2024 Watershed Management Bureau in Review: Program achievements and data quality report

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

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TABLE OF CONTENTS

List of Figures

List of Tables

Executive Summary

In 2024, the Watershed Management Bureau (WMB) oversaw the implementation of over 20 programs to monitor, protect and restore the state's surface waters, including its lakes and ponds, rivers and streams, coastal, wetlands, and public bathing facilities. In all cases, these programs are designed to promote the health of one of New Hampshire's most valuable natural resources: water.

During this reporting year, 40 river trend stations were monitored three times, more than 15,000 samples were processed from 180 lakes participating in the volunteer lakes assessment program, support was provided to 25 volunteer river assessment groups, lake trophic surveys were completed on eight waterbodies, fecal bacteria counts were tracked at 32 freshwater beaches and 16 coastal beaches, 771 samples were microscopically inspected for cyanobacteria, 80 waterbodies surveyed for the presence of invasive plants, and macroinvertebrate samples were collected from and continuous water temperature sensors placed in approximately 40 river sampling stations.

Additionally, the shellfish program collected thousands of bacteria and phytoplankton samples to ensure New Hampshire’s shellfish resources were harvested during periods that minimized human-health risks from pathogens and harmful algal blooms. Long-standing acid deposition and mercury in fish tissue programs continued to track statewide conditions. The Clean Vessel Act (CVA) program funded a mobile wastewater collection vessel that removed more than 11,000 gallons of wastewater from private recreational boats.

Several lake “special studies” were completed including water quality samples for NPDES permit monitoring on Marsh Pond, New Durham, stepped up cyanobacteria monitoring on Lake Kanasatka in Moultonborough and Arlington Pond in Salem, in response to persistent cyanobacteria blooms, and follow-up monitoring at Nippo Lake, Barrington in conjunction with the application of aluminum compounds. Water quality monitoring was also conducted at Tucker Pond in Salisbury, Partridge Lake in Littleton, and Province Lake in Effingham, using deployed sensor arrays to collect temperature and oxygen data to determine the extent of anoxic conditions in these waterbodies that could be driving cyanobacteria blooms.

WMB environmental data quality is ensured through Quality Assurance Project Plans (QAPP) or detailed standard operating procedure (SOPs). In both cases, these documents spell out specific procedures to confirm the acceptance of only high-quality data for the programs that operate under the Watershed Management Bureau and the Jody Connor Limnology Center. These data are housed in NHDES' environmental monitoring database (EMD). The EMD contains millions of unique data records from over 46,000 monitoring stations and 800 individual projects. The EMD serves as a vital component in meeting the bureau's data management needs and responsibilities. The data is used for a variety of purposes including water quality assessment reports, total maximum daily loads, watershed management plans, water quality criteria development and permit issuance.

The following report describes the various program activities within the WMB that collected data, utilized the facilities of the JCLC in 2024, or provided services to the public. The report is organized into three sections; the first section provides individual program summaries in a standardized template for quick reference; the second section includes an account of the various quality assurance efforts that are undertaken, and the third section provides a brief description of the lab and field safety measures that are in place.

I. WATERSHED AMBIENT MONITORING PROGRAM SUMMARIES

1.1 Jody Connor Limnology Center (JCLC)

Challenges addressed: The JCLC practices rigorous science to ensure that water quality data can be used by communities and industry to make decisions about lake and river management. JCLC also has the capacity to respond to water quality emergencies such as toxic algal blooms and chemical spills. The JCLC provides the necessary equipment, expertise and space to allow for the processing of thousands of water quality samples and field work associated with surface water assessments conducted throughout the state.

Data usage: Data processed through the JCLC is used to complete surface water quality assessments, for issuance of public health advisories, completion of waterbody-specific reports, compliance with regulatory activities and general investigations of surface water quality.

Approach: JCLC provides equipment, analytical services and sampling services to support probability-based, synoptic and trend monitoring activities.

Parameters measured: JCLC and the Colby-Sawyer College satellite laboratory provide analysis for approximately 25 chemical and physical parameters as well as more than a half dozen biological parameters.

Method of data collection: Discrete samples are collected by both staff and trained volunteers and analyzed in the JCLC or the Public Health Laboratories (PHL). Continuous data records are generated by deployment of remote water quality sensors.

Achievements: In 2024, JCLC and the Colby-Sawyer College (CSC) satellite laboratory created 14,664 chemical records. JCLC analyzed 215 biological samples and identified thousands of individual species of plankton, cyanobacteria and aquatic plants. For more specific information on the achievements of the JCLC and the CSC laboratory in 2024 see Section 2.2 below.

Quality Assurance measures: JCLC, PHL and the (CSC) each maintain a laboratory manual detailing quality assurance measures and procedures for each specific analysis. In-lab quality assurance measures include blanks, duplicate analyses, continuing calibration verification (CCV) samples and spikes where appropriate. An in-depth summary of all quality assurance measures can be found in Section 2 of this report.

Funding: General funds (1000 account) and federal funds (Account 7602).

Program needs: Vital roles within the JCLC are shared amongst WMB monitoring staff. The Lab Safety Officer, QA/QC Officer and Data Administrator have ambient monitoring programs responsibilities. The JCLC took a small step by hiring a dedicated intern to manage JCLC analysis and data entry operations for the past five summers, which has been quite successful. The JCLC has been fortunate each year to find some dedicated and competent candidates for this pivotal position. It would be an asset to the JCLC if this position had more permanence.

A replacement for the aging JCLC database is currently part of the NHDES IT Plan and the lab's highest priority. Moving forward with this project would be a benefit to the efficient operation of the JCLC.

1.2 Volunteer Lake Assessment Program (VLAP)

Challenges addressed: VLAP works with lake associations to assess and protect the health of New Hampshire's lakes and ponds. Over 400 volunteers monitor summer water quality at 180 lakes. These data allow for the identification of potential problems and to fix them before they impact recreation or fishing. VLAP reports are routinely requested by realtors and lakefront property buyers.

Data usage: Data generated through VLAP are utilized annually to create approximately 180 annual individual lake reports. VLAP is a primary source of lake and pond data utilized to complete surface water quality assessments for the federally required section 305(b) / 303(d) water quality report. VLAP data are also utilized by NHDES to complete Total Maximum Daily Loads (TMDLs), watershed management plans, and by lake associations and organizations to apply for grant funds. The New Hampshire Lake Trend Report: Status and trends of water quality indicators utilized VLAP data collected from 1991 to 2018 in 150 lakes and was published in June 2020. Data are continually used in research and most recently utilized in *Anoxia begets anoxia: A positive feedback to the deoxygenation of temperate lakes* published in Global Change Biology, December, 2023.

Approach: Trend Monitoring - Repetitive visits to set of established sampling locations annually or on an established schedule for the purpose of tracking water quality parameters over time.

Parameters measured: VLAP measures a total of 13 chemical and biological parameters including: pH, conductivity, turbidity, apparent color, chloride, total phosphorus, alkalinity, *E. coli*, dissolved oxygen, temperature, transparency, chlorophyll-*a* and phytoplankton (including cyanobacteria).

Method of data collection: VLAP collects discrete samples at multiple in-lake and tributary stations.

Achievements: In 2024, VLAP and its associated satellite laboratory at Colby-Sawyer College accomplished the following:

- 358 individual sampling events conducted by volunteers.
- 170 lake deep spots and 400 river/stream stations monitored.
- 114 in-person biologist visits conducted.
- 16,251 individual chemical and biological sample results generated.
- 184 individual lake reports generated summarizing current conditions, trends, observations and future recommendations.
- Approximately 3,570 hours collecting water quality samples.
- Approximately $124,000 value of volunteer time collecting water quality samples.

Quality Assurance measures: VLAP operates under an EPA-approved Quality Assurance Project Plan (QAPP), RFA# 24111, dated May 2024. VLAP is required to update the plan once every five years and submit it to EPA for approval. VLAP is also required to complete an annual program audit detailing any deviations from the methods and data criteria stated in the QAPP and resolutions to those deviations.

Funding: General Fund (1000 Account).

Program needs: VLAP receives requests from lake associations and Watershed Management Bureau staff to add lakes or increase monitoring to supplement the development of watershed management plans and to understand current lake conditions. VLAP is at its maximum capacity and can no longer accept new lakes. To provide expanded services requires additional staff to support operations in the Jody Connor Limnology Center and complete annual biologist visit trainings and audits at participating lakes.

1.3 Volunteer River Assessment Program (VRAP)

Challenges addressed: VRAP was initiated in 1998 to promote awareness and education of the importance of maintaining water quality in New Hampshire's rivers and streams. VRAP volunteers monitor water quality from May through October in rivers and streams throughout the state, allowing NHDES to analyze water quality trends, identify potential problems and fix them before they cause degradation in water quality.

Data usage: VRAP is primarily a data procurement mechanism to determine whether rivers or streams are impaired or potentially impaired based on surface water quality criteria and designated uses (e.g., swimming, fishing and aquatic life support). Data collected through VRAP are used to develop the federally required section 305(b) / 303(d) water quality report. Almost 40% percent of the surface water quality assessments of riverine assessment units included in the 2024 303(b) report was provided by VRAP. Currently this data contributed to the assessment of over 3,000 miles of rivers and streams.

Approach: VRAP conducts trend monitoring via repetitive visits to established sampling locations on an established schedule. Targeted monitoring is also conducted to investigate suspected sources of pollution or to measure the water quality impacts as they relate to changes in the landscape such as development.

Parameters measured: VRAP measures field parameters including dissolved oxygen, pH, turbidity, specific conductance, water temperature and flow. Laboratory parameters include *E.coli*, nutrients, chloride and chlorophyll-*a*.

Method of data collection: VRAP collects discrete samples at multiple river and riverine impoundment stations.

Achievements: In 2024, data generated by VRAP volunteers are summarized as follows:

- 30 VRAP groups supported.
- Approximately 200 river/stream stations monitored across 3,000 miles of streams.
- Approximately 5,782 individual chemical and biological sample results generated.

Quality Assurance measures: VRAP operates under an EPA-approved QAPP, recently updated and approved in December 2023. VRAP is required to update the plan once every five years and submit it to EPA for approval. VRAP is also required to complete an annual program audit detailing any deviations from the methods and data criteria stated in the QAPP and the resolutions to those deviations.

Funding: Federal funds (Account 7602).

Program needs: The day-to-day operations of VRAP are currently done by a part time staff member. If this position were to be made full-time it would reduce the need for assistance from current full-time staff, reduce turnover in the current part-time position and provide consistency in program operations.

1.4 River Trend Monitoring Program (RTMP)

Challenges addressed: RTMP began in the early 1970s, and prior to 2012, it was known as the Ambient River Monitoring Program (ARMP). In 2013, NHDES updated its surface water monitoring strategy to include 40 river and stream stations that are visited three to five times per year. The monitoring network includes stations that span a wide range of watershed sizes, levels of development and geographic locations. All Data collected are maintained in NHDES' Environmental Monitoring Database (EMD). The RTMP is implemented directly by NHDES staff and measures water quality in rivers and streams throughout the state. Ultimately, it is used by many programs both within the bureau and outside.

Data usage: RTMP is primarily a data procurement mechanism to determine whether river or stream conditions are declining, improving or remaining stable over time. The data are used to assess if river segments are impaired or potentially impaired, based on surface water quality standards and designated uses (e.g., swimming, fishing and aquatic life support). Data collected through RTMP are used to develop the federally required section 305(b) / 303(d) water quality report. In 2019, data collected, in part, through RTMP was used to complete a report on the status and trends of water quality conditions in New Hampshire rivers. This report is being updated in 2025.

Approach: RTMP conducts trend monitoring via repetitive visits to established sampling locations with the purpose of tracking water quality parameters over time. RTMP also conducts confirmation monitoring to determine if waterbodies can be removed from the 303(d) list. Targeted monitoring of previously unsampled waterbodies is also completed to gain additional information about the condition of New Hampshire surface water resources. Targeted sampling is done by sampling locations chosen from 10-digit hydrologic drainage units (HUC 10) using predetermined schedule.

Parameters measured: RTMP measures field parameters including dissolved oxygen, pH, turbidity, specific conductance and water temperature. These parameters are collected via instantaneous measurements and deployable multi-parameter dataloggers. Laboratory parameters include nutrients (nitrogen and phosphorus), chloride, chlorophyll-*a*, metals, cations and other parameters as needed.

Method of data collection: RTMP collects discrete and continuous samples at multiple river and riverine impoundment stations. In 2024, over 5,000 individual chemical and biological sample results were generated including:

- 160 site visits to 40 River Trend stations over 4 rounds of sampling.
- 66 site visits to 22 Synoptic stations over 3 rounds of sampling.

Quality Assurance measures: RTMP operates under an EPA-approved QAPP that is required to be updated every five years and submitted to EPA for approval. An updated QAPP received approval from EPA in 2024. The RTMP is also required to complete an annual program audit detailing any deviations from the methods and data criteria stated in the QAPP and resolutions to those deviations.

