State and local partnership grant to build resiliency to climate change

1. Engage Community
2. Identify CC impacts and hazards
3. Complete assessment of vulnerabilities & strengths
4. Develop and prioritize actions
5. Take Action

Municipal Vulnerability Preparedness (MVP)
MVP Program
2017-2018

20% of cities and towns, $1.1 million
MVP Program
Learn more

https://www.mass.gov/municipal-vulnerability-preparedness-program

Katie Theoharides – kathleen.theoharides@state.ma.us
Jenny Norwood – jennifer.norwood@state.ma.us
NATURE-BASED SOLUTIONS

Steve Long slong@tnc.org
Sara Burns sara.burns@tnc.org
EXECUTIVE ORDER NO. 569

ESTABLISHING AN INTEGRATED CLIMATE CHANGE STRATEGY
FOR THE COMMONWEALTH

WHEREAS, climate change presents a serious threat to the environment and the Commonwealth’s residents, communities, and economy;

WHEREAS, extreme weather events associated with climate change present a serious threat to public safety, and the lives and property of our residents;

WHEREAS, the Global Warming Solutions Act (the “GWSA”) directs the Secretary of Energy and Environmental Affairs and the Department of Environmental Protection to take certain steps to reduce greenhouse gas emissions and prepare for the impacts of climate change, including setting statewide greenhouse gas emissions limits for 2020, 2030, 2040 and 2050;

WHEREAS, the statewide greenhouse gas emissions limit for 2020 is 25% below the 1990 level of emissions and the corresponding limit for 2050 is 80% below the 1990 level of emissions, but no interim limits have yet been set for 2030 or 2040;

WHEREAS, the Commonwealth can provide leadership by reducing its own emissions from state operations, planning and preparing for impending climate change, and enhancing the resilience of government investments;

WHEREAS, the transportation sector continues to be a significant contributor to greenhouse gas emissions in the Commonwealth, and is the only sector identified through the GWSA with a volumetric increase in greenhouse gas emissions;

WHEREAS, the generation and consumption of energy continues to be a significant contributor to greenhouse gas emissions in the Commonwealth, and there is significant potential
Baker Administration’s Support

EO Language:
“...strategies that conserve and sustainably employ the natural resources of the Commonwealth to enhance climate adaptation, build resilience and mitigate climate change...”
Nature-Based Solutions use natural systems, mimic natural processes, or work in tandem with traditional approaches to address natural hazards like flooding, erosion, drought, and heat islands.

Incorporating nature-based solutions in local planning, zoning, regulations, and built projects can help communities reduce their exposure to these impacts, resulting in reduced costs, economic enhancement, and safer, more resilient communities.
Green Infrastructure: A network of waterways, wetlands, woodlands, wildlife habitats, and other natural areas that support native species, maintain natural ecological processes, sustain air and water resources and contribute to health and quality of life.

(McDonald, Benedict and O’Conner, 2005).
LID is a category of Green Infrastructure (GI):

- **Works with nature**
- **Manages stormwater** as close to the source as possible
- **Preserves natural landscape** (or creates natural features).
- **Treats rain as a resource** rather than a waste product.
Where is MVP Now?

- Communities are choosing their provider
- Providers are planning their CRB process

Diagram:

Executive Order 569

- TNC trains Service Providers to use Community Resilience Builder (CRB)
- EEA provides 51 municipalities with awards for CRB process

- Trained Certified Service Provider
- Awarded Municipality

Local CRB process develops plan

- Municipality becomes a Certified Community

Municipality is now eligible for EEA awards for implementation funding

$$$
Identify environmental vulnerabilities and strengths (small teams).

