Strategic Watershed Plan

Falmouth, Maine August 2021



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Strategic Watershed Plan

Table of Contents

EXECUTIVE SUMMARYii
SECTION I – FOREWORD1
Background1
Problem Statements3
Purpose4
Introduction5
Analysis and Recommendations6
SECTION II – "HOW TO GUIDE" for Assessing Watersheds Simultaneously7
STEP #1: Scope of Work8
STEP #2: Team Identification10
STEP #3: Data Request and Collection11
STEP #4: Data Review and Analysis12
STEP #5: Preliminary Watershed Health Metrics15
STEP #6: Final Metrics and Feedback Loop22
SECTION III – RESULTS
Attributes of Vulnerability Error! Bookmark not defined.
Watershed Health Metrics24
SECTION IV – RECOMMENDATIONS
GLOSSARY
APPENDICES

EXECUTIVE SUMMARY

Municipalities have numerous and wide-ranging public interests competing for finite resources. In Falmouth, 85% of polled residents consider water quality protection important. Even with that resounding statistic, the challenge is to direct resources in the most effective and efficient manner possible to optimize the net positive impacts to waterbodies municipal wide.

Specifically in Southern Maine, coastal communities are faced with restoring multiple impaired or threatened watersheds within their municipality, plus managing protection efforts for healthier watersheds. Therefore, the question becomes: which watershed should receive resources and attention first?

This project strives to provide a data-driven, science-based framework for proactively prioritizing water resources on a municipal wide basis. The overall process for developing the framework for prioritizing watershed health has been memorialized for two reasons:

- To allow the Town of Falmouth the opportunity to improve upon this preliminary prioritization in future iterations, as part of a recommended adaptive management approach (i.e., learn by doing); and
- 2. To provide a guide for other (upstream and coastal) communities to follow and/or improve upon the process in hopes of aggregating the positive effects to improve water quality in Casco Bay and beyond.

The framework for comparing the relative health of each watershed is based on USEPA tools and resources that are widely accepted, publicly available and non-proprietary. Within the framework, attributes for watershed health are established; these are meant to be metrics that the Town can influence.

For example, directly altering the physical condition (i.e., temperature or dissolved oxygen) of waterbodies is difficult to do in the municipal setting. However, the physical condition of a waterbody can be influenced by indirect factors that the Town can directly control through policy and performance standards, such as:

• Maximizing tree cover and riparian zones

- Tree cover provides shade for a waterbody to keep it cool thus maximizing the potential concentration of dissolved oxygen that sustains many aquatic organisms that are indicators of a healthy watershed. Tree cover provides many other benefits to stream health (e.g., stabilizes soils; improves air and water quality; reduces stream channel erosion; promotes infiltration, evaporation, and transpiration to naturally dissipate rainfall and access nutrients in runoff).
- Riparian zones, like tree canopy, provide numerous health benefits to a watershed, such as maintaining riverbank stability, retaining soils and nutrients on the land, improving water quality and habitat diversity, and minimizing thermal impacts.

Leaving riparian zones intact is a high priority and is enforceable through shoreland zone regulations.

- Minimizing stream barriers and impervious area
 - Stream barriers (i.e., undersized and/or malfunctioning culverts) do not allow connectivity of habitat species, migration pathways, hydrologic regimes, and other important factors that contribute to a healthy watershed.
 - Impervious area (IA) reduces the potential for infiltration, increases pollutant loads, increases temperature, and degrades water quality. Studies have shown that when impervious surfaces in a watershed approach or exceed 10% of the land cover, water quality degrades.

By calculating and monitoring these controllable factors, or watershed health surrogate metrics, municipalities can begin to measure and influence the health of the watersheds within their municipal jurisdiction. With the help of GPCOG, these watershed metrics were calculated using GIS on a watershed basis throughout the Town of Falmouth. The relative health of watersheds can be compared and prioritized to direct resources and actions.

In the case of Falmouth, the watersheds were grouped into three larger basins:

- **Casco Bay Frontal Drainage** includes all the watersheds along Route One, most of which drain to Mussel Cove, the Town's impaired marine waterbody.
- **Presumpscot River Basin** includes the main stem and many smaller tributaries, including Meader and Minnow Brooks.
- **Piscataqua River Basin**, which discharges to Presumpscot River, includes several large tributaries (i.e., East Branch) and Hobbs Brook that is also impaired.

The relative results and recommendations are summarized in **TABLE A.1 through TABLE A.3** with supporting details on relative priorities, (broad or specific) applicability, and estimated cost(s) included in this strategic plan. These results should be considered a preliminary path for action that is annually reviewed and updated with input from the project team (e.g., municipal staff, DEP, etc.) and partners (e.g., municipal officials, committees, etc.) to allow a long-term adaptive management approach that is continually improving.

TABLE A.1 – Relative health and prioritization for Casco Bay Frontal Drainage Basin and subwatersheds

BASIN	Subwatershed		Need	Priority			
or Major Watershed		BIOLOGICAL CONDITION + WATER QUALITY	HYDROLOGY	GEOMORPHOLOGY + HABITAT	LANDSCAPE		
		The ultimate indicator of watershed health, as aquatic organisms and communities reflect the cumulative conditions of all other watershed components and processes. The chemical and physical characteristics of water include concentrations of pollutants (like salt) and nutrients, as well as physical parameters (like pH and temperature).	Watershed hydrology is driven by climatic processes, land use, surface characteristics, such as topography and geology. Robust + mature forested cover in a watershed helps to maintain the hydrology and overall health of a watershed.	Stream channel, influenced by climatic processes and other disturbances, cause stream channels to become unbalanced. When the stream bank is unstable, sedimentation and deposition covers critical stream substrates providing habitat for aquatic organisms that determine the health of the waterbody.	The condition of the natural landscape influences aquatic habitats, cycles nutrients, retains sediment, and allows infiltration. The Riparian Zone (RZ), 75 to 250 feet from river's edge, is critical to maintain in order to maintain the landscape condition.	Update data + analysis annually to monitor changes over time in each watershed Share data + process with abutting municipalities to amplify positive impacts	H = High M = Moderate L = Low
CASCO BAY	FRONTAL	Data is most plentiful within this basin. DEP's Assessment Unit gathered a significant amount of data within the	32% forested with 10% protected forests in Falmouth	31 stream-road crossings with 28 of them occurring within Falmouth; 6 of the 28 in Falmouth are considered barriers	29% disturbed Riparian Zone	A broad multi-watershed management plan for the Casco Bay Frontal Drainage Basin is considered the highest priority.	н
DRAIN	IAGES	subwatersheds during this project in 2018 and 2019. DEP's rock bag samples, which determine if water quality standards are being met, are not available to fully characterize watershed health				Continuing the multi-phase approach of the MCP grant application (e.g., developing model ordinance language, creating a BMP selection guide, etc.) with an anchor organization to address the needs of each (sub)watershed	
	Scitterygussett Creek	In 2018-2019, DEP has done additional field work in this watershed, but results have not been shared yet	46% forested cover with 10% protected forest	Subwatershed with most stream-road crossings at 10 with only 1 being a barrier	43% disturbed Riparian Zone	Consider addressing stream-road crossings (see Appendix F.4) in Capital Improvement Plan and/or when grant funds are available Continuing the multi-phase approach (mentioned above) will allow for more protections for remaining forests and undisturbed RZ	H
	Webes Creek	According to DEP: Water quality standards are NOT being met.	subwatershed with the least amount of forested land cover at 26% with only 1% protected forest within Falmouth	1 stream-road crossing within Falmouth, but do not become barriers for aquatic organism passage	44% disturbed Riparian Zone (RZ)	Protect remaining forest canopy (lowest forested cover of all subwatersheds) and remaining undisturbed R2 in an overlay district and/or when ordinances are revised, as mentioned above	н
	Chenery Brook	According to DEP's 2019 rock bag sampling efforts: Not meeting water quality standards	65% forested cover with 6% protected forest	1 stream-road crossing within Falmouth, but do not become barriers for aquatic organism passage	26% disturbed Riparian Zone	Begin outreach with Cumberland to discuss protections efforts for shared watersheds (e.g., Chenery and Hobbs Brooks)	н
	Mill Creek	According to DEP's 2019 rock bag sampling efforts: Water quality standards are being met.	subwatershed with the most forested land cover at 77%. It also has the most protected forest at 19% within Falmouth	6 stream-road crossings with 2 (33%) being barriers	13% disturbed Riparian Zone	See recommendations for Casco Bay Frontal Drainage	н
	Norton Brook	According to DEP's Integrated Report: Water quality standards are being met.	64% forested cover with 3% protected forest	1 stream-road crossing within Falmouth, but do not become barriers for aquatic organism passage	12% disturbed Riparian Zone	See recommendations for Casco Bay Frontal Drainage	н
	Mussel Cove	According to DEP's Integrated Report: Water quality standards are NOT being met.	34% forested cover with 4% protected forest	No stream-road crossings	76% disturbed Riparian Zone	Gather hydraulics & hydrology (H&H) info/reports and/or conduct geomorphic assessments of watersheds draining to Mussel Cove	н
	Other Subwatersheds	Little to no water quality data exists for other subwatersheds	forested cover ranges from 14 to 57% in these other subwatersheds (with 2 to 36% protected forest)	9 stream-road crossings are located within Falmouth in this watershed, but 3 (33%) are considered barriers	53% to 100% of the Riparian Zones are disturbed in other watersheds	Gather H&H reports and/or conduct geomorphic assessments; and Consider addressing stream crossings (culverts), like Scitterygusset	н

BASIN	Subwatershed		Health	Metric		Need	Priority
or Major Watershed		BIOLOGICAL CONDITION + WATER QUALITY	HYDROLOGY	GEOMORPHOLOGY + HABITAT	LANDSCAPE		
		The ultimate indicator of watershed health, as aquatic organisms and communities reflect the cumulative conditions of all other watershed components and processes. The chemical and physical characteristics of water include concentrations of pollutants (like salt) and nutrients, as well as physical parameters (like pH and temperature).	Watershed hydrology is driven by climatic processes, land use, surface characteristics, such as topography and geology. Robust + mature forested cover in a watershed helps to maintain the hydrology and overall health of a watershed.	Stream channel, influenced by climatic processes and other disturbances, cause stream channels to become unbalanced. When the stream bank is unstable, sedimentation and deposition covers critical stream substrates providing habitat for aquatic organisms that determine the health of the waterbody.	The condition of the natural landscape influences aquatic habitats, cycles nutrients, retains sediment, and allows infiltration. The Riparian Zone (RZ), 75 to 250 feet from river's edge, is critical to maintain in order to maintain the landscape condition.	Update data + analysis annually to monitor changes over time in each watershed Share data + process with abutting municipalities to amplify positive impacts	H = High M = Moderate L = Low
PRESUMPSCOT RIVER		Data is plentiful within the main stem of the river because of the volunteer river monitoring program. However, there is little to no data in the smaller tributaries, such as Meader and Minnow Brooks	relatively densely forested at 64% watershed wide with 5% protected forest within Falmouth	18 stream-road crossings with 8 of them occurring within Falmouth	11% disturbed Riparian Zone	This waterbody is in flux (stabilizing from dam removal activity and a 2020 landslide) and is being studied carefully by DEP. Consider organizing a Presumpscot River Leadership Team.	м
	Meader Brook	Little to no water quality data available	81% forested cover with only 1% protected forest	5 of 7 stream-road crossings occurring in Falmouth with 4 becoming barriers	4% disturbed Riparian Zone	Consider addressing stream-road crossings (see Appendix F.4) in Capital Improvement Plan and/or when grant funds are available	M-H
	Minnow Brook	Little to no water quality data available	78% forested cover with only 4% protected forest	Minnow Brook has 1 stream-road crossing becoming a barrier, but none occur in Falmouth	11% disturbed Riparian Zone	See recommendations for Presumpscot River Basin	L
	Other Subwatersheds	Little to no water quality data available for other Presumpscot River subwatersheds	forested cover ranges from 38% to 78% in these subwatersheds with 1% to 11% protected forest	No other stream-road crossings are located within Falmouth in this watershed, but there are 10+ in upstream locations outside of Falmouth	62% to 91% of the Riparian Zones are disturbed	Begin outreach to upstream communities to address/discuss issues not occurring in Falmouth	L

TABLE A.2 – Relative health and prioritization for Presumpscot River Drainage Basin and subwatersheds

BASIN	Subwatershed		Health	n Metric		Need	Priority
or Major Watershed		BIOLOGICAL CONDITION + WATER QUALITY	HYDROLOGY	GEOMORPHOLOGY + HABITAT	LANDSCAPE		
		The ultimate indicator of watershed health, as	Watershed hydrology is driven by climatic	Stream channel, influenced by climatic	The condition of the natural landscape	Update data + analysis annually to monitor	H = High
		aquatic organisms and communities reflect the	processes, land use, surface characteristics,	processes and other disturbances, cause stream	influences aquatic habitats, cycles nutrients,	changes over time in each watershed	M = Moderate
		cumulative conditions of all other watershed	such as topography and geology. Robust +	channels to become unbalanced. When the	retains sediment, and allows infiltration. The		L = Low
		components and processes. The chemical and	mature forested cover in a watershed helps to	stream bank is unstable, sedimentation and	Riparian Zone (RZ), 75 to 250 feet from river's	Share data + process with abutting	
		physical characteristics of water include	maintain the hydrology and overall health of a	deposition covers critical stream substrates	edge, is critical to maintain in order to maintain	municipalities to amplify positive impacts	
		concentrations of pollutants (like salt) and	watershed.	providing habitat for aquatic organisms that	the landscape condition.		
		nutrients, as well as physical parameters (like		determine the health of the waterbody.			
		pH and temperature).					
		Data is relatively sparse in the	relatively forested at 66% watershed wide.	30 stream-road crossings with 12 of them	13% disturbed Riparian Zone	Lowest priority of 3 basins in Falmouth based on	L
PISCATAC	LUA KIVEK	subwatersheds, but DEP has augmented	Protected forest in this basin is 11%	occurring within Falmouth; 5 out of 12 in		watershed calculations + projected	
		data in Hobbs Brook watershed		Falmouth are considered barriers		development using NELF Explorer Tool	
http://www.totre.go/Mapleotechronit	Hobbs Brook	According to DEP's 2019 field sampling efforts:	66% forested cover. 15% protected forest land	6 stream-road crossings with 1 in Falmouth	6% disturbed Riparian Zone	Begin outreach to Cumberland (who shares the	Н
		Not meeting water quality standards		that is not a barrier		watershed) to coordinate efforts in the	
		See Total Maximum Daily Load report in				watershed, including a WMP to be developed	
		hyperlink					
	East Branch	Meeting Class B standards but threats of E. Coli	53% forested cover. 7% protected forest	13 stream-road crossings with 3 being	12% disturbed Riparian Zone	Address recommendations from the 2008	L
Piscataqua River		are documented by DEP		barriers in Falmouth		Watershed Survey, including remaining NPS	
						sites.	
	Other	Little to no water quality data exists for other	forested cover ranges from 29% to 100% in the	No other stream-road crossings are located	86% to 99% of the Riparian Zone are disturbed	Consider an overlay district or strengthening	L
	Cubwatarshada	subwatersheds	subwatersheds with 4-84% protected forest	within Falmouth in this watershed, but there		ordinances that	
	Subwatersneus			are 40+ in upstream locations outside of			
				Falmouth			

TABLE A.3 – Relative health and prioritization for Piscataqua River Drainage Basin and subwatersheds

SECTION I – FOREWORD

Through grant funding, this document was developed in collaboration with the Greater Portland Council of Government (GPCOG), the Town of Falmouth (Town), Maine Department of Environmental Protection's Assessment Unit (DEP), and a watershed management consultant, Robyn Saunders, Principal/Owner of ATTAINING: sustainable solutions LLC (ATTAINING).

Grant funding was made possible through the Maine Coastal Program (MCP), the Department of Agriculture, Conservation, and Forestry (DACF), the National Oceanic and Atmospheric Administration (NOAA). Additional support was provided by Harvard Forest, which is Harvard University's long-term ecological research site. Specifically, Lucy Lee (Harvard Forest Research Assistant) contributed hours of time to harness the power of the New England Landscape Futures (NELF) Explorer Tool for this project.

Background

The Town of Falmouth has a long-standing history of land and water conservation and a common-sense approach to land use management. In some instances, Falmouth's efforts provided technical guidance documents for landowners and developers long before Maine Department of Environmental Protection (DEP) would establish statewide standards for land use management and certain best management practices (BMPs).

For example, prior to 1995, DEP's stormwater regulation offered minimal performance standards for runoff, but offered some more specific protections for runoff to lakes. **Meanwhile, in Falmouth, more comprehensive protections than the statewide standards were already contemplated**:

- In 1991, the Falmouth Conservation Commission prepared an "Illustrated Guide to Stream Protection Districts" – a manual to "maintain Falmouth's rural character, high quality of life and its efficient and economical Town government through the protection of natural resources" in concert with the authority provided in the Open Space Plan and Town Code.
- In 1993, a town-wide watershed management plan was commissioned by the Falmouth Conservation Commission with additional funding from Casco Bay Estuary Partnership. The Falmouth Planning Department and a land use consultant were part of a team that prepared the plan that:
 - Defined the Problem and Study Area (Part I);
 - Recommended Improvement for Typical Best Management Practices (Part II); and
 - Provided Technical Information on Permitting and Natural Drainage Features (Part III).

In the 2000s, Falmouth continued its proactive leadership in protecting natural resources, valuing open spaces and place making, and thoughtfully managing land use within their municipal boundaries. Examples of Falmouth's continued work that pre-dates this project includes the following:

- In 2013, a Stormwater Management Plan for the Route One South Commercial District was prepared to align policy, zoning, and the required infrastructure to guide public and private investment through a tax increment finance (TIF). A stormwater and wetlands review of Depot Road was also completed in 2013. These efforts, in combination with a Comprehensive Plan update in 2013, have resulted in significant investment in stormwater management by the Town.
- In 2018, the Highland Lake Leadership Team (HLLT) was formed in partnership with the Town of Windham, Town of Falmouth, the Highland Lake Association, and other stakeholders. The team was created to improve the overall health of Highland Lake. Recently, the increased activity of HLLT is due to the bacteria bloom Highland Lake is experiencing as well as overall degraded water quality.
- In 2018, a grant application for the work to prepare this Strategic Watershed Plan was submitted to DACF's Coastal Communities Grant program. In January 2019, the grant was awarded, and the project team began collecting and analyzing available data.
 - Existing data was compiled by the Project Team (see STEP 2: Team Identification and STEP 3: Data Request and Collection); and
 - Additional data was collected by DEP (See **STEP 4: Data Review and Analysis**).
- In March 2020, Falmouth Town Council adopted a Pesticide and Fertilizer Ordinance that requires professional applicators to register with the Town and submit an annual usage report, it also prohibits the use of fertilizers during the winter. The Ordinance is designed to promote public health and the health of our waterways. This project is another step in that proactive legacy of considering natural resources protection as part of land use management in the Town of Falmouth.

In fact, this Strategic Watershed Plan is intended to provide a "road map" for prioritizing finite municipal resources, both financial and technical, to protect watersheds (and all natural resources) in a clear, science-based approach using:

- Publicly-available data both analytical sampling data and GIS data; and
- Publicly-available tools to make informed decisions to direct finite resources.

Problem Statements

Municipalities have numerous and wide-ranging interests competing for finite municipal resources. Falmouth is in a unique position: residents resoundingly agree that water quality protection is an

important priority for the Town to address. Subsequently, the challenge is to direct their resources in the most effective and efficient manner possible, to optimize the net positive impact.

Many coastal communities in Southern Maine are faced with the reality of restoring multiple impaired or threatened watershed within their respective communities. Falmouth is no exception.

85% of polled residents consider water quality protection important

(2013 Comprehensive Plan Survey Results)

According to <u>DEP's Integrated Water Quality Report</u>, there are two impaired waters in Falmouth:

- Mussel Cove, an impaired marine water; and
- Hobbs Brook, an impaired stream.

Based on communications with DEP during this project, Webes Creek and Norton Brook may be added to the impaired streams list¹, when the DEP updates this biennial report based on 2018 and/or 2020 data. According to Maine statute: A waterbody is considered impaired if it fails to meet water quality standards (WQS) for one or more pollutants.

The impairments and threats for all watersheds within Falmouth are summarized in a Watershed Inventory completed by Cumberland County Soil and Water Conservation District (CCSWCD) in 2018, updated in 2020, and included as **Appendix A – Watershed Inventory and Map**. Although this inventory is fairly technical in nature, it provides quick reference for watersheds in Falmouth and a starting point for this project to identify potential impairments, threats, and restoration efforts in progress.

Balancing the restoration burden for impaired waters with the need to proactively protect healthy watersheds leaves Falmouth and many other coastal municipalities wondering how to prioritize their resources and efforts effectively. Meanwhile, development pressures continue to rise. With limited regulatory support from the State level to guide development review policy and standards in impaired, threatened, or even healthy watersheds, municipalities like Falmouth are left to consider more effective solutions and creative strategies to improve or sustain water quality in order to welcome ongoing development that is essential to our local and regional economy.

¹ Relayed in email correspondence with DEP's Assessment Unit on 6/8/2021.

Purpose

The purpose of this project is twofold:

- 1. To assist Falmouth in prioritizing watershed health municipal-wide by providing a framework of watershed health parameters to assess the health and needs of each watershed, which will inform decision makers (and others: developers, municipal staff, general public) in directing financial and technical resources proactively; and
- 2. To provide a guide for other upstream and coastal communities to follow and/or improve upon the process in hopes of aggregating the positive effects to improve water quality in Casco Bay and beyond.

Proactive prioritization of watersheds using the assessment framework, known as the <u>Proposed</u> <u>Watershed Health Metrics</u>, is the first task in a multi-phase approach. This strategic plan for proactive watershed management is:

- The Town of Falmouth's roadmap for assessing and prioritizing the needs of each watershed, relative to each watershed's characteristics and data available; and
- A playbook (or "How to Guide" see Section II) for other municipalities within GPCOG's region (and beyond) to prioritize the needs of their municipality's competing watersheds in a similar fashion, to maximize and aggregate the protective efforts to protect the health of Casco Bay².

Specifically, the project team has worked collaboratively to:

- Evaluate existing data for each watershed within the Town of Falmouth's municipal boundaries (see **APPENDIX B DATA: Reports and GIS**);
- Establish metrics to serve as a framework for assessing watershed health using existing USEPA tools, resources, and scientific principles to serve as the basis for prioritizing the watersheds within the Town of Falmouth;
- Provide recommendations to assist in prioritizing Falmouth's finite resources to address the needs and protect the health of watersheds (See **SECTION IV RECOMMENDATIONS**); and
- Prepare this Strategic Plan and case study for Falmouth and a reasonable approach for other municipalities to consider in (and around) Casco Bay.

IMPORTANT NOTE: Because the science of watershed management is very different for lakes, than it is for rivers and streams, the Proposed Watershed Health Metrics apply to rivers and streams only. The metrics for lakes in Falmouth (e.g., Highland Lake) may be very different. There are active Lake Association efforts in lake watersheds in Falmouth that should be consulted.

² As seen in Section IV – RECOMMENDATIONS, the Town of Falmouth is interested in a multi-phase approach to implement this Strategic Plan, which will include developing updated stormwater ordinances for: 1) commercial, rural, and suburban zoning; and 2) promoting regionally-consistent practices for land use management to benefit receiving waters, Casco Bay, and beyond. Pursuit of another grant award is expected to continue this multi-phase approach.

Introduction

This is a first-of-its kind exploratory project, designed to provide a tool for prioritizing the needs of competing water resources within one municipality's jurisdiction. Falmouth is ripe for this project due to its:

- History of proactively managing natural resources and land use practices;
- Downstream location from all municipalities sharing watersheds (i.e., coastal convergence of tributaries at the mouth of the Presumpscot River);
- Conservation focus and alignment of project goals within the Comprehensive Plan; and
- Position and willingness in regional collaborative efforts to benefit Casco Bay.

As far as we know, no other municipality in Maine has attempted to assess all watersheds at the same time. To inspire other municipalities to consider this same prioritization, finding a widely-accepted, science-based approach was paramount. For this reason, USEPA was consulted to identify models, existing methods, and readily-available, science-based tools to assess, compare, and produce a defensible prioritization for the Town of Falmouth.



Analysis and Recommendations

After developing the framework and compiling available data for watersheds in Falmouth, comparative analysis allowed prioritization to take place. A summary and prioritization of Falmouth watersheds are provided in **SECTION III – RESULTS.**

SECTION IV – RECOMMENDATIONS includes several ways for improving upon this preliminary baseline assessment. Subsequently, next steps for more communities to implement this toolkit should also include (but not be limited to):

- Convening with upstream (and other interested) municipalities to review this framework and results of defining and analyzing Proposed Watershed Health Metrics. Watersheds cross municipal boundaries, therefore, collaborating with upstream communities is critical to taking action within most watersheds. There are over 400 watershed health indicators that have been compiled and calculated by USEPA for larger rivers and streams. Only a handful of those most relevant are used in this preliminary framework. A more regional approach may identify additional or alternate indicators to be used to assess watershed health and guide regional resources available.
- Identifying an anchor organization³ to lead a regional review and revision of this framework and Proposed Watershed Metrics. The lead organization or municipality must have the technical skills and capacity to:
 - Understand, communicate, and analyze multiple complex watershed data sets, as well as land use management policies on the local, State, and Federal level;
 - Utilize GIS geodatabases to visually present multiple complex data sets, as well as provide watershed calculations in a land use context; and
 - Communicate with a wide range of stakeholders, regulators, decision makers, etc.
- Applying adaptive management principles to future iterations of this process to update outputs (i.e., priorities). Watershed management is a complex and dynamic effort with many unknowns of impacts from development, natural processes, and other factors. Adaptive management is a process where decisions are made on available information with an iterative approach of "learning by doing and adapting as you learn."

A comprehensive list of **RECOMMENDATIONS** considered next steps are in **SECTION IV**. Adaptive management (i.e., iterative process to maximize outcomes) is strongly recommended with all next steps and recommendations.

SECTION II – "HOW TO GUIDE" for Assessing Watersheds Simultaneously

The step-by-step process below provides the methodology for this proactive watershed management project, including some cautions and shortcuts for other communities to consider as they assess multiple watersheds within their jurisdiction.

³ The "anchor organization" may be a Department or Commission within the Town of Falmouth, or another municipality or municipalities, entity or organization that has a regional mission, like GPCOG, Maine Municipal Association (MMA), Cumberland County Government, CCSWCD, etc.

STEP #1: Scope of Work

Available literature differs with respect to the order of tasks associated with watershed management planning. Some experts believe that a clear scope of work should be the first step, while other experts, like USEPA, recommend selecting your project team (or building relationships) first, as part of a traditional watershed-based management plan to restore watershed health. However, this project (and specifically this Strategic Plan) is <u>not</u> meant to be an <u>EPA-approved 9-Element</u> <u>Watershed-based Management Plan⁴ that provides a blueprint for a specific watershed's restoration activities.</u>

Instead, this project and Strategic Plan are meant to provide the Town of Falmouth (and other coastal communities) with a comparison of all watersheds within municipal boundaries using a useful framework that is based on existing, science-based tools and resources developed by USEPA and Harvard Forest.

- Specifically, this project:
 - Evaluates the available data and provides a framework for prioritizing the Town's resources to address the needs of the watersheds within Falmouth (excluding the lake watersheds, like Highland Lake); and
 - Provides step-by-step procedures by which this project was completed, as a means of providing a guide for other municipalities within our region to do the same, potentially multiplying the positive impacts to Casco Bay.
- Specifically, this Strategic Plan:
 - Provides references and resources utilized to develop the framework of Proposed Watershed Health Metrics and watershed calculations; and
 - Provides tiered recommendations for the Town of Falmouth to consider:
 - 1. regionally in conjunction with adjoining municipalities;
 - 2. municipal-wide as part of a future ordinance and/or Comp Plan review; and
 - 3. on a watershed-specific basis.

⁴ <u>https://www.epa.gov/nps/handbook-developing-watershed-plans-restore-and-protect-our-waters</u>

Subsequently, **a clear scope of work was the first step completed** during the grant application process for this project. The scope was further refined in successive grant submittals, and eventually refined in the grant agreement with DACF and GPCOG, which is included in **APPENDIX C**. At that time, significant input was solicited and received from DEP's Assessment Unit to ensure that the scope was mutually agreeable among funders (NOAA and DACF), regulators (DEP), and the entire Project Team – including Town staff.

IMPORTANT NOTE: The Scope of Work conducted as part of this project was one of three tasks originally included in the MCP grant application (in **APPENDIX C**) developed in coordination with the Town of Falmouth and GPCOG in 2017. In 2018, the grant was revised and resubmitted to MCP for consideration as a regional effort. The three tasks included in Falmouth's multi-phase scope of work for proactive watershed management included the following:

- TASK 1. **Stormwater Ordinance Review and Revision.** Draft model ordinance language and other mechanisms (e.g., overlay district, zoning changes, etc.) were contemplated to address the effects of land use activity (i.e., rural, commercial, residential) and storm events on the health of each receiving water.
- TASK 2. **BMP Guide and Strategy.** A plain language guide for both public (municipal staff and decision makers) and private (developers and landowners) audiences to use as a reference guide to address watershed needs on both public and private property.
- TASK 3. Watershed Planning. An evaluation of existing watershed data sets would be used to develop a list of watershed health metrics using science-based principles to serve as a baseline for future planning efforts and prioritizing resources to address watershed needs.

Only Task 3 (above) was approved and authorized by the MCP grant awarded in 2019. The remaining two tasks are considered RECOMMENDATIONS in **Section IV** of this document.

"If you fail to plan, you are planning to fail."

~ Benjamin Franklin, American history figure, statesman, author, inventor, diplomat

STEP #2: Team Identification

Project Team members and their respective role(s) must be clearly defined and communicated early in the process of prioritizing watershed needs.

- Town staff = provide connection to policy and report to decision makers
- GPCOG = land use planning experts and GIS practitioners and grantee (fiscal agent)
- ATTAINING = watershed management expert and data analysis and strategic plan development

Additional team members play important roles in the process, such as these listed below. Other municipalities may have other partners to be effectively included into their Project Team⁵.

- DEP = regulatory and water quality/health experts
- Conservation Commission = local input, buy-in/support, etc.
- Other consultants/experts (e.g., GIS experts)

Input from other municipal staff (planners, engineers, stormwater coordinators, etc.) is also a key component to developing and implementing a regionally-consistent approach to protect Casco Bay. The framework for the Proposed Watershed Health Metrics was summarized and presented at Maine Water Utility Association's (MWUA) 95th Annual Conference on February 3, 2021, at the suggestion of the Maine Water Environment Association's Stormwater Committee.



~Helen Keller, American author and educator

⁵ Additional team members may include (but not be limited to): other State and Federal partners/regulators (i.e., USEPA, USFS, or IFW), other volunteer/conservation groups (i.e., Trout Unlimited, "Friends of..." groups), SWCDs, etc.

STEP #3: Data Request and Collection

At the beginning of the project, requests for existing/available data were sent throughout the entire Project Team, which included:

- Water quality data from DEP's Assessment Unit, Maine Healthy Beaches Program, wastewater treatment plant, Friends of Casco Bay, and other partners conducting sampling and water quality monitoring
- Watershed reports from conservation partners and municipal staff
- GIS information and maps from municipal staff, consultants, contractors, State and Federal agencies
- Land use management data from Planning
- Comprehensive Plan information
- Information on toxics (e.g., pesticide/herbicide usage, salt storage/applications, etc.)
- And more

Existing Data. A significant amount of existing data was compiled, reviewed, summarized, analyzed, and divided into two distinct groups:

- Water quality and Watershed Reports (see Appendix B.1)
- GIS Layers and Maps (see Appendix B.2)

The aggregate data for each watershed was compiled in **Appendix B.3 – Watershed Summary**.

New Data. DEP's Assessment Unit conducts water quality monitoring and watershed assessments on a rotating schedule. Additional data in Falmouth was collected by DEP in the 2018 and 2019 monitoring seasons, which was provided to this project as it was (and continues to be) made available. With the exception of biomonitoring data (that takes 18-24 months to receive results), DEP's data and summary reports were included in this project.



"The goal is to turn data into information, and information into insight."

~ Carly Fiorina, former CEO of Hewlett-Packard

STEP #4: Data Review and Analysis

Tackling the "mountain" (ample amount) or "desert" (sparse amount) of data can seem like a daunting task, as was the case on this project – especially considering this was a first-of-its kind, exploratory project. Some of the challenges and solutions encountered during this phase of the project are offered below.

The DATA REVIEW and ANALYSIS portion of the project was the most time-consuming effort. Several tips are offered to help:

- Inform upstream (and interested) municipalities who conduct a similar watershed assessment.
- Refine the iterative process and feedback loop in Falmouth and/or as part of a larger regional effort including neighboring municipalities that share a watershed, like Hobbs Brook with Cumberland or Casco Bay with numerous other municipalities.

TIP #1: Develop a seamless watershed layer

A mosaic layer of GIS shapefiles for each (sub)watershed should cover the municipality from boundary to boundary, as seen in the watershed map below created by GPCOG.



TIP #2: Work out the bugs ahead of time

- Nomenclature.
 - Important. DEP and other organizations may have a different name (or spelling) for a specific watershed than the town or local citizens use for the respective waterbody; therefore, an identifying attribute may be needed to link the data together for a single data point, or a subwatershed.
 - **Example.** Several subwatersheds in the map above were listed as nested tributaries to a larger watershed, which had to be clarified to ensure that the information gathered is assigned to the correct watershed.
- Watershed boundaries.
 - Important. Carefully consider the source of the watershed boundary (shapefiles, GIS, etc.), as well as the date of the data, especially since DEP has been ground-truthing watersheds one-at-atime throughout the State. As a result, DEP has been refining the national data set for watershed boundaries and investigating the perimeter complexities (around watershed boundaries) where drainage is complicated by underground conduits and the built environment.
 - **Example.** Of the 207 segments received in shapefiles, 140 of them had no name (or watershed) assigned as an attribute to the stream segment.
- Data consistency.
 - Important. This is known as quality control in the technical world, but the need for data consistency goes beyond the technical realm. For example, the naming of watersheds (mentioned above in *Nomenclature*) is clearly a non-technical issue to sort out as data is reviewed, analyzed, and incorporated into the data set.

