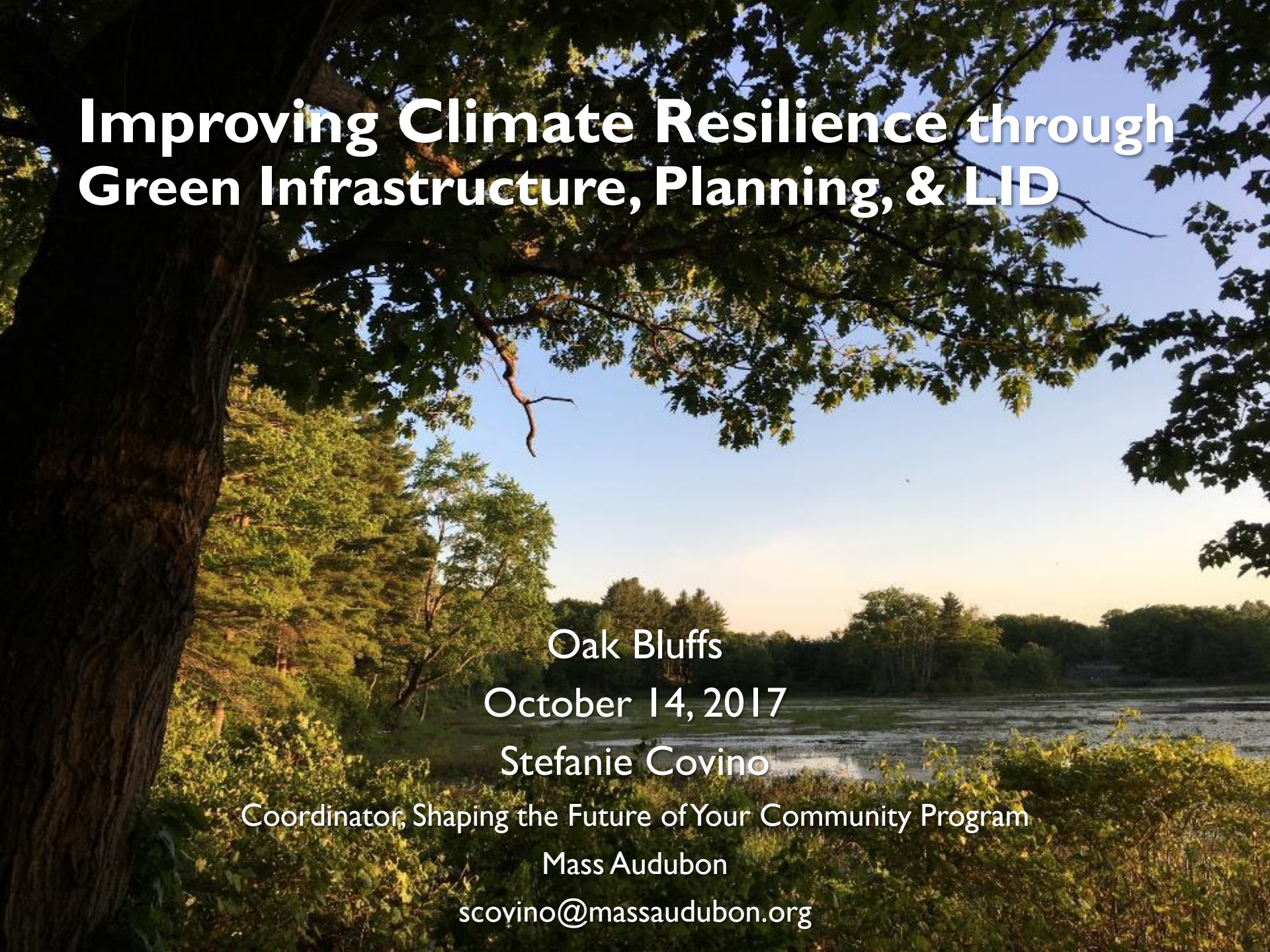
Improving Climate Resilience through Green Infrastructure, Planning, & LID



Oak Bluffs

October 14, 2017

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Mass Audubon

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Resilient Taunton Watershed Network (RTWN) Project Partners

SRPEDD

manomet
Soaring Solutions. Grounded Science.

The Nature Conservancy
nature.org

Mass Audubon
Protecting the Nature of Massachusetts

MAPC

SHAPING the Future of YOUR COMMUNITY

RTWN: Who we are & our goals

Formed in 2104, we're a **collaboration** of local, non-profit, regional organizations, and state and federal government representatives who care about the future health and resilience of the Taunton River Watershed **and believe that ecological and economic resilience go hand in hand.**

- ✓**Promote environmental, economic, and social resiliency**
- ✓**Provide education and resources to local officials and residents**

srpedd.org/rtwn

RTWN Members

Bridgewater State University
Horsley Witten Group
Manomet Inc.
MA Department of Environmental Protection (DEP)
MA Division of Ecological Restoration (DER)
MA Executive Office of Energy and Environmental Affairs (EEA)
Mass Audubon
Metropolitan Area Planning Council (MAPC)
Narragansett Bay Estuary Program
The Nature Conservancy (TNC)
Old Colony Planning Council (OCPC)
Save the Bay
Southeastern Regional Planning and Economic Development District (SRPEDD)
Taunton River Watershed Alliance (TRWA)
Tighe & Bond
US Environmental Protection Agency (EPA)
National Park Service
Wildlands Trust