Funding: Federal funds (Account 7602).

Program needs: The River Trend Monitoring Program requires continued financial support for laboratory and equipment costs. Annual costs to process water quality samples through this program are approximately $30,000. The equipment used by this program includes both handheld meters and multiparameter dataloggers that require regular maintenance and replacement. A recently identified limitation is the lack of funds for laboratory analyses of contaminants of emerging concern, such as PFAS.

1.5 Lake Trophic Survey Program (LTSP)

Challenges addressed: LTSP was initiated in the mid-1970s to provide basic information on the hundreds of lakes and ponds in New Hampshire. The LTSP was revamped and reinitiated by the Biology Section in 2013 to generate periodic data on a portion of New Hampshire lakes and ponds.

Data usage: To establish or update lake trophic ratings and determine if waterbodies meet their designated uses as required by sections 305(b) / 303(d) report for the Federal Clean Water Act. In 2020, a report documenting the status and trends of lakes in New Hampshire was completed. The report is based, in part, on data collected as part of the LTSP.

Approach: Targeted monitoring. Lakes are selected from an annual schedule of targeted watersheds on a rotational basis using 10-digit hydrologic drainage units (synoptic monitoring). The selection process is conducted by several biologists in the WMB and takes into consideration the age of available water quality data, public accessibility and recreational use.

Parameters measured: At the deepest point(s) of a lake, a dissolved oxygen/temperature profile is collected, and the degree of stratification is assessed. Secchi depth transparency is measured. A composite water sample from the mid-metalimnion is collected and analyzed for Chlorophyll-*a*, and a plankton haul is collected to mid-metalimnion depth. A discrete mid-epilimnion sample is collected and analyzed for alkalinity, pH, conductivity, apparent color, chloride, calcium, magnesium, NO_2 and NO_3 nitrogen, TKN nitrogen, total phosphorus, potassium, sodium, sulfate, silica and dissolved organic carbon. If a hypolimnion is present, a discrete sample is taken from the mid-hypolimnion and analyzed for pH, conductivity, chloride and total phosphorus. Beginning in 2016, spring sampling after ice-out and shoreline habitat data collection at 10 stations around each waterbody was added for newly selected waterbodies.

Method of data collection: The LTSP collects discrete samples.

Achievements: In 2024, seven lakes were sampled. In addition to that, 10 lakes from 2022 were completed and 11 lakes from 2023 were continued. Overall, a total of 2,353 chemical records were generated. Additionally, the Squam Lake field sampling was concluded (report pending). Lake trophic survey reports can be found on the Lake Information Mapper.

Quality Assurance measures: LTSP's QAPP RFA #21039 was approved by EPA in 2015 and updated in 2021. All analyses are performed in accordance with the JCLC laboratory manual or the Department of Health and Department of Health and Human Services – Public Health Lab (DHHS-PHL) NELAC certification.

Funding: General funds (Account 1000) and federal funds (Account 7602).

Program needs: The LTSP requires continued financial support to maintain its current staffing level, laboratory analysis and field equipment costs. It is important to note, however, that there are often 50 or more candidate lakes with data that are 20 years or older. At the current level of support the program is only able to select around 10 new lakes each year for sampling. At this pace the NHDES will not be able to update the data on all lakes and ponds in New Hampshire without increased capacity for sampling.

1.6 Biomonitoring Program

Challenges addressed: The biomonitoring program was established in 1995 to determine the ability of the state's surface waters to support a healthy community of aquatic organisms. Sampling is completed each in summer and fall and serves to satisfy federal water quality reporting requirements under sections 303(d) / 305(b) for the Clean Water Act. To date, sampling by the biomonitoring program has been primarily focused on rivers and streams.

Data usage: Data produced through the biomonitoring program are used to complete water quality assessments to determine whether rivers or streams are impaired or potentially impaired, based on surface water quality criteria and designated uses (aquatic life support). Biological data are used in the development of water quality criteria and in making regulatory decisions. Data collected through the biomonitoring program are used to develop the federally required section 305(b) / 303(d) water quality report. The data are also used to track site-specific trends in biological condition and characterize the variability associated with macroinvertebrate data.

Approach: Starting in 2013, biological monitoring expanded to support three elements of the NHDES surface water quality monitoring strategy: trend, synoptic (targeted) and probability-based monitoring. Trend monitoring is conducted in collaboration with River Trend Monitoring Program and encompasses approximately 28 long-term biological monitoring stations monitored annually. Synoptic monitoring selects 30-50 biological monitoring stations within specified HUC10 watersheds each year. Probability-based monitoring randomly selects 14-20 biological monitoring stations a random set of stations as provided by EPA. In 2024, the biomonitoring program assisted other WMB staff with deployment and retrieval of 43 water temperature loggers and completing water quality monitoring at 40 trend monitoring sites between May and October. Biomonitoring staff were responsible for coordinating the collection and data processing of macroinvertebrate data at 28 trend, 12 synoptic, six probability and four regional monitoring sites. With assistance from WMB staff, rock baskets were deployed in July/August and retrieved approximately eight weeks later. Collection of fish data occurred for 67 events at 65 locations. This included both wadable and boatable fish surveys for trend, synoptic and probability-based monitoring. Since 2014, NHDES and the New Hampshire Fish and Game Department have worked cooperatively to complete fish surveys at 26-28 trend sites every four years.

Parameters measured: Fish, macroinvertebrates, dissolved oxygen, pH, specific conductance, water temperature, flow, physical habitat characters and various laboratory generated water chemistry parameters.

Method of data collection: Discrete water quality samples and physical habitat measurements. Continuous water temperature data. Surveys of biological communities including fish and macroinvertebrates.

Achievements: In 2024 the Biomonitoring Program collected the following data:

- Temperature Loggers: Assisted other WMB staff with deployment and retrieval of 43 water temperature loggers.
- Water Quality: Assisted WMB staff with water quality monitoring at 69 trend, synoptic and probability sites.
- Macroinvertebrate samples: Deployment and retrieval of 154 samples at 64 sample sites (>34,000 data points).
- Fish surveys: 67 sample sites (>12,000 data points).

Quality Assurance measures: The Biomonitoring Program operates under the RTMP QAPP, an EPA-approved QAPP that is required to be updated every five years and approved by EPA. The QAPP most recently received EPA approval in 2025. The Biomonitoring Program is also required to complete a bi-annual program audit detailing any deviations from the methods and data criteria stated in the QAPP and resolutions to those deviations. Specifics on the Biomonitoring Program's quality assurance/quality control (QAQC) efforts can be found in Section 2.4.

Funding: Federal funds (Account 7602).

Program needs: The Biomonitoring Program requires continued support for sample processing, supplies and equipment on an annual basis. Although expensive, the program would be enhanced by microalgal sampling and toxicological analysis.

1.7 Fish Tissue Mercury Monitoring Program

Challenges addressed: To collect data on the mercury content in tissue of freshwater fish species within the State of New Hampshire. The source of mercury contamination is from airborne stack emissions regionally and from the west due to prevailing winds. This makes mercury contamination of fish a widespread problem in New Hampshire.

Data usage: The data are used to conduct risk assessments for mercury exposure from fish consumption. Risk assessments are used to update statewide and, if appropriate, waterbody-specific fish consumption advisories. The data are also used to track trends over time in the mercury content in fish tissue. A summary report was initiated in 2015 and was finalized in 2018. The report includes data from 1992 through 2017.

Approach: Trend and targeted monitoring. Most samples are supplied by volunteers who bring in fish from the lake where they live or often fish. Additional fish may be obtained through specific studies related to regulatory changes designed to reduce the deposition of atmospheric mercury. Additionally, certain waterbodies have been targeted for long-term collection to perform trend monitoring.

Parameters measured: Mercury content in fish tissue expressed as mg of elemental mercury/kg of fish, weight and length of the fish.

Method of data collection: Discrete.

Achievements: In 2024, 88 fish were analyzed and additional fish were brought in for analysis in the winter/spring of 2025. Mercury in fish tissue data for 239 lakes can also be found as individual waterbody mercury reports on the Lake Information Mapper.

Quality Assurance measures: The scale used for the weight is inspected and certified annually by a third party (contractor). Blanks, duplicates, continuing calibration verification (CCV) and spikes are performed in accordance with JCLC laboratory manual protocols.

Funding: General Fund (Account 1000B).

Program needs: A revised sampling design is required to maintain consistency in the number of fish analyzed, waterbodies sampled and fish species assessed. Implementation of the revised design requires collaboration from the Fish and Game Department.

1.8 Acid Rain Deposition Program

Challenges addressed: To collect data on acid rain deposition and determine its effects on sensitive lakes and ponds. Acid deposition is caused when SO_2 and NO_X is released into the atmosphere from burning hydrocarbon fuels. In New Hampshire most emission sources result from westerly stack emissions brought in on prevailing winds, regional stack emissions and automotive emissions.

Data usage: Data are used to conduct trend analysis on the effects of acid rain deposition and the effectiveness of air pollution regulations. Data have been used by the New Hampshire Fish & Game Department to make stocking decisions on acid sensitive ponds and lakes. In 2015, a summary report was completed utilizing data collected from the mid-1980s through 2014.

Approach: Trend Monitoring. Lakes and ponds included in this monitoring program have been monitored consistently for more than 30 years. Twenty ponds are sampled by WMB staff, and 10 remote ponds are sampled cooperatively by the New Hampshire Fish & Game Department during helicopter stocking. Rain is also collected in Concord, New Hampshire and analyzed to verify source inputs to lakes and ponds.

Parameters measured:

- Lakes/Ponds **–** pH, acid neutralizing capacity, conductivity, color, sulfate, nitrate and chloride.
- Rain – pH, nitrate, sulfate and total phosphorus.

Method of data collection: Discrete. Samples are collected from specified lake outlets in fall and spring. Rain event samples are collected at NHDES headquarters in Concord.

Achievements: In 2024, 397 chemical records were generated to support the remote and non-remote lakes monitoring effort during the spring and fall collection events. A total of 16 rain/snow events were collected resulting in 149 chemical analyses.

Quality Assurance measures: This program is included in the Lake Trophic Survey Program QAPP that was approved by EPA in 2015 and updated in 2021.

Funding: General funds (Account 1000B) and federal funds (Account 7602).

Program needs: Continued support for current staffing, laboratory analyses and equipment needs.

1.9 Surface Water Quality Complaints

Challenges addressed: Investigate concerns impacting surface water quality reported to the Watershed Management Bureau by staff and the public.

Data usage: Data are used to evaluate whether an issue or water quality criterion violation exists. If an issue exists, there may be administrative action taken by NHDES or a referral to another agency for action to be taken.

Approach: If an investigator deems monitoring is warranted, targeted sampling is completed at strategically located stations. All complaints are logged into a complaint module of the Environmental Monitoring Database (EMD).

Parameters measured: Depends on the nature of the complaint.

Method of data collection: Continuous monitoring or discrete samples depending on the nature of the complaint.

Achievements: In 2024, 103 complaints were received, 32 were investigated, 34 were office resolved and 37 were referred to or worked with other bureaus. No samples were processed for complaints in the JCLC.

Quality Assurance measures: Parameter specific based on the JCLC Laboratory Manual or DHHS water lab protocols.

Funding: General funds (1000 account).

Program needs: This program is administered by one person who has other duties. In the summer when monitoring activities are at their maximum, resources for field investigations and sampling are limited. These resources include vehicles and sampling equipment.

1.10 Public Bathing Facility Program (PBFP)

Challenges addressed: RSA 485A:26 requires NHDES to operate a year-round statewide program to ensure health and safety of public bathing facilities such as pools and spas. Exposure to contaminated, poorly managed and maintained pool and spa water in New Hampshire has resulted in lung, skin, ear and eye infections, as well as gastric illness caused by pool chemicals or airborne and waterborne pathogens such as Legionella, Cryptosporidium, Giardia, Staphylococcus, Norovirus and E. Coli. The program has established standards of design and operation to ensure that construction provides for safe use, that scheduled maintenance is regularly performed, and that water quality is routinely monitored and always maintained.

Data usage: Data generated through PBFP are used to evaluate facility compliance with state and federal public health and safety laws, determine enforcement actions, prioritize seasonal/regional inspections, shape educational outreach efforts and make historical comparison to evaluate program effectiveness. The U.S. Center for Disease Control makes periodic requests for data in studying chlorinated aquatic venues.

Approach: Targeted monitoring. PBFP conducts periodic routine inspections to evaluate public health and safety and responds to illness complaints.

Parameters measured: PBFP measures a total of 10 chemical and biological parameters. In-situ analysis includes temperature, pH, free chlorine, total chlorine, combined chlorine, bromine, turbidity, total dissolved solids, cyanuric acid, hardness and alkalinity. Field samples are submitted to DHHS-PHL for *E. coli* and total coliform analysis.

