

Water Quality Assessment Report **2021**

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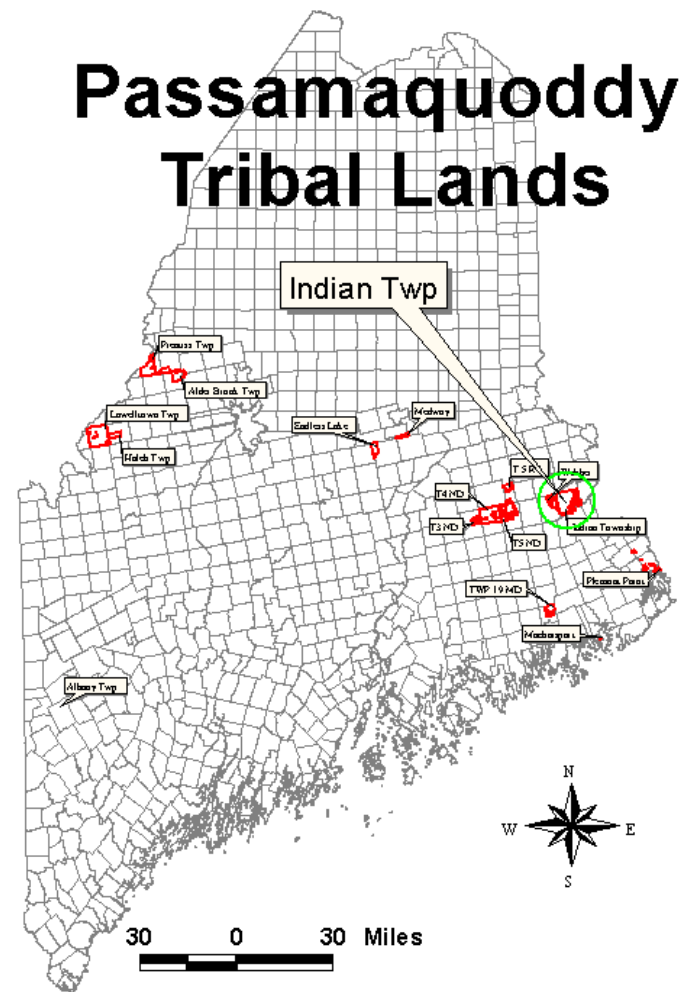


Figure 1: Location of Indian Township, Maine.

Introduction

Background

The Passamaquoddy Tribe at Indian Township began its Water Resources Planning and Inventory Program in April 1993 with funding from a Multi-Media grant from the U.S. Environmental Protection Agency (US EPA), and a Bureau of Indian Affairs (BIA) Water Resources contract. The US EPA requires a Quality Assurance Project Plan (QAPP) as a prerequisite for funding of monitoring programs. The QAPP details the program's procedures for field work, transportation, data use, laboratory and field protocols, and safety. For data to be useful, procedures must be consistent and reliable. The QAPP is submitted to, reviewed, and approved by the US EPA for each year of monitoring.

Indian Township has a wealth of water resources. Bordering the southern edge of the Reservation is part of a long series of reservoirs controlled by Woodland Pulp LLC as part of the St. Croix River drainage. The Reservation waters include Big Lake, Long Lake, Lewey Lake, Grand Falls Flowage and its tributary Tomah Stream. These water bodies make up a significant section of the 647 mi² West Branch of the St. Croix River basin. Reservoir water levels are controlled and used for power generation, mill effluent dilution, fisheries, and flood control. Indian Township's lake levels are controlled at the Grand Falls Dam in Woodland. In addition to Tribal land inside Indian Township, the Passamaquoddy Tribe has in Trust over 115,000 acres distributed over 7 counties in the State of Maine.

Purpose

The Indian Township Water Quality Monitoring Program was undertaken to compile baseline data for reservation water bodies. Water quality is the biological, chemical, and physical composition of the water in its natural state, taking into account any human inputs and alterations. In order to protect water quality in the future, one must have an idea of the current water quality, the sources of pollution currently entering the system, and the trends of the system. Determining trophic state and water quality trends are nearly impossible without data to back up those determinations. A reliable, long term monitoring program can help identify problems before the degradation of water quality is irreversible. To further complicate the water quality issue, watersheds cross municipal, state, tribal and national boundaries. Reliable data can also provide the necessary scientific backing to elicit the political will to address pollution sources.

General Program Summary

We restarted the Water Quality Sampling Program in 2008 with sampling the original four Township lakes: Big Lake, Long Lake, Lewey Lake, and Grand Falls Flowage. The 2009 season built on this foundation by continuing sampling of the Township lakes, as well as adding in monthly sampling of 13 other lakes and ponds, most of which had been regularly sampled in the past. The 2010 Water Quality Sampling Season continued on our 2009 season with sampling of the same 17 lakes and ponds. In 2011 we continued to build on 2010 by adding in 4 more lakes: East and West Musquash Lake, Pleasant Lake, and West Grand Lake. We also added in sampling of a small pond known locally as Bassett Pond, which is evidently fishless, in the summer of 2013.

All of those additions combined with slowly eroding budgets and of course inflation, have caught up to us. We were forced to cut back sampling in order to reduce costs and man hours. Bassett Pond, while interesting and unique, was given the axe for now. It would be best focused on with a special project. Shaw and Mill Privilege were also cut after just one visit in 2017, as the access is poor and causes damage to equipment. The three ponds in the Jackman area were also cut for now, as they require the most resources to get to for the amount of data gained. Now in 2021 sampling has been scaled back to once a month instead of twice. Staffing limits and the emergence of variable leaved water milfoil as a serious aquatic invasive issue in Big Lake has the Department reorganizing priorities.

An updated look at our sampling lakes are as follows: **Big Lake, Long Lake, Lewey Lake, and Grand Falls Flowage** (the original four lakes to be sampled) **Junior Lake, Pocumcus Lake, Scraggly Lake, Sysladobsis Lake, West Grand Lake** (5 major lakes upstream of the Township lakes), **Pleasant Lake** (large tributary to Scraggly Lake), **Upper Chain Lake, Middle Chain Lake** (2 tributaries to Sysladobsis Lake), **East and West Musquash Lakes** (eventually drain into Big Lake) **Side Pistol Lake** (drains into the Passadumkeag River, and eventually the Penobscot River), and **Killman Pond** (drains into Upper Chain Lake). If looked at the watershed level, fifteen of our lakes and ponds sampled are part of the St. Croix River watershed, while only one remains (Side Pistol) included of the extensive Penobscot River watershed.

