Building Effective Watershed-Based Plans

http://prj.geosyntec.com/MassDEPWBP

Training Workshop
Date: 04/07/2021

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Geosyntec consultants

Building Effective Watershed-Based Plans Workshop

MASSACHUSETTS watershed·based plans

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Workshop Goal

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- Provide Overview of Watershed-Based Plan Tool
- Enable the creation of watershed-based plans by workshop attendees
- Understand the characteristics of a good watershed-based plan

Workshop Agenda

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Activity	Duration	Total Time
Introductions- Clean Water Act Overview	0:15	0:15
WBP-Tool Overview and Demonstration - Project Vision and Need - Introduction to WBP 9 Elements - DEP Review Process - WBP-Tool Demonstration	0:35	0:50
Tips and Tricks to Build Effective WBPs	0:15	1:05
Introduction to Hands on Exercise	0:25	1:30
Break	0:15	1:45
WBP Development (*Hands on Exercise*) - Watershed Selection - Goal Setting - BMP Selection and Sizing - Outreach & Monitoring	1:10	2:55
Closing and Wrap up	0:05	3:00

303(d): Impaired Waters List

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- Biennial submission by states and tribes to EPA for review and approval
- List of waters currently not meeting water quality standards
- Final Massachusetts Year 2016 Integrated List of Waters: https://www.mass.gov/doc/final-massachusetts-year-2016-integrated-list-of-waters/download
- FY 2021 319 RFR used Recovery Potential Screening Tool and 2016 Integrated List to create list of priority waterbodies for NPS pollution remediation

Integrated List of Waters
Five Categories

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- 1 – "Waters Attaining All Designated Uses
- 2 – "Waters Attaining Some Use But Not Assessed For All Uses"
- 3 – "No Uses Have Been Assessed"
- 4A (303d) – "Waters where TMDLs have Been Completed"
- 4B – "Impairment Controlled by Alternative Pollution Control Requirements
- 4C – "Waters Where an Impairment is NOT Caused by a Pollutant"
- 5 (303d) – "Waters Impaired and Requiring a TMDL"

Top Causes and Sources of Impaired Water Quality

Causes		
Rivers	Lakes	Marine
Pathogens	Mercury	***Pathogens***
Nutrients	***Nutrients***	PCBs (fish Tissue)
Biology	***Low D.O.***	***Nutrients***
Low D.O.	Noxious Aquatic Plants	Biology

Sources		
Rivers	Lakes	Marine
Point Source	Atmospheric Deposition	Point & NPS wastewater (title 5)
Unknown	Unknown	***Stormwater***
Nonpoint sources (inc. stormwater)	***Nonpoint sources***	Legacy pollutants
Hydro	***Agriculture***	Recreational Boating

Why WBPs?

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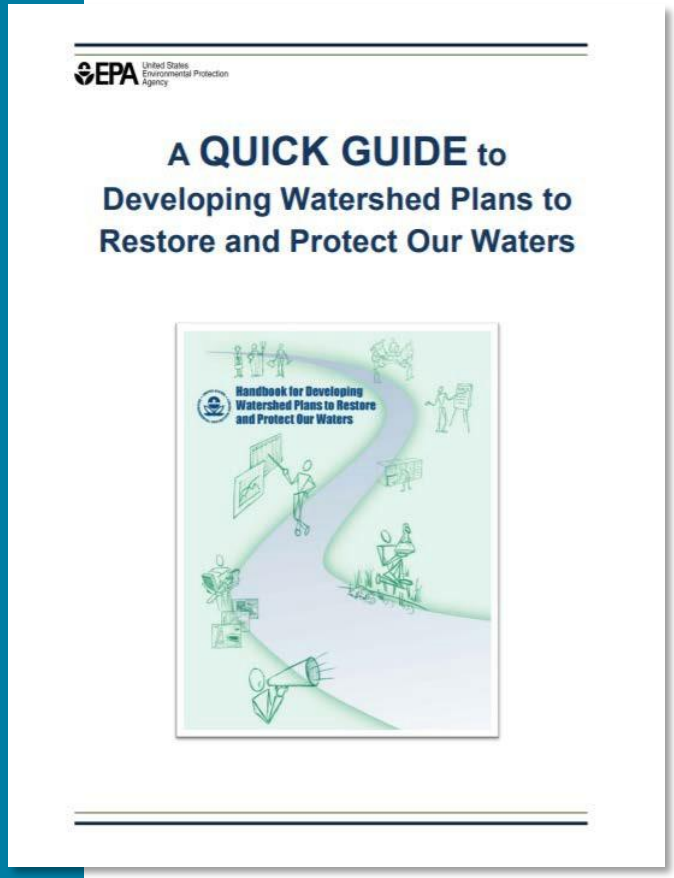
"Watershed plans provide an **analytic framework** for managing efforts to both **restore water quality** in degraded areas and to protect overall **watershed health**."



"Watershed plans assist states and tribes in addressing **nonpoint source pollution** by providing a comprehensive assessment of nonpoint source pollution and a set of **management measures** to address them."

Why WBPs?

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Summary of the nine minimum elements to be included in section 319-funded watershed plans for threatened or impaired waters

a. Identify causes and sources of pollution
b. Estimate pollutant loading into the watershed and the expected load reductions
c. Describe management measures that will achieve load reductions and targeted critical areas
d. Estimate amounts of technical and financial assistance and the relevant authorities needed to implement the plan
e. Develop an information/education component
f. Develop a project schedule
g. Describe the interim, measurable milestones
h. Identify indicators to measure progress
i. Develop a monitoring component

Why WBPs?

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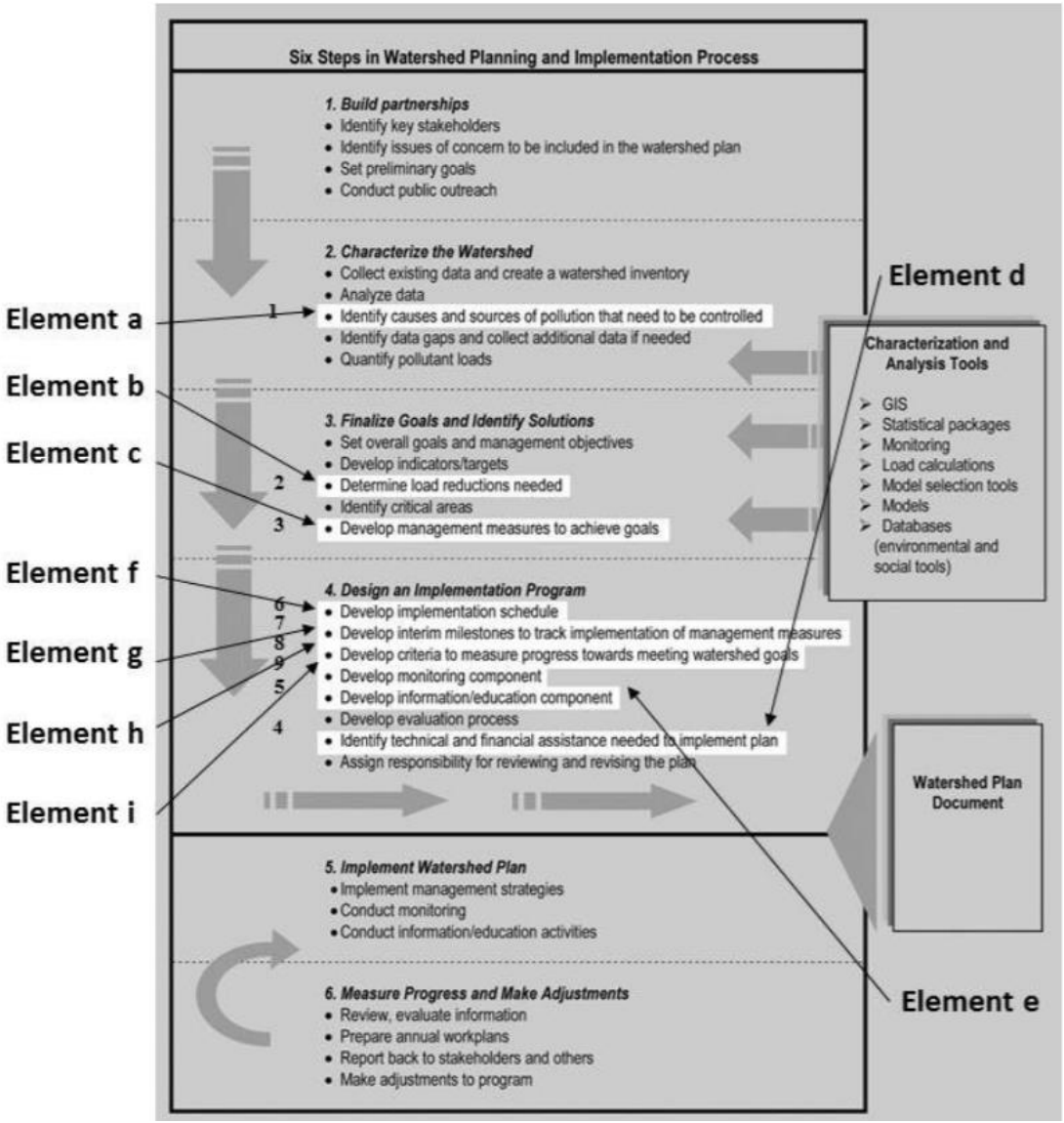

WBP–Tool Development Timeline

- **Initiated Development of WBP-Tool (2015)**
- **WBP-Tool Live (2016)**
- **Added MS4 Module (2017)**
- **Ongoing Enhancements (2018 – Present)**
  - WBP-tool updates (BMP Guidance, review criteria, Hotspot Map)
  - Outreach (workshops, presentations, etc.)
  - WBP Development (18 WBPs completed and 5 WBPs in progress)

Workshop Objective

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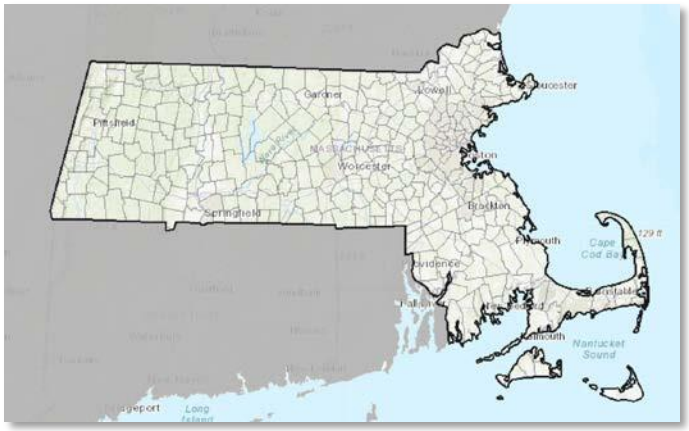
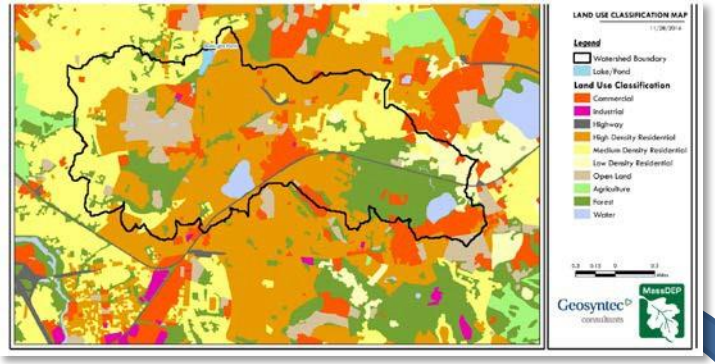
Provide attendees with tools, resources, tips, and hands on experience to develop WBPs using the MassDEP Watershed Based Planning Tool





Pollutant	Existing Estimated Total Load	Water Quality Goal	Required Load Reduction
Total Phosphorus	1377 lbs/yr	574 lbs/yr	804 lbs/yr
Total Nitrogen	9973 lbs/yr	add item (optional)	add item (optional)
Total Suspended Solids	163 ton/yr	add item (optional)	add item (optional)

ESTIMATED POLLUTANT LOAD REDUCTIONS (lbs/yr)

TN: 69.98527 **TP:** 8.79558 **TSS:** 6148.58658

ESTIMATED FOOTPRINT (sf)

9,579.2

ESTIMATED COST ($)

186,348

Project Vision

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WBPs are required for **all** implementation projects supported with Section 319 funds

Goal was to develop a tool to simplify WBP development, **so that good projects in all areas of the state may be eligible** for federal watershed implementation grant funds under Section 319 of the Clean Water Act.

Project Vision

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The WBP-tool simplifies WBP development with web-based **resources, tools, and guidance** using EPA's recommended "nine-element" format.

9 Required Elements of a WBP

A. ID causes /sources of pollution requiring control.

B. Determine pollutant load reductions needed.

C. Develop measures to achieve water quality goals.

D. Determine technical/financial assistance needed.

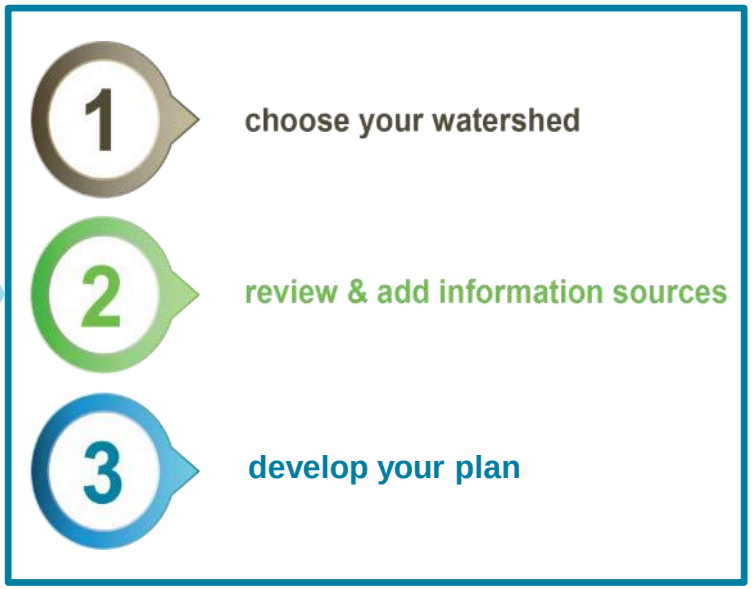
E. Information/education component.

