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1. Problem Definition and Background

Mountain View Lake is an impoundment of the Salmon River, Franklin County NY, which is a tributary to the St. Lawrence River. The 242-acre (95 ha) lake was created by damming the Salmon River late in the 19th century (before 1894). The Town of Bellmont currently owns and operates the outlet dam that controls the water level of Mountain View Lake. Indian Lake is a natural lake of 333 acres (134 ha) that flows into Mountain View Lake through a relatively wide channel; the Indian Lake outlet enters Mountain View Lake close to the outlet dam.

The watershed of Mountain View Lake is estimated to extend over an area of 44.2 mi^2 (11,448 ha), with virtually all of the watershed lands classified as forest, wetlands, or open waters. No state or federal roadways traverse the watershed in this remote region of the northern Adirondack Park; there are only 7.9 miles (12.8 km) of local roads (Kelting and Laxson 2014)[1].

Despite the current pristine state of the watershed lands, excessive sediment deposition and aquatic vegetation in parts of Mountain View Lake and the connecting channel with Indian Lake impair recreational and navigational uses. The Mountain View Association, a not-for-profit membership organization of property owners around the two lakes, has spearheaded an effort to hand-harvest the invasive aquatic macrophyte species Eurasian watermilfoil (*Myriophyllum spicatum*) under the terms of an Adirondack Park Agency (APA) permit. This effort has been successful in reducing the areal coverage and density of the Eurasian watermilfoil in both lakes, as reported by Kelting.[2]

[1] Kelting, D.L., and C.L. Laxson. 2014. Adirondack Lake Assessment Program: 2013 Report, Mountain View Lake. Adirondack Watershed Institute of Paul Smith's College. Report No. PSCAWI 2014-35. 23p.

[2] Kelting, Daniel. Undated. Mountain View and Indian Lakes Milfoil Monitoring Program: Transect Results May – August 2012. Report to the Mountain View Association. 5 pp.

The Town of Bellmont and the MVA have been actively investigating measures to help protect and

Table 1
Analytical results for sediment samples collected from Mountain View Lake, July 2013.
Results in mg/kg dry weight

		Site 1		Site 2		Site 3	
Parameter	**Analytical Method**	**Result**	**Threshold Class**	**Result**	**Threshold Class**	**Result**	**Threshold Class**
Pesticides/PCBs	EPA 8081/ 8082	ND	A	ND	A	ND	A
Polycyclic aromatic hydrocarbons (PAH)	EPA 8270	ND	A	ND	A	ND	A
Arsenic	EPA 6010	ND	A	ND	A	1.6	A
Barium	EPA 6010	15	--	14	--	26	--
Cadmium	EPA 6010	ND	A	ND	A	ND	A
Chromium	EPA 6010	5.6	--	4.3	--	5.5	--
Lead	EPA 6010	3.7	A	2.3	A	27	A
Selenium	EPA 6010	ND	--	ND	--	ND	--
Silver	EPA 6010	ND	A	ND	A	ND	A
Mercury	EPA 7471	ND	A	ND	A	ND	A

ND - non-detect. Analytes reported as less than the method detection limit.

Threshold Classes:

Class A - No Appreciable Contamination (No Toxicity to aquatic life).
Class B - Moderate Contamination (Chronic Toxicity to aquatic life).
Class C - High Contamination (Acute Toxicity to aquatic life).

In 2013, the Town authorized EcoLogic to begin certain defined tasks while the funding applications are evaluated. This local investment in professional services is an indication of the seriousness of the community's intent to protect and restore their water resources.

In 2013, EcoLogic scientists evaluated and mapped the littoral aquatic habitat of Mountain View and Indian Lakes and collected Ponar grab samples of surface sediment to screen for the presence of any chemical contaminants that could affect the options for sediment handling and ultimate disposal. The findings were reviewed with the Town Board and representatives of the MVA. In November, 2013 the project team met with representatives of the APA, NYSDEC, and ACOE to update them on progress with the feasibility study. The agency representatives provided insights into additional information they would require for review and ultimate approval of a dredging project.

This sediment testing workplan addresses one of the requirements identified by representatives of the regulatory agencies; namely, to collect and analyze sediment core samples to characterize the texture and nutrient content of sediments. The Agency representatives requested a quantitative assessment of the depth of the "muck" layer, and an analysis of how its nutrient content might affect eutrophication and macrophyte growth.

