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



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 resourc**e rather than a waste product.



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Co-benefits

	Reduces Stormwater Runoff											Improves Community Livability						
Benefit	Reduces Water Treatment Needs	Improves Water Quality	Reduces Grey Infrastructure Needs	Reduces Flooding	Increases Available Water Supply	Increases Groundwater Recharge	Reduces Salt Use	Reduces Energy Use	Improves Air Quality	Reduces Atmospheric CO ₂	Reduces Urban Heat Island	Improves Aesthetics	Increases Recreational Opportunity	Reduces Noise Pollution	Improves Community Cohesion	Urban Agriculture	Improves Habitat	Cultivates Public Education Opportunities
Practice	53				A	2		۲	2	CO2			K	*13	ttt	業		Ò
Green Roofs		•			0	0	0		•		•		\bigcirc		\bigcirc	\bigcirc		
Tree Planting					0	\bigcirc	0		•							\bigcirc		
Bioretention & Infiltration		•			\bigcirc	\bigcirc	0	0			•			\bigcirc	\bigcirc	0		
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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





Avoided Costs

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





Environmental Services

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





Enhanced Safety



Environmental Services

Avoided Costs

Key Observed Climate Changes in MA



Why do rising temperatures also bring more precipitation?

...consider your morning coffee.

more moisture aloft More fuel for storms

More evaporation





More precipitation

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.

What's the problem?





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

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



Restore

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



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



Return on Investment Studies in MA Div. of Ecological Restoration



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



www.nature.com/scientificreports

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%





OPEN The Value of Coastal Wetlands for Flood Damage Reduction in the Northeastern USA

Received: 17 March 2017 Accepted: 1 August 2017 Published online: 31 August 2017 Siddharth Narayan¹, Michael W. Beck^{1,2}, Paul Wilson³, Christopher J. Thomas¹, Alexandra Guerrero³, Christine C. Shepard⁴, Borja G. Reguero^{1,2}, Guillermo Franco⁵, Jane Carter Ingram⁶ & Dania Trespalacios²



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: <u>View recording</u>
- Advancing Social Equity in Climate Adaptation Planning: <u>View recording</u>
- Alternatives for engaging your community: <u>View presentation slides</u>
- The importance of listening: <u>View recording</u>
- Bylaw Review Encouraging Nature Based Solutions: <u>View recording</u>
- Nature Based Solutions: <u>View recording</u>
- Characterizing coastal flood hazards and increasing resilience: <u>View recording</u>

Resources for Nature-Based Solutions

Guidance/Case Studies

- <u>Naturally Resilient Communities</u> 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
- <u>EPA's RAINE</u> database of vulnerability, resilience and adaptation reports, plans and webpages at the state, regional and community level.
- <u>Climate Action Tool</u> 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.
- <u>Low Impact Development Fact Sheets</u> 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 solution costs
- Massachusetts Division of Ecological Restoration's economic benefits of aquatic restoration based on MA case studies

Bylaws/Ordinances

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

SOLUTIONS 6 Results

CASE STUDIES 0 Results

HELP ME CHOOSE

Hazard Types

- Coastal Erosion
- Tidal Flooding
- Coastal Flooding
- Riverine Erosion
- Riverine Flooding
- Stormwater Flooding

Region

- Coastal West
- Great Lakes
- Gulf of Mexico
- Mid-Atlantic
- Midwest
- Northeast
- Pacific Northwest
- Rocky Mountain West
- Southeast
- Southwest

Community Type

- Rural
- Suburban
- Urban

Scale

- Community
- Neighborhood
- Site



Open Space Preservation through Land Acquisition

Coastal Erosion Riverine Flooding Riverine Erosion

Coastal Flooding Stormwater Flooding Tidal Flooding This strategy focuses on the public acquisition of undeveloped land to lessen ...



Urban Trees + Forests



Urban forestry is the planned installation and management of trees within an ...



Horizontal Levees

Coastal Erosion	Riverine Flooding Riverine Erosio	21
Coastal Flooding	Stomewater Flooding Tidal Flood	ling

A horizontal levee consists of a hardened structure (levee) setback from the ...



Green Streets

oastal Econom	Riverine Flooding Ro	nume Erosion
	Stormwater Flooding	Tidal Bosiding
een streets	incorporate depre	ssed plante

ed areas. typically located between the roadway pavement



Floodwater Detention and **Retention Basins**



A detention basin is an area that has been designed and designated...



Daylighting Rivers and Streams

Coastal Eresion	Riverine Flooding	Ryperine Erasion
Coastal Flooding	Stormwater Floodin	Tidal Flooding

Daylighting rivers or streams is the process of removing obstructions (such as...

http://nrcsolutions.org/



Factors	Conventional	Better	Best	Community's Zoning	Community's Subdivision Rules & Regulations	Community's Site Plan Review	Community's Stormwater/LID Bylaw/Regulations		
GOAL I: PROTECT NATURAL RESOURCES AND OPEN SPACE									
Soils managed for revegetation	Not addressed	Limitations on removal from site, and/or requirements for stabilization and revegetation	Prohibit removal of topsoil from site. Require rototilling and other prep of soils compacted during construction	(Not applicable)					
Limit clearing, lawn size, require retention or planting of native vegetation/natural ized areas	Not addressed or general qualitative statement not tied to other design standards	Encourage minimization of clearing/ grubbing	Require minimization of clearing/grubbing with specific standards						
Require native vegetation and trees	Require or recommend invasives	Not addressed, or mixture of required plantings of native and nonnative	Require at least 75% native plantings						
GOAL 2: PROM	OTE EFFICIENT, C	OMPACT DEVELOPMENT	PATTERNS AND INFILL						
Lot size	Required minimum lot sizes	OSRD/NRPZ preferred. Special permit with incentives to utilize	Flexible with OSRD/NRPZ by right, preferred option		(Not applicable)	(Not applicable)	(Not applicable)		
Setbacks	Required minimum front, side, and rear setbacks	Minimize, allow flexibility	Clear standards that minimize and in some instances eliminate setbacks		(Not applicable)	(Not applicable)	(Not applicable)		
Frontage	Required minimum frontage for each lot/unit	Minimize especially on curved streets and cul-de-sacs	No minimums in some instances, tied into other standards like OSRD design and shared driveways.		(Not applicable)	(Not applicable)	(Not applicable)		
Common driveways	Often not allowed, or strict limitations	Allow for 2-3 residential units	Allow for up to 4 residential units, preferrably constructed with permeable pavers or pavement	5 OSPD Applyric 6 Zoning	Subdiv SDP SW Applysis 7 Common	Acronyme 8 Decourses	(Not applicable)		

massaudubon.org/lidcost or download here

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 Enh

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)



