Mystic River Watershed Alternative TMDL Analysis for Eutrophication Management

Mystic River Steering Committee

June 4, 2020

https://www.epa.gov/mysticriver

Topics to be Discussed Today

- Alternative TMDL/TMDL process - 5 min
- Summary of Mystic Alternative TMDL Eutrophication Analysis - 30 min
  - Project Objectives and Key Elements
  - Summary of Key Results
  - Stormwater Management Optimization Analysis
  - Phase 3: Facilitated Technical Support Process of working with pilot
  - Permitting
- EPA and MassDEP Next Steps - 5 min
- Q&A - 30 minutes

EPA's CWA Section 303(d) Vision, Dec 2013

Alternatives Goal

- *By 2018, States use alternative approaches, in addition to TMDLs, that incorporate adaptive management and are tailored to specific circumstances where such approaches are better suited to implement priority watershed or water actions that achieve the water quality goals of each state, including identifying and reducing nonpoint sources of pollution*

Traditional TMDLs vs. Alternative TMDLs

Traditional TMDL	Alternative TMDL
Slow	Fast
Expensive	Less Expensive
Inflexible	Flexible
Legally binding requirements	Adaptive management

Future MS4 Permits

Traditional Approach

TMDL Development → WLA Calculations → Numeric Reductions in MS4 Permit with Extended Schedule

Mystic Approach

Alternative TMDL Development → Watershed Reduction Targets → Iterative Requirements Every MS4 Permit Term

Status of Mystic River Watershed Alternative TMDL Analysis for Eutrophication Management

1) Final Report of Alternative TMDL Technical Analyses completed January 2020
https://www.epa.gov/sites/production/files/2020-05/documents/mystic-phosphorus-tmdl-development.pdf

2) Phase 3 Facilitated Technical SW Management Support with 6 Pilot Communities

- Pilot process completed with Arlington and Winchester – March-September 2019
- Process expanded to work with 4 additional watershed communities, Cambridge, Lexington, Reading and Watertown – November 2019-September 2020

3) Rollout of Final Report

- EPA and MassDEP sent joint letter to watershed communities announcing release of the report and its significance to communities – May 28, 2020

  https://www.epa.gov/mysticriver/environmental-challenges-mystic-river-watershed#MysticAltTMDL
- Presentation of project results including Phase 3 work at Mystic Steering Committee Meeting today - June 4, 2020

4) EPA and MassDEP Continue Outreach to Communities on Alt TMDL following its release – June-Sept 2020

Project Goals

- Develop best available information for moving forward on improving water quality and restoring watershed health
- Working on nutrient problem is strategic and its solutions will contribute to other water resource problems throughout the watershed (bacteria, depleted baseflows, excessive runoff flows i.e. flooding)
- Ultimately, it is to improve the quality of life within the communities through collective problem-solving

Big-Picture Overview of Study

- This is a scientifically robust study based on extensive data and modelling analyses and we are confident that it:
  - provides sufficient information to support beginning wise management actions now
  - supports a long-term adaptive management approach that will result in improvements
- Heavy lift for wise watershed management:
  - No short cuts to restore watershed's health except to find most cost-effective and sustainable approaches
  - Over last decade much has been learned and much will likely be learned going forward
  - Opportunity for collective problem solving to find best workable strategies communities

Freshwater issues in the Mystic due to Eutrophication

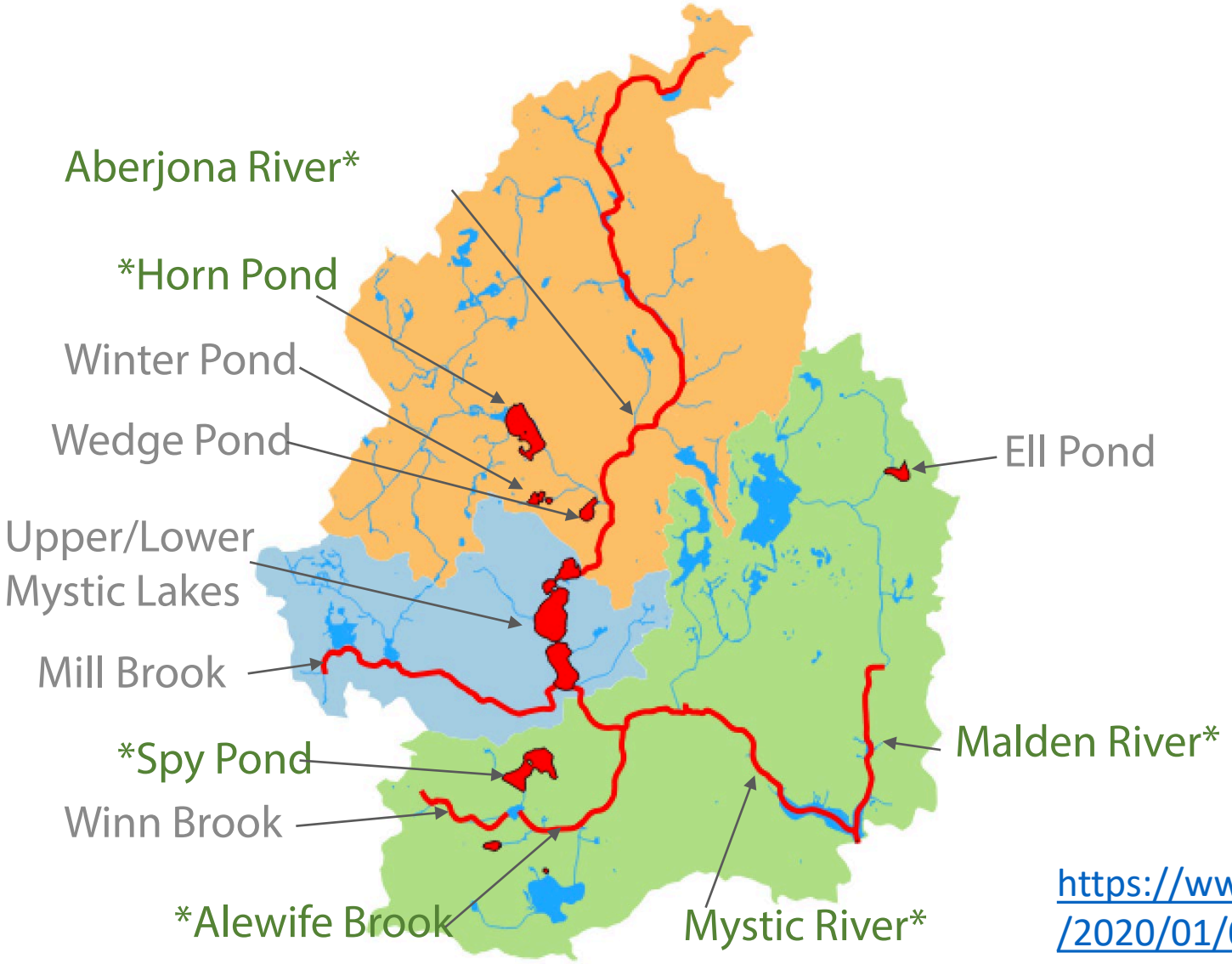
- excessive algal growth
- cyanobacteria blooms
- excessive aquatic plant growth (including invasive species)