2. Task Description

2.1. Number of Sediment Cores

During the field 2013 investigations, EcoLogic collected composite samples of surficial sediments using a petite ponar dredge. The samples were analyzed for texture (particle size distribution) as well as for the presence of the suite of metals and organic compounds NYSDEC uses to assess whether dredged material is considered to be contaminated. The results (Table 1) revealed that the lake sediments were free of contamination, and would be suitable for unrestricted disposal.

NYSDEC has issued a guidance document (TOGS 5.1.9, 2004) for navigational dredging projects which includes the number of core samples required based on the surface area and/or volume of material to be removed[3]. Based on this document, between five and eight core samples may be required, depending on the final scope of a dredging project (which, in turn, depends on project costs and permitting). Because of the expense associated with mobilization, the workplan includes acquisition and

[3] http://www.dec.ny.gov/docs/water_pdf/togs519.pdf

analysis of eight core samples. This was estimated using Balduck's equation (Appendix B, p. 47) with a Dredging Factor (DF) of 0.5, signifying that prior investigations have revealed no contamination and the nature of the watershed is such that no contamination is anticipated. Eight samples are adequate to characterize up to 200,000 square yds. of lake bottom area to be dredged.

2.2. Location of Sediment Cores

Several sources of information regarding the nature of the bottom sediments were used to select the locations for coring. The 2013 littoral habitat survey completed by EcoLogic delineated habitat zones and described the sediment texture and areas of environmental sensitivity. In 2010, Cedar Eden Environmental of Saranac Lake NY mapped the thickness of the lakes' sediment layer. Photographs of the exposed sediment surface during lake drawdown were instructive, as was a video of an aerial survey by plane taken in late November 2013 when the lake level was lowered to allow repairs to the dam. Finally, we reviewed Dr. Kelting's report of the 2012 milfoil monitoring referenced in footnote 2.

These sources of information make it clear that sediment carried by the Salmon River is deposited in the southern reaches of the lake. This is a natural consequence of creating an impoundment; when the water velocity slows, sediments carried by the river water tend to fall out of suspension. Light penetrates to the sediment surface in most regions of the shallow Mountain View Lake, despite the water's high level of dissolved organic material and color. Rooted aquatic plants grow in abundance, decomposing organic material accumulates on the lake bottom and contributes to a deepening much (silt) layer. Anecdotal reports of residents confirm an every-increasing layer of silt and muck around docks. Sediment deposits are also evident at the mouths of tributary streams.

The objective is to describe the sediment texture and depth of the strata (e.g., separation between silts and sands), sample various strata for nitrogen and phosphorus levels (all eight cores) and to confirm that sediments are free of contamination (three cores). Sites are listed in Table 2 and plotted in Figure 1.

Table 2
Summary of Proposed Coring Locations

Core Number	General Location	Coordinates (to be confirmed)	Rationale for inclusion
1	Just north of Bryants Siding Rd. bridge	44°41'12.97"N 74° 6'56.19"W	Southern-most region of lake
2	Downstream of inlets from Charlie and Deerfly Ponds	44°41'20.51"N 74° 6'55.12"W	Major stream inlets
3	Mt. View- mid-channel (west)	44°41'36.94"N 74° 7'18.38"W	Region of navigational impairment
4	Mt. View- mid-channel (east)	44°41'52.89"N 74° 7'25.80"W	Region of navigational impairment
5	Vicinity of lake outlet	44°42'15.68"N 74° 8'9.97"W	Depositional area

6	Near inlet to Indian Lake	44°42'13.64"N 74° 7'47.43"W	Region of navigational impairment
7	Mid-channel between lakes	44°42'34.00"N 74° 7'49.73"W	Region of navigational impairment
8	Indian Lake, northern	44°43'16.15"N 74° 8'12.56"W	Persistent Eurasian watermilfoil population

