Adapting to the Rise

A Guide for Connecticut's Coastal Communities

The mission of The Nature Conservancy is to conserve the lands and waters on which all life depends. Our vision is to leave a sustainable world for future generations.

The Nature Conservancy in Connecticut

55 Church Street, Floor 3
New Haven, CT 06510-3029

The Nature Conservancy
Protecting nature. Preserving life.®

Table of Contents

Recommended Citation

Ambrette, B. and A. W. Whelchel. 2013. Adapting to the Rise: A Guide for Connecticut's Coastal Communities. The Nature Conservancy, Coastal Resilience Program. Publication 13-5, New Haven, CT.

Introduction

This guidebook is intended to provide town planners, city managers, municipal staff, elected officials, and concerned citizens with 1) a basic understanding of several areas of focus related to adapting to immediate and future flooding projections, 2) examples from communities that have adopted various adaptation strategies, and 3) links to resources and deeper background material. The first chapter provides a description of building codes for the coastal floodplain required by the National Flood Insurance Program. An evaluation of the codes' effectiveness is presented as well as recommended actions that municipalities can take to improve building survivability through reduced structural exposure. The second chapter introduces innovative zoning options that towns can implement to address long-term growth, resilience, and conservation. The third chapter provides details on enrollment in the Federal Emergency Management Agency's Community Rating System. This is perhaps the most significant initial step a town can take to improve overall resilience. The fourth chapter discusses various financing options for towns and incentives for developers to promote resilient development and "climate ready" communities. Readers are encouraged to follow the footnoted links to referenced documents, websites and other particularly informative and helpful resources.

A few resources deserve mention here for the breadth and depth of knowledge they contain. These will be of immense use to you in your community resilience efforts:

- The Georgetown Climate Center's Adaptation Clearinghouse has case studies, white papers, scientific papers, and strategy guides for adaptation to climate change. Its goal is to assist planners, policy makers, resource managers, and others who are working to help communities adapt to climate change.http://www.georgetownclimate.org/adaptation/clearinghouse

- The Climate Adaptation Knowledge Exchange which features many case studies, a virtual library, tools, and a directory of practitioners from across the nation. http://www.cakex.org/

- The NOAA Coastal Services Center report "*What Will Adaptation Cost? An Economic Framework for Coastal Community Infrastructure*" is a step-by-step guide for municipalities to begin to understand their risk, to estimate the costs of action and inaction, and to implement adaptation strategies. http://www.csc.noaa.gov/digitalcoast/publications/adaptation

The Nature Conservancy (www.nature.org) has also developed tools, visualizations (www.coastalresilience.org), case studies and a hazards and community resilience workshop series to assist coastal and inland communities comprehensively identifying vulnerabilities and strengths and prioritize actions to reduce risk and improve resilience. These tools and services are introduced here in this guidebook. For information on bringing these tools and services to your community, contact Dr. Adam Whelchel, the Director of Science for The Nature Conservancy in Connecticut (awhelchel@tnc.org, tel. (203) 568-6296).

Storm Sandy striking Middle Beach Road in Madison, CT.
© myrecordjournal.com.

Coastal Building Codes

The State of Connecticut adopts the International Code Council's building codes for residential buildings. These guidelines cover general planning and construction, materials and fastenings, mechanical and utility systems, venting and drainage, and so on.[1] For special flood hazard areas, FEMA's National Flood Insurance Program (NFIP) sets minimum building standards for flood risk reduction and flood damage prevention.[2] Local municipalities are encouraged to set more stringent building standards to adequately cope with peak events not seen since the Great New England Hurricane of 1938. Specific zoning ordinances for flood prone areas are a common approach to reducing risk to structures.

Flood Zones

FEMA defines the special flood hazard area (SFHA) as the area having a 1% probability of flooding of at least 1 foot in a given year. The SFHA is synonymous with the 100-year floodplain. Three zones fall within the special flood hazard area. Areas that are expected to be inundated by one foot or more of swiftly moving water or water with waves greater than 3 feet are designated as the V Zone (also known as the Coastal High Hazard Area). Areas that expect less than three feet of flooding and waves of less than 3 feet are designated A Zones. The Coastal A (or Coastal AE) Zone is a non-regulatory term for A Zone areas for which waves are between 1.5 and 3 feet and the primary cause of flooding is tidal, astronomical, or storm-related rather than riverine. NFIP building standards are identical for A and Coastal A zones. The base flood elevation (BFE) is the height of the 100-year flood surface including waves.