Cataloguing the vulnerabilities and strengths of natural systems can be complex. Existing factors such as pollution, haphazard development/redevelopment, and invasive species can reduce the ability of natural systems to respond and assist with hazard impact reduction. Previous and ongoing open-space protection in high-risk areas (i.e., unstable slopes, low-lying floodplains) is viewed as a strength that often directly increases community resilience. Other benefits of natural systems to communities include flood storage, recreation, tourism, elevated property values, cooling during heat waves, and water filtration, among others. Understanding these factors can help facilitate collaborative approaches between development and conservation that fosters community resilience building.

(i) List environmental features. On the Risk Matrix, list environmental features. Consider natural resources that are vulnerable to hazards or that can provide protection for people, property, and amenities from top hazards. Refer to “Triggering Questions” to accelerate dialogue.

(ii) Describe locations via participatory mapping. For each feature, describe the location. Be as specific as possible. Legibly mark the location on the community base map provided. Example: Identify where wetlands are in relation to current development (e.g., marinas, road crossings, fire stations, historic building, cemeteries, neighborhoods, nursing homes, etc.).

Triggering Questions:
- What natural resources are important to your community?
- What benefits do these natural resources provide (storm buffering, fire breaks, erosion control, water quality improvement, slope stabilization, recreation)?
- Which natural resources are exposed to current and future hazards?
- What have been the effects of these hazards on these natural resources?
- Where are the high-risk areas and what vulnerabilities exist for the environment?
How to Talk about...

• Use: Nature Based Solution, NOT natural infrastructure

• Highlight Benefits:
  • Enhancing Safety
  • Avoiding Costs
  • Natural Assets:
    • Recreation
    • Public Health
Avoided Costs

Riverine flooding
Coastal flooding
Coastal erosion
Stormwater flooding
Heat island effects

Nature-based solutions

Open space preservation
Ecosystem restoration
Low Impact Development

Municipal benefits

Enhanced Safety
Environmental Services

Ecosystem restoration
Open space preservation
Low Impact Development

Enhanced Safety
Environmental Services
Enhance Safety: Charles River Natural Valley Storage Area. US Army Corps of Engineers

- 8,095 Acres purchased or protected in the middle and upper Charles River watershed since 1977. Project Cost of $8,300,000

- From 1977 through September 2016, the project has provided $11,932,000 in flood protective services (not counting for inflation).

- Co-benefits include recreation and natural resource benefits

Avoid Costs: Land Protection as Water Protection

• Quabbin & Wachusett Reservoirs serve 2.5 million

• Over 20 years, Massachusetts Water Resources Authority spent $130M to protect 22,000 acres of watershed lands

• Avoided ratepayer cost of $250M on a filtration plant and $4M/yr in operations
Preserve Services: Massachusetts Forests Mitigate Climate Change

• MA forests sequester 14% of the state’s gross annual carbon emissions

• Average acre stores 85 tons carbon

• Capacity increases over time as forests mature
Return on Investment Studies in MA: Trust for Public Lands Study

- Outdoor recreation generates:
  - $10 billion in consumer spending
  - $739 million in state and local tax revenue
  - 90,000 jobs
  - $3.5 billion in annual wages and salaries
- Agriculture, forestry, commercial fishing, and related activities generate:
  - $13 billion in output
  - 147,000 MA Jobs
- Conservation Projects Return $4 : $1 spent
DER Research on Aquatic Restoration

DER projects produce an average employment demand of **12.5 jobs** and **$1.75 Million** in total economic output from each $1 Million spent, contributing to a growing “restoration economy” in Massachusetts.
Return on Investment Studies:

- In Hurricane Sandy, wetlands protected $625,000,000 in property value in New Jersey

- In New England, wetlands reduce storm damage by approximately 16%
Needs and Wants

From the Climate Action Tool survey, 2015

*Note! 70% of respondents were municipal professionals, but most already engaged in land conservation.*
Needs and Wants

The most relevant needs across the board were for examples!

