

MEMO

TO: Town of Windham c/o Amanda Lessard, Planner and Gretchen Anderson, Environmental and Sustainability Coordinator

FROM: Heather Hunt and Damon Yakovleff, Cumberland County Soil and Water Conservation District (CCSWCD)

DATE: 1/9/2021

RE: **2021 Windham Watershed Prioritization**

Background

The Town of Windham likely contains a greater number of significant waterbodies than any other municipality in the State. The Town has 35 notable freshwater surface waterbodies including Sebago Lake: the drinking water source for 1/5 of Maine's population, Little Sebago Lake: a premier bass fishery in southern Maine, Highland Lake: one of the only recently restored alewives spawning and nursery habitats in southern Maine, Pleasant River: a nationally recognized trout brook fly fishing destination and the only waterbody in southern Maine known to carry the greatly threatened brook floater mussel, and the historic Presumpscot River which is the largest freshwater input into Casco Bay. Of its 35 fresh waterbodies, five are considered impaired and seven are considered threatened with nine of these listed as Priority Waters by the State of Maine for remediation and protection efforts.

With so many significant surface water resources within the Town's boundaries, the Town asked CCSWCD to assist in strategizing ways to effectively protect and improve these natural resources. In doing so, CCSWCD conducted a preliminary investigation of all of Windham's State-designated priority watersheds that included conducting a vulnerability analysis of the Town's lakes, a stream/river comparison reviewing impairments and current land use, and a needs assessment with timeline for addressing Windham's surface waterbodies municipal wide. Information on the vulnerability analysis and the stream/river comparison of impairments and land use were presented to Windham's Natural Resources Advisory Committee on October 7, 2020. An overview of this information and a suggested timeline for next steps are provided in this memo as a final project deliverable.

CCSWCD and the Town of Windham have worked together to protect and address water quality issues within the Town for over 40 years. Although the Town is designated a "MS4 (Municipal Separate Storm Sewer System) community", meaning it is regulated by the US Environmental Protection Agency (EPA)'s Phase II National Pollutant Discharge Elimination System (NPDES) and must significantly reduce the discharge of pollutants into local waterways, the Town is very proactive in water quality protection efforts, going above and beyond in requirements to protect and improve its surface waters. Some recent examples include:

- Hiring a full time Environmental and Sustainability Coordinator (Gretchen Anderson) to: implement the Town's required Stormwater Management Program; assist with watershed planning and implementation efforts; assist in reviewing erosion and sediment control plans; and review stormwater management and maintenance plans for construction and development.
- Collaboration with Town of Falmouth and the Highland Lake Association to form the Highland Lake Leadership Team to identify recent picocyanobacterial blooms in the watershed and methods to improve the lake's overall water quality.

- Re-establishment of a Natural Resources Advisory Committee to assist the Town Council and Planning Board in natural resource protection considerations.
- Increased yearly funding for watershed protection/improvement support including the amount of grant funds offered through the Town's yearly Watershed Protection Grant Program.
- Financial and in-kind assistance of efforts to identify, plan for, and address water quality impact sources.
- Increased involvement with local volunteer groups in collecting water quality samples.

Current Status of Surface Waters

The Town of Windham has several significant waterbodies, all of which drain into the Presumpscot River which flows into Casco Bay:

Table 1. Windham's Significant Waterbodies

Anderson Brook	Forest Lake[^]	McIntosh Brook	Presumpscot River
Baker Brook	Glantz Brook	Mill Pond	Sebago Lake[^]
Black Brook*	Haskell Brook	Milliken Brook	Small Brook
Chaffin Pond[^]	Highland Lake[^]	Mud Ponds	Stanley Hall Brook
Colley Wright Brook*	Hyde Brook	North Gorham Pond	Tarkill Pond
Collins Pond	Inkhorn Brook*	Ollie Brook	
Ditch Brook	Legrande Brook	Otter Brook*	
Dundee Pond	Lincoln Weeks Brook	Outlet Brook	
Dutton Hills Brook	Little Duck Pond[^]	Pettingill Pond[^]	
Elmer Brook	Little Sebago Lake[^]	Pleasant River*	

* Impaired; [^]Threatened

Except for the Presumpscot River, all of Windham's freshwater rivers and streams are classified by the State as Class B waters and all of Windham's lakes and ponds are categorized as Class GPA¹. The main stem of Presumpscot River is classified in segments: Class A from the outlet of Sebago Lake to the confluence with the Pleasant River, Class B from the confluence of the Pleasant River to Saccarappa Falls, and Class C from Saccarappa Falls to tidewater.