© FEMA

[1] http://publicecodes.cyberregs.com/icod/irc/2012/index.htm

[2] FEMA. 2011. Coastal Construction Manual: Principles and Practices of Planning, Siting, Designing, Constructing, and Maintaining Residential Buildings in Coastal Areas. 4th ed. http://www.fema.gov/library/viewRecord.do?id=1671

NFIP Building Standards

In the 100-year floodplain, structures that have been built or substantially improved after the adoption of flood insurance rate maps (FIRMs) in 1974 are required to comply with NFIP building standards. The standards regulate building elevation and foundation construction.

Elevation: The NFIP regulations require structures in V Zones to be elevated such that the bottom of the lowest horizontal structural member supporting the lowest floor is at or above the base flood elevation. In A Zones, however, it is the *top* surface of the lowest floor that must be constructed at or above the BFE. In all zones, mechanical equipment must be elevated above BFE, or, if below the BFE, must be designed to prevent floodwaters from entering or obstructing the system.

Freeboard: Freeboard is any extra elevation of the lower floor above the BFE that yields a margin of safety from floodwater and wave action. Freeboard is not required by NFIP but adding freeboard may reduce NFIP premiums. Some communities have adopted freeboard requirements for flood zones via their zoning regulations.

Foundations: Buildings in V Zones must be constructed such that the space below the BFE is open, allowing flood waters to enter and pass through with as little obstruction as possible. Pilings should be sunk deep enough to minimize the effects of scour and to provide lateral stability. Walls enclosing the area below the BFE are discouraged. However, where walls are desired, they must be slatted and/or be designed to breakaway under pressures of 20 pounds per square foot. Enclosed areas below the BFE may be cause for higher insurance premiums.

In A Zones, NFIP does not regulate the type of foundation that may be used. Piles or slab-on-fill are both permitted. Structures that are built on concrete foundations must be secured to the foundation so that they do not float away during flooding. Enclosures below the BFE are also permitted but must have openings that allow the entry and exit of floodwater. Non-residential structures may have enclosed floors below BFE if the walls and foundation are watertight.

Evaluation of NFIP Building Standards

In 2006, FEMA released its Evaluation of the National Flood Insurance Program Final Report. Included in the report was an analysis of the NFIP's building standards.[3] The study concluded that:

---

[3] Jones, C., Coulbourne, W., Marshall, J., and Rogers, S. Jr. 2006. *Evaluation of the National Flood Insurance Program's Building Standards, Prepared as part of the 2001-2006 Evaluation of the National Flood Insurance Program.* http://www.fema.gov/library/file?type=publishedFile&file=nfip_eval_building_standards.pdf &fileid=6d7fe0c0-ff08-11db-a1f1-000bdba87d5b

1) for the buildings analyzed, the cost of adding freeboard or installing a more flood-resistant foundation at the time of construction is modest but the benefit of doing so can be great, particularly in coastal areas subject to wave effects and riverine floodplains with small flood hazard factors; and

2) NFIP floodplain management regulations and flood insurance premium rates generally promote sound construction practices and reduce potential flood damages, but some changes are warranted to provide additional incentives for flood loss reduction and to eliminate disincentives.

Freeboard was found to be "one of the most effective means of reducing property losses." It provides protection against wave action and protection during floods that exceed the 100-year event intensity. Additionally, because the BFE represents only the present-day flood risk and does not consider future conditions resulting from sea level rise, freeboard provides an additional level of prudent protection against future flooding.

The study compared the construction costs of adding freeboard with the potential costs of damage to the structure and loss of its contents. It was determined that owners were justified in spending, at the time of construction, an additional 3-7% over the at-BFE building costs to gain 1 foot of freeboard. Owners were justified in spending an additional 6-14% to gain 4 feet of freeboard. The study did not consider insurance premium discounts or expenses incurred as a result of being unable to live in a damaged home; therefore, the justified costs of adding freeboard presented in the report are conservative estimates.

The study also made recommendations for improving the NFIP's building standards. However, municipalities need not wait for federal adoption of the recommendations. They can include the following recommendations in their local zoning ordinances:

- Require *at least* 1 foot of freeboard in all flood zones. The exact amount should be determined by anticipating future flooding conditions.

- Require Zone V construction standards for foundations in Coastal A Zones. Require non-enclosed, open space below BFE.

- Amend Coastal A Zone standards such that horizontal structural members of the lowest floor are required to be above the BFE.

In addition to adopting more stringent building codes, like those above, municipal governments are authorized to make other regulations for flood hazard areas including restrictions on floodway encroachment and restrictions on the size of the building (height, envelope and footprint). Municipal governments may also issue variances when, for example, elevating an existing structure would violate local height restrictions.

Examples

The Gulf Coast city of Waveland, Mississippi experienced 28 feet of storm surge and 55-foot waves during Hurricane Katrina. The surge extended approximately 6 miles inland and wiped away nearly every structure within one mile of the coast.[4] In order to reduce future storm damage, Waveland adopted its flood damage prevention ordinance in 2009.[5] The ordinance includes:

- V Zones require at least 1 foot of freeboard elevation for the lowest floor and mechanical systems.