**Needed Examples:**

1. Bylaw, conservation restrictions, and regulation

2. Infrastructure Modification

3. Conservation and planning

4. Existing municipal climate change adaptation plans
Resources for Nature-Based Solutions

Prepared for municipalities at the launch of the Municipal Vulnerability Preparedness Program based on a survey on the needs of municipal practitioners and recommendations of a diverse team of engineers, planners and ecologists. For future updates to this list and a broader range of resources on climate change adaptation and resiliency, please see the Climate Change web site of the Executive Office on Energy and Environmental Affairs.

Nature-Based Solutions use natural systems, mimic natural processes, or work in tandem with traditional approaches to address natural hazards like flooding, erosion, drought, and heat islands. Incorporating nature based solutions in local planning, zoning, regulations, and built projects can help communities reduce their exposure to these impacts, resulting in reduced costs, economic enhancement, and safer, more resilient communities.

- Enhanced safety by reducing risks from flooding and heat risks to vulnerable populations and community assets.
- Avoided infrastructure costs of unplanned repairs and improving safety due to flooding and failure from intense rain events.
- Securing the natural resource benefits of water quality, wildlife habitat and community resiliency.

Guidance/Case Studies

- Naturally Resilient Communities successful project case studies from across the country to help communities learn and identify nature-based solutions
- EPA's Soak Up the Rain stormwater outreach tools, how-to guides and resources
- EPA's RAIN database of vulnerability, resilience and adaptation reports, plans and webpages at the state, regional and community level.
- Climate Action Tool explore adaptation strategies and actions to help maintain healthy, resilient wildlife communities in the face of climate change.

Mapping/Planning

- Mapping and Prioritizing Parcels for Resilience (MAPPR) identify the priority parcels for protection and climate change resilience
- Low Impact Development Fact Sheets cover valuing green infrastructure, conservation design, development techniques, regulations, urban waters, and cost calculations.

Cost-Benefit

- EPA's Green Infrastructure cost/cost-benefit/tools Database of tools for comparing costs between solutions
- Massachusetts Division of Ecological Restoration's economic benefits of aquatic restoration based on Massachusetts case studies

Bylaws and Ordinances

- EEA's Smart Growth Toolkit access to information on planning, zoning, subdivision, site design, and building construction techniques
- Guide for Supporting LID in Local Land Use Regulations provides a framework for communities to review their zoning, rules, and regulations for a number of factors.
Guidance/Case Studies

- **Naturally Resilient Communities** successful project case studies from across the country to help communities learn and identify nature-based solutions
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- **EPA’s RAINE** database of vulnerability, resilience and adaptation reports, plans and webpages at the state, regional and community level.
- **Climate Action Tool** explore adaptation strategies and actions to help maintain healthy, resilient wildlife communities in the face of climate change.
Naturally Resilient Communities

You Choose:

1. Hazard Types
2. Region
3. Community type
4. Scale
5. Cost
Floodplain Buyout: Woloski Park, Middleborough, MA

- 10 homes in Taunton River floodplain

- Buyout funded by FEMA’s Hazard Mitigation Grant Program (HMGP). Total cost ~$1,003,745, with FEMA grant covering 75%

- Resilience benefits:
  - Avoided emergency evacuation and property recovery costs.

- Additional benefits
  - High quality habitat is restored, floodplain and ecosystem services recovered.
Resources for Nature-Based Solutions

Prepared for municipalities at the launch of the Municipal Vulnerability Preparedness Program based on a survey on the needs of municipal practitioners and recommendations of a diverse team of engineers, planners and ecologists. For future updates to this list and a broader range of resources on climate change adaptation and resiliency, please see the Climate Change web site of the Executive Office on Energy and Environmental Affairs.

Mapping/Planning

- **Mapping and Prioritizing Parcels for Resilience (MAPPR)** identify the priority parcels for protection and climate change resilience.
- **Living Shorelines in New England: State of the Practice** and **Profile Pages for Solutions** are case studies, siting criteria, and regulatory challenges for coastal resilience in New England.
- **Low Impact Development Fact Sheets** cover valuing green infrastructure, conservation design, development techniques, regulations, urban waters, and cost calculations.
A detailed profile page was created for each of the eight (8) living shoreline types listed below. The purpose of these profile pages is to provide a comprehensive overview of the design recommendations, siting criteria and regulatory topics pertinent to a range of living shorelines designs that practitioners and regulators can use as a quick reference in the field or as an informational tool when educating homeowners.

