Collaborative Engagement and Capacity Building in the Powwow River Watershed

A Final Report to

The New Hampshire Department of Environmental Services

Submitted by

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Rockingham Planning Commission

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NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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EXECUTIVE SUMMARY

The primary goal of the Powwow River Watershed Collaborative is to identify effective strategies to improve water quality and protect existing high quality water and natural resources. ***To accomplish this, collaboration across municipal boundaries and among watershed stakeholders is key.*** RPC convened a working group comprised of municipal officials, residents, and other stakeholders. The working group met to work collaboratively with the RPC on water quality, water resource protection, and watershed-based planning in the Powwow River watershed to improve impaired waters and protect existing high quality waters. Other key elements of this project focused on compiling information on specific characteristics of the watershed including: locations of point and nonpoint sources of pollution; inventory of septic systems near impaired water bodies; pollutant loading analyses or "hot spot mapping"; and inventory of local water quality protection regulations for each municipality in the watershed. This information forms a baseline for future planning efforts including preparation of watershed management plans, municipal actions to protect water quality, land conservation decisions, strategies for local lake and pond associations to pursue, and identifies where further analysis and research may be necessary.

Project Start Date: April 5, 2017 **Project End Date: December 31, 2019**

Total Project Cost: $28,000 for Phase I and Phase II

Funding Sources and Amounts Contributed

Funding	Percentage	Amount (proposed)	Amount (actual)
Federal EPA 604(b) Grant funds requested	100%	$28,000	$28,000
Non-federal match amount	0	0	0
Other funding source(s)	0	0	0
Total project cost	100%	$28,000	$28,000

Project Partners:
Project partners include representatives from 10 NH watershed municipalities, Country Pond Lake Association, federal and state agencies in NH and MA, and NH municipal boards and commissions.

Project Objectives and Status

Objective	Status
Objective 1: Inventory and report of nonpoint source pollution (NPS) sources.	Met with minor modification
Objective 2: Prepare an audit of zoning and land development regulations for each town in the watershed.	Met Fully
Objective 3: Convene a Collaborative Working Group of watershed representatives and other watershed stakeholders.	Met with minor modification
Objective 4: Conduct All Project Management.	Met Fully

INTRODUCTION

The majority of the Powwow River watershed is largely rural and undeveloped yet still has serious water quality impairments due to dense development nearby its largest surface water bodies. There is a need to gain a better understanding of the role of non-point source pollution in the watershed and how future land use or protection actions may impact water quality. The Powwow River watershed, a HUC-12 watershed within the greater Merrimack River watershed, is a complex arrangement of ponds and lakes connected by freshwater wetlands, and stream and river segments. The watershed also serves as a secondary drinking water supply for the City of Amesbury, MA and a wellhead protection area for the Town of Merrimac, MA. Of the 72 assessment units identified in the draft 2014 305(b)/303(d) report, 21 AU's need a TMDL and 5 AU's have a completed TMDL. Because of its complex nature and largely undeveloped landscape, sources of pollution are not obvious. A synthesis of the spatial extent and severity of impairment of surface waters, an inventory of possible pollution sources, and an evaluation of land use/cover characteristics in the watershed are needed. Thus, the project will identify causes and sources of non-point source pollution that will need to be controlled in order to improve impaired waters and protect existing high quality waters. Refer to the deliverables described in the Final Products section. These deliverables may serve as a foundation for future efforts to develop and implement watershed-based plans that include the EPA Watershed Plan Elements (a-i).

Facts and Figures About the Powwow River Watershed

The Powwow River Watershed, a HUC 12 watershed (#010700061403), contains 37,955 acres of land and water: 30,114 acres (79 percent) in New Hampshire and 7,842 acres (21 percent) in Massachusetts (Merrimac and Amesbury). Ten New Hampshire municipalities are partially or wholly within the watershed: Seabrook, Kensington, East Kingston, Kingston, Danville, Sandown, Hampstead, Newton and South Hampton. South Hampton is the only NH municipality located entirely within the watershed. Kingston, Danville and South Hampton have the top 3 highest number of acres in the watershed.

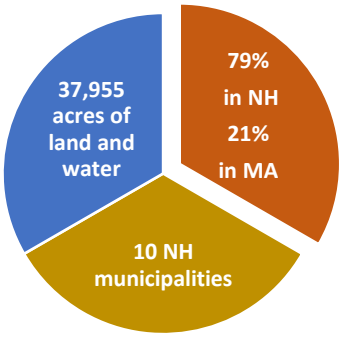


Table 1. Watershed area by municipality.

Municipality	Total Area (acres)	Acres in Watershed	% Area in Watershed (acres)	Impervious Surface (watershed acres)
Danville	7,569	5,575	73%	325 / 5.8%
East Kingston	6,381	3,144	49%	132 / 4.2%
Hampstead	9,014	1,581	17%	*NA*
Kensington	7,668	699	9%	19 / 2.7%
Kingston	13,450	7,836	58%	434 / 5.5%
Newton	6,365	4,244	67%	*NA*
Plaistow	6,790	77	1%	*NA*
Sandown	9,232	1,583	17%	83 / 5.2%
Seabrook	6,161	228	4%	32 / 14.0%
South Hampton	5,147	5,147	100%	*NA*

Note: NA = Impervious surface data not available

Table 2. High value habitat in NH and MA.

Land Conservation Plan for the Merrimack River Watershed of New Hampshire and Massachusetts (2014)			
Resource Category	**Total Acres**	**Acres in NH**	**Acres in MA**
Tier 1 – Highest value	6,303	6,020 (96%)	283
Tier 2 – Higher value	16,242	14,569 (90%)	1,673
Tier 3 – High value	9,085	8,071 (89%)	1,014
Total Acres	31,630	28,661 (91%)	2,970

Source: Land Conservation Plan for the Merrimack River Watershed of New Hampshire and Massachusetts (2014) available on the Society for Protection of New Hampshire Forests website at https://forestsociety.org/sites/default/files/Merrimack%20Plan%20Executive%20Summary%20FINAL%20April%202014.pdf

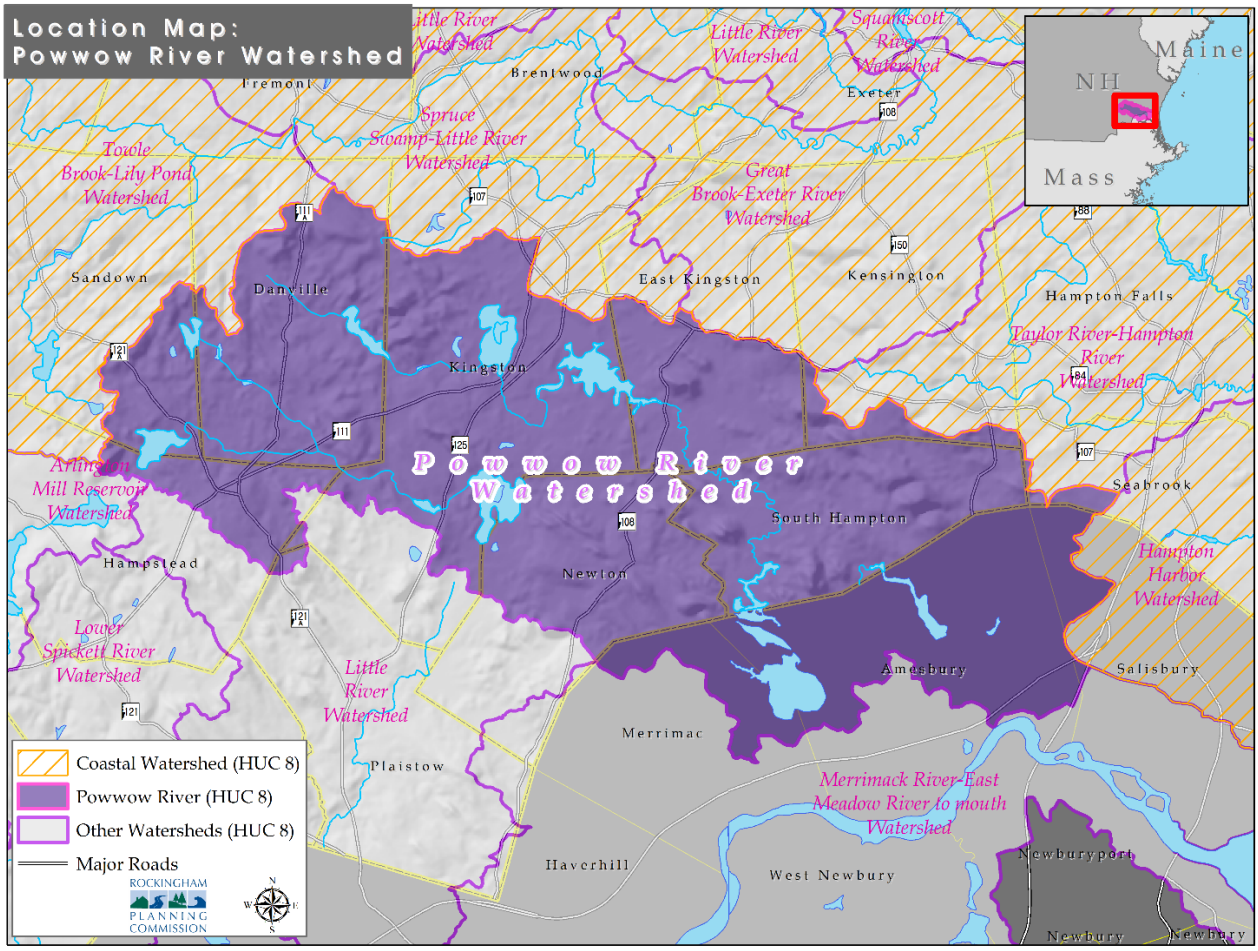
Table 3. Resources reported in acres and percent total watershed area.

Resource Category	**Acres in Watershed-NH**	**% Total Watershed-NH**
Freshwater Wetlands	6,997	23%
Forested	13,285	44%
Stratified Drift Aquifer	8,911	30%
Surface Water	1,570	5%
Agricultural Soils (total)	9,651	32%
Farmland of Statewide Importance	3,796	13%
Farmland of Local Importance	4,349	14%
Prime Farmland	1,506	5%
NH Wildlife Action Plan	**Acres in Watershed-NH**	**% Total Watershed-NH**
Tier 1 – Highest	3,928	13%
Tier 2 - Higher	4,884	16%
Tier3 - High	7,210	24%
Total Acres	16,022	53%
Land Use Category	**Acres in Watershed-NH**	**% Total Watershed-NH**
Undeveloped Lands	16,157	54%
Developed Lands	13,957	46%

Table 4. Land uses from 1962 to 2015.

Land Use	**1962**	**2015**	**Percent Change**
Active Agricultural	2,041.0	928.2	-55%
Aux Transportation	--	62.1	N/A
Farmsteads	78.8	122.9	56%
Forested	23,252.8	13,284.6	-43%
Industrial/Commercial	220.7	469.4	113%
Mixed Urban	9.7	27.4	184%
Open Wetlands	640.7	5,196.2	711%
Other/Idle	619.8	1,505.8	143%
Playing Fields / Recreation	--	231.7	N/A
Railroad	--	14.5	N/A
Residential	1,547.0	5,729.4	270%
Transportation	259.4	506.6	95%
Utilities	--	322.3	N/A
Water	1,443.6	1,712.4	19%
Total Acres	***30,113.5***	***30,113.4***	

WATERSHED MAP



PROJECT OBJECTIVES, OUTCOMES AND MEASUREABLE RESULTS

Objective 1: Inventory and report of nonpoint source pollution (NPS) sources.
Measure of Success: Point and nonpoint sources of pollution identified.
Deliverable 1: Non-Point Source Pollution Inventory, Maps and Report.

Outcomes and Measurable Results Task 1: Perform field reconnaissance to identify stormwater systems that discharge to surface waters and hydrologically connected wetlands. Minor Modification
In lieu of extensive field reconnaissance, RPC relied on information collected by MS4 municipalities to identify point and nonpoint sources of pollution. The MS4 municipalities in the watershed - Danville, Newton, Kingston, Sandown and Hampstead - completed their outfall inventories in the fall of 2019. Danville, Sandown and Hampstead completed their outfall inventory and mapping, however we were unable to obtain a copy of Kingston's outfall map. Outfall maps are attached as well as information from town NOI's and Stormwater Management Plan documents about impaired waters and number of outfalls to impaired water bodies. These documents report direct sources of point and nonpoint source pollution for each impaired water body. The other watershed municipalities are either not subject to the MS4 permit or have been granted waivers to the permit requirements and thus do not collect detailed information on point and nonpoint source pollution. See maps and tables attached in Appendix A.