- New construction must be located landward of the reach of mean high tide.

- Construction of new or substantially improved critical facilities must be located outside of the SFHA (100-year floodplain) or must be elevated at least 3 feet above BFE (approximately equivalent to the 500-year flood)

- In a SFHA, residential buildings may exceed height restrictions by no more than the distance between the lot elevation and the BFE.

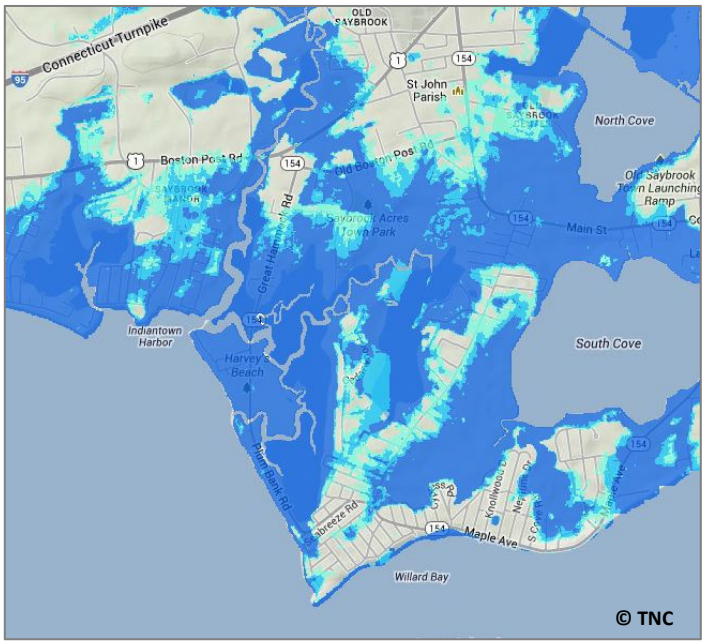
- Sanitary sewage and on-site waste disposal systems must be located and constructed to avoid contamination and discharge during flooding.

---

[4] National Hurricane Center. 2005 (Updated 2006 and 2011). *Tropical Cyclone Report: Hurricane Katrina*. http://www.nhc.noaa.gov/pdf/TCR-AL122005_Katrina.pdf

[5] City of Waveland, MS. *Flood Damage Prevention Ordinance Number 342*. http://www.georgetownclimate.org/sites/default/files/CITY%20OF%20WAVELAND%20ordinance%20342.pdf

In Connecticut, the Town of Old Saybrook amended its Flood Plain Management Ordinance[6] to extend the V Zone regulations into the Coastal AE Zone. New construction must now include 1 foot of freeboard for all buildings and structures in *both* the V Zone and the Coastal A Zone. New construction must also be located landward of the Connecticut Coastal Jurisdiction Line.[7] New critical facilities must be elevated or dry flood-proofed to at least 1 foot above the BFE. Existing standards in the ordinance already require construction on pilings and breakaway walls for enclosures below the BFE. The ordinance also includes specific procedures, considerations, and criteria for granting variances for hardships related to a parcel (not financial hardships).



Old Saybrook, Connecticut – Category 3 Hurricane (1938 simulation)

Coastal Resilience Tool

The Nature Conservancy's Coastal Resilience Tool (www.CoastalResilience.org) allows users to visualize the impacts of sea level rise at the parcel-level scale for the entire coast of Connecticut. The tool has projections for 2020, 2050, and 2080 under various downscaled sea level rise scenarios. In addition, users can add on storm surges for Category 2 and Category 3 hurricanes alongside social, economic and ecological information for their municipality.

---

[6] Town of Old Saybrook Flood Plain Management Ordinance: http://ecode360.com/8719128

[7] In 2012, Connecticut redefined the mean high tide line (MHW) as the Coastal Jurisdiction Line. For more information, see http://www.ct.gov/deep/cwp/view.asp?A=2705&Q=511544

Municipal Zoning Options for Coastal Areas

The effects of climate change and, in particular, sea level rise are already being observed along Connecticut's shoreline. Fortunately for municipal planners, there are adaptation options that coastal towns can implement under existing state and federal laws. A few options to be considered include more resilient building codes as already mentioned, zoning, property acquisitions or easements, and tax incentives.[8] This chapter will focus in particular on municipal zoning options. Later chapters will discuss acquisition and tax incentives.

Overlay Zoning

Overlay zones work in concert with existing zoning to apply an additional layer of regulation in areas that have special characteristics. Coastal overlays may prescribe future-flood informed building regulations such as setback, elevation, and freeboard requirements; building footprint and height restrictions; and construction requirements such as breakaway walls on floors below the base flood elevation.[9] The overlays may also set development densities or water-dependent use requirements to assist in coastal growth management and/or gradually move development out of high flood-risk areas. Overlays can also prioritize areas for conservation based on flood-buffering and natural infrastructure defense potential.

