member of the audience who is on the Planning Board said that in the 1990s there was a proposal to restrict sizes of houses on scarps and it was called "satanic".

Wrapup (Jo Ann): Our approach will be to identify existing examples of relevant bylaws and policies to build on for your model bylaw, rather than starting from scratch. We've mentioned some examples (e.g., Black Beach-Sippewissett DCPC, Chatham floodplain bylaw) and will locate others. As needed we'll do the research to build the scientific basis to address specific issues. The NOAA Adaptation Toolbox will provide useful tools.

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Conservation Commission Comments on Draft DLTA minutes for discussion at Sept. 5 meeting

We should stay focused on the idea that we want a Model Conservation Bylaw for Climate Change Adaptation. Although we have identified items broader than that, which also have merit.

Edits – under Education and incentives – **technical assistance** was received from Schoodic Institute (not a grant)

Hillary and I put level of importance to the issues:

H- Rising groundwater will cause freshwater wetlands to expand

New issue: H – Migrating shoreline. Neither bay or ocean shoreline are static, need to address SLR and SLR with storm surge and potential effects on erosion rates, mean and king tides, and 100-year coastal flooding in mind. We need to allow for wetlands/salt marsh to migrate upland.

We've discussed having applicants be required to show us future conditions on their submissions. A few ideas have been floated for new areas to be delineated, such as: if property is on Atlantic side, map CZM 30-year MORIS short term shoreline change line to define short-term change; and, if property is on bayside, use LIMWA projection or some other parameter that can be easily located. But, we'd like to explore this more through this DLTA project.

Also, we'll need some parameters for living shoreline, dune building, elevated structures, stormwater bioretention and any other soft solutions.

And, what about hotspots/ areas of particular vulnerability? Differing circumstances in velocity zone vs. A zone regarding activities, fill, etc.

H – Buffer strip and development

Add – **M - Extent of allowable disturbance** in the buffer zone is also an issue we'd like some guidance on. We have 3,000 (in 2.01 4.d.1.a.) and 5,000 square feet of disturbance (in 4.1.d.1.a.iv.b.) parameters in our regulations; this is not scaled based on lot size/extent of resource area within lot.

M – Coastal armoring

M – Protecting restricted tidal wetlands

L – Rare species habitat protection

L – Vista pruning impacts

L – Use of chemicals

Hot spots in town – for coastal flooding – Commercial Street, Route 6 at Blackfish Creek

DLTA Project for Model Conservation Bylaw for Climate Change Adaptation

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Subtask 2A. Interview coastal experts to obtain information on existing bylaws, policies, measures and plans.

Deliverables: List of interviewees and notes on interviews.

List of Interviewees and Notes

Hawaii erosion-based setback:

Dr. S. Jeffress ("Jeff") Williams. Scientist emeritus USGS and Affiliate Faculty, University of Hawaii. Regarding County of Maui erosion-based setback, Dr. Williams suggested contacting Chip Fletcher, University of Hawaii, (808) 956-2582, fletcher@soest.hawaii.edu .

Dr. Chip Fletcher, University of Hawaii, SOEST, (808) 956-2582, fletcher@soest.hawaii.edu . Dr. Fletcher provided links to the erosion-based setback regulations for the Counties of Maui and Kauai, the supporting scientific studies and the City of Honolulu adoption of a recent report and recommendations for climate change adaptation. See attached email thread and the packet of materials including ordinance, information packet, application packet, variance application, and scientific reports.

John S. Rapacz, Administrator, Zoning Administration and Enforcement Division, Department of Planning, County of Maui, (808) 270-7253, John.Rapacz@co.maui.hi.us . See attached email thread regarding County of Maui erosion-based setback regulations and supporting science, also cross-referencing Dr. Chip Fletcher.

Jeffrey Dack, Maui Planning Department, (808) 270-7735, 11/19/18. Jo Ann interviewed Jeffrey Dack. Q: why are there two methods of determining the erosion-based setback? A: One part of the island consisting of three areas had historical aerial photos dating back to the early 1900's and those aerials had 20 meter transects that enabled the average annual erosion rate to be calculated. The aerial photos allow the SLR factor to be applied, from the state SLR report. This is a probabilistic (80% probability) that for 3.2' of SLR (from the IPCC) that could occur by 20160. The remainder of the island did not have historical aerial photos, so this is where the average lot depth method of calculating a setback is used. Q: What is the status of the regulations? A: The Univ. HI studies are informing a proposed update. Currently they use historical rates of erosion (annual average rate of erosion) to project into the future, with a 50-yr building lifetime and a 25' allowance. The new study has different rates of erosion to apply. Q: Who approves regulations and changes? A: Maui County consists of three islands, each with its own Planning Commission. They are authorized to implement the state CZM laws (based on federal CZM) delegated to each planning commission. Q: What other resource areas are there in Maui County (e.g., coastal beach, etc.)? A: The erosion-based setback applies to the shoreline, beach, and the highest vegetation line washed by the waves. It is not applied to other resource areas. Q: have there been any successful appeals? A: There have not been any appeals or lawsuits as far as he is aware, in the last two years. When the regulation was first proposed by the Maui Planning Commission, there were many threats

of lawsuits, but none materialized. He assumes it is because the regulations are solid and science-based. More people were concerned about potential takings, but the rules allow for a minimum buildable property depth (with some restrictions, e.g., no slab on grade building, the building may need to be on pilings to elevated it above the floodplain, etc.). Q: How many variances are granted? A: about 1 or 2 per year, not always granted, but most are granted with conditions. Q: How many applications per year? A: In 2015 there were 71, in 2016 there were 71, and in 2017 there were 44. The numbers may be high because if a condo is located in the setback area and renovations are proposed, they need to get a permit. Q: Are there any dune restoration or beach restoration projects? A: There is some coastal dune restoration, but not beach nourishment as it involves complex permitting. Q: Was the Maui County regulation first, followed by Kauai County? A: Yes, Maui was first, and Kauai followed suit. Maui uses a 50-year building lifetime, and Kauai uses a 70-year lifetime. Q: Who appoints the Planning Commission? A: The charter for the Maui Planning commission members specifies that they are appointed by the Mayor. The County Council is elected.

Proposed Boston wetlands bylaw addressing climate change:

Jack Clarke, Director of Public Policy and Government Relations, Mass Audubon, jclarke@massaudubon.org . Mr. Clarke brought our attention to the wetlands bylaw Proposed by the City of Boston to address climate change adaptation and Mass Audubon's support for the proposed bylaw. See the Mass Audubon letter of support signed by Heidi Ricci, the proposed ordinance, and the order for a public hearing dated 7/11/18.

Other erosion-based setback regulations:

Dr. Robert Thieler, USGS, Woods Hole, MA, email: rthieler@usgs.gov . Rob said the best example of an erosion-based setback is North Carolina, where the law has been in place since 1979; he provided a link to the state website for the regulation. South Carolina has been trying to pass similar regulations since the late 1980s; he provided a link to a newspaper article.

Dr. Andrew Ashton, Woods Hole Oceanographic Institution, aashton@whoi.edu . Andrew is on the Town of Falmouth Coastal Resiliency Committee. A separate discussion with Jennifer McKay (see below) indicated that Andrew had also identified the North Carolina regulation as an example.

Jennifer McKay, Town of Falmouth Conservation Administrator, jmckay@falmouthmass.us . Notes: Jennifer did not know of any removal of coastal armoring except for the Town's removal of an old bridge at Menauhant Road which acted like coastal armoring. A member of the Coastal Resiliency Committee who is a coastal geologist had expressed surprise that Falmouth did not have an erosion-based setback. The Coastal Resiliency Committee should be interested in this project, as they will be providing recommendations for updating the Town's policies next May.

Herring River values:

Dr. John Portnoy, Herring River Restoration Committee, Town of Wellfleet. John provided references that identify the resource area values and special values of the Herring River, currently and when it is restored.

Examples of removal of coastal armor:

Jim Mahala (Chief, Wetlands and Waterways Division, DEP SERO) said in the Southeast Region that the Town of Chilmark recently removed a rock revetment that was protecting a beach parking lot. The Town removed it to regain their beach since high water was forced up against the revetment and beachgoers had nowhere to go (photos available). After removing the revetment and restoring the dune and beach, the Town relocated their parking lot to an upland location and relocated a road as well. A second revetment removal project was in Orleans near Skaket Beach. A third example is where the Town of Brewster undertook a managed retreat project and removed riprap protecting their beach parking lot due to repeated storm damage to the riprap and parking lot, restored the beach and dune, and relocated the parking lot inland. The Cape Cod National Seashore proposed a retreat project at Herring Cove Beach for their parking lot in Provincetown.

On using past rates of sea level rise, erosion, and other changes:

Coastal geologists Jeff Williams (USGS emeritus, former Falmouth Conservation Commission member, Univ. HI) and Andrew Ashton (WHOI Department of Geology, Falmouth Coastal Resiliency Committee) both said that using past rates of sea level rise, flooding, shoreline change, storm frequency/magnitude, and so on are not adequate for Cape Cod towns to best prepare for dealing with predicted climate change impacts. These predictions should be incorporated but what to use, what timeframe and how best to use the prediction, need to be determined. The IPCC predictions are a good place to start, and several states (e.g., CA, HI) are leading the way. Keep in mind that even FEMA uses historic data for their FIMP flood maps released a couple of years ago, and that these maps are therefore conservative in expressing coastal flood risk and vulnerability. The next century is going to be quite different from the current century, and the FIMP maps don't represent this reality. Attempts were made years ago to get FEMA to consider climate change science in their FIMP program, but this still does not appear to have been done despite two decades of considerable advances in climate change science.

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Project Title: Model Bylaw for Climate Change Adaptation, Town of Wellfleet, MA

Literature review of relevant bylaws, policies, measures and plans

Task 2: Conduct a literature review to identify relevant bylaws, policies, measures and plans. The objective of this task is to identify and collect information which may be utilized or modified to create a model bylaw for climate change adaptation.