Country Pond Lake Association

Working with the Country Pond Lake Association, we were able to identify sources of water quality impairments through a shoreline tour and a watershed tour. The most prominent sources of point and nonpoint source pollution identified were: shoreline erosion, proximity and suspected age of septic systems near the water, poorly managed stormwater and sedimentation from roads, and density of development at and near the shoreline (e.g. impervious cover, loss of naturally vegetated areas. All of these factors contribute to high nutrient loading causing frequent cyanobacteria blooms in Country Pond. With the exception of cyanobacteria, many of these same water quality and land use issues were reported by members of the working group at Powwow Pond in Kingston and East Kingston, Angle Pond in Sandown, and Great Pond in Kingston, and demonstrated by the land use, impervious cover and septic system inventory maps for the watershed.

Outcomes and Measurable Results Task 2: Perform Geographic Information Systems (GIS) mapping and impervious cover analysis for the watershed.
RPC prepared a set of six land use and environmental features maps for the watershed: Map 1 NH Wildlife Action Plan high value habitat; Map 2 The Land Conservation Plan for New Hampshire's Coastal Watersheds (2006), Map 3 Wellhead and Aquifer Protection Areas, Map 4 Current Land Use, Map 5 Impervious Cover and Map 6 Septic System Inventory. Refer to Table 4 for a comparison of land use

from 1962 to present was also prepared to evaluate changes in potential pollution sources. See maps attached in Appendix B.

Land Use and Environmental Features Maps

RPC prepared a set of six land use and environmental features maps for the watershed: Map 1 NH Wildlife Action Plan high value habitat; Map 2 The Land Conservation Plan for New Hampshire's Coastal Watersheds (2006), Map 3 Wellhead and Aquifer Protection Areas, Map 4 Current Land Use, Map 5 Impervious Cover and Map 6 Septic System Inventory. Also refer to Table 5 for a comparison of land use from 1962 to present.

Summary of Land Use Change Data

Land use changes can serve as a proxy for evaluating changes in potential pollution sources. Referencing data presented previously in Table 4, the three categories that stand out as having the greatest impact on land use change is the expansion of industrial/commercial (+113%), residential (+270%) and transportation (+95%) development. Collectively, these land uses have resulted in a fragmented landscape or a sprawl type development pattern. This diffuse development pattern often results in widespread nonpoint pollution sources namely stormwater as indicated on the impervious surface map. Development that occurred more than 7-10 years ago, prior to local and state stormwater management regulations becoming more protective of water quality, likely have little or no water quality controls in place. This "legacy pollution" is difficult and costly to address, relying primary on the slow cycle of redevelopment to mitigate.

Outcomes and Measurable Results Task 3: Prepare inventory of septic systems within 250 feet from impaired surface waters and hydrologically connected wetlands.

RPC prepared an inventory of septic systems within 500 feet of all impaired water bodies in the watershed using the developed or undeveloped status of each parcel and age of structures on each parcel based on assessor's data as a proxy for the age of septic systems. The resulting data is displayed in spreadsheet and map form. The map shows the high density of development surrounding the major water bodies in the watershed and that the majority of structures and septic systems (or other types of waste system) were originally installed prior to 1967 before the state began a subsurface permitting program. Based on their age, number and proximity to waterbodies, many conclude that failing or malfunctioning septic systems and other unpermitted waste systems are a primary source of water pollution in the watershed. See spreadsheet and map attached in Appendix C.

Outcomes and Measurable Results Task 4: Conduct pollutant load analyses in selected priority sub-catchment areas using land cover and impervious surface data from GRANIT and develop maps showing pollutant load hot spot areas.

The Stormwater Center at the University of New Hampshire prepared a pollutant load analysis and maps for the three municipalities in the watershed - Sandown, Kingston and Newton. Three maps for each town were prepared for total phosphorous, total nitrogen and total suspended solids. The analyses calculated pollutant loads for phosphorous, nitrogen and total sediments, reported in pounds per year. In some instances, this calculation identified some of the largest parcels as being the highest contributors based on their size. See maps and data attached in Appendix D.

Further analysis to convert the pollutant load calculation to pounds per acre may yield more granular results as to which parcels are the highest contributors.

Objective 2: Prepare an audit of zoning and land development regulations for each town in the watershed.
Measure of Success: Municipal audit completed.
Deliverable 2: Complete Municipal Audit and Report.

Outcomes and Measurable Results Task 5: Conduct an audit of municipal zoning and land development standards for each municipality to determine how local regulations could be strengthened to be protective of water quality.
RPC prepared a water quality protection audit for all watershed municipalities. Factors documented include: impervious cover, stormwater management regulation, erosion/sediment control regulation, surface water and wetland buffers and setbacks, other resource protection measures such as aquifer protection, floodplain development standards, prime wetland designation, natural resource inventory, and open space plans. Key findings of the municipal audit are provided below

KEY FINDINGS OF THE MUNICIPAL AUDIT

1. Updates/improvements needed in post-construction stormwater management regulations.
2. Updates/improvements needed in erosion and sediment control regulations during construction.
3. The terms “buffer” and “setback” are often used without definition, weakening their intent and effectiveness.
4. Posting information, zoning ordinances and land use regulations on municipal websites is not enough to elevate awareness of local regulations to protect water quality and quantity.
5. 5 municipalities subject to EPA MS4 Permit; 5 municipalities waivered or not subject to Permit.
6. 6 of 10 municipalities have no-disturb buffers to wetlands.
7. 3 of 10 municipalities have no-disturb buffers to streams, rivers and surface waters.
8. 2 of 10 municipalities have designated Prime Wetlands.
9. 8 of 10 municipalities have impaired water bodies in the watershed.
10. 4 of 10 municipalities have adopted the SWA or equivalent stormwater management standards.
11. 1 of 10 municipalities have impervious surface limits for developments.
12. 3 of 10 municipalities have a designated Aquifer Protection District and protection zoning standards.

The results are summarized in the report "Municipal Audit Report: Water Quality Protections in the Powwow River Watershed" attached in Appendix E.

Objective 3: Convene a Collaborative Working Group of watershed representatives and other watershed stakeholders.
Measure of Success: Watershed stakeholder collaboration and engagement performed.
Deliverable 3: Outreach and Engagement with a collaborative working group of watershed stakeholders.

Outcomes and Measurable Results Task 6: Facilitate a watershed-based collaborative working group to improve inter-municipal coordination and communication, increase public awareness of water quality problems and sources, and gain consensus on the need for future watershed-based planning and water resource protection.
RPC convened meetings of the collaborative working group on January 25, 2018 and October 23, 2018. Major themes and issues that emerged from these meetings were:

- Lack of capacity to conduct adequate enforcement
- Likelihood of underperforming and/or failing septic systems, community systems best
- Zoning and land use regulations could be strengthened for water quality protection (e.g. buffers, impervious surface limits, better stormwater management)
- Less incentive for non-MS4 municipalities to take action to protect water quality
- Use of fertilizer and pesticides close to water bodies
- Presence of Cyanobacteria
- Older campgrounds have high density, old septic systems, poor stormwater management and active erosion at their shorelines
- Need more outreach to raise awareness about water quality issues and strategies to address them
- Need to coordinate monitoring and water quality sampling efforts by towns that share a water body and coordinate MS4 activities
- Subwatershed management plans would be very helpful

Country Pond Lake Association

As a result of project outreach, RPC met on January 8, 2018 with representatives from the Country Pond Lake Association (CPLA) to discuss in greater detail water quality, land use and point and nonpoint source pollution issues in the lake's watershed. Major themes and issues that emerged from this meeting were:

- Under new leadership, CPLA has become a 501.C.3 organization and conducts regular meetings of its membership
- CPLA has a robust new sampling and monitoring program and are considering adding more sampling during the year, and coordinate with program in Newton
- Need to coordinate MS4 activities between Kingston and Newton
- Presence of Cyanobacteria throughout the year
- Active erosion along the shoreline and a lot of hardened structures some of which are failing
- Blocked or undersized culverts and outlets, and beaver activity impede flow and flushing capacity of Country Pond

- Desire to apply for grant funding to support monitoring and planning efforts

Continued engagement with the CPLA yielded in depth discussions about moving ahead with a more detailed assessment of Country Pond. The result was a 604(b) grant award to RPC and a consulting firm to prepare an a-i watershed plan for Country Pond and coordinate with the MS4 municipalities to provide relevant project data for permit compliance purposes. This project is ongoing through 2020.

Outcomes and Measurable Results Task 7: Enhance coordination and sharing of information between NH and MA agencies, towns and stakeholders. Minor Modification

RPC met with the Amesbury Conservation Commission and coordinated with staff at EPA Region 1 and the Merrimack River Watershed Association (MRWA) at the beginning of the project. The Commission invited RPC to present its findings at the conclusion of the project, and EPA and MRWA requested access to the final report and data as resources. Future work in the watershed should include more extensive coordination with MRWA, MA municipalities in the watershed and state and federal agencies.

Outcomes and Measurable Results Task 8: Prepare outreach and education materials about water quality problems and sources of pollution in the watershed.

RPC prepared a 2-page project flyer and informational pieces about sources of nonpoint source pollution (pet waste, yard waste, lawn care and general best practices adapted from other sources) and how to reduce them through municipal, community based and homeowner actions (*Be the Solution to Water Pollution* prepared by RPC). See materials attached in Appendix F.

Objective 4: Conduct All Project Management.

Measure of Success: All project materials and reporting requirements completed.

Deliverable 4: All completed products delivered to the NHDES including reports, and invoices.

Outcomes and Measurable Results Task 9: Submit electronic semi-annual reports documenting all work performed during the project periods.

Semi-annual reports documenting all work performed during the project periods and invoices were submitted electronically. The final project report was provided by email and all other project deliverables were provided electronically under separate cover using a large file online transfer system. Following submittal of the final report and deliverables, a printed copy will be provided to all of the watershed municipalities. All project deliverables have been posted to the RPC project webpage at https://www.therpc.org/environment/water-resources/powwow.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Significant outcomes from this project include:

- Substantial data and information were developed about the Powwow River watershed where little had existed before.
- Enforcement of shoreland regulations remains a top challenge for all communities.
- Lake and pond associations appear active though it's not clear how effective they are in communicating about water quality issues; however, the Country Pond Lake Association is highly visible and effective at communicating with its members and residents.
- Coordination among watershed municipalities is lacking (e.g. MS4 activities, enforcement, water quality monitoring).
- Zoning, and land use and environmental regulations for water quality protection vary widely across the watershed.
- Partnership with the Country Pond Lake Association resulted in acquisition of funds to develop an a-i watershed based plan for Country Pond.
- There is widespread interest in this small watershed in the upper reaches of the greater Merrimack River Watershed as one with high development potential and high value as a regional drinking water supply for both NH and MA.
- Further analysis of septic system contributions to pollutant loads and water quality impairment is needed.

Recommendations

General recommendations for future actions in the watershed:

1. Priority actions that would be most helpful to water quality protection in the watershed include:
   - Targeted outreach to property owners on topical issues related to water quality
   - Engagement with municipal elected officials and staff on water quality issues and solutions
   - MS4 Permit compliance coordination
   - Outreach to planning boards, conservation commissions and ZBA's about water quality protection options
   - Provide information about septic system maintenance to lake/pond associations and residents
   - Provide information to municipalities, lake/pond associations and residents and about soft/living shoreline options
   - Work with Conservation Commissions to incorporate into their strategic land conservation plans actions that protect water quality (e.g. shoreland easements (buying development rights)
2. Secure funding for technical assistance to continue the Powwow Watershed Working Group.
3. Expand outreach to lake and pond associations to address local water quality issues particularly erosion and alternatives to hardened shoreline structures.
4. Conduct yearly outreach to local elected officials on topics such as MS4 permit coordination, pooling of resources, sharing water quality monitoring data, public outreach and community engagement.
5. Coordinate water quality testing across towns that share a water body.
6. Improve public access points throughout the watershed to gain support for water quality improvements and initiatives.

