



Climate Resiliency Through Land Use Planning

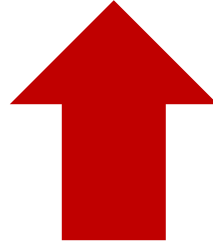
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Assistant Coordinator, Shaping the Future of Your Community

Key Observed Climate Changes in MA

Temperature:

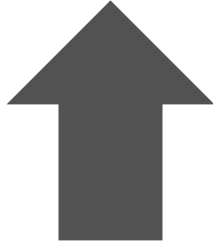


2.9°F

Since 1895

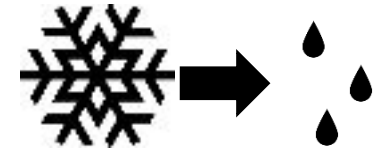


Growing Season:

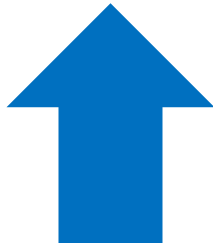


11 Days

Since 1950



Sea Level Rise:



11 inches

Since 1922

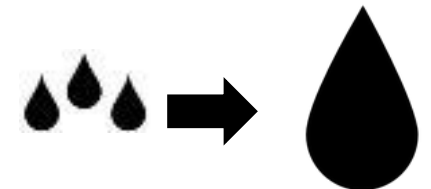


Strong Storms:



55%

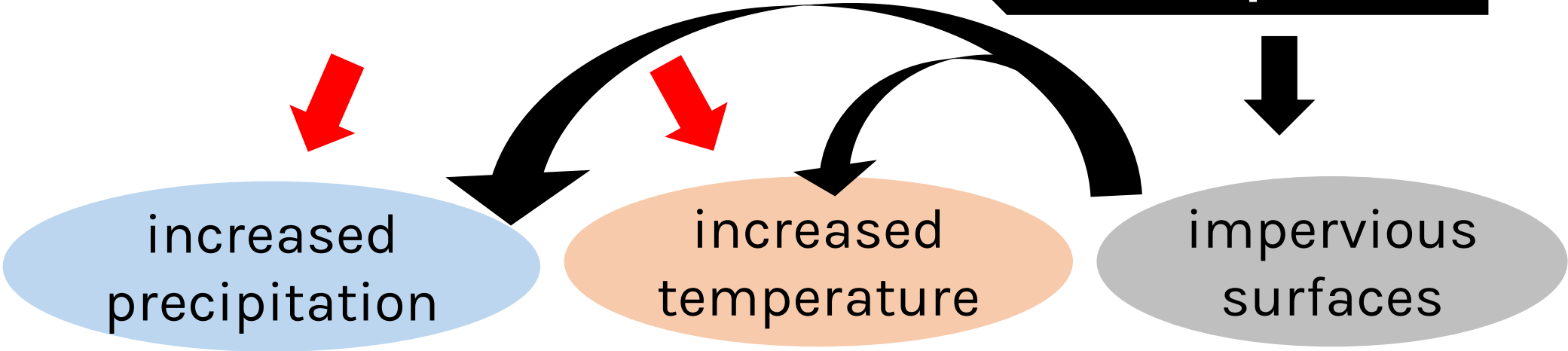
Since 1958



Recommended resource: massaudubon.org/climate

Climate change

Sprawling Development



stormwater & WQ issues

flooding & infrastructure damage

heat-related illnesses

more cooling shelters



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**.