TIP #3: Decide what is relevant data

- Important. Most partners are eager to respond to the request for data. The hardest part may be deciding how to use the data within your community. A simple example is tidal influence, which may be an important factor in coastal watersheds, like Falmouth, but may not be relevant data in neighboring municipalities and watersheds, like Westbrook and Windham.
- **Example.** Hobbs Brook is a small, shared watershed with Cumberland, another coastal community. However, Hobbs Brook is not a coastal watershed so tidal influence is not relevant. An ample data set was collected for this project. The following guidance for deciding on relevant data was taken from USEPA's watershed academy⁶:
 - **Prioritize challenges and opportunities.** *"Unfortunately, there are usually not enough funds or time to address all potential watershed management needs. Priorities must be set that target efforts to the most critical problems/opportunities."*
 - **Relationship to watershed goals and valued features.** "Ask yourselves if the problem may alter the watershed's character and condition, or if it poses a risk to some part of the watershed."
 - Ability to bring about change. "Choose your battles."
 - **Time between actions and results.** *"...changes near a stream bank may quickly affect the quality of the stream's water and the surrounding habitats."*
 - Willlingness to change. "Ask yourselves if the reasons are strong enough to motivate those who may need to change, and whether any incentives or regulatory tools may be appropriate."
 - Cost benefit ratio.
 - **Determine critical areas**. "Vegetated areas next to a stream or lake...serve as important habitat, help control flooding, and can be critical sites for protection efforts."

⁶ <u>https://cfpub.epa.gov/watertrain/moduleFrame.cfm?parent_object_id=879</u>

STEP #5: Preliminary Watershed Health Metrics

In early stages of the project, a preliminary list of watershed health metrics was compiled, based on past watershed planning projects in Maine. These science-based metrics are generally used to develop <u>traditional watershed management plans</u> for restoring impaired waterbodies.

Because this project is meant to provide a framework for assessing all watersheds simultaneously to proactively prioritize resources (both technical and financial), the objective was to find metrics that were available for all watersheds to facilitate comparative analysis and prioritization among the watersheds of Falmouth (see USEPA Tool #3).

PROPOSED METRIC	RATIONALE
Size	Land acreage, length of stream
% impervious area	• Direct correlation to stream health (CWP)
• % canopy	Shoreland zone especially
• % within Falmouth	Shared restoration costs/responsibility
Land use	Zoning implications
% open space	Include public land and undeveloped lots
% rural, residential, commercial	 Include special designations
Other special categories	 Include conservation easements,
Land cover	agriculture and other factors
Planning Demographics	
Population density	Correlation to bacterial presence
 Designated growth areas 	Correlation to additional development
Urbanized area	Correlation to regulatory vulnerabilities
Status	Impaired, threatened, unassessed
 # and location of sampling points 	Identify monitoring agent
 Exceedances or excursions 	Provide summary
 # and location of culvert/AOP issues 	Use Stream Habitat Viewer
Hydrologic considerations	
 % (or acreage of) wetlands 	 Correlation to dissolved oxygen (DO)
 Impoundments 	Correlation to DO and temperature
Accessible floodplains	Correlation with stream health
 Shoreland zone designation 	Correlation with stream health
Stormwater infrastructure	Correlation with point source discharges
Other Considerations	
Presence of brook trout	Correlation to stream health
Sewered vs. septic systems	Correlation with nutrients
WWTP and MS4 outfalls	Correlation with nutrients and toxics
 Salt storage and application 	Correlation with toxics
Pesticide and fertilizer	Correlation with nutrients and toxics
storage/application	

TABLE 1 – Preliminary Watershed Health Metrics Contemplated

The preliminary list, included in **TABLE 1**, was dwarfed by the list of 435 watershed health indicators defined in <u>USEPA's Watershed Index Online</u>⁷ – an existing USEPA tool developed nationally to prioritize watersheds in a meaningful way with limited data and resources.

Because the purpose of this project is to prioritize watersheds within Falmouth's municipal boundaries and to inspire other municipalities to do the same, **the need for a widely-accepted, science-based regional approach was paramount.** Therefore, USEPA was consulted to identify models, existing methods and readily-available, science-based tools to regionally assess and compare watersheds. By using proven means and methods already in practice throughout the country, the hope is to use and present defensible method(s) with a successful track record to ensure buy-in from:

- **Municipal staff and officials** to ensure long-term viability of the project in Falmouth. This project is meant to be an iterative process and feedback loop since the Town and each watershed is a dynamic landscape, changing slowly (yet quickly aggregating) over time.
- **Other municipalities**, especially those that share watersheds with the Town of Falmouth, to adopt a similar approach for prioritizing watersheds (and the needed resources) within their jurisdiction.
- **Regional partners, including GPCOG and DEP**, that hold pivotal roles in the acceptance, adoption, and propagation of a successful regional effort to direct regional resources (both financial and technical) in a meaningful way to the overall benefit to Casco Bay's health and regional prosperity.

The USEPA tools used to guide the development of preliminary watershed health metrics, thresholds, and framework include:

- USEPA TOOL #1 How's My Waterway
 - o https://mywaterway.epa.gov/
- USEPA TOOL #2 Integrated Assessment of Healthy Watersheds

 https://www.epa.gov/hwp/integrated-assessment-healthy-watersheds
- USEPA TOOL #3 Watershed Index Online
 - o https://www.epa.gov/waterdata/watershed-index-online

To assess the vulnerability and overarching priority of each watershed, a fourth tool was used.

- TOOL #4 New England Landscape Futures (NELF) Explorer
 - o https://www.newenglandlandscapes.org/

Each tool was used in concert with another to develop a widely-accepted, science-based, reproduceable framework (to be used iteratively) as the landscape, policies, and priorities evolve within the Town of Falmouth, and also regionally across watershed boundaries. Specific information on each tool is included in **APPENDIX D – USEPA TOOLS** and **APPENDIX E – NELF EXPLORER TOOL**.

⁷ USEPA's Watershed Index Online (WSIO) <u>https://www.epa.gov/wsio</u> provides tools and data for comparing watershed characteristics to assist resource managers with evaluating, comparing, and prioritizing watershed for decisions and other use-defined purposes.

USEPA Tool #1 - How's My Waterway

This tool pulls data from multiple databases across Federal, State and local agencies to provide the general public with information about the condition of local waterways. Although the impetus for this USEPA tool is tragically related to drinking water disasters like <u>Flint, MI</u> and <u>Newark, NJ</u>, the outcome is

an easily accessible and readily understandable on-line resource with important information for every **major watershed** throughout the United States. A similar effort undertaken by USFS is the <u>Forest to Faucets</u> story map and map viewer, which uses GIS to determine the relative importance of small watersheds relative to drinking water source protection.

Outcomes from USEPA Tool #1. Although both the USFS and USEPA water quality tools have very limited data to compare the smallest watersheds within Falmouth's

What is a major watershed?

The United States Geological Survey (USGS) uses a hierarchical system of nesting hydrologic units at various scales across the country. A code, depending on the region or basin, is assigned on a nationwide scale and used by consistently across all Federal agencies.

- FMI on hydrologic unit codes (HUCs), see Appendix C.2 or <u>USGS's website</u>
- A major watershed in this Strategic Plan refers to HUC12 watersheds, like the Presumpscot and Piscataqua Rivers, and the Casco Bay Frontal Drainage Basins.

municipal boundaries, the tool(s) supported the idea of grouping watersheds into **major watersheds**, or basins. Specifically, the basins in Falmouth are as follows:

BASIN	DESCRIPTION
Casco Bay Frontal Drainage Basin	Includes all the subwatersheds that drain to Mussel Cove and intertidal waters including: • Scitterygussett Creek • Webes Creek • Norton Brook • Chenery Brook
Presumpscot River Basin	Includes all subwatersheds that drain to the Presumpscot River, including: Meader Brook Minnow Brook
Piscataqua River Basin	Includes all subwatersheds that drain to the Piscataqua River, including: Hobbs Brook East Branch of Piscataqua

TABLE 2 – Major Watersheds (or Basins) within the Town of Falmouth

IMPORTANT NOTE: Because the science of watershed management is very different for lakes, than it is for rivers and streams, the grouping of watersheds into basins is only applied to rivers and streams for this project. Highland Lake drains into the Presumpscot River Basin. The very small portion of the Forest Lake watershed (located in the northwest corner of Falmouth) drains into the Piscataqua River basin.

As previously mentioned, there is only limited water quality data for some of the basins, and subsequently for watersheds within the Town of Falmouth. This is a common issue in most parts of Maine and throughout the United States. To address the inequality in available water quality data, another USEPA Tool is needed to provide a framework where data gaps may exist.

USEPA Tool #2 – Integrated Assessment of Healthy Watersheds

This tool provides an existing conceptual framework for assessing rapidly changing watersheds using relative ecological indices. Specifically, this tool offers six attributes for watershed health that have been used regionally across the United States to assess the relative differences among watersheds rather than labeling watersheds as unhealthy. **Multimetric indices allow resources to be prioritized based on relative health, which mirrors the purpose and intent of this regional watershed project.**

FIGURE 1 – USEPA's Six Ecological Attributes for Watershed Health



Outcomes from USEPA Tool #2. USEPA offers several examples of local customization of this sixattribute framework allowing regional resources to be prioritized within dynamic and diverse landscapes (e.g., CA, WI, AL, OR, TN) and regional efforts as nearby as Taunton River in MA.

- <u>Metrics can be combined</u>. In AL, Habitat Condition and Geomorphology were combined due to local geology/geography and stakeholder priorities. These two attributes are combined in the proposed framework of watershed health metrics proposed in **APPENDIX F**.
- <u>Locally relevant metrics can be added</u>. In CA where a vast landscape includes multiple climatological zones (i.e., arid regions in southern CA to rainy winters in north CA) and numerous vulnerability factors (i.e., earthquakes and drought), an index for Natural Disturbances was added to the State's watershed health metrics. No additional metrics were proposed; however, the amount of land served by public sewer is contemplated.

The other concept that this USEPA tool provides is a <u>framework for assessing the vulnerability</u> of a watershed, which USEPA defines as "*watershed condition changes over time due to natural processes and anthropogenic influences*", such as population increases and climate change. Based on USEPA's definition of vulnerability as a function of three factors: (1) wildfire; (2) water use; and (3) land use change, **the primary vulnerability factor in Falmouth (like the rest of Southern Maine) is land use change.**

- **Tool #4** provides a model for projecting watershed vulnerability over time in Falmouth, which aids in the prioritization of watersheds and the subsequent allocation of resources.
- **USEPA Tool #3** provides insight into existing vulnerability data for major watersheds in Falmouth.

USEPA TOOL #3 – Watershed Index Online This WSIO tool is a national library for watershed indicator data for comparing watershed characteristics. The impetus for this national resource is to restore and maintain the integrity of the nation's waters with limited resources, including the declining funding by Congress of Section 319 of the Clean Water Act that funds most restoration and protection efforts in Maine. This tool is meant to answer some of the same questions that our proactive watershed health project poses:

- From a science-based perspective, why is this watershed a priority?
- From a collaborative standpoint, how can our collective resources be the most effective?
- From a regional perspective, where should our limited resources be focused?

FIGURE 2 – USEPA's Six Ecological Attributes

Easy Access to Hundreds of Watershed Datasets

Science-Based Information Helps Prioritize Limited Funds for Restoration Enhanced Communication with

Stakeholders

Tool that Helps

Federal, State

and Local

Community

Partners

Outcomes from USEPA Tool #3. By querying the WSIO database for **major watersheds** in Falmouth, quick ranking is possible using the 435 watershed health indicators. However, not all 435 indicators may apply to Falmouth or the regional study area.

- For example, the density of mining operations within the watershed may not be locally relevant for the purposes of this project, where it may be more relevant to watersheds in the Appalachian Mountain States where coal mining (instead of mineral mining in Maine) is more prevalent.
- Furthermore, some values in the data set require local ground-truthing, like impervious cover (IC or IA). For this reason, the watershed calculations by GPCOG provide a local check of the watershed-specific data once the relevant watershed health metrics are identified.

TABLE 3.A – WSIO DATA	MINING IMPERVIOUS AREA					
MAJOR WATERSHEDS IN FALMOUTH Source: WSIO (date depends on data set)	Mineral Mines	All Mines in WS	% IA in WS	IA within WS	% Land in HUC12	Area of HUC12 WS
DATE OF DATA SET	2016	2016	2016	2016	2016	
UNITS	#	#	%	Sq. Meters	%	Sq. Meters
Casco Bay Frontal Drainages	0	0	8.3	1,884,148	87	205,025,400
Presumpscot River – Lower	2	2	10.9	955,884	83	79,160,400
Piscataqua River	0	0	2.8	171,552	89	50,908,500
East Branch Piscataqua River	0	0	4.2	239,079	86	54,625,500

A local check of the WSIO data provides the ability to ground-truth the national data set for local conditions and considerations. For this project, it was important to parse out the portions of the major watersheds within the Town of Falmouth. For it is only within the Town's municipal boundaries that

their jurisdiction can be adopted and ultimately make a change within the watershed. Since watersheds do not follow municipal boundaries, analyzing the data on a regional level with an anchor organization (e.g., GPCOG, MMA, etc.) may help municipal leaders through this process of prioritizing resources within major watersheds and smaller subwatersheds, to amplify potential positive impacts to Casco Bay.

The watershed-specific calculations by GPCOG, along with the corresponding WSIO indicator values from the available data set, are included in **APPENDIX G**.

- GPCOG calculations were used to check the overarching WSIO data set.
- GPCOG calculations are considered far more accurate for small watersheds than the WSIO data. A portion of the watershed calculations are presented in the table below. See **SECTION III – RESULTS** for a more in-depth discussion of each WATERSHED HEALTH ATTRIBUTE for each watershed.

TABLE 3.B – WATERS	TABLE 3.B – WATERSHED CALCULATIONS						
MAJOR WATERSHEDS: "IN FALMOUTH ONLY" indicates the portion within the municipality	% IMPERVIOUS AREA (IA)	% SEWERED	MONITORING STATIONS	% FORESTED AREA	% FOREST PROTECTED	COMMENTS ON VULNERABILITY and WATERSHED HEALTH	
Casco Bay	11		7	49	8	VULNERABILITY FACTORS.	
	10	20	6	E2	10	Although these watersheds	
Scitterygussett Creek	14	20	0	46	10	equipped with public sewer	
Webes Creek	32	33	0	26	1	WATERSHED HEALTH.	
Chenery Brook	10	5	1	65	6	Water quality data (i.e.,	
Mill Creek	6	15	1	77	19	monitoring stations) is	
Norton Brook	10	36	3	64	3	augmented by DEP field sites	
Mussel Cove	9	20	0	34	4	providing insight into the	
Other Subwatersheds	8-15	9-40	2	14-57	2-36	biological condition. Maximizing forested areas should be a priority.	
Presumpscot River	13		28	45	2	VULNERABILITY FACTORS.	
IN FALMOUTH ONLY	8	5	8	64	5	%IA is approaching a sensitive	
Meader Brook	4	4	0	81	1	condition (i.e., 10) with limited	
Minnow Brook	3	2	0	78	4	public sewered areas.	
Other Subwatersheds	6-19	2-8	20	25-61	0-11	WATERSHED HEALTH. Same comments as above.	
Piscataqua River	4		14	63	11	VULNERABILITY FACTORS.	
IN FALMOUTH ONLY	4	3	9	66	17	Although these watersheds	
Hobbs Brook	2	2	3	66	26	are lowest in %IA, this basin	
Other Subwatersheds	3-5	0-7	3	29-74	0-84	lacks public sewer.	
East Branch Piscataqua River	5	12	3	53	11	<u>WATERSHED HEALTH</u> . Same comments as above.	

TOOL #4 – New England Landscape Futures (NELF) Explorer Tool

This tool uses recent development trends to predict impacts of future land use changes in New England. The NELF Explorer Tool also anticipates changes in policy and priority related to:

- Natural Resources Planning and Innovation ranging from high to low priority; and
- Socio-Economic Connectedness ranging from global growth to limited local connectedness.

More information, including a case study by Harvard Forest using the full breadth of the NELF Explorer Tool, is presented in **APPENDIX E**. This project focused solely on the tool's ability to predict land use changes in 10-year increments through 2060 based on land use trends across all five scenarios presented above. A <u>story map by Harvard Forest</u> on the benefits of ecosystem services clearly conveys the need for municipalities to prioritize preservation of natural resources.

By examining the rate of development within each watershed for all five scenarios, and making assumptions relating development predictions to the amount of future impervious cover, the vulnerability of each watershed becomes more apparent. The NELF Explorer outputs for the Town of Falmouth projected in the year 2060 are presented in **APPENDIX E**.

The land use map was then converted into impervious cover based on the projected land use cover by Harvard Forest. The images for each projected scenario in 2060 are included in **APPENDIX E.1**. The most vulnerable watersheds indicated, using a "stop light approach" (i.e., green = healthy; red = not healthy in 2060), are located in:

- Casco Bay Frontal Drainage Basin; and
- Lower Presumpscot River Basin.

These findings were verified using the USEPA's Preliminary Healthy Watershed Assessment (PHWA) Vulnerability Index included in the WSIO data set. The vulnerability index characterizes the vulnerability of aquatic ecosystems due to future alterations. The vulnerability is highest as it approaches 1.0; the Casco Bay Frontal Drainage Basin (0.594) is highest, slightly lower in the Presumpscot River Basin (0.525), and lowest in the Piscataqua River Basin (0.344-0.412).

TABLE 5 – PRIORITIZATION OF BASINS IN FALMOUTH					
BASIN OR MAJOR WATERSHED	RELATIVE	USEPA's Preliminary Healthy Watershed Assessment (PHWA) Vulnerability Index			
		SOURCE: WSIO			
Casco Bay Frontal Drainages	HIGH	0.594			
Presumpscot River	MODERATE	0.525			
Piscataqua River	LOW	0.344-0.412			

See **SECTION III – RESULTS** for a more in-depth discussion of each WATERSHED HEALTH ATTRIBUTE for each watershed.

STEP #6: Final Metrics and Feedback Loop

The watershed health metrics proposed are detailed in **APPENDIX F – WATERSHED HEALTH METRICS** and are summarized In Table 6.

TABLE 6 – PRO	POSED WATERSHED HEALTH METRICS	
WATERSHED HEALTH	USEPA DEFINITION and ICON	WATERSHED
METRIC		CALCULATION
A. BIOLOGICAL CONDITION and WATER QUALITY	Biological Condition Biological community diversity, composition, relative abundance, trophic structure, condition, and sensitive species. PO33 Water Quality Chemical and physical characteristics of water.	 # of Monitoring stations in the watershed # of Monitoring stations in the watershed not meeting water quality standards
B. HYDROLOGY CONDITION	Hydrology Hydrologic regime: Quantity and timing of flow or water level fluctuation. Highly dependent on the natural flow (disturbance) regime and hydrologic connectivity, including surface-ground water interactions.	 Forested Area (amount and % of cover) in the watershed Protected forests in the watershed
C. GEOMORPHOLOGY and HABITAT CONDITION	Geomorphology Stream channels with natural geomorphic dynamics. Habitat Aquatic, wetland, riparian, floodplain, lake, and shoreline habitat. Hydrologic connectivity.	 # of road crossings within the watershed # of stream barriers in watershed
D. LANDSCAPE CONDITION	Landscape Condition Patterns of natural land cover, natural disturbance regimes, lateral and longitudinal connectivity of the aquatic environment, and continuity of landscape processes.	 Riparian Zone in watershed, expressed as both undisturbed and disturbed %
E. ATTRIBUTES OF VULNERABILITY	Defined by USEPA as risk of: (1) Land Use Change (2) Water Usage – not applicable (3) Wildfire – not applicable	 Impervious area or cover (IA or IC), expressed as a % and projected into the future using NELF Explorer Tool

The relative watershed calculations for each watershed are included in **APPENDIX G**. These metrics and calculations are the basis for the RECOMMENDATIONS in **SECTION IV** of this Strategic Plan. However, it is strongly recommended that adaptive management be incorporated to allow for an iterative approach to choosing metrics to compare among the watersheds. This type of approach facilitates "learning by doing

and adapting as you learn" about the watersheds and the publicly available data sets for the metrics and relative watershed calculations. Specifically, it is recommended to:

- Update the watershed-specific values based on land use and landscape changes periodically
- Consider choosing different or additional watershed health metrics based on local or regional priorities and proposed policy changes
- Evaluate the available metrics to inform land use management policies and standards

A consistent and iterative feedback loop is recommended to promote input from stakeholders, community groups, municipal decision makers within and around Falmouth, and other relevant local and regional partners. Feedback is crucial to this project to ensure that this exploratory project:

- Provides appropriate guidance to:
 - The Town of Falmouth to assist in prioritizing the needs of each watershed and the necessary resources to protect each watershed;
 - Other municipalities that will use this approach to prioritize their own competing watershed needs within their municipal boundaries; and
 - Regional policy makers and agencies to understand the full breadth of natural resource management in our physical and economic landscape.
- Promotes buy-in, support, and participation from other municipalities and watershed stakeholders who will be instrumental in effectively protecting the health of each shared watershed and the natural resources that provide for a robust tax base and prosperous economy.

This framework for proactive watershed protection was introduced at the intermunicipal roundtable at the 95th Annual Meeting of the Maine Water Utilities Association (MWUA) on February 3, 2021. The watershed managers and water resource professionals in attendance and who viewed the presentation (via the zoom link or an encore presentation) were resoundingly receptive to the science-based methodology.

See **RECOMMENDATION #2** in **SECTION IV** for more information on the need for coordinated regional support by an anchor organization to continue this important process of proactively prioritizing watersheds and their aggregate natural resources using existing, publicly available data.

SECTION III – RESULTS

As previously mentioned in **SECTION II** and **TABLE 5**, the three basins (or major watersheds) within Falmouth are easily prioritized based on multiple factors, including USEPA's Vulnerability Index and Impervious Area (as a percentage of the watershed) calculated by GPCOG.

TABLE 7 – PRIORITIZATION OF BASINS IN FALMOUTH					
BASINS or MAJOR WATERSHED	RELATIVE PRIORITY	USEPA's PHWA Vulnerability Index	Current Impervious Area	Future Impervious Area	Watershed served by Public
IN FALMOUTH		SOURCE: WSIO		SOURCE: NELF	Sewer
Casco Bay Frontal Drainages	HIGH	0.594	11%	Up to 20%	20%
Presumpscot River	MODERATE	0.525	8%	Up to 15%	5%
Piscataqua River	LOW	0.344-0.412	4%	Up to 10%	3%

Watershed Health Metrics were used to evaluate and compare each smaller/nested subwatershed within the three basins in Falmouth.

The metrics for each basin's smaller watersheds are summarized in the **APPENDIX F.1** – Casco Bay Frontal Drainage and **APPENDIX F.2** – Presumpscot and Piscataqua River Basins and discussed below. Each of the four watershed health metrics and the results are discussed below.

FIGURE 1 – BIOLOGICAL CONDITION and WATER QUALITY	
WATERSHED HEALTH METRIC	PLAIN LANGUAGE SUMMARY
Biological Condition Biological community diversity, composition, relative abundance, trophic structure, condition, and sensitive species.	The ultimate indicator of watershed health, as aquatic organisms and communities reflect the cumulative conditions of all other watershed components and processes.
Chemical and physical characteristics of water.	The chemical and physical characteristics of water include concentrations of pollutants (like salt) and nutrients, as well as physical parameters (like pH and temperature).

A. BIOLOGICAL CONDITION and WATER QUALITY metrics are explained in FIGURE 1 above.

- Casco Bay Frontal Drainage data are most plentiful in Falmouth within this basin. In fact, DEP's Assessment Unit gathered a significant amount of data within these subwatersheds during this project in 2018 and 2019. DEP collected rock bag samples, which determine if water quality standards (WQS) are being met, from Chenery Brook, Mill Creek, and Hobbs Brook. Mill Creek was found to be meeting WQS (i.e., Class C), but the rock bag data reportedly indicates that Hobbs and Chenery Brooks are not meeting WQS.
- **Presumpscot River Basin** data are plentiful within the main stem of the river because of the volunteer river monitoring program. However, there is little to no data in the smaller tributaries, such as Meader and Minnow Brooks.
- **Piscataqua River Basin** data are relatively sparse in these subwatersheds.

FIGURE 2 – HYDROLOGY CONDITION

WATERSHED HEALTH METRIC

Hydrology Hydrologic regime: Quantity and timing of flow or water level fluctuation. Highly dependent on the natural flow (disturbance) regime and hydrologic connectivity, including surface-ground water interactions.

PLAIN LANGUAGE SUMMARY

Watershed hydrology is driven by climatic processes, land use, surface characteristics, such as topography and geology.

- B. HYDROLOGY CONDITION is dependent on natural flow regime, as explained in FIGURE 2 above. Forested cover is the surrogate metric used for this condition, which is calculated as a percentage of the watershed land cover. Protected forest is considered a "fail safe" for this condition; in other words, if all the available forests were developed, then the minimum amount of forested cover within the watershed may eventually become just the smaller % of protected forests.
 - Casco Bay Frontal Drainage is 52% forested in Falmouth with 10% protected forests.
 - Mill Creek is the subwatershed with the most forested land cover at 77%. It also has the most protected forest at 19% within Falmouth.

- Chenery Brook and Norton Brook have 65% and 64% forested cover, respectively, with 6% and 3% protected forest in each subwatershed.
- Scitterygusset Creek is 46% forested cover with 10% protected forest within Falmouth.
- Webes Creek is the subwatershed with the least amount of forested land cover at 26% with only 1% protected forest within Falmouth.
- **Presumpscot River Basin** is relatively densely forested at 64% watershed wide, but as high as 78% and 81% in Minnow Brook and Meader Brook, respectively.
- Piscataqua River Basin is also relatively forested at 66% watershed wide, and also 66% in Hobbs Brook and 53% in East Branch. Protected forest in this basin is 11% (or 17% of the watershed's land cover in Falmouth).
 - Hobbs Brook watershed has 15% protected forest land, but accounting for 26% of the watershed's land cover within Falmouth.
 - East Branch of the Piscataqua River watershed has 7% protected forest, but accounting for 11% of the watershed's land cover within Falmouth.

These watershed metrics further support the need to:

- <u>Prioritize the BASINS as follows</u>: Casco Bay Frontal Drainage Basin continues to be the highest priority BASIN over Presumpscot and Piscataqua River basins. Due to the relatively small size of each nested watershed (all predominantly located within the Town of Falmouth) and the impaired nature of Mussel Cove (the receiving water for Casco Bay Frontal Drainage Basin), it would be most logical and cost effective to address Casco Bay Frontal Drainage watersheds altogether, rather than individually. Most of the recommendations included in SECTION IV can be scaled appropriately to address the entire basin or an individual nested subwatershed. (NOTE: DEP encourages and funds watershed management plans on an individual watershed basis, so a multiwatershed management plan may not be a competitive application for grant funding given DEP's proclivity. However, a case could be made based time and cost efficiency to consider the Casco Bay Frontal Drainage the watershed in question.)
- <u>Conserve and protect forests</u>: According to the CASE STUDY in APPENDIX E.2 that is based on recent development trends (using NELF Explorer Tool), Falmouth is about 60% forested, and one-fifth of existing forests are protected. If development trends continue (that are modeled in the NELF Explorer Tool), 11% of Falmouth's existing forests could be lost by 2060. Falmouth is not alone. Projected loss in forested lands is calculated for several other municipalities in APPENDIX E.2, and aggregated for Cumberland County, which is projected to be over 72,000 acres lost within 40 years.
- <u>Coordinate regionally with other municipalities</u> to address this need to conserve and protect forests, as a means of proactively prioritizing watershed health within our region, which is experiencing tremendous growth and continued development pressures. The need for a coordinated regional approach grows each year as development pressures continue in 2020-2021 despite (or perhaps due to) a global pandemic.

A case study of development pressures using Harvard Forests NELF Explorer Tool is offered on the next page.

CASE STUDY: DEVELOPMENT-FOCUSED FUTURE IN FALMOUTH

As discussed in TOOL #4 – New England Landscape Futures (NELF) Explorer Tool, recent development trends are used to predict future impacts to land use changes throughout New England. The NELF Explorer Tool was developed at Harvard Forest under a National Science Foundation (NSF) grant with input from stakeholders and practitioners alike. A <u>story map by Harvard Forest</u> provides background on the tool and the benefits of ecosystem services to municipalities.



From Falmouth's founding in 1718 through 2010, the town developed 20% of its area, creating the bucolic town residents enjoy today. In recent decades, the rate of development has increased, like other municipalities in our region. If these trends continue, Falmouth could increase from 20% to 28% developed – an increase of 38% - in just two generations.

Graphic and tabular depictions of the projected land use changes in Falmouth are presented below. Projected changes to other municipalities in Cumberland County are presented in **APPENIDIX E.2**, summarized below, and described in detail in **APPENDIX E.2**.



Table 1. Proportional land uses.			
Land Use	2010	<i>Futur</i> e	
% of land that is forest	59	53	
% of forest conserved	19	22	
% of forest unprotected	81	78	
% of land that is developed	20	28	
% of developed low dens.	90	92	
% of developed high dens.	10	8	

According to the NELF Explorer Tool:

By 2060 Cumberland County could lose up to **72,421 acres of unprotected forests**, if current development trends continue. That's almost THREE TIMES the size of the entire Town of Falmouth, or an area larger than the Towns of Falmouth, Windham and Cumberland combined – in just two generations.

Projections for potential loss of forests in surrounding communities are included in **APPENDIX E.2** to inspire regional conversation(s).

FIGURE 3 – GEOMORPHOLOGY and HABITAT CONDITION	N	
WATERSHED HEALTH METRIC	PLAIN LANGUAGE SUMMARY	
Geomorphology Stream channels with natural geomorphic dynamics.	Like hydrology (referring to the land), the stream channel is also influenced by climatic processes and other disturbances that may cause the stream channel to become unbalanced.	
Habitat Aquatic, wetland, riparian, floodplain, lake, and shoreline habitat. Hydrologic connectivity.	When the stream bank is unstable, sedimentation and deposition covers critical stream substrates that provides habitat for aquatic organisms (macroinvertebrates) that determine the health of the waterbody, according to DEP WQS.	
C. GEOMORPHOLOGY and HABITAT CONDITION are a	a function of the altered channel, as explained in	
FIGURE 3 above. The number of stream-road cross	ings, as reported in the Maine Stream Habitat	
Viewer, are used as the surrogate metric for these	conditions. The number of stream-road crossings	
and the subsequent barriers of the stream are cou	nted and calculated as a percentage.	
• Casco Bay Frontal Drainage has 31 stream-	road crossings with 28 of them occurring within	
Falmouth; 6 of the 28 (21%) in Falmouth ar	e considered barriers.	
 Scitterygussett Creek has the most s 	stream-road crossings at 10 with only 1 (10%) being	
a barrier. A detailed summary of Sci	tterygussett stream crossings is included in	
Appendix F.		
 Mill Creek has 6 stream-road crossing 	ngs with 2 (33%) being barriers.	
Webes Creek, Chenery Brook, and Norton Brook all have 1 stream-road crossing withir		
Falmouth, but do not become barrie	ers for aquatic organism passage.	
• Presumpscot River Basin has 18 stream-road crossings with 8 of them occurring within		
Falmouth.		
 Meader Brook has 5 of its 7 stream- 	road crossings occurring in Falmouth with 4 (80%)	
becoming barriers.		
 Minnor Brook has 1 stream-road crossing becoming a barrier, but none occur in 		
Falmouth.		
 Piscataqua River Basin has 30 stream-road 	crossings with 12 of them occurring within	
Falmouth; 5 out of 12 (42%) in Falmouth ar	e considered barriers.	
• East Branch has 13 stream-road cro	ssings with 3 being barriers (23%) in Falmouth.	
 Hobbs Brook has 6 stream-road cross 	ssings with 1 in Falmouth that is not a barrier.	
FOR MORE INFORMATION ON STREAM BARRIERS,		
Please visit the Maine Stream Habitat Viewer, another	tool funded by Maine Coastal Program, which	
"helps bring people together to cooperatively restore c	and conserve fish and wildlife habitats important to	
Maine's economy and way of life." It also provides imp	portant information about dams and road crossings	

Maine's economy and way of life." It also provides important information about dams and road crossings that act as a barrier to aquatic organisms, which are used to define water quality standards. A detailed summary of the stream crossings found in the Maine Stream Habitat Viewer for Scitterygussett Creek are included in Appendix F.4
FIGURE 4 – LANDSCAPE CONDITION

Landscape Condition

Patterns of natural land cover, natural disturbance regimes, lateral and longitudinal connectivity of the aquatic environment, and continuity of landscape processes.

PLAIN LANGUAGE SUMMARY

The condition of the natural landscape influences aquatic habitats, cycles nutrients, retains sediment, and allows infiltration.

- D. LANDSCAPE CONDITION is explained in FIGURE 4. The surrogate metric for this watershed health condition is assessed based on the amount of Riparian Zone undisturbed and disturbed, calculated as a percentage of the total Riparian Zone (RZ).
 - **Casco Bay Frontal Drainage** has 71% of the RZ undisturbed and 29% disturbed RZ. The subwatersheds are as follows:
 - Norton Brook has 88% of the RZ undisturbed with 12% disturbed.
 - Mill Creek has 85% of the RZ undisturbed with 15% disturbed.
 - **Chenery Brook** has 74% of the RZ undisturbed with 26% disturbed.
 - Scitterygussett Creek and Webes Creek have 57% and 56% of the RZ undisturbed with 43% and 44% disturbed, respectively, within the Town of Falmouth.
 - **Presumpscot River Basin** has 89% of the RZ undisturbed with 11% disturbed RZ within Falmouth.
 - Meader Brook and Minnow Brook have 96% and 89% undisturbed RZ with 4% and 11% disturbed, respectively, within Falmouth.
 - **Piscataqua River Basin** has 87% of the RZ undisturbed with 13% disturbed RZ within Falmouth.
 - Hobbs Brook and the East Branch are 94% and 88% undisturbed RZ with 6% and 12% disturbed, respectively, within Falmouth.

Attributes of Vulnerability are important to capture the dynamic nature of watersheds that account for future changes in climate and human activity. Although USEPA typically defines watershed vulnerability as a function of three factors (i.e., land use change, water use change, wildfire potential), this project considered several locally-relevant vulnerability factors including:

- USEPA's Preliminary Healthy Watersheds Assessment (PHWA) Vulnerability Index that characterizes the vulnerability of aquatic ecosystems based on future alterations due to land and water usage change. However, USEPA only calculates these for HUC 12 watersheds, which are the three basins within Falmouth. However, to assess the smaller/nest subwatersheds, another vulnerability factor had to be considered for prioritization.
- Impervious Area (IA) as a percentage of land area within the watershed was used since:
 - there is an accepted science-based methodology established by the Center for Watershed Protection, which indicates that watershed health declines rapidly once over 10%; and
 - this metric is easily calculated using GIS geodatabase for each smaller/nested subwatershed.

However, %IA can be skewed based on the size (or lack of size) in smaller, nested subwatersheds. Therefore, additional vulnerability factors were considered to provide additional insight.

- The **% of the watershed served by public sewer** is offered as an alternate vulnerability factor.
- The projected Impervious Area in the year 2060 according to the NELF Explorer Tool, which helps to provide insight into the relative changes in the smaller watersheds (or nested subwatersheds) within each of the three basins within Falmouth. This projected IA in 2060 provides the anticipated change over roughly 40 years based on recent trends in development back to 1990. From the %IA in 2060, we can calculate the anticipated rate of change (i.e., 40-year delta = %IA in 2060 current %IA) over the next 40 years. The deltas calculated for each smaller, nested subwatershed is indicated in APPENDIX F.1 and APPENDIX F.2 BASIN CALCULATIONS. For example, the 40-year delta for each of the subwatersheds in the:
 - CASCO BAY FRONTAL DRAINAGES is (+2%) across the board, except for Webes Creek (0%).
 - PRESUMPSCOT RIVER BASIN ranges from (+2%) to (+5%).
 - PISCATAQUA RIVER BASIN is (+1%) to (+2%).