1. BYLAWS, REGULATIONS AND ISSUES

Town of Wellfleet General Bylaws, Wellfleet Environmental Protection Bylaw.

Town of Wellfleet Environmental Protection Regulations.

Town of Wellfleet General Bylaws, Special Flood Hazard District Regulations.

Powerpoint presentation. Spring 2018. Adaptation in Outer Cape towns and Cape Cod National Seashore. This Powerpoint presentation describes the major adaptation challenges in the Outer Cape and Cape Cod National Seashore. Prepared by Outer Cape Conservation Team (Hillary Greenberg Lemos, Conservation Agent, Town of Wellfleet; Lauren McKean, Park Planner, Cape Cod National Seashore; Emily Beebe, Conservation Agent, Town of Truro; Cally Harper, Town Planner, Town of Truro; Jenna Sabers; AmeriCorps National Seashore Planning Assistant; and Sophia Fox, Aquatic Ecologist, Cape Cod National Seashore).

Beach nourishment projects, Town of Wellfleet. Excel spreadsheet prepared by Wellfleet Conservation Department.

Massachusetts Wetlands Protection Act, MGL Ch. 131, Section 40. See: https://malegislature.gov/Laws/GeneralLaws/PartI/TitleXIX/Chapter131/Section40 .

Massachusetts Wetlands Protection Act Regulations, 310 CMR 10.00. See: https://www.mass.gov/files/documents/2016/08/vy/310cmr10a.pdf .

Massachusetts Rivers Protection Act. See: https://www.mass.gov/guides/rivers-protection-act-questions-answers . This webpage explains the Rivers Protection Act and provides a link to the Act and to the Rivers Protection Regulations contained within the Wetlands Protection Act.

2. EXAMPLES OF BYLAWS FOR CLIMATE CHANGE ADAPTATION

City of Arlington Wetlands Protection Bylaw. Although not a coastal community (except for the tidal Mystic River), the City of Arlington has an interesting, newly adopted climate change

resilience section (Section 31) in its wetlands regulations. Available at: https://www.arlingtonma.gov/home/showdocument?id=41320 .

City of Boston, proposed wetlands ordinance addressing climate change. This proposed wetlands ordinance contains specific references to the need for climate change adaptation and protection of resource areas. This proposed ordinance may serve as a model for some of the elements of a model bylaw for climate change adaptation. Available at: https://www.boston.gov/sites/default/files/document-file-07-2018/pn07262018115217.pdf . The ordinance was submitted in October 2018.

Town of Chatham's Protective Zoning Bylaw. Prohibits new residential construction on vacant lots in the 100-year flood plain per FEMA flood maps (some exceptions apply). Redevelopment of existing structures allowed by special permit issuance by the zoning board of appeals. Available at https://www.chatham-ma.gov/sites/chathamma/files/uploads/2016_attested_protective_zoning_bylaw_1.pdf

NOTES: Chatham Bylaw regulates the flood plain through two overlay districts – "Conservancy" and "Flood Plain". The Conservancy District refers to both coastal and freshwater wetlands. The purposes of these districts respectively are: to preserve and maintain the ground water supply on which the inhabitants depend, to protect the purity of coastal and inland waters for the propagation of fish and shellfish and for recreational purposes, to protect the public health and safety, protect persons and property from the hazards of flood and tidal waters which may result from unsuitable development in or near swamps, ponds, bogs and marshes, along water courses or in areas subject to flooding, extreme high tides and the rising sea level and to preserve the amenities of the Town and to conserve natural conditions, wildlife and open space for the education and general welfare of the public AND to protect public health, safety, and general welfare, to protect human life and property from the hazards of flood and tidal waters, to preserve the natural flood control characteristics, and the flood storage capacity of the flood plain, and to preserve and maintain the ground water table and water recharge areas within the flood plain.

The Bylaw contains definitions of regulatory terms and references 2014 FEMA maps on file with the Town Clerk. Best management practices during construction are specified and compliance with Flood Resistant Design and Construction requirements of the MA building code is referenced, which as of Jan 2018, among other things, requires 1ft of freeboard above base flood elevation for residential buildings. (Chatham had required this prior to the building code change.) There is also a "conservancy district" While new residential dwellings are prohibited on vacant lots in the conservancy district, there are other permitted uses, either outright or by special permit.

City of Del Mar, California, Sea Level Rise Local Coastal Program Amendment and Sea Level Rise Adaptation Plan, 2016 updated 2018 (Hillary sent the link to us). The City of Del Mar's favored adaptation approach is to use beach nourishment, sand management and flood management. Managed retreat was considered but a decision was made that it was not needed and/or not feasible due to high cost of acquiring property for open space, and the high risk of legal action if managed retreat is used. Available at:

http://www.delmar.ca.us/498/Sea-Level-Rise-Local-Coastal-Program-Ame .

Georgetown Law Climate Center. Zoning for Sea-Level Rise: a model ordinance and case study of implementation barriers in Maryland. Available at: http://www.georgetownclimate.org/reports/zoning-for-sea-level-rise.html

Hingham, MA amendment: *"For activities proposed in VE-zones and A-zones, at a minimum, the historic rate of relative sea level rise in Massachusetts of 1 foot per 100 years shall be incorporated into the project design and construction. The commission may also take other credible evidence of projected sea level rise, such as the Intergovernmental Panel on Climate Change into consideration."* .

Oak Bluffs, MA, Floodplain Overlay District Bylaw: The StormSmart Coasts team, led by the Oak Bluffs Conservation Agent, spent significant time discussing and coming to consensus on proposed amendments to their zoning bylaw for the floodplain. The zoning bylaw now prohibits new residential development and expansion of existing development in the most hazardous flood zones—those designated as V, VE, or AO zones on the Federal Emergency Management Agency's Flood Insurance Rate Maps (FIRMs). The bylaw also requires that all new development in less hazardous areas—those designated as A zones on the FIRMs—go through a special permit process to ensure proposed development and redevelopment projects meet design criteria and performance standards that minimize threats to public health and safety and increase the town's capacity to recover after a storm by reducing damage to personal and public property. Town Meeting voters adopted amendments to the **Town of Oak Bluffs Floodplain Overlay District Bylaw** (PDF, 40 KB) by an overwhelming majority at the Spring 2010 Annual Town Meeting. The bylaw is available at: https://www.mass.gov/files/documents/2016/08/sm/oak-bluffs-bylaw.pdf .

3. PROTECTING SENSITIVE AREAS

Falmouth Wetlands Protection Bylaw and Wetland Regulations. The Bylaw and regulations contain sections defining a special protected area, e.g., the Black Beach/Sippewissett Salt Marsh District of Critical Planning Concern (DCPC) with its own specific interests and performance standards that are stricter than those for non-DCPC resource areas. DCPC regulations limit the area of development and redevelopment in flood hazard zones and require protection, enhancement and compensatory mitigation of vegetative cover in order to maintain water quality and protect wildlife habitat. In addition, the Falmouth Wetland Regulations are comprehensive in addressing many resource areas under the Bylaw, with regulations separate and distinct from the state Wetland Protection Act (WPA) regulations. One benefit is that appeals would need to address local performance standards. The Bylaw is available at https://ecode360.com/9074642 and the wetland regulations are available at https://ecode360.com/12120136 .

4. CONSERVATION AND PLANNING FOR CLIMATE CHANGE

Rubinoff, P., C. Rubin, D. Robadue, J. Ricitelli, C. Collins, D. Robadue, C. Damon, K. Ruddock, P. August, C. Chaffee, E. Horton-Hall, and A. Ryan. 2013. Building capacity to adapt to climate change through local conservation efforts: a South Kingston Land Trust pilot project. Technical Report, Rhode Island Sea Grant, Narragansett, RI. Available at: www.seagrant.gso.uri.edu . This project may provide useful suggestions for land conservation for climate change adaptation.

MA Division of Fisheries and Wildlife. Massachusetts Wildlife Climate Action Tool. Developed by the Massachusetts Division of Fisheries and Wildlife to help people explore climate change impacts, learn about vulnerabilities, and plan for adaptation. Posted at: https://climateactiontool.org . This tool may be helpful for adaptation planning to protect fish and wildlife habitat.

5. LEGAL ANALYSES AND RESEARCH

Columbia Law School. Managed coastal retreat: a legal handbook on shifting development away from vulnerable areas. Available at: http://columbiaclimatelaw.com/files/2016/11/Siders-2013-10-Managed-Coastal-Retreat.pdf .

Georgetown Law Climate Center. Zoning for Sea-Level Rise . Available at: http://www.georgetownclimate.org/reports/zoning-for-sea-level-rise.html

Higgins, M. 2009. Sea level rise impacts on beaches and coastal property. Posted at WHOI webpage on "Understanding Future Sea Level Rise" at: http://www.whoi.edu/page.do?pid=34346&tid=282&cid=59486 . This brief suggests that there will be much coastal litigation as sea level rises and impacts properties.

Thomas, E.A. and T. Turner. Climate change and emergency management: adaptation planning. Available at: https://www.americanbar.org/content/dam/aba/publications/state_and_local_law_news/sl_34_3_thomas_turner.authcheckdam.pdf .

Roger Williams University School of Law, Nov. 2018 workshop on "Legal Approaches to Climate Change Adaptation". Video of presentations are posted at: https://law.rwu.edu/academics/marine-affairs-institute/research-and-outreach/symposiaconferences/legal-strategies-climate-adaptation .

Cape Cod Commission, legal research conducted at request of APCC for this project. The document lists topics and summarizes legal research. It does not constitute legal advice.

