

PROPOSAL SUBMITTED

Date: April 4, 2022

To: Jay Cassella, Hidden Lake Association

From: Aquatic Ecosystem Research – 1204 Main St. #161, Branford, CT 06405

RE: Proposed Lake Management Initiatives Hidden Lake

Dear Mr. Cassella:

Thank you for the opportunity to submit this proposal for services at Hidden Lake in Haddam, CT. Based on our communications, we have developed this proposal for services that include 1) 2022 estimation of sediment accretion in sections of the lake; 2) 2022 bathymetry mapping; and 3) lake management planning report based on findings from the sediment accretion study and bathymetry mapping.

Please review the list and descriptions of each initiative, and if satisfied, select those initiatives in the Selection Matrix you wish AER to perform, sign and date Attachment 1, and return it back to us. If you have any questions, please do not hesitate to contact me at (203) 794-4395 or lmarsicano@aerlimnology.com or Mark June-Wells at (860)-576-8628 or mjunewells@aerlimnology.com. We appreciate your interest and look forward to helping you manage and conserve the beautiful Hidden Lake.

Kind regards,

AQUATIC ECOSYSTEM RESEARCH LLC



Larry Marsicano
NALMS CLM

INTRODUCTION

Hidden Lake is a 39-acre, waterbody located in Haddam, CT. The lake is shallow so much of the lake bottom provides suitable habitat for the robust aquatic plant community documented in past reports. Earliest ecological reports noted “abundant weed growth” and recommended removal of “30 to 50%” of the submerged plant growth in the interest of better game fish habitat (CT State Board of Fish and Game 1959). That same publication provided a bathymetry map and reported an average depth of 4.6 feet and a maximum depth of 9 feet.

In 1989, Aquatic Control Technologies (formerly ACT, now SOLitude) performed an aquatic plant survey and reported “reasonable diversity”, but also “extremely heavy” densities of plant growth resulting in impaired recreational use (ACT 1989). The Connecticut Agricultural Experiment Station conducted aquatic plant surveys in 2005 and 2018 (both available at <https://portal.ct.gov/CAES/Invasive-Aquatic-Plant-Program/H/Hidden-Lake/Hidden-Lake-Survey-Results>). Mappings from both efforts revealed high plant coverage and included several floating-leaf species, e.g., White Water Lilly, Yellow Water Lilly, and Watershield.

Similar to the ACT report, the CAES surveys also provided limited single-day water quality data. More detailed water quality data was provided by Marine and Freshwater Research Services in 1995 and 2006 (Baillie 1995, 2006). There, nutrient and other water chemistry data were collected three to four times in each of those years. The aquatic plant community was also assessed in the 1995 report; the CAES 2005 assessment was used in Dr. Baillie’s 2006 report. The 1995 work also included a bathymetry mapping, and reported an average depth of 4.48 feet and maximum depth of 6.1 feet. Depth at each point along transects utilized in both the 2005 and 2018 CAES plant surveys were measured, and in each year the maximum depth reported was 6.5 feet. Average loss of depth based on comparisons of depth data from those two years (13 years apart) was 1.3 feet.

In discussions with the Hidden Lake Association (HLA), it was clear that sediment accretion and its impact on recreational use is a primary concern of the community. Below we have provided service options to 1) estimate sediment accretion in locations of the lake and report on that, 2) update the aquatic plant dataset and report on that, 3) update the water quality dataset and report on that, 4) update the bathymetry dataset and provide a new bathymetry map, and 5) compile historical data and in conjunction with the 2022 data, assess trends (plant community, water quality, bathymetry/sediment accretion) and provided a management plan to address undesirable trends.



Task 1. Sediment Accretion Assessment

Summary: Sediment accretion is resulting in the loss of water column depth and recreational values that Hidden Lake provides. It also modifies plant habitat such and the accretion rate which may have increased over time. In order to plan for a mitigation strategy, the volume of sediment that has collected must be quantified.

