2021 FINAL MONITORING REPORT

UV-C Light Aquatic Invasive Plant Control Pilot Project

October 2019-December 2021, Reporting Period

Cardno®

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Acronyms

AIP	aquatic invasive plants
AIS	aquatic invasive species
BMI	benthic macroinvertebrates
BMP	best management practice
CEQA	California Environmental Quality Act
cm	centimeter
CPW	Curly-leaf pondweed
DO	dissolved oxygen
DDM	degree and decimal minutes
EIP	Environmental Improvement Program
EPA	Environmental Protection Agency
EWM	Eurasian watermilfoil
GPS	Global Positioning System
IRI	Inventive Resources, Inc.
LFA	Laminar Flow Aeration
LSB	Lakeside Swim Beach
LSM	Lakeside Marina
mg/L	milligrams per liter
µS/cm	micro-Siemens/centimeter
MTS	Marine Taxonomic Services, Ltd.
(mW/cm2)	megawatt/square centimeter
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NTU	Nephelometric Turbidity Unit
Pilot Project	UV-C Light Aquatic Invasive Plant Control Pilot Project, 2019-2021
PLC	Programmable Logic Controller
ppm	parts per million
Tahoe RCD	Tahoe Resource Conservation District
TKPOA	Tahoe Keys Property Owners Association
TRPA	Tahoe Regional Planning Agency

Water Board	Lahontan Regional Water Quality Control Board
UNR	University of Nevada – Reno
USDA	United States Department of Agriculture
UV-C	Ultraviolet C (shortwave)

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Executive Summary

This Final Monitoring Report is submitted to fulfill Contract Number 20C00002 Amendment #1 between Inventive Resources, Inc. (IRI) and the Tahoe Regional Planning Agency (TRPA) for the Aquatic Invasive Plant Control Pilot Project (Pilot Project). This Pilot Project tested the effectiveness of ultra-violet light, C wavelength (UV-C) on aquatic invasive plant (AIP) infestations in Lake Tahoe in two lake environments: open water and enclosed water. Contract deliverables are contained within **Appendix A**.

In the 1980s and 1990s, the aquatic invasive plant (AIP) Eurasian watermilfoil (*Myriophyllum spicatum)* became established in the Tahoe Keys Property Owners Association (TKPOA) lagoons and other areas around Lake Tahoe. As of 2012, 18 infestation sites were known with the possibility of more that were not surveyed (Wittmann and Chandra 2015). Then, in 2003, Curly-leaf pondweed (*Potamogeton crispus*) was first discovered in Lake Tahoe. Currently, Curly-leaf pondweed is limited to the south and southeastern shores of Lake Tahoe with infestations observed from Taylor Creek to Lakeside Marina (Wittmann and Chandra 2015). Newer infestations were also recently found as far north as Elk Point Marina (Anderson 2016, pers. communication) on the Nevada side of Lake Tahoe. Coontail (*Ceratophyllum demersum*) is classified as a native plant to California, but in recent years has grown in abundance in the Lake Tahoe region, specifically in the lagoons. Coontail has heavily infested the deeper channels of all the lagoons, most abundantly in the Tahoe Keys Marina Lagoon and Lake Tallac Lagoon, where it comprises over 70% percent of the aquatic plant matter (TKPOA 2016).

Emerging research indicates that using UV-C light, a short-wave electromagnetic radiation light that damages the DNA and cellular structure of aquatic plants and their fragments, could be an effective new method to kill and control AIP species, as laboratory tests resulted in complete mortality when exposure times of more than 5 minutes were applied. This technology was applied in Lake Tahoe to determine the full potential of UV-C light treatment as a new non-chemical control method to enhance and support current efforts in the treatment and control of AIP.

Initial pilot testing of UV-C light treatment applications for the control of AIP occurred at Lakeside Beach & Marina in South Lake Tahoe, California between June and October 2017. Results were published in the Aquatic Invasive Plant Control Pilot Project Final Monitoring Report (Tahoe RCD 2019) and reported measurable AIP mortality and no significant temporary or long-term impacts to water quality. The 2019-2021 UV-C Light AIP Control Pilot Project (Pilot Project) continues testing the efficacy of UV-C light treatment to control AIP at three (3) locations: Lakeside Marina (approximately 0.71-acre); Lakeside Beach (approximately 1.83-acre); and select locations of the TKPOA lagoons (up to 0.5-acre in 2019). During 2020 the TKPOA Research Area increased to 1.0-acre. These treatment sites changed in acreage for 2021 as follows: Lakeside Marina (approximately 0.8-acre), Lakeside Beach (approximately 1.6-acres) and two TKPOA Research Area sites in Coves 3 and 4 (6-acres were accessible of the combined 8.2-acres).

While the terms aquatic plant control and aquatic plant management are often considered synonymous, resource managers commonly consider control efforts as being operational in nature and management as a process more aligned with program goals and objectives. The American Plant Management Society (APMS) defines aquatic plant control as "*techniques used alone or in combination that result in a timely, consistent, and substantial reduction of a target plant population to levels that alleviate an existing or potential impairment to the uses or functions of the water body"*. This definition best applies to management techniques that directly target reductions in plant biomass with the understanding that plant biomass reductions may not result for a number of years. The use of the term substantial in the APMS definition addresses the inherent problem with using quantitative guidelines to determine the success of the management activity (ies) (Netherland and Schart 2009). A single definition of AIP control is difficult to apply uniformly to all infestation areas given the numerous direct and indirect variables that can influence AIP control programs and projects. Additionally, some management strategies are recognized to potentially affect factors such as nutrient availability and plant reproductive capacity (e.g., production of flowers, seeds, turions, tubers, etc.), which are considered important components of an integrated management program.

Achievement of the overall goals and objectives of the Pilot Project, including TKPOA control method testing, will further inform AIP management success criteria for these AIP infestation areas.

This 2021 Final Monitoring Report for Tahoe Regional Planning Agency (TRPA) Environmental Improvement Program (EIP) project 01.03.01.0030 describes actions, results and conclusions of UV-C light treatment of the AIP infestation areas at Lakeside Beach & Marina. Testing conducted in the TKPOA lagoons in 2019 and 2020 included test spot treatments, site condition investigations and the development of a pilot test plan within the TKPOA lagoons for Phase II that was conducted 2021 and results have been reported separately to TRPA (UNR 2021). Investigations for UV-C treatment opportunities in the TKPOA lagoons in 2019 and 2020 are intended to inform implementation actions of Control Methods Test applied for by the TKPOA to test a variety of AIP control methods, including the testing of future herbicide applications, in the Tahoe Keys waterways. The Control Methods Test received TRPA and California Environmental Quality Act (CEQA) clearance in January 2022. The results of UV-C light testing conducted in the TKPOA lagoons in 2021 occurred in new areas identified for testing, have been reported to TRPA in a separate stand-alone report (**Appendix B**; UNR 2021) and are summarized in this Final Monitoring Report.

Historical AIP Treatment Methods

Lakeside Beach & Marina

As reported in Gramble et al. (2015), select sites at Lakeside Beach & Marina with known Curly-leaf pondweed infestation were surveyed in 2011 for plant and turion density and biomass. Ultimately, no suitable sites for benthic barrier deployment were identified for Lakeside Beach and Marina at this time. AIP infestations persisted, however, and Tahoe RCD began pilot testing of benthic barriers and diver-assisted hand suction across approximately 1-acre of Lakeside Marina in 2015 (TRPA EIP Project 01.03.01.0010) and continue seasonal deployment of benthic barriers through present day.

Maintenance dredging was conducted at the Lakeside Marina in 2015 across an area of 0.023-acre, during a period of low lake levels to remove sediment to maintain boating access to the existing public marina and boat ramp. Maintenance dredging returned the marina lake bottom to elevation 6219 feet Lake Tahoe Datum (LTD), the previously authorized depth. A turbidity curtain was placed across the mouth of the marina and held on the lake bottom with a heavy chain. A long-reach excavator stationed at the boat ramp was used to dredge the marina in the fall of 2015. De-watered material was loaded into sealed dump trucks after initial dewatering on the boat ramp and transported to a legal disposal site outside of the Lake Tahoe Basin. Theoretically, maintenance dredging actions removed accumulated sediments and organic materials, including aquatic plants and portions of the root zone that had established in the marina lake bottom. However, Tahoe RCD surveillance monitoring identified AIP infestations in 2016.

Tahoe RCD installed benthic barriers in the Lakeside Marina in 2016, which remained in place until fall of 2017. Tahoe RCD contracted with IRI in 2017 to conduct pilot testing of the efficacy of UV-C light to control AIP. Pilot testing occurred between June and October 2017, with post-project monitoring continuing through 2018. Results are reported in the Aquatic Invasive Plant Control Pilot Project Final Monitoring Report (Tahoe RCD 2019). Results indicated that UV-C light was successful at treating the leaves and stems but does not penetrate the lake bed or sediment profile, and therefore, roots can be shielded from UV-C light. New plant growth that was observed appears to have originated from Curly-leaf pondweed turions, untreated plants or rigorous root structures. Mature Curly-leaf pondweed turions may exist on the lake bed and can accumulate in the sediment profile. As long as the crown of the plant was treated effectively, minimal new growth occurred from the stock of the plant.

Long-term post-treatment results allowed for further analysis of AIP regrowth rates. Long-term post-treatment surveys indicate that some Natives reestablished by June 2018. Some AIP also reestablished with mean plant height measured at 132 centimeters (cm) pre-treatment and 15 cm measured post treatment by August 2018. This represents an 88% reduction in average plant height. Long-term post-treatment results from August 2018 measured Natives out competing Invasive in percent cover, mean plant height in centimeters and frequency of occurrence. The report recommended that further UV-C light

treatment applications and projects should be implemented and monitored for a period of 2-3 years to investigate the full potential of this tool, and noted that UV-C light implementation was the least expensive treatment method when compared to diver-assisted suction removal and benthic barriers.

The 2017 UV-C Light Pilot Project implemented TRPA EIP project number 01.03.01.0020 and tested UV-C light technology in the two lake environments, an enclosed waterbody (marina) and an open water body (beach littoral) system, for the control of AIP infestations. The results of this study demonstrated the efficacy of UV-C light as a useful tool for controlling AIP and provided information to support future environmental document analysis and permitting requirements. UV-C light technology is one of the suite of non-chemical (i.e., physical) control methods proposed by the Lake-wide Control of Aquatic Invasive Plants Project and analyzed in the joint environmental documentation prepared by Tahoe RCD, TRPA and the USDA Forest Service.

This second Pilot Project (TRPA EIP project 01.03.01.0030) is designed to complement and potentially improve historical control efforts conducted at Lakeside Beach & Marina and potentially reduce AIP control costs, as past AIP control methods have yielded varying levels of effectiveness over the period of record. This Pilot Project builds on the first UV Light pilot project by utilizing lessons learned and increasing the size of the treatment areas. The initial pilot showed promising results in that most treated plants exhibited signs of deterioration 7-10 days following treatment. This second pilot expanded treatment areas within the marina and off-shore locations. Project work lasted at least three seasons. Inventive Resources Inc. (IRI) is the developer of the technology and implemented the second Pilot Project with the University of Nevada - Reno (UNR), which conducted project monitoring.

TKPOA Research Areas

Since the mid-1980s, seasonal harvesting has been the main AIP control practice in the Tahoe Keys lagoons. Over the long period of record, monitoring observations and results indicate that continued reliance on harvesting operations would not improve AIP management or reduce the spread of viable plant fragments to nearshore environments outside of the lagoons. Crowell (1994) and TKPOA (2015; 2018a) concluded that mechanical harvesting might aid and benefit AIP population growth (TKPOA 2017; TKPOA 2018b). Harvesting continues as additional mechanical and chemical AIP control methods are tested and developed. Each summer at least five mechanical harvesting machines are necessary to keep the waterways navigable. These machines cut the tops off the plants approximately three to five feet below the water surface and place the bulk of the cut plant materials on an on-board conveyor and storage system. The cut plants are then transferred to trailers, dried, and transported to a disposal site outside the Tahoe Basin. During the past 30 years, there has been a trend toward increasing mass of harvested plants. Harvests in 2016 totaled over 10,125 cubic yards. In 2017, TKPOA staff removed 9,996 cubic yards, which is more than 900 dump trucks, of AIP from its lagoons, an undertaking that totaled more than 6,000 man-hours of work (https://tahoekeysweeds.org/tkpoa-efforts/; accessed October 26, 2020).

Between 2011 and 2014, initial experiments with benthic barriers were conducted in collaboration with TRPA and Tahoe RCD (https://tahoekeysweeds.org/timeline/; accessed on October 21, 2020). The expansion and excessive AIP growth in the TKPOA lagoons is due to several environmental conditions including abundant nutrient availability, relative warm, stagnant and shallow waters with sufficient light for weed growth. The lagoon environment has been found to offer ideal habitat conditions for prolific AIP growth. In response to the growing AIS problem in the TKPOA lagoons and the goal to limit non-point sources of pollution, Lahontan Regional Water Quality Control Board (Water Board) issued Waste Discharge Requirements to TKPOA on July 14, 2014. As part of these requirements, TKPOA was tasked with developing two planning documents: A Non-Point Source Water Quality Management Plan (NPS Plan; TKPOA 2018c) to address potential land-based sources of nutrients; and an Integrated Management Plan (IMP; 2018a) to address the growth of target AIP. The purpose of the IMP is to optimize management effects on controlling target AIP by incorporating a suite of feasible and proven control methods that can be tailored to fit site constraints, infestation size, and urgency of control.

The control methods included in the TKPOA IMP are non-chemical (i.e., mechanical) management in nature. At this time, these methods consisted primarily of mechanical harvesting and benthic barriers.

However, due to the size, density, and dominance of the infestation, these control methods have been shown to produce limited results. In addition, the current primary control method, harvesting, results in the production of large quantities of AIP fragments (Water Board 2014). Without proper controls, these fragments may be transported by wind, aquatic animals, and boat traffic within the lagoons and into Lake Tahoe, thus contributing viable AIP fragments and turions that can become established and create new populations in nearshore habitats and marinas.

The Lahontan Water Board issued approval on the Amended Supplemental Application for Exemption to the Bain Plan Prohibition on the Use of Pesticides for the Take Keys West Lagoon Integrated Control Methods Test in 2019. Board Order No. R6T-2014-0059, as amended, (WDID A090089000) outlines the project criteria and conditions for the TKPOA to test the efficacy of three herbicides followed by several non-chemical, mechanical control methods to test an integrated methods strategy to bring AIP under control within a limited area of the TKPOA lagoons. Three aquatic herbicides proposed for use, endothall, triclopyr, and penoxsulam, have been approved by the U.S. EPA, and California EPA/ Department of Pesticide Regulation for the target plants, and are also covered by the California Statewide National Pollutant Discharge Elimination System (NPDES) General Permit for Aquatic Pesticide Applications. No adjuvants are proposed for use with the aquatic herbicides and the proposed rate of use of each of the aquatic herbicides will be 50%, or less, of the maximum allowable concentration specified by the California Statewide NPDES General Permit and approved herbicide labeling. The expected result is an improvement in initial control of the AIP using herbicides that can then be followed in subsequent years with other (non-herbicide) methods, which include hand removal, diver-assisted hand suction removal, benthic barriers, and UV-C light. Additional indirect control measures that were approved for testing include bubble curtains and laminar flow aeration (LFA) and of course ongoing surveillance monitoring for identification of new infestations and re-infestations.

In 2019, the TKPOA purchased and installed a “Bubble Curtain” in the West Channel, the outlet of the lagoons to Lake Tahoe. The bubble curtain consists of multiple hoses that are submerged at the bottom of the waterway and are fed by an air compressor on the shore to push bubbles in a sheet, throughout the water column, to the surface. It was installed in a “V” formation to drive submerged plant fragments to the water’s surface, and then to the edges of the channel to ease collection and removal. An additional benefit of the bubble curtain is that it traps the stray fragments without impeding boating activity. This technology is being used in other locations around the world (including places with currents, tides and swells) to prevent debris from moving through an area.

TKPOA with funding support from the League to Save Lake Tahoe is conducting a three-year project called Laminar Flow Aeration (LFA). LFA is a technology used for improving water quality where there is consistently low dissolved oxygen and buildup of fine organic sediment. The technology uses microporous ceramic disks that are placed throughout the area to be aerated. These disks are connected by self-sinking hoses connected to an air compressor. Air is then pumped through the system creating an abundance of bubbles that rise and create laminar flow, providing oxygenation to the bottom of the water column where dissolved oxygen is typically the lowest. This project is taking place in the waterway between Christie Drive and Lucerne Way.

The bubble curtain and LFA projects also include conducting hydro-acoustic mapping of the lagoons on a two-week rotation, monthly water quality data collection, algae monitoring, annual macrophyte surveys at the beginning of July (TKPOA 2016, 2017, 2018d) bottom barriers monitoring (TKPOA 2018e) and weekly monitoring of the boat backup station.

This Pilot Project tests the efficacy of UV-C light treatment, a Group A (large-scale treatment) and Group B control method listed in the TKPOA Control Methods Test (CMT). Group B also includes benthic barriers, diver-assisted suction removal and diver hand pulling localized control methods. Group A also includes aquatic herbicide applications, which received TRPA and California Environmental Quality Act (CEQA) clearance in January 2022. Additional information for ongoing AIP management by the TKPOA can be found at https://www.keysweedsmanagement.org/.

UV-C Light AIP Treatment Method – Pilot Project Findings

The following questions guided the project monitoring. Responses are based on and supported by the monitoring results for the period of record:

a) How effective is the UV tool developed by Inventive Resources in increasing the mortality (death) of plant species?

UV-C light treatment is an effective tool for reducing plant biomass and reducing the amount of vegetative regrowth of plants. Laboratory and field experiments show that plants treated with a lethal dose of UV-C in the 254 nm (nanometer) range were damaged and irreparable above the crown when exposed for 5 to 20 minutes. After treatment of 10 to 20 minutes, a decrease in the plants structural integrity was observed within 7 to 10 days; plants then decay and breakdown within 30 days. Some vegetative re-growth occurs but at less height and vigor compared to plants not exposed to UV-C light treatment. The regrowth can be attributed to two factors: 1) UV-C light treatments occur over a large dense community of plants and exposure does not occur equally on every plant and 2) some microbial fouling of lamps when placed in the organic substrate materials may reduce the amount of UV-C exposure the plant community. Cleaning the lamps and changing operations so the light exposure occurring with the water column is maintained at maximum transmission and treating earlier in the season should improve the exposure efficiency and thus increase plant mortality. This UV-C light technology is likely most effective in increasing plant mortality when applied early in the growing season before populations reach greater heights and infestations become denser. The life cycle of the UV-C light treated plant is disrupted and plants do not regrow from root systems. Treatment early in the growing season reduces the shadowing effects from over story plants and the potential need for follow up treatments later in the season. Additionally, early treatment results in Curly-leaf pondweed mortality and should decrease in plant densities in the following growing season and subsequent years. Additionally, by treating Curly-leaf pondweed when turions are still green and attached to the plant body, this should reduce the amount of mature turions placed into the seed bank.

Specific results for the treatments at Lakeside Beach and Marina and TKPOA follows:

1. Plant coverage decreased at Lakeside Beach from 62.3% coverage (October 2019 baseline conditions) to 18.9% post-treatment (November 2021). Plant heights measured for the Lakeside Beach treatment area were highly variable over the monitoring period, mostly driven by the dense stand of Eurasian watermilfoil (Myriophyllum spicatum) ringing the shoreline. However, even when including Eurasian watermilfoil heights, average plant height remained was well below the water surface. Comparing pre- and post-treatment plant heights, there was a trend towards decreased plant height from July to August 2020; however, plant growth had recovered by October 2020. This trend is not evident in the 2021 data; rather the plants are shorter overall compared to 2020 plant heights. Greater than 92% of all plants measured had heights of 20 cm or less and 78% were 10 cm or less for 2021 post-treatment conditions.
2. Plant coverage decreased at Lakeside Marina from 100% coverage (October 2019 baseline conditions) to 0% coverage post-treatment (November 2021). A decreased water level coupled with increased propeller turbulence may have attributed to the decrease in plant coverage in 2021, but following the first treatment in July 2021, the bare coverage increased from 25% to 78.4% and continued to increase until no plants were observed in November 2021. The plants at the Lakeside Marina, in general, are able to grow much taller than those at Lakeside Beach. Plants were able to recover significantly after removal of the benthic barrier mats in spring 2020 and Curly-leaf pondweed grew to over 2-meters tall by July 2020. Initial sampling after the first UV-C light treatment in 2020 reported no reduction of average plant height; however, following a subsequent treatment the heights of leafy pondweed were diminished, and no Curly-leaf pondweed was observed. This may have coincided with the end of the pondweed species growth cycle, but no plants emerged to recolonize in 2020. In 2021, all plants measured well below 50 cm for the entire year. Treatment during the peak growing season in 2020 may have damaged the plants enough to reduce reproduction and stunt regeneration in 2021. Additional treatments would have further

damaged the already diminished plants to the point that plants were eradicated from the Lakeside Marina by November 2021. The lower water level coupled with increased boat propeller turbulence in 2021 may have also had reductive effects.

3. Testing results at TKPOA Research Area 2019-2020 report that after the initial testing in TKPOA Research Test Site in 2019, there was an increase in Curly-leaf pondweed in spring 2020. Curly leaf pondweed overwinters as a sprouted turion and is able to reach maturity faster than the native species. In August 2020, one-month post-treatment, one quadrat had no viable plants and approximately 2 months post-treatment no viable plants were observed in either quadrat. The plants had been reduced to a black decaying organic layer on the sediment surface. Comparing across the two years of testing, there was a 60% reduction in Curly-leaf pondweed in the tested section in May 2021 compared to May 2020 and a 31% reduction in the 1-year post-testing control section (tested in 2019 but not in 2020), evidence that treating Curly-leaf pondweed during the plant maturation stage is pivotal in reducing the amount of viable turions and reducing the Curly-leaf pondweed population the following year. Comparing the UNR Established Site across the sampling years, a decrease of Curly-leaf pondweed was also measured in 2021: an almost 30% reduction from 2020 to 2021 and a nearly 13% reduction in the 1-year post-testing control section. Plant height results were variable and according to plant species (Refer to Section 3.2.1.3.2).Major findings include: 1) a significant depression in plant biomass 4 to 6 weeks after the initial UV-C light testing in 2020, which continues after the second UV-C light exposure; and 2) a significant depression in plant biomass following the 2019 testing that occurred late in the growing season, which is due to the UV-C light exposure or patch scale compositional variability in plants.
4. Testing results at TKPOA Research Area 2021 reported that pre-treatment sampling showed the TKPOA UV Site 2 had significantly less bare area than the other two sites in both the shallow and the deep samples. Pondweed dominates early in the season with an increase in presence of Eurasian watermilfoil in the shallow areas and coontail in the shallow and deeper habitats. The deep transect had an increase of bare area earlier than the shallow areas, but still contained patches of coontail. Sprouted turions of Curly-leaf pondweed started to emerge in September 2021. Evidence of general plant species patchiness is seen in the variance of the percent coverage the deep sections in September, October, and November 2021, and the shallow sections in October and November 2021 have ranges from 0-100% for both coontail and bare. As expected, pre-treatment plant heights differed by species due to the start of the growing conditions and the life history of the taxa (Refer to **Appendix B**; Figure 5: Plant Height) with no overall difference in plant heights between TKPOA UV sites and the TKPOA Harvested Reference. Over the course of the season, plants in the shallow depths were growing closer to the surface compared to plants in the deeper depths. Both depths showed a marked decrease in plant height over time which may be because of variable changes in light conditions in the watershed due to changes in light quality from the wildfires, changes in the seasons, or effects from the treatments. An evaluation of the UV-C post-treatment and mechanical harvest treatments indicates the plant heights were similar across taxa and between treatment methods, illustrating the UV-C light control method when employing 5 to 10 minute exposures is on par with mechanical harvesting in controlling plant height.

Observations of plant fragments and risk of recolonization made over the treatment period include:

- UV-C light treatment results in mortality of whole plants rather than producing vegetative fragments which can move with hydrologic flows and reestablish plant populations. For example, UV-C light was applied in areas of Lakeside Marina with benthic barriers that had new plant growth establishing on sediments deposited on the barrier mats.
- Plant fragments have been observed entering Lake Tahoe Marina from the Lake Tahoe water body and viable plant fragments have been observed accumulating along the Lakeside Beach breakwater.
- Maintenance dredging was conducted in the TKPOA West Channel in April-June 2015 and following complete removal of approximately 1-acre of AIP infestation at the month of the channel

(including the root systems and up to 5-feet depth of lake bed substrate deposits), the site was recolonized by late August/early September 2015.

- Risk of recolonization is observed to be associated with type of use at a treatment site, viability of the historic seedbank, and distance from other infestation areas. Specific to the Lake Tahoe environment, distance of AIP control sites from uncontrolled infestation sites when considered with the direction of littoral drift patterns of Lake Tahoe's nearshore could increase the likelihood of recolonization.

b) What is the influence of environments with complex habitats including rock crib, riprap, and around piers in determining overall mortality from a given area?

Fluctuating water levels, water quality, boat traffic and water bottom morphology influenced plant mortality. Low water levels made it difficult to reach the entire wetted perimeter of coves in the 2021 TKPOA Research area. Higher colloidal sediments (muck) banks in the TKPOA Research area accounted for higher turbidity and lower UV-C light transmittance in some portions. Lakeside Marina water levels were historically low and made it difficult to have sufficient clearance under moored boats that typically had less than 12 inches of water clearance. Ideal site conditions have a water level of 6-foot depth or more. Sloping bottoms, riprap, rocks, piers or obstacles can limit or prevent the access of the treatment Array to the plants.

The 2021 season was subject to new challenges of shallow water column depths. New UV-C light tools are in development for 2022 treatment to help address some of these concerns but this may require ongoing improvements. Changes in the lights and smaller, slender light application tools would help in these areas with a shorter water column. In the past the riprap and rock crib was addressed by adding a stainless-steel grid on the bottom of the array. This allowed the team to lower the lamps directly on the objects without damaging the equipment. However, with the shallow waters the screen would hit the ground when trying to move forward and this caused issues. It was determined adding lifting pipes to the bottom of the array would keep the screen from hitting the ground. IRI is now developing a UV-C mat type array that can be lowered on top of the complex ground structure to address the shallow areas. Refer to Chapter 4, Recommendations and Next Steps, for information on existing UV-C light application tools that have been developed to respond to site-specific constraints and those tools under development for testing in 2022.

c) What is the influence of complex environments (e .g. dissolved substances and flocculent organic matter) in UV Light attenuation and potential mortality of plants?

This monitoring question is specific to the TKPOA Research Areas environmental variables that are outside the control or influence of the Pilot Project. Aquatic invasive plants start growing in the spring in the TKPOA area. These plants grow tall very quickly in order to reach available light and establish a thick over story canopy. The TKPOA Research Area has a thick layer of organic flocculent material and colloidal solids covering the bed substrates, so when plants are treated with UV-C light, these plants are reduced in height and structure. As a result they can no longer process adequate sunlight, and may become less viable due to the lack of photosynthesis.

Water quality in the TKPOA water ways became an issue during the 2021 treatment year in the TKPOA Research Area sites. Water with higher levels of turbidity, low UV-C transmittance, and particulates in the water such as iron decreased the efficacy of UV-C light from reaching the plants, which lead to increased need for cleaning of fouled lights. When heavy densities of decaying vegetation or organic sediment were visible, the array was kept above the sediment layer to minimize light fouling.

Dissolved organic matter (as measured by dissolved organic carbon [DOC]) contributing to turbidity can be caused by growth of the natural populations of phytoplankton and from decomposition of plant material, either from natural senescence or decay after treatment. The lowest levels of DOC and turbidity are in May, June, and July, coinciding with the desired months for initial treatment for the annual growth cycle. Therefore, dissolved substances should not interfere with the UV-C light attenuation during peak treatment

months. Conversely, turbid waters may assist in the treatment process. If plants are treated in June or July, when turbidity is low, growth rates are high, and Curly-leaf pondweed is beginning to set turions, the plants will lose turgor pressure and fall to the sediment surface. The phytoplankton will be increasing during this time, and combined with decomposition brought on by recent treatment activities, the turbidity in the water column will be much higher. With the increased DOC contributions to turbidity, sunlight is not be able to penetrate to the sediment surface and the fallen plants are not able to photosynthesize, producing increased death rates of mature plants, decreased nutrient storage in rhizomes, and reduced viability of turions, which will lead to decreased plant coverage the following year.

d) What is the indirect influence of plant structure (density, height) for controlling plants and regrowth of plants?

When plants are treated in dense colonies or in areas where plants are very tall in comparison to neighboring plants, shadowing plays a role in the resultant success of treatment on the plant. In these cases, multiple treatments are necessary to minimize densities or harvesting plants to a more desirable and controllable height. Treating plants with developing immature turions results in nonviable turions placed in the sediments, thus reducing plant regrowth in the long-term at these locations. If densely colonized areas are treated in turbid waters, as in the TKPOA Research Areas, the treated plants will fall to the sediment surface and lay in a mat. Plants that are not directly exposed to UV-C light due to the high plant density may be brought down with the falling plants. Plants laying below a photic minimum will not be able to photosynthesize and will die.

e) What is the plant composition and quality over time as measured by plant tissue chlorophyll a, carbon and nitrogen before and after treatments at the site?

We used particulate carbon and nitrogen and chlorophyll-*a* as a surrogate for trying to understand the physiological state of the plants. The differences in chlorophyll-*a*, carbon, and nitrogen are seasonal rather than impacted directly from the treatments of UV-C light. There is high variability within each plant species, and no significant differences in these measurements are reported pre- and post-treatment for plant growth that persisted. Plants that succumbed to UV-C treatment decomposed fairly rapidly and were not able to be sampled. Thus, a recommendation is made to not measure these parameters in future studies, but instead focus on the field measured plant density, composition and height and overall biomass removed from the water column towards determination of mortality and AIP control.

f) Prior to and after treatments, are there differences in Curly-leaf pondweed turion densities in the treated areas?

Shed turions were typically not visible on the sediment surface. Turion bodies easily sunk into the soft organic sediment of the TKPOA Research Area and Lakeside Marina or were obscured by plant growth. No turions were seen at Lakeside Beach, and no Curly-leaf pondweed plants were observed with immature turions developing. UV-C light treatment suppressed the growth of plants at Lakeside Beach and plant heights remained stunted. Although the shed turions themselves could not be counted, the decline in the percent CPM the year following each treatment period expressed the effects of treatment on turion density.

Lakeside Marina had a 16% decrease in Curly-leaf pondweed from 2020 to 2021. The TKPOA Research Tested and UNR Established sites had an annual decrease in Curly-leaf pondweed of 26.6% and 18.8%, respectively, while the TKPOA Reference site had a 3% increase for the same time period. Lakeside Beach had a maximum of 1.7% Curly-leaf pondweed. As the density was initially low at Lakeside Beach, it is difficult to define any changes brought on by UV-C treatment in this location. There were newly sprouted Curly-leaf pondweed turions seen in 2021 at the beach after no developing turions were observed in 2020 and it is unknown if the sprouted turions were from the seed bank or washed in from another location.

g) What are pre- and post-treatment levels of BMI populations in the treatment areas?

All treatment and test sites showed similar trends: 1 month post-treatment samples had an increase of BMI over pre-treatment samples, mostly oligochaetes. Initial UV-C light treatment is observed to causes some immediate decomposition of plants, leading to increased recruitment of mobile decomposers to the area. The subsequent samples, taken 2 to 4 months after initial UV-C light treatment and directly after a second treatment, had a sharp decline in all BMI, with some samples having no individuals present. Over time the UV-C treatments are causing increased plant mortality and increased decomposition, which could lead to localized hypoxic areas, driving away or decreasing the insect population of the food web. By December, approximately six months post-treatment, the BMI community in all samples had recovered and increased, with many samples having the highest population counts and most diversity of the sample sets. The increased recruitment and diversity after the treatment cycle is complete supports the conclusion that UV-C light exposure will not result in long-term degradation of the BMI community and that changes in the BMI community are transitory and will stabilize after treatment is completed. With long-term treatment there may be an overall loss of population size as plant biomass is decreased overtime, thus decreasing the food source for decomposers. Conversely, with the general decrease in biomass there may be decreased hypoxia, leading to a more stable BMI population.

Acknowledgements

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- Lakeside Park Homeowners Association - For allowing access and space to operate and store treatment vessel
- Lakeside Marina Staff and Management - For everything! Thank you for accommodating treatment and monitoring staff daily plus allowing access to the public to see the project in progress
- Tahoe Keys Property Owners Association, specifically Greg Hoover the Water Quality/AIS Program Manager, for allowing access and space to operate treatment vessel
- Dr. Lars Anderson for his expertise in plant identification and growth cycles
- League to Save Lake Tahoe for providing AIP educational materials
- Tahoe Resource Conservation District (Tahoe RCD) and Nearshore Aquatic Weed Working Group (NAWWG) for allotting times to present interim results and progress presentations during quarterly meetings
- Tahoe Keys Marina for allowing for safe ingress and egress of the 2021 UV-C Light Treatment Vessel during periods of low lake levels
- Ski Run Marina for providing boat and marina access for research purposes
- Marine Taxonomic Services (MTS) for conducting diving in support of monitoring at TKPOA Research Area in 2021
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- Jon Derek Larson, Annie Larson, Elizabeth Everest provided diving assistance
- Logan Gregory, Shaye McMillen, Audrey Dufresne, and Aidan Trammell provided field and laboratory assistance

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1 Introduction

1.1 Pilot Project Locations

1.1.1 Lakeside Beach & Marina

Figure 1 depicts the Lakeside Beach & Marina project area location and vicinity. The Lakeside Beach & Marina is located within the littoral zone of the Lake Tahoe water body in the vicinity of the California-Nevada Stateline area in South Lake Tahoe, California. The littoral zone is the near shore area where sunlight penetrates all the way to the sediment and allows aquatic plants (i.e., macrophytes) to grow. Two different types of littoral environments, an open water and closed marina system, with known AIP colonies, were chosen to receive treatment to observe the effects of UV-C light on two different nearshore lake environments. Marinas can be defined as establishments providing water-oriented services that has had man-made alterations to a littoral zone. These alterations typically result in localized change to aquatic ecology and littoral drift.

The Lakeside Beach treatment area, an open water beach environment that includes a water taxi docking and swim area and totals approximately 1.83-acres. The treatment area can be accessed from Lakeshore Boulevard between Park Avenue and Stateline Avenue through a private gate. There is no vehicle access to the project site; however, visitors can walk through the gate and onto the Lakeside beach.

The Lakeside Marina, a closed marina system with an approximate area of 0.71-acre. This treatment area is adjacent to Lakeside Beach along the California-Nevada Stateline in South Lake Tahoe, California and can be accessed from Lakeshore Boulevard and Park Avenue through a private gate and boat launch.

1.1.2 TKPOA Research Area, 2019-2020

Figure 2 depicts the Tahoe Key Property Owners Association (TKPOA) research area location and vicinity for 2019 and 2020 testing (Phase 1). TKPOA is located in South Lake Tahoe, California. The research area can be accessed by boat from the Tahoe Keys Marina. To view the treatment area, the area is located near Venice Drive, Emerald Drive and Christie Drive within the coves and lagoons in this northern general area. A select portion of the 172-acre TKPOA lagoon system comprise the TKPOA research area of the Pilot Project. In 2019 and 2020, site investigations and testing of UV-C light treatment intensities and time periods were conducted in the area shown later in this report on **Figure 10** in Section 2.3. The lagoons are part of the TKPOA, a multi-use development situated on approximately 372 acres of land and 172 acres of waterways (known as the lagoons). The Tahoe Keys development was constructed in the 1960s on the Upper Truckee River Marsh by excavating the lagoons and capping the soil with sand to form stable building sites.

The TKPOA development includes 1,529 homes and townhomes, a commercial marina, and a commercial center. Three primary man-made water features exist in the Tahoe Keys: 1) the Main Lagoon (also known as the West Lagoon); 2) the Marina Lagoon (also known as the East Lagoon); and 3) the Lake Tallac Lagoon. The lagoons are connected to Lake Tahoe via two narrow, direct channels: The West Channel that connects the Main Lagoon and the East Channel that connects the Marina Lagoon. Boat access to Lake Tahoe from the lagoons is restricted to these two channels. The Lake Tallac Lagoon flows into Pope Marsh to the west of the Tahoe Keys lagoons.

Primarily, two AIP populations in the TKPOA lagoons have been growing rapidly since AIP first established in the TKPOA lagoons and other areas around Lake Tahoe in the 1980s and 1990s. Aquatic plant surveys conducted in 2014, 2015, 2016 and 2017 show the extent and density of excessive plant growth in the lagoons. In recent years, 85% to 90% of the available wetted surface in the lagoons has been infested with target aquatic weeds with a large majority being the non-native invasive species. Of particular concern is

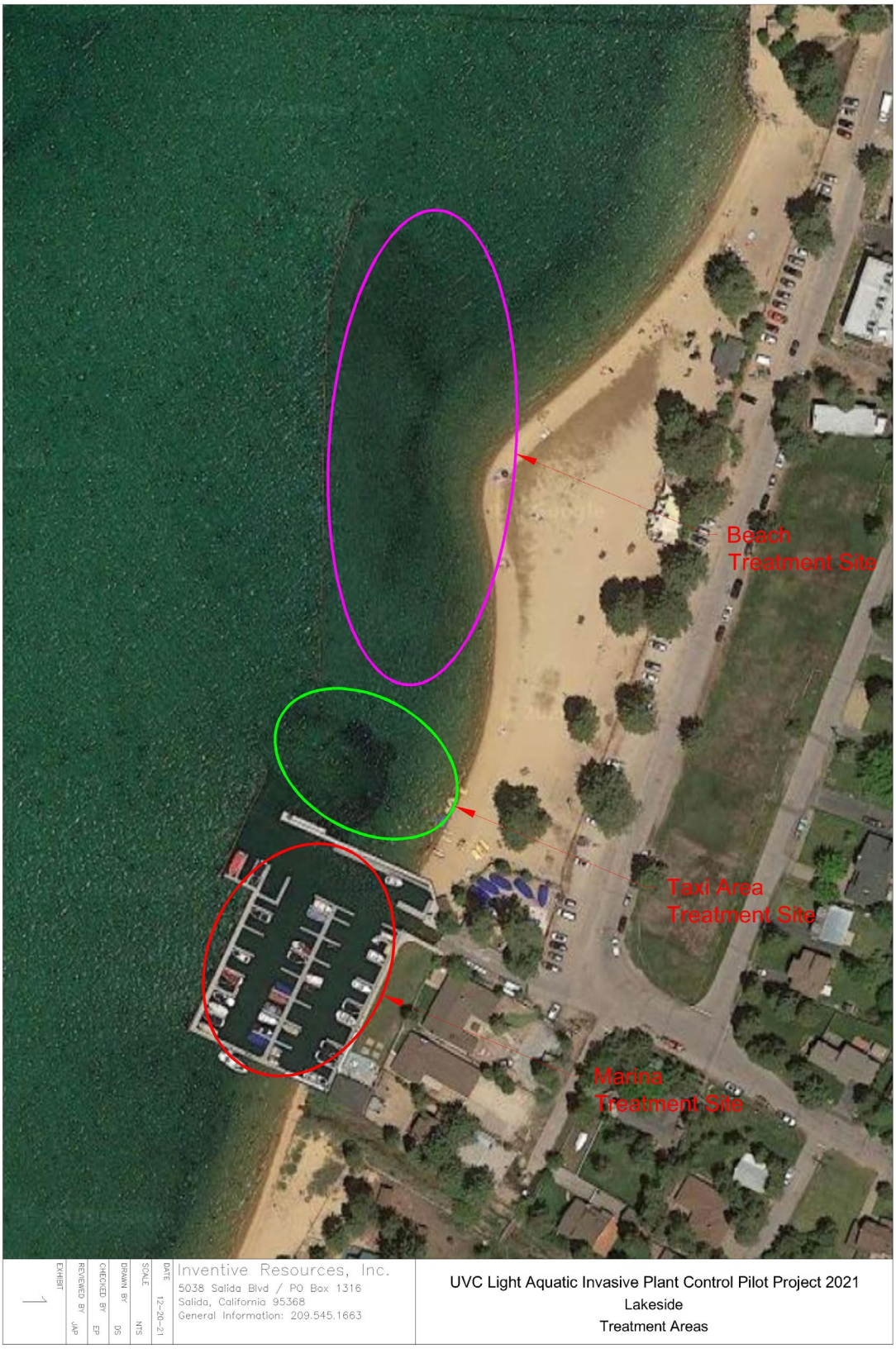

Figure 1 Lakeside Beach & Marina Treatment Area Locations, 2019-2021

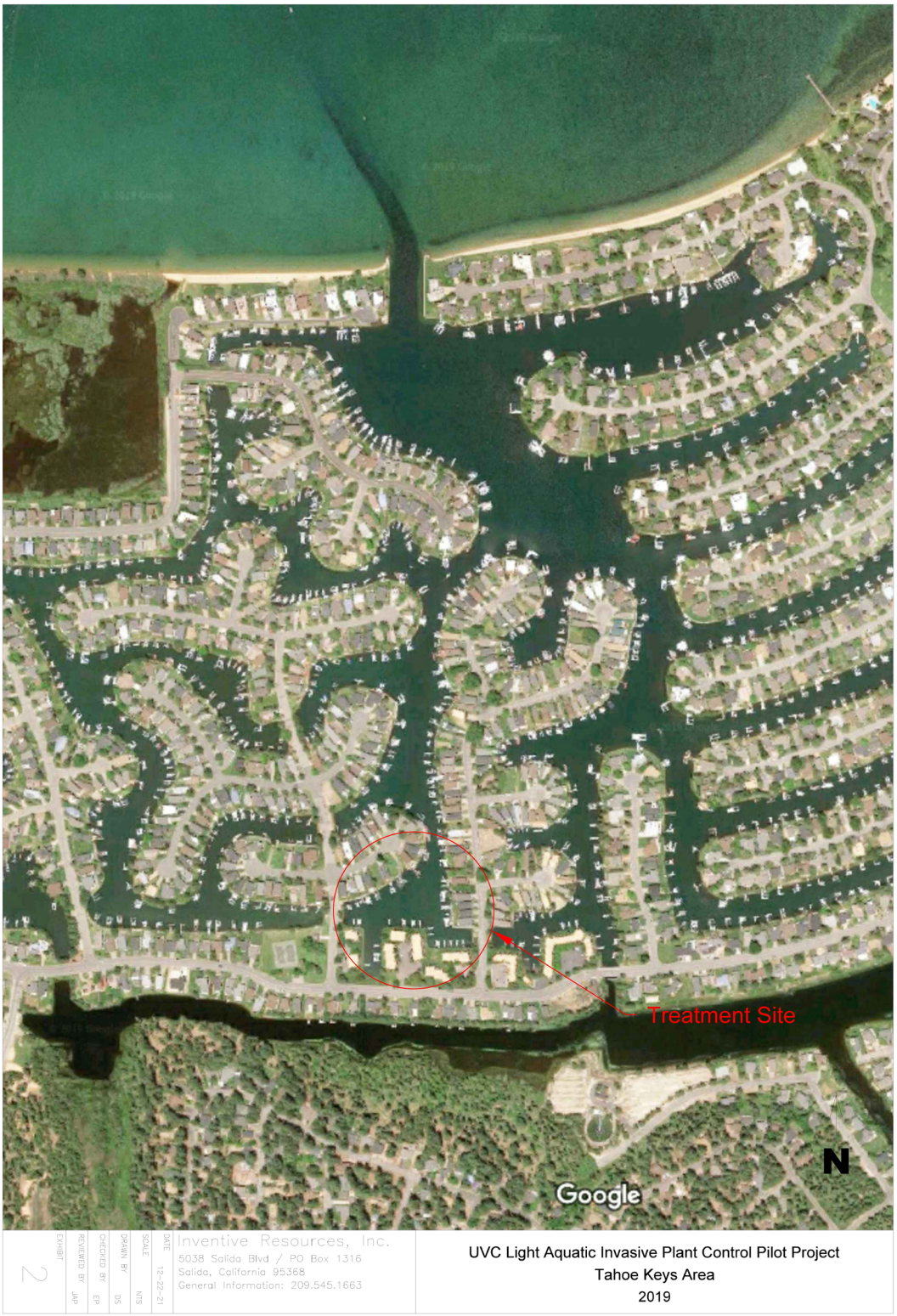

Figure 2 TKPOA Research Area Location, 2019-2020

the recent rapid growth and spread of Curly-leaf pondweed, which has the potential to not only infest significantly more of Lake Tahoe's aquatic habitat than Eurasian watermilfoil, but can also be more difficult to control due to the large number and dispersal capacity of its asexual turions that are produced in mid to late summer (Woolf and Madsen 2003; Wittmann et al. 2015; Xie and Yu 2011).

1.1.3 TKPOA Research Area, 2021

Phase 2 began in July of 2021 to quantify the efficacy of the UV-C tool at larger, acreage level spatial scale. The original project design was to compare sites with UV-C light exposure to an area with no plant control, using predetermined sites established by the TKPOA and consultants designing monitoring and testing for the Association. Since mechanical harvesting is a prevalent tool utilized by the TKPOA, the project design for Phase 2 was modified. The new Phase 2 design compared the UV-C tool to a location with mechanical harvest (positive control). Hence, starting in July 2021, three areas of the TKPOA lagoons were treated (1 with mechanical harvest serving a positive control and 2 with UV-C light). The site harvested by a boat mechanical harvester are referred to as Harvested Reference. Sites exposed to UV-C light are referred to as UV Site 1 and UV Site 2, respectively (**Figure 3**). Treatment dates are detailed in **Table 1** below depicting the overall Pilot Project schedule.

1.2 Lakeside Beach & Marina Treatment Goals

The overall goals of this Pilot Project are to:

- Test the efficacy of control efforts on plants using UV-C light in complex environments that include varying water quality (turbid and non-turbid waters), (soft sediments, and grainy sand), structures (piers, riprap, rocks, uneven bottoms), and open (windy) and closed (less windy like marinas) waters.
- Quantify efficacy on the life-history aspects of plants including young plants, Curly-leaf pondweed turions (i.e., seed like structures), and older plant communities with complex structure.

The performance measure to reduce target AIP biomass by at least 75% reflects prior studies on the efficacy of some control methods (Anderson 2017) and has been applied to the Pilot Project as a measure of success. The utility of UV-C light treatment to control AIP heights is also assessed and reported.

1.3 TKPOA Research Area Goals

Goals and objectives specific to the TKPOA Control Method Test include testing a range of large-scale, localized and long-term target AIP control methods to determine what combination of methods could be most effective. Information on the TKPOA Control Method Test can be found at https://www.waterboards.ca.gov/lahontan/water_issues/programs/tahoe_keys_weed_control/, https://tahoekeysweeds.org/ and https://www.trpa.gov/major-projects/#keys.

Project effectiveness is being evaluated based on the following performance criteria:

- Determine the effect on water quality in the TKPOA lagoons through monitoring.
- Achieve and maintain at least a 75% reduction of target aquatic weed biomass in test locations from baseline (invasive weed biomass from hydroacoustic scans in summer of 2019).
- Achieve and maintain a minimum three feet of vessel hull clearance within navigation channels year-round to maintain beneficial uses and prevent weed fragment generation and dispersal.

The performance measure to reduce target aquatic weed biomass by at least 75% reflects prior studies on the efficacy of some control methods (Anderson 2017). In addition, reducing target AIP biomass by at least 75% presents the most realistic probability for long-term AIP control that minimizes the need for repeated long-term use of control methods. Also anticipated is that a 75% reduction in biomass would be required to achieve and maintain three feet of vessel hull clearance. With a 75% reduction in AIP biomass, competition for space, light, and nutrients is expected to be sufficiently reduced such that native aquatic habitat may be re-established.

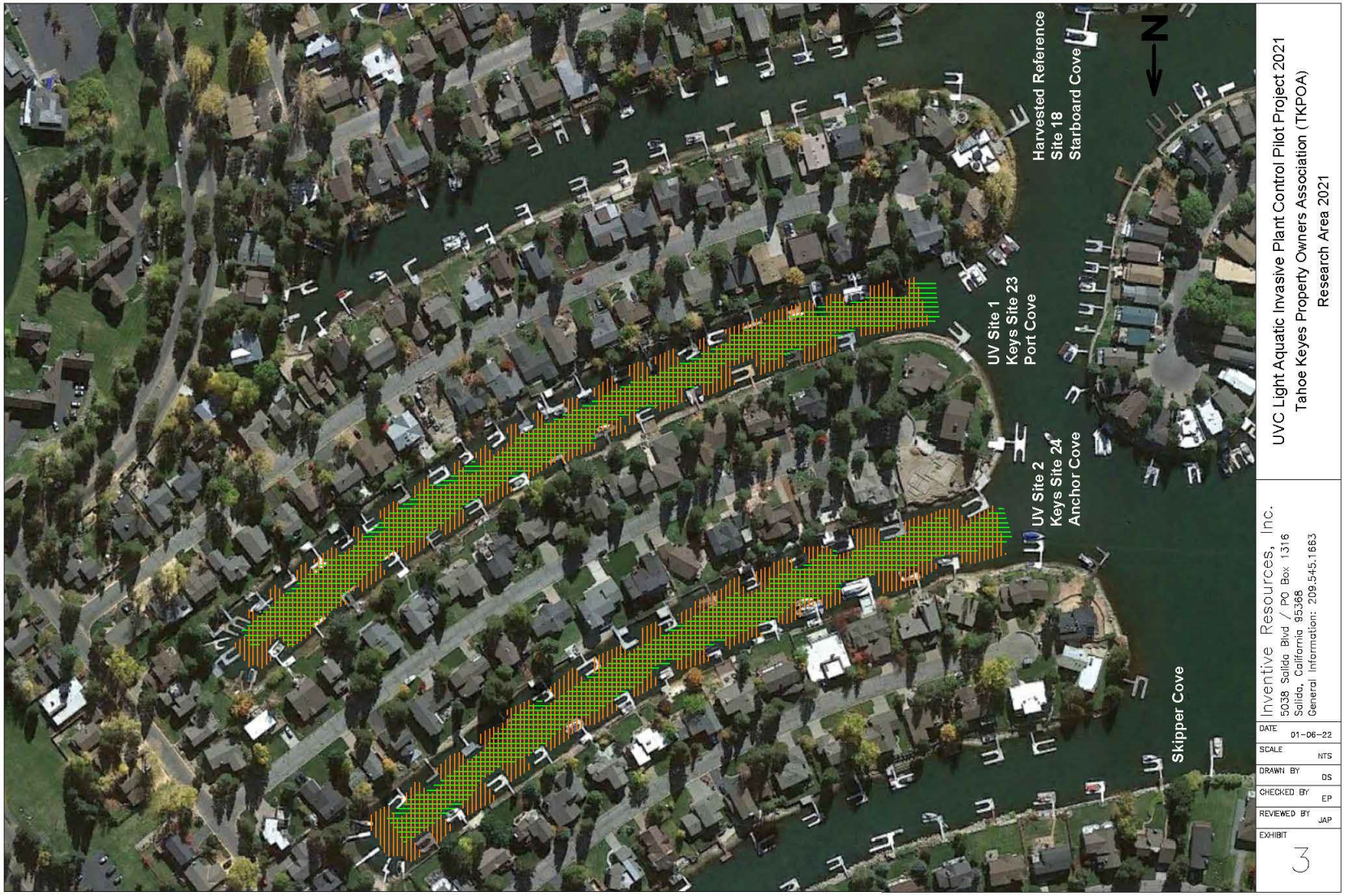

Figure 3 TKPOA Research Area Location, 2021

1.4 Project Scope and Schedule

Table 1 details the Project timeline from October 2019 through December 2021. The Project commenced late in 2019 due to contracting and was implemented according to the Project Schedule in 2020 and 2021.

Table 1 UV-C Light AIP Control Pilot Project Schedule, 2019-2021

Phase 1 - 2019 (cells list the weeks marked x)

Month	July	Aug	Sept	Oct	Nov	Dec
Week	1 2 3 4 5	1 2 3 4	1 2 3 4	1 2 3 4 5	1 2 3 4	1 2 3 4
UNR Quarterly Report (Task 5)						
Weekly Meetings (Administrative)						
Preparation (Task 1)		4	1, 2			
IRI UV-C Light Treatments and Investigations						
TKPOA Research Area - Phase 2 investigation and testing of additional up to 1-acre in 2021 (Task 6)						
TKPOA Research Area - Phase 1 investigation and testing of 0.6-acre in 2019 and 2020 (Task 3, above and beyond work)			3		2, 3	
Lakeside Beach - Phase 1/Phase 2 implementation (Task 2)			2	2, 3, 4, 5	1	
Lakeside Marina - Phase 1/Phase 2 implementation (Task 2)				1		
Requests for TKPOA Hydroacoustic Scans						
UNR Field Plant Monitoring Transects (Task 4)						
TKPOA Research Area - Monitoring for Phase 2 investigation and testing of additional up to 1-acre in 2021						
TKPOA Research Area - Monitoring for Phase 1 investigation and testing of 0.6-acre in 2019 and 2020 (above and beyond work)			3, 4		2, 3	
Lakeside Beach - Monitoring of treatment area			2	2, 3, 4, 5	1	
Lakeside Marina - Monitoring of treatment area				1, 5		
UNR Field Water Quality Monitoring (Task 4)						
TKPOA Research Area - Monitoring for Phase 2 investigation and testing of additional up to 1-acre in 2021						
TKPOA Research Area - Monitoring for Phase 1 investigation and testing of 0.6-acre area in 2019 and 2020 (above and beyond work)						
TKPOA Research Area - Collection of surface water for turbidity, pH, electrical conductivity, and total dissolved solids.				2	2	
TKPOA Research Area - Collection of surface water for total carbon, total nitrogen, dissolved organic carbon				2	2	
TKPOA Research Area - Deployment of sonde for real time analysis of dissolved oxygen, temperature, and chlorophyll *a*				2	2	
Lakeside Beach - Monitoring of treatment area						
Lakeside Beach - Collection of surface water for turbidity, pH, electrical conductivity, and total dissolved solids.				1		
Lakeside Beach - Collection of surface water for total carbon, total nitrogen, dissolved organic carbon				1		
Lakeside Beach - Deployment of sonde for real time analysis of dissolved oxygen, temperature, and chlorophyll a				1		
Lakeside Marina - Monitoring of treatment area						
Lakeside Marina - Collection of surface water for turbidity, pH, electrical conductivity, and total dissolved solids.				1		
Lakeside Marina - Collection of surface water for total carbon, total nitrogen, dissolved organic carbon				1		
Lakeside Marina - Deployment of sonde for real time analysis of dissolved oxygen, temperature, and chlorophyll a				1		
UNR Field Benthic Macroinvertebrate Monitoring (Task 4)						
TKPOA Research Area - Monitoring for Phase 2 investigation and testing of additional up to 1-acre in 2021						
TKPOA Research Area - Monitoring for Phase 1 investigation and testing of 0.6-acre area in 2019 and 2020 (above and beyond work)				1		
Lakeside Beach - Monitoring treatment area				2		
Lakeside Marina - Monitoring treatment area				2		
UNR Laboratory Activities (Task 4)						
Grinding Plants for Carbon and Nitrogen						
Analysis of Chlorophyll-*a*						
Benthic Macroinvertebrate Sorting						

Phase 2 - 2020 (cells list the weeks marked x)

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Week	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4 5	1 2 3 4	1 2 3 4	1 2 3 4 5	1 2 3 4	1 2 3 4	1 2 3 4 5	1 2 3 4	1 2 3 4
UNR Quarterly Report (Task 5)			4th	1st			2nd			3rd		
Weekly Meetings (Administrative)			4	2, 4	1, 3	1, 2, 3, 4	1, 2, 3, 4, 5	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4, 5		
Preparation (Task 1)												
IRI UV-C Light Treatments and Investigations												
TKPOA Research Area - Phase 2 investigation and testing of additional up to 1-acre in 2021 (Task 6)						1, 2, 4	1	4	1	3		
TKPOA Research Area - Phase 1 investigation and testing of 0.6-acre in 2019 and 2020 (Task 3, above and beyond work)						1, 2, 4	1	4	1	3		
Lakeside Beach - Phase 1/Phase 2 implementation (Task 2)						3, 4	5	1, 2		1		
Lakeside Marina - Phase 1/Phase 2 implementation (Task 2)						3, 4	2, 3, 4					
Requests for TKPOA Hydroacoustic Scans					4	2, 4	2, 4	1, 3	1, 3	1, 3, 5	2, 4	
UNR Field Plant Monitoring Transects (Task 4)												
TKPOA Research Area - Monitoring for Phase 2 investigation and testing of additional up to 1-acre in 2021					4	3	3	2	2	2	1	1
TKPOA Research Area - Monitoring for Phase 1 investigation and testing of 0.6-acre in 2019 and 2020 (above and beyond work)			3, 4	3	2, 4	3	3	2	2	2	1	1
Lakeside Beach - Monitoring of treatment area			4	4	3	2	1, 5	4	4	4	3	
Lakeside Marina - Monitoring of treatment area			4	4	3	2	1, 5	4	4	4	3	
UNR Field Water Quality Monitoring (Task 4)												
TKPOA Research Area - Monitoring for Phase 2 investigation and testing of additional up to 1-acre in 2021					4	3	3	2	2	2	1	1
TKPOA Research Area - Monitoring for Phase 1 investigation and testing of 0.6-acre area in 2019 and 2020 (above and beyond work)			3, 4	3	2, 4	3	3	2	2	2	1	1
TKPOA Research Area - Collection of surface water for turbidity, pH, electrical conductivity, and total dissolved solids.			3, 4	3	2, 4	3	3	2	2	2	1	1
TKPOA Research Area - Collection of surface water for total carbon, total nitrogen, dissolved organic carbon			3, 4	3	2, 4	3	3	2	2	2	1	1
TKPOA Research Area - Deployment of sonde for real time analysis of dissolved oxygen, temperature, and chlorophyll *a*			3, 4	3	2, 4	3	3	2	2	2	1	1
Lakeside Beach - Monitoring of treatment area			4	4	3	2	1, 5	4	4	4	3	
Lakeside Beach - Collection of surface water for turbidity, pH, electrical conductivity, and total dissolved solids.			4	4	3	2	1, 5	4	4	4	3	
Lakeside Beach - Collection of surface water for total carbon, total nitrogen, dissolved organic carbon			4	4	3	2	1, 5	4	4	4	3	
Lakeside Beach - Deployment of sonde for real time analysis of dissolved oxygen, temperature, and chlorophyll a			4	4	3	2	1, 5	4	4	4	3	
Lakeside Marina - Monitoring of treatment area			4	4	3	2	1, 5	4	4	4	3	
Lakeside Marina - Collection of surface water for turbidity, pH, electrical conductivity, and total dissolved solids.			4	4	3	2	1, 5	4	4	4	3	
Lakeside Marina - Collection of surface water for total carbon, total nitrogen, dissolved organic carbon			4	4	3	2	1, 5	4	4	4	3	
Lakeside Marina - Deployment of sonde for real time analysis of dissolved oxygen, temperature, and chlorophyll a			4	4	3	2	1, 5	4	4	4	3	
UNR Field Benthic Macroinvertebrate Monitoring (Task 4)												
TKPOA Research Area - Monitoring for Phase 2 investigation and testing of additional up to 1-acre in 2021					4	3						
TKPOA Research Area - Monitoring for Phase 1 investigation and testing of 0.6-acre area in 2019 and 2020 (above and beyond work)					4	3				2		
Lakeside Beach - Monitoring treatment area						2	1			2		1
Lakeside Marina - Monitoring treatment area						2	1			2		1
UNR Laboratory Activities (Task 4)												
Grinding Plants for Carbon and Nitrogen			3, 4							1, 2, 3, 4, 5	1, 2, 3, 4	1, 2, 3, 4
Analysis of Chlorophyll-*a*			4							1, 2, 3, 4, 5	1, 2, 3, 4	1, 2, 3, 4
Benthic Macroinvertebrate Sorting				1, 2						1, 2, 3, 4, 5	1, 2, 3, 4	1, 2, 3, 4

Phase 2 - 2021 (cells list the weeks marked x)

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Week	1 2 3 4 5	1 2 3 4	1 2 3 4	1 2 3 4 5	1 2 3 4	1 2 3 4	1 2 3 4 5	1 2 3 4	1 2 3 4	1 2 3 4 5	1 2 3 4	1 2 3 4 5
UNR Quarterly Report (Task 5)			4th	1st			2nd			3rd		Final (5)
Weekly Meetings (Administrative)		1, 4		1	1, 4	2	4	1, 3	3	1, 3, 5	3	2, 4
Preparation (Task 1)												
IRI UV-C Light Treatments and Investigations												
TKPOA Research Area - Phase 2 investigation and testing of additional up to 1-acre in 2021 (Task 6)							2, 3, 4, 5	1, 2	2, 3, 4	1, 2, 3		
TKPOA Research Area - Phase 1 investigation and testing of 0.6-acre in 2019 and 2020 (Task 3, above and beyond work)												
Lakeside Beach - Phase 1/Phase 2 implementation (Task 2)						3, 4	1	3, 4				
Lakeside Marina - Phase 1/Phase 2 implementation (Task 2)						3, 4		2, 3, 4				
Requests for TKPOA Hydroacoustic Scans												
UNR Field Plant Monitoring Transects (Task 4)												
TKPOA Research Area - Monitoring for Phase 2 investigation and testing of additional up to 1-acre in 2021					1							
TKPOA Research Area - Monitoring for Phase 1 investigation and testing of 0.6-acre in 2019 and 2020 (above and beyond work)					1							
Lakeside Beach - Monitoring of treatment area					1	2	1		3		3	
Lakeside Marina - Monitoring of treatment area					1	2	1		3		3	
UNR Field Water Quality Monitoring (Task 4)												
TKPOA Research Area - Monitoring for Phase 2 investigation and testing of additional up to 1-acre in 2021												
TKPOA Research Area - Monitoring for Phase 1 investigation and testing of 0.6-acre area in 2019 and 2020 (above and beyond work)												
TKPOA Research Area - Collection of surface water for turbidity, pH, electrical conductivity, and total dissolved solids.					1							
TKPOA Research Area - Collection of surface water for total carbon, total nitrogen, dissolved organic carbon					1							
TKPOA Research Area - Deployment of sonde for real time analysis of dissolved oxygen, temperature, and chlorophyll *a*					1							
Lakeside Beach - Monitoring of treatment area					1	2	1		3		3	
Lakeside Beach - Collection of surface water for turbidity, pH, electrical conductivity, and total dissolved solids.					1	2	1		3		3	
Lakeside Beach - Collection of surface water for total carbon, total nitrogen, dissolved organic carbon					1	2	1		3		3	
Lakeside Beach - Deployment of sonde for real time analysis of dissolved oxygen, temperature, and chlorophyll a					1	2	1		3			
Lakeside Marina - Monitoring of treatment area					1	2	1		3		3	
Lakeside Marina - Collection of surface water for turbidity, pH, electrical conductivity, and total dissolved solids.					1	2	1		3		3	
Lakeside Marina - Collection of surface water for total carbon, total nitrogen, dissolved organic carbon					1	2	1		3		3	
Lakeside Marina - Deployment of sonde for real time analysis of dissolved oxygen, temperature, and chlorophyll a					1	2	1		3			
UNR Field Benthic Macroinvertebrate Monitoring (Task 4)												
TKPOA Research Area - Monitoring for Phase 2 investigation and testing of additional up to 1-acre in 2021												
TKPOA Research Area - Monitoring for Phase 1 investigation and testing of 0.6-acre area in 2019 and 2020 (above and beyond work)												
Lakeside Beach - Monitoring treatment area												
Lakeside Marina - Monitoring treatment area												
UNR Laboratory Activities (Task 4)												
Grinding Plants for Carbon and Nitrogen												
Analysis of Chlorophyll-*a*												
Benthic Macroinvertebrate Sorting												

Source: UNR 2021

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2 Methodology

2.1 UV-C Light Treatment

Emerging research indicates that using ultra-violet light (UV-C), a short-wave electromagnetic radiation light that damages the DNA and cellular structure of aquatic plants and their fragments, could be an effective new method to kill and control AIP species, as laboratory tests resulted in complete mortality when exposure times of more than 5 minutes were applied. Field testing commenced in 2017 at Lakeside Beach & Marina as part of the Tahoe RCD pilot project using a used a small 60 square foot UV-C Light Array equipped with low intensity UV-C lamps. Field results closely aligned with laboratory results, with the plants losing turgor pressure and dropping from the water column in in treated areas within two weeks. Based on initial field results reported in Tahoe RCD 2019, a larger 160 square foot UV-C light Array equipped with more powerful UV-C lamps was designed and built. Each year the UV-C vessels become more advanced and the treatment process becomes more streamlined. GPS tracking is now used to position the array and the system is becoming more autonomous, allowing additional time for the operator to focus on adjusting the treatment time or movements depending on characteristics of the AIP infestation present.

UV-C light treatment vessel was staged at Lakeside Marina or in the vicinity of the TKPOA Research Area. Both storage areas are locked and secured. Operations included setting up, photographic/video monitoring in the morning, UV-C light treatment or testing, coordinating with marina staff to move boats, when necessary, light array cleaning, and securing the site before end of work day. The UV-C light treatment vessel was also used to take photographs in harder to reach grids away from the dock. IRI staff assignments varied day to day in response to work schedules and meetings.

2.1.1 2019 UV-C Light Treatment Vessel

The 2019 UV-C light treatment vessel (**Figure 4**) was comprised of the following:

- 6 Propane generators;
- 240 UV-C Lamps mixture of 24, 36, 55, 95-watts (Size is 8-feet by 20-feet);
- 10-inch castor wheels for easy removal on boat ramp;
- 20-foot depth poles schedule 80;
- Propane tanks;
- 12-volt trolling motors;
- 15-foot winch system to lower array; and
- Outriggers.