6. ROLLING EASEMENTS

EPA Climate Ready Estuaries. Rolling Easements Primer. 2011. This is a comprehensive primer on rolling easements to address changing resource areas. Chapters include: What can a

rolling easement accomplish? Legal approaches to creating a rolling easement, Choosing the approach: is there legal authority; Advantages and disadvantages of rolling easements; Defining how it will work; Defining where to apply the rolling easement; Managing the rolling easement; and The Endgame: managing the transition. Available at: https://www.epa.gov/cre/climate-ready-estuaries-rolling-easements-primer . Also available through: https://toolkit.climate.gov/tool/rolling-easements-primer as well as the StormSmart Coasts Massachusetts website at: http://ma.stormsmart.org/2011/06/21/rolling-easements-finally-a-longterm-approach-for-rising-seas-and-coastal-erosion/ and the Wetlands Watch website below : http://wetlandswatch.org/rolling-easement/ .

MA CZM. 2011. Rolling easements: finally, a long-term approach for rising seas and coastal erosion? As part of MA CZM's StormSmart Coasts Program, CZM's NOAA Coastal Fellow Wes Shaw provided a review of EPA's report on "Rolling Easements" (see above).

Wetlands Watch. Rolling easements. Wetlands Watch is an NGO based in Virginia, formed to protect wetlands through advocacy, policy and outreach aimed at influencing land use policies and regulatory decisions. Their webpage summarizes rolling easements or similar approaches in four states: Maine, Texas, Hawaii (Maui and Kauai Counties, see below) and North Carolina (see below), as well as a concept for a Shoreline Adaptation Land Trust (SALT). This webpage also references the EPA document on rolling easements. Available at: http://wetlandswatch.org/rolling-easement/ .

O'Donnell, T. Rolling easements: a flexible solution. University of Canberra. Available at: http://www.coastalconference.com/2014/papers2014/Tayanah%20O%27Donnell%20Full%20Paper.pdf .

Texas A&M University, Rolling Easements. Available at: https://coastalresilience.tamu.edu/home/wetland-protection/adapting-to-sea-level-rise-under-existing-policy-frameworks-for-wetland-protection/enabling-wetland-migration/a-bay-side-rolling-easement-to-insure-wetland-migration/ .

Texas Open Beaches Act and Rolling Easements. Texas protects public access to the beach through an easement that is intended to migrate as the shoreline migrates. The law may have been weakened in recent years. Available at: https://coastalresilience.tamu.edu/home/wetland-protection/policy-framework/bay-and-ocean-side-submerged-lands-some-fundamental-differences-in-law-and-management/the-texas-open-beaches-act-an-exceptional-example-of-a-rolling-easement/ .

Ginno, C. 2017. DO mess with Texas? Why rolling easements may provide a solution to the loss of public beaches due to climate change-induced landward coastal migration. UC San Diego School of Law. Posted at: http://digital.sandiego.edu/cgi/viewcontent.cgi?article=1075&context=jcel .

7. EROSION-BASED SETBACKS: This is one type of rolling easement that uses setbacks from coastal resources that are determined based on the local rate of erosion. This approach may

be useful for a model bylaw that takes into account the local erosion rate. Several examples are described below.

- **State of Hawaii:** Several counties in Hawaii (Maui, Kauai) have had erosion-based setback regulations in effect since 2003-2004. These refer to scientific studies of local sea level rise and climate change impacts by University of Hawaii climate scientists. These regulations, policies, studies, plans and tools are listed below:

    - **Maui County, Hawaii. Three approaches for sea level rise adaptation.** The three approaches include restoring and protecting coastal dunes, updating erosion-based shoreline setbacks, and planning for post-disaster reconstruction. The original erosion-based setback rules were adopted in 2003; the update is based on a new statistical methodology for reporting the rate of beach erosion. The new formula would "increase the considered lifetime of a structure by which the erosion rate is multiplied, increase the minimum setback to account for episodic events, and add a buffer for accelerated sea level rise. The formula would increase the setbacks on most parcels compared to the existing setbacks". Posted at: https://climateadaptation.hawaii.gov/wp-content/uploads/2016/06/Maui-County-SLR-Story-Final.pdf .

    - **Maui County, Hawaii. Shoreline Setbacks.** Maui's erosion-based setback is based on the local annual erosion rate multiplied by 50 years (average lifetime of a structure) with an added 25 feet. See the Planning Department webpage at: https://www.mauicounty.gov/697/Shoreline-Setback-Area-Limitations . This contains rules, application packages, variance application package, and other information on the Maui County Shoreline Setback Rule.

    - **Kauai County, Hawaii.** See https://www.kauai.gov/Government/Departments-Agencies/Planning-Department/Shoreline-Setback . Also see PDF of webpage, application forms.

    - **State of Hawaii Coastal Zone Management.** Maui County Planning Department staff said that the state's CZM act provides the implementing authority for the Maui and Kauai erosion-based setback regulations. See website at: http://planning.hawaii.gov/czm/ .

    - **State of Hawaii Climate Change Adaptation Planning.** See http://planning.hawaii.gov/czm/initiatives/adapting-to-climate-change-2/ .

    - **Hawaii Sea Level Rise Viewer.** At: http://www.pacioos.hawaii.edu/shoreline/slr-hawaii/ .

    - **City and County of Honolulu, Office of the Mayor.** The Honolulu Mayor recently issued a Directive to adopt the Hawaii Climate Change Commission report. At: https://www.resilientoahu.org/pressconference071618/ .

  - **City and County of Honolulu, Office of Climate Change, Sustainability and Resiliency.** At: https://www.resilientoahu.org/about-the-commission/ .

- **North Carolina:** North Carolina's erosion-based setback law, in place since 1979, is said to be one of the best-known examples of erosion-based setback regulations. Their setback is based on the size of the structure and the rate of shoreline change. See https://deq.nc.gov/about/divisions/coastal-management/coastal-management-oceanfront-shorelines/oceanfront-construction-setback-erosion-rate .

- **South Carolina:** South Carolina has a beach setback rule to prevent building on beaches, but has been attempting to pass an erosion-based setback rule since the late 1980s. This last Spring, see https://www.postandcourier.com/news/south-carolina-legislators-pass-compromise-beach-setback-rules/article_06765d64-43df-11e8-b0a1-cfbc0a0cc69b.html

8. PROGRAMS FOR CLIMATE CHANGE ADAPTATION AND COASTAL RESILIENCE

Massachusetts

Massachusetts Office of Coastal Zone Management (CZM), Storm Smart Coasts Program. The StormSmart Coasts Program provides information, strategies, and tools to help communities and people working and living on the coast to address the challenges of erosion, flooding, storms, sea level rise, and other climate change impacts. The program also promotes effective management of coastal landforms, such as beaches and dunes. Topics include Overview and Index-Tools for Local Officials and Homeowners; Shoreline Change Project (historic shoreline and rates of erosion); coastal resilience grants; Coastal Manual – Applying the Massachusetts Wetland Coastal Wetland Regulations; Massachusetts Sea Level Rise and Coastal Flooding Viewer; and CZM StormSmart Coasts Publications. The Webpage is located at: https://www.mass.gov/stormsmart-coasts-program . The Shoreline Change Project provides historic rates of shoreline change, maps of historic shorelines, and detailed transects of erosion rates along the shore. Such information will be useful for the Wellfleet model bylaw.

Massachusetts Municipal Vulnerability Preparedness (MVP) program. 2016.
In 2016 the Governor signed Executive Order 569: An Integrated Climate Change Strategy for the Commonwealth, with the goals of reducing greenhouse gases to combat climate change and preparing for the impacts of climate change through the following actions: State Adaptation Planning, Agency Vulnerability Assessments, Municipal Support, and Climate Coordinators. The 2018 Environmental Bond Bill codified EO 569 and provided funding for climate change resilience and adaptation. The MVP program will provide grants for communities to identify vulnerabilities and actions. Planning, inter-agency coordination and integration, and use of nature-based solutions are key. MVP program information is available at: https://www.mass.gov/municipal-vulnerability-preparedness-mvp-program . The MVP Toolbox is available at: https://www.mass.gov/service-details/ensuring-success-webinars-municipal-vulnerability-preparedness-mvp-programs-tool . As part of the MVP program, The Nature

Conservancy prepared a Powerpoint presentation on "Natural and Nature-Based Solutions for Vulnerability Reduction and Resilience".

Rhode Island

State law requires planning board and commission members to take six trainings:
"*NEW Mandatory Education for Planning Boards/Commissions:*
In 2017, a new provision (see Public Law Chapter 403) was added to RIGL §45-22-7. of the Rhode Island General Laws. This portion of State Law describes the powers and duties of a planning board or commission. The new provision (j) requires that each member of a planning board or commission must participate in training and education classes concerning the effects of development in a flood plain and the effects of sea-level rise once every two years. Each member must complete two hours of training by September 30, 2019 and file with the municipal clerk a statement asserting that the training has been completed. A sample "Statement of Completion" is included in a Planning Guidance: New Mandatory Education for Planning Boards/Commissions from the Division of Statewide Planning.
In order to meet this requirement, planning board/commission members can watch six educational modules regarding making informed choices for supporting resilience to the impacts from climate change. Access all six training modules called PREP-RI. In addition, members are strongly encouraged to review or watch the additional resources listed below to round out the 2-hour training requirement." Available at: http://climatechange.ri.gov/cities-towns/toolkits-guidance.php .

Rhode Island Resources, provided by RI.gov online (downloaded to APCC file):

- **Achieving Resilience in Coastal Communities** (2014) http://climatechange.ri.gov/documents/achieving-resilience-in-coastal-communities.pdf - produced by RESTORE the Mississippi River Delta and National Wildlife Federation – in particular, see appendix C that deals with "legal issues associated with non-structural mitigation." Key Legal Issues….. "These examples underscore the basic point of this paper: governments will not necessarily be sued for diligent efforts to protect people. In fact, governments may be sued if their actions are not found to be diligent enough."