LIST OF TABLES AND FIGURES

PHOTOGRAPHIC DOCUMENTATION

All photos contributed with permission by Evelyn Nathan, Kingston Conservation Commission.

APPENDICES

APPENDIX A MUNICIPAL MS4 INFORMATION

Notice of Intent (NOI) for coverage under Small MS4 General Permit

Part II: Summary of Receiving Waters

Please list the waterbody segments to which your MS4 discharges. For each waterbody segment, please report the number of outfalls discharging into it and, if applicable, any impairments.

New Hampshire list of impaired waters: http://des.nh.gov/organization/divisions/water/wmb/swqa/

Check off relevant pollutants for discharges to impaired waterbodies (see above 303(d) lists) without an approved TMDL in accordance with part 2.2.2 of the permit. List any other pollutants in the last column, if applicable.

Waterbody segment that receives flow from the MS4	Number of outfalls into receiving water segment	Chloride	Chlorophyll-a	Dissolved Oxygen/ DO Saturation	Nitrogen	Oil & Grease/ PAH	Phosphorus	Solids/ TSS/ Turbidity	E. coli	Enterococcus	Other pollutant(s) causing impairments
NHLAK600030802-02 Lilly Pond											Mercury, pH
NHLAK600030802-03-01 Phillips Pond	6		X				X				Cyanobacteria, Mercury, pH, non-native aquatic plants
NHLAK600030802-03-02 Phillips Pond-Seeley Town Beach											Cyanobacteria, Mercury, non-native aquatic plants
NHLAK600030802-04 Showell Pond			X				X				Cyanobacteria, Mercury, pH, non-native aquatic plants
NHLAK700061403-01-01 Angle Pond	5		X				X				Cyanobacteria, Mercury, pH
NHRIV600030802-03 Exeter River	1								X		Mercury, pH, non-native aquatic plants
NHRIV600030802-10 Towle Brook to Pandolpin Dam									X		Mercury
NHRIV600030802-16 Unnamed Brook to southwest inlet of Phillips Pond											Mercury, pH
NHRIV700061403-05 Bartlett Brook-Colby Brook-Unnamed Brook				X							Mercury, pH
NHRIV700061403-21 Unnamed Brook to Angle Pond at north inlet											Mercury, pH
NHRIV700061403-22Unnamed Brook to Angle Pond at west inlet											Mercury pH
See Note 1 in Section IV											

TMDL study for certain parameters. **Table 2-1** lists the "impaired waters" partially or wholly located within the boundaries of Sandown's regulated area based on the Final 2016 New Hampshire Integrated List of Waters produced by NHDES every 2 years[1]. These waters are shown in **Figure 2-3**. Sandown will review changes as new lists are published and record these changes and any new permit requirements in **Appendix B**.

Table 2-1. Impaired Waters

Waterbody ID	Waterbody Name	Impairment(s)	Category
NHIMP600030802-01	Exeter River - Denson Pond	Mercury	4A-M
NHIMP600030802-08	Unnamed Brook - Atkins Dam	Mercury	4A-M
NHIMP600030802-09	Unnamed Brook - Fire Hole Pond Dam	Mercury	4A-M
NHLAK600030802-01	Hunt Pond	pH	4A-M
		Mercury	4A-M
NHLAK600030802-02	Lily Pond	pH	5-M
		Mercury	4A-M
NHLAK600030802-03-01	Phillips Pond	Chlorophyll-a	5-M
		Non-Native Aquatic Plants	4C-P
		Phosphorus (Total)	5-M
		pH	5-M
		Mercury	4A-M
		Cyanobacteria	5-M
NHLAK600030802-03-02	Phillips Pond - Seeley Town Beach	Non-Native Aquatic Plants	4C-P
		Mercury	4A-M
		Cyanobacteria	5-M
NHLAK600030802-04	Showell Pond	Chlorophyll-a	4A-P
		Phosphorus (Total)	4A-P
		pH	5-M
		Mercury	4A-M
		Cyanobacteria	4A-M
NHLAK700061403-01-01	Angle Pond	Chlorophyll-a	5-M
		Phosphorus (Total)	5-M
		pH	5-M
		Mercury	4A-M
		Cyanobacteria	5-M
NHLAK700061403-01-02	Angle Pond - Angle Pond Grove Beach	Mercury	4A-M
NHLAK700061403-04	Cub Pond	pH	5-M
		Mercury	4A-M

[1]Note that at the time of preparation of this report (April 2, 2019), the 2016 303d list is the most up to date finalized 303d List.

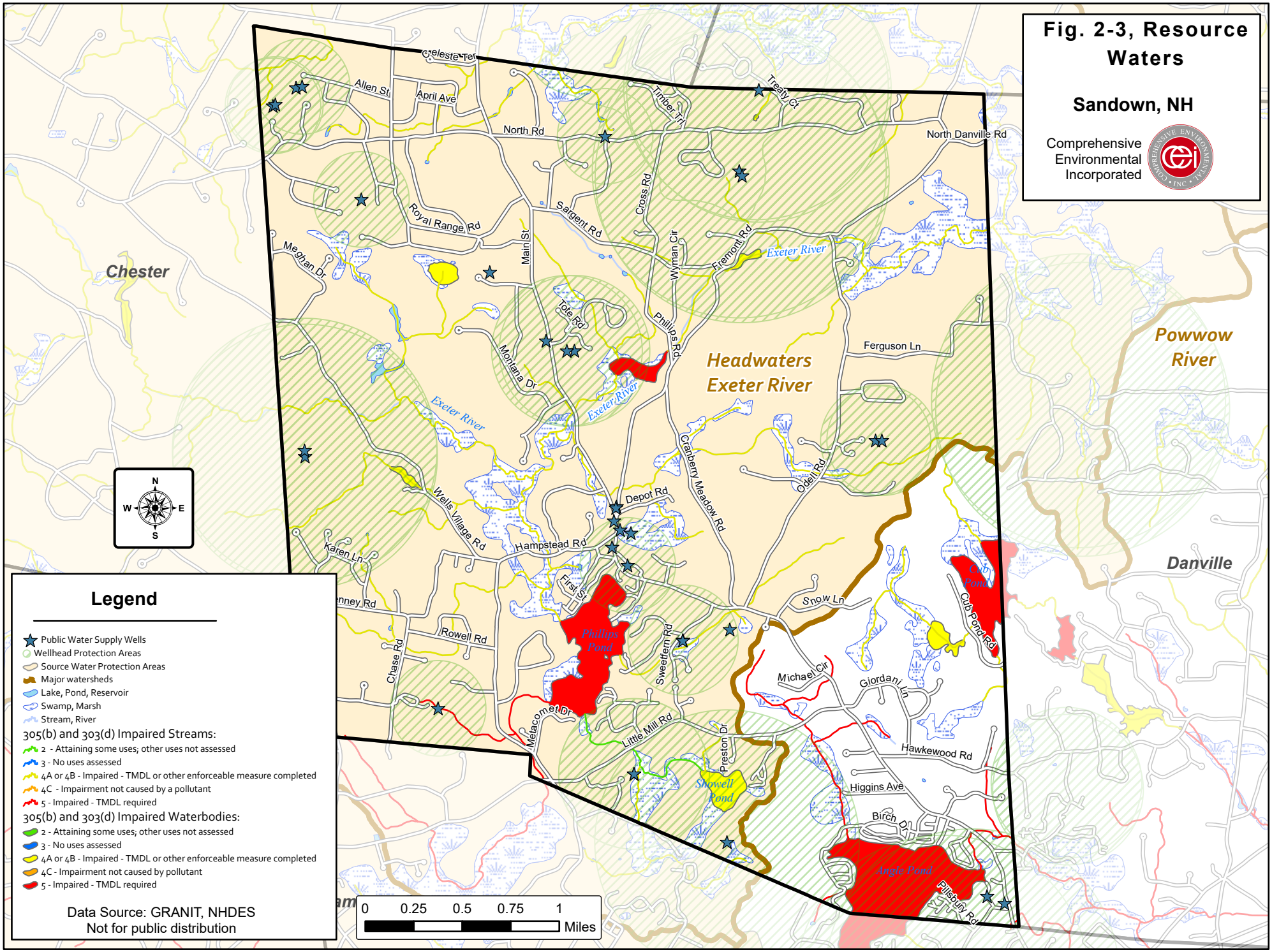


Fig. 2-3, Resource Waters
Sandown, NH
Comprehensive Environmental Incorporated
Chester
Danville
Powwow River
Headwaters Exeter River
Exeter River
Celeste Ter
Allen St
April Ave
North Rd
Timber Trl
Treaty Ct
North Danville Rd
Royal Range Rd
Sargent Rd
Cross Rd
Wyman Cir
Fremont Rd
Meghan Dr
Main St
Tole Rd
Phillips Rd
Ferguson Ln
Montana Dr
Cranberry Meadow Rd
Odell Rd
Depot Rd
Wells Village Rd
Hampstead Rd
Karen Ln
First St
Snow Ln
Cub Pond
Cub Pond Rd
Phillips Pond
Rowell Rd
Chase Rd
Sweetfern Rd
Michael Cir
Giordani Ln
Metacomet Dr
Little Mill Rd
Preston Dr
Hawkewood Rd
Higgins Ave
Birch Dr
Stowell Pond
Angle Pond
Pillsbury Rd
N
W
E
S
0 0.25 0.5 0.75 1 Miles
Legend
Public Water Supply Wells
Wellhead Protection Areas
Source Water Protection Areas
Major watersheds
Lake, Pond, Reservoir
Swamp, Marsh
Stream, River
305(b) and 303(d) Impaired Streams:
2 - Attaining some uses; other uses not assessed
3 - No uses assessed
4A or 4B - Impaired - TMDL or other enforceable measure completed
4C - Impairment not caused by a pollutant
5 - Impaired - TMDL required
305(b) and 303(d) Impaired Waterbodies:
2 - Attaining some uses; other uses not assessed
3 - No uses assessed
4A or 4B - Impaired - TMDL or other enforceable measure completed
4C - Impairment not caused by pollutant
5 - Impaired - TMDL required
Data Source: GRANIT, NHDES
Not for public distribution

04.08.19

FREMONT

CHESTER

DANVILLE

DERRY

Celeste Ter
Elizabeth Rd
Allen St
Reed Rd
Brian St
Dee Dee Dr
Hale True Rd
Lilac Ln
Woodbury Ln
Compromise Ln
North Rd
Lexington Dr
Stagecoach Dr
Waterford Dr
Country Acres Rd
Hollow Oak Dr
Holmeswood Dr
Highland Ave
Cricket Ln
Cross Rd
Royal Range Rd
Rangeway Ave
Hunt Pond Rd
Sargent Rd
Fremont Rd
Penacook Rd
Meghan Dr
Hunt Pond
Pheasant Run Dr
Eastfield Loop
Phillips Rd
Twitchells Way
Mallard Ln
Montana Dr
David Ln
Ferguson Ln
Pine Ridge Cir
Riverbend Dr
Wells Village Rd
Main St
Odell Rd
Meadow Brook Xing
Hersey Rd
Depot Rd
Glastonbury Dr
Alexis Ln
Cranberry Meadow Rd
Candlestick Ln
Lantern Dr
Kenneth Rd
School House Rd
Tenney Rd
Woodland Dr
Rowell Rd
Hampstead Rd
Tacoma Dr
North Shore Rd
Chestnut Hill Dr
Snow Ln
Cub Pond
Cub Pond Rd
Brown Ave
Phillipswood Rd
Phillips Pond
Phillips Pond Dr
Beechwood Rd
Sweetfern Rd
Michael Cir
Pinewood Loop
Giordani Ln
Chase Rd
Walnut Hill Rd
Hemlock Cir
Oak Ridge Rd
Little Mill Rd
Metacomet Dr
Showell Pond Rd
Showell Pond
Christopher Dr
Hawkewood Rd
Morrison Ln
Higgins Ave
Jeannes Way
Birch Dr
Lakeside Dr
Holts Point Rd
Round Hill Rd
Trues Pkwy
Angle Pond

1
2
3
4
5
6
7
8
9
10
11
12

Legend

- Lake, Pond, Reservoir
- Swamp, Marsh
- Non-Urban Area
- Outfall
- Stream, Brook
- Roads

N
W
E
S

0 0.25 0.5 1
Miles

Stormwater Infrastructure Map
Sandown, NH

Comprehensive Environmental Incorporated

Data Sources: CEI, GRANIT, Town of Sandown

04.25.2019

4.0 RECEIVING WATERS

The following table lists MS4 receiving waters, impairments, and number of outfalls discharging to each waterbody segment.