The 2019 UV-C light treatment vessel was the first large scale UV-C treatment vessel made. This design was chosen to allow the operators to use propane as a fuel. Six propane generators powered the lamps. The array was made up of a combination of 36, 55, and 95-watt UV-C lamps. The 8-foot by 20-foot array could slowly move over the plants and target larger infestations. A smooth rounded pipe system was added around the outer edge of the array to help deflect plants under the lamps.

2.1.1.1 Vessel movement

To position the vessel, ropes and trolling motors were used. The treatment patterns were done in arc movements. This allowed for proper overlap and 100 percent coverage. The vessel had four 55-watt electric motors for population.

2.1.1.2 Treatment Duration

In 2019 our focus was to test the new lamps and provide treatment to all areas. On average, the vessel is positioned and stabilized for 15 to 20 minutes during UV-C light applications and then moved within the grid to have proper coverage and some overlap when possible. This worked well, however, many times the array was only treating sand and it was a waste of time and fuel. The need for a better way to move the vessel more quickly over sandy areas but also stay on course with the grid was identified for the 2020

treatment design. Generator hours of use of the UV-C light vessel for 2019 implementation totaled approximately 200 hours.

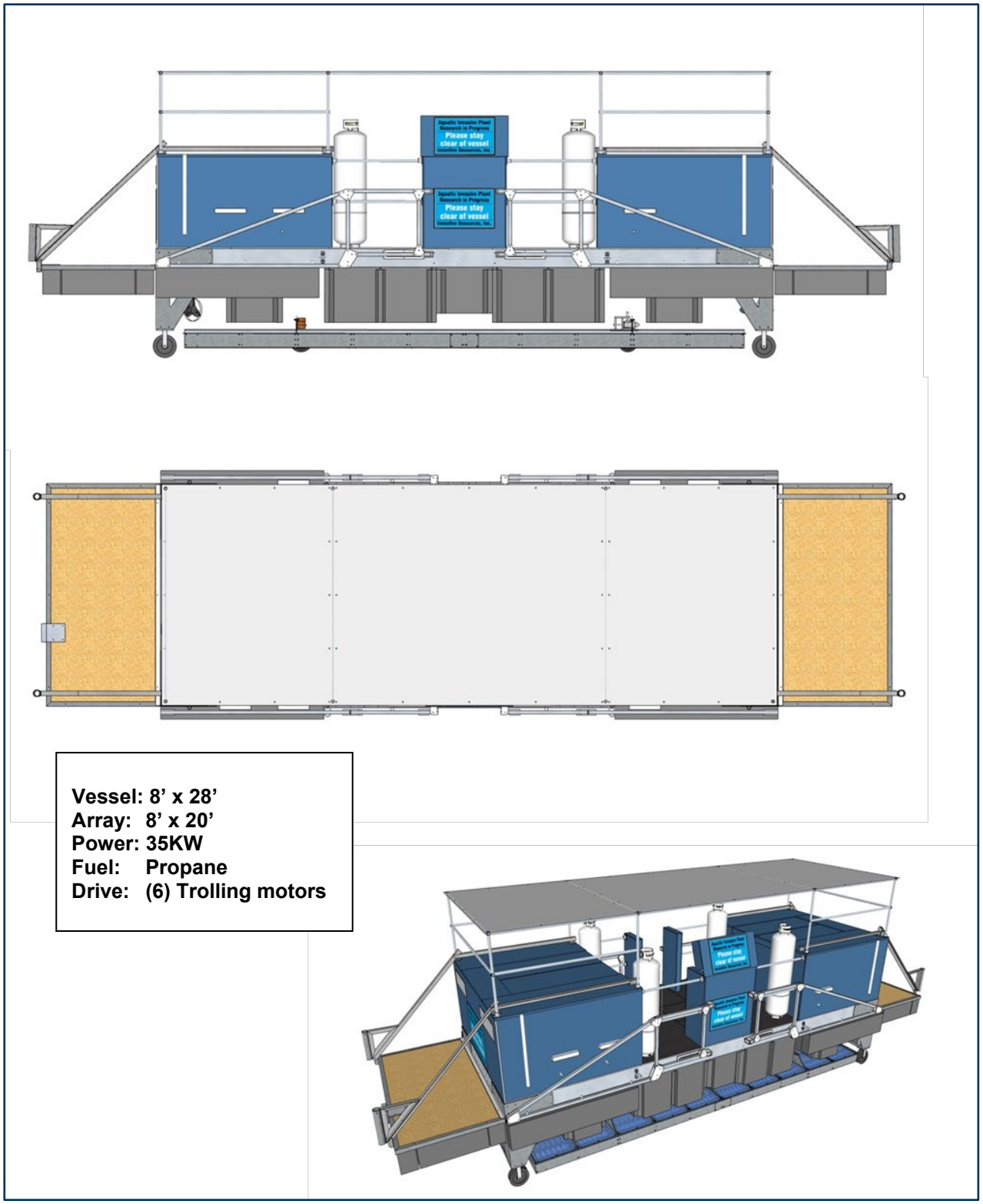

Figure 4 UV-C Light Treatment Vessel, 2019

2.1.2 2020 UV-C Light Treatment Vessel

The 2020 UV-C light treatment vessel (**Figure 5**) was comprised of the following:

- 6 Propane generators
- 240 UV-C Lamps mixture of 24, 36, 55, 95-watts (Size is 8-feet by 20-feet)
- 10-inch castor wheels for easy removal on boat ramp
- 20-foot depth poles schedule 80
- propane tanks
- 12-volt trolling motors
- 15-foot winch system to lower array
- Outriggers.

The 2020 UV-C light treatment vessel was the second large-scale UV-C treatment vessel made. This design upgraded the power system and use a 99 KW Kohler Generator. The power system was chosen to allow use of a 16-foot by 40-foot array; ultimately a 12-foot by 32-foot array was constructed. This design allowed operators to cantilever under docks and boats when in deep water. The design worked well, however; it was difficult to remove for maintenance. The lights could only be cleaned underwater by a diver and this proved to be costly and inefficient.

2.1.2.1 Vessel Movement

To position the vessel eight electric trolling motors were used. The control was a joystick and movements were not very smooth. At times, the drone software chosen would lose signal and the boat was difficult to control. The decision was made halfway thought the season to move the boat more manually with the trolling motors.

2.1.2.2 Treatment Duration

With use of the larger array, larger movements could be conducted to speed up the treatment process. Less overlap in treatment occurred and cut the treatment time down by approximately half. The lamps used were longer and drew more power. Treatment time was on average 10 to 15 minutes and a noticeable difference on plant mortality was observed. The longer treatment time caused plants to decay and disintegrate faster, and in the end, all treated plants expressed mortality.

Generator hours of use of the UV-C light treatment vessel for 2020 implementation totaled approximately 520 hours:

- Lakeside Beach = 145 hours
- Lakeside Marina (and Taxi Area) = 170 hours
- TKPOA Research Area = 205 hours.

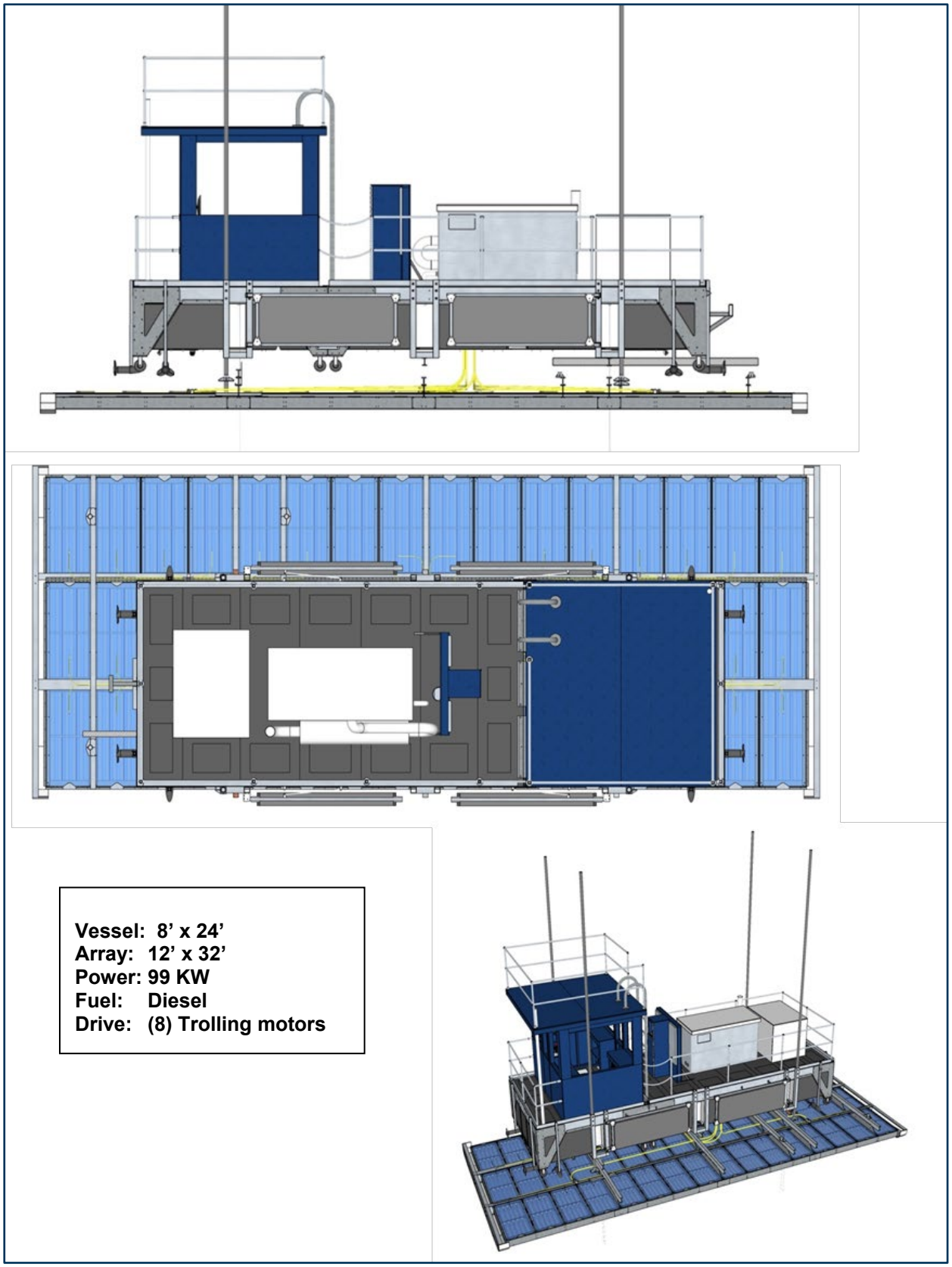

Figure 5 UV-C Light Treatment Vessel, 2020

2.1.3 2021 UV-C Light Treatment Vessel

The 2021 UV-C light treatment vessel (**Figure 6**) was comprised of the following:

- 99kW Kohler Diesel generator
- 400 UV-C Lamps
- 20-foot depth poles schedule 80
- 12-volt trolling motors
- 15-foot winch system to lower array.

The 2021 treatment vessel was the third large-scale UV-C treatment vessel made. In 2020, the importance of having a more maneuverable vessel in tight areas became an important design criterion, which dictated the design and construction of a new smaller vessel and array and allowed the ability to not rotate the array when working in the Lakeside Marina. At any point, cantilevering under vessels could occur, which resulted in the treatment of the entire marina area. This design worked perfect at the beginning of the season, but as the season when on and the water level lowered, the ability to treat under boats decreased and was eventually lost due to lake level. Ideal site conditions have a water level that is 6-feet or more.

2.1.3.1 Vessel Movement

To position the vessel twelve (12) electric trolling motors were used. The control was through a programmable logic controller (PLC). A PLC is an industrial computer that is ruggedized for variable environments and repetitive actions on a machine or robotic device. Button controls were used, which proved to be very useful and controllable. Forward, sided shift and rotate actions were able to be conducted by pressing a single button. The movements were clean and good control was maintained. Additionally, the UV-C treatment vessel was tied into a GPS (global positioning system) system to plot locations and this was also helpful to re-locate areas treated previously when necessary.

2.1.3.2 Treatment Duration

In 2021, a treatment of 5 to 10 minutes was applied at most locations. Plant mortality was still achieved by the end of the season, but plants did not drop from the water column as fast as previous treatment years. The 5 to 10 minute treatment time was chosen because of improved lamp size and power and a start date later in the growing season and to test this faster treatment time to observe the effect on plants. Positive results were observed when the lamps were clean and a drop in efficacy was observed when the lamps were fouled. As soon as this was observed, the lamps were cleaned or replaced.

Noting that the project was suspended between August 28, 2021 and September 7, 2021 in response to Caldor Fire evacuations, generator hours of use of the UV-C light vessel for 2021 implementation totaled approximately 679 hours:

- Lakeside Beach = 126 hours
- Lakeside Marina (and Taxi Area) = 95 hours
- TKPOA Research Area (Phase 2) = 458 hours.

Treatment duration (5 to 10 minutes) was adjusted down in 2021 to meet the commitment of testing as much of the larger 2021 TKPOA Research Area as possible. The commitment was impacted by work days lost due to a late season start and the Caldor Fire evacuation period. Ultimately low water levels presented during the 2021 season prohibited access to the complex habitats associated with the rock crib, riprap, and piers of the 2021 TKPOA Research Area.

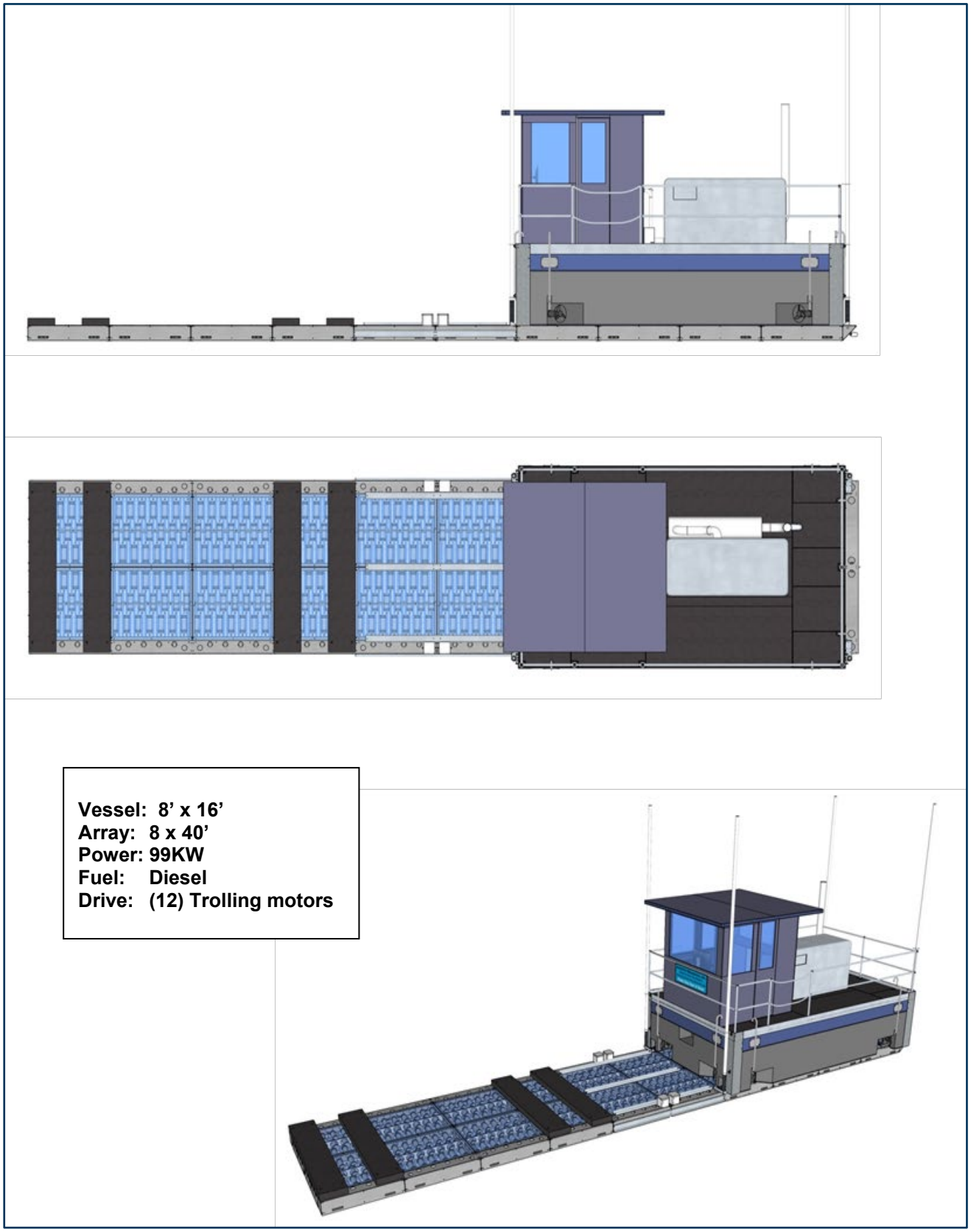

Figure 6 UV-C Light Treatment Vessel, 2021

2.1.4 Lakeside Beach Treatment Area

Nine (9) treatment transects were established in the Lakeside Beach treatment area, the GPS coordinates of which are identified in **Table 2**. The grid identifiers listed in the table describe the matrix illustrated in **Figure 7**.

Table 2 GPS Coordinates for Lakeside Beach Treatment Area

Location	GPS Coordinates	Grids
Transect 1	38.960720, -119.951498 to 38.960720, -119.950294	F1 to U1
Transect 2	38.960545, -119.951588 to 38.960545, -119.950437	E4 to T4
Transect 3	38.960410, -119.951618 to 38.960410, -119.950583	D6 to Q6
Transect 4	38.960272, -119.951625 to 38.960272, -119.950761	D8 to O8
Transect 5	38.960126, -119.951637 to 38.960126, -119.950977	D11 to K11
Transect 6	38.959997, -119.951642 to 38.959997, -119.951090	D13 to J13
Transect 7	38.959838, -119.951630 to 38.959838, -119.951079	D16 to J16
Transect 8	38.959702, -119.951632 to 38.959702, -119.951055	D18 to J18
Transect 9	38.959540, -119.951646 to 38.959540, -119.951060	D21 to J21

Source: IRI 2019

At Lakeside Beach treatment area, UV-C treatment time durations ranged from 15-20 minutes in 2019, 10-15 minutes in 2020 and 5-10 minutes in 2021.

2.1.5 Lakeside Marina Treatment Area

Three (3) treatment transects were established in the Lakeside Marina treatment area, the GPS coordinates of which are identified in **Table 3**. The grid identifiers listed in the table describe the matrix illustrated in **Figure 8**.

Table 3 GPS Coordinates for Lakeside Marina Treatment Area

Location	GPS Coordinates	Grids
Transect 1	38.959046, -119.951869 to 38.958878, -119.951392	A4 to I4
Transect 2	38.958872, -119.951777 to 38.958514, -119.951979	D6 to D13
Transect 3	38.958854, -119.951717 to 38.958497, -119.951929	E6 to E13

Source: IRI 2019

At Lakeside Marina treatment area, UV-C treatment time durations ranged from 15-20 minutes in 2019, 10-15 minutes in 2020 and 5-10 minutes in 2021.

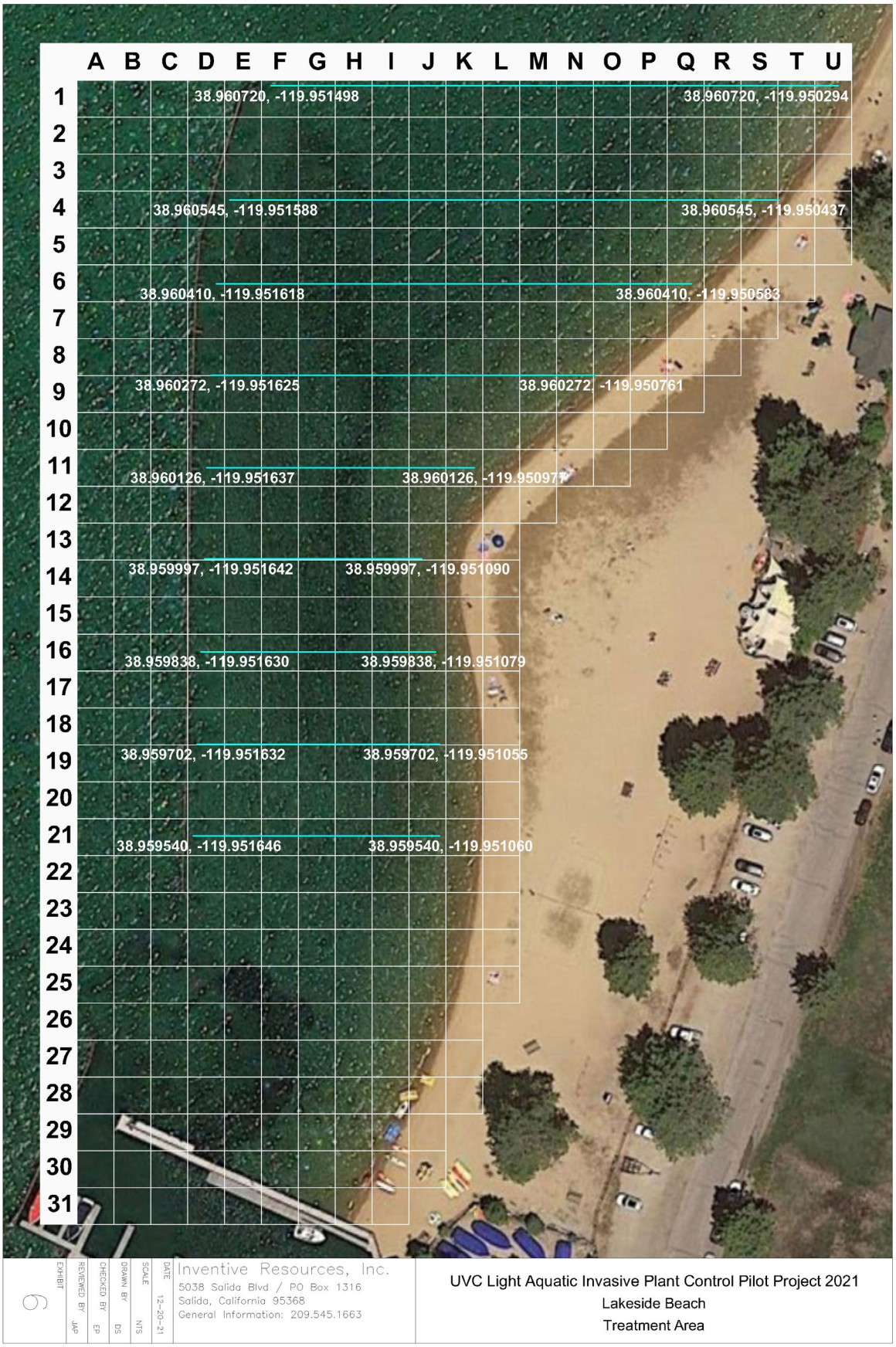

Figure 7 Lakeside Beach Treatment Area Grid and Monitoring Transects

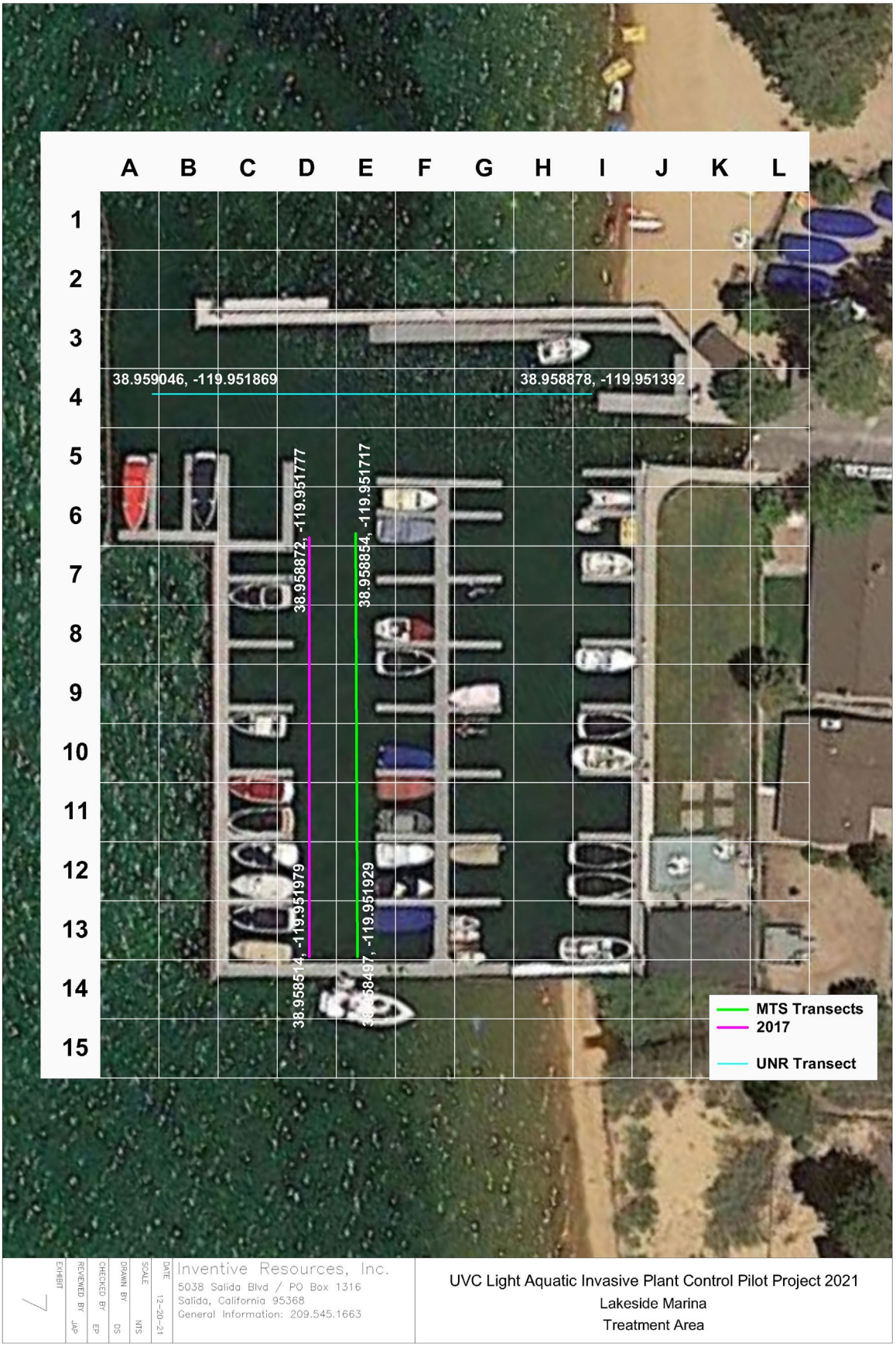

Figure 8 Lakeside Marina Treatment Area Grid and Monitoring Transect

2.1.6 TKPOA Research Area, 2019-2020

Two (2) treatment transects were established in the TKPOA Research Area (2019-2020), the GPS coordinates of which are identified in **Table 4**. The grid identifiers listed in the table describe the matrix illustrated in **Figure 9**. The UV-C light testing times applied within the TKPOA Research Area ranged from 2 to 10 minutes, as illustrated in **Figure 10**.

Table 4 GPS Coordinates for TKPOA Research Area

Location	GPS Coordinates	Grids
Transect 1	38.929180, -120.014940 to 38.928206, -120.014967	G14 to G31
Transect 2	38.929205, -120.014550 to 38.928888, -120.014645	L13 to K19

Source: IRI 2019

At the TKPOA Research area, UV-C testing time durations ranged from 15-20 minutes in 2019 and 10-15 minutes in 2020.

2.1.7 TKPOA Research Area, 2021

Figure 11 depicts the testing areas and sampling locations of the 2021 TKPOA Research Area. The TKPOA Harvest Reference Site had plants removed by a mechanical boat harvester while two sites were used for the UV-C treatment testing (UV Site 1 and UV Site 2). Orange and green shaded colors represent UV-C testing areas. Red dots on the map are locations of plant collections by divers collected from individual 25 cm by 25 cm quadrats. Thirteen (13) quadrats were collected in the middle of each location (deep sampling locations) and thirteen (13) near the docks on each side (shallow sampling locations).

The UV-C testing occurred in two events: one spanning the month of July and the second spanning late September to early October 2021 (**Table 5**). For treatment, the light array of UV-C lamps was lowered into the stand of plants and remained in place for 5 to 10 minutes. As noted in Section 2.1.3.2, testing duration was adjusted down in 2021 to meet the commitment of testing as much of the larger 2021 TKPOA Research Area as possible. The commitment was impacted by work days lost due to a late season start and the Caldor Fire evacuation period. Additionally, low water levels presented during the 2021 season prohibited access to the complex habitats associated with the rock crib, riprap, and piers of the 2021 TKPOA Research Area.

The TKPOA Harvest Reference Site was treated with mechanical harvesters eight (8) times during the July to November 2021 monitoring period. TKPOA operates several harvesters and skimming equipment throughout the summer. Two (2) harvesters continuously operate in the West Lagoon, and one moves from Lake Tallac to the East Lagoon. The skimming equipment, OmniCat, follows behind the harvesters to collect fragments, but only through navigation lanes as it is fairly large in size and cannot collect fragments between docks. Depending on the area being harvested they will use the Harvester 3 to harvest biomass between docks, Harvester 4 to harvest navigation lanes, and Harvester 5 for Lake Tallac and the East Lagoon. Plants were mechanically cut at a depth of four (4) feet below the surface and biomass was removed, although fragments can persist. All three sites were harvested in early July, prior to commencement of the UV-C testing, but after the initial pre-treatment sampling had been completed. No other harvesting was reported to occur in the sites UV-1 and UV-2 after UV-C treatment was initiated, but the potential effects of harvesting are considered in the 2021 results reported.

Figure 9 TKPOA Research Area, 2019-2020, and Monitoring Transects

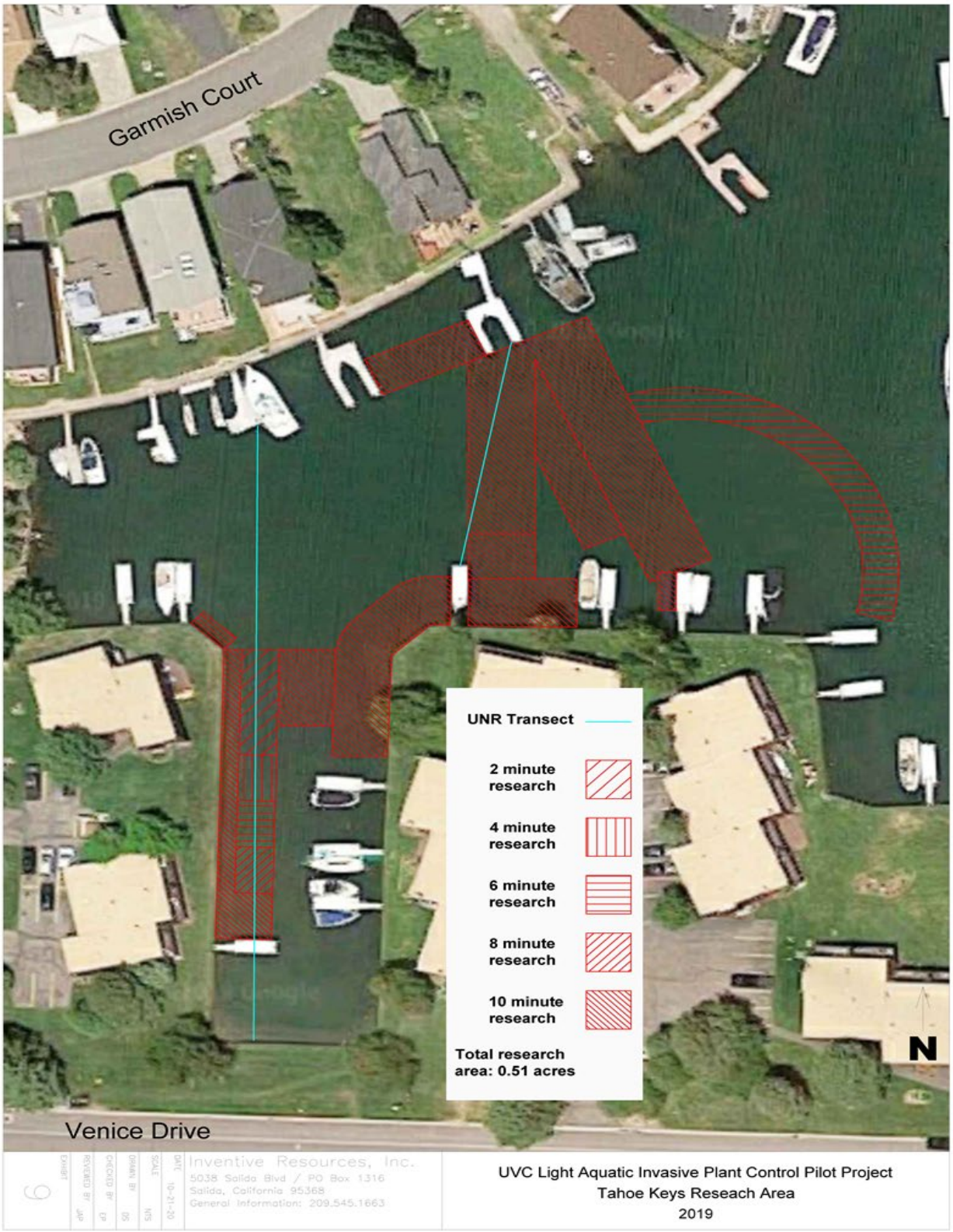

Figure 10 TKPOA Research Area UV-C Light Testing Map, 2019-2020

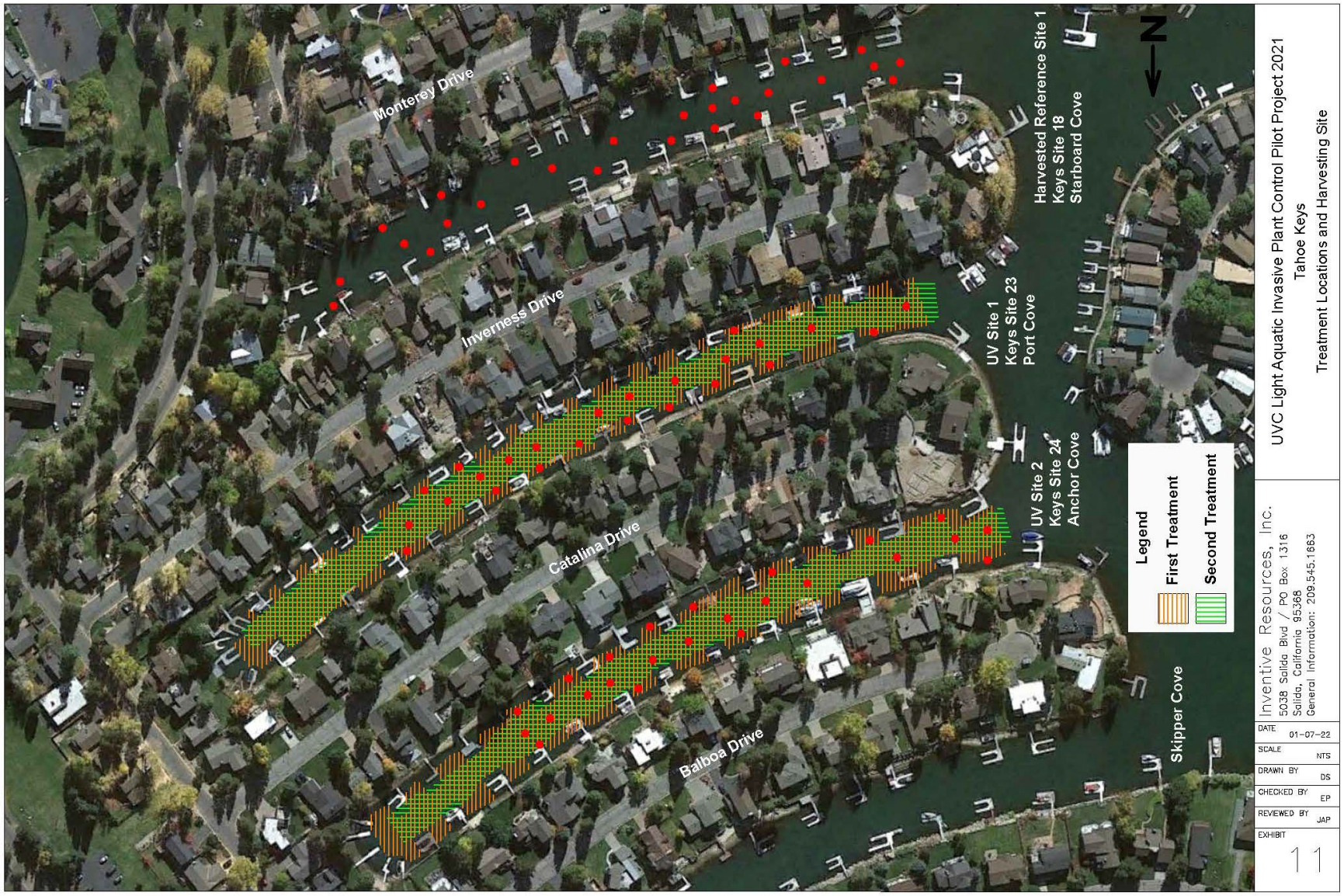

Figure 11 TKPOA Research Area, 2021, and Monitoring Locations

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2.2 Implementation Regime

Table 5 presents the 2019-2021 treatment periods and monitoring dates at Lakeside Beach & Marina and the 2019-2021 testing periods and monitoring dates at the two distinct TKPOA Research Areas. Additional details on monitoring implementation by sampling type are presented previously in **Table 1**.

Table 5 Pre-Treatment Survey, UV-C Light Treatment and Post-Treatment UV-C Light Treatment and Sampling Dates, 2019-2021

Location	TKPOA Research Area	Lakeside Beach	Lakeside Marina
2019			
Pre-treatment sampling dates	September 4, 2019		
First UV-C light treatment dates	September 19-28, 2019	September 9-18, 2019*	October 1-10, 2019
Post-treatment sampling dates	October 14, 2019	October 8-10, 2019*	October 8, 2019 November 18, 2019
Second UV-C light treatment dates	November 10-19, 2019	October 12-21, 2019	November 21, 2019 (Taxi Area only)
Post-treatment sampling dates	November 22, 2019	November 18, 2019 December 16, 2019	December 16, 2019
2020			
Pre-treatment sampling dates	April 10, 2020 May 28, 2020 June 22, 2020	April 10, 2020 May 14, 2020 June 19, 2020 July 14, 2020	April 10, 2020 May 14, 2020 June 19, 2020
First UV-C light treatment dates	June 29-July 14, 2020	July 27-29, 2020 August 4-10, 2020	June 20-26, 2020 July 16-24, 2020 July 30-31, 2020 August 11-21, 2020
Post-treatment sampling dates	July 27, 2020 August 24, 2020 September 22, 2020	August 27, 2020	July 14, 2020 August 4, 2020 October 6, 2020
Second UV-C light treatment dates	September 4-October 2, 2020	October 15-24, 2020 October 28-November 10, 2020	October 6-14, 2020 October 27, 2020
Post-treatment sampling dates	October 13, 2020 December 4, 2020	October 6, 2020 November 19, 2020	November 19, 2020
2021			
Pre-treatment sampling dates	May 4, 2021 June 30, 2021	April 30-May 7, 2021 June 16-18, 2021	April 30-May 7, 2021 June 16-18, 2021
First UV-C light treatment dates	July 7-August 3, 2021 (Coves)	June 16-21, 2021 June 25-28, 2021 June 29 - July 1, 2021	June 21-25, 2021 June 28-29, 2021
Post-treatment sampling dates	September 22-24, 2021 October 18-20, 2021	July 7, 2020 July 9, 2020	July 7, 2020 July 9, 2020
Second UV-C light treatment dates**	September 23-October 8, 2021	August 23-26, 2021	August 16-20, 2021 August 27, 2021

Location	TKPOA Research Area	Lakeside Beach	Lakeside Marina
Post-treatment sampling dates	November 15-17, 2021	September 24, 2021 November 18, 2021	September 24, 2021 November 18, 2021

Source: UNR and IRI 2021 (Table 1 and Appendix A.5)

*Note the first Lakeside Beach UV-C treatment did not include areas that were sampled in October 2019. The October 2019 Lakeside Beach sampling can be considered pre-treatment.

** Caldor Fire Evacuation suspended treatment from August 28 to September 12, 2021.

2.3 Aquatic Plant Monitoring and Assessment

Effectiveness monitoring of Pilot Project sites occurred pre-treatment/testing and post-treatment/testing, and also on a bi-weekly to monthly basis to gauge plant health and response to UV-C light treatment. Effectiveness monitoring was conducted by UNR staff and includes the following components measured at the frequency detailed in **Table 6**:

- Infestation density and composition
- Plant tissue chlorophyll-*a*
- Plant tissue nitrogen
- Plant tissue carbon
- Turion mortality.

Benthic Macroinvertebrate (BMI) samples were also collected in 2019 prior to UV-C light treatment and in 2020 post-treatment.

Table 6 Effectiveness Monitoring Parameters and Regime

Parameter	Pre-Treatment Monitoring	Post-Treatment Monitoring
Chlorophyll-*a*	Not greater than 10-days prior to Active-treatment	Between 5 and 10-days Post-treatment and thereafter
Nitrogen	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Carbon	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Conductivity	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Plant Density/Height	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Plant Composition	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Water Quality Corollary-Dissolved Organic Carbon	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Turion Count	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Turion Survival	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Benthic Macroinvertebrates	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and 1-year post-treatment

Source: UNR 2019

2.3.1 Plant Density, Height and Composition

2.3.1.1 Lakeside Beach & Marina Treatment Areas

Divers divided the Lakeside Beach section into nine (9) transects (**Figure 7**) and Lakeside Marina was surveyed along one transect (**Figure 8**). Within each transect, five (5) quarter-meter quadrats were evenly spaced along the transect line. The percent cover of plant taxa present within each quadrat was visually estimated, a representative plant height was measured for each taxa, and a specimen of each taxa was collected for chlorophyll-*a*, carbon, and nitrogen analyses. Plant heights were measured from sediment surface to top of plant. Composition was determined by divers randomly placing a 25 cm x 25 cm quadrat along a visual transect. Species present were identified and percent composition of species was visually estimated.

2.3.1.2 TKPOA Research Area, 2019-2020

To investigate the UV-light treatment vessel efficacy at the 2019-2020 TKPOA Research Area, the testing area was divided into three sections (**Figure 9**): a treated site, an untreated site, and a site that has been sampled in previous years by UNR, which will serve for a longer period of assessment.

In these areas, rake pulls were conducted from a boat along the transect line. The percent composition of taxa was estimated using the plant material collected in the rake. Plant heights were measured from sediment surface to top of plant, and a plant sample from each species was collected for chlorophyll a, carbon, and nitrogen analyses. The TKPOA Research Area results reflect the average of the three (3) rake pulls conducted in each of the three (3) sections indicated.

2.3.1.3 TKPOA Research Area, 2021

Starting in July 2021, three (3) areas of the 2021 TKPOA Research Area were tested (one Harvesting Site serving a positive control and two exposed to UV-C light, sites UV-1 and UV-2, as shown in **Figure 11**. Treatment dates are listed in **Table 5**. Pre-treatment collection occurred at all sites on June 30 to July 2, 2021. Not within the control of the Pilot Project, sites UV-1 and UV-2 had mechanical harvest prior to UV-C exposure on July 6 and 5, 2021, respectively.

The sites were sampled over a five (5) month period, including pre-treatment sample collection (late June/ early July 2021) and post-treatment collection at monthly intervals (September to November 2021). An August 2021 sample was scheduled, but was canceled due to the hazardous air conditions and evacuations related to the Caldor Fire. SCUBA divers from Marine Taxonomic Services (MTS) collected samples using 25 x 25 cm quadrats. Each site was divided into shallow (i.e., along the sides of the cove near the docks) and deep sections (i.e., down the middle of the cove) and 13 quadrats were collected in each section, for a total of 26 samples in each cove. In each quadrat the water depth was measured, percent cover of each taxa present was estimated, a representative plant was measured for height in centimeters (cm). Plants were cut directly above the sediment and the plant biomass collected. The biomass samples were initially air dried and then dried in a drying even and weighed. Analysis of variance (ANOVA) were performed to determine differences between treatment locations. Tukey-Kramer post-hoc tests were performed to determine which sites were significantly different from one another.

2.3.2 *Plant Tissue Chlorophyll-*a

Chlorophyll-*a* (chl-*a*) was measured in whole plant tissue using a modified method based upon Su et al. 2010. Frozen plant samples were divided into two subsamples. One subsample was added to methanol and magnesium carbonate and then ground using a tissue grinder and allowed to extract in the dark overnight. The samples were then analyzed fluorometrically using a Turner 10AU fluorometer. The other subsample was dried to determine the fresh weight/dry weight ratio and saved for carbon and nitrogen analysis. Results are reported as milligrams (mg) chl-*a* per gram dry weight (mg chl-*a*/g).

2.3.3 Plant Tissue Nitrogen

Dried plant samples were ground using a mortar and pestle and then analyzed using a Costech ECS 4010 CN analyzer. Results are reported as percent Nitrogen per gram dry weight (%N/g).

2.3.4 Plant Tissue Carbon

Dried plant samples were ground using a mortar and pestle and then analyzed using a Costech ECS 4010 CN analyzer. Results are reported as percent Carbon per gram dry weight (%C/g).

2.3.5 Turion Counts, Survival and Mortality

Turion results are qualitative and primarily based on visual observations of mature turions during sampling, Throughout the sampling regime, turions were visibly assessed in each quadrant, and when present and still attached to the plant, were counted on all Curly-leaf pondweed (*Potamogeton crispus*) samples collected, regardless of maturity status.

At Lakeside Marina, shed turions were difficult to observe due to embeddedness of the turion body within organic materials and obscured by the initial plant coverage encountered. There were no turions observed on the sediment surface at the Lakeside Beach treatment area; shed turions could have easily been buried due to wave action and sand movement and would then be out of view.

Due to water turbidity, plant growth and a dense organic sediment, mature turions that had been shed were not able to be seen in sediment in the 2019-2020 TKPOA Research Area and 2021 TKPOA Research Area.

2.3.6 Benthic Macroinvertebrates

In 2019 at Lakeside Beach, using a 152-mm by 152-mm (i.e., 6-inch by 6-inch or 0.023-m^2 surface area) Petite Ponar, benthic sediments representative samples were collected once pre-treatment and then again within two weeks post-treatment to quantify potential change in abundance of the benthic macroinvertebrate (BMI) community; these samples were analyzed in 2020. Samples were collected from the lakebed and fixed with ethanol, then sorted for BMI and classified to Order using published aquatic macroinvertebrate keys. The BMI count was standardized to number of organisms per m^2 for each sample.

In 2019, BMI were not collected from Lakeside Marina to avoid damage to the benthic barrier mats placed for a previous plant control project. However, the mats were not removed at the end of 2019 and BMI collections were rescheduled prior to the first UV-C light treatment of 2020. The same sampling scheme was employed at Lakeside Marina, but was done along a single transect.

BMI were collected pre-testing in 2019 and post-testing in 2020 at the TKPOA Reference Site, TKPOA Research Test Site, and UNR Established Site using a Petite Ponar to collect a representative benthic sample from a 0.023 m^2 surface area. Samples were collected from the lakebed and fixed with ethanol, then sorted for invertebrates and classified to Order. The BMI count was standardized to number of organisms per m^2 for each sample. Samples were collected 5 to10 days before exposure to UV-C, then 5 to 10 days post-exposure, one month post-testing, and one year post-testing. Unfortunately, the TKPOA Reference Site was not able to be sampled due to the amount of aquatic plant growth in that area. The TKPOA Research Test Site was the only site able to be accessed in December 2020, as the other two sites were covered with ice. The TKPOA Research Test Site substrate is mostly organic matter and decomposing plants. The UNR Established Site was also tested with UV-C light. That area is slightly shallower than the other two sites and has a much sandier substrate.

2.4 Water Quality

As presented in **Table 7**, water quality monitoring of site conditions at Lakeside Beach & Marina treatment areas and the TKPOA Research Areas measured temperature, turbidity, pH, dissolved oxygen (DO) and specific conductivity during pre-treatment, active treatment and post-treatment periods.

Table 7 Water Quality Monitoring Parameters and Sampling Regime

Parameter	Basin Plan Water Quality Objective[1]	Pre-Treatment/Pre-Investigation	During Treatment/Active Treatment	Post-Treatment	Frequency
Temperature (°C)	The natural receiving water temperature of all waters shall not be altered unless it can be	No greater than 10 days prior	During each round of active treatment at each site	Between 5 and 10-	Continuously during active treatment

Parameter	Basin Plan Water Quality Objective[1]	Pre-Treatment/Pre-Investigation	During Treatment/Active Treatment	Post-Treatment	Frequency
	demonstrated to the satisfaction of the Regional Board that such an alteration in temperature does not adversely affect the water for beneficial uses. For waters designated COLD, the temperature shall not be altered			days post-treatment	Once during stated time frame for pre- and post-treatment
Turbidity (NTU)	Waters shall be free of changes in turbidity that cause nuisance or adversely affect the water for beneficial uses. Increases in turbidity shall not exceed natural levels by more than 10 percent	No greater than 10 days prior	During each round of active treatment at each site	Between 5 and 10-days post-treatment	1 per active treatment
pH	In Lake Tahoe, the pH shall not be depressed below 7.0 nor raised above 8.4	No greater than 10 days prior	During each round of active treatment at each site	Between 5 and 10-days post-treatment	1 per active treatment
Dissolved Oxygen (mg/L)	Shall not be depressed by more than 10 percent, nor shall the minimum dissolved oxygen concentration be less than 80 percent of saturation	No greater than 10 days prior	During each round of active treatment at each site	Between 5 and 10-days post-treatment	1 per active treatment
Conductivity (*m*S/cm)	In Lake Tahoe, the mean annual electrical conductivity shall not exceed 95 umhos/cm at 25°C at any location in the Lake	No greater than 10 days prior	During each round of active treatment at each site	Between 5 and 10-days post-treatment	1 per active treatment

Source: UNR 2019; 2016 Water Quality Control Plan for the Lahontan Region

Notes:

[1] 2016 Basin Plan WQO narratives for Lake Tahoe/Cold Freshwater Habitat

2.4.1 Water Quality Constituents

2.4.1.1 Temperature

The natural receiving water temperature of all waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such an alteration in temperature does not adversely affect the water for beneficial uses. For waters designated COLD, the temperature shall not be altered. Temperature data was field collected pre-treatment, throughout active treatment at approximately 3-hour intervals, and post-treatment frequency.

2.4.1.2 Turbidity

Waters shall be free of changes in turbidity that cause nuisance or adversely affect the water for beneficial uses. Increases in turbidity shall not exceed natural levels by more than 10 percent. Turbidity data was field collected pre-treatment, throughout active treatment at approximately 3-hour intervals, and post-treatment frequency.

2.4.1.3 pH

In fresh waters with designated beneficial uses of COLD, changes in normal ambient pH levels shall not exceed 0.5 pH units. For all other waters, the pH shall not be depressed below 6.5 nor raised above 8.5. pH data was field collected pre-treatment, throughout active treatment at approximately 3-hour intervals, and post-treatment frequency.

2.4.1.4 Dissolved Oxygen

The dissolved oxygen (DO) concentration, as percent saturation, shall not be depressed by more than 10 percent, nor shall the minimum dissolved oxygen concentration be less than 80 percent of saturation. DO data was field collected pre-treatment, throughout active treatment at approximately 3-hour intervals, and post-treatment frequency.

2.4.1.5 Conductivity

In Lake Tahoe, the mean annual electrical conductivity shall not exceed 95 umhos/cm at 25°C at any location in the Lake. Electrical Conductivity data was field collected pre-treatment, throughout active treatment at approximately 3-hour intervals, and post-treatment frequency.

2.4.2 Monitoring Equipment

Water quality monitoring equipment included the following:

- YSI 556 Multi-parameter Meter
- WizTech TDS pH and Temp Multi-meter
- LaMotte Turbidimeter
- Milwaukee MW802 ph/EC/TDS 3 in 1 Meter
- Milwaukee MW600 DO Meter
- RCYAGO WQ Multi-parameter Meter.

Monitoring forms include:

- Daily Treatment and Testing Logs
- Equipment Calibration Logs
- Equipment Cleaning and Maintenance Logs
- National Oceanic and Atmospheric Administration (NOAA) Weather
- Lake Tahoe Lake Level Daily Reports.

Daily treatment logs collected for the Lakeside Beach & Marina treatment areas and daily testing logs collected for the TKPOA Research Area are included in **Appendix A.1**. Proper calibration of monitoring equipment and devices occurred. Meters were cleaned as needed and batteries were checked daily. Calibration logs are included in **Appendix A.2** and equipment cleaning and maintenance logs are provided in **Appendix A.3**.

Weather information posted on the National Oceanic and Atmospheric Administration (NOAA) database (https://www.nws.noaa.gov/) was collected daily for weather forecast and Lake Tahoe water level information (http://tahoe.uslakes.info/Level.asp) and is provided in **Appendix A.4**.

3 Results and Observations

3.1 Environmental Variables

This section discusses the uncontrolled environmental variables that were encountered and had to be accommodated during UV-C light treatment and testing each year of the Pilot Project. Field conditions include many environmental variables that affect treatment performance that differ from controlled laboratory testing. Environmental factors such as plant shading could be rectified by increased exposure durations and multiple treatment visits.

3.1.1 2019 Treatment Period

In 2019, UV-C light treatment was conducted over a period of July to November, 2019, at the frequency and duration presented in **Table 1** and **Table 5.** Technical challenges and environmental conditions encountered included the following:

- Late Start: The Pilot Project start date was delayed several months and prevented conducting initial UV-C light treatment in early May, when the plants were much shorter and less dense and more susceptible to UV-C damage. The delay in the start date allowed for an additional growing period to occur after a full year in 2018 without AIP control method implemented. The exception is the portion of the Lakeside Maria with benthic barriers installed in 2018.
- Benthic Barriers: Barrier mats installed in 2018 were not removed in 2019, which may have impacted the BMI sample regime. Additionally, at the late start date in 2019, there were observations of plants establishing in the sediments that had accumulated over the mats. UV-C light treatment was applied to this area to control new plant growth and reduce risk of recolonization of other parts of the marina.
- The tall, dense vegetation found in the treatment areas contributed to plant shadowing and as a result not all plants inside the chamber received an even dose of UV-C light treatment.

3.1.2 2020 Treatment Period

In 2020, UV-C light treatment was conducted over a period of June to November, 2020, at the frequency and duration detailed in **Table 1** and **Table 5**. Technical challenges and environmental conditions encountered included the following:

- Wildfires: There was significant smoke cover in the Lake Tahoe Basin for over a one month period in the late summer of 2020. In recognition of the likely effect on plant growth, this period of reduced light levels may have contributed to senescence of plants 2 to 6 weeks early and benefited the UV-C light treatment efficacy results reported for 2020.
- Lake Level: Lower lake levels presented in 2020 were observed to increase the extent of prop wash from boats at Lakeside Marina. Lower lake levels at Lakeside Beach increased ease of public access to plant communities and potentially contributed to creation of plant fragments and plant trampling in this treatment area.
- Benthic Barriers: Benthic barriers were not able to be removed in DATE 2020 and although plants observed growing in sediments that had accumulated over the mats were treated in 2019 by June 2020 new plant growth was observed again with plant heights measuring up to 2 meters. New growth was treated in 2020, which resulted in a 75 percent reduction in plant cover measured in 2021 (100% plant cover in June 2020 compared to 25% plant cover in June 2021). Average plant height was also reduced by 75% (60 cm average plant height in June 2020 compared to 15 cm in June 2021). Additionally, the earlier start date in 2020 allowed for more unshed turions to be treated, precluding new mature turions from being shed into the seed bank.
- Tall, dense vegetation contributing to plant shadowing was reduced to small pockets.

3.1.3 2021 Treatment Period

In 2021, UV-C light treatment was conducted over a period of June to October, 2021, at the frequency and duration detailed in **Table 1** and **Table 5**. Technical challenges and environmental conditions encountered included the following:

- Late Start: Procuring the many special components for the 2021 UV-C light treatment vessel and light array involved design, ordering and unanticipated delays in deliveries, then installing the components, run-in testing and calibrating the apparatus for use. The Pilot Project start date was delayed several months and this prevented us from conducting the early May UV-C light treatment, when the plants were much shorter and less dense and more susceptible to UV-C damage.
- Wildfires: Operations ceased between August 28 and September 13, 2021 due to extensive smoke cover that presented unsafe field conditions for technicians and ultimately the mandatory Caldor Fire evacuation of South Lake Tahoe.
- Ash: Airborne ash and soot from active wildfires increased the turbidity of the water and that may reduce the effectiveness of the UVC lamps.
- Low Water Levels: Drought conditions contributed to very low lake levels and warmer water temperatures of the treatment areas. Low lake levels hindered treatment operations and some portions of the treatment areas were too shallow to treat with the current UV-C treatment tools. Redesign of the UV-C light treatment tools are being considered for effective applications in shallow waters.
- Muck and Minerals: In several areas, the build-up of decaying vegetation and muck in the 2021 TKPOA Research Area created problems to the treatment array. A reddish mineral coating covered the protective quartz sleeves that enclose the UV-C lamps, which substantially reduced the treatment effectiveness of the lamps in the lethal “C” range that damages the plants. This was a new development and was not discovered until after a large portion of the TKPOA Research Area had been treated. The areas treated with mineral coated sleeves received a fraction of the lethal dose of UV-C light rays planned and little damage was done to those plants. Once the problem was found the 2021 UV-C light treatment vessel was removed and the light array replaced or cleaned and 400 quartz sleeves were installed over the lamps. Additionally, moving forward in 2021, the lamps in the light array were placed more conservatively and at a greater distance from the muck surface. This action greatly reduced the fouling of the lamps, and the frequency of the light array inspections and cleaning was increased. In response to conditions presented in 2021, a complete set of replacement quartz sleeves is being maintained so that down time of the treatment vessel for maintenance of the light array is minimized.
- TKPOA 2021 Harvesting: The TKPOA Research Area 2021 Reference site was mechanically harvested eight (8) times with no communications to our Pilot Project team.

3.2 Aquatic Plant Monitoring and Assessment

Appendix C presents field data collected for assessment of aquatic plants. Photo compilations illustrating each treatment area over the assessment periods are presented in support of field results. **Appendix A.7** contains additional photo and video documentation in support of the following results has been provided electronically to TRPA in accordance with contract specifications, and is available upon request.

3.2.1 Plant Density, Height and Composition

Sampling was conducted according to the regime detailed in **Table 1** and on dates presented in **Table 5**. Refer to Section 2.3 for sampling methodologies.

3.2.1.1 Lakeside Beach Treatment Area

Lakeside Beach, an open water site with a series of metal breakwaters aligned with the beach, is characterized by sandy sediment and low growing native species including Najas sp., Isoetes sp., and Characeae algae. This area has also been invaded by Curly-leaf pondweed (*Potamogeton crispus*) and Eurasian watermilfoil (*Myriophyllum spicatum*); however, the population thus far remains sporadic. There

is a distinct dense population of Eurasian watermilfoil in the shallows following the shoreline. Filamentous algae coverage was not considered in the percent composition calculations, but divers have noticed an increase in the coverage of filamentous algae in the Lakeside Beach treatment area, with the summer of 2021 being notably dense. This may have been compounded by lower lake levels in treatment years 2020 and 2021. Lakeside Beach has the greatest percentage of bare (open sand) of the Pilot Project test areas.

3.2.1.1.1 Plant Composition and Percent Coverage

Seasonal variation is seen in each species population, as is expected, and a decline is seen in all species in late fall through early spring. Initial plant coverage in October 2019 measured 62%. Between June 2020 and July 2020 there was a 40% increase in plant coverage. Following initial July 2020 UV-C light treatment, plant coverage decreased by 46%. The second 2020 treatment yielded another 9% decrease in plant coverage.

The initial June 2021 treatment did not produce any appreciable plant cover reduction. The percentage of bare sand was relatively the same pre- and post-treatment, but it should be noted the plant cover measured in July 2021 was half of the coverage measure in July 2020. The 2021 treatment may have restricted further growth, as there was no jump in plant coverage between June and July, as was seen during this same period in 2020. Due to the Caldor Fire in 2021, the second treatment and related monitoring was delayed. Once able to be conducted, the second treatment reduced plant coverage by almost 20%.

Comparing year to year post-treatment (i.e., two annual treatment cycles), a difference is seen in the plant composition during the peak growing season. The population of invasive species of concern (Eurasian watermilfoil and Curly-leaf pondweed) did not increase during the monitoring period. UV-C light exposure may be beneficial to reducing the spread of Curly-leaf pondweed and any other turion or bud producing species by keeping the adult plant size limited, and thus restricting the development of turions. No mature Curly-leaf pondweed plants with attached developing turions were observed in the beach area during the monitoring period. No free detached mature turions were observed on the surface of the sand but sprouted Curly-leaf pondweed turions and small plants were observed throughout the year. It is unknown if sprouted turions were from the seed bank or washed in from other locations and then sprouted. Conversely, UV-C treatments may not be as effective in controlling Eurasian watermilfoil and other vegetative reproducing species; more frequent or longer duration UV-C treatments or a combination of AIP control methods might be required to control this aggressive species.

The water column height is also a significant factor in determining treatment parameters. The ring of Eurasian watermilfoil along the beach remained throughout the treatment period and has anecdotally been observed by Marine Taxonomic Service (MTS) divers preceding this Pilot Project. The water level in that area of Lakeside Beach may be too shallow to allow for UV-C light treatment vessel access. This section of beach may also benefit from a combined control method effort. In assessing the treatment data from Lakeside Beach, a negative impact to the native plant community is not expressed. There is a greater decrease in percent plant coverage after the second UV-C treatment when treatments are separated by one month and less so when treatments are spaced farther apart. Treatments earlier in the year may inhibit initial plant community growth, and treatments should be scheduled to target the species of concern (e.g., treating in late spring to target Curly-leaf pondweed prior to turion development and potential shedding).

Plant density observed and recorded at the Lakeside Beach treatment area is expressed as percent plant cover composition by species in **Figure 12.** Data shown is an average of 45 quadrats: 9 set transects with 5 quadrats each. Yellow bars are UV-C light exposures. **Table 8** details the reduction in percent cover achieved at Lakeside Beach treatment area between October 2019 and November 2021. A total of approximately 126 hours of UV-C light treatment was applied to increase bare lakebed by 43.4%, reduce Eurasian watermilfoil by 4.5%, and maintain Curly-leaf pondweed at less than 1%. Noting that Algae increased following the first UV-C light treatments in 2020 and 2021, percent plant cover at the end of each treatment year measured less than the pre-treatment Algae cover of 28.1% reported for October 2019. **Table 9** presents the common aquatic vegetation observed by monitors at Lakeside Beach during monitoring, from October 2019 to November 2021; months during which monitoring and sampling were not conducted are not presented in this table.