A full sampling regiment of parameters in 2021 includes the following: **Dissolved Oxygen (DO), Temperature, pH, Conductivity, Transparency** (Secchi depth), **Chlorophyll-a (Chla), Total Phosphorus (TP), Alkalinity, and True Color** analysis. Each one of those parameters will be explained in greater detail later on in the report.

Monthly Program Summary

May 2021 Our weather station on the reservation recorded about 3.6" (2.25" on the last day of the month), compared to about 3.4" for May 2020, 4.90" for 2019, 2.20" for 2018, 4.75" for 2017, 2.75" for 2016. There is some concern coming into the Spring with the drought from last year continuing. It was a pretty dry month until the last few days.

Things have started to open back up regarding Covid restrictions and our field season should be back to 2019 normal. We started out with our first samples on May 17th, missing the first half of the month due to mostly weather issues and local dirt road closures for mud season. We did get all 16 lakes and ponds done though in the second half.

A full QAPP rewrite was completed and approved this April/May. No major changes to report. Our new last year boat barely got any use in 2020 and has been running great. We finally managed to track down a new truck this winter and that has been put into service. Ryan Gabriel returns for another season as our field assistant. Our yearly retraining with Lake Stewards of Maine (formerly VLMP) may be only online sessions again this year, its still up in the air at this point. **(16/16: 100%)**

June 2021 Our weather station on the reservation recorded about 2" of rain for June 2021. Most of that rain came in the second half of the month, again being a concerning start for another possible drought. For comparison, we had 2.75" of rain for June 2020, 7.3" for 2019, 5.0" for 2018, 1.9" for 2017, and 2.80" for 2016. Between dodging Covid closures and rain storms we focused on getting all lakes on the schedule surveyed once in the month. Junior and Scraggly got a bonus visit. No issues this month out of the ordinary. **(18/16: 100+%)**

July 2021 Our weather station on the reservation recorded 5.8" for July 2021, a large total for July. Rain came regularly the entire month, with a pair of large storms in the first half. Productivity for fruit trees, mushrooms, etc are amazing this season. Compare this to about 1.75" of rain for July 2020, 3.8" for 2019, 1.5" for 2018, 1.4" of rain in 2017, 3.8" of rain for July 2016. While the field portion of July went smoothly, the lab portion for CHLA and TP was less so. The lab was struggling with understaffing (as most every business is this summer) and numerous samples were processed past the holding time. **(16/16: 100%)**

August 2021 Our weather station on the reservation recorded 1.8" of rain for August this year, not a large amount but given the good totals in July, we're doing ok. In comparison we had 2.6" of rain for August 2020, 4.2" for 2019, 4.5" for 2018, only 1.0" of rain for August 2017, about 3.25" of rain for 2016. No issues with samples at the lab in August. **(16/16: 100%)**

September 2021 Our weather station on the reservation recorded 6.7" of rain for September 2021, a very wet September. In comparison 1.3" of rain fell in September 2020, 4.2" in 2019, 2.4" in 2018, 1.4" in 2017, 2.0" of rain for September 2016. Looking at

that short 5 year window, 2021 was a very wet month. The regular rains have been great, along with a warm September, really extending this year's growing season. All mast/fruit trees and mushrooms have had an amazing year of productivity. **(16/16: 100%)**

The last sample of the season was taken on September 23rd at Pocumcus Lake. Reducing samples to once a month from twice a month made a big difference in success rate and efficiency. You can be choosier with weather conditions when not trying to get the 16 sites done every two weeks. This allowed for much more staff flexibility for other priorities like milfoil surveys, etc. Hopefully 2022 follows a similar path and outcome.

Parameter Summary

In order to further measure our sampling success, the following shows each parameter sampled and its associated success rate (measured by valid samples taken/possible samples taken) not including quality control duplicate samples.

- **Dissolved Oxygen/Temperature Profiles:** 82/82 (100%) 2021 had our field season get back on track, with a less intensive survey schedule, moving from twice a month to once a month. We replace the ProDO probe tip every Spring and that's normally the only maintenance required. This meter has shown to be extremely accurate in DO and Temp readings and having a 40m cable allows us to take readings to the bottom of even the deepest lakes in the area.
- **Chlorophyll-a:** *82/82 (100%) Most of the July samples were tested past the 28 day frozen holding time due to lab understaffing and have been flagged. We've been assured by other water quality experts that the data is still viable. Again this year there were no large outliers to deal with, all the readings were within the general expected range from past experience. Chl-a readings ranged from a low of 1.0 ppb (the reporting limit) on most lakes at least once, to a high of 5.0ppb (Middle Chain, East Musquash, Pleasant).
- **Transparency/Secchi:** 82/82 (100%) No secchi readings were missed in 2021. The secchi disk didn't hit bottom at all this season. The season was wetter than usual and water levels didn't dip very low. The consistent surface flow from wetlands also likely kept waters more turbid and colored. We'll see how the color data compares to past years soon enough. Secchi depth ranged from 3.50m (Killman Pond) in the shallowest to 12.45m (West Grand) at the deepest.
- **Total Phosphorus:** *82/82 (100%) No additional Total Phosphorus samples were missed in 2021 per se, but most of July's samples were flagged due to being tested past the 28 day holding time. HETL (as well as most every business) had staffing

issues in the summer of 2021 which led to a backlog of samples. To help compensate we made sure to get all of our sampling activities done and mailed as quickly as possible to maximize the extra holding time on their end. We had no issues for August or September. Our TP range for 2021 was a low of 3ppb (West Grand) with a high of 21ppb (Lewey Lake). The 21ppb was a bit of an outlier but considering the high current of that location it isn't out of the ordinary to have picked up.

- **pH:** 81/82 (99%) No major issues to report, one reading was tossed due to erratic values. The refillable probe continues to be reliable. We emptied and flushed the old fluid at the start of the season, replacing it with fresh solution. Our pH low for the season was 6.67 (Upper Chain) and a high of 7.19 (Junior Lake).
- **Alkalinity:** 82/82 (100%) No additional samples were lost. No problems to report. Our low alkalinity reading for the season was 4.5 mg/l of CaCO₃ (Upper Chain) with a high of 8.5 mg/l of CaCO₃ (Big and Sysladobsis). These readings are very stable from year to year it seems.
- **Conductivity:** 82/82 (100%) Our conductivity meter has always been very reliable, due to the short season we did not pursue a backup unit at this time. We lost no additional samples in 2021. Our low conductivity reading was 18.5 UMHOS/cm (West Musquash Lake) with a high of 28.3 UMHOS/cm (Grand Falls Flowage).
- **Color:** 82/82 (100%) We didn't lose any true color readings for 2021. Our lowest true color reading was 6 PCU (Side Pistol Lake), with a high reading of 67 PCU (Upper Chain). The wetter than average summer seems to be giving rise to higher color values than last season's drought numbers.