WATERBODY SEGMENT THAT RECEIVES FLOW FROM THE MS4	NUMBER OF OUTFALLS INTO RECEIVING WATER SEGMENT	CHLORIDE	CHLOROPHYLL-A	DISSOLVED OXYGEN / DO SATURATION	NITROGEN	OIL & GREASE / PAH	PHOSPHORUS	SOLIDS / TSS/ TURBIDITY	E. COLI	ENTEROCOCCUS	OTHER POLLUTANT(S) CAUSING IMPAIRMENTS
Powwow River – Powwow Pond [NHIMP700061403-04]	2	☐	☒	☒	☐	☐	☒	☐	☐	☐	Mercury, pH
Great Pond [NHLAK700061403-06-01]	0	☐	☐	☒	☐	☐	☐	☐	☐	☐	Cyanobacteria hepatotoxic microcystins, Mercury, pH
Great Pond – Kingston State Park Beach [NHLAK700061403-06-02]	0	☐	☐	☒	☐	☐	☐	☐	☒	☐	Cyanobacteria hepatotoxic microcystins, Mercury
Great Pond – Camp Blue Triangle Beach [NHLAK700061403-06-03]	1	☐	☐	☒	☐	☐	☐	☐	☐	☐	Mercury
Great Pond – Camp Lincoln Beach [NHLAK700061403-06-04]	0	☐	☐	☒	☐	☐	☐	☐	☒	☐	Mercury
Great Pond – Great Pond Park Association Beach [NHLAK700061403-06-05]	0	☐	☐	☐	☐	☐	☐	☐	☒	☐	Mercury
Greenwood Pond [NHLAK700061403-07]	0	☐	☒	☐	☐	☐	☒	☐	☐	☐	Cyanobacteria hepatotoxic microcystins, Mercury
Halfmoon Pond [NHLAK700061403-08]	1	☐	☒	☐	☐	☐	☒	☐	☒	☐	Cyanobacteria hepatotoxic microcystins, Mercury
Long Pond [NHLAK700061403-09]	0	☐	☐	☐	☐	☐	☐	☐	☐	☐	Mercury
Little River – Unnamed Brook [NHRIV600030803-07]	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	Mercury

WATERBODY SEGMENT THAT RECEIVES FLOW FROM THE MS4	NUMBER OF OUTFALLS INTO RECEIVING WATER SEGMENT	CHLORIDE	CHLOROPHYLL-A	DISSOLVED OXYGEN / DO SATURATION	NITROGEN	OIL & GREASE / PAH	PHOSPHORUS	SOLIDS / TSS/ TURBIDITY	E. COLI	ENTEROCOCCUS	OTHER POLLUTANT(S) CAUSING IMPAIRMENTS
Bartlett Brook – Colby Brook – Unnamed Brook [NHRIV700061403-05]	2	☐	☐	☒	☐	☐	☐	☐	☐	☐	Mercury, pH
Powwow River [NHRIV700061403-09]	1	☐	☐	☒	☐	☐	☐	☐	☐	☐	Mercury, pH
Powwow River – Unnamed Brook [NHRIV700061403-11]	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	Mercury, pH
Unnamed Brook – To Great Pond through northwest inlet [NHRIV700061403-12]	3	☐	☐	☐	☐	☐	☐	☐	☐	☐	Mercury, pH
Powwow River [NHRIV700061403-14]	2	☐	☐	☒	☐	☐	☐	☐	☐	☐	Mercury, pH
Great Pond – Thayer Rd Inlet [NHRIV700061403-27]	2	☐	☐	☐	☐	☐	☐	☐	☐	☐	Mercury, pH
Powwow Pond – RTE 125 Inlet [NHRIV700061403-29]	2	☐	☐	☐	☐	☐	☐	☐	☐	☐	Mercury, pH
Bakie Brook [NHRIV700061403-30]	0	☐	☐	☐	☐	☐	☐	☐	☐	☐	Mercury, pH
Country Pond [NHLAK700061403-03-01]	2	☐	☐	☐	☐	☐	☒	☐	☐	☐	Cyanobacteria hepatotoxic microcystins, Mercury, pH

Receiving Waters

The following table lists all receiving waters, impairments and number of outfalls discharging to each waterbody segment.

OR

The information can be found in the following document or at the following web address:

Waterbody segment that receives flow from the MS4	Number of outfalls into receiving water segment	Chloride	Chlorophyll-a	Dissolved Oxygen/ DO Saturation	Nitrogen	Oil & Grease/ PAH	Phosphorus	Solids/ TSS/ Turbidity	E. coli	Enterococcus	Other pollutant(s) causing impairments
Unnamed Tributary to Country Pond (Newton Junction) (NHRIV70061403-13)	2	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Unnamed Tributary to Country Pond (Pond Road) (NHRIV700061403-32)	1	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Unnamed tributary to Tuxbury Pond (NHRIV700061403-34)	5	☐	☐	☐	☐	☐	☐	☐	☐	☐	
Unnamed Tributary to Little River (NHRIV700061401-01?)	3	☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
UNNAMED BROOK (NHRIV700061403-32)		☐	☐	☐	☐	☐	☐	☐	☐	☐	
COUNTRY POND (NHLAK700061403-03)		☒	☒	☒	☐	☐	☒	☐	☐	☐	MERCURY, PH, CYANOBACTERIA
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	
		☐	☐	☐	☐	☐	☐	☐	☐	☐	

Table 2-4. Impaired Waters

Waterbody ID	Waterbody Name	AUID-NHDES Category	Impairment	NHDES Category
NHIMP700061403-01	Colby Brook – Diamond Pond	3-ND	Mercury	4A-M
NHIMP700061403-02	Colby Brook	3-ND	Mercury	4A-M
NHLAK700061403-05	Little Cub Pond	5-M	Mercury	4A-M
NHLAK700061403-09	Long Pond	4C-M	Mercury	4A-M
NHRIV600030802-06	Unnamed Brook – to Exeter River	3-ND	Mercury	4A-M
NHRIV600030802-30	Unnamed Brook	3-ND	Mercury	4A-M
NHRIV700061403-02	Colby Brook	3-ND	Mercury	4A-M
NHRIV700061403-03	Colby Brook – From Little Cub Pond	3-ND	Mercury	4A-M
NHRIV700061403-04	Colby Brook – Diamond Pond	3-ND	Mercury	4A-M
NHRIV700061403-05	Barlett Brook – Colby Brook - Unnamed Brook	5-P	Mercury	4A-M
			Oxygen, Dissolved	5-P
NHRIV700061403-08	Unnamed Brook – Powow River	3-ND	Mercury	4A-M
NHRIV700061403-37	Unnamed Brook	3-ND	Mercury	4A-M
NHRIV700061403-38	Unnamed Brook	3-PNS	Mercury	4A-M

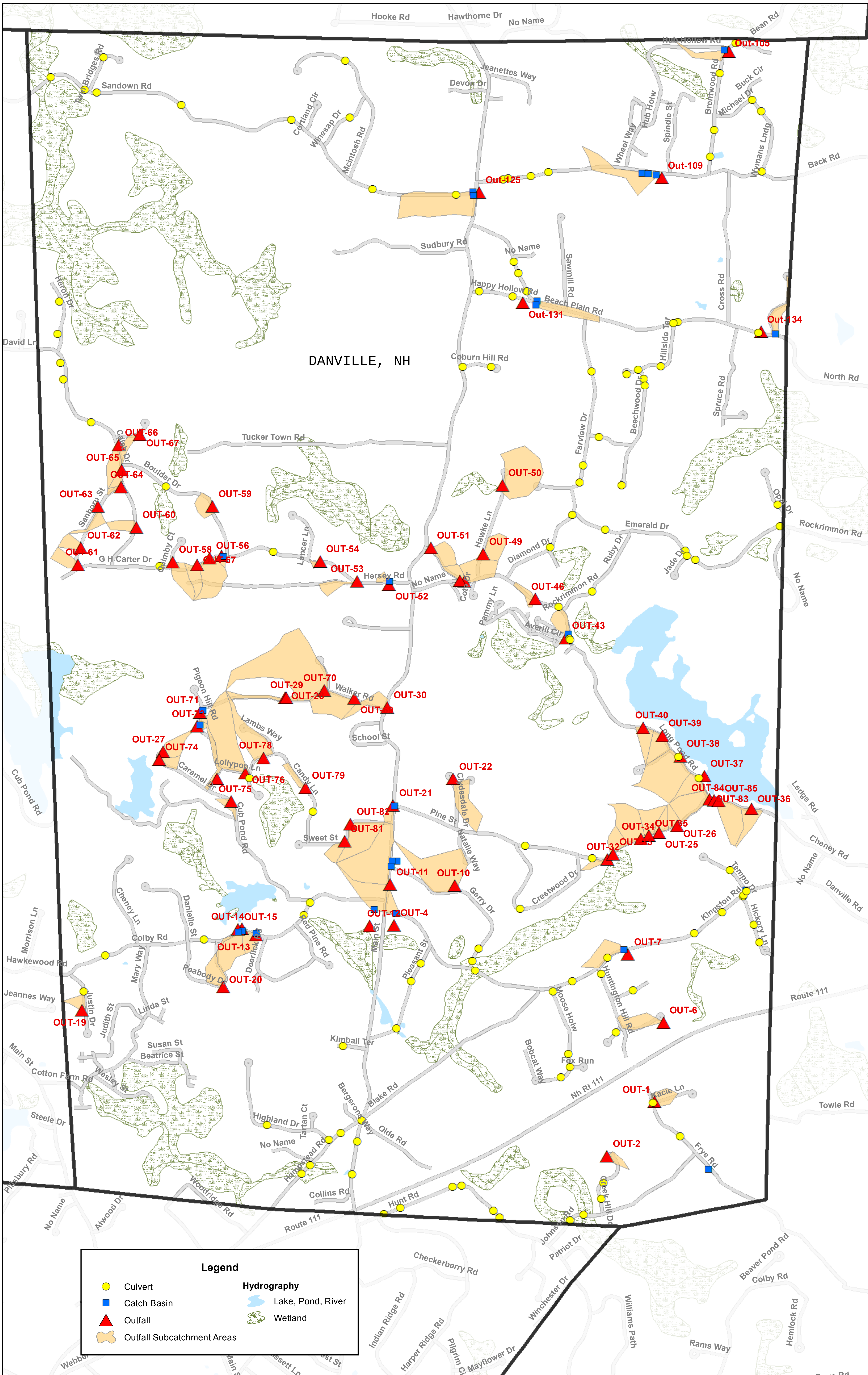
Category 4A-M Waters - There is an impairment per the CALM by a parameter which is a pollutant and an EPA-approved TMDL has been completed. However, the impairment is relatively slight or marginal.
Category 5-P Waters - There is an impairment per the CALM by a parameter which is a pollutant that requires a TMDL. The impairment is more severe and causes poor water quality conditions.