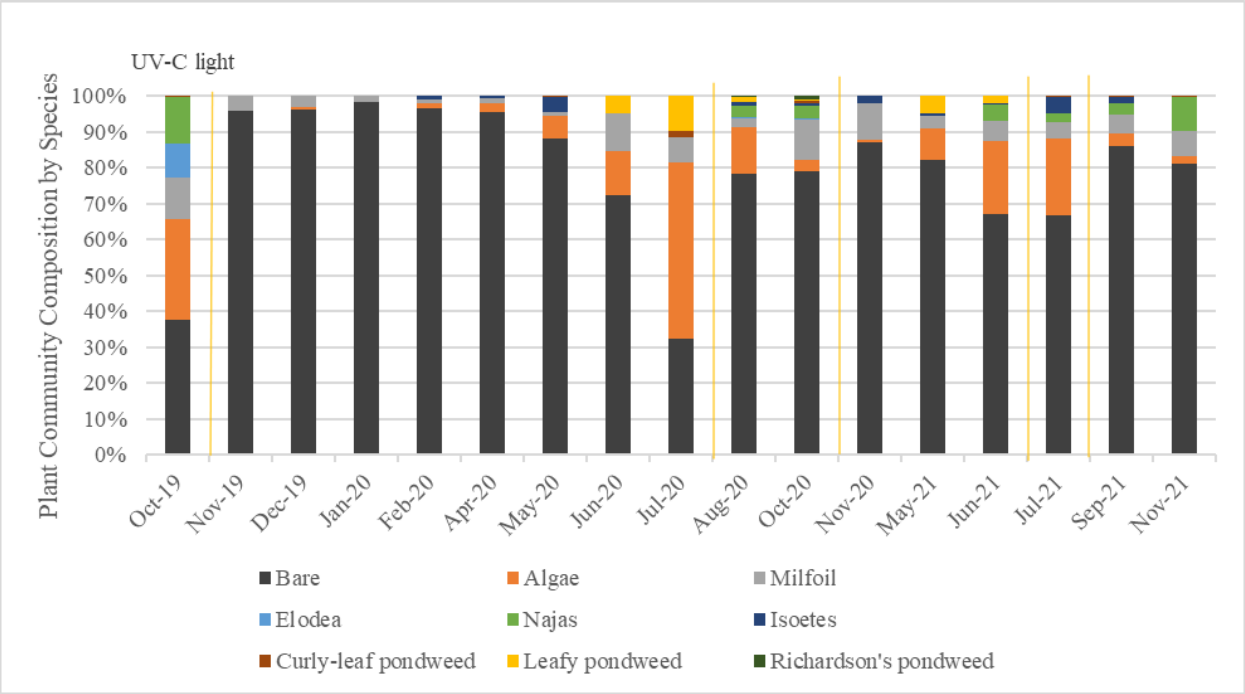


Figure 12 **Percent Composition by Species at Lakeside Beach, 2019-2021. Data shown is an average of 45 quadrats: 9 set transects with 5 quadrats each. Yellow bars are UV-C light exposures.**

Table 8 **Percent Composition by Species Observed at Lakeside Beach, 2019-2021**

	Bare	Algae	Eurasian watermilfoil	Elodea	Najas	Isoetes	Curly-leaf pondweed	Leafy pondweed	Richardson's pondweed
19-Oct	37.7	28.1	11.6	9.3	13	0	0.3	0	0
19-Nov	96	0	4	0	0	0	0	0	0
19-Dec	96.2	0.8	3	0	0	0	0	0	0
20-Jan	97.8	0.1	1.6	0	0	0	0	0	0
20-Feb	96.7	1.4	0.9	0.1	0	1	0	0	0
20-Apr	95.5	2.6	1.2	0	0	0.7	0	0	0
20-May	88.2	6.2	1.1	0	0	4.2	0.3	0	0
20-Jun	72.5	12.1	10.5	0	0	0	0	4.9	0
20-Jul	32.3	49.3	6.8	0	0	0	1.7	9.9	0
20-Aug	78.3	13	2.3	0.5	3.2	0.8	0	1.6	0.2
20-Oct	79.1	3.1	11.2	0.4	3.6	0.7	0.5	0.5	0.9
20-Nov	87.2	0.5	10.2	0.1	0	2.1	0	0	0
21-May	82.1	8.8	3.6	0	0	0.6	0.1	4.8	0
21-Jun	67.2	20.4	5.6	0	4.3	0.6	0	2	0
21-Jul	66.6	21.4	4.8	0	2.4	4.6	0.2	0	0
21-Sep	86.2	3.4	5.3	0	3.3	1.5	0.3	0	0.1
21-Nov	81.1	2.2	7.1	0	9.4	0	0.3	0	0

Source: Appendix C

Table 9 Common Aquatic Vegetation Observed at Lakeside Beach, 2019-2021

Plant	Oct 19	Nov 19	Dec 19	Jan 20	Feb 20	Mar 20	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Nov 20	May 21	Jun 21	Jul 21	Sep 21	Nov 21
Canadian Waterweed (*Elodea canadensis*)	■	■						■			■	■	■	■					
Characeae algae (*Chara spp. & Nitella spp.)*				■	■		■	■	■	■	■		■	■	■	■	■	■	■
Coontail (*Ceratophylum demersum)*																			
Curly-leaf pondweed (*Potamogen crispus*)	■							■		■	■		■		■			■	■
Isoetes spp.		■		■	■			■	■		■		■	■	■		■	■	
Leafy Pondweed (*Potamogeton foliosus*)						■			■	■	■		■		■	■			
Eurasian watermilfoil *(Myriophyllum spicatum)*	■	■	■	■	■		■	■	■	■	■		■	■	■	■	■	■	■
Naiad (*Najas spp.*)	■										■		■			■	■	■	■
Richardson's Pondweed (*Potamogeton richardsonii*)								■			■		■			■		■	
Utricularia (*Utricularia spp.)*								■											

Source: Appendix A.5

3.2.1.1.2 Plant Height

Plant heights measured for the Lakeside Beach treatment area were highly variable over the monitoring period, mostly driven by the dense stand of Eurasian watermilfoil (Myriophyllum spicatum) ringing the shoreline. However, even when including Eurasian watermilfoil heights, average plant height remained was well below the water surface. Comparing pre- and post-treatment plant heights, there was a trend towards decreased plant height from July to August 2020; however, plant growth had recovered by October 2020. This trend is not evident in the 2021 data; rather the plants are shorter overall compared to 2020 plant heights.

UV-C treatment may have restricted the growth of all plants so that they remained stunted throughout the growth cycle. The water level in 2021 was 1 to 2 meters lower than 2020 water levels, which may have compounded the reduced plant height measurements. Eurasian watermilfoil plant heights continued to grow despite the UV-C treatments, which may dictate enhanced testing to determine treatment parameters better suited for controlling Eurasian watermilfoil. The low growing manner of the plants at Lakeside Beach may express the limit of the UV-C light array depths. Greater than 92% of all plants measured have heights of 20 cm or less and 78% were 10 cm or less for 2021 post-treatment conditions. Because of the shallow, clear water at the shoreline, completely eradicating plants may prove difficult, and due to the open water environment and the site location within the littoral drift currents of the shoreline, there is a higher risk of recolonization.

Figure 13 illustrates plant heights measured at Lakeside Beach between October 2019 and November 2021. Data shown is the average of individual height measurements in centimeters (cm) collected during sampling period indicated, error bars are standard deviation, and yellow lines depict the timing of UV-C light treatment. This data accounts for plant height only, not plant abundance or biomass.

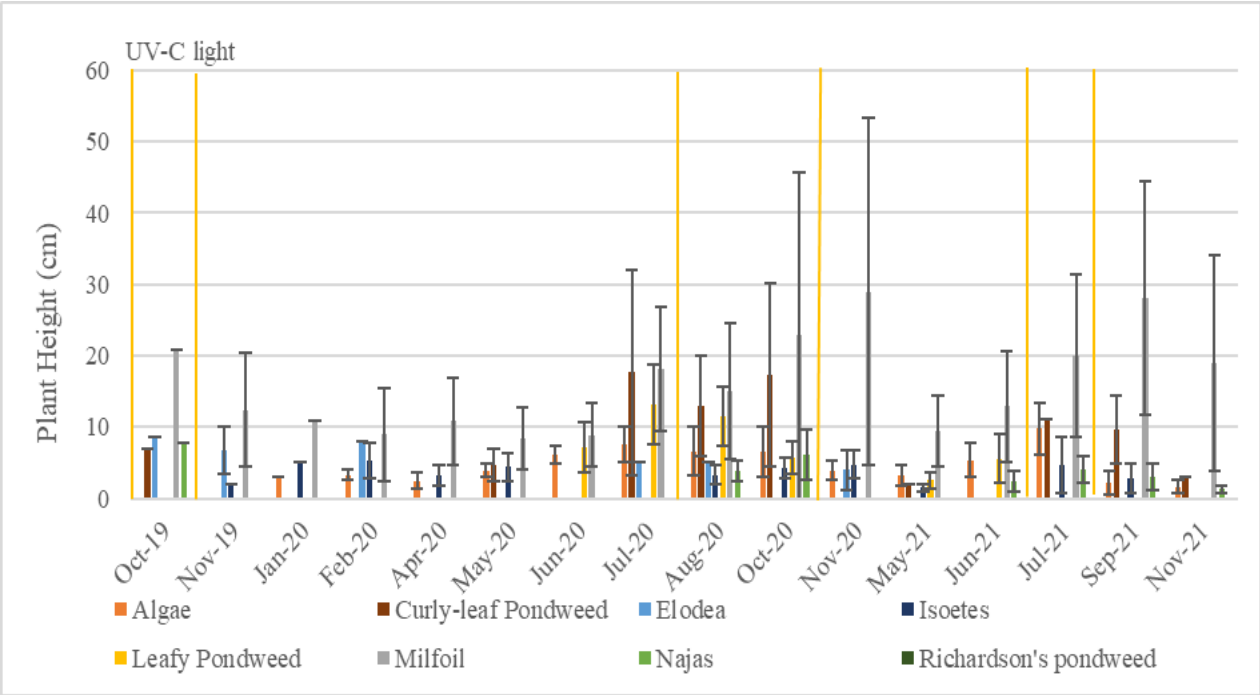
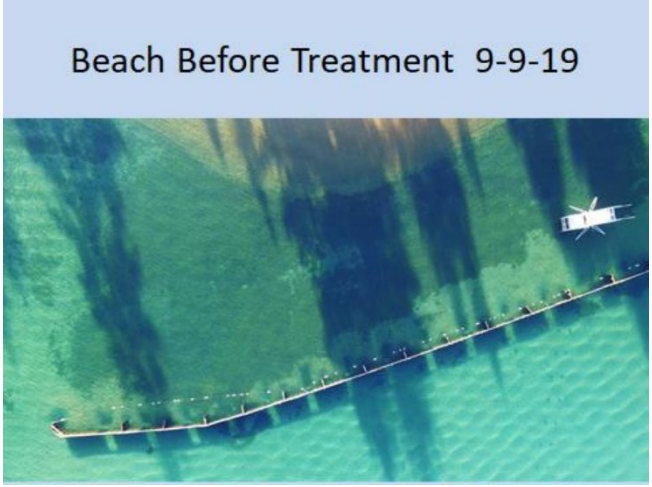


Figure 13 Plant Heights Measured at Lakeside Beach, 2019-2021

Photo Composite 1 is provided in support of Lakeside Beach plant height results and percent plant coverage results discussed previously. Refer to **Appendix A.7** for additional photo documentation.

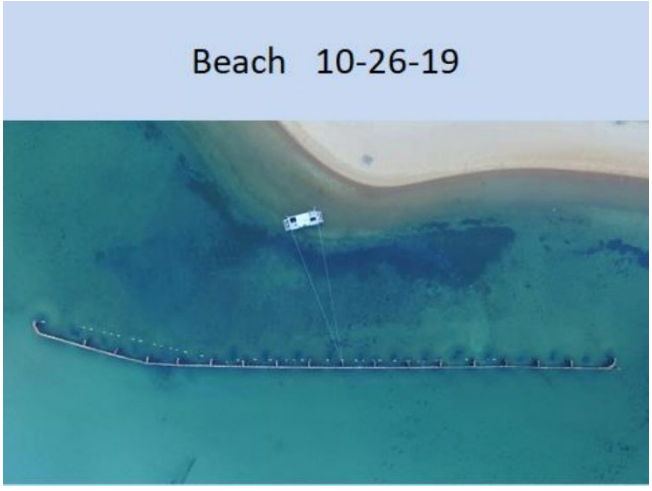
Photo Composite 1 Lakeside Beach Treatment Area Conditions 2019-2021



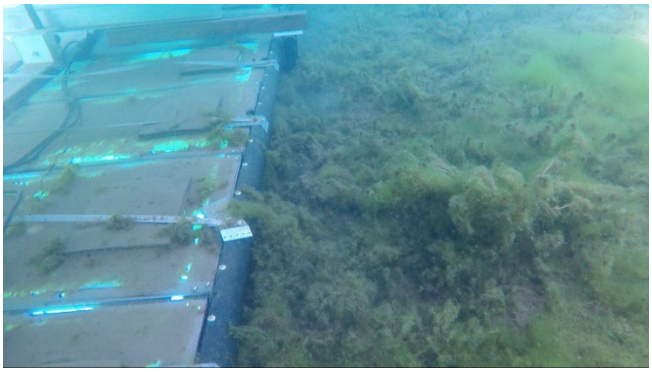
Picture 1: 09092019 Lakeside Beach Pre-treatment Aerial

Picture 2: 09132019 Lakeside Beach Pre-treatment Conditions

Picture 3: 10262019 Lakeside Beach Pre-treatment conditions



Picture 4: 10262019 Lakeside Beach Active-treatment Aerial

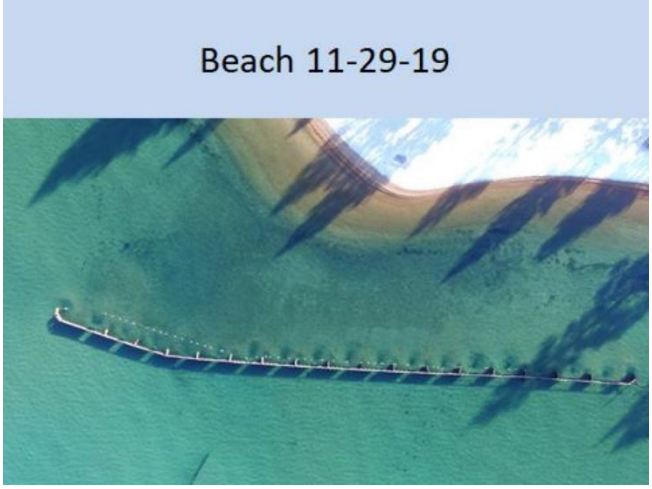


Picture 5: 11012019 Lakeside Beach, conducting 10-15 minutes treatments

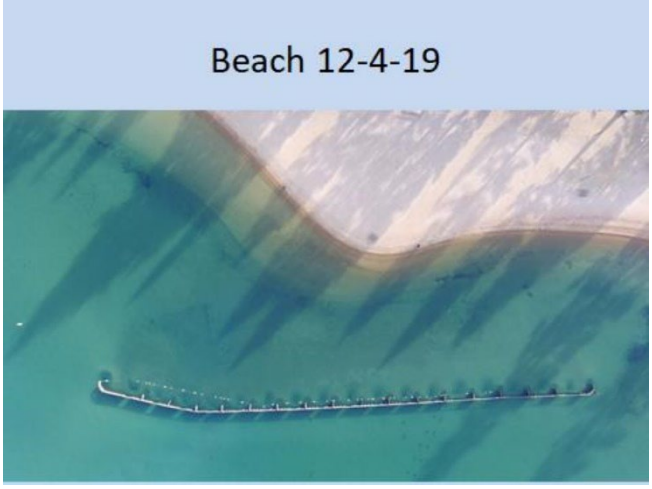
Picture 6: 11062021 Lakeside Beach Active-treatment Aerial

Picture 7: 11082019 Lakeside Beach Post-treatment conditions of portion of beach treated in early October

Picture 8: 11082019 Lakeside Beach Post-treatment conditions of portions of beach treated in early October



Picture 9: 11292019 Lakeside Beach Post-treatment Aerial



Picture 10: 12042019 Lakeside Beach Post-treatment Aerial

Picture 11: 01102020 Lakeside Beach Post-treatment Aerial

Picture 12: 02062020 Lakeside Beach Post-treatment Aerial

Picture 13: 06272020 Lakeside Beach Pre-treatment conditions 2020

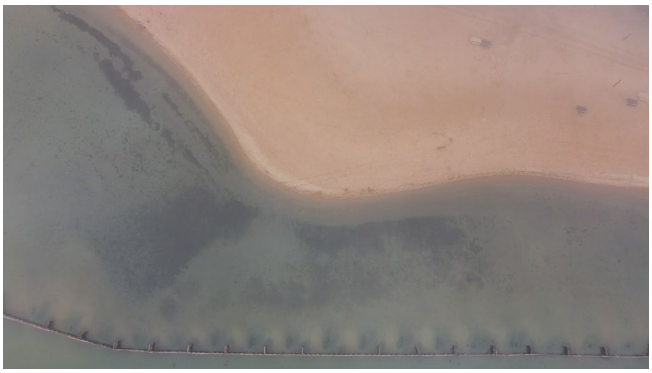
Picture 14: 07282020 Lakeside Beach, Test Site comparing treated (left of white marker) to un-treated (right)

Picture 15: 08062020 Lakeside Beach Active-treatment

Picture 16: 09112020 Lakeside Beach Post-treatment conditions

Picture 17: 09112020 Lakeside Beach Post-treatment conditions

Picture 18: 06182021 Pre-treatment Drone image 2021

Picture 19: 06252021 Lakeside Beach Pre-treatment conditions 2021	**Picture 20: 11082021 Lakeside Beach Post-treatment conditions, remaining plants are brown and decaying**
	
Picture 21: 11082021 Lakeside Beach Post-treatment conditions, plants are brown and decaying	**Picture 22: December 2021 Lakeside Beach Post-treatment conditions Aerial**

3.2.1.2 Lakeside Marina Treatment Area

Lakeside Marina is adjacent to Lakeside Beach, but as a “closed water body” has protected waters. Plants are not as affected by wave action, but are subjected to boat traffic. The sediment of this treatment area is a thick organic layer over a sandy substrate. Prior to this Pilot Project, benthic barrier mats were installed in this area sometime in 2018 to help control plant populations but were removed early 2020. The plant community in this area is a mix of native species: leafy pondweed (*Potamogeton foliosus*), elodea (*Elodea canadensis*), and Characeae algae, and invasive species: Curly-leaf pondweed (*Potamogeton crispus*) and Eurasian watermilfoil (*Myriophyllum spicatum*). The plant community in the Lakeside Marina grows more densely and has more of a seasonally dominant species pattern than Lakeside Beach, and there is a more pronounced reaction to UV-C light treatment than at the beach.

3.2.1.2.1 Plant Composition and Percent Coverage

Following the initial treatment in July 2020, a slight increase in bare sediment was observed. In August 2020, after a second treatment, the bare coverage increased from 13% to 67% and then increased to 94.6% in October 2020 after a third treatment. The increase in bare coverage does follow the natural growth cycle of leafy and Curly-leaf pondweeds, but the area was not recolonized by other species, except for a large increase in Characeae algae in November 2020. The following spring 2021 started with approximately 50%

less plant coverage as spring 2020 and never achieved plant coverage comparable to 2020. A decreased water level coupled with increased propeller turbulence may have attributed to the decrease in plant coverage in 2021, but following the first treatment in July 2021, the bare coverage increased from 25% to 78.4% and continued to increase until no plants were observed in November 2021.

There was a growing population of Curly-leaf pondweed in 2020: 7.4% in June and 17% in July. Following treatment, the Curly-leaf pondweed population decreased to 0.7% in August 2020, which is near the end of the growth cycle for this species. Year 2021 may illustrate the longer-term effects of UV-C light treatment on this species, as Curly-leaf pondweed comprised 1% of the plant coverage in June 2021, and no Curly-leaf pondweed plants were found in July 2021 post-treatment. A conclusion can be made that treatment of Curly-leaf pondweed in July 2020 caused damage to the developing turions that resulted in a significant decrease in the Curly-leaf pondweed population in 2021. For maximum efficacy, future treatment of the Lakeside Marina should include three (3) rounds of UV-C light treatment: the first in May to reduce the early growth species, the second in June or July to reduce the viability of developing Curly-leaf pondweed turions, and a possible third treatment in September or October to reduce any potential recolonization and treat any Eurasian watermilfoil that may overwinter.

Plant density observed and recorded at Lakeside Marina is expressed as percent composition by species in **Figure 14**. Data shown is the average of 5 quadrats within the set transect. Yellow bars are UV-C light exposures. **Table 10** details the reduction in percent plant coverage achieved at the Lakeside Marina treatment area between October 2019 and November 2021. A total of approximately 95 hours of UV-C light treatment was applied to achieve 100% bare lake bed in November 2021. Noting that percent Algae coverage increased in May and November 2020, this increase in Algae did not persist and was not observed post-treatment 2021. Between October 2019 and November 2021, Eurasian watermilfoil was reduced from 17% coverage to 0% coverage. **Table 11** presents the common aquatic vegetation observed by monitors at the Lakeside Marina, from October 2019 to November 2021; months during which monitoring and sampling were not conducted are not presented in this table.

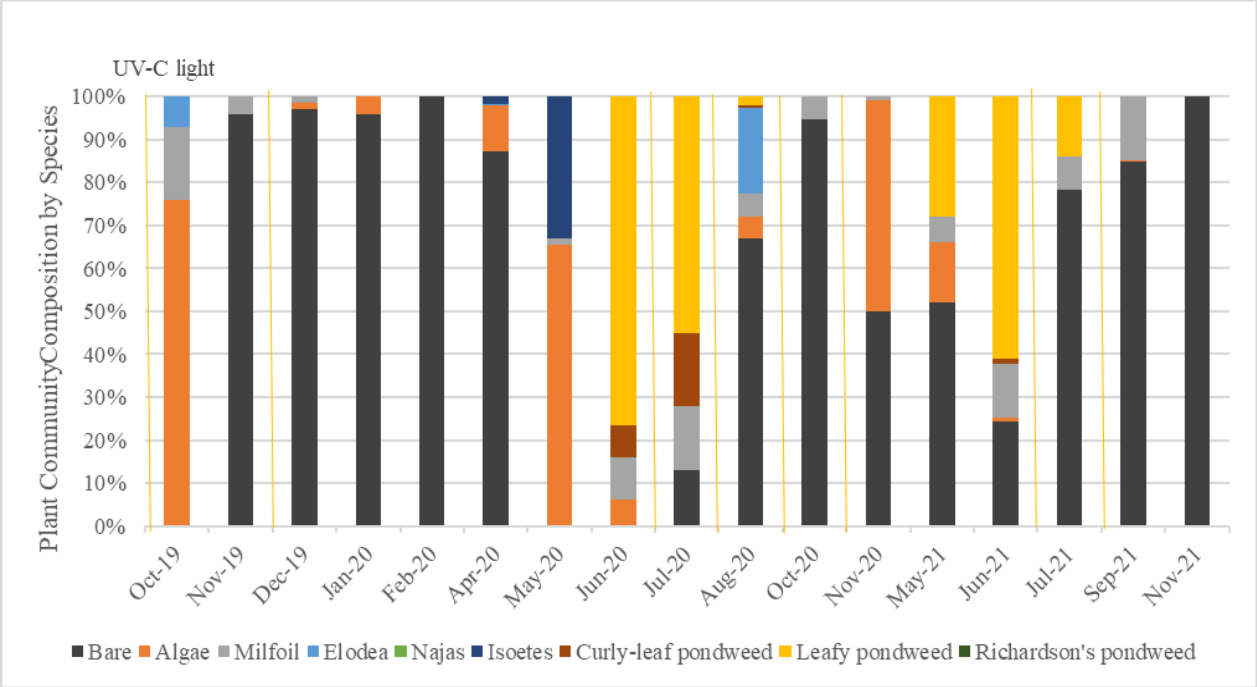


Figure 14 **Percent Composition by Species at Lakeside Marina. Data shown is the average of 5 quadrats. Yellow bars are UV-C light exposures.**

Table 10 Percent Composition by Species Observed at Lakeside Marina, 2019-2021

	Bare	Algae	Eurasian watermilfoil	Elodea	Najas	Isoetes	Curly-leaf pondweed	Leafy pondweed	Richardson's pondweed
19-Oct	0	76	17	7	0	0	0	0	0
19-Nov	96	0	4	0	0	0	0	0	0
19-Dec	97.2	1.4	1.4	0	0	0	0	0	0
20-Jan	96	4	0	0	0	0	0	0	0
20-Feb	100	0	0	0	0	0	0	0	0
20-Apr	87.2	10.8	0	0.4	0	1.6	0	0	0
20-May	0	65.6	1.4	0	0	33	0	0	0
20-Jun	0	6	10	0	0	0	7.4	76.6	0
20-Jul	13	0	15	0	0	0	17	55	0
20-Aug	67	5	5.3	20	0	0	0.7	2	0
20-Oct	94.6	0	5.4	0	0	0	0	0	0
20-Nov	50	49.3	0.8	0	0	0	0	0	0
21-May	52	14	6	0	0	0	0	28	0
21-Jun	0	6	10	0	0	0	7.4	76.6	0
21-Jul	78.4	0	7.6	0	0	0	0	14	0
21-Sep	85	0.2	14.8	0	0	0	0	0	0
21-Nov	100	0	0	0	0	0	0	0	0

Source: Appendix C

Table 11 Common Aquatic Vegetation Observed at Lakeside Marina, 2019-2021

Plant	Oct 19	Nov 19	Dec 19	Apr 20	May 20	Jun 20	Jul 20	Aug 20	Oct 20	Nov 20	May 21	Jun 21	Jul 21	Aug 21	Sep 21	Nov 21
Canadian Waterweed (*Elodea canadensis*)	■			■				■								
Characeae algae (*Chara spp. & Nitella spp.)*				■	■	■	■	■			■	■			■	
Coontail (*Ceratophyllum demersum)*																
Curly-leaf pondweed (*Potamogeton crispus*)						■	■	■				■				
Isoetes spp.											■					
Leafy Pondweed (*Potamogeton foliosus*)						■	■	■			■	■	■			
Eurasian watermilfoil (*Myriophyllum spicatum*)	■	■	■		■	■	■	■	■	■	■	■	■		■	
Naiad (*Najas spp.*)																
Richardson's Pondweed (*Potamogeton richardsonii*)																
Utricularia (*Utricularia spp.)*																

Source: Appendix A.5

3.2.1.2.2 Plant Height

The plants at the Lakeside Marina, in general, are able to grow much taller than those at Lakeside Beach. Plants were able to recover significantly after removal of the benthic barrier mats in spring 2020 and Curly-leaf pondweed grew to over 2-meters tall by July 2020. Initial sampling after the first UV-C light treatment in 2020 reported no reduction of average plant height; however, following a subsequent treatment the heights of leafy pondweed were diminished, and no Curly-leaf pondweed was observed. This may have coincided with the end of the pondweed species growth cycle, but no plants emerged to recolonize in 2020. In 2021, all plants measured well below 50 cm for the entire year. Treatment during the peak growing season in 2020 may have damaged the plants enough to reduce reproduction and stunt regeneration in 2021. Additional treatments would have further damaged the already diminished plants to the point that plants were eradicated from the Lakeside Marina by November 2021. The lower water level coupled with increased boat propeller turbulence in 2021 may have also had reductive effects.

Figure 15 illustrates plant heights measured at Lakeside Marina between October 2019 and November 2021. Data shown is the average of all measurements collected during sampling period. Error bars are standard deviation. Yellow lines are UV-C light exposures. This data accounts for plant height only, not plant abundance or biomass.

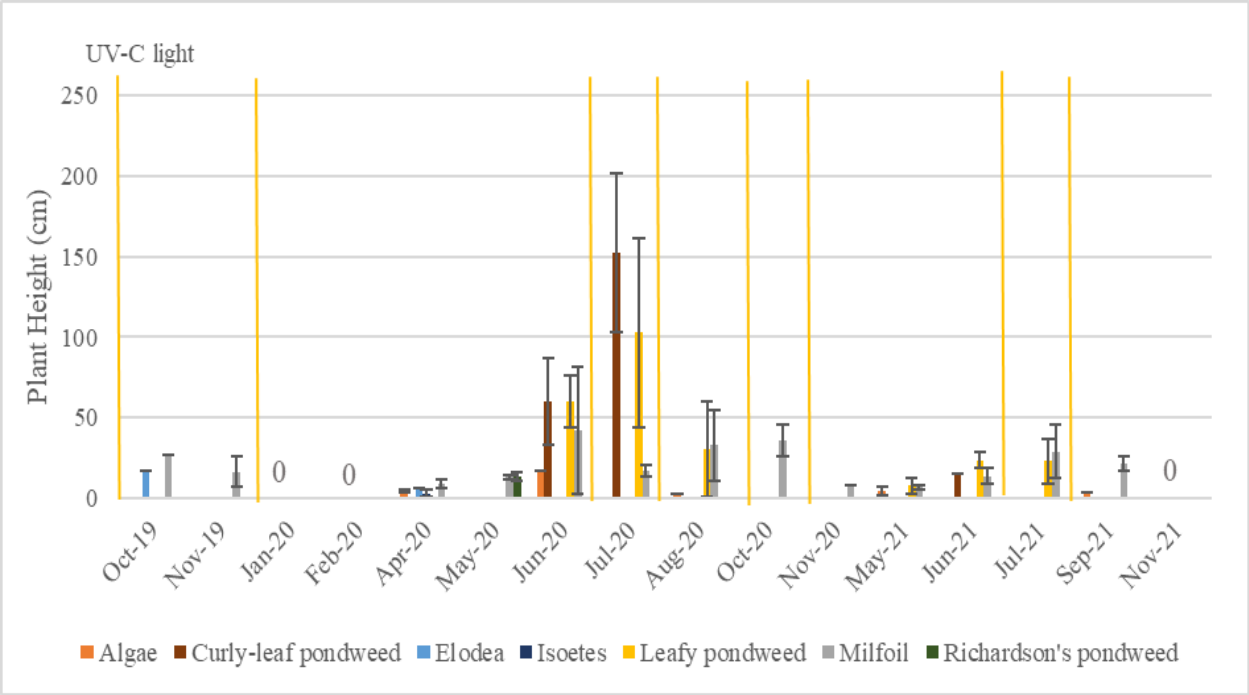
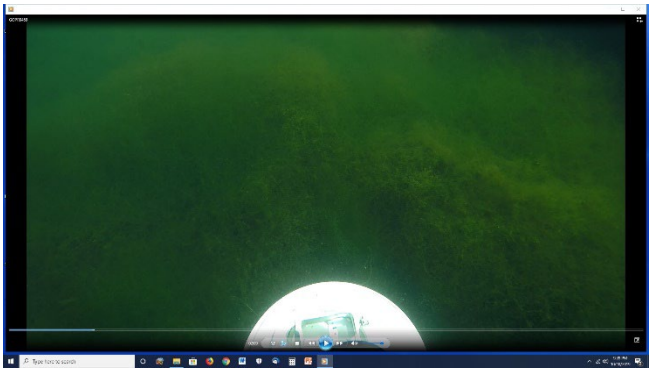


Figure 15 Plant Heights for Lakeside Marina, 2019-2021

Photo Composite 2 is provided in support of Lakeside Marina plant height results and percent plant coverage results discussed previously. See **Appendix A.7** for additional photo documentation.

Photo Composite 2 Lakeside Marina Treatment Area Conditions 2019-2021

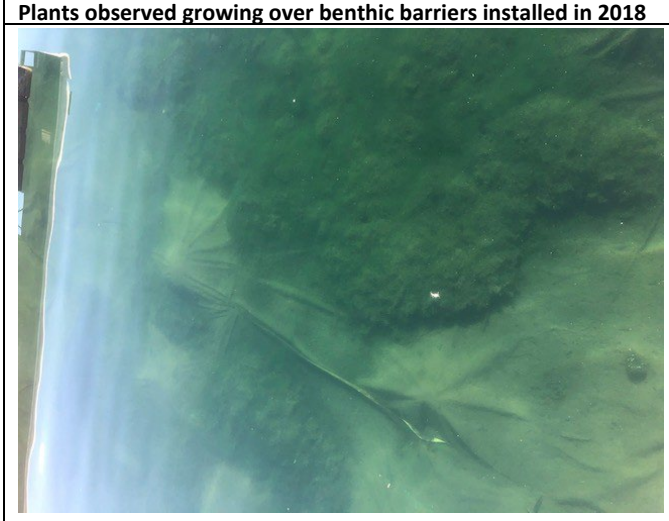


Picture 23: 09262019 Lakeside Marina Pre-treatment 2019, Baseline Condition

Picture 24: 09262019 Lakeside Marina Pre-treatment 2019, Baseline Condition dense with algae

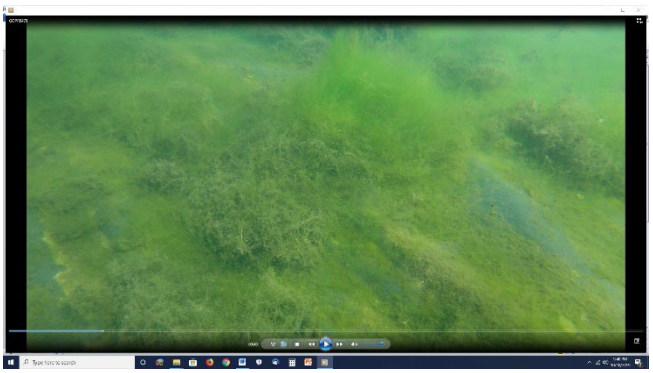
Picture 25: 09262019 Lakeside Marina Pre-treatment 2019, Plants observed growing over benthic barriers installed in 2018

Picture 26: 09262019 Lakeside Marina Pre-treatment 2019, Plants observed growing over benthic barriers installed in 2018



Picture 27: 10032019 Lakeside Marina Pre-treatment 2019

Picture 28: 10072019 Lakeside Marina Active-treatment 2019



Picture 29: 10102019 Lakeside Marina on week Post-treatment 2019

Picture 30: 11052019 Lakeside Marina, IRI built a handheld fragment skimmer

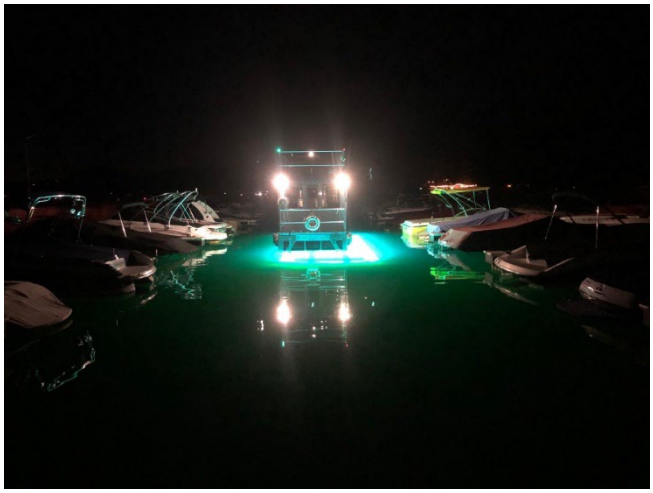
Picture 31: 11052019 Lakeside Marina Post-treatment 2019, Plants are yellowing and decomposing

Picture 32: 11052019 Lakeside Marina Post-treatment 2019

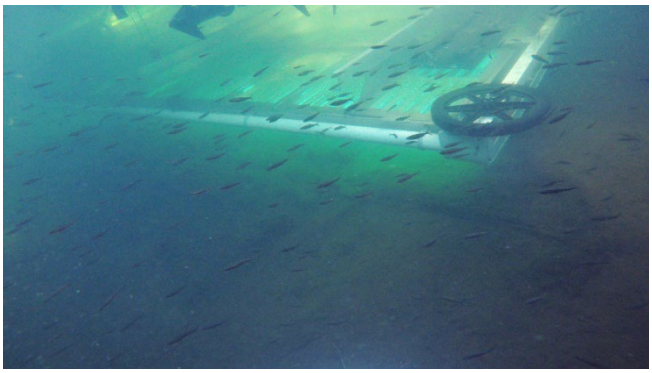
Picture 33: 11052019 Lakeside Marina Post-treatment 2019

Picture 34: 06192020 Lakeside Marina Pre-treatment 2020

Picture 35: 06192020 Lakeside Marina Pre-treatment 2020, Plants growing near 10-foot frame marker

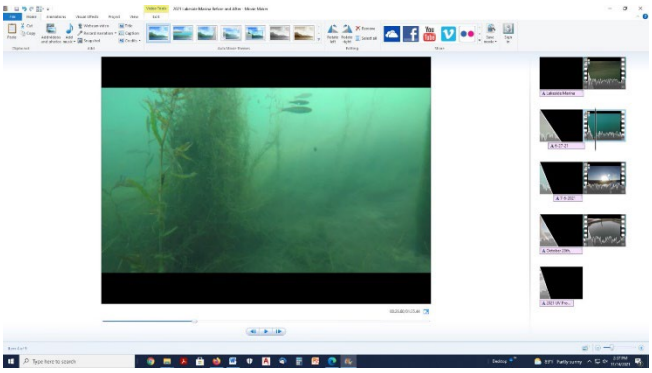


Picture 36: 06232020 Lakeside Marina Active-treatment 2020, Work at times conducted at night/outside of prime boating



Picture 37: 06272020 Lakeside Marina Active-treatment 2020, Treatment conducted under docks

Picture 38: 06272020 Lakeside Marina Active-treatment 2020, Curly-leaf pondweed observed to be around 36-inches tall

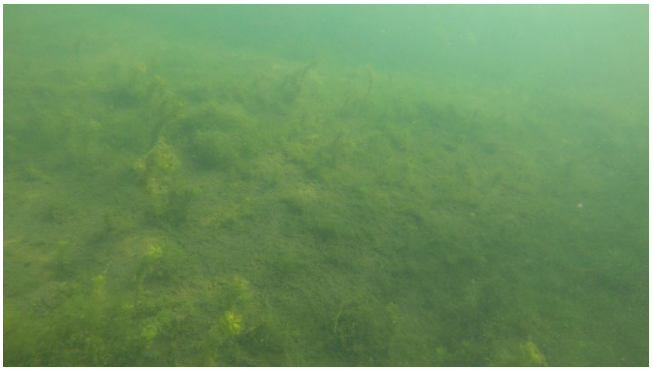


Picture 39: 06272021 Lakeside Marina 10 Days Post-Treatment 2020

Picture 40: 07112020 Lakeside Marina Post-treatment 2020, Treated area is void of plant cover

Picture 41: 07112020 Lakeside Marina Post-treatment 2020, Untreated area shown in comparison to Picture 40

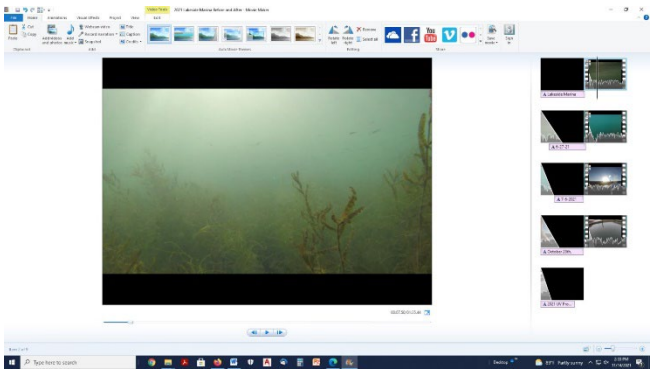
Picture 42: 07312020 Lakeside Marina Post-treatment 2020, Plants dropping from the water column in UNR transect



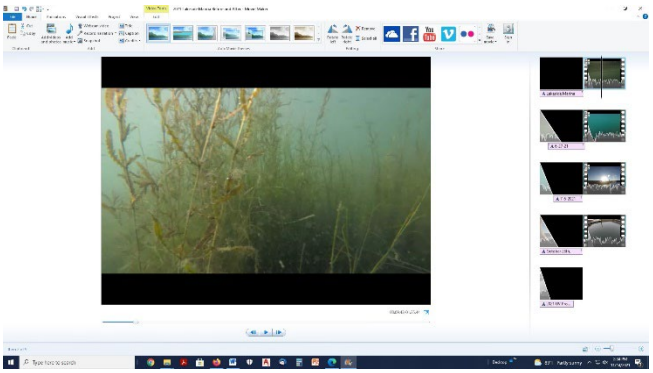
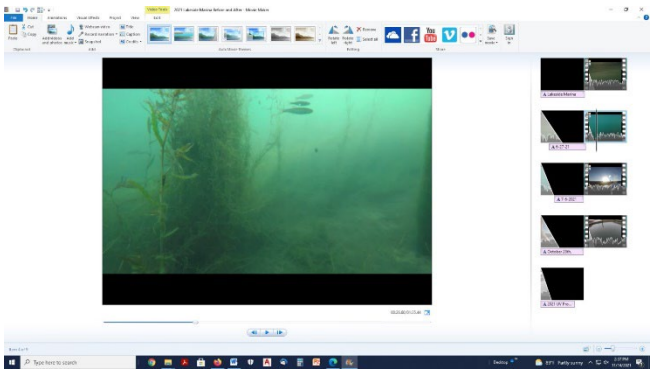
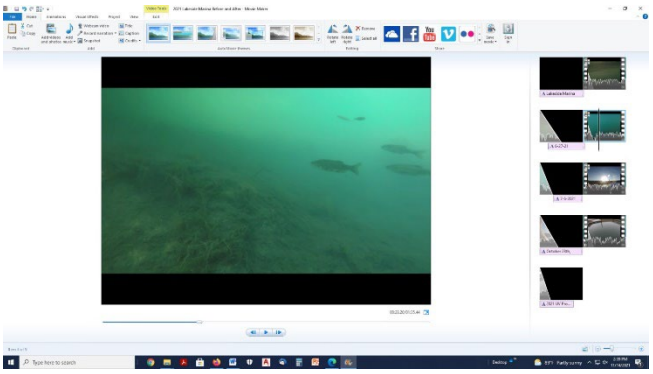
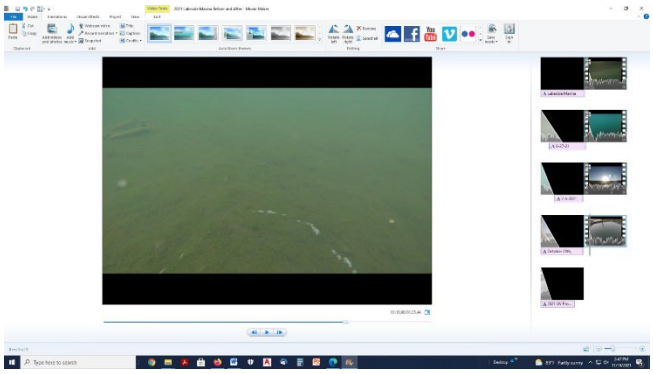
Picture 43: 08072020 Lakeside Marina Post-treatment 2020

Picture 44: 08072020 Lakeside Marina Post-treatment 2020, UNR sampling transect shown

Picture 45: 08072020 Lakeside Marina Post-treatment 2020, Treated area outside of UNR sampling transect is shown



Picture 46: 06162021 Lakeside Marina Pre-treatment 2021

	
Picture 47: 06162021 Lakeside Marina Pre-treatment 2021	**Picture 48: 06272021 Lakeside Marina 10 Days Post-Treatment**
	
Picture 49: 07062021 Lakeside Marina 20 Days Post-Treatment	**Picture 50: 10282021 Lakeside Marina 4 Months Post-treatment**

3.2.1.3 TKPOA Research Area, 2019-2020

The TKPOA Research Area 2019-2020 sites are located in an area of the lagoons with low water exchange, more dense plant communities, and thick organic sediment. Unfortunately, the location chosen to be the untreated control area became a near monoculture of coontail (*Ceratophyllum demersum*). Coontail, although a native, can become a nuisance species by producing very dense stands. The tested areas were a mix of native plant species: coontail, leafy pondweed (*Potamogeton foliosus*), Richardson's pondweed (*Potamogeton richardsonii*), Elodea (*Elodea canadensis*), and Characeae algae, and invasive plant species: Curly-leaf pondweed (*Potamogeton crispus*) and Eurasian watermilfoil (*Myriophyllum spicatum*). The two treated areas, TKPOA Research Test site and UNR Established Site, were divided after the 2019 testing period: one half was tested in 2020 and the other half was used as a one year post-testing control and did not receive UV-C light exposure in 2020. No UV-C light testing was conducting in these areas in 2021, but samples were collected to examine plant growth one year post-testing.

Because the TKPOA Research Area has a higher plant density than the other sample locations, the sampling methodology was different. Initially, multiple rake pulls were performed in each transect and the plant community composition was estimated. To better assess the plant community and effects of UV-C light exposure, quadrat sampling was employed in July 2020 through the end of sampling in 2021. All plant

biomass was collected from within a 25 cm x 25 cm quadrat and 4 quadrats per sample transect. Biomass samples were then separated by species, dried, and weighed; thus, the percent plant composition is based on the dry weight of each species relative to the weight of the entire quadrat. Because of this, there is no bare coverage calculated, unless there were no live plants found in the quadrat.

After the initial testing in 2019, there was an increase in Curly-leaf pondweed in spring 2020. Curly leaf pondweed overwinters as a sprouted turion and is able to reach maturity faster than the native species. In August 2020, one-month post-treatment, one quadrat had no viable plants and approximately 2 months post-treatment no viable plants were observed in either quadrat. The plants had been reduced to a black decaying organic layer on the sediment surface. A few unrooted plant fragments were in the testing area and were decaying as well. When compared to the subsection that had been treated in 2019 only, that did not experience loss of plant community, the conclusion can be made that the UV-C light exposure was able to completely eradicate the plants after two rounds of testing. These results were short lived, however, and in the third month the tested area plant growth increased as mature turions in the sediment began sprouting and coontail began recolonizing.

Comparing across the two years of testing, there was a 60% reduction in Curly-leaf pondweed in the tested section in May 2021 compared to May 2020 and a 31% reduction in the 1-year post-testing control section (tested in 2019 but not in 2020), evidence that treating Curly-leaf pondweed during the plant maturation stage is pivotal in reducing the amount of viable turions and reducing the Curly-leaf pondweed population the following year.

The plant community in the UNR Established Site is more varied, perhaps due to the sandy sediment, shallower water, and more sheltered location. There was no eradication of plants post-testing, as was seen in the Research Test Site, but there was a change in plant community: increased Eurasian watermilfoil in November 2019 and increased coontail in September 2020. This may be due to seasonal cycles but may also signal the need for further testing of treatment times to better eradicate certain species with diverse growth parameters. Because UNR Established Site is shallower than the Research Test Site, sunlight may be more accessible and as a result plants may be able to overcome the effects of the UV-C light exposure, whereas plants in the deeper areas of the Research Test Site may be flattened to below a photic minimum, restricting plant access to sunlight and hastening their decline. Comparing the UNR Established Site across the sampling years, a decrease of Curly-leaf pondweed was also measured in 2021: an almost 30% reduction from 2020 to 2021 and a nearly 13% reduction in the 1-year post-testing control section.

3.2.1.3.1 Plant Coverage and Composition

Plant density observed at the TKPOA Reference Site is expressed as percent composition by species in **Figure 16**. Data accounts for presence of plants only, not biomass or height. Data was estimated by rake pulls October 2019 through June 2020. From July 2020 through 2021, coverage was determined through species weight ratios from a collection of all plant biomass in a 25 cm x 25 cm quadrat. Data shown is the average of 1 to 4 rake pulls per quadrat. NS = Not sampled due to ice coverage. **Table 12** details percent plant coverage measured between October 2019 and June 2021.

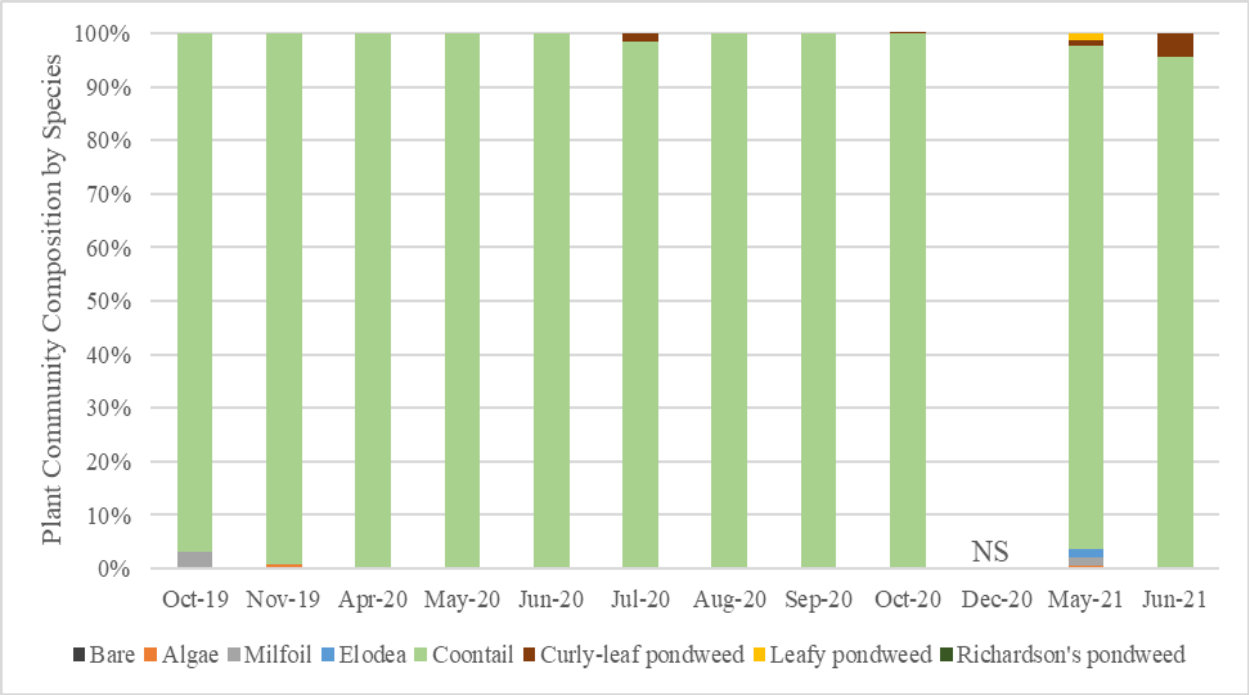


Figure 16 **Plant coverage percentages by species at the 2019-2020 TKPOA Reference Site. Data shown is the average of 1 to 4 rake pulls per quadrat. NS = Not sampled due to ice coverage**

Table 12 **Percent Composition by Species, 2019-2020 TKPOA Reference Site**

	Bare	Algae	Eurasian watermilfoil	Elodea	Coontail	Curly-leaf pondweed	Leafy pondweed	Richardson's pondweed
Oct-19	0.0	0.0	3.0	0.0	97.0	0.0	0.0	0.0
Nov-19	0.0	0.7	0.0	0.0	99.3	0.0	0.0	0.0
Apr-20	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
May-20	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Jun-20	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Jul-20	0.0	0.0	0.0	0.0	98.5	1.5	0.0	0.0
Aug-20	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Sep-20	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Oct-20	0.0	0.0	0.0	0.0	100.0	0.1	0.0	0.0
Dec-20	Not sampled due to ice cover.							
May-21	0.0	0.6	1.4	1.6	94.2	0.9	1.4	0.0
Jun-21	0.0	0.0	0.0	0.1	95.5	4.4	0.0	0.0

Source: Appendix C

Plant density observed at the TKPOA Research Test Site is expressed as percent composition by species in **Figure 17**. This data accounts for presence of plants only, not biomass or height. Yellow bars are UV-C light exposures. Data was estimated by rake pulls October 2019 through June 2020. From July 2020

through 2021, percent plant coverage was determined through species weight ratios from a collection of all plant biomass in a 25 cm x 25 cm quadrat. Data shown is the average of 1-4 rake pulls per quadrat. Table 13 details percent plant coverage measured between October 2019 and June 2021.

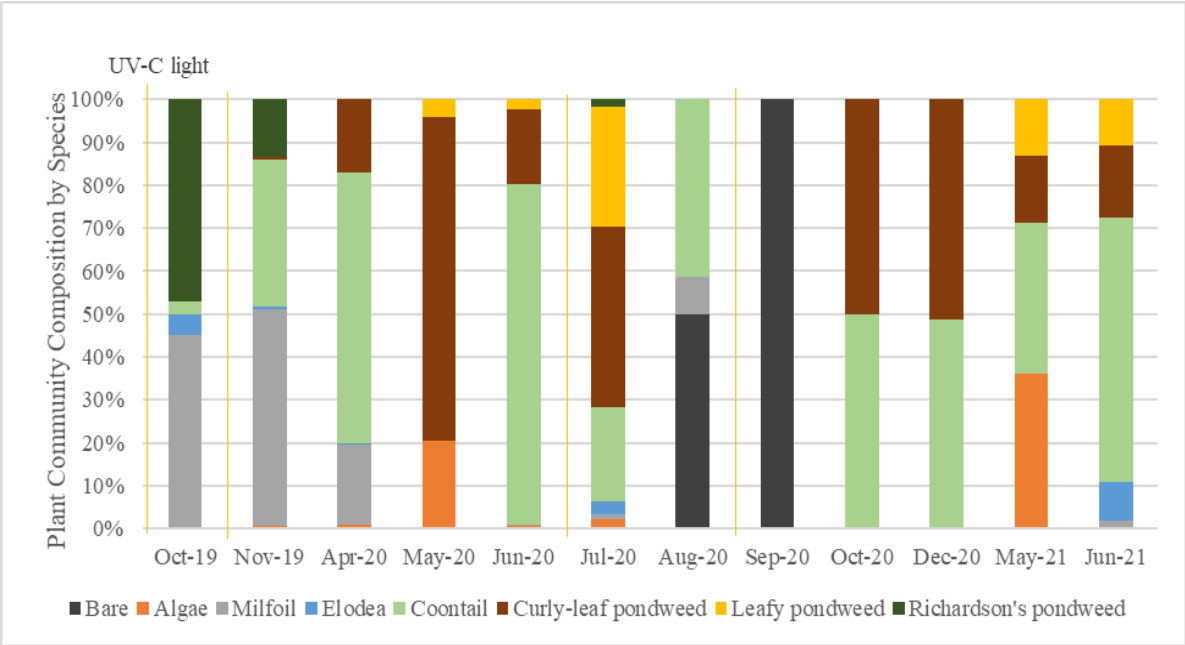


Figure 17 **Plant coverage percentages by species at TKPOA Research Test Site (Tested 2019+2020). Data shown is the average of 1-4 rake pulls per quadrat.**

Table 13 **Percent Composition by Species, TKPOA Research Test Site (Tested 2019+2020)**

	Bare	Algae	Eurasian watermilfoil	Elodea	Coontail	Curly-leaf pondweed	Leafy pondweed	Richardson's pondweed
Oct-19	0.0	0.0	45.0	5.0	3.0	0.0	0.0	47.0
Nov-19	0.0	0.7	50.3	0.7	34.3	0.7	0.0	13.3
Apr-20	0.0	1.1	18.4	0.3	63.1	17.2	0.0	0.0
May-20	0.0	20.4	0.0	0.0	0.0	75.5	4.1	0.0
Jun-20	0.0	0.8	0.2	0.0	79.2	17.5	2.4	0.0
Jul-20	0.0	2.2	1.0	3.2	21.7	42.1	27.9	1.8
Aug-20	50.0	0.0	8.6	0.0	41.5	0.0	0.0	0.0
Sep-20	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oct-20	0.0	0.0	0.0	0.0	50.0	50.0	0.0	0.0
Dec-20	0.0	0.0	0.0	0.4	48.4	51.2	0.0	0.0
May-21	0.0	36.0	0.0	0.0	35.3	15.5	13.3	0.0
Jun-21	0.0	0.0	1.9	9.0	61.7	16.8	10.7	0.0

Source: Appendix C

Plant density observed at the TKPOA Research Test Site (Tested 2019 Only) is expressed as percent composition by species in **Figure 18**. This data accounts for presence of plants only, not biomass or height. Yellow bars are UV-C light exposures. Plant coverage was determined through species weight ratios from a collection of all plant biomass in a 25 cm x 25 cm quadrat. Data shown is the average of 1-2 quadrats. **Table 14** details percent plant coverage measured between July 2020 and June 2021.

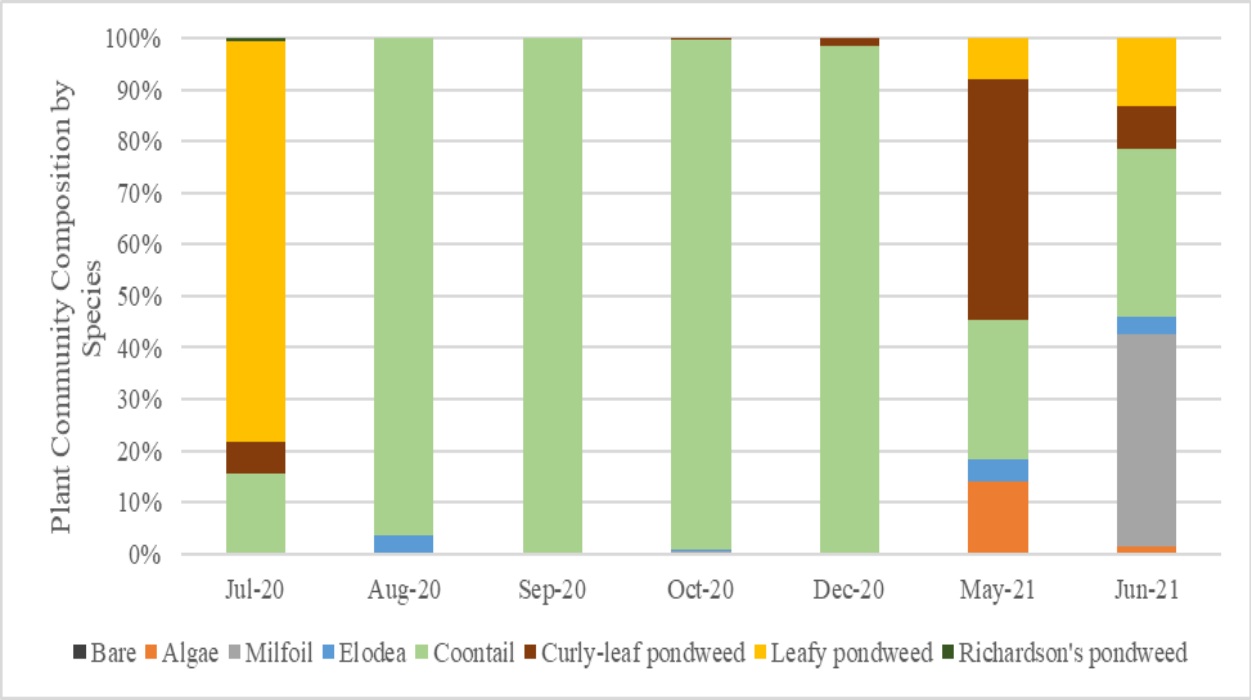


Figure 18 **Plant Coverage Percentages by Species at TKPOA Research Test Site (Tested 2019 only). Data shown is the average of 1-2 quadrats.**

Table 14 **Percent Composition by Species, TKPOA Test Site (Tested 2019 only)**

	Bare	Algae	Eurasian watermilfoil	Elodea	Coontail	Curly-leaf pondweed	Leafy pondweed	Richardson's pondweed
Jul-20	0.0	0.0	0.2	0.0	15.4	6.4	78.1	0.7
Aug-20	0.0	0.0	0.0	3.5	96.5	0.0	0.0	0.0
Sep-20	0.0	0.0	0.1	0.0	99.9	0.0	0.0	0.0
Oct-20	0.0	0.0	0.7	0.2	98.7	0.3	0.0	0.0
Dec-20	0.0	0.0	0.0	0.2	98.7	1.7	0.0	0.0
May-21	0.0	13.9	0.0	4.4	26.9	46.7	8.1	0.0
Jun-21	0.0	1.6	41.2	3.1	32.7	8.3	13.2	0.0

Source: Appendix C

Plant density observed at the TKPOA UNR Established Site (Tested 2019+2020) is expressed as percent composition by species in **Figure 19**. This data accounts for presence of plants only, not biomass or height. Yellow bars are UV-C light exposures. Data was estimated by rake pulls October 2019 through June 2020. From July 2020 through 2021, coverage was determined through species weight ratios from a collection of all plant biomass in a 25 cm x 25 cm quadrat. Data shown is the average of 1 to 4 rake pulls or quadrats. NS = Not sampled due to ice coverage. **Table 15** details percent plant coverage measured between October 2019 and June 2021.

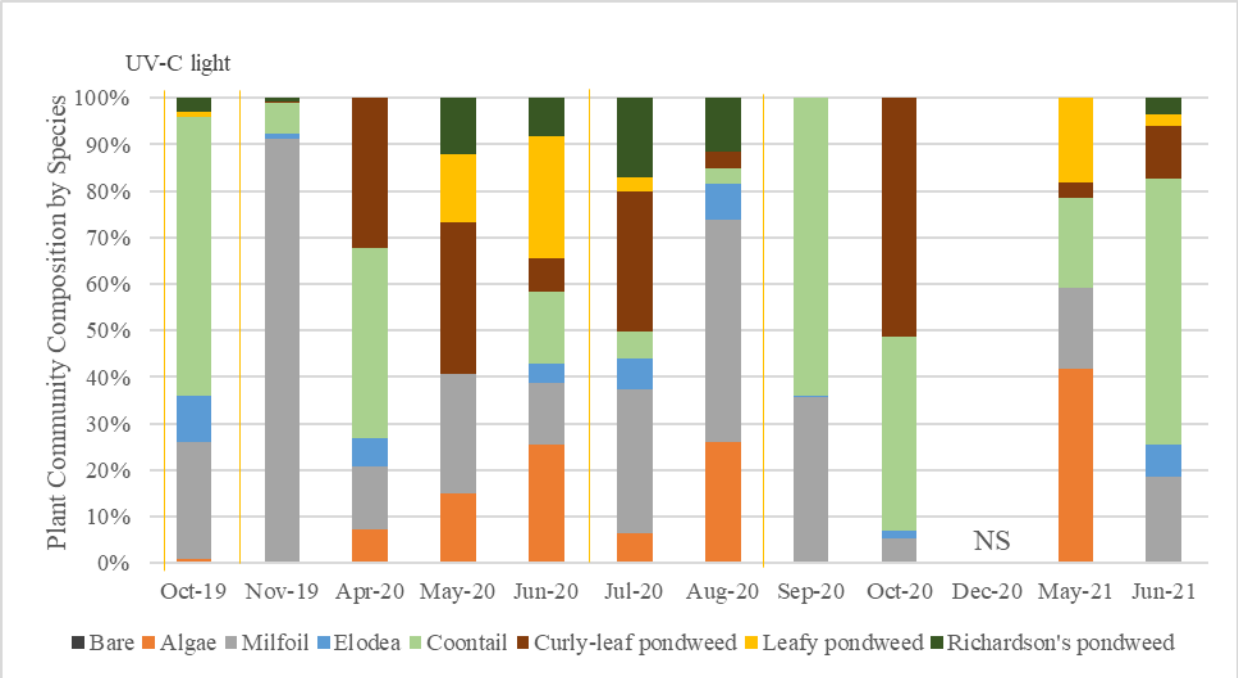


Figure 19 **Plant Coverage Percentages by Species at TKPOA UNR Established Site (Tested 2019+2020). Data shown is the average of 1-4 rake pulls or quadrats. NS = Not sampled due to ice coverage.**

Table 15 **Percent Composition by Species, TKPOA UNR Established Site (Tested 2019+2020)**

	Bare	Algae	Eurasian watermilfoil	Elodea	Coontail	Curly-leaf pondweed	Leafy pondweed	Richardson's pondweed
Oct-19	0	1.0	25.0	10.0	60.0	0.0	1.0	3.0
Nov-19	0	0.3	91.0	1.0	6.7	0.3	0.0	0.7
Apr-20	0	7.1	13.7	6.1	40.7	32.3	0.0	0.0
May-20	0	14.9	25.8	0.0	0.0	32.7	14.7	12.0
Jun-20	0	25.5	13.4	4.1	15.5	7.1	26.3	8.2
Jul-20	0	6.4	30.8	6.8	5.7	30.1	3.2	17.0
Aug-20	0	25.9	47.8	7.8	3.3	3.7	0.0	11.5
Sep-20	0	0.0	35.6	0.4	64.0	0.0	0.0	0.0
Oct-20	0	0.0	5.3	1.7	41.8	51.3	0.0	0.0
Dec-20	Not sampled due to ice cover							
May-21	0	41.8	17.3	0.0	19.4	3.2	18.3	0.0
Jun-21	0	0.0	18.6	7.0	57.2	11.3	2.3	3.7

Source: Appendix C

Plant density observed at the TKPOA UNR Established Site (Tested 2019 Only) is expressed as percent composition by species in **Figure 20**. This data accounts for presence of plants only, not biomass or height. Yellow bars are UV-C light exposures. Data was estimated by rake pulls October 2019 through June 2020. From July 2020 through 2021, coverage was determined through species weight ratios from a collection of all plant biomass in a 25 cm x 25 cm quadrat. Data shown is the average of 1 to 2 quadrats. NS = Not

sampled due to ice coverage. **Table 16** details percent plant coverage measured between July 2020 and June 2021.

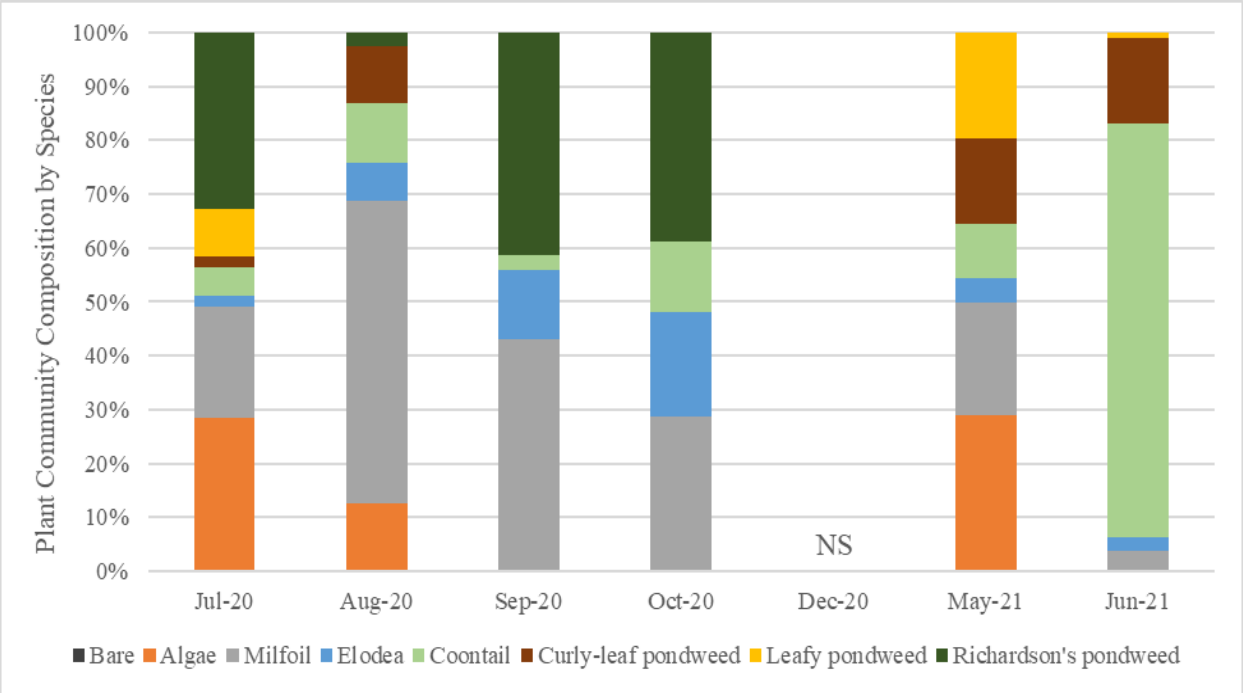


Figure 20 **Plant Coverage Percentages by Species at TKPOA UNR Established Site (Tested 2019 only). Data shown is the average of 1 to 2 quadrats. NS = Not sampled due to ice coverage.**

Table 16 **Percent Composition by Species, TKPOA UNR Established Site (Tested 2019 only)**

	Bare	Algae	Eurasian watermilfoil	Elodea	Coontail	Curly-leaf pondweed	Leafy pondweed	Richardson's pondweed
Jul-20	0.0	28.7	20.8	2.1	5.3	2.1	8.8	33.1
Aug-20	0.0	12.8	57.1	7.4	11.2	10.8	0.0	2.6
Sep-20	0.0	0.0	43.1	12.9	2.7	0.0	0.0	41.3
Oct-20	0.0	0.0	28.7	19.6	13.1	0.0	0.0	38.7
Dec-20	Not sampled due to ice cover.							
May-21	0.0	29.0	20.8	4.7	9.9	15.9	19.7	0.0
Jun-21	0.0	0.0	3.9	2.3	76.8	16.0	1.0	0.0

Source: Appendix C

Table 17 presents the common aquatic vegetation observed by monitors at the TKPOA Research Area 2019-2020 during monitoring, from October 2019 to June 2021; months during which monitoring and sampling were not conducted are not presented in this table.

