The State of New Hampshire
Department of Environmental Services

Robert R. Scott Commissioner

December 18, 2024

Katie Lamoureux, Chief
Water Quality and Wetlands Protection Section
EPA New England, Region 1
5 Post Office Square - Suite 100
Boston, MA 02109-3912

Re: Request for approval of NHDES' 2024 303(d) List

Dear Ms. Lamoureux:

The New Hampshire Department of Environmental Services (NHDES) is pleased to submit our 2024 Section 303(d) List and justification material for your consideration of approval. All of the relevant files, including our responses to public comments, the documents supporting our decisions, as well as the technical support document for the Great Bay Estuary (GBE) can be found on our website. NHDES is still in the process of uploading the material including the assessment categories for each waterbody to EPA's ATTAINS database. We expect to have that completed in early 2025.

In response to EPA's approval of NHDES' 2020/2022 303(d) List on March 14, 2022, NHDES has continued to gather additional data in the GBE with several partners including EPA. In addition to the ongoing monitoring by the Piscataqua Regional Estuary Partnership, 2022-2024 included detailed work by the eelgrass resiliency project to understand the relationships between eelgrass, phytoplankton, seaweed, sediment and nutrients in the estuary. EPA gathered data in Little Bay and the Upper Piscataqua River in 2022, 2023 and 2024 and the Squamscott River in 2022 and 2023. NHDES anticipates that eelgrass resiliency and EPA data to be available for review as part of the 2026 cycle. Similar to the 2020/2022 assessment cycle, and as outlined in the Great Bay Estuary Technical Support Document, the data that has been gathered to date, in conjunction with our state water quality standards, does not yet afford NHDES a simple path to make a full assessment decision (category 2 or 5) for several assessment units in the GBE. NHDES reaffirms it's committed to working towards the collection of additional data so that a full assessment decision can be made in a future assessment cycle.

Should you have any questions, please do not hesitate to contact me at (603) 271-3289 or david.e.neils@des.nh.gov.

Sincerely,

David Neils, Administrator
NHDES Watershed Management Bureau

cc (electronically distributed): EPA – Nathan Chien, Ivy Mlsna, Tom Faber
NHDES – Robert Scott, Adam Crepeau, Rene Pelletier, Ted Diers, Matthew Wood

R-WD-24-22

STATE OF NEW HAMPSHIRE

Response to Public Comment on the Draft 2024 Section 303(d) List of Impaired Waters, the Draft Consolidated Assessment and Listing Methodology, the Draft 2024 TMDL Priorities and the 2022-2032 Draft TMDL Vision

December 18, 2024

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

STATE OF NEW HAMPSHIRE

Response to Public Comment on the Draft 2024 Section 303(d) List of Impaired Waters, the Draft Consolidated Assessment and Listing Methodology, the Draft 2024 TMDL Priorities and the 2022-2032 Draft TMDL Vision

STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
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December 18, 2024

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A. INTRODUCTION

On September 20, 2024, the New Hampshire Department of Environmental Services (NHDES) released the Draft 2024 303(d) List of Impaired Waters, the Draft Consolidated Assessment and Listing Methodology (CALM), Draft 2024 Total Maximum Daily Load (TMDL) Priorities and the 2022-2032 Draft TMDL "Vision for the Clean Water Act Section 303(d) Program, (also known as the '2022 Vision')" for public comments. Downloadable copies of the assessment and TMDL material were made available on the NHDES website for review. Public comments were accepted through the close of business on October 21, 2024. In addition to posting the notice of comment opportunity at multiple locations on the NHDES website, direct notification by email was sent to nearly 2,000 stakeholders including but not limited to:

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

The following sections contain the comments received, NHDES' responses to comments and supporting information. The sections are organized as follows:

A. Introduction.
B. Public Comment on the Draft 2024 material. Note: This section contains applicable text from the comments received. Each individual comment in the letters have been assigned a reference number. The reference number corresponds to the responses in Section C.
C. Response to Public Comment. Note: This section contains NHDES' responses to all of the comments received. The responses are organized by reference number. A reference number refers to a specific section of a comment letter in Section B.
D. Full Public Comments on the Draft 2024 material. Note: This section contains the full text of all comments received.

Table 1: Comment Letters Received by NHDES and the Designated Comment Letter Number.

COMMENTER	RECEIVED	COMMENT #
Rick Cantu, OspreyOwl Environmental, LLC	10/16/2024	#1
Kate Buckman, NH River Steward, Connecticut River Conservancy	10/21/2024	#2
Katie Lamoureux, USEPA Region 1	10/21/2024	#3

B. SUMMARY OF PUBLIC COMMENTS ON THE DRAFT 2024 ASSESSMENT AND TMDL MATERIAL

Below are excerpts from the public comments on the Draft 2024 assessment and TMDL material. This section contains the comments received presented as excerpts taken from the original documents. Each individual comment in the letters has been assigned a reference number. The reference number

corresponds to the responses in Section C. While, in some cases, the bulk of the comment text is provided in this document, the full original comments received on the September 20, 2024, draft material are presented in Section D. If any accommodations are required with this section, please contact the NHDES Water Quality Assessment Program Coordinator.

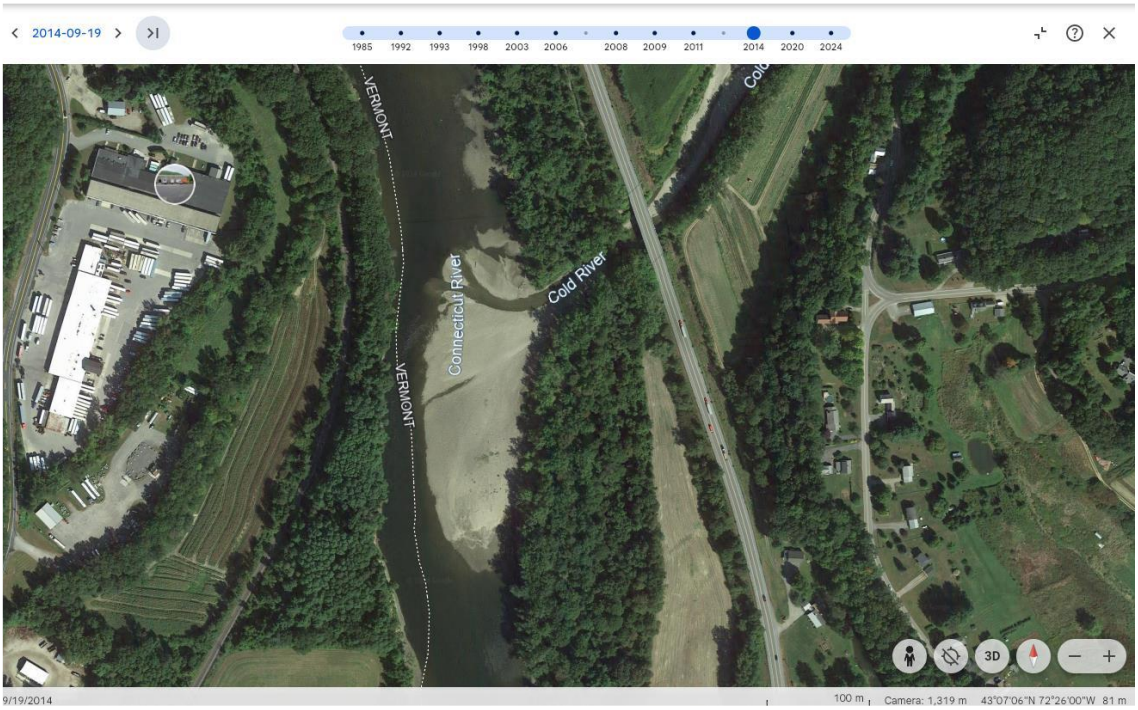
COMMENT #1: Rick Cantu, OspreyOwl Environmental, LLC

Extracted from page 1, opening paragraph: Dear Mr. Wood, These are extensive comments to the 303(d) listing regarding the present aluminum criteria WQ concentration and the consideration for adoption of the EPA Aluminum Calculator Ver. 2.0 with modifications due to trends of pH and flow.	**1- 1**
Extracted from page 1, introduction paragraph: **INTRODUCTION** The NHDES has proposed upgrading the impairment of the Merrimack River (downstream reach NHRIV700060803 to the upstream reach NHRIV70006084) for Aluminum impairing Aquatic Life Integrity and a redesignation of this span as a new assessment unit NHRIV70006083-14-03. Station 08-MER is mentioned as the location of the sample data. This is the railroad bridge area south of the Manchester wastewater outfall 001. This segment of the river is proposed to be designated as category 5-M in the draft 303(d) listing.	**1- 2**
The bulk of material starting on page 1, following the introduction, to the conclusion of the first paragraph on page 6 (except 1- 4 below) pertains to NPDES permitting.	**1- 3**
Extracted from page 3, paragraph 2: **SCOURING VELOCITY** The scouring velocity plays a big role in the concentration of Aluminum in this proposed designated section of the Merrimack River. The proposed 87 ug/l limit is a chronic value developed when rivers are at critical low-flow conditions. When sampling at flows below 1,500 cfs the grass blades, sticks, leaf and organic debris, and even the pollen patches appear to move at less than 1 ft/sec and at times the river flow seems stalled. The time of travel at this point can be 12 hours to a day or more in a 25-mile stretch of river. The acid soluble (similar to the dissolved faction) of aluminum is at quite a high ratio during these low-flow events (90% +/- of the total Al concentration). Most of the aluminum is in the available state for aquatic toxicity. These are chronic river conditions that could lead to aquatic toxicity as the dissolved aluminum is almost at par with the total aluminum.	**1- 4**
Extracted from page 6, paragraph 2: One of the sources listed in the extensive list outlined in Section 3.19 of the CALM is the 'NHDES Permits and Compliance Section (NPDES permits)' [NPDES, National Pollutant Discharge Elimination System]. A fair amount of the data displayed in the NHDES graph is from municipal WET tests that are required within the NPDES Permit. Larger municipalities are required to test quarterly, medium plants semi-annually, and smaller plants annually. The clustered green values in the above NHDES graph are from the years 2008/2009/2010 with many from the Aluminum Study conducted at the Manchester WWTP with staff from the NHDES. This was the first 'Clean Sampling' study I had physically participated in and the first time I was introduced to a Quality Assurance Project Plan. It was also the first time I developed an SOP for sampling. In that joint study with the NHDES we did a few practice runs in the fall of 2008 using the 'Clean Techniques', completed samples throughout the 2009 year, and finished in May of 2010. A report was generated and the results indicated that the Merrimack River was not impaired for	**1- 5**

aluminum with the 87 ug/l aluminum limit being removed from the final permit. The graph demonstrates this was the period of the most tightly grouped aluminum results indicating good QA/QC, sampling technique that followed a QAPP, and a prepared sampling SOP. The quality of the results could be grouped in category 3 and later category 4 of Table 3-9.	
Extracted from page 7, paragraph 1, through page 8: **ALUMINUM CALCULATOR VS. GOLD BOOK STANDARD** The NHDES currently uses the 1988-developed Aluminum Standard of 87 ug/l for chronic criteria and 750 ug/l for acute criteria. These were developed 36 years ago with the information from the best available science at the time. In 2018 the EPA published the Final Fact Sheet[1] for the updated criteria for aluminum toxicity. The second paragraph of the summary states, *"States and authorized tribes can adopt these criteria into their water quality standards* ***or can adopt other aluminum criteria that is scientifically defensible based on local or site-specific conditions.*** *These final criteria are not a regulation, nor do they impose a legally-binding requirement. These criteria provide information for states to develop science-based standards that reflect site-specific factors and are protective against the effects of aluminum on aquatic life."* The NHDES has been moving steadily toward the adoption of the new 2018 criteria that are scientifically defensible based on local or site-specific conditions (pH, dissolved organic carbon, and hardness) parameters that are not recognized within the 1988 standard of 87 ug/l. On January 14th, 2021 the NHDES, with the participation of the EPA, held a Water Quality Standards Advisory Committee Meeting (WASAC)[3] Zoom meeting due to Covid. There was an 86-slide presentation prepared that day that discussed the 2018 aluminum study scientific Fact Sheet starting at slide 51 that discussed the adoption of the 2018 Aluminum Water Criteria Standard. There were representatives from both the EPA and the NHDES Present at that meeting. The direction of the NHDES for the adoption of the 2018 study was evident in the Allenstown Draft Permit[4] issued in 2021. The limit for aluminum was 87 ug/l with footnote 9 that stated, *"See Part I.G.1 for aluminum compliance schedule."* Section G states, *"If during the three-year period after the effective date of the permit, New Hampshire adopts revised aluminum criteria but EPA has not yet approved them, then the Permittee may request a permit modification, pursuant to 40 CFR § 122.62(a)(3), for a further delay in the effective date of the final aluminum effluent limit. If new criteria are approved by EPA before the effective date of the final aluminum effluent limit, the Permittee may apply for a permit modification, pursuant to 40 CFR § 122.62(a)(3), to revise the time to meet the final aluminum effluent limit and/or for revisions to the permit based on whether there is reasonable potential for the facility's aluminum discharge to cause or contribute to a violation of the newly approved aluminum criteria.[2]"* The superscript reference indicates, " [2] The final effluent limit of 87 µg/L for aluminum may be modified prior to the end of the three-year compliance schedule if warranted by the new criteria and a reasonable potential analysis and consistent with antidegradation requirements. Such a modification would not trigger anti-backsliding prohibitions, as reflected in CWA 402 § (o) and 40 CFR § 122.44(l)."	**1- 6**
The entirety of the text from page 9, paragraph 1, through the completion of the comments on page 16 has not been captured here but will be addressed in Section C.	**1- 7**

COMMENT #2: Kate Buckman, NH River Steward, Connecticut River Conservancy

Extracted from page 1, paragraphs 2 and 3: It is clear how much work goes into the creation and maintenance of these documents and the corresponding programs by DES staff. This effort on behalf of the state's waters is appreciated. It is also clear that there is a pervasive lack of data that could enhance these efforts and which, in some instances, prevents a clear understanding of the condition of water bodies. For example, the section of the Connecticut River upstream of the Bellows Falls Dam (AUID NHIMP801060703-05) is listed as impaired on the draft 303(d) list for pH and not meeting the designated use for Aquatic Life Integrity. When looking at the most recently available "report card" on the Surface Water Quality Assessment Viewer there are 12 parameters listed under this designated use. Eight of which are parameter category 3, with limited or no data. This lack of data means that other pollutants such as metals, ammonia, and turbidity may also require the implementation of a TMDL, but because the data are beyond the maximum age allowable for assessment (CALM section 3.1.10) an appropriate evaluation of the condition and need for prioritization of management and restoration needs for the 1720 acres of water in this assessment unit is not possible.	**2- 1**
Extracted from page 2, paragraph 1: Additionally, for the same stretch of river, the report card lists the designated use for a drinking water supply as being met (2-G), yet the associated parameters are all listed as 3-ND, no current data. This is not the only AUID where I have observed this type of discrepancy and would seem counter to the protocols outlined in CALM sections 3.1.3 through 3.1.5 and can be confusing to those attempting to understand whether water quality standards are being upheld.	**2- 2**
Extracted from page 2, paragraph 2: There needs to be more support for expanding regular water quality monitoring either through current volunteer programs, state agencies, or partnering with other organizations. CRC partners with the CRJC through the NH VRAP program to engage volunteers in collecting mainstem water quality data. We are hampered in adding more sites by a lack of equipment and staff availability at the state. Capacity building is a focus area (Vision plan section 7.3) and the legally required components of both the Clean Water Acts as well as NH statutes regarding water quality will increasingly require collaboration and coordination, especially in the face of increased population growth in NH and climate change. Increasing data gathering to support these efforts needs to be a priority. We strongly support the Vision Plan capacity building to address water quality at the state level as well as increased efforts to provide comprehensive, recent data to inform water quality evaluation.	**2- 3**
Extracted from page 2, paragraph 3: The Surface Water Quality Assessment Viewer is an excellent tool. It provides easy public access to important data, and clear indications of what the various categories mean in regard to the 305(b) listing. It would be nice to be able to incorporate more data into that portal, like ARPs etc. if they are available for various waterbodies. I will also note that the incorporation of supplemental ADB categories (CALM Section 3.1.5) has been a helpful addition and should be maintained.	**2- 4**
Extracted from page 2, paragraph 4 through page 3, paragraph 1:	**2- 5**

It is interesting to note that all of the physical impairments on the 2024 303(d) list are related to stormwater (Vision Figure 2-2). The mainstem of the Connecticut River faces significant alterations to natural sediment transport regimes due to the presence of multiple dams. We have also noticed that the mouths of many of the tributaries are accumulating substantial deposits of sediments where they meet the Connecticut River (see the Google Earth screenshot of the Cold River on Sep 19, 2014 below. The large sediment deposit persists today).  The buildup of sediments within the impoundments and at confluences impacts aquatic life (including endangered species) and recreational uses and likely violates water quality standards regarding benthic deposits. It may have additional negative impacts through the transport of sediment bound contaminants and nutrients, impacting other parameters and designated uses as well. Little attention has been paid to this issue, and we again reiterate how lack of comprehensive data gathering hampers efforts to preserve and improve water quality and maintain designated uses within the State. The Vision Plan prioritization (Section 2.1.2) emphasizes the importance of water quality assessments and impairment determinations, so the gathering necessary data to do so must also be prioritized.	
Extracted from page 3, paragraph 2: CALM section 3.1.26 and Vision plan section 2.2 cover the TMDL priority ranking process, however despite the tables, it is still somewhat unclear how the prioritization is justified. CALM Table 3-16 appears to indicate that “adequate resources available to conduct the TMDL” takes precedence over the TMDL being implementable or a high initial priority, which seems backwards. I appreciate the complexity of making these prioritization decisions, however, it does not seem justifiable to prioritize developing an unimplementable TMDL over an implementable TMDL for higher classification waters that may support endangered species or be of higher classification solely based on resources, which is what the table appears to be suggesting. The Vision Plan should include guidance on how to obtain resources for TMDL implementation when it is clearly both feasible and necessary.	**2- 6**

Extracted from page 3, paragraph 3: I agree that the probabilistic assessment (CALM section 3.1.27) is a more reasonable option than a true census of the state's waters. Does the probabilistic assessment categorize all rivers the same? Would an assessment of a first order stream also be considered representative of fourth order streams? This seems to decrease the utility of this assessment scheme. Clarification on how assessment units are randomly chosen and how often the probabilistic assessment happens for different water types would be welcome.	**2- 7**
Extracted from page 4, paragraph 1: Addressing climate change impacts as prioritized in section 7.2 of the Vision is critical. New Hampshire is already seeing changes to and impacts on state waters linked to climate change effects. Incorporating this into models, restoration plans, and assessments cannot be ignored, and I strongly encourage NH DES to be proactive in addressing this focus area.	**2- 8**

COMMENT #3: Katie Lamoureux, Section Supervisor, Water Quality & Wetlands Protection, EPA Region 1

Extracted from page 2, paragraph 5: Coordination with the Instream Flow Program. As outlined in section 2.1, the 303(d) program plans to coordinate with a number of different programs within NHDES. One program that is not mentioned is the Instream Flow Program. Maintaining adequate flow in surface waters is essential to the health and maintenance of a balanced indigenous aquatic community. Close collaboration between these two programs is essential to the protection and restoration of aquatic life habitat and the sustainable use of surface water supplies. If these programs do not currently coordinate over streamflow-related impairments and flow management plans, EPA recommends that that occurs.	**3- 1**
Extracted from page 2, paragraph 6: Great Bay Estuary Prioritization. One of the most significant water quality issues in New Hampshire is eutrophication in the Great Bay estuary. The complex mixture of point and nonpoint sources, the multiple designated uses and pollutant impairments, these are quintessential management problems that the Clean Water Act's TMDL program was designed to address. In the 2022 Vision, NHDES gives passing reference to the estuary, highlighting the coordination efforts needed given the complex management situation. However, the document lacks specific plans to work on TMDLs or Advanced Restoration Plans, leading one to conclude that the estuary is not a department priority. Given the significant public comments NHDES receives during each Integrated Reporting period on the estuarine impairments, along with the pressing need to renew impactful permits that cover the estuary within the 2022-2032 Vision period, EPA would like to see Great Bay TMDL development given a higher priority in NHDES's 303(d) program planning and prioritization.	**3- 2**
Extracted from page 3, paragraph 1: Adaptive Management Plans. One of the 2022 Vision's restoration goals is to "Understand how to utilize and best interact with current adaptive management plans to meet restoration goals." This goal is laudable and is worth emphasizing and refining further. The concept of adaptive management and the related concept of adaptive implementation have been described in the TMDL context. For example, one framing is that adaptive implementation can be used in TMDLs as a way of recognizing and grappling with scientific uncertainty. See, e.g., National Research Council (2001) *Assessing the TMDL Approach to Water Quality Management* and Reckhow (2007) *Adaptive Implementation of Water Quality Improvement Plans:*	**3- 3**

Opportunities and Challenges.[1] EPA recommends not only considering how the TMDL program can interact with current adaptive management plans, but also how to incorporate adaptive implementation into the TMDL program. One example is the core restoration document, statewide permit framework described in section 2.1.3 of the 2022 Vision. Establishing core documents in such a way that the TMDL can adapt to new information throughout the duration of the waterbody's impaired status could be an area of focus. I.e., the core document could build in a process such that monitoring to track TMDL effectiveness feeds back into adjustments to margin of safety or load allocations. Similarly lack of progress on some implementation measures could trigger a readjustment of wasteload and load allocations. These are just examples, but further refinement of this restoration goal is encouraged.	

C. RESPONSES TO PUBLIC COMMENT ON THE SEPTEMBER 20, 2024 DRAFT MATERIAL

RESPONSE TO COMMENT #1: Rick Cantu, OspreyOwl Environmental, LLC

***NHDES RESPONSE to* 1- 1**

The commenter begins with an overall statement that they are submitting extensive comments on the present aluminum criteria as it relates to the adoption of the EPA aluminum calculator. However, EPA's 2018 304(a) guidance on aluminum is not the current New Hampshire water quality standard and the assessment process utilizes the most recent EPA approved state water quality standards. This is not the appropriate forum to discuss proposed changes to state water quality standards or the draft NPDES implementation methods, permit limits or state water quality standards. This comment solicitation was meant to specifically address the 303(d) list, CALM and TMDL prioritization. The department will address assessment and TMDL Vision related points raised in the comments. We do note that the commenter provided oral and written comments on the proposed changes to state water quality standards during the public comment period and those comments will be responded to in that forum.

***NHDES RESPONSE to* 1- 2**

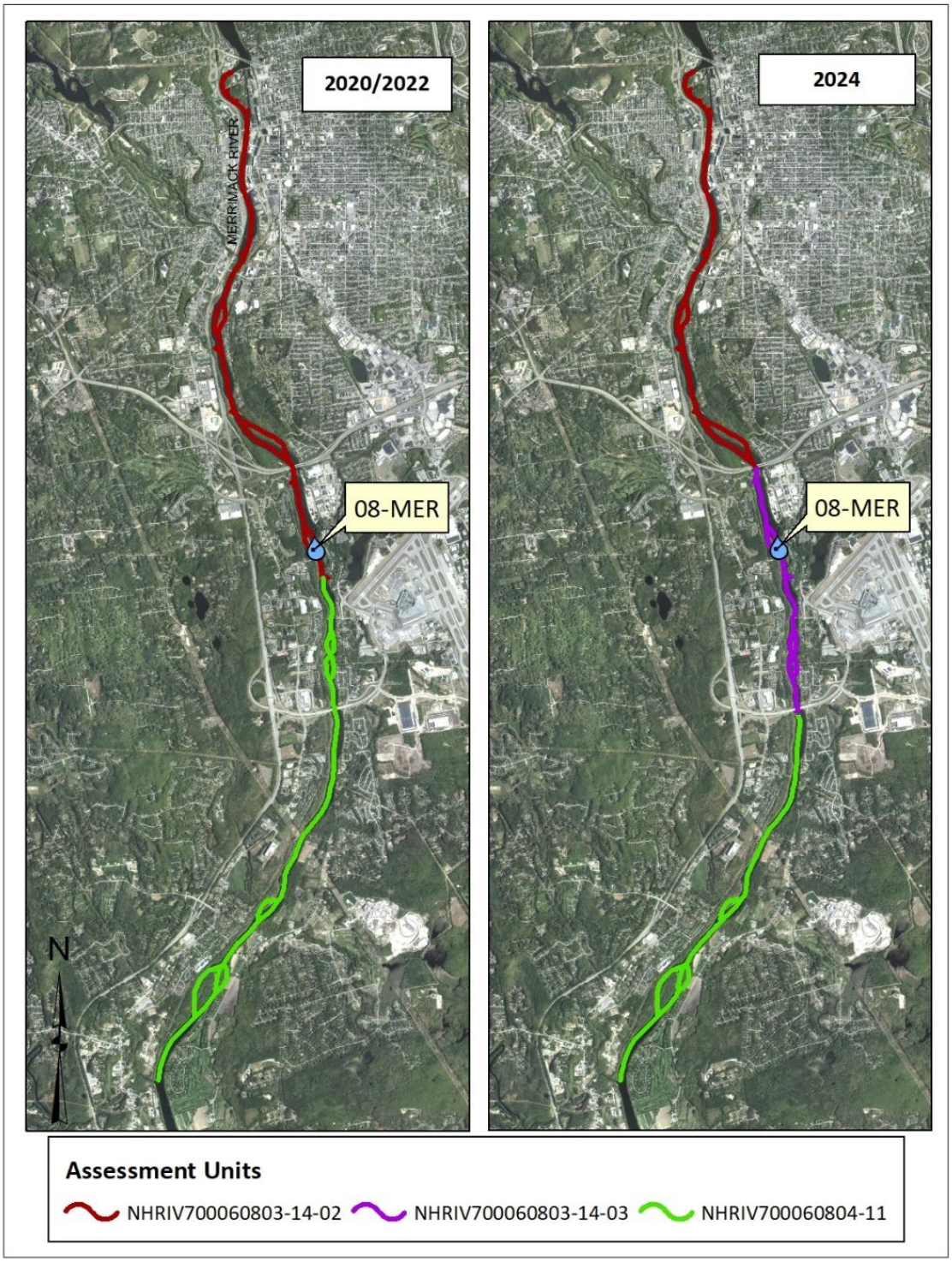
The comment seems to presume that NHDES is changing the assessment category (i.e., adding a new impairment) to a portion of the Merrimack River that was not previously impaired. Although the comment does not articulate if they are in agreement or opposed to the change in the assessment units, NHDES would like to clarify what is occurring in this area.

The city of Manchester requested that NHDES alter the assessment units in the area adjacent to their WWTF outfall, to better represent any impacts to the river from their discharge. After reviewing the information provided by the city, NHDES agreed that an alteration was warranted in part because the WWTF outfall was so close to the downstream boundary of NHRIV700060803-14-02 (we believe that this is what the commenter referred to as "NHRIV700060803"). As shown in Figure 1, NHDES ultimately determined that trimming the downstream extent of NHRIV700060803-14-02 and the upstream extent of NHRIV700060804-11 (we believe that this is what the commenter referred to as "NHRIV70006084"), so that a new assessment unit (NHRIV700060803-14-03) could be created in the middle was the best solution. Whenever the assessment unit network is altered an examination must be conducted of the underlying data to ensure that any impairments tied to an existing unit be assigned to the newly created unit when appropriate.

During this review it was determined that the upstream assessment unit (NHRIV700060803-14-02) had an existing aluminum impairment for the aquatic life integrity designated use. Examination of the data used to make that impairment determination showed that it was due to high aluminum concentrations collected at stations, including but not limited to, 10-MER-L030, 10-MER-R100, 10-MER and 08-MER. Station 08-MER

was the only station that fell within the extent of the newly delineated assessment unit (NHRIV700060803-14-03). Both current and historic data collected at station 08-MER was reviewed, and it was determined that there was sufficient evidence to warrant the aluminum impairment remain for this portion of the Merrimack River. The data is presented in its entirety in the Waters Added to the 2024 303(d) List document and below in Figure 2.

Figure 1: Assessment Units Adjacent to the Manchester WWTF from the 2020/2022 Assessment Cycle vs 2024 Assessment Cycle



***NHDES RESPONSE to* 1- 3**

The discussion submitted in this section pertains to NPDES permitting, not to the assessment material, 303(d) List or TMDL material released for public comment. Therefore, no comments are warranted at this time. Any relevant comments have been addressed through subsequent responses in this section. Also see the response to comment 1- 1, above.

***NHDES RESPONSE to* 1- 4**

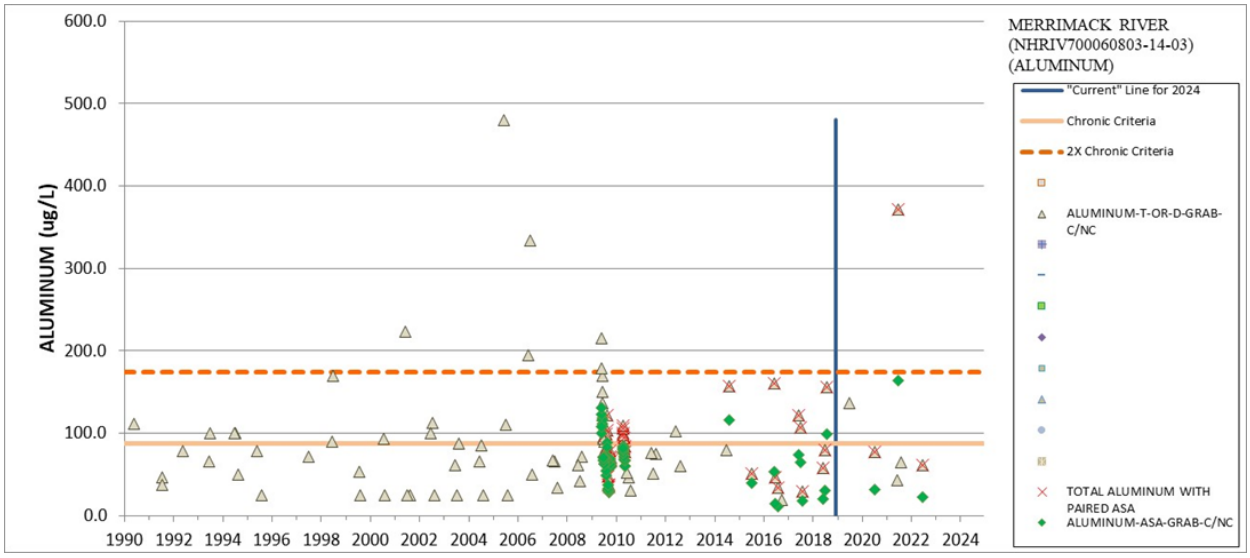
The comment appears to be mixing NPDES permitting "reasonable potential" calculation methods and the assessment process, which uses existing surface water quality standards. Toxic criteria have a magnitude, frequency and duration. The chronic criterion of 87 ug/L (magnitude) is a 4-day average (duration) not to be exceeded more than once in 3-years (frequency). Similarly, the acute criterion of 750 ug/L (magnitude) is a 1-hour average (duration) not to be exceeded more than once in 3-years (frequency). With respect to the assessment process, when the criteria are exceeded, flow is not strictly relevant. The 7Q10 is used by the NPDES program with the assumption that if there is adequate dilution of wastewater at the low 7Q10 flow, then there will be adequate dilution at all other flows. The fact that the 87 ug/L criterion is being exceeded during flows that last more than 4-days and reoccur more than once every 3-years is further evidence that the 87 ug/L criterion is not being met and the waterbody should be listed as impaired.

The comment notes on Page 1, "A Scouring Velocity Report that outlines how flows above 5,000 cfs in this segment create conditions where the 87 ug/l WQ limit for aluminum is generally exceeded. The use of EPA's aluminum calculator eliminates much of the impact of flows on the acute and chronic toxicity impacts." This confirms the impairment under the existing chronic criterion.

***NHDES RESPONSE to* 1- 5**

The comment seems to be questioning the validity or confidence of some of the aluminum data used in the assessment process. The comment seems to be melding the NPDES permitting process with that of the assessments, which are separate and use different types of data. The comment infers that in the assessment process, the department used the metals data that was collected from the water used in the Whole Effluent Toxicity (WET) testing for NPDES permitting. While WET testing data is utilized in the NPDES permitting process it is not used directly in the assessment process. The data presented in Figure 2 was collected through NHDES' Ambient River Monitoring Program, Merrimack River Aluminum Sampling Project and the River Monitoring Trend Project. The data was analyzed as either acid soluble, total or dissolved aluminum and samples were collected within the Merrimack River. WET tests are typically collected from a facility's effluent, and as such cannot be used in the assessment of the river.

Figure 2: Aluminum Concentration Data for the Merrimack River (NHRIV700060803-14-03)



The comment incorrectly assumes that because NHDES utilizes NPDES permit effluent violations as part of the assessment process that it examines the WET test data. As indicated in section 3.1.21 NHDES Permit Effluent Violations of the CALM, NHDES does not examine the WET test data directly. NPDES permit violations are reported to our bureau and a waterbody is placed in category 4B-T when the WWTF discharging to it is in significant non-compliance of its permit limits for two or more quarters. Determining if a facility is in significant non-compliance of its permit limits is a completely separate process from the assessments and is handled through EPA and NHDES' Wastewater Engineering Bureau.

***NHDES RESPONSE to* 1- 6**

The comment discusses the current state water quality standard as it relates to the EPA's 2018 methodology for calculating a sample specific criteria utilizing its aluminum calculator. EPA's 2018 methodology for calculating a sample specific criteria is currently being evaluated by NHDES for adoption into the state water quality standards. However, it is not yet adopted as a state standard, and therefore not able to be used in the assessment process. Also see the response to comment 1- 1, above.

***NHDES RESPONSE to* 1- 7**

The comment discusses, in detail, EPA's 2018 methodology for calculating a sample specific criteria utilizing its aluminum calculator. What the comment has outlined is a potential NPDES permitting approach that is neither a current water quality standard nor applicable for use in the 2024 assessment process. Also see the response to comment 1- 1, above.

RESPONSE TO COMMENT #2: Kate Buckman, NH River Steward, Connecticut River Conservancy

***NHDES RESPONSE* to 2- 1**

The commentor expresses their appreciation for NHDES, for all the work in pulling the material together for the assessments but is also concerned with the volume of unknown data information on the state's waterbodies. NHDES appreciates the commenter's gratitude and agrees that there is a tremendous amount of data that is unknown on the state's surface waters, which can make it challenging to evaluate the condition of a waterbody. The simple reality is that NHDES, like all other organizations, is limited by resources and manpower. NHDES is tasked with monitoring and assessing nearly 17,000 river miles, over 180,000 acres of lakes/ponds, and nearly 100 square miles of estuarine waters throughout the state.

Despite NHDES' utilization of its Water Monitoring Strategy, varied monitoring programs and a solicitation of data from outside originations prior to the start of the assessment process, the reality is that it is impossible to monitor all the surface waters throughout the state for all the varied parameters of concern. NHDES will continue to innovate and improve in this arena but we are limited by the state budget, staffing and resources. To help gain a better overall understanding of the health of New Hampshire's waters, probabilistic assessment reports are completed approximately every 10 years, (see NHDES Response to 2- 7 below, for links to the most recent reports). In addition, NHDES' 10-year Water Monitoring Strategy is due to be updated for the time period of 2025-2035. These comments will be considered in the preparation of that update.

The commenter also states that when data is deemed to be too old for use in the assessment process that it is no longer possible to prioritize a waterbody's management and restoration needs. The first step in assessing a waterbody per the CALM, is to evaluate data in the current period (10-years for lakes and 5-years for all other water types). The next step is to consider all of the historic data prior to assigning a final assessment category. If historic data demonstrated that a waterbody was impaired, that impairment would remain until, 1) new data is collected under similar conditions which demonstrates an improvement in water quality (i.e., meeting standards), 2) there is a change in water quality standards, or 3) the original assessment was shown to be conducted in error.

***NHDES RESPONSE* to 2- 2**

The comment indicates that the criteria outlined in the CALM under sections 3.1.3 through 3.1.5 can be confusing to those attempting to understand whether water quality standards are being met. While NHDES does not disagree with the observation, there are lots of nuances (e.g., core parameters) that must be considered when assigning an assessment category to a designated use or assessment unit. Table 3-6 in the CALM provides the most concise explanation of the overall hierarchal process used to roll up categories. However, when trying to understand if a water quality standard or threshold is being met or not it is best to focus on the parameter level category. This category relates directly to the particular water quality standard or threshold for the parameter of interest to the reader. This is also the reason why NHDES removed the AUID Level and Designated Use Level – NHDES Categories from the 303(d) List and Status of Each Assessment Unit documents, beginning with the 2020/2022 assessment cycle. The AUID level and designated use level categories are a reporting requirement to EPA, however, NHDES will consider additional options (i.e., removal from the report cards) in the future to help alleviate any confusion.

More specifically, as it relates to the commenters question about a parameter in the potential drinking water supply designated use being categorized as having no current data, yet the designated use being categorized as meeting standards, NHDES offers the following as outlined in Table 3-4 (page 10) of the CALM. The definition of the potential drinking water supply designated use, per Env-Wq 1702.17, states, "Potential drinking water supply, meaning the surface water could be suitable for human intake and meet state and federal drinking water requirements after adequate treatment." The important piece of that definition is the last three words, "…after adequate treatment…" Although any particular parameter may not be meeting its standard, or there is a lack of data to assess it, there is always the ability to treat the drinking water source, so that it does meet its standard. It is for this reason that NHDES assigns the potential drinking water supply designated use as "fully supporting" for all waterbodies.

***NHDES RESPONSE* to 2- 3**

This comment highlights the need to expand water quality monitoring efforts and supports capacity building to inform water quality evaluations. The TMDL Program agrees and Section 7.3 of *The New*

Hampshire 2022 – 2032 Vision for the Clean Water Act Section 303(d) Program, A Guidance Document highlights the need to apply resources efficiently and encourages collaboration efforts.

***NHDES RESPONSE* to 2- 4**

The commenter expresses their appreciation for the development of the water quality assessment viewers but would like to see their expansion to include additional information like Advanced Restoration Plans (ARPs). NHDES appreciates the commenter's remarks and we continue to add information we feel will benefit the public. As an example, new to the 2024 viewer is the ability to see the legislative classification of a waterbody (i.e., class A or B). NHDES is also currently developing a TMDL specific viewer. This viewer will have similar functionality as the assessment viewer but will depict waterbodies that have TMDLs and/or ARPs. The viewer will also allow users to view/download the actual TMDL or ARP documents. Once completed, the TMDL viewer will be available on the NHDES website.

***NHDES RESPONSE* to 2- 5**

The commenter feels that little attention is being given to the buildup of sediments within impoundments and at confluences of rivers, which can have impacts on aquatic life and recreational uses, and likely violates water quality standards. The commenter also feels that sediment transport may have additional negative impacts through contaminants bound to the sediment causing impacts to downstream designated uses.

NHDES does consider both sediment deposits and sediment quality in its assessment process, as evident by Indicator 15: Sediment Quality (p. 97) and Indicator 18: Benthic Deposits (p. 99) of the CALM. Though it should be noted that sediment sampling and analysis can be cost prohibitive, and therefore, little information has been conveyed to NHDES by project proponents for analysis and consideration during the assessment cycle. Emphasis must be placed on showing that deposits are not naturally occuring, which can also be difficult to ascertain. NHDES has evaluated sevaral waterbodies with regard to the sedimentation/siltation, three of which are currently on the 2024 303(d) list (e.g., Rust Pond, Railroad Pond and Hueber Brook). NHDES encourgages the commenter, as well as any other orginizations, to submit data or documentation of sediment related issues specific to a waterbody to NHDES at any time so that appropriate evaluations can be completed and the information used in the biennial assessment process.

The commenter also seems to be implying that the Cold River should be impaired for sediment. It is worth noting that sediment movement is natural in a riverine system, but is sometime made worse by humans via land use changes. Furthermore, the Cold River experienced catastrophic flooding in 2005. In order to make an impairment determination NHDES would need to separate the anthropogenic from natural influences, which is exceedingly difficult.

***NHDES RESPONSE* to 2- 6**

The commenter notes a lack of clarity regarding the TMDL prioritization process outlined in section 2.2 of *The New Hampshire 2022 – 2032 Vision for the Clean Water Act Section 303(d) Program, A Guidance Document*. Table 2-5 (TMDL Priority Ranking from the 2024 Section 305(b) and 303(d) Consolidated Assessment and Listing Methodology) is referenced and the commenter notes that the question, "Are there adequate resources available to conduct the TMDL?" is prioritized over the question, "Is it very likely that the TMDL, once developed, can or will be implemented (is it technologically possible and economically feasible)?" The commenter mentions the possibility of prioritizing an unimplementable TMDL over an implementable TMDL for a higher classification water that may support endangered species or be of higher classification solely based on resources.

The TMDL prioritization results from the 2024 assessment followed the process referenced by the commenter. The scenario described by the commentor did not occur. The prioritization process provides

guidance and once completed, results are reviewed and final prioritization for TMDLs are made using best professional judgement. In practice, water resources ranked as "High" in the preliminary TMDL prioritization are the only waterbodies carried through the entire prioritization process. This is the result of a combination of the number of impairments needing TMDLs (greater than 3,000) and the resources available to develop TMDLs. Through following this process, NHDES does not envision a situation where limited resources would be dedicated to the development of a TMDL that is not implementable. Additionally, the TMDL prioritization process is reviewed every assessment cycle and updated as necessary. The comments shared by the commenter will be considered for the 2026 assessment cycle as NHDES works to improve the prioritization process.

***NHDES RESPONSE* to 2- 7**

The commenter wishes to understand the probabilistic assessment process in more detail, including the frequency of reporting and site selection criteria. Although this comment is not directly related to the material put forth for public comment, NHDES offers the following information for the commenter.

Probability-based surveys have been implemented by EPA since 2000 to evaluate the overall condition of the nation's surface waters (lakes, rivers, wetlands and estuaries). National surveys are completed on a 5-year rotating schedule by waterbody type. The department undertakes an intensification (i.e. increased frequency of sampling) for lakes and rivers once every ten years. This provides sufficient data for a state-level, probability-based, intensification survey. The state intensification survey for rivers includes wadeable rivers and perennial streams. Non-wadeable rivers are not included due to the department's limited technical capacity and resources. Rivers can be categorized by either stream order or other methods, such as mean annual flow. During the statistical site selection process and subsequent data analysis, sites are weighted based on the river miles in each category and the number of sites evaluated in each category. This occurs at both the national and state scale. By assigning a weight, each site can then be utilized to extrapolate the condition of all river miles, at the scale (national or state) being evaluated. Additional information on how NHDES participates in this project can be found in NHDES' Water Monitoring Strategy as well as EPA's National Aquatic Resource Surveys website. The most recent probabilistic reports by NHDES for lakes, ponds and reservoirs; rivers and streams; as well estuarine waters, can be found on NHDES' website.

***NHDES RESPONSE* to 2- 8**

The commenter highlights the critical need to address climate change impacts. The TMDL Program agrees and Section 7.2 of *The New Hampshire 2022 – 2032 Vision for the Clean Water Act Section 303(d) Program, A Guidance Document* addresses climate change and the need to consider impacts when working to meet the goals of the Clean Water Act. Furthermore, the TMDL Program will utilize the newly released guidance provided by the *Climate Change Considerations When Prioritizing, Developing and Implementing Total Maximum Daily Loads* and incorporate it in future planning documents when appropriate.

RESPONSE TO COMMENT #3: Katie Lamoureux, Section Supervisor, Water Quality & Wetlands Protection, EPA Region 1

***NHDES RESPONSE* to 3- 1**

The comment points out that in section 2.1 of *The New Hampshire 2022 – 2032 Vision for the Clean Water Act Section 303(d) Program, A Guidance Document* does not specifically mention the Instream Flow Program when discussing coordination with different programs within NHDES. While not specifically mentioned, the document does state the need to cooperate with programs and sections within NHDES. The

TMDL Program will continue to collaborate with the Instream Flow Program to meet protection and restoration goals.

***NHDES RESPONSE* to 3- 2**

The commenter communicates the desire for higher priority for the development of a Great Bay TMDL. The department's TMDL Program recognizes that eutrophication of the Great Bay Estuary is a significant water quality issue that needs to be addressed. At this time, the TMDL Program is in the process of developing capacity and building new approaches to surface water quality restoration efforts, e.g. through the use of future watershed management plans and ARPs. Completion of *The New Hampshire 2022 – 2032 Vision for the Clean Water Act Section 303(d) Program, A Guidance Document* has been helpful to this process. Given the scale, scope, and complexity of developing a Great Bay TMDL, NHDES has chosen not to include it in the long-term vision for the program at this time. However, as noted below, there are other initiatives in which NHDES participates that advance water quality planning in the region.

Additionally, there are efforts being made that will focus on reducing nitrogen loads to the Great Bay Estuary. These include the EPA's Great Bay Estuary Total Nitrogen General NPDES Permit and the efforts made by the Municipal Alliance for Adaptive Management (MAAM). MAAM is responding to the Total Nitrogen General Permit with the goal of implementing an adaptive management framework to provide greater long-term flexibility for meeting regulatory compliance and a more collaborative framework for protecting and promoting water quality throughout the Great Bay Estuary watershed. MAAM also funds the Pollutant Tracking and Accounting Project (PTAP) which tracks nutrient reductions associated with the implementation of structural and non-structural best management practices (BMPs).

The Piscataqua Region Estuaries Partnership (PREP) and the Eelgrass Resilience Projects continue to provide valuable data and analyses related to the Great Bay Estuary. NHDES will continue to collaborate with these programs, and others, in an effort to understand the impacts of pollutants which could lead to targets that could be addressed through the development of a future TMDL. Overall, The TMDL Program agrees with the commenter's statement, "EPA encourages NHDES to treat this as a 'live' planning document, modifying it as necessary over the 2022-2032 planning period." The department's TMDL Program is working with interested parties, including EPA, to develop a plan for the Great Bay Estuary and will update and modify the guidance document appropriately.

***NHDES RESPONSE* to 3- 3**

The commenter encourages further refinement when incorporating adaptive management to meet restoration goals. *The New Hampshire 2022 – 2032 Vision for the Clean Water Act Section 303(d) Program, A Guidance Document* does offer some insight into adaptive management plans within the restoration section. The TMDL Program agrees that adaptive management and implementation are important and can lead to responsive restoration approaches. The TMDL Program also believes that adaptive management is inherent in its prioritization, planning and implementation but will work towards refinement as it gains experience developing and applying the approach outlined in the 2022 Vision. It is further agreed that this document should be treated as a 'live' planning document and will modify and refine as experience dictates.

D. FULL PUBLIC COMMENTS ON THE DRAFT 2024 ASSESSMENT AND TMDL MATERIAL

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Comments to the Draft 2024 – 303(d) List – Al Criteria

Matthew A. Wood
Water Quality Assessment Program Coordinator
Water Division, NH Department of Environmental Services
PO Box 95, - 29 Hazen Drive
Concord, NH 03302-0095

October 1, 2024

Dear Mr. Wood,

These are extensive comments to the 303(d) listing regarding the present aluminum criteria WQ concentration and the consideration for adoption of the EPA Aluminum Calculator Ver. 2.0 with modifications due to trends of pH and flow.

INTRODUCTION

The NHDES has proposed upgrading the impairment of the Merrimack River (downstream reach NHRIV700060803 to the upstream reach NHRIV70006084) for Aluminum impairing Aquatic Life Integrity and a redesignation of this span as a new assessment unit NHRIV70006083-14-03. Station 08-MER is mentioned as the location of the sample data. This is the railroad bridge area south of the Manchester wastewater outfall 001. This segment of the river is proposed to be designated as category 5-M in the draft 303(d) listing.

These comments include:

- General points regarding the NHDES graph of aluminum concentration that includes data from 1992 through 2022. The expectation is that the Small General Permits will receive an 87 ug/l limit in the mentioned segment of the Merrimack River;
- A Scouring Velocity Report that outlines how flows above 5,000 cfs in this segment create conditions where the 87 ug/l WQ limit for aluminum is generally exceeded. The use of EPA's aluminum calculator eliminates much of the impact of flows on the acute and chronic toxicity impacts;
- A review of the quality of past and present data and comparing these to the quality criteria outlined in the CALM. Review the adequacy of the QA/QC used in sample collection and determine if data points should not be used on the NHDES graph;
- A comparison of the updated scientific-based multi-factor (DOC, pH, and hardness) aluminum calculator against the 36-year-old aluminum acute and chronic data set;

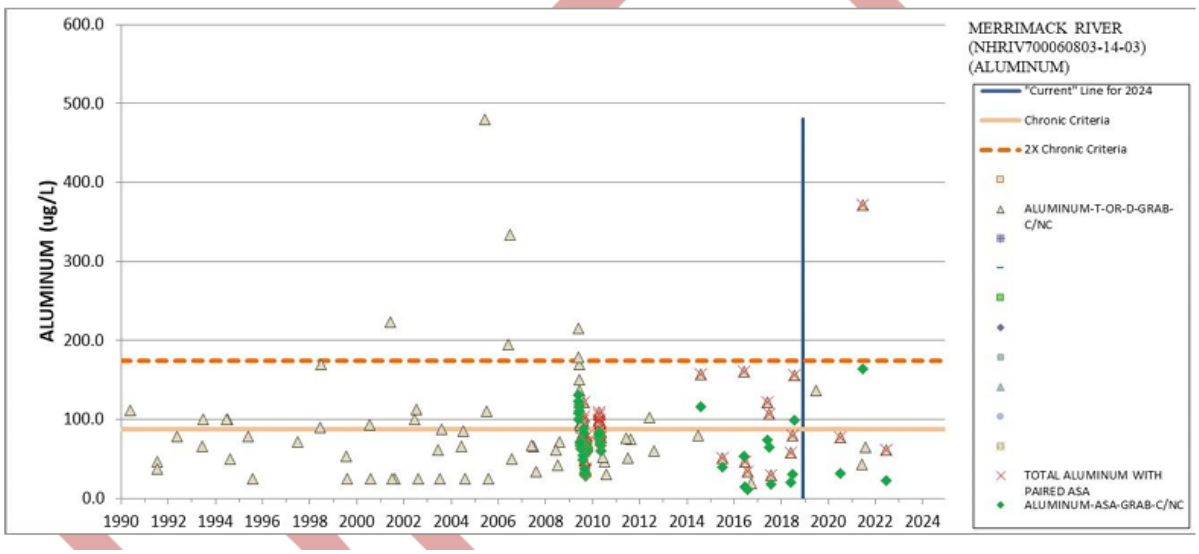
- Review of the NHDES additional criteria that must be completed before implementing EPA's Aluminum Calculator with the flow-based adjustments;
- Provide Information from the OOE spring/summer/fall sampling program that is being conducted for four municipalities. They are adjacent to or within this new segment designation. List the results of CMC and CCC from calculator concentrations using DOC, Hardness, and pH as displayed in calculator tables;
- Massachusetts Watershed Approach using default aluminum concentrations from EPA's Aluminum calculator when actual sampling data is lacking;
- Why the aluminum calculator CCC values are not relevant to river flows at any time during the year.

Aluminum for Aquatic Life Integrity

Merrimack River (NHRIV700060803-14-03)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Merrimack River	NHRIV700060803-14-03	Aluminum	MANCHESTER	n/a	5-M

For the 2024 assessment cycle the downstream reach of NHRIV700060803-14-02 and the upstream reach of NHRIV700060804-11 were clipped, and a new assessment unit (NHRIV700060803-14-03) was created in this stretch of the Merrimack River. This modification to the assessment unit network was completed in consultation with the City of Manchester to better represent the area of the river impacted by the Manchester WWTF outfall. Prior to the split, NHRIV700060803-14-02 was impaired for aluminum for the aquatic life integrity designated used, due in part to samples collected at station 08-MER. Station 08-MER is now located in the newly created assessment unit and as such the impairment must be assigned to the newly created assessment unit. The Merrimack River (NHRIV700060803-14-03) has been placed in category 5-M for aluminum for the aquatic life integrity designated used based of the data reviewed as part of the current assessment period.



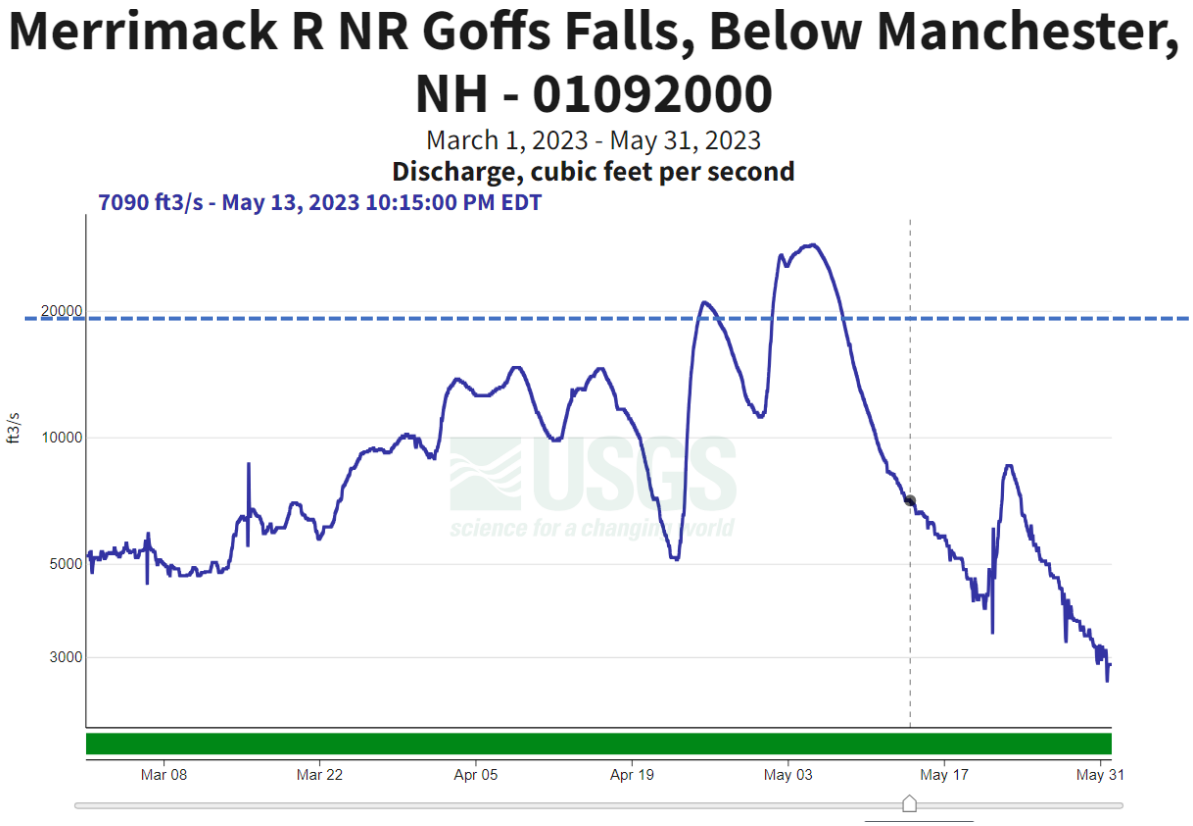
The EPA and NHDES are jointly proposing a Small General Permit for all NH treatment plants under a 5-mgd daily design flow. The town of Hooksett, which is upstream from Manchester, and the Towns of Derry and Merrimack would all fall under this General Permit designation. Manchester has a proposed 87 ug/l limit in the final NPDES permit to which the City has contested the aluminum limitation placed in the permit. Hooksett, Derry, and Merrimack have been unofficially informed by the EPA that they are likely to have aluminum imposed within their Small General Permits. All four municipalities have contracted with OspreyOwl Environmental (OOE) to collect 'Clean Samples' over the summer and fall in anticipation of providing representative data from this proposed

redesignated segment of the Merrimack River and the segments immediately upstream and downstream from this segment. Note the light orange solid line in the NHDES graph is the chronic criteria value of 87 ug/l for Aluminum taken from the 1988 Gold Book Standard. The acute 1-hour value is 750 ug/l for Aluminum as outlined in the Gold Book and no value has exceeded this acute value. The highest value listed between 2005/2006 is approximately 450 ug/l of total aluminum which is less than 2/3 of the acute value of 750 ug/l.

SCOURING VELOCITY

The scouring velocity plays a big role in the concentration of Aluminum in this proposed designated section of the Merrimack River. The proposed 87 ug/l limit is a chronic value developed when rivers are at critical low-flow conditions. When sampling at flows below 1,500 cfs the grass blades, sticks, leaf and organic debris, and even the pollen patches appear to move at less than 1 ft/sec and at times the river flow seems stalled. The time of travel at this point can be 12 hours to a day or more in a 25-mile stretch of river. The acid soluble (similar to the dissolved faction) of aluminum is at quite a high ratio during these low-flow events (90% +/- of the total Al concentration). Most of the aluminum is in the available state for aquatic toxicity. These are chronic river conditions that could lead to aquatic toxicity as the dissolved aluminum is almost at par with the total aluminum.

When this section of the Merrimack River exceeds 5,000 to 6,000 cfs the river is moving quickly and surface debris moves past the sampler at rates of 5 fps or faster. The river bed begins to be stirred up and suspended throughout the river's water column. It is almost impossible to collect a river sample under 87 ug/l even under the best 'Clean Sampling' effort at river flows greater than this. The acid-soluble/dissolved portion drops steadily as the flows increase and typically drop to ratios of 50%+/-. The river at levels of 5,000/6,000 cfs and greater covers one mile of river run in less than one hour. This is indicative of acute flow conditions and exposure.



The days of heavy participation can also add significantly to river aluminum. The soil from the river banks adds greatly to the total aluminum in the river and this contribution is from a naturally occurring condition.

An example of these conditions is evident in the May 30, 2024 sample OOE collected for the Merrimack WWTP (attached in the Appendix). I was doing four consecutive days of sampling and that day happened to be a down-pour when we went to the sample location. The river level was at 4,825 cfs. Note on that chain of custody the statement "River moving fast" and also "Rain got into the field blank." Below are the screen-shot results from the upstream sample and field blank from the laboratory report.

Sample ID:	MER-Outfall-Upstream
Lab Sample ID:	279335.01
Matrix:	aqueous
Date Sampled:	5/30/24
Date Received:	5/30/24
Aluminum	**0.085**
Copper	**0.0013**
Lead	< 0.0005
Total Hardness (as CaCO3)	**17**

Sample ID:	MER-Outfall-Upstream Dup	MERWWTP-Field Blank
Lab Sample ID:	279335.02	279335.03
Matrix:	aqueous	aqueous
Date Sampled:	5/30/24	5/30/24
Date Received:	5/30/24	5/30/24
Aluminum	**0.084**	**0.32**
Copper	**0.0011**	< 0.001
Lead	< 0.0005	**0.0011**

Note the upstream aluminum is 85 ug/l with a duplicate of 84 ug/l (one of the highest river results from the summer sampling) resulting in an RPD of 0.3% for the duplicate. The field blank has an aluminum value of 320 ug/l and the lead concentration was 1.1 ug/l.

The field blank is placed on the outer bag (from the double bagging of each critical sample bottle) to keep sand off the bottom of the field blank. It is set out as part of the QA/QC protocols and placed upwind of our sample location. This is done to determine and measure any ambient pollutants. There were grains of sand that splashed up onto the outside of the field blank and on the outer bag. This was noted as it was not possible to determine the impact until the analytical results were returned by the lab. This was the only field blank contaminated during the summer/fall sampling project. The upstream aluminum was 85 mg/l at the flow approaching the 5,000 cfs cut-off as outlined above and within the Scouring Velocity Report.

Several years ago, I developed a Scouring Velocity Report (attached as an appendix to comments) from the Manchester sampling project of 2009/2010 (green cluster period outlined in the above NHDES raft graph) with that data. Over the last couple of years, I have included this with each QAPP that I create for clients. This is included as a reminder to plant sampling staff that flows more than seven to eight times the 7Q10 will yield poor and non-representative concentrations regarding critical low flow conditions. The limitations in future NPDES permits for this section of the Merrimack River (Allenstown down to Nashua) should include a daily max value of 750 ug/l aluminum when flows are above eight times the 7Q10 for each WWTP. These are conditions when the Chronic Value of 750 ug/l for Aluminum should be applied as river time of travel, is greater than a mile during velocities of 5 fps or greater.

QUALITY OF SAMPLING DATA

An NHDES document called the Consolidated Assessment and Listing Methodology (CALM)[1] outlines how the integrity of collected sample data is specified along with descriptions of acceptable Data Quality. The 2024 draft CALM table 3-9 outlines the parameters for acceptable and marginal sample values. The table is identical to the present CALM that is in place.

Table 3-9: Generalized Level of Information Descriptions for Data Quality

Level of Information - or - Data Confidence	Hallmarks of Datasets within this Confidence Level*	Assessment Applicability	Use Support Option(s) that can be used with this level of information
Low	SOPs or QA/QC plan are not available or were not provided. SOPs or QA/QC plan is available but protocols were not followed, QA/QC results are inadequate, and /or there is inadequate metadata.	Screening Level assessments only	"Not Assessed" "Insufficient Information"
Fair	SOPs or a QA/QC plan is available; SOPs were used for field and lab; QA/QC protocols were followed and QA/QC results and metadata are adequate; Samplers had some training;	Final Assessments	"Insufficient Information" "Fully Supporting" (with caution) "Not Supporting" (with caution)
Good	An acceptable QA/QC plan is available; SOPs were used for field and lab; QA/QC protocols were followed and QA/QC results and metadata are adequate; Samplers were well trained.	Final Assessments	"Insufficient Information" "Fully Supporting" "Not Supporting"
Excellent	An acceptable QA/QC plan is available; SOPs were used for field and lab; QA/QC protocols were followed and QA/QC results and metadata are adequate; Samplers were well trained and audited.	Final Assessments	"Insufficient Information" "Fully Supporting" "Not Supporting"

Notes:
SOP stands for Standard Operating Protocols
QA/QC stands for Quality Assurance/Quality Control

The narration before Table 3-9 is as follows: *"Data used to make final assessment decisions, must be scientifically defensible. Consequently, it is extremely important that the quality of the data is known. Information about the procedures used for sample collection, sample analysis, data analysis and data reporting are requested in the data request process described in Section 3.1.9.*

ATTAINS requires documentation of the data quality used to make a final assessment decision. In terms of ATTAINS, this is called the "level of information" for which there are four options to select from:

[1] 2024 Section 305(b) and 303(d) Consolidated Assessment and Listing Methodology (nh.gov)

1. *Low.*
2. *Fair.*
3. *Good.*
4. *Excellent*

The 2024 New Hampshire Consolidated Assessment and Listing Methodology 25 General criteria for determining the appropriate level of data confidence are provided in Table 3-9. As shown, only data which is considered to be Fair, Good or Excellent can be used to make a final assessment and from Fair to Excellent there is an increasing confidence in the datasets precision and accuracy. As a reference, quality assurance/quality control (QA/QC) procedures used by the NHDES are considered Good to Excellent and were used to help determine appropriate levels for data collected by others. Data or information that is assigned a Low level is not considered defensible for use in final assessments. Such data, however, can and is used for making preliminary or screening level assessments, which help guide future monitoring efforts."

One of the sources listed in the extensive list outlined in Section 3.19 of the CALM is the 'NHDES Permits and Compliance Section (NPDES permits)'. A fair amount of the data displayed in the NHDES graph is from municipal WET tests that are required within the NPDES Permit. Larger municipalities are required to test quarterly, medium plants semi-annually, and smaller plants annually. The clustered green values in the above NHDES graph are from the years 2008/2009/2010 with many from the Aluminum Study conducted at the Manchester WWTP with staff from the NHDES. This was the first 'Clean Sampling' study I had physically participated in and the first time I was introduced to a Quality Assurance Project Plan. It was also the first time I developed an SOP for sampling. In that joint study with the NHDES we did a few practice runs in the fall of 2008 using the 'Clean Techniques', completed samples throughout the 2009 year, and finished in May of 2010. A report was generated and the results indicated that the Merrimack River was not impaired for aluminum with the 87 ug/l aluminum limit being removed from the final permit. The graph demonstrates this was the period of the most tightly grouped aluminum results indicating good QA/QC, sampling technique that followed a QAPP, and a prepared sampling SOP. The quality of the results could be grouped in category 3 and later category 4 of Table 3-9.

Before I participated in this 'Clean Sampling' program I, along with most of my fellow wastewater treatment plant (WWTP) operators in Manchester and all WWTP in New Hampshire, had only produced results that would be considered in the low category (No SOP or QA/QC plans and results are inadequate). WWTP sampling staff had learned sampling protocols from previous WWTP operators who had learned from the original operators hired in the 1970s. Operators were not aware of the impact of aluminum found in deodorant, the fact that aluminum is contained in galvanized steel and other metal products, and that aluminum is the lightest of the metals being measured. They had no concept of scouring velocities and were not aware that many of the samples taken in the spring during snow runoff season exceeded the Merrimack's scouring velocity. As OOE has conducted 'Clean Sampling' studies from 2015 to present at a dozen municipalities it demonstrated time and again that sample collection had not changed since the inception of the Clean Water Act in 1972. Analytical instrumentation in the 1970s and 1980s was only capable of reaching detection limits of 0.1 mg/l range (100 ug/l). Many of the early WET tests had metal concentrations that came back as Non-Detect (ND).

Instrumentation improved and detection limits started going lower and lower. Most instruments are capable of measuring down to 3 ug/l with some reaching 0.5 ug/l for certain metals (Pb and Cd).

As it was in the 1970s and 1980s, most samplers throw buckets (galvanized, aluminum, or stainless steel as they are heavy and sink faster) from shore or off bridges or reach in from shore with a dipper and/or jug and scoop up the river water. These devices are not cleaned from sample event to sample event, are stored in truck beds or

utility boxes, and are used over and over again with the same technique. It is likely that a majority of the concentrations of aluminum measured in NPDES WET samples are taken by WWTP operators and only meet the screening level assessment criteria.

Below are pictures of how sampling is done and what kind of collection equipment WWTP samplers are using currently. There were no QAPPs or SOPs and collection was quick and hap-hazard. WET test data used in the graph is more likely a class 1 designation according to the NHDES CALM and should not be used to determine NPDES 'Reasonable Potential' calculations or river segment impairment.

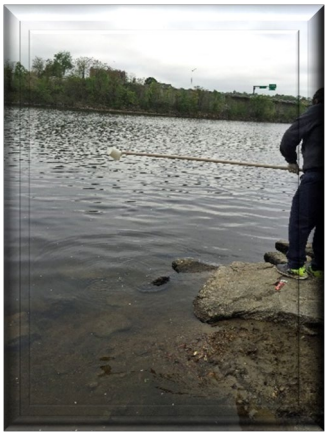


Figure 1 Dipper Sample Collection

Figure 2 Filling WET Test Carboy

Figure 3 3-Tier Sample Pole

Figure 4 Throwing Bucket

Figure 5 Aluminum Pail

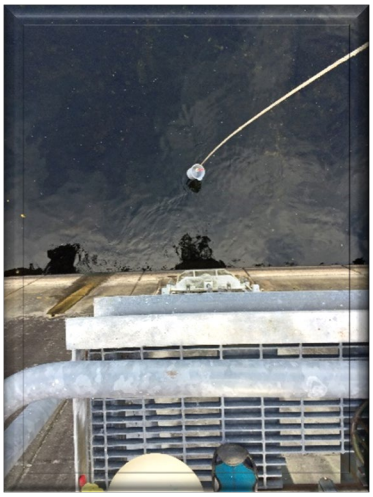


Figure 6 Sample from Galvanized Platform

ALUMINUM CALCULATOR VS. GOLD BOOK STANDARD

The NHDES currently uses the 1988-developed Aluminum Standard of 87 ug/l for chronic criteria and 750 ug/l for acute criteria. These were developed 36 years ago with the information from the best available science at the time.

In 2018 the EPA published the Final Fact Sheet[2] for the updated criteria for aluminum toxicity. The second paragraph of the summary states, *"States and authorized tribes can adopt these criteria into their water quality standards* ***or can adopt other aluminum criteria that is scientifically defensible based on local or site-specific conditions.*** *These final criteria are not a regulation, nor do they impose a legally-binding requirement. These criteria provide information for states to develop science-based standards that reflect site-specific factors and are protective against the effects of aluminum on aquatic life."*

The NHDES has been moving steadily toward the adoption of the new 2018 criteria that are scientifically defensible based on local or site-specific conditions (pH, dissolved organic carbon, and hardness) parameters that are not recognized within the 1988 standard of 87 ug/l.

On January 14th, 2021 the NHDES, with the participation of the EPA, held a Water Quality Standards Advisory Committee Meeting (WASAC)[3] Zoom meeting due to Covid. There was an 86-slide presentation prepared that day that discussed the 2018 aluminum study scientific Fact Sheet starting at slide 51 that discussed the adoption of the 2018 Aluminum Water Criteria Standard. There were representatives from both the EPA and the NHDES Present at that meeting.

Water Quality Standards Advisory Committee (WQSAC)

MEETING SUMMARY

Thursday, January 14, 2021, 1:30 pm – 3:30 pm
WEB ONLY
~~**NH Department of Environmental Services (NHDES)**~~
~~**29 Hazen Drive, Concord, NH**~~
~~**Rooms 112-114**~~

Attendees

Name	Organization
Bill Schroeder	NH Lakes Association
Boyd Smith	NH Water Works Association
Brian Maloy	Monadnock Paper Mills
Dan Arsenault	EPA R1
Don Kretchmer	DK Water Resource Consultants
Gregg Comstock	NHDES
Gretchen Young	City of Dover
Jim Hagy	EPA -Narragansett
Ken Edwardson	NHDES
Matt Wood	NHDES
Melisa Paly	Conservation Law Foundation
Paul Stacey	Footprints in the Water
Rob Robinson	Manchester EPD
Sarita Croce	Town of Merrimack
Scott Decker	NHFG
Senator James Gray	NH Senate
Sherry Young	Rath, Young and Pignatalli
Stephen Roy	NHDES
Ted Diers	NHDES
Toby Stover	EPA R1
Tracy Wood	NHDES
Walt Henderson	NHDES
Wayne Ives	NHDES

The direction of the NHDES for the adoption of the 2018 study was evident in the Allenstown Draft Permit[4] issued in 2021. The limit for aluminum was 87 ug/l with footnote 9 that stated, *"See Part I.G.1 for aluminum compliance schedule."*

Section G states, "*If during the three-year period after the effective date of the permit, New Hampshire adopts revised aluminum criteria but EPA has not yet approved them, then the Permittee may request a permit modification, pursuant to 40 CFR § 122.62(a)(3), for a further delay in the effective date of the final aluminum effluent limit. If new criteria are approved by EPA before the effective date of the final aluminum effluent limit, the Permittee may apply for a permit modification, pursuant to 40 CFR § 122.62(a)(3), to revise the time to meet the final aluminum effluent limit and/or for revisions to the permit based on whether there is reasonable potential for the facility's aluminum discharge to cause or contribute to a violation of the newly approved aluminum criteria.[2]"*

The superscript reference indicates, "[2] The final effluent limit of 87 µg/L for aluminum may be modified prior to the end of the three-year compliance schedule if warranted by the new criteria and a reasonable potential analysis

[2] aluminum-criteria-final-factsheet.pdf (epa.gov)
[3] January 14, 2021 WQSAC Meeting Summary (nh.gov)
[4] draftnh0101390permit_Allenstown.pdf

and consistent with antidegradation requirements. Such a modification would not trigger anti-backsliding prohibitions, as reflected in CWA 402 § (o) and 40 CFR § 122.44(l)."

NHDES CRITERIA FOR ACCEPTING THE ALUMINUM CALCULATOR TO DETERMINE TOTAL AL WQ CRITERIA

A recent NHDES slide presentation from April of 2024 reviewed the progress of the Aluminum Criteria based on the EPA's Aluminum Calculator.[5] The NHDES attempts to equate the 20 DOC, pH, and Hardness data points to flows in three associated distribution curves that are created for each parameter. There is quite a bit of comparison work here. There are three particular slides to focus on. Slide 14, Hardness vs. Flow, slide 15, DOC vs. Flow, and slide 17, pH vs. Flow. In these slides, some values increase or decrease with increasing and decreasing flows. Slide 14 provides a conclusion that hardness will increase at decreasing flows. Review the Hooksett Al Calculator table below. The hardness is 14 mg/l at 5,100 cfs, 3,200 cfs and at 1,930 cfs. The Manchester Calculator table has a 16 mg/l hardness at 5,100 cfs and also at 2,570 cfs. The Derry table has a hardness of 19 mg/l at 5,020 cfs and 1,460 cfs. Finally, the Merrimack Al Calculator table demonstrates an 18 mg/l hardness at flows of 2,520 cfs, 5,100 cfs, 2,400 cfs and 944 cfs. The conclusion does not bear out in OOE's 'Clean Sample' collection and values. This NHDES-suggested pattern is not demonstrated over the spring/summer sample results for Hooksett, Manchester, Derry, and Manchester and no trend can be established.

Slide 15 indicates that 10% of the DOC samples increase with decreasing flows and that 90% of the samples decrease with decreasing flows. The below 36 sample sets from the four communities on the Merrimack River would indicate that the DOC tends are random and reflective of the actual water quality rather than flows. The four tables demonstrate on 8/21 and 8/23 that the highest DOC increase happened with decreasing flows. This is 20% of the sample set with other lesser examples. DOC and flow by themselves cannot predict an increase or decrease in CCC toxicity. The prediction of toxicity only happens when DOC is combined with the parameters of pH and hardness; this is when a true toxicity value emerges. The data collected by OOE indicates both an increase and decrease in DOC with decreasing flows. DOC and hardness are of little to no predictive value when compared to the river flow at the time of sample collection.

The sampling technique may have more to do with DOC values than actual WQ background concentrations. In the spring there are copious patches of pollen floating on the surface of the ambient water. Should a sampler use a bucket or jug to skim the ambient sample off the top of the water then the chances of elevated DOC are highly probable. This is the same for samplers who walk in shallow streams and brooks while grabbing a sample. The decaying vegetation of the bottom of these low-flowing water bodies would be kicked up and could add to the DOC.

The findings for pH are similar to those for DOC and hardness. The NHDES states that ninety-five percent (525) of 544 samples (designated a significant relationship) demonstrated an increase in pH with decreasing flows and 5% demonstrated a decrease with decreasing flow. Reviewing the four community tables we see that the last four Hooksett samples (8/21, 8/23, 9/6, and 9/11) have a significant pH decrease with decreasing river flow (50% of the sample set). Manchester has a pH of 7.3 at a flow of 5,070 cfs and 7.3 at 916 cfs. The other six samples have pHs in the low to mid 7.0 range regardless of the river flow. Derry also has a pH of 6.97 at a flow of 944 cfs and a pH of 7.11 at 5,020 cfs. The table trends lower pH at lower flows. The only obvious case where the pH increased with decreasing flow is the 9/11 sample at Manchester where the pH was 7.31 and the flow was 944 cfs.

[5] June 13, 2023 WQSIE Slide Deck (acwa-us.org)

A decrease in pH with decreasing flow is more dependent on antecedent rainfall. Should previous short-duration rainfall events (24 to 96 hours) happen in the upper watersheds previous to the sampling events, the feeder ponds in the upper watershed would fill quickly and then drain out into small tributaries leading the rivers and streams being tested. Feeder ponds are generally over bedrock and have large amounts of decaying vegetation on their bottom level. This creates humic and fulvic acids that drop the feeder pond's pH to between 4 and 5 pH units and sometimes even in the pH range of 3.5 +/-. This stagnant water washes into the main stems, and as the flows are already low, tends to lower the pH by up to a unit or more. Time of travel would be reduced as the streams and rivers would be running low and the measured pH value would naturally be lower than at lower flows.

The Aluminum calculator looks at these values wholistically. There is a combination of toxicity contribution dependent on the ratio of pH vs DOC/hardness, DOC vs pH/hardness, and hardness vs DOC/pH. The toxicity of each parameter individually can not be determined, but rather in combination with the other two parameters and is completely independent of river flows.

Slide 28 has the following statements;

- Large spatial variability.
- In our datasets, the new criteria are inversely related to flow. That is, aluminum is predicted to be more toxic as flows increase.
- There is generally the lowest toxicity during the warmest, most biologically active, lowest flow periods.

This statement is a generalization of findings from 20 datasets. Each of the three parameters (pH, DOC, and hardness) plays a unique role in the calculation. DOC plays a critical role in the calculation. When compared to the 36 data sample sets collected and processed through the Aluminum Calculator Ver 2.0, and outlined in the below calculator tables, the results show variations that would be expected when all three values are judged in combination and against the scientifically designed tables from the species tested in the development of the calculator. It is the impact of DOC, hardness, and pH on the potential availability of toxic aluminum and is not related to flow and water temperature. If that were the case, temperature would be factored in, as it is in predicting ammonia toxicity. These three parameters, in and of themselves are what determine aquatic toxicity and determining an aluminum concentration. When attempts are made to introduce flows, temperatures, or other parameters it dilutes the effectiveness of the aluminum calculator resulting in a less scientifically-based product than was originally intended.

RESULTS OF ALUMINUM CALCULATOR CONCENTRATIONS FROM FOUR WWTPs

The tables below are from the spring and summer clean sampling with the duplicate RPDs and field blank values likely demonstrating the highest quality QA/QC of any study conducted to date. All samples were taken per the Town of Merrimack's QAPP and SOP (similar programs developed for the other three communities) that was presented to Michael Cobb of the EPA and Haley Franz of the NHDES in June of this year. The first column titled total aluminum is the actual measured total aluminum concentration for the sample collected. The dates are listed and the data input into the DOC, hardness, and pH columns directly calculate the results in the CMC and CCC columns. The river flow in cfs from the USGS Goffs Falls Gauge is in the far-right column.

HOOKSETT SAMPLES

The highest aluminum value measured for Hooksett was 86 ug/l on 8/21/2024. This is one ug/l below the current NHDES limit of 87 ug/l. The corresponding aluminum calculator CCC is 320 ug/l aluminum toxicity at a Merrimack River flow of 2,400 cfs. The 86 ug/l concentration is 27% of the calculated limit of 320 ug/l and would not present a toxicity concern to the aquatic life in the Merrimack River when the calculator is used. The 86 ug/l value abuts 100% of the current WQ limitation with no WWTP dilution factor applied. This location is the uppermost reach (northern direction) of the study area and representative of the quality of the Merrimack River as it begins to enter more heavily populated and industrialized sections of the Merrimack River.

Tot Al	Hooksett Site Upstream	DOC (mg/L)	Total Hardness (mg/L as $CaCO_3$)	pH		FAV	CMC	CCC	River Flow cfs
45	6/25/2024	3.2	14	6.8	#	1,375	**690**	**320**	5,100
49	6/27/2024	3.4	14	6.8	#	1,418	**710**	**330**	3,200
61	7/2/2024	4.6	13	7.27	#	2,761	**1,400**	**570**	3,080
27	7/18/2024	3.3	15	7.01	#	1,860	**930**	**410**	1,570
86	8/21/2024	5.3	13	6.58	#	1,291	**650**	**320**	2,400
63	8/23/2024	5.7	14	6.67	#	1,568	**780**	**360**	1,930
40	9/6/2024	3.7	15	6.66	#	1,267	**630**	**300**	1,060
30	9/11/2024	3.3	16	6	#	399	**200**	**130**	1,210

MANCHESTER SAMPLES

The highest aluminum value measured for Manchester was 93 ug/l on 7/2/2024 and 8/21/2024 respectively. As Manchester completed an Aluminum Study in 2010 with acid-soluble comparison, the total aluminum value is 118 ug/l (when compared to the ratio of acid soluble aluminum) as outlined in the current proposed NPDES. An aluminum concentration of 93 ug/l is 78% of the water quality standard of 118 ug/l.

The DOC on 8/21 is 5.5 mg/l compared to 4.3 mg/l on 7/2, the hardness is 15 mg/l on 7/2 and 14 mg/l on 8/21 and the pH is 7.0 on 8/21 and 7.42 on 7/2. Essentially, a change of 1 mg/l for DOC and hardness and a half pH unit change produces a difference of 200 ug/l of CCC aluminum toxicity and 500 ug/l of CMC at nearly the same flows. This explains the large variations the NHDES notes in their slide presentation and verifies that DOC, pH, or hardness variations, by themselves, have little relevance to similar flows when viewed independently.

The corresponding CCC is 670 ug/l at 2,720 cfs and 470 ug/l at 2,450 cfs of total aluminum respectively. This is an excellent example of the discrepancy that is found when river flows are essentially the same. Note that 93 ug/l is 20% of the calculated limit of 470 ug/l and again would not present a toxicity concern to the aquatic life in the Merrimack River under the calculator scenario. The median value of the eight measured concentrations is 52 ug/l which is 44% of the acid-soluble corrected NPDES value of 118 ug/l. The sample location behind the Fischer Cat Stadium is the site of the most industrialized and populated area on the Merrimack River in NH. This location is upstream from the WWTP's outfall and the 08-MER site designated for 303(d) listing inclusion as noted above by the NHDES.

Also to be noted from this sample set is the first sample taken on 6/25/2024 and the last sample taken on 9/11/2024. The aluminum calculator CCC is 550 ug/l and 570 ug/l respectively. There is a DOC difference of 0.3 mg/l, a difference of 1 mg/l for hardness, and an identical pH of 7.3. The river flow for 6/25 is 5,070 cfs and 916 cfs on 9/11/2024, yet the CCC is almost the same. This demonstrates that river volume in cfs has no influence on results within the aluminum calculator equation and strictly focuses on the interaction of DOC, hardness, and pH. **The NHDES has extensively related CCC values to flows and concentrations of these three parameters which is expressly outside the intent of the aluminum calculator. The extensive work and assumptions from the April 17, 2024 slide presentation are not relevant to the aluminum calculator results when compared to the conditions of flows in the waterbody.**

The 7/2/2024 aluminum concentration of 93 ug/l is 14% of the calculated limit of 670 ug/l and would not present a toxicity concern to the aquatic life in the Merrimack River.

Tot Al	Manchester Site Upstream	DOC (mg/L)	Total Hardness (mg/L as $CaCO_3$)	pH		FAV	CMC	CCC	River Flow cfs
47	6/25/2024	3	16	7.3	#	2,517	**1,300**	**550**	5,070
56	6/27/2024	3.1	16	7.4	#	2,831	**1,400**	**620**	2,670
93	7/2/2024	4.3	15	7.42	#	3,242	**1,600**	**670**	2,720
26	7/18/2024	3.7	15	7.48	#	3,243	**1,600**	**700**	1,590
93	8/21/2024	5.5	14	7	#	2,278	**1,100**	**470**	2,450
71	8/23/2024	5.2	14	7.68	#	4,366	**2,200**	**910**	2,780
46	9/6/2024	3.6	15	7.1	#	2,148	**1,100**	**460**	1,530
26	9/11/2024	3.3	17	7.3	#	2,662	**1,300**	**570**	916

DERRY SAMPLES

The highest aluminum value measured for the Derry site was 84 ug/l on 8/21/2024. This is 3 ug/l below the current NHDES limit of 87 ug/l. This is 96.6% of the current limit of 87 ug/l. The corresponding CCC is 450 ug/l aluminum toxicity at a Merrimack River flow of 3,750 cfs. The 84 ug/l concentration is 19% of the calculated limit of 450 ug/l using the aluminum calculator and would not present a toxicity concern to the aquatic life in the Merrimack River. The 84 ug/l value is close to the WQ limitation. The sample location is about two miles below the 08-MER designated sample location and ¼ of a mile below the Roger Wozjerek Bridge. This is either within or immediately below the 08-MER segment of the Merrimack River being considered for reclassification for aluminum impairment. The median value of the 'Clean Sampling' collected data is 47 ug/l. This median value is 54% of the 87 ug/l WQ limit for aluminum impairment. This location is a wider quieter section of the Merrimack River with little industrial impacts or any heavily populated concerns.

Tot Al	Derry Site Upstream	DOC (mg/L)	Total Hardness (mg/L as $CaCO_3$)	pH		FAV	CMC	CCC	River Flow
51	6/25/2024	3.2	17	7.11	#	2,142	**1,100**	**460**	5,020
43	6/27/2024	3.2	16	7.1	#	2,078	**1,000**	**450**	2,660
51	7/2/2024	4.8	16	6.94	#	2,091	**1,000**	**440**	3,450
24	7/18/2024	3.6	17	7.11	#	2,257	**1,100**	**470**	1,460
84	8/21/2024	5.3	16	6.93	#	2,167	**1,100**	**450**	3,750
70	8/23/2024	5.1	16	7.01	#	2,322	**1,200**	**470**	1,800
39	9/6/2024	3.7	19	7.09	#	2,312	**1,200**	**470**	1,470
27	9/11/2024	5.7	18	6.97	#	2,431	**1,200**	**480**	944

MERRIMACK SAMPLES

The last section of the Merrimack River that was included in the four-area study was upstream of the Merrimack WWTP outfall. The highest aluminum value measured at the Merrimack WWTP's upstream location was 100 ug/l on 8/21/2024. This is 13 ug/l above the current NHDES limit of 87 ug/l. The corresponding CCC is 560 ug/l using the aluminum calculator at a Merrimack River flow of 2,400 cfs. The 100 ug/l concentration is 18% of the calculated limit of 560 ug/l and would not present a toxicity concern to the aquatic life in the Merrimack River. The 100 ug/l concentration value is 115% of the current WQ limitation with no WWTP dilution factor applied. The median value of the eight sample sets is 64 ug/l for aluminum. This is 73.5% of the WQ limit of 87 ug/l. This is the lowest southern reach of the study area and likely downstream of the 08-MER designated length of the river. There were four consecutive days of samples taken in May and June regardless of the weather conditions. The other samples fell within the timeframe of the samples taken at the other three plants other than the 7/16 sample that was taken in conjunction with the WWTP's annual WET test.

Tot Al	Merrimack Upstream Site	DOC (mg/L)	Total Hardness (mg/L as $CaCO_3$)	pH		FAV	CMC	CCC	River Flow cfs
79	Upstream 5/28/24	3.9	19	7.19	#	2,625	**1,300**	**530**	3,740
72	Upstream 5/29/24	3.7	19	6.89	#	1,853	**930**	**390**	5,210
85	Upstream 5/30/24	3.7	17	6.94	#	1,888	**940**	**400**	4,825
67	Upstream 5/31/24	3.8	16	7	#	2,007	**1,000**	**430**	4,050
68	Upstream 6/11/24	3.9	19	7.08	#	2,341	**1,200**	**480**	3,259
60	Upstream 6/12/24	4.0	18	7.08	#	2,329	**1,200**	**480**	2,520
52	Upstream 6/13/24	3.9	18	7.11	#	2,378	**1,200**	**490**	5,100

49	Upstream 6/14/24	3.5	19	7.12	#	2,329	**1,200**	**480**	3,200
27	Upstream 7/16/24	3.5	20	7.29	#	2,815	**1,400**	**580**	3,080
25	Upstream 7/18/24	3.5	19	7.11	#	2,305	**1,200**	**480**	1,570
100	Upstream 8/21/24	5.6	18	7.15	#	2,888	**1,400**	**560**	2,400
27	Upstream 9/11/23	3.4	18	7.31	#	2,764	**1,400**	**580**	944

MASSACHUSETTS WATERSHED APPROACH – DEFAULT AL VALUES WHEN INSUFFICIENT DATA IS AVAILABLE

The Merrimack River is one large watershed with several smaller watersheds that contribute to the mainstem. The State of Massachusetts has a suggested aluminum calculator-based default value for various watersheds throughout the State. Below is a chart that designates values, but is not a binding value for NPDES permit calculations. Hard site-specific data is preferable. Note the Merrimack/Shawsheen (Lowell, GLSD, and Haverhill areas) has a CCC of 249 ug/l and a CMC of 460 ug/l. This is in line with the values listed above in OOE's four-site study.

Fresh Water Aquatic Life Water Quality Criteria for Aluminum: Methodology for Deriving Watershed Default Criteria

3.0 Results

Final default freshwater aluminum criteria by watershed or watershed group are listed in **Table 2**. A watershed map for the Commonwealth is in Appendix A.

Table 2. Default freshwater aluminum criteria by watershed or watershed group.

Default Fresh Water Aluminum Criteria by Watershed (River Basin or Coastal Drainage Area)[5]		
River Basin or Coastal Drainage Area	**CMC (Acute) µg/L**	**CCC (Chronic) µg/L**
Blackstone	532	262
Boston Harbor/Charles	978	380
Buzzards Bay/Mt Hope Bay/Narragansett Bay/Ten Mile	451	230
Cape Cod Coastal	**	**
Chicopee (5th percentile)	290	170
Connecticut (5th percentile)	600	290
Deerfield	440	220
Farmington/Westfield (5th percentile)	299	169
French/Quinebaug	570	270
Housatonic/Hudson	1400	515
Ipswich/North Coastal/Parker	932	396
Islands Coastal	**	**
Merrimack/Shawsheen (5th percentile)	460	249
Millers	329	200
Nashua (5th percentile)	368	200
South Coastal	1200	460
Sudbury, Assabet, and Concord (SuAsCo)	940	394
Taunton (5th percentile)	300	190
** Insufficient data are available to calculate watershed-based default criteria.		

4.0 Discussion

For the Cape Cod and Islands Coastal Drainage Areas, default criteria for aluminum are not included in the Massachusetts Surface Water Quality Standards. There were insufficient data available to derive default criteria using the methodology described in Section 2.0; see Appendix B, Appendix C, and Appendix D for additional information. For water quality assessment and permitting purposes in the Cape Cod and Islands Coastal Drainage Areas, appropriate water quality data must be collected to calculate site-dependent aluminum criteria values. For all other watersheds, if there are applicable

[5] Defaults are based on 10th percentile criteria calculated from concurrent pH, DOC, and total hardness data, except watersheds marked as 5th percentile to protect state and federal endangered species.

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WHY USING ALUMINUM CALCULATOR VALUES WITH RIVER FLOWS IS INCONSEQUENTIAL

The NHDES in the April 2024 slide presentation has the following criteria for any site adoption of the aluminum calculator.

NPDES IMPLEMENTATION

- NPDES permit reasonable potential analysis needs to be based on site level data.
- Five years of quarterly sampling of DOC *(TOC),* pH, hardness, and total aluminum.
  - 20 samples would be a complete dataset. 17 samples would be adequately representative (85%).
- Alternatively, Monthly sampling for 2-years (n=24, 21 samples would be adequately representative (85%))
  - Bi-monthly sampling for one year (n=24, 21 samples would be adequately representative

Calculations

1.Determine if **threatened or endangered species** are present, or habitat has been declared.
2.Calculate the **aluminum instantaneous criteria values (ICVs).**
3.Perform a power regression of flow (cfsm) verses aluminum CCC and determine the **95th percentile lower prediction interval**.
4.Calculate the **7Q10** for the representative gage(s) or the more site representative synthetic hydrograph depending upon the method used to generate the flow data for the power regression.
5.Calculate the **5th, 10th and 50th percentile CCC from the ICVs** for the site data (CCC-5, CCC-10, CCC-50).
6.Calculate the **CCC of the 95th percentile lower prediction interval at 7Q10** (CCC-L95-PI).

The second bullet is looking for WET test data during a five-year permit period. It does not indicate if a permit is stayed or a compliance schedule (similar to Allenstown, NH) is given to the NPDES Permittee while this data is being collected. Twenty samples and 17 samples seem excessive as the EPA/NHDES routinely uses very limited and older data for the development of permit limitations that create very expensive treatment requirements for NPDES Permittees. A good example of this is the current proposed Small General Permits that have as little as four data points that are over six years old, yet the regulatory agencies consider this to be enough data to require extremely expensive upgrades for NPDES Permittees.

Ten samples taken over five summer months (similar to what OOE is completing for the four communities) are more than sufficient to determine aluminum calculator relevance. The three bullets are an excessive request to obtain sufficient information to justify the use of the aluminum calculator.

In the calculations section, EPA determines if endangered or threatened species are present. This is outlined in all permits under section 6.0 under Federal Permitting Requirements. The EPA will determine if there is the presence of threatened or endangered species during the renewal of any existing permits.

Are the instantaneous criteria values (ICVs) part of the aluminum calculator calculations? If not, what would the purpose be when comparing CMC and CCC values?

Items 3, 4, and 5 are based on flow conditions and as illustrated extensively in the above examples, are not relevant to predicting aluminum toxicity. Manchester samples of 6/25 and 9/11 have almost identical CCC and have identical CMC values yet there is over 500% increase in flow on the 6/25 sample date when compared to the 9/11 date. This demonstrates that flow has no bearing on how the calculator functions. Applying the flow component without any solid trends is not scientifically defensible. The NHDES should consider contacting the creator of the calculator and discuss with them the idea of how varying flows interact with DOC, hardness, and pH. NHDES has to defend the use of flow as a relevant component of the aluminum calculator with a 95th percentile certainty. They need to confidently demonstrate that flow is highly relevant to ICV values, the 5th, 10^{th,}

and 50th percentile of the ICVs, and justify applying these variables to the CMC and CCC concentrations of the aluminum calculator. NHDES should also demonstrate what other states, tribes, EPA regions, or independent agencies have used this approach. At first, the approach seems reasonable, but once the findings are compared to actual 'Clean Sample' field data, the assumptions do not hold up to the claims of the findings.

END OF COMMENTS.

Connecticut River Conservancy

Clean water. Healthy habitat. Resilient communities.

PO Box 445, Alstead, NH 03602
603.931.2448 · www.ctriver.org

21 Oct 2024

New Hampshire Department of Environmental Services
Watershed Management Bureau
29 Hazen Drive
New Hampshire 03302-0095

Attention: Matt Wood, Harvey Pine

Re: CRC Comments on Draft 2024 CALM, 303(d) list, and 2022 Draft TMDL Vision

Dear Mr. Wood and Dr. Pine,

Thank you for this opportunity to comment on the draft 2024 Consolidated Assessment and Listing Methodology, 2024 303(d) list, and 2022 TMDL Vision documents. The Connecticut River Conservancy (CRC) restores and advocates for clean water, healthy habitats, and resilient communities to support a diverse and thriving watershed. Through collaborative partnerships in New Hampshire, Vermont, Massachusetts, and Connecticut, CRC leads and supports science-based efforts for natural and life-filled rivers from source to sea. CRC is invested in ensuring that NH's waters throughout the Connecticut River watershed meet and exceed NH Water Quality Standards and are improved, restored, and protected to ensure all designated uses are achievable and supported. We recognize that a robust and comprehensive water quality monitoring strategy implemented in combination with the 303(d) TMDL by NH Department of Environmental Services (NH DES) is critical to achieving these goals. As there is considerable overlap in the various topics and sections of the CALM and Vision plan, please find CRC's combined comments on all the draft documents below.

It is clear how much work goes into the creation and maintenance of these documents and the corresponding programs by DES staff. This effort on behalf of the state's waters is appreciated. It is also clear that there is a pervasive lack of data that could enhance these efforts and which, in some instances, prevents a clear understanding of the condition of water bodies.

For example, the section of the Connecticut River upstream of the Bellows Falls Dam (AUID NHIMP801060703-05) is listed as impaired on the draft 303(d) list for pH and not meeting the designated use for Aquatic Life Integrity. When looking at the most recently available "report card" on the Surface Water Quality Assessment Viewer there are 12 parameters listed under this designated use. Eight of which are parameter category 3, with limited or no data. This lack of data means that other pollutants such as metals, ammonia, and turbidity may also require the implementation of a TMDL, but because the data are beyond the maximum age allowable for assessment (CALM section 3.1.10) an appropriate evaluation of the condition and need for

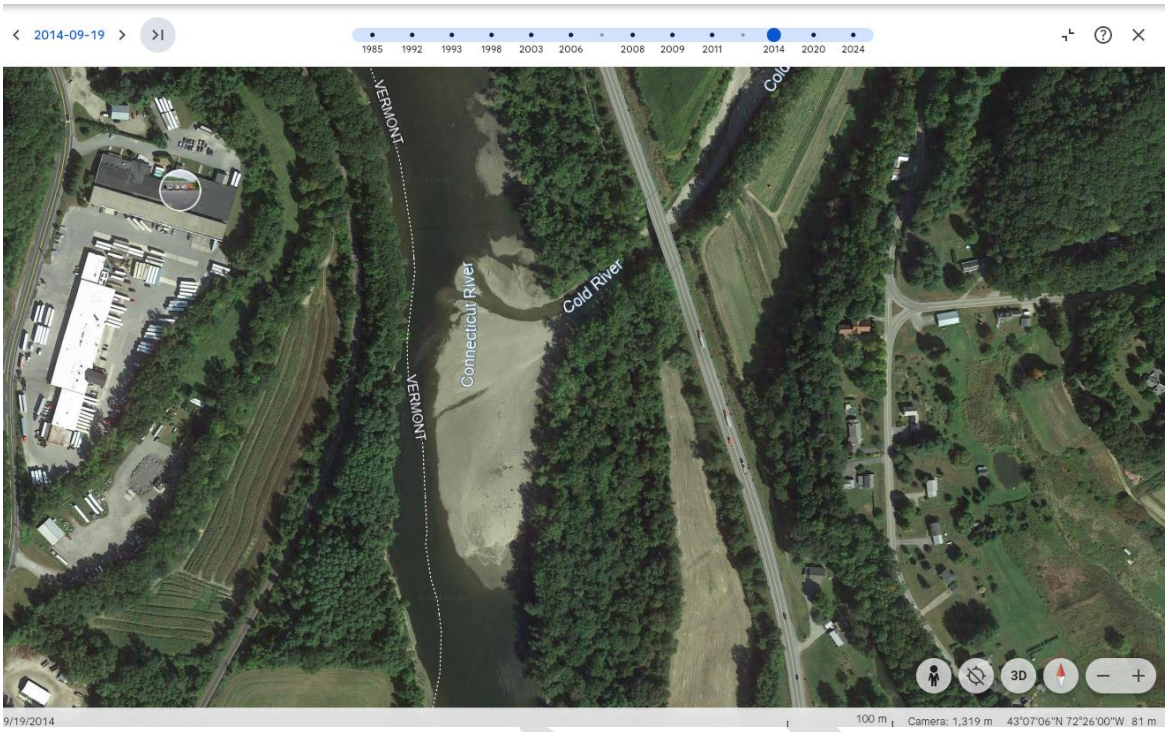
prioritization of management and restoration needs for the 1720 acres of water in this assessment unit is not possible.

Additionally, for the same stretch of river, the report card lists the designated use for a drinking water supply as being met (2-G), yet the associated parameters are all listed as 3-ND, no current data. This is not the only AUID where I have observed this type of discrepancy and would seem counter to the protocols outlined in CALM sections 3.1.3 through 3.1.5 and can be confusing to those attempting to understand whether water quality standards are being upheld.

There needs to be more support for expanding regular water quality monitoring either through current volunteer programs, state agencies, or partnering with other organizations. CRC partners with the CRJC through the NH VRAP program to engage volunteers in collecting mainstem water quality data. We are hampered in adding more sites by a lack of equipment and staff availability at the state. Capacity building is a focus area (Vision plan section 7.3) and the legally required components of both the Clean Water Acts as well as NH statutes regarding water quality will increasingly require collaboration and coordination, especially in the face of increased population growth in NH and climate change. Increasing data gathering to support these efforts needs to be a priority. We strongly support the Vision Plan capacity building to address water quality at the state level as well as increased efforts to provide comprehensive, recent data to inform water quality evaluation.

The Surface Water Quality Assessment Viewer is an excellent tool. It provides easy public access to important data, and clear indications of what the various categories mean in regard to the 305(b) listing. It would be nice to be able to incorporate more data into that portal, like ARPs etc. if they are available for various waterbodies. I will also note that the incorporation of supplemental ADB categories (CALM Section 3.1.5) has been a helpful addition and should be maintained.

It is interesting to note that all of the physical impairments on the 2024 303(d) list are related to stormwater (Vision Figure 2-2). The mainstem of the Connecticut River faces significant alterations to natural sediment transport regimes due to the presence of multiple dams. We have also noticed that the mouths of many of the tributaries are accumulating substantial deposits of sediments where they meet the Connecticut River (see the Google Earth screenshot of the Cold River on Sep 19, 2014 below. The large sediment deposit persists today).



The buildup of sediments within the impoundments and at confluences impacts aquatic life (including endangered species) and recreational uses and likely violates water quality standards regarding benthic deposits. It may have additional negative impacts through the transport of sediment bound contaminants and nutrients, impacting other parameters and designated uses as well. Little attention has been paid to this issue, and we again reiterate how lack of comprehensive data gathering hampers efforts to preserve and improve water quality and maintain designated uses within the State. The Vision Plan prioritization (Section 2.1.2) emphasizes the importance of water quality assessments and impairment determinations, so the gathering necessary data to do so must also be prioritized.

CALM section 3.1.26 and Vision plan section 2.2 cover the TMDL priority ranking process, however despite the tables, it is still somewhat unclear how the prioritization is justified. CALM Table 3-16 appears to indicate that "adequate resources available to conduct the TMDL" takes precedence over the TMDL being implementable or a high initial priority, which seems backwards. I appreciate the complexity of making these prioritization decisions, however, it does not seem justifiable to prioritize developing an unimplementable TMDL over an implementable TMDL for higher classification waters that may support endangered species or be of higher classification solely based on resources, which is what the table appears to be suggesting. The Vision Plan should include guidance on how to obtain resources for TMDL implementation when it is clearly both feasible and necessary.

I agree that the probabilistic assessment (CALM section 3.1.27) is a more reasonable option than a true census of the state's waters. Does the probabilistic assessment categorize all rivers the same? Would an assessment of a first order stream also be considered representative of fourth order streams? This seems to decrease the utility of this assessment scheme. Clarification on how

assessment units are randomly chosen and how often the probabilistic assessment happens for different water types would be welcome.

Addressing climate change impacts as prioritized in section 7.2 of the Vision is critical. New Hampshire is already seeing changes to and impacts on state waters linked to climate change effects. Incorporating this into models, restoration plans, and assessments cannot be ignored, and I strongly encourage NH DES to be proactive in addressing this focus area.

I am happy to answer any questions you may have and/or provide additional commentary on the draft documents. I may be contacted via email at kbuckman@ctriver.org or via phone at 603-931-2448.

Sincerely,

Kate Buckman
River Steward, NH

REGION 1
BOSTON, MA 02109

October 15, 2024

Harvey Pine – TMDL Coordinator
New Hampshire Department of Environmental Services
Watershed Management Bureau
29 Hazen Drive, P.O. Box 95
Concord, New Hampshire 03302-0095

Dear Mr. Pine:

Thank you for the opportunity to comment on the draft New Hampshire 2022-2032 Vision for the Clean Water Act Section 303(d) Program Guidance Document (2022 Vision). Through the 2022 Vision, the New Hampshire Department of Environmental Services (NHDES) has developed and proposed a comprehensive planning document to guide and direct the state's 303(d) program.

The EPA Clean Water Act 303(d) "Vision" is designed to help coordinate and focus efforts to advance the effectiveness of 303(d) program implementation in the coming decade. The 2022 Vision builds on the experience gained from implementing the 2013 Vision outlined in *A New Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303(d) Program*. Long-term planning from fiscal year 2025 (FY25) to FY32 provides states, territories, and authorized tribes an opportunity to strategically focus their efforts and best use limited resources to demonstrate progress over time in achieving environmental results through the leveraging of partnerships and development of innovative solutions.

It is important that the public understands New Hampshire will also identify specific plan development priorities in individual two-year increments. These two-year priority commitments under this Vision metric shall be selected considering the long-term planning documented in the Vision 2.0 Prioritization Framework. NHDES has released their TMDL priorities for 2024-2026 in an appendix to their 303(d) list, *Appendix B – 2024 TMDL Priorities and Comment Opportunity*. At this time, EPA does not have any substantive comment on these priorities.

NHDES's 2022 Vision addresses a number of 303(d) program planning ideas, too many to recount here without quoting extensively from the document. However, several of these planning ideas are worth highlighting as important elements that EPA strongly supports.

Nonpoint Source Coordination. The 303(d) program plans to increase collaboration with the Watershed Assistance Section (WAS). Specifically, NHDES will work to ensure that Watershed-Based Plans will be able to fulfill a dual role as an Advanced Restoration Plan (ARP). This will eliminate redundancy and expedite state protection planning for watersheds without point sources. This move towards increased collaboration is also represented in NHDES's revised 5-year Nonpoint Source Program Management Plan, approved by EPA on September 23, 2024.

TMDL Core Document Development. NHDES is focusing TMDL development on bacteria, nutrient, and chloride impairments. Modelled after the Connecticut Department of Energy and Environmental Protection's Lake Nutrient TMDL, NHDES TMDLs will be developed around core documents. These core documents will cover programmatic information that is relevant statewide; then, waterbody specific information will be added as addenda for any newly impaired waters that are able to be covered by the TMDL. Ideally, this will facilitate consistency between TMDLs and expedite their development.

Data and Analysis Capacity Building. NHDES's 303(d) program is built on the extensive environmental monitoring data stored in its Environmental Monitoring Database (EMD). Integrated Reports are data rich documents that provide data visualizations and important summary statistics. The department's OneStop Database and Surface Water Quality Assessment Viewers provide data transparency and public access. Building on this, NHDES has outlined a number of data and analysis goals that includes a project to integrate lake monitoring program data into the EMD. EPA is broadly supportive of NHDES maintaining and improving upon its data management practices.

TMDL Tracking Module. One specific example of a planned data and analysis project worth highlighting is the TMDL Tracking Module. This module will be built into the EMD to facilitate evaluations of TMDL effectiveness. Vision 2.0 describes the objective of the module as a way, "to provide data to the public, update water quality assessments more efficiently, create reporting [sic], and facilitate data uploads to ATTAINS. Closer tracking of TMDLs and other restoration plans will also assist in evaluating the success of restoration plans." These are important functions that will facilitate future improvements to the 303(d) program and TMDL development.

As outlined above, EPA is generally supportive of NHDES's 2022 Vision but provides the following comments/suggestions for NHDES's consideration.

Coordination with the Instream Flow Program. As outlined in section 2.1, the 303(d) program plans to coordinate with a number of different programs within NHDES. One program that is not mentioned is the Instream Flow Program. Maintaining adequate flow in surface waters is essential to the health and maintenance of a balanced indigenous aquatic community. Close collaboration between these two programs is essential to the protection and restoration of aquatic life habitat and the sustainable use of surface water supplies. If these programs do not currently coordinate over streamflow-related impairments and flow management plans, EPA recommends that that occurs.

Great Bay Estuary Prioritization. One of the most significant water quality issues in New Hampshire is eutrophication in the Great Bay estuary. The complex mixture of point and nonpoint sources, the multiple designated uses and pollutant impairments, these are quintessential management problems that the Clean Water Act's TMDL program was designed to address. In the 2022 Vision, NHDES gives passing reference to the estuary, highlighting the coordination efforts needed given the complex management situation. However, the document lacks specific plans to work on TMDLs or Advanced Restoration Plans, leading one to conclude that the estuary is not a department priority. Given the significant public comments NHDES receives during each Integrated Reporting period on the estuarine impairments, along with the pressing need to renew impactful permits that cover the estuary within the 2022-2032 Vision period, EPA would like to see Great Bay TMDL development given a higher priority in NHDES's 303(d) program planning and prioritization.

Adaptive Management Plans. One of the 2022 Vision's restoration goals is to "Understand how to utilize and best interact with current adaptive management plans to meet restoration goals." This goal is laudable and is worth emphasizing and refining further. The concept of adaptive management and the related concept of adaptive implementation have been described in the TMDL context. For example, one framing is that adaptive implementation can be used in TMDLs as a way of recognizing and grappling with scientific uncertainty. See, e.g., National Research Council (2001) *Assessing the TMDL Approach to Water Quality Management* and Reckhow (2007) *Adaptive Implementation of Water Quality Improvement Plans: Opportunities and Challenges*.[1] EPA recommends not only considering how the TMDL program can interact with current adaptive management plans, but also how to incorporate adaptive implementation into the TMDL program. One example is the core restoration document, statewide permit framework described in section 2.1.3 of the 2022 Vision. Establishing core documents in such a way that the TMDL can adapt to new information throughout the duration of the waterbody's impaired status could be an area of focus. I.e., the core document could build in a process such that monitoring to track TMDL effectiveness feeds back into adjustments to margin of safety or load allocations. Similarly lack of progress on some implementation measures could trigger a readjustment of wasteload and load allocations. These are just examples, but further refinement of this restoration goal is encouraged.

EPA appreciates the hard work of NHDES staff and partners who contributed to this effort. EPA encourages NHDES to treat this as a "live" planning document, modifying it as necessary over the 2022-2032 planning period. We look forward to continuing discussions on 303(d) program planning and the protection of New Hampshire waters.

Sincerely,

KATIE LAMOUREUX

Digitally signed by KATIE LAMOUREUX
Date: 2024.10.15 15:53:07 -04'00'

Katie Lamoureux
Section Supervisor
Water Quality & Wetlands Protection
EPA Region 1

cc: Judith Sears Houston (NHDES); Nathan Chien (EPA)

[1] Available at: NRC Report and Reckhow Report.

STATE OF NEW HAMPSHIRE

Impairments Removed (i.e. Delisted) from the 2020/2022 303(d) List of Threatened or Impaired Waters (i.e. Category 5)

December 18, 2024

NEW HAMPSHIRE
DEPARTMENT OF
Environmental
Services

R-WD-24-12

STATE OF NEW HAMPSHIRE

Impairments Removed (i.e. Delisted) from the 2020/2022 303(d) List of Threatened or Impaired Waters (i.e. Category 5)

STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
29 HAZEN DRIVE
CONCORD, N.H. 03301

ROBERT R. SCOTT
Commissioner

ADAM CREPEAU
Assistant Commissioner

RENE PELLETIER
Water Division Director

Prepared by:
MATTHEW A. WOOD
Water Quality Assessment Program Coordinator

December 18, 2024

New Hampshire Department of Environmental Services
PO Box 95, Concord, NH 03302-0095
https://www.des.nh.gov | (603) 271-3503

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Introduction

In accordance with Section 303(d) of the federal Clean Water Act, States must prepare a list of impaired waters that require a Total Maximum Daily Load study every two years (i.e., the 303(d) List). The last approved 303(d) List was prepared by the New Hampshire Department of Environmental Services (NHDES) for the 2020/2022 cycle. Downloadable copies of the past lists as well as the 303(d) 2024 list are available on the NHDES website for review. This document provides a list of all surface waters and parameter combinations that were removed as impairments on the 2024 303(d) List and the reasons why they were removed.

Assessment outcomes cover a spectrum from very good to very bad coded as an alpha numeric scale that provides additional distinctions in cases where an impairment exists. In each of the new impairments detailed within this document the assessment status is highlighted applying the categories in the table below.

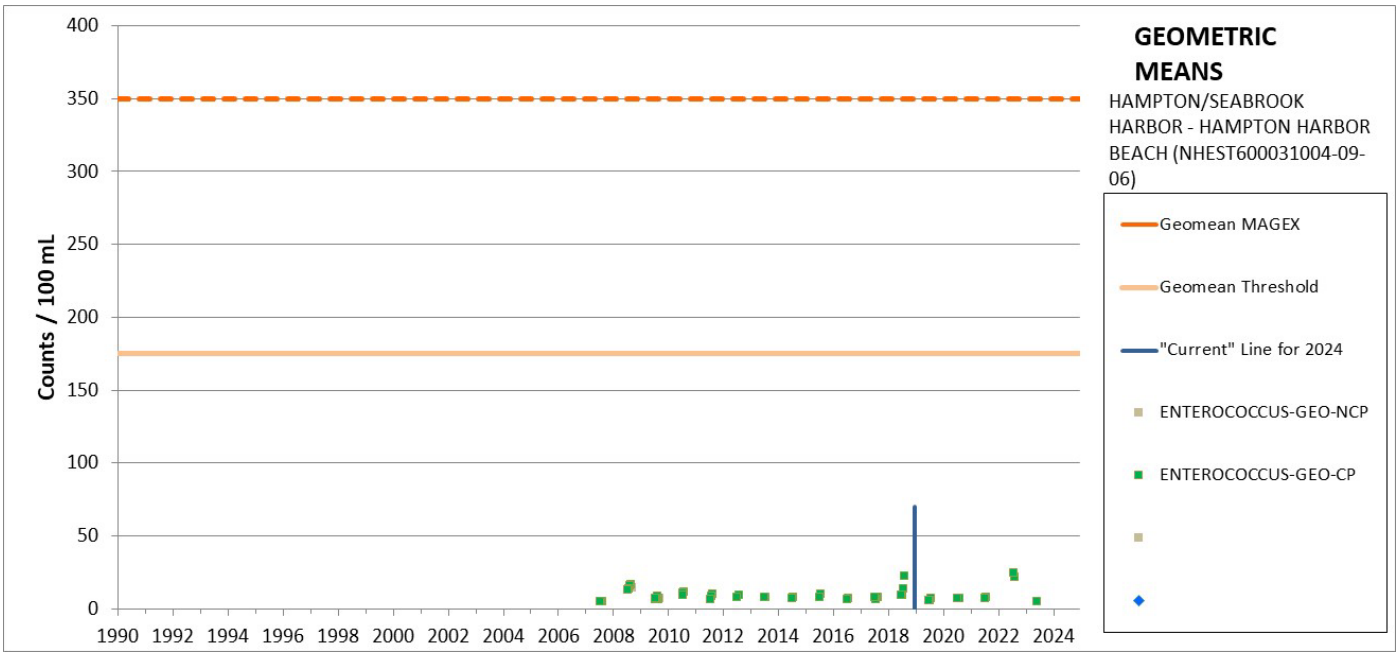
Category	Description	Severe	Poor	Likely Bad	No Data	Likely Good	Marginal	Good
		Not Supporting, Severe	Not Supporting, Marginal	Insufficient Information – Potentially Not Supporting	No Data	Insufficient Information – Potentially Full Supporting	Full Support, Marginal	Full Support, Good
Category 2	Meets standards	N/A	N/A	N/A	N/A	N/A	2-M or 2-OBS	2-G
Category 3	Insufficient Information	N/A	N/A	3-PNS	3-ND	3-PAS	N/A	N/A
Category 4A	Does not Meet Standards; TMDL* Completed	4A-P	4A-M or 4A-T	N/A	N/A	N/A	N/A	N/A
Category 4B	Does not Meet Standards; Other enforceable measure will correct the issue.	4B-P	4B-M or 4B-T	N/A	N/A	N/A	N/A	N/A
Category 4C	Does not Meet Standards; Non-pollutant (i.e. exotic weeds)	4C-P	4C-M	N/A	N/A	N/A	N/A	N/A
Category 5	Does not Meet Standards; TMDL* Needed	5-P	5-M or 5-T	N/A	N/A	N/A	N/A	N/A
Category 5R	Does not Meet Standards; An EPA-approved alternative plan has been completed	5R-P	5R-M	N/A	N/A	N/A	N/A	N/A

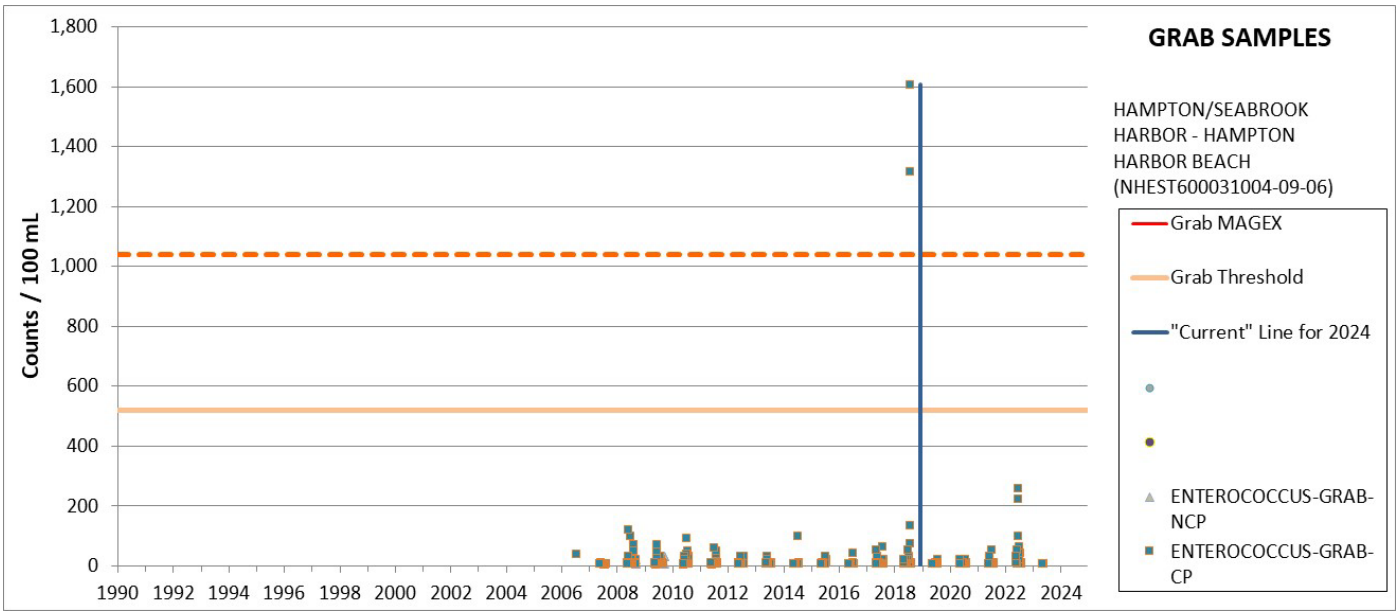
Bacteria for Secondary Contact Recreation (i.e. boating)

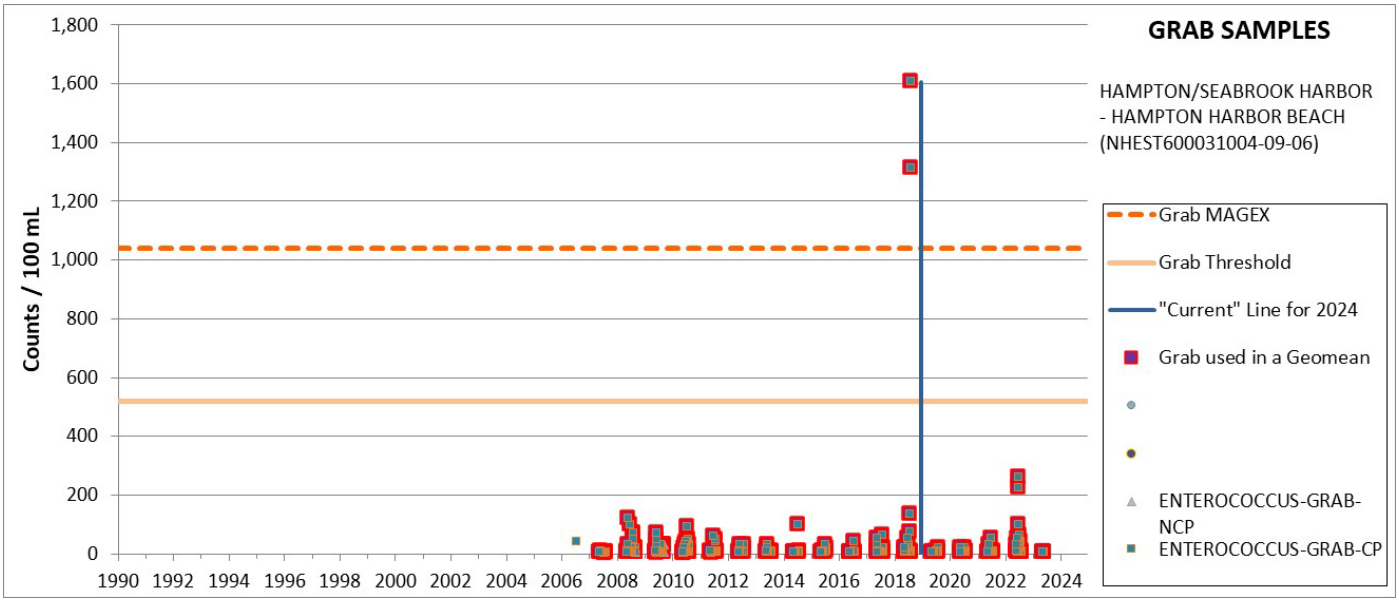
Hampton/Seabrook Harbor - Hampton Harbor Beach (NHEST600031004-09-06)

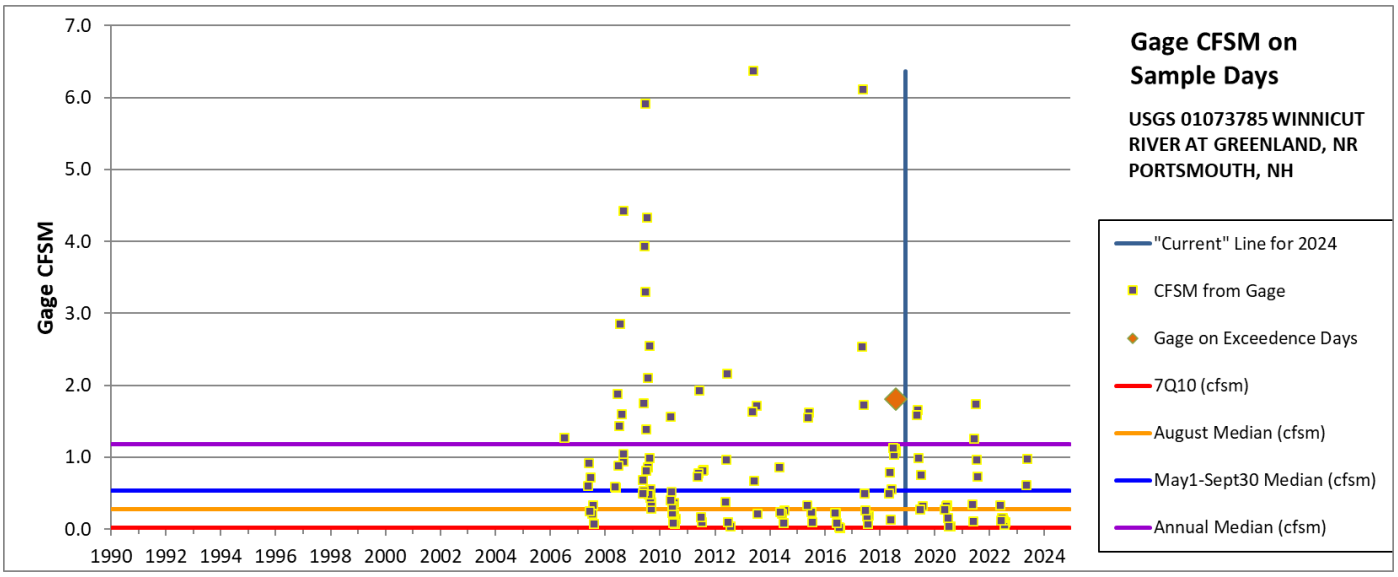
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Hampton/Seabrook Harbor - Hampton Harbor Beach	NHEST600031004-09-06	Enterococcus	Hampton	5-P	2-M

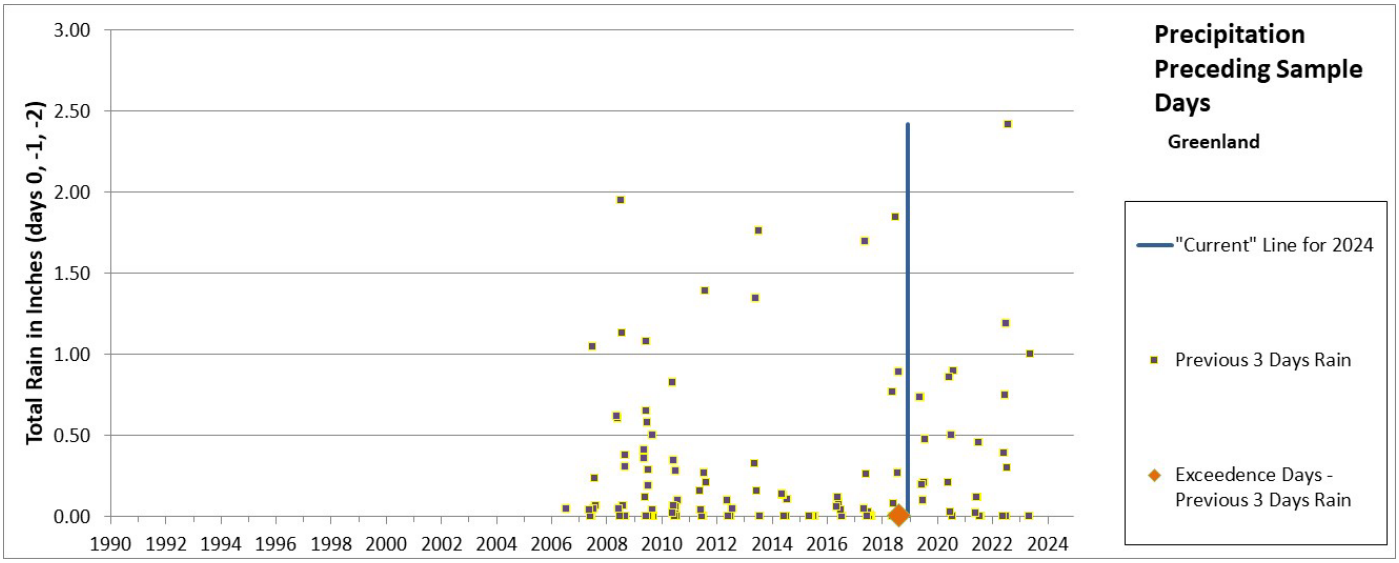
Zero of the 10 geomeans in the current assessment period (2019-2024) were above the geometric mean threshold (175 counts/100mL). Zero of the 81 samples collected during the current assessment period were above the single sample threshold (520 counts/100mL). Samples were collected during a range of flow (0 – 1.74 cfsm on the Winnicut River gage (01073785) and a range of three-day rainfall totals (0 – 2.42 inches). The samples collected in the current period were collected under similar meteorological and hydrologic conditions as those that drove the initial impairment in 2020/2022. Additionally, it appears that this beach was mistakenly impaired in 2020/2022 as the same beach was not impaired for the primary contact recreation designated use, which has much lower thresholds and utilized the same data. The two grab sample exceedances that drove the initial impairment were collected on the same day (8/22/18) but at different stations. Both samples were used to calculate the geometric mean, which better represents the human health risk. Because there was no exceedance of the geometric mean the beach should not have been impaired and should be delisted as part of the 2024 cycle. It is also important to note that a ruptured sewer main was discovered in 2018 that was buried beneath the adjacent salt marsh. The ruptured forced main has been repaired and was most likely the cause of the elevated bacteria sampled in 2018. Routine sampling will continue through the NHDES Beach Inspection Program. Hampton/Seabrook Harbor- Hampton Harbor Beach (NHEST600031004-09-06) has been moved form 5-P to 2-M for Enterococcus for the secondary contact recreation designated use based on data evaluated during the current assessment cycle.

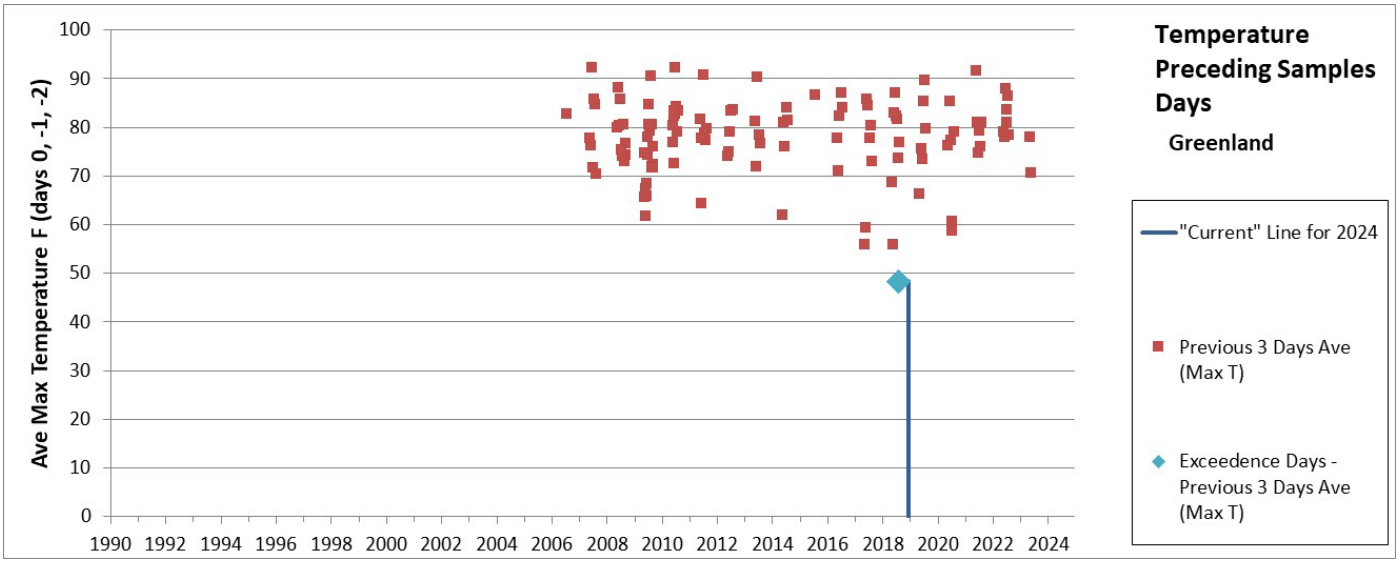


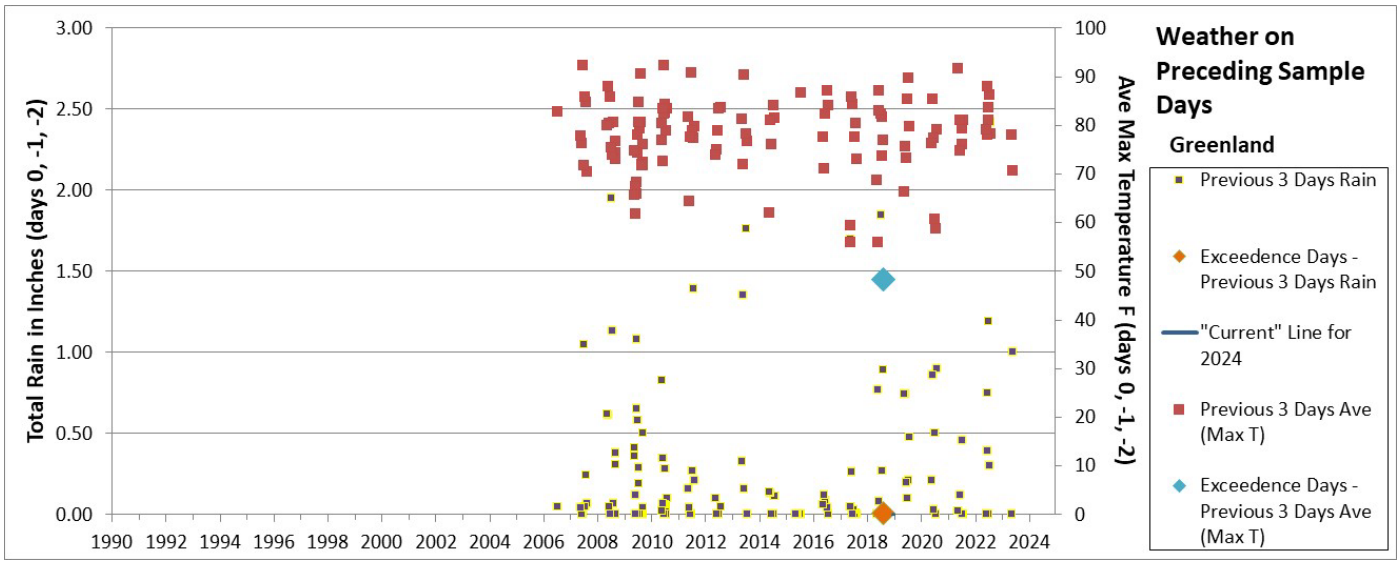

GRAB SAMPLES
HAMPTON/SEABROOK HARBOR - HAMPTON HARBOR BEACH (NHEST600031004-09-06)
Counts / 100 mL
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Grab MAGEX
Grab Threshold
"Current" Line for 2024
ENTEROCOCCUS-GRAB-NCP
ENTEROCOCCUS-GRAB-CP


GRAB SAMPLES
HAMPTON/SEABROOK HARBOR - HAMPTON HARBOR BEACH (NHEST600031004-09-06)
Counts / 100 mL
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Grab MAGEX
Grab Threshold
"Current" Line for 2024
Grab used in a Geomean
ENTEROCOCCUS-GRAB-NCP
ENTEROCOCCUS-GRAB-CP


Gage CFSM on Sample Days
USGS 01073785 WINNICUT RIVER AT GREENLAND, NR PORTSMOUTH, NH
Gage CFSM
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Precipitation Preceding Sample Days
Greenland
Total Rain in Inches (days 0, -1, -2)
"Current" Line for 2024
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain


Temperature Preceding Samples Days
Greenland
Ave Max Temperature F (days 0, -1, -2)
"Current" Line for 2024
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)

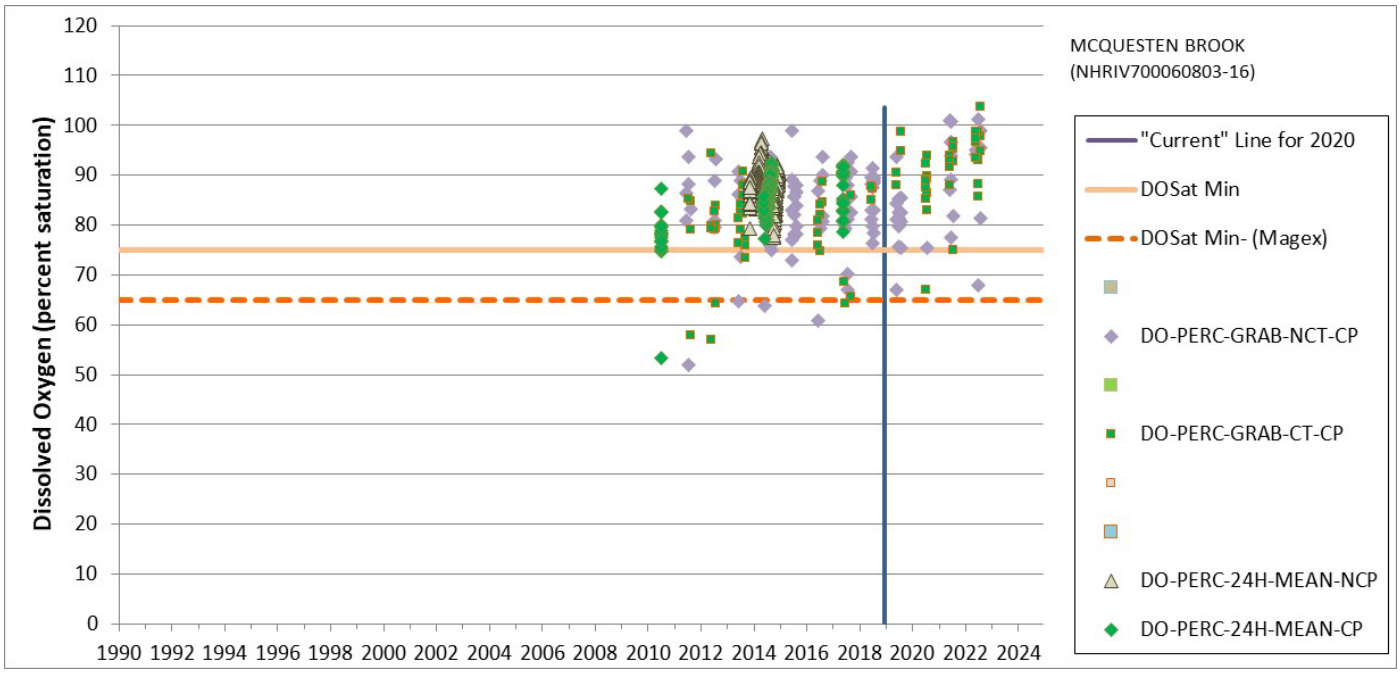


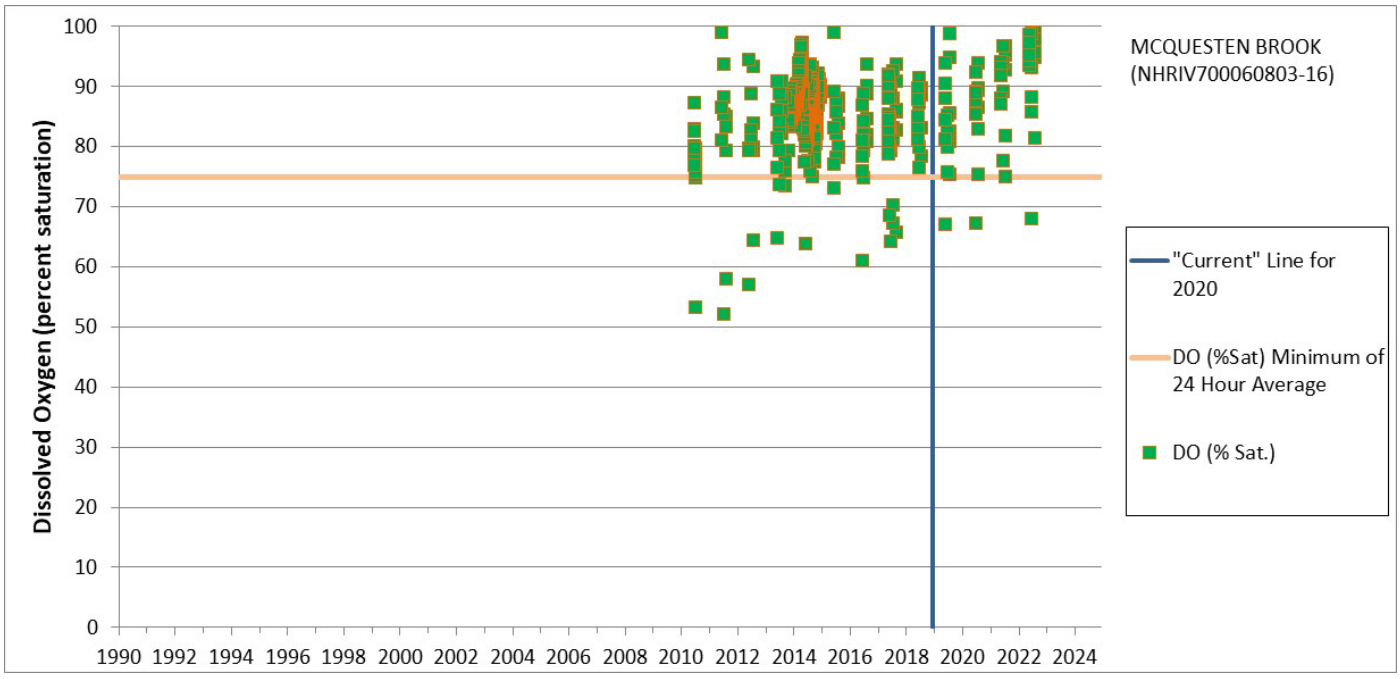
Dissolved Oxygen Saturation for Aquatic Life Integrity

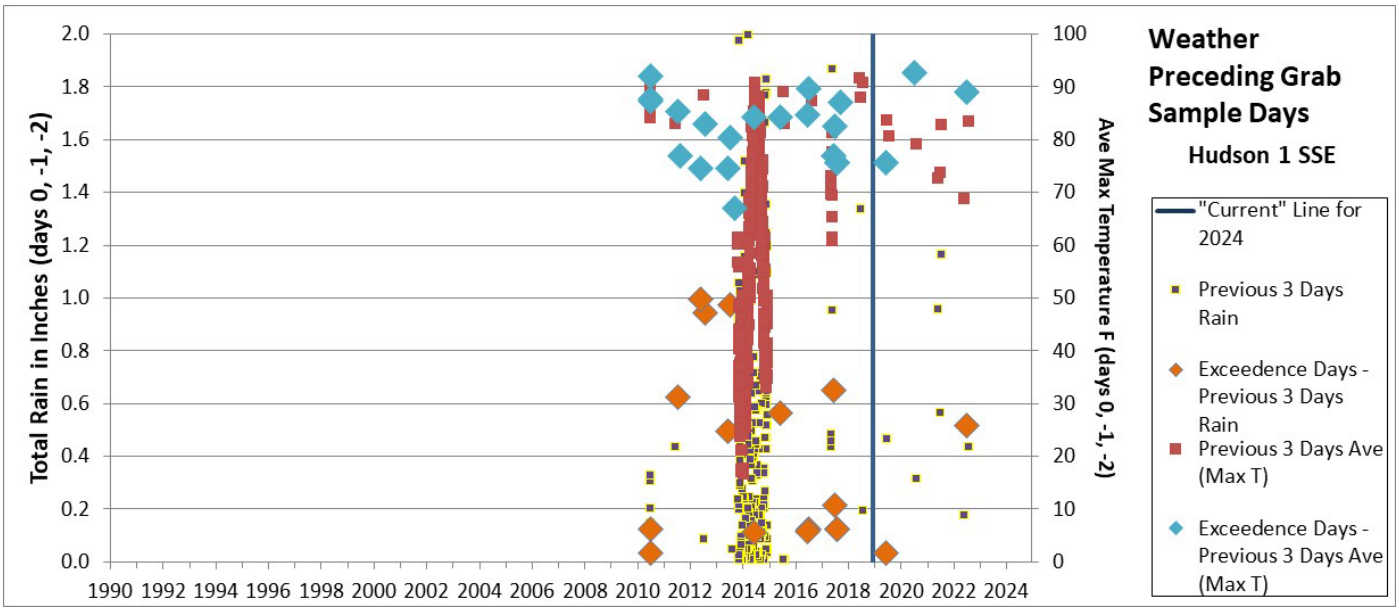
McQuesten Brook (NHRIV700060803-16)

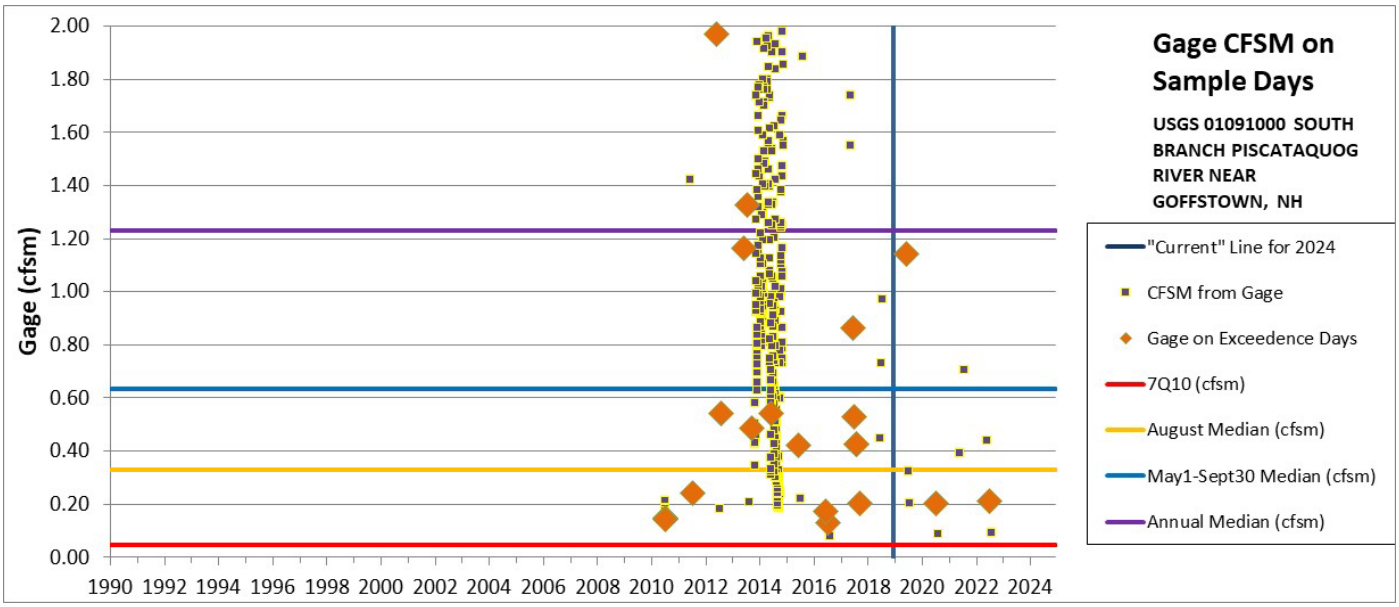
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
McQuesten Brook	NHRIV700060803-16	Dissolved oxygen saturation	BEDFORD, MANCHESTER	5-P	2-G

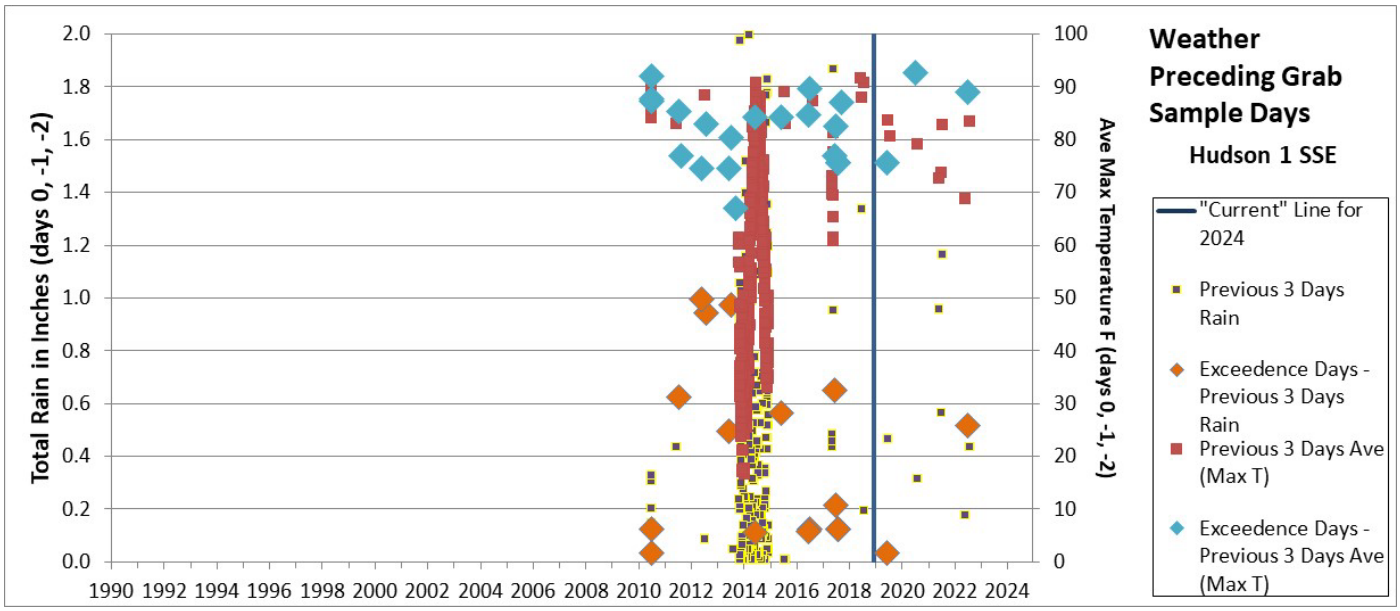
Sixty-two of the 65 (95%) of the grab samples collected at stations 01-MQB, 02-MQB, 03-MQB, 03D-MQB, 04A-MQB, and 05-MQB in the current assessment period (2019-2024) were above the dissolved oxygen (percent saturation) threshold of 75%. The high dissolved oxygen samples were collected during similar conditions of the samples that drove the initial impairment including flows ranging from 0.09 to 4.63 cfsm, and 3-day rainfall totals from 0.00 to 1.17 inches. The high dissolved oxygen samples were collected during critical period and critical time as well as critical period and non-critical time. The New Hampshire Rivers Council, NHDES, New Hampshire Fish and Game, and the Samuel P. Hunt Foundation have been working with the City of Manchester, the Town of Bedford, and other groups to protect and improve the McQuesten Brook watershed since roughly 2011. As part of these efforts four dams, one stream obstruction, and two culverts were removed in 2016. Sampling at the aforementioned sites has been conducted throughout the restoration activities, and prior to and following the dam removals and culvert replacements. It is evident that the restoration efforts outlined in the McQuesten Brook Geomorphic Assessment and Watershed Restoration Plan have contributed to improvements in water quality. In 2018, McQuesten Brook (NHRIV700060803-16) was removed from the 2016 303(d) List of Threatened or Impaired Waters for dissolved oxygen for the aquatic life integrity use. As a result of the restoration efforts and continual monitoring, McQuesten Brook (NHRIV700060803-16) has been moved from 5-P to 2-G for dissolved oxygen saturation for the aquatic life integrity designated use based on data collected in the current assessment period.

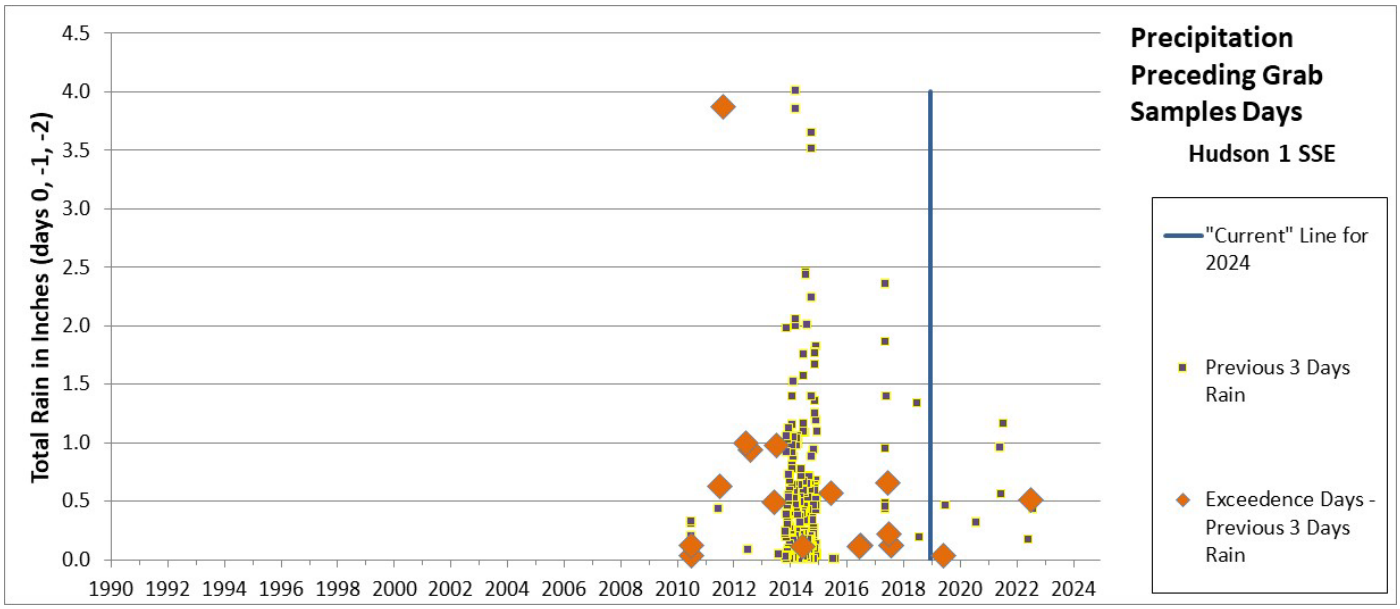

MCQUESTEN BROOK
(NHRIV700060803-16)
Dissolved Oxygen (percent saturation)
"Current" Line for 2020
DOSat Min
DOSat Min- (Magex)
DO-PERC-GRAB-NCT-CP
DO-PERC-GRAB-CT-CP
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP

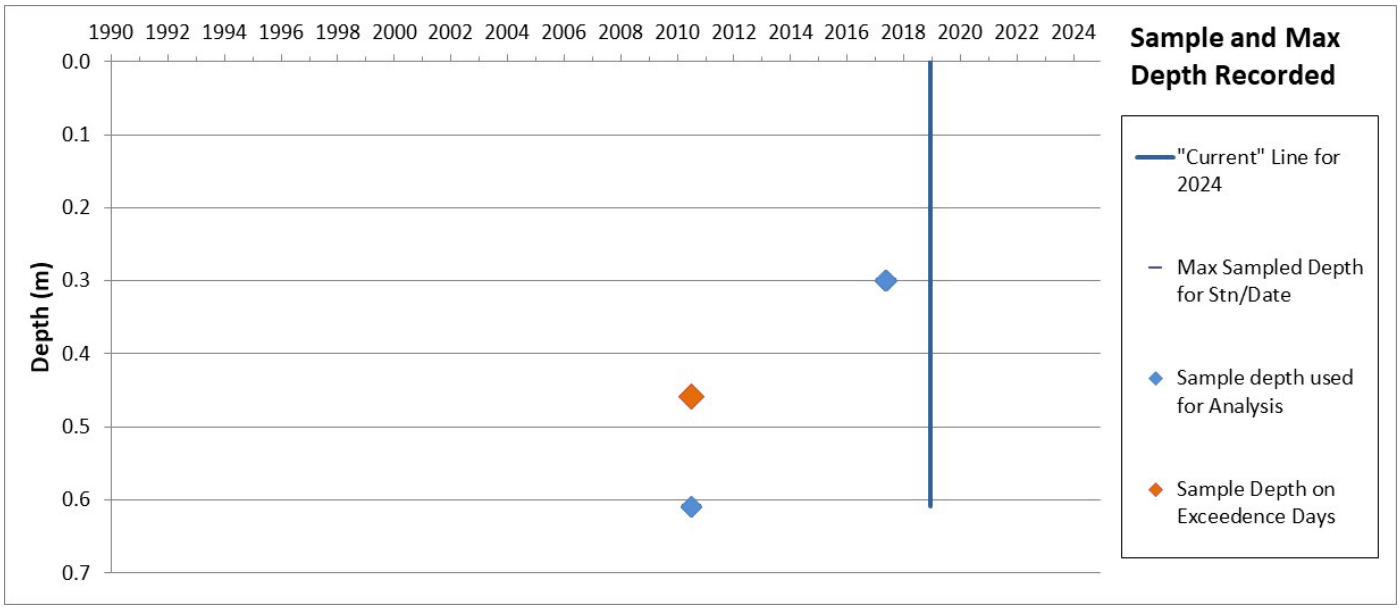

MCQUESTEN BROOK
(NHRIV700060803-16)
Dissolved Oxygen (percent saturation)
"Current" Line for 2020
DO (%Sat) Minimum of 24 Hour Average
DO (% Sat.)