F. Develop implementation schedule.

G: Develop interim milestones to track implementation.

H: Develop criteria to measure progress towards goals.

I: Monitoring component.



Project Vision

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Thousands of watersheds - carefully tailored to the correct scale for planning

Rivers

Lakes/Ponds

Coastal Watersheds

MS4s

Massachusetts Watershed Based Plans

WBPs not just for s.319!

- Lake /watershed groups
- Stormwater planning
- Education/outreach
- Partner programs and agencies
- General data gathering and assessment

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The 9 Elements

Element A:

Identify ***causes and sources*** that need to be controlled to achieve necessary pollutant load reductions.

Watershed Data Analysis

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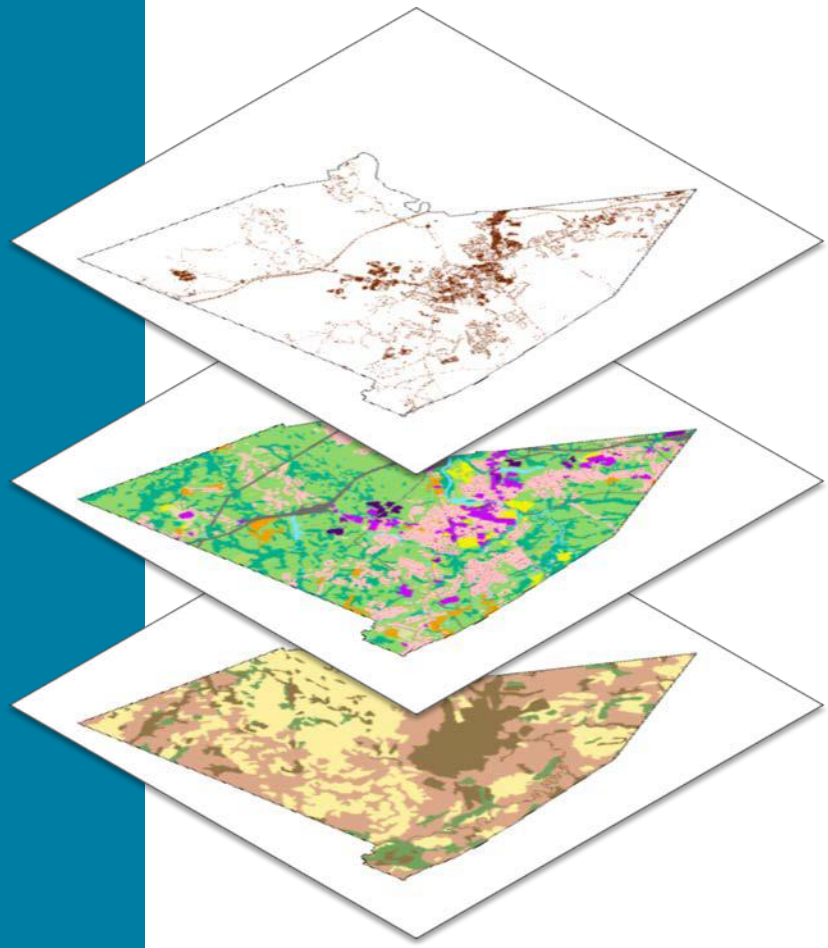

Automatic Outputs:

- Characteristics (area, etc.)
- Reports / Impairments
- Land Use Map
- Impervious Cover
- DCIA%
- Watershed Health Indicator
- Pollutant Load Estimates
- Others

Water Quality Goals

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- For water bodies with known impairments:
  - Approved TMDL Target(s) are the goal
- For water bodies without a TMDL for total phosphorus (TP):
  - default water quality goal is based on target concentrations established in the Quality Criteria for Water (USEPA, 1986) (also known as the "Gold Book").
  - Gold Book states that TP **should not exceed 50 ug/L** in any stream at the point where it enters any lake or reservoir, nor 25 ug/L within a lake or reservoir.
- For waterbodies with other known impairments:
  - Default to MA SW Quality Standards for Bacteria, or
  - Add user-defined goal **+ water quality goal**

The 9 Elements

Element B:

Determine ***pollutant load reductions*** needed to meet water quality goals

Estimated Load Reductions (if no TMDL)

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Pollutant	Existing Estimated Total Load	Water Quality Goal	Required Load Reduction
Total Phosphorus	587 lbs/yr	579 lbs/yr	8 lbs/yr
Total Nitrogen	4517 lbs/yr	add item (optional)	add item (optional)
Total Suspended Solids	116 ton/yr	add item (optional)	add item (optional)

Estimated Load Reductions (if no TMDL)

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From Element A

Pollutant	Existing Estimated Total Load	Water Quality Goal	Required Load Reduction
Total Phosphorus	587 lbs/yr	579 lbs/yr	8 lbs/yr
Total Nitrogen	4517 lbs/yr	add item (optional)	add item (optional)
Total Suspended Solids	116 ton/yr	add item (optional)	add item (optional)

Estimated Load Reductions (if no TMDL)

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Concentration Goal (from Element A)
multiplied by
Estimated Annual Watershed Discharge

Pollutant	Existing Estimated Total Load	Water Quality Goal	Required Load Reduction
Total Phosphorus	587 lbs/yr	579 lbs/yr	8 lbs/yr
Total Nitrogen	4517 lbs/yr	add item (optional)	add item (optional)
Total Suspended Solids	116 ton/yr	add item (optional)	add item (optional)

Estimated Load Reductions (if no TMDL)

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Approximation, can also enter user-specific data and goals

Pollutant	Existing Estimated Total Load	Water Quality Goal	Required Load Reduction
Total Phosphorus	587 lbs/yr	579 lbs/yr	8 lbs/yr
Total Nitrogen	4517 lbs/yr	add item (optional)	add item (optional)
Total Suspended Solids	116 ton/yr	add item (optional)	add item (optional)

The 9 Elements

Element C:

Develop ***management measures*** to achieve water quality goals.

BMP Selector Tool

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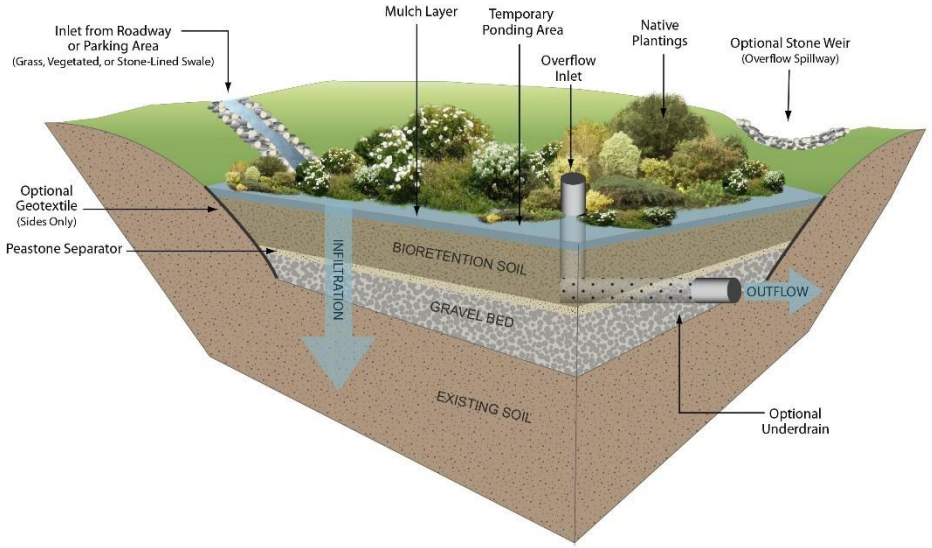
User Inputs:

- BMP type (e.g., bioretention)
- Design storm depth
- Drainage Area / Land Use

BMP Selector Tool

Outputs:

- Estimated Load Reduction
- Planning Level Cost



BMP Selection – Upcoming Enhancements

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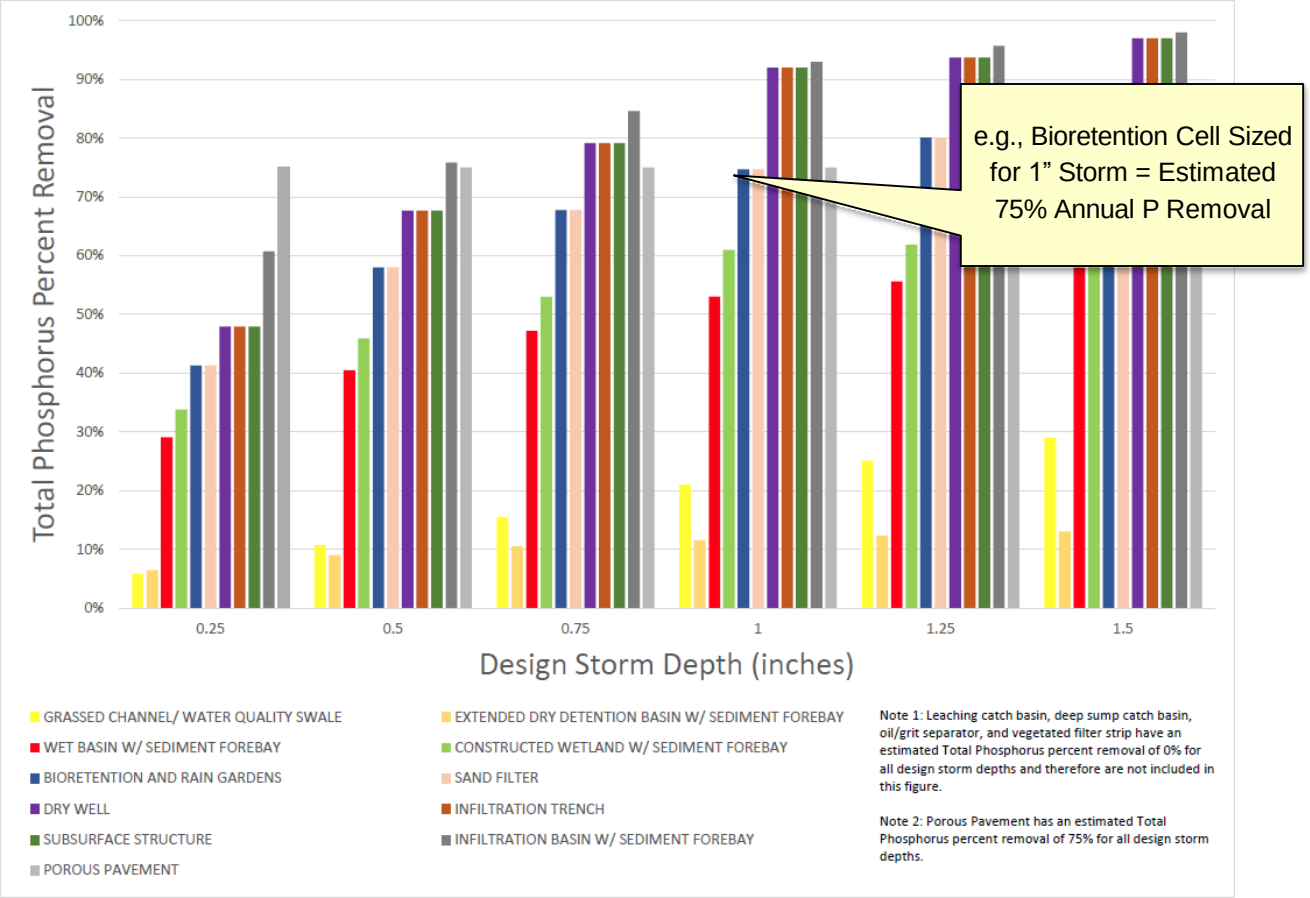
Updating BMP Guidance to Help Users Conceptualize BMPs
Selection, Siting, Sizing, Costing

Updating BMP Selector Tool to Output Expected BMP Footprint Based on User Inputs



BMP Phosphorus Removal Efficiency by Design Storm Depth

The 9 Elements

Element D:
Estimate the ***technical and financial assistance*** needed to implement the plan.

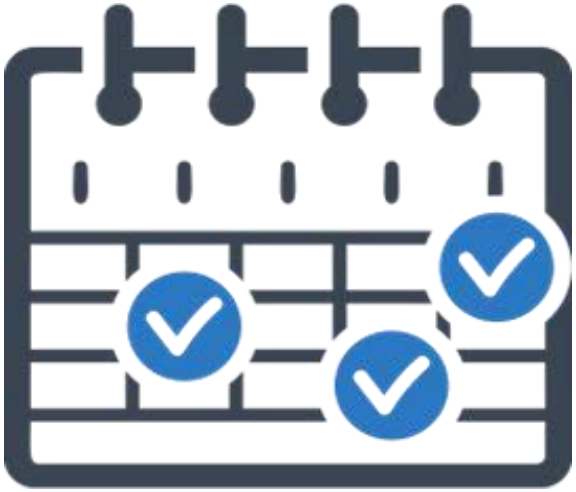
The 9 Elements

Element E:
Public Information and Education

The 9 Elements

Element F: Implementation Schedule

Element G: Interim Measureable Milestones



The 9 Elements

Element H: Criteria to measure progress

Element I: Monitoring

DEP Review Process

DEP is planning to review WBPs that accompany s.319 applications for consistency. **Refer to forms frequently when preparing your WBP**

1. **Provisional Review**
   - Checklist to confirm that all 9 EPA elements are included

2. **Rating and Acceptance**
   - Rating Scoresheet to enable consistent review and constructive feedback to plan preparers

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Demonstration

http://prj.geosyntec.com/MassDEPWBP

Sign In

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A Watershed Plan in 3 Easy Steps

1 | Choose Your Watershed

2 | Review Information Sources

3 | Develop Your Plan

Get Started!

for instant access to your watershed's maps, data, modeling and more.