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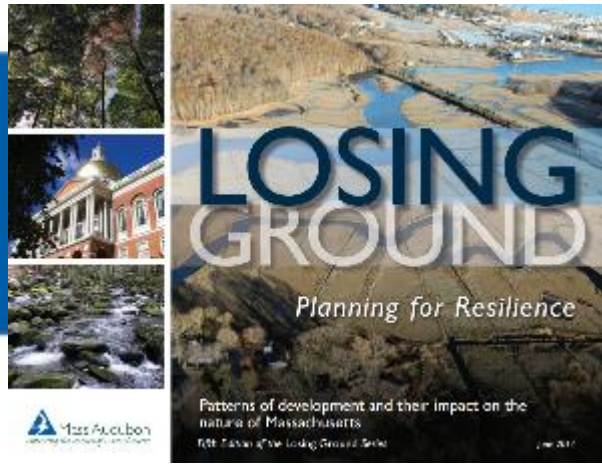
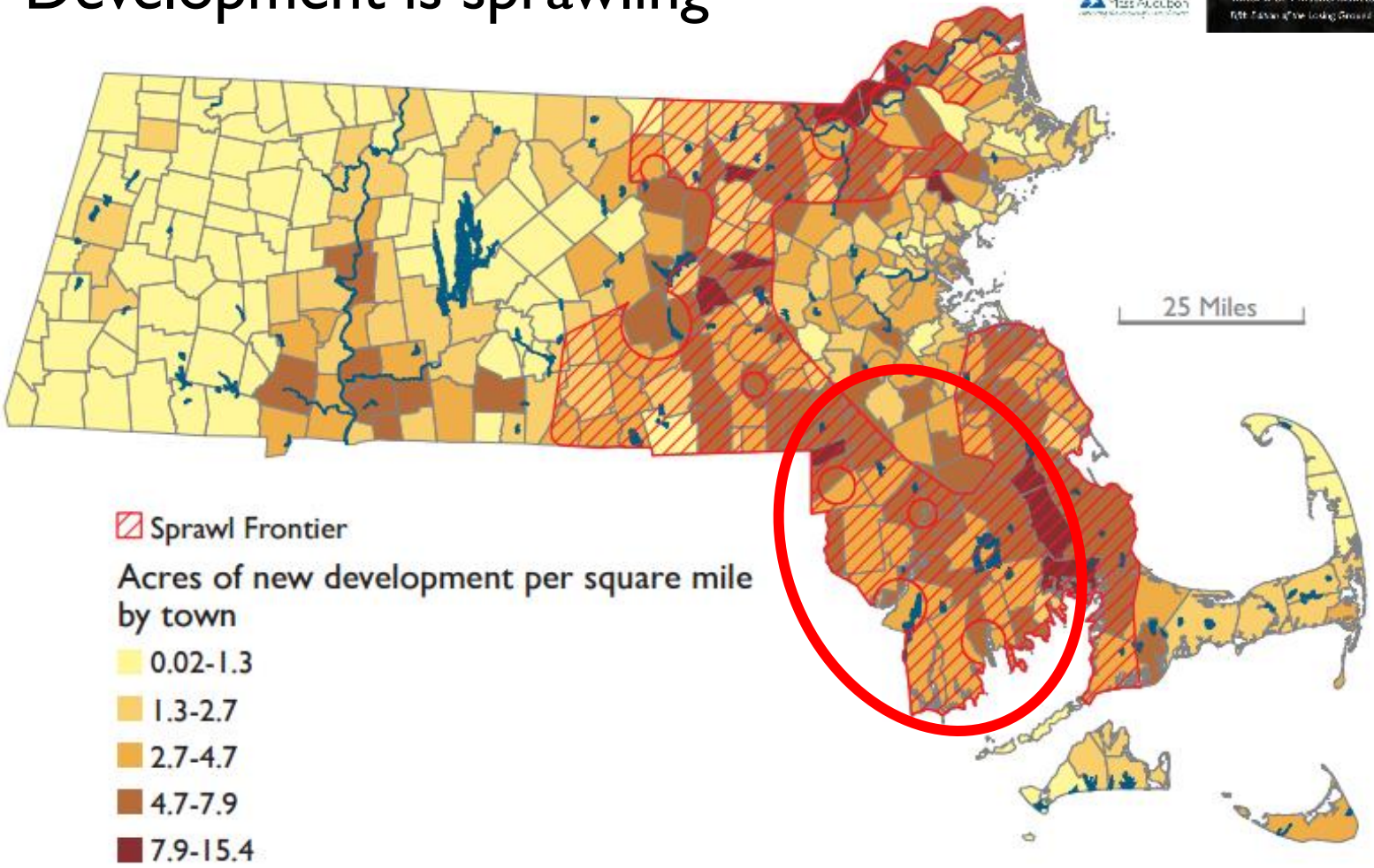
What's the problem?



