

Climate Change, Development, and Nature-based Solutions



**Shaping
the Future
of Your
Community**

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Shaping the Future of Your Community Program

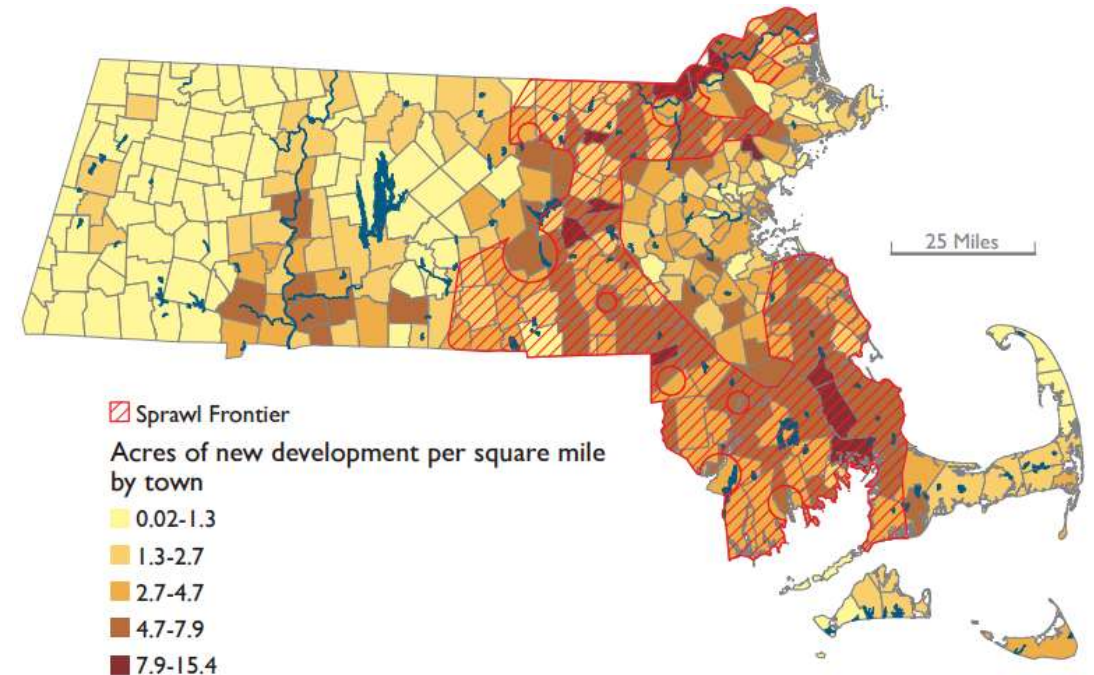
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Shaping the Future of Your Community

- Created in 2009 in response to *Losing Ground*
- Help the fastest-developing communities chart a more **sustainable future** through customized community workshops and direct assistance

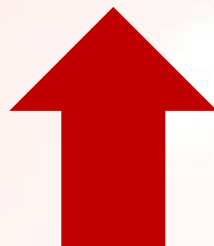


Shaping
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Key changes already observed in Massachusetts.

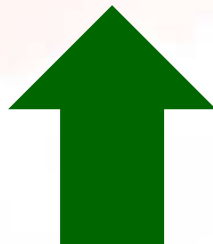
Temperature:



2.9°F

Since 1895

Growing Season:



11 Days

Since 1950

Sea Level Rise:



11 inches

Since 1922

Strong Storms:



55% >precip

Since 1958

What's in a degree?



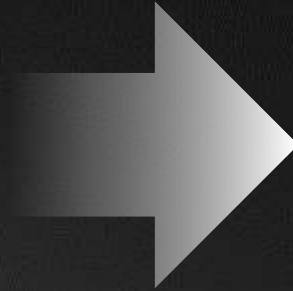
During the last ice age, temperatures were 9°F cooler than today.

**Why do rising temperatures also
bring more precipitation?**



...consider your
morning coffee.