Table 17 Common Aquatic Vegetation Observed at TKPOA Research Area, 2019-2020

Plant	Oct 19	Nov 19	May 20	Jun 20	Jul 20	Aug 20	Sep 20	Oct 20	Dec 20	May 21	Jun 21
Canadian Waterweed (*Elodea canadensis*)	■	■		■	■	■	■	■	■	■	■
Characeae algae (*Chara spp. And Nitella spp.)*		■	■			■			■	■	■
Coontail (*Ceratophyllum demersum)*	■	■	■	■	■	■	■	■	■	■	■
Curly-leaf pondweed (*Potamogeton crispus*)			■	■	■	■	■	■	■	■	■
Isoetes spp.											
Leafy Pondweed (*Potamogeton foliosus*)	■		■		■					■	■
Eurasian watermilfoil (*Myriophyllum spicatum*)	■	■		■	■	■	■		■	■	■
Naiad (*Najas spp.*)											
Nitella spp.	■				■						
Richardson's Pondweed (*Potamogeton richardsonii*)	■	■			■	■	■	■			■
Utricularia (*Utricularia spp.)*											

Source: Appendix A.5 and Appendix C

3.2.1.3.2 Plant Height

Coontail plant heights for the TKPOA Reference site remained between 1.5 and 4 meters for the duration of the monitoring period. There were few other species found; however, Curly-leaf pondweed was able to grow to 3.5 meters. As this area was left untested by both UV-C and mechanical harvesting, the plants were able to grow to the surface by mid-summer. For the TKPOA Research Test location, plants were able to reach heights of greater than 2.5 meters by mid-summer. Plant heights were consistent month to month when measured within 10 days after the first treatment of 2020. There was not an immediate drop in plant height of Curly-leaf pondweed, and a small decrease in plant height for leafy pondweed. On the other hand, there was not an increase in Curly-leaf pondweed height in the TKPOA Research Test site, while there was an increase in heights measured in the TKPOA Reference site for the same period.

By one month post-testing, all plants had dropped to the sediment. No heights were recorded for this period, as the plants remained collapsed and eventually decayed the following month. This is a result of the UV-C light exposure, as the heights in the 2020 untreated control subsection of the TKPOA Research Test site continued to increase in height through September 2020. Plants began to recolonize in October 2020, though at increments too small to collect height measurements. Curly leaf pondweed shed turions were able to sprout and overwinter in the TKPOA Research Test location and 1-year post-testing had grown to over 2 meters, which is 0.5 to 1 meter taller than the plants located in the subsection treated in 2019 only.

There is an unknown reason as to why the plants in the 2020 treated section were higher. This may reflect a natural phenomenon or may be related to the suspected mechanical removal by the homeowner in the subsection treated in 2019 only. In the TKPOA UNR Established site, the plant height reactions to UV-C

light exposure expressed similar trends as the plant community composition. There was reduction of Curly-leaf pondweed height in July 2020 when compared with the June 2020 pre-treatment sampling. Average Curly-leaf pondweed heights decreased from 191 cm to 45 cm. There was also reduction of Curly-leaf pondweed height in the 1-year post-testing control subsection. Although to a lesser extent, average heights decreased from 191 cm to 90 cm.

Eurasian watermilfoil heights remained stable and even increased after the second UV-C light exposure. Comparison with the 1-year post-testing control section shows that although the Eurasian watermilfoil may not have been eradicated, the UV-C light exposure did affect overall plant height; the tested plants were an average of 75 cm tall while the untested plants had an average height of 198 cm. This was also observed for Richardson's pondweed; the August 2020 tested plants were an average of 70 cm tall while the untested plants were an average of 168 cm tall. The following spring 2021, one-year and two-year post-testing, Eurasian watermilfoil and Curly-leaf pondweed plant heights were similar across the tested and untested subsections of the TKPOA UNR Established site.

Figure 21 presents plant height measurements by species for the TKPOA Reference site 2019-2020 from October 2019 through June 2021. Data shown is the average of 1 to 4 measurements. Error bars are standard deviation. Yellow lines are UV-C light exposures. This data accounts for plant height only, not plant abundance or biomass. NS = Not sampled due to ice coverage.

Figure 22 presents plant height by species for the TKPOA Research Test Site Tested 2019+2020 for the October 2019 to June 2021 period of record. Data shown is the average of 1 to 4 measurements. Error bars are standard deviation. Yellow lines are UV-C light exposures. This data accounts for plant height only, not plant abundance or biomass. No plants were present in August and September 2020.

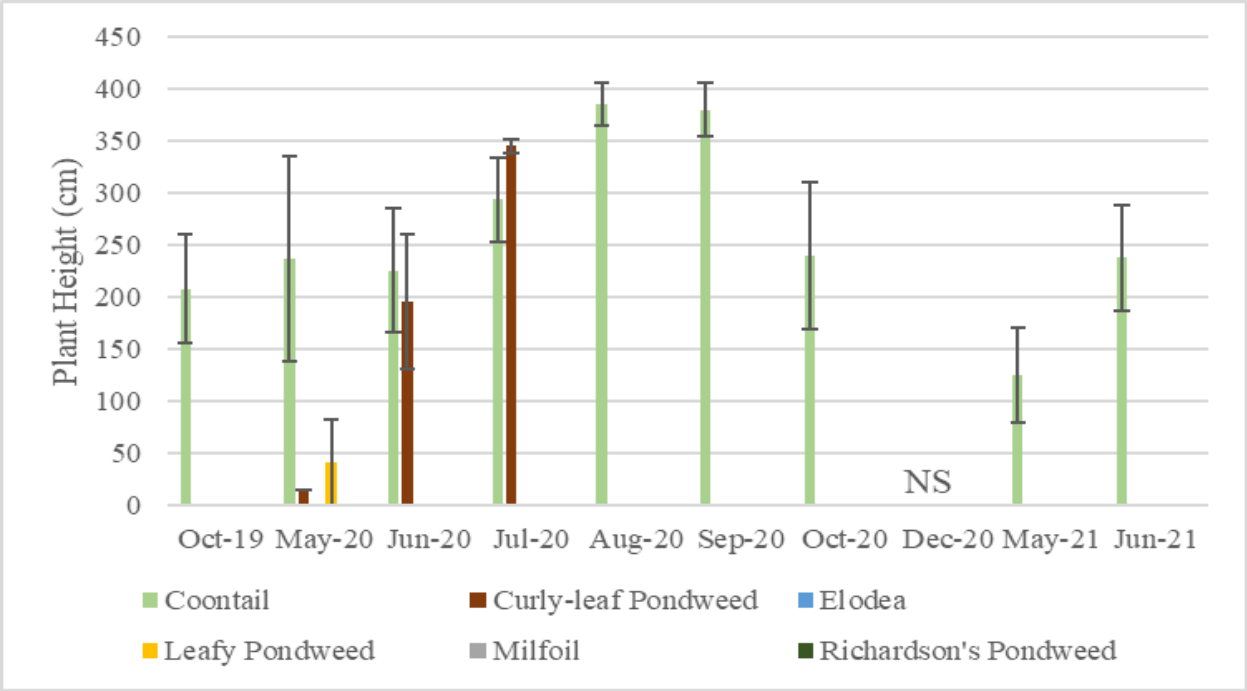


Figure 21 Plant Heights for TKPOA Reference Site 2019-2020

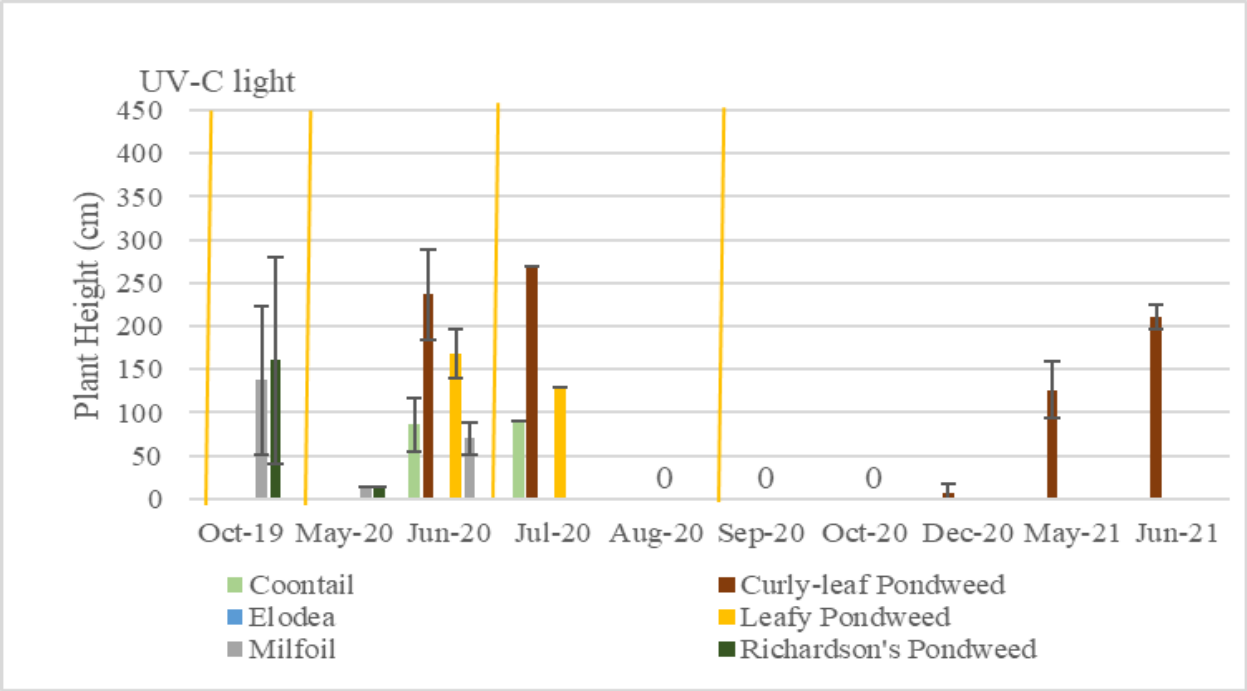


Figure 22 Plant Heights for TKPOA Research Test Site (Tested 2019+2020)

Figure 23 presents plant height by species for the TKPOA Research Test Site (Tested 2019 Only) for the July 2020 to June 2021 period of record. Data shown is the average of 1 to 2 measurements. Error bars are standard deviation. This data accounts for plant height only, not plant abundance or biomass.

Figure 24 presents plant height by species for the TKPOA UNR Established Site (Tested 2019+2020) for the October 2019 to June 2021 period of record. Data shown is the average of 1 to 4 measurements. Error bars are standard deviation. Yellow lines are UV-C light exposures. This data accounts for plant height only, not plant abundance or biomass. NS = Not sampled due to ice coverage.

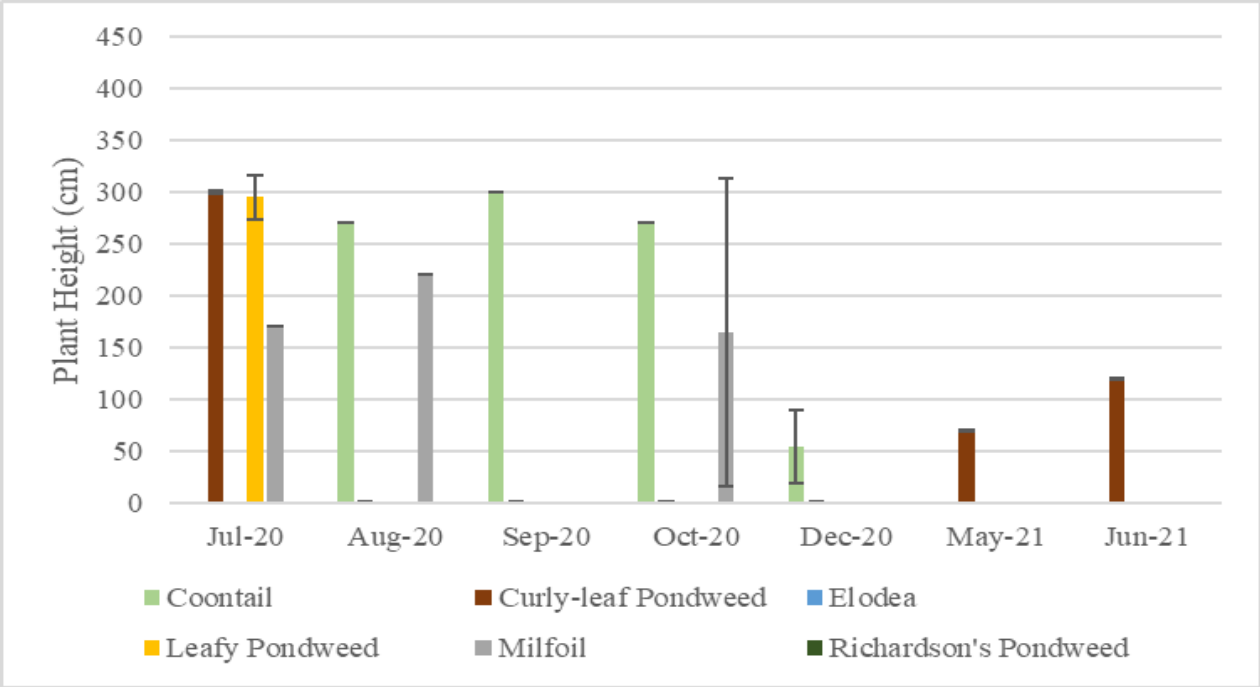


Figure 23 Plant Heights for TKPOA Research Test Site (Tested 2019 Only)

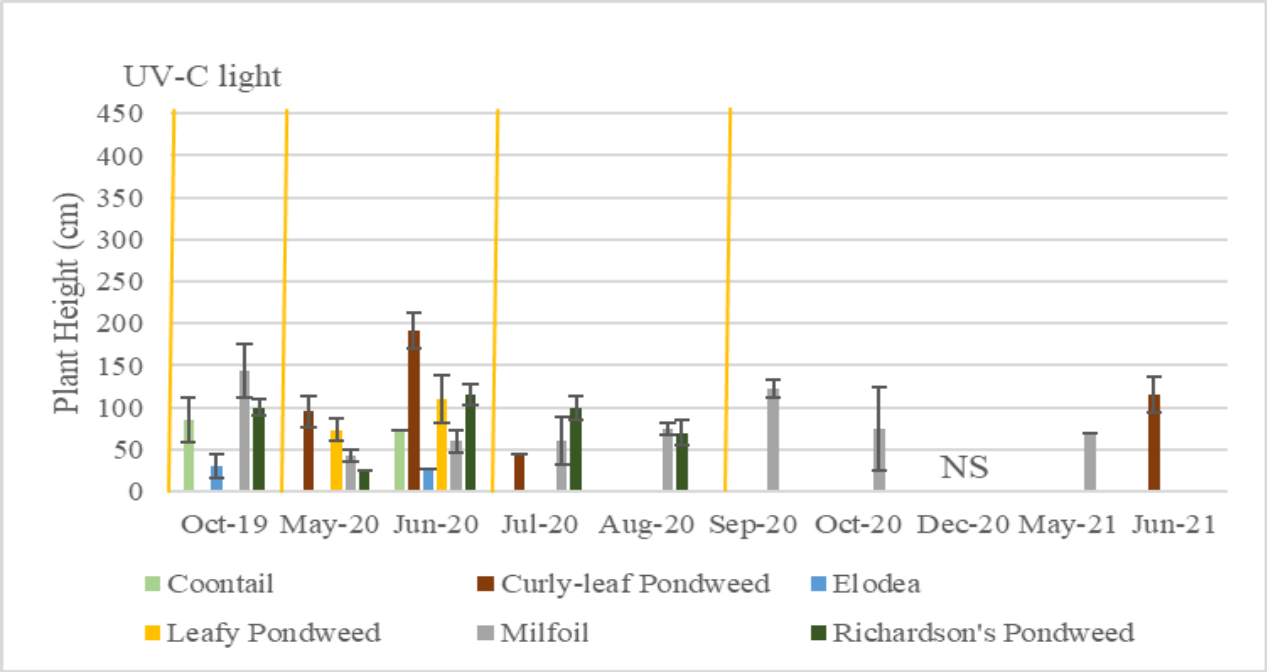


Figure 24 Plant Heights for TKPOA UNR Established Site (Tested 2019+2020)

Figure 25 presents plant height by species for the TKPOA UNR Established Site (Tested 2019 Only) for the July 2020 to June 2021 period of records. Data shown is the average of 1 to 2 measurements. Error bars are standard deviation. This data accounts for plant height only, not plant abundance or biomass. NS = Not sampled due to ice coverage.

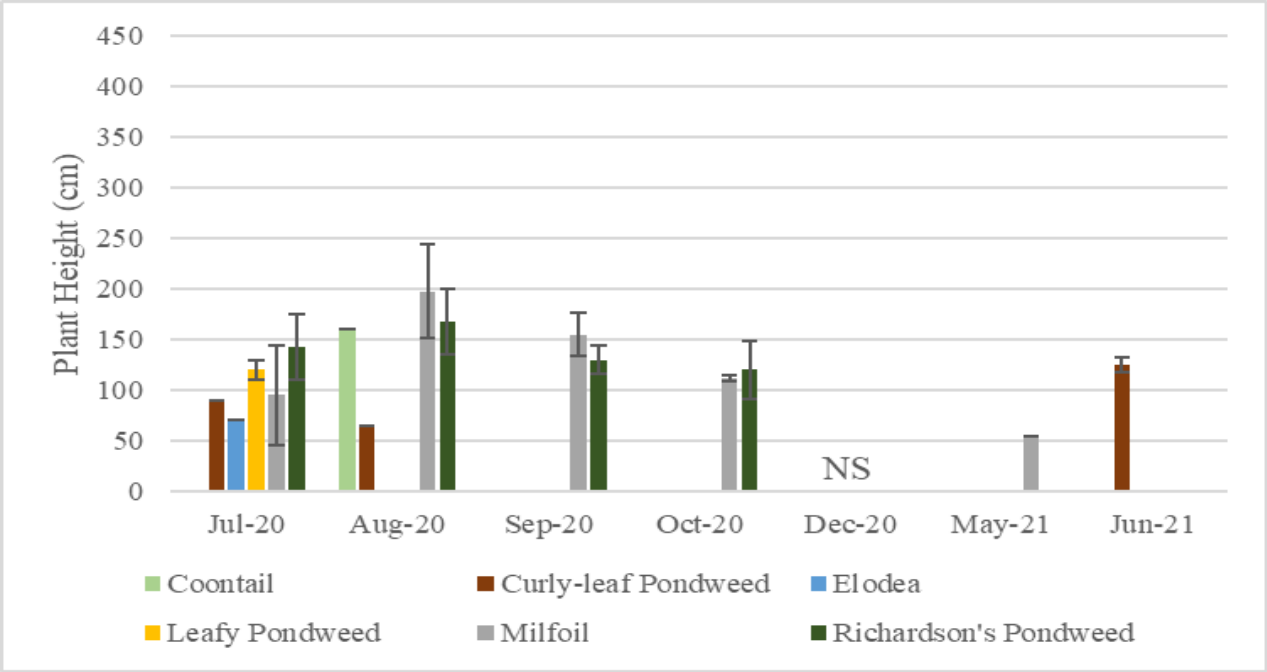


Figure 25 Plant Heights for TKPOA UNR Established Site (Tested 2019 Only)

3.2.1.3.3 Plant Biomass

To better measure the efficacy of UV-C light exposure, plant biomass was collected in the TKPOA Research Area 2019-2020 transects beginning 2020. Dried plant matter was averaged over 4 random quadrats (25 cm x 25 cm) along a transect line. Both the TKPOA Research Test and TKPOA UNR Established sites were subdivided after the 2019 testing year: half of the transect was tested in both 2019 and 2020 (i.e., UV Tested 2019+2020) and half was treated solely in 2019 (i.e., UV Tested 2019 Only) to then serve as the 1-year post-test untreated control in 2020.

In August 2020, TKPOA Reference transect was densely covered with coontail and deemed unsafe for divers to collect samples. Therefore, the average of the July and September 2020 data was used as a proxy. There was a distinct difference in biomass volume between the TKPOA Reference and the other sites due to the monoculture of coontail in the TKPOA Reference site. The subsection of TKPOA Research Tested site (UV Tested 2019+2020) initially had more biomass than the 2020 untested section. While the untreated section continued to increase, one month post-testing, the tested section saw a decline in plant biomass and 2 months post-testing there was no biomass. Results were similar in the TKPOA UNR Established site, although biomass was never fully eradicated post-testing.

The biomass for the TKPOA Reference, UV Tested 2019 Only and UV Tested 2019+2020 sites were compared with an analysis of variance and found to be significantly different. A Tukey-Kramer post hoc analysis was used to determine that the TKPOA Reference and Tested 2019+2020 sites were significantly different from each other, while the UV Tested 2019 Only site was not significantly different from the TKPOA Reference site or the UV Tested 2019+2020 site. The difference between tested and untested areas shows the distinct potential of UV-C light exposure to minimize generation of plant biomass. As less biomass is produced the first year following UV-C light exposure, continued exposure in coming years and for longer treatment times should results in less plant growth over time. We predict the less treatment that will be needed over the years unless there is a re-inoculation of the sediments with vegetative plant fragments or new introductions to the location. UV-C light treatment of vegetative growth will reduce production of turions, rhizomes, and other methods of reproduction or storage organs for winter survival, and as UV-C light treatment does not produce plant fragments, there will not be freely floating biomass adding to risk of recolonization.

Figure 26 graphs biomass measured for the TKPOA Research Area 2019-2020 sites for comparison of biomass over the July 2020 to June 021 period of record. Yellow lines mark UV-C testing. Error bars are standard deviation. All plant matter was collected in a 25 cm x 25 cm quadrat, dried and weighed. Data is expressed in grams dry weight per square meter (dry g/m^2). NS = Not Sampled: August was due to plant coverage creating hazardous conditions and December was due to ice coverage. Note that the August 2020 TKPOA Reference site sample (grey with black bars) is an average of the July and September samples, as the location in August was densely covered with coontail and deemed unsafe for divers to collect samples. No biomass was found in the September 2020 sample in the both the UV Tested sites. Only the UV Tested sites were accessible in December due to ice coverage.

Major findings include: 1) a significant depression in plant biomass 4 to 6 weeks after the initial UV-C light testing in 2020, which continues after the second UV-C light exposure; and 2) a significant depression in plant biomass following the 2019 testing (indicated in blue) that occurred late in the growing season, which is due to the UV-C light exposure or patch scale compositional variability in plants.

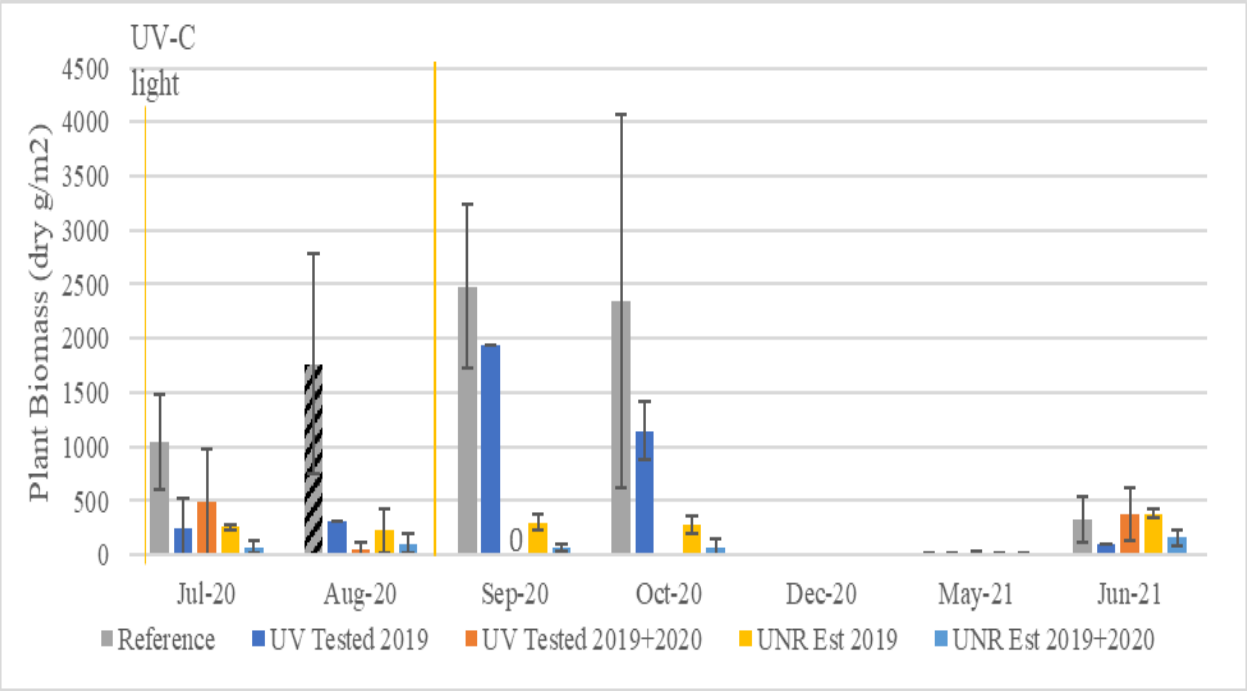


Figure 26 Biomass for TKPOA Research Area 2019-2020 Sites

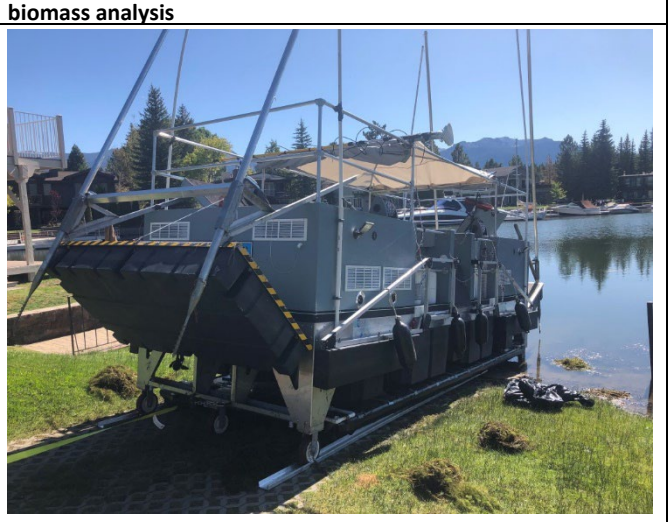
Table 18 Biomass for TKPOA Research Area 2019-2020 Sites (dry g/m^2)

Date	Reference	UV Tested 2019	UV Tested 2019+2020	UNR Established 2019	UNR Established 2019 + 2020
Jul-20	1045.0	250.2	491.2	260.2	73.1
Aug-20	NS	307.0	45.7	225.6	105.7
Sep-20	2481.9	1933.7	0.0	303.5	72.4
Oct-20	2346.4	1148.4	3.4	283.2	72.4
Dec-20	NS	2.3	0.2	NS	NS
May-21	12.8	16.5	16.5	15.4	17.3
Jun-21	330.3	102.1	373.9	384.7	162.4

Source: Appendix C

Photo Composite 3 is provided in support of the TKPOA Research Area 2019-2020 results for percent plant coverage, plant height and plant biomass that are discussed above. See **Appendix A.7** for additional photo documentation.

Photo Composite 3 TKPOA Research Area 2019-2020

Picture 51: 09192019 TKPOA Pre-testing 2019	**Picture 52: 09192019 TKPOA Weeds Collected for 2019 initial biomass analysis**
	
Picture 53: 09202019TKPOA Pre-testing 2019	**Picture 54: 09212019 TKPOA 2019 Vessel Inspection**

Picture 55: 09242019 TKPOA Pre-testing 2019, Plants green and viable

Picture 56: 09242019 TKPOA Pre-testing 2019

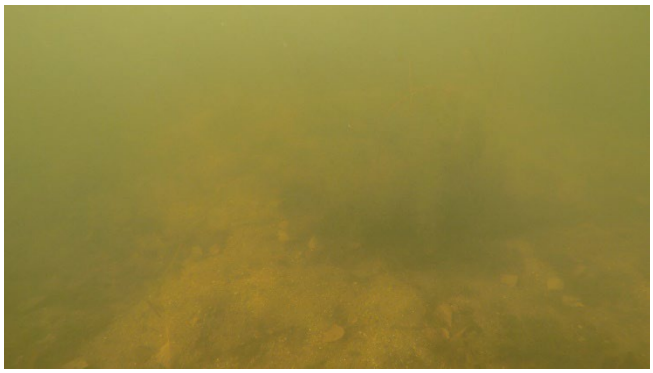
Picture 57: 09272019 TKPOA Pre-testing 2019, South Wall

Picture 58: 09262019 TKPOA Pre-testing 2019, South Wall

Picture 59: 09272019 TKPOA Pre-testing 2019, South Wall

Picture 60: 10142019 TKPOA Pre-testing 2019, South Wall

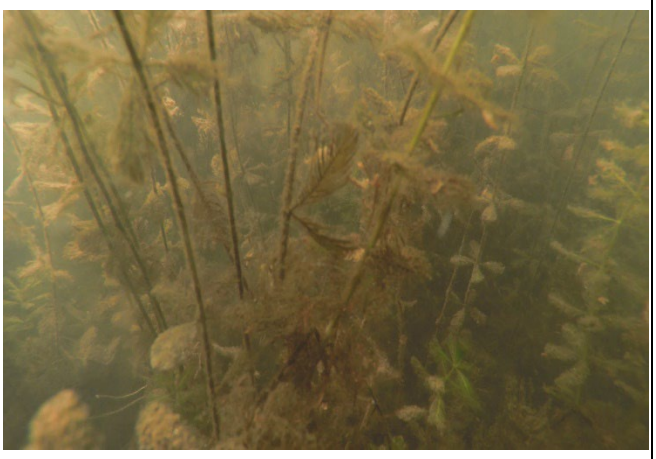
Picture 61: 11052019 TKPOA Post-testing 2019, Location at South Wall Marker 3



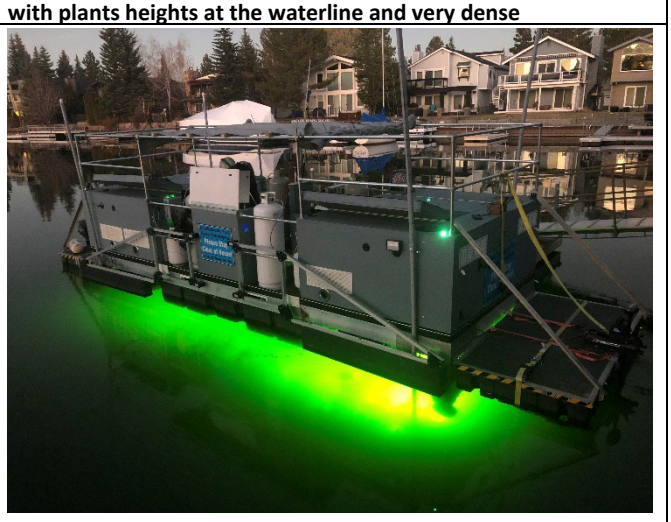
Picture 62: 11052019 TKPOA Post-testing 2019, Location at South Wall Marker 5

Picture 63: 11052019 TKPOA Post-testing 2019, Near Walkway with decomposing plants covered by sediment and leaf

Picture 64: 11052019 TKPOA Post-testing 2019, Untested Area with plants heights at the waterline and very dense

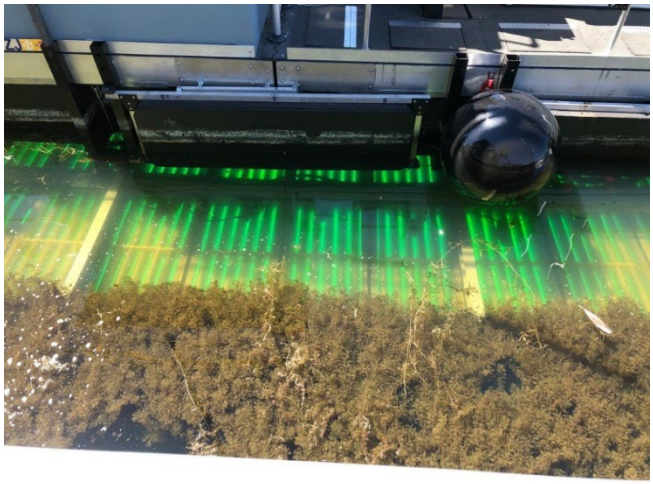


Picture 65: 11052019 TKPOA Post-testing, Plant condition of un-tested area shown in Picture 64

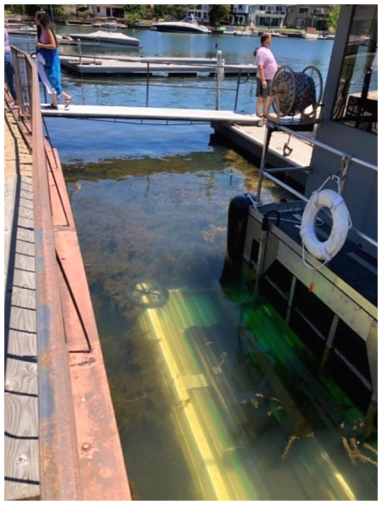


Picture 66: 11102019 TKPOA 2019 Vessel

Picture 67: 06292020 TKPOA Active-testing 2020, Working along a bulkhead



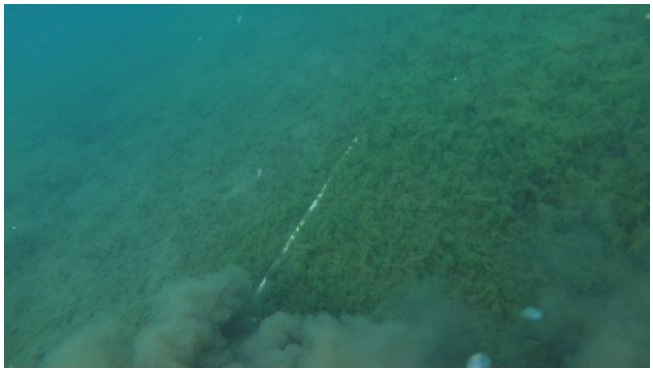
Picture 68: 06292020 TKPOA Active-testing 2020, Working along bulkheads



Picture 69: 07122020 TKPOA Active-testing 2020, Working under walkways

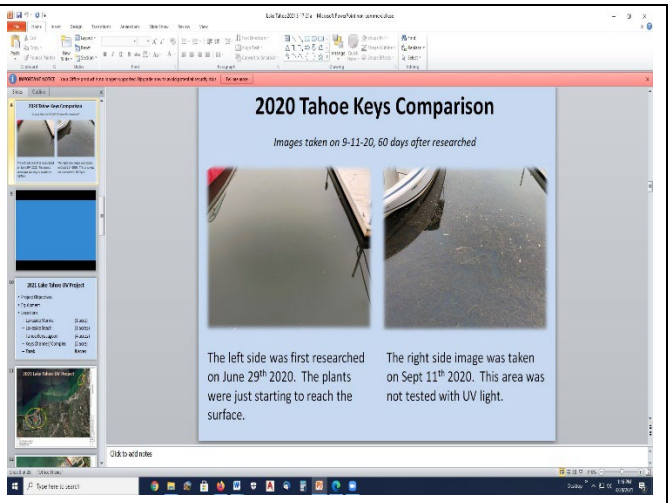
Picture 70: 07142020 TKPOA Active-testing 2020, Evening investigations during periods of calm water conditions

Picture 71: 07142020 TKPOA Active-testing 2020, Working in the evening outside of prime boating hours



Picture 72: 07282020 TKPOA 2020 Test Site showing density of plants within test grid (left) compared to untested area (right)

Picture 73: 08192020 TKPOA Post-testing 2020, Un-tested control (left) compared area tested for 15 minutes (right)



Picture 74: 09112020 TKPOA Pre-testing (June 29, 2020) compared to Post-testing (September 11, 2020) plant conditions

3.2.1.4 TKPOA Research Area, 2021

Observations and results reported for the TKPOA testing conducted in 2019-2020 informed the treatment plan implemented for the TKPOA Research Area 2021. The TKPOA Research Area 2019-2020 that was tested (**Figure 2**) was a smaller area and has fairly uniformed bathymetry and vertical bulkheads, while the TKPOA Research Area 2021 (**Figure 3**) that was treated was larger in size and has less uniformed bathymetry and shoreline development (e.g., sloped rock crib walls and in-water obstacles). Because of low water levels in 2021, portions of the rock crib walls were exposed and inaccessible to the 2021 UV-C light treatment vessel. Low water levels also prohibited treating under some docks, as those structures were at times lying on the bed substrates. As a result, the TKPOA Research Area 2021 that could be treated was reduced.

A total of approximately 458 hours of UV-C light treatment was applied. The following results for plant coverage and composition, plant height and biomass are based on UNR field and laboratory measurements for the actual treatment area and do not include portions of the TKPOA Research Area 2021 that were inaccessible and thus not exposure to UV-C light. Results are supported by **Appendix B**, *Utility of ultraviolet light to reduce aquatic plants in the Tahoe Keys (Lake Tahoe): Results from a large acreage pilot test project in 2021* (UNR 2021; Interim Report).

3.2.1.4.1 Plant Coverage and Composition

Initial pre-treatment sampling showed the plant community to consist of Curly-leaf pondweed (*Potamogeton crispus*), coontail (*Ceratophyllum demersum*), Elodea sp., leafy pondweed (*Potamogeton foliosus*), and Eurasian watermilfoil (*Myriophyllum* spicatum) (**Appendix B**; Figure 4: Percent Plant Coverage by Species). One plant of white water buttercup (*Ranunculus aquatilis*) was found in the shallow area of the TKPOA Harvested Reference during pre-treatment sampling (not shown in the figure).

The pre-treatment sampling showed the TKPOA UV Site 2 had significantly less bare area than the other two sites in both the shallow ($p=0.03$) and the deep ($p<0.001$). Pondweed dominates early in the season with an increase in presence of milfoil in the shallow areas and coontail in the shallow and deeper habitats. The deep transect had an increase of bare area earlier than the shallow areas, but still contained patches of coontail. Sprouted turions of Curly-leaf pondweed started to emerge in September 2021. Evidence of general plant species patchiness is seen in the variance of the percent coverage the deep sections in September, October, and November 2021, and the shallow sections in October and November 2021 have ranges from 0-100% for both coontail and bare.

In terms of the efficacy of UV-C light treatment in influencing plant composition, a difference of plant community types between the TKPOA UV treated sites and the TKPOA Harvested Reference Site was no observed, although the pre-treatment conditions for each site contained differences in the amount of bare (no plant cover). For example, TKPOA UV Site 2 started with 0% bare cover in the shallow and deep habitats. By the end of the treatments overall plant coverage was similar (not significantly different) between the TKPOA UV Site 2 and the TKPOA Harvested Reference.

3.2.1.4.2 Plant Height

As expected, pre-treatment plant heights differed by species due to the start of the growing conditions and the life history of the taxa (**Appendix B**; Figure 5: Plant Height) with no overall difference in plant heights between TKPOA UV sites and the TKPOA Harvested Reference. Over the course of the season, plants in the shallow depths were growing closer to the surface compared to plants in the deeper depths. Both depths showed a marked decrease in plant height over time which may be because of variable changes in light conditions in the watershed due to changes in light quality from the wildfires, changes in the seasons, or effects from the treatments. An evaluation of the UV-C post-treatment and mechanical harvest treatments indicates the plant heights were similar across taxa and between treatment methods, illustrating the UV-C light control method when employing 5 to 10 minute exposures is on par with mechanical harvesting in controlling plant height.

3.2.1.4.3 Plant Biomass

Biomass at the pretreatment locations were significantly higher in TKPOA UV Site 2 in both the shallow ($p=0.04$) and the deep ($p=0.01$) sections indicating the variability which can be found within the TKPOA water ways depending on the environmental conditions (**Appendix B**; Figure 6: Above Sediment Plant Biomass Collections using SCUBA divers).

The biomass did increase in all sites as the summer progressed and declined in November 2021 (fall season). Post-treatment evaluations throughout the summer indicated no differences between the TKPOA UV treated sites and the TKPOA Harvested Reference site. In addition, the treatment by UV-C in TKPOA UV Site 2, which had an initial pre-treatment condition with larger biomass, was reduced by the UV-C light treatment to similar conditions as the TKPOA Harvested Reference and TKPOA UV Site 1 by the end of summer. Results suggest that this is due to the treatment effect of UV-C light exposure, but also may be due to the highly dynamic conditions experienced by the environment due to the 2021 Caldor Fire wildfire smoke and changing lake conditions.

Photo Composite 4 is provided in support of the TKPOA Research Area 2021 results for percent plant coverage and composition, plant height and plant biomass that are summarized above. See **Appendix A.7** for additional photo documentation. Refer to **Appendix B**, Figure 3 presenting: TKPOA UV Site 1 on July 6, 2021, pre-treatment (Photos A and B); TKPOA UV Site 1 on September 27, 2021, 8 weeks post-first treatment (Photos C and D); TKPOA UV Site 2 on July 6, 2021, pre-treatment (Photos E and F); and TKPOA UV Site 2 on September 27, 2021, 11 weeks post-first treatment (Photos G and H).

Photo Composite 4 TKPOA Research Area 2021

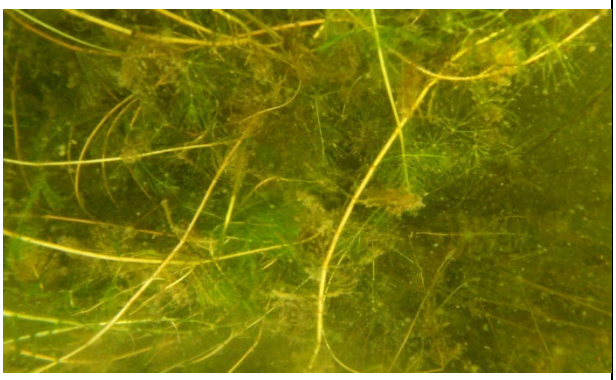
Picture 75: 07062021 TKPOA 2021 Site UV-1 (Cove 23) Pre-Treatment

Picture 76: 07062021 TKPOA 2021 Site UV-1 (Cove 23) Pre-Treatment

Picture 77: 09272021 TKPOA 2021 Site UV-1 (Cover 23) Post-Treatment

Picture 78: 09272021 TKPOA 2021 Site UV-1 (Cove 23) Post-Treatment

Picture 79: 07062021 TKPOA 2021 Site UV-2 (Cove 24) Pre-treatment



Picture 80: 07062021 TKPOA 2021 Site UV-2 (Cove 24) Pre-treatment

Picture 81: 09272021 TKPOA 2021 Site UV-2 (Cove 24) Post-Treatment	**Picture 82: 09272021 TKPOA 2021 Site UV-2 (Cove 24) Post-Treatment**

3.2.2 Plant Tissue Chlorophyll-a

Chl-*a* in plant tissue is relatively stable throughout the season, but there is high variability within individual plants. No loss of chlorophyll was seen after testing, but plants or parts of plants that had decayed post treatment were not able to be collected for analysis. The measurement of chlorophyll *a* in the treated tissues may not be the best measure of treatment success. The concentration of pheophytin-*a* was subtracted from the concentration of chlorophyll *a,* thus any negative corrected values are indicative of decay. Because of the high number of samples analyzed, only two representative species are shown in the figures below: a native species (Leafy pondweed) and a species of concern (Curly-leaf pondweed). All other data is presented in **Appendix D.**

Figure 27 and Figure 28 presents plant tissue chl-*a* measured for Leafy Pondweed and Curly-leaf pondweed at Lakeside Beach and Lakeside Marina, respectively. Yellow bars are dates of UV-C treatment. Chl-*a* values are corrected for the concentration of pheophytin-*a.*

Figure 29 and **Figure 30** present plant tissue chl-*a* measured for Leafy Pondweed and Curly-leaf pondweed at TKPOA Research Reference site and TKPOA Test site, respectively. Yellow bars are dates of UV-C treatment. Chl-*a* values are corrected for the concentration of pheophytin-*a.*

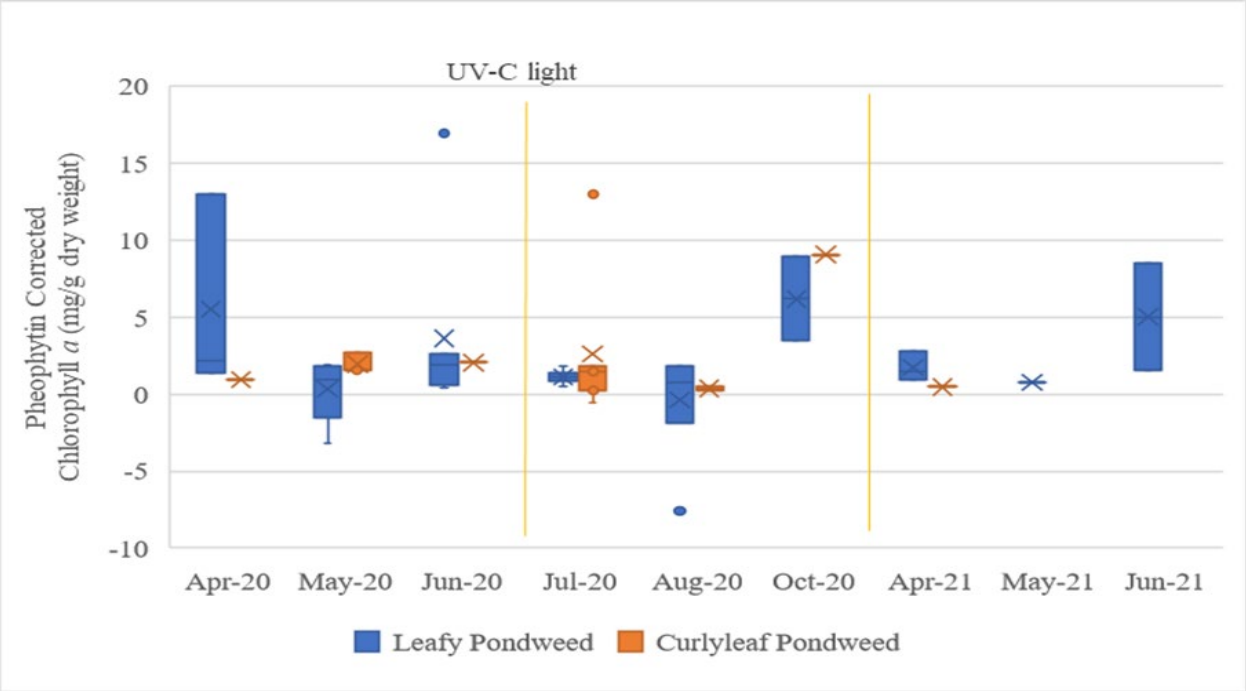


Figure 27 Plant Tissue Chlorophyll-*a*, Lakeside Beach

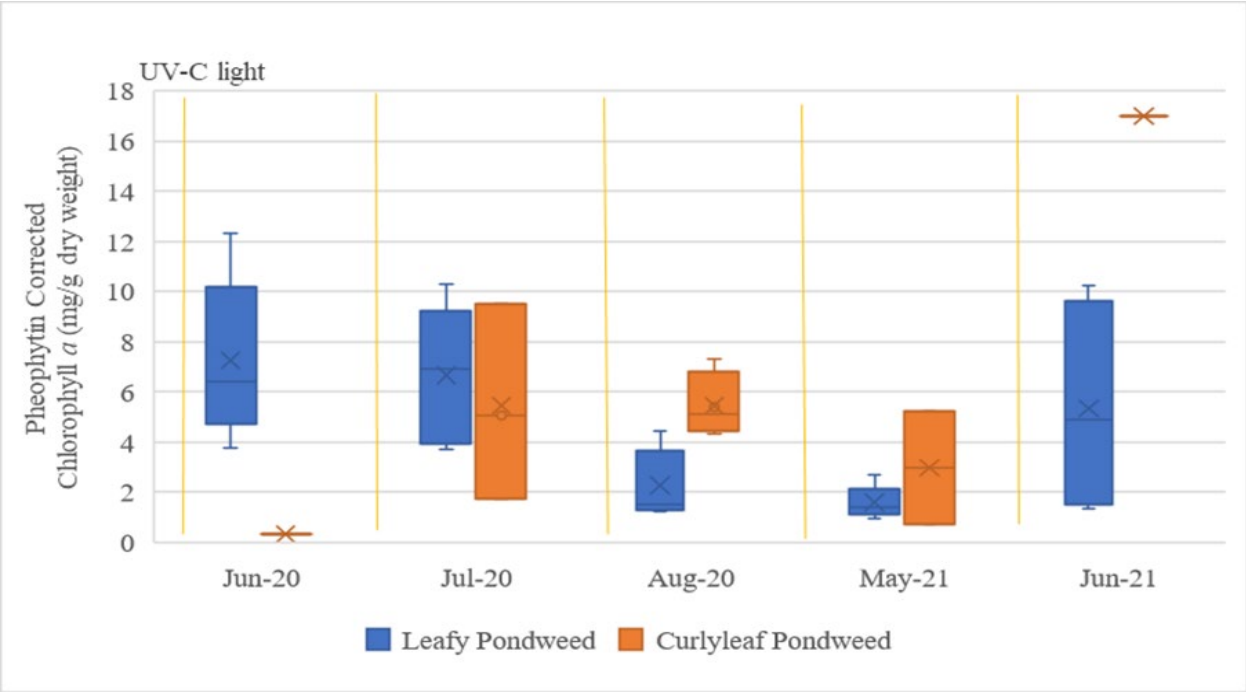


Figure 28 Plant Tissue Chlorophyll-*a, Lakeside Marina*

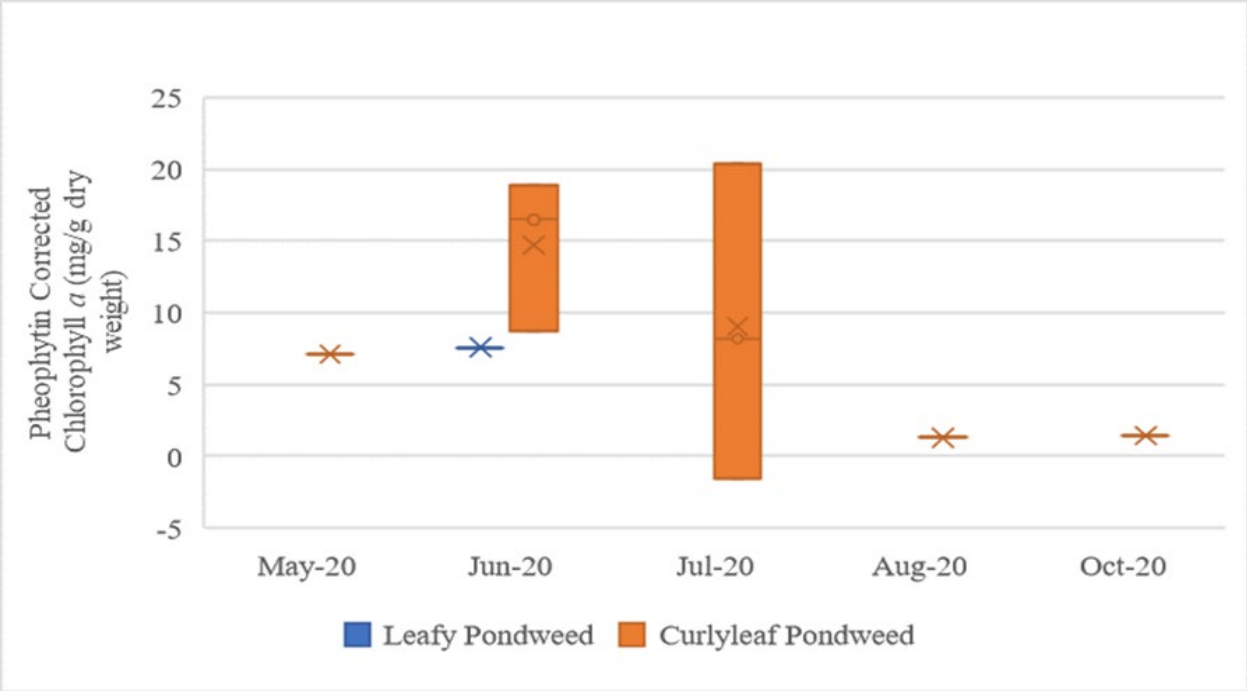


Figure 29 Plant Tissue Chlorophyll-*a, TKPOA Research Area Reference Site*

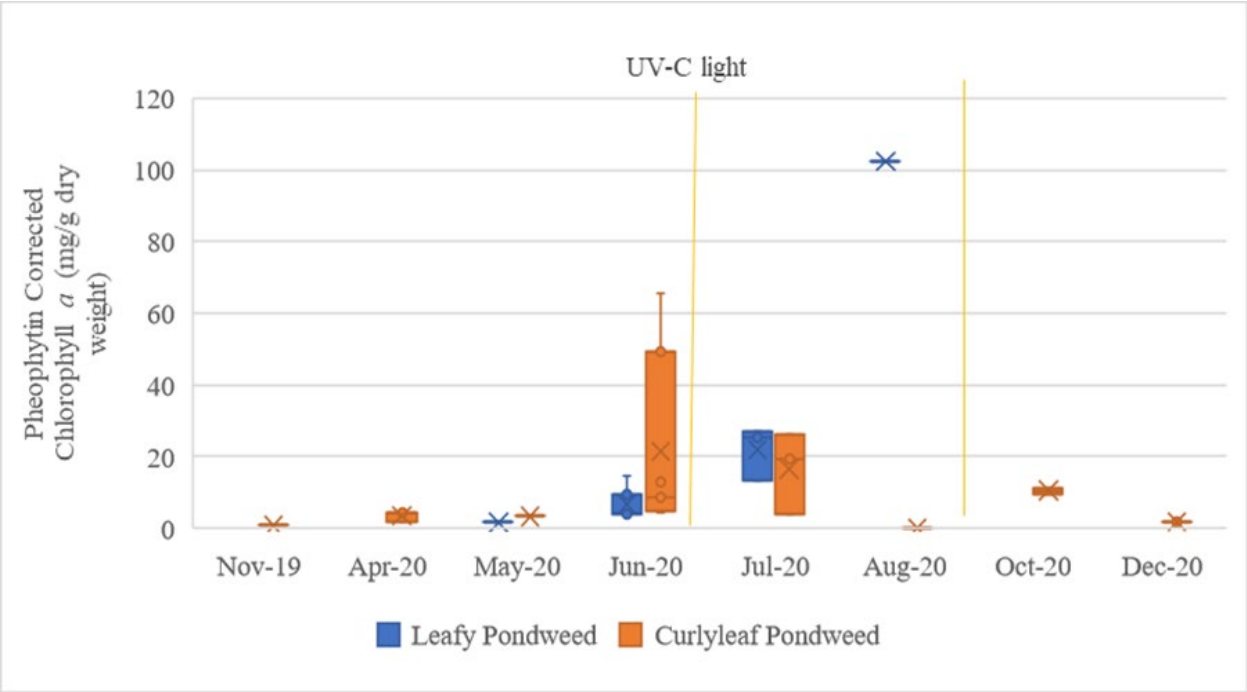


Figure 30 Plant Tissue Chlorophyll-*a, TKPOA Research Area Test Site*

3.2.3 Plant Tissue Nitrogen

Nitrogen in plant tissue is relatively stable throughout the season, but there is high variability within individual plants. No loss of nitrogen was seen after testing, but plants or parts of plants that had decayed post treatment were not able to be collected for analysis. The measurement of nitrogen in the treated tissues may not be the best measure of treatment success. There is generally a higher concentration of nitrogen found in the more organic sediments in the Lakeside Marina and TKPOA Research Area sites. By treating

the plants early before biomass is produced, less nitrogen may be cycled into the water column from the sediment through plant uptake and subsequent decay. Because of the high number of samples analyzed, only two representative species are shown in the figures below: a native species (Leafy pondweed) and a species of concern (Curly-leaf pondweed). All other data is presented in **Appendix D.**

Figure 31 and **Figure 32** present plant tissue nitrogen for Leafy Pondweed and Curly-leaf pondweed at Lakeside Beach and Lakeside Marina, respectively. Yellow bars are dates of UV-C treatment.

Figure 32 and **Figure 33** present plant tissue nitrogen for Leafy Pondweed and Curly-leaf pondweed for the TKPOA Research Area Reference site and TKPOA Test site. Yellow bars are dates of UV-C treatment.

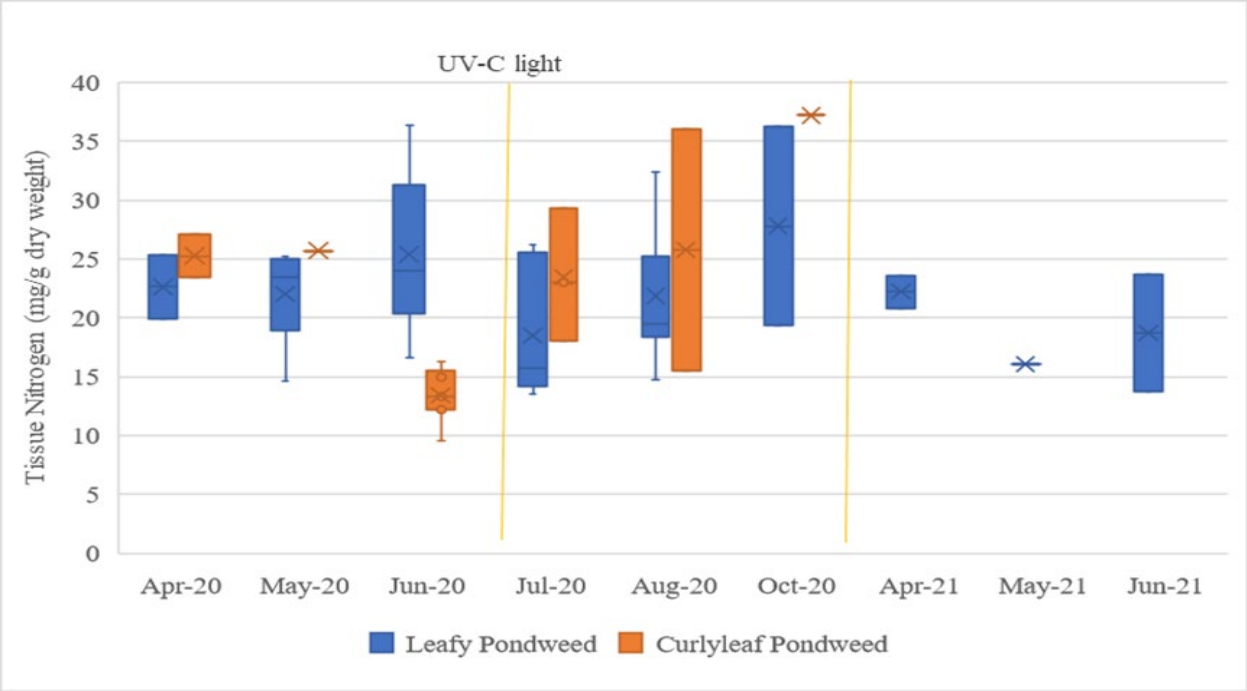


Figure 31 Plant Tissue Nitrogen for Leafy Pondweed and Curly leaf pondweed, Lakeside Beach

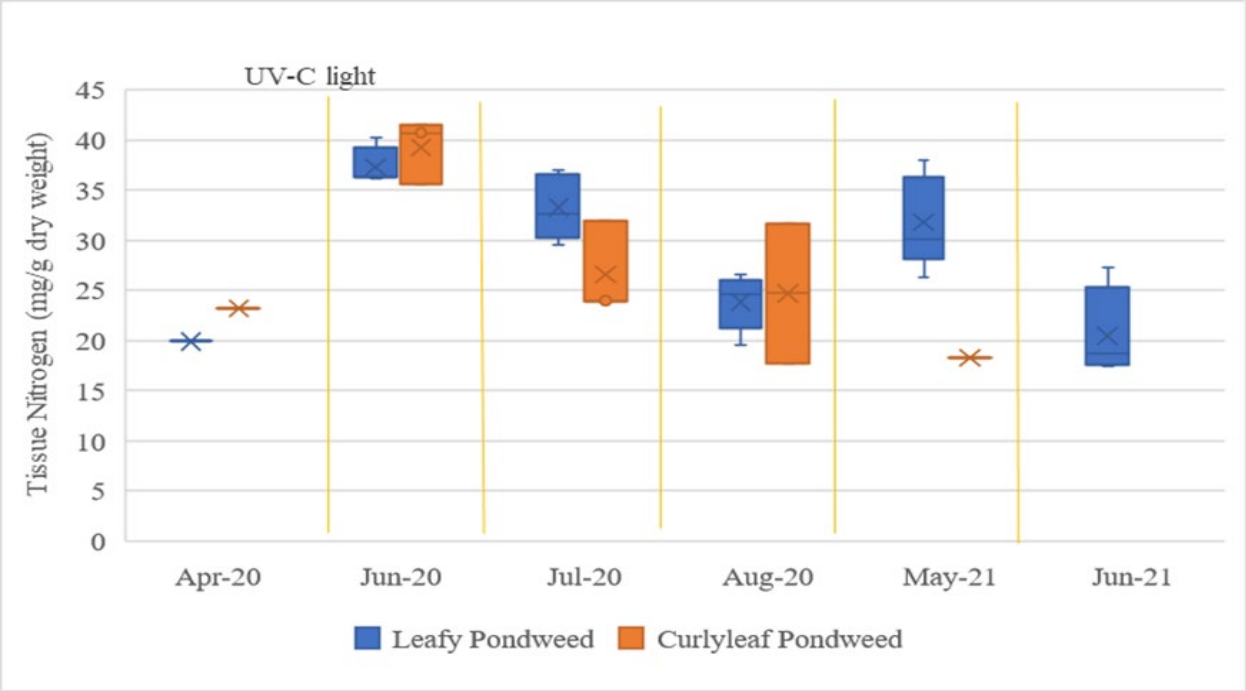


Figure 32 Plant Tissue Nitrogen for Leafy Pondweed and Curly-leaf pondweed, Lakeside Marina

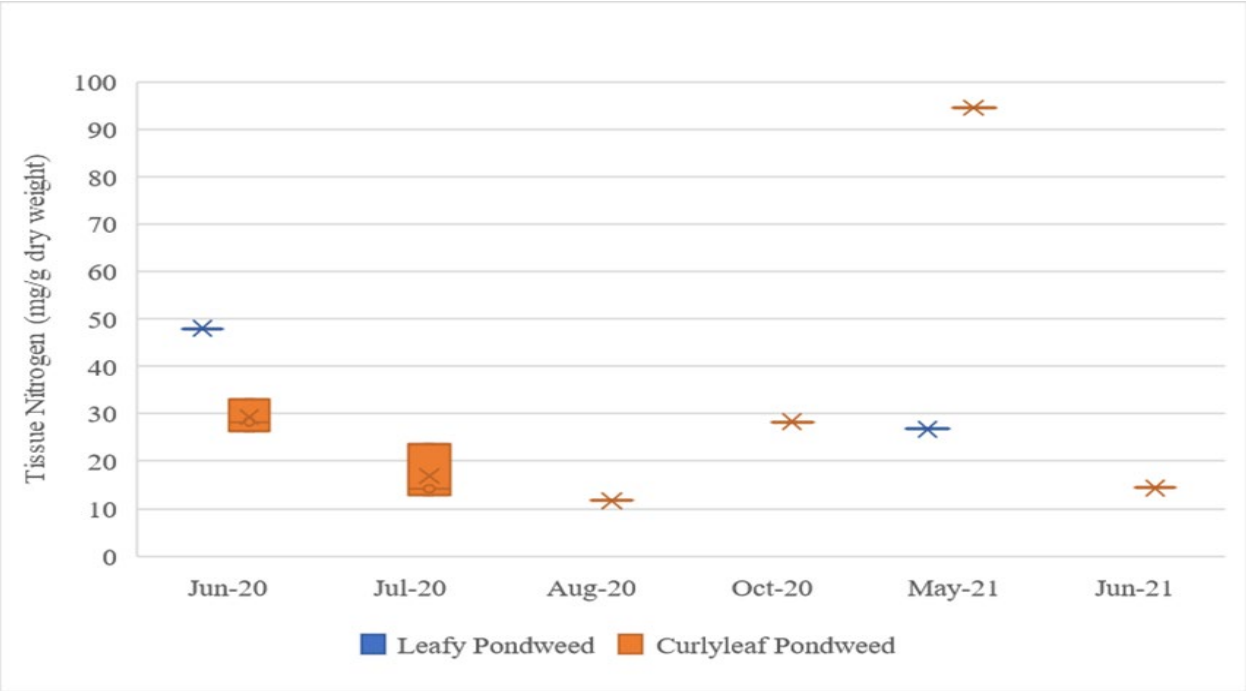


Figure 32 Plant Tissue Nitrogen for Leafy Pondweed and Curly-leaf pondweed, TKPOA Reference Site

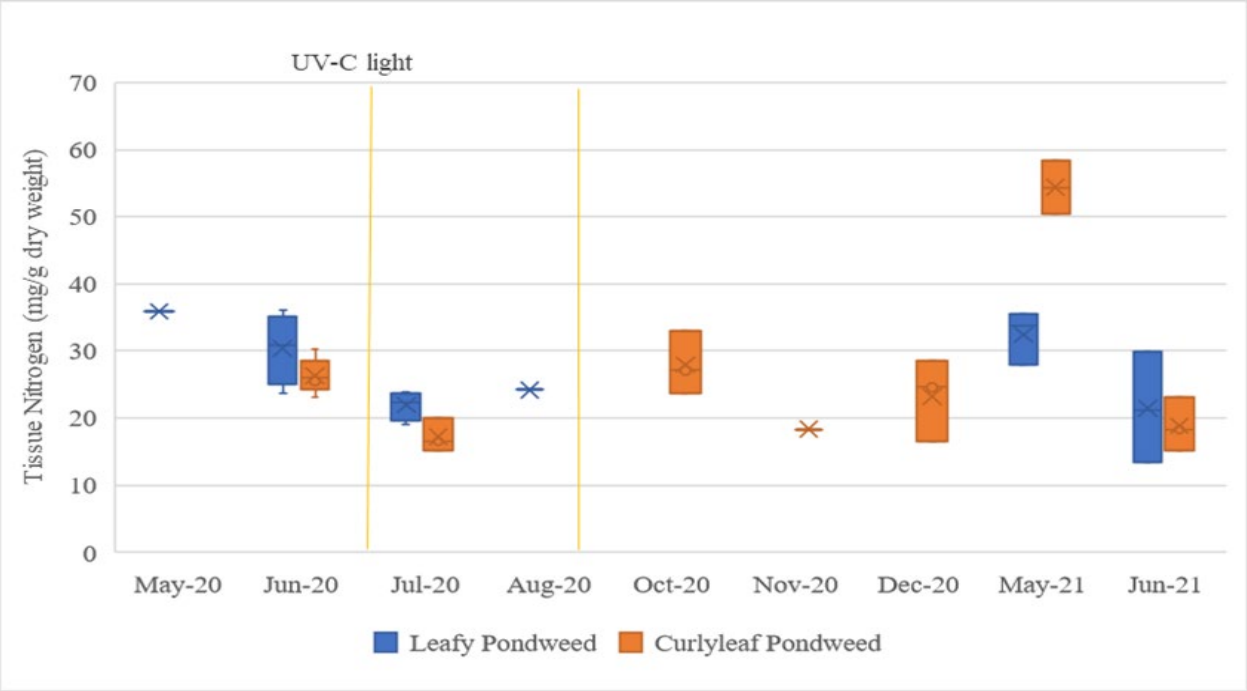


Figure 33 Plant Tissue Nitrogen for Leafy Pondweed and Curly-leaf pondweed, TKPOA Research Test Site

3.2.4 Plant Tissue Carbon

Carbon in plant tissue is relatively stable throughout the season, but there is high variability within individual plants. No loss of carbon was seen after testing, but plants or parts of plants that had decayed post treatment were not able to be collected for analysis. The measurement of carbon in the treated tissues may not be the best measure of treatment success. There is generally a higher concentration of carbon found in the plants at Lakeside Beach. This is to be expected, as there is less organic matter at this location, leading to less nitrogen and therefore, a higher ratio of carbon. By treating the plants early before biomass is produced, there will be less decaying biomass producing less dissolved organic carbon, which may improve water clarity and dissolved oxygen over time. Because of the high number of samples analyzed, only two representative species are shown in the figures below: a native species (Leafy pondweed) and a species of concern (Curly-leaf pondweed). All other data is presented in **Appendix D.**

Figure 34 and **Figure 35** present plant tissue carbon for Leafy Pondweed and Curly-leaf pondweed at Lakeside Beach and Lakeside Marina, respectively. Yellow bars are dates of UV-C treatment.