What is a Watershed-Based Plan?
Click here to learn more.

Click here to see completed Massachusetts Watershed-Based Plans

MassDEP Home
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Creating Effective WBPs

One Size Does not Fit all Watersheds:

Tips & Tricks to Create Effective WBPs

Important: Each "Element" on the WBP-Tool Includes a **Guide** that describes most of these tips in more detail

Creating Effective WBPs

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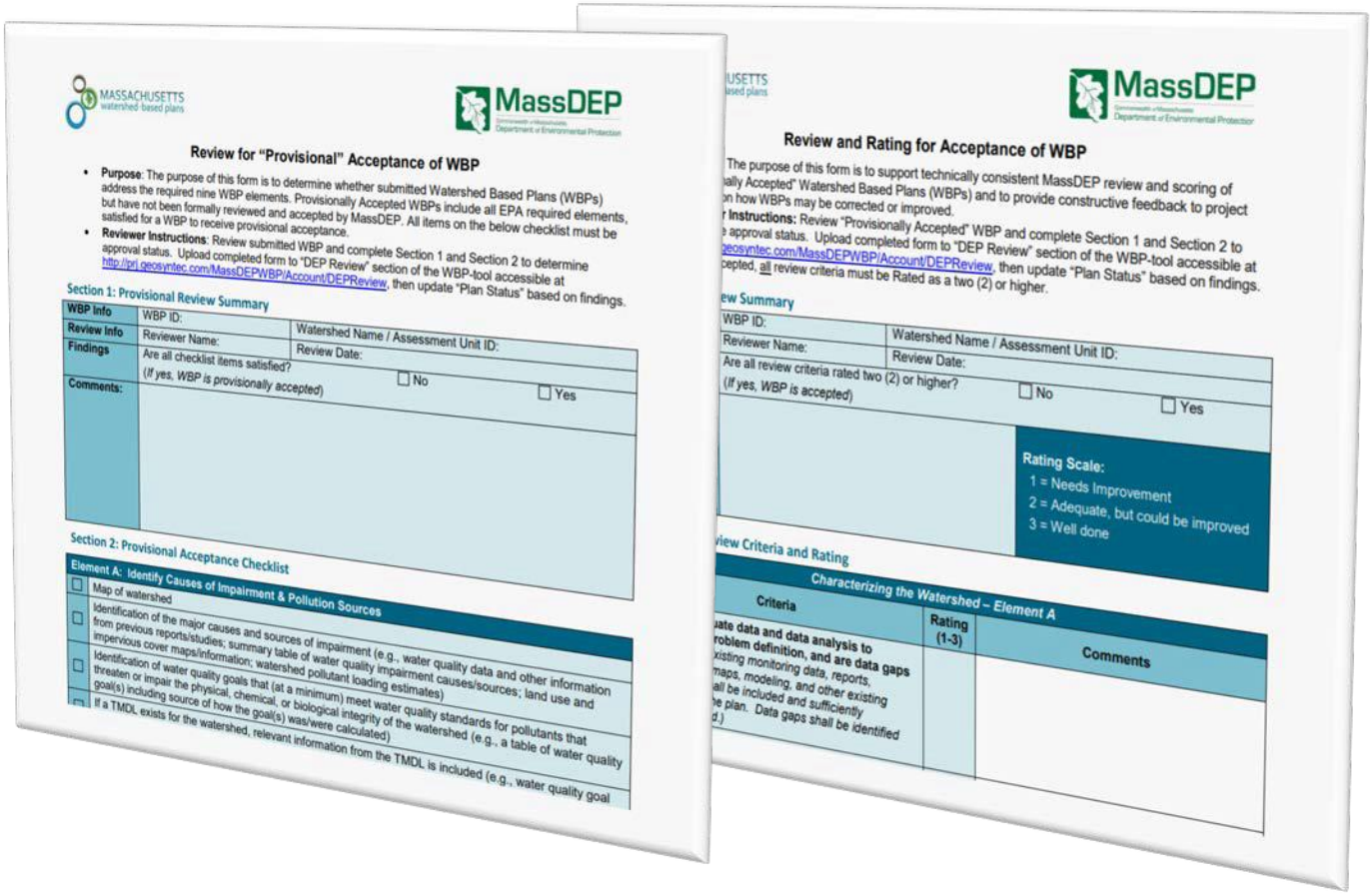
[Frequently refer to DEP review forms (provisional acceptance; rating scoresheet) and s.319 RFR guidance]



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MassDEP Department of Environmental Protection

Review for "Provisional" Acceptance of WBP

- **Purpose**: The purpose of this form is to determine whether submitted Watershed Based Plans (WBPs) address the required nine WBP elements. Provisionally Accepted WBPs include all EPA required elements, but have not been formally reviewed and accepted by MassDEP. All items on the below checklist must be satisfied for a WBP to receive provisional acceptance.
- **Reviewer Instructions**: Review submitted WBP and complete Section 1 and Section 2 to determine approval status. Upload completed form to "DEP Review" section of the WBP-tool accessible at http://prj.geosyntec.com/MassDEPWBP/Account/DEPReview, then update "Plan Status" based on findings.

Section 1: Provisional Review Summary

WBP Info	WBP ID:	Watershed Name / Assessment Unit ID:
Review Info	Reviewer Name:	Review Date:
Findings	Are all checklist items satisfied? (*If yes, WBP is provisionally accepted*)	☐ No ☐ Yes
Comments:		

Section 2: Provisional Acceptance Checklist

	Element A: Identify Causes of Impairment & Pollution Sources
☐	Map of watershed
☐	Identification of the major causes and sources of impairment (e.g., water quality data and other information from previous reports/studies; summary table of water quality impairment causes/sources; land use and impervious cover maps/information; watershed pollutant loading estimates)
☐	Identification of water quality goals that (at a minimum) meet water quality standards for pollutants that threaten or impair the physical, chemical, or biological integrity of the watershed (e.g., a table of water quality goal(s) including source of how the goal(s) was/were calculated)
☐	If a TMDL exists for the watershed, relevant information from the TMDL is included (e.g., water quality goal

MassDEP Department of Environmental Protection

Review and Rating for Acceptance of WBP

The purpose of this form is to support technically consistent MassDEP review and scoring of ally Accepted" Watershed Based Plans (WBPs) and to provide constructive feedback to project on how WBPs may be corrected or improved.
Instructions: Review "Provisionally Accepted" WBP and complete Section 1 and Section 2 to approval status. Upload completed form to "DEP Review" section of the WBP-tool accessible at geosyntec.com/MassDEPWBP/Account/DEPReview, then update "Plan Status" based on findings. cepted, all review criteria must be Rated as a two (2) or higher.

ew Summary

WBP ID:	Watershed Name / Assessment Unit ID:
Reviewer Name:	Review Date:
Are all review criteria rated two (2) or higher? (*If yes, WBP is accepted*)	☐ No ☐ Yes

Rating Scale:
1 = Needs Improvement
2 = Adequate, but could be improved
3 = Well done

view Criteria and Rating

Characterizing the Watershed – Element A		
Criteria	Rating (1-3)	Comments
uate data and data analysis to roblem definition, and are data gaps xisting monitoring data, reports, maps, modeling, and other existing all be included and sufficiently he plan. Data gaps shall be identified d.)		

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Element A: Perform literature review to concisely define watershed **problems and strengths** and identify data gaps

- ❑ Review WQ Assessment data from Element A of tool *(**summarize for large waterbodies** – e.g., Blackstone River)*
- ❑ Interview stakeholders as feasible
- ❑ Review existing reports and assessments *(e.g., WQ sampling, vegetation assessments)*
- ❑ Review current and ongoing efforts *(e.g., existing BMPs, existing monitoring etc.)*
- ❑ Add callouts and relevant information to automatically generated maps

Example Existing Monitoring Data Summary

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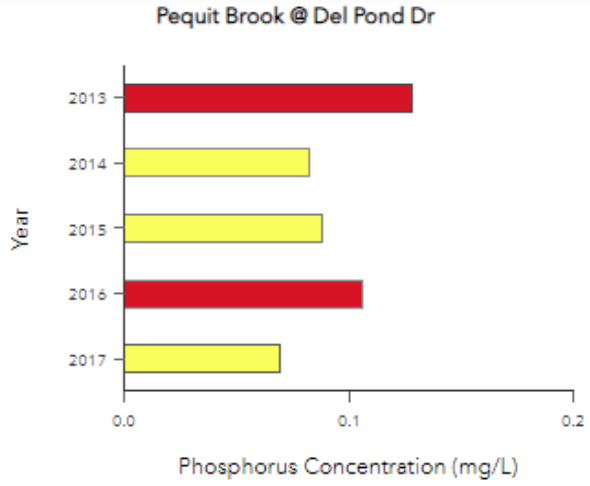
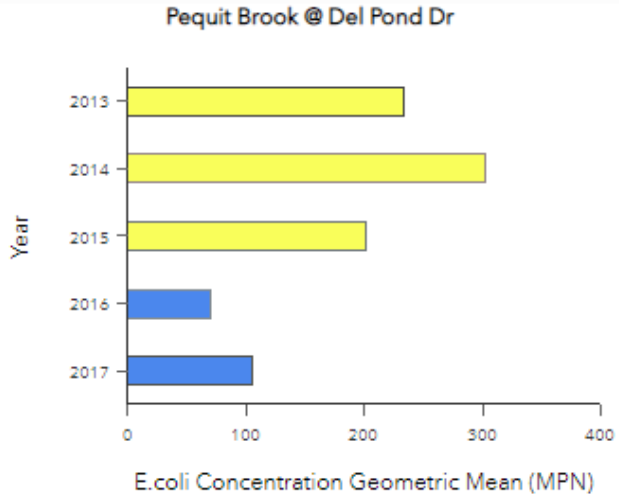
Phosphorus



Blue Bars - Healthy Level of Phosphorus
(<0.05 mg/L in streams | <0.025 mg/L in ponds)
Yellow Bars - Concerning Level of Phosphorus
(>.05<.1 mg/L in streams | >.025<.05 mg/L in ponds)
Red Bars - Harmful Level of Phosphorus
(<0.1mg/L in streams | <0.05 mg/L in ponds)

E.coli



Blue Bars - Safe for Swimming
(<126 MPN geomean)
Yellow Bars - Safe for Boating
(<630 MPN geomean)
Red Bars - Neither Safe for Swimming nor Boating

Example Monitoring Data Summary from Town of Canton's Pequit Brook Watershed Based Plan.

(Source: Neponset River Watershed Association Citizen Water Monitoring Network)

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Element A: Understand pollutant loading estimate calculation methodology

- Beware that pollutant loading estimates from WBP-tool only consider land-use based sources from 2009 data *(Phosphorus calculations do not consider septic loading, aerial deposition, or internal loading)*

- Consider performing additional analysis and quantification of loading if problems are expected to stem from other sources or if considerable changes to land use have occurred since 2009 *(e.g., internal loading, septic; new development)*

Creating Effective WBPs

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Element B: Get creative when setting meaningful water quality and pollutant load reduction goals

- ❑ Consider setting **qualitative water quality goals** for impairments of concern for which no water quality criteria exists, then linking those goals to attainable load reductions. *(e.g., if impairment is non-native macrophytes, set the water quality goal as systematically reducing biomass over time by decreasing nonpoint source pollutants such as TSS.)*

- ❑ Consider defining reasonable and attainable **Interim and Long-Term goals**. *(e.g., if a watershed requires extensive restoration effort; establish a long-term goal to ultimately meet water quality standards but start with a reasonable 5-year goal with well established milestones.)*

Example Load Reduction Estimates / Goals

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Lake Cochituate WBP included <u>additional</u> Trophic State analysis via the Vollenweider Model

Scenario	Estimated P Load Reduction (lb/yr)	Estimated P Load to Lake (lb/yr)	Estimated In-Lake Concentration (µg/L)
Existing Conditions	-	6,107	32.2
1 µg/L Reduction	190	5,917	31.1
5% Reduction	305	5,802	30.5
10% Reduction	611	5,497	28.9
15% Reduction	916	5,191	27.3
20% Reduction	1,221	4,886	25.7
22% Reduction	1,344	4,764	25.1

Incremental Goals

Ultimate Goal

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Element C / D. Review BMP-Selector output carefully; add more information as needed

- ❑ Confirm that cost appears reasonable for available footprint
  - *Refer to MassDEP Clean Water Toolkit BMP Fact Sheets for approximate capital cost ranges (e.g., bioretention = $5-30/sq. ft.)*
  - *Refer to EPA Opti Tool (Table 1) for additional approximate BMP costs*

- ❑ Calculate engineering and permitting costs, if needed
  - Engineering costs (i.e., design, survey, permitting, CQA) can range from 20-40% of capital costs as a ballpark estimate.
  - O&M costs can also be estimated. These will vary widely but can be estimated as a function of capital cost (e.g., 1-3% of capital costs) or additional guidance from EPA (EPA 2005) or others can be utilized.

- ❑ Confirm that estimated load reductions are clearly quantified
  - For BMPs not available in the BMP-selector tool, other methods can be used, such as converting estimated **removal efficiencies** from the MA Stormwater Handbook into estimates of mass from EPA **pollutant load export rates** (PLERS) – see MA MS4 Permit, Appendix F, Attachment 1.