General Information

Stratification

Holdren et al (2001) defines stratification as a process in which several horizontal water layers of different density form in some lakes. These layers are classified as follows:

Epilimnion – the well-mixed and uniformly warm surface waters

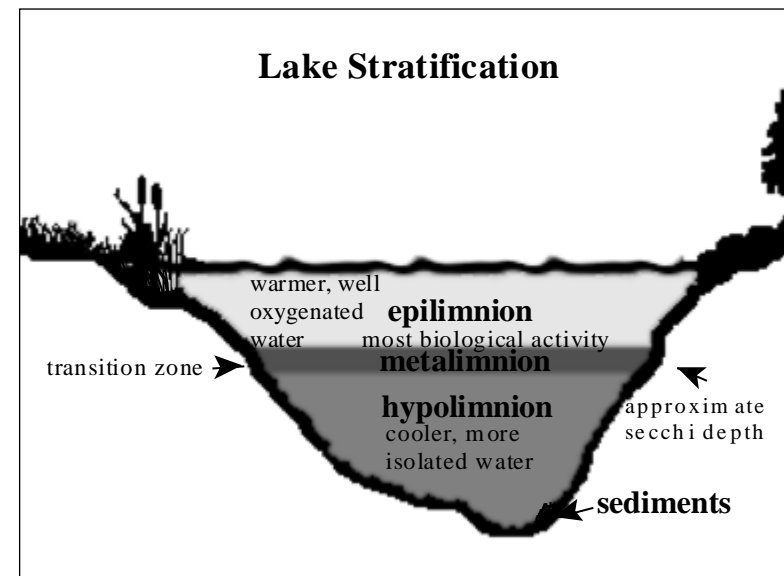
Hypolimnion – the uniformly unmixed bottom waters

Metalimnion - zone of rapidly changing temperature and density separating the epilimnion and the hypolimnion

The lake is stratified when warm water, the epilimnion, floats on the significantly colder water, the hypolimnion. The metalimnion is formed in the region where the temperature gradient decreases markedly. This separation also allows little mixing of the upper layer with the bottom waters. After stratification, the hypolimnion has a finite quantity of oxygen until fall turnover.

Dissolved Oxygen

Dissolved Oxygen (D.O.) is the measure of the amount of oxygen dissolved in the water. All living organisms, except for certain types of bacteria, need oxygen to survive. Organisms living in the water have the ability to use the oxygen dissolved in the water to breathe. Too little oxygen severely reduces the diversity and population of aquatic communities. Therefore the amount of D.O. in the water is very important to aquatic life. Low oxygen can directly kill or stress organisms such that they will not be able to successfully reproduce or grow. Water with less than 1 part per million (ppm) of oxygen is considered anoxic (no oxygen present); less than 5 ppm of oxygen is generally considered so stressful that most coldwater fish will avoid these areas. Anoxic conditions can also promote TP release from sediments (VLMP, 2008 Maine Lakes Report).



An example of a typical stratified lake in midsummer.
Hill, R., Williams, S. 2008 Maine Lakes Report



Chlorophyll is what makes plants green, Snappy the Quill Pig loves his green veggies.

Chlorophyll-a

A pigment found in algae and other plants used to estimate biological productivity of lake ecosystems. By measuring the concentration of Chl-a in lake water, the algae population can be estimated. Chl-a is measured in parts per billion (ppb).

Chlorophyll-a samples are generally obtained from an integrated water column sample because the greatest concentration of algal growth typically occurs from the surface of the lake to the bottom of the epilimnion or the top of the thermocline (VLMP, 2008 Maine Lakes Report).

Transparency

A measure of water clarity; the distance one can see down into the water column. Factors that affect transparency include algal growth, zooplankton, natural watercolor, and suspended silt particles. Because algae are the most abundant particles in most lakes, transparency indirectly measures algal growth. Transparency values vary widely in Maine lakes. Unless a lake is highly colored or turbid from suspended sediment, transparency readings of 2 meters or less generally indicates a severe algal bloom (VLMP, 2008 Maine Lakes Report).



Two summer youth workers learning how to take secchi readings.



First pair of loon chicks spotted in July 2020 on Scraggly Lake!

Total Phosphorous

A measure of all forms of phosphorus (organic and inorganic) in the water. Phosphorus is one of the major nutrients needed for plant growth. Because its natural occurrence in lakes is very small, phosphorus “limits” the growth of algae in lake ecosystems. Small increases in phosphorus in lake water can cause substantial increases in algal growth.

Phosphorus is measured in parts per billion (ppb). Phosphorus concentrations may be based on samples taken from the surface of the lake or from discrete samples taken at specific depths, or from an integrated water column

(epilimnetic core) sample (VLMP, 2008 Maine Lakes Report).

pH

A measure of the relative acid-base status of lake water, pH helps determine which plant and animal species can live in the lake, and it governs biochemical processes that take place. The pH scale ranges from 0-14, with 7 being neutral. Water is increasingly acidic below 7, and increasingly alkaline above 7. A one unit change in pH represents a tenfold change in acidity or alkalinity. The pH scale is the inverse log of the hydrogen ion concentration (VLMP, 2008 Maine Lakes Report).



A rare find! Fresh water jellyfish in Mill Privilege Pond, 2015.



Jack Downing taking an integrated Core sample on Side Pistol Lake, May 2016.

Alkalinity

A measure of the capacity of water to neutralize acids, or buffer against changes in pH, alkalinity is also referred to as “buffering capacity.” It is a measure primarily of naturally available bicarbonate, carbonate, and hydroxide ions in the water. Alkalinity is measured in milligrams per liter (mg/l) (VLMP, 2008 Maine Lakes Report).

Specific Conductance

A measure of the ability of water to carry an electrical current, conductivity is directly related to the level of dissolved ions in the water. Conductivity levels will generally increase if there is an increase in the concentration of pollutants in the water. Conductivity is measured in micro-siemens per centimeter ($\mu\text{S}/\text{cm}$) or micro-mhos per centimeter (or $\mu\text{mhos}/\text{cm}$) (VLMP, 2008 Maine Lakes Report).



