STATE OF NEW HAMPSHIRE

2020/2022 Section 305(b) Surface Water Quality Report

August 19, 2022

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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EXECUTIVE SUMMARY

The New Hampshire Department of Environmental Services' (NHDES) 2020/2022 assessments are supported by more than 1 million grab samples and several million datalogger results. These data records were collected from more than 2,000 stream sites, 2,500 lake sites and 640 marine sites, and include over 180 water-quality and ecological parameters. Most of the data are available from NHDES' data warehouse or by contacting the NHDES Water Quality Assessment Program Coordinator.

NHDES assessed over 21,000 parameter/designated use/waterbody combinations as part of the 2020/2022 assessment cycle (Table 4). Of those, 2,357 were found to be meeting state water quality standards. In contrast, 2,717 were found to be impaired or threatened and require a TMDL, this is the 303(d) List. Apart from mercury, PCBs and dioxins that are associated to fish consumption advisories, the top causes of impairments for surface waters in the 2020/2022 cycle (Table 5) were:

- pH
- bacteria
- dissolved oxygen
- aluminum
- non-native aquatic plants
- cyanobacteria

When the parameters causing impairments were examined in broader context it was determined that approximately 50% of waterbodies were being impaired by stormwater related parameters (Table 6). Similarly, approximately 21% of waterbodies were being impaired by nutrient related parameters (Table 7). Estuarine waters were by far the largest waterbody type affected, with approximately 97% being affected by stormwater. Likewise, because they share some of the same parameters, 53% of estuaries were affected by nutrient related parameters.

In addition to discrete assessments for the 2020/2022 cycle, long-term trends were also examined. Some of the trends and general observations include:

- The percentage of beaches that issued bacteria advisories and the number of days an advisory was in place significantly increased.
- Approximately 10% of lakes and ponds had a significant decrease in chlorophyll-a concentrations. In contrast, about 3% showed a significant increase.
- Biological condition, as measured by macroinvertebrates, was considered "healthy" for greater than 90% of river sites monitored.
- The acres of eelgrass present in the Great Bay Estuary have significantly decreased since 1996.

NHDES continues to face challenges in preventing the degradation of our surface waters, which include many drinking water supplies. As our ability to detect and evaluate contaminants in water has increased, so has the need to address emerging contaminants, most recently, per- and polyfluroalkyl (PFAS). Additionally, increasing water temperatures resulting from climate change are interacting with excess nutrients to generate more algae blooms, including cyanobacteria, and depleting the ecosystem of oxygen.

The seemingly ever-growing issues surrounding PFAS have brought into light the state's need for a comprehensive dataset characterizing the frequency and magnitude of toxicant concentrations, not just in water, but in fish and shellfish tissue. Additionally, with 40% of residents in New Hampshire relying on private wells, the need to address emerging contaminants in drinking water continues to grow. Municipalities have attempted to lessen the impact of these contaminants through wastewater treatment upgrades, which has resulted in significant upgrade costs and local funding challenges. Despite these new challenges, New Hampshire continues to see progress in other areas such as air emissions and chlorides from road salt. Improvements in sulfate and nitrate concentrations in remote ponds are encouraging and provide evidence of the success of national and state air quality policies in protecting our environment. Similarly, the certification of over 1,300 salt applicators through the Green SnowPro certification program, has resulted and a decrease in the amount of chlorides entering the state's surface waters.

A Surface Water Quality Assessment Viewer has been created for the 2020/2022 assessment cycle. This tool was developed for users to:

1) View the spatial extend of assessment units.
2) Identify where sampling data was collected.
3) Access the watershed report cards.
4) Run reports to access the base data and water quality data summaries for the Aquatic Life and Primary Contact (i.e., Swimming) designated uses in the 2020/2022 assessment cycle.
5) See what waterbodies are impaired in the 2020/2022 assessment cycle.
6) View the extent of the United States Environmental Protection Agency (EPA) 2017 MS4 General Permit Areas.

A. INTRODUCTION

The water quality status of New Hampshire's surface waters and groundwater in accordance with Section 305(b) and 303(d) of the Federal Water Pollution Control Act as last reauthorized by the Water Quality Act of 1987 [PL92-500, commonly called the Clean Water Act (CWA)] is reported biennially on even years.

Section 305(b) of the CWA requires submittal of a report (commonly called the "305(b) Report"), that describes the quality of its surface waters and an analysis of the extent to which all such waters provide for the protection and propagation of a balanced population of shellfish, fish and wildlife, and allow recreational activities in and on the water. Section 303(d) requires submittal of a list of waters (i.e., the 303(d) List) that are:

1) Impaired or threatened by a pollutant or pollutant(s).
2) Not expected to meet water quality standards within a reasonable time even after application of best available technology standards for point sources or best management practices for nonpoint sources.
3) Require development and implementation of a comprehensive water quality study (i.e., called a Total Maximum Daily Load or TMDL study) that is designed to meet water quality standards.

The methodology for assessing surface waters in New Hampshire is fully described in the State's Consolidated Assessment and Listing Methodology (CALM). As described in the CALM, water quality data is compared to the State's surface water quality standards to determine which designated uses are supported, which are not, and which uses cannot be assessed due to insufficient information. Designated uses for New Hampshire surface waters include aquatic life integrity, fish consumption, potential drinking water supply, swimming and other recreation in and on the water (i.e., primary and secondary contact recreation) and wildlife. In addition, tidal waters include the shellfish consumption designated use. To facilitate management of water quality data, surface waters in New Hampshire have been divided into over 8,828 individual segments or assessment units (AUs). The ultimate goal is to have all surface waters assessed and supporting their designated uses.

The ability to assess a surface water is dependent on having high quality monitoring data. In 2016, the State prepared a Water Monitoring Strategy, which focused on NHDES' need to utilize a collaborative approach to data collection and utilization. The approach integrated multiple monitoring programs within NHDES while making full use of volunteer collected data. The strategy makes efficient use of limited monitoring resources for sampling New Hampshire's surface waters, sets forth a plan for data usage and outlines a timetable for reporting. The strategy is organized around a basic conceptual model designed to achieve specific water quality-based objectives. At the center of the model are three design components:

1) **Probability-based water quality surveys**: a statistical approach to understand overall conditions state-wide.
2) **Trend-based monitoring**: a long-term commitment to track the trajectory of important water quality indicators over time.
3) **Synoptic (or site specific) monitoring**: Short-term collection of water quality data in a coordinated fashion from targeted, site-specific locations for the purpose of maintaining a current statewide dataset.

B. BACKGROUND INFORMATION

1. TOTAL WATERS

While New Hampshire is not a large state in terms of land area or population, it is fortunate to have numerous lakes, ponds, rivers, streams and estuaries. Though its coastline is limited, its tidal embayments are extensive. Table 1 provides a general overview of surface statistics for New Hampshire.

Table 1: General Overview of New Hampshire's Surface Waters

Waterbody Type	Amount		Number of Assessment Units
Rivers & Streams	16,982.5	Miles	5,929
	14	Beaches	14
Lakes	162,314.2	Acres	1,237
	326	Beaches	326
Impoundments	22,333.3	Acres	1,200
	24	Beaches	24
Estuaries	18.0	Square Miles	69
	2	Beaches	2
Ocean	81.0	Square Miles	12
	15	Beaches	15
		Total =	**8,828**

2. WATER POLLUTION CONTROL PROGRAMS

New Hampshire has numerous water pollution control programs in place to help protect, restore and sustain the quality of its water resources. The following sections include a brief description of many of these programs.

I. WATER QUALITY STANDARDS PROGRAM

Surface water quality standards establish the baseline quality that all surface waters of the state must meet in order to support their intended uses. They are the "yardstick" for identifying where surface water quality is good or poor and for determining the effectiveness of regulatory pollution control and prevention programs. The Water Quality Standards Program ensures that the State's surface water quality standards are up-to-date and protective of designated uses.

Water quality standards in New Hampshire are included in the state's surface water quality regulations (Env-Wq 1700) and in New Hampshire state statute RSA 485-A:1-22. The standards are composed of three parts; designated uses, criteria and antidegradation which are described in more detail below. Legislative classifications are described in chapter law and are attainment goals for all waters. Surface waters of the State are either classified as Class A or B (Table 2), with most waters being Class B.

Table 2: Classifications for New Hampshire Surface Waters

Classification	Designated Uses as described in RSA 485-A:8
Class A	These are generally of the highest quality and are considered potentially usable for water supply after adequate treatment. Discharge of sewage or wastes is prohibited to waters of this classification
Class B	Of the second highest quality, these waters are considered acceptable for fishing, swimming and other recreational purposes, and, after adequate treatment, for use as water supplies

a) Designated Uses

Designated uses are the desirable uses that surface waters should support such as swimming (i.e., primary contact recreation) and fishing (i.e., aquatic life). Env-Wq 1702.17 of the state's surface water quality regulations (Env-Wq 1700) includes the designated uses for New Hampshire surface waters. As shown in Table 3
Table 3, there are six designated uses in Env-Wq 1707.17. Each of these designated uses, except for wildlife, was assessed for this reporting cycle. An assessment methodology for wildlife has not yet been developed but will be included in future assessments. Because they have different assessment indicators, the designated use of "Swimming and Other Recreation In and On the Water," was individually assessed for "Primary Contact Recreation (i.e., swimming)" and for "Secondary Contact Recreation (i.e. boating)."

Table 3: Designated Uses for New Hampshire Surface Waters

Designated Use	New Hampshire Code of Administrative Rules (Env-Wq 1702.17) Description			Applicable Surface Waters
Aquatic Life Integrity	The surface water can support aquatic life, including a balanced, integrated, and adaptive community of organisms having a species composition, diversity, and functional organization comparable to that of similar natural habitats of the region.			All surface waters
Fish Consumption	The surface water can support a population of fish free from toxicants and pathogens that could pose a human health risk to consumers.			All surface waters
Shellfish Consumption	The tidal surface water can support a population of shellfish free from toxicants and pathogens that could pose a human health risk to consumers.			All tidal surface waters
Potential Drinking Water Supply	The surface water could be suitable for human intake and meet state and federal drinking water requirements after adequate treatment.			All surface waters
Swimming and Other Recreation In and On The Water	The surface water is suitable for swimming, wading, boating of all types, fishing, surfing, and similar activities.	**NHDES Clarification**		All surface waters
		Primary Contact Recreation (i.e., swimming)	Waters suitable for recreational uses that require or are likely to result in full body contact and/or incidental ingestion of water	
		Secondary Contact Recreation (i.e., boating)	Waters that support recreational uses that involve minor contact with the water.	
Wildlife	The surface water can provide habitat capable of supporting any life stage or activity of undomesticated fauna on a regular or periodic basis.			All surface waters

b) Water Quality Criteria

The second major component of the water quality standards is the "criteria." Criteria are designed to protect the designated uses of all surface waters and may be expressed in either numeric or narrative form. A waterbody that meets the criteria is considered to meet its intended use. Water quality criteria may be found in RSA 485-A:1-22 and in the state's surface water quality regulations (Env-Wq 1700).

c) Antidegradation

The third component of water quality standards is antidegradation, which is a provision designed to preserve and protect the existing beneficial uses and to minimize degradation of the State's surface waters. Antidegradation regulations are included in Part Env-Wq 1708 of the State's surface water quality regulations (Env-Wq 1700). According to Env-Wq 1708.03, antidegradation applies to the following:

- Any proposed new or increased activity, including point and nonpoint source discharges of pollutants that would lower water quality or affect the existing or designated uses.
- A proposed increase in loadings to a waterbody when the proposal is associated with existing activities.
- An increase in flow alteration over an existing alteration.
- All hydrologic modifications, such as dam construction and water withdrawals.