Development is sprawling



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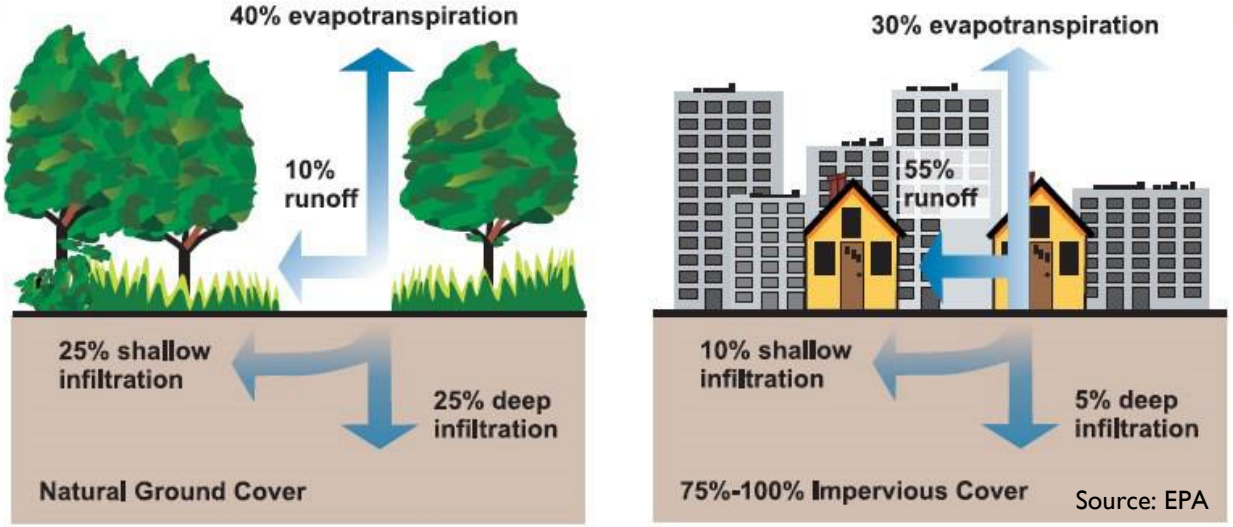
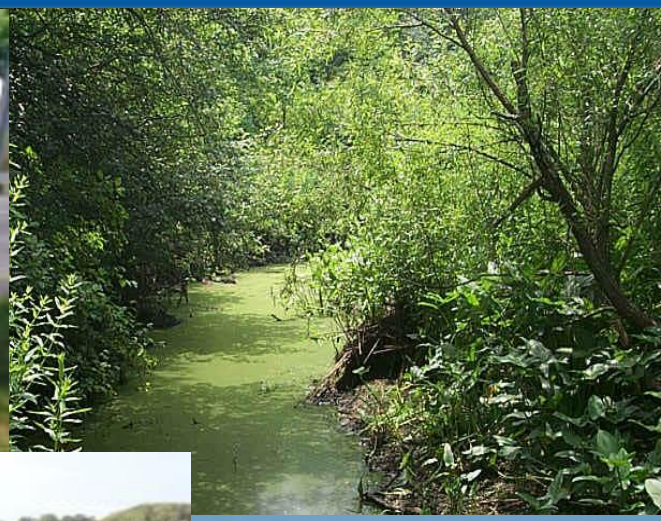
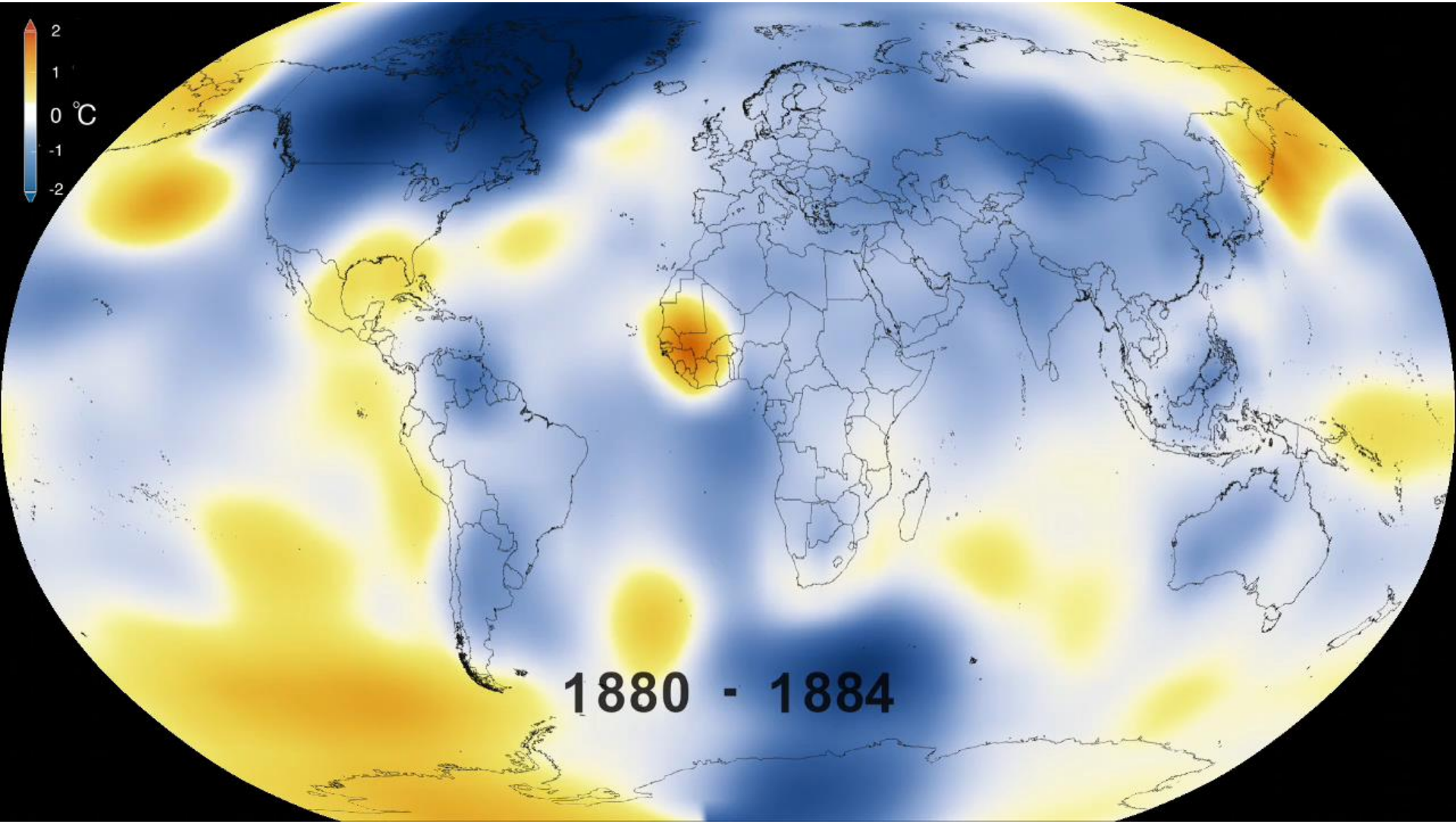