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Element C / D. Include additional descriptive BMP information

Some factors to consider:

- ❑ **BMP/ Project Prioritization**
- ❑ Site description, including problem definition
- ❑ BMP description / location
- ❑ Photos and conceptual design details
- ❑ O&M Requirements
- ❑ Permitting Constraints
- ❑ Property Ownership

Example Conceptual BMP "Fact Sheet"

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Site Wayland 3: Cochituate Baseball Field A

Micro-watershed No.: W-36

BMP Type: Bioretention

BMP Location: Intersection of Pemberton Rd and Bradford St

Priority Rank: High

Site Summary:

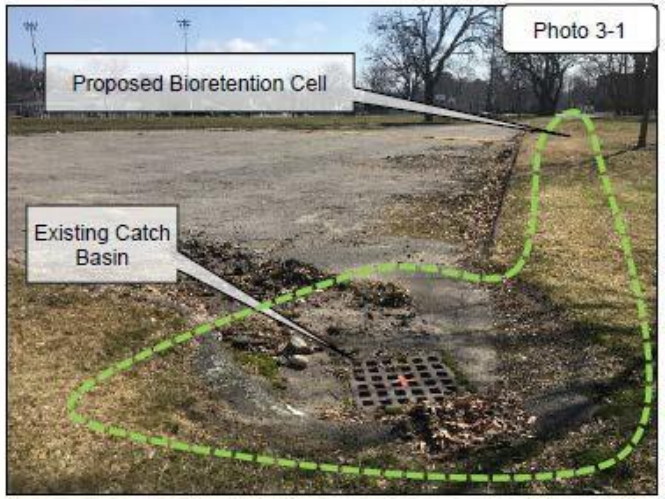
Cochituate Baseball Field is a recreational park that consists of a large grassed athletic field, playground area, and paved parking lots. Runoff from the athletic field drains southwest to an existing catch basin located at the edge of the southern paved lot that appeared to require resurfacing. A speed bump or potential water berm was installed in the center of the damaged asphalt lot to direct water or slow traffic.

Proposed Improvement:

Install a 2,000-square foot grassed bioretention cell at the location of the existing catch basin southwestern edge of the lower Baseball field parking lot to capture runoff from the athletic field and the paved parking lot. Option to resurface the existing parking lot.

Expected O&M: Remove accumulated sediment from bioretention cell annually. Mow routinely to maintain ideal grass height.

Parcel Ownership: Town owned (Recreational Park)



Sizing Characteristics	
BMP Drainage Area (acres)	2.1
BMP Size (storm depth; inches)	0.5
Impervious Area (%)	19
Estimated Pollutant Load Reduction	
TP (lbs./yr.)	0.56
TN (lbs./yr.)	4.7
TSS (lbs./yr.)	213.2
Estimated Cost	
Planning-level Capital Cost	$39,100

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Element C / D. Review BMPs for Consistency with Overall Water Quality Goals

- ❑ Confirm that proposed BMPs address listed impairments and meet target load reduction goals and that a clear, **long-term plan** is in place to achieve potential **future de-listing** *(interim goals can be effective for challenging watersheds)*

- ❑ Get creative with BMPs to maximize load reductions – BMPs can also be non-structural such as Street Sweeping and Catch Basin Cleaning *(Appendix F of the MS4 General Permit includes information to calculation reductions from these BMPs)*

Creating Effective WBPs

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Element E. Education and Outreach

- ❑ Make messaging clear and concise and easy to implement
- ❑ Provide trackable goal *(e.g., # of web page views, # of brochures submitted, # of cleanup days, # of waste stations, # of signs, etc.)*
- ❑ Don't Re-Invent the Wheel – visit Element E Guidance for many guidance documents, including specific items to help MS4 communities comply with permit requirements.

Example Outreach Products

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Storm Drain Stenciling

Pet Waste Cleanup

Pubic Info. Kiosk

Source: Town of Great Barrington WBP

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Element F/G. Schedule and Milestones

- ❑ Use as an opportunity to summarize entire WBP in easy to follow table
- ❑ Categorize actions and include clear milestones
- ❑ Be clear when progress towards water quality goals is expected to be made
- ❑ Include a milestone to periodically evaluate and update the WBP as needed *(e.g., if progress isn't be made towards goals, make adjustments)*

Example Schedule

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Category	Action	Year(s)
Monitoring / Vegetation	Perform annual water quality sampling per Element H&I monitoring guidance	Annual
Structural BMPs	Document estimated pollutant removals from existing BMPs in the watershed	2019
	Complete installation of BMPs at the Fairfield at Dean Avenue and the end of Griffin Road	2020
	Obtain funding and implement 2-3 additional BMPs within the MS4 subwatershed	2022
	Obtain funding and implement 2-3 additional BMPs within the MS4 subwatershed	2024
	Obtain funding and implement 2-3 additional BMPs within the MS4 subwatershed	2026
Public Education and Outreach *(See Element E)*	Periodically post project updates to website and social media profiles, including completed WBP and updates of progress	Annual
	Create Information signage for up to 3 completed BMPs	TBA
Adaptive Management and Plan Updates	Establish working group comprised of stakeholders and other interested parties to implement recommendations and track progress. Meet at least twice per year.	2019
	Re-evaluate Watershed Based Plan at least once every three (3) years and adjust, as needed, based on ongoing efforts (e.g., based on monitoring results, 319 funding, etc.). – Next update, December 2021	2021
	Reach interim goal to reduce land-based phosphorus by 50% (26.4 kg)	**2024**
	Establish additional long-term reduction goal(s) from baseline monitoring results, if needed.	**2024**
	Reach long-term phosphorus load reduction goal	**2034**

Example schedule includes categorized actions and milestones, including sequential goals

Example Schedule

MASSACHUSETTS watershed·based plans

Category	Action	Year(s)
Monitoring / Vegetation	Perform annual water quality sampling per Element H&I monitoring guidance	Annual
Structural BMPs	Document estimated pollutant removals from existing BMPs in the watershed	2019
	Complete installation of BMPs at the Fairfield at Dean Avenue and the end of Griffin Road	2020
	Obtain funding and implement 2-3 additional BMPs within the MS4 subwatershed	2022
	Obtain funding and implement 2-3 additional BMPs within the MS4 subwatershed	2024
	Obtain funding and implement 2-3 additional BMPs within the MS4 subwatershed	2026
Public Education and Outreach *(See Element E)*	Periodically post project updates to website and social media profiles, including completed WBP and updates of progress	Annual
	Create Information signage for up to 3 completed BMPs	TBA
Adaptive Management and Plan Updates	Establish working group comprised of stakeholders and other interested parties to implement recommendations and track progress. Meet at least twice per year.	2019
	Re-evaluate Watershed Based Plan at least once every three (3) years and adjust, as needed, based on ongoing efforts (e.g., based on monitoring results, 319 funding, etc.). – Next update, December 2021	2021
	Reach interim goal to reduce land-based phosphorus by 50% (26.4 kg)	**2024**
	Establish additional long-term reduction goal(s) from baseline monitoring results, if needed.	**2024**
	Reach long-term phosphorus load reduction goal	**2034**

Example schedule includes categorized actions and milestones, including sequential goals

Creating Effective WBPs

MASSACHUSETTS watershed·based plans

Element H/I. Progress Evaluation and Monitoring

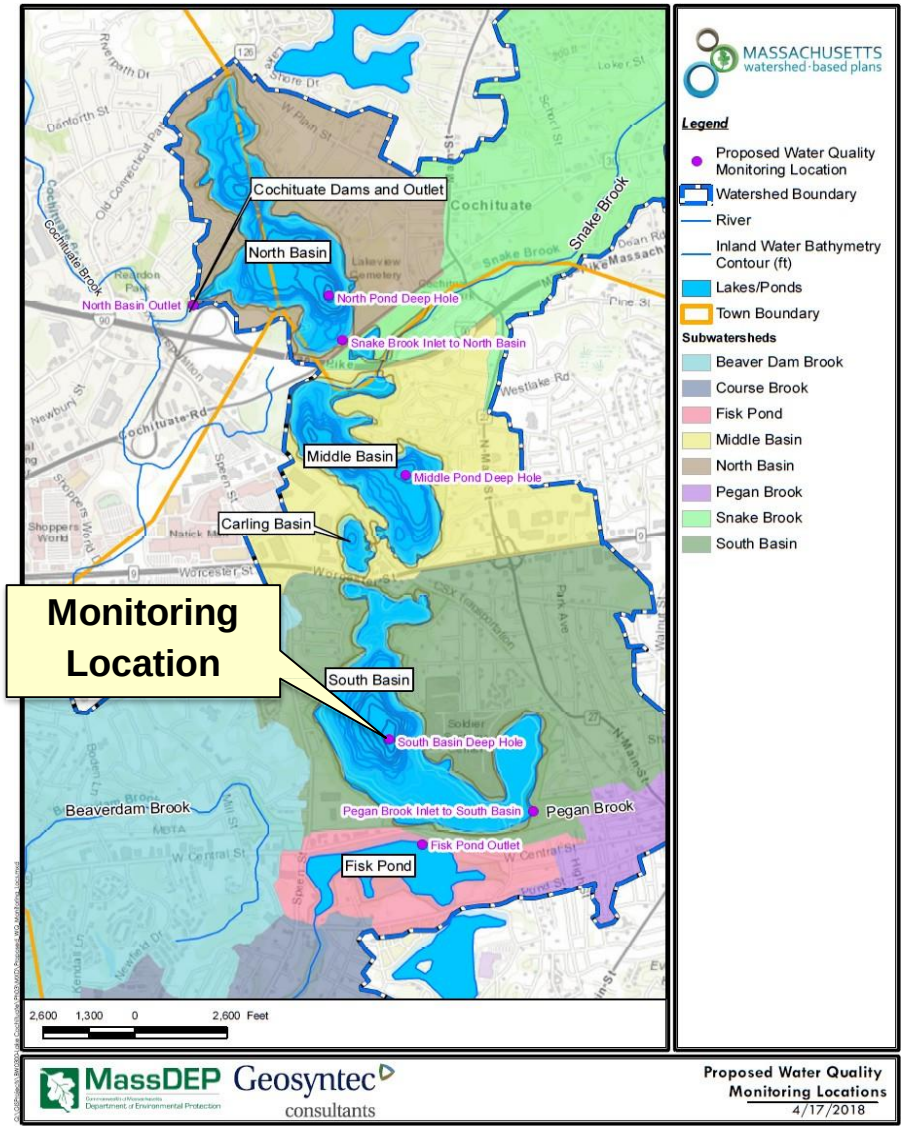
- ❑ Establish easily tracked indirect indicators of water quality to monitor progress *(e.g., number of beach closures, number of cyanobacteria blooms)*
- ❑ Establish easily tracked project-specific indicators to monitor progress *(e.g., number of BMPs installed, number of catch basins cleaned, number of road miles swept)*
- ❑ Establish a monitoring program that fits within existing resources and focuses on evaluating progress specifically towards goals *(i.e., where to monitor, what to monitor for, when to monitor)*
- ❑ Consider using volunteers to save costs on monitoring

Example Monitoring Plan

Example from Lake Cochituate WBP

Direct Measurements:

- Parameters:
  - Bacteria
  - Phosphorus
  - Chl-A, Secchi, Etc.
- Frequency:
  - 3 times per year
- Locations:
  - Deep hole
  - Tributaries
  - Outlet



Creating Effective WBPs

MASSACHUSETTS watershed·based plans

WBP Summary: Develop a concise summary of plan elements in accordance with s.319 selection guidance

- ❑ Are problem(s) and goals clearly and concisely defined?
- ❑ Is there adequate supporting data *(or do data gaps need to be addressed such as implementing a monitoring program)*
- ❑ **Do all WBP elements focus on defined 303(d) list impairments?** *(e.g., non-native aquatic plants could reasonably be linked to excessive sediment loading)*
- ❑ Are reasonable goals defined to improve listed impairments? *(e.g., reduce by 50% over next 10 years)*
- ❑ Will recommended improvements address 303(d) listed impairments?