### Living Shoreline Types

<table>
<thead>
<tr>
<th>1. Dune – Natural</th>
<th>5. Coastal Bank – Engineered Core</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Beach Nourishment</td>
<td>7. Marsh Creation/Enhancement w/ Toe Protection</td>
</tr>
<tr>
<td>4. Coastal Bank – Natural</td>
<td>8. Living Breakwater</td>
</tr>
</tbody>
</table>

### Design Schematics

The following living shoreline profile pages provide an example design schematic for each of the eight living shoreline types. Each schematic shows a generalized cross-section of the installed design. In addition, they illustrate each design’s location relative to MHW and MLW, whether plantings are recommended, if fill is required, and any other major components of the design. It is important to note that these are not full engineering designs, and due to each site’s unique conditions, a site-specific plan, developed by an experienced practitioner, is required for all living shoreline projects. Also note that these design schematics are meant to provide a general concept only, and are not drawn to scale.

### Case Study

One example case study, with the following information, is provided for each living shoreline type.

<table>
<thead>
<tr>
<th>Project Proponent</th>
<th>The party responsible for the project.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>The status of the project (i.e. design stage, under construction, or completed) and completion date if appropriate.</td>
</tr>
<tr>
<td>Permitting Insights</td>
<td>This section notes any specific permitting hurdles that occurred, or any regulatory insights that might help facilitate similar projects in the future.</td>
</tr>
<tr>
<td>Construction Notes</td>
<td>This section identifies major construction methods or techniques, any unique materials that were used, or deviations from a traditional design to accommodate site-specific conditions.</td>
</tr>
<tr>
<td>Maintenance Issues</td>
<td>If the project is complete and has entered the maintenance phase, this section will note whether the project has functioned correctly, if it is holding up, and/or if any specific maintenance needs have required since construction.</td>
</tr>
<tr>
<td>Final Cost</td>
<td>This section provides costs for the project, broken down into permitting, construction, monitoring, etc. when possible.</td>
</tr>
<tr>
<td>Challenges</td>
<td>This section highlights any unique challenges associated with a particular project and how these were handled.</td>
</tr>
</tbody>
</table>

### Explanation of Design Overview Tables

<table>
<thead>
<tr>
<th>Materials</th>
<th>A description of materials most commonly used to complete a living shoreline project of this type.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Habitat Components</td>
<td>A list of what types of coastal habitats are created or impacted by a living shoreline project of this type.</td>
</tr>
<tr>
<td>Durability and Maintenance</td>
<td>Although specific timelines are impossible to provide in this context, general guidelines and schedules for probable maintenance needs, and design durability are detailed here.</td>
</tr>
<tr>
<td>Design Life</td>
<td>Although specific design life timelines will vary by site for each living shoreline type, this section provides some insight into factors that could influence design life.</td>
</tr>
<tr>
<td>Ecological Services Provided</td>
<td>This section provides an overview of the ecological services that could be provided or improved through the installation of that particular type of living shoreline project.</td>
</tr>
<tr>
<td>Unique Adaptations to NE Challenges (e.g. ice, winter storms, cold temps)</td>
<td>This section provides any unique practices or design improvements that could be made to improve the performance of the design given New England climatic and tidal challenges.</td>
</tr>
</tbody>
</table>