Impervious surface → **Runoff** →

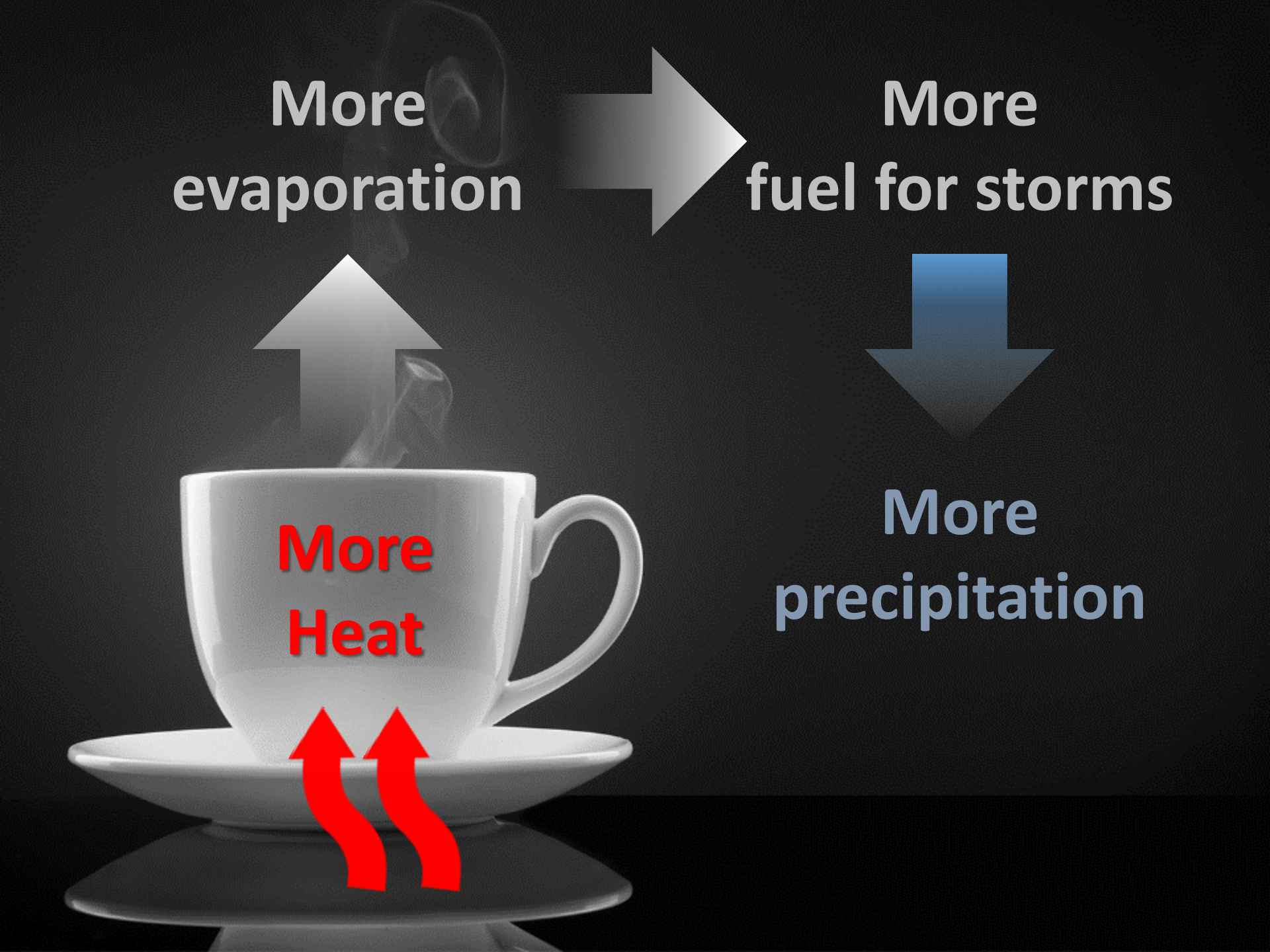
Impacts: dry rivers, flooding, algae blooms



Observed Change: Temperature



Animation of Global Surface Temperature Anomalies from 1880-2015. Source: NASA/GSFC Scientific Visualization Studio