- **Climate Change and Emergency Management: Adaptation Planning** by Edward A. Thomas and Terri Turner, 2010. A legal discussion about regulating against development in the flood plain. They question whether the courts will uphold same regulations based on "climate change"
(URL: https://www.americanbar.org/content/dam/aba/publications/state_and_local_law_news/sl_34_3_thomas_turner.authcheckdam.pdf) .

- **20 Good Ideas for Promoting Climate Resilience - Opportunities for State and Local Governments** (July 2014) http://climatechange.ri.gov/documents/20-good-ideas-for-promoting-climate-resilience.pdf In particular, see "Integrating Climate Change into Laws" #11 – 15 .

9. VEGETATED BUFFER ZONES

Hardesty, P. and C. Kuhns. 1998. The Buffer Handbook: a guide to creating vegetated buffers for lakeshore development. EPA Boston and Maine provided funding for development of this buffer manual for lakes. Posted at:
https://www.maine.gov/dep/land/watershed/buffhandbook.pdf

NRCS webpage on "conservation buffers". Available at:
https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/home/?cid=nrcs143_023568

Buffers and vegetative filter strips: As it relates to agricultural runoff, but findings wrt to pollution and sedimentation relevant. *Buffers have been found to be most effective in trapping particulate pollutants. In addition, the export of soluble pollutants is expected to decrease when infiltration is maximized…one of the primary functions of buffers is to slow surface water movement which reduces the export of pollutants, particularly particulate pollutants, and narrow strips of dense grass can function in this capacity and provide water quality benefits (Dabney et al. 2006). Research has shown buffers to be most effective in trapping particulate pollutants but they also are beneficial in reducing the export of soluble pollutants. So, buffers are expected to reduce concentrations of nitrogen, phosphorus, and sediment in surface water runoff. Buffers would be expected to have a positive effect on soil and wildlife resources.* Available at:
https://www.epa.gov/sites/production/files/2015-07/documents/2006_8_24_msbasin_symposia_ia_session4-2.pdf .

Vermont, Floodplain and Riparian Corridor Protection:
https://dec.vermont.gov/watershed/rivers/river-corridor-and-floodplain-protection/protection .

10. SCIENTIFIC REPORTS AND PUBLICATIONS

Cape Cod National Seashore. January 2018. Herring River Tidal Estuary Restoraton Project. https://www.nps.gov/caco/learn/nature/herring-river-tidal-restoration-project.htm .

Frumhoff, P.C., J.J. McCarthy, J.M. Melillo, S.C. Moser, and D.J. Wuebbles. 2007. Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions. Synthesis report of the Northeast Climate Impacts Assessment (NECIA). Cambridge, MA: Union of Concerned Scientists (UCS). http://www.northeastclimateimpacts.org/

Gade, M. October 2012. "Sea level rise accelerating on U.S. Atlantic coast"
http://soundwaves.usgs.gov/2012/10/research.html .

Giese, G.S., M. Borelli, S.T. Mague, P. Barger, and S. McFarland. 2018. Assessment of the century-scale sediment budget for the Eastham and Wellfleet coasts of Cape Cod Bay. Utilizes a new and important method of determining the net sediment budget along the shoreline, which can be used to predict whether beach nourishment is needed or not and to help assess chances of success. Posted at:. https://www.eastham-ma.gov/sites/easthamma/files/pages/task_07_eastham-wellfleet_czm-report-final_1.pdf .

Intergovernmental Panel on Climate Change (IPCC). The IPCC is the leading international body for assessment of climate change and climate change impacts. It was established by the United Nations and the World Meteorological Organization in 1988 to provide the world with a clear scientific view on the current state of knowledge in climate change and the potential environmental and socio-economic impacts. The IPCC reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change. See the IPCC website at: http://www.ipcc.ch .
Massachusetts Coastal Erosion Commission report. 2015. Posted at: https://www.mass.gov/files/documents/2016/12/vl/cec-final-report-dec2015-v1.pdf .

MA Office of Coastal Zone Management, StormSmart Coasts website at http://www.mass.gov/czm/stormsmart/ .

MA Shoreline Change Project website at: https://www.mass.gov/service-details/massachusetts-shoreline-change-project .

Masterson, J.P. and Walter, D.A. 2009. Hydrogeology and groundwater resources of the coastal aquifers of Southeastern Massachusetts. USGS Circular 1338. http://pubs.usgs.gov/circ/circ1338/.

Masterson, J.P. 2004. Simulated interaction between freshwater and saltwater and effects of groundwater pumping and sea-level change, Lower Cape Cod aquifer system, Massachusetts. USGS Scientific Investigations Report 2004-5014. http://pubs.usgs.gov/sir/2004/5014/ .

Masterson, J.P., and Portnoy, J.W. 2005. Potential changes in ground-water flow and their effects on the ecology and water resources of the Cape Cod National Seashore, Massachusetts: USGS General Information Product 13. http://pubs.usgs.gov/gip/2005/13/ .

Northeast Climate Adaptation Science Center. The NECASC is a consortium of eight universities (Climate Change Adaptation Centers) and the USGS, and is part of a federal network formed to work with natural and cultural resource managers to gather the scientific information and build the tools needed to help fish, wildlife, and ecosystems adapt to the impacts of climate change. It is the Commonwealth's source of scientific information on climate change, adaptation and resilience, and is utilized by the MA Municipal Vulnerability Preparedness (MVP) program. https://necsc.umass.edu .

John Portnoy. 2003. Past and present management of the Herring River estuary. Posted at: http://www.wellfleet-ma.gov/sites/wellfleetma/files/file/file/briefing.pdf .

Sallenger, A.H., Jr., Doran, K.S., and Howd, P.A. 2012. Hotspot of accelerated sea-level rise on the Atlantic coast of North America. Nature Climate Change, online June 24, 2012.

Thieler, R., E. Schwarzmann, J. Tucker, R. Geier, J. Wilber, and J. Muramoto. 2003. The Future of Falmouth's South Shore. 2003. A working group of coastal geologists and coastal managers evaluated causes of erosion and provided recommendations for policies, regulations

and planning. Posted at: http://www.falmouthmass.us/776/Coastal-Resiliency-Action-Committee .

Thieler, R., E. Schwarzmann, J. Tucker, R. Geier, J. Wilber, and J. Muramoto. 2010. The Future of Falmouth's Buzzards Bay Shore. 2010. Similar to the South Shore report above, but developed for the Buzzards Bay shoreline which differs from the South Shore due to a number of localized sediment transport cells. Posted at: http://www.falmouthmass.us/776/Coastal-Resiliency-Action-Committee .

Walter, D.A. T.D. McCobb, J.P, Masterson and M.N. Fienen. 2016. Potential effects of sea-level rise on the depth to saturated sediments of the Sagamore and Monomoy flow lenses on Cape Cod, Massachusetts. USGS Scientific Investigations Report 2016-5058, available at: https://pubs.er.usgs.gov/publication/sir20165058 . This study, commissioned by the Association to Preserve Cape Cod, provided GIS-based modeling of the major groundwater aquifers of Cape Cod to evaluate effects of sea level rise on the water table, wetlands, stream discharge, and subsurface infrastructure (e.g., septic systems, foundations, roads, etc.). As in the older modeling of the Outer Cape, sea level rise is expected to cause the water table to rise from below, causing greater inundation of low-lying areas and potentially increasing stream flow in some areas.

11. "RESILIENT CAPE COD" TOOLKIT

The Cape Cod Commission obtained a NOAA Coastal Resilience grant to develop a coastal resilience tool to help communities to identify options for improving coastal resilience. As part of this project, APCC prepared an Adaptations Matrix identifying many different coastal resilience and coastal adaptation approaches. The Coastal Resilience Tool is available at: http://www.capecodcommission.org/index.php?id=631 .

The literature collected by APCC for the development of the Tool is provided below as Attachment 1. The entire list of references is included here. Some references may be useful for background information, scientific rationale, adaptation measures, tools or other uses. These are indicated by an asterisk (*).

Attachment 1. Cape Cod Commission's Coastal Resilience Tool Adaptation Strategies Resources Updated 1/10/2017 Association to Preserve Cape Cod

[1] Cost Analysis - The Costs of Restoration. (n.d.). Retrieved July 12, 2016, from http://www.edc.uri.edu/restoration/html/tech_sci/socio/costs.htm#salt

[2] Niedowski, N. L. (2000, December 1). New York State Salt Marsh Restoration and Monitoring Guidelines. Retrieved June 28, 2016, from http://www.habitat.noaa.gov/pdf/saltmarsh1.pdf

[3] NOAA Habitat Conservation | Featured Habitat of the Month. (n.d.). Retrieved June 09, 2016, from http://www.habitat.noaa.gov/abouthabitat/coastalwetlands.html

[4] Salt Marshes. (n.d.). Retrieved June 28, 2016, from http://restoration.gulfofmaine.org/projectplanning/saltmarsh.php

[5] Titus, J. (n.d.). Greenhouse Effect, Sea Level Rise, and Barrier Islands. Retrieved June 09, 2016, from http://papers.risingsea.net/NJ/CM.html

[6] Manage Flood Risk. (2016, March 10). Retrieved June 09, 2016, from https://www.epa.gov/green-infrastructure/manage-flood-risk *

[7] Dechert, S. (2015, February 02). New Climate Measure Restricts Floodplain Development. Retrieved June 09, 2016, from http://cleantechnica.com/2015/02/02/new-climate-measure-restricts-floodplain-development/ *

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[10] McAlinden, B. (2015, September 28). Managed Realignment at Medmerry, Sussex. Retrieved June 29, 2016, from https://www.ice.org.uk/disciplines-and-resources/case-studies/managed-realignment-at-medmerry-sussex . *

[11] Siders, A. (2013, October). Managed Coastal Retreat: A Legal Handbook on Shifting Development Away from Vulnerable Areas. Retrieved June 29, 2016, from https://web.law.columbia.edu/sites/default/files/microsites/climate-change/files/Publications/Fellows/ManagedCoastalRetreat_FINAL_Oct 30.pdf . *

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[14] Frequently Asked Questions About Conservation Restrictions. (n.d.). Retrieved July 15, 2016, from http://www.ecga.org/docs/MassWoods_FAQ_about_CRs.pdf . Page not found..