The Town of Greenwich, Connecticut has implemented a Coastal Overlay Zone intended, among other purposes, to "limit the potential impact of coastal flooding and erosion patterns on coastal development so as to minimize damage to and destruction of life and property and to reduce the necessity of public expenditure to protect future development from such hazards." Development projects within the zone require a Coastal Site Plan detailing the project's water-dependent activity and a "description of proposed methods to mitigate adverse effects on coastal resources."[10]

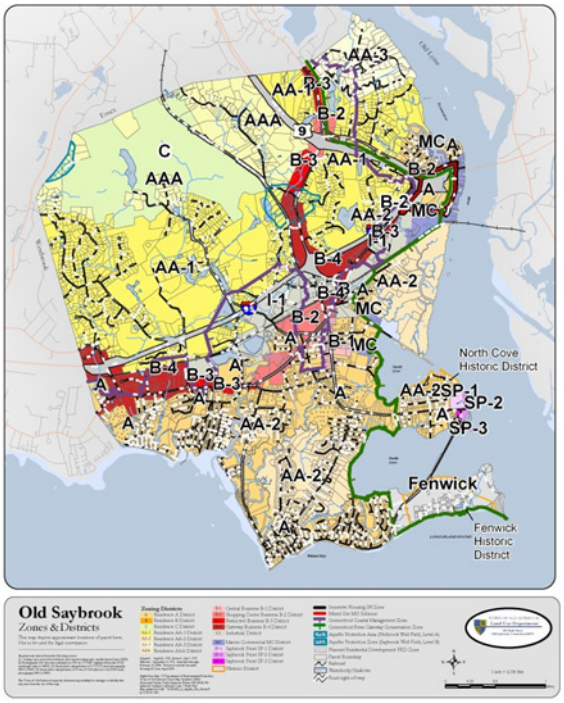
---

[8] A superb resource for planners who are exploring adaptation measures is the Georgetown Climate Center's Adaptation Toolkit: http://www.georgetownclimate.org/resources/adaptation-tool-kit-sea-level-rise-and-coastal-land-use

[9] For an example of flood zone construction requirements, see the City of Waveland, Mississippi Flood Damage Prevention Ordnance Number 342, Section E. Coastal High Hazard Areas, p.18: http://www.georgetownclimate.org/sites/default/files/CITY%20OF%20WAVELAND%20ordinance%20342.pdf

[10] Greenwich Municipal Code, Division 9, Section 6-111. http://www.greenwichct.org/upload/medialibrary/23f/pzRegsDivision09.pdf

The Town of Stonington, Connecticut has implemented a Coastal Area Management Overlay District, a Flood Hazard Overlay District, and a Groundwater Protection Overlay District. The Coastal Area Management District encompasses the 100-year coastal floodplain and all areas within 1000 feet of the mean high water mark and coastal wetlands. Within the district, the town may require additional erosion controls or conservation easements.[11]



© Town of Old Saybrook

Another overlay zoning approach is to identify zones based on future-flood adaptation goals.[12] The zones can be delineated by a combination of existing development density, dominant use, public utility services (sewer, water, etc.), elevation contours, and erosion rates. A town might divide the 100-year (or 500-year) floodplain into the following overlays:

- A **Protection Zone** for areas with critical infrastructure and dense development that have few options for adaptation. These areas, which may include town centers and historic districts, likely rely on existing hard armoring for flood protection and erosion control. Maintenance of existing hardened flood protection structures may be permitted while other resiliency practices are encouraged, such as employing green infrastructure for stormwater control.

- An **Accommodation Zone** for moderately to intensely developed but non-critical areas promotes development that considers future flooding. Downzoning to lower-impact uses reduces risk exposure. Building codes are strengthened with setback, elevation, freeboard, and construction requirements as well as limits on structure height and footprint size. Shoreline armoring is restricted to soft or natural infrastructure solutions.

- A **Conservation Zone** includes areas that provide the greatest natural infrastructure defense or have non-critical structures at the greatest risk of extensive damage. The purpose is to gradually move development out of these areas and replace it with natural infrastructure,

[11] Stonington Zoning Regulations, Article 7.3. http://www.stoningtonct.gov/Pages/StoningtonCT_Planning/regs/ZR_E23_7_1_11.pdf

[12] Grannis, J. 2012. *Coastal Management in the Face of Rising Seas: Legal Strategies for Connecticut*. Sea Grant Law & Policy Journal. vol. 5.1.

marsh advancement areas, open space, and/or public amenities with access. This can be achieved by downzoning to low density, water-dependent purposes. Shoreline armoring is restricted to natural infrastructure solutions. Maximum setbacks aim to locate any new development landward. Rebuilding damaged structures is also restricted. Property acquisition and conservation programs are focused on this area.