Mystic River Cyanobacteria Bloom Summer 2017


Evidence of impairment:
Invasive plants

303(d)-listed Water Bodies in Watershed

All category 5 impairments (TMDL required) 2014



https://www.mass.gov/files/documents/2020/01/07/16ilwplist.pdf

Partial List of Activities Related to Alt-TMDL and SW Management in the Mystic River Watershed

Summary of Funding for Mystic River Watershed Alternative TMDL Analysis and Related Watershed Management Implementation Activities				
Source	**Description**	**Year**	**Program**	**Value**
MWRA	USGS flow gage install and operate	2015-2017	TMDL	$140,000
Massachusetts Environmental Trust	Grant for phosphorus sampling/municipal education	2017- 2018	TMDL	$45,000
Caswell Foundation	Grants for phosphorus field work etc, 5 yrs.	2015-2019	TMDL	$150,000
EPA Reg 1 Lab	In-kind lab services	2015-2017	TMDL	$40,000
EPA HQ TMDL/ R1 Water	ALT-TMDL Nutrient Management Study	2016-2019	TMDL	$235,000
MassDEP	Alt-TMDL Study & Community Technical Support for Implementation Activities (Phase 3)	2018- 2019	TMDL/MS4/ GI	$25,000
EPA HQ Urban Waters	Alt-TMDL Community Technical Support for Implementation Activities (Phase 3)	2018-2019	TMDL/MS4/ GI	$142,000
			Subtotal for TMDL related	**$777,000**
EPA Urban Waters	Grant for P mapping and GI feasibility 3 municipalities	2013-2015	GI	$60,000
EPA Urban Waters	Grant for Stormwater Education Collaborative	2015-2017	MS4	$60,000
Municipalities	Stormwater Education Collaborative	2018-2019	MS4	$80,000
MA 319 Grant	Green infrastructure Arlington	2017	GI	$45,000
MA 319 Grant	Grant for green infrastructure Winchester	2018	GI	$190,000
CZM-CPR	Medford green infrastructure	2016	GI	$50,000
CZM-CPR	Everett green infrastructure	2017	GI	$40,000
CZM-CPR	Arlington green infrastructure	2018	GI	$135,000
			Subtotal for Implementation related	**$660,000**
Total for TMDL and Implementation related				**$1,437,000**

Study Objectives

Conduct TMDL-like analyses to address cultural eutrophication related water quality impairments in the freshwater portion of the Mystic River Watershed