A waterbody is listed as impaired when it does not meet its designated classification. In Maine, all fresh waters are considered impaired for Fish Consumption Use due to levels of mercury found in fish from sources beyond the New England region. As this is a given for all of Maine's freshwaters and because the impairment is not able to be solved within Maine's jurisdiction, this impairment is not typically called out separately when impaired waterbodies are discussed. Thus, apart from impaired Fish Consumption Use caused by mercury, the Town currently has five impaired waterbodies: **Black Brook, Colley Wright Brook, Inkhorn Brook, Otter Pond, and Pleasant River**. All five of these waterbodies are designated as Class B yet are impaired due to high E. coli and low dissolved oxygen readings and all reside completely within the Town of Windham's boundaries except for Pleasant River whose headwaters begin in the Town of Gray and Inkhorn Brook which drains into the Presumpscot River in Westbrook. In addition to the five impaired waterbodies, Windham also has seven State-listed threatened waterbodies: **Chaffin Pond, Forest Lake, Highland Lake, Little Duck Pond, Little Sebago Lake, Pettingill Pond, and Sebago Lake**.

The State's impaired and threatened waterbodies are listed in the State's 303(d)² list under five main categories with three subcategories under Category 4 (a-c) and four subcategories under Category 5 (a-d) that help detail the status of each

¹ Classification of Maine's Waters:

[https://www.maine.gov/dep/water/monitoring/classification/#:~:text=The%20State%20has%20four%20classes,lakes%20and%20ponds%20\(GPA\).](https://www.maine.gov/dep/water/monitoring/classification/#:~:text=The%20State%20has%20four%20classes,lakes%20and%20ponds%20(GPA).)

² Integrated Water Quality Monitoring and Assessment Reports (all information from this project based on the most current report which is the 2016 Report, includes information on impaired waters (303(d) list and categories these impaired waters are placed into): <https://www.maine.gov/dep/water/monitoring/305b/index.html>



waterbody's assessment. Through the U.S. Clean Water Act, States are required to develop Total Maximum Daily Loads (TMDL) for all waters identified on a State's 303(d) list according to their priority ranking on that list. TMDLs calculate the maximum amount of a pollutant allowed into the waterbody while the waterbody will continue to meet water quality standards for that pollutant. The TMDL also provides a pollutant reduction target and allocates load reductions for the source(s) of the pollutant. Pollutant sources are either point sources which required a Maine Pollution Discharge Elimination System (MEPDES) permit (such as wastewater treatment facilities) or non-point sources (NPS). Over the past decade, Maine has worked with EPA to develop statewide TMDL approaches for 303(d) listed waters with the same NPS impairments. To-date this has resulted in the following approved Statewide NPS TMDLs:

- 2009 EPA-approved Maine Statewide Bacteria TMDL
- 2012 EPA-approved Maine Statewide Impervious Cover TMDL (with a 2014 addendum)
- 2016 Maine Statewide NPS Pollution TMDL

303(d) list categories and TMDL status for Windham's impaired waterbodies include:

Table 2. 303(d) Categories and TMDL Status for Impaired Waterbodies

Black Brook	Category 5-A for E. coli, not included in 2009 Statewide Bacteria TMDL, to be included in future update Category 5-A for Dissolved Oxygen, dissolved oxygen impairment to be included in future update to the 2016 Statewide NPS TMDL
Colley Wright Brook	Category 4-A for E. coli, included in 2009 Statewide Bacteria TMDL Category 5-A for Dissolved Oxygen, dissolved oxygen impairment to be included in future update to the 2016 Statewide NPS TMDL
Inkhorn Brook	Category 4-A for E. coli, included in 2009 Statewide Bacteria TMDL Category 5-A for Dissolved Oxygen, dissolved oxygen impairment to be included in future update to the 2016 Statewide NPS TMDL
Otter Brook	Category 4-A for E. coli, included in 2009 Statewide Bacteria TMDL Category 5-A for Dissolved Oxygen, dissolved oxygen impairment to be included in future update to the 2016 Statewide NPS TMDL
Pleasant River	Category 4-A for E. coli, included in 2009 Statewide Bacteria TMDL Category 5-A for Dissolved Oxygen, dissolved oxygen impairment to be included in future update to the 2016 Statewide NPS TMDL

