BI-WEEKLY STATUS REPORT #1
ON THE OWASCO LAKE HAB INHIBITING TECHNOLOGIES ASSESSMENT.

SUBMITTED TO
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THE OWASCO WATERSHED LAKE ASSOCIATION

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INTRODUCTION

This project was designed to scientifically assess the effectiveness of three different blue green algae (BGA, cyanobacteria) inhibiting technologies installed primarily along the northeast shoreline of Owasco Lake. In brief, each technology works by reducing the floatation capabilities of the BGA, each using a different strategy. The proposed assessment is designed to determine if the frequency and/or concentration of BGA blooms is reduced at any of the mitigation sites compared to "control" sites, i.e., neighboring sites without mitigation measures. The site locations were determined jointly by Halfman and OWLA representatives.

This report is the August 10, 2018 status on the Owasco Lake Nearshore HAB (Harmful Algal Bloom) Inhibiting Technologies Assessment and describes the results from the surveys completed on Monday July 30 and Monday August 6. This timeframe preceded or was early in the start of the anticipated BGA bloom season. Please note: The results are currently provisional and may change as the final QA/QC methodologies are pending. We thank the homeowners and Barb Halfman, Katie Valicenti, Shelby Johnson, Trevor Massey and Kely Amejecor for their help in the field and/or in the laboratory.

METHODS

Each survey collected samples and images from eleven sites around the lake (Fig. 1, Table 1). Three different technologies were deployed including a Quattro-DB ultrasonic emitting device deployed at two sites, the Martin Point Swim Club on South Martin Drive and the Owasco Yacht Club, and PS20 or SW20 Airmax air diffusing water column mixers deployed at six sites: the Owasco Yacht Club, Fire Lane 6, N. Burtis, S. Burtis, Glenwood Rd, Indian Cove and Fire Lane 26 (Table 1). Three sites, Sucker Brook, N. Martin and Sunset Beach, had no inhibiting technologies installed and served as experimental "controls". The hypothesis was simple. If BGA blooms do not impact the sites with the mitigation technologies during the August-September BGA season but impact the experimental "control" sites as in the past then it suggests that the technologies played a role at reducing the BGA blooms at the mitigated sites.

The methods employed during each site visit include:

- Algal pigment concentrations measured by bbe Fluoroprobe from the water surface at the nearshore and offshore ends of the homeowner's dock. A third sample was collected from the lake floor at the offshore end of the dock.
- Phytoplankton and zooplankton assemblages determined by microscopic analysis of a plankton tow (80 μm mesh) collected at the offshore end of the homeowner's dock.
- BGA surface distributions detected in a drone aerial image and/or a cell phone image.
- Wind speed and direction measured with a Kestral 5000 hand held meter coupled with a cell phone compass.
- Each homeowner was also asked to collect a cell phone image of the water at the nearshore end their dock between 10 am to 2 pm on a daily basis.