[15] Grannis, J. (2011, October). Adaptation Tool Kit: Sea-Level Rise and Coastal Land Use. Retrieved July 5, 2016, from http://www.georgetownclimate.org/files/Adaptation_Tool_Kit_SLR.pdf .

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[18] Titus, J. G. (2011, June). Rolling Easements. Retrieved July 5, 2016, from https://www.epa.gov/sites/production/files/documents/rollingeasementsprimer.pdf . *

[19] Evaluation of Erosion Mitigation Alternatives for Southern Monterey Bay. (2012, May 30). Retrieved July 18, 2016, from http://montereybay.noaa.gov/research/techreports/esapwa2012.pdf . Not found.

[20] Smart Growth / Smart Energy Toolkit - Transfer of Development Rights (TDR). (n.d.). Retrieved July 19, 2016, from http://www.mass.gov/envir/smart_growth_toolkit/pages/mod-tdr.html. *

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Task 2C. Gap Analysis of Priorities Identified by the Conservation Commission

Summary: For the Gap Analysis, APCC used a checklist approach to identify potential gaps. The Commission's list of priorities dated 9/11/18 was one of two documents which were checked (see below). The second document which we checked for gaps was APCC's recommendations dated 11/19/18.

Note: Conservation Commission text is in black, APCC responses are in red font).

1) Comments on Draft DLTA minutes for discussion at Sept. 5 meeting, dated 9/11/18
We should stay focused on the idea that we want a Model Conservation Bylaw for Climate Change Adaptation. Although we have identified items broader than that, which also have merit."

Response: APCC has focused on addressing climate change adaptation and resilience in our proposed changes to the Bylaw. We noted, however, that there are sections of the existing Bylaw which could be revised to support and strengthen the ability of the Conservation Commission to regulate climate change adaptation and resilience.

Edits – under Education and incentives – **technical assistance** was received from Schoodic Institute (not a grant)
Hillary and I put level of importance to the issues:

H- Rising groundwater will cause freshwater wetlands to expand

Response: See Article 2 (Definitions for "Alter", "Impacts of Climate Change", "Special Transitional Areas") and Article 11 ("Climate Change Resilience").

New issue: H – Migrating shoreline. Neither bay or ocean shoreline are static, need to address SLR and SLR with storm surge and potential effects on erosion rates, mean and king tides, and 100-year coastal flooding in mind. We need to allow for wetlands/salt marsh to migrate upland.

Response: See Article 2, definitions added for "Special Transitional Areas" and Article 11.

We've discussed having applicants be required to show us future conditions on their submissions. A few ideas have been floated for new areas to be delineated, such as: if property is on Atlantic side, map CZM 30-year MORIS short term shoreline change line to define short-term change; and, if property is on bayside, use LIMWA projection or some other parameter that can be easily located. But, we'd like to explore this more through this DLTA project.

Response: At a recent conference in Rhode Island on "Legal Approaches to Climate Change Adaptation", speakers said that based on case law, there appears to be a growing acceptance by courts of scientific studies and predictions of future conditions as the basis for regulation. The Rhode Island Sea Grant staff are said to have calculated and mapped setbacks needed to address future sea level rise but the maps have not been published, so this needs to be confirmed. Counties in the state of Hawaii (Maui, Kauai) have already adopted erosion-based setbacks based

on best available science, and they are considered the most progressive regulations so they will bear watching for developments.

Also, we'll need some parameters for living shoreline, dune building, elevated structures, stormwater bioretention and any other soft solutions.

Response: APCC feels that parameters for such projects should be provided in implementing regulations (which are promulgated by the Conservation Commission) rather than the Bylaw. This will enable the Conservation Commission to easily revise such parameters as new information becomes available.

And, what about hotspots/ areas of particular vulnerability? Differing circumstances in velocity zone vs. A zone regarding activities, fill, etc.

Response: APCC feels that these are best regulated through the implementing regulations rather than the bylaw.

H – Buffer strip and development

Response: See Article 2, definition for "Bordering" that includes buffer strip, definition for "Cumulative effect", and Article 11.

Add – **M - Extent of allowable disturbance** in the buffer zone is also an issue we'd like some guidance on. We have 3,000 (in 2.01 4.d.1.a.) and 5,000 square feet of disturbance (in 4.1.d.1.a.iv.b.) parameters in our regulations; this is not scaled based on lot size/extent of resource area within lot.

Response: This may be better addressed by a zoning bylaw concerning lot coverage. If so, it is a gap not addressed by this project.

M – Coastal armoring

Response: Our understanding of the Commission's concerns about coastal armoring include the following:

1) Permitting of new armoring on properties developed prior to 1978;
2) Permitting repair, replacement or expansion of existing coastal armoring;
3) Removal of coastal armoring that is damaging resource area values;
4) Requiring applicants to consider landward retreat as a preferred solution over new or expanded coastal armoring;
5) Regulating beach nourishment as an ongoing requirement for mitigation of coastal armoring projects.

With regard to the first three, our information collection process included interviewing wetland regulators (DEP, other conservation agents). The Cape Cod Commission also conducted legal research. This information indicates the following:

- Known examples of removal of coastal armoring in DEP Southeast Region are for municipal projects where managed retreat was necessary to avoid further damage. These include some examples on Cape Cod and Martha's Vineyard.
- The Conservation Commission can deny a project under their Bylaw provided the performance standards that are not met by the project are stricter than the state Wetlands Protection Act (substantive denial), or the application was lacking required information needed to assess the project (procedural denial). Our suggested edits to the Bylaw strengthen the ability of the Conservation Commission to deny a project based on substantive and procedural grounds.
- For a robust permit that can withstand appeals, it is important to include relevant findings that support the decision, which are based on factual information.
- Consider pros and cons of adopting a measure which prohibits new or expanded armoring.

With regard to requiring applicants to take managed retreat into consideration, our suggested Bylaw includes definitions of Special Transition Zones that should enable the Conservation Commission to adopt implementing regulations that will require the applicant to apply a suitable buffer strip based on estimation of risk from erosion or sea level rise or other climate change impact. For an example, see the erosion setback regulations adopted by the Counties of Maui and Kauai in the state of Hawaii; also the Falmouth Wetland Regulations contain relevant language that can serve as an example. The details should be specified in the implementing regulations.

With regard to requiring ongoing beach nourishment as mitigation for permitted coastal armoring, we feel that this can be conditioned in the permit provided that findings are made that support the need for ongoing beach nourishment and enough specifics are provided (e.g., specifying a schedule for ongoing monitoring by Commission staff, consequences of not following through with beach nourishment, allowing for change, etc.). The need for ongoing beach nourishment is likely best supported by technical studies of sediment transport and sediment budgets that lead to recommendations and/or management plans that are adopted by the Town. Citing such studies would strengthen the ability of the Commission to regulate this issue.

This is a complex topic about which concerns are widespread. We recommend revisiting this topic in several years to see if there have been advances in law, policy or science.

M – Protecting restricted tidal wetlands

Response: See the following additions (underlined words indicate additions to the existing Bylaw):

Article 1 (Purpose, resource area values):

- Water quality, including water pollution control;
- Coastal and stormwater flood control;
- Storm damage prevention, including coastal storm flowage;
- Flood conveyance and storage;
- Adaptation to climate change.

Article 2 (Definitions): Adaptation;

- Bordering: adding 100' to the edge of any wetland or within the water elevation of the 500-year storm event;
- Coastal storm flowage;
- Coastal wetlands;
- Green infrastructure projects;
- Nature-based solutions;
- Resilience;
- Special Transitional Areas (this is a particularly important definition with respect to allowing salt marshes and other resource areas to migrate in response to rising sea level and other climate change effects such as rising groundwater);

Article 11 (Climate Change Resilience"): Conservation Commission must consider a project's adaptation to climate change impacts by considering and prioritizing:

- Restoration or enhancement of marsh or other wetland systems by adaptive management of elevations or water distributon;
- Paragraph beginning with "Those portions of coastdal floodplains which are immediately landward of salt marshes, etc. require special protection, are likely to be in a state of transition, etc.".

L – Rare species habitat protection

Response: See Article 1 (Purpose, resource area values).

L – Vista pruning impacts

Response: See Article 2 (Definitions for "Activity" and "destruction, extensive trimming (defined as 20% or more of limbs or growth, or removal of native or beneficial plant life, vegetation or trees"). Note that 20% is a number carried over from the proposed Boston ordinance so the Commission may want to consider what number is appropriate for Wellfleet.

L – Use of chemicals

Response: See Article 2 (Definitions).

Hot spots in town – for coastal flooding – Commercial Street, Route 6 at Blackfish Creek

Response: Although we addressed coastal flooding through changes in Article 1 (resource area values), Article 2 (Definitions for Bordering, Coastal Storm Flowage, Flood Control, Impacts of Climate Change, Land Subject to Flooding or Inundation, and Article 11 or 12, we did not consider hot spots per se. Would the Commission treat hot spots in a different manner?

Funding for this project is provided by the Department of Housing and Community Development's District Local Technical Assistance program through the Cape Cod Commission

Task 2C. Gap Analysis of Recommendations provided by APCC

Summary: For the Gap Analysis, APCC used a checklist approach to identify potential gaps. The Commission's list of priorities dated 9/11/18 was one of two documents which were checked. The second document which we checked for gaps was APCC's recommendations dated 11/19/18 and revised 12/15/18 (see below).

Note: Conservation Commission text is in black, APCC responses are in red font).