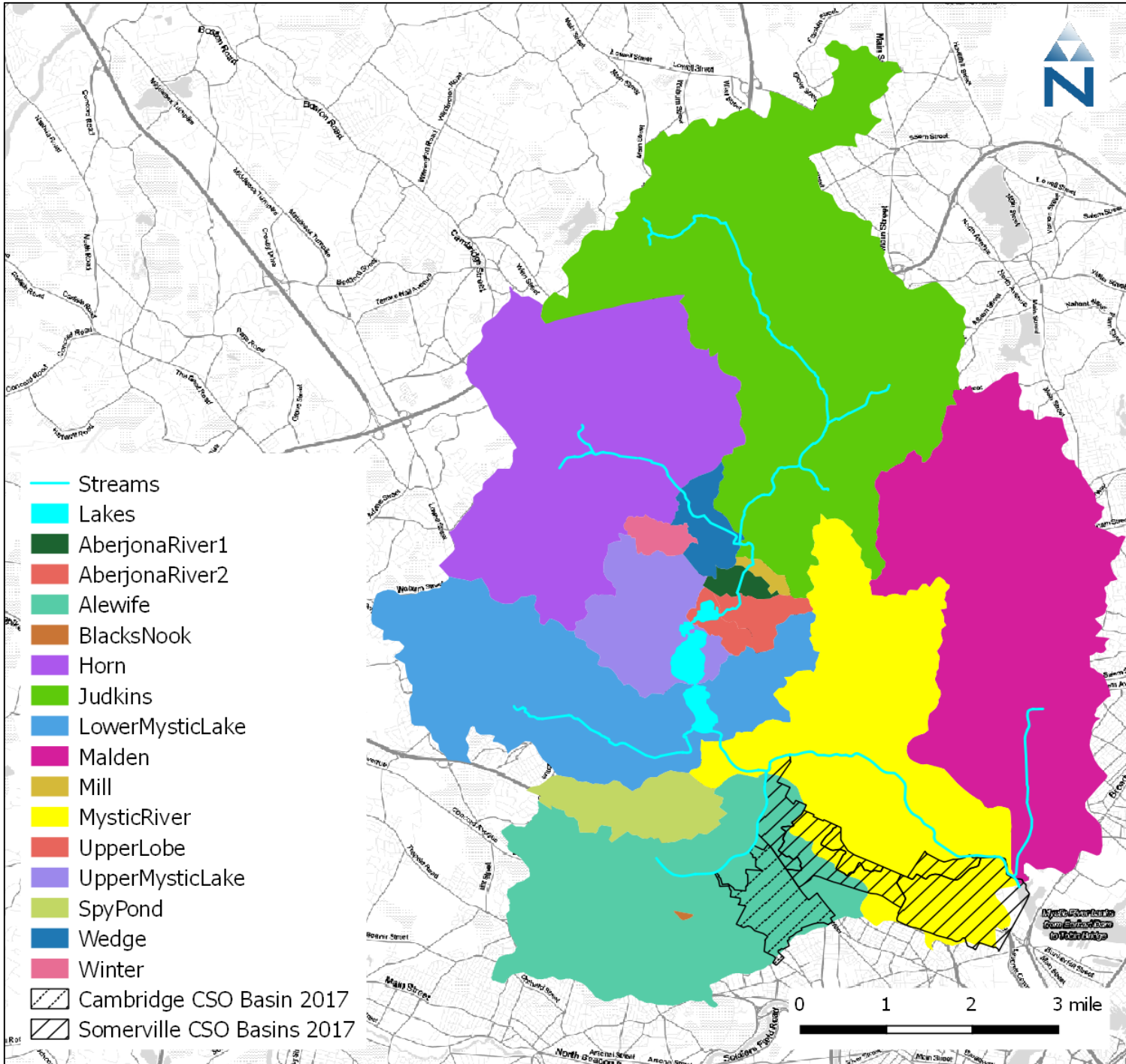
1. Form Technical Steering Committee -Completed
2. Develop predictive watershed phosphorus loading and receiving water quality response models -Completed
3. Estimate watershed-based phosphorus load reductions needed to attain nutrient related MASWQS -Completed
4. Translate P reductions to inform communities on optimal SW management strategies for urban/suburban landscapes -Completed
5. Conduct independent technical review of work -Completed
6. Work collaboratively with local communities to learn about workable SW management retrofit opportunities for municipal operations, urban renewal and redevelopment – Underway

Project Partners - Technical Steering Committee (TSC)

- The **Mystic River Watershed Association (MyRWA)** - Water quality monitoring, USGS flow gaging project management, TSC
- The **MWRA** - Water quality monitoring, financial support, TSC
- The **MassDEP** -Technical and policy support, TSC, pond/lake phosphorus load reduction analyses
- **EPA Region 1** - EPA Contractor support, water quality monitoring, laboratory analyses, technical and policy support, TSC, pond/lake load reduction analyses
- **EPA's Contractor: Environmental Research Group (ERG)** - Team includes PG Environmental, Horsley Witten Group, & Paradigm Environmental - Overall technical support including data analyses, water quality endpoints, watershed and receiving water modeling

