



What on Earth is Green Infrastructure?

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Hudson, MA

Thank you



FOUNDATION FOR METROWEST



Shaping
the Future
of Your
Community

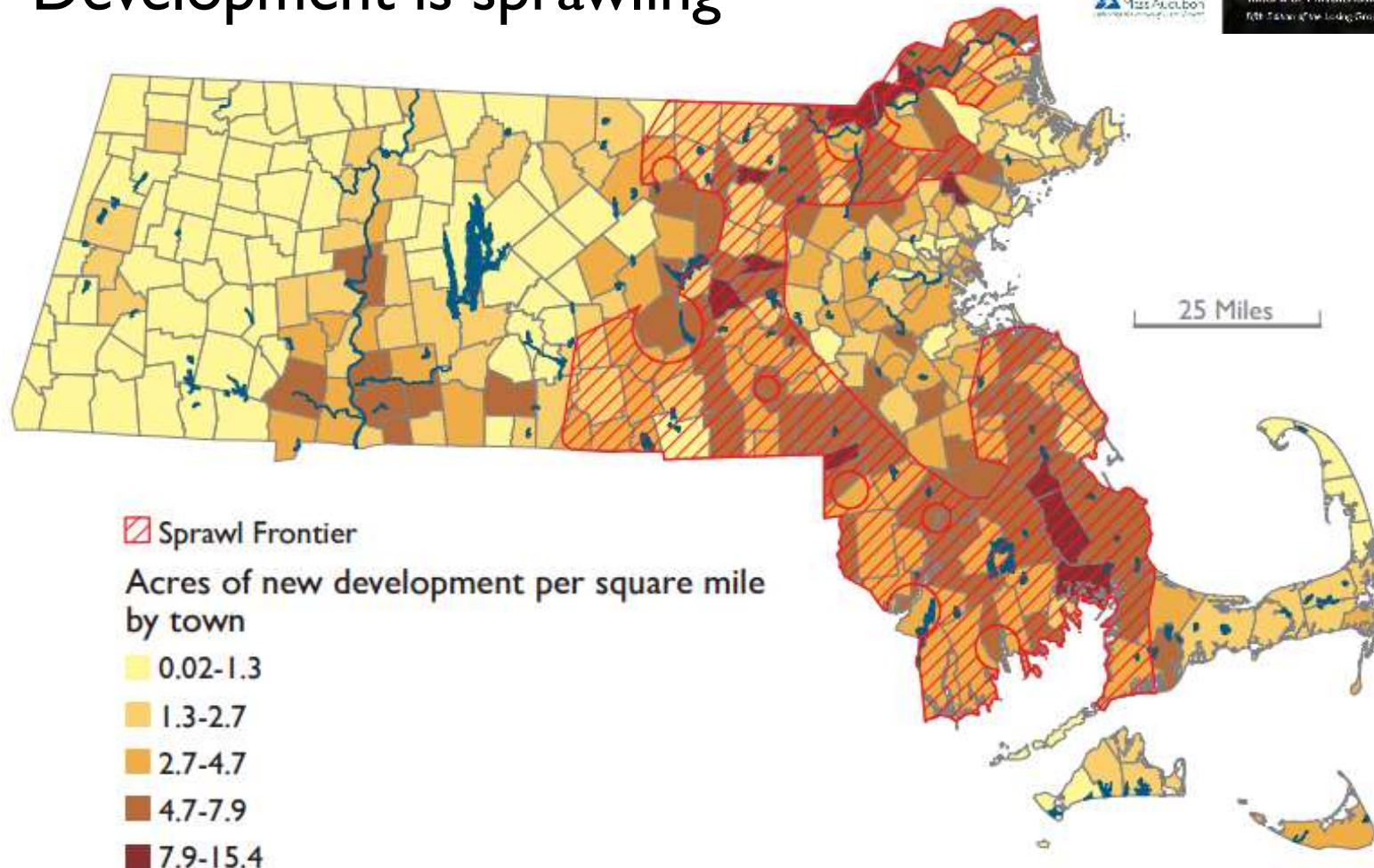


What's the problem?