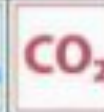










Green Infrastructure



Low Impact Development (LID)

Nature-Based Solutions Offer Multiple Benefits

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																		
Tree Planting	●	●	●	●	○	◐	○	●	●	●	●	●	●	●	●	◐	●	●
Bioretention & Infiltration	●	●	●	●	◐	◐	○	○	●	●	●	●	●	◐	◐	○	●	●

● Yes ◐ Maybe ○ No

Tools for Your Community

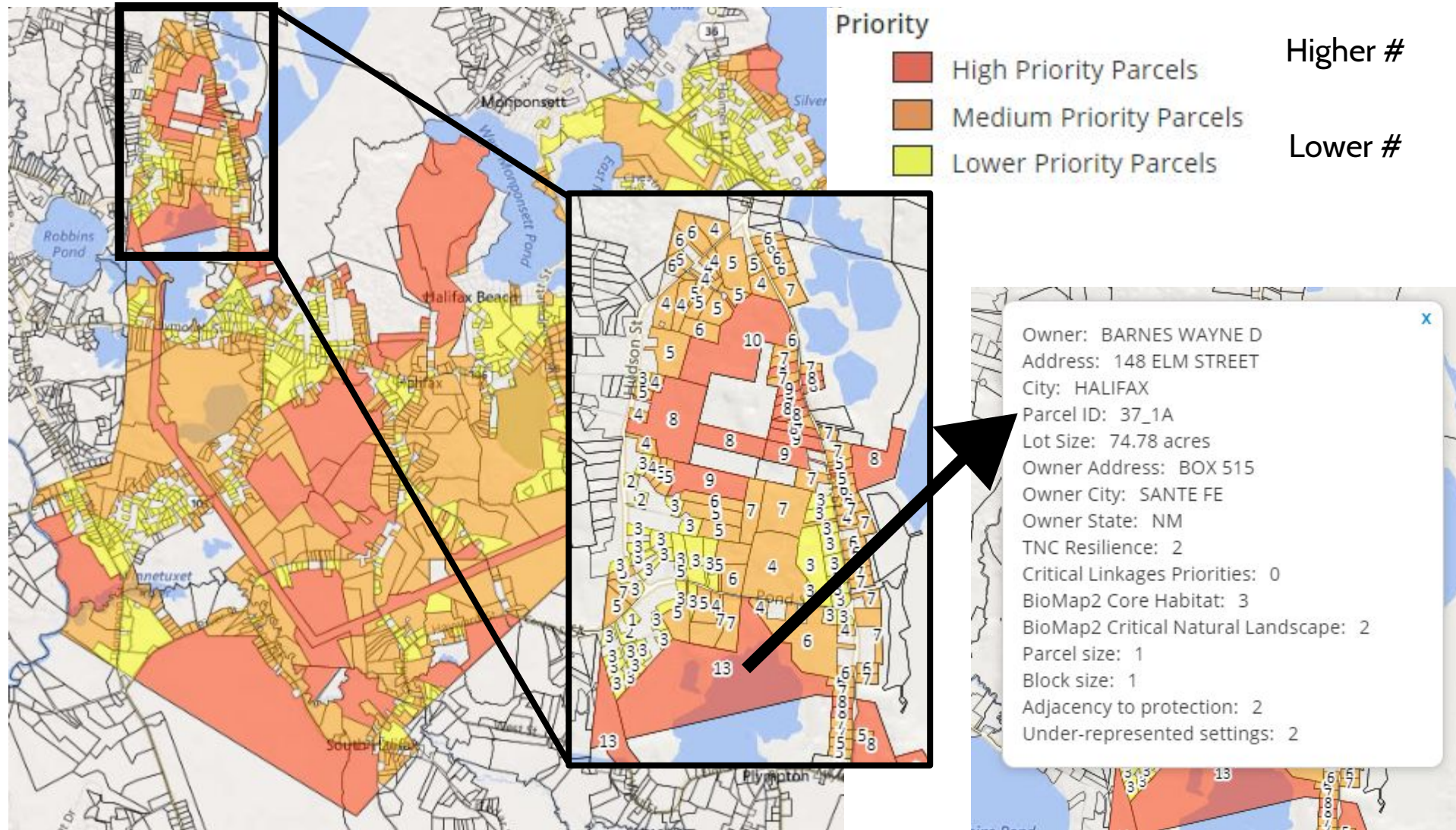
- LID Fact Sheets
- Bylaw Review Tool
- Mapping and Prioritizing Parcels for Resilience (MAPPR)