Mystic River Watershed Summary

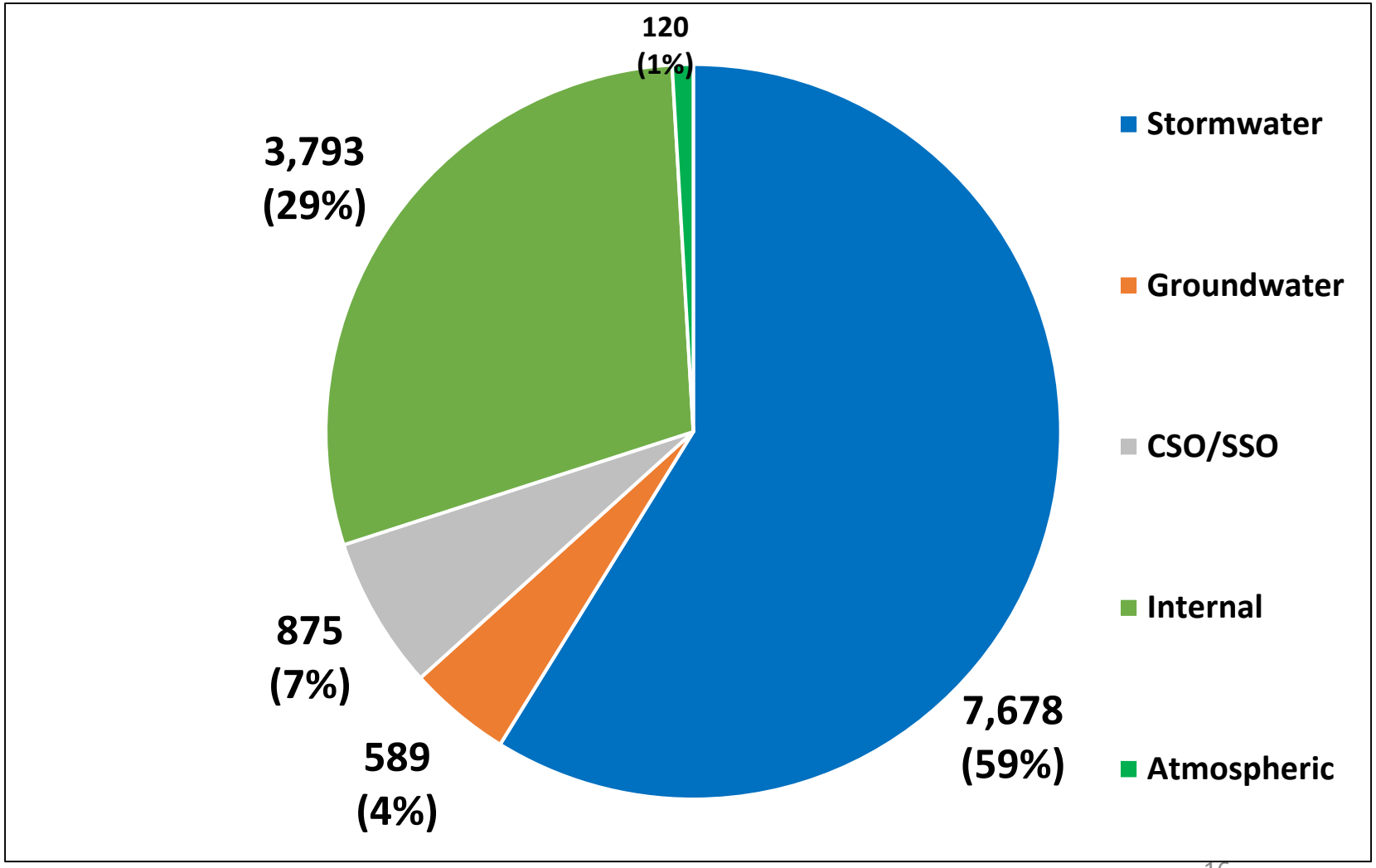
- 76 square mile watershed- 22 urban & suburban communities
- **Land Use:** 46% High Density Residential (HDR) and Medium Density Residential (MDR); 22 % Forest & 15% Commercial and Industrial
- **Extensive Impervious Cover (IC):** (e.g., 56% IC in HDR and MDR and 31% IC in Commercial and Industrial
- 15 Subwatershed Delineations according to watershed flow and pollutant routing to critical waterbody segments
  - 3 Critical WQS Attainment Segments
  - 5 ponds/lakes impaired by excessive nutrients



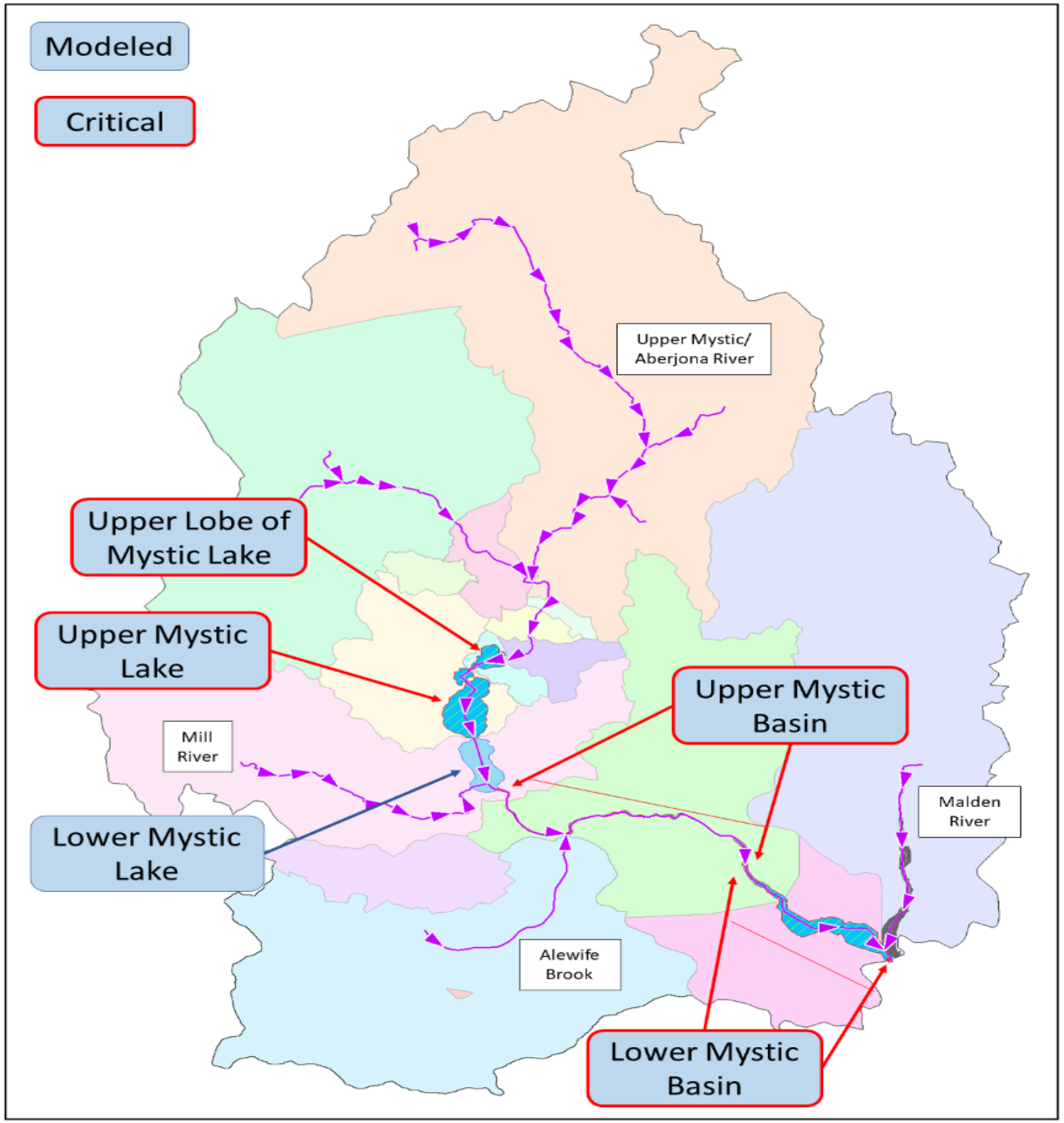
Mystic River Watershed
Phosphorus Source Load Contributions (lbs./yr.)