**More
evaporation**



**More
fuel for storms**



**More
precipitation**

*warmer air holds
more moisture aloft*

**More
Heat**



How Much More Precipitation?

Total annual precipitation
has increased by:

15%

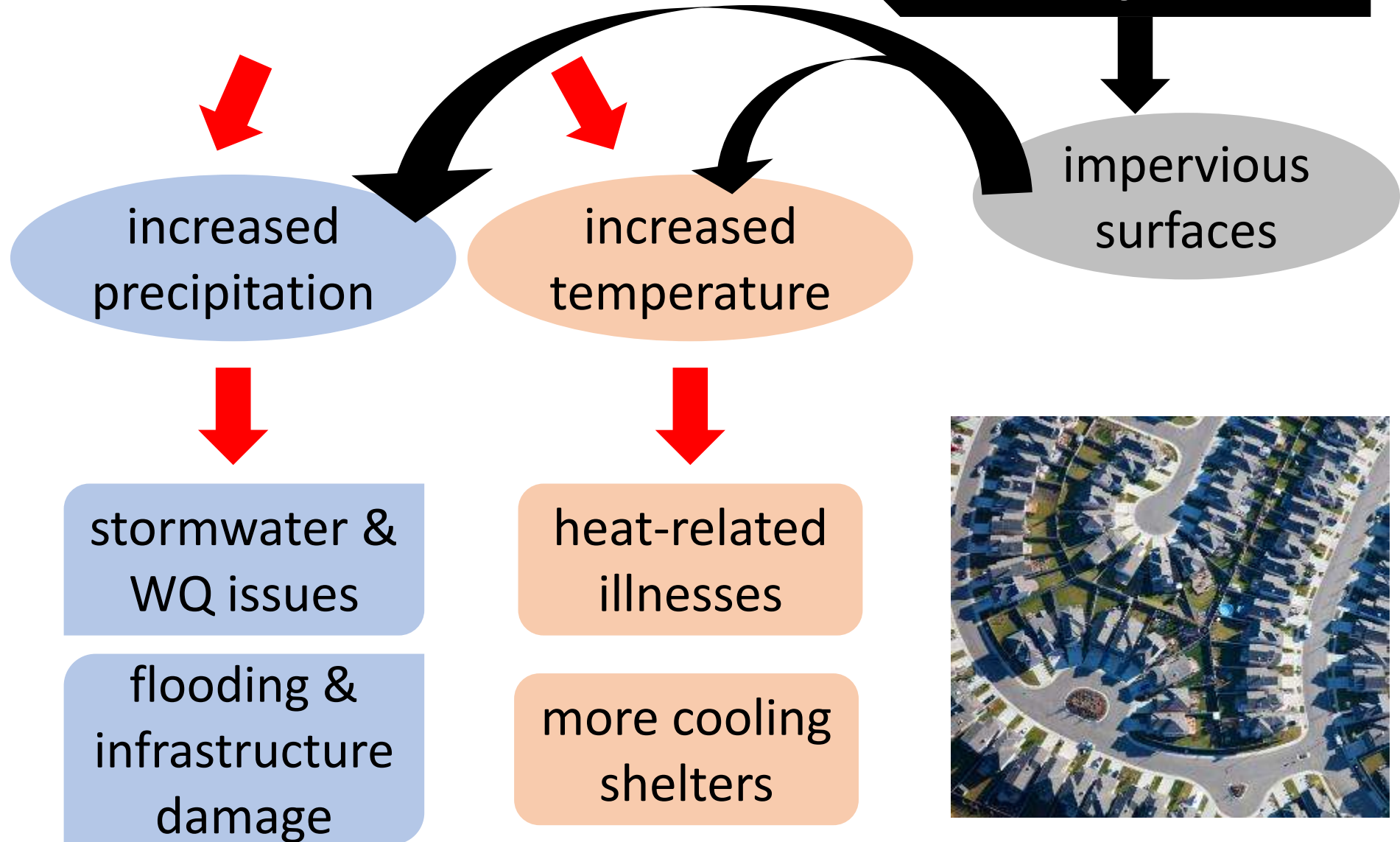
***1.2 trillion more gallons of
water or equivalent snow falling
on Massachusetts each year.***

~9,700 filled Prudential Towers



Climate change

**Sprawling
Development**



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**.