Our remote floating lake ‘lab’ hard at work. Testing around the West Branch of the St Croix every summer.

Color

The concentration of natural, dissolved, humic acids in lake water, organic “Humic” acids leach from vegetation in the lake watershed. Color is measured in Standard Platinum Units (SPU). Lakes with color levels greater than 25 SPU are considered to be colored. This can cause transparency to be reduced, and phosphorus levels to be elevated. The water in highly colored lakes often has the appearance of tea. When lakes are highly colored, the best indicator of algal growth is chlorophyll-a (VLMP, 2008 Maine Lakes Report).



Getting Martin Dana out of the office and into the boat for once.

Methods

Site Selection

Lakes on or near tribal lands to be included in the monitoring program were selected according to accessibility by road. Bathymetric maps were obtained from the Maine Department of Inland Fisheries and Wildlife for the following water bodies: **Junior Lake, Killman Pond, Middle Chain Lake, Pocumcus Lake, Scraggly Lake, Side Pistol Lake, Sysladobsis Lake, Upper Chain Lake, Pleasant Lake, West Musquash Lake, East Musquash Lake, and West Grand Lake.** These were all incorporated into the monitoring program along with the 4 lakes on Indian Township: **Big Lake, Long Lake, Lewey Lake, Grand Falls Flowage.** See Table 1 for summary of water bodies sampled each season.



Joe Musante and Ryan Gabriel taking samples on Lewey Lake, July 2019.

Table 1. Waterbodies included in ITTG Monitoring Program

Waterbodies Sampled in the ITTG Water Quality Program by Year													
93-'99	00-'02	2002	03-'04	2005	06-'07	2008	09-'10	11-'12	13-'16	2017	18-'19	2020	2021
Big	Big	Big	Big	Big (2)	No	Big	Big	Big	Big	Big	Big	*Big	Big
Long	Long	Long	Long	Long	sampling	Long	Long	Long	Long	Long	Long	*Long	Long
Lewey	Lewey	Lewey	Lewey	Lewey	done	Lewey	Lewey	Lewey	Lewey	Lewey	Lewey	*Lewey	Lewey
Grand Falls	Grand Falls	Grand Falls	Grand Falls	Grand Falls(2)	these	Grand Falls	Grand Falls	Grand Falls	Grand Falls	Grand Falls	Grand Falls	*Grand Falls	Grand Falls
			Tomah Str.	Tomah Str	two	Tomah Str	Tomah Str						
	*Side Pistol	Side Pistol	Side Pistol	Side Pistol	years.		Side Pistol	Side Pistol	Side Pistol	Side Pistol	Side Pistol	*Side Pistol	Side Pistol
	*Upper Chain	Upper Chain	Upper Chain	Upper Chain		*Upper Chain	Upper Chain	Upper Chain	Upper Chain	Upper Chain	Upper Chain	*Upper Chain	Upper Chain
		Duncan	Duncan	Duncan		*Duncan	Duncan	*Duncan	*Duncan				
		Junior	Junior	Junior			Junior	Junior	Junior	Junior	Junior	*Junior	Junior
		Killman	Killman	Killman		*Killman	Killman	Killman	Killman	Killman	Killman	*Killman	Killman
		Mill Privilege	Mill Privilege	Mill Privilege			Mill Privilege	Mill Privilege	Mill Privilege	*Mill Privilege			
		Pocumcus	Pocumcus	Pocumcus			Pocumcus	Pocumcus	Pocumcus	Pocumcus	Pocumcus	*Pocumcus	Pocumcus
		Scraggly	Scraggly	Scraggly			Scraggly	Scraggly	Scraggly	Scraggly	Scraggly	*Scraggly	Scraggly
		Shaw	Shaw	Shaw			Shaw	Shaw	Shaw	*Shaw			
		Sysladobsis	Sysladobsis	Sysladobsis			Sysladobsis	Sysladobsis	Sysladobsis	Sysladobsis	Sysladobsis		Sysladobsis
				Mary Petuche		*Mary Petuche	Mary Petuche	*Mary Petuche	*Mary Petuche				
						*Hall	Hall	*Hall	*Hall				
				East Grand			Middle Chain	Middle Chain	Middle Chain	Middle Chain	Middle Chain	*Middle Chain	Middle Chain
								West Grand	West Grand	West Grand	West Grand	*West Grand	West Grand
								Pleasant	Pleasant	Pleasant	Pleasant	*Pleasant	Pleasant
								E. Musquash	E. Musquash	E. Musquash	E. Musquash	*E. Musquash	E. Musquash
								W. Musquash	W. Musquash	W. Musquash	W. Musquash	*W. Musquash	W. Musquash
									Bassett				

*Only sampled once or twice this year

Sample Collection and Field Measurements

Samples were collected and *in situ* measurements were taken according to procedures outlined in *Maine Department of Environmental Protection's 1993 Standard Field Methods for Lake Water Quality Monitoring* by Judy Potvin and Linda Bacon. These methods have been updated throughout the years, but that document was the start of our program!

Laboratory Analysis

Alkalinity samples are typically titrated within 48 hours of collection by staff in the office, some however are tested later, but well within the 14 day holding time. True color samples are processed by staff in the office within 48 hours of collection. Chl *a* samples are filtered within 24 hours using a hand held filter apparatus. The filter is then stored in the freezer waiting to be sent to the Health and Environmental Testing Lab (HETL) in Augusta to be processed. TP samples are immediately placed in the fridge. Within the appropriate time period (generally 1-2 weeks) Chl *a* and TP samples are mailed to HETL for analysis. The holding time for Chl-*a* and TP samples to be processed by the lab (assuming the Chl-*a* has been filtered and frozen) is 28 days.

Statistical Analysis

The formulas for calculating the Carlson Trophic State Index values for Secchi disk, chlorophyll *a*, and total phosphorus are presented below. Also presented is a table that lists the trophic state values and the corresponding measurements of the three parameters. Ranges of trophic state index values are often grouped into trophic state classifications. The range between 40 and 50 is usually associated with mesotrophy (moderate productivity). Index values greater than 50 are associated with eutrophy (high productivity). Values less than 40 are associated with oligotrophy (low productivity).