Maryland has a tiered zoning structure, similar to the one just described, under its Chesapeake Bay Critical Areas Program.[13] The program seeks to improve water quality and resource protection by regulating development near the Bay. Existing residential dwelling density, public services, and primary land use are used to identify three overlay zones:

- Intensely Developed Areas (IDA's) with greater than 4 dwelling units per acre; or greater than 3 dwelling units per acre plus public sewer and water; or high industrial or commercial uses.

- Limited Development Areas (LDA's) with 0.2-4 dwelling units per acre and public sewer and water; or areas not dominated by agriculture, wetland, or open space.

- Resources Conservation Areas (RCA's) with less than 1 dwelling unit per 5 acres; or areas with a dominant use of agriculture, wetland, or open space.

Downzoning

A powerful tool that planners can employ is downzoning from more dense or intense use to low density or low impact use. Downzoning can be used with or without overlay zoning. The Connecticut Coastal Management Act authorizes municipalities to employ downzoning (which, along with setbacks and special use zones, is not authorized under the Zoning Enabling Act (ZEA)) to regulate development in coastal areas.[14] Low intensity uses that could be promoted by downzoning include low density residential (e.g. less than 1 unit per 20 acres), agriculture, recreational amenities, open space, and water-dependent use.

---

13 Maryland Department of Natural Resources. *Bay Smart: A Citizen's Guide to Maryland's Critical Area Program*. http://www.dnr.state.md.us/criticalarea/BaySmartGuide.asp

14 Grannis, J. 2012. *Coastal Management in the Face of Rising Seas: Legal Strategies for Connecticut*. Sea Grant Law & Policy Journal. vol. 5.1.

Subdivisions and Cluster Development

© Chester Co. Planning Commission

Cluster development allows a developer to subdivide and build in greater density than zoning regulations permit, provided that a specified percentage of the parcel is set aside as open space. For example, a developer wants to subdivide a 50 acre parcel into 50 lots. Existing zoning regulations specify a 1-acre minimum lot size. Under cluster development as an example, the developer agrees to set aside 50% of the parcel, or 25 acres, for open space in return for permission to subdivide into half-acre lots. In coastal areas, cluster development regulations specify that the upland or landward portion of the lot be developed while the low-lying portion can be reserved for non-structural flood defense or future marsh advancement. The developer can be incentivized to adopt cluster development practices by a streamlined application process or by earning a building density bonus on the upland lots. In Chatham County, Georgia, developers are permitted to increase a project's density by 10% above regulations if 40% of the land is reserved for conservation. [15]

Legal Challenges: Nonconformities and Takings

Overlay zoning and, in particular, downzoning are not without challenges. New zoning regulations will likely result in existing uses that had been legal under previous rules but no longer conform to current zoning requirements. The effectiveness of downzoning may be limited because the ZEA requires that nonconforming uses be allowed and preserved even when a structure is damaged or destroyed. However, when that structure is repaired or rebuilt, it will be subject to any additional future-flood informed construction regulations under the new zoning. These regulations may include freeboard minimums as well as height and footprint limitations. Only when a use is abandoned (as opposed to having been idle or destroyed) may the new use requirements be enforced. However, the courts may be more inclined to rule in favor of use enforcement when a structure is destroyed by a natural disaster such as coastal flooding, but the case law is not yet established on this point.[16]

---

[15] Grannis, J. 2011. *Adaptation Toolkit: Sea-Level Rise and Coastal Land Use*. Georgetown Climate Center. p34.
[16] *Ibid*.

Another challenge in designing sea level rise adaptation zoning regulations is to avoid instances of "taking" in which a government seizes a property or, more likely with zoning, adversely affects the value of a property through regulation without just compensation to the owner. For example, regulations under a new overlay may seek to prohibit rebuilding after a storm; or setback requirements may leave an owner without space on the property to rebuild. Courts may rule these scenarios as takings. Typically, the Connecticut courts have ruled against zoning regulations when a taking results in a substantial decrease in economic value to the land owner.[17] However, the U.S. Supreme Court has left room for an owner's loss of economic value to be balanced against the public good.[18] [19]

Natural Infrastructure defending the coast against waves during Storm Sandy (Madison, Connecticut)
© Adam Whelchel/TNC

[17] *Ibid.*

[18] McGuire, C. and Hill J. 2012. *Climate Adaptation and the Fifth Amendment of the U.S. Constitution: A Regulatory Takings Analysis of Adaptation Strategies in Coastal Development with Application to Connecticut's Coastal Management Regime*. Sea Grant Law & Policy Journal. vol 5.1.