In accordance with the CWA, water quality standards are reviewed and revised, as necessary, at least every three years. Statutory authority to create (or revise) the water quality standards is provided under RSA 485-A:6 and RSA 485-A:8. Any new rules or changes to rules must be adopted in accordance with RSA 541-A, which first requires a public hearing. After state adoption, the water quality standards are submitted to EPA for federal approval and full use in CWA provisions.

In 2000, NHDES formed a Water Quality Standards Advisory Committee (WQSAC). The Committee no longer has specific membership as it once did, rather it serves a venue for anyone with an interest in surface water quality standards to make their voice heard. Many different interests and organizations actively participate on the committee. NHDES meets with the WQSAC quarterly to share briefings on hot topics, developments in NHDES programs and to solicit input on potential rule revisions. Finally, NHDES uses the committee to further vet draft rule revisions before conducting public hearings on proposed changes as part of the formal administrative rule making process. Over the past few years, NHDES has worked with the WQSAC to revise sections of the Surface Water Quality Regulations, Env-Wq 1700.

II. POINT SOURCE CONTROL PROGRAM

The Clean Water Act of 1972 provided much of the impetus for the water pollution abatement effort of the last four decades. With associated federal, state and local funding, involving the earlier Construction Grants Program, the current State Revolving Loan Program, as well as the State Aid Grant Program, significant progress in abating pollution from point sources was made and improvements in New Hampshire surface water quality was noted. The construction of industrial and municipal Wastewater Treatment Facilities (WWTFs) initially focused on technology-based controls and on conventional pollutants. With the completion of the upgrade of the primary plants to secondary treatment and with the elimination of dry weather raw municipal discharges, New Hampshire has shifted emphasis to water quality-based controls and

to the control of toxic pollutants. The following is an overview of the major components comprising New Hampshire's point source control program.

a) Discharge Permits

The discharge permit process is the primary vehicle used to control and prevent point source discharges from violating water quality standards. Any facility that discharges directly to a surface water is required to obtain a federal permit, called a National Pollutant Discharge Elimination System (NPDES) permit administered by EPA. The State of New Hampshire is one of three states not delegated by EPA to administer this program. However, NHDES must certify that the limitations and conditions contained in the NPDES permit will ensure that the proposed discharge will not violate any state law or regulation.

NPDES permits include individual and general permits. Individual NPDES permits are issued to reflect site-specific conditions of a single discharger and is unique to that discharger. Permits specific to a municipality are available on EPA's website. General NPDES permits are issued to cover multiple dischargers with similar operations and types of discharges. Facilities covered under individual NPDES permits must submit individual applications available through EPA. Facilities covered under general permits must file Notice of Intent (NOI) forms in lieu of individual applications. NPDES general permits applicable in New Hampshire are available on EPA's NPDES Permits website.

b) Combined Sewer Overflows

The NPDES and state discharge permit system also regulate Combined Sewer Overflows (CSOs). A combined sewer system collects and conveys municipal sewage, industrial wastewater and stormwater runoff in a single pipe. Combined sewer systems are designed to transport all wastewater to a treatment plant during dry weather and overflow when stormwater and/or snowmelt combined with wastewater exceeds the capacity of the conveyance system or treatment plant. Combined sewer systems are designed to overflow occasionally and discharge from an outfall to a waterbody. The event is referred to as a Combined Sewer Overflow (CSO). The overflow may contain untreated human and industrial waste and debris. The event may be a source of contamination for public beaches, shellfish harvest areas, drinking water intakes, and waterbodies in general.

The NPDES permitting program authorizes and regulates discharges to surface waters from outfall pipes in compliance with the CWA. CWA requirements for CSOs are outlined in EPA's National CSO Control Policy (CSO Policy) as published in the Federal Register on April 19, 1994 (59 Fed. Reg. 18688). Objectives of the CSO Policy are compliance with technology-based requirements of the CWA and state water quality standards, as soon as practicable, in order to minimize water quality impacts to aquatic biota and human health from wet weather CSO discharges.

Additional CSO control requirements include the development and implementation of a Long-Term CSO Control Plan (LTCP) to achieve full compliance with the CWA. The LTCP provides a framework for effective CSO control planning through the characterization, monitoring, modeling and the evaluation of abatement alternatives for developing a plan

that meets water quality standards and protects the receiving water uses. Final implementation typically includes a phased approach and post construction monitoring.

New Hampshire CSO communities include Berlin, Exeter, Lebanon, Manchester, Nashua and Portsmouth. Permittees continue to make progress in reducing and/or eliminating CSO discharges under the requirements of their NPDES permits and formal enforcement actions.

c) Industrial Pretreatment

Another important component is the industrial pretreatment program, the purpose of which is to control the pollutants that industries discharge to municipal WWTFs so that the pollutants do not pass through or interfere with the treatment processes at the WWTF or contaminate the sewage sludge.

Pretreatment of industrial wastewater can be as simple as allowing solids to settle in order to remove materials heavier than water that could clog sewer pipes, or adjusting the pH of the waste to prevent an acidic or caustic discharge that could corrode pipes and pumps. Pretreatment can also involve complex chemical processes to remove chemical compounds and heavy metals such as reverse osmosis and micro-filtration processes and biological processes to reduce excessive loadings that could overload the WWTF.

All WWTFs in New Hampshire are required to implement the Pretreatment of Industrial Wastewater Rules. Additionally, federal regulations set the minimum pretreatment standards for certain high-risk publicly owned treatment works and those with a design flow greater than 5 million gallons per day. These federal regulations also require that these WWTFs establish an Industrial Pretreatment Program. There are 13 WWTFs in New Hampshire that directly implement the Federal Industrial Pretreatment Program: Claremont, Concord, Derry, Dover, Franklin, Jaffrey, Keene, Manchester, Merrimack, Milford, Nashua, Rochester and Somersworth.

d) Permit Compliance

After EPA issues a federal NPDES permit, NHDES may adopt it as a state permit. For NPDES permits adopted as State Surface Water Discharge Permits, NHDES conducts routine inspections of permitted sites to ensure compliance with the NPDES permit. NHDES also tracks permit-required reports (Monthly Operating Report (MOR) and Discharge Monitoring Report (DMR)) in addition to tracking permit noncompliance. When required, NHDES will investigates illicit discharges and discharges to surface waters.

Permit compliance is a self-monitoring program supported by inspections and required permittee reporting. The NPDES inspection program identifies and documents noncompliance, supports the enforcement process, monitors compliance with enforcement orders and decrees, establishes presence in the regulated community, deters noncompliance, and supports the permitting process.

Routine NPDES compliance inspections are performed in a manner designed to:

- Determine compliance with NPDES permit.

- Verify the accuracy of information submitted by permittees.
- Evaluate in-house laboratory procedures conducted for NPDES reportable parameters.
- Verify the adequacy of sampling and monitoring conducted by the permittee.

e) Sludge and Septage

While both wastewater products, sludge and septage are different materials: sludge is the semi-solid material produced by water and wastewater treatment processes, whereas septage is the liquid and solid material removed from septic tanks, cesspools, holding tanks, or other sewage treatment/storage units. Both residuals can include pollutants and pathogens, that can potentially harm people, animals and the environment if not handled properly. NHDES regulates the removal, transportation, and disposal of sludge and septage to ensure it is utilized or disposed of properly.

f) Biosolids

Biosolids are derived from sludge that has been treated to reduce pathogens and meet federal and state pollutant regulatory limits and standards. Some biosolids are utilized as fertilizer or soil conditioner to improve a soils physical and chemical properties and enhance crop growth. Biosolids come in different forms from compost to dried pellets. Farmers, landscapers and soil manufacturers use biosolids as an affordable alternative to chemical fertilizers sourced from petroleum. Biosolids are considered safe when they meet the federal and state requirements for pathogen reduction and pollutant limits. A generator of biosolids must apply for a Sludge Quality Certificate (SQC), before they can distribute biosolids in the state of New Hampshire. The applicant must supply information including all industrial inputs into the treatment facility, annual volume generation, a description of the treatment process with proof of federal compliance, and test reports of 177 required compounds. Under RSA 485-A XVI-c (a), NHDES has established an annual testing program of SQC holders.

III. MERCURY REDUCTION PROGRAM

Mercury is a persistent, bioaccumulative, toxic pollutant that when released to the environment is harmful to humans and wildlife. Mercury is a naturally occurring element found in rocks, soils, sediments and the atmosphere. It is a relatively stable metal that does not readily react chemically. Mercury will vaporize at relatively low temperatures and can enter the atmosphere through the combustion of mercury containing materials (e.g., coal) and through natural processes such as the eruption of volcanoes. Mercury can also enter the environment through improper disposal of mercury-containing devices.

Significant progress has been made by the Mercury Reduction Program to reduce non-natural sources of mercury in the environment in an effort to reduce risks to human health and wildlife. A multi-disciplinary approach was implemented to reduce the release of mercury from New Hampshire sources. Legislation was passed to restrict or ban the sale of certain mercury-containing products and to place tighter restrictions on solid waste incinerators.

RSA 149-M:51 through 149-M:57 regulates the sale, distribution and use of mercury-added products in New Hampshire. This law prohibits the sale of certain mercury-added products and product categories and requires manufacturers to notify the state about the mercury-added products they produce and distribute. New Hampshire is a member of the Interstate Mercury Education & Reduction Clearinghouse, which serves as a single point of contact for manufacturers that produce or sell products with intentionally added mercury.

The major pathway of mercury to aquatic organisms is when mercury is emitted to the atmosphere and deposited into lakes and ponds. The deposited mercury can accumulate over time in organic matter of lake sediments, where bacteria convert the mercury into a form that enters the food chain. Once incorporated into the food chain it accumulates in the tissues of fish. The state of New Hampshire has a statewide fish consumption advisory that specifies the recommended amounts that are safe to eat as well as certain species and waterbodies that are known to have higher mercury levels.

NHDES continues to monitor mercury levels in fish tissues. In 2018, NHDES published a report analyzing the mercury content in 26 freshwater fish species from over 200 New Hampshire waterbodies from 1992-2016. The report evaluates human health risks, trends over time, and geographic patterns of mercury in fish tissue. The report concluded that mean concentration of total mercury in fish tissue for all species and commonly consumed species were well below the benchmark concentration of 0.7 mg/kg used to establish the State's consumption guidelines, which adds an extra level of safety, making New Hampshire's guidelines more protective of human health. The current mercury fish consumption advisory in New Hampshire is 4 meals per month for adults and children over age 7 (non-sensitive individuals) and 1 meal per month for women of childbearing age and children under age 7 (sensitive individuals).