**Green
Infrastructure**



**Low Impact
Development (LID)**

Nature based solutions at every scale

Rural, suburban, or urban

Conserve available open space providing ecosystem services



Integrate low impact development (LID) designs into new development at neighborhood scales



Restore resilience in urban areas at site specific scale

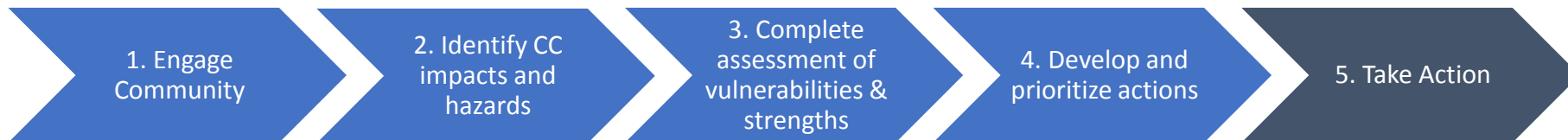




Municipal Vulnerability Preparedness (MVP)



State and local partnership grant to build resiliency to climate change



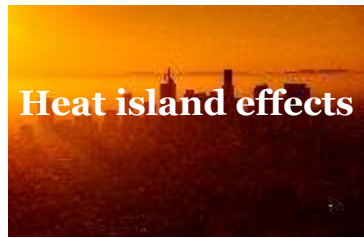
<https://www.mass.gov/municipal-vulnerability-preparedness-mvp-program>

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...**”

Hazards



Nature-based solutions

Open space preservation

Ecosystem restoration

Low Impact Development

Municipal benefits



Avoided Costs





















Enhanced Safety






Environmental Services

Co-benefits

Low Impact Development

Benefit	Reduces Stormwater Runoff				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 Community Livability					Improves Habitat	Cultivates Public Education Opportunities
	Reduces Water Treatment Needs	Improves Water Quality	Reduces Grey Infrastructure Needs	Reduces Flooding								Improves Aesthetics	Increases Recreational Opportunity	Reduces Noise Pollution	Improves Community Cohesion	Urban Agriculture		
Practice																		
Green Roofs	●	●	●	●	○	○	○	●	●	●	●	●	◐	●	◐	◐	●	●
Tree Planting	●	●	●	●	○	◐	○	●	●	●	●	●	●	●	●	◐	●	●
Bioretention & Infiltration	●	●	●	●	◐	◐	○	○	●	●	●	●	●	◐	◐	○	●	●
Permeable Pavement	●	●	●	●	○	◐	●	◐	●	●	●	○	○	●	○	○	○	●
Water Harvesting	●	●	●	●	●	◐	○	◐	◐	◐	○	○	○	○	○	○	○	●

 Yes
  Maybe
  No

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**

Floodplain Buyout: Woloski Park, Middleborough, MA

- 10 home buyout in Taunton River floodplain
- FEMA's Hazard Mitigation Grant Program funded 75% of ~\$1Million cost
 - 25%: Town and The Nature Conservancy

Benefits:

- Avoided safety risk
- Avoided emergency evacuation and property recovery costs
- High quality habitat is restored, floodplain and ecosystem services recovered