VIA EMAIL

November 19, 2018

Hillary Greenberg-Lemos
Health and Conservation Agent
Town Hall
300 Main Street
Wellfleet, MA 02667

Re: Town of Wellfleet model bylaw for climate change adaptation:
Recommendations for next steps: drafting a model bylaw

Dear Hillary:

This letter describes APCC's preliminary recommendations for drafting a model conservation bylaw for climate change adaptation ("Model Bylaw"). We feel that these steps can be taken even as Task 2 (interviews, information collection and gap analysis) is finalized.

Recommendations for changes to the Wellfleet Environmental Protection Bylaw:

Consider the following changes to the Wellfleet Environmental Protection Bylaw ("existing bylaw") to enable the Conservation Commission to regulate adaptation measures:

1) Modify the existing bylaw rather than replacing it. Response: Done.

2) Add additional environmental values or interests. For examples, see the proposed Boston wetlands bylaw and the Chatham and Falmouth wetlands bylaws. Example:

    - Public safety (Boston); Response: Done
    - Adaptation to climate change (Boston); Response: Done.

- Special protected area (e.g., Black Beach/Great Sippewissett Salt Marsh District of Critical Planning Concern, Falmouth); Response: Not done; instead, added a definition for "Special Transitional Areas".
- Aesthetics (various examples); Response: Not done.
- Public access to water. Response: done (public access).

3) Add a paragraph stating that the Bylaw utilizes Home Rule authority (see Boston example). Response: Done.

4) Review the existing resource areas and add additional resource areas (see the Boston, Chatham and Falmouth bylaws for examples, especially the migration zone and special transitional areas (Boston). Consider adding other resource areas (e.g., 200-foot Riverfront area). Decide whether to designate special protected areas as resource areas, DCPC, ACEC, whether by name or more generally. Response: Done.

5) Decide whether flooded areas (e.g., Land Subject to Coastal Storm Flowage, Bordering Land Subject to Flooding, Isolated Land Subject to Flooding) should have a 100-foot buffer zone or less or none at all. Response: clarification is needed regarding whether the existing bylaw has a buffer zone to flooded areas or not.

6) Using the erosion-based setback regulations from Hawaii as examples, develop a buffer strip "setback" from the boundaries of resource areas (e.g., coastal bank, coastal beach, coastal dune, wetland, etc.) that takes into account future predicted change (or past change if no better information is yet available). An example of past change is the CZM Shoreline Change map, or FEMA floodplain maps. Decide how change will be defined. In the Hawaii example, the annual rate of erosion was used. Response: with the changes we have suggested to the Bylaw, the details of defining a setback may be best done under implementing regulations. This matter should continue to be explored as the Bylaw is finalized and implementing regulations are developed.

7) Specify that the climate change adaptation measures will be based on an adopted climate change scenario(s), to be determined by the Conservation Commission following suitable credible study or analysis by a climate change expert and presented at a public hearing, which can be changed by the Commission as needed to keep up with scientific advances, following the same process. The purpose of mentioning this in the Model Bylaw is to explicitly give the Commission the ability to specify the climate change scenario and to adapt to changes in climate change science. Response: The ConCom is given the ability to use best available information for its regulations.

8) In the Model Bylaw, refer to a body of credible scientific studies of past and future change that will serve as the basis for climate change adaptations. Specify

these in the regulations that will be developed following the Model Bylaw. Examples:

a. CZM Shoreline Change project (past shoreline change);
b. Center for Coastal Studies study of critical flood pathway analysis (underway): looks at current flood hazard;
c. Potential inundation area for restoration projects;
d. Potential inundation area based on future sea level rise;
e. Future sea level rise scenarios (see Northeast Climate Change Center projections).
Response: After further consideration, APCC staff decided that the proposed revisions in the Model Bylaw that give the Commission the ability to use best available information are sufficient and flexible enough, and that the details can be specified in implementing regulations. The rationale is that best available information will continue to improve and change over time, and citing these in the regulations will enable updating of the regulations more easily than if they were cited in the Bylaw.

9) Include somewhere a rebuttable presumption for applications, e.g., these performance standards will apply unless the applicant can demonstrate that there is an alternative that protects the interests equally well. Response: See the existing Article 5.

10) Add a section that explicitly gives the Conservation Commission the authority to deny permission for activities when it deems such denial is necessary to preserve environmental quality, address interests, etc. (see Boston Section 6.03 for example). Response: See the existing Article 5.

11) Continue to develop and finalize the Model Bylaw in tandem with development of the implementing regulations. This is recommended to ensure that the Model Bylaw and implementing regulations are consistent. (added 12/15/18).

Recommendations relating to other plans, policies and regulations *

12) Develop implementing regulations and update existing regulations to follow the Model Bylaw.

13) Conduct the necessary scientific studies or collect existing studies that will serve as a basis for climate change adaptation regulations, policies and plans. Until these are conducted, either use best available science for developing regulations, or use a placeholder in the regulations. (Added 12/15/18): Example: conduct the sediment budget and transport studies needed to develop a Coastal Management Plan that specifies, among other needs, the need for maintenance of a resilient self-sustaining shoreline.

14) Develop a Management Plan for sensitive areas that identifies issues, locations, potential solutions, responsible parties, milestones, reporting, etc. Use the Management Plan as the vehicle for detailed management and protection of sensitive areas. The Management Plan will complement the Model Bylaw and the following regulations. See above.

15) Ensure that the Town's Local Comprehensive Plan for wetlands, open space, natural resources, and other bylaws and regulations are consistent with the final Model Bylaw.

16) Ensure that the Commission's process for reviewing projects referred to it under the Wellfleet Special Flood Hazard District Regulations is consistent with the Model Bylaw.

17) Open space planning and protection: work with land trusts and other open space partners to identify vulnerable areas that also offer natural resource value or value for climate change adaptation measures (e.g., planned migration) and to protect such areas.

18) Consider a zoning bylaw that allows for transfer of development rights from vulnerable areas to less vulnerable areas.

19) Consult with adjacent towns and the Cape Cod National Seashore to adopt coordinated adaptation measures.

20) Set up a working group or committee that routinely reviews the latest climate change science and regulations, plans, policies and other measures in order to identify whether these should be modified to reflect the latest science.

21) As the actual bylaw is written, additional recommendations may be forthcoming.

* Some of these are likely to be outside the scope of this contract.

Caveats and assumptions

Legal expertise will be needed to review the proposed Model Bylaw and provide suggestions. APCC assumes that the Conservation Commission will obtain such expertise. Alternatively, the Cape Cod Commission legal staff may be able to provide a review and suggestions.

We hope that these recommendations will be helpful. APCC staff are ready to begin work on the draft model bylaw.

Thank you. If you have any questions, please feel free to contact us.

Funding for this project is provided by the Department of Housing and Community Development's District Local Technical Assistance program through the Cape Cod Commission

WELLFLEET ENVIRONMENTAL PROTECTION BYLAW

AG 7/29/1986, 8/5/2010

Preamble

[*Recommend adding preamble to the bylaw.*]

Article 1. Purpose. The purpose of this bylaw is to protect the natural resources, flood prone areas, wetlands, and adjoining upland areas existing in the Town of Wellfleet from net loss of their function, value, or acreage by controlling activities and mitigating effects deemed by the Wellfleet Conservation Commission ("Conservation Commission" or "Commission") to have a significant or cumulative adverse effect upon protection of the following [*recommend changing existing "environmental values" to resource area values" here and throughout bylaw*] resource area values, including but not limited to, the following:

- public or private water supply
- groundwater supply and quality
- water quality, including water pollution control
- prevention of pollution
- coastal and stormwater flood control
- fisheries
- land containing shellfish and shellfish habitat
- storm damage prevention, including coastal storm flowage
- erosion and sedimentation control
- wildlife species and habitat, rare/unique plant and animal species and habitat
- scenic and recreational resources
- aquaculture
- public safety
- flood conveyance and storage
- adaptation to climate change

Collectively, these are the resource area values and interests resource area values protected by this bylaw.

[*Recommend adding definitions section to bylaw, including the following definitions relating to, or having some significance with regard to, climate change.*]

Article 2. Definitions. Except as otherwise provided in the bylaw or its regulations, the definitions of terms in the bylaw are the same as set forth in the WPA, MGL c 131, s. 40 and its Regulations, 310 CMR 10.00

Adaptation. Measures designed or intended to protect resource areas from the impacts of climate change and to protect the ability of resource areas to mitigate the impacts of climate change through providing the Resource Area Values protected by the bylaw.

Alter. To change the condition(s) of any area subject to protection by the bylaw including but limited to one or more of the following actions upon the resource areas protected by this bylaw:

i. filling, removing, excavating or dredging of soil, sand, gravel, or aggregate material of any kind;
ii. changing of pre-existing drainage characteristics, flushing characteristics, salinity distribution, sedimentation patterns, flow patterns, or flood storage retention areas;
iii. draining, disturbing, or lowering of the water level or water table;
iv. the dumping, discharging, or filling with any material which could degrade the water quality;
v. driving of pilings, erection of buildings or structures of any kind;
vi. placing of any object or obstruction whether or not it interferes with the flow of water;
vii. destruction of plant life, cutting, or removal of vegetation;
viii. changing of water temperature, biochemical oxygen demand, nutrient concentration or chemical concentration, or other natural characteristics of the receiving water;
ix. any activities, changes, or work which pollutes any stream or body of water;
x. application of pesticides and herbicides;
xi. any activity, change or work which adversely effects groundwater or drinking water supply;
xii. any incremental activity that has or may have a cumulative adverse effect on the Resource Area Values protected by the bylaw; or
xiii. changing the capacity of resource areas to respond to the impacts of climate change, including without limitation, changes in:
    (a) the timing, intensity and amount of precipitation,
    (b) temperatures,
    (c) intensity and/or frequency of storms, extreme weather events, and/or droughts.