Creating Effective WBPs

MASSACHUSETTS watershed·based plans

Finalization: Export your plan prior to submittal to incorporate more details

- ❑ Embellish auto-generated maps with callouts
- ❑ Add photos of problem areas
- ❑ Add figures or tables from literature review
- ❑ **Review DEP checklist and rating sheet prior to submission!**

MASSACHUSETTS
watershed·based plans

MassDEP

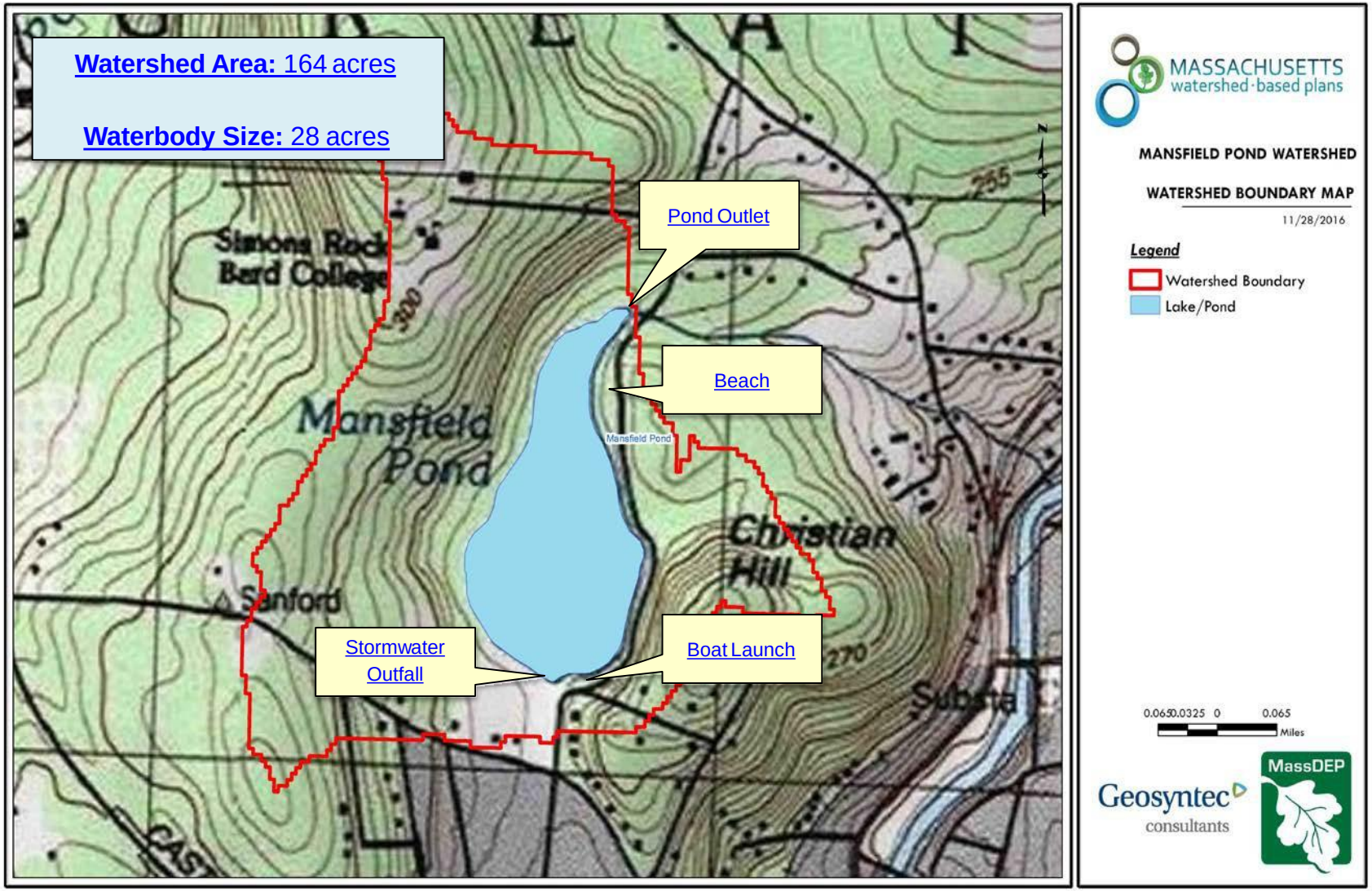
Hands-on Exercise

Hands-on Exercise Schedule

MASSACHUSETTS watershed·based plans

Activity	Duration	Total Time
Introduction/Watershed Overview	0:25	0:25
Break	0:15	0:40
Watershed Selection/Review Existing Info	0:15	0:55
Develop Goals	0:15	1:10
Develop BMP Concepts - BMP Selection and Sizing	0:25	1:35
Develop Outreach & Monitoring Plans	0:15	1:50