Enhanced Safety



Avoided Costs

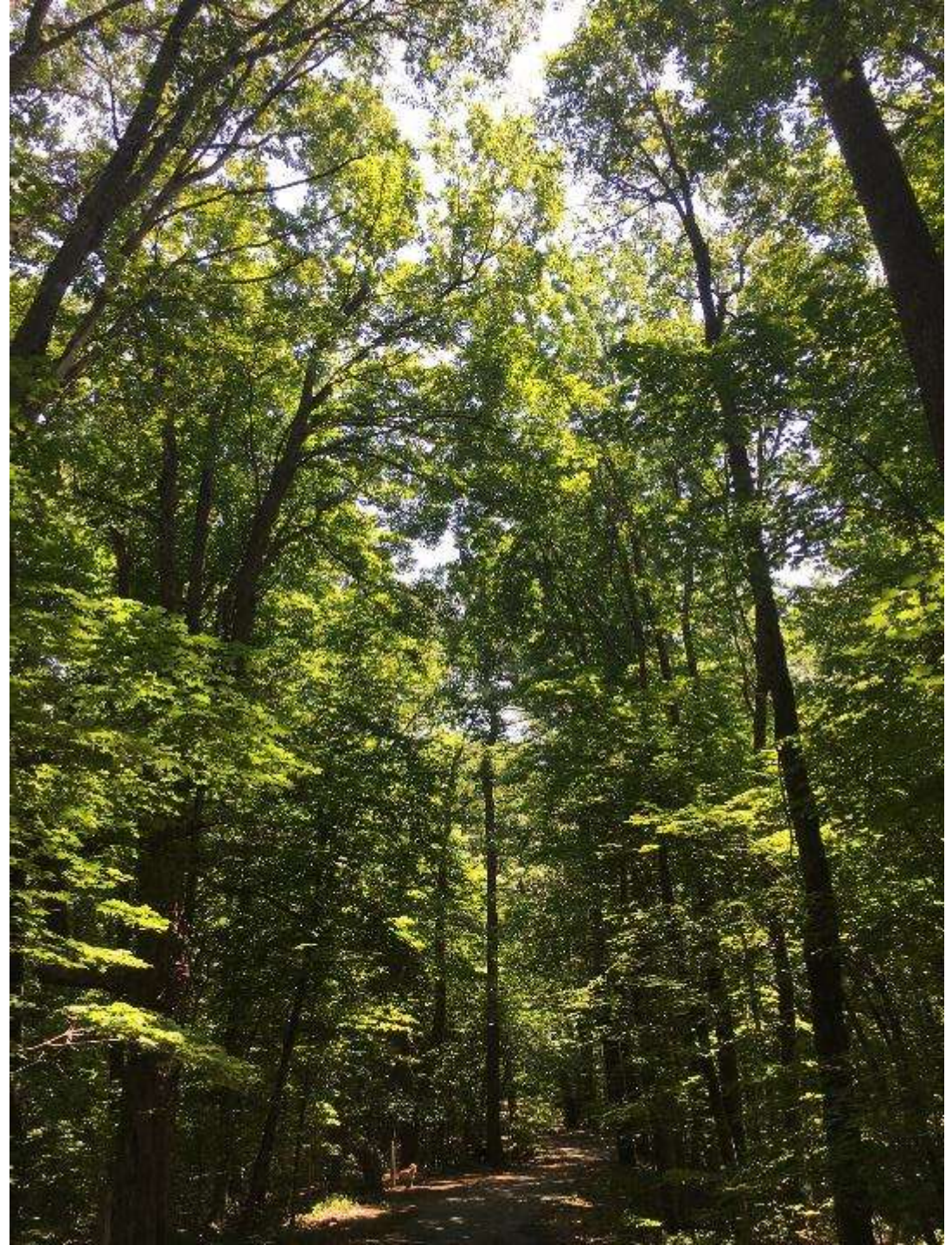


Environmental Services



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

Dept. 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



Photo Credits: SRPEDD

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%



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 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.

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/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.

Ten things local homeowners & citizens can do

1. Divert your downspouts

2. Plant a rain garden

3. Replace impervious surfaces

4. Adopt a drain – and encourage others to

5. Don't wash your car in the driveway



6. Pick up pet waste

7. Reduce fertilizer and pesticide use

8. Replace lawn with native plants

9. Reduce lawn watering and mowing

10. Pick up leaf litter (compost/dispose of properly)

Thank you!



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