Greening Your Community

Cost-effective LID solutions

#1

Fact Sheet #1:
Preserving Natural Assets—Nature Based Solutions

Competing Priorities & Cost-Effective Solutions

Communities are facing many pressures. More jobs and housing are needed, while the costs of providing essential services rise faster than revenues. Infrastructure maintenance needs for roads, bridges, and water systems are growing. An estimated $40 billion is needed over the next 20 years for water, sewer, and stormwater systems across Massachusetts.[1] There is pressure to increase the local tax base and opposition to "unfunded mandates" such as federal and state water resource management regulations.

In the midst of these challenges, we also need to address persistent water pollution and increased flooding due to more intense storm patterns. How do we do it all?

Luckily, local communities do have primary control over one important factor: land use. Well-planned land use can create housing and reduce municipal costs, while also preserving community character and the capacity of the natural landscape to provide clean air, water, and a host of other "free" services.

What are Green Infrastructure (GI) and Low Impact Development (LID)?

Green Infrastructure (GI) includes both natural features such as forests and wetlands as well as engineered landscapes that mimic these natural processes like a rain garden.

Low Impact Development (LID) works to preserve the natural landscape and minimize impervious surfaces to keep stormwater close to the source and use it as a resource rather than a waste product.

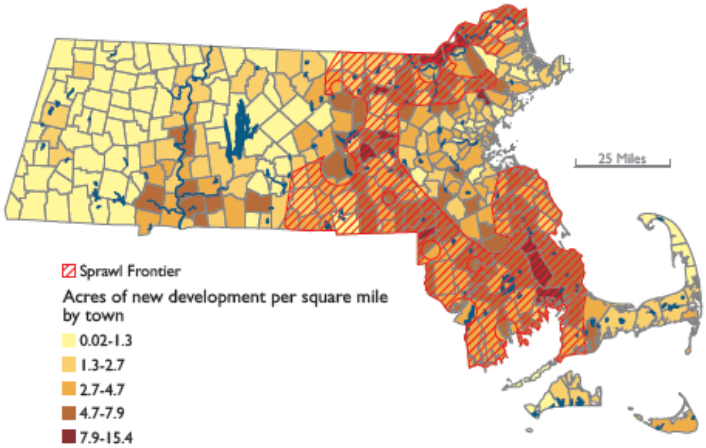
Together, LID and GI not only manage stormwater and improve groundwater supplies, but also offer many free ecosystem services including cleaner air and water, flood control, shade and energy savings, recreational opportunities, and enhanced property values and quality of life.

Preserving our existing GI is our first line of defense against climate impacts such as increased storm intensities as well as achieving long-term cost savings.

We Need to Change Course

Every day in Massachusetts, 13 acres of land are developed.[2] Traditional development uses large lot subdivisions—converting forests and farmlands to roads, driveways, houses, and lawns. This creates more impervious surfaces and generates more stormwater. Managing that stormwater with pipes and engineered treatment (grey infrastructure) can reduce pollution and minimize flooding, but they come at a high price in terms of monitoring and maintenance.

There is another way. Nature-based solutions that use plants and soil to absorb and filter water can be cost-effective and provide many benefits to your community. By developing smarter with GI and LID, conservation and development can occur together.



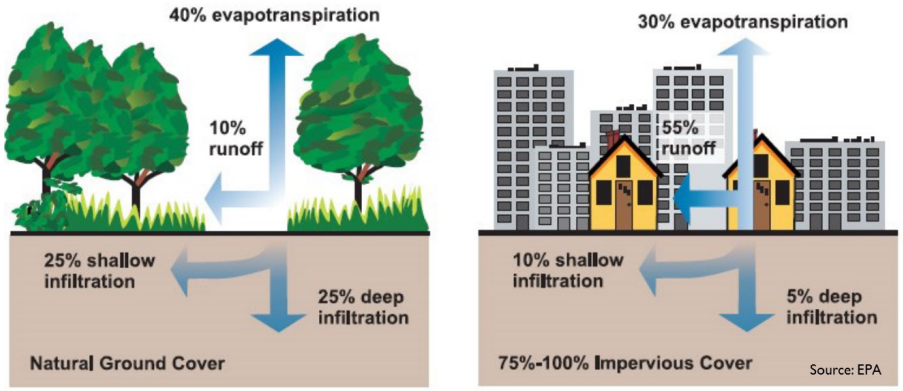
Mass Audubon, Losing Ground: Planning for Resilience