LID Fact Sheets



Mapping local priorities

massaudubon.org/mappr



MAPPR in 3 Steps

1

Select a study area

- Town, county, or watershed

2

Choose model

- Choose a pre-calculated model (balanced, resilience, aquatic, or biological)
- Choose specific model

3

Run & Review Results

- Review results, including priority scoring and parcel ownership
- Adjust optional filters and constraints

Values: Resilient Sites for Conservation, Critical Linkages Priorities, BioMap2 Core Habitat, Parcel Size, Block Size, Adjacent to Protection

Resilience: The capacity to absorb disturbance and reorganize while retaining the same basic function, structure and identity.

Landscape Complexity

Number of microclimates are found in the area

Landscape Connectivity

Possibility for individuals and populations to move among these microclimates



James C. Engberg

Choose a category

Town

County

Watershed

Multi-town Land Trusts

Mass DFW Districts

Pre-calculated Models

- Balanced Model
- Resilience Model
- Aquatic Model
- Biological Model

Assign Model Values

- Resilient Sites for Conservation
- Critical Linkages Priorities
- BioMap2 Core Habitat
 - BioMap2 Priority Natural Communities
 - BioMap2 Forest Cores
 - BioMap2 Vernal Pool Cores
 - BioMap2 Wetland Cores
 - BioMap2 Aquatic Cores
 - BioMap2 Species of Conservation Concern
- BioMap2 Critical Natural Landscape
 - BioMap2 Landscape Blocks
 - BioMap2 Coastal Adaptation
- Prime Farmland
- Surface Water Protection Zones
- Wellhead Protection Areas
- Parcel Size
- Block Size

select min parcel size

Filter by Block Size (Unprotected Acres)

select min block size

Constrain Model Only Adjacent to Protection

Misc. Controls

- Show parcel priority ranks
- Show parcel export IDs
- Hide parcel labels
- Parcel priority rank colors
- Mass GIS Open Space Layer
- Blocks of Contiguous Parcels

Ref Layer

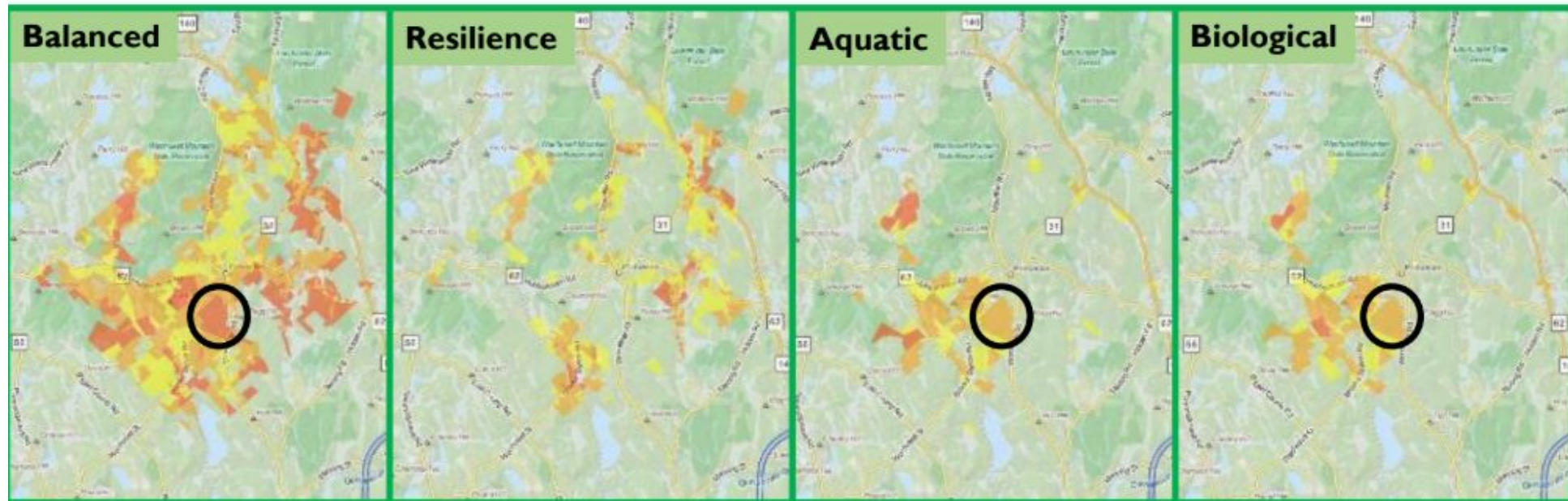
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Map Type Selector