[19] For a more thorough and Connecticut-specific discussion of takings and other legal issues with adaptation measures, see the Sea Grant Law & Policy Journal, volume 5, p. 77-79 and 140-168: http://nsglc.olemiss.edu/SGLPJ/SGLPJVol5No1.htm

Getting Started with the Community Rating System

The National Flood Insurance Program's Community Rating System (CRS) was implemented in 1990 as a voluntary program to encourage community floodplain management activities which exceed the minimum NFIP standards. Any community in full compliance with the minimum NFIP floodplain management requirements may apply to join the CRS. Residents and businesses in communities that join the CRS are eligible for discounts on their flood insurance premiums. The discounts increase with the level of action taken by the community to improve floodplain risk management, up to a maximum of 45%. Eight towns in Connecticut maintain a status in the CRS.[20] Property owners with national flood insurance in Stamford, Connecticut's highest rated town, receive a 15% discount on their flood insurance premiums.

How does the CRS work?

Once a community has entered the CRS, it may earn credits for various risk reduction actions it takes. Insurance premium discounts are based on the total number of credits the community has earned. The Insurance Services Office, Inc. (ISO) works on behalf of FEMA and insurance companies to review CRS applications, verify communities' credit points, and perform program improvement tasks.

CRS Class	Accumulated Credits	Premium Discount[21]
1	4,500+	45%
2	4,000-4,499	40%
3	3,500-3,999	35%
4	3,000-3,499	30%
5	2,500-2,999	25%
6	2,000-2,499	20%
7	1,500-1,999	15%
8	1,000-1,499	10%
9	500-999	5%
10	0-499	0%

Source: FEMA CRS website (see Resources section for link)

[20] FEMA state statistics: http://www.fema.gov/library/viewRecord.do?id=3629

[21] Discounts apply to Special Flood Hazard Areas (flood zones V and A). Lower discounts are given for properties in non-SFHA's.

What types of activities earn CRS credits?

Credits are earned for a variety of activities ranging from short term to longer term activities that may require legislative action or more costly initiatives. The activities are divided into four categories:

1. Public Information – Credits are earned for programs that educate property owners about flood hazards, flood insurance, and means to reduce risk. This includes publishing elevation and map data, outreach projects, hazard disclosure to community members and insurance agents, and flood protection information and assistance.

2. Mapping and Regulations – Credits are earned for activities that protect and reduce risk in new development. This includes development of additional flood data, enactment and enforcement of stricter regulatory measures, open space preservation, flood data records, and stormwater management.

3. Flood Damage Reduction – Credits are earned for activities that protect existing development. This includes floodplain management planning, property acquisition and relocation, flood protection, and drainage system maintenance.

4. Flood Preparedness – This includes a flood warning system and levee and dam safety programs.

Some activities earn credits for satisfying a yes/no requirement. Other credits are calculated based, for example, on number of structures elevated above the base flood elevation or number of acres in the SFHA that are preserved as open space. With over 12,000 credits available, there are many possible combinations of actions that communities can take to improve their rating. Planners are encouraged to develop a plan to reduce risk that best fits their community's needs and enrollment in CRS.

Are there prerequisites for eligibility?

In order to be eligible for the CRS, communities must meet all NFIP minimum requirements for floodplain management. A site visit by CRS personnel will confirm this. Other information that is required for the initial application includes 1) the number of repetitive loss structures in your community, 2) the number of buildings in your Special Flood Hazard Area (SFHA), and 3) the area (in acres) of your community's SFHA.

Structures in CRS communities that are eligible for premium discounts include all pre-FIRM (flood insurance rate maps) structures in all flood zones and post-FIRM structures in A and V flood zones that meet base flood elevations (BFE). Post-FIRM structures that lie more than 1 foot below BFE or that fail to meet NFIP requirements (such as breakaway walls on ground floors or machinery below BFE) are ineligible for premium discounts.

How do we get started?

Two items are needed to begin the application process: a Letter of Intent from the community's Chief Executive Officer (mayor, first selectman, etc.) and the CRS Quick Check spreadsheet (see Resources for link). The spreadsheet will help calculate any credits for which your community may already be eligible. Communities that apply successfully are admitted initially as Class 10 and may be promoted to Class 9 (5% discount) when they have achieved 500 credits. Once enrolled in the CRS, there are annual reporting requirements in order to maintain eligibility. As a community takes stronger actions to build awareness and decrease flood damage risk, it can earn more points and greater premium discounts for property owners. See Appendix B for links to CRS resources.