Category 5-A is for impaired or threatened waters that require a TMDL report

Category 4-A is for impaired or threatened waters that already have an approved TMDL report

Highland Lake was listed as impaired from 1990 to 2010 and had a 2003 watershed-specific EPA-approved TMDL for Nutrients

Although NPS TMDLs identify significant sources of impairments, the Maine Department of Environmental Protection (MDEP) still sees these waterbodies as needing a follow-up comprehensive watershed planning to achieve water quality standards. According to MDEP's 2016 Vision for Assessment, Restoration, and Protection of Maine's Water Resources (<https://www.maine.gov/dep/water/monitoring/tmdl/vision-for-assessment-restoration-protection-of-maine-water-resources.pdf>) report, several adaptive approaches that are continually evolving are used to restore impaired waters and protect non-impaired waters. These approaches include TMDLs, Watershed Management Plans, Protection Plans, Alternative Plans, Maine Pollutant Discharge Elimination System (MEPDES) Permits, and Source Elimination.

Other listings the State uses regarding water quality of freshwater surface waters include:

Table 3. Additional State Lists

<p>Maine Lakes at Risk of Having an Algal Bloom (https://www.maine.gov/dep/water/lakes/bloomrisk.html)</p> <ul style="list-style-type: none"> • Highland Lake - high risk, 2-5 years or more in the past of frequency of blooms • Little Sebago Lake - low risk, one year on record



Maine Lakes Most at Risk from New Development

- Listed under MDEP Chapter 502 with criteria of being a public water supply or identified by MDEP as impaired or particularly sensitive to impairment
 - Chaffin Pond**
 - Forest Lake**
 - Highland Lake**
 - Little Duck Pond**
 - Little Sebago Lake**
 - Petingill Pond**
 - Sebago Lake**

Urban Impaired Streams

- Listed under MDEP Chapter 502: Streams that are impaired because of stormwater runoff from developed land.
- None in Windham

Nonpoint Source (NPS) Priority Watersheds List

(https://www.maine.gov/dep/land/watershed/nps_priority_list/index.html)

- Purpose is to call out watersheds most vulnerable to NPS pollution to prioritize MDEP efforts and encourage local communities to restore and protect these impaired or threatened waterbodies.
- Waterbodies must be on this list to be eligible for Clean Water Act Section 604(b) (Watershed Management Plan development) or 319 (NPS Implementation Projects) grant funds from MDEP.
 - Threatened Lake Priority List with Priority List Reasoning:
 - Forest Lake - Sensitive**
 - Highland Lake – MS4 Priority Water, Watch List, Sensitive**
 - Little Sebago Lake – Sensitive**
 - Sebago Lake – Outstanding Water Quality, Public Water System**
 - Impaired Streams Priority List with Priority List Reasoning:
 - Black Brook – TMDL**
 - Colley Wright Brook – TMDL**
 - Inkhorn Brook – TMDL**
 - Otter Brook – TMDL**
 - Pleasant River – TMDL, Highway Access-related Development Threat**

303(d) Vision Priority List (<https://www.maine.gov/dep/water/monitoring/tmdl/vision-for-assessment-restoration-protection-of-maine-water-resources.pdf>)

- List of priority water bodies identified by MDEP for restoration and/or protection plans by 2016 with plans to be completed by 2022.
 - Black Brook**
 - Colley Wright Brook**
 - Inkhorn Brook**
 - Otter Brook**
 - Pleasant River**

Pleasant River and Presumpscot River are the only two waterbodies in Maine known to have current active Maine Pollution and Detection Elimination Systems (MEPDES) Permits:

- Pleasant River - Currently has a 5-year 2017 combined MEPDES Individual Permit (#ME0102751) / Maine Waste Discharge License (#W002510-5D-D-R) now assigned as WDL #W002510-5D-E-R for the Windham/Raymond School District, RSU #14 for treated sanitary wastewater of the High School complex into the Pleasant River. This permit/license states that the point source discharge does not lower Pleasant River's water quality below its designated classification.
- Presumpscot River - Had a 5-year 2006 combined MEPDES Individual Permit (#ME0101729) / Maine Waste Discharge License #W000716-5B-B-R for secondary treated sanitary wastewater from the Maine State Correctional



Facility to the Presumpscot River that expired in January of 2011. This permit/license stated that the point source discharge did not lower Presumpscot River's water quality below its designated classification.

Lake Assessment Overview

For this current assignment, a brief lake assessment was conducted comparing water chemistry data and sediment sampling data. Water chemistry data is available for Windham's four largest lakes: Forest Lake, Highland Lake, Little Sebago Lake, and Sebago Lake³ (**Table 4**). Looking at average transparency readings, all four lakes were well above the State's average of 4.8 meters. For average phosphorous readings, all four lakes were below 20 parts per billion above which there would be concern. Highland Lake did show the highest average with 16. However, averages can be misleading as they can include outlier data and don't show trends.

In looking at transparency readings for each lake over the past 30-40 years, it appears water clarity is decreasing for Little Sebago Lake and Highland Lake, remaining the same for Forest Lake, and possibly increasing on Sebago Lake. Again, this too may be deceiving as newer equipment is likely to have been used in the past few years providing more accurate readings

Looking at water chemistry data in bottom sampling grabs (**Table 5**), Forest Lake, Little Sebago Lake, and Highland Lake all appear to show a large amount of phosphorus at the bottom of the water column along with very low dissolved oxygen. This can be concerning because phosphorus will release from bonded iron within the sediment at or below 2 parts per million of oxygen and can cause an internal phosphorus loading cycle. Luckily, sediment samples from the bottom of these lakes are showing a high aluminum to phosphorus ratio which is helping to protect internal phosphorus from releasing (**Table 6**). Aluminum permanently bonds to phosphorus. However, if more phosphorus is added to the system/sediment, the aluminum to phosphorus ratio can change and phosphorus can be released. That is why preventing phosphorus from entering these lakes is the most important thing that can be done to protect them.

According to Portland Water District, the aluminum to iron ratio for Sebago Lake is low meaning at risk for internal phosphorus loading; Yet modeling shows that the potential for anoxic conditions (absence of dissolved oxygen) is extremely rare given that the lake is very deep and the shape is very steep, and thus the pure magnitude of volume of water it contains.

Table 4. Chemistry Data for Windham's Lakes

	Forest Lake	Highland Lake	Little Sebago Lake	Sebago Lake
Transparency (m)	5.1	5.4	5.3	9.3
Chlorophyll (ppb)	3.4	4.2	4.1	1.7
Phosphorus (ppb)	8	16	9	4
Color (spu)	19	17	24	9
Alkalinity (mg/l)	8.2	7.8	10.8	6.1
pH	6.41	6.34	6.54	7.15
Conductivity (uS/cm)	65	53	42	39

Data Source: lakesofmaine.org

³ Lakesofmaine.org



Table 5. Water Chemistry for Bottom Grabs of Windham's Lakes

Example: Forest Lake			Date	Depth (m)	Oxygen (ppm)	Temp. (C)
Date	Depth (m)	Phosphorus (ppb)				
9/5/18	5	6	9/5/2018	0	8.1	25.8
			9/5/2018	1	8.1	25.8
			9/5/2018	2	8.1	25.9
			9/5/2018	3	7.8	25.4
			9/5/2018	4	7.7	24.9
			9/5/2018	5	6.7	24.4
9/5/18	8	16	9/5/2018	6	0.9	20.8
			9/5/2018	7	0.4	15.6
			9/5/2018	8	0.3	11.6
9/5/18	11	27	9/5/2018	9	0.2	9.8
			9/5/2018	10	0.2	9.2
			9/5/2018	11	0.2	8.9