Watershed Overview

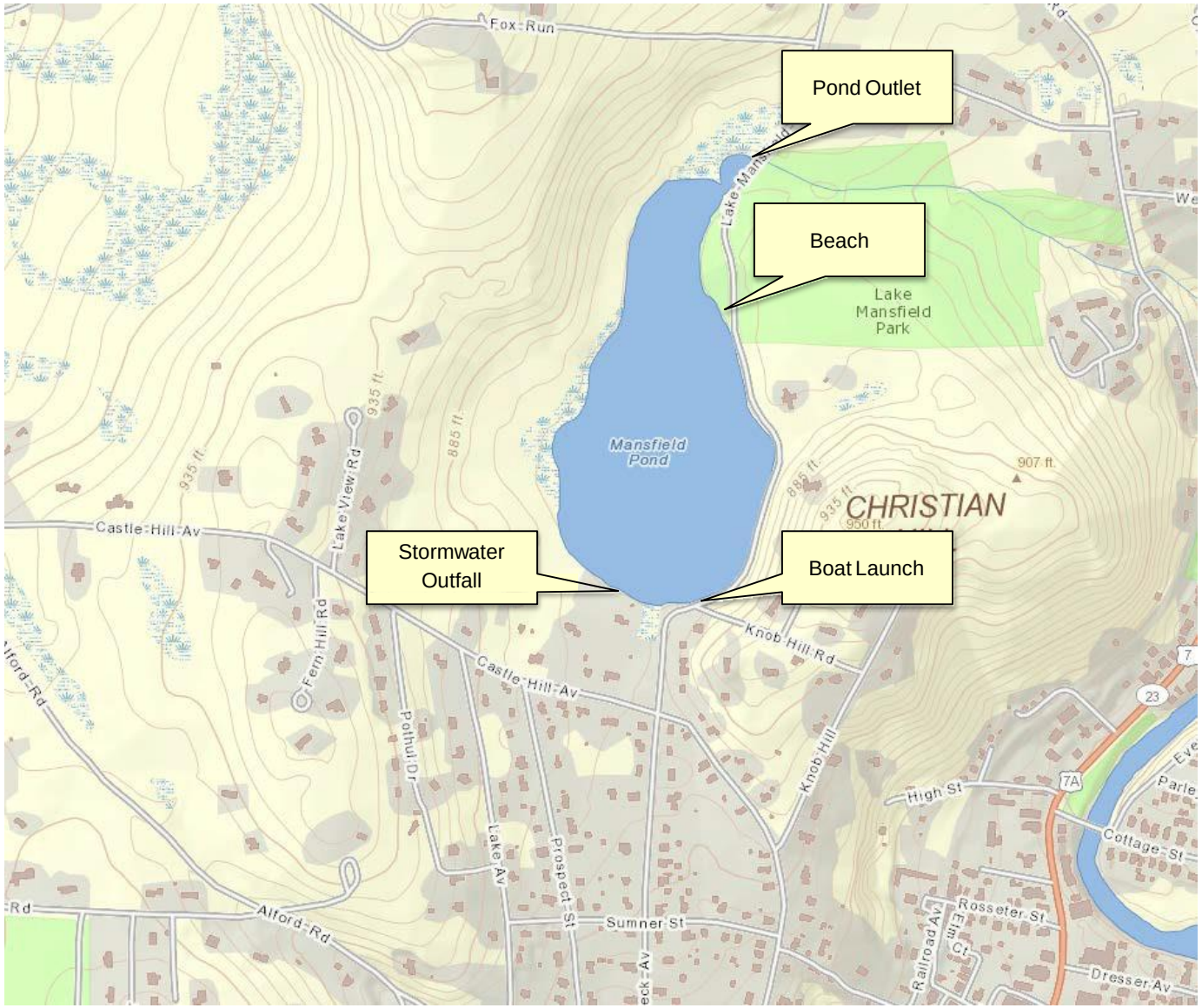


Watershed Overview

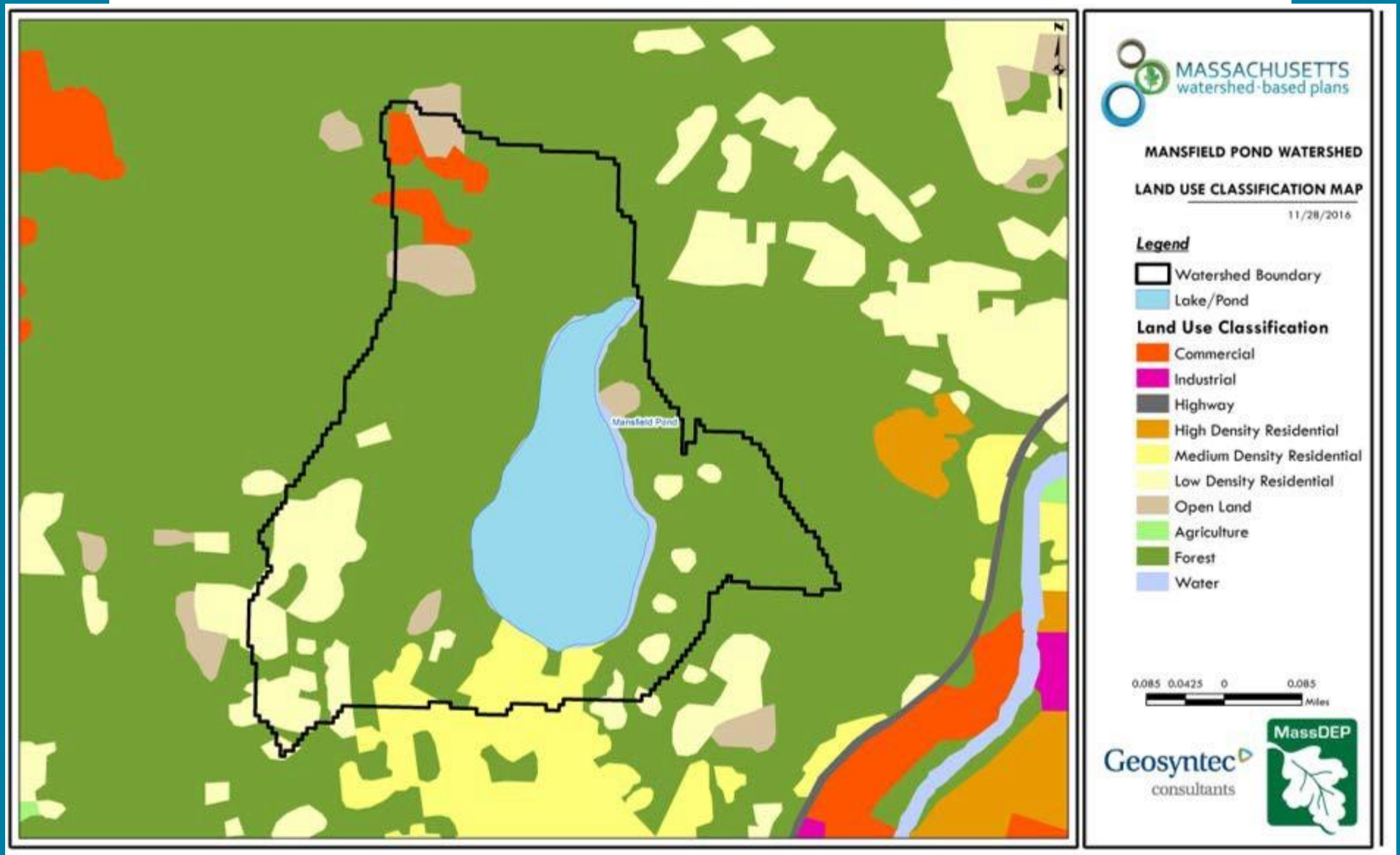
MASSACHUSETTS watershed·based plans

Watershed Overview

MASSACHUSETTS watershed·based plans

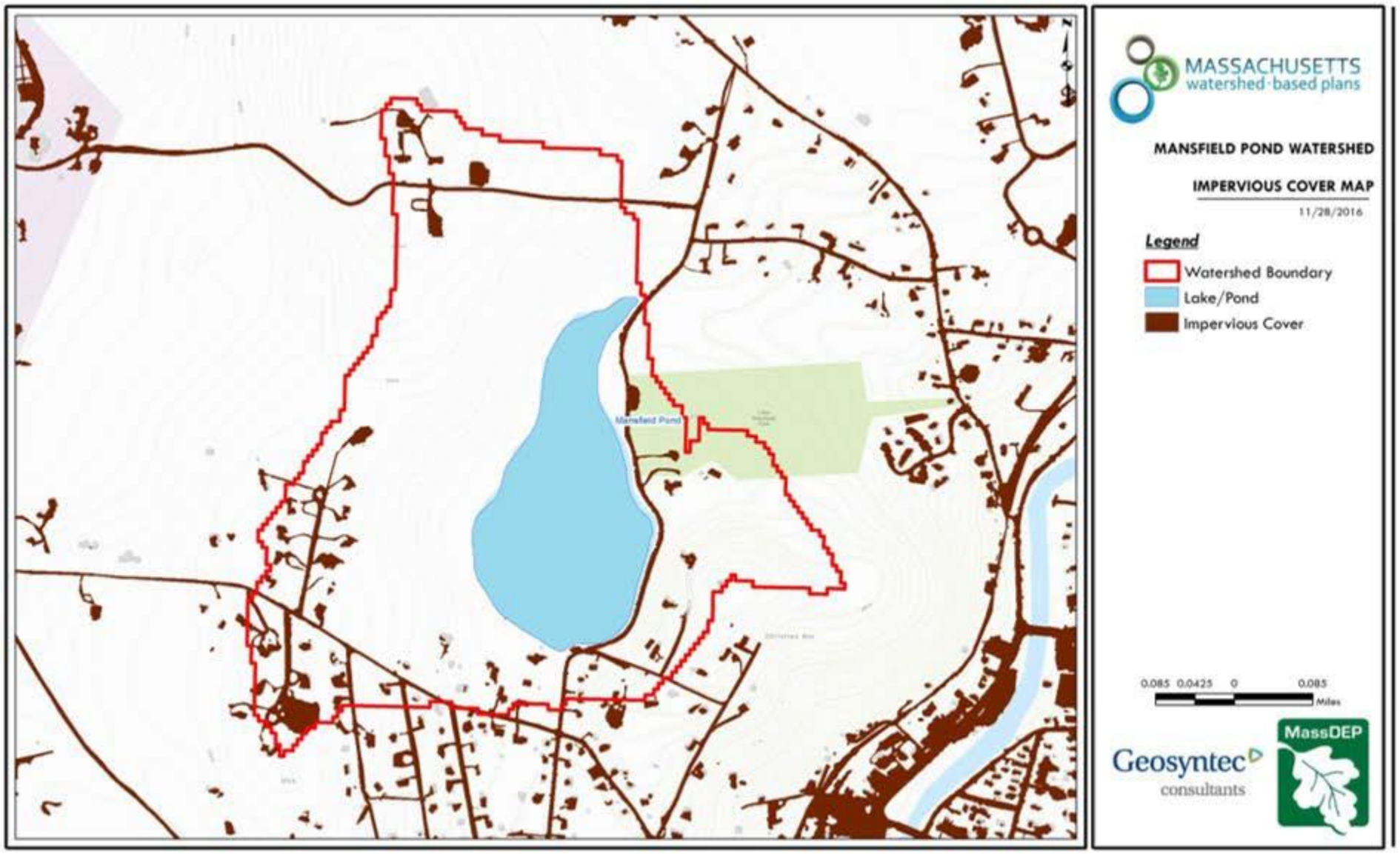


Watershed Overview



Watershed Overview

MASSACHUSETTS watershed·based plans



Watershed Overview

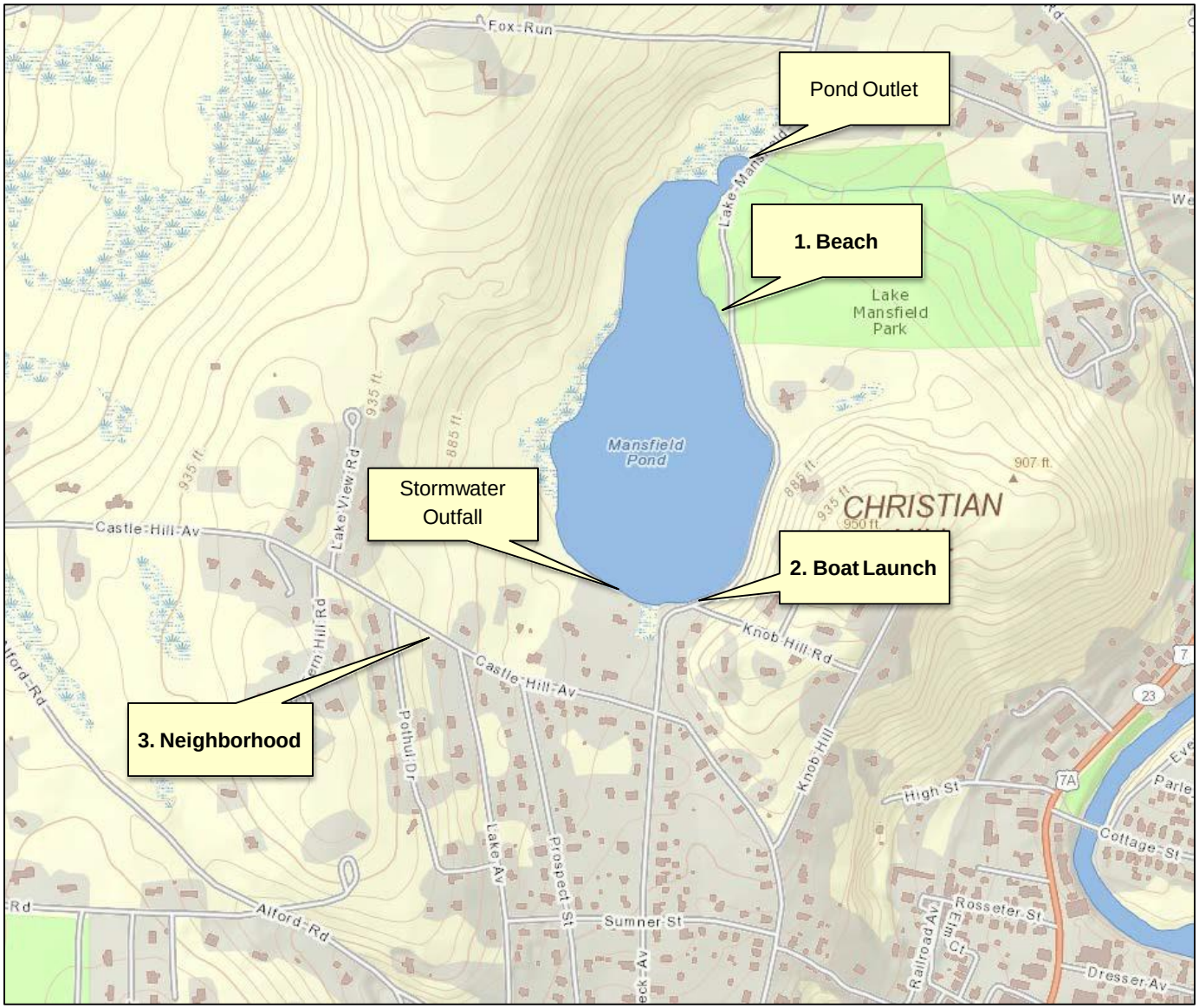
MASSACHUSETTS watershed·based plans

Background Information

- Impaired Category 4C (Non-Native Aquatic Macrophytes)
- Sediment is primary pollutant to Lake and encouraging growth of invasive and nuisance plants
- Sediment loading from tool is estimated as 4 ton/yr; however, likely far exceeds this given gravel / dirt roads in watershed
- Previous Structural BMPs (hydrodynamic separators) removed appx. 30 tons of sediment in their 1st year
- Monitoring is performed sporadically; long-term loading and other water quality parameters are unknown

Problem Area Overview

MASSACHUSETTS watershed·based plans



Site 1 – Beach

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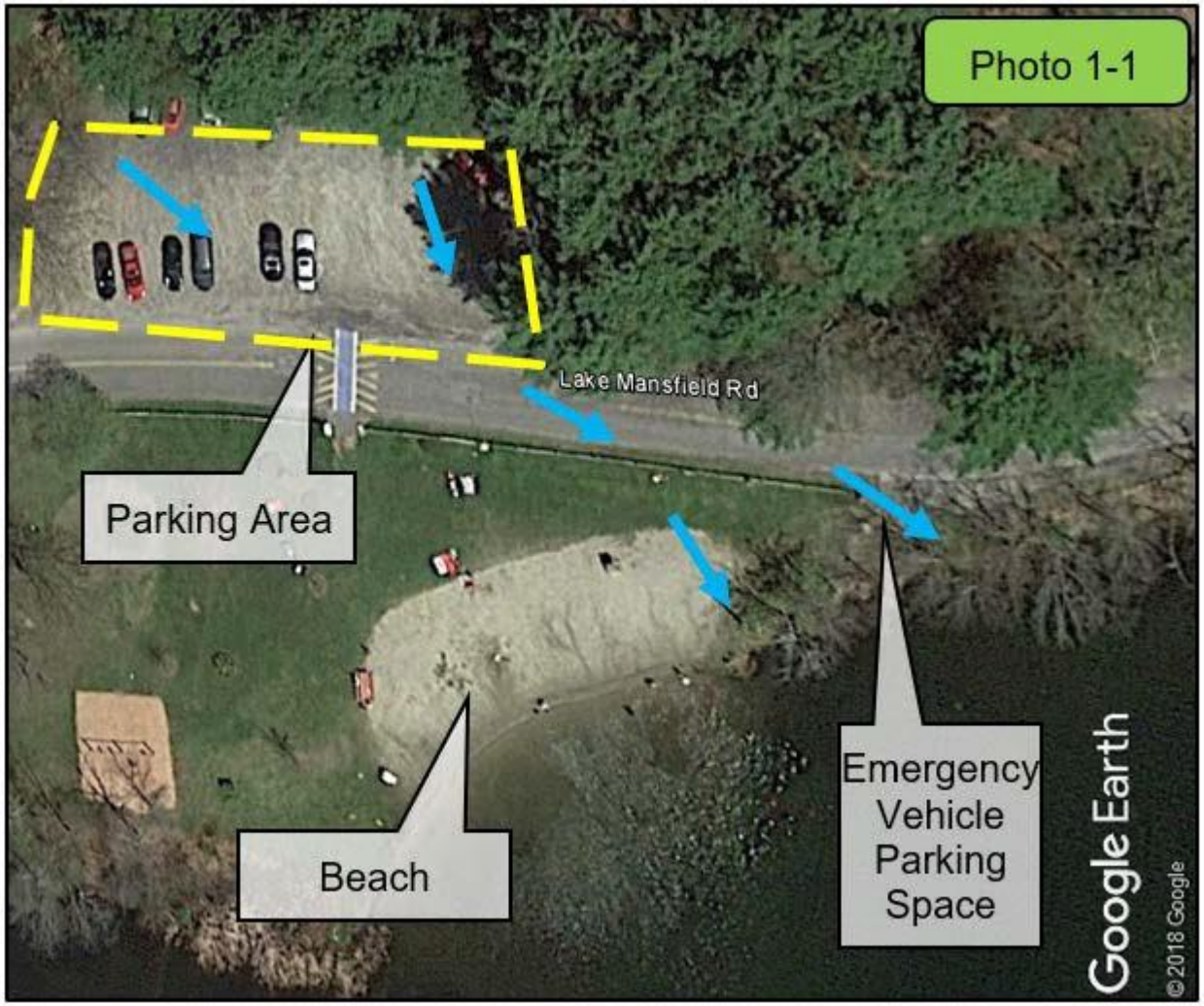
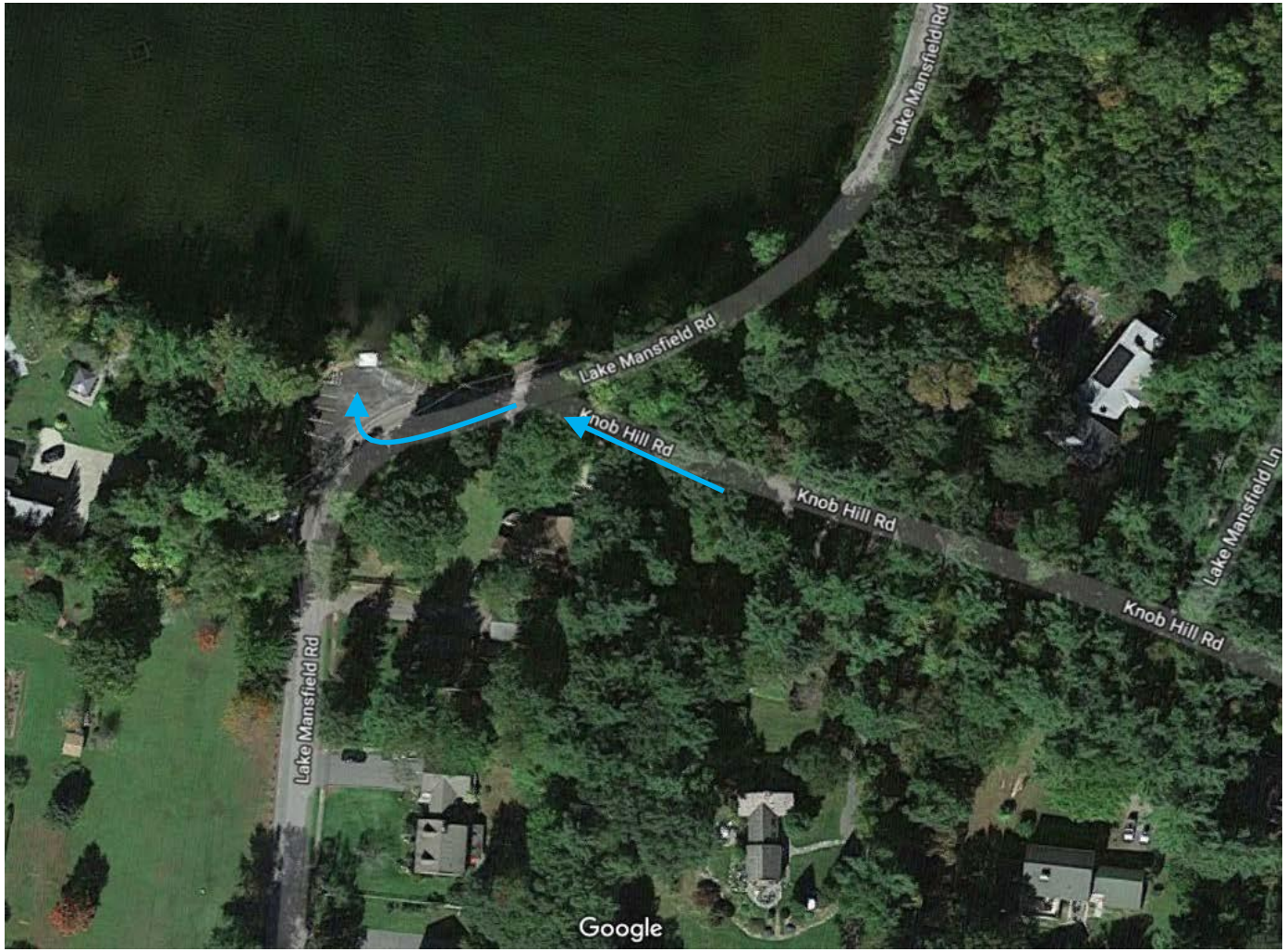