IV. WATERSHED ASSISTANCE PROGRAM

The NHDES Watershed Assistance Section works with local organizations, statewide nonprofits, municipalities, regional planning commissions, other programs within NHDES, EPA New England, and other state agencies to improve water quality in New Hampshire at the watershed level by implementing the New Hampshire Nonpoint Source Management Program Plan. At the heart of this plan is the protection and/or restoration of surface waters in New Hampshire enabled by far-reaching collaboration with a diverse portfolio of watershed management stakeholders throughout the state.

Funds for Watershed Assistance Grants are appropriated through the NHDES Watershed Assistance Section from the U.S. Environmental Protection Agency under Section 319 of the Clean Water Act. Grant funds are available on a yearly basis, which begins with NHDES soliciting project ideas to address nonpoint source (NPS) pollution through the implementation of watershed-based plans in priority watersheds. Projects must comprehensively address NPS problems and must have a quantitative way to assess progress and determine success. The watershed-based plan must have a clear water quality goal and include the nine minimum (a) through (i) elements required by the United States Environmental Protection Agency (EPA).

Funded projects must make reasonable progress toward achieving the water quality goal established in the watershed-based plan.

Required for funding for Clean Water Act Section 319 funds, watershed-based plans work toward water quality goals to either restore impaired waters, or to meet long-term goals for high quality waters. As a result of past funding, the Watershed Assistance Program has successfully removed a number of impairments from waterbodies on the 303(d) list, which are documented in Success Stories submitted to EPA.

V. 401 WATER QUALITY CERTIFICATION PROGRAM

The purpose of the Water Quality Certification (WQC) program is to protect surface water quality and uses (such as swimming and aquatic life) by ensuring compliance with New Hampshire surface water quality standards. The WQC program is authorized by New Hampshire RSA 485-A:12, III and IV. Water Quality Certification for federal NPDES permits are administered by the NHDES Wastewater Engineering Bureau. All other WQCs are administered by the NHDES Watershed Management Bureau. Water Quality Certifications typically include enforceable conditions, including monitoring requirements, to ensure compliance with surface water quality standards.

Water quality certification is required for any activity that requires certification under §401 of the federal CWA as well as for any surface water withdrawal or diversion that requires registration under RSA 488-A:3 and was not in active operation as of September 5, 2008. §401 of the CWA requires that, for any federally-licensed or permitted project that may result in a discharge into waters of the United States (33 USC 1341), a water quality certification be issued to ensure that the discharge complies with applicable water quality requirements or that certification be waived. EPA's regulations at 40 CFR 121 address §401 certification generally. EPA also has water quality certification regulations for federally-issued CWA Section 402 permits that are subject to the Section 401 certification requirements (40 CFR 124.53-124.55). Other federal agencies may also have §401 certification regulations for their licensing and permitting programs. Activities that are covered under general federal permits such as the U.S. Army Corps of Engineers §404 general permits for New Hampshire do not need to submit an application for water quality certification unless notified by the NHDES.

VI. TOTAL MAXIMUM DAILY LOAD STUDIES

The purpose of the Total Maximum Daily Load (TMDL) program is to satisfy Section 303(d) of the Clean Water Act, which requires TMDLs to be conducted on all surface waters included on the Section 303(d) list of impaired waters. Total maximum daily load refers to the calculation of the maximum amount of a pollutant that a waterbody can receive and attain or maintain water quality standards for its designated use.

The TMDL calculation allows for a carefully identified allowable pollutant load equivalent to the sum of the Waste Load Allocations (WLA) for point sources, Load Allocations (LA) for nonpoint sources and naturally occurring background sources, and an allocation of that load among the

pollutant's sources. The TMDL is required to account for seasonal variations and must also include a Margin of Safety (MOS) that accounts for uncertainty and any lack of knowledge concerning the relationship between effluent limitations and water quality. In equation form, the TMDL may be expressed as:

TMDL = WLA + LA + MOS

Once calculated, the TMDL is then allocated between all sources of the pollutant causing the impairment. TMDLs may be expressed in terms of either mass per time, toxicity, concentration, narrative description, or other appropriate measure that relate to a state's water quality standard. All TMDLs are subject to public review and comment and must be submitted to EPA for review and approval. The general process for developing TMDLs includes identifying the problem pollutant, establishing the water quality goals or target values needed to achieve water quality standards, identifying the specific sources contributing the pollutant of concern, and then assigning a specific load allocation to each of the sources. Follow-up monitoring is usually needed to ensure that the implemented TMDL results in the attainment of the targeted water quality standard. NHDES' Long-Term TMDL Vision focus is on the development of TMDLs for bacteria in all waters, and nutrients in lakes and ponds.

VII. INVASIVE SPECIES PROGRAM

The primary purpose of the Invasive Species program is the prevention and rapid response to exotic aquatic species that threaten New Hampshire's freshwater systems. NHDES recognizes the threats invasive species pose to our aquatic resources. In an effort to reduce the introduction of invasive species and manage their spread in the state's surface waters, the Invasive Species Program has five focal areas: 1) Prevention of new infestations; 2) Monitoring for early detection of new infestations to facilitate rapid control activities; 3) Control of new and established infestations; 4) Research towards new control methods with the goal of reducing or eliminating infested areas; and 5) Regional cooperation.

New Hampshire has been actively involved in protecting our freshwater resources from aquatic invasive species since they were first identified in the state in the 1960s. Today, nearly 100 waterbodies across the state are impacted by growths of aquatic exotic/invasive species. Grants are available to local lake associations and municipalities for control and/or prevention of state-listed exotic aquatic plants, and to institutions of higher learning for furthering research associated with exotic aquatic plant management, control, biology, ecology or prevention.

NHDES tracks growths of state-listed aquatic invasive species in freshwaters of the state and maintains an overall list of infested waterbodies. Many of these waterbodies are under active management, and waterbody-specific maps and long-term management plans are available in NHDES' Lake Information Mapper.

VIII. DAM REMOVAL AND RIVER RESTORATION PROGRAM

There are more than 2,600 active dams that are regulated by the Dam Bureau in the State of New Hampshire and likely hundreds more that do not meet the definition of a dam. Many of these dams were built during the Industrial Revolution in the 19th and early 20th centuries, and they played central roles in New Hampshire's economic and societal growth during that period. But as technological and societal needs have changed, so too has the need for many dams.

Dam removal is an option that can be considered for dams that are obsolete or are in disrepair. It can result in significant environmental, economic and social benefits. Selective dam removal can eliminate a public safety hazard, relieve a dam owner's financial and legal burdens and restore a river to a healthier, free-flowing condition. The Dam Removal and River Restoration Program assists dam owners and communities through the dam removal process. Since the inception of the program in 2001, 39 dam removal projects have been completed. A list of projects planned, completed or under consideration can be found online.

In January 2000, the New Hampshire River Restoration Task Force was formed with the common goal of exploring opportunities to selectively remove dams for a variety of reasons, including for the purpose of restoring rivers and eliminating public safety hazards. The task force is an initiative with a diverse representation, including multiple state and federal agencies, conservation organizations, local interests and others.

Through its work, the task force is enabling an efficient and effective process of removing dams in New Hampshire. Due to the collaborative efforts of the task force, the first New Hampshire dam removal for the purpose of river restoration was completed in the summer of 2001, the McGoldrick Dam on the Ashuelot River in Hinsdale. The removal of this dam was a critical piece of a larger plan to restore anadromous fish to the Ashuelot River, a historically significant Connecticut River tributary for American shad, blueback herring and Atlantic salmon. Two additional dams on the river have since been removed, the Winchester Dam in Winchester, removed in 2002 and the Homestead Woolen Mill Dam in West Swanzey, removed in 2010. Since 2002, numerous obsolete dams have been removed in New Hampshire with input from the task force. Most recently, the Lower Peverly Pond dam on Peverly Brook and the South Branch Gale River Dam on the South Branch Gale River were removed in the 2021 and 2020, respectively. The task force continues to evaluate potential removal projects while existing projects move through the planning and permitting process.

IX. LAKES & RIVERS MANAGEMENT AND PROTECTION PROGRAMS

The Rivers Management and Protection Program (RMPP) strives to protect the outstanding natural and cultural resources associated with the designated rivers of New Hampshire. The RMPP is based on a unique cooperative approach: local nomination for State designation of significant rivers to manage and protect the river's values and characteristics combined with local development of river corridor management plans for shorelines and adjacent lands to protect river resources.

A designated river is managed and protected for its outstanding natural and cultural resources in accordance with RSA 483, the Rivers Management and Protection Act. At the request of the local communities through which they run, 19 of New Hampshire's rivers have been recognized by the state legislature and the governor for their important natural resources, historical significance and their contribution to our quality of life. Each designated river has a local river management advisory committee to facilitate communication among the municipalities along the river in the management of their shared resource, and also provide local input into state management of their river.

The Rivers Management Advisory Committee (RMAC) principal duty is to advise NHDES in implementing the RMPP. The RMAC has 17 members representing conservation commissions, the scientific community, tourism, business and industry, fishing, public water suppliers, hydropower associations, and state agencies. Among its advisory duties, the RMAC is responsible for reviewing nominations to designate additional rivers into the RMPP and for preparing a recommendation to the NHDES Commissioner on the merits of the nomination. Another important responsibility of the RMAC is to advise the NHDES on the adoption of rules for the protection of instream flow. The RMAC is also responsible for reviewing and making recommendations on plans to dispose of state-owned property along or providing access to a river.

The Lakes Management and Protection Program (LMPP) strives to protect the health and water quality of lakes and ponds while balancing its multiple uses. Lake management works to balance the multiple uses of lakes and ponds, while also protecting their health. The LMPP was created as a result of the recognition of competing uses of the state surface waters. The program, defined in RSA 483-A, promotes communication and coordinated action among the many stakeholders who use New Hampshire's lakes. Program staff provide technical assistance to the public on lake management issues.

The Lakes Management Advisory Committee (LMAC) advises NHDES on state-wide issues affecting lakes and ponds. The LMAC has 19 members representing state agencies, municipalities, the conservation community, marine trades, tourism, real estate, business and industry interests, and academia. The LMAC provides a forum for exchanging technical assistance and ideas among state and federal agencies, municipalities, private businesses, conservation interests, and the public regarding lake management issues. The LMAC provides input on state legislation related to lakes and ponds, making recommendations both to the NHDES Commissioner and to state legislators in support of healthy lakes and public access.

X. INSTREAM FLOW PROGRAM

The Instream Flow Program ensures that rivers continue to flow in spite of the uses and stresses that people put on them. Under natural conditions, rivers flow freely with source waters coming from precipitation via lakes, ponds, wetlands, small streams and groundwater. Under human influences, however, river dynamics can change drastically. People frequently withdraw large amounts of water for drinking and irrigation directly from rivers, as well as from the sources that supply the rivers, particularly lakes and groundwater. Land use changes can

result in faster runoff and changes to the stream structure. Many rivers have dams that restrict the amount and timing of water flowing downstream. In addition, the loss of wetlands to land development reduces the amount of water that would normally augment rivers during dry periods. These changes in stream flow can impair river habitat. The Instream Flow Program operates within the New Hampshire Rivers Management and Protection Program statute, Section 9-c (RSA 483:9-c) and in accordance with Administrative Rule Env-Wq 1900.