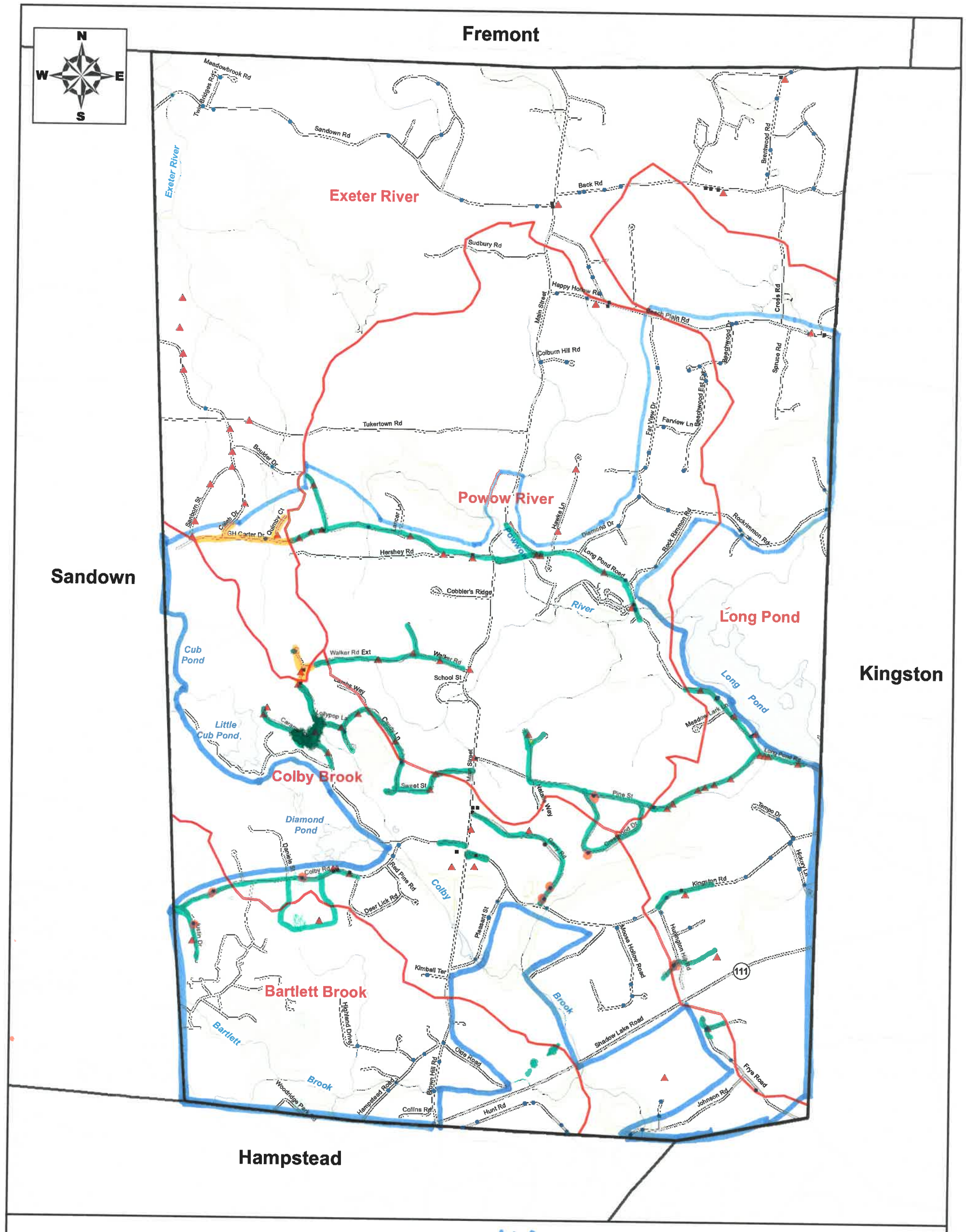
2.6 Endangered Species Act Determination

In order to be eligible to discharge stormwater under the 2017 MS Permit, the Town of Danville must certify that its stormwater system is not impacting federally listed rare or endangered species habitat or other critical environmental locations. This was completed in the summer of 2018 as meeting "Criterion C" on the Notice of Intent (**Appendix A**) with the results documented in **Appendix A**. The Northern Long-eared Bat *(Myotis septentrionalis)* was the only species identified as potentially being present within Danville's regulated area. No critical habitats were identified.

2.7 National Historic Preservation Act Determination

Regulated MS4s must also evaluate whether its discharges have the potential to affect historic properties. The MS4 Permit typically authorizes discharges from existing facilities


DANVILLE, NH
Hooke Rd
Hawthorne Dr
No Name
Bean Rd
Hub Hollow Rd
Out-105
Twin Bridges Rd
Sandown Rd
Jeanettes Way
Devon Dr
Cortland Cir
Winesap Dr
Mcintosh Rd
Brentwood Rd
Buck Cir
Michael Dr
Wheel Way
Hub Holw
Spindle St
Wymans Lndg
Back Rd
Out-109
Out-125
Sudbury Rd
No Name
Sawmill Rd
Happy Hollow Rd
Beach Plain Rd
Out-131
Cross Rd
Hillside Ter
Out-134
Heron Dr
David Ln
Coburn Hill Rd
North Rd
Beechwood Dr
Spruce Rd
Farview Dr
Tucker Town Rd
OUT-66
OUT-67
OUT-65
Caleb Dr
Boulder Dr
OUT-64
OUT-63
Sanborn St
OUT-59
OUT-60
OUT-50
OUT-62
OUT-61
G H Carter Dr
Quimby Ct
OUT-58
OUT-56
OUT-57
Lancer Ln
OUT-54
OUT-53
Hersey Rd
OUT-52
No Name
OUT-51
Hawke Ln
OUT-49
Diamond Dr
Emerald Dr
Ruby Dr
Jade Dr
Opal Dr
Rockrimmon Rd
No Name
Cote Dr
Pammy Ln
OUT-46
Rockrimmon Rd
Averill Cir
OUT-43
Pigeon Hill Rd
OUT-71
OUT-72
OUT-29
OUT-70
OUT-28
Walker Rd
OUT-30
OUT-31
Lambs Way
School St
OUT-27
OUT-74
OUT-78
Lollypop Ln
Caramel Dr
OUT-76
OUT-75
Candy Ln
OUT-79
Cub Pond Rd
Cub Pond Rd
OUT-40
OUT-39
Long Pond Rd
OUT-38
OUT-37
OUT-84
OUT-85
OUT-83
OUT-36
Ledge Rd
OUT-22
Clydesdale Dr
OUT-21
Pine St
Natalie Way
OUT-82
OUT-81
Sweet St
OUT-34
OUT-35
OUT-33
OUT-26
OUT-25
OUT-32
Cheney Rd
No Name
Danville Rd
OUT-11
OUT-10
Gerry Dr
Crestwood Dr
Tempo Dr
Kingston Rd
Hickory Ln
Cheney Ln
Danielle St
OUT-14
OUT-15
OUT-13
Red Pine Rd
OUT-12
OUT-4
Main St
Pleasant St
Morrison Ln
Colby Rd
Hawkewood Rd
Mary Way
Deerlick Rd
Peabody Dr
OUT-20
OUT-7
Huntington Hill Rd
Moose Holw
Jeannes Way
Justin Dr
OUT-19
Judith St
Linda St
OUT-6
Route 111
Susan St
Beatrice St
Kimball Ter
Bobcat Way
Fox Run
Main St
Cotton Farm Rd
Wesley St
Nh Rt 111
OUT-1
Kacie Ln
Towle Rd
Steele Dr
Bergerons Way
Blake Rd
Highland Dr
Tartan Ct
Olde Rd
No Name
Hampstead Rd
Frye Rd
OUT-2
Pillsbury Rd
Woodridge Rd
Collins Rd
Creek Hill Dr
No Name
Atwood Dr
Route 111
Hunt Rd
Johnson Rd
Patriot Dr
Checkerberry Rd
Beaver Pond Rd
Colby Rd
Winchester Dr
Williams Path
Hemlock Rd
Indian Ridge Rd
Harper Ridge Rd
Pilgrim Cir
Mayflower Dr
Rams Way
Morning Dove Rd
Webber
Main St
Legend
Culvert
Catch Basin
Outfall
Outfall Subcatchment Areas
Hydrography
Lake, Pond, River
Wetland



Legend

- Outfall
- Inlet
- Private Outfall
- Catch Basin
- Drain Manhole
- Culvert
- Subwatershed Boundary
- Town Boundary

Hydrography

- Surface Water
- Wetland
- River, Stream, Brook

UA
2x
1x

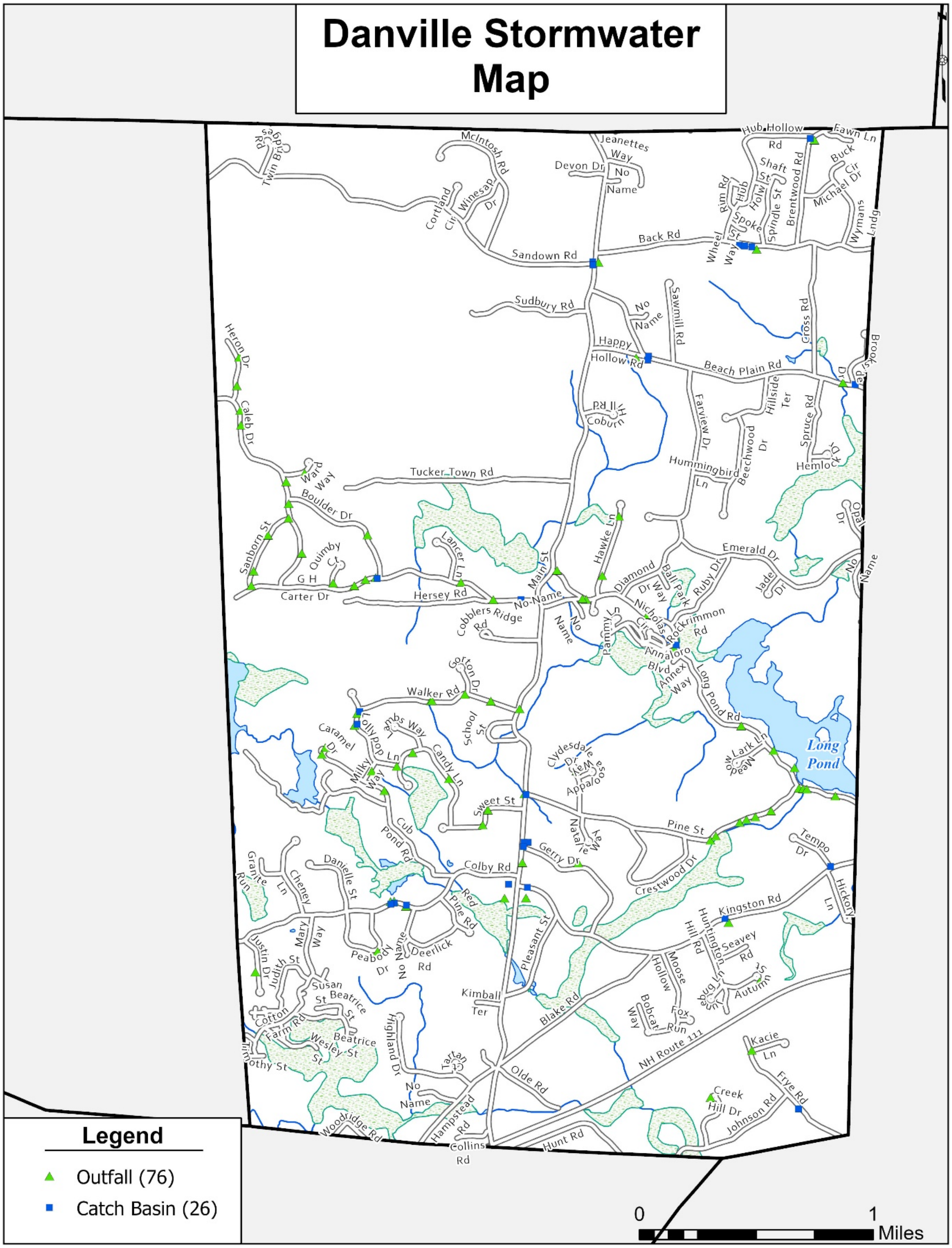
0 1,500 3,000 4,500 6,000 Feet

Figure 3-1

Drainage System

Town of Danville, NH

Comprehensive Environmental Inc.


Danville Stormwater Map
Legend
Outfall (76)
Catch Basin (26)
0
1
Miles
Long Pond
McIntosh Rd
Jeanettes Way
Devon Dr
No Name
Hub Hollow Rd
Fawn Ln
Back Rd
Sandown Rd
Sudbury Rd
Sawmill Rd
Gross Rd
Happy Hollow Rd
Beach Plain Rd
Farview Dr
Hillside Ter
Spruce Rd
Hemlock Dr
Hummingbird Ln
Beechwood Dr
Tucker Town Rd
Heron Dr
Caleb Dr
Ward Way
Boulder Dr
Sanborn St
Quimby Ct
Carter Dr
Hersey Rd
Lancer Ln
Main St
Hawke Ln
Emerald Dr
Diamond Dr
Ruby Dr
Cobblers Ridge Rd
Walker Rd
Gorton Dr
School St
Long Pond Rd
Lark Ln
Candy Ln
Lolly Pop Ln
Caramel Dr
Sweet St
Pine St
Tempo Dr
Colby Rd
Gerry Dr
Crestwood Dr
Kingston Rd
Hickory Ln
Danielle St
Cheney Ln
Granite Run
Mary Way
Justin Dr
Judith St
Deerlick Rd
Pleasant St
Kimball Ter
Blake Rd
Seavey Rd
Autumn St
Bobcat Way
Fox Run
NH Route 111
Kacie Ln
Frye Rd
Creek Hill Dr
Johnson Rd
Highland Dr
Olde Rd
Hampstead Rd
Woodridge Rd
Collins Rd
Hunt Rd

APPENDIX B LAND USE AND ENVIRONMENTAL FEATURES MAP SET

List of project maps:

Map NR2 Impaired Waters
Map 1 Wildlife Action Plan High Value Habitats
Map 2 Coastal Conservation Plan Core Focus Areas
Map 3 Wellhead and Aquifers
Map 4 Land Use
Map 5 Impervious Cover
Map 6 Septic System Inventory

Hot Spot/Pollutant Load Maps: TP, TSS and TN for Sandown, Kingston and Newton, Parcel Inventory (Excel spreadsheet)

Septic Inventory (Excel spreadsheet)

All project maps provided electronically under separate cover using a large file online transfer system.