Site 1 – Beach

MASSACHUSETTS watershed·based plans

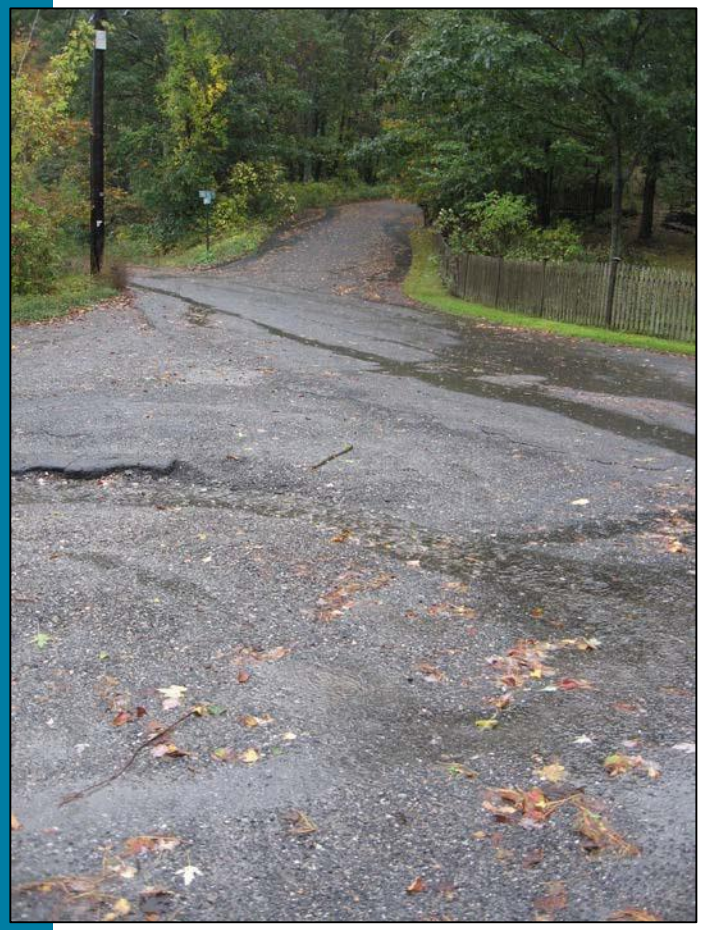
Site 1 – Beach

Site 2 – Boat Launch



Site 2 – Boat Launch

MASSACHUSETTS watershed·based plans



Site 3 – Neighborhood

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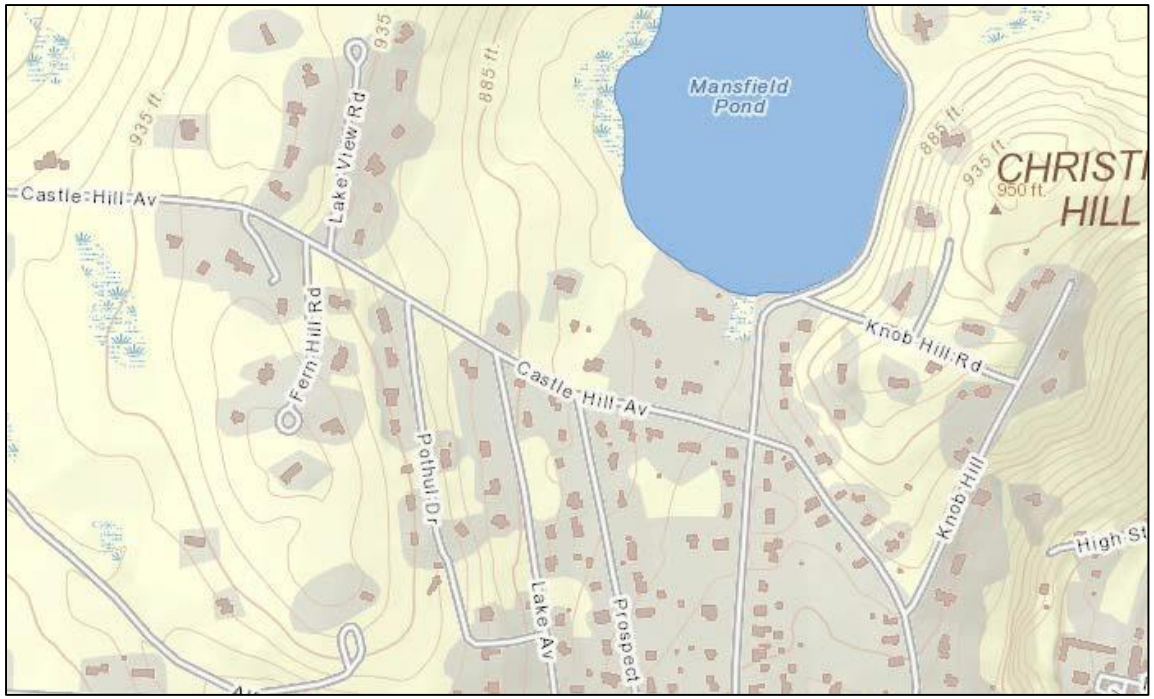

Site 3 – Neighborhood

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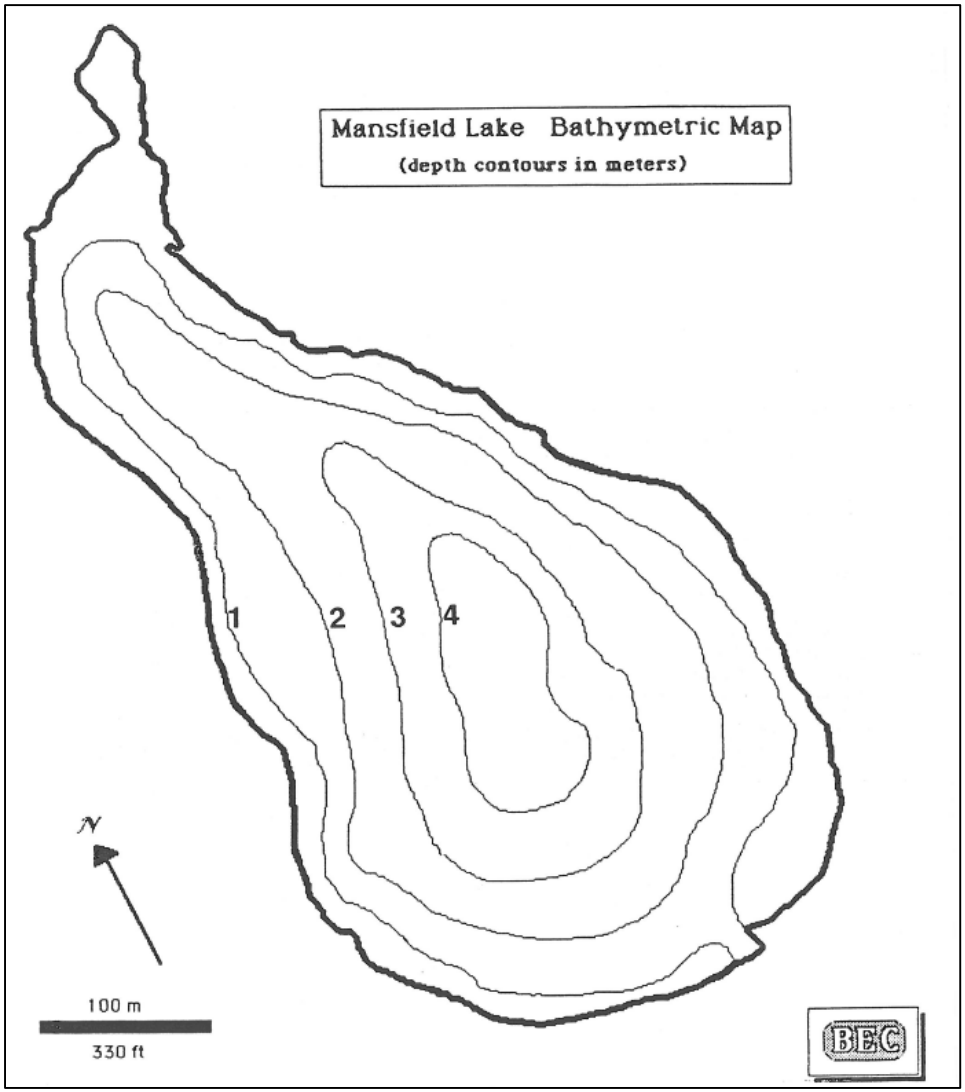
Pond Bathymetry Map

(**Hint:** Use when Developing Monitoring Plan)



Hands-on Exercise

MASSACHUSETTS watershed·based plans

Lake Mansfield, Great Barrington, MA

Watershed Based Planning

Initial Tasks *(15 minutes)*

- ❑ Sign-in to the tool (http://prj.geosyntec.com/MassDEPWBP/Home)
- ❑ Find and select Lake Mansfield in Great Barrington, MA
- ❑ Briefly review existing data
- ❑ Info Slides:
  - ❑ Watershed Maps (Overview, Land Use, Impervious Area)
  - ❑ BMP Site Overview Maps and Photos
  - ❑ Potential Monitoring Locations

Hands-on Exercise

MASSACHUSETTS watershed·based plans

Element A & B:
Identify Impairments and Set Goals

Set Goals *(15 minutes)*

- ❑ Identify pollutant(s) and/or impairments for WBP to focus on.
- ❑ Identify short term pollutant load reduction goals.
- ❑ Identify long term pollutant load reduction goals.

Hint: Goals should focus on obtaining eventual de-listing from the 303(d) list. **Use guidance and output from WBP-Tool**

Hands-on Exercise

MASSACHUSETTS watershed·based plans

Element A & B: Identify Impairments and Set Goals

Potential Answers

- ❑ Identify pollutant(s) and/or impairments for WBP to focus on.
  - Non-Native Macrophytes (303d Listed)
  - Sedimentation (TSS) *(linked to plant growth)*
  - Others (e.g., TP, bacteria)

Table A-6: Water Quality Goals

Pollutant	Goal	Source
Total Phosphorus (TP)	Total phosphorus should not exceed: --50 µg/L in any stream --25 µg/L within any lake or reservoir	Quality Criteria for Water (USEPA, 1986)
Bacteria	Class B Standards Public Bathing Beaches: For E. coli, geometric mean of 5 most recent samples shall not exceed 126 colonies/ 100 ml and no single sample during the bathing season shall exceed 235 colonies/100 ml. For enterococci, geometric mean of 5 most recent samples shall not exceed 33 colonies/100 ml and no single sample during bathing season shall exceed 61 colonies/100 ml; Other Waters and Non-bathing Season at Bathing Beaches: For E. coli, geometric mean of samples from most recent 6 months shall not exceed 126 colonies/100 ml (typically based on min. 5 samples) and no single sample shall exceed 235 colonies/100 ml. For enterococci, geometric mean of samples from most recent 6 months shall not exceed 33 colonies/100 ml, and no single sample shall exceed 61 colonies/100 ml.	Massachusetts Surface Water Quality Standards (314 CMR 4.00, 2013)
Non-Native Aquatic Macrophytes	An aquatic vegetation survey of Lake Mansfield was performed on July 11, 2012 where increased biomass was observed from a previous 2005 assessment. This goal is therefore to consistently reduce the assessed biomass of non-native aquatic macrophytes, eventually leading to de-listing of the impairment from the 303(d) list.	Geosyntec (2012)

Load Reduction Goals:

- Reduce by 50% over next 3 years
- Perform WQ monitoring, evaluate results
- Establish long-term goal, including other potential parameters (i.e. TP)

Hands-on Exercise

MASSACHUSETTS watershed·based plans

Element C: Conceptual BMP Planning

Create BMP Concepts *(25 minutes)*

- ❑ Choose from 3 potential sites
- ❑ Prepare One BMP Concept (type, schematic sketch)
- ❑ Use BMP-Selector Tool for preliminary sizing and costing

Tips:

- Consider prioritization in terms of pollutant removal
- Use Element A maps for rough approximations of catchment area and land use information
- **Use guidance and output from WBP-Tool**
- Consider space constraints, accessibility issues, potential utility conflicts, drainage patterns, visible erosion, etc.
- **Goal**: Obtain the most pollutant removal for the least cost

Hands-on Exercise

MASSACHUSETTS watershed·based plans

Element C: Conceptual BMP Planning

Potential Answers – Site 1 Beach

Site 2: Emergency Vehicle Parking*

BMP Type: Swale, Rain Garden, and Grass Pavers

BMP Location: Rec. Area Emergency Vehicle Parking

**This site is likely not needed if Site 1 is implemented*

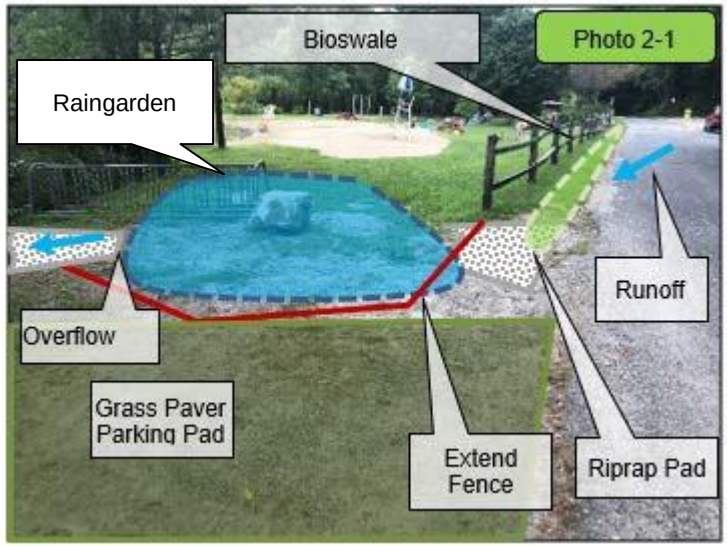
Site Summary: As summarized above (Site 1), runoff from the Lake Mansfield Recreation Area parking lot flows across the Emergency Vehicle Parking Area and into Lake Mansfield (Photo 1-1). It appears that unstabilized sand/dirt from the Parking Area is eroding and potentially contributing to increased sediment inputs into Lake Mansfield (Photo 1-1). A bike rack and large stone bollard are also at this location.

Proposed Improvement: Install an approx. 50-ft water quality swale (or asphalt Cape Cod berm) along the downstream edge of Lake Mansfield Road across from the Recreation Area parking lot to direct runoff into an approximately 200-square foot rain garden (Example cross-section included in Photo 2-2). Extend the fence around the edge of the rain garden to keep pedestrians from approaching the rain garden; however, provide a gate to allow emergency personnel access. Relocate the rock bollard and bike rack to discourage pedestrians from using this area. Install a mesh grass paver structure to serve as vegetated parking area for emergency vehicles.

Expected O&M: Remove accumulated sediment from water quality swale and rain garden annually and maintain/replace plants as needed every two years. Re-mulch annually. Remove accumulated sediment/debris, as needed.

Wetland Permitting: As a project with minor buffer zone disturbances, Wetlands Protection Act (WPA) permitting is expected to require submittal of a Notice of Intent.