The program determines the seasonal flows necessary to support both natural aquatic habitats and human uses and then works with water users and dam owners to ensure that their water needs are met while maintaining the protected flows during periods of unusually low flow, even during droughts. The program annually performs a wide range of field activities to collect the environmental data necessary to develop protected instream flow values and evaluate the success of instream flow management; the program's 2022 Work Plan summarizes those field activities.

Currently, two rivers, the Lamprey and Souhegan Rivers, are actively managed under the Instream Flow Program. In addition, protected instream flows have been established for the Cold River and are being developed for the Ashuelot and Warner Rivers.

XI. PROTECTED SHORELAND PROGRAM

The Protected Shoreland Program strives to manage vegetation and development in proximity to public waters. The shorelands of New Hampshire are among the state's most valuable and fragile natural resources. The removal of vegetation in our shorelands can deteriorate water quality and affect the beauty of our landscapes. Fill, excavation, and construction can have similar impacts. In New Hampshire, shorelands next to public waters are protected through regulations. In turn, protected shorelands ensure greater protection of property, water quality, human health, flora and fauna, and recreational opportunities.

The Shoreland Water Quality Protection Act (RSA 483-B) and its associated rules, Env-Wq 1400, establish a "protected shoreland." The protected shoreland is an area close to public waters within which vegetation removal, excavation, fill, and development is regulated. Within the protected shoreland, excavation, fill and construction typically require a shoreland permit. However, if development occurs within the bank of a waterbody, a wetland permit may be required instead of a shoreland permit.

Changes to the rules regulating accessory structures, such as beaches, patios, sheds, etc., within the protected shoreland were adopted on December 15, 2019. These rules regulate the construction, modification, and expansion of accessory structure structures close to public waters.

XII. ALTERATION OF TERRAIN PROGRAM

Stormwater runoff from a forest, meadow or other natural environment is filtered by natural processes as it flows along the ground and over native vegetation and filtered further when it

passes through the soil before reaching groundwater. Stormwater pollution from developed land (and from construction activities) is one of the leading causes of water pollution, accounting for approximately 50% of impairments in New Hampshire (Table 6). Stormwater can become polluted when it runs off streets, lawns, farms in addition to construction and industrial sites if there are fertilizers, sediments, heavy metals, or bacterial sources in its path.

When stormwater is left untreated, it enters our surface and coastal waters and can introduce pollutants that can impact drinking water supplies, stream health, and aquatic and land-based wildlife. In addition to introducing pollutants into surface and groundwater, development can increase the amount and rate of stormwater runoff which, if unchecked, can contribute to flooding in other areas.

The Alteration of Terrain (AoT) permitting program requires the control and treatment of stormwater from large developments. The program applies to earth moving operations, such as gravel pits, as well as industrial, commercial and residential developments. Treatment usually occurs through biological or physical means, and can take the form of rain gardens, infiltration ponds, gravel wetlands or other best management practices.

Controls implemented to satisfy the requirement of no increase in runoff from the developed property include detention ponds and underground storage facilities. The same structures that provide treatment can also be used to store and control the rate of stormwater runoff.

To help protect surface water and groundwater, the AoT regulations require a permit whenever a project proposes to disturb more than 100,000 square feet of contiguous terrain (50,000 square feet, if any portion of the project is within the protected shoreland). In addition to these larger disturbances, disturbances of greater than 2,500 square feet over terrain having grades of greater than 25%, may also require an AoT permit. In addition, an AoT General Permit by Rule applies to smaller sites and does not require an application or notification to the department.

XIII. WETLANDS PROGRAM

The goal of the Wetlands Program is to preserve and protect New Hampshire's tidal and freshwater wetlands from unregulated alteration. New Hampshire's diverse natural resources support many of the activities that drive New Hampshire's economy. Residents, businesses and visitors enjoy New Hampshire's wetlands, streams, lakes and the seacoast for their natural beauty and recreational opportunities.

In addition to their economic value, New Hampshire's wetland resources are of great importance for flood control, water quality, water storage and recharge for both groundwater and surface waters. These functions are more valuable given the expected increase in frequency and severity of storm events associated with climate change. Wetlands also support the food chain, providing food and habitat for a variety of aquatic and upland plants and wildlife.

Although New Hampshire has lost fewer wetlands to filling and dredging than many neighboring coastal states, landscape change poses a significant challenge to the protection of New Hampshire's wetlands and natural resources. It is found to be for the public good and welfare of the State of New Hampshire to protect and preserve both tidal and fresh waters and its wetlands (including lakes, ponds, rivers, streams, marshes, forested wetlands and peatlands) from unregulated despoliation because of the important functions and values that these aquatic resources provide, such as:

- Absorbing flood waters.
- Treating stormwater.
- Recharging groundwater supplies.
- Providing habitat for fish and wildlife.
- Providing economic and recreational value.

Activities located in wetlands and surface waters, such as excavation, removal, filling, dredging and/or construction of structures in or on any bank, flat, marsh, forested wetland or adjacent to waterbodies, generally requires review and approval from the Wetlands Bureau in accordance with the Fill and Dredge in Wetlands Act (RSA 482-A), unless otherwise specified by rule or law.

The New Hampshire Wetland Program Plan (2017-2023) provides a framework and direction over a six-year period for the NHDES and its partners to strengthen and improve the program and in doing so better protect wetlands and aquatic resources statewide. The development of the Wetland Program Plan was guided by four general goals: 1) Sustain economic vitality; 2) Resilient to climate change; 3) Protect public safety and public health; and, 4) Protect and preserve wetlands, natural resources and water quality.

XIV. COASTAL PROGRAM

New Hampshire's coastal ecosystems are threatened by habitat loss, stormwater pollution and the effects of a changing climate. Coastal areas are especially vulnerable to storm surge, flooding and sea level rise, which puts coastal infrastructure, property and habitats at risk. The New Hampshire Coastal Program (NHCP) protects clean water, protects public health for shellfish consumers, restores coastal habitats, and helps make communities more resilient to flooding and other natural hazards through staff assistance and funding to 42 coastal towns and cities as well as other local and regional groups. The NHCP is one of 34 federally approved coastal programs authorized under the Coastal Zone Management Act and is administered by NHDES.

XV. CLEAN VESSEL ACT PROGRAM

The goal of the Clean Vessel Act Program is to promote responsible boat wastewater management through education, grants and the use of mobile and fixed pumpout facilities. The Federal Clean Vessel Act (CVA) of 1992 was established to support adequate facilities for recreational boaters to dispose of waste from marine sanitation devices. The act authorized a competitive grant program for states to provide funds for the construction, renovation,

operation, and maintenance of pump-out and dump stations. Eligible activities also include the operation and maintenance of a mobile pump-out boat service and educational outreach to marina owners, boat dealers, and their consumers. These federal funds can be used to account for up to 75% of all approved projects with the remaining 25% supplemented by the applicant who can include state and local government, private businesses, and associations.

Federal law prohibits the discharge of treated or untreated boat sewage in water that is designated as a No Discharge Area (NDA). All waters within three miles of the New Hampshire shoreline and the Isles of Shoals are part of the coastal NDA. Tidal and estuarine waters, including all bays and rivers to the tidal dams, are also incorporated. New Hampshire also enforces a "No Discharge" law for inland waters. Freshwater vessels cannot have devices that will allow for overboard discharge of treated or untreated sewage, or graywater. Boat pumpout facilities in New Hampshire can be located by using NHDES' Boat Pumpout Mapper.

XVI. GROUNDWATER PROTECTION PROGRAMS

The goals of the Groundwater Protection Program are to monitor groundwater levels, regulating water wells and water use, and preventing contamination. Groundwater is the water below the surface of the land that is replenished by rain and melting snow seeping into the ground. Groundwater fills the innumerable small spaces that make up the materials, such as sand and gravel, that lie on top of bedrock; or it occupies openings formed by fractures in the mostly solid bedrock.

In order to be able to pump significant quantities of groundwater out of either the land above the bedrock or the bedrock itself, the pores and fractures must be well connected so that groundwater can easily flow into and through them. An "aquifer" is said to exist wherever pumping of groundwater can be sustained over time without drastically depleting the supply.

Groundwater levels in a statewide network of wells are monitored year-round by the New Hampshire Geological Survey (NHGS) with the assistance of cooperating partners and trained citizen volunteers. This information is critical to decision-making by the state's interagency Drought Management Team, among others. Both hand-level and hourly logger data are accessible to the public through the National Ground-Water Monitoring Network online data portal.

Sixty percent of New Hampshire's residents are dependent on groundwater for their drinking water supplies. New Hampshire's Groundwater Protection Act, passed in 1991, authorizes NHDES to regulate large groundwater withdrawals and commercial discharges of wastewater; establishes best management practices that must be employed by activities that are considered potential contamination sources; creates four classes of groundwater; establishes groundwater quality standards; and enables local entities, such as water suppliers and town boards, to play a role in actively managing activities having the potential to contaminate valuable groundwater.

New Hampshire's groundwater is recognized as a valuable resource by the Legislature and held in public trust. There are a number of ways groundwater quality is protected in the state,

including requiring permits for discharges of waste and wastewater into groundwater and issuing remediation permits when contamination is found; requiring setbacks from wells and aquifers of high value; and providing technical and financial assistance to help protect areas of groundwater critical for water supplies. All discharges of non-domestic wastewater to the ground must be registered with, and in some cases permitted by, the NHDES Groundwater Discharge Permitting and Registration Program.

3. SPECIAL STATE CONCERNS AND RECOMMENDATIONS

Although tremendous progress has been made in the past 50 years since the CWA to clean up surface waters in the New Hampshire, there is much more to be done. The following is a list of the major water quality concerns and issues in New Hampshire that NHDES and others will be directing their attention to in upcoming years.

I. SUSTAINABILITY OF WATER RESOURCES

New Hampshire's water resources are essential elements of the State's unique natural beauty, tourist economy, quality of life, and livelihood for many. However, increasing growth and development is stressing the quality, quantity, and natural aquatic biota of many of the State's water resources. Although much has been accomplished, there is concern and evidence that existing water management programs may not be adequate to protect water quality and quantity. To help restore and protect its water resources for future generations, the Commissioner of NHDES authorized the Lakes Management Advisory Committee (LMAC) and the Rivers Management Advisory Committee (RMAC) on January 3, 2007 to undertake a Sustainability Initiative. These committees, which are comprised of representatives from numerous state agencies and public and private sector groups with water interests, are legislatively charged with advising NHDES on maintaining water quality and quantity.