SECTION IV – RECOMMENDATIONS

Future actions for effectively prioritizing all the watersheds within the Town of Falmouth are summarized in this section. These recommendations should not be considered an exhaustive list of activities to consider and/or implement, as they are limited by the scope of this work and the timeframe for the project. Additional recommendations should be considered, evaluated, and included in terms of any long-term plan for the Town of Falmouth and their partners.

Recommendations to consider implementing are grouped into three (3) tiers:

TIERS OF RECOMMENDATIONS				
۵	1. WATERSHED- SPECIFIC	These recommendations pertain predominantly to a specific watershed area and may be aggregated to protect or improve a specific watershed.		
	2. MUNICIPAL-WIDE	These recommendations are applicable throughout the Town of Falmouth (e.g., update data and analysis annually) and are meant to have cascading effects throughout the Town.		
~	3. REGIONAL	These recommendations pertain to an area larger than the Town and/or multiple municipalities (e.g., budget for watershed management plans).		

In addition to the tiered recommendations, the anticipated priority for each recommendation is indicated as HIGH, MODERATE, or LOW.

- HIGH priorities are recommended for immediate implementation; and
- MODERATE or LOW priorities are meant to be implemented over time.

When available, an estimate of cost for implementation is provided as well. These cost estimates are "order of magnitude only" and are not meant to be an implicit budget for the project.

RECOMMENDATION #1:

Secure additional (grant) funding: multi-phase approach

TIER	PRIORITY	COST
	HIGH	\$90,000 See budget in original grant application in APPENDIX C

As mentioned in the PURPOSE (see Page 3), the project (including the development of this Strategic Plan for PROACTIVE WATERSHED MANAGEMENT) is part of a multi-phase approach to protect the overall health of the watersheds in the Town of Falmouth and Casco Bay. The multi-phase approach is described in the original grant application to the Maine Coastal Program, included as **APPENDIX C**.

Additional phases of this multi-phase approach include:

1. **Development of model ordinance language** for addressing land use management activities that promote resiliency and stormwater improvements, both quality and quantity. This is Task 1 in the MCP Grant Application in **APPENDIX C**.

• Municipal-wide Recommendation . A tiered ordinance is envisioned to properly serve the three types of community in Falmouth: commercial, residential and rural districts.
 Regional Recommendation. The proposed model ordinance language is intended to provide a framework for Falmouth, but also other municipalities, especially those upstream from Falmouth that are interested in: (1) addressing impairments and threats in each respective watershed; and (2) collaborating to protect watershed health within their municipal boundaries. Engaging a regional group, like MMA or GPCOG, to assist with ordinance revision and drafting new language would encourage other municipalities to participate, especially those that share watersheds with Falmouth. Convening a stakeholder group with engineers, planners, and design professionals involved to help develop and/or evaluate the proposed ordinance language is recommended to ensure that the Town's long-term goal of proactive watershed protection is properly codified in the revised language.
 Watershed-Specific Recommendation. An overlay district can be created to protect each watershed and promote specific best management practices (BMPs) in land use ordinances, similar to a Resource Conservation Zoning Overlay or the Route 100 Corridor Overlay District. Each overlay district can address the stressors identified by DEP and promote proper Best Management Practices (BMPs) tailored within each watershed. See WATERSHED SUMMARY included in APPENDIX B.3 for more specifics on watershed-specific stressors.

2. **Creation of a menu or selection guide of Best Management Practices (BMPs)** to be used as a resource (i.e., Reference Guide) in the development process from pre-application and Site Inventory and Analysis to long-term maintenance agreements. This is Task 2 in the original MCP Grant Application in **APPENDIX C**.

	Municipal-wide Recommendation. This BMP selection guide is envisioned to be written in laymen's terms to allow the developer, municipal staff, and decision makers to "speak the same language" with respect to watershed health, protection, and best practices to incorporate in the development process. This is meant to address projects of all sizes, from construction of single-family homes to site plan review for large-scale commercial and multi family residential subdivisions.
	Regional Recommendation. The BMP selection guide is intended to provide a framework for other municipalities to use in multiplying the potential positive effects in Casco Bay, by providing clear guidance for all parties to reference regionally throughout the planning, pre-construction, construction, and long-term maintenance phases of land use development within our communities.
	 Watershed-Specific Recommendation. The BMP selection guide is created to provide tangible examples of both types of BMPs available to protect watershed health: <u>Structural BMPs</u> are built or engineered pollution controls, devices, structures, etc. incorporated into designs and/or the built environment (e.g., catch basins, detention ponds, etc.); and <u>Non-structural BMPs</u> are operational or procedural controls to control pollution (e.g., street sweeping, catch basin cleaning, policy changes, etc.).

ANCHOR ORGANIZATION RECOMMENDATION: An additional phase or aspect, not included in the original MCP application, would be for an anchor organization, like GPCOG or MMA, to serve as a convener and potentially establish a regional training center for design engineers and developers. During training sessions, design professionals and developers could interface directly with municipal planners and professionals to more thoroughly understand one another's priorities – without the pressures of a specific project, financial concerns, regulatory deadlines, and other concerns. This would allow the municipal sector and the private development sector to:

- Fully or partially satisfy Minimum Control Measures (MCMs) associated with construction, post-construction and municipal operations in the municipal separate storm sewer system (MS4) permit (i.e., MCM 4, 5, and 6). FMI – see next page "How does this project help address MS4 Requirements?"
- Engage in regular dialogue on issues and relevant topics, like new MS4 compliance and watershed concerns, that we all face together in a harmonious fashion.
- Explore how to apply these metrics and outcomes of the project, as well as common themes, such as disconnecting impervious area, applying low-impact development (LID) and green

infrastructure (GI) to projects to alleviate some of the watershed vulnerabilities in a constructive fashion.

Once the regional training center is established with grant/seed money, it would be self-sustaining with revenue generated from class registration fees. It could easily leverage existing training resources, including (but not limited to):

- Maine DEP's Nonpoint Source Training Program
- MaineDOT's Local Roads Program
- Wells Nation Estuary Research Reserve Coastal Training Program
- Maine Audobon's Stream Smart Program
- o And other long-standing training resources that prioritize and protect watershed health

HOW DOES THIS PROJECT HELP ADDRESS MS4 REQUIREMENTS?

With or without the proposed regional training center with a DESIGNATED ANCHOR ORGANIZATION, this project may provide additional protection relative to the Municipal Separate Storm Sewer System (MS4) permit that the Town of Falmouth is subject to, and recently prepared a 5-year Stormwater Management Plan (SWMP). The ways this project helps to achieve the SWMP are offered below:

1.4 Water Quality and Discharges to Impaired Waters	Based on communication received from DEP throughout this project, Webes Creek and Norton Brook may be proposed as impaired waters in the near future. This Strategic Plan provides a method for proactively and voluntarily considering "additional stormwater treatment controls on development in watersheds" to be considered impaired in the future.
1.5 Priority Watersheds	Although the Town of Falmouth is already satisfying this requirement fully, this project provides a roadmap for prioritizing watershed health, instead of waiting until the watersheds become impaired.
	RECOMMENDATION #4 includes development of a WMP for Hobbs Brook, although not located within UA (i.e., not subject to MS4 requirements in this watershed), a TMDL has been proposed by DEP.
2.1 MCM 1 Education and Outreach Program	This Strategic Plan provides information to include (or become) the outreach tools for an AWARENESS CAMPAIGN. If planned carefully, one or more of the recommendations could satisfy a BEHAVIOR CHANGE CAMPAIGN (e.g., see RECOMMENDATION #1 re: BMP selection guide and model ordinance). The Town's pesticide and herbicide ordinance might also be a CAMPAIGN.
2.2 MCM 2 Public Involvement and Participation	In RECOMMENDATION #1 , the proposed stakeholder group, convened by or with an anchor organization, to develop and/or evaluate ordinance language could be considered "a public community event with a pollution prevention and/or water quality theme." Another public community event would be the workshop(s) proposed in RECOMMENDATION #2 .

2.4 MCM 4 Construction Site Stormwater Runoff Control	The ordinance changes included in RECOMMENDATION #1 could support MS4 requirements if more incentives or rigorous standards are included to address runoff from construction sites, including capturing sediment-laiden dewatering discharges, drill and saw-cutting water, and other waste streams that present a threat to HABITAT CONDITION, BIOLOGICAL CONDITION, and WATER QUALITY.
2.5 Post-Construction Stormwater Management in New / (Re)Development	The ordinance changes included in RECOMMENDATION #1 could support MS4 requirements if more incentives or rigorous standards are included to ensure that watersheds are benefitting from the appropriate maintenance of structural BMPs and incorporation of non-structural BMPs, such as:
	 reducing the threshold for requiring a Post Construction Stormwater Management Plan (PCSWMP) to less than one acre of land disturbance. assessing existing BMPs, starting with those on public property (but allowing for a discount on assessing BMPs on private property) within the Casco Bay Frontal Drainage watersheds, as seen in the DEP recommendations for Norton Brook – see RECOMMENDATION #10.
2.6 MCM 6 Pollution Prevention / Good Housekeeping for Municipal Operations	This project, in its entirety, is an example of a municipal-wide pollution prevention program. Providing training and a road map for keeping sediments, nutrients, and other pollutants out of watersheds is a perfect example of good housekeeping for municipal operations. Furthermore, by focusing on protecting watershed health (instead of costly restoration) is far more cost effective and proactive approach to meeting NPDES MS4 goals.

RECOMMENDATION #2:

Update watershed data and analysis (at least annually)

TIER	PRIORITY	COST
<u></u>	HIGH	\$10,000 - \$50,000
		Depending on the level of effort and frequency of updates

This project presents the watershed data as a snapshot in time. By updating the watershed data and calculations regularly, it can be used to monitor the watershed health – or vulnerabilities – as a function of development over time. For example, the watershed parameters calculated as part of this project could be repeated periodically to gain a better understanding of how the watershed landscape dynamics change in the future. For this project, watershed calculations supporting health parameters were calculated by:

1. GPCOG using available data listed in **APPENDIX B.2**.

<u>ل</u> ت	Municipal-wide Recommendation. The parameters calculated by GPCOG
	within each watershed include:
	 Background data: watershed areas, watershed areas within Falmouth,
	watershed boundary comparison
	 Water quality and biological conditions: number of monitoring sites
	 Hydrology: forested areas, both protected and unprotected as a % of
	land cover within the watershed
	 Habitat and geomorphology conditions: stream crossings and barriers
	along stream lengths
	 Landscape conditions: stream length and riparian zone (RZ), both
	disturbed and undisturbed, as a % if the entire RZ within the watershed
	• Vulnerability attribute: impervious cover as a % of total land cover
	within the watershed
	• An alternate vulnerability attribute: % of watershed sewered within
	Faimouth
	The Town's GIS consultant could update the data set and calculations as part of a
	intermunicipal watershed information makes more sonse since:
	• watersheds dep't follow municipal boundaries:
	 Water sheas don't follow indincipal boundaries, the Town may not want, or even he able to:
	 the rown may not want, of even be able, to. even be able, to.
	 expend range outside of their municipal boundaries, and evoke change outside of their municipal jurisdiction
	Furthermore relying on a regional anchor organization would also provide
	consistent calculations regionally, rather than every Town in a watershed relying
	on their GIS consultants. For small watersheds, like Hobbs Brook, that may not be a
	problem. But larger watersheds, like Presumpscot and Piscatagua Rivers, will
	require a significant amount of coordination among neighboring municipalities to
	update GIS calculations regularly. An effort like this is ripe for regional cost sharing
	using an anchor organization, like GPCOG, CCSWCD, MMA, Cumberland County, or
	another regional service center.

	 Regional Recommendation. Due to the regional nature of watersheds, it is recommended that an anchor organization, like GPCOG, keep and maintain this intermunicipal watershed-based GIS data set of watershed boundaries, calculations, demographics, and the State and Federal databases that are used in the tools leveraged to prioritize watersheds. This regional approach with an anchor organization will allow Towns that share watersheds an opportunity to share costs, and to more readily collaborate on watershed efforts that require multidiscipline expertise within the watershed(s), including (but not limited to): municipal and conservation planning; natural resource and land use management; education and outreach efforts; and science and engineering professionals 	
	GPCOG has conducted the calculations already for Falmouth, and (with proper funding) can repeat the calculations for Falmouth's next iterative process, and/or for neighboring municipalities embarking on their first prioritization of watersheds. If other communities join the effort, it provides efficiencies in costs to develop a regional watershed-based map and plan for our region currently experiencing intense development pressures. Furthermore, by having a non-regulatory, intermunicipal organization with a successful history of regional collaboration, like GPCOG, manage the data (versus a regulatory body like DEP) allows the municipalities more control of that data, trends, and future of development within their respective communities.	
2. Harvard	Forest using the NELF Explorer Tool, which uses recent trends predicted out to year 20)60
based or	 five scenarios, to demonstrate vulnerability within watersheds. Municipal-wide Recommendation. A case study using the NELF Explorer Tool for the Town of Falmouth, included in APPENDIX E, was developed by Lucy Lee using: NELF Explorer Tool was developed as part of a National Science Foundation (NSF) grant-funded project at Harvard Forest, which is Harvard University's long-term ecological research site. The tool was developed to visualize landscape changes in the future based on data and trends in land use management and development from the 1990s through 2010. According to the NELF Explorer Tool, impervious cover and %IC within Falmouth watersheds will continue to increase, rapidly in some watersheds, and more gradually in others. Because of the science-based correlation between %IC and watershed health by the Center for Watershed Protection, this tool was used to assess watershed vulnerability. Case Study was developed specifically for Falmouth as part of this project. According to the Case Study using the NELF Explorer Tool included in APPENDIX E, it is likely that:	
	38% increase in developed area – an area larger than 500	ĺ

38% increase in developed area – an area larger than 500 baseball fields – will be lost within two generations in Falmouth.

A workshop for Town staff, elected officials, planning board and conservation commission members would help the Town understand how policies could be shaped to protect watershed health and the natural resources that exist within each watershed. Lucy Lee, Research Assistant and NELF Explorer Tool practitioner at Harvard Forest, is recommended to provide this beneficial review of the Case Study and its findings with Town staff, planning board members, conservation commission, elected officials, and other stakeholders (or the regional training center proposed in **RECOMMENDATION #1**). Regional Recommendation. As previously mentioned, an anchor organization could have a valuable role in the protection of watershed health. Generally, DEP's watershed management unit focuses primarily on restoration of impaired and threatened waters. However, by looking at the healthy waters, there is a lot more to protect. Unfortunately, DEP's land bureau is overloaded with development reviews and permits, as a result of the significant development pressures encountered throughout Southern Maine. This leaves little to no time to review the watershed health metrics that require constant monitoring as the dynamic landscape changes over time. A workshop for by Lucy Lee/Harvard Forest of the NELF Explorer Tool to both DEP and any potential anchor organization would help shift the paradigm from dwelling on impairments to proactively protecting the healthy watersheds that currently outnumber the impaired. The powerful visualizations in the NELF tool may empower DEP and a potential anchor organization to utilize these tools efficiently and effectively to inform regional decision making.

Specifically, an annual update and analysis of the watershed data and calculations will allow the Town of Falmouth to:

- 1. track changes and eventually rates of change occurring in each watershed, such as:
 - <u>% Forest = the percentage of forested land in a watershed</u> as development clears or replaces forests over time, the % Forested Change can be calculated.
 - <u>% RZ = the percentage of the Riparian Zone disturbed and undisturbed in a watershed</u>
 - <u>% IC = the percentage of impervious cover (IC) in a watershed</u> as development creates additional IC over time, the rate of IC growth within the watershed can be calculated. For example, the amount of IC in Norton Brook has increased 40% in 15 years (since 2004), which translates to roughly 2.2 acres of impervious cover added each year to the watershed.

Norton Brook Watershed	Year	Acres of IC	% IC
510 acres total	2019	80	15.8
2.2 acres of IC added per year	2004	47.6	9.3

- 2. proactively manage watershed characteristics and health through Site Inventory and Analysis.
 - The Site Inventory and Analysis process generally requires the identification of "opportunities and constraints for open space preservation, subdivision, and

development." Connecting this annual update of the watershed health metrics to the Site Inventory and Analysis during the development review process may allow the Town of Falmouth (and other municipalities) to actively track these changes throughout the year.

- Municipalities could actively manage watershed health if Site Inventory and Analysis, or another local permitting process, was the trigger, or tool, for updating watershed health metrics. For example, the definition of "environmentally sensitive areas" and "significant natural features" could be updated, expanded, or interpreted to include the watershed health metrics proposed, such as (but not limited to) the acreage of:
 - The acreage of forests, both protected and unprotected, is used as a primary metric for HYDOLOGIC CONDITIONS proposed in this framework. Wetlands may be a secondary proxy for this watershed health indicator. In fact, DEP maintains a data base of wetland alterations that is updated annually. Since 2015, a total of 0.65 acres of wetlands have been altered (e.g., drained, filled in, etc.) in the Town of Falmouth. Requesting an update from DEP annually is as simple as an email requesting acreages from the Land Bureau, but monitoring the alterations using visual data interface like GIS could be a more powerful tool.
 - The acreage of riparian zone, both disturbed and undisturbed, is used a primary metric for LANDSCAPE CONDITION proposed in this framework. Natural land cover, both developed and undeveloped, may be a secondary metric (or surrogate) for this watershed health indicator. Again, these annual updates could be as simple or complex as the Town and/or stakeholders (e.g., neighboring municipalities within a shared watershed, partners, etc.) would like them to be – depending on the intent to monitor and propagate the program to make meaningful change.
 - The acreage of impervious cover is used as a proxy for VULNERABILITY ATTRIBUTES to help prioritize watersheds in this framework. This attribute is generally captured during the development review process, but could be updated for each project that:
 - comes before the planning board; and/or
 - requests a local permit (e.g., single family homes, etc.).
 - Other features to consider requesting be reported by the applicant and tracked by Town staff could include:
 - Natural vs. man-made drainage features (e.g., number of culverts installed, swales retained or constructed, etc.)
 - Environmentally sensitive areas (especially in conservation subdivisions)
 - Prime farmland (which has protections under the same Natural Resource Protection Act that protects sand dunes and wetlands)
 - other significant man-made and natural features of the site
 - Provisions for buffering

RECOMMENDATION #3:

Designate a watershed manager's position

TIER	PRIORITY	COST
<u>ل</u>	HIGH	\$40,000 - \$100,000 per year
		Depending on the responsibilities and expectations for the staff
		position, and whether it is a shared position with another
		municipality or anchor organization

The responsibilities for this municipal position could be shared with another community, like Cumberland with shared watersheds, or a stand-alone position serving just the Town of Falmouth. Although no Town specifically has a watershed manager on staff, these responsibilities are generally assigned to a Stormwater or Sustainability Coordinator.

The cost of the position depends on the level of experience that is expected from the staff member. A watershed manager to serve multiple municipalities from an anchor organization should have a significant amount of experience with both watershed management (from a natural resources protection perspective), but also with public administration (from a policy perspective).

Duties would include (but not be limited to) the following:

- Collect, update, synthesize watershed data within municipal boundaries, and provide recommendations for prioritization of resources to implement recommendations, as well as watershed restoration and protection projects.
- Communicate across municipal boundaries to coordinate shared watershed responsibilities.
- Participate across Town Departments to ensure that:
 - watershed considerations are included in day-to-day municipal operations, the development review process, code enforcement and zoning appeals, and other relevant activities; and
 - o resources are allocated, collectively and collaboratively, for each watershed.

A sample job description for a watershed manager is included in **APPENDIX H**. Additional expertise in geomorphology, hydraulics and hydrology, or another niche specialty would bring added value to the proposed position.

RECOMMENDATION #4:

Include watershed management plans (WMPs) in future municipal budgets

TIER	PRIORITY	COST
	HIGH	\$75,000 - \$250,000 per watershed Depending on the size, stressors, conditions of the respective watersheds, and the scope of the WMP
1. Casco Bay Frontal Drainage WMP		 \$100,000 - \$250,000 for a multi-watershed management plan to benefit Mussel Cove, and include these watersheds that are indicated with an (*) asterisk within this RECOMMENDATION: Webes Creek (100% within Falmouth) Scitterygusset Creek (100% within Falmouth) Norton Brook (>75% within Falmouth) Mill Creek (>75% within Falmouth) Chenery Brook (shared with Cumberland)
2. Hobbs Brook WMP		\$75,000 - \$100,000 for a single watershed management plan to be shared with the Town of Cumberland
3. Updates to existing WMPs or WPPs		 \$25,000 per year to be earmarked for updating an existing watershed plan (required every 5-10 years per plan), conducting a watershed survey or project (required after plan is prepared/approved), participating in an existing watershed effort(s), such as: Highland Lake WPP and implementation Presumpscot River participation Updates or implementation of the proposed WMPs (i.e., Casco Bay Frontal Drainage, Hobbs Brook)

Although this project presents the relative health, stressors, and vulnerability of watersheds in Falmouth, it is not a proper substitute for:

- an EPA-approved 9-element watershed-based management plan (WMP) for impaired or threatened watersheds; or
- a watershed protection plan (WPP) for a lake.

Once prepared, these plans provide a "road map" for restoring and protecting watershed health. Because DEP encourages and only funds WMP on a smaller (sub)watershed level, a strong case can be made for a developing a WMP for the Casco Bay Frontal Drainage Basin as one unit to provide efficiencies on time and money. By addressing the small subwatersheds altogether, it will take less time and money for the Town of Falmouth to develop and implement the WMP. If DEP does not authorize a broad multi-watershed management plan for the Casco Bay Frontal Drainage Basin, then the estimated cost for this recommendation should be multiplied by 2-4 (i.e., cost becomes \$400,000 to over a \$1M to address the Casco Bay Frontal Drainage Basin's subwatersheds). The cost of preparing a WMP for smaller watersheds varies widely depending on the characteristics and condition of each watershed. In general, the cost of a WMP can range from \$75,000 to \$250,000 per watershed (i.e., average plan ~\$100,000). Each plan includes recommendations for implementing structural and non-structural BMPs with its own schedule of, and costs for, projected restoration and/or protection projects in each watershed.

Since many of the watersheds in Falmouth cross municipal boundaries, **the possibility to share costs across neighboring municipal boundaries should be explored** – while the watersheds located entirely within Falmouth may be the sole responsibility of the Town (and its stakeholders), unless a DEP grant or other financial assistance is made available.

1. Watersheds located entirely within the Town of Falmouth are prioritized relative to one another as follows.

PRIORITY	WATERSHED		
HIGH	Mussel Cove*	Located: along Route 88 corridor Drains to: Casco Bay/Atlantic Ocean Basin: Casco Bay Frontal Drainage Rationale for Priority: DEP-impaired marine waterbody; included in Casco Bay Frontal Drainage WMP	
HIGH	Webes Creek*	Located: Route 1 Commercial Corridor and Route 88 Drains to: Mill Creek then to Mussel Cove Basin: Casco Bay Frontal Drainage Rationale for Priority: not meeting DEP's Class B water quality standards, per email from Maine DEP personnel during project; included in Casco Bay Frontal Drainage WMP	
HIGHScitterygusset Creek*Located: along Route 9 and Route 95 corridors Drains to: Presumpscot River then to Casco Bay Basin: Casco Bay Frontal Drainage Rationale for Priority: meeting DEP's Class B water q standards, but identified as a more vulnerable water the NELF Explorer analysis in APPENDIX E; included in Bay Frontal Drainage WMP		Located: along Route 9 and Route 95 corridors Drains to: Presumpscot River then to Casco Bay Basin: Casco Bay Frontal Drainage Rationale for Priority: meeting DEP's Class B water quality standards, but identified as a more vulnerable watershed in the NELF Explorer analysis in APPENDIX E; included in Casco Bay Frontal Drainage WMP	

2. Watersheds located almost entirely (>75%) within the Town of Falmouth are prioritized as a moderate priority since water quality standards are being met:

PRIORITY	WATERSHED	
MODERATE to HIGH	Norton Brook*	Located: along Route 1 North corridor, headwaters in Cumberland

		Drains to: Mill Creek then to Mussel Cove Basin: Casco Bay Frontal Drainage Rationale for Priority: included in Casco Bay Frontal Drainage WMP, and DEP macroinvertebrate samples in 2002 and 2017 did not meet stream Class B standards, indicating it is impaired though not yet listed as such.
MODERATE to HIGH	Mill Creek*	Located: along Route 9 Drains to: Mussel Cove Basin: Casco Bay Frontal Drainage Rationale for Priority: included in Casco Bay Frontal Drainage WMP
MODERATE	Meader Brook	Located: along Blackstrap Road and crosses Mountain Road, share watershed with Westbrook Drains to: Presumpscot River Basin: Presumpscot River

3. Watersheds shared with other municipalities include:

PRIORITY	WATERSHED	
MODERATE	Chenery	Located: along railroad and Route 295, headwaters in
to HIGH	Brook*	Cumberland
		Drains to: Mill Creek
		Basin: Casco Bay Frontal Drainage
		Rationale for Priority: Grouped with other MODERATE-
		priority watersheds in Casco Bay Frontal Drainage Basin
HIGH Hobbs Brook Located: along Route 100 c		Located: along Route 100 corridor, primarily in Cumberland
		Drains to: Piscataqua River
		Basin: Piscataqua River
		Rational for Priority: DEP-Impaired waterbody with a DEP-
		prepared <u>IMDL Summary</u> recommending that WMP be
		completed by the Towns of Cumberland and Falmouth
MODERATE	Presumpscot	Located: in Windham, Westbrook, Portland, Falmouth
	River	Drains to: Casco Bay/Atlantic Ocean
		Basin: Presumpscot River
		Rationale for Priority: Numerous stakeholders conduct
		monitoring and reporting in this large watershed. Efforts
		should focus on outreach to stakeholders, aligning
		stakeholders' values and on-going duties/responsibilities.
		before moving to action since this waterbody is in flux
		(stabilizing from dam removal activity and a 2020 landslide in
		2020) and is being studied carefully be DEP. However, a multi-

		municipal leadership presence (similar to Highland Lake Leadership Team), in coordination with a regional anchor organization, may provide the backbone structure needed to form an effective working coalition for this important shared watershed.
LOW	Piscataqua River	Located: in Windham, Yarmouth, North Yarmouth, Gray, Cumberland Drains to: Presumpscot River then Casco Bay Basin: Piscataqua River Rationale for Priority: lowest priority of 3 basins in Falmouth based on watershed calculations and projected development using NELF Explorer Tool; Hobbs Brook = priority watershed within basin

4. One watershed is located almost entirely in a neighboring municipality.

PRIORITY	WATERSHED		
LOW	Minnow	Located: primarily in Westbrook, off Brook Rd in W.Falmouth	
	Brook	Drains to: Presumpscot River	
		Basin: Presumpscot River	
		Rationale for Priority: Because the majority of the watershed	
		is not located in Falmouth, the Town has little influence on	
		the direction and health of the watershed.	

The highest priority WMP(s). A broad multi-watershed management plan for the Casco Bay Frontal Drainage Basin is considered the highest priority for developing a watershed-based management plan in the Town of Falmouth. The proposed Casco Bay Frontal Drainage Basin WMP includes watersheds, or tributaries, contributing discharges to <u>Mussel Cove</u>, a DEP-listed impaired marine waterbody located entirely within Falmouth.

- The four (4) watersheds contributing to Mussel Cove are collectively known as the Casco Bay Frontal Drainage basin, as defined by USEPA⁸ and are intended to be included in this multi-watershed WMP:
 - Webes Creek
 - Norton Brook
 - Chenery Brook
 - Mill Creek
 - Scitterygusset Creek*

⁸ USEPA's tool <u>How's My Waterway</u> (when queried for Falmouth, Maine) has grouped the Route One corridor streams into the Casco Bay Frontal Drainage basin.

Although Scitterygusset Creek does not contribute directly to Mussel Cove, it is grouped together by USEPA in the Casco Bay Frontal Drainage Basin. For this reason and its apparent vulnerability index (see **APPENDIX E**), it is recommended that the WMP for the Casco Bay Frontal Drainage Basin include Scitterygusset Creek as a nested watershed.

- Because these subwatersheds are largely located within Falmouth, the Town has a good opportunity to directly influence the proposed actions and implementation schedule in the WMP benefiting Mussel Cove.
- Other reasons for making the Casco Bay Frontal Drainage Basin WMP the highest priority of the WMPs in Falmouth include:
 - A significant amount of data is available for these watersheds, so the scope of the WMP to be contracted could be minimized.
 - Combining smaller watersheds into a larger WMP provides overall cost efficiency to the project, instead of doing an individual WMP for multiple nested subwatersheds.
 - Addressing impaired waters continues to be the impetus for WMPs. Although only Mussel Cove is impaired, which means that they are not meeting DEP's water quality standards established (i.e., Class B), DEP may classify Webes Creek and Norton Brook as impaired in the future based on their recent monitoring efforts.

The next highest priority WMP. Hobbs Brook is not meeting Class B water quality standards and is considered impaired⁹. DEP has developed a Total Maximum Daily Load (TMDL), or pollution budget, for Hobbs Brook. On page 14 of the TMDL Summary, DEP states the following:

"It is recommended that municipal officials, landowners, and conservation stakeholders in Cumberland and Falmouth work together to develop a watershed management plan to:

- Encourage greater citizen involvement through the development of a watershed coalition to ensure the long term protection of Hobbs Brook.
- Address existing non-point source problems in the Hobbs Brook watershed by instituting BMPs where necessary; and
- Prevent future degradation of Hobbs Brook through the development and/or strengthening of a local Nutrient Management Ordinance."

Because the watershed is shared with Cumberland, so should the responsibility to develop and implement a WMP in this watershed. A shared Request for Proposal (RFP) or Request for Qualifications (RFQ) could be published to solicit bids for this important work once funding is secured or allocated for this work in Falmouth and Cumberland.

⁹ Impairments in Hobbs Brook include low dissolved oxygen levels and high e. coli concentrations in DEP water quality monitoring reports.

WMPs should be continually reviewed and updated. Once WMPs are completed, the implementation schedule for recommendations and action strategies should be adhered to by all contributing partners, including the host municipalities, like Falmouth.

- What happens once the WMP is completed? The WMP will include an implementation schedule of prioritized projects, often with an order of magnitude cost estimate that can be plugged into the annual municipal budget process and/or capital improvement plan, to ensure that resources are properly allocated for follow up actions in the watershed.
- What happens if you don't adhere to the WMP's implementation schedule? Adhering to the implementation schedule makes the municipality and stakeholders in the WMP eligible for EPA, DEP and other grant funding. However, if the implementation schedule is not followed, grant eligibility under Section 319 of the Clean Water Act may be compromised.
- What is the purpose of implementing a WMP? Ultimately, the purpose of any WMP is for water quality standards to be met within the waterbody. However, full implementation of the WMP may not achieve restoration of water quality classification standards. At that time, the Town can either request reclassification from DEP or conduct a Use Attainability Analysis (UAA) to determine if the water quality standards should be lowered.

Watershed Protection Plans (WPPs) for Lakes should be continually reviewed and updated. WPPs are prepared for lake watersheds, where WMPs are for stream/river watersheds. WPPs are already in process for the two lake watersheds (Highland and Forest Lakes) in Falmouth. However, just like WMPs, WPPs should be revisited and revised on a regular basis (every 2-5 years, no more than 10 years) to maintain eligibility for DEP NPS Program funding, under Section 319 of the Clean Water Act. Costs for updating the WPPs and WMPs should be carried annually in the Town's long-term budget.

At least \$25,000 is recommended to be carried annually in the municipal budget for the review and update of WMPs and WPPs that are existing, in progress, and recommended for development.

RECOMMENDATION #5:

Gather geomorphic data and assessments

TIER	PRIORITY	COST
~	HIGH	\$10,000 - \$250,000 Depending on the size and condition of the stream or river to be assessed
		ASSUME: \$50,000 annually to fund rapid geomorphic assessments, using Falmouth Conservation Commission (or other volunteers) to help coordinate access agreements along the selected stream sections.

A robust data set was considered during this project and the development of this Strategic Plan. However, there is very limited geomorphic data available for each watershed in Falmouth. Geomorphic data is important to assess channel stabilization, floodplain accessibility, erosion and deposition, and other important watershed health factors, like habitat. Geomorphic data and assessments could be included in:

- the development of watershed-based management plans, as seen in **RECOMMENDATION #4** above;
- the strengthening of ordinances around shoreland zoning and riparian buffers, as seen in **RECOMMENDATION #8 and #9**; and
- the capital improvement planning for culvert upgrades under roadways, as seen in **RECOMMENDATION #6** below.

Hydraulics and Hydrology Studies. Working with MaineDOT and MTA to conduct more detailed analysis of the Route One corridor and its intersection with MTA's Falmouth Spur may be another option to costshare the needs of the watersheds that drain to Mussel Cove, an impaired marine waterbody in Falmouth. In order to design effective instream enhancement measures, a detailed fluvial geomorphology assessment and/or hydraulics & hydrology (H&H) study is recommended, especially for the Route One Corridor watersheds (i.e., Casco Bay Frontal Drainage watersheds) that drain to Mussel Cove.

Rapid Geomorphic Assessments. A standard protocol has been established to assess geomorphology in watersheds without the high cost of a robust academic exercise. The number of companies and practitioners qualified and experienced in these assessments is increasing in our area. The challenge is finding the right scientist or engineer that can communicate the information effectively to the Town and stakeholders. Many may not fully appreciate the obstacles of navigating private property on behalf of a municipality or public anchor organization since the length of stream must be walked and studied in order to gather the correct amount and type of information. This type of effort takes a significant amount of coordination to ensure access issues are addressed.

Carrying roughly \$50,000 each year to address as many stream sections as possible would be a start for collecting this important watershed health information. Engaging the help of the Falmouth Conservation Commission to assist in landowner coordination could also help defer the costs of that expensive portion of the project.

REC. #6:

Gather data and apply for culvert replacement assistance

TIER	PRIORITY	COST
	HIGH	\$100,000 – millions of dollars Depending on the size and location of the culvert
		ASSUME: \$50,000 in match is required for each grant application, at a minimum. Some grant opportunities may even require that the engineering be completed in advance of the grant application being submitted (i.e., shovel ready).

Maine Water Bond funds, or other grant and funding sources, may be available to offset the cost of design (between 8-10% of project costs), permitting, removal and replacement of the failing or obstructing culvert. Match funds or the entire cost of each project should be carried in the Town's Capital Improvement Plan. For example, in Norton Brook there are 4 culverts that require evaluation for potential mitigation. Replacing each of these culverts is a tremendous undertaking, requiring significant resources (both human and capital).

Each of the stream barriers identified in the WATERSHED CALCULATIONS should be included in the Town's Capital Improvement Plan (CIP) or a CIP for each watershed could be developed.