More evaporation
More fuel for storms
More precipitation
More Heat

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

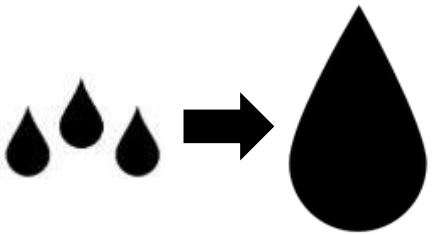
Key Observed Climate Changes in MA

Temperature: **2.8°F**
Since 1895

Growing Season: **10 Days**
Since 1950

Sea Level Rise: **10 inches**
Since 1922

Strong Storms: **71%**
Since 1958



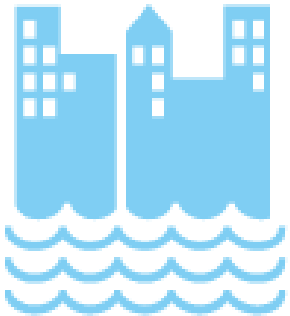
Future Expectations

Annual precipitation likely to increase

Extreme precipitation more likely

Outdated assessments do not capture continual change

Sea level rise will drive greater flood risk




There are real solutions.
One of the best adaptation practices is preserving natural areas.

We need to change course

Traditional development

Impervious surfaces

Thirsty Lawns

Stormwater runoff

Water quality impairment

Groundwater depletion

Infrastructure impacts

Financial and regulatory burdens

What is Green Infrastructure?

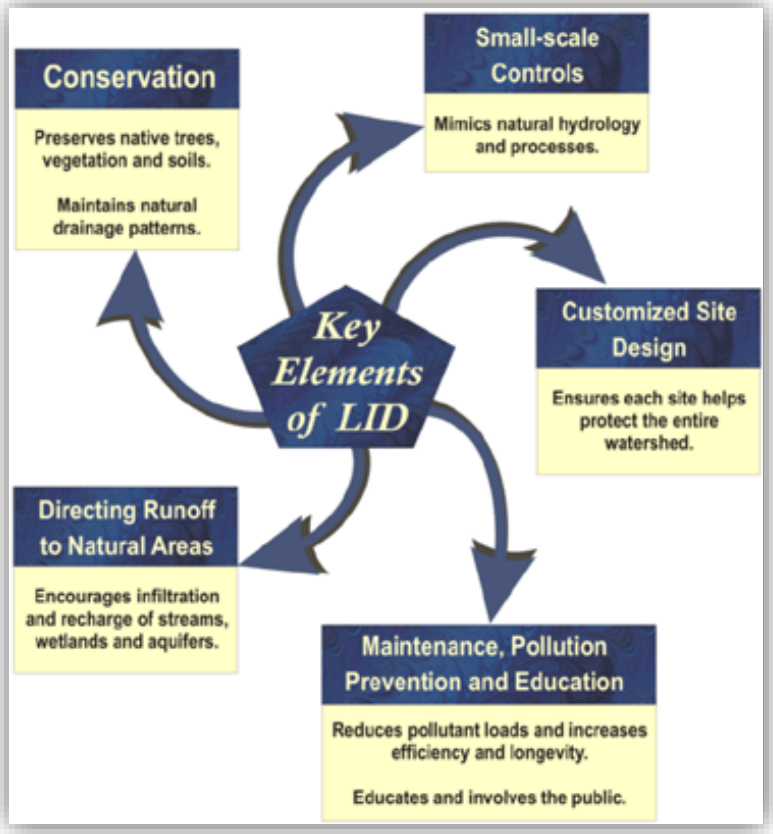
A network of waterways, wetlands, woodlands, wildlife habitats, and other natural areas that support native species, maintain natural ecological processes, sustain air and water resources and contribute to health and quality of life.

(McDonald, Benedict and O'Conner, 2005)

What is Low Impact Development?

“LID is an approach to land development (or re-development) that **works with nature to manage stormwater** as close to its source as possible. LID employs principles such as preserving and recreating natural landscape features, minimizing effective imperviousness to create functional and appealing site drainage that **treat stormwater as a resource** rather than a waste product.”

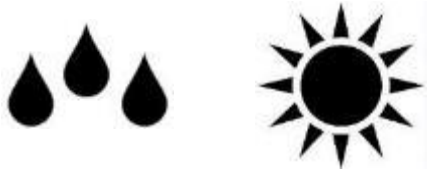
- EPA



Source: Whole Buildings Design Guide, wbdg.com

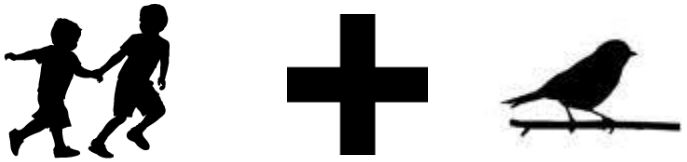
Goal: Maximize the benefits provided by intact, healthy ecosystems

- Climate change resiliency



- Control of tax burden and infrastructure costs

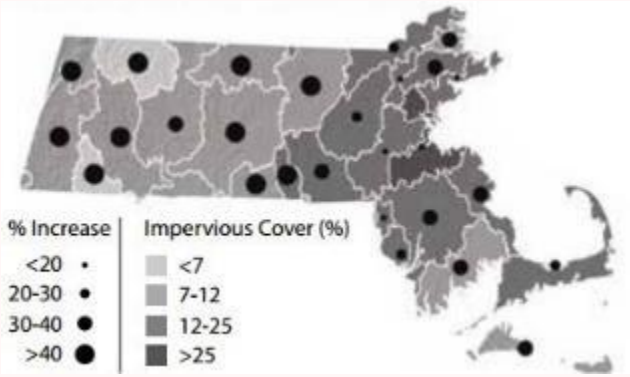
- Improve health and safety, quality of life