Best Available Measures. The most up-to-date technology or the best designs, measures, data, or engineering practices that have been developed and that are commercially or readily available.

Best Management Practices. Technologies, designs, measures, data, or engineering practices that are in general use to protect the Resource Area Values of the bylaw.

Bordering. Any land within either of the following or the greater thereof:

i. one hundred (100) feet horizontally lateral from the edge of any marsh, freshwater wetland, vernal pool, wet meadow, bog, swamp, river, stream, creek, pond, reservoir, or lake; or

ii. within the maximum lateral extent of the water elevation of the statistical five hundred (500) year frequency storm as determined by best available measures.

Building. A combination of any materials, whether portable or fixed, temporary or permanent, having a roof enclosed within exterior walls or firewalls built to form a structure for the shelter of persons, animals, or property.

Coastal Storm Flowage. Land subject to any inundation caused by coastal storms up to and including that caused by the 500-year storm, surge of record, or storm of record, whichever is greater.

Cumulative Effect. An effect that is significant when considered in combination with other activities that have occurred, are going on simultaneously, or that are likely to occur, whether such other activities have occurred or are contemplated as a separate phase of the same project, or unrelated but reasonably foreseeable actions, including worsened effects of flooding or other climate change effects, or other development projects that are currently under construction, under review, or that may be expected to come forward.

Extreme Weather Event. Weather at the extremes of the historical distribution lying in the outermost ten percent (10%) of a place's history, including but not necessarily limited to droughts, high winds and microbursts, blizzards and ice storms, excessive precipitation, wildfires, tornadoes, and severe thunderstorms or hurricanes.

Flood Control. The prevention or reduction of flooding and flood damage, both as currently expected to occur and as projected to occur based on the best available data regarding the impacts of climate change.

Green Infrastructure. Projects and practices incorporating both/either the natural environment and/or engineered systems that provide or supplement natural processes or work in concert with natural systems to provide flood, fire, and/or drought risk reduction, and/or clean water/air benefits. Green infrastructure practices protect, restore, augment, or mimic ecological processes.

Green Infrastructure Projects. Include but are not limited to decentralized wastewater systems that infiltrate treated water; water reuse for other beneficial purposes; low impact development projects; the conservation, enhancement and restoration of natural landscape features that naturally filter and remove silt and pollution from surface waters, maintain or restore natural hydrologic cycles, minimize imperviousness in a watershed through preservation and restoration of natural landscape buffers such as forests, floodplains, wetlands and other natural systems and restoration of natural

stream channels; land acquisition and restoration projects that protect and filter drinking water supplies and buffer reservoirs; and the mitigation of risks of flooding and erosion using the restoration of saltmarsh, oyster reefs and eelgrass beds from sea-level rise, storm surges and extreme weather events, including the protection and restoration of natural coastal landscapes; provided, that green infrastructure projects may be stand-alone and shall also be used to complement built water management infrastructure technologies such as pipes, dikes and treatment facilities; and provided, further, that green infrastructure projects may include innovative technologies that further the mandates under the federal Clean Water Act.

Impacts of Climate Change. Include without limitation: extreme heat; the timing, frequency, intensity, and amount of precipitation and storm surges; rising sea levels; changes in groundwater; changes in wetlands and water levels; increased intensity and/or frequency of storm events or extreme weather events; and frequency, intensity, and duration of droughts.

Land Subject to Flooding or Inundation. The land within the estimated maximum lateral extent of flood water which will theoretically result from the statistical 500-year frequency storm. Said boundary must be determined by reference to the most recently available flood profile data prepared for the town of Wellfleet within which the work is proposed under the National Flood Insurance Program ("NFIP"). Where NFIP data are unavailable or deemed by the Commission to be outdated or inaccurate or not reflecting current or reasonably anticipated conditions, the boundary of said land must be based on the maximum lateral extent of flood water which has been observed or recorded, or other evidence presented and considered by the Commission. The Commission must give special consideration to the best available resources provided by the town of Wellfleet or other credible sources on expected conditions due to climate change. Said land also includes isolated areas which frequently or seasonably hold standing water; such areas may or may not be characterized by wetland vegetation or soil characteristics.

Nature-Based Solutions. Strategies that conserve, create, restore and employ natural resources to enhance climate adaptation, resilience, and mitigation. Nature-based solutions mimic natural processes or work in tandem with constructed engineering approaches to address natural hazards like flooding, erosion, drought, and heat islands. Nature-based solutions can also maintain healthy natural cycles to sequester and maintain carbon and other greenhouse gases.

Person. The term "person" as used in this bylaw includes any individual, group of individuals, association, partnership, corporation, company, business, organization, trust, estate, the Commonwealth or political subdivision thereof, including the Town of

Wellfleet, administrative agency, public or quasi-public corporation of body, or any other legal entity or its representative, agent or assigns.

Resilience. The ability to minimize the negative impacts of climate change; to build capability and ability of a resource area to minimize negative impacts of climate change.

Significant. Playing a discernable role. A resource area is significant to an interest identified in this bylaw or its regulations when it plays a role in the provisions or protection, as appropriate, of that interest, including by mitigating any adverse impacts of climate change in the provision or protection of that interest.

Special Transitional Areas. a) Coastal: Those portions of coastal floodplains which are immediately landward of salt marshes, coastal beaches, barrier beaches, coastal dunes or coastal banks and are likely to be in a state of transition due to climate and coastal changes, resulting in inundation of these areas further landward and/or migration of these areas further inland. As sea level rises, the shoreline may retreat as areas are successively inundated more frequently by storm and tidal activity. b) Freshwater: those portions of the buffer zone and floodplain to freshwater wetlands which are landward of ponds, streams, wetlands, and vernal pools which are likely to be in a state of transition due to climate change, resulting in inundation of these areas further landward. As groundwater or surface water levels rise, the wetland area may expand due to increased inundation. A Special Transitional Area may include all or part of the resource Buffer Zone, Riverfront Area, and No- Disturbance Area and in any case includes lands subject to 500-year flood (0.2 percent annual chance flood).

Storm Damage Prevention. The prevention of damage caused by water from storms, as currently occurs and is predicted by best available data to occur from the impacts of climate change, including but not limited to erosion and sedimentation, damage to vegetation, property or buildings or damage caused by flooding, waterborne debris or waterborne ice.

[*Recommending also including definitions of wildlife, wildlife habitat, and rare species to list of definitions.*]

Article 3. No person shall remove, fill, dredge or alter any fresh water wetland, coastal wetland, bank, beach, dune, flat, marsh, wet meadow, bog, swamp or any estuary, creek, river, stream, pond, lake or any land within 100 feet of the foregoing areas or any land under the ocean, land subject to tidal action or coastal storm flowage, land subject to flooding (bordering or isolated); or land in an Area of Critical Environmental Concern

with the exception of privately owned upland areas in the Bound Brook and Griffin Island areas which are not within the jurisdiction of the Massachusetts Wetlands Protection Act or the current jurisdiction of the Wellfleet Environmental By-law other than in the course of maintaining, repairing, or replacing (but not substantially changing or enlarging) an existing and lawfully located structure or facility used in the service of the public and used to provide electric, gas, water, telephone, telegraph and other telecommunication services, without filing written notice of his intention to so remove, fill, dredge or alter with the Conservation Commission of the Town of Wellfleet. Such Notice of Intent shall be sent by certified mail or be hand-delivered to the Commission at the Town Offices and shall include such plans as may be necessary to describe and clearly delineate all proposed activity, its relation to, and its effect on the above-named wetland resources. The same Notice, plans and specifications required to be filed by an applicant under Massachusetts General Laws, Chapter 131, Section 40, plus the parcel number and the assessor's, map number as kept in the Town Offices in Wellfleet may be accepted as fulfilling the requirements of the bylaws. The Commission, in its discretion, may hear any oral presentation under this bylaw at the same public hearing required to be held under the provisions of said Chapter 131, Section 40, of the Massachusetts General Laws. Upon the written request of any person, the Commission may make a Determination of Applicability of this bylaw to any work. Procedures in connection with such a Request for Determination shall be as provided in MGL C.131, S.40 and Regulations thereunder as applicable and in effect on the date of the filing of such Request. Definitions set forth in said chapter and section and the regulations in effect as of the date of this bylaw as issued by the Department of Environmental Protection thereunder, are hereby made a part of this bylaw.

The Commission and its agent may enter upon the land upon application of a notice of intention for purposes of reviewing and monitoring projects which the proposed work is to be done in response to a request for a prior determination of applicability of this bylaw or for the purpose of carrying out its duties under this bylaw, and may make or cause to be made such examination or survey as deemed necessary.

If any work subject to an Order of Conditions issued under this bylaw is not substantially completed within three (3) years from the date of issuance of said Order of Conditions, a new Notice of Intent must be filed, public hearing(s) held and the work re-conditioned or denied by the Commission as seems appropriate under the circumstance at the time. In lieu of the applicant filing a new Notice of Intent, the Commission may, after a request in writing and a public hearing before the three (3) year expiration date, allow an original Order of Conditions to be extended for a period not to exceed two (2) years.

Article 4. If the Conservation Commission has failed to hold a public hearing within twenty-one (21) days of filing a Notice of Intent under this bylaw, or if the Commission, after closing such a hearing has failed within twenty-one (21) days therefrom to issue an Order, or, if the Commission upon written request by any person to determine whether this bylaw is applicable to any work, fails within twenty-one (21) days from the filing of such request with the Commission to make any determination, the project must be deemed approved unless, the applicant requests or agrees to an extension beyond the

twenty-one (21) days. Any person aggrieved by the Commission's Order, determination of failure to act may appeal to Superior Court, Barnstable County, pursuant to the provisions of MGL C.249, S4. Filing of a Notice of Intent or a Request for Determination may be accomplished in the same manner as provided in MGL C. 131, S.40 and regulations thereunder, as may be applicable and in effect on the date of such filing, and must conform in all respects with any submission guidelines adopted by the Commission as part of its Regulations.