RECOMMENDATION #7:

Consider funding instream and riparian enhancements

Several streams will require instream and riparian enhancements to achieve water quality standards. The geomorphic assessment and/or H&H studies (see RECOMMENDATION #4) should be completed in order to properly design the appropriate enhancements in each applicable watershed.

These enhancements may be as simple as strategic placement of logs and boulders, to meanders and plunge pools, to aeration and flow equalization. These will benefit the Casco Bay Frontal Drainage Basin watersheds the most. Therefore, this watershed is recommended to be assessed first among the three basins.

According to the <u>Maine Stream Habitat Viewer</u>, Scitterygusset Creek has the most stream-road crossings. A detailed summary of the stream barriers is provided in **APPENDIX B.4** – Stream Habitat Viewed Data for Scitterygusset Creek. A similar analysis of each of the Casco Bay Frontal Drainage subswatersheds is recommended to inventory the stream-road crossings and confirm the details of each potential barrier to identify retrofits and enhancements.

After the Casco Bay Frontal Drainage Basin is reviewed, a similar review is recommended for Presumpscot and Piscataqua River Basins to review/confirm the details of each stream-road crossing and potential enhancements for implementation.

Once these enhancements are identified through **RECOMMENDATION #4**, these projects can be incorporated as part of:

- the TIF District in Falmouth
- a Compensation Fee Utilization Plan for specific watershed (as part of the WMP development in **RECOMMENDATION #4**)
- other feasible funding mechanism, such as a municipal-wide bond to:
 - o upgrade instream and riparian enhancements;
 - o replace culverts to meet aquatic organism passage included in **RECOMMENDATION #6**;
 - develop WMPs, update WPPs, conduct geomorphic assessments, and other important recommendations included herein.

FUNDING SOURCES for these RECOMMENDATIONS include (but may not necessarily be limited to):

- TIF District
- Grant opportunities (e.g., MNRCP, DEP's NPS Program, DACF's MCP, etc.)
- Municipal or regional bond for water quality
- General fund and/or capital improvement plan
- Public and private partners, like PWD, TNC, TCF, TU and others
- Compensation Fee Utilization Plan

RECOMMENDATION #8:

Consider organizing a Presumpscot River Leadership Team

TIER	PRIORITY	COST
	HIGH	\$40,000 - \$75,000 annually shared across the four municipalities that share the watershed (Falmouth,
		Westbrook, Windham, Portland) and other
		stakeholders to staff the coalition

Numerous stakeholders conduct monitoring and reporting in this large watershed. Understanding the numerous stakeholders' contributions, values, plan of action, and goals would be helpful to organize a more coordinated watershed-wide approach for this important watershed that is shared by so many municipalities.

Efforts should focus on outreach to stakeholders, aligning stakeholders' values and on-going duties/responsibilities, before moving to action since this waterbody is in flux (stabilizing from dam removal activity and a 2020 landslide in 2020) and is being studied carefully be DEP and so many other citizen action groups.

However, a multi-municipal leadership presence (similar to Highland Lake Leadership Team), in coordination with a regional anchor organization (like GPCOG, CCSWCD, Cumberland County, MMA, CBEP, USM, UNE, PRLT, PWD, or another regional organization within the watershed to act as convener and facilitator), would provide the backbone structure needed to form an effective working coalition for this important shared watershed. Examples of successful watershed coalitions include:

- Androscoggin River Watershed Council
- Saco Watershed Collaborative

Generally, these collaboratives require annual base funding to operate effectively, which could be shared by the municipalities and stakeholder organizations that would ultimately benefit from a coordinated and collaborative effort within the watershed.

RECOMMENDATION #9:

Continue to implement watershed protection efforts in Comprehensive Planning

The Town of Falmouth has been including proactive watershed protection for years through the Staterequired Comprehensive Planning process (or Comp Plan). Specifically, the following excerpts from previous efforts are particularly salient to this project and are important recommendations from the current Comprehensive Plan that should be carried forward in future Town planning efforts.

EX	EXISTING WATERSHED PROTECTION EFFORTS			
1.	Focus growth areas where public sewer is available	Residential and commercial growth areas are deliberately located where public sewer services is available. This "allows for higher density, walkable developments in proximity to public services without environmental drawbacks, and would [be] most efficient use of public resources and land in the growth area."		
2.	Prioritize/anticipate wastewater treatment capacity from growth areas	 Reducing flow from commercial and residential development during extreme peak wet weather events through diversion, infiltration, and other means will help maintain the long-term wastewater capacity in growth areas, such as: In Route 100 Corridor (designated growth area) In intermunicipal agreement with Cumberland In new tax-increment financing (TIF) district to explore a sewer extension 		
3.	Prioritize forestry protection, especially in rural areas	Once forests (and other green space) are gone, they're gone for good. Forests, especially in rural headwaters, are the best line of defense for stream protection and watershed health. RECOMMENDATION #1 should include a review of ordinances to ensure that forests, riparian corridors, flood plains, and other shoreland protections are properly protected.		
4.	Expand regional coordination efforts to include more collaboration on water bodies and stormwater management	In addition to this project, the Town of Falmouth is already involved in at least two regional water-related efforts, including <u>Interlocal</u> <u>Stormwater Working Group</u> and <u>Highland Lake Leadership Team</u> . However, the Town has ample opportunity to participate in, and/or lead efforts, other water-related collaborative efforts, especially in shared watersheds, as presented in RECOMMENDATION #4		
5.	Increase on-going measures to manage watershed health in Falmouth's CIP	As seen in RECOMMENDATION #6 , there are a number of culverts (or road crossings) in each watershed that should be rehabilitated to allow <u>aquatic organism passage</u> (AOP) per Stream Smart guidelines. A significant amount of money is periodically available for AOP updates through the DEP and Maine Municipal Bond Bank. To maximize the opportunity for these programs, all culverts that require replacement should be identified, inventoried, provided a 25-50% match for each culvert replacement within the Capital		

6.	Strengthen Ordinances around	As risks from extreme weather and rising sea levels continue to increase, it will be more and more important to build resiliency and
	Shoreland Zoning	keep watersheds healthy or from being impaired. The Town
	Buffers	 "clearly define[d] protection measures for critical natural resources and, where applicable, important natural resources." "coordinating with Cumberland, Westbrook, Windham, Portland, GPCOG, PACTS on land use design, and regulatory and non-regulatory strategies."

RECOMMENDATION #10:

Consider watershed-specific recommendations from DEP

DEP's watershed-specific recommendations largely come from their Stream Stressor Report, dated January 2020 and included in APPENDIX B.3; a summary of the relevant information and recommendations are included in the TABLES below.

CASCO BAY FRONTAL DRAINAGE BASIN

The DEP completed several studies within the nested watersheds within Casco Bay Frontal Drainage Basin. By virtue of these recent in-depth field studies, the stressors within each watershed have been recently examined. These recommendations for this Basin are a direct result of this important work by DEP.

WATERSHED(S)	RECOMMENDATION	PRIORITY LEVEL
Norton Brook	Disconnect large spans of contiguous and	HIGH
also applicable to:	connected impervious area across all uses	GOAL:
Webes Creek	(e.g., commercial and institutional	1. Limit the amount of
Chenery Brook	properties to single-family and multi-unit	disturbance to the substrate
Mill Creek	residential communities).	that decreases the
Will CICCK	 This concept was introduced in the 	GEOMORPHIC and HABITAT
	2013 Woodard and Curran report on	CONDITION
	the Route One Corridor	2. Maximize buffers and other
	This is achieved by rerouting	attenuation BMPs to slow
	concentrated stormwater flows to	down flows and remove
	ample buffer areas or other structural	pollutants (i.e., nutrients to
	BMPs to attenuate flows and pollutants	Mussel Cove) to maximize
	(i.e., water quality and quantity), such	BIOLOGICAL CONDITION and
	as:	WATER QUALITY
	 Channel protection and storage BMDs to reduce "flashy" flows 	3. Stabilize the stream channel
	Biving to reduce flashy flows	to minimize washouts and
	chappelized flow to sheet flow	erosion to benefit all
	over protected buffers	4 Equalize flow and avoid
	 Boof line drip trenches to infiltrate 	"flashy" erosiye flows that
	roof runoff	are harmful to all watershed
	A non-structural BMP would be to	health metrics
	require alternative designs for	
	impervious cover, such as:	
	 unconcentrated flow to protected 	
	natural buffers with deed	
	restriction and/or convenance	
	 concentrated flow to level lip 	
	spreaders, drip line trenches and	
	other attenuation BMPs to	
	minimize channelized flow and	
	maximize sheet flow runoff	

TABLE 9.A – Casco Bay Frontal Drainage Basin

NORTON BROOK also applicable to: Webes Creek Chenery Brook Mill Creek	 Protect riparian area along <u>all stream</u> corridors by updating ordinances to include the following recommendations: Require natural vegetation be maximized/maintained/undisturbed up to 100' from shoreline (from 25') to protect against thermal impacts and nutrient loading Increase shoreland zoning setback to 250' (from 100') to maintain forested character and wildlife corridors that foster healthy stream biota Require follow up on landscape maintenance plans (e.g., 2-yr guarantee; non-invasive, native plants; etc.) to ensure that: Buffer effectiveness is maximized Forested canopy is not diminished Require natural drainage ways and intermittent channels are protected (i.e., not diverted to roadway ditches or storm drains where flow is concentrated) 	 HIGH GOAL: 1. Limit the amount of disturbance to the Riparian Zone (RZ) to maximize the watershed health metric of LANDSCAPE CONDITION 2. Limit the amount of disturbance to forest cover and natural hydrology to maximize the watershed health metric HYDROLOGY CONDITION
Norton Brook also applicable to: Webes Creek Chenery Brook	 Conduct geomorphic assessments to identify: In-stream and riparian enhancements Culvert replacements priorities Restoration efforts to include the WMP 	HIGH See RECOMMENDATIONS #4, #5, #6, #7 above
Norton Brook also applicable to: Webes Creek	 Conduct an assessment of existing BMPs within the watershed to identify where improvements are needed to properly control water quality and quantity: Start on public property to address and improve functionality of the existing BMPs that require routine operations and maintenance (OandM) for optimal effectiveness¹⁰. Offer a discounted program for private property to join in assessment, as part of the RFP from contractors/vendors 	 HIGH GOAL: Maximize the effectiveness of the existing BMPs that are considered public infrastructure, before asking private landowners to join in the assessment and improvements to improve all watershed health metrics

¹⁰ In DEP's Stream Stressor Report (dated Jan 2020), they observed both public and private BMPs in need of attention to function properly.

Norton Brook also applicable to: Webes Creek Chenery Brook Mill Creek	 Consider a salt management program to limit toxic chlorides from entering the stream. DEP recommends: Adopting standards for new and existing development that provide(s) detention and storage of runoff from heavily salted areas (e.g., commercial, institutional, office, multi-family subdivisions, etc.) Encouraging design practices and principles that limit salt applications, such as heated sidewalks and driveways, under-business parking, etc. Infiltrating roof runoff 	MODERATE TO LOW RATIONALE: There are already regional salt management campaigns underway
Norton Brook also applicable to: Webes Creek Chenery Brook Mill Creek Chenery Brook also applicable to: Mill Creek Mussel Cove	 Minimize the use of fertilizers and pesticides to prevent nutrients and toxic pollutants that reduce watershed health Rezone the stream corridor to: allow only compatible uses limit uses that contribute to pollutants, such as agricultural, high-density residential areas, concentrated impervious area require nutrient-reducing BMPs (e.g., ban fertilizer, etc.) 	LOW RATIONALE: Falmouth has already adopted a fertilizer and pesticide use ordinance
Mussel Cove	 Adopt resource protection and restoration efforts for eelgrass: Limit recreational vessels from anchoring or dragging fishing gear within or near eelgrass beds Offer outreach material on: pump out restrictions on dumping human waste protecting marsh habitat from human activity 	HIGH 1. Limit the amount of disturbance to optimize the GEOMORPHIC and HABITAT CONDITION, as well as LANDSCAPE CONDITION

Please note that Scitterygusset Creek is also considered part of the Casco Bay Frontal Drainage Basin. Therefore, these recommendations (above) are anticipated to apply to this nested watershed; however, the stressor report for Scitterygusset Creek was not received from DEP personnel.

PRESUMPSCOT RIVER BASIN

DEP did not provide recommendations for the subwatersheds within this basin in their report.

PISCATAQUA RIVER BASIN

In addition to the June 2016 NPS TMDL Report for Hobbs Brook, DEP also provided a draft stressor report (dated March 2020) for Hobbs Brook. The DEP recommendations included in the report are summarized below.

WATERSHED	RECOMMENDATION	PRIORITY LEVEL
Hobbs Brook	Develop a watershed management plan (WMP) in coordination with the Town of Cumberland	HIGH See RECOMMENDATION #4
Hobbs Brook	See TABLE 9.A above – DEP recommends that those applying to the Casco Bay Frontal Drainage are considered for Hobbs Brook as well	LOW RATIONALE: These recommendations should be fully vetted through the WMP development process
East Branch	Address recommendations (e.g., WMP development, BMP implementation, etc.), including NPS sites remaining, from the 2008 Watershed Survey included in the <u>Watershed</u> <u>Report</u>	LOW

TABLE 9.C – Piscataqua River Basin

GLOSSARY OF ACRONYMS

ACRONYM	DEFINITION/MEANING
ATTAINING	ATTAINING: sustainable solutions, LLC – Owner/Principal, Robyn Saunders, is the watershed management professional who prepared this report in coordination with GPCOG and Falmouth, to develop this framework for assessing watersheds using available data and resources
BMPs	 Best Management Practices are considered pollution controls that may be either: Structural BMPs that are built or engineered controls, devices, structures, etc. incorporated into designs or the built environment Non-structural BMPs that are operational or procedural in nature
CCSWCD	Cumberland County Soil and Water Conservation District
DACF	Maine Department of Agriculture, Conservation, and Forestry
DEP	Maine Department of Environmental Protection
GPCOG	Greater Portland Council of Government
IA or IC	Impervious Area and/or Impervious Cover are used interchangeably to represent the (percentage of) land cover that contributes substantially to stormwater runoff being efficiently directed to stream channels usually through a closed curb-and-gutter system, like within the Route One corridor, or from a serious of paved surfaces. Disconnecting the conveyances of stormflows will reduce the stream channel erosion from high volume and velocities that scour stream banks and stream beds causing unnecessary erosion, sedimentation, and decreases in water quality.
MaineDOT	Maine Department of Transportation
МСР	Maine Coastal Program
MEWEA	Maine Water Environment Association facilitates communication of ideas that will result in achieving improved treatment techniques and the preservation of Maine's waterways
ММА	Maine Municipal Association
MWUA	Maine Water Utility Association strives to bring together and support the manifestation of water education, to ensure the people of Maine maintain access to clean drinking water.
NELF	New England Landscape Futures (NELF) Explorer is a scenario-based mapping tool that uses recent trends in land use change and New Englanders' ideas about the future to develop five possible future scenarios for the region and map their potential impacts on the landscape. By exploring these futures and

ACRONYM	DEFINITION/MEANING
	their consequences, NELF Explorer asks big questions about how our choices today can affect the world of tomorrow, and provides frameworks for finding solutions through uncertainty.
ΝΟΑΑ	National Oceanic and Atmospheric Administration
TIF	Tax Increment Financing is a public financing method used to subsidize and invest in redevelopment, infrastructure, and other community-improvement projects.
TMDL	Total Maximum Daily Load is the maximum amount of a pollutant allowed to enter a waterbody so that the waterbody will meet and continue to meet watershed quality standards for that specific pollutant.
Town	Town of Falmouth is specifically referenced as the Town in this document.
USEPA	United States Environmental Protection Agency
WMP	Watershed-based Management Plan is required by USEPA/DEP for impaired waterbodies to provide road map for restoring the waterbody to its assigned water quality standard(s).
WPP	Watershed Protection Plan is required for lake watersheds in order to leverage funds from Section 319 of the Clean Water Act.
WQS	Water Quality Standards are established by statute dependent on the classification assigned to each waterbody by DEP and USEPA

APPENDICES

	TITLE	SOURCE
Α	WATERSHED INVENTORY and MAP	CCSWCD
A.1	Watershed Inventory	
A.2	Watershed Inventory Map	
В	DATA INVENTORY:	ATTAINING
B.1	Water Quality and Watershed Reports	DEP
B.2	GIS Layers and Maps	GPCOG
B.3	Stressor Report (Jan 2020)	DEP
B.4	Stream-Road Crossing Summary:	ATTAINING
	Scitterygusset Creek	
С	ORIGINAL MCP GRANT APPLICATION	Falmouth
D	USEPA TOOLS	ATTAINING
D.1	How's My Waterway Fact Sheet	USEPA
D.2	HUC Overview	USEPA/EnviroAtlas
D.3	WSIO Overview	USEPA
E	NEW ENGLAND LANDSCAPE FUTURE (NELF)	HARVARD FOREST
	EXPLORER TOOL	
E.1	NELF Explorer: Impervious Cover Analysis	
E.2	Falmouth Case Study	
F	WATERSHED HEALTH METRICS	ATTAINING
F.1	BASIN RESULTS: Casco Bay Frontal Drainage	
F.2	BASIN RESULTS: Presumpscot and Piscataqua	
	River	
F.3	Scitterygusset Creek Stream-Road Crossing	
	Details	
G	WATERSHED CALCULATIONS	GPCOG
Н	SAMPLE JOB DESCRIPTION: Watershed Manager	MIDCOAST CONSERVANCY

ATTACHMENTS TO

Strategic Watershed Plan

Falmouth, Maine | August 2021

APPENDIX A Watershed Inventory and Map

A.1 WATERSHED INVENTORY A.2 WATERSHED MAP

Prepared by

Cumberland County Soil and Water Conservation District

Watershed Inventory

f Calmouth Τc

OW	n of Falm	louth						t Risk ed	ed					Classification Notes		n Fee an	n Fund	TMDLs			
Basir	Waterbody / Watershed	Downstream / Receiving Waterbody	Other Municipalities in Watershed	State Classification	Impaired? (y/n)	Impairment Code	Reason for Impairment	Lakes Most a OR Urban Impair Stream	NPS Priority Watershed	Work Done & NPS Projects Completed	Compensatio Utilization Pla	Stormwater Compensatio	Needed			Completed	Possible Next Steps				
Hobbs Brook Basin	Hobbs Brook	Tributary to Piscataqua River	Cumberland	Class B	Yes	4-A (Ec)	Dissolved Oxygen High E. Coli levels	No	Yes Impaired	n/a	 9/28/2009: Recreational use impairments now Category 4A due to approval of statewide bacteria TMDL. 5/29/2012: TMDL monitoring for dissolved oxygen in 2007; will be included in a Statewide NPS TMDL when analysis is complete. 11/10/2015: Statewide NPS TMDL to go out for public review in late 2015. 10/5/2016: Aquatic life use impairment moved to Category 4-A in 2016 cycle due to approval of Statewide NPS TMDL (8/9/2016). Agriculture is 35 % of land area. Ag is likely leading cause of impairment due to sediment and nutrient enrichment 	No	No	n/a	Approved 2016	Yes 2009 Bacteria NPS	Survey and Management Plan				
	Johnson Branch (East Branch Piscataqua)	Flows to East Branch Piscataqua, to Piscataqua, to Prescumpscot, to Casco Bay	n/a	Class B	No	1	n/a	No	No	See East Branch Piscataqua	n/a	No	No	n/a	No	No	See East Branch Piscataqua				
River Basin	North Branch (East Branch Piscataqua)	Flows to East Branch Piscataqua, to Piscataqua, to Prescumpscot, to Casco Bay	n/a	Class B	No	1	n/a	No	No	See East Branch Piscataqua	Aqua n/a Monitoring for Statewide bacteria TMDL indicates this water attains bacteria standards 5/7/2015: Newly mapped, corrected length from 5.6 to 4.0 miles. Segment begins just below Woodville Road at biomonitoring station S-757. Class B stream only attained Class C biocriteria in 2004; resampling needed to confirm whether impairment exists.		No	n/a	No	No	See East Branch Piscataqua				
	East Branch Piscataqua River	Mainstem entering Piscataqua just upstream of confluence with Presumpscot River in Falmouth	Impaired Segment in Falmouth, Upper watershed includes: Cumberland, Yarmouth, North Yarmouth	Class B	No	3	High E. Coli levels Macroinvertebrates (potential)	No	Yes Threatened	2008 Watershed Survey			No	n/a	No	No	Outreach to Cumberland and Yarmouth for updated survey and Management Plan				
Piscataqua	Unnamed Trib to Piscataqua River, crosses Mountain Rd, I- 95 & Gray Rd	Flows to Piscataqua River	n/a	Class B	No	1	n/a	No	Yes Threatened	n/a	n/a	No	No	n/a	No	No	See Piscataqua				
	Piscataqua River	Tributary to Presumpscot River	Cumberland, Gray, Windham, North Yarmouth	Class B	No	2	High E. Coli levels Macroinvertebrates (potential)	No	Yes Threatened	2008 Watershed Survey	6/1/2012: New Category 3 listing for aquatic life use; biomonitoring station S-787 showed algae (periphyton) non-attainment in 2005 and Class C in 2010. Needs resampling. Category 2 for contact recreation due to TMDL monitoring data showing attainment of bacteria standards. Was included in statewide bacteria TMDL (approved 9/28/09). Met class C in 2010 2016: Applicable WQS attained; original basis for listing was incorrect 2016: Monitoring for Statewide bacteria TMDL indicates this water attains bacteria standards	No	No	n/a	No	No	Additional sampling needed				
Scitterygusset Creek Basin	Scitterygusset Creek	Flows to Presumpscot River to Casco Bay	n/a	Class B	No	1	n/a	No	Yes Threatened	n/a	n/a	No	No	n/a	Νο	No	Survey and Management Plan				



CUMBERLAND COUNTY SOIL & WATER CONSERVATION DISTRICT

Last Updated: 3/12/2018 Date Printed: 5/27/2020

Watershed Inventory

n of Falmouth T

OW	n of Fair	nouth						t Risk	ed				ased t Plan	n Fee an	n Fund	ТМІ	DLs
Basin	Waterbody / Watershed	Downstream / Receiving Waterbody	Other Municipalities in Watershed	State Classification	Impaired? (y/n)	Impairment Code	t Reason for Impairment	Lakes Most a OR	Urban Impair Stream	NPS Priority Watershed	Work Done & NPS Projects Completed	Classification Notes	Watershed-B Management	Compensatio Utilization Pla	Stormwater Compensatio	Needed	Completed
	Meader Brook	Flows to Presumpscot River to Casco Bay	Westbrook	Class B	No	1	n/a		No	No	n/a	n/a	No	No	n/a	No	No
Presumpscot River Basin	Presumpscot River	Casco Bay	Standish, Windham, Gorham Westbrook, Portland, and Falmouth before emptying into Casco Bay at Falmouth	, Class C	No	2	n/a	ſ	No	No	EPA Targetted Watershed Grant Completed Water quality monitoring completed by Presumpscot River Watch now Presumpscot Regional Land Trust Presumpscot River Youth Conservation Corps operated 2006- 2008	 2005: Habitat Restoration Inventory Summary Report 2005: Sources removed, pulping operation closed and Smelt Hill Dam has been breached. Bioassessment (2005) shows attainment of Class C dissolved oxygen and biocriteria (Class B biocriteria just above Smelt Hill dam site). 8/31/2006: State determines water quality standard is being met (Category 2) 6/12/2015: Corrected mapping in 2014 cycle, updated length from 6.9 to 8.4 miles. Also corrected spelling of dam from 'Sacarappa' to 'Saccarappa '. Segment delisted in 2006. Closure of pulp mill and breach of Smelt Hill Dam. Attainment of dissolved oxygen and biocriteria. 	No	No	n/a	No	Yes 1998 BOD TSS
Highland Lake/Mill Brook Basin	Highland Lake	Flows to Mill Brook, to Presumpscot River, to Casco Bay	, Windham	GPA	No	2	n/a	Y	Yes	Yes Threatened	 1999: WMP developed by CCSWCD 2003: 319 Phase I complete by CCSWCD 2005: Watershed Based Plan completed by DEP & CCSWCD 2008: 319 Phase II complete by CCSWCD 2010: 319 Phase III complete by CCSWCD 2010: 319 Phase III complete by CCSWCD 2018: NPS Watershed Survey completed by Highland Lake Association 2020: Updated WMP completed by CCSWCD 2020: Proposal submitted for Phase IV 319 Grant 	Listed as impaired from 1990-2010 due to decreased water clarity (decreased Secchi Disk readings)	Yes	n/a	No	No	Yes 2003 Phos.
۶	Chenery Brook	Flows to Mill Creek, to Norton Brook, to Casco Bay	, Cumberland	Class B	No	1	n/a	1	No	Yes Threatened	n/a	n/a	No	No	n/a	No	No
rton Brook Basi	Norton Brook	Tributary to Mill Creek/Casco Bay	Cumberland	Class B	No	3	Benthic- Macroinvertebrate Bioassessments (Streams) Macroinvertebrates (potential). Data is conflicting	r	No	Yes Threatened	n/a	Administrative error, conflicting data. More data required to support impaired assessment. Nonattainment of biocriteria in 2002 may be due to natural habitat effects; needs resampling	No	Νο	n/a	No	No
nery/No	Mill Creek	Flows to Norton Brook, to Casco Bay	, n/a	Class B	No	1	n/a	^	No	Yes Threatened	n/a	n/a	No	No	n/a	No	No
Cher	Mussell Cove	n/a	Cumberland	Class B	Threatened Priority Marine Waters	1	n/a	Γ	No	Yes Threatened	n/a	n/a	No	No	n/a	n/a	n/a



CUMBERLAND COUNTY SOIL & WATER CONSERVATION DISTRICT

Possible Next Steps
Survey and Management Plan
Need to pursue/are pursuing survey and management plans for impaired tributaries
Follow objectives of 2020 WMP Waiting to see if Phase IV 319 grant project is funded
Survey and Management Plan
Resolve data conflicts through further sampling
Resubmit to Maine Coastal Program for Management Plan
Survey and Management Plan
Survey and Management Plan

Last Updated: 3/12/2018 Date Printed: 5/27/2020



26	295 1				
Cu Co 35 MAIN	Imberland County Soil & Water Onservation District ST. SUITE 3 WINDHAM ME 04062	Notes:	72	Major Basin Stream / River Chenery / Norton Road Coastal Major Road Piscatagua Interstate	0 0.2 0.4 0.8 1.2 Miles
Watershed Falmouth,	ds and Waterbodies Maine	Location:Falmo	buth, ME	Presumpscot	Bridgton Poland Libbon Alia Bremen Denmark Casco Durbon Alia Bremen
Owner:	Falmouth, ME	Coordinates	NAD83 UTM Zone 19N	_	Hiram Sebago Gray Brunswick & Boothbau
Project:	ISWG Outreach 2018	Scale:	1 inch = 0.7 miles		Baldwin Standish Windham
Date:	2/13/2018	Sheet Size:	11" x 17"		Limington Gorham Portland
Drawn By: Damon Yakovleff		Data Sources: MEGIS, CCSWCD, ESRI.		Disclaimer- Datasets represented here	Hollis Buxton Scarborough
Reviewer:	Adam Sellick			accuracy by CCSWCD. This map is to be	Waterboro Saco Cape Elizabeth
Sheet #:	1 of 1]		used for planning and demonstration purposes only.	Sanford Biddeford

Document Path: G:\CCSWCD_GIS\Maps\County\CC Stream Classes\Falmouth\11x17 Falmouth Watershed Basemap.mxd

ATTACHMENTS TO

Strategic Watershed Plan

Falmouth, Maine |August 2021

APPENDIX B DATA: Reports and GIS

B.1 REPORTS

Reports prepared by Maine Department of Environmental Protection **B.2 GIS** Prepared by GPCOG **B.3 STRESSOR REPORT** Prepared by Maine Department of Environmental Protection **B.4 STREAM BARRIER REPORT: Scitterygusset Creek** Compiled by
Falmouth Watershed Characterization

Sources

Chenery Brook

Maine Department of Environmental Protection, Falmouth Stream Stressor Report, "Individual Watershed Reports" (Draft). 1/10/20

Maine Department of Environmental Protection, 2015 Turnpike Stream Screening (Falmouth)

Maine Department of Environmental Protection, 2017 Threatened Streams Review (Falmouth)

Maine Department of Environmental Protection Sampling Data – Collected 9/17/18 - See note in Chenery Brook file for this source. Is there a more appropriate title?

Hobbs Brook

Maine Department of Environmental Protection, Maine Statewide TMDL for NPS Pollution, "TMDL Summary - Hobbs Brook". June 2016.

See note in Hobbs Brook file for a source without a title. The header says MDEP Draft 3-9-20

Meader Brook

Maine Department of Environmental Protection, 2015 Turnpike Stream Screening (Falmouth)

Maine Department of Environmental Protection, 2017 Threatened Streams Review (Falmouth)

Mill Creek

Maine Department of Environmental Protection, Falmouth Stream Stressor Report, "Individual Watershed Reports" (Draft). 1/10/20

Maine Department of Environmental Protection, 2015 Turnpike Stream Screening (Falmouth)

Maine Department of Environmental Protection, 2017 Threatened Streams Review (Falmouth)

Maine Department of Environmental Protection Sampling Data – Collected 9/17/18

Minnow Brook

Maine Department of Environmental Protection, 2015 Turnpike Stream Screening (Falmouth)

Maine Department of Environmental Protection, 2017 Threatened Streams Review (Falmouth)

Mussel Cove

Maine Department of Environmental Protection, Falmouth Stream Stressor Report, "Individual Watershed Reports" (Draft). 1/10/20

Norton Brook

Maine Department of Environmental Protection, Biological Monitoring Program Aquatic Life Classification Attainment Report – 5/2/2007, 5/21/19

Maine Department of Environmental Protection, Falmouth Stream Stressor Report, "Individual Watershed Reports" (Draft). 1/10/20

Maine Department of Environmental Protection, Stressor Report: Norton Brook (Draft), 11/25/19

Maine Department of Environmental Protection, 2015 Turnpike Stream Screening (Falmouth)

Maine Department of Environmental Protection, 2017 Threatened Streams Review (Falmouth)

Maine Department of Environmental Protection Sampling Data Sampling Data – Collected 7/11/18

Piscataqua River

Maine Department of Environmental Protection, Biological Monitoring Program Aquatic Life Classification Attainment Report – 3/9/16

Maine Department of Environmental Protection (2009) "Nonpoint Source Management Program 2008 Annual Report" Document# DEPLW-0973

Maine Department of Environmental Protection, 2015 Turnpike Stream Screening (Falmouth)

Maine Department of Environmental Protection, 2017 Threatened Streams Review (Falmouth)

Piscataqua River – East Branch

Maine Department of Environmental Protection (2009) "Nonpoint Source Management Program 2008 Annual Report" Document# DEPLW-0973

Scitterygusset Creek

Maine Department of Environmental Protection, 2015 Turnpike Stream Screening (Falmouth)

Maine Department of Environmental Protection, 2017 Threatened Streams Review (Falmouth)

Maine Department of Environmental Protection Sampling Data Sampling Data – Collected 9/17/18

Webes Creek

Maine Department of Environmental Protection, Falmouth Stream Stressor Report, "Individual Watershed Reports" (Draft). 1/10/20

Maine Department of Environmental Protection Sampling Data Sampling Data – Collected 9/17/18

Woodard & Curran, Stormwater Management Plan. "Webes Creek Retrofit Site Location Map". (11/12)

Presumpscot River

Cumberland County Soil and Water Conservation District. "Presumpscot River Watershed Population Density". (1/18)

Levesque, V., Craig, M., and Engle, S. 2013. Land Conservation in the Lower Presumpscot River Watershed: Vision, Values and Priorities. Portland, Maine: Casco Bay Estuary Partnership.