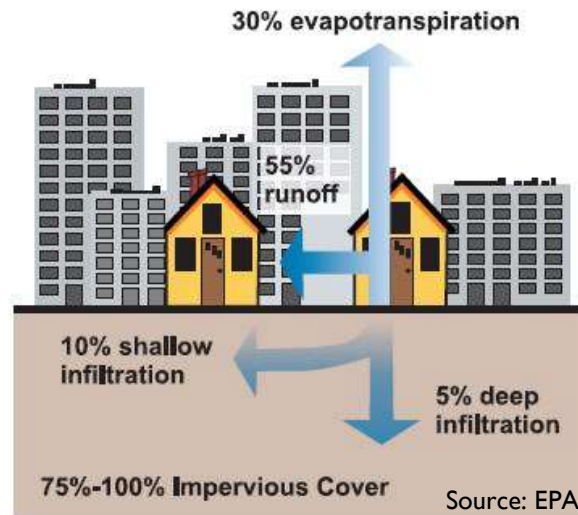
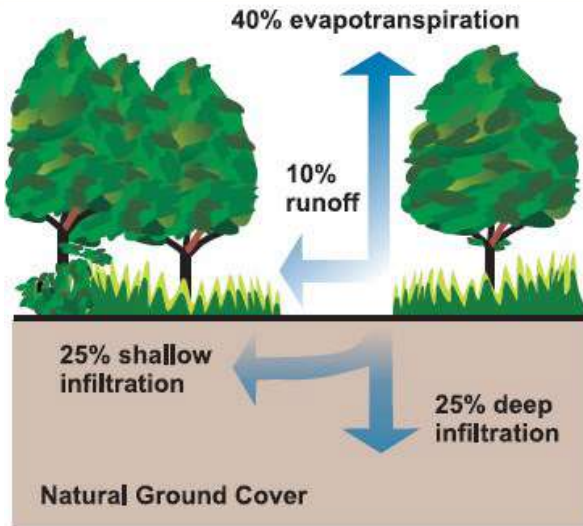
Development is sprawling



Mass Audubon
www.massaudubon.org



What's the problem?



Impervious
surface



Runoff



Large lawns



Fertilizer



We need to change course

Traditional development

Impervious surfaces

Large, thirsty, fertilized lawns

Stormwater runoff

Groundwater depletion

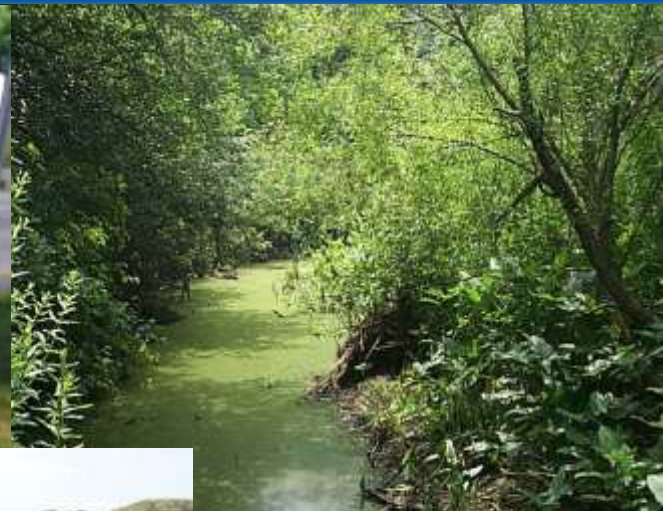
Water quality impairments

Infrastructure impacts

Unsustainable for people & wildlife



Impacts: dry rivers, flooding, algae blooms, beach closures



More Precipitation

**Total annual precipitation
has increased by:**

15%

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

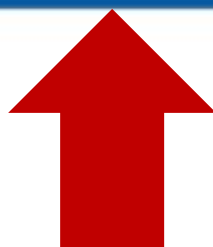
~9,700 filled Prudential Towers



Key Observed Climate Changes in MA



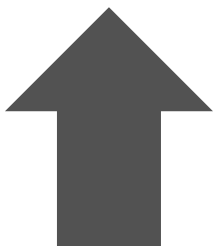
Temperature:



2.9°F

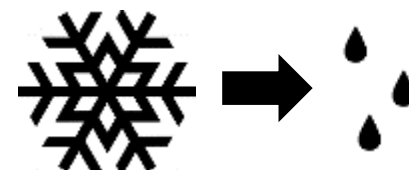
Since 1895

Growing Season:

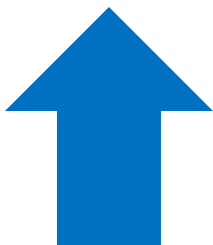


11 Days

Since 1950



Sea Level Rise:



11 inches

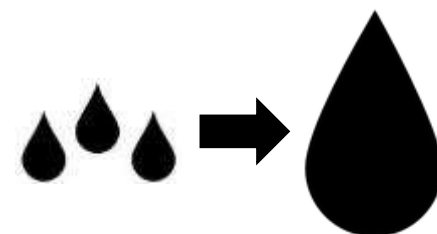
Since 1922

Strong Storms:



55%

Since 1958



Storms + Temps = Algal Blooms

West Monponsett Pond, Halifax, Massachusetts



Stronger Storms

More Runoff

Greater Nutrient Loading

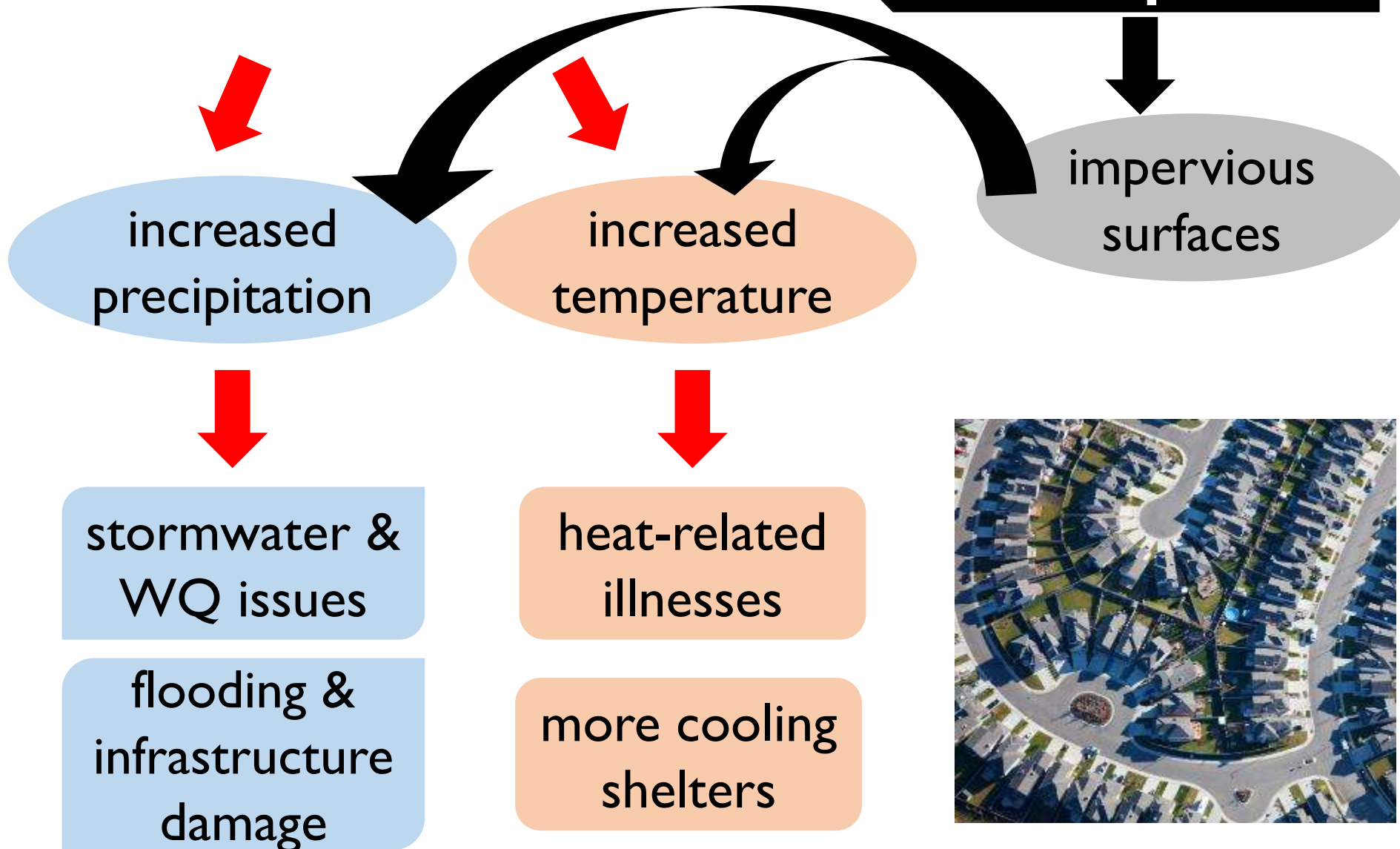
**Warmer Lake
Temperatures**

**Changed Lake
Dynamics**

**Algal Blooms,
Fish Kills**

Climate change

**Sprawling
Development**



There are real solutions.

**One of the best adaptation practices
is preserving natural areas.**



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 and built projects can help communities reduce their exposure to these impacts, resulting in reduced costs, economic enhancement, and **safer, more resilient communities**.

Nature based solutions keeps water where you need it most

Last year, the City of Worcester's reservoirs went dry and the city had to try and spend >\$1M to purchase MWRA water.

This **takes money from our local budget** for infrastructure repairs, monitoring, education, and more.