Maine DEP Lake Assessment Criteria for Calculating Valid TSIs

1. Samples are to be taken from open water.
2. Five months of data are necessary; one reading per month is acceptable, but 2 readings per month are preferred.
3. Sampling period is May through November.
4. It is not permissible to be missing any 2 consecutive months of data.
5. The mean used in the equations shall be calculated as the mean of the monthly means in order that all months be equally weighted in the calculation.
6. Integrated cores should be taken to a depth equal to that of the late summer epilimnion or to the 2.0 mg/l D.O. level, whichever is less.
7. Secchi Transparency readings must not have hit the lake bottom.

Formulas

All lakes: $TSI_c = 70 \log (\text{mean Chlorophyll } a \text{ in ppb} + 0.71)$

Lakes having color less than or equal to 25 Standard Platinum Units:

$TSI_p = 70 \log (0.33 \text{ mean total phosphorus in ppb} + 0.7)$

$TSI_{sd} = 70 \log [(105 / \text{mean Secchi transparency}^2) + 0.7]$

Note: Secchi transparency in meters

TSI Table

TSI	Chlorophyll a (ppb)	Secchi Transparency (m)	Total Phosphorus (ppb)
0	0.3	18.7	0.9
10	0.7	12.3	2.1
20	1.2	9.2	3.1
30	2.0	7.3	6.0
40	3.0	5.9	9.2
50	4.5	4.8	13.6
60	6.5	4.0	19.7
70	9.3	3.4	28.2
80	13.2	2.8	40
90	18.6	2.4	56.4
100	26.1	2.0	79.2

Note: Avoid making comparisons using raw data for the various parameters; the criteria assure that the TSIs are representative of the water quality for the open water season of May through November.

Results: Reservation Waters

Big Lake, Washington County, Maine

Table 2, Big Lake

2021 Big Lake			Site: BIG2					
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l CaCO3)	pH	Cond (UMHOS/CM)	Color (PCU)	
05/19/21	1.0	9	4.80	7.0	6.96	25.8	45	
06/16/21	3.0	10	4.30	8.0	7.01	26.0	36	
07/23/21	2.0	9	5.25	8.5	7.07	26.2	33	
08/12/21	3.0	8	4.70	8.5	7.08	26.8	31	
09/21/21	3.0	10	4.50	8.0	7.07	27.4	39	
Year Mean:	2.4	9	4.71	8.0	7.04	26.4	37	
Maximum:	3.0	10	5.25	8.5	7.08	27.4	45	
Minimum:	1.0	8	4.30	7.0	6.96	25.8	31	
Stand Dev:	0.89	0.84	0.36	0.61	0.05	0.65	5.50	
TSI:	*34	40	51					
July CHLA and TP tested past 28 day holding time.								
*Only valid TSI due to mean color >25								

Table 2 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color mean, max, min, standard deviations, and TSI values for Big Lake for May – September 2021. Big Lake is about 10,300 acres, with a max depth of 70 feet (21m) and is part of the St. Croix River watershed. Our sample site is in a shallower basin of 30 feet (9m). Sampling has been done on this lake since 1993.

Long Lake, Washington County, Maine

Table 3, Long Lake

2021 Long Lake			Site: LNG2					
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l CaCO3)	pH	Cond (UMHOS/CM)	Color (PCU)	
05/19/21	2.0	10	4.55	6.0	6.89	26.0	49	
06/16/21	3.0	10	4.10	8.0	6.95	26.0	39	
07/23/21	2.0	9	5.15	8.0	7.07	25.8	31	
08/12/21	3.0	9	5.30	8.0	6.92	27.2	32	
09/21/21	3.0	8	5.00	7.5	7.06	27.0	32	
Year Mean:	2.6	9	4.82	7.5	6.98	26.4	37	
Maximum:	3.0	10	5.30	8.0	7.07	27.2	49	
Minimum:	2.0	8	4.10	6.0	6.89	25.8	31	
Stand Dev:	0.55	0.84	0.49	0.87	0.08	0.65	7.64	
TSI:	*36	40	50					
July CHLA and TP tested past 28 day holding time.								
*Only valid TSI due to mean color >25								

Table 3 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations for Long Lake for May – September 2021. Long Lake is about 595 acres, and is part of the St. Croix River watershed. It has been sampled since 1993. It also should be noted in Long Lake that from June to late August the hypolimnion becomes anoxic. This results in an increase of anaerobic bacteria and production of hydrogen sulfide. Water collected from the hypolimnion typically has a rotten egg odor when anoxic. Numerous seasonal and year-round residences and camps occur on its western and southern shores.

Lewey Lake, Washington County, Maine

Table 4, Lewey Lake

2021 Lewey Lake			Site: LWY1					
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l CaCO3)	pH	Cond (UMHOS/CM)	Color (PCU)	
05/20/21	2.0	21	4.60	7.0	6.95	25.9	47	
06/16/21	4.0	12	4.10	8.0	6.98	26.9	42	
07/23/21	2.0	9	4.30	8.0	7.07	26.4	34	
08/12/21	3.0	10	4.95	8.0	6.94	27.6	36	
09/21/21	3.0	8	5.45	8.0	7.09	27.5	32	
Year Mean:	2.8	12	4.68	7.8	7.01	26.9	38	
Maximum:	4.0	21	5.45	8.0	7.09	27.6	47	
Minimum:	2.0	8	4.10	7.0	6.94	25.9	32	
Stand Dev:	0.84	5.24	0.54	0.45	0.07	0.72	6.18	
TSI:	*38	47	52					
July CHLA and TP tested past 28 day holding time.								
*Only valid TSI due to mean color >25								

Table 4 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations values for Lewey Lake for May – September 2021. Lewey Lake is about 447 acres, and is part of the St. Croix River watershed. It has been sampled since 1993. It is very populated along its eastern and southern shores, Indian Township and Princeton respectively.

Grand Falls Flowage, Washington County, Maine

Table 5, Grand Falls Flowage

2021 Grand Falls Flowage				Site: GFF1				
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l CaCO3)	pH	Cond (UMHOS/CM)	Color (PCU)	
05/20/21	2.0	9	4.35	7.0	6.98	26.8	51	
06/16/21	3.0	13	3.80	8.0	6.91	27.5	49	
07/23/21	2.0	10	4.25	7.5	6.91	27.2	44	
08/12/21	4.0	10	4.80	8.0	6.95	28.2	35	
09/21/21	3.0	8	5.10	7.5	NONE	28.3	33	
Year Mean:	2.8	10	4.46	7.6	6.94	27.6	42	
Maximum:	4.0	13	5.10	8.0	6.98	28.3	51	
Minimum:	2.0	8	3.80	7.0	6.91	26.8	33	
Stand Dev:	0.84	1.87	0.50	0.42	0.03	0.64	8.11	
TSI:	*38	42	54					
July CHLA and TP tested past 28 day holding time.								
*Only valid TSI due to mean color >25								

Table 5 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations values for Grand Falls Flowage for May – September 2021. Grand Falls Flowage expands to 6,691 acres of mostly shallow coves due to the impoundment of the dam. Not far below the dam does this watershed finally meet the St. Croix River. Maximum depth is listed at 29 feet (9 m), but our sampling site is located at 20 feet (6m). There are numerous seasonal and year-round residences along its shores, primarily to the south.