- Street Map
- Satellite

RUN MODEL

The different models. Example: Princeton



Priority

- High Priority Parcels
- Medium Priority Parcels
- Lower Priority Parcels

Factors**Conventional****Better****Best****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
Limit clearing, lawn size, require retention or planting of native vegetation/naturalized 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 invasive species	Not addressed, or mixture of required plantings of native and nonnative	Require at least 75% native plantings

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

Bylaw Review:

Why

How

- Check up and alignment
- Are your resilience goals reflected in your bylaws?
 - If so, how?
 - If not, what might barriers be?



- Review existing bylaws
- ID ends of “conventional” and “best”
- Draft summary and recommendations
- Edit, Submit
- ID administrative vs. town meeting changes

Planning Document	What does it do?	What should I look for?	How do I change it?
Master Plan (MP)	Comprehensive guiding document that sets community goals	<ul style="list-style-type: none"> • Current, reflects changing priorities? • Prioritizes sustainable development? • Defines specific measures to retain local community character & values? 	Planning Board often with assistance of a special Master Planning Committee
Open Space and Recreation Plan (OSRP)	Identifies local natural resource and recreation priorities and plans for protection and management	<ul style="list-style-type: none"> • Current, reflects current parcel status, priorities? • Allows variety of OS uses: recreation, conservation? • Considers land and water resources? • Consider local context of existing OS? 	Conservation Commission, often with assistance of a special OS Committee. Must meet state guidelines
Zoning Bylaw/ Ordinance	Determines how parcels may be used and sets dimensional requirements	<ul style="list-style-type: none"> • Focuses development near existing infrastructure, away from natural resources? • Allows flexible dimensional requirements? • Prioritizes protection of natural features? • Limits clearing/grading, impervious areas? • Requires LID features? 	Adoption and revision requires approval through Town Meeting (TM) or City Council
Open Space Residential Design (OSRD)	Type of conservation development that maximizes protection of natural resources	<ul style="list-style-type: none"> • Allowed by right (not by special permit)? • Requires ≥ 50% of open space protection on a parcel? • References priority areas from local MP/OSRP? • Connects OS within and on adjoining parcels? • Allow flexible dimensional requirements? • Requires LID features? 	Adoption/revision requires approval through TM/City Council
Site Plan Review	Reviews development design for consistency with local standards	<ul style="list-style-type: none"> • Limits clearing/grading, impervious areas? • Requires LID features? • Allows easy siting of LID features, including near roadways and in parking islands? 	Adoption requires approval through TM/City Council
Stormwater or LID Bylaw	Reduces stormwater pollution and/or specifically encourages LID	<ul style="list-style-type: none"> • Requires LID features? • Discourages curbing and limits impervious areas? • Prohibits topsoil removal? • Limits clearing/grading? 	Adoption requires approval through TM/City Council

The Power of a Bylaw: Westford

- 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



Rail Trail in Westford

Stormwater Bylaw

- ✓ LID is encouraged in stormwater design
- ✓ Stormwater O&M plan is required, LID encouraged
- ✓ Construction erosion & sedimentation plan includes BMPs
- Specifically allow LID in variety areas, including ROW, common areas, etc.
- Allow permeable pavement where appropriate
- Address/discourage curbing, encourage roadside swales