make
sure
water that
falls in our
communities
stays in our
communities

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



restore



protect



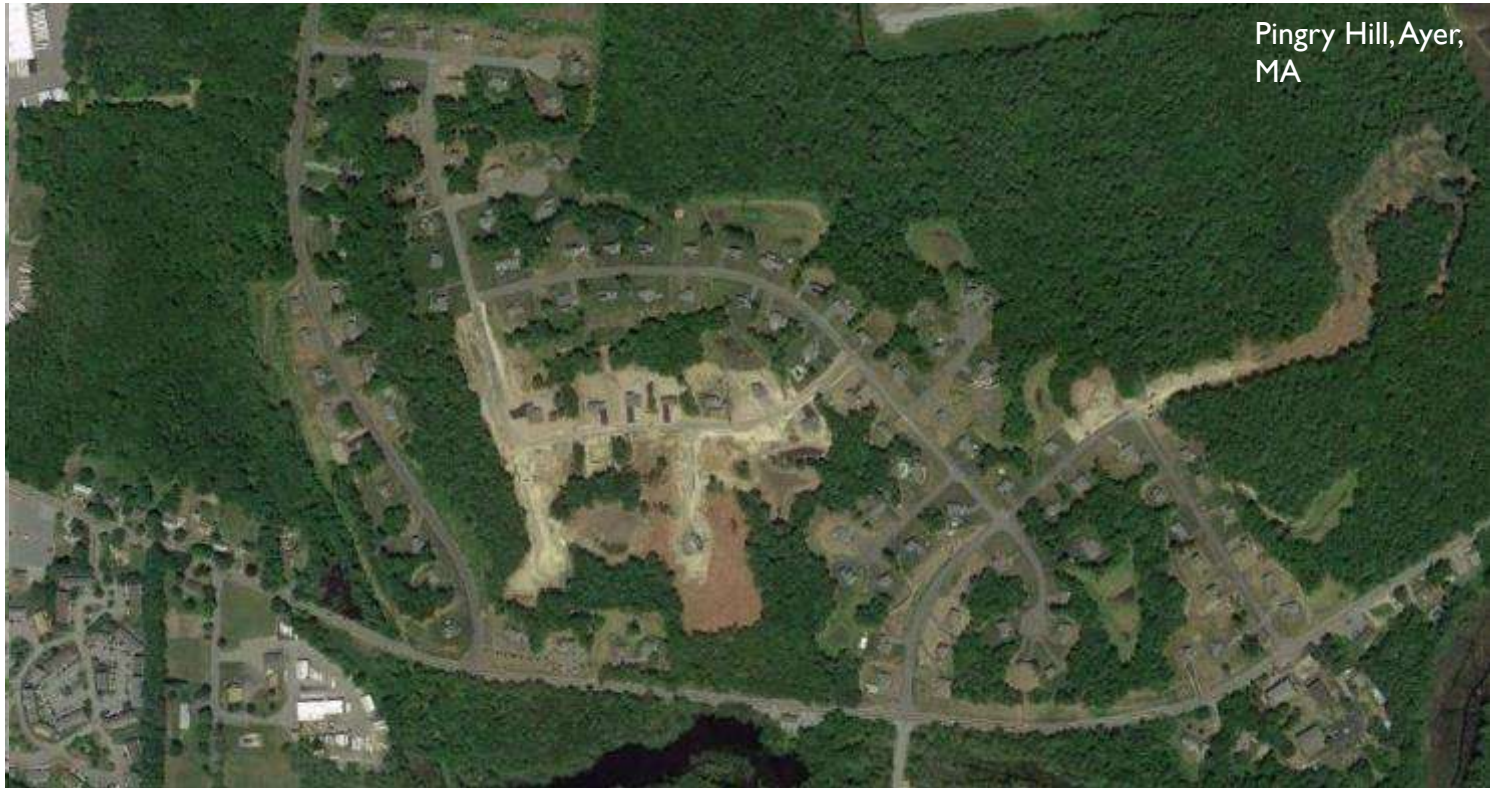
save money

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

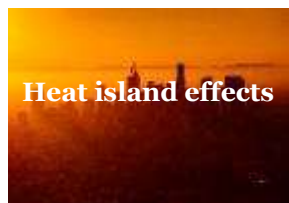
Restore the resiliency of local landscapes through LID in redevelopment