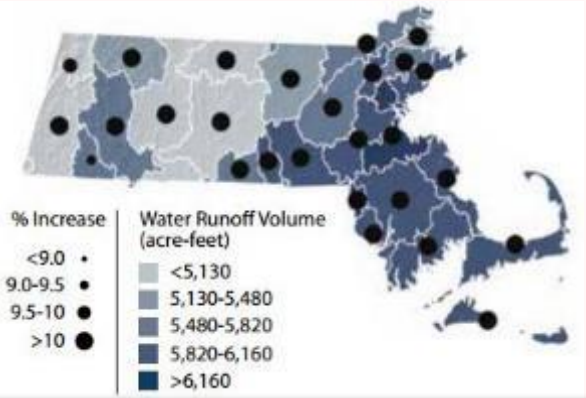


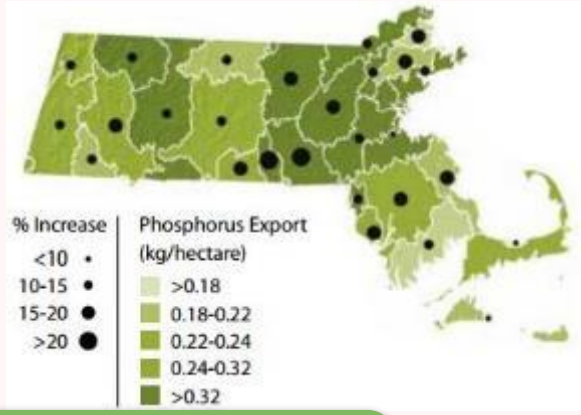
The value of green: impervious, runoff, nutrients

Source: Harvard Forest *Changes to the Land* 2014

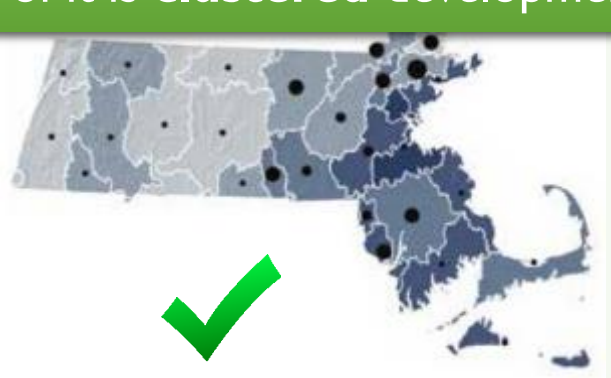
If we continue to follow opportunistic growth, in 2060:

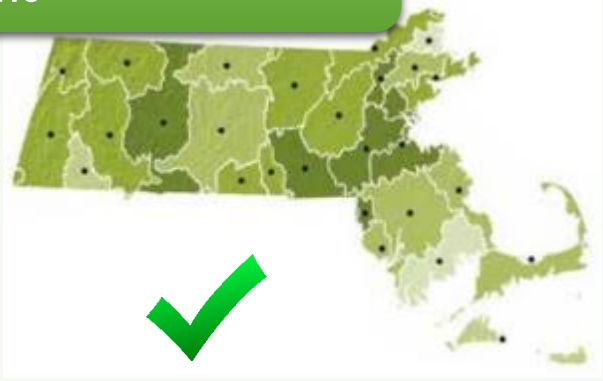






These allow for nearly the **same amount of development,** but 2/3 of it is **clustered** development