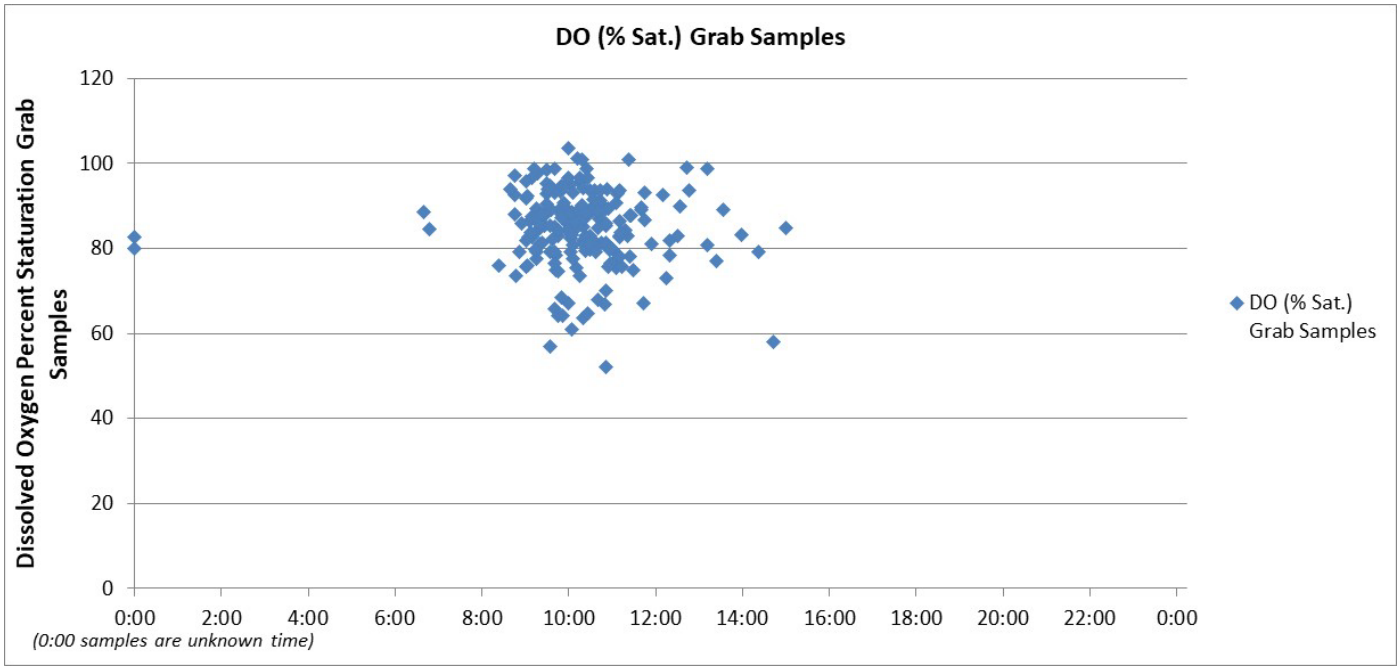

Weather Preceding Grab Sample Days
Hudson 1 SSE
Total Rain in Inches (days 0, -1, -2)
Ave Max Temperature F (days 0, -1, -2)
"Current" Line for 2024
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)

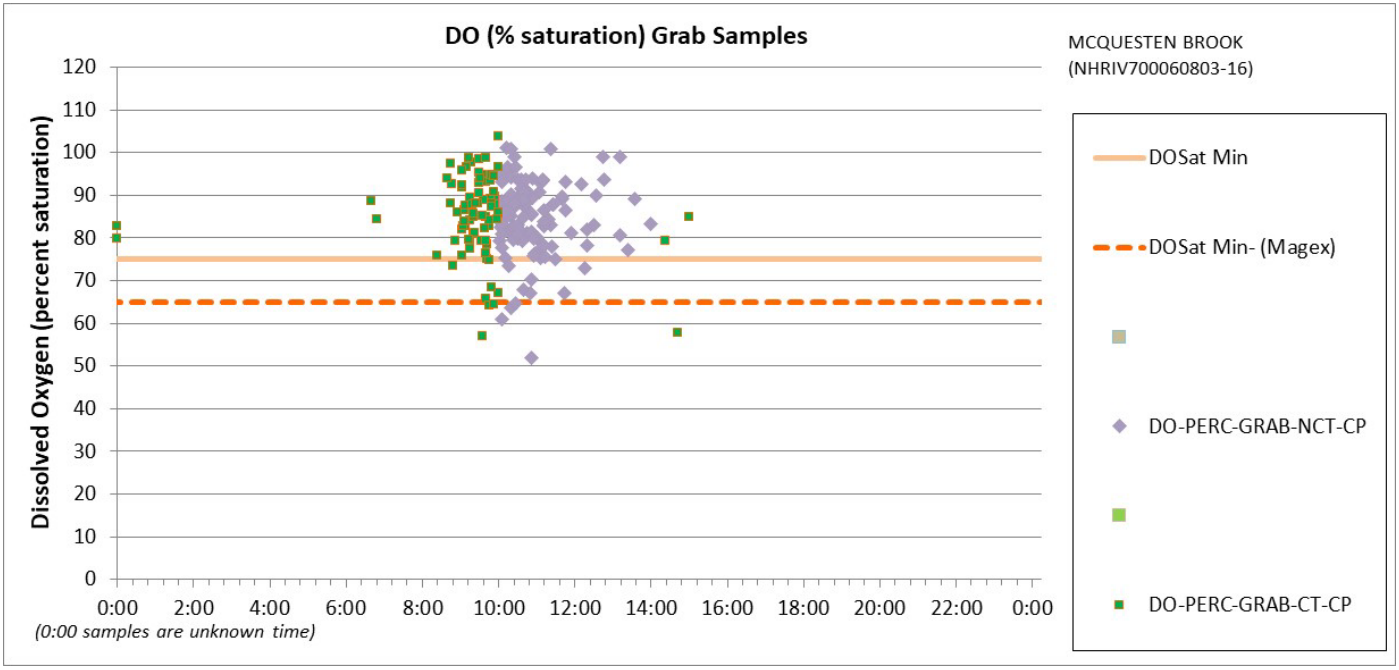

Gage CFSM on Sample Days
USGS 01091000 SOUTH BRANCH PISCATAQUOG RIVER NEAR GOFFSTOWN, NH
Gage (cfsm)
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Weather Preceding Grab Sample Days
Hudson 1 SSE
Total Rain in Inches (days 0, -1, -2)
Ave Max Temperature F (days 0, -1, -2)
"Current" Line for 2024
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)


Precipitation Preceding Grab Samples Days
Hudson 1 SSE
Total Rain in Inches (days 0, -1, -2)
"Current" Line for 2024
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain


Sample and Max Depth Recorded
Depth (m)
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
0.0 0.1 0.2 0.3 0.4 0.5 0.6 0.7
"Current" Line for 2024
Max Sampled Depth for Stn/Date
Sample depth used for Analysis
Sample Depth on Exceedence Days


DO (% Sat.) Grab Samples
Dissolved Oxygen Percent Staturation Grab Samples
120 100 80 60 40 20 0
0:00 2:00 4:00 6:00 8:00 10:00 12:00 14:00 16:00 18:00 20:00 22:00 0:00
(0:00 samples are unknown time)
DO (% Sat.) Grab Samples

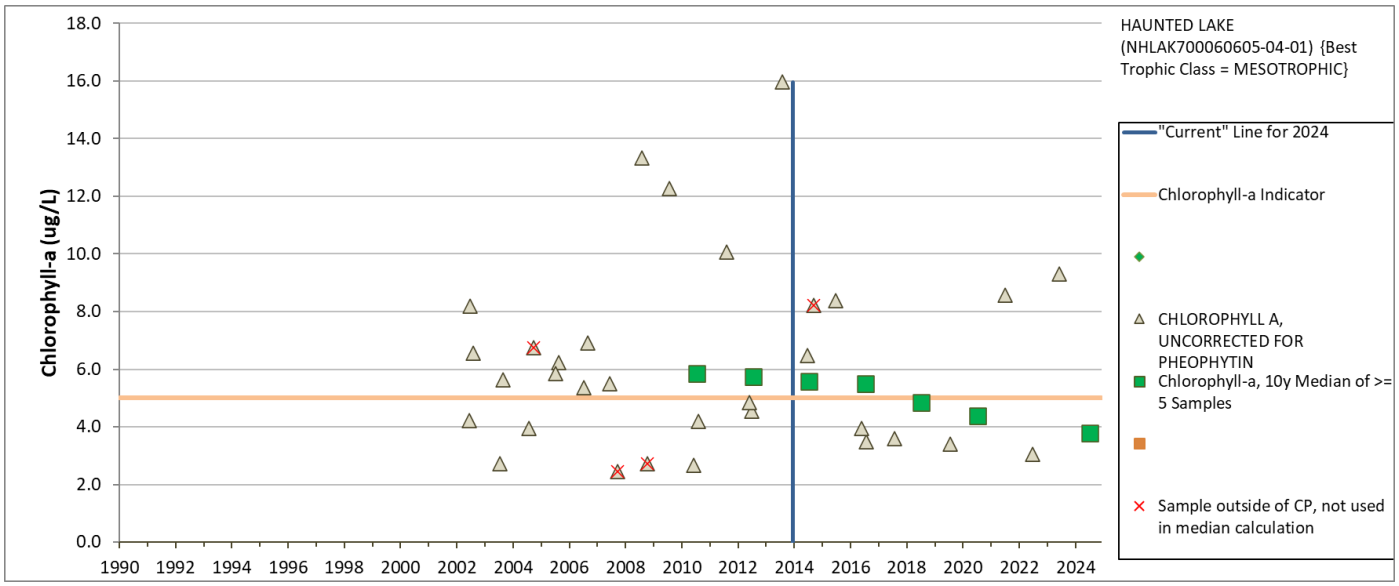


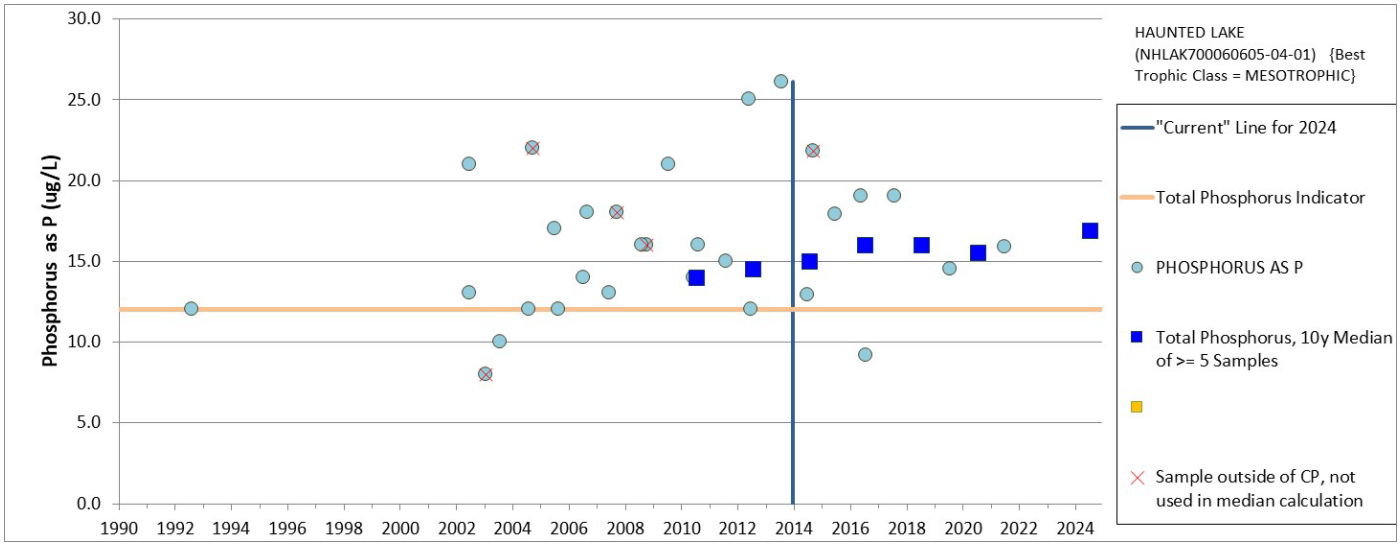
Chlorophyll-a & Total Phosphorus for Aquatic Life Integrity

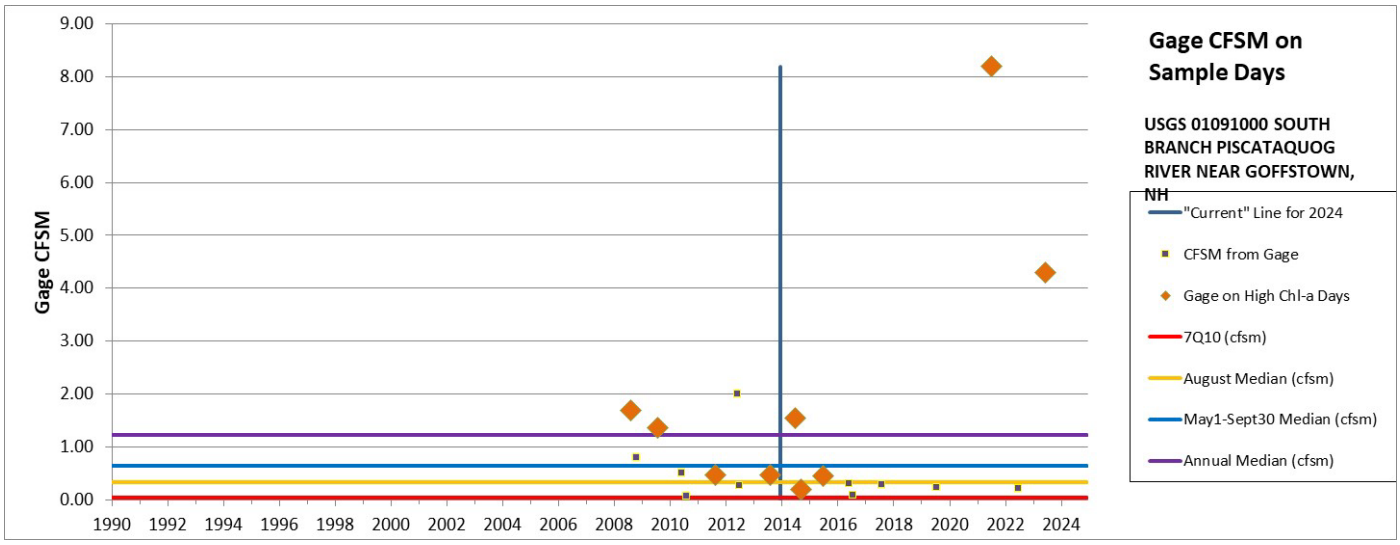
Haunted Lake (NHLAK700060605-04-01)

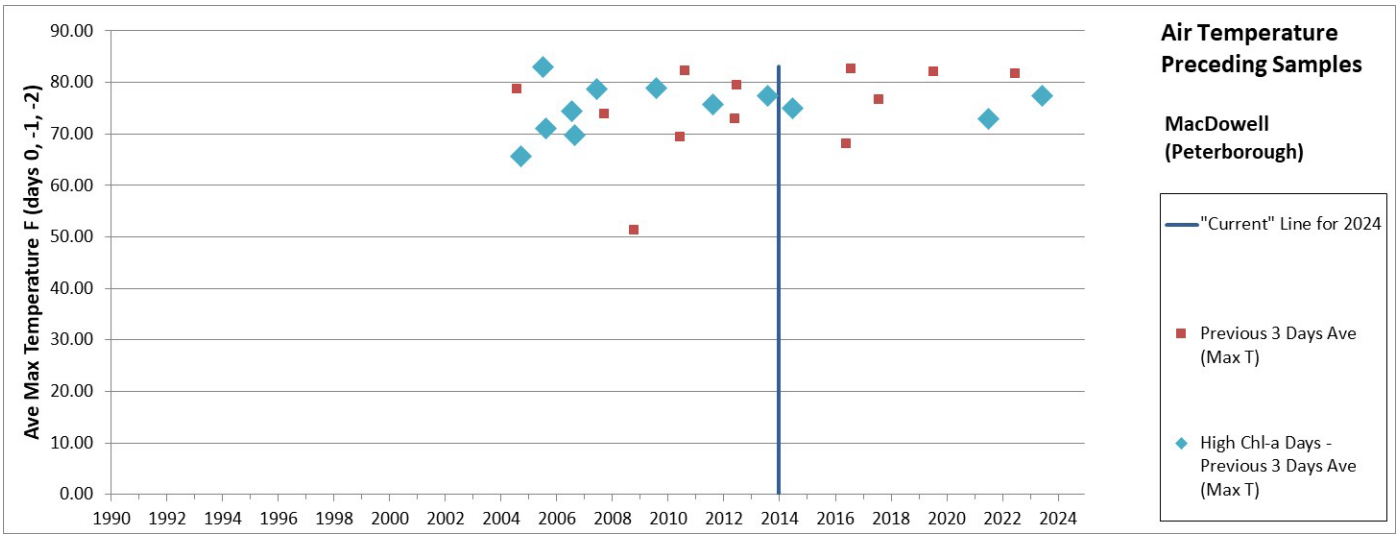
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Haunted Lake	NHLAK700060605-04-01	Chlorophyll-a	Francestown	5-M	4A-M
Haunted Lake	NHLAK700060605-04-01	Phosphorus (Total)	Francestown	5-M	4A-M

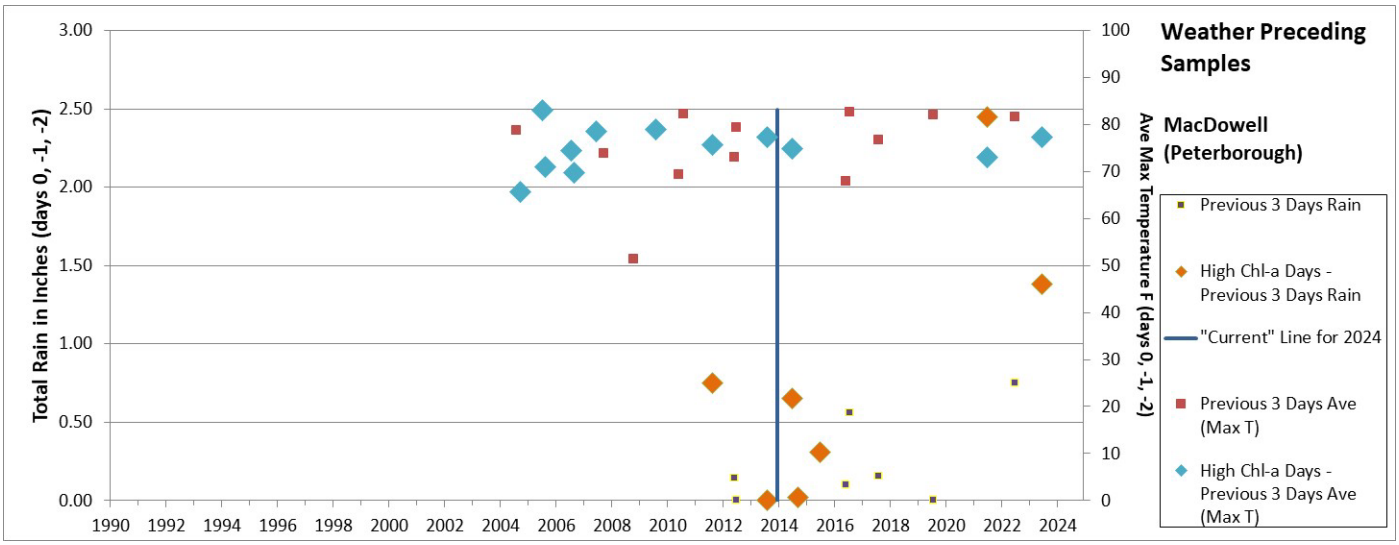
Haunted Lake was listed as impaired (category 5-M) for chlorophyll-a and total phosphorus for the 2020/2022 cycle. A TMDL was completed and accepted by EPA in 2019 and addresses the impairments for aquatic life integrity for total phosphorus and chlorophyll-a. The TMDL sets a goal for total phosphorus at 14.5 ug/L based on inputs of phosphorus from natural sources. While the current median for chlorophyll-a suggests category 2-M (fully supporting), it is based on one sample per summer. It is also contrasted by an increase in the total phosphorus concentration median. Based on the current data it is recommended to list Haunted Lake at category 4-A. Category 4-A indicates that Haunted Lake is impaired for chlorophyll-a and total phosphorus and has a total maximum daily load (TMDL) in place. The TMDL calculates the phosphorus input limits that should be met for Haunted Lake to be fully supporting of aquatic life integrity. The TMDL implementation plan should be evaluated and recommendations for increased sampling followed to aid in future assessments. Sampling should be increased to three times a year between May and September at the deep site (HAUFRSD). Haunted Lake (NHLAK700060605-04-01) is assigned assessment category 4A-M for the current assessment cycle for chlorophyll-a and total phosphorus.


Chlorophyll-a (ug/L)
HAUNTED LAKE (NHLAK700060605-04-01) {Best Trophic Class = MESOTROPHIC}
"Current" Line for 2024
Chlorophyll-a Indicator
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN
Chlorophyll-a, 10y Median of >= 5 Samples
Sample outside of CP, not used in median calculation


Phosphorus as P (ug/L)
HAUNTED LAKE (NHLAK700060605-04-01) {Best Trophic Class = MESOTROPHIC}
"Current" Line for 2024
Total Phosphorus Indicator
PHOSPHORUS AS P
Total Phosphorus, 10y Median of >= 5 Samples
Sample outside of CP, not used in median calculation


Gage CFSM
Gage CFSM on Sample Days
USGS 01091000 SOUTH BRANCH PISCATAQUOG RIVER NEAR GOFFSTOWN, NH
"Current" Line for 2024
CFSM from Gage
Gage on High Chl-a Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)



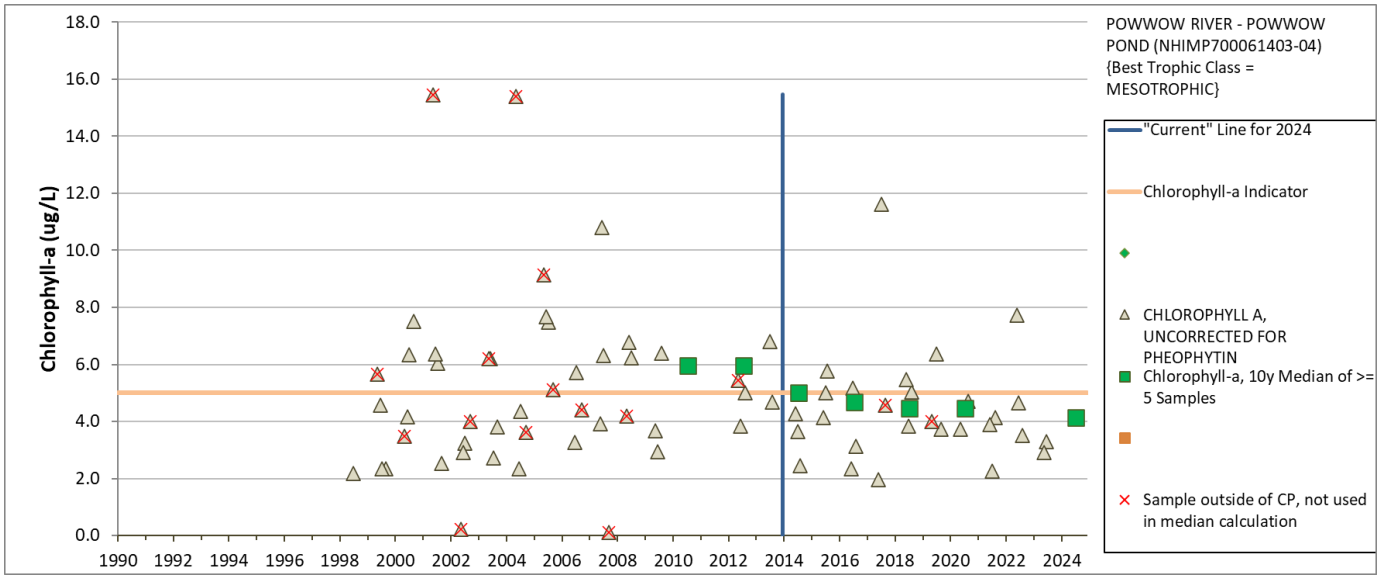


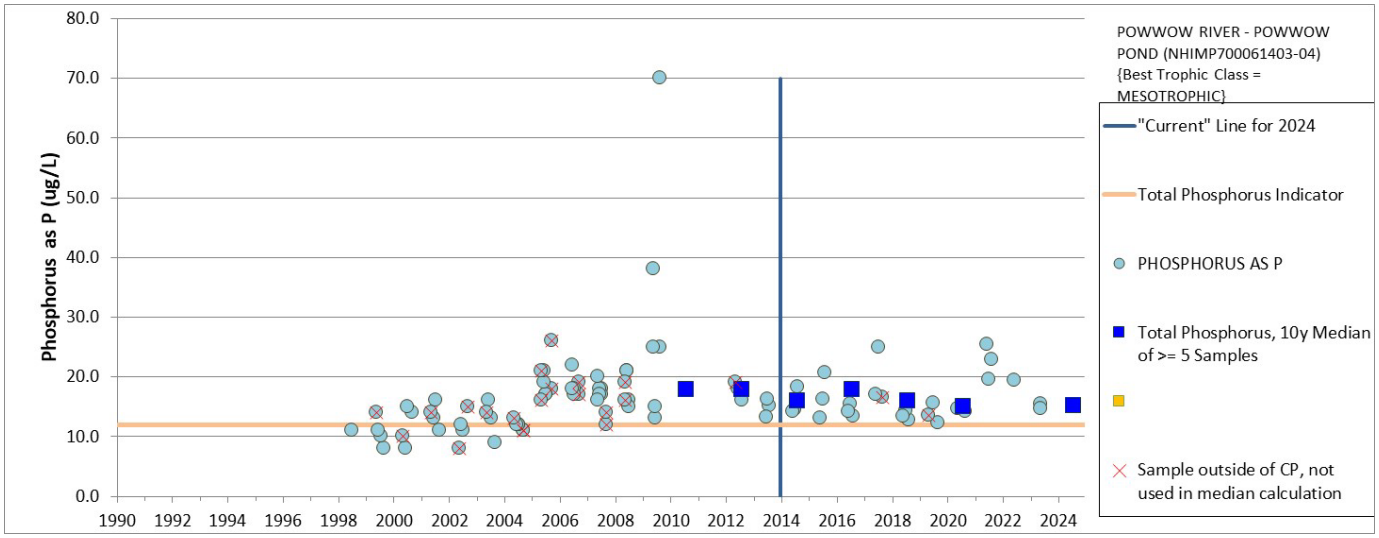
Powwow Pond (NHIMP700061403-04)

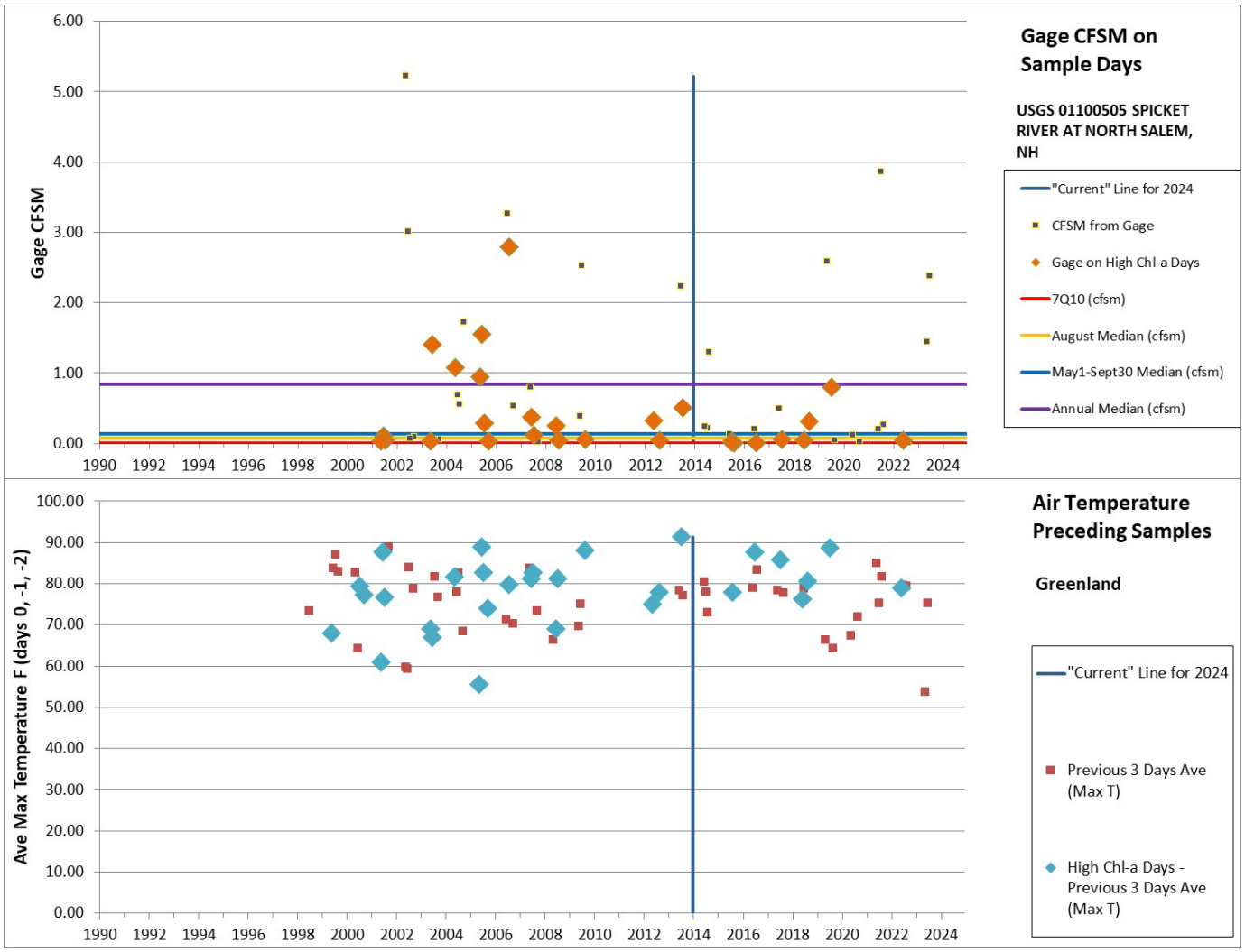
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
POWWOW RIVER – POWWOW POND	NHIMP700061403-04	Chlorophyll-a	Kingston, East Kingston, Newton	5-M	2-M
POWWOW RIVER – POWWOW POND	NHIMP700061403-04	Phosphorus (Total)	Kingston, East Kingston, Newton	5-M	3-PNS

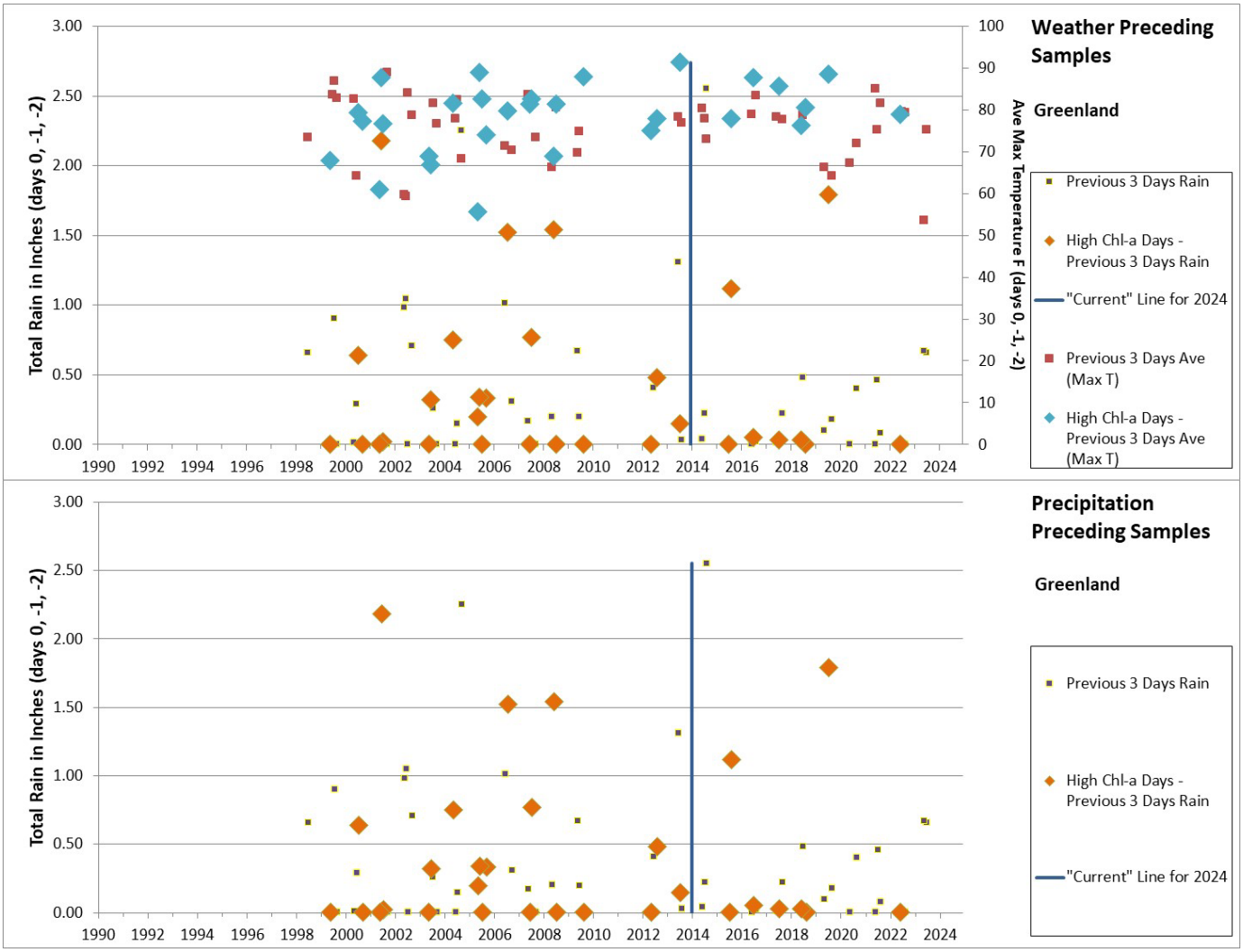
The 2020/2022 assessment comments noted: *"Potential de-list in upcoming cycles. Wait another assessment cycle to evaluate whether the chlorophyll-a median values remain below the threshold. Median in 2018 and 2020 is 4.47 ug/L which is close to 5.0 ug/L threshold. Need consistent data below the threshold to de-list. Total phosphorus median remains above threshold for mesotrophic lakes. Highly colored water may also be a limiting factor to algal growth."* Chlorophyll-a has continued to decrease and remains below the threshold with a current median of 4.13 ug/L. Both the previous and current data have been collected under similar meteorological and hydrological conditions, supporting a change in water quality. Although total phosphorus medians continue to remain slightly above the threshold for mesotrophic lakes (12 ug/L), the stressor-response decision matrix recommends a category of 3-PNS,

due to the chlorophyll-a concentrations. The Powwow River appears to be a shallow impoundment with a lot of aquatic vegetation, which along with color could be limiting algal growth. It is recommended that additional data be collected at station POWKIND during the summer months. Powwow River – Powwow Pond (NHIMP700061403) has been delisted from category 5-M to 2-M for chlorophyll-a and from 5-M to 3-PNS for total phosphorus for the aquatic life integrity designated use based on data collected in the current assessment period.





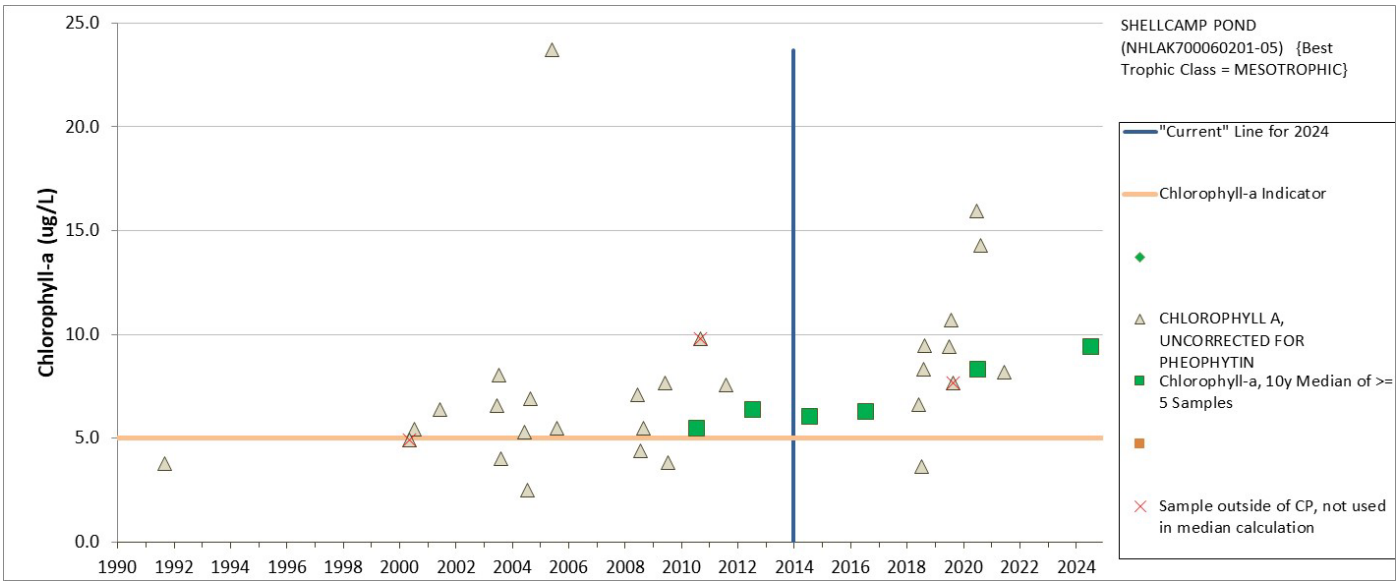

Gage CFSM on Sample Days
USGS 01100505 SPICKET RIVER AT NORTH SALEM, NH
"Current" Line for 2024
CFSM from Gage
Gage on High Chl-a Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)
Gage CFSM
Air Temperature Preceding Samples
Greenland
"Current" Line for 2024
Previous 3 Days Ave (Max T)
High Chl-a Days - Previous 3 Days Ave (Max T)
Ave Max Temperature F (days 0, -1, -2)

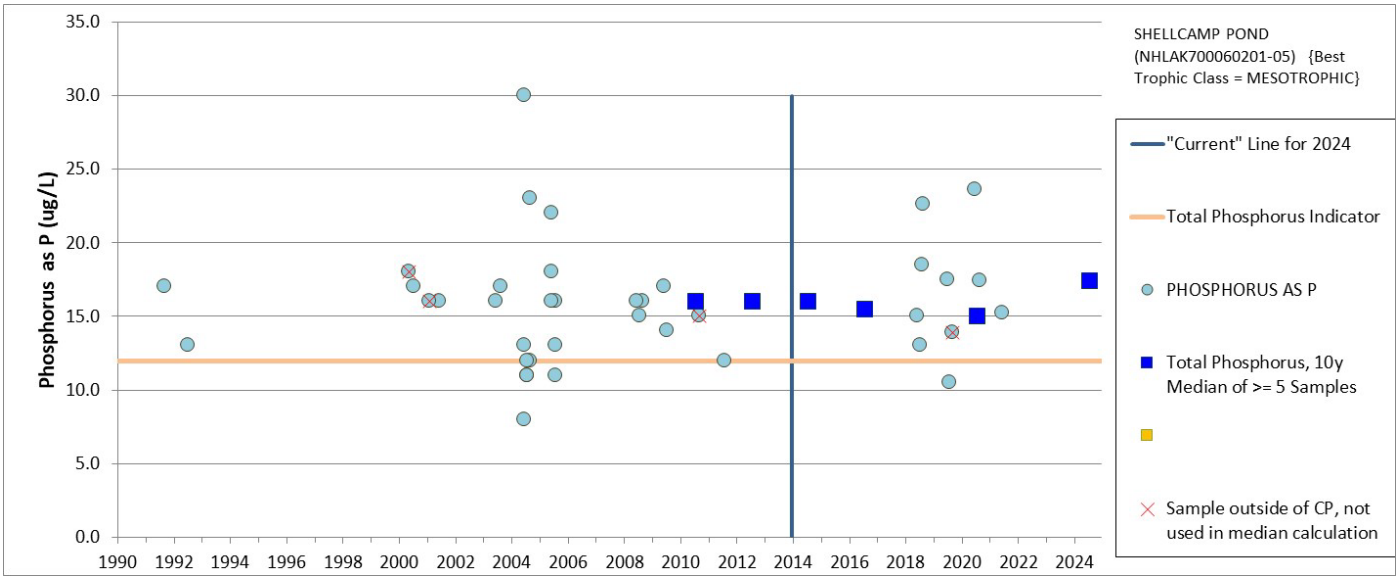


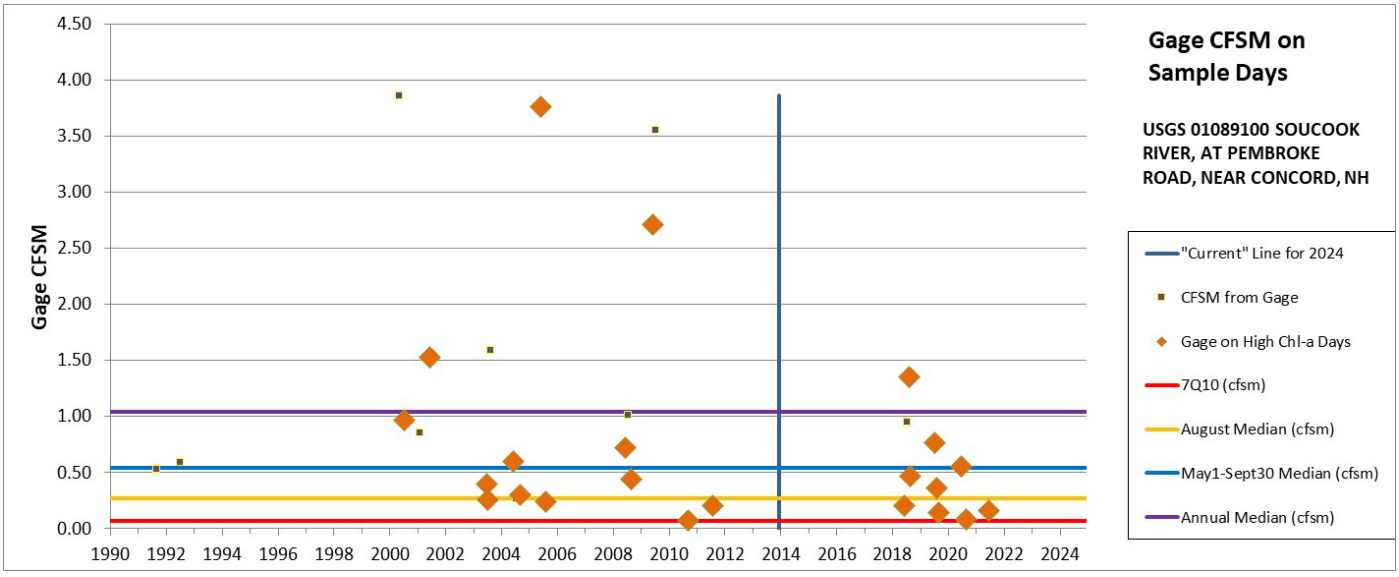
Shellcamp Pond (NHLAK700060201-05)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Shellcamp Pond	NHLAK700060201-05	Chlorophyll-a	Gilmanton	5-M	4A-M
Shellcamp Pond	NHLAK700060201-05	Phosphorus (Total)	Gilmanton	5-M	4A-M

On September 28, 2022 EPA approved the Total Maximum Daily Load for Phosphorus for Shellcamp Pond, Gilmanton, NH. The purpose of the TMDL is to address impairments of the aquatic life integrity designated use due to total phosphorus and chlorophyll-a. These impairments were due to atmospheric deposition, internal loading, septic systems (within 250 feet of the lake), waterfowl and watershed loads. The TMDL will result in attainment of surface water quality criteria and thresholds for total phosphorus and chlorophyll-a. A copy of the EPA TMDL approval letter and additional detail documents may be found in NHDES' TMDL Webpage. Since the TMDL has been approved by EPA, Shellcamp Pond (NHLAK700060201-05) has been moved from 5-M to 4A-M for Phosphorus (Total) and Chlorophyll-a for the aquatic life integrity designated use.


SHELLCAMP POND (NHLAK700060201-05) {Best Trophic Class = MESOTROPHIC}
Chlorophyll-a (ug/L)
"Current" Line for 2024
Chlorophyll-a Indicator
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN
Chlorophyll-a, 10y Median of >= 5 Samples
Sample outside of CP, not used in median calculation


SHELLCAMP POND (NHLAK700060201-05) {Best Trophic Class = MESOTROPHIC}
Phosphorus as P (ug/L)
"Current" Line for 2024
Total Phosphorus Indicator
PHOSPHORUS AS P
Total Phosphorus, 10y Median of >= 5 Samples
Sample outside of CP, not used in median calculation


Gage CFSM on Sample Days
USGS 01089100 SOUCOOK RIVER, AT PEMBROKE ROAD, NEAR CONCORD, NH
Gage CFSM
"Current" Line for 2024
CFSM from Gage
Gage on High Chl-a Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)

Chlorophyll-a for Primary Contact Recreation (i.e. swimming)

Bellamy River - Unnamed Brook (NHRIV600030903-09)

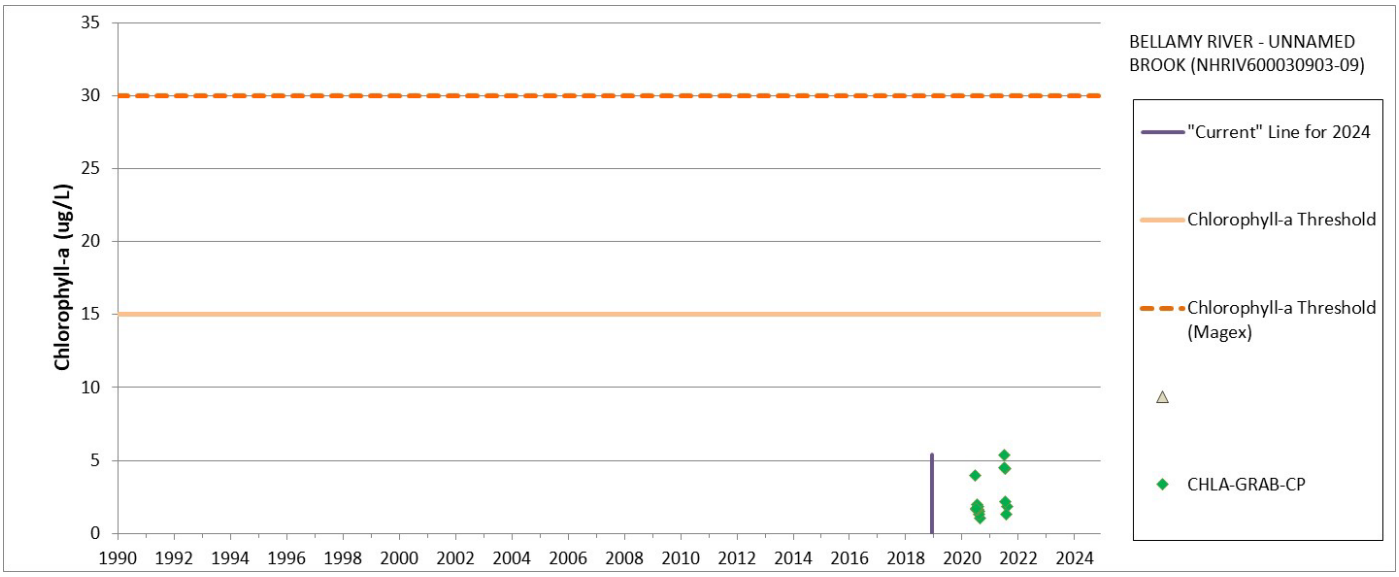
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Bellamy River - Unnamed Brook	NHRIV600030903-09	Chlorophyll-a	Dover	n/a	2-G

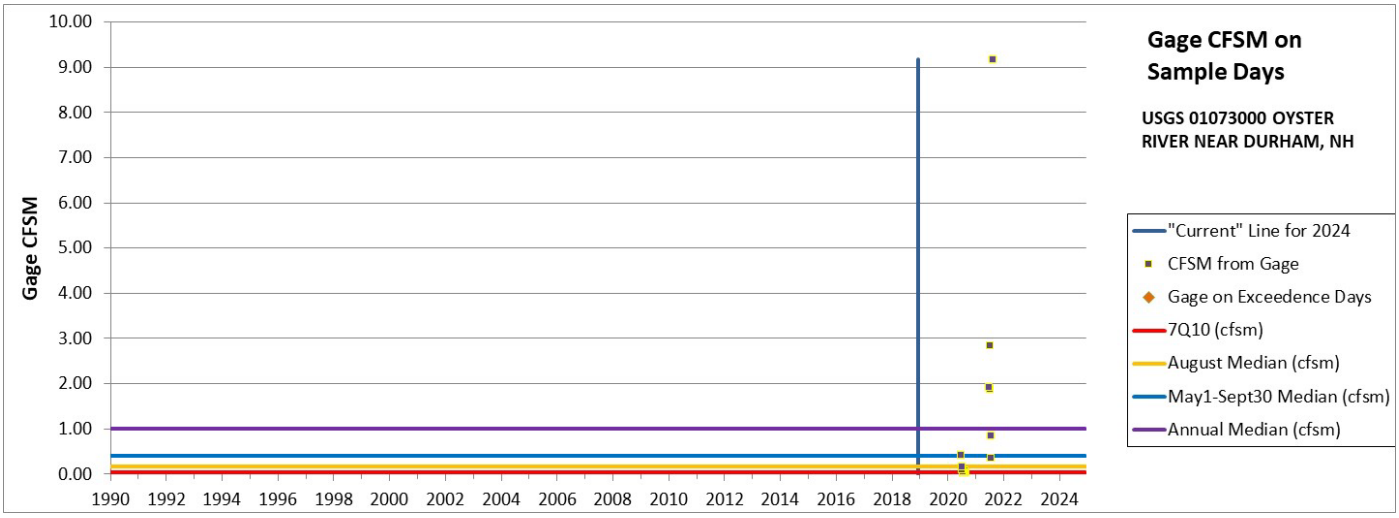
In 2020 the Upper Sawyer Mill Dam (D067007) was removed, allowing the impoundment (NHIMP600030903-02) to return to a free-flowing stream. As a result of the dam removal, NHIMP600030903-02 was deactivated and the upstream river assessment unit (NHRIV600030903-09) was extended downstream through the old impoundment area. Because NHIMP600030903-02 was impaired (5-M) for chlorophyll-a for the primary contact recreation designated use, and NHRIV600030903-09 was not, the impairment had to be transferred to the waterbody until new sampling data demonstrated a change in water quality.

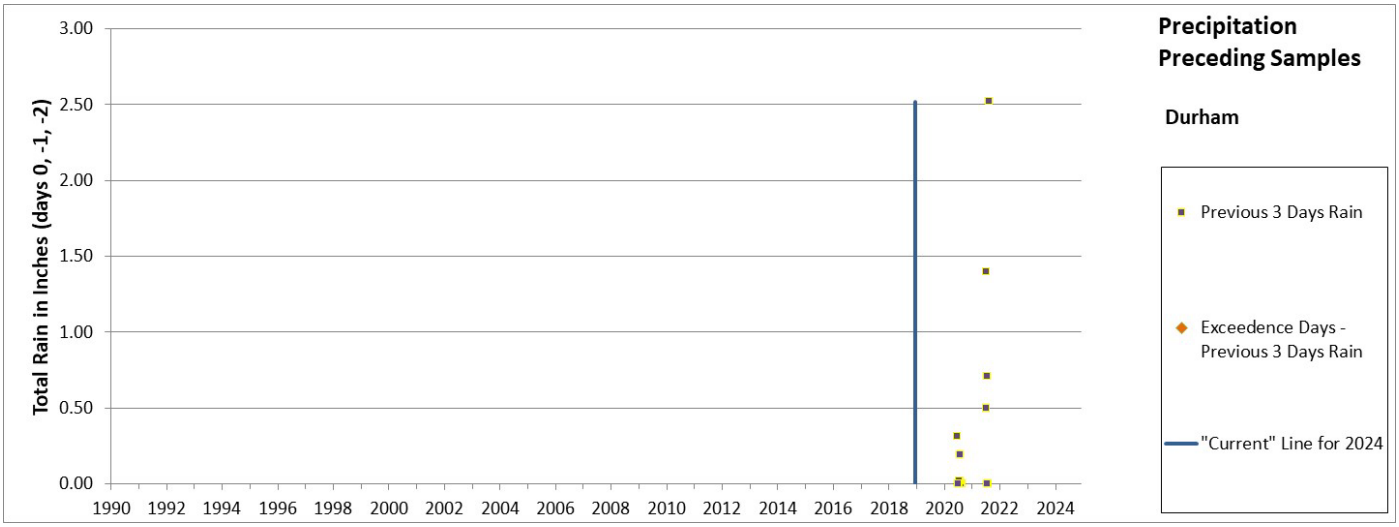
All water samples associated with the impounded conditions (station 05-BLM-DAMMED, n=71) are no longer appropriate for use during the assessment of the free-flowing river. During the current assessment period and post dam removal, 16 samples were collected at station 05-BLM in 2020 and 2021. All of the samples were well below the chlorophyll-a threshold of 15 ug/L, with a maximum of 5.4 ug/L), which indicates that the river consistently meets water quality standards. The samples were collected during flows between 0.02 and 9.17 cfsm at the Oyster River gage (01073000) and with 3-day rainfall totals between 0.00 and 2.52 inches. These hydrologic and meteorological conditions are very similar to those that were observed under the impounded conditions and drove the impairment determination for NHIMP600030903-02. Therefore, the Bellamy River - Unnamed Brook (NHRIV600030903-09) will be placed directly into category 2-G for chlorophyll-a for the primary contact recreation designated use, essentially being listed and then immediately delisted for the 2024 assessment cycle.

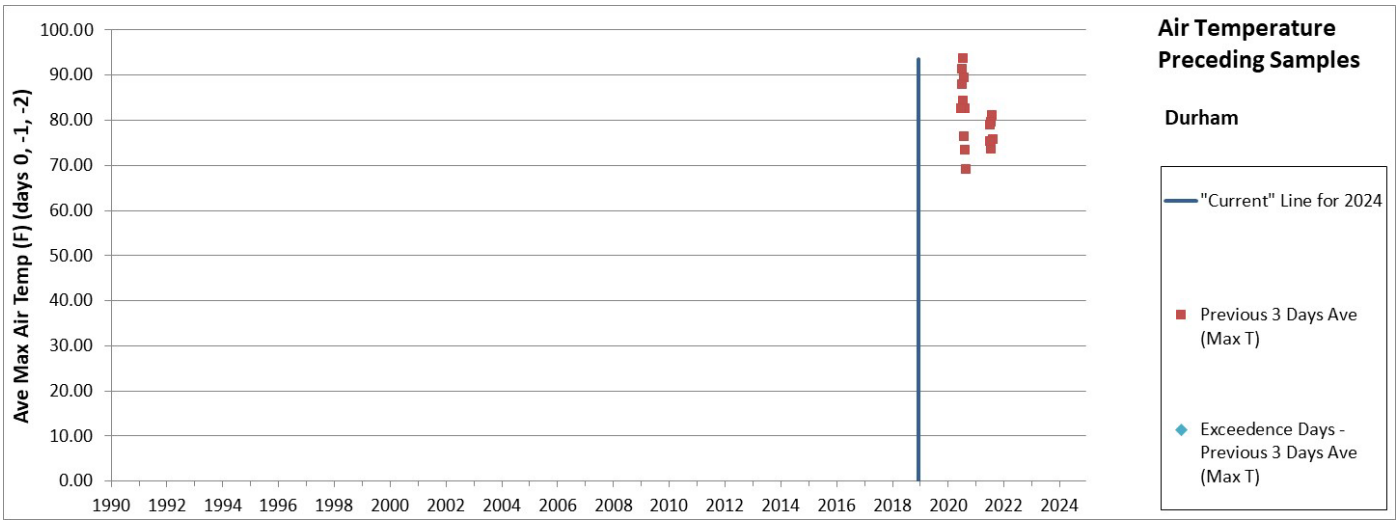
2018 Imagery

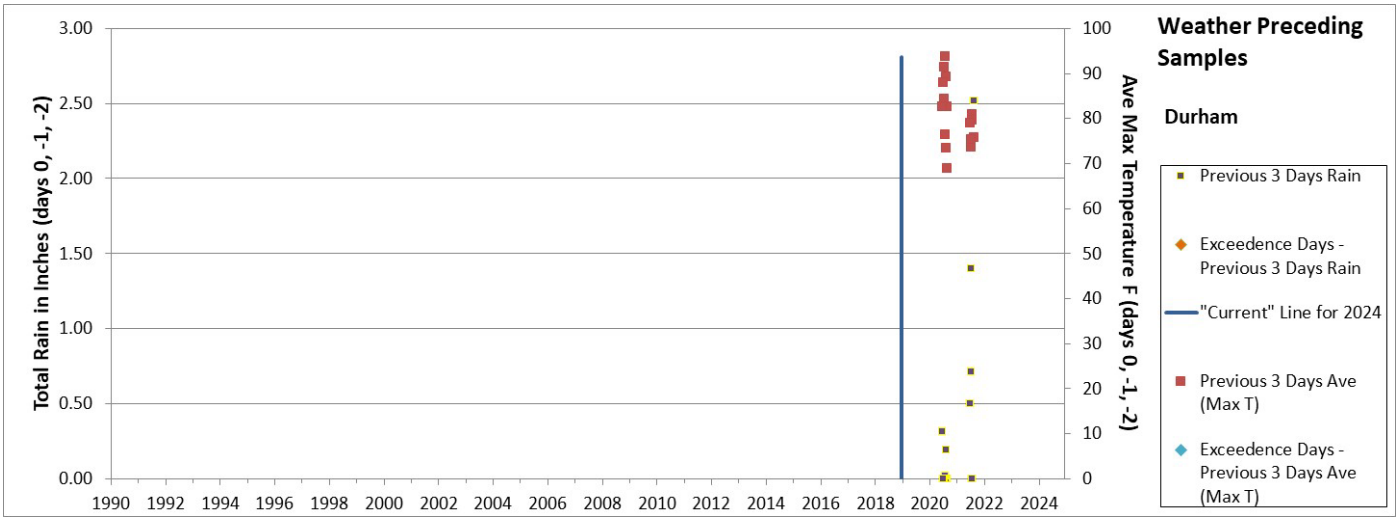
2020 Imagery

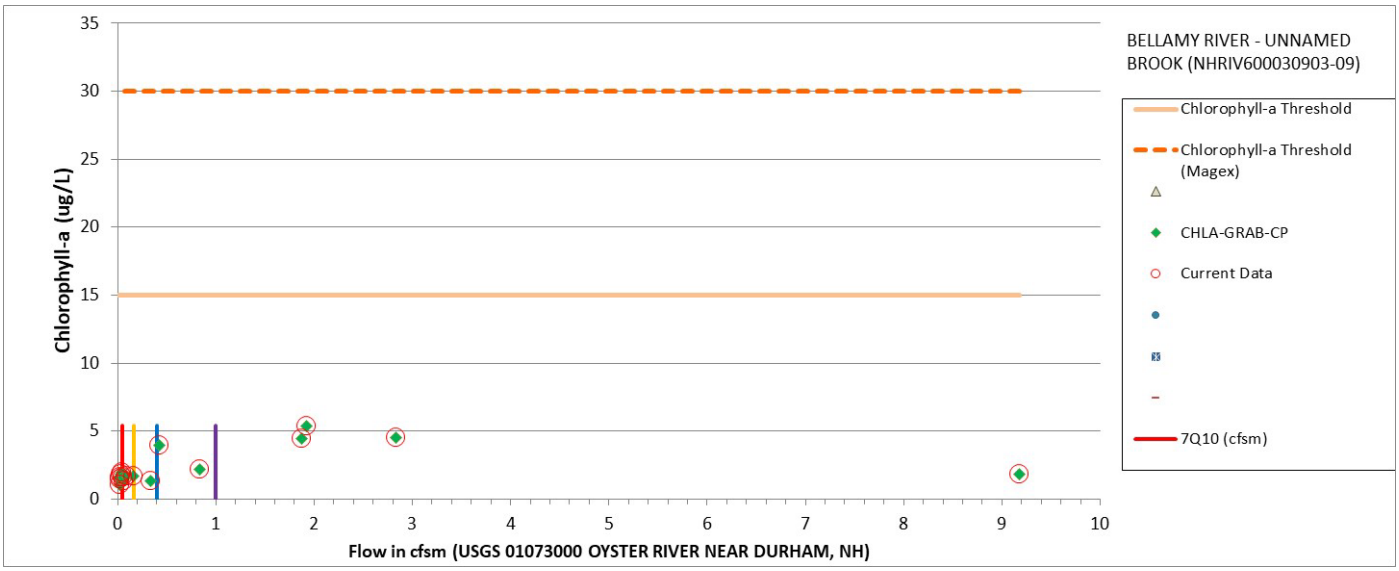

Chlorophyll-a (ug/L)
35
30
25
20
15
10
5
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
BELLAMY RIVER - UNNAMED BROOK (NHRIV600030903-09)
"Current" Line for 2024
Chlorophyll-a Threshold
Chlorophyll-a Threshold (Magex)
CHLA-GRAB-CP

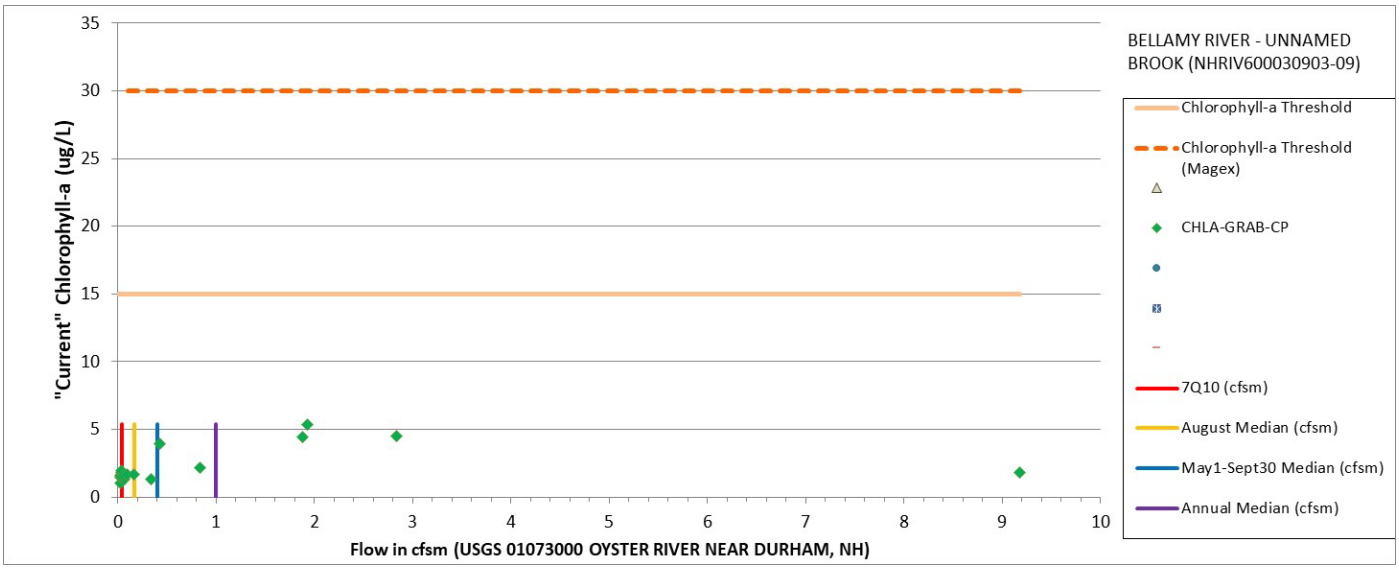

Gage CFSM
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Gage CFSM on Sample Days
USGS 01073000 OYSTER RIVER NEAR DURHAM, NH
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)

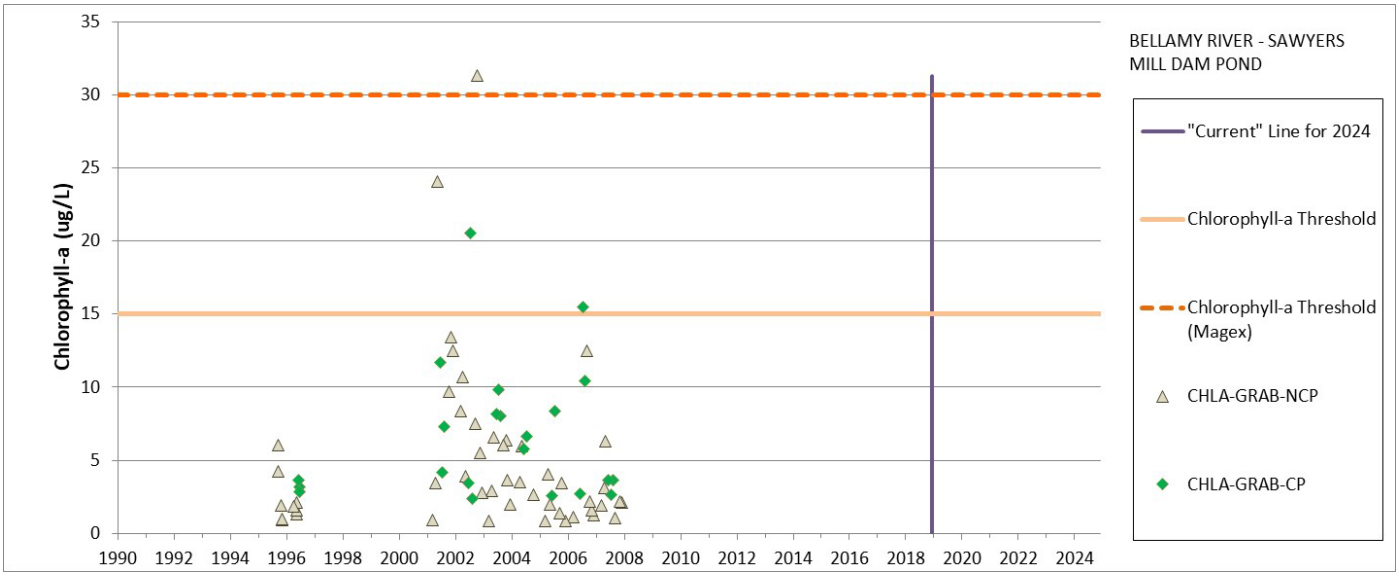

Total Rain in Inches (days 0, -1, -2)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Precipitation Preceding Samples
Durham
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024

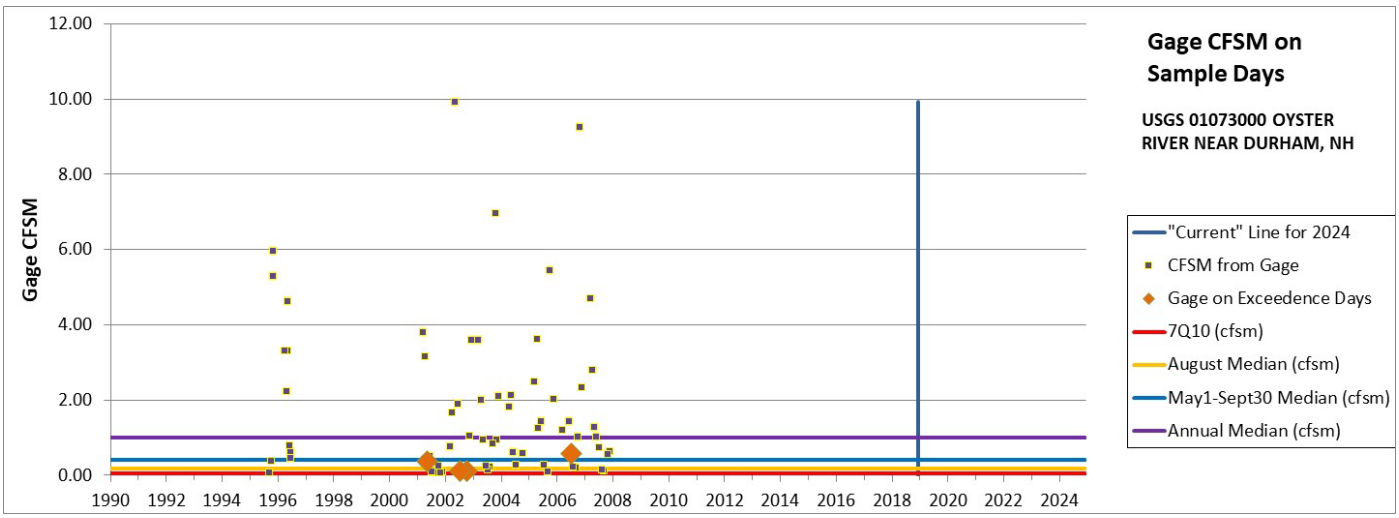

Air Temperature Preceding Samples
Durham
Ave Max Air Temp (F) (days 0, -1, -2)
"Current" Line for 2024
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)

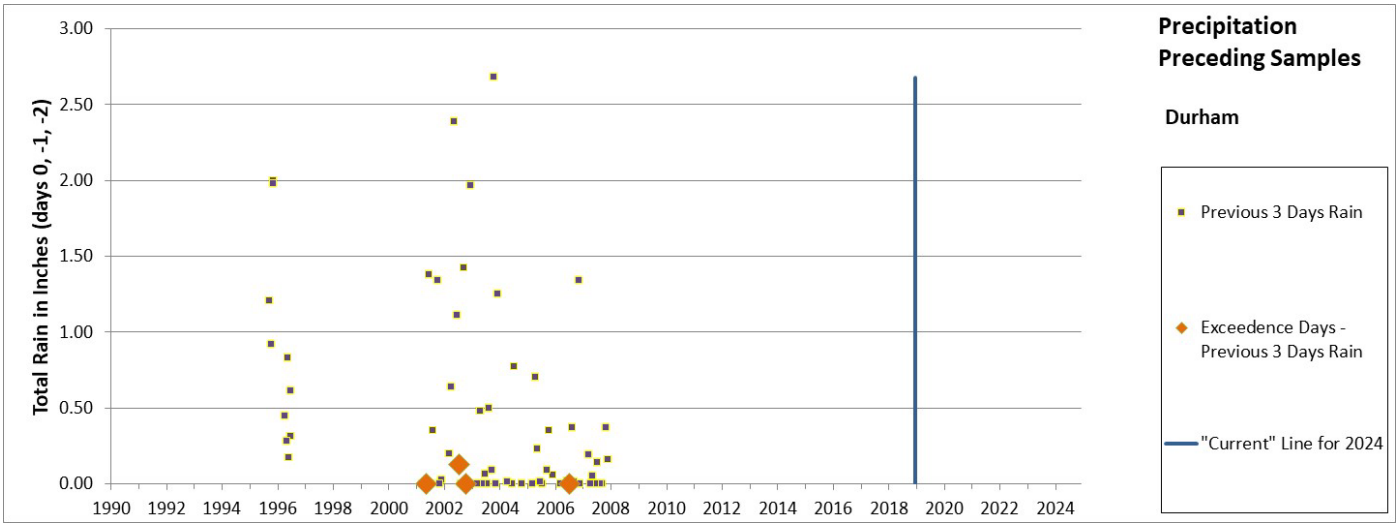

Weather Preceding Samples
Durham
Total Rain in Inches (days 0, -1, -2)
Ave Max Temperature F (days 0, -1, -2)
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)


BELLAMY RIVER - UNNAMED BROOK (NHRIV600030903-09)
Chlorophyll-a (ug/L)
Flow in cfsm (USGS 01073000 OYSTER RIVER NEAR DURHAM, NH)
Chlorophyll-a Threshold
Chlorophyll-a Threshold (Magex)
CHLA-GRAB-CP
Current Data
7Q10 (cfsm)

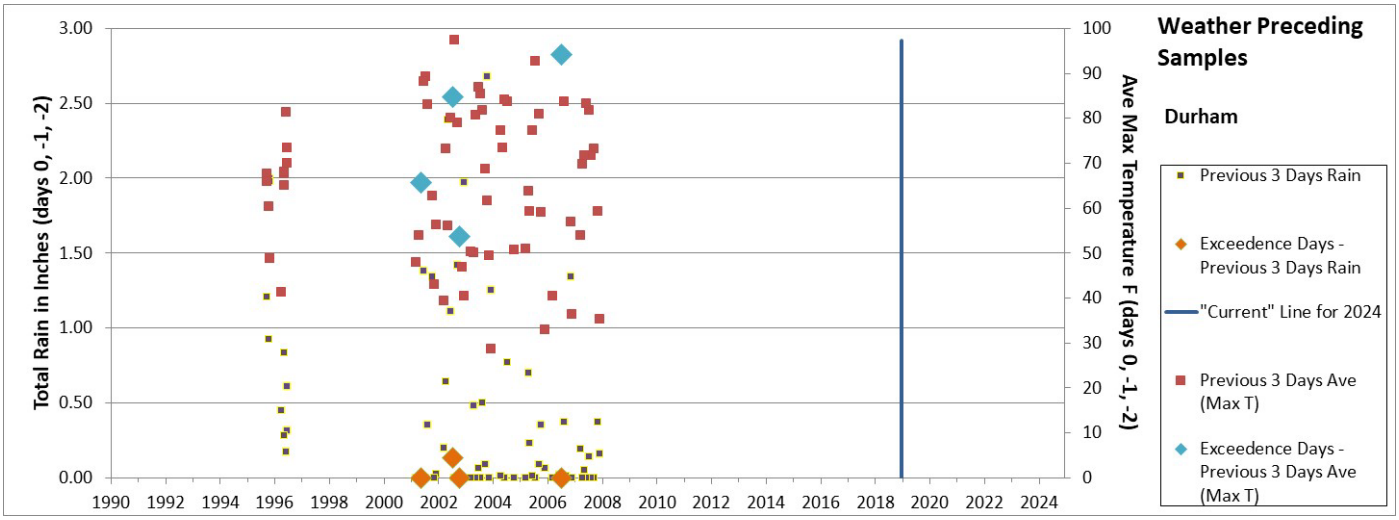

"Current" Chlorophyll-a (ug/L)
Flow in cfsm (USGS 01073000 OYSTER RIVER NEAR DURHAM, NH)
BELLAMY RIVER - UNNAMED BROOK (NHRIV600030903-09)
Chlorophyll-a Threshold
Chlorophyll-a Threshold (Magex)
CHLA-GRAB-CP
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)

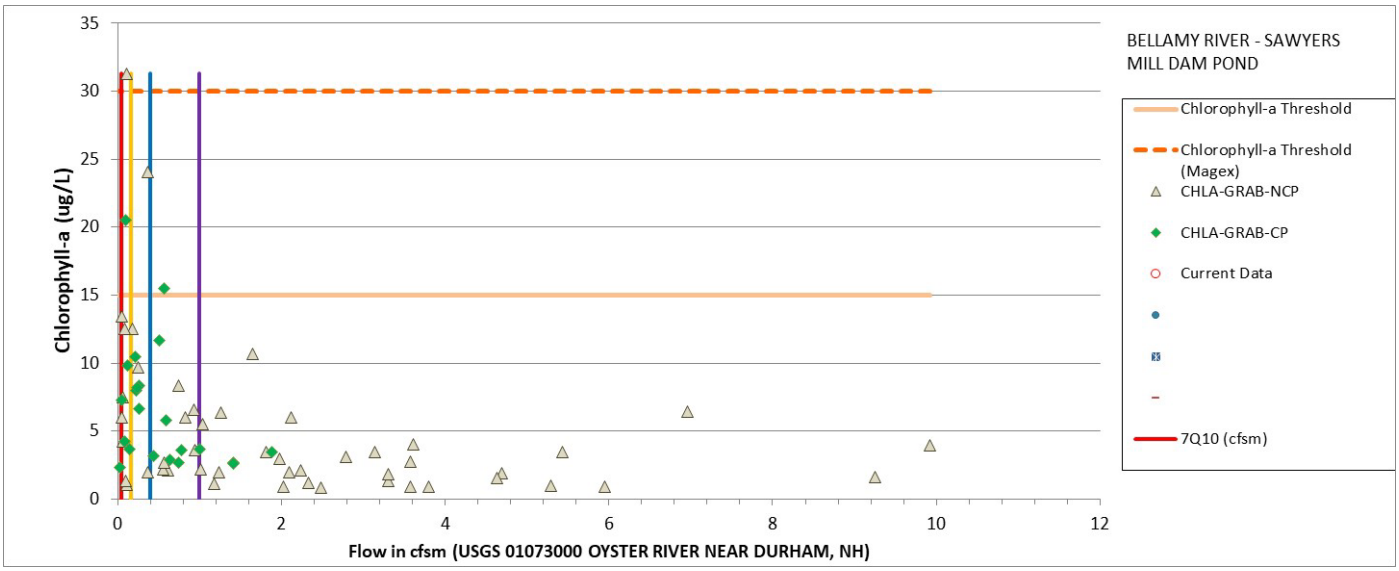

Chlorophyll-a (ug/L)
BELLAMY RIVER - SAWYERS MILL DAM POND
"Current" Line for 2024
Chlorophyll-a Threshold
Chlorophyll-a Threshold (Magex)
CHLA-GRAB-NCP
CHLA-GRAB-CP

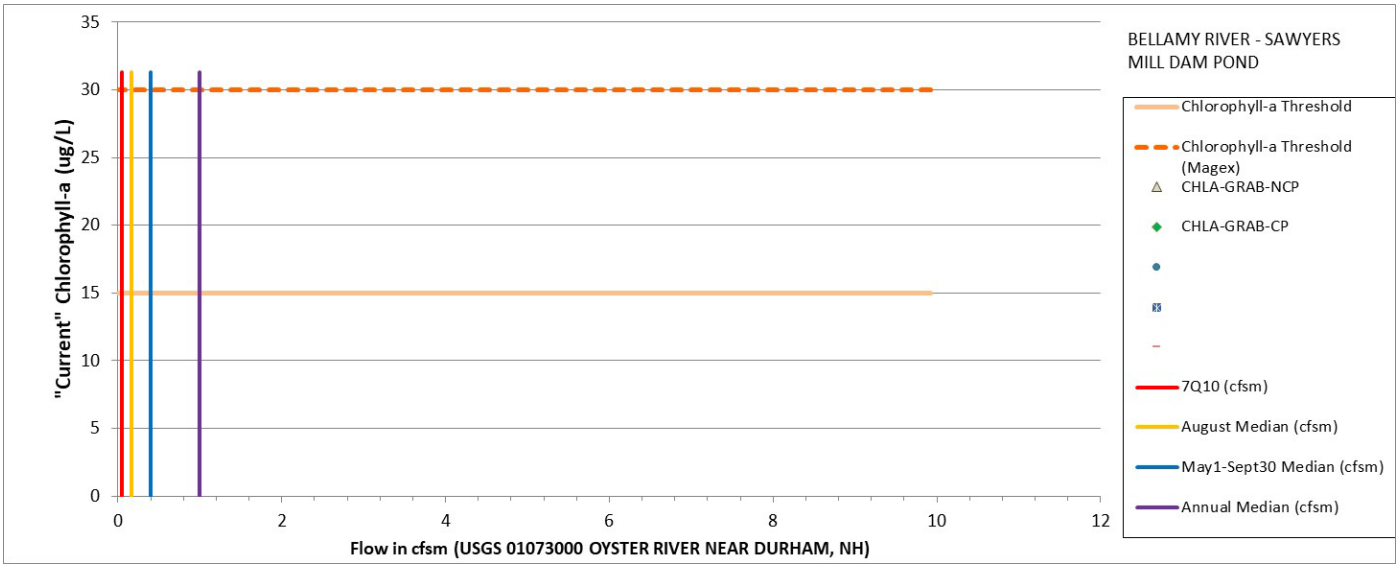

Gage CFSM
Gage CFSM on Sample Days
USGS 01073000 OYSTER RIVER NEAR DURHAM, NH
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Precipitation Preceding Samples
Durham
Total Rain in Inches (days 0, -1, -2)
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024


Air Temperature Preceding Samples
Durham
Ave Max Air Temp (F) (days 0, -1, -2)
"Current" Line for 2024
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)


Weather Preceding Samples
Durham
Total Rain in Inches (days 0, -1, -2)
Ave Max Temperature F (days 0, -1, -2)
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)

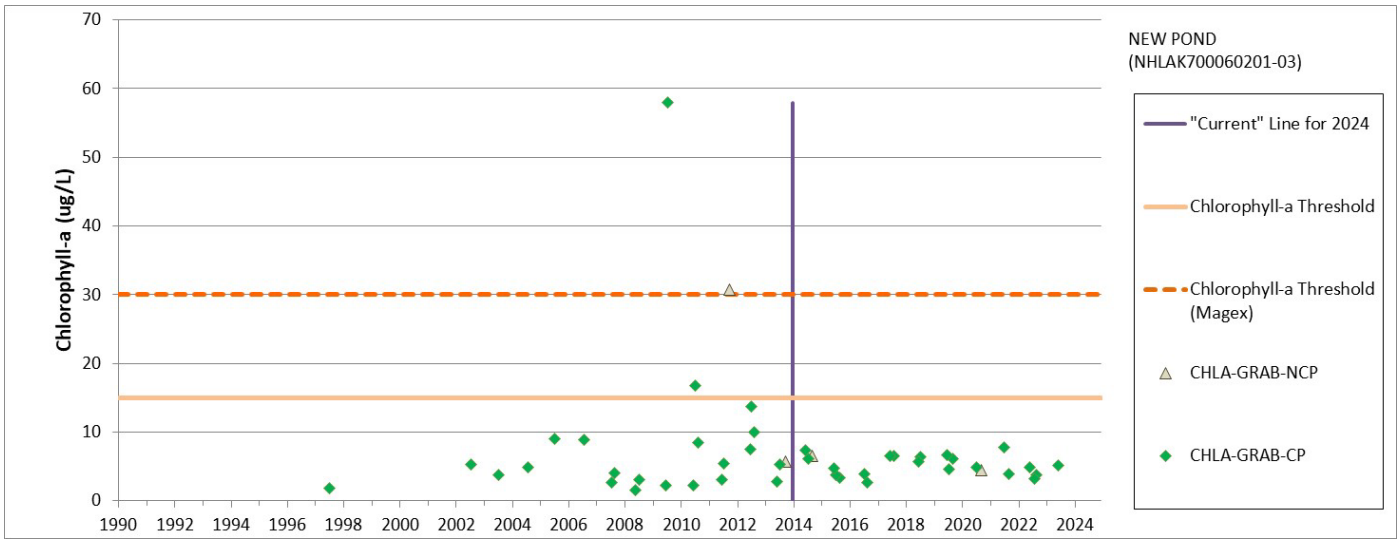


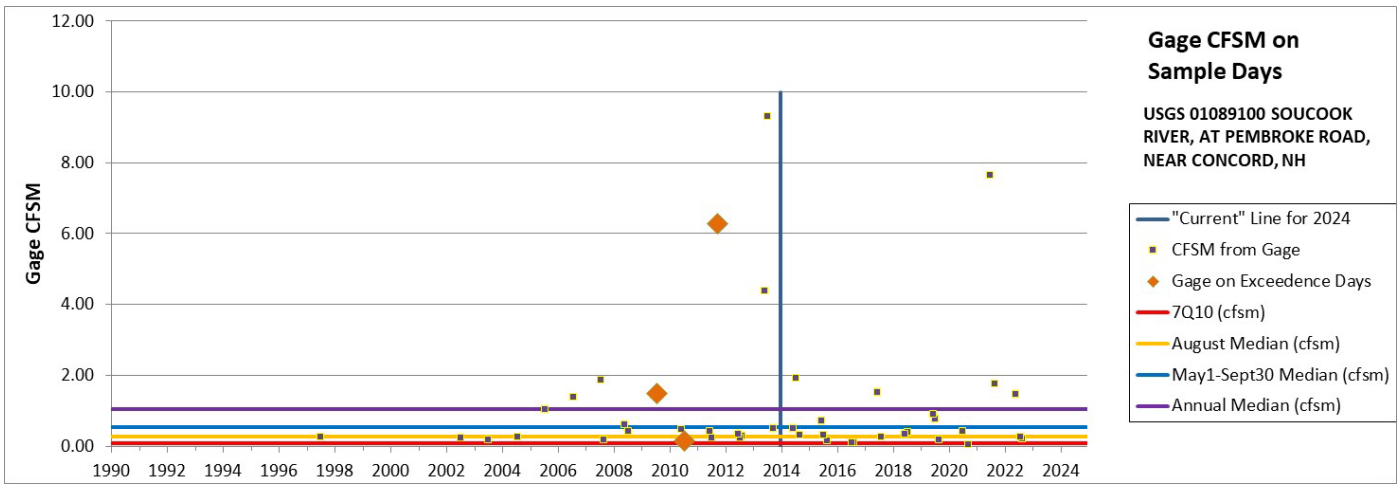


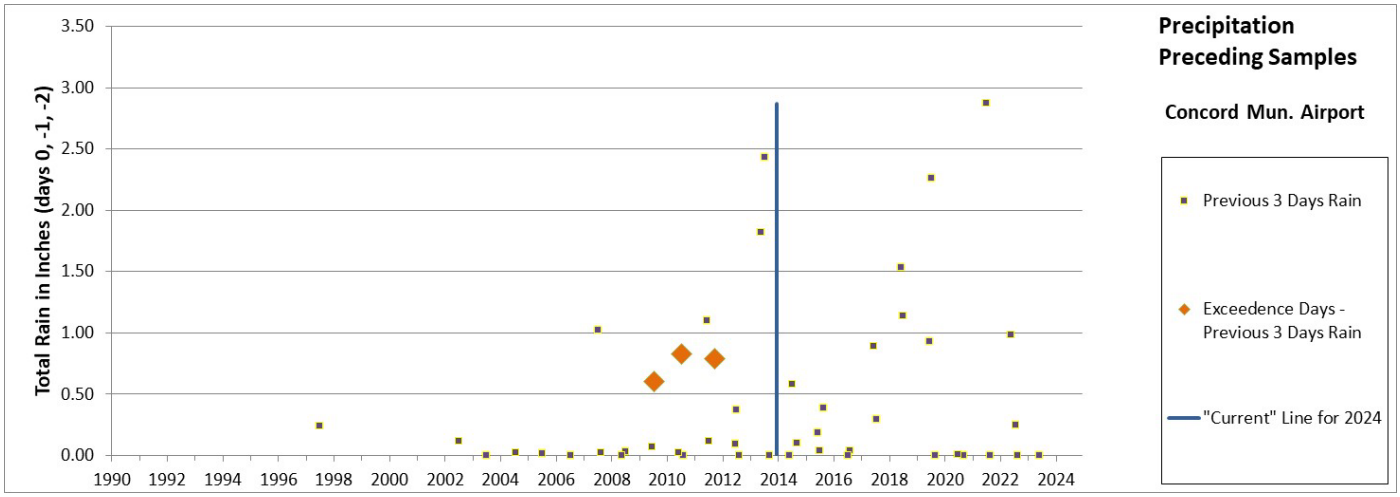
New Pond (NHLAK700060201-03)

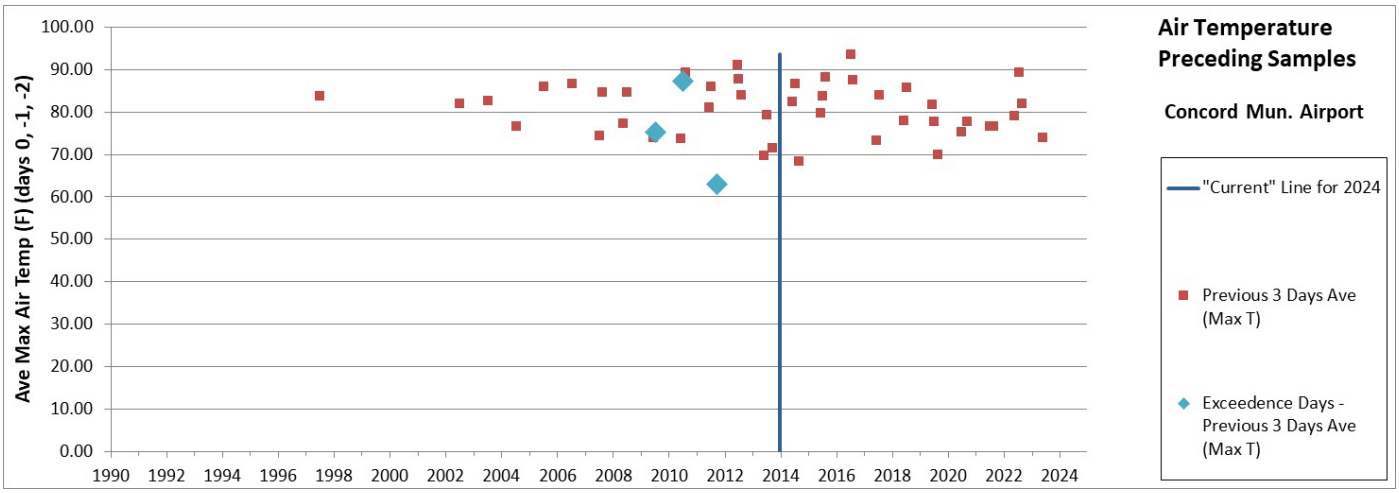
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
New Pond	NHLAK700060201-03	Chlorophyll-a	Canterbury, Northfield	5-P	2-G

New Pond (NHLAK700060201-03) has had no exceedances for chlorophyll-a for primary contact recreation for the past 10 years (n=23). Past exceedances were marginal or occurred during the non-critical period (September to May), with the exception of one sample collected when flow conditions were above the annual median. The current results are representative of a flow and rainfall conditions similar to those that triggered the initial impairment decisions (3-day rainfall totals > 0.5 inches and flows both above and below the annual median. Recommend continued monitoring through VLAP at the deep site (NEWCTND). New Pond (NHLAK700060201-03) has been moved from 5-P to 2-G for chlorophyll-a for the primary contact recreation (i.e. swimming) designated use based on data collected in the current assessment period.

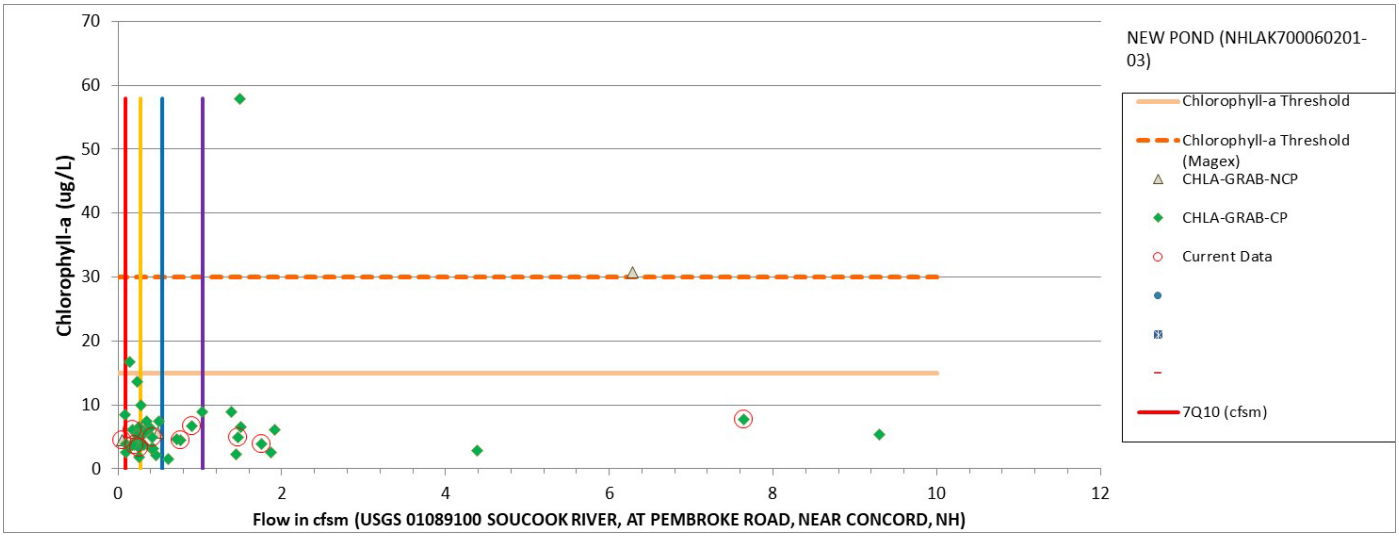

Chlorophyll-a (ug/L)
NEW POND
(NHLAK700060201-03)
"Current" Line for 2024
Chlorophyll-a Threshold
Chlorophyll-a Threshold (Magex)
CHLA-GRAB-NCP
CHLA-GRAB-CP

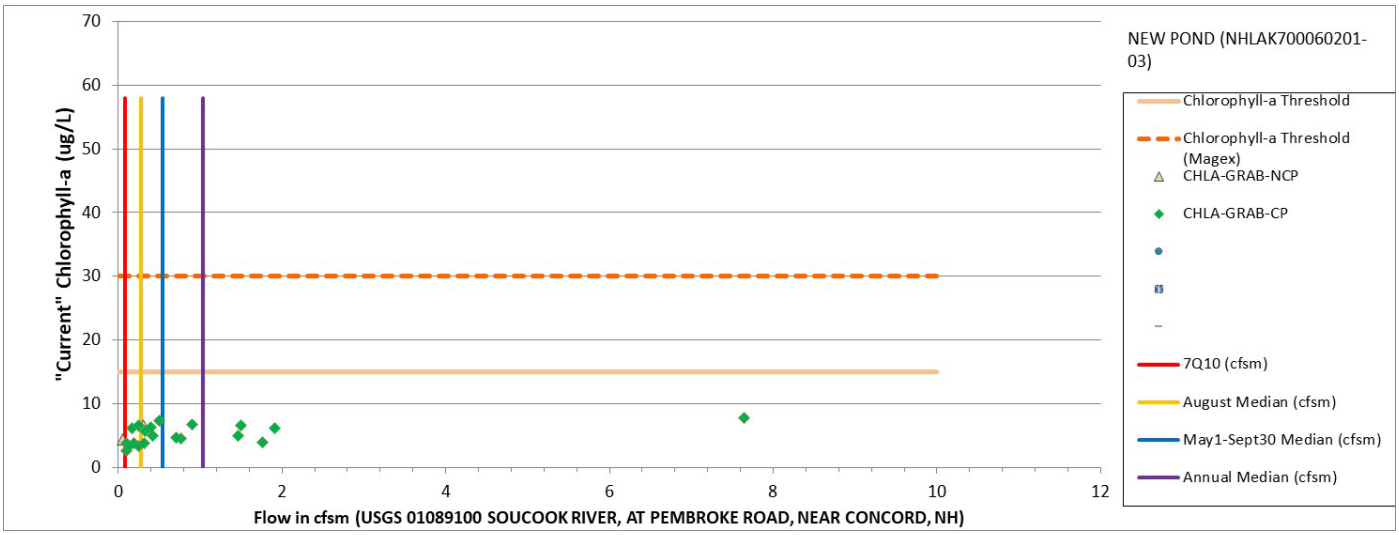

Gage CFSM
Gage CFSM on Sample Days
USGS 01089100 SOUCOOK RIVER, AT PEMBROKE ROAD, NEAR CONCORD, NH
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Total Rain in Inches (days 0, -1, -2)
Precipitation Preceding Samples
Concord Mun. Airport
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024


Air Temperature Preceding Samples
Concord Mun. Airport
Ave Max Air Temp (F) (days 0, -1, -2)
"Current" Line for 2024
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)


Weather Preceding Samples
Concord Mun. Airport
Total Rain in Inches (days 0, -1, -2)
Ave Max Temperature F (days 0, -1, -2)
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)

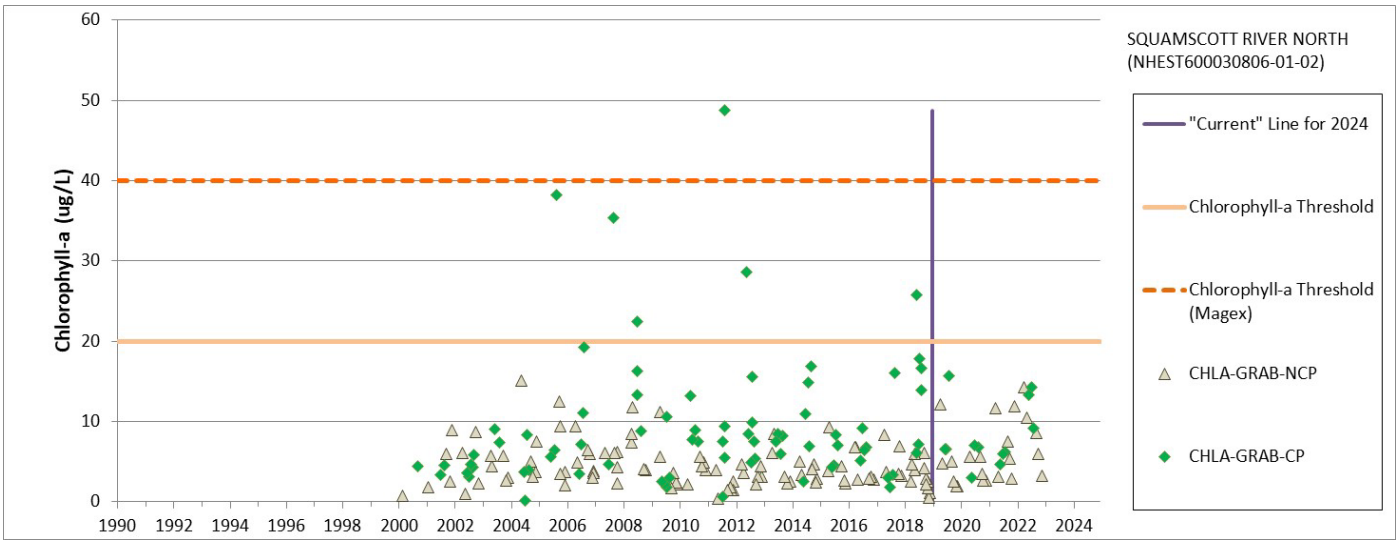

NEW POND (NHLAK700060201-03)
Chlorophyll-a (ug/L)
Flow in cfsm (USGS 01089100 SOUCOOK RIVER, AT PEMBROKE ROAD, NEAR CONCORD, NH)
Chlorophyll-a Threshold
Chlorophyll-a Threshold (Magex)
CHLA-GRAB-NCP
CHLA-GRAB-CP
Current Data
7Q10 (cfsm)

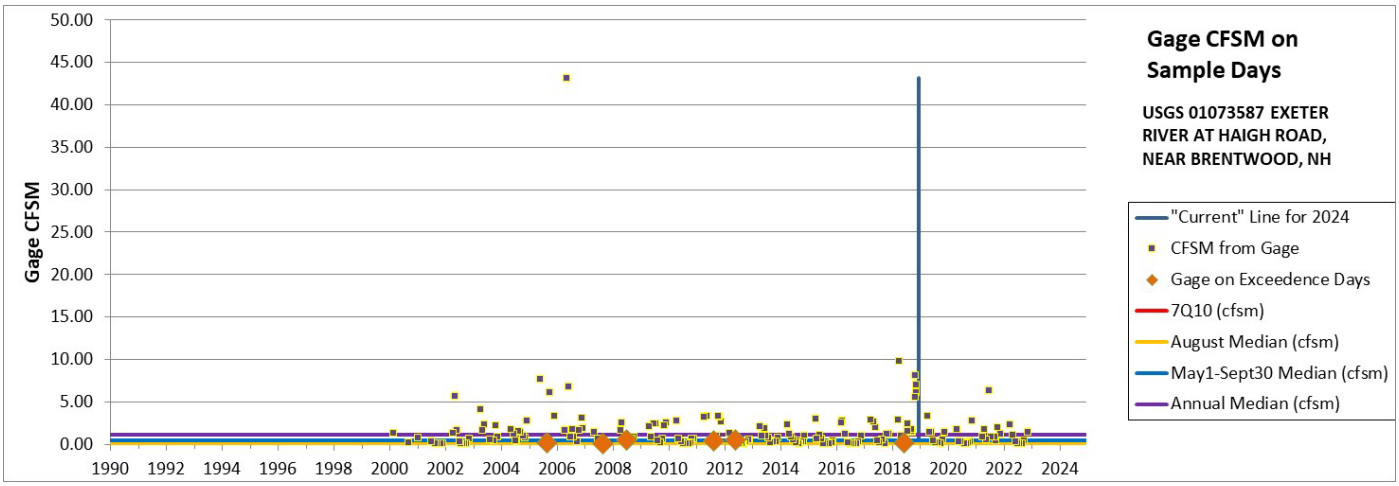


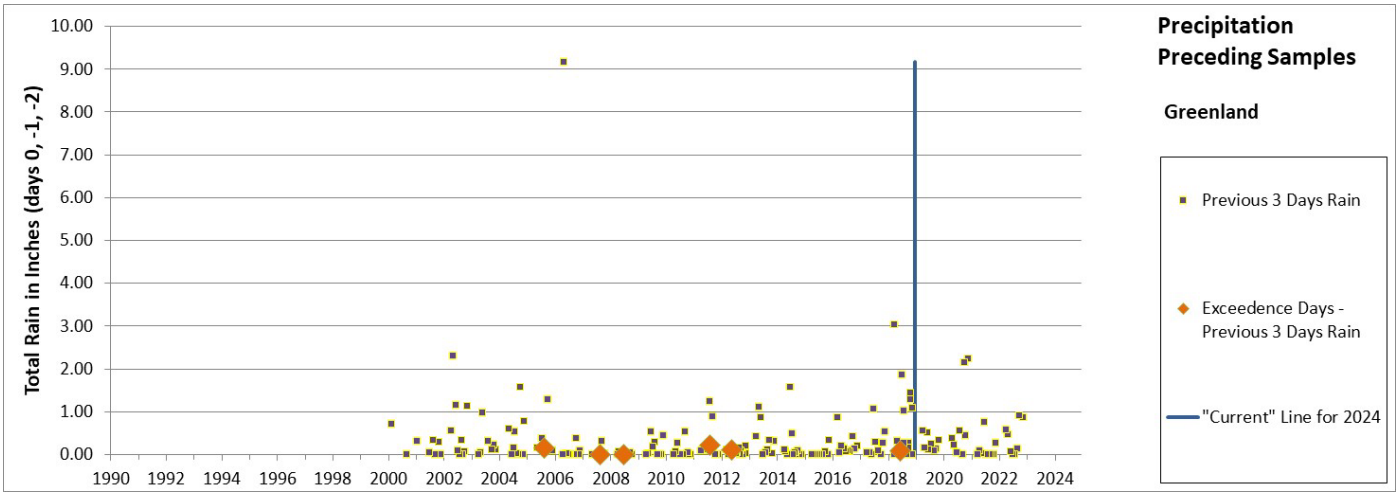
Squamscott River North (NHEST600030806-01-02)

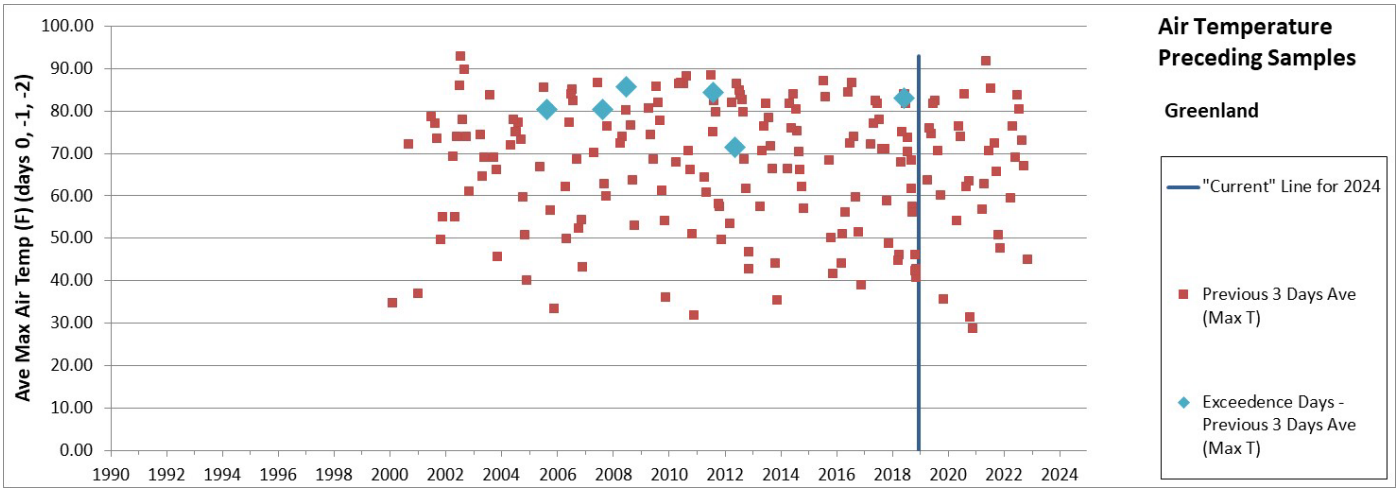
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Squamscott River North	NHEST600030806-01-02	Chlorophyll-a	STRATHAM, NEWFIELDS	5-M	2-G

Since 1990 there have been 87 samples collected during the critical period between May and September, with six exceedances (7%). The last exceedance occurring in 2018. There have been no exceedance results from the 126 samples obtained outside of the critical period since 1990. For the current period (2019-2024) there have been no exceedances for chlorophyll-a from the samples collected within or outside of the critical period (n=34). All of the samples collected in the current period were collected from the same stations (GRBSQ & GBRCL) as those that triggered the original impairment decisions. Similarly, the samples were collected under similar meteorological and hydrological conditions. Squamscott River North (NHEST600030806-01-02) has been moved from 5-M to 2-G for chlorophyll-a for the primary contact recreation (i.e. swimming) designated use based on data collected in the current assessment period.

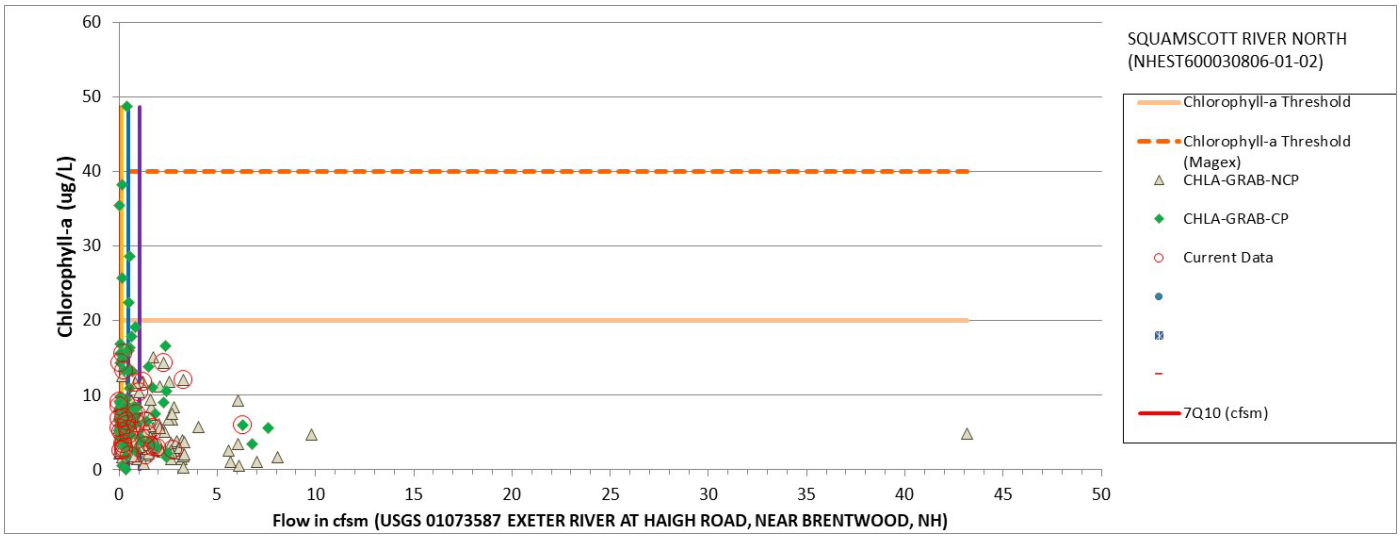


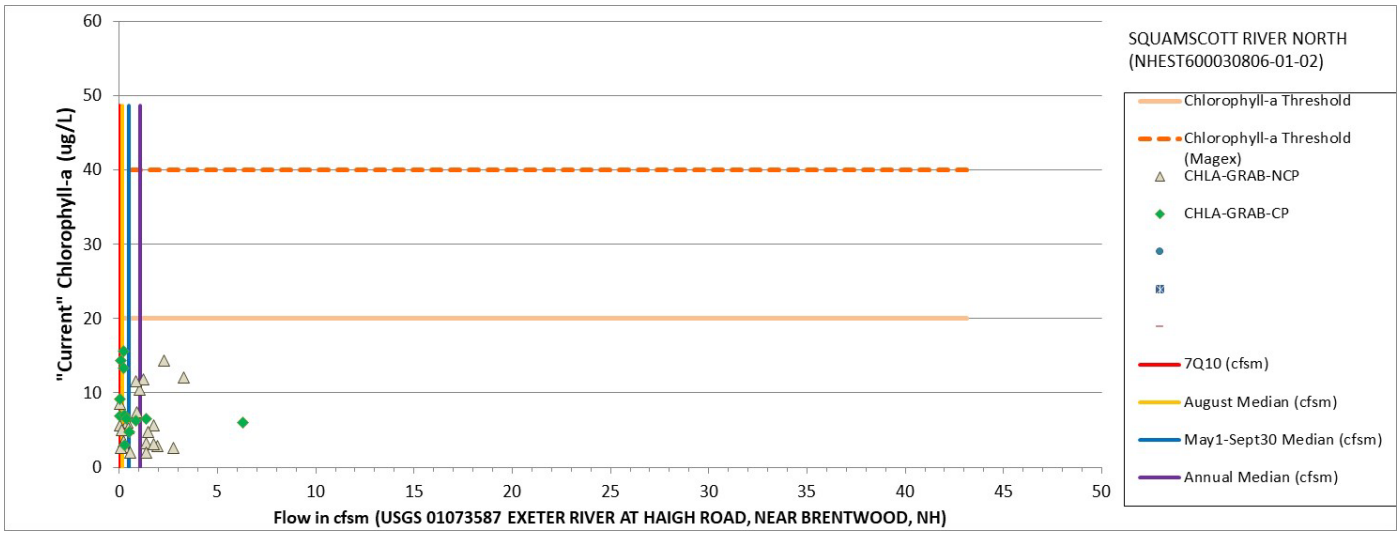

Gage CFSM
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Gage CFSM on Sample Days
USGS 01073587 EXETER RIVER AT HAIGH ROAD, NEAR BRENTWOOD, NH
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Total Rain in Inches (days 0, -1, -2)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Precipitation Preceding Samples
Greenland
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024


Ave Max Air Temp (F) (days 0, -1, -2)
100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Air Temperature Preceding Samples
Greenland
"Current" Line for 2024
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)


Weather Preceding Samples
Greenland
Total Rain in Inches (days 0, -1, -2)
Ave Max Temperature F (days 0, -1, -2)
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)


SQUAMSCOTT RIVER NORTH (NHEST600030806-01-02)
Chlorophyll-a (ug/L)
Flow in cfsm (USGS 01073587 EXETER RIVER AT HAIGH ROAD, NEAR BRENTWOOD, NH)
Chlorophyll-a Threshold
Chlorophyll-a Threshold (Magex)
CHLA-GRAB-NCP
CHLA-GRAB-CP
Current Data
7Q10 (cfsm)


SQUAMSCOTT RIVER NORTH (NHEST600030806-01-02)
"Current" Chlorophyll-a (ug/L)
Flow in cfsm (USGS 01073587 EXETER RIVER AT HAIGH ROAD, NEAR BRENTWOOD, NH)
Chlorophyll-a Threshold
Chlorophyll-a Threshold (Magex)
CHLA-GRAB-NCP
CHLA-GRAB-CP
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)

Macroinvertebrates for Aquatic Life Integrity

Nesenkeag Brook (NHRIV700061002-05)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Nesenkeag Brook	NHRIV700061002-05	Benthic-Macroinvertebrate Bioassessments (Streams)	LITCHFIELD, LONDONDERRY	5-M	3-ND

Nesenkeag Brook (NHRIV700061002-05) was first impaired (category 5-M) for benthic-macroinvertebrate bioassessments (streams) for the aquatic life integrity designated use as part of the 2006 cycle. While reviewing data for the 2024 cycle it was discovered that Nesenkeag Brook (NHRIV700061002-05) was mistakenly impaired. The two samples that were collected in 2000 and 2005 were collected at station 00M-17 (aka 01-NEG), which is actually on Nesenkeag Brook - Unnamed Brook (NHRIV700061002-06), not Nesenkeag Brook (NHRIV700061002-05). Furthermore, the B-IBI scores for the two samples were 53.2 and 52.7. B-IBI scores greater than 53.1 indicate the invertebrate community meets or exceeds the narrative aquatic life use water quality criteria. Because these B-IBI scores were so close to the threshold, and one was above and one was below, the waterbody should have been place in category 3 (insufficient information) until additional data could be collected. Because the data indicates that the impairment category was mistakenly assigned, in addition to it being attributed to the wrong waterbody, the impairment will go away and not be moved to Nesenkeag Brook - Unnamed Brook (NHRIV700061002-06). Nesenkeag Brook (NHRIV700061002-05) has been changed from 5-M to 3-ND for benthic-macroinvertebrate bioassessments (streams) for the aquatic life integrity designated use based on the data reviewed during this assessment cycle.

STATE OF NEW HAMPSHIRE

Technical Support Document for the Great Bay Estuary Aquatic Life Integrity Designated Use Assessments, 2024 305(b) Report/303(d) List

December 18, 2024

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Technical Support Document for the Great Bay Estuary Aquatic Life Integrity Designated Use Assessments, 2024 305(b) Report/303(d) List

STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
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December 18, 2024

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Introduction

The Federal Water Pollution Control Act [PL92-500, commonly called the Clean Water Act (CWA)], as last reauthorized by the Water Quality Act of 1987, requires each state to submit two surface water quality documents to the U.S. Environmental Protection Agency (USEPA) every two years. Section 305(b) of the CWA requires submittal of a report (commonly called the "305(b) Report") that describes the quality of its surface waters and an analysis of the extent to which all such waters provide for the protection and propagation of a balanced population of shellfish, fish and wildlife, and allow recreational activities in and on the water. The second document, typically called the "303(d) List," which is required by Section 303(d) of the CWA, includes surface waters that are:

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

In accordance with these requirements, the New Hampshire Department of Environmental Services (NHDES) assesses all available data for freshwaters and marine waters every two years to determine compliance with the Surface Water Quality Regulations, Env-Wq 1700 *et sq*. The assessments determine whether or not water quality supports specific designated uses. Designated uses are the desirable uses that surface waters should support such as swimming (i.e., Primary Contact Recreation) and Aquatic Life use. The full list of designated uses considered by NHDES is:

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

The Great Bay estuary constitutes approximately 86% (by area) of all New Hampshire estuaries. The Great Bay estuary is a valuable resource to the State and nation, and, as such, has been designated by USEPA as an "estuary of national significance" under Section 320 of the CWA. The 2013 State of the Estuaries Report (SOOE) for the estuary (PREP, State of Our Estuaries, 2013) showed that the Great Bay estuary has all the classic signs of eutrophication: increasing nitrogen concentrations, low dissolved oxygen and disappearing eelgrass habitat. The 2018 report (PREP, 2018) that followed found that the estuaries are declining due to stress from human activities as well as natural processes influenced by

human activities. These symptoms of eutrophication have the potential to impair the Aquatic Life Integrity designated use, which would be a violation of the State water quality standards for nutrients (Env-Wq 1703.14) and biological and aquatic community integrity (Env-Wq 1703.19):

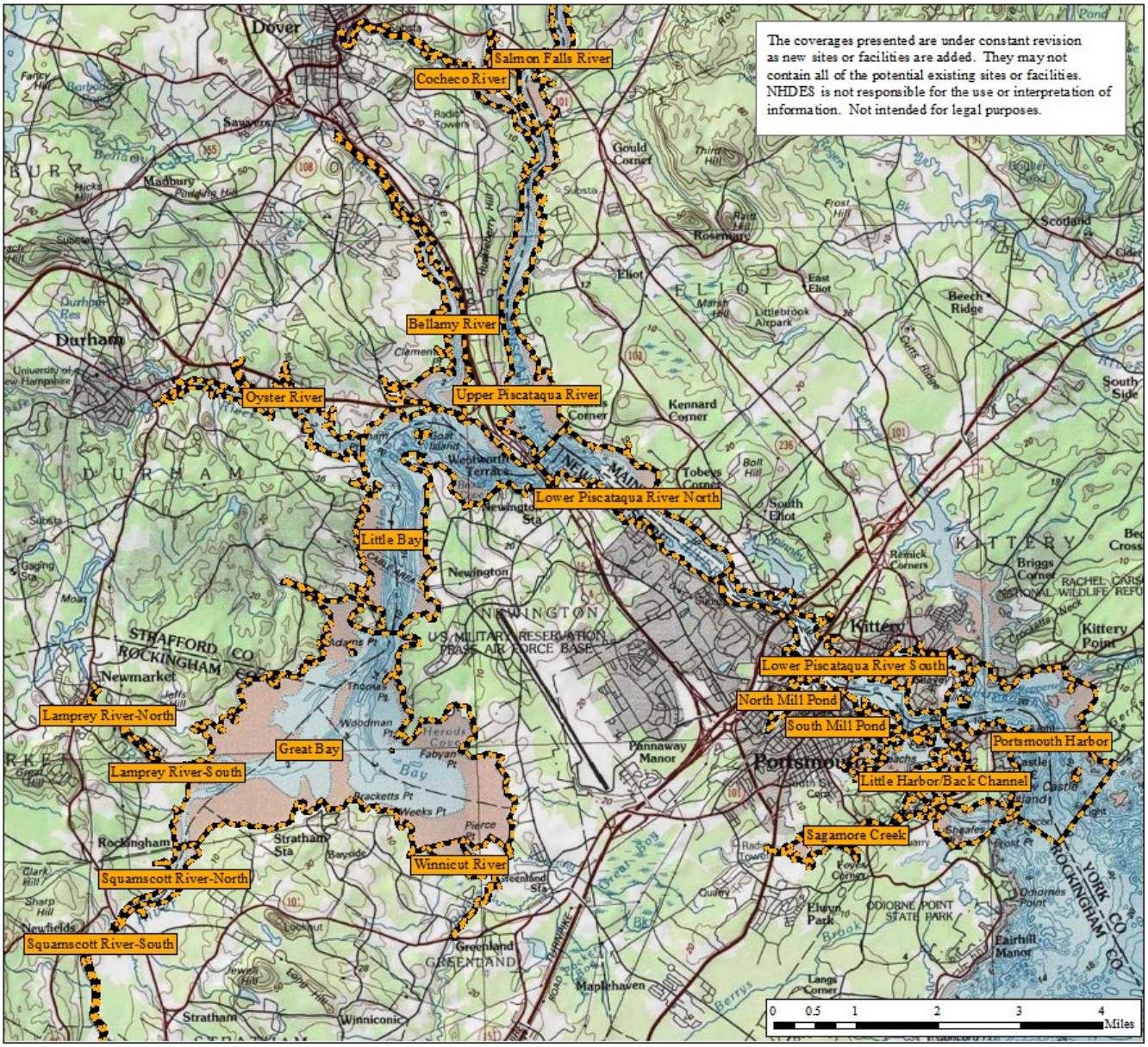
> Env-Wq 1703.14
>
> (b) Class B waters shall contain no phosphorus or nitrogen in such concentrations that would impair any existing or designated uses, unless naturally occurring.
>
> Env-Wq 1703.19
>
> (a) The surface waters shall support and maintain a balanced, integrated and adaptive community of organisms having a species composition, diversity and functional organization comparable to that of similar natural habitats of a region.
>
> (b) Differences from naturally occurring conditions shall be limited to non-detrimental differences in community structure and function.

Given the complexity of the Great Bay estuary and the inherent challenges in assessing it, this technical support document (TSD) is meant to provide additional information about how the water quality status of each of the 19-assessment zones was determined. Specifically, this document addresses the water quality data used to determine if the estuary meets the Aquatic Life designated use.

Estuary Assessment Zones

For 305(b)/303(d) assessments, NHDES uses 43 assessment units to cover the Great Bay estuary that are coincident with the shellfish growing areas established by the NHDES Shellfish Program. Great Bay itself consists of seven different assessment units. Nitrogen and eutrophication parameters are logically evaluated utilizing data from larger aggregates of assessment units covering contiguous areas. Eutrophication effects are less localized than the bacteria pollution sources that affect shellfish harvesting. Therefore, NHDES aggregated the 43 assessment units in the Great Bay estuary into 19 assessment zones. The boundaries of each of the aggregated assessment zones are shown in Figure 1. For the purposes of 305(b)/303(d) reporting, the categories assigned to these larger assessment zones will be assigned to each of the assessment units comprising the assessment zone. For the Salmon Falls/Piscataqua River, the assessment zones cover both the New Hampshire and Maine sides of the main stem of the river in order to select data from both sides of the river. The river is well-mixed and data from both sides of the State-line are needed to provide a comprehensive dataset for assessments. However, the impairment determinations made by NHDES only apply to the New Hampshire side of the river. The Maine Department of Environmental Protection makes its own assessment determinations for the Maine side of the Salmon Falls/Piscataqua River. No changes have been made to the composition or locations of assessment zones between the 2020/2022 and 2024 reporting cycles.

Figure 1. Great Bay estuary assessment zones for the 2024 305(b)/303(d) aquatic life integrity designated use assessments.



Eelgrass Mapping

From 1996 through 2015, the University of New Hampshire's (UNH) Jackson Estuarine Laboratory (Dr. Fred Short) mapped eelgrass using low-altitude, oblique aerial photographs (eg. (Short, 2016)). In 2013, 2016, 2017 and 2019, Seth Barker used high resolution vertical aerial imagery collected by Cornerstone Energy Services (formerly Kappa Mapping Inc.) to map the eelgrass extent (eg. (Barker)). The 2013 concurrent datasets were obtained as a way to evaluate each of the methodologies. Since the eelgrass was mapped in the Great Bay estuary using two different sets of aerial imagery in 2013, NHDES took an average of the eelgrass mapped by UNH and Cornerstone/Barker for assessment purposes. Eelgrass was not mapped in 2018. In 2021 and 2022 the mapping work was completed by UNH researchers; Michael Routhier, Ray Grizzle, Taylor Goddard and Krystin Ward using 10m spatial resolution European Space Agency (ESA) Sentinel satellite imagery and 2-6cm spatial resolution low-altitude drone imagery (eg.

(Routhier, Grizzle, Goddard, & Ward, 2023)). As eelgrass was not mapped in 2020, the 2019, 2021 and 2022 datasets were used to calculate the recent 3-year median for historic acreage comparisons.

Water Quality Data

The NHDES Environmental Monitoring Database (EMD) is a publicly accessible database containing field observations, measurements and laboratory samples for various public, private and volunteer programs. It was developed in March 2003 and became available on the web in June 2004. Data sets are continuously being added and updated. Datasets from the EMD are the foundation of the water quality assessments. The procedures below describe the processes that were undertaken to compile and synthesize the comprehensive dataset from the EMD for the Aquatic Life designated use assessment of the Great Bay estuary described in this document.

1. The base dataset that is considered "current" data for the 2024 assessments are the measurements collected on or after January 1, 2018, that were incorporated in the NHDES EMD by April 13, 2023. For nutrients and most estuarine samples this generally meant data collected through the end of 2022. To enhance the ability to look across cycles and into more historic data the Supplemental Assessment Database (SADB) minimum date age was set to January 1, 1990.
2. The data were pulled from the EMD into the SADB by an automated query. Some of the conditions on the query were:
    a. Results marked as invalid were carried forward but marked as not to be used in the final summaries.
    b. Results marked as Below Detection Limits (BDL) were assigned a value of one-half the Method Detection Limit (MDL). There are two limited cases of high detection limits where this was not followed as to not introduce bias; 1) where ammonia samples were BDL and the MDL was greater than or equal to 200 µg/L, and 2) where total Kjeldahl nitrogen samples were BDL and the MDL was greater than or equal to 500 µg/L. [Also note: Regarding BDLs, in the nutrient criteria report, NHDES used the MDL for BDLs. In the bulk query, the adjusted value is reported as 1/2 the MDL. The Piscataqua Regional Estuaries Partnership (PREP) has used 1/2 MDL for BDLs for trends in "modern" datasets. Therefore, for the 2024 assessments, NHDES will apply the 1/2 MDL approach for consistency across datasets.]
    c. Quality assurance samples were excluded. This condition removed field duplicate samples. [Note: QA samples: In the nutrient criteria report, NHDES averaged field duplicate results. In the bulk data pull for the 305(b)/303(d) assessment, field duplicates were excluded to have consistency between eutrophication assessment methods and other NHDES assessments methods. PREP had included replicates in the past but as of 2014 the Technical Advisory Committee decided to not include QA samples to be consistent across datasets. Therefore, since the 2012 assessments, NHDES has excluded QA replicate samples for consistency.]

Assessment Zone Data Summaries

Plot Legend and Summary Table Abbreviations

In the assessment zone summaries that follow, all available data from January 1, 2000, to April 13, 2023, are displayed in the data plots for context (except eelgrass cover which is plotted back to 1990 along with all available light attenuation data). Summary statistics in the data tables cover the period from January 1, 2018, to April 13, 2023. For nutrients and most estuarine samples this generally meant data

collected through December 2022. The legend for a given attribute only contains text for those parameters that have data available since the year 2000. The full comparison codes for the samples are predominantly those from the SADB and were used within the legend of the graphs and tables for brevity. The descriptions for those codes are provided below. For total nitrogen, total suspended solids and light attenuation coefficient, in cases where multiple samples were collected on a single day from a given station, those samples were averaged for the day for use in the plots and data tables. For chlorophyll-a, the highest concentration for a day is used.

- Chlorophyll-a.
    - CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN - The majority of the chlorophyll-a in the marine environment has been processed with the correction for pheophytin.
    - CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN – In a few cases samples the chlorophyll-a in the marine environment has been processed without the correction for pheophytin.
    - CHLOROPHYLL A, combined – In those cases where both corrected and uncorrected chlorophyll-a have been collected, the statistics for the combined measurements are provided.
    - Annual 90th Percentile (n>=5) – Plots only.
- Dissolved Oxygen Concentration.
    - DO-PPM-24HR-MIN-CP = 24-hour minimum dissolved oxygen concentration from a datalogger deployed during the summer critical period.
    - DO-PPM-24HR-MIN-NCP = 24-hour minimum dissolved oxygen concentration from a datalogger not deployed during the summer critical period.
    - DO-PPM-GRAB-CP = Grab samples of dissolved oxygen concentration during the summer critical period.
    - DO-PPM-GRAB-NCP = Grab samples of dissolved oxygen concentration during the summer critical period.
- Dissolved Oxygen Percent Saturation.
    - DO-PERC-24H-MEAN-CP = 24-hour average dissolved oxygen percent saturation from a datalogger deployed during the summer critical period.
    - DO-PERC-24H-MEAN-NCP = 24-hour average dissolved oxygen percent saturation from a datalogger not deployed during the summer critical period.
    - DO-PERC-2TIDE-GRAB-CP = The average to two grab samples for dissolved oxygen percent saturation, one at high tide and one at low tide of a single day, during the summer critical period.
    - DO-PERC-2TIDE-GRAB-NCP = The average to two grab samples for dissolved oxygen percent saturation, one at high tide and one at low tide of a single day, not during the summer critical period.
    - DO-PERC-GRAB (% sat) = Dissolved oxygen percent saturation grab samples not used in a high tide-low tide average.
- Total Suspended Solids (TSS).

  - TSS – Total Suspended Solids.
  - Annual Median (n>=5) – Plots only.
- Light Attenuation Coefficient (Water Clarity).
  - Light Attenuation Coefficient – A measurement of the light attenuation coefficient, Kd.
  - Annual Median (n>=5) – Plots only .
- Eelgrass and Light Attenuation Coefficient (Water Clarity).
  - Eelgrass cover acres – Plots only.
  - Light Attenuation Coefficient – A measurement of the light attenuation coefficient, Kd.
  - Annual Median Light Attenuation Coefficient (n>=5) – Plots only.
- Nitrogen – Graphics within this document plot the primary measure of nitrogen within the system, total nitrogen (TN), while the tables provide the statistics for TN and individual fractions of nitrogen. In most cases, there was one sample collected at a given station per day. Where multiple samples were collected at a particular station on a single day, those samples for multiple times and/or depths were averaged and then processed as described in the sections above.
  - Day Ave of TN – Total Nitrogen.

    If multiple values of TN are available for the same date/time/station, the hierarchy is 1 over 2 over 3.

    1. If total dissolved nitrogen and particulate nitrogen were measured, sum these two values.
    2. If TN was measured directly, use that value.
    3. If total Kjeldahl nitrogen and nitrate+nitrite were measured, sum these two values.
  - Annual Median (n>=5) – Plots only.
  - Annual Median (n<5) – Plots only.
  - Day Ave of TDN – Total Dissolved Nitrogen.
  - Day Ave of DIN (NH3 + NO2/3) – Dissolved Inorganic Nitrogen.
  - Day Ave of NH3 – Ammonia.
  - Day Ave of PON – Particulate Organic Nitrogen.
  - Day Ave of NO2/3 – Nitrite+Nitrate.
- Turbidity (data tables only) – While both grab samples and datalogger records exist for turbidity, daily statistics make up 98% of the record. As such, the table provides summary statistics on the two data types (grab samples and daily medians) as a single group.
- Colored Dissolved Organic Matter (CDOM) (data tables only) – Summary statistics are provided based on the currently available CDOM data.
- Dissolved Organic Carbon (DOC) (data tables only) – Summary statistics are provided based on the currently available DOC data.
- Salinity (data tables only).
  - Grab Samples.
  - Datalogger Daily Median.
- pH (data tables only).

  - pH-grab – Grab Samples.
  - pH-24HR (min) – Datalogger Daily Minimums.
  - pH-24HR (max) – Datalogger Daily Maximums.
- Water Temperature (data tables only).
  - Temperature – Grab Samples.
  - Temperature-Daily Median – Datalogger Daily Median.
- Plot Reference Lines.
  - "Current" Line for 2024 - Per the methodology outlined in the Consolidated assessment and Listing Methodology (CALM), all data to the right of this referenced data are considered "current." Available older data are provided for context and are needed for that historic context if newer data indicates changed conditions. See the 2024 CALM for addition details.
  - Chl-a Ind. (90^{th} percentile) – This is the reference line for the chlorophyll-a indicator. The 90^{th} percentile (10 µg/L) of the assessment zone dataset is compared to this chlorophyll-a threshold indicator described in the CALM.
  - DO mg/L Std. – This is the 5 mg/L reference line for the dissolved oxygen criteria.
  - DO mg/L Ind MAGEX – This is the 4.5 mg/L reference line for the dissolved oxygen magnitude of exceedance indicator described in the CALM.
  - DO % Sat Std. – This is the 24-hour average 75 percent reference line for the dissolved oxygen percent saturation criteria.
  - DO % Sat Ind. MAGEX – This is the 24-hour average 65% reference line for the dissolved oxygen percent saturation magnitude of exceedance indicator described in the CALM.
  - Survival Min. Ind. (median) – This is the light attenuation coefficient threshold that corresponds to the minimum light needed for eelgrass to survive at the restoration depth set for a given assessment zone. The median of the assessment zone dataset is compared to this light attenuation coefficient threshold indicator as described in the CALM.
- Table Highlights.
  - Highlighted statistics in the data tables are provided to help the reader focus in on the most commonly pertinent statistics.

Aquatic Life Integrity Designated Use Assessment Summary Table

Comparison of the Final 2020/2022 to the 2024 assessment of eutrophication parameters for the Aquatic Life designated use in the Great Bay Estuary assessment zones. Assessment category definitions are provided in sections 3.1.3 and 3.1.5 of the 2020/2022 CALM.

De-impairment	New Impairment

Assessment Zone	Cycle	Chlorophyll-a	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat)	Estuarine Bioassessments (eelgrass)	Water Clarity (Light Attenuation Coefficient, Kd)	Total Nitrogen
Squamscott River South	2020/2022	5-P	5-P	5-P	No Std	No Std	5-P
	2024	5-P	5-P	5-P	No Std	No Std	5-P
Squamscott River North	2020/2022	5-P	5-P	5-M	5-P	5-P	5-P
	2024	5-P	5-P	5-M	5-P	5-P	5-P
Lamprey River North	2020/2022	5-M	5-P	5-P	No Std	No Std	5-M
	2024	5-M	5-P	5-P	No Std	No Std	5-M
Lamprey River South	2020/2022	5-M	3-PNS	3-PNS	5-P	5-P	5-M
	2024	5-M	5-P	5-M	5-P	5-P	5-M
Winnicut River	2020/2022	3-ND	3-ND	3-ND	5-P	3-ND	3-ND
	2024	3-ND	3-ND	3-ND	5-P	3-ND	3-ND
Great Bay	2020/2022	5-M	3-PNS	2-M	5-P	5-M	5-M
	2024	5-M	5-M	2-M	5-P	5-P	5-M
Oyster River	2020/2022	5-M	5-P	5-P	5-P	5-P	5-M
	2024	5-M	5-P	5-P	5-P	5-P	5-P
Bellamy River	2020/2022	5-M	5-P	2-M	5-P	5-P	5-P
	2024	5-M	5-P	2-M	5-P	5-P	5-P
Little Bay	2020/2022	3-PNS	2-G	2-G	5-P	5-M	3-PNS
	2024	3-PNS	5-P	2-M	5-P	5-M	3-PNS
Cocheco River	2020/2022	5-P	5-M	2-M	No Std	No Std	5-M
	2024	5-P	5-M	2-M	No Std	No Std	5-M
Salmon Falls River	2020/2022	5-P	5-P	5-M	No Std	No Std	5-P
	2024	5-P	5-P	5-M	No Std	No Std	5-P
Upper Piscataqua River	2020/2022	2-M	2-M	2-M	5-P	5-M	3-PNS
	2024	3-PNS	2-M	2-G	5-P	5-P	3-PNS
Lower Piscataqua River - North	2020/2022	3-PAS	2-G	2-G	5-P	3-ND	3-PAS
	2024	3-ND	3-ND	3-ND	5-P	3-ND	3-ND
Lower Piscataqua River - South	2020/2022	3-PAS	2-G	2-G	5-P	3-ND	3-PAS
	2024	3-ND	3-ND	3-ND	5-P	3-ND	3-ND
North Mill Pond	2020/2022	3-ND	3-ND	3-ND	3-ND	3-ND	3-ND
	2024	3-ND	3-ND	3-ND	3-ND	3-ND	3-ND
South Mill Pond	2020/2022	3-ND	3-ND	3-ND	3-PAS	3-ND	3-ND

Assessment Zone	Cycle	Chlorophyll-a	Dissolved Oxygen (mg/L)	Dissolved Oxygen (% Sat)	Estuarine Bioassessments (eelgrass)	Water Clarity (Light Attenuation Coefficient, Kd)	Total Nitrogen
	2024	3-ND	3-ND	3-ND	3-ND	3-ND	3-ND
Portsmouth Harbor	2020/2022	2-G	2-G	2-G	5-P	5-M	2-M
	2024	3-ND	3-PAS	3-PAS	5-P	5-M	3-ND
Sagamore Creek	2020/2022	5-P	5-P	2-M	5-P	3-ND	5-M
	2024	5-M	5-P	2-M	5-P	3-ND	5-M
Little Harbor/Back Channel	2020/2022	3-PAS	3-PAS	3-ND	5-P	5-M	3-PAS
	2024	3-ND	3-ND	3-ND	5-M	5-M	3-ND

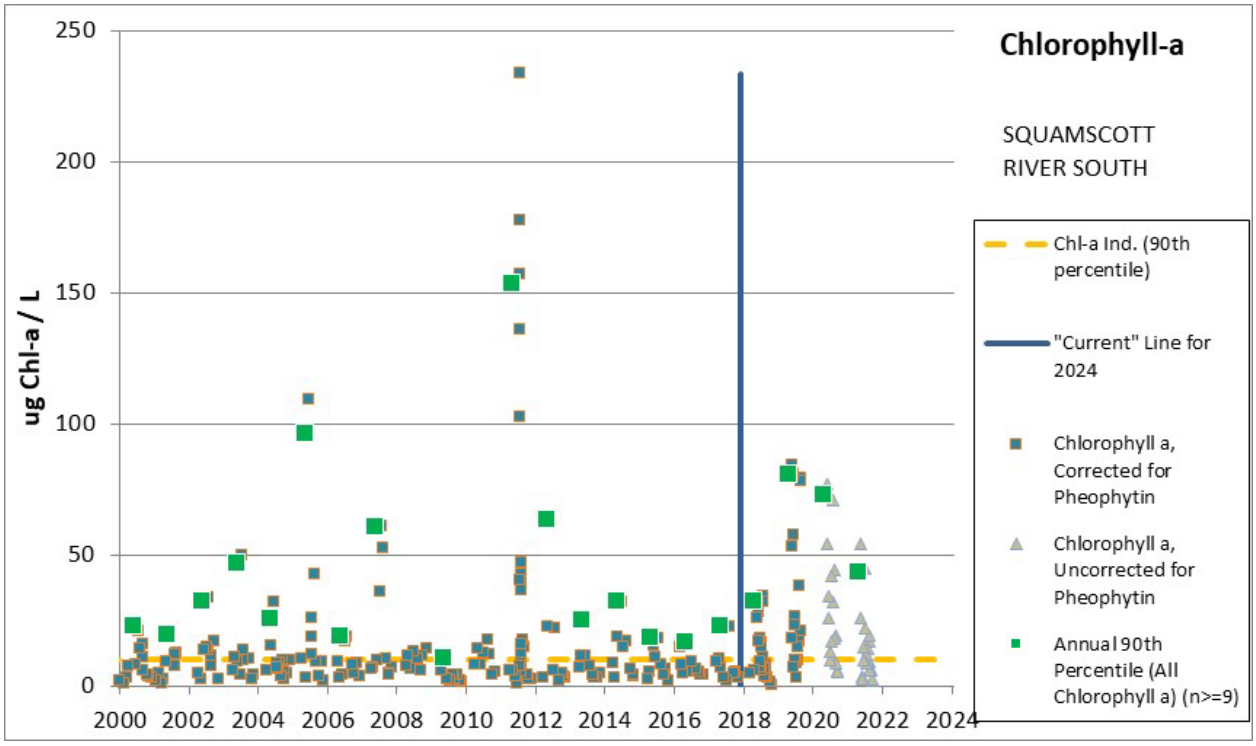
Assessment Zone = SQUAMSCOTT RIVER SOUTH

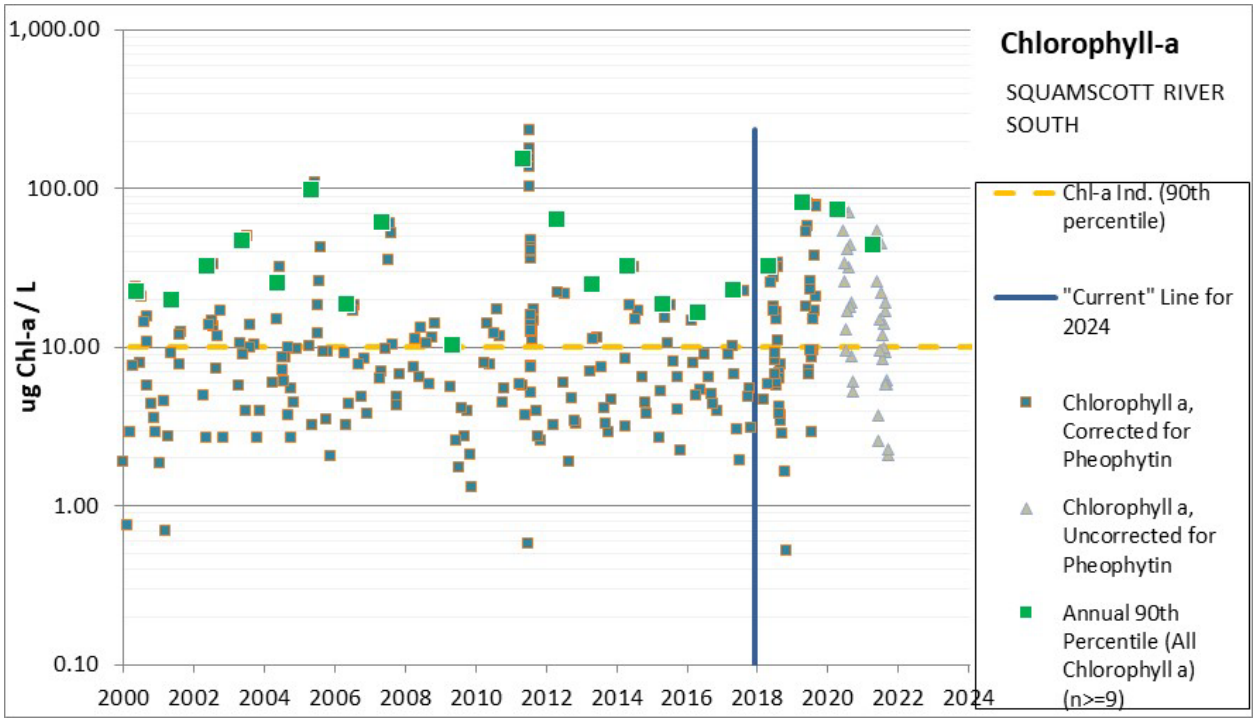
(NHEST600030806-01-01)

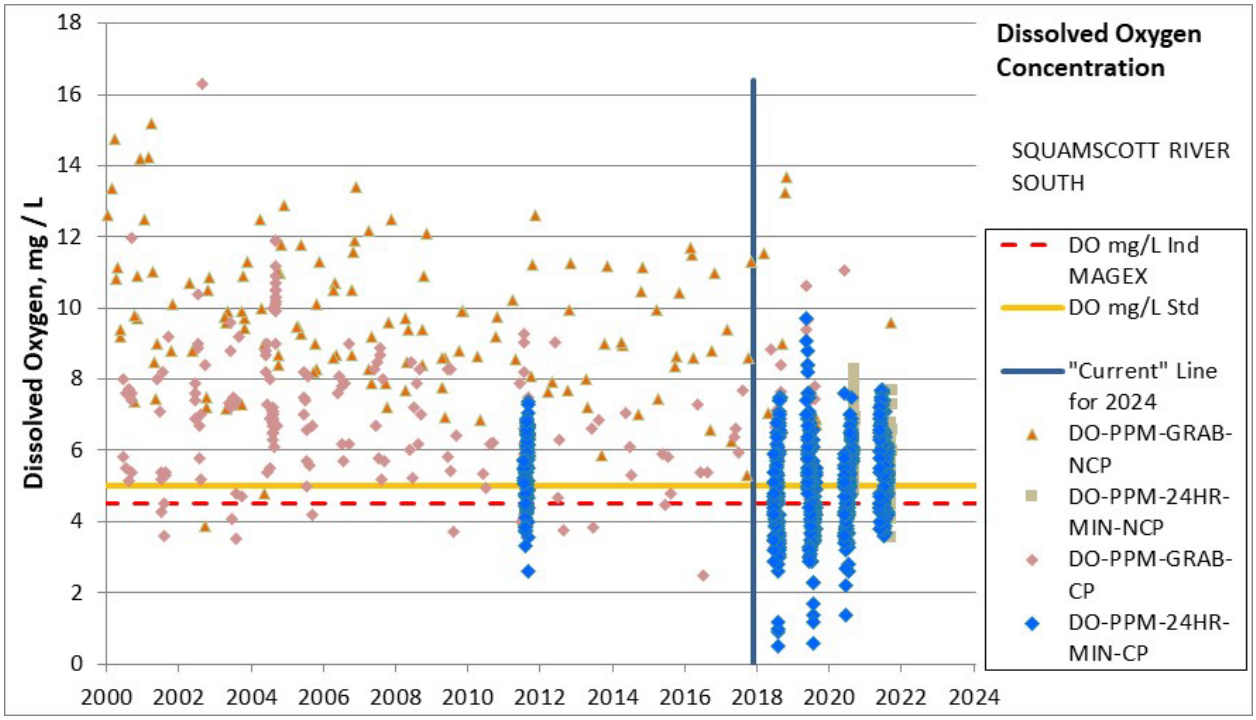
As of the date of data retrieval (April 13, 2023) water quality data for this assessment zone through October 2021 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means there are two additional years (2020, 2021) of data compared to the 2020/2022 assessment.

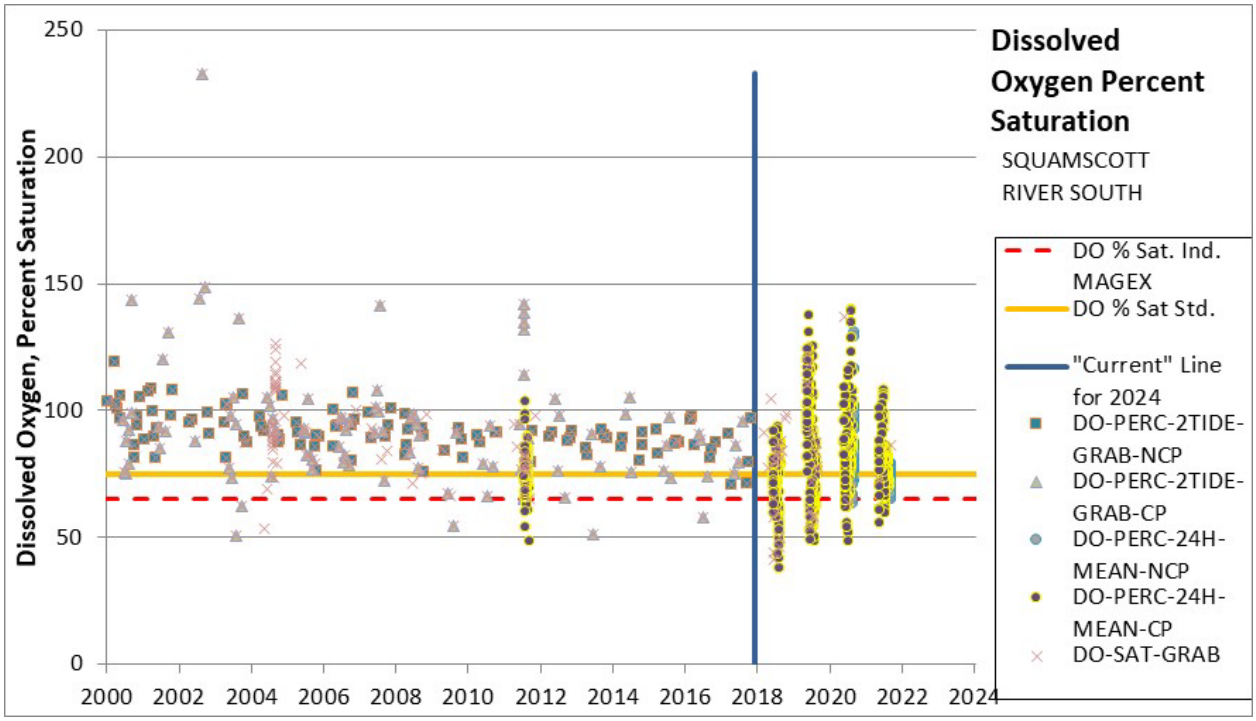
Indicator	Aquatic Life Use Category 2020/2022 / 2024	2024 Comment
Chlorophyll-a	5-P / 5-P	All of the chlorophyll-a data reported for the Squamscott River South from 2012 through 2017 had been collected at Chapmans Landing (GRBCL), the downstream boundary of the assessment zones. From 2018-2021, the GRBCL data was supplemented with data collected at three sites further upstream in proximity to the WWTF discharges. Consequentially, the annual 90th percentiles for chlorophyll-a appears to have risen after 2017 and for the 2024 assessment "current period" 90th percentile is now up to 55 µg/L (n=87). The chlorophyll-a indicator threshold to prevent low dissolved oxygen is a 90th percentile below 10 µg/L. As noted in the March 20, 2012 HydroQual report, "…such elevated algal levels probably contribute to increased sediment oxygen demand (SOD) which will contribute to lower DO when algal levels are low…" (HydroQual, March 20, 2012). The chlorophyll-a impairment has been retained.
Dissolved Oxygen (mg/L)	5-P / 5-P	All of the dissolved oxygen (DO) concentration data reported for the Squamscott River South from 2012 through 2017 had been collected at Chapmans Landing (GRBCL), the downstream boundary of the assessment zones. From 2018-2021, the GRBCL grab sample data was supplemented with datalogger deployments collected at three sites further upstream in proximity to the WWTF discharges. Excursions below 5 mg/L in from 2018-2022 were frequent, of extended durations and far below 5 mg/L. That said, the severity of the excursions appears to be diminishing. The new deployments, as well as the 2011 datalogger deployment, demonstrated that grab samples underrepresent the frequency of low dissolved oxygen conditions.
Dissolved Oxygen (% Saturation)	5-P / 5-P	All of the dissolved oxygen (DO) percent saturation data reported for the Squamscott River South from 2012 through 2017 had been collected at Chapmans Landing (GRBCL), the downstream boundary of the assessment zones. From 2018-2021, the GRBCL grab sample data was supplemented by datalogger deployments collected at three sites further upstream in proximity to the WWTF discharges. Excursions below 75 percent daily average saturation in the 2018-2021 datasets were frequent and on multiple occasions falling below a daily average of 50%. That said, the severity of the excursions appears to be diminishing. The new deployments, as well as the 2011 datalogger deployment, demonstrated that paired high-tide/low-tide grab sample percent saturation averages underrepresent the frequency of low dissolved oxygen saturation conditions.
Estuarine Bioassessments (eelgrass)	No Std / No Std	Not applicable. Eelgrass habitat has not historically existed in this assessment zone. This assessment zone was created for the 2012 cycle by splitting the Squamscott River assessment zone (assessment unit ID = NHEST600030806-01) into two pieces. The parent assessment zone was listed as impaired (5-P) for eelgrass loss on the 2010 303d list. For the 2012 list, the impairment was associated with the other child assessment zone (Squamscott River North; NHEST600030806-01-02) because eelgrass has not historically existed in this assessment zone.

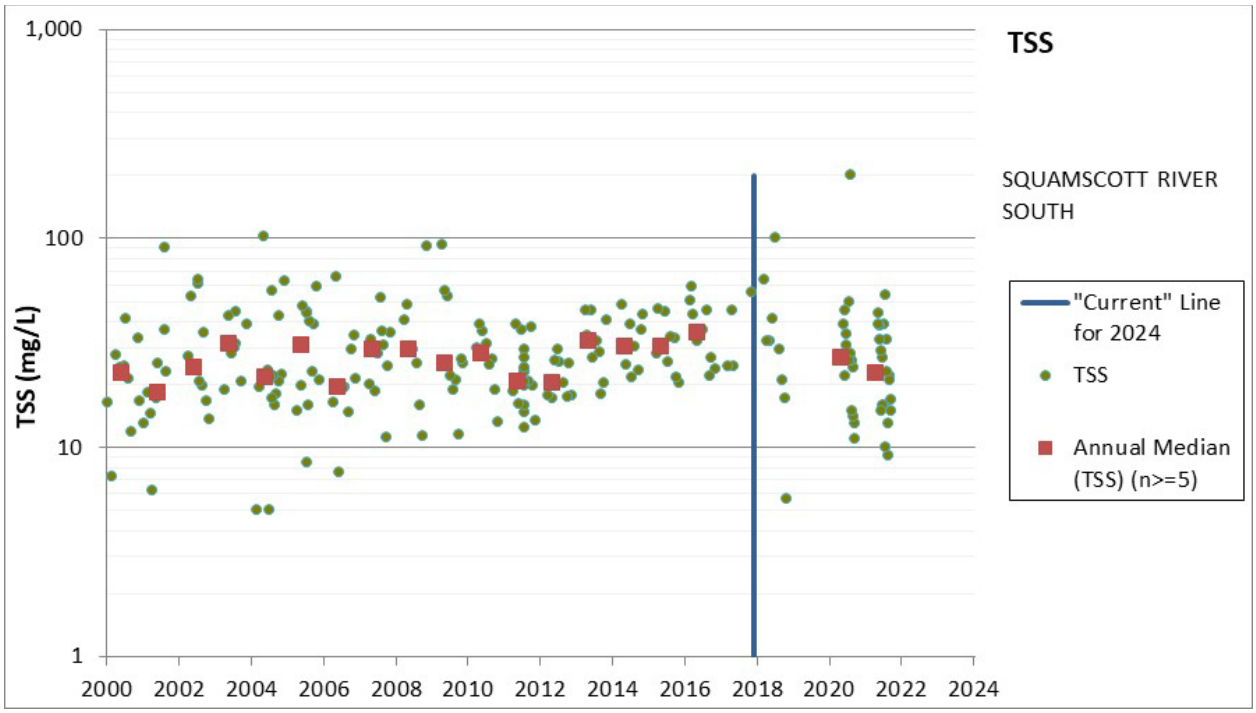
Water Clarity (Light Attenuation Coefficient)	No Std / No Std	Not applicable. This assessment unit was created for the 2012 cycle by splitting the Squamscott River assessment zone (assessment unit ID = NHEST600030806-01) into two pieces. The parent assessment zone was listed as impaired (5-P) for water clarity to protect eelgrass habitat on the 2010 303d list. The impairment was contingent upon the Estuarine Bioassessments (eelgrass) impairment and therefore not retained on this assessment zone in 2012 because eelgrass has not historically existed in this assessment zone.
Total Nitrogen	5-P / 5-P	The median total nitrogen from 2018 through 2021 was 680 µg/L (n=87), 72 ug/L lower than the 2020/2022 assessment cycle median. Further, the annual medians have been lower every year since 2017. All of the total nitrogen (TN) data used in the 2018 assessment was collected at Chapmans Landing, the downstream boundary of the assessment zone. The 2024 assessment includes data collected from 2018-2021 at three sites further upstream in closer proximity to the WWTF discharges. This expansion of sampling is reflected in the apparently higher individual TN measurements in 2018 and in part makes the 2019 measured TN not look substantially lower even though Exeter's new nitrogen removal process went on-line on June 10, 2019 and after a few weeks of initial operation was switched to the designed Bardenpho configuration (Town of Exeter, January 31, 2020). This assessment zone experiences frequent dissolved oxygen concentrations far below 5 mg/L and far below daily average percent saturation of 75%. While supersaturation still peaked above 150% in the 2021 data, those peaks have fallen in recent years. The 90th percentile for chlorophyll-a concentration was 55 ug/L (n=87) from 2018 through 2022 including one sample measured at 84 µg/L. Total nitrogen reductions began in the summer of 2019 within this assessment zone. The status of the indicators of nutrients and nutrient-related impacts has not changed and continue to present a preponderance of evidence that eutrophication effects are lingering. As such, the impairment has been retained.

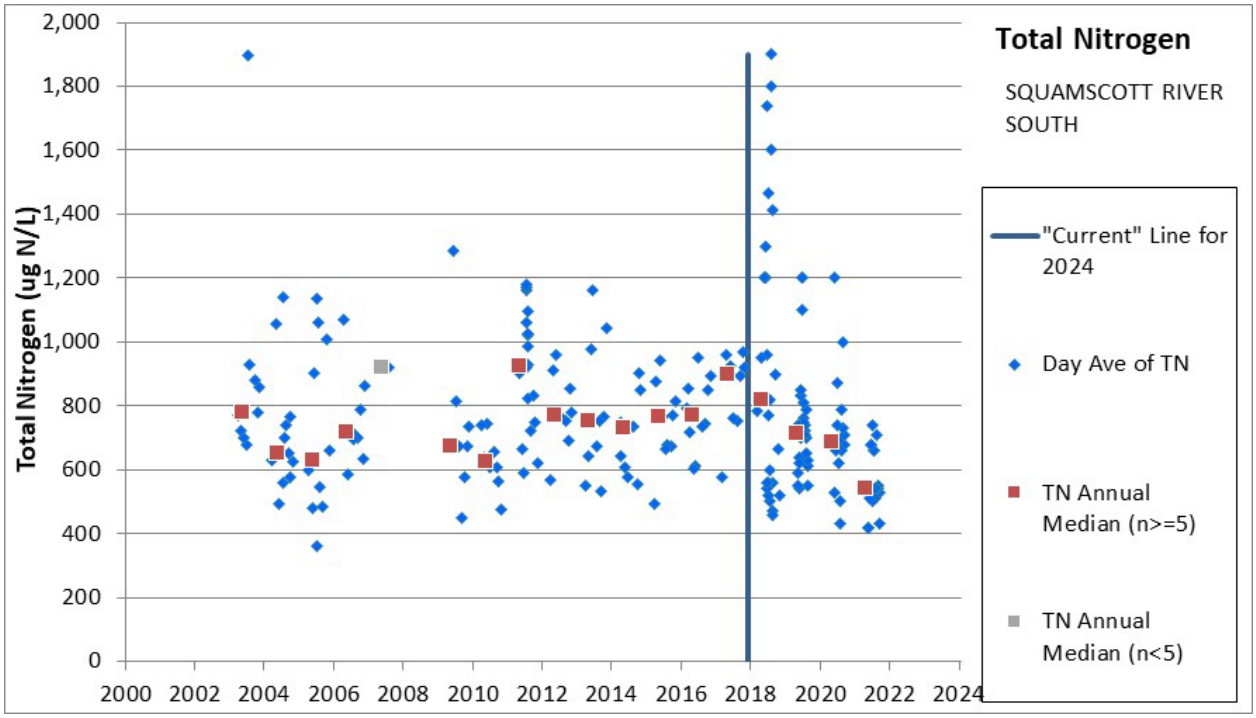



Chlorophyll-a
SQUAMSCOTT RIVER SOUTH
ug Chl-a / L
1,000.00
100.00
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)


Dissolved Oxygen Concentration
SQUAMSCOTT RIVER SOUTH
Dissolved Oxygen, mg / L
18
16
14
12
10
8
6
4
2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
SQUAMSCOTT RIVER SOUTH
Dissolved Oxygen, Percent Saturation
250
200
150
100
50
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
SQUAMSCOTT RIVER SOUTH
TSS (mg/L)
1,000
100
10
1
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)


Total Nitrogen
SQUAMSCOTT RIVER SOUTH
Total Nitrogen (ug N/L)
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)
TN Annual Median (n<5)

Squamscott River - South Assessment Zone (1/1/2018-4/13/2023)	**Date Count**	**Minimum**	**Median**	**90th Percentile**	**Maximum**
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	51	0.5	11.0	73.9	84.0
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	36	2.1	14.5	54.0	77.0
CHLOROPHYLL A, Combined (ug/L)	87	0.5	14.0	54.7	84.0
LIGHT ATTENUATION COEFFICIENT (1/m)	9	2.25	4.47	8.73	8.73
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	377	5.3	14.4	23.4	46.3
TSS (mg/L)	87	0.0	9.1	39.5	200.0
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	9	6.1	8.4	12.3	12.3
DO-PPM-24HR-MIN-CP (mg/L)	674	0.5	5.0	6.9	9.7
DO-PPM-24HR-MIN-NCP (mg/L)	95	3.6	6.1	7.5	8.3
DO-PPM-GRAB-CP (mg/L)	30	3.3	6.8	9.7	11.1
DO-PPM-GRAB-NCP (mg/L)	8	6.8	9.3	-	13.7
DO-PERC-24H-MEAN-CP (% sat)	638	37.7	80.4	103.6	139.6
DO-PERC-24H-MEAN-NCP (% sat)	89	63.5	75.6	98.2	130.8
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	38	41.2	80.5	111.0	137.1
Day Ave of TN (ug N/L)	87	420	680	1,200	1,900
Day Ave of TDN (ug N/L)	9	406	718	1,309	1,309
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	87	45	230	460	880
Day Ave of NH3 (ug N/L)	87	33	89	263	500
Day Ave of PON (ug N/L)	0	-	-	-	-
Day Ave of NO2/3 (ug N/L)	87	12	140	242	521
SALINITY-Grabs (pss)	80	0.1	4.4	16.1	23.4
SALINITY-Datalogger Daily Median (pss)	478	0.1	9.5	21.3	29.8
pH-grab	7	6.9	7.1	-	7.7
pH-24HR (min)	781	6.2	7.0	6.8*	7.8
pH-24HR (max)	781	6.6	7.7	8.2	9.1
Temperature	80	1.7	22.4	25.9	28.3
Temperature-Daily Median	781	10.6	22.8	26.8	29.3

*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

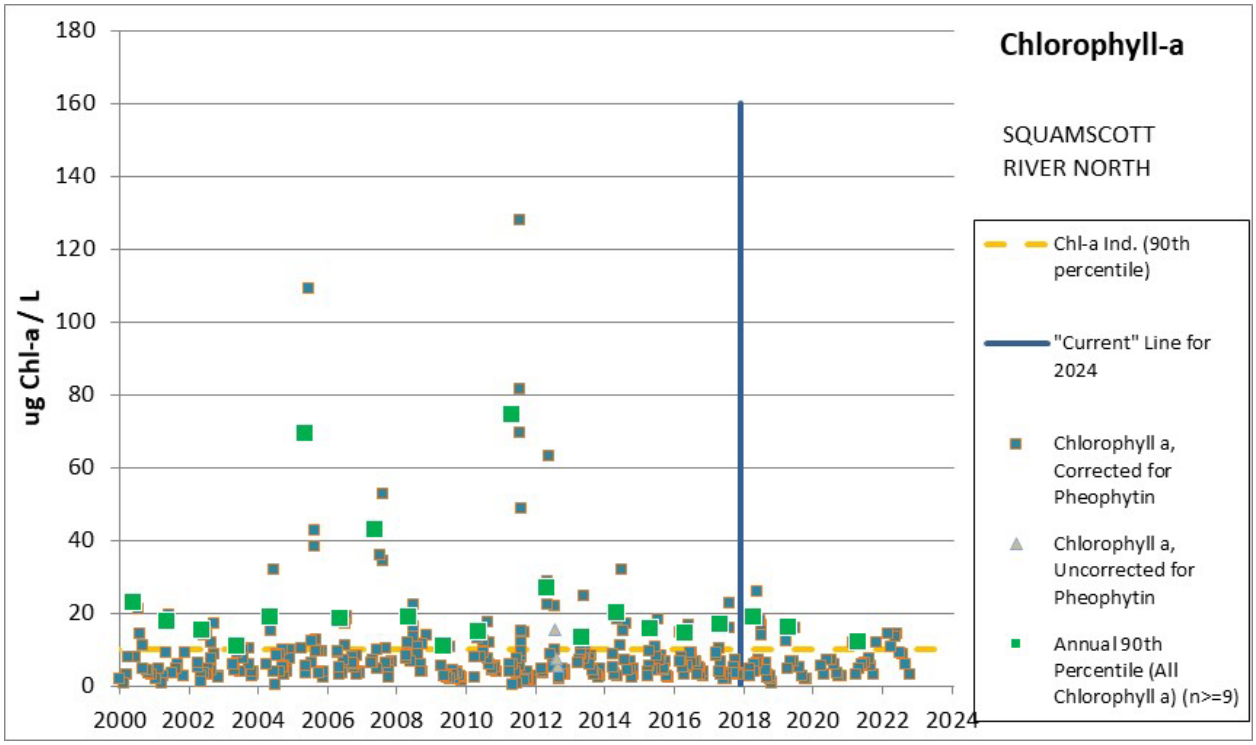
Assessment Zone = SQUAMSCOTT RIVER NORTH

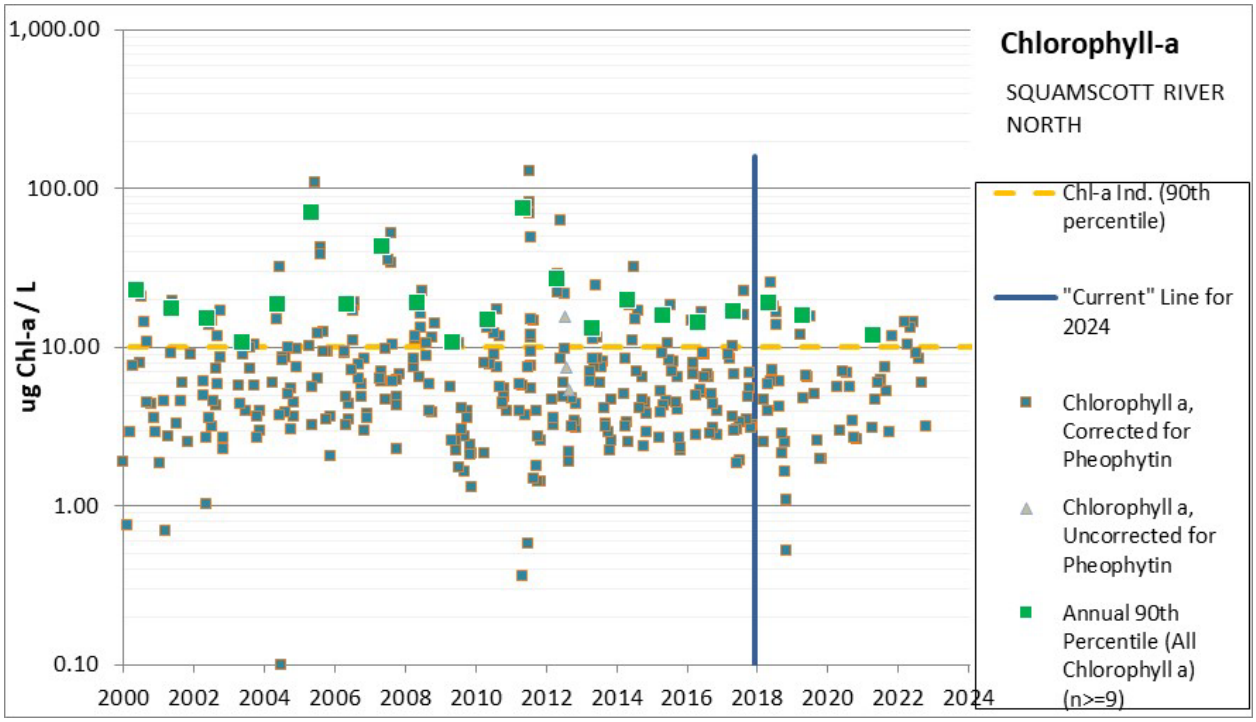
(NHEST600030806-01-02)

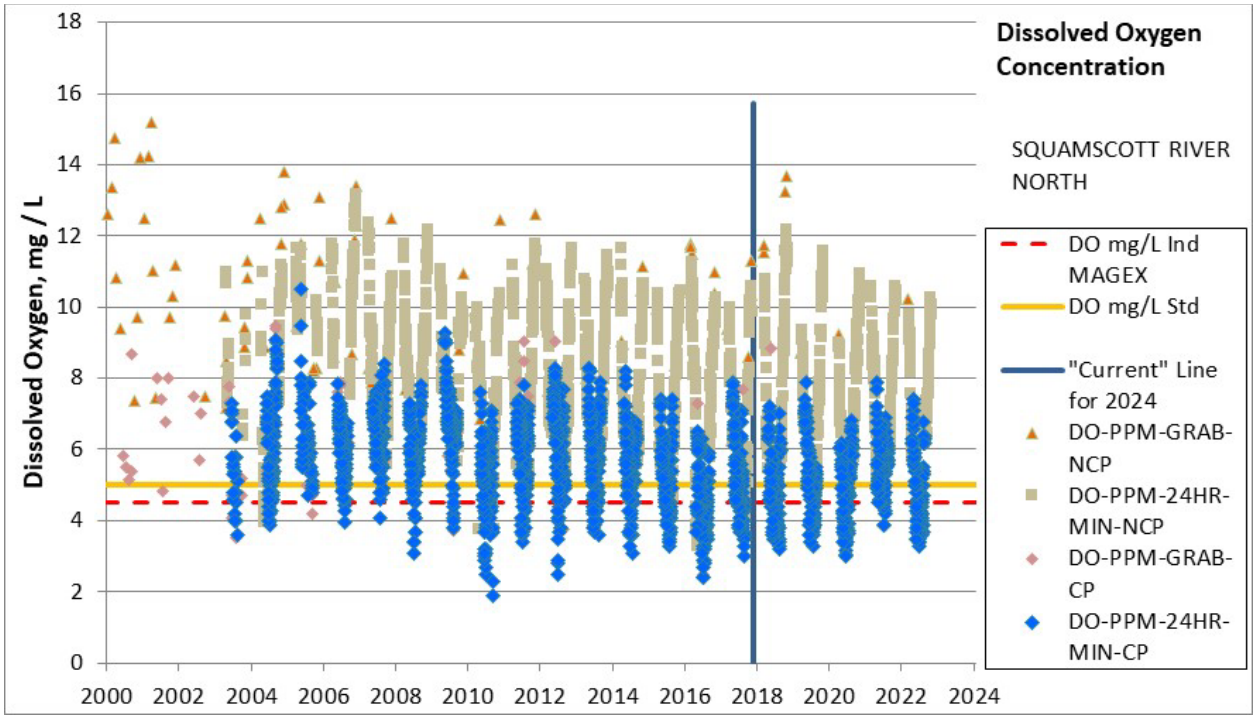
As of the date of data retrieval (April 13, 2023) water quality data through December 2022 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means there are four additional years of data (2019-2022) compared to the 2020/2022 assessment.