### Acronyms and Definitions

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>CV</td>
<td>Cubic yards; one cubic yard equals 27 cubic feet. Project materials are often measured in cubic yards.</td>
</tr>
<tr>
<td>MHW</td>
<td>Mean High Water: The average of the all the high water (i.e. high tide) heights observed over a period of time.</td>
</tr>
<tr>
<td>MTL</td>
<td>Mean Tide Level: The average of mean high water and mean low water.</td>
</tr>
<tr>
<td>MLW</td>
<td>Mean Low Water: The average of all the low water (i.e. low tide) heights observed over a period of time.</td>
</tr>
<tr>
<td>SAV</td>
<td>Submerged aquatic vegetation, which includes seagrass such as eelgrass (Zostera marina) and widgeon grass (Ruppia maritima). Naturally occurring materials that have been broken down by weathering and erosion. Finer, small-grained sediments such as silts or clays. Slightly coarser sediments on larger materials are gravels or cobbles.</td>
</tr>
</tbody>
</table>

Photo credit: Janet Friedman
Beach Nourishment projects are appropriate for almost any tide range or grain size, and can be done independently, or in conjunction with a dune restoration project.

<table>
<thead>
<tr>
<th>Siting Characteristics and Design Considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selection Characteristics</td>
</tr>
<tr>
<td>ES</td>
</tr>
<tr>
<td>EE</td>
</tr>
<tr>
<td>SR</td>
</tr>
<tr>
<td>TR</td>
</tr>
<tr>
<td>EL</td>
</tr>
<tr>
<td>IS</td>
</tr>
<tr>
<td>BS</td>
</tr>
<tr>
<td>ER</td>
</tr>
</tbody>
</table>

Other Characteristics
- Grain Size: It is important to utilize sediment with a grain size, shape and color compatible to the site. The percentage of sand-, gravel-, and cobble-sized sediment should match, or be slightly coarser than, the existing sediments. The shape of the material is also important, especially for larger sediment, and should be rounded rather than angular.
- Impairment Level: Consideration should be given to invasive species, level of existing armoring, and extent of public use. Beach nourishment projects are more successful if they are located where there are already existing beaches. The longer and more contiguous the project is, the more resilient the project will be.
- Surrounding Land Use: Beach nourishment is best suited where natural beaches have existed at a site and where there is a natural source of sand to help sustain the beach. Beach nourishment is also suitable to help restore sediment supply to a sediment-starved system. Not generally well-suited for application to most major urban centers or areas with large port and harbor facilities because of the space requirements and the level of risk reduction desired. Existing structures on site, like seawalls, may force beach nourishment projects to have a steeper slope than desirable. Steeper slopes leave little opportunity for wave energy dissipation.
Coastal bank protection, including slope grading, and toe protection and planting of natural vegetation will reduce the steepness and protect the toe of the bank from further erosion. Coir logs, root wads protect bank toes from erosion, while planted vegetation develops strong root systems.

Objectives: erosion control; shoreline protection; dissipate wave energy; enhanced wildlife habitat.

Overview of Technique

Materials
- Sediment, if fill is needed, to establish a stable slope. Coir rolls or root wads from fallen trees to minimize erosion. Coir rolls, typically rolls 12-20" in diameter and 10-20 feet long, packed with coir fibers and held together by mesh. 2 (Coir rolls can be pre-vegetated to head start the growing process.) A high-density roll may be necessary at the toe, while lower-density rolls could be used above. 3 Wooden stakes for blankets, earth anchors for rolls, or a combination of the two are necessary to anchor the system. 4 Other naturally occurring woody material or root wads may also be utilized to stabilize the toe of the coastal bank in some sites. Salt-tolerant vegetation with extensive root systems are often used in conjunction with fiber rolls to help stabilize the site. 5 Natural fiber blankets can be used to stabilize the ground surface while plants become established. 6 (Blankets should be run up and down the slope rather than horizontally across it.)