Data Source: lakesofmaine.org

Table 6. Sediment Samples for Windham's Lakes

	Al:Fe	Al:P
Forest Lake: Station 1, 8/19/2010	2.06	57.02
Highland Lake: Station 1, 8/19/2010	3.11	48.32
Highland Lake: Station 2, 6/5/2018	4.68	135.57
Highland Lake: Station 3, 6/5/2018	.62	27.2
Little Sebago Lake: Station 3, 8/31/2010	2.15	31.56
Sebago Lake*		

Al:Fe < 3 or Al:P < 25 means risk for internal P releasing

* Portland Water District has Al:Fe data indicating the ratio "is not great". However modeling show the potential for anoxic conditions to be extremely rare given that the lake is very deep and the shape is very steep. Dissolved oxygen monitoring over the past 30 years confirms this model.

Data Source: Maine DEP

River/Stream Comparison Overview

Black Brook, Colley Wright Brook, Inkhorn Brook, Otter Brook, and Pleasant River are all impaired, priority waterbodies with the impairment being high E. coli readings and low dissolved oxygen. **Table 7** below compares the sizes of these watersheds and waterbodies to one another. The sources of the E. coli and dissolved oxygen impairments are mostly unknown. The E. coli could be from wildlife (i.e. congregating geese), failing septic or sewer systems, or agriculture and hobby farm uses (i.e. livestock or farm animals waste from access to the brook or that occurs during stream flooding into adjacent floodplains used for animal grazing, or for manure spreading on nearby fields). In high enough quantities, E. coli can be of human health concern for recreational uses of the waterbody. However, E. coli is often a greater concern to water quality because it indicates that additional sources of nutrients are being delivered to the waterbody. These nutrients can "overfeed" a waterbody and causing excess algal growth and low dissolved oxygen.

For this Comparison Overview, land use maps were generated for the five impaired waterbodies (maps available upon request). The maps show the watersheds as having 15-30% pasture/agriculture coverage which may indicate potential E.



coli inputs from these areas is livestock and/or manure fertilization is used. These maps can be used with bracket water quality testing to pinpoint where the source(s) of E. coli are likely coming from.

Table 7. Sizes of Windham's Impaired Watersheds and Waterbodies

Waterbody	Watershed Area (square miles)	Stream Length Impaired (miles)
Black Brook	3.91	6.07
Colley Wright Brook	7.66	8.16
Inkhorn Brook	3.92	4.32
Otter Brook	1.86	2.16
Pleasant River	29	11.2

Recommendations

For all Lakes Most at Risk from New Development (Chaffin Pond, Forest Lake, Highland Lake (and Little Duck Pond), Little Sebago Lake, Pettingill Pond, Sebago Lake):

- *Review ordinances and explore incentives to reduce impacts from development/redevelopment (i.e. consider watershed zoning ordinances, require private road improvements when new development or redevelopment (conversion of houses from seasonal to year-round) occurs)*
- *Explore pros and cons of Stormwater Compensation Funds*

For Sebago Lake:

- *Continue to support Portland Water District (PWD) in their efforts to protect Sebago Lake*
- *Identify any known problem sites to PWD as they arise to see if they have resources to assist in addressing them*

For Highland Lake, Forest Lake, and Little Sebago Lake:

- *Primary goal is to reduce phosphorus input into these lakes*
- *Based on Non-Point Source Watershed Surveys, focus on landowner education and reducing road impacts*
- *Repeat some of the actions being taken on Highland Lake with Forest Lake and Little Sebago Lake (i.e. ordinance language, education and outreach efforts, action items from Highland Lake Watershed-Based Management Plan)*
- *Continue to support Section 319 Clean Water Act grant funded projects*
- *Continue to support milfoil removal in Little Sebago Lake (Sebago Lake and Little Sebago Lake are currently the only two lakes in Windham with milfoil)*
- *Assist lake associations in keeping an ongoing list of NPS sites to be addressed (referred to as an NPS Site Tracker by MDEP)*
- *Re-apply for Highland Lake Phase V in 2023 if HLLT Watershed Management Plan determines doing so is feasible, and Little Sebago Lake if there are enough sites to warrant its need and its Watershed Protection Plan is still active. Forest Lake will likely not need another phase of 319 grant funding in the next 5 years.*