Maine Department of Environmental Protection, "Presumpscot River – Presumpscot River Watch". (2017)

Maine Department of Environmental Protection, 2017 Threatened Streams Review (Falmouth)

All sites were analyzed using:

- Maine Department of Environmental Protection, Watershed Inventory Table Falmouth
- Maine Department of Environmental Protection MS4 UA Map
- Maine Geologic Survey Maps
- Stream Habitat Viewer
- Town of Falmouth MS4 Program SWMP
- Town of Falmouth GIS Map
- Web Soil Survey

STRATEGIC WATERSHED PLAN

Town of Falmouth | GPCOG = grantee for Maine Coastal Program

DATA LAYERS SUMMARY | CURRENT MAP LINK: <u>https://arcg.is/1SeiDG</u>

LAYER NAME	SOURCE	RATIONALE / POTENTIAL PAIRING	IMPORTANCE PROCESS / PROJECT
		BASEMAP ATTRIBUTES*	
*Falmouth Boundary	Maine Office of GIS	Identify municipal boundary, especially important when sharing a watershed	HIGH / HIGH
* NOTE:	See "DETAILED PARCELS" laye	er for additional attributes to add on zoomed in mapping	
		WATER RESOURCES	
*National Hydrography Dataset Catchments	DEP's water bureau, environmental assessment unit	NHD Catchment outlines	HIGH / HIGH
Maine Wetland Characterization	Provided by MEGIS, refined from NWI	Assigns a "value" to the wetland feature based on 6 attributes. Each attribute is either assigned a 0 or 1 score, meaning that the attribute is present or not present. <i>"WETCHAR contains attributes that represent a series of</i> <i>query results as applied to a subset of National Wetlands</i> <i>Inventory data. The dataset contains NWI polygons (open</i> <i>water removed, dissolved by NWI system) attributed Y or N</i> <i>to indicate proximity of the wetland on the landscape to</i> <i>known plant and animal habitat, flood zones, cultural</i> <i>features, hydrography and coastal features, and to indicate</i> <i>known wetland conditions of slope, emergent vegetation,</i> <i>acidity, and unconsolidated bottom. The items</i> <i>QFLOODFLOW, QSEDIMENT, QPLANT_ANI, QFINFISH,</i> <i>QSHELLFISH, QCULTURE represent queries and are coded</i> <i>with 1 to indicate that the wetland meets the criteria for</i> <i>the specific function and with 0 to indicate that it does not.</i> <i>The item TOTAL represents the total number of queries for</i> <i>which the wetland received a 1."</i>	MOD / MOD
*NHD Stream Subsets	MaineDEP	Provides some stream info as determined by NHD.	HIGH / HIGH
Maine Floodplains *MaineDEP Monitoring Sites	Falmouth	 A- Areas subject to a one percent or greater annual chance of flooding in any given year. Because detailed hydraulic analyses have not been performed on these areas, no base flood elevations are shown. AE- Areas subject to a one percent or greater annual chance of flooding in any given year. Base flood elevations are shown as derived from detailed hydraulic analyses (Zone AE is used on new and revised maps in place of Zones A1-A30). VE- Areas along coasts subject to a one percent or greater annual chance of flooding in any given year that include additional hazards associated with velocity wave action. Base flood elevations are shown as derived from detailed hydraulic analyses. (Zone VE is used on new and revised maps in place of Zones V1-V30.) X500- Areas of moderate flood hazard from the principal source of flood in the area, determined to be within the limits of one percent and 0.2 percent annual chance floodplain. (Shaded Zone X is used on new and revised maps in place of Zone B.) (EGAD) - Site Types (Threats to Groundwater and Environmental 	LOW / LOW
	MaineDEP	(EGAD) - Site Types (Threats to Groundwater and Environmental Monitoring) Selected records where SiteType = "RIVER/STREAM", "STREAM/RIVER BIOMONITORING, "LAKE/POND", or "WETLAND" (Other categories such as ESTUARINE may be relevant in other studies but there were none present in the study area)	חוטה / חוטה
MaineDEP Pollutant Discharge Elimination System Outfalls	MaineDEP	Identify any NPDES-permitted discharges, including POTWs, industrial and MS4 discharges IMPORTANT: only mapped outfall is the Town's POTW	MOD / LOW
swPump Station	Town of Falmouth	Used to calculate sewered areas of the watersheds	MOD / MOD
swGravity Main	Sewer Dept.		
swForce Main MaineDEP CSO	MaineDEP	Identify any combined sewer overflows that may be discharging	HIGH / LOW
	I		
General Zoning	Spatial Alternatives	Important to the next phase of the project, once grant funding is	LOW / LOW
		secured	
ShorelandZone	Town of Falmouth GIS Town of Falmouth GIS Further definition can be	Sec. 19-6 DistrictsOVRC- Ocean View Retirement CommunityWVOD- Water View Overlay District (regulate visual access)ARC- Avesta Retirement CommunityGC- Garden Center (As in Walmart Garden Center?)Route100- 1000' from Route 100Highland Lake- Highland Lake Conservation1. Resource Protection2. Limited Residential	MOD / MOD
	found in Sec. 19-99 of Town Ordinance	3. Limited Commercial	

APPENDIX B.2 Strategic Watershed Plan GIS DATA LAYERS

LAYER NAME	SOURCE	RATIONALE / POTENTIAL PAIRING	IMPORTANCE PROCESS / PROJECT
		4 Stream Protection	
*Current + Future Land Use	Town of Falmouth GIS	Provides info on forested land, protected forests, impervious surface	HIGH / HIGH
Maine Coastal Public Road Stream Barriers	NATURA The Nature Conservancy	AL RESOURCE CONSIDERATIONS Understand the level of stream (dis)connection of habitat and/or hydrology PAIRED: with subwatershed boundary → # of barriers per watershed or per linear foot or mile	MOD / MOD
Maine Riparian Habitat	Beginning with Habitat	Riparian buffers, combined Streams and Stream ponds (75ft) and Great Ponds and Coastal Rivers (250ft). https://beginningwithhabitat.org/the_maps/gis_data_request.html	MOD / MOD
*Crossing and Barriers	Maine Stream Habitat Viewer	These layers provide information about surveyed stream crossings, dams and natural features that can act as barriers to the movements of native fish and wildlife between important aquatic habitats. Barriers also can block natural stream processes necessary to create and maintain habitat, like delivery of sediment, nutrients, organic material and also tidal flow. Barriers can also block the expansion of invasive species, but barrier removal to restore native fisheries and habitat most often takes precedence over concerns about the spread of invasive species	HIGH / HIGH
Crossings	Maine Stream Habitat Viewer	These data were collected at public road, trail and railroad crossings in select watersheds starting in 2007. Data for crossings on private roads are not provided by the Stream Habitat Viewer without the express approval of the landowner. A wide range of cooperating organizations used survey methods developed by the U.S. Fish and Wildlife Service Gulf of Maine Coastal Program and its partners and were supported by funding from state, federal and nongovernment organizations. Descriptions of the legend categories are:	See Crossing and Barriers above
		 Barrier: The crossing has physical factors that significantly restrict upstream passage of aquatic organisms and fishes, such as perching above the stream surface, as well as downstream movement of materials that create and maintain habitat. Potential Barrier: The barrier has physical factors that likely limit upstream passage of various aquatic organisms and downstream movement of materials that create and maintain habitat. The crossing shows signs of excessive current velocities, like scour. Excessive velocities can block fish and wildlife passage and are frequently caused or exacerbated by undersized culverts. No Barrier: neither of the above conditions was observed at the crossing. Unknown: survey crew could not access these sites. 	
Dams	Maine Stream Habitat Viewer	 These data were compiled by the US Fish and Wildlife Service Gulf of Maine Coastal Program from field surveys and from the Maine Department of Environmental Protection's dam database. Note that many dams have not yet been mapped and do not appear in this database. For some dams, not all attribute data (e.g. alewife acres blocked) are available. Descriptions of the legend categories are: Barrier: the dam blocks most if not all passage of fish and wildlife and their access to habitat that supports key phases of their life cycle. Potential Barrier: the dam blocks some species while others may achieve passage during some flows where fishways have been installed or where the dam is partially breached. Fishways are designed for passage of a narrow range of species and often do not allow passage at all flows. 	See Crossing and Barriers above
Natural Barriers	Maine Stream Habitat Viewer	 Data describing locations of barriers caused by bedrock features and beaver dams were collected in field surveys or compiled by fisheries biologists of the Maine Department of Inland Fisheries and Wildlife. This dataset may be the most incomplete of those in the Stream Habitat Viewer and for the first three legend categories, it includes determinations of fish passability that may not represent a consensus of fish biologists in Maine. Descriptions of categories are: Barrier: the feature blocks most if not all passage of fish and wildlife. 	See Crossing and Barriers above

LAYER NAME	SOURCE	RATIONALE / POTENTIAL PAIRING	IMPORTANCE PROCESS / PROJECT
		 Potential Barrier: the feature blocks some species while others may achieve passage. 	
Impassable Waterfalls	Maine Stream Habitat Viewer	Data describing locations of waterfalls that block most if not all passage of fish and aquatic wildlife and where no records indicate passage was historically possible. Data were collected during field surveys or compiled by fisheries biologists of the Maine Department of Inland Fisheries and Wildlife and Maine Department of Marine Resources. This dataset is not complete, but represents the opinion of state biologists.	See Crossing and Barriers above
		DETAILED PARCELS	
FalmouthTaxParcels2018	Town of Falmouth GIS		MOD / MOD
Maine Elevation Contours 2 feet	Town of Falmouth GIS		MOD / LOW
MGS LIDAR Hillshade	Maine Office of GIS		MOD / LOW

Falmouth Stream Stressor Report Study Watersheds Summary – Mussel Cove Tributaries

DEP conducted additional surveying, monitoring and assessment of several streams in Falmouth – Norton Brook, Webes Creek, Chenery Brook and Mill Creek. These stream watersheds are in Falmouth's high growth coastal area and drain to Mussel Cove. These streams were chosen for additional study due to their location in an area with continuing development pressure, and the likelihood of threat to stream health. Scitterygusset Creek and Hobbs Brook were also surveyed and monitored by DEP in 2019 and results will be provided in the larger stressor report. Following is a summary of the monitoring and assessment of the streams which drain to Mussel Cove. Detailed information of the study methods and findings are available in the Section "Individual Watershed Reports."



Desktop Assessment Summary

DEP conducted a GIS desktop analysis to determine the characteristics of each study stream and its watershed, including stream length, watershed size, percent impervious cover and stream channel gradient. See Table 1 for summary characteristics. Overall, the streams are low gradient, with the exception of portions of Mill Creek. The streams have varying lengths, watershed sizes and impervious cover. Norton Brook and Webes Creek have impervious cover percentages over the 10% threshold when watersheds show signs of stress. The Norton Brook watershed has seen the greatest increase in percent impervious cover since 2004, expanding from 9% to 16%. Webes Creek continues to have a very high percent impervious cover at 35%.

Stream	Length (miles)	Watershed Size (acres)	Impervious 2004	npervious Cover (%) 2004 2018 Stream Gradien	
Norton Brook	2.0	510	9%	16%	Low gradient (0.6%-1.1%)
Webes Creek	0.7	337	29%	35%	Low gradient (0.18%-1.12%)
Chenery Brook	4.0	1300	7%	8%	Low gradient (0.25%-1.3%)
Mill Creek	3.7	3485	5%	6%	Varied (0.1%-7.3%)

Table 1. Study Stream Characteristics



Survey and Monitoring Locations Falmouth Study Watersheds

Field Surveying and Monitoring Methods

DEP deployed continuous monitoring devices (recording readings every 15 minutes) for temperature, dissolved oxygen and specific conductance in Norton Brook for several weeks during the summer in 2017. In 2019, DEP deployed these devices in Webes Creek, Mill Creek and Chenery Brook.

Falmouth Stream Stressor Report Study Watersheds Summary

Comprehensive stream walks were conducted on Norton Brook in 2018 and Webes Creek in 2019. These surveys consisted of walking most of the stream, documenting stream habitat, form and function conditions, taking instantaneous temperature, dissolved oxygen and specific conductance readings, and taking photos.

Screening surveys at stream crossings and in accessible sections of stream were conducted on Chenery Brook and Mill Creek in 2019. These surveys focused on habitat, form and function conditions and conductivity readings.

DEP deployed and retrieved macroinvertebrate rock bags in Norton Brook during the summer of 2017 and in Mill Creek and Chenery Brook in 2019.

See Table 2 for a summary of DEP study stream monitoring of Mussel Cove tributaries.



Stream	Continuous Water Quality Monitor	Instantaneous Readings	Macroinvertebrate Rock Bag Sampling
Norton Brook	2017 – Temp, DO, SPC	2018 stream walk – Temp, DO, SPC	2002, 2017
Webes Creek	2019 – Temp, DO, SPC	2019 stream walk – Temp, DO, SPC	(2019 samples not analyzed since buried at retrieval)
Chenery Brook	2019 – Temp, DO, SPC	N/A	2019
Mill Creek	2019 – Temp, DO, SPC	N/A	2019

Table 2. Water Quality Monitoring Summary Table

Survey and Monitoring Results Summary

DEP analyzed the stream temperature, dissolved oxygen and specific conductance data collected for each of the study streams. Riparian and habitat condition was determined for locations visited during the stream surveys, supplemented with information from available aerial photographs. Results are summarized in Table 3 below.

Dissolved oxygen readings at Norton Brook and Webes Creek during the study period were not of concern. Mill Creek had low dissolved oxygen (diurnally to below 5 ppm, with one instance as low as 3.5 ppm) during times of low flow. Chenery Brook had dissolved oxygen swings of 2.0 to 3.5 ppm, indicating the low nighttime dissolved oxygen was a result of algal respiration from significant algal production.

Specific conductance is a proxy for chloride and when high during low flow conditions indicates contamination of groundwater. During the dry weather study period, Webes Creek had high specific conductivity readings (swings between 700 μ s and 1200 μ s, and short-term spikes as high as 2,600 μ s). Specific conductance was low in Mill Creek (maximum of 320 μ s) and moderately low (400 μ s to 500 μ s) in Chenery Brook. In Norton Brook, specific conductance was moderately low at the continuous monitoring site (average 486 μ s) but high readings (1250 μ s, 830 μ s) were recorded at different locations during the stream walks, indicating portions of the groundwater sources are contaminated.



For much of the time that continuous monitors were deployed, temperatures in Chenery Brook were

moderately high during the daytime (exceeding 20°C, with spikes over 24°C) at the monitoring location. Overall temperatures were good at the other study streams, though Webes Creek was found to be periodically warm (up to 22 °C) during storm events and Mill Creek was warm (up to 23 °C) during times of high air temperature and low flow.

The condition of most of the riparian corridor of the study streams is generally natural and is either forested, shrub-scrub, meadow floodplain, or invasive plants. Exceptions are road crossings and areas were development encroaches.

Instream habitat is in good shape and mostly natural for much of the nontidal portions of Mill Creek. Sand substrate is not stable and is likely altered during large runoff events in Norton Brook and Webes Creek. Chenery Brook has very little habitat variation. Low flows during dry periods are of concern for all the streams.

The 2019 macroinvertebrate sampling results of Mill Creek and Chenery Brook are not available at the time of this report. The rock bags deployed at Webes Creek could not be analyzed since they were buried in the sandy substrate at retrieval. This extreme movement of sand however suggests that the community is likely impaired. Norton Brook macroinvertebrate sampling in 2002 and 2017 did not meet Class B standards, indicating they are impaired.

Stream	Dissolved Oxygen	Specific Conductance	Temperature	Riparian Condition	Habitat Condition	Biological Condition
Norton Brook	Good	At risk: Moderately low, with high locations	Good	Mostly forested	Unstable substrate	Did not meet Class B standards (2002 & 2017)
Webes Creek	Good	High	Periodically warm with storm events	Mostly shrub-scrub and invasive plants	Unstable substrate	Likely impaired
Chenery Brook	Diurnal swings	Moderately low	Warm	Forested, shrub-scrub, meadow floodplain	Lack of habitat variation	Unknown (2019 samples TBD)
Mill Creek	Low at times of low flow	Low	Generally good, though fluctuates with air temperature during low flow	Mostly forested	Mostly Natural	Unknown (2019 samples TBD)

Table 3. Survey and Monitoring Results Summary Table

Stream Stressors Summary

Using the watershed characterization, survey information and monitoring data, DEP conducted a preliminary assessment to determine the likely current and potential future stressors to the biological community, as well as their impact to the Mussel Cove ecosystem. See Table 4 for a summary of the stream stressors, and the "Individual Watershed Reports" section for discussion of each stressor and stream.



Stream	Current Stressors	Potential Future Stressors	Impact to Mussel Cove
Norton Brook	 Frequent disturbance of substrate Very low baseflow 	 Baseflow chloride toxicity 	 Possible nitrogen source
Webes Creek	 Frequent disturbance of substrate Baseflow chloride toxicity Very low baseflow Likely nutrient, heavy metals, and hydrocarbons 	 Increase of current stressors 	 Possible nitrogen source Possible heavy metal, hydrocarbon source
Mill Creek	 Very low baseflow Diurnally low dissolved oxygen 	 Baseflow chloride toxicity 	 Possible nitrogen source
Chenery Brook	 Lack of habitat and flow diversity Low baseflow velocities 	 Diurnally depressed dissolved oxygen Baseflow chloride toxicity Frequent disturbance of substrate 	 Possible nitrogen source

Table 4. Stream Stressors Summary Table

Management Implications Summary

DEP considered each individual streams' current stressors and likely future stressors due to watershed land use and zoning. Using this information, DEP identified which types of land use, activities or conditions should be prioritized for each watershed (see Table 5). The appropriate types of management strategies were then identified for each streams' major stressors and land use (see Tables 6 & 7). Management strategies included stormwater management, resource protection and restoration, and further monitoring.

Table 5. Potential Future Land Use Threats

Stream	Concentrated impervious areas	Salted parking lots	Nutrient runoff from agriculture	Concentrated runoff from high density residential development
Norton Brook	Х	Х		
Webes Creek	Х	Х		
Chenery Brook	X	Х	X	Х
Mill Creek	Х	Х	Х	Х

Stream	Stormwater Ma	Stormwater Management							
	Concentrated impervious area runoff strategies: provide secure runoff storage	Salt impact reduction strategies: design to minimize salt need; infiltrate salt-free runoff	Commercial nitrogen runoff strategies: use effective N- removal BMPs; minimize fertilizer use	Residential runoff strategies: design to encourage unconcentrated flow; protect natural drainageways	Agricultural runoff strategies: incorporate manure management; runoff to natural buffers; minimize soil loss				
Norton Brook	Х	Х	Х	Х					
Webes Creek	Х	Х	Х	Х					
Chenery Brook	(X)	(X)	(X)	Х	Х				
Mill Creek	(X)	(X)	(X)	Х	Х				

Table 6. Stormwater Management Strategies to Address Stream Stressors

(X) = If zoning is altered to allow significant development of this type, these practices should be considered.

Table 7. Additional Management Strategies to Address Stream Stressors

Stream	Resource Protection and Restoration		Further Assessment Needs			
	Protect riparian corridor, including tributaries	Instream habitat enhancement	Fluvial geomorphological assessment	Culvert evaluation	Stormwater infrastructure assessment	Biological and/or Water quality monitoring
Norton Brook	Х	Х	Х	Х	Х	Х
Webes Creek	Х	Х	Х		Х	Х
Chenery Brook	Х	Х				(X)
Mill Creek	Х					(X)

(X) = Conduct monitoring as needed after macroinvertebrate sample results are available, and/or as conditions change due to new development in the watershed.

SUMMARY OF STREAM BARRIERS: SCITTERYGUSSETT CREEK

Lunt Road Crossing

Crossings and Barriers: Crossings Site ID: 8735 Crossing Type: Culvert Crossing Class: Potential Barrier Survey Date: 07/16/2009

Stream: Scitterygusset Creek Town: Falmouth County: Cumberland **Road: Lunt Rd**

<u>Photos</u> <u>Inlet Outlet</u> <u>Upstream</u>

Detailed Stream Crossing Information Latitude: 43.72364 Longitude: -70.24138 Road Type: Paved Road Class: State Number Of Culverts: 1 Crossing Condition: No data

Crossing Condition: No data Structure Type: Round Culvert Material: Plastic Inlet Grade: At Stream Grade Inlet Width (ft): 4.40 Inlet Water Depth (ft): 0.12 Inlet Height (ft): 4.16 Crossing Length (ft): 72.18 **Outlet Grade: At Stream Grade** Outlet Width (ft): 4.04 Outlet Water Depth (ft): 0.43 Outlet Drop (ft): -1.00 Outlet Height (ft): 4.43 Structure Substrate Matches Stream: None

Inlet

Physical Barriers: None Physical Barrier Severity: None Road Fill Height (ft): -1.00 Total Opening Width (ft): 4.00 Area of Opening (sq ft): 14.10 Estimated Bankfull Width (ft): 8.70 Upstream Blocked Miles: 0.07 **Upstream Total Miles: 1.49 Upstream Barriers: 10 Downstream Barriers: 0**

Potential Effects of this Crossing Atlantic Salmon Modeled 100 sq m Habitat Units Blocked: -1.00 Alewife Pond Acres Blocked: -1.00 Wild Eastern Brook Trout Habitat: Unknown Rainbow Smelt Habitat: Yes **Tidal Marsh: Yes**

Other Habitat Considerations Beginning with Habitat Connectors: No data Threatened Endangered or Rare Species: No data Non-Native Fish: Documented Downstream **Tidal Waterfowl & Wading Bird Habitat: Yes** Inland Waterfowl & Wading Bird Habitat: No data Beginning with Habitat Focus Area: No data

Figure 2 (BELOW): Upstream of Lunt Rd Xing







INSERTED COMMENT: There is likely another stream barrier between this first mapped culvert (Lunt Road) and Dam #1 since there are 10 barriers upstream of Lunt Rd, but only 8 upstream barriers from this Dam and 2 downstream barriers (but only Lunt Road is listed as a barrier below Dam #1 in the Stream Habitat Viewer).

SCITTERYGUSSETT CREEK - DAM #1

Crossings and Barriers: Dams

Site ID: D0445 Dam Name: Unknown **Barrier Class: Barrier** Survey Date: Stream: Scitteryqusset Brook Town: Falmouth County: Cumberland Latitude: 43.72457 Longitude: -70.24102 Spillway Height (ft): 2.00 Spillway Length (ft): 2.00 Structure Height (ft): -1.00 Structure Length (ft): -1.00 Primary Material: Concrete Breach: Partial Fishway: none Fishway Condition: No data Upstream Blocked Miles: 0.17 **Upstream Barriers: 8 Downstream Barriers: 2**

Habitats Related to this Dam Atlantic Salmon Modeled 100 sq m Habitat Units Blocked: -1.00 Alewife Pond Acres Blocked: 0.00 Wild Eastern Brook Trout Habitat: No data Rainbow Smelt Habitat: Yes Tidal Marsh: No data

Other Habitat Considerations Beginning with Habitat Connectors: No data Threatened Endangered or Rare Species: No data Non-Native Fish: No data Tidal Waterfowl & Wading Bird Habitat: No data Inland Waterfowl & Wading Bird Habitat: No data Beginning with Habitat Focus Area: No data

<u>Watersheds</u> HUC 12 Subwatershed Name: Highland Lake-Lower Presumpscot River HUC 10 Watershed Name: Presumpscot River HUC 8 Sub-basin Name: Presumpscot HUC 6 Basin Name: Saco

Comments: Added by AA, 12/12/13 from orthophotos; measurements estimated from photos ScitterygussetBrook



Figure 4: Dam #1 Downstream Face



Figure 5: Dam #1 Upstream

SCITTERYGUSSETT CREEK – I-295 Crossing

Crossings and Barriers: Crossings Site ID: 8288 Crossing Type: Culvert Crossing Class: Potential Barrier Survey Date: 09/14/2009

Stream: Scitterygusset Creek Town: Falmouth County: Cumberland **Road: I-295**

<u>Photos</u> Inlet Upstream

Detailed Stream Crossing Information Latitude: 43.72647 Longitude: -70.23983 Road Type: Paved Road Class: State Number Of Culverts: 1 Crossing Condition: No data Structure Type: Box Culvert Material: Concrete Inlet Grade: At Stream Grade Inlet Width (ft): 4.99 Inlet Water Depth (ft): 0.01 Inlet Height (ft): 5.03 Crossing Length (ft): 200.13 **Outlet Grade: No data** Outlet Width (ft): -1.00 Outlet Water Depth (ft): -1.00 Outlet Drop (ft): -1.00 Outlet Height (ft): 5.03 Structure Substrate Matches Stream: None Physical Barriers: None Physical Barrier Severity: None Road Fill Height (ft): -1.00 Total Opening Width (ft): 5.00 Area of Opening (sq ft): 25.10 Estimated Bankfull Width (ft): 7.90 Upstream Blocked Miles: 0.23 **Upstream Total Miles: 1.24 Upstream Barriers: 7 Downstream Barriers: 3**

Potential Effects of this Crossing Atlantic Salmon Modeled 100 sq m Habitat Units Blocked: -1.00 Alewife Pond Acres Blocked: -1.00 Wild Eastern Brook Trout Habitat: Unknown Rainbow Smelt Habitat: No data Tidal Marsh: No data INSERTED COMMENT: should be "NO" since Dam #1 would impedetidal influence

Other Habitat Considerations

Beginning with Habitat Connectors: No data Threatened Endangered or Rare Species: No data Non-Native Fish: No data Tidal Waterfowl & Wading Bird Habitat: No data Inland Waterfowl & Wading Bird Habitat: No data Beginning with Habitat Focus Area: No data

Watersheds



Figure 6: I-295 Crossing Inlet



Figure 7: Upstream of I-295 Xing

SCITTERYGUSSETT CREEK – Bucknam Road Crossing

Crossings and Barriers: Crossings Site ID: 8455 Crossing Type: Multiple Culvert **Crossing Class: Potential Barrier** Survey Date: 07/16/2009 Stream: Scitterygusset Creek Town: Falmouth County: Cumberland **Road: Bucknam Rd**

Photos Downstream Inlet Outlet Upstream

Detailed Stream Crossing Information Latitude: 43.72932 Longitude: -70.24062 Road Type: Paved Road Class: State Number Of Culverts: 2 Crossing Condition: No data Structure Type: Round Culvert Material: Metal Inlet Grade: At Stream Grade Inlet Width (ft): 3.02 Inlet Water Depth (ft): 0.10 Inlet Height (ft): 2.86 Crossing Length (ft): 53.15 **Outlet Grade: At Stream Grade** Outlet Width (ft): 3.02 Outlet Water Depth (ft): 0.26 Outlet Drop (ft): -1.00 Outlet Height (ft): 3.05 Structure Substrate Matches Stream: None Physical Barriers: None Physical Barrier Severity: None Road Fill Height (ft): -1.00 Total Opening Width (ft): 6.00 Area of Opening (sq ft): 14.30 Estimated Bankfull Width (ft): 7.90 Upstream Blocked Miles: 0.04 **Upstream Total Miles: 1.01 Upstream Barriers: 6 Downstream Barriers: 4**

Potential Effects of this Crossing Atlantic Salmon Modeled 100 sq m Habitat Units Blocked: -1.00 Alewife Pond Acres Blocked: -1.00 Wild Eastern Brook Trout Habitat: Unknown Rainbow Smelt Habitat: No data Tidal Marsh: No data (INSERTED COMMENT: should be "NO" as per previous comment above)

Other Habitat Considerations

Beginning with Habitat Connectors: No data Threatened Endangered or Rare Species: No data Non-Native Fish: No data Tidal Waterfowl & Wading Bird Habitat: No data Inland Waterfowl & Wading Bird Habitat: No data Beginning with Habitat Focus Area: No data

Watersheds



Figure 8: Downstream of Bucknam Rd Xing



Figure 9: Bucknam Rd Inlet



SCITTERYGUSSETT CREEK – Middle Road Crossing

Crossings and Barriers: Crossings Site ID: 8287

Crossing Type: Multiple Culvert

Crossing Class: Potential Barrier

Survey Date: 07/16/2009 Stream: Scitterygusset Creek Town: Falmouth County: Cumberland **Road: Middle Rd**

Photos

Downstream Inlet Outlet Upstream

Detailed Stream Crossing Information Latitude: 43.72990 Longitude: -70.24151 Road Type: Paved Road Class: State Number Of Culverts: 3 Crossing Condition: Rust Structure Type: Round Culvert Material: Metal Inlet Grade: At Stream Grade Inlet Width (ft): 2.69 Inlet Water Depth (ft): 0.19 Inlet Height (ft): 2.22 Crossing Length (ft): 67.26 **Outlet Grade: At Stream Grade** Outlet Width (ft): 2.56

Outlet Width (ft): 2.56 Outlet Water Depth (ft): 0.36 Outlet Drop (ft): -1.00 Outlet Height (ft): 2.59 Structure Substrate Matches Stream: None Physical Barriers: None Physical Barrier Severity: None Road Fill Height (ft): -1.00 Total Opening Width (ft): 7.90 Area of Opening (sq ft): 16.30 Estimated Bankfull Width (ft): 7.90 Upstream Blocked Miles: 0.08 **Upstream Total Miles: 0.97 Upstream Barriers: 5 Downstream Barriers: 5**

Potential Effects of this Crossing Atlantic Salmon Modeled 100 sq m Habitat Units Blocked: -1.00 Alewife Pond Acres Blocked: -1.00 Wild Eastern Brook Trout Habitat: Unknown Rainbow Smelt Habitat: No data Tidal Marsh: No data (NO)

Other Habitat Considerations

Beginning with Habitat Connectors: No data Threatened Endangered or Rare Species: No data Non-Native Fish: No data Tidal Waterfowl & Wading Bird Habitat: No data Inland Waterfowl & Wading Bird Habitat: No data Beginning with Habitat Focus Area: No data

Watersheds



Figure 12: Downstream of Middle Rd Xing



Figure 13: Inlet of Middle Rd Xing



Figure 14: Outlet of Middle Rd Crossing



Figure 15: Upstream of Middle Rd Crossing

Crossings and Barriers: Crossings Site ID: 8774

Crossing Type: Multiple Culvert Crossing Class: Potential Barrier Survey Date: 07/16/2009

Stream: Scitterygusset Creek Town: Falmouth County: Cumberland **Road: Mitchwood Rd**

<u>Photos</u>

Downstream Inlet Outlet Upstream

Detailed Stream Crossing Information Latitude: 43.73085 Longitude: -70.24186 Road Type: Paved **Road Class: Town** Number Of Culverts: 2 Crossing Condition: No data Structure Type: Round Culvert Material: Concrete Inlet Grade: At Stream Grade Inlet Width (ft): 2.62 Inlet Water Depth (ft): 0.30 Inlet Height (ft): 2.10 Crossing Length (ft): 49.54 **Outlet Grade: At Stream Grade** Outlet Width (ft): 2.69 Outlet Water Depth (ft): 1.51 Outlet Drop (ft): -1.00 Outlet Height (ft): 2.72 Structure Substrate Matches Stream: None Physical Barriers: None Physical Barrier Severity: None Road Fill Height (ft): -1.00 Total Opening Width (ft): 5.40 Area of Opening (sq ft): 11.40 Estimated Bankfull Width (ft): 7.90 Upstream Blocked Miles: 0.08 **Upstream Total Miles: 0.90 Upstream Barriers: 4 Downstream Barriers: 6**

Potential Effects of this Crossing Atlantic Salmon Modeled 100 sq m Habitat Units Blocked: -1.00 Alewife Pond Acres Blocked: -1.00 Wild Eastern Brook Trout Habitat: Unknown Rainbow Smelt Habitat: No data Tidal Marsh: No data

Other Habitat Considerations Beginning with Habitat Connectors: No data Threatened Endangered or Rare Species: No data Non-Native Fish: No data Tidal Waterfowl & Wading Bird Habitat: No data Inland Waterfowl & Wading Bird Habitat: No data Beginning with Habitat Focus Area: No data

Watersheds



Figure 16: Downstream of Mitchellwood Drive Crossing



Figure 17: Inlet of Mitchellwood Drive crossing



Figure 18: outlet of Mitchellwood Drive Xing



Figure 19: Upstream of Mitchellwood Drive Xing

SCITTERYGUSSETT CREEK – Scittery Gussett Drive Crossing

Crossings and Barriers: Crossings

Site ID: 8773 Crossing Type: Culvert Crossing Class: Potential Barrier

Survey Date: 07/16/2009 Stream: Scitterygusset Creek Town: Falmouth County: Cumberland Road: Scittery Gusset Lane

<u>Photos</u>

Downstream Inlet Outlet Upstream

Detailed Stream Crossing Information Latitude: 43.73182 Longitude: -70.24093 Road Type: Paved Road Class: Town Number Of Culverts: 1 Crossing Condition: No data Structure Type: Pipe Arch/Elliptical Culvert Material: Metal Inlet Grade: At Stream Grade Inlet Width (ft): 5.84 Inlet Water Depth (ft): 0.45 Inlet Height (ft): 3.57 Crossing Length (ft): 67.91 **Outlet Grade: At Stream Grade** Outlet Width (ft): 6.50 Outlet Water Depth (ft): 1.54 Outlet Drop (ft): -1.00 Outlet Height (ft): 3.77 Structure Substrate Matches Stream: Comparable Physical Barriers: None Physical Barrier Severity: None Road Fill Height (ft): -1.00 Total Opening Width (ft): 5.80 Area of Opening (sq ft): 19.20 Estimated Bankfull Width (ft): 7.90 **Upstream Blocked Miles: 0.22 Upstream Total Miles: 0.82 Upstream Barriers: 3 Downstream Barriers: 7**

Potential Effects of this Crossing Atlantic Salmon Modeled 100 sq m Habitat Units Blocked: -1.00 Alewife Pond Acres Blocked: -1.00 Wild Eastern Brook Trout Habitat: Unknown Rainbow Smelt Habitat: No data Tidal Marsh: No data

Other Habitat Considerations

Beginning with Habitat Connectors: No data Threatened Endangered or Rare Species: No data Non-Native Fish: No data Tidal Waterfowl & Wading Bird Habitat: No data Inland Waterfowl & Wading Bird Habitat: No data Beginning with Habitat Focus Area: No data

Watersheds



Figure 20: Downstream of Scittery Gussett Ln Xing



Figure 21: Inlet of Scittery Gussett Dr Xing



Figure 22: Outlett of Scittery Gussett Dr Xing



Figure 23: Upstream of Scittery Gussett Dr Xing

Crossings and Barriers: Crossings Site ID: 8516

Crossing Type: Culvert Crossing Class: Barrier

Survey Date: 09/10/2009

Stream: Scitterygusset Creek Town: Falmouth County: Cumberland Road: I-95

<u>Photos</u> <u>Downstream</u> <u>Inlet</u> <u>Outlet</u> <u>Upstream</u>

Detailed Stream Crossing Information Latitude: 43.73422 Longitude: -70.24230 Road Type: Paved Road Class: State (MAINE TURNPIKE AUTHORITY) Number Of Culverts: 1

Crossing Condition: No data (REQUEST OR LOOK UP IN MTA'S ANNUAL INSPECTION REPORT)

Structure Type: Round Culvert

Material: Concrete Inlet Grade: At Stream Grade Inlet Width (ft): 4.27 Inlet Water Depth (ft): 0.03 Inlet Height (ft): 3.90 Crossing Length (ft): 180.45

Outlet Grade: Free Fall

Outlet Width (ft): 4.27 Outlet Water Depth (ft): 0.16 Outlet Drop (ft): 0.33 Outlet Height (ft): 3.93 Structure Substrate Matches Stream: None Physical Barriers: None Physical Barrier Severity: None Road Fill Height (ft): -1.00 Total Opening Width (ft): 4.30 Area of Opening (sq ft): 13.20 Estimated Bankfull Width (ft): 7.90 **Upstream Blocked Miles: 0.19 Upstream Total Miles: 0.60 Upstream Barriers: 2 Downstream Barriers: 8**

Potential Effects of this Crossing Atlantic Salmon Modeled 100 sq m Habitat Units Blocked: -1.00 Alewife Pond Acres Blocked: -1.00 Wild Eastern Brook Trout Habitat: Unknown Rainbow Smelt Habitat: No data Tidal Marsh: No data (SHOULD BE NO)

Other Habitat Considerations

Beginning with Habitat Connectors: No data Threatened Endangered or Rare Species: No data Non-Native Fish: No data Tidal Waterfowl & Wading Bird Habitat: No data Inland Waterfowl & Wading Bird Habitat: No data Beginning with Habitat Focus Area: No data

Watersheds



Figure 24: Downstream of Falmouth Spur Xing



Figure 25: Inlet of Falmouth Spur Xing



Figure 26: outlet of Falmouth Spur Xing



Figure 27: Upstream of Falmouth Spur Xing

INSERTED COMMENT: Woods Rd crosses Scitterygussett Creek twice; this is lower/downstream crossing

SCITTERYGUSSETT CREEK – Lower Woods Road Crossing

Crossings and Barriers: Crossings

Site ID: 8717 Crossing Type: Culvert

Crossing Class: Potential Barrier

Survey Date: 07/16/2009 Stream: Scitterygusset Creek Town: Falmouth County: Cumberland **Road: Woods Rd**

<u>Photos</u> <u>Downstream</u> <u>Inlet</u> <u>Outlet</u> <u>Upstream</u>

Detailed Stream Crossing Information Latitude: 43.73602 Longitude: -70.24487 Road Type: Paved **Road Class: Town** Number Of Culverts: 1 Crossing Condition: No data Structure Type: Round Culvert Material: Concrete Inlet Grade: At Stream Grade Inlet Width (ft): 3.05 Inlet Water Depth (ft): 0.03 Inlet Height (ft): 2.95 Crossing Length (ft): 57.41 **Outlet Grade: At Stream Grade** Outlet Width (ft): 3.08 Outlet Water Depth (ft): 0.23 Outlet Drop (ft): -1.00 Outlet Height (ft): 2.99 Structure Substrate Matches Stream: None Physical Barriers: None Physical Barrier Severity: None Road Fill Height (ft): -1.00 Total Opening Width (ft): 3.10 Area of Opening (sq ft): 7.40 Estimated Bankfull Width (ft): 7.90 **Upstream Blocked Miles: 0.10 Upstream Total Miles: 0.41 Upstream Barriers: 1 Downstream Barriers: 9**

Potential Effects of this Crossing Atlantic Salmon Modeled 100 sq m Habitat Units Blocked: -1.00 Alewife Pond Acres Blocked: -1.00 Wild Eastern Brook Trout Habitat: Unknown Rainbow Smelt Habitat: No data Tidal Marsh: No data (SHOULD BE "NO")

<u>Other Habitat Considerations</u> Beginning with Habitat Connectors: Yes Threatened Endangered or Rare Species: No data Non-Native Fish: No data Tidal Waterfowl & Wading Bird Habitat: No data Inland Waterfowl & Wading Bird Habitat: No data Beginning with Habitat Focus Area: No data


Figure 28: Downstream of lower Woods Rd Xing



Figure 29: Inlet of lower Woods Rd Xing



Figure 30: Outlet of lower Woods Rd Xing



Figure 31: Upstream of lower Woods Rd Xing

INSERTED COMMENT: Woods Rd crosses Scitterygussett Creek twice; this is upper/upstream crossing

SCITTERYGUSSETT CREEK – Upper Woods Road Crossing

Crossings and Barriers: Crossings Site ID: 8716 Crossing Type: Multiple Culvert Crossing Class: Potential Barrier

Survey Date: 07/16/2009 Stream: Scitterygusset Creek Town: Falmouth County: Cumberland **Road: Wood Rd**

<u>Photos</u> <u>Downstream</u> <u>Inlet</u> <u>Outlet</u> <u>Upstream</u>

Detailed Stream Crossing Information Latitude: 43.73686 Longitude: -70.24598 Road Type: Paved **Road Class: Town** Number Of Culverts: 2 Crossing Condition: No data Structure Type: Round Culvert Material: Plastic Inlet Grade: At Stream Grade Inlet Width (ft): 2.03 Inlet Water Depth (ft): 0.07 Inlet Height (ft): 2.04 Crossing Length (ft): 59.38 **Outlet Grade: At Stream Grade** Outlet Width (ft): 2.03 Outlet Water Depth (ft): 0.26 Outlet Drop (ft): -1.00 Outlet Height (ft): 2.23 Structure Substrate Matches Stream: None Physical Barriers: None Physical Barrier Severity: None Road Fill Height (ft): -1.00 Total Opening Width (ft): 4.00 Area of Opening (sq ft): 6.40 Estimated Bankfull Width (ft): 7.90 **Upstream Blocked Miles: 0.31 Upstream Total Miles: 0.31 Upstream Barriers: 0 Downstream Barriers: 10**

Potential Effects of this Crossing Atlantic Salmon Modeled 100 sq m Habitat Units Blocked: -1.00 Alewife Pond Acres Blocked: -1.00 Wild Eastern Brook Trout Habitat: Unknown Rainbow Smelt Habitat: No data Tidal Marsh: No data NO

Other Habitat Considerations

Beginning with Habitat Connectors: Yes Threatened Endangered or Rare Species: No data Non-Native Fish: No data Tidal Waterfowl & Wading Bird Habitat: No data Inland Waterfowl & Wading Bird Habitat: No data Beginning with Habitat Focus Area: No data

Watersheds

HUC 12 Subwatershed Name: Highland Lake-Lower Presumpscot River HUC 10 Watershed Name: Presumpscot River HUC 8 Sub-basin Name: Presumpscot HUC 6 Basin Name: Saco



Figure 32: Downstream of upper Woods Rd Xing



Figure 33: Inlet of Upper Woods Rd Xing



Figure 34: Outlet of Upper Woods Rd Xing



Figure 35: Upstream of upper Woods Rd Xing

ATTACHMENTS TO

Strategic Watershed Plan

Falmouth, Maine | August 2021

APPENDIX C MCP GRANT APPLICATION



GREATER PORTLAND COUNCIL OF GOVERNMENTS

July 26, 2018

Ruta Dzenis AICP, Senior Planner DACF - Municipal Planning Assistance Program Harlow Building, Room 413 Augusta, ME 04333-0022

RE: Maine Coastal Communities Grant (CCG) Proposal

Dear Ms. Dzenis:

The Greater Portland Council of Governments (GPCOG) is excited to submit this Coastal Communities (CCG) grant application for your consideration. We are eager to build on past successes throughout our region and offer a regionally consistent approach to land use management with our neighboring coastal communities in Cumberland County and beyond.