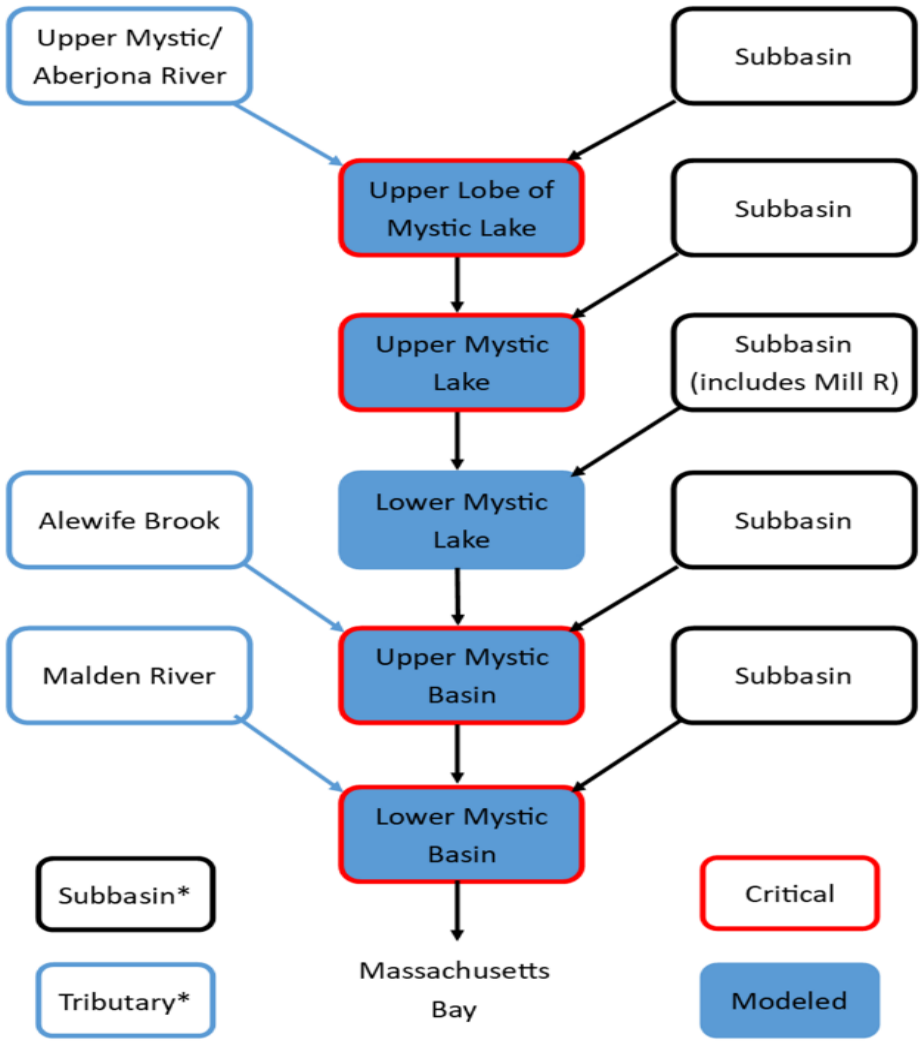
Primary Watershed Source Categories of Nutrients:

- Stormwater (SW),
- Combined Sewer Overflows (CSOs),
- Sanitary Sewer Overflows (SSOs),
- Natural Background (e.g., groundwater base flow)



Mystic River Watershed Sub-Basin Delineation and Schematic Diagram for Final BATHTUB Model





*Subbasin loads are unattenuated while tributary loads are attenuated by the river network

Mystic River Watershed Alternative TMDL Analysis for Eutrophication Management

Phosphorus (P)Load Reductions

Critical period of interest

- 10-year period from 2007 to 2016
- Includes 2 wet years (2008, 2011), 2 dry years (2015, 2016)