Figure 36 and **Figure 37** present plant tissue carbon for Leafy Pondweed and Curly-leaf pondweed at the TKPOA Research Area TKPOA Reference Site and Test Site, respectively.

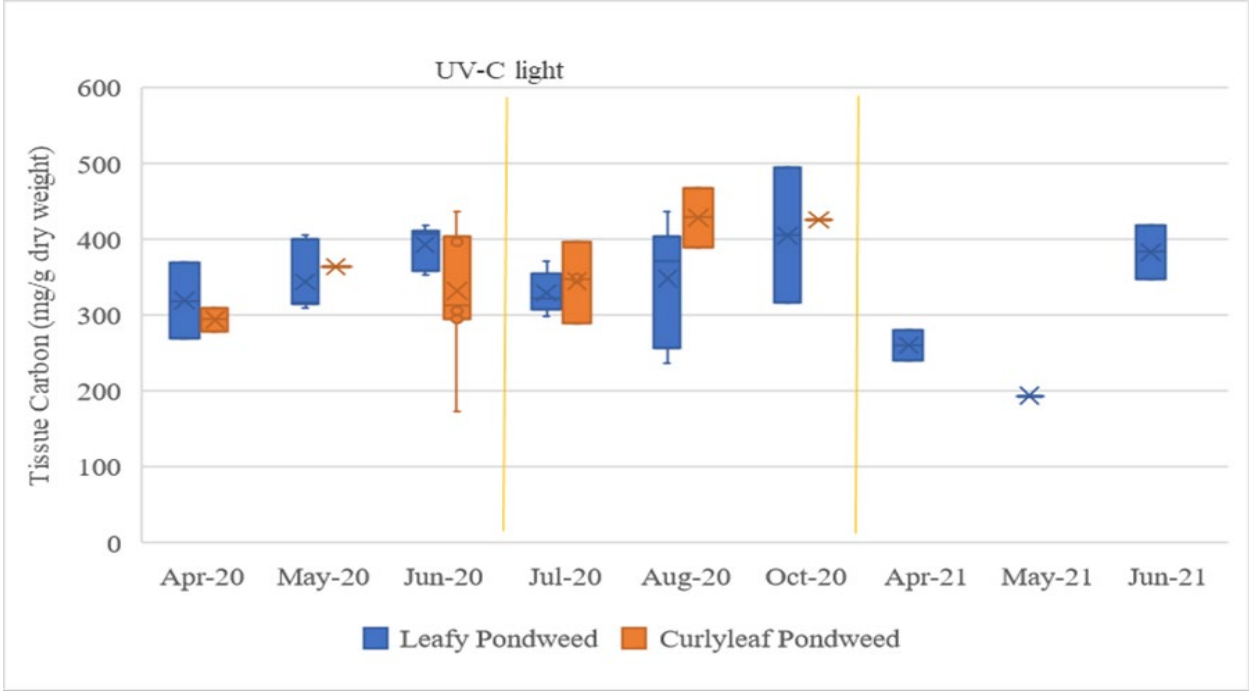


Figure 34 Plant Tissue Carbon for Leafy Pondweed and Curly leaf Pondweed, Lakeside Beach

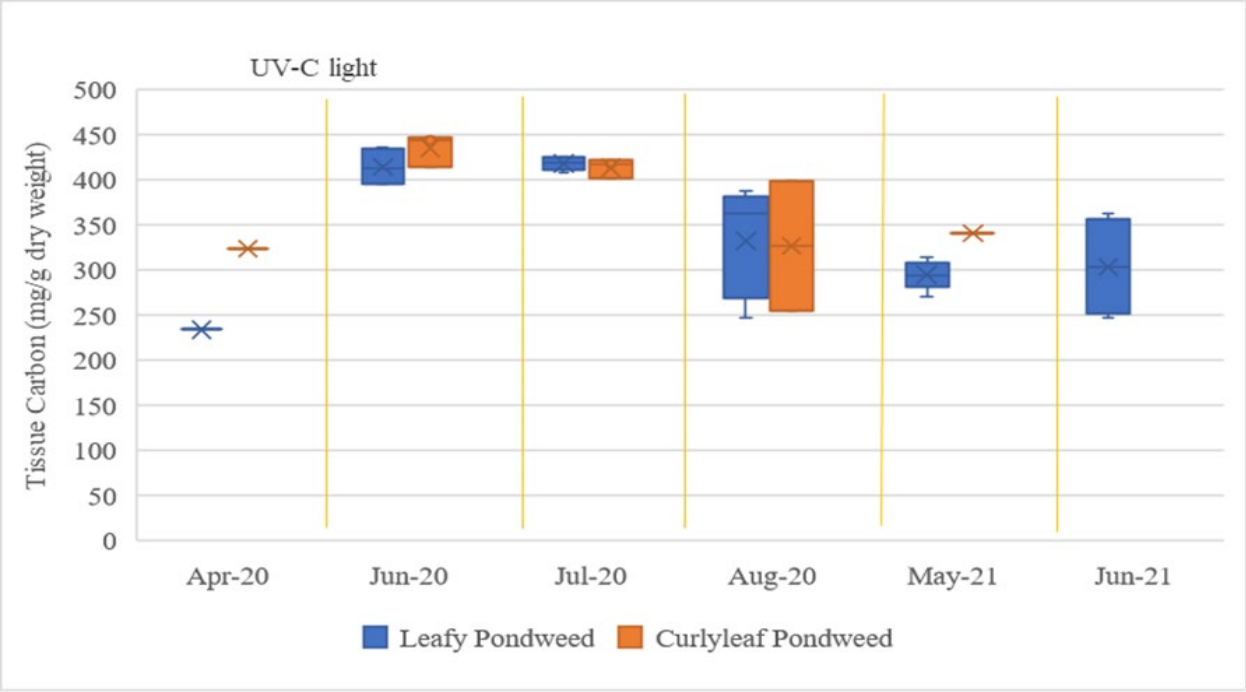


Figure 35 Plant tissue Carbon for Leafy Pondweed and Curly leaf Pondweed, Lakeside Marina

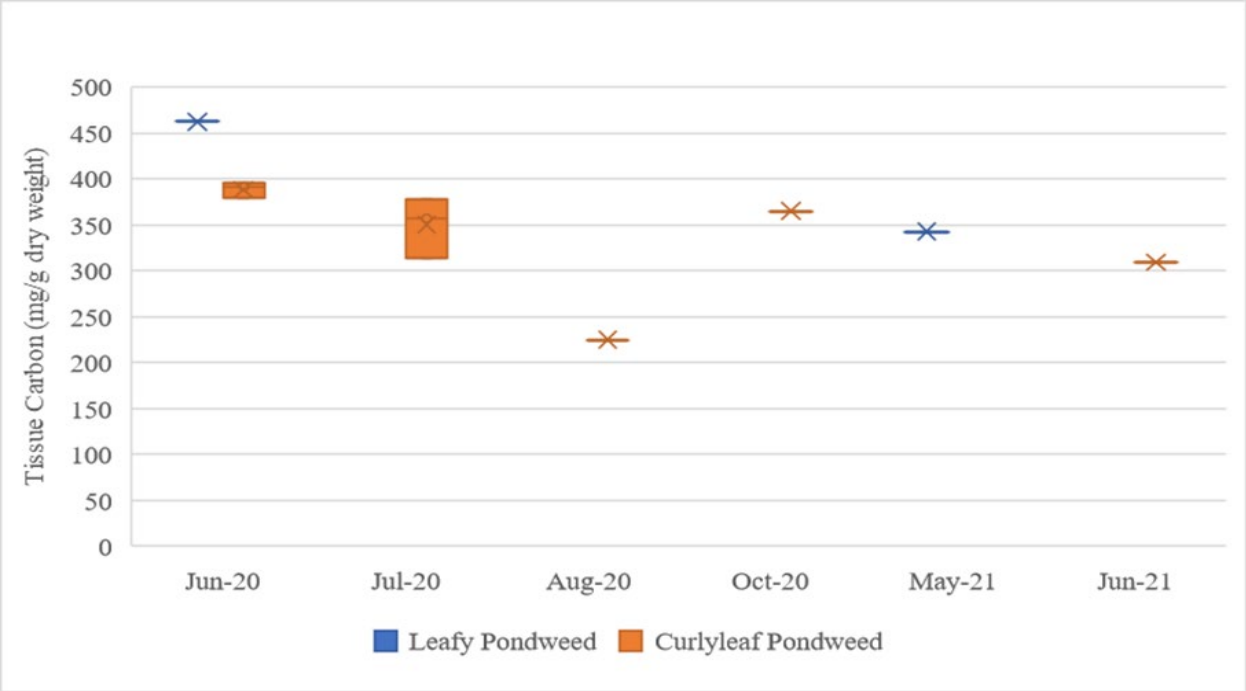


Figure 36 Plant Tissue Carbon for Leafy Pondweed and Curly leaf Pondweed, TKPOA Reference Site

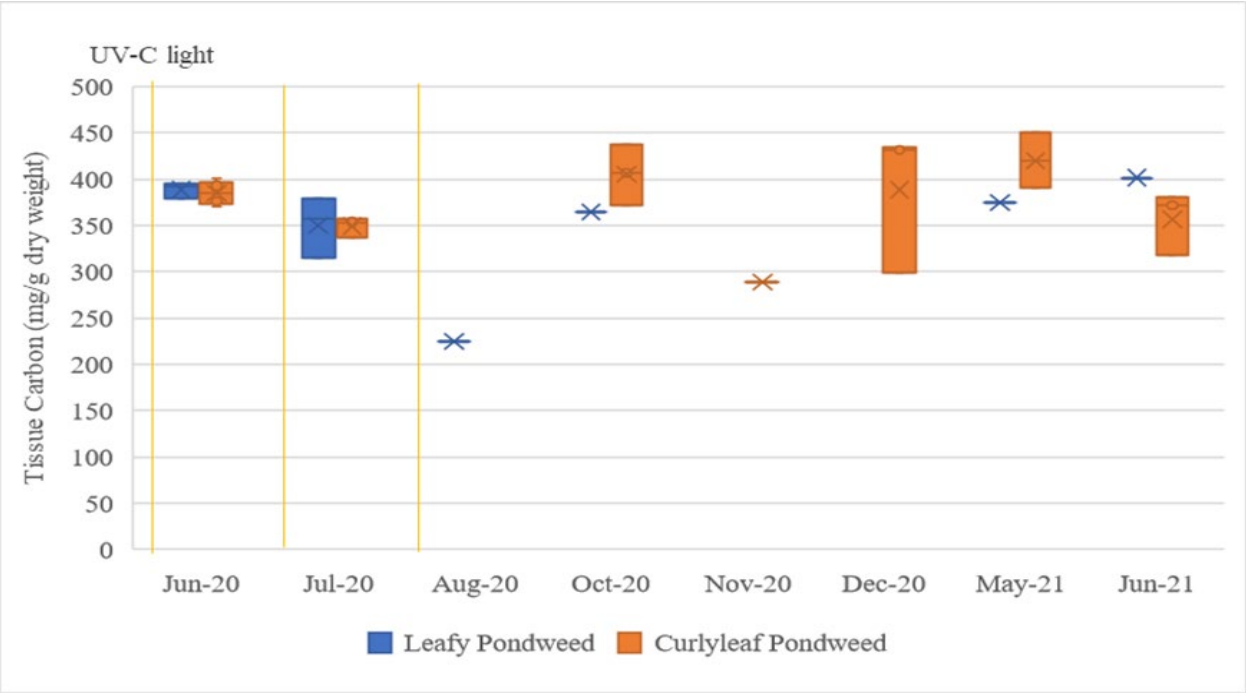


Figure 37 Plant Tissue Carbon for Leafy Pondweed and Curly leaf Pondweed, TKPOA Research Test Site

3.3 Turion Counts, Survival and Mortality

Refer to **Appendix A.5** for quarterly reporting of turion observations and additional information on turion sampling efforts at all sites.

3.3.1 Lakeside Beach Treatment Area

No turions were seen on the sediment surface at Lakeside Beach, and no Curly-leaf pondweed plants were seen with immature turions developing. Treatment suppressed the growth of plants at the beach and plant heights remained stunted. Lakeside Beach had a maximum of 1.7% Curly-leaf pondweed and because the density was initially low, it is difficult to determine any changes incurred by UV-C treatment in this location. There were newly sprouted Curly-leaf pondweed turions seen in 2021 after no developing turions were seen in 2020, and it is unknown if the sprouted turions were from the historic seed bank or washed in from another location of the lake body.

3.3.2 Lakeside Marina Treatment Area

Turions were not visible on the surface of the soft organic sediment and immature turions were not tabulated in situ. Although the turions themselves could not be counted at Lakeside Marina, the decline in the percent Curly-leaf pondweed the year following treatment shows the effects of treatment on turion density. Lakeside Marina had a 16% decrease in Curly-leaf pondweed from 2020 to 2021.

3.3.3 TKPOA Research Area, 2019-2020

Turions were not visible laying on the sediment surface; they can easily sink into the soft organic sediment. During the May-June 2020 time period turions were observed to be forming on mature plants in the TKPOA Research Area. Plants were collected in a 25 cm x 25 cm quadrat and any forming turions were collected. All turions attached to plants were counted for each quadrat and are enumerated in **Table 14** below. Only one quadrat was collected at the TKPOA Research Test 2019 only site, as it appeared that half of the transect had been raked or pulled by an outside entity. The normal two quadrats were collected at the section of the TKPOA Research Test site that had been treated in 2019 and 2020. There were no turions found in the TKPOA Reference Site, and only one of the four quadrats collected contained Curly-leaf pondweed.

It is evident that plants sprouting post-treatment are capable of producing turions. As these samples were collected prior to treatment in 2020, it shows how imperative it is to treat Curly-leaf pondweed as it is setting turions. Laboratory studies have shown that immature turions (not naturally shed by the parent plant) have low germination rates and UV-C treatment does not inhibit germination of mature, unsprouted turions. Thus, treating the Curly-leaf pondweed before turions reach maturity is key to reducing the future Curly-leaf pondweed population. As turions remain viable for many years, and turions can be transported into the TKPOA Research Area tested areas, it is difficult to determine if there is a long-term decrease in turion production in the tested areas. Although turion numbers were not able to be measured directly, the density of sprouts and mature plants one year post treatment shows a decline in the number of viable turions after UV-C treatment. TKPOA Research Tested and UNR Established sites had an annual decrease (2020 to 2021) in Curly-leaf pondweed of 26.6% and 18.8%, respectively, while the Reference site had a 3% increase for the same time period.

Table 19 Number of Turions collected per m^2, TKPOA Research Area 2020

Date	Location	# of Turions/m^2
May 4, 2020	Tahoe Keys UNR Established	4
June 30, 2020	Tahoe Keys Research Test (2019 only)	28
	Tahoe Keys Research Test (2019+2020)	16, 60
	Tahoe Keys UNR Established	24, 76, 32, 8

Source: Appendix C

3.3.4 TKPOA Research Area, 2021

Turion counts were not collected at the TKPOA Research Area in 2021.

3.4 Benthic Macroinvertebrates

Appendix E contains BMI source data. Benthic samples were collected as described in Section 2.3.6 and on dates presented in **Table 5**.

3.4.1 Lakeside Beach Treatment Area

BMI samples were collected 5 to 10 days before pre-treatment and post-treatment. The Lakeside Beach treatment area had the highest and most diverse population of all sample locations. The open water and sandy substrate produce increased recruitment. Initial reaction to UV-C treatment was an increased abundance of BMI. The initial decay of plant matter may have stimulated invertebrate recruitment by enhancing the available food source. This is illustrated when comparing the November 2019 treated and untreated samples with the October 2019 sample; the October 2019 and November 2019 untreated sample were very similar in size and composition while the November 2019 treated sample was over twice as numerous, with the majority being oligochaetes mobile decomposers.

After a few months the BMI population crashed, which may be due to depletion of the food source or decomposition leading to localized hypoxia. No BMI were found in the October 2020 sample, four months after the first UV-C treatment. This is a temporary loss of invertebrate population, as the December 2020 sample showed the BMI population had rebounded significantly and Lakeside Beach treatment area presented the highest population of all samples collected.

The community composition did experience changes post-treatment. There was a general decrease in sphaerids and chironomids and an increase of oligochaets. It is unknown if this change was due to natural growth cycles or UV-C light treatment effects. Besides being the most numerous sample, the December 2020 sample was also the most diverse sample, and although the majority of individuals were oligochaets, there was an increase in sphaerids.

Figure 38 presents abundance of benthic macroinvertebrates by Order at Lakeside Beach. Yellow lines are dates of exposure to UV-C light. NS signifies dates that were not sampled due to benthic barrier mats. November 2019 was sampled during treatment; therefore, 2 samples were taken, one that had been exposed to UV-C light and one that had not. **Table 20** identifies counts of BMI identified to Order, in a 1 m^2 sample from Lakeside Beach.

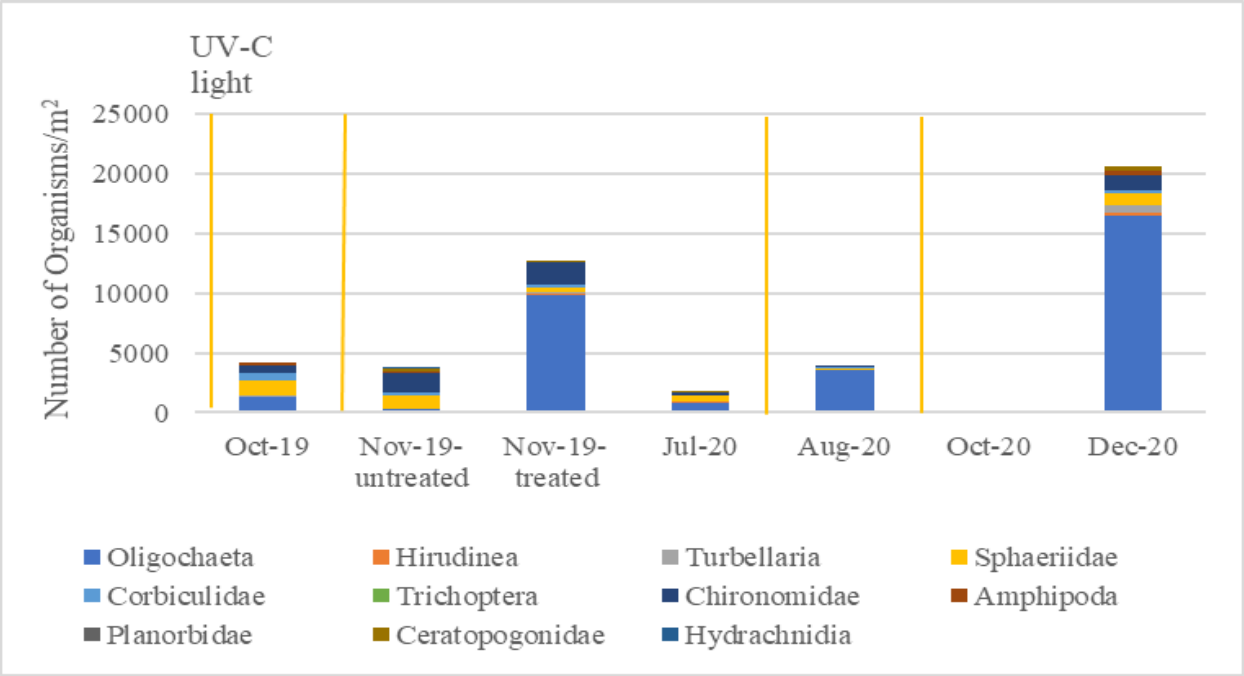


Figure 38 Abundance of BMI by Order, Lakeside Beach

Table 20 Counts of BMI identified to Order, in a 1 m^2 sample, Lakeside Beach

Date	Oligochaeta	Hirudinea	Turbellaria	Sphaeriidae	Corbiculidae	Trichoptera	Chironomidae	Amphipoda	Planorbidae	Ceratopogonidae	Hydrachnidia
Oct-19	1,261	43	87	1,261	696	0	652	217	0	0	0
Nov-19 (untreated)	304	0	0	1,087	348	0	1,522	174	0	217	87
Nov-19 (treated)	9,826	174	43	478	174	0	1,870	87	0	87	0
Jul-20	870	43	0	565	0	0	174	0	0	130	0
Aug-20	3,565	43	0	87	87	43	87	0	0	0	0
Oct-20	0	0	0	0	0	0	0	0	0	0	0
Dec-20	16,522	174	696	957	261	0	1,261	435	0	304	0

Source: Appendix E

3.4.2 Lakeside Marina Treatment Area

In 2019 and the start of 2020, a portion of the UNR transect established for the Lakeside Marina treatment area sampling that was covered with benthic barrier mats prior to the initiation of this test. Therefore, sampling for BMI was completed once mats were removed in 2020. It is unknown how the benthic mats effected the BMI community, as the Pilot Project can only report post-treatment results for this site. Comparison with historical data may elucidate any changes to the BMI community incurred by the benthic barrier control method.

Lakeside Marina has more organic sediment than the Lakeside Beach treatment area, and also more plant biomass contributing to the organic matter in the bed sediments. The majority of invertebrates found in all samples were oligochaetes, which are possibly attracted to the marina substrates by the high organic matter. Similar to Lakeside Beach, the Lakeside Marina had an increase in BMI population counts immediate post-treatment, then a sharp decline four months post-treatment, and an increase in population in December 2020. The December 2020 sample contained the highest number of individuals.

Figure 39 presents abundance of benthic macroinvertebrates by Order at Lakeside Marina. Yellow lines are dates of exposure to UV-C light. NS signifies dates that were not sampled due to benthic barrier mats. **Table 21** identifies counts of BMI identified to Order, in a 1 m^2 sample from Lakeside Marina.

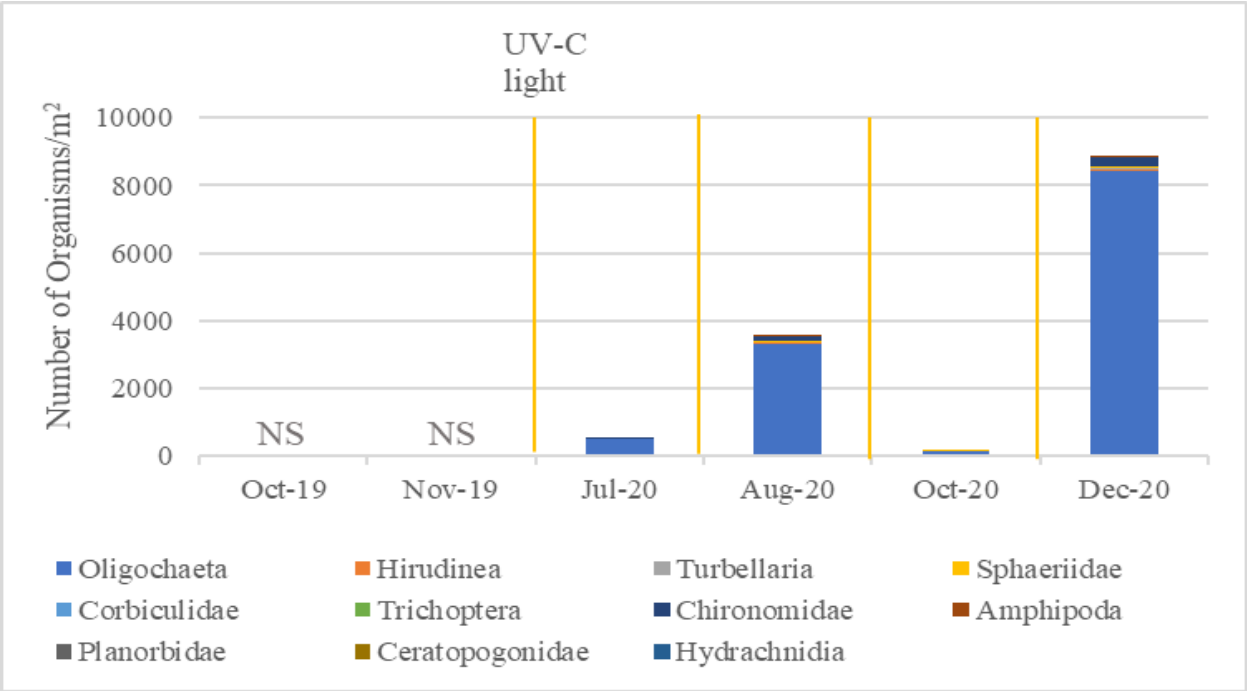


Figure 39 Abundance of BMI by Order, Lakeside Marina

Table 21 Counts of BMI identified to Order, in a 1 m^2 sample, Lakeside Marina

Date	Oligochaeta	Hirudinea	Turbellaria	Sphaeriidae	Corbiculidae	Trichoptera	Chironomidae	Amphipoda	Planorbidae	Ceratopogonidae	Hydrachnidia
Oct-19	Not sampled due to benthic barrier mats.										
Nov-19											
Jul-20	478	0	0	0	0	0	43	0	0	0	0
Aug-20	3,304	43	0	43	0	0	130	43	0	0	0
Oct-20	130	0	0	43	0	0	0	0	0	0	0
Dec-20	8,435	43	43	43	0	0	261	43	0	0	0

Source: Appendix E

3.4.3 TKPOA Research Area 2019-2020

The TKPOA Research Area 2019-2020 sites have a higher organic content, warmer water temperatures, and are more prone to hypoxic conditions near the sediment. Unfortunately, the TKPOA Reference site was so dense with coontail the sediment was inaccessible and the petite ponar used for sample collection could not penetrate the mat of coontail at the sediment surface. For future sampling endeavors, care should be used to remove coontail from a small area prior to sampling. Samples at the TKPOA Research Test and TKPOA UNR Established sites were collected from areas that were actively being tested, but not the one-year post-testing control subsections.

The TKPOA Research Test site had an initial post-test increase of invertebrates, mostly oligochaetes, and a decline in counts the following month, and then no individuals were found 2 months after treatment. There was a rebounding of the BMI population 4 months after the second testing. The TKPOA UNR Established site is shallower than the Research Test site and has a sandier sediment; thus, this area had a more diverse BMI community composition and higher individual counts in each sample than the other TKPOA Research Area 2019-2020 sites. The TKPOA UNR Established site also demonstrated similar results post-test: initial population increase, followed by overall population decline with the population rebounding. However, in the TKPOA UNR Established site, the BMI population never decreased to 0 and recovered much sooner than the TKPOA Research Test site. This may be due to hypoxic conditions post treatment in the Research Test site driving the macroinvertebrate community dynamics.

Future studies should determine pore water oxygen levels over the summer and have a more comparable control section. We are confident changes in the BMI community are transitory and generally begin to stabilize once UV-C light exposure is completed. With long-term treatment there may be an overall loss of population size as plant biomass is decreased overtime because of a coupled decrease in food source for decomposers. With a general decrease in biomass, there may be decreased hypoxia leading to a more stable BMI population.

Figure 40, Figure 41 and Figure 42 present abundance of BMI by Order at TKPOA Research Area Reference, Research Test, and UNR Established sites, respectively. Yellow lines are dates of exposure to UV-C light. NS signifies dates not sampled. July, August, and September 2020 samples were not able to be collected at the TKPOA Reference site due to heavy plant growth and in December 2020 at the TKPOA Tested site due to ice cover. **Table 22, Table 23 and Table 34** describe counts of BMI identified to Order, in a 1-m^2 sample from the TKPOA Reference, Research Test and UNR Established Site, respectively, in support of the figures.

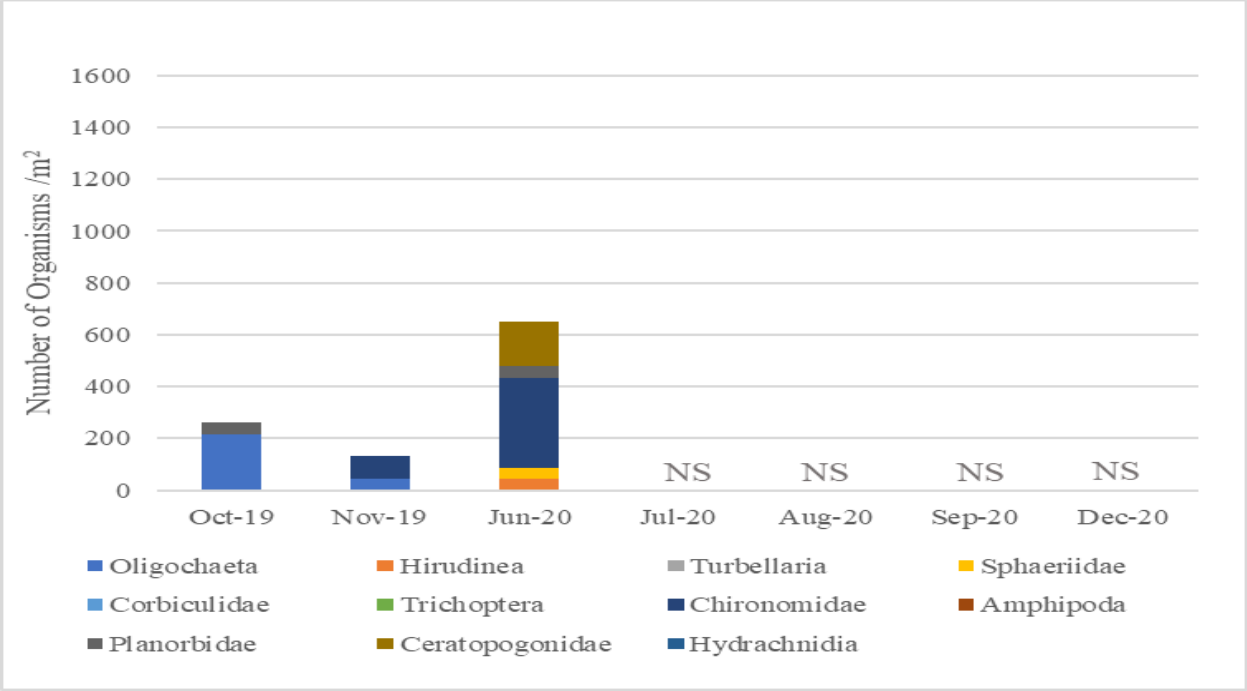


Figure 40 Abundance of BMI by Order, TKPOA Reference Site

Table 22 Counts of BMI identified to Order, in a 1 m^2 sample, TKPOA Reference Site

Date	Oligochaeta	Hirudinea	Turbellaria	Sphaeriidae	Corbiculidae	Trichoptera	Chironomidae	Amphipoda	Planorbidae	Ceratopogonidae	Hydrachnidia
Oct-19	217	0	0	0	0	0	0	0	43	0	0
Nov-19	43	0	0	0	0	0	87	0	0	0	0
Jun-20	0	43	0	43	0	0	348	0	43	174	0
Jul-20	Not sampled due to heavy plant cover.										
Aug-20											
Sep-20											
Dec-20	Not sampled due to ice cover										

Source: Appendix E

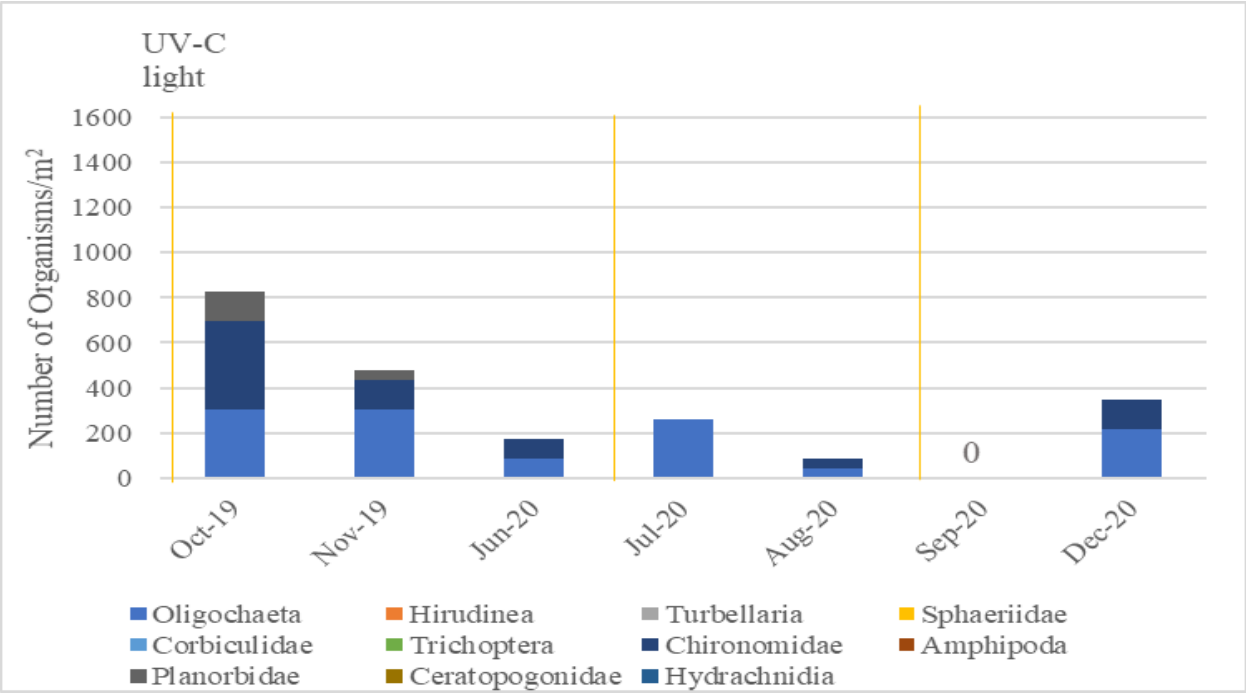


Figure 41 Abundance of BMI by Order, TKPOA Research Test Site

Table 23 Counts of BMI identified to Order, in a 1 m^2 sample from TKPOA Research Test Site

Date	Oligochaeta	Hirudinea	Turbellaria	Sphaeriidae	Corbiculidae	Trichoptera	Chironomidae	Amphipoda	Planorbidae	Ceratopogonidae	Hydrachnidia
Oct-19	304	0	0	0	0	0	391	0	130	0	0
Nov-19	304	0	0	0	0	0	130	0	43	0	0
Jun-20	87	0	0	0	0	0	87	0	0	0	0
Jul-20	261	0	0	0	0	0	0	0	0	0	0
Aug-20	43	0	0	0	0	0	43	0	0	0	0
Sep-20	0	0	0	0	0	0	0	0	0	0	0
Dec-20	217	0	0	0	0	0	130	0	0	0	0

Source: Appendix E

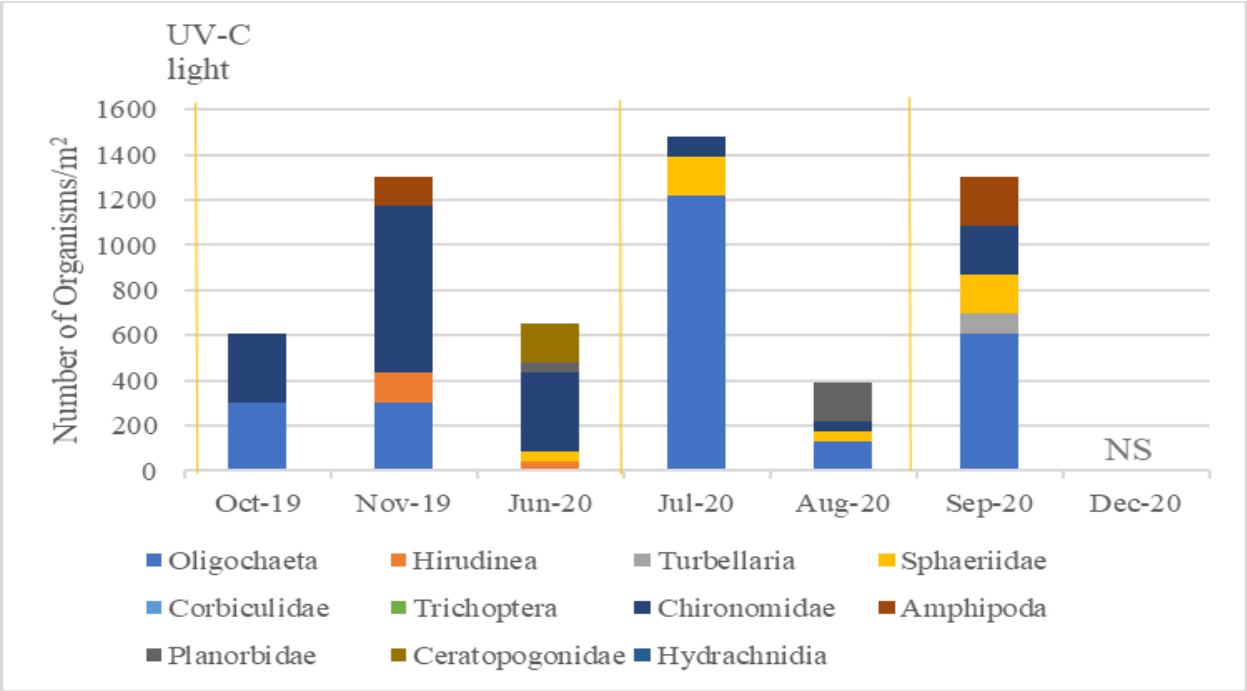


Figure 42 Abundance of BMI by Order, TKPOA UNR Established Site

Table 24 Counts of BMI identified to Order, in a 1 m^2 sample from TKPOA UNR Established Site

Date	Oligochaeta	Hirudinea	Turbellaria	Sphaeriidae	Corbiculidae	Trichoptera	Chironomidae	Amphipoda	Planorbidae	Ceratopogonidae	Hydrachnidia
Oct-19	304	0	0	0	0	0	304	0	0	0	0
Nov-19	304	130	0	0	0	0	739	130	0	0	0
Jun-20	0	43	0	43	0	0	348	0	43	174	0
Jul-20	1217	0	0	174	0	0	87	0	0	0	0
Aug-20	130	0	0	43	0	0	43	0	174	0	0
Sep-20	609	0	87	174	0	0	217	217	0	0	0
Dec-20	Not sampled due to ice cover.										

Source: Appendix E

3.5 Water Quality

3.5.1 Lakeside Beach Treatment Area

Table 25 presents results for daily water quality monitoring collected by IRI for Lake Level, pH, conductivity, turbidity, dissolved oxygen, and water temperature, along with ambient air temperature by UV-C light control implementation year, along with UNR monthly measurements for pH, DOC and turbidity in support of **Figure 43**. Refer to **Appendix F** for source data.

Table 25 Water Quality Monitoring Results, Lakeside Beach, 2019-2021*

Lakeside Beach 2019-2021	Lake Level	Water Quality Parameters						
		pH	EC	Turbidity	DO	DOC	Water Temp.	Air Temp
	feet LTD		(uS/cm)	(NTU)	(mg/L)	(mg/L)	(°F)	(°F)
2019 Count	30	28	28	28	28		30	30
2019 Max	6228.3	7.80	59	0.34	9.08		65.1	79
2019 Min	6227.4	7.50	43	0.12	7.80		48.3	40
2019 Mean	6227.6	7.65	47	0.23	8.37		53.8	62
2019 Median	6227.5	7.63	45	0.24	8.32		52.4	63
2019 UNR Reference (October)		7.84	43	0.08		5.03		
2019 UNR Reference (November)		7.61	198	0.00		5.08		
2020 Count	68	68	68	68	68		68	68
2020 Max	6227.5	7.87	90	0.27	8.20		72.5	66
2020 Min	6225.8	6.19	78	0.02	2.30		50.9	28
2020 Mean	6226.2	7.17	84	0.12	6.38		60.6	49
2020 Median	6226.1	7.29	83	0.10	6.73		59.8	48
2020 UNR Reference (June)		7.95	72	0.13		5.18		
2020 UNR Reference (August)		7.80	92	0.00		6.31		
2020 UNR Reference (October)		7.99	88	0.00		5.89		
2020 UNR Reference (December)		7.81	60	0.00		7.37		
2021 Count	21	21	21	21	21		21	20
2021 Max	6224.9	7.90	211	0.26	9.29		75.0	99
2021 Min	6223.8	7.48	23	0.09	7.80		58.7	50
2021 Mean	6224.4	7.55	80	0.19	8.56		69.2	77
2021 Median	6224.7	7.53	82	0.21	8.42		68.9	84
2021 UNR Reference (May)		7.87	196	0		4.64		
2021 UNR Reference (June)		7.78	84	0.09		5.22		
2021 UNR Reference (July)		8.21	84	0.24		5.54		
2021 UNR Reference (September)		8.00	96	0.02		6.44		
2021 UNR Reference (November)		7.85	88	0		7.07		

Source: 2016 Water Quality Control Plan for the Lahontan Region; Appendix F, 2019-2021 Pilot Project Water Quality Monitoring Data

Notes: * Results presented are based on IRI daily monitoring. UNR monthly monitoring results are presented in Appendix F and discussed further in Appendix A.5

[1] In Lake Tahoe, the pH shall not be depressed below 7.0 nor raised above 8.4

[2] In Lake Tahoe, the mean annual electrical conductivity shall not exceed 95 umhos/cm at 25°C at any location in the Lake

[3] Waters shall be free of changes in turbidity that cause nuisance or adversely affect the water for beneficial uses. Increases in turbidity shall not exceed natural levels by more than 10 percent

[4] Shall not be depressed by more than 10 percent, nor shall the minimum dissolved oxygen concentration be less than 80 percent of saturation

[5] The natural receiving water temperature of all waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such an alteration in temperature does not adversely affect the water for beneficial uses for waters designated COLD, the temperature shall not be altered

[6] Not a Basin Plan Narrative WQO

3.5.1.1 Temperature

Water temperature was measured continuously during active treatment, along with ambient air temperature. Initial testing of UV-C technology explored the potential for the light array to temporarily raise

water temperatures. Results are reported in Response to Comments by Conservancy Staff on Categorical Exemption Memorandum for AIP Control UV-C Light Project (Tahoe RCD 2017). For initial testing, the treatment area was a confined volume of water and not open water. One 35 Watt UV-C light was placed in a 4-foot by 4-foot confined container full of water. Thermometers were placed at 1-inch, 12-inches and 24-inches from the light array. Temperatures were recorded at one (1) minute intervals for a total of four (4) hours to cumulatively represent a typical day of use. Another tank with the same specifications and conditions was used as a control point to measure “non UV-C light” ambient conditions. Results reported that nearby water temperature increase for be 0.086 °F (Fahrenheit) or less than one-tenth of a degree increase, which would then dissipate once the light array is shut down.

A second experiment was also conducted in an open water setting and after running the light array for an extended period of time, no change in water temperature was measured. Considering the average depth of and total volume of water contained in Lake Tahoe, the conclusion that water evaporation at the water surface and environmental variables, such as solar radiation would have an effect on water temperature that would be thousands of times greater than any potential effect to water temperature by extended use of the UV-C light array.

Continuous temperature monitoring, along with focused monitoring conducted 2 to 3 times a day, depending on the length of active treatment, supports the initial testing results that UV-C light treatment creates no significant change to Lake Tahoe water temperature.

3.5.1.2 pH, Conductivity, Turbidity, Dissolved Oxygen and Dissolved Organic Carbon

The pH values at Lakeside Beach remained stable post-treatment. Some minor seasonal shifts are evident, but all values are within the expected range. As Lakeside Beach is an open water environment, no long-term pH changes would be expected from UV-C treatment. DOC) does appear to increase slightly following UV-C light treatment. This is due to decaying material being released from plants post-treatment and reflective of increases in DOC that would be expected at the end of the natural growth season. Turbidity levels are generally low, as the water is readily exchanged with the open lake. Higher turbidity levels are seen in the summer, which is most likely is caused by increased phytoplankton production. Increased recreational beach use or high winds creating turbulent waters could also cause temporary spikes in turbidity. There is no evidence UV-C treatment has detrimental effects on water quality in an open water environment.

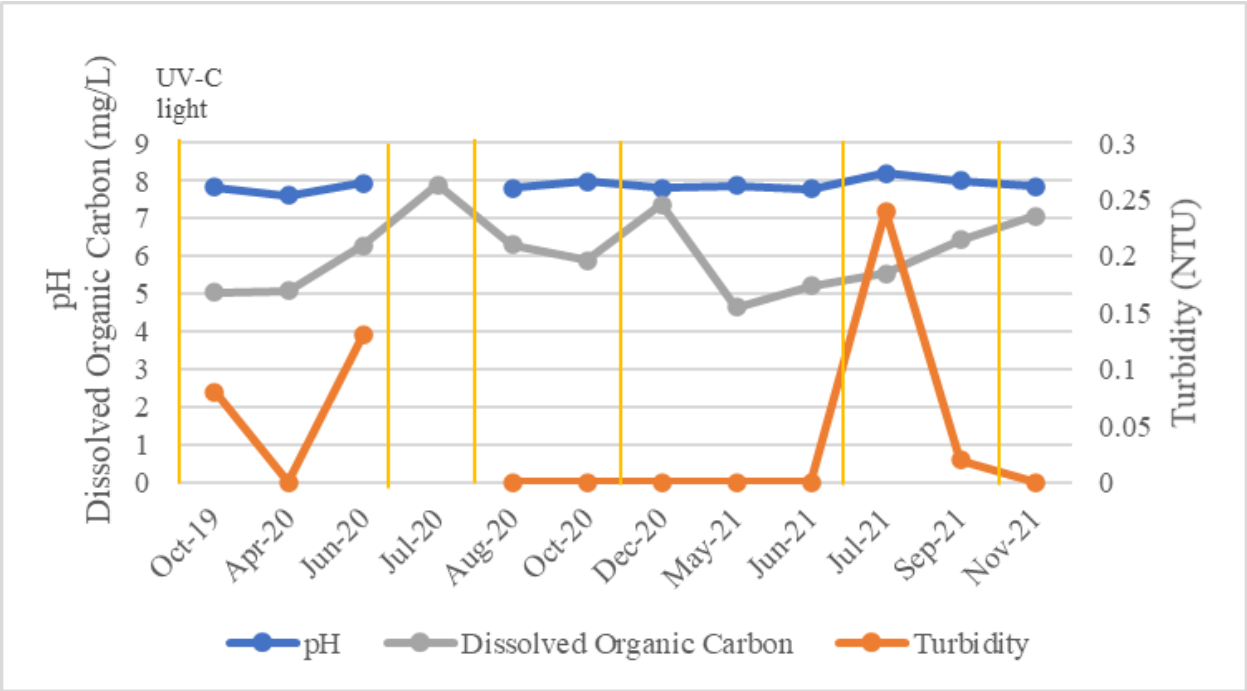


Figure 43 **UNR Monthly Measurement for pH, DOC, and turbidity, Lakeside Beach. Yellow bars mark UV-C treatment dates.**

3.5.2 Lakeside Marina Treatment Area

Table 26 presents results for daily water quality monitoring collected by IRI for Lake Level, pH, conductivity, turbidity, dissolved oxygen, and water temperature, along with ambient air temperature by UV-C light control implementation year, along with UNR monthly measurements for pH, DOC and turbidity in support of **Figure 44**. Refer to **Appendix F** for source data.

Table 26 Water Quality Monitoring Results, Lakeside Marina, 2019-2021*

Lakeside Marina 2019-2021	Lake Level	Water Quality Parameters						
		pH	EC	Turbidity	DO	DOC	Water Temp.	Air Temp
	feet LTD		(uS/cm)	(NTU)	(mg/L)	(mg/L)	(°F)	(°F)
2019 Count	20	18	18	18	18		18	21
2019 Max	6229.0	7.91	72	0.35	8.80		67.8	78
2019 Min	6227.6	7.41	35	0.11	7.40		52.9	49
2019 Mean	6228.1	7.67	54	0.23	8.13		59.9	66
2019 Median	6227.9	7.66	46	0.23	8.10		56.5	67
2019 UNR Reference (October)		7.80	43	0.12		5.54		
2019 UNR Reference (November)		7.52	88	0.00		6.29		
2020 Count	71	71	71	71	71		71	71
2020 Max	6227.9	8.39	120	3.01	8.90		72.8	72
2020 Min	6226.0	6.98	67	0.10	2.30		53.4	44
2020 Mean	6227.2	7.60	87	0.62	7.12		66.1	62
2020 Median	6227.5	7.61	85	0.30	6.90		67.8	64
2020 UNR Reference (June)		7.87	102	0.24		6.05		
2020 UNR Reference (August)		7.61	84	0.00		6.31		
2020 UNR Reference (October)		7.77	90	0.00		10.27		
2020 UNR Reference (December)		7.64	84	0.00		7.42		
2021 Count	25	25	25	25	25		25	25
2021 Max	6224.8	7.55	201	0.34	84.60		74.8	99
2021 Min	6223.8	7.40	33	0.10	6.20		66.0	57
2021 Mean	6224.4	7.51	81	0.20	13.74		69.6	75
2021 Median	6224.8	7.51	89	0.20	8.52		68.9	76
2021 UNR Reference (May)		7.64	178	0.10		5.32		
2021 UNR Reference (June)		7.86	88	0.14		4.69		
2021 UNR Reference (July)		7.62	100	0.26		5.06		
2021 UNR Reference (September)		7.50	116	0.00		6.97		
2021 UNR Reference (November)		7.79	112	0.40		7.17		

Source: 2016 Water Quality Control Plan for the Lahontan Region; Appendix F, 2019-2021 Pilot Project Water Quality Monitoring Data

Notes: * Results presented are based on IRI daily monitoring and UNR monthly monitoring sampling and discussed further in Appendix A.5. Refer to Table 25 for Notes 1-6

3.5.2.1 Temperature

Refer to Subsection 3.5.1.1 above.

3.5.2.2 pH, Conductivity, Total Dissolved Solids, Turbidity, and Dissolved Organic Carbon

Lakeside Marina has less water exchange than the beach area, increased plant abundance and daily boat traffic late spring to early fall. The pH values in the marina are slightly lower than the beach but all values are within the acceptable range for the Basin Plan water quality objectives. There are no long-term treatment effects on water pH. DOC did initially decrease after treatment in July 2020, but then continued to increase after subsequent treatments until December 2020. These trends are likely to be more naturally based than effects of UV-C treatment. The decrease in DOC in July may be due to interception and uptake by plankton, with later increases due to both UV-C induced and natural plant decay. With a smaller plant population in the Lakeside Marina the following year (2021) there is less DOC released from decay and an overall lower concentration of DOC in the water. Turbidity levels are generally higher in the marina but show a similar trend as the beach area. The highest turbidity was measured in November 2021, when plants were eradicated from the marina taxi area. The increased turbidity could have been caused by the decomposition of plants or a resuspension of sediment. No long terms effects on water quality are expected from UV-C light treatment.

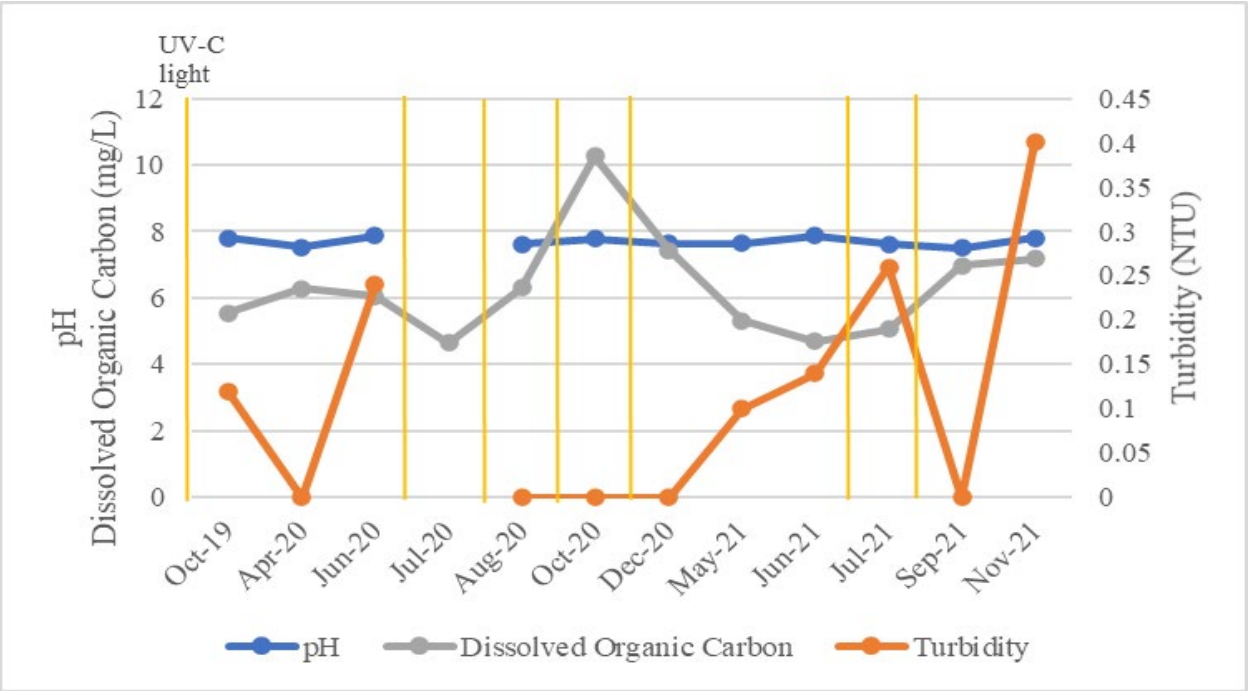


Figure 44 UNR Monthly Measurement for pH, DOC, and turbidity, Lakeside Marina. Yellow bars mark UV-C treatment dates

3.5.3 TKPOA Research Area 2019-2020

Table 27 presents results for daily water quality monitoring collected by IRI for Lake Level, pH, conductivity, turbidity dissolved oxygen, water temperature, along with ambient air temperature by UV-C light control implementation year, along with UNR monthly measurements for pH, DOC and turbidity in support of **Figure 45**, **Figure 46** and **Figure 47**, which present measurements for TKPOA Reference, TKPOA Research Test and TKPOA UNR Established sites, respectively. Refer to **Appendix F** for source data.

Table 27 Water Quality Monitoring Results, TKPOA Research Area, 2019-2021*

TKPOA Research Area, 2019-2020	Lake Level	Water Quality Parameters						Air Temp
		pH	EC	Turbidity	DO	DOC	Water Temp.	
	feet LTD		(uS/cm)	(NTU)	(mg/L)	(mg/L)	(°F)	(°F)
2019 Count	22	16	16	16	16		18	19
2019 Max	6228.1	9.01	130	3.70	6.90		60.6	78
2019 Min	6227.2	8.30	54	2.16	4.70		50.3	51
2019 Mean	6227.6	8.64	82	2.80	6.02		53.7	62
2019 Median	6227.3	8.70	58	2.88	6.10		50.8	61
2019 TKPOA Research Test (October)		9.15	51	2.38		8.51		
2019 TKPOA Research Test (November)		8.21	96	2.12		9.01		
2019 TKPOA UNR Established (October)		9.08	47	3.92		8.25		
2019 TKPOA UNR Established (November)		8.11	114	2.96		9.91		
2019 TKPOA Reference (October)		9.09	44	2.15		8.91		
2019 TKPOA Reference (November)		8.20	128	2.27		9.09		
2020 Count	88	85	86	85	86		88	88
2020 Max	6227.8	9.50	130	7.20	9.91		75.3	68
2020 Min	6226.2	6.76	62	0.02	4.70		52.4	48
2020 Mean	6227.0	8.26	102	2.65	6.25		68.2	58
2020 Median	6226.8	8.25	101	2.91	5.90		68.5	57
2020 TKPOA Research Test (April)		7.80	104	0.35	8.73	8.73		
2020 TKPOA Research Test (June)		9.13	78	0.45	5.79	5.39		
2020 TKPOA Research Test (July)		9.31	80	2.87	7.14	7.14		
2020 TKPOA Research Test (August)		8.73	98	0.32	8.87	8.87		
2020 TKPOA Research Test (September)		8.17	116	2.99	10.67	10.67		
2020 TKPOA Research Test (October)		7.76	120	2.45	11.12	11.12		
2020 TKPOA UNR Established (April)		7.84	104	0.31	7.64	7.64		
2020 TKPOA UNR Established (June)		9.21	76	0.13	5.33	5.33		
2020 TKPOA UNR Established (July)		9.53	78	1.82	7.35	7.35		
2020 TKPOA UNR Established (August)		9.13	98	0.32	9.11	9.11		
2020 TKPOA UNR Established (September)		8.34	104	3.33	10.61	10.61		
2020 TKPOA UNR Established (October)		7.96	120	1.86	11.39	11.39		
2020 TKPOA Reference (April)		7.80	102	0.34	7.41	7.41		
2020 TKPOA Reference (June)		8.37	70	0.10	6.21	6.21		
2020 TKPOA Reference (July)								
2020 TKPOA Reference (August)		9.23	100	0.33	8.91	8.91		
2020 TKPOA Reference (September)		8.33	116	3.01	10.54	10.40		
2020 TKPOA Reference (October)		7.83	108	2.22	11.45	11.45		
2021 Count	111	107	107	106	107		111	107
2021 Max	6244.6	8.99	223	3.21	8.00		80.7	91
2021 Min	6222.9	6.32	119	1.75	5.02		48.0	33

Table 27 Water Quality Monitoring Results, TKPOA Research Area, 2019-2021*

TKPOA Research Area, 2019-2020	Lake Level	Water Quality Parameters						Air Temp
		pH	EC	Turbidity	DO	DOC	Water Temp.	
	feet LTD		(uS/cm)	(NTU)	(mg/L)	(mg/L)	(°F)	(°F)
2021 Mean	6224.1	8.19	155	2.36	6.05		66.7	70
2021 Median	6224.1	8.60	150	2.30	5.92		69.3	73
2021 TKPOA Research Test (May)		8.23	158	0.42		8.16		
2021 TKPOA Research Test (June)		10.17	82	0.13		7.04		
2021 TKPOA UNR Established (May)		8.32	130	0.41		9.41		
2021 TKPOA UNR Established (June)		10.14	110	0.09		6.96		
2021 TKPOA Reference (May)		8.29	138	0.25		8.73		
2021 TKPOA Reference (June)		10.17	108	0.02		6.27		

Source: 2016 Water Quality Control Plan for the Lahontan Region; Appendix F, 2019-2021 Pilot Project Water Quality Monitoring Data

Notes: * Results presented are based on IRI daily monitoring and UNR monthly monitoring sampling and discussed further in Appendix A.5. Refer to Table 25 for Notes 1-6

3.5.3.1 Temperature

Refer to Subsection 3.5.1.1 above.

3.5.3.2 pH, Conductivity, Turbidity, Dissolved Oxygen and Dissolved Organic Carbon

Natural seasonal variations are the main drivers of water quality changes in the TKPOA Research Area sites, as all three sites share similar trends. The pH increases in the summer and is generally coupled to the rapid growth of plants. DOC is highest in the fall and winter when the plants are decomposing. The TKPOA Reference and UV Test sites are not significantly different; thus, UV-C light exposure is not increasing the DOC in the water any more than natural seasonal decomposition. With continuing treatment, less plant growth would be expected, and therefore, lower DOC levels would result in the winter months. Turbidity did increase post-testing, as the plants were decomposing but decreased to pre-testing levels one month post-test. Unfortunately, the water sample collected from the TKPOA Reference site in July 2020 was damaged during transport, and a comparison cannot be made with the TKPOA Test site during that month to determine if the increased turbidity levels are the result of UV-C light exposure. The lowest levels of DOC and turbidity are in May, June, and July, coinciding with the desired months for initial UV-C light treatment for the annual growth cycle. Therefore, dissolved substances should not interfere with the UV-C light attenuation during peak treatment months.