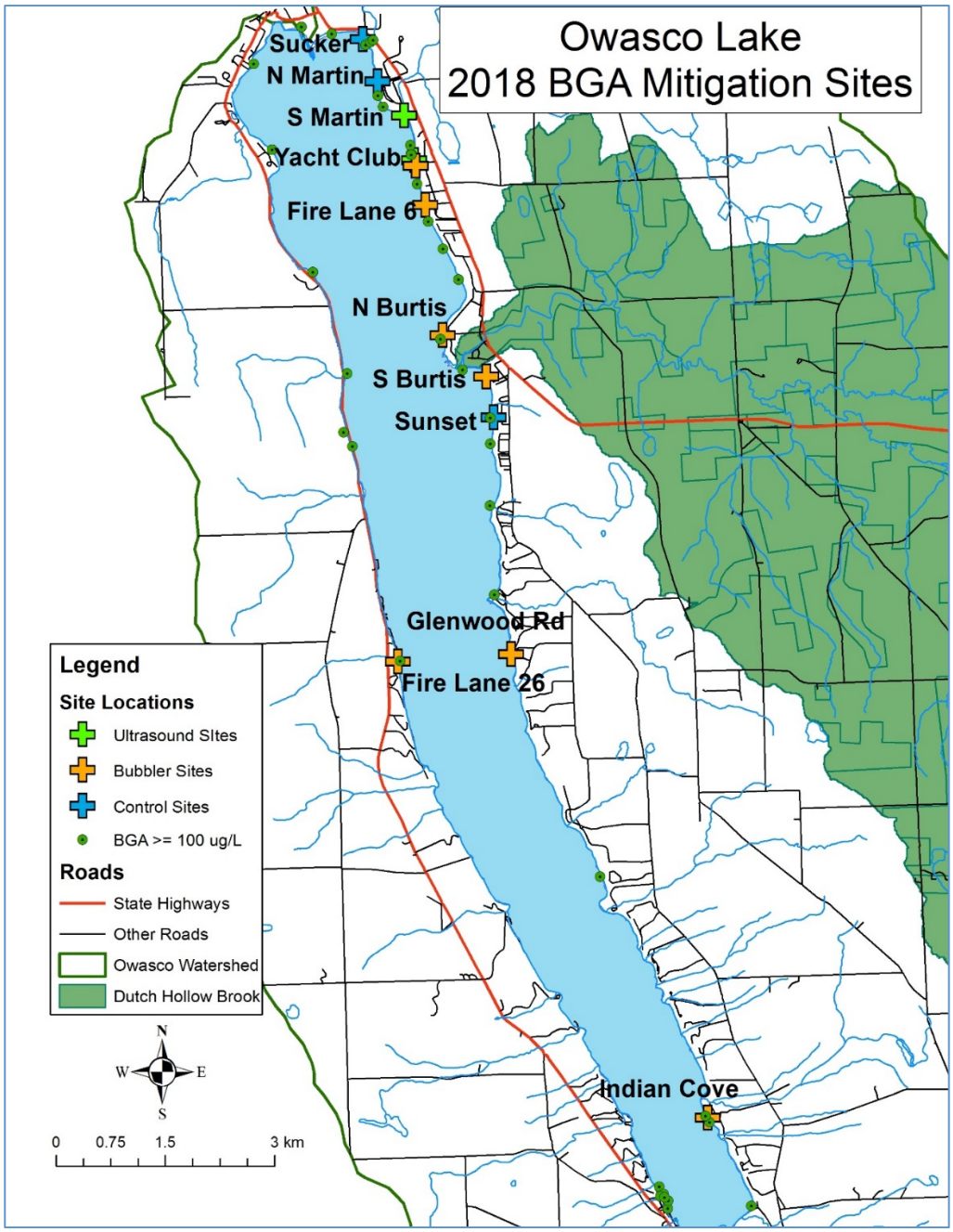


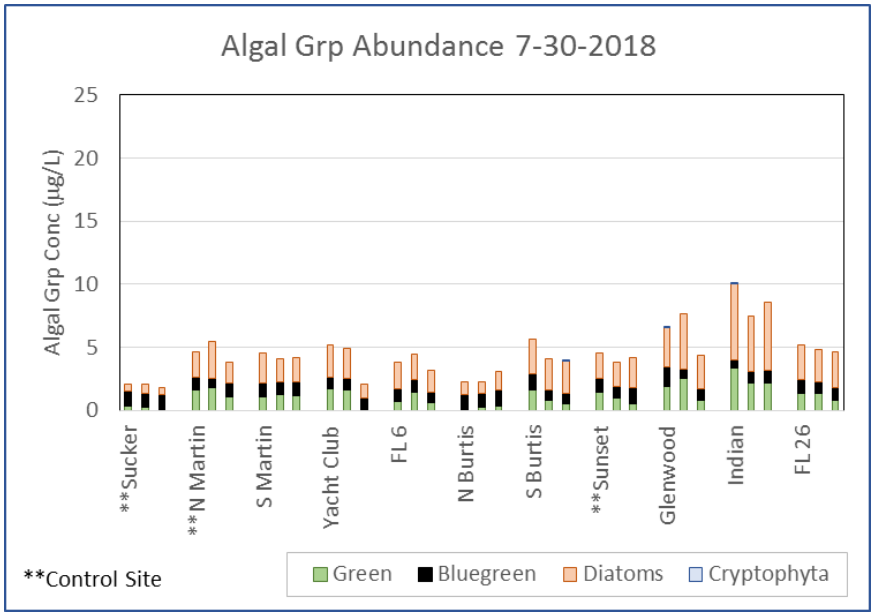
Fig. 1. Site locations (crosses) for the Owasco Lake HABs Inhibiting Technologies Assessment Project. The color of each cross differentiates control sites or the type of technology at the site.