Method of data collection: PBFP collects discrete samples at public bathing facilities statewide.

Achievements: In 2024, inspection activity included pre-opening inspections, routine inspections and complaint investigations. In total, the PBFP achieved the following:

- 196 facility inspections (1 complaint inspection, 1 complaint/illness inspection, 1 follow-up inspection, 173 routine-inspections, 20 pre-opening inspections).
- Collected 135 samples for chemical analysis.
- Identified 12 water quality violations.
- Found 6 safety/facility violations.
- Issued 0 Letter of Deficiencies.
- Issued 3 Notice of Deficiencies.
- Issued 8 Emergency Closures.
- Issued 14 full design permits for new construction.

Quality Assurance measures: Follows and updates the PBFP Field Inspection QA & SOP manual (last updated April 24, 2025). PBFP staff follows JCLC quality assurance measures for specific analysis. PBFP is also required to complete an annual program audit detailing any deviations from the methods and data criteria stated in the QA manual and resolutions to those deviations.

Funding: Newly established dedicated account (1045) – funded by design review fees and annual PBF self-certifications.

Program needs: Significantly understaffed program. There is only one full-time employee to administer this program, more employees are needed to properly inspect facilities, test, complete design reviews and provide assistance to the nForms program.

1.11 Beach Inspection Program

Challenges addressed: Since the 1970s, the Beach Inspection Program has been protecting the public health of swimmers. To do so, freshwater and coastal beaches are monitored for the presence of fecal bacteria during the swim season (Memorial Day to Labor Day). All New Hampshire coastal beaches are sampled on either a bi-monthly, weekly or bi-weekly schedule. A selection of New Hampshire's freshwater beaches are sampled on a monthly or semi-monthly (heavily used State Park Beaches) schedule. When fecal bacteria results exceed the state criteria an advisory is issued. During an advisory, informative signs will be present at the beach and the online Healthy Swimming Mapper is updated to warn the public that the water is not suitable for swimming. An advisory does not close a beach but instead informs the public of a potential health risk.

Data usage: Data collected is used in making public health decisions by issuing advisories and informing the public of potential health risks. Individual reports are generated using data collected at each beach and made available to the public as an information tool. Data is also utilized in the assessment process of the federally required section 305(b)/303(d) water quality report.

Approach: Targeted monitoring. Routine inspections are conducted at a beach to evaluate public health and issue advisories when necessary. Samples are collected at predetermined stations during scheduled inspections. Resampling is completed at all stations of a beach after an advisory is issued and will continue until the fecal bacteria levels are within the state criteria.

Parameters measured: Water samples are analyzed for the presence of *E. coli* at freshwater beaches and enterococci at coastal beaches. Beach inspections also include collecting water temperature, salinity (coastal waters only), tide level (coastal waters only), water conditions, number of bathers, number of waterfowl and number of dogs. Other comments or concerns are noted during beach inspections.

Method of data collection: Discrete data points are collected during each beach visit.

Achievements: During the 2024 summer swim season, NHDES personnel collected 753 enterococci samples from 16 coastal beaches. Based on these samples, 20 advisories were issued at 8 different beaches, resulting in 55 total advisory days. NHDES personnel also collected 740 *E. coli* samples from 62 freshwater beaches. Based on these samples, 34 advisories were issued at 24 different beaches.

Quality Assurance measures: An EPA-approved PBIP QAPP was updated in May 2022 (RFA# 22075).

Funding: Federal funds, Org. Code: 2065, Approximately $194,000 per year.

Program needs: In recent years, there have been frequent changes in the freshwater beach sampling schedule. There is a need to establish a routine schedule that will help increase the sampling frequency at popular beaches with reoccurring advisories. The Beach Inspection Program does not have the staff or time capacity to sample all New Hampshire freshwater beaches, so there continues to be towns or lake associations interested in completing their own sampling. These volunteer beach inspection efforts require the creation of protocols for towns or lake associations so that additional samples are collected effectively and produce valuable data that can be combined with the Beach Inspection dataset.

1.12 Clean Vessel Act (CVA) Program

Challenges addressed: The New Hampshire CVA program works to ensure that wastewater from boats is disposed of properly. Given the vast and growing number of boaters in New Hampshire, education is much more important than enforcement. The program works with marinas and the boating public to educate boat owners about how to manage sewage and graywater in a way that protects New Hampshire's surface water quality. The program provides funding for mobile and stationary pumpout facilities to ensure plenty of options for wastewater offload are available.

Data usage: The locations, availability and status of operation of stationary and mobile pumpout resources are tracked to provide this information to the public boating community and to identify potential CVA funding assistance opportunities. Additionally, data from the mobile pumpout services are collected and stored.

Approach: Targeted information is collected annually about stationary and mobile pumpout resources through grantees, contractors and facility owners. The CVA program offers grants year-round to help keep pumpouts operational.

Parameters measured: Information collected may include the location of the pumpout resource, whether it is stationary or mobile, marina amenities, pumpout system mechanical information, system availability, usage fee collected (if any), participant contact information, vessel name, vessel type and estimated wastewater gallons pumped. Information for the boat inspection database is collected from individual boat registrations and wastewater systems that include graywater and marine sanitation devices. Details on location, dates of inspections and/or re-inspections, and compliance/non-compliance issues are documented by the boat inspector.

Method of data collection: Staff use data sheets for site visits of a stationary facility. Grantees are required to document boater information and wastewater estimates in logbooks to receive annual reimbursement for upkeep costs. The mobile pumpout services collect information using a physical receipt during each service. The boat inspection program collects data on physical forms or may enter directly onto a laptop in the field if one is available.

Achievements: In 2024, the program accomplished the following:

- The mobile pumpout boat documented about 762 captain hours, 491 boats serviced and approximately 14,709 gallons of wastewater pumped.
- Since 2002, the mobile pumpout service has pumped off approximately 260,000 gallons of boat wastewater.
- Provided operations and maintenance reimbursement funding to three contracted marinas to defray their annual costs and ensure stationary pumpout facilities remain open and accessible to the boating public.

Quality Assurance measures: Input from data sheets, logbooks and receipts are verified either by the seasonal intern or CVA program coordinator. Boat inspection database entries are reviewed by either the boat inspection program staff or CVA program coordinator.

Funding: Federal Funds, Org. Code 2061, SFY 2022/2023, $272,033.

Program needs: Currently, the program funds 50% of a full-time staff position as the program coordinator. Future goals include decreasing the federally funded portion of the coordinator's salary to 25% and using state funds to account for the other 25%; this will aid the program in reaching its matching fund goal as required by the federal grant. The coordinator aims to increase the number of contracts with marinas and other stationary facilities for operations and maintenance reimbursement sub-grants, which will create the need for a summer intern position which hasn't been posted or occupied since 2019.

1.13 Exotic Species Program

Challenges addressed: The primary purpose of New Hampshire's Exotic Aquatic Plant Program is to "prevent the introduction and further dispersal of exotic aquatic weeds and to manage or eradicate exotic aquatic weed infestations in the surface waters of the state" (RSA 487:17, II). Aquatic invasive species are a constant threat to the ecological, biological, recreational and economic values of New Hampshire's waterbodies. Infestations lead to waterbody impairments and reduced values of the resource.

Data usage: Data generated through the Exotic Species Program are used to guide control activities on waterbodies. Data are also used to track concentrations of aquatic herbicides that may be used in various waterbodies and to determine the presence/absence of invasive aquatic plants in waterbodies.

Approach: Trend Monitoring. Repetitive visits are made to infested waterbodies to track infestations (size, density, distribution) over time. Targeted water quality monitoring may also be performed to document conditions before, during and after implementation of the control practices.

Parameters measured: Plant location, density and percent cover are surveyed annually on infested waters. Water depth, clarity, dissolved oxygen concentrations, herbicide concentrations, nutrient concentrations, temperature and turbidity may also be monitored as part of these projects.

Method of data collection: Discrete samples and observations at multiple stations in lakes and ponds for plant surveys or as needed for special studies. Data loggers are occasionally deployed for continuous data collection for parameters like dissolved oxygen.

Achievements: In 2024, the Exotic Species Program collected the following data:

- 97 infested waterbodies, with 131 total infestations (some waterbodies have more than one species of invasive present).
    - No new infestations were documented during the summer of 2024.
- >500plant identifications.
- >100 field inspections (mapping with GPS, site visits for presence/absence, point intercept surveys and qualitative assessments).

Quality Assurance measures: Activities performed by the Exotic Species Program are described in the Quality Assurance Project Plan for the program, which was approved in 2014 by EPA, with an update and revision approved by EPA in 2019. An update to the QAPP is underway as of winter 2024.

Funding: State Fee Funds derived from boat registrations total approximately $893,000 annually.

Program needs: Additional funding is needed to expand control efforts. Currently, just under half of the waterbodies with infestations are being managed. Grant awards for management are provided by the state, but local entities assume at least 50% of the cost of management on the municipal or non-profit level. Also, additional work is needed to expand knowledge of the out-of-state boater decal requirement that was initiated in June 2021, so that more boaters visiting New Hampshire are aware of the need for a decal, if their vessel is registered in a state other than New Hampshire. Over winter of 2024 the sales platform for decals was migrated in house to nForms to save costs by letting a contract with an outside vendor expire.

1.14 Chloride Reduction efforts

Challenges addressed: Chlorides are toxic to aquatic organisms, plants and to the infrastructure that supports our roads and bridges. NHDES has measured increasing chloride pollution in both lakes and rivers over the past 20 years. The primary source of those chlorides is road salt used for winter maintenance. NHDES has a few programs to address this issue that include implementation monitoring for chloride Total Maximum Daily Loads (TMDL) of water bodies in the vicinity of the I-93 corridor from Massachusetts to Manchester, New Hampshire, and a voluntary commercial salt applicator certification program (Green SnowPro or GSP). Each of these programs has been successful in their respective efforts to reduce chloride contamination of the environment.

Data usage: The data is used to determine track surface water trends, compliance with the TMDLs, and judge success of the commercial salt applicator program.

Approach:

- Monthly monitoring at river trend monitoring sites and lakes that participate in VLAP.
- Investigation into identified rivers and lake where high chloride is detected.
- Number of approved certified applicators.

Parameters measured (TMDL, River Trend, VLAP): Temperature, specific conductance and chloride. The chloride samples are processed in the Jody Connor Limnology Center**.**

Parameters measured (GSP): Applications received and meeting the approval criteria as specified in RSA 489-C.

- Method of data collection (TMDL): Continuous (datasonde) and discrete (chloride).
- Method of data collection (GSP): Electronic (PDF or Word attachments), facsimile or direct mailing of hard copy applications.

Achievements:

- Long-term data from 40 trend stations.
- Active investigation as needed at location with elevated chloride.
- Over 1,200 certified salt applicator certificates issued since 2011.

Quality Assurance measures (TMDL): A full description of all the data quality control measures are contained in a 2006 EPA-approved QAPP, the 22024 River Monitoring Program QAPP and updated field SOPs for the I-93 Implementation monitoring.

Quality Assurance measures (GSP): Certified Salt Applicators must apply for certification annually and meet the requirements listed in the RSA.

Funding (TMDL): NHDES has expended all the funding dedicated for the TMDL and monitoring by NHDOT as part of the I-93 study. Addition monitoring funds may become available as a result of the future Exit 4A project.

Funding (GSP): The Commercial Certified Salt Applicator Program became fee-based as of June 2018. Application costs are tiered and written into the RSA. These funds support a part-time Salt Reduction Coordinator position within NHDES.

Program needs (GSP): The Green SnowPro salt reduction coordinator position was filled in August 2018. The position is part-time and tasked with processing hundreds of applications each year, planning for the annual Salt Symposium, organizing and hosting full and refresher training courses, assisting with database development, conducting outreach, education and evaluating and implementing new marketing opportunities. The scope of work associated with this program merits a full-time coordinator.

1.15 Shellfish Program

Challenges addressed: The mission of the Shellfish Program is to ensure that the shellfish harvested in New Hampshire meet standards for human consumption. The program monitors coastal waters for bacteria, viruses and algal blooms that produce biotoxins that can accumulate to potentially fatal levels in shellfish. The program creates the regulatory conditions that allow the commercial shellfish industry to legally harvest and engage in interstate commerce. Recently, the commercial shellfish industry has grown rapidly in New Hampshire, adding two to three commercial aquaculture farms per year since 2011. In 2024, there were 32 oyster farms, three oyster upwellers and three blue mussel farms. The program also ensures the safety of recreational shellfishing.

Data usage: Data generated by the Shellfish Program are used to prepare and update Sanitary Survey reports for the eight major shellfish growing areas in the state's jurisdiction. Data generated by the program are also used to make daily and weekly management decisions regarding which harvesting areas are open or closed based on current information on public health threats such as red tide levels, recent rainfall, boating and mooring surveys and others. These decisions are communicated through a hotline message and internet-based tools.