Habitat Components
- Because they are made with natural fibers and planted with vegetation, natural fiber blankets also help preserve the natural character and habitat value of the coastal environment. 1

Durability and Maintenance
- Installing coir rolls at the toe of a bank stabilization project can provide increased stability while the vegetation becomes established, but bioengineering projects with coir rolls and vegetation require ongoing maintenance, such as resetting, anchoring, or replacement, to ensure their success. 14 Coir logs must be securely anchored to prevent wave and tidal current-induced movement. 13 Invasive species management should be incorporated into the project. 1 Runoff and groundwater management will also be crucial to project success. 6

Design Life
- As the coir rolls disintegrate, typically over 5-7 years, the plants take over the job of site stabilization. 1 The bank slope is extremely important. Often the existing condition of the slope is steep or undercut. Before installing coir logs or planting vegetation, the bank slope should be stabilized. 1 This is often done by regrading the bank slope by removal of sediment from the top of the bank rather than adding sediment to the toe of the slope. 1

Ecological Services Provided
- Upland plantings stabilize bluffs and reduce rainwater runoff. 11

Unique Adaptations to NE Challenges (e.g. ice, winter storms, cold temps)
- Shorter planting and construction window due to shorter growing season. Utilization of irrigation to establish plants quickly. Freeze and thaw processes can damage this design. Consideration should be given to the slope aspect and the implications on plant growth and microbe from shading and sun exposure.

Case Study
Coastal Bank Stabilization, Orleans, MA
Wilkinson Ecological Design developed a plant-focused coastal bioengineering project, determined not to be a coastal engineering structure by the local municipality and MA DRP. The project included a robustly anchored fiber roll array at the bottom of the bank and intensive planting and stabilization throughout the remainder of their coastal bank, which falls within a mapped FEMA Velocity Zone.
Swansea Marsh and Habitat Preservation: Conservation

- 37 Acres purchased and conserved by the Town of Swansea, Wildlands Trust, and Blount Fine Foods in the Palmer River Corridor for $110,000.

- Major storms in 2010 and 2012 damaged stormwater and transportation infrastructure.

- Resilience Benefits:
  - Dissipated energy from storm, tide, and flood events
  - Avoided cost of infrastructure repair and replacement

- Additional Benefits:
  - Protected water quality
  - Future marsh migration
Resources for Nature-Based Solutions

Prepared for municipalities at the launch of the Municipal Vulnerability Preparedness Program based on a survey on the needs of municipal practitioners and recommendations of a diverse team of engineers, planners and ecologists. For future updates to this list and a broader range of resources on climate change adaptation and resiliency, please see the Climate Change web site of the Executive Office on Energy and Environmental Affairs.

Cost-Benefit

• **EPA’s Green Infrastructure cost/cost-benefit/tools** Database of tools for comparing costs between solutions

• **Massachusetts Division of Ecological Restoration’s** economic benefits of aquatic restoration based on Massachusetts case studies
Green Infrastructure

Green Infrastructure Cost-Benefit Resources

Green infrastructure can be a cost-effective approach to improve water quality and help communities stretch their infrastructure investments further by providing multiple environmental, economic, and community benefits. On this page, learn more about how other communities have realized cost savings through their green infrastructure programs as well as about tools you can use to inform your own cost-benefit analysis.

On this page:

- Cost Analysis
- Cost-Benefit Analysis
- Tools

Cost Analysis
Whittenton Mill Dam was removed in 2013

- **Costs**
  - Estimated Cost of Dam Repair = $1.9 Million
  - Ongoing Cost of Dam maintenance = variable
  - 2005 Evacuation Costs = $1.5 Million
  - Dam Removal Costs = $440,000

- **Benefits**
  - Increased revenue from river based recreation
  - Increased Property Values
  - Water quality benefits
Resources for Nature-Based Solutions

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Bylaws and Ordinances

• **EEA’s Smart Growth Toolkit** access to information on planning, zoning, subdivision, site design, and building construction techniques

• **Guide for Supporting LID in Local Land Use Regulations** provides a framework for communities to review their zoning, rules, and regulations for a number of factors.
Review bylaws, ordinances, zoning, and other considerations for overall site design, LID project standards, and maintenance and operations considerations.
### GOAL 1: PROTECT NATURAL RESOURCES AND OPEN SPACE