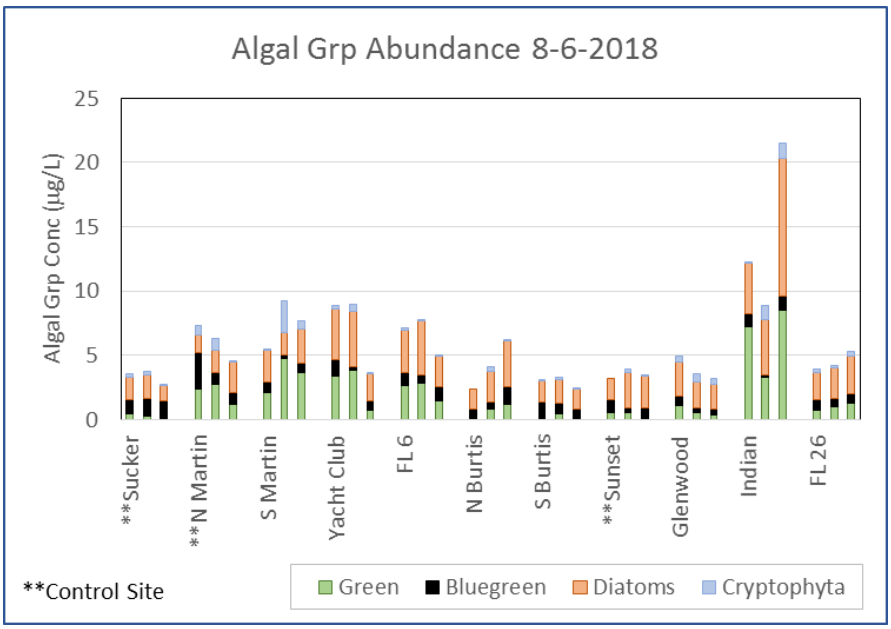
Table 1. Assessment Site Locations, Technologies, Dock Lengths and Water Depths.

Site Name	Technology Deployed	Dock Length (m)	Water Depth at Offshore End (m)
Sucker Br	**Control**	12.3	0.49
N Martin	**Control**	22.1	1.85
S Martin	Quattro-BP	25.4	1.68
Yacht Club	Quattro-BP & PS20 Airmax	24.7	2.28
Fire Lane 6	SW20 (Small) Airmax	23.8	1.83
N Burtis	SW20 Airmax	19.1	1.42
S Burtis	SW20 Airmax	35.4	1.55
Sunset Beach	**Control**	27.7	1.6
Glenwood Rd	SW20 Airmax	28.6	1.35
Indian Cove	PS20 (Large) Airmax	19.6	2.25
Fire Lane 26	PS20 Airmax	23.5	1.85

RESULTS

bbe Fluoroprobe: During these two early weeks of the BGA bloom season, the bbe Fluoroprobe results revealed minimal change between all samples at all sites (Fig. 2). The total Chlorophyll-a concentrations were small, typically below 10 μg/L. Indian Cove, the deepest nearshore site, had the largest concentrations, slighter larger than 20 μg/L in the offshore, lake-floor sample on 8-6-2018. These concentrations were more typical of the open lake slightly below the lake surface where algal concentrations typically peak between 5 and 15 m below the surface of the lake. Minimal change was detected between survey dates as well. Diatoms and green algae dominated the plankton distribution. Each site also detected some blue-green algae but BGA concentrations were always small, smaller than 2 μg/L and NYS-DEC's 25 μg/L minimum concentration for a BGA bloom.





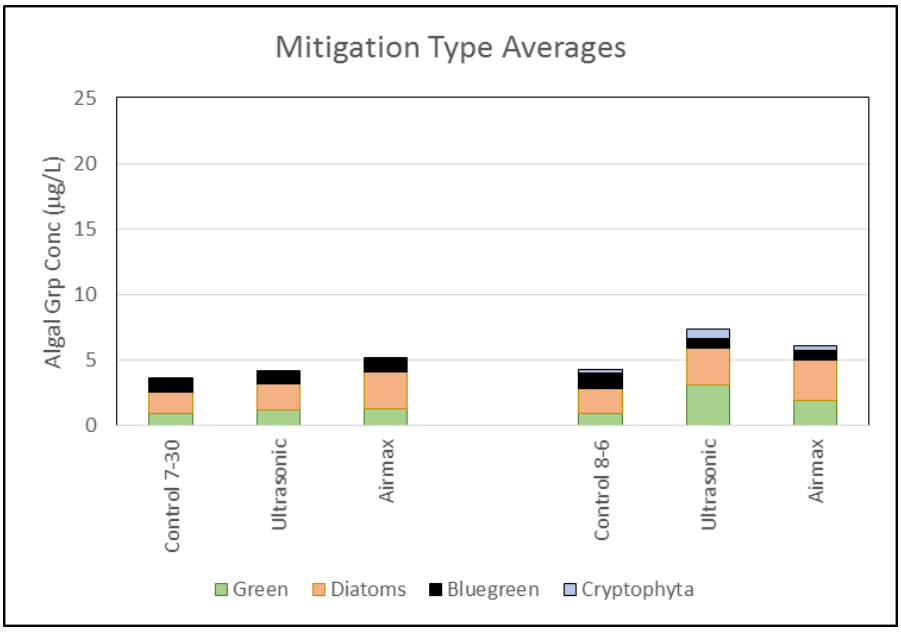


Fig. 2. bbe Fluoroprobe results. The three stacked bars for each site are, from left to right, the nearshore, offshore surface and offshore lake-floor samples. The last plot averaged the all of the fluoroprobe results for each mitigation technology and both sample dates.