For Presumpscot River:



- *Support partners in their efforts to improve the River, primarily focusing on improving the water quality of the streams flowing into Presumpscot River.*

For Black Brook:

- *Complete a Watershed Management Plan (WMP) (starting in 2021) and pursue Section 319 Clean Water Act grant funds once WMP is complete*

For Colley Wright Brook:

- *Consider combining sampling efforts with Inkhorn Brook and Otter Brook to pinpoint sources of impairments with diurnal sampling and bracket sampling.*
- *If cost/resource prohibited to sample, consider starting outreach to known agriculture properties and consider applying for Section 604b Clean Water Act grant funds to create a WMP (CCSWCD to serve as Grantee).*

For Inkhorn Brook and Otter Brook⁴:

- *Focus on identifying and addressing impairments without a WMP (given their small size)*
- *Pinpoint sources of impairments with diurnal sampling and bracket sampling*

For Pleasant River:

- *Complete current 319 grant project*
- *Explore Future Needs:*
 - *NPS Survey*
 - *Additional water quality sampling*
 - *Geomorphic assessment/landslides*
 - *Pros/cons of updating WMP*

Timeline

General recommendations to be implemented/continued implementing as resources allow include:

- *Review ordinances and explore incentives to reduce impacts from development/redevelopment (i.e. consider watershed zoning ordinances, require private road improvements when new development or redevelopment (conversion of houses from seasonal to year-round) occurs)*
- *Explore pros and cons of Stormwater Compensation Funds*
- *Continued participation in the Highland Lake Leadership Team and its Committees in implementing the 2020-2030 Highland Lake Watershed Management Plan*
- *Continued participation in the 2nd year (2021) of 2-year Forest Lake Phase III 319 Protection Project: Large focus on addressing Lakeside Drive sites (Windham, Gray, and Cumberland)*

For 2021, key tasks planned and recommended include:

January – April

- Submittal of a 604(b) proposal to MDEP in mid-April to create a 2022-2023 Colley Wright Brook WMP
- Completion and approval of a 10-year Highland Lake Education and Outreach Plan through HLLT at the beginning of 2021 to be implemented throughout the remainder of 2021 into 2022 for the next 10 years
- Review of nutrient management ordinance language / possibilities for Highland Lake's shoreland zone in Falmouth that may be applied in Windham (Highland Lake)

⁴ If sampling and investigations reveal an illicit discharge as potential culprit to poor water quality readings, a follow-up investigation will need to be done following the Illicit Discharge Detection and Elimination requirements of Windham's MS4 NPDES General Permit.



- Start of 2-year Highland Lake Phase IV 319 Protection Project: Kick-off Steering Committee meeting (Windham and Falmouth)
- Start of 2-year Pleasant River Phase II 319 Protection Project: Kick-off Steering Committee meeting (Windham and Gray)
- Start of 2-year Black Brook 604(b) Watershed Management Plan Development Project: Kick-off Steering Committee
- Meet with water quality protection partners (CCSWCD, MDEP, Presumpscot Regional Land Trust, etc.) to discuss plan and feasibility of diurnal and bracket sampling of Colley Wright Brook, Inkhorn Brook, and Otter Brook in 2021
- Discussions/workshops on ways to minimize private road impacts to lakes (Highland Lake and Forest Lake)

May – August

- 319 Project site visits and projects implemented for Forest Lake, Highland Lake, and Pleasant River
- Implementation of Highland Lake Education and Outreach Plan
- Black Brook watershed and stream corridor survey through 604(b) WMP grant project
- Diurnal and bracket sampling of Colley Wright Brook, Inkhorn Brook, and Otter Brook
- Continued discussions/workshops on ways to minimize private road impacts to lakes (Highland Lake and Forest Lake)

September - December

- 319 on-the-ground projects wrap up
- Completion of Forest Lake Phase III 319 Project
- Review of collected Black Brook watershed data through 604(b) WMP grant project
- Review of diurnal and bracket sampling of Colley Wright Brook, Inkhorn Brook, and Otter Brook
- Wrap up of discussions/workshops on ways to minimize private road impacts to lakes and follow-up creation of a game plan for next steps (Highland Lake and Forest Lake)