Results: Trust Lands

Junior Lake, Penobscot County, Maine

Table 6, Junior Lake

2021 Junior Lake				Site: JNR1				
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l CaCO3)	pH	Cond (UMHOS/CM)	Color (PCU)	
05/18/21	1.0	6	7.95	7.5	7.00	25.2	15	
06/02/21	2.0	7	8.70	8.0	6.96	25.0	16	
06/18/21	2.0	6	8.80	8.0	7.02	24.7	15	
June Avg	2.0	7	8.75	8.0	6.99	24.9	16	
07/13/21	2.0	5	7.65	7.5	7.19	24.8	13	
08/10/21	3.0	6	8.05	8.0	7.07	25.1	13	
09/20/21	2.0	5	7.60	8.0	7.03	25.2	11	
Year Mean:	2.0	6	8.00	7.8	7.06	25.0	14	
Maximum:	3.0	7	8.80	8.0	7.19	25.2	16	
Minimum:	1.0	5	7.60	7.5	6.96	24.7	11	
Stand Dev:	0.71	0.67	0.46	0.27	0.08	0.19	1.80	
TSI:	30	30	26					

July CHLA and TP tested past 28 day holding time.

Table 6 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations values for Junior Lake for May – September 2021. Junior Lake is a large lake in the St. Croix River watershed at approximately 3866 acres. Junior has seasonal camps primarily dotting the north and western shores, and its deepest spot is about 64 feet (19.5m). Up lake from Junior is Scraggly Lake, and down lake via Junior Stream is Junior Bay and West Grand Lake. Junior has been sampled most years since 2002.

Killman Pond, Hancock County, Maine

Table 7, Killman Pond

2021 Killman Pond				Site: KLL1				
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l CaCO3)	pH	Cond (UMHOS/CM)	Color (PCU)	
05/28/21	2.0	8	4.95	6.5	6.84	24.2	23	
06/29/21	2.0	11	4.25	6.5	6.93	23.7	22	
07/27/21	1.0	9	3.80	6.5	6.91	24.5	23	
08/17/21	1.0	8	4.10	7.0	6.95	24.8	23	
09/23/21	2.0	10	3.50	7.5	6.99	25.2	19	
Year Mean:	1.6	9	4.12	6.8	6.92	24.5	22	
Maximum:	2.0	11	4.95	7.5	6.99	25.2	23	
Minimum:	1.0	8	3.50	6.5	6.84	23.7	19	
Stand Dev:	0.55	1.30	0.55	0.45	0.06	0.57	1.73	
TSI:	25	40	59					
July CHLA and TP tested past 28 day holding time.								

Table 7 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations values for Killman Pond for May – September 2021. Killman Pond is a small pond of about 17 acres flowing into Upper Chain Lake via a small stream. It is part of the St. Croix River watershed. There are no camps or structures along its shores, but it does have a maintained dirt road within 100 feet along its north shore, which undoubtedly adds runoff and sediments. The boat launch is only accessible to canoes and the like. This pond is strongly stratified most of the field season, and is about 23 feet (7m) at its deepest. This pond has been sampled most years since 2002.

Middle Chain Lake, Hancock County, Maine

Table 8, Middle Chain Lake

2021 Middle Chain Lake			Site: MCL1				
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l CaCO3)	pH	Cond (UMHOS/CM)	Color (PCU)
05/28/21	1.0	10	4.30	6.0	6.73	22.5	59
06/29/21	5.0	9	3.60	5.5	6.95	22.5	52
07/27/21	5.0	13	4.00	5.5	6.88	23.2	48
08/17/21	3.0	8	4.30	7.0	7.00	23.2	45
09/22/21	1.0	7	4.40	6.0	6.78	22.9	48
Year Mean:	3.0	9	4.12	6.0	6.87	22.9	50
Maximum:	5.0	13	4.40	7.0	7.00	23.2	59
Minimum:	1.0	7	3.60	5.5	6.73	22.5	45
Stand Dev:	2.00	2.30	0.33	0.61	0.11	0.35	5.41
TSI:	*40	40	59				
July CHLA and TP tested past 28 day holding time.							
*Only valid TSI due to mean color >25							

Table 8 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations values for Middle Chain Lake for May – September 2021. Middle Chain Lake is about 220 acres, and flows downstream into Lower Chain Lake, and eventually into the large lake of Sysladobsis. These are all part of the St. Croix River watershed. Middle Chain had one camp along its shores that burned down recently, and also did have a small wood mill on the northern shore in the past, with remnant saw dust piles. Maximum depth found was 20 feet (6m). The lake strongly stratifies in the summer, and also is very colored. A new boat launch was constructed recently, allowing easy boat access. Middle Chain has been sampled regularly since 2009.

Pocumcus Lake, Washington County, Maine

Table 9, Pocumcus Lake

2021 Pocumcus Lake				Site: POC1					
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l CaCO3)	pH	Cond(UMHOS/CM)	Color (PCU)		
05/17/21	1.0	5	9.60	7.0	7.11	24.2	12		
06/24/21	2.0	5	8.55	7.0	7.17	23.5	12		
07/12/21	1.0	4	8.45	7.5	7.17	23.3	13		
08/09/21	2.0	4	8.95	8.0	7.03	23.9	11		
09/23/21	2.0	4	8.30	8.0	7.10	24.2	10		
Year Mean:	1.6	4	8.77	7.5	7.12	23.8	12		
Maximum:	2.0	5	9.60	8.0	7.17	24.2	13		
Minimum:	1.0	4	8.30	7.0	7.03	23.3	10		
Stand Dev:	0.55	0.55	0.52	0.50	0.06	0.41	1.14		
TSI:	25	21	22						
July CHLA and TP tested past 28 day holding time.									