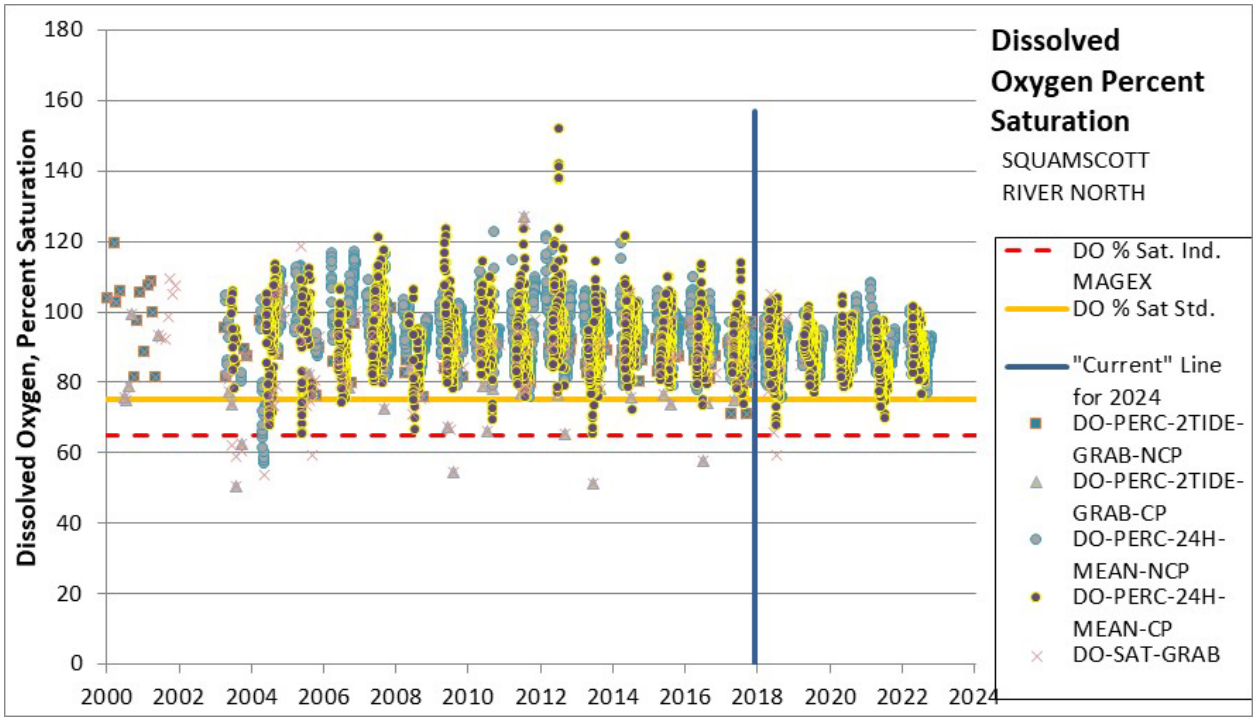
Indicator	Aquatic Life Use Category 2020/2022 /2024	2024 Comment
Chlorophyll-a	5-P / 5-P	The 90th percentile for chlorophyll-a, is 14.3 µg/L (n=52). The chlorophyll-a indicator threshold to prevent low dissolved oxygen and preserve light for eelgrass is a 90th percentile below 10 µg/L. As noted in the March 20, 2012 HydroQual report, "…such elevated algal levels probably contribute to increased SOD which will contribute to lower DO when algal levels are low…" (HydroQual, March 20, 2012). Although the 90th percentile remains over 10 ug/L, the frequency of measurements over 20 ug/L has diminished. The chlorophyll-a impairment has been retained.
Dissolved Oxygen (mg/L)	5-P / 5-P	Dissolved oxygen concentration measurements in this assessment zone fall below the 5 mg/L criterion every year. Because a portion of those measurements fall below 4 mg/L each year, and in some years approach 3 mg/L, this impairment is considered severe.
Dissolved Oxygen (% Saturation)	5-M / 5-M	Following the 10% method listed in the 2024 CALM this parameter would be categorized as 2-M. Part of the concept behind the 10% rule was to address random errors within the meter measurement accuracy, thereby limiting accidental impairments. The magnitude of exceedance indicator threshold was layered into the assessment process to address major exceedances and exceedances beyond all normal measurement errors. In the case of this assessment zone there are 593 station/days of DO readings during the critical summer period. Two of the last five years of data show criterion exceedances, sometimes on multiple days, which demonstrates that this phenomenon is not limited to a single summer. Looking back through the dataset, we see that this is a regularly occurring condition, further demonstrating that this phenomenon is not limited to a single summer. It appears to be becoming less common in this assessment zone to have 24-hour average dissolved oxygen below 75%. While no 24-hour average dissolved oxygen readings fell below the magnitude of exceedance indicator threshold of 65 percent, there were several close values (e.g. 68 percent average in 2018). This impairment has been retained.
Estuarine Bioassessments (eelgrass)	5-P / 5-P	In the 2012 assessment cycle, this assessment zone was listed as impaired for "Estuarine Bioassessments" (i.e. a lack of eelgrass) based on the 1948 survey that indicated that roughly 42 acres of eelgrass were present and despite intensive mapping efforts since 1981, eelgrass has never again been documented in this zone. While the 1948 map is rough enough that we cannot say that precisely 42 acres of eelgrass were present, its presence was clearly documented. Combined with the application of the Eelgrass Site Selection Model (Short, Davis, Kopp, Short, & Burdick, 2002) and a rudimentary suitability evaluation of temperature and salinity leads one to conclude that eelgrass should be present. As such, the impairment for "Estuarine Bioassessments" has been retained on the 2024 final 303(d).
Water Clarity (Light Attenuation Coefficient)	5-P / 5-P	Median water clarity is 4.06 m^-1 (n=44). For an eelgrass restoration depth of 2 m, the light attenuation coefficient threshold is 0.75 m^-1. Therefore, the impaired (5-P) listing from the 2020/2022 303d list has been retained.

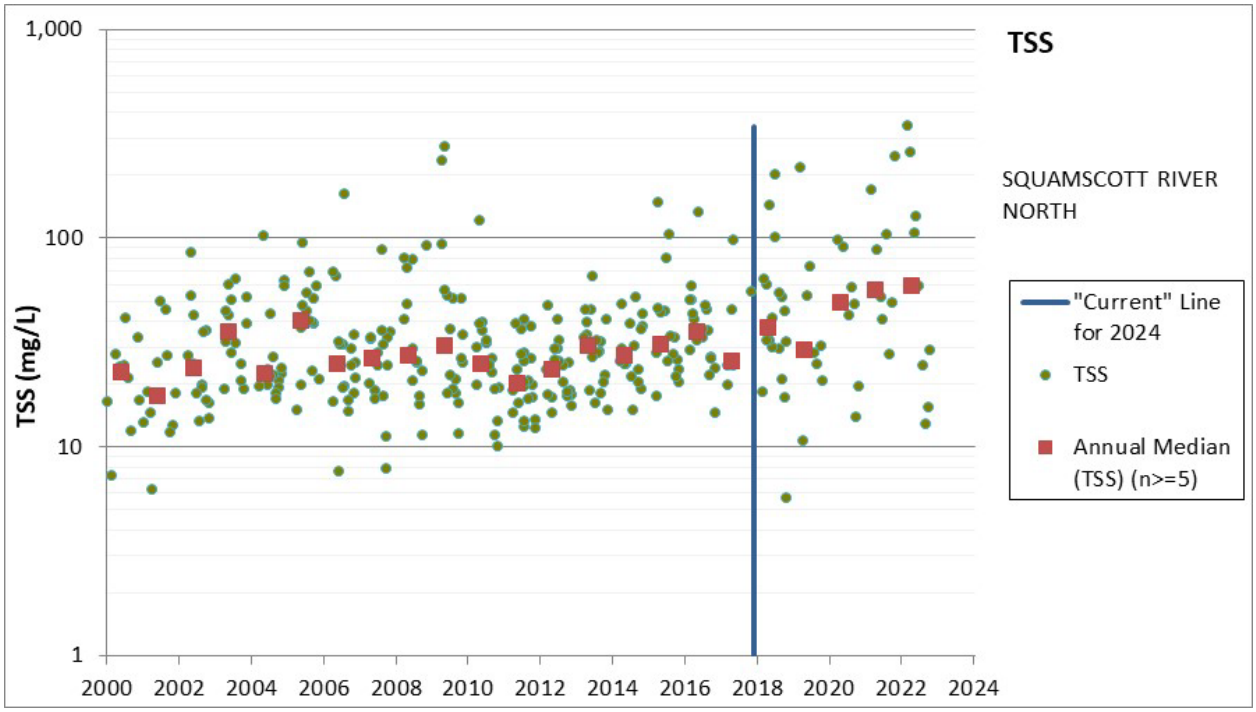
Total Nitrogen	5-P / 5-P	The median total nitrogen from 2018 through 2022 was 785 µg/L (n=92). This assessment zone continues to experience frequently dissolved oxygen concentrations well below 5 mg/L and periodically below a 24-hour average dissolved oxygen saturation of 75%. The chlorophyll-a concentration 90th percentile was 14.3 (n=52) from 2018 through 2022. The data used in this assessment includes the period after Exeter WWTF's new nitrogen removal process went on-line on June 10, 2019 and then after a few weeks of initial operation was switched to the designed Bardenpho configuration (Town of Exeter, January 31, 2020). The status of the indicators of nutrients and nutrient-related impacts has not changed and continue to present a preponderance of evidence that eutrophication effects are ongoing. As such, the impairment for nitrogen has been retained

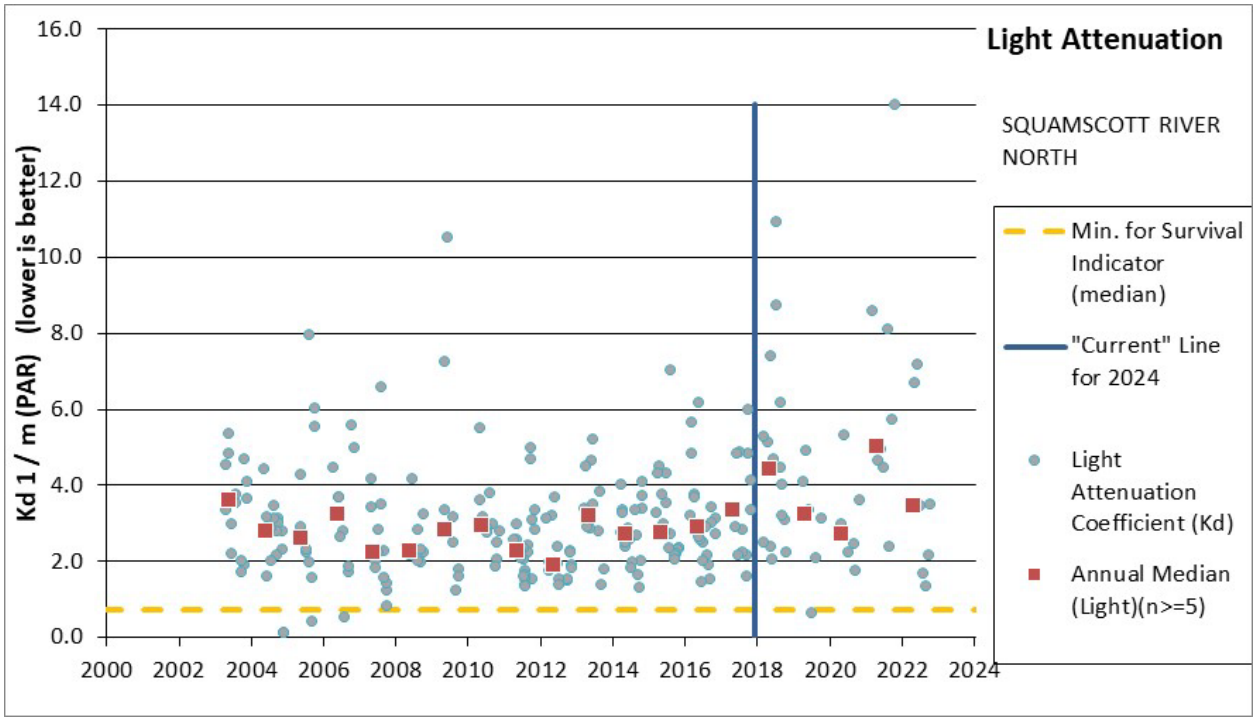


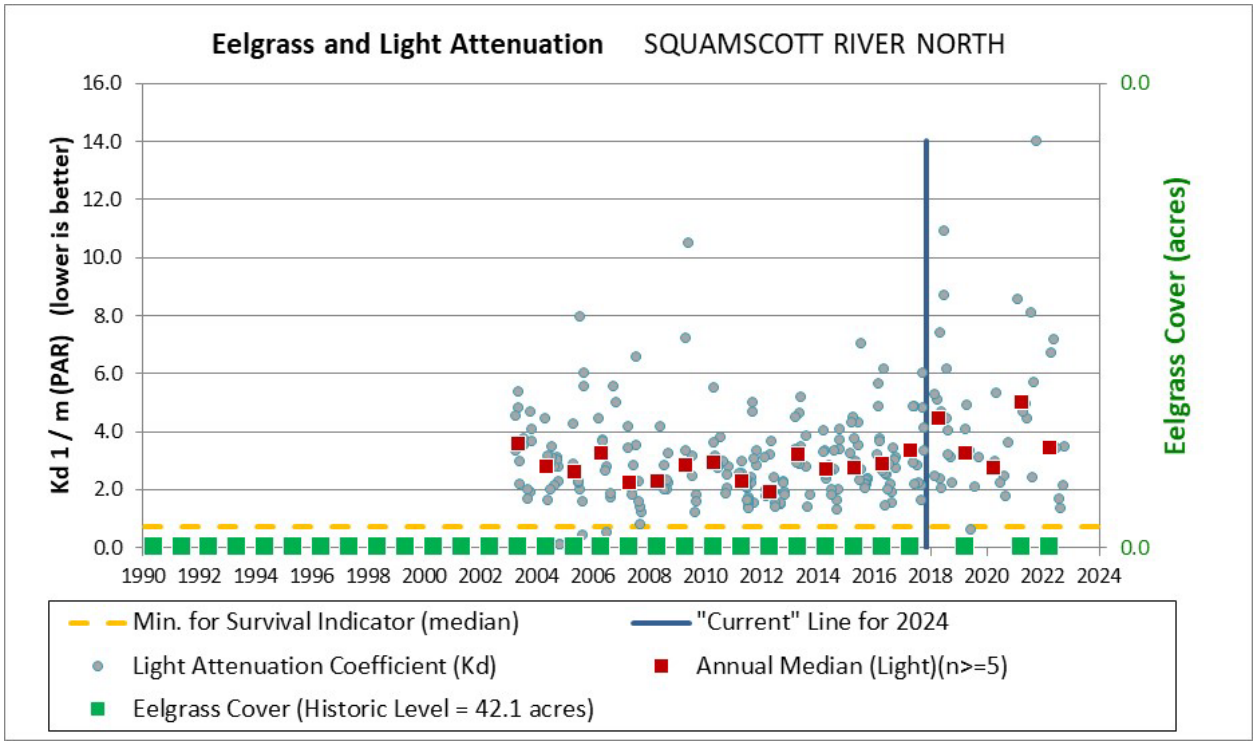

Chlorophyll-a
SQUAMSCOTT RIVER NORTH
ug Chl-a / L
1,000.00
100.00
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

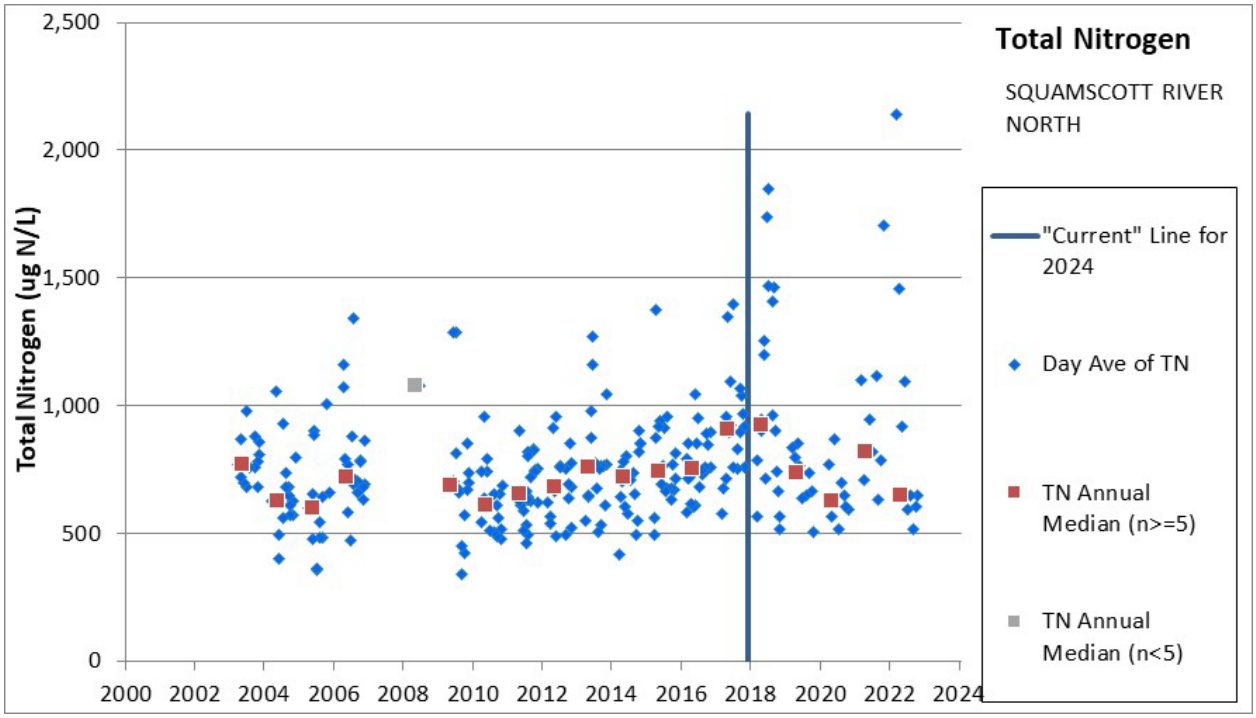

Dissolved Oxygen Concentration
SQUAMSCOTT RIVER NORTH
Dissolved Oxygen, mg / L
18
16
14
12
10
8
6
4
2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
SQUAMSCOTT RIVER NORTH
Dissolved Oxygen, Percent Saturation
180
160
140
120
100
80
60
40
20
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
SQUAMSCOTT RIVER NORTH
TSS (mg/L)
1,000
100
10
1
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)


Light Attenuation
SQUAMSCOTT RIVER NORTH
Kd 1 / m (PAR) (lower is better)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)


Eelgrass and Light Attenuation
SQUAMSCOTT RIVER NORTH
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
0.0
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)
Eelgrass Cover (Historic Level = 42.1 acres)


Total Nitrogen
SQUAMSCOTT RIVER NORTH
Total Nitrogen (ug N/L)
2,500
2,000
1,500
1,000
500
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)
TN Annual Median (n<5)

Squamscott River - North Assessment Zone (1/1/2018-4/13/2023)	**Date Count**	**Minimum**	**Median**	**90th Percentile**	**Maximum**
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	52	0.5	5.8	14.3	25.8
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	52	0.0	5.8	14.3	25.8
LIGHT ATTENUATION COEFFICIENT (1/m)	44	0.63	4.06	8.34	14.02
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	1,130	2.4	12.0	22.0	70.0
TSS (mg/L)	53	5.7	47.9	189.1	343.6
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	45	3.2	6.1	11.9	13.7
DO-PPM-24HR-MIN-CP (mg/L)	593	3.0	5.1	6.5	7.9
DO-PPM-24HR-MIN-NCP (mg/L)	536	4.8	8.3	10.5	12.2
DO-PPM-GRAB-CP (mg/L)	3	5.1	5.2	-	8.9
DO-PPM-GRAB-NCP (mg/L)	9	7.1	10.3	13.7	13.7
DO-PERC-24H-MEAN-CP (% sat)	593	67.9	89.2	96.7	104.0
DO-PERC-24H-MEAN-NCP (% sat)	525	75.5	90.3	95.2	108.1
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	12	59.4	89.6	103.0	104.9
Day Ave of TN (ug N/L)	53	505	785	1,465	2,141
Day Ave of TDN (ug N/L)	53	325	506	743	1,309
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	53	124	263	505	794
Day Ave of NH3 (ug N/L)	53	3	110	229	333
Day Ave of PON (ug N/L)	9	92	267	1,797	1,797
Day Ave of NO2/3 (ug N/L)	53	23	134	277	521
SALINITY-Grabs (pss)	52	0.1	7.4	22.9	28.9
SALINITY-Datalogger Daily Median (pss)	1,129	0.7	21.9	29.4	31.4
pH-grab	0	-	-	-	-
pH-24HR (min)	1,137	6.6	7.2	7*	7.8
pH-24HR (max)	1,137	7.4	8.0	8.1	8.3
Temperature	52	0.2	16.5	24.2	27.5
Temperature-Daily Median	1,135	0.0	18.7	24.9	27.2

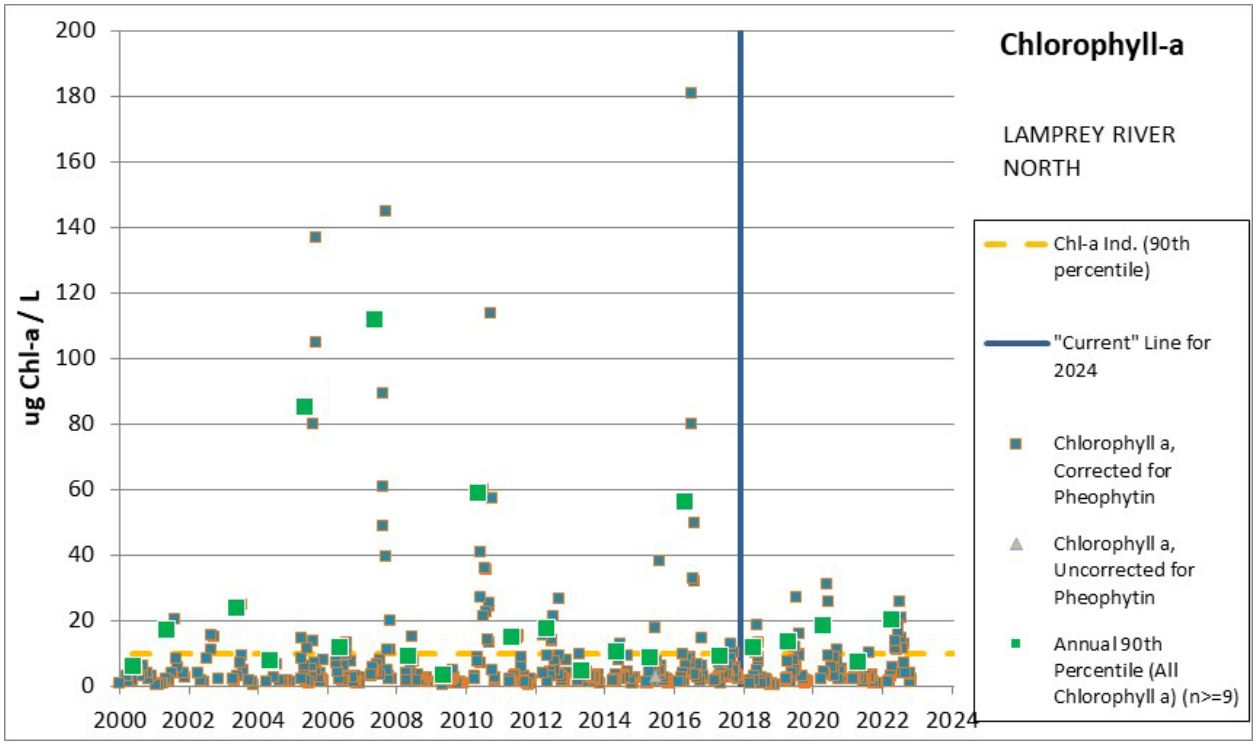
*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

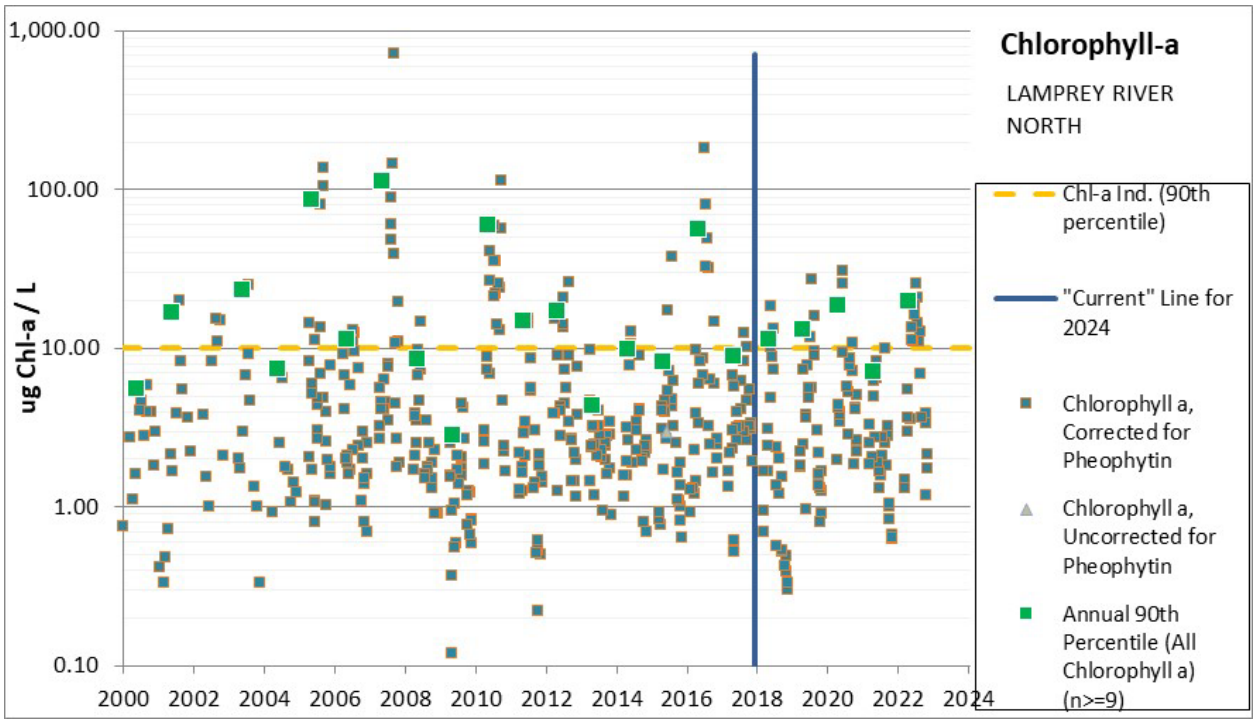
Assessment Zone = LAMPREY RIVER NORTH

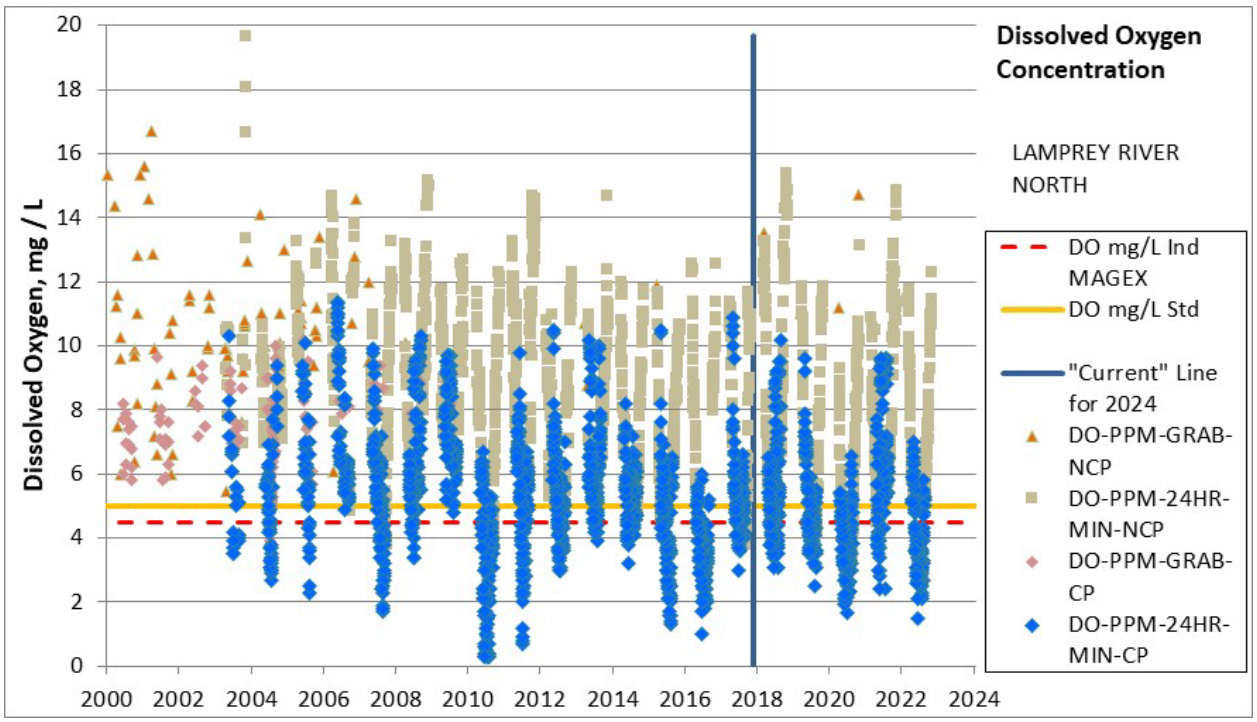
(NHEST600030709-01-01)

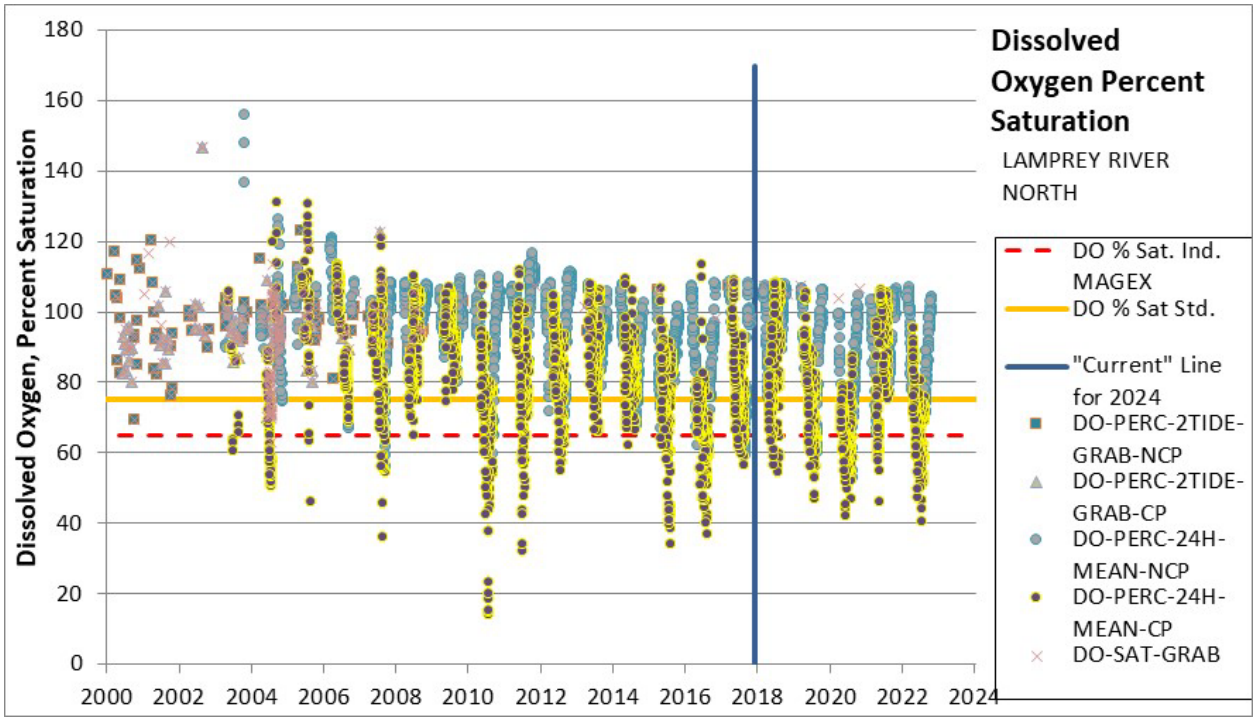
As of the date of data retrieval (April 13, 2023) water quality data through 2022 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means there are four additional years of data (2019-2022) compared to the 2020/2022 assessment.

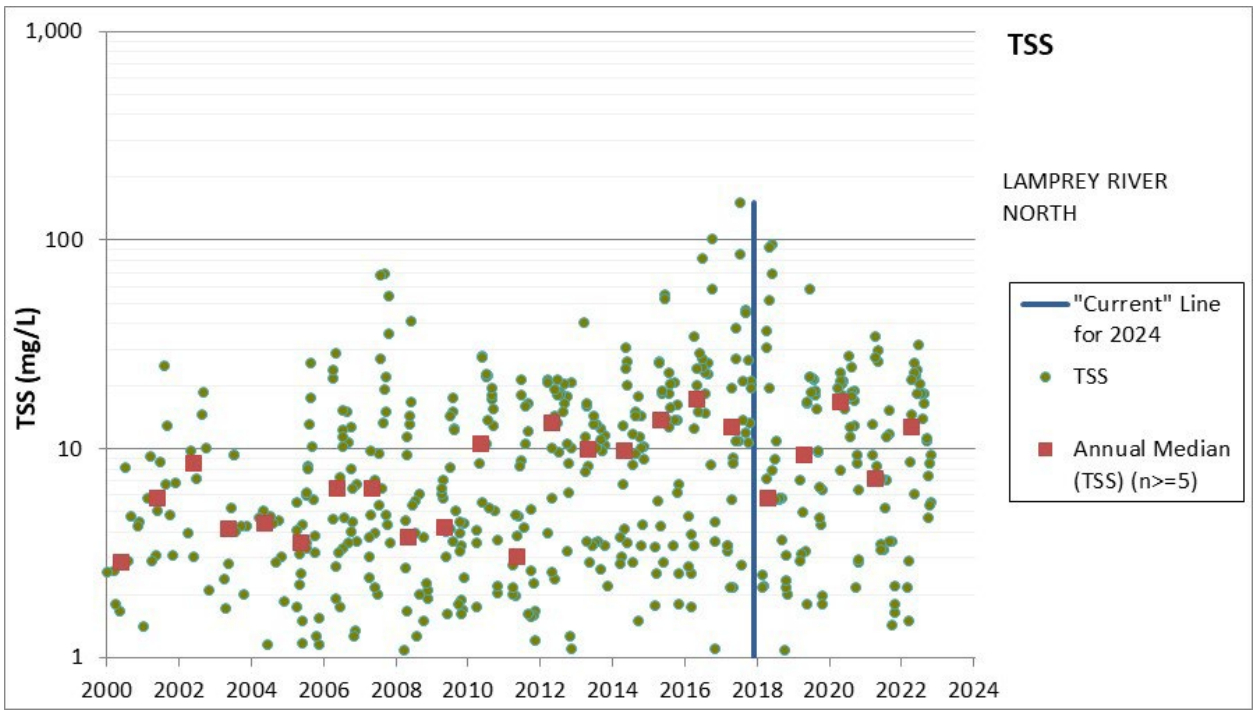
Indicator	Aquatic Life Use Category 2020/2022 / 2024	2024 Comment
Chlorophyll-a	5-M / 5-M	The calculated 90th percentile chlorophyll-a in this assessment zone is 12.9 µg/L (n = 125) and a peak measurement of 31 µg/L. The chlorophyll-a indicator threshold to prevent low dissolved oxygen is a 90th percentile below 10 µg/L. Large nutrient load reductions began when the new wastewater treatment facility came online in 2017, which may be reflected on the lack of very high readings since 2016. The chlorophyll-a impairment has been retained.
Dissolved Oxygen (mg/L)	5-P / 5-P	Dissolved oxygen concentration measurements in this assessment zone fall below the 5 mg/L criterion every year. Because a portion of those measurements fall below 4 mg/L each year, and in some years within the "current period" down to 1.5 mg/L, this impairment is considered severe.
Dissolved Oxygen (% Saturation)	5-P / 5-P	Dissolved oxygen 24-hour average percent saturation measurements in this assessment zone fall below the 75% every year. Because a portion of those measurements fall below 65% each year and in some years down to 40% within the "current period", this impairment is considered severe.
Estuarine Bioassessments (eelgrass)	No Std / No Std	Not applicable. Eelgrass habitat has not historically existed in this assessment zone.
Water Clarity (Light Attenuation Coefficient)	No Std / No Std	Not applicable. The water clarity has not been assessed because eelgrass has not historically existed in this assessment zone.
Total Nitrogen	5-M / 5-M	The median total nitrogen from 2018 through 2022 was 458 µg/L (n=44). It is important to note that some of the 2017 and all of the 2018 data represents the period after the large nutrient load reductions from the new wastewater treatment facility came online in 2017. Indeed, after 2017 there are no longer spikes over 700 ug/L that had been present for years. In the available dataset, this assessment zone still experiences frequent dissolved oxygen concentrations well below the 5 mg/L criterion and daily average saturation below 75%. The chlorophyll-a concentration 90th percentile was 12.9 µg/L (n=125) from 2018 through 2022 although no measurements were over 31 µg/L. The status of the indicators of nutrients and nutrient-related impacts has not changed and continue to present a preponderance of evidence that eutrophication effects are ongoing. As such, the impairment for nitrogen has been retained.

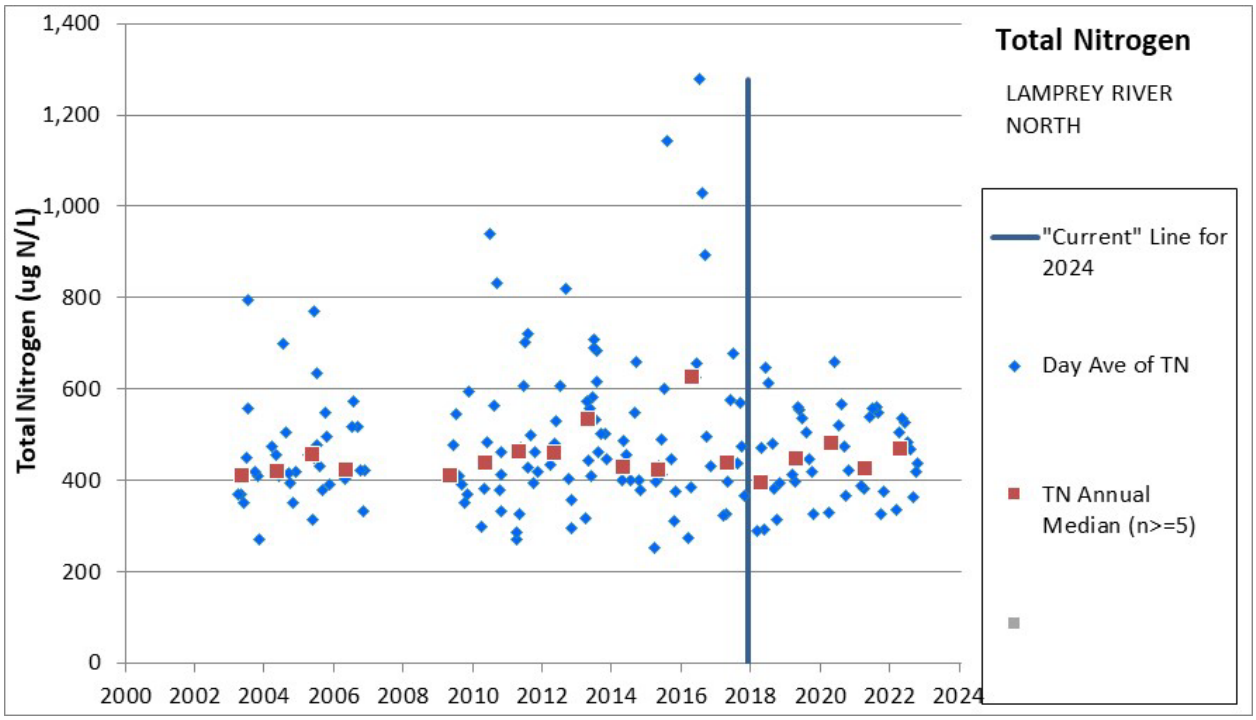

Chlorophyll-a
LAMPREY RIVER NORTH
ug Chl-a / L
200
180
160
140
120
100
80
60
40
20
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)


Chlorophyll-a
LAMPREY RIVER NORTH
ug Chl-a / L
1,000.00
100.00
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)


Dissolved Oxygen Concentration
LAMPREY RIVER NORTH
Dissolved Oxygen, mg / L
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
LAMPREY RIVER NORTH
Dissolved Oxygen, Percent Saturation
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
LAMPREY RIVER NORTH
TSS (mg/L)
1,000
100
10
1
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)


Total Nitrogen
LAMPREY RIVER NORTH
Total Nitrogen (ug N/L)
1,400
1,200
1,000
800
600
400
200
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)

Lamprey River - North Assessment Zone (1/1/2018-4/13/2023)	**Date Count**	**Minimum**	**Median**	**90th Percentile**	**Maximum**
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	125	0.3	3.0	12.9	30.9
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	125	0.0	3.0	12.9	30.9
LIGHT ATTENUATION COEFFICIENT (1/m)	32	0.83	1.68	2.52	2.86
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	1,157	1.0	4.0	9.0	71.0
TSS (mg/L)	123	1.1	9.3	26.8	95.2
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	105	3.0	5.2	8.4	11.3
DO-PPM-24HR-MIN-CP (mg/L)	609	1.5	4.7	7.3	10.2
DO-PPM-24HR-MIN-NCP (mg/L)	547	3.4	8.4	12.4	15.4
DO-PPM-GRAB-CP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-NCP (mg/L)	5	11.0	13.5	-	14.7
DO-PERC-24H-MEAN-CP (% sat)	610	40.5	73.4	101.5	108.4
DO-PERC-24H-MEAN-NCP (% sat)	537	52.9	96.2	105.5	107.9
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	5	103.7	106.6	-	107.5
Day Ave of TN (ug N/L)	44	291	458	565	661
Day Ave of TDN (ug N/L)	129	220	359	471	564
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	129	33	169	240	333
Day Ave of NH3 (ug N/L)	129	5	50	131	326
Day Ave of PON (ug N/L)	9	64	110	255	255
Day Ave of NO2/3 (ug N/L)	129	5	98	161	214
SALINITY-Grabs (pss)	44	0.0	2.2	25.7	28.9
SALINITY-Datalogger Daily Median (pss)	1,157	0.0	16.5	26.6	29.5
pH-grab	0	-	-	-	-
pH-24HR (min)	1,151	6.2	7.2	6.8*	7.9
pH-24HR (max)	1,151	6.3	7.6	7.8	8.1
Temperature	44	0.5	16.9	25.0	26.1
Temperature-Daily Median	1,157	0.1	19.0	25.2	28.3

*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

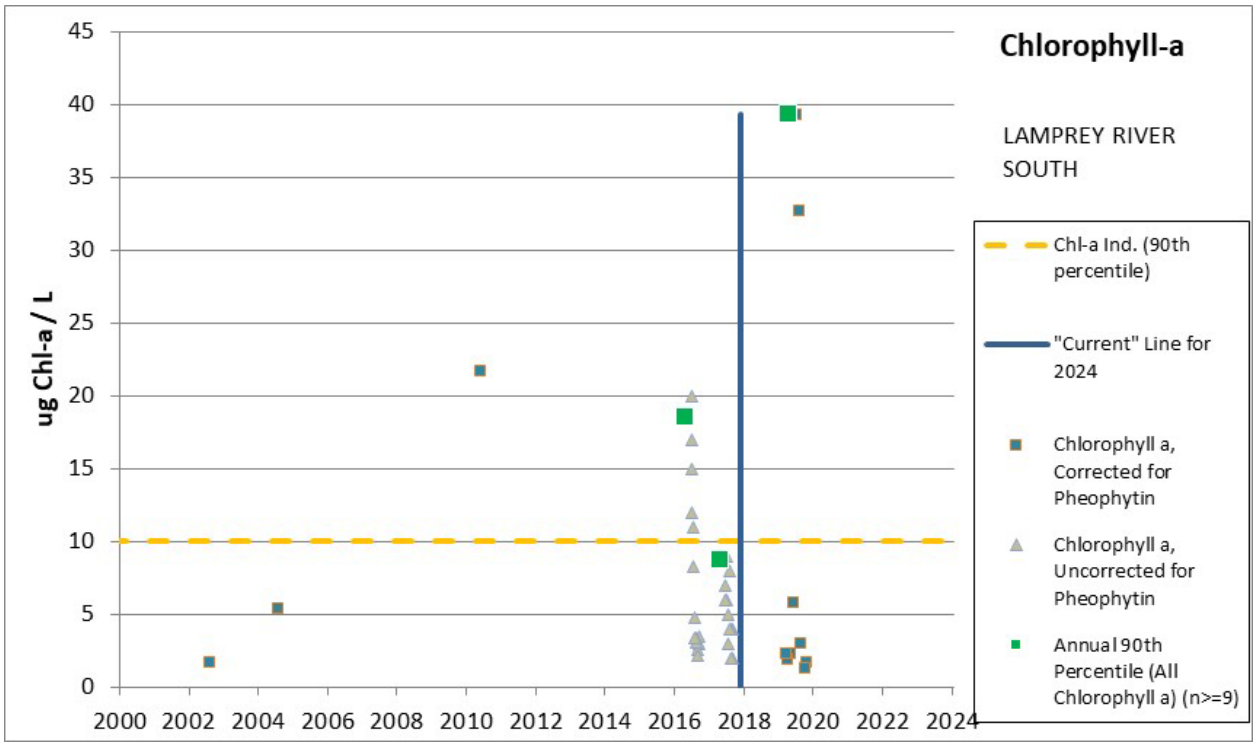
Assessment Zone = LAMPREY RIVER SOUTH

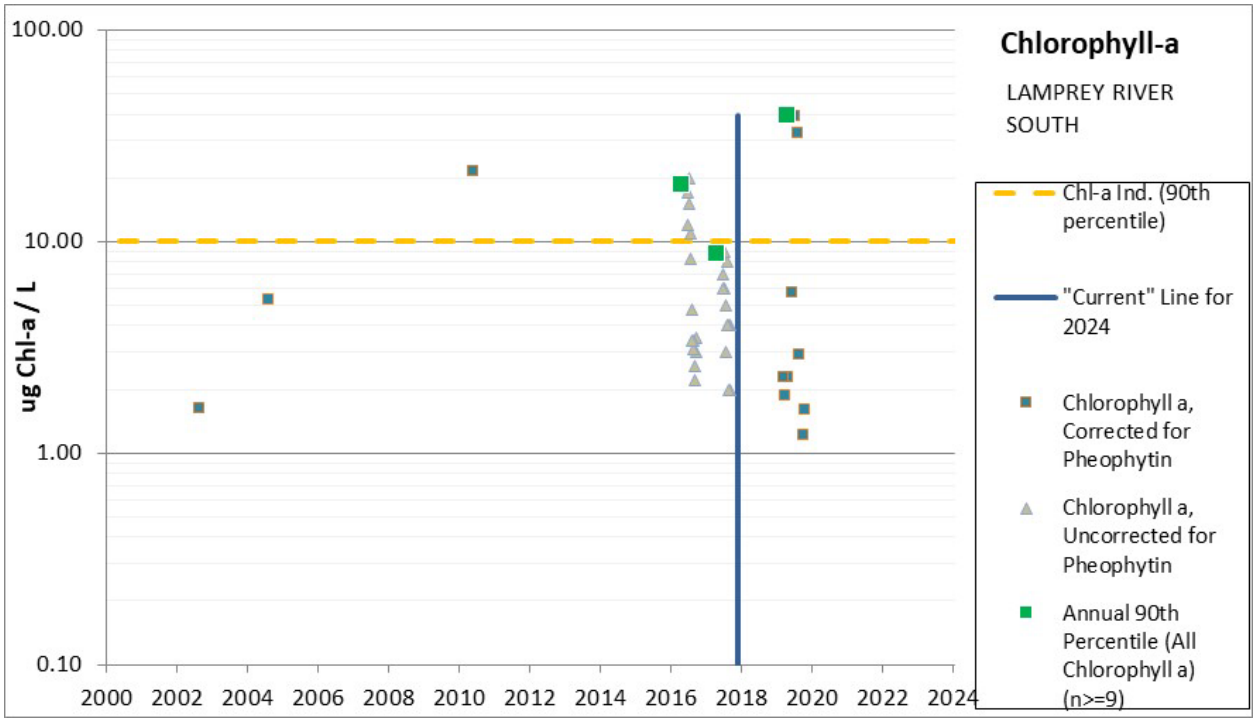
(NHEST600030709-01-02)

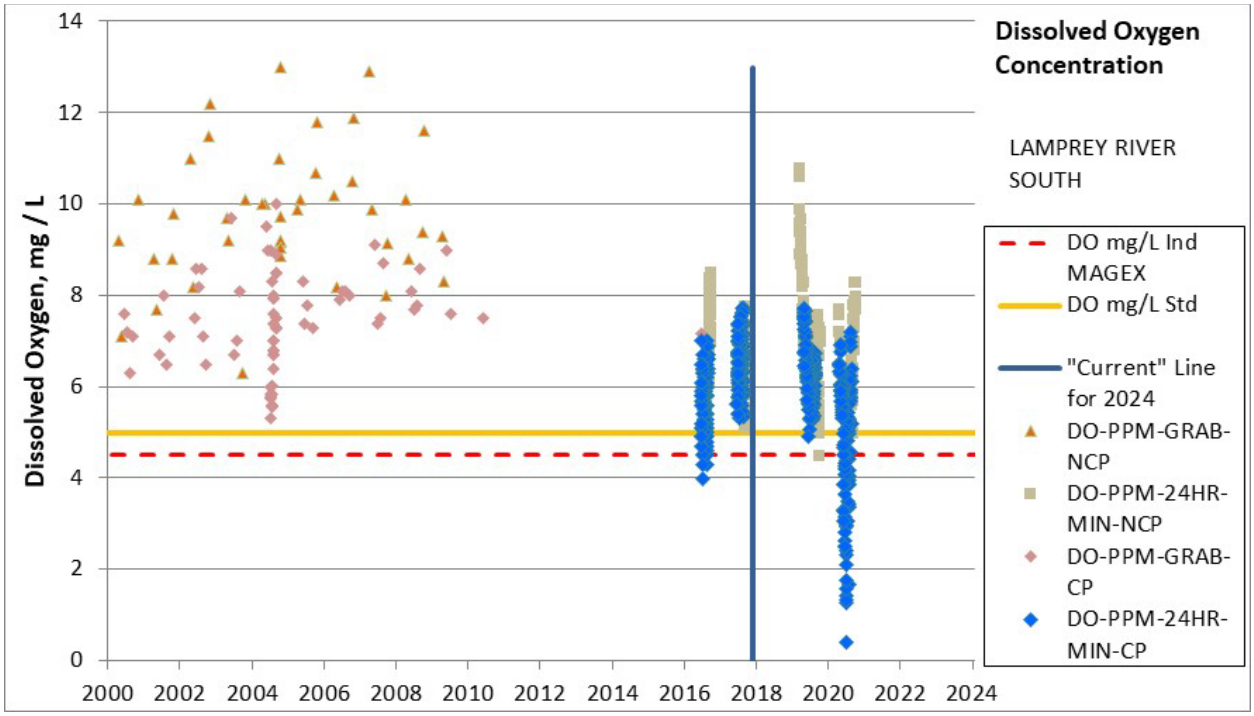
As of the date of data retrieval (April 13, 2023) water quality data through 2022 had been uploaded to the Environmental Monitoring Database for this assessment zone. While no grab samples or dataloggers were deployed in 2018, UNH collected data grab samples for Newmarket in 2019 and deployed dataloggers in 2019 and 2020. Note that the 2019 and 2020 data is not yet in the EMD nor the SADB, but the Excel files were used in this assessment. For this assessment zone, that means there are two additional years of data compared to the 2020/2022 assessment.

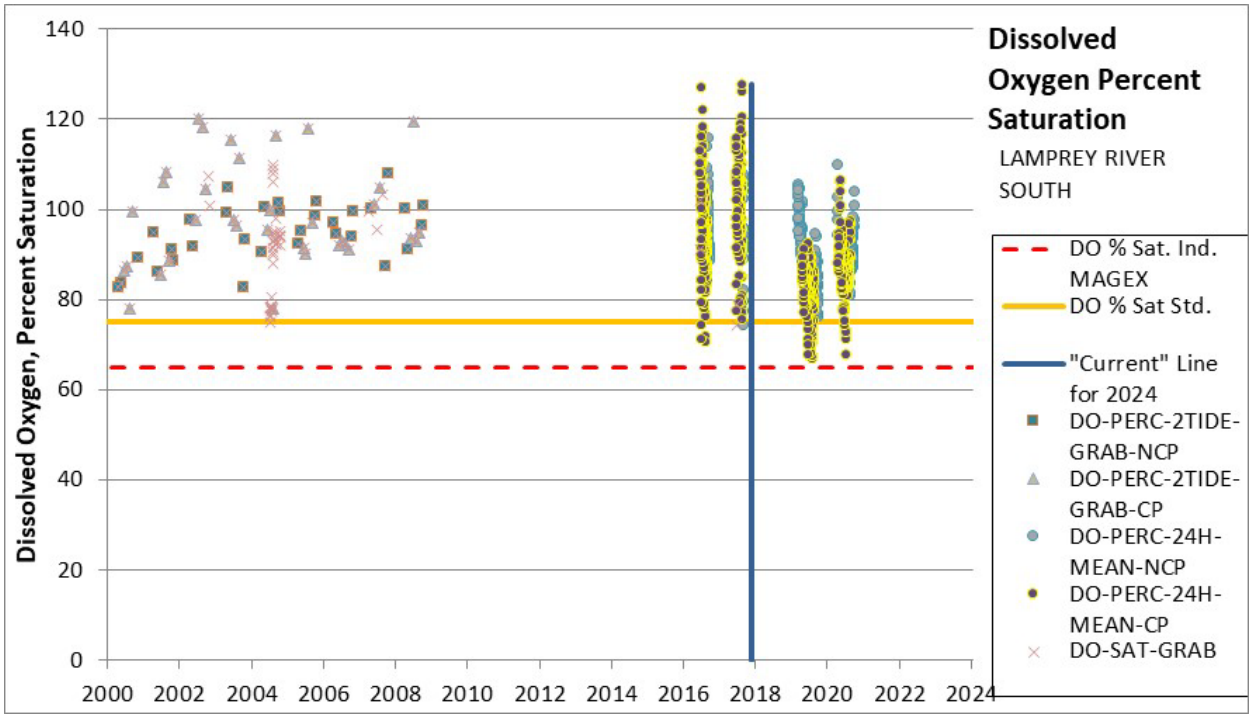
Indicator	Aquatic Life Use Category 2020/2022 / 2024	2024 Comment
Chlorophyll-a	5-M / 5-M	The calculated 90th percentile chlorophyll-a (uncorrected for pheophytin) in this assessment zone is 39.3 µg/L (n = 9). The chlorophyll-a indicator threshold to prevent low dissolved oxygen and preserve light for eelgrass is a 90th percentile below 10 µg/L. Large nutrient load reductions began when the new wastewater treatment facility came online in 2017 and the differences in the 2016 verses 2017 datasets suggest that those reductions are having the desired impact. The chlorophyll-a impairment has been retained until additional data demonstrates continued chlorophyll-a reductions.
Dissolved Oxygen (mg/L)	3-PNS / 5-P	This assessment zone received its first datalogger deployments in 2016 and 2017 (suspended 1-meter from the surface), straddling the period when the new wastewater treatment facility came online. Dissolved oxygen concentration measurements in 2016 in this assessment zone routinely fell below the 5 mg/L and at times below 4 mg/L. In 2019 and 2020, dataloggers were deployed 1-meter from the bottom demonstrating that dissolved oxygen concentration frequently falls below 5 mg/L and at times down to 3 mg/L, typically during periods of minimal freshwater flushing in minimal tidal amplitude. As such, dissolved oxygen concentration has been added as a severe impairment.
Dissolved Oxygen (% Saturation)	3-PNS / 5-M	This assessment zone received its first datalogger deployments in 2016 and 2017 (suspended 1-meter from the surface), straddling the period when the new wastewater treatment facility came online. Dissolved oxygen 24-hour average percent saturation measurements in this assessment zone periodically fell below the 75 percent in both 2016 and 2017. In 2019 and 2020, dataloggers were deployed 1-meter from the bottom demonstrating that dissolved oxygen saturation frequently falls below a 24-hour average of 75%, but not below 67%, typically during periods of minimal freshwater flushing in minimal tidal amplitude. Due to the frequency of measurements falling below 75%, dissolved oxygen 24-hour average percent saturation has been concentration has been added as a marginal impairment.
Estuarine Bioassessments (eelgrass)	5-P / 5-P	The historical extent of eelgrass in this assessment zone was 53.4 acres from the 1948 dataset. Patches of eelgrass were found in 2003 (2.2 acres) and 2011 (0.5 acres). The median current extent of eelgrass in 2019-2022 is 0 acres, which is a 100% decrease. Since 1990, the trend in eelgrass cover in this assessment zone could not be determined because the eelgrass cover has been zero for most years since 1981. The thresholds for impairment are either a loss of more than 20% of the historic extent of eelgrass or a recent trend of greater than 20% loss.
Water Clarity (Light Attenuation	5-P / 5-P	Median = 1.69 m^-1 (n=9). For an eelgrass restoration depth of 2 m, the light attenuation coefficient threshold is 0.75 m^-1. This assessment zone historically had eelgrass growing in

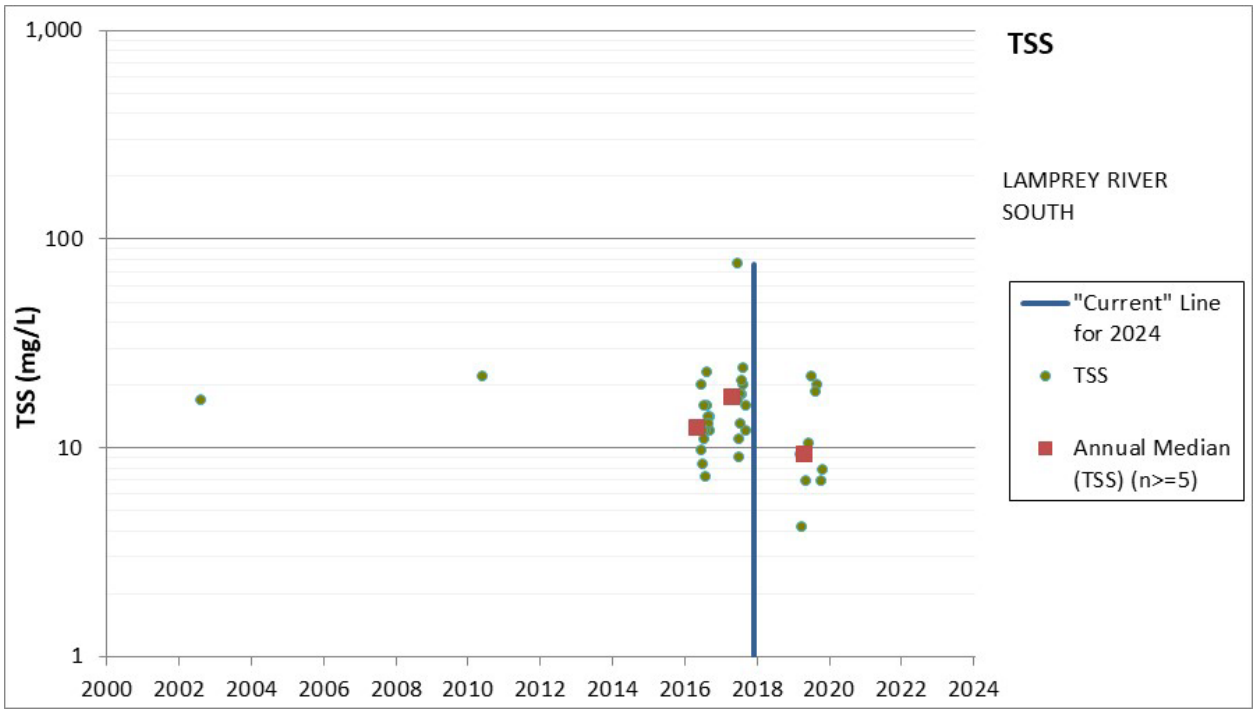
Coefficient)		both the shallows and deeper habitat making the 2m restoration depth a valid target. Therefore, the impaired (5-M) listing from the 2020/2022 303d list has been retained.
Total Nitrogen	5-M / 5-M	The median total nitrogen from 2018 through 2022 was 482 µg/L (n=9). The calculated 90th percentile chlorophyll-a in this assessment zone is 39.3 µg/L (n = 9). The eelgrass beds have been eliminated and the available light attenuation (median = 1.69 m^-1 (n=9)) is very poor. This assessment zone experienced dissolved oxygen concentrations well below the 5 mg/L criterion in 2019 and down to 3 mg/L in 2020. In both 2019 and 2020 the daily average saturation fell below the 75% criterion. The status of the indicators of nutrients and nutrient-related impacts has not changed and continue to present a preponderance of evidence that eutrophication effects are lingering. As such, the impairment for nitrogen has been retained.

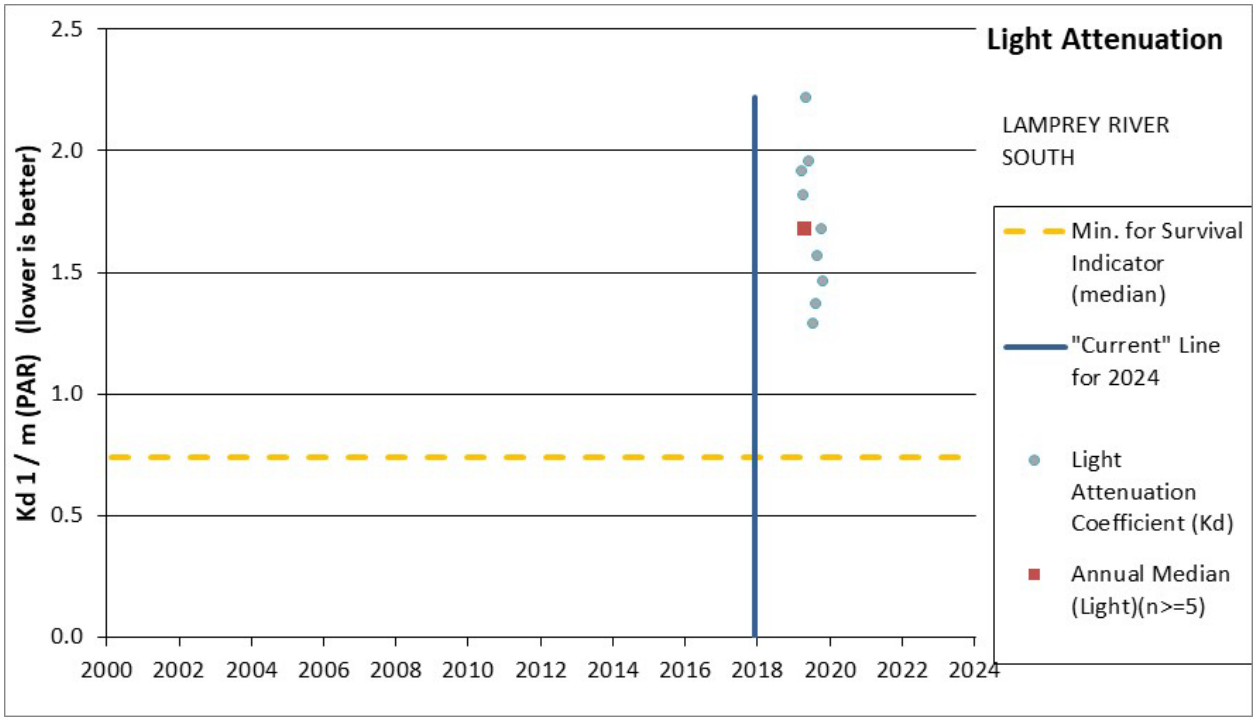


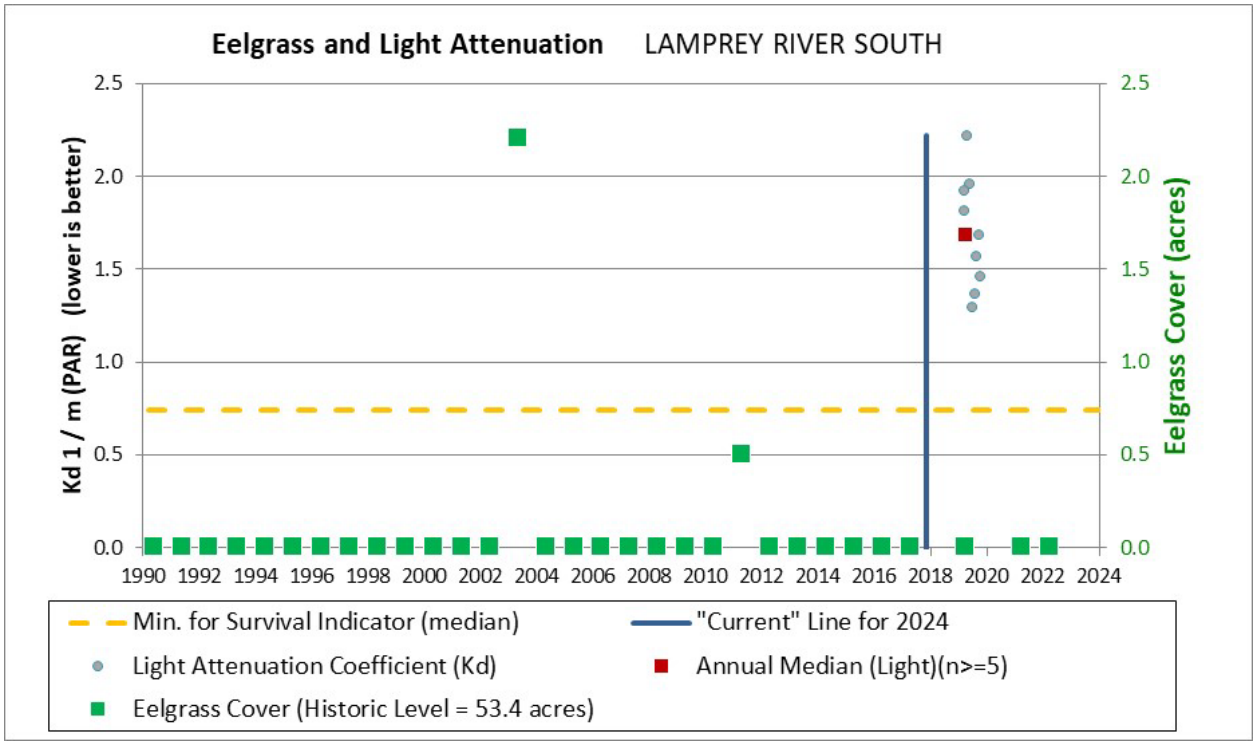

Chlorophyll-a
LAMPREY RIVER SOUTH
ug Chl-a / L
100.00
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

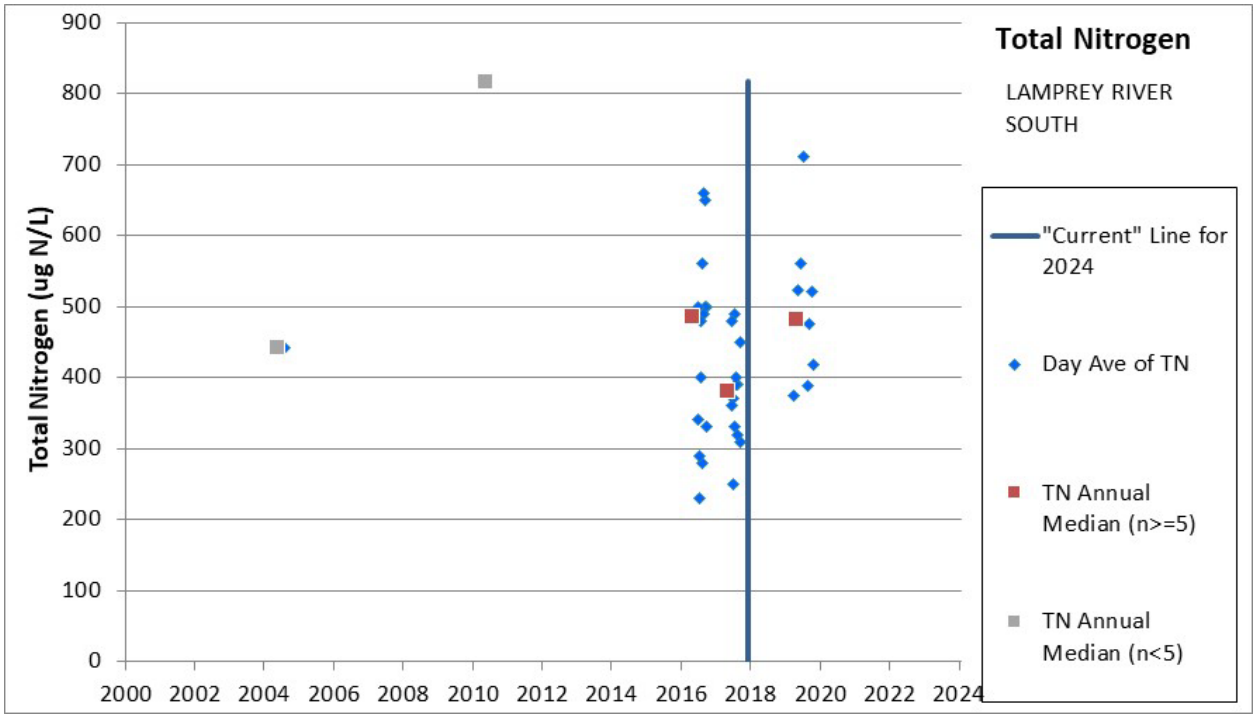

Dissolved Oxygen Concentration
LAMPREY RIVER SOUTH
Dissolved Oxygen, mg / L
14
12
10
8
6
4
2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
LAMPREY RIVER SOUTH
Dissolved Oxygen, Percent Saturation
140
120
100
80
60
40
20
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
LAMPREY RIVER SOUTH
TSS (mg/L)
1,000
100
10
1
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)


Light Attenuation
LAMPREY RIVER SOUTH
Kd 1 / m (PAR) (lower is better)
2.5
2.0
1.5
1.0
0.5
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)


Eelgrass and Light Attenuation
LAMPREY RIVER SOUTH
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
2.5
2.0
1.5
1.0
0.5
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)
Eelgrass Cover (Historic Level = 53.4 acres)


Total Nitrogen
LAMPREY RIVER SOUTH
Total Nitrogen (ug N/L)
900
800
700
600
500
400
300
200
100
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)
TN Annual Median (n<5)

Lamprey River - South Assessment Zone (1/1/2018-4/13/2023)	**Date Count**	**Minimum**	**Median**	**90th Percentile**	**Maximum**
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	9	1.2	2.3	39.3	39.3
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	9	0.0	2.3	39.3	39.3
LIGHT ATTENUATION COEFFICIENT (1/m)	9	1.30	1.69	2.23	2.23
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	402	2.6	7.9	20.9	55.7
TSS (mg/L)	9	4.2	9.3	22.1	22.1
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	0	-	-	-	-
DO-PPM-24HR-MIN-CP (mg/L)	244	3.0	5.9	6.9	7.7
DO-PPM-24HR-MIN-NCP (mg/L)	162	6.4	8.4	11.0	11.5
DO-PPM-GRAB-CP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-NCP (mg/L)	0	-	-	-	-
DO-PERC-24H-MEAN-CP (% sat)	244	66.8	84.5	92.1	106.4
DO-PERC-24H-MEAN-NCP (% sat)	162	76.2	93.5	102.6	109.7
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	0	-	-	-	-
Day Ave of TN (ug N/L)	9	375	482	712	712
Day Ave of TDN (ug N/L)	9	245	334	432	432
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	9	36	147	239	239
Day Ave of NH3 (ug N/L)	9	3	22	122	122
Day Ave of PON (ug N/L)	9	46	92	433	433
Day Ave of NO2/3 (ug N/L)	9	32	110	173	173
SALINITY-Grabs (pss)	0	-	-	-	-
SALINITY-Datalogger Daily Median (pss)	409	0.1	26.5	29.8	31.3
pH-grab	0	-	-	-	-
pH-24HR (min)	412	0.0	7.6	7.1*	8.0
pH-24HR (max)	412	0.0	7.9	8.1	8.2
Temperature	0	-	-	-	-
Temperature-Daily Median	412	4.3	18.8	24.9	26.7

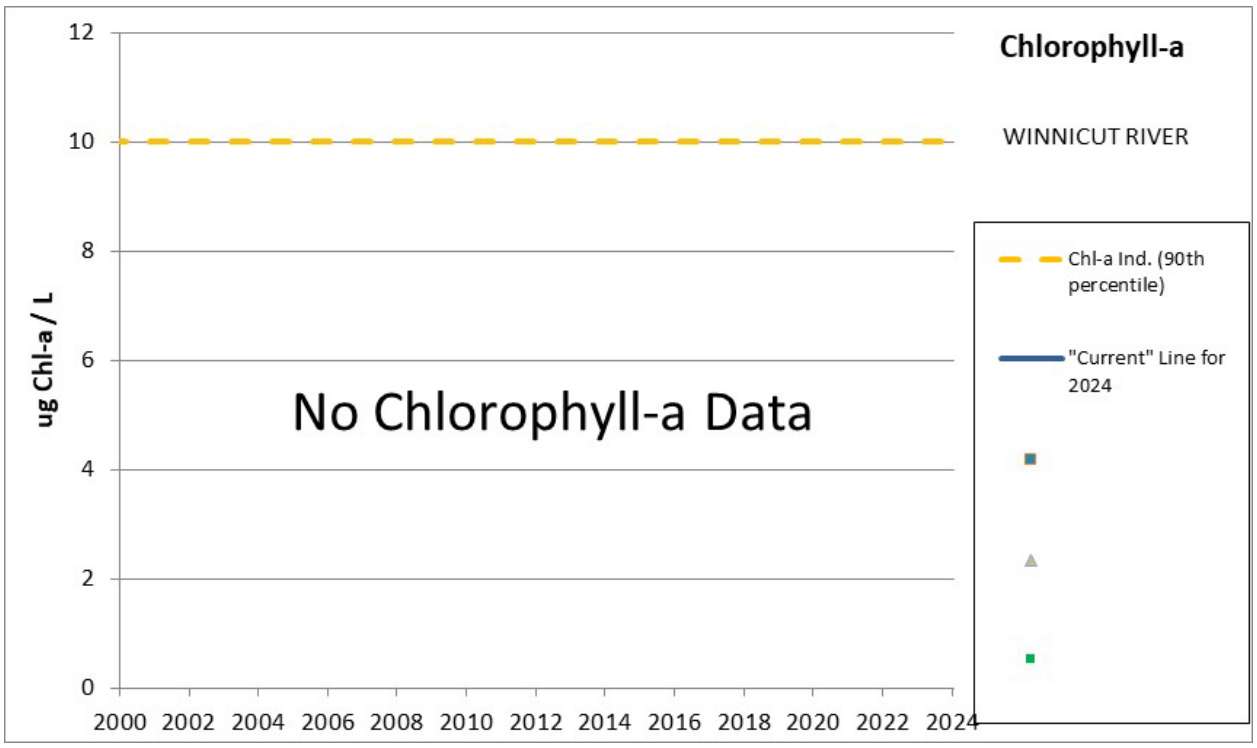
*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

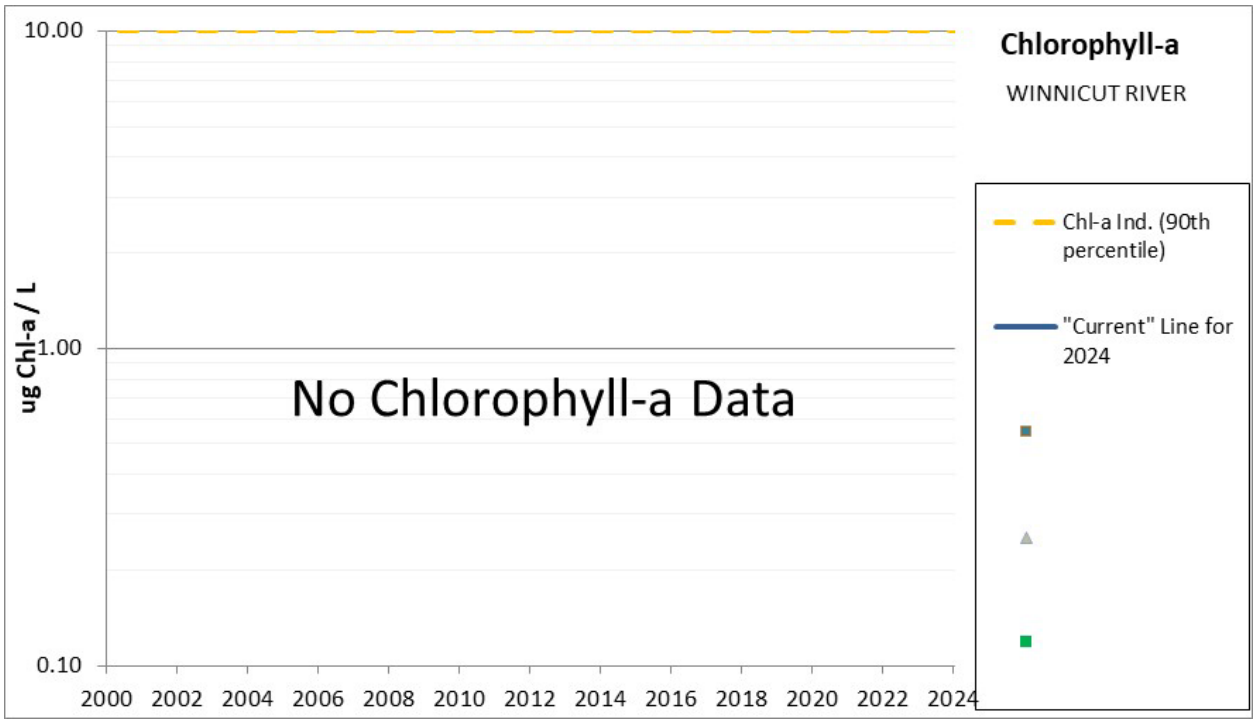
Assessment Zone = WINNICUT RIVER

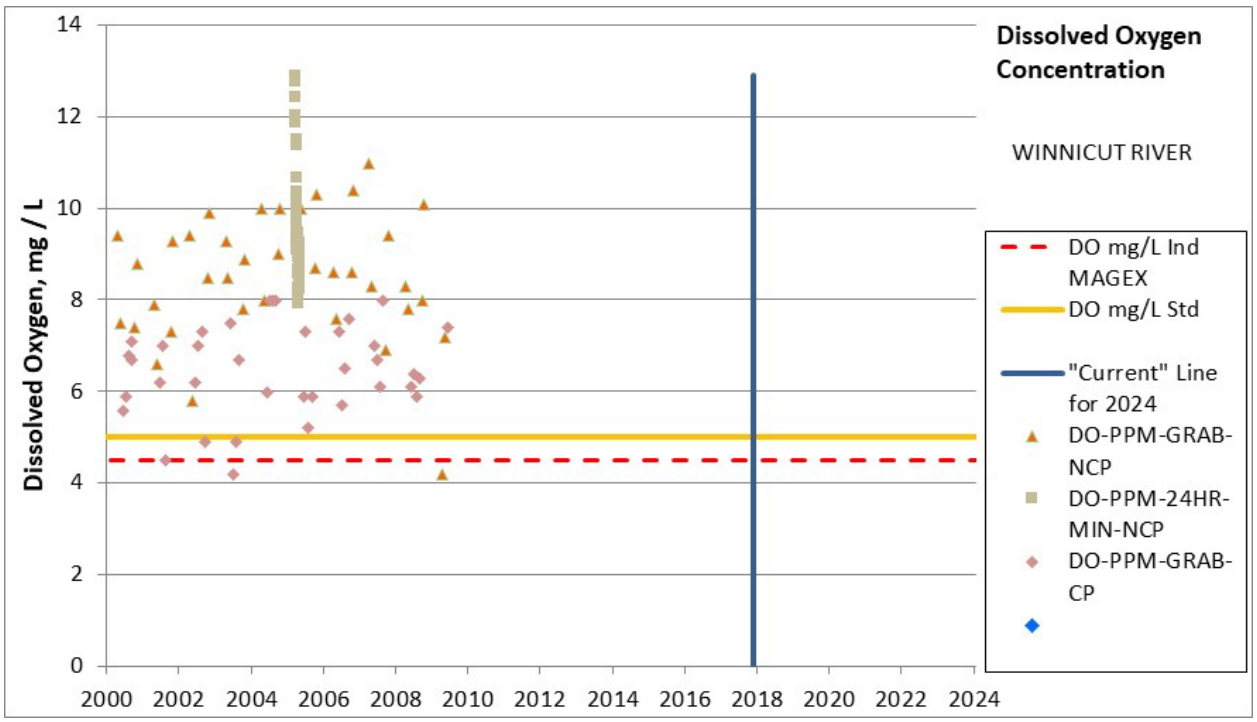
(NHEST600030904-01)

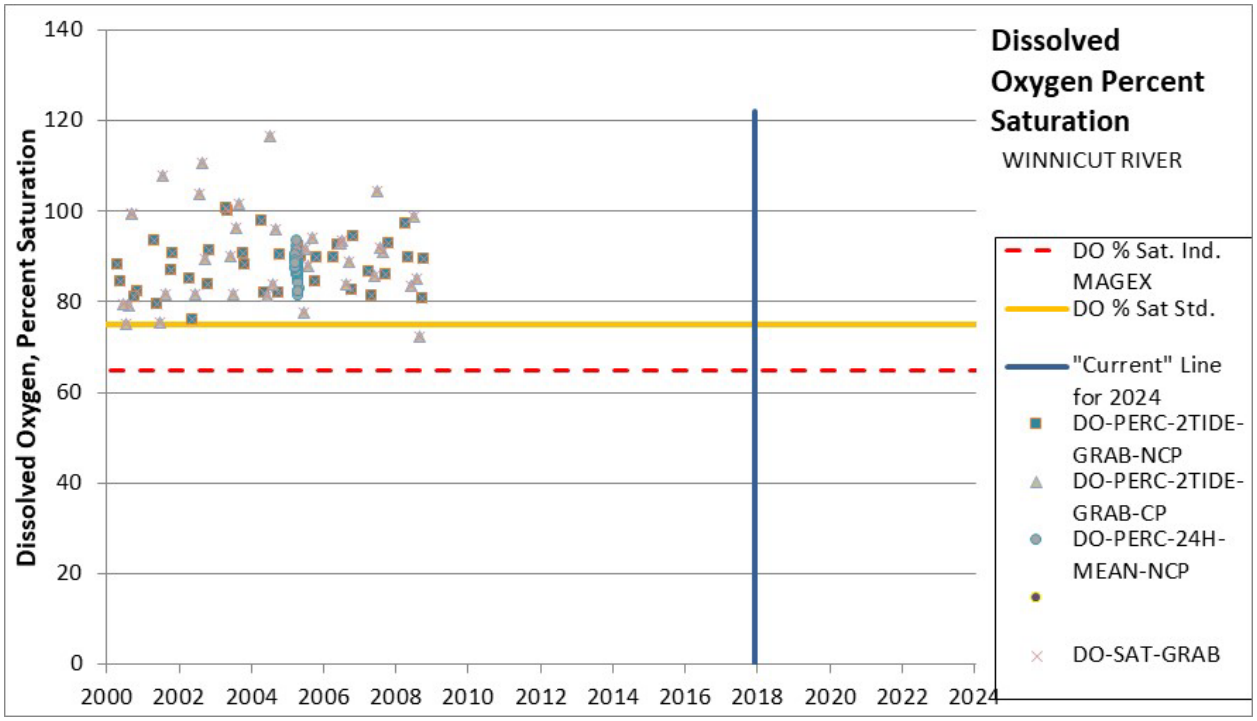
As of the date of data retrieval (April 13, 2023), available water quality data through 2022 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means there are no additional years of data compared to the 2020/2022 assessment.

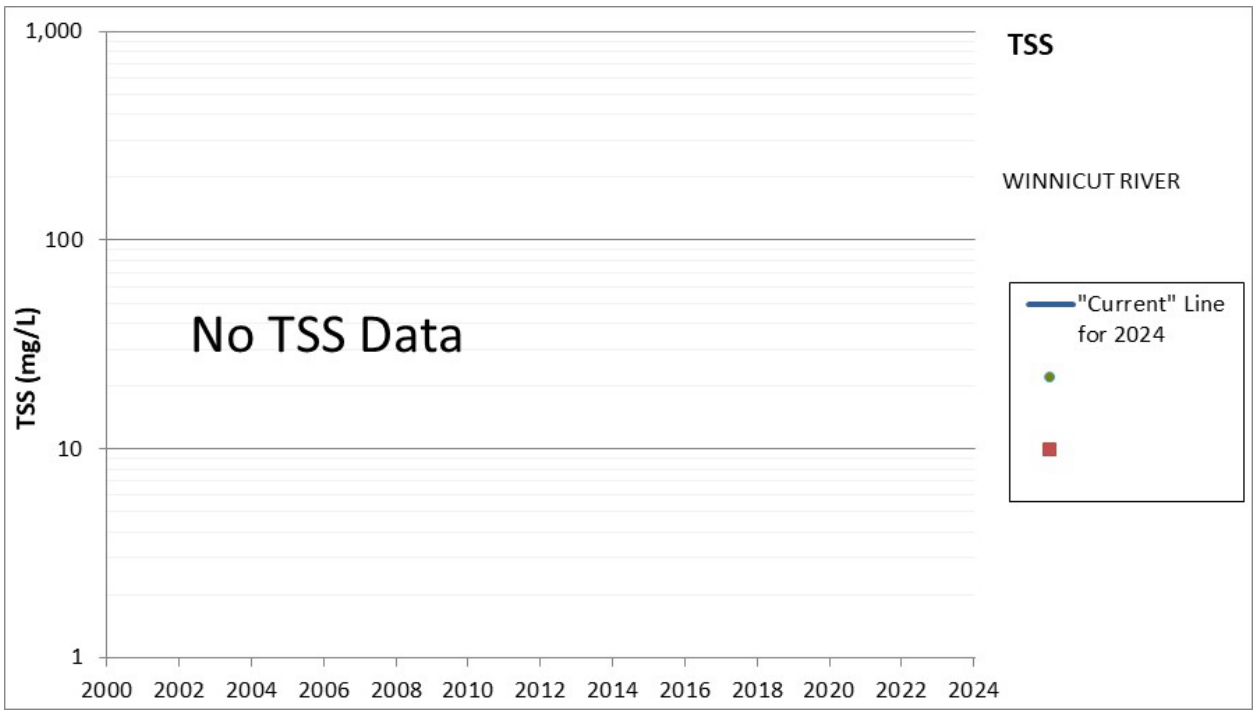
Indicator	Aquatic Life Use Category 2020/2022 / 2024	2024 Comment
Chlorophyll-a	3-ND / 3-ND	The chlorophyll-a indicator threshold to prevent low dissolved oxygen and preserve light for eelgrass is a 90th percentile below 10 µg/L. However, no chlorophyll-a data was collected in the current period for this assessment zone.
Dissolved Oxygen (mg/L)	3-ND / 3-ND	This assessment zone has no measurements for dissolved oxygen concentration since 2009. As such, this assessment zone has been assessed as 3-ND (No Data) dissolved oxygen concentration.
Dissolved Oxygen (% Saturation)	3-ND / 3-ND	This assessment zone has no measurements for dissolved oxygen percent saturation since 2008. As such, this assessment zone has been assessed as 3-ND (No Data) for dissolved oxygen percent saturation.
Estuarine Bioassessments (eelgrass)	5-P / 5-P	The historical extent of eelgrass in this assessment zone was not available from the 1948, 1962, 1980 and 1981 datasets. Eelgrass was present from 1990 through 2006. The median current extent of eelgrass in 2019-2022 is 1.3 acres. Notably, the 2022 eelgrass cover (7.8 acres) was the highest since 2005. Since 1990, the trend in eelgrass cover in this assessment zone is a loss of 72.7%. The thresholds for impairment are either a loss of more than 20% of the historic extent of eelgrass or a recent trend of greater than 20% loss.
Water Clarity (Light Attenuation Coefficient)	3-ND / 3-ND	No light attenuation coefficient data has been collected in the current period for this assessment zone.
Total Nitrogen	3-ND / 3-ND	There are no “current” total nitrogen data from which to calculate a median total nitrogen from 2012 through 2018. As such, this assessment zone cannot be assessed for total nitrogen.

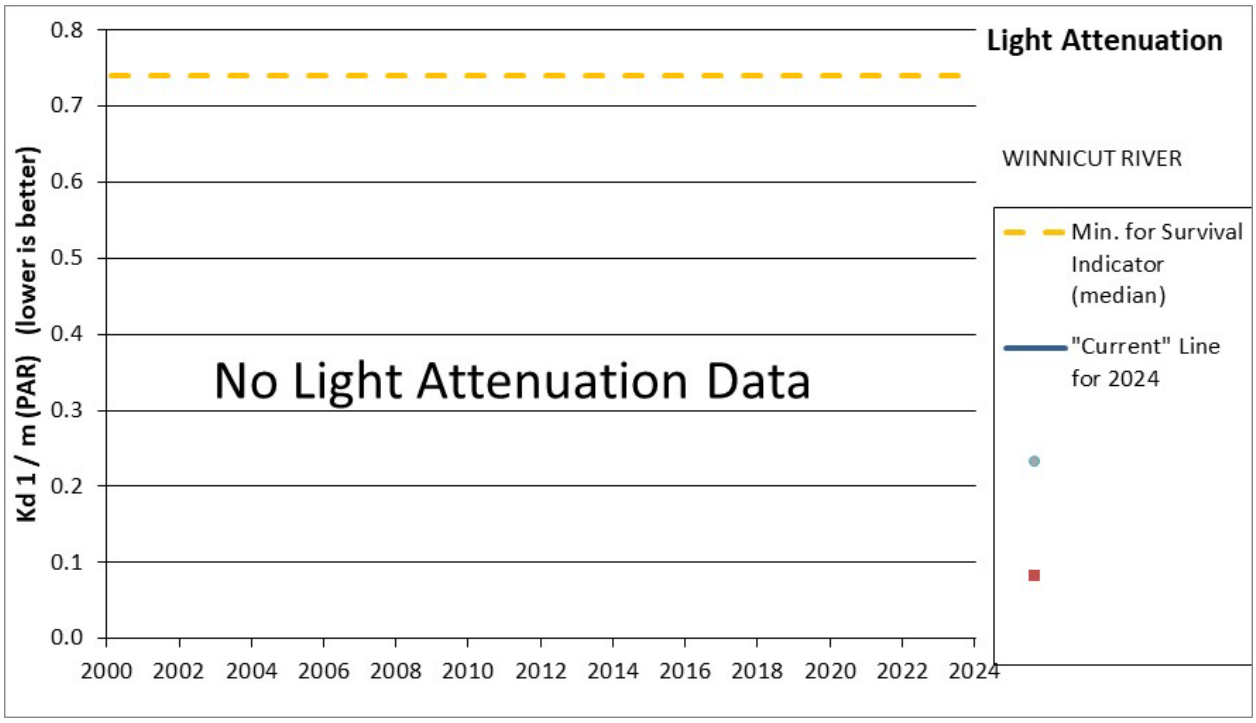

Chlorophyll-a
WINNICUT RIVER
ug Chl-a / L
No Chlorophyll-a Data
Chl-a Ind. (90th percentile)
"Current" Line for 2024
12
10
8
6
4
2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024

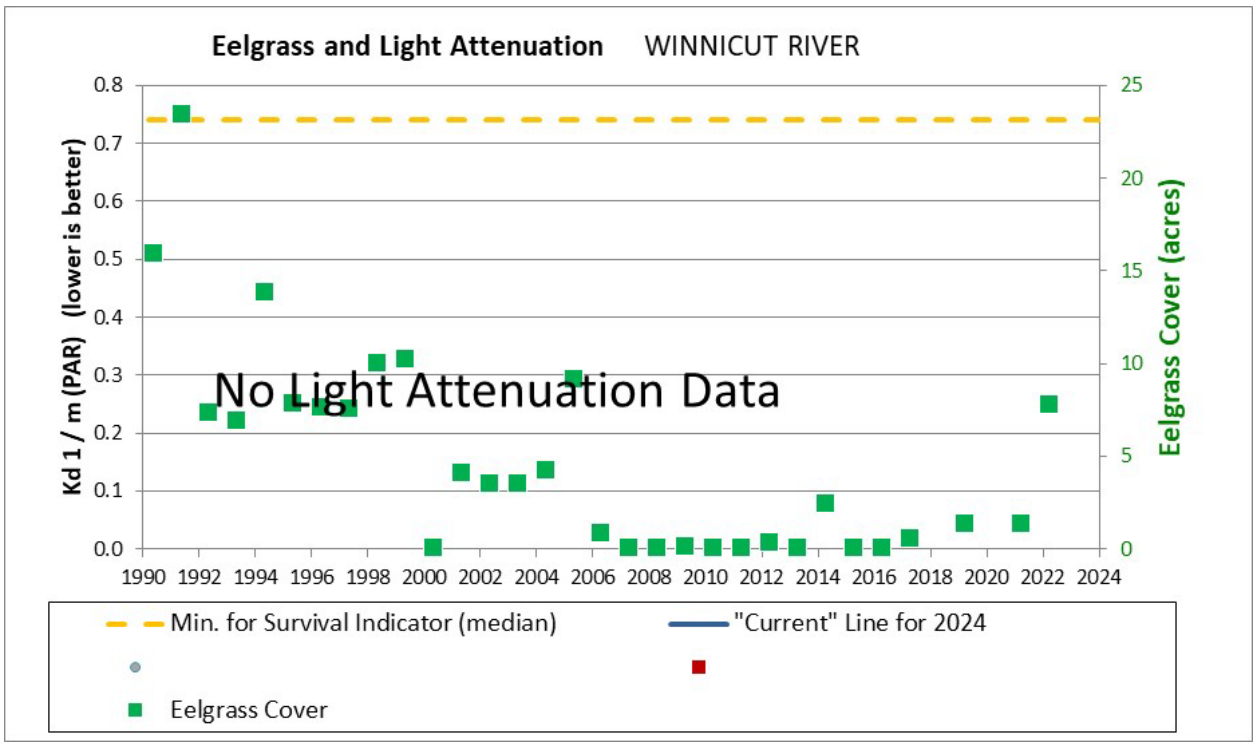

Chlorophyll-a
WINNICUT RIVER
ug Chl-a / L
No Chlorophyll-a Data
Chl-a Ind. (90th percentile)
"Current" Line for 2024
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024

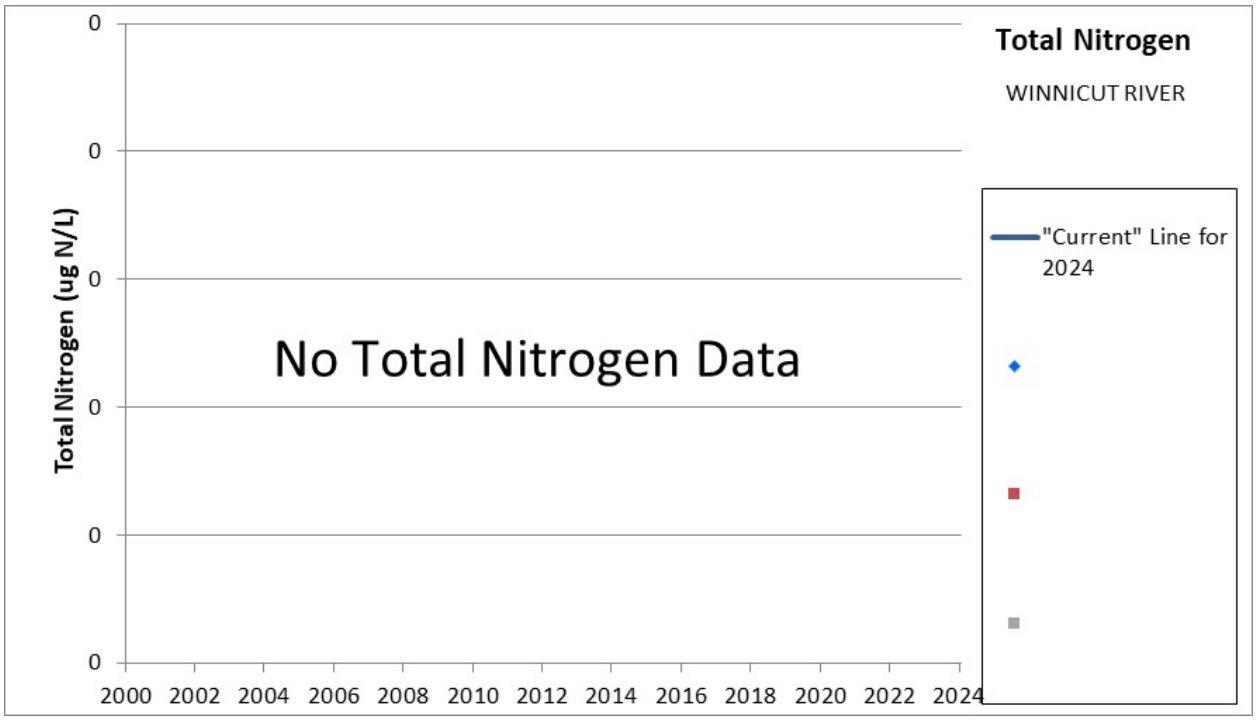

Dissolved Oxygen Concentration
WINNICUT RIVER
Dissolved Oxygen, mg / L
0
2
4
6
8
10
12
14
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP


Dissolved Oxygen Percent Saturation
WINNICUT RIVER
Dissolved Oxygen, Percent Saturation
0
20
40
60
80
100
120
140
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-PERC-24H-MEAN-NCP
DO-SAT-GRAB


TSS
WINNICUT RIVER
No TSS Data
TSS (mg/L)
1,000
100
10
1
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024


Light Attenuation
WINNICUT RIVER
No Light Attenuation Data
Kd 1 / m (PAR) (lower is better)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024


Eelgrass and Light Attenuation
WINNICUT RIVER
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
No Light Attenuation Data
Min. for Survival Indicator (median)
"Current" Line for 2024
Eelgrass Cover


Total Nitrogen
WINNICUT RIVER
Total Nitrogen (ug N/L)
No Total Nitrogen Data
"Current" Line for 2024

Winnicut River Assessment Zone (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	0	-	-	-	-
LIGHT ATTENUATION COEFFICIENT (1/m)	0	-	-	-	-
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	0	-	-	-	-
TSS (mg/L)	0	-	-	-	-
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	0	-	-	-	-
DO-PPM-24HR-MIN-CP (mg/L)	0	-	-	-	-
DO-PPM-24HR-MIN-NCP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-CP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-NCP (mg/L)	0	-	-	-	-
DO-PERC-24H-MEAN-CP (% sat)	0	-	-	-	-
DO-PERC-24H-MEAN-NCP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	0	-	-	-	-
Day Ave of TN (ug N/L)	0	-	-	-	-
Day Ave of TDN (ug N/L)	0	-	-	-	-
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	0	-	-	-	-
Day Ave of NH3 (ug N/L)	0	-	-	-	-
Day Ave of PON (ug N/L)	0	-	-	-	-
Day Ave of NO2/3 (ug N/L)	0	-	-	-	-
SALINITY-Grabs (pss)	3	19.7	28.1	-	28.5
SALINITY-Datalogger Daily Median (pss)	0	-	-	-	-
pH-grab	0	-	-	-	-
pH-24HR (min)	0	-	-	-	-
pH-24HR (max)	0	-	-	-	-
Temperature	3	12.2	13.3	-	17.8
Temperature-Daily Median	0	-	-	-	-

*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

Assessment Zone = GREAT BAY

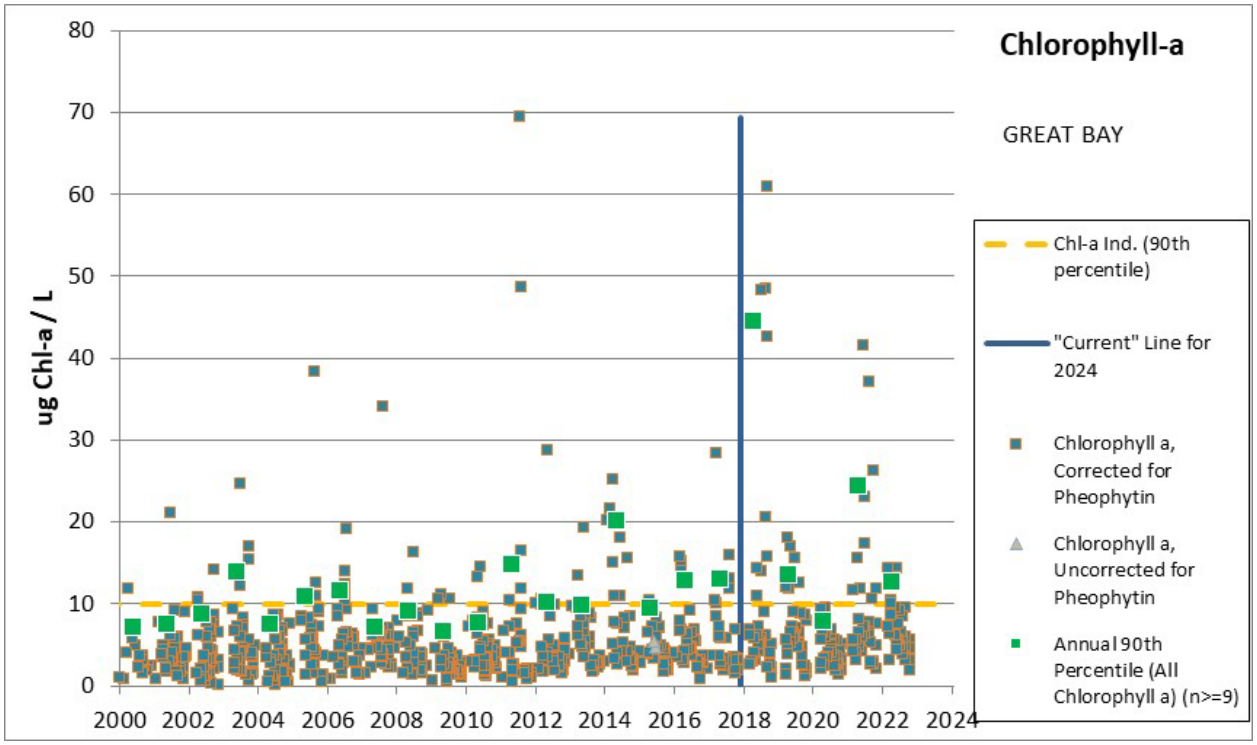
(NHEST600030904-02, NHEST600030904-03, NHEST600030904-04-02, NHEST600030904-04-03, NHEST600030904-04-04, NHEST600030904-04-05, NHEST600030904-04-06).

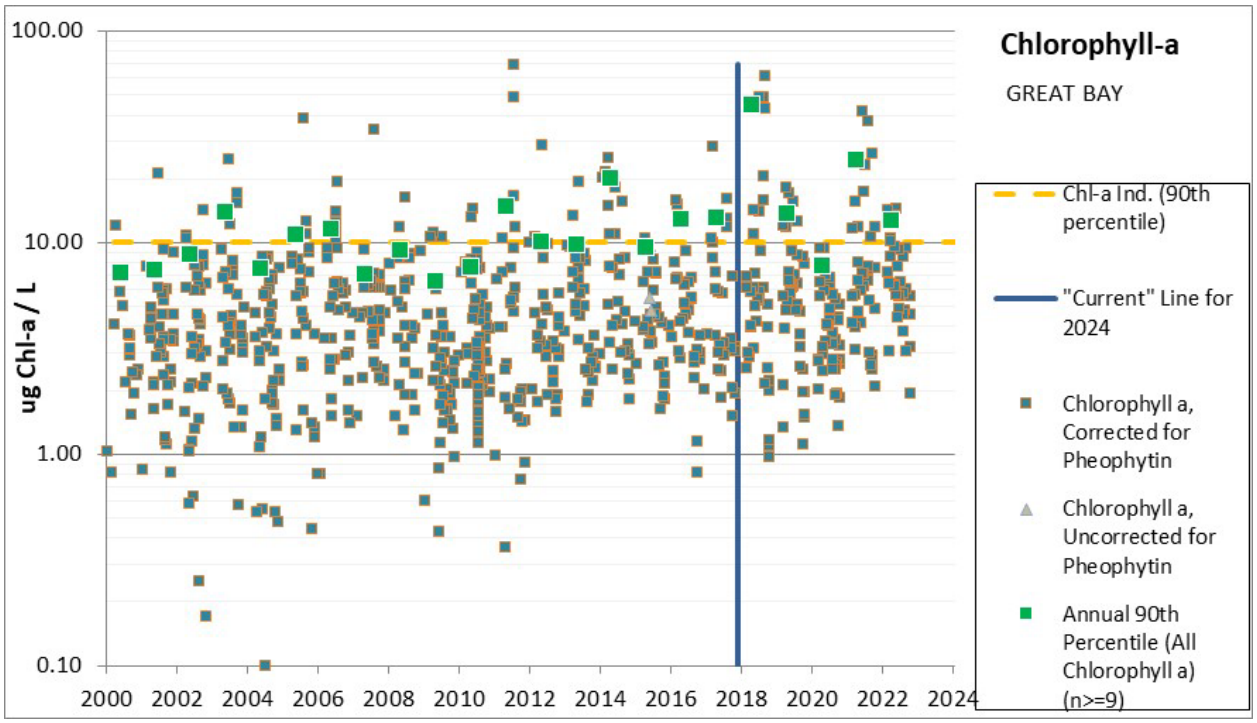
As of the date of data retrieval (April 13, 2023) water quality data through 2022 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means there are four additional years of data (2019-2022) compared to the 2020/2022 assessment. Almost all of the historic, and much of the current, data for the assessment zone comes from the Great Bay Bouy NW of Nannie Island (GRBGB) and the two boundary stations at the Squamscott (GRBSQ) and Adams Point (GRBAP). There are two relatively new stations in the Great Bay assessment zone. In 2017, 2019 and 2021 (Jun-Dec) Great Bay West (GRBGBW) had a datalogger deployed and grab samples in 2020 and 2022, and in 2018, 2020 and 2022 (Apr-Nov) Great Bay East (GRBGBE) had a dataloggers deployed and grab samples in 2018-2021.

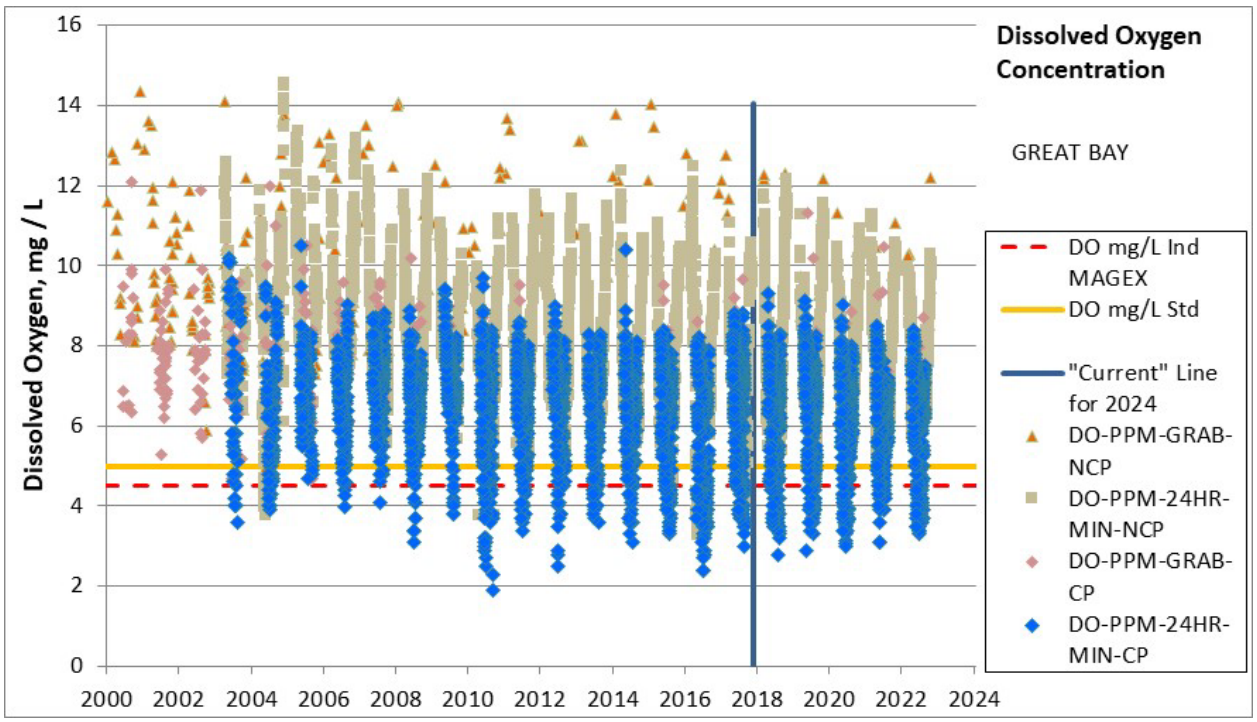
Indicator	Aquatic Life Use Category 2020/2022 / 2024	2024 Comment
Chlorophyll-a	5-M / 5-M	The calculated 90th percentile for chlorophyll-a in this assessment zone is 14.3 µg/L (n = 180) [19.5 µg/L (n=93) without GRBAP and GRBSQ]. The chlorophyll-a indicator threshold to prevent low dissolved oxygen and preserve light for eelgrass is a 90th percentile below 10 µg/L. Elevated chlorophyll-a levels were particularly common in 2018 and 2021 in the non-boundary stations, GRBGB and the new GRBGBE, exceeding 40 ug/L on 4 of the different grab sample dates at GRBGBE and peaking at 60.9 ug/L at GRBGB. As chlorophyll-a is very high at the Squamscott River boundary and generally high and at times very high at two additional stations within Great Bay, one of the response variables is marginal bad (dissolved oxygen), and the other is very poor (light), chlorophyll-a has been assessed as Not Supporting.
Dissolved Oxygen (mg/L)	3-PNS / 5-M	This assessment zone has 24-hour dataloggers and grab measurements for dissolved oxygen concentration. In the center of Great Bay is the GRBGB station which has never had DO readings under 5 mg/L. One of the assigned stations (GRBSQ - Squamscott River datalogger at RR bridge) is at the mouth of the Squamscott River, precisely at the divide between the Squamscott River and Great Bay assessment zones. The very low readings from GRBSQ have been cause for concern in Great Bay for some time now. While GRBSQ more accurately represents the conditions in the Squamscott River than the entirety of Great Bay proper, it indicates that low DO issues are likely to extend into portions of Great Bay. In 2017 a new rotational site was established on the west side of Great Bay (GRBGBW), roughly 1 mile from GRBSQ. Were the low DO issues from GRBSQ to extend into Great Bay, GRBGBW is the datalogger where we would expect to see those low DO concentrations. In 2017 and 2019 GRBGBW had DO minimums of 5.6 and 5.3 mg/L respectively, then in 2021 during a period of low freshwater inflow there were 21 days when the minimum fell below 5 mg/L and as low as 3.1 mg/L. Although the duration of the low DO values never exceeded 1.5 hours, the frequency of occurrence and the magnitude of the DO drops illustrate that either the low DO from the tidal tributaries extends well out into Great Bay or that the western side of Great Bay has its own DO problems. In counter rotation to GRBGBW a new site was established on the east side of Great Bay (GRBGBE). In both 2018 and 2022 GRBGBE had infrequent, less severe, short-term drops below 5 mg/L compared to GRBGBW. Considering all the data across the assessment zone, conditions warrant adding dissolved oxygen concentration as an impairment to the 2024 assessment. Although, the low DO readings would normally

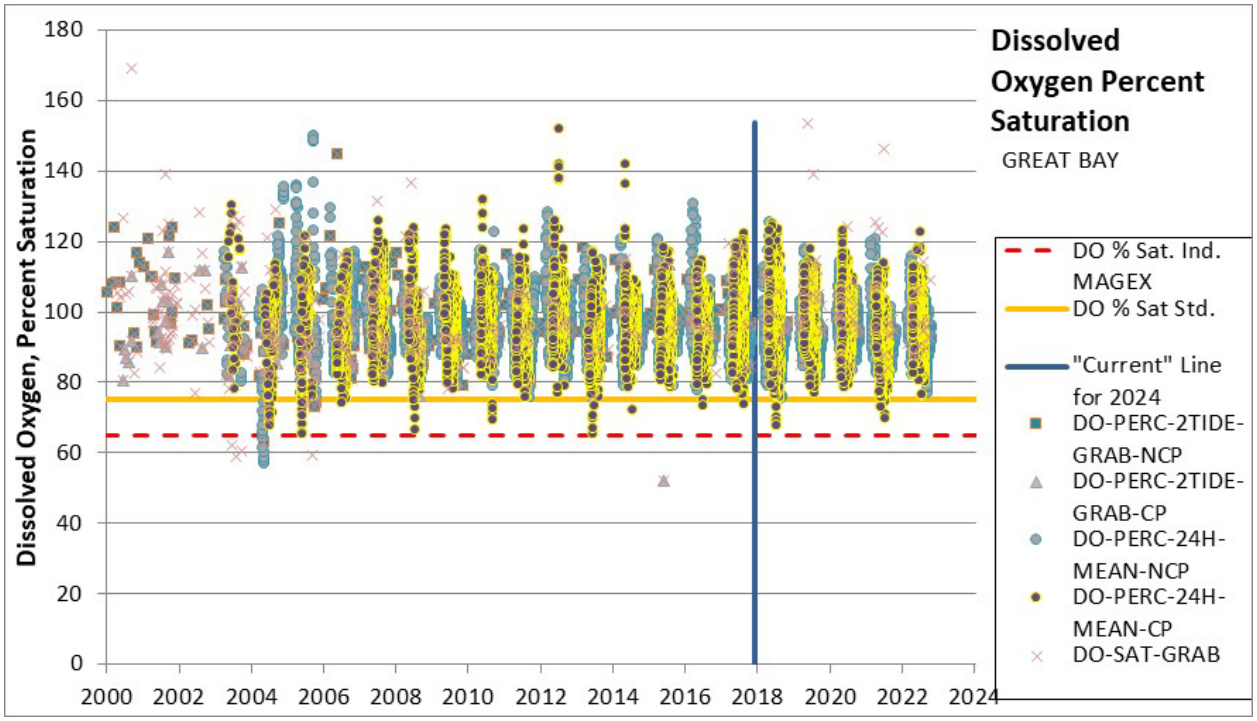
		qualify as a severe impairment, the spatial extent and frequency warrants a 5-M determination.
Dissolved Oxygen (% Saturation)	2-M / 2-M	This assessment zone has 24-hour datalogger and grab measurements for dissolved oxygen percent saturation. One of the assigned stations (GRBSQ - Squamscott River datalogger at RR bridge) is at the mouth of the Squamscott River, precisely at the divide between the Squamscott River and Great Bay assessment zones. While GRBSQ more accurately represents the conditions in the Squamscott River than the entirety of Great Bay proper, it does indicate low DO issues are likely to extend into portions of Great Bay. The primary sampled station (GRBGB) as well as the new GRBBGW and GRBGBE stations inside of the Great Bay assessment zone all have recorded acceptable dissolved oxygen saturation 0.5 meters off the bottom.
Estuarine Bioassessments (eelgrass)	5-P / 5-P	The historical extent of eelgrass in this assessment zone was 2,130.7 acres from the 1948, 1962, 1980 and 1981 datasets. The median current extent of eelgrass in 2019-2022 is 1,451 acres, which is a 31.9% decrease. Since 1990, the trend in eelgrass cover in this assessment zone is a loss of 32.4%. The thresholds for impairment are either a loss of more than 20% of the historic extent of eelgrass or a recent trend of greater than 20% loss.
Water Clarity (Light Attenuation Coefficient)	5-M / 5-P	Median=1.63 m^-1 (n=157) [1.60 µg/L (n=77) without GRBAP and GRBSQ]. For an eelgrass restoration depth of 2 m, the light attenuation coefficient threshold is 0.75 m^-1. This assessment zone historically had eelgrass growing in both the shallows and deeper habitat making the 2m restoration depth a valid target. As the light attenuation is now more than twice the target, the impaired is considered severe (5-P).
Total Nitrogen	5-M / 5-M	The median total nitrogen from 2018 through 2022 was 425 µg/L (n=186) when considering only the stations in the middle of Great Bay; and 406 µg/L (n=97) when including the boundary stations GRBSQ and GRBAP. The long-term Great Bay sites (GRBGB, GRBGBW, GRBGBE) recorded 27-measurments over 500 ug/L in the current period (28% of samples). Dr. Howes indicated (Howes, 2019) a growing season (May-Sept) average of 320-350 ug/L "…should be protective of that resource [eelgrass in the Great Bay system] based on [his] experience with nearby Massachusetts estuarine waters." As indicated here, the median total nitrogen from 2018 through 2022 was 406 µg/L (n=97) when considering only the stations in the middle of Great Bay. The average of the same 97 samples is 446 ug/L over the full calendar year and 428 ug/L (n=55) in the growing season. The calculated 90th percentile for chlorophyll-a in this assessment zone is 14.3 µg/L (n = 180) [19.5 µg/L (n=93) without GRBAP and GRBSQ]. For shallow systems, it is expected that changes in macroalgae will precede changes in phytoplankton (McGlathery, Sundbäck, & Anderson, 2007) (Valiela, et al., 1997), which in part appears to be the case in the Great Bay assessment zone. Both intertidal green and red seaweeds (macroalgae) decreased (weakly significant) from 2013 to 2020 at the Depot Road site which, of the macroalgae monitoring sites, is closest to the mouths of the Lamprey and Squamscott Rivers, and intertidal green macroalgae decreased (significantly) since 2014 at Adams Point (Payne, et al., 2021) . However, the appreciable cover at Lubberland Creek and Sunset Hill Farm did not show statistical decreases although those two sites have only been sampled 4 and 3-times respectively from 2013-2020 making trend detection more difficult(Payne, et al., 2021) . Beginning in 2018, subtidal sampling was first added to the macroalgae monitoring at the four sites around Great Bay. The 2019 annual macroalgae report notes that, "Sites with the highest percent cover and biomass of red and green seaweed had the lowest abundance of eelgrass." (Burdick, et al., 2020), a finding that is consistent of competitive displacement but the 2020 data report notes, "However, the increase in cover of all three groups

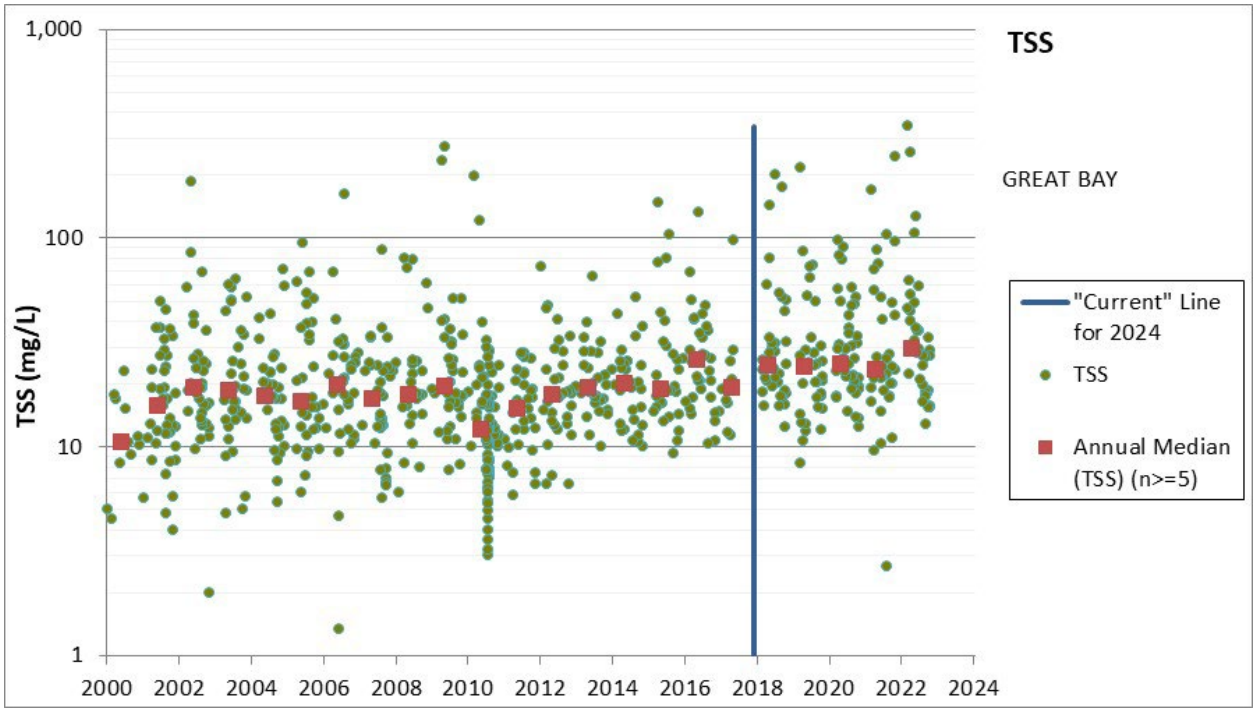
		indicates that the increased abundance of greens and reds did not appear to impair seagrass growth this year [2020].” (Payne, et al., 2021). There is evidence that macroalgae is impacting eelgrass and changing the species composition and diversity in Great Bay to some extent as noted by Payne, et al. 2021, “Historical accounts of seaweeds in the estuary over the past 30 years suggest increases in nuisance and exotic species as seagrasses declined (Cianciola 2014, Nettleton et al. 2011, Beem and Short 2009, Short 2014).” Using data from Great Bay (Pe’eri, Morrison, Short, Mathieson, Brook, & Trowbridge, 2008), NHDES determined that macroalgae mats had replaced nearly 5.7% of the area formerly occupied by eelgrass in Great Bay in 2007 (NHDES, 2009). The 2019, 2021 and 2022 eelgrass mapping suggests that the large area that was dominated by macroalgae along the south side of the bay is still macroalgae (2021 mapping) with some recolonization by eelgrass and widgeon along the edges of that macroalgae zone. Overall, the eelgrass beds remain degraded and the available light attenuation ([median=1.63 m^-1 (n=157)] [1.60 µg/L (n=77) without GRBAP and GRBSQ]) is poor. This assessment zone has no demonstrated dissolved oxygen concentration exceedances at station GRBGB in the middle of Great Bay, but some at GRBGBE (2018 and 2022) and more at GRBGBW (2022) on the west side illustrating the scope of areas in the southwest that exhibit poor dissolved oxygen concentration. Daily average dissolved oxygen percent saturation values remain above 75% at the main stations GRBGB, GRBGBW and GRBGBE. Per the CALM, in order to assess compliance with the narrative nutrient criteria for the Great Bay estuary, the indicators of nutrients and nutrient-related impacts are collectively evaluated. The methodology describes that the assessment decision is based on a preponderance of evidence and the status of those indicators. In this assessment zone, not only has eelgrass been lost and light attenuation is unsuitable for its growth, but the chlorophyll-a indicator is elevated above the 90th percentile for the protection of eelgrass and is elevated as compared to previous assessment periods and DO is low in particular areas. The levels of TN in the assessment zone are higher than what would be considered protective levels (Howes, 2019) and are quite high (over 500 ug/L) on many occasions (27 of 97 samples or 28% of the time). Given the number of eutrophication indicators that are above the levels identified in CALM as needed to support aquatic life use integrity, and the preponderance of evidence indicating the impacts of eutrophication, this assessment zone has been retained as non-supporting for total nitrogen.

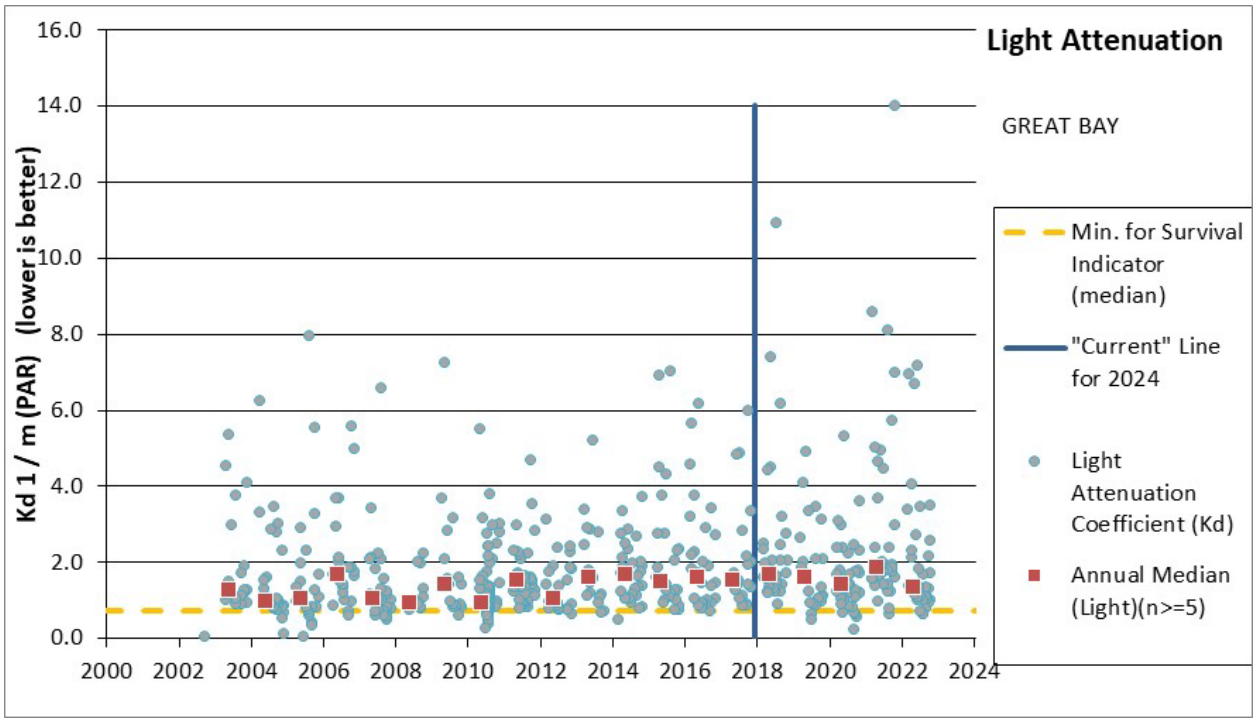

Chlorophyll-a
GREAT BAY
ug Chl-a / L
80
70
60
50
40
30
20
10
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

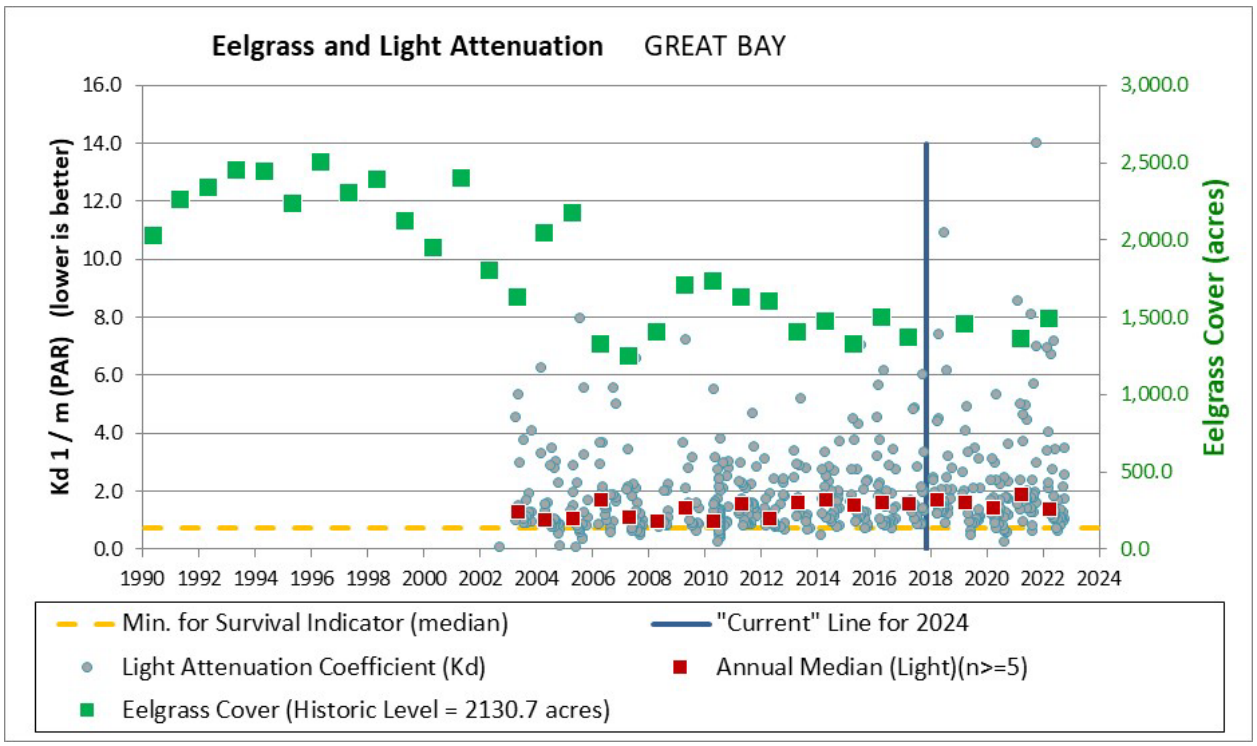

Chlorophyll-a
GREAT BAY
ug Chl-a / L
100.00
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

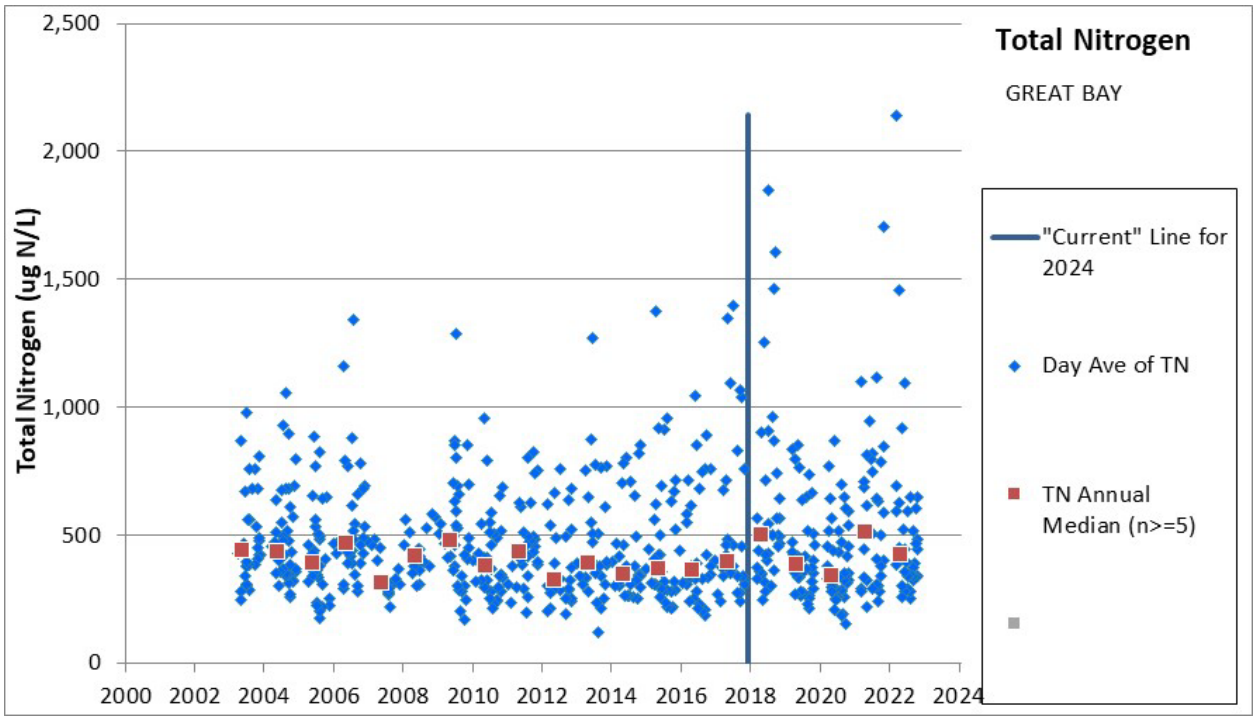

Dissolved Oxygen Concentration
GREAT BAY
Dissolved Oxygen, mg / L
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
GREAT BAY
Dissolved Oxygen, Percent Saturation
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB

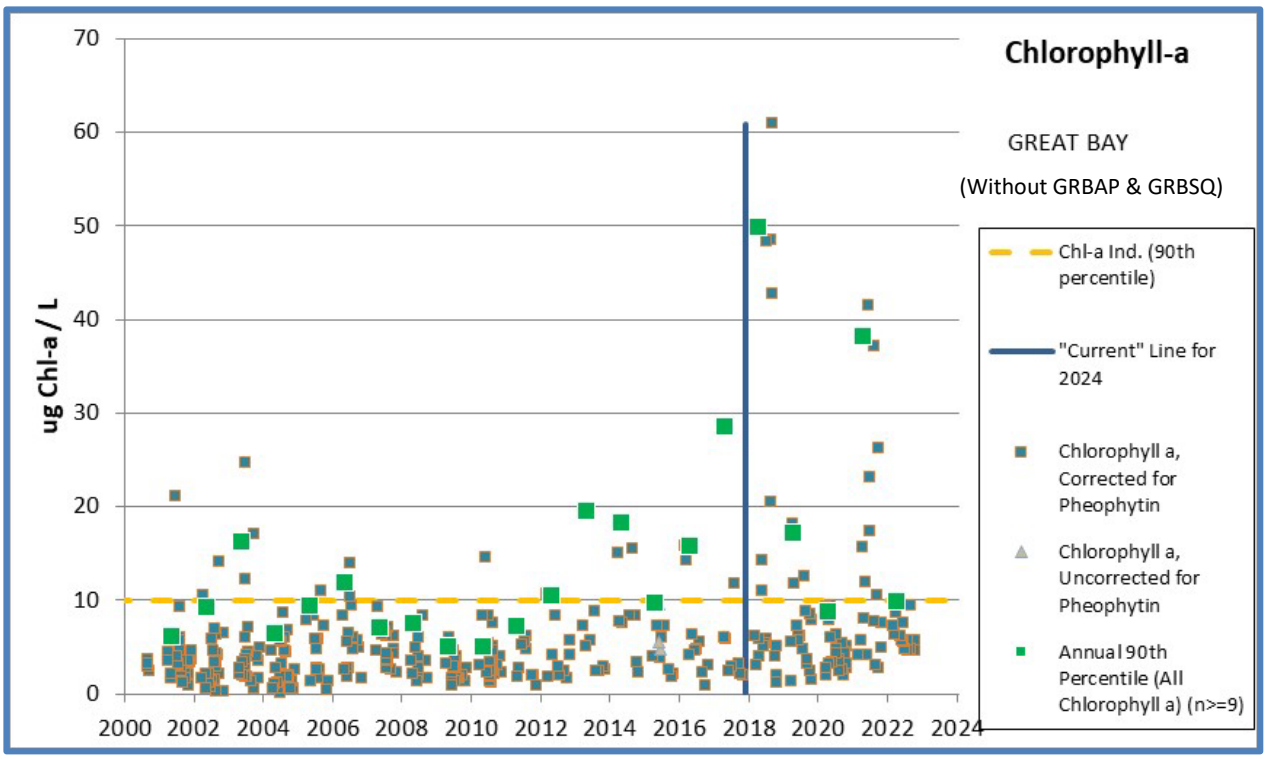

TSS
GREAT BAY
TSS (mg/L)
1,000
100
10
1
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)

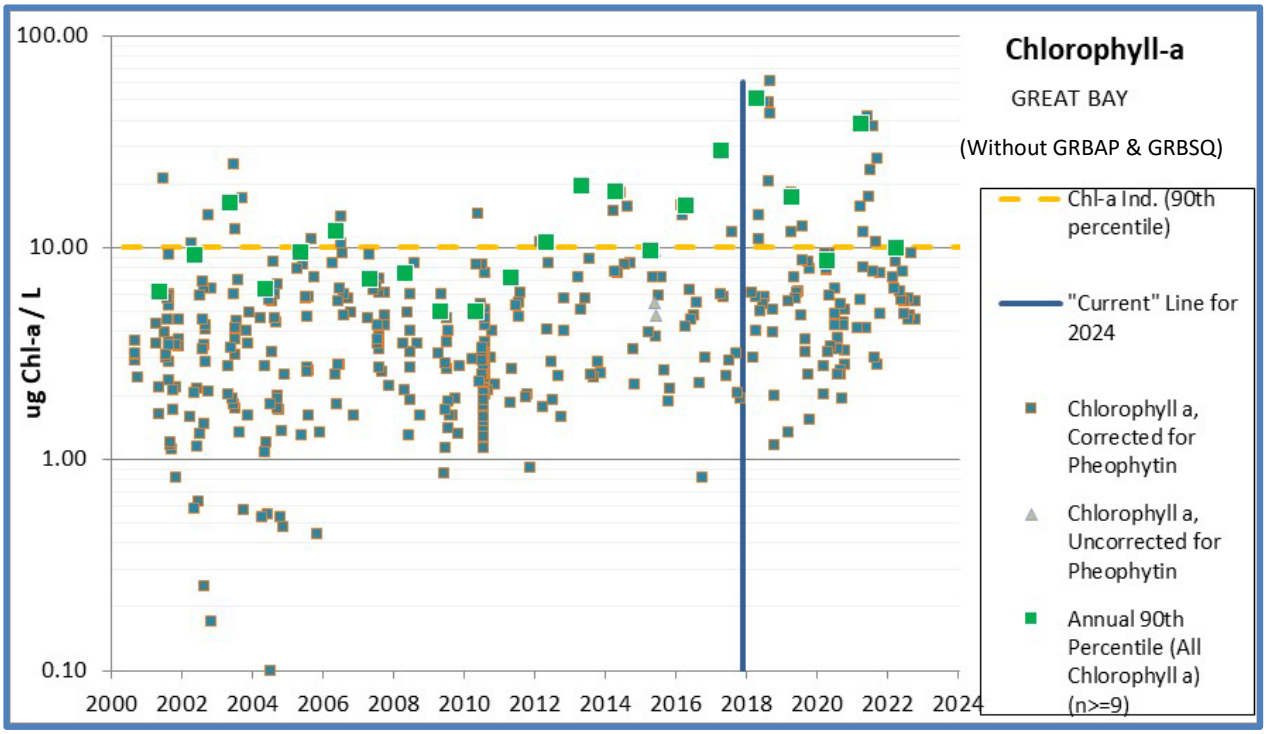

Light Attenuation
GREAT BAY
Kd 1 / m (PAR) (lower is better)
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)

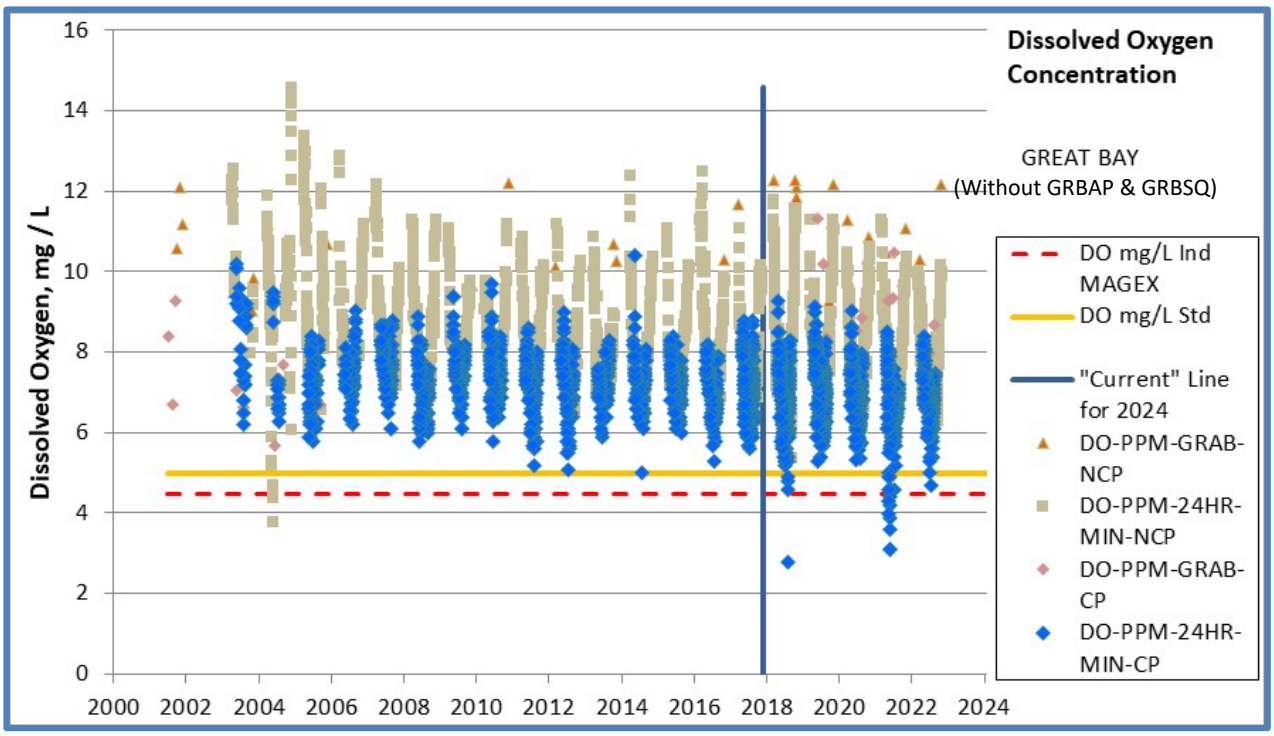


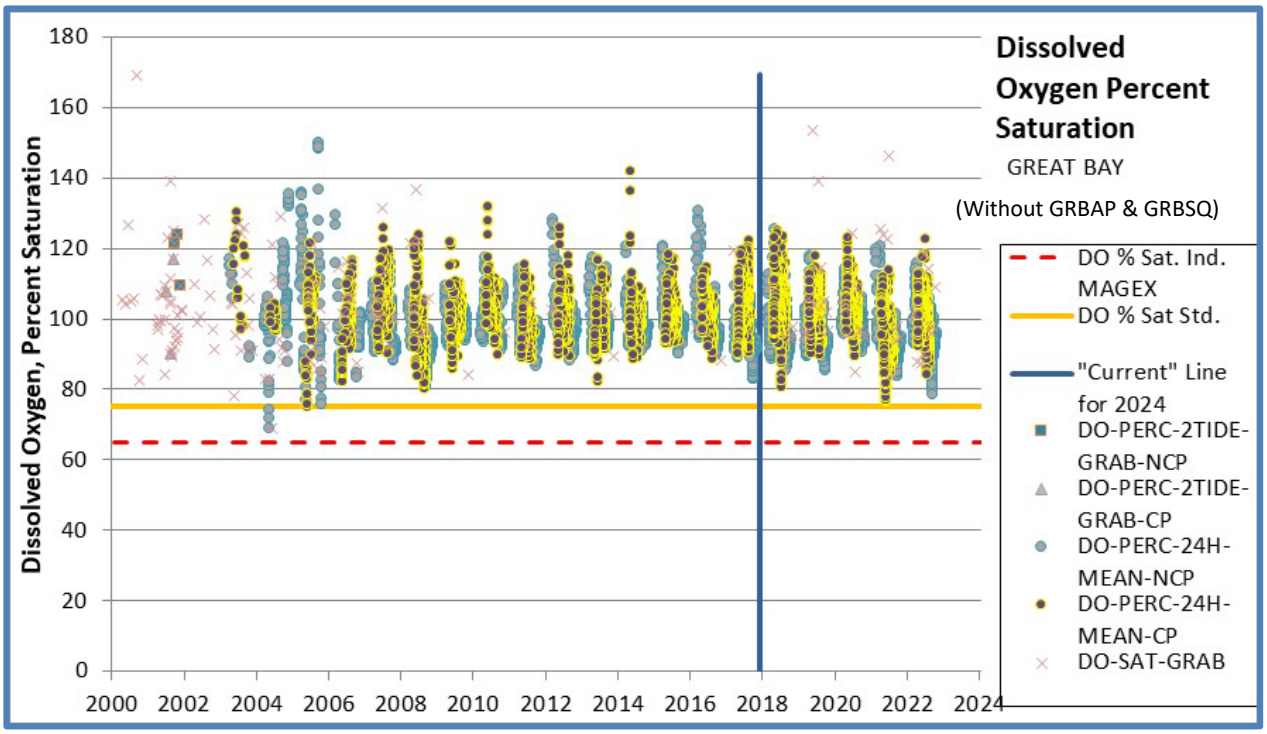


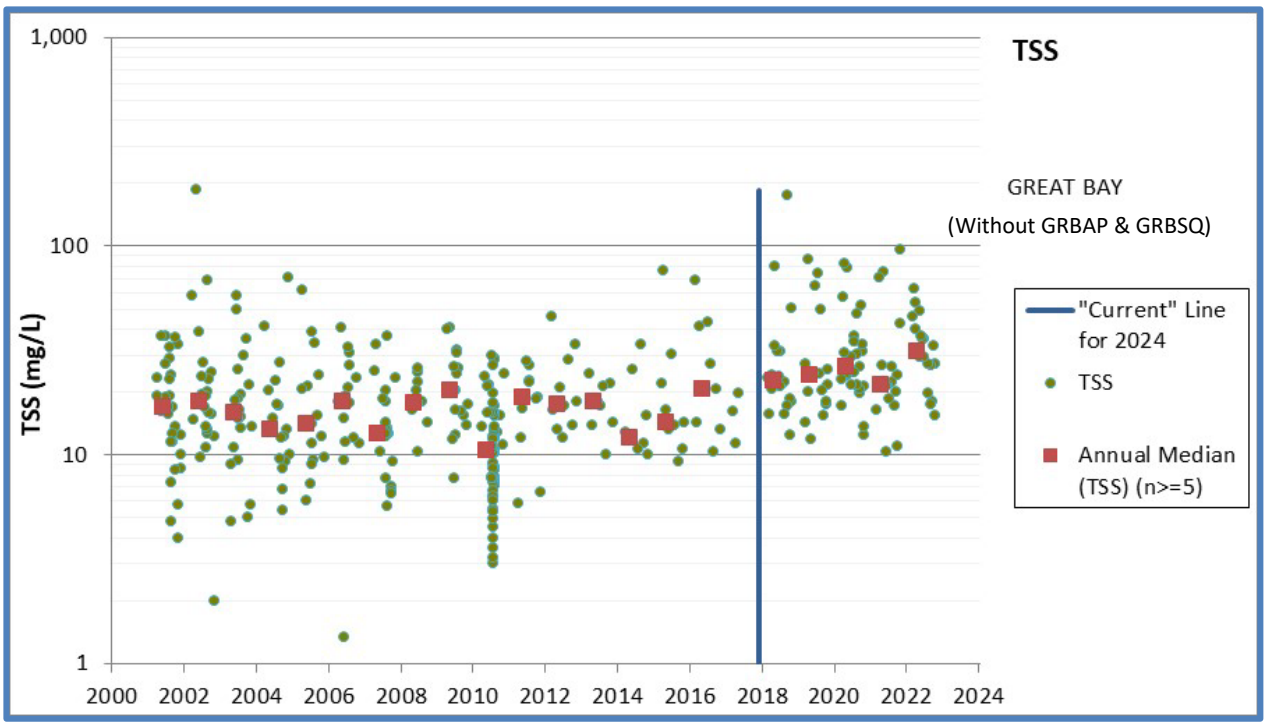
Plots of Great Bay without the boundary sampling stations at Adams Point (GRBAP) and the Squamscott River at the railroad trestle (GRBSQ).

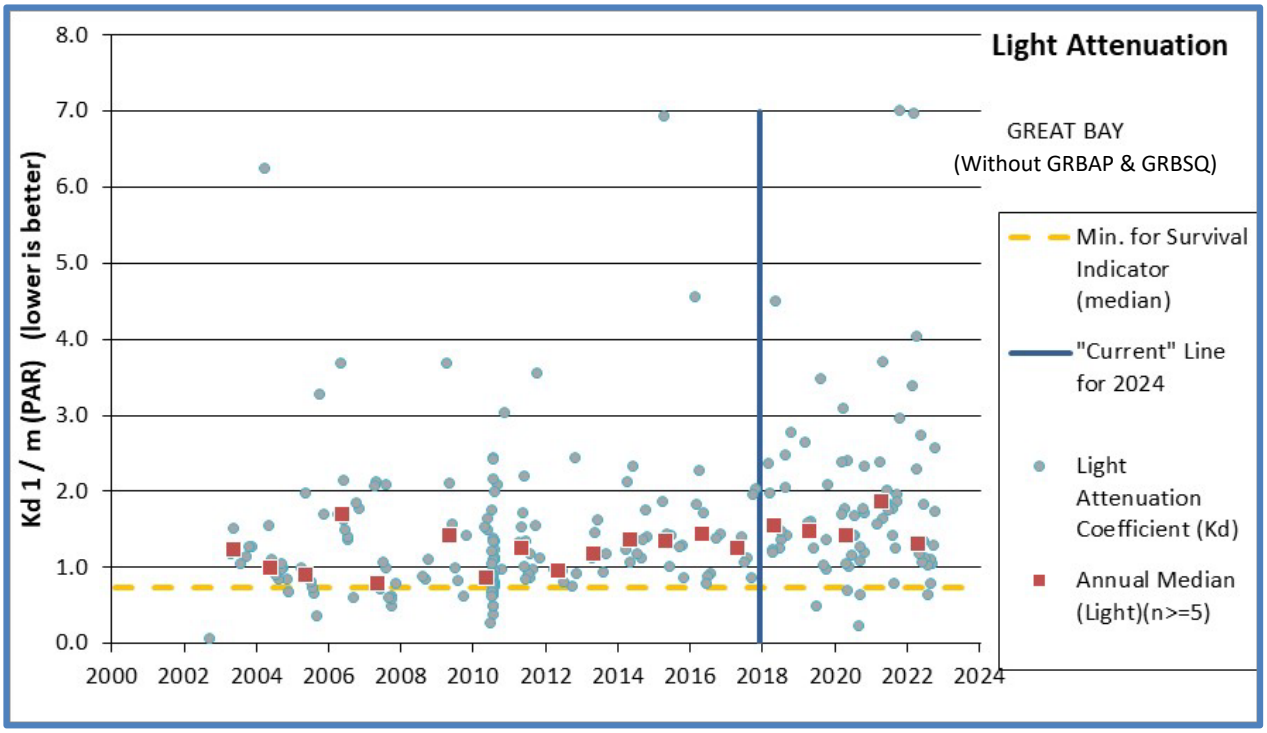

Chlorophyll-a
GREAT BAY
(Without GRBAP & GRBSQ)
ug Chl-a / L
70
60
50
40
30
20
10
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

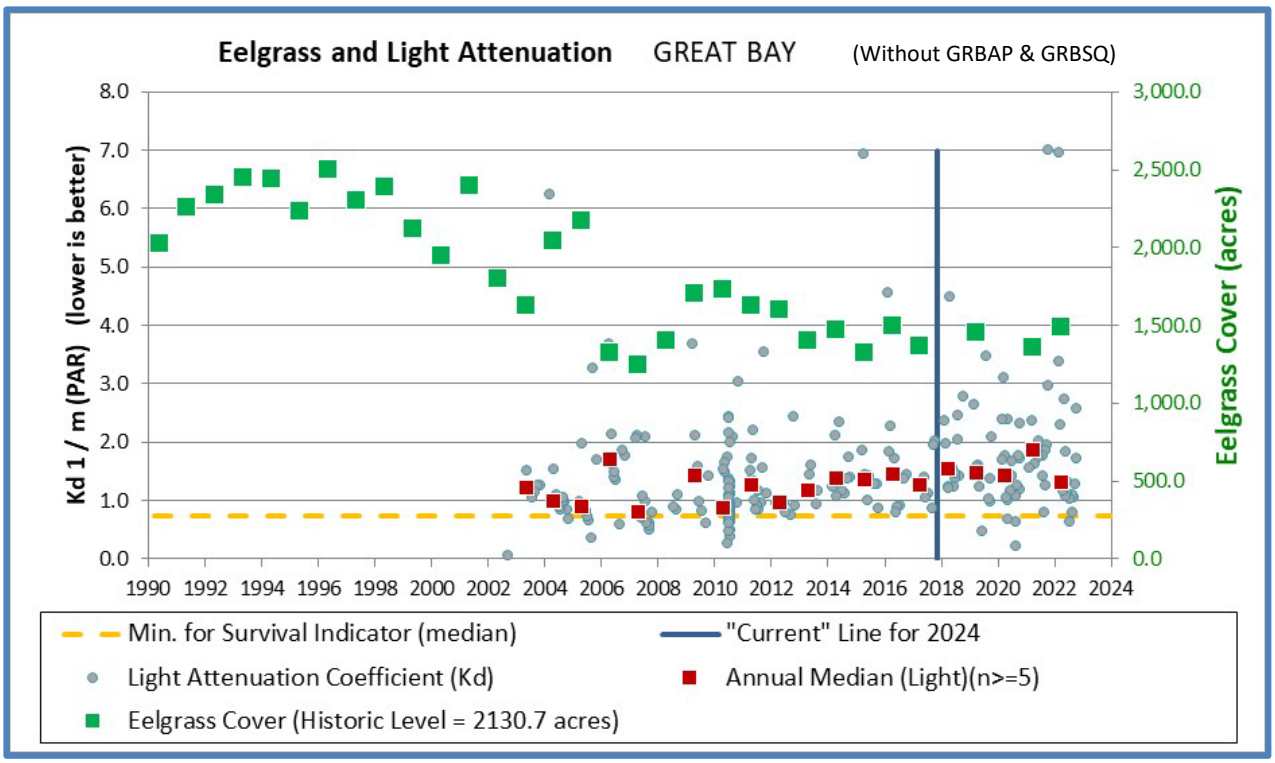

Chlorophyll-a
GREAT BAY
(Without GRBAP & GRBSQ)
ug Chl-a / L
100.00
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

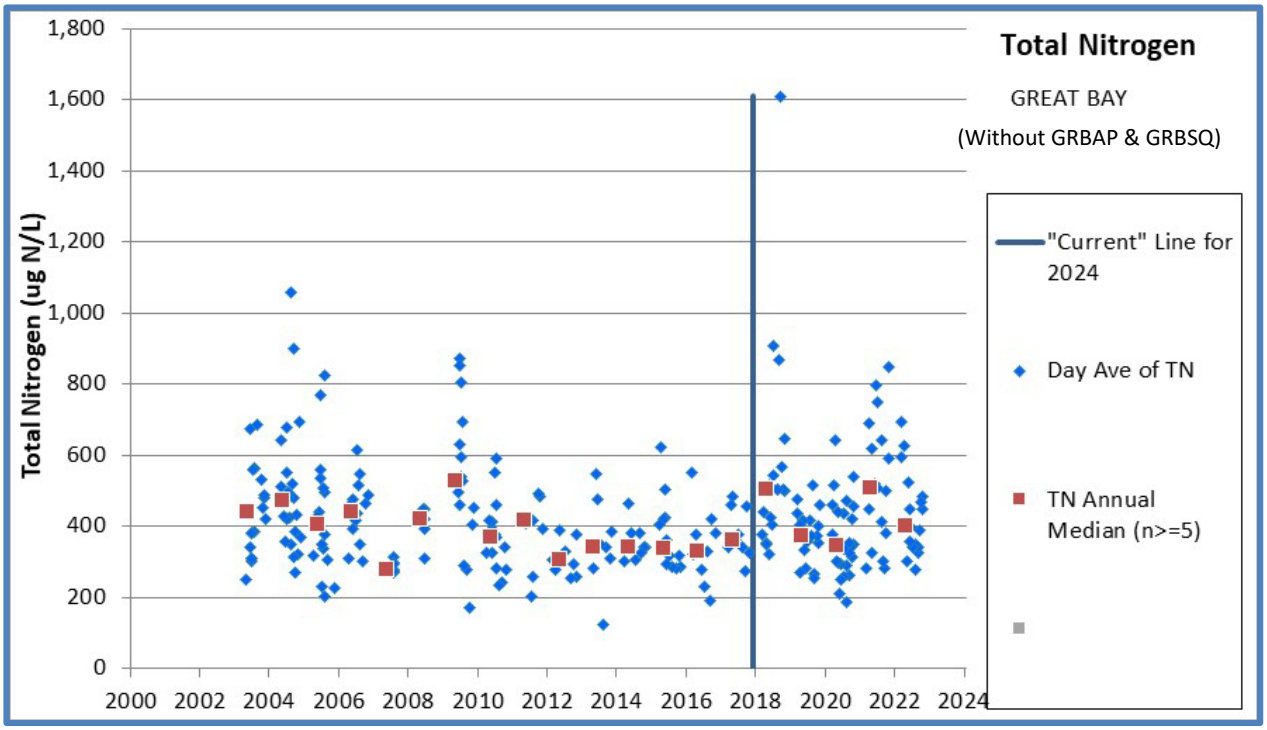

Dissolved Oxygen Concentration
GREAT BAY
(Without GRBAP & GRBSQ)
Dissolved Oxygen, mg / L
DO mg/L Ind
MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
GREAT BAY
(Without GRBAP & GRBSQ)
Dissolved Oxygen, Percent Saturation
DO % Sat. Ind.
MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
GREAT BAY
(Without GRBAP & GRBSQ)
TSS (mg/L)
1,000
100
10
1
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)


Light Attenuation
GREAT BAY
(Without GRBAP & GRBSQ)
Kd 1 / m (PAR) (lower is better)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)


Eelgrass and Light Attenuation
GREAT BAY
(Without GRBAP & GRBSQ)
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
3,000.0
2,500.0
2,000.0
1,500.0
1,000.0
500.0
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)
Eelgrass Cover (Historic Level = 2130.7 acres)


Total Nitrogen
GREAT BAY
(Without GRBAP & GRBSQ)
Total Nitrogen (ug N/L)
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)

Great Bay Assessment Zone (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	180	1.0	5.5	14.3	60.9
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	180	0.0	5.5	14.3	60.9
LIGHT ATTENUATION COEFFICIENT (1/m)	157	0.24	1.63	4.71	14.02
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	3,338	1.0	6.0	16.0	366.0
TSS (mg/L)	186	2.7	24.8	78.9	343.6
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	143	1.7	3.7	6.8	13.7
DO-PPM-24HR-MIN-CP (mg/L)	1,798	2.8	6.6	7.7	9.3
DO-PPM-24HR-MIN-NCP (mg/L)	1,562	4.8	8.6	10.2	12.2
DO-PPM-GRAB-CP (mg/L)	36	6.0	7.6	9.6	11.3
DO-PPM-GRAB-NCP (mg/L)	53	7.5	9.6	12.1	12.3
DO-PERC-24H-MEAN-CP (% sat)	1,791	67.9	97.4	109.8	125.2
DO-PERC-24H-MEAN-NCP (% sat)	1,532	75.5	93.4	101.9	125.5
DO-PERC-2TIDE-GRAB-CP (% sat)	20	81.8	100.8	108.8	112.1
DO-PERC-2TIDE-GRAB-NCP (% sat)	25	87.3	96.5	104.6	110.6
DO-PERC-GRAB (% sat)	89	81.8	97.8	114.5	153.7
Day Ave of TN (ug N/L)	186	157	425	851	2,141
Day Ave of TDN (ug N/L)	186	55	280	510	957
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	186	8	128	285	570
Day Ave of NH3 (ug N/L)	186	3	37	133	490
Day Ave of PON (ug N/L)	36	58	132	508	1,797
Day Ave of NO2/3 (ug N/L)	186	4	60	164	462
SALINITY-Grabs (pss)	192	0.1	22.1	29.9	31.5
SALINITY-Datalogger Daily Median (pss)	3,365	0.7	25.0	30.3	31.8
pH-grab	0	-	-	-	-
pH-24HR (min)	3,371	6.6	7.7	7.2*	8.3
pH-24HR (max)	3,371	7.4	8.0	8.2	8.6
Temperature	192	0.1	15.6	24.2	27.5
Temperature-Daily Median	3,397	0.0	18.0	23.9	27.2

*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

Great Bay Assessment Zone (Without GRBAP & GRBSQ) (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	93	1.2	5.7	19.5	60.9
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	93	0.0	5.7	19.5	60.9
LIGHT ATTENUATION COEFFICIENT (1/m)	77	0.24	1.60	3.16	7.01
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	2,208	1.0	4.0	9.0	366.0
TSS (mg/L)	97	10.4	24.6	65.8	175.4
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	71	1.7	3.4	5.8	8.3
DO-PPM-24HR-MIN-CP (mg/L)	1,205	2.8	6.9	7.9	9.3
DO-PPM-24HR-MIN-NCP (mg/L)	1,026	5.4	8.7	10.1	11.8
DO-PPM-GRAB-CP (mg/L)	16	6.0	8.5	10.7	11.3
DO-PPM-GRAB-NCP (mg/L)	24	7.8	10.3	12.2	12.3
DO-PERC-24H-MEAN-CP (% sat)	1,198	76.8	102.1	111.3	125.2
DO-PERC-24H-MEAN-NCP (% sat)	1,007	78.7	94.8	103.9	125.5
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	40	84.2	99.7	125.5	153.7
Day Ave of TN (ug N/L)	97	185	406	644	1,609
Day Ave of TDN (ug N/L)	97	55	250	362	437
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	97	8	75	194	497
Day Ave of NH3 (ug N/L)	97	3	24	71	490
Day Ave of PON (ug N/L)	18	77	144	252	377
Day Ave of NO2/3 (ug N/L)	97	4	43	156	289
SALINITY-Grabs (pss)	103	4.8	22.9	30.1	31.4
SALINITY-Datalogger Daily Median (pss)	2,236	7.6	25.8	30.5	31.8
pH-grab	0	-	-	-	-
pH-24HR (min)	2,234	7.1	7.8	7.6*	8.3
pH-24HR (max)	2,234	7.5	8.0	8.2	8.6
Temperature	103	0.1	15.6	24.9	27.4
Temperature-Daily Median	2,262	0.9	17.7	23.4	25.9

*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

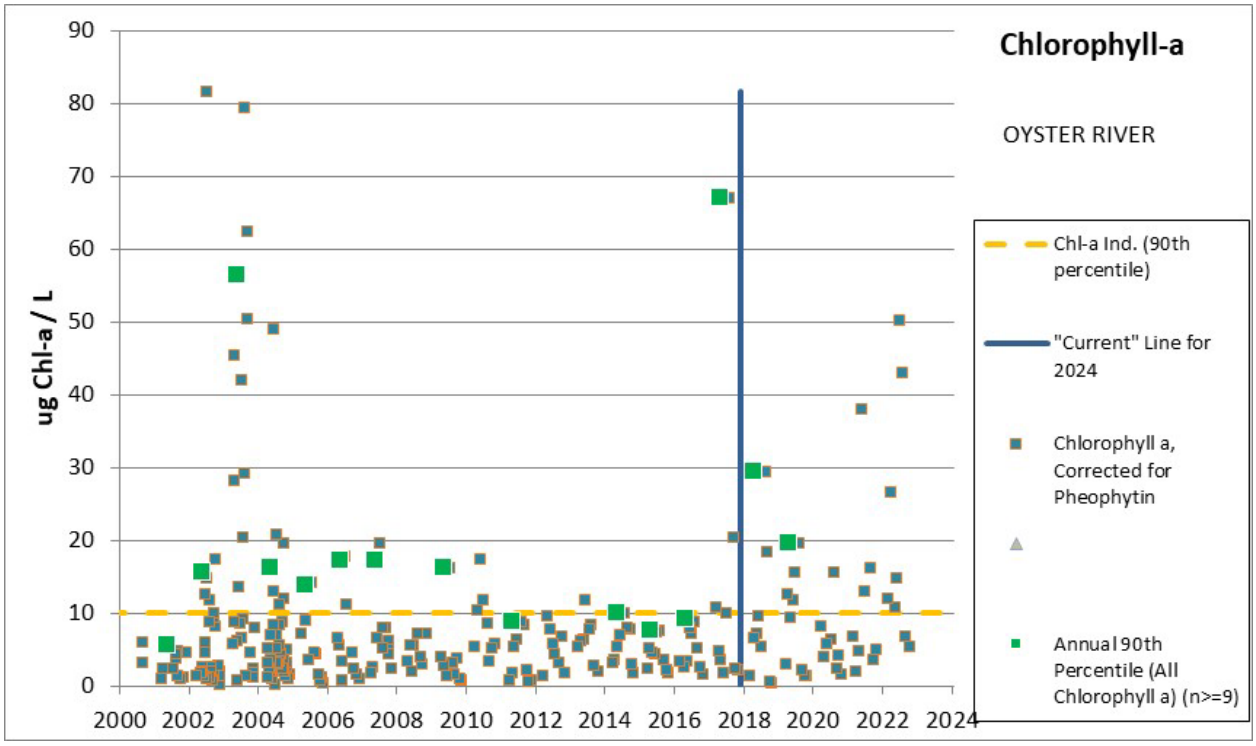
Assessment Zone = OYSTER RIVER

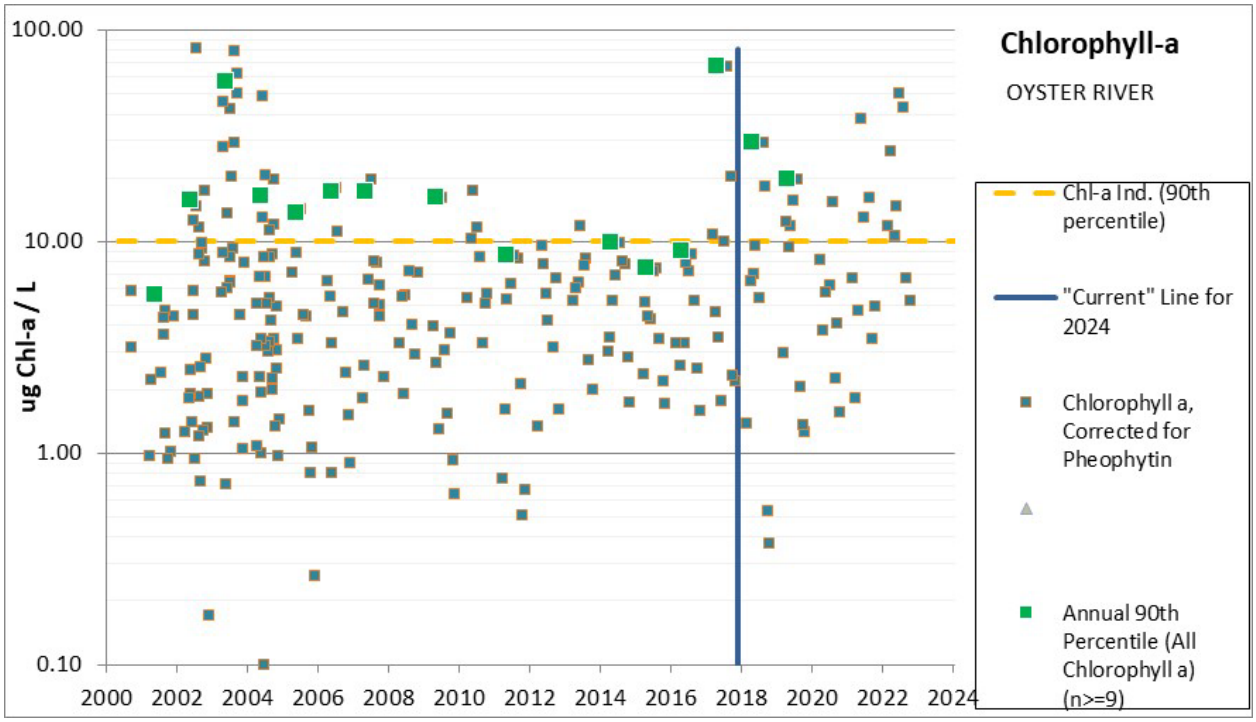
(NHEST600030902-01-03, NHEST600030902-01-04, NHEST600030904-06-17)

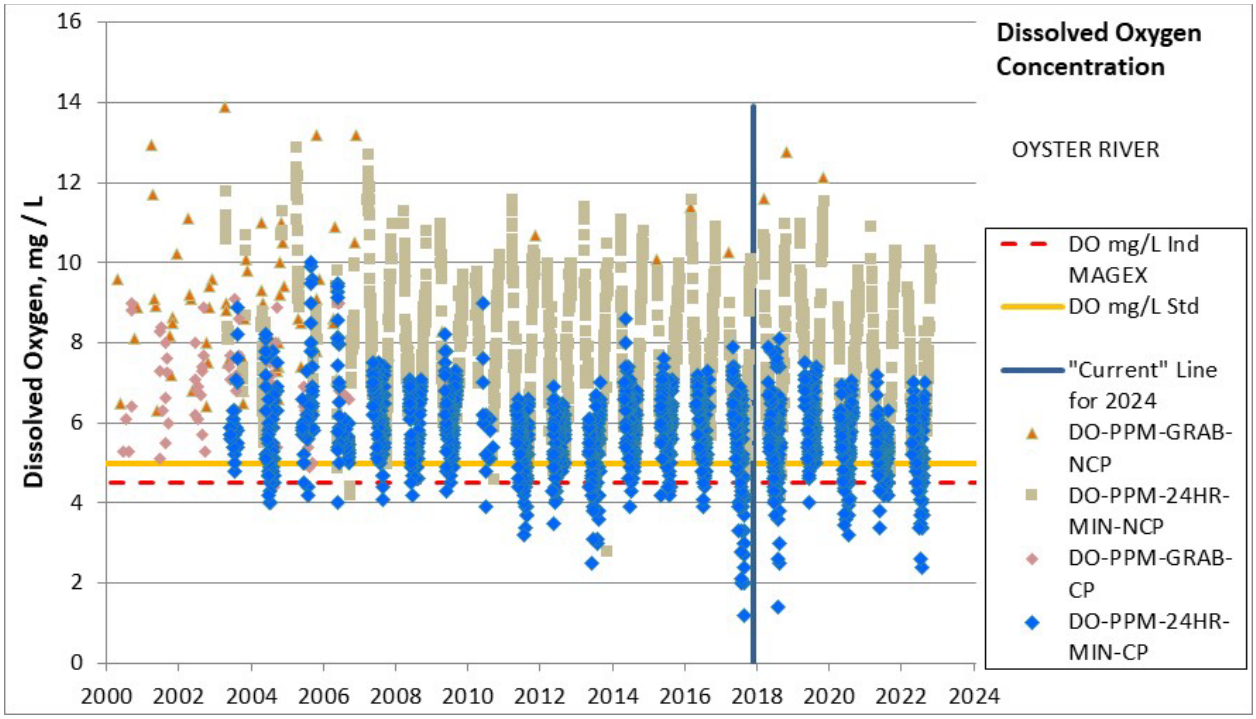
As of the date of data retrieval (April 13, 2023) water quality data through 2022 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means there are four additional years of data (2019-2022) compared to the 2020/2022 assessment. Note that the 2019 datalogger was missing from the EMD at the time of the SADB built for this cycle but the Excel file was used in this assessment below.