Approach: The shellfish monitoring program implements a systematic random sampling program to maintain updated bacteria data on 70 monitoring stations in the state's tidal waters. Data from event-based seawater and shellfish tissue testing after pollution events such as heavy rainfall events are used to supplement the ambient program and to support management decisions. Additional monitoring programs include Harmful Algal Bloom Monitoring, Shoreline Survey Program, a monitoring program focused on *Vibrio* bacteria risk assessment, and sampling focused on viral indicators of sewage pollution.

Parameters measured: Seawater and shellfish tissue sampling programs document fecal coliform bacteria, water temperature, salinity and other observations; phytoplankton monitoring and biotoxin levels in blue mussels and other shellfish species; water temperatures near commercial oyster farms and Vibrio bacteria levels in oysters; and Male Specific Coliphage (virus) levels in municipal wastewater treatment facility effluent, as well as in oysters, softshell clams and blue mussels.

Achievements: In 2024, the Shellfish Program accomplished the following:

- 49 rounds of sampling on tidal waters.
- 900 seawater samples collected.
- 20 rounds of sampling in response to rainfall events.
- 31 red tide samples collected.
- 202 rounds of phytoplankton/seawater sampling completed for harmful algal bloom identification.
- 486 commercial harvesting decisions generated.
- 137 wastewater treatment facility calls evaluated.
- 66 harvesting hotline updates implemented.
- 2080 properties surveyed and tracked for pollution.
- 12 marina/mooring field surveys performed.
- 937 pollution sources tracked.
- 40 rounds of pollution source sampling completed.

Quality Assurance measures: The Shellfish Program operates under three EPA-approved Quality Assurance Project Plans (QAPPs). The five-year updates for the Quality Assurance Project Plan for Shellfish Ambient Monitoring was approved in April 2024. The five-year updates for the Quality Assurance Project Plan for Shellfish Sanitary Surveys was also approved in April 2024. The May 2013 "Red Tide" monitoring QAPP is being revised into a "Harmful Algal Bloom" QAPP that will

incorporate new monitoring programs involving weekly sampling and enumeration of selected marine phytoplankton. This QAPP will be submitted to EPA for review and approval in 2025. The Shellfish Program is also required to complete a program audit every other year detailing any deviations from the methods and data criteria stated in the QAPPs and resolutions to those deviations.

Funding: General fund (1523) FY 24 $492,636.

Program needs: Increased capacity for offshore/nearshore monitoring of Harmful Algal Blooms needs to be developed, especially with respect to the algae genus *Pseudo-nitzschia*, and the biotoxin domoic acid. Increased capacity for laboratory testing of shellfish tissue and field screening methods for marine biotoxins is needed. Increased capacity for managing growing commercial aquaculture industry also needed.

1.16 Special Studies

Challenges addressed: Short-term monitoring to collect data for the purposes of evaluating the environmental impact of a temporary event such as construction, answer a specific scientific question, evaluate a data collection method or solve a specific problem within a waterbody or watershed.

Data usage: The primary use of data will fulfill the goal of the study. Any ambient monitoring data will be available via the EMD for other programs to use.

Approach: Targeted monitoring approach.

Parameters measured: Determined by study design.

Method of data collection: Determined by study design.

Achievements: NHDES partnered with EPA for the National River and Stream Assessment. All samples were submitted to EPA or other laboratories or affiliates.

Enhanced monitoring was performed on Partridge Lake in Littleton, Tucker Pond in Salisbury and Province Lake in Effingham as part of proposed or future lake or watershed restoration projects. Each of these waterbodies has sustained cyanobacteria blooms in recent years.

NHDES Biologists also assisted with monitoring activities on Lake Kanasatka in Moultonborough as part of the aluminum treatment in June 2024. Monitoring continued for a fourth year following the 2021 aluminum treatment on Nippo Lake in Barrington, to track in-lake phosphorus and phytoplankton populations, among other parameters.

Bi-weekly monitoring was conducted at Marsh Pond in New Durham throughout the season, as part of a water quality violation at the Powder Mill Hatchery on the Merrymeeting River.

Quality Assurance measures: As determined by study design.

Funding: Various.

Program needs: A sustained source of funds is required to support focused lake studies where cyanobacteria blooms occur regularly. These funds would be used to identify the source of nutrient loads, level of cyanobacteria toxicity and bloom likelihood, and implementation of lake management actions to reduce cyanobacteria bloom likelihood.

1.17 Cyanobacteria Harmful Algal Bloom (CyanoHAB) Program

Challenges addressed: CyanoHAB program personnel collect water from lakes, ponds and rivers in response to the presence of reported algal and cyanobacteria blooms. When a cyanobacteria bloom is observed, the public is encouraged to take a photo and report the location of the bloom using a standardized bloom report form. When the cyanobacteria cell counts are higher than the state's recreational threshold (70,000 cells/mL), a warning is issued to notify the public of its severity. If a sample is below but approaching the recreational threshold, or if a picture of a likely bloom event is submitted but a sample cannot be reviewed, a watch is issued. Current warnings and watches can be found on the Healthy Swimming Mapper. The program also responds to complaints about other algae and suspicious anomalies needing microscopic identification.

Data usage: Data collected is used in making public health decisions by issuing warnings and watches to inform the public of potential health risks. These data are also used to determine impairment for the 303(d) list of impaired waters. Cyanobacteria data further help to inform the safety of surface water supplies for public drinking water.

Approach: Targeted data collection. Samples are collected from the location(s) of the complaint that was reported. Public access sites such as beaches and boat launches are often also sampled. Follow up sampling at waterbodies with warnings is completed weekly until cyanobacteria levels fall below the state's recreational threshold.

Parameters measured: Samples are microscopically analyzed, identifying the algae or cyanobacteria present, and enumerating the cyanobacteria in cells/mL. During the winter, select samples are analyzed for cyanotoxins by way of enzyme-linked immunosorbent assay (ELISA). Additionally, the extent of bloom, weather and any other concerns or comments are noted during site inspections. Warning data are entered under complaints of the EMD.

Method of data collection: Grab samples or discrete data points are collected during each inspection.

Achievements: In 2024, a total of 771 samples were collected and microscopically analyzed from New Hampshire waterbodies following bloom complaints. In total, 66 warnings were issued at 43 waterbodies and 71 watches were issued at 45 waterbodies. Around 200 samples were evaluated for the cyanotoxins Microcystins, Cylindrospermopsin, Anatoxin-a and BMAA. Following completion of the "New Hampshire's Cyanobacteria Plan: A Statewide Strategy" in 2023, new tools were updated and fully implemented. This included the Healthy Swimming Mapper with more information including photos of the bloom, and a new standardized Bloom Report Form. Changes were also made to streamline communication. A weekly statewide cyanobacteria update is shared widely from May 15 through October 15, and a new form was created for folks to sign up for email updates for specific waterbodies. An additional full-time employee was trained to run the program and perform the required cyanobacteria identification and cell counts. NHDES also completed "New Hampshire's Cyanobacteria Plan: A Statewide Strategy" and Bloom Report form. An additional full-time employee was trained to perform the required cyanobacteria identification and cell counts and able to assist in running the program.

Quality Assurance measures: SOPs and QAPPs are under development.

Funding: General funds, Org. Code: 1000.

Program needs: This newly formed program needs an approved QAPP that details the operations for data management, communication and reporting for cyanobacteria blooms and algal complaints. There is a dire need for data management, particularly with cell counts and toxin data, and possibly a program-specific database, if funds are available. While the new tools and communication streamlining have helped, program demand continues to significantly increase. There is a need for more staff to run the monitoring part of the program and assist with education and outreach. There is also a need for staff to connect waterbodies with frequent cyanobacteria blooms to funding that can support management options.

1.18 Surface Water Quality Assessment (305(b)/303(d)) Program

Challenges addressed: The water quality status of New Hampshire's surface waters are reported in accordance with Section 305(b) and 303(d) of the Clean Water Act (CWA), and New Hampshire Statutes Chapter 485-A:4.XIV. Per the CWA, assessments are to be completed biennially on even numbered years.

Data usage: Assessments are viewed and used by the general public, local, state and federal agencies, as well as non-governmental organizations. Assessment results are formally sent to EPA for transmital to Congress. All assessment results are made availiable to the public via the program website and a web-based data mapper.

Assessments determine if a waterbody meets its designated uses. Waters that do not meet one or more designated use are considered impaired. In cases where a waterbody meets one or more of its designated uses, protection measures may be an appropriate management action. The Surface Water Quality Assessment Program does not take any actions based upon the attainment determinations, but rather, provides that information to other programs. Impaired waters become eligible for 319 restoration funds. Impairment status may influence certain permitting actions.

Method of data collection: The primary source of data for the assessments is the EMD. Every two years, as part of the assessment process, a snapshot of all the surface water samples are imported to the Supplimental Assessment Database (SADB) for processing and tracking. The snapshot includes discrete and continuous data records.

Achievement: For the 2024 assessment cycle, the Surface Water Quality Assessment Program reviewed the following to complete designated use support decisions:

- 244 different project sources of data.
- 9,997 monitored stations.
- 483,900 individual sampling events.
- 558,167 day/parameter combinations from datalogger record sets.
- 1,977,897 individual chemical and biological grab sample results.
- 5,129,999 individual water quality standard comparisons were made.

Quality Assurance measures: In addition to the quality assurance methods of each of the data sources, the assessment is guided by set of standard procedures called the Consolidated Assessment and Listing Methodology (CALM). More information is available on CALM on the Surface Water Quality Assessment publications website.

Assessments are conducted in a stepwise fashion. First, the SADB manages all imported sample data and performs the initial sample level water quality standard comparisons. Next, each waterbody/parameter combination is summarized in bulk and those bulk assessments are quality assured by a second individual. Third, the detailed lists of waterbodies with significant changes and/or borderline assessments are subjected to detailed review using a tool that allows all samples to be paired up with weather and flow data. Finally, all new impairments and de-impairments are vetted through professional staff to confirm that the data are sufficient to support those decisions.

Funding: Federal funds, Org. Code: 7602.

Program needs: The process of the biennial vetting of assessments through NHDES professional staff could be streamlined.

1.19 TMDL Program

Challenges addressed: The TMDL Program develops pollution control plans for impaired waters. TMDLs have been developed for rivers and streams, lakes and ponds, estuaries, and beaches. In the past several years the focus of TMDL development has been on bacteria and nutrient impairments. In 2024 the TMDL Program completed the *The New Hampshire 2022 – 2032 Vision for the Clean Water Act Section 303(d) Program* which provides guidance and priorities for the program. Human health and aquatic life impacts related to bacteria and nutrients will continue to be prioritized, with chloride impairments added to the prioritization list.

Data usage: The TMDL Program uses in the NHDES Environmental Database (EMD) to estimate nutrient loads and develop estimated reductions necessary to achieve water quality targets. Where needed, supplemental data are collected to develop, update and/or confirm existing data.

Approach: Data used in the development of TMDLs are targeted to the specific waterbody of interest or those draining into or out of the waterbody of interest.

Method of data collection: When necessary, the TMDL program collects discrete and continuous data in lakes, ponds, rivers and streams where applicable to develop each TMDL project. Samples are collected following the applicable EPA approved programmatic QAPP(s).

Achievement: As of 2024, EPA has approved over 700 TMDLs in New Hampshire, which apply to over 5,000 waterbodies. *The New Hampshire 2022 – 2032 Vision for the Clean Water Act Section 303(d) Program* was completed and made available in December 2024

Quality Assurance measures: The TMDL program uses data in the EMD that has been collected according to an EPA approved programmatic QAPP. The TMDL program is also required to complete an annual program audit detailing any deviations from the methods and data criteria and resolutions to those deviations.

Funding: Federal funds, Org. Code: 7602.

Program needs: The program would benefit from additional staff resources to develop TMDLs.

1.20 Rivers and Lakes Management and Protection Programs

Challenges addressed: The Rivers and Lakes Management and Protection Programs provide a mechanism for public recognition and management of important state waterbodies. The programs participate in the development and implementation of statewide surface water management policies.

Data usage: The Instream Flow (ISF) Program uses stream flow data to determine when management such as reducing water use and conducting dam releases is needed on rivers for which protected instream flows have been established. The Program also measures river stage and flow to develop rating curves for locations with streamflow stations.

Method of data collection: Continuous, seasonal data records are obtained for stream flow, conductivity, water level and water temperature using dataloggers. Near real-time river stage data are collected using wireless streamflow stations and posted to the public via online dashboards. Discrete field measurements of stream velocity, depth and width are collected to estimate stream flow. Fish communities are regularly monitored using electrofishing surveys. Riparian ecosystems are periodically monitored by field survey, mapped with a combination of auto level survey for elevation and sub-meter GPS survey for location.