In January, 2008, the LMAC and RMAC published a report entitled, "The Sustainability of New Hampshire's Surface Waters." An excerpt from the report summarizing why a Sustainability Initiative is needed, is provided below:

> *"A combination of forces, including rapid population growth and urbanization are imposing new stresses on New Hampshire's surface waters and the State's ability to protect, maintain, and when necessary, restore surface water quality. This is the last major opportunity the State has to address critical water issues, before they either become extremely costly to manage or irreversible. To prevent the negative consequences that accompany our growing population we must develop new approaches that go beyond tasks forces and piecemeal strategies. If we adequately protect the ecological function of our terrestrial and aquatic resources, do not burden them with pollutants, nutrients, toxins, or sediment, or demand more than they can provide, they will be sustainable. To attain and continue to achieve excellent water quality, the State must take the lead by promoting a strong economy and maintaining environmental integrity. However, based on our performance to date we are not attaining these objectives. The LMAC and RMAC recommend that the State move forward with a Sustainability Initiative where the State undertakes an aggressive effort, including addressing landscape change and development and its impact upon water quality and quantity."*

For the purposes of their report, the LMAC and the RMAC developed the following functional definition of sustainability to achieve their goals:

> *"to institute anti-degradation measures to preserve and protect water quality and quantity, to maintain intact ecological linkages between surface waters and their surrounding watersheds, to achieve the appropriate balance between different human uses while protecting the biological integrity of the resource, and to restore and improve existing degraded systems."*

The report is a preliminary roadmap for the initiative in that it provides an overview of the problem, what has been done in the past, and, most importantly, identifies eight key issues that need to be addressed to achieve Sustainability. These issues are summarized below:

1. Lack of data to properly manage water resources (i.e., the need to increase the network of stream gages and to expand and improve the water quality monitoring network) and the need to improve data access and management by data users.
2. Lack of a coordinated well-communicated strategy on a state-wide scale to effectively address landscape change and its impacts on water quality and quantity.
3. The need to improve protection of shorelands and riparian buffers.
4. The need to limit impacts to water quality and quantity from urbanization and watershed development (including stormwater impacts).
5. The need to determine the biological, social and physical carrying capacity of state surface waters and to provide adequate public access.
6. The need to control invasive species.
7. The need to determine and properly manage consumptive uses of surface and groundwater (i.e., determine and implement instream flow and groundwater withdrawal protections).
8. The need to address climate change impacts (i.e., rising sea levels, altered runoff patterns from reduced amounts of snowfall and more frequent extremes in precipitation from drought to floods, and increased water temperatures that could degrade cold water fisheries).

Having identified the issues, next steps include cataloging ongoing efforts, describing roadblocks to success, prioritizing the issues, proposing concrete options to consider for each of the eight issues, and proposing environmental and programmatic indicators to measure how well success is achieved. Development of a sustainability initiative is a high priority at NHDES and is a major undertaking that will take significant time, resources, coordination, and cooperation to complete and implement.

II. CLIMATE CHANGE

Since the Industrial Revolution, the concentration of carbon dioxide in the atmosphere has been increasing as a result of human activities. The Intergovernmental Panel on Climate Change has determined that this increase is unequivocally caused by human activities and is the dominant cause of the observed global warming since the mid-twentieth century (IPCC, 2021). As the planet has warmed, New Hampshire's climate has changed. This can lead to a variety of water quality impacts. These include:

a) Water Supply Changes

- Increasing temperatures will reduce the amount of snowpack and cause it to melt faster and earlier (USGCRP, 2018). As a result, flows could be reduced in later months, concentrating pollutants and degrading water quality.
- Increased rainfall intensity may produce increased flooding. Flooding can result in large amounts of runoff flowing across the landscape which can pick-up numerous pollutants that impair water quality, including sediments, nutrients, pesticides, oil, grease, gasoline, and litter contamination (USGCRP, 2018). Flooding can also overload storm and wastewater systems, and damage water and sewage treatment facilities, thereby increasing the risks of contamination (USGCRP, 2018).

b) Water Temperature Changes

- Increasing water temperatures can interact with excess nutrients to generate algae blooms on the lake surface, depleting the ecosystem of oxygen and harming the other organisms in the system (USGCRP, 2018).
- Increasing water temperatures also change the chemical reactivity of water and its components, and the resulting effects on water quality can cause water bodies to violate their water quality standards. For example, as water warms, its capacity to hold dissolved oxygen decreases just a species like fish need more oxygen, reducing the waterbody's ability to support animal life (USGCRP, 2018).

c) Salinity Changes

- Sea level is also rising in response to climate change (IPCC, 2021). As saltwater rises along the coast, it will invade coastal streams, rivers, lakes, and aquifers, a process known as saltwater intrusion (USGCRP, 2018).
- At the same time, however, increased rainfall and flooding in the eastern United States may alter the salinity balance in New Hampshire's estuaries; this could affect ecosystem productivity and composition.

As a result, climate change is causing and will continue to influence water quality, including increased pollution, changes to water chemistry, and changes to aquatic ecosystems. In response to these issues, the Watershed Management Bureau and NHDES have begun to develop plans for monitoring and managing these impacts.

III. INSUFFICIENT FUNDING TO MANAGE WATER RESOURCES

Management of New Hampshire's surface waters requires adequate funding to support essential core programs. These programs are needed to 1) help prevent the degradation of surface waters in the state and the potential loss of revenue and 2) to protect the hundreds of millions of dollars which have already been invested to restore and maintain water quality in New Hampshire. For many of the past several years federal funding for many programs have remained flat or decreased. As a result, some programs, such as the beach monitoring program

have already had to downsize. As of late, Federal funding for infrastructure has increased dramatically. It is important to fund monitoring to ensure that the investments made now are having the desired impacts on the environment. If this trend is not reversed soon, or if other sources of funding are not found, other important water quality programs will need to be cut back in scope and staff or eliminated. This would be extremely detrimental to New Hampshire's water resources to keep monitoring funding level or reduced since many programs are already challenged to have enough funding and staffing.

The seemingly ever-growing issues around PFAS have brought into light that the state of New Hampshire is lacking a comprehensive dataset that characterizes the frequency and magnitude of toxicant concentrations in fish and shellfish tissue. There is an urgent need to understand the presence of historic toxicants, such as DDT and PCBs, and newer toxicants, such as PFAS, in the tissue of these commonly consumed natural resources. The resulting data would be used to assess consumptive risks and inform development of new, or justification of existing, water quality criteria.

IV. DRINKING WATER ISSUES

New Hampshire has an abundant supply of clean drinking water. There are challenges, however, for the public water systems that serve 60% of New Hampshire's population and for the remaining 40% of residents that rely on private household drilled or dug wells. Drinking water from public water supplies is highly regulated to protect public health, but aging infrastructure and the cost of treating drinking water and otherwise meeting ever increasing regulatory requirements are significant issues for public water suppliers. Also, as our ability to detect and evaluate contaminants in drinking water has increased, so has the need to address emerging contaminants such as cyanotoxins, pharmaceuticals and most recently, PFAS. These challenges speak to the need for more effective efforts to prevent the degradation of water supply sources. For both private well owners and public water systems that use wells, naturally occurring contaminants such as radon and arsenic are also significant health concerns. Finally, New Hampshire is a nationally recognized leader in source water protection, but landscape change has the potential to degrade our sources of drinking water by both contributing contaminants and changing hydrology.

V. WASTEWATER TREATMENT FACILITY ISSUES

a) Upgrading Existing Wastewater Treatment Facilities

Many wastewater treatment plants in New Hampshire are facing the challenge of treating wastewater while the plants are approaching their hydraulic and or technology limitations. These plants have served the purpose for which they were designed, but with increased flow to the headworks and new or more stringent permit limits, permittees are faced with the need for facility upgrades, equipment replacement, and construction of new wastewater treatment facilities. The availability of American Rescue Plan Act of 2021 (ARPA) funding spurred a flurry of upgrade activity for municipalities with wastewater treatment facilities, but many permittees are facing significant upgrade costs and local funding challenges. The passage of the

Infrastructure Investment and Jobs Act (IIJA) in 2021 holds tremendous process to help to renew old water infrastructure.

b) Combined Sewer Overflows

The Point Source Control Program, which oversees Combined Sewer Overflows (CSOs) is addressed in Section B.2.II. As mentioned, there are currently CSOs located in the six New Hampshire communities, including Berlin, Exeter, Lebanon, Manchester, Nashua, and Portsmouth. Each of these communities has implementation plans to abate CSO pollution. Studies to date suggest that bacteria and floatables are the major pollutants of concern. To expedite implementation of CSO abatement plans, federal funding assistance will be needed.

VI. NONPOINT SOURCES

Unlike pollution from industry or sewage treatment facilities (i.e., point source pollution, which is caused by a discrete number of sources that are easily identified), stormwater pollution is caused by the daily activities of people everywhere. Most of the water quality problems in lakes and rivers are the result, in some part, of stormwater runoff. Because of this, the responsibility of managing stormwater falls on everyone. To address such NPS issues it is necessary to 1) illustrate the existing problem to people, 2) develop reasonable solutions and 3) fund the solutions. Stormwater runoff causes or contributes to the impairment of over 800 waterbodies in the state, Table 6. To address nonpoint sources in impaired waterbodies, NHDES uses a quantitative approach documenting the sources, load reductions, and BMPs necessary to bring the waterbody into compliance with water quality standards. Since 2004, NHDES has assisted local organizations in developing more than 25 watershed-based plans addressing impaired waters, and several plans using a quantitative approach to improve or maintain high quality waters.

In urban areas, stormwater utilities offer a promising tool for municipalities to address stormwater infrastructure and improve water quality. NHDES worked with the cities of Dover, Nashua and Portsmouth to conduct stormwater utility feasibility studies, addressing such issues as public needs, capital improvements, optimal stormwater programs and billing structure. While no municipality has adopted a utility, these studies improved local understanding of how such an entity can be implemented. New federal stormwater regulations are likely to increase the desirability of local utilities as a stable funding source for local stormwater programs.

As NHDES continues to assess nitrogen loading in Great Bay, it has become clear that much work is needed to address nitrogen sources in the 46 coastal watershed communities. In 2019, in response to requests for a flexible approach to permitting from the communities and the state, EPA proposed a draft Nitrogen General Permit to cover the 13 wastewater treatment plants (WWTPs) in 12 communities. The General Permit was issued on November 24, 2020, and was effective beginning on February 1, 2021. The permit aims to reduce nutrient loading beyond simply treating point sources at the WWTFs, but through the management of things like stormwater treatment, reduced fertilizer use and properly functioning septic systems.

VII. INTRODUCTION OF NON-NATIVE NUISANCE AQUATIC SPECIES

Preventing the spread of new exotic aquatic plants and animals into state waters is a major concern in New Hampshire. Since its inception in 1981 with the passage of RSA 487:15, the Exotic Aquatic Plant Program has grown to become a cooperative effort among state agencies, lake organizations and concerned citizens. The Exotic Species Program must continue to prevent the introduction and spread of non-native nuisance aquatic species in New Hampshire's surface waters so as to protect the ecological, recreational, aesthetic, and economic values of our waterbodies. Through education and outreach efforts the rate of spread of exotic aquatic plants has slowed in New Hampshire, and new infestations are found much earlier while they are still establishing and more easily managed, however new infestations are still found each year. As reported in NHDES' Exotic Species Program Report, by the end of 2017, there were 113 infestations in 88 waterbodies across the state. Currently, there are 119 infestations in 91 waterbodies.