APPENDIX C SEPTIC SYSTEM INVENTORY

See Excel Spreadsheet and Map Provided in Appendix B

APPENDIX D HOT SPOT INVENTORY

See Excel Spreadsheet and Maps Provided in Appendix B

APPENDIX E MUNICIPAL AUDIT AND REPORT

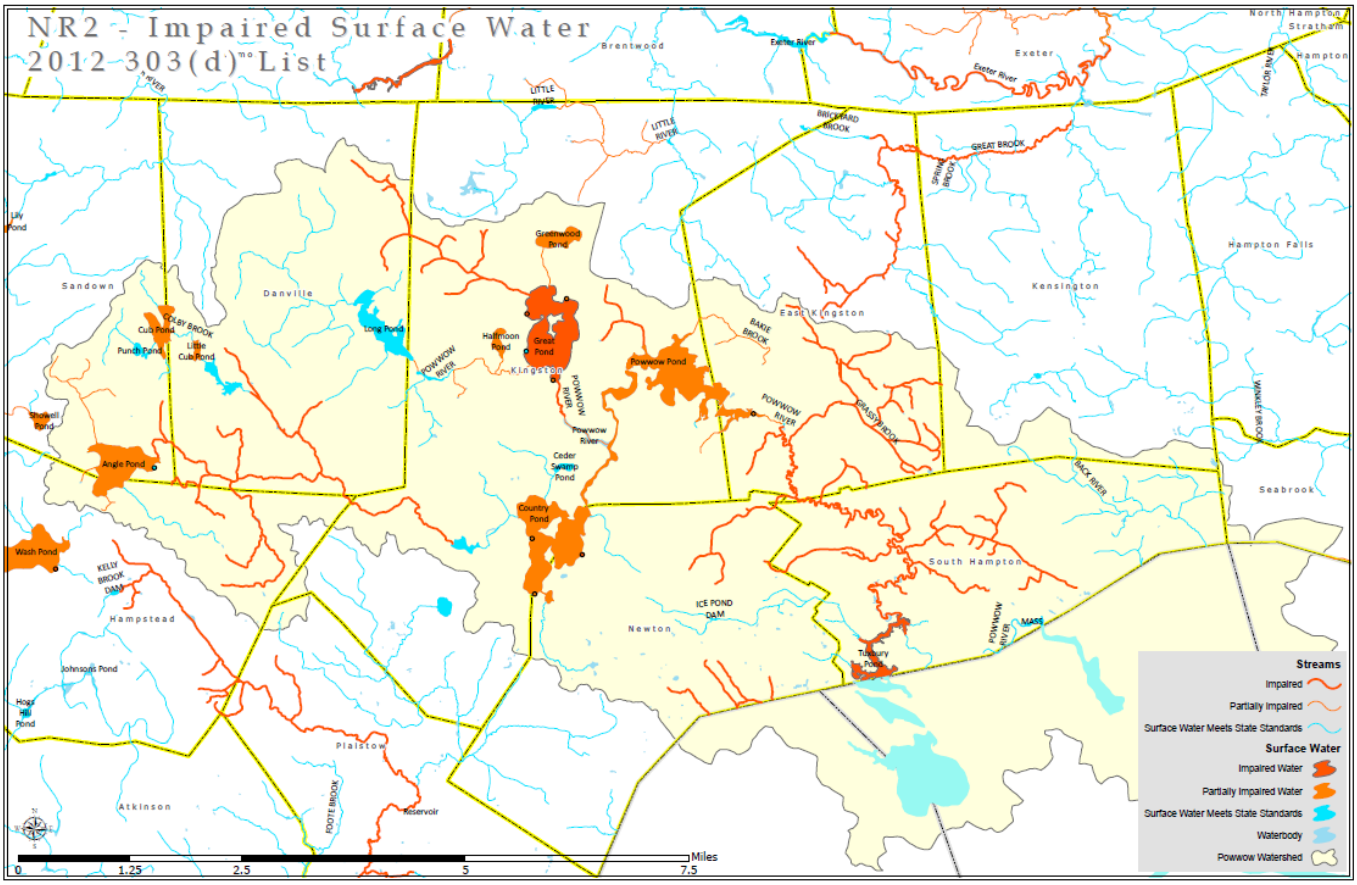
POWWOW RIVER WATERSHED COLLABORATIVE

IMPROVING WATER QUALITY IN THE POWWOW RIVER WATERSHED

MUNICIPAL AUDIT REPORT:
Water Quality Protections in the Powwow River Watershed

ROCKINGHAM PLANNING COMMISSION

Prepared by the Rockingham Planning Commission
September 2018



Funding for this project was provided in part by a Watershed Assistance Grant from the NH Department of Environmental Services with Clean Water Act Section 604(b) funds from the U.S. Environmental Protection Agency.

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

POWWOW RIVER WATERSHED MUNICIPAL AUDIT REPORT

INTRODUCTION

The purpose of this municipal audit is to document the existing levels of protection in force in the 10 NH municipalities that protects water quality and quantity, manages development impacts, and reduces pollutant loads in the Powwow River watershed.

Completing this municipal audit provides many benefits to the watershed communities:

- Identifies gaps and opportunities for improvement in regulatory and nonregulatory protections throughout the watershed.
- Informs municipal level policies, funding needs, investment priorities, and long-term infrastructure and facilities planning.
- Identifies options to adopt or amend existing regulatory standards to protect watershed resources and improve water quality.
- Provides a basis for future comprehensive watershed planning.

HOW CAN THE MUNICIPAL AUDIT BE USED?

Planning Boards can use the audit results to develop long-range plans to improve regulatory standards related to land development and resource protection.

Conservation Commissions can use the audit results to help establish priorities for land conservation investments that provide maximum water quality and resource protection benefits.

Municipalities that have waterbodies with shared boundaries can use the audit results to collaborate on water quality issues, reduce pollution entering waterbodies, and educate land owners about ways to protect water resources.

Infrastructure and facilities managers can use the audit results to prioritize asset improvements necessary to address water quality impairments and sources of pollution both point and nonpoint.

Municipal staff can use the audit results to identify gaps in regulatory protections needed for MS4 permit compliance, funding needs, planning and implementation.

KEY FINDINGS OF THE MUNICIPAL AUDIT

1. Updates/improvements needed in stormwater management regulations (post-construction).
2. Updates/improvements needed in erosion and sediment control regulations (during construction).
3. The terms “buffer” and “setback” are often used without definition, weakening their intent and effectiveness.
4. Posting information, zoning ordinances and land use regulations on municipal websites is not enough to elevate awareness of local regulations to protect water quality and quantity.
5. 5 municipalities subject to the EPA MS4 Permit; 5 municipalities are waivered or not subject to Permit.
6. 6 of 10 municipalities have no-disturb buffers to wetlands.
7. 3 of 10 municipalities have no-disturb buffers to streams, rivers and surface waters.
8. 2 of 10 municipalities have designated Prime Wetlands.
9. 8 of 10 municipalities have impaired water bodies in the watershed (Kensington and Seabrook have none).
10. 4 of 10 municipalities have adopted the SWA or equivalent stormwater management standards.
11. 1 of 10 municipalities have impervious surface limits for developments.
12. 3 of 10 municipalities have a designated Aquifer Protection District and protection zoning standards.
13. 2 of 10 municipalities have standards limiting development on steep slopes.

RECOMMMENDATIONS

Following are recommendations for regulatory, non-regulatory and municipal actions, and opportunities for collaboration to protect water quality at the municipal level.

REGULATORY ACTIONS

☑ *Adopt State of the Art Erosion and Sediment Control and Stormwater Management Standards*

All of the 10 watershed municipalities would benefit from some degree of updating or improvement to erosion and sediment control and post-construction stormwater management standards in their Site Plan Review Regulations and Subdivision Regulations. Specific standards absent in most existing regulations include:

- Numeric water quality treatment and pollutant removal criteria;
- Use of current precipitation data for design of stormwater infrastructure such as Northeast Regional Climate Center extreme precipitation atlas or NOOA precipitation atlas;
- Implementation of low impact development and Green Infrastructure practices;
- Stormwater volume controls and groundwater recharge requirements;
- Preparation of Operations and Maintenance Plans for privately owned stormwater infrastructure; and
- Specific inspection criteria during and after installation of stormwater BMP's.

Municipalities are encouraged to share examples of erosion and sediment control and post-construction stormwater management standards successfully implemented with other watershed municipalities.

☑ *Adopt No-Disturb Buffers and Development Setbacks to Wetlands and Surface Waters*

Buffer

A buffer is a naturally occurring or planted vegetated area that separates resources such as wetlands, streams, and lakes from human activity and disturbances. A buffer performs many functions including removing sediment and other pollutants from stormwater runoff, slowing the flow of stormwater runoff to these resources, storing flood waters, providing wildlife habitat, and regulating the temperature of surface water.

Existing naturally occurring vegetated buffers are also a cost-effective way of managing stormwater and removing pollutants from runoff. Natural buffers require little maintenance to keep them functioning and attractive landscape features. Man-made or replanted buffers can often be integrated into the landscaping plan for a developed site. Native plants are recommended for man-made or replanted buffers as these species are acclimated to local climate conditions so need less watering and upkeep.

Setback

A setback is the distance separating resources such as wetlands, streams, rivers and lakes typically from buildings and septic systems. Setbacks are not required to remain vegetated and are often allowed to be developed into parking lots, stormwater management structures, and other structures that support a development.

Buffer Versus Setback: What do they mean to accomplish?

Functionally, buffers and setbacks are quite different. A buffer serves to protect the area of separation in a natural state thereby preserving the natural functions (described above) of the fringe areas surrounding the resource. Setbacks do little or nothing to protect these natural functions and in some instances incentive replacing natural vegetation in the setback with managed turf, lawn, accessory structures and impervious surfaces.

☑ *Adopt Impervious Surface Limits for Developed Sites*

A uniformly effective method for reducing stormwater runoff is to set impervious surface limits for developed sites. Another important aspect of runoff to keep in mind is the cumulative impact of impervious cover in a particular drainage area or subwatershed. While total impervious surface acreage in a municipality may remain at or below the recommended 15 percent threshold to prevent water quality and aquatic habit impacts (Schueler, 2000[1]), where impervious surfaces are located is also important as concentration of impervious surfaces can cause localized flooding, pollutant loading and erosion problems. These headwater areas of a watershed are critical for protecting water quality as they typically contain a dense network of small streams that attenuate pollution and maintain water temperature.

> *Impervious surfaces* (or impervious cover) are hardened surfaces such as asphalt, concrete, rooftops and stone that do not infiltrate water and runoff. Impervious surfaces can include highly compacted materials like gravel and crushed asphalt that do not readily infiltrate water or runoff.

Another element of impervious surface to consider what is called "*effective impervious area*" or EIA which is the portion of total impervious area that is discharged to surface waters and wetlands or hydraulically connected to the storm sewer system. In other words, EIA takes into account the impervious surfaces that can contribute to water pollution and degradation. For example, a bio-retention area where all stormwater runoff from impervious surfaces is treated and infiltrated in the ground would not count toward EIA.