Achievements:

- 19 Designated Rivers; 1,010 total Designated River miles.
- 20 active Local River Management Advisory Committees (LACs).
- 200+ active volunteers.
- 284 permit applications reviewed by local citizens in 2024.
- 7 proposals for disposal of state-owned land were reviewed in 2024 to ensure that public access to state waters is maintained.
- 59 letters of testimony submitted during the 2024 New Hampshire legislative session by the state-wide Rivers and Lakes Management Advisory Committees.
- Assisted one LAC with an approved grant application to update their river corridor management plan.
- ISF staff began conducting dam release testing needed to draft the Ashuelot River Water Management Plan.
- Fieldwork for Protected Instream Flow Studies began on the Isinglass River and the Pemigewasset River.
- 56 dataloggers collected baseline water quality data in six designated rivers.
- Fish surveys were performed on the Ashuelot, Isinglass and Warner Rivers; riparian ecosystem surveys were completed on the Isinglass and Pemigewasset Rivers.
- The ISF Program maintained 11 real-time stream flow stations on the Ammonoosuc, Contoocook, Lamprey, Piscataquog and Swift rivers.

Quality Assurance measures: Elevation surveys and stream flow measurements are assessed by duplicate measurements to evaluate the variability of individual measurements and estimate the overall accuracy of the results. Water temperature and specific conductivity datalogger results are compared to replicate data from hand-held meters.

- NHDES Instream Flow Priorities for Annual Monitoring/Sampling.
- NHDES Instream Flow Protocols for Field Data Records.
- NHDES Instream Flow Protocols for Performing Instream Flow Studies.
- NHDES Instream Flow Protocols for Conductivity, Temperature, and Water Level Dataloggers.
- NHDES Protocols for Long-Term Monitoring of Riparian Ecosystems.
- NHDES Procedures for River Stage and Streamflow Measurement.
- NHDES Protocols for Streamflow Station Data Management (in development).
- NHDES Protocols for Stream Gradient and Floodplain Transect Survey.

Funding: General Funds: Org. Code 1518 (FY2024 $567,545); Federal Funds: Org. Code 7602 (FY2024 $111,505).

Program needs: The ISF Program needs additional contract funds of $200,000+ per year over FY24 funding levels to hire consultants to develop protected instream flows at the target rate of one river per year. Budget cuts have resulted in larger rivers requiring up to four years for development of protected instream flows. The Program also needs one additional part-time aquatic biologist to evaluate fish and wildlife health and to develop long-term monitoring protocols for determining the effectiveness of program implementation. The ISF Program depends heavily on the Dam Bureau staff to operate dams as part of management. Support for the staffing of Dam Bureau is needed to allow them to support the ISF Program.

The Lakes Management and Protection Program requires funding for a Lakes Coordinator to provide support to the Lakes Management Advisory Committee and lake management efforts throughout the state. The Lakes Program is currently unfunded.

1.21 Coastal Program

Challenges addressed: The Coastal Program protects clean water, 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. Coastal areas are especially vulnerable to storm surge, flooding and sea level rise, putting coastal infrastructure, property and habitats at risk. The Coastal Program helps local decision-makers to minimize damage and increase preparedness for these natural hazards.

Achievements:

- **Culvert Flood Risk Assistance Grant (CFRAG) and Critical Flood Risk Infrastructure Grant (CFRING) Programs**

The Coastal Program advanced $4.2 million in ARPA-funded CFRING projects to support flood resilience and stormwater management planning and assessment work, as well as implementation projects in New Hampshire's coastal watershed. The first CFRING project to be completed, a resilient culvert replacement at Topaz Drive in Barrington that is anticipated to result in a 303(d) delisting for dissolved oxygen in the Oyster River, was successfully delivered by The Nature Conservancy and the Emerald Acres Cooperative. A project write-up, including before and after photos is available to view.

The CFRAG program advanced $1.2 million in ARPA-funded projects to support the replacement of outdated, undersized, perched and/or degraded culverts highly susceptible to flooding. Replacing these four high-risk culverts with better designed crossings that meet improved structural and environmental design standards and flood resiliency criteria helps reduce local flood impacts and public safety risks.

Additionally, over the summers of 2022 and 2023, UNH teams assessed over 4,000 stream crossings for geomorphic compatibility, hydraulic capacity and aquatic wildlife passage using standardized methods by the New Hampshire Stream Crossing Initiative. Thanks to this effort, all accessible stream crossings within the Merrimack and Salmon Falls-Piscataqua River watersheds have been assessed. The second phase of this UNH partnership project, which is underway, is rolling out an extensive engagement process to elicit feedback from a diverse group of stakeholders at the local and state level that can inform the development of a stream crossing prioritization model and interactive planning tool utilizing the stream crossing assessment data.

- **Habitat Restoration and Resilience**

Recent federal investments through the Bipartisan Infrastructure Law (BIL) and Inflation Reduction Act (IRA) as well as local donations through the New Hampshire Charitable Foundation have created/expanded grant programs for habitat restoration and resilience projects. During this period, NHDES Coastal Program staff collaborated with partners to scope projects and write grant proposals, which generated over $8 million dollars of grant funding for coastal habitat restoration and resilience projects (see table below).

GRANTOR	GRANT PROGRAM	GRANT APPLICATION TITLE	GRANT AMOUNT	GRANTEE
NOAA Coastal Zone Management	BIL Habitat Restoration	NH Resilient Tidal Crossings Project-Building Resilience through Upgraded Replacements of High Priority Tidal Culverts	$2,988,122	NHDES
NH Charitable Foundation	Great Bay 2030	Sawyer Mill Dam Removal Project - Final Adaptive Management Project	$85,000	Great Bay Stewards
NH Charitable Foundation	Great Bay 2030	Fairhill Salt Marsh - Collaborative Restoration Design Planning	$121,906	Rockingham County Conservation District
Federal Highways Administration	Culvert AOP Grant	Advancing Design and Permitting for the Upgraded Replacement of the Bellamy Road Culvert in Dover, NH	$421,600	City of Dover
National Fish and Wildlife Foundation	America the Beautiful Challenge	Restoring New Hampshire Salt Marshes to Benefit At Risk Species and Increase Coastal Resilience	$2,000,000	NHDES
NH Charitable Foundation	Great Bay 2030	Bellamy Road Fish Passage Project	$206,500	City of Dover
National Fish and Wildlife Foundation	National Coastal Resilience Fund	Pipeline Wagon Hill Farm Living Shoreline (NH)	$1,994,539	Town of Durham
NOAA Coastal Zone Management	Project of Special Merit	Advancing Resilience in Hampton Seabrook Estuary (HSE)	$250,000	NHDES
			$8,067,667	

- **Community Hazard Mitigation and Resilience**

The Coastal Program completed the NOAA-funded Flood Smart Seacoast project, which built capacity in the coastal communities through a regional and state partnership that provided technical assistance and developed tools that advanced local floodplain management and hazard mitigation initiatives and increased the ability of coastal communities to prepare for and adapt to changing coastal hazard conditions. The project advanced the field of coastal management by establishing a partnership of state coastal program, hazard mitigation, and floodplain management staff and regional planners that collaboratively reduced barriers and increased capacity of small, resource-strapped coastal communities to adopt higher floodplain regulations and access available hazard mitigation grant funding. The project also resulted in the completion of the partnership's long-term strategy, which will provide the partners with a collaborative action plan to continue the project work as opportunities and funding arise.

The Coastal Program kicked off the update of the 2019-2020 New Hampshire Coastal Flood Risk (NHCFR) Summary in October 2024. The NHCFR Summary update fulfills the requirements of RSA 483-B:22, which directs NHDES to supervise updates to the 2014 Coastal Risk and Hazard Commission Science and Technical Advisory Panel report, *Sea-Level Rise, Storm Surges, and Extreme Precipitation in Coastal New Hampshire, Analysis of Past and Projected Trends*, at least every five years. The NHCFR Summary update is expected to be completed in early 2026.

- **Offshore Wind Stakeholder Engagement**

The Coastal Program in collaboration with the New Hampshire Fish and Game Department, New Hampshire Sea Grant and the Northeast Regional Association of Coastal Ocean Observing Systems (NERACOOS) continued to provide communication materials and perform extensive outreach to New Hampshire stakeholders, including the commercial and recreational fishing industries, regarding the Bureau of Ocean Energy Management's (BOEM) process for identifying Wind Energy Areas and ultimately commercial lease areas in the Gulf of Maine. Efforts focused on ensuring that stakeholders remain engaged and had the information necessary to provide substantive comments on BOEM's multi-phase process. In September, BOEM announced a Final Sale Notice (FSN) for offshore wind leasing in the Gulf of Maine. The FSN included eight lease areas of Massachusetts, New Hampshire and Maine. In October, BOEM held an auction for commercial offshore wind leases that resulted in two winners on four lease areas and over $21.9 million in winning bids. Together, the leased areas have the potential to power more than 2.3 million homes.

Funding: Federal Funds (The Coastal Program is funded by The National Oceanic and Atmospheric Administration).

Org. Code 3642; Received $1,234,000 for FFY24.

Program needs: Funding and staff to help communities prepare for coastal hazards and restore habitats through grants, technical assistance and outreach and training

II. NHDES WATERSHED MANAGEMENT BUREAU DATA QUALITY CONTROL

2.1 Watershed Management Bureau QAPPs and Standard Operating Procedures (SOPs)

The Watershed Management Bureau maintains several Quality Assurance Project Plans (QAPP) and Standard Operating Procedures (SOP) (Table 1). QAPPs are documents submitted to and approved by the Environmental Protection Agency (EPA), which describe the scope of a monitoring project, defining what is to be monitored, how it is to be monitored and the procedures to be carried out to ensure high data quality. SOPs outline specific procedures for things such as field data collection, laboratory sample handling, sample preparation and sample analysis.

Program Name	Document Title	EPA RFA	Type	Year Created	Last Update
Jody Connor Limnology Center (JCLC)	NHDES Jody Connor Limnology Center Laboratory Manual		SOP	2001	2019
Lake Assessment Program and special projects	Lake Assessment Program Quality Assurance Plan	21039	QAPP	2015	2021
Volunteer Lake Assessment Program	NHDES Volunteer Lake Assessment Program Quality Assurance Project Plan	24111	QAPP	2003	2024
Volunteer River Assessment Program	NHDES Volunteer River Assessment Program Quality Assurance Project Plan	24027	QAPP	2003	2023
Beach Inspection Program	NHDES Beach Program Generic Quality Assurance Project Plan	22075	QAPP	2003	2022
Shellfish Program	Quality Assurance Project Plan for Shellfish Ambient Water Quality Monitoring	22098	QAPP	2024	2024
Shellfish Program	Quality Assurance Project Plan for Shellfish Sanitary Surveys	24078	QAPP	2024	2024
Shellfish Program	Quality Assurance Project Plan for Paralytic Shellfish Poisoning Monitoring	13006	QAPP	2002	2013
Exotic Species Program	NHDES Exotic Species Program Quality Assurance Project Plan		QAPP	2014	2019
River Monitoring Program	NHDES River Monitoring Program Quality Assurance Project Plan	QA24110	QAPP	2014	2024
Instream Flow Program	NHDES Instream Flow Priorities for Annual Monitoring/Sampling		SOP	2020	2020
Instream Flow Program	NHDES Instream Flow Protocols for Field Data Records		SOP	2024	2024
Instream Flow Program	NHDES Instream Flow Protocols for Conductivity, Temperature, and Water Level Dataloggers		SOP	2018	2020
Instream Flow Program	NHDES Protocols for Streamflow Measurement and Data Management		SOP	2020	2021
Instream Flow Program	NHDES Protocols for Prioritizing Protected Instream Flow Studies		SOP	2020	2020
Instream Flow Program	NHDES Protocols for Long-Term Monitoring of Riparian Ecosystems		SOP	2020	2020
Instream Flow Program	NHDES Protocols for Stream Gradient and Floodplain Transect Survey		SOP	2020	2020
Shellfish Program	NHDES Standard Operating Procedures for Marine Harmful Algal Bloom Monitoring		SOP	2021	2025
Instream Flow Program	NHDES Instream Flow Program QA Manual		SOP	2018	2020