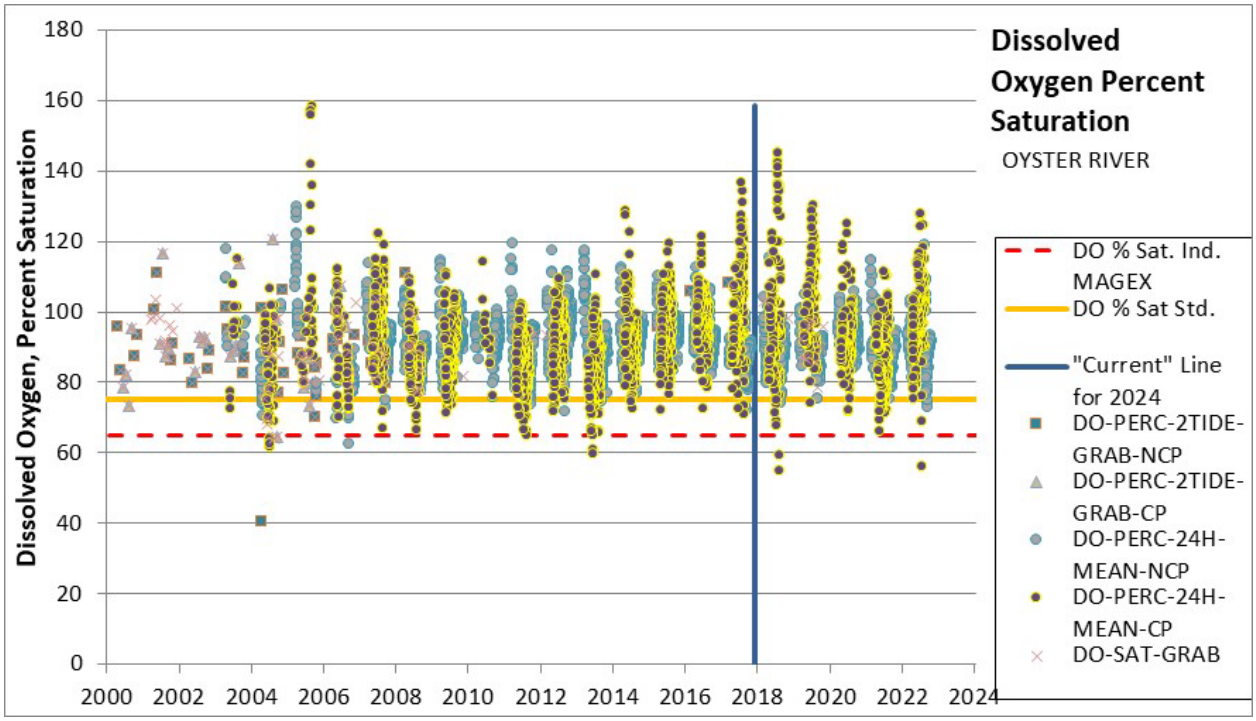
Indicator	Aquatic Life Use Category 2020/2022 / 2024	2024 Comment
Chlorophyll-a	5-M / 5-M	The calculated 90th percentile chlorophyll-a in this assessment zone is 28.5 µg/L (n = 42) and a maximum reading of 50.2 µg/L in 2022. The chlorophyll-a indicator threshold to prevent low dissolved oxygen and preserve light for eelgrass is a 90th percentile below 10 µg/L. The assessment for chlorophyll-a remains not supporting.
Dissolved Oxygen (mg/L)	5-P / 5-P	Up until 2016 the minimum dissolved oxygen concentration appeared to be improving, however, 2017 and 2018 saw the worst recorded dissolved oxygen in the 16-years of datalogger deployment and there have been multiple poor DO years since that time. Dissolved oxygen concentration measurements in this assessment zone fall below the 5 mg/L criterion every year and in 2018 and 2022 below 3 mg/L and on rare occasions even below 2 mg/L, therefore this impairment is considered severe.
Dissolved Oxygen (% Saturation)	5-P / 5-P	Up until 2016 the minimum dissolved oxygen percent saturation appeared to be improving, however, 2018 saw some of the most extreme recorded dissolved oxygen saturation in the 16-years of datalogger deployment with many days below a 24-hour average of 75%. Further, in 2018, 2020 and 2022 there were 17, 24-hour averages in excess of 125% and over two of those years there were 10-days where peak saturation exceeded 200%. Such super-saturation can have it's own deleterious impacts on aquatic life. In 2018 and again in 2022 a portion of those 24-hour averages fell below 65%, therefore this impairment is considered severe.
Estuarine Bioassessments (eelgrass)	5-P / 5-P	The historical extent of eelgrass in this assessment zone was 182.5 acres from the 1948 dataset. Some eelgrass was found in 1996 (14 acres) and 2015 (2.4 acres). The median current extent of eelgrass in 2019-2022 is 0 acres, which is a decrease of 100%. Since 1990, the trend in eelgrass cover in this assessment zone could not be determined because the eelgrass cover has been zero for most years since 1981. The thresholds for impairment are either a loss of more than 20% of the historic extent of eelgrass or a recent trend of greater than 20% loss.
Water Clarity (Light Attenuation Coefficient)	5-P / 5-P	The current median light attenuation coefficient can no long be calculated due to a lack of measurements since 2017. For an eelgrass restoration depth of 2 m, the light attenuation coefficient threshold is 0.75 m^-1 and the historic data (2004-2017) exceeded that threshold leading to the impairment designation. The recent mapping (2019-2022) showed 0 acres of eelgrass. Older datasets had eelgrass growing in both the shallow and deeper habitat making the 2m restoration depth a valid target. Therefore, the impaired (5-P) listing has been retained.
Total Nitrogen	5-M / 5-P	The median total nitrogen from 2018 through 2022 was 553 µg/L (n=43). This assessment zone experiences frequent dissolved oxygen concentrations well below 5 mg/L and, at times, below 2 mg/L. The daily average dissolved oxygen percent saturation

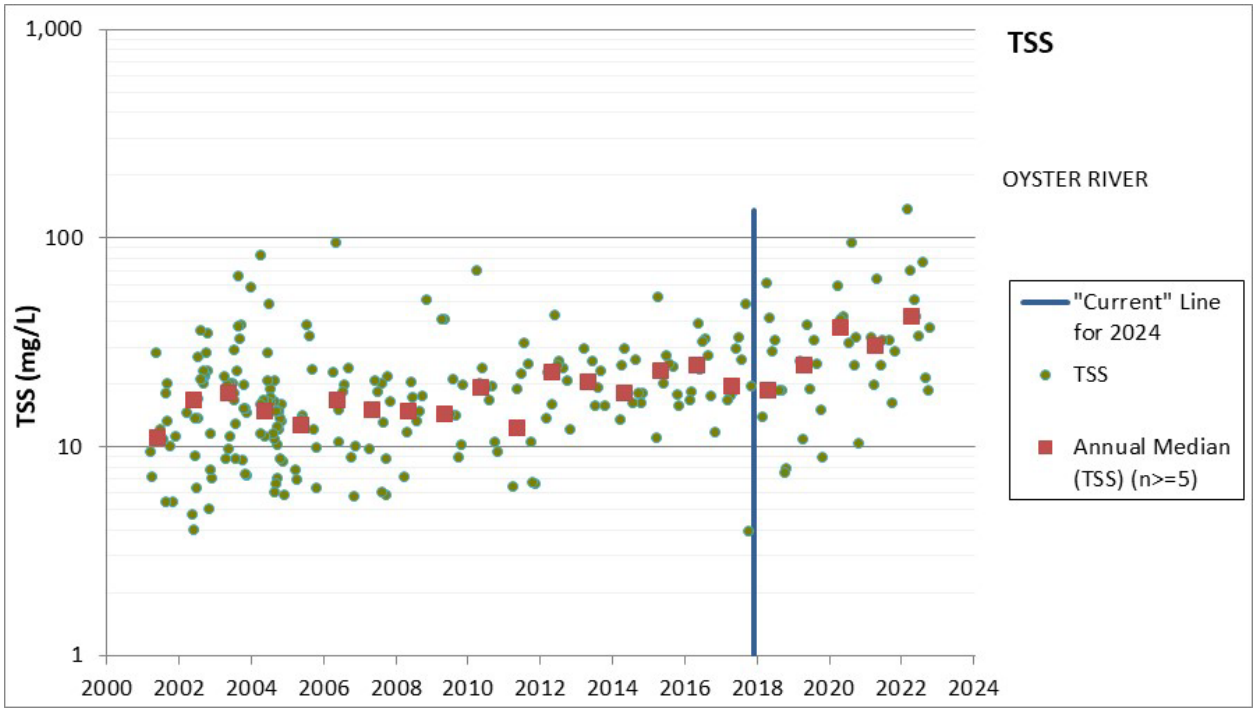
		falls below 75% nearly every year and in two recent years below 65%. During multiple years this assessment zone has also demonstrated super saturation over 125% including 24-hour averages unto 145% (2018). The chlorophyll-a concentration 90th percentile was 28.5 (n=42) from 2018 through 2022. The eelgrass beds are severely degraded and the available light attenuation has aged out. In the 2019 macroalgae annual report, the appreciable cover at Wagon Hill Farm did not show statistical decreases although that site has only been sampled 3-times (2013, 2015, 2018) making trend detection more difficult (Burdick, et al., 2020). The status of the indicators of nutrients and nutrient-related impacts has not changed and continue to present a preponderance of evidence that eutrophication effects are ongoing. As such, the impairment for nitrogen has been retained.

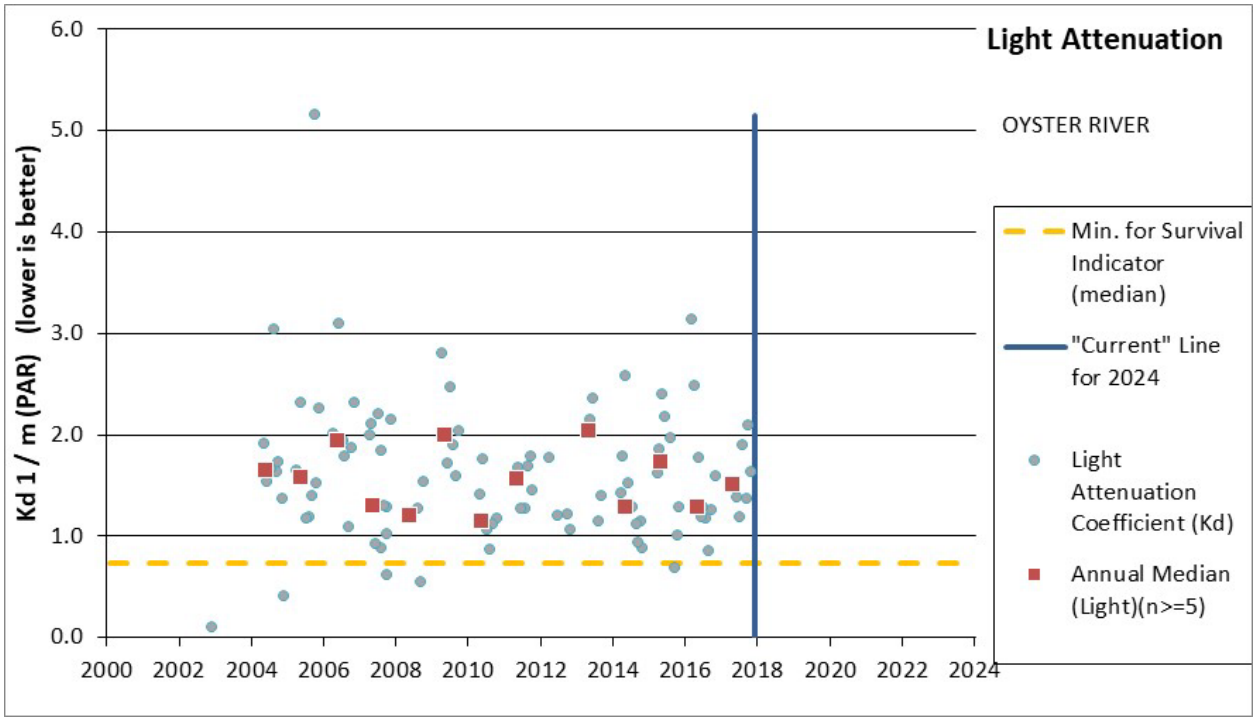


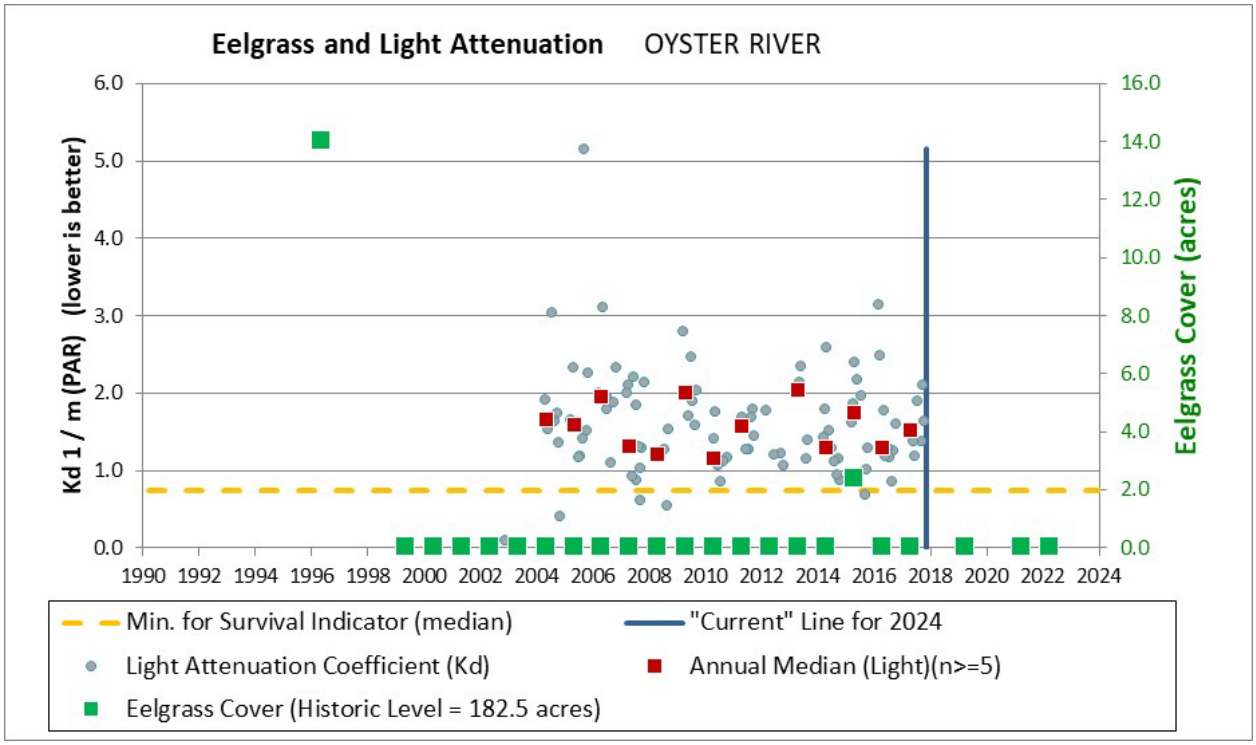

Chlorophyll-a
OYSTER RIVER
ug Chl-a / L
100.00
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

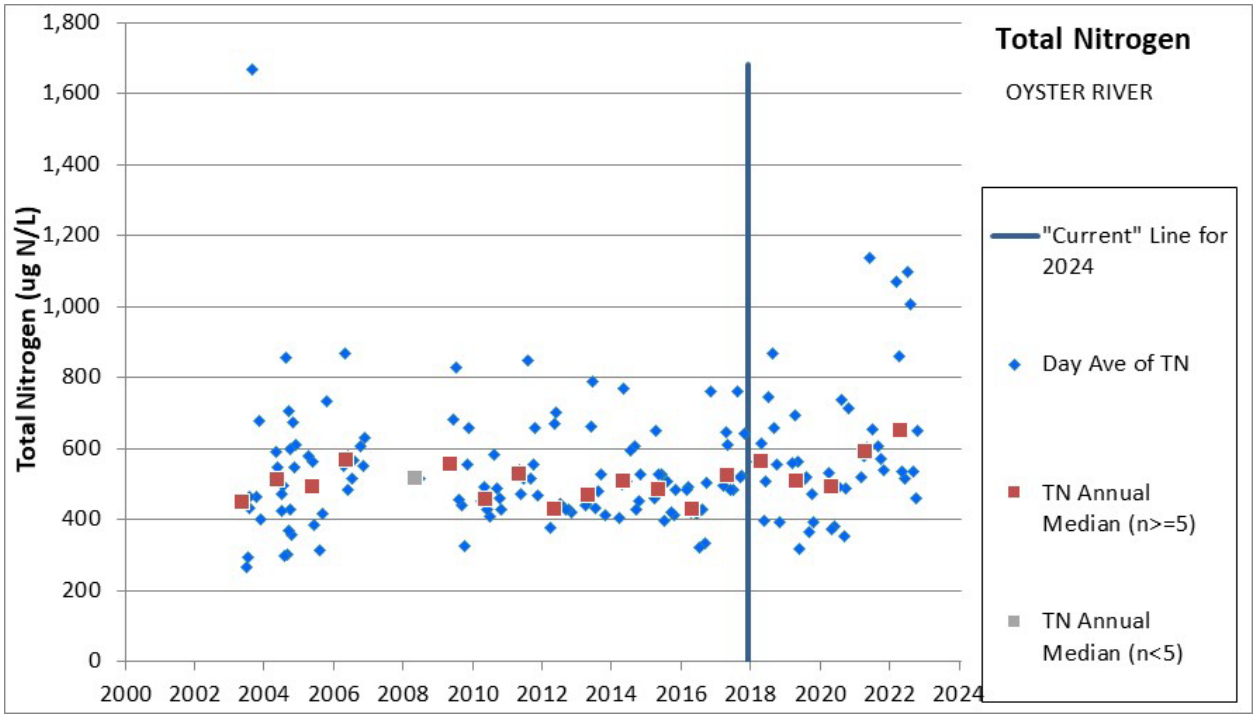

Dissolved Oxygen Concentration
OYSTER RIVER
Dissolved Oxygen, mg / L
16
14
12
10
8
6
4
2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
OYSTER RIVER
Dissolved Oxygen, Percent Saturation
180
160
140
120
100
80
60
40
20
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
OYSTER RIVER
TSS (mg/L)
1,000
100
10
1
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)


Light Attenuation
OYSTER RIVER
Kd 1 / m (PAR) (lower is better)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)


Eelgrass and Light Attenuation OYSTER RIVER
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)
Eelgrass Cover (Historic Level = 182.5 acres)


Total Nitrogen
OYSTER RIVER
Total Nitrogen (ug N/L)
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)
TN Annual Median (n<5)

Oyster River Assessment Zone (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	42	0.4	6.7	28.5	50.2
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	42	0.0	6.7	28.5	50.2
LIGHT ATTENUATION COEFFICIENT (1/m)	0	-	-	-	-
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	1,113	2.0	9.0	17.0	197.0
TSS (mg/L)	43	7.5	31.1	67.2	136.4
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	35	1.7	3.9	7.5	10.8
DO-PPM-24HR-MIN-CP (mg/L)	570	1.4	5.4	6.6	8.1
DO-PPM-24HR-MIN-NCP (mg/L)	550	4.2	7.9	10.1	11.5
DO-PPM-GRAB-CP (mg/L)	4	6.8	7.0	-	7.2
DO-PPM-GRAB-NCP (mg/L)	7	6.9	10.1	-	12.8
DO-PERC-24H-MEAN-CP (% sat)	568	55.1	93.9	114.2	145.1
DO-PERC-24H-MEAN-NCP (% sat)	542	73.1	89.9	98.6	119.1
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	11	78.7	92.4	102.2	103.2
Day Ave of TN (ug N/L)	43	316	553	952	1,135
Day Ave of TDN (ug N/L)	43	50	355	496	723
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	43	14	175	284	495
Day Ave of NH3 (ug N/L)	43	3	57	142	488
Day Ave of PON (ug N/L)	9	99	284	733	733
Day Ave of NO2/3 (ug N/L)	43	5	98	206	310
SALINITY-Grabs (pss)	72	0.0	22.7	29.7	30.6
SALINITY-Datalogger Daily Median (pss)	1,138	0.7	23.8	29.2	30.8
pH-grab	0	-	-	-	-
pH-24HR (min)	1,133	6.3	7.5	7.3*	8.1
pH-24HR (max)	1,133	7.4	7.9	8.2	8.8
Temperature	72	2.0	15.8	23.8	28.1
Temperature-Daily Median	1,298	1.0	18.6	24.6	27.6

*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

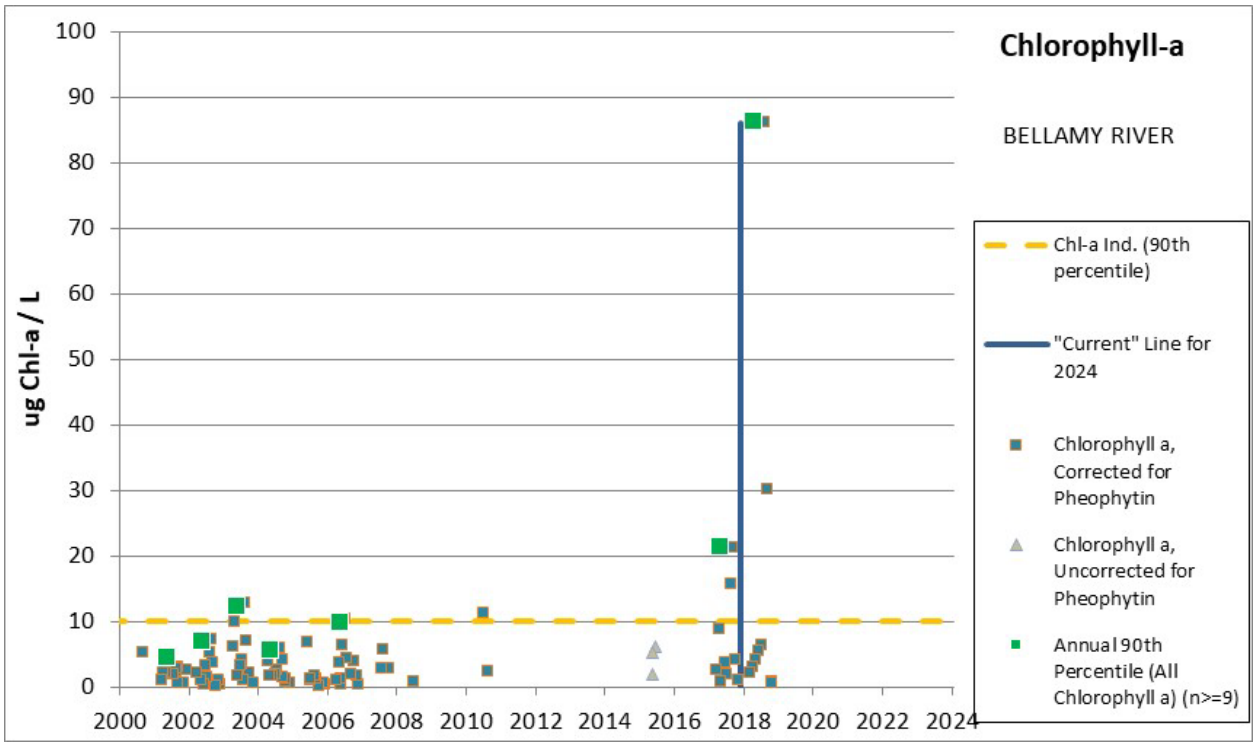
Assessment Zone = BELLAMY RIVER

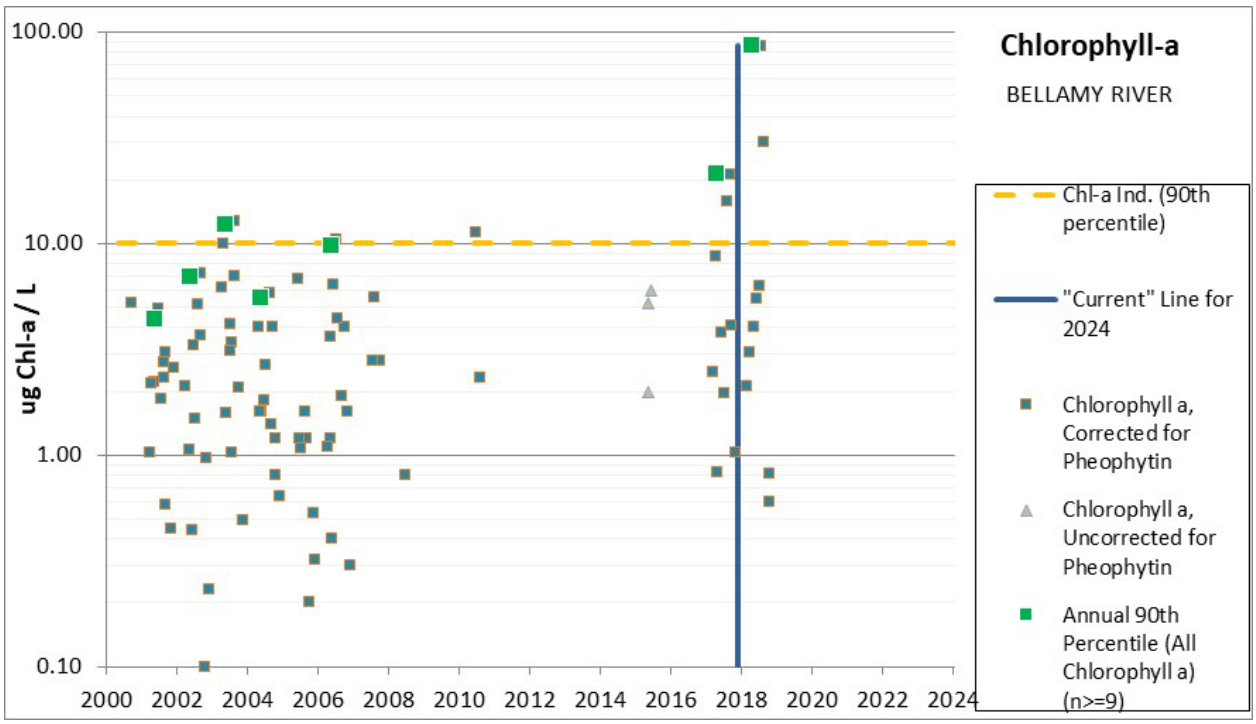
(NHEST600030903-01-01, NHEST600030903-01-03, NHEST600030903-01-04).

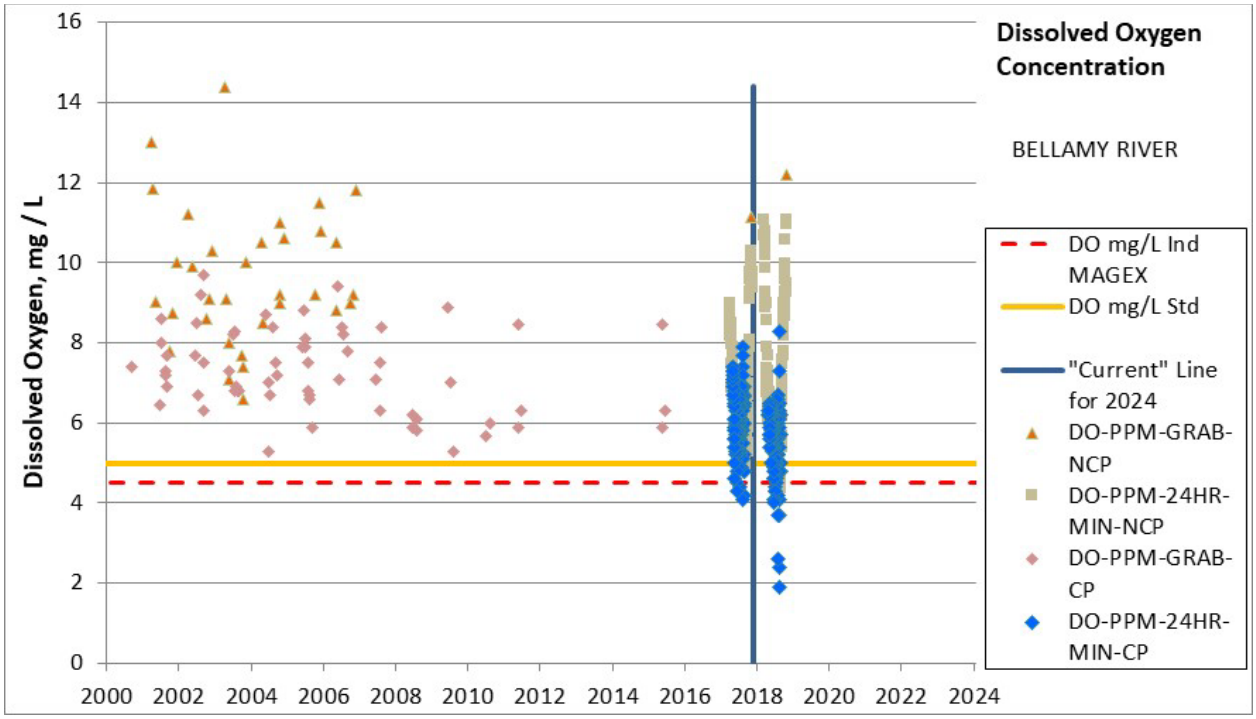
As of the date of data retrieval (April 13, 2023) water quality data through 2022 had been uploaded to the Environmental Monitoring Database for this assessment zone, however, the most recent year of data collection in this assessment zone was 2018. For this assessment zone, that means there is no additional years of data compared to the 2020/2022 assessment.

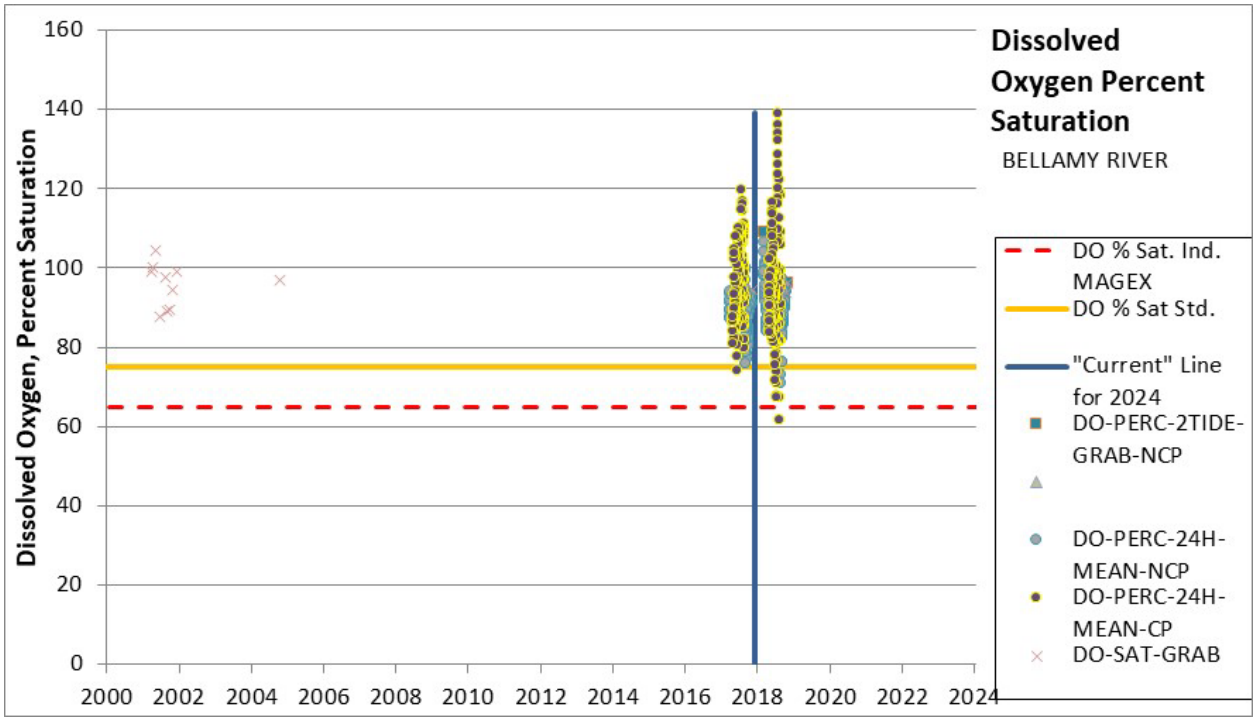
Indicator	Aquatic Life Use Category 2020/2022 /2024	2024 Comment
Chlorophyll-a	5-P / 5-P	The calculated 90th percentile chlorophyll-a in this assessment zone is 86.2 µg/L (n = 9) and a maximum reading of 86.2 µg/L. The chlorophyll-a indicator threshold to prevent low dissolved oxygen and preserve light for eelgrass is a 90th percentile below 10 µg/L. Therefore, this assessment zone has been assessed as not supporting aquatic life based on chlorophyll-a.
Dissolved Oxygen (mg/L)	5-P / 5-P	This assessment zone had its first datalogger deployments in 2017 and 2018. 36 of 241 days (15%) of summer datalogger records experienced DO below 5 mg/L in 78 distinct events. Additionally, 5 of the events saw DO fall below 3 mg/L. Many of the low DO events occurred in the night to early morning hours that coincided with low tide and these events lasted up to 5-hours around low-tide. In both 2017 and 2018 the DO below 5 mg/L started in mid-July. The added warmth of August and September of 2018 may have contributed to the low readings. The available dissolved oxygen data discussed above was collected in 2017 and 2018 indicates there is a consistent moderate level of stress in the system and multiple occasions of severe stress when the DO goes below 3 mg/L. The frequency, duration and magnitude of the low DO warranted an impairment in the 2020/2022 assessment cycles and the not supporting assessment of aquatic life due to low dissolved oxygen concentration has been retained.
Dissolved Oxygen (% Saturation)	2-M / 2-M	Based on the datalogger dataset, in 2017 there was one day that DO percent saturation 24-hour average fell to 74% and in 2018 there were 9-days including 1-day when the average fell to 62% (insufficient to trigger the magnitude of exceedance indicator). In 2018 there was a 4-consecutive day period wherein the 24-hour averages were below 75%. The earliest percent saturation below 75% was in mid-July. Counting just the summer critical period, there were 8 days (3%) in 2017 and 2018 (n=242 days of datalogger record) during which the 24-hour averages were below 75%. Similarly, counting all days of datalogger record, there were 10-days (2%) in 2017 and 2018 (n=436 days of datalogger record) during which the 24-hour averages were below 75%. Regardless of the time period, this indictor does not reach the 10% exceedance rule of thumb nor the magnitude of exceedance threshold to suggest impairment. The 2020/2022 assessed as supporting aquatic life based on dissolved oxygen percent saturation has been retained.
Estuarine Bioassessments (eelgrass)	5-P / 5-P	The historical extent of eelgrass in this assessment zone was 66.9 acres from the 1948, 1962, 1980 and 1981 datasets. Some eelgrass was found in 2004 (0.8 acres). The median current extent of eelgrass in 2019-2022 is 0 acres, which is a decrease of 100%. Since 1990, the trend in eelgrass cover in this assessment zone could not be determined because the eelgrass cover has been zero for most years since 1981. The thresholds for impairment are either a loss of more than 20% of the historic extent of eelgrass or a recent trend of greater than 20% loss.

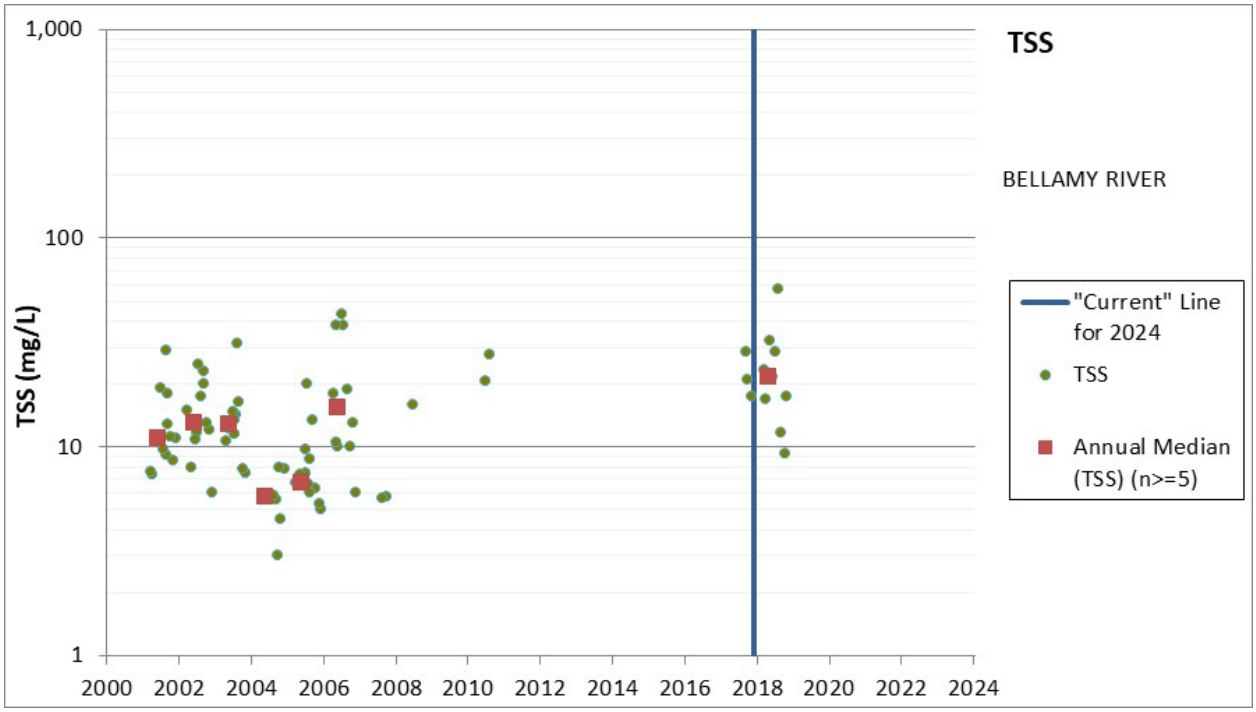
Water Clarity (Light Attenuation Coefficient)	5-P / 5-P	Median water clarity is 1.99 m^-1 (n=9). For an eelgrass restoration depth of 2 m, the light attenuation coefficient threshold is 0.75 m^-1. Given the eelgrass condition and the available light data, the 2020/2022 assessment of not supporting aquatic life integrity due to light attenuation has been retained.
Total Nitrogen	5-P / 5-P	The median total nitrogen from 2018 through 2022 (really just 2018 data) was 445 µg/L (n=9). This assessment zone experiences dissolved oxygen concentrations below 5 mg/L (at times below 3 mg/L) and occasional daily average saturation below 75%. During multiple years this assessment zone also demonstrated super saturation well over 125% as a daily average and over 165% in the 15-minute dataset. The chlorophyll-a concentration 90th percentile was 86.2 µg/L (n =9) and a maximum reading of 86.2 µg/L. The status of the indicators of nutrients and nutrient-related impacts have been revealed by the sampling data to present a preponderance of evidence of eutrophication impacts. As such, the assessment of not supporting aquatic life integrity due to total nitrogen has been retained.

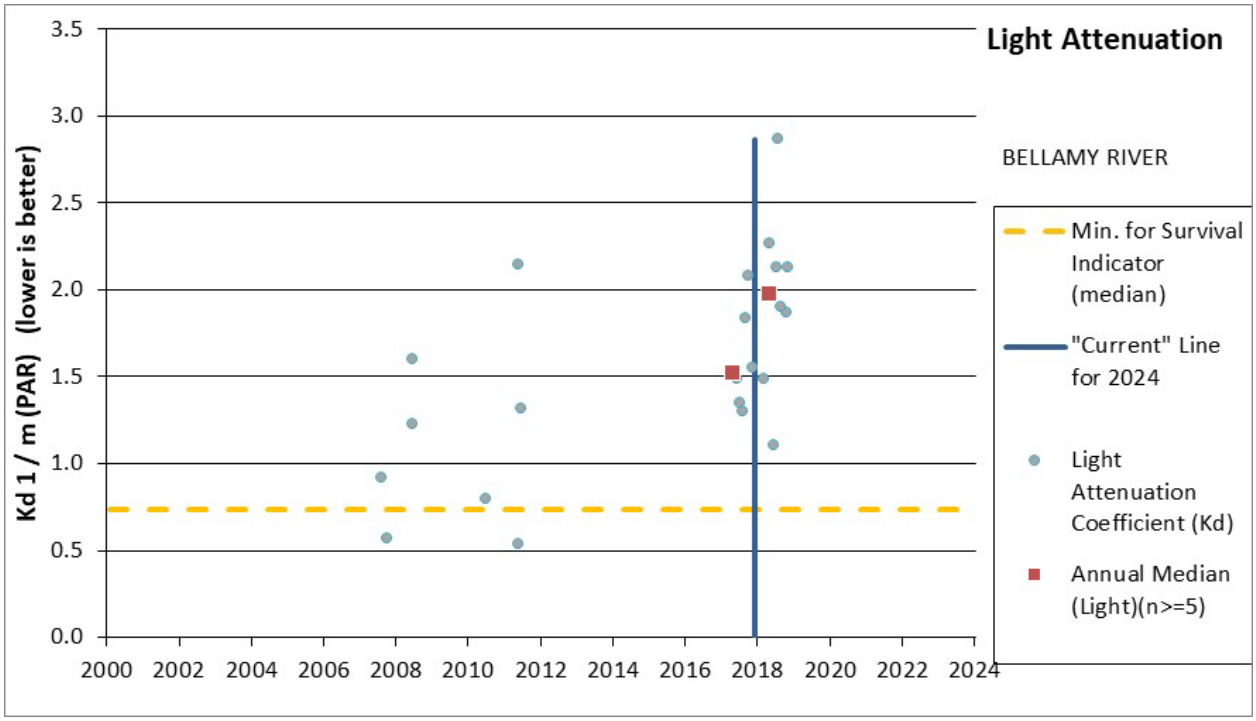


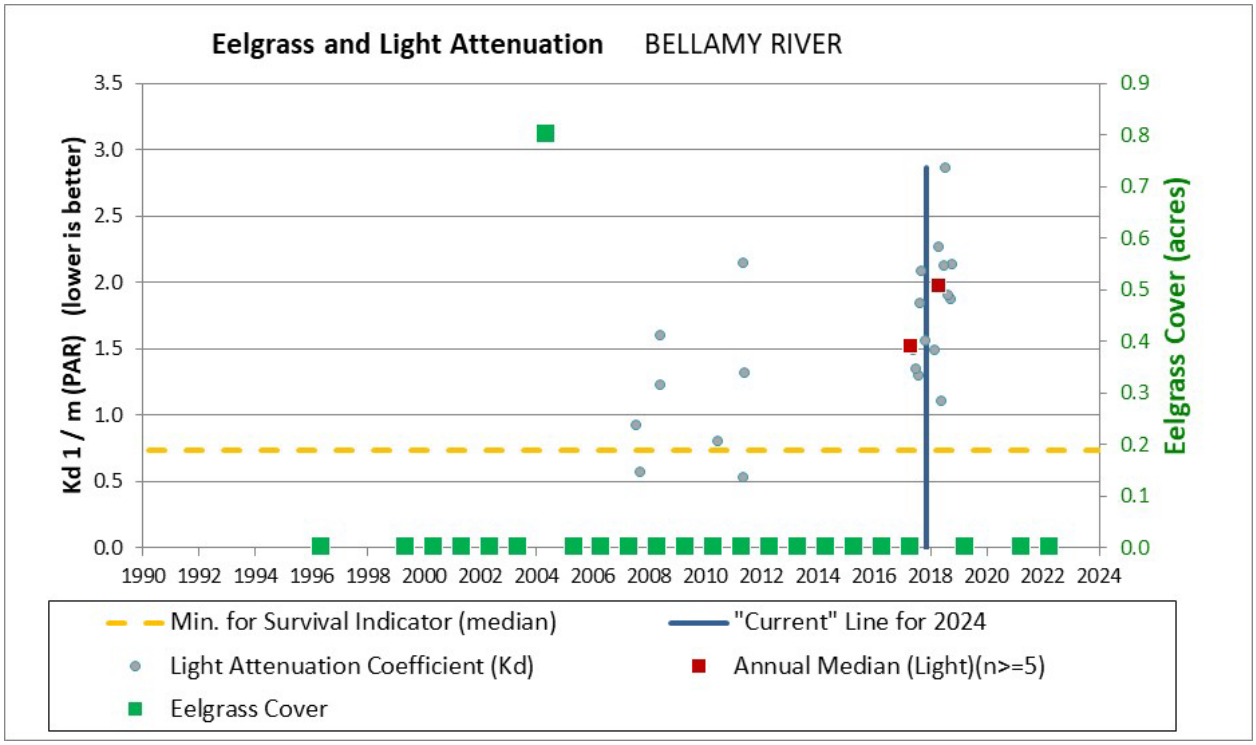

Chlorophyll-a
BELLAMY RIVER
ug Chl-a / L
100.00
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

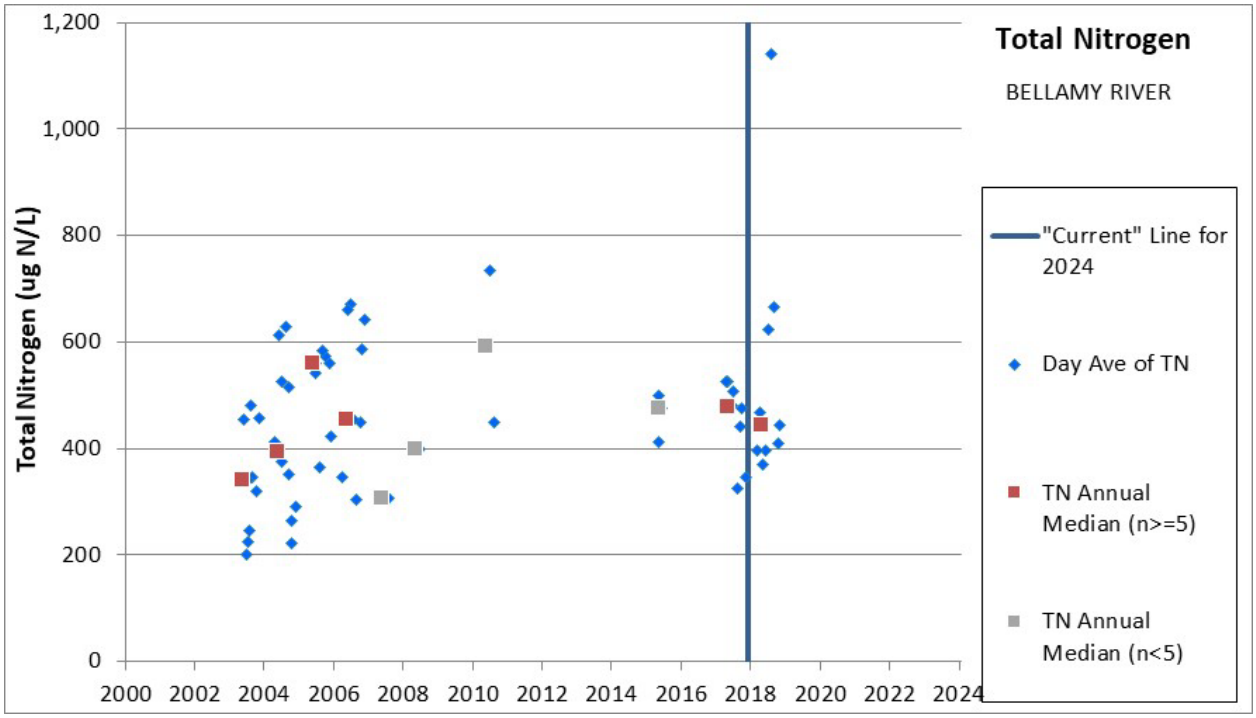

Dissolved Oxygen Concentration
BELLAMY RIVER
Dissolved Oxygen, mg / L
16
14
12
10
8
6
4
2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
BELLAMY RIVER
Dissolved Oxygen, Percent Saturation
160
140
120
100
80
60
40
20
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
BELLAMY RIVER
TSS (mg/L)
1,000
100
10
1
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)


Light Attenuation
BELLAMY RIVER
Kd 1 / m (PAR) (lower is better)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)


Eelgrass and Light Attenuation
BELLAMY RIVER
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)
Eelgrass Cover



Bellamy River Assessment Zone (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	9	0.6	4.1	86.2	86.2
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	9	0.0	4.1	86.2	86.2
LIGHT ATTENUATION COEFFICIENT (1/m)	9	1.12	1.99	2.87	2.87
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	223	4.0	7.0	11.0	44.0
TSS (mg/L)	9	9.3	21.7	57.4	57.4
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	9	2.9	5.2	8.4	8.4
DO-PPM-24HR-MIN-CP (mg/L)	119	1.9	5.7	6.5	8.3
DO-PPM-24HR-MIN-NCP (mg/L)	97	4.4	8.2	10.6	11.1
DO-PPM-GRAB-CP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-NCP (mg/L)	1	12.2	12.2	-	12.2
DO-PERC-24H-MEAN-CP (% sat)	121	61.7	94.0	117.4	139.0
DO-PERC-24H-MEAN-NCP (% sat)	98	71.1	90.1	99.2	106.6
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	2	96.2	102.6	-	109.0
DO-PERC-GRAB (% sat)	2	93.7	94.9	-	96.2
Day Ave of TN (ug N/L)	9	369	445	1,140	1,140
Day Ave of TDN (ug N/L)	9	231	355	501	501
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	9	38	110	243	243
Day Ave of NH3 (ug N/L)	9	4	30	154	154
Day Ave of PON (ug N/L)	2	240	315	-	390
Day Ave of NO2/3 (ug N/L)	9	33	72	155	155

SALINITY-Grabs (pss)	23	0.3	27.1	30.8	30.8
SALINITY-Datalogger Daily Median (pss)	223	1.6	21.0	26.4	28.2
pH-grab	0	-	-	-	-
pH-24HR (min)	223	6.8	7.4	7.1*	7.9
pH-24HR (max)	223	7.5	8.0	8.2	8.5
Temperature	23	2.9	16.5	23.1	25.6
Temperature-Daily Median	223	4.2	18.8	25.5	27.8

*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

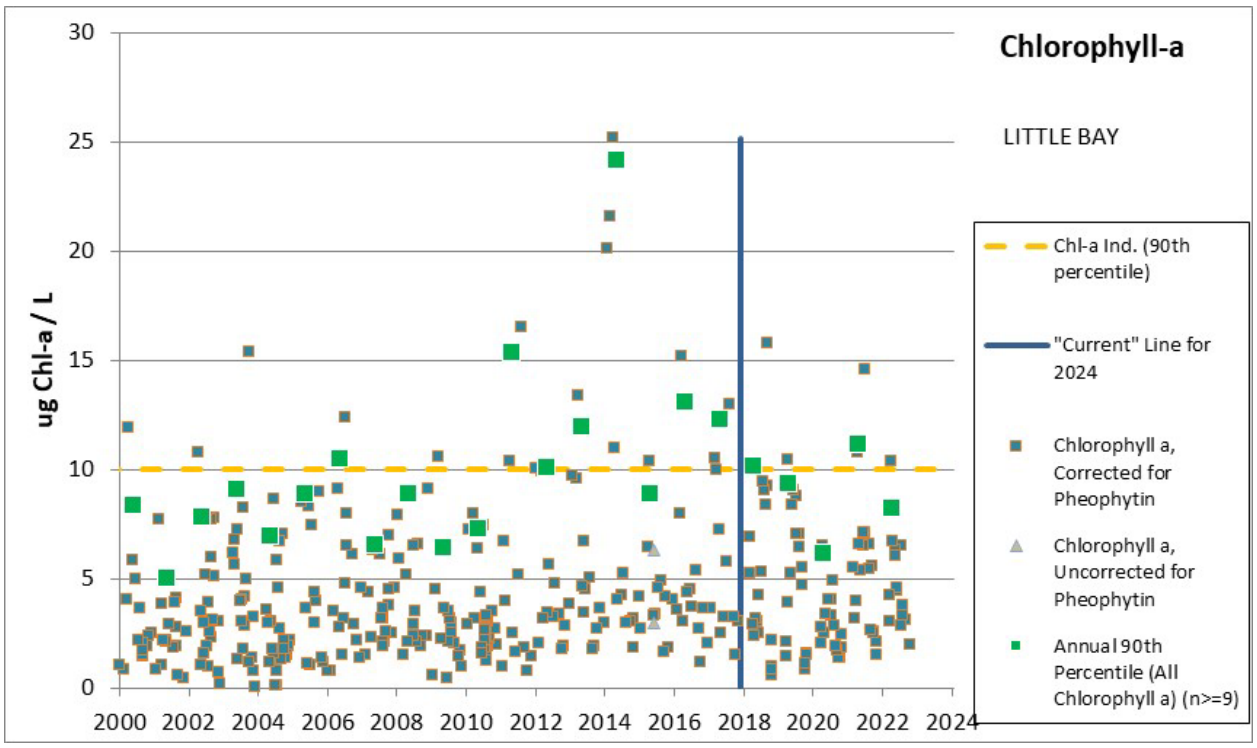
Assessment Zone = LITTLE BAY

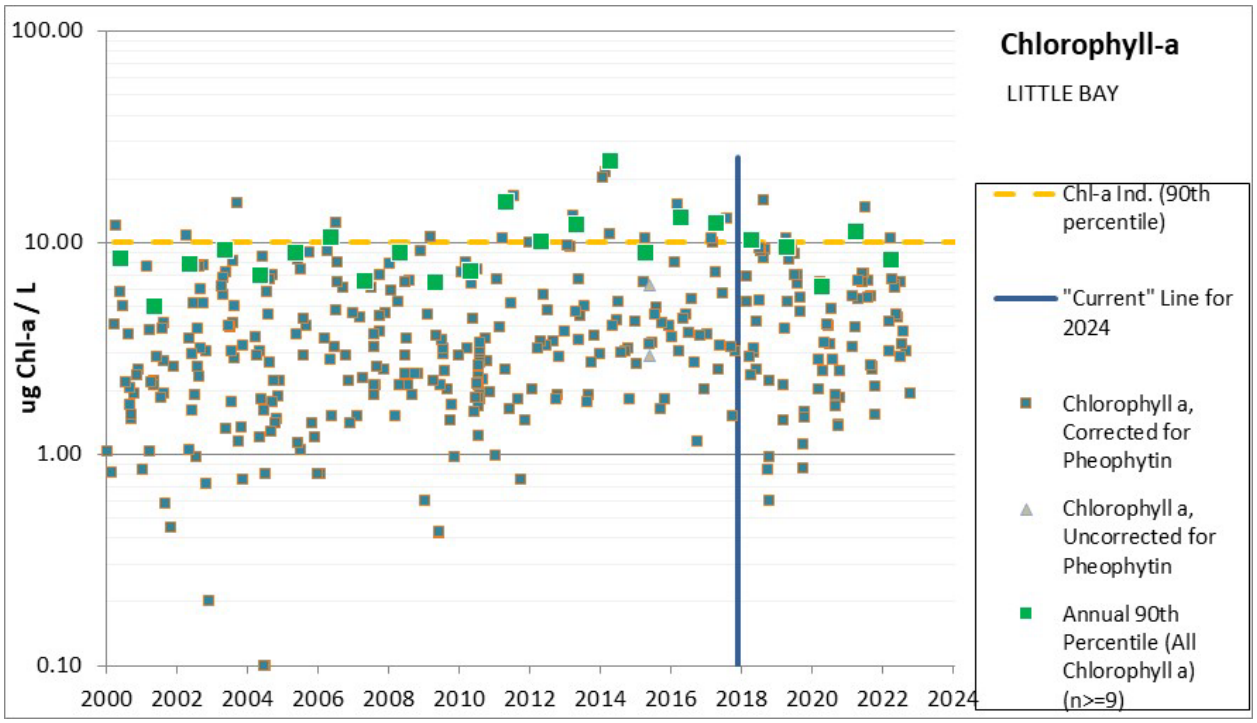
(NHEST600030904-06-10, NHEST600030904-06-11, NHEST600030904-06-14, NHEST600030904-06-15, NHEST600030904-06-18, NHEST600030904-06-19, NHEST600030904-06-20).

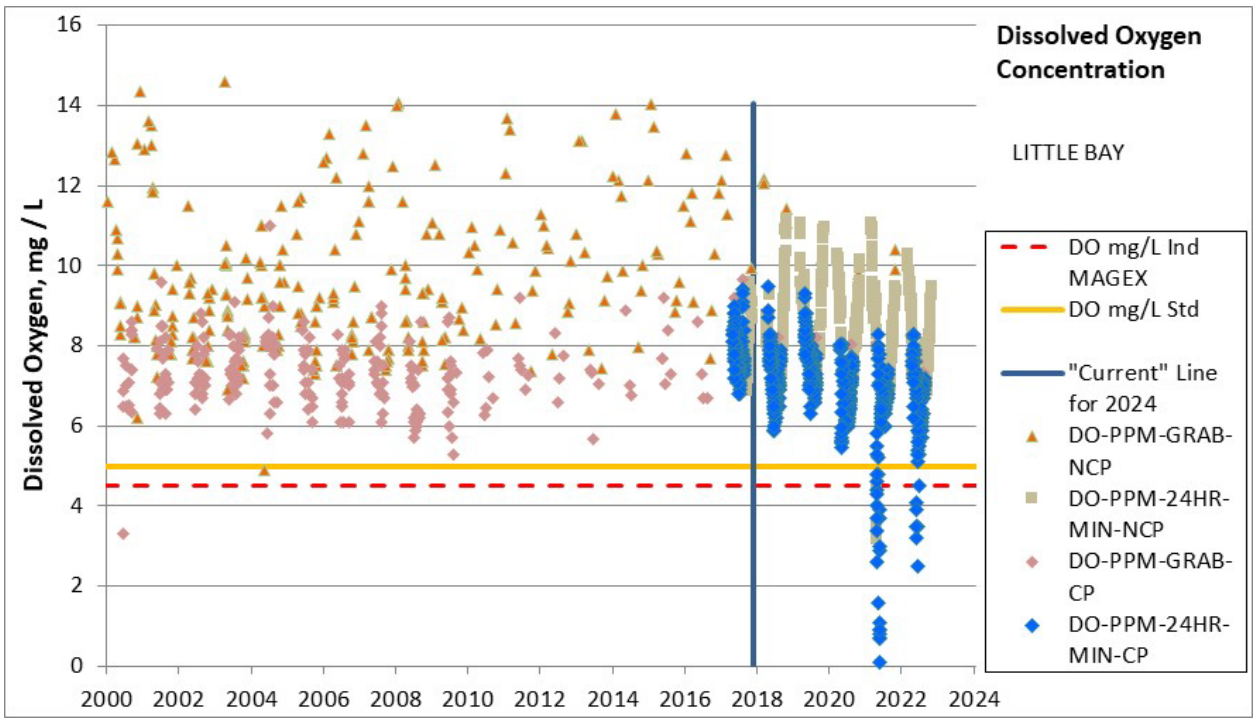
As of the date of data retrieval (April 13, 2023) water quality data through 2022 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means that compared to the 2020/2022 assessment, there is added grab sample and datalogger data from GRBULB (2019, 2020, 2021 and 2022) as well as grab sample data from GRBAP (2019, 2020, 2021 and 2022).

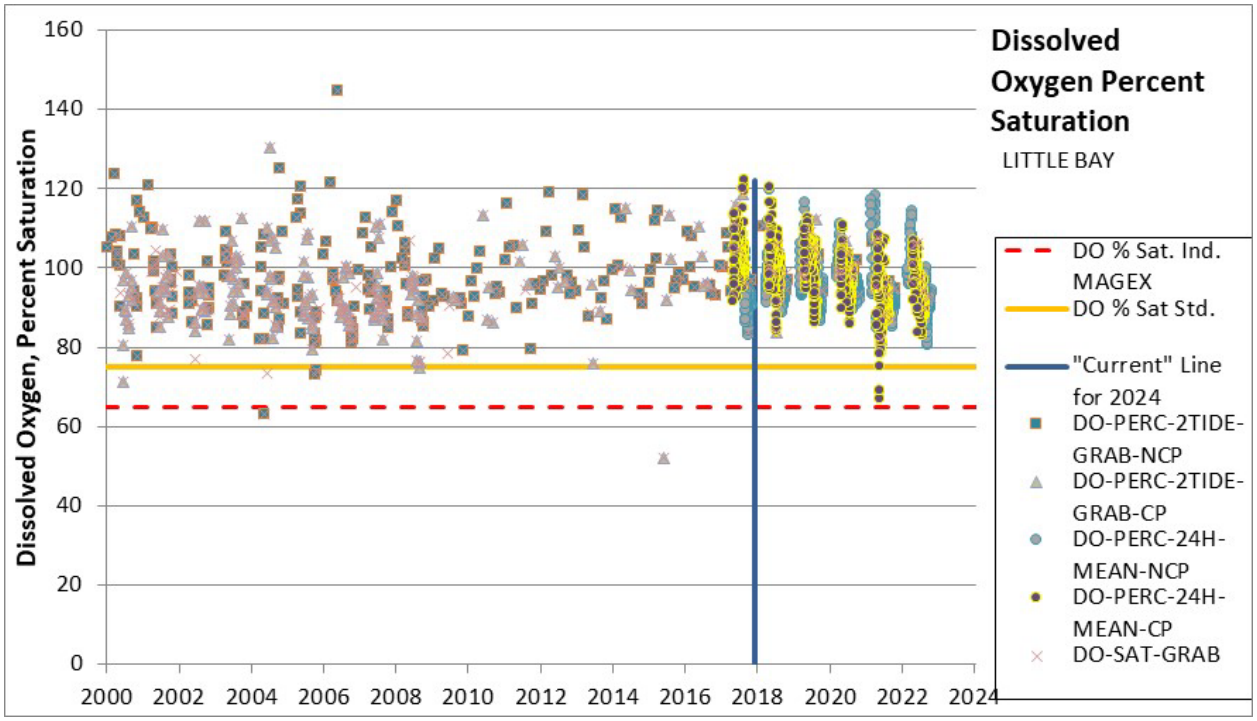
Indicator	Aquatic Life Use Category 2016/ 2020/2022	2020/2022 Comment
Chlorophyll-a	3-PNS / 3-PNS	The calculated 90th percentile chlorophyll-a in this assessment zone is 9.0 µg/L (n = 85) and a maximum reading of 15.8 µg/L. The current dataset includes the samples from GRBULB and GRBAP. The chlorophyll-a indicator threshold to prevent low dissolved oxygen and preserve light for eelgrass is a 90th percentile below 10 µg/L. As chlorophyll-a is marginally better than the assessment threshold, one of the response variables is very poor (DO), and the other is marginal bad (light), chlorophyll-a has been assessed as Insufficient Information – potentially not supporting.
Dissolved Oxygen (mg/L)	2-G / 5-P	This assessment zone did not have a datalogger until 2017. Before that time only surface (0.5m below surface) grab sample measurements (GRBAP) for dissolved oxygen concentration occurred. In 2021, the datalogger recorded low dissolved oxygen around high tide. The researchers responsible for the datalogger noted that, "We suggest that as the colder, more saline, high tide water slowed, settled, and equilibrated in the deeper area of the sonde site, respiration from the benthic environment may have drawn down dissolved oxygen levels and increased carbon dioxide output, consequently lowering the pH slightly. As the tide turned and the current picked up, the stagnant water was washed away from the datasonde, and the pH and dissolved oxygen rebounded." (Martin, 2022) Such a scenario suggests that the low DO could be due to imported organics rather than local production noting here that the 90th percentile of chlorophyll-a is below the threshold one would expect to trigger DO problems. Similar low DO results occurred in 2022, although centered around low tides. The 103-DO events below 5 mg/L averaged 1.5 hours each and the 22 events below 3 mg/L averaged 1.3 hours. The frequency, magnitude and duration of the low DO events warrants a new impairment and that impairment is considered severe (5-P).
Dissolved Oxygen (% Saturation)	2-G / 2-M	This assessment zone did not have a datalogger until 2017. Before that time only surface (0.5m below surface) grab sample measurements (GRBAP) were used to evaluate against the dissolved oxygen 24-hour average percent saturation. There 5-years of continuous dataloggers usable in the current period to evaluate against the 24-hour dissolved oxygen percent saturation criteria. Although there were a few drops below the 24-hour average of 75%, those amounted to just 0.5% of the dataset and those exceedances were minor. The available data indicates that this assessment zone's dissolved oxygen percent saturation remains good.
Estuarine Bioassessments (eelgrass)	5-P / 5-P	The historical extent of eelgrass in this assessment zone was 252 acres from the 1948, 1962, 1980 and 1981 datasets. The median current extent of eelgrass in 2019-2022 is 7.5 acres. While 2019 had the most eelgrass (20.3 acres) since 2012 (much of which was gone in 2021 and 2022) there is an overall a decrease of 97.0%. There is no significant

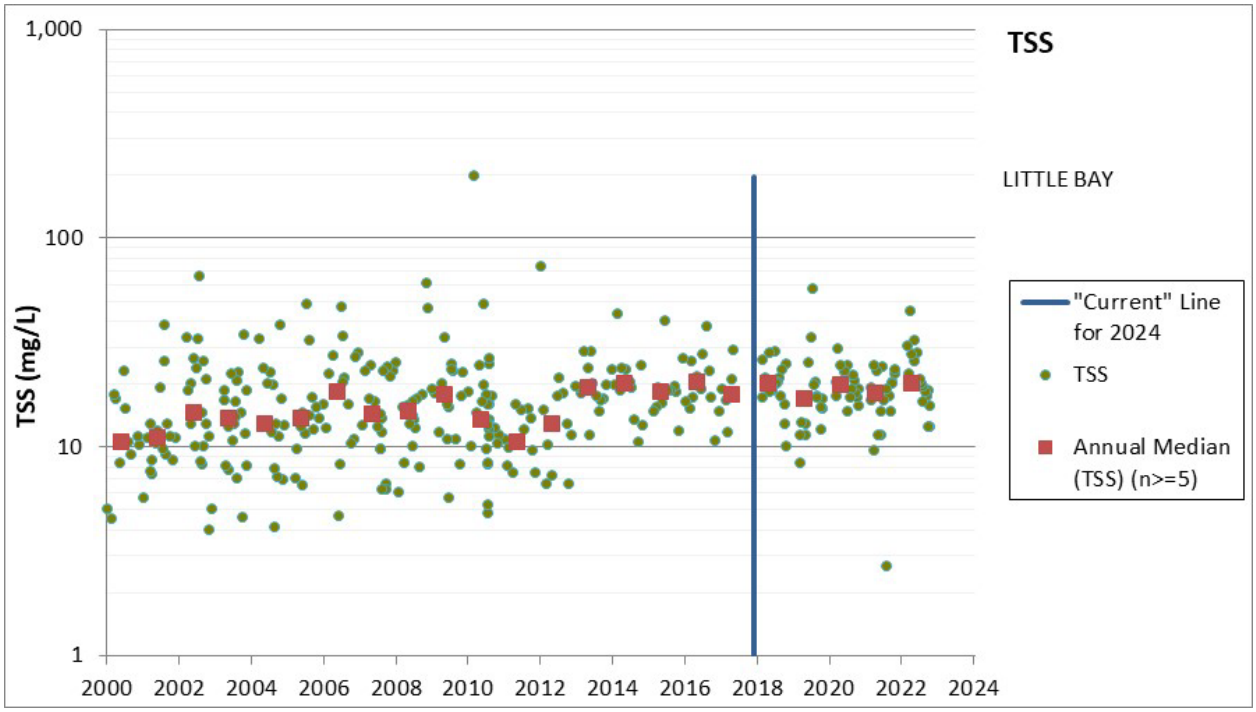
		trend in eelgrass cover in this assessment zone since 1990. The thresholds for impairment are either a loss of more than 20% of the historic extent of eelgrass or a recent trend of greater than 20% loss.
Water Clarity (Light Attenuation Coefficient)	5-M / 5-M	Median=1.11 m^-1 (n=85). The dataset includes the new GRBULB (2018-2022) sampling site in addition the annual data at GRBAP. For an eelgrass restoration depth of 2 m, the light attenuation coefficient threshold is 0.75 m^-1. This assessment zone historically had eelgrass growing in both the shallows and deeper habitat making the 2m restoration depth a valid target. Therefore, the impaired (5-M) listing from the 2020/2022 303d list has been retained.
Total Nitrogen	3-PNS / 3-PNS	The dataset includes the grab sample and datalogger datasets from the GRBULB sampling site in addition the grab sample data at GRBAP. The median total nitrogen from 2018 through 2022 was 311 µg/L (n=89). Dr. Howes indicated (Howes, 2019) a growing season (May-Sept) average of 320-350 ug/L "…should be protective of that resource [Great Bay system] based on [his] experience with nearby Massachusetts estuarine waters." As indicated here, the median total nitrogen from 2018 through 2022 was 311 µg/L (n=89). The average of the same 89-samples is 324 ug/L over the full calendar year and 310 ug/L (n=49) in the growing season. Based on dataloggers from 2018-2022 the measurements in this assessment zone demonstrate dissolved oxygen concentration exceedances but only occasional, and minor, 24-hour averages below 75% saturation. The calculated 90th percentile chlorophyll-a in this assessment zone is 9.0 µg/L (n = 85) and a maximum reading of 15.8 µg/L. Chlorophyll-a is just better than the threshold described in the CALM but dissolved oxygen problems are evident in the GRBULB datalogger data. The eelgrass beds are severely degraded (97% reduction from historic) and the available light attenuation (median=1.11 m^-1 (n=85)) is poor. For shallow systems, it is expected that changes in macroalgae will precede changes in phytoplankton (McGlathery, Sundbäck, & Anderson, 2007) (Valiela, et al., 1997), as appears to be occurring in the Great Bay Estuary. Burdick et al. (Burdick, Mathieson, Peter, & Sydney, 2016) note that, "Monitoring results from 2014 show high levels of cover of nuisance green and red algae (*Ulva* and *Gracilaria*, respectively) at all sites except near the mouth of the Estuary." That study included several sites within Little Bay. In the 2020 macroalgae annual report, the appreciable cover at Cedar Point (near the mouth of the Bellamy) appears to have a visually variable trend in green macroalgae although that site has only been sampled 4-times (2013, 2015, 2018 and 2020) making trend detection more difficult (Payne, et al., 2021). The same study found a statistically significant decline in green macroalgae at Adams Point, just outside the Little Bay assessment zone (Payne, et al., 2021). The status of the indicators of nutrients and nutrient-related impacts now more strongly shows evidence that eutrophication effects could be occurring in this zone. Eelgrass has been lost and light attenuation is often not sufficient, DO percent saturation levels are better than the levels of concern but DO concentration appears to be very poor at time in the deep waters, chlorophyll-a is just better than the assessment indicator threshold and TN levels are within protective levels (Howes, 2019) with few high measurements above 500 ug/L (only 5 of 89 samples). This assessment zone has been assessed as insufficient information – potentially not supporting (3-PNS) for total nitrogen.

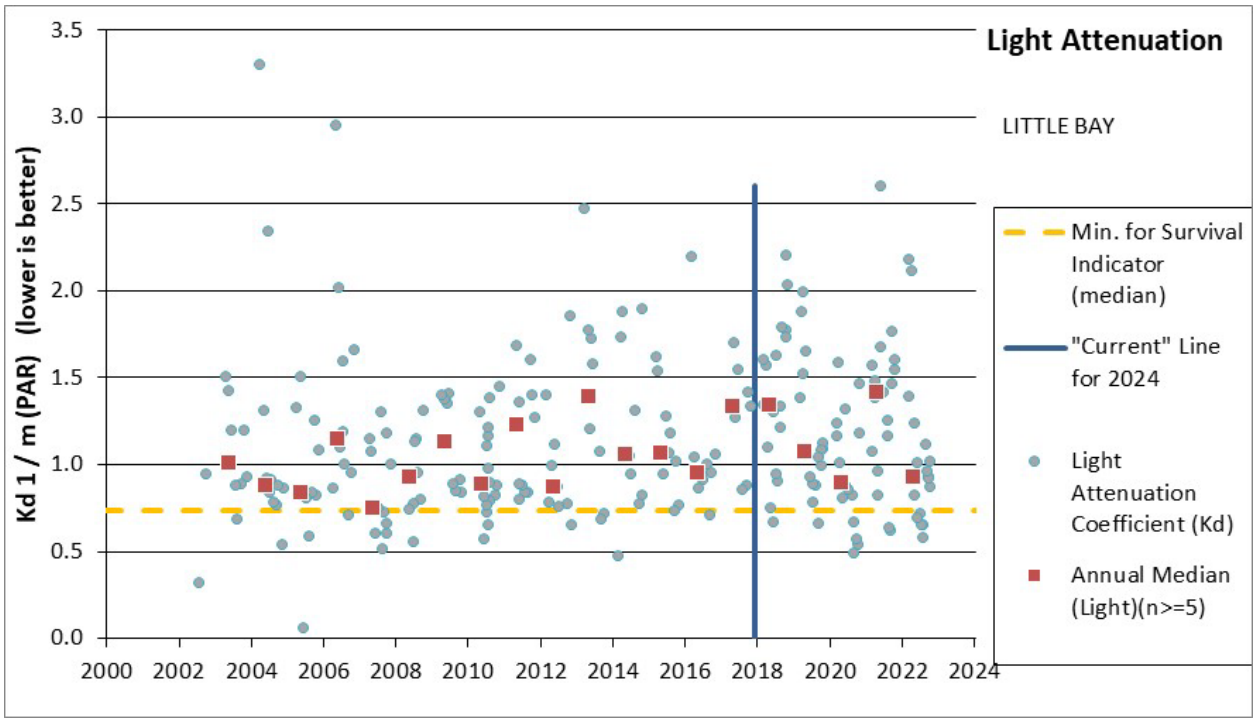

Chlorophyll-a
LITTLE BAY
ug Chl-a / L
30
25
20
15
10
5
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

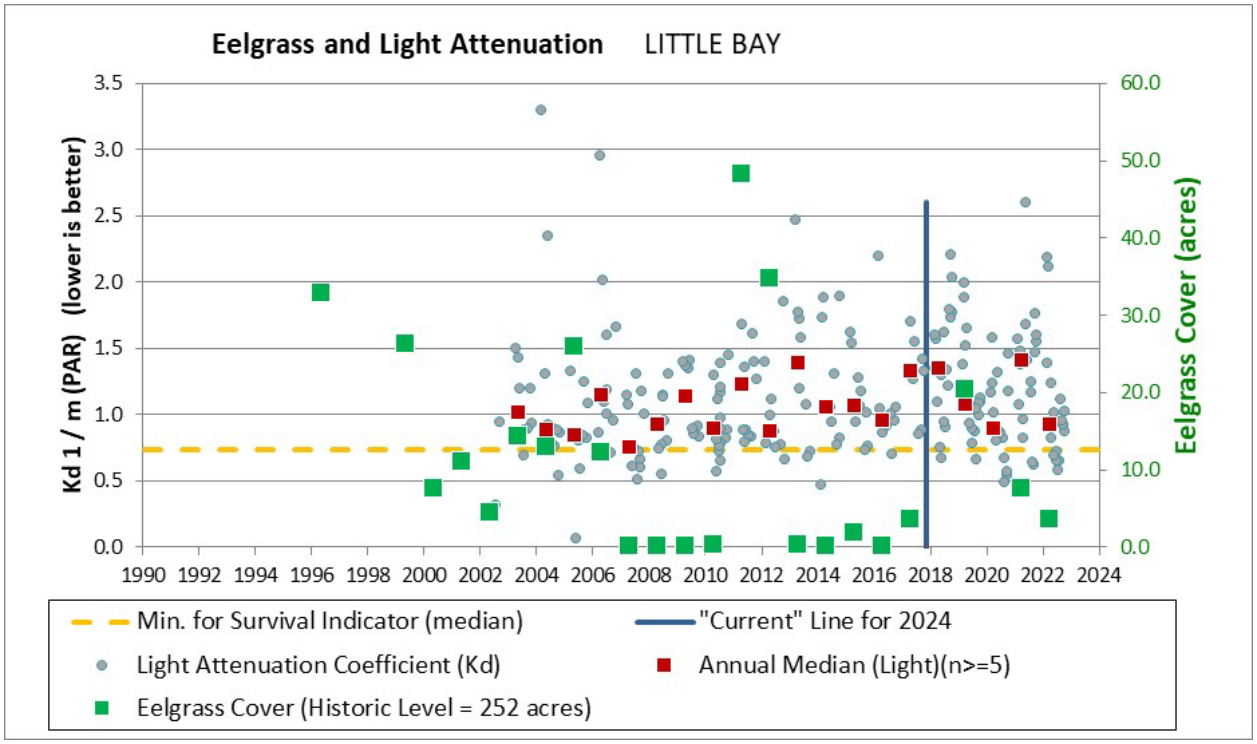

Chlorophyll-a
LITTLE BAY
ug Chl-a / L
100.00
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

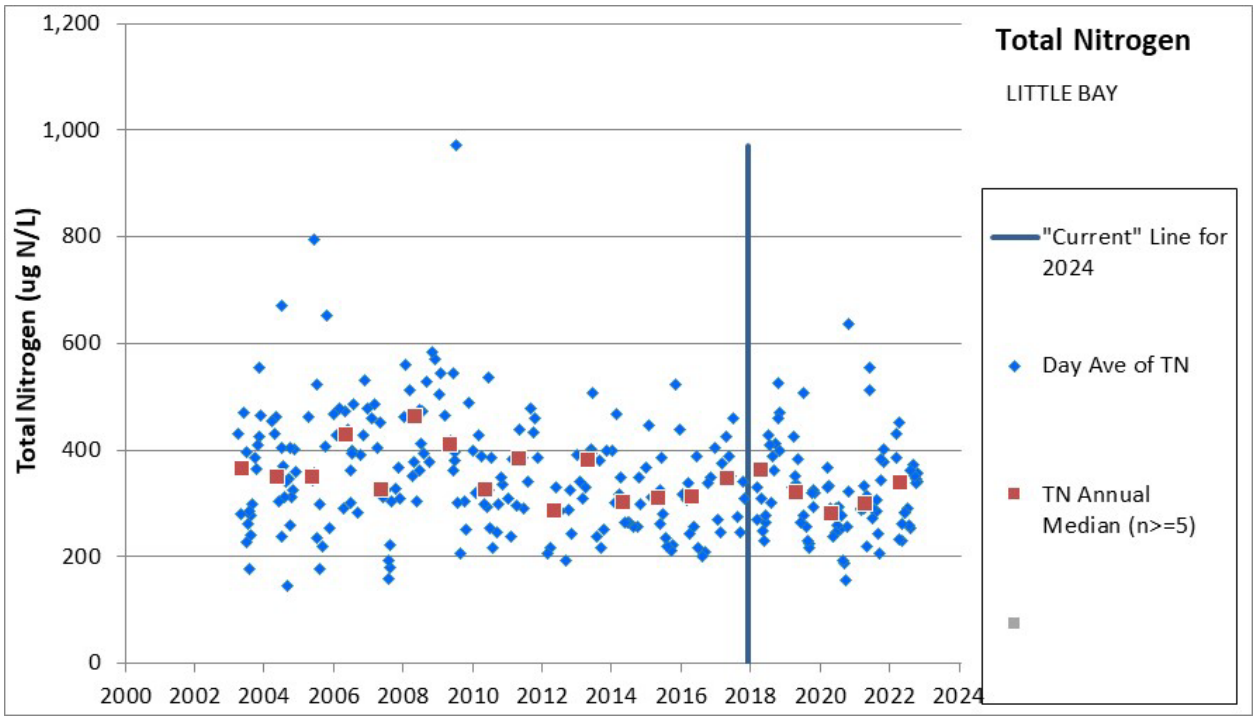

Dissolved Oxygen Concentration
LITTLE BAY
Dissolved Oxygen, mg / L
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
LITTLE BAY
Dissolved Oxygen, Percent Saturation
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
LITTLE BAY
TSS (mg/L)
1,000
100
10
1
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)


Light Attenuation
LITTLE BAY
Kd 1 / m (PAR) (lower is better)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)


Eelgrass and Light Attenuation
LITTLE BAY
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)
Eelgrass Cover (Historic Level = 252 acres)


Total Nitrogen
LITTLE BAY
Total Nitrogen (ug N/L)
1,200
1,000
800
600
400
200
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)

Little Bay Assessment Zone (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	85	0.6	4.0	9.0	15.8
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	85	0.0	4.0	9.0	15.8
LIGHT ATTENUATION COEFFICIENT (1/m)	85	0.50	1.11	1.79	2.61
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	1,107	1.3	4.0	7.0	32.0
TSS (mg/L)	89	2.7	19.1	28.0	57.1
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	71	1.1	2.8	4.9	7.0
DO-PPM-24HR-MIN-CP (mg/L)	590	0.1	7.0	8.0	9.5
DO-PPM-24HR-MIN-NCP (mg/L)	545	3.2	8.8	9.9	11.2
DO-PPM-GRAB-CP (mg/L)	20	6.0	7.5	8.2	8.3
DO-PPM-GRAB-NCP (mg/L)	28	7.5	9.6	11.5	12.2
DO-PERC-24H-MEAN-CP (% sat)	591	67.1	97.4	106.4	120.5
DO-PERC-24H-MEAN-NCP (% sat)	535	80.5	94.6	104.2	119.9
DO-PERC-2TIDE-GRAB-CP (% sat)	20	81.8	100.8	108.8	112.1
DO-PERC-2TIDE-GRAB-NCP (% sat)	25	87.3	96.5	104.6	110.6
DO-PERC-GRAB (% sat)	48	81.8	98.0	107.6	112.1
Day Ave of TN (ug N/L)	89	157	311	432	636
Day Ave of TDN (ug N/L)	89	117	208	311	460
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	89	6	84	192	360
Day Ave of NH3 (ug N/L)	89	3	25	68	199
Day Ave of PON (ug N/L)	18	0	91	198	242
Day Ave of NO2/3 (ug N/L)	89	4	48	151	325
SALINITY-Grabs (pss)	99	0.1	24.9	30.9	31.5
SALINITY-Datalogger Daily Median (pss)	1,150	10.4	26.4	30.7	31.9
pH-grab	0	-	-	-	-
pH-24HR (min)	1,102	7.1	7.9	7.7*	8.1
pH-24HR (max)	1,102	7.6	8.0	8.1	8.4
Temperature	99	1.6	15.1	22.9	24.5
Temperature-Daily Median	3,138	1.6	17.0	21.9	24.7

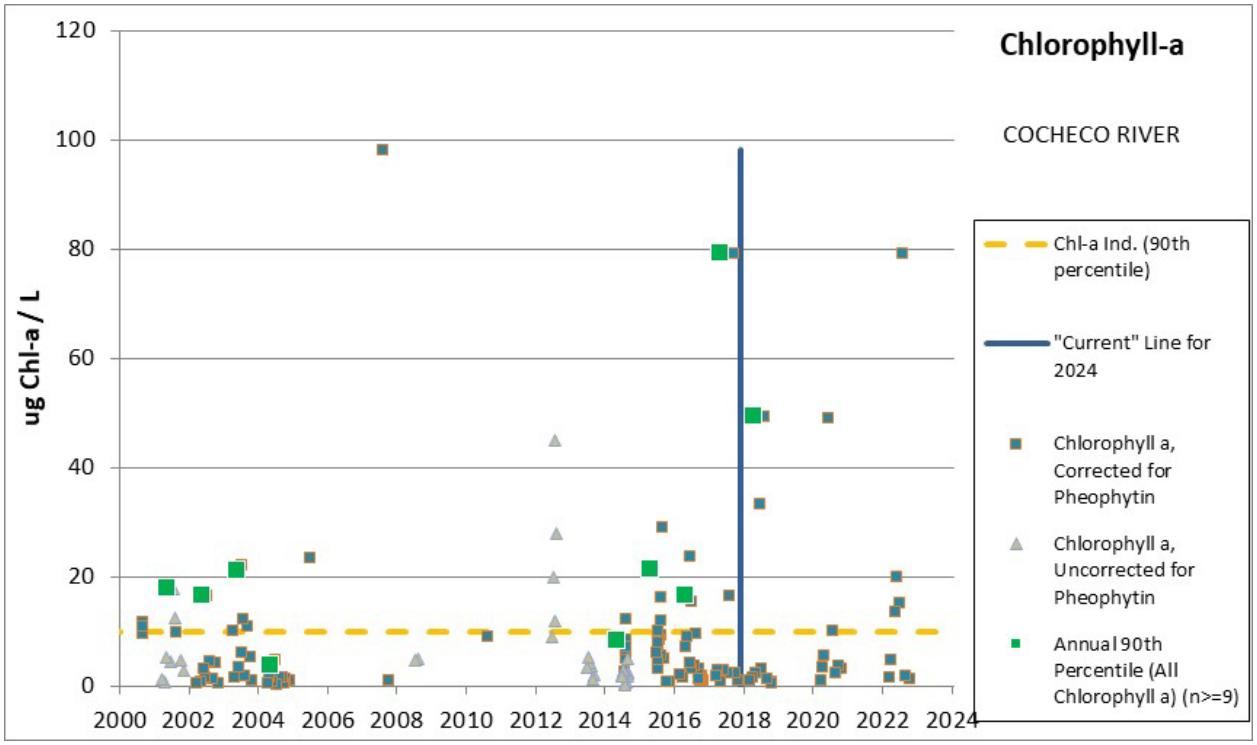
*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

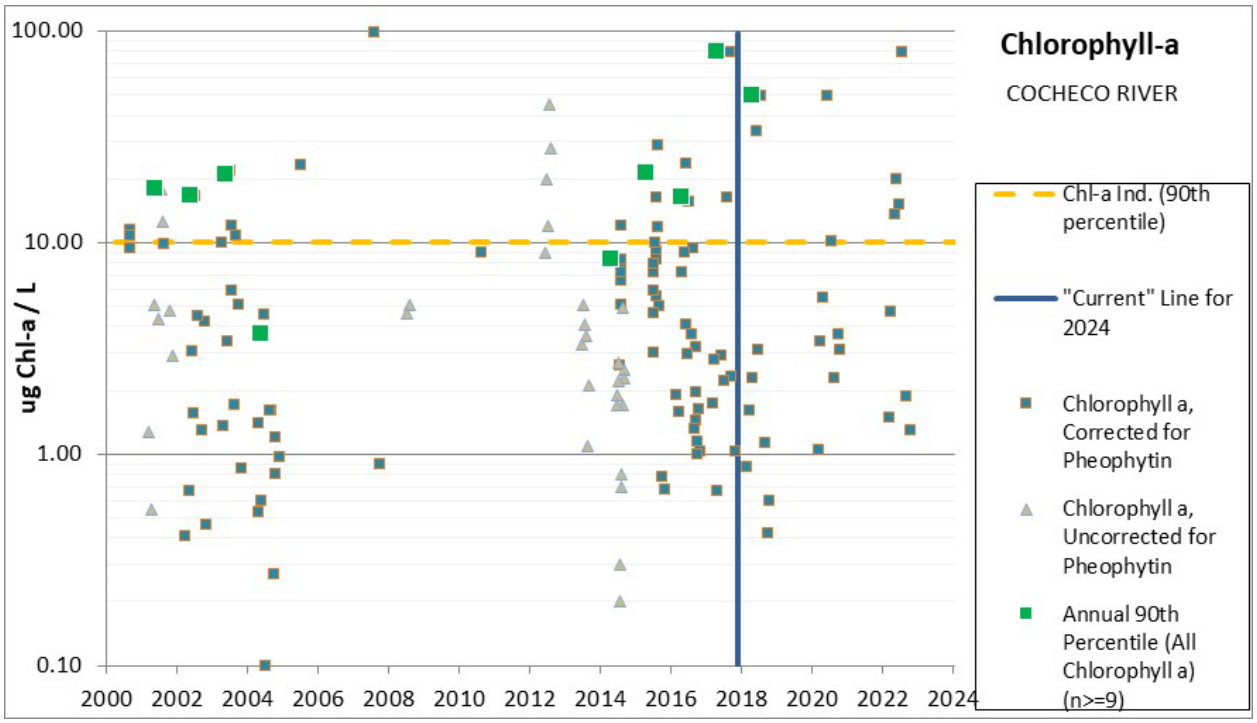
Assessment Zone = COCHECO RIVER

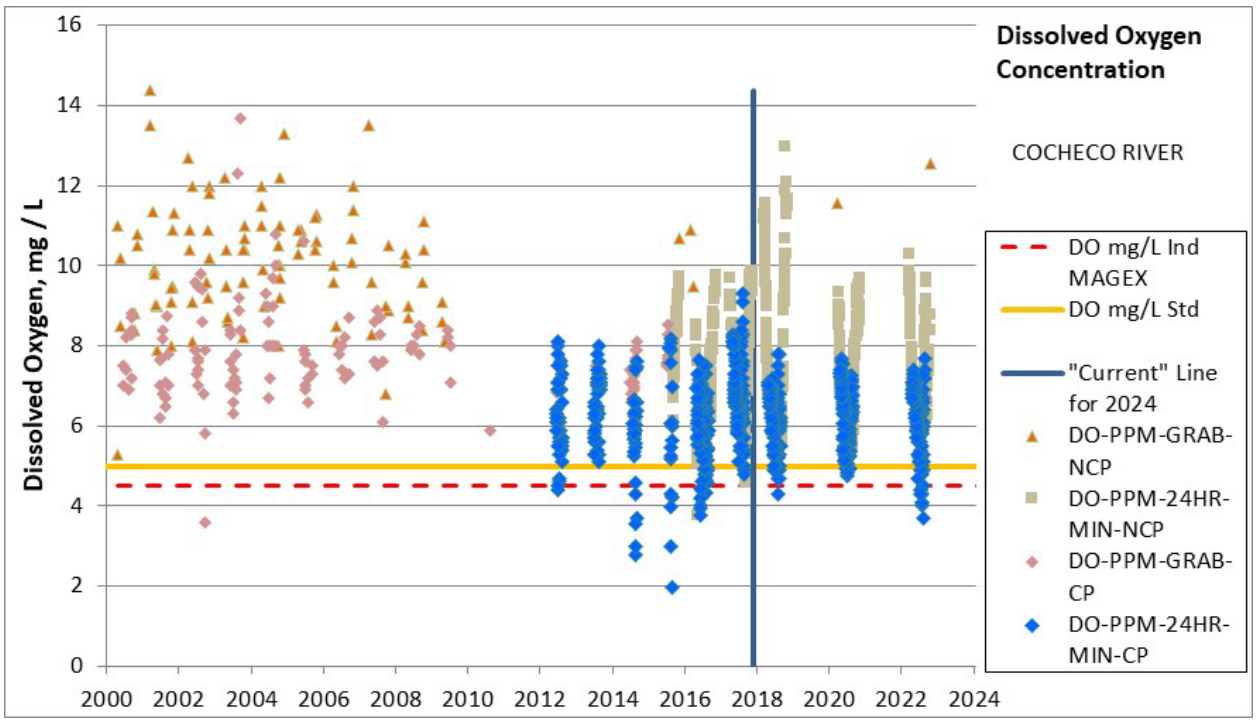
(NHEST600030608-01)

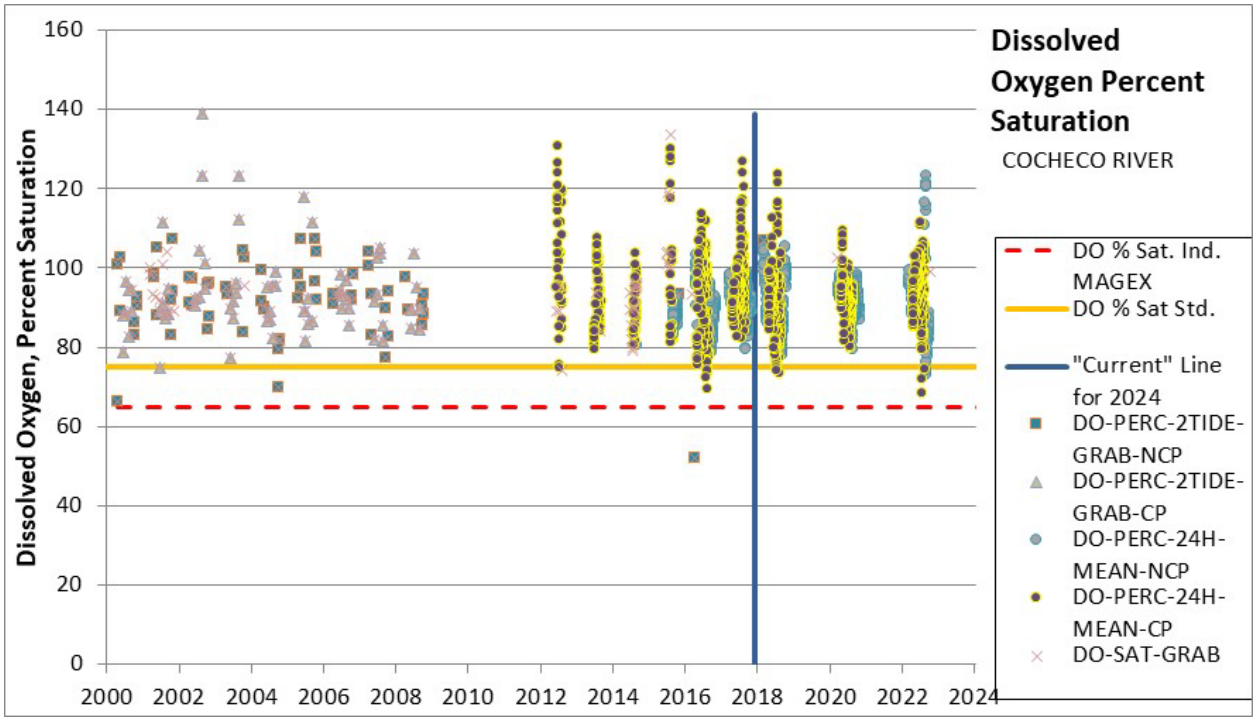
As of the date of data retrieval (April 13, 2023) water quality data through 2022 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means there are two additional years of datalogger and grab sample data (2020, 2022) compared to the 2020/2022 assessment.

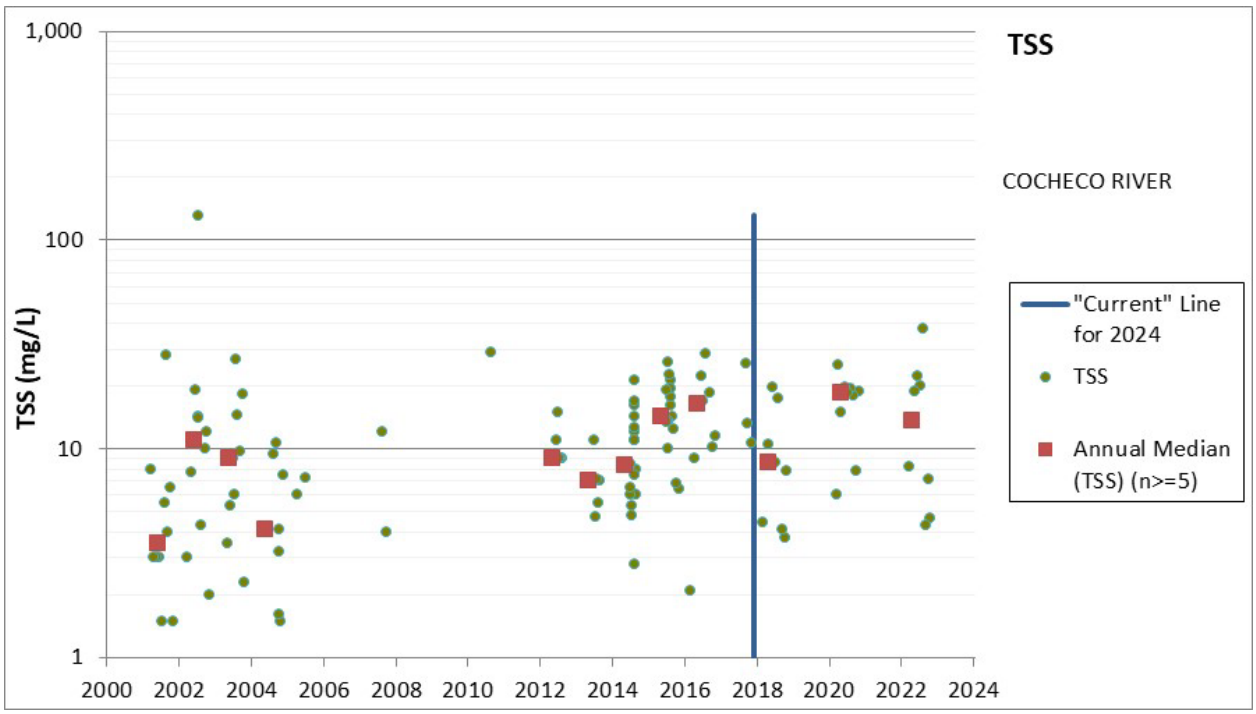
Indicator	Aquatic Life Use Category 2020/2022 /2024	2024 Comment
Chlorophyll-a	5-P / 5-P	The calculated 90th percentile chlorophyll-a in this assessment zone is 49.1 µg/L (n = 25) and a maximum reading of 79 µg/L. The chlorophyll-a indicator threshold to prevent low dissolved oxygen is a 90th percentile below 10 µg/L. The chlorophyll-a impairment has been retained.
Dissolved Oxygen (mg/L)	5-M / 5-M	This assessment zone had datalogger deployments in 2018, 2020 and 2022. During the critical summer period across those 3-years, there were 85-instances of DO below 5 mg/L with an average event duration of 4.5-hours. The frequency, duration and magnitude of the low DO that warranted an impairment in the 2020/2022 assessment cycles has been retained.
Dissolved Oxygen (% Saturation)	2-M / 2-M	Dissolved oxygen percent saturation has been assessed using the 2018, 2020 and 2022 dataloggers. On only 6-occasions did the critical summer period 24-hour average percent saturation fall below 75% (1.7% of measure days) with a 24-hour minimum of 68% saturation. The 2020/2022 assessed as supporting aquatic life based on dissolved oxygen percent saturation has been retained.
Estuarine Bioassessments (eelgrass)	No Std/ No Std	Not applicable. Eelgrass habitat has not historically existed in this assessment zone.
Water Clarity (Light Attenuation Coefficient)	No Std/ No Std	Not applicable. The water clarity has not been assessed because eelgrass has not historically existed in this assessment zone.
Total Nitrogen	5-M / 5-M	The median total nitrogen from 2018 through 2022 was 551 µg/L (n=27). It must be noted that recent total nitrogen reductions have occurred due to infrastructure investments by the municipalities (Rochester WWTP reductions in 2014 and Dover WWTP began reductions in 2015) which may help explain why there are fewer of the very-high TN values seen in the past. This assessment zone experienced frequent dissolved oxygen concentrations below 5 mg/L in 2018 through 2022 and as low as 3.7 mg/L but rarely daily average dissolved saturation below 75%. The chlorophyll-a concentration 90th percentile was 49.1 µg/L (n = 25) and a maximum reading of 79 µg/L. It is not clear at this time whether the measured high chlorophyll and low dissolved oxygen is solely the result of current loads of nitrogen or if the historically higher loads are still flushing through the ecosystem. The status of the indicators of nutrients and nutrient-related impacts has not changed and continue to present a preponderance of evidence that eutrophication effects are ongoing. While there has been a rapid decrease in nutrient loading and improved conditions expected in the coming years, the response datasets still warrant nitrogen impairment under New Hampshire's narrative standard.

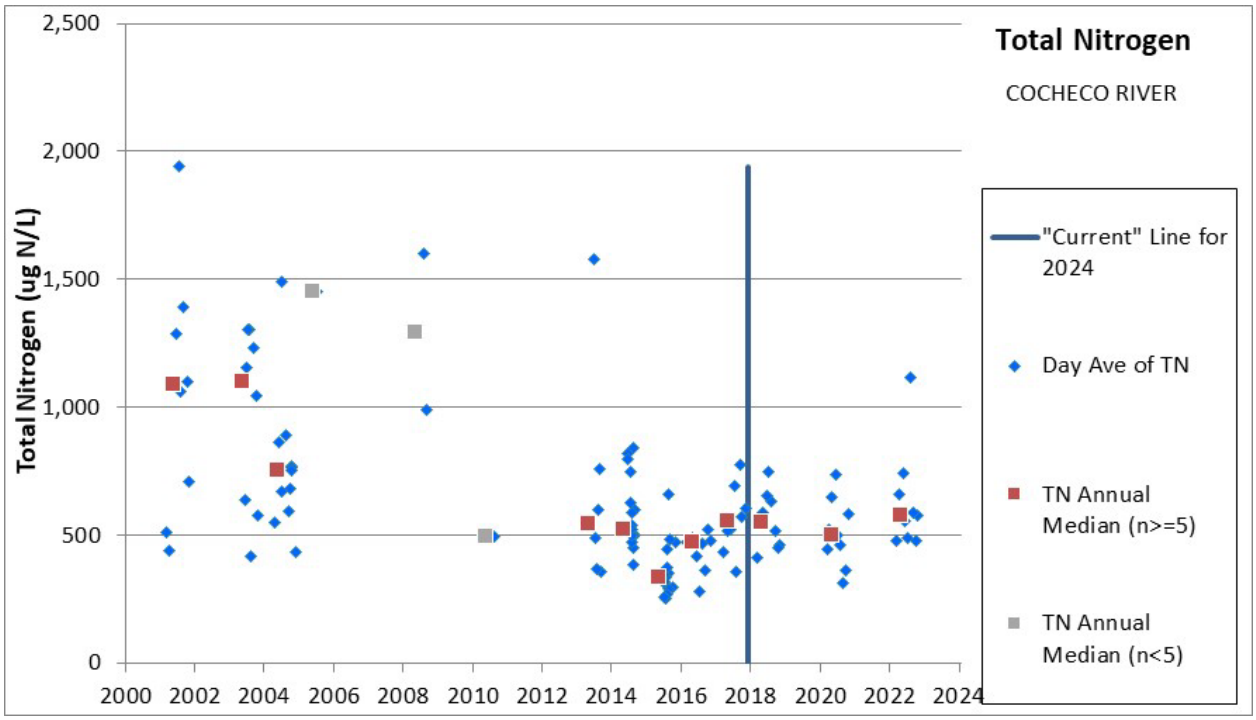

Chlorophyll-a
COCHECO RIVER
ug Chl-a / L
120
100
80
60
40
20
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)


Chlorophyll-a
COCHECO RIVER
ug Chl-a / L
100.00
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)


Dissolved Oxygen Concentration
COCHECO RIVER
Dissolved Oxygen, mg / L
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
COCHECO RIVER
Dissolved Oxygen, Percent Saturation
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
COCHECO RIVER
TSS (mg/L)
1,000
100
10
1
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)


Total Nitrogen
COCHECO RIVER
Total Nitrogen (ug N/L)
2,500
2,000
1,500
1,000
500
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)
TN Annual Median (n<5)

Cocheco River Assessment Zone (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	25	0.4	3.1	49.1	79.0
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	25	0.0	3.1	49.1	79.0
LIGHT ATTENUATION COEFFICIENT (1/m)	27	0.82	1.70	2.45	3.53
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	664	1.4	5.0	8.0	69.0
TSS (mg/L)	27	3.8	13.6	22.8	37.5
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	19	3.7	4.8	9.0	10.2
DO-PPM-24HR-MIN-CP (mg/L)	358	3.7	6.1	7.0	7.8
DO-PPM-24HR-MIN-NCP (mg/L)	296	5.6	8.2	10.7	13.0
DO-PPM-GRAB-CP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-NCP (mg/L)	2	11.6	12.1	-	12.6
DO-PERC-24H-MEAN-CP (% sat)	356	68.4	93.0	101.8	123.7
DO-PERC-24H-MEAN-NCP (% sat)	294	73.1	92.3	100.9	123.4
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	1	106.9	106.9	-	106.9
DO-PERC-GRAB (% sat)	3	99.0	102.5	-	106.9
Day Ave of TN (ug N/L)	27	315	551	746	1,116
Day Ave of TDN (ug N/L)	27	230	404	529	548
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	27	18	250	357	510
Day Ave of NH3 (ug N/L)	27	4	30	72	141
Day Ave of PON (ug N/L)	16	5	113	434	629
Day Ave of NO2/3 (ug N/L)	27	5	228	316	478
SALINITY-Grabs (pss)	26	0.2	5.9	23.6	24.5
SALINITY-Datalogger Daily Median (pss)	667	0.1	22.6	27.1	29.5
pH-grab	0	-	-	-	-
pH-24HR (min)	648	6.3	7.6	7.3*	8.1
pH-24HR (max)	648	7.1	7.9	8.1	8.4
Temperature	27	2.3	17.0	25.4	26.4
Temperature-Daily Median	667	1.4	18.1	24.3	26.9

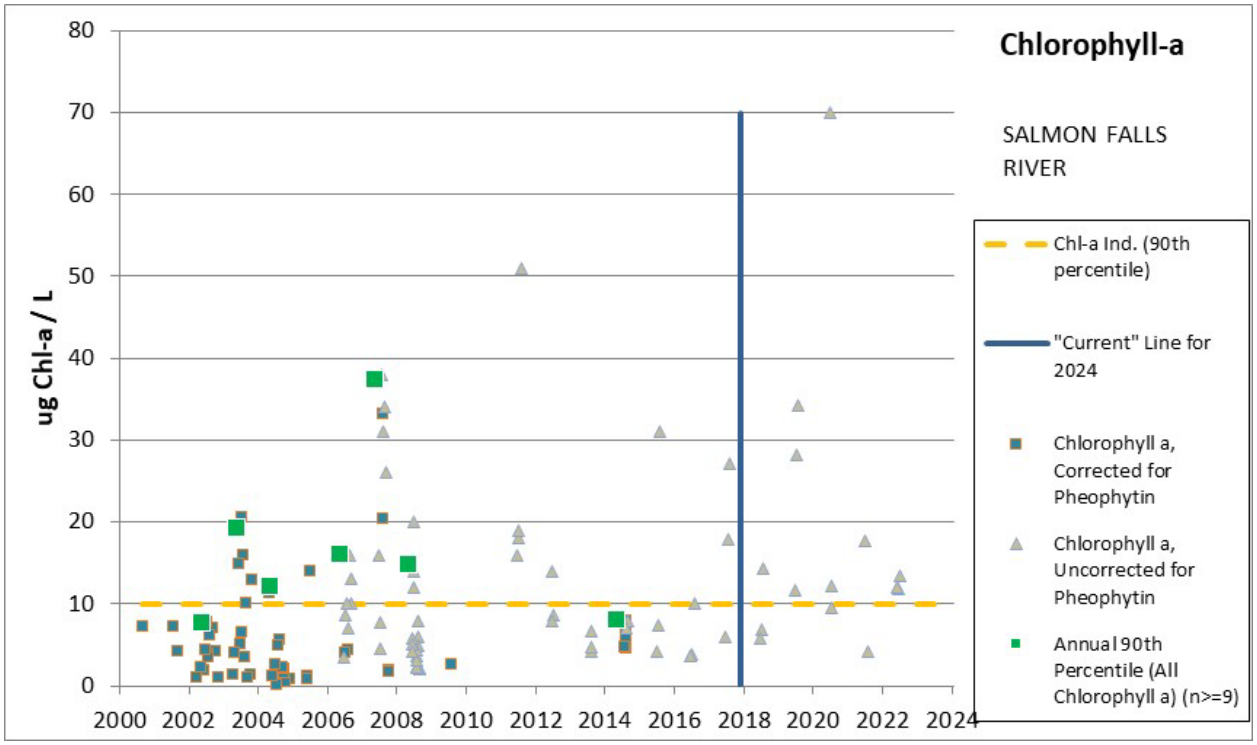
*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

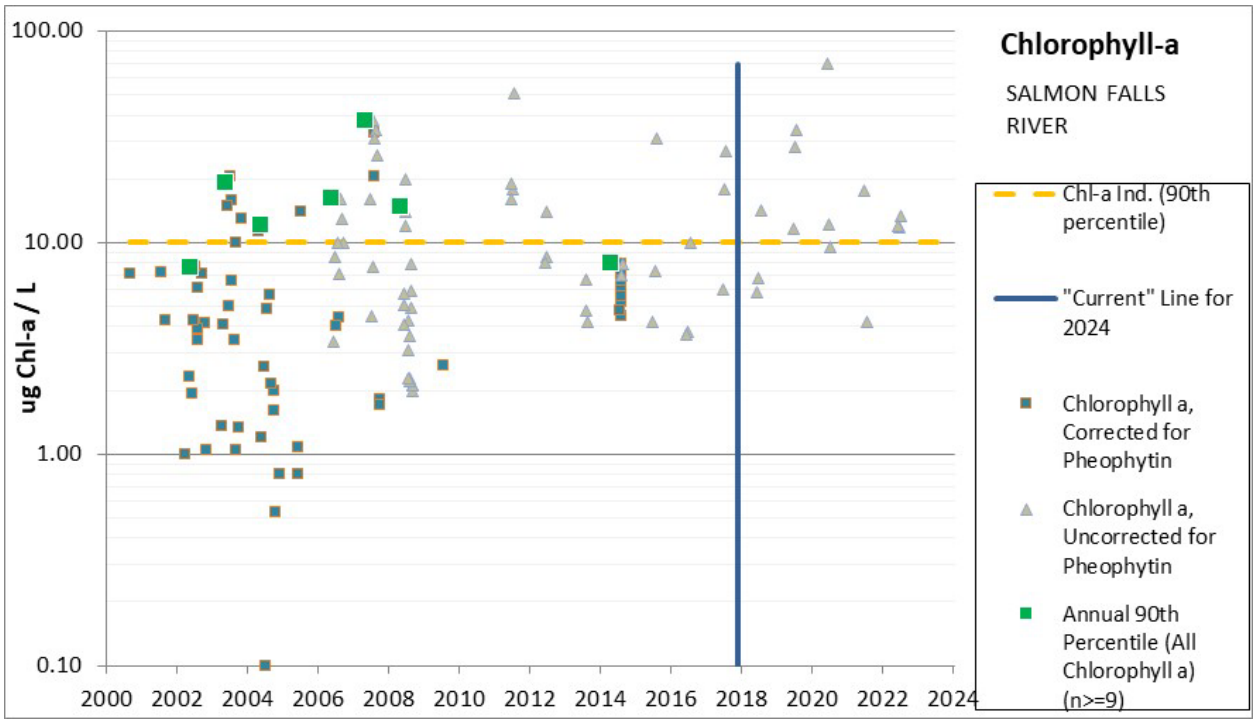
Assessment Zone = SALMON FALLS RIVER

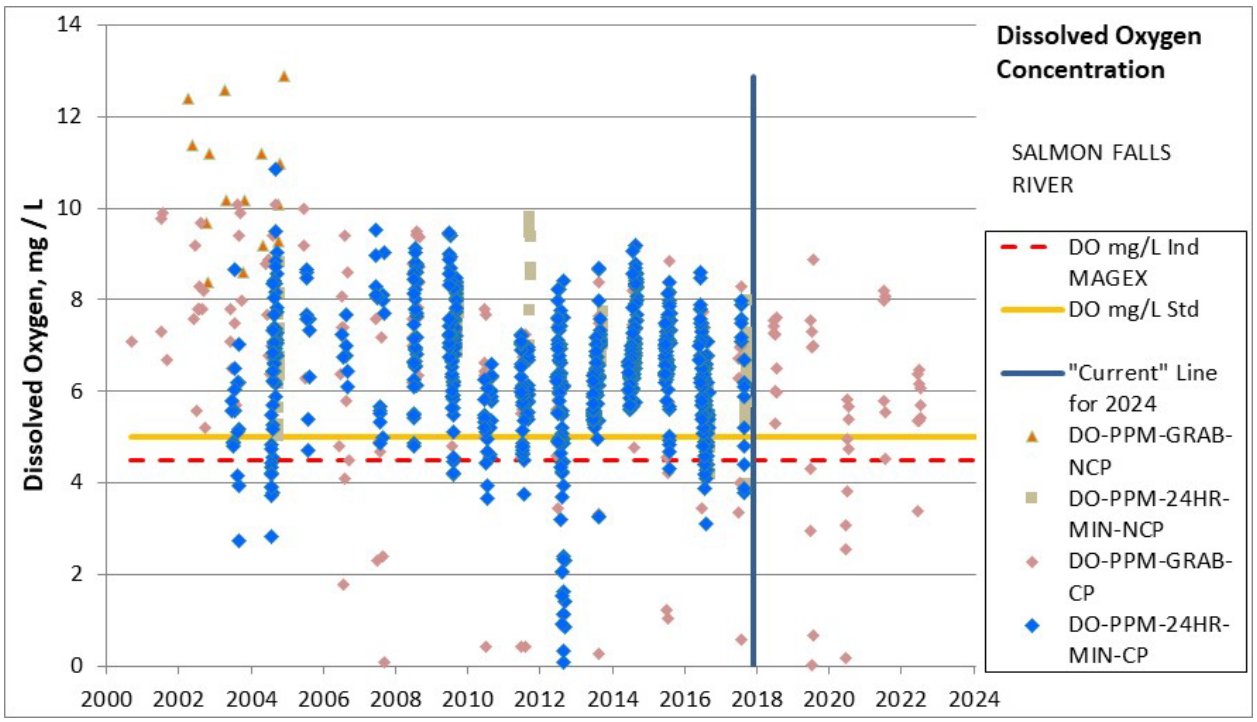
(NHEST600030406-01)

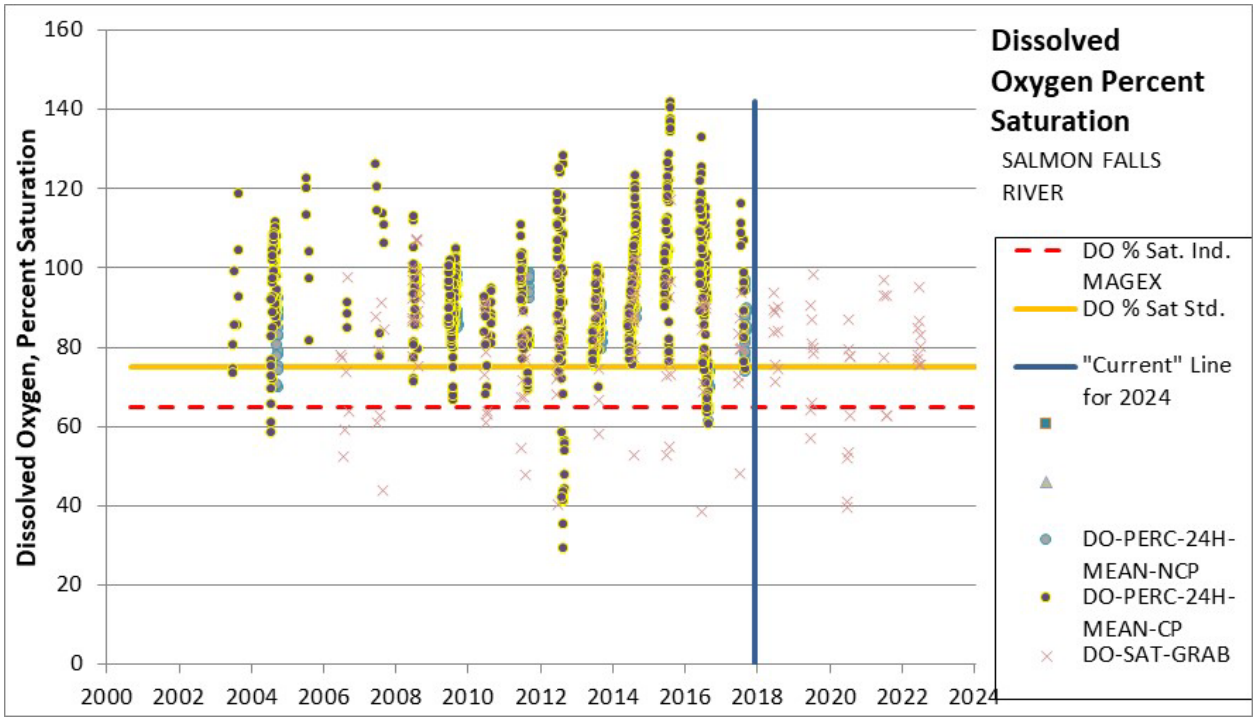
As of the date of data retrieval (April 13, 2023) water quality data through 2022 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means there are 4-years of additional grab sample data (2019-2022) compared to the 2020/2022 assessment but no new dataloggers as the most recent datalogger deployment was in 2017, outside of the "current" period used in assessments.

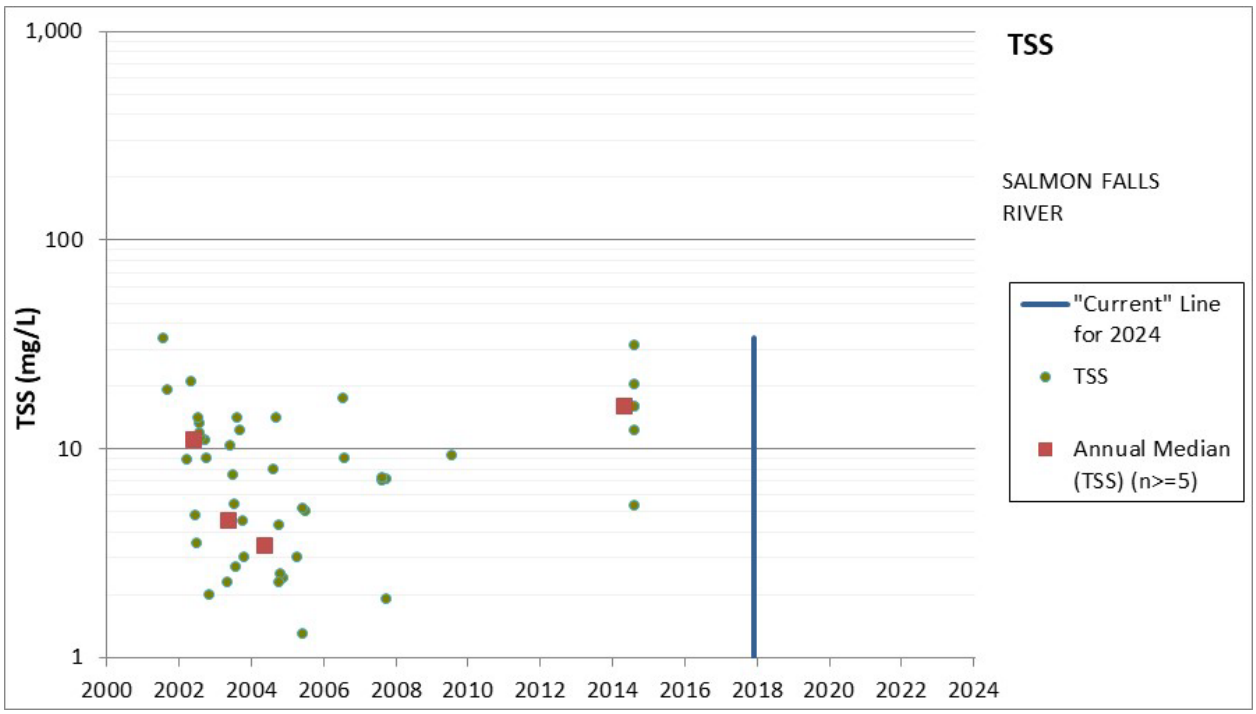
Indicator	Aquatic Life Use Category 2020/2022/2024	2024 Comment
Chlorophyll-a	5-P / 5-P	The calculated 90th percentile chlorophyll-a in this assessment zone is 52.1 µg/L (n = 14) and a maximum reading of 70 µg/L. The chlorophyll-a indicator threshold to prevent low dissolved oxygen is a 90th percentile below 10 µg/L. The chlorophyll-a impairment has been retained.
Dissolved Oxygen (mg/L)	5-P / 5-P	Dissolved oxygen concentration measurements in this assessment zone are now just represented by grab samples and consistently fall below the 5 mg/L criterion. In most years, a portion of those grab samples fall below 4 mg/L and in 2019 and 2020 there were several measurements below 1 mg/L, as such, this impairment is considered severe.
Dissolved Oxygen (% Saturation)	5-M / 5-M	Dissolved oxygen 24-hour average percent saturation is now solely represented by grab samples. The distribution of grab samples appears just as it did when the grab samples were supported by continuous dataloggers, as such, dissolved oxygen 24-hour average percent saturation assessment has been retained as not supporting.
Estuarine Bioassessments (eelgrass)	No Std / No Std	Not applicable. Eelgrass habitat has not historically existed in this assessment zone.
Water Clarity (Light Attenuation Coefficient)	No Std / No Std	Not applicable. The water clarity has not been assessed because eelgrass has not historically existed in this assessment zone.
Total Nitrogen	5-P / 5-P	The median total nitrogen from 2018 through 2022 was 726 µg/L (n=42). This assessment zone experiences frequent dissolved oxygen concentrations well below 5 mg/L and daily average saturation below 75%. The chlorophyll-a concentration 90th percentile was 52.1 µg/L (n = 14) and a maximum reading of 70 µg/L. The status of the indicators of nutrients and nutrient-related impacts has not changed and continue to present a preponderance of evidence that eutrophication effects are ongoing. As such, the impairment for nitrogen has been retained.

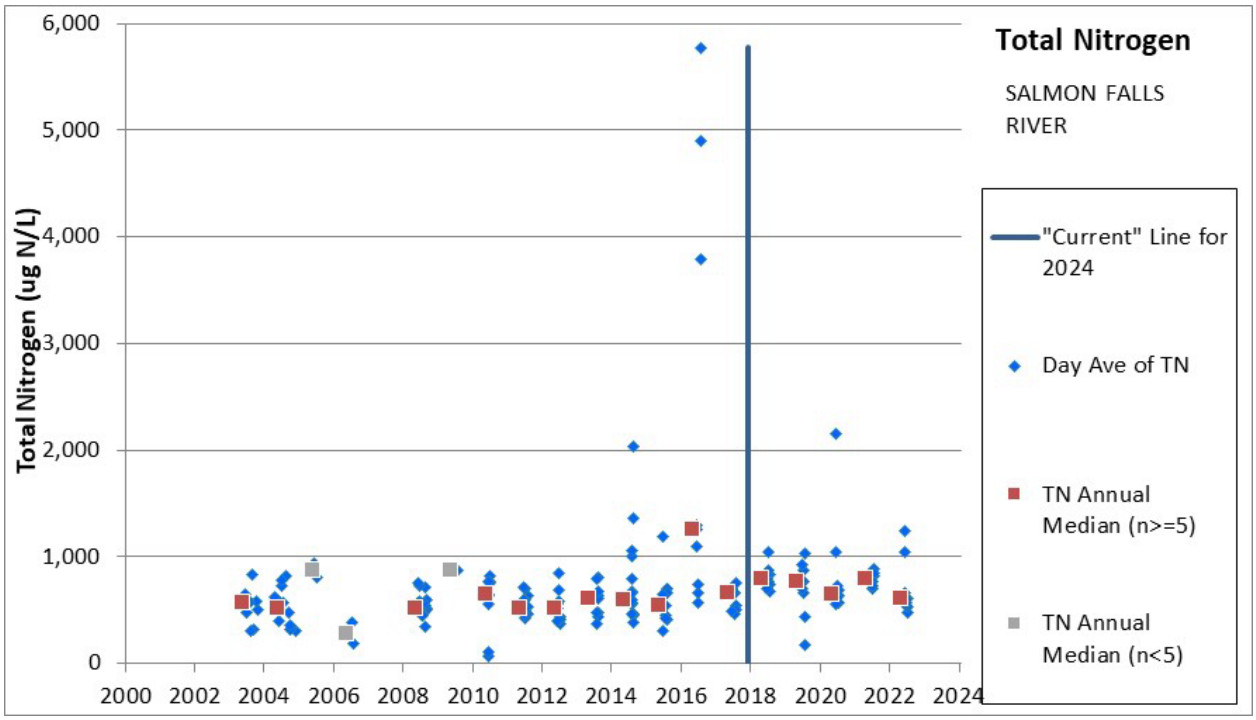

Chlorophyll-a
SALMON FALLS RIVER
ug Chl-a / L
80
70
60
50
40
30
20
10
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

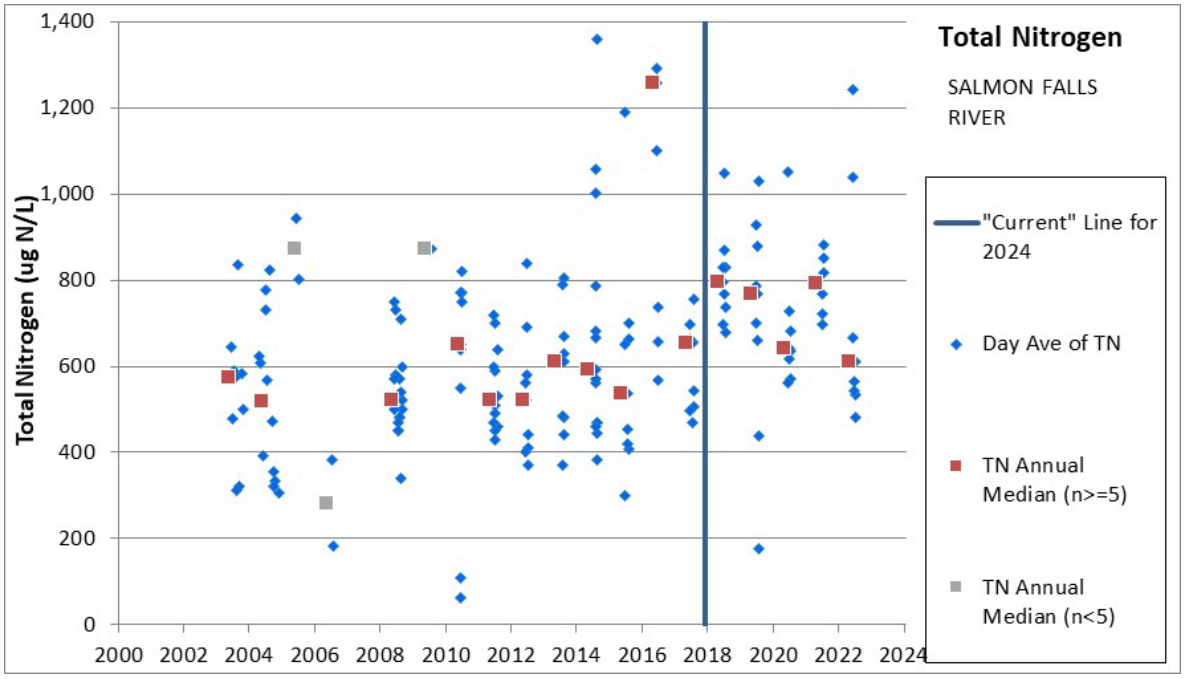

Chlorophyll-a
SALMON FALLS RIVER
ug Chl-a / L
100.00
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)


Dissolved Oxygen Concentration
SALMON FALLS RIVER
Dissolved Oxygen, mg / L
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
SALMON FALLS RIVER
Dissolved Oxygen, Percent Saturation
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
SALMON FALLS RIVER
TSS (mg/L)
1,000
100
10
1
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)


Total Nitrogen
SALMON FALLS RIVER
Total Nitrogen (ug N/L)
6,000
5,000
4,000
3,000
2,000
1,000
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)
TN Annual Median (n<5)


Total Nitrogen
SALMON FALLS RIVER
Total Nitrogen (ug N/L)
1,400
1,200
1,000
800
600
400
200
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)
TN Annual Median (n<5)

Salmon Falls River Assessment Zone (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	14	4.2	12.1	52.1	70.0
CHLOROPHYLL A, Combined (ug/L)	14	0.0	12.1	52.1	70.0
LIGHT ATTENUATION COEFFICIENT (1/m)	0	-	-	-	-
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	0	-	-	-	-
TSS (mg/L)	0	-	-	-	-
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	0	-	-	-	-
DO-PPM-24HR-MIN-CP (mg/L)	0	-	-	-	-
DO-PPM-24HR-MIN-NCP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-CP (mg/L)	42	0.0	5.8	7.9	8.9
DO-PPM-GRAB-NCP (mg/L)	0	-	-	-	-
DO-PERC-24H-MEAN-CP (% sat)	0	-	-	-	-
DO-PERC-24H-MEAN-NCP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	42	39.5	79.0	93.5	98.4
Day Ave of TN (ug N/L)	42	175	726	1,046	2,150
Day Ave of TDN (ug N/L)	0	-	-	-	-
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	42	37	239	361	430
Day Ave of NH3 (ug N/L)	42	12	89	153	294
Day Ave of PON (ug N/L)	0	-	-	-	-
Day Ave of NO2/3 (ug N/L)	42	25	120	306	331
SALINITY-Grabs (pss)	39	1.0	7.1	20.0	23.0
SALINITY-Datalogger Daily Median (pss)	0	-	-	-	-
pH-grab	42	6.2	7.1	7.6	7.7
pH-24HR (min)	0	-	-	-	-
pH-24HR (max)	0	-	-	-	-
Temperature	42	20.7	23.6	26.5	27.1
Temperature-Daily Median	0	-	-	-	-

*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

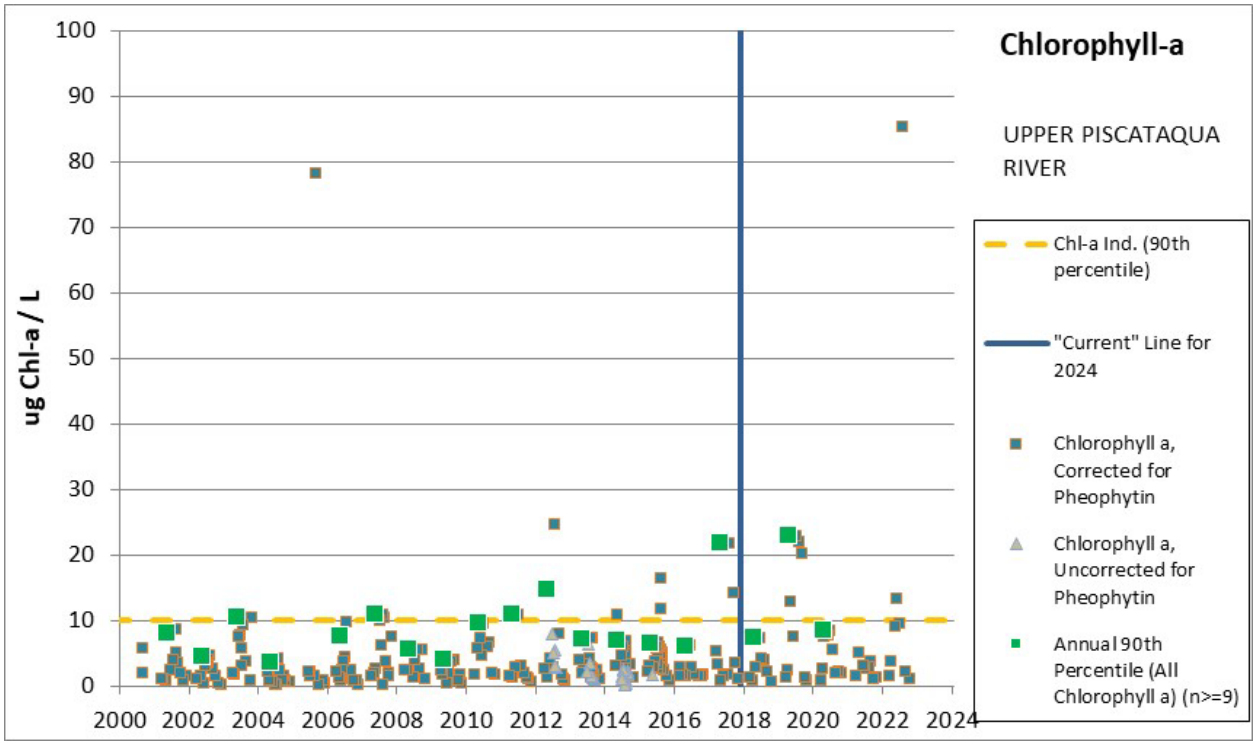
Assessment Zone = UPPER PISCATAQUA RIVER

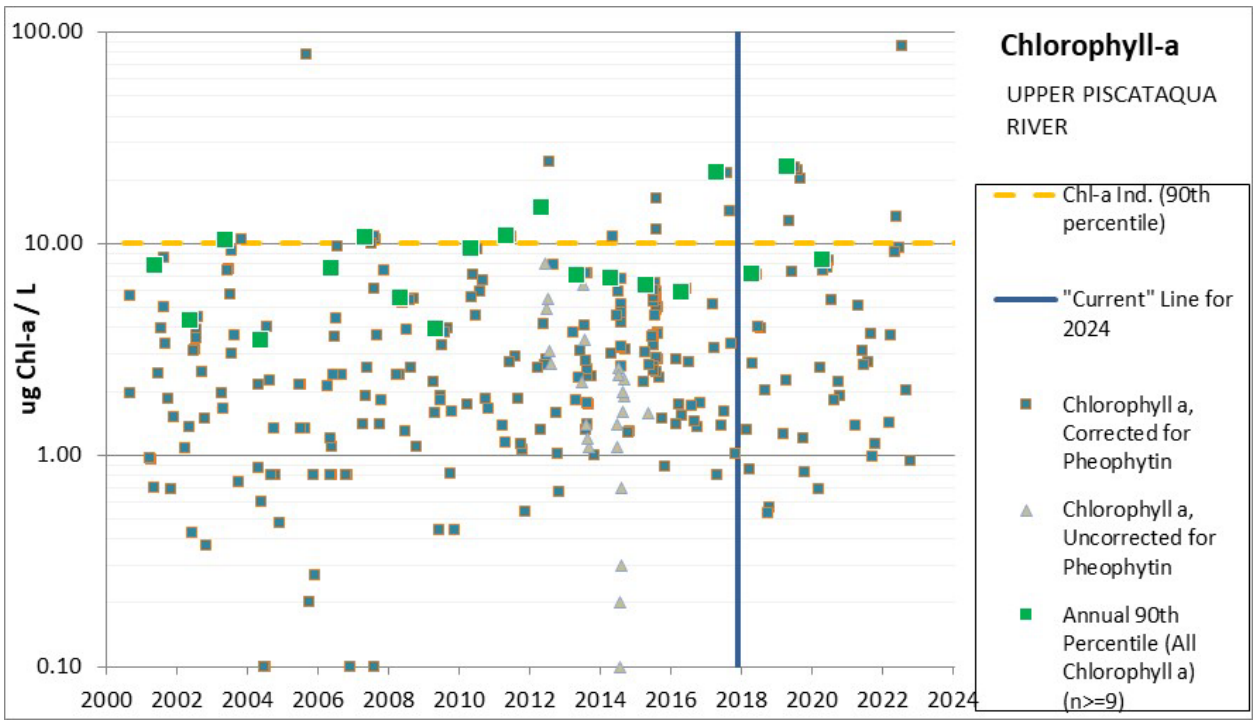
(NHEST600031001-01-01, NHEST600031001-01-02, NHEST600031001-01-03)

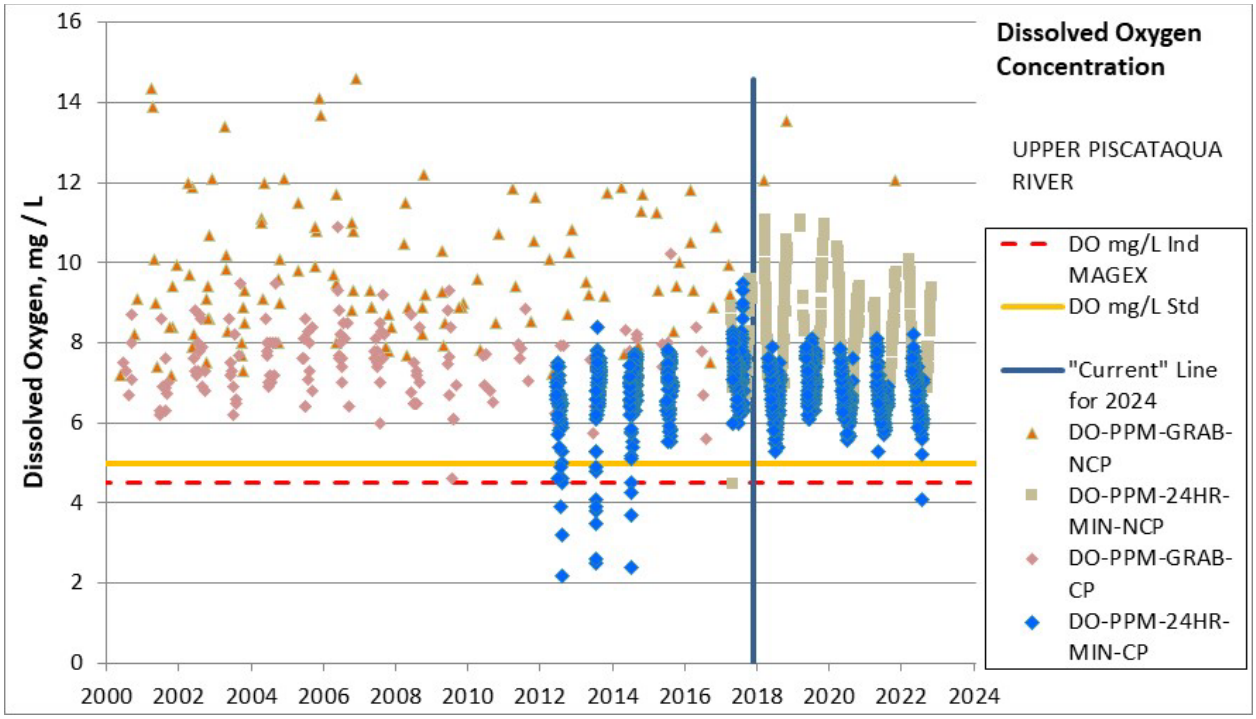
As of the date of data retrieval (April 13, 2023) water quality data through 2022 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means there are 4-additional years of datalogger and grab sample data (2019-2022) compared to the 2020/2022 assessment.

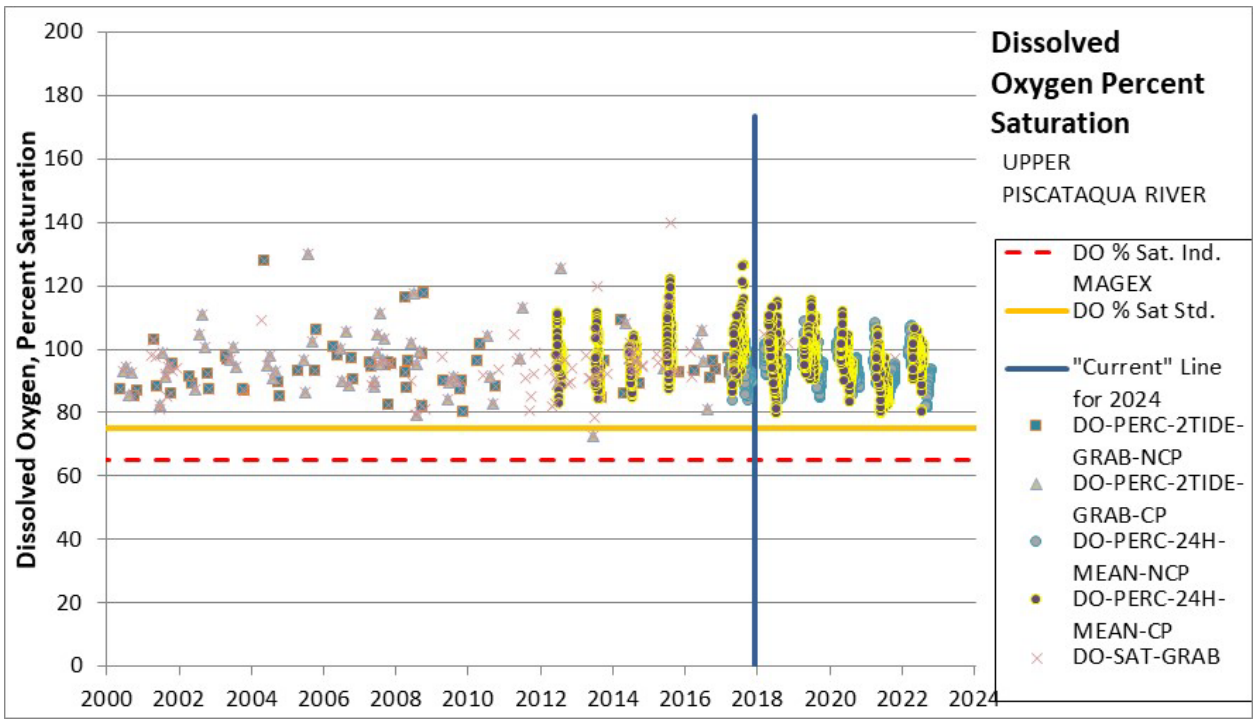
Indicator	Aquatic Life Use Category 2020/2022 / 2024	2024 Comment
Chlorophyll-a	2-M / 3-PNS	The calculated 90th percentile chlorophyll-a in this assessment zone is 17.5 µg/L (n = 43). The chlorophyll-a indicator threshold to prevent low dissolved oxygen and preserve light for eelgrass health is a 90th percentile below 10 µg/L. Dissolved oxygen generally remains well above the 5 mg/L criteria (and the percent saturation criteria is always met), but light attenuation is high. The status of the indicators of excess chlorophyll-a and related impacts provide a mixed story on the water column primary production effects occurring in this zone. Therefore, this assessment zone has been assessed as Insufficient Information – Potentially Not Supporting aquatic life based on chlorophyll-a.
Dissolved Oxygen (mg/L)	2-M / 2-M	The datalogger deployments from 2012-2014 indicated that there were infrequent but at times severe reductions in DO. The nutrient load to this assessment zone is rapidly decreasing due to ongoing work by the municipalities (Rochester reductions in 2014 and Dover began reductions in 2015). The data logger deployments from 2018-2022 demonstrate a single day where DO dropped below the 5 mg/L criterion. The assessment zone remains fully supporting of the dissolved oxygen concentration criteria.
Dissolved Oxygen (% Saturation)	2-M / 2-G	The data logger deployments from 2018-2022 always stayed above the 24-hour average percent saturation criterion of 75%. The assessment zone remains fully supporting of the dissolved oxygen percent saturation criterion.
Estuarine Bioassessments (eelgrass)	5-P / 5-P	The historical extent of eelgrass in this assessment zone was 79.7 acres from the 1948, 1962, 1980 and 1981 datasets. The median current extent of eelgrass in 2019-2022 is 2.4 acres, which is a decrease of 97.0%. In 2019 2.2 acres of eelgrass were mapped, the first eelgrass measured since the last bits of eelgrass that had been hanging on were lost after 2006. Since 1990, the trend in eelgrass cover in this assessment zone was not significant. The thresholds for impairment are either a loss of more than 20% of the historic extent of eelgrass or a recent trend of greater than 20% loss.
Water Clarity (Light Attenuation Coefficient)	5-M / 5-P	Median=1.64 m^-1 (n=40). For an eelgrass restoration depth of 2 m, the light attenuation coefficient threshold is 0.75 m^-1. This assessment zone historically had eelgrass growing in both the shallows and some in deeper habitat making the 2m restoration depth a valid target. Only one of the 40 light measurements collected since 2018 met the 0.75 m^-1 threshold. The impaired status has been moved to severe (5-P).
Total Nitrogen	3-PNS / 3-PNS	The median total nitrogen from 2018 through 2022 was 429 µg/L (n=44). While the dissolved oxygen data showed that this assessment zone experienced short duration concentrations below the 5 mg/L criterion before 2015, the assessment zone has had just a single DO issues since that time. The 24-hour average dissolved oxygen percent saturation did not fall below 75% in any of the 5-years of datalogger records in the current period. The calculated 90th percentile chlorophyll-a in this assessment zone is now 17.5 µg/L (n = 43) and a maximum reading of 85.4 µg/L. The grab sample based light attenuation (median=1.64 m^-1, n=40) appears to have worsened in recent years. For

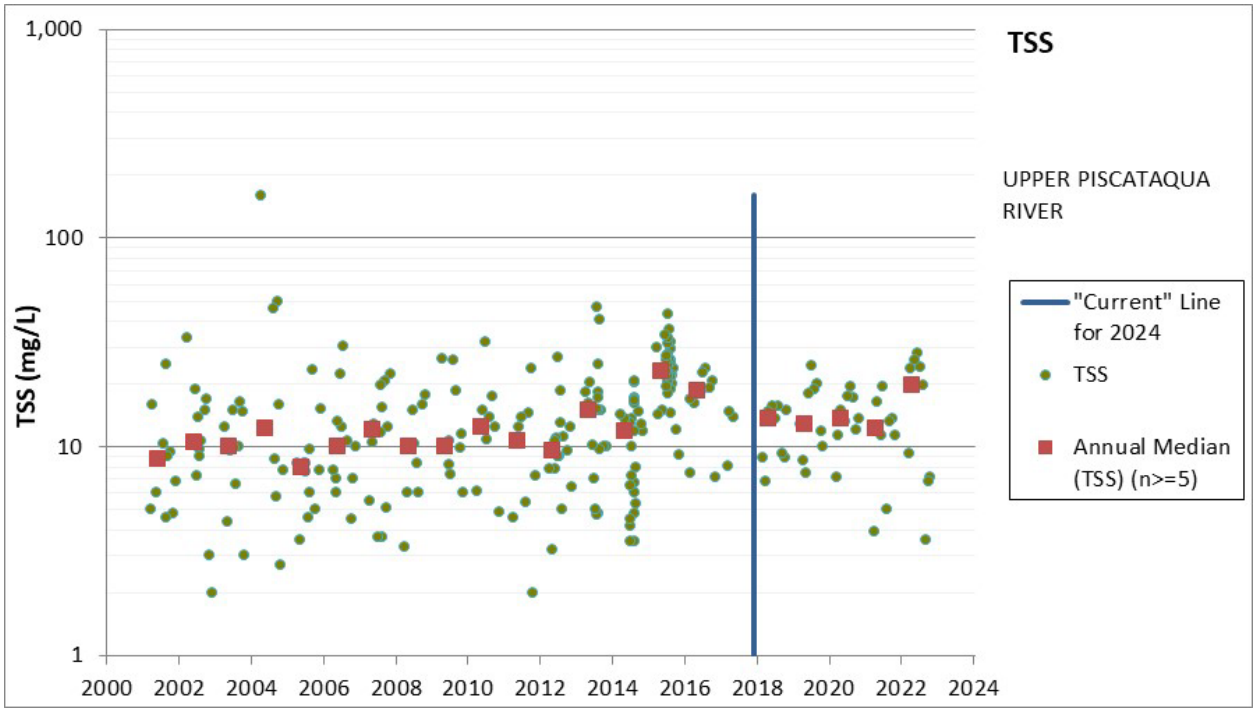
		shallow systems, it is expected that changes in macroalgae will precede changes in phytoplankton (McGlathery, Sundbäck, & Anderson, 2007) (Valiela, et al., 1997), and perhaps has been occurring in this assessment zone. The foremost authority on macroalgae for this estuary, Dr. Arthur C. Mathieson, commented on the draft 2012 303(d) that he remained concerned about the macroalgae and epiphyte conditions in Great Bay estuary (NHDES, 2013). In the 2019 macroalgae annual report, the appreciable cover at Hilton Point appears to have a visually downwards trend in green macroalgae but did not show statistical decreases in any macroalgae, although that site has only been sampled 3-times (2013, 2015, 2018) making trend detection more difficult (Burdick, et al., 2020). The status of the indicators of nutrients and nutrient-related impacts provide a mixed story on the eutrophication effects occurring in this zone. Eelgrass is just 3% of its historic extent, light attenuation is rarely sufficient, chlorophyll-a levels appear to have risen and are episodically very high, and the recent TN levels are elevated, yet DO remains good. Point-source nutrient load to this assessment zone is rapidly decreasing due to ongoing work at WWTFs by the nearby municipalities (Rochester reductions in 2014 and Dover began reductions in 2015 and Portsmouth reduced TN in 2020) but the high TN suggests that non-point sources are still very high. As such, this assessment zone has been assessed as insufficient information – potentially not supporting (3-PNS) for total nitrogen.