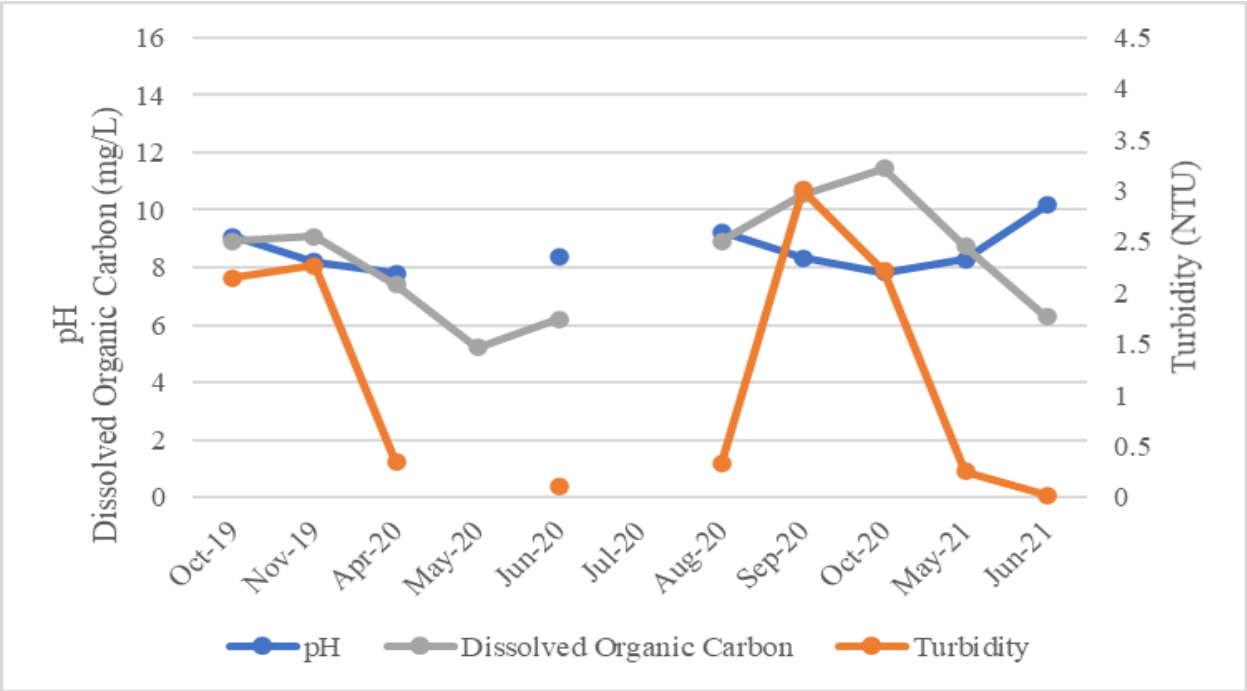


Figure 45 **UNR Monthly Measurement for pH, DOC, and turbidity, TKPOA Reference Site**

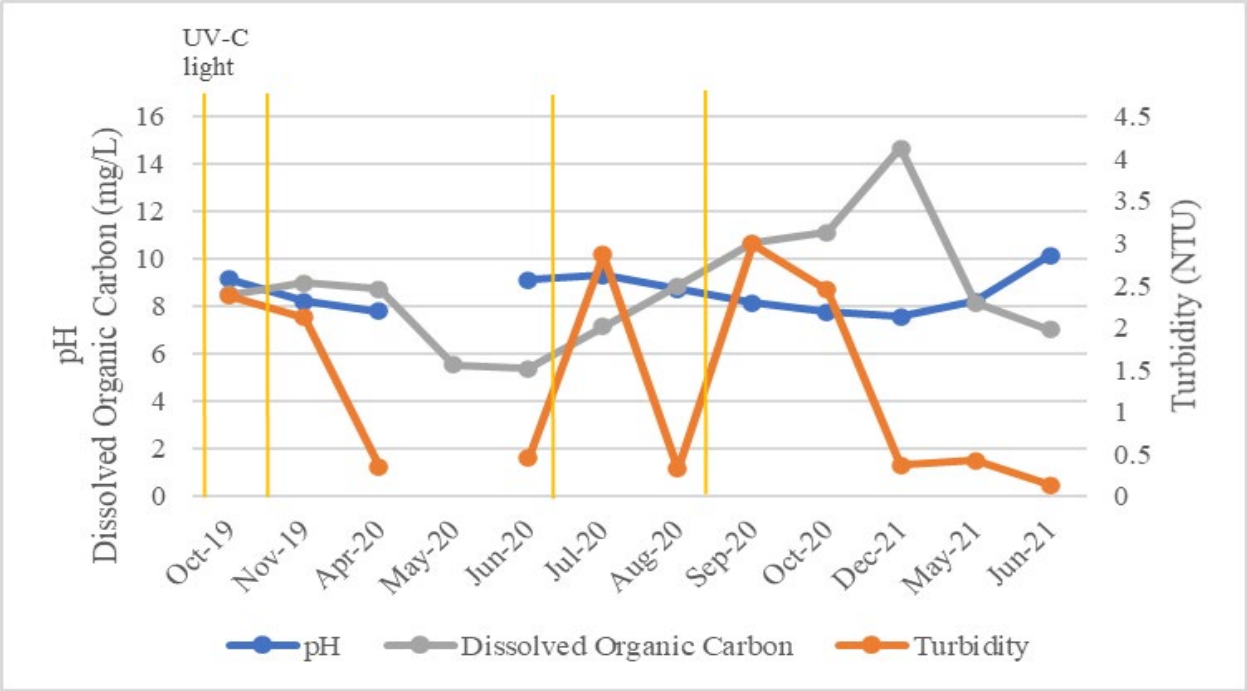


Figure 46 **UNR Monthly Measurement for pH, DOC, and turbidity, TKPOA Research Test Site. Yellow bars mark UV-C treatment dates.**

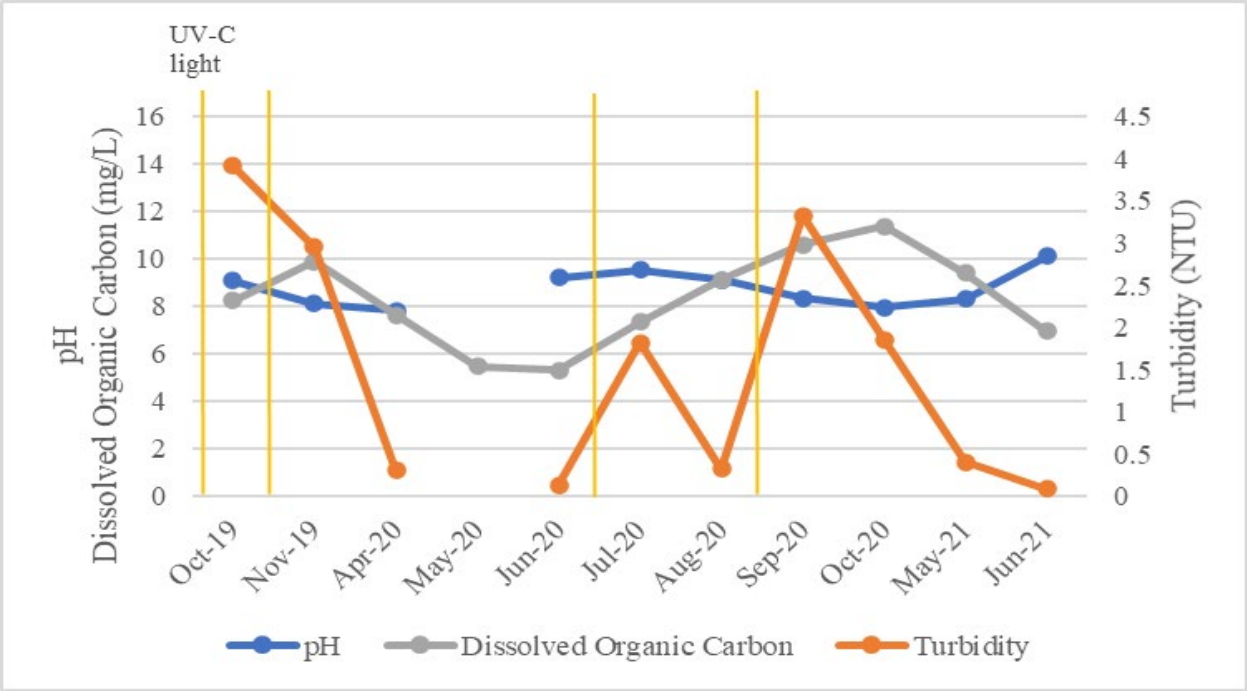


Figure 47 UNR Monthly Measurements for pH, DOC, and turbidity, TKPOA UNR Established Site. Yellow bars mark UV-C treatment dates.

4 Recommendations and Next Steps

4.1 2022 UV-C Light Treatment Vessel

In order to achieve successful UV-C treatment outcomes, a number of site conditions must be considered:

- Water quality: The open water at Lake Tahoe is extremely clean and allows for ideal UV-C light treatment applicable and shorter treatment time. The water in the TKPOA Research Area, especially near the bottom, had a high level or total dissolved solids (TDS) and that requires longer treatment times to treat plants.
- Water depth: The UV-C Treatment Vessel used in 2021 was not able to treat in certain low water level areas.
- Bottom conditions: Sloping bottoms, riprap, rocks, piers or obstacles can limit or prevent the access of the treatment Array to the plants. New UVC tools are in development for 2022 treatment to help address some of these concerns but this may require ongoing improvements. For UV-C light treatment to the effective, a lethal dose of “C” rays needs to reach the plants and this is a function of exposure time and proximity to the crown and to a lesser degree ambient water quality. The greater the distance between the light array and the plant crown, the longer the exposure time.

The 2022 UV-C Light treatment vessel will be the largest treatment vessel to date (**Figure 48**). The vessel is under construction now and will be ready by mid-April 2022 and will support continued testing and treatment at the TKPOA Research Area. To address a lesson learned in 2021, this vessel will have removable bays so lamps can be cleaned more often and without requiring a diver.

The vessel will be 8-feet wide by 38-feet long. The array will be 16-feet wide by 40-feet long; however, the treatment area under the array will be slightly smaller. Should water levels be low, the arrays are designed to move to the outside of the vessel to work in lower water. This positioning may increase treatment time and some areas may receive less/more treatment.

4.1.1 Vessel moment

The vessel will be positioned with 12 electric trolling motors. The control will be the same as 2020 by use of a PLC (programmable logic controller). Button controls will be used. All motors will be upgraded to 36-volt motors to provide for more power, which will reduce travel time to each treatment site.

4.1.2 Treatment Times

In 2021, 5 minute treatment times were determined to not be as effective in very dense infestation areas. So, longer treatment times will be applied and adjusted to respond to infestation densities. A second treatment vessel will be available for treating under docks when the water depth is sufficient. The “under-dock “vessel was designed to work under docked boats to reduce the need for pro can be avoided during treatment.

One of the new UV-C treatment tools planned for testing summer 2022 is a 12vdc array. This low voltage, minimum power system will hang from the docks to treat under owner slips. The array will be kept off the bottom and the lamps will be on a timer system to turn on/off to control plant growth as necessary (Refer to **Photo Compilation 5**, Picture 8 below for design schematic under development).

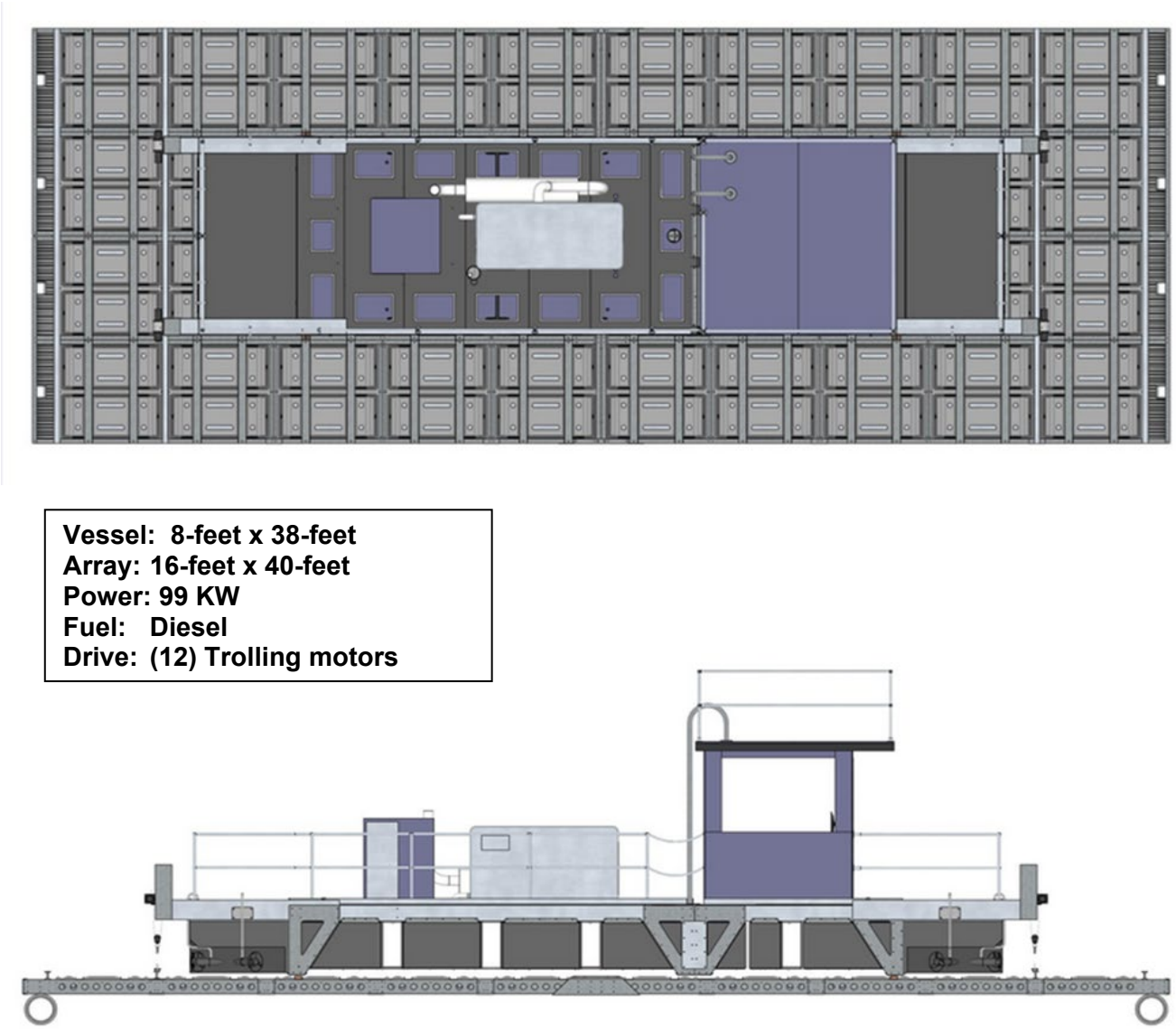


Figure 48 UV-C Light Treatment Vessel, 2022

4.2 Lakeside Beach & Marina Treatment Areas

In 2020 and 2021 plants were able to be treated in the early growing season. The expectation is that developing turions still attached to plant bodies have been rendered unviable, avoiding the addition of mature turions to the seed bank. The following are considerations and recommendations for continued AIP control at Lakeside Beach and Marina:

- Lakeside Beach is an open waterbody and fragments float into the beach area and are trapped by the breakwater structure. The water column height along the beach shoreline is a factor in determining treatment parameters. The ring of EWM along the beach remained throughout the treatment period and has anecdotally been observed by Marine Taxonomic Service (MTS) divers previous to this Pilot Project. The water level in that area of Lakeside Beach may be too shallow to allow for UV-C light treatment vessel access. This section of beach may also benefit from a combined control method effort. In assessing the treatment data from Lakeside Beach, a negative impact to the native plant community is not expressed.
- There is a greater decrease in percent plant coverage after the second UV-C treatment when treatments are separated by one month, and less so when treatments are spaced farther apart. Treatments earlier in the year may inhibit initial plant community growth, and treatments should be scheduled to target the species of concern (e.g., treating in late spring to target Curly-leaf pondweed prior to turion development and potential shedding).
- Attention to fragments entering the Lakeside Marina via littoral drift currents and on boat props should be continued.
- A conclusion can be made that treatment of Curly-leaf pondweed in July 2020 caused damage to the developing turions that resulted in a significant decrease in the Curly-leaf pondweed population in 2021. For maximum efficacy, future treatment of the Lakeside Marina should include 3 rounds of treatment: the first in May to reduce the early growth species, the second in June or July to reduce the viability of developing Curly-leaf pondweed turions, and a possible third treatment in September or October to reduce any potential recolonization and treat any milfoil that may overwinter.
- Density is expected to continue to decrease and not be supplied by mature turions. Noting that there is a continued risk of recolonization. If UV-C light treatment is not continued in 2022, post-project monitoring should be scheduled for July and August during the mid-growing season to assess density and if new growth is attributable to shed turions that remain embedded in the lake bed.
- Focused UV-C light treatment should be planned over the next 10 year period to address potential recolonization from the seedbank.

4.3 TKPOA Research Area, 2022

The following are considerations and recommendations towards continued UV-C light testing and treatment for the TKPOA water ways in 2022 and beyond:

- Conducting UV-C testing should continue in 2022 at larger acreage scales. Increasing larger acreage test Additional areas for testing are being identified for UV-C light testing to assess the efficacy of UV-C light treatment effects at increasingly larger infestation areas, building upon the monitoring record reported in Appendix B.
- Test treatments at longer treatment intervals to determine mortality efficacy. Continue UV-C treatment tests at 10 minutes on average with more overlap of treatment areas.
- Conduct treatments earlier in the growing season (spring to summer transition), when plants begin to grow in the TKPOA water ways. Treatment of Curly-leaf pondweed should occur early in growth cycle to suppress the development of turions that could lead to the establishment of new plants.
- Consider monitoring results collected at 1 month post-treatment and assess need for follow up treatment.

- Monitor plant fragments from mechanical harvested areas adjacent to UV-C light treatment areas to determine quantitative movements of plant fragment into treated areas and the potential for recolonization.
- Monitoring of plant composition, density and biomass is recommended to complement the hydroacoustic monitoring conducted by the TKPOA.
- Chemical measurement of plant tissue chl-*a* is no longer recommended.
- Some limited measurement of plant particulate carbon, nitrogen, and phosphorus combined with biomass measurements is recommended to understand the amount of nutrients removed from the TKPOA water ways.
- Identification of a "positive control site" that will not incur mechanical harvesting is recommended, such a control area is necessary to present clear efficacy results. Currently, no control area has been identified by the TKPOA, and therefore, the Pilot Project design in 2022 may need to include select buffer areas between treatment/testing as positive control area to support clear and meaningful monitoring results.
- If a control site must be mechanically harvested, the control site(s) will be identified appropriately as a "positive reference site." The 2022 harvesting schedule can be integrated into the UV-C light monitoring schedule to avoid conflict.
- Pre- and post-harvest hydroacoustic scans are conducted by TKPOA and our Pilot Project Team requests these scans for calibration by field sampling and laboratory testing for biomass, understanding that this is not typical protocol of the Control Method Test but could be additive and benefit data set development. Or the Pilot Project Team recommends TKPOA conduct this analysis for biomass calibration. Biomass tends to be more informative than the Biovolume ratio, which is not as useful for reporting and communications.
- Water quality monitoring conducted during several UV-C light pilot projects reports no significant change or degradation in constituents of concern. While our Pilot Project Team can continue water quality monitoring if included in contracting, water quality sampling collected by TKPOA for the Control Method Test and annual WDR reporting could also be utilized.
- A strong recommendation is made towards the establishment of contracts and scope of work in March, well in advance of the growing season.

4.4 UV-C Light Technology Tools

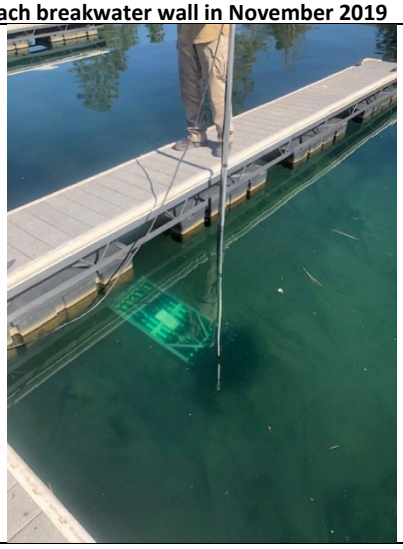
The UV-C light technology can be adapted to respond to various site conditions and is currently being used to control AIP infestations for a variety of projects and studies in California and Nevada. **Photo Composite 5** illustrates some examples of UV-C light technology designs, including:

- Handheld arrays used in 2019 to respond to site constraints at Lakeside Beach and Marina
- Remote Treatment Unit
- Array "walls" installed within a spillway gate
- Canal Boats of various sizes
- Autonomous Boat
- Under Dock Array to be operated by marinas and private dock owners (2022)
- Stand Alone Solar/Small Generator Unit to be operated by marinas (2022).

Photo Composite 5 UV-C Light Technology Designs

Picture 83: UV-C light treatment using a 4-foot array along the Lakeside Beach breakwater wall in November 2019

Picture 84: UV-C light treatment over benthic barriers in Lakeside Marina in 2019 using a handheld array

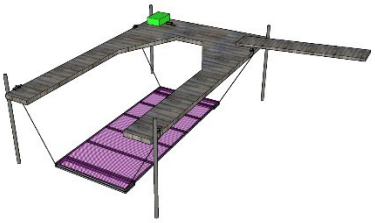
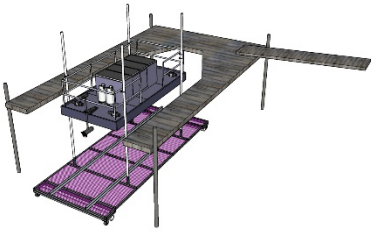


Picture 85: UV-C light treatment under Lakeside Marina walkways in 2019 using a handheld array

Picture 86: November 2019, Testing the UV-C Light Remote Treatment Unit in the TKPOA waterways

Picture 87: Los Angeles Department of Water and Power testing the UV-C light technology within a spillway gate

Picture 88: Contra Costa County Water District's 3-year study within a pond and a concrete-lined canal

	
Picture 89: UV-C light control pilot study in an irrigation canal in Fallon, Nevada in 2021	**Picture 90: Design schematic for Under-Dock Array that will be tested in 2022 at Lakeside Marina and TKPOA**
	
Picture 221: Design schematic for Solar UV-C Light Treatment Vessel that will also be tested in 2022	**Blank**

4.5 Final Comments

UV-C light treatment effectiveness is achieved by treating early in the season when plants are still small, tender and of reasonable size to minimize canopy shadow. Commencing UV-C light treatment early minimizes the amount of vegetation needing treatment and allows for better penetration of the light through the treatment area and thus a better visible result of plants starting their decomposition process and loss of turgor pressure. When treatment was started late in the season, plant densities were high and consequently needed multiple treatment passes in order to achieve desired results. In the field it was noted that treatment durations of 15 to 20 minutes were effective in killing plants. UV-C light treatment has not been found to degrade water quality or result in long-term adverse effects to BMI communities; however, water quality can at times affect the efficacy of UV-C transmissivity. Conditions such as plant height, water temperature, UV-C light transmittance and turbidity can play a role in the overall effectiveness and reach of UV-C light treatment. Dissolved organic carbon concentrations, specifically, can increase turbidity and contribute to interference of UV-C light transmissivity; however, increased turbidity level in and of itself does not and turbidity measurements vary according to depth within the water column.

In addition to pilot studies conducted in Lake Tahoe since 2017, this type of non-chemical AIP control method is being applied in multiple project and study areas with varying site complexities:

- The Los Angeles Department of Water and Power is currently testing this treatment within a spill gate in one of their canals located in the Owens Valley area near Bishop, California and will be evaluating if this type of treatment will decrease maintenance costs of hand pulling out vegetation and biomass that clogs the gate (**Photo Compilation 5**, Photo 5).
- A three-year pilot study for the Contra Costa Water District tested the UV-C light control method in two different scenarios: a pond water body and a concrete-lined irrigation canal where herbicide applications are not permitted.
- A two-year study with the United States Bureau of Reclamation implemented small-scale testing in an irrigation canal in the Lahontan Basin in Nevada.

In summary, UV-C light treatment has been tested at various acreages and has been found effective in controlling both the density and height of AIP infestations, including areas of Lake Tahoe that have a high risk of re-colonization – an important variable that is outside the control of any AIP control method. UV-C treatment and testing will continue in 2022 to assessment of the efficacy of UV-C light treatment effects for increasingly larger infestation areas. Larger acreage tests are currently being planned and contracted and additional areas for non-chemical AIP control are being identified. Treating at the start of the growing season will improve upon efficacy, and while multiple treatment may still be needed in response to initial plant heights and densities) and has been successful in AIP control in a variety of test areas, as discussed in Section 4.4 of this monitoring report and specific to the TKPOA Research Area, as reported in **Appendix B**.

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6 Project Team

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2021 Final Monitoring Report
UV-C Light Aquatic Invasive Plant
Control Pilot Project

APPENDIX A

2021 CONTRACT DELIVERABLES (PROVIDED ELECTRONICALLY)

Appendix A
2021 Contract Deliverables

A.1 Daily Treatment Logs, 2019-2021

A.2 Equipment Calibration Logs, 2019-2021

A.3 Equipment Cleaning and Maintenance Logs, 2019-2021

A.4 National Oceanic and Atmospheric Administration (NOAA) Weather and Lake Tahoe Lake Level Daily Reports, 2019-2021

A.5 Quarterly Reports, 2019-2021

A.6 Benthic Macroinvertebrates (BMI) Pre and Post Treatment Report, UNR 2021

A.7 Video and Photo Documentation, 2019-2021 (provided electronically)

A.8 Progress Payments and Budget Summary, 2019-2021

A.9 Presentations, Media and Interim Reporting

A.10 TRPA Contract #20C00002 and Amendment #1

A.10.1 Task 1 – Preparation

Task 1, Preparation, was completed in 2019 and presented in the 2019 Monthly Activities Report. This task has been completed and is closed.

A.10.2 Task 2 – Lakeside Beach & Marina Treatment

Task 2, Lakeside Beach & Marina Treatment, was conducted in 2019, 2020 and 2021.

The IRI team mobilized to the Lakeside treatment areas on June 16, 2021. Year 2021 treatment at Lakeside Beach commenced on June 18, 2021, and concluded on August 26, 2021. Year 2021 treatment at Lakeside Marina commenced on June 29, 2021 and concluded on August 27, 2021.

Task 2 deliverables (**Appendix A**) include:

- ✓ Daily logs from operator for pre-treatment equipment check, treatment activity logs for time duration and locations, and equipment issues; and
- ✓ Daily logs provided in routine progress reports.

A.10.3 Task 3 – Tahoe Keys Investigations Phase 1

Task 3, Tahoe Keys Investigation Phase 1, was completed in 2019, presented in the 2019 Monthly Activities Report, and informed the development of Tahoe Keys Phase II Plan Development discussed below under **Task 6**. This task has been completed and is closed.

A.10.4 Task 4 – Monitoring

Monitoring (**Task 4**) of water quality conducted by the IRI team included daily collection of the following parameters during active-treatment in the immediate area of UV-C light application at each Pilot Project site:

- Sample collection times;
- GPS coordinates of sample;
- Ambient temperature;
- Water temperature;
- pH; and
- Specific conductivity.

As presented in **Table A-1**, water quality monitoring of site conditions at Lakeside Beach & Marina treatment areas measured temperature, turbidity, pH, dissolved oxygen and specific conductivity, pre-treatment, during active treatment and post-treatment. At the TKPOA Research Area, these parameters were also measured pre-testing, during test and post-testing.

Table A-1. Water Quality Monitoring Parameters and Sampling Regime

Parameter	Pre-Treatment/Pre-Investigation	During Treatment/Active Treatment	Post-Treatment	Frequency
Temperature (°C)	No greater than 10 days prior	During each round of active treatment at each site	Between 5 and 10-days post-treatment	Continuously during active treatment Once during stated time frame for pre- and post-treatment
Turbidity (NTU)	No greater than 10 days prior	During each round of active treatment at each site	Between 5 and 10-days post-treatment	1 per active treatment
pH	No greater than 10 days prior	During each round of active treatment at each site	Between 5 and 10-days post-treatment	1 per active treatment
Dissolved Oxygen (mg/L)	No greater than 10 days prior	During each round of active treatment at each site	Between 5 and 10-days post-treatment	1 per active treatment
Conductivity (*m*S/cm)	No greater than 10 days prior	During each round of active treatment at each site	Between 5 and 10-days post-treatment	1 per active treatment

Source: UNR 2019

Monitoring equipment includes the following:

- YSI 556 Multi-parameter Meter;
- WizTech TDS pH and Temp Multi-meter;
- LaMotte Turbidimeter;
- Milwaukee MW802 ph/EC/TDS 3 in 1 Meter;
- Milwaukee MW600 DO Meter; and
- RCYAGO WQ Multi-parameter Meter.

Monitoring forms include:

- Daily Treatment Logs (**Appendix A-1**)
- Equipment Calibration Logs (**Appendix A-2**);
- Equipment Cleaning and Maintenance Logs (**Appendix A-3**); and
- National Oceanic and Atmospheric Administration (NOAA) Weather and Lake Tahoe Lake Level Daily Reports (**Appendix A-4**).

Proper calibration of monitoring equipment and devices occurred. Meters were cleaned as needed and batteries were checked daily. Calibration logs are included in **Appendix A-2,** and equipment cleaning and maintenance logs are provided in **Appendix A-3**. Additionally, daily treatment logs collected for the Lakeside Beach & Marina treatment areas and daily testing logs collected for the TKPOA Research Area are included in **Appendix A-1**. Weather information posted on the NOAA database was collected daily for weather forecast and Lake Tahoe water level information and this information is provided in **Appendix A-4**.

Effectiveness monitoring (**Task 4**) by UNR staff of occurred pre-treatment/testing and post-treatment/testing, and on a bi-weekly to monthly basis to gauge plant health and response to UV-C light applications. Effectiveness monitoring includes the following components measured at the frequency detailed in **Table A-2**:

- Infestation density and composition;
- Plant tissue Chlorophyll-a;
- Plant tissue Nitrogen;

- Plant tissue Carbon; and
- Turion mortality.

Table A-2. Effectiveness Monitoring Parameters and Regime

Parameter	Pre-Treatment Monitoring	Post-Treatment Monitoring
Chlorophyll-a	Not greater than 10-days prior to Active-treatment	Between 5 and 10-days Post-treatment and thereafter
Nitrogen	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Carbon	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Conductivity	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Plant Density/Height	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Plant Composition	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Water Quality Corollary-Dissolved Organic Carbon	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Turion Count	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Turion Survival	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and thereafter
Benthic Macroinvertebrates	Not greater than 10-days prior to Active-Treatment	Between 5 and 10-days Post-treatment and 1-year post-treatment

Source: UNR 2019

Task 4 deliverables include:

- ✓ Data logs of water quality parameters submitted with quarterly reports (**Appendix A-5)**
- ✓ Video logs of plant regrowth will be provided as an attachment to annual reports (**Appendix A.7, provided electronically**)
- ✓ Data logs of effectiveness will be provided at the end of each sampling year (**Appendix A-5**).
- ✓ Data logs of BMI (benthic macroinvertebrates) will be provided at the end of each sampling year (**Appendix A-6**).

A.10.5 Task 5 – Reporting

Task 5 includes submittal of Quarterly Reports of activities, conditions, noted observations and monitoring results will to TRPA and that IRI and UNR staff be available for routine progress calls or meetings on a bi-weekly basis.

Task 5 deliverables include:

- ✓ Quarterly reports highlighting progress and issues that need to be addressed (**Appendix A-8**).
- ✓ Annual report summarizing findings to date and anticipated issues in the coming year (**Fulfilled by the 2019 Monthly Activities Report and this 2020 Monthly Activities Report**).
- ✓ Final report at the end of the project (**Final Monitoring Report due December 31, 2021**).

A.10.6 Task 6 – Tahoe Keys Phase II Plan Development and Implementation

As a result of 2019, field work within the Tahoe Keys, IRI developed a plan to treat up to 1-acre within the various waterways within the Tahoe Keys lagoons and west channel which began in 2020 and continued in 2021. TRPA, IRI, UNR and the TKPOA worked collaboratively to develop this plan to ensure elements of an EIS/EIR under development for the Tahoe Keys are incorporated. A budget amendment to conduct the Phase II investigations was approved on in early 2020 and Phase II investigations began in the spring of 2020.

Task 6 deliverables include:

- ✓ Test treatment plan for 1 acre within the Tahoe Keys waterways (**Provided in the 2020 Monthly Activities Report).**

APPENDIX

B

UTILITY OF ULTRAVIOLET LIGHT TO REDUCE AQUATIC PLANTS IN THE TAHOE KEYS (LAKE TAHOE): RESULTS FROM A LARGE ACREAGE PILOT TEST PROJECT IN 2021 (INTERIM REPORT; UNR 2021)

Utility of ultraviolet light to reduce aquatic plants in the Tahoe Keys (Lake Tahoe): Results from a large acreage pilot test project in 2021 (Interim Report)

Prepared for Inventive Resources, Inc.

for submission to

Mr. Dennis Zabaglo
Aquatic Resources Program Manager
Principal Environmental Specialist
Tahoe Regional Planning Agency (primary funding organization)

by

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Aquatic Ecosystems Analysis Laboratory and the Global Water Center
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Background

In 2020 to early summer 2021, a Phase I pilot project was initiated to develop and measure the efficacy of using an ultraviolet light-C (UV-C) tool to control aquatic plants in Lakeside and the Tahoe Keys. While the final data analysis for Phase I is ongoing, a second effort (Phase II) began in July of 2021 to quantify the efficacy of the UV-C tool at larger, acreage level spatial scale. The original project design was to compare sites with UV-C light exposure to an area with no plant control, using predetermined sites established by the Tahoe Keys Property Association and consultants designing monitoring and testing for the Association. Since mechanical harvesting is a prevalent tool utilized by the Keys Property Association, the project design for Phase II was modified. The new design compared the UV-C tool to a location with mechanical harvest (positive control). Hence, starting in July 2021, three areas of the Tahoe Keys were treated (1 with mechanical harvest serving a positive control and 2 with UV-C light). The site harvested by a boat mechanical harvester are referred to as Harvested Reference. Sites exposed to UV-C light and are referred to as UV Site 1 and UV Site 2, respectively (Figure 1) and treatment dates are listed in Table 1.

Table 1: Dates of treatments and sampling to determine the efficacy of the trials. Pre treatment collection occurred at all sites on June 30 to July 2, 2021. Not within our control, UV sites 1 and 2 had mechanical harvest prior to treatment with UV-C on July 6 and 5, respectively.

UV Treatment		**Mechanical Harvesting Site**	**Sampling Dates**
UV Site 1	**UV Site 2**		
Jul 26-Aug 3	Jul 7-25	Jul 2, 16	
		Aug 13, 27, 31	
	Sep 23-Oct 1	Sep 17	Sep 22-24
Oct 4-8		Oct 8, 11	Oct 18-20
			Nov 15-17

The UV-C treated sites were treated with an 8 x 16 foot vessel with an 8 x 40 foot light chamber array powered by a 99kW Kohler Generator with twelve (12) trolling motors. The treatments occurred in two events, one spanning the month of July, the second in late September to early October. For treatment, the light array of UV-C lamps was lowered into the stand of plants and remained in place for 5-10 minutes. The harvested reference site was treated with mechanical harvesters 8 times during the July to November monitoring period. The Tahoe Keys Property Owners Association operates several harvesters and skimming equipment throughout the summer. Two harvesters continuously operate in the West Lagoon, and one moves from Lake Tallac to the East Lagoon. The skimming equipment, OmniCat, follows behind the harvesters to collect fragments, but only through navigation lanes as it is fairly large in size and cannot collect fragments between docks. Depending on the area being harvested they will use the Harvester 3 to harvest biomass between docks, Harvester 4 to harvest navigation lanes, and Harvester 5 for Lake Tallac and the East Lagoon. Plants were mechanically cut at a depth of 4 feet below the surface and biomass was removed, although fragments can persist. All three sites were harvested in early July, prior to commencement of the UV-C treatment, but after the initial pre-treatment sampling had been completed. To our knowledge, no other harvesting occurred in the UV treatment sites after UV-C treatment was initiated.

The sites were sampled over a five-month period including an initial sample collection (late June/ early July) and after UV-C exposure at monthly intervals (September to November). We scheduled a sampling in August, but the sampling was canceled due to the hazardous air conditions and evacuations related to the Caldor Fire. SCUBA divers from Marine Taxonomic Services collected samples using 25 x 25 cm quadrats (Figure 2). Each cove was divided into shallow (along the sides of the cove near the docks) and deep sections (down the middle of the cove); thirteen quadrats were collected in each section, for a total of 26 samples in each cove. In each quadrat the water depth was measured, percent cover of each taxa present was estimated, a representative plant was measured for height, and plants were cut directly above the sediment and the plant biomass collected. The biomass samples were initially air dried and then dried in a drying even and weighed (Figure 2). Analysis of variance (ANOVA) were performed to determine differences between treatment locations. Tukey-Kramer post-hoc tests were performed to determine which sites were significantly different from one another.

Preliminary Results and Discussion

Plant composition percent coverage

Initial pre-treatment sampling showed the plant community to consist of curly-leaf pondweed (*Potamogeton crispus*), coontail (*Ceratophyllum demersum*), *Elodea sp.*, leafy pondweed (*Potamogeton foliosus*), and milfoil (*Myriophyllum sp.*) (Figures 3 and 4). One plant of white water buttercup (*Ranunculus aquatilis*) was found in the shallow area of the Harvested Reference during pre-treatment sampling (not shown in the figure). The pretreatment sampling showed the UV Site 2 had significantly less bare area than the other 2 sites in both the shallow ($p=0.03$) and the deep ($p<0.001$). Pondweed dominates early in the season with an increase in presence of milfoil in the shallow areas and coontail in the shallow and deeper habitats. The deep transect had an increase of bare area earlier than the shallow areas, but still contained patches of coontail. Sprouted turions of curly-leaf pondweed started to emerge in September. Evidence of general plant species patchiness is seen in the variance of the percent coverage- the deep sections in September, October, and November, and the shallow sections in October and November have ranges from 0-100% for both coontail and bare.

In terms of the efficacy of UV-C in influencing plant composition, we do not observe differences of plant community types between the UV treated sites and the Harvested Reference Site, although the starting conditions for each site contained differences in the amount of bare (no plant cover). For example, UV Site 2 started with 0% bare cover in the shallow and deep habitats. By the end of the treatments overall plant coverage was similar (not significantly different) between the UV site and the Harvested Reference.

Plant Height

As expected, pre-treatment plant heights differed by species due to the start of the growing conditions and the life history of the taxa (Figure 5) with no overall difference in plant heights between UV sites and the Harvested Reference. Over the course of the season, plants in the shallow depths were growing closer to the surface compared to plants in the deeper depths. Both depths showed a marked decrease in plant height over time which may be because of variable changes in light conditions in the watershed due to changes in light quality from the wildfires, changes in the seasons, or effects from the treatments.
An evaluation of the post UV and mechanical harvest treatments indicates the plant heights were similar across taxa and between all treatments, illustrating the UV-C method when employing 5-10 minute exposures is on par with mechanical harvesting in controlling plant height.

Plant Biomass

Biomass at the pretreatment locations were significantly higher in UV Site 2 in both the shallow ($p=0.04$) and the deep ($p=0.01$) sections indicating the variability which can be found within the Tahoe Keys depending on the environmental conditions (Figure 6). The biomass did increase in all sites as the summer progressed and declined in November (Fall season). Post treatment evaluations throughout the

summer indicated no differences between the UV treated sites and the Harvested Reference site. In addition, the treatment by UV-C in UV Site 2, which had an initial starting condition with larger biomass, was reduced by the UV treatment to similar conditions as the Harvested Reference and UV Site 1 by the end of summer. We suggest this is due to the treatment effect of UV but also may be due to the highly dynamic conditions experienced by the environment due to the Caldor wildfire smoke and changing lake conditions.

Preliminary conclusions and recommendations

1. Ultraviolet-C trials at the acreage scale, with exposure times of 5-10 minutes at 1-2 exposures during the season at a given site, results in a reduction in plant biomass and height that is similar to the mechanical harvesting of plants over 8 periods of times (July to October). We would expect UV-C, with increased treatment times, to perform better than mechanical harvesting, as was seen in other experiments.
2. Plant composition and succession over time is highly variable across sites (coves) but similar by the end of the treatments periods when comparing UV sites and Mechanical Harvest. We started these trials in mid-summer (July) when plants were establishing or established for the summer growing season. We may have success in controlling the composition of plants if trials occur earlier in the growing season when pondweed and other plants are growing.
3. Water milfoil can resprout from vegetative cuttings, establishing new plants. We presume the ultraviolet light tool does not fragment plants like a mechanical harvest would do. While we did not test this in the field, our pilot work in the laboratory setting shows that vegetative regrowth does not occur when plants are exposed to UV-C. Thus, there should be a reduction in invasive milfoil reestablishment while using UV-C as opposed to Mechanical Harvesting.
4. Large scale acreage tests provide needed information for developing tools for controlling aquatic plants in the Tahoe Keys. Testing at these larger scales in space and over time allows for an understanding of the efficacy of control methods under the highly variable conditions and patch scale structure found in nature related to plant composition including the coverage along the lake bottom, changes in starting conditions in the habitats (deep and shallow), changes in plant succession during the growing season (e.g. from curly leaf pond weed to milfoil and coontail), and the utility of using methods early (immediately after ice off) versus late in the growing season. Unfortunately, due to contracting and complexities in planning, we were not able to initiate this work as early in the growing season as we had wanted to accomplish. Treating 'early in the season and often there after' may allow for strong controls of the plant biomass and height.

Acknowledgements.

Veronica Wright assisted in laboratory sample analysis. Monique Rydel-Fortner and Seth Jones led the Marine Taxonomic Services, Inc. staff in field data and plant collections. Greg Hoover and the Tahoe Keys Property Owners Association staff were instrumental in granting access to the sites. The Tahoe Keys Property Owners Association manages and operates the aquatic vegetation harvesting program. Funding was provided through the Tahoe Regional Planning Agency.

Figure 1: Map of treatment and sampling locations. A Harvest Reference Site had plants removed by a mechanical boat harvester while two sites were used for the UV-C treatments (UV Site 1 and UV Site 2). Orange and green shaded colors represent UV treatment areas. Red dots on the map are locations of plant collections by divers collected from individual 25 x 25 cm quadrats. Thirteen quadrats were collected in the middle of each location (deep samples) and thirteen near the docks on each side (shallow locations).

Figure 2: (A) Diver collecting a pre-treatment sample. (B) Using a quadrat for sampling in a coontail dominant location in the UV Site 2 Shallow area. (C) Pre-treatment sample containing curly-leaf pondweed, leafy pondweed, and coontail. (D) Bags from September sampling drying outside prior to being placed in the oven. Each bag is the plant biomass collected from a single quadrat. (E) UV-C Boat during treatment, and (F) UV-C light array.

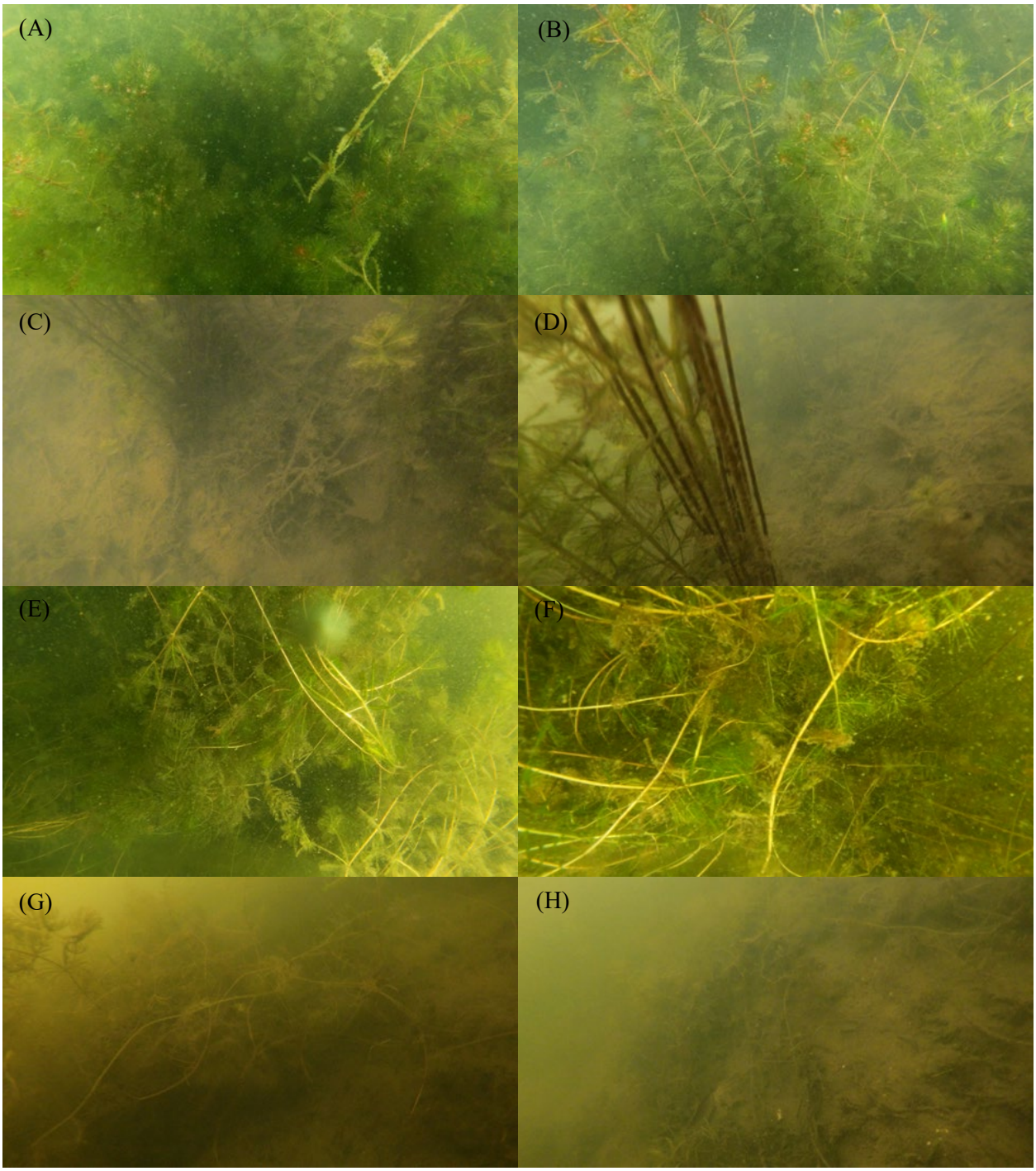

Figure 3: (A) and (B) UV Site 1 on July 6, 2021, prior to UV treatment. (C) and (D) UV Site 1 on September 27, 2021, 8 weeks post first treatment. (E) and (F) UV Site 2 on July 6, 2021, prior to UV treatment. (G) and (H) UV Site 2 on September 27, 2021, 11 weeks post first treatment.

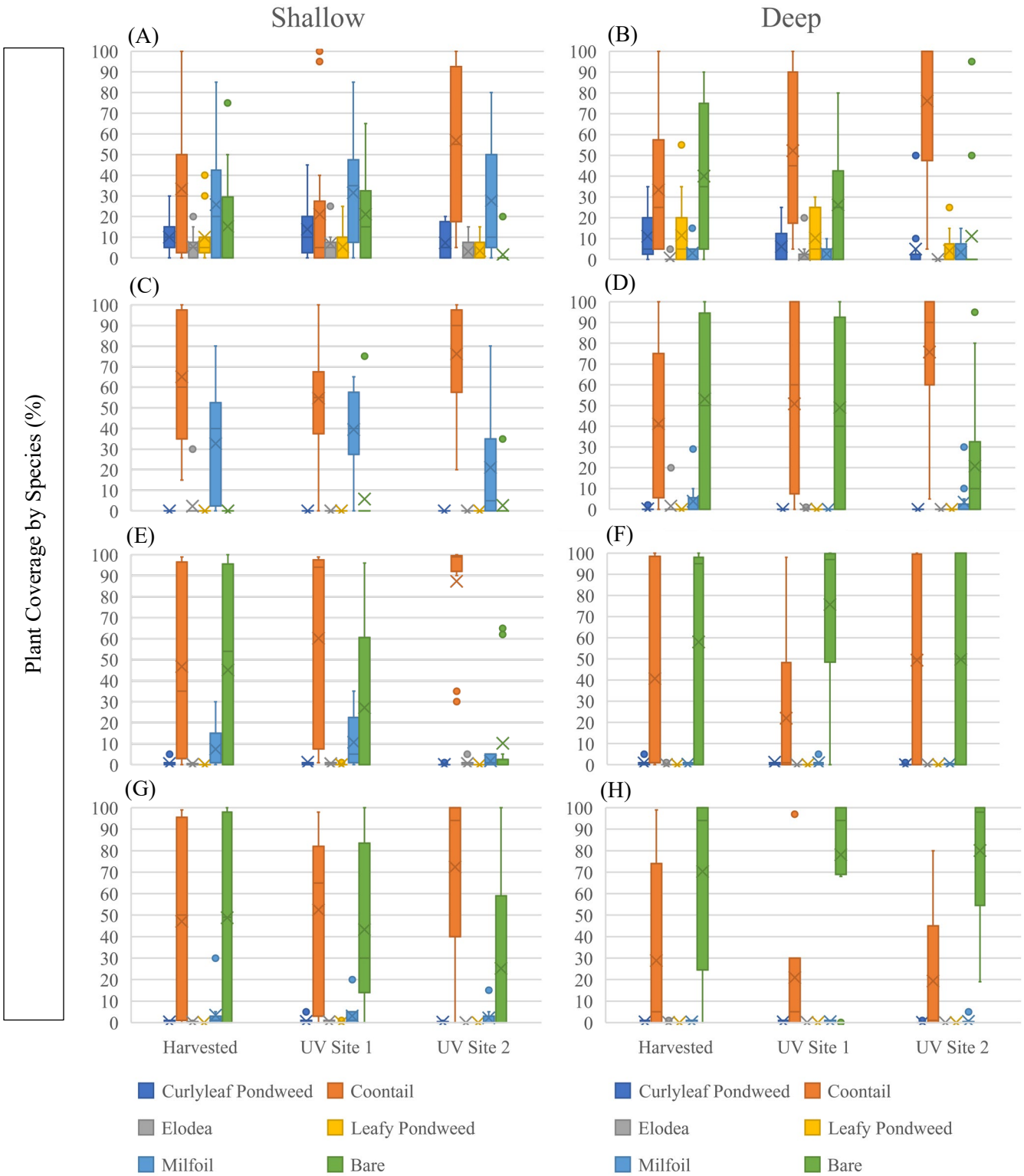

Figure 4: Percent coverage by plant species. Boxes plots include the interquartile range (the middle 50% of all values), which are connected to the minimum and maximum values via lines and bars, the mean is represented by an X, and closed circles are outliers. (A) pre-treatment- shallow, (B) pre-treatment-deep, (C) September- shallow, (D) September- deep, (E) October- shallow, (F) October- deep, (G) November- shallow, (H) November- deep.

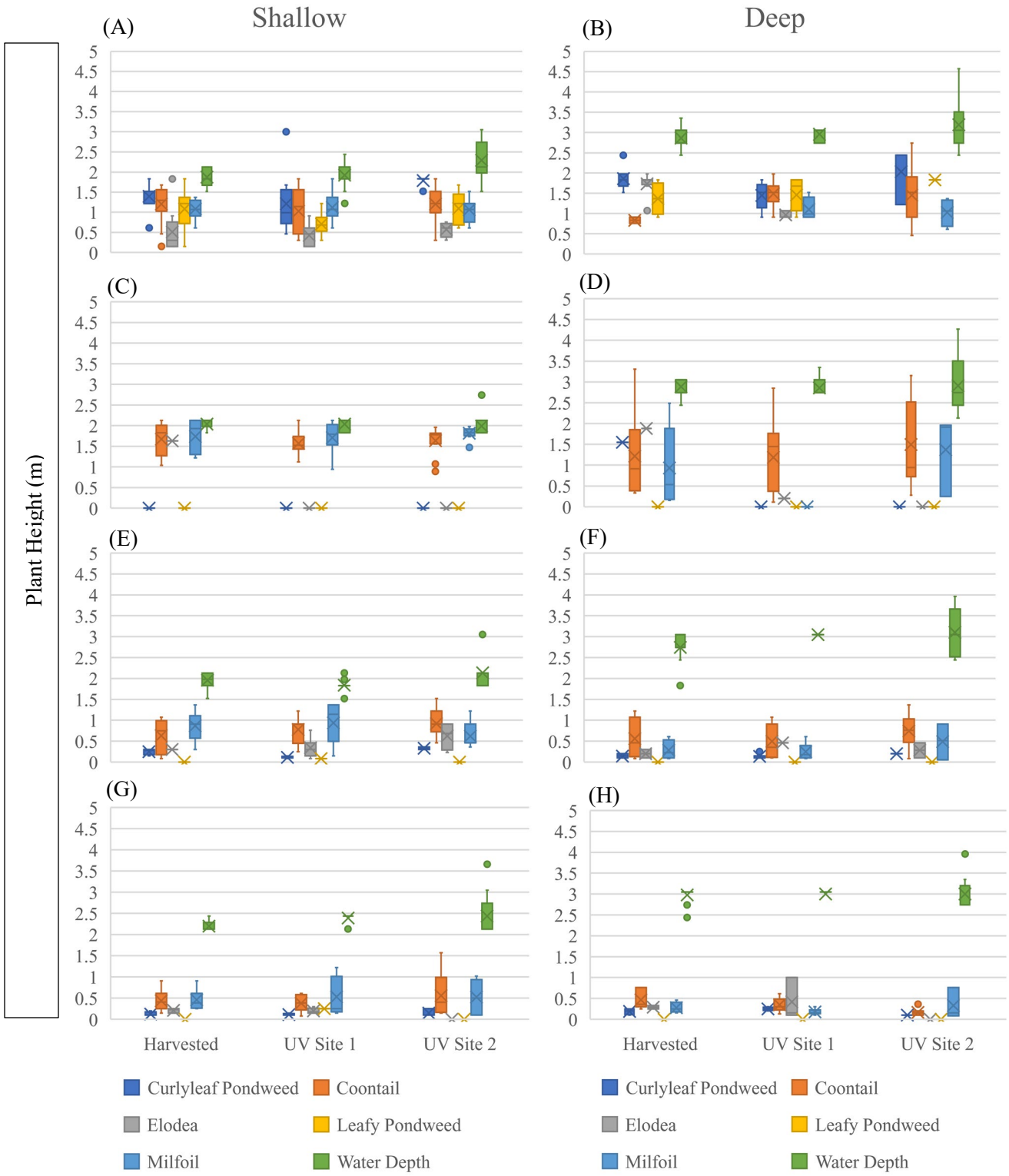

Figure 5: Plant height. Box plots include the interquartile range (the middle 50% of all values), which are connected to the minimum and maximum values via lines and bars, the mean is represented by an X, and closed circles are outliers. (A) pre-treatment- shallow, (B) pre-treatment-deep, (C) September- shallow, (D) September- deep, (E) October- shallow, (F) October- deep, (G) November- shallow, (H) November- deep.

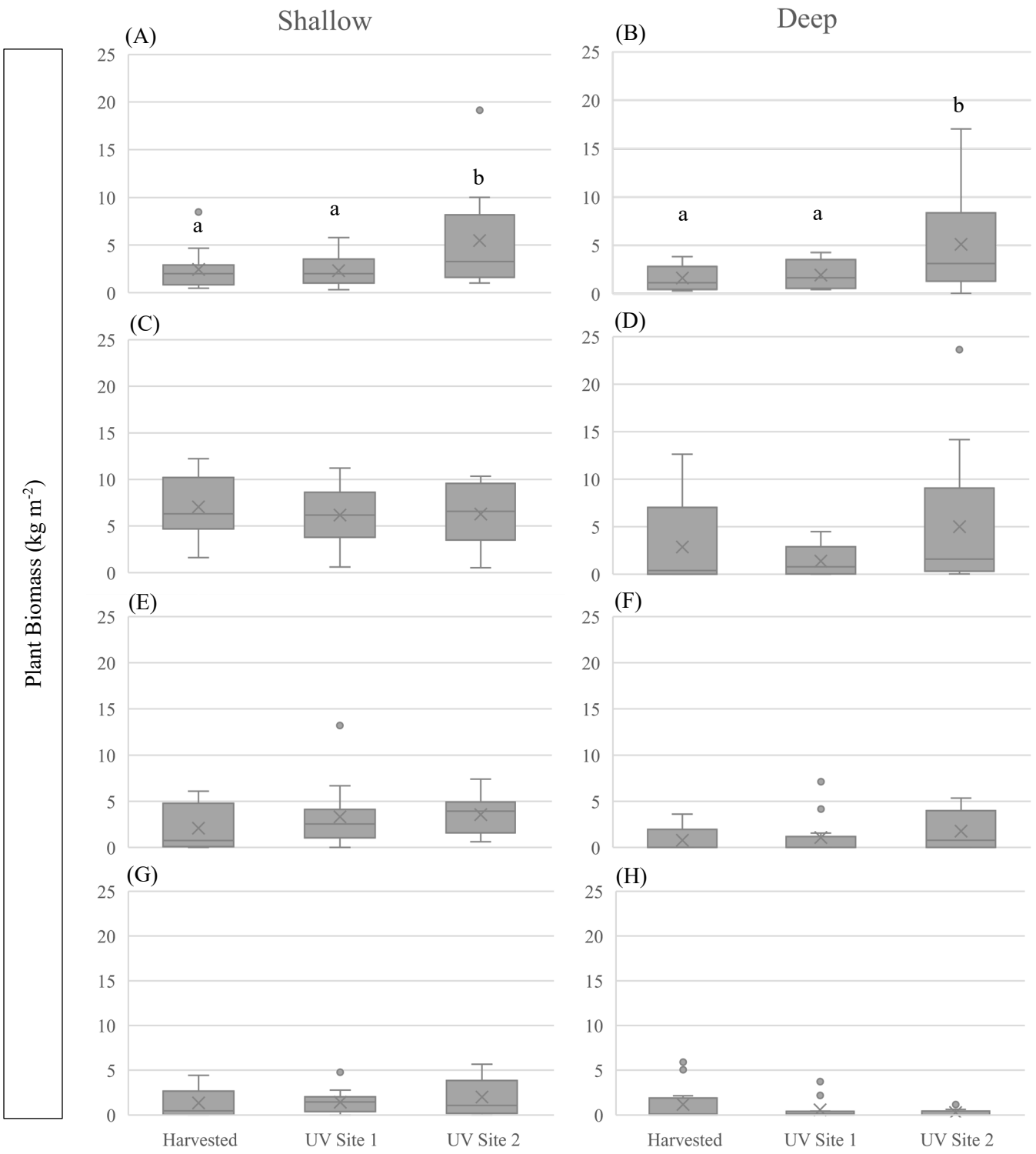

Figure 6: Above sediment plant biomass collections using SCUBA divers. Boxes include the interquartile range (the middle 50% of all values), which are connected to the minimum and maximum values via lines and bars, the mean is represented by an X, and closed circles are outliers. (A) pre-treatment- shallow, (B) pre-treatment-deep, (C) September- shallow, (D) September- deep, (E) October- shallow, (F) October- deep, (G) November- shallow, (H) November- deep. Dissimilar lowercase letters are significantly different from each other (Tukey-Kramer Post Hoc Test).