The project will build upon Falmouth's CCG-funded project in 2013, *Route 1 Falmouth Commercial District Stormwater Management Plan* to protect Mussel Cove (a DEP-listed waterbody), as well as the 2017 *Casco Bay Community Guidebook* to support coastal resiliency. This project, which incorporates both CCG priorities for resiliency and water quality, will utilize a round table of regional experts and practitioners to explore and develop regionally-consistent land use management strategies and solutions.

Public private partnerships (P3), including tax increment financing districts, are essential tools for fostering resiliency and constructing effective stormwater and green infrastructure in our region. For decision makers to be properly informed in these P3 negotiations, development tools are needed to guide the decisions that are shaping our rapidly growing landscape in both rural and urban areas. By equipping decision makers with the following tools, we aim to positively affect coastal preparedness and water quality consistently throughout our region:

- A menu of creative stormwater ordinance options and templates that may include special overlay districts or zoning restrictions in impaired or threatened watersheds.
- A guidebook for siting and selecting appropriate Best Management Practices to inform decision makers and developers alike on considerations, such as local/specific details, strategies, locations, etc.
- A set of desktop metrics to assess the health of watersheds in our communities as a means of prioritizing each Town's investments in P3, capital improvements, and long-range planning.

Because of the Town of Falmouth's generous match, we can customize these regionally-consistent development tools for Falmouth to adopt, which can be used as a case study to inform other communities in our area that are eager to adopt similar solutions and strategies. Results of these tasks are regionally applicable in Cumberland County and statewide.

Helping Communities Thrive and Prosper in the Greater Portland and Lakes Region 970 Baxter Boulevard, Suite 201 & Portland, Maine 04103 & Telephone (207) 774-9891 & Fax (207) 774-7149 July 26, 2018 Page 2

Please contact me, or Jessa Berna, GPCOG's lead Land Use Planner, at 774-9891, if we can provide any additional information. We look forward to working with you on this exciting regionally beneficial project.

Sincerely, Stephanie Carver, AICP

Planning Director

SECTION 2 – COVER SHEET

Project Title:

A Comprehensive Development Toolbox for Proactive Watershed Management



Town or Region covered:	Town of Falmouth and the Greater Portland Area municipalities through an existing intermunicipal effort
MCP Goal(s) addressed:	 Addressing effects of land use activity on Water Quality to Mussel Cove (listed by DEP as "Threatened Marine Waters") Preparing for Coastal Storms, Erosion and Flooding
Grant request amount:	\$33,200 Funds Requested toward Total Project Cost \$90,040
Match proposed and source:	\$11,000 Cash + \$45,840 In-kind services from Project Partners listed below \$56,840 Total Match
Project Manager contact	Jessa Berna, AICP; GPCOG Land Use Planner
info:	Phone: 774-9891 x210 Email: jberna@gpcog.org
Project Partners:	Greater Portland Council of Government Town of Falmouth & Cumberland County Government Cumberland County Soil & Water Conservation District Interlocal Stormwater Working Group Falmouth Conservation Commission DEP & DACF
Project start/end dates:	November 2018 – November 2020
Project summary statement:	A comprehensive development toolbox to promote regionally- consistent policies, standards and metrics for proactive intermunicipal watershed management and planning centered around resiliency (preparing for coastal storms, erosion, flooding, coastal hazards) and improving water quality.

SECTION 3 – EXECUTIVE SUMMARY

The application seeks funding to compile a comprehensive development toolbox that addresses the effects of land use activity on water quality and coastal resiliency across municipal boundaries. The Town of Falmouth intends to champion this land use management effort as part of an intermunicipal regional approach; the regionally-consistent tools developed will be customized for Falmouth adoption to support improvement of Mussel Cove (an area in Falmouth where intermittent pollution has halted shellfish harvest) and to foster regional consistency around Casco Bay, where shellfish harvests exceed \$4M annually. Greater Portland Council of Government (GPCOG) and Cumberland County Soil & Water Conservation District (CCSWCD) will both provide cost-effective technical assistance and work cooperatively with municipal staff and decision makers from around the region to explore local successes in policy and standards that have benefited coastal communities from Brunswick to Biddeford and beyond. As part of this project, municipalities from the Interlocal Stormwater Working Group¹ (ISWG) will join Falmouth in technical working groups (i.e., municipal round table approaches) to establish:

- Model ordinance language for addressing land use management activities that promote resiliency and stormwater improvements, both quality and quantity (Task 1);
- (2) Best Management Practice (BMP) selection guide and strategy for developers and municipal staff, officials, and reviewers alike to use as a resource in the development review process (Task 2); and
- (3) **Desktop indicators for evaluating** watershed health based on widely accepted science-based metrics and stressors present or absent (Task 3).

Falmouth has successfully completed MCP-funded projects and will build on previous successes to address common water resource concerns through costeffective and regionally-consistent solutions with Project Partners: GPCOG (ordinance and planning experts), CCSWCD (stormwater experts and leader of ISWG), other municipal staff and decision makers from ISWG communities, as well as the Falmouth



Figure 1 - ISWG Municipalities surrounding/including Falmouth

Conservation Commission, Cumberland County Government and State representatives from DEP and DACF.

¹ ISWG is a coalition of 14 municipalities working together to meet Clean Water Act permit requirements on a regionally-consistent, economy-of-scale approach under the leadership of CCSWCD.

SECTION 4 – PROJECT SUMMARY

Many coastal communities in Southern Maine are faced with the reality of restoring multiple impaired or threatened watersheds within their respective communities. For example, in addition to Mussell Cove, the Town of Falmouth has one impaired stream watershed and ten threatened watersheds (9 streams and 1 lake) within its municipal boundary. Balancing this restoration burden with the need to proactively protect healthy watersheds leaves Falmouth and many other municipalities wondering how to prioritize their resources and efforts appropriately.

Meanwhile, in these vibrant Southern Maine coastal communities, development pressures continue to rise. With limited regulatory support from the State level to guide development review policy and standards in impaired, threatened or even healthy watersheds, the Town of Falmouth, along with 14 other municipalities from Brunswick to Biddeford, has begun to take proactive measures to consider more effective local policies and standards, as well as solutions and strategies to improve and sustain quality in order to welcome ongoing development that is essential for our local and regional economy.

Most recently, the Town Managers from the 14 ISWG communities have begun meeting regularly to discuss clean water priorities exclusively. This group, known as the Regional Clean Water Collaborative² (RCWC), has adopted a 2-year work plan that includes establishing regionally-consistent development tools and guidance for local decision makers on land use activities. Therefore, developing a comprehensive development toolbox for watershed management and planning, from restoration to protection, will provide municipalities in our region with a means of:

- Achieving regional consistency in policy (Task 1 Stormwater Ordinance) and standards (Task 2 – BMP Guide) for our rapidly expanding landscape and prosperous regional economy;
- Assessing, prioritizing and directing solutions and strategies for their efforts and resources (Task 3 Watershed Assessment: Desktop Metrics); and
- Maintaining vibrant communities, healthy watersheds and a robust tax base.

Background on Stormwater Ordinance (Task 1). In 2017, GPCOG began the process of inventorying and reviewing stormwater ordinances in coastal communities within Cumberland County. A summary report, completed in June 2017, provided a review of barriers to low impact development (LID) and other stormwater BMPs that are critical in effective land use management, as well as water quality and quantity control. This GPCOG report, as well as the Municipal Climate Adaptation Guidance Series available from DACF, will be used as a roadmap to lead an intermunicipal working group in overcoming LID barriers and promoting BMP implementation. Because many Towns, including Falmouth, have already taken proactive steps to revise ordinances to promote LID and BMPs, this aggregate work to date will be used as the basis for **developing model ordinance language and mechanisms (overlay districts, zoning requirements) to address water resources concerns and prepare for coastal storms, erosion and flooding.** GPCOG and CCSWCD will then work with the Town of Falmouth to customize the ordinance and ready it for local Council adoption. Lessons learned from this process will provide consistent talking points and a case study for other coastal communities to follow suit.

Background on BMP Guide (Task 2). As part of a previous MCP-funded project, the Town of

² RCWC is funded partially by Cumberland County Government and is staffed by CCSWCD and GPCOG.

Falmouth developed an integrated strategy to incorporate green infrastructure management and stormwater BMP retrofits into traditional public infrastructure within its Route 1 Commercial District³. The final deliverable from that work, January 2013 *Route 1 Commercial District Stormwater Management Plan*, contributed to the final design of an \$11.7M Route 1 Infrastructure Plan that detailed many stormwater improvements, including a \$1.2M water quality and quantity improvement (i.e., 16 biofilters in the public ROW). Additional private stormwater management installations in the Route 1 Commercial District included development at Falmouth Veterinary Associates, Casco Bay Ice Arena, and Goodwill Industries. The other Town Managers that are part of RCWC hope to replicate the success of this public private partnership (P3) in their communities as a means of positively impacting water quality.

Seeking implementation of all aspects of the 2013 Route 1 Commercial District Stormwater Management Plan, the Town of Falmouth 2017-2018 Annual Council Work Plan includes a "high priority" item to "prepare and adopt zoning ordinance amendments that implement the stormwater recommendations that are contained in the 2013 Report." In 2016-2018, the Town requested technical assistance from CCSWCD in considering Phase II of the 2013 Report, providing review of complex proposed development before the Planning Board, and completing an inventory of Falmouth's watersheds. Through these collaborative efforts, the need was apparent for a concise reference resource (i.e., BMP guide) to identify and evaluate the feasibility, suitability, maintenance, short- and long-term costs, and other considerations for proposed stormwater improvements in Falmouth, including BMPs, green infrastructure and LID techniques being considered for P3 or tax increment financing (TIF) projects.

Therefore, a **BMP Selection Guide will be developed** in partnership with CCSWCD to include relevant information for both regional officials (reviewing, approving, maintaining BMPs) and developers/engineers (selecting, designing, constructing BMPs).

- (1) Because Falmouth is interested in and is successfully using P3 and TIF strategies to add additional green infrastructure within its Route 1 Commercial District, a BMP Selection Guide will allow both audiences (private developers and public officials) to have similar selection criteria at their fingertips. This information could include criteria such as suitability of soil types, feasibility for water quality improvements, long-term maintenance needs and costs, and watershed and flood plain considerations.
- (2) Because Brunswick and some ISWG municipalities have already adopted (or are interested in adopting) design standards for BMPs that are more rigorous than the current State land use development standards (i.e., DEP's Chapter 500 Stormwater Management), a BMP Selection Guide will also serve as a local, yet regionally applicable, reference manual for restoring water quality, conserving habitat and controlling water quantity (flooding hazards).
- (3) Because CCSWCD has been actively performing watershed management, protection and restoration for over 50 years, a BMP Selection Guide will also include the numerous benefits and implications Towns must consider before assuming the long-term

³ The "Route 1 Falmouth Commercial District: Stormwater Management Plan" was completed in January 2013 under award NOAA CZM NA10NOS4190188 to MCP from NOAA, US Department of Commerce.

responsibility of BMPs, either solely or collectively through P3 with landowners. Implications include (but may not be limited to):

- Procedural establishing workflow for incorporating BMPs into municipal asset management systems, geodatabases and capital improvement plans (CIPs) and expenditures;
- Regulatory understanding the compliance and permitting obligations for BMPs ranging from mapping and annual inspections to recertification and recordkeeping;
- Financial reserving long-term maintenance and replacement costs in Capital Improvement Plans (CIPs), as well as avoiding cost-prohibitive BMPs;
- Legal drafting templates for access agreements and maintenance easements to memorialize the landowner and municipal rights and responsibilities in the P3; and
- Educational familiarizing public and private audiences with respect to the suitability and/or pros and cons of each BMP type.

Background on Watershed Planning (Task 3). Municipal staff and officials (both ISWG and RCWC) have indicated interest in developing a set of metrics to gauge water quality and overall watershed health to learn the effect of stormwater management investments. To avoid potential unintended legal and regulatory consequences, these metrics will not include new water quality sampling or analytical laboratory testing. Instead, existing DEP data will be considered with desktop metrics that are widely-accepted indicators of watershed health as a surrogate for collecting new water quality sampling and testing data. One example of a widely-accepted surrogate indicator is the *Center for Watershed Protection's Impervious Cover Model* (ICM), which is frequently used to signal when watershed health is in peril. This model (see Figure 2) is as simple as calculating the percent of impervious area relative to the overall size of the

watershed as a means of characterizing watershed health. Other indicators. such as forest cover, road density, land usage, public support and more. will be considered in this dashboard indicator tool. DEP and DACF will be invited to contribute to this intermunicipal effort.



Figure 2 - Impervious Cover Model for Watershed Planning and Stream Health

SECTION 5 - PROJECT NARRATIVE & PROJECT SCHEDULE

The proposed project includes the following tasks, which are detailed further below:

- 1. Stormwater Ordinance (regionally-applicable task led by GPCOG, CCSWCD support, intermunicipal participation from Falmouth and other municipalities): draft model ordinance language and other mechanisms (overlay district, zoning changes) to address the effects of land use activity and storm events on water quality, quantity and habitat; convene an intermunicipal round table to develop regionally-consistent policy; customize the model ordinance tools to facilitate Falmouth's adoption of ordinance; develop talking points and/or lessons learned for adopting the ordinance tools zzon a regional level
- 2. BMP Guide (regionally-applicable task led by CCSWCD, individual case studies for Falmouth based on existing P3 BMPs, intermunicipal and partner participation based on aggregate work to date): convene an intermunicipal working group; develop a regionally-consistent reference guide to act as a resource for both the development community and municipal decision makers
 - A. **BMP Guide & Strategy:** summarize benefits and operational procedures for the range of BMP types; address implications and costs specific to BMP type(s) as an educational tool for both public (municipal) and private (developers) audiences
 - **B. BMP Prioritization (Falmouth Case Study):** conduct outreach to landowners where BMPs were previously identified on private property; prioritize the BMPs for Falmouth; prepare BMP cost estimates for inclusion in municipal budget and CIP
- 3. Watershed Planning (regionally-applicable task led by CCSWCD with support from DEP, individual case study for Falmouth, intermunicipal and partner participation): evaluate existing data for watershed health (e.g., identify outliers and/or questionable data points); propose a list of metrics to serve as indicators of watershed health with input from DEP's Environmental Assessment Division; establish thresholds for watershed metrics that measure or predict watershed health using scientific principles and widely-accepted methodology, as well as serve as a baseline for future planning efforts; assist Falmouth in prioritizing watershed efforts as a case study to be shared with other municipalities

Task 1: Stormwater Ordinance Tools

GPCOG and CCSWCD, on behalf of the Town of Falmouth, will convene an intermunicipal collaborative round table

with ISWG municipalities to propose policy to benefit water quality, quantity and habitat. This intermunicipal round table, to be staffed by GPCOG (ordinance experts) and supported by CCSWCD (stormwater experts), will convene a series of meetings to review and align the proactive work of Project Partners, including:

- A. Review the findings of GPCOG's 2017 Coastal Assessment Report to overcome the barriers identified in the report associated with implementing stormwater BMPs and LID;
- B. Identify and share municipal ordinance tools that can be used, or improved upon, to promote stormwater BMPs consistently on a regional basis across municipal boundaries;
- C. Develop a Stormwater Ordinance Template (i.e., model ordinance language, overlay districts, zoning, etc.) to be used by each municipality as the basis for future, regionally-consistent ordinances that mitigate or avoid the effects of storms, flooding and land use activity on water quality;
- D. Customize the ordinance to support the Town of Falmouth with adoption as a case study; and

E. Develop and share consistent talking points in support of the ordinance to assist municipal representatives in delivering consistent regional messages to their associated City/Town Councils to ensure sustainable, vibrant coastal communities on a regional basis.

The timeline for the six (6) meetings of the intermunicipal round table is as follows:

Meeting 1:	 GPCOG to summarize the findings of the 2017 Coastal Assessment Report CCSWCD to solicit the Towns of Falmouth Brunswick and interacted
Dec. 2018	ISWG municipalities to summarize their proactive stormwater improvements, standards, policies and ordinances
	GOAL: Solicit input from participating municipalities and partners
Meeting 2: Feb. 2019	• Towns to present their existing proactive ordinances, standards and policies for discussion and review by participating members of the intermunicipal round table
1	• CCSWCD & GPCOG to moderate, coordinate, and take notes particularly on "lessons learned" by each community
	GOAL: Draft a list of potential improvements (recent successful updates to policies, standards, requirements, etc.) that can be shared with decision makers along with rationale for improvements; solicit input and feedback to be brought back to round table
Meeting 3: May 2019	 Municipal reps to discuss input/feedback received from their decision makers and/or Board presentations to shape regionally-consistent ordinance improvements
1 	 Brainstorming session with municipal planners, engineers, public works directors, town managers and other staff/officials to evaluate and prioritize the list of potential improvements from Meeting 2
1994 - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 - 1994 -	GOAL: Prioritized list of potential improvements will be used to establish a model ordinance or menu of amendments/improvements with regionally consistent messages/talking points
Meeting 4:	• Municipal reps will have reviewed the list of regionally-consistent ordinance updates/amendments and be prepared to provide edits/feedback
July 2019	 CCSWCD & GPCOG to moderate, coordinate, and take notes to ensure that review by State (e.g., DACF, DEP) is well informed GOAL: List of potential improvements provided to State for review/comment
Meeting 5:	 Municipal reps will have reviewed the comments received from the State and be prepared to finalize the list of regionally-consistent improvements
001 2017	 CCS wCD & GPCOG to moderate, coordinate, and take notes to ensure that final list is accurately captured and distributed to participating municipalities GOAL: Final list of potential improvements will be customized for adoption by the Falmouth Town Council
Meeting 6: Jan 2020	• Results of the Falmouth-specific case study of the Stormwater Ordinance Template (i.e., adoption of improved/updated/amended ordinances) to be discussed
	GOAL: Support adoption of a regionally-consistent stormwater ordinance in multiple coastal communities

Task 2: BMP Guide

TASK 1: S	TORMWATER ORDINANCE
DELIVERABLES:	A Stormwater Ordinance Template or menu of ordinance
a 8.,*	amendments to be used by participating municipalities to consider
× × ×	adopting, including customized ordinance language for adoption by
e A de la acta	the Town of Falmouth
56 жла ¹⁶ ю. к. ¹⁶ ж.	Talking Points (i.e., lessons learned from Falmouth case study) for
с. т. ⁵⁰ . у	each municipality to use with their town/city councils
	Minutes from meetings, including the Falmouth-specific Case Study
RESPONSIBLE PARTY:	CCSWCD with support from GPCOG, Falmouth and ISWG
START/END DATE:	December 2018/January 2020

Task 2A - BMP Selection Guide & Strategy

CCSWCD will convene a second/separate intermunicipal working group with ISWG municipalities, to develop a BMP Selection

Guide & Strategy. This second intermunicipal working group, to be staffed primarily by CCSWCD with support from GPCOG, will convene a series of meetings to address:

- 1. **Duplication and redundancy.** There are several existing BMP manuals both locally and nationally, but none of them provide concise and comprehensive information with local considerations for public and private audiences.
- 2. Procedural implications. Assist in developing a workflow process for adopting BMPs that recognizes the roles of asset management, records retention, long-term capital improvement planning, and other administrative and operational implications.
- 3. **Regulatory Implications. Include permit compliance considerations** and long-term maintenance for each BMP type throughout the respective BMP's design life.
- 4. Cost Implications. Provide costs and financial considerations for each BMP type, including upfront capital costs, as well as the long-term potential liabilities and responsibilities for BMP maintenance and management over time. This will allow coastal communities to more effectively target and identify P3/TIF opportunities, estimate the overall investment and level of risk with greater certainty, and negotiate sound P3/TIF agreements and easements.
- 5. Legal Implications. Develop templates for access agreements and easements based on CCSWCD's work with regional landowners and specifically the Long Creek Watershed Management District. The Town can use customized templates as a basis for considering P3/TIF opportunities with interested landowners and will allow the Town reasonable access to conduct routine inspection, maintenance/repairs, and reconstruction (as needed) throughout the BMP's design life.
- 6. Educational Implications. Provide education and outreach to ensure that Town staff/officials are well-informed regarding the numerous BMPs available to developers and engineers. Education and outreach to the development community on BMPs and their benefits and drawbacks is also expected.
- 7. Watershed-specific Consideration. Input from DEP will be solicited to ensure that all watershed-specific sensitivities are considered. Flood plain maps, projected sea level rise and other DACF resources will be considered to ensure that BMPs are not constructed within important flood plains, are properly sized to reflect resiliency and projected sea level.

FY 2019 Coastal Communities Grant Program Applicant: GPCOG

TASK 2A: B	MP SELECTION GUIDE & STRATEGY
DELIVERABLES:	An inventory of relevant BMPs with suitability and cost
	considerations
	Workflow process for adopting BMPs as public infrastructure
а.	Cost Estimates for specific types of BMPs
	Template(s) for access agreements for BMPs on private property
	Education and outreach materials that present clear consistent
	information on BMPs
RESPONSIBLE PARTY:	CCSWCD with support from GPCOG, Falmouth and ISWG
START/END DATE:	December 2018/January 2020 for intermunicipal round table; October
	2020 for BMP Selection Guide & Strategy

Task 2B - FALMOUTH CASE STUDY: BMP Prioritization

Through a prior MCP-funded project to rank and propose retrofits in the Webes Creek watershed (Route 1 corridor) that discharges to Mussel Cove, the Town of Falmouth has explored the linkage of private and public stormwater runoff and demonstrated the inherent benefits of integrating BMPs (both public and private) into traditional infrastructure. Building on the success of this work, the Town of Falmouth wishes to continue to improve discharges into Mussel Cove, a high-value mudflat listed on DEP's impaired list, by partnering with CCSWCD to prioritize the acquisition of targeted BMPs on private property within the Route 1 Corridor. This work will ensure that BMPs continue to function as intended thereby minimizing impacts of development and runoff to coastal habitats and water quality that threaten Mussel Cove. Through the subtasks below, supplemental data can be added to the BMP Guide & Strategy in Task 2A:

- **Conduct outreach to landowners** where private BMPs are located to gauge the level of interest to coordinate with the Town on a retrofit for their property
- **Prioritize the existing list of BMPs** from the MCP-funded report based on landowner interest and expand the list to identify new opportunities (if needed) based on criteria, such as:
 - Level of interest from the property owner(s)
 - Redevelopment potential to protect any Town investment
 - o Cost estimates for both construction and long-term maintenance
 - **Highest value for treatment with the lowest maintenance cost** to equip decision makers with a proactive plan for incorporating the highest priority projects
- Return on investment calculations (or algorithm) for BMP cost estimates based on:
 - Range of incentive option
 - o-Consistent criteria for evaluating or prioritizing existing, new and future retrofits

TASK 2B: B	MP PRIORITIZATION: Falmouth Case Study
DELIVERABLES:	Summary of outreach to private landowners
	Prioritized list of BMPs for P3 opportunities and/or CIP inclusion
· · · · · · · · · · · · · · · · · · ·	Cost estimates and schedule for implementation
RESPONSIBLE PARTY:	CCSWCD and Falmouth
START/END DATE:	Jan 2019/July 2019 for outreach and site visits; Aug 2019/June 2020 for estimates and schedule; Aug/Sept 2020 for BMP Guide & updates

Task 3: Watershed Planning

Task 3A – Baseline Water Quality Assessment CCSWCD, in partnership with the Town of Falmouth, Falmouth Conservation Commission, DEP and other

technical partners, will evaluate the watershed inventory and data within the Town of Falmouth first to glean a set of proposed metrics that are commonly-accepted, science-based surrogates for watershed health, water quality indicators and/or stressors. Next, like Tasks 1 and 2, intermunicipal meetings will be held to share the findings with regional partners (e.g., ISWG, DEP, DACF, CBEP, FOCB, etc.) in hopes of providing a tool for watershed management and planning.

- Evaluate the available data for the watershed(s) inventory, including available water quality and quantity data, GIS, measurements, geomorphologic/hydrologic information, etc.; identify any data gaps and/or questionable data; (December 2018)
- Analyze data for watershed/subwatershed health based on available data with key areas being field verified in the spring (after snowmelt); (April 2019)
- Propose a list of metrics to be analyzed in a geodatabase (over the winter: Jan-March 2019) and field verified (in the spring: April-June 2019), which will include considerations, such as: drainage area size and conditions; soils and surficial geology; impervious area totals, type, treated and disconnected; water quality and quantity data; climatological data and trends; open space and forests; riparian buffers and canopy; public support and other factors;
- Establish thresholds for each metric on a (sub)watershed level to provide a range within which stream health or impairment can be measured or predicted; (July-Sept 2019)
- **Consult with DEP** on the desktop parameters, thresholds, and analyses used to assess overall watershed health; (Sept-Dec 2019) and
- Summarize desktop metrics in a memo (Jan-March 2020) and apply to one watershed in Falmouth (April-June 2020).

TASK 3A:	BASELINE WATER QUALITY METRICS
DELIVERABLES:	Summary of desktop metrics to serve as indicators of
· · · · ·	watershed health
· · · ·	Geodatabase of metrics as applicable to Falmouth
	Minutes from meetings
RESPONSIBLE PARTY:	CCSWCD with support from GPCOG, Falmouth and ISWG
START/END DATE:	December 2018/June 2020 as detailed above
1	

Task 3B – Watershed Prioritization: Falmouth Case Study

Using the established desktop indicators (i.e., watershed health surrogates), CCSWCD will work with the Town of Falmouth and Project Partners to prioritize the watershed implementation to establish a Town-wide strategic plan that answers questions, such as:

- "How can/is Falmouth making meaningful improvements and investments with respect to water quality and resiliency?"
- "What are the priority protection areas, projects, programs, etc. to inform municipal policies?"

• "Where should resources be directed first? Are there targeted areas for policy, investment, etc.? What should be down Town-wide?"

This strategic plan will then be used to inform policy, decision makers and the Town of Falmouth's CIP moving forward.

TASK 3B: W	ATERSHED PRIORITIZATION: Falmouth Case Study
DELIVERABLES:	Strategic Plan for prioritizing efforts and resources in Falmouth
RESPONSIBLE PARTY:	CCSWCD, Falmouth, Falmouth Conservation Commission
START/END DATE:	Aug 2019/June 2020
Task 4: Project M	GPCOG and CCSWCD will coordinate to ensure that agreements and reports are completed and submitted to DACF in a timely manner.
IASK 4: PI	<u>COJECT MANAGEMENT</u>
DELIVERABLES:	Grant and subgrantee agreements
	Semi-annual and final reports
RESPONSIBLE PARTY:	GPCOG and CCSWCD
START/END DATE:	Nov 2018/Dec 2020

SECTION 6 – PROJECT BUDGET

Budget Table 1: Detailed Budget is included on the next two pages.