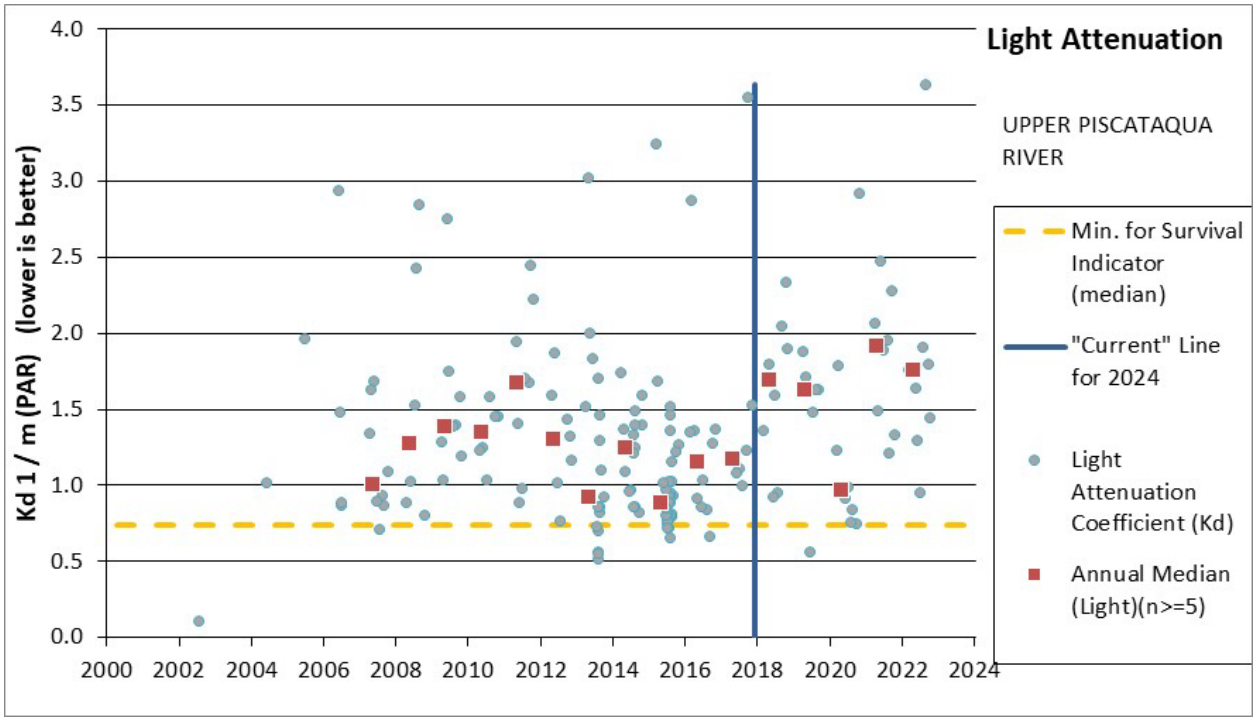


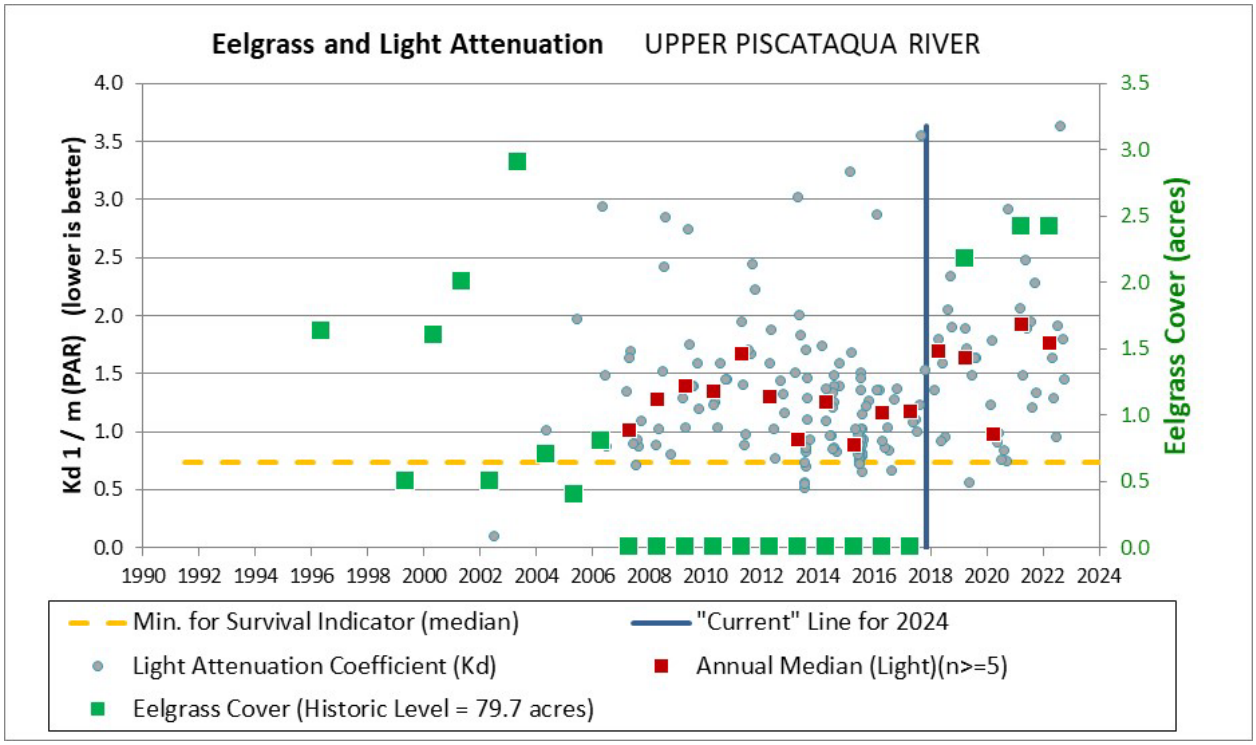

Chlorophyll-a
UPPER PISCATAQUA RIVER
ug Chl-a / L
100.00
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

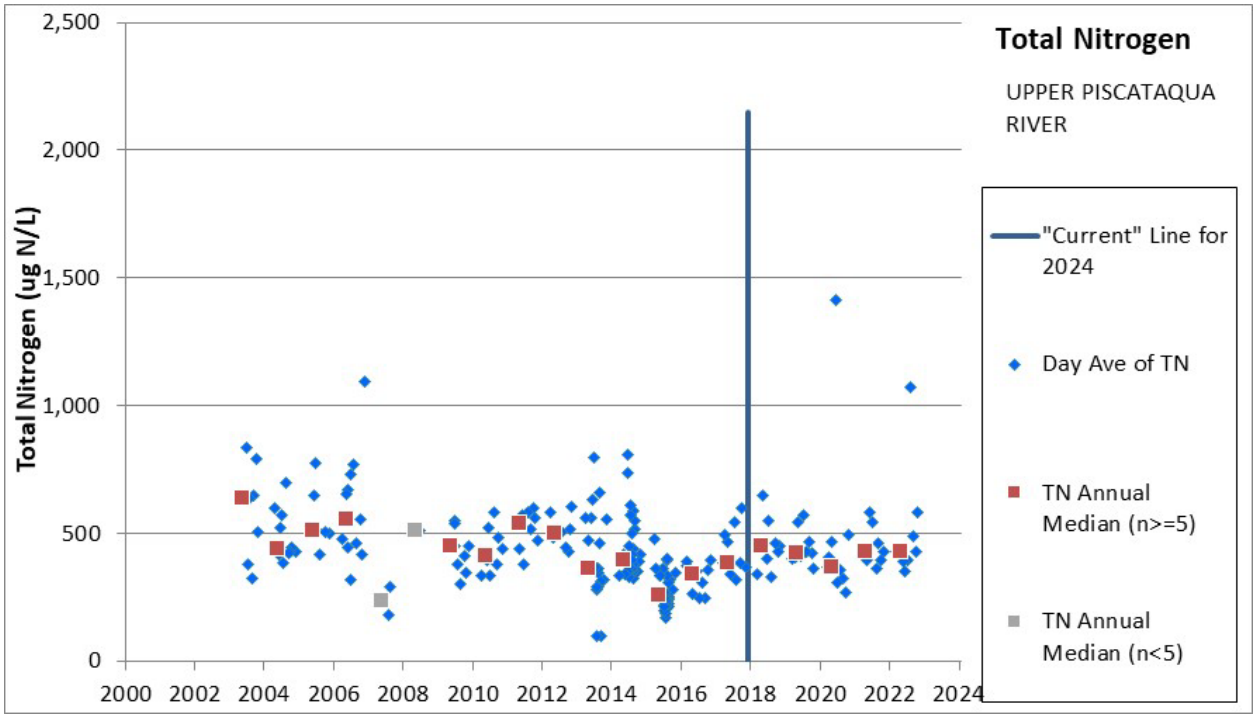

Dissolved Oxygen Concentration
UPPER PISCATAQUA RIVER
Dissolved Oxygen, mg / L
16
14
12
10
8
6
4
2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
UPPER PISCATAQUA RIVER
Dissolved Oxygen, Percent Saturation
200
180
160
140
120
100
80
60
40
20
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
UPPER PISCATAQUA RIVER
TSS (mg/L)
1,000
100
10
1
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)


Light Attenuation
UPPER PISCATAQUA RIVER
Kd 1 / m (PAR) (lower is better)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)


Eelgrass and Light Attenuation
UPPER PISCATAQUA RIVER
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)
Eelgrass Cover (Historic Level = 79.7 acres)


Total Nitrogen
UPPER PISCATAQUA RIVER
Total Nitrogen (ug N/L)
2,500
2,000
1,500
1,000
500
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)
TN Annual Median (n<5)

Upper Piscataqua River Assessment Zone (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	43	0.5	2.7	17.5	85.4
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	43	0.0	2.7	17.5	85.4
LIGHT ATTENUATION COEFFICIENT (1/m)	40	0.57	1.64	2.34	3.64
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	1,071	1.0	5.0	9.7	432.0
TSS (mg/L)	44	3.6	13.4	23.8	28.2
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	35	2.6	4.6	7.3	10.3
DO-PPM-24HR-MIN-CP (mg/L)	564	4.1	6.7	7.6	8.2
DO-PPM-24HR-MIN-NCP (mg/L)	490	6.4	8.4	9.9	11.1
DO-PPM-GRAB-CP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-NCP (mg/L)	3	12.1	12.1	-	13.6
DO-PERC-24H-MEAN-CP (% sat)	576	79.8	96.9	104.1	115.3
DO-PERC-24H-MEAN-NCP (% sat)	479	81.5	93.5	101.1	108.7
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	3	97.2	102.0	-	104.8
Day Ave of TN (ug N/L)	44	268	429	584	1,412
Day Ave of TDN (ug N/L)	44	151	325	475	569
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	44	21	172	256	372
Day Ave of NH3 (ug N/L)	44	3	36	77	292
Day Ave of PON (ug N/L)	9	73	126	582	582
Day Ave of NO2/3 (ug N/L)	44	5	124	208	340
SALINITY-Grabs (pss)	43	1.1	12.8	26.0	27.9
SALINITY-Datalogger Daily Median (pss)	1,066	5.8	25.9	29.5	30.8
pH-grab	0	-	-	-	-
pH-24HR (min)	1,083	6.6	7.7	7.4*	8.1
pH-24HR (max)	1,083	7.8	8.0	8.1	8.5
Temperature	44	2.3	17.0	25.3	26.1
Temperature-Daily Median	1,115	2.3	17.0	22.2	23.7

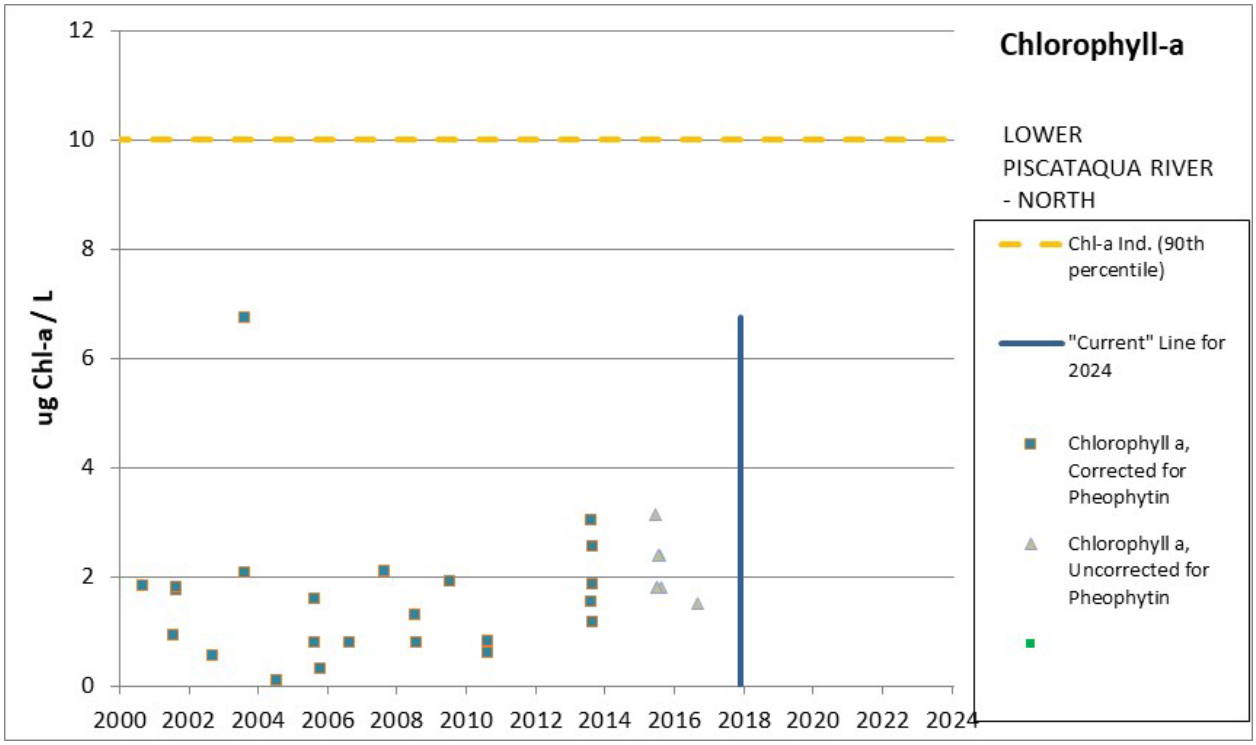
*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

Assessment Zone = LOWER PISCATAQUA RIVER - NORTH

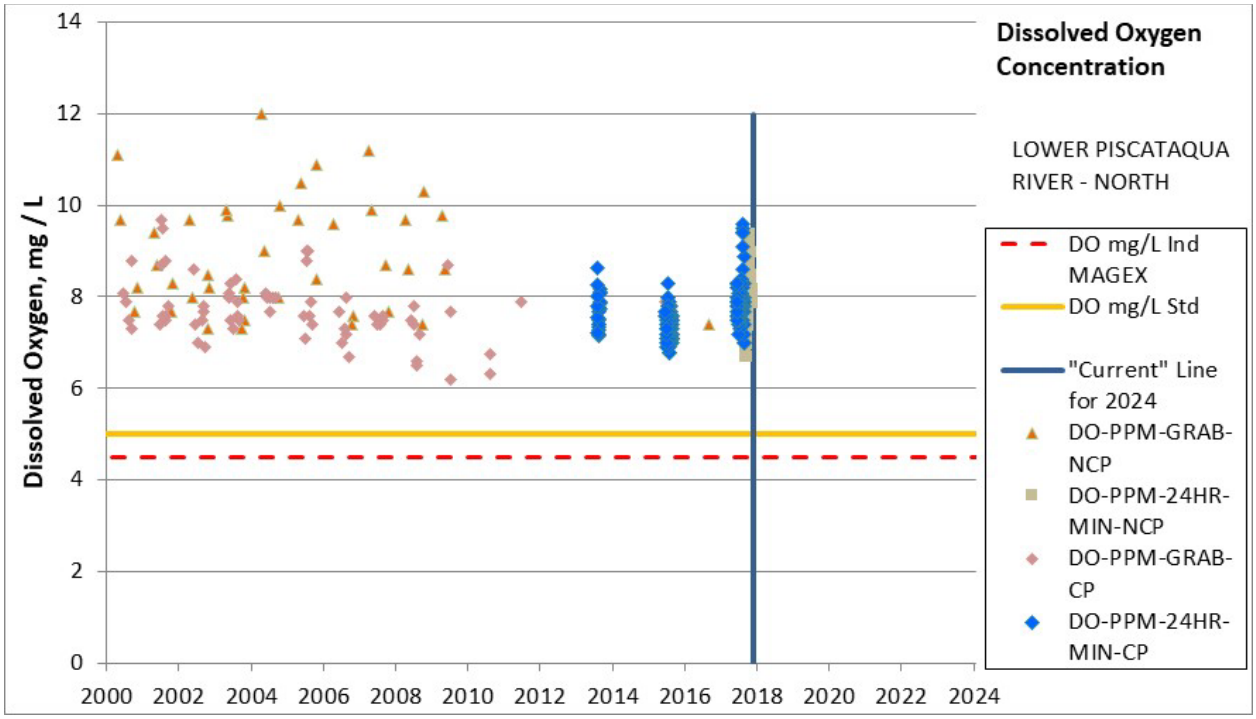
(NHEST600031001-02-01)

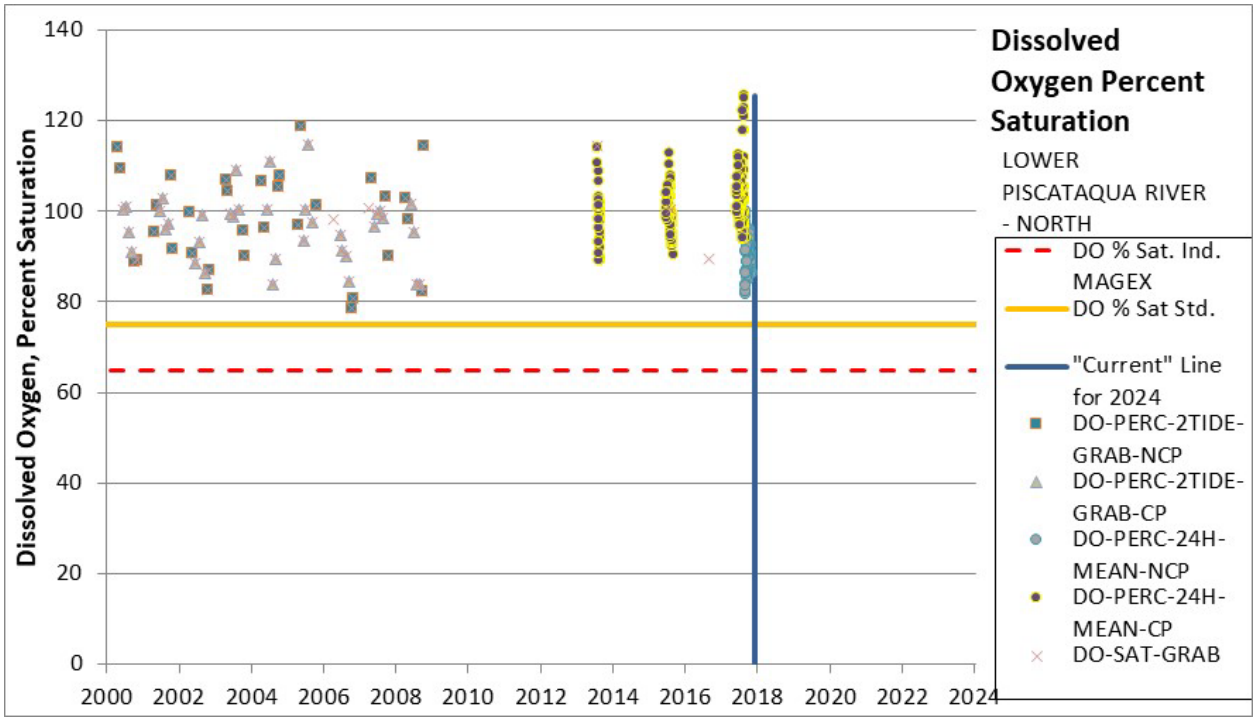
As of the date of data retrieval (April 13, 2023) water quality data through 2022 had been uploaded to the Environmental Monitoring Database. However, this assessment zone has had no data collected since 2017.

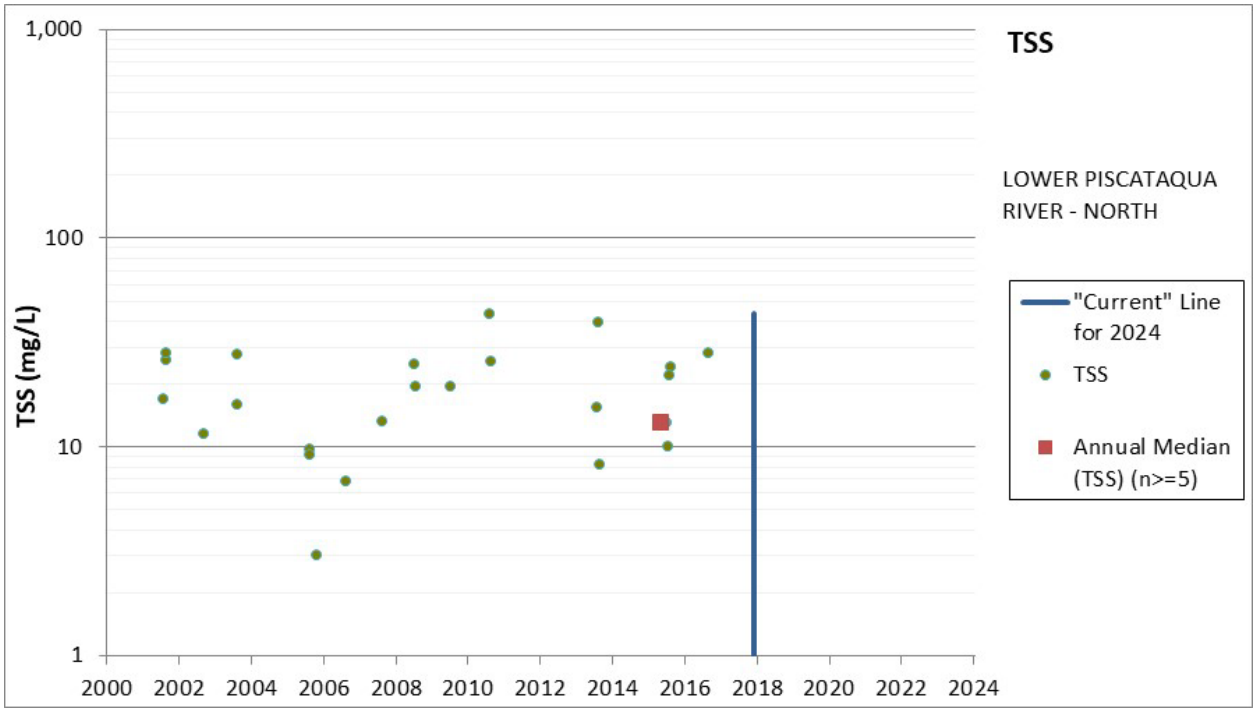
Indicator	Aquatic Life Use Category 2020/2022 /2024	2024 Comment
Chlorophyll-a	3-PAS / 3-ND	The calculated 90th percentile chlorophyll-a in this assessment zone cannot be calculated as there are no longer any measured values in the current period. The chlorophyll-a indicator threshold to prevent low dissolved oxygen and preserve light for eelgrass is a 90th percentile below 10 µg/L.
Dissolved Oxygen (mg/L)	2-G / 3-ND	This assessment zone has had no dissolved oxygen concentration data collected since 2017. As such, this assessment zone has been assessed as 3-ND (No Data) for the dissolved oxygen concentration criteria.
Dissolved Oxygen (% Saturation)	2-G / 3-ND	This assessment zone has had no dissolved oxygen concentration data collected since 2017. As such, this assessment zone has been assessed as 3-ND (No Data) for the dissolved oxygen percent saturation criteria.
Estuarine Bioassessments (eelgrass)	5-P / 5-P	The historical extent of eelgrass in this assessment zone was 60.1 acres from the 1948, 1962, 1980 and 1981 datasets. The median current extent of eelgrass in 2019-2022 is 9.6 acres, which is a decrease of 84.0%. Since 1990, the trend in eelgrass cover in this assessment zone could not be determined. The thresholds for impairment are either a loss of more than 20% of the historic extent of eelgrass or a recent trend of greater than 20% loss.
Water Clarity (Light Attenuation Coefficient)	3-ND/ 3-ND	There have been no light measurements collected since 2013. Measurements from 2002 to 2013 ranged from 0.05 to 1.3 m^-1. For an eelgrass restoration depth of 2 m, the light attenuation coefficient threshold is 0.75 m^-1. This assessment zone historically had eelgrass growing in both the shallows and deeper habitat making the 2m restoration depth a valid target. As there is no measured light attenuation, this zone remains assessed as “no data.”
Total Nitrogen	3-PAS / 3-ND	There are no “current” total nitrogen data from which to calculate a median total nitrogen from 2018 through 2023 and none of the other water quality is “current”. As such, this assessment zone cannot be assessed for total nitrogen.

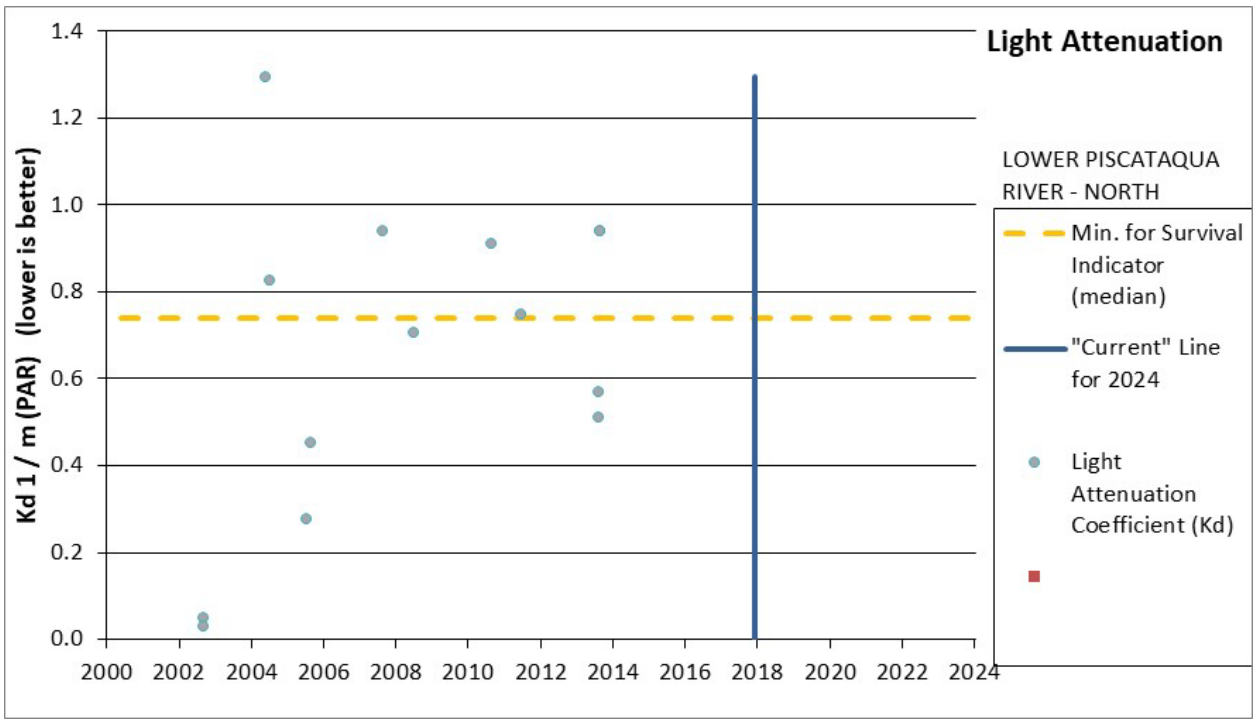

Chlorophyll-a
LOWER PISCATAQUA RIVER - NORTH
ug Chl-a / L
12
10
8
6
4
2
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin

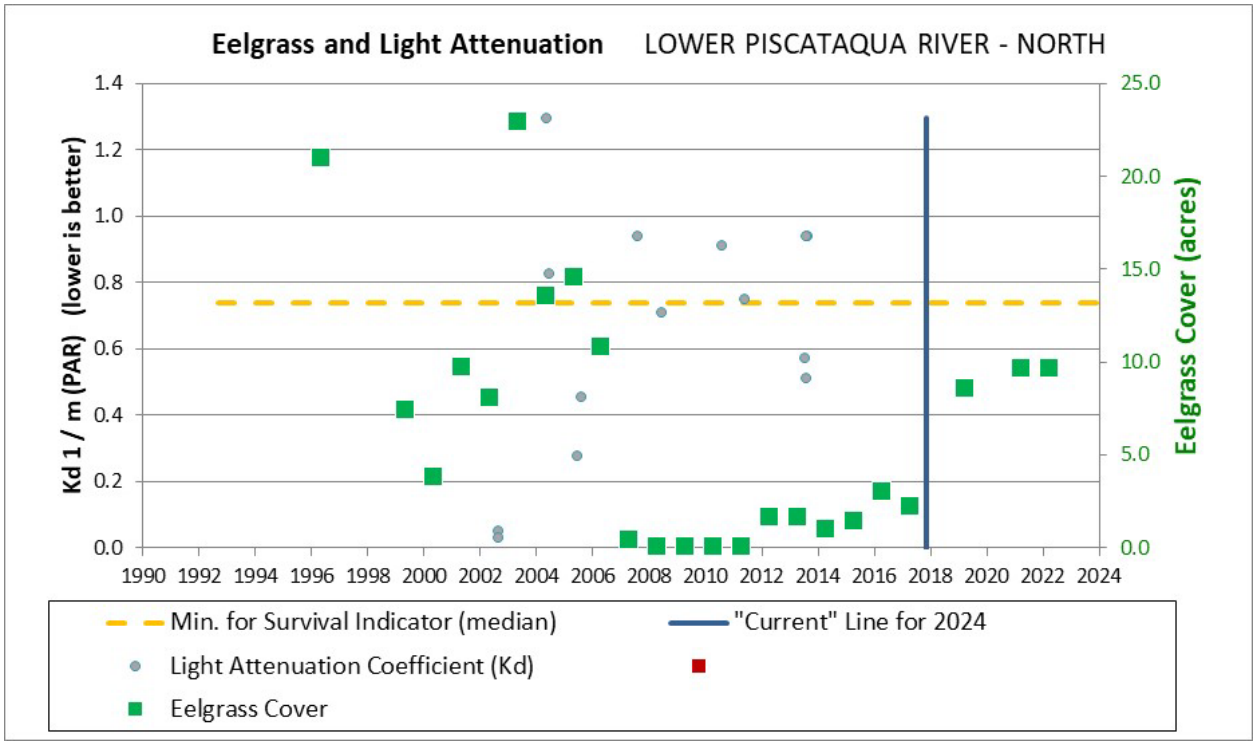

Chlorophyll-a
LOWER PISCATAQUA RIVER - NORTH
ug Chl-a / L
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin

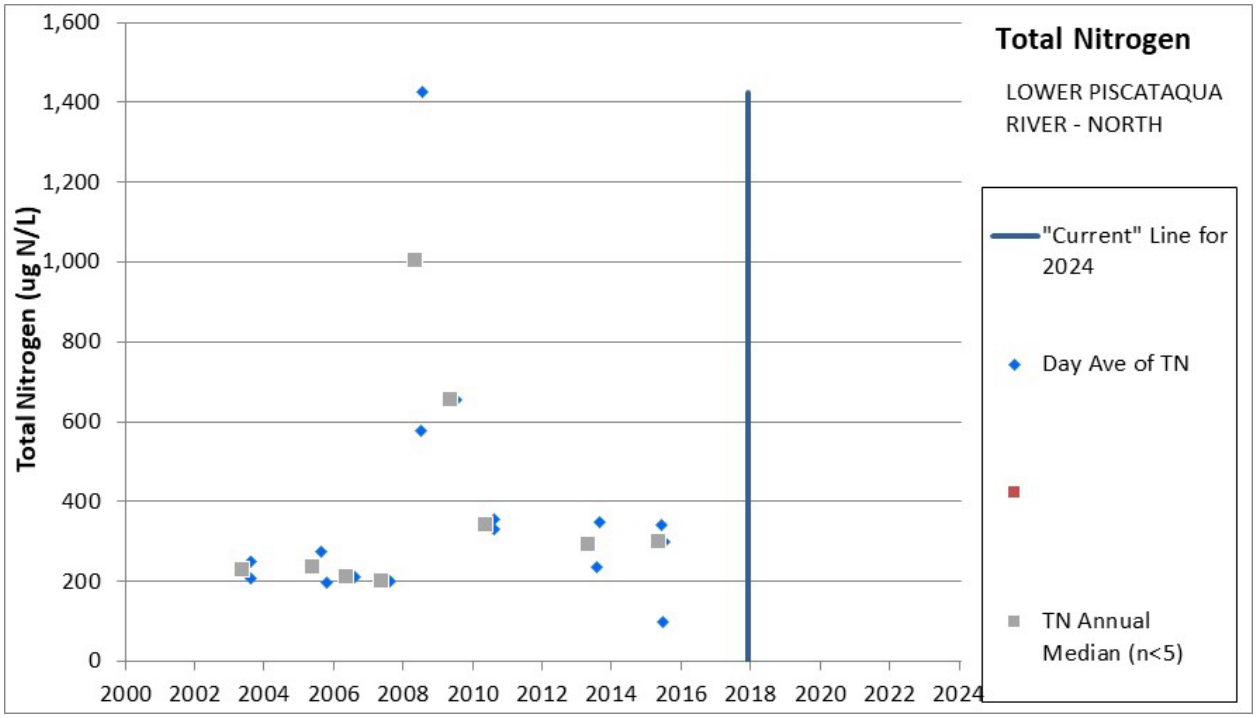

Dissolved Oxygen Concentration
LOWER PISCATAQUA RIVER - NORTH
Dissolved Oxygen, mg / L
14
12
10
8
6
4
2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
LOWER PISCATAQUA RIVER - NORTH
Dissolved Oxygen, Percent Saturation
140
120
100
80
60
40
20
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
LOWER PISCATAQUA RIVER - NORTH
TSS (mg/L)
1,000
100
10
1
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)


Light Attenuation
LOWER PISCATAQUA RIVER - NORTH
Kd 1 / m (PAR) (lower is better)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)


Eelgrass and Light Attenuation
LOWER PISCATAQUA RIVER - NORTH
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
25.0
20.0
15.0
10.0
5.0
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Eelgrass Cover


Total Nitrogen
LOWER PISCATAQUA RIVER - NORTH
Total Nitrogen (ug N/L)
1,600
1,400
1,200
1,000
800
600
400
200
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n<5)

Lower Piscataqua River - North Assessment Zone (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	0	-	-	-	-
LIGHT ATTENUATION COEFFICIENT (1/m)	0	-	-	-	-
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	0	-	-	-	-
TSS (mg/L)	0	-	-	-	-
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	0	-	-	-	-
DO-PPM-24HR-MIN-CP (mg/L)	0	-	-	-	-
DO-PPM-24HR-MIN-NCP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-CP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-NCP (mg/L)	0	-	-	-	-
DO-PERC-24H-MEAN-CP (% sat)	0	-	-	-	-
DO-PERC-24H-MEAN-NCP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	0	-	-	-	-
Day Ave of TN (ug N/L)	0	-	-	-	-
Day Ave of TDN (ug N/L)	0	-	-	-	-
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	0	-	-	-	-
Day Ave of NH3 (ug N/L)	0	-	-	-	-
Day Ave of PON (ug N/L)	0	-	-	-	-
Day Ave of NO2/3 (ug N/L)	0	-	-	-	-
SALINITY-Grabs (pss)	0	-	-	-	-
SALINITY-Datalogger Daily Median (pss)	0	-	-	-	-
pH-grab	0	-	-	-	-
pH-24HR (min)	0	-	-	-	-
pH-24HR (max)	0	-	-	-	-
Temperature	0	-	-	-	-
Temperature-Daily Median	0	-	-	-	-

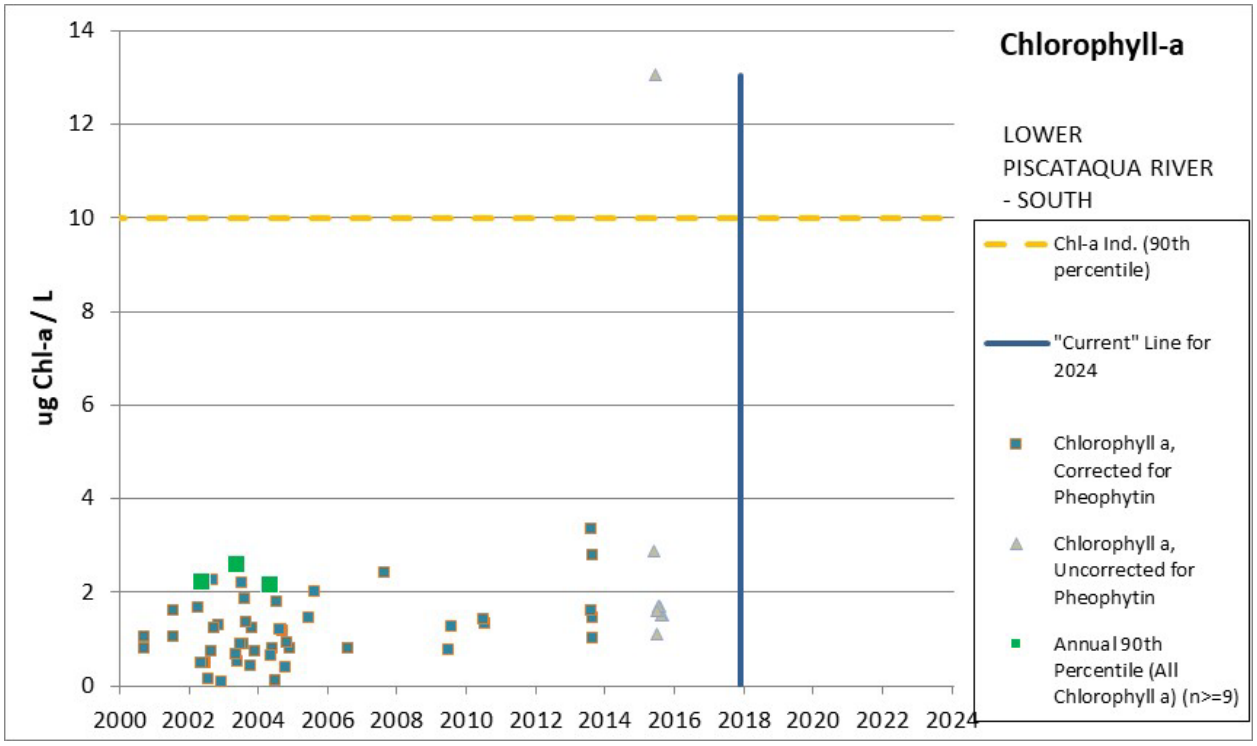
*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

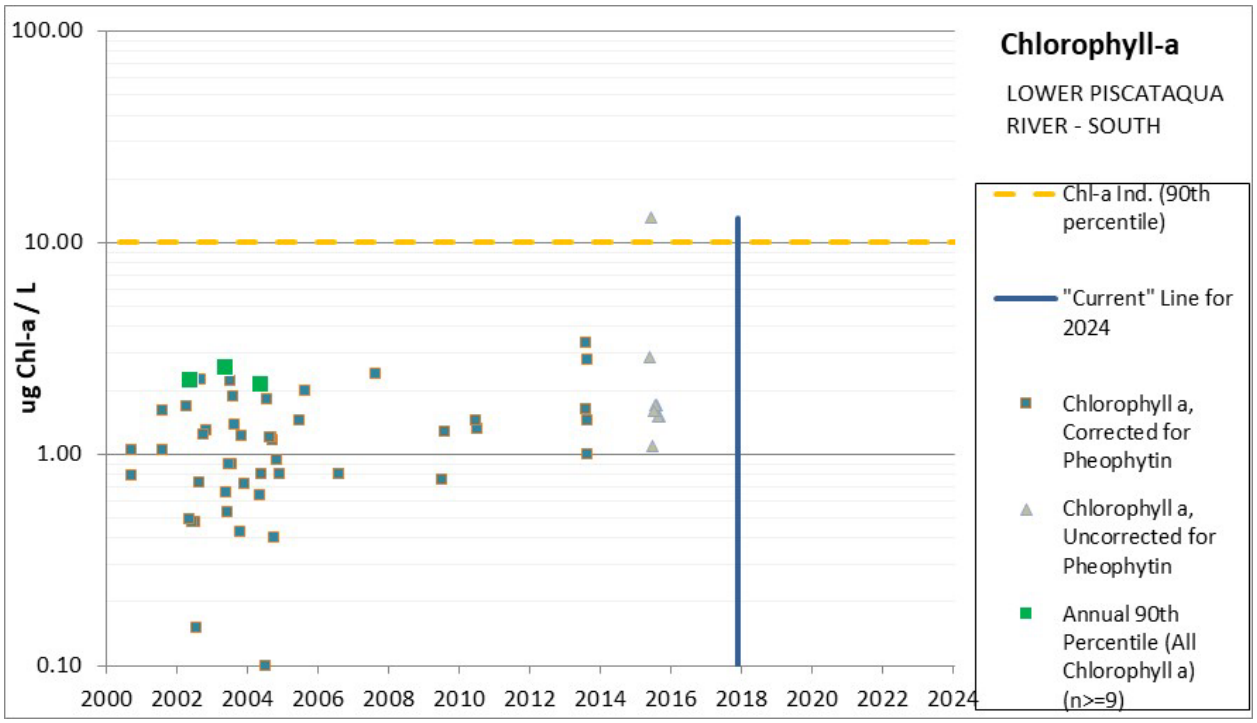
Assessment Zone = LOWER PISCATAQUA RIVER - SOUTH

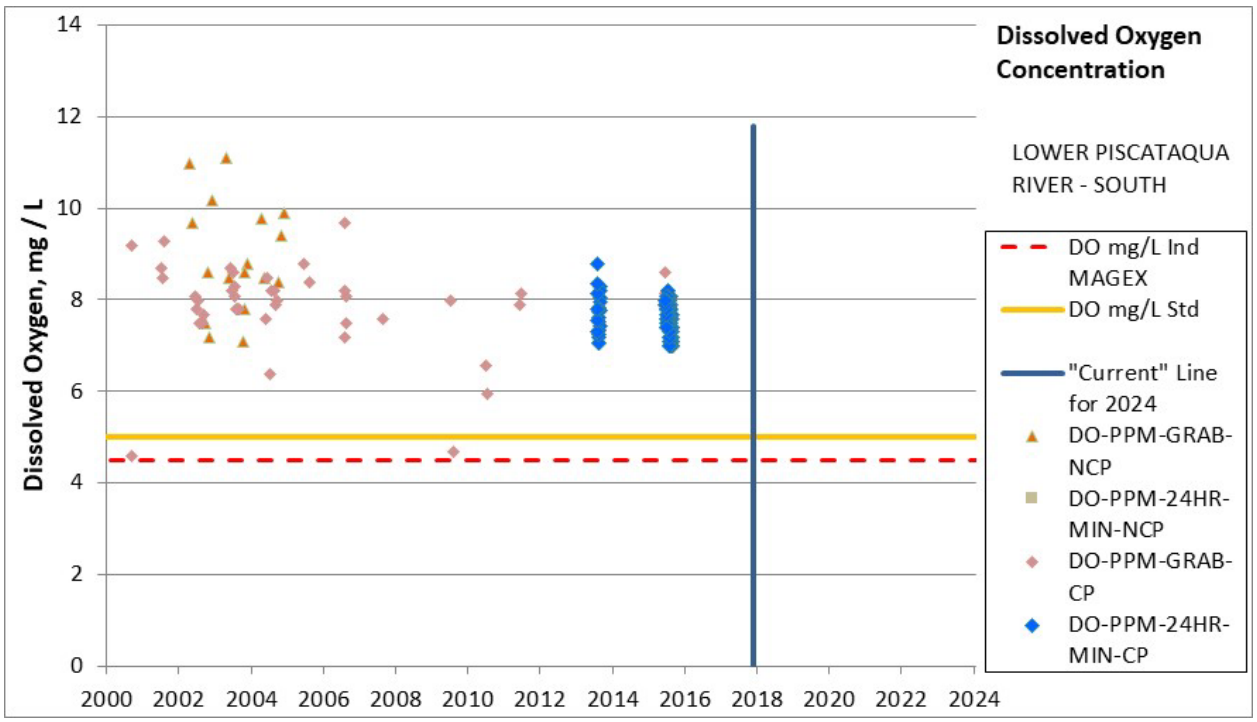
(NHEST600031001-02-02)

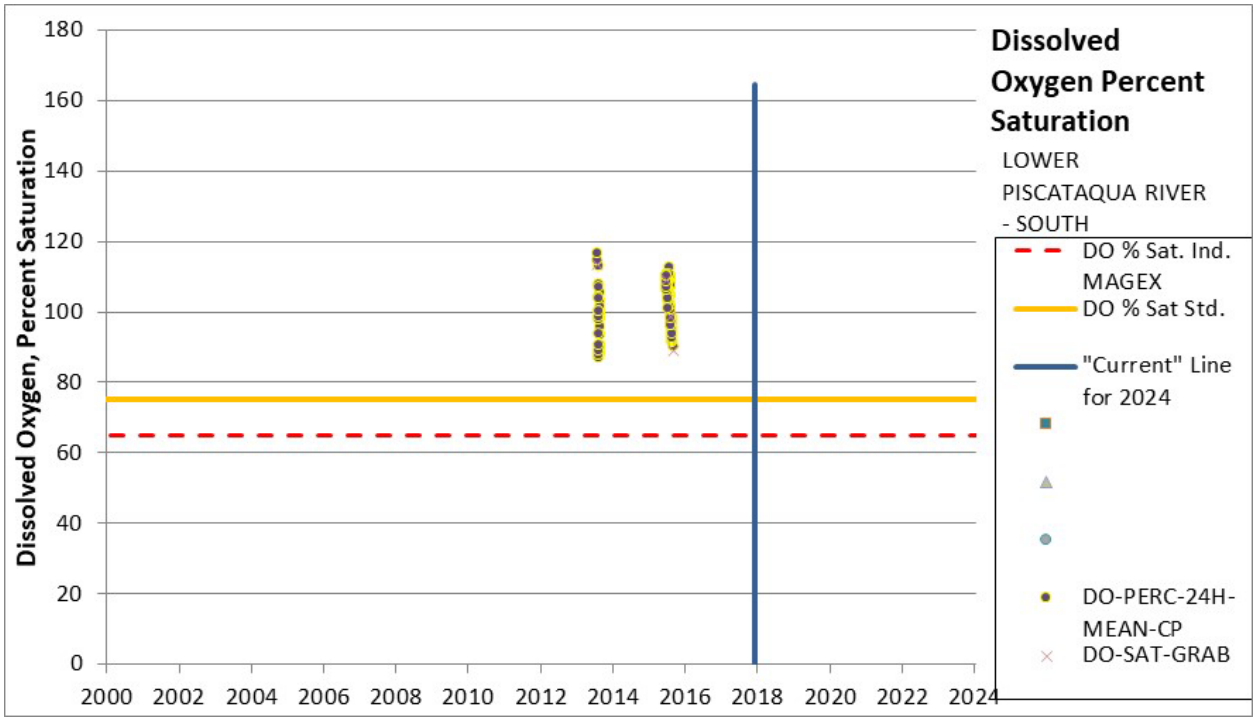
As of the date of data retrieval (April 13, 2023) water quality data through 2022 had been uploaded to the Environmental Monitoring Database. However, this assessment zone has had no data collected since 2015.

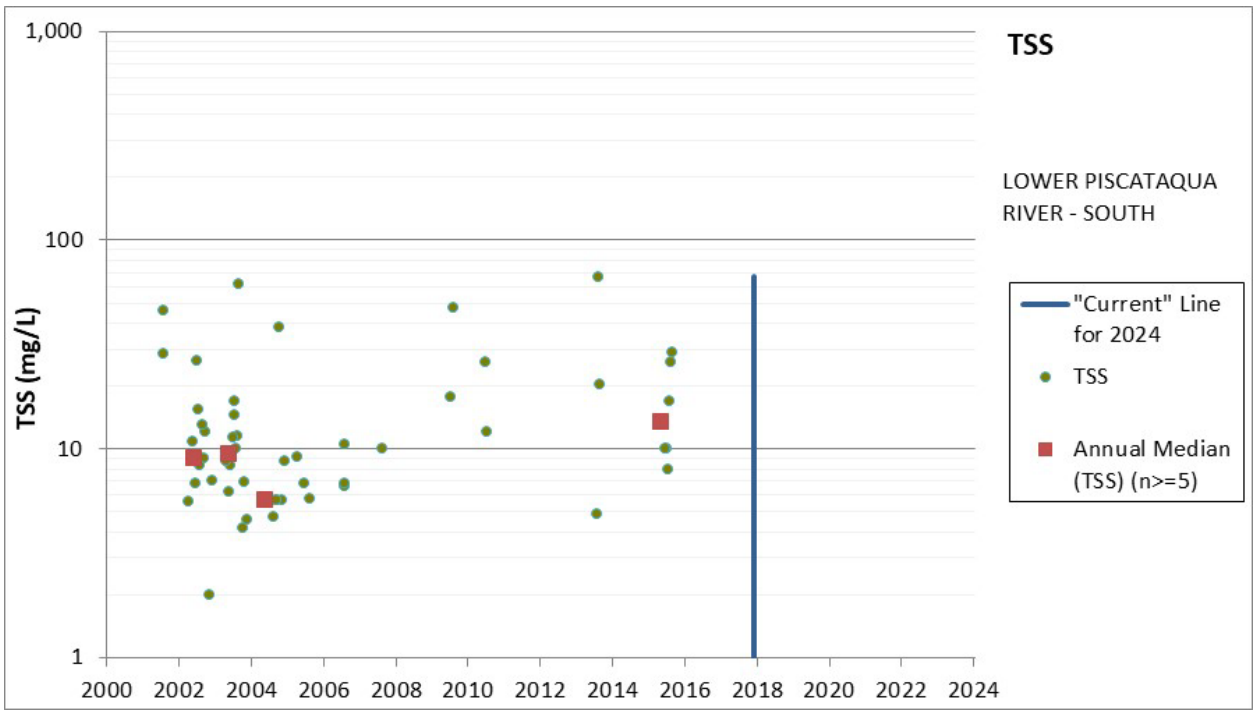
Indicator	Aquatic Life Use Category 2020/2022 / 2024	2024 Comment
Chlorophyll-a	3-PAS / 3-ND	The calculated 90th percentile chlorophyll-a in this assessment zone cannot as there are no measured values in the current period. The chlorophyll-a indicator threshold to prevent low dissolved oxygen and preserve light for eelgrass is a 90th percentile below 10 µg/L.
Dissolved Oxygen (mg/L)	2-G / 3-ND	This assessment zone had its last datalogger deployment in 2015. As such, this assessment zone has been assessed as 3-ND (No Data) for the dissolved oxygen concentration criteria.
Dissolved Oxygen (% Saturation)	2-G / 3-ND	This assessment zone had its last datalogger deployment in 2015. As such, this assessment zone has been assessed as 3-ND (No Data) for the dissolved oxygen percent saturation criteria.
Estuarine Bioassessments (eelgrass)	5-P / 5-P	The historical extent of eelgrass in this assessment zone was 32.5 acres from the 1948, 1962, 1980 and 1981 datasets. The median current extent of eelgrass in 2019-2022 is 3.6 acres, which is a decrease of 84.0%. Since 1990, the trend in eelgrass cover in this assessment zone is a loss of 38.7%. The thresholds for impairment are either a loss of more than 20% of the historic extent of eelgrass or a recent trend of greater than 20% loss.
Water Clarity (Light Attenuation Coefficient)	3-ND / 3-ND	There have been no light measurements collected since 2013. Measurements from 2002 to 2013 ranged from 0.3 to 0.7 m^-1. For an eelgrass restoration depth of 2 m, the light attenuation coefficient threshold is 0.75 m^-1. This assessment zone historically had eelgrass growing in both the shallows and deeper habitat making the 2m restoration depth a valid target. As there is no measured light attenuation, this zone remains assessed as “no data.”
Total Nitrogen	3-PAS / 3-ND	There are no “current” total nitrogen data from which to calculate a median total nitrogen from 2018 through 2023 and none of the other water quality is “current”. As such, this assessment zone cannot be assessed for total nitrogen.

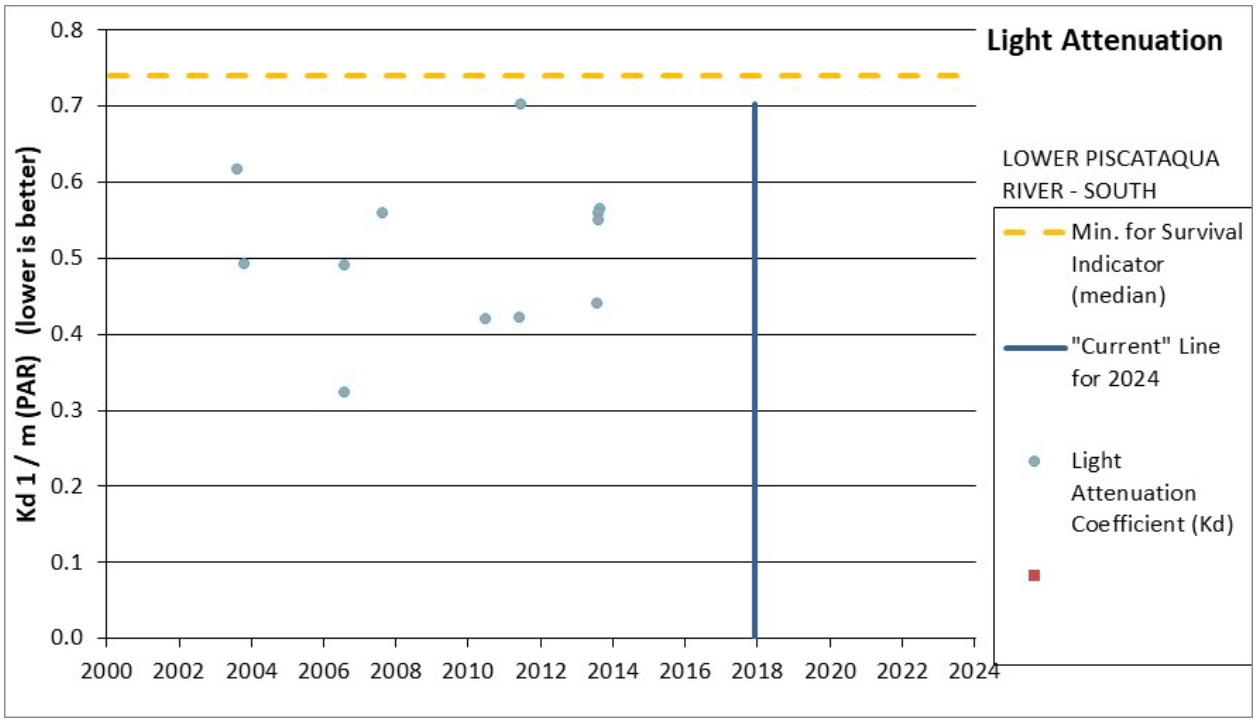

Chlorophyll-a
LOWER PISCATAQUA RIVER - SOUTH
ug Chl-a / L
14
12
10
8
6
4
2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

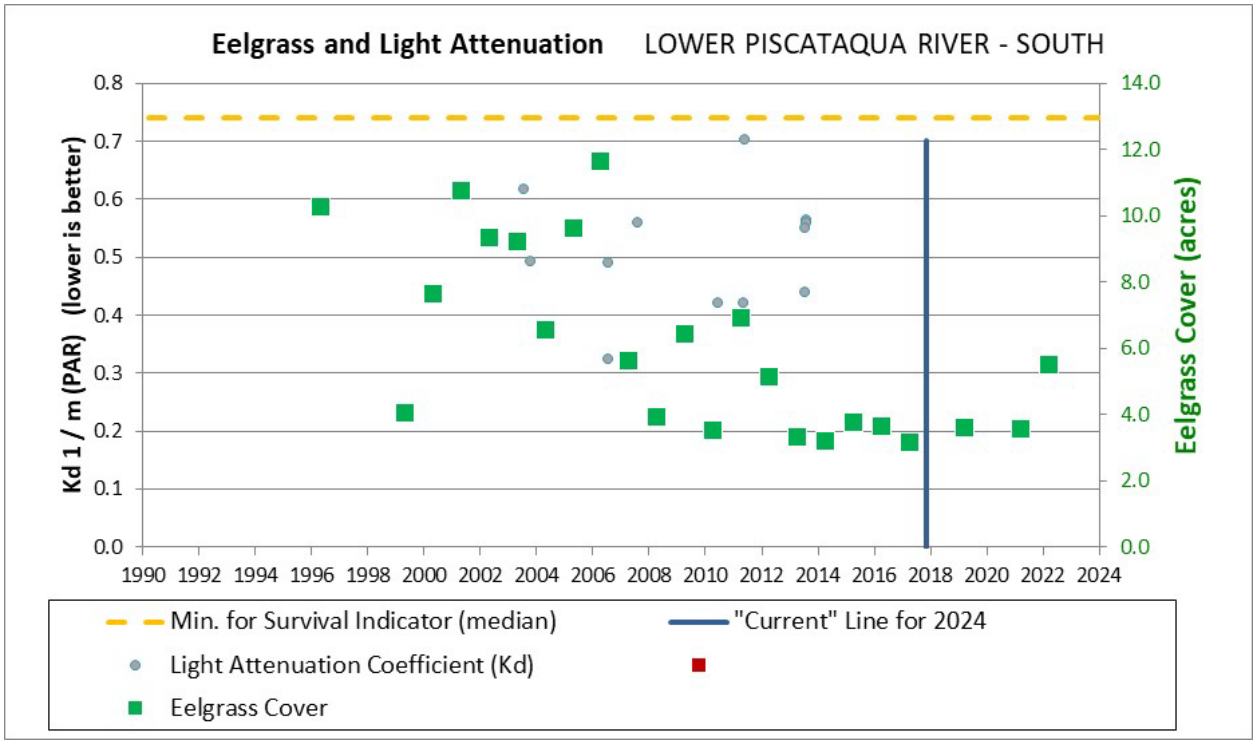

Chlorophyll-a
LOWER PISCATAQUA RIVER - SOUTH
ug Chl-a / L
100.00
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

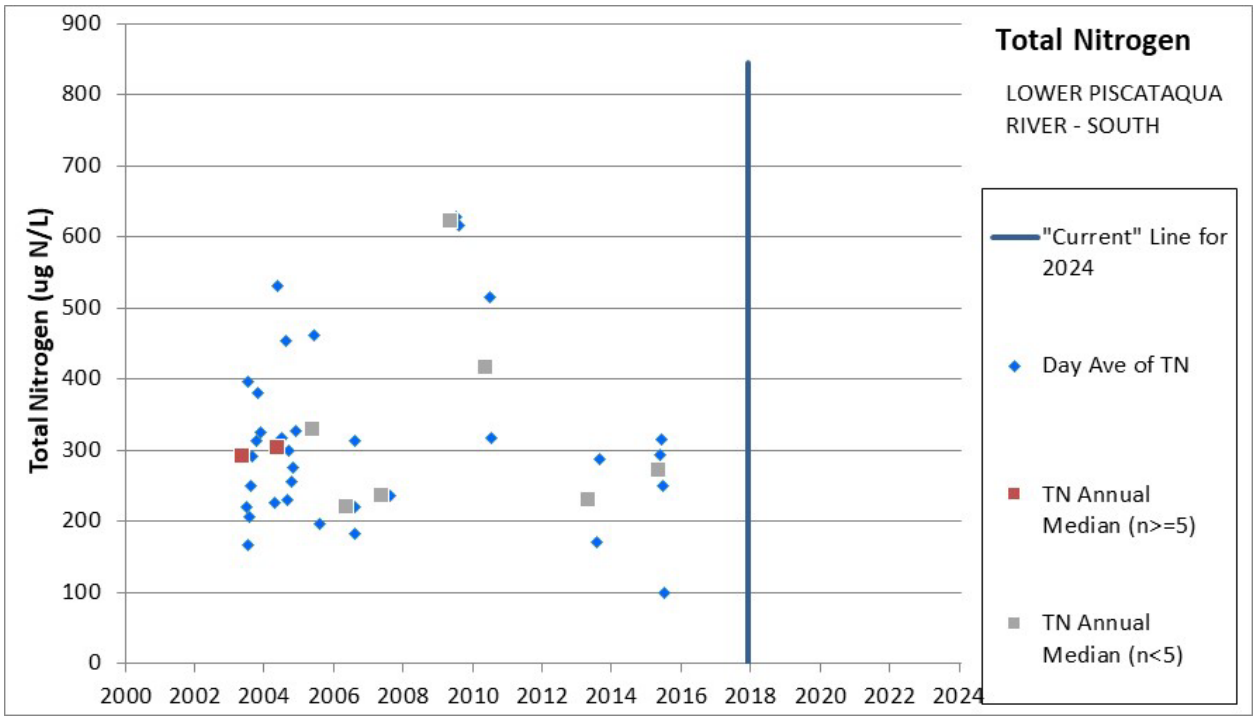

Dissolved Oxygen Concentration
LOWER PISCATAQUA RIVER - SOUTH
Dissolved Oxygen, mg / L
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
LOWER PISCATAQUA RIVER - SOUTH
Dissolved Oxygen, Percent Saturation
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
LOWER PISCATAQUA RIVER - SOUTH
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)
TSS (mg/L)
1,000
100
10
1
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024


Light Attenuation
LOWER PISCATAQUA RIVER - SOUTH
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Kd 1 / m (PAR) (lower is better)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024


Eelgrass and Light Attenuation
LOWER PISCATAQUA RIVER - SOUTH
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.0
2.0
4.0
6.0
8.0
10.0
12.0
14.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Eelgrass Cover


Total Nitrogen
LOWER PISCATAQUA RIVER - SOUTH
Total Nitrogen (ug N/L)
0
100
200
300
400
500
600
700
800
900
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)
TN Annual Median (n<5)

Lower Piscataqua River - South Assessment Zone (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	0	-	-	-	-
LIGHT ATTENUATION COEFFICIENT (1/m)	0	-	-	-	-
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	0	-	-	-	-
TSS (mg/L)	0	-	-	-	-
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	0	-	-	-	-
DO-PPM-24HR-MIN-CP (mg/L)	0	-	-	-	-
DO-PPM-24HR-MIN-NCP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-CP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-NCP (mg/L)	0	-	-	-	-
DO-PERC-24H-MEAN-CP (% sat)	0	-	-	-	-
DO-PERC-24H-MEAN-NCP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	0	-	-	-	-
Day Ave of TN (ug N/L)	0	-	-	-	-
Day Ave of TDN (ug N/L)	0	-	-	-	-
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	0	-	-	-	-
Day Ave of NH3 (ug N/L)	0	-	-	-	-
Day Ave of PON (ug N/L)	0	-	-	-	-
Day Ave of NO2/3 (ug N/L)	0	-	-	-	-
SALINITY-Grabs (pss)	0	-	-	-	-
SALINITY-Datalogger Daily Median (pss)	0	-	-	-	-
pH-grab	0	-	-	-	-
pH-24HR (min)	0	-	-	-	-
pH-24HR (max)	0	-	-	-	-
Temperature	0	-	-	-	-
Temperature-Daily Median	0	-	-	-	-

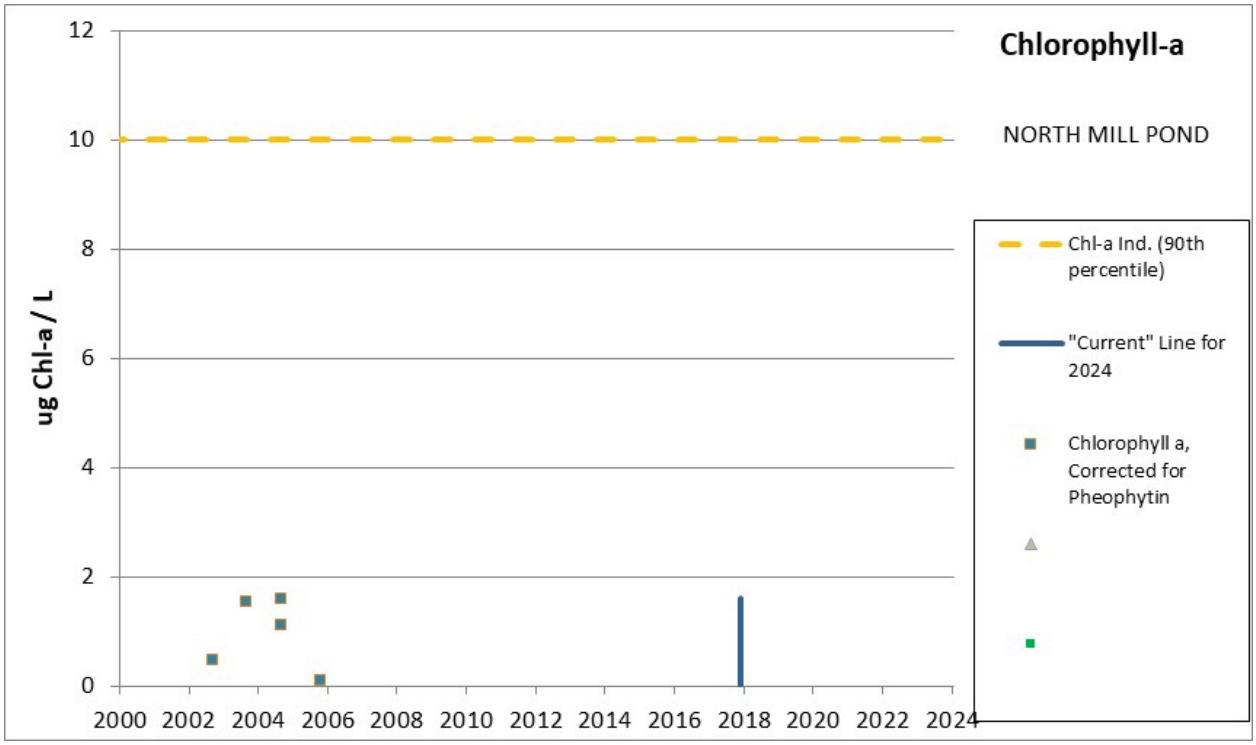
*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

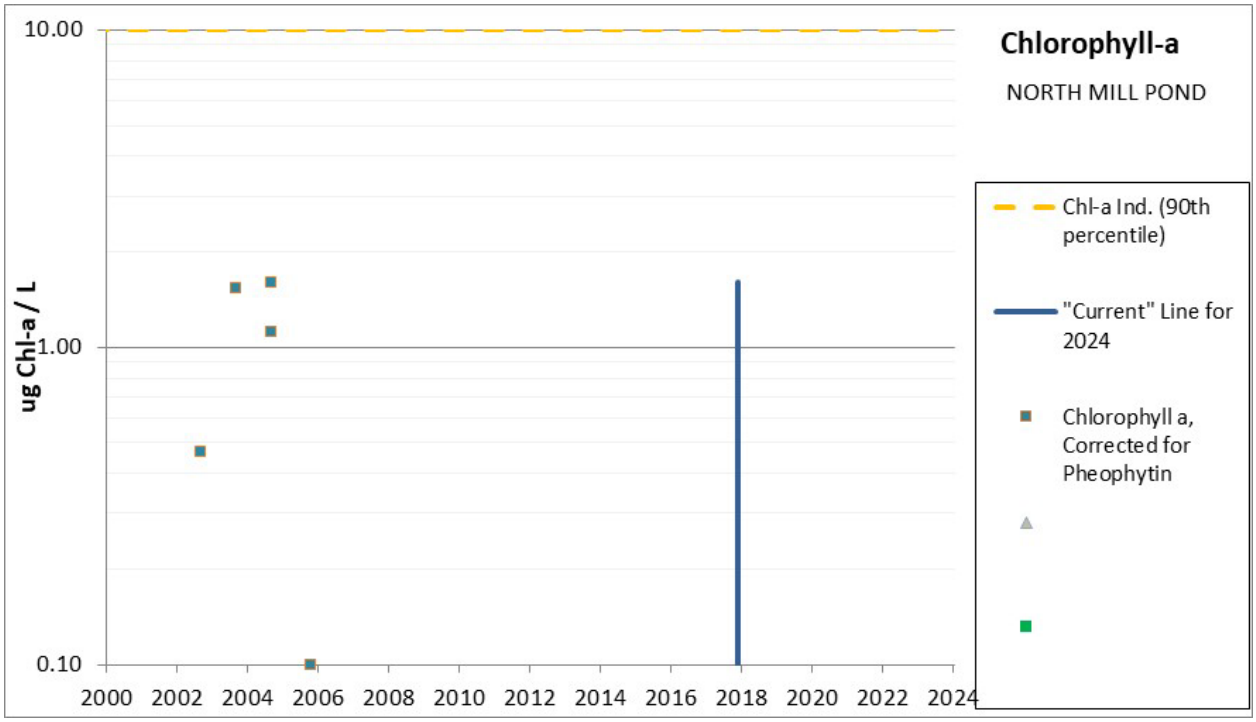
Assessment Zone = NORTH MILL POND

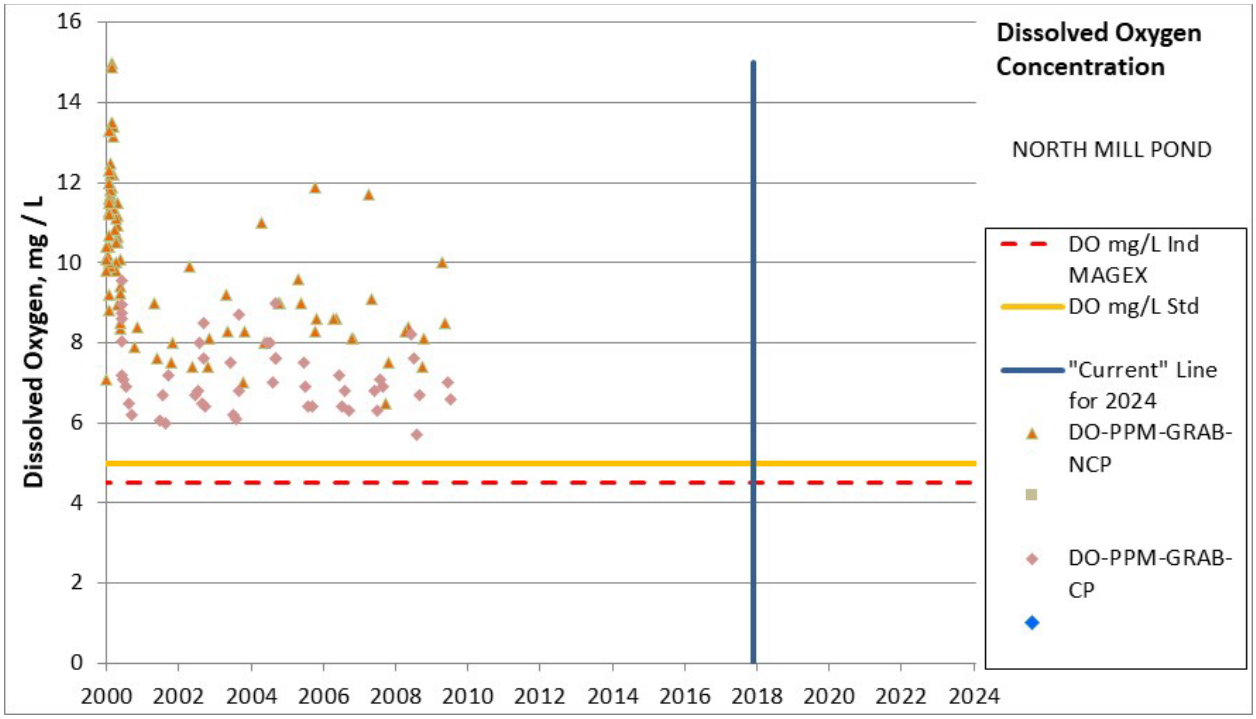
(NHEST600031001-10)

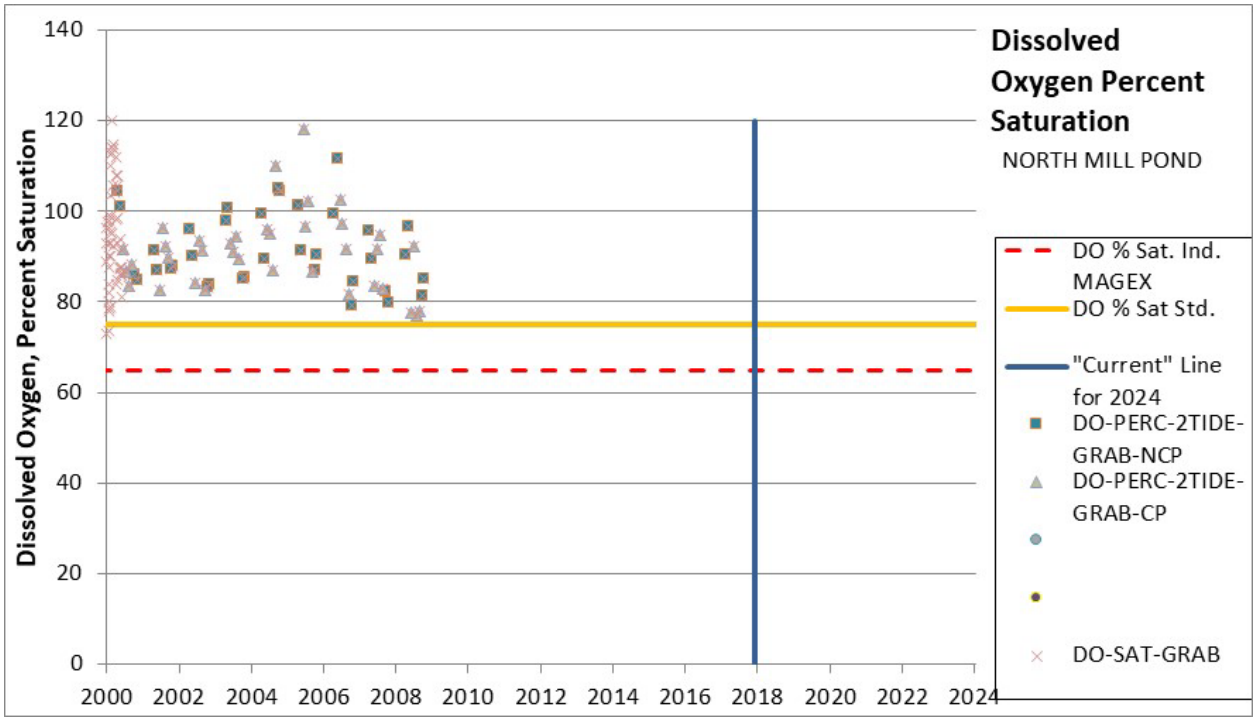
As of the date of data retrieval (April 13, 2023) water quality data through 2022 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means there are no additional years of data compared to the 2022 assessment.

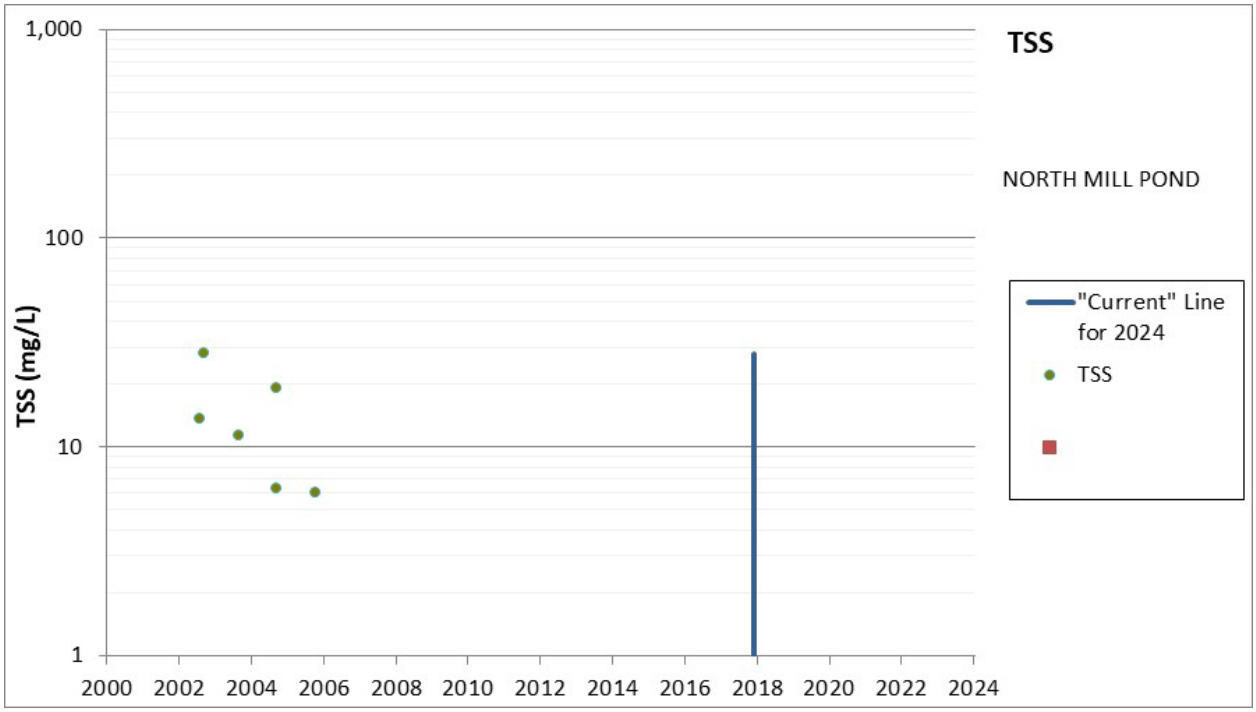
Indicator	Aquatic Life Use Category 2020/2022 / 2024	2024 Comment
Chlorophyll-a	3-ND / 3-ND	The chlorophyll-a indicator threshold to prevent low dissolved oxygen is a 90th percentile below 10 µg/L. This assessment zone has no measurements for chlorophyll-a since 2005.
Dissolved Oxygen (mg/L)	3-ND / 3-ND	This assessment zone has only grab sample measurements for dissolved oxygen concentration and those measurements were only collected up through 2009. As such, this assessment zone has been assessed as 3-ND (No Data) for the dissolved oxygen concentration criteria.
Dissolved Oxygen (% Saturation)	3-ND / 3-ND	This assessment zone has only grab sample measurements for dissolved oxygen 24-hour average percent saturation and those measurements were only collected up through 2008. As such, this assessment zone has been assessed as 3-ND (No Data) for dissolved oxygen percent saturation.
Estuarine Bioassessments (eelgrass)	3-ND / 3-ND	No data has been collected in the current period.
Water Clarity (Light Attenuation Coefficient)	3-ND / 3-ND	No data has been collected in the current period.
Total Nitrogen	3-ND / 3-ND	There are no “current” total nitrogen data from which to calculate a median total nitrogen from 2018 through 2023. As such, this assessment zone cannot be assessed for total nitrogen.

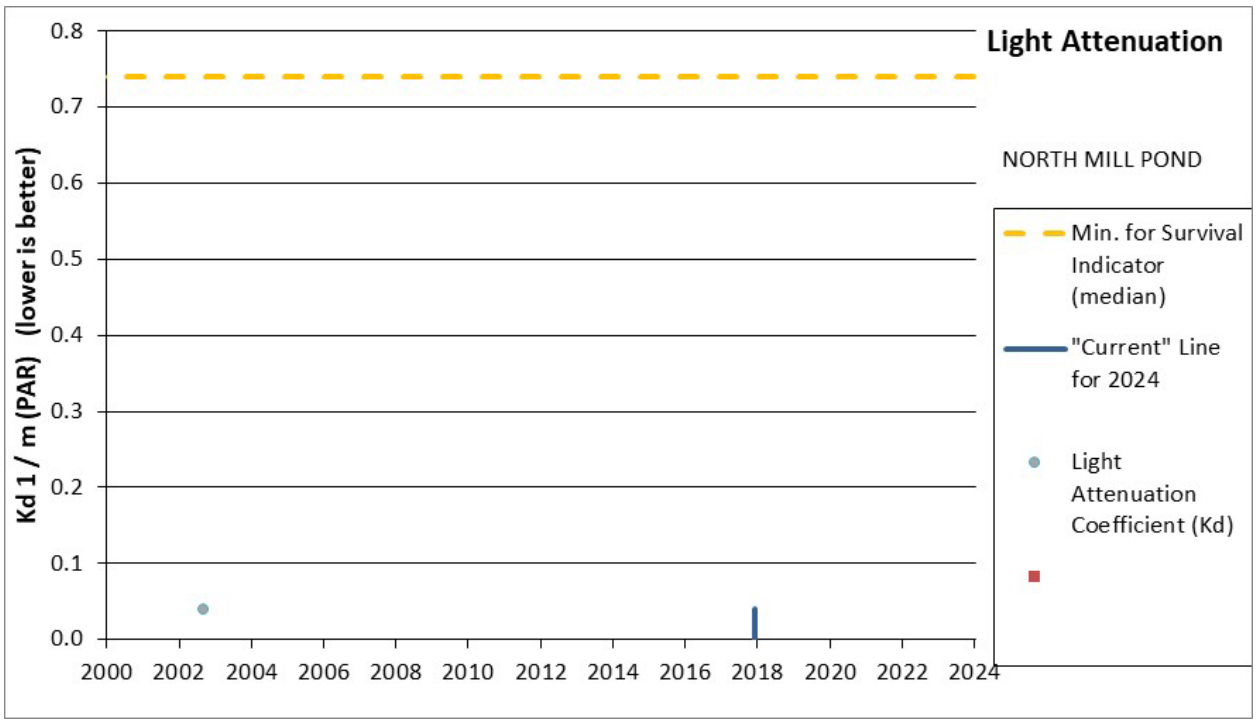

Chlorophyll-a
NORTH MILL POND
ug Chl-a / L
12
10
8
6
4
2
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin

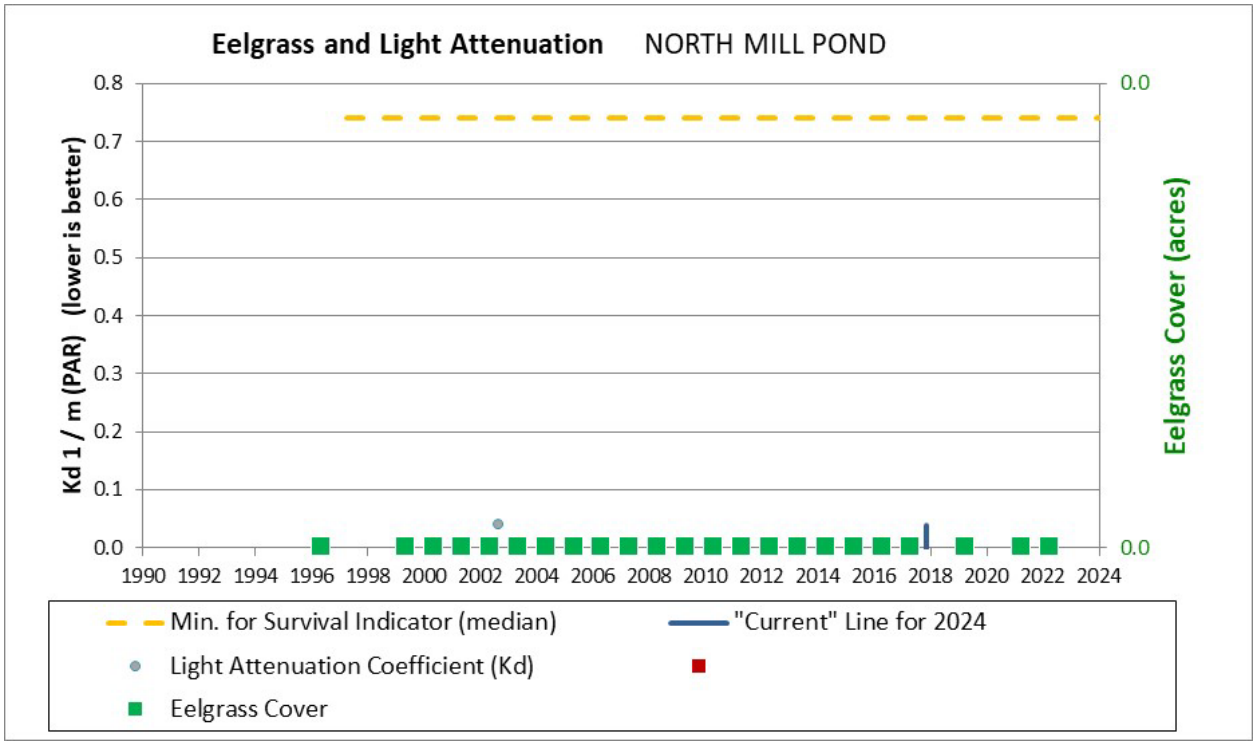

Chlorophyll-a
NORTH MILL POND
ug Chl-a / L
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin

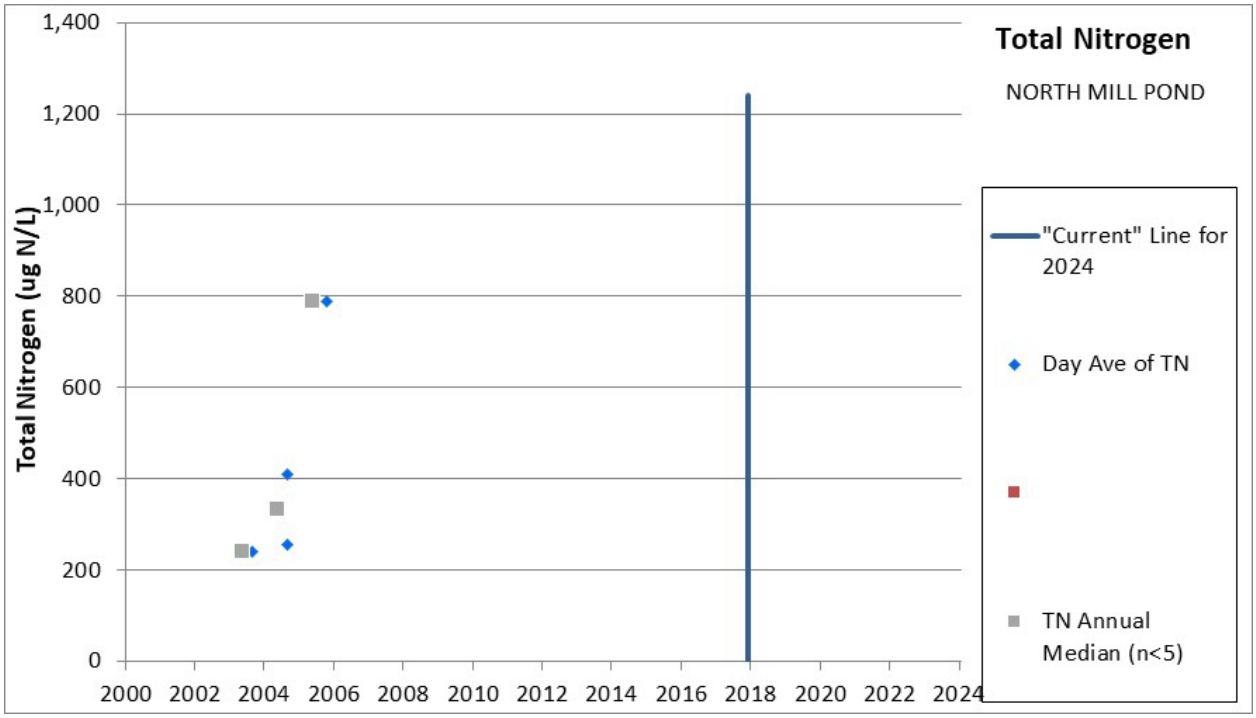

Dissolved Oxygen Concentration
NORTH MILL POND
Dissolved Oxygen, mg / L
16
14
12
10
8
6
4
2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-GRAB-CP


Dissolved Oxygen Percent Saturation
NORTH MILL POND
Dissolved Oxygen, Percent Saturation
140
120
100
80
60
40
20
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-SAT-GRAB


TSS
NORTH MILL POND
TSS (mg/L)
1,000
100
10
1
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
TSS


Light Attenuation
NORTH MILL POND
Kd 1 / m (PAR) (lower is better)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)


Eelgrass and Light Attenuation
NORTH MILL POND
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0.0
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Eelgrass Cover


Total Nitrogen
NORTH MILL POND
Total Nitrogen (ug N/L)
1,400
1,200
1,000
800
600
400
200
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n<5)

North Mill Pond Assessment Zone (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	0	-	-	-	-
LIGHT ATTENUATION COEFFICIENT (1/m)	0	-	-	-	-
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	0	-	-	-	-
TSS (mg/L)	0	-	-	-	-
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	0	-	-	-	-
DO-PPM-24HR-MIN-CP (mg/L)	0	-	-	-	-
DO-PPM-24HR-MIN-NCP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-CP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-NCP (mg/L)	0	-	-	-	-
DO-PERC-24H-MEAN-CP (% sat)	0	-	-	-	-
DO-PERC-24H-MEAN-NCP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	0	-	-	-	-
Day Ave of TN (ug N/L)	0	-	-	-	-
Day Ave of TDN (ug N/L)	0	-	-	-	-
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	0	-	-	-	-
Day Ave of NH3 (ug N/L)	0	-	-	-	-
Day Ave of PON (ug N/L)	0	-	-	-	-
Day Ave of NO2/3 (ug N/L)	0	-	-	-	-
SALINITY-Grabs (pss)	0	-	-	-	-
SALINITY-Datalogger Daily Median (pss)	0	-	-	-	-
pH-grab	0	-	-	-	-
pH-24HR (min)	0	-	-	-	-
pH-24HR (max)	0	-	-	-	-
Temperature	0	-	-	-	-
Temperature-Daily Median	0	-	-	-	-

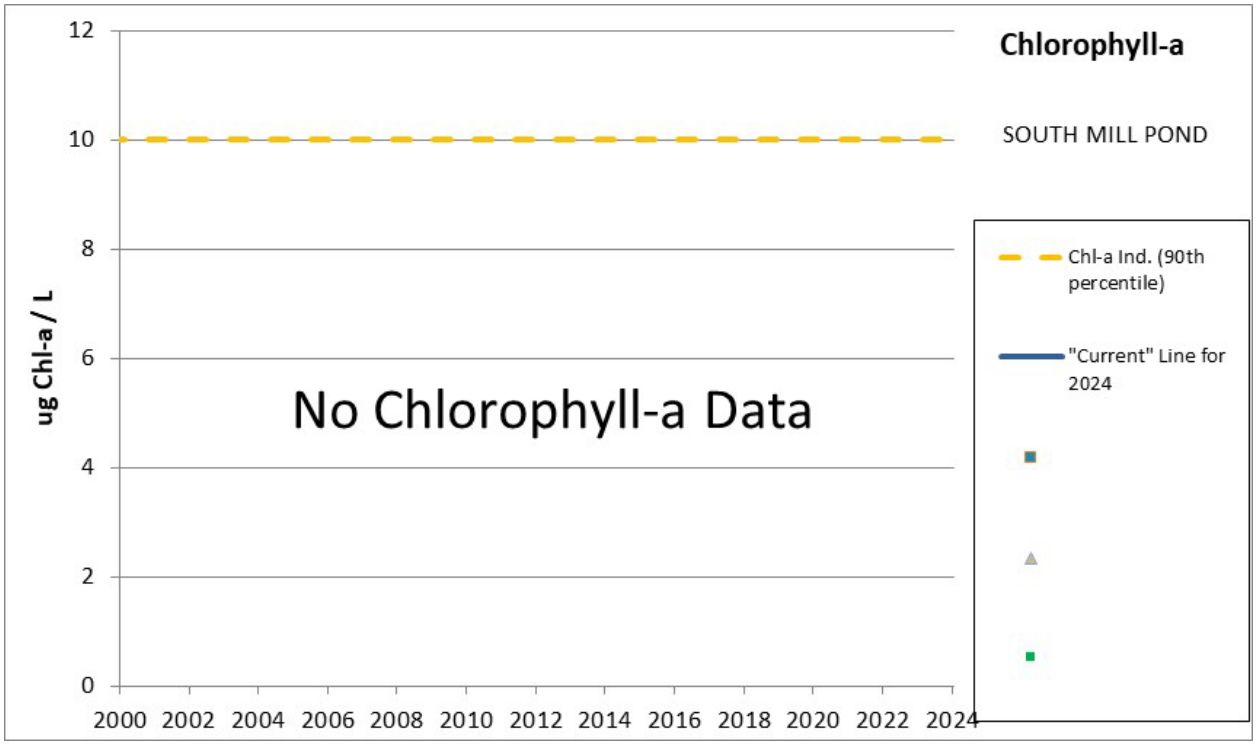
*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

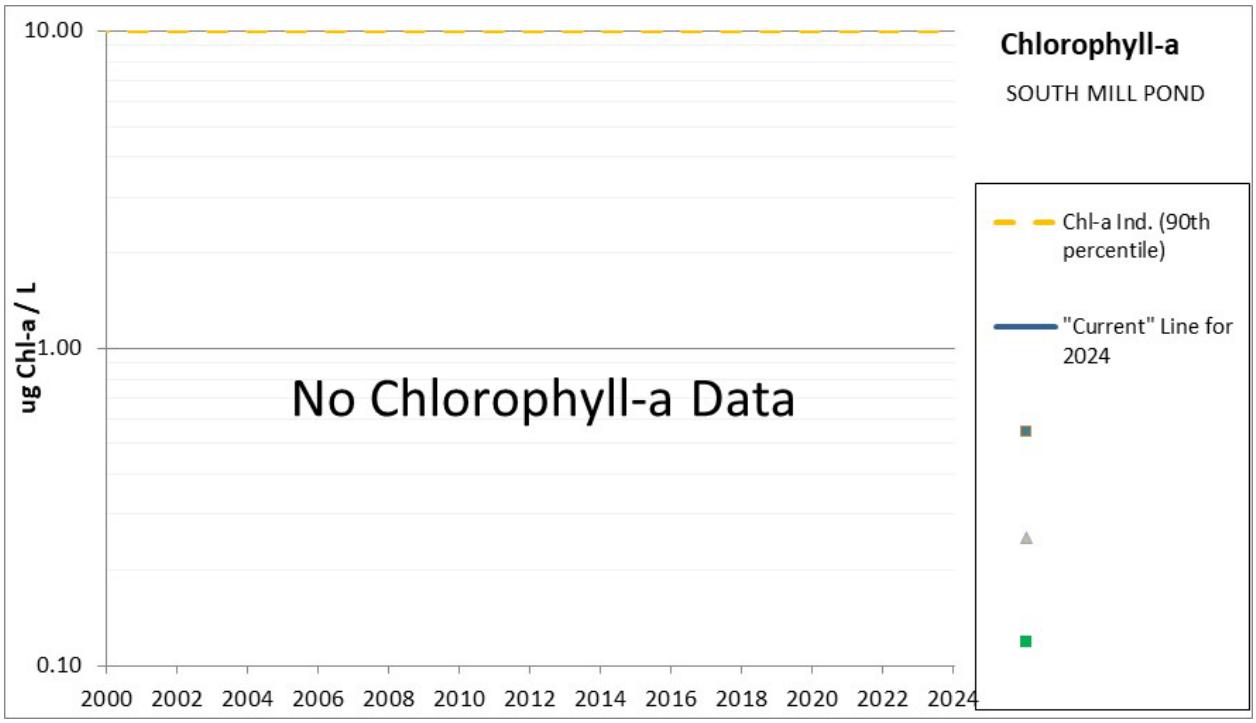
Assessment Zone = SOUTH MILL POND

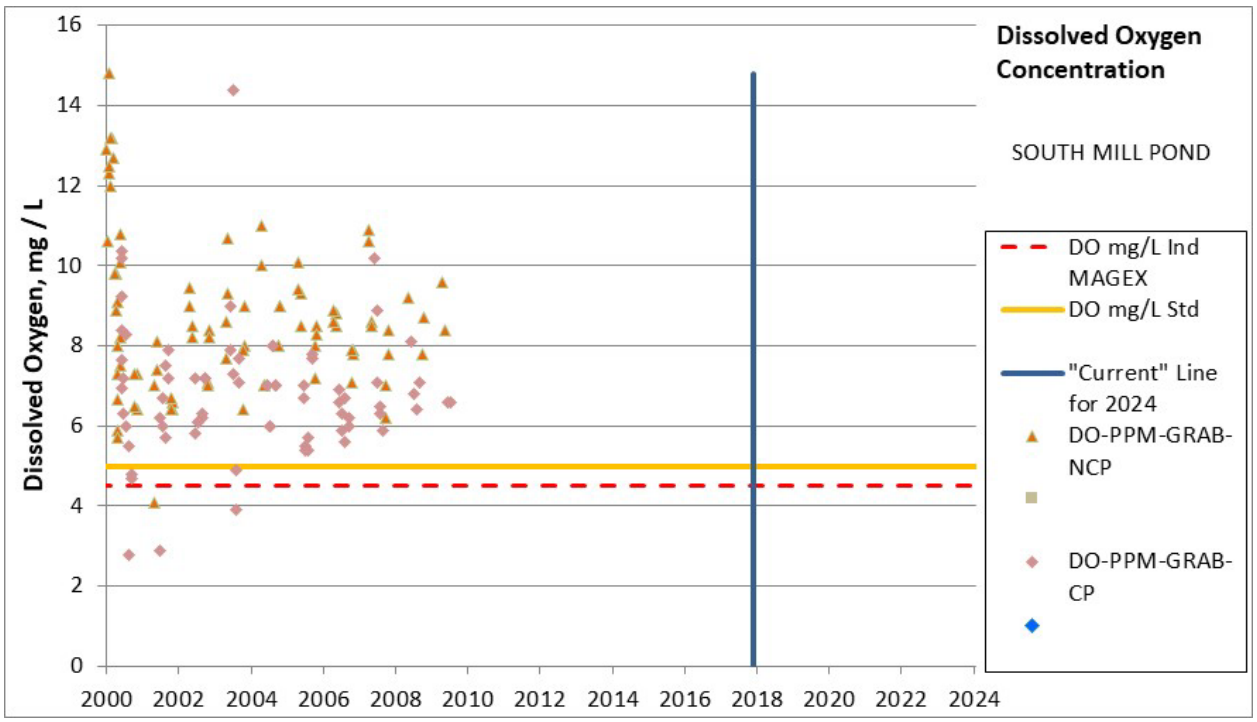
(NHEST600031001-09)

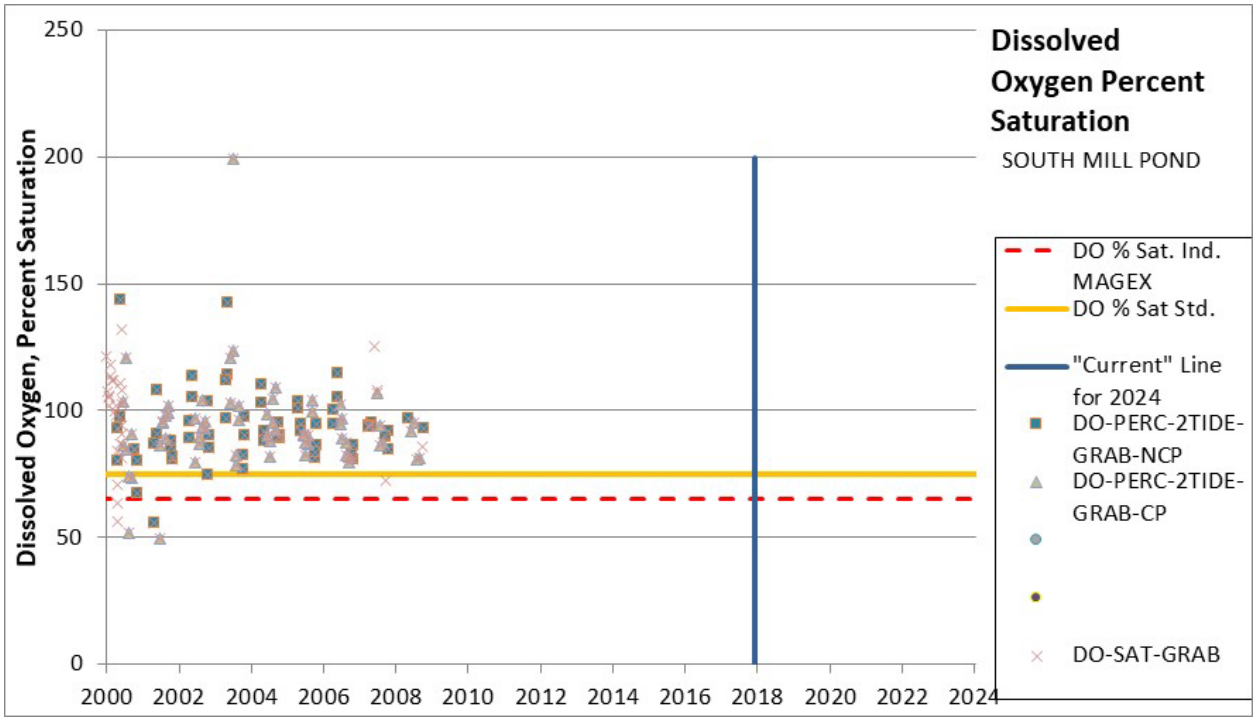
As of the date of data retrieval (April 13, 2023) water quality data through 2018 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means there are no additional years of data compared to the 2018 assessment.

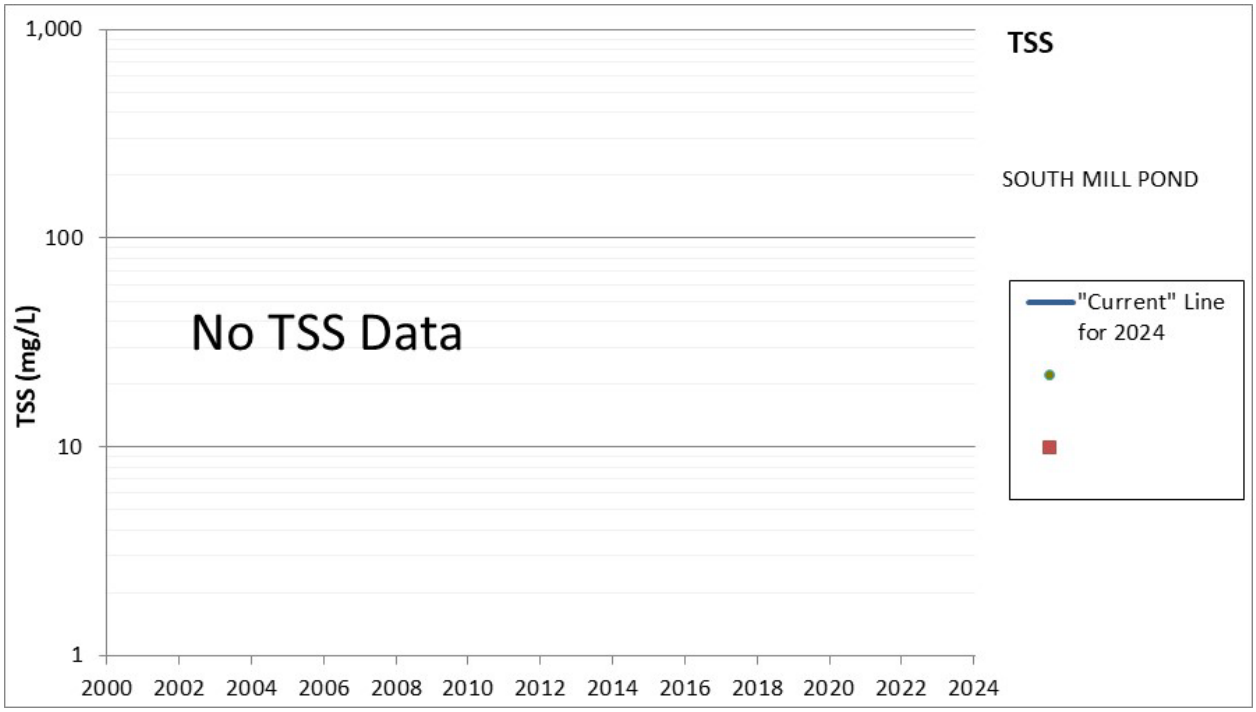
Indicator	Aquatic Life Use Category 2020/2022 /2024	2024 Comment
Chlorophyll-a	3-ND / 3-ND	The chlorophyll-a indicator threshold to prevent low dissolved oxygen is a 90th percentile below 10 µg/L. However, there is no chlorophyll-a data for this assessment zone.
Dissolved Oxygen (mg/L)	3-ND / 3-ND	This assessment zone has only grab sample measurements for dissolved oxygen concentration and those measurements were only collected up through 2009. As such, this assessment zone has been assessed as 3-ND (No Data) for the dissolved oxygen concentration criteria.
Dissolved Oxygen (% Saturation)	3-ND / 3-ND	This assessment zone has only grab sample measurements for dissolved oxygen 24-hour average percent saturation and those measurements were only collected up through 2008. As such, this assessment zone has been assessed as 3-ND (No Data) for dissolved oxygen percent saturation.
Estuarine Bioassessments (eelgrass)	3-PAS / 3-ND	In 2016, a 0.012 acres (520 sq feet) patch of eelgrass was seen in South Mill Pond for the first time. While the patch was below the minimum mapping unit and not field verified, the mapper was confident that based on morphology and growth pattern the plant seen was indeed *Zostera marina*. As there is no known baseline for comparison and the mapping effort only represents a single year of presence, and not seen since 2016, estuarine bioassessments (eelgrass) has been assessed as 3-ND (No Data).
Water Clarity (Light Attenuation Coefficient)	3-ND / 3-ND	No data has been collected in the current period.
Total Nitrogen	3-ND / 3-ND	There are no “current” total nitrogen data from which to calculate a median total nitrogen from 2018 through 2023. As such, this assessment zone cannot be assessed for total nitrogen.

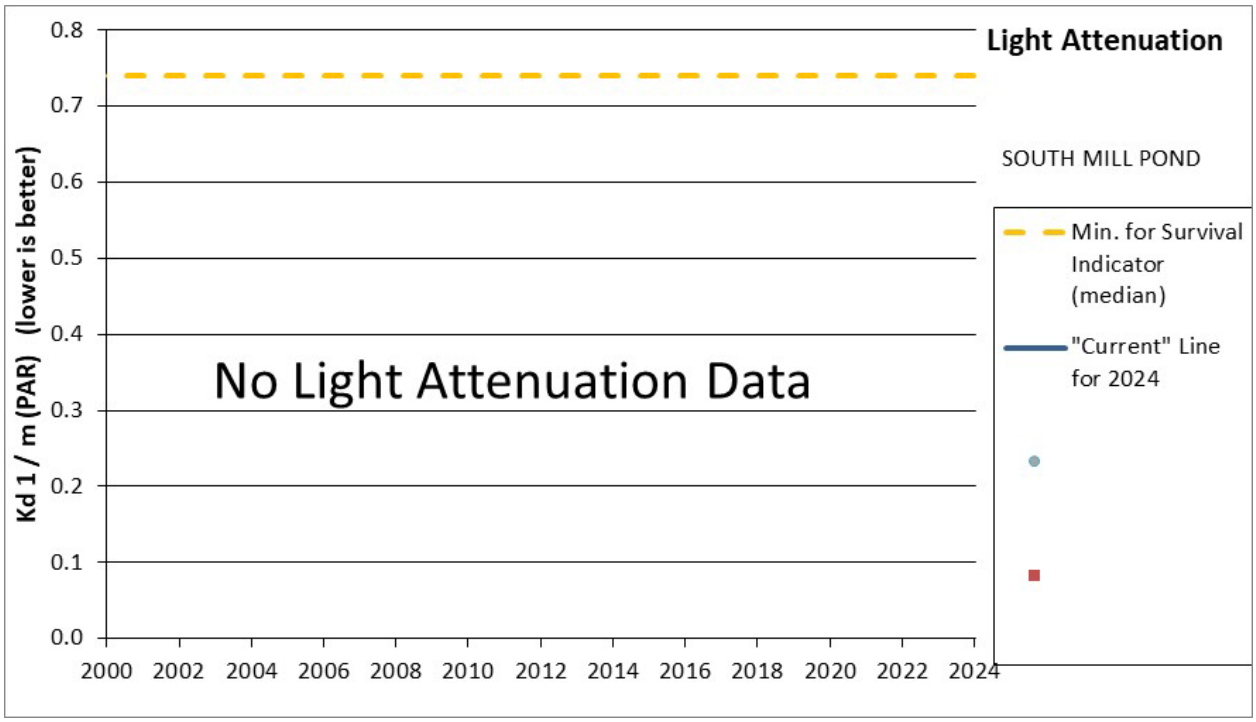

Chlorophyll-a
SOUTH MILL POND
ug Chl-a / L
12
10
8
6
4
2
0
No Chlorophyll-a Data
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024

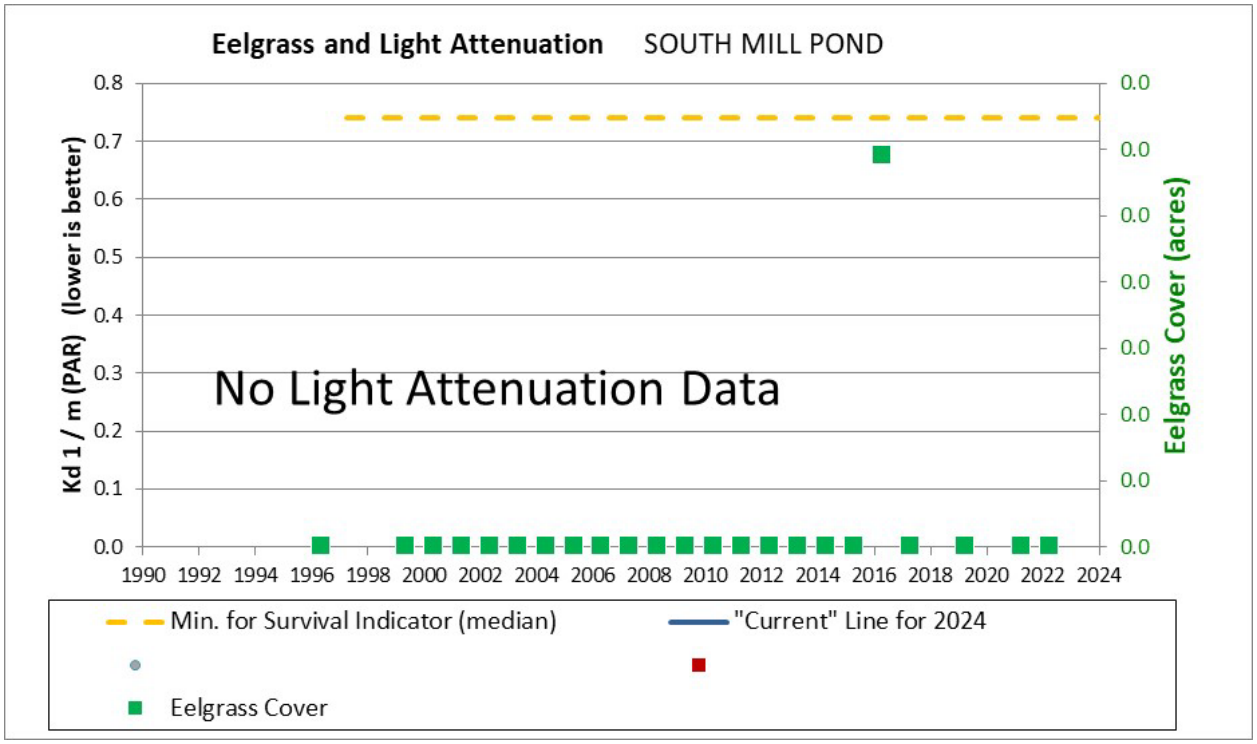

Chlorophyll-a
SOUTH MILL POND
ug Chl-a / L
10.00
1.00
0.10
No Chlorophyll-a Data
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024

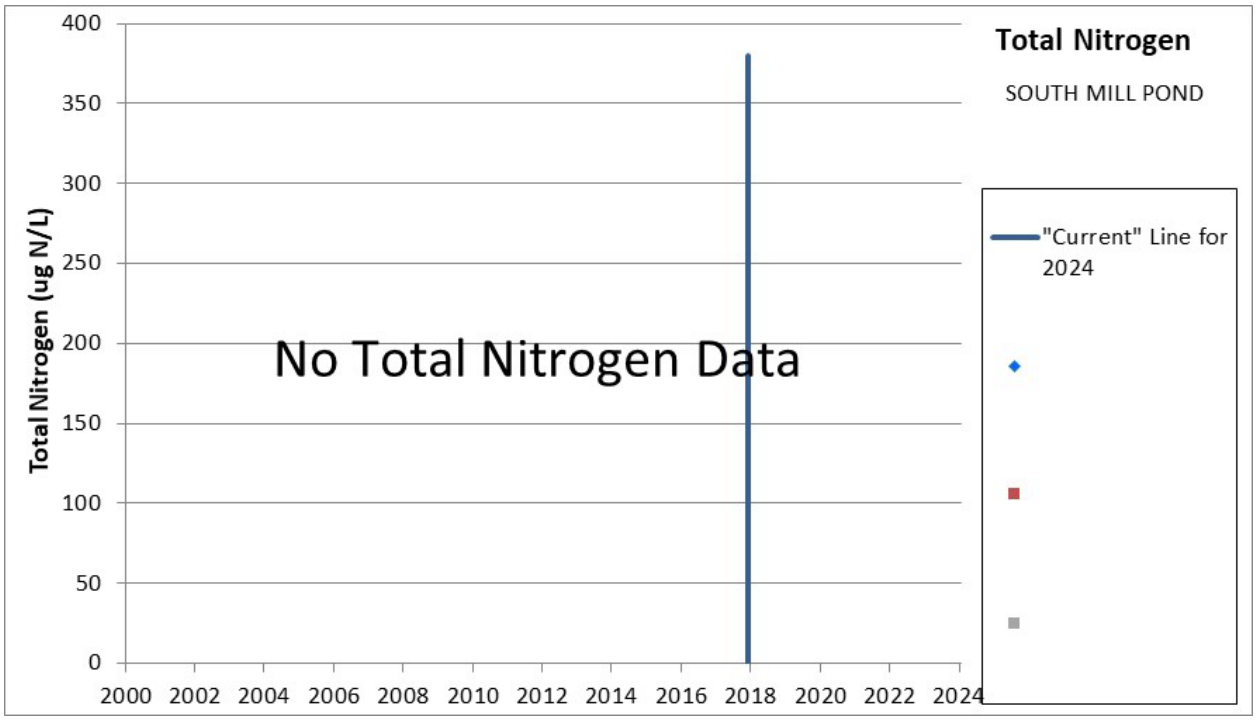

Dissolved Oxygen Concentration
SOUTH MILL POND
Dissolved Oxygen, mg / L
16
14
12
10
8
6
4
2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-GRAB-CP


Dissolved Oxygen Percent Saturation
SOUTH MILL POND
Dissolved Oxygen, Percent Saturation
250
200
150
100
50
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-SAT-GRAB


TSS
SOUTH MILL POND
No TSS Data
TSS (mg/L)
1,000
100
10
1
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024


Light Attenuation
SOUTH MILL POND
No Light Attenuation Data
Kd 1 / m (PAR) (lower is better)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024


Eelgrass and Light Attenuation
SOUTH MILL POND
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
No Light Attenuation Data
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Eelgrass Cover


Total Nitrogen
SOUTH MILL POND
Total Nitrogen (ug N/L)
No Total Nitrogen Data
400
350
300
250
200
150
100
50
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024

South Mill Pond Assessment Zone (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	0	-	-	-	-
LIGHT ATTENUATION COEFFICIENT (1/m)	0	-	-	-	-
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	0	-	-	-	-
TSS (mg/L)	0	-	-	-	-
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	0	-	-	-	-
DO-PPM-24HR-MIN-CP (mg/L)	0	-	-	-	-
DO-PPM-24HR-MIN-NCP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-CP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-NCP (mg/L)	0	-	-	-	-
DO-PERC-24H-MEAN-CP (% sat)	0	-	-	-	-
DO-PERC-24H-MEAN-NCP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	0	-	-	-	-
Day Ave of TN (ug N/L)	0	-	-	-	-
Day Ave of TDN (ug N/L)	0	-	-	-	-
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	0	-	-	-	-
Day Ave of NH3 (ug N/L)	0	-	-	-	-
Day Ave of PON (ug N/L)	0	-	-	-	-
Day Ave of NO2/3 (ug N/L)	0	-	-	-	-
SALINITY-Grabs (pss)	0	-	-	-	-
SALINITY-Datalogger Daily Median (pss)	0	-	-	-	-
pH-grab	0	-	-	-	-
pH-24HR (min)	0	-	-	-	-
pH-24HR (max)	0	-	-	-	-
Temperature	0	-	-	-	-
Temperature-Daily Median	0	-	-	-	-

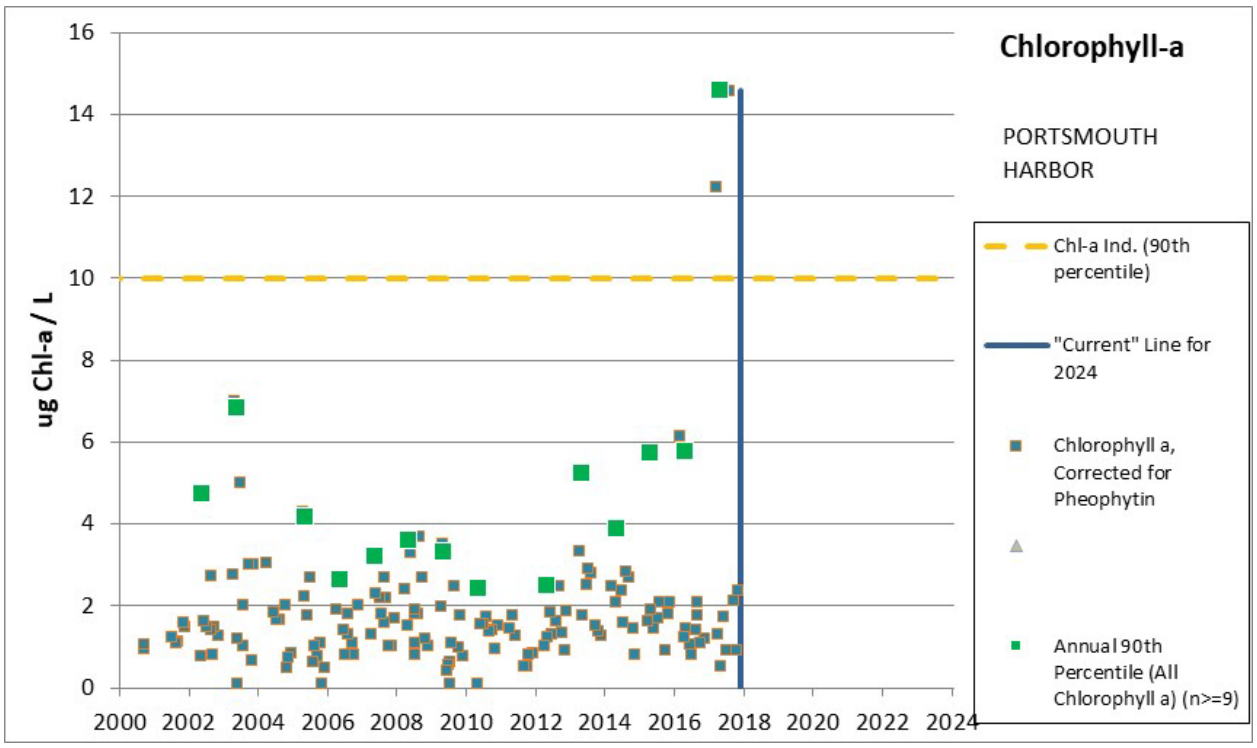
*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

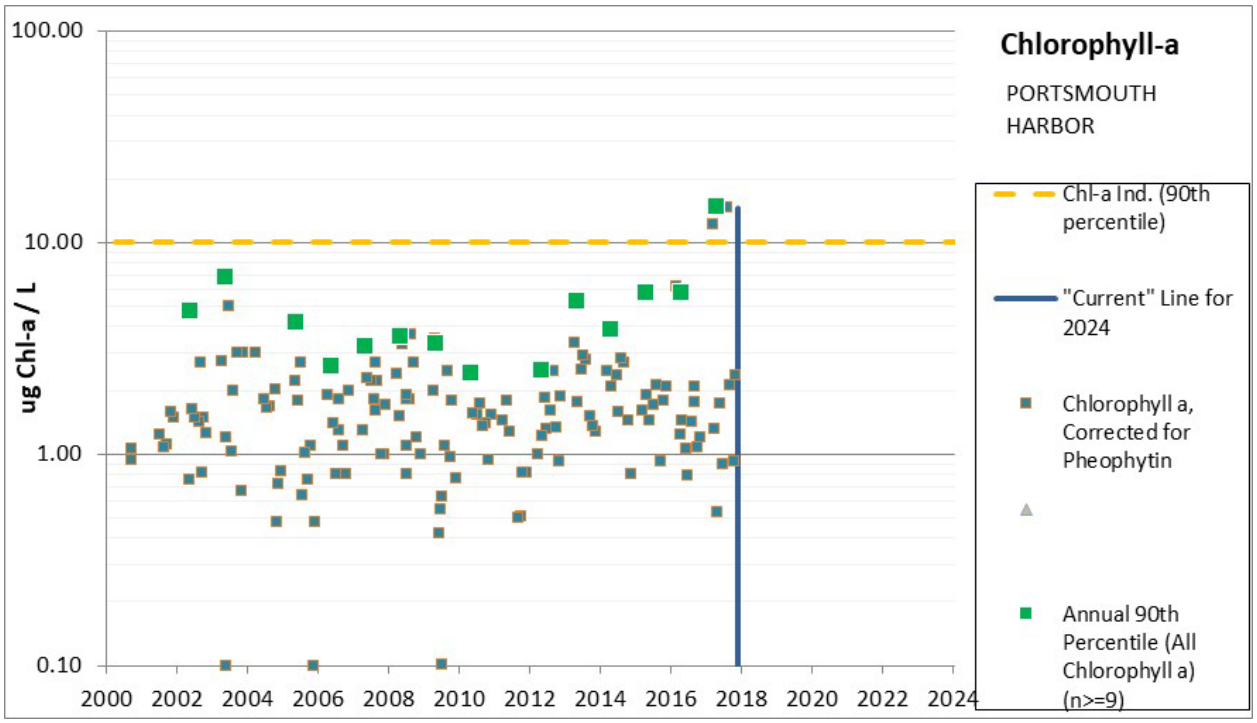
Assessment Zone = PORTSMOUTH HARBOR

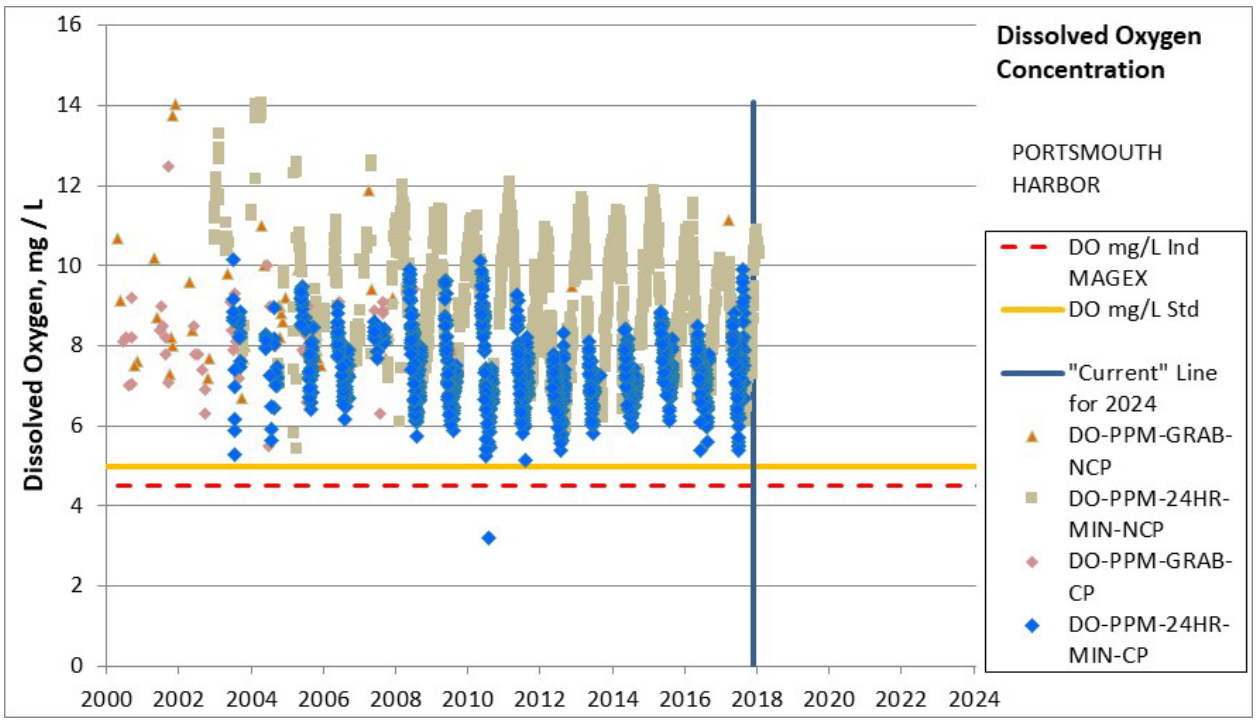
(NHEST600031001-11)

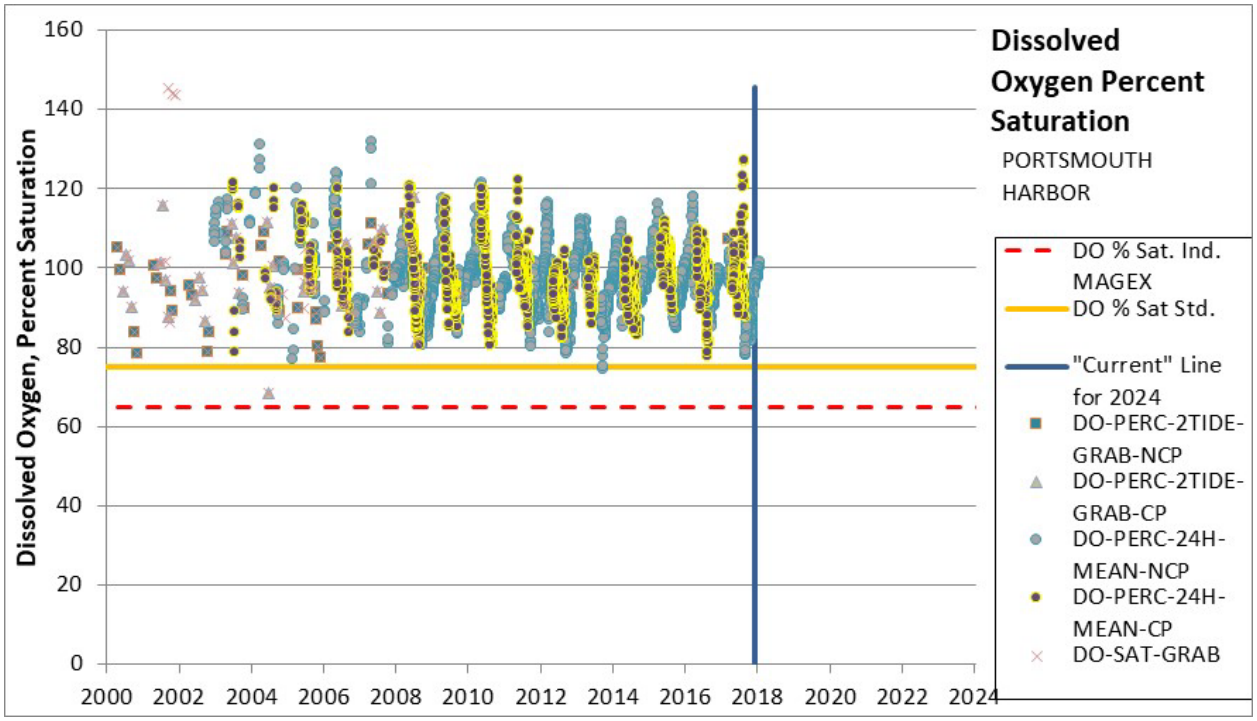
As of the date of data retrieval (April 13, 2023), datalogger data through February 2018 and grab sample data through 2017 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means there are no additional water quality datasets compared to the 2020/2022 assessment.

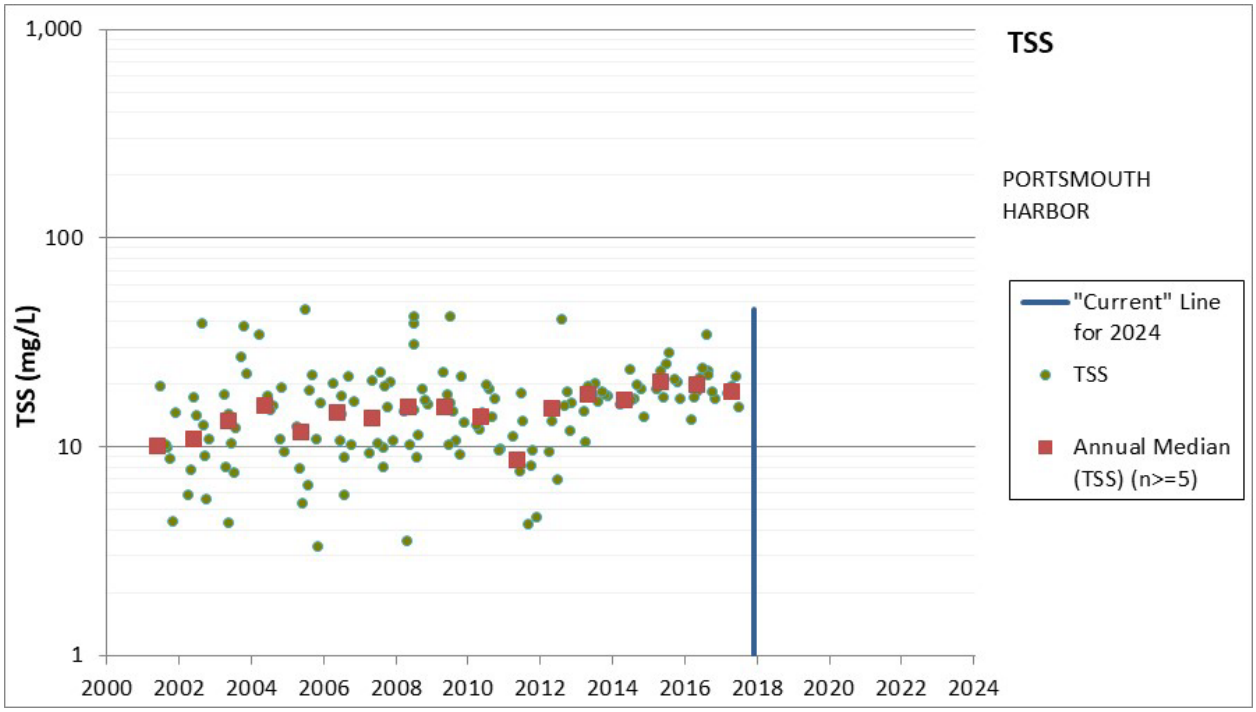
Indicator	Aquatic Life Use Category 2020/2022 /2024	2024 Comment
Chlorophyll-a	2-G / 3-ND	The calculated 90th percentile chlorophyll-a in this assessment zone cannot as there are no measured values in the current period. The chlorophyll-a indicator threshold to prevent low dissolved oxygen and preserve light for eelgrass is a 90th percentile below 10 µg/L.
Dissolved Oxygen (mg/L)	2-G / 3-PAS	This assessment zone has datalogger and grab measurements for dissolved oxygen concentration through February 2018. Although the available data indicates that this assessment zone meets the dissolved oxygen concentration criteria, that data is only from winter months. The assessed category has been moved to insufficient information – potentially attaining standards.
Dissolved Oxygen (% Saturation)	2-G / 3-PAS	This assessment zone has 24-hour average datalogger dissolved oxygen percent saturation through February 2018. Although the available data indicates that this assessment zone meets the dissolved oxygen percent saturation criteria, that data is only from winter months. The assessed category has been moved to insufficient information – potentially attaining standards.
Estuarine Bioassessments (eelgrass)	5-P / 5-P	The historical extent of eelgrass in this assessment zone was 227.7 acres from the 1948, 1962, 1980 and 1981 datasets. The median current extent of eelgrass in 2019-2022 is 87.1 acres, which is a decrease of 46.9%. Since 1990, the trend in eelgrass cover in this assessment zone is a loss of 30.0%. The thresholds for impairment are either a loss of more than 20% of the historic extent of eelgrass or a recent trend of greater than 20% loss.
Water Clarity (Light Attenuation Coefficient)	5-M / 5-M	There have been no light measurements collected since 2017. Measurements from 2002 to 2017 ranged from 0.2 to 1.4 m^-1. For an eelgrass restoration depth of 3 m, the light attenuation coefficient threshold is 0.5 m^-1. This assessment zone historically had eelgrass growing in both the shallows and deeper habitat making the 3 m restoration depth a valid target. Further, a review of the location of the deep edge of the eelgrass suggests that the maximum depth of eelgrass survival is not as deep as it was in the past. Due to the proximity of the Portsmouth WWTF, the data through 2018 reflects the pre-upgrade period when there was still a large TSS load out of the discharge. The impaired (5-M) listing from the 2020/2022 303d list has been retained until new data is collected.
Total Nitrogen	2-M / 3-ND	There are no “current” total nitrogen data from which to calculate a median total nitrogen from 2018 through 2023 and very little of the other water quality is “current”. The bits of other water quality that is “current” was all collected in the winter ending in 2018. As such, this assessment zone cannot be assessed for total nitrogen

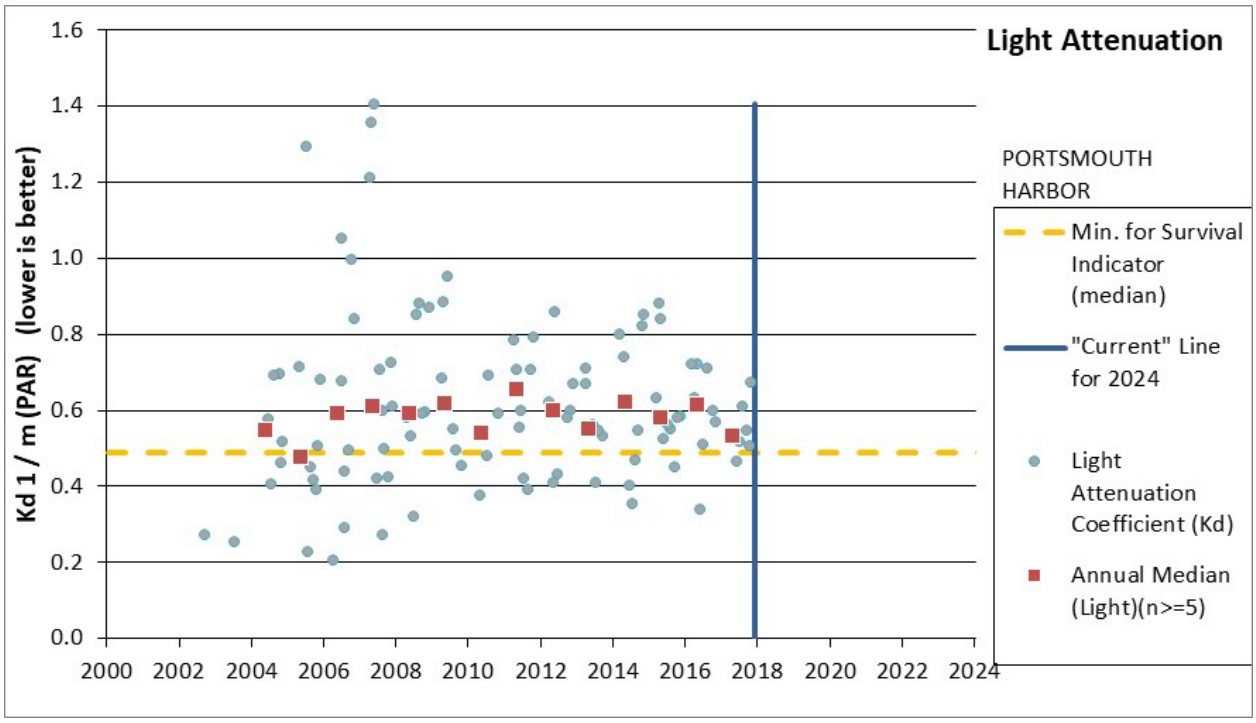

Chlorophyll-a
PORTSMOUTH HARBOR
ug Chl-a / L
16
14
12
10
8
6
4
2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

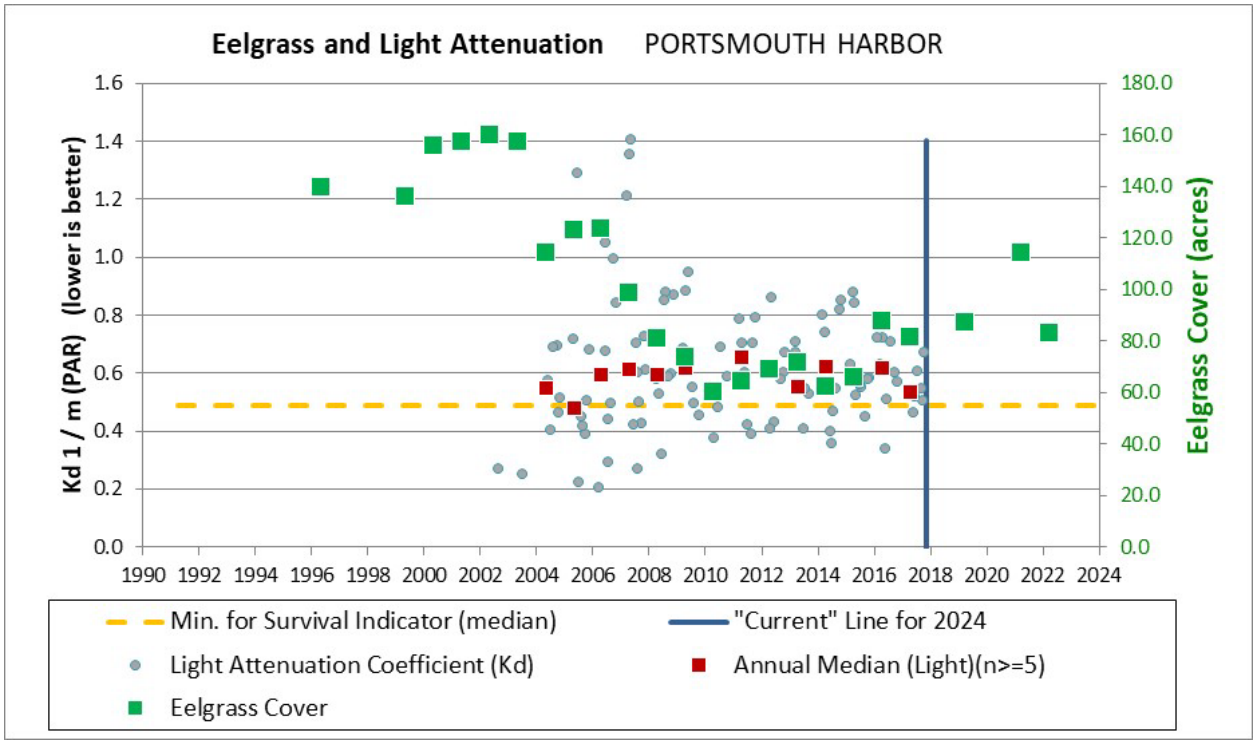

Chlorophyll-a
PORTSMOUTH HARBOR
ug Chl-a / L
100.00
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

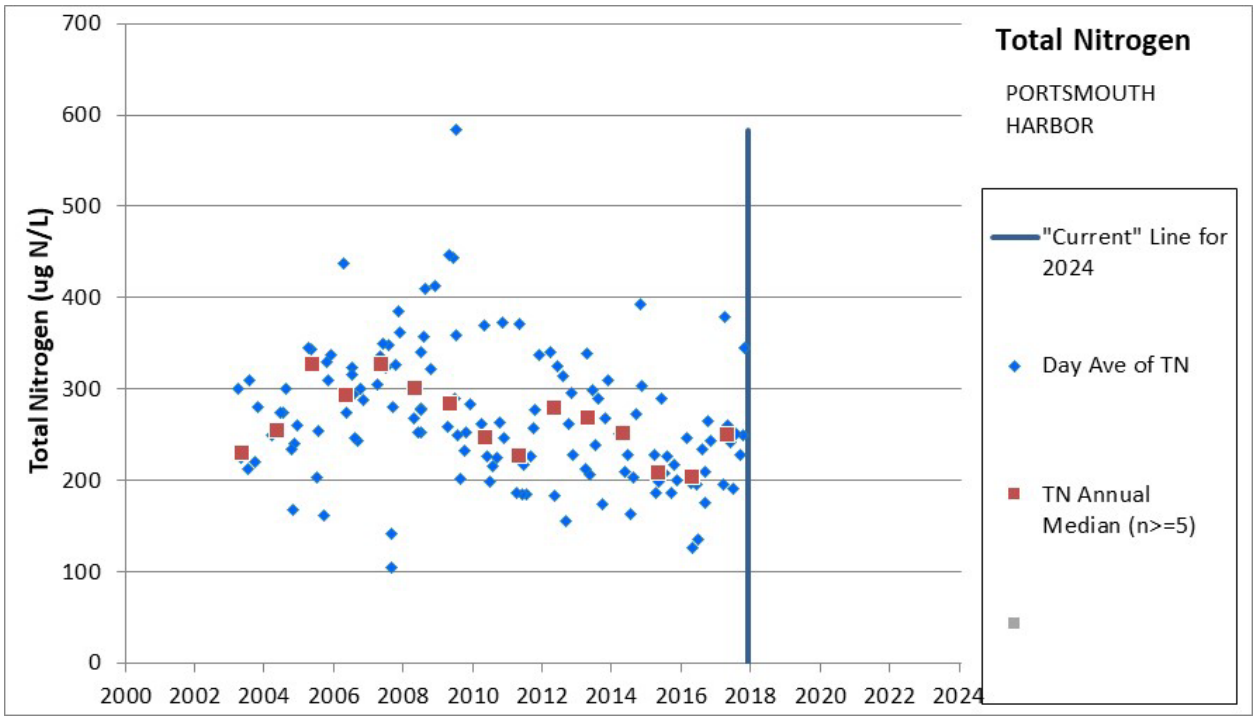

Dissolved Oxygen Concentration
PORTSMOUTH HARBOR
Dissolved Oxygen, mg / L
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
PORTSMOUTH HARBOR
Dissolved Oxygen, Percent Saturation
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-2TIDE-GRAB-NCP
DO-PERC-2TIDE-GRAB-CP
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
PORTSMOUTH HARBOR
TSS (mg/L)
1,000
100
10
1
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)


Light Attenuation
PORTSMOUTH HARBOR
Kd 1 / m (PAR) (lower is better)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)


Eelgrass and Light Attenuation
PORTSMOUTH HARBOR
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
180.0
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)
Eelgrass Cover


Total Nitrogen
PORTSMOUTH HARBOR
Total Nitrogen (ug N/L)
700
600
500
400
300
200
100
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)

Portsmouth Harbor Assessment Zone (1/1/2018-4/13/2023)	**Date Count**	**Minimum**	**Median**	**90th Percentile**	**Maximum**
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	0	-	-	-	-
LIGHT ATTENUATION COEFFICIENT (1/m)	0	-	-	-	-
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	53	1.0	1.0	2.0	3.0
TSS (mg/L)	0	-	-	-	-
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	0	-	-	-	-
DO-PPM-24HR-MIN-CP (mg/L)	0	-	-	-	-
DO-PPM-24HR-MIN-NCP (mg/L)	53	10.1	10.5	10.7	10.9
DO-PPM-GRAB-CP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-NCP (mg/L)	0	-	-	-	-
DO-PERC-24H-MEAN-CP (% sat)	0	-	-	-	-
DO-PERC-24H-MEAN-NCP (% sat)	52	94.6	97.9	99.8	101.4
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	0	-	-	-	-
Day Ave of TN (ug N/L)	0	-	-	-	-
Day Ave of TDN (ug N/L)	0	-	-	-	-
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	0	-	-	-	-
Day Ave of NH3 (ug N/L)	0	-	-	-	-
Day Ave of PON (ug N/L)	0	-	-	-	-
Day Ave of NO2/3 (ug N/L)	0	-	-	-	-
SALINITY-Grabs (pss)	0	-	-	-	-
SALINITY-Datalogger Daily Median (pss)	53	28.5	30.0	31.7	31.8
pH-grab	0	-	-	-	-
pH-24HR (min)	53	7.9	8.0	7.9*	8.0
pH-24HR (max)	53	8.0	8.0	8.0	8.0
Temperature	0	-	-	-	-
Temperature-Daily Median	53	0.5	2.5	3.5	4.1

*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

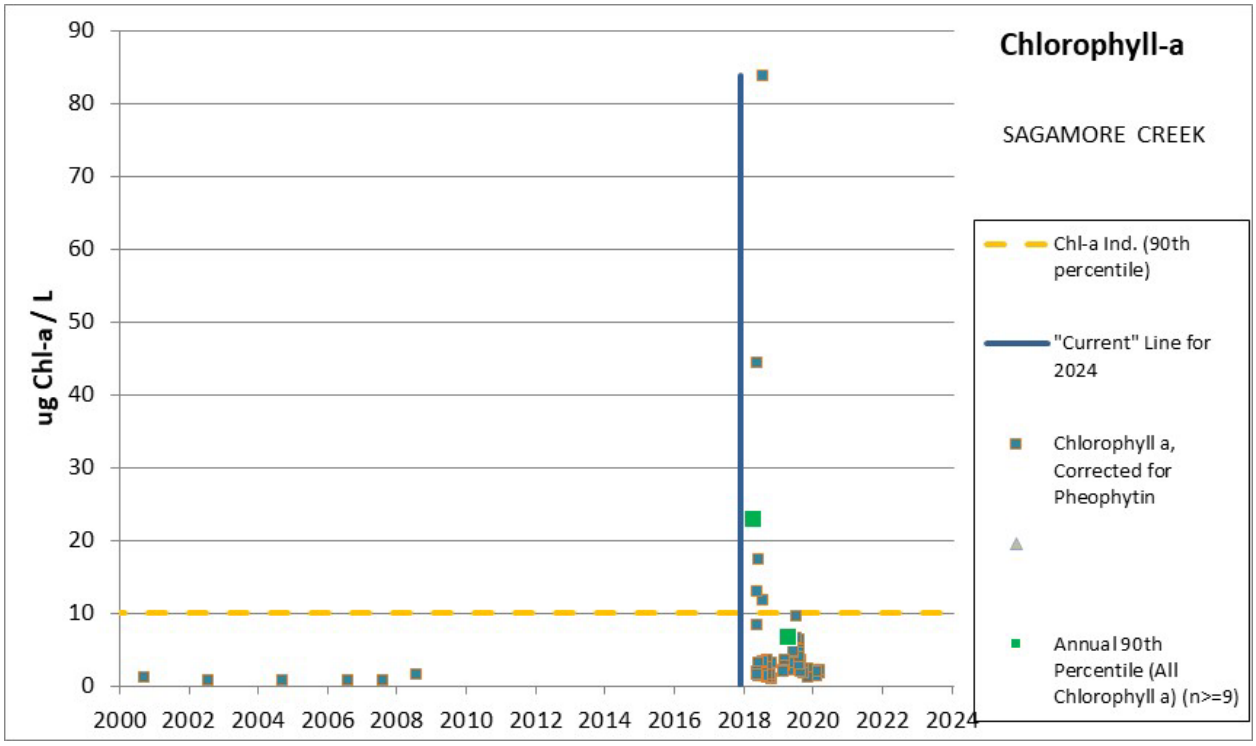
Assessment Zone = SAGAMORE CREEK

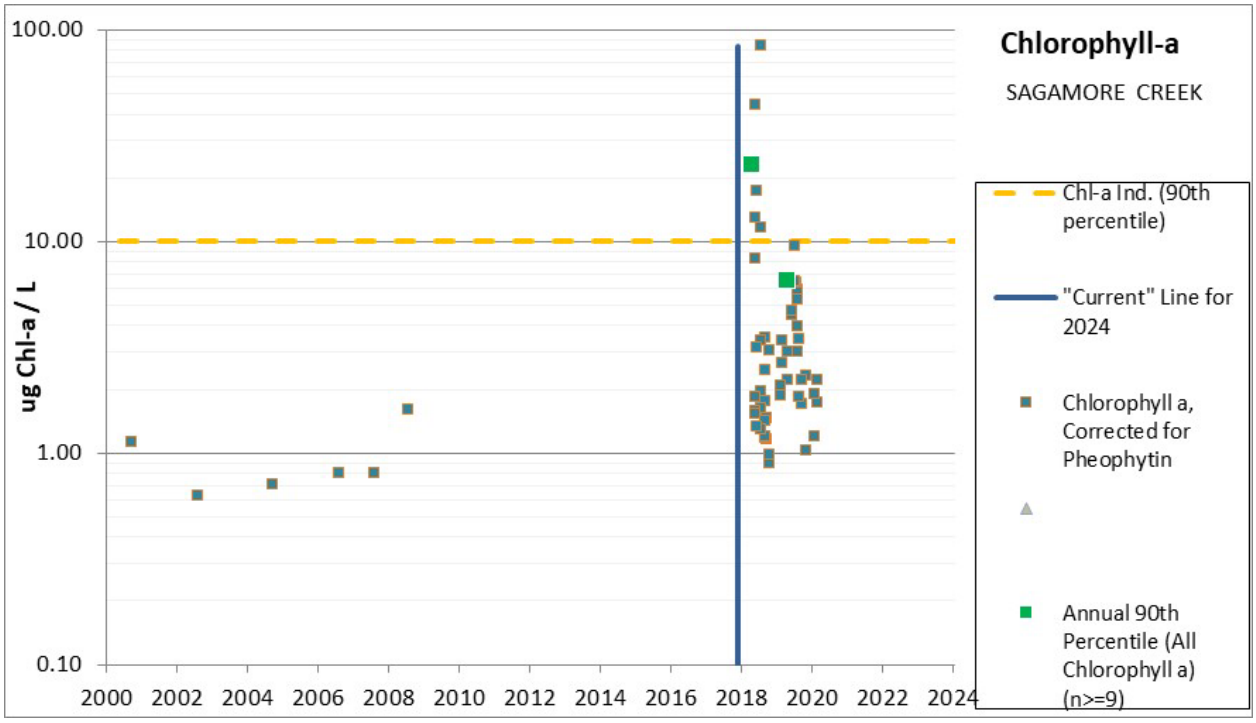
(NHEST600031001-03, NHEST600031001-04)

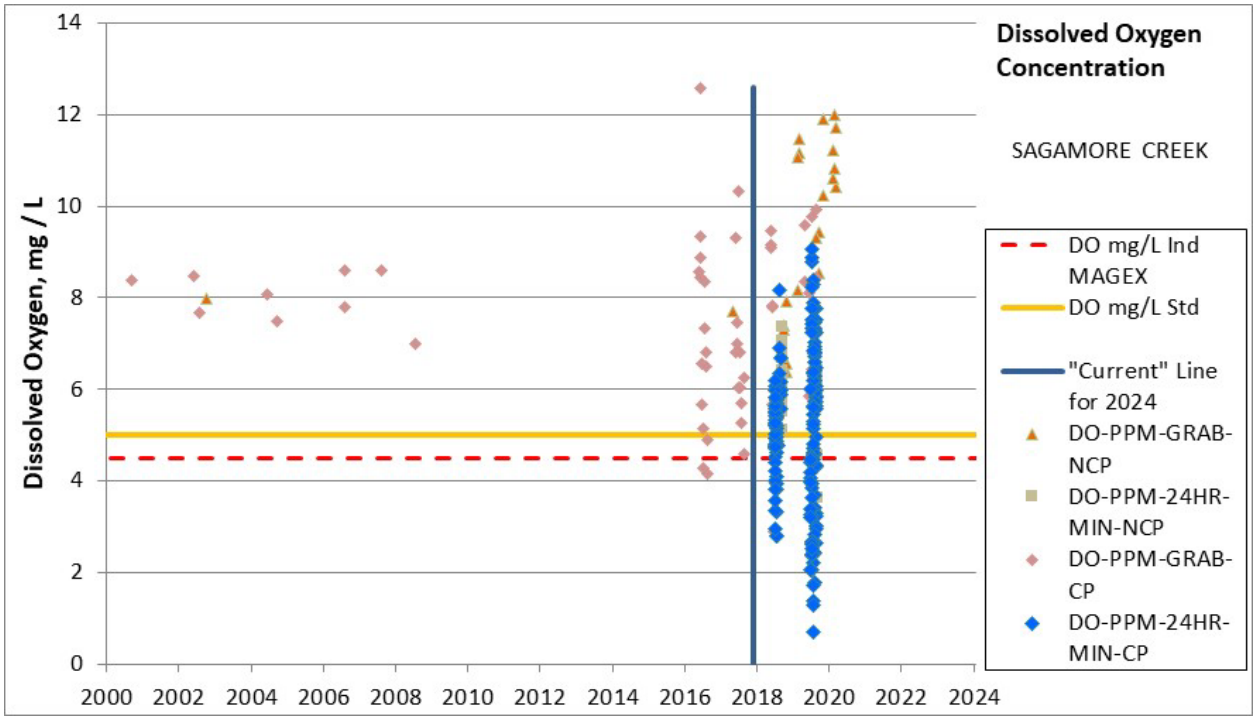
As of the date of data retrieval (April 13, 2023) water quality data through 2022 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means there is 1-additional year (2019) of datalogger data and grab samples for 2019 through April 2020 for limited additional parameters compared to the 2020/2022 assessment.

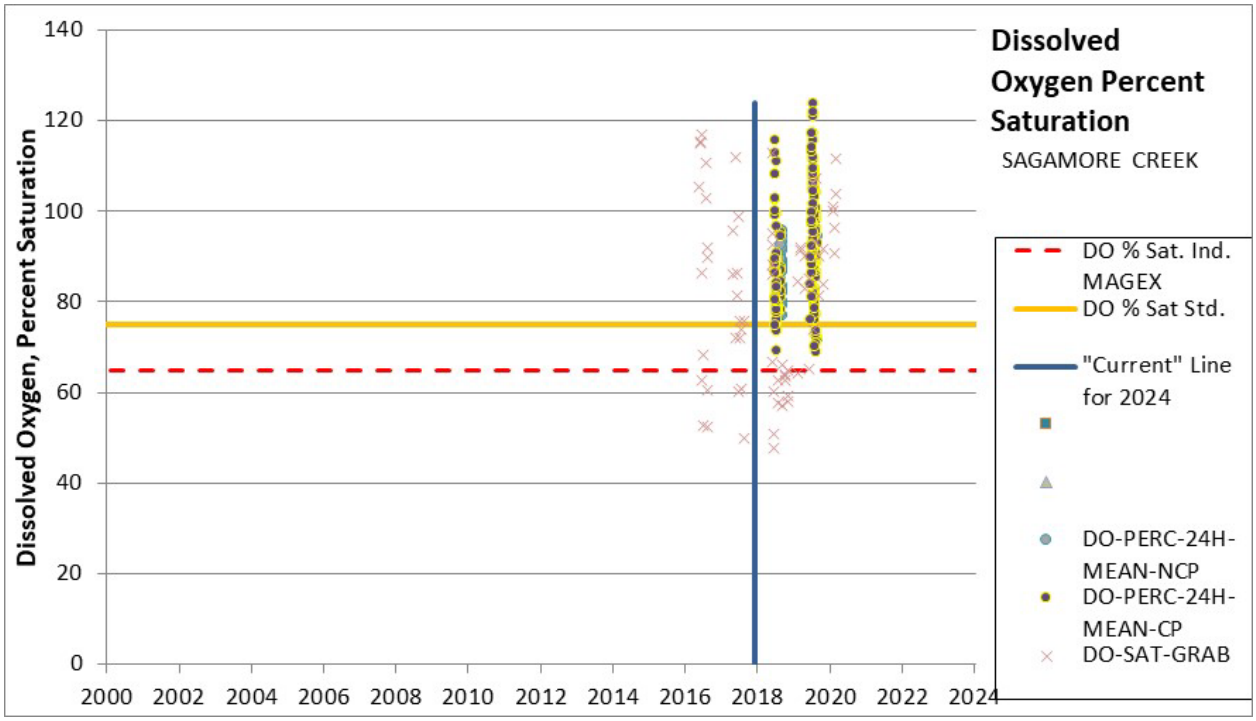
Indicator	Aquatic Life Use Category 2020/2022 /2024	2024 Comment
Chlorophyll-a	5-P / 5-M	The calculated 90th percentile chlorophyll-a (corrected for pheophytin) in this assessment zone is 11.0 µg/L (n =52) and a maximum of 83.8 ug/L. The chlorophyll-a indicator threshold to prevent low dissolved oxygen and preserve light for eelgrass is a 90th percentile below 10 µg/L.
Dissolved Oxygen (mg/L)	5-P / 5-P	In 2016-2018 this zone had grab samples for DO collected at three sites 02-SAG, 04-SAG and LHB19. In 2018 and 2019 dataloggers were deployed at sites 02-SAG and 04-SAG. During the summer periods of deployment there were 19-events at 02-SAG (15% of days) and 91-events at 04-SAG (61% of days) below the 5 mg/L criterion. While 02-SAG dropped down to 4 mg/L, 04-SAG fell below 2 mg/L on multiple dates. The available data indicates that this assessment zone does not meet the dissolved oxygen concentration criteria.
Dissolved Oxygen (% Saturation)	2-M / 2-M	In 2016-2018 this zone had grab samples for DO collected at three sites 02-SAG, 04-SAG and LHB19. In 2018 and 2019 dataloggers were deployed at sites 02-SAG and 04-SAG. During the summer periods of deployment there were 6, 24-hour averages at 02-SAG (6%) and 9, 24-hour averages at 04-SAG (8%) below the 24-hour 75 percent saturation criterion. The available data indicates that this assessment zone has marginally good dissolved oxygen saturation.
Estuarine Bioassessments (eelgrass)	5-P / 5-P	The historical extent of eelgrass in this assessment zone was 4.1 acres from the 1948, 1962, 1980 and 1981 datasets. The median current extent of eelgrass in 2019-2022 is 0.8 acres, which is a decrease of 79.6%. Since 1990, the trend in eelgrass cover in this assessment zone could not be determined. The thresholds for impairment are either a loss of more than 20% of the historic extent of eelgrass or a recent trend of greater than 20% loss.
Water Clarity (Light Attenuation Coefficient)	3-ND / 3-ND	There have been no light measurements collected since 2005.This assessment zone historically had eelgrass growing in both the shallows and deeper habitat making the 3m restoration depth a valid target. Further, a review of the location of the deep edge of the eelgrass suggests that the maximum depth of eelgrass survival is not as deep as it was in the past. As there is no measured light attenuation, this zone remains assessed as “no data.”
Total Nitrogen	5-M / 5-M	The median total nitrogen from 2018 through 2019 was 353 µg/L (n=51) having a range of 159-905 ug/L. The available dissolved oxygen data shows that water quality concentration frequently falls well below 5 mg/L however the daily average dissolved oxygen percent saturation remains marginally over 75%. There is no light attenuation data in the current period. Chlorophyll-a is high at 11.0 µg/L (n = 52). The eelgrass beds are severely degraded. The addition of the 2019 dataset confirms and homes in on the

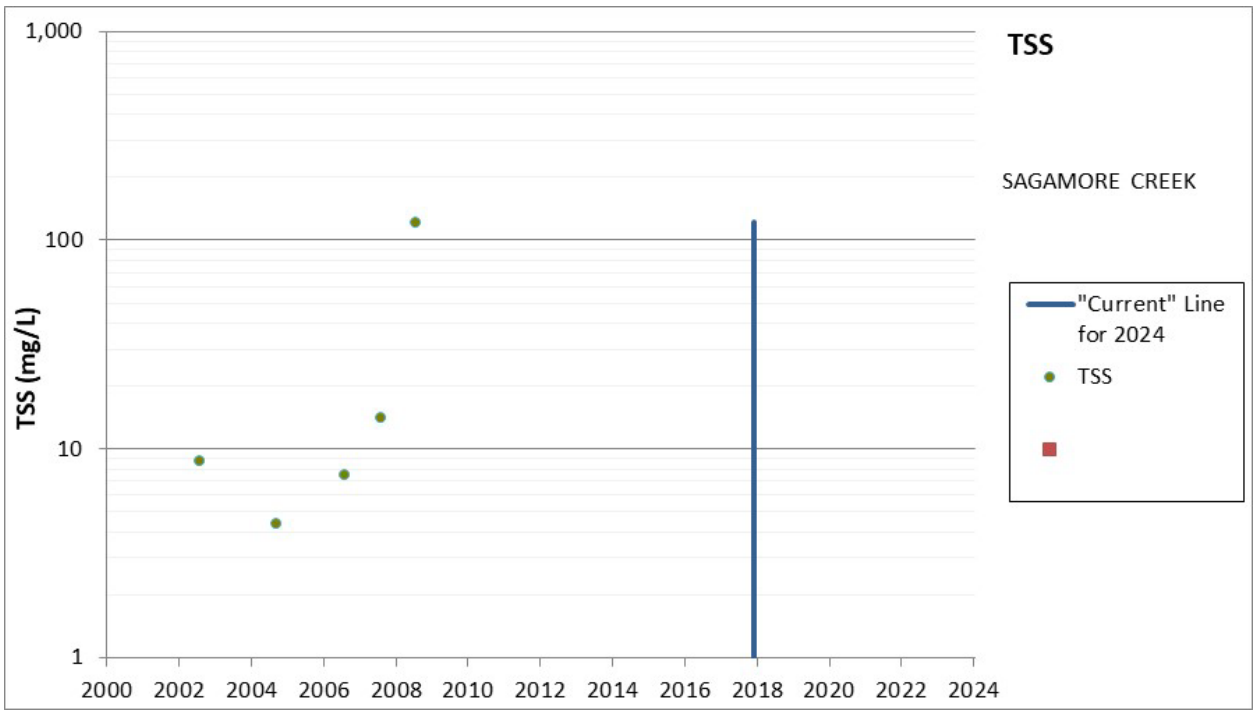
		severity of the indicators of nutrients and nutrient-related impacts and continue to present a preponderance of evidence that eutrophication effects are ongoing.