APPENDIX

C

PLANT TRANSECT DATA

LSB	Lakeside Beach	
LSM	Lakeside Marina	
TK	TKPOA	
E	TKPOA UNR Established Site	
U	TKPOA Untreated Site	
T	TKPOA Treated Site	
%Composition	TKPOA Sites	Rakepulls until 6/22 pretreatment then 4 quadrat samples collected from each transect
%Composition	Lakeside Sites	Based on transects with quadrats along transects
WW	Wet Weight (g)	Includes the fresh weight and the bag weight
FW	Fresh Weight (g)	Weigh of plants only after blotting (WW-BW)
BW	Bag Weight (g)	Weight of the bag contining the sample
WW-chl.a	Wet Weight - chl.a	Weight of the plants and bag after a small sample for chl.a has been removed
DW	Dry Weight	Weight of plants after drying
TDW	Total Dry Weight	Includes the weight of the dry plants and the bag

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
10/8/2019	LSB	1	A	Bare	10				7	55	
10/8/2019	LSB	1	A	Elodea	20	7			7	55	
10/8/2019	LSB	1	A	Milfoil	2	7			7	55	
10/8/2019	LSB	1	A	Najas	68	5			7	55	
10/8/2019	LSB	1	B	Algae	15				6	55	
10/8/2019	LSB	1	B	Bare	85				6	55	
10/8/2019	LSB	1	C	Algae	7				6	55	
10/8/2019	LSB	1	C	Bare	86				6	55	
10/8/2019	LSB	1	C	Milfoil	7	15			6	55	
10/8/2019	LSB	1	D	Algae	48				5	55	
10/8/2019	LSB	1	D	Bare	50				5	55	
10/8/2019	LSB	1	D	Elodea	2	7			5	55	
10/8/2019	LSB	1	E	Bare	100				5	55	
10/8/2019	LSB	2	A	Bare	30				8	57	
10/8/2019	LSB	2	A	Elodea	30	10			8	57	
10/8/2019	LSB	2	A	Milfoil	40	20			8	57	
10/8/2019	LSB	2	B	Bare	50				6	57	
10/8/2019	LSB	2	B	Elodea	18	17			6	57	
10/8/2019	LSB	2	B	Milfoil	2	20			6	57	
10/8/2019	LSB	2	B	Najas	30	10			6	57	
10/8/2019	LSB	2	C	Bare	60				6	57	
10/8/2019	LSB	2	C	Milfoil	40	45			6	57	
10/8/2019	LSB	2	D	Algae	40				5	57	
10/8/2019	LSB	2	D	Milfoil	30	40			5	57	
10/8/2019	LSB	2	D	Najas	30	10			5	57	
10/8/2019	LSB	2	E	Bare	40				5	57	
10/8/2019	LSB	2	E	Milfoil	60	30			5	57	
10/8/2019	LSM	1	A	Algae	70				7	55	
10/8/2019	LSM	1	A	Milfoil	30	30			7	55	
10/8/2019	LSM	1	B	Algae	50				6	55	
10/8/2019	LSM	1	B	Milfoil	50	42			6	55	
10/8/2019	LSM	1	C	Algae	95				6	55	
10/8/2019	LSM	1	C	Milfoil	5	10			6	55	
10/8/2019	LSM	1	D	Algae	65				5	55	
10/8/2019	LSM	1	D	Elodea	35	17			5	55	
10/8/2019	LSM	1	E	Algae	100				5	55	
10/9/2019	LSB	7	A	Algae	20				6	54	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
10/9/2019	LSB	7	A	Bare	55				6	54	
10/9/2019	LSB	7	A	Elodea	5	5			6	54	
10/9/2019	LSB	7	A	Milfoil	15	10			6	54	
10/9/2019	LSB	7	A	Najas	5				6	54	
10/9/2019	LSB	7	B	Algae	27				6	54	
10/9/2019	LSB	7	B	Bare	70				6	54	
10/9/2019	LSB	7	B	Milfoil	3	13			6	54	
10/9/2019	LSB	7	C	Algae	65				6	54	
10/9/2019	LSB	7	C	Bare	25				6	54	
10/9/2019	LSB	7	C	Elodea	5	5			6	54	
10/9/2019	LSB	7	C	Milfoil	5	10			6	54	
10/9/2019	LSB	7	D	Algae	10				5	54	
10/9/2019	LSB	7	D	Bare	87				5	54	
10/9/2019	LSB	7	D	Milfoil	3	2			5	54	
10/9/2019	LSB	7	E	Bare	5				5	54	
10/9/2019	LSB	7	E	Elodea	17	5			5	54	
10/9/2019	LSB	7	E	Milfoil	3	30			5	54	
10/9/2019	LSB	7	E	Najas	75				5	54	
10/9/2019	LSB	8	A	Algae	70				6	54	
10/9/2019	LSB	8	A	Bare	30				6	54	
10/9/2019	LSB	8	B	Bare	88				7	54	
10/9/2019	LSB	8	B	Milfoil	2				7	54	
10/9/2019	LSB	8	B	Najas	10	3			7	54	
10/9/2019	LSB	8	C	Algae	30				6	54	
10/9/2019	LSB	8	C	Bare	30				6	54	
10/9/2019	LSB	8	C	Milfoil	40	10			6	54	
10/9/2019	LSB	8	D	Algae	35				6	54	
10/9/2019	LSB	8	D	Bare	30				6	54	
10/9/2019	LSB	8	D	Milfoil	35	15			6	54	
10/9/2019	LSB	8	E	Algae	76				6	54	
10/9/2019	LSB	8	E	Elodea	20	10			6	54	
10/9/2019	LSB	8	E	Milfoil	2	7			6	54	
10/9/2019	LSB	8	E	Najas	2				6	54	
10/9/2019	LSB	9	A	Algae	20				8	54	
10/9/2019	LSB	9	A	Bare	30				8	54	
10/9/2019	LSB	9	A	Elodea	50	15			8	54	
10/9/2019	LSB	9	B	Bare	55				7	54	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
10/9/2019	LSB	9	B	Milfoil	15	17			7	54	
10/9/2019	LSB	9	B	Najas	30	5			7	54	
10/9/2019	LSB	9	C	Algae	30				6	54	
10/9/2019	LSB	9	C	Bare	70				6	54	
10/9/2019	LSB	9	D	Algae	45				6	54	
10/9/2019	LSB	9	D	Bare	40				6	54	
10/9/2019	LSB	9	D	Milfoil	2	5			6	54	
10/9/2019	LSB	9	D	RPW	13	7			6	54	
10/9/2019	LSB	9	E	Algae	92				5	54	
10/9/2019	LSB	9	E	Elodea	3	7			5	54	
10/9/2019	LSB	9	E	Milfoil	3				5	54	
10/9/2019	LSB	9	E	Najas	2				5	54	
10/10/2019	LSB	3	A	Algae	28				7	52	
10/10/2019	LSB	3	A	Bare	63				7	52	
10/10/2019	LSB	3	A	Elodea	2	7			7	52	
10/10/2019	LSB	3	A	Milfoil	2	12			7	52	
10/10/2019	LSB	3	A	Najas	5	10			7	52	
10/10/2019	LSB	3	B	Algae	50				5	52	
10/10/2019	LSB	3	B	Bare	27				5	52	
10/10/2019	LSB	3	B	Elodea	15	15			5	52	
10/10/2019	LSB	3	B	Milfoil	5	20			5	52	
10/10/2019	LSB	3	B	Najas	3	7			5	52	
10/10/2019	LSB	3	C	Algae	88				5	52	
10/10/2019	LSB	3	C	Bare	2				5	52	
10/10/2019	LSB	3	C	Milfoil	10	20			5	52	
10/10/2019	LSB	3	D	Algae	30				5	52	
10/10/2019	LSB	3	D	Elodea	45	7			5	52	
10/10/2019	LSB	3	D	Milfoil	20	23			5	52	
10/10/2019	LSB	3	D	Najas	5				5	52	
10/10/2019	LSB	3	E	Algae	7				5	52	
10/10/2019	LSB	3	E	Bare	10				5	52	
10/10/2019	LSB	3	E	Elodea	3				5	52	
10/10/2019	LSB	3	E	Milfoil	80	50			5	52	
10/10/2019	LSB	4	A	Algae	15				5	54	
10/10/2019	LSB	4	A	Bare	25				5	54	
10/10/2019	LSB	4	A	Elodea	2	10			5	54	
10/10/2019	LSB	4	A	Milfoil	3	15			5	54	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
10/10/2019	LSB	4	A	Najas	55	10			5	54	
10/10/2019	LSB	4	B	Algae	68				6	54	
10/10/2019	LSB	4	B	Bare	20				6	54	
10/10/2019	LSB	4	B	Milfoil	2	10			6	54	
10/10/2019	LSB	4	B	Najas	10	10			6	54	
10/10/2019	LSB	4	C	Algae	40				6	54	
10/10/2019	LSB	4	C	Bare	50				6	54	
10/10/2019	LSB	4	C	Milfoil	10	25			6	54	
10/10/2019	LSB	4	D	Algae	35				6	54	
10/10/2019	LSB	4	D	Bare	10				6	54	
10/10/2019	LSB	4	D	Elodea	15	7			6	54	
10/10/2019	LSB	4	D	Milfoil	10				6	54	
10/10/2019	LSB	4	D	Najas	30	5			6	54	
10/10/2019	LSB	4	E	Algae	90				5	54	
10/10/2019	LSB	4	E	Bare	7				5	54	
10/10/2019	LSB	4	E	Milfoil	3	20			5	54	
10/10/2019	LSB	5	A	Bare	33				5	54	
10/10/2019	LSB	5	A	Milfoil	2	10			5	54	
10/10/2019	LSB	5	A	Najas	65	7			5	54	
10/10/2019	LSB	5	B	Bare	50				5	54	
10/10/2019	LSB	5	B	Elodea	20	10			5	54	
10/10/2019	LSB	5	B	Milfoil	5	10			5	54	
10/10/2019	LSB	5	B	Najas	25	5			5	54	
10/10/2019	LSB	5	C	Bare	65				5	54	
10/10/2019	LSB	5	C	Elodea	20	7			5	54	
10/10/2019	LSB	5	C	Najas	15	7			5	54	
10/10/2019	LSB	5	D	Bare	25				5	54	
10/10/2019	LSB	5	D	Najas	75	10			5	54	
10/10/2019	LSB	5	E	Elodea	70	7			5	54	
10/10/2019	LSB	5	E	Milfoil	30	50			5	54	
10/10/2019	LSB	6	A	Algae	5				6	54	
10/10/2019	LSB	6	A	Bare	93				6	54	
10/10/2019	LSB	6	A	Milfoil	2	20			6	54	
10/10/2019	LSB	6	B	Algae	43				5	54	
10/10/2019	LSB	6	B	Bare	20				5	54	
10/10/2019	LSB	6	B	Milfoil	2	15			5	54	
10/10/2019	LSB	6	B	Najas	35	7			5	54	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
10/10/2019	LSB	6	C	Algae	45				5	54	
10/10/2019	LSB	6	C	Bare	45				5	54	
10/10/2019	LSB	6	C	Elodea	3	5			5	54	
10/10/2019	LSB	6	C	Milfoil	7	15			5	54	
10/10/2019	LSB	6	D	Algae	39				5	54	
10/10/2019	LSB	6	D	Bare	25				5	54	
10/10/2019	LSB	6	D	Elodea	30	10			5	54	
10/10/2019	LSB	6	D	Milfoil	6	50			5	54	
10/10/2019	LSB	6	E	Algae	50				5	54	
10/10/2019	LSB	6	E	Elodea	25	10			5	54	
10/10/2019	LSB	6	E	Milfoil	15	45			5	54	
10/10/2019	LSB	6	E	Najas	10	15			5	54	
10/14/2019	TK	E	1	Algae	1						Rake Pulls no depth or temp recorded
10/14/2019	TK	E	1	Coontail	60						Rake Pulls no depth or temp recorded
10/14/2019	TK	E	1	Elodea	10						Rake Pulls no depth or temp recorded
10/14/2019	TK	E	1	LPW	1						Rake Pulls no depth or temp recorded
10/14/2019	TK	E	1	Milfoil	25						Rake Pulls no depth or temp recorded
10/14/2019	TK	E	1	RPW	3						Rake Pulls no depth or temp recorded
10/14/2019	TK	T	1	Coontail	3						Rake Pulls no depth or temp recorded
10/14/2019	TK	T	1	Elodea	5						Rake Pulls no depth or temp recorded
10/14/2019	TK	T	1	Milfoil	45						Rake Pulls no depth or temp recorded
10/14/2019	TK	T	1	RPW	47						Rake Pulls no depth or temp recorded
10/14/2019	TK	U	1	Coontail	97						Rake Pulls no depth or temp recorded
10/14/2019	TK	U	1	Milfoil	3						Rake Pulls no depth or temp recorded
11/13/2019	TK	E	1	Coontail	7						Rake Pulls no depth or temp recorded
11/13/2019	TK	E	1	elodea	3						Rake Pulls no depth or temp recorded
11/13/2019	TK	E	1	milfoil	90						Rake Pulls no depth or temp recorded
11/13/2019	TK	E	2	Algae	1						Rake Pulls no depth or temp recorded
11/13/2019	TK	E	2	Coontail	3						Rake Pulls no depth or temp recorded
11/13/2019	TK	E	2	milfoil	94						Rake Pulls no depth or temp recorded
11/13/2019	TK	E	2	RPW	2						Rake Pulls no depth or temp recorded
11/13/2019	TK	E	3	CLPW	1						Rake Pulls no depth or temp recorded
11/13/2019	TK	E	3	Coontail	10						Rake Pulls no depth or temp recorded
11/13/2019	TK	E	3	milfoil	89						Rake Pulls no depth or temp recorded
11/13/2019	TK	T	1	Coontail	8						Rake Pulls no depth or temp recorded
11/13/2019	TK	T	1	elodea	2						Rake Pulls no depth or temp recorded
11/13/2019	TK	T	1	milfoil	50						Rake Pulls no depth or temp recorded

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
11/13/2019	TK	T	1	RPW	40						Rake Pulls no depth or temp recorded
11/13/2019	TK	T	2	Algae	2						Rake Pulls no depth or temp recorded
11/13/2019	TK	T	2	Coontail	5						Rake Pulls no depth or temp recorded
11/13/2019	TK	T	2	milfoil	93						Rake Pulls no depth or temp recorded
11/13/2019	TK	T	3	CLPW	2						Rake Pulls no depth or temp recorded
11/13/2019	TK	T	3	Coontail	90						Rake Pulls no depth or temp recorded
11/13/2019	TK	T	3	milfoil	8						Rake Pulls no depth or temp recorded
11/13/2019	TK	U	1	Coontail	100						Rake Pulls no depth or temp recorded
11/13/2019	TK	U	2	Coontail	100						Rake Pulls no depth or temp recorded
11/13/2019	TK	U	3	Algae	2						Rake Pulls no depth or temp recorded
11/13/2019	TK	U	3	Coontail	98						Rake Pulls no depth or temp recorded
11/18/2019	LSB	1	A	Bare	100				6	52	
11/18/2019	LSB	1	B	Bare	100				6	52	
11/18/2019	LSB	1	C	Bare	98				6	51	
11/18/2019	LSB	1	C	Milfoil	2	5			6	51	
11/18/2019	LSB	1	D	Bare	97				6	51	
11/18/2019	LSB	1	D	Milfoil	3	10			6	51	
11/18/2019	LSB	1	E	Bare	95				5	51	
11/18/2019	LSB	1	E	Milfoil	5	13			5	51	
11/18/2019	LSB	2	A	Algae	20				7	51	
11/18/2019	LSB	2	A	Bare	80				7	51	
11/18/2019	LSB	2	B	Algae	5				6	51	
11/18/2019	LSB	2	B	Bare	95				6	51	
11/18/2019	LSB	2	C	Algae	3				6	51	
11/18/2019	LSB	2	C	Bare	95				6	51	
11/18/2019	LSB	2	C	Milfoil	2	10			6	51	
11/18/2019	LSB	2	D	Bare	97				6	51	
11/18/2019	LSB	2	D	Milfoil	3	5			6	51	
11/18/2019	LSB	2	E	Bare	95				6	51	
11/18/2019	LSB	2	E	Milfoil	5	10			6	51	
11/18/2019	LSB	3	A	Bare	99				5	50	
11/18/2019	LSB	3	A	Milfoil	1	5			5	50	
11/18/2019	LSB	3	B	Bare	98				5	50	
11/18/2019	LSB	3	B	Milfoil	2	8			5	50	
11/18/2019	LSB	3	C	Bare	95				6	50	
11/18/2019	LSB	3	C	Milfoil	5	11			6	50	
11/18/2019	LSB	3	D	Algae	2				6	50	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
11/18/2019	LSB	3	D	Bare	90				6	50	
11/18/2019	LSB	3	D	Milfoil	8	16			6	50	
11/18/2019	LSB	3	E	Algae	5				5	50	
11/18/2019	LSB	3	E	Bare	65				5	50	
11/18/2019	LSB	3	E	Milfoil	30	35			5	50	
11/18/2019	LSB	4	A	Algae	10				5	50	
11/18/2019	LSB	4	A	Bare	89				5	50	
11/18/2019	LSB	4	A	Milfoil	1	5			5	50	
11/18/2019	LSB	4	B	Algae	5				5	50	
11/18/2019	LSB	4	B	Bare	90				5	50	
11/18/2019	LSB	4	B	Milfoil	5	13			5	50	
11/18/2019	LSB	4	C	Bare	95				5	50	
11/18/2019	LSB	4	C	Milfoil	5	15			5	50	
11/18/2019	LSB	4	D	Bare	95				6	50	
11/18/2019	LSB	4	D	Milfoil	5	10			5	50	
11/18/2019	LSB	4	E	Bare	98				6	50	
11/18/2019	LSB	4	E	Milfoil	2	25			6	50	
11/18/2019	LSB	5	A	Bare	97				5	50	
11/18/2019	LSB	5	A	Milfoil	2	11			5	50	
11/18/2019	LSB	5	A	UNK - Grass	1	2			5	50	
11/18/2019	LSB	5	B	Bare	98				5	50	
11/18/2019	LSB	5	B	Milfoil	2	8			5	50	
11/18/2019	LSB	5	C	Bare	98				5	50	
11/18/2019	LSB	5	C	Milfoil	2	11			5	50	
11/18/2019	LSB	5	D	Bare	85				5	50	
11/18/2019	LSB	5	D	Milfoil	15	27			5	50	
11/18/2019	LSB	5	E	Algae	1				5	50	
11/18/2019	LSB	5	E	Bare	98				5	50	
11/18/2019	LSB	5	E	Milfoil	1	7			5	50	
11/18/2019	LSB	6	A	Algae	5				6	51	
11/18/2019	LSB	6	A	Bare	90				6	51	
11/18/2019	LSB	6	A	Milfoil	5	8			6	51	
11/18/2019	LSB	6	B	Bare	98				6	51	
11/18/2019	LSB	6	B	Milfoil	2	5			6	51	
11/18/2019	LSB	6	C	Bare	98				6	50	
11/18/2019	LSB	6	C	Milfoil	2	10			6	50	
11/18/2019	LSB	6	D	Bare	100				6	50	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
11/18/2019	LSB	6	E	Bare	90				5	50	
11/18/2019	LSB	6	E	Milfoil	10	35			5	50	
11/18/2019	LSB	7	A	Algae	2				5	48	
11/18/2019	LSB	7	A	Bare	95				5	48	
11/18/2019	LSB	7	A	Milfoil	3	8			5	48	
11/18/2019	LSB	7	B	Bare	90				6	48	
11/18/2019	LSB	7	B	Elodea	2	9			6	48	
11/18/2019	LSB	7	B	Milfoil	8	12			6	48	
11/18/2019	LSB	7	C	Bare	85				6	48	
11/18/2019	LSB	7	C	Milfoil	15	12			6	48	
11/18/2019	LSB	7	D	Algae	3				5	48	
11/18/2019	LSB	7	D	Bare	65				5	48	
11/18/2019	LSB	7	D	Elodea	2	3			5	48	
11/18/2019	LSB	7	D	Milfoil	30	14			5	48	
11/18/2019	LSB	7	E	Bare	90				6	48	
11/18/2019	LSB	7	E	Milfoil	7	14			6	48	
11/18/2019	LSB	7	E	UNK - Grass	3	2			5	48	
11/18/2019	LSB	8	A	Algae	8				7	51	
11/18/2019	LSB	8	A	Bare	90				7	51	
11/18/2019	LSB	8	A	Milfoil	2	10			7	51	
11/18/2019	LSB	8	B	Bare	95				7	51	
11/18/2019	LSB	8	B	Milfoil	5	10			7	51	
11/18/2019	LSB	8	C	Bare	95				7	51	
11/18/2019	LSB	8	C	Elodea	1	5			7	51	
11/18/2019	LSB	8	C	Milfoil	3	15			7	51	
11/18/2019	LSB	8	C	RPW	1				7	51	
11/18/2019	LSB	8	D	Algae	15				6	51	
11/18/2019	LSB	8	D	Bare	80				6	51	
11/18/2019	LSB	8	D	Milfoil	5	15			6	51	
11/18/2019	LSB	8	E	Algae	5				6	51	
11/18/2019	LSB	8	E	Bare	85				6	51	
11/18/2019	LSB	8	E	Milfoil	10	31			6	51	
11/18/2019	LSB	9	A	Algae	50				6	48	
11/18/2019	LSB	9	A	Bare	48				6	48	
11/18/2019	LSB	9	A	Milfoil	2	3			6	48	
11/18/2019	LSB	9	B	Algae	6				7	48	
11/18/2019	LSB	9	B	Bare	93				7	48	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
11/18/2019	LSB	9	B	Milfoil	1	5			7	48	
11/18/2019	LSB	9	C	Bare	99				7	48	
11/18/2019	LSB	9	C	Milfoil	1	3			7	48	
11/18/2019	LSB	9	D	Algae	3				7	48	
11/18/2019	LSB	9	D	Bare	94				7	48	
11/18/2019	LSB	9	D	Milfoil	3	15			7	48	
11/18/2019	LSB	9	E	Algae	16				7	48	
11/18/2019	LSB	9	E	Bare	80				7	48	
11/18/2019	LSB	9	E	Elodea	1	10			7	48	
11/18/2019	LSB	9	E	Milfoil	3	11			7	48	
11/18/2019	LSM	1	A	Bare	85				6	48	
11/18/2019	LSM	1	A	Milfoil	15	25			6	48	
11/18/2019	LSM	1	C	Bare	99				6	48	
11/18/2019	LSM	1	C	Bare	99				6	48	
11/18/2019	LSM	1	C	Milfoil	1	16			6	48	
11/18/2019	LSM	1	C	Milfoil	1	8			6	48	
11/18/2019	LSM	1	D	Bare	99				8	50	
11/18/2019	LSM	1	D	Milfoil	1	7			8	50	
11/18/2019	LSM	1	E	Bare	98				10	50	
11/18/2019	LSM	1	E	Milfoil	2	27			10	50	
1/30/2020	LSB	1	A	Bare	100				6	42	
1/30/2020	LSB	1	B	Algae	2				6	42	
1/30/2020	LSB	1	B	Bare	98				6	42	
1/30/2020	LSB	1	C	Bare	99				6	42	
1/30/2020	LSB	1	C	milfoil	1	5			6	42	
1/30/2020	LSB	1	D	Bare	97				6	42	
1/30/2020	LSB	1	D	milfoil	3	8			6	42	
1/30/2020	LSB	1	E	Bare	100				5	42	
1/30/2020	LSB	2	A	Bare	100				6	42	
1/30/2020	LSB	2	B	Bare	100				6	42	
1/30/2020	LSB	2	C	Bare	100				6	42	
1/30/2020	LSB	2	D	Bare	98				6	42	
1/30/2020	LSB	2	D	milfoil	2	5			6	42	
1/30/2020	LSB	2	E	Bare	98				5	42	
1/30/2020	LSB	2	E	milfoil	2	8			5	42	
1/30/2020	LSB	3	A	Bare	100				6	42	
1/30/2020	LSB	3	B	Bare	99				6	42	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
1/30/2020	LSB	3	B	milfoil	1	2.5			6	42	
1/30/2020	LSB	3	C	Bare	97				6	42	
1/30/2020	LSB	3	C	milfoil	3	8			6	42	
1/30/2020	LSB	3	D	Bare	95				6	42	
1/30/2020	LSB	3	D	milfoil	5	10			6	42	
1/30/2020	LSB	3	E	Bare	85				5	42	
1/30/2020	LSB	3	E	milfoil	15	25			5	42	
1/30/2020	LSB	4	A	Bare	100				6	42	
1/30/2020	LSB	4	B	Algae	5				6	42	
1/30/2020	LSB	4	B	Bare	95				6	42	
1/30/2020	LSB	4	C	Algae	3				6	42	
1/30/2020	LSB	4	C	Bare	96				6	42	
1/30/2020	LSB	4	C	milfoil	1	5			6	42	
1/30/2020	LSB	4	D	Algae	3				6	42	
1/30/2020	LSB	4	D	Bare	96				6	42	
1/30/2020	LSB	4	D	milfoil	1	8			6	42	
1/30/2020	LSB	4	E	Bare	90				5	42	
1/30/2020	LSB	4	E	milfoil	10	23			5	42	
1/30/2020	LSB	5	A	Bare	100				6	42	
1/30/2020	LSB	5	B	Algae	4				6	42	
1/30/2020	LSB	5	B	Bare	96				6	42	
1/30/2020	LSB	5	C	Algae	2				6	42	
1/30/2020	LSB	5	C	Bare	95				6	42	
1/30/2020	LSB	5	C	milfoil	3	5			6	42	
1/30/2020	LSB	5	D	Bare	100				6	41	
1/30/2020	LSB	5	E	Bare	100				6	41	
1/30/2020	LSB	6	A	Bare	100				6	42	
1/30/2020	LSB	6	B	Algae	5				6	42	
1/30/2020	LSB	6	B	Bare	95				6	42	
1/30/2020	LSB	6	C	Bare	100				6	41	
1/30/2020	LSB	6	D	Bare	100				6	41	
1/30/2020	LSB	6	E	Bare	97				5	41	
1/30/2020	LSB	6	E	milfoil	3	20			5	41	
1/30/2020	LSB	7	A	Bare	100				6	42	
1/30/2020	LSB	7	B	Bare	100				6	42	
1/30/2020	LSB	7	C	Bare	99				6	42	
1/30/2020	LSB	7	C	milfoil	1	8			6	42	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
1/30/2020	LSB	7	D	Bare	100				6	42	
1/30/2020	LSB	7	E	Bare	98				5	42	
1/30/2020	LSB	7	E	milfoil	2	15			5	42	
1/30/2020	LSB	8	A	Algae	1	3			7	42	
1/30/2020	LSB	8	A	Bare	98				7	42	
1/30/2020	LSB	8	A	milfoil	1	3			7	42	
1/30/2020	LSB	8	B	Bare	97				7	42	
1/30/2020	LSB	8	B	milfoil	3	8			7	42	
1/30/2020	LSB	8	C	Bare	100				7	41	
1/30/2020	LSB	8	D	Bare	94				7	41	
1/30/2020	LSB	8	D	milfoil	5	3			7	41	
1/30/2020	LSB	8	D	unk grass	1	5			7	41	
1/30/2020	LSB	8	E	Bare	97				6	41	
1/30/2020	LSB	8	E	milfoil	3	13			6	41	
1/30/2020	LSB	9	A	Bare	100				6	42	
1/30/2020	LSB	9	B	Algae	1	3			6	42	
1/30/2020	LSB	9	B	Bare	94				6	42	
1/30/2020	LSB	9	B	milfoil	5	3			6	42	
1/30/2020	LSB	9	C	Bare	98				7	43	
1/30/2020	LSB	9	C	milfoil	2	3			7	43	
1/30/2020	LSB	9	D	Bare	100				7	43	
1/30/2020	LSB	9	E	Bare	98				7	44	
1/30/2020	LSB	9	E	milfoil	2	8			7	44	
1/30/2020	LSM	1	A	Bare	100				7	42	
1/30/2020	LSM	1	B	Bare	100				7	42	
1/30/2020	LSM	1	C	Algae	10				7	42	
1/30/2020	LSM	1	C	Bare	90				7	42	
1/30/2020	LSM	1	D	Algae	10				7	42	
1/30/2020	LSM	1	D	Bare	90				7	42	
1/30/2020	LSM	1	E	Bare	100				8	42	
2/25/2020	LSB	1	A	Bare	100				6	42	
2/25/2020	LSB	1	B	Bare	100				6	42	
2/25/2020	LSB	1	C	Bare	100				6	42	
2/25/2020	LSB	1	D	Bare	100				6	42	
2/25/2020	LSB	1	E	Bare	99				6	42	
2/25/2020	LSB	1	E	milfoil	1	8			6	42	
2/25/2020	LSB	2	A	Bare	100				6	43	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
2/25/2020	LSB	2	B	Bare	100				6	43	
2/25/2020	LSB	2	C	Bare	100				6	43	
2/25/2020	LSB	2	D	Bare	100				6	43	
2/25/2020	LSB	2	E	Bare	50				5	43	
2/25/2020	LSB	2	E	milfoil	10	3			5	43	
2/25/2020	LSB	2	E	other	40	3			5	43	
2/25/2020	LSB	3	A	Bare	100				6	42	
2/25/2020	LSB	3	B	Bare	100				6	42	
2/25/2020	LSB	3	C	Algae	4	3			6	42	
2/25/2020	LSB	3	C	Bare	95				6	42	
2/25/2020	LSB	3	C	milfoil	1	10			6	42	
2/25/2020	LSB	3	D	Bare	95				6	42	
2/25/2020	LSB	3	D	milfoil	5	15			6	42	
2/25/2020	LSB	3	E	Bare	90				5	42	
2/25/2020	LSB	3	E	milfoil	10	28			5	42	
2/25/2020	LSB	4	A	Bare	100				6	43	
2/25/2020	LSB	4	B	Algae	3				6	43	
2/25/2020	LSB	4	B	Bare	97				6	43	
2/25/2020	LSB	4	C	Algae	10	5			6	42	
2/25/2020	LSB	4	C	Bare	90				6	42	
2/25/2020	LSB	4	D	Algae	4	3			6	43	
2/25/2020	LSB	4	D	Bare	95				6	43	
2/25/2020	LSB	4	D	milfoil	1	10			6	43	
2/25/2020	LSB	4	E	Bare	100				6	43	
2/25/2020	LSB	5	A	Bare	100				6	43	
2/25/2020	LSB	5	B	Algae	5	3			6	43	
2/25/2020	LSB	5	B	Bare	95				6	43	
2/25/2020	LSB	5	C	Algae	4	3			6	42	
2/25/2020	LSB	5	C	Bare	95				6	42	
2/25/2020	LSB	5	C	milfoil	1	8			6	42	
2/25/2020	LSB	5	D	Algae	3	3			5	42	
2/25/2020	LSB	5	D	Bare	97				5	42	
2/25/2020	LSB	5	E	Bare	97				5	42	
2/25/2020	LSB	5	E	elodea	3	8			5	42	
2/25/2020	LSB	6	A	Algae	5				6	42	
2/25/2020	LSB	6	A	Bare	95				6	42	
2/25/2020	LSB	6	B	Algae	3	3			6	42	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
2/25/2020	LSB	6	B	Algae	2				6	42	
2/25/2020	LSB	6	B	Bare	95				6	42	
2/25/2020	LSB	6	C	Algae	3				6	42	
2/25/2020	LSB	6	C	Bare	97				6	42	
2/25/2020	LSB	6	D	Bare	100				6	42	
2/25/2020	LSB	6	E	Bare	98				5	42	
2/25/2020	LSB	6	E	milfoil	2				5	42	
2/25/2020	LSB	7	A	Algae	2				6	42	
2/25/2020	LSB	7	A	Bare	98				6	42	
2/25/2020	LSB	7	B	Algae	2				6	42	
2/25/2020	LSB	7	B	Bare	98				6	42	
2/25/2020	LSB	7	C	Algae	2				6	42	
2/25/2020	LSB	7	C	Bare	98				6	42	
2/25/2020	LSB	7	D	Algae	2				6	42	
2/25/2020	LSB	7	D	Bare	95				6	42	
2/25/2020	LSB	7	D	milfoil	3	10			6	42	
2/25/2020	LSB	7	E	Algae	2				5	42	
2/25/2020	LSB	7	E	Bare	98				5	42	
2/25/2020	LSB	8	A	Algae	3				7	43	
2/25/2020	LSB	8	A	Bare	95				7	43	
2/25/2020	LSB	8	A	other	2	5			7	43	
2/25/2020	LSB	8	B	Algae	2				7	43	
2/25/2020	LSB	8	B	Bare	98				7	43	
2/25/2020	LSB	8	C	Bare	98				6	42	
2/25/2020	LSB	8	C	other	2	8			6	42	
2/25/2020	LSB	8	D	Algae	3				6	42	
2/25/2020	LSB	8	D	Bare	95				6	42	
2/25/2020	LSB	8	D	milfoil	2	10			6	42	
2/25/2020	LSB	8	E	Bare	97				5	42	
2/25/2020	LSB	8	E	milfoil	3	13			5	42	
2/25/2020	LSB	9	A	Bare	100				6	43	
2/25/2020	LSB	9	B	Algae	5				6	43	
2/25/2020	LSB	9	B	Bare	95				6	43	
2/25/2020	LSB	9	C	Algae	4				7	43	
2/25/2020	LSB	9	C	Bare	95				7	43	
2/25/2020	LSB	9	C	milfoil	1	8			7	43	
2/25/2020	LSB	9	D	Algae	1				6	43	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
2/25/2020	LSB	9	D	Bare	98				6	43	
2/25/2020	LSB	9	D	milfoil	1	5			6	43	
2/25/2020	LSB	9	E	Bare	97				6	43	
2/25/2020	LSB	9	E	milfoil	3	13			6	43	
2/25/2020	LSM	1	A	Bare	100				7	42	
2/25/2020	LSM	1	B	Bare	100				7	43	
2/25/2020	LSM	1	C	Bare	100				7	43	
2/25/2020	LSM	1	D	Bare	100				6	43	
2/25/2020	LSM	1	E	Bare	100				7	43	
4/1/2020	TK	E	?								%composition by weight noted in Tahoe Curlyleaf data
4/1/2020	TK	T									%composition by weight noted in Tahoe Curlyleaf data
4/1/2020	TK	U									%composition by weight noted in data
4/10/2020	LSB	1	A	Algae	10	3			7	42.8	
4/10/2020	LSB	1	A	Bare	90				7	42.8	
4/10/2020	LSB	1	B	Algae	2	2			7	41	
4/10/2020	LSB	1	B	Bare	98				7	41	
4/10/2020	LSB	1	C	Algae	2	2			7	41	
4/10/2020	LSB	1	C	Bare	97				7	41	
4/10/2020	LSB	1	C	milfoil	1	8			7	41	
4/10/2020	LSB	1	D	Algae	2	3			6	41	
4/10/2020	LSB	1	D	Bare	97				6	41	
4/10/2020	LSB	1	D	milfoil	1	4			6	41	
4/10/2020	LSB	1	E	Algae	2	4			5	41	
4/10/2020	LSB	1	E	Bare	98				5	41	
4/10/2020	LSB	2	A	Algae	1	1			7	41	
4/10/2020	LSB	2	A	Bare	99				7	41	
4/10/2020	LSB	2	B	Algae	1	1			7	41	
4/10/2020	LSB	2	B	Bare	99				7	41	
4/10/2020	LSB	2	C	Algae	2	1			7	41	
4/10/2020	LSB	2	C	Bare	97				7	41	
4/10/2020	LSB	2	C	milfoil	1	9			7	41	
4/10/2020	LSB	2	D	Algae	2	2			6	41	
4/10/2020	LSB	2	D	Bare	97				6	41	
4/10/2020	LSB	2	D	milfoil	1	10			6	41	
4/10/2020	LSB	2	E	Algae	2	2			6	41	
4/10/2020	LSB	2	E	Bare	93				6	41	
4/10/2020	LSB	2	E	milfoil	5	11			6	41	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
4/10/2020	LSB	3	A	Bare	100				5	42.8	
4/10/2020	LSB	3	B	Algae	2	2			6	41	
4/10/2020	LSB	3	B	Bare	98				6	41	
4/10/2020	LSB	3	C	Algae	1	2			6	41	
4/10/2020	LSB	3	C	Bare	97				6	41	
4/10/2020	LSB	3	C	milfoil	1	6			6	41	
4/10/2020	LSB	3	D	Algae	1	2			6	41	
4/10/2020	LSB	3	D	Bare	96				6	41	
4/10/2020	LSB	3	D	milfoil	1	8			6	41	
4/10/2020	LSB	3	D	other	1	3			6	41	
4/10/2020	LSB	3	E	Algae	3	2			6	41	
4/10/2020	LSB	3	E	Bare	89				6	41	
4/10/2020	LSB	3	E	milfoil	5	11			6	41	
4/10/2020	LSB	3	E	other	3	4			6	41	
4/10/2020	LSB	4	A	Algae	3	2			7	41	
4/10/2020	LSB	4	A	Bare	97				7	41	
4/10/2020	LSB	4	B	Algae	2	2			6	41	
4/10/2020	LSB	4	B	Bare	95				6	41	
4/10/2020	LSB	4	B	milfoil	3	9			6	41	
4/10/2020	LSB	4	C	Algae	2	1			6	41	
4/10/2020	LSB	4	C	Bare	97				6	41	
4/10/2020	LSB	4	C	milfoil	1	6			6	41	
4/10/2020	LSB	4	D	Algae	3	2			7	41	
4/10/2020	LSB	4	D	Bare	93				7	41	
4/10/2020	LSB	4	D	milfoil	1	7			7	41	
4/10/2020	LSB	4	D	other	3	2			7	41	
4/10/2020	LSB	4	E	Algae	2	1			6	41	
4/10/2020	LSB	4	E	Bare	96				6	41	
4/10/2020	LSB	4	E	other	2	2			6	41	
4/10/2020	LSB	5	A	Algae	3	3			7	39	
4/10/2020	LSB	5	A	Bare	97				7	39	
4/10/2020	LSB	5	B	Algae	2	2			6	39	
4/10/2020	LSB	5	B	Bare	95				6	39	
4/10/2020	LSB	5	B	milfoil	3	5			6	39	
4/10/2020	LSB	5	C	Algae	2	2			6	39	
4/10/2020	LSB	5	C	Bare	98				6	39	
4/10/2020	LSB	5	D	Algae	2	2			6	39	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
4/10/2020	LSB	5	D	Bare	92				6	39	
4/10/2020	LSB	5	D	milfoil	4	16			6	39	
4/10/2020	LSB	5	D	other	2	2			6	39	
4/10/2020	LSB	5	E	Algae	1	3			6	39	
4/10/2020	LSB	5	E	Bare	96				6	39	
4/10/2020	LSB	5	E	other	3	5			6	39	
4/10/2020	LSB	6	A	Algae	2	3			6	39	
4/10/2020	LSB	6	A	Bare	97				6	39	
4/10/2020	LSB	6	A	milfoil	1	8			6	39	
4/10/2020	LSB	6	B	Algae	2	2			6	39	
4/10/2020	LSB	6	B	Bare	98				6	39	
4/10/2020	LSB	6	C	Algae	2	2			6	39	
4/10/2020	LSB	6	C	Bare	94				6	39	
4/10/2020	LSB	6	C	milfoil	2	7			6	39	
4/10/2020	LSB	6	D	Algae	2	2			6	39	
4/10/2020	LSB	6	D	Bare	95				6	39	
4/10/2020	LSB	6	D	milfoil	2	8			6	39	
4/10/2020	LSB	6	D	other	1	3			6	39	
4/10/2020	LSB	6	E	Algae	2	2			5	39	
4/10/2020	LSB	6	E	Bare	97				5	39	
4/10/2020	LSB	6	E	milfoil	1	11			5	39	
4/10/2020	LSB	7	A	Algae	5	2			7	39	
4/10/2020	LSB	7	A	Bare	95				7	39	
4/10/2020	LSB	7	A	milfoil	2	6			7	39	
4/10/2020	LSB	7	B	Algae	1	1			6	39	
4/10/2020	LSB	7	B	Bare	95				6	39	
4/10/2020	LSB	7	B	milfoil	1	9			6	39	
4/10/2020	LSB	7	B	other	3	3			6	39	
4/10/2020	LSB	7	C	Algae	3	2			6	39	
4/10/2020	LSB	7	C	Bare	90				6	39	
4/10/2020	LSB	7	C	milfoil	4	12			6	39	
4/10/2020	LSB	7	C	other	3	3			6	39	
4/10/2020	LSB	7	D	Algae	2	2			6	39	
4/10/2020	LSB	7	D	Bare	91				6	39	
4/10/2020	LSB	7	D	milfoil	4	9			6	39	
4/10/2020	LSB	7	D	other	3	4			6	39	
4/10/2020	LSB	7	E	Algae	5	3			6	39	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
4/10/2020	LSB	7	E	Bare	95				6	39	
4/10/2020	LSB	8	A	Algae	5	4			7	39	
4/10/2020	LSB	8	A	Bare	90				7	39	
4/10/2020	LSB	8	A	other	5	7			7	39	
4/10/2020	LSB	8	B	Algae	2	3			7	39	
4/10/2020	LSB	8	B	Bare	96				7	39	
4/10/2020	LSB	8	B	milfoil	1	11			7	39	
4/10/2020	LSB	8	B	other	1	3			7	39	
4/10/2020	LSB	8	C	Algae	2	3			5	39	
4/10/2020	LSB	8	C	Bare	98				5	39	
4/10/2020	LSB	8	D	Algae	5	5			6	39	
4/10/2020	LSB	8	D	Bare	91				6	39	
4/10/2020	LSB	8	D	milfoil	3	15			6	39	
4/10/2020	LSB	8	D	other	1	2			6	39	
4/10/2020	LSB	8	E	Algae	6	3			5	39	
4/10/2020	LSB	8	E	Bare	90				5	39	
4/10/2020	LSB	8	E	milfoil	3	6			5	39	
4/10/2020	LSB	8	E	other	1	2			5	39	
4/10/2020	LSB	9	A	Algae	5	3			8	39	
4/10/2020	LSB	9	A	Bare	95				8	39	
4/10/2020	LSB	9	B	Algae	2	2			7	39	
4/10/2020	LSB	9	B	Bare	98				7	39	
4/10/2020	LSB	9	C	Algae	1	5			7	39	
4/10/2020	LSB	9	C	Bare	99				7	39	
4/10/2020	LSB	9	D	Algae	3	5			8	39	
4/10/2020	LSB	9	D	Bare	96				8	39	
4/10/2020	LSB	9	D	milfoil	1	9			8	39	
4/10/2020	LSB	9	E	Algae	3	5			6	39	
4/10/2020	LSB	9	E	Bare	96				6	39	
4/10/2020	LSB	9	E	milfoil	1	11			6	39	
4/10/2020	LSM	1	A	Algae	5	6			8	41	
4/10/2020	LSM	1	A	Bare	90				8	41	
4/10/2020	LSM	1	A	elodea	2	6			8	41	
4/10/2020	LSM	1	B	Algae	1	4			8	41	
4/10/2020	LSM	1	B	Bare	98				8	41	
4/10/2020	LSM	1	B	other	3	6			8	41	
4/10/2020	LSM	1	C	Algae	1	3			8	41	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
4/10/2020	LSM	1	C	Bare	98				8	41	
4/10/2020	LSM	1	C	other	1	2			8	41	
4/10/2020	LSM	1	D	Algae	7	5			8	41	
4/10/2020	LSM	1	D	Bare	90				8	41	
4/10/2020	LSM	1	D	other	1	2			8	41	
4/10/2020	LSM	1	E	Algae	40	5			8	41	
4/10/2020	LSM	1	E	Bare	60				8	41	
4/10/2020	LSM	1	E	other	3	3			8	41	
5/14/2020	LSB	1	A	Algae	5	5			7	45	
5/14/2020	LSB	1	A	Bare	96				7	45	
5/14/2020	LSB	1	A	other	1	4			7	45	
5/14/2020	LSB	1	B	Algae	4	4			7	45	
5/14/2020	LSB	1	B	Bare	94				7	45	
5/14/2020	LSB	1	B	milfoil	2	11			7	45	
5/14/2020	LSB	1	C	Algae	5	5			6	45	
5/14/2020	LSB	1	C	Bare	94				6	45	
5/14/2020	LSB	1	C	other	1	4			6	45	
5/14/2020	LSB	1	D	Algae	2	4			5	45	
5/14/2020	LSB	1	D	Bare	97				5	45	
5/14/2020	LSB	1	D	milfoil	1	17			5	45	
5/14/2020	LSB	1	E	Algae	15	2			4	45	
5/14/2020	LSB	1	E	Bare	85				4	45	
5/14/2020	LSB	2	A	Bare	97				7	45	
5/14/2020	LSB	2	B	Bare	97				7	45	
5/14/2020	LSB	2	C	Bare	97				6	45	
5/14/2020	LSB	2	C	other	1	4			6	45	
5/14/2020	LSB	2	D	Bare	90				5	45	
5/14/2020	LSB	2	D	milfoil	5	12			5	45	
5/14/2020	LSB	2	E	Bare	90				4	45	
5/14/2020	LSB	3	A	Algae	3	4			6	45	
5/14/2020	LSB	3	A	Bare	96				6	45	
5/14/2020	LSB	3	A	other	1	4			6	45	
5/14/2020	LSB	3	B	Algae	3	3			6	45	
5/14/2020	LSB	3	B	Bare	81				6	45	
5/14/2020	LSB	3	B	milfoil	1	5			6	45	
5/14/2020	LSB	3	B	other	15	5			6	45	
5/14/2020	LSB	3	C	Algae	5	5			6	45	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
5/14/2020	LSB	3	C	Bare	78				6	45	
5/14/2020	LSB	3	C	milfoil	10	4			6	45	
5/14/2020	LSB	3	C	other	7	4			6	45	
5/14/2020	LSB	3	D	Algae	4	4			6	45	
5/14/2020	LSB	3	D	Bare	95				6	45	
5/14/2020	LSB	3	D	other	2	3			6	45	
5/14/2020	LSB	3	E	Algae	5	3			4	45	
5/14/2020	LSB	3	E	Bare	95				4	45	
5/14/2020	LSB	4	A	Algae	4	3			6	45	
5/14/2020	LSB	4	A	Bare	95				6	45	
5/14/2020	LSB	4	A	other	1	2			6	45	
5/14/2020	LSB	4	B	Algae	7	2			5	45	
5/14/2020	LSB	4	B	Bare	90				5	45	
5/14/2020	LSB	4	B	other	3	2			5	45	
5/14/2020	LSB	4	C	Algae	1	3			5	45	
5/14/2020	LSB	4	C	Bare	74				5	45	
5/14/2020	LSB	4	C	milfoil	10	6			5	45	
5/14/2020	LSB	4	C	other	15	4			5	45	
5/14/2020	LSB	4	D	Algae	2	3			5	45	
5/14/2020	LSB	4	D	Bare	90				5	45	
5/14/2020	LSB	4	D	CLPW	3	7			5	45	
5/14/2020	LSB	4	D	other	5	7			5	45	
5/14/2020	LSB	4	E	Algae	5	4			4	45	
5/14/2020	LSB	4	E	Bare	95				4	45	
5/14/2020	LSB	5	A	Algae	15	3			6	45	
5/14/2020	LSB	5	A	Bare	85				6	45	
5/14/2020	LSB	5	B	Algae	8	3			6	43	
5/14/2020	LSB	5	B	Bare	90				6	43	
5/14/2020	LSB	5	B	milfoil	1	10			6	43	
5/14/2020	LSB	5	B	Other	1	3			6	43	
5/14/2020	LSB	5	C	Algae	5	4			6	45	
5/14/2020	LSB	5	C	Bare	94				6	45	
5/14/2020	LSB	5	C	Other	1	3			6	45	
5/14/2020	LSB	5	D	Algae	1	3			7	45	
5/14/2020	LSB	5	D	Bare	78				7	45	
5/14/2020	LSB	5	D	milfoil	1	3			7	45	
5/14/2020	LSB	5	D	Other	20	6			7	45	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
5/14/2020	LSB	5	E	Bare	?				5	45	
5/14/2020	LSB	5	E	CLPW	5	6			5	45	
5/14/2020	LSB	5	E	milfoil	?	?			5	45	
5/14/2020	LSB	5	E	Other	5	8			5	45	
5/14/2020	LSB	6	A	Algae	5	3			6	43	
5/14/2020	LSB	6	A	Bare	95				6	43	
5/14/2020	LSB	6	B	Algae	4	5			6	43	
5/14/2020	LSB	6	B	Bare	95				6	43	
5/14/2020	LSB	6	B	milfoil	1	6			6	43	
5/14/2020	LSB	6	C	Algae	3	5			6	43	
5/14/2020	LSB	6	C	Bare	95				6	43	
5/14/2020	LSB	6	C	milfoil	1	7			6	43	
5/14/2020	LSB	6	C	Other	1	3			6	43	
5/14/2020	LSB	6	D	Algae	2	4			6	45	
5/14/2020	LSB	6	D	Bare	95				6	45	
5/14/2020	LSB	6	D	Other	3	2			6	45	
5/14/2020	LSB	6	E	Algae	20	4			4	45	
5/14/2020	LSB	6	E	Bare	75				4	45	
5/14/2020	LSB	6	E	CLPW	5	1			4	45	
5/14/2020	LSB	7	A	Algae	5	5			7	43	
5/14/2020	LSB	7	A	Bare	90				7	43	
5/14/2020	LSB	7	A	other	5	6			7	43	
5/14/2020	LSB	7	B	Algae	3	6			7	43	
5/14/2020	LSB	7	B	Bare	90				7	43	
5/14/2020	LSB	7	B	milfoil	1	13			7	43	
5/14/2020	LSB	7	B	other	6	5			7	43	
5/14/2020	LSB	7	C	Bare	49				7	43	
5/14/2020	LSB	7	C	milfoil	1	4			7	43	
5/14/2020	LSB	7	C	other	50	10			7	43	
5/14/2020	LSB	7	D	Algae	13	4			7	43	
5/14/2020	LSB	7	D	Bare	85				7	43	
5/14/2020	LSB	7	D	other	2	4			7	43	
5/14/2020	LSB	7	E	Algae	10	4			6	43	
5/14/2020	LSB	7	E	Bare	83				6	43	
5/14/2020	LSB	7	E	milfoil	5	17			6	43	
5/14/2020	LSB	7	E	other	2	4			6	43	
5/14/2020	LSB	8	A	Algae	20	4			8	43	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
5/14/2020	LSB	8	A	Bare	65				8	43	
5/14/2020	LSB	8	A	other	15	6			8	43	
5/14/2020	LSB	8	B	Algae	8	4			8	43	
5/14/2020	LSB	8	B	Bare	90				8	43	
5/14/2020	LSB	8	B	other	2	5			8	43	
5/14/2020	LSB	8	C	Algae	10	4			7	43	
5/14/2020	LSB	8	C	Bare	87				7	43	
5/14/2020	LSB	8	C	CLPW	2	5			7	43	
5/14/2020	LSB	8	C	other	1	2			7	43	
5/14/2020	LSB	8	D	Algae	3	4			7	43	
5/14/2020	LSB	8	D	Bare	94				7	43	
5/14/2020	LSB	8	D	milfoil	3	7			7	43	
5/14/2020	LSB	8	E	Algae	4	5			7	43	
5/14/2020	LSB	8	E	Bare	90				7	43	
5/14/2020	LSB	8	E	CLPW	1	4			7	43	
5/14/2020	LSB	8	E	milfoil	3	9			7	43	
5/14/2020	LSB	8	E	other	2	3			7	43	
5/14/2020	LSB	9	A	Bare	100				7	43	
5/14/2020	LSB	9	B	Algae	2	3			8	43	
5/14/2020	LSB	9	B	Bare	97				8	43	
5/14/2020	LSB	9	B	milfoil	1	5			8	43	
5/14/2020	LSB	9	C	Algae	2	4			8	43	
5/14/2020	LSB	9	C	Bare	98				8	43	
5/14/2020	LSB	9	D	Algae	3	7			7	43	
5/14/2020	LSB	9	D	Bare	97				7	43	
5/14/2020	LSB	9	E	Algae	25	4			7	43	
5/14/2020	LSB	9	E	Bare	73				7	43	
5/14/2020	LSB	9	E	milfoil	1	7			7	43	
5/14/2020	LSB	9	E	other	1	5			7	43	
5/14/2020	LSM	1	A	Algae	80				10	45	
5/14/2020	LSM	1	A	milfoil	3	15			10	45	
5/14/2020	LSM	1	A	other	15	10			10	45	
5/14/2020	LSM	1	B	Algae	59				7	45	
5/14/2020	LSM	1	B	milfoil	1	12			7	45	
5/14/2020	LSM	1	B	other	40	15			7	45	
5/14/2020	LSM	1	C	Algae	70				8	45	
5/14/2020	LSM	1	C	other	30	12			8	45	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
5/14/2020	LSM	1	D	Algae	50				8	45	
5/14/2020	LSM	1	D	other	45	17			8	45	
5/14/2020	LSM	1	E	Algae	64				7	45	
5/14/2020	LSM	1	E	milfoil	1	13			7	45	
5/14/2020	LSM	1	E	other	35	14			7	45	
5/28/2020	TK	E	A	CLPW		120	2.3				Plant heights for transects
5/28/2020	TK	E	A	LPW		90	2.3				Plant heights for transects
5/28/2020	TK	E	A	milfoil		54	2.3				Plant heights for transects
5/28/2020	TK	E	A	RPW		25	2.3				Plant heights for transects
5/28/2020	TK	E	B	CLPW		100	2.4				Plant heights for transects
5/28/2020	TK	E	B	LPW		60	2.4				Plant heights for transects
5/28/2020	TK	E	B	milfoil		44	2.4				Plant heights for transects
5/28/2020	TK	E	C	CLPW		90	2.3				Plant heights for transects
5/28/2020	TK	E	C	LPW		63	2.3				Plant heights for transects
5/28/2020	TK	E	C	milfoil		45	2.3				Plant heights for transects
5/28/2020	TK	E	D	CLPW		95	2.2				Plant heights for transects
5/28/2020	TK	E	D	LPW		70	2.2				Plant heights for transects
5/28/2020	TK	E	D	milfoil		35	2.2				Plant heights for transects
5/28/2020	TK	E	E	CLPW		70	2.1				Plant heights for transects
5/28/2020	TK	E	E	LPW		85	2.1				Plant heights for transects
5/28/2020	TK	E	E	milfoil		39	2.1				Plant heights for transects
5/28/2020	TK	T	1	Algae	60						% composition from rake pulls
5/28/2020	TK	T	1	CLPW	25						% composition from rake pulls
5/28/2020	TK	T	1	LPW	15						% composition from rake pulls
5/28/2020	TK	T	2	Algae	20						% composition from rake pulls
5/28/2020	TK	T	2	CLPW	70						% composition from rake pulls
5/28/2020	TK	T	2	LPW	10						% composition from rake pulls
5/28/2020	TK	T	3	Algae	20						% composition from rake pulls
5/28/2020	TK	T	3	CLPW	75						% composition from rake pulls
5/28/2020	TK	T	3	LPW	5						% composition from rake pulls
5/28/2020	TK	U	1	Coontail	100						% composition from rake pulls
5/28/2020	TK	U	2	Coontail	100						% composition from rake pulls
5/28/2020	TK	U	3	Coontail	100						% composition from rake pulls
5/28/2020	TK	U	A	CLPW		15	4.1	15			
5/28/2020	TK	U	A	Coontail		97	4.1	15			
5/28/2020	TK	U	A	LPW		12	4.1	15			
5/28/2020	TK	U	B	Coontail		290	3.9	15			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
5/28/2020	TK	U	B	LPW		70	3.9	15			
5/28/2020	TK	U	C	Coontail		176	4.5	15			
5/28/2020	TK	U	D	Coontail		342	4	15			
5/28/2020	TK	U	E	Coontail		278	3.8	15			
6/16/2020	LSB	1	A	Bare	100						Depth and temp not noted
6/16/2020	LSB	1	B	Bare	95						Depth and temp not noted
6/16/2020	LSB	1	B	milfoil	5	7					Depth and temp not noted
6/16/2020	LSB	1	C	Bare	80						Depth and temp not noted
6/16/2020	LSB	1	C	milfoil	20	16					Depth and temp not noted
6/16/2020	LSB	1	D	Bare	99						Depth and temp not noted
6/16/2020	LSB	1	D	other	1	4					Depth and temp not noted
6/16/2020	LSB	1	E	Bare	90						Depth and temp not noted
6/16/2020	LSB	1	E	milfoil	10	5					Depth and temp not noted
6/16/2020	LSB	2	A	Bare	100				7		temp not noted
6/16/2020	LSB	2	B	Bare	90				7		temp not noted
6/16/2020	LSB	2	B	milfoil	10	7			7		temp not noted
6/16/2020	LSB	2	C	Bare	79				7		temp not noted
6/16/2020	LSB	2	C	milfoil	20	9			7		temp not noted
6/16/2020	LSB	2	D	Bare	78				6		temp not noted
6/16/2020	LSB	2	D	milfoil	20	17			6		temp not noted
6/16/2020	LSB	2	E	Bare	75				6		temp not noted
6/16/2020	LSB	2	E	milfoil	25	18			6		temp not noted
6/16/2020	LSB	3	A	Bare	100						Depth and temp not noted
6/16/2020	LSB	3	B	Bare	90						Depth and temp not noted
6/16/2020	LSB	3	B	milfoil	10	6					Depth and temp not noted
6/16/2020	LSB	3	C	Bare	79						Depth and temp not noted
6/16/2020	LSB	3	C	milfoil	20	9					Depth and temp not noted
6/16/2020	LSB	3	C	other	1	4					Depth and temp not noted
6/16/2020	LSB	3	D	Bare	92						Depth and temp not noted
6/16/2020	LSB	3	D	milfoil	5	6					Depth and temp not noted
6/16/2020	LSB	3	D	other	3	3					Depth and temp not noted
6/16/2020	LSB	3	E	Bare	94						Depth and temp not noted
6/16/2020	LSB	3	E	milfoil	6	7					Depth and temp not noted
6/16/2020	LSB	4	A	Bare	98				8		
6/16/2020	LSB	4	A	milfoil	2	6			8		
6/16/2020	LSB	4	B	Bare	84				8		
6/16/2020	LSB	4	B	LPW	1	5			8		

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
6/16/2020	LSB	4	B	milfoil	15	6			8		
6/16/2020	LSB	4	C	Bare	70						Depth and temp not noted
6/16/2020	LSB	4	C	LPW	50						Depth and temp not noted
6/16/2020	LSB	4	C	milfoil	30	not noted					Depth and temp not noted
6/16/2020	LSB	4	D	Bare	40						Depth and temp not noted
6/16/2020	LSB	4	D	LPW	30	10					Depth and temp not noted
6/16/2020	LSB	4	D	milfoil	10	12					Depth and temp not noted
6/16/2020	LSB	4	E	Bare	60						Depth and temp not noted
6/16/2020	LSB	4	E	milfoil	10	13					Depth and temp not noted
6/16/2020	LSB	5	A	Bare	95				7		
6/16/2020	LSB	5	A	milfoil	5	8			7		
6/16/2020	LSB	5	B	Bare	85				7		
6/16/2020	LSB	5	B	milfoil	15	15			7		
6/16/2020	LSB	5	C	Bare	89				6		
6/16/2020	LSB	5	C	milfoil	10	8			6		
6/16/2020	LSB	5	C	other	1	1			6		
6/16/2020	LSB	5	D	Bare	85						
6/16/2020	LSB	5	D	milfoil	5	6					
6/16/2020	LSB	5	D	other	10	16					
6/16/2020	LSB	5	E	Bare	95						
6/16/2020	LSB	5	E	milfoil	5	7					
6/16/2020	LSB	6	A	Bare	80				8		
6/16/2020	LSB	6	A	milfoil	20	8			8		
6/16/2020	LSB	6	B	Bare	80				8		
6/16/2020	LSB	6	B	milfoil	20	7			8		
6/16/2020	LSB	6	C	Bare	75				7		
6/16/2020	LSB	6	C	milfoil	25	7			7		
6/16/2020	LSB	6	D	Bare	78				7		
6/16/2020	LSB	6	D	milfoil	20	5			7		
6/16/2020	LSB	6	D	other	2	4			7		
6/16/2020	LSB	6	E	Bare	50				6		
6/16/2020	LSB	6	E	milfoil	25	20			6		
6/16/2020	LSB	6	E	other	20	25			6		
6/16/2020	LSB	7	A	Algae	45	6					
6/16/2020	LSB	7	A	Bare	50		2.3	13			
6/16/2020	LSB	7	A	LPW	5	8	2.3	13			
6/16/2020	LSB	7	B	Algae	25	7	2.3	13			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
6/16/2020	LSB	7	B	Bare	35		2.2	13			
6/16/2020	LSB	7	B	LPW	15	6	2.2	13			
6/16/2020	LSB	7	B	milfoil	25	2	2.2	13			
6/16/2020	LSB	7	C	Algae	10	6	2.2	13			
6/16/2020	LSB	7	C	Bare	5		2.1	13			
6/16/2020	LSB	7	C	LPW	80	14	2.1	13			
6/16/2020	LSB	7	C	milfoil	5	6	2.1	13			
6/16/2020	LSB	7	D	Bare	10		2	13			
6/16/2020	LSB	7	D	LPW	30	11	2	13			
6/16/2020	LSB	7	D	milfoil	60	3	2	13			
6/16/2020	LSB	7	E	Algae	40	4	2	13			
6/16/2020	LSB	7	E	Bare	60		1.6	13			
6/16/2020	LSB	8	A	Algae	90	7	1.6	13			
6/16/2020	LSB	8	A	Bare	6		2.1	13			
6/16/2020	LSB	8	A	LPW	3	3	2.1	13			
6/16/2020	LSB	8	A	milfoil	1	6	2.1	13			
6/16/2020	LSB	8	B	Algae	90	7	2.1	13			
6/16/2020	LSB	8	B	Bare	5		2.3	13			
6/16/2020	LSB	8	B	LPW	5	10	2.3	13			
6/16/2020	LSB	8	B	milfoil	3		2.3	13			
6/16/2020	LSB	8	C	Algae	20	4	2.3	13			
6/16/2020	LSB	8	C	Bare	67		2.3	13			
6/16/2020	LSB	8	C	LPW	10	5	2.3	13			
6/16/2020	LSB	8	C	milfoil	3	9	2.3	13			
6/16/2020	LSB	8	D	Algae	75	7	2.3	13			
6/16/2020	LSB	8	D	Bare	20		2.2	13			
6/16/2020	LSB	8	D	LPW	3	5	2.2	13			
6/16/2020	LSB	8	D	milfoil	2	10	2.2	13			
6/16/2020	LSB	8	E	Algae	30	5	2.2	13			
6/16/2020	LSB	8	E	Bare	69		2	13			
6/16/2020	LSB	8	E	LPW	1	4	2	13			
6/16/2020	LSB	9	A	Algae	20		2	13			
6/16/2020	LSB	9	A	Bare	80		2.3	12			
6/16/2020	LSB	9	B	Algae	10	8	2.3	12			
6/16/2020	LSB	9	B	Bare	90		2.3	12			
6/16/2020	LSB	9	C	Algae	5	6	2.3	12			
6/16/2020	LSB	9	C	Bare	95		2.4	12			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
6/16/2020	LSB	9	D	Algae	2	5	2.4	12			
6/16/2020	LSB	9	D	Bare	97		2.5	12			
6/16/2020	LSB	9	D	LPW	1	3	2.5	12			
6/16/2020	LSB	9	E	Algae	25	7	2.5	12			
6/16/2020	LSB	9	E	Bare	50		2.3	13			
6/16/2020	LSB	9	E	LPW	5	9	2.3	13			
6/16/2020	LSB	9	E	milfoil	20	13	2.3	13			
6/16/2020	LSM	1	A	Algae	30	17	2.3	13			
6/16/2020	LSM	1	A	CLPW	7	37	2.3	13			
6/16/2020	LSM	1	A	LPW	63	34	2.3	13			
6/16/2020	LSM	1	B	CLPW	15	54	2.8	13			
6/16/2020	LSM	1	B	LPW	85	68	2.8	13			
6/16/2020	LSM	1	C	LPW	90	63	2.6	13			
6/16/2020	LSM	1	C	milfoil	10	14	2.6	13			
6/16/2020	LSM	1	D	LPW	60	60	3	13			
6/16/2020	LSM	1	D	milfoil	40	70	3	13			
6/16/2020	LSM	1	E	CLPW	15	90	2.9	14			
6/16/2020	LSM	1	E	LPW	85	76	2.9	14			
6/22/2020	TK	E	1	CLPW	32						Rake Pull no depth or temp recorded
6/22/2020	TK	E	1	elodea	5						Rake Pull no depth or temp recorded
6/22/2020	TK	E	1	LPW	25						Rake Pull no depth or temp recorded
6/22/2020	TK	E	1	milfoil	32						Rake Pull no depth or temp recorded
6/22/2020	TK	E	1	RPW	1						Rake Pull no depth or temp recorded
6/22/2020	TK	E	2	Coontail	33						Rake Pull no depth or temp recorded
6/22/2020	TK	E	2	elodea	1						Rake Pull no depth or temp recorded
6/22/2020	TK	E	2	LPW	25						Rake Pull no depth or temp recorded
6/22/2020	TK	E	2	milfoil	40						Rake Pull no depth or temp recorded
6/22/2020	TK	E	2	RPW	1						Rake Pull no depth or temp recorded
6/22/2020	TK	E	3	CLPW	43						Rake Pull no depth or temp recorded
6/22/2020	TK	E	3	elodea	4						Rake Pull no depth or temp recorded
6/22/2020	TK	E	3	LPW	20						Rake Pull no depth or temp recorded
6/22/2020	TK	E	3	milfoil	33						Rake Pull no depth or temp recorded
6/22/2020	TK	E	A	CLPW		208	2.2	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	A	Coontail		73	2.2	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	A	LPW		130	2.2	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	A	milfoil		80	2.2	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	A	RPW		128	2.2	20			Plant heights from diver, % composition by weight tbd

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
6/22/2020	TK	E	B	CLPW		210	2.3	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	B	LPW		130	2.3	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	B	milfoil		55	2.3	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	B	RPW		113	2.3	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	C	CLPW		182	2.3	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	C	elodea		27	2.3	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	C	LPW		109	2.3	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	C	milfoil		54	2.3	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	C	RPW		104	2.3	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	D	CLPW		165	2.4	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	D	LPW		70	2.4	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	E	D	milfoil		50	2.4	20			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	T	1	Algae	3						Rake Pulls no depth or temp recorded
6/22/2020	TK	T	1	CLPW	27						Rake Pulls no depth or temp recorded
6/22/2020	TK	T	1	Coontail	60						Rake Pulls no depth or temp recorded
6/22/2020	TK	T	1	milfoil	10						Rake Pulls no depth or temp recorded
6/22/2020	TK	T	2	Algae	1						Rake Pulls no depth or temp recorded
6/22/2020	TK	T	2	CLPW	50						Rake Pulls no depth or temp recorded
6/22/2020	TK	T	2	Coontail	30						Rake Pulls no depth or temp recorded
6/22/2020	TK	T	2	elodea	4						Rake Pulls no depth or temp recorded
6/22/2020	TK	T	2	milfoil	15						Rake Pulls no depth or temp recorded
6/22/2020	TK	T	3	Algae	1						Rake Pulls no depth or temp recorded
6/22/2020	TK	T	3	CLPW	32						Rake Pulls no depth or temp recorded
6/22/2020	TK	T	3	Coontail	60						Rake Pulls no depth or temp recorded
6/22/2020	TK	T	3	LPW	1						Rake Pulls no depth or temp recorded
6/22/2020	TK	T	3	milfoil	6						Rake Pulls no depth or temp recorded
6/22/2020	TK	T	A	CLPW		186	2.3	20			
6/22/2020	TK	T	A	Coontail		70	2.3	20			
6/22/2020	TK	T	A	milfoil		50	2.3	20			
6/22/2020	TK	T	B	CLPW		250	3	19			
6/22/2020	TK	T	B	Coontail		85	3	19			
6/22/2020	TK	T	B	LPW		136	3	19			
6/22/2020	TK	T	B	milfoil		75	3	19			
6/22/2020	TK	T	C	CLPW		305	3.3	20			
6/22/2020	TK	T	C	Coontail		60	3.3	20			
6/22/2020	TK	T	C	LPW		180	3.3	20			
6/22/2020	TK	T	D	CLPW		205	3.3	20			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
6/22/2020	TK	T	D	Coontail		130	3.3	20			
6/22/2020	TK	T	D	LPW		189	3.3	20			
6/22/2020	TK	T	D	milfoil		85	3.3	20			
6/22/2020	TK	U	1	CLPW	3						Rake Pulls no depth or temp recorded
6/22/2020	TK	U	1	Coontail	97						Rake Pulls no depth or temp recorded
6/22/2020	TK	U	2	CLPW	5						Rake Pulls no depth or temp recorded
6/22/2020	TK	U	2	Coontail	95						Rake Pulls no depth or temp recorded
6/22/2020	TK	U	3	CLPW	3						Rake Pulls no depth or temp recorded
6/22/2020	TK	U	3	Coontail	97						Rake Pulls no depth or temp recorded
6/22/2020	TK	U	A	CLPW		190	4	19			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	U	A	Coontail		250	4	19			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	U	B	CLPW		135	4.2	19			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	U	B	Coontail		290	4.2	19			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	U	C	CLPW		172	3.9	19			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	U	C	Coontail		150	3.9	19			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	U	D	CLPW		287	4	19			Plant heights from diver, % composition by weight tbd
6/22/2020	TK	U	D	Coontail		212	4	19			Plant heights from diver, % composition by weight tbd
7/14/2020	LSB	1	A	Algae	10	6	2	18			
7/14/2020	LSB	1	A	Bare	90		2	18			
7/14/2020	LSB	1	B	Algae	50	4	2	18			
7/14/2020	LSB	1	B	Bare	50		2	18			
7/14/2020	LSB	1	C	Algae	60	6	2	18			
7/14/2020	LSB	1	C	Bare	40		2	18			
7/14/2020	LSB	1	D	Bare	98		1.9	18			
7/14/2020	LSB	1	D	milfoil	2	4	1.9	18			
7/14/2020	LSB	1	E	Algae	5	3	1.9	18			
7/14/2020	LSB	1	E	Bare	95		1.9	18			
7/14/2020	LSB	2	A	Algae	50	7	1.9	18			
7/14/2020	LSB	2	A	Bare	50		1.9	18			
7/14/2020	LSB	2	B	Algae	60	7	1.8	19			
7/14/2020	LSB	2	B	Bare	37		1.8	19			
7/14/2020	LSB	2	B	milfoil	3	11	1.8	19			
7/14/2020	LSB	2	C	Algae	79	6	2	19			
7/14/2020	LSB	2	C	Bare	15		2	19			
7/14/2020	LSB	2	C	CLPW	3	11	2	19			
7/14/2020	LSB	2	C	milfoil	3	16	2	19			
7/14/2020	LSB	2	D	Algae	90	7	1.9	19			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
7/14/2020	LSB	2	D	Bare	10		1.9	19			
7/14/2020	LSB	2	E	Algae	40	6	1.8	19			
7/14/2020	LSB	2	E	Bare	55		1.8	19			
7/14/2020	LSB	2	E	LPW	5	9	1.8	19			
7/14/2020	LSB	3	A	Algae	72	6	1.8	19			
7/14/2020	LSB	3	A	Bare	25		1.8	19			
7/14/2020	LSB	3	A	milfoil	3	8	1.8	19			
7/14/2020	LSB	3	B	Algae	50	11	1.8	19			
7/14/2020	LSB	3	B	Bare	5		1.8	19			
7/14/2020	LSB	3	B	LPW	23	17	1.8	19			
7/14/2020	LSB	3	B	milfoil	7	18	1.8	19			
7/14/2020	LSB	3	C	Algae	22	9	1.9	19			
7/14/2020	LSB	3	C	Bare	15		1.9	19			
7/14/2020	LSB	3	C	LPW	60	12	1.9	19			
7/14/2020	LSB	3	C	milfoil	3	17	1.9	19			
7/14/2020	LSB	3	D	Algae	89	8	1.8	19			
7/14/2020	LSB	3	D	Bare	5		1.8	19			
7/14/2020	LSB	3	D	CLPW	1	6	1.8	19			
7/14/2020	LSB	3	D	LPW	35	18	1.8	19			
7/14/2020	LSB	3	D	milfoil	5	18	1.8	19			
7/14/2020	LSB	3	E	Algae	25	9	1.9	19			
7/14/2020	LSB	3	E	milfoil	40	27	1.9	19			
7/14/2020	LSB	4	A	Algae	40	8	1.9	19			
7/14/2020	LSB	4	A	Bare	60		1.9	19			
7/14/2020	LSB	4	B	Algae	40	7	1.9	19			
7/14/2020	LSB	4	B	Bare	53		1.9	19			
7/14/2020	LSB	4	B	milfoil	7	17	1.9	19			
7/14/2020	LSB	4	C	Algae	25	6	1.9	19			
7/14/2020	LSB	4	C	Bare	30		1.9	19			
7/14/2020	LSB	4	C	LPW	65	9	1.9	19			
7/14/2020	LSB	4	D	Bare	40		1.9	19			
7/14/2020	LSB	4	D	CLPW	10	41	1.9	19			
7/14/2020	LSB	4	D	LPW	50	12	1.9	19			
7/14/2020	LSB	4	E	Algae	96	3	1.9	19			
7/14/2020	LSB	4	E	LPW	2	10	1.9	19			
7/14/2020	LSB	4	E	milfoil	2	9	1.9	19			
7/14/2020	LSB	5	A	Algae	89	8	1.9	19			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
7/14/2020	LSB	5	A	Bare	10		1.8	19			
7/14/2020	LSB	5	A	milfoil	1	14	1.8	19			
7/14/2020	LSB	5	B	Algae	60	9	1.8	19			
7/14/2020	LSB	5	B	Bare	35		1.9	19			
7/14/2020	LSB	5	B	CLPW	5	7	1.9	19			
7/14/2020	LSB	5	C	Algae	87	7	1.9	19			
7/14/2020	LSB	5	C	Bare	10		1.8	19			
7/14/2020	LSB	5	C	milfoil	3	12	1.8	19			
7/14/2020	LSB	5	D	Bare	25		1.9	19			
7/14/2020	LSB	5	D	elodea	3	5	1.9	19			
7/14/2020	LSB	5	D	LPW	55	26	1.9	19			
7/14/2020	LSB	5	D	milfoil	30	27	1.9	19			
7/14/2020	LSB	5	E	Algae	35	9	1.9	19			
7/14/2020	LSB	5	E	Bare	37		1.7	19			
7/14/2020	LSB	5	E	LPW	25	19	1.7	19			
7/14/2020	LSB	5	E	milfoil	3	11	1.7	19			
7/14/2020	LSB	6	A	Algae	50	5	1.7	19			
7/14/2020	LSB	6	A	Bare	50		1.9	19			
7/14/2020	LSB	6	B	Algae	85	8	1.9	19			
7/14/2020	LSB	6	B	Bare	15		1.9	19			
7/14/2020	LSB	6	C	Algae	35	9	1.9	19			
7/14/2020	LSB	6	C	Bare	5		1.9	19			
7/14/2020	LSB	6	C	LPW	40	7	1.9	19			
7/14/2020	LSB	6	C	milfoil	20	28	1.9	19			
7/14/2020	LSB	6	D	Algae	40	7	1.9	19			
7/14/2020	LSB	6	D	Bare	35		1.8	19			
7/14/2020	LSB	6	D	LPW	45	16	1.8	19			
7/14/2020	LSB	6	D	milfoil	30	16	1.8	19			
7/14/2020	LSB	6	E	CLPW	15	30	1.8	19			
7/14/2020	LSB	6	E	LPW	40	19	1.8	19			
7/14/2020	LSB	6	E	milfoil	45	24	1.8	19			
7/14/2020	LSB	7	A	Algae	95	8	1.9	19			
7/14/2020	LSB	7	A	Bare	5		1.9	19			
7/14/2020	LSB	7	B	Algae	85	8	2	19			
7/14/2020	LSB	7	B	milfoil	15	19	2	19			
7/14/2020	LSB	7	C	Algae	90	9	2.2	19			
7/14/2020	LSB	7	C	Bare	10		2.2	19			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
7/14/2020	LSB	7	D	Algae	40	8	2.2	19			
7/14/2020	LSB	7	D	Bare	60		2.2	19			
7/14/2020	LSB	7	E	Algae	55	7	2	19			
7/14/2020	LSB	7	E	Bare	10		2	19			
7/14/2020	LSB	7	E	milfoil	35	26	2	19			
7/14/2020	LSB	8	A	Algae	5	6	2.3	19			
7/14/2020	LSB	8	A	Bare	95		2.3	19			
7/14/2020	LSB	8	B	Algae	35	7	2.3	19			
7/14/2020	LSB	8	B	Bare	65		2.3	19			
7/14/2020	LSB	8	C	Algae	7	7	2.1	19			
7/14/2020	LSB	8	C	Bare	93		2.1	19			
7/14/2020	LSB	8	C	milfoil	25	15	2.1	19			
7/14/2020	LSB	8	D	Algae	65	8	2	19			
7/14/2020	LSB	8	D	Bare	10		2	19			
7/14/2020	LSB	8	D	milfoil	25	17	2	19			
7/14/2020	LSB	8	E	Algae	94	9	1.9	19			
7/14/2020	LSB	8	E	Bare	5		1.9	19			
7/14/2020	LSB	8	E	LPW	1	7	1.9	19			
7/14/2020	LSB	9	A	Algae	75	8	2.1	20			
7/14/2020	LSB	9	A	Bare	25		2.1	20			
7/14/2020	LSB	9	B	Algae	15	8	2.1	19			
7/14/2020	LSB	9	B	Bare	10		2.1	19			
7/14/2020	LSB	9	B	LPW	45	12	2.1	19			
7/14/2020	LSB	9	B	milfoil	35	44	2.1	19			
7/14/2020	LSB	9	C	Algae	25	18	2	20			
7/14/2020	LSB	9	C	CLPW	35	44	2	20			
7/14/2020	LSB	9	C	LPW	40	13	2	20			
7/14/2020	LSB	9	D	Algae	60	8	1.9	20			
7/14/2020	LSB	9	D	Bare	40		1.9	20			
7/14/2020	LSB	9	E	Algae	40	11	1.9	19			
7/14/2020	LSB	9	E	Bare	20		1.9	19			
7/14/2020	LSB	9	E	LPW	40	9	1.9	19			
7/14/2020	LSM	1	A	CLPW	15	90	2.3	19			
7/14/2020	LSM	1	A	LPW	35	34	2.3	19			
7/14/2020	LSM	1	A	milfoil	5	14	2.3	19			
7/14/2020	LSM	1	B	CLPW	20	155	2.4	19			
7/14/2020	LSM	1	B	LPW	80	120	2.4	19			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
7/14/2020	LSM	1	C	Bare	15		2.4	18			
7/14/2020	LSM	1	C	LPW	45	50	2.4	18			
7/14/2020	LSM	1	C	milfoil	40	18	2.4	18			
7/14/2020	LSM	1	D	CLPW	30	155	2.3	18			
7/14/2020	LSM	1	D	LPW	45	170	2.3	18			
7/14/2020	LSM	1	D	milfoil	25	22	2.3	18			
7/14/2020	LSM	1	E	Bare	10		2.6	18			
7/14/2020	LSM	1	E	CLPW	20	210	2.6	18			
7/14/2020	LSM	1	E	LPW	70	140	2.6	18			
7/14/2020	LSM	1	E	milfoil	5	15	2.6	18			
7/27/2020	TK	E	A	elodea		70		22			Southern most quadrat, treated 2019 only
7/27/2020	TK	E	A	LPW		120		22			Southern most quadrat, treated 2019 only
7/27/2020	TK	E	A	milfoil		130		22			Southern most quadrat, treated 2019 only
7/27/2020	TK	E	A	RPW		165		22			Southern most quadrat, treated 2019 only
7/27/2020	TK	E	B	CLPW		90		22			treated 2019 only
7/27/2020	TK	E	B	milfoil		60		22			treated 2019 only
7/27/2020	TK	E	B	RPW		120		22			treated 2019 only
7/27/2020	TK	E	C	CLPW		45		22			treated 2019 and 2020, plants collapsed, less dense and more brown and decayed
7/27/2020	TK	E	C	milfoil		40		22			treated 2019 and 2020, plants collapsed, less dense and more brown and decayed
7/27/2020	TK	E	C	RPW		90		22			treated 2019 and 2020, plants collapsed, less dense and more brown and decayed
7/27/2020	TK	E	D	milfoil		80		22			Northern most quadrat, treated 2019 and 2020, no CLPW to measure, totally collapsed and decayed
7/27/2020	TK	E	D	RPW		110		22			Northern most quadrat, treated 2019 and 2020, no CLPW to measure, totally collapsed and decayed
7/27/2020	TK	T	A	CLPW		300		22			East boat slip, Treated 2019 only, closest to boat slip (south), LPW appears brittle and wilted, CLPW rather brown but not fallen, hard to distinguish other species due to low light penetration and very limited visibility
7/27/2020	TK	T	A	LPW		280		22			East boat slip, Treated 2019 only, closest to boat slip (south)
7/27/2020	TK	T	A	milfoil		170		22			East boat slip, Treated 2019 only, closest to boat slip (south)
7/27/2020	TK	T	B	CLPW		300		22			East boat slip, Treated 2019 only, further into channel (north
7/27/2020	TK	T	B	LPW		310		22			East boat slip, Treated 2019 only, further into channel (north