Climate Hazards

Nature-based solutions

Municipal benefits



Conserve natural areas



Avoided Costs



Restore ecosystems



Enhanced Safety



Integrate Low Impact Development



Environmental Services

Return on Investment Studies in MA



Avoided Costs



Environmental
Services

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



Environmental
Services



Enhanced Safety



Avoided Costs

Div. 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



Return on Investment Studies in Northeast US



Environmental
Services



Enhanced
Safety



Avoided
Costs

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%



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

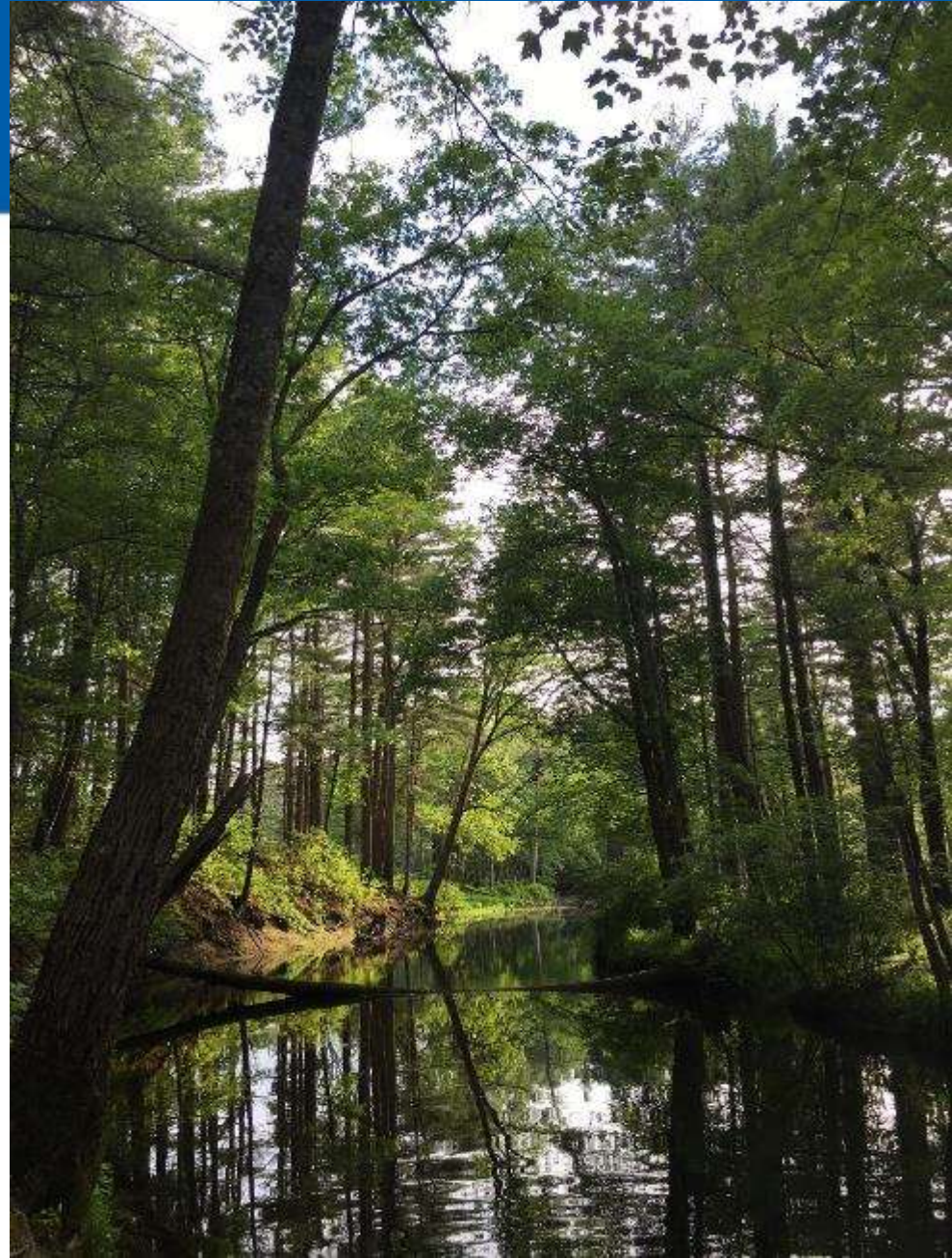
without altering existing parking or bus stops

5 Things You Can Do: Conservation Commissioners

- ✓ 1. Apply to become an MVP community & participate in the core team