Mass Audubon
Protecting the Nature of Massachusetts

SHAPING the Future of YOUR COMMUNITY

Understanding the Land Use—Water Resources Connections

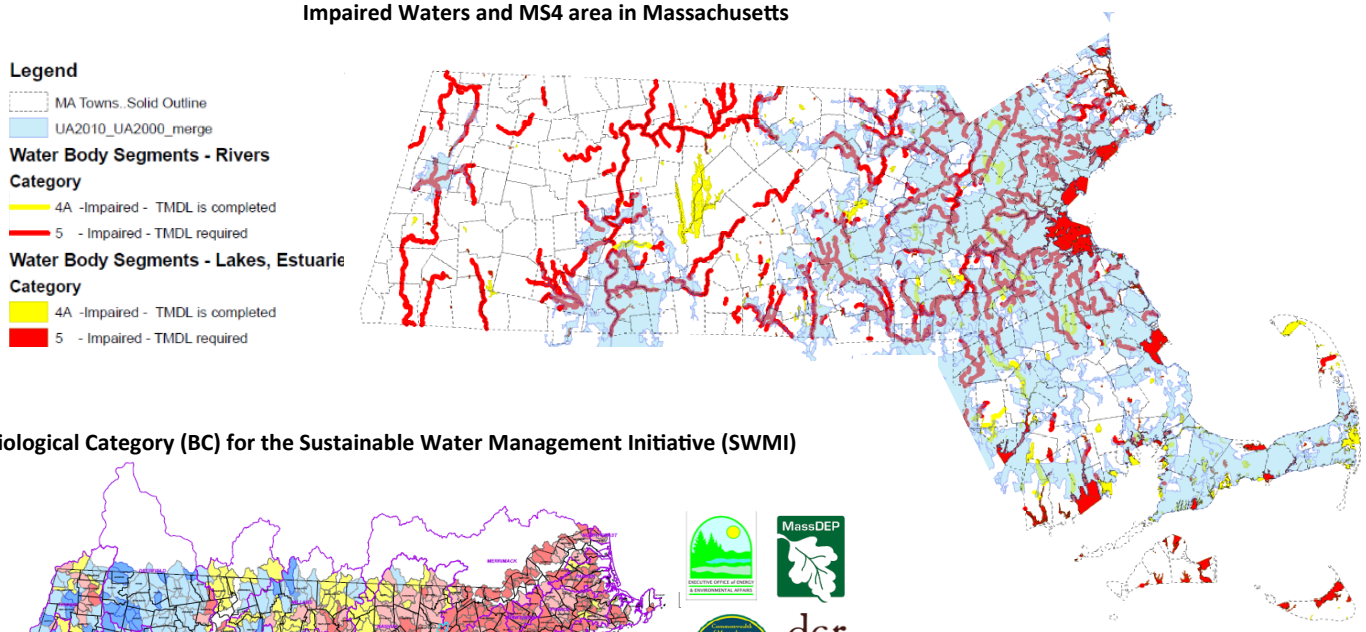
Our land use choices affect the health of our waterways. Massachusetts has abundant water resources, but many waterways are impaired due to pollution and/or reductions in natural flows. Maintaining or restoring the capacity of the land to absorb and filter precipitation would help the health of our rivers and streams.



Left: A Natural landscape has about 10% runoff and 50% infiltration.
Right: A highly developed landscape with high impervious cover has 55% runoff and only 15% infiltration.

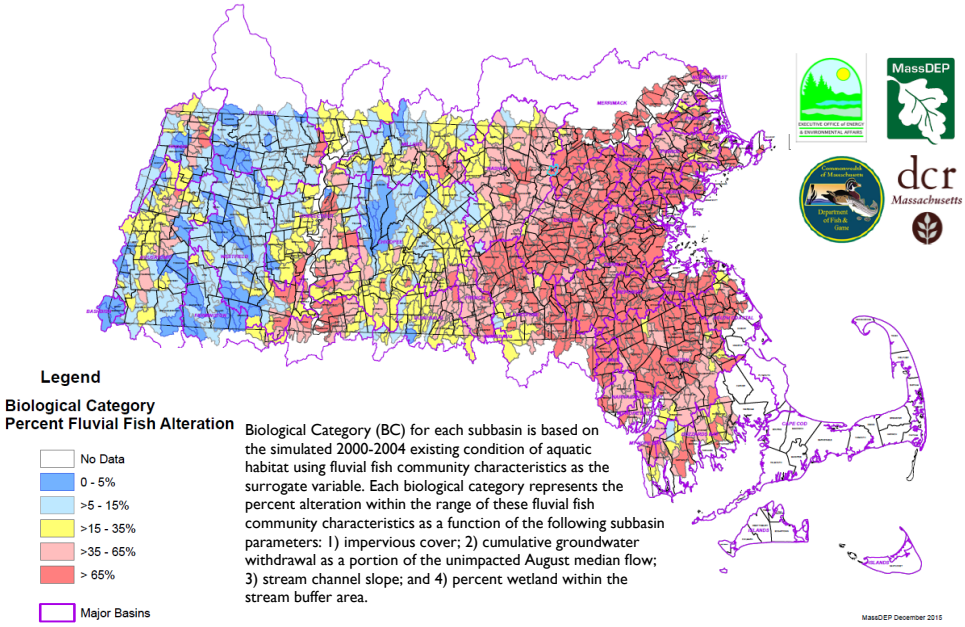
These maps illustrate water management issues across the state. Many communities are facing limits under the state Water Management Act on how much water they can withdraw. Requirements for managing stormwater under the federal Clean Water Act are also being imposed to help clean up stormwater pollution, which contributes to more than half of water quality impairments in the state.