VIII. ESTUARINE EUTROPHICATION

Eutrophication from excess nutrients is a critical issue affecting the aquatic life designated use in the Great Bay Estuary. The Great Bay Estuary is a national treasure and a valuable resource to New Hampshire. It is one of 28 "estuaries of national significance" designated by EPA. Unfortunately, increasing nitrogen concentrations, low dissolved oxygen, and disappearing eelgrass habitat all have been observed in the estuary, as documented in the Technical Support Document for the Great Bay Estuary. These symptoms of eutrophication from excess nutrients impair the aquatic life designated use which is a violation of the state water quality standards for nutrients (Env-Wq 1703.14) and biological and aquatic community integrity (Env-Wq 1703.19). Reducing nitrogen loads to the estuary to remove these impairments and restore the estuary are top priorities for NHDES and EPA.

As previously stated in Section B.3.VI, in 2019, in response to requests for a flexible approach to permitting from the communities and the state, EPA proposed a draft Nitrogen General Permit to cover the 13 wastewater treatment plants (WWTPs) in 12 communities. The General Permit was issued on November 24, 2020 and was effective beginning on February 1, 2021. The permit aims to reduce nutrient loading beyond simply treating point sources at the WWTFs, but through the management of things like stormwater treatment, reduced fertilizer use and properly functioning septic systems.

IX. ACID DEPOSITION (ACID RAIN)

The passage of the Clean Air Act Amendments in 1990 has resulted in a decrease in sulfur dioxide emissions from in-state and out-of-state sources. Unfortunately, this has resulted in little if any improvement in the acidity or acid neutralizing capacity status of New Hampshire surface waters. As a result, hundreds of waterbodies in the state do not meet state water quality standards for the protection of aquatic life due to low pH (i.e., acidic conditions).

Several reasons contribute to this lack of improvement in surface waters and the need for further cuts in emissions. Nitrogen emissions have not decreased substantially region-wide and wet deposition of nitrogen has remained largely unchanged since the 1980s. Nitrogen oxides

are primarily released from transportation sources and are more difficult to regulate. Additionally, the loss of acid-neutralizing minerals from the soil and the long-term accumulation of sulfur and nitrogen in the soil have left many ecosystems more sensitive to the input of additional acids, further delaying recovery from acid deposition.

NHDES' 2015 Acid Rain Status and Trends report concluded that sulfate concentrations have shown a statistically significant decrease at all of the remote pond locations and have remained stable or decreased at all of the acid outlet ponds. Similarly, nitrate also demonstrated significant decreases at a majority of remote pond and acid outlet waterbodies. These trends are suggestive that the large reduction in emissions of sulfur dioxide to the atmosphere over the last several decades are having an impact. The improvements are encouraging and provide evidence of the success of national and state air quality policies in protecting our environment. The results also highlight that waterbody recovery from acid deposition parameters is a work in progress, as pH and acid neutralizing capacity values at many of the waterbodies have remained stable despite the reduction in acid deposition-related variables. This lag in recovery time is especially severe in sensitive ecosystems like those found in New Hampshire and is attributed to the long-term accumulation of acids and loss of buffering capacity in soils (Charles T. Driscoll, 2001) (Kristin E. Strock, 2014).

X. CHLORIDES AND ROAD SALT

Monitoring data have shown increasing levels of sodium, chloride, and conductivity in surface waters, largely from deicing runoff. Most lakes continue to meet the chronic chloride criteria of 230 mg/L but increases of well over 100% in all three parameters have been documented in many lakes over the past 25 to 30 years, with the greatest increases occurring in recent years. The most impacted lakes are lakes that drain salted roads, highways, and urban areas. Streams also show increases in conductivity and streams in urban areas may violate criteria. The only way to prevent chloride from reaching surface waters and groundwater is to reduce the amount applied to our roadways, parking lots and sidewalks without compromising safety. When road salt dissolves in water, the chloride molecule is not retained by the soil and easily moves with water flow.

Since publication of the chloride TMDLs covering I-93 corridor watersheds in 2007, substantial progress has been made in both local and statewide programs addressing road salt. There are now 50 chloride-impaired waterbodies in the state. In some impaired watersheds, private parking lots and driveways account for as much as 50% of the total chloride load. The University of New Hampshire Technology Transfer Center developed the Green SnowPro certification program, providing a training program for winter road maintainers with particular emphasis on the private sector. Initially launched in the fall of 2011, the program has certified over 1,300 salt applicators. The course work emphasizes the basics of road salt management and focuses on improved efficiency to achieve the desired level of service while using less salt. To address the demand side, NHDES is working with the State Police and the Department of Transportation on improved communications and public messaging designed to give road crews the time they need to provide safe roadways as soon as practical after a storm ends.

XI. CYANOBACTERIA BLOOMS

Cyanobacteria blooms are aesthetically displeasing in sight, odor and taste, as well as potentially toxic to domestic animals, livestock, wildlife and humans. Cyanobacteria are a potential public health danger because they may produce toxins, collectively referred to as "cyanotoxins," that can be consumed by organisms in the food chain and released into the water when cells die. However, the amount and type of toxin produced varies over time and from lake to lake. A cyanobacterial bloom may produce very little to no toxin in one lake, and a later bloom in the same lake could produce a large toxin concentration. Cyanotoxins can cause both acute and chronic illnesses, as these toxins target the liver, kidney and central nervous system, and can irritate the skin. Acute effects, such as skin and mucous membrane irritations, can occur after short-term exposure with water containing cyanotoxins. Chronic effects, such as liver, kidney and central nervous system damage, can occur over a long period of time from ingesting water containing toxins. NHDES' Harmful Algal and Cyanobacterial Bloom Program coordinates monitoring, public communication and educational outreach efforts in regard to cyanobacterial blooms.

C. SURFACE WATER MONITORING AND ASSESSMENT

1. MONITORING PROGRAM

NHDES' Watershed Management Bureau is responsible for understanding and assessing the quality of the state's surface waters. The department has sampled over 1,300 river segments and over 660 lakes and impoundments looking to answer the question: Are New Hampshire's rivers and lakes clean? The results of these efforts are contained in a variety of reports, summaries, and interactive maps available on the River and Lake Monitoring website, in addition to being summarized in this report.

The NHDES Water Monitoring Strategy details the agency's approach to monitoring the state's water bodies. The strategy includes three primary design components:

- Probability-based water quality surveys: A statistical approach to understand overall conditions state-wide.
- Trend-based monitoring: To track the trajectory of important water quality indicators over time.
- Synoptic (or site specific) monitoring: Collection of summary water quality data in a coordinated fashion from targeted, site-specific locations in order generate a statewide dataset over time.

Taken together, these three approaches provide the necessary structure to ensure that the data are collected with specific goals in mind. The strategy relies on the incorporation of surface water data collected across programmatic boundaries to achieve a series of objectives while simultaneously providing a broad view of water quality conditions across New Hampshire. The Watershed Management Bureau is home to a variety of surface water quality programs. Each year a workload report documents these programs, the activities within the Jody Connor Limnology Center (JCLC), as well as the quantity and quality of the data that is collected.

2. ASSESSMENT METHODOLOGY

The purpose of the Consolidated Assessment and Listing Methodology (CALM) is to describe, in detail, how surface water quality data are analyzed and how assessment decisions for 305(b) reporting and 303(d) listing purposes are made. The CALM is the translator document bridging the gap between the Water Quality Criteria and water quality data for waterbodies in the state. Readers are strongly encouraged to read the CALM before reviewing assessments as it will help one to better understand and interpret assessment results. Examples of topics addressed in the CALM include:

- Waterbody coverage, types and assessment units
- Designated uses
- Data sources
- Data quality
- Data age
- Core parameters
- Definition of independent samples
- Spatial coverage per sample site
- Minimum number of samples for various parameters
- Magnitude of exceedance criteria
- Specific assessment criteria for each designated use
- Section 303(d) listing and delisting
- Total Maximum Daily Load (TMDL) priority ranking

Assessment methodologies often change as new information, new or changed criteria, and new assessment techniques become available. Consequently, NHDES reviews and updates its CALM a minimum of every 2 years. These periodic updates should result in more accurate and reliable assessments, and therefore, better management of water resources in the future. As outlined in the CALM, some of the samples used in the assessment process are collected as part of the NHDES' probabilistic assessments. The probabilistic assessment involves sampling a portion of a population through probability (or random) sampling. Random sampling ensures that no particular portion of the population being sampled is favored (or biased) over another. Results of sample surveys can be used to make statistically based inferences (i.e., probabilistic assessments) about the condition of the population as a whole. NHDES partners with EPA to take part in the national assessments conducted every 5-years, with intensification of New Hampshire sites every 10-years.

The first edition of the CALM was prepared for New Hampshire's 2002 Section 305(b) and 303(d) Surface Water Quality Report. Since then, the CALM has been updated biennially. A copy of the 2020/2022 CALM, as well as past CALMs are available online. Prior to being finalized, a draft of the 2020/2022 CALM was released for public comment.

3. ASSESSMENT RESULTS

The 2020/2022 assessments are supported by more than 1-million grab samples and several million datalogger results. These data records were collected from more than 2,000 stream

sites, 2,500 lake sites, and 640 marine sites and include over 180 water-quality and ecological parameters. Most of the raw data are available from NHDES' Environmental Monitoring database (EMD) or by contacting NHDES. All readily available data is then brought into the NHDES assessment database (ADB) for comparison to the water quality standards and accessible via the Surface Water Quality Assessment Viewer which has been created for the 2020/2022 assessment cycle. This tool was developed for users to:

1) View the spatial extend of assessment units.
2) Identify where sampling data was collected.
3) Access the watershed report cards.
4) Run reports to access the base data and water quality data summaries for the Aquatic Life and Primary Contact (i.e., Swimming) designated uses in the 2020/2022 assessment cycle.
5) See what waterbodies are impaired in the 2020/2022 assessment cycle.
6) View the extent of the EPA 2017 MS4 General Permit Areas.

The department's surface water quality assessment website contains all the materials that were submitted to EPA in support of the state's 303(d) List, which was approved on March 14, 2022. In addition to the 303(d) List, NHDES has created an excel file containing a comprehensive list of all assessments conducted for the 2020/2022 cycle, including the assessment category assigned to each waterbody/designated use/parameter combination. To help understand what has changed between the 2018 cycle and the 2020/2022 cycle, a group of change documents have been published. Those documents include:

- Waters Removed from the 2018 303(d) List
- Waters Added to the 2020/2022 303(d) List
- Impairments Removed Since the 2018 305(b)
- Impairments Added to the 2020/2022 305(b)

Table 4: provides a summary of the assessment category breakdown of all the assessed parameters by waterbody type and designated use for the 2020/2022 cycle. The assessment categories are defined as follows:

Category 2: Meeting state water quality standards.
Category 3: Insufficient data and information available to make a full assessment decision.
Category 4: Impaired or threatened but does not require development of a TMDL because:
4A: A TMDL has been completed.
4B: Other pollution control requirements are reasonably expected to result in attainment of the water quality standard in the near future.
4C: The impairment is not caused by a pollutant.
Category 5: Impaired or threatened by a pollutant and requires a TMDL (this is the 303(d) List).