A different direction: Greening your community

Sustainable development

Increased infiltration

Reduced runoff & more groundwater

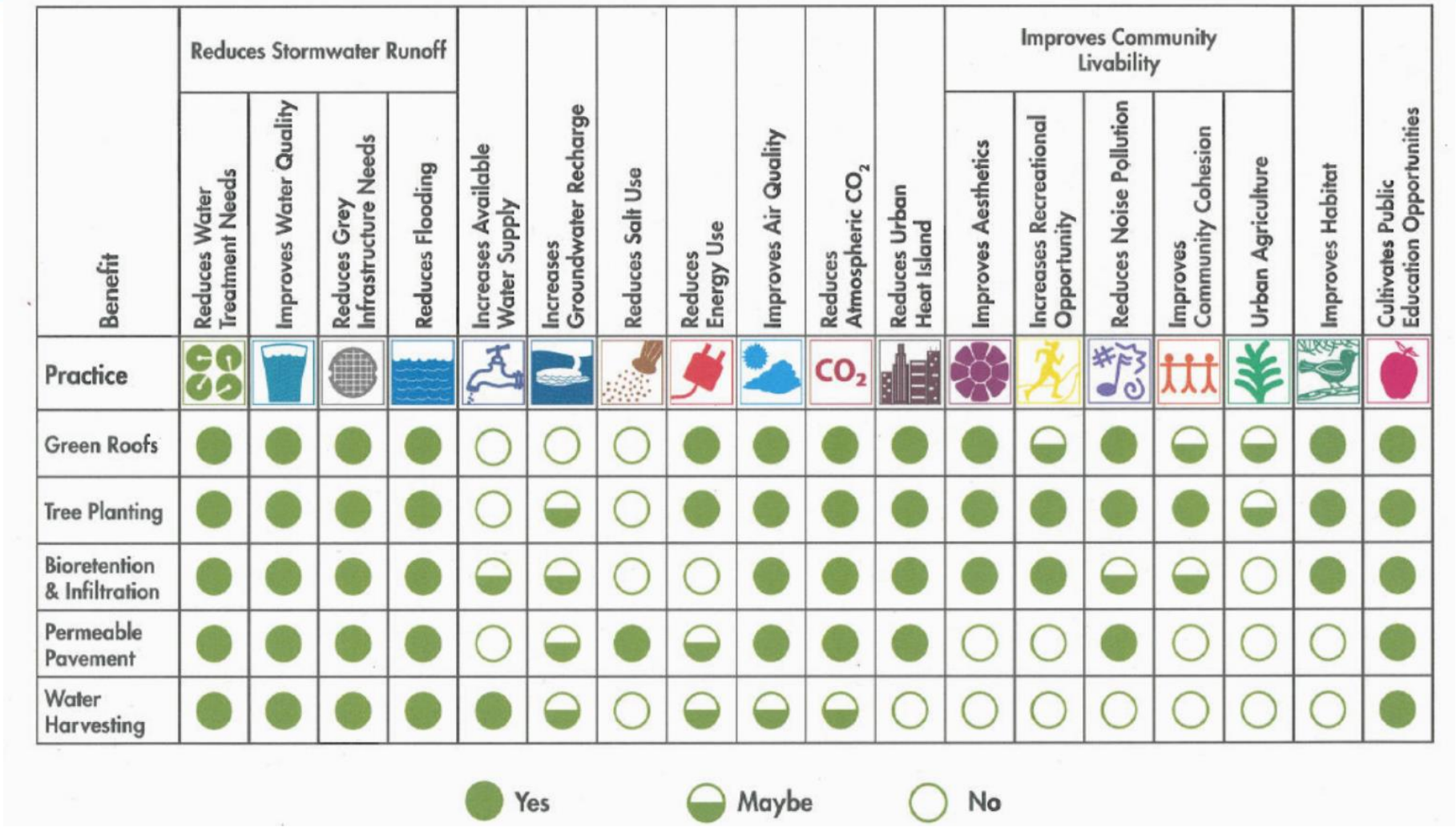
Water quality & quantity

Intact infrastructure

Regulations met

Money saved

Benefits of LID practices



Source: Center for Neighborhood Technology's The Value of Green Infrastructure

Start here.

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 urban landscapes through LID in redevelopment

North Street, Pittsfield, MA

Free ecosystem services:

Free services provided by the natural landscape

Every $1 invested in land conservation offers a ***$4 Return on Investment*** in terms of these ecosystem service values

- **Flooding**: Floodplains provide flood protection and reduce infrastructure damage
- **Public Health**: Managing stormwater and reducing retention ponds reduces creation of mosquito habitat
- **Air Quality & Public Health**: Trees reduce the urban heat island effect, reducing smog creation and resulting asthma occurrences as well as reducing nitrogen dioxide and particulate matter
- **Water Quality**: Streamside vegetation filters pollutants and reduces erosion
- **Water Quantity**: Forests and wetlands store water, improve water quality, and recharge groundwater
- **Recreation**: Clean, flowing waters support recreation, including boating, fishing, and swimming while open space provides areas for hiking and biking
- **Quality of Life**: Open space and street trees create a more enjoyable walking environment, benefiting community connection, health, and economic benefit in downtowns and commercial areas
- **Property Value**: Healthy, mature trees add an average of 10-30% to a property's value

The value of green: Reduced paving costs

Road Diets

Narrowing just 2 miles of road by 4 feet/lane saves

Plus savings on repair, salting, plowing…

Not building the road through a sprawling development in the first place? Savings grow to the *millions*.

The value of green:
Reduced clearing & grading costs

- A 20-unit development with two-acre lots requires 40 acres to be cleared and graded
- Conservation subdivisions offer the same amount of housing but preserve 50% of land – and $200,000+

The more **land** you save, the more **money** you save.

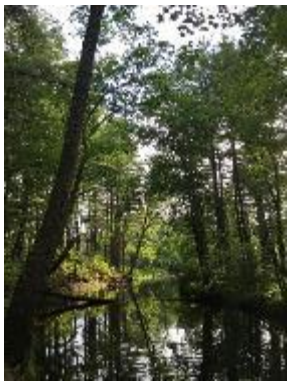
Land protection = water protection

- 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

Five things you can do now to improve community resilience

1. Take Advantage of Nature
2. Be Smart with Regulations and Bylaws
3. Think Ahead and Plan
4. Be Opportunistic & Work Together
5. Look Around for Easy Fixes