Plankton assemblages: The plankton assemblages from each tow were dominated by diatoms (typically exceeding 90% of the counts) at these sites, especially on 7-30-2018 (Table 2). The exceptions were on 8-6-2018 where significant numbers of colonies of a blue-green algae, *Dolichospermum* (formerly *Anabaena*), were detected at N Martin (38%), S Martin (22%) and Sunset Beach (37%). Each colony is counted as one individual in these identifications. Interestingly, the largest percentages were detected at two of the control sites, N Martin and Sunset Beach. *Dolichospermum* was detected but less prevalent at the other sites, 6% or less of the assemblage.

Table 2. Plankton Assemblages.

Site Name	7-30-2018 Diatoms (%)	Blue-Green	8-6-2018 Diatoms (%)	Blue-Green
Sucker Br	94	-ND-	92	3
N Martin	99	-ND-	52	38
S Martin	96	-ND-	69	22
Yacht Club	96	-ND-	89	6
Fire Lane 6	92	-ND-	96	3
N Burtis	98	-ND-	89	6
S Burtis	94	-ND-	84	11
Sunset Beach	95	-ND-	50	37
Glenwood Rd	99	-ND-	96	2
Indian Cove	100	-ND-	99	1
Fire Lane 26	97	-ND-	96	1

Aerial Images: The drone images did not detect surface blooms of BGA at any site on either survey date. Neither did the cell phone images collected by Halfman. The 7-30-2018 image from the Owasco Yacht Club is shown (Fig. 4).

Fig. 4. Aerial image by drone at the Owasco Yacht Club on 7-30-2018. .

Wind Speed & Direction: Wind speed and direction data revealed light and variable winds on 8-6-2018 (Table 3). These data were not collected on 7-30-2018 because winds were nearly calm.

Table 3. Wind Speed & Direction.

Site Name	7-30-2018 Wind Speed (m/s)	Direction (360°)	8-6-2018 Wind Speed (m/s)	Direction (360°)
Sucker Br	Not measured,		2.8	196
N Martin	but light & variable		2.2	215
S Martin			1.7	222
Yacht Club			2.6	225
Fire Lane 6			2.1	221
N Burtis			0.0	--
S Burtis			1.0	242
Sunset Beach			2.4	263
Glenwood Rd			2.3	255
Indian Cove			2.4	279
Fire Lane 26			1.5	148

Please note: 5 miles/hour = 2.2 meters/second

Homeowner Photos: Peter Rogers, OWLA, indicated that only one homeowner photo detected a suspicious and very small surface bloom during these first two weeks. The algal composition was not determined. It was suggested that the Owasco Lake Watershed Inspector's office be notified if substantial blooms are detected, so the inspector can take a sample and send it in for analysis~~. We thank Peter Rogers for his compilation. A link to the cell phone photo depository will soon be sent to Halfman.~~

Of Note: A diatom bloom (often called a "whiting bloom") was observed on 7-30-2018. The bloom was also observed the following day on the weekly monitoring of the lake for the Emerson nearshore and OLWMC offshore lake monitoring efforts. The fluorescence concentrations peaked near and slightly above 2 μg/L between 2 and 11 meters below the lake surface. Aerial photographs (collected by Brian Brundage), the aerial images collected by drone (e.g., Fig. 4), and direct observations by Halfman while driving around the lake indicated that this event spanned the entire lake and thus could be observed by satellite (Fig. 5). A diatom "whiting" bloom is different than a BGA bloom. The diatom bloom had a milky (calcite) bluish-green (algae) coloration typical of an algal bloom induced whiting event. Active algal photosynthesis and warm temperatures (>25°C) increase the pH (by reducing the CO_2 concentration) and decrease calcite solubility enough around each algal cell to make the water supersaturated with respect to calcite and induce the precipitation of a fine-grained white calcite. Enhanced turbidity and the lack of any BGA on this date in the FLI monitoring buoy data support the whiting event hypothesis (Fig. 6).