- ✓ 2. Talk to your neighbors, fellow board members, and community members about climate change and nature based solutions
- ✓ 3. Advocate to adopt the Community Preservation Act or support CPA projects
- ✓ 4. Work with your planning board to adjust local bylaws & regulations that support climate smart nature based solutions
- ✓ 5. Vote in local, state, and federal elections to promote candidates that support climate smart solutions and funding

I. Plant trees

- MVVRA spent \$130M to protect 22,000 acres of watershed lands
- Avoided ratepayer cost of \$250M on a filtration plant and \$4M/yr in operations



2. Plant a rain garden (workshop on April 25!)



3. Reduce impervious surfaces

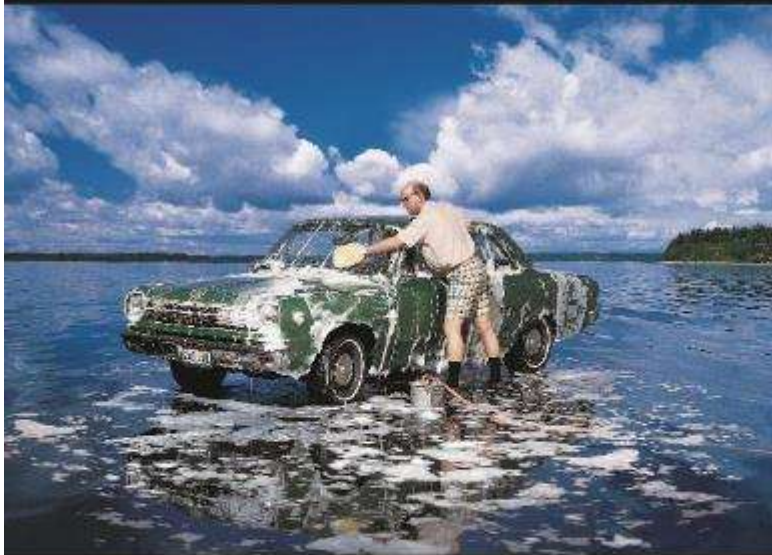


4. Adopt a drain



5. Don't wash your car in the driveway

WHEN YOU'RE WASHING YOUR CAR IN
THE DRIVEWAY, REMEMBER YOU'RE
NOT JUST WASHING YOUR CAR
IN THE DRIVEWAY.