Budget Table 2: Sourc	es and Status of Ma	atch				
Source of Cash Match	Status of Cash Match	Sourc	e of In-Kind Match	Status Kind 1	of In- Match	Amount of Match
Town of Falmouth	In hand/\$10,000	F	almouth Staff		\$12,200	\$22,200
		IS	WG Members		\$29,400	\$ 29,400
		DE	P/DACF Staff		\$1,740	\$1,740
GPCOG	In hand/\$1,000	GP	COG Facility		\$2,500	\$ 3,500
· · · · ·	1		Т	OTAL N	IATCH	\$56,840
Budget Table 3: Budget	Estimates by Cost C	Category				ί."
Cost Category	MCP	Grant	Non-Federal	Match		Total Cost
Personn	el	\$5,692		\$28,464		\$34,156
Fringe Benefi	its	\$2,858	×	\$14,376		\$17,234
Trav	el	\$150		\$500		\$650
Equipme	nt					
Supplie	es	<u> </u>		-	* 	
Contractu	ial S	517,000		\$11,000*		\$28,000
Other: MEETING SPA	CE			\$2,500		\$2,500
Indire	ct	\$7,500			_	\$7,500
TOTALS	\$ \$3	32,200	\$	56,840		\$90,040

*\$11,000 provided for the balance of consultant services as match by the Town of Falmouth

APPLICANT: GPCOG PROJECT TITLE: A Comprehensive Development Toolbox for Proactive Watershed Management

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			Program Statement:	FY2019 MCF	Grant					
. 1.	Budget	Table 1 : Coast	tal Community Grant	Project Bud	get by Task a	and Cost (Category			
Greater Portland Council of	Governments									e
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						Hourly com	pensation		Proposed	Source of
Task	Personnel	Affiliation	" Column D"	# Project Hours	Total hourly compensation		Fringe	Total Cost		Non- Federal
(DIDAN LOWIT DY LASN)	(inst name)		Sala	ries		Contract A				
			(please note each per	sons role in column	1 D)					
	Jessa Bema	GPCOG	Falmouth Case Study	24	\$ 75	\$ 50	\$ 25	\$ 1,800	\$ 1,800	•
	Stephanie Carver	GPCOG	Review, QA/QC	4	\$ 100	36	\$ 34	\$ 400	\$ 400	5
	Rick Harbison	GPCOG	Mapping	5	S 75	\$ 50	\$ 25	\$ 375	\$ 375	s .
	CCSWCD	Contractual	Outreach, Meetings, Minutes, Falmouth Case Study	- 4 10 ⁴ 5 2 2				\$ 4,000	\$ 2,000	\$ 2,000
	Nathan Poore	Falmouth Town Manager	Meetings, Falmouth Case Study	6	06 \$	\$ 54	\$36	\$ 540		\$ 540
- - -	Ethan Croce	Falmouth Planning Director	Meetings, Falmouth Case Study	16	\$ 75	\$ 50	\$25	\$ 1,200		\$ 1,200
ι. Έ	Theo Holtwijk	Falmouth Ec Dev Director	Meetings, Falmouth Case Study	6	S 75	\$ 50	\$25	\$ 450		\$ 450
- -	Jay Reynolds	Falmouth DPW	Meetings, Falmouth Case Study	16	S 75	\$ 50	\$25	\$ 1,200		\$ 1,200
-	Dawn Emerson	Falmouth Town Planner	Meetings, Falmouth Case Study	12	S 75	\$ 50	\$25	S 900		\$ 900
i. G	ISWG Rep #1	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	\$ 900		\$ 900
	ISWG Rep #2	Town Planner or Engineer	Meetings	12	S 75	\$ 50	\$25	\$ 900		\$ 900
Task 1: Stormwater	ISWG Rep #3	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	\$ 900		\$ 900
	ISWG Rep #4	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	\$ 900		\$ 900
	ISWG Rep #5	Town Planner or Engineer	Meetings	12	S 75	\$ 50	\$25	006 \$		\$ 900
-12	ISWG Rep #6	Town Planner or Engineer	Meetings	12	S 75	S 50	\$25	\$ 900		\$ 900
× 	ISWG Rep #7	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	006 \$		006 \$
1. 	ISWG Rep #8	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	S 900		\$ 900
	ISWG Rep #9	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	006 \$		\$ 900
1	ISWG Rep #10	Town Planner or Engineer	Meetings	12	\$ 75	S 50	\$25	006 \$	-	006 \$
	ISWG Rep #11	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	\$ 900		\$ 900
	ISWG Rep #12	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	006 S		006 \$
-	ISWG Rep #13	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	006 \$		006 \$
	DACF	Resiliency Expert	Meetings	12	\$ 75	\$ 50	\$25	006 \$		006 \$
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Program Statement: EV2010 MCD Creat	PROJECT TITLE: A Comprehensive Development Toolbox for Proactive Watershed I	APPLICANT: GPCOG
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Greater Portland Council o	# Governments									
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						Hourly co rate br	mpensation eakdown		Proposed	Source of
Task (break down by task)	Personnel (list name)	Affiliation	" Column D"	# Project Hours by Task	Total hourly compensation rate	Salarv	Fringe	Total Cost by Task	MCP Grant	Non- Federal Match
			Sal. (please note each pe	aries rsons role in colum	n D)					
	Jessa Berna	GPCOG	Outreach, Meetings, Falmouth Case Study	34	e 75	e 50	e ar	•	2 200	
•	Stephanie Carver	GPCOG	Review, QA/QC	4	\$ 100	88	24	\$ 1,000	400 S	<i>n</i> G
	Rick Harbison	GPCOG	Mapping	5	S 75	\$ 50	\$ 25	\$ 375	\$ 375	•
	CCSWCD	Contractual	Outreach, Meetings, Minutes, Falmouth Case Study					\$ 11,000	\$ 8,000	\$ 3,000
	Nathan Poore	Falmouth Town Manager	Meetings, Falmouth Case Study	6	90 \$	\$ 54	\$36	\$ 540		\$ 540
	Ethan Croce	Falmouth Planning Director	Meetings, Falmouth Case Study	16	\$ 75	\$ 50	\$25	\$ 1,200		\$ 1,200
	Theo Holtwijk	Falmouth Ec Dev Director	Meetings, Falmouth Case Study	6	\$ 75	\$ 50	\$25	\$ 450		\$ 450
	Jay Reynolds	Falmouth DPW	Meetings, Falmouth Case Study	16	\$ 75	\$ 50	\$25	\$ 1,200		\$ 1,200
	Dawn Emerson	Falmouth Town Planner	Meetings, Falmouth Case Study	12	\$ 75	\$ 50	\$25	900 \$		006 \$
	ISWG Rep #1	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	006 \$		006 \$
	ISWG Rep #2	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	006 \$		006 S
Task 2: BMP Selection Guide & Strateov	ISWG Rep #3	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	006 \$		006 \$
	ISWG Rep #4	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	006 \$		006 \$
	ISWG Rep #5	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	006 \$		\$ 900
	ISWG Rep #6	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	906 \$		006 \$
4 1	ISWG Rep #7	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	00e S		00e S
	ISWG Rep #8	Town Planner or Engineer	Meetings	12	\$ 75	\$ 50	\$25	00e \$		006 \$
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Page | 12

Task (break down by task) eater Portland Council of Governments Task 3: Watershed Planning Task 4: Project Management Þ Stephanie Carver Rick Harbison CCSWCD CCSWCD DEP ISWG Rep #4 ISWG Rep #3 ISWG Rep #2 ISWG Rep #1 Jay Reynolds Theo Holtwijk Ethan Croce Jessa Berna Jessa Bema Vathan Poore awn Emerson Personnel (list name) ω Budget Table 1 : Coastal Community Grant: Project Budget by Task and Cost Category Director Falmouth Ec Dev Manager Falmouth Planning GPCOG Town Planner or Engineer Director Falmouth DPW Falmouth Town Engineer Town Planner or Planner Town Planner or GPCOG Engineer Town Planner or GPCOG Falmouth Town Contractual Engineer Contractual Watershed Specialist Affiliation C (please note each pr Outreach, Meetings, Falmouth Case Study Review, OA/QC Mapping Outreach, Meetings, Minutes, Falmouth Case Study Program Statement: FY2019 MCP Grant reports Semi-annual and final reports Meetings, Review of metrics Meetings Falmouth Case Study Meetings, Falmouth Case Falmouth Case Study Falmouth Case Study Meetings, Falmouth Case Meetings Meetings Study Study Semi-annual and final Meetings (please note cost assumpti Meetings Meetings Meetings " Column D" 0 Salaries Travel persons role in column D) # Project Hours compensation by Task rate tions in column D) 24 16 16 16 16 4 m 8 8 16 16 α 4 00 s \$ S SSS Ś S 75 S 100 S 75 S 75 75 90 75 75 75 75 75 75 75 75 G H Hourly compensation rate breakdown \$ 69 \$ ŝ \$ \$ \$ s \$ G Salary 50 50 50 50 50 50 50 50 50 50 <u>4</u> 50 50 50 50 50 50 5 rotal Salaries: \$ 79,390 \$ 25,550 \$ 53,840 S Fringe benefits
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PROJECT TITLE: A Comprehensive Development Toolbox for Proactive Watershed Management APPLICANT: GPCOG

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Page | 13

Town Reps GPCOG

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APPLICANT: GPCOG PROJECT TITLE: A Comprehensive Development Toolbox for Proactive Watershed Management

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Page | 14

SECTION 7 – LETTERS OF SUPPORT

Letters of support are included from the following Project Partners:

- Town of Falmouth
- Cumberland County Soil & Water Conservation District
- Interlocal Stormwater Working Group

Additional partners (not submitting letters, but expected to participate) include:

- Cumberland County Government
- Regional Clean Water Collaborative
- Falmouth Conservation Commission
- DACF
- DEP

TOWN OF FALMOUTH, MAINE

July 18, 2018

Ruta Dzenis AICP, Senior Planner Municipal Planning Assistance Program Department of Agriculture, Conservation and Forestry 22 State House Station Augusta, ME 04333-0022

Re: FY19 Coastal Community Planning Grant application

Dear Ruta:

The Town of Falmouth is excited to be part of the FY19 Coastal Community Planning Grant application to develop a comprehensive toolbox for proactive watershed management and pledges \$15,000 cash and \$7,000 staff in-kind support towards this effort.

Building on the success of our 2013 Route 1 Commercial District Watershed Management Plan, which focused on the Webes Creek Watershed and was funded through the same planning grant program, the Town feels the time is right to initiate a comprehensive assessment of all watersheds in Falmouth. Our belief is that a prioritized plan will allow the Town to devote its time and resources in implementation in the most efficient manner possible.

In addition, having in place state-of-the-art stormwater zoning ordinance standards and a BMP guide, will allow Falmouth to effectively address new development proposals as well as work in a cooperative manner with private property owners to consider the best stormwater solutions for their property.

While these efforts will immediately benefit Falmouth, we are equally excited that by serving as a case study, we can assist fellow communities that face similar stormwater issues.

We believe such a comprehensive and pro-active approach is essential to address the significant issue of restoring threatened and impaired watersheds in our state.

We hope the review team will look favorably on this application.

Sincerely,

Nathan A. Poore, Town Manager

271 FALMOUTH ROAD FALMOUTH, MAINE 04105 207.781.5253 www.falmouthme.org

APPLICANT: GPCOG PROJECT TITLE: A Comprehensive Development Toolbox for Proactive Watershed Management

July 18, 2018

Ruta Dzenis AICP, Senior Planner Municipal Planning Assistance Program Department of Agriculture, Conservation and Forestry Harlow Building, Room 413 18 Elkins Lane 22 State House Station Augusta, ME 04333-0022

RE: Coastal Community Grant Application

Dear Ms. Dzenis:

The Interlocal Stormwater Working Group (ISWG) is pleased to support GPCOG's proposal to develop the following elements through a collaborative process to ensure regionally-consistent land use strategies among the Maine Coastal Zone in Cumberland County and beyond:

- Element 1. **Regionally-consistent policies.** A revised menu of stormwater ordinances will be based on input received through a roundtable of local experts and resources including DACF's <u>Municipal Planning Assistance Program</u> and the recently completed <u>Casco Bay Community Guidebook: Building a Resilient Future</u> on policies and standards that benefit water quality and build resiliency within Casco Bay.
- Element 2. **Regionally-consistent standards.** A Best Management Practice (BMP) Selection Guide and Strategy will provide dual purposes for municipal staff and officials:
 - a. To serve as a quick reference summary for decision makers that review, approve and may even enter into a public-private partnership to assume long-term maintenance responsibilities of BMPs to ensure water quality and quantity controls are sustained; and
 - To provide guidance for recommending BMPs beyond the current State standards and requirements for development (i.e., beyond Chapter 500 Stormwater Management Law) to restore and protect land and water resources.
- Element 3. **Regionally-consistent watershed metrics.** A set of desktop metrics will be developed with input from DEP, DACF and other experts to serve as a surrogate for identifying stressors and indicators of watershed health in freshwater coastal streams that discharge into valuable and productive mudflats, estuaries and eventually into the Gulf of Maine

Our commitment to this project will include in-kind services (i.e., attending/participating in meetings, proposing/reviewing language, sharing case studies) and/or cash match (i.e., \$500) to help in the development of these important elements we hope to adopt in our community.

Please contact me if I can help in any way in your consideration of this proposal. Thank you.

Sincerely

Jaini Fitch ISWG Coordinator

Biddeford | Cape Elizabeth | Cumberland | Falmouth | Freeport | Gorham | Old Orchard Beach Portland | Saco | Scarborough | South Portland | Westbrook | Windham | Yarmouth

king G

APPLICANT: GPCOG

PROJECT TITLE: A Comprehensive Development Toolbox for Proactive Watershed Management 35 Main Street, Suite 3

Cumberland County Soil & Water Conservation District

35 Main Street, Suite 3 Windham, ME 04062 P: 207.892.4700 F: 207.892.4773 www.cumberlandswcd.org

July 25, 2018

Ruta Dzenis AICP, Senior Planner DACF - Municipal Planning Assistance Program Harlow Building, Room 413 18 Elkins Lane 22 State House Station Augusta, ME 04333-0022

RE: GPCOG's Application

Dear Ms. Dzenis:

The Cumberland County Soil & Water Conservation District (CCSWCD) is pleased to support the Town of Falmouth's application to develop regionally-consistent water resource tools for the Coastal Communities in Cumberland County.

Our District is a recognized and respected leader in natural resource conservation. We accomplish our mission to "assist and educate the public to promote stewardship of soil and water resources" through strong and successful partnerships. One of our most prolific partnerships is with Cumberland County government and the 14 municipalities that comprise the Interlocal Stormwater Working Group that will be working with GPCOG and CCSWCD on this importnat project. We believe this effort is essential to advancing policies and practices that benefit and protect water quality and habitat on a regional basis.

Having vast experience with stormwater solutions and natural resource management, CCSWCD is excited to work with GPCOG, Falmouth and partners to:

- Develop a model stormwater ordinance (and other mechanisms, like overlay districts and zoning requirements) to address effects of land use activity on water quality protection, especially around the DEP-listed Mussel Cove in Falmouth;
- Create a regionally-consistent Best Management Practice (BMP) Selection Guide and Strategy that can be used as a resource for all municipalities in our region to guide development and municipal investments (e.g., public private partnerships, TIFs, etc.);
- Establish specific metrics that are commonly used as indicators of watershed health, water quality indicators and/or stressors for the region to use, but will be applied to the Town of Falmouth to strategically guide their investments and watershed efforts, particularly relative to Mill Brook, tributary to Mussel Cove.

Please contact me, or Robyn Saunders at 892-4700, if we can help in any way in your consideration of this grant application. Thank you.

Sincerely, CUMBERLAND COUNTY SOIL & WATER CONSERVATION DISTRICT

John T. Flaherty, Jr. Chair, Board of Supervisors

Assist and educate the public to promote stewardship of soil and water resources

Page | 18

EOE

A Comprehensive Development Toolbox for Proactive Watershed Management

SECTION 8 – RESUMES OF KEY PARTICIPANTS

GPCOG Staff

Stephanie M. Carver, AICP – Planning Director

Stephanie has been a planner at the Greater Portland Council of Governments since 2010. She has worked on a variety of state and municipal planning projects, providing her with a comprehensive knowledge of the complex economic, environmental, and zoning challenges currently facing Maine communities. She has managed numerous planning studies, analyzing current state and local policies affecting economic development, transportation and land use in Maine. Prior to joining GPCOG, Stephanie worked as a municipal planner in Massachusetts.

Jessa Berna, AICP – Land Use Planner

Jessa was recently hired as a Land Use Planner for the Greater Portland Council of Governments. She has over ten years of experience in GIS, planning and community engagement. For seven years prior to joining GPCOG in 2017, she has worked as a municipal planner in Maine and New Hampshire and has experience with a range of projects from economic development to administering grants and amending zoning and site design standards. Jessa was the project manager for the City of Portsmouth, New Hampshire's Comprehensive Plan and helped create and implement form-based code for the City's urban core. Before moving to Maine, she worked as a GIS technician for a planning and environmental consulting firm in Tempe, AZ where she focused on Community Wildfire Protection plans, regional land use and transportation analyses, and technologically innovative community engagement.

Town of Falmouth Staff

Jay Reynolds – Director of Public Works

As Director of Public Works, Jay is responsible for maintaining and updating traditional infrastructure, including the stormwater BMPs and green infrastructure that have recently been constructed and proposed in Falmouth. Through his experience as point of contact for the municipal stormwater permit and ISWG representative, he brings solid direction and guidance related to the long-term inspection, maintenance and reporting requirements for BMPs. His role in the development review process will also be instrumental in the success of this project.

Theo Holtwijk – Director of Long Range Planning

Theo is a distinguished planner, landscape architect and author. He has successfully led and implemented numerous grants throughout his career, including a recent Maine Coastal Program grant in the Town of Falmouth.

Nathan Poore – Town Manager

Nathan's long-standing service and leadership in the Town of Falmouth is instrumental in the Town Council's approval of this proactive project and authorization of significant matching funds (see Page 2 of Section 1 – back side of cover letter). He is proud to have the Town Council support him in this regionally-beneficial, cost-effective project to protect water quality and habitat, which will ensure long-term viability and sustainability of Coastal Communities in Cumberland County.

CCSWCD Staff

Aubrey L. Strause, PE – Stormwater Program Manager/District Engineer

Aubrey brings 20 years of water resource engineering expertise to this project, ranging from BMP selection, analysis, inspection, maintenance and replacement planning. At CCSWCD, she leads the Stormwater Program by providing technical oversight and co-coordination of ISWG and the Long Creek Watershed Management District project, which is a public-private partnership that was formed to restore the stream to its water quality standards according to the community-support watershed management plan. She is a nationally recognized educator and expert, with experience in managing numerous successful grants throughout New England.

Robyn Saunders, EIT, M.E. (pending) – Technical Director

Robyn is a graduate of the University of Maine's Department of Civil and Environmental Engineering, as both an undergraduate and graduate student. Before joining CCSWCD in 2014, Robyn worked at GZA GeoEnvironmental, Inc. for 17 years where she successfully led a national stormwater initiative (annual billings of \$2M), managed a diverse portfolio of public and private sector clients (including Maine municipalities, State agencies and Federal contracts), and specialized in complex programmatic environmental projects throughout Maine and New England. Robyn has received recognition as the 2003 Maine Section ASCE Young Engineer of the Year and as an environmental merit award recipient from USEPA Region 1 in 2009 as part of the Long Creek Restoration Project Team.

ATTACHMENTS TO

Strategic Watershed Plan

Falmouth, Maine | August 2021

APPENDIX D USEPA TOOLS

D.1 FACT SHEET: How's My Waterway

https://mywaterway.epa.gov/

D.2 HUC OVERVIEW

https://www.epa.gov/hwp/integrated-assessment-healthy-watersheds

D.3 WATERSHED INDEX ONLINE OVERVIEW

https://www.epa.gov/waterdata/watershed-index-online



Informing the conversation about your waters

Use **How's My Waterway** to learn about your water, explore data, and find out what's happening in your community — anywhere, anytime.

How's My Waterway provides the public with an easily accessible and understandable picture of water quality at a community, state, or national scale. Map-centric and mobile-friendly, How's My Waterway works on all different screen sizes ranging from desktop computers and tablets to mobile phones.

What will I find?

Community: Learn about the health of your waters, identified issues, why the issues matter, and what's being done to restore or protect the waters. Find out more about your drinking water. Discover if waters in your community are suitable for swimming or eating fish and if they support aquatic life.

State: Choose a state to find basic facts about a state's waters, summaries of specific water assessments, a statewide survey of water quality where available, and state drinking water metrics.

National: Learn about the quality of water resources across the nation (lakes, rivers and streams, wetlands, and coastal areas) and the main challenges to our water resources nationwide. You will also find information about national drinking water quality and national drinking water metrics.





Aquatic Life

Swimming



Drinking Water Eating

Fish

READY TO EXPLORE?

https://mywaterway.epa.gov

QUESTIONS? Contact: mywaterway@epa.gov With How's My Waterway you can explore waters at the community, state, and national levels.



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Scan the QR Code using your smartphone's camera app or your preferred search app.



https://mywaterway.epa.gov

EnviroAtlas

people
 health
 nature
 economy

Fact Sheet

www.epa.gov/enviroatlas

Hydrologic Unit Codes: HUC 4, HUC 8, and HUC 12

The Watershed Boundary Dataset (WBD) maps the full areal extent of surface water drainage for the U.S. using a hierarchical system of nesting hydrologic units at various scales, each with an assigned hydrologic unit code (<u>HUC</u>). HUCs are delineated and georeferenced to U.S. Geological Survey (USGS) 1:24,000 scale topographic base maps according to compilation criteria monitored by the national <u>Subcommittee on Spatial Water Data</u>.

The hydrologic unit hierarchy is indicated by the number of digits in groups of two (such as HUC 2, HUC 4, and HUC 6) within the HUC code. In EnviroAtlas, HUC 4 represents the subregion level, delineating large river basins (shown in yellow in the image). HUC 8 maps the subbasin level, analogous to medium-sized river basins (about 2200 nationwide, pictured in red in the image); and HUC 12 is a more local sub-watershed level that captures tributary systems (about 90,000 nationwide used by EnviroAtlas to display national metrics for the conterminous U.S.).

Things to know before using these data:

The EPA and USGS have incorporated WBD into their <u>NHDPlusV2</u> dataset that integrates useful features from the <u>National Hydrography Dataset (NHD)</u>, the <u>National</u> Elevation Dataset (NED), and the <u>Watershed Boundary</u> <u>Dataset (WBD)</u>. These datasets are continually updated. The watershed boundaries data found in EnviroAtlas were updated in a WBD Snapshot in April 2015 to ensure that recent HUC boundaries are available in EnviroAtlas.

A watershed is defined as the geographic area within the boundary of a drainage divide. Watershed boundaries follow the highest ridgeline around the stream drainage area; the bottom of the watershed or the pour point is the lowest point of the land area where water flows out of the watershed. Hydrologic unit boundaries do not always surround a complete watershed but may delineate truncated portions of a larger watershed-for example, the mid-stem of a larger stream or river along with the tributaries in that area. Hydrologic units are generally synonymous with watersheds when their boundaries include all the source area contributing surface water to a single defined outlet point. This distinction between watersheds and HUCs is important in the context of water resources data analysis and water quality monitoring, because the area contributing to the downstream outlet point in a single HUC may extend



beyond its boundaries in an upstream direction to include a number of other sub-basin HUCs.

Where can I go for more information?

The Natural Resources Conservation Service (NRCS) defines and compares true watersheds and <u>hydrologic units</u> and their applications for watershed assessment.

<u>Water Supply Paper 2294</u> from USGS outlines the history and development of hydrologic unit maps, criteria for compilation and certification, and applications.

The improvements incorporated into NHDPlusV2 include greatly enhanced capabilities for upstream and downstream navigation, analysis and modeling. National WBD <u>data</u>, NHDPlusV2 User Guide (January 2016), and the <u>metadata</u> are available online.

NOTE: The data described in this fact sheet have not been prepared or reviewed by the EnviroAtlas team; they are sourced from publicly available external web services and as such are prepared, stored, and managed by the organization listed above. With current technology, the EnviroAtlas team has no control over the way these data display in our application. Please go to the sources listed here for more information.



CADMUS

What is the Goal of the Watershed Index Online?



Clean and Safe Water for the Nation

What is the Problem?



Impaired Rivers & Streams



Limited Resources Mean You Must Prioritize!
Why Did We Build the Watershed Index Online?







Watershed Index Online (WSIO) Scientific Basis of Approach





What is the Watershed Index Online?

http://gispub.epa.gov/wsio/

Watershed Index Calculations

Ecological metrics	Stressor metrics	Social context metric		
Indicator 1	Indicator 1	Indicator 1		
Indicator 2	Indicator 2	Indicator 2		
Indicator 3	Indicator 3	Indicator 3		
Indicator 4	Indicator 4	Indicator 4		
Indicator 5	Indicator 5	Indicator 5		
Ecological Index	Stressor Index	Social Index		
Watershed Index =	Ecological + Social + 3	<u>(100– Stressor)</u>		



Hundreds of national datasets make up the WSIO!

What Do the Results Look Like?

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CADMUS

SAIC.

WSIO Summary

Support Better Decisions

• Why is this watershed a priority?

Science-based Decision Management Tool

Where can we be most effective ?

- Repeatable, flexible approach that helps to enhance communication with partners and stakeholders.
- Where should we focus limited resources?
 - Target restoration or protection
- WSIO Tool Saves \$\$\$\$!
 - \$40,000 approximate savings in contractor costs to do state-wide analysis
- Increased Access to National Datasets
 - Data for lower 48 states and software in the cloud
 - Easily downloaded to analysis workbook
 - Access to hundreds of unique datasets/indicators!



WSIO Disclaimer and User Requirements

Software requirements: The WSIO tool requires Microsoft Excel 2010 (or later) for data download and calculation. Excel 2013, the ESRI Maps for Office Add-in, and access to ArcGIS Online are required to use the tool's interactive mapping feature. Mention of product names does not denote endorsement by the EPA.

The WSIO is intended to be used as a decision-support tool by government, professional, academic, and community users with a basic understanding of how the ecological condition of a watershed and the stressors that act upon it can affect hydrology, biology, and water quality. WSIO data and tool outputs do not represent, change or substitute for any statute, regulation, policy, EPA decision or position.

It is the responsibility of the user to read and evaluate dataset limitations, restrictions, and intended use. To the best of our knowledge, the data, information, and supporting materials on the WSIO website are accurate; however, no warranty expressed or implied is made regarding the accuracy or utility of the data for general or scientific purposes, nor shall the distribution constitute any such warranty. All modeled geographic data are, by their nature, imperfect. The data provided by this tool shall not be taken as absolute truth, but rather as an approximation made in good faith based on the best available data.

For site-specific data, WSIO data will not replace "boots-on-the-ground" measurements or local knowledge. Better local data may be available from local sources.

Neither the EPA, EPA contractors, nor any other organizations cooperating with the EPA assume any responsibility for damages or other liabilities related to the accuracy, availability, use or misuse of the information provided on this website. The EPA reserves the right to change information at any time without public notice. Any errors or omissions should be reported to WSIO team using "Contact Us" on the WSIO website. We are always happy to hear your feedback and use that feedback for future enhancements.

April 2015

ATTACHMENTS TO

Strategic Watershed Plan

Falmouth, Maine | August 2021

APPENDIX E New England Landscape Futures (NELF) Explorer Tool

E.1 NELF Explorer: Impervious Cover Analysis Prepared by Lucy Lee, Harvard Forest Research Assistant E.2 Falmouth Case Study Prepared by Lucy Lee, Harvard Forest Research Assistant and Robyn Saunders, ATTAINING

NELF EXPLORER TOOL SCENARIOS: 2060 Falmouth, ME

This tool uses recent development trends to predict impacts of future land use changes in New England. The NELF Explorer Tool also anticipates changes in policy and priority related to:

- Natural Resources Planning and Innovation ranging from high to low priority; and
- Socio-Economic Connectedness ranging from global growth to limited local connectedness.

SCENARIO NATURAL RESOURCE PLANNING SOCIO-ECONOMIC CONNECTEDNESS and INNOVATION No change – business as usual No change – business as usual 1. Recent Trends 1.2 million acres of forest will be Landscape change is converting forests lost by 2060 across New England and farms to low-density development (forest cover reduced by 4%) near major cities and natural wonders (lakes and mtns) 2. Connected High Local Communities Climate change has limited negative Slow population growth with an emphasis on local culture and impacts resources Local economies and sustainability are heavily promoted 3. Yankee Global High Abundant forests remain, driving Cosmopolitan Substantial population growth, tourism. New England has a high including climate refugees and demand for skilled labor economic migrants 4. Growing Low Global Global Considerable population growth, but Little to no agreement globally on climate change or use of renewable local planning fails to keep pace with energy development. As global trade increases, so does privatization of municipal services 5. Go It Alone Low Local Shrinking national budgets and Low population growth due to lack of global economic connections lead opportunities and high cost of living. to little natural resources protection. Ecosystem services degrade significantly due to poor planning, increased pollution, heavy reliance on local resources.

TABLE E.1 – NELF EXPLORER TOOL SCENARIO INTRODUCTION

This project focused solely on the tool's ability to predict land use changes in 10-year increments through 2060 based on land use trends across all five scenarios presented above. A <u>story map by</u> <u>Harvard Forest</u> on the benefits of ecosystem services clearly conveys the need for municipalities to prioritize preservation of natural resources.



TABLE E.2 – NELF EXPLORER TOOL SCENARIOS APPLIED TO FALMOUTH



By examining the rate of development within each watershed for all five scenarios and making assumptions relating development predictions to the amount of future impervious cover, the vulnerability of each watershed becomes more apparent, as indicated in the red areas in Table E.2.

Falmouth + NELF Impervious Cover

Lucy Lee, Harvard Forest

lucylee@fas.harvard.edu

New England Landscape Futures (NELF)

- Land use futures for New England from 2010-2060
- Scenarios created with New Englanders
 - Each scenario has a story & maps
- One business-as-usual scenario (Recent Trends) and 4 alternatives
- Development rates and patterns identified within CBSAs from 1990-2010
 - Those continue for another 50 years in Recent Trends
 - Those are tweaked according to stakeholder ideas for the 4 alternative scenarios
- Development is controlled by things like:
 - Slope
 - Distance to existing development
 - Distance to roads

Impervious Cover in NELF maps

- There are 2 intensities of development in the NELF scenario maps
- Two development classes (high and low density) are each made of two categories of development. Therefore there is a range of imperviousness included in both the high and low density development shown in NELF maps.
- High density development is, on average, 77.5% impervious.
- Low density development is, on average, 25% impervious.



2010 (actual conditions)







Number of times a pixel is developed by 2060 (considering all 5 scenarios):

5

This map gives a sense of *where* development happens within Falmouth in the NELF scenarios. To take this a step further, I could separate out low and high density development to get a better sense of each pixel's estimated imperviousness.

For example: a pixel could be developed 5 times (developed in every scenario) by either low density development, high density development, or a mixture (high density in one scenario but low density in another). In this map all those look the same because they are all developed 5 times.



This map gives a sense of *where* development happens within Falmouth in the NELF scenarios. To take this a step further, I could separate out low and high density development to get a better sense of each pixel's estimated imperviousness.

For example: a pixel could be developed 5 times (developed in every scenario) by either low density development, high density development, or a mixture (high density in one scenario but low density in another). In this map all those look the same because they are all developed 5 times.

Rates of Development in NELF Scenarios

Modeling for NELF scenario maps is done within CBSAs. Falmouth is part of the Portland CBSA, which is relatively small compared to other CBSAs in Maine.

Rate of development in the Recent Trends (business as usual) scenario for **Portland CBSA** is **1954.5 ac/year**, which is 0.13% of the total area. The following table shows how much development happens within Falmouth in the Recent Trends scenario and the 4 alternatives to Recent Trends:

Annual Development in Falmouth in NELF Scenarios

NELF Scenario	Acres developed per year	% of area developed annually
Connected Communities	3.6	0.02%
Go It Alone	18.54	0.10%
Yankee Cosmopolitan	20.44	0.11%
Recent Trends	30.5	0.16%
Growing Global	76.5	0.39%

Lucy's takeaways & questions: - In the Recent Trends scenario Falmouth has roughly the same rate of development as the Portland CBSA as a proportion of its total area. It's slightly higher which makes sense given Falmouth is adjacent to Portland, the most densely populated part of the CBSA.

- Only Growing Global has a higher rate of development in Falmouth than Recent Trends. All other scenarios have a lower rate of development.
- Wondering how these rates of development compare to more local data sources Robyn mentioned



Took the MEAN of values within watersheds to estimate % impervious

Recent Trends 2060

% impervious

4.659650 - 7.000000
 7.000001 - 10.000000
 10.000001 - 15.000000
 15.000001 - 20.000000
 20.000001 - 31.208936



Connected Communities 2060

% impervious

4.199795 - 7.000000
 7.000001 - 10.000000
 10.000001 - 15.000000
 15.000001 - 20.000000
 20.000001 - 33.705650



Yankee Cosmopolitan 2060



% impervious

3.822219 - 7.000000
7.000001 - 10.000000
10.000001 - 15.000000
15.000001 - 20.000000
20.000001 - 31.176084

Growing Global 2060



% impervious

11.462815
 11.462816 - 15.000000
 15.000001 - 20.000000
 20.000001 - 25.000000
 25.000001 - 39.027595

Go It Alone 2060

% impervious

3.879840 - 7.000000
7.000001 - 10.000000
10.000001 - 15.000000
15.000001 - 20.000000
20.000001 - 31.159658



All 5 scenarios – mean of means



% impervious

5.7367	78549 - 7.00000000
7.0000	00001 - 10.0000000
<u> </u>	0001 - 15.0000000
15.000	0001 - 20.0000000
20.000	0001 - 33.2555848

Strategic Watershed Plan

Falmouth, Maine | June 30, 2021

APPENDIX E: New England Landscape Futures (NELF) Explorer CASE STUDY: Descriptive Statistics

SOURCE: https://newenglandlandscapes.org/story/

As described in the <u>NELF's storymap</u>, the purpose of the NELF project is to "*understand possible trends and impacts of landscape change in New England*." Using this powerful model, the possible landscape futures as they apply to the Town of Falmouth are presented below.

Development-focused Future in Falmouth

From Falmouth's founding in 1718 through 2010, the town developed **20%** of its area, creating the bucolic town its residents enjoy today.

Table 1. Proportional land uses.					
Land Use	2010	Future			
% of land that is forest	59	53			
% of forest conserved	19	22			
% of forest unprotected	81	78			
% of land that is developed	20	28			
% of developed low dens.	90	92			
% of developed high dens.	10	8			



In recent decades, the rate of development has increased and, if those trends continue into the future, Falmouth could jump from 20% to 28% developed by 2060. This represents a 38% increase in developed acres -- an area larger than 500 baseball fields -- in just two generations. With one fifth of Falmouth's forests currently protected, there is no time like the present to conserve our forests and shape the future of our town.



Source: Narrative uses data & language from this spreadsheet on using descriptive statistics from NELF's Recent Trends scenario, provided by Lucy Lee, Harvard Forest's Research Assistant.



Forest-focused Futures in Falmouth

Falmouth is about 60% forest, and one fifth of existing forests are protected. Given recent land-use trends, it is likely that 11% of Falmouth's existing forests -- an area the size of 1,200 football fields -- will be lost by 2060.



Falmouth is not alone. Reductions in forests + agriculture are anticipated over the next 40 years. Future reductions in open space + increases in development for Falmouth + several other municipalities experiencing intense development pressures are included on the next page (see **Descriptive Statistics with the NELF Explorer and Recent Trends**).

Descriptive Statistics with the NELF Explorer and Recent Trends

This introduction will explain the purpose of each worksheet in this document and will provide step by step instructions to retrieve and analyze the data you need from the NELF Explorer. **All you need is a computer** with an **internet** connection and a **free Google account** so that you can edit a copy of this document.

Contents of this docume	ent
Sheet Name	Description
Instructions	Explains the purpose of each worksheet in the document
Explains how to navigate to the necessary chart in the NELF Explorer (see below)	
Statistics	Contains the table that the user fills in with acreages from the NELF Explorer
olalistics	Derives other statistics and calculations automatically based on the user's input
Charts	Creates two pie charts showing present and future land use
Gliaits	Creates one bar chart showing change in developed and conserved acres over time
Example	Shows how the statistics and charts from this document can be used to create a place based narrative

Instructions to retrieve data and use this document

Part 1: Edit access to this Google Sheets

1. If you do not have a free Google account, <u>create one here.</u>

2. Create a copy of this Google Sheets document that you can edit. On this document, go to File and select either Add to My Drive or Make a copy ... and the copy will save to your Google Drive.

click here to open.

FOR THE FALMOUTH EXERCISE: Another option is to download the file as an Excel spreadsheet.

Part 2: Retrieving land use acres from NELF Explorer

- 1. Open the NELF Explorer in Chrome, Firefox, or Safari -
- 2. Click the "Skip to maps" button.

3. Click the "Explore Areas" button on the navigation bar at the top of the Explorer.

4. From the "Explore Areas" dropdown menu that appears, select your spatial scale. Polygons showing those areas will apear on the map.

Note: Depending on your internet speed and the spatial scale selected, this may take a minute. Be patient!

FOR THE FALMOUTH EXERCISE: From "Explore Areas" go to Municipality.

5. On the map, click on the area that you want to generate statistics for. (You may need to zoom in to find it.) Once you click, a new section of the NELF Explorer will appear on the bottom of the page, with charts on the left and text on the right.

6. On the left side of this new section, find the Recent Trends chart below "Land uses over time for [your area]". The land use charts are labeled with the FOR THE FALMOUTH EXERCISE: Once you click the map for Falmouth, the boundaries will be highlighted and LAND USE CHARTS +

STATISTICS will be generated on a municipal-wide basis. 7. Hover your computer mouse over the Recent Trends land use chart at 2010. Enter these numbers into Table 1 on the "Statistics" worksheet.

> FOR THE FALMOUTH EXERCISE: Once you hover over Falmouth, the boundaries will be highlighted and LAND USE CHARTS + STATISTICS will be generated on a municipal-wide basis. The 2010 + 2020 STATISTICS are as follows:

8. Repeat for a future decade of Recent Trends, such as 2050 or 2060.

FOR THE FALMOUTH EXERCISE: Each of the decades are entered in TABLE 1

9. Some tips to make retrieving the land use acreages from the chart smoother:

a. Write the acreages down on paper first, then enter them into Table 1. This reduces moving the mouse off the chart and the acreages disappearing.

b. Make sure this document and the NELF Explorer are open in different browser windows so you can view both at the same time. When hovering over a decade in the Recent Trends land use chart, right click with your mouse. This will freeze the acreage table so that it does not disappear when your mouse leaves, and you can enter the acreages into Table 1 more easily. You can also try using the "Copy image" option that appears when you right click, and paste the photo of land use FOR THE FALMOUTH EXERCISE: The same statistics for Westbrook + Scarborough have been gathered for comparison purposes.