Fig. 5. A whiting event induced by diatom algal photosynthesis and warm water on 7-30-2018. It spanned the entire lake and was associated with the high diatom concentrations along the nearshore sites (photo by Brian Brundage).

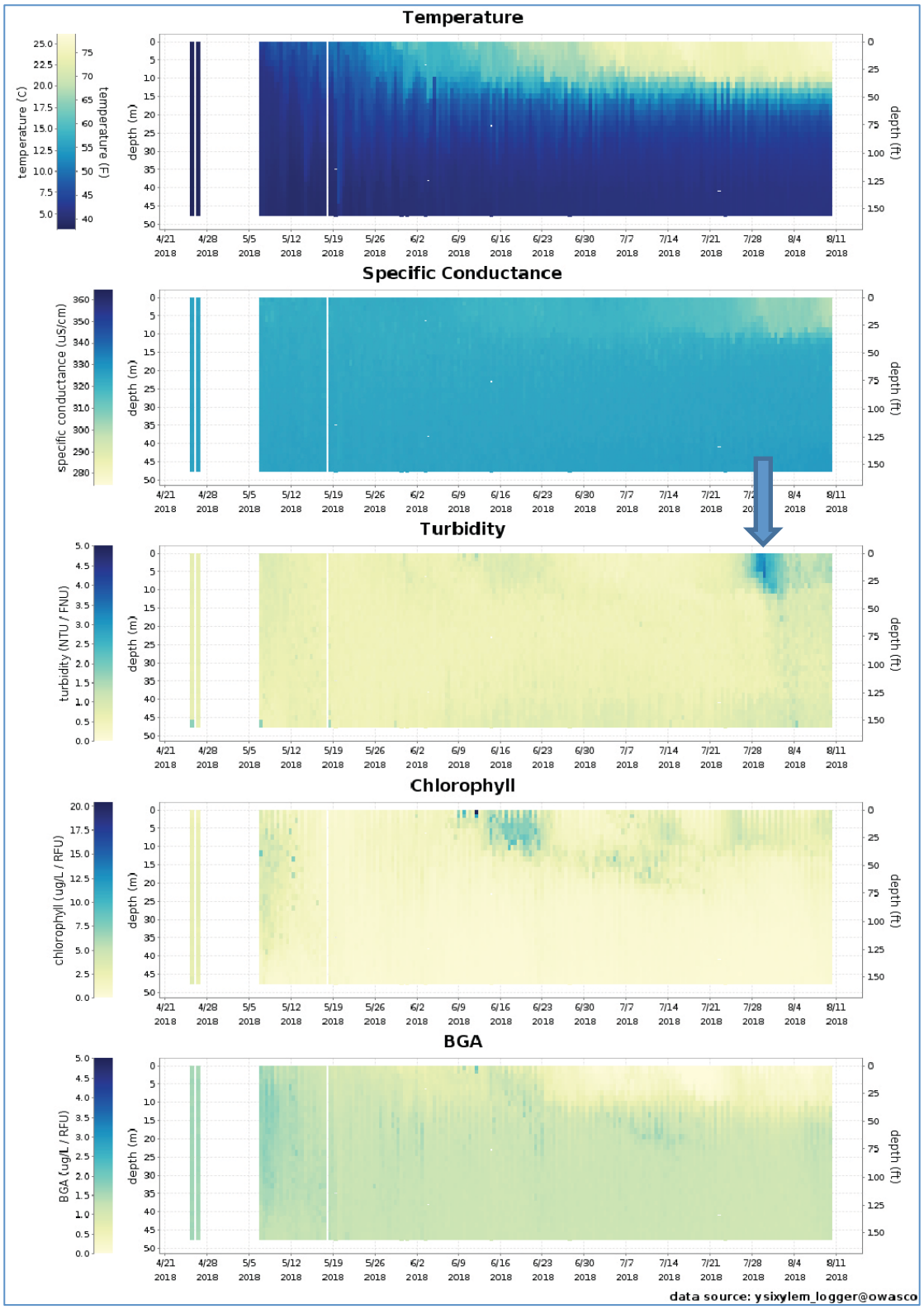


Fig. 6. Water quality data collected by the FLI monitoring buoy in 2018. Note, the turbid water on 7-30-2018 (indicated by the vertical blue arrow) presumably due to a whiting event from a diatom bloom. It was not a lake-wide BGA bloom as the detected BGA concentrations were very small and remained unchanged at the buoy location. Each plot has depth on the y axis, date on the x axis and the blue to yellow color gradient reflects the temperature or concentration.