Annual phosphorus load reductions to attain targets for critical period

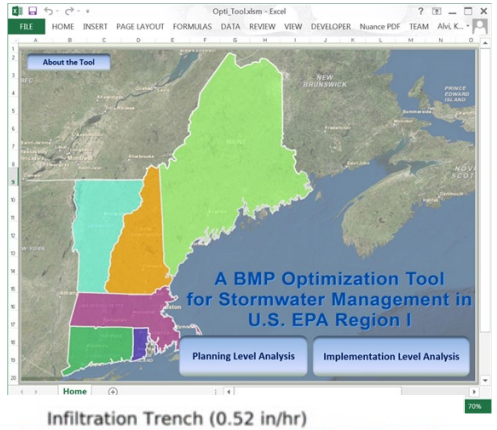
- **Stormwater:** 59% to 67% depending on amount of combined sewer separation
- **CSOs**: Consistent with level of control in MWRA approved Long-Term Control Plan
- **SSOs:** 50%
- **Internal nutrient cycling:** 30% to 34% assumed proportional to Watershed P load reduction

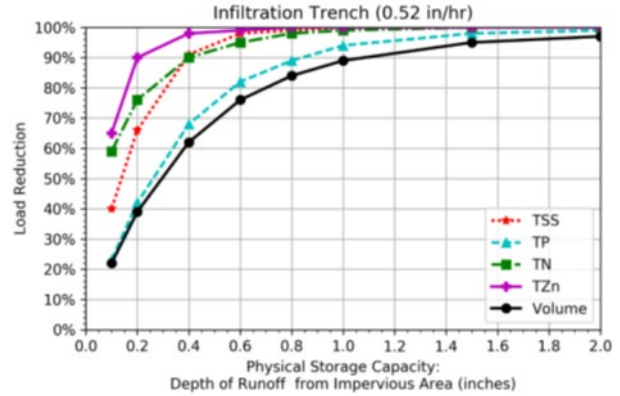
Table IX-6. Total Phosphorus Load Reductions for Scenario 2A

Item	SW	GW Base flow	CSO/SSO	Internal	Atm.	Total
Existing Conditions Total P Load (lb./yr.)	14,887	1,141	1,696	3,793	120	21,638
Scenario 2A P Load (lb./yr.	9,974	1,141	412	1,271	120	12,919
Reduction (%)	**67%**	**0%**	**24%**	**34%**	**0%**	**60%**

Some Resulting Management Questions for the Mystic

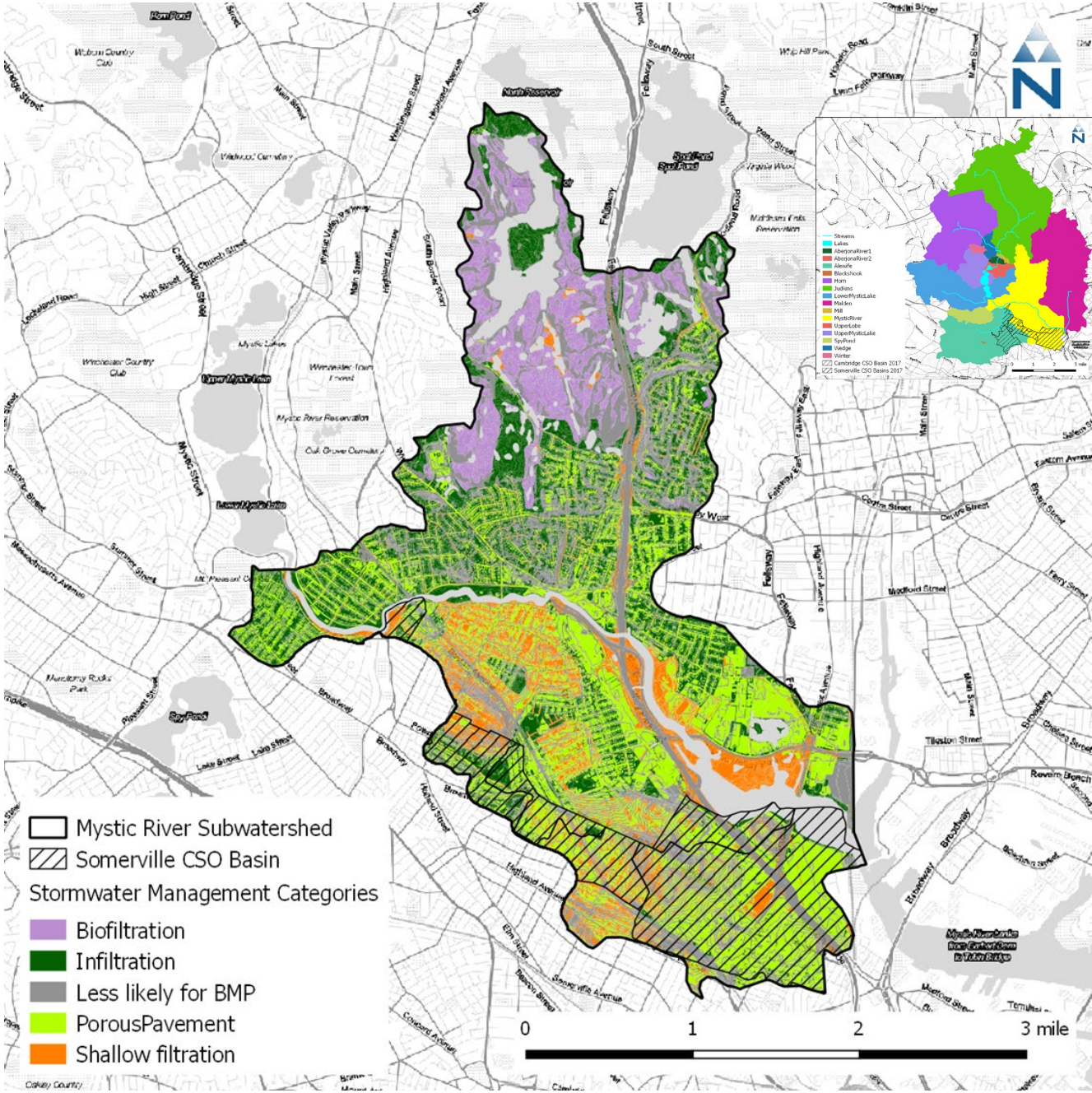
- *What does this high level of SW control retrofit management entail?*
- *Potential cost ($)?*
- *What types of controls would be most cost effective?*