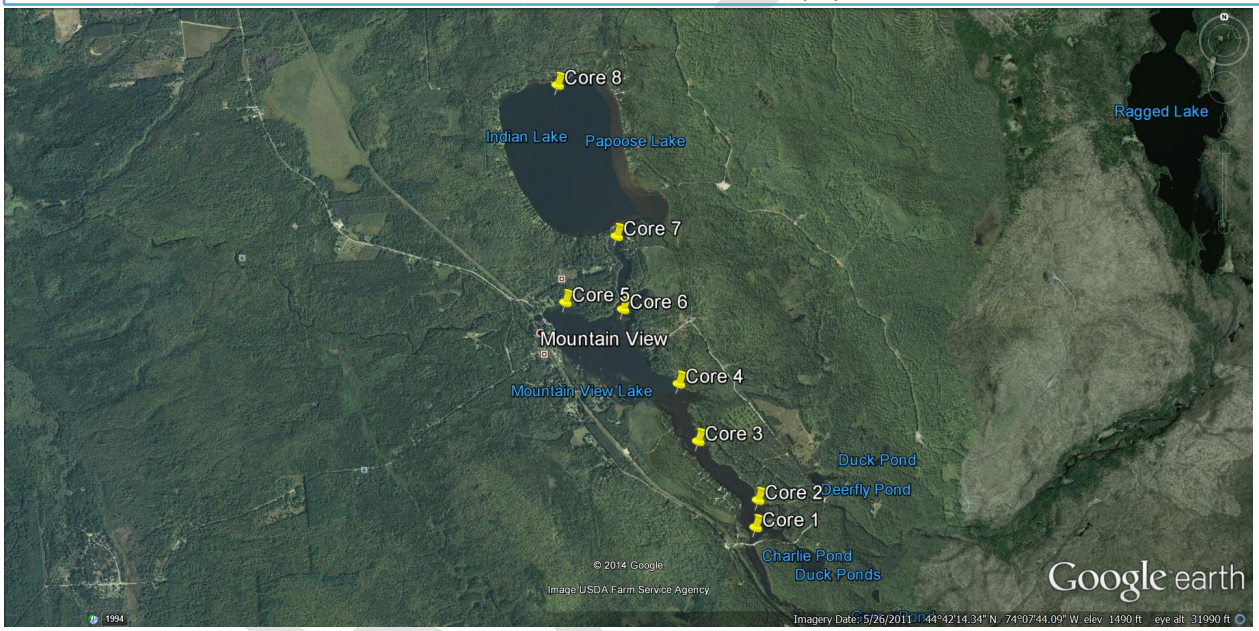

Figure 1. Proposed locations of sediment cores

2.3. Coring Procedures

The NYSDEC Guidance document (referenced in footnote 3) cites the following requirements: (pg. 53)

> "Sediment cores should be collected using a vibra-coring apparatus, or other appropriate coring device. Selected equipment is to be used in accordance with the manufacturer's instructions. Clean, decontaminated core tube liners must be used. The bottom of the coring tube liner should be immediately capped and taped upon removal of the coring apparatus from the water. The core tube liner should then be removed from the coring apparatus and its top immediately capped and taped. The core tube liner and boat deck should then be rinsed with ambient water to reduce the risk of contaminated sediments becoming airborne as they dry.
>
> "A visual inspection of the sediment cores should then be performed. Individual horizons or strata within each core should be measured, along with the overall core length. These measurements and all significant features should be documented in a field notebook. The field notebook should also document the date, time, and location of each sample collected. Using a permanent marker, the date, time, and sample location should also be recorded on the sediment core tube liner. High resolution photographs of the cores may be taken.
>
> "The sediment core (or segment if appropriate) should be emptied into a clean tub and mixed with a clean spatula made of appropriate material. Generally sediment to be analyzed for trace metals should not come into contact with metals and sediment to be analyzed for organic

compounds should not come into contact with plastics. When the sediment appears mixed to a uniform color and consistency, a clean scoop should be used to place the material into acid washed wide mouth glass jars with Teflon® lined screw lids. After a jar is capped and labeled, it should be immediately placed on ice in a cooler. All sample containers should be labeled using a permanent marker to indicate the date, time, and sampling location. This information should then be recorded in a field log book and on a chain of custody form which will follow the samples. Sediment material not placed in sample bottles should be returned to the location from which it was collected. All sample bottles should be placed in coolers with ice and delivered to the laboratory via overnight delivery service."

Thew Associates of Canton NY will complete the sediment coring tasks. Their approach and equipment are summarized as follows.