Parcel Ownership: Town of Great Barrington



Sizing Characteristics	
BMP Drainage Area (acres)[1]	0.30
BMP Size (storm depth; inches)	0.5
Impervious Area (%)	100
Estimated Pollutant Load Reduction	
TP (lbs./yr.)	0.34
TN (lbs./yr.)	2.61
TSS (lbs./yr.)	124.7
Estimated Cost	
Planning-level Capital Cost	$11,000

Hands-on Exercise

MASSACHUSETTS watershed·based plans

Element C: Conceptual BMP Planning

Potential Answers – Site 2 Boat Launch

Site 6: Boat Launch

BMP Type: Bioretention Cell

BMP Location: Lake Mansfield Boat Launch

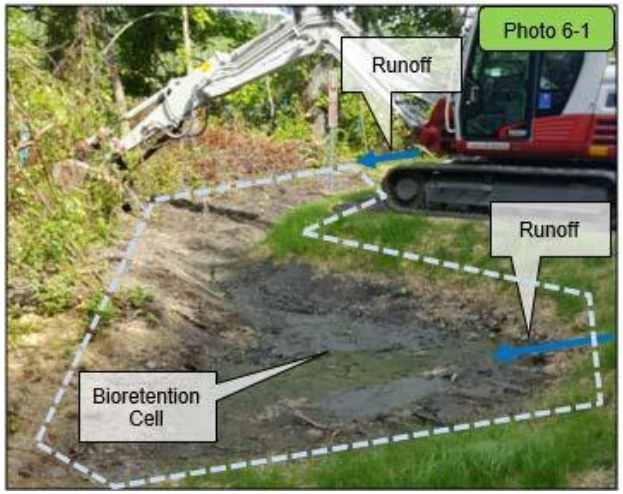
Summary: Runoff from Knob Hill Road has historically caused erosion and sedimentation issues at the Lake Mansfield Boat Launch. Stormwater BMP improvements are nearing completion at the boat launch. The improvements include concrete paving of the boat launch and parking spaces, added curbing, restoring vegetated buffer, and an approximately 660-sf grassed depression that collects runoff from the boat launch area (Photo 6-1 & Photo 6-2). The current depression does not have a gravel bed layer, bioretention soil media layer or native plantings.

Proposed Improvement: Make the existing vegetated depression a bioretention cell by installing a 6-inch gravel bed layer and a 2.5-4 feet thick bioretention cell soil media layer to increase biological treatment of the stormwater infiltrating through the bioretention cell. Also install 2-3 inches of mulch and include a minimum of 6-inch ponding depth. In addition, native species should be planted within the ponding area of the bioretention cell to improve bioretention resiliency, stormwater treatment, biodiversity and aesthetics (Photo 6-3). With some added informational signage, this BMP could also have significant public education and outreach value.

Expected O&M: Remove accumulated sediment from the bioretention cell and vegetate annually. Replant grass and native plantings as needed to maintain adequate vegetative cover. Remove accumulated debris prior to mowing.

Wetland Permitting: Not expected, proposed improvements are maintenance related tasks to improve functionality.

Parcel Ownership: Town of Great Barrington



Sizing Characteristics	
BMP Drainage Area (acres)	0.37
BMP Size (storm depth; inches)	0.5
Impervious Area (%)	100
Estimated Pollutant Load Reduction	
TP (lbs./yr.)	0.42
TN (lbs./yr.)	3.22
TSS (lbs./yr.)	153.7
Estimated Cost	
Planning-level Capital Cost	$10,000

Hands-on Exercise

MASSACHUSETTS watershed·based plans

Element C: Conceptual BMP Planning

Potential Answers – Site 3 Neighborhood

Site 9: Pothul Drive

BMP Type: Water Quality Swales

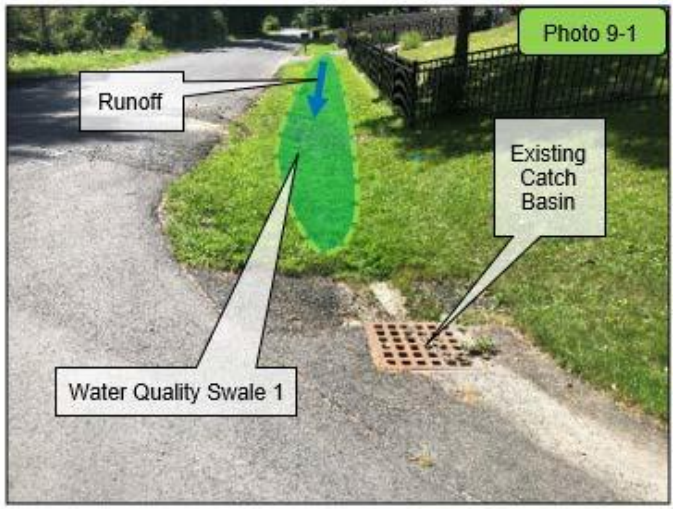
BMP Location: Intersection of Pothul Drive and Castle Hill Avenue

Site Summary: Runoff from Pothul Drive and Castle Hill Avenue drains into two existing catch basins at either side of Pothul Drive where it intersects with Castle Hill Avenue. These catch basins are part of the Castle Hill drainage system, which was implemented in 2013 (Site 8). Unstabilized soil was observed up-gradient of the catch basins.

Proposed Improvement: Install two grass-lined water quality swales upstream of the catch basins to treat the stormwater prior to discharging into the catch basins. Water quality swale 1 (Photo 9-1) will be approximately 80 feet long. Water quality swale 2 (Photo 9-2) will be approximately 40 feet long. Depending on further analysis, a rock-lined swale may be more appropriate, which may help to capture more sediment and reduce erosion.

Expected O&M: Remove accumulated sediment and debris maintain/replace grasses as needed annually.

Parcel Ownership: Town of Great Barrington (Right-of-Way)



Sizing Characteristics	
BMP Drainage Area (acres)	7.12
BMP Size (storm depth; inches)	0.5
Impervious Area (%)	16
Estimated Pollutant Load Reduction	
TP (lbs./yr.)	0.31
TN (lbs./yr.)	-
TSS (lbs./yr.)	438
Estimated Cost	
Planning-level Capital Cost	$9,000

Hands-on Exercise

MASSACHUSETTS watershed·based plans

Elements E,H,I:

Outreach, Evaluation, Monitoring

Outreach and Monitoring *(15 Minutes)*

Outreach Plan Tasks:

- ❑ Define goals of the outreach program
- ❑ Identify the target audience
- ❑ Identify up to 3 outreach products

Tip: Use WBP-Tool guidance

Monitoring Program Tasks:

- ❑ Identify up to 3 indirect indicators of load reductions
- ❑ Design a monitoring program
  - ❑ Where to monitor
  - ❑ When to monitor
  - ❑ What to monitor

Hands-on Exercise

MASSACHUSETTS watershed·based plans

Elements E,H,I: Outreach, Evaluation, Monitoring

Potential Answers: Outreach

- ❑ Define goals of the outreach program
  - Provide information to promote watershed stewardship
- ❑ Identify the target audience
  - Residents, Businesses, Recreational Users, Watershed Organizations, etc.
- ❑ Identify up to 3 outreach products
  - Newsletter – Annual
  - Perform Annual Cleanup
  - Post WBP to website – track # of views
  - Install BMP signage at “X” number of locations
  - Provide resident workshops
  - Etc.

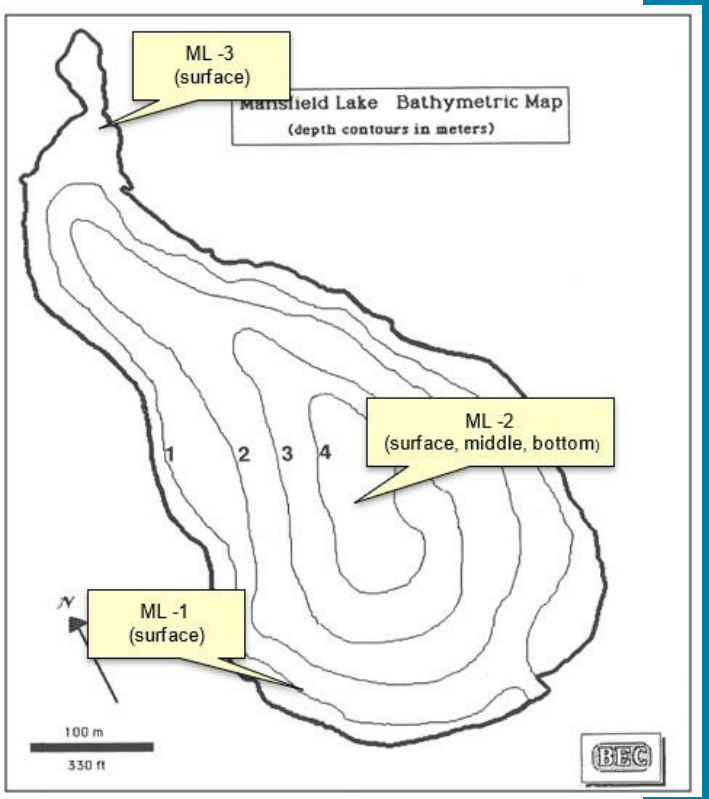
Hands-on Exercise

MASSACHUSETTS watershed·based plans

Elements E,H,I: Outreach, Evaluation, Monitoring

Potential Answers: Monitoring

- ❑ Identify up to 3 indirect indicators of load reductions
  - # Algal Blooms
  - # Beach Closures
  - Vegetation Extent
  - # of BMPs Installed
  - # of Fertilizer Outreach Residents
- ❑ Design a monitoring program
  - Where to monitor – See Figure
  - When to monitor – 3x per year
  - What to monitor:
    - Vegetation Biomass
    - TSS Discharge
    - Bacteria
    - TP
    - Chl-A, secchi, other



Closing

MASSACHUSETTS watershed·based plans

Any General Questions? Remember to refer to available resources frequently when writing a WBP

Resources:

- MassDEP WBP Planning Tool
  - WBP-tool Element Specific Guidance
  - WBP-Tool Provisional Review Checklist and Rating Scoresheet
  - Example Completed WBPs

- Other Resources
  - MassDEP Clean Water Tool Kit
  - MA Stormwater Handbook
  - EPA Opti Tool (Cost Information)
  - MWC BMP Cost Catalog

Building Effective Watershed Based Plans

http://prj.geosyntec.com/MassDEPWBP

Thank you for your time!

Contact:
Matthew Reardon, matthew.reardon@mass.gov
Julia Keay, Geosyntec, jkeay@geosyntec.com
Adam Questad, Geosyntec, aquestad@geosyntec.com

End

MS4 only if time allows

MS4 Module

MASSACHUSETTS watershed·based plans

The WBP-tool can help with MS4 Permit assistance

Example Permit Requirements:

- Develop Stormwater Management Plan (SWMP)
  - Catalog receiving waters and impairments
- Prepare Nutrient Control Plans / Source Identification Reports
  (for water quality limited waterbodies and waterbodies subject to TMDLs)
  - Calculate DCIA
  - Calculate baseline loading and reduction requirements
  - Identify and prioritize catchments with high loading
  - Identify nonstructural and structural controls
  - Estimate implementation costs
  - Evaluate performance
- Develop Public Education and Outreach Plan

MS4 Assistance

MASSACHUSETTS watershed·based plans

WBP-Tool, MS4 Module: Similar to "standard" tool, but includes calculations for MS4 planning areas

Applicable Features for Each MS4 Planning Area:

- Catalogs receiving waters and impairments
- Calculates total and disconnected impervious area
- Calculates land use based pollutant loading
  - Can use results for initial prioritization
- Provides waterbody-specific TMDL requirements
- Includes Element C BMP Planning and Costing Tool
- Includes MS4-specific guidance for Public Education and Outreach

MASSACHUSETTS
watershed·based plans

MassDEP

MS4 Module Demonstration

http://prj.geosyntec.com/MassDEPWBP

Use the slider or select a town to view waterbodies on the map. Choose your watershed by clicking on the waterbody, then click "Next Step". ***Tip****: Click directly on lakes/ponds and MS4 regulated areas. For rivers, click the most downstream segment that you want included in your watershed. This will select the MassDEP sub-basin (purple boundary lines) that your river segment is within, and all areas that drain to it. If the selected sub-basin results in a larger watershed than intended (due to significant downstream areas and receiving waters within the sub-basin), try selecting the adjacent upstream sub-basin.*

What type of watershed are you interested in?

(•) Lakes & Ponds ( ) Rivers & Streams ( ) MS4 Area

Reset Map | Select a Town... | **You Selected: New Boston Road Pond** | Next Step

MS4 Assistance

MASSACHUSETTS watershed·based plans

WBP-Tool, MS4 Module: Similar to "standard" tool, but includes calculations for MS4 planning areas

Applicable Features for Each MS4 Planning Area:

- Catalogs receiving waters and impairments
- Calculates total and disconnected impervious area
- Calculates land use based pollutant loading
  - Can use results for initial prioritization
- Provides waterbody-specific TMDL requirements
- Includes Element C BMP Planning and Costing Tool
- Includes MS4-specific guidance for Public Education and Outreach

MASSACHUSETTS
watershed·based plans

MassDEP

MS4 Module Demonstration

http://prj.geosyntec.com/MassDEPWBP

Use the slider or select a town to view waterbodies on the map. Choose your watershed by clicking on the waterbody, then click "Next Step". ***Tip****: Click directly on lakes/ponds and MS4 regulated areas. For rivers, click the most downstream segment that you want included in your watershed. This will select the MassDEP sub-basin (purple boundary lines) that your river segment is within, and all areas that drain to it. If the selected sub-basin results in a larger watershed than intended (due to significant downstream areas and receiving waters within the sub-basin), try selecting the adjacent upstream sub-basin.*

What type of watershed are you interested in?

(•) Lakes & Ponds ( ) Rivers & Streams ( ) MS4 Area

Reset Map | Select a Town... | **You Selected: New Boston Road Pond** | Next Step