All the soap, suds, and oily grit runs along the curb. Then into the storm drain and directly into our lakes, streams and into coastal waters including the Chesapeake Bay. And that causes pollution which is unhealthy for fish. So how do you avoid this whole mess? Easy. Wash your car on grass or gravel instead of the street. Or better yet, take it to a car wash where the water gets treated and recycled.

It's not just dirt...



If you want to keep **oil**, **heavy metals**,
and **toxic chemicals** from getting
into Puget Sound...

Take your car to a professional car wash.



This message is brought to you by the Puget Sound Car Wash Association

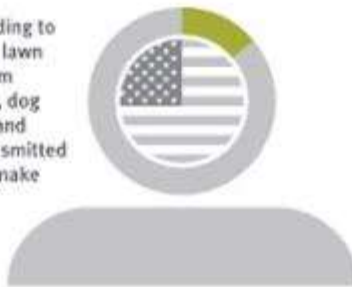
6. Pick up pet waste

Two or three days worth of droppings from a population of about 100 dogs can contribute enough bacteria to temporarily close a bay and all watershed areas within 20 miles to swimming and shell fishing.



DOG WASTE CAN HARM YOUR HEALTH

Unlike other sources adding to water pollution, such as lawn fertilizer, rinse water from driveways and motor oil, dog waste carries parasites and bacteria that can be transmitted directly to humans and make them sick.



The longer dog waste stays on the ground, the greater a contamination becomes.



Roundworm is one of the most common parasites found in dog waste. It can remain infectious in contaminated soil and water for years. A recent CDC study found 14 percent of Americans tested positive for roundworms.

Dog feces are common carriers of:

- Heartworms
- Whipworms
- Hookworms
- Roundworms
- Tapeworms
- Parvovirus
- Giardia
- Salmonella
- E. coli



7. Reduce fertilizers & pesticides



8. Plant natives (workshop on May 8!)



9. Reduce lawn watering and mowing



10. Pick up leaf litter

Don't let *THIS*.....turn into *THIS*



Leaf litter is full of nutrients.
Great for forests and growth;
not for stormwater



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.

Naturally Resilient Communities

nrcsolutions.org

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

Cost

- ☐ \$
- ☒ \$\$
- ☐ \$\$\$
- ☐ \$\$\$\$

SOLUTIONS

6 Results

CASE STUDIES

0 Results



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

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

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



Horizontal Levees

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

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



Green Streets

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

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



Floodwater Detention and Retention Basins

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

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



Daylighting Rivers and Streams

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

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

LID Fact Sheets



massaudubon.org/lidfactsheets

massaudubon.org/lidcost or [download here](#)

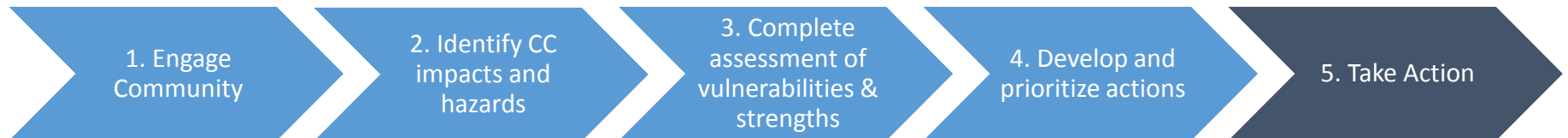
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Municipal Vulnerability Preparedness (MVP)



State and local partnership grant to build resiliency to climate change



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

Ensuring Success Webinars

MVP Tool Box

www.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](#)

Thank you



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