<table>
<thead>
<tr>
<th>Factors</th>
<th>Conventional</th>
<th>Better</th>
<th>Best</th>
<th>Community’s Zoning</th>
<th>Community’s Subdivision Rules &amp; Regulations</th>
<th>Community’s Site Plan Review</th>
<th>Community’s Stormwater/LID Bylaw/Regulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soils managed for revegetation</td>
<td>Not addressed</td>
<td>Limitations on removal from site, and/or requirements for stabilization and revegetation</td>
<td>Prohibit removal of topsoil from site. Require rototilling and other prep of soils compacted during construction</td>
<td>(Not applicable)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limit clearing, lawn size, require retention or planting of native vegetation/naturalized areas</td>
<td>Not addressed or general qualitative statement not tied to other design standards</td>
<td>Encourage minimization of clearing/grubbing</td>
<td>Require minimization of clearing/grubbing with specific standards</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Require native vegetation and trees</td>
<td>Require or recommend invasives</td>
<td>Not addressed, or mixture of required plantings of native and nonnative</td>
<td>Require at least 75% native plantings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### GOAL 2: PROMOTE EFFICIENT, COMPACT DEVELOPMENT PATTERNS AND INFILL

<table>
<thead>
<tr>
<th>Lot size</th>
<th>Required minimum lot sizes</th>
<th>OSRD/NRPZ preferred. Special permit with incentives to utilize</th>
<th>Flexible with OSRD/NRPZ by right, preferred option</th>
<th>(Not applicable)</th>
<th>(Not applicable)</th>
<th>(Not applicable)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setbacks</td>
<td>Required minimum front, side, and rear setbacks</td>
<td>Minimize, allow flexibility</td>
<td>Clear standards that minimize and in some instances eliminate setbacks</td>
<td>(Not applicable)</td>
<td>(Not applicable)</td>
<td>(Not applicable)</td>
</tr>
<tr>
<td>Frontage</td>
<td>Required minimum frontage for each lot/unit</td>
<td>Minimize especially on curved streets and cul-de-sacs</td>
<td>No minimums in some instances, tied into other standards like OSRD design and shared driveways.</td>
<td>(Not applicable)</td>
<td>(Not applicable)</td>
<td>(Not applicable)</td>
</tr>
<tr>
<td>Common driveways</td>
<td>Often not allowed, or strict limitations</td>
<td>Allow for 2-3 residential units</td>
<td>Allow for up to 4 residential units, preferably constructed with permeable pavers or pavement</td>
<td>(Not applicable)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The power of a bylaw: Westford

- Adopted a Conservation Subdivision bylaw in 1978
- Requires conservation and conventional plans

Benefits
- 1,700 Acres of land Protected
- Preserved local habitat and water resources
- Created 13 miles of hiking trails & public recreation
- Town saved millions of dollars
Potential Partners:

- Land Trust – Mass Land Trust Coalition
- Watershed Associations – Mass Rivers Alliance
- Climate Action Groups – Mass Climate Action Network

http://tnc.maps.arcgis.com/apps/View/index.html?appid=eb68b8f45e4548a59a1283b4d8c3a2e3
Potential Partners, cont’d:

CZM Regional Offices:

- North Shore
- Boston Harbor
- South Shore
- Cape and Islands
- South Coastal

http://www.mass.gov/eea/agencies/czm/regional-offices/
Steve Long  slong@tnc.org
Sara Burns  sara.burns@tnc.org
Resources Discussed in Q&A

• Blue carbon calculator [https://www.mass.gov/blue-carbon-calculator](https://www.mass.gov/blue-carbon-calculator)

Eelgrass


• Northeast Ocean Data [http://www.northeastoceandata.org/eelgrass/](http://www.northeastoceandata.org/eelgrass/)