- Reference the sediment core locations horizontally to the North American Datum of 1983 1.(NAD83) projected on the New York State Plane Coordinate System (East Zone), and vertically to the North American Vertical Datum of 1988 (NAVD88). Utilize RTK GPS surveying techniques for vessel positioning and as-sampled sediment core locating.
- Upload the sediment core identification number and coordinates into the GPS controller. 2.
- Mobilize and demobilize technical personnel with the following equipment and supplies:
  a. 8-foot by 24-foot self-propelled (barge) sampling vessel with a fixed derrick equipped with a 3,000 lb. electric winch for sediment sample retrieval
  b. one Rossfelder P-3 vibracore with 4-inch diameter by 6-foot and 10-foot steel core barrels and core noses, and one 5,000 watt three-phase generator
  c. Trimble R8 GPS/GNSS units with RTK capabilities
  d. Ancillary sediment coring equipment, and materials and supplies
- Verify the operation and accuracy of the RTK GPS equipment prior to initiating sediment coring activities.
- Navigate to each sediment core location, and spud the sampling vessel at the pre-determined coordinates.
- Measure the water surface elevation and water depth (depth to top of sediment) at the sediment core location. The water surface elevation will be measured with RTK GPS. The water depth will be measured utilizing a survey rod or weighted tape. The water surface elevation and water depth will be manually recorded in a field book.
- Advance a 4-inch diameter steel core barrel lined with a plastic sock to an approximate depth of six feet utilizing a Rossfelder P-3 vibracore. Measure and record the depth of penetration in a field book. Measure and record the coordinates of the sediment core location utilizing RTK GPS. The coordinates of the sediment core will be electronically stored in the GPS controller.
- Retrieve the vibracore, extract the sediment sample, and relinquish the sediment sample to representatives of EcoLogic for processing
- Prepare a spreadsheet containing the sediment core identification number, northing, easting, water surface elevation, mudline elevation, penetration depth, and recovery.

2.4. Sample Handling

Kurt Jirka of EcoLogic will be on the sampling barge with the two staff members from Thew Associates. The coring team has concluded that the most efficient way to collect and process the lake sediment core samples is to use 4-inch plastic bag liners inside the steel vibracore barrel. We will remove the liner from the vibracore and lay it in a trough on the sampling barge for trough for processing. In this way, the sample integrity will be maintained. Kurt will cut open the core (six ft. in length) and complete the visual inspection and measurements of sediment texture horizons. The core will be photographed. Once the description is complete and documented in the field notes, samples will be extracted from various strata of the sediment core (maximum of four samples per sediment core), based on field judgment of changes in horizons as indicated by sediment texture and color. The pre-labeled containers provided by the analytical laboratory will be filled. Sediment samples will be placed in clear plastic bags. Chain-of-custody documentation will be completed.

For the three cores selected for confirmation testing of sediment contaminant levels, composite samples of the upper meter of the core will be made by mixing the sediment in a sampling tray on board the barge, then filling the pre-labeled containers provided by the analytical laboratory. Sediment samples will be placed in clear plastic bags. Chain-of-custody documentation will be completed.

All samples will be placed in an ice-filled cooler and held until delivery to the testing laboratory. Life Sciences Laboratory of East Syracuse NY will complete the analyses.

2.5. Laboratory Analysis: Sediment Samples

Table 3
Summary of Sediment Testing

Analyte(s)	Method reference	Sample container	Preservation
Total P	EPA 365.1 , rev 2.0	Wide-mouth glass jar, Teflon lined cap	Iced, no preservatives
Total Kjeldahl N	EPA 351.2 (post digestion)	Wide-mouth glass jar, Teflon lined cap	Iced, no preservatives
Total Solids	SM 18-20 2540B	Wide-mouth glass jar, Teflon lined cap	Iced, no preservatives
Metals: As, Ba, Cd, Cr, Pb, Se, Ag	SW846: 6010	Wide-mouth glass jar, Teflon lined cap	Iced, no preservatives
Metals: Hg	SW846: 7471	Wide-mouth glass jar, Teflon lined cap	Iced, no preservatives
Pesticide/PCBs	SW846: 8081/8082	Wide-mouth glass jar, Teflon lined cap	Iced, no preservatives

3. Report and Project Deliverables

EcoLogic LLC will be responsible for managing and maintaining project documents and records on behalf of the Town of Bellmont and will maintain both paper and electronic files related to the dredging

feasibility analysis. A full electronic copy of all data and information will be delivered to the Town of Bellmont for their unrestricted use. Project data will include, but are not limited to: geospatial coordinates, field notes, sediment photographs and observations, equipment calibration records, collection and handling records, chain of custody forms, analytical laboratory results, and draft and final reports.