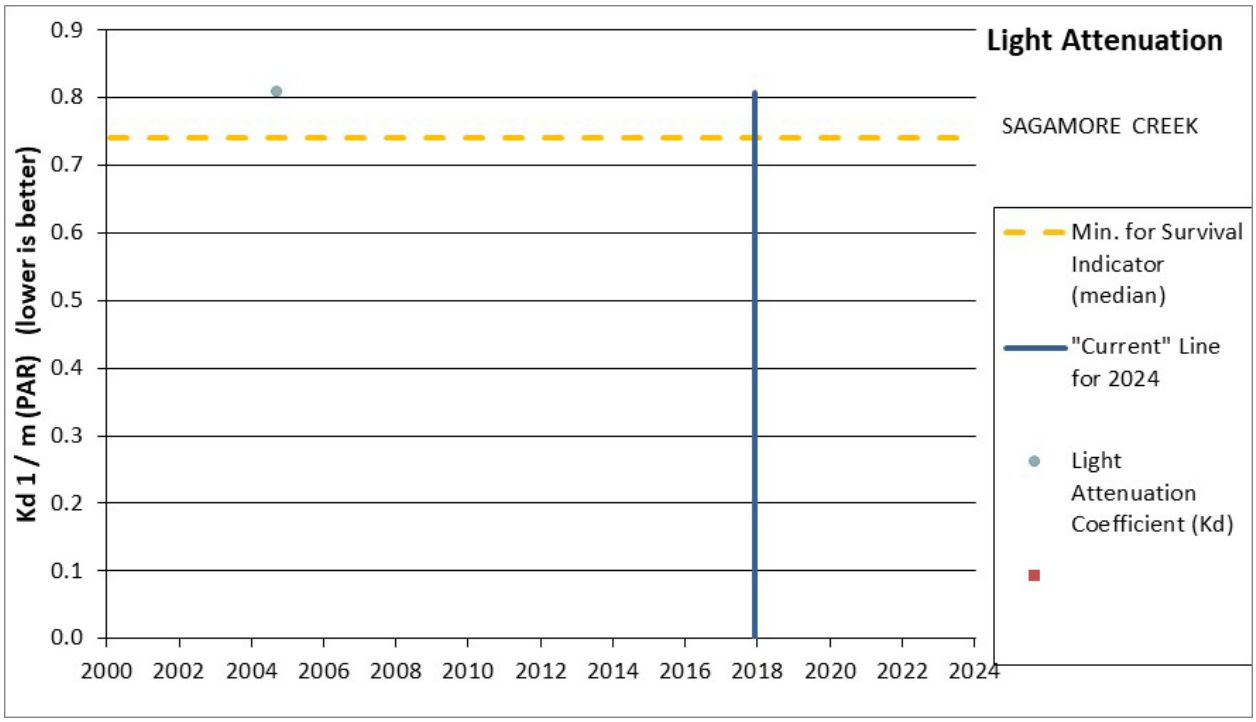


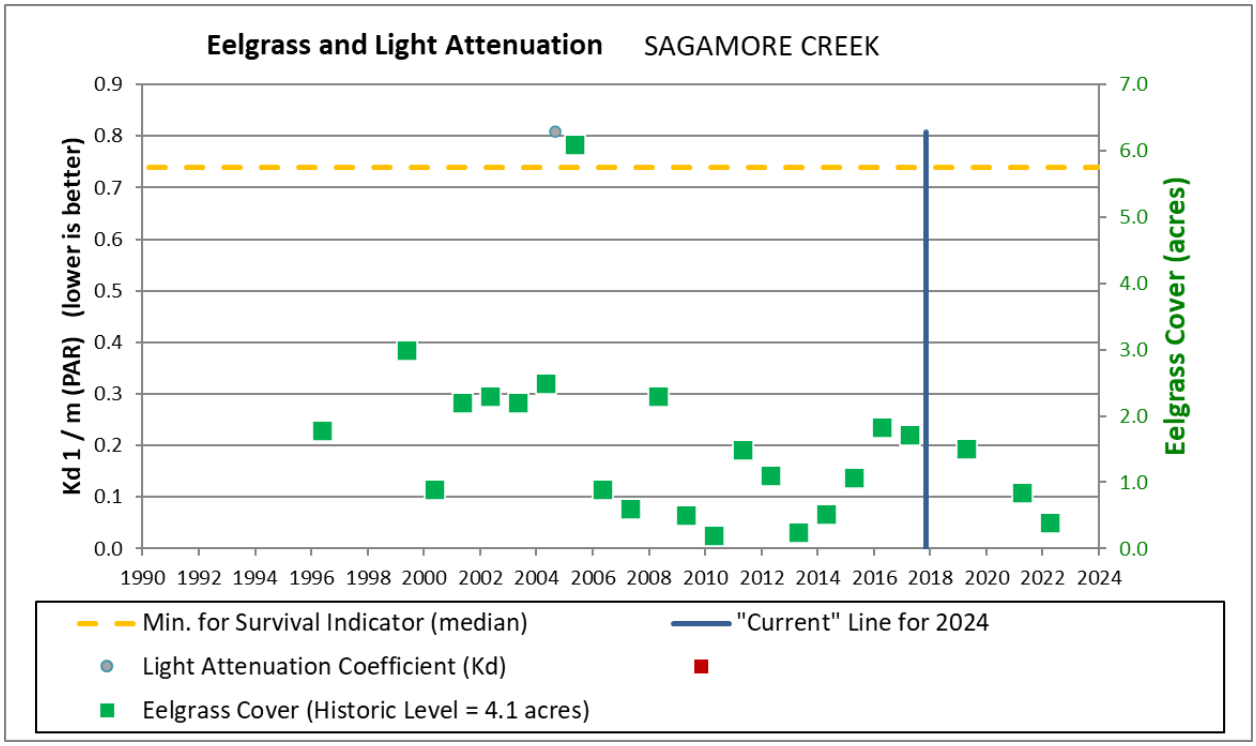


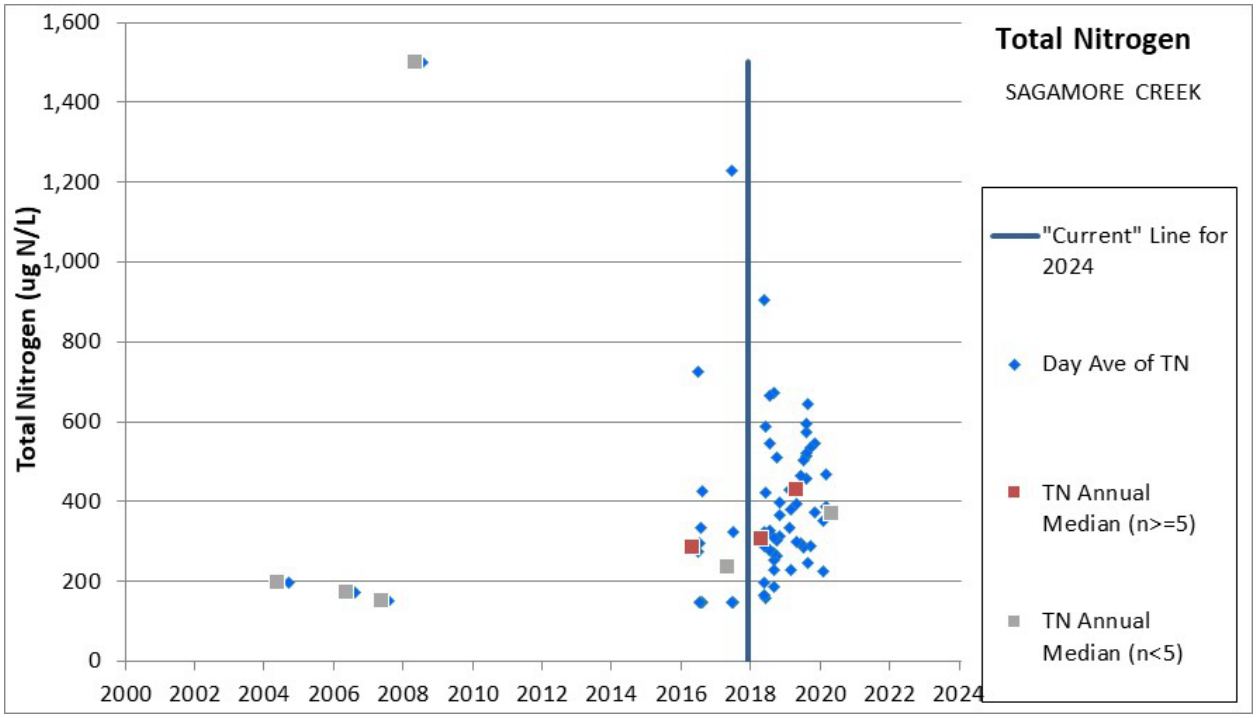

Dissolved Oxygen Concentration
SAGAMORE CREEK
Dissolved Oxygen, mg / L
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-24HR-MIN-NCP
DO-PPM-GRAB-CP
DO-PPM-24HR-MIN-CP


Dissolved Oxygen Percent Saturation
SAGAMORE CREEK
Dissolved Oxygen, Percent Saturation
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-PERC-24H-MEAN-NCP
DO-PERC-24H-MEAN-CP
DO-SAT-GRAB


TSS
SAGAMORE CREEK
TSS (mg/L)
1,000
100
10
1
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
"Current" Line for 2024
TSS


Light Attenuation
SAGAMORE CREEK
Kd 1 / m (PAR) (lower is better)
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)


Eelgrass and Light Attenuation
SAGAMORE CREEK
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Eelgrass Cover (Historic Level = 4.1 acres)


Total Nitrogen
SAGAMORE CREEK
Total Nitrogen (ug N/L)
0
200
400
600
800
1,000
1,200
1,400
1,600
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)
TN Annual Median (n<5)

Sagamore Creek Assessment Zone (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	52	0.9	2.2	11.0	83.8
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	52	0.0	2.2	11.0	83.8
LIGHT ATTENUATION COEFFICIENT (1/m)	0	-	-	-	-
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	221	0.0	4.0	12.2	38.7
TSS (mg/L)	0	-	-	-	-
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	27	0.7	2.4	5.1	5.8
DO-PPM-24HR-MIN-CP (mg/L)	171	0.7	5.2	7.3	9.1
DO-PPM-24HR-MIN-NCP (mg/L)	36	3.7	6.1	6.8	7.4
DO-PPM-GRAB-CP (mg/L)	19	2.9	7.8	9.8	9.9
DO-PPM-GRAB-NCP (mg/L)	23	5.6	9.5	11.8	12.0
DO-PERC-24H-MEAN-CP (% sat)	161	68.8	89.5	109.2	123.8
DO-PERC-24H-MEAN-NCP (% sat)	30	71.6	87.7	94.5	95.8
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	41	47.7	84.5	105.9	112.9
Day Ave of TN (ug N/L)	51	159	353	594	905
Day Ave of TDN (ug N/L)	52	112	237	463	591
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	25	39	155	243	288
Day Ave of NH3 (ug N/L)	25	4	40	98	123
Day Ave of PON (ug N/L)	0	-	-	-	-
Day Ave of NO2/3 (ug N/L)	52	11	84	177	229
SALINITY-Grabs (pss)	53	1.3	25.8	32.3	41.8
SALINITY-Datalogger Daily Median (pss)	0	-	-	-	-
pH-grab	19	7.4	8.6	9.0	9.2
pH-24HR (min)	231	6.8	7.4	7*	8.2
pH-24HR (max)	231	7.7	8.1	8.2	8.3
Temperature	49	3.4	16.3	22.0	24.1
Temperature-Daily Median	240	12.3	18.7	22.5	24.8

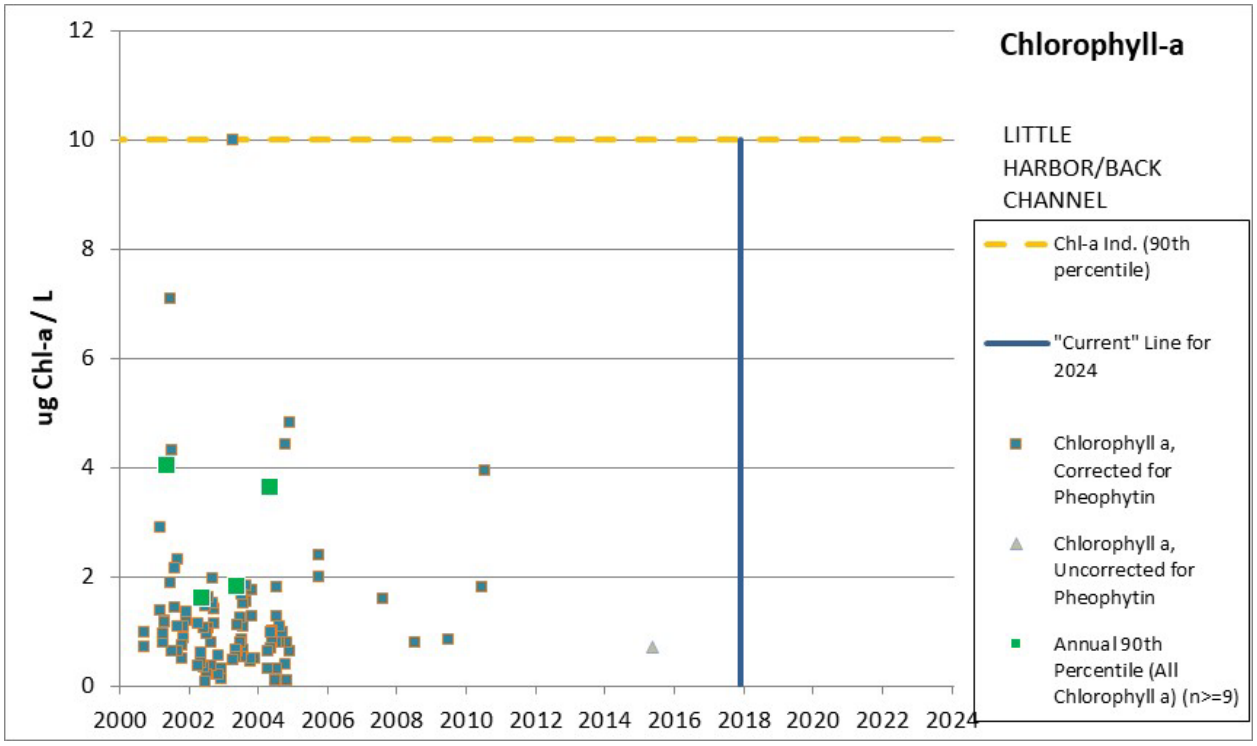
*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

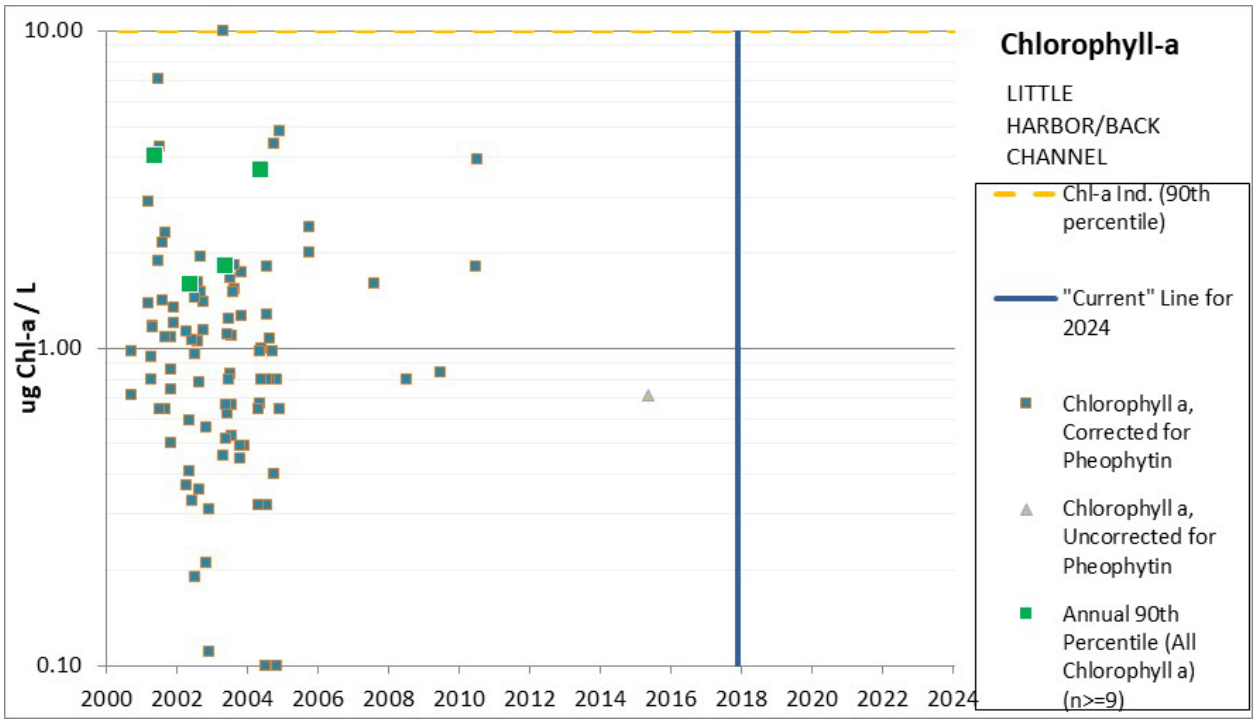
Assessment Zone = LITTLE HARBOR/BACK CHANNEL

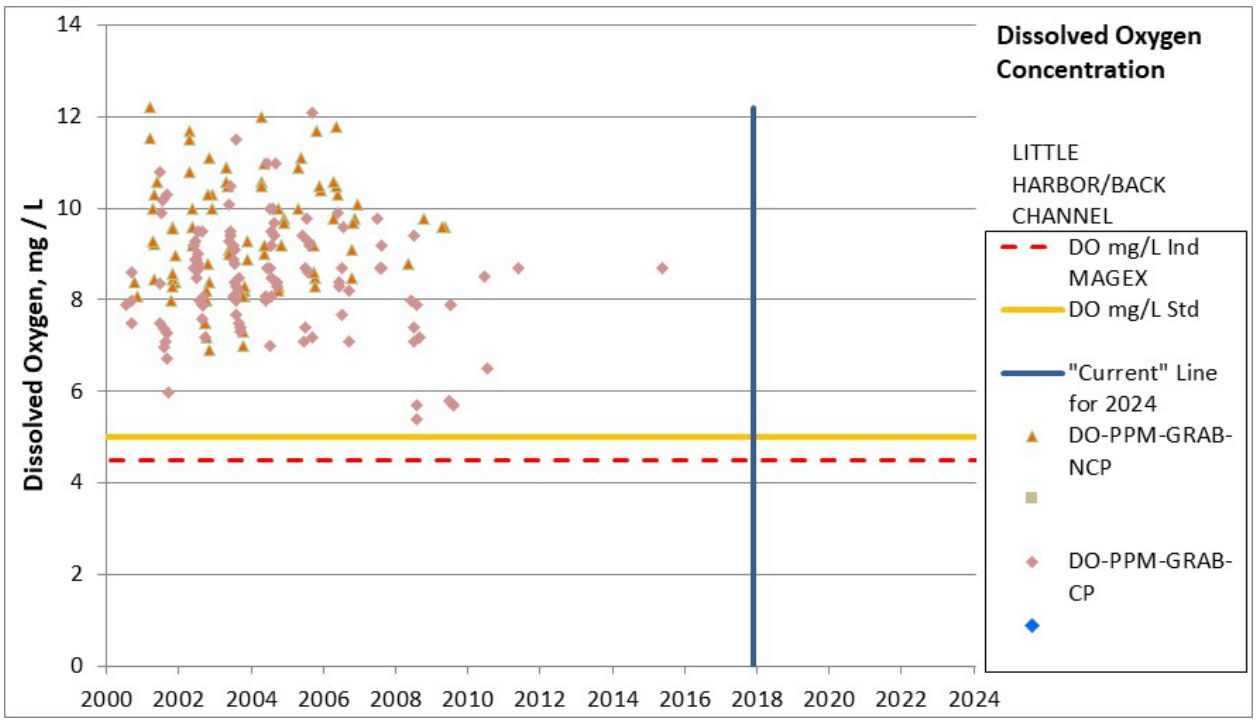
(NHEST600031001-05, NHEST600031001-08, NHEST600031002-02)

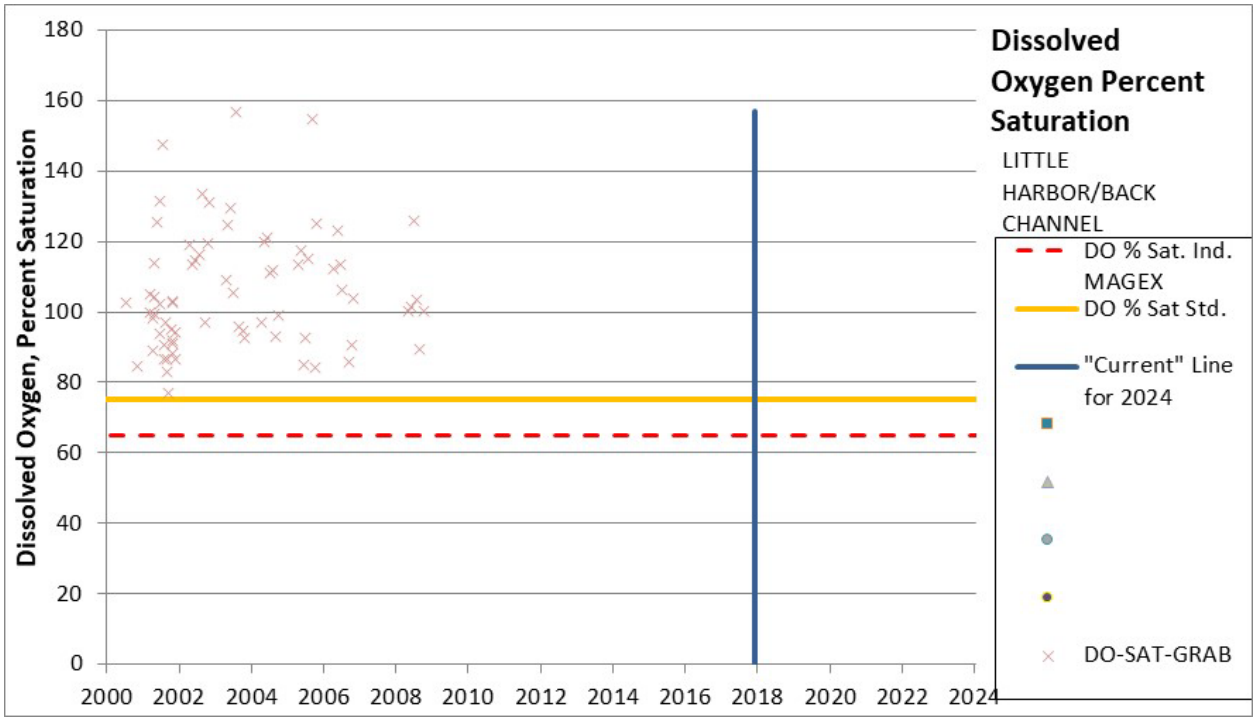
As of the date of data retrieval (April 13, 2023) water quality data through 2022 had been uploaded to the Environmental Monitoring Database for this assessment zone. For this assessment zone, that means there are no additional years of data compared to the 2020/2022 assessment.

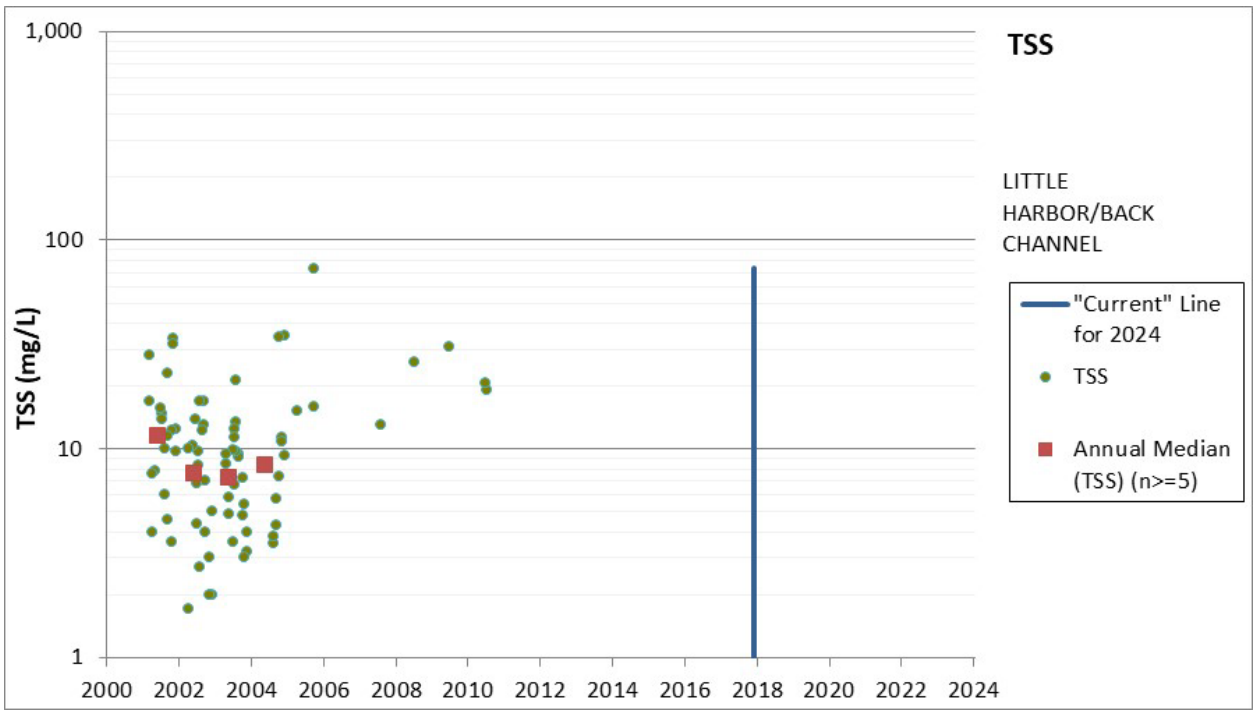
Indicator	Aquatic Life Use Category 2020/2022 /2024	2024 Comment
Chlorophyll-a	3-PAS / 3-ND	The calculated 90th percentile chlorophyll-a in this assessment zone cannot be calculated due to the presence of no measurements in the current period. This assessment zone has no measurements for chlorophyll-a since 2015.
Dissolved Oxygen (mg/L)	3-PAS / 3-ND	No data has been collected in the current period.
Dissolved Oxygen (% Saturation)	3-ND / 3-ND	No data has been collected in the current period.
Estuarine Bioassessments (eelgrass)	5-P / 5-M	The historical extent of eelgrass in this assessment zone was 68.8 acres from the 1948, 1962, 1980 and 1981 datasets. The median current extent of eelgrass in 2019-2022 is 41.9 acres, which is a decrease of 39.1%. Since 1990, the trend in eelgrass cover in this assessment zone is a loss of 30.9%. The thresholds for impairment are either a loss of more than 20% of the historic extent of eelgrass or a recent trend of greater than 20% loss.
Water Clarity (Light Attenuation Coefficient)	5-M / 5-M	There have been no light measurements collected since 2010. For an eelgrass restoration depth of 3 m, the light attenuation coefficient threshold is 0.5 m^-1. This assessment zone historically had eelgrass growing in both the shallows and deeper habitat making the 3 m restoration depth a valid target. This assessment zone was listed as impaired (5-M) for water clarity to protect eelgrass habitat on the 2010 303d list. At that time the Light Attenuation Coefficient median was 0.58 m^-1 (n=25). Assessment zones that were impaired in the previous cycle cannot be removed from the 303d list if there are insufficient data to make a new assessment. Therefore, the impaired (5-M) listing from the 2010 through 2020/2022 303d lists has been retained.
Total Nitrogen	3-PAS/ 3-ND	The most recent total nitrogen sample collected was in 2015. There is no current dissolved oxygen, chlorophyll-a or light attenuation data. The eelgrass beds are just over half their historic extent. As such, this assessment zone cannot be assessed for total nitrogen.

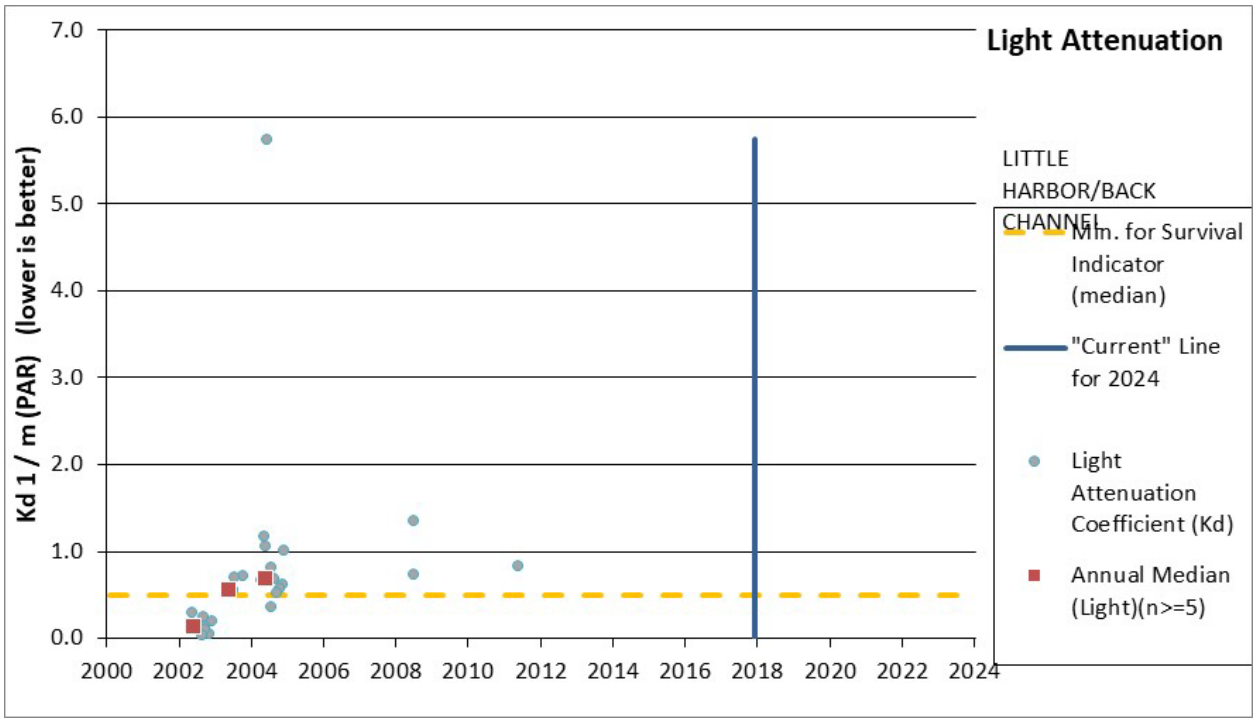

Chlorophyll-a
LITTLE HARBOR/BACK CHANNEL
ug Chl-a / L
12
10
8
6
4
2
0
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

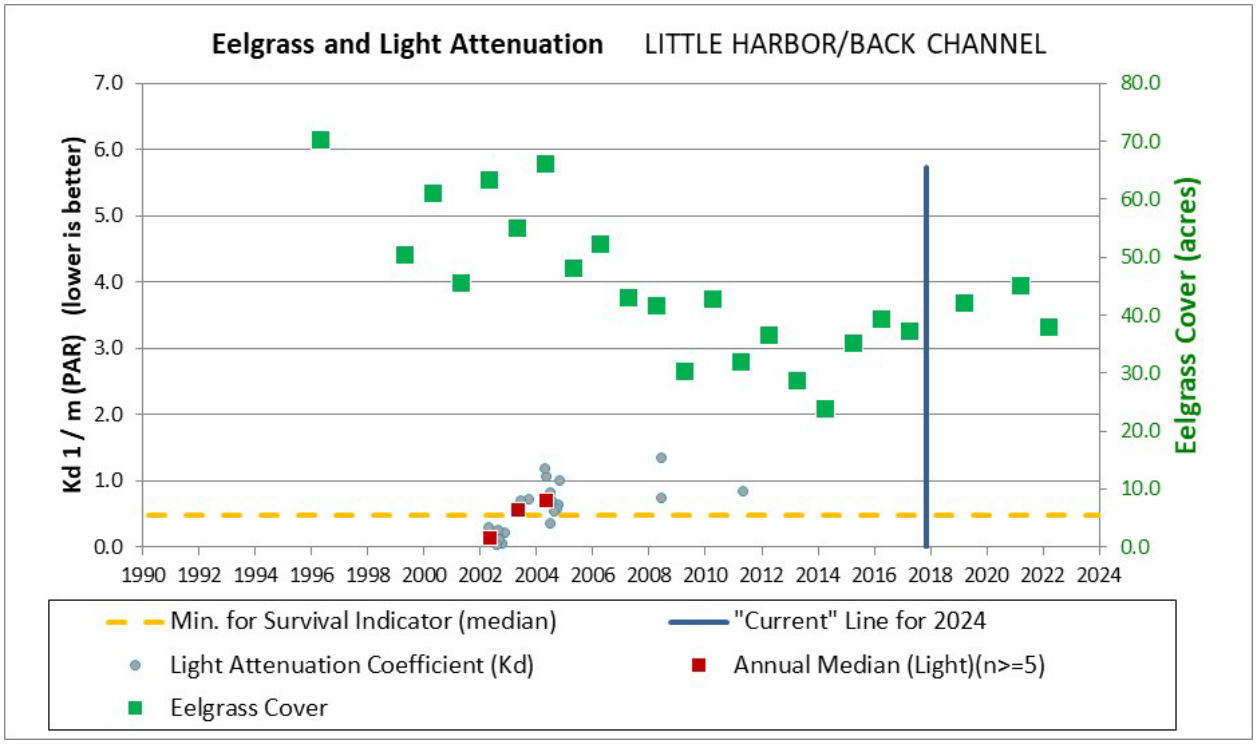

Chlorophyll-a
LITTLE HARBOR/BACK CHANNEL
ug Chl-a / L
10.00
1.00
0.10
2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Chl-a Ind. (90th percentile)
"Current" Line for 2024
Chlorophyll a, Corrected for Pheophytin
Chlorophyll a, Uncorrected for Pheophytin
Annual 90th Percentile (All Chlorophyll a) (n>=9)

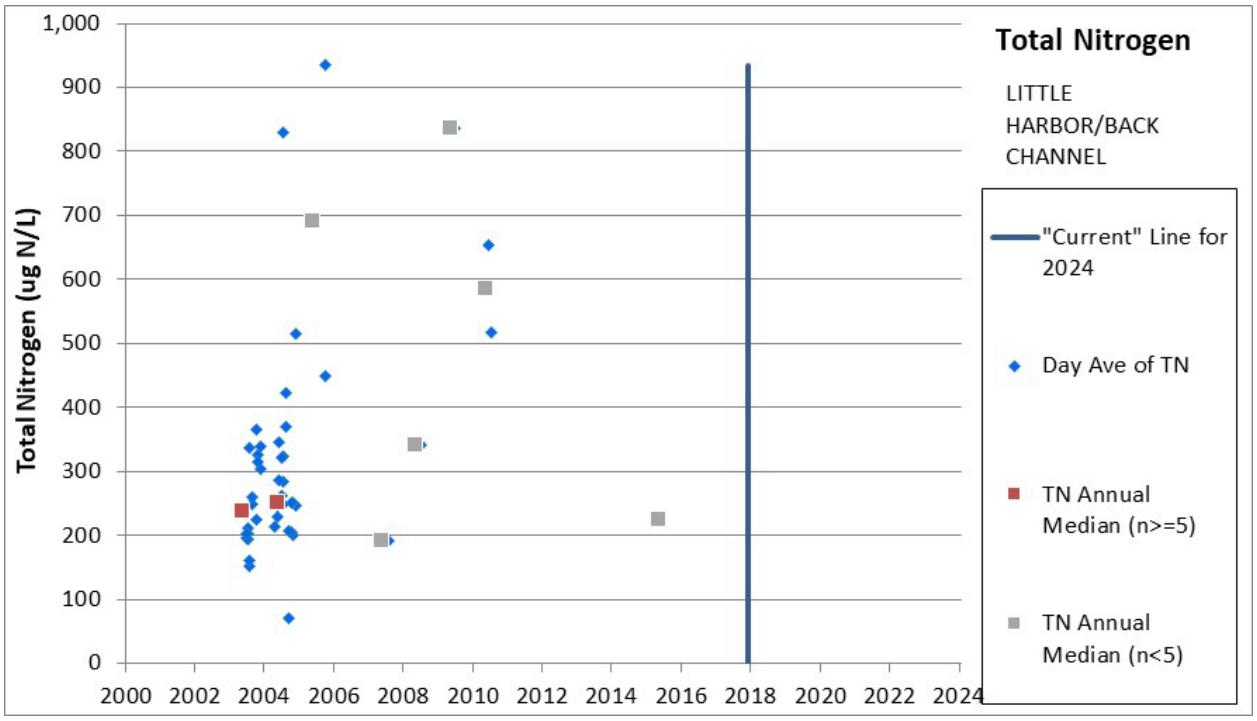

Dissolved Oxygen Concentration
Dissolved Oxygen, mg / L
0
2
4
6
8
10
12
14
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
LITTLE HARBOR/BACK CHANNEL
DO mg/L Ind MAGEX
DO mg/L Std
"Current" Line for 2024
DO-PPM-GRAB-NCP
DO-PPM-GRAB-CP


Dissolved Oxygen Percent Saturation
Dissolved Oxygen, Percent Saturation
0
20
40
60
80
100
120
140
160
180
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
LITTLE HARBOR/BACK CHANNEL
DO % Sat. Ind. MAGEX
DO % Sat Std.
"Current" Line for 2024
DO-SAT-GRAB


TSS
LITTLE HARBOR/BACK CHANNEL
"Current" Line for 2024
TSS
Annual Median (TSS) (n>=5)
TSS (mg/L)
1,000
100
10
1
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024


Light Attenuation
LITTLE HARBOR/BACK CHANNEL
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)
Kd 1 / m (PAR) (lower is better)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024


Eelgrass and Light Attenuation
LITTLE HARBOR/BACK CHANNEL
Kd 1 / m (PAR) (lower is better)
Eelgrass Cover (acres)
Min. for Survival Indicator (median)
"Current" Line for 2024
Light Attenuation Coefficient (Kd)
Annual Median (Light)(n>=5)
Eelgrass Cover


Total Nitrogen
LITTLE HARBOR/BACK CHANNEL
Total Nitrogen (ug N/L)
"Current" Line for 2024
Day Ave of TN
TN Annual Median (n>=5)
TN Annual Median (n<5)

Little Harbor / Back Channel Assessment Zone (1/1/2018-4/13/2023)	Date Count	Minimum	Median	90th Percentile	Maximum
CHLOROPHYLL A, CORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN (ug/L)	0	-	-	-	-
CHLOROPHYLL A, Combined (ug/L)	0	-	-	-	-
LIGHT ATTENUATION COEFFICIENT (1/m)	0	-	-	-	-
TURBIDITY (NTU)	0	-	-	-	-
TURBIDITY (datalogger daily median) (NTU)	0	-	-	-	-
TSS (mg/L)	0	-	-	-	-
COLORED DISSOLVED ORGANIC MATTER (CDOM) (1/m)	0	-	-	-	-
DISSOLVED ORGANIC CARBON	0	-	-	-	-
DO-PPM-24HR-MIN-CP (mg/L)	0	-	-	-	-
DO-PPM-24HR-MIN-NCP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-CP (mg/L)	0	-	-	-	-
DO-PPM-GRAB-NCP (mg/L)	0	-	-	-	-
DO-PERC-24H-MEAN-CP (% sat)	0	-	-	-	-
DO-PERC-24H-MEAN-NCP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-CP (% sat)	0	-	-	-	-
DO-PERC-2TIDE-GRAB-NCP (% sat)	0	-	-	-	-
DO-PERC-GRAB (% sat)	0	-	-	-	-
Day Ave of TN (ug N/L)	0	-	-	-	-
Day Ave of TDN (ug N/L)	0	-	-	-	-
Day Ave of DIN (NH3 + NO2/3) (ug N/L)	0	-	-	-	-
Day Ave of NH3 (ug N/L)	0	-	-	-	-
Day Ave of PON (ug N/L)	0	-	-	-	-
Day Ave of NO2/3 (ug N/L)	0	-	-	-	-
SALINITY-Grabs (pss)	0	-	-	-	-
SALINITY-Datalogger Daily Median (pss)	0	-	-	-	-
pH-grab	0	-	-	-	-
pH-24HR (min)	0	-	-	-	-
pH-24HR (max)	0	-	-	-	-
Temperature	0	-	-	-	-
Temperature-Daily Median	0	-	-	-	-

*As a statistic on the pH minimum, this is the 10th rather that a 90th percentile.

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STATE OF NEW HAMPSHIRE

Impairments Added to the 2024 303(d) List of Threatened or Impaired Waters

December 18, 2024

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

STATE OF NEW HAMPSHIRE

Impairments Added to the 2024 303(d) List of Threatened or Impaired Waters

STATE OF NEW HAMPSHIRE
DEPARTMENT OF ENVIRONMENTAL SERVICES
29 HAZEN DRIVE
CONCORD, N.H. 03301

ROBERT R. SCOTT
Commissioner

ADAM CREPEAU
Assistant Commissioner

RENE PELLETIER
Water Division Director

Prepared by:
MATTHEW A. WOOD
Water Quality Assessment Program Coordinator

December 18, 2024

New Hampshire Department of Environmental Services
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Introduction

In accordance with Section 303(d) of the federal Clean Water Act, states must prepare a list of impaired waters that require a Total Maximum Daily Load study every two years (i.e., the 303(d) List). The last approved 303(d) List was prepared by the New Hampshire Department of Environmental Services (NHDES) for the 2020/2022 cycle. Downloadable copies of the past lists as well as the 303(d) 2024 list are available on the NHDES website for review. This document provides a list of all surface waters and parameter combinations that were added as impairments on the 2024 303(d) List and the reasons why they were added.

Assessment outcomes cover a spectrum from very good to very bad coded as an alpha numeric scale that provides additional distinctions in cases where an impairment exists. In each of the new impairments detailed within this document the assessment status is highlighted applying the categories in the table below.

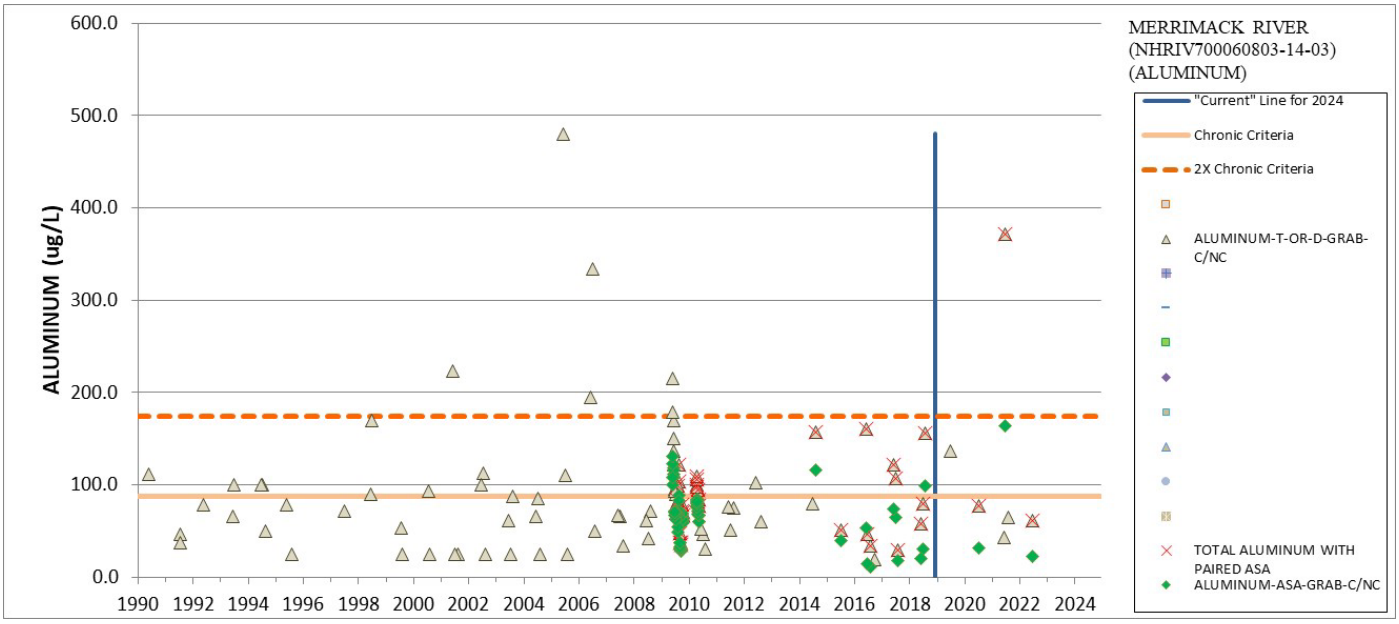
Category	Description	Severe	Poor	Likely Bad	No Data	Likely Good	Marginal	Good
		Not Supporting, Severe	Not Supporting, Marginal	Insufficient Information – Potentially Not Supporting	No Data	Insufficient Information – Potentially Full Supporting	Full Support, Marginal	Full Support, Good
Category 2	Meets standards	N/A	N/A	N/A	N/A	N/A	2-M or 2-OBS	2-G
Category 3	Insufficient Information	N/A	N/A	3-PNS	3-ND	3-PAS	N/A	N/A
Category 4A	Does not Meet Standards; TMDL* Completed	4A-P	4A-M or 4A-T	N/A	N/A	N/A	N/A	N/A
Category 4B	Does not Meet Standards; Other enforceable measure will correct the issue.	4B-P	4B-M or 4B-T	N/A	N/A	N/A	N/A	N/A
Category 4C	Does not Meet Standards; Non-pollutant (i.e. exotic weeds)	4C-P	4C-M	N/A	N/A	N/A	N/A	N/A
Category 5	Does not Meet Standards; TMDL* Needed	5-P	5-M or 5-T	N/A	N/A	N/A	N/A	N/A
Category 5R	Does not Meet Standards; An EPA-approved alternative plan has been completed	5R-P	5R-M	N/A	N/A	N/A	N/A	N/A

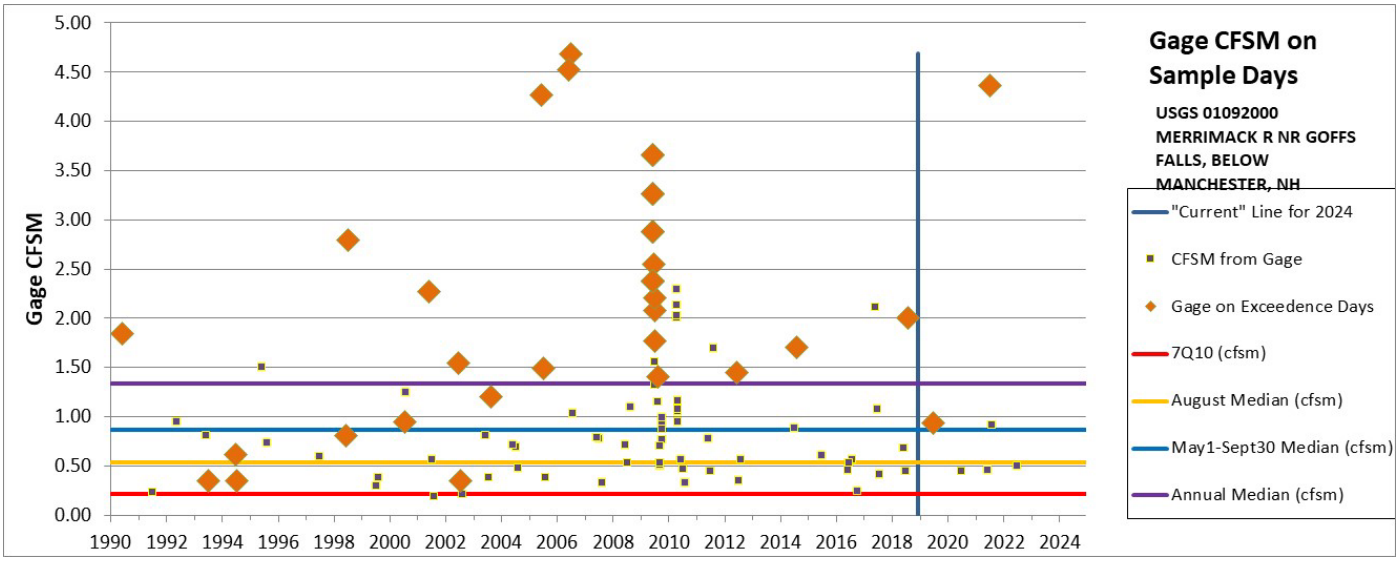
Aluminum for Aquatic Life Integrity

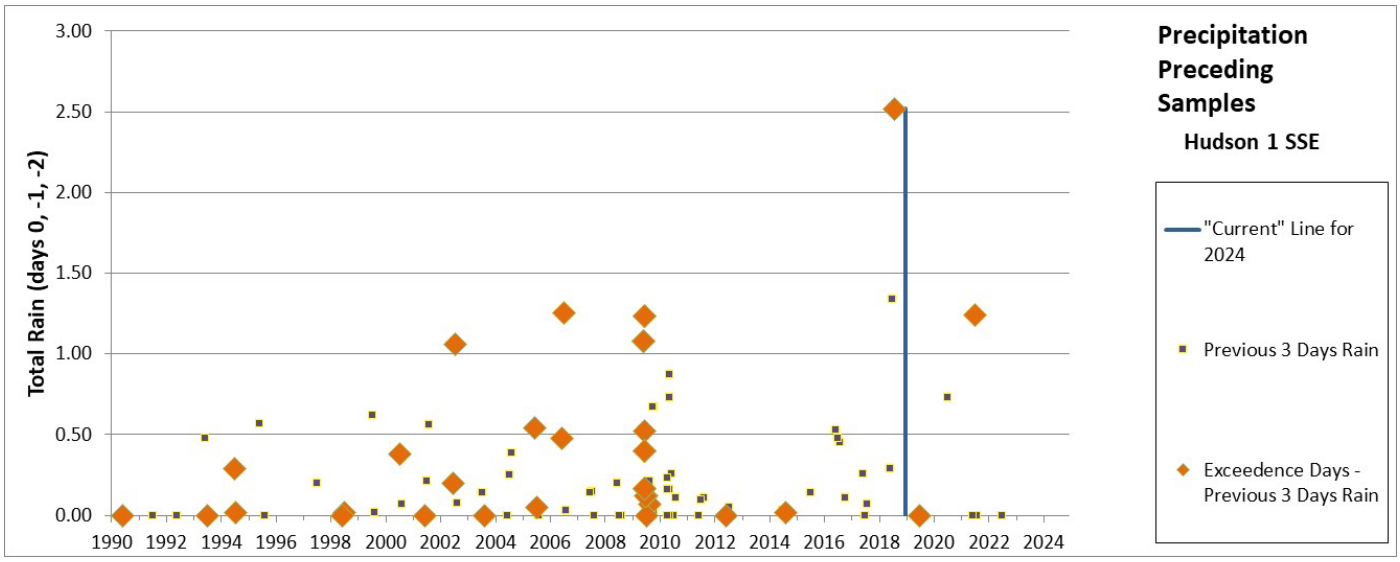
Merrimack River (NHRIV700060803-14-03)

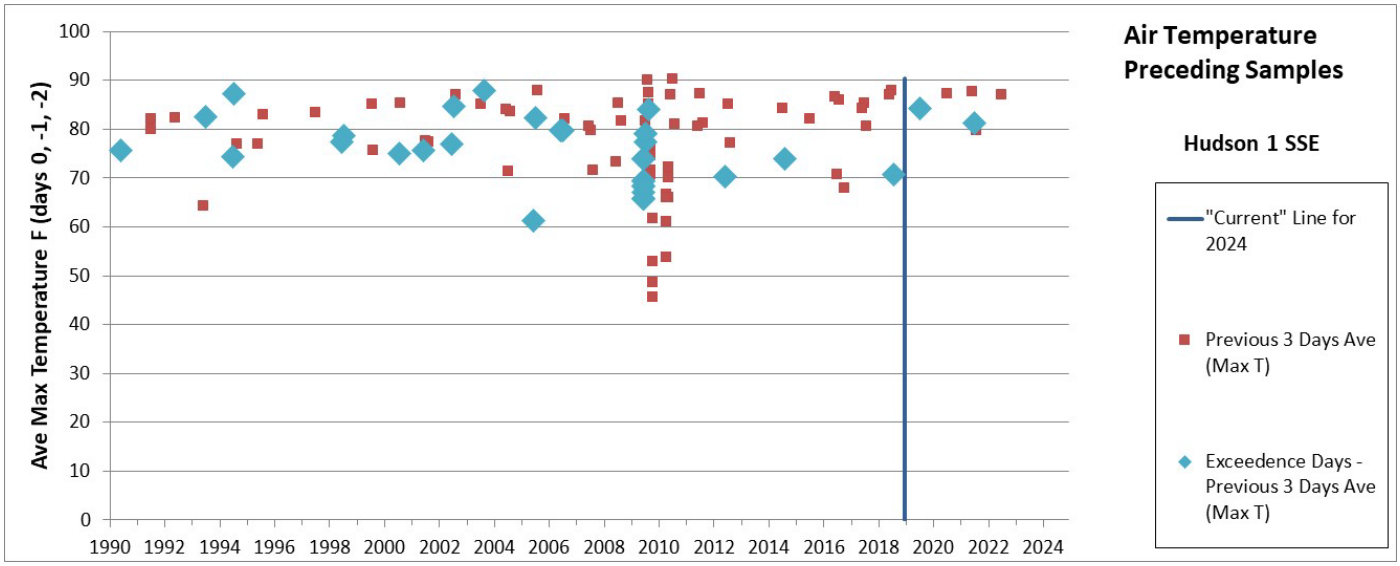
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Merrimack River	NHRIV700060803-14-03	Aluminum	MANCHESTER	n/a	5-M

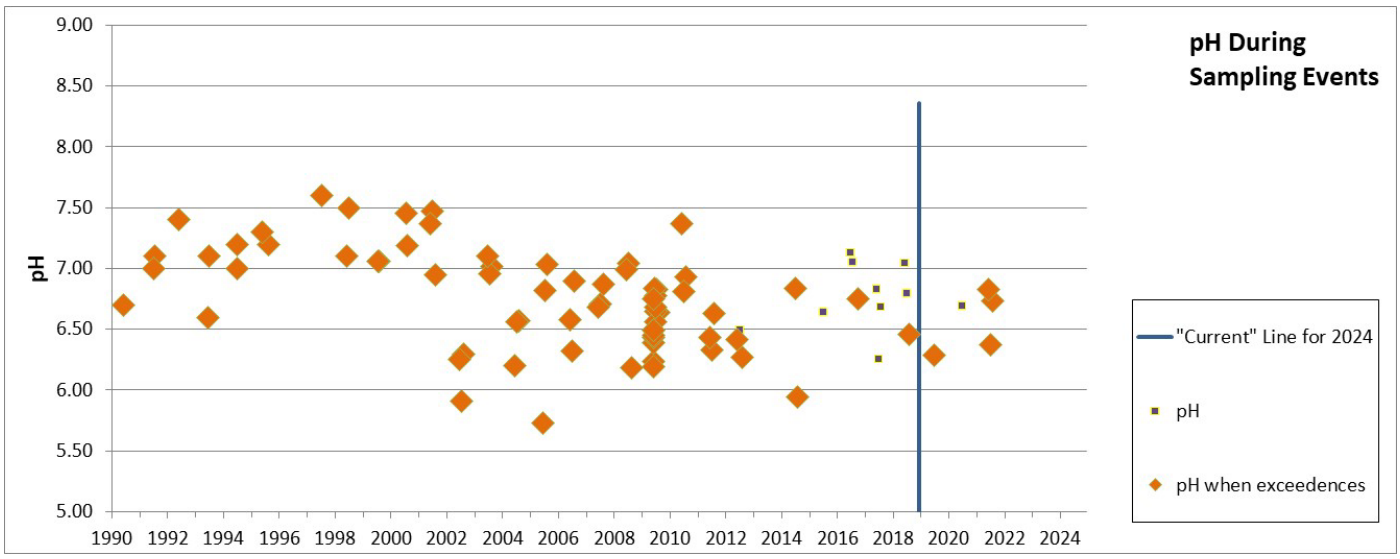
For the 2024 assessment cycle the downstream reach of NHRIV700060803-14-02 and the upstream reach of NHRIV700060804-11 were clipped, and a new assessment unit (NHRIV700060803-14-03) was created in this stretch of the Merrimack River. This modification to the assessment unit network was completed in consultation with the City of Manchester to better represent the area of the river impacted by the Manchester WWTF outfall. Prior to the split, NHRIV700060803-14-02 was impaired for aluminum for the aquatic life integrity designated used, due in part to samples collected at station 08-MER. Station 08-MER is now located in the newly created assessment unit and as such the impairment must be assigned to the newly created assessment unit. The Merrimack River (NHRIV700060803-14-03) has been placed in category 5-M for aluminum for the aquatic life integrity designated used based of the data reviewed as part of the current assessment period.











Notes:
ALUMINUM-T-OR-D-GRAB-C/NC = Grab samples of total or dissolved aluminum using clean or non-clean techniques.

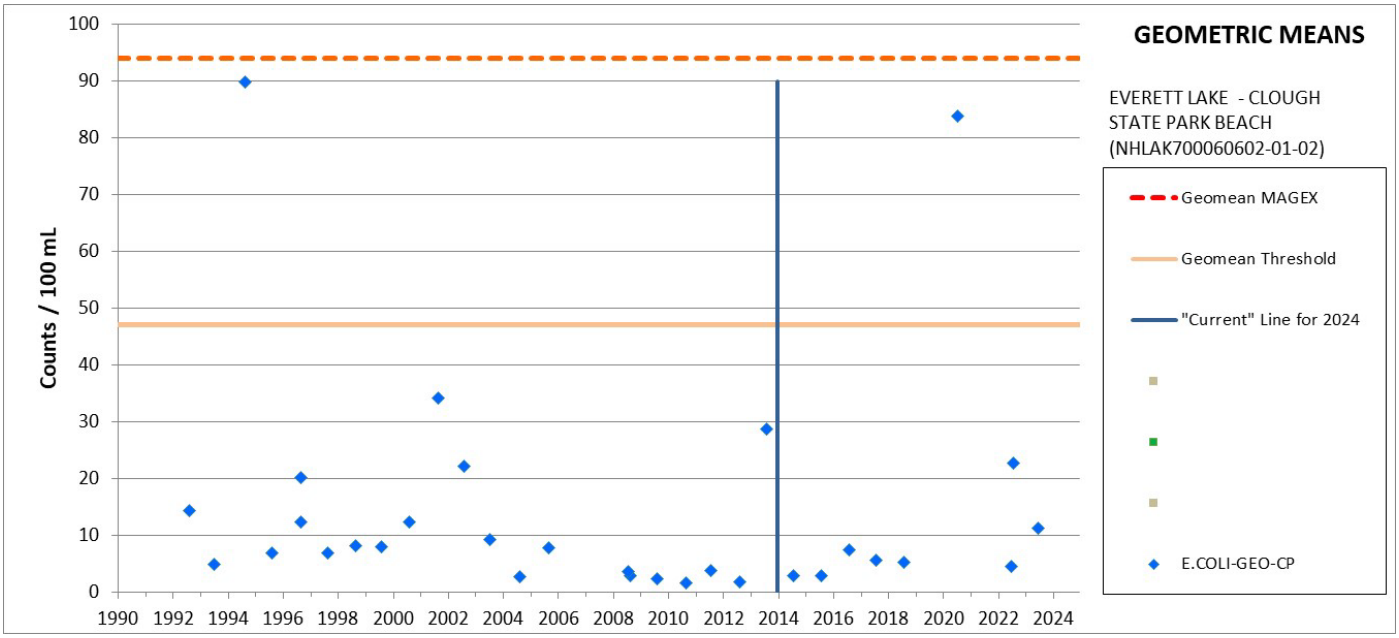
ALUMINUM-ASA-GRAB-C/NC = Grab samples of acid soluble aluminum using clean or non-clean techniques.

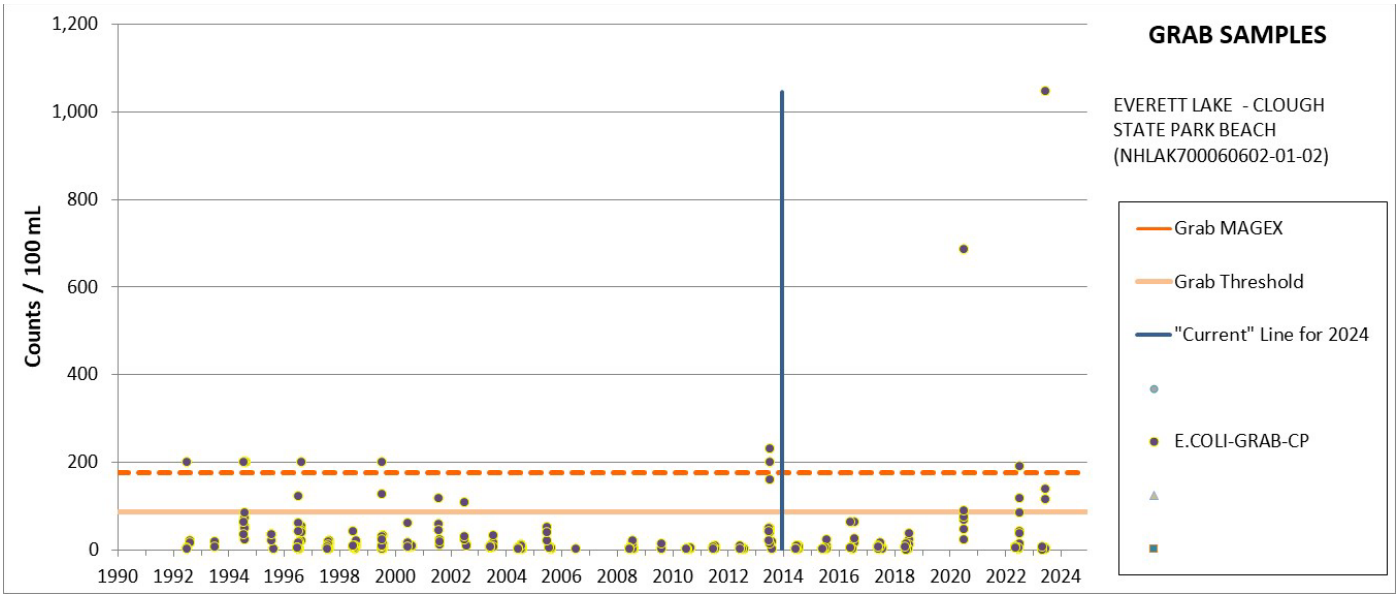
Bacteria for Primary Contact Recreation (i.e. swimming)

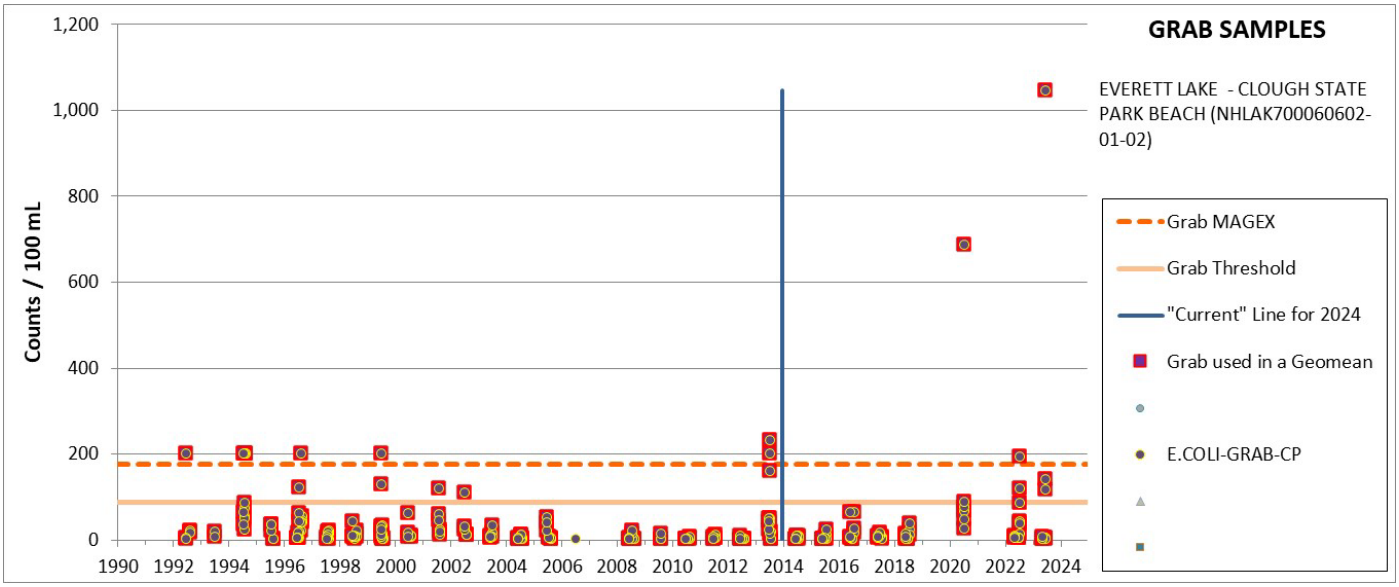
Everett Lake - Clough State Park Beach (NHLAK700060602-01-02)

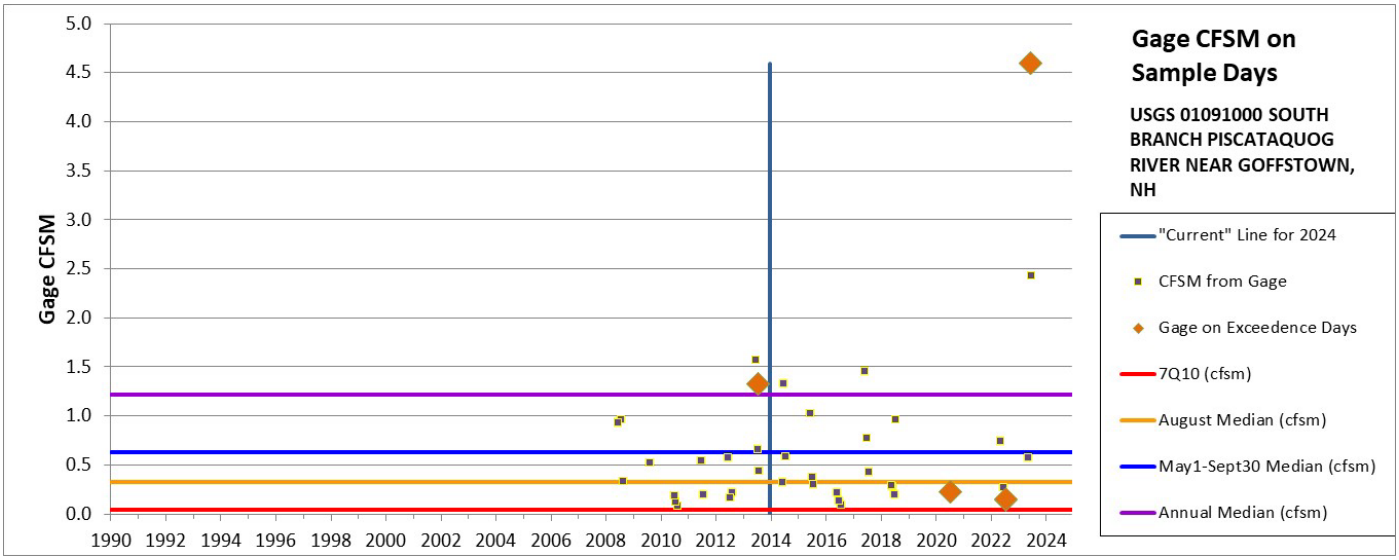
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Everett Lake - Clough State Park Beach	NHLAK700060602-01-02	Escherichia coli	Weare	2-M	5-P

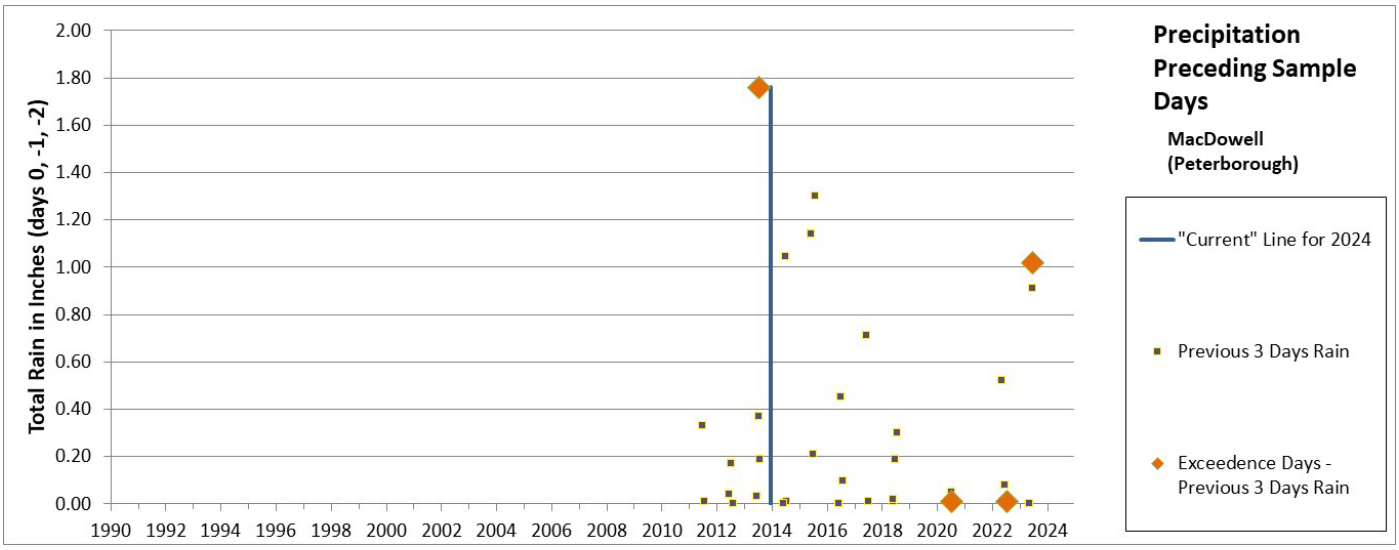
One of the nine geomeans (11%) in the current assessment period (2014-2024) were above the geometric mean threshold (47 counts/100mL). Seven of the 73 (10%) samples collected during the current assessment period were above the single sample threshold (88 counts/100mL), with 3 of these exceeding the MAGEX. Additional samples from 2023 that were not available for the initial evaluation were also above the single sample threshold. These exceedances were collected during a range of flow (0.14 – 4.60 cfsm on the South Branch Piscataquog River Gage (01091000)) and a range of three-day rainfall totals (0 – 1.02 inches). Routine sampling will continue through the NHDES Beach Inspection Program. Everett Lake – Clough State Park Beach (NHLAK700060602-01-02) has been moved from 2-M to 5-P for Escherichia coli for the primary contact recreation designated use based on data collected in the current assessment period.

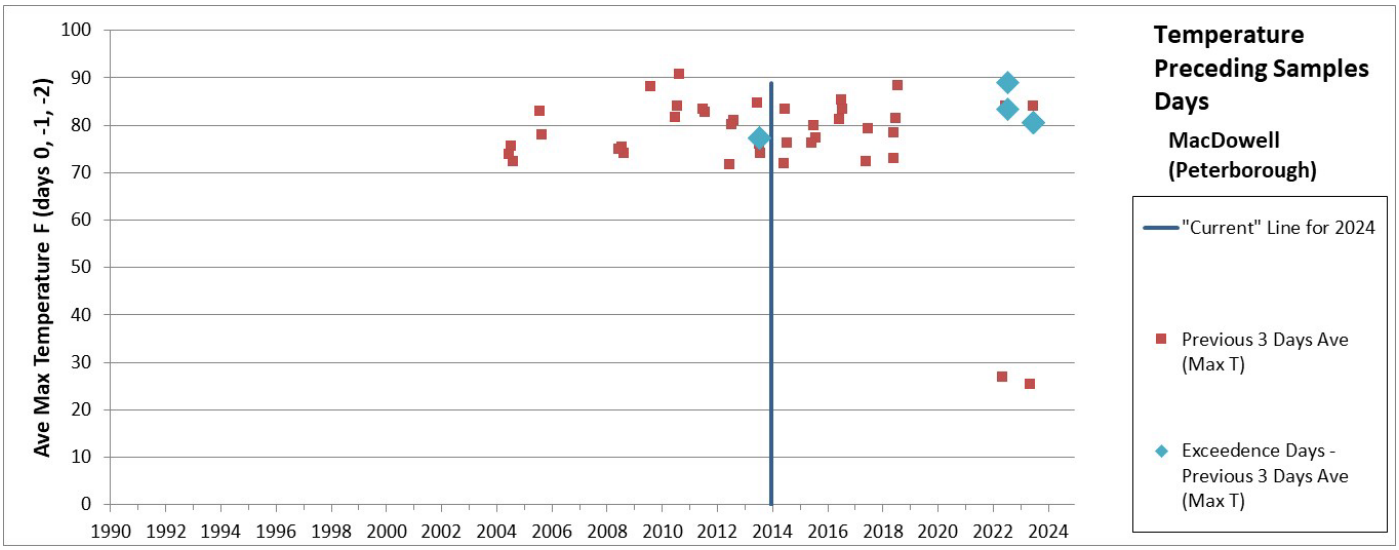



GRAB SAMPLES
EVERETT LAKE - CLOUGH STATE PARK BEACH (NHLAK700060602-01-02)
Counts / 100 mL
1,200
1,000
800
600
400
200
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Grab MAGEX
Grab Threshold
"Current" Line for 2024
E.COLI-GRAB-CP


GRAB SAMPLES
EVERETT LAKE - CLOUGH STATE PARK BEACH (NHLAK700060602-01-02)
Counts / 100 mL
1,200
1,000
800
600
400
200
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Grab MAGEX
Grab Threshold
"Current" Line for 2024
Grab used in a Geomean
E.COLI-GRAB-CP


Gage CFSM on Sample Days
USGS 01091000 SOUTH BRANCH PISCATAQUOG RIVER NEAR GOFFSTOWN, NH
Gage CFSM
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)





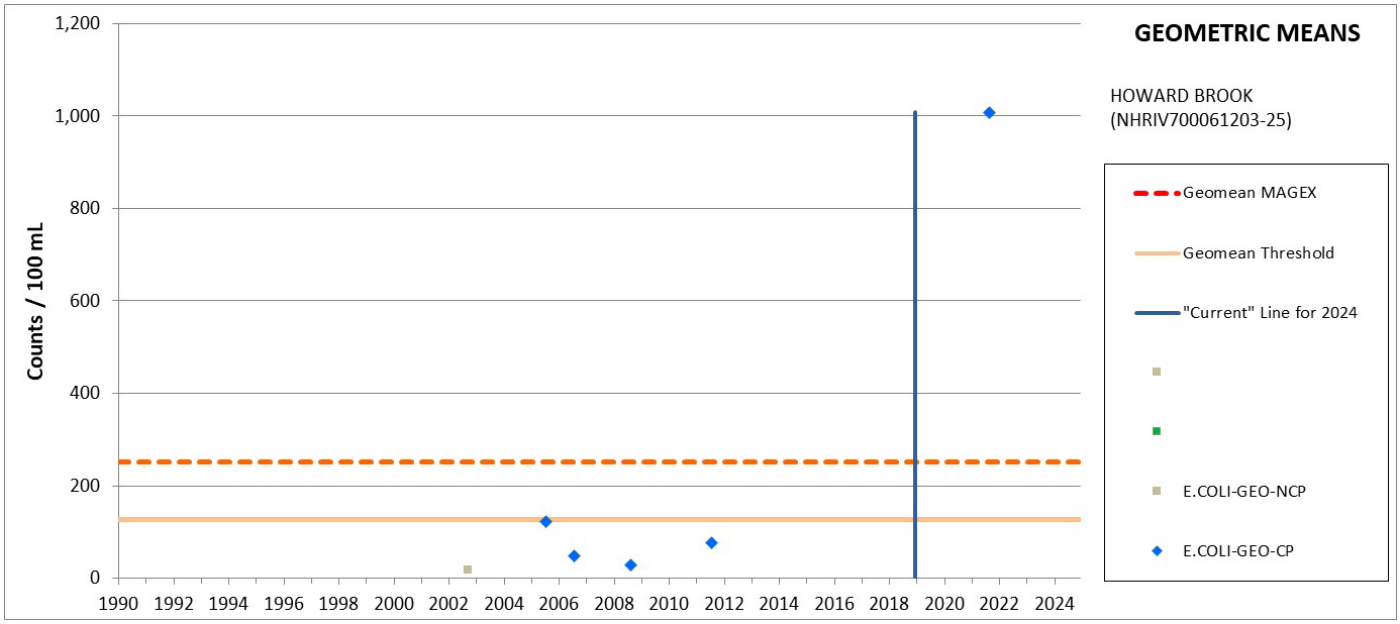
Notes:
E.COLI-GRAB-CP = Grab samples of E. coli during the summer critical period.
E.COLI-GRAB-NCP = Grab samples of E. coli not during the summer critical period.
E.COLI-GEO-CP = Geometric mean samples of E. coli during the summer critical period.
E.COLI-GEO-NCP = Geometric mean samples of E. coli not during the summer critical period.

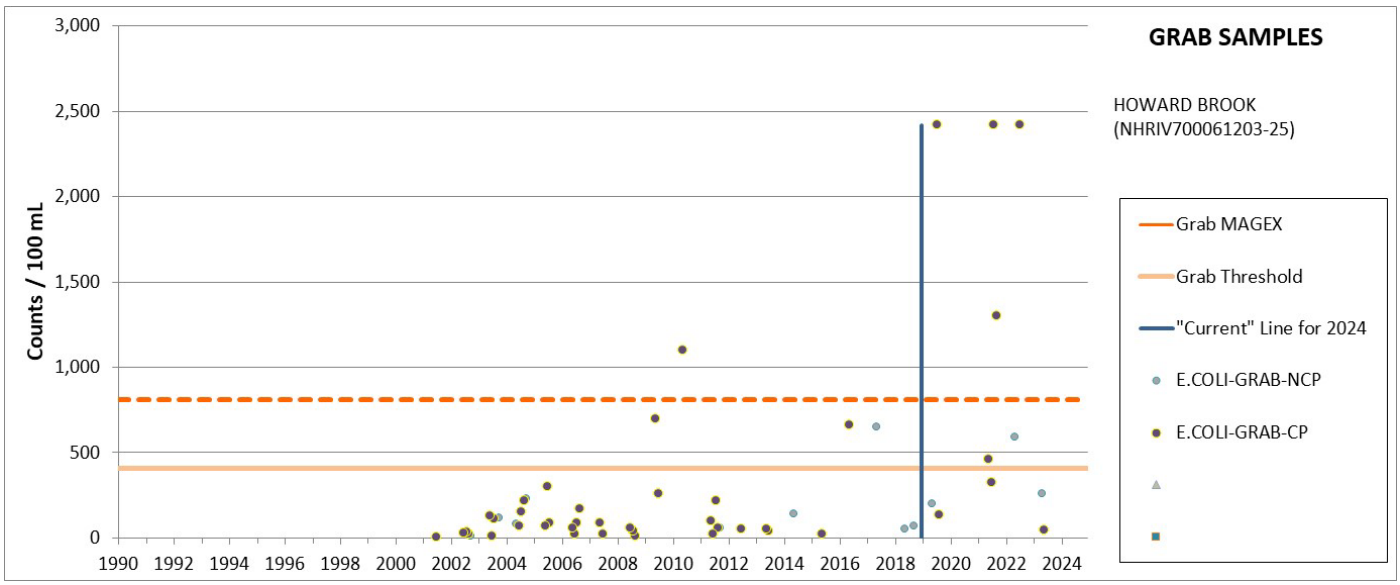
Howard Brook (NHRIV700061203-25)

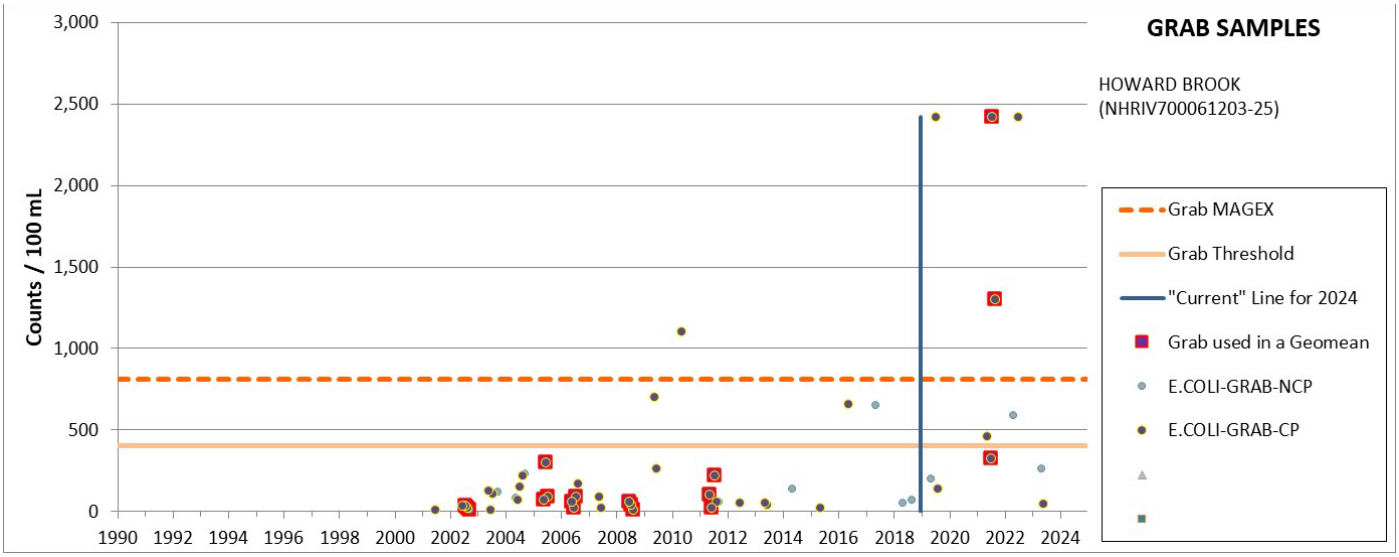
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Howard Brook	NHRIV700061203-25	Escherichia coli	Hudson	2-M	5-P

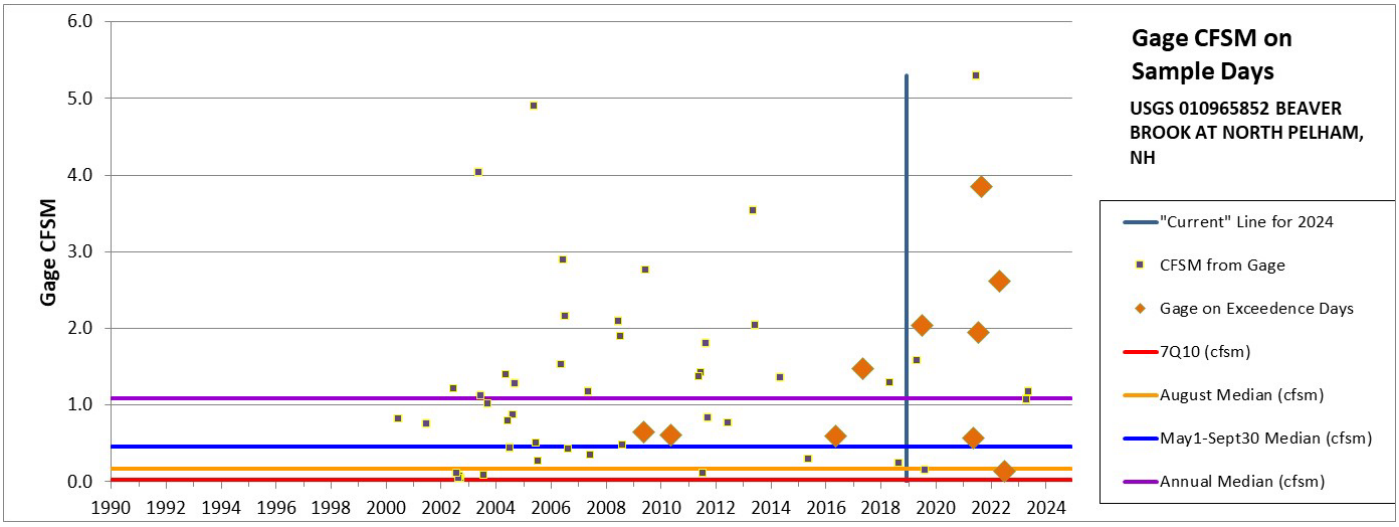
Six of the 11 (55%) grab samples exceeded the single sample threshold of 406 cts/100 mL, with five of those exceedances collected during the critical period (May 24 to September 15) ranging from 461.1 to > 2,420 cts/100 mL. Exceedances were reported as > 2,420 cts/100 mL, indicating that the actual value might be much higher. Four of these exceedances were above the magnitude of exceedance threshold of 812 cts/100 mL. An additional exceedance was obtained during the non-critical period (September 16 to May 23) on 5/17/2022 with a value of 591 cts/100 mL. One geometric mean was calculated from results collected during the critical period and exceeded the geometric mean magnitude of exceedance of 252 cts/100 mL, with a result of 1,008 cts/100 mL. Exceedances occurred during flow conditions ranging from 0.14 cfsm to 3.85 cfsm (USGS 010965852 gage), and with preceding 3-day rainfall totals from

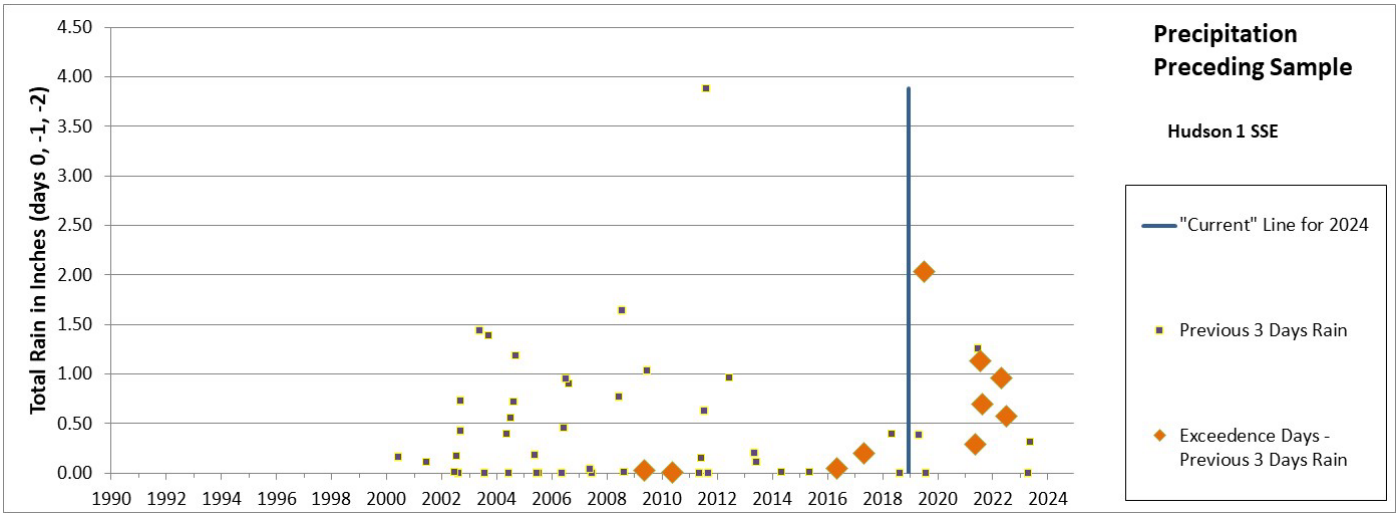
0.29 inches to 2.03 inches (Hudson gage). Sampling at station ROBHUDH3 under a variety of flow and rainfall conditions should be continued in subsequent years to better understand the conditions contributing to the elevated bacteria. Howard Brook (NHRIV700061203-25) has been moved from 2-M to 5-P for *Escherichia coli* for the primary contact recreation (i.e. swimming) designated use based on data collected in the current assessment period.

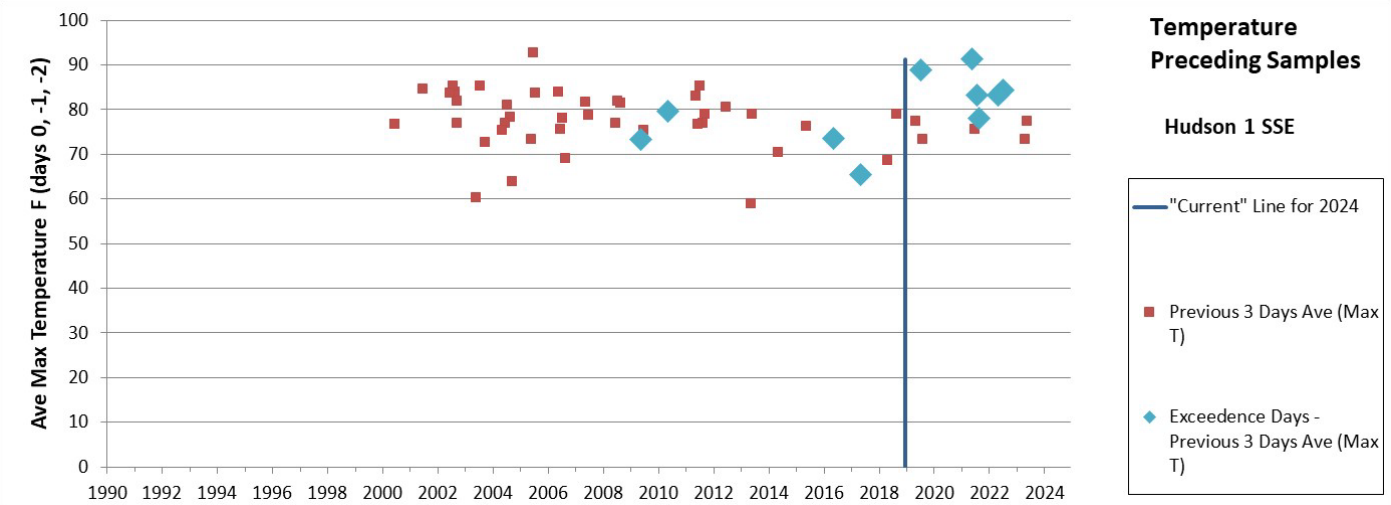





GRAB SAMPLES
HOWARD BROOK
(NHRIV700061203-25)
Counts / 100 mL
3,000
2,500
2,000
1,500
1,000
500
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Grab MAGEX
Grab Threshold
"Current" Line for 2024
Grab used in a Geomean
E.COLI-GRAB-NCP
E.COLI-GRAB-CP


Gage CFSM on Sample Days
USGS 010965852 BEAVER BROOK AT NORTH PELHAM, NH
Gage CFSM
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Precipitation Preceding Sample
Hudson 1 SSE
Total Rain in Inches (days 0, -1, -2)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain

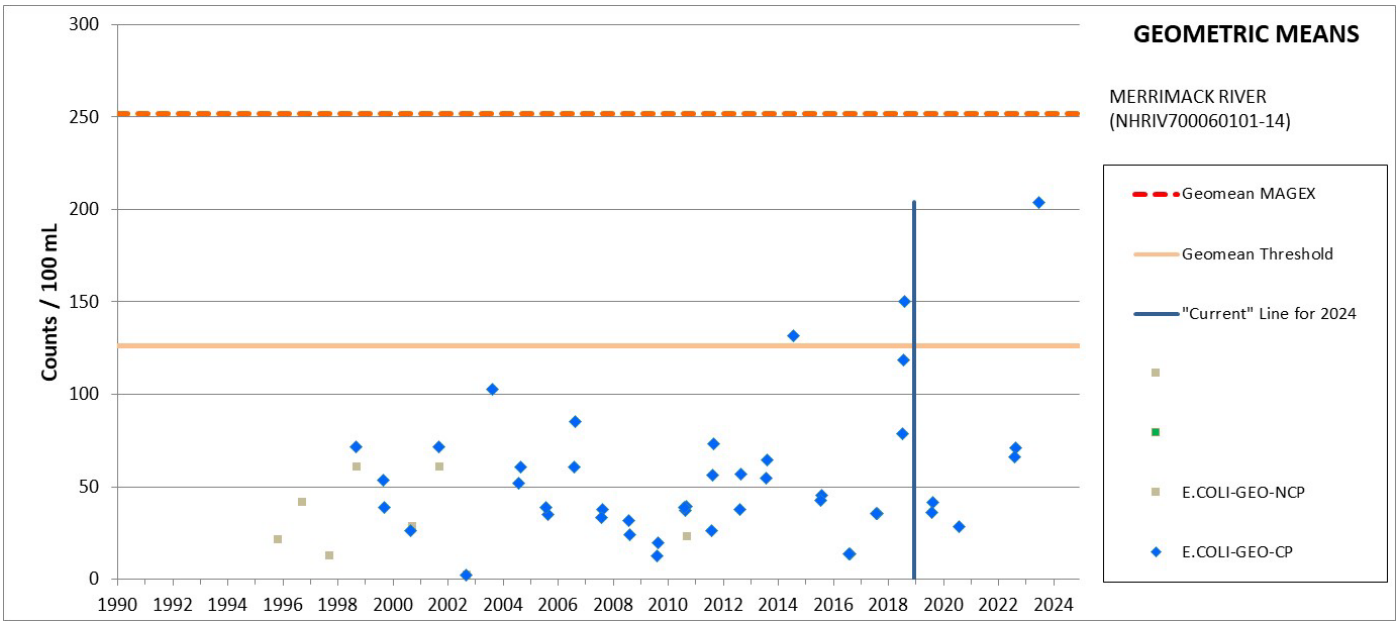


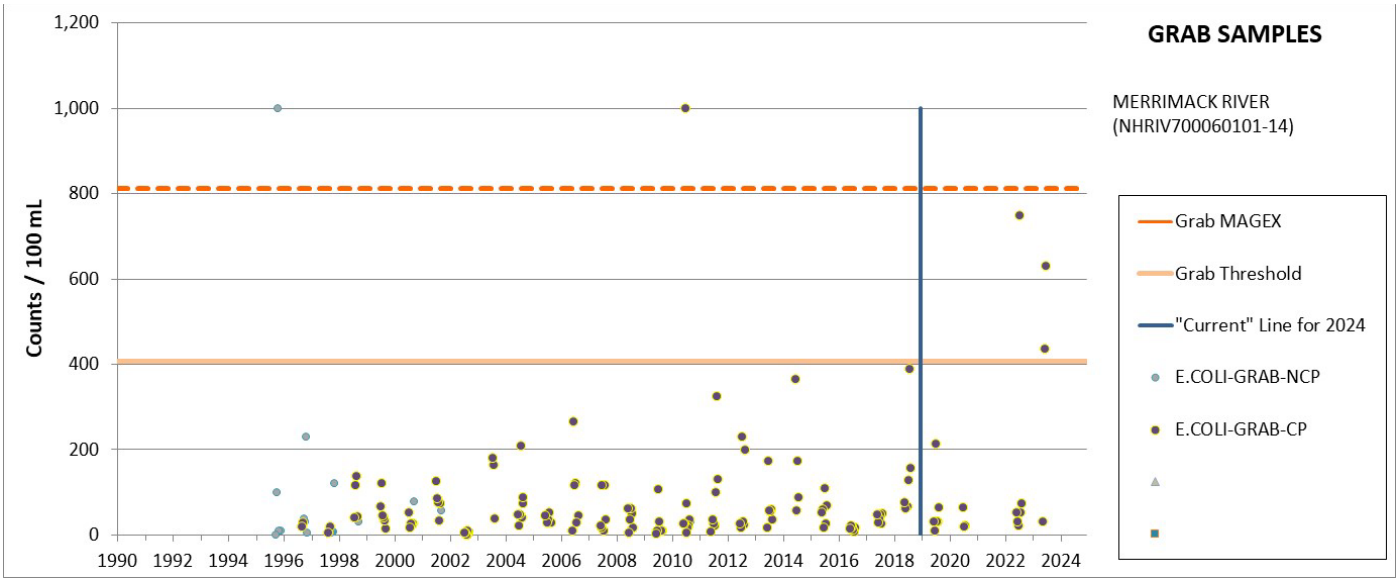
Notes:
E.COLI-GRAB-CP = Grab samples of E. coli during the summer critical period.
E.COLI-GRAB-NCP = Grab samples of E. coli not during the summer critical period.
E.COLI-GEO-CP = Geometric mean samples of E. coli during the summer critical period.
E.COLI-GEO-NCP = Geometric mean samples of E. coli not during the summer critical period.

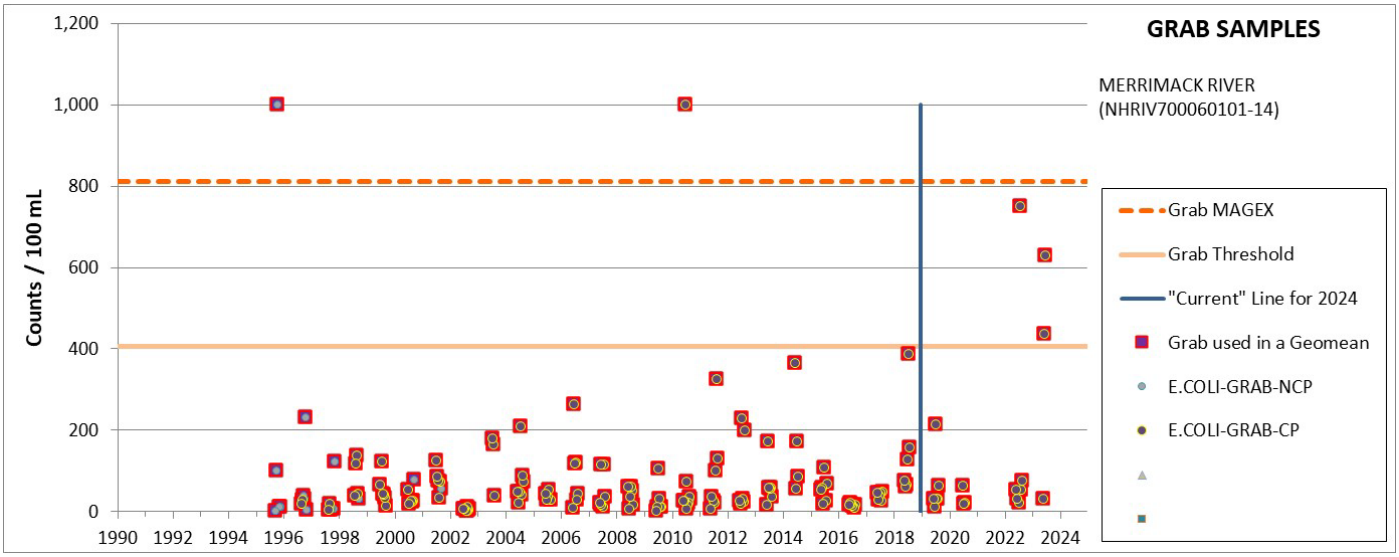
Merrimack River (NHRIV700060101-14)

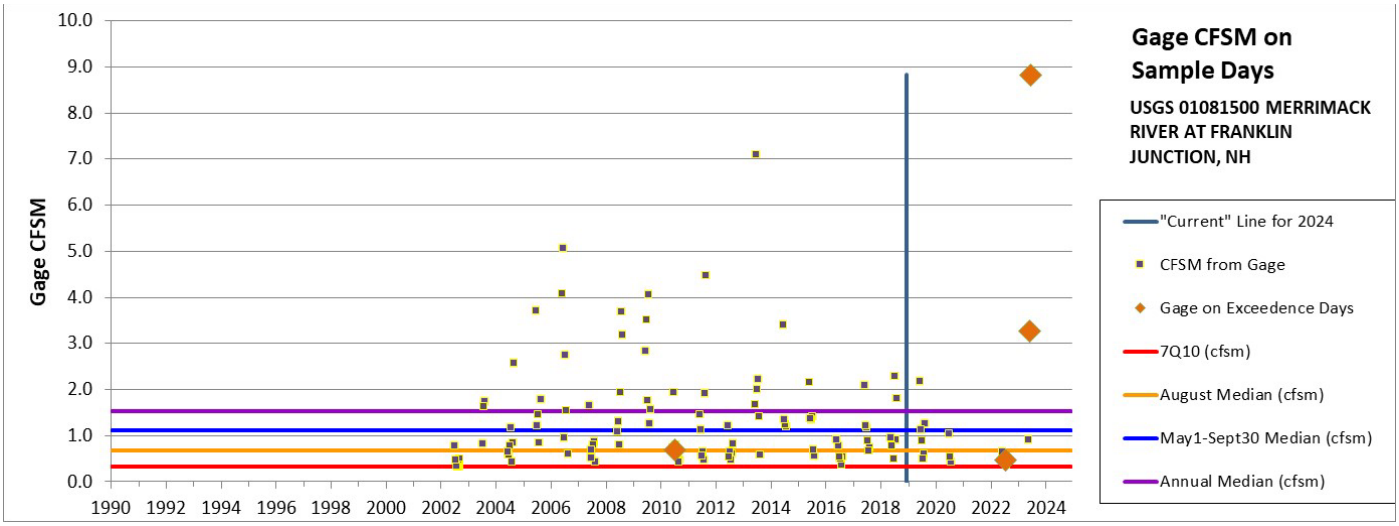
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Merrimack River	NHRIV700060101-14	Escherichia coli	Franklin, Northfield	2-M	5-M

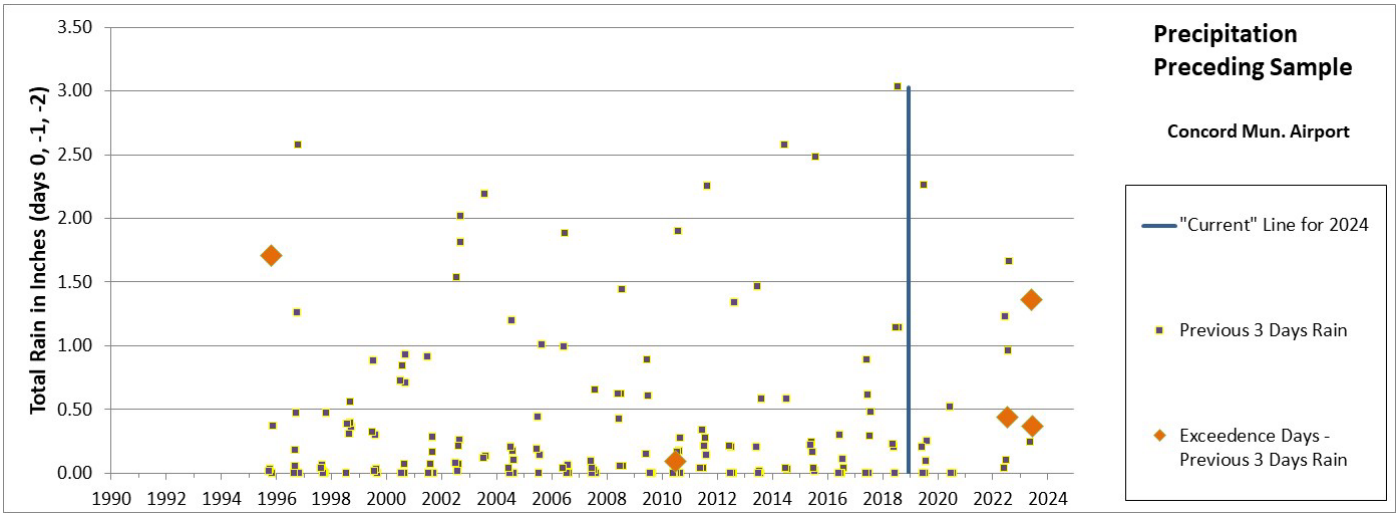
There are 18 single sample results with 3 exceedances (16%) of the 406 cts/100 mL threshold for the current assessment period. Six geometric means were calculated with one result (2,03.97 cts/100 mL) exceeding the 126 cts/100 mL threshold. Exceedances occurred during flows ranging from 0.47 to 8.83 cfsm (USGS 01081500 gage) and 3-day cumulative rainfall was between 0.37 to 1.36 inches (Concord Municipal Airport gage). Sampling at station UMMP-04 under a variety of flow and rainfall conditions should be continued in subsequent years to better understand the conditions contributing to the elevated bacteria. Merrimack River (NHRIV700060101-14) has been moved form 2-M to 5-M for *Escherichia coli* for the primary contact recreation (i.e. swimming) designated use based on data collected in the current assessment period.

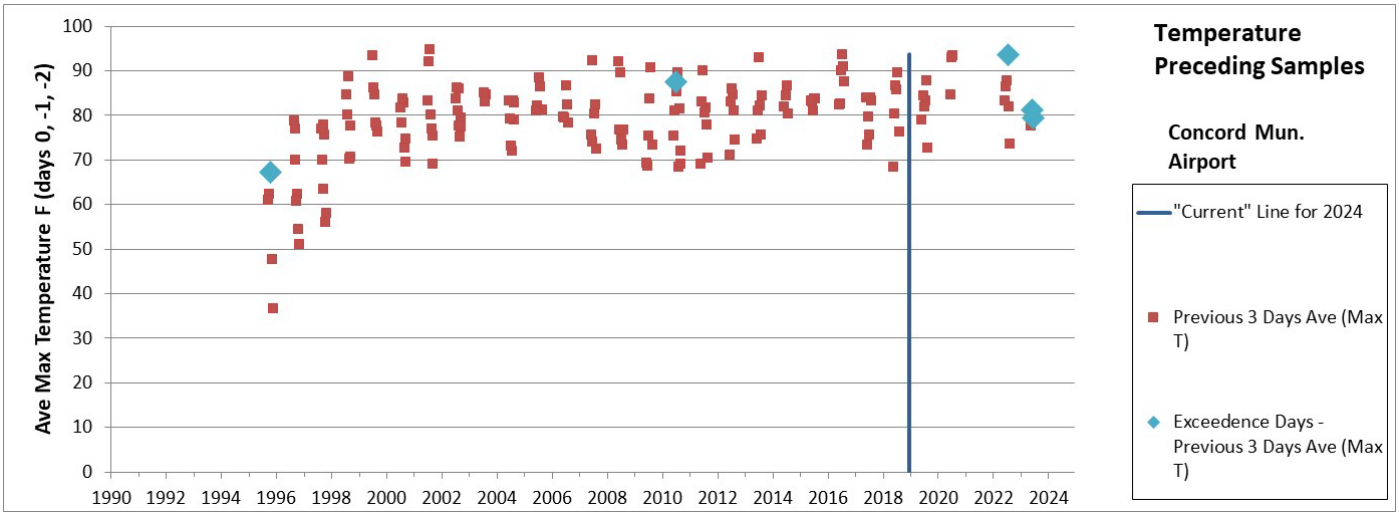

GEOMETRIC MEANS
MERRIMACK RIVER
(NHRIV700060101-14)
Counts / 100 mL
300
250
200
150
100
50
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Geomean MAGEX
Geomean Threshold
"Current" Line for 2024
E.COLI-GEO-NCP
E.COLI-GEO-CP


GRAB SAMPLES
MERRIMACK RIVER
(NHRIV700060101-14)
Counts / 100 mL
1,200
1,000
800
600
400
200
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Grab MAGEX
Grab Threshold
"Current" Line for 2024
E.COLI-GRAB-NCP
E.COLI-GRAB-CP


GRAB SAMPLES
MERRIMACK RIVER
(NHRIV700060101-14)
Counts / 100 mL
1,200
1,000
800
600
400
200
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Grab MAGEX
Grab Threshold
"Current" Line for 2024
Grab used in a Geomean
E.COLI-GRAB-NCP
E.COLI-GRAB-CP





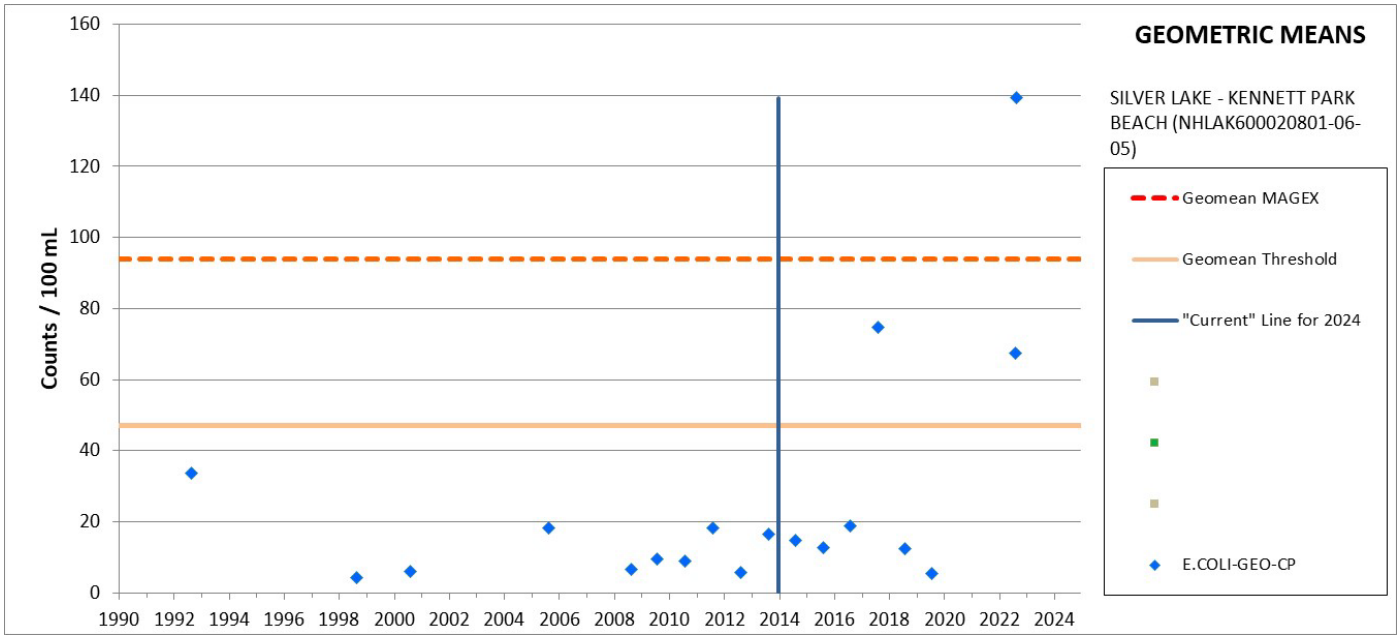


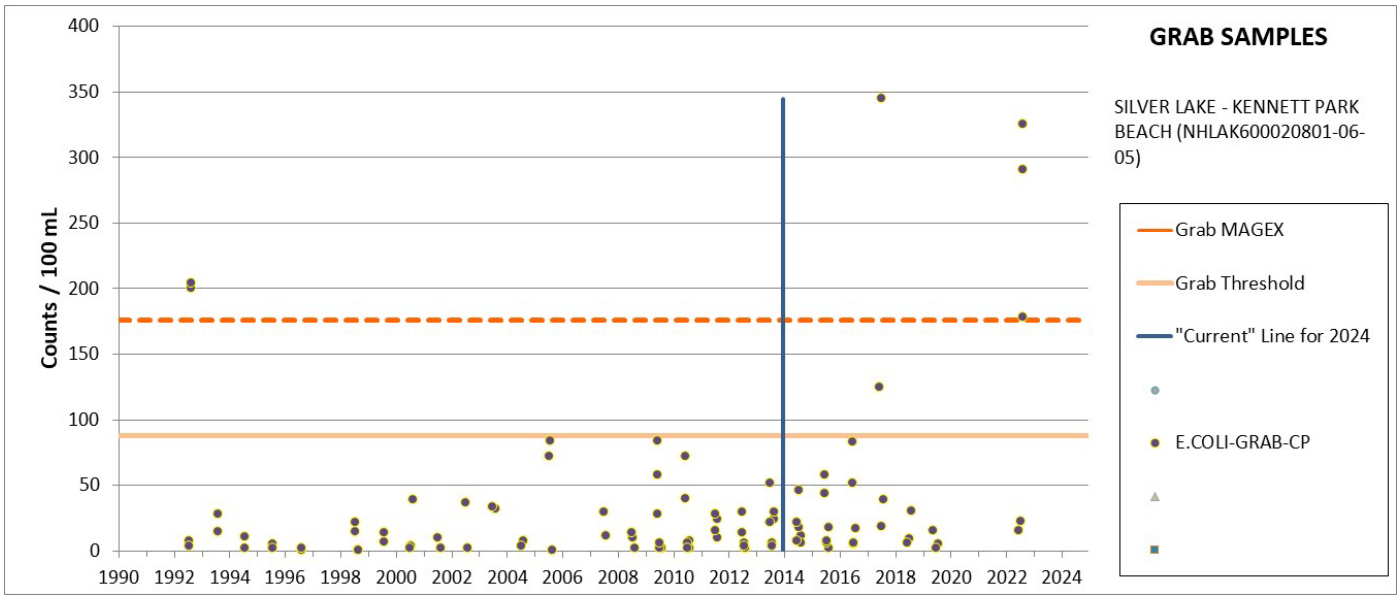
Notes:
E.COLI-GRAB-CP = Grab samples of E. coli during the summer critical period.
E.COLI-GRAB-NCP = Grab samples of E. coli not during the summer critical period.
E.COLI-GEO-CP = Geometric mean samples of E. coli during the summer critical period.
E.COLI-GEO-NCP = Geometric mean samples of E. coli not during the summer critical period.

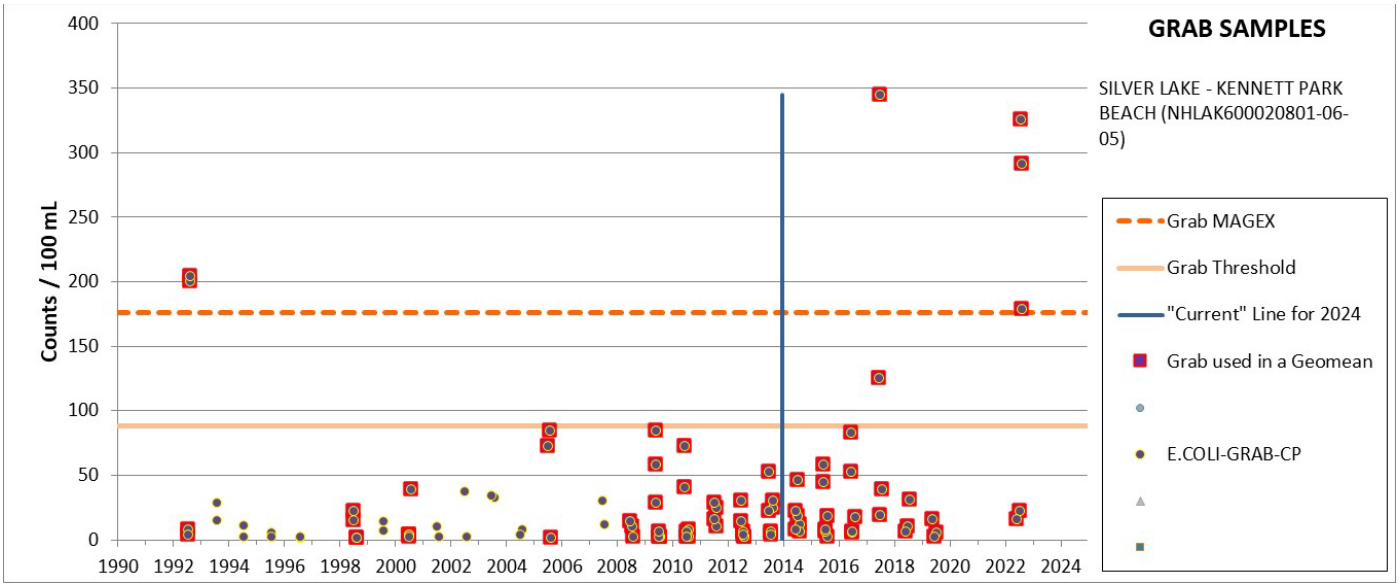
Silver Lake - Kennett Park Beach (NHLAK600020801-06-05)

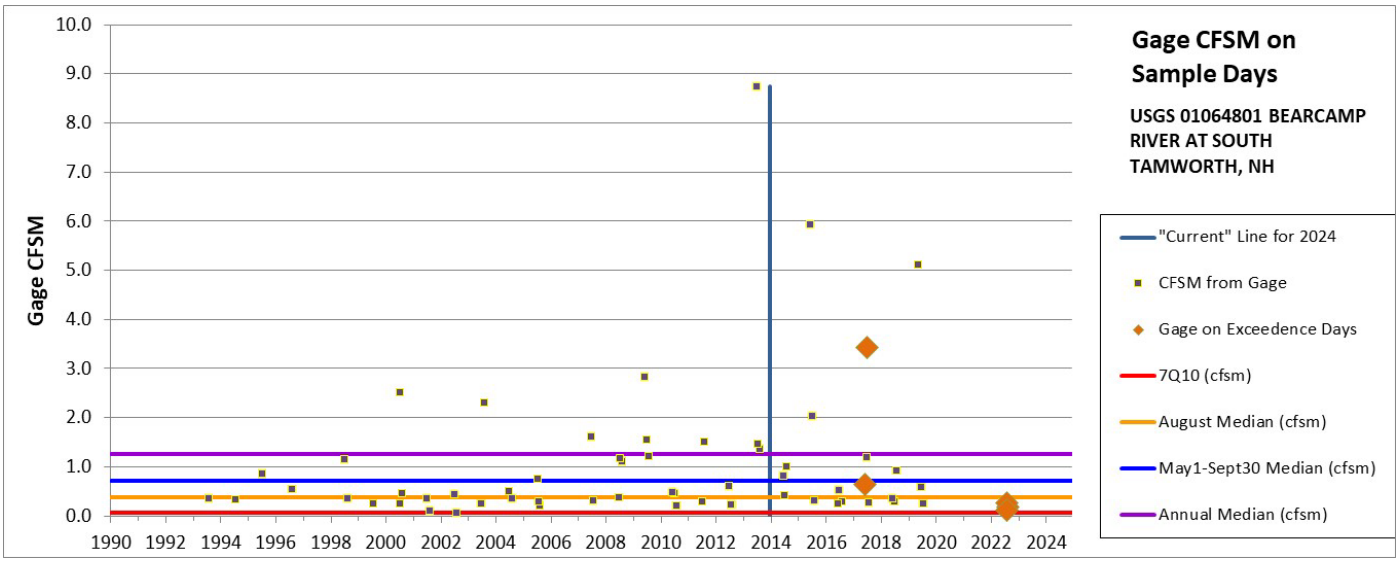
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Silver Lake - Kennett Park Beach	NHLAK600020801-06-05	Escherichia coli	Madison	2-M	5-P

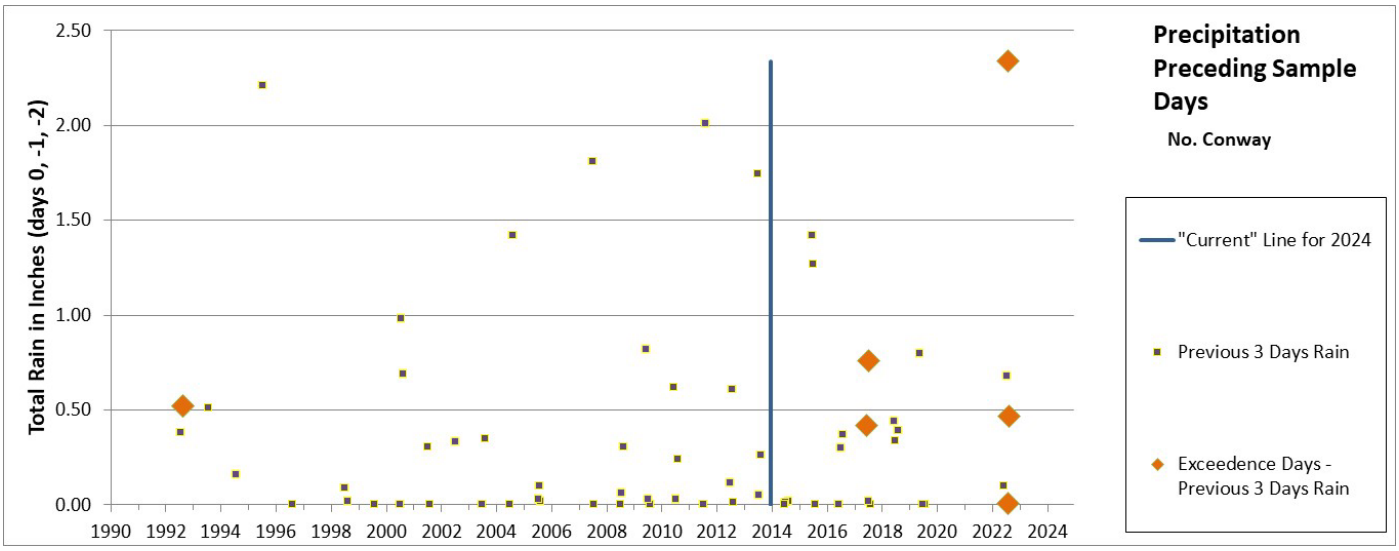
Three of the eight geomeans (38%) in the current assessment period (2014-2024) were above the geometric mean threshold (47 counts/100mL). Five of the 32 (16%) samples collected during the current assessment period were above the single sample threshold (88 counts/100mL), with 4 of those exceeding the MAGEX. These exceedances were collected during a range of flow (0.12 – 3.43 cfsm on the Bearcamp River gage (01064801)) and a range of three-day rainfall totals (0 – 2.34 inches). Routine sampling did not occur in 2020, 2021, or 2022 and this beach is no longer part of the NHDES Beach Program. Silver Lake – Kennett Park Beach (NHLAK600020801-06-05) has been moved from 2-M to 5-P for Escherichia coli for the primary contact recreation designated use based on data collected in the current assessment period.

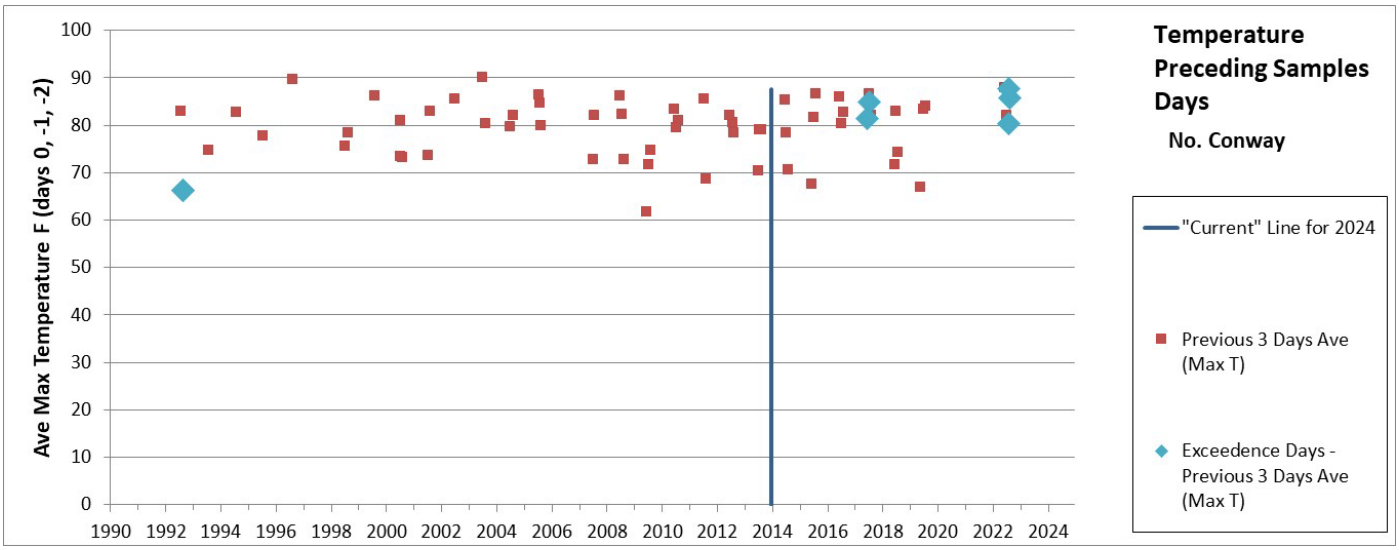





GRAB SAMPLES
SILVER LAKE - KENNETT PARK BEACH (NHLAK600020801-06-05)
Counts / 100 mL
Grab MAGEX
Grab Threshold
"Current" Line for 2024
Grab used in a Geomean
E.COLI-GRAB-CP


Gage CFSM on Sample Days
USGS 01064801 BEARCAMP RIVER AT SOUTH TAMWORTH, NH
Gage CFSM
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Precipitation Preceding Sample Days
No. Conway
Total Rain in Inches (days 0, -1, -2)
"Current" Line for 2024
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain



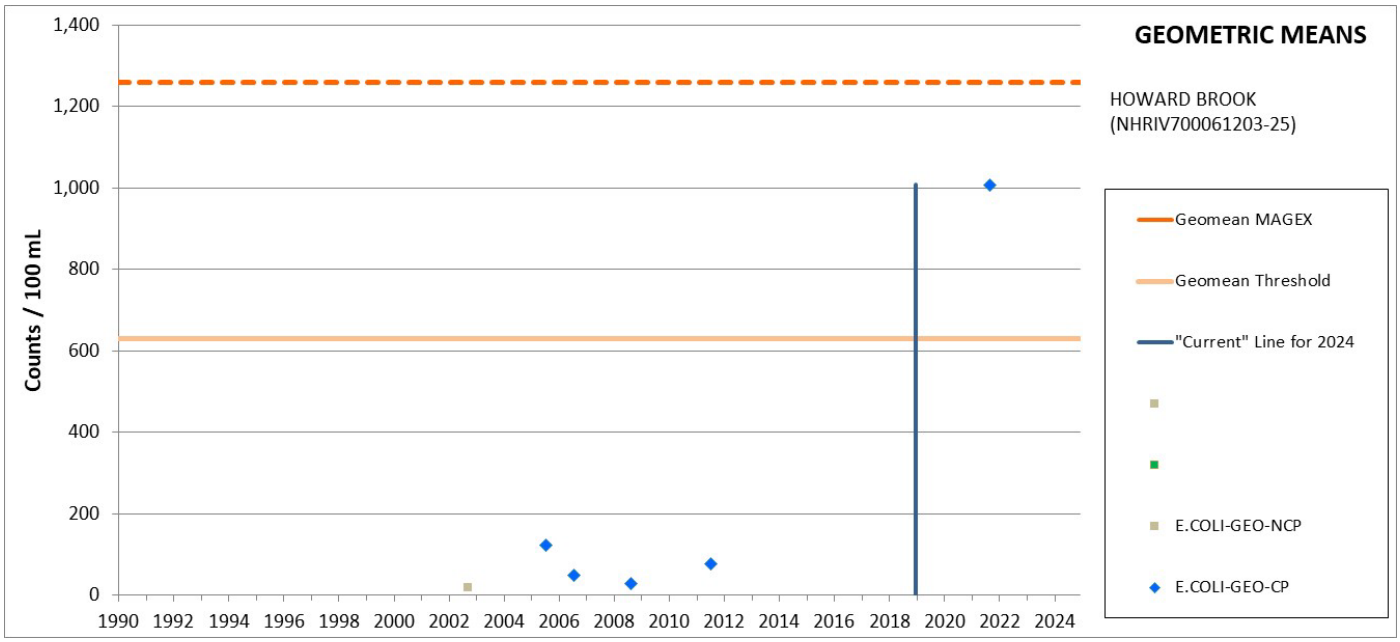
Notes:
E.COLI-GRAB-CP = Grab samples of E. coli during the summer critical period.
E.COLI-GRAB-NCP = Grab samples of E. coli not during the summer critical period.
E.COLI-GEO-CP = Geometric mean samples of E. coli during the summer critical period.
E.COLI-GEO-NCP = Geometric mean samples of E. coli not during the summer critical period.

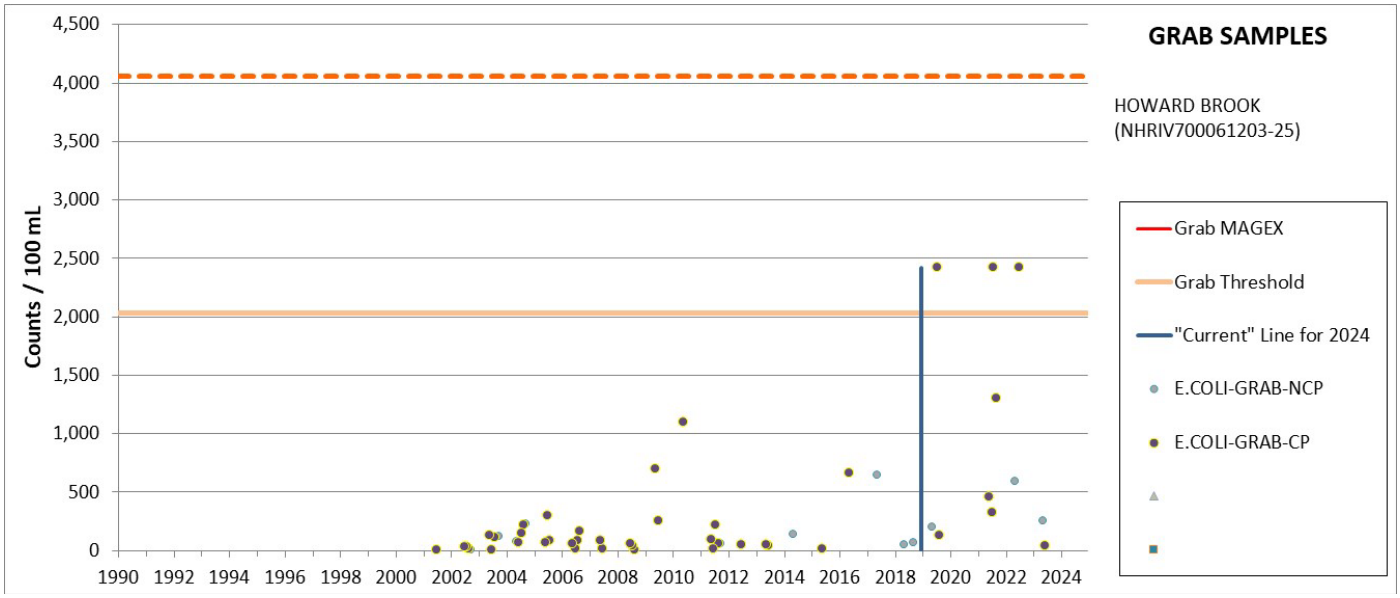
Bacteria for Secondary Contact Recreation (i.e. boating)

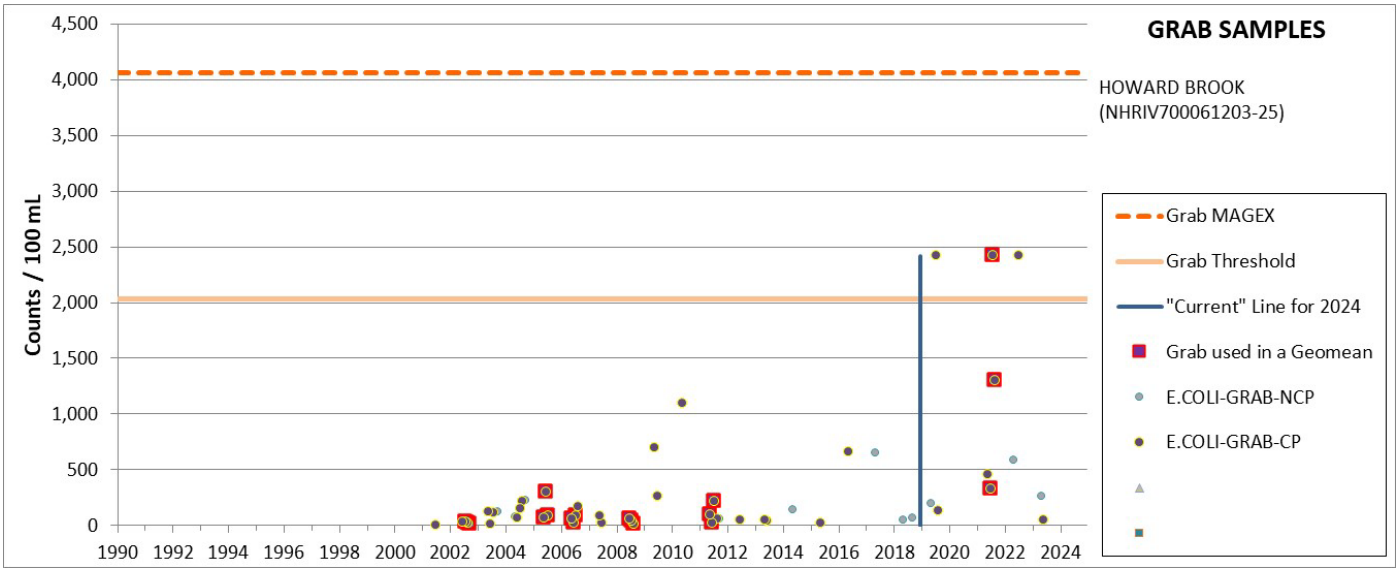
Howard Brook (NHRIV700061203-25)

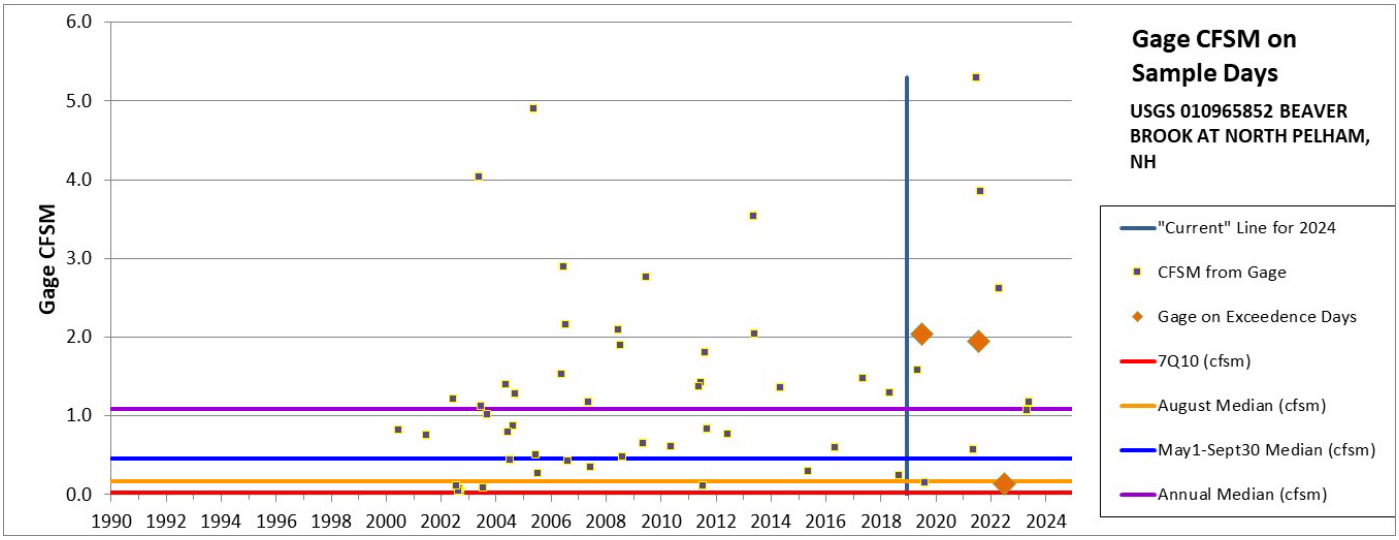
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Howard Brook	NHRIV700061203-25	Escherichia coli	Hudson	3-PNS	5-M

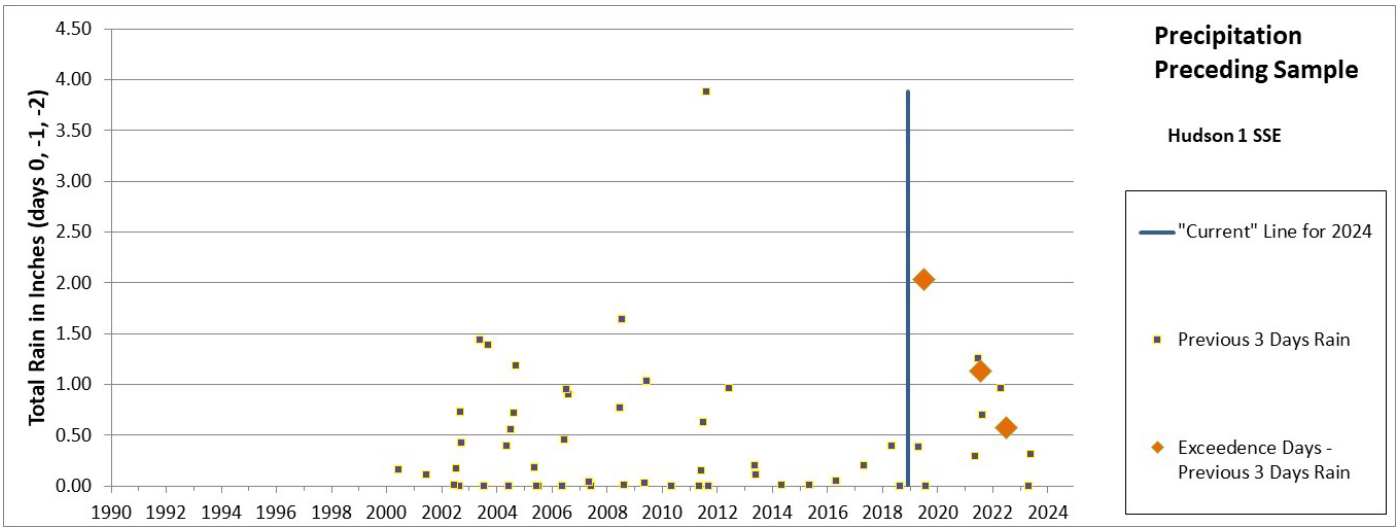
Three out of 11 (27%) grab samples exceed the 2,030 cts/100 mL single sample threshold. Exceedances were reported as > 2,420 cts/100 mL, indicating that the actual value might be much higher. Exceedances occurred during both high and low flow conditions ranging from 0.14 cfsm to 2.04 cfsm (USGS 010965852 gage) and with previous 3-day rainfall totals ranging between 0.57 and 2.03 inches (Hudson gage). One geometric mean exceeded the 630 cts/100 mL threshold, at nearly 1,000 cts/100 mL. Supplemental data not included in the initial assessment indicate another exceedance occurring on 9/12/2023 with a reported result of > 2,420 cts/100 mL. Howard Brook (NHRIV700061203-25) has been moved from 3-PNS to 5-M for *Escherichia coli* for the secondary contact recreation (i.e. boating) designated use based on data collected in the current assessment period. Howard Brook (NHRIV700061203-25) has also been impaired for *Escherichia coli* for the primary contact recreation (i.e. swimming) designated use as part of the 2024 cycle.

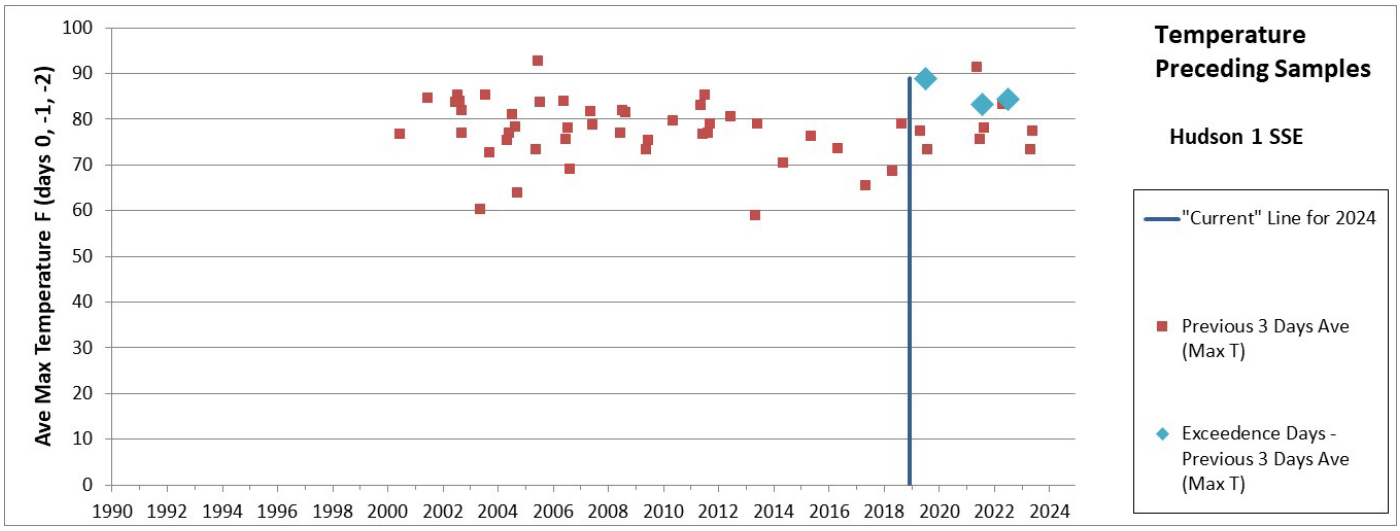

GEOMETRIC MEANS
HOWARD BROOK
(NHRIV700061203-25)
Counts / 100 mL
1,400
1,200
1,000
800
600
400
200
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Geomean MAGEX
Geomean Threshold
"Current" Line for 2024
E.COLI-GEO-NCP
E.COLI-GEO-CP


GRAB SAMPLES
HOWARD BROOK
(NHRIV700061203-25)
Counts / 100 mL
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Grab MAGEX
Grab Threshold
"Current" Line for 2024
E.COLI-GRAB-NCP
E.COLI-GRAB-CP


GRAB SAMPLES
HOWARD BROOK
(NHRIV700061203-25)
Counts / 100 mL
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Grab MAGEX
Grab Threshold
"Current" Line for 2024
Grab used in a Geomean
E.COLI-GRAB-NCP
E.COLI-GRAB-CP


Gage CFSM on Sample Days
USGS 010965852 BEAVER BROOK AT NORTH PELHAM, NH
Gage CFSM
6.0
5.0
4.0
3.0
2.0
1.0
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Precipitation Preceding Sample
Hudson 1 SSE
Total Rain in Inches (days 0, -1, -2)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain



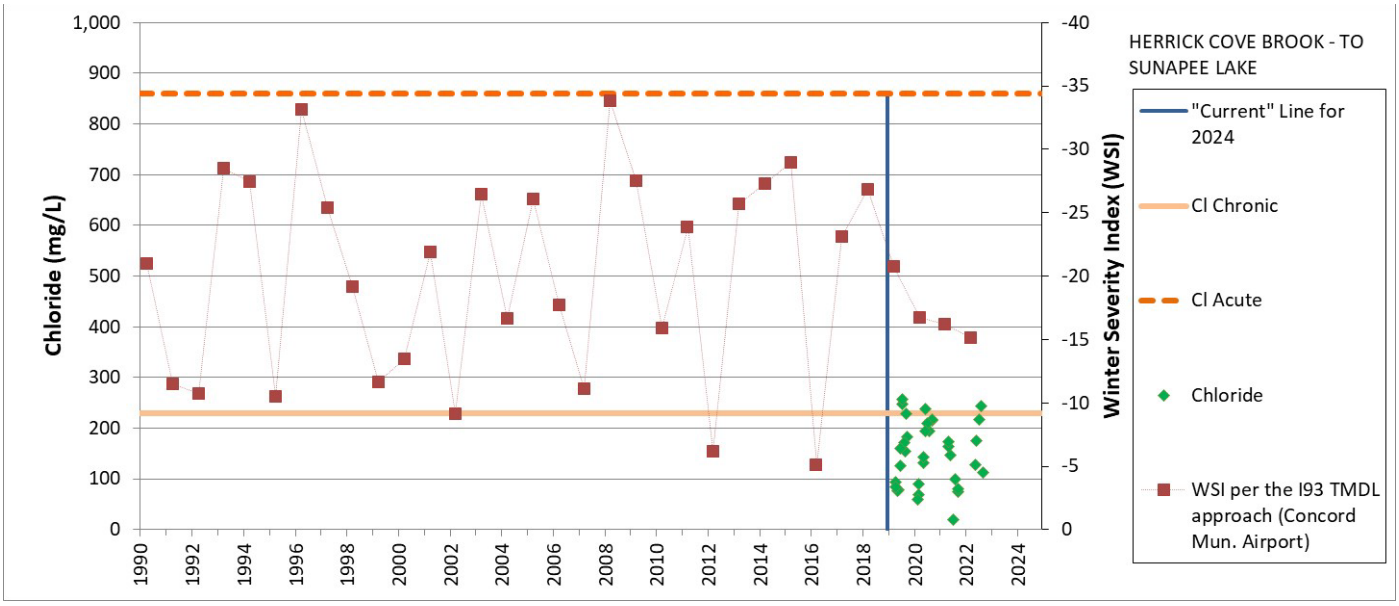
Notes:
E.COLI-GRAB-CP = Grab samples of E. coli during the summer critical period.
E.COLI-GRAB-NCP = Grab samples of E. coli not during the summer critical period.
E.COLI-GEO-CP = Geometric mean samples of E. coli during the summer critical period.
E.COLI-GEO-NCP = Geometric mean samples of E. coli not during the summer critical period.

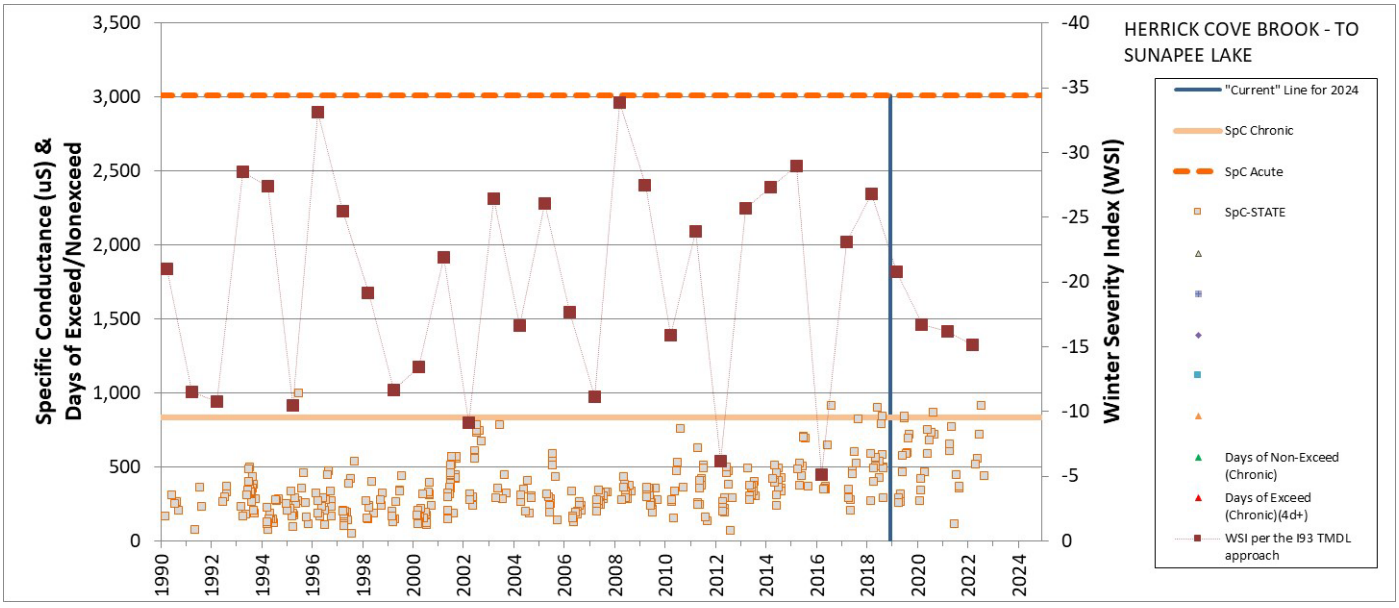
Chloride for Aquatic Life Integrity

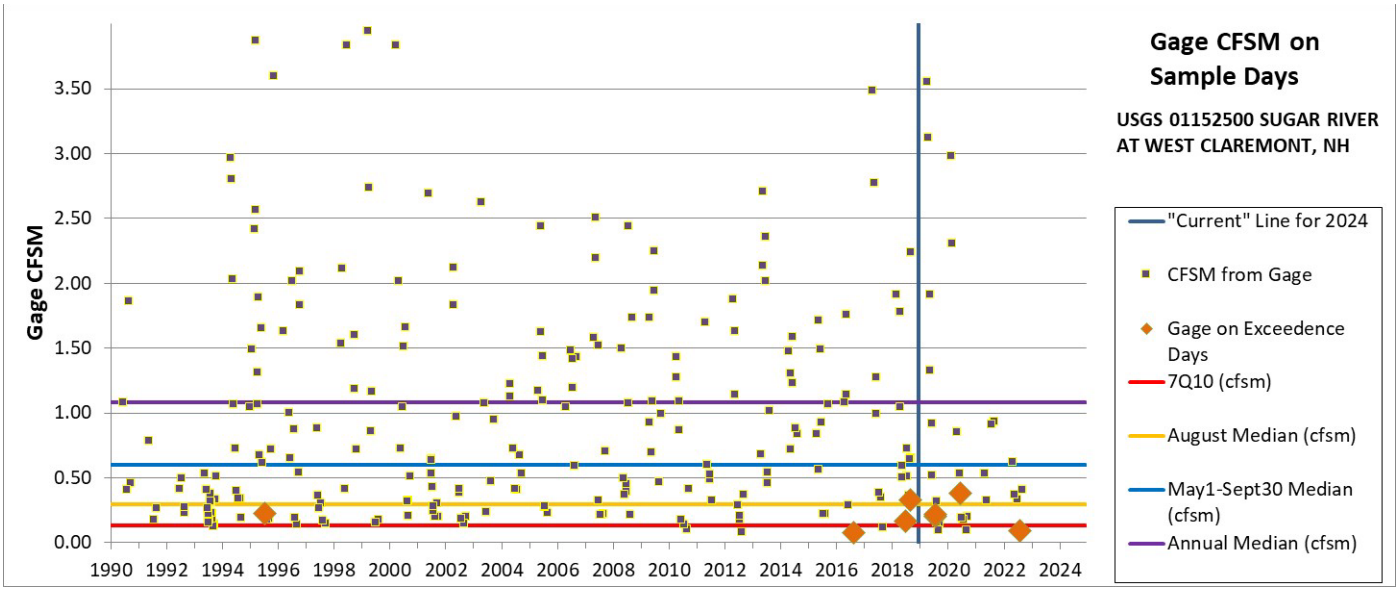
Herrick Cove Brook – To Sunapee Lake (NHRIV801060402-18)

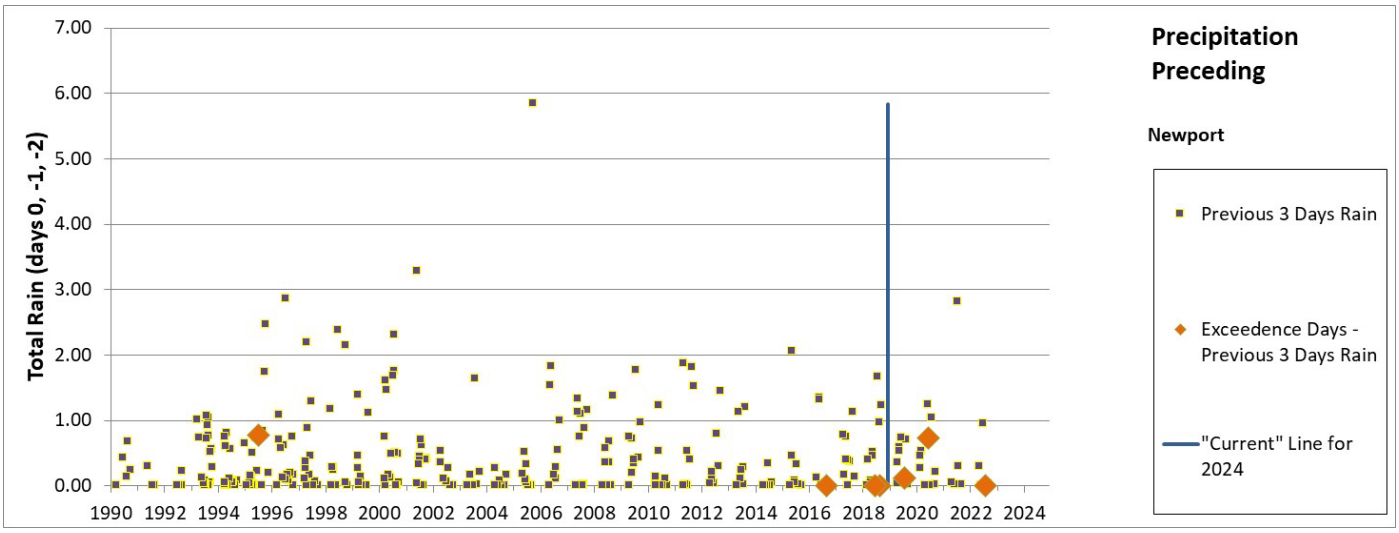
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Herrick Cove Brook – To Sunapee Lake	NHRIV801060402-18	CHLORIDE	NEW LONDON	3-PNS	5-M

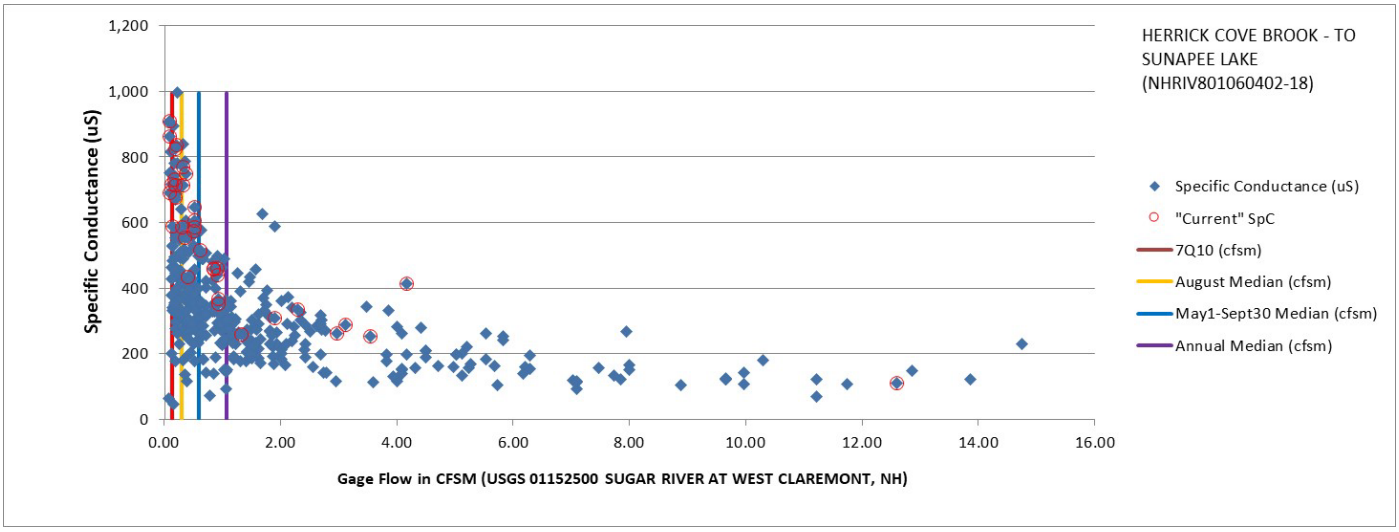
Four out of 35 chloride samples collected at stations SUNSUN83015 and SUNSUN830 in the current assessment period (2019-2023) exceeded the chronic water quality criteria of 230 mg/L. The statewide chloride/specific conductance regression identifies 835 µS/cm as the specific conductance threshold that corresponds to chloride levels exceeding the chronic water quality standard of 230 mg/L. Chloride and specific conductance samples collected at SUNSUN83015 and SUNSUN830 indicate that the statewide chloride/specific conductance regression is appropriate to use for this assessment unit. Flow data indicates that impairments are much more likely to occur when discharge levels are just above or below the August median. Given that low flow period will last for multiple days or even weeks it is likely that there were additional days where the chloride levels in NHRIV801060402-18 exceeded the chronic water quality standard of 230 mg/L. Herrick Cove Brook – to Sunapee Lake (NHRIV801060402-18) has been moved from 3-PNS to 5-M for Chloride for the aquatic life integrity designated use based on data collected in the current assessment period.

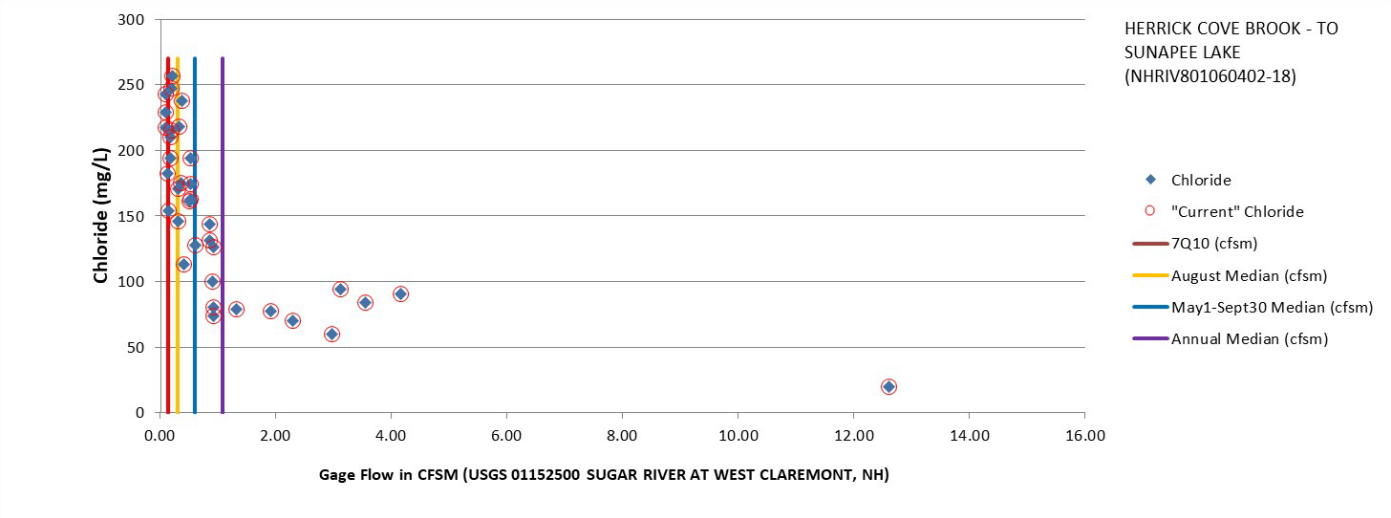

HERRICK COVE BROOK - TO SUNAPEE LAKE
Chloride (mg/L)
Winter Severity Index (WSI)
"Current" Line for 2024
Cl Chronic
Cl Acute
Chloride
WSI per the I93 TMDL approach (Concord Mun. Airport)

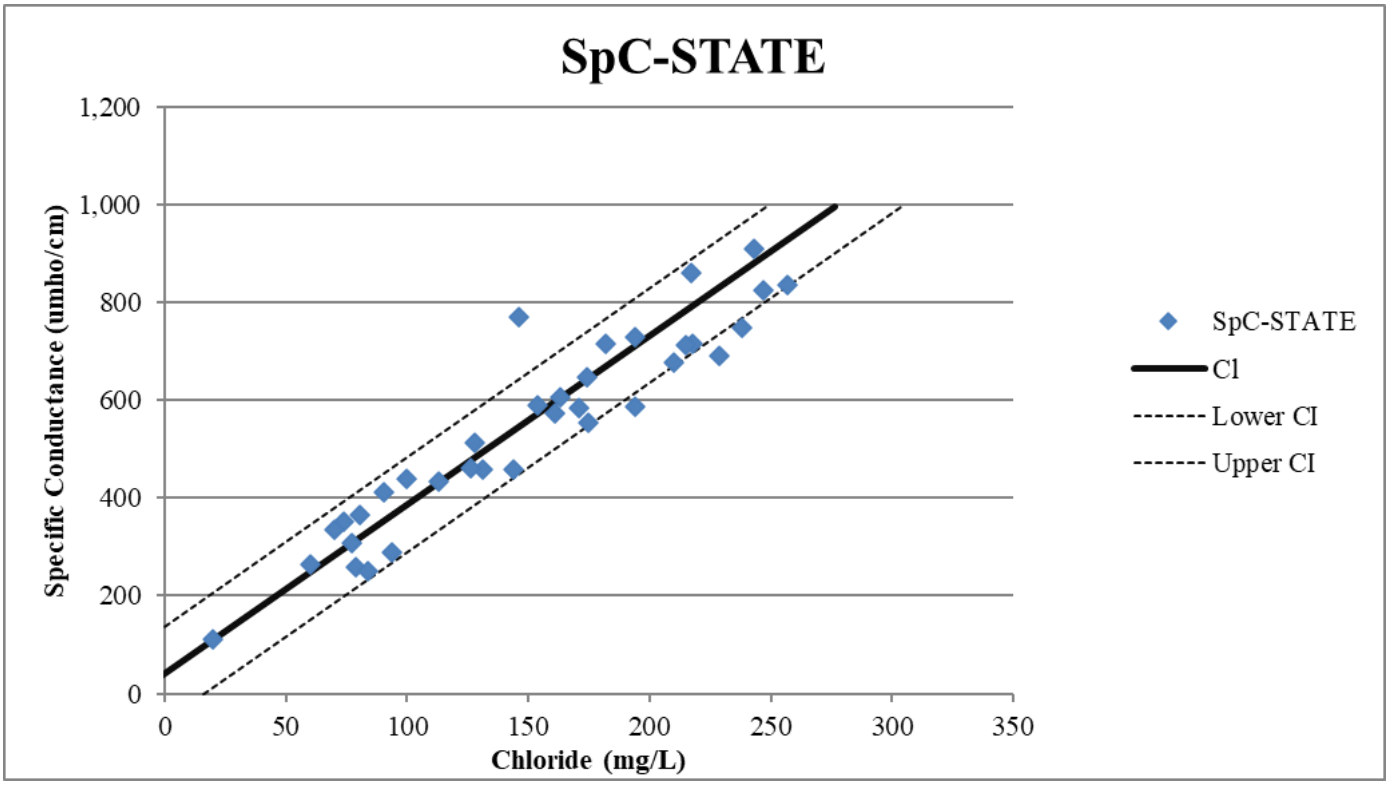

HERRICK COVE BROOK - TO SUNAPEE LAKE
Specific Conductance (uS) & Days of Exceed/Nonexceed
Winter Severity Index (WSI)
"Current" Line for 2024
SpC Chronic
SpC Acute
SpC-STATE
Days of Non-Exceed (Chronic)
Days of Exceed (Chronic)(4d+)
WSI per the I93 TMDL approach


Gage CFSM on Sample Days
USGS 01152500 SUGAR RIVER AT WEST CLAREMONT, NH
Gage CFSM
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Precipitation Preceding
Newport
Total Rain (days 0, -1, -2)
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024


HERRICK COVE BROOK - TO SUNAPEE LAKE (NHRIV801060402-18)
Specific Conductance (uS)
Gage Flow in CFSM (USGS 01152500 SUGAR RIVER AT WEST CLAREMONT, NH)
Specific Conductance (uS)
"Current" SpC
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)





Mink Brook (NHRIV801040401-05)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Mink Brook	NHRIV801040401-05	CHLORIDE	HANOVER, LEBANON	2-G	5-P

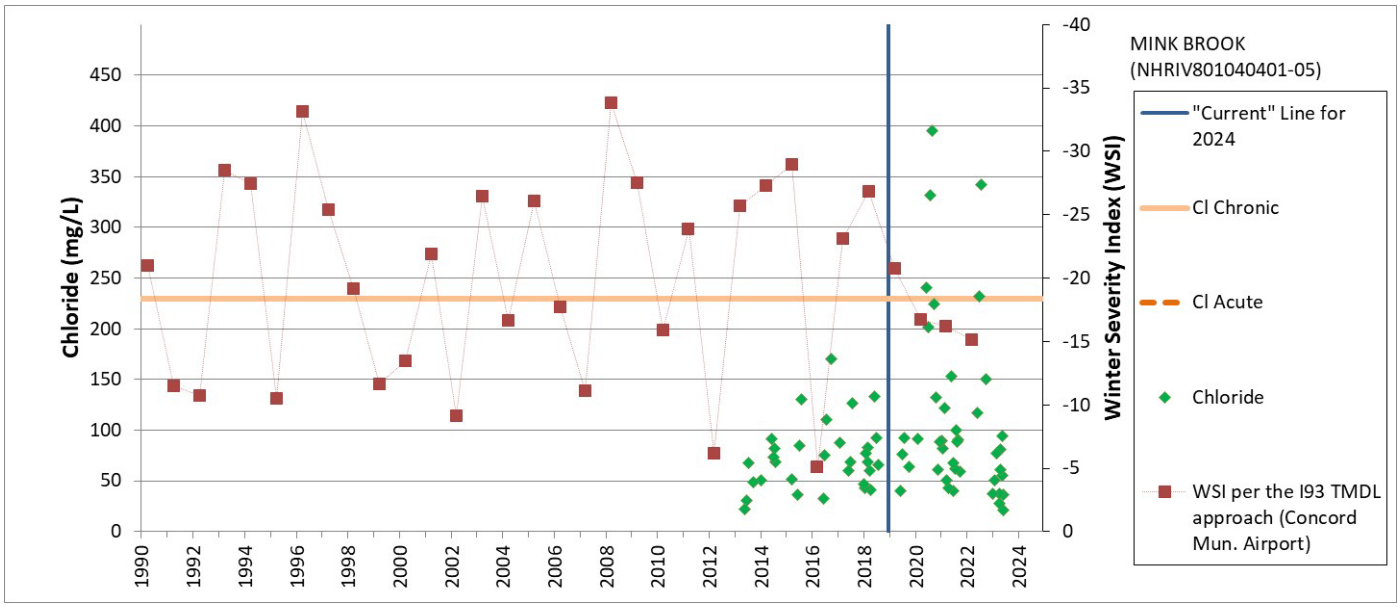
Five out of 41 chloride samples (342 mg/L 8/15/22, 232 mg/L 6/14/22, 395 mg/L 9/17/20. 332 mg/L 8/18/20 and 241 mg/L 6/23/20) collected at stations 01T-MKB and 02-MKB in the current assessment period (2019-2023) exceeded the chronic criteria of 230 mg/L.