- **Phase 1**
 - A georeferenced grid will be digitally overlaid on aerial photographs of Hidden Lake using Geographic Information Systems (GIS). The coordinates of the intersections of the gridlines will be determined and uploaded into a Garmin Handheld GPS with <3-meter accuracy.
 - In the field, each coordinate will be located with the GPS on the Lake and the following data will be collected:
 - The first variable collected will be water depth.
 - The second variable collected will be the depth of the soft sediment
 - The third variable collected will be the depth to refusal.
 - All depths will be measured using a calibrated rod capable of penetrating sediment to hard bottom (refusal).
 - To correct for varying water level, which is an inherent problem with sediment surveying approaches, a static structure will be used as a reference point.
- **Phase 2**
 - Data collected during Phase 1 will be compiled, sediment profiles developed, and maps created. Additionally, the total sediment volume of the area will be calculated and used to determine whether sediment removal is necessary/feasible.
- **Reporting**
 - A summary report will be developed that will include estimations of sediment volumes and recommendations for restoration.

Task 2: Bathymetric Survey

Summary: Bathymetry the Hidden Lake was assessed in a 1959 publication where a maximum depth of 9 feet was reported. In 1995, another assessment reported a maximum depth of 6 feet. Depths have also been reported by the CAES in 2006 and 2018 along transects used to assess the aquatic plant community. Maximum depth in both those surveys was 6.5 feet, but average loss of depth along those transects over the 12-year span was 1.3 feet. We propose to develop a new bathymetry map for the entire Lake.

- **Study Design:**
 - The bathymetric survey will be conducted over a one-day period during the month of May.

- A digital georeferenced 25x25m grid will be developed and overlaid on a map Hidden Lake system.
 - Coordinates of each intersection on the grid will be uploaded into a Garmin GPS.
 - Each point will be visited and the depth will be assessed with a Garmin Sonar or with weighted drop line.
 - The recorded depths will then be input in to Geographic Information System (GIS) and spatial statistics will applied to the dataset to create a bathymetric map.
- Deliverables:
 - A digital and hard copy of the bathymetric map will be provided to the client. The digital copy will be in pdf file format which can be shared with other members of the Hidden Lake community. A short report summarizing our finding on the bathymetry of Hidden Lake will also be provided in both hard copy and pdf file format.

Task 3: Management Planning

Summary: Data collected in Tasks 1 and 2 will be analyzed in conjunction with comparable historical data (if available) to determine trajectories for the lake. Where applicable, statistical methods will be used to model trends. Recommendations and plans on lake management efforts will be developed.



SCOPE OF SERVICES: OPTIONS

Services and reporting options for 2022 with the associated pricing are provided below. Please mark options you would like executed in 2022.

Task	Pricing	✓
<u>Task 1 – Sediment Accretion Study</u> <ul style="list-style-type: none"> • June of 2022 <ul style="list-style-type: none"> ○ Reporting by August of 2022 	\$3,000.00	_____
<u>Task 4 – Bathymetric Survey</u> <ul style="list-style-type: none"> • To occur in May of 2022 <ul style="list-style-type: none"> ○ Reporting by July of 2022. ○ Monthly Cost: <ul style="list-style-type: none"> ▪ \$2,000 following completion of field work ▪ \$1,000 following reporting 	\$2,500.00	_____
<u>Task 5 – Management Report</u> <ul style="list-style-type: none"> • Due in December of 2022 	\$2,500.00	_____
Total of all services selected	\$8,000.00	_____

ATTACHMENT 1: TERMS & CONDITIONS

These Terms and Conditions and the Proposal dated 4/4/2022 prepared and submitted by Aquatic Ecosystem Research LLC. to Hidden Lake Association (Clients), constitute the "Agreement" between Aquatic Ecosystem Research LLC and the Clients.

1. Payment: By the signing of this proposal, it is agreed and understood that payment will be made upon receipt of the invoice. It is further understood that any balances on this account remaining unpaid for a period of 30 days will incur a service charge of 1.5% per month (expressed as an annual percentage rate, the charge is 18%). It is further agreed that if said account is turned over for collection, reasonable attorney's fees and costs of collection shall be added to the unpaid balances, whether or not legal action is instituted.

IN WITNESS WHEREOF, the parties hereto have made and executed this Agreement as of the day and year herein below written.

Aquatic Ecosystem Research LLC.

By: 

Date: 4/4/2022

By: _____

Date: _____

