Lake Winnisquam Tiered Monitoring Plan

Overview of Plan Design and Recommendations

Lake Winnisquam currently has multiple groups monitoring water quality through two volunteer monitoring programs, the UNH Lakes Lay Monitoring Program (LLMP) and the NH DES Volunteer Lake Assessment Program (VLAP). LLMP and VLAP feel both programs have value and expertise to assist the Winnisquam Watershed Network (WWN), Lakes Region Planning Commission (LRPC) and the five towns of Belmont, Laconia, Meredith, Sanbornton, and Tilton in monitoring water quality of Lake Winnisquam and its watershed and recommend joining the NH DES Volunteer River Assessment Program (VRAP) to monitoring tributaries flowing into the lake. LLMP, VLAP and VRAP recommend the following in-lake and tributary monitoring plan as a way to comprehensively assess in-lake water quality, maintain historical data sets tracking water quality trends over time, establish new trend stations, and identify potential pollution sources and loads to the lake.

The comprehensive in-lake and tributary monitoring plans have three tiers identifying high, medium and low priority areas for monitoring and makes recommendations on monitoring frequency, parameters and costs (Tables 1 and 2). We recommend VLAP protocols continue to be followed at the three deep basins while LLMP protocols continue to be followed at off-shore/cove stations and VRAP protocols be followed at tributary monitoring stations.

All three monitoring programs are resource limited and sharing resources across programs is recommended at this time. However, it is recommended that the group utilize one analytical laboratory to process all laboratory samples. For that purpose, costs are broken down by laboratory. We recommend purchasing and/or making a set of in-lake and tributary monitoring equipment as described in Table 3.

Based upon response and participation by the WWN, LRPC and towns, a comprehensive water quality report will be developed to inform all interested parties of the conditions of Lake Winnisquam and make recommendations to protect, maintain and improve the lake.

Table 1. Lake Winnisquam Tiered Monitoring Plan UNH/VLAP

Tier	Site/Station	Pollution Source Potential	Monitoring Period	Monitoring Frequency	Monitoring Parameters	Monitoring Protocol	Monthly Monitoring Cost	Annual Monitoring Cost
I High	Three Island Deep Basin Max. Depth = 22m		May – Sept.	1x/month	pH, ANC, conductivity, chloride, turbidity, total phosphorus, chlorophyll-a, transparency, dissolved oxygen/temperature, apparent color	VLAP	$60-DES	$300-DES
I High	Three Island Deep Basin		July	1x/summer	Phytoplankton	VLAP	$0	$0
I High	Pot Island Deep Basin Max Depth = 53m		May – Sept.	1x/month	pH, ANC, conductivity, chloride, turbidity, total phosphorus, chlorophyll-a, transparency, dissolved oxygen/temperature, apparent color	VLAP	$60-DES	$300-DES
I High	Pot Island Deep Basin		July	1x/summer	Phytoplankton	VLAP	$0	$0
I High	Mohawk Island Deep Basin Max Depth = 18m		May – Sept.	1x/month	pH, ANC, conductivity, chloride, turbidity, total phosphorus, chlorophyll-a, transparency, dissolved oxygen/temperature, apparent color	VLAP	$60-DES	$300-DES
I High	Mohawk Island Deep Basin		July	1x/summer	Phytoplankton	VLAP	$0	$0
I High	10-Waldron Bay Max Depth = 6-10m		May-Sept.	2x/month	Total phosphorus, chlorophyll-a, transparency, color, phycocyanin, temperature, conductivity	LLMP	$40-DES	$200-DES
I High	30-Bartlett Bay Max Depth = 6-10m		May-Sept.	2x/month	Total phosphorus, chlorophyll-a, transparency, color, phycocyanin, temperature, conductivity	LLMP	$40-DES	$200-DES
II Med.	20- Gilson Cove Max Depth = 6-10m		May-Sept.	2x/month	Total phosphorus, transparency, phycocyanin, temperature, conductivity	LLMP	$40-DES	$200-DES
II Med.	Ahern Cove Max Depth = 4-6m	Gov. Park Stream, Ahern SP, Defunct State School	May-Sept.	2x/month	Total phosphorus, transparency, phycocyanin, temperature, conductivity	LLMP	$40-DES	$200-DES
II Med.	Public Dock Cove Max Depth = 4-6m	Winnipesaukee River, Public Docks, Belknap Marine, Bartlett Beach	May-Sept.	2x/month	Total phosphorus, transparency, phycocyanin, temperature, conductivity	LLMP	$40-DES	$200-DES
III Low	Sand Bar Cove Max Depth = 6-10m	Sand Bar, Chapman Brook	May-Sept.	2x/month	Transparency	LLMP/VLAP	$0	$0
III Low	Black Brook Cove Max Depth = 6-10m	Black Bk.	May-Sept.	2x/month	Transparency	LLMP/VLAP	$0	$0
III Low	Mohawk N Cove Max Depth = 6-10m	Marina, sand bar and high traffic boating impacts	May-Sept.	2x/month	Transparency	LLMP/VLAP	$0	$0

Table 2. Lake Winnisquam Tiered Monitoring VRAP

Tier	Site/Station	Monitoring Period	Monitoring Frequency	Monitoring Parameters	Monitoring Protocol	Monthly Monitoring Cost	Annual Monitoring Cost
I High	WINPLACB-Black Brook Inlet	May-October	1-2x/ Month	Dissolved Oxygen, Temperature, Specific Conductance, pH, Turbidity	VRAP	$0	$0
I High	WINPLACCB-Chapman Brook	May-October	1-2x/ Month	Dissolved Oxygen, Temperature, Specific Conductance, pH, Turbidity	VRAP	$0	$0
I High	WINPLACW-Winnipesauke River	May-October	1-2x/ Month	Dissolved Oxygen, Temperature, Specific Conductance, pH, Turbidity	VRAP	$0	$0
I High	WINMBELJMI-Jay's Inlet	May-October	1-2x/ Month	Dissolved Oxygen, Temperature, Specific Conductance, pH, Turbidity	VRAP	$0	$0
II Med.	WINPLACB-Black Brook Inlet	June, July, August	1x/month	Chloride, E.coli, Total Phosphorous	VRAP	$50	$150
II Med.	WINPLACCB-Chapman Brook	June, July, August	1x/month	Chloride, E.coli, Total Phosphorous	VRAP	$50	$150
II Med.	WINPLACW-Winnipesauke River	June, July, August	1x/month	Chloride, E.coli, Total Phosphorous	VRAP	$50	$150
II Med.	WINMBELJMI-Jay's Inlet	June, July, August	1x/month	Chloride, E.coli, Total Phosphorous	VRAP	$50	$150
III Low							

Table 3. Monitoring Equipment Cost Estimated

Equipment Name	Purpose	Estimated Cost	Comments
Kemmerer Bottle	In-lake sampling at discrete monitoring depths.	$400-$500	
Secchi Disk	Transparency monitoring	$50	
Viewscope	Transparency monitoring	$75-$100	
Plankton Net	Deep basin phytoplankton ID and counts	$500	
Calibrated lines	Attach to Secchi disk and plankton net	$25	
Integrated tube	Collect column of water for multiple analyses	$100 to make your own	
Bucket	Empty contents of integrated tube into	$25	
DO/Temp/Conductivity Meter, probes and cable	Determine thermal layers for more precise monitoring, identify DO deficits, measure near-shore conductivity	$3,000-$5,000	May be able to get a re-purposed one for less