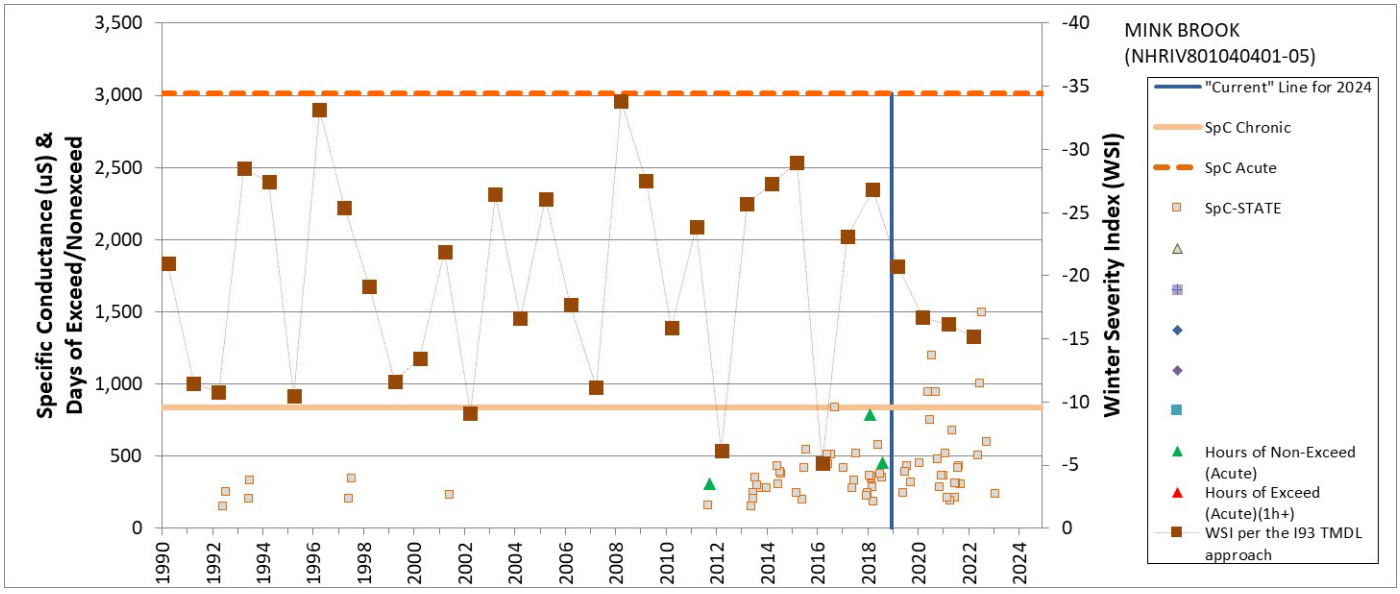
Additionally, five out of 28 specific conductance measurements exceeded the 835 µS/cm threshold – all five of these were paired with the chloride exceedances already cited. Chloride and specific conductance samples collected at station 01T-MKB indicate that the statewide chloride/specific conductance regression is appropriate to use for this

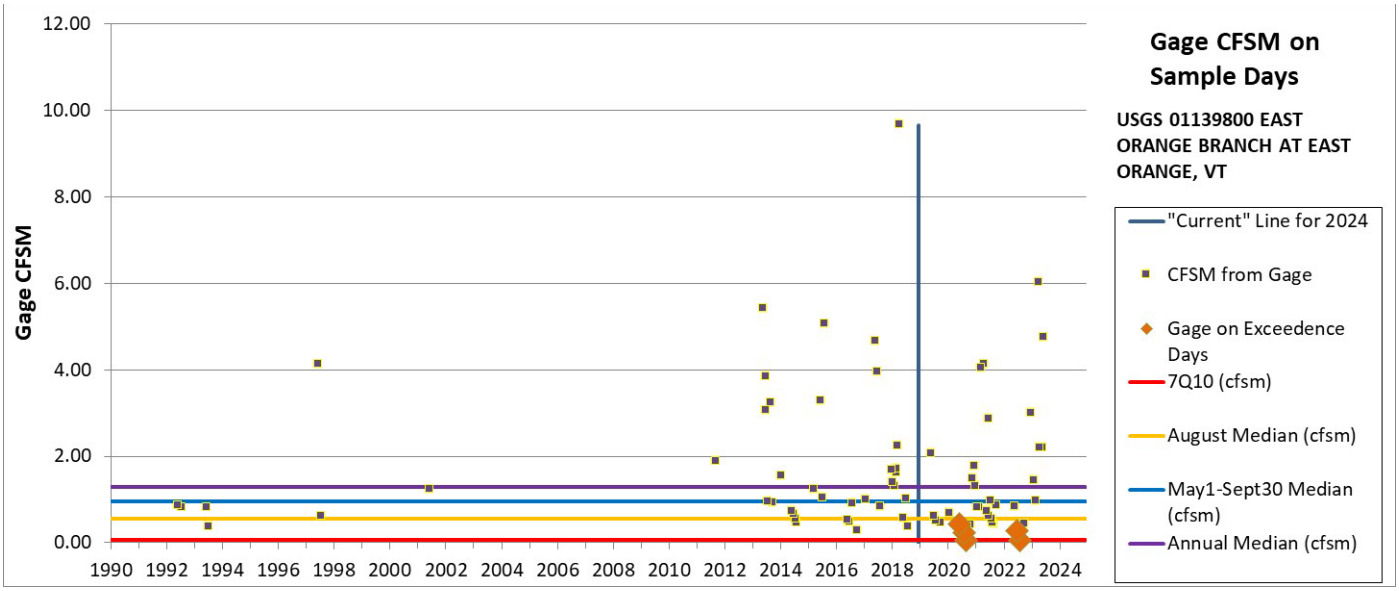
assessment unit. The statewide chloride/specific conductance regression identifies 835 µS/cm as the specific conductance threshold that corresponds to chloride levels exceeding the chronic water quality standard of 230 mg/L.

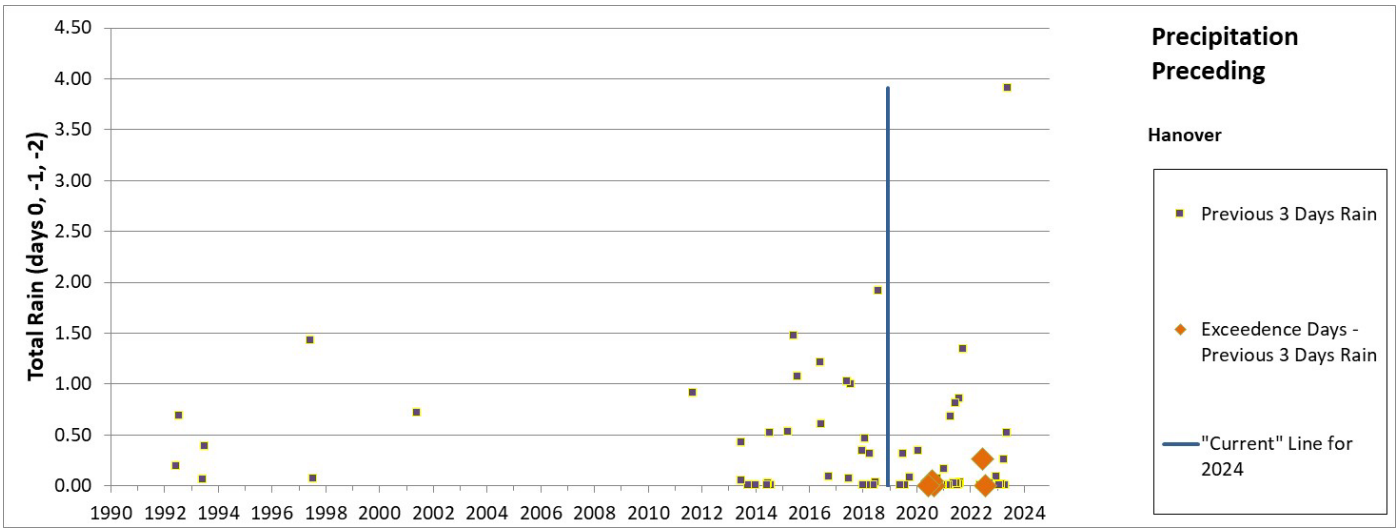
During the summer and fall of 2023, conductivity dataloggers were deployed in the Mink Brook watershed to further investigate the elevated specific conductance/chloride levels. These datalogger deployments included one at station 01-DHB on Dartmouth Brook, a tributary to Mink Brook that is also part of assessment unit NHRIV801040401-05. Datalogger data from Dartmouth Brook (01-DHB) showed a severe impairment for chloride with levels exceeding the one-hour acute standard on multiple occasions. Although this data was not initially available when data for assessments was compiled, NHDES staff have reviewed the data to verify its validity and availability for water quality assessments.

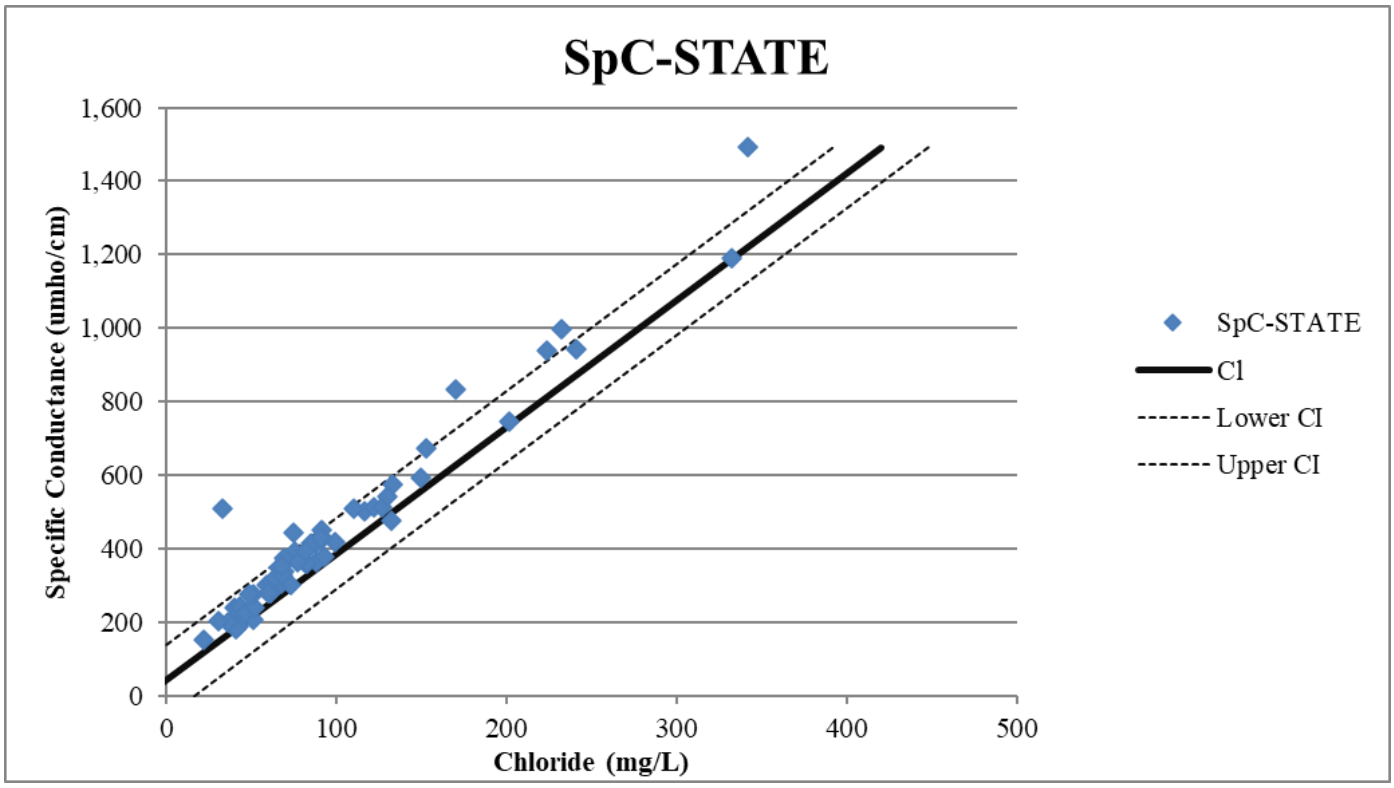
Mink Brook (NHRIV801040401-05) has been moved from 2-G to 5-P for Chloride for the aquatic life integrity designated use based on data collected in the current assessment period.






Gage CFSM
12.00
10.00
8.00
6.00
4.00
2.00
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Gage CFSM on Sample Days
USGS 01139800 EAST ORANGE BRANCH AT EAST ORANGE, VT
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Total Rain (days 0, -1, -2)
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Precipitation Preceding
Hanover
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024

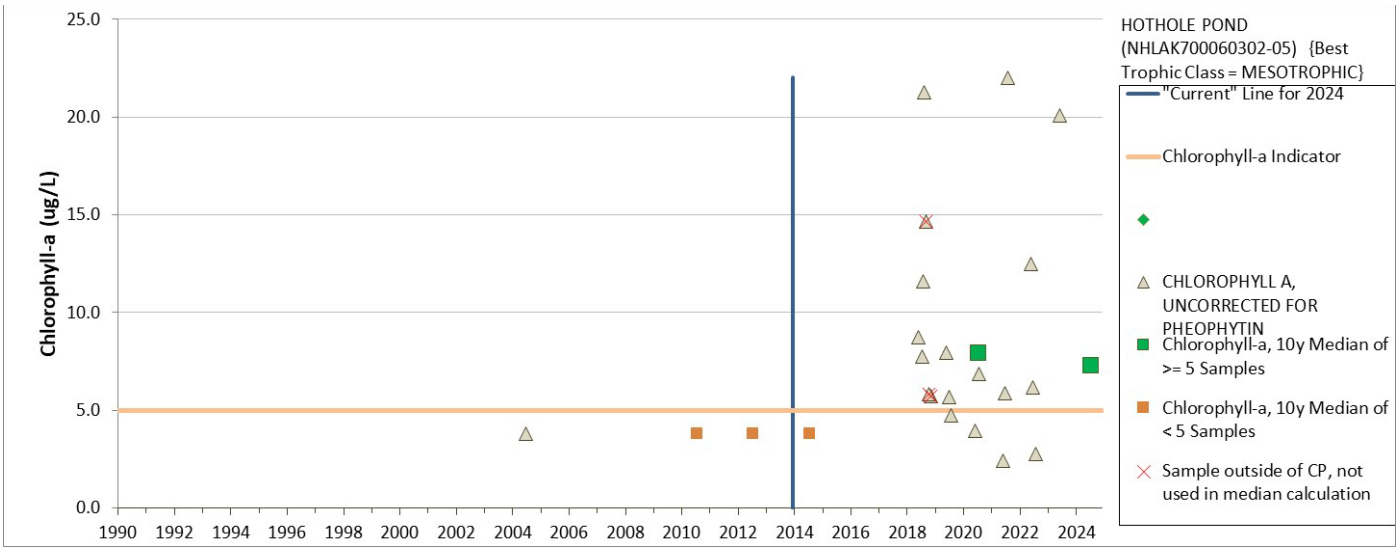


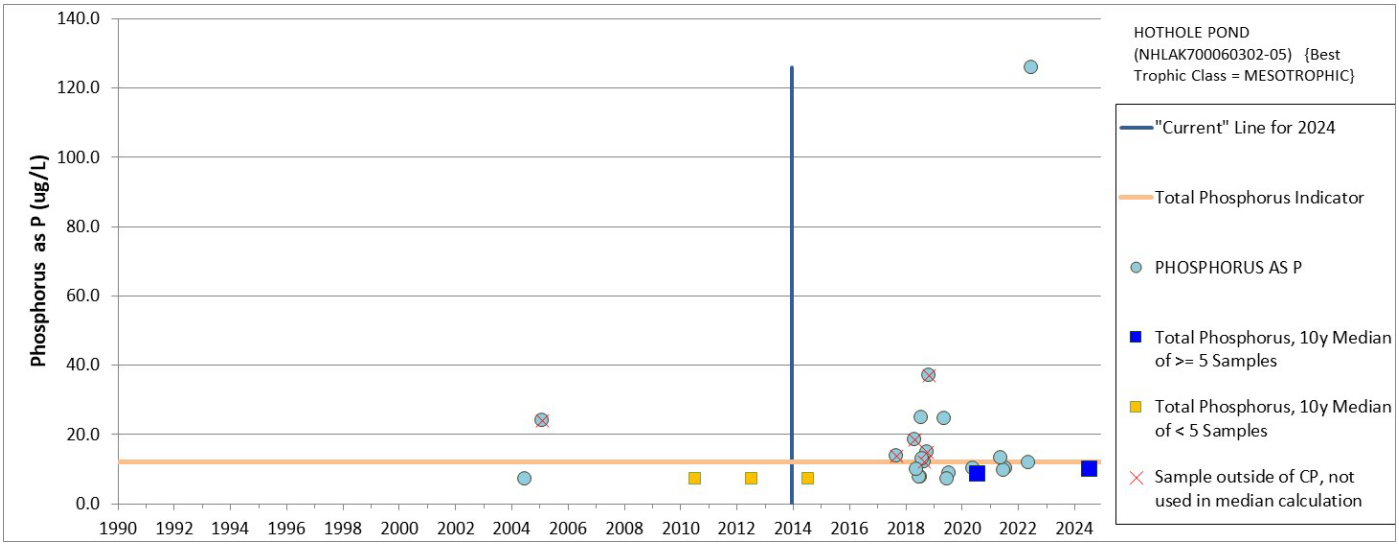
Chlorophyll-a & Total Phosphorus for Aquatic Life Integrity

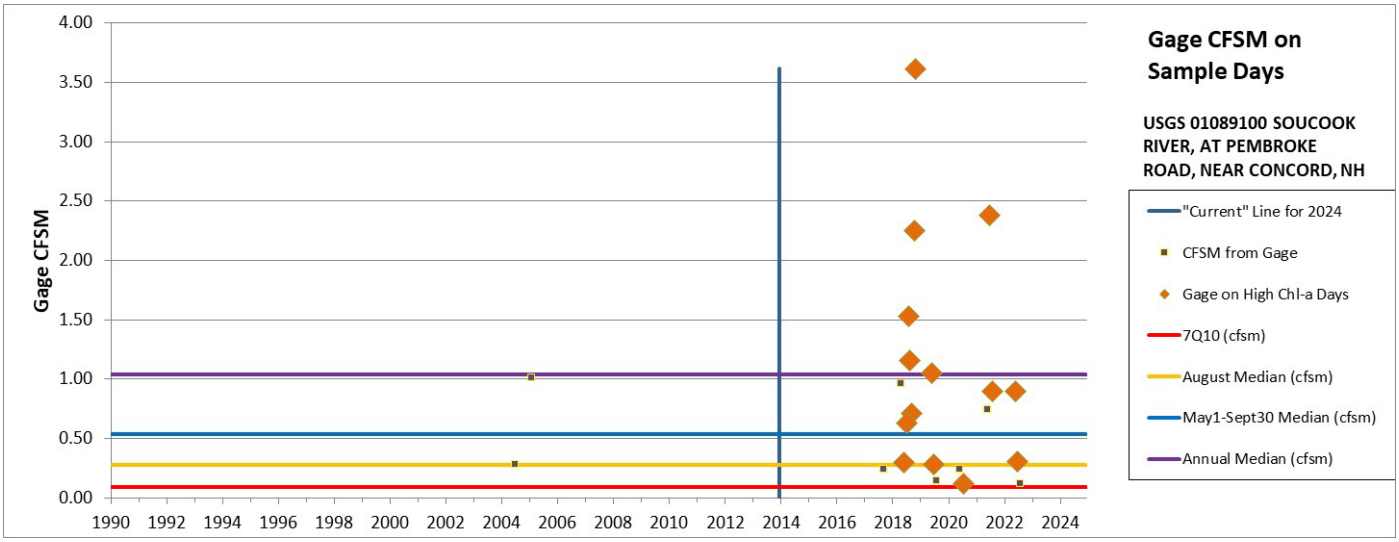
Hothole Pond (NHLAK700060302-05)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Hothole Pond	NHLAK700060302-05	Chlorophyll-a	Loudon, Concord	3-PNS	5-M
Hothole Pond	NHLAK700060302-05	Phosphorus (Total)	Loudon, Concord	3-PAS	5-M

The previous assessment noted insufficient data was available to make a full assessment decision and that Hothole Pond may potentially not be supporting the designated use for chlorophyll-a (3-PNS). Supplemental data that was not available during the preliminary assessment, but has been reviewed during this evaluation, shows that chlorophyll-a is consistently above the 5.0 ug/L threshold for mesotrophic ponds. The medians for the current and past assessment cycles exceeded this threshold as well. The 10-year medians for total phosphorus are just below the threshold of 12 ug/L. Chlorophyll-a is an indicator of algal biomass and is a response to total phosphorus concentrations. Based on this relationship Hothole Pond is impaired for total phosphorus. It is recommended that additional sampled be collected at station HOTLOUD between May and September in subsequent year to better understand conditions of the pond. Hothole Pond (NHLAK700060302-05) has been moved from category 3-PNS to 5-M for chlorophyll-a and from 3-PAS to 5-M for total phosphorus for the aquatic life integrity designated use based on data collected in the current assessment period.


Chlorophyll-a (ug/L)
25.0
20.0
15.0
10.0
5.0
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
HOTHOLE POND (NHLAK700060302-05) {Best Trophic Class = MESOTROPHIC}
"Current" Line for 2024
Chlorophyll-a Indicator
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN
Chlorophyll-a, 10y Median of >= 5 Samples
Chlorophyll-a, 10y Median of < 5 Samples
Sample outside of CP, not used in median calculation

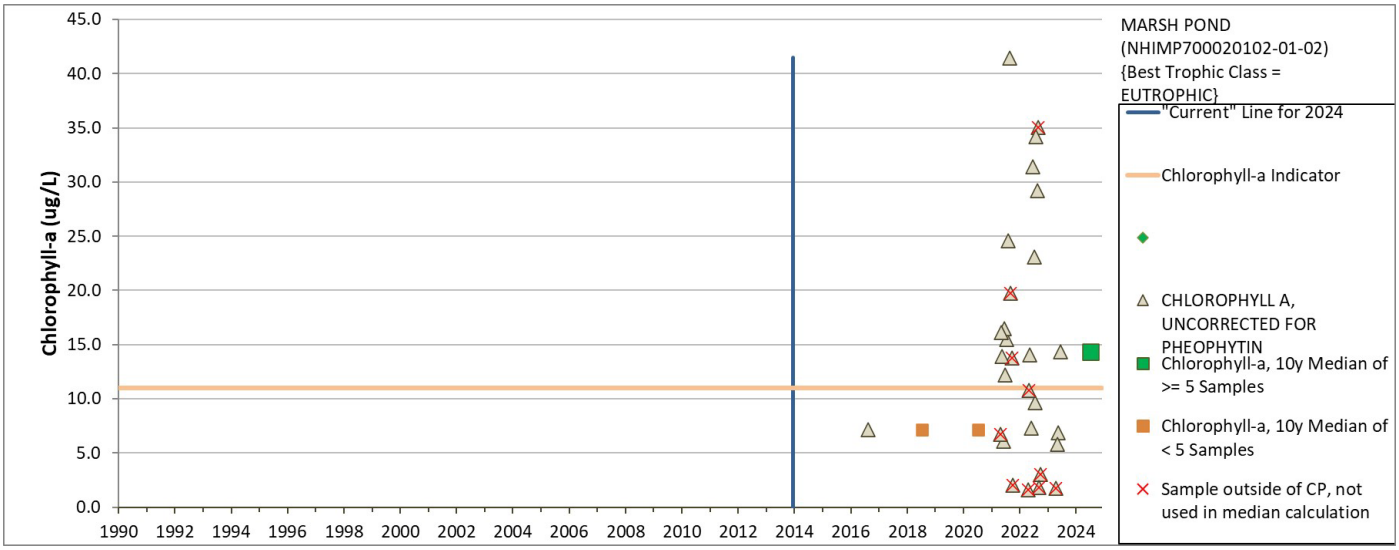

Phosphorus as P (ug/L)
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
HOTHOLE POND (NHLAK700060302-05) {Best Trophic Class = MESOTROPHIC}
"Current" Line for 2024
Total Phosphorus Indicator
PHOSPHORUS AS P
Total Phosphorus, 10y Median of >= 5 Samples
Total Phosphorus, 10y Median of < 5 Samples
Sample outside of CP, not used in median calculation

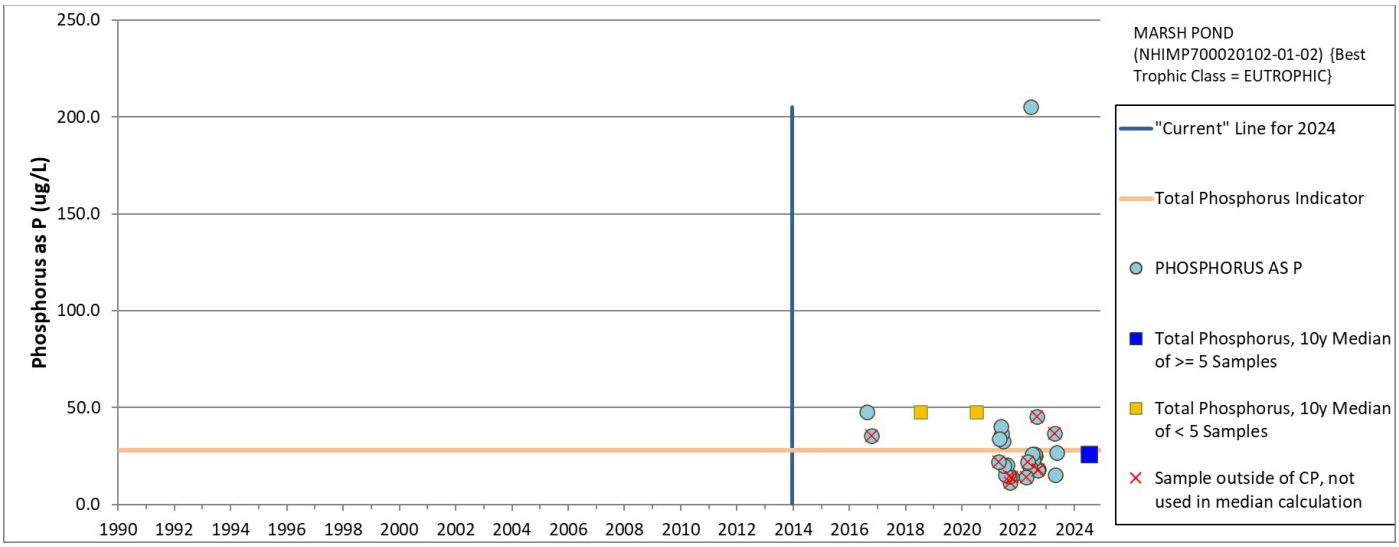

Gage CFSM
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Gage CFSM on Sample Days
USGS 01089100 SOUCOOK RIVER, AT PEMBROKE ROAD, NEAR CONCORD, NH
"Current" Line for 2024
CFSM from Gage
Gage on High Chl-a Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)

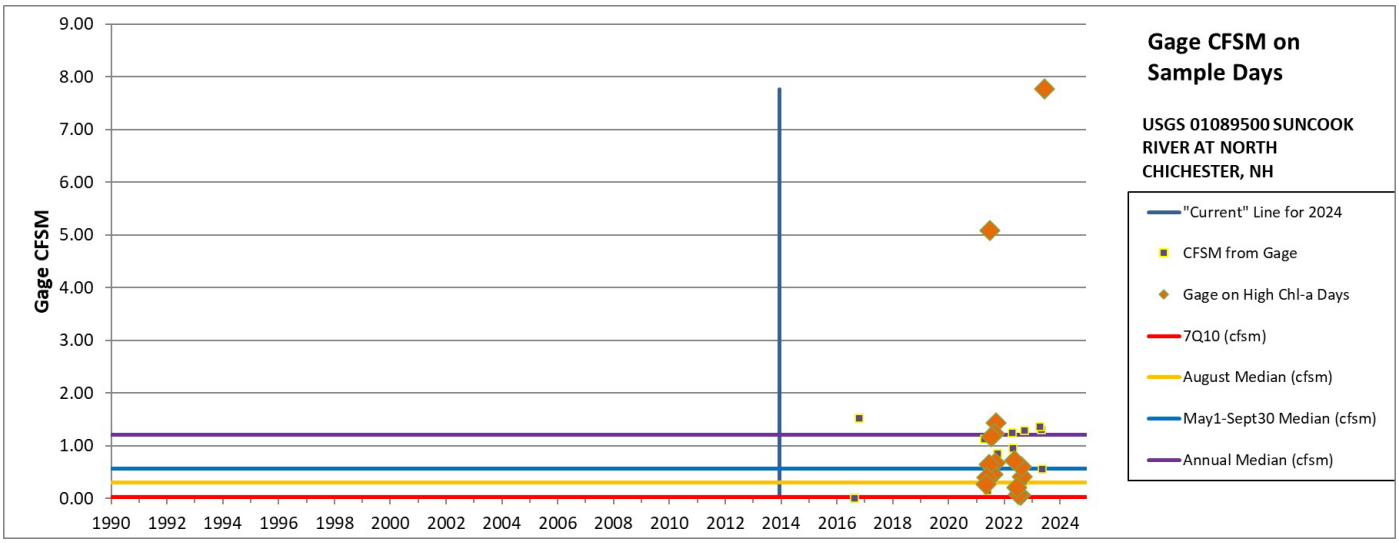
Marsh Pond (NHIMP700020102-01-02)

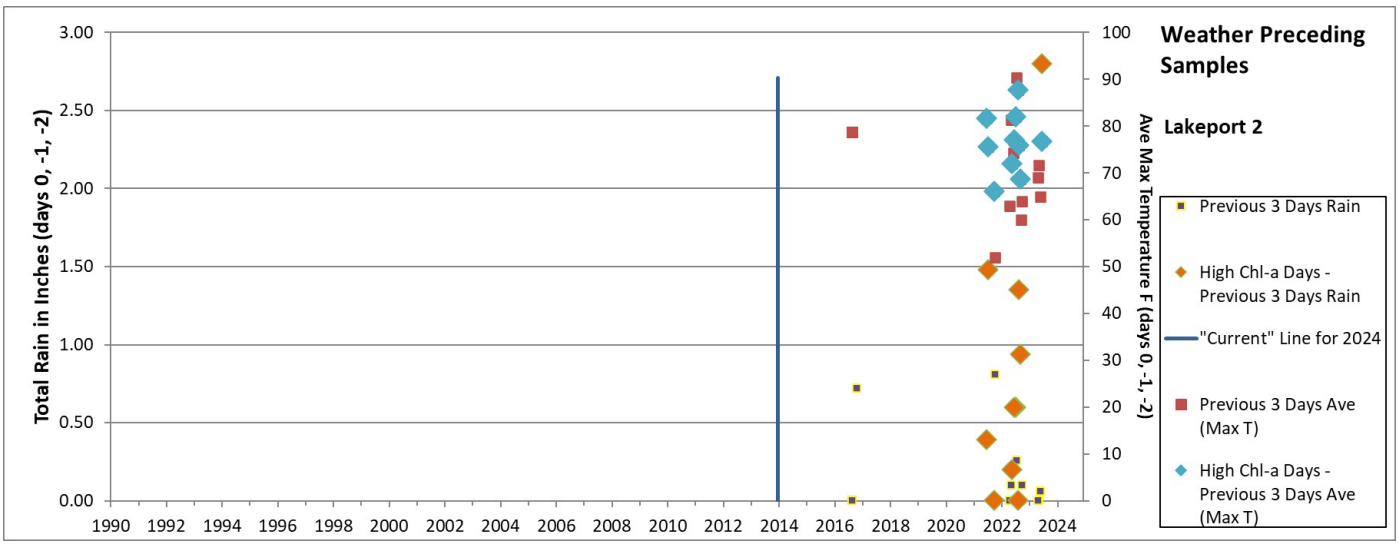
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Marsh Pond	NHIMP700020102-01-02	Chlorophyll-a	NEW DURHAM, ALTON	3-PAS	5-M
Marsh Pond	NHIMP700020102-01-02	Phosphorus (Total)	NEW DURHAM, ALTON	3-PNS	5-M

Marsh Pond is a eutrophic pond with 28 chlorophyll-a and 26 total phosphorus results for the 2024 assessment cycle. The median chlorophyll-a concentration was 14.31 ug/L with 16 results above the 11 ug/L threshold for eutrophic lakes and ponds. Chlorophyll-a is an indicator of algal biomass and is a response to total phosphorus concentrations. Based on this relationship Marsh Pond is impaired for total phosphorus with a median concentration of 26 ug/L with 7 results above 28.0 ug/L threshold for eutrophic lakes and ponds. Marsh Pond receives effluent from the Powder Mill Fish Hatchery and New Hampshire Fish and Game is in the process of addressing effluent water quality. Increased monitoring should continue at the deep site (MARALTD). Marsh Pond (NHIMP700020102-01-02) has been moved from category 3-PAS to 5-M for chlorophyll-a and from category 3-PNS to 5-M for total phosphorus for the aquatic life integrity designated use based on data collected in the current assessment period.







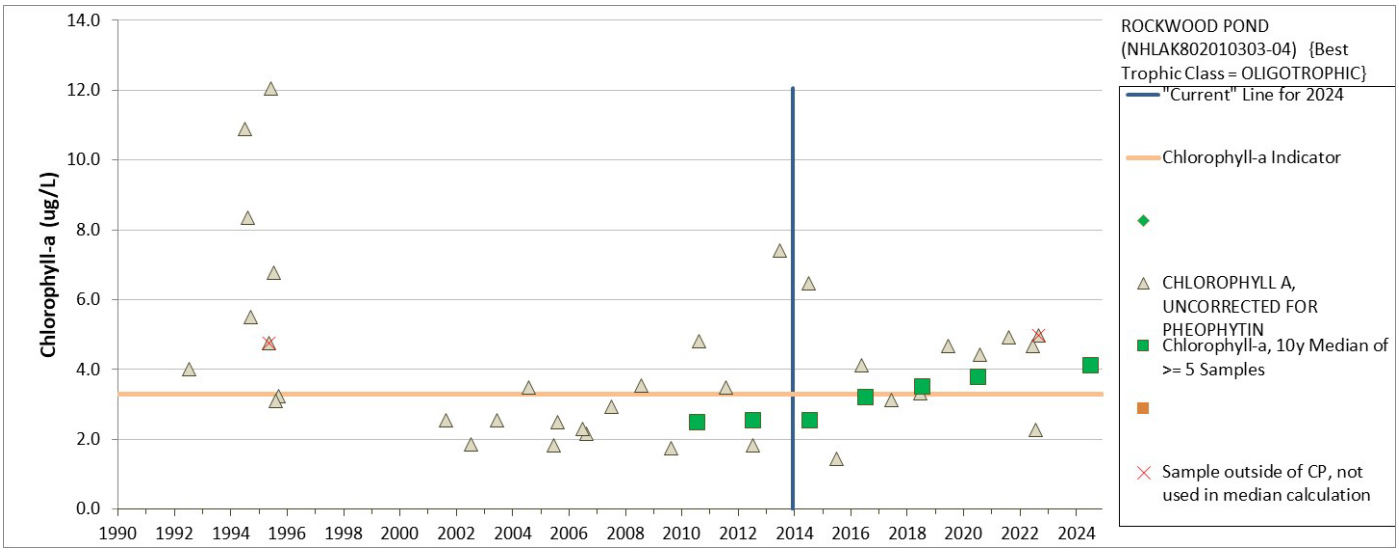


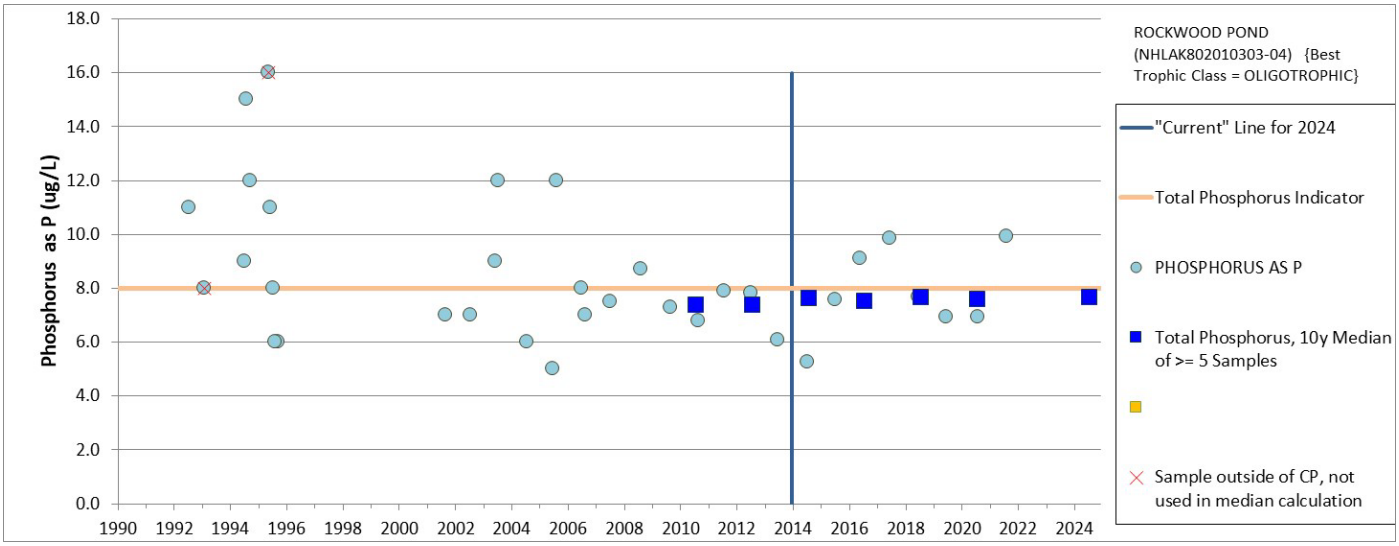
Rockwood Pond (NHLAK802010303-04)

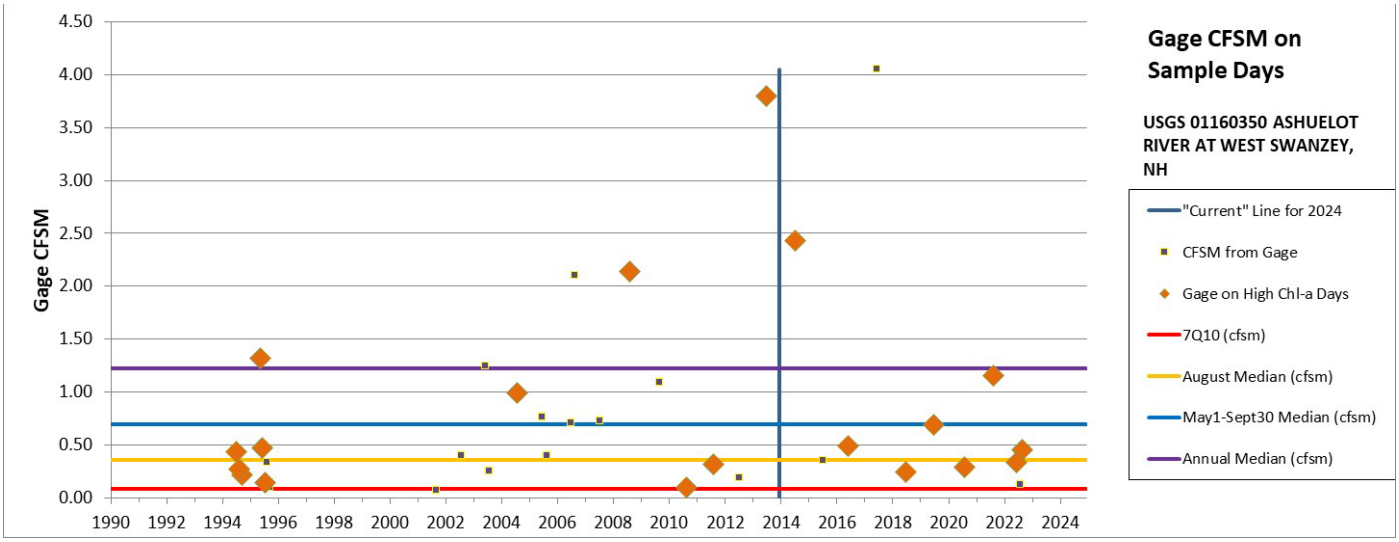
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024

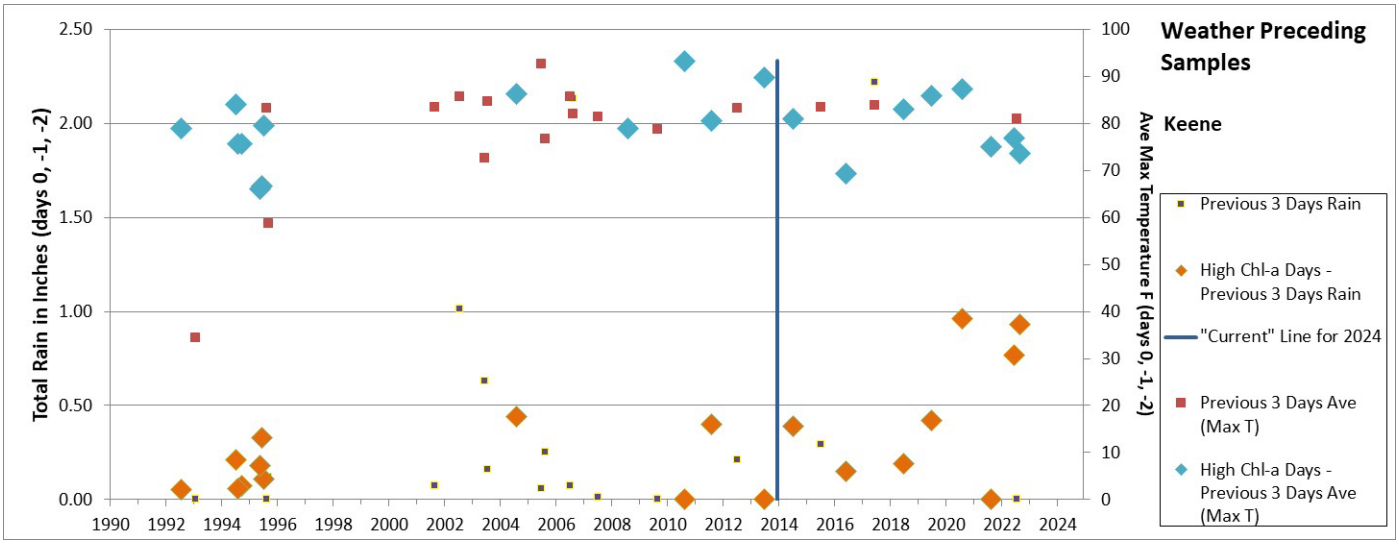
Rockwood Pond	NHLAK802010303-04	Chlorophyll-a	Fitzwilliam	2-M	5-M
Rockwood Pond	NHLAK802010303-04	Phosphorus (Total)	Fitzwilliam	2-M	5-M

Rockwood Pond has been above the threshold for chlorophyll-a for 3 cycles. While the previous exceedances were based on one summertime sample, recent sampling for 2022 and 2023 have had 3 samples taken in July, August and September. All but one of the 2022 and 2023 samples have been above the chl-a threshold of 3.3 ug/L. The 2023 data was not uploaded to DES' database in time to be incorporated in the initial evaluation, however it has been evaluated as part of the assessment process. The results from 2023 were 11.68, 6.71, and 5.81 ug/L for July, August and September respectively, and all above the chlorophyll-a threshold. Total phosphorus remains slightly under the threshold of 8.0 ug/L, but the exceedance for chlorophyll-a results in an impairment for total phosphorus for Rockwood Pond. The recent increased sampling schedule should be continued at the deep site (ROCFITD). Rockwood Pond (NHLAK802010303-04) has been moved from category 2-M to 5-M for both chlorophyll-a and total phosphorus for the aquatic life integrity designated use based on data collected in the current assessment period.





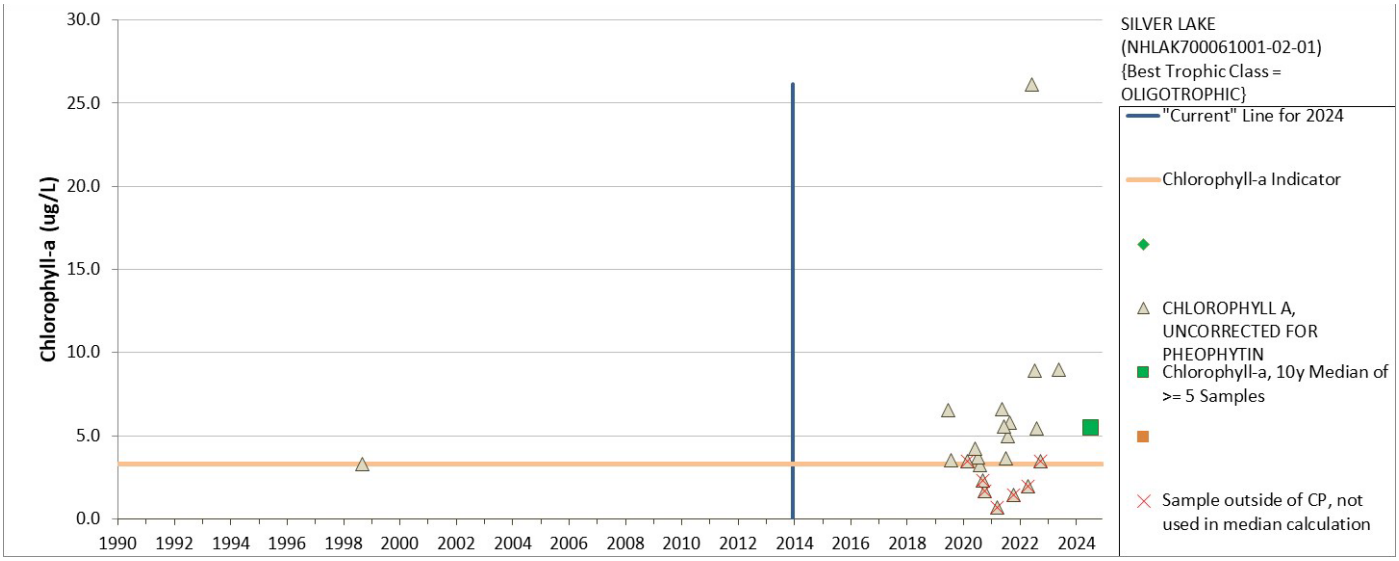


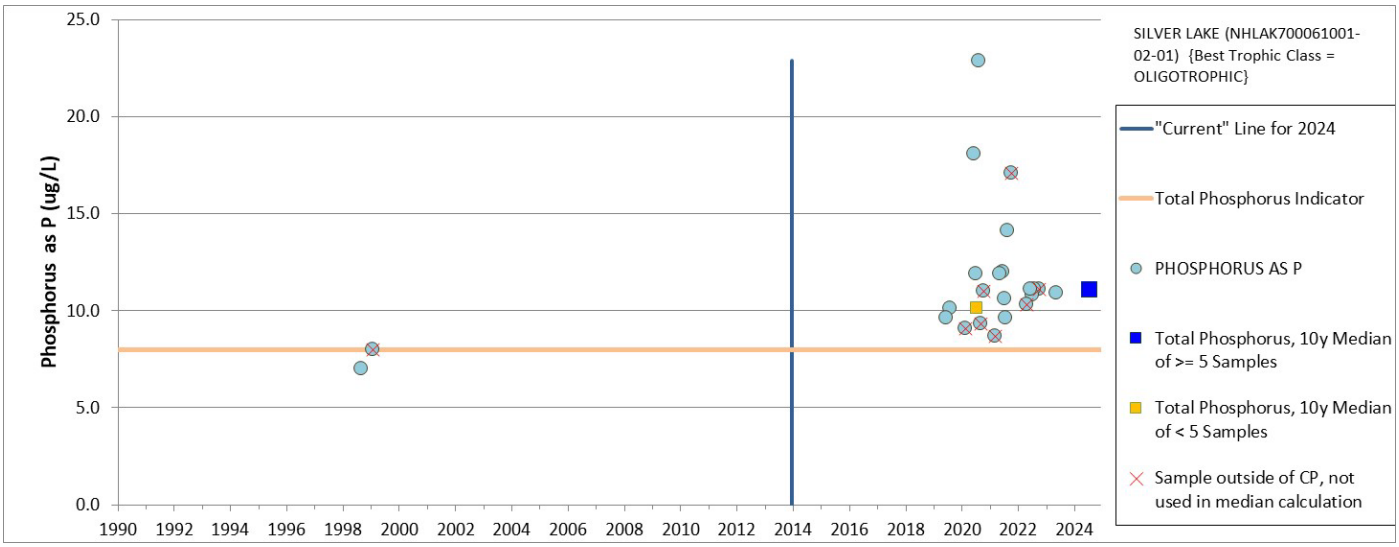


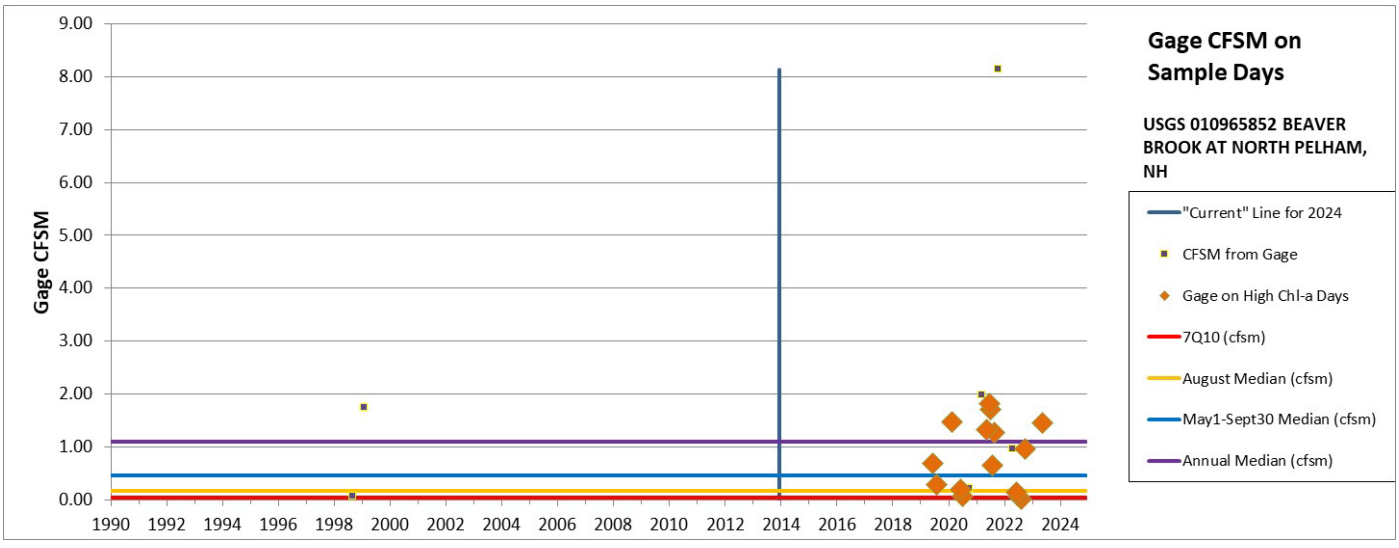
Silver Lake (NHLAK700061001-02-01)

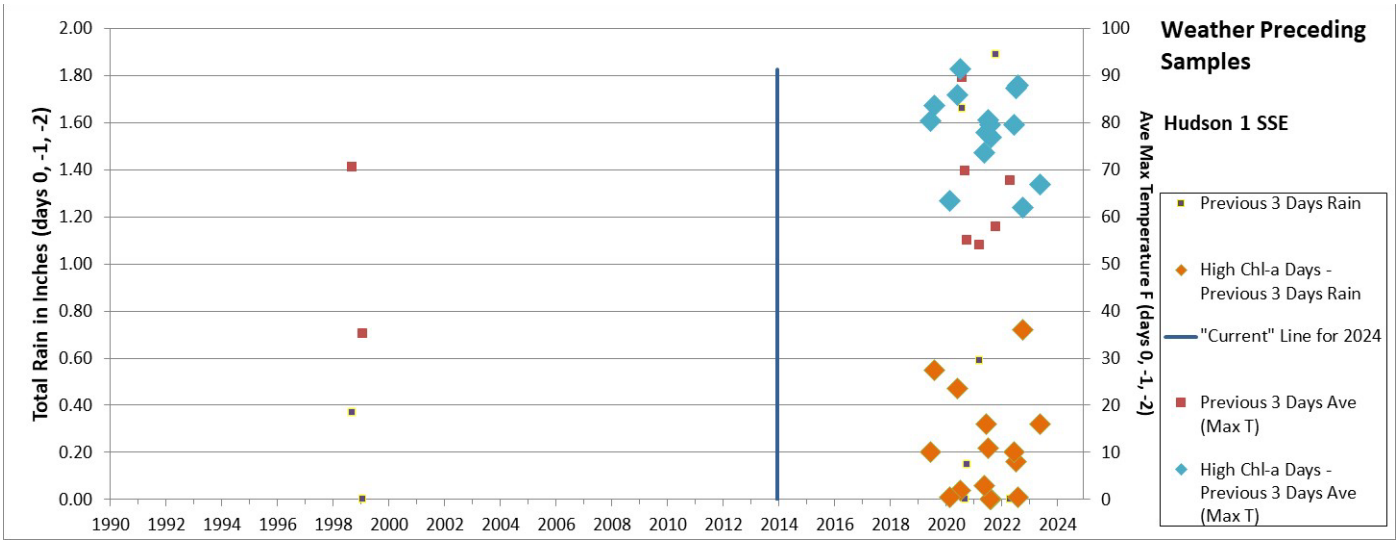
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Silver Lake	NHLAK700061001-02-01	Chlorophyll-a	Hollis	3-ND	5-M
Silver Lake	NHLAK700061001-02-01	Phosphorus (Total)	Hollis	3-ND	5-M

The previous assessed category for Silver Lake was 3-ND, meaning that there was insufficient information – no current data. Data collected since the last assessment cycle support listing Silver Lake as impaired (category 5-M). Chlorophyll-a concentrations exceeded the 3.3 ug/L threshold in 15 of the 21 results collected during the critical period (samples collected between May 24 and September 15) with a median of 5.5 ug/L. All of the 21 total phosphorus results exceeded the 8.0 ug/L threshold with a median of 11.1 ug/L. Silver Lake is also impaired for cyanobacteria, which typically results from excess nutrients, further justifying the impairment determination for chlorophyll-a and total phosphorus. Silver Lake (NHLAK700061001-02-01) has been moved from category 3-ND to 5-M (not supporting) for both chlorophyll-a and total phosphorus for the aquatic life integrity designated use based on data collected in the current assessment period.


Chlorophyll-a (ug/L)
30.0
25.0
20.0
15.0
10.0
5.0
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
SILVER LAKE (NHLAK700061001-02-01) {Best Trophic Class = OLIGOTROPHIC}
"Current" Line for 2024
Chlorophyll-a Indicator
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN
Chlorophyll-a, 10y Median of >= 5 Samples
Sample outside of CP, not used in median calculation


Phosphorus as P (ug/L)
25.0
20.0
15.0
10.0
5.0
0.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
SILVER LAKE (NHLAK700061001-02-01) {Best Trophic Class = OLIGOTROPHIC}
"Current" Line for 2024
Total Phosphorus Indicator
PHOSPHORUS AS P
Total Phosphorus, 10y Median of >= 5 Samples
Total Phosphorus, 10y Median of < 5 Samples
Sample outside of CP, not used in median calculation

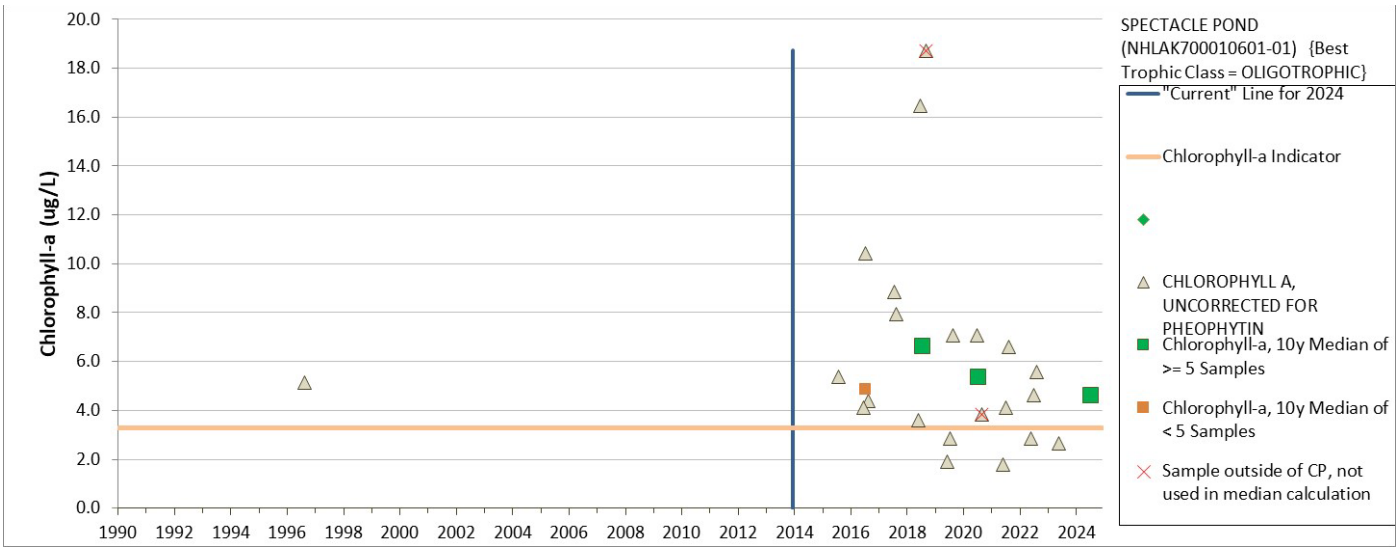

Gage CFSM
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Gage CFSM on Sample Days
USGS 010965852 BEAVER BROOK AT NORTH PELHAM, NH
"Current" Line for 2024
CFSM from Gage
Gage on High Chl-a Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)

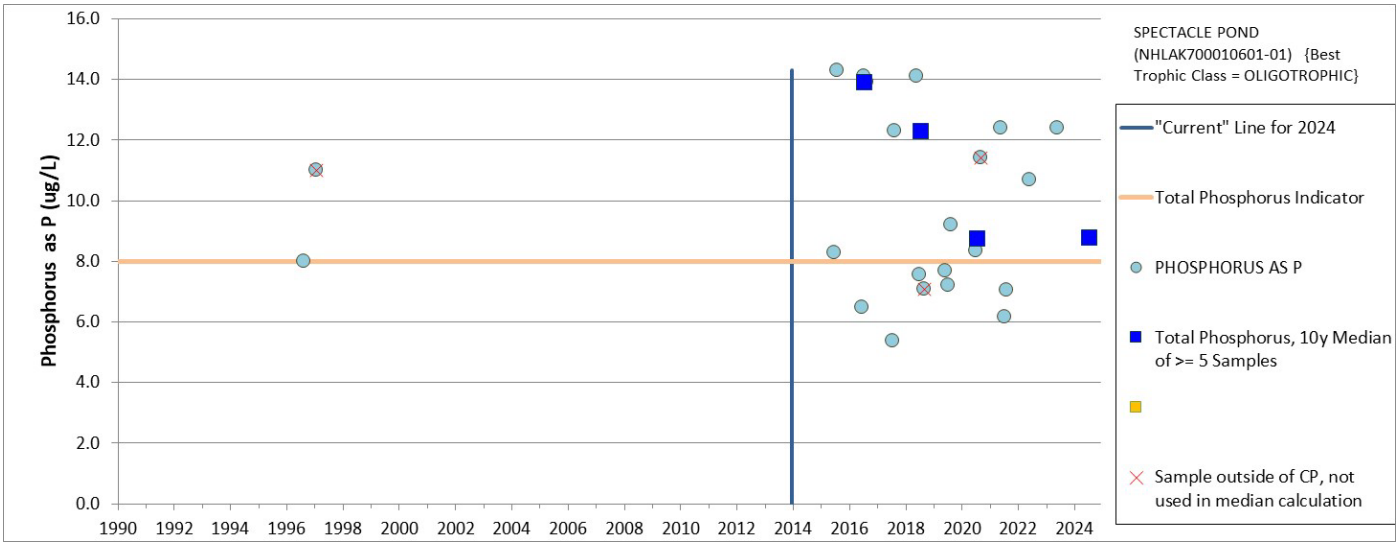


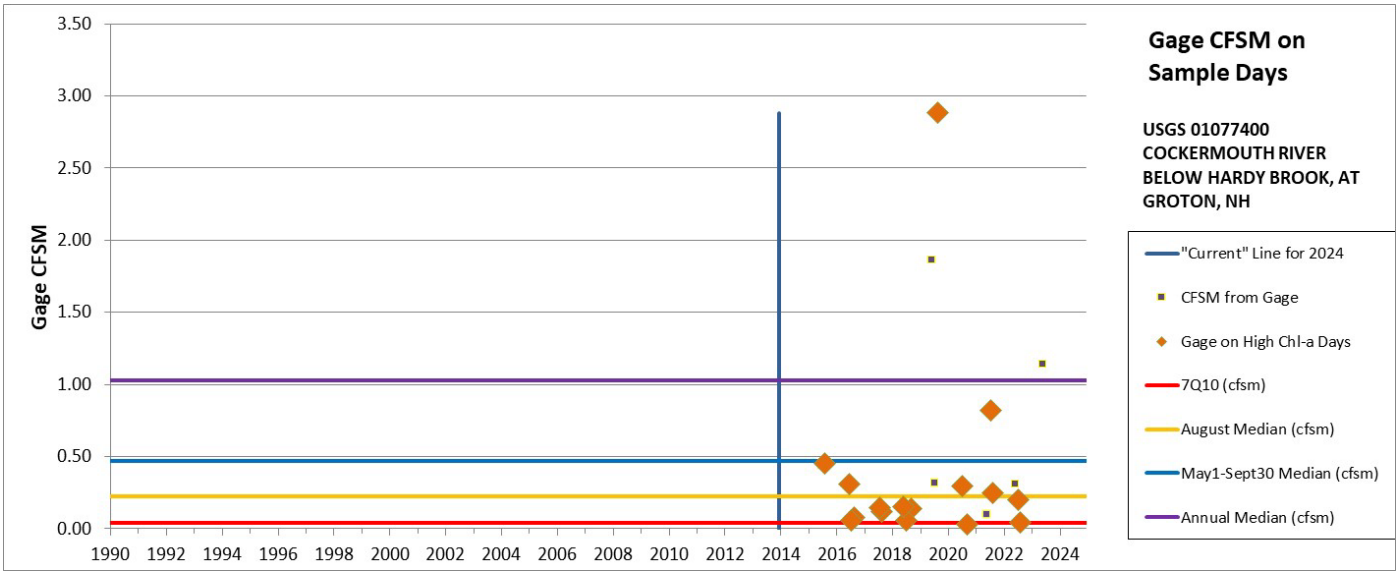
Spectacle Pond (NHLAK700010601-01)

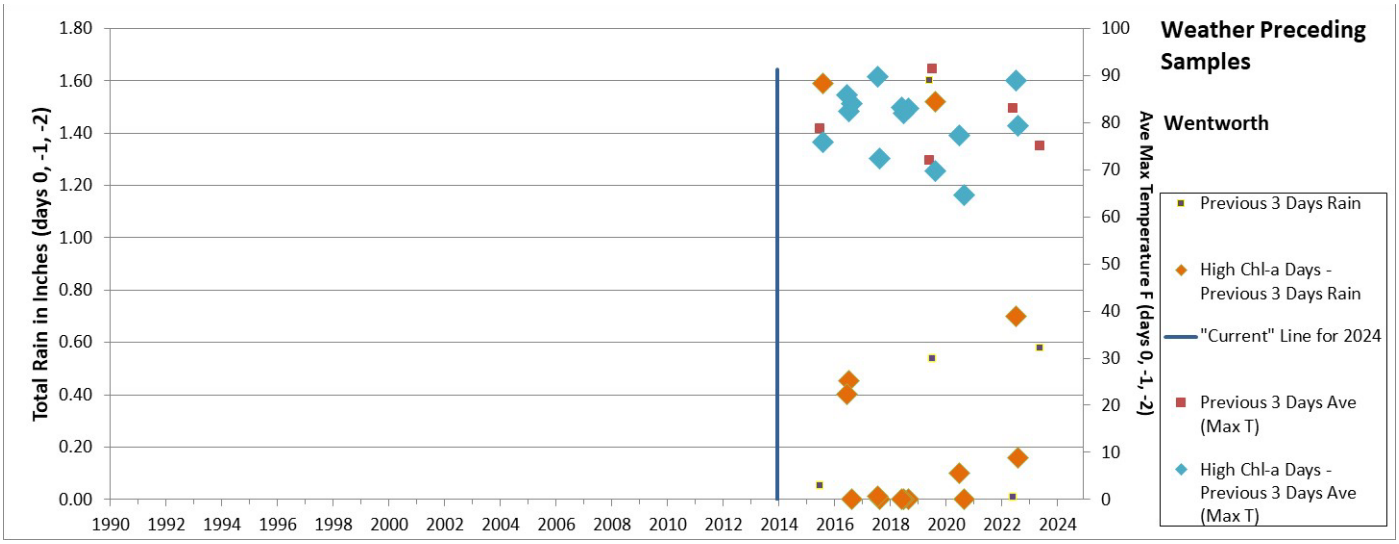
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Spectacle Pond	NHLAK700010601-01	Chlorophyll-a	Groton, Hebron	3-PNS	5-M
Spectacle Pond	NHLAK700010601-01	Phosphorus (Total)	Groton, Hebron	3-PNS	5-M

During the last assessment cycle, it was noted that there was not enough data to make a full assessment decision, and the waterbody was categorized as 3-PNS (insufficient information, potentially not supporting) for the aquatic life integrity designated use, for chlorophyll-a and total phosphorus. A local camp was also in the process of replacing a failing septic system, so it was recommended that additional data be collected to evaluate the response of the waterbody. However, for the current cycle both chlorophyll-a and total phosphorus remain above the thresholds for oligotrophic lakes. Supplemental data collected in 2023 and reviewed during the assessment process confirmed that concentrations of chlorophyll-a and total phosphorus remain elevated. Two of three chlorophyll-a and all three total phosphorus results were above the thresholds. It is recommended that additional data be collected three times a year, between May and September, at station SPEGROVLAPD. Spectacle Pond (NHLAK700010601-01) has been moved from category 3-PNS to 5-M for chlorophyll-a and total phosphorus for the aquatic life integrity designated use based on data collected in the current assessment period.


Chlorophyll-a (ug/L)
SPECTACLE POND (NHLAK700010601-01) {Best Trophic Class = OLIGOTROPHIC}
"Current" Line for 2024
Chlorophyll-a Indicator
CHLOROPHYLL A, UNCORRECTED FOR PHEOPHYTIN
Chlorophyll-a, 10y Median of >= 5 Samples
Chlorophyll-a, 10y Median of < 5 Samples
Sample outside of CP, not used in median calculation


Phosphorus as P (ug/L)
SPECTACLE POND (NHLAK700010601-01) {Best Trophic Class = OLIGOTROPHIC}
"Current" Line for 2024
Total Phosphorus Indicator
PHOSPHORUS AS P
Total Phosphorus, 10y Median of >= 5 Samples
Sample outside of CP, not used in median calculation


Gage CFSM
Gage CFSM on Sample Days
USGS 01077400 COCKERMOUTH RIVER BELOW HARDY BROOK, AT GROTON, NH
"Current" Line for 2024
CFSM from Gage
Gage on High Chl-a Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)

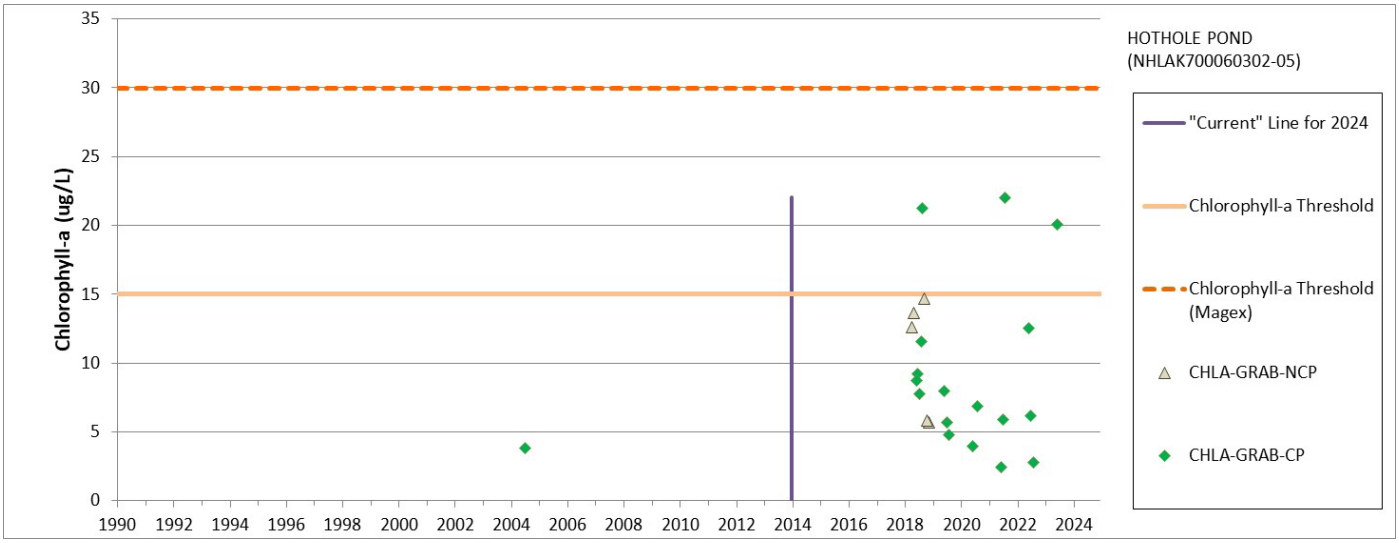


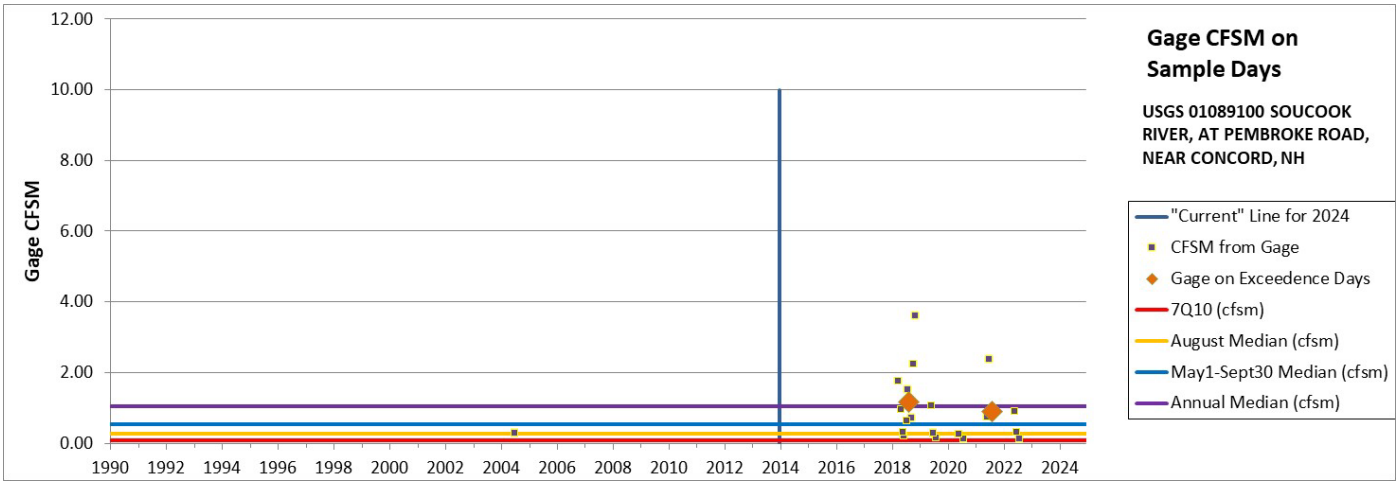
Chlorophyll-a for Primary Contact Recreation (i.e. swimming)

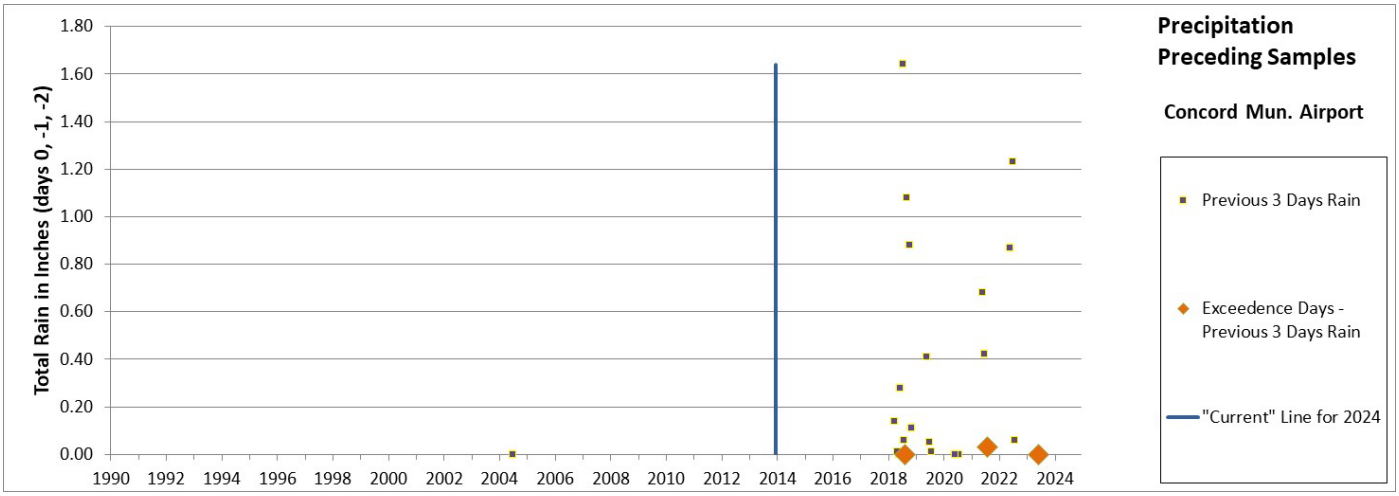
Hothole Pond (NHLAK700060302-05)

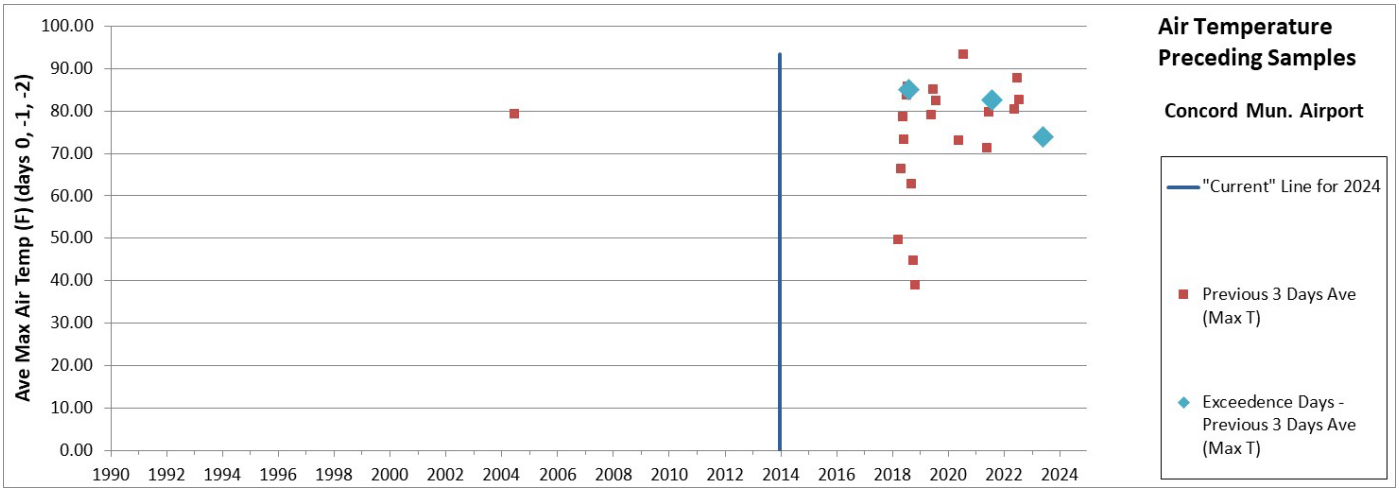
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Hothole Pond	NHLAK700060302-05	Chlorophyll-a	Loudon, Concord	3-PNS	5-M

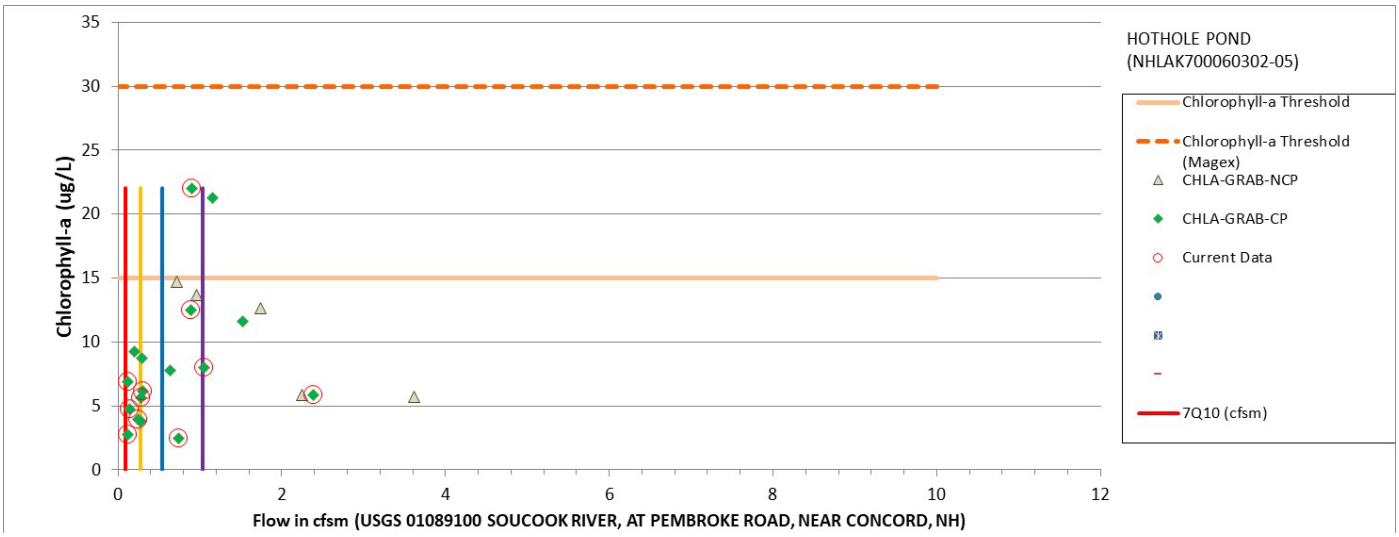
Hothole pond has had four of 18 (22%) exceedances above the threshold of 15 ug/L (including a sample on 8/23/23 with a result of 23.94 ug/L), which was reviewed as supplemental data) for the current assessment period. All of the exceedances were above 20 ug/L and occurred near annual median flow conditions and somewhat low rainfall conditions (< 0.25”). Hothole Pond is currently listed as category 5 (not supporting) for cyanobacteria hepatotoxic microcystins and has had several advisories for cyanobacteria blooms. Recommend continuing the current sampling routine at the deep site (HOTLOUD). Hothole Pond (NHLAK700060302-05) has been moved from 3-PNS to 5-M for chlorophyll-a for the primary contact recreation (i.e. swimming) designated use based on data collected in the current assessment period.




Gage CFSM on Sample Days
USGS 01089100 SOUCOOK RIVER, AT PEMBROKE ROAD, NEAR CONCORD, NH
Gage CFSM
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Precipitation Preceding Samples
Concord Mun. Airport
Total Rain in Inches (days 0, -1, -2)
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024

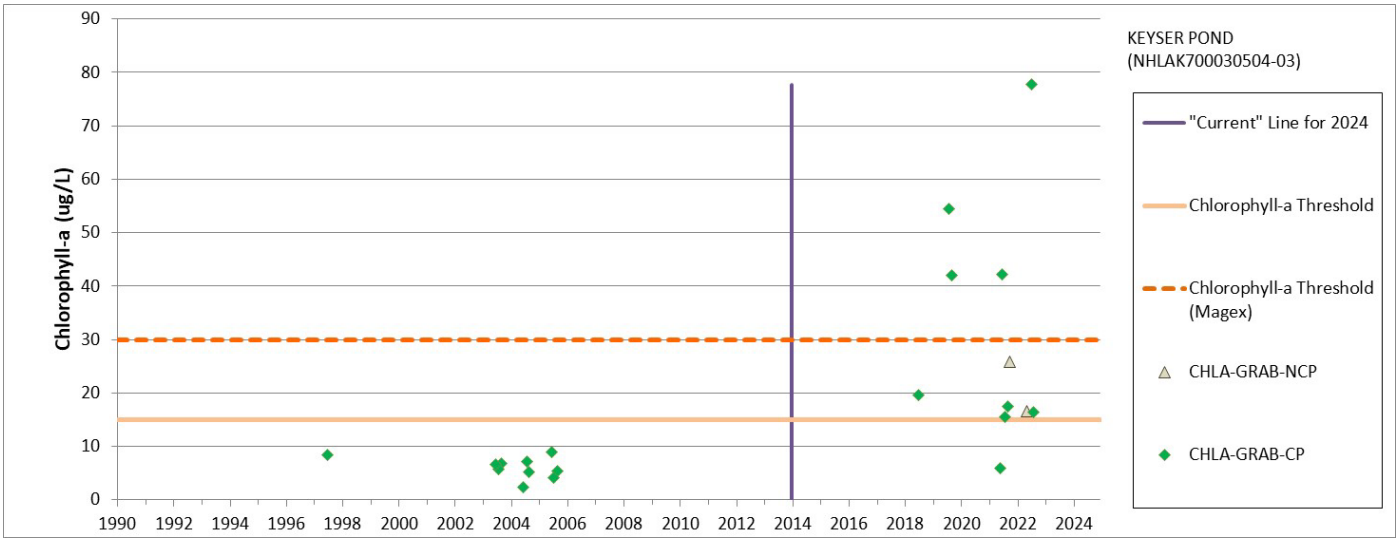

Air Temperature Preceding Samples
Concord Mun. Airport
Ave Max Air Temp (F) (days 0, -1, -2)
"Current" Line for 2024
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)

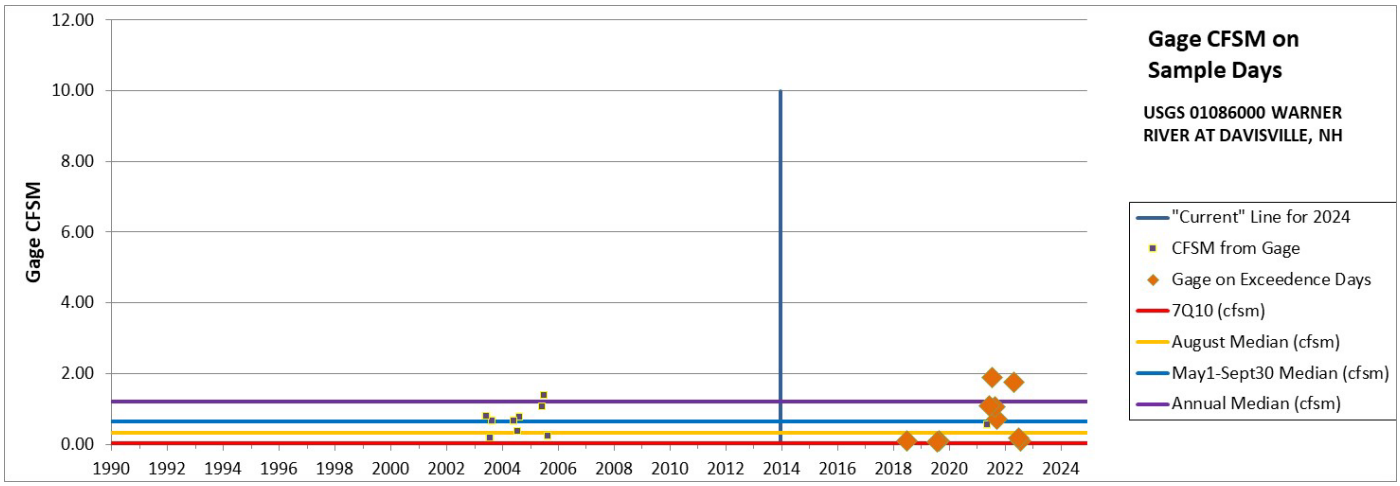


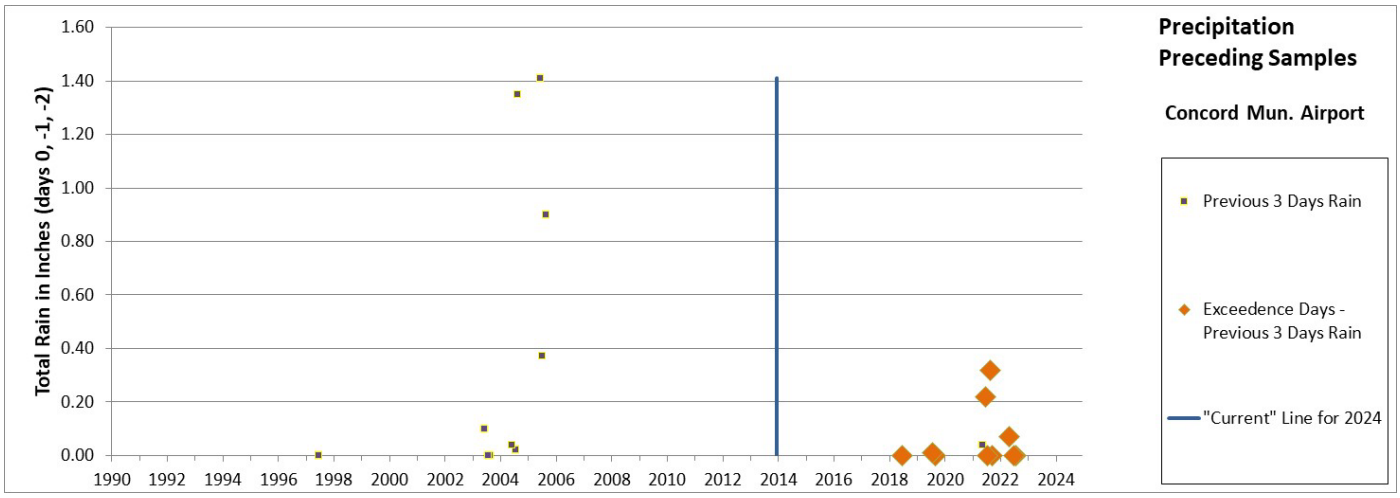
Keyser Pond (NHLAK700030504-03)

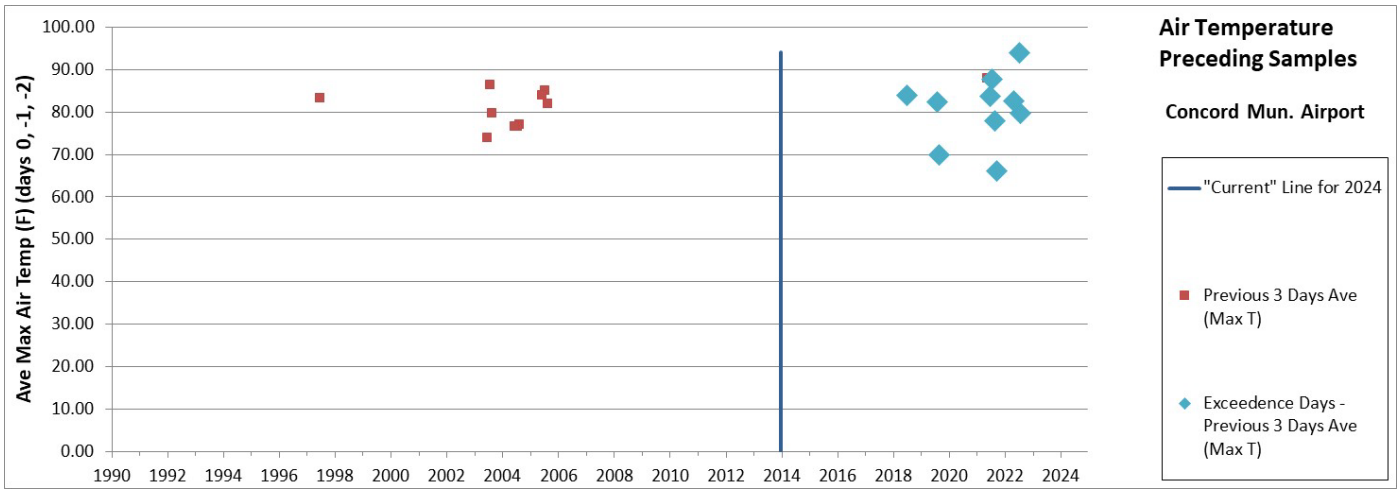
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Keyser Pond	NHLAK700030504-03	Chlorophyll-a	Henniker	3-PNS	5-P

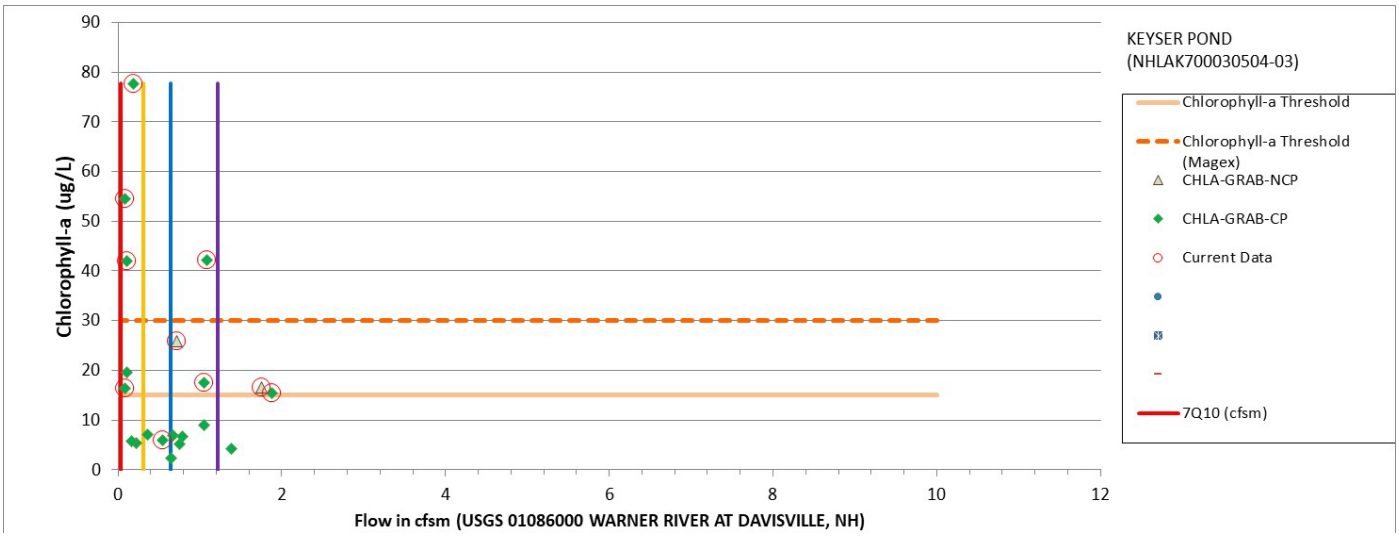
There was not enough data to make a full assessment decision for the past cycle. Increased sampling since 2019 has added 8 more results during the May to September critical period and 2 from the non-critical sampling period. Of the 10 additional samples 9 exceeded the threshold for chlorophyll-a for the primary contact recreation designated use. Four exceedances were above the magnitude of exceedance (well above the threshold) of 30 ug/L. Continued sampling during the critical period should occur at the deep site (KEYHEND). There appears to be a relationship between samples gathered at flow conditions above median flows. Future sampling should attempt to obtain samples during a variety of flow and rainfall conditions Keyser Pond (NHLAK700030504-03) has been moved from 3-PNS to 5-P for chlorophyll-a for the primary contact recreation (i.e. swimming) designated use based on data collected in the current assessment period.




Gage CFSM on Sample Days
USGS 01086000 WARNER RIVER AT DAVISVILLE, NH
Gage CFSM
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Precipitation Preceding Samples
Concord Mun. Airport
Total Rain in Inches (days 0, -1, -2)
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024

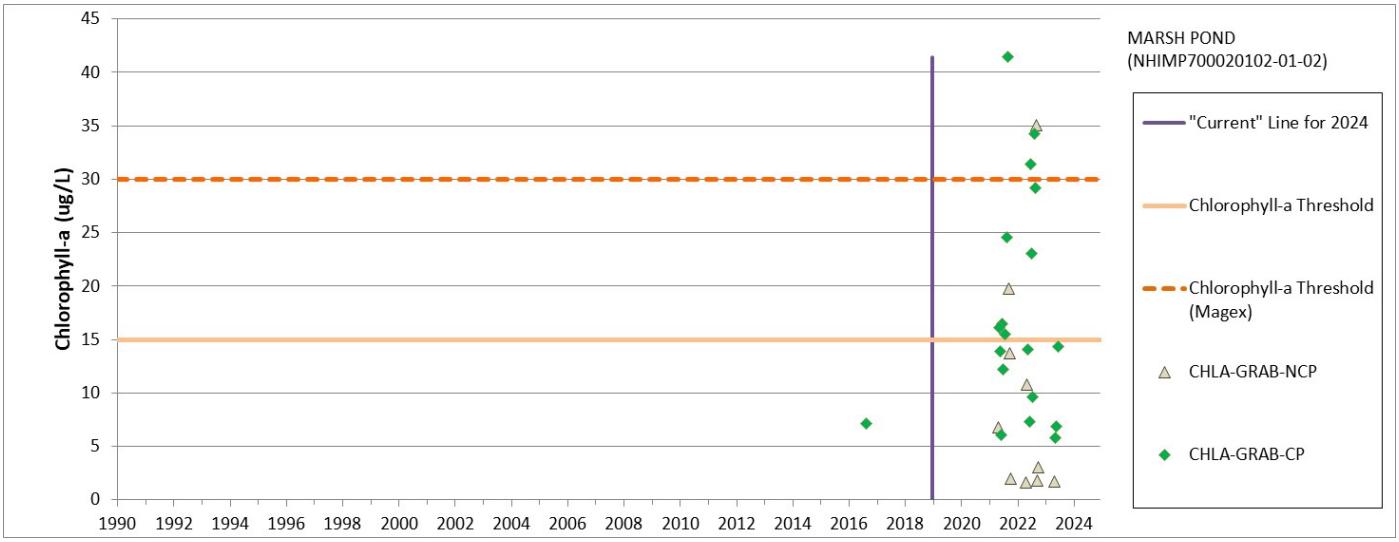

Air Temperature Preceding Samples
Concord Mun. Airport
Ave Max Air Temp (F) (days 0, -1, -2)
"Current" Line for 2024
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)

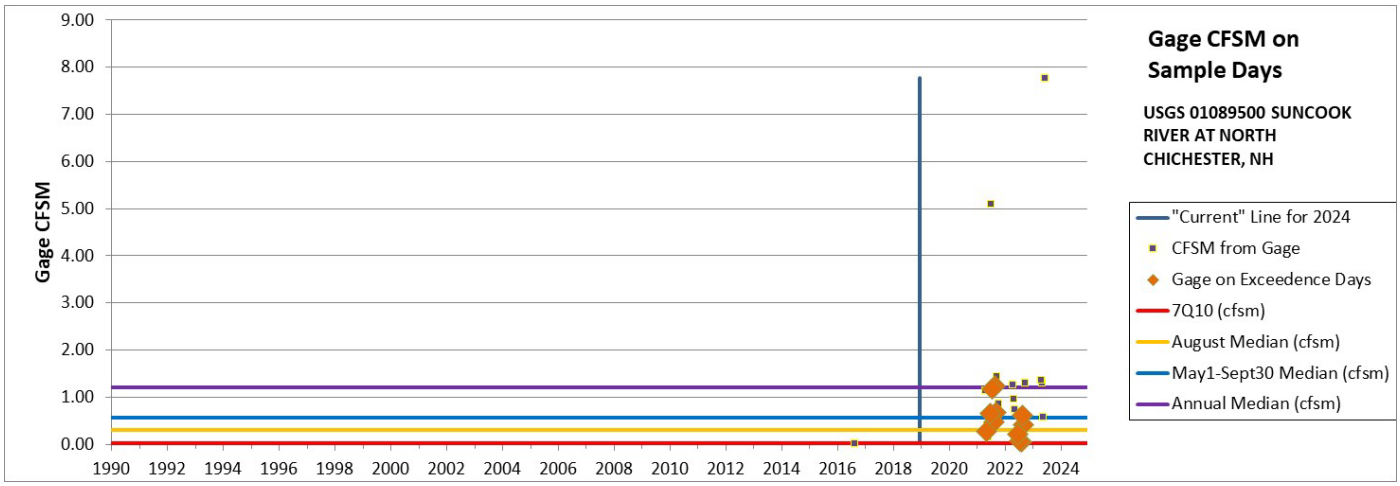


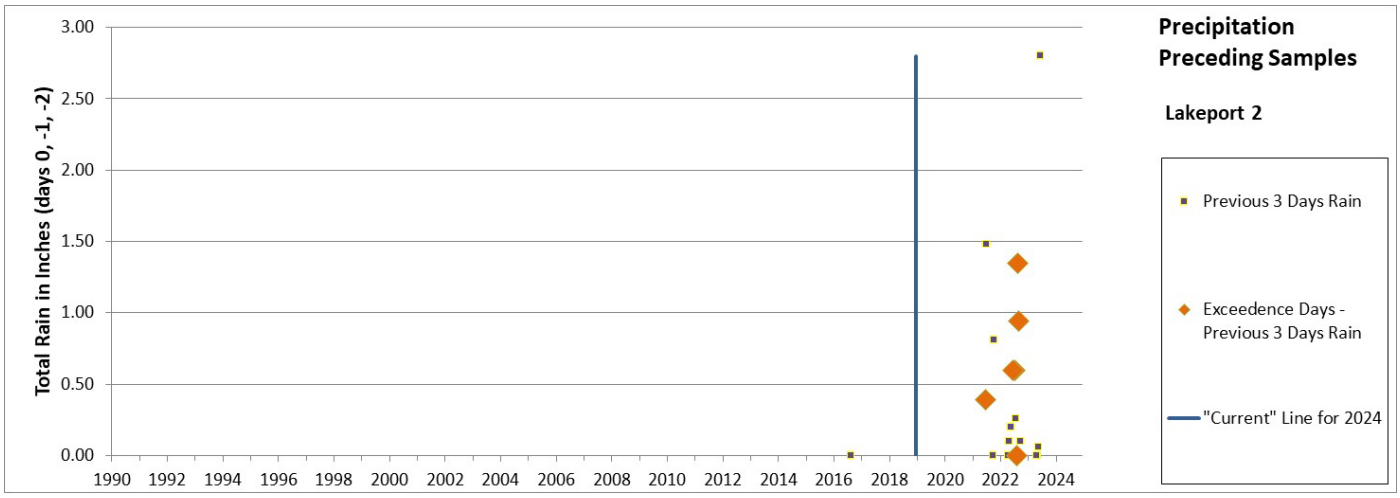
Marsh Pond (NHIMP700020102-01-02)

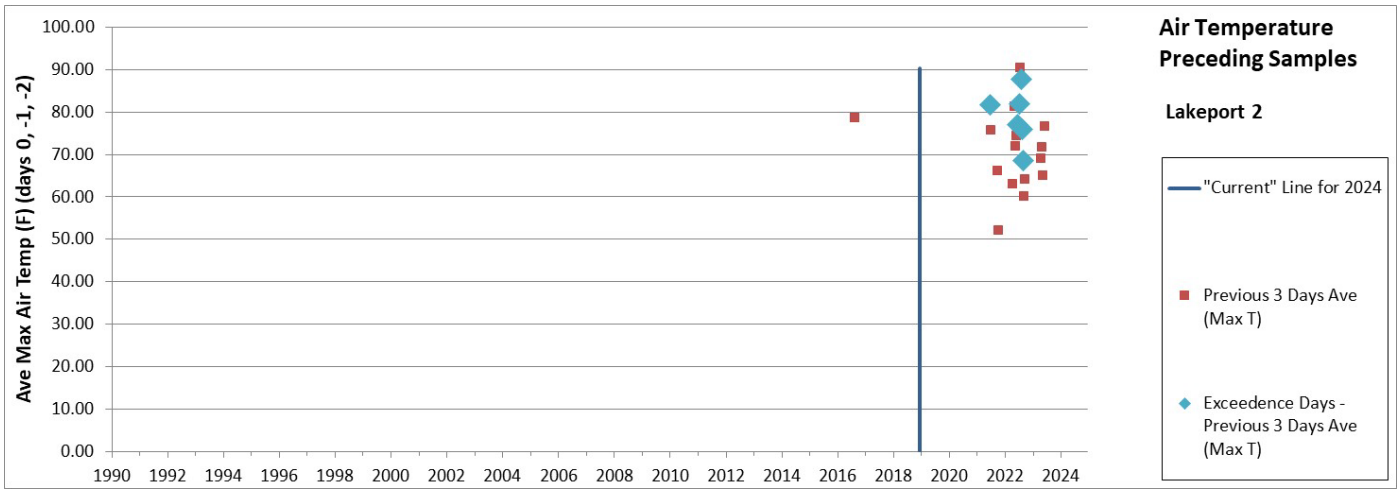
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Marsh Pond	NHIMP700020102-01-02	Chlorophyll-a	New Durham, Alton	3-PAS	5-P

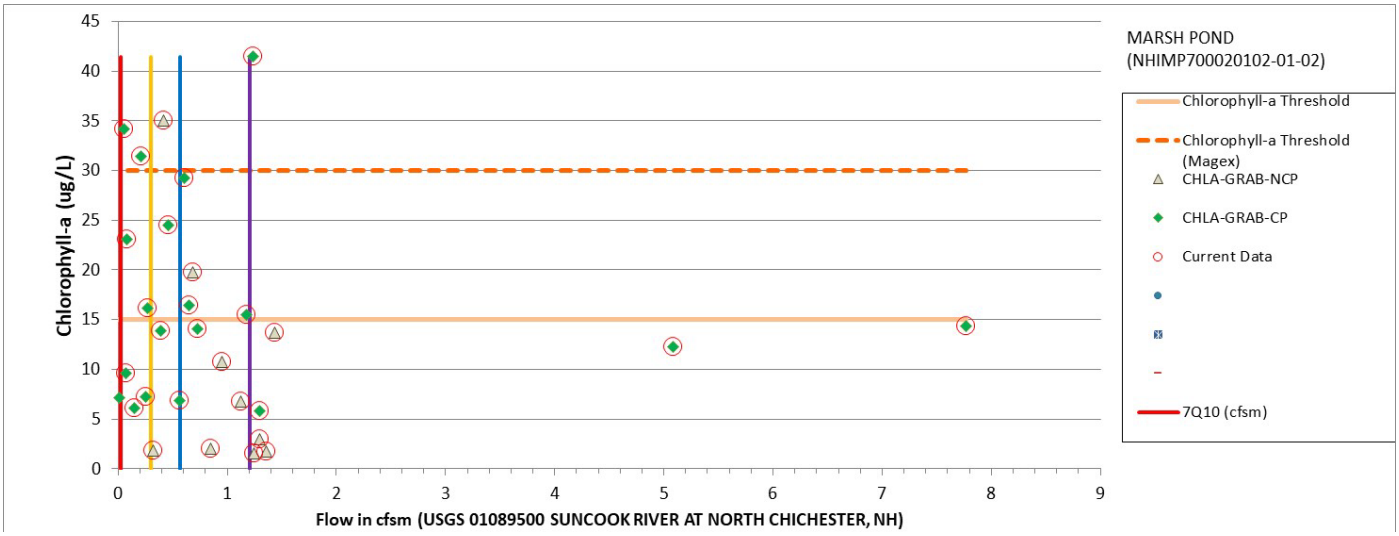
There was insufficient data to list Marsh Pond for the 2020/2022 cycle. Increased sampling has resulted in nearly half (9 of 19) of the samples taken during the critical sampling period exceeding the 15 ug/L threshold. Three of these results were above the magnitude of exceedance (a large exceedance) threshold of 30 ug/L. Two exceedances have also occurred outside of the May to September critical period with one result above the magnitude of exceedance. The increased sampling since the last cycle has revealed that Marsh Pond is impaired for chlorophyll-a. Recommend continuing the current sampling schedule at station ID MARALTD. Marsh Pond (NHIMP700020102-01-02) has been moved from 3-PAS to 5-P for chlorophyll-a for the primary contact recreation (i.e. swimming) designated use based on data collected in the current assessment period.




Gage CFSM on Sample Days
USGS 01089500 SUNCOOK RIVER AT NORTH CHICHESTER, NH
Gage CFSM
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Precipitation Preceding Samples
Lakeport 2
Total Rain in Inches (days 0, -1, -2)
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024


Air Temperature Preceding Samples
Lakeport 2
Ave Max Air Temp (F) (days 0, -1, -2)
"Current" Line for 2024
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)



Cyanobacteria for Primary Contact Recreation (i.e. swimming)

Duncan Lake (NHLAK600020703-01-01)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Duncan Lake	NHLAK600020703-01-01	Cyanobacteria hepatotoxic microcystins	OSSIPEE	3-PAS	5-P

Duncan Lake experienced extreme cyanobacteria blooms (density and duration) in both 2022 and 2023. The Warning in 2022 lasted 57 days, and 56 days in 2023. The dominant cyanobacteria present both years was a benthic *Oscillatoria*, appearing in large clumps along shorelines and at times throughout the lake. As time progressed, each year shifted to a more traditional planktonic *Microcystis* bloom. Densities of samples were often too numerous to count. Samples from 2022 analyzed for cyanotoxins had microcystis ranging from 1.92 µg/L to > 48 µg/L. Duncan Lake (NHLAK600020703-01-01) has been placed in category 5-P for cyanobacteria hepatotoxic microcystins for the primary contact recreation designated use.

Lake Kanasatka (NHLAK700020105-02)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Lake Kanasatka	NHLAK700020105-02	Cyanobacteria hepatotoxic microcystins	MOULTONBOROUGH	n/a	5-P

Lake Kanasatka has had 9 cyanobacteria Warnings in the past 3 years, with an average length of 24 days. The Warnings in 2020 were issued on 12 August lasting for 14 days, and 29 September lasting 10 days. Two Warnings were again issued in 2021 on 3 August lasting 15 days and 13 September lasting 7 days. Another two Warnings were issued in 2022 on 29 July lasting for 13 days and 29 August lasting for 79 days. Three Warnings were issued in 2023, on 2 Jun, 7 August and 22 September lasting for 14, 24 and 83 days respectively. Most of these warnings were lake-wide events, with multiple reports received around the waterbody. Samples collected often contained levels of Dolichospermum that were too numerous to count. Samples from 2022 were analyzed and had concentrations of microcystins ranging from Below the Detectable Limit (BDL) to 10.86 µg/L. In addition to the Warnings issued, seven Alerts were issued from 2020

through 2023. Lake Kanasatka (NHLAK700020105-02) has been placed in category 5-P for cyanobacteria hepatotoxic microcystins for the primary contact recreation designated use.

Northwood Lake (NHLAK700060502-08-01)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Northwood Lake	NHLAK700060502-08-01	Cyanobacteria hepatotoxic microcystins	NORTHWOOD, DEERFIELD, EPSOM	3-PNS	5-P

Northwood Lake has experienced blooms in the last three years (2021, 2022, 2023). 2023 was a particularly severe year for cyanobacteria on Northwood Pond with 5 separate cyanobacteria events (issued as both Warnings and Alerts). The average length of the Warnings was 9.4 days. Though each Warning was relatively short, the bloom material was widespread and intense throughout the waterbody, spanning the entire length of the south shoreline and occasionally along the north shoreline. The dominant cyanobacteria present in Northwood Pond has been *Dolichospermum* and *Microcystis*. Both species can produce hepatotoxins called microcystins. In addition to microcystins, Dolichospermum can produce anatoxin-a, anatoxin-a(S), saxitoxin, and cylindrospermopsin. The one sample from Northwood tested for toxins in 2022 had 11.27 µg/L of microcystins, exceeding the EPA recreational threshold of 8 µg/L. Low levels of anatoxin-a were also found (0.28 µg/L). Northwood Lake (NHLAK700060502-08-01) has been moved from 3-PNS to 5-P for cyanobacteria hepatotoxic microcystins for the primary contact recreation designated use.

Northwood Lake - Town Beach (NHLAK700060502-08-02)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Northwood Lake - Town Beach	NHLAK700060502-08-02	Cyanobacteria hepatotoxic microcystins	NORTHWOOD	n/a	5-P

The parent waterbody that this beach resides on has experienced cyanobacteria blooms in recent years and has subsequently been impaired for cyanobacteria hepatotoxic microcystins for the primary contact recreation designated use (2024:5-P). In 2023, there were 5 separate bloom events observed on the parent waterbody of Northwood Lake. In 2023, the average length of the warning was 9.4 days. Based upon reports and resampling, the bloom material was widespread, spanning the entire length of the south shoreline and occasionally along the north shoreline (where the beach is located). The dominant cyanobacteria present in Northwood Pond has been Dolichospermum and Microcystis. The one sample from Northwood tested for toxins in 2022 had 11.27 µg/L of microcystins, exceeding the EPA recreational threshold of 8 µg/L. Northwood Lake -Town Beach has been moved from n/a to 5-P for cyanobacteria hepatotoxic microcystins for the primary contact recreation designated use.

Tucker Pond (NHLAK700030304-07)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Tucker Pond	NHLAK700030304-07	Cyanobacteria hepatotoxic microcystins	SALISBURY	3-PNS	5-P

Tucker Pond has experienced a cyanobacteria bloom event every year since 2019. The duration of these blooms has ranged from 14 days (2019) to 132 days (2020). This past year in 2023, there was an active cyanobacteria Warning in place from 5 July through 27 July (22 days) and 31 July through 2 November. In addition to duration, cyanobacteria blooms at Tucker Pond have been severe with samples frequently at a cyanobacteria density too numerous to count. Resampling efforts on Tucker Pond indicate that the bloom is widespread around the waterbody. The dominant cyanobacteria present in Tucker Pond over the last five years is *Woronichinia* and *Microcystis*. Samples tested for the

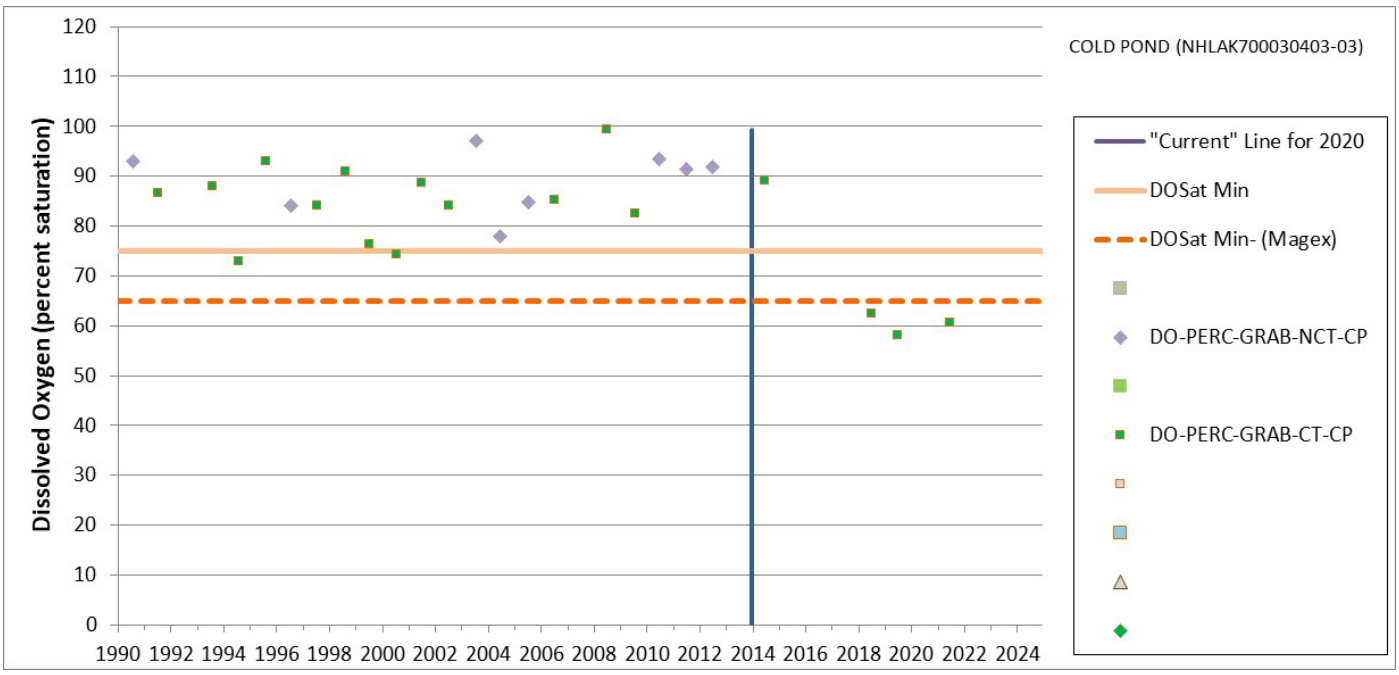
hepatotoxin microcystins in 2020 and 2021 had below detectable to low levels of microcystins. From the ten samples analyzed for microcystins in 2022, all had detectable levels. Densities of microcystins were much higher than previous years, ranging from 0.40 µg/L to 15.23 µg/L. Tucker Pond (NHLAK700030304-07) has been moved from 3-PNS to 5-P for cyanobacteria hepatotoxic microcystins for the primary contact recreation designated use.

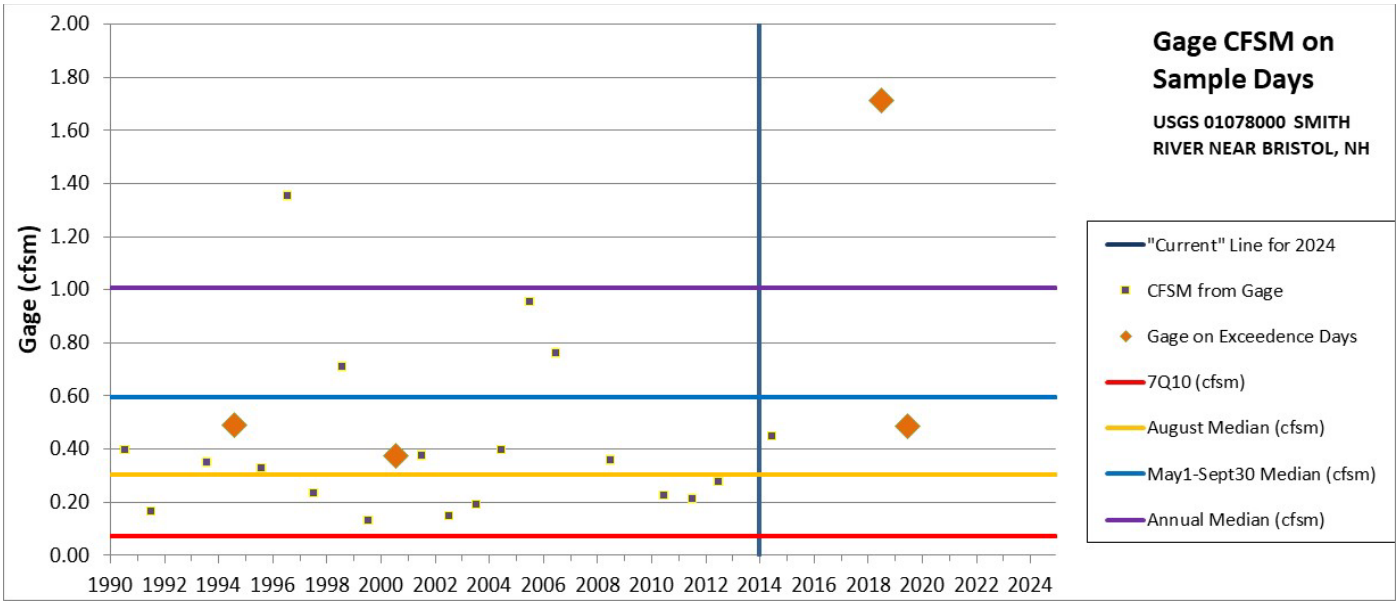
Dissolved Oxygen Saturation for Aquatic Life Integrity

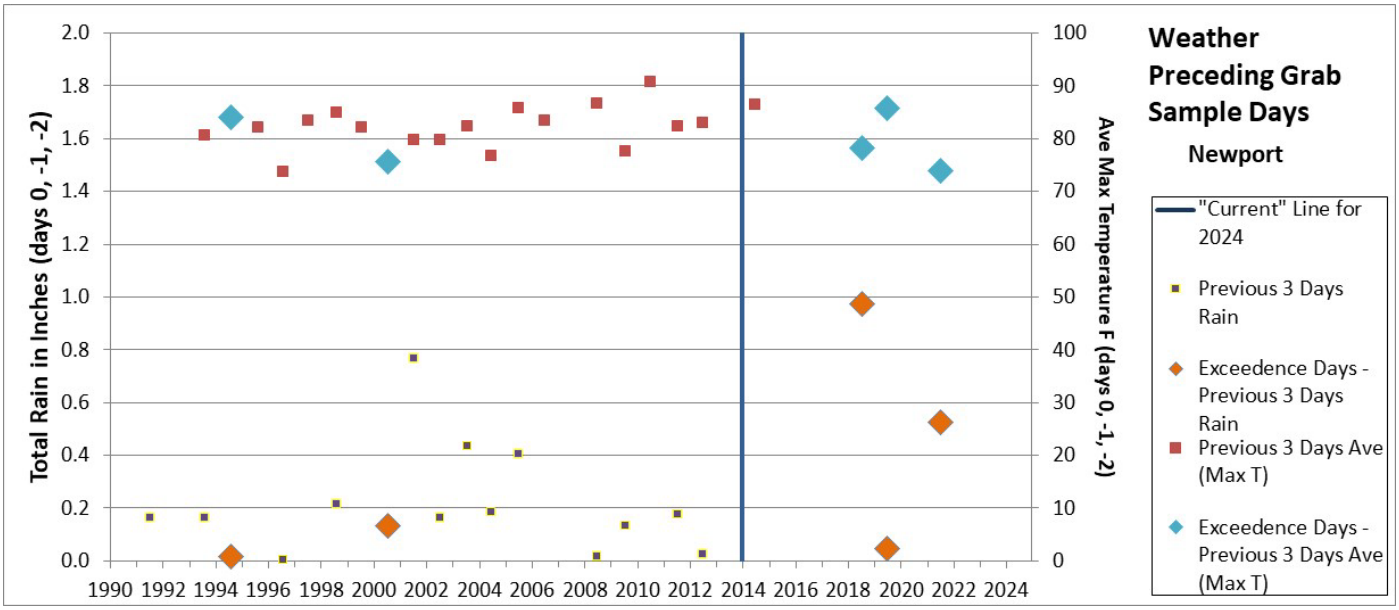
Cold Pond (NHLAK700030403-03)

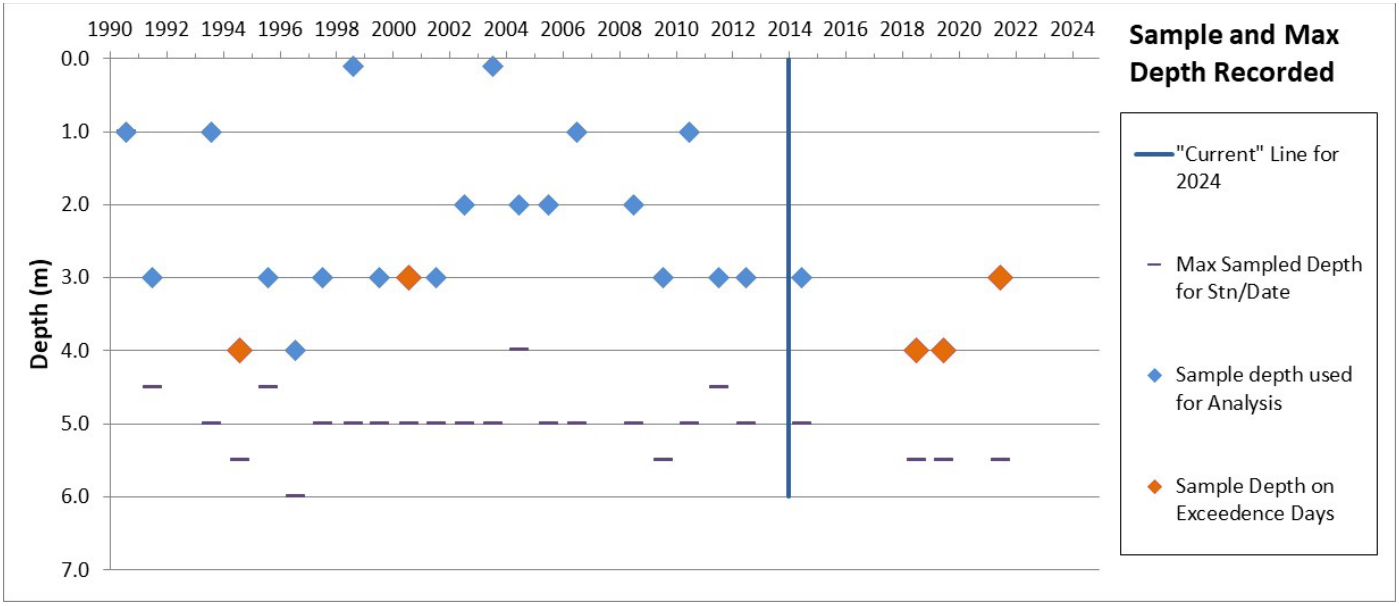
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Cold Pond	NHLAK700030403-03	DISSOLVED OXYGEN SATURATION	ANDOVER	3-PNS	5-M

Three of the four (75%) grab samples collected at station COLANDD in the current assessment period (2014-2024) were below the dissolved oxygen (percent saturation) threshold of 75%, and all three of these were below the threshold of the magnitude of exceedance for dissolved oxygen (percent saturation) of 65%. Samples in this assessment period for this Class A waterbody were collected at flows between of 0.49 and 1.71 cfsm at the Smith River gage near Bristol (USGS 01078000). Three-day rainfall totals ranged between 0.05 and 0.98 inches, and water temperatures ranged between 19.3 and 22.8 degrees Celsius. Cold Pond (NHLAK700030403-03) has been moved from 3-PNS to 5-M for dissolved oxygen saturation for the aquatic life integrity designated use based on data collected in the current assessment period.




Gage CFSM on Sample Days
USGS 01078000 SMITH RIVER NEAR BRISTOL, NH
Gage (cfsm)
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Weather Preceding Grab Sample Days
Newport
Total Rain in Inches (days 0, -1, -2)
Ave Max Temperature F (days 0, -1, -2)
"Current" Line for 2024
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)



Notes:
DO-PERC-GRAB-CT-CP = Grab samples of dissolved oxygen during the early morning hours of the summer critical period.
DO-PERC-GRAB-CT-NCP = Grab samples of dissolved oxygen during the early morning hours and not during the summer critical period.
DO-PERC-GRAB-NCT-CP = Grab samples of dissolved oxygen not in the early morning hours of the summer critical period.
DO-PERC-24HR-MEAN-CP = 24-hour average dissolved oxygen saturation from a datalogger deployed during the summer critical period.

Lamprey River South Assessment Zone (NHEST600030709-01-02)

Assessment Zone	Assessment Unit IDs	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Lamprey River South	NHEST600030709-01-02	DISSOLVED OXYGEN SATURATION	NEWMARKET	3-PNS	5-M

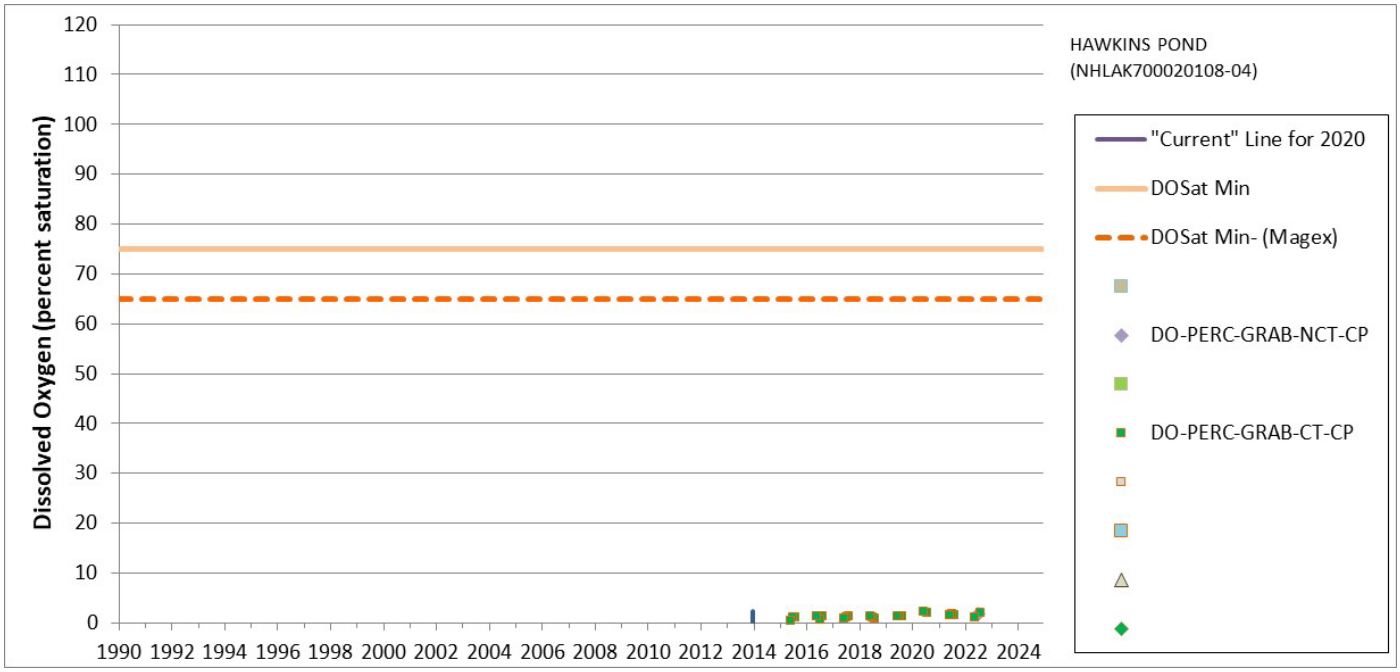
The Lamprey River South Assessment Zone (NHEST600030709-01-02) has been moved from category 3-PNS to 5-M for dissolved oxygen saturation for the aquatic life integrity designated use based on data collected in the current assessment period. A full parameter level discussion of the rational used to make the assessment determination for this waterbody is provided by assessment zone in the Technical Support Document for the Great Bay Estuary Aquatic Life Use Support Assessments, 2024 305(b) Report/303(d) List.

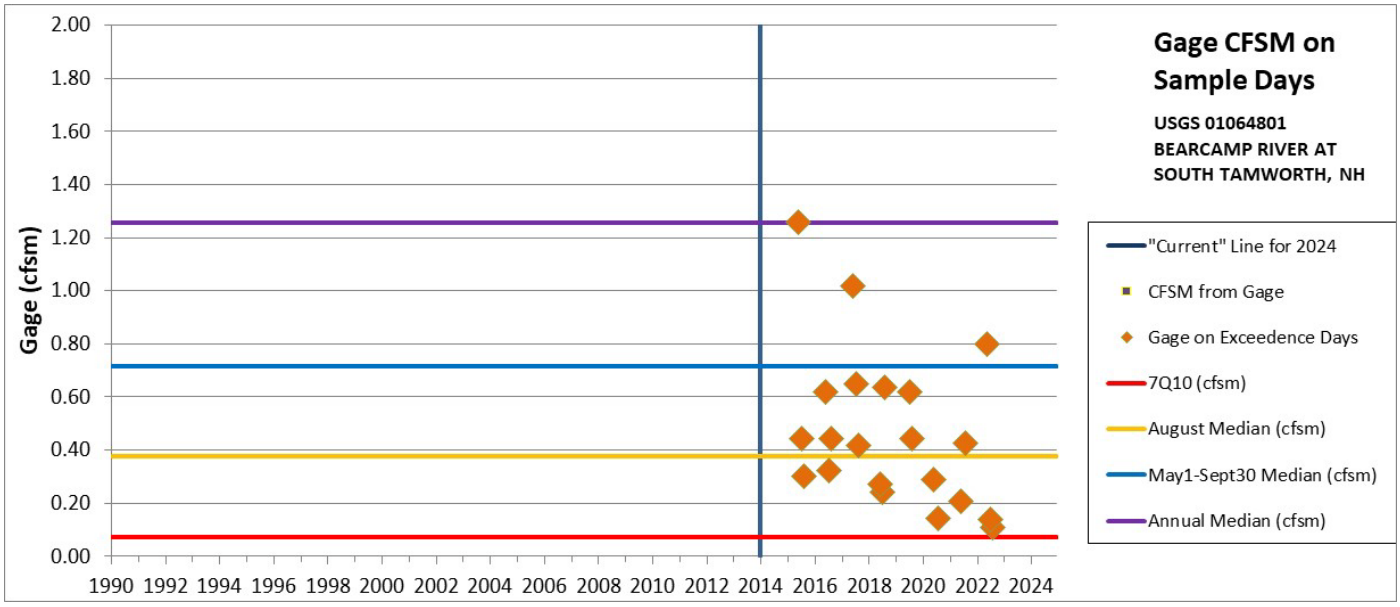
Hawkins Pond (NHLAK700020108-04)

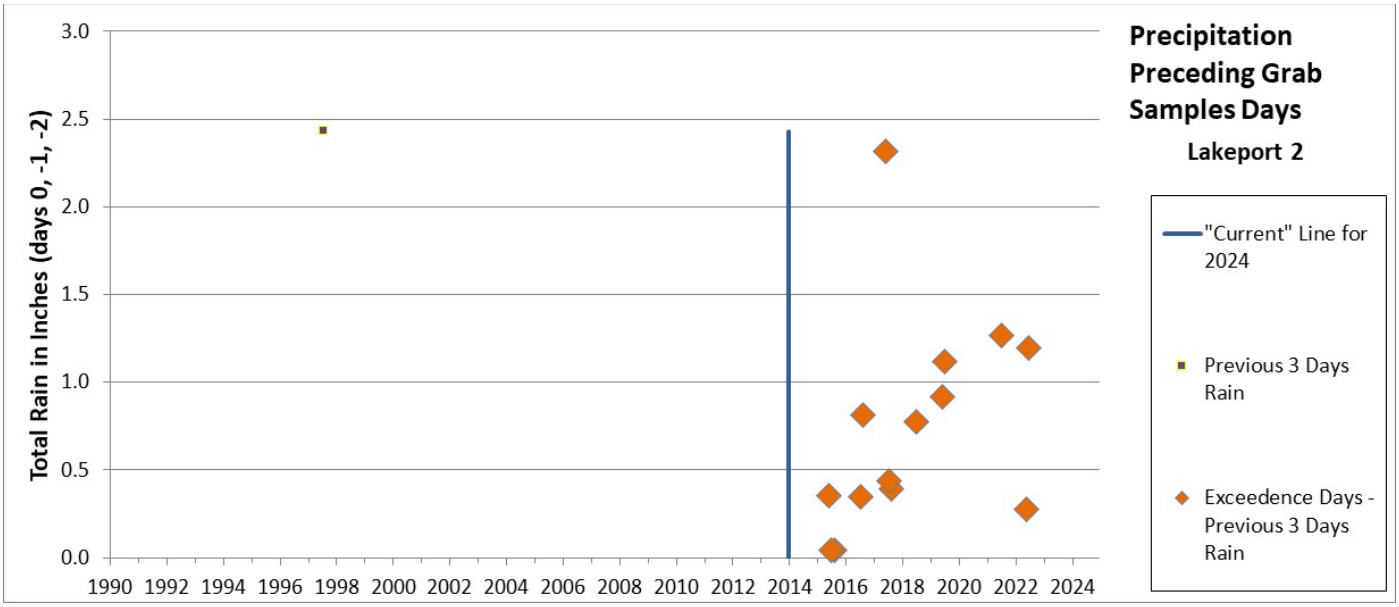
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Hawkins Pond	NHLAK700020108-04	DISSOLVED OXYGEN SATURATION	CENTER HARBOR	3-PNS	5-P

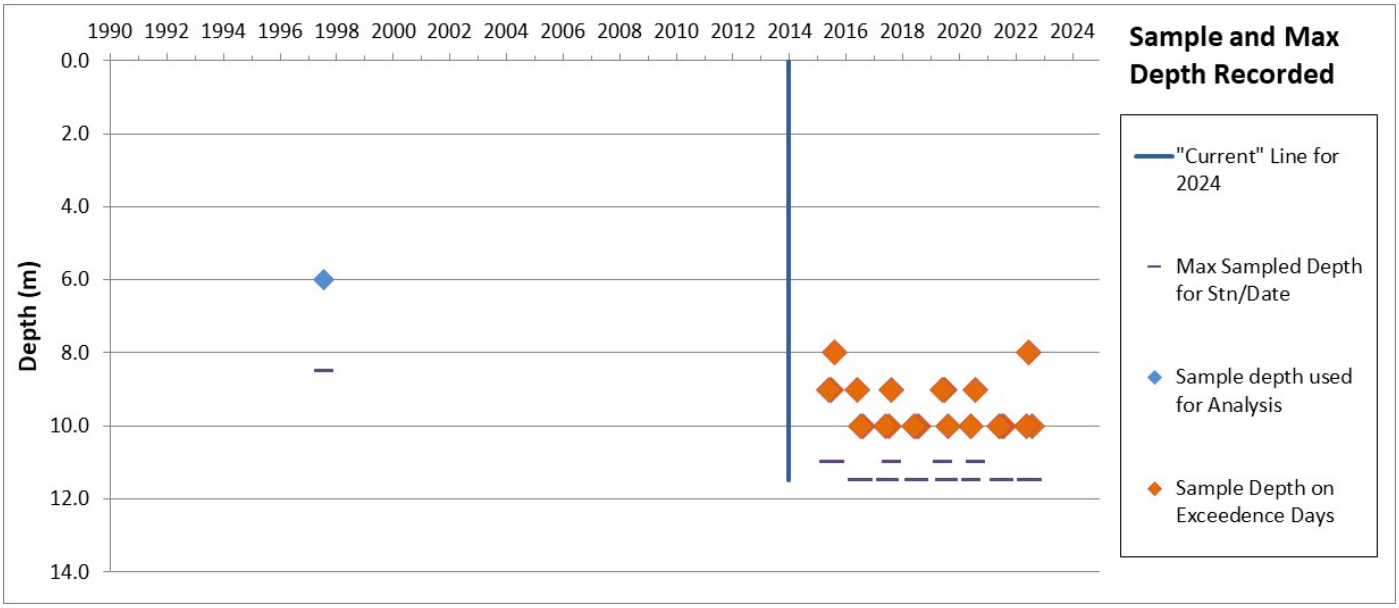
Twenty-three of the 23 (100%) grab samples collected at station HAWCEND in the current assessment period (2014-2024) were below the dissolved oxygen (percent saturation) threshold of 75%. Twenty-two of the samples were collected within the critical time and critical period, and one was collected in the critical period, but not critical time. The low dissolved oxygen samples were collected between flows of 0.11 to 1.26 cfsm on the Bearcamp River gate at South Tamworth (USGS 01064801), with a 3-day rainfall total between 0.05 and 1.27 inches, and water temperatures between 5.10 and 8.40 degrees Celsius. Because this is a Class A waterbody the 75% daily average threshold must be met at any depth, and the samples used in the assessment were within a meter or two above bottom sediments. Looking at whole water column profiles from VLAP data, it appears that the oxygen deficits occur at or below a depth of 4-5 meters as the summer stratification season progresses, while the top 0.1-4 meter depths appear to have

dissolved oxygen > 75%. Hawkins Pond (NHLAK700020108-04) has been moved from 3-PNS to 5-P for dissolved oxygen saturation for the aquatic life integrity designated use based on data collected in the current assessment period.









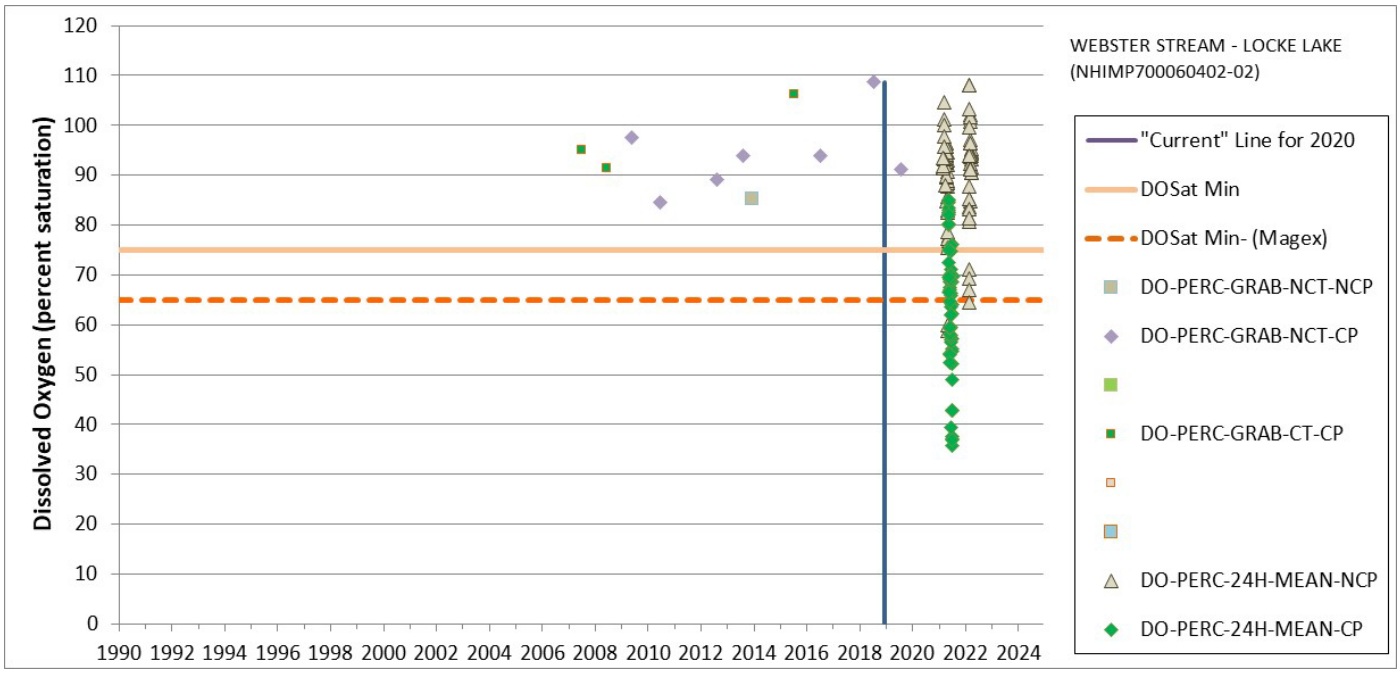
Notes:
DO-PERC-GRAB-CT-CP = Grab samples of dissolved oxygen during the early morning hours of the summer critical period.
DO-PERC-GRAB-CT-NCP = Grab samples of dissolved oxygen during the early morning hours and not during the summer critical period.
DO-PERC-GRAB-NCT-CP = Grab samples of dissolved oxygen not in the early morning hours of the summer critical period.
DO-PERC-24HR-MEAN-CP = 24-hour average dissolved oxygen saturation from a datalogger deployed during the summer critical period.

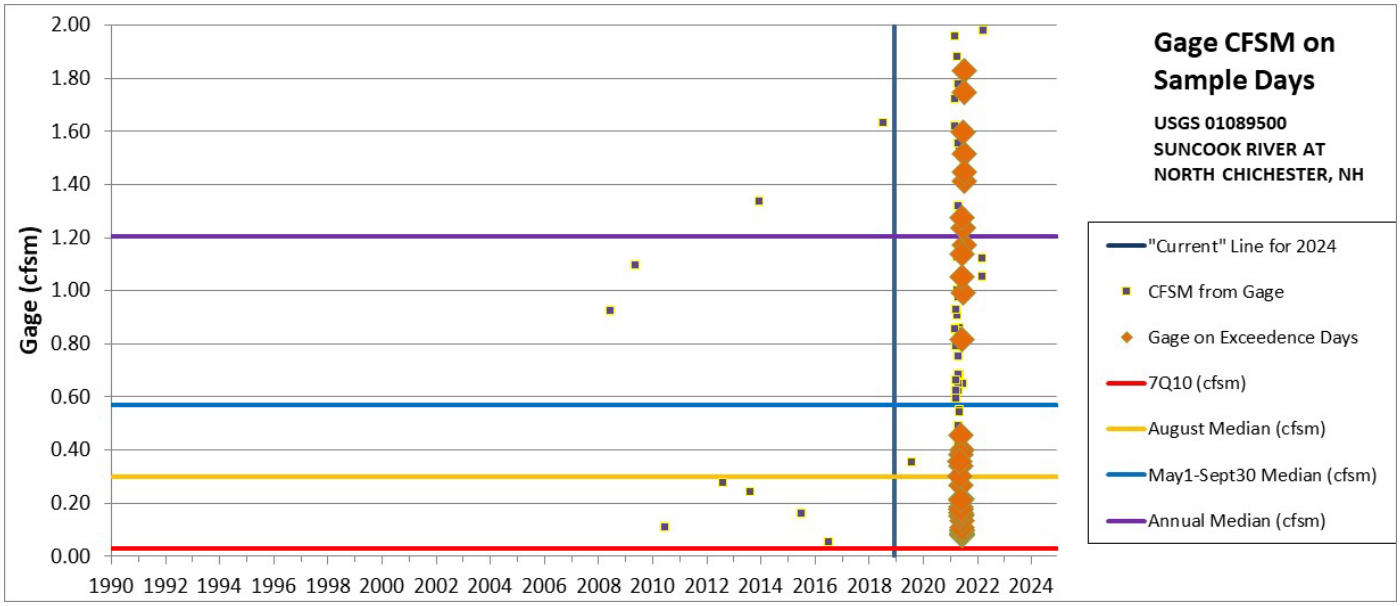
Webster Stream – Locke Lake (NHIMP700060402-02)

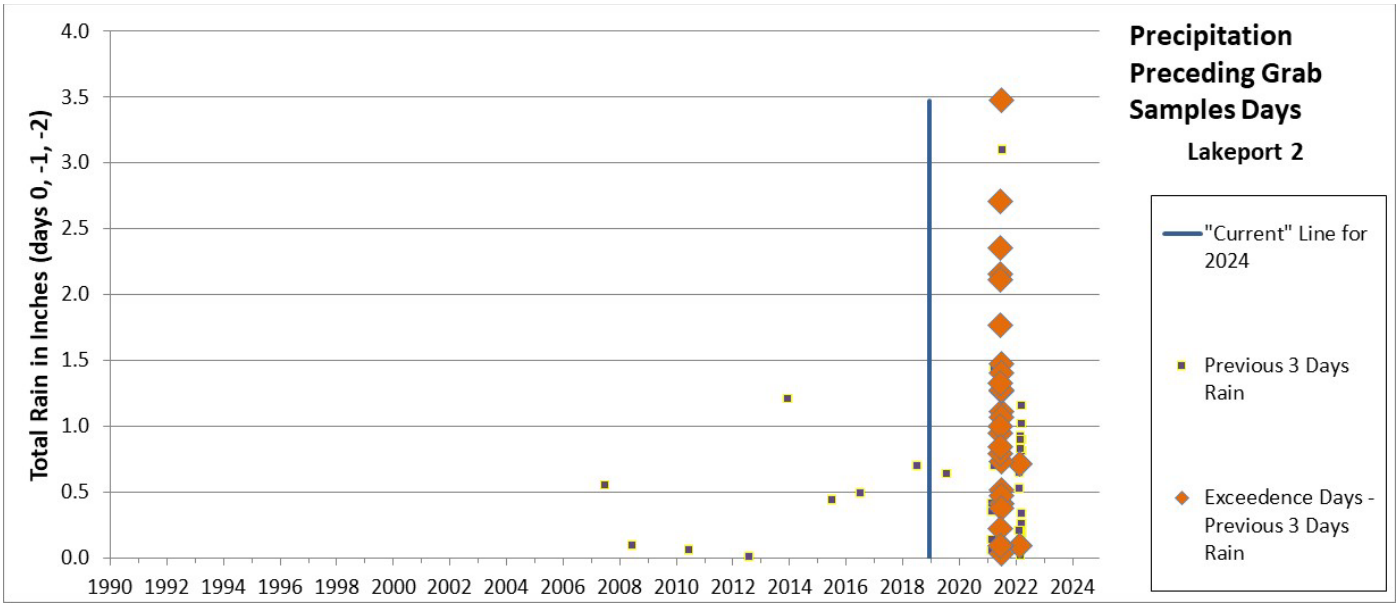
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Webster Stream – Locke Lake	NHIMP700060402-02	DISSOLVED OXYGEN SATURATION	BARNSTEAD	3-PAS	5-P

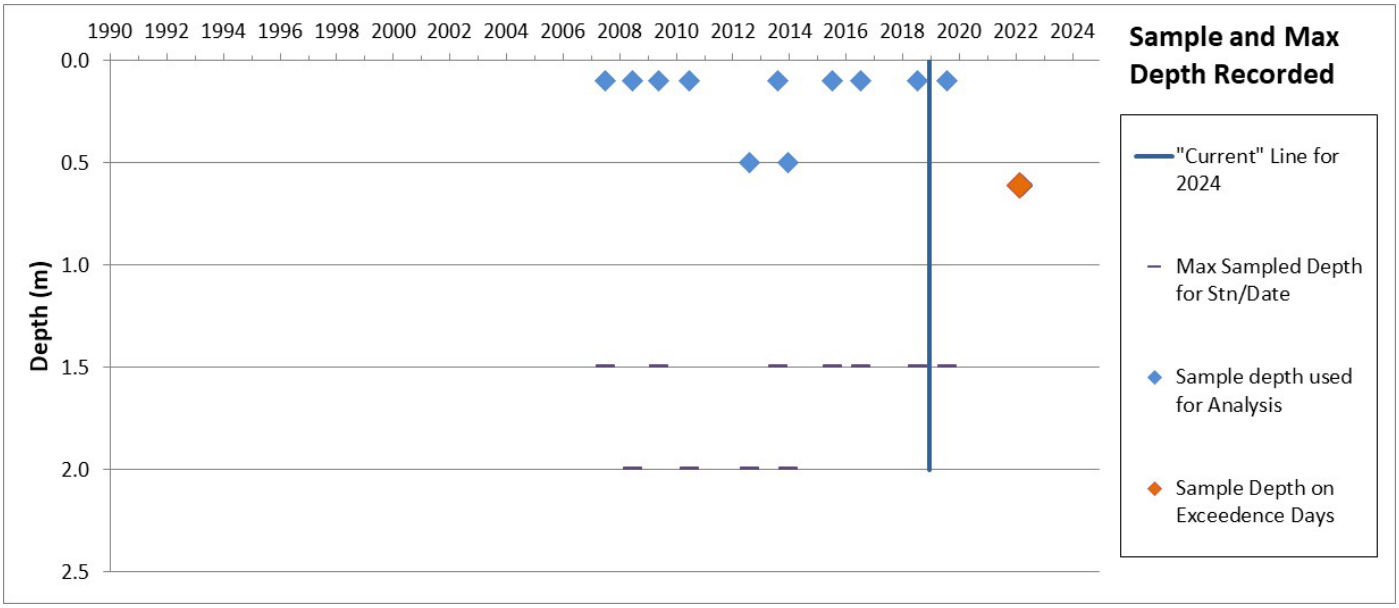
Fifty-six of the 148 (38%) grab samples collected at station WQMS1B in the current assessment period (2019-2024) were below the dissolved oxygen (percent saturation) threshold of 75%. The samples below the threshold were collected as 24-hour mean samples within the critical period (n=45) and some (n=3) were collected during the

noncritical period. The samples were collected at water temperatures of 3.73 to 27.77 degrees C, flows of 0.0 to 1.83 cfsm on the Suncook River gage at North Chichester (01089500) and with a 3-day rainfall totals between 0.8 and 1.7 inches. Webster Stream – Locke Lake (NHIMP700060402-02) has been moved from 3-PAS to 5-P for dissolved oxygen saturation for the aquatic life integrity designated use based on data collected in the current assessment period.









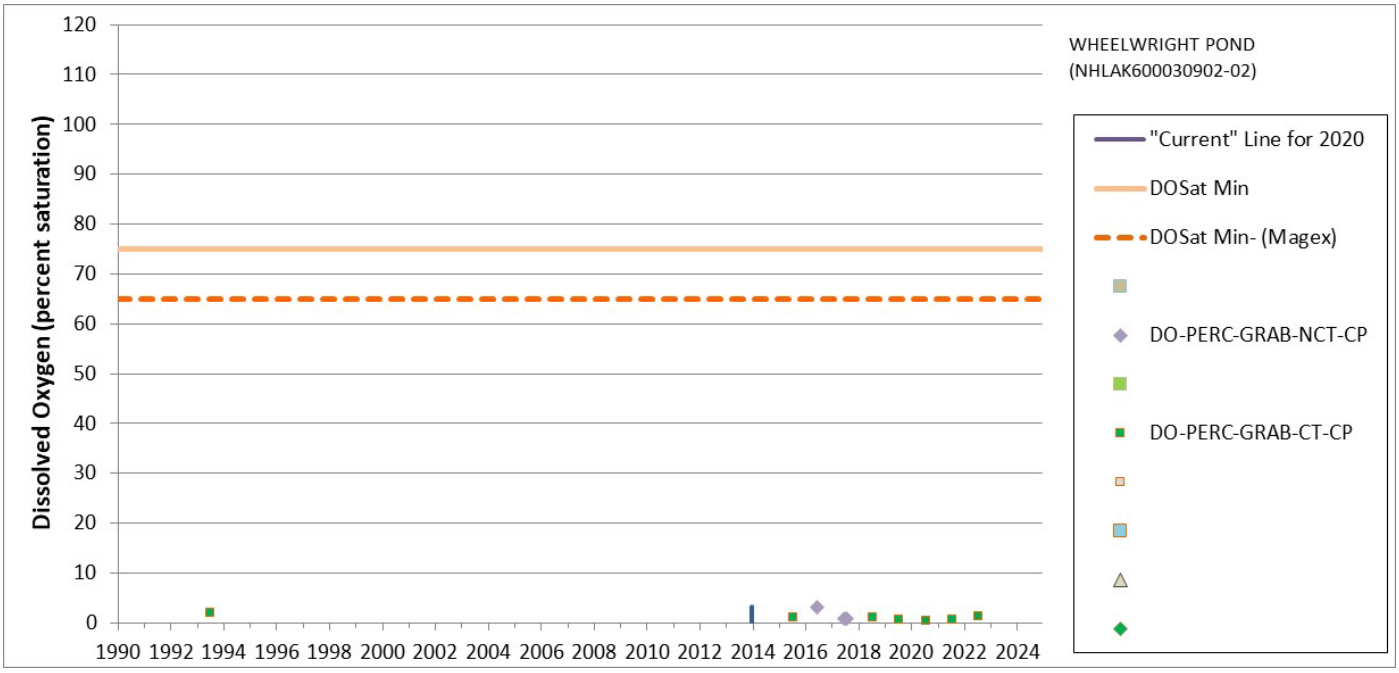
Notes:
DO-PERC-GRAB-CT-CP = Grab samples of dissolved oxygen during the early morning hours of the summer critical period.
DO-PERC-GRAB-CT-NCP = Grab samples of dissolved oxygen during the early morning hours and not during the summer critical period.
DO-PERC-GRAB-NCT-CP = Grab samples of dissolved oxygen not in the early morning hours of the summer critical period.
DO-PERC-24HR-MEAN-CP = 24-hour average dissolved oxygen saturation from a datalogger deployed during the summer critical period.

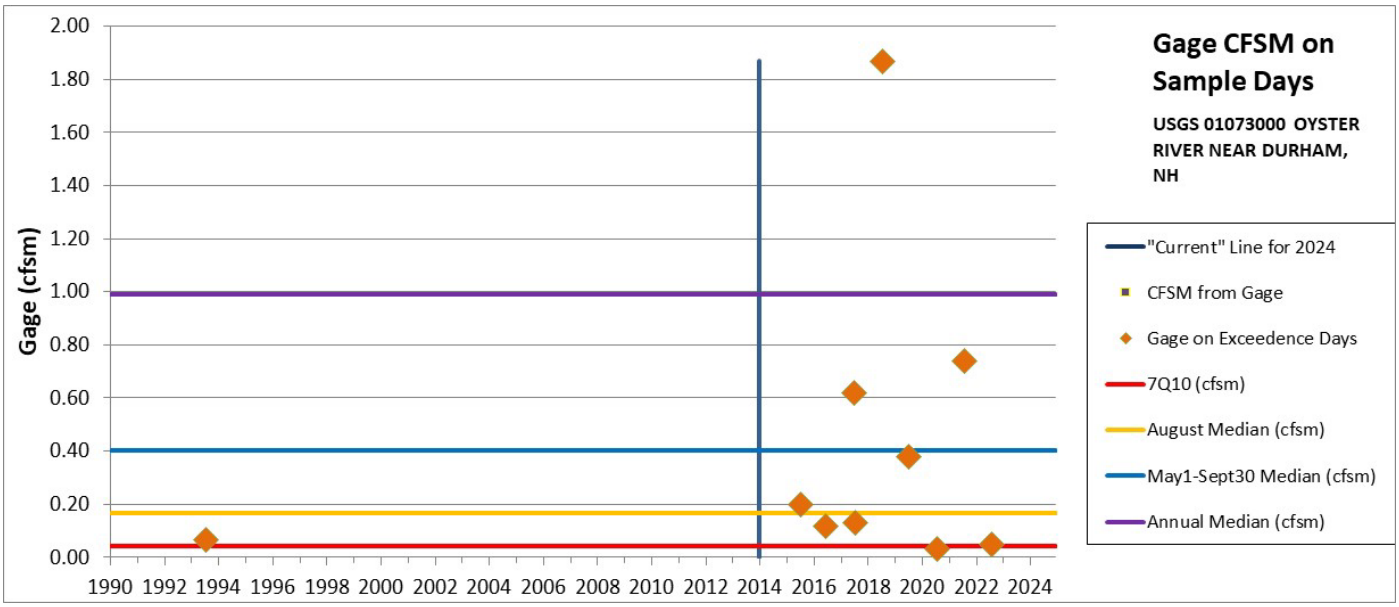
Wheelwright Pond (NHLAK600030902-02)

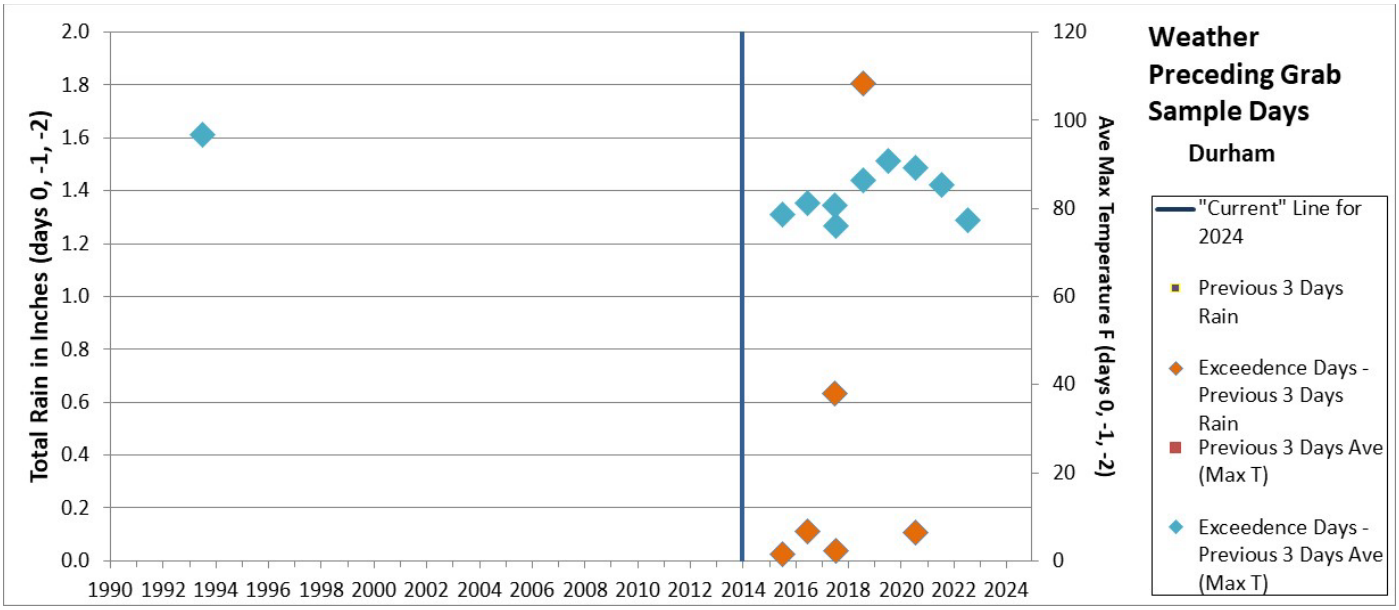
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Wheelwright Pond	NHLAK600030902-02	DISSOLVED OXYGEN SATURATION	LEE	3-PNS	5-P

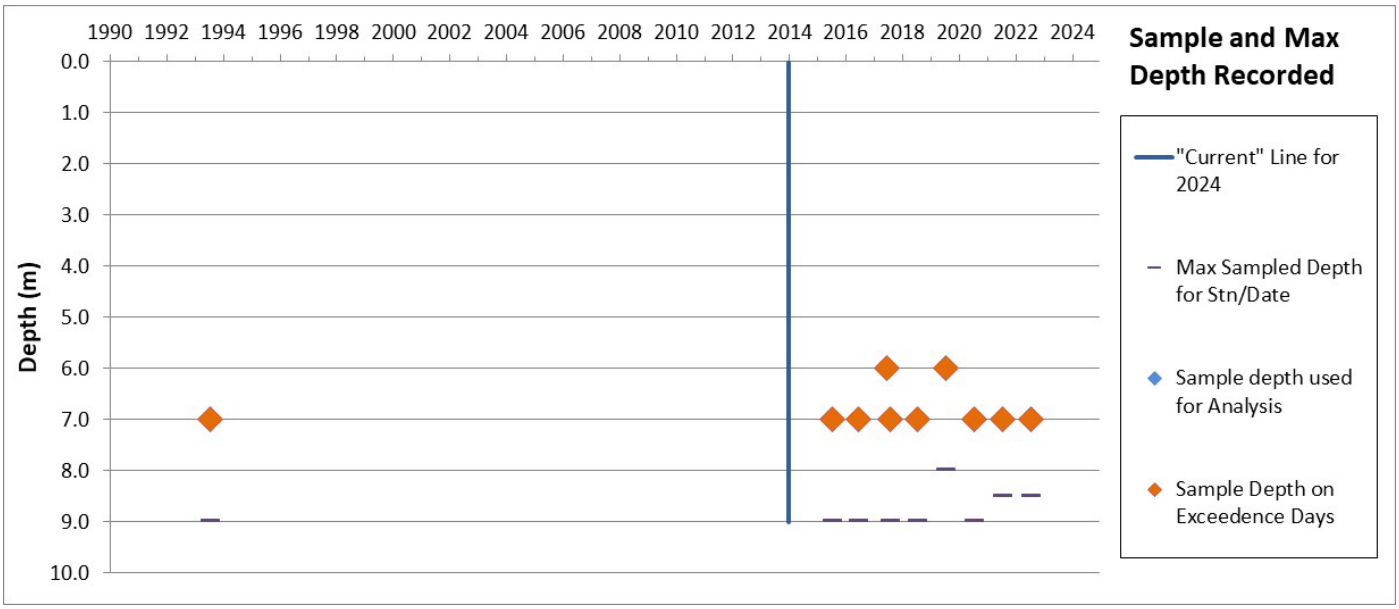
Nine of the nine (100%) grab samples collected at station WHELEED in the current assessment period (2014-2024) were below the dissolved oxygen (percent saturation) threshold of 75%. Six of the nine samples were collected within both the critical time and period, three were collected within the critical period but outside of the critical time. The low dissolved oxygen samples were collected between flows of 0.03 to 1.87 cfsm on the Oyster River gage near New

Durham (USGS 01073000), with a 3-day rainfall total between 0.03 and 1.81 inches, and water temperatures between 8.0 and 14 degrees Celsius. Because this is a Class A waterbody the 75% daily average threshold must be met at any depth, and samples used in the assessment were within a meter or two above bottom sediments. Looking at whole water column profiles from VLAP data, it appears that the oxygen deficits occur at or below a depth of 4 meters as the summer stratification season progresses, while the top 0.1-4 meter depths appear to be > 75%. Wheelwright Pond (NHLAK600030902-02) has been moved from 3-PNS to 5-P for dissolved oxygen saturation for the aquatic life integrity designated use based on data collected in the current assessment period.