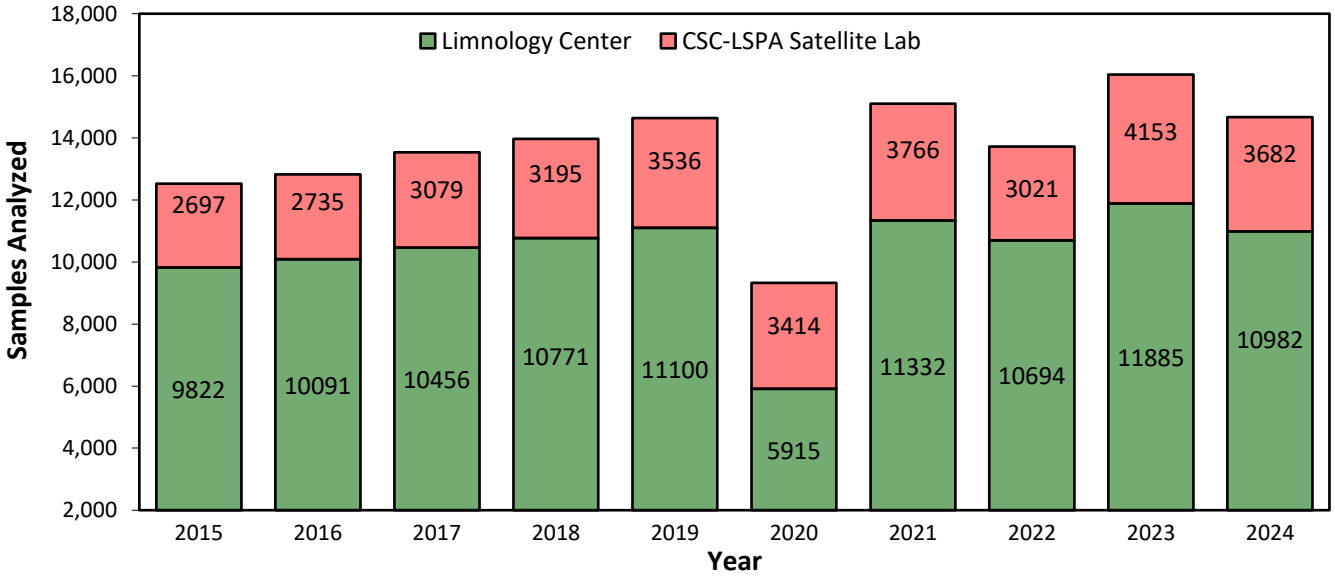
Table 1: Current Watershed Management Bureau QAPPs and SOPs

2.2 Jody Connor Limnology Center

Jody Connor Limnology Center (JCLC) staff processed 10,982 chemical analyses in 2024 (Figure 1). Additionally, 5,234 samples were collected by JCLC programs in 2024 but analyzed by DHHS-PHL. These numbers reflect a resumption of near normal operation in the JCLC and Watershed Management Bureau's monitoring programs after the COVID pandemic.

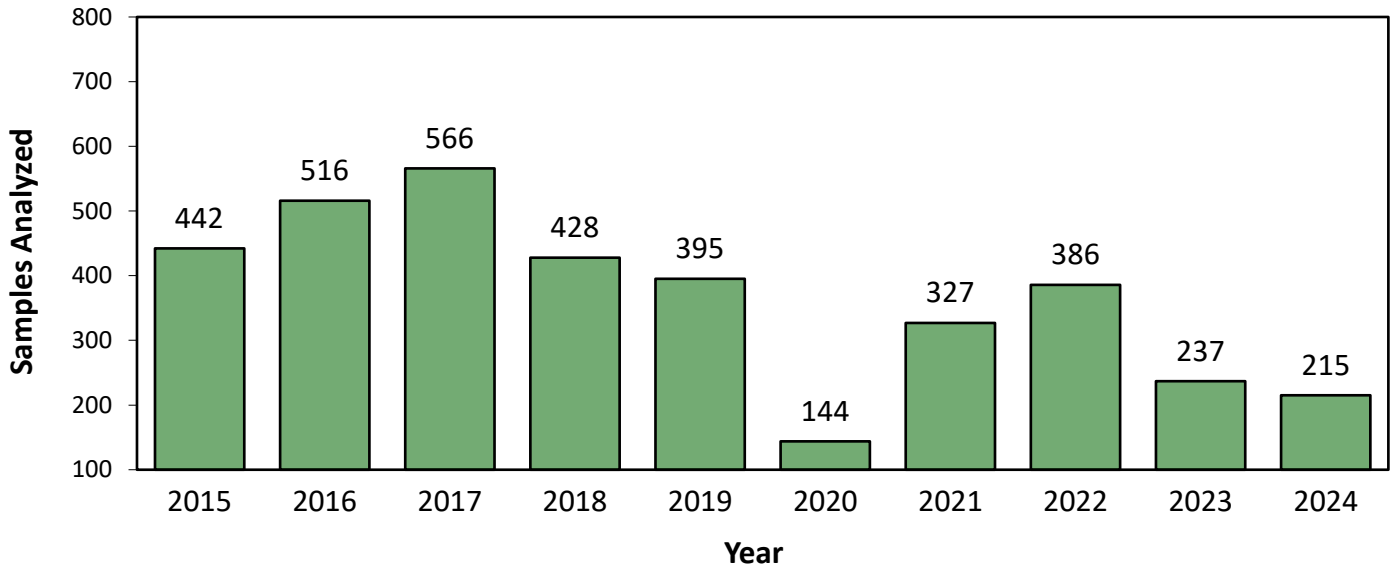
JCLC provides volunteer monitors additional services by making available and providing support to a satellite laboratory at Colby-Sawyer College (CSC). The laboratory is a cooperative effort between CSC and the Lake Sunapee Protective Association (LSPA). In 2024, 3,682 chemical analyses were processed at the CSC satellite laboratory (Figure 1).

Figure 1: Satellite vs JCLC Analysis Last 10 Years.



The JCLC also processes biological samples of phytoplankton, zooplankton and macrophyte identifications. Cyanobacteria samples are processed and tracked separately through the Cyanobacteria Harmful Algal Bloom Program (see Cyanobacteria Harmful Algal Bloom Program Summary). The number of annual biological analyses performed has hovered between 400 and 500 for several years except for 2020, due to the pandemic (Figure 2). In 2021 and 2022 the number of samples rose back to near-normal levels. The lower total number of biological samples in 2023 and 2024 is due to a change in how Aquatic Plant samples are analyzed and recorded. In the past, the samples would come into the lab and the identification would be logged into the database. Now, most of the samples are submitted as voucher photos sent over email and the identification is done electronically in most cases and sent to the person of interest rather than logging it through the database.

Figure 2: NHDES JCLC Total Annual Biological Analyses Last 10 Years.



2.2.1 JCLC and Satellite Lab Data Quality Objectives

Quality control (QC) is an important component assuring the production of high-quality data. At both the JCLC and the CSC satellite lab, QC samples are processed regularly. Over 1,700 QC sample analyses were conducted by the two laboratories in 2024.

JCLC and the CSC satellite laboratory met their data quality objective (DQO) requirement of completing replicate analyses on 10% of the processed samples. Since establishing this DQO in 1999, the cumulative laboratory replicate percentage has surpassed the 10% requirement each year. All laboratories also continued to follow both Continuing Calibration Verification (CCV) (Table 2) and Critical Range (CR) criteria (Table 3). The CCV and CR processes verify that the laboratory equipment and personnel are all meeting established standards and confirming that high-quality, reliable data are being produced. The 2023 NHDES QA Self-Audit was completed by both the JCLC and CSC labs.

Parameter	Frequency	CCV Standard	Acceptance Limit
pH and Alkalinity	10% or at the end of the day's analyses, whichever comes first	6.0 pH	+/- 0.1 pH unit
Conductivity		100 µS/cm	+/- 10% = 90-110 µS/cm
Chloride		100 mg/l	+/- 15% = 85-115 mg/L
Turbidity		10 NTU	+/- 10% = 9-11 NTUs
Color Hanna		50 CPU	+/- 10 CPU
Total Phosphorus*		50 PPB	+/- 10%

* CSC lab only

Table 2: JCLC and CSC Laboratory CCV Acceptance Criteria

Parameter	Acceptance Limit	Parameter	Acceptance Limit
pH	+/- .5 units	Chlorophyll-a	+/- 3.0 µg/L= 3mg/m3
Alkalinity	+/- 1.20 mg/L	T. Phosphorus*	+/- 0.004 mg/L
Conductivity	< 10%	Color Hanna	+/- 10 CPU
Turbidity	0-20 NTU: +/- 1	Color Nessler	+/- 2.0 CPUs
	>20-100 NTU: +/- 3	Chloride	< 15%
	>100 NTU +/- 10	E. coli*	< 5% of count

* CSC lab only

Table 3: JCLC and CSC Laboratory Duplicate Critical Range Criteria

2.2.2 JCLC Laboratory

As a result of requirements set forth in the NHDES Quality Management Plan (QMP), JCLC began to track new staff training in 2003. Tracking staff training is a critical component to verify competency on equipment use, DQO procedures, CR and CCV procedures. Over the past two field seasons the JCLC has improved intern training in laboratory procedures. Now each newly hired intern attends a full-day training session consisting of different elements including JCLC lab procedures and safety, training on database entry and sample login procedures. The training also includes an afternoon of hands-on, practical training using JCLC bench meters with oversight by full-time JCLC staff. As part of this training, each intern must pass a competency check on each meter in the JCLC.

The JCLC and CSC-LSPA lab analyze two aliquots (replicates) from the same sample as a QC for at least 10% (Table 4). Replicate samples processed in the JCLC are evaluated using split mean range (SMR) and relative percent difference (RPD) measures and are used to demonstrate consistency in data quality. The SMR is the range and the RPD is the percent difference, which is calculated when a replicate QC analysis is performed. Depending on analysis factors such as the range of the analytical instrument used, either a SMR or RPD is calculated for each QC sample. The JCLC generates SMR/RPDs as a quantitative measure to review that replicate ranges are consistent with historical SMRs/RPDs. In 2024, all parameters exhibited SMRs or RPDs that were well within the acceptable range established for the parameter (Table 4). Lastly, over 99% of laboratory replicates met established critical range criteria for their respective parameters.

Parameter	2024 Replicate Analyses	2024 Sample Analyses	2024 Replicate Percent	Mean Relative Percent Difference or Split Mean Range					
				2019	2020	2021	2022	2023	2024
Alkalinity (ANC) mg/L (Range)	50	451	11.09	0.16	0.58	0.25	0.51	0.17	0.31
Apparent Color CPU (Range)	14	115	12.17	0.71	0.88	0.6	0.27	0.54	0.92
Color in Water - Hanna (Range)	59	524	11.26	4.51	4.29	3.46	3.7	3.81	3.34
Chloride mg/L (Range)	227	2034	11.16	1.46	1.44	1.08	2.66	3.46	3.15
Chlorophyll-a mg/L (Range)	66	537	12.29	0.51	0.34	0.54	0.52	0.38	0.45
Conductivity µmhos/cm (RPD)	269	2381	11.30	1.61	1.95	1.45	1.09	1.64	1.09
Mercury mg/L (Range)	9	88	10.23	0.02	0.01			6.01	13.05
pH units (Range)	272	2455	11.08	0.06	0.08	0.04	0.12	0.04	0.04
Turbidity NTU (Variable Range)	253	2255	11.22	0.18	0.13	0.14	0.2	0.2	0.19

Table 4: 2024 calendar year JCLC chemical analyses quality assurance summary.

In 2020 the QC Officer/Database Administrator began an initiative to document quality control and data administration procedures within the JCLC database by producing several instructional videos. The videos consist of screen recordings along with narration outlining specific procedures and functions within the JCLC database. Six videos were produced in 2020 and four more were produced in 2021 all covering JCLC database operation and data management procedures.

These videos were leveraged during the 2021 and 2022 intern trainings as part of a 100% virtual training, thus avoiding all intern staff gathering in the training room. Over the past few years, the intern training has evolved and has been refined with input from all the JCLC staff. This effort predated the pandemic and had already paid dividends with a better trained intern staff and a smoother running JCLC lab. Also, the changes made, and tools developed for training made the process nimbler and easier to adapt to the challenges during the pandemic.

2.2.3 Satellite Laboratory

The Colby Sawyer College – Lake Sunapee Protective Association (CSC-LSPA) Satellite Laboratory continues to be well operated and serves as a model for producing high quality data in support of NHDES' volunteer water quality monitoring programs. In 2018 the lab gained the ability to analyze for chloride and color. There is now four years of split mean range annual averages to look at for each parameter and that data is more useful in drawing conclusions regarding quality. The ranges have become tighter and lower over the last four years reflecting the fact that the analyses are becoming tightly engrained within the CSC lab operations and better data is the result.

The CSC-LSPA lab has consistently met or exceeded the replicate DQO for all parameters since 2016 (Table 5). In addition, the 2024 split mean remained consistent with previous years (Table 5). Lastly, over 98% of CSC-LSPA lab replicates met established critical range criteria for their respective parameters.

Parameter	2024 Replicate Analyses	2024 Sample Analyses	2024 Replicate Percent	Mean Relative Percent Difference or Split Mean Range					
				2019	2020	2021	2022	2023	2024
Alkalinity (ANC) mg/L (Range)	9	79	11.39	0.11	0.14	0.33	0.52	0.42	0.21
Color in Water (Hanna) (Range)	27	234	11.54	6.79	2.76	1.82	2.08	2.96	3.04
Chloride (Range)	74	641	11.54	0.68	1.37	0.54	0.97	2.44	2.28
Chlorophyll-a mg/L (Range)	19	130	14.62	0.16	0.41	0.69	0.18	0.23	0.19
Conductivity µmhos/cm (RPD)	86	756	11.38	1.46	1.25	0.77	1.34	0.98	1.18
pH units (Range)	85	743	11.44	0.07	0.06	0.04	0.06	0.06	0.07
Turbidity NTU (Range)	83	748	11.10	0.17	0.18	0.27	0.31	0.17	0.35
E. coli counts/100ml (Range)	11	68	16.18	0.44	0.34	2.87	2.43	1.65	1.93
Total Phosphorus µg/L (Range)	107	754	14.19	0.6	1	0.1	0.01	0.00	0.00

Table 5: 2024 CSC-LSPA Laboratory chemical analyses quality assurance summary.