Table 1 - FALMO	DUTH. Acres o	f land use as see	en in "Land u	ses over time" R	ecent Trends cha	art.	DELTA
Land Use	2010 acres	2020 acres		Futu	re acres		
Water	451	451	451	451	451	451	0
Other	1,341	1,341	1,341	1,341	1,341	1,341	0
Agriculture	2,137	2,091	2,046	1,994	1,948	1,903	-234
Conserved Forest	2,187	2,229	2,239	2,265	2,269	2,279	92
Unprotected Forest	9,340	9,025	8,757	8,474	8,216	7,959	-1,381
Low Density Development	3,562	3,880	4,181	4,489	4,785	5,074	1,512
High Density Development	415	417	419	421	423	426	11
		Future decade:	2030	2040	2050	2060	

WESTBROOK. Acres of land use as seen in "Land uses over time" Recent Trends chart.								
Land Use	2010 acres 2020 acres Future acres							
Water	34	34	34	34	34	34		
Other	1,343	1,343	1,343	1,343	1,343	1,343		
Agriculture	1,181	1,100	1,037	970	911	857		
Conserved Forest	4	91	91	91	91	166		
Unprotected Forest	4,863	4,571	4,354	4,157	3,969	3,710		
Low Density Development	2,959	3,002	3,046	3,099	3,151	3,204		
High Density Development	863	1,107	1,341	1,552	1,749	1,932		
	F	uture decade:	2030	2040	2050	2060		

CUMBERLAND. Acres of land use as seen in "Land uses over time" Recent Trends chart.										
Land Use	2010 acres	2020 acres		Future acres						
Water	54	54	54	54	54	54				
Other	1,345	1,345	1,345	1,345	1,345	1,345				
Agriculture	2,388	2,340	2,296	2,255	2,207	2,174				
Conserved Forest	725	745	764	812	883	894				
Unprotected Forest	7,746	7,528	7,344	7,128	6,910	6,728				
Low Density Development	2,423	2,669	2,879	3,087	3,282	3,485				
High Density Development	196	196	196	196	197	197				
	F	uture decade:	2030	2040	2050	2060				

WINDHAM. Acres of land use as seen in "Land uses over time" Recent Trends chart.									
Land Use	2010 acres	2020 acres Future acres							
Water	2,349	2,349	2,349	2,349	2,349	2,349			
Other	3,443	3,443	3,443	3,443	3,443	3,443			
Agriculture	3,348	3,293	3,235	3,180	3,123	3,079			
Conserved Forest	220	428	474	835	972	1,162			
Unprotected Forest	17,679	16,916	16,312	15,387	14,735	14,014			
Low Density Development	4,869	5,478	6,094	6,710	7,279	7,851			
High Density Development	457	458	459	4,662	464	468			
	I	Future decade:	2030	2040	2050	2060			

SCARBOROU	GH. Acres of la	and use as seen	in "Land use	s over time" Rec	ent Trends chart	
Land Use	2010 acres	2020 acres		Futu	re acres	
Water	377	377	377	377	377	377
Other	6,129	6,129	6,129	6,129	6,129	6,129
Agriculture	2,511	2,469	2,426	2,388	2,348	2,308
Conserved Forest	2,042	2,184	2,381	2,385	2,385	2,528
Unprotected Forest	13,196	12,793	12,380	12,159	11,937	11,594
Low Density Development	5,656	5,925	6,151	6,360	6,566	6,759
High Density Development	1,219	1,254	1,286	1,333	1,387	1,435
		Future decade:	2030	2040	2050	2060

CUMBERLAND CO	DUNTY. Acres	of land use as s	een in "Land	uses over time"	Recent Trends of	hart.
Land Use	2010 acres	2020 acres		Futu	re acres	
Water	57,030	57,030	57,030	57,030	57,030	57,030
Other	51,993	51,993	51,993	51,993	51,993	51,993
Agriculture	40,965	40,991	41,066	41,142	41,270	41,418
Conserved Forest	29,033	33,790	38,903	46,965	52,252	57,548
Unprotected Forest	330,156	316,532	302,588	285,778	271,728	257,735
Low Density Development	72,972	80,678	88,327	95,900	103,446	110,894
High Density Development	11,884	13,019	14,127	15,227	16,315	17,416
	F	uture decade:	2030	2040	2050	2060

942	
-3,665	
2,982	
11	

0 0 269

0 -324 162 -1,153 245 1,069

> 0 0

169 -1,018 1,062 1

0
0
-203
486
-1,602
1,103
216

0 453 28,515 -72,421 37,922 5,532 **ATTACHMENTS TO**

Strategic Watershed Plan

Falmouth, Maine | August 2021

APPENDIX F Proposed Watershed Health Metrics

TABLE F.1 BASIN METRICS: Casco Bay Frontal Drainage TABLE F.2 BASIN METRICS: Presumpscot and Piscataqua Rivers Prepared by ATTAINING

> Computations by GPCOG (See Appendix G)

APPENDIX F - WATERSHED HEALTH METRICS

	USEPA's	USEPA DEFINITION + ICON	ноw то со	MMUNICATE SIMPLY	INDICATORS		ADAPTIVE MAN	AGEMENT OPTI	ONS
	MULTIMETRIC INDICES		SymbolIcon	 Proposed Message Based on <u>USEPA TOOL</u> <u>#2: Integrated</u> <u>Assessment of Healthy</u> <u>Watersheds</u> 	Proposed applicable indicator(s) from <u>USEPA TOOL</u> <u>#3: Watershed Index Online</u>	PROPOSED HEALTHY WATERSHED PARAMETERS	FINAL WS Calcs provided by GPCOG for 2021 Strategic Plan	WS Calcs for future analysis #1	#2
A	BIOLOGICAL CONDITION	Biological Condition Biological community diversity, composition, relative abundance, trophic structure, condition, and sensitive species.	500	The ultimate indicator of watershed health, as aquatic organisms + communities reflect the cumulative conditions of all other watershed components + processes.	 Mean Probability of Good Biological Condition (Watershed = Ws) Biological Condition at Watershed Outlet 	 BIOLOGICAL CONDITION: Macroinvertebrate (or "rock bag") sampling data 	# of all monitoring stations within watershed		
	WATER QUALITY	Water Quality Chemical and physical characteristics of water.	-	The chemical + physical characteristics of water include concentrations of pollutants (like salt) + nutrients, as well as physical parameters (like pH + temperature).	 Difference Between % Assessed HUC12 Streamlength Supporting vs. Impaired Difference Between % Assessed HUC 12 Watershed Area Supporting vs Impaired 	 WATER QUALITY: Amount of Data available vs. Amount of Data impaired 	# of stations achieving water quality standards		
В	<u>HYDROLOGY</u>	Hydrology Hydrologic regime: Quantity and timing of flow or water level fluctuation. Highly dependent on the natural flow (disturbance) regime and hydrologic connectivity, including surface-ground water interactions.		Watershed hydrology is driven by climatic processes, land use, and surface characteristics, such as topography + geology.	 % Ag on Hydric Soils (Ws) Dam Storage Ratio (Ws) % Forest Remaining (Ws) % Wetland Remaining (Ws) % Impervious Cover (Ws) 	 HYDROLOGY: % Impervious % Forested % Wetland (Remaining) 	Forested Area in the WS, expressed as a % + as protected forests	Wetland Area in the WS, expressed as a % + as protected wetlands	
С	GEOMORPHOLOGY	Geomorphology Stream channels with natural geomorphic dynamics.		Like hydrology (referring to the land), the stream channel is also influenced by climatic processes + other disturbances that may cause the stream channel to become unbalanced.	 Dam Density (Ws) % Ditch Drainage (Ws) Road Density (Riparian Zone = RZ) % High-Intensity Land Cover (RZ) 	 GEOMORPHOLOGY: Road Stream Crossing Density (Ws vs. RZ) % High-Intensity Land Cover (Ws vs. RZ) 	# of road stream crossings	# of road stream crossing in WS vs. RZ	
	<u>HABITAT</u>	Habitat Aquatic, wetland, riparian, floodplain, lake, and shoreline habitat. Hydrologic connectivity.		When the stream bank is unbalanced, sedimentation + deposition covers critical stream substrates that provides habitat for aquatic organisms.	NFHP Habitat Condition Index	 HABITAT: % Hydrologic Active # of stream barriers acres of wetlands destruction annually 	# of stream barriers	Acres of wetland destroyed annually is tracked by DEP	
D	LANDSCAPE CONDITION	Landscape Condition Patterns of natural land cover, natural disturbance regimes, lateral and longitudinal connectivity of the aquatic environment, and continuity of landscape processes.	WE	The condition of the natural landscape influences aquatic habitats, cycles nutrients, retains sediment, and allows infiltration.	 % Natural Land Cover (Ws) Population Density (Ws) Population Density (RZ) Mining Density (Ws) 	 LANDSCAPE CONDITION: % Natural Land Cover Population Density (Ws vs. RZ) 	Riparian Zone in WS, expressed as disturbed/ undisturbed		

	USEPA's	USEPA DEFINITION + ICON	но	w то со	M	NU	NICATE SIMPLY	IN	DICATORS			ADAPTIVE MAN	AGEMENT OPTIC	ONS
	MULTIMETRIC		•	Symbol	•	[Proposed Message	Pro	pposed applicable			FINAL WS Calcs	WS Calcs for	#2
	INDICES		•	lcon	•		Based on <u>USEPA TOOL</u>	ind	licator(s) from <u>USEPA TOOL</u>	PR	OPOSED HEALTHY	provided by	future	
						4	#2: Integrated	<u>#3</u> :	Watershed Index Online	WATE	RSHED PARAMETERS	GPCOG for	analysis #1	
							Assessment of Healthy					2021 Strategic		
							Watersheds					Plan		
Е	ATTRIBUTES OF				۷	Nat	tershed health is	SEE	E VULNERABILITY SUB-					
	VULNERABILITY				ď	yna	amic and should account	IND	DICES BELOW					
					fc	or f	uture changes in climate							
					+	hu	man activity.							
		1. Land Use Change			N	los	t applicable to Southern	•	% Human Use Change (Ws)	VULN	ERABILITY:	IC – use <u>CWP</u>	Alternate	
					N	1air	ne where development	٠	% Human Use Change (RZ)	• %	Change in IC using	<u>model</u>	Vulnerability	
					р	res	sures are mounting due	•	Projected Change in	<u>T(</u>	OOL #4: NELF	and	Index:	
					to	o:			Impervious Cover (Ws)	<u>E></u>	kplorer Tool	NELF analysis	Sewered Area	
						•	 Within the State – 		2010-2050					
							migration from more	•	% Protected Lands (Ws)					
							rural areas							
							 From other States – 							
							migration from more							
							metropolitan areas							
		2. Water Use			N	1or	e applicable to	•	Ag Water Use (Ws)			N/A		
					w	/ate	ersheds, like Sebago Lake	٠	Domestic Waters Use (Ws)					
					0	r Sa	aco River, used as a	•	Industrial Water Use (Ws)					
					d	rinl	king water source							<u> </u>
		3. Wildfire			N	1or	e applicable to	•	Mean Wildfire Risk (Ws)			N/A		Í
					w	/ate	ersheds in arid + Western	•	% High or Very High					1
					cl	lim	ates, like CA		Wildfire Risk (Ws)					Ì

The purpose of this project is to: (1) propose watershed health parameters (metrics + thresholds) to provide a relative comparison of health for all watersheds within the Town of Falmouth; (2) allow for resources (technical + financial) to be proactively guided toward the needs of watersheds in a prioritized, science-based approach; and (3) encourage buy-in from other (preferably upstream) communities in order to amplify the positive impacts to Casco Bay.

This project + presentation made possible through award CZM NA18NOS4097419 to the Maine Coastal Program from the National Oceanic and Atmospheric Administration, U.S. Department of Commerce. The statements, findings, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of NOAA or the Department of Commerce.

BASIN: CASCO BAY FRONTAL DRAINAGE (HIGH Priority Basin)

WATERSHED HEALTH	USEPA DEFINITION + ICON	WATERSHED	CASC	CO BAY	Scittery	gussett	Webe	s Creek	Chenery	/ Brook	Mill C	Creek	Norton	Brook
METRIC		CALCULATION	FRC	NTAL	Cre	eek								
			DRA	INAGE										
	WS = Total Watershed; FO = Within	n Falmouth Only \rightarrow	WS	FO	WS	FO	WS	FO	WS	FO	WS	FO	WS	FO
A. BIOLOGICAL CONDITION + WATER QUALITY	Biological Condition Biological community diversity, composition, relative abundance, trophic structure, condition, and sensitive species.	# of Monitoring stations in watershed	7	6	0	0	0	0	1	1	1	1	3	3
	Chemical and physical characteristics of water.	 # of stations meeting WQS 												
B. HYDROLOGY CONDITION	Hydrology Hydrologic regime: Quantity and timing of flow or water level fluctuation. Highly dependent on the natural flow (disturbance) regime and hydrologic connectivity, including surface-ground water interactions.	 Forested Area (amount + % of cover) in 	49%	52%	46%	46%	26%	26%	64%	65%	79%	77%	68%	64%
		 Protected forests in the watershed 	8%	10%	10%	10%	1%	1%	6%	6%	18%	19%	2%	3%
C. GEOMORPHOLOGY + HABITAT CONDITION	Geomorphology Stream channels with natural geomorphic dynamics.	 # of road crossings within the watershed # of stream barriers in 	31 7 (22%)	28 6 (21%)	10	10	1 0 (0%)	1 0 (0%)	3	1 0 (0%)	6	6 2 (22%)	1 0 (0%)	1 0 (0%)
		watershed	(2370)	(21/0)	(1070)	(10%)	(078)	(070)	(3370)	(078)	(3370)	(3370)	(078)	(078)
D. LANDSCAPE CONDITION	Landscape Condition Patterns of natural land cover, natural disturbance regimes, lateral and longitudinal connectivity of the aquatic environment, and continuity of landscape processes.	 Undisturbed Riparian Zone (RZ) in watershed Disturbed RZ as a % 		71% 29%		57% 43%		56% 44%		74% 26%		85% 15%		88%
E. ATTRIBUTES OF VULNERABILITY	Defined by USEPA as risk of: (1) Land Use Change (2) Water Usage – not applicable (3) Wildfire – not applicable	 Impervious area or cover (IA or IC), expressed as a % + projected using NELF Explorer Tool 	10%	11%	14% 2060: 16% (+2%)	14%	32% 2060: 32% (+0%)	32%	7% 2060: 9% (+2%)	10%	5% 2060: 7% (+2%)	6%	8% 2060: 10% (2%)	10%

BASIN: PRESUMPSCOT RIVER (MODERATE PRIORITY) + PISCATAQUA RIVER (LOW PRIORITY)

WATERSHED HEALTH	USEPA DEFINITION + ICON	PRESUMPSCO		OT Meader Brook		Minnov	v Brook	PISCAT	AQUA	Hobbs	Brook	East B	ranch	
METRIC		RIVE	RBASIN					RIVER	BASIN					
	WS = Total Watershed; FO = With	in Falmouth Only \rightarrow	WS	FO	WS	FO	WS	FO	WS	FO	WS	FO	WS	FO
A. BIOLOGICAL CONDITION + WATER QUALITY	Biological Condition Biological community diversity, composition, relative abundance, trophic structure, condition, and sensitive species.	 # of Monitoring stations in watershed 	28	8	0	0	0	0	14	9	6	3	3	3
	Water Quality Chemical and physical characteristics of water.	 # of stations meeting WQS 												
B. HYDROLOGY CONDITION	Hydrology Hydrologic regime: Quantity and timing of flow or water level fluctuation. Highly dependent on the natural flow (disturbance) regime and hydrologic connectivity, including surface-ground water interactions.	 Forested Area (amount + % of cover) in 	45%	64%	81%	81%	68%	78%	63%	66%	58%	66%	55%	53%
		 watershed Protected forests in the watershed 	2%	5%	1%	1%	0%	4%	11%	17%	15%	26%	7%	11%
C. GEOMORPHOLOGY + HABITAT CONDITION	Geomorphology Stream channels with natural geomorphic dynamics.	 # of road crossings within the watershed 	18	8	7	5	1	0	30	12	6	1		13
	Habitat Aquatic, wetland, riparian, floodplain, lake, and shoreline habitat. Hydrologic connectivity.	 # of stream barriers in watershed 	9 (50%)	5 (63%)	5 (71%)	4 (80%)	1 (100%)	0 (0%)	10 (33%)	5 (42%)	2 (33%)	0 (0%)		3 (23%)
D. LANDSCAPE CONDITION	Landscape Condition Patterns of natural land cover, natural disturbance regimes, lateral and longitudinal connectivity of the aquatic environment, and continuity of landscape processes.	 Undisturbed Riparian Zone (RZ) in watershed 	42%	89%	97%	96%	97%	89%	28%	87%	88%	94%	28%	88%
		• Disturbed RZ as a %	58%	11%	3%	4%	3%	11%	72%	13%	12%	6%	72%	12%
E. ATTRIBUTES OF VULNERABILITY	Defined by USEPA as risk of: (1) Land Use Change (2) Water Usage – not applicable (3) Wildfire – not applicable	 Impervious area or cover (IA or IC), expressed as a % + projected using NELF Explorer Tool 	13%	8%	4% 2060: 6% (+2%)	4%	5% 2060: 10% (+5%)	3%	4% 2060: 7% (+3%)	4%	4% 2060: 5% (+1%)	2%	5% 2060: 7% (2%)	5%

ATTACHMENTS TO

Strategic Watershed Plan

Falmouth, Maine | August 2021

APPENDIX G Watershed Calculations

Prepared by GPCOG Compiled by ATTAINING

STRATEGIC WATERSHED PLAN

Falmouth, Maine | June 30, 2021

PROPOSED WAT	ERSHE	D HEA		ETRICS	Vulnera Wate	bility of rshed	A. BIOL CONDITION QUA	OGICAL N + WATER LITY	В	. HYDR	OLOGY	CONDITI	ON	C. GE HAB	OMORI BITAT CO	PHOLO ONDIT	GY + ION	D. LA	NDSCAP	E COND	ITION	Alterr Vulnerablil	ate ty Factor
ASIN Nested Sub-Watershed (WS)	WA Calculated by DEP	ATERSHED A Calculated by NELF	REA Calculated by WSIO	STREAM LENGTH	IMPERVI	DUS AREA	MONITORIN Located in WS	G STATIONS Meeting WQS	Located in WS	FO % in WS	RESTED AR % in WS by WSIO	EA IN WS Protected Forests in WS	% Protected	STI Located in WS	REAM-ROAL # Barriers	CROSSIN % Barriers	GS Barrier Density	Located in WS	RIPARIAN Undisturbed in WS	ZONE (RZ) % Undist'd	% Disturbed	SEWEREI WITHIN FA ONI	D AREA LMOUTH .Y
GPCOG GIS Labels Sub Basin	ACRES DEP	ACRES NELF		Str Len	Tot ISA	PCT ISA	Monitor		Tot FOR	PCT FOR		PROT FOR	PCT PROT	Stream Bar	Stream_B ar Yes			RZ Area	RZ Und Area			Sew_Acre	PCT_Sew
SCO BAY FRONTAL DRAINAGE	ACRES	ACRES	ACRES	MILES	ACRES	%	# Stations	#	ACRES	%	%	ACRES	%	#	#	%	#/MILE	ACRES	ACRES	%	%	ACRES	%
TOTAL WATERSHED	7,291.47	7,290.31	Henzo	24.1	730.4	10%	6		3544.5	49%	53%	560.0	8%	31	7	23%	0.29	837.9	2011.2	~	,,,	, lentes	~
WATERSHED WITHIN FALMOUTH	4,829.58	4,828.41		16.5	539.5	11%	7		2497.7	52%		500.6	10%	28	6	21%	0.36	664.3	474.0	71%	29%	980.8	20%
1 Scitterygussett Creek	495.79	495.72		1.7	70.2	14%	0		227.7	46%		49.1	10%	10	1	10%	0.58	36.5	20.7	57%	43%	07.2	200/
2 Webes Creek	495.79 337.80	338.48		0.9	107.2	32%	0		89.6	4 6% 26%		49.1	10%	10	0	10%	0.58	30.5 14.8	20.7	5/%	43% 44%	97.2	20%
WITHIN FALMOUTH ONLY	337.80	338.48		0.9	107.3	32%	Ő		89.6	26%		4.7	1%	1	Ő	0%	0.00	14.8	8.3	56%	44%	109.9	33%
3 Chenery Brook	1,294.89	1,296.56		4.5	87.9	7%	1		831.1	64%		72.9	6%	3	1	33%	0.22	77.6	64.3	83%	17%		
WITHIN FALMOUTH ONLY	314.73	314.47		1.4	30.7	10%	1		205.3	65%		17.3	6%	1	0	0%	0.00	23.4	17.3	74%	26%	15.4	5%
4 MIII Creek	1,343.93	1,342.82		3.9	68.7	5% 6%	1		1055.5 953.4	79% 77%		239.3 239.3	18%	6	2	33%	0.51	81.7 81 7	69.1 69.0	85% 85%	15% 15%	181.0	15%
9 Norton Brook	510.20	509.28		1.7	42.9	8%	3		346.3	68%		8.5	2%	1	0	0%	0.00	24.4	21.347143	87%	13%	10110	10/0
WITHIN FALMOUTH ONLY	326.69	326.03		1.3	32.9	10%	3		209.3	64%		8.5	3%	1	0	0%	0.00	19.1	16.7	88%	12%	118.4	36%
10 Mussel Cove	193.50	193.71		1.7	15.8	8%	0		62.9	32%		6.9	4%	0	0	-	0.00	60.4	46.1	76%	24%		
WITHIN FALMOUTH ONLY	185.46	185.70		0.9	15.8	9%	0		62.5	34%		6.9	4%	0	0	-	0.00	60.4	46.1	76%	24%	36.4	20%
WITHIN FALMOUTH ONLY	445.05 443.76	444.79		2.0 1.1	47.8 47.6	11%	0		149.2 149.2	54% 34%		24.7 24.7	6%	0	0	-	0.00	134.8 134.7	78.0	58%	42% 42%	173.5	39%
12 Casco Bay 2	660.27	658.73		1.7	84.3	13%	0		249.1	38%		10.5	2%	0	0	-	0.00	110.5	65.6	59%	41%		
WITHIN FALMOUTH ONLY	396.34	397.20		0.3	61.5	15%	1		118.1	30%		10.5	3%	0	0	-	0.00	66.0	35.1	53%	47%	73.3	19%
21 Tidal Flats East	651.10	650.50		2.8	49.0	8%	0		93.4	14%		38.0	6%	0	0	-	0.00	119.4	97.5	82%	18%		
WITHIN FALMOUTH ONLY	390.95	389.19		2.7	48.5	12%	0		93.2	24%		38.0	10%	0	0	-	0.00	118.1	96.1	81%	19%	100.1	26%
22 Tidal Flats West	1,326.20	1,327.70		2.6	152.9	12%	1		427.4	32%		93.9	/% 1.4%	10	3	30%	1.14	1/2./	120.0 91 E	70%	30%	67.6	9%
23 Mild Pond	32.13	32.02		0.0	3.5	11%	0		12.2	38%		11.6	36%	0	0	-	1.55	5.1	5.1	100%	0%	02.0	576
WITHIN FALMOUTH ONLY	32.13	32.02		0.0	3.5	11%	0		12.2	38%		11.6	36%	0	0	-		5.1	5.1	100%	0%	12.9	40%
RESUMPSCOT MAIN STEM	ACRES	ACRES	ACRES	MILES	ACRES	%	# Stations		ACRES	%	%	ACRES	%	#	#	%	#/MILE	ACRES	ACRES	%	%	ACRES	%
TOTAL WATERSHED	7,168.46	7,166.66	16,235.60	12.1	918.2	13%	28		3249.0	45%	54%	152.1	2%	18	9	50%	0.74	759.3	315.3	42%	58%		
WATERSHED WITHIN FALMOUTH	2,598.84	2,594.90		4.5	201.8	8%	8		1649.7	64%		119.0	5%	8	5	63%	1.12	345.7	306.1	89%	11%	124.0	5%
5 Meader Brook	874.33	872.90		2.8	31.9	4%	0		710.1	81%		8.9	1%	7	5	71%	1.79	57.5	55.7	97%	3%	27.4	40/
WITHIN FALMOUTH ONLY	733.48	731.68		2.3	26.6	4%	0		594.5	81% 47%		8.9	1%	5	4	80%	1.75	46.7 12.0	44.9 6.7	96%	4%	27.4	4%
	250.75	251.31 251.31		0.5	39.5	16%	0		117.6	47%		0.0	0%	3	1	33%	1.86	12.0	6.7	56%	44%	13.9	6%
8 Presump trib 2 (along Gray Rd)	15.66	16.01		0.2	2.6	16%	0		1.6	10%		0.0	0%	0	0	-	0.00	10.6	7.4	70%	30%		
WITHIN FALMOUTH ONLY	15.66	16.01		0.2	2.6	16%	0		1.6	10%		0.0	0%	0	0	-	0.00	10.6	7.4	70%	30%	0.0	0%
15 Minnow Brook	914.46	915.82		2.6	48.9	5%	0		618.7	68%		4.2	0%	1	1	100%	0.38	55.3	53.3	97%	3%	2.0	20/
WITHIN FALMOUTH ONLY	3 0/0 36	82.51 3 0/0 36		0.1	2.6 588 1	3% 19%	U 21		64.7 769.7	78% 25%		3.b 15.3	4% 1%	7	2	-	0.00	2.5 360 5	2.2	89%	11%	2.0	2%
WITHIN FALMOUTH ONLY	166.91	166.57		0.0	20.1	12%	2		78.3	47%		2.0	1%	0	0	-	0.00	27.9	24.3	87%	13%	11.0	7%
25 Presumpscot Main Stem 2	290.81	290.45		0.6	41.2	14%	1		113.0	39%		8.2	3%	0	0	-	0.00	69.0	61.8	89%	11%		
WITHIN FALMOUTH ONLY	255.51	254.42		0.4	34.0	13%	1		103.9	41%		8.2	3%	0	0	-	0.00	69.0	61.7	89%	11%	19.3	8%
26 Presumpscot Main Stem 3 - Lower	760.09	759.70		0.4	65.9	9%	5		438.8	58%		56.3	7%	0	0	-	0.00	93.8	91.0	97%	3%	11.4	29/
WITHIN FALMOUTH ONLY 27 Presumpscot Main Stem 4	509.24 499.79	209.73		0.4	29.3 34 1	0% 7%	5 1		342.3 274 7	6/% 55%		3/.1 47 9	7% 9%	U	U 0	-	0.00	106.7	74.9 89.6	90% 84%	4% 16%	11.1	2%
WITHIN FALMOUTH ONLY	447.09	445.23		0.6	33.8	8%	Ō		273.8	61%		42.9	10%	Ő	Ő	-	0.00	106.2	89.2	84%	16%	32.1	7%
28 Presumpscot Main Stem 3 - Upper	537.87	537.31		0.0	68.5	13%	0		206.4	38%		16.2	3%	0	0	-	0.00	4.5	3.0	68%	32%		
WITHIN FALMOUTH ONLY	154.91	153.45		0.0	15.9	10%	0		74.7	49%		16.2	11%	0	0	-	0.00	3.7	2.2	61%	39%	7.2	5%
	ACRES	ACRES	ACRES	MILES	ACRES	%	# Stations		ACRES	9/	%	ACRES	%∠	#	#	9/	#/MILE	ACRES	ACRES	%	%	ACRES	%
TOTAL WATERSHED	9,583.80	9,586.31	19,561.00	26.9	418.1	4%	14		6041.6	63%	66%	1010.1	11%	30	10	33%	0.37	697.2	191.8	28%	72%	ACRES	/0
WATERSHED WITHIN FALMOUTH	5,363.48	5,365.49		15.5	219.3	4%	9		3545.2	66%		897.4	17%	12	5	42%	0.32	486.2	421.1	87%	13%	164.2	3%
7 Piscat trib 1 (crosses Leighton Rd)	493.62	491.71		1.5	23.2	5%	0		362.9	74%		0.0	0%	4	2	50%	1.30	34.1	26.3	77%	23%		
WITHIN FALMOUTH ONLY	493.62	491.71		1.5	23.2	5%	0		362.9	74%		0.0	0%	4	2	50%	1.30	34.1	26.3	77%	23%	17.4	4%
WITHIN FALMOUTH ONLY	7,043.39 4,223.51	4.226.83		21.3 11.6	550.4 184.4	5% 4%	ŏ 6		4642.0 2756.8	65%		789.1	10%	20 7	ъ 3	50% 43%	0.28	588.7 410.2	355.6	87%	13%	133.4	3%
17 Hobbs Brook	1,446.80	1,448.23		4.1	38.5	3%	6		836.0	58%		221.1	15%	6	2	33%	0.49	74.4	65.6	88%	12%		
WITHIN FALMOUTH ONLY	646.35	646.95		2.4	11.7	2%	3		425.4	66%		169.7	26%	1	0	0%	0.00	41.9	39.2	94%	6%	13.4	2%
	ACREC	ACDEC	ACDEC	MUSC	ACREC	9/	# Chesting	"	ACDEC	0/	8/	ACREC	C /		"	0/	#/84115	ACDEC	ACDEC	84	9/	ACREC	9/
	ACKES 12 756 17	12 754 32	12 579 80	41 7	572 0	% 4%	# Stations	#	6979 9	% 55%	% 48%	923 4	% 7%	# 49	# 10	% 20%	0.24	875 /	248 7	% 28%	70 72%	ACRES	70
WATERSHED WITHIN FALMOUTH	3,804.99	3,803.39	12,575.00	13.0	191.8	5%	3		1997.3	53%	-070	412.5	11%	13	3	23%	0.24	318.7	280.6	88%	12%	446.7	12%
13 Upper East Branch Piscataqua River	10,494.58	10,491.68		34.9	513.4	5%	2		5347.0	51%		548.6	5%	44	8	18%	0.23	684.8	611.2	89%	11%		
WITHIN FALMOUTH ONLY	3,656.36	3,654.61		12.5	182.6	5%	2		1913.3	52%		354.5	10%	13	3	23%	0.24	278.5	246.0	88%	12%	440.0	12%
18 Upper Mill Brook	183.31	182.59		0.0	2.7	1%	0		166.6	91%		7.3	4%	0	0	-	0.00	2.5	2.5	99%	1%		00/
WITHIN FALMOUTH ONLY	1 007 00	1 000 33		6.2	46 7	20/	0		1440.2	700/		257.0	100/	-	2	400/	0.33	140.0	142.7	0.0%	40/	0.0	0%
	1,987.98 58.32	1,989.32 58.04		0.3 0.0	46.7 0.0	∠% 0%	0		1440.2 58.0	72% 100%		357.8 48.5	18% 84%	5 0	2	40%	0.32	148.0 0.0	0.0	90%	4%	0.0	0%
20 Lower East Branch Piscatagua River	90.31	90.74		0.5	9.2	10%	1		26.0	29%		9.6	11%	0	0	-	0.00	40.2	34.7	86%	14%	0.0	
WITHIN FALMOUTH ONLY	90 31	90 74		0.5	9.2	10%	1		26.0	29%		96	11%	0	0		0.00	40.2	34.7	96%	1.49/	67	79/
ATTACHMENTS TO

Strategic Watershed Plan

Falmouth, Maine | August 2021

APPENDIX H Sample Job Description: Watershed Manager

Prepared by

Midcoast Conservation Conservancy



Job Announcement: Senior Watershed Manager

Since 2016, five conservation organizations have merged to create Midcoast Conservancy. Our mission is to support and promote healthy lands, waters, wildlife and people in Midcoast Maine through conservation, outdoor adventure and learning. Our focus includes the watersheds of Damariscotta Lake, Medomak River and Sheepscot River.

This position is primarily responsible for protecting and improving water resources for human and ecological benefit within the service area of Midcoast Conservancy. The position is salaried based on a 35-hour work week. Benefits include sick leave, all Federal holidays, 3 weeks of vacation, retirement plan and health insurance all in a collaborative and flexible work environment. Periodic work on weekends and evenings will be required. Work-related mileage will be reimbursed. Reports to the Executive Director; Annual salary of \$35,000 – \$45,000 depending on experience.

Duties and responsibilities:

- Leadership: Represents Midcoast Conservancy interests with regional and state organizations. Works with organization's Grants Team to research and write grants related to watershed restoration and climate resiliency. Stays current on science and trends in field of watershed management by attending relevant conferences and meetings. Hires and supervises seasonal staff (Maine Conservation Corps and Youth Conservation Corps.)
- Watershed Management: Develops and implements Watershed Protection Plans as well as strategies to protect and improve water quality, aquatic habitat, connectivity, and recreational access throughout the Midcoast Conservancy service area. Works with community leaders to implement and promote programs that reduce erosion and mitigate pollution within lakes, rivers, streams and estuaries within the region.
- Water Quality: Implements core programs in water quality including sampling water chemistry. Addresses diverse sources of pollution within the watershed, implements structural and non-structural Best Management Practices. Maintains organization's field equipment related to water quality (sampling equipment, boats, docks, etc.)
- Invasive Aquatic Plants & Animals: Works with volunteers, state agencies and municipalities on reducing the risk of invasive aquatic plant infestations throughout the service area. Facilitates the control of *Hydrilla* infestations in Damariscotta Lake and manages programs to prevent and identify other invasive aquatic species within the service area
- **Community Engagement:** Engages the community to create and implement new opportunities for protecting water quality throughout the region. (e.g. volunteers, municipalities, community institutions and members.) Responsible for creating content for all newsletters, press releases and social media related to their work and forwarding to

Clean Water. Thriving Communities. Land for All.

ACCREDIT

290 U.S. Route One, PO Box 439, Edgecomb, ME 04556-0439 (207) 389-5150 midcoastconservancy.org Communications staff for telling our story. Acts as an ambassador for the organization within the community. May be organizational representative for any of the five Local Councils to assist in development or implementation of programs related to their work.

Desired knowledge, skills and experience:

- Bachelor's degree in science-related or natural resource management-related field and 5-7 years of experience, or equivalent combination. Graduate degree preferred.
- Exceptional track record in developing successful relationships with diverse local stakeholders and managing multiple priorities.
- Experience in aquatic invasive plant identification, management and control.
- Certifications in water quality sampling and experience with water quality data collection standards and techniques.
- Experience with state and federal grant administration including Clean Water Act (319.)
- Excellent oral and written communication skills and experience in supervisory role.
- Ability to be innovative, flexible and empathetic; and a strong desire to do what it takes to get the job done.
- Experience with technical software such as ArcGIS, AutoCAD and other statistical or analytical software.

To apply, submit a resume and cover letter to kristin@midcoastconservancy.org. Deadline for applications is **Wednesday**, **6** November 2019. Start date in December 2019.

Qualified individuals with disabilities and those from diverse backgrounds are strongly encouraged to apply. We provide reasonable accommodations for qualified individuals. Midcoast Conservancy is an Equal Opportunity Employer.