Notes:
DO-PERC-GRAB-CT-CP = Grab samples of dissolved oxygen during the early morning hours of the summer critical period.
DO-PERC-GRAB-CT-NCP = Grab samples of dissolved oxygen during the early morning hours and not during the summer critical period.
DO-PERC-GRAB-NCT-CP = Grab samples of dissolved oxygen not in the early morning hours of the summer critical period.
DO-PERC-24HR-MEAN-CP = 24-hour average dissolved oxygen saturation from a datalogger deployed during the summer critical period.

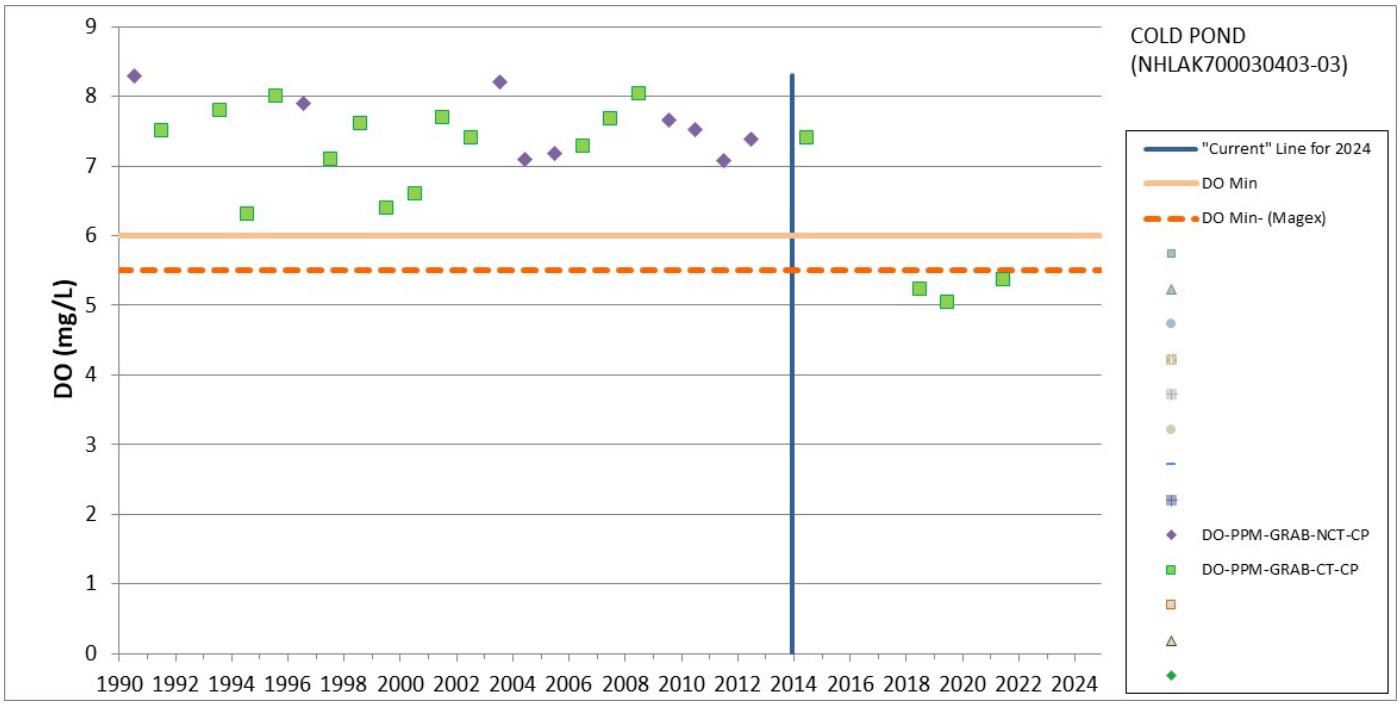
Dissolved Oxygen Concentration for Aquatic Life Integrity

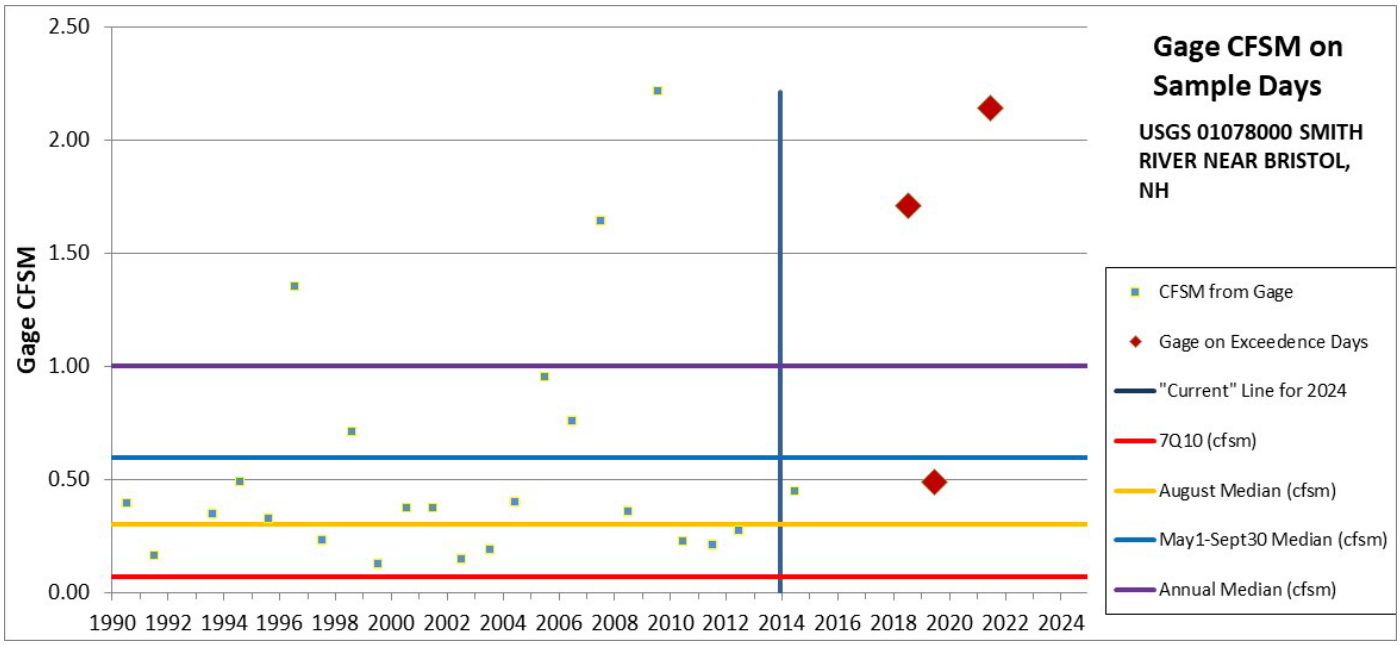
Cold Pond (NHLAK700030403-03)

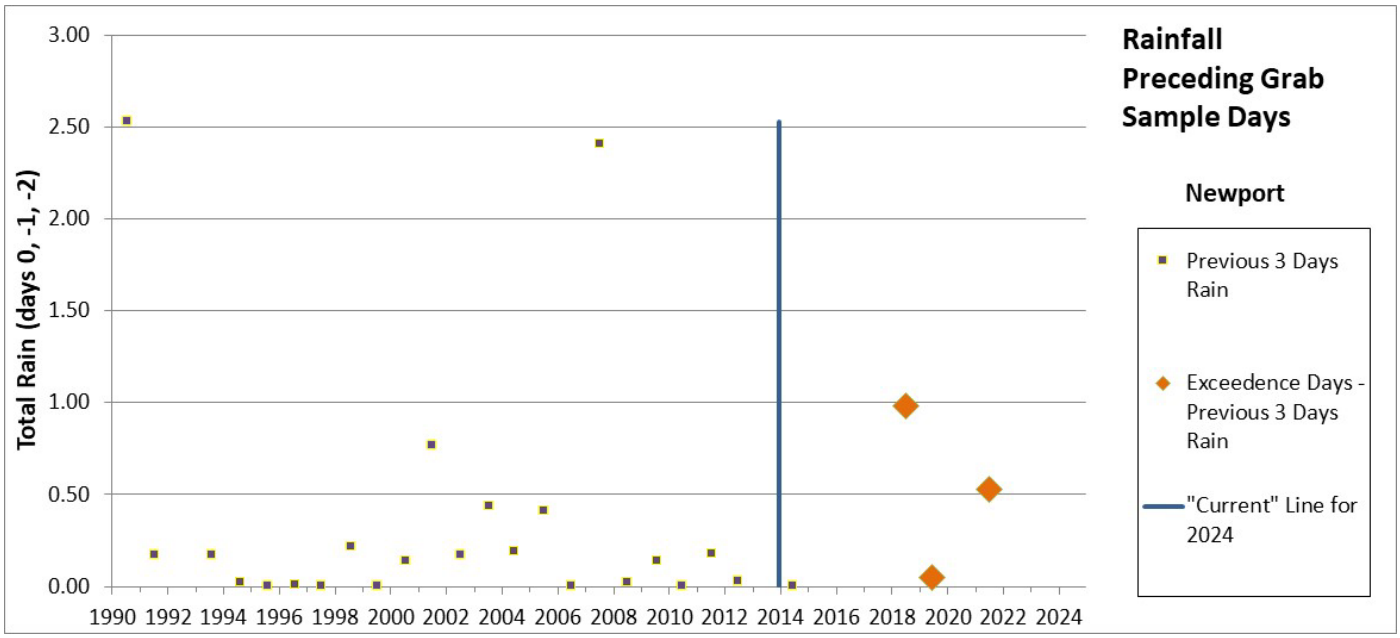
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Cold Pond	NHLAK700030403-03	Oxygen, Dissolved	ANDOVER	3-PNS	5-M

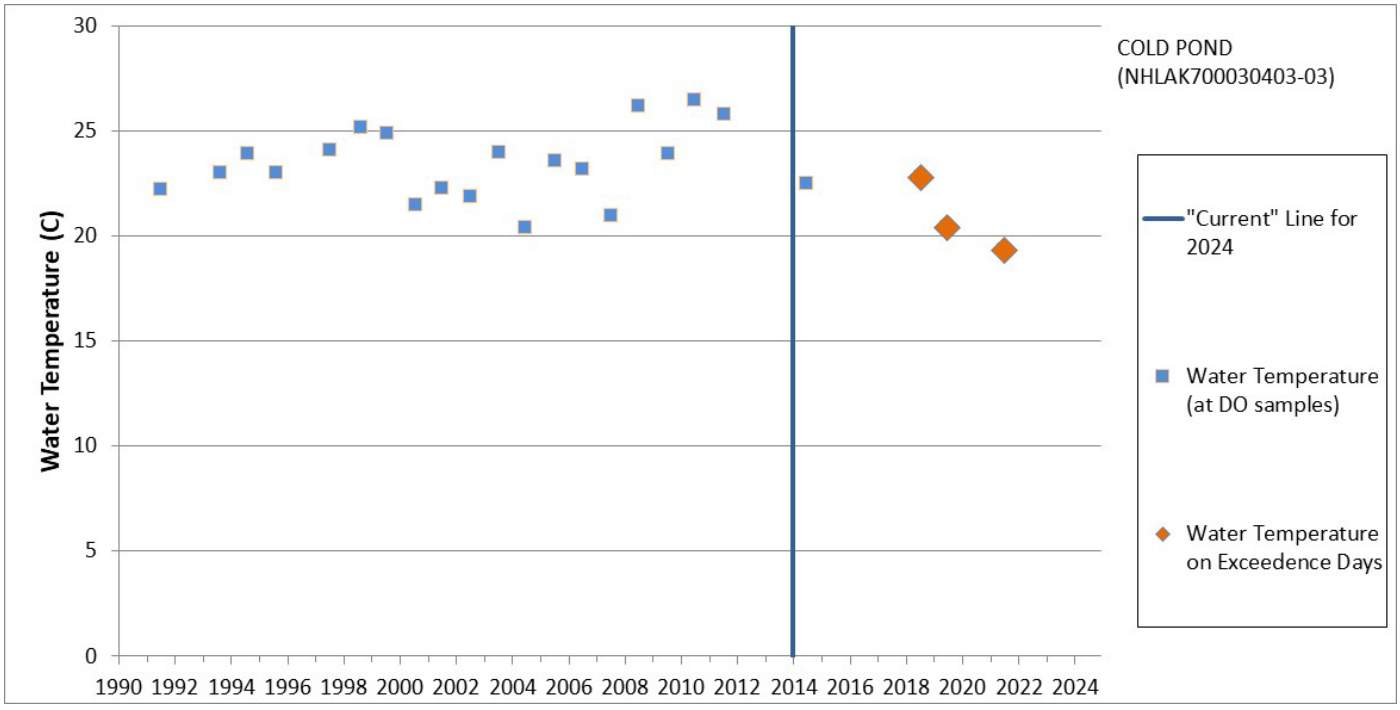
Three of four (75%) grab samples collected at station COLANDO during the current assessment period (2014-2024) were below the dissolved oxygen threshold of 6 mg/L (Class A waterbody). The low dissolved oxygen samples were collected from water temperatures ranging from 19.3 to 22.8 degrees C, flows ranging from 0.49 to 2.14 cfsm (USGS

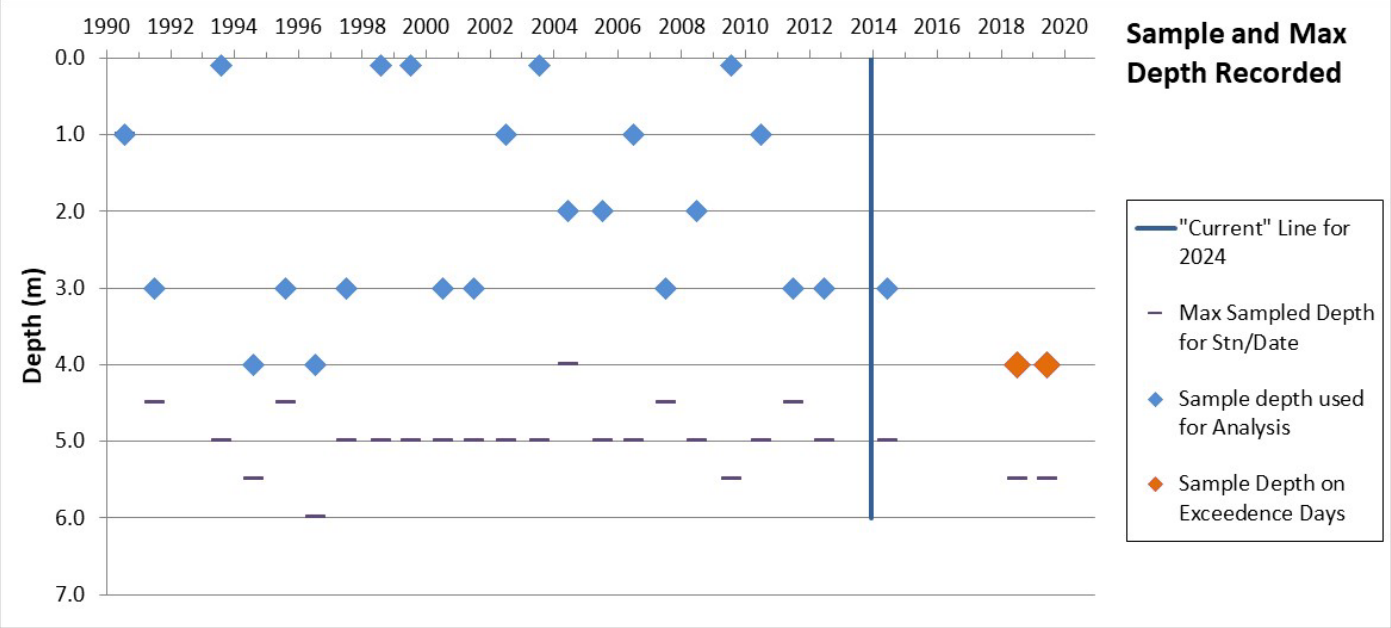
01078000 Smith River near Bristol, NH) and 3-day rainfall totals between 0.05 and 0.98 inches. In general, data are sparse for this waterbody, with gaps in data collection from 2015-2017 and in 2020, and very limited data collected in the years where monitoring was performed; however, with 75% of the samples in this assessment period not only indicating that Cold Pond is below the minimum dissolved oxygen thresholds, but also 75% of the samples were below the threshold for the magnitude of exceedance (5.5 mg/L), this waterbody should be considered impaired for dissolved oxygen concentration. Data from 2014 and prior suggest that Cold Pond was attaining dissolved oxygen concentration standards, but recent inconsistent and limited data collection don't allow for depiction of trends over time from 2014 onward to pick out at what point conditions changed. More frequent samples from station COLANDO during critical period and critical time would be helpful in future assessments. Cold Pond is placed in category 5-M for dissolved oxygen (mg/L) for the aquatic life integrity designated use based on data collected in the current assessment period where 75% of data were below dissolved oxygen thresholds for aquatic life integrity. (A. Smagula)






Rainfall Preceding Grab Sample Days
Newport
Total Rain (days 0, -1, -2)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024


COLD POND
(NHLAK700030403-03)
Water Temperature (C)
30
25
20
15
10
5
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
Water Temperature (at DO samples)
Water Temperature on Exceedence Days



Notes:
DO-PPM-GRAB-CT-CP = Grab samples of dissolved oxygen during the early morning hours of the summer critical period.
DO-PPM-GRAB-CT-NCP = Grab samples of dissolved oxygen during the early morning hours and not during the summer critical period.
DO-PPM-GRAB-NCT-CP = Grab samples of dissolved oxygen not in the early morning hours of the summer critical period.
DO-PPM-GRAB-NCT-NCP = Grab samples of dissolved oxygen not in the early morning hours and outside the summer critical period.
DO-PPM-24HR-MIN-CP = 24-hour minimum dissolved oxygen concentration from a datalogger deployed during the summer critical period.

Great Bay Assessment Zone (NHEST600030904-02, NHEST600030904-03, NHEST600030904-04-02, NHEST600030904-04-03, NHEST600030904-04-04, NHEST600030904-04-05, NHEST600030904-04-06)

Assessment Zone	Assessment Unit IDs	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Great Bay	NHEST600030904-02, NHEST600030904-03, NHEST600030904-04-02, NHEST600030904-04-03, NHEST600030904-04-04, NHEST600030904-04-05, NHEST600030904-04-06	Oxygen, Dissolved	DURHAM, GREENLAND, NEWFIELDS, NEWINGTON, NEWMARKET, STRATHAM	3-PNS	5-M

The Great Bay Assessment Zone (NHEST600030904-02, NHEST600030904-03, NHEST600030904-04-02, NHEST600030904-04-03, NHEST600030904-04-04, NHEST600030904-04-05, NHEST600030904-04-06) has been moved from category 3-PNS to 5-M for dissolved oxygen concentration for the aquatic life integrity designated use based on data collected in the current assessment period. A full parameter level discussion of the rational used to make the assessment determination for this waterbody is provided by assessment zone in the Technical Support Document for the Great Bay Estuary Aquatic Life Use Support Assessments, 2024 305(b) Report/303(d) List.

Lamprey River South Assessment Zone (NHEST600030709-01-02)

Assessment Zone	Assessment Unit IDs	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Lamprey River South	NHEST600030709-01-02	Oxygen, Dissolved	NEWMARKET	3-PNS	5-P

The Lamprey River South Assessment Zone (NHEST600030709-01-02) has been moved from category 3-PNS to 5-P for dissolved oxygen concentration for the aquatic life integrity designated use based on data collected in the current

assessment period. A full parameter level discussion of the rational used to make the assessment determination for this waterbody is provided by assessment zone in the Technical Support Document for the Great Bay Estuary Aquatic Life Use Support Assessments, 2024 305(b) Report/303(d) List.

Little Bay Assessment Zone (NHEST600030904-06-10, NHEST600030904-06-11, NHEST600030904-06-14, NHEST600030904-06-15, NHEST600030904-06-18, NHEST600030904-06-19, NHEST600030904-06-20)

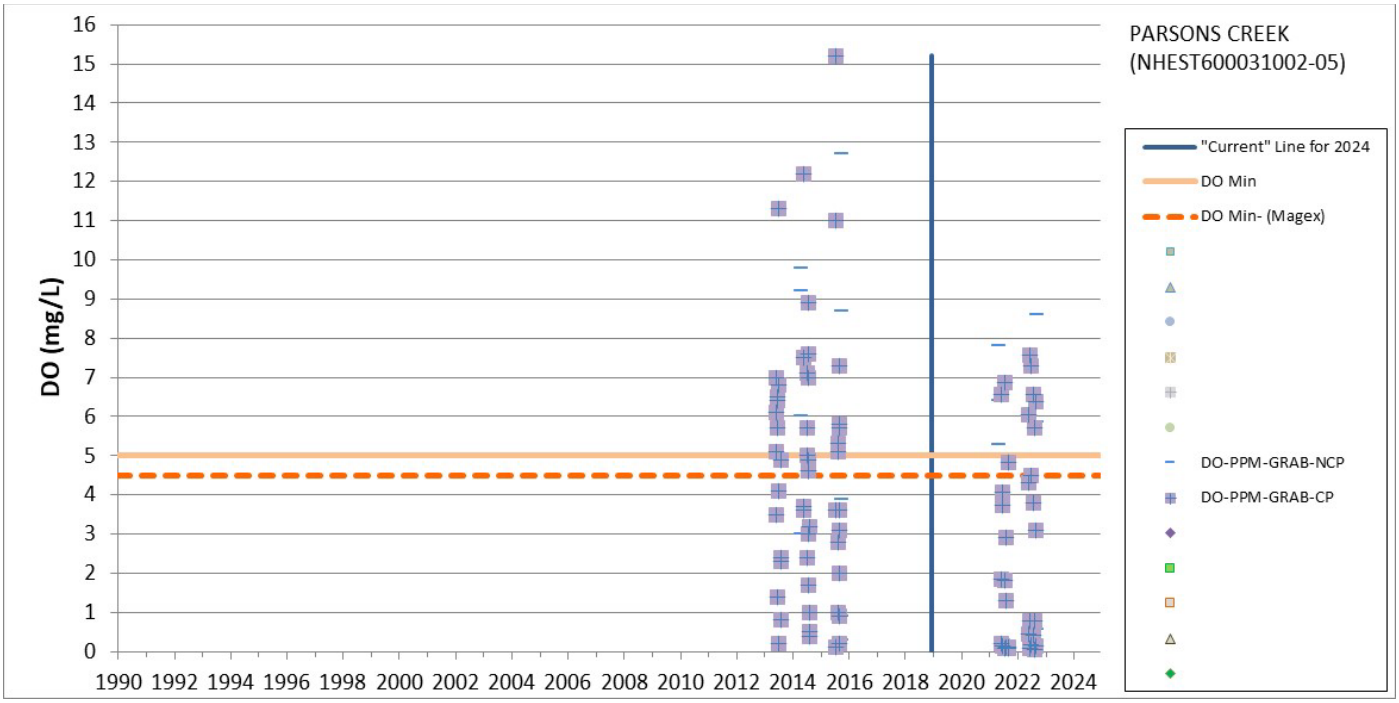
Assessment Zone	Assessment Unit IDs	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Little Bay	NHEST600030904-06-10, NHEST600030904-06-11, NHEST600030904-06-14, NHEST600030904-06-15, NHEST600030904-06-18, NHEST600030904-06-19, NHEST600030904-06-20	Oxygen, Dissolved	DURHAM, GREENLAND, NEWFIELDS, NEWINGTON, NEWMARKET, STRATHAM	2-G	5-P

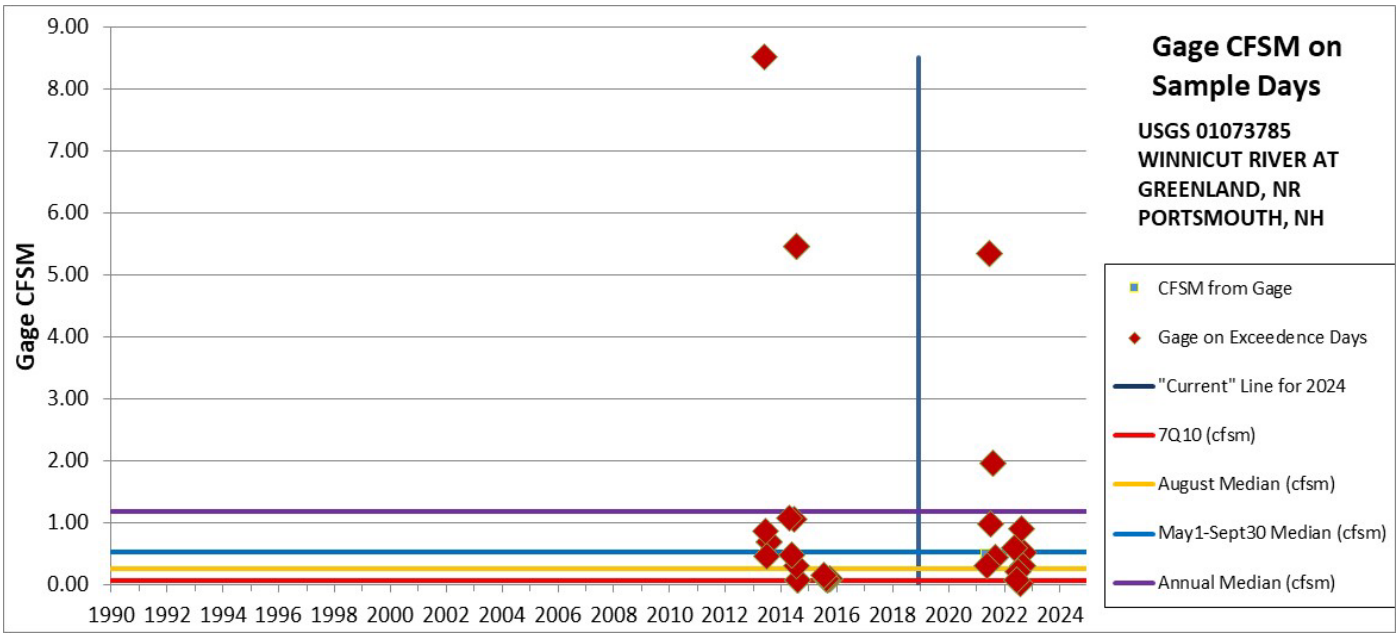
The Little Bay Assessment Zone (NHEST600030904-06-10, NHEST600030904-06-11, NHEST600030904-06-14, NHEST600030904-06-15, NHEST600030904-06-18, NHEST600030904-06-19, NHEST600030904-06-20) has been moved from category 2-G to 5-P for dissolved oxygen concentration for the aquatic life integrity designated use based on data collected in the current assessment period. A full parameter level discussion of the rational used to make the assessment determination for this waterbody is provided by assessment zone in the Technical Support Document for the Great Bay Estuary Aquatic Life Use Support Assessments, 2024 305(b) Report/303(d) List.

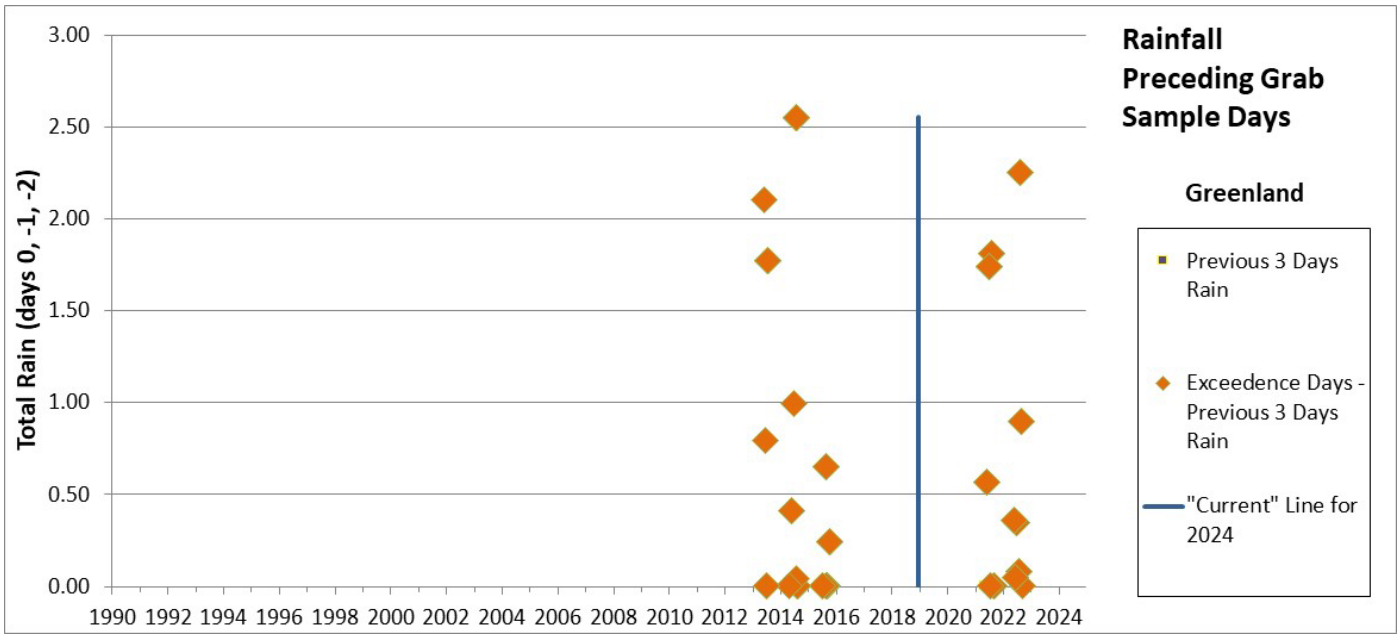
Parsons Creek (NHEST600031002-05)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Parsons Creek	NHEST600031002-05	Oxygen, Dissolved	RYE	3-PNS	5-P

New data collected in 2021 and 2022 at stations ACPS005-PCOUT, BCH11, and PC08 indicates that the creek consistently has dissolved oxygen concentrations below 4.5 mg/L, and on occasion the concentrations fall below 1.0 mg/L. The low dissolved oxygen samples collected during the current assessment period were collected during flows between 0.03 and 4.34 cfsm at the Winnicut River gage (01073785), with 3-day rainfall totals between 0.00 and 2.25 inches, and with water temperatures ranging from 13-27 degrees C. Parsons Creek (NHEST600031002-05) has been moved from 3-PNS to 5-P for dissolved oxygen for the aquatic life integrity designated use based on data collected in the current assessment period.


PARSONS CREEK
(NHEST600031002-05)
DO (mg/L)
"Current" Line for 2024
DO Min
DO Min- (Magex)
DO-PPM-GRAB-NCP
DO-PPM-GRAB-CP


Gage CFSM on Sample Days
USGS 01073785
WINNICUT RIVER AT GREENLAND, NR PORTSMOUTH, NH
Gage CFSM
CFSM from Gage
Gage on Exceedence Days
"Current" Line for 2024
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)

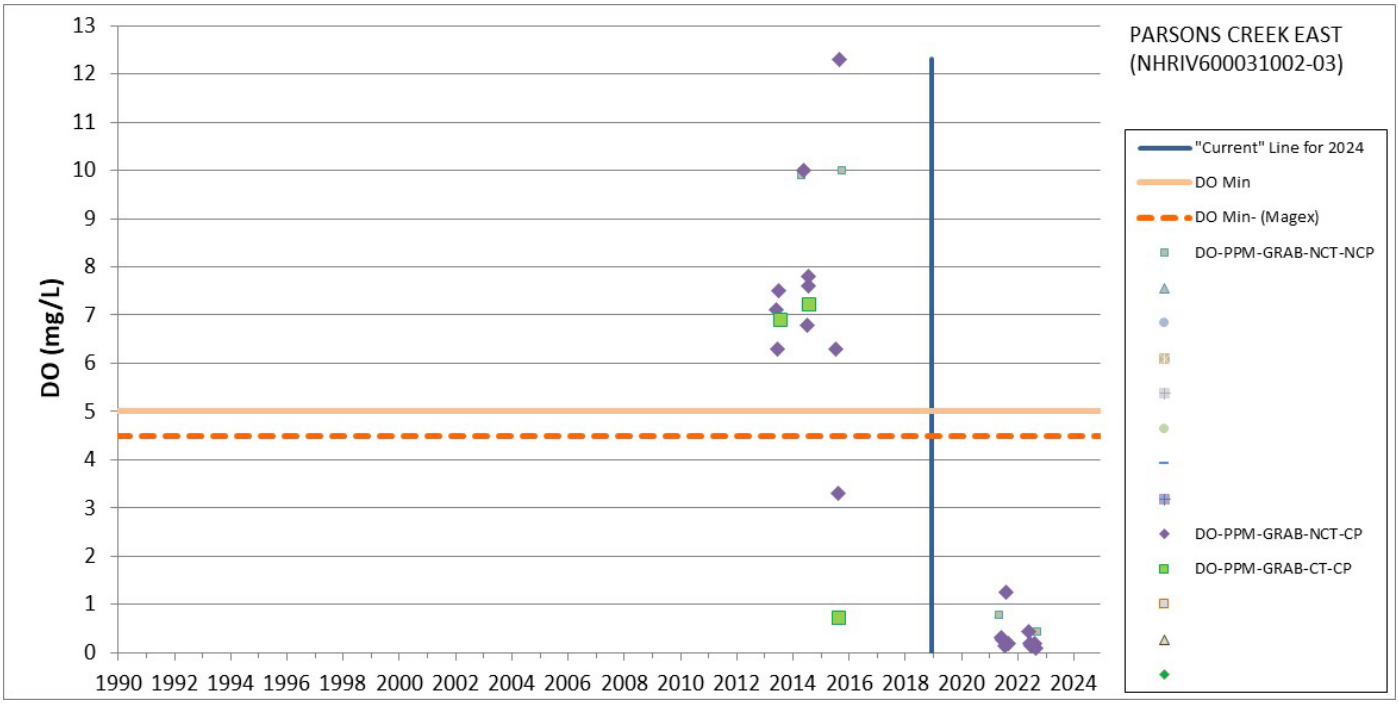


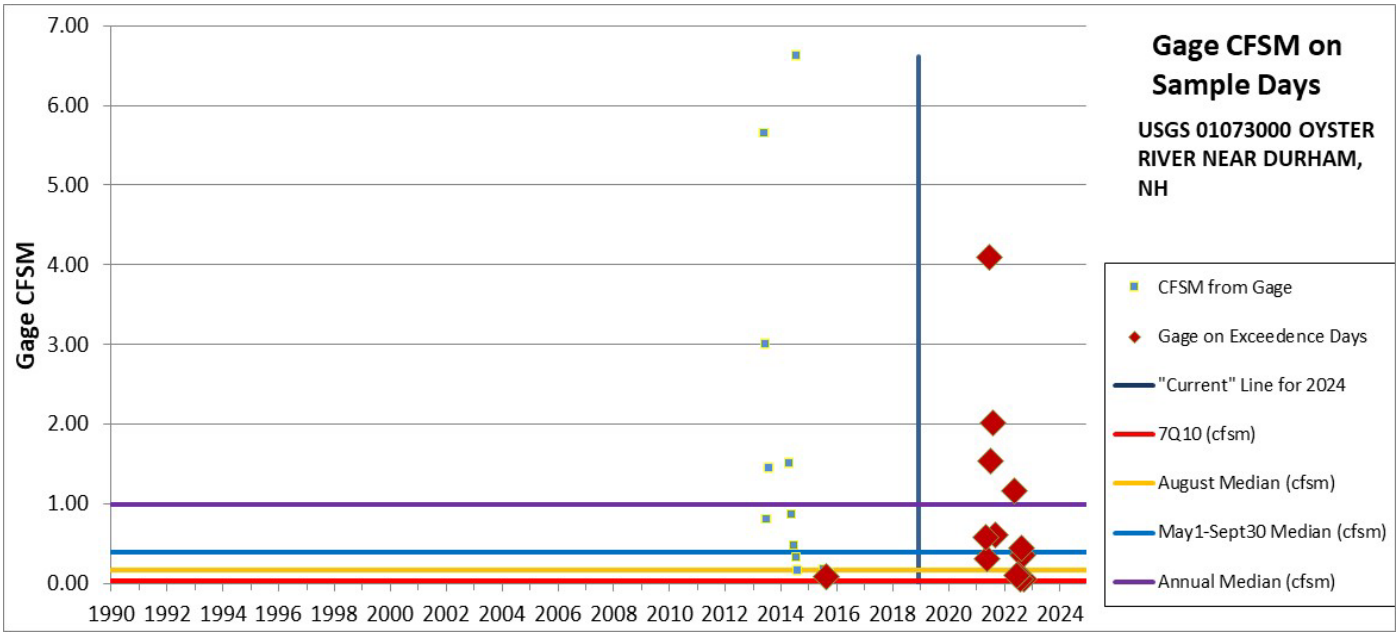
Notes:
DO-PPM-GRAB-CT-CP = Grab samples of dissolved oxygen during the early morning hours of the summer critical period.
DO-PPM-GRAB-CT-NCP = Grab samples of dissolved oxygen during the early morning hours and not during the summer critical period.
DO-PPM-GRAB-NCT-CP = Grab samples of dissolved oxygen not in the early morning hours of the summer critical period.
DO-PPM-GRAB-NCT-NCP = Grab samples of dissolved oxygen not in the early morning hours and outside the summer critical period.
DO-PPM-24HR-MIN-CP = 24-hour minimum dissolved oxygen concentration from a datalogger deployed during the summer critical period.

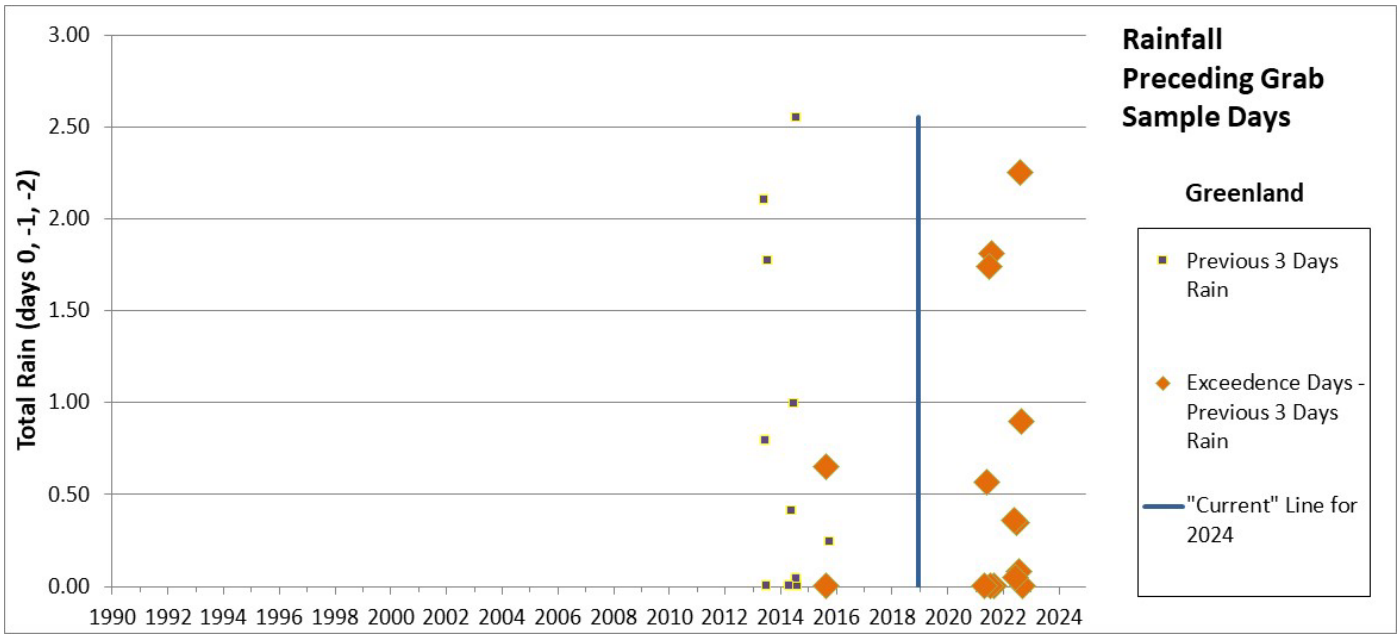
Parsons Creek East (NHRIV600031002-03)

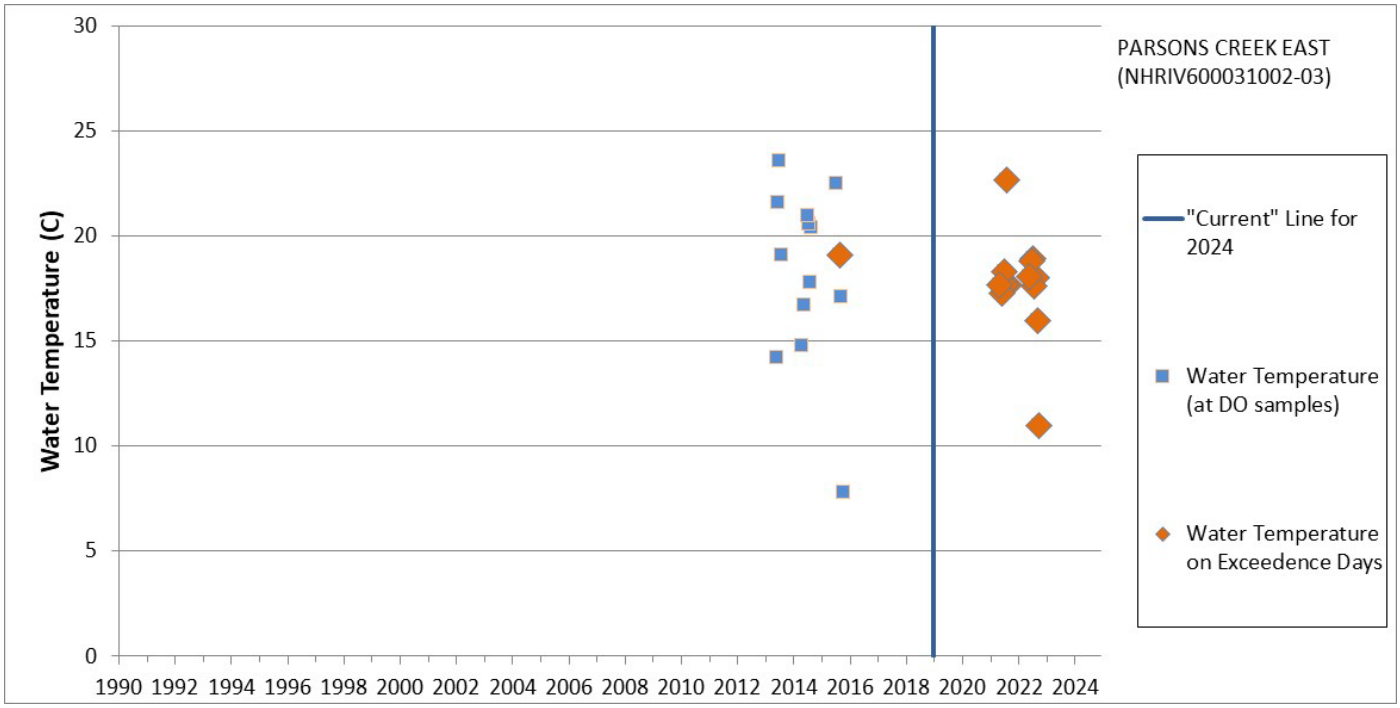
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Parsons Creek East	NHRIV600031002-03	Oxygen, Dissolved	RYE	3-PNS	5-P

Thirteen of 13 (100%) grab samples collected at station ACPS005-U35 during the current assessment period (2019-2024) were below the dissolved oxygen concentration threshold of 5 mg/L, and magnitude of exceedance threshold of 4.5 mg/L. The low dissolved oxygen samples (ranging from 0.10 to 1.25 mg/L) were collected during flows between 0.07 and 4.09 cfsm at the Oyster River gage (01073000), with 3-day rainfall totals between 0.00 and 2.25 inches, and with water temperatures ranging from 11-22.7 degrees C. The data in the current assessment period indicates that Parsons Creek East consistently has dissolved oxygen concentrations that do not meet water quality standards. Parsons Creek East (NHRIV600031002-03) has been moved from 3-PNS to 5-P for dissolved oxygen concentration for the aquatic life integrity designated use based on data collected in the current assessment period.







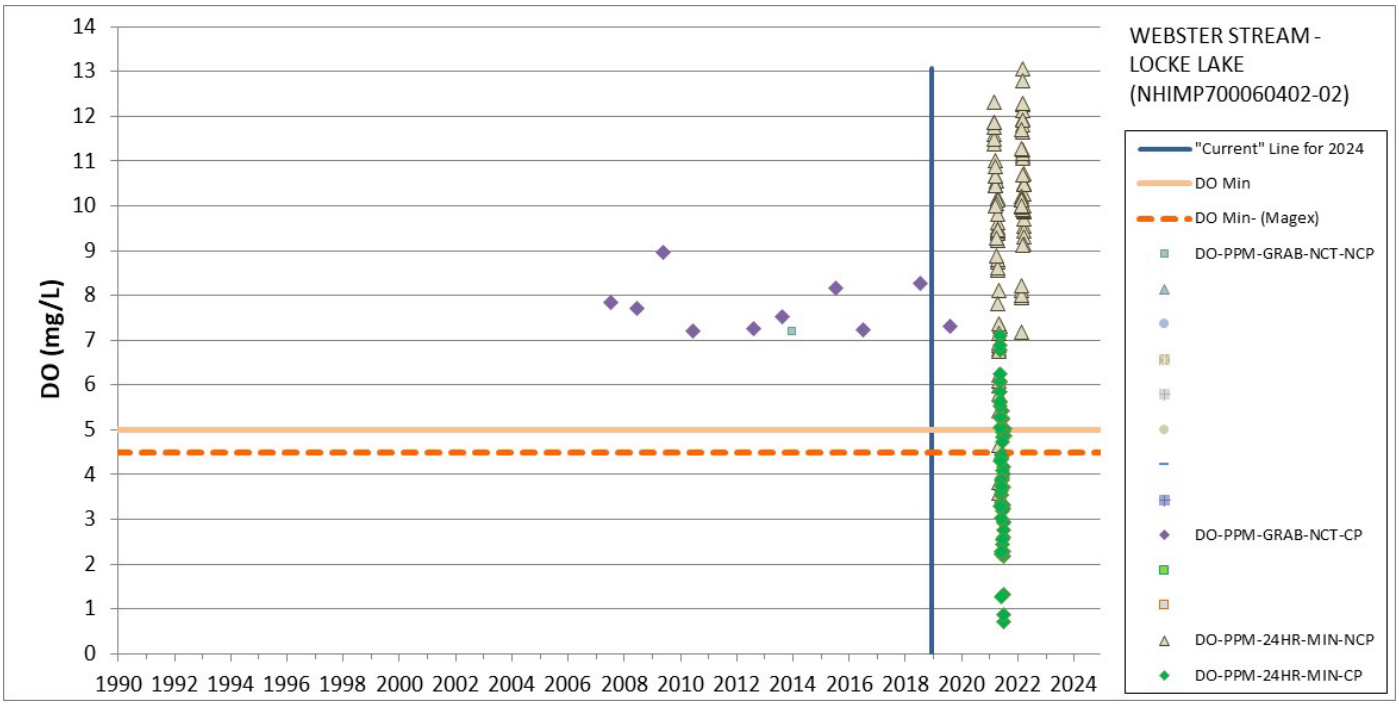


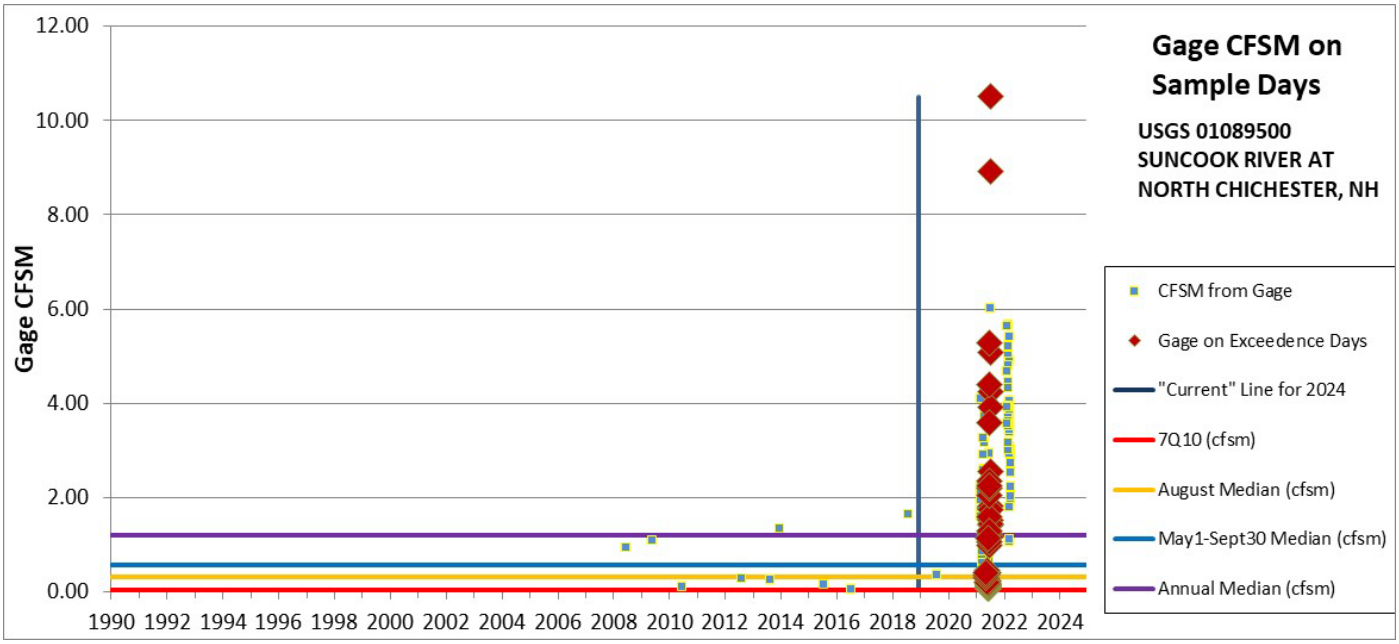
Notes:
DO-PPM-GRAB-CT-CP = Grab samples of dissolved oxygen during the early morning hours of the summer critical period.
DO-PPM-GRAB-CT-NCP = Grab samples of dissolved oxygen during the early morning hours and not during the summer critical period.
DO-PPM-GRAB-NCT-CP = Grab samples of dissolved oxygen not in the early morning hours of the summer critical period.
DO-PPM-GRAB-NCT-NCP = Grab samples of dissolved oxygen not in the early morning hours and outside the summer critical period.
DO-PPM-24HR-MIN-CP = 24-hour minimum dissolved oxygen concentration from a datalogger deployed during the summer critical period.

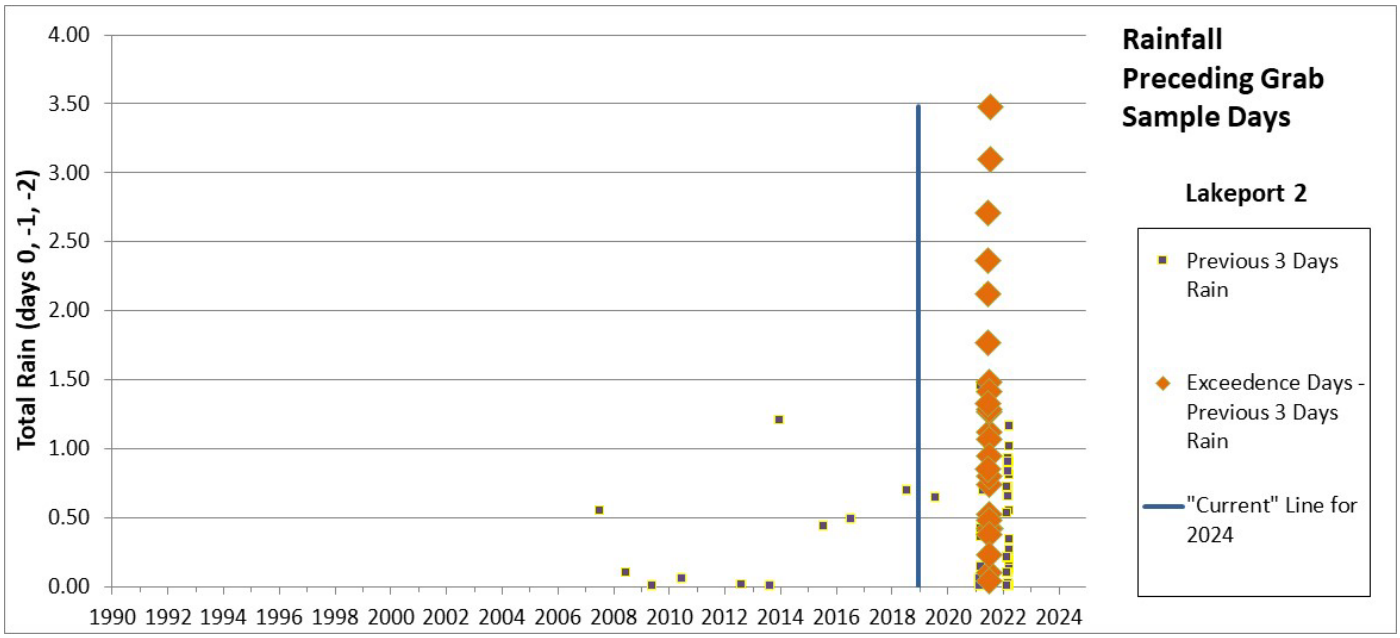
Webster Stream – Locke Lake (NHIMP700060402-02)

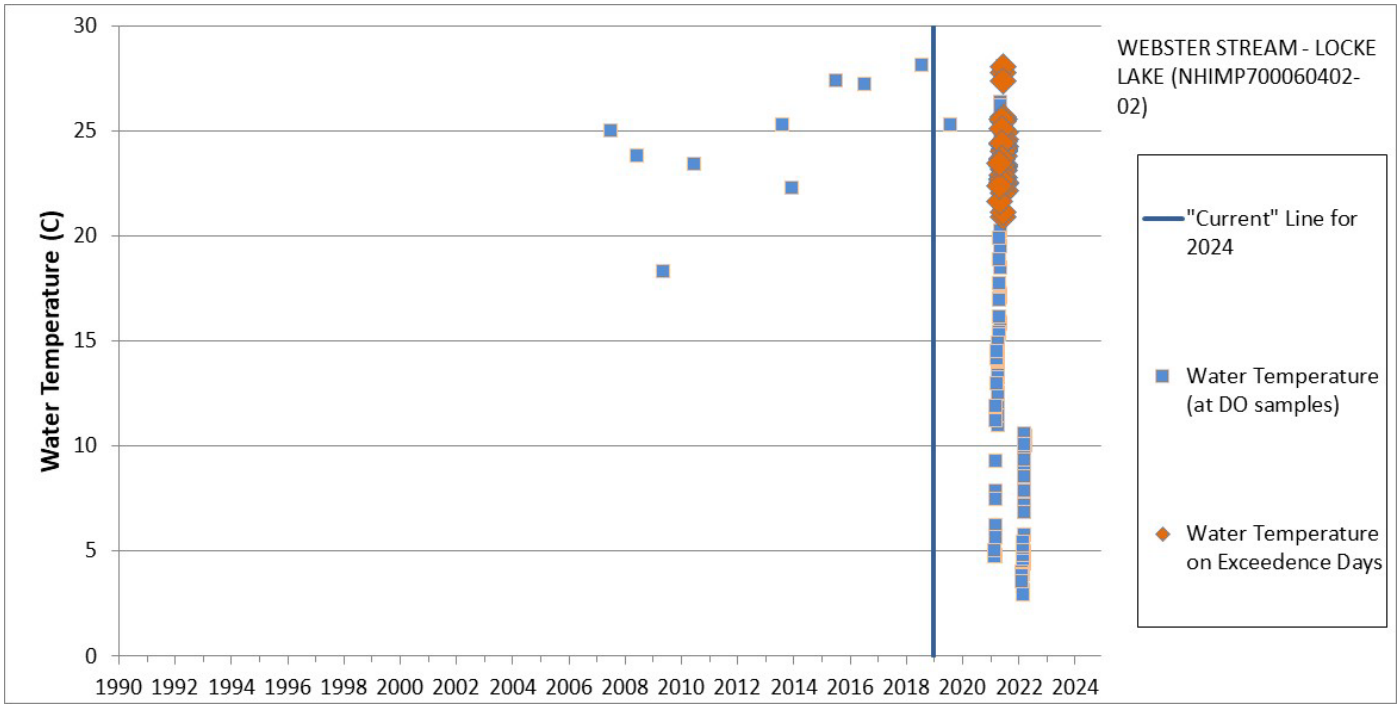
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Webster Stream – Locke Lake	NHIMP700060402-02	Oxygen, Dissolved	BARNSTEAD	3-PAS	5-P

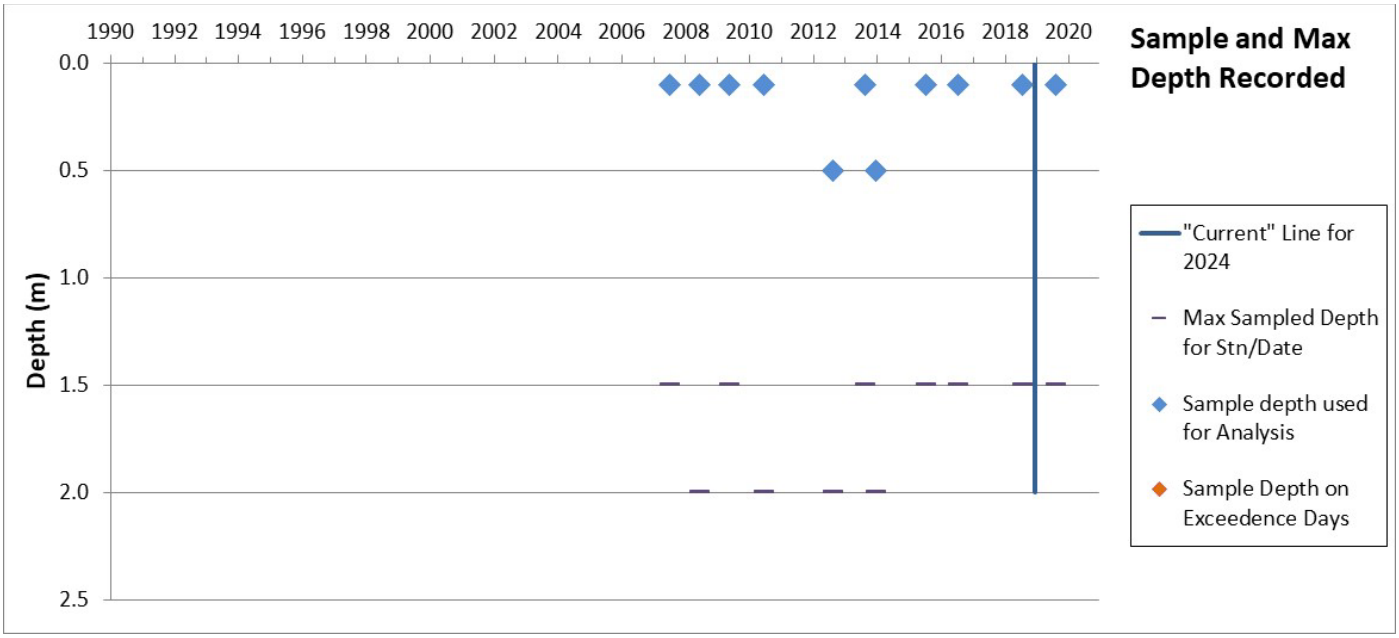
Forty-seven of 158 (29.7%) samples collected at station WQMS1B during the current assessment period (2019-2024) were below the dissolved oxygen threshold of 5 mg/L, and with many (n=40) that were below the magnitude of exceedance threshold of 4.5 mg/L. The low dissolved oxygen samples were collected from water temperatures ranging from 20.94 to 27.7 degrees C, flow ranging from 0.0 to 10.51 cfsm (USGS 01089500 Suncook River at North Chichester, NH) and 3-day rainfall totals between 0.0 and 3.48 inches. The data were collected with a continuous logger and reflect the 24-hour minimum for the critical period, and the 24-hour minimum for non-critical period. The bulk of the samples that are below the dissolved oxygen threshold are from within the critical period. Webster Stream – Locke Lake (NHIMP700060402-02) has been moved from 3-PAS to 5-P for dissolved oxygen (mg/L) for the aquatic life integrity designated use based on data collected in the current assessment period.






Rainfall Preceding Grab Sample Days
Lakeport 2
Total Rain (days 0, -1, -2)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024


WEBSTER STREAM - LOCKE LAKE (NHIMP700060402-02)
Water Temperature (C)
30
25
20
15
10
5
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
Water Temperature (at DO samples)
Water Temperature on Exceedence Days



Notes:
DO-PPM-GRAB-CT-CP = Grab samples of dissolved oxygen during the early morning hours of the summer critical period.
DO-PPM-GRAB-CT-NCP = Grab samples of dissolved oxygen during the early morning hours and not during the summer critical period.
DO-PPM-GRAB-NCT-CP = Grab samples of dissolved oxygen not in the early morning hours of the summer critical period.
DO-PPM-GRAB-NCT-NCP = Grab samples of dissolved oxygen not in the early morning hours and outside the summer critical period.
DO-PPM-24HR-MIN-CP = 24-hour minimum dissolved oxygen concentration from a datalogger deployed during the summer critical period.

Fish Bioassessments for Aquatic Life Integrity

Baboosic Brook - Riddle Brook (NHRIV700060905-19)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Baboosic Brook - Riddle Brook	NHRIV700060905-19	Fishes Bioassessments (Streams)	MERRIMACK, BEDFORD	3-ND	5-P

Fish Assemblage = Warm Water Low Gradient. WW-IBI threshold = 27. Fish assemblage maps as Warm Water. Two fish surveys since 2003. All fish IBI scores below fish assemblage IBI thresholds. WW-IBI scores = 9.79 (2003) and 10.21 (2022). WW-IBI score less than 27 indicates the fish community fails to meet or exceed the narrative aquatic life use water quality criteria. For station 01M-RID, 30% of 8.55 square mile watershed considered developed (USGS LC11DEV) and 7% of 8.55 square mile watershed considered impervious (USGS LC11IMP). Baboosic Brook - Riddle Brook (NHRIV700060905-19) has been placed in category 5-P for Fishes Bioassessments (Streams) for the aquatic life integrity designated use based on data reviewed as part of the 2024 assessment cycle. This is a new impairment (added to the 303(d) list). This is a new assessment. 3-ND to 5-P.

Wild Ammonoosuc River (NHRIV801030505-08)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Wild Ammonoosuc River	NHRIV801030505-08	Fishes Bioassessments (Streams)	BATH, LANDAFF	3-PNS	5-M

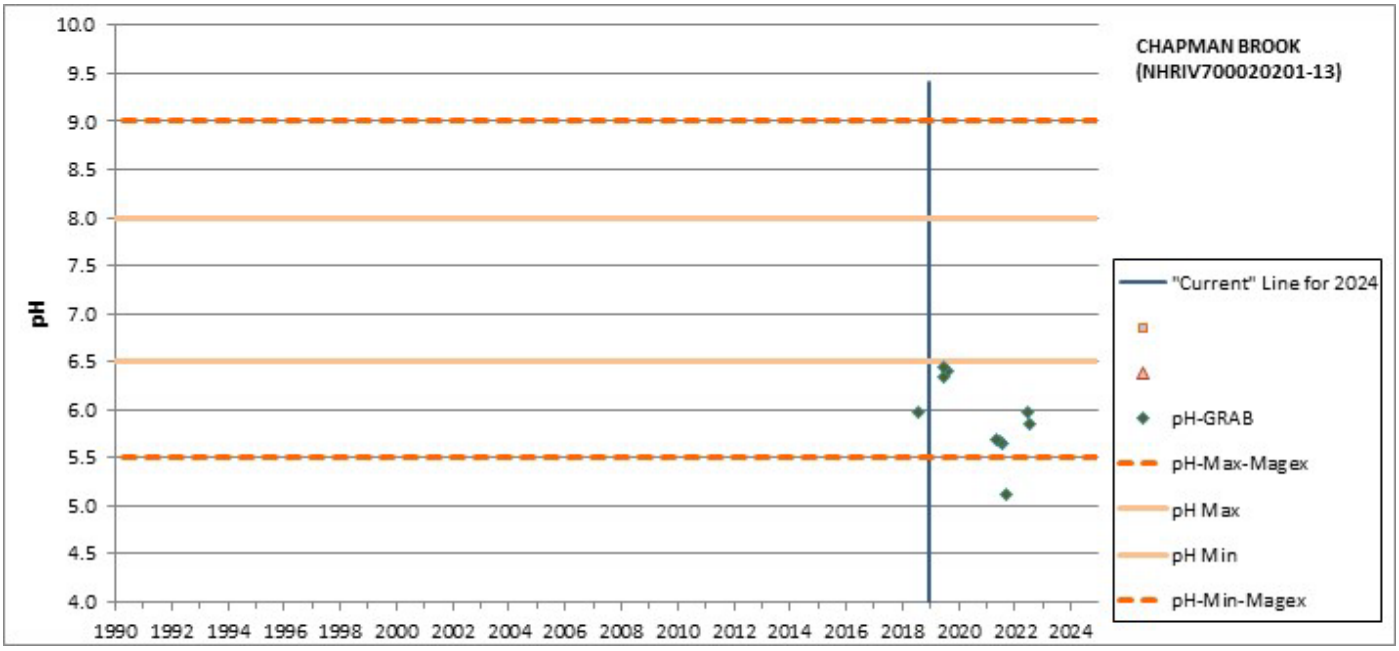
Fish Assemblage = Transitional Water. TW-IBI threshold = 28. Four fish surveys at two stations (08-WAM and 10-WAM) between 2005 and 2020. TW-IBI scores ranging from 17-25. TW-IBI score less than 28 indicates the fish community fails to meet or exceed the narrative aquatic life use water quality criteria. Mean July water temperatures from 2015 to 2021 ranged from 17.09 deg C (2015) to 22.58 deg C (2019). Water temperatures exceeding 20 deg C often limit abundance of cold water fish species typical of transitional water fish assemblages. There is very little structure/habitat for fish to utilize in the stream which could also be contributing to the poor IBI scores. Wild Ammonoosuc (NHRIV801030505-08) has been placed in category 5-M for Fishes Bioassessments (Streams) for the aquatic life integrity designated use based on data reviewed as part of the 2024 assessment cycle. This is a new impairment (added to the 303(d) list). This is a change in the assessment category from the previous cycle. 3-PNS to 5-M. Consider additional sampling within this AUID.

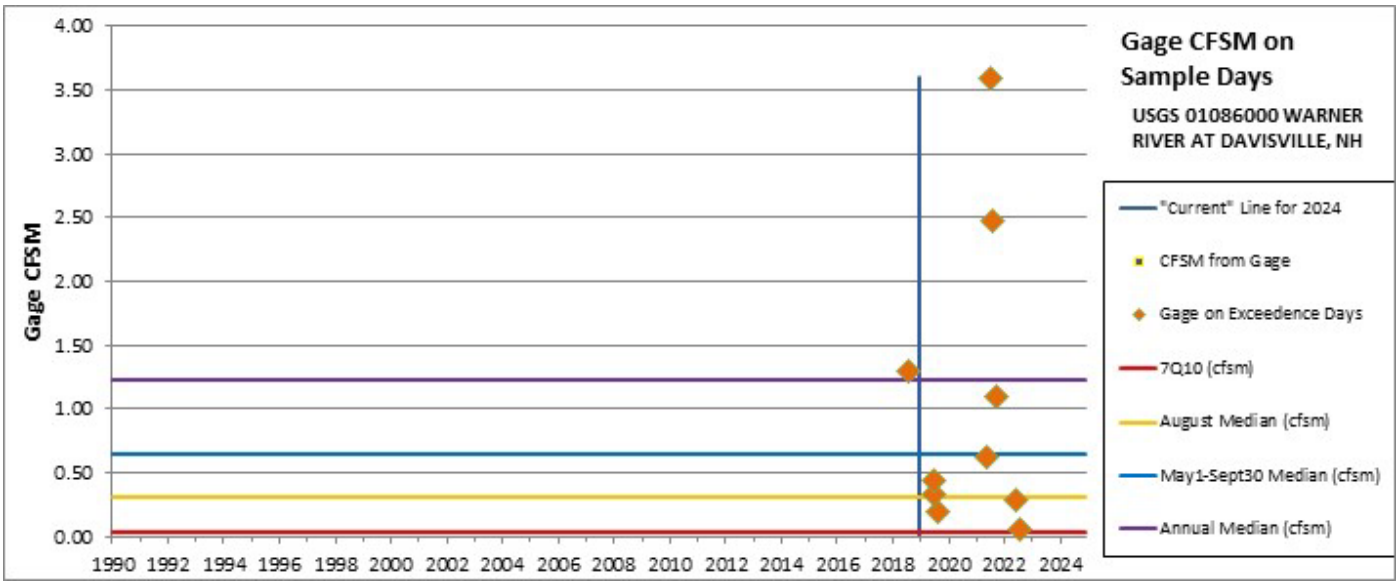
pH for Aquatic Life Integrity

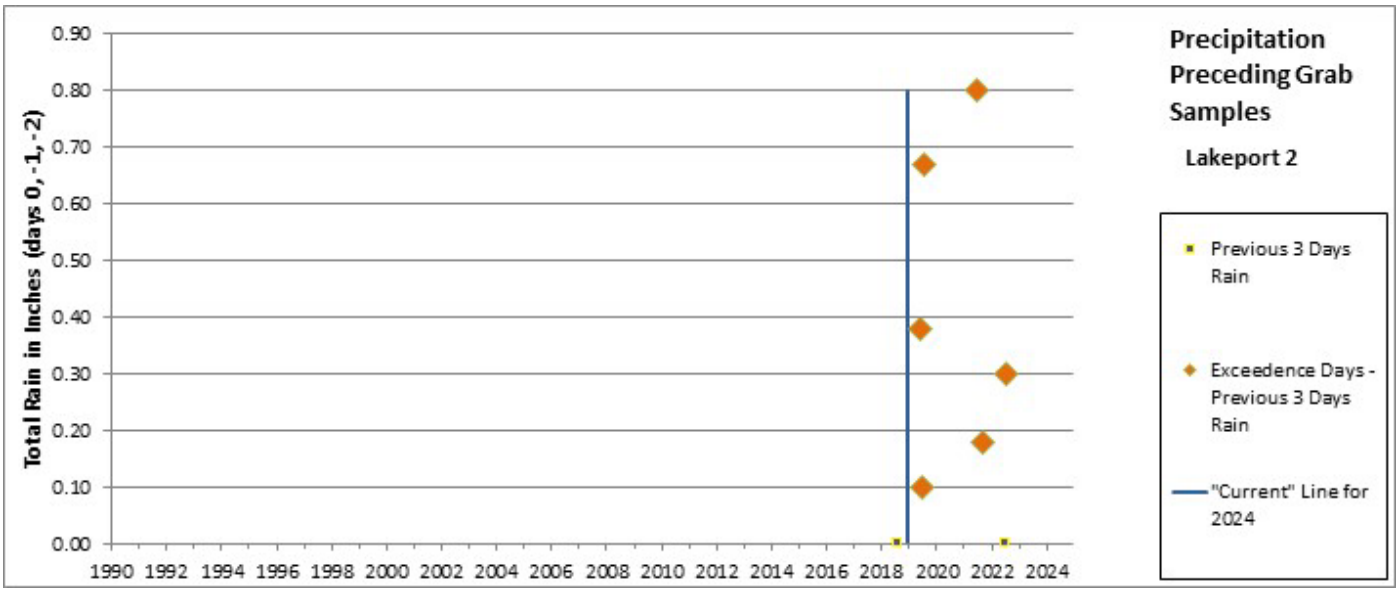
Chapman Brook (NHRIV700020201-13)

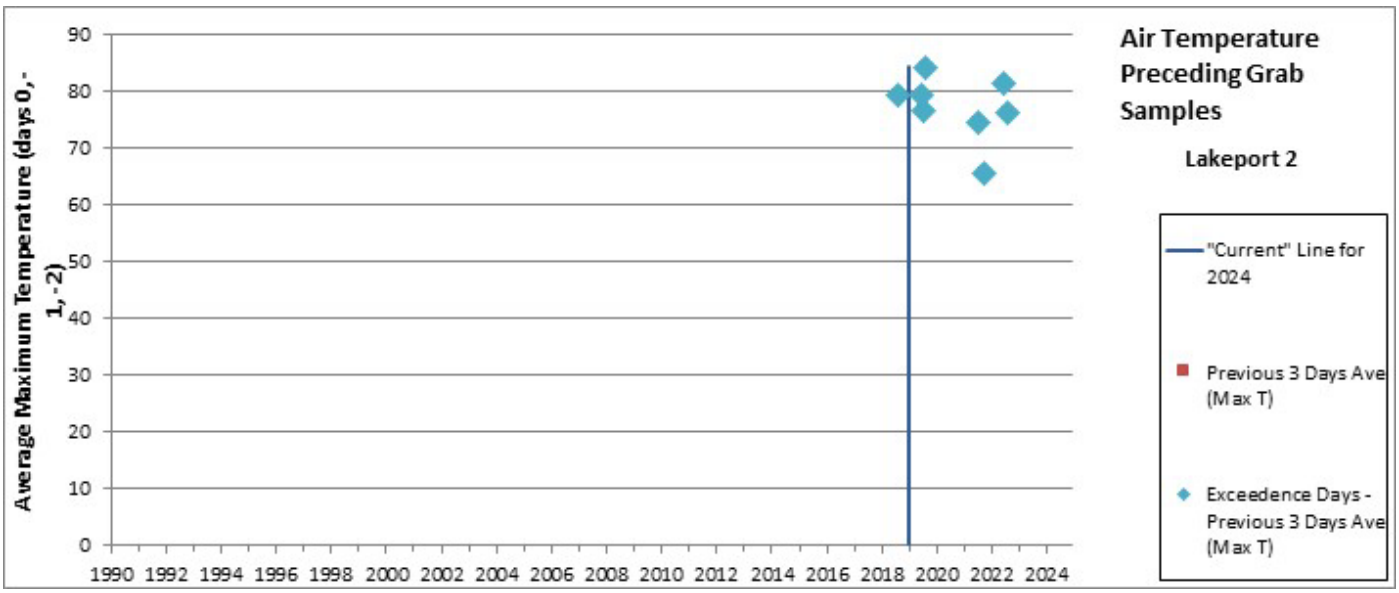
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Chapman Brook	NHRIV700020201-13	pH	SANBORNTON	3-PNS	5-M

All ten of the grab samples collected at station WINPLACI-UP were below the lower pH threshold of 6.5, with one below the magnitude of exceedance threshold (5.5). These samples triggered the new impairment in the 2024 cycle. The low pH samples were collected between June and October at flows ranging from 0.06 to 3.60 cfsm on the Warner River gage (01086000) and during varying weather conditions (0.10-0.80 inches preceding three day precipitation). Chapman Brook (NHRIV700020201-13) has been moved from 3-PNS to 5-M for pH for the aquatic life integrity designated use based on data collected in the current assessment period.




Gage CFSM on Sample Days
USGS 01086000 WARNER RIVER AT DAVISVILLE, NH
Gage CFSM
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)

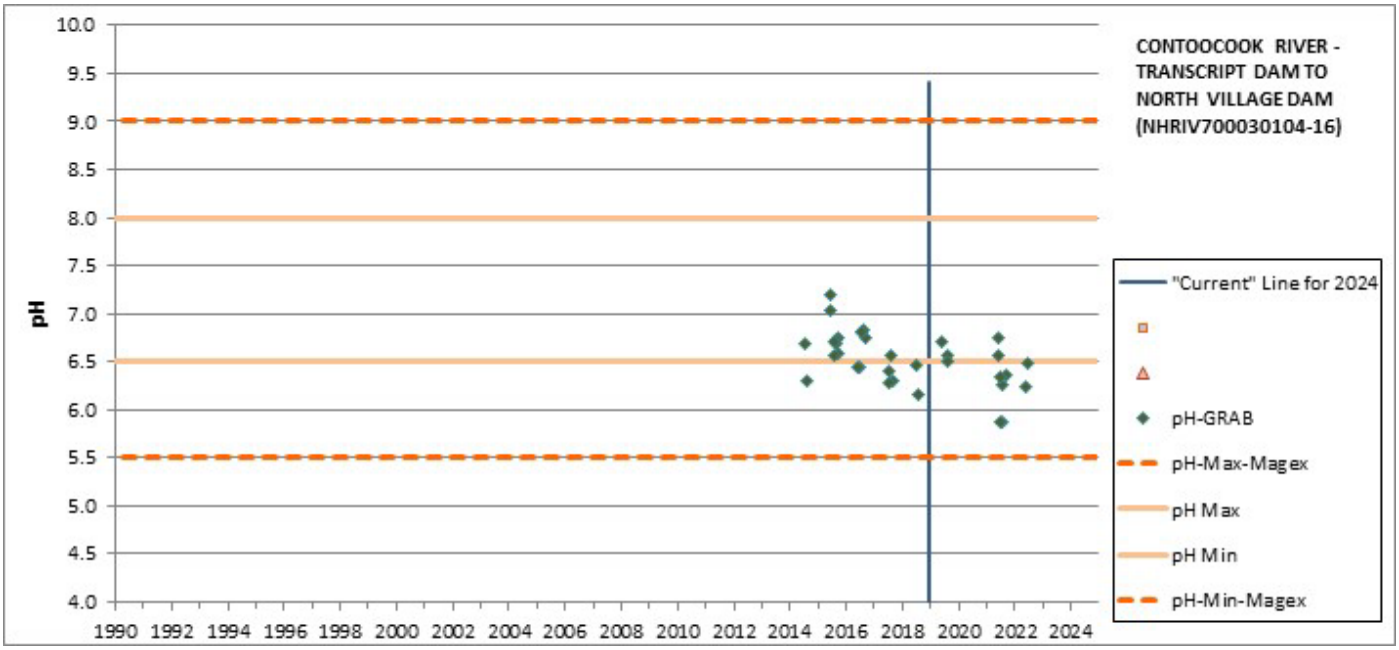

Precipitation Preceding Grab Samples
Lakeport 2
Total Rain in Inches (days 0, -1, -2)
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024

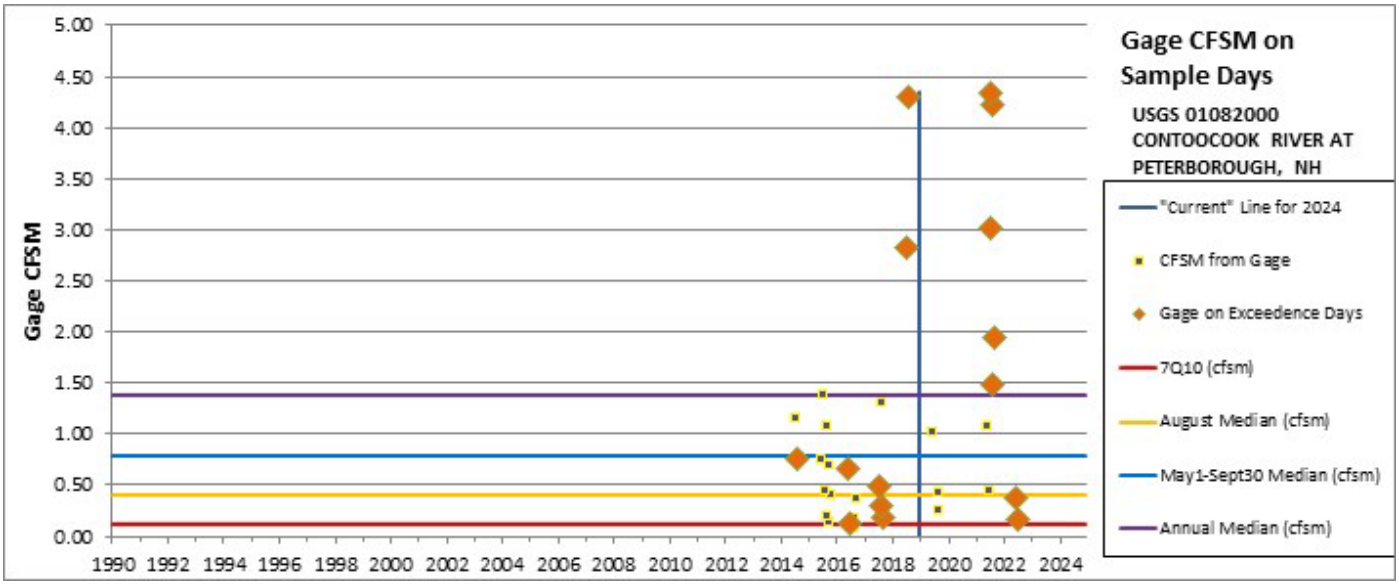

Air Temperature Preceding Grab Samples
Lakeport 2
Average Maximum Temperature (days 0, -1, -2)
"Current" Line for 2024
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)

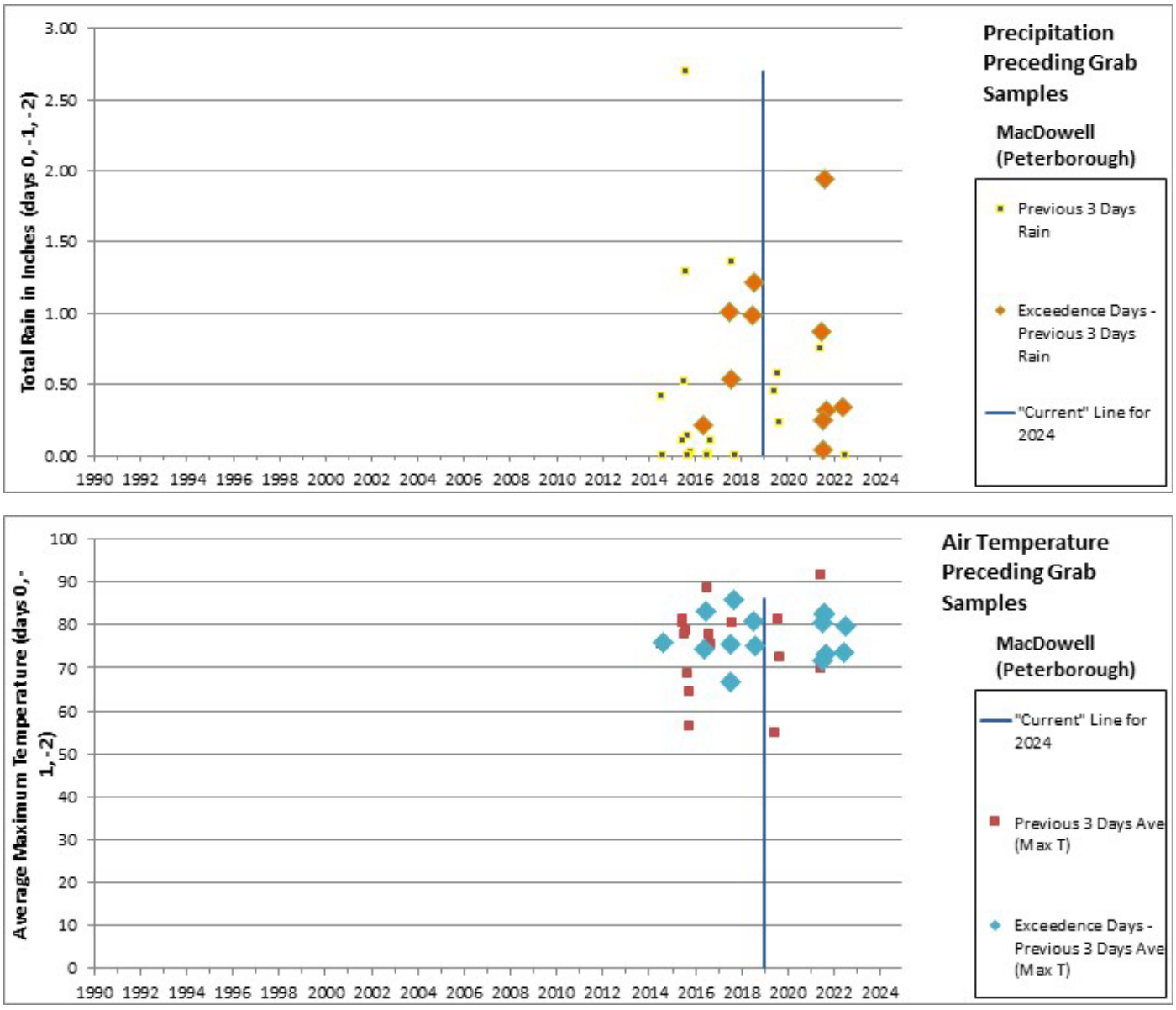
Contoocook River – Transcript Dam to North Village Dam (NHRIV700030104-16)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Contoocook River - Transcript Dam to North Village Dam	NHRIV700030104-16	pH	PETERBOROUGH	3-PNS	5-M

Seven of the 12 (58%) grab samples collected at station 27W-CTC were below the lower pH threshold of 6.5. These samples triggered the new impairment in the 2024 cycle. The low pH samples were collected between July and September at flows ranging from 0.17 to 4.23 cfsm on the Contoocook River gage (01082000) and during varying weather conditions (0.04-1.94inches preceding three day precipitation). Contoocook River – Transcript Dam To North Village Dam (NHRIV700030104-16) has been moved from 3-PNS to 5-M for pH for the aquatic life integrity designated use based on data collected in the current assessment period.



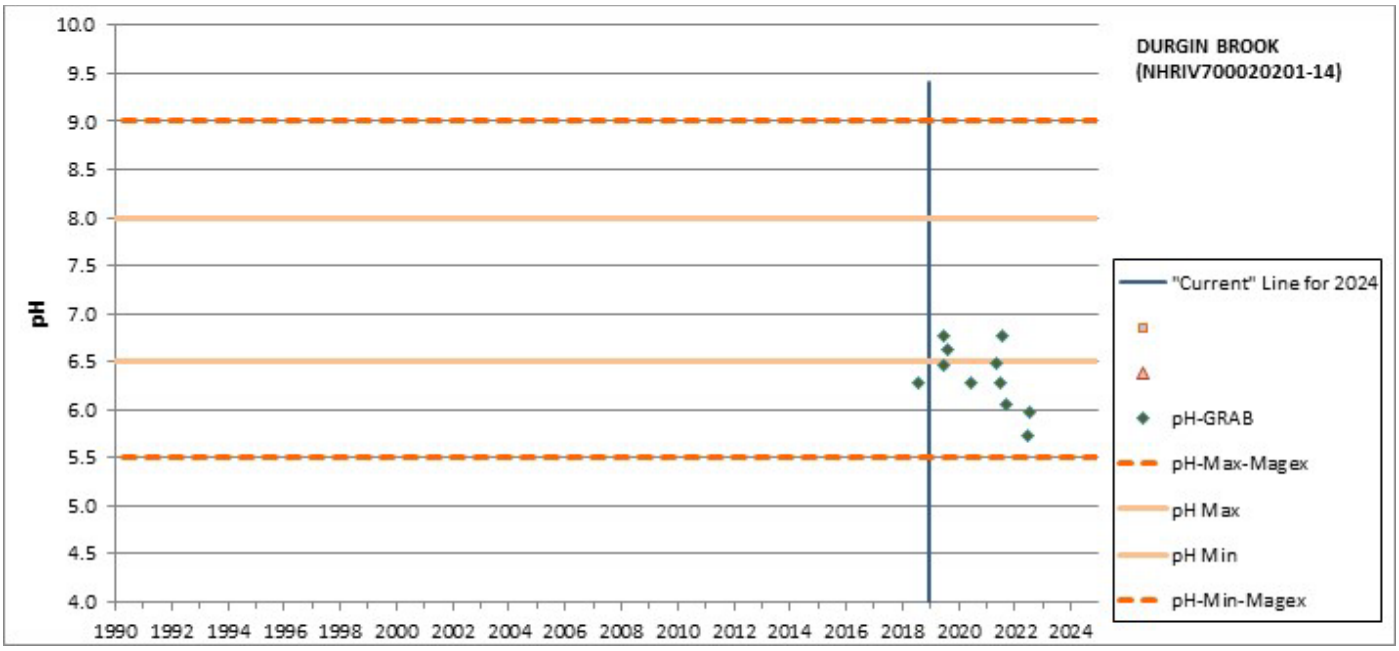


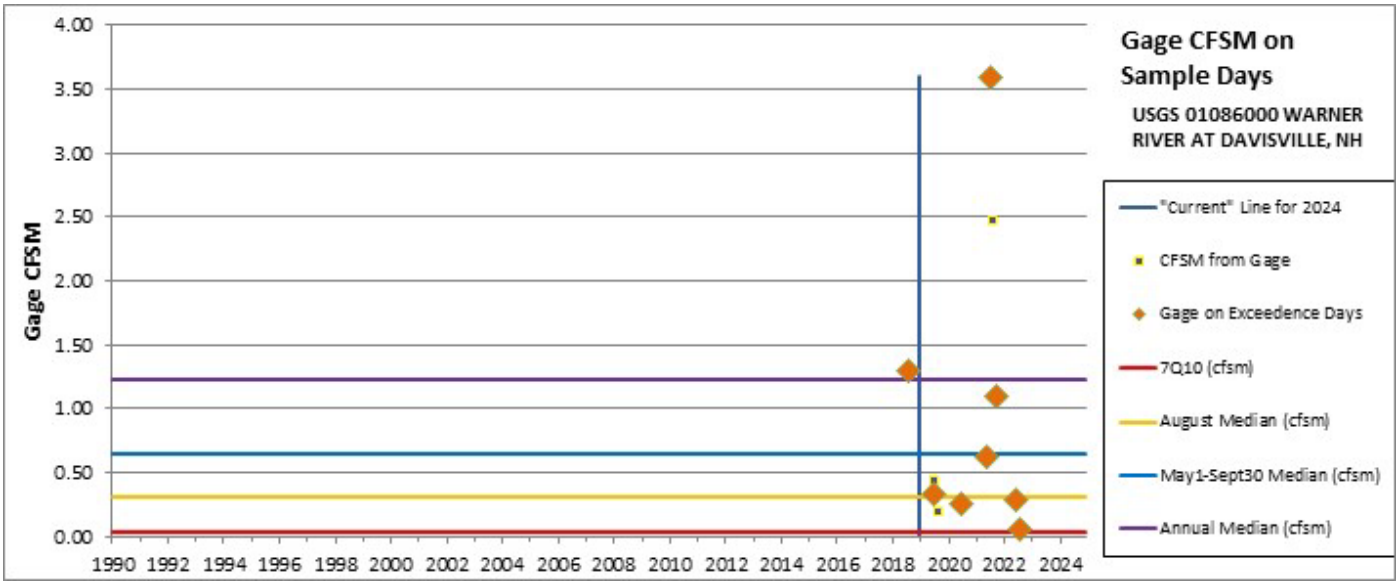


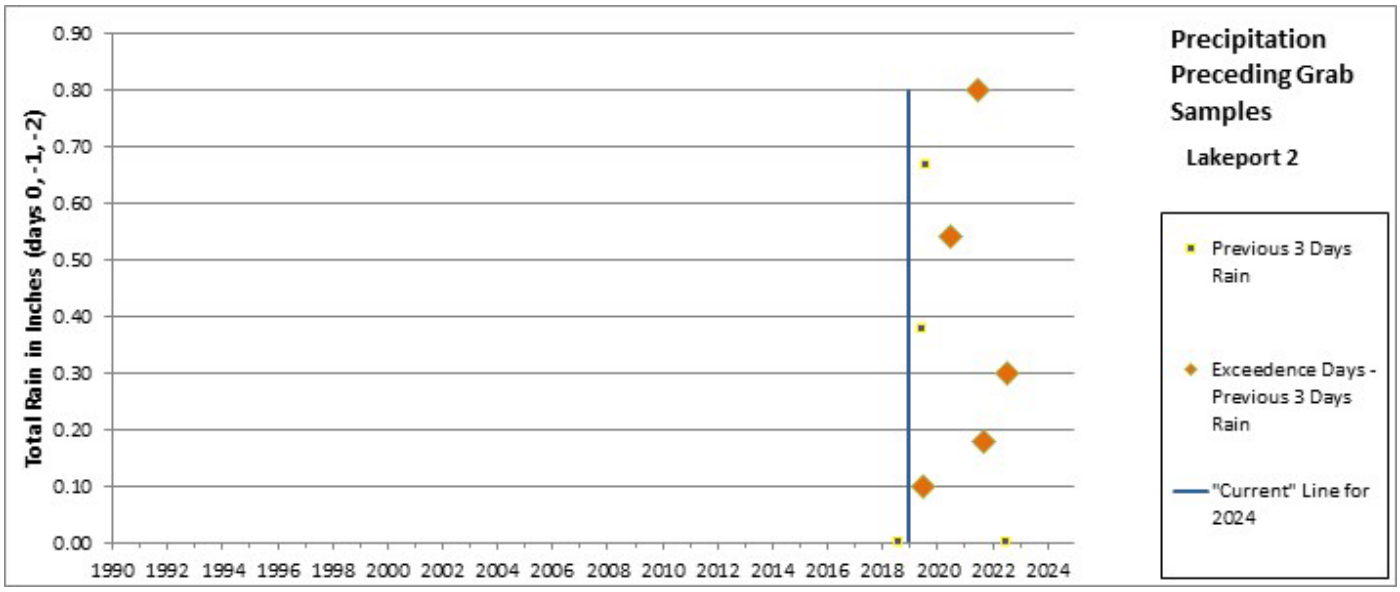
Durgin Brook (NHRIV700020201-14)

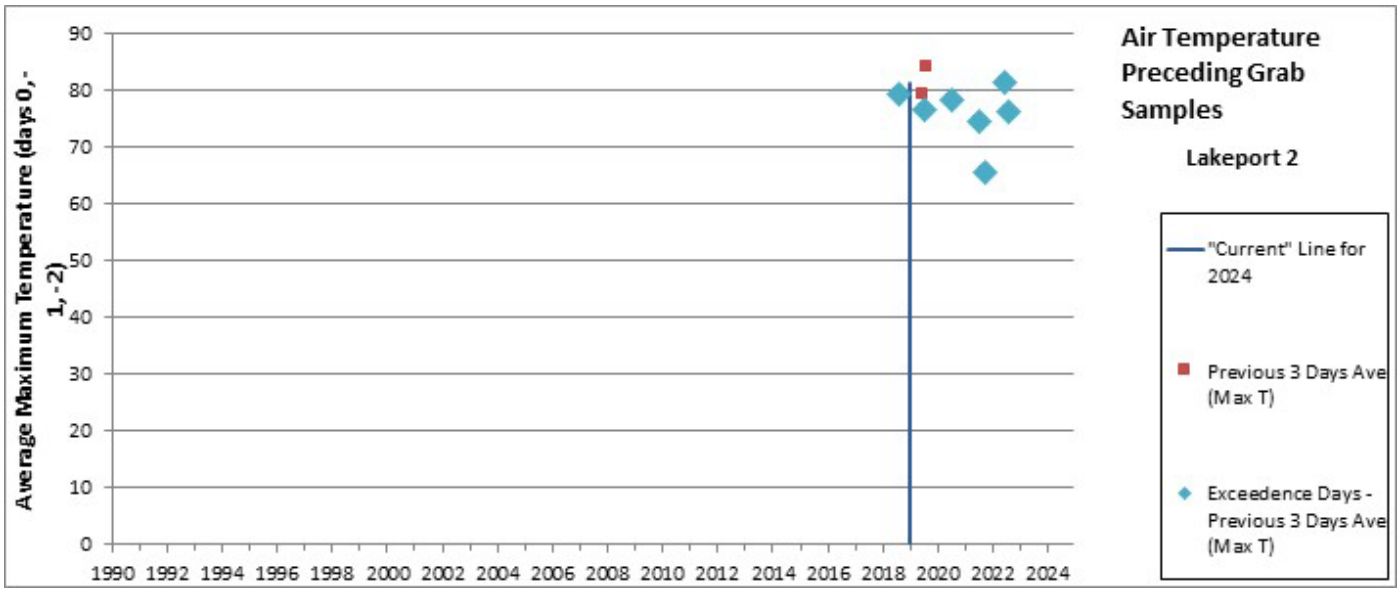
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Durgin Brook	NHRIV700020201-14	pH	BELMONT	3-PNS	5-M

Seven of the ten (70%) grab samples collected at station WINMBELI-UP were below the lower pH threshold of 6.5. These samples triggered the new impairment in the 2024 cycle. The low pH samples were collected between June and September at flows ranging from 0.06 to 3.60 cfsm on the Warner River gage (01086000) and during varying weather conditions (0.10-0.80 inches preceding three day precipitation). Durgin Brook (NHRIV700020201-14) has been moved from 3-PNS to 5-M for pH for the aquatic life integrity designated use based on data collected in the current assessment period.


DURGIN BROOK
(NHRIV700020201-14)
pH
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
pH-GRAB
pH-Max-Magex
pH Max
pH Min
pH-Min-Magex


Gage CFSM on Sample Days
USGS 01086000 WARNER RIVER AT DAVISVILLE, NH
Gage CFSM
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)





Exeter River (NHRIV600030803-03)

Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Exeter River	NHRIV600030803-03	pH	FREMONT	n/a	5-M

In 2019 the Exeter River Dam (D029001) was decommissioned, with the lower level gate, penstock and power intake removed from the spillway, allowing the impoundment (NHIMP600030803-03) to return to a free-flowing stream. Dam removal is still being evaluated for the future as the dam itself is still a barrier to fish passage. As a result of the dam decommissioning, NHIMP600030803-03 was deactivated and the upstream river assessment unit (NHRIV600030803-03) was extended downstream through the old impoundment area. Because NHIMP600030803-03 was impaired (5-M) for pH for the aquatic life integrity designated use, and NHRIV600030803-03 was not, the impairment had to be transferred to the waterbody until new sampling data demonstrated a change in water quality. The Exeter River (NHRIV600030803-03) has been placed in category 5-M for pH for the aquatic life integrity designated use based on data evaluated in the current assessment period.

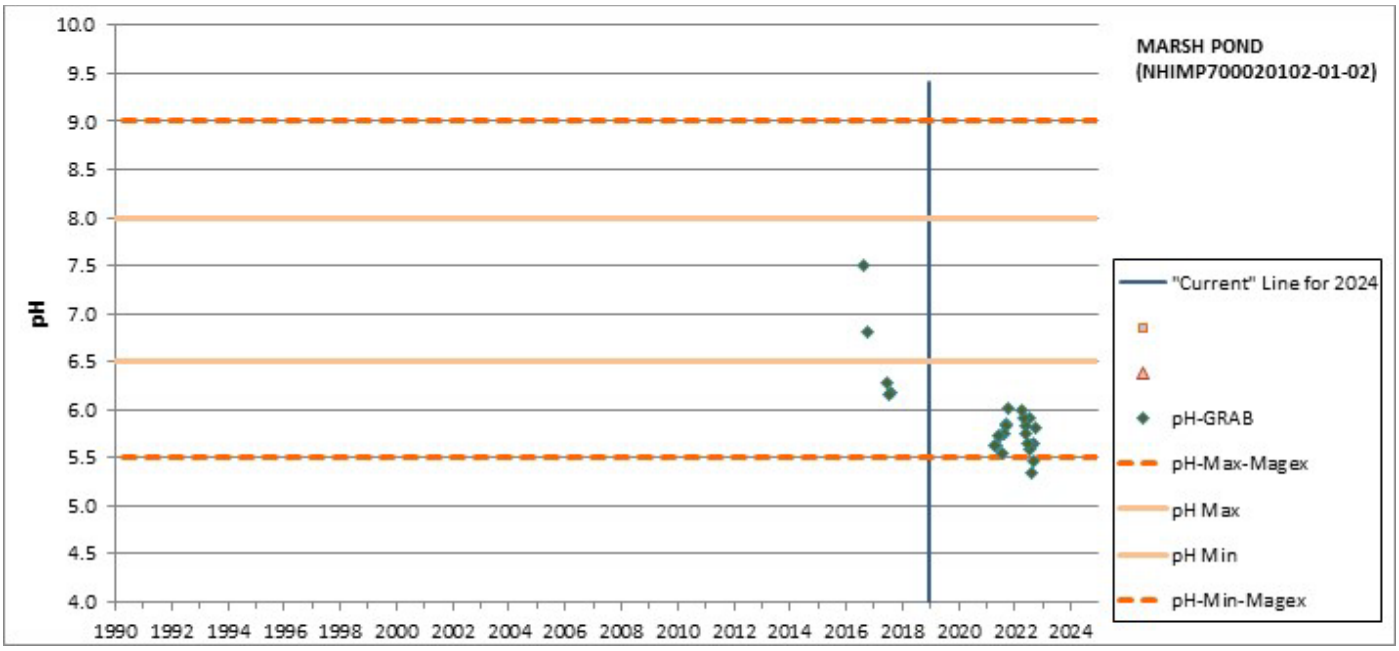
2018 Imagery

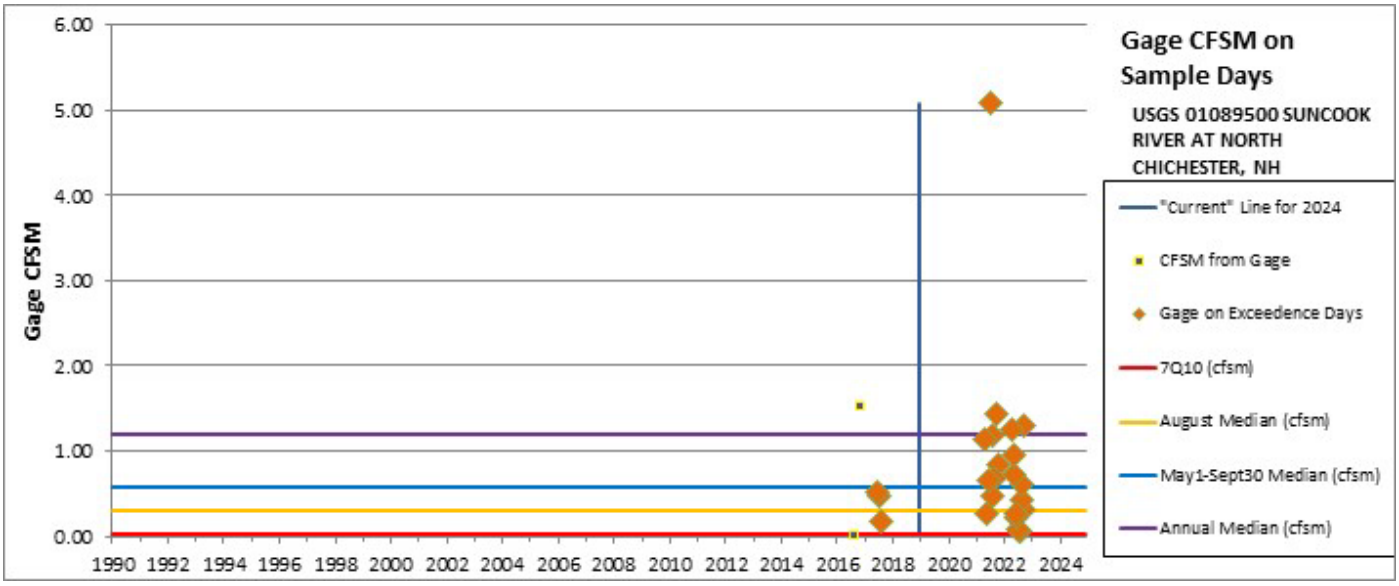
2020 Imagery

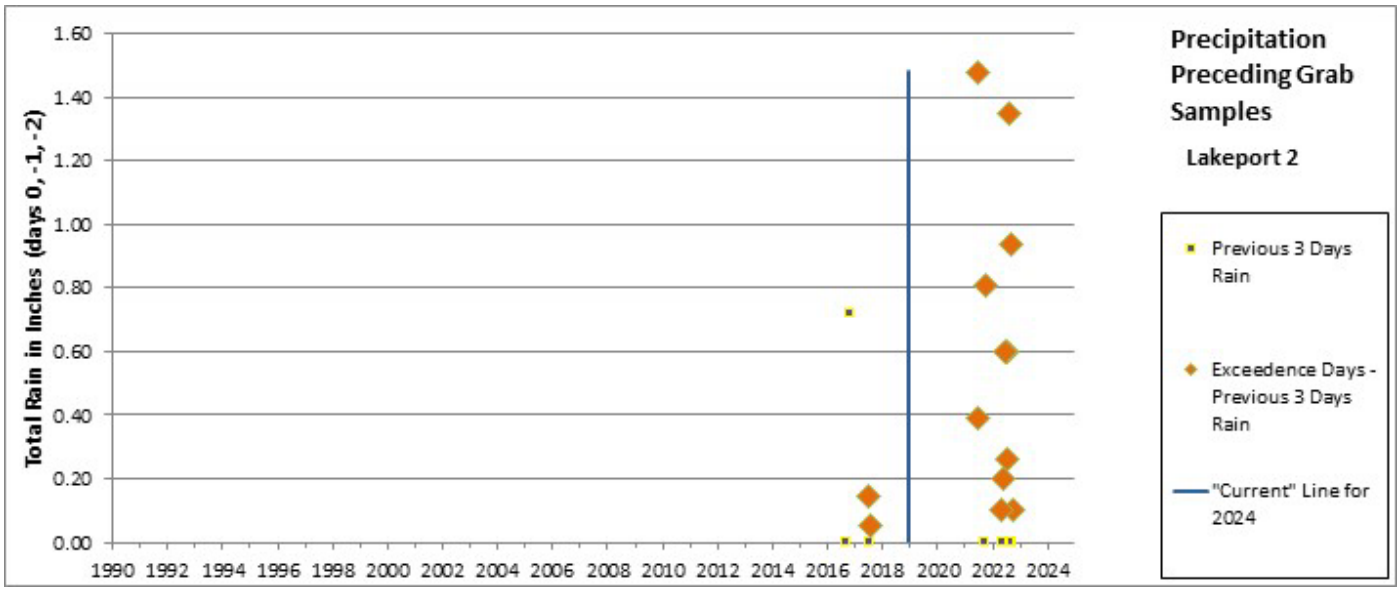
Marsh Pond (NHIMP700020102-01-02)

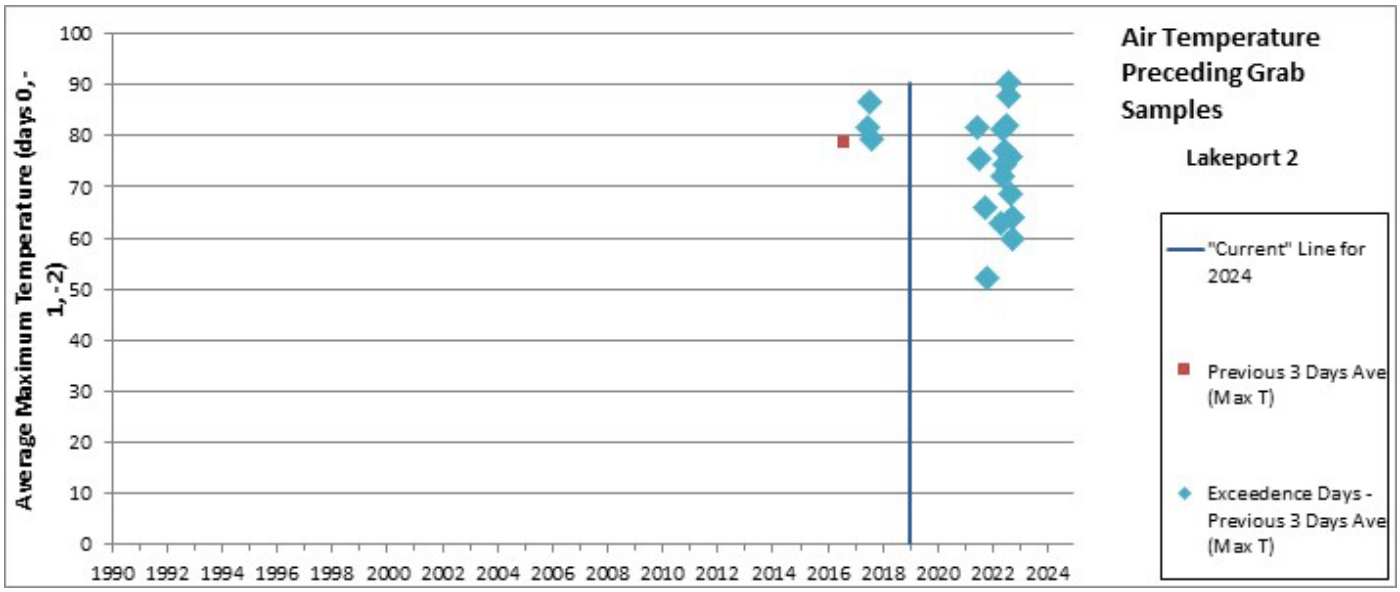
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Marsh Pond	NHIMP700020102-01-02	pH	New Durham, Alton	3-PNS	5-P

Grab sample data collected in 2021 through 2022 at station MARALTD triggered the new impairment in the 2024 cycle. 21 of the 21 (100%) grab samples were below the lower water quality criteria (6.5). The low pH samples were collected between May and November at flows ranging from 0.06 to 5.08 cfsm on the Suncook River gage (01089500) and various weather conditions (0.00-1.48” preceding three day precipitation). Marsh Pond (NHIMP700020102-01-02) has been moved from 3-PNS to 5-P for pH for the aquatic life integrity designated use based on data collected in the current assessment period.


MARSH POND
(NHIMP700020102-01-02)
pH
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
pH-GRAB
pH-Max-Magex
pH Max
pH Min
pH-Min-Magex


Gage CFSM on Sample Days
USGS 01089500 SUNCOOK RIVER AT NORTH CHICHESTER, NH
Gage CFSM
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)

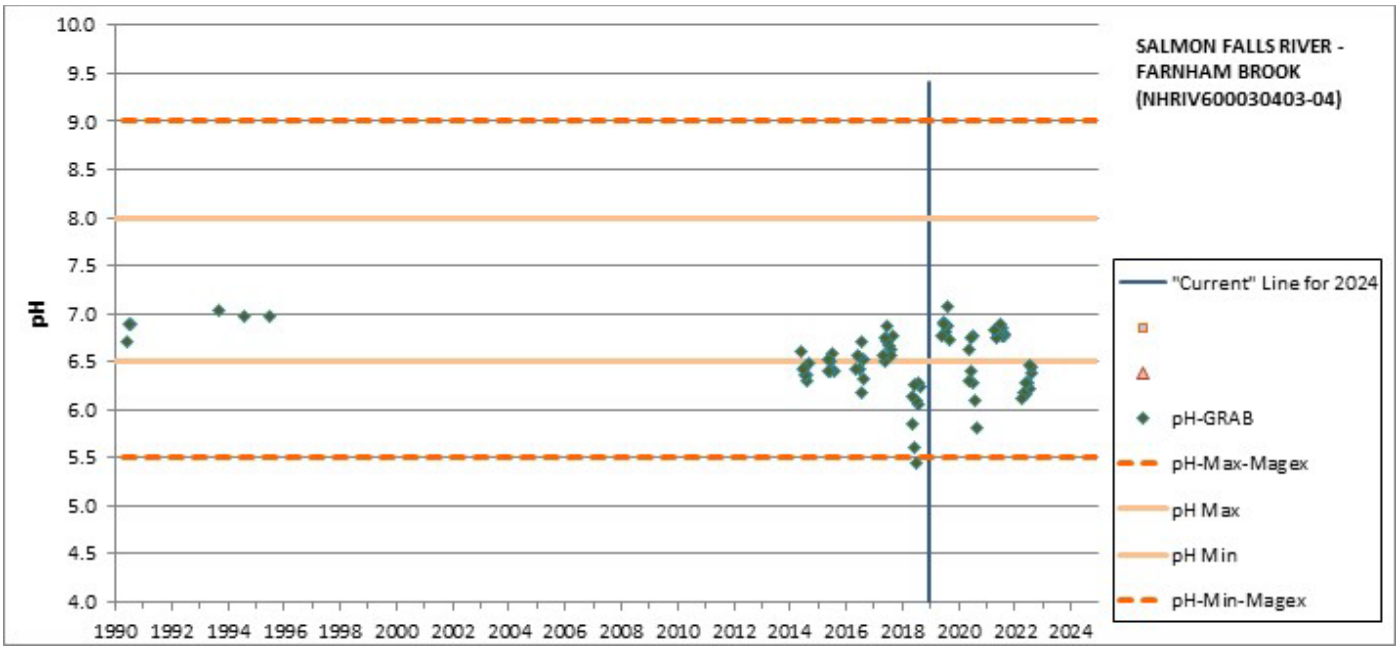


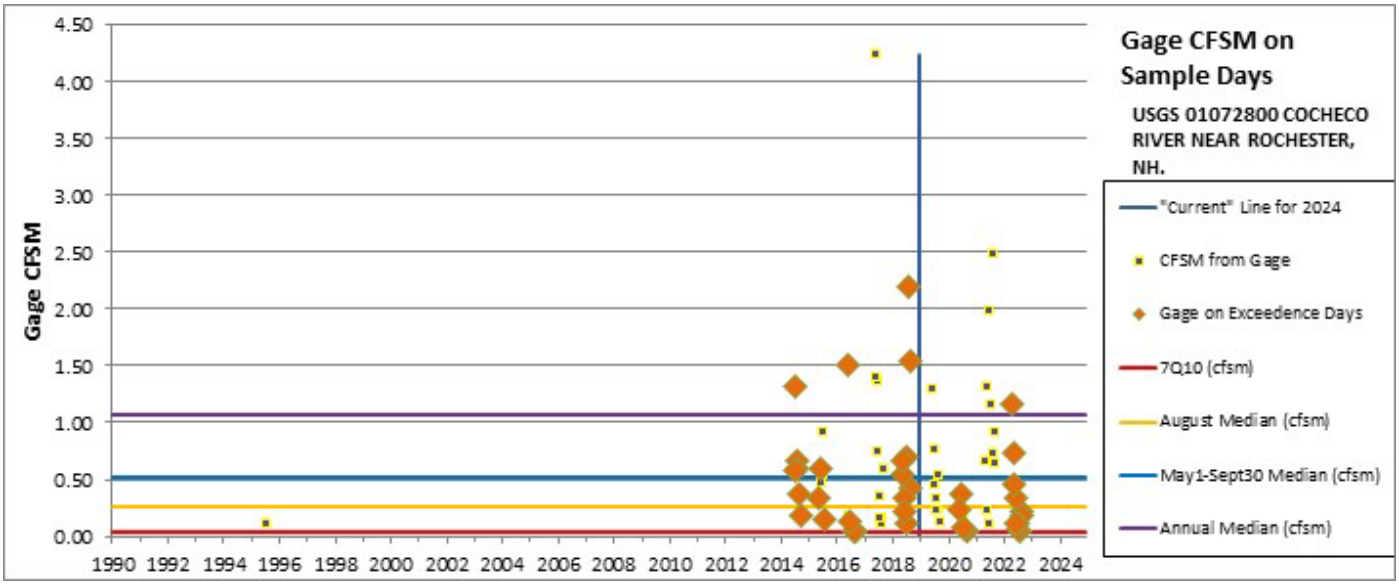


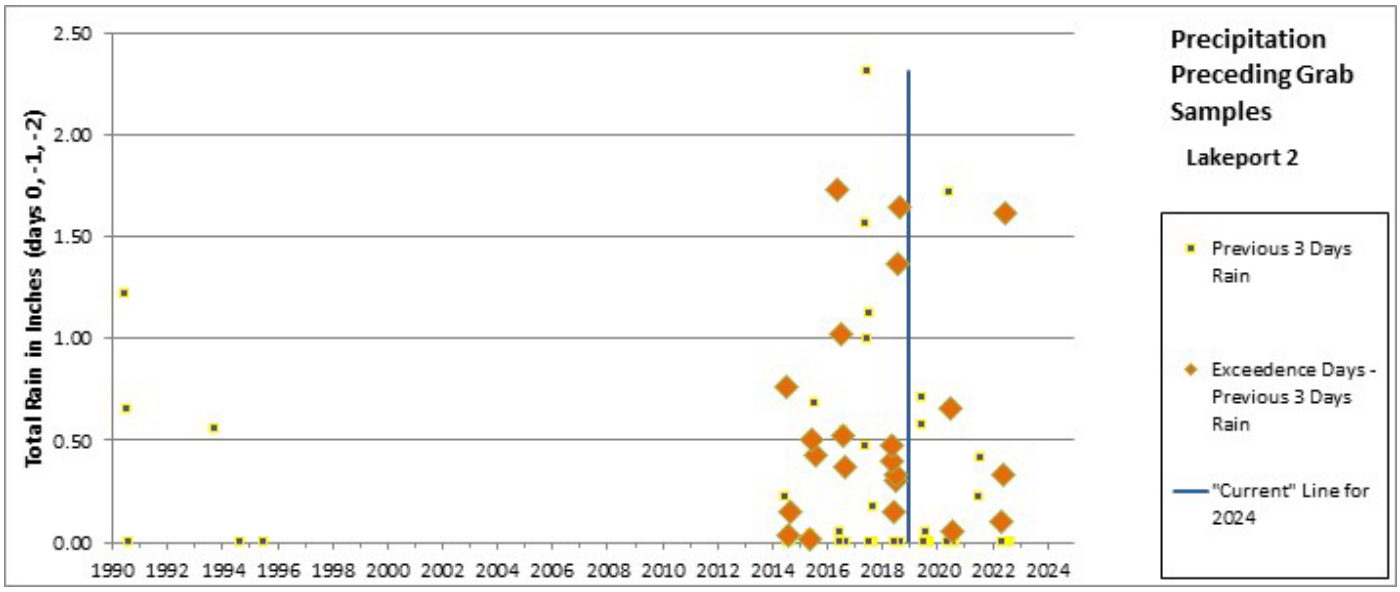
Salmon Falls River – Farnham Brook (NHRIV600030403-04)

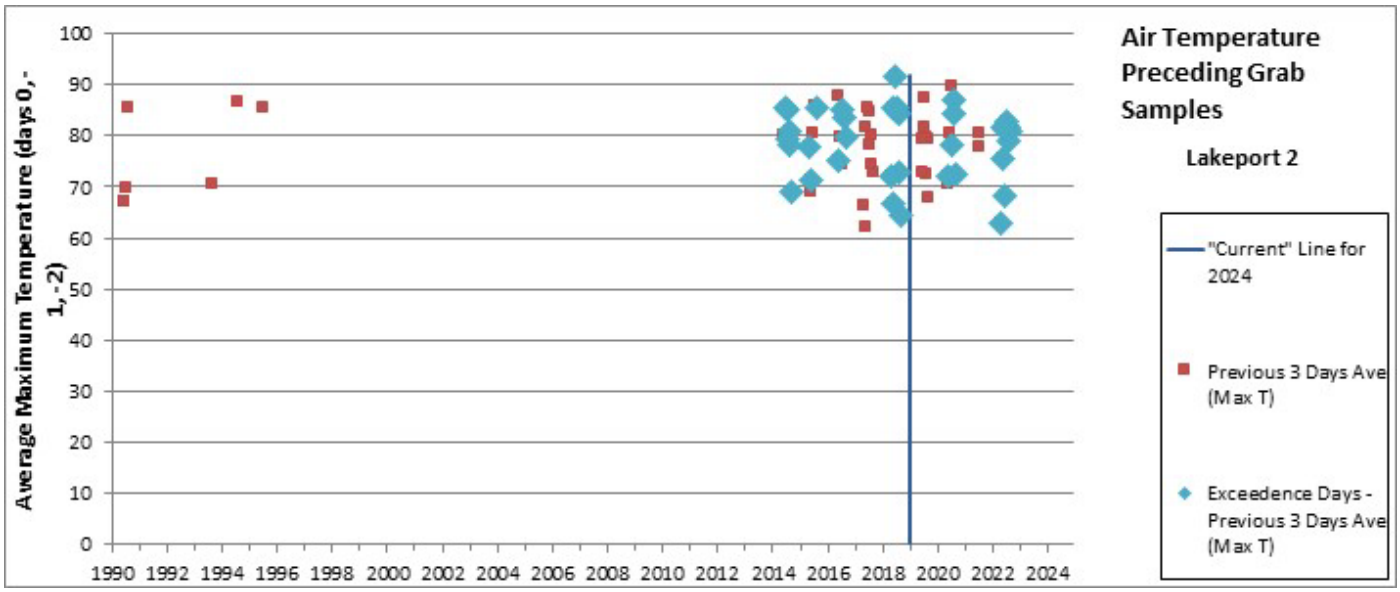
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Salmon Falls River - Farnham Brook	NHRIV600030403-04	pH	WAKEFIELD	3-PNS	5-M

Grab sample data collected in the current assessment period (2019-2024) at station 31-SFR triggered the new impairment in the 2024 cycle. Fifteen of the 36 (42%) grab samples were below the lower water quality criteria (6.5). The low pH samples were collected between May and Septemebr at flows ranging from 0.04 to 1.16 cfsm on the Cocheco River gage (01072800) and during varying weather conditions (0.05-1.62 inches preceding three-day precipitation). The Salmon Falls River – Farnham Brook (NHRIV600030403-04) has been moved from 3-PNS to 5-M for pH for the aquatic life integrity designated use based on data collected in the current assessment period.


SALMON FALLS RIVER - FARNHAM BROOK (NHRIV600030403-04)
pH
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
pH-GRAB
pH-Max-Magex
pH Max
pH Min
pH-Min-Magex


Gage CFSM on Sample Days
USGS 01072800 COCHECO RIVER NEAR ROCHESTER, NH.
Gage CFSM
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)

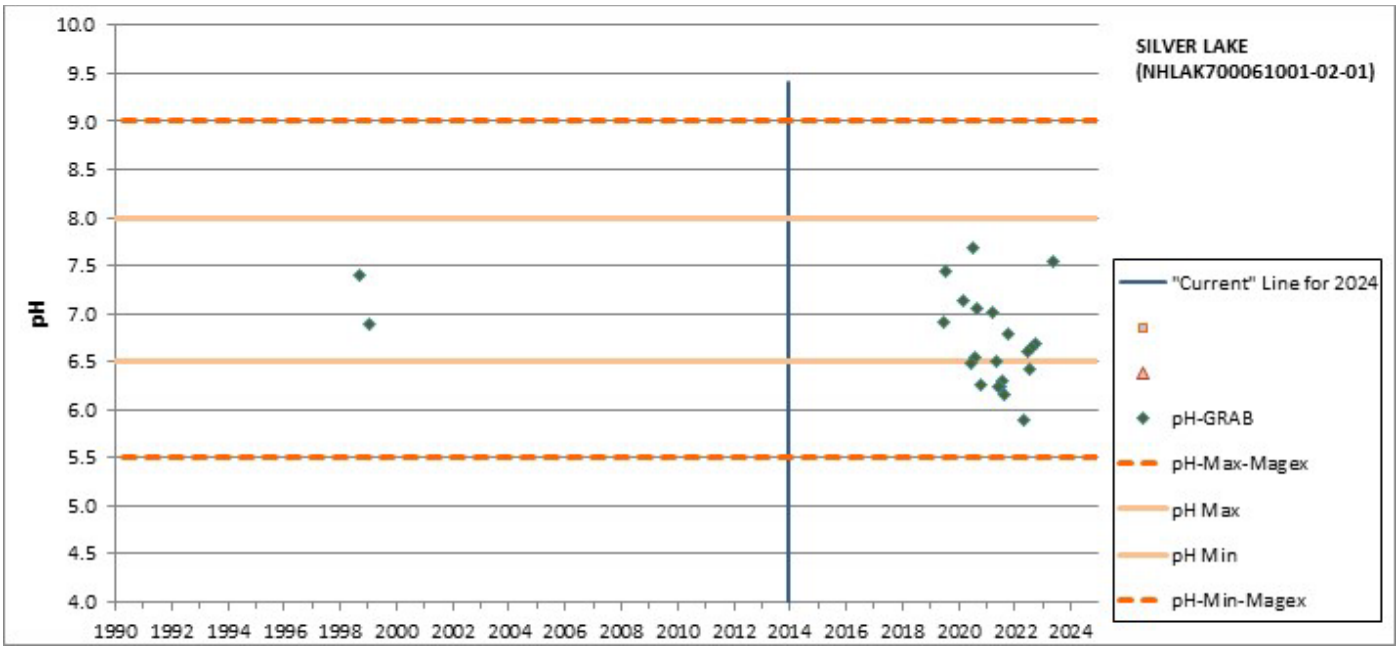


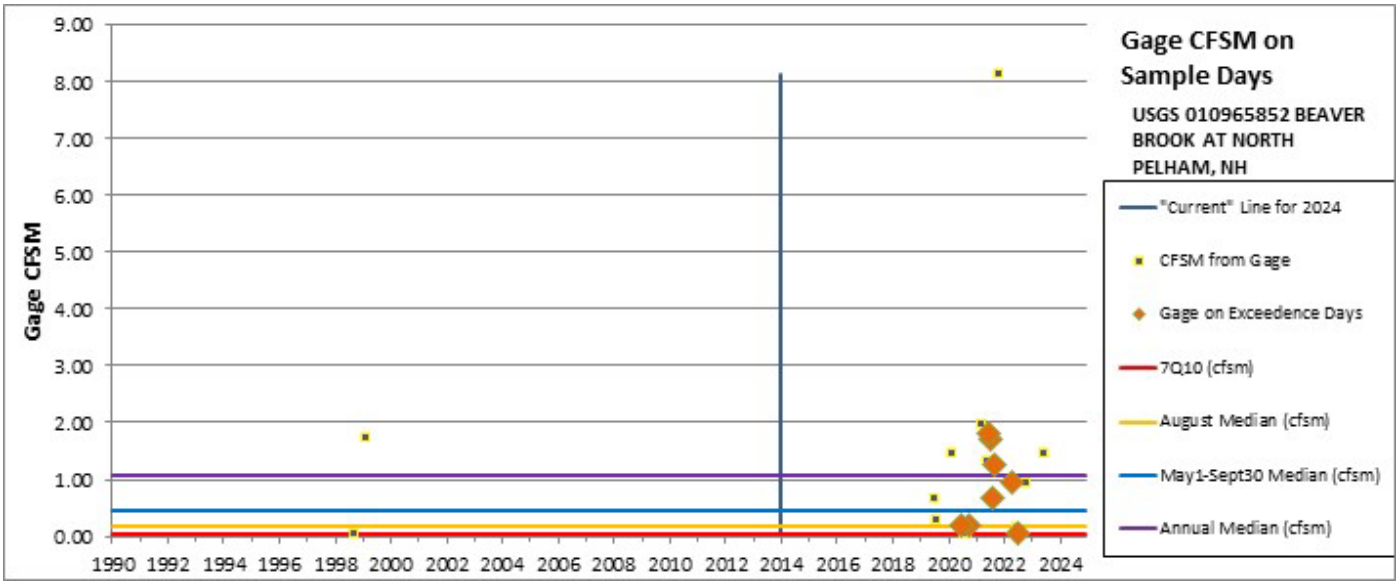


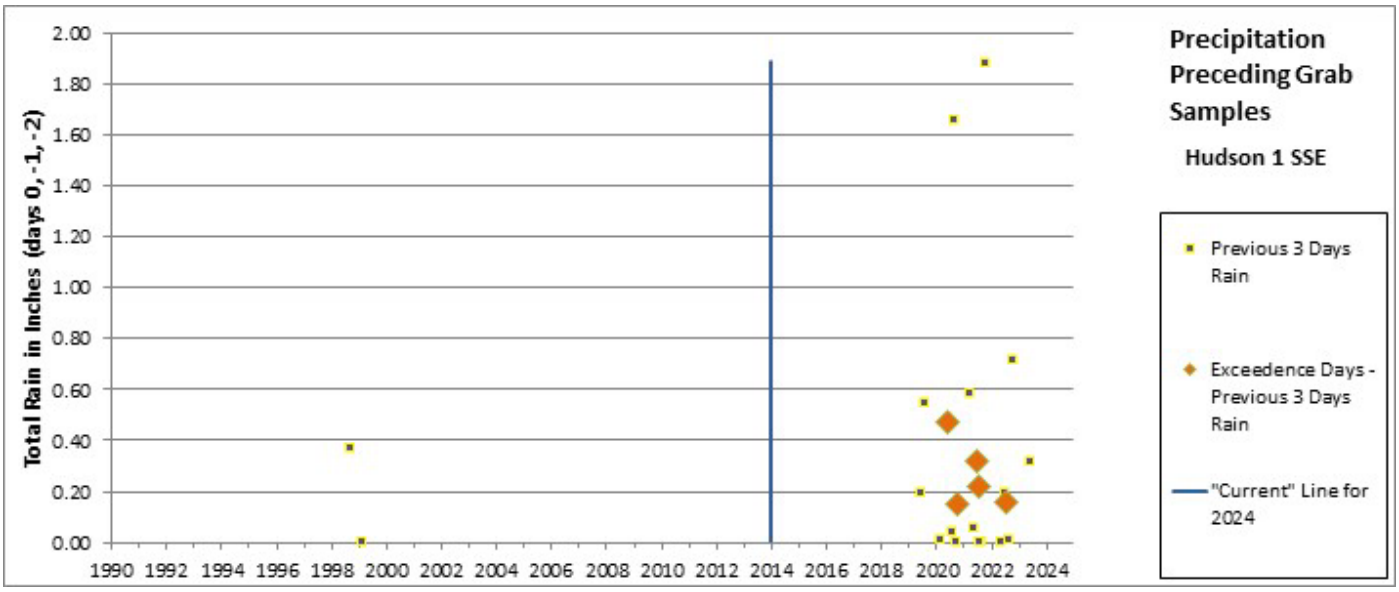
Silver Lake (NHLAK700061001-02-01)

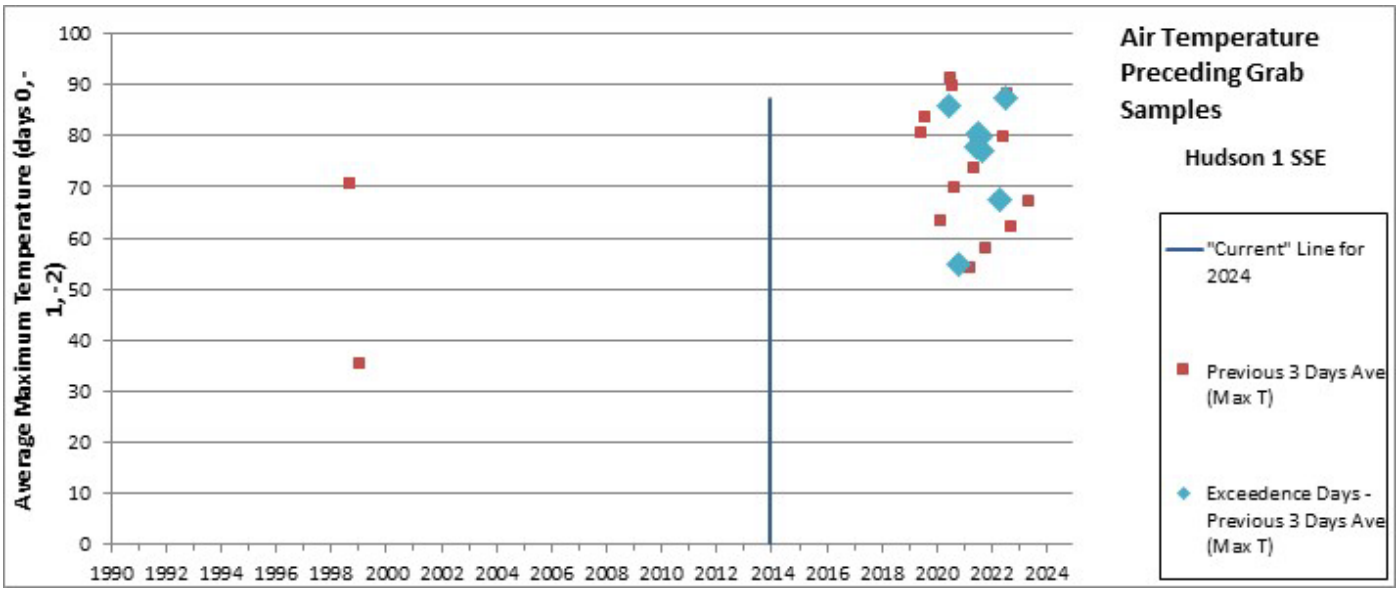
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Silver Lake	NHLAK700061001-02-01	pH	Hollis	3-PAS	5-M

Grab sample data collected in 2019 through 2023 at station SILHLSD triggered the new impairment in the 2024 cycle. 8 of 21 (38.1%) grab samples were below the lower water quality criteria (6.5). The pH samples were collected between February and November at flows ranging from 0.00 to 8.14 cfsm on the Beaver Brook gage (010965852) and various weather conditions (0.00-1.89" preceding three day precipitation). Due to the wide variety of sample month, flow, and weather showing 38.1% of samples below the lower water quality criteria. Silver lake (NHLAK700061001-02-01) has been moved from 3-PNS to 5-M for pH for the aquatic life integrity designated use based on data collected in the current assessment period.


SILVER LAKE
(NHLAK700061001-02-01)
pH
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
pH-GRAB
pH-Max-Magex
pH Max
pH Min
pH-Min-Magex


Gage CFSM on Sample Days
USGS 010965852 BEAVER BROOK AT NORTH PELHAM, NH
Gage CFSM
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)

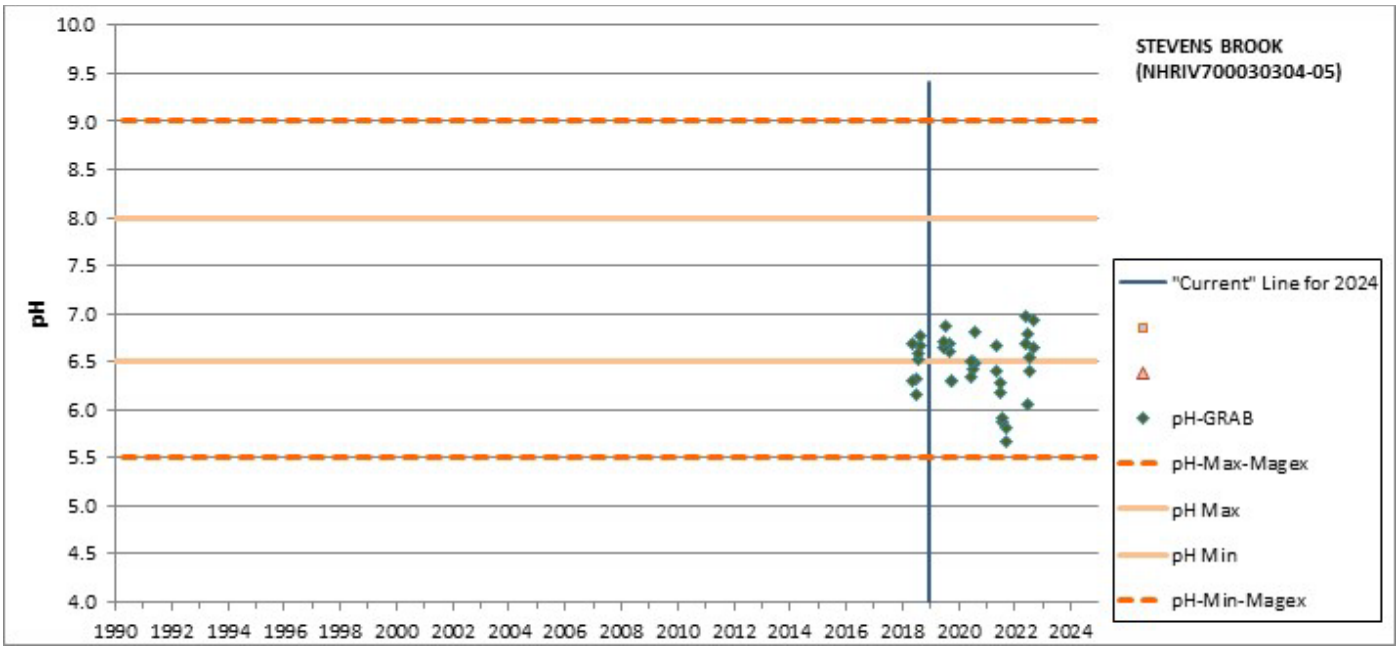


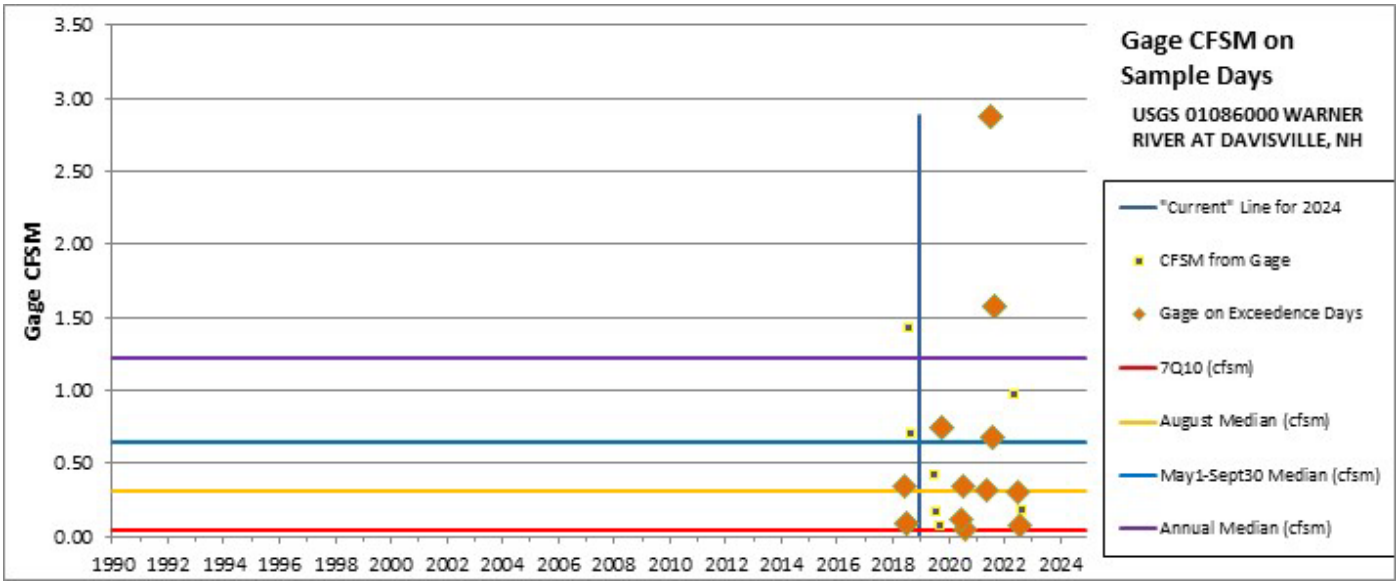


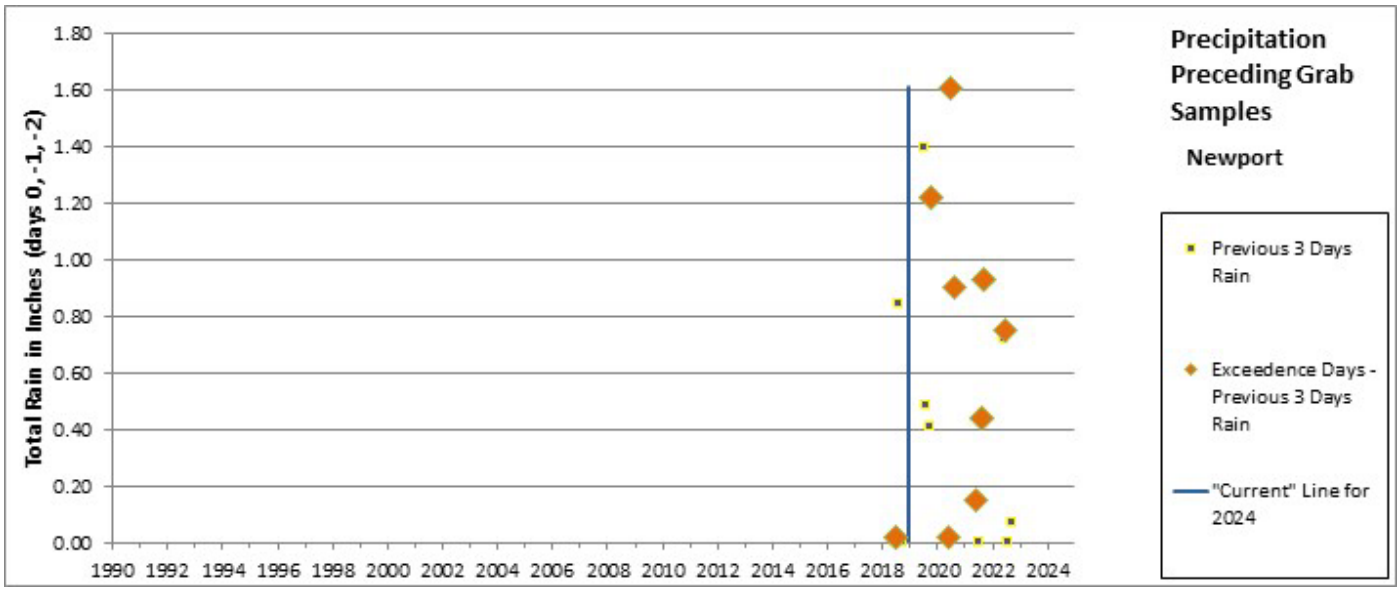
Stevens Brook (NHRIV700030304-05)

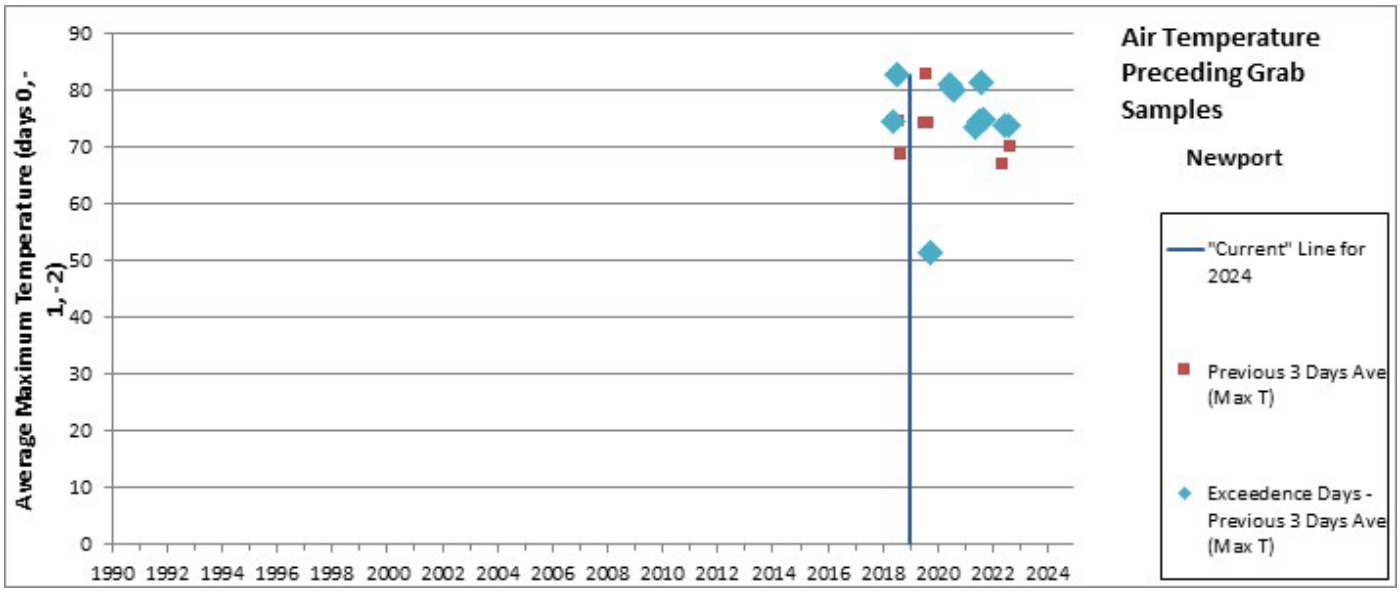
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Stevens Brook	NHRIV700030304-05	pH	WARNER	3-PNS	5-M

Fourteen of the 30 (47%) grab samples collected at stations 02-STV and 10-STV were below the lower pH threshold of 6.5, with several approaching the magnitude of exceedance threshold (5.5). These samples triggered the new impairment in the 2024 cycle. The low pH samples were collected between June and October at flows ranging from 0.04 to 2.88 cfsm on the Warner River gage (01086000) and during varying weather conditions (0.00-1.61 inches preceding three-day precipitation). Stevens Brook (NHRIV700030304-05) has been moved from 3-PNS to 5-M for pH for the aquatic life integrity designated use based on data collected in the current assessment period.


STEVENS BROOK
(NHRIV700030304-05)
pH
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
pH-GRAB
pH-Max-Magex
pH Max
pH Min
pH-Min-Magex


Gage CFSM on Sample Days
USGS 01086000 WARNER RIVER AT DAVISVILLE, NH
Gage CFSM
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)

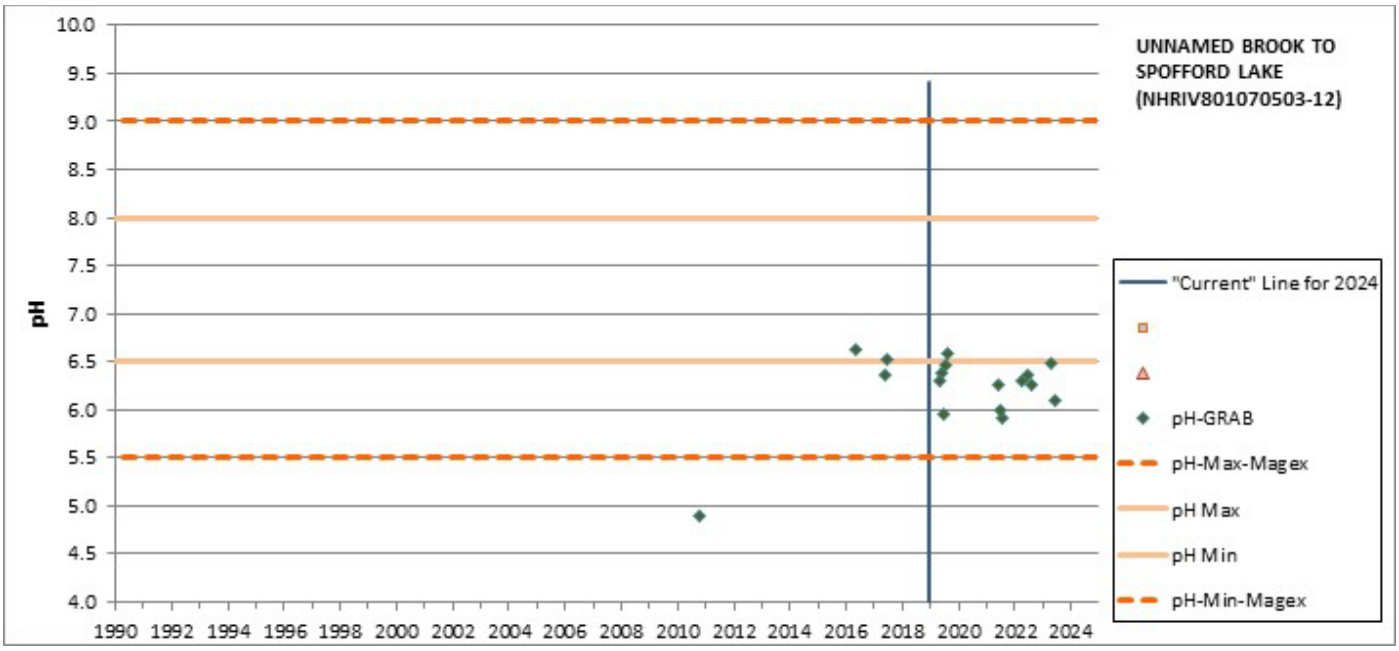


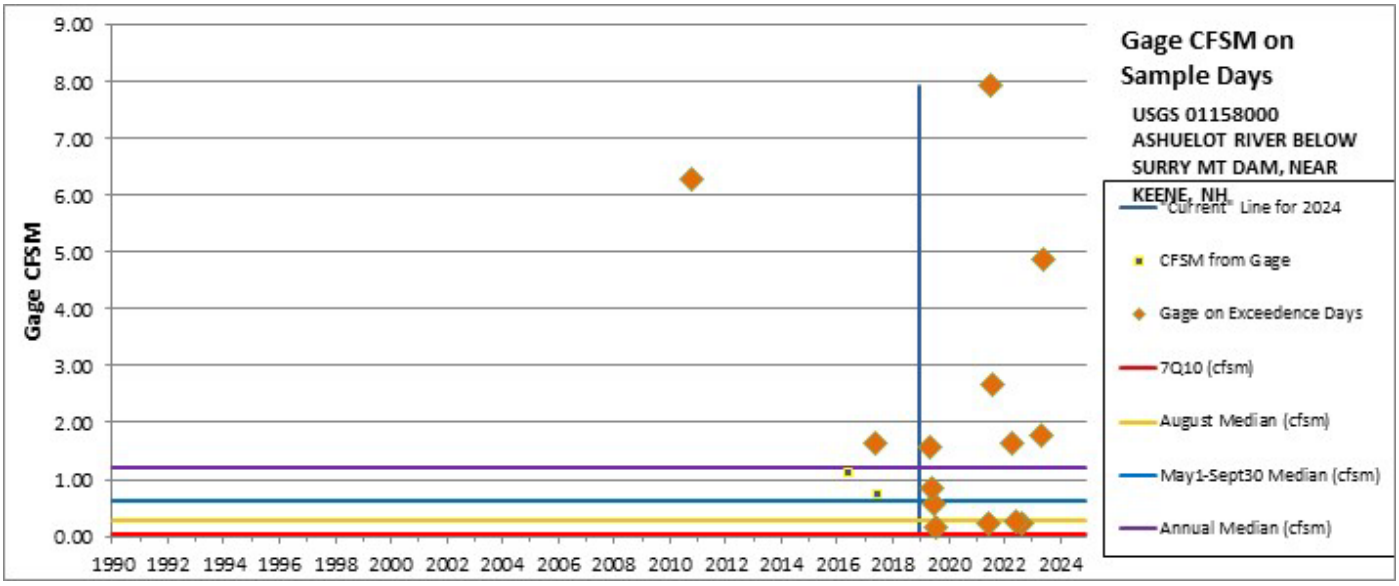


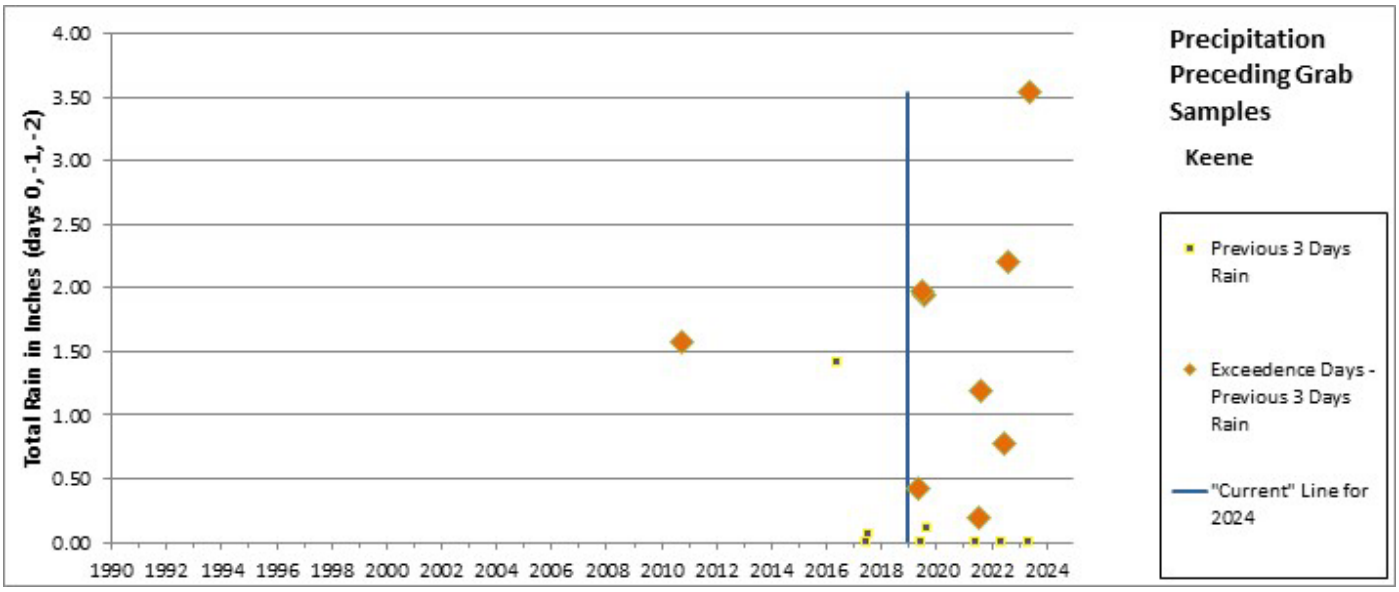
Unnamed Brook to Spofford Lake (NHRIV801070503-12)

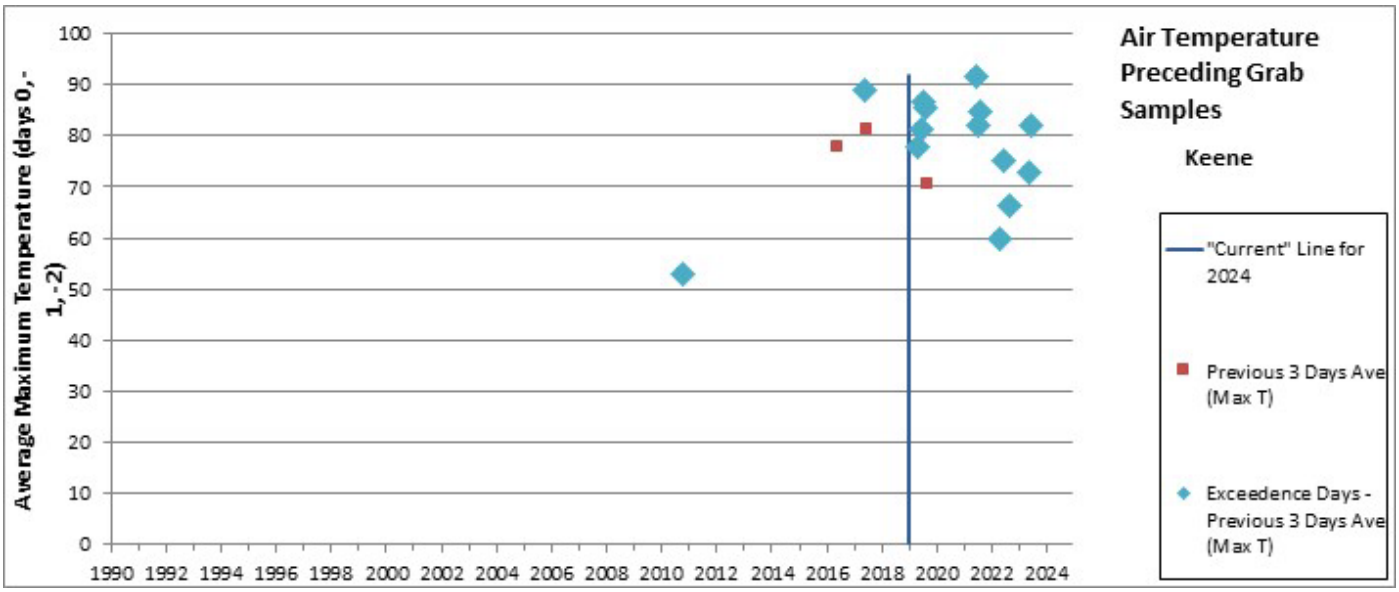
Assessment Unit Name	Assessment Unit ID	Parameter Name	Town(s) - Primary Town Listed First	2020/2022	2024
Unnamed Brook to Spofford Lake	NHRIV801070503-12	pH	CHESTERFIELD	3-PNS	5-M

Grab sample data collected in the current assessment period (2019-2024) at station SPOCHEL triggered the new impairment in the 2024 cycle. Twelve of the 13 (92%) grab samples were below the lower water quality criteria (6.5). The low pH samples were collected between May and September at flows ranging from 0.21 to 7.93 cfsm on the Ashuelot River gage (01158000) and during varying weather conditions (0.20-3.54 inches preceding three day precipitation). The Unnamed Brook to Spofford Lake (NHRIV801070503-12) has been moved from 3-PNS to 5-M for pH for the aquatic life integrity designated use based on data collected in the current assessment period.


UNNAMED BROOK TO SPOFFORD LAKE (NHRIV801070503-12)
pH
"Current" Line for 2024
pH-GRAB
pH-Max-Magex
pH Max
pH Min
pH-Min-Magex


Gage CFSM on Sample Days
USGS 01158000 ASHUELOT RIVER BELOW SURRY MT DAM, NEAR KEENE, NH
Gage CFSM
"Current" Line for 2024
CFSM from Gage
Gage on Exceedence Days
7Q10 (cfsm)
August Median (cfsm)
May1-Sept30 Median (cfsm)
Annual Median (cfsm)


Precipitation Preceding Grab Samples
Keene
Total Rain in Inches (days 0, -1, -2)
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
Previous 3 Days Rain
Exceedence Days - Previous 3 Days Rain
"Current" Line for 2024


Air Temperature Preceding Grab Samples
Keene
Average Maximum Temperature (days 0, -1, -2)
100
90
80
70
60
50
40
30
20
10
0
1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014 2016 2018 2020 2022 2024
"Current" Line for 2024
Previous 3 Days Ave (Max T)
Exceedence Days - Previous 3 Days Ave (Max T)