2.3 Volunteer Lake Assessment Program (VLAP)

VLAP program participation has remained stable since 2016 due to staffing resources. However, in 2023, VLAP accepted two new lakes into the program. Horace Lake in Weare and Millville Lake in Salem and had four lakes re-join the program after several years of not sampling. Requests to participate in the program have increased in recent years likely due to increased concern over noticeable changes in water quality, plant, algae and cyanobacteria growth, and concerns of climate impacts to New Hampshire lakes. In the most recent years, due to aging volunteers, difficulty finding replacements and lack of commitment from associations, several lakes discontinued sampling. VLAP was able to give several lakes on the wait list the opportunity to join VLAP in 2022 and 2023 resulting in an increase in sampling events conducted and volunteer participation (Table 6), as well a significant increase in results generated in the past 20 years (Figure 3 and Table 7).

Year	# Of volunteers	# Of lakes	New or returning lakes	# Of deep spots	# Of annual bio visits	# Of volunteer sampling events	Total # sampling events*	Est. # of volunteer hours	Monetary value of vol. hrs.	# Of individual sample results generated
2024	400	170	3	177	114	358	472	~3,570	$124,000	16,251

Table 6: Program Participation

Lab	Alk	Color	Chla	Cl-	Cond	DO/T	EC	TN	TP	Phyto	SD	SD Scope	pH	Turb
CSC-LSPA	71	220	128	541	653		129		668		50	104	653	653
JCLC	376	444	426	1269	2208	282	241	6	2048	161	396	393	2203	2209
Total	**447**	**664**	**554**	**1783**	**2861**	**282**	**370**	**6**	**2716**	**161**	**446**	**497**	**2856**	**2862**

* = The Colby-Sawyer College - Lake Sunapee Protective Association Satellite Laboratory

** = NHDES JCLC and NH DHHS Water Analysis Laboratory. The NH DHHS Laboratory analyzes the total phosphorus, and *E. coli* samples, while pH, ANC, conductivity, chloride, turbidity, chlorophyll and phytoplankton are analyzed in the JCLC and Secchi disk depth is measured in the field.

Table 7: Number of VLAP Sample Results Generated by Parameter and by Laboratory (2023).

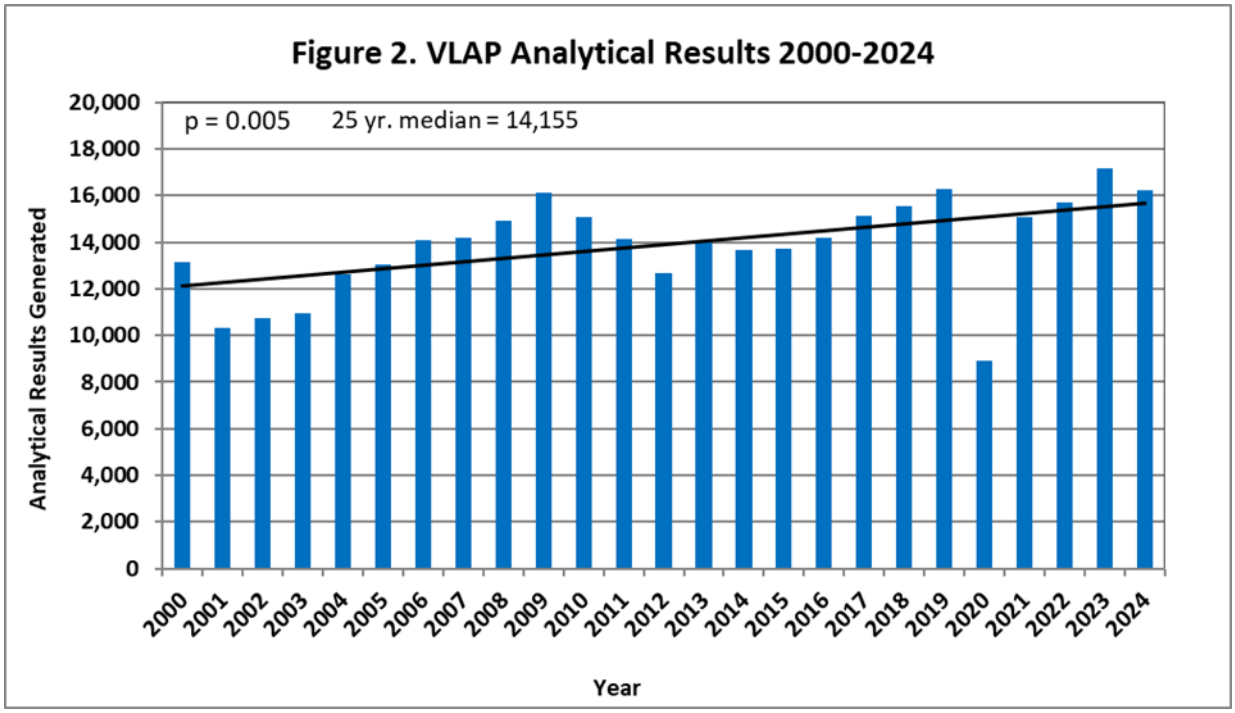


Figure 3: Analytical Results Generated for the Volunteer Lake Assessment Program (VLAP) 1999-2024.

2.3.1 Quality Assurance and Quality Control Management

The Generic VLAP Quality Assurance Project Plan (QAPP) was submitted to EPA in 2024 for its five-year review and revision. The VLAP QAPP review was completed and the QAPP approved by EPA in May 2024. The QAPP, which outlines the standard operating procedures for sample collection, sample analysis, data management, data assessment and data reporting, was followed by all NHDES JCLC and satellite laboratory staff during the 2024 sampling season. VLAP produced training materials including presentations and videos that are available on-line for volunteers to refresh sampling skills during years a biologist is unavailable to audit performance. The VLAP Coordinator and CSC satellite Lab Manager were in constant communication with volunteers, reviewed sampling procedures upon sample drop-off if necessary, and made corrective actions to ensure each monitor followed the standard operating procedures for sample collection as outlined in the QAPP.

2.3.2 Quality Assurance and Quality Control

The VLAP QAPP specifies that Quality Assurance and Quality Control (QA/QC) samples, including field duplicate samples, are collected and analyzed for specific parameters sampled through the program. However, most volunteers from the lakes and ponds participating in the program do not collect field duplicate samples as standard practice. This is due to the following reasons:

1. Long-term water quality trend analysis, not a single sample result, is used for decision making within NHDES.
2. There are no available funds within NHDES to pay for the analysis of VLAP QA/QC samples, including total phosphorus and E. coli duplicate samples.

Therefore, in 2002, the VLAP Coordinator, Biology Section QA/QC Officer and the JCLC Director decided that the field collection and laboratory analysis of QA/QC samples, as outlined in the VLAP QAPP, will be incorporated into the program as feasible under the existing program structure and the operating constraints of the JCLC.

Specifically, volunteer monitoring groups that decide to pursue additional federal grant programs and wish to use VLAP monitoring activities as a match, are required to conduct QA/QC sampling in accordance with the VLAP QAPP. In this case, the JCLC agrees to run these additional QA/QC samples, but the volunteer monitoring group is required to bear the additional cost, as necessary.

2.3.3 VLAP Duplicate Sampling

During the annual 2024 (Table 8) biologist visits to select volunteer monitoring groups, the biologists assisted volunteer monitors in collecting duplicate sets of samples from the hypolimnion (lower layer) and one tributary. These duplicate samples were analyzed in the JCLC for conductivity, turbidity, pH and chloride (if applicable). On a weekly basis during the season, each biologist collected one duplicate dissolved oxygen/temperature profile and one duplicate chlorophyll-a sample at lake deep spots during the annual lake visits.

The duplicate samples are compared not just to the total number of routine samples conducted during the biologist visits, but for the whole program respectively. This routinely meets a seven to eight percent duplicate range rather than a ten percent range. However, if compared with just the number of samples generated during biologist visits only, it would be well above the ten percent range.

Parameter	Duplicate Samples Collected	Routine Samples Collected	Percentage of Duplicate Samples Collected	Meets Target (10%)
Alkalinity*	21	426	5	N
Apparent Color	48	616	8	N
Chlorophyll-a	42	512	8	N

Chloride	97	1686	6	N
Conductivity	206	2655	8	N
DO/Temp Profile	25	257	10	Y
pH	206	2650	8	N
Total Phosphorus**	37	631	6	N
Turbidity	208	2654	8	N

* = During the Spring of 2002, the Biology Section QA Officer determined that it was not feasible for the Limnology Center to handle the additional workload of duplicate samples for Alkalinity and phytoplankton parameters. These analyses take much longer to conduct than the pH, turbidity, and conductivity analyses.

** = Volunteers are asked to collect and pay for duplicate sample analysis for phosphorus and *E. coli* on a voluntary basis. There is no internal funding source available to pay for the analysis of QA/QC samples that are processed in the NH DHHS Water Analysis Laboratory. All total phosphorus duplicate samples are conducted through the CSC-LSPA laboratory and paid for by the LSPA

Table 8:VLAP Duplicate Quality Assurance Samples Collected (2024).

Field duplicate sample results were analyzed at the end of the season to determine if the relative percent difference (RPD) or critical range for each parameter of interest exceeded the QA/QC standard outlined in the VLAP QAPP. A very low number and percentage of duplicate samples failed to meet the QA/QC standard during the 2024 sampling season (Table 9).

Parameter	Duplicate Samples Collected	Duplicate Samples Failing QA/QC	Percentage of Failed Duplicate Samples
Alkalinity*	21	0	0
Apparent Color	48	8	17.0
Chloride*	97	1	0.01
Chlorophyll-a*	42	4	8
Conductivity*	206	1	0.5
DO/Temp Profile***	25	0	0
pH*	206	0	0
Total Phosphorus*	37	4	11
Turbidity**	208	10	5

* = The QA/QC standard for duplicate ANC, chloride, chlorophyll, conductivity, pH and total phosphorus samples is the 20% Relative Percent Difference.

** = The QA/QC standard for duplicate turbidity standards is the critical range standard used in the NHDES JCLC.

*** = Individual dissolved oxygen duplicate profiles acceptance limit of +/- 2 mg/L.

Table 9: VLAP Duplicate QA/QC Samples (2024).

2.3.4 VLAP Intern Training

The training and assessment of the VLAP intern's ability to perform field sampling activities according to the program standard operating procedures is the responsibility of the coordinator. At the beginning of the sampling season, the coordinator trains or re-trains the intern in the proper field sampling standard operating procedures, as outlined in Appendix C of the VLAP QAPP.

In 2024, one full-time three-month, one part-time five-month, and one full-time six-month intern were hired to conduct laboratory analyses and assist VLAP program operations in the JCLC. The VLAP Coordinator trained each intern on

auditing volunteers during biologist visits, preparing equipment and bottle pick-ups for volunteers, receiving samples from volunteers, laboratory sample analysis and monthly data reporting. Each VLAP intern was required to fulfill the JCLC training requirements before they were allowed to independently log-in and analyze samples in the JCLC.

2.3.5 VLAP Volunteer Training

During the annual visit to each lake or pond, the biologist (the VLAP coordinator, biologist or one of the interns) conducts a "Sampling Procedures Assessment Audit" for each monitoring group. Specifically, the biologist observes the performance of each monitoring group and fills out an assessment audit form to document the ability of the volunteer monitors to follow the proper field sampling procedures (as outlined in the VLAP Monitor's Field Manual).

The assessment identifies areas of sample collection in which volunteer monitors are not following the proper procedures and provides an opportunity for the biologist to retrain the volunteer monitors as necessary. This will ultimately ensure that samples collected by volunteer monitors are truly representative of actual lake and tributary conditions. Overall, the assessments show that the majority of monitoring groups follow the proper sampling techniques.

In 2011, it was necessary for VLAP to alter its schedule for annual biologist visits. The schedule for biologist visits changed from an annual visit at each lake to a biennial visit at each lake depending on a lake's name. To compensate for the lack of an annual biologist sampling procedure assessment audit, VLAP developed additional training videos for volunteers to view and review sampling procedures prior to sampling on their own. The videos are posted on YouTube and a link is available via the VLAP website. The video has also proved a useful training tool during the VLAP annual refresher workshop. VLAP developed a Volunteer Monitor Field Sampling Procedure Checklist for volunteers to complete every time they sample without a biologist. The checklist acted as a self-audit for field sampling procedures to minimize improper sampling techniques and has been very successful. Volunteer feedback has been positive and resulted in overall better-quality samples collected. The form will continue to be implemented in subsequent sampling seasons.