RECOMMENDED NON-REGULATORY ACTIONS

☑ *Develop and Implement a Comprehensive Public Outreach and Engagement Initiative About Water Quality Protection and Sources of Water Pollution*

Provide information via municipal website, social media, and at municipal and civic events about how residents and businesses can help protect water resources. The purpose of this outreach is to empower residents and businesses to identify water quality problems and take action on their own property to remedy them. Informational materials should focus on the "how to's" of protecting water quality by illustrating "if I do this, this will be the result". Convening neighborhood gatherings can be an informal and social way to strengthen local support to address water quality problems and deepen understanding of and interest in solving them.

☑ *Utilize Land Protection and Conservation to Protect High-Quality and High-Value Water Resources*

Evaluate the most critical local water resource protection features including groundwater recharge areas, stratified drift aquifer deposits, and the condition of natural buffers to surface waters and wetlands, and features that could negatively impact water quality such as steep slopes, erodible soils and impervious surfaces. Evaluate existing land uses and zoning district standards. Use this information to prioritize land for conservation and protection. Develop water resource protection objectives to incorporate into the scoring criteria used for land acquisition decisions. Partner with regional land trusts and national land conservation organizations to conserve and protect high-value water resource lands. Consider implementing other water resource protection measures such as Groundwater Reclassification (see NHDES www.des.nh.gov/organization/divisions/water/dwgb/dwspp/reclassification/index.htm) or protecting groundwater recharge areas by requiring infiltration of stormwater runoff, prohibiting land uses that pose a high risk for contamination, limiting development of steel slopes, and land conservation.

RECOMMENDED MUNICIPAL ACTIONS

☑ *Identify Measures for Municipal Properties, Facilities and Infrastructure and Prioritize Their Implementation to Address Water Quality Impairments*

[1] The Importance of Imperviousness, Schueler 2000. Feature article from Watershed Protection Techniques. 1(3): 100-111

Another way of leading by example is to ensure that municipal properties, facilities and infrastructure are being managed properly so as not to contribute to water quality impairment. As part of their overall Stormwater Management Plan, MS4 municipalities are required to inventory their municipal properties, facilities and infrastructure and identify measures to improve impaired waters and protect high-quality waters. Some MS4 areas cover only a portion of a municipality, however because water does not abide by MS4 boundaries, it makes sense to apply the same methodology across the entire municipality beyond just their MS4 area and by those municipalities with waivers or that are not subject to the MS4 permit. Non-MS4 and waivered municipalities can prioritize corrective measures for municipal properties, facilities and infrastructure that discharge stormwater runoff to a surface water body or hydrologically connected wetlands.

☑ *Install Demonstration Projects at Municipal Properties and Facilities*

Municipalities can lead by example by installing demonstration projects aimed at eliminating a source of water quality pollution. Tangible examples go a long way toward helping property owners visualize what these practices may look like in their own back yards such as a rain garden, grass swale or vegetated buffer.

☑ *Work Toward Improving Water Quality Regardless of Whether the Municipality is Subject to the MS4 Permit*

MS4 communities are responsible for complying with the water quality standards in their permits, however in many instances water flows across borders from non-MS4 and waivered municipalities to permitted municipalities. For this reason, being proactive voluntarily about protecting water quality only makes sense and could result in a more effective and consistent approach on a watershed scale.

☑ *Incorporate Water Quality Goals and Objectives in the Municipal Master Plan (e.g. Vision Chapter, Land Use Chapter, Natural Resources Chapter or Natural Resources Inventory).*

Under RSA 674:2 Master Plan Purpose and Description, municipalities and Planning Boards are responsible for maintaining a Master Plan to ensure appropriate future development, preserving and enhancing the unique quality of life and culture in New Hampshire, and guide smart growth, sound planning, and wise resource protection. The Master Plan is a document that lays out a vision chapter containing a set of guiding principles and priorities, and supporting chapters that state the goals and objectives necessary to carry out that vision. The Master Plan enables the municipality to plan, regulate, invest and otherwise act to attain their vision, goals and objectives for water quality and water resource protection.

OPPORTUNITIES FOR COLLABORATION

☑ *Collaborate with Lake and Pond Associations*

Most major water bodies in the watershed have a formal association or active stewardship organization of some kind. These groups often perform water quality testing, conduct outreach to property owners, work to control non-native aquatic species, and interact regularly with local residents and property owners about environmental issues. Municipalities can benefit from the expertise of these groups, share data, and collaborate to fund and implement new water quality initiatives including identifying sites for erosion control and stormwater retrofit projects. The causes of pollution are more readily identified when all parties are engaged and have a similar level of understanding.

☑ *Collaborate with the Manchester/Nashua and Seacoast Stormwater Coalitions*

Regional stormwater coalitions, comprised of municipal representatives and stormwater professionals, are very helpful in organizing municipalities, providing resources and guidance, and sharing success stories. Refer to the NH Stormwater Coalition website at https://www.des.nh.gov/organization/divisions/water/stormwater/coalitions.htm for stormwater related materials. Watch for new materials focused on water quality outreach and education to be posted soon.

☑ *Collaborate with Neighboring Municipalities on Public Outreach and Engagement*

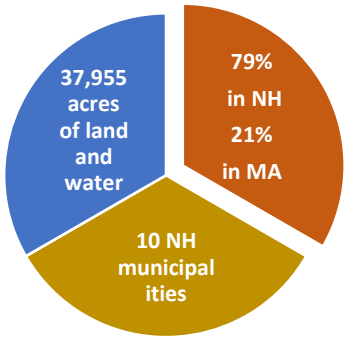
Because most municipalities share surface water bodies and watershed boundaries, collaborating on public outreach and engagement can result in consistent messaging and wider public support for water quality protection (e.g. interests ranging from recreation, fishing, habitat and drinking water). Local messages resonate most effectively with local water based activities and users which can help create a stronger sense of ownership about water quality issues and the actions necessary to address them.

☑ *Collaborate on Water Quality Testing with Municipalities that Share Water Bodies*

Lake and Pond Associations and municipalities under an EPA MS4 permit can benefit from collaborating on water quality testing for shared waterbodies. In additional to efficiency and cost savings, a more comprehensive water quality profile and history can be collected for each water body. Water quality testing can help document over time the effectiveness of measures implemented to reduce specific pollutants causing impairments and guide adjustment of measures as necessary to improve the desired reductions.

APPENDIX A: FACTS AND FIGURES ABOUT THE POWWOW RIVER WATERSHED

The Powwow River Watershed contains 37,955 acres of land and water: 30,114 acres (79 percent) in New Hampshire and 7,842 acres (21 percent) in Massachusetts (Merrimac and Amesbury). Ten New Hampshire municipalities are partially or wholly within the watershed: Seabrook, Kensington, East Kingston, Kingston, Danville, Sandown, Hampstead, Newton and South Hampton. South Hampton is the only NH municipality located entirely within the watershed.



Municipality	Total Area (acres)	Acres in Watershed	% Area in Watershed (acres)	Impervious Surface (watershed acres)
Danville	7,569	5,575	73%	325 / 5.8%
East Kingston	6,381	3,144	49%	132 / 4.2%
Hampstead	9,014	1,581	17%	*NA*
Kensington	7,668	699	9%	19 / 2.7%
Kingston	13,450	7,836	58%	434 / 5.5%
Newton	6,365	4,244	67%	*NA*
Plaistow	6,790	77	1%	*NA*
Sandown	9,232	1,583	17%	83 / 5.2%
Seabrook	6,161	228	4%	32 / 14.0%
South Hampton	5,147	5,147	100%	*NA*

Note: NA = Impervious surface data not available

Land Conservation Plan for the Merrimack River Watershed of New Hampshire and Massachusetts (2014)			
Resource Category	Total Acres	Acres in NH	Acres in MA
Tier 1 – Highest value	6,303	6,020 (96%)	283
Tier 2 – Higher value	16,242	14,569 (90%)	1,673
Tier 3 – High value	9,085	8,071 (89%)	1,014
Total Acres	31,630	28,661 (91%)	2,970

Source: Land Conservation Plan for the Merrimack River Watershed of New Hampshire and Massachusetts (2014) available on the Society for Protection of New Hampshire Forests website at https://forestsociety.org/sites/default/files/Merrimack%20Plan%20Executive%20Summary%20FINAL%20April%202014.pdf

Resource Category	Acres in Watershed-NH	% Total Watershed-NH
Freshwater Wetlands	6,997	23%
Forested	13,285	44%
Stratified Drift Aquifer	8,911	30%
Surface Water	1,570	5%
Agricultural Soils (total)	9,651	32%
Farmland of Statewide Importance	3,796	13%
Farmland of Local Importance	4,349	14%
Prime Farmland	1,506	5%
NH Wildlife Action Plan	**Acres in Watershed-NH**	**% Total Watershed-NH**
Tier 1 – Highest	3,928	13%
Tier 2 - Higher	4,884	16%
Tier3 - High	7,210	24%
Total Acres	16,022	53%
Land Use Category	**Acres in Watershed-NH**	**% Total Watershed-NH**
Undeveloped Lands	16,157	54%
Developed Lands	13,957	46%

APPENDIX F OUTREACH MATERIALS

POWWOW RIVER WATERSHED COLLABORATIVE

IMPROVING WATER QUALITY IN THE POWWOW RIVER WATERSHED

COLLABORATION ON WATER QUALITY STRATEGIES

The primary goal of the Powwow River Watershed Collaborative is to identify effective strategies to improve water quality and protect existing high quality water and natural resources. To accomplish this, collaboration across municipal boundaries and among watershed stakeholders is key!

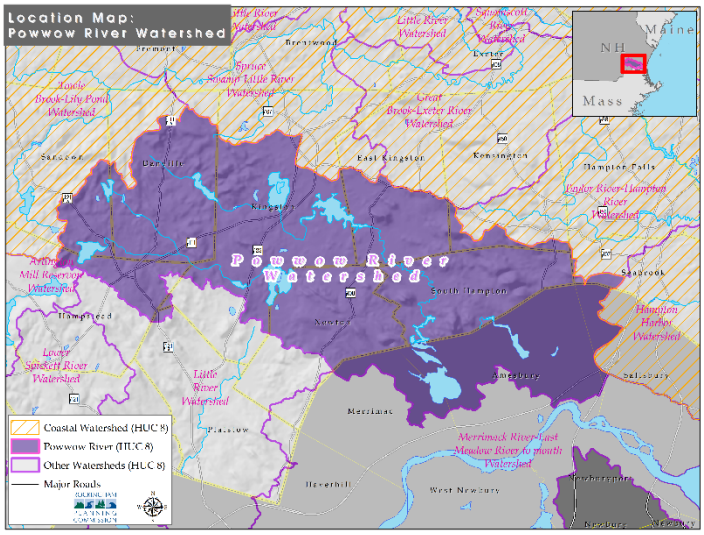
WE NEED YOU ON THE POWWOW RIVER WATERSHED TEAM

The Rockingham Planning Commission (RPC) is launching a new project designed to improve and protect water quality in the Powwow River Watershed. We need you to share your knowledge of existing pollution problems and potential sources of pollution. Representatives are needed from every town in the watershed - Seabrook, Kensington, East Kingston, Kingston, Danville, Sandown, Hampstead, Newton, Plaistow, and South Hampton. This collaborative working group will serve as a forum for sharing your knowledge about the watershed with other stakeholders.

The Powwow River watershed is largely rural and undeveloped and so threats to water quality are not always obvious. Data from the NH Department of Environmental Services indicate there are serious water quality impairments, and a need to gain a better understanding of the sources of water pollution.

INFORMATION AND TOOLS

RPC will compile information about existing water quality problems, land use, impervious surface cover, and sensitive resources and habitat areas to create a water quality profile of the watershed. Refer to the watershed statistics on the back page.



DISCUSSION AND DISCOVERY

RPC needs your participation in a working group comprised of municipal officials, residents, and other stakeholders. The working group will work collaboratively with the RPC to on water quality and water resource protection watershed-based planning in the Powwow River watershed to improve impaired waters and protect existing high quality waters. The working group will have a kick-off meeting in October 2017, then meet quarterly through 201

Funding for this project was provided in part by a Watershed Assistance Grant from the NH Department of Environmental Services with Clean Water Act Section 604(b) funds from the U.S. Environmental Protection Agency.