© TNC

Hazards and Community Resilience Workshops

The Nature Conservancy provides workshops to Connecticut towns that help to assess their vulnerabilities and strengths and develop priority hazard mitigation actions. Facilitated by trained staff, community-based teams of elected officials, department heads, planners, and community leaders comprehensively identify high risk locations and infrastructure and use the Conservancy's Risk Matrix to define priority action items to reduce existing and future impacts from all

Financing & Incentives for Coastal Adaptation

For a community to move towards true resilience, it must integrate hazard mitigation and adaptation with town planning (i.e., Natural Hazard Mitigation Plans merged with Plans of Conservation and Development). Planning for future growth and development must consider future conditions and reduce potential risk from flooding and other hazards. One common obstacle to integration is resistance by landowners and developers. Landowners are justified in their concern that the value of their property will be diminished by regulatory changes that limit their ability to build on, subdivide, or sell their land. Developers have concerns about the profitability of investing in a town that faces a future of restricted development necessitated by further extreme weather events and climate change. Fortunately, there are innovative concepts for preserving value and profits while planning for resilience and growth.

Transfer of Development Rights (TDR)

Transfer of development rights (TDRs) has traditionally been used to promote land conservation, typically to preserve farmland[22] and open space. In these cases, the owner of a tract of farmland undertakes legal action to sever the development rights from the property, usually through a conservation easement. Those development rights are then sold to another landowner or developer who can apply them at another site to increase the building density there. Through zoning regulations, the relevant municipality defines "sending" and "receiving" zones for TDRs. Sending zones are the areas to be protected and receiving zones are the areas identified for more intensive development. In this manner, the farmland is preserved in perpetuity and development is concentrated in designated locations often advantaged by existing transportation systems, other critical infrastructure, and concentrated conveniences and amenities. In Montgomery County, Maryland[23], the sending zones were downzoned to a lower density to discourage future growth and to encourage the sale of development rights. Meanwhile, the receiving zones are frequently in areas of urban blight or deterioration. Redevelopment of these areas is encouraged by allowing developers who buy TDRs to build in greater densities than the zoning regulation would otherwise permit. The goals of conservation and urban renewal are both achieved while the rural landowner is compensated for the reduced utility of their property.

---

[22] Pennsylvania Land Trust, ConservationTools.org: *Transfer of Development Rights*. http://conservationtools.org/guides/show/12-Transfer-of-Development-Rights

[23] Bratton, N. & Fox, N. 2008. *Alternative Transfer of Development Rights (TDR) Transaction Mechanisms*. Casacade Land

The TDR method as applied to farmland can also be applied to conservation of land to increase the flood resilience of a community. Sending zones are designated 1) in areas of frequent coastal flooding and expected future flooding that may eventually be abandoned because of the excessive cost of flood mitigation or difficulty in delivering municipal emergency, utility, or sewer services; or 2) in areas that would provide flood buffering, wave attenuation, or marsh advancement to further help defend against sea level rise, storm surge and inland flooding. In both cases, TDR's give landowners an option to recoup the developable value of their property while preventing future development in high risk locations. Receiving zones present an opportunity for a community to direct future development to areas with lower risk and, perhaps, with better public transportation and other attributes of sustainability. Planners can use other regulatory methods (building codes, zoning, etc.) in receiving zones to build in resilience for a town or city center.

In implementing a TDR system, the municipality will need to decide how the rights will be bought and sold. In particular, how will buyers and sellers of rights find one another? There are four potential methods[24] for creating a TDR marketplace: 1) a private market between buyers and sellers; 2) a private market assisted by a public entity that maintains a registry so that buyers and sellers can more easily find one another; 3) a brokerage system for matching buyers and sellers and conducting their transactions; or 4) a public or private bank that buys rights from sellers and sells them to buyers. The community will need to weigh these options based on its tolerances for cost, ease of transaction, and government involvement.

A variation on TDRs is the purchase of development rights (PDR). Under this type of program, a municipality purchases a landowner's development rights and permanently sequesters them, rather than making them available for redevelopment elsewhere. This method is more costly to the municipality than TDR but is less costly than a fee-simple property acquisition program. While future development is prohibited on properties under PDR, the current uses and buildings are preserved for current and future landowners – maintaining the current level of risk but preventing additional risk compounding.

---

[24] *Ibid.*

Impact Fees

Impact fees, and variations such as density fees[25] and fees-in-lieu[26], are methods for municipalities to fund conservation and acquisition projects. Impact fees are charged to developers at the time construction as compensation to the community for providing public services to the new development or mitigating negative effects such as traffic congestion. In the case of sea level rise adaptation, the town could apply the revenue towards land acquisitions or purchasing easements in marsh advancement zones which would improve the community's resilience.

