Getting Your Community to MVP Status: Climate Change & Planners

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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

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).
Low Impact Development (LID)

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.
Avoided Costs
Heat island effects
Stormwater flooding
Riverine flooding
Coastal flooding
Coastal erosion

Nature-based solutions
Open space preservation
Ecosystem restoration
Low Impact Development

Municipal benefits
Avoided Costs
Enhanced Safety
Environmental Services
Co-benefits

<table>
<thead>
<tr>
<th>Practice</th>
<th>Reduces Stormwater Runoff</th>
<th>Improves Water Quality</th>
<th>Improves Grey Infrastructure Needs</th>
<th>Reduces Flooding</th>
<th>Increases Available Water Supply</th>
<th>Increases Groundwater Recharge</th>
<th>Reduces Salt Use</th>
<th>Reduces Energy Use</th>
<th>Improves Air Quality</th>
<th>Reduces Atmospheric CO₂</th>
<th>Reduces Urban Heat Island</th>
<th>Improves Aesthetics</th>
<th>Increases Recreational Opportunity</th>
<th>Reduces Noise Pollution</th>
<th>Improves Community Cohesion</th>
<th>Urban Agriculture</th>
<th>Improves Habitat</th>
<th>Cultivates Public Education Opportunities</th>
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Source: Center for Neighborhood Technology's The Value of Green Infrastructure
Avoided 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
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
Enhanced Safety

Whittenton Dam Removal, Taunton, MA

Costs
- Dam Repair = $1.9 Million
- Dam maintenance = variable
- 2005 Evacuation Costs = $1.5 Million
- Dam Removal Costs = $440,000

Benefits
- Reduced Flood Risk
- Increased revenue
- Increased property values
- Water quality benefits
Key Observed Climate Changes in MA

Temperature: 2.9°F
Since 1895

Growing Season: 11 Days
Since 1950

Sea Level Rise: 11 inches
Since 1922

Strong Storms: 55%
Since 1958
Why do rising temperatures also bring more precipitation?

...consider your morning coffee.
More fuel for storms
More heat
More evaporation
More precipitation
Warmer air holds more moisture aloft
How Much More Precipitation?

Total annual precipitation has increased by:

15%

1.2 trillion more gallons of water or equivalent snow falling on Massachusetts each year.

~9,700 filled Prudential Towers

Changes are calculated from a linear regression of annual totals from 1895-2015, 1901-2000 reference period.

Source: NOAA
What’s the problem?

- Impervious surface → Runoff
- Large lawns → Fertilizer

Source: EPA
Climate change

Sprawling Development

impervious surfaces

increased precipitation

increased temperature

stormwater & WQ issues

heat-related illnesses

flooding & infrastructure damage

more cooling shelters

more cooling shelters
**Impacts**: dry rivers, flooding, algae blooms, beach closures
There are real solutions.

One of the best adaptation practices is preserving natural areas.
What does sustainable development really look like?: Actions at every scale

**Conserve** the natural green infrastructure already providing free ecosystem services

**Integrate** LID and green infrastructure design into development

**Restore** the resiliency of urban landscapes through LID in redevelopment
Conserve the natural green infrastructure already providing free ecosystem services
Integrate LID and green infrastructure designs into current development projects
Restore the resiliency of urban landscapes through LID in redevelopment
Integrate

Conserve the natural green infrastructure already providing free ecosystem services

Integrate LID and green infrastructure designs into current development projects

Restore the resiliency of urban landscapes through LID in redevelopment
Conserve the natural green infrastructure already providing free ecosystem services
Integrate LID and green infrastructure designs into current development projects
Restore the resiliency of local landscapes through LID in redevelopment

North Street, Pittsfield, MA
Return on Investment Studies in MA
Trust for Public Land

- 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 aquatic restoration 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 MA
Div. of Ecological Restoration

Avoided Costs
Environmental Services
Enhanced Safety
Return on Investment Studies Northeast US Scientific Reports

• In Hurricane Sandy, wetlands reduced $625,000,000 in direct flooding damages in New Jersey

• In New England, wetlands reduce storm damage by approximately 16%

https://www.nature.com/articles/s41598-017-09269-z
Ensuring Success Webinars

MVP Tool Box
mass.gov/municipal-vulnerability-preparedness-program

- Working with MVP Service Providers: View recording
- Advancing Social Equity in Climate Adaptation Planning: View recording
- Alternatives for engaging your community: View presentation slides
- The importance of listening: View recording
- Bylaw Review –Encouraging Nature Based Solutions: View recording
- Nature Based Solutions: View recording
- Characterizing coastal flood hazards and increasing resilience: View recording
Resources for Nature-Based Solutions

**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)** ID 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.

**Cost/Benefit**

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

**Bylaws/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.
Solutions

1. Open Space Preservation through Land Acquisition
   - This strategy focuses on the public acquisition of undeveloped land to lessen...

2. Urban Trees + Forests
   - Urban forestry is the planned installation and management of trees within an...

3. Horizontal Levees
   - A horizontal levee consists of a hardened structure (levee) setback from the...

4. Green Streets
   - Green streets incorporate depressed planted areas, typically located between the roadway pavement...

5. Floodwater Detention and Retention Basins
   - A detention basin is an area that has been designed and designated...

6. Daylighting Rivers and Streams
   - Daylighting rivers or streams is the process of removing obstructions (such as...
### Goal 1: Protect Natural Resources and Open Space

<table>
<thead>
<tr>
<th>Factor</th>
<th>Conventional</th>
<th>Better</th>
<th>Best</th>
<th>Community’s Zoning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soils managed for re-vegetation</td>
<td>Not addressed</td>
<td>Limitations on removal from site, and/or requirements for stabilization and re-vegetation.</td>
<td>Prohibit removal of topsoil from site. Require reseeding and other prep of soils compacted during construction.</td>
<td>(Not applicable)</td>
</tr>
<tr>
<td>Limit clear, 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 with specific standards.</td>
<td>Require minimization of clearing/grubbing with specific standards.</td>
<td></td>
</tr>
<tr>
<td>Require native vegetation and trees</td>
<td>Require or recommend non-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>
</tr>
</tbody>
</table>

### Goal 2: Promote Efficient, Compact Development Patterns and Infill

<table>
<thead>
<tr>
<th>Factor</th>
<th>Conventional</th>
<th>Better</th>
<th>Best</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>Lot size</td>
<td>Required minimum lot size</td>
<td>OSRD/NRPZ preferred. Special permit with incentives to utilize</td>
<td>Flexible with OSRD/NRPZ by right, preferred option</td>
<td>(Not applicable)</td>
<td>(Not applicable)</td>
<td>(Not applicable)</td>
</tr>
<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>
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<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>
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MVP Example: identified intersection that floods?

- Bioretention bump outs & street trees can help to...
  - capture & filter excess water – alleviate pressure on MS4
  - improved pedestrian safety – better visibility, shorter walkway
  - enhance aesthetics to encourage visitors & walking

without altering existing parking or bus stops

Environmental Services  Enhanced Safety
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
Funding

Certified MVP Communities Receive Priority Ranking

- MA Clean Water State Revolving Fund Program (CWSRF)
- MA Office of Coastal Zone Management (CZM)
- MA Department of Agricultural Resources (MDAR)
- MA Executive Office of Energy and Environmental Affairs (EEA)
- MA Department of Environmental Protection (DEP)
- MA Department of Conservation & Recreation (DER)
- Mass Environmental Trust (MET)