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

FACTS AND FIGURES ABOUT THE POWWOW RIVER WATERSHED

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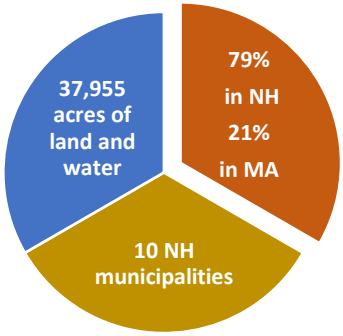

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Coming soon to the RPC website - a map set showing the occurrence of land cover and resources in the watershed.

Be the Solution to Water Pollution!

SOURCES OF WATER POLLUTION

Stormwater is the leading cause of water quality decline in New Hampshire. The daily activities of residents and businesses across the region impact our water resources, wildlife and environment. Being knowledgeable is the key to taking action and practice water pollution prevention.

BE THE SOLUTION! 10 BEST PRACTICES YOU CAN DO TO PITCH IN

1. Never dump anything onto the street, down a storm drain or into a drainage ditch.
2. Pick up after your pet. Bag it and throw pet waste in the trash.
3. Compost or bag your grass clippings and leaves for curbside collection.
4. Use fertilizers and pesticides sparingly.
5. Dispose of all litter properly.
6. Keep your septic system pumped and maintained to prevent leaks.
7. Check your vehicles for leaks and repair them as soon as possible.
8. Always recycle your motor oil and other chemicals properly.
9. Wash your car over a grassy area or at a commercial car wash.
10. Tell a friend or neighbor how they can prevent stormwater pollution!

WHY SHOULD WE CARE ABOUT CLEAN WATER?

When it rains……it pollutes!

Every time it rains, water runs off the land as stormwater. As it flows over rooftops, roads, lawns, driveways and other surfaces, stormwater picks up pollutants and debris such as dirt, motor oil, fertilizer, litter and pet waste. All of these pollutants can be carried by stormwater into storm drains and drainage ditches which flow untreated into rivers, streams, lakes and wetlands.

Stormwater pollution is one of the biggest threats to New Hampshire's water resources. It harms our ability to use these waters for drinking water, swimming and fishing, and negatively impacts wildlife, habitat and the environment.

It is far easier to prevent pollution than it is to clean it up or treat polluted water. Keeping our water resources free of pollution benefits everyone and every community in the watershed.

GET INVOLVED TO PROTECT AND IMPROVE WATER QUALITY

There are many ways to get involved in protecting water resources. Here a just a few:

- Become a volunteer member of a local watershed group.
- Invite a professional to speak at your next civic or neighborhood meeting.
- Teach your children and family members about best practices that prevent water pollution.
- Set a goal every year to volunteer in a clean water or water pollution prevention activity, event or organization.

Photos Credited to Evelyn Nathan, Kingston, NH

For more information, contact:
{customize this section with local information}

Funding for this project was provided in part by a Watershed Assistance Grant from the NH Department of Environmental Services with Clean Water Act Section 604(b) funds from the U.S. Environmental Protection Agency.

WHAT YOU CAN DO

- Remove the bag from your lawnmower or use a mulching lawnmower. Leave the clippings in place to add organic matter and recycle nutrients, and avoid having to dispose of the grass clippings.

- Mark your calendar every spring and fall to schedule a yard waste management day by either composting or disposing of yard waste properly.

- Drop off your yard waste at the town's recycling center for composting.

- Start backyard composting keeping yard waste away from streams, rivers and wetlands. See: https://www.des.nh.gov/organization/divisions/waste/swrtas/documents/compost_flier.pdf for a free "how-to" brochure.

- NEVER dispose of grass, leaves or clippings in or near storm drains or roadside drainage channels, streams, rivers or wetlands. Keeping these drains and channels free flowing will prevent local flooding!

DISPOSE OF YARD WASTE PROPERLY

Yard waste can be disposed of at

_____

RAKE IT, LEAVE IT OR REMOVE IT

What to do with your leaves, grass clippings and yard waste

Our Community Cares

Our community cares about clean water and is doing its part to help prevent water pollution in local waterways. This outreach message helps our community meet US Environmental Protection Agency (EPA) requirements to share pollution prevention information with its residents.

{insert local contact information}

Distributed by the Town of

_____

NEW HAMPSHIRE

Revised from a document produced by the NH Department of Environmental Services 603-271-7889

Why Does it Matter?

You Choose - ***your leaves and grass clippings can be a valuable resource OR a source of water pollution.***

As a resource . . .

Mulched leaves or grass clippings on your lawn add valuable nutrients and organic matter.

Grass clippings provide a source of slow-release nutrients reducing the amount of lawn fertilizer needed by at least half or none. A thin layer of leaves will break down and add much needed organic matter to plant beds. ***Composting leaves and grass clippings save money.***

Compost is natural recycling. Compost can be used as a top dressing on your lawn or garden beds reducing or eliminating the need for fertilizer and mulch.

Drawing Courtesy David M. Carroll

As a source of water pollution . . .

Decaying leaves and grass kill critters in streams, rivers, lakes, ponds, and wetlands.

Leaves and grass clippings decompose in water and wetlands by using the oxygen that other organisms such as dragonfly larvae, crabs, and fish need to live.

Yard waste on stream banks smothers natural vegetation.

Leaves or grass dumped near banks, shorelines and wetlands block sunlight and smother the natural plant life that provide food and cover to animals such as turtles, ducks, chipmunks, and deer.

Yard waste dumped near waterbodies contributes to stream algae and odors.

Seepage from yard waste piled on or near banks and shorelines will slowly make its way into the water. Algae then grow and form foul-smelling, green mats on the water surface.

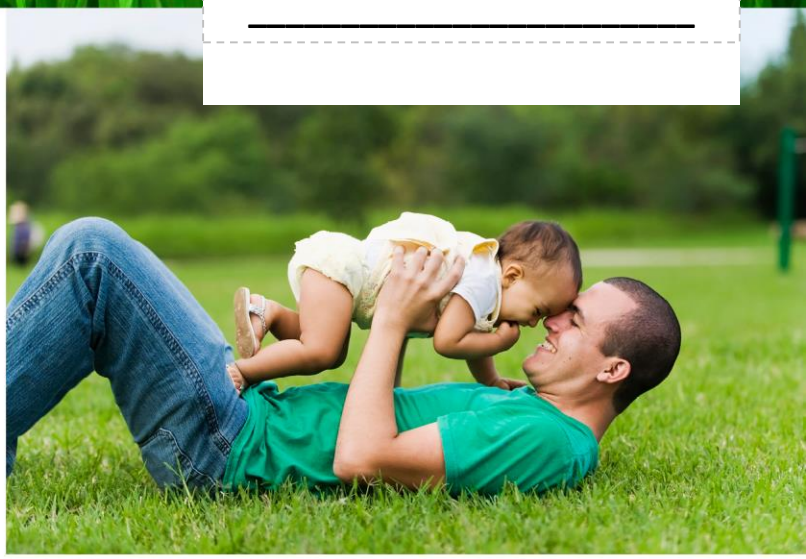
Yard waste dumped in or near wetlands or surface waters is against the law!

In an effort to protect wetlands and surface waters, the NH legislature passed a law that prohibits filling streams and wetlands with waste materials, including yard waste. RSA 482-A:3

Green Grass & Clear Water

{town/city of _____}
Yard waste can be disposed of at
_____

Water-quality friendly lawn care and fertilizer recommendations for northern New England



According to a recent survey, it's likely that you and your neighbors believe having a lawn that is safe for the environment is very important.[1] However, some lawn care practices can create water quality problems. Plants need nutrients to grow, but excess nutrients (including nitrogen and phosphorous found in fertilizers) that run off our properties into local waterbodies can trigger algal blooms that cloud water and rob it of oxygen.

Many of us enjoy the time we spend working on our lawns and are willing to try new practices as long as our lawns continue to look good.[1] Here are some easy practices for creating and maintaining a truly healthy lawn that is both attractive and safer for the environment.

For additional fact sheets and videos, please visit:

www.extension.unh.edu/tags/home-lawn-care

Simple Recommendations for Every Lawn

1. Choose the Right Grass Seed

Consider limiting lawn area to locations where grass will grow easily and will actually be used for outdoor activities.

Choose grass varieties that require less maintenance. For northern New England, choose seed mixes with higher percentages of turf-type tall fescues, compact-type tall fescues and/or fine fescues. Choose mixes with smaller percentages of Kentucky bluegrass and/or perennial ryegrass. Overseed bare spots.

In shaded areas, select shade-tolerant turf grasses like fine-leaf and tall fescues.

Up to 10% of total seed mix can be white clover to help fix nitrogen in soil naturally. Avoid clover if anyone in the household is allergic to bee stings.

2. Don't Overwater

1" of water per week (from rain or irrigation) is usually enough. Overwatering can cause excess nutrients to move out of the root zone and into waterbodies or groundwater.

3. Test Your Soil

To have your soil tested, please visit this site: **extension.unh.edu/programs/soil-testing-services**. Sometimes adjusting the soil pH or organic matter are the only treatments needed to improve a lawn. If your soil test results are acceptable but your lawn is not, check for other problems like pests, grass variety, or sun/shade conditions.

4. Mow Smart

Mow grass no shorter than 3" high. Cut no more than one-third (⅓) of the blade each time you mow to encourage longer, stronger roots. Leave the clippings after mowing so they can return nutrients to the soil. NEVER dispose of clippings in drainage areas, storm drains, or waterbodies!

Recommendations for Lawns That Need Fertilizer

1. Determine How Much to Apply

Measure the dimensions of the area where you plan to apply. The square footage of the area will determine how much fertilizer to purchase and use.

Only use what you need. Nearly half of homeowners mistakenly use the entire bag whether it is needed or not.[1] Seal and store opened fertilizer bags in an airtight container or share excess with others.

Lawns older than 10 years usually need less nitrogen than newer lawns, especially if the clippings are left, so apply only half of the amount directed on the bag. Only apply more if there's no improvement over time in turf color and density. Staying under four applications per season at this reduced rate helps keep the overall application at the recommended level[2] for water-quality friendly practices.

Lawns less than 10 years old may need the full amount of nitrogen as indicated on the fertilizer instructions. Apply less than four times per year.

2. Know When & Where to Apply

Avoid applying fertilizers mid-summer when turf growth naturally subsides or before a big rain when it can run off into nearby waterways or leach into ground water.

In northern New England, apply no earlier than spring green-up and no later than mid-September to ensure the proper soil temperature for grass to take up the nutrients.

Know your local and state laws related to fertilizer application. For example, do not apply any fertilizers within 25 feet of water bodies in New Hampshire.

3. Choose the Right Fertilizer

Avoid combination products that include both pesticide and fertilizer unless confident you need both. Unnecessary applications of fertilizers and pesticides can lead to soil and water contamination.

Select lawn fertilizers with low or no phosphorus unless your soil test indicates otherwise. The fertilizer formula (e.g., 20-0-15) tells the relative percentages of nitrogen (N), phosphorous (P) and potassium (K), in that order.

3. Choose the Right Fertilizer, cont.

Slow release formulations (>50% water insoluble nitrogen, "WIN") are generally preferable. Only use quick release products when there is a need to grow turf very quickly, for example, to prevent erosion of bare soil during a new seeding. Check the product label to see what type of nitrogen it contains.

Organic fertilizers are typically slow release and contain micronutrients that are beneficial to soil. They are not petroleum-based like most synthetic fertilizers. Overapplying any type of fertilizer or over-irrigating fertilized turf can lead to water quality problems.

For more home lawn care information:

www.extension.unh.edu/tags/home-lawn-care

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UNH Cooperative Extension Education Center
329 Mast Road, Suite 115
Goffstown, NH 03045
answers@unh.edu
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Margaret Hagen, Retired Field Specialist in Agricultural Resources, Hillsborough County

[1]Survey references from:
Changing Homeowner's Lawn Care Behavior to Reduce Nutrient Losses in New England's Urbanizing Watersheds: the Report of Findings from Social Science Research. Eisenhauer, B.W. and B. Gagnon. 2008.
USDA CSREES project # 2006-51130-03656

[2]Recommendations adapted from:
New England Regional Nitrogen and Phosphorus Fertilizer and Associated Management Practice Recommendations for Lawns Based on Water Quality Considerations. 2008. Karl Guillard (ed.). Turfgrass Nutrient Management Bulletin B-0100. College of Agriculture and Natural Resources, University of Connecticut.
USDA CSREES project # 2006-51130-03656.

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Designed by: Rebecca Zeiber
NH Sea Grant Science Writer
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