Stormwater/LID Bylaw

Draft regulations



Require annual reporting for Major Land Disturbance Permits



Require Construction Erosion and Sedimentation Plan



Require stabilization and revegetation plans

Next Steps

- Decide which changes are right for you
 - Politically feasible
 - Administrative changes that are supported (subdivision)
 - Long term strategy for changes requiring Town Meeting
- Take steps to meet MS4 regulations
- Increase community outreach & public awareness




Municipal Separate Storm Sewer System (MS4)

- EPA has new standards for MS4 permits, effective July 1, 2018
- Resource homepage for new permits [can be found here](#)
- Central Massachusetts Regional Stormwater Coalition [Instructional Video](#)

FACT SHEET ISSUED: SPRING 2018

Stormwater in Massachusetts

U.S. EPA MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) PERMITS



PERMIT AT-A-GLANCE

- ✓ Stormwater is the # 1 cause of water quality impairments in MA
- ✓ The new permit replaces the single 2003 permit that covered MA & NH
- ✓ 5 Year permit term
- ✓ Permit may cover 260 municipalities in MA
- ✓ Permit contains no end-of-pipe limits
- ✓ Addresses nutrient and flooding issues across MA

MS4 PERMIT FLEXIBILITY

- ▶ The new permit has the same 6 minimum control measures as the 2003 MS4 permit
- ▶ The permit has more direction and anticipated end-points, but still allows flexibility in planning and prioritizing

THIS PERMIT ALLOWS

- **Permittee to prioritize** catch basin inspection and cleaning based on their knowledge of the system
- **Credit for past work**, tailor their inspection priorities and up to **10 years** to complete illicit discharge requirements
- **Allows 1 year to update** from 2003 Stormwater Management Plan

POST-CONSTRUCTION

- ▶ Routine road maintenance and paving will never trigger post-construction requirements
- ▶ There are no retrofits required during the permit term
- ▶ The most cost effective way to treat stormwater is during new and redevelopment opportunities

<https://www.epa.gov/npdes-permits/massachusetts-small-ms4-general-permit>

💰 COST BREAKDOWN

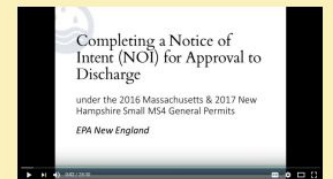
- 50%** of program funding is assumed to be used for system operations and maintenance (street sweeping and catch basin cleaning)
- 30%** of program funding is assumed to be used to track and remove illicit connections to the storm sewer (removing sanitary sewage from stormwater systems)
- 20%** of program funding is assumed to be used for planning, public education and other administrative requirements

TRAINING AND TOOLS

<https://go.usa.gov/xQNsv>

EPA is providing multiple tools to assist permittees with stormwater management and reduce the administrative burden.

(At right) Notice of Intent instructional video.



BMP Optimization, Accounting & Tracking Tools
Prioritize green infrastructure projects & track and report pollution removal

Contractor Supported Training
As well as EPA sponsored workshops/webinars for new permittees and IDDE Planning

Templates
Work with MassDEP to produce templates for public education and outreach requirements

Stormwater Management Plan Template
To assist permittees in developing a comprehensive stormwater management plan consistent with permit requirements

Pre-populated Annual Reports
Based on each permittee's Notice of Intent

Factsheet source:

<https://www3.epa.gov/region1/npdes/stormwater/ma/ma-ms4-permit-info-spring-2018.pdf>

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.
- [Green Infrastructure Network](#) models priority undeveloped, unprotected resilient land in the Taunton Watershed

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
- [The Value of Nature-based Solutions](#) by Center for Neighborhood Technology

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.



**Thank You!
Questions?**

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