Table 4: Counts of Assessed Parameters by Assessment Category, Water Type and Designated Use

Waterbody Type	Designated Use	Assessment Category						Grand Total
		2	3**	4A	4B	4C	5	
Rivers & Streams	Aquatic Life Integrity	564	3,431	6	10	42	1,365	**5,418**
	Fish Consumption	-	92	5,942*	10	-	3	**6,047**
	Primary Contact Recreation	141	102	237	17	1	10	**508**
	Secondary Contact Recreation	229	50	46	2	-	2	**329**
Lakes	Aquatic Life Integrity	329	1,521	293	-	65	426	**2,634**
	Fish Consumption	-	35	1,563*	-	-	3	**1,601**
	Primary Contact Recreation	455	301	134	-	-	69	**959**
	Secondary Contact Recreation	365	19	4	-	-	1	**389**
Impoundments	Aquatic Life Integrity	51	200	7	-	25	106	**389**
	Fish Consumption	-	4	1,224*	8	-	1	**1,237**
	Primary Contact Recreation	26	38	29	10	-	12	**115**
	Secondary Contact Recreation	34	5	4	-	-	-	**43**
Estuaries	Aquatic Life Integrity	100	305	-	-	-	215	**620**
	Fish Consumption	-	-	-	-	-	142	**142**
	Primary Contact Recreation	17	14	23	-	-	12	**66**
	Secondary Contact Recreation	11	6	12	-	-	1	**30**
	Shellfish Consumption	-	26	40	-	-	213	**279**
Ocean	Aquatic Life Integrity	2	-	-	1	-	-	**3**
	Fish Consumption	-	-	-	-	-	54	**54**
	Primary Contact Recreation	12	1	5	-	-	-	**18**
	Secondary Contact Recreation	13	1	4	-	-	-	**18**
	Shellfish Consumption	8	9	8	-	-	82	**107**
Grand Total =		**2,357**	**6,160**	**9,581**	**58**	**133**	**2,717**	**21,006**

* All freshwaters in the state are covered by the Northeast Regional Mercury TMDL
** Only includes instances where there is some data although insufficient to make a full assessment.

Table 5 Summarizes the number of assessment units that were impaired by a specific parameter in the 2020/2022 assessment cycle. It is important to note that all freshwaters in the state are subject to mercury fish consumption guidelines and are therefore impaired for mercury – fish consumption advisory. These waterbodies are also covered by the Northeast Regional Mercury TMDL.

Table 5: Cause of Impairment

Rank	Parameter	Number of Assessment Units Impaired
1	MERCURY - FISH CONSUMPTION ADVISORY	8,828*
2	pH	1,354
3	Escherichia coli	385

Rank	Parameter	Number of Assessment Units Impaired
4	Dissolved oxygen saturation	203
5	Oxygen, Dissolved	192
6	Aluminum	122
7	Chlorophyll-a	104
8	PCBS - FISH CONSUMPTION ADVISORY	104
9	DIOXIN - FISH CONSUMPTION ADVISORY	98
10	Non-Native Aquatic Plants	98
11	Cyanobacteria hepatotoxic microcystins	94
12	Phosphorus (Total)	67
13	Benthic-Macroinvertebrate Bioassessments (Streams)	63
14	Chloride	50
15	Fecal Coliform	49
16	Estuarine Bioassessments	34
17	Enterococcus	29
18	Light Attenuation Coefficient	29
19	Lead	28
20	Fishes Bioassessments (Streams)	24
21	Iron	23
22	Nitrogen (Total)	21
23	Dioxin (including 2,3,7,8-TCDD)	18
24	Habitat Assessment (Streams)	17
25	Other flow regime alterations	11
26	Arsenic	8
27	Copper	8
28	Zinc	8
29	Benzo(a)pyrene (PAHs)	7
30	Mercury	6
31	Benzo[a]anthracene	5
32	Cadmium	5
33	Chrysene (C1-C4)	5
34	DDD	5
35	Nickel	5
36	Pyrene	5
37	Sedimentation/Siltation	5
38	Acenaphthylene	4
39	Anthracene	4
40	DDE	4
41	Dibenz[a,h]anthracene	4
42	Fluoranthene	4
43	Indeno[1,2,3-cd]pyrene	4

Rank	Parameter	Number of Assessment Units Impaired
44	Manganese	4
45	Phenanthrene	4
46	trans-Nonachlor	4
47	Acenaphthene	3
48	Benzo[b]fluoranthene	3
49	Benzo[k]fluoranthene	3
50	Fluorene	3
51	Physical substrate habitat alterations	3
52	Turbidity	3
53	2-Methylnaphthalene	2
54	Ammonia (Total)	2
55	Barium	2
56	DDT	2
57	Dieldrin	2
58	Naphthalene	2
59	Benzo[g,h,i]perylene	1
60	BOD, Biochemical oxygen demand	1
61	Chromium (total)	1
62	Creosote	1
63	Debris/Floatables/Trash	1
64	Excess Algal Growth	1
65	Lindane	1
66	Low flow alterations	1
67	Total Suspended Solids (TSS)	1

* = All freshwaters in the state are covered by the Northeast Regional Mercury TMDL

Table 6 summarizes the length and area of waterbodies in the state impaired by stormwater influenced parameters. The percentages are representative of stormwater impaired waterbodies out of the total number of impaired waterbodies, excluding impairments based off fish consumption advisories (i.e., mercury). NHDES categorized stormwater influenced parameters to include substances such as bacteria, nutrients, metals, sediments, dissolved oxygen, chloride, fish and bug bioassessments, as well as habitat assessments.

Table 6: Summary of Waterbodies Impaired by Stormwater Influenced Parameters

Waterbody Type	Summary of Stormwater Impairments	Number of Stormwater Impaired Assessment Units
Rivers & Streams	2,601.2 Miles (53.6%)	475 (44.9%)
	5 Beaches (100%)	5 (100%)
Lakes	53,555.6 Acres (38.7%)	193 (40.7%)
	96 Beaches (94.1%)	96 (94.1%)
Impoundments	2,258.5 Acres (21.1%)	55 (58.5%)

Waterbody Type	Summary of Stormwater Impairments		Number of Stormwater Impaired Assessment Units	
	11	Beaches (11.7%)	11	(100%)
Estuaries	17.0	Square Miles (96.5%)	63	(98.4%)
	2	Beaches (100%)	2	(100%)
Ocean	0.4	Square Miles (27.7%)	6	(85.7%)
	4	Beaches (100%)	4	(100%)
		Total =	**910**	**(50%)**

Table 7 summarizes the length and area of waterbodies in the state impaired by nutrient influenced parameters. The percentages are representative of nutrient impaired waterbodies out of the total number of impaired waterbodies, excluding impairments based off fish consumption advisories (i.e., mercury). NHDES categorized nutrient influenced parameters to include substances such as ammonia, total nitrogen, total phosphorus, cyanobacteria, excess algal growth, dissolved oxygen as well as chlorophyll-a.

Table 7: Summary of Waterbodies Impaired by Nutrient Influenced Parameters

Waterbody Type	Summary of Nutrient Impairments		Number of Nutrient Impaired Assessment Units	
Rivers & Streams	838	Miles (17.3%)	150	(14.2%)
	0	Beaches (0%)	0	(0%)
Lakes	47,479	Acres (34.3%)	157	(33.1%)
	29	Beaches (28.4%)	29	(28.4%)
Impoundments	1,237	Acres (11.6%)	28	(29.8%)
	1	Beach (9.1%)	1	(9.1%)
Estuaries	9	Square Miles (52.5%)	22	(34.4%)
	0	Beaches (0%)	0	(0%)
Ocean	1.1	Square Miles (72.3%)	1	(14.3%)
	0	Beaches (0%)	0	(0%)
		Total =	**388**	**(21.3%)**

NHDES' monitoring strategy also provides regular reports on statewide probabilistic surveys, which use a randomized selection of sample locations intended to be a representative snapshot in time of the entire population of the State's surface waters. By collecting data from these randomly selected sites, the overall condition of the waterbody population can be assessed with a known level of confidence. Probability surveys represent a cost-effective means for estimating and reporting on the physical, chemical, and biological conditions by waterbody type and the factors that affect these conditions at a particular point in time.

NHDES' statewide probability surveys were built off the National Aquatic Resource Surveys (NARS) used by the EPA. The 2017-2019 Probabilistic Survey assessed New Hampshire's lakes, ponds and reservoirs for the Aquatic Life Integrity (ALI), Primary Contact Recreation (PCR, i.e.,

swimming) and Secondary Contact Recreation (SCR) designated uses. The survey found that less than 10% of New Hampshire's lakes, ponds and reservoirs met the ALI designated use, primarily due to low pH values. The PCR designated use assessment found that over 90% of lakes in New Hampshire were achieving full support, and that 100% were in full support of the SCR designated use. This indicates that most New Hampshire lakes and ponds are safe for recreation, despite a lower level of support for aquatic life integrity.

Similarly, the 2013-2017 Survey assessed New Hampshire's rivers and streams for ALI and PCR designated uses. Aquatic life integrity is assessed through the analysis of macroinvertebrate and fish communities while the PCR use is assessed by analyzing bacteria concentrations. The survey concluded that for ALI, 59% (5,254 miles) of rivers and streams were in good or fair condition (fully supporting), while 18% (1,603 miles) were in poor condition (non-supporting). The remaining 23% (2,021 miles) were categorized as insufficient information. For the PCR designated use the survey showed that 70% (6,239 miles) of rivers and streams were in good condition (fully supporting), while 7% (618 miles) were in poor condition (non-supporting). Twenty-three percent of river miles (2,021) were categorized as insufficient information. Comparison of results from the current probability-based assessment to previous probability-based assessments indicates that water quality conditions supportive of ALI remains close to 60%, while primary contact recreation has decreased from near 90% to 70% with the most recent assessment. However, the percent of waterbodies in the insufficient information category have increased from less than 5% to greater than 20%.

4. WETLAND PROGRAM

For the 2010 reporting cycle NHDES built wetland complexes to correspond to the wetland complex methodology of the New Hampshire Method. In all, 52,313 wetland assessment units covering 286,696 acres were added. This did not include wetlands in open water to avoid overlap with existing assessment units in other waterbody types. NHDES developed GIS-based criteria using the characteristics of adjacent land uses. This information was used to conduct a preliminary or Level 1 assessments of wetlands. Although none of the wetlands were assessed as fully supporting or not supporting as part of the 2012 cycle, this represents a significant first step to being able to assess and report on wetland water quality.

The landscape level wetland assessment was based upon the aquatic life designated use and was intended to identify those wetlands that were likely or unlikely to provide suitable conditions for supporting a balanced, integrated, and adaptive community of aquatic flora and fauna. The assessment was based on the idea that the condition of a wetlands buffer will be a major driver of the condition of the wetland. Further, we were able to systematically estimate the condition of the buffer based on landcover types within that buffer. Due to the inherent roughness of a landscape level analysis and that no in-wetland measurements were conducted, no definitive support categorizations were made. Based upon the results of the analysis the use support category "insufficient information - potentially supporting" or "insufficient information - potentially not supporting" were assigned to each assessment unit.