Impaired Waters and MS4 area in Massachusetts



Above: Impaired waters in Massachusetts (those that do not meet state water quality standards) and the MS4 (Municipal Separate Storm Sewer System) permit area regulated under the federal Clean Water Act. About 55% of water quality impairment in the state is due to stormwater runoff.[3] Map source: EPA

Biological Category (BC) for the Sustainable Water Management Initiative (SWMI)



Left: Impervious surfaces and groundwater pumping reduce groundwater levels that provide flow to streams during dry weather. This impacts habitat for flow-dependent fish. Map source: DEP

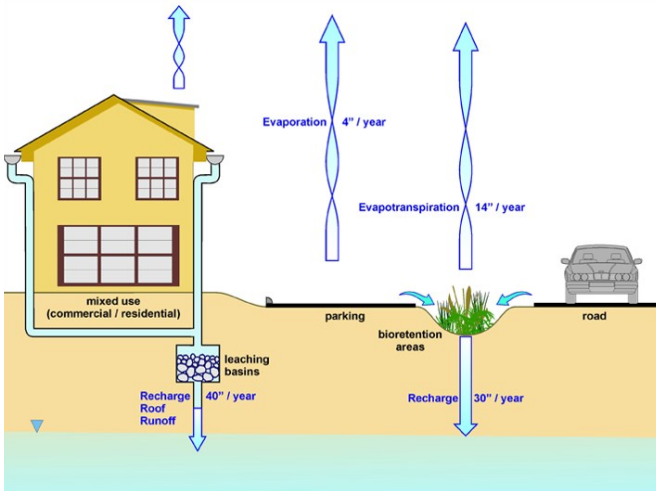
Development + Conservation = Opportunities Everywhere

Our traditional approach to development is not sustainable, but affordable solutions are available. As we develop and redevelop, there are opportunities to reduce water management cost burdens on taxpayers while enhancing the environment and quality of life.

First, the value of the natural landscape – particularly forests and vegetated buffers to wetlands and waterways – needs to be recognized to maintain the free services it provides.

Secondly, where land is altered by development or redevelopment, LID techniques can be used to retain and filter water on the site in order to preserve or restore water quality and infiltration.

LID techniques can maintain pre-development water conditions and groundwater recharge. In some instances development or redevelopment can even increase or restore the capacity of the land to absorb water.



Positive Impact Development, Horsley Witten Group

The Value of Green Infrastructure: Free Ecosystem Services

Reduced Flooding: Green infrastructure acts as a sponge for excess water, providing flood protection and avoiding costly repairs to flood-damaged roadways and culverts. Systems like rain gardens can reduce runoff by up to 90%.[4] A single, mature tree can intercept nearly 2,000 gallons of stormwater per year.[5]

Improved Water Quality: Polluted runoff contributes to more than half of water quality impairments in the state.[3] Natural streamside vegetation filters pollutants and reduces erosion. Vegetated buffers also remove an average of 74% of nitrogen pollution in runoff, depending on buffer width, soil type, and vegetation.[6]

Water Quantity: Vegetation and soils capture and infiltrate water, recharging groundwater that feeds streams. GI systems like rain barrels and cisterns can save the average homeowner 1,300 gallons of water during peak summer months.[7] With good design, a development can rely entirely on natural precipitation for all landscape irrigation.

Recreational Opportunities: Clean, flowing waters support recreation, including boating, fishing, and swimming while open space provides areas for hiking and biking.

Improved 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.

Improved Public Health: Trees and vegetation reduce the urban heat island effect, reducing smog that contributes to asthma and other respiratory diseases. Managing stormwater through soils and vegetation reduces the need for retention ponds and catch basins, avoiding creation of mosquito habitat. More than $11 million is spent annually on mosquito control in Massachusetts.[8]

Creation of Habitat: Open space and clean waters create healthy habitat for fish, birds, and other wildlife.