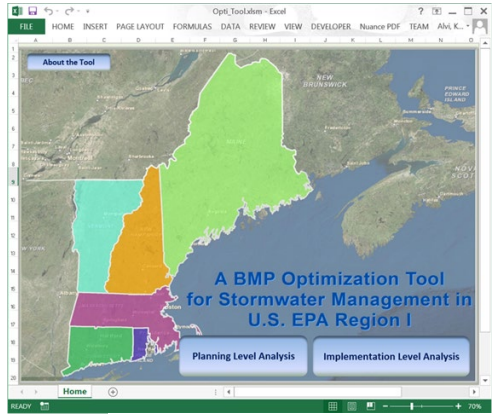
Identifying Cost-Effective Stormwater Management Strategies w/Opti-Tool

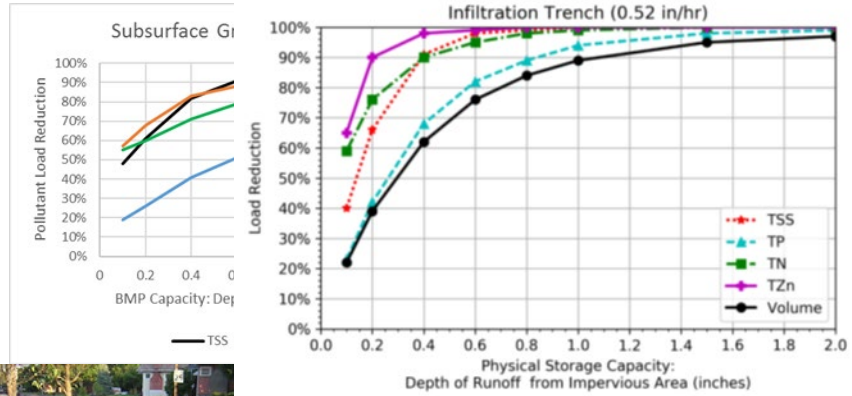
- Pilot sub-watershed (5,151 acres - ~10% of entire watershed area)
- The Demonstration project:
  - Developed a step-by-step, high-level approach
    - Generalize approach
    - Treating impervious areas
    - Structural SW control retrofits only
  - Demonstrates cost-benefits of optimization at watershed scale
    - Quantifies treatment performance for all precipitation events (2007 – 2016)
    - Developed cost-effective curve for P load reduction