When volunteer monitors dropped off samples at the JCLC and the CSC-LSPA Satellite Laboratory, the laboratory staff continued to use the sample receipt checklist to assess and document if the volunteer monitors followed proper sampling techniques when collecting the samples. Specifically, the purpose of the sample receipt checklist is to minimize, and hopefully eliminate, future occurrences of improper sampling techniques. When necessary, volunteer monitors were contacted by laboratory personnel with questions so that the samples could be logged into the system properly. In some cases, it was necessary to retrain volunteers in proper sample collection techniques, and, in a few severe cases, samples were not accepted for analysis.

2.4 Biomonitoring Program QAQC

Fish identification data quality control measures relied on having an expert fish taxonomist on site during sampling. Any unknown species were documented with photos and/or retained for laboratory analysis and further consultation with other state agencies and partners.

All field data are reviewed for quality assurance and entered into the biomonitoring program's Ecological Data Application System (EDAS) database. Additional data checks for completeness and accuracy are performed prior to uploading data to the NHDES EMD and later to the EPA's WQX Database.

Macroinvertebrate data quality control measures rely on enumeration and identification by external primary and quality control contractors, primary and quality control. In addition to in-house quality control measures performed by the primary contractor, quality control measures are performed by a separate quality control (QC) contractor. Ten percent of all samples are sent to the QC contractor and re-picked to account for individuals missed by the primary contractor. If the primary contractor does not meet the required threshold (95% of individuals found during the initial pick), sorted debris from all samples are re-picked, with additional individuals identified and enumerated. In addition to repicking the

sorted debris, a voucher set of all individuals found each year is assembled by the primary contractor and sent to the QC contractor for identification. This is completed as a "blind" voucher set with voucher identifications sent to NHDES for review. Any discrepancies are reconciled by the primary contractor, QC contractor and NHDES with data updated to reflect any necessary corrections.

Taxonomy must be performed by a professional freshwater macroinvertebrate taxonomist that, at a minimum, holds and maintains for the duration of the contract a certification from the Society of Freshwater Science for eastern genera in group 1 (Crustacea and Arthropods other than EPT and Chironomidae), group 2 (Ephemeroptera, Plecoptera, and Trichoptera nymphs and larvae only) and group 3 (Chironomidae larvae only).

2.4 Instream Flow Program QAQC

In 2022, the ISF Program formalized its QAQC protocols in an *Instream Flow Program QA Manual*. Observations from the 2024 field season (see below) have been used to update the *QA Manual*.

2.4.1 Datalogger Studies

The data collected for each station are plotted in scatterplot graphs, with the date on the x-axis. Plotting the data allows users to visually identify trends and incongruities. Once plotted, the graph is visually examined for outliers. For example, if the temperature values erratically rise and fall faster than typically observed in the water, it is presumed that the datalogger was in-and-out of the water. Non-representative data, such as periods where the datalogger was suspected to be out of the water, are removed from the analysis.

Next, the field duplicate measurements made with calibrated, hand-held conductivity/temperature meters or a folding ruler are reintroduced to the dataset and compared to the measurements recorded by the datalogger.

a. If both field duplicate measurements for conductivity do not fall within 20% of the logged values, the dataset must be processed using HOBOware Pro® Conductivity Assistant 2.1 or later. HOBOware Pro® Conductivity Assistant will calibrate the readings and adjust for drift caused by fouling. The field calibration measurements of conductivity and temperature and times from the deployment and recovery are recorded on the Field Data Sheet.
b. If both field duplicate measurements for temperature do not fall within 20% of the logged values, the dataset must be processed manually within the spreadsheet. [No software to apply – one would calculate the initial/final variances and create a line with slope that could be used to correct the data].
c. If both field duplicate measurements for water level do not fall within 20% of the logged values, the dataset must be processed manually within the spreadsheet [No software to apply – one would calculate the initial/final variances and create a line with slope that could be used to correct the data].

During 2024, a total of 56 dataloggers were deployed and recovered by the ISF Program on six designated rivers and their tributaries. QAQC review of the datalogger data found that one of the 24 temperature dataloggers, one of the 13 pressure dataloggers, and two of the 5 conductivity dataloggers did not meet QAQC criteria and were rectified in accordance with the ISF Program QA Manual.

2.4.2 Fish Surveys

Fish identification data quality control measures relied on having an expert fish taxonomist on-site during sampling. Any unknown species were documented with photos and/or retained for laboratory analysis and further consultation with other state agencies and partners.

All fish identification field data are reviewed for quality assurance and entered into the biomonitoring program's Ecological Data Application System (EDAS) database. Additional data checks for completeness and accuracy are performed prior to uploading data to the NHDES EMD and later to the EPA's WQX Database.

The Biomonitoring Program provided support to the ISF Program in performing three fish surveys on three designated rivers in 2024. There were no reported QAQC issues with the survey data.

2.4.3 Water Level Stations

Stream Flow Measurement

For quality assurance purposes, replicate analyses are required on at least ten percent (10%) of all incremental velocity/depth measurements collected as part of each flow measurement event. For every set of 10 increments where velocity and depth are recorded, replicate the velocity *(V)* and depth measurements for one full increment are recorded on the data sheet. Quality control is based on a comparison of flow calculated for each replicate increment and should be less than 10% different. If greater than 10%, repeat the measurements and recalculate the flow until the measurements meet QAQC criteria. The use of electronic spreadsheets for field data collection allows instantaneous identification of QAQC deviations and immediate resurvey.

Staff Gage Installation and Monitoring

When the elevation survey has been completed, Person #1 reacquires the beginning survey point. Person #2 carefully rotates the auto level to sight on the beginning point, and re-reads the middle crosshair, recording the value as the Elevation QA Check in the field logbook. If the two values differ by more than 0.02 inches, the variance is considered excessive, and the survey must be repeated. Field check of instrument accuracy and stability is included in the Field Procedures – Elevation Survey (Subsection A6.3, Step 7). In addition, each auto level is annually certified for accuracy; see Attachment F for an example of Survey Auto level Calibration and Certification.

River Stage Measurement

The staff gage/game camera or staff gage/water level station set-up is inspected periodically during deployment, and a photograph of the staff gage is taken during each visit. Following recovery of the game camera pictures and creation of a data file of river stage measurements, the staff gage measurements obtained from the game camera photographs are compared to the periodic inspection photographs for quality control/quality assurance.

On an ongoing basis, the water depth measurements obtained from each water level station are compared to the periodic staff gage readings for quality control/quality assurance. This continuing check not only monitors for water depth sensor drift, but also checks for physical movement of the stilling well/water depth sensor. A consistent difference between the water depth measurements and staff gage readings is expected. Deviations are investigated and resurveyed from established benchmarks to maintain continuity.

Training for Use of Equipment/Methodology

Prior to conducting a stream flow measurement or installing a staff gage/game camera, staff are trained on site on the use of the flowmeter and the stadia rod/auto level by the Instream Flow Program Manager. This training, initial or refresher, is noted on the data sheet for that site. Training includes how to hold and operate the flowmeter, set up the measuring tape, hold the stadia rod, tripod setup, auto level setup, sighting/reading the stadia rod with the auto level, setting temporary benchmarks, operating the game camera, completing the data sheets and data processing.

The ISF Program performed 46 streamflow measurements at eight streamflow stations during the 2023 field season. Any QAQC issues were rectified immediately in the field by re-performing problematic surveys.

2.4.4 Riparian Ecosystem Surveys

To ensure quality data, all individuals performing habitat assessment surveys will be trained in these procedures, prior to data collection. There will be a team of two or more people for each survey, so an individual observer can consult the team when any uncertainty arises. Additionally, before beginning the survey at each site, the team will discuss the SOP, address any questions, and clarify any discrepancies to ensure consistency between all team members.

When the elevation survey has been completed, Person #1 reacquires the beginning survey point. Person #2 carefully rotates the auto level to sight on the beginning point, and re-reads the middle crosshair, recording the value as the Elevation QA Check in the field logbook. If the two values differ by more than 0.02 inches, the variance is considered excessive, and the survey must be repeated. Field check of instrument accuracy and stability is included in the Field Procedures – Elevation Survey (Subsection A6.3, Step 7). In addition, each auto level is annually certified for accuracy; see Attachment F for an example of Survey Auto level Calibration and Certification.

Additionally, after completion of every 10^{th} habitat assessment survey, a replicate site survey will be completed. One of the 10 previously surveyed sites will be re-visited and re-surveyed at a later date within the same year, and the data between the two visits will be compared to ensure that quality control standards are being met. The Instream Flow Program will be evaluating the standards of quality control that are sufficient to meet program needs.

Six riparian ecosystem surveys were performed on two designated rivers during the 2024 field season.

III. WATERSHED MANAGEMENT BUREAU SAFETY PROCEDURES

3.1 Watershed Management Bureau Safety Training

The Watershed Management Bureau (WMB) workload involves various types of work in multiple environments. Safety is of great importance and guidelines and training are provided and updated as concerns and new methods arise. NHDES institutes agency-wide training, which the Watershed Management Bureau participates in.

Department-wide training courses cover topics such as Active Shooter Training, Defensive Driving and Cyber Security, the last covering the safety of our data and our business. Some of these training programs are required to be repeated every year, with the defensive driving every three years at a minimum. All NHDES employees, full-time, part-time and interns, are required to take these safety programs.

3.2 Watershed Management Bureau Vehicle and Watercraft Safety

Defensive Driving is required before any individual may operate a state vehicle. Those individuals who use large vehicles or trailers are also required to take a safe backing course that deals with issues involving trailers, blind spots and trucks. Much of the work the WMB does requires trailering or using full-sized vehicles, therefore many WMB personnel are required to take this extra defensive driving training. Each WMB vehicle is equipped with a first aid kit, insurance information and a procedure in case of accident.

Some of the workload done by the WMB requires the use and operation of boats. New Hampshire law requires all PWC or boat operators who are 16 years old or older and operating a motorboat over 25 horsepower to complete the New Hampshire Boater Safety Course and to carry a Safe Boating Certificate. The official NHDES policy goes a step further as any employee who wishes to operate a NHDES power boat is required to take the course and obtain the certificate. This course covers basic watercraft rules and operation as well as the safety involved in the use of state boats and is offered by the state of New Hampshire's Department of Safety as an online course. WMB staff that routinely use our boats also accompany and train new personnel and interns in the operation of the individual watercraft that are available for use. This training covers canoes and kayaks as well as tiller-steered outboards, and steering-wheeled driven outboards. All individuals are required to wear a personnel flotation device (PFD) whenever in a boat. To facilitate the comfortable use of PFDs, inflatable suspender style PFDs are purchased for all employees who commonly use boats as well as sufficient spares to accommodate those who need them on occasions. All of our boats carry a fire extinguisher and a noise-making device as well as extra PFDs. All power boats are equipped with a usage log to record usage time and note any issues. Trailer wiring and lights are inspected and tested annually each spring and necessary repairs and replacements are made. All tires and spares are inspected and worn tires are replaced.

3.3 Watershed Management Bureau Lab and Field Safety

The Jody Connor Limnology Center (JCLC) contains laboratory equipment designed to analyze surface waters along with the chemicals associated with the analysis and, as such, safety procedures and training that go beyond normal workplace safety have been developed. This training involves personal protective equipment, the operation of laboratory equipment, and safe handling and disposal of chemicals. Locations of fire extinguishers, acid spill kits, broken glass containers and other safety equipment are labeled and obvious in the lab. Small group training is given to all new hires and interns of the Watershed Management Bureau. A copy of the training manual can be found electronically on the NHDES network and in the JCLC Laboratory Manual. This manual is reviewed and updated yearly. The lab also includes a ventilation hood that is inspected regularly and a small chemical storage cabinet.

A majority of sampling and monitoring done by the WMB involves working in the field in both urban and remote sites. Working in the field requires yet another set of safety factors. These include things like personnel attire and protection to weather and field conditions. Wading in fast moving or deep water, insect and plant interactions, as well as interactions with the public, also bring up safety concerns. These safety issues and procedures are addressed in the

NHDES Standard Operating Procedure for Field Safety. However, each monitoring program within the WMB presents unique safety risks. For this reason, supervisors spend several days training staff on the field and safety protocols for each specific program.

The biomonitoring program completes fish surveys regularly using backpack electroshocking units that discharge an electrical current into the water. To prevent injury, non-breathable waders and electrical gloves must be worn. Optional, but highly recommended, additional personal equipment includes a hat and polarized sunglasses. Electrofishing is strenuous work, and staff are encouraged to drink fluids and eat food regularly to maintain proper hydration and energy levels. Staff typically work in teams of four and are in constant communication with each other during a sampling event and use simple code words to indicate start and stop of electrical discharge.