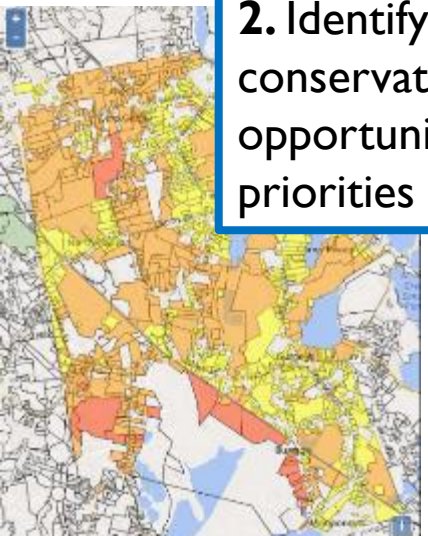


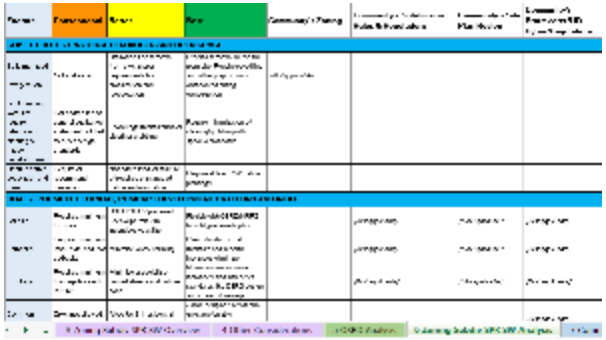
So what do we do now?

1. Identify existing and future problems that GI can help alleviate

5. Prioritize and incentivize sustainable development



2. Identify conservation opportunities and priorities



3. Include this information in local planning (OS, Comprehensive plans, zoning, etc.)

4. Educate the public and local boards to encourage sustainable development

Examples

Municipal Vulnerability Preparedness Program

1. Identify existing and future problems that GI can help alleviate

http://www.mass.gov/eea/air-water-climate-change/climate-change/massachusetts-global-warming-solutions-act/municipal-vulnerability-preparedness-program.html

2. Identify conservation opportunities and priorities

www.massaudubon.org/mappr

Mapping & Prioritizing Parcels for Resilience Project

Mass Audubon, in partnership with The Nature Conservancy and LandVest, developed Mapping and Prioritizing Parcels for Resilience (MAPPR) to allow Massachusetts conservationists to rapidly identify specific parcels that, if protected, could contribute the most to achieving land protection goals.

While land trusts, towns, and agencies have long relied on a wide range of maps and data sets to identify priority areas for land protection to meet their goals, MAPPR takes advantage of newly available digital parcel data to identify specific land protection opportunities. MAPPR also helps land trusts, towns, and agencies to easily define and refine their priorities, discover new opportunities, and extract the data necessary to take the next steps in land protection.

Support for MAPPR

Resources

MAPPR Tool

Resources

Questions

For more information:
MAPPR@massaudubon.org

Project Partners

The Nature Conservancy

LandVest

3. Include this information in local planning (Open Space, Comprehensive plans, zoning, etc.)

Factors	Conventional	Better	Best	Community's Zoning	Community's Subdivision Rules & Regulations	Community's Site Plan Review	Community's Stormwater/LID Bylaw/Regulations
GOAL 1: 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/natu	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: PROMOTE EFFICIENT, COMPACT 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		*(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	Often not allowed,	Allow for 2-3 residential	Allow for up to 4 residential units, preferrably				*(Not applicable)*

4. Educate the public and local boards to encourage sustainable development

- Westford, MA adopted a Conservation Subdivision bylaw in 1978
- Requires developers to submit both conservation and conventional plans & Planning Board chooses
- 48 developments protected over1,700 of land

- Preserved local habitat
- Protected water resources
- Created 13 miles of hiking trails & public recreation
- Town didn't have to purchase the land themselves, saving millions of dollars

5. Prioritize and incentivize sustainable development

Weir Village Park

- Redevelopment project demolishing old F.B. Rogers Silver factory in Taunton
- Building new city park and boat ramp to improve access
- Working with TNC to construct rain gardens to reduce runoff impairments into Taunton River

Weir Village Park - Benefits

✓**Economic**

✓**Environmental**

✓**Community**

Benefits

Pollutant Reductions	Environmental Benefit	Economic Benefits
90% Removal of Total Suspended Solids	Clearer Water, Clean Riverbed Surfaces	Healthier Fish Communities
30-50% Removal of Total Nitrogen	Nitrogen control helps prevent harmful algal blooms in saltwater habitats	Healthier Shellfish Communities
30-90% Removal of Total Phosphorus	Phosphorus control helps prevent harmful algal blooms in freshwater habitats	Higher levels of oxygen lead to healthier Fish and freshwater shellfish habitat
40-90% Removal of Metals	Metals can be toxic in high concentration	Healthier fish and shellfish communities

Whittenton Dam Removal

- Partnership worked to remove a failing dam built in 1832
- Threatened safety of downtown Taunton

Whittenton Dam Removal - Benefits

Environmental

- ✓Fewer algae blooms; improved water quality
- ✓Improved fish passage and habitat

Community

- ✓Reduced safety threat
- ✓Increased local property value
- ✓Improved recreational opportunities

Economics

- ✓Cost of removal $.5M vs. future cost of repair $1.9M
- ✓DER study: Each $1M spent on restoration projects supported 10-13 jobs and $1.5-$1.8M in regional economic output

Take Home Messages

- Forests and other natural green infrastructure offer numerous **free ecosystem services,** including **climate resilience**
- We can ID issues, GI solutions, and incorporate into local planning to **prioritize sustainable, healthy communities**

Local Challenges

- Capacity
  - Few full time staff in small towns
  - Comprehensive planning takes time

- Public understanding
- Local champions to stay the course over time
- Need for interdepartmental cooperation and integration – Planning, conservation, public works, fire & safety, etc.

www.srpedd.org/rtwn

Thank you! Please remember that both RTWN and Mass Audubon are resources available to you – both in and out of the watershed and state.

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massaudubon.org/shapingthefuture