Developers, naturally opposed to impact fees, might be inclined to seek out a more growth-friendly town. Density fees, therefore, could be substituted for impact fees. Under this mechanism developers pay a fee and in return are permitted to build at a higher density than the standard zoning allows. In residential zones, the developers could be granted a greater building height allowance than the zoning permits. Through zoning practices, towns can designate which areas are subject to impact fees and which have the added benefit of a density fee. In this way, towns can direct growth to less risky or more sustainable locations

Some municipalities require developers to incorporate public space into their projects. If that space could be more effectively used elsewhere by the town for flood mitigation, then the town might offer the developer a fee-in-lieu of the public space. As compensation for paying the fee, the developer can reclaim the planned public space for more profitable development. The town, then, can appropriate the revenue for land acquisition or conservation in the flood zone.

Tax Increment Financing (TIF)

As sea level rises, the costs of flood protection (elevating roads, building seawalls) or delivering public services (fire, water, and sewer) in some coastal areas will outweigh the benefits. Over time, these neighborhoods may have to be abandoned. In anticipation of this, towns will need to be proactive in directing future development patterns. This presents an opportunity for towns to consider smart growth concepts such as transit oriented development and low impact development. In order to realign development, towns will need to relieve development pressure on the higher-risk shoreline by financing inland projects or offering incentives to developers who build in designated inland smart growth areas.

---

[25] *Ibid*. p28.

[26] Pennsylvania Land Trust, ConservationTools.org: http://conservationtools.org/guides/show/17

Tax Increment Financing (TIF)[27] [28] considers the new tax revenue (the "increment") generated by a development project, or more frequently, a redevelopment project. The increment can be used by the town to finance the project directly. Alternately, the town can incentivize development by agreeing to pay a developer a percentage of the increment for a specified number of years. Often, in order to qualify for the benefit, the developer is required to certify that a project has created an agreed upon benefit to the community, such as a specific number of jobs or low income housing units. In the resiliency case, the town could require that the project protect a specified acreage of open space for flood management or marsh advancement either on site or elsewhere in the town.

Old Saybrook, Connecticut – Tidal Marsh Advancement (green); Current Development (red)

Marsh Advancement

The Nature Conservancy has modeled and mapped marsh advancement zones for all towns along the Connecticut coastline. These maps show where tidal marshes are likely to advance upslope as sea levels continue to rise. These high resolution map allow planners and decision makers to see which parcels in their communities are ideal for additional natural infrastructure and conservation. Maps for your community can be viewed at **www.coastalresilience.org**

---

[27] http://www.mass.gov/envir/smart_growth_toolkit/pages/mod-diftif.html

[28] http://www.ctcda.com/Financing/Bond_Financing/TAX_INCREMENTAL_FINANCING/

Acknowledgements

This effort was made possible through partial funding by the Horizon Foundation, Anne S. Richardson Fund, Community Foundation of Eastern Connecticut, and the McCance Foundation Trust.

Appendix A: Abbreviations

BFE	Base flood elevation
CRS	FEMA's Community Rating System
FEMA	Federal Emergency Management Agency
FIRM	Flood insurance rate map
NFIP	FEMA's National Flood Insurance Program
NOAA	National Oceanic and Atmospheric Administration
PDR	Purchase of development rights
SFHA	Special Flood Hazard Area (the 100-year floodplain)
SLR	Sea level rise
TDR	Transfer of development rights
TIF	Tax increment financing
TNC	The Nature Conservancy
ZEA	Connecticut's Zoning Enabling Act

Appendix B: Resources

- The Nature Conservancy's Coastal Resilience Tool
  www.coastalresilience.org

- Georgetown Climate Center's Adaptation Clearinghouse: http://www.georgetownclimate.org/adaptation/clearinghouse

- NOAA Coastal Services Center report "*What Will Adaptation Cost? An Economic Framework for Coastal Community Infrastructure:* http://www.csc.noaa.gov/digitalcoast/publications/adaptation

- FEMA Community Rating System website: http://www.fema.gov/national-flood-insurance-program/national-flood-insurance-program-community-rating-system

- CRSResources.org: http://crsresources.org/

- Quick Check spreadsheet and CRS application instructions (downloads an Excel file):

  http://crsresources.org/quick-check/

- Map of Connecticut's CRS communities (downloads a 5.1MB zip file):

  http://www.fema.gov/library/file;jsessionid=79D7C83C28D22C91EC262641F2D341B2.WorkerPublic2?type=publishedFile&file=ca_co_ct_crs_may_2012_508.zip&fileid=0bcea0c0-ca9e-11e1-8f68-001cc456982e

- Integrating Hazard Mitigation Into Local Planning: Case Studies and Tools for Community Officials (FEMA):

  http://www.fema.gov/media-library/assets/documents/31372?id=7130

The mission of The Nature Conservancy is to conserve the lands and waters on which all life depends. Our vision is to leave a sustainable world for future generations.

The Nature Conservancy in Connecticut

55 Church Street, Floor 3
New Haven, CT 06510-3029

The Nature Conservancy
Protecting nature. Preserving life.®