Table 9 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations values for Pocumcus Lake for May – September 2021. Pocumcus Lake is a large lake of 2200 acres in the St. Croix River watershed. Upstream is Sysladobsis Lake, and downstream is West Grand Lake. Numerous camps, including a campground, dot its shores, particularly the southern shore. The campground has a good boat launch where you can launch any reasonably sized motor boat, the launch is shallow however. Maximum depth of this lake is 44 feet (13.5m) and it does not strongly stratify every year. The lake is cool and clear. Pocumcus Lake has been sampled now since 2002.

Scraggly Lake, Penobscot County, Maine

Table 10, Scraggly Lake

2021 Scraggly Lake				Site: SCR1				
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l	CaCO ₃)	pH	Cond (UMHOS/CM)	Color (PCU)
05/18/21	2.0	7	5.75	7.5		6.95	22.0	21
06/02/21	2.0	8	6.40	7.5		7.00	22.3	25
06/18/21	3.0	16	5.85	6.5		7.03	22.8	22
June Avg	2.5	12	6.13	7.0		7.02	22.6	24
07/13/21	4.0	8	5.30	7.0		7.03	22.8	20
08/10/21	3.0	7	6.25	7.0		7.03	23.5	20
09/20/21	3.0	10	6.00	7.0		6.91	23.1	17
Year Mean:	2.9	9	5.89	7.1		6.99	22.8	20
Maximum:	4.0	16	6.40	7.5		7.03	23.5	25
Minimum:	2.0	7	5.30	6.5		6.91	22.0	17
Stand Dev:	0.74	2.17	0.38	0.22		0.05	0.57	2.33
TSI:	39	40	40					
July CHLA and TP tested past 28 day holding time.								

Table 10 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations values for Scraggly Lake for May – September 2021. Scraggly Lake is the furthest lake upstream to be affected by the impoundment by the dam at Sysladobsis Lake, all part of the St. Croix River watershed. Measuring up at 2758 acres, this lake is sizeable, with a channel running through the center of it at about 42 feet (13m) at its deepest. Shallow coves line the north, south, and eastern shores. There are a few seasonal camps along its shores, and has a small boat launch at Hasty Cove where small trailered boats can be launched. This lake stratifies each summer as well. We have sampled this lake since 2002.

Side Pistol Lake, Hancock County, Maine

Table 11, Side Pistol Lake

2021 Side Pistol Lake				Site: SPL1				
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l CaCO3)	pH	Cond (UMHOS/CM)	Color (PCU)	
05/28/21	1.0	9	6.80	7.0	7.09	22.6	6	
06/29/21	2.0	9	6.40	6.0	7.10	21.4	7	
07/27/21	2.0	7	6.20	6.0	7.12	22.9	6	
08/17/21	3.0	8	6.10	6.0	7.01	22.8	9	
09/22/21	4.0	9	4.35	7.0	6.97	22.3	6	
Year Mean:	2.4	8	5.97	6.4	7.06	22.4	7	
Maximum:	4.0	9	6.80	7.0	7.12	22.9	9	
Minimum:	1.0	7	4.35	6.0	6.97	21.4	6	
Stand Dev:	1.14	0.89	0.94	0.55	0.06	0.60	1.30	
TSI:	34	37	39					
July CHLA and TP tested past 28 day holding time.								

Table 11 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations values for Side Pistol Lake for May – September 2021. Side Pistol Lake is a small lake of 147 acres in a series of small lakes known as the Pistol's. Maximum depth of the lake is 26 feet (8m). There are only a few seasonal camps on this lake, as well as a small boat launch able to handle small trailered boats. This lake is mostly sand bottomed near the launch (NE corner), and is very clear, almost blue-green colored. This lake chain is the only lake sampled in the Springfield or Township area that isn't part of the St. Croix River watershed; it flows into the Passadumkeag River, and finally the Penobscot River. Side Pistol Lake has been sampled somewhat since 2000.

Sysladobsis Lake, Hancock County, Maine

Table 12, Sysladobsis Lake

2021 Sysladobsis Lake				Site: SYS1				
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l CaCO ₃)	pH	Cond (UMHOS/CM)	Color (PCU)	
05/20/21	1.0	7	8.50	7.5	7.07	23.5	17	
06/24/21	2.0	6	8.95	7.0	7.15	24.2	17	
07/12/21	1.0	4	7.70	7.0	7.06	23.9	17	
08/09/21	2.0	8	8.50	7.5	7.10	24.5	14	
09/16/21	2.0	5	8.45	8.5	7.16	24.1	15	
Year Mean:	1.6	6	8.42	7.5	7.11	24.0	16	
Maximum:	2.0	8	8.95	8.5	7.16	24.5	17	
Minimum:	1.0	4	7.70	7.0	7.06	23.5	14	
Stand Dev:	0.55	1.58	0.45	0.61	0.05	0.37	1.41	
TSI:	25	30	24					
July CHLA and TP tested past 28 day holding time.								

Table 12 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations values for Sysladobsis Lake for May – September 2021. Sysladobsis Lake is a large lake of 5376 acres in the St. Croix River watershed. Maximum lake depth found was 65 feet (20m). Numerous camps dot the shoreline and islands of this large lake. There is a small boat launch at the southern end, as well as a state run public launch on the northern end of the lake. This lake can get rough easily with just a little wind. Early morning sampling on the calmest of days is recommended. Sampling has occurred here since 2002.

Upper Chain Lake, Hancock County, Maine

Table 13, Upper Chain Lake

2021 Upper Chain Lake			Site: UCL1					
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l CaCO3)	pH	Cond (UMHOS/CM)	Color (PCU)	
05/28/21	2.0	9	4.50	4.5	6.73	21.5	67	
06/29/21	4.0	8	4.25	5.0	6.76	21.2	63	
07/27/21	1.0	8	4.20	5.5	6.68	22.2	63	
08/17/21	3.0	9	4.90	6.0	6.67	22.3	60	
09/22/21	3.0	8	4.30	5.5	6.70	22.7	61	
Year Mean:	2.6	8	4.43	5.3	6.71	22.0	63	
Maximum:	4.0	9	4.90	6.0	6.76	22.7	67	
Minimum:	1.0	8	4.20	4.5	6.67	21.2	60	
Stand Dev:	1.14	0.55	0.29	0.57	0.04	0.61	2.68	
TSI:	*36	37	55					
July CHLA and TP tested past 28 day holding time.								
*Only valid TSI due to mean color >25								

Table 13 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations values for Upper Chain Lake for May – September 2021. Upper Chain Lake is about 717 acres with a maximum depth of 30 feet (9m). This lake eventually flows into Sysladobsis Lake, and thus is part of the St. Croix River watershed. There are only a few camps along the north, east, and southern shores. There is a public boat launch able to take small boat trailers at the northern end of the lake. Also here is a group of tribally run tenting campsites and a year-round residence. The lake strongly stratifies in the summer, and also is very colored. Sampling here has occurred since 2000 in some form.