Article 5. The Conservation Commission is empowered to deny permission for any removal, dredging, filling, or altering within the areas subject to protection under this bylaw, regardless of any mitigation proposed, including creation of new wetlands, if in its judgment, such denial is necessary to preserve environmental quality of resources and area defined in Article 3 of this bylaw. The Conservation Commission is further empowered to deny a permit for failure to meet the requirements of this bylaw; for failure to submit necessary information and plans requested by the Conservation Commission; for failure to meet the design specifications, performance standards and other requirements in regulations of the Conservation Commission; for failure to avoid or prevent significant or cumulative effects upon the Resource Area Values protected by this bylaw; or where no conditions are adequate to protect those values, in its sole discretion as the issuing authority. The Commission may, as alternative to a denial, impose such conditions as it deems necessary to contribute to the protection and preservation of resources described in Article 3 and the values as listed in Article 1, in accordance with the purpose of this bylaw.

Article 6. **Emergencies.** The Notice required by Article 3 of the bylaw does not apply to emergency projects necessary for the protection of the health or safety of the citizens of the Town of Wellfleet and to be performed or ordered to be performed by an administrative agency of the Commonwealth or by the Town of Wellfleet. Emergency projects mean any projects certified to be an emergency by the Commissioner of the Department of Environmental Protection or by the Conservation Commission, or other authorized local officials. Removal, filling, dredging, or alteration authorized by such emergency certification must not extend beyond the time necessary to abate the emergency. The Commission is empowered to hold a post-emergency hearing in order to set conditions for any further remedial measures necessary.

Article 7. Security. The Conservation Commission may require the posting of a bond with surety, running to the municipality, and sufficient as to form and surety in the opinion of the Commission's Counsel, to secure faithful and satisfactory performance of the work required by any final Order of Conditions, in such sum and upon such conditions as the Commission may require. Other evidence of financial responsibility which is satisfactory to the Commission may be accepted in lieu of bonding. Notwithstanding the above, the amount of such bond shall not exceed 150% of the estimated cost of the work required or the restoration of affected lands and properties if the work is not performed as required, whichever is greater.

Article 8. Enforcement. Any person, who violates any provision of the bylaw, or of any

condition issued pursuant to it, shall be punished by a fine of not more than $200. Each day or portion thereof during which a violation continues shall constitute a separate offense. If more than one, each condition violated shall constitute a separate offense. This bylaw may be enforced pursuant to Massachusetts General Laws, Chapter 40, Section 21 (d) by the Conservation Commission through its agent. Upon request of the Conservation Commission, the Board of Selectmen and Town Counsel shall take such legal action as may be necessary to enforce this bylaw and orders issued pursuant to it.

Article 9. Regulations. The Conservation Commission is empowered thereunder to promulgate and to amend, from time to time, after public notice and hearing, such Regulations as are deemed necessary by it to implement the purpose of this bylaw, whether or not identical to the requirements of MGL C. 131, S. 40. Such Regulations must not be deemed to be invalid because they are not identical with MGL C.131, S.40, and regulations thereunder, as long as no direct conflict with MGL C. 131, S.40 is thereby created.

Article 10. Severability. The invalidity of any section or provision of this bylaw must not invalidate any other section or provision thereof, nor invalidate any Order of determination which previously has been issued.

Article 11. Climate Change Resilience. The Conservation Commission must explicitly consider climate change resilience and impacts in the issuance or denial of any permit through measurement of potential adverse impacts to resource areas for the protection of resource areas both as they currently exist and as are reasonably expected to exist based on the best available data on the projected impacts of climate change.

In reviewing activities within the Buffer Zone and Special Transitional Area, the Commission must presume both zones are important to the protection of other resource areas because activities undertaken in close proximity have a high likelihood of adverse impact, either immediately, as a consequence of construction, or over time, as a consequence of daily operation or existence of the activities. These adverse impacts from construction and use can include, without limitation, erosion, siltation, loss of groundwater recharge, poor water quality, loss of wildlife habitat, and limitation of the ability of the natural system, wetland, and/or salt marsh to migrate naturally in response to climate change. The Commission may establish, in its regulations, design specifications, performance standards, and other measures and safeguards, including setbacks, no-disturb areas, no-build areas, and other work limits for protection of such lands, including, without limitation, strips of continuous, undisturbed vegetative cover, unless the applicant convinces the Commission by a preponderance of the evidence that the area or part of it may be disturbed without harm to the values protected by the bylaw.

When Land Subject to Flooding or Inundation is significant to the interests of flood control and storm damage prevention, the following performance standards must apply:
(a) Any activity must not have an adverse effect by increasing the elevation or velocity of flood waters or by increasing flows due to a change in drainage or flowage characteristics (e.g. change in direction) on the subject site, adjacent properties, or any public or private way.

(b) Relative sea level rise and the landward migration of resource area in response to relative sea level rise must be incorporated into the design and construction of structures and other activities proposed in Land Subject to Flooding or Inundation. At a minimum, the lowest floor must be elevated 1 foot or higher above the base flood elevation in a FEMA-mapped AE-Zone, and setting the lowest horizontal structural member 2 feet or higher above the base flood elevation in a VE-Zone unless a higher elevation is determined by the Commission.

(c) Activities and their ancillary uses in FEMA Velocity zones which result in alterations to vegetative cover, interruptions in the supply of sediment to other wetland resources, and/or changes to the form or volume of a dune or beach that will have an adverse effect on said landform's ability to provide storm damage prevention and flood control are, therefore, prohibited. These activities include, but are not limited to, construction of: foundations other than open pilings or columns; new or proposed expansions of roads, driveways or parking lots, or impermeable paving for existing unpaved roads, driveways or parking lots; new or proposed expansions of coastal engineering structure.

(d) The following projects may be permitted and conditioned by the Commission, providing they adhere to the provisions of this bylaw: pedestrian walkways; resilient landscaping designed to increase wetland and marsh development and plantings compatible with natural vegetative cover; resource area enhancement or other forms of non-structural protection, restoration, nourishment, or improvement of the feature(s) intended to meet the goals enumerated in this bylaw.

Article 12. Climate Change Adaptation and Planning. The Applicant must, to the extent applicable as determined solely by the Commission, integrate climate change and adaptation planning considerations into their project to promote climate resilience to protect and promote Resource Area Values and functions into the future. These considerations include but are not limited to: sea level rise, increased heat waves, extreme precipitation events, stormwater runoff, groundwater levels, changing precipitation patterns and changes in coastal and stormwater flooding.

The Conservation Commission must consider a project's adaptation to potential climate change impacts by considering and prioritizing the following:

i. Design considerations to limit storm and flood damage during extended periods of disruption and flooding as might be expected in extreme weather events;
ii. Management and/or mitigation of project stormwater surface runoff, which may increase due to storm surges and extreme weather events, and how the project will prevent pollution (including nutrients from fertilizers, roadway runoff, etc.) from entering any resource area, and consideration of eliminating impervious surfaces as feasible;
iii. Implementation of project vegetation, planting, and landscaping plans and other measures to improve the resiliency of the wildlife habitat and resource area to

withstand climate change impacts and promote landscape and habitat connectivity;

iv. Restoration or enhancement of marsh or other wetland systems by adaptive management of elevations or water distribution;

v. Mitigation of the heat island effect;

vi. Protection of existing and proposed structures and reduction of damage to structures due to the impacts of climate change;

vii. Development of on-site green infrastructure and its effectiveness in relation to similar infrastructure or other stormwater control structures or systems already in existence;

viii. Ability of a project to withstand current climate risks as well as those reasonably expected and predicted to exist over the life of the project being permitted.

Those portions of coastal floodplains which are immediately landward of salt marshes, coastal beaches, barrier beaches, coastal dunes or coastal banks require special protection. These areas are likely to be in a state of transition as the entire complex of coastal wetland resources gradually moves landward due to rising sea levels along the coast of Massachusetts, resulting in inundation of more landward area. As sea levels rise, the shoreline may retreat and areas are successively inundated more frequently by storm and tidal activity. Activities carried out within these Special Transitional Areas of coastal floodplains may interfere with the natural landward migration of the adjacent coastal resource areas. Therefore, maintaining these special transitional areas in as much of their natural state as possible is necessary to protect the interests of other wetland resources. The Commission may at its discretion require that projects within the Special Transitional Areas seek a Notice of Determination of Applicability from the Commission for the project site and potential impacts to be reviewed.

Relative to stormwater management, work or activity specified in a Request for Determination of Applicability or an application for a permit and subject to the bylaw must meet, at a minimum, the best management practices for stormwater management as set forth in the Stormwater Management Standards of the Massachusetts Department of Environmental Protection. The Commission may in its sole discretion require the applicant to provide a runoff plan and calculations using the best available measures of precipitation frequency statistics and based on 500-year flood frequency event period. Calculations must show existing and proposed runoff conditions for comparative purposes and include a narrative on the proposed project's impact on the climate change resilience of the resource area.

The requirements of this section must be met commensurate with the nature, scope, and type of the proposed project or activity.

Article 13. Relation to the Wetlands Protection Act and Other Statutes. This

bylaw is adopted under the Home Rule Amendment of the Massachusetts Constitution and the Home Rule statutes, independent of the Wetlands Protection Act (M.G.L. c. 131, § 40) and regulations (310 CMR 10.00) thereunder, and other federal, state and local environmental statutes. Activities that may not require review or permitting under the Wetlands Protection Act, the Rivers Protection Act, or other federal, state or local statutes are not assumed to be exempt from this bylaw. It is the intention of this bylaw that the purposes, jurisdiction, authority, exemptions, regulations, specifications, standards, and other requirements must be interpreted and administered as stricter than those under the Wetlands Protection Act and regulations.