Demonstration Study to Understand Optimal Management Solutions and Opportunities

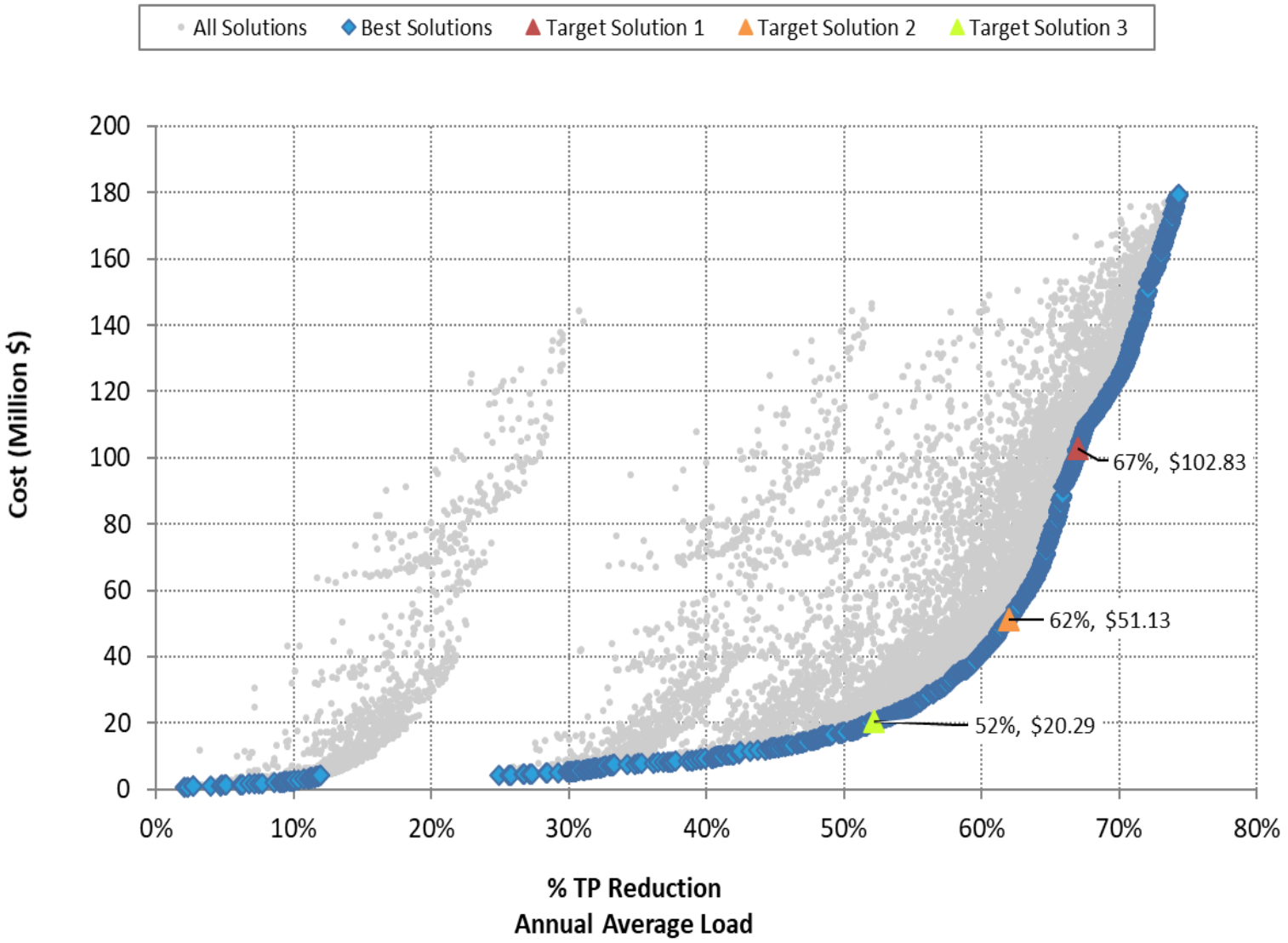
- Seamless translation of SW load estimates and reductions using credible accounting information developed by Region for MS4 permitting (incorporated into Opti-Tool)
- Demonstrate the power of cumulative performance estimates for SW controls/GI of all sizes in urban settings
- Identify types of management opportunities that communities can act on (e.g., redevelopment and urban renewal projects)





Opti-Tool: Model Results (Scenario 2)

- Optimize SW retrofit opportunity areas and associated SW control retrofit sizes
- Identify a solution on the CE-Curve that meets the SW P load reduction target for the pilot watershed
- Existing condition (target solution 1)
  - Annual average P load reduction: 67%
  - Million $102.83
- Future condition 1 (target solution 2)
  - Annual average P load reduction: 62%
  - Million $51.13 (50% less cost)
- 15% non-structural (target solution 3)
  - Annual average TP load reduction: 52%
  - Million $20.29 (80% less cost)



Take-Away Messages from Mystic Opti-Tool Study

- Provides a full range of optimal solutions for a range of load reduction targets and can be used to identify the most cost effective strategies to make greatest progress for least costs
- SW management retrofit costs vary widely with optimized low-cost solutions being substantially lower (1/3rd to 1/10th) than other more conventional SW retrofit approaches
- Highlights the importance of developing wise SW management strategies to apply most efficient SW retrofit strategies to treat IC runoff wherever and whenever opportunities arise (e.g., future infrastructure, roadway and redevelopment projects)

Stormwater Management Technical Support with Pilot Communities (Phase 3)

- Pilot process to work with watershed communities to identify affordable stormwater management retrofit and nutrient reduction strategies
- Started with two communities (2018 – 2019)
- Received additional funding to work with four more communities (2019 – Sept 2020)
- The process has involved facilitated working meetings with communities and contractors to promote dialog; these have been moved online recently

<u>Ph. 3:</u>
Arlington
Winchester

<u>Ph. 3.5:</u>
Cambridge
Lexington
Reading
Watertown

Stormwater Management Technical Support with Pilot Communities (Phase 3)

Objectives included:

- Understand the challenges and constraints municipalities (especially those in the Mystic) face in implementing stormwater management retrofit programs, begin to identify technical and informational needs for overcoming them.
- Identify how communities can make progress towards nutrient reduction goals while also addressing related water and environmental issues.
- Share and discuss critical stormwater management information and recent science, including EPA R1 efforts.

Stormwater Management Technical Support with Pilot Communities (Phase 3)

- Overall, the program has been successful in many ways:
  - The dialog among municipalities and regulators about stormwater management will inform future work throughout the region.
  - It helped to jumpstart creative work on stormwater retrofits / implementation in the watershed.
  - The process has been very informative for EPA
  - Provide some tools and ideas for other communities

Future MS4 Permits

Traditional Approach

TMDL Development → WLA Calculations → Numeric Reductions in MS4 Permit with Extended Schedule

Mystic Approach

Alternative TMDL Development → Watershed Reduction Targets → Iterative Requirements Every MS4 Permit Term

Next Steps

- Continue Rollout of Final Report/Alt TMDL -June-August – Conduct follow-up webinars for further discussions on study (maybe two repeating June 4 format and 2-3 topical based on stakeholder feedback) June-Sept 2020
- Complete Phase 3 targeted technical assistance through Sept 2020
- Seek funding to provide continued technical support through 2020 into 2021
- Issue draft MS4 for Massachusetts with Mystic-specific requirements, 2021-2022
- Assess progress on implementation activities related to Alt-TMDL
- MassDEP Activities

Questions & Discussion