West Grand Lake, Washington County, Maine

Table 14, West Grand Lake

2021 West Grand Lake				Site: WGL1				
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l	CaCO ₃)	pH	Cond (UMHOS/CM)	Color (PCU)
05/17/21	2.0	7	11.80	6.0		7.03	23.1	7
06/24/21	1.0	4	12.45	7.0		7.14	22.6	8
07/12/21	1.0	4	11.70	6.5		7.13	22.3	9
08/09/21	2.0	3	11.30	6.5		7.09	22.7	7
09/16/21	2.0	4	11.10	7.0		7.11	22.3	9
Year Mean:	1.6	4	11.67	6.6		7.10	22.6	8
Maximum:	2.0	7	12.45	7.0		7.14	23.1	9
Minimum:	1.0	3	11.10	6.0		7.03	22.3	7
Stand Dev:	0.55	1.52	0.52	0.42		0.04	0.33	1.00
TSI:	25	21	12					
July CHLA and TP tested past 28 day holding time.								

Table 14 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations values for West Grand Lake for May – September 2021. West Grand Lake is a large lake, at about 14,340 acres with numerous islands. Most of the shoreline is forested with few camps, the only built up area is along the dam in the Southeastern corner. Our sampling location of about 110ft near a supposed 127ft hole that could not be located. West Grand is part of the West Branch of the St. Croix Watershed and is considered one of the more premier fishing and recreation lakes in the area.

Pleasant Lake, T6R1 Washington County, Maine

Table 15, Pleasant Lake

2021 Pleasant Lake				Site: PLS1				
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l	CaCO ₃)	pH	Cond (UMHOS/CM)	Color (PCU)
05/24/21	2.0	8	8.20	7.5		7.02	23.0	17
07/01/21	2.0	6	8.50	7.0		7.04	22.5	14
07/19/21	2.0	5	7.85	7.5		7.08	22.5	21
08/16/21	5.0	7	8.50	7.0		7.16	23.5	13
09/20/21	2.0	5	8.60	8.0		7.11	23.0	14
Year Mean:	2.6	6	8.33	7.4		7.08	22.9	16
Maximum:	5.0	8	8.60	8.0		7.16	23.5	21
Minimum:	2.0	5	7.85	7.0		7.02	22.5	13
Stand Dev:	1.34	1.30	0.31	0.42		0.06	0.42	3.27
TSI:	36	30	24					
July CHLA and TP tested past 28 day holding time.								

Table 15 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations values for Pleasant Lake for May – September 2021. Pleasant Lake is a moderately sized lake at 1,574 acres, with a max depth of 92ft. Two campgrounds are located on this lake, a public one with boat launch on the Southern shore, as well as a private business with a few rentable cabins and sites on the North shore. There are few, if any, other camps along its shores. Pleasant Lake outlet flows out of the Southwest part of the lake into Scraggly Lake, making it part of the St. Croix Watershed.

East Musquash Lake, Washington County, Maine

Table 16, East Musquash Lake

2021 East Musquash Lake				Site: EMQ1				
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l CaCO3)	pH	Cond (UMHOS/CM)	Color (PCU)	
05/24/21	4.0	7	5.00	5.0	6.84	23.6	29	
07/01/21	3.0	6	5.25	6.0	6.98	23.2	24	
07/19/21	3.0	6	5.85	5.5	6.68	23.5	30	
08/16/21	5.0	6	6.90	5.5	6.88	23.9	25	
09/17/21	2.0	6	6.75	6.0	6.77	23.5	25	
Year Mean:	3.4	6	5.95	5.6	6.83	23.5	27	
Maximum:	5.0	7	6.90	6.0	6.98	23.9	30	
Minimum:	2.0	6	5.00	5.0	6.68	23.2	24	
Stand Dev:	1.14	0.45	0.86	0.42	0.11	0.25	2.70	
TSI:	*43	30	39					
July CHLA and TP tested past 28 day holding time.								
*Only valid TSI due to mean color >25								

Table 16 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations values for East Musquash Lake for May – September 2021. East Musquash, located right alongside of Rt 6, in Topsfield, is about 806 acres. Rt. 6 runs along most of the Southern shore of the lake with numerous camps and year round residences. There is also a public boat launch and rest area (with a restroom) here. The outlet is located on the southeastern corner of the lake and eventually flows into Big Lake, including it in the St. Croix Watershed.

West Musquash Lake, Washington County, Maine

Table 17, West Musquash Lake

2021 West Musquash Lake				Site: WMQ1				
Date	Chl-a (µg/L)	TP (µg/L)	Secchi (m)	Alka (mg/l CaCO ₃)	pH	Cond (UMHOS/CM)	Color (PCU)	
05/24/21	2.0	5	8.00	6.0	6.87	19.0	10	
07/01/21	1.0	4	8.80	5.5	7.00	18.5	7	
07/20/21	2.0	6	9.70	6.0	7.03	18.7	16	
08/18/21	1.0	4	9.65	6.0	6.96	19.0	9	
09/17/21	2.0	4	9.45	6.0	7.08	18.6	8	
Year Mean:	1.6	5	9.12	5.9	6.99	18.8	10	
Maximum:	2.0	6	9.70	6.0	7.08	19.0	16	
Minimum:	1.0	4	8.00	5.5	6.87	18.5	7	
Stand Dev:	0.55	0.89	0.72	0.22	0.08	0.23	3.54	
TSI:	25	26	20					
July CHLA and TP tested past 28 day holding time.								

Table 17 shows Chl-*a*, TP, Secchi, Alkalinity, pH, Conductivity, and True Color; mean, max, min, and standard deviations values for West Musquash Lake for May – September 2021. This lake can be accessed off of the Pleasant Lake Road, south of Rt. 6. The shores of this lake are primarily undeveloped, except for a few camps on the Eastern shores. Numerous public boat access only campsites are available on the west end of the lake with great sand beaches. This lake has beautiful clear and cold water. The outlet is located on the eastern end of the lake and eventually flows into Big Lake, including it in the St. Croix Watershed.

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