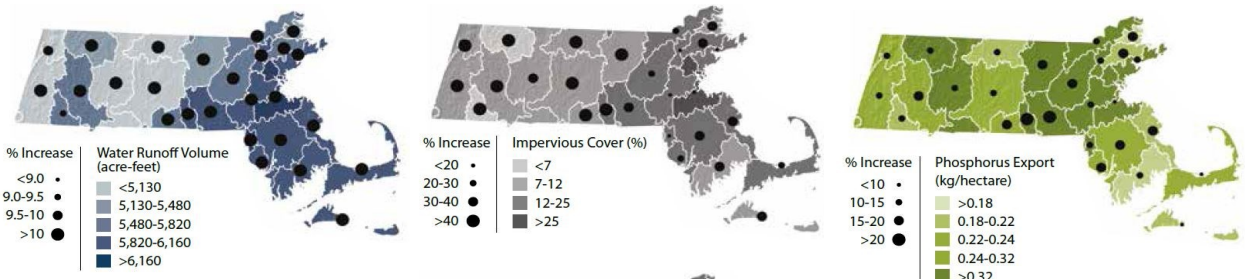
Climate Change Mitigation: Protecting forests allows them to continue absorbing carbon dioxide and acting as a carbon sink, while also reducing flooding from increased storm events. Massachusetts forests store an average of 85 tons of C per acre[9]—14% of the commonwealth's annual gross carbon emissions each year.[10]

Economic Value: Every dollar invested in land conservation provides a $4 payback in benefits.[11]

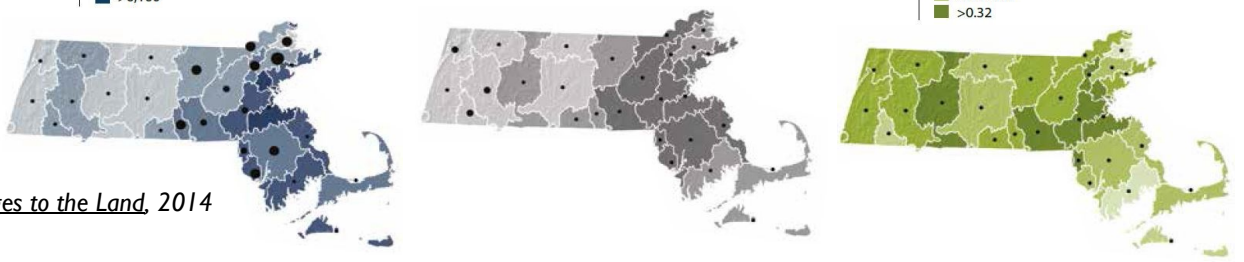
Developing Smarter

Harvard Forest's study *Changes to the Land* analyzed several scenarios for land use through 2060, including two with nearly the same amount of development, but with different effects on land and water resources. The first scenario retained forests for their natural green infrastructure values and clustered development. The second allowed unregulated, sprawling growth. Retaining forests resulted in reduced runoff, less impervious cover, and less phosphorus pollution. Runoff would increase by less than 10% in every watershed except one. Tree species with high commercial value would increase by 20% and timber harvests would double, while the carbon storage capacity would increase by 35% compared to 2010. Forests would remain intact, with 25% less fragmentation and an additional 750,000 acres conserved— again, all with nearly the same amount of development.[12]

Opportunistic Growth



Forests as Infrastructure



Harvard Forest, Changes to the Land, 2014

Protecting Land, Protecting Water, and Saving Money

Carefully targeting land for water quality protection can offer significant cost savings. Two and a half million people receive their drinking water from the Quabbin and Wachusett Reservoirs. Over the last 20 years, the Massachusetts Water Resources Authority (MWRA) spent $130 million to protect approximately 22,000 acres of watershed lands that naturally filter the water flowing into the reservoir. This saved MWRA ratepayers from building a $250 million filtration plant as well as $4 million each year in operating costs.[13]

By valuing our natural green infrastructure and restoring where it's been lost, communities can enhance their safety, resiliency, community character, and more while simultaneously growing in a sustainable manner. We can set Massachusetts on a new path to reduce our impervious surfaces, increase water infiltration, and reduce runoff, while minimizing nutrient loading into our waterways and protecting water quality. Allowing green infrastructure to do the work of soaking up and filtering water reduces the burden on our costly engineered systems while also improving quality of life, meeting regulations, and saving money.

Learn More

See our website for more information, including guidance, tools, and document references:
www.massaudubon.org/shapingthefuture or www.masaudubon.org/LIDCost

Mass Audubon
Protecting the Nature of Massachusetts

CMRPC
Central Massachusetts Regional Planning Commission

Horsley Witten Group

The Blackstone River Coalition

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NARRAGANSETT BAY ESTUARY PROGRAM

NEIWPCC
New England Interstate Water Pollution Control Commission