The resulting scores from the Level 1 assessment showed that no wetlands were assessed as fully support or not supporting. A total of 42,837 (81.90%) wetland assessment units were

assessed as insufficient information - potentially supporting and 9,476 (18.1%) as insufficient information - potentially not supporting. The methodology used to create the wetland assessment units and conduct the Level 1 assessment are available online as part of the 2012 Integrated Report, in Appendix 38: Level 1 Landscape Level Wetlands Assessment (ver. 2). The Level 1 assessment is a huge first step towards ultimately being able to develop criteria and a methodology for definitively assessing wetlands as fully supporting or not supporting.

In March of 2020, NHDES released an Investigation into the Development of Biocriteria to Assess Wetland Condition in New Hampshire. This project began in 2014 and was conducted to advance New Hampshire's wetland monitoring and assessment work by investigating potential biological criteria (biocriteria) to assess the condition of fringing and emergent open-water freshwater wetlands. The project applied all three levels of USEPA's tiered approach for wetland monitoring and assessment, commonly referred to as Levels 1, 2 and 3.

- **Level 1** assessments use remote sensing and desktop analysis.
- **Level 2** assessments are rapid and field-based to provide information that can be observed only in the field, and should take about four field hours to complete, on average.
- **Level 3** assessments are intensive field surveys that include the collection of biological data or onsite sampling of water, soil, etc.

The four-year effort involved conducting two rapid assessments, in addition to collecting Level 3 data consisting of water, vegetation and macroinvertebrate samples. Through the project NHDES increased its knowledge of the wide variation in open-water wetland habitats, their complexities, and identified some moderately strong correlations between landscape condition and wetland water quality. Ultimately, it was determined that additional time and resources were needed to fully develop numerical or quantitative biological criteria. NHDES concluded that additional data are needed to validate and calibrate any floristic metrics to assess wetlands under Section 303(d) and 305(b) of the CWA. Additionally, sampling of macroinvertebrates should target wetland tolerant species to better define/refine target populations. Lastly, future analysis of macroinvertebrates should be conducted on a finer scale, especially in wetlands with multiple open water areas.

5. TREND ANALYSIS OF SURFACE WATERS

A summary of trend analysis studies completed by NHDES and its partners for estuaries, lakes and rivers is provided in the following sections.

a) Estuaries

Every five years, the Piscataqua Region Estuaries Partnership (PREP) publishes a State of Our Estuaries report that examines environmental and social indicators of estuarine health, such as bacteria levels, nutrient concentrations, toxic contaminant levels, abundance of shellfish, and land use in the coastal watershed. The 2018 report concludes that the environmental quality of the Piscataqua Region estuaries have declined and are under stress. Of the 16 environmental indicators, 12 are characterized as having cautionary or negative trends. The four indicators focused on management activities are split; two show positive progress

toward management goals and two demonstrate only marginal headway. PREP concluded that New Hampshire's estuaries, and the many benefits that they provide for communities, continue to experience significant stress.

b) Lakes and Ponds

One component of NHDES' Water Monitoring Strategy is to provide regular reports on the status and trends of water quality conditions. NHDES' 2020 Lake Trend Report, looked at data from 150 lakes and ponds from 1991 through 2018. Data were analyzed to examine current conditions, long-term trends and short-term changes for individual waterbodies. Trophic class and regional trends were also examined. The report concluded the following:

- Approximately 10% of waterbodies had significant decreases in both long-term and short-term chlorophyll-a concentrations. In contrast, about 3% of waterbodies showed significant increases in both the short-term and long-term trends.

- Long-term analyses found water clarity significantly decreased (worsened) in mesotrophic and oligotrophic waterbodies.

- Specific conductance and alkalinity significantly increased over the long-term in mesotrophic and eutrophic waterbodies. Analyses of short-term changes indicate that both parameters are rapidly shifting, as nearly 80% of investigated waterbodies had increasing specific conductance and 75% had increasing alkalinity over the past ten years.

- Total phosphorus significantly increased over the long-term in eutrophic waterbodies but was unchanged in mesotrophic and oligotrophic waterbodies.

- Dissolved oxygen decreased in approximately 15% of waterbodies over the long-term, with a significant overall decrease for mesotrophic waterbodies.

- Water temperature significantly increased in mesotrophic and oligotrophic waterbodies over the long-term. Subsequently, ice-out on lakes is occurring significantly earlier in the year.

In some cases the 2020 Lake Trend Report evaluated data from additional programs and lakes to evaluate waterbody condition. From those extended datasets the report found that:

- The percentage of beaches that issued bacteria advisories and the number of days an advisory was in place significantly increased from 2003 to 2018.

- The number of cyanobacteria advisories issued increased from 2003 to 2018; however, the number of days' advisories were in place each year was highly variable with no overall trend.

- Aquatic invasive species infestations have increased from 2000 to 2018, while the overall acreage of infestations and herbicide use has remained constant.

c) Rivers and Streams

Similar to lakes and ponds, the Water Monitoring Strategy provide regular reports on the status and trends of rivers and streams. NHDES' 2019 River Trend Report, looked at data from 1990 through 2016. Data were analyzed to examine current conditions, long-term trends and short-term changes for individual rivers. The report concluded the following:

- Specific conductance was high at over one-third of River Monitoring Network (RMN) sites relative to statewide river data and is worsening at four RMN sites. High specific conductance levels tended to occur in rivers lying within watersheds with greater than 6% of developed land.

- Nutrient concentrations at RMN sites were higher than statewide concentrations 23% of the time (11 sites – phosphorus; 7 sites – nitrogen) but had improving trends at eight RMN sites. As with specific conductance, sites with high nutrient concentrations tended to occur at RMN sites with a higher percentage of developed watersheds

- Acidic waters, as measured by pH, continue to be problematic in NH rivers and streams. The statewide median of 6.53 was near the minimum water quality criteria of 6.5 and 40% of RMN sites had medians below the minimum water quality criteria. Five RMN sites had worsening trends for pH.

- Biological condition, as measured by macroinvertebrates, was considered "healthy" for greater than 90% of wadeable RMN sites.

D. GROUND WATER MONITORING AND ASSESSMENT

New Hampshire is highly dependent on groundwater for drinking water, with roughly 60% of residents obtaining their drinking water from groundwater. Groundwater is found in both overburden and fractured bedrock aquifers. Highly productive stratified drift aquifers are found scattered throughout the state. Naturally occurring contaminants are common in groundwater in New Hampshire. About half of the state's bedrock wells have radon at levels of concern, and an estimated 30% have arsenic at levels that exceed the 5 ppb limit that is enforceable in public water systems. Iron and manganese are also quite common at levels that taste bad or cause staining of laundry or fixtures. Manganese may also occur at potentially unsafe levels. Fluoride, beryllium, and radionuclides other than radon are less common but do occur naturally at levels of concern for human consumption throughout the state.

In addition to naturally occurring contaminants, there are many areas of localized contamination due primarily to releases of petroleum and volatile organic compounds from petroleum facilities, commercial and industrial operations, and landfills. Due to widespread winter application of road salt, sodium is also a contaminant of concern in New Hampshire

groundwater. Most recently, PFAS has become a contaminant of concern in drinking water. Often called forever chemicals, this large family of chemicals is being studied and tested to understand its occurrence and risk in drinking water. In 2019, NHDES adopted administrative rules that establish health-based Maximum Contaminant Levels (MCLs) and Ambient Groundwater Quality Standards (AGQS) for four PFAS that include: 12 ppt for perfluorooctanoic acid (PFOA), 15 ppt for perfluorooctane sulfonic acid (PFOS), 18 ppt for perfluorohexane sulfonic acid (PFHxS), and 11 ppt for perfluorononanoic acid (PFNA). While enforcement of these standards was temporarily stayed by a court injunction, the MCLs and AGQS were established as a matter of law by House Bill 1264, which became effective July 23, 2020.

The mission of the NHDES Drinking Water and Groundwater Bureau (DWGB) is to protect public health by ensuring safe and reliable drinking water, through collaboration, education, assistance and oversight.

E. PUBLIC PARTICIPATION

NHDES constantly solicits data from within and outside of the agency. A guidance document for submittal of surface water data in available online. In 2003, NHDES created the EMD, the purpose of which is to serve as a warehouse for all types of environmental data. Whenever NHDES is aware of monitoring being conducted, it attempts to obtain the data for inclusion in the EMD. For the 2020/2022 assessment cycle NHDES issued a Request for Data through a direct notification by email, which was sent to nearly 2,000 stakeholders, on September 12, 2019. Any data in the EMD or submitted to the NHDES water quality assessment coordinator by November 15, 2019, was considered in the 2020/2022 assessment process.

On October 16, 2020, NHDES released the Draft 2020 303(d) List of impaired waters and the Draft Consolidated Assessment and Listing Methodology (CALM) for public comments. Downloadable copies of the draft 303(d) list and CALM were made available on the NHDES website for review. Public comments were accepted through the close of business on November 23, 2020. In addition to posting the notice of comment opportunity at multiple locations on the NHDES website, direct notification by email was sent to nearly 2,000 stakeholders including but not limited to:

Federal agencies
State agencies in New Hampshire and abutting states
Municipal officials
DPW Directors of the MS4 Communities
County Conservation Districts
Regional Planning Commissions
Nonprofit interest groups
Volunteer monitoring groups
New England Interstate Water Pollution Control Commission
University of New Hampshire

EPA issued a memo and milestone template on January 25, 2021 to facilitate timely submission of the 2022 Section 303(d) and 305(b) integrated report. The intent of the memo and template were to facilitate nationwide reporting of water quality data, successes, and challenges to the public for the CWA 50th anniversary. If states determined that meeting the deadline was particularly challenging or potentially unachievable they were asked to identify potential actions to address the challenges, which included the option of submitting a combined cycle. After careful review of our assessment process and key milestones, NHDES concluded that the only way to guarantee submittal of our integrated report by April 1, 2022 would be to submit a combined 2020/2022 Section 303(d) and 305(b) Integrated Report. On April 12, 2021 NHDES sent a letter to EPA to request consideration on the submittal of a combined 2020/2022 Integrated Report.

EPA accepted NHDES' request for submittal of a combined 2020/2022 Integrated Report in a letter dated April 29, 2021. As a result of this decision future references to the 2020 assessments and accompanying documents were denoted as the 2020/2022 assessments.

Included with NHDES' submittal of the combined 2020/2022 Section 303(d) List to EPA, was a Response to Comments on the Draft 303(d) List and CALM. While the bulk of the comments text is provided in the response to comments, the full original comments and attachments received on the October 16, 2020 draft are available on the department's FTP site. The following instructions can be followed to access those documents:

1. Go to this address using a web browser: ftp://pubftp.nh.gov/DES/wmb/WaterQuality/SWQA/2020-2022/Draft_CALM_303d_Comments
2. At the login window, click on the box in the lower left-hand corner labeled "Login Anonymously."
3. The username will then be automatically filled in with the word "Anonymous."
4. Type in your email address in the "Email Address" block.
5. Then click on the "Log On" button.

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