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
7/27/2020	TK	T	C	Coontail		90		22			West boat slip, treated 2019 and 2020, closest to boat slip (south), plants totally fallen, hardly any plants to measure, all collapsed
7/27/2020	TK	T	D	CLPW		270		22			West boat slip, treated 2019 and 2020, further into channel (south), CLPW still robust but flattened, LPW looked very degraded.
7/27/2020	TK	T	D	LPW		130		22			West boat slip, treated 2019 and 2020, further into channel (south), CLPW still robust but flattened, LPW looked very degraded.
7/27/2020	TK	U	A	Coontail		310		22			Southern most quadrat
7/27/2020	TK	U	B	CLPW		350		22			
7/27/2020	TK	U	B	Coontail		240		22			
7/27/2020	TK	U	C	CLPW		340		22			
7/27/2020	TK	U	C	Coontail		290		22			
7/27/2020	TK	U	D	Coontail		335		22			northern most quadrat
8/4/2020	LSM	1	A	Algae	15	3	2	20			
8/4/2020	LSM	1	A	Bare	80		2	20			
8/4/2020	LSM	1	A	LPW	1	5	2	20			
8/4/2020	LSM	1	A	milfoil	5	30	2	20			
8/4/2020	LSM	1	B	Algae	20		2.1	20			collapsed and degraded. Fell apart when I attempted to measure it.
8/4/2020	LSM	1	B	Bare	10		2.1	20			
8/4/2020	LSM	1	B	elodea	3	46	2.1	20			
8/4/2020	LSM	1	B	LPW	20		2.1	20			collapsed and degraded. Fell apart when I attempted to measure it.
8/4/2020	LSM	1	B	milfoil	60	65	2.1	20			
8/4/2020	LSM	1	C	CLPW	2		2.3	21			collapsed and degraded. Fell apart when I attempted to measure it.
8/4/2020	LSM	1	C	elodea	60	34	2.3	21			
8/4/2020	LSM	1	C	LPW	3	66	2.3	21			66 but had to pull it up and stretch it out very gently
8/4/2020	LSM	1	C	milfoil	3		2.3	21			collapsed and degraded. Fell apart when I attempted to measure it.
8/4/2020	LSM	1	D	Bare	90		2.4	21			bare, but covered in detritus
8/4/2020	LSM	1	D	LPW	2	8	2.4	21			
8/4/2020	LSM	1	D	milfoil	8	16	2.4	21			
8/4/2020	LSM	1	E	LPW		43	3.2	21			need to check video
8/4/2020	LSM	1	E	milfoil		21	3.2	21			need to check video

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
8/24/2020	TK	E	A	milfoil		165	2.1	22			Collections for weighted % Composition in separate datasheet
8/24/2020	TK	E	A	RPW		145	2.1	22			Collections for weighted % Composition in separate datasheet
8/24/2020	TK	E	B	CLPW		65	2.2	22			Collections for weighted % Composition in separate datasheet
8/24/2020	TK	E	B	Coontail		160	2.2	22			Collections for weighted % Composition in separate datasheet
8/24/2020	TK	E	B	milfoil		230	2.2	22			Collections for weighted % Composition in separate datasheet
8/24/2020	TK	E	B	RPW		190	2.2	22			Collections for weighted % Composition in separate datasheet
8/24/2020	TK	E	C	milfoil		80	2.2	22			Collections for weighted % Composition in separate datasheet
8/24/2020	TK	E	C	RPW		70	2.2	22			Collections for weighted % Composition in separate datasheet
8/24/2020	TK	E	D	RPW		85	2.2	22			Collections for weighted % Composition in separate datasheet
8/24/2020	TK	E	E	milfoil		70	2.3	22			Collections for weighted % Composition in separate datasheet
8/24/2020	TK	E	E	RPW		55	2.3	22			Collections for weighted % Composition in separate datasheet
8/24/2020	TK	T	A	Coontail		270	2.6	22			Collections for weighted % Composition in separate datasheet
8/24/2020	TK	T	A	Milfoil		220	2.6	22			Collections for weighted % Composition in separate datasheet
8/24/2020	TK	T	B	Bare	100		3.5	22			only Quadrat A contained measurable plants. Collections for weighted % Composition in separate datasheet
8/24/2020	TK	T	C	Bare	100		2.5	22			only Quadrat A contained measurable plants. Collections for weighted % Composition in separate datasheet
8/24/2020	TK	T	D	Bare	100		3.7	22			only Quadrat A contained measurable plants. Collections for weighted % Composition in separate datasheet
8/24/2020	TK	U	1	CLPW	1						rake pull, 1 single strand of CLPW present
8/24/2020	TK	U	1	Coontail	99						rake pull, no depth or temp collected, chl. A sample collected bag 1D
8/24/2020	TK	U	2	Coontail	100						rake pull, no depth or temp collected, chl. A sample collected bag D (duct tape label)

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
8/24/2020	TK	U	3	Coontail	100						rake pull, no depth or temp collected, chl. A sample collected bag 1C
8/24/2020	TK	U	A	Coontail		360					Only plant heights collected. Too dense for quadrats. Rake pulls used for % Composition
8/24/2020	TK	U	B	Coontail		410					Only plant heights collected. Too dense for quadrats. Rake pulls used for % Composition
8/24/2020	TK	U	C	Coontail		390					Only plant heights collected. Too dense for quadrats. Rake pulls used for % Composition
8/24/2020	TK	U	D	Coontail		380					Only plant heights collected. Too dense for quadrats. Rake pulls used for % Composition
8/26/2020	LSB	1	A	Algae	3	7	1.8	21			
8/26/2020	LSB	1	A	Bare	97		1.8	21			
8/26/2020	LSB	1	B	Algae	10	8	1.9	21			
8/26/2020	LSB	1	B	Bare	79		1.9	21			
8/26/2020	LSB	1	B	milfoil	1	6	1.9	21			
8/26/2020	LSB	1	B	Tufty	10	4	1.9	21			need to identify
8/26/2020	LSB	1	C	Algae	5	3	1.8	21			
8/26/2020	LSB	1	C	Bare	88		1.8	21			
8/26/2020	LSB	1	C	Isoetes	3	2	1.8	21			
8/26/2020	LSB	1	C	milfoil	1	6	1.8	21			
8/26/2020	LSB	1	C	Tufty	3	2	1.8	21			need to identify
8/26/2020	LSB	1	D	Algae	10	4	1.7	21			
8/26/2020	LSB	1	D	Bare	85		1.7	21			
8/26/2020	LSB	1	D	CLPW	1	8	1.7	21			
8/26/2020	LSB	1	D	elodea	1	5	1.7	21			
8/26/2020	LSB	1	D	Isoetes	2	3	1.7	21			
8/26/2020	LSB	1	D	milfoil	1	9	1.7	21			
8/26/2020	LSB	1	E	Algae	3	5	1.8	21			
8/26/2020	LSB	1	E	Bare	97		1.8	21			
8/26/2020	LSB	2	A	Bare	100				5	72	
8/26/2020	LSB	2	B	Algae	8	8			5	72	
8/26/2020	LSB	2	B	Bare	90				5	72	
8/26/2020	LSB	2	B	Tufty	2	2					need to identify
8/26/2020	LSB	2	C	Algae	4	6			6	72	
8/26/2020	LSB	2	C	Bare	95				6	72	
8/26/2020	LSB	2	C	Tufty	1	5					need to identify
8/26/2020	LSB	2	D	Algae	7	6			6	72	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
8/26/2020	LSB	2	D	Bare	90				6	72	
8/26/2020	LSB	2	D	milfoil	1	4			6	72	
8/26/2020	LSB	2	D	Tufty	2	5					need to identify
8/26/2020	LSB	2	E	Algae	17	10			5	72	
8/26/2020	LSB	2	E	Bare	80				5	72	
8/26/2020	LSB	2	E	milfoil	1	10			5	72	
8/26/2020	LSB	2	E	Tufty	2	6					need to identify
8/26/2020	LSB	3	A	Algae	2	2.5	1.8	21			
8/26/2020	LSB	3	A	Bare	96		1.8	21			
8/26/2020	LSB	3	A	Tufty	2	3	1.8	21			need to identify
8/26/2020	LSB	3	B	Algae	30	8	1.8	21			
8/26/2020	LSB	3	B	Bare	67		1.8	21			
8/26/2020	LSB	3	B	Tufty	3	5	1.8	21			need to identify
8/26/2020	LSB	3	C	Algae	10	5	1.8	21			
8/26/2020	LSB	3	C	Bare	84		1.8	21			
8/26/2020	LSB	3	C	milfoil	1	12	1.8	21			
8/26/2020	LSB	3	C	Tufty	5	4	1.8	21			need to identify
8/26/2020	LSB	3	D	Algae	5	7	1.9	21			
8/26/2020	LSB	3	D	Bare	72		1.9	21			
8/26/2020	LSB	3	D	Isoetes	5	2	1.9	21			
8/26/2020	LSB	3	D	milfoil	15	28	1.9	21			
8/26/2020	LSB	3	D	Tufty	3	3.5	1.9	21			need to identify
8/26/2020	LSB	3	E	Algae	5	10	1.9	21			
8/26/2020	LSB	3	E	Bare	85		1.9	21			
8/26/2020	LSB	3	E	milfoil	5	12	1.9	21			
8/26/2020	LSB	3	E	RPW	2	13	1.9	21			
8/26/2020	LSB	3	E	Tufty	3	6	1.9	21			need to identify
8/26/2020	LSB	4	A	Algae	5	5			5	73	
8/26/2020	LSB	4	A	Bare	95				5	73	
8/26/2020	LSB	4	A	Tufty	1	4			5	73	need to identify
8/26/2020	LSB	4	B	Algae	30	7			6	72	
8/26/2020	LSB	4	B	Bare	50				6	72	
8/26/2020	LSB	4	B	Tufty	20	3			6	72	need to identify
8/26/2020	LSB	4	C	Algae	12	7			5	71	
8/26/2020	LSB	4	C	Bare	80				5	71	
8/26/2020	LSB	4	C	Isoetes	3	4			5	71	
8/26/2020	LSB	4	C	milfoil	2	11			5	71	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
8/26/2020	LSB	4	C	Tufty	3	3			5	71	need to identify
8/26/2020	LSB	4	D	Algae	26	11			6	72	
8/26/2020	LSB	4	D	Bare	60				6	72	
8/26/2020	LSB	4	D	LPW	2	3			6	72	
8/26/2020	LSB	4	D	milfoil	2	8			6	72	
8/26/2020	LSB	4	D	Tufty	10	8			6	72	need to identify
8/26/2020	LSB	4	E	Algae	16	8			5	72	
8/26/2020	LSB	4	E	Bare	60				5	72	
8/26/2020	LSB	4	E	elodea	1				5	72	height not recorded
8/26/2020	LSB	4	E	LPW	4	10			5	72	
8/26/2020	LSB	4	E	milfoil	8	16			5	72	
8/26/2020	LSB	4	E	Tufty	12	9			5	72	need to identify
8/26/2020	LSB	5	A	Algae	15	4	1.8	21			
8/26/2020	LSB	5	A	Bare	80		1.8	21			
8/26/2020	LSB	5	A	Tufty	5	3	1.8	21			need to identify
8/26/2020	LSB	5	B	Algae	15	7	1.8	21			
8/26/2020	LSB	5	B	Bare	75		1.8	21			
8/26/2020	LSB	5	B	RPW	7	13	1.8	21			
8/26/2020	LSB	5	B	Tufty	3	5	1.8	21			need to identify
8/26/2020	LSB	5	C	Algae	20	7	1.8	21			
8/26/2020	LSB	5	C	Bare	78		1.8	21			
8/26/2020	LSB	5	C	Isoetes	1	3	1.8	21			
8/26/2020	LSB	5	C	milfoil	5	13	1.8	21			
8/26/2020	LSB	5	C	Tufty	1	4	1.8	21			need to identify
8/26/2020	LSB	5	D	Algae	3	5	1.9	21			
8/26/2020	LSB	5	D	Bare	65		1.9	21			
8/26/2020	LSB	5	D	elodea	20	10	1.9	21			
8/26/2020	LSB	5	D	LPW	1	3	1.9	21			
8/26/2020	LSB	5	D	milfoil	10	28	1.9	21			
8/26/2020	LSB	5	D	Tufty	1	5	1.9	21			need to identify
8/26/2020	LSB	5	E	Algae	5	6	1.8	21			
8/26/2020	LSB	5	E	Bare	74		1.8	21			
8/26/2020	LSB	5	E	LPW	10	7	1.8	21			
8/26/2020	LSB	5	E	milfoil	1	20	1.8	21			
8/26/2020	LSB	5	E	Tufty	10	6	1.8	21			need to identify
8/26/2020	LSB	6	A	Algae	29	4			6	73	
8/26/2020	LSB	6	A	Bare	70				6	73	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
8/26/2020	LSB	6	A	Tufty	1	3			6	73	
8/26/2020	LSB	6	B	Algae	38	5			6	72	
8/26/2020	LSB	6	B	Bare	60				6	72	
8/26/2020	LSB	6	B	Tufty	2	4			6	72	
8/26/2020	LSB	6	C	Algae	10	4			6	72	
8/26/2020	LSB	6	C	Bare	80				6	72	
8/26/2020	LSB	6	C	Isoetes	8	5			6	72	
8/26/2020	LSB	6	C	milfoil	2	5			6	72	
8/26/2020	LSB	6	D	Algae	15	11			6	72	
8/26/2020	LSB	6	D	Bare	70				6	72	
8/26/2020	LSB	6	D	LPW	4	12			6	72	
8/26/2020	LSB	6	D	milfoil	5	26			6	72	
8/26/2020	LSB	6	D	Tufty	6	5			6	72	
8/26/2020	LSB	6	E	Bare	100				6	72	
8/26/2020	LSB	7	A	Algae	52	12					
8/26/2020	LSB	7	A	Bare	25		2	21			
8/26/2020	LSB	7	A	Isoetes	10	25	2	21			
8/26/2020	LSB	7	A	LPW	5	7	2	21			
8/26/2020	LSB	7	A	milfoil	5	26.5	2	21			
8/26/2020	LSB	7	A	Tufty	3	3.5	2	21			need to identify
8/26/2020	LSB	7	B	Algae	20	8	2	21			
8/26/2020	LSB	7	B	Bare	74		2	21			
8/26/2020	LSB	7	B	milfoil	3	19	2	21			
8/26/2020	LSB	7	B	Tufty	3	3	2	21			need to identify
8/26/2020	LSB	7	C	Algae	1	7	2	21			
8/26/2020	LSB	7	C	Bare	55		1.9	21			
8/26/2020	LSB	7	C	LPW	40	17	1.9	21			
8/26/2020	LSB	7	C	milfoil	3	30	1.9	21			
8/26/2020	LSB	7	C	Tufty	1	5	1.9	21			need to identify
8/26/2020	LSB	7	D	Algae	1	3	1.9	21			
8/26/2020	LSB	7	D	Bare	78		1.9	21			
8/26/2020	LSB	7	D	Isoetes	5	3	1.9	21			
8/26/2020	LSB	7	D	LPW	5	10	1.9	21			
8/26/2020	LSB	7	D	milfoil	10	30	1.9	21			
8/26/2020	LSB	7	D	Tufty	1	6	1.9	21			need to identify
8/26/2020	LSB	7	E	Algae	10	4	1.9	21			
8/26/2020	LSB	7	E	Bare	80		1.8	21			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
8/26/2020	LSB	7	E	milfoil	5	7	1.8	21			
8/26/2020	LSB	7	E	Tufty	5	5	1.8	21			need to identify
8/26/2020	LSB	8	A	Algae	40	14			6	72	
8/26/2020	LSB	8	A	Bare	50				6	72	
8/26/2020	LSB	8	A	Tufty	10	5			6	72	need to identify
8/26/2020	LSB	8	B	Algae	45	12			6	71	
8/26/2020	LSB	8	B	Bare	50				6	71	
8/26/2020	LSB	8	B	milfoil	4	8			6	71	
8/26/2020	LSB	8	B	Tufty	1	3			6	71	need to identify
8/26/2020	LSB	8	C	Algae	20	6			6	71	
8/26/2020	LSB	8	C	Bare	70				6	71	
8/26/2020	LSB	8	C	CLPW	1	18			6	71	blackened in places looks burnt
8/26/2020	LSB	8	C	milfoil	3	8			6	71	
8/26/2020	LSB	8	C	Tufty	1	5			6	71	need to identify
8/26/2020	LSB	8	D	Algae	4	3			6	71	
8/26/2020	LSB	8	D	Bare	95				6	71	
8/26/2020	LSB	8	D	Tufty	1	1			6	71	need to identify
8/26/2020	LSB	8	E	Algae	1	2			5	72	
8/26/2020	LSB	8	E	Bare	99				5	72	
8/26/2020	LSB	9	A	Algae	10	10	2.1	21			
8/26/2020	LSB	9	A	Bare	86		2.1	21			
8/26/2020	LSB	9	A	milfoil	1	5.5	2.1	21			
8/26/2020	LSB	9	A	Tufty	3	3.6	2.1	21			need to identify
8/26/2020	LSB	9	B	Algae	9	7	2.3	21			
8/26/2020	LSB	9	B	Bare	90		2.3	21			
8/26/2020	LSB	9	B	Tufty	1	2.3	2.3	21			need to identify
8/26/2020	LSB	9	C	Algae	1	1	2.3	21			
8/26/2020	LSB	9	C	Bare	99		2.3	21			
8/26/2020	LSB	9	D	Algae	4	7	2.1	21			
8/26/2020	LSB	9	D	Bare	95		2.1	21			
8/26/2020	LSB	9	D	Tufty	1	1	2.1	21			need to identify
8/26/2020	LSB	9	E	Algae	10	11	2	21			
8/26/2020	LSB	9	E	Bare	80		2	21			
8/26/2020	LSB	9	E	milfoil	10	18	2	21			
8/26/2020	LSB	9	E	Tufty	1	2	2	21			need to identify
9/22/2020	TK	E	A	milfoil		170	1.9			62	RPW and milfoil healthy, very hard to see
9/22/2020	TK	E	A	RPW		140	1.9			62	RPW and milfoil healthy, very hard to see

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
9/22/2020	TK	E	B	milfoil		140	2.2			62	appears less dense from surface, but water quality is so poor
9/22/2020	TK	E	B	RPW		120	2.2			62	appears less dense from surface, but water quality is so poor
9/22/2020	TK	E	C	milfoil		115	2.1			62	sandy bottom plants less dense
9/22/2020	TK	E	D	milfoil		130	2.5			62	much fewer plants few standing plans appear unhealthy dull hardly anything to measure
9/22/2020	TK	T	A	Coontail		300			10	62	dense coontail, hard to tell if anything else growing nearby, black water, milfiol noted further south towards wall and between boat docs% comp data noted under %comp-weight
9/22/2020	TK	T	B				3.2			62	no plants found, height not recorded, totally fallen, no standing plants observed, found lots of turions, vis very bad, % comp data noted under %comp-weight
9/22/2020	TK	T	C				3.2			62	again, observed no standing plants. no plants found, height not recorded % comp data noted under %comp-weight
9/22/2020	TK	T	D				3.3			62	same as B and C no plants found, height not recorded % comp data noted under %comp-weight
9/22/2020	TK	U	A	Coontail		390	400			62	massive coontail growth no other plants observed
9/22/2020	TK	U	B	Coontail		350	400			62	massive coontail growth no other plants observed
9/22/2020	TK	U	C	Coontail		410	420			62	massive coontail growth no other plants observed
9/22/2020	TK	U	D	Coontail		370	410			62	massive coontail growth no other plants observed
10/6/2020	LSB	1	A	Algae	2	4			5	61	Very bare, only MF remaining
10/6/2020	LSB	1	A	Bare	96				5	61	
10/6/2020	LSB	1	A	Najas	2	5			5	61	
10/6/2020	LSB	1	B	Algae	5	5			5	61	
10/6/2020	LSB	1	B	Bare	90				5	61	Only sprigs of MF here and there
10/6/2020	LSB	1	B	Najas	5	4			5	61	Very bare, only MF remaining
10/6/2020	LSB	1	C	Algae	10	6			5	61	
10/6/2020	LSB	1	C	Bare	75				5	61	
10/6/2020	LSB	1	C	Isoetes	5	2			5	61	
10/6/2020	LSB	1	C	Najas	10	4			5	61	Only sprigs of MF here and there
10/6/2020	LSB	1	D	Algae	3	3			5	61	
10/6/2020	LSB	1	D	Bare	94				5	61	
10/6/2020	LSB	1	D	Najas	1	3			5	61	
10/6/2020	LSB	1	E	Bare	95				5	61	
10/6/2020	LSB	1	E	milfoil	5	11			5	61	
10/6/2020	LSB	2	A	Bare	100				5	60	
10/6/2020	LSB	2	B	Bare	100				5	60	
10/6/2020	LSB	2	C	Bare	95				5	60	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
10/6/2020	LSB	2	C	Isoetes	3	4			5	60	
10/6/2020	LSB	2	C	milfoil	2	25			5	60	Lots of fluffy green algae
10/6/2020	LSB	2	D	Bare	97				4	60	
10/6/2020	LSB	2	D	milfoil	3	22			4	60	
10/6/2020	LSB	2	E	Bare	96				4	60	
10/6/2020	LSB	2	E	Isoetes	2	5			4	60	
10/6/2020	LSB	2	E	milfoil	2	13			4	60	only Iso observed EE
10/6/2020	LSB	3	A	Algae	2	4			5	61	
10/6/2020	LSB	3	A	Bare	96				5	61	
10/6/2020	LSB	3	A	Najas	2	4			5	61	
10/6/2020	LSB	3	B	Algae	8	6			5	61	
10/6/2020	LSB	3	B	Bare	85				5	61	
10/6/2020	LSB	3	B	Najas	2	4			5	61	
10/6/2020	LSB	3	B	RPW	5	9			5	61	
10/6/2020	LSB	3	C	Bare	97				5	61	
10/6/2020	LSB	3	C	milfoil	3	11			5	61	
10/6/2020	LSB	3	D	Bare	2				5	61	
10/6/2020	LSB	3	D	milfoil	97	47			5	61	
10/6/2020	LSB	3	D	RPW	1	9			5	61	
10/6/2020	LSB	3	E	Bare	69				5	61	
10/6/2020	LSB	3	E	elodea	1	4			5	61	
10/6/2020	LSB	3	E	milfoil	30	12			5	61	Lots of fluffy green algae
10/6/2020	LSB	4	A	Bare	100				5	60	
10/6/2020	LSB	4	B	Bare	95				4	60	
10/6/2020	LSB	4	B	Isoetes	5	6			4	60	
10/6/2020	LSB	4	C	Bare	93				4	60	
10/6/2020	LSB	4	C	Isoetes	5	3			4	60	Lots of fluffy green algae
10/6/2020	LSB	4	C	RPW	2				4	60	
10/6/2020	LSB	4	D	Bare	95				4	60	
10/6/2020	LSB	4	D	milfoil	3	12			4	60	
10/6/2020	LSB	4	D	Najas	2	7			4	60	
10/6/2020	LSB	4	E	Bare	50				4	60	Lots of fluffy green algae
10/6/2020	LSB	4	E	milfoil	50	45			4	60	
10/6/2020	LSB	5	A	Bare	100				5	60	
10/6/2020	LSB	5	B	Bare	90				4	60	
10/6/2020	LSB	5	B	Isoetes	5	6			4	60	
10/6/2020	LSB	5	B	milfoil	1	18			4	60	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
10/6/2020	LSB	5	B	Najas	4	3			4	60	
10/6/2020	LSB	5	C	Bare	91				4	60	
10/6/2020	LSB	5	C	Isoetes	5	4			4	60	
10/6/2020	LSB	5	C	milfoil	1				4	60	
10/6/2020	LSB	5	C	RPW	3	12			4	60	height not recorded
10/6/2020	LSB	5	D	Bare	95				4	60	
10/6/2020	LSB	5	D	milfoil	5	26			4	60	
10/6/2020	LSB	5	E	Bare	40				4	60	
10/6/2020	LSB	5	E	milfoil	30	50			4	60	
10/6/2020	LSB	5	E	RPW	30	25			4	60	
10/6/2020	LSB	6	A	Algae	15	7			5	61	
10/6/2020	LSB	6	A	Bare	78				5	61	
10/6/2020	LSB	6	A	elodea	1	3			5	61	height not recorded
10/6/2020	LSB	6	A	LPW	1	4			5	61	
10/6/2020	LSB	6	A	milfoil	5	8			5	61	
10/6/2020	LSB	6	B	Algae	60	4			5	61	
10/6/2020	LSB	6	B	Bare	39				5	61	
10/6/2020	LSB	6	B	milfoil	1	8			5	61	
10/6/2020	LSB	6	C	Bare	95				5	61	
10/6/2020	LSB	6	C	milfoil	5	15			5	61	
10/6/2020	LSB	6	D	CLPW	9	32			5	61	
10/6/2020	LSB	6	D	elodea	1	5			5	61	
10/6/2020	LSB	6	D	milfoil	90	42			5	61	
10/6/2020	LSB	6	E	Algae	5	6			5	61	
10/6/2020	LSB	6	E	Bare	55				5	61	
10/6/2020	LSB	6	E	milfoil	40	40			5	61	Tones of tall MF nearby
10/6/2020	LSB	7	A	Bare	95				5	60	
10/6/2020	LSB	7	A	Najas	5	9			5	60	
10/6/2020	LSB	7	B	Bare	90				5	60	
10/6/2020	LSB	7	B	LPW	3	9			5	60	
10/6/2020	LSB	7	B	milfoil	7	30			5	60	
10/6/2020	LSB	7	C	Bare	20				5	60	
10/6/2020	LSB	7	C	LPW	10	5			5	60	
10/6/2020	LSB	7	C	milfoil	20				5	60	
10/6/2020	LSB	7	C	Najas	50	10			5	60	
10/6/2020	LSB	7	D	Bare	60				5	60	
10/6/2020	LSB	7	D	LPW	10	5			5	60	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
10/6/2020	LSB	7	D	milfoil	10	35			5	60	
10/6/2020	LSB	7	D	Najas	30	15			5	60	
10/6/2020	LSB	7	E	Bare	95				4	60	
10/6/2020	LSB	7	E	milfoil	5	25			4	60	
10/6/2020	LSB	8	A	Algae	15	16			6	61	
10/6/2020	LSB	8	A	Bare	39				6	61	height not recorded
10/6/2020	LSB	8	A	elodea	1	6			6	61	
10/6/2020	LSB	8	A	Najas	45	9			6	61	
10/6/2020	LSB	8	B	Algae	5	10			6	61	
10/6/2020	LSB	8	B	Bare	88				6	61	
10/6/2020	LSB	8	B	CLPW	5	8			6	61	
10/6/2020	LSB	8	B	milfoil	2	11			6	61	
10/6/2020	LSB	8	C	Algae	5	10			6	61	
10/6/2020	LSB	8	C	Bare	75				6	61	
10/6/2020	LSB	8	C	elodea	15	6			6	61	Appeared to be more milfoil than previously
10/6/2020	LSB	8	C	milfoil	5	12			6	61	More RPW than previous samples - lots of green algae
10/6/2020	LSB	8	D	Algae	5	4			6	61	
10/6/2020	LSB	8	D	Bare	85				6	61	
10/6/2020	LSB	8	D	CLPW	7	12			6	61	
10/6/2020	LSB	8	D	milfoil	3	12			6	61	
10/6/2020	LSB	8	E	Bare	30				5	61	
10/6/2020	LSB	8	E	milfoil	70	40			5	61	
10/6/2020	LSB	9	A	Bare	100				7	60	
10/6/2020	LSB	9	B	Bare	100				6	60	
10/6/2020	LSB	9	C	Bare	98				6	60	
10/6/2020	LSB	9	C	Najas	2	3			6	60	
10/6/2020	LSB	9	D	Bare	98				6	60	
10/6/2020	LSB	9	D	milfoil	1	6			6	60	
10/6/2020	LSB	9	D	Najas	1	5			6	60	
10/6/2020	LSB	9	E	Bare	90				5	60	
10/6/2020	LSB	9	E	milfoil	10	17			5	60	
10/6/2020	LSM	1	A	Bare	95				6	61	
10/6/2020	LSM	1	A	milfoil	5	34			6	61	
10/6/2020	LSM	1	B	Bare	95				6	61	
10/6/2020	LSM	1	B	milfoil	5	21			6	61	
10/6/2020	LSM	1	C	Bare	95				6	61	
10/6/2020	LSM	1	C	milfoil	5	36			6	61	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
10/6/2020	LSM	1	D	Bare	93				9	61	
10/6/2020	LSM	1	D	milfoil	7	42			9	61	
10/6/2020	LSM	1	E	Bare	95				10	61	
10/6/2020	LSM	1	E	milfoil	5	47			10	61	
10/13/2020	TK	E	A	milfoil		110	1.5			57	RPW height is approximate, milfoil appears wilted pale and of poor quality
10/13/2020	TK	E	A	RPW		100	1.5			57	RPW height is approximate, milfoil appears wilted pale and of poor quality
10/13/2020	TK	E	B	milfoil		114	1.95			57	fallen plants not totally collapsed just sunken
10/13/2020	TK	E	B	RPW		140	1.95			57	fallen plants not totally collapsed just sunken
10/13/2020	TK	E	C	milfoil		40	2.3			57	only 2 sprigs of standing milfoil, nothing else around just detritus
10/13/2020	TK	E	D	milfoil		110	2			57	only milfoil sprigs and mud
10/13/2020	TK	T	A	milfoil			2.7			57	Plants to the surface, milfoil and Coontail look brown and degraded
10/13/2020	TK	T	B	milfoil		60	3.3			57	Milfoil degraded and fallen only small amounts of green
10/13/2020	TK	T	C				2.9			57	nothing to measure, only detritus
10/13/2020	TK	T	D				3.2			57	No plants to measure
10/13/2020	TK	U	A	Coontail		310	3.65			57	Coontail appears fallen. No longer at the water surface. Just as dense, but the height is less not collapsed, just "fallen"
10/13/2020	TK	U	B	Coontail		170	3.8			57	Coontail appears fallen. No longer at the water surface. Just as dense, but the height is less not collapsed, just "fallen"
10/13/2020	TK	U	C	Coontail		190	3.9			57	Coontail appears fallen. No longer at the water surface. Just as dense, but the height is less not collapsed, just "fallen"
10/13/2020	TK	U	D	Coontail		290	3.9			57	Coontail appears fallen. No longer at the water surface. Just as dense, but the height is less not collapsed, just "fallen"
11/19/2020	LSB	1	A	Bare	100				5		temp not noted,
11/19/2020	LSB	1	B	Bare	100				5		temp not noted,
11/19/2020	LSB	1	C	Bare	95				5		temp not noted,
11/19/2020	LSB	1	C	Isoetes	5	3			5		temp not noted,
11/19/2020	LSB	1	D	Bare	95				5		temp not noted,
11/19/2020	LSB	1	D	Isoetes	5	4			4		temp not noted,
11/19/2020	LSB	1	E	Bare	100				4		temp not noted,
11/19/2020	LSB	2	A	Bare	100				5		
11/19/2020	LSB	2	B	Bare	100				5		
11/19/2020	LSB	2	C	Algae	5	3			5		
11/19/2020	LSB	2	C	Bare	95				5		

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
11/19/2020	LSB	2	D	Algae	5	3			4		
11/19/2020	LSB	2	D	Bare	95				4		
11/19/2020	LSB	2	E	Bare	95				4		
11/19/2020	LSB	2	E	milfoil	5	6			4		
11/19/2020	LSB	3	A	Bare	100				5	47	Nothing collected
11/19/2020	LSB	3	B	Bare	100				5	47	
11/19/2020	LSB	3	C	Bare	72				5	47	
11/19/2020	LSB	3	C	Isoetes	3	3			5	47	
11/19/2020	LSB	3	C	milfoil	25	22.5			5	47	
11/19/2020	LSB	3	D	Bare	39				5	47	
11/19/2020	LSB	3	D	elodea	1	2			5	47	
11/19/2020	LSB	3	D	milfoil	60	37			5	47	
11/19/2020	LSB	3	E	Bare	85				5	47	
11/19/2020	LSB	3	E	milfoil	15	32			5	47	
11/19/2020	LSB	4	A	Bare	100				5		temp not recorded
11/19/2020	LSB	4	B	Bare	100				5		
11/19/2020	LSB	4	C	Bare	90				5		
11/19/2020	LSB	4	C	Isoetes	5	5			5		
11/19/2020	LSB	4	C	milfoil	5	35			5		
11/19/2020	LSB	4	D	Bare	69				5		
11/19/2020	LSB	4	D	Isoetes	30	10			5		
11/19/2020	LSB	4	D	milfoil	1	22			5		
11/19/2020	LSB	4	E	Bare	50				4		
11/19/2020	LSB	4	E	milfoil	50	75			4		
11/19/2020	LSB	5	A	Bare	90				5	47	
11/19/2020	LSB	5	A	Isoetes	10	4			5	47	
11/19/2020	LSB	5	B	Algae	2	4			5	47	
11/19/2020	LSB	5	B	Bare	94				5	47	
11/19/2020	LSB	5	B	milfoil	2	15			5	47	
11/19/2020	LSB	5	C	Algae	5	5			5	47	Burried Elodea not observed until collection
11/19/2020	LSB	5	C	Bare	85				5	47	Burried Elodea not observed until collection
11/19/2020	LSB	5	C	Isoetes	9	6			5	47	Burried Elodea not observed until collection
11/19/2020	LSB	5	C	milfoil	1	7			5	47	Burried Elodea not observed until collection
11/19/2020	LSB	5	D	Bare	30				5	46	
11/19/2020	LSB	5	D	milfoil	70	86			5	46	
11/19/2020	LSB	5	E	Bare	35				5	46	
11/19/2020	LSB	5	E	milfoil	65	63			5	46	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
11/19/2020	LSB	6	A	Bare	98				5		
11/19/2020	LSB	6	A	Isoetes	1	5			5		
11/19/2020	LSB	6	A	milfoil	1	10			5		
11/19/2020	LSB	6	B	Bare	95				5		
11/19/2020	LSB	6	B	Isoetes	3	6			5		
11/19/2020	LSB	6	B	milfoil	2	12			5		
11/19/2020	LSB	6	C	Bare	95				5		
11/19/2020	LSB	6	C	Isoetes	4	3			5		
11/19/2020	LSB	6	C	milfoil	1	8			5		
11/19/2020	LSB	6	D	Bare	100				5		
11/19/2020	LSB	6	E	Bare	50				5		
11/19/2020	LSB	6	E	milfoil	50	70			5		
11/19/2020	LSB	7									MISSING DATA SHEET
11/19/2020	LSB	8	A	Bare	98				5		
11/19/2020	LSB	8	A	Isoetes	2	4			5		
11/19/2020	LSB	8	B	Bare	98				6		
11/19/2020	LSB	8	B	milfoil	2	15			6		
11/19/2020	LSB	8	C	Bare	90				5		
11/19/2020	LSB	8	C	milfoil	10	25			5		
11/19/2020	LSB	8	D	Bare	80				6		
11/19/2020	LSB	8	D	milfoil	20	26			6		
11/19/2020	LSB	8	E	Bare	95				5		
11/19/2020	LSB	8	E	Isoetes	5	4			5		
11/19/2020	LSB	9	A	Algae	1	2			6	45	
11/19/2020	LSB	9	A	Bare	98				6	45	
11/19/2020	LSB	9	A	milfoil	1	8			6	45	
11/19/2020	LSB	9	B	Algae	1	4			6	45	
11/19/2020	LSB	9	B	Bare	99				6	45	nothing to collect
11/19/2020	LSB	9	C	Algae	2	6			6	45	
11/19/2020	LSB	9	C	Bare	99				6	45	
11/19/2020	LSB	9	D	Bare	97				6	45	
11/19/2020	LSB	9	D	elodea	2	6			6	45	
11/19/2020	LSB	9	D	milfoil	1	8			6	45	
11/19/2020	LSB	9	E	Bare	80				6	45	near PVC square
11/19/2020	LSB	9	E	milfoil	20	25			6	45	Milfoil looks droopy wilted and almost burnt, near PVC square
11/19/2020	LSM		A	Algae	97						MISSING DATA SHEET
11/19/2020	LSM		A	milfoil	3	8					

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
11/19/2020	LSM		B	bare	100						
11/19/2020	LSM		C	algae	100						
11/19/2020	LSM		D	algae	50						
11/19/2020	LSM		D	Bare	50						
11/19/2020	LSM		E	Algae	100						
12/3/2020	TK	T	A	Coontail		80	2.6				Bags sorted by EE but not weighed, frozen plants in freezer; Some milfoil visible, coontail very fallen, only 80cm off the very bottom. In bag 4 E
12/3/2020	TK	T	B	Coontail		30	2.9				Bags sorted by EE but not weighed, frozen plants in freezer; Stand of degraded coontail, and then bare, noted a CLPW sprout but unable to measure before stirring everything up.
12/3/2020	TK	T	C	CLPW		15	2.7				Bags sorted by EE but not weighed, frozen plants in freezer; A few pondweeds noted - approx 15 cm. Mostly bare.
12/3/2020	TK	T	D				2.7				Bags sorted by EE but not weighed, frozen plants in freezer, Some floating coontail but no rooted plants observed
5/7/2021	LSB	1	A	bare	100		1.2	13.3			
5/7/2021	LSB	1	B	bare	98		1.2	13.3			
5/7/2021	LSB	1	B	algae	2	4	1.2	13.3			
5/7/2021	LSB	1	C	bare	80		1.2	13.3			
5/7/2021	LSB	1	C	Algae	20	3	1.2	13.3			
5/7/2021	LSB	1	D	Bare	95		0.9	13.3			
5/7/2021	LSB	1	D	Algae	5	3	0.9	13.3			
5/7/2021	LSB	1	E	Bare	93		0.9	13.3			
5/7/2021	LSB	1	E	Algae	3	3	0.9	13.3			
5/7/2021	LSB	1	E	milfoil	3	11	0.9	13.3			
5/7/2021	LSB	1	E	LPW	1	1	0.9	13.3			
5/7/2021	LSB	2	A	Bare	100		1.2	13.3			
5/7/2021	LSB	2	B	Bare	97		0.9	13.3			
5/7/2021	LSB	2	B	Algae	3	3	0.9	13.3			
5/7/2021	LSB	2	C	Bare	95		0.9	13.3			
5/7/2021	LSB	2	C	Algae	5	3	0.9	13.3			
5/7/2021	LSB	2	D	Bare	98		0.9	13.3			
5/7/2021	LSB	2	D	Algae	2	2	0.9	13.3			
5/7/2021	LSB	2	E	Bare	85		0.9	13.3			
5/7/2021	LSB	2	E	Algae	15	5	0.9	13.3			
5/7/2021	LSB	3	A	Bare	99		0.9	13.3			
5/7/2021	LSB	3	A	Algae	1	2	0.9	13.3			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
5/7/2021	LSB	3	B	Bare	94		0.9	13.3			
5/7/2021	LSB	3	B	Algae	5	3	0.9	13.3			
5/7/2021	LSB	3	B	LPW	1	1	0.9	13.3			
5/7/2021	LSB	3	C	Bare	76		0.9	13.3			
5/7/2021	LSB	3	C	Algae	20	4	0.9	13.3			
5/7/2021	LSB	3	C	milfoil	3	7	0.9	13.3			
5/7/2021	LSB	3	C	CLPW	1	2	0.9	13.3			
5/7/2021	LSB	3	D	Bare	55		0.9	13.3			
5/7/2021	LSB	3	D	Algae	5	2	0.9	13.3			
5/7/2021	LSB	3	D	milfoil	30	14	0.9	13.3			
5/7/2021	LSB	3	D	LPW	10	3	0.9	13.3			
5/7/2021	LSB	3	E	Bare	55		0.9	13.3			
5/7/2021	LSB	3	E	Algae	10	2	0.9	13.3			
5/7/2021	LSB	3	E	milfoil	30	19	0.9	13.3			
5/7/2021	LSB	3	E	LPW	5	3	0.9	13.3			
5/7/2021	LSB	4	A	Bare	99		0.9	13.3			
5/7/2021	LSB	4	B	Bare	65		0.9	13.3			
5/7/2021	LSB	4	B	Algae	10	3	0.9	13.3			
5/7/2021	LSB	4	B	LPW	25	2	0.9	13.3			
5/7/2021	LSB	4	C	Bare	83		0.9	13.3			
5/7/2021	LSB	4	C	Algae	10	4	0.9	13.3			
5/7/2021	LSB	4	C	milfoil	2	3	0.9	13.3			
5/7/2021	LSB	4	C	LPW	15	5	0.9	13.3			
5/7/2021	LSB	4	D	Bare	50		0.9	13.3			
5/7/2021	LSB	4	D	Algae	15	7	0.9	13.3			
5/7/2021	LSB	4	D	milfoil	20	15	0.9	13.3			
5/7/2021	LSB	4	D	LPW	15	5	0.9	13.3			
5/7/2021	LSB	4	E	Bare	50		0.9	13.3			
5/7/2021	LSB	4	E	Algae	10	4	0.9	13.3			
5/7/2021	LSB	4	E	milfoil	20	10	0.9	13.3			
5/7/2021	LSB	4	E	LPW	20	3	0.9	13.3			
4/30/2021	LSB	5	A	bare	100		1.5	8.3			no videos of transect 5- gopro not working
4/30/2021	LSB	5	B	bare	70		1.5	8.3			
4/30/2021	LSB	5	B	Algae	15	6	1.5	8.3			
4/30/2021	LSB	5	B	LPW	15	2	1.5	8.3			
4/30/2021	LSB	5	C	Bare	49		1.2	8.3			
4/30/2021	LSB	5	C	Algae	20	4	1.2	8.3			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
4/30/2021	LSB	5	C	milfoil	25	12	1.2	8.3			
4/30/2021	LSB	5	C	LPW	3	1	1.2	8.3			
4/30/2021	LSB	5	C	CLPW	1	2	1.2	8.3			
4/30/2021	LSB	5	C	Isoetes	2	1	1.2	8.3			
4/30/2021	LSB	5	D	Bare	80		1.2	8.3			
4/30/2021	LSB	5	D	Algae	10	3	1.2	8.3			
4/30/2021	LSB	5	D	milfoil	5	5	1.2	8.3			
4/30/2021	LSB	5	D	Isoetes	5	2	1.2	8.3			
4/30/2021	LSB	5	E	bare	80		1.2	8.3			
4/30/2021	LSB	5	E	milfoil	5		1.2	8.3			height not measured
4/30/2021	LSB	5	E	LPW	15		1.2	8.3			height not measured
4/30/2021	LSB	6	A	Bare	85		1.5	8.3			
4/30/2021	LSB	6	A	Algae	15	3	1.5	8.3			
4/30/2021	LSB	6	B	Bare	85		1.5	8.3			
4/30/2021	LSB	6	B	Algae	15	5	1.5	8.3			
4/30/2021	LSB	6	C	bare	68		1.2	8.3			
4/30/2021	LSB	6	C	Algae	15	3	1.2	8.3			
4/30/2021	LSB	6	C	LPW	15	2	1.2	8.3			
4/30/2021	LSB	6	C	CLPW	1	2	1.2	8.3			
4/30/2021	LSB	6	C	Isoetes	1	1	1.2	8.3			
4/30/2021	LSB	6	D	Bare	74		1.2	8.3			
4/30/2021	LSB	6	D	Algae	20	3	1.2	8.3			
4/30/2021	LSB	6	D	milfoil	1	10	1.2	8.3			
4/30/2021	LSB	6	D	LPW	5	2	1.2	8.3			
4/30/2021	LSB	6	E	Bare	82		0.9	8.3			
4/30/2021	LSB	6	E	Algae	15	3	0.9	8.3			
4/30/2021	LSB	6	E	milfoil	1	6	0.9	8.3			
4/30/2021	LSB	6	E	LPW	1	2	0.9	8.3			
4/30/2021	LSB	6	E	Isoetes	1	2	0.9	8.3			
4/30/2021	LSB	7	A	Bare	60		1.5	8.3			
4/30/2021	LSB	7	A	Algae	20	4	1.5	8.3			
4/30/2021	LSB	7	A	LPW	20	3	1.5	8.3			
4/30/2021	LSB	7	B	bare	65		1.5	8.3			
4/30/2021	LSB	7	B	Algae	15	3	1.5	8.3			
4/30/2021	LSB	7	B	LPW	20	3	1.5	8.3			
4/30/2021	LSB	7	C	Bare	70		1.5	8.3			
4/30/2021	LSB	7	C	Algae	10	2	1.5	8.3			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
4/30/2021	LSB	7	C	LPW	20	3	1.5	8.3			
4/30/2021	LSB	7	D	Bare	95		1.2	8.3			
4/30/2021	LSB	7	D	milfoil	1	3	1.2	8.3			
4/30/2021	LSB	7	D	LPW	4	2	1.2	8.3			
4/30/2021	LSB	7	E	Bare	90		1.2	8.3			
4/30/2021	LSB	7	E	milfoil	10	15	1.2	8.3			
4/30/2021	LSB	8	A	bare	90		1.5	8.3			
4/30/2021	LSB	8	A	Algae	10	7	1.5	8.3			
4/30/2021	LSB	8	B	Bare	75		1.5	8.3			
4/30/2021	LSB	8	B	Algae	25	3	1.5	8.3			
4/30/2021	LSB	8	C	bare	69		1.5	8.3			
4/30/2021	LSB	8	C	Algae	15	2	1.5	8.3			
4/30/2021	LSB	8	C	Isoetes	15	2	1.5	8.3			
4/30/2021	LSB	8	C	LPW	1	2	1.5	8.3			
4/30/2021	LSB	8	D	bare	85		1.5	8.3			
4/30/2021	LSB	8	D	algae	5	1	1.5	8.3			
4/30/2021	LSB	8	D	milfoil	5	4	1.5	8.3			
4/30/2021	LSB	8	D	Isoetes	5	1	1.5	8.3			
4/30/2021	LSB	8	E	bare	90		1.2	8.3			
4/30/2021	LSB	8	E	Algae	2	1	1.2	8.3			
4/30/2021	LSB	8	E	milfoil	3	7	1.2	8.3			
4/30/2021	LSB	8	E	LPW	5	3	1.2	8.3			
4/30/2021	LSB	9	A	bare	100		0.9	8.3			no videos of transect 9- gopro not working
4/30/2021	LSB	9	B	bare	100		1.2	8.3			
4/30/2021	LSB	9	C	bare	90		1.2	8.3			
4/30/2021	LSB	9	C	Algae	10	2	1.2	8.3			
4/30/2021	LSB	9	D	bare	90		1.5	8.3			
4/30/2021	LSB	9	D	Algae	10	3	1.5	8.3			
4/30/2021	LSB	9	E	bare	95		1.5	8.3			
4/30/2021	LSB	9	E	Algae	5	2	1.5	8.3			
5/7/2021	LSM		A	bare	40		1.8				
5/7/2021	LSM		A	Algae	10	6	1.8				
5/7/2021	LSM		A	milfoil	15	6	1.8				
5/7/2021	LSM		A	LPW	25	6	1.8				
5/7/2021	LSM		B	Bare	80		1.5				
5/7/2021	LSM		B	Algae	5	2	1.5				
5/7/2021	LSM		B	LPW	15	12	1.5				

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
5/7/2021	LSM		C	Bare	50		1.5				
5/7/2021	LSM		C	Algae	10		1.5				
5/7/2021	LSM		C	LPW	40		1.5				
5/7/2021	LSM		D	Bare	50		1.5				
5/7/2021	LSM		D	Algae	15		1.5				
5/7/2021	LSM		D	milfoil	5		1.5				
5/7/2021	LSM		D	LPW	30	12	1.5				
5/7/2021	LSM		E	Bare	30		1.5				
5/7/2021	LSM		E	Algae	30	6	1.5				
5/7/2021	LSM		E	milfoil	10	8	1.5				
5/7/2021	LSM		E	LPW	30	1	1.5				
5/4/2021	TK	U	A				3.7	13.3			bag SR2
5/4/2021	TK	U	B				3.6	13.3			bag 5
5/4/2021	TK	U	C				3.3	13.3			bag TK5
5/4/2021	TK	U	D				3.2	13.3			bag TK1
5/4/2021	TK	T	A				2.9	13.3			bag TA
5/4/2021	TK	T	B				2.9	13.3			bag TKT2
5/4/2021	TK	T	C				2.6	13.3			bag SA
5/4/2021	TK	T	D				2.9	13.3			bag SA 3
5/4/2021	TK	E	A				2.2	13.3			bag 1A
5/4/2021	TK	E	B				1.7	13.3			bag 1B
5/4/2021	TK	E	C				1.5	13.3			bag 1C
5/4/2021	TK	E	D				1.6	13.3			bag 2D
6/16/2021	LSB	1	A	bare	100		1.2	16.1			
6/16/2021	LSB	1	B	Bare	99		1.07	16.1			
6/16/2021	LSB	1	B	Algae	1	1	1.07	16.1			
6/16/2021	LSB	1	C	Bare	70		1.07	16.1			
6/16/2021	LSB	1	C	Algae	30	7	1.07	16.1			
6/16/2021	LSB	1	D	Bare	80		1.07	16.1			
6/16/2021	LSB	1	D	Algae	20	4	1.07	16.1			
6/16/2021	LSB	1	E	bare	99		1.07	16.1			
6/16/2021	LSB	2	A	bare	100		1.5	16.1			all filamentous
6/16/2021	LSB	2	B	bare	100		1.5	16.1			all filamentous
6/16/2021	LSB	2	C	bare	99		0.91	16.1			
6/16/2021	LSB	2	C	Algae	1	1	0.91	16.1			
6/16/2021	LSB	2	D	bare	72		0.91	16.1			
6/16/2021	LSB	2	D	Algae	10	2	0.91	16.1			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
6/16/2021	LSB	2	D	milfoil	3	7	0.91	16.1			
6/16/2021	LSB	2	D	Najas	5	2	0.91	16.1			
6/16/2021	LSB	2	E	Bare	83		0.91	16.1			
6/16/2021	LSB	2	E	Algae	6	4	0.91	16.1			
6/16/2021	LSB	2	E	milfoil	1	12	0.91	16.1			
6/16/2021	LSB	2	E	Najas	10	1	0.91	16.1			
6/16/2021	LSB	3	A	Bare	100		1.22	15.6			
6/16/2021	LSB	3	B	Bare	99		1.22	15.6			
6/16/2021	LSB	3	B	Algae	1	4	1.22	15.6			
6/16/2021	LSB	3	C	Bare	68		1.22	15.6			
6/16/2021	LSB	3	C	Algae	30	6	1.22	15.6			
6/16/2021	LSB	3	C	Najas	2	1	1.22	15.6			
6/16/2021	LSB	3	D	Bare	65		1.22	15.6			
6/16/2021	LSB	3	D	Algae	35	3	1.22	15.6			
6/16/2021	LSB	3	E	Bare	75		1.22	15.6			
6/16/2021	LSB	3	E	Algae	25	4	1.22	15.6			
6/16/2021	LSB	4	A	Bare	99		0.91	16.1			
6/16/2021	LSB	4	A	Algae	1		0.91	16.1			
6/16/2021	LSB	4	B	Bare	70		0.91	16.1			
6/16/2021	LSB	4	B	Algae	15	5	0.91	16.1			
6/16/2021	LSB	4	B	Najas	15	2	0.91	16.1			
6/16/2021	LSB	4	C	bare	40		0.91	16.1			
6/16/2021	LSB	4	C	Algae	30		0.91	16.1			
6/16/2021	LSB	4	C	Najas	10		0.91	16.1			
6/16/2021	LSB	4	C	RPW	20		0.91	16.1			
6/16/2021	LSB	4	D	bare	35		0.91	16.1			
6/16/2021	LSB	4	D	Algae	20	10	0.91	16.1			
6/16/2021	LSB	4	D	milfoil	20	8	0.91	16.1			
6/16/2021	LSB	4	D	LPW	25	6	0.91	16.1			
6/16/2021	LSB	4	E	Bare	10		0.91	16.1			
6/16/2021	LSB	4	E	Algae	5		0.91	16.1			
6/16/2021	LSB	4	E	milfoil	70	22	0.91	16.1			
6/16/2021	LSB	4	E	LPW	15	7	0.91	16.1			
6/16/2021	LSB	5	A	bare	100		0.91	16.1			
6/16/2021	LSB	5	B	Bare	35		0.91	16.1			
6/16/2021	LSB	5	B	Algae	40	6	0.91	16.1			
6/16/2021	LSB	5	B	milfoil	5	7	0.91	16.1			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
6/16/2021	LSB	5	B	Najas	20	2	0.91	16.1			
6/16/2021	LSB	5	C	bare	25		0.91	16.1			
6/16/2021	LSB	5	C	Algae	50	8	0.91	16.1			
6/16/2021	LSB	5	C	milfoil	10	7	0.91	16.1			
6/16/2021	LSB	5	C	Najas	15	5	0.91	16.1			
6/16/2021	LSB	5	D	bare	20		0.91	16.1			
6/16/2021	LSB	5	D	Algae	60	4	0.91	16.1			
6/16/2021	LSB	5	D	milfoil	5	12	0.91	16.1			
6/16/2021	LSB	5	D	Najas	10	1	0.91	16.1			
6/16/2021	LSB	5	D	RPW	5	4	0.91	16.1			
6/16/2021	LSB	5	E	milfoil	80	34	0.91	16.1			
6/16/2021	LSB	5	E	Najas	20	4	0.91	16.1			
6/18/2021	LSB	6	A	bare	96		0.91	18.3			
6/18/2021	LSB	6	A	Algae	3	4	0.91	18.3			
6/18/2021	LSB	6	A	Najas	1	2	0.91	18.3			
6/18/2021	LSB	6	B	bare	55		0.91	18.3			
6/18/2021	LSB	6	B	Algae	25	3	0.91	18.3			
6/18/2021	LSB	6	B	Najas	20	3	0.91	18.3			
6/18/2021	LSB	6	C	bare	55		0.91	18.3			
6/18/2021	LSB	6	C	Algae	45		0.91	18.3			
6/18/2021	LSB	6	D	bare	65		0.91	18.3			
6/18/2021	LSB	6	D	Algae	35	8	0.91	18.3			
6/18/2021	LSB	6	E	Bare	60		0.91	18.3			
6/18/2021	LSB	6	E	milfoil	40	17	0.91	18.3			
6/18/2021	LSB	7	A	Bare	40		0.91	18.3			
6/18/2021	LSB	7	A	Algae	55	9	0.91	18.3			
6/18/2021	LSB	7	A	Najas	5	3	0.91	18.3			
6/18/2021	LSB	7	B	Bare	20		0.91	18.3			
6/18/2021	LSB	7	B	Algae	60	7	0.91	18.3			
6/18/2021	LSB	7	B	Najas	20	2	0.91	18.3			
6/18/2021	LSB	7	C	Bare	35		0.91	18.3			
6/18/2021	LSB	7	C	Algae	20	7	0.91	18.3			
6/18/2021	LSB	7	C	milfoil	5	9	0.91	18.3			
6/18/2021	LSB	7	C	LPW	40	10	0.91	18.3			
6/18/2021	LSB	7	D	Bare	60		0.91	18.3			
6/18/2021	LSB	7	D	Algae	30	3	0.91	18.3			
6/18/2021	LSB	7	D	Najas	10	3	0.91	18.3			

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
6/18/2021	LSB	7	E	bare	69		0.91	18.3			
6/18/2021	LSB	7	E	Algae	25	3	0.91	18.3			
6/18/2021	LSB	7	E	milfoil	1	3	0.91	18.3			
6/18/2021	LSB	7	E	LPW	5	1	0.91	18.3			
6/18/2021	LSB	8	A	bare			0.91				
6/18/2021	LSB	8	A	Algae	15	5	0.91				
6/18/2021	LSB	8	A	Najas	5	2	0.91				
6/18/2021	LSB	8	B	bare	50		0.91				
6/18/2021	LSB	8	B	Algae	50	6	0.91				
6/18/2021	LSB	8	C	bare	50		0.91				
6/18/2021	LSB	8	C	Algae	30	8	0.91				
6/18/2021	LSB	8	C	Najas	20	6	0.91				
6/18/2021	LSB	8	D	bare	75		0.91				
6/18/2021	LSB	8	D	Algae	15	9	0.91				
6/18/2021	LSB	8	D	milfoil	5	16	0.91				
6/18/2021	LSB	8	D	LPW	5	4	0.91				
6/18/2021	LSB	8	E	Bare	70		0.91				
6/18/2021	LSB	8	E	Algae	27	3	0.91				
6/18/2021	LSB	8	E	milfoil	3	13	0.91				
6/18/2021	LSB	9	A	bare	100		0.61				
6/18/2021	LSB	9	B	bare	74		0.91				
6/18/2021	LSB	9	B	Algae	25	5	0.91				
6/18/2021	LSB	9	B	Najas	1	1	0.91				
6/18/2021	LSB	9	C	bare	65		0.91				
6/18/2021	LSB	9	C	Algae	35	6	0.91				
6/18/2021	LSB	9	D	bare	80		1.52				
6/18/2021	LSB	9	D	Algae	15	8	1.52				
6/18/2021	LSB	9	D	Najas	5	1	1.52				
6/18/2021	LSB	9	E	Bare	73		1.52				
6/18/2021	LSB	9	E	Algae	25	8	1.52				
6/18/2021	LSB	9	E	milfoil	2	13	1.52				
6/16/2021	LSM		A	Algae	5						
6/16/2021	LSM		A	CLPW	5	15					
6/16/2021	LSM		A	LPW	90	21					
6/16/2021	LSM		B	milfoil	25	16					
6/16/2021	LSM		B	LPW	90	27					
6/16/2021	LSM		C	LPW	100	29					

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
6/16/2021	LSM		D	Bare	60						
6/16/2021	LSM		D	milfoil	5	8					
6/16/2021	LSM		D	LPW	35	18					
6/16/2021	LSM		E	Bare	65						
6/16/2021	LSM		E	milfoil	35	17					
7/7/2021	LSB	1	A	Bare	100						really windy, high turbidity
7/7/2021	LSB	1	B	Bare	95						
7/7/2021	LSB	1	B	Algae	5	10					
7/7/2021	LSB	1	C	Bare	80						
7/7/2021	LSB	1	C	Algae	20	15					
7/7/2021	LSB	1	D	bare	80						
7/7/2021	LSB	1	D	Algae	18	12					
7/7/2021	LSB	1	D	Isoetes	2	3					
7/7/2021	LSB	1	E	bare	98						
7/7/2021	LSB	1	E	Isoetes	2	4					
7/7/2021	LSB	2	A	bare	99						
7/7/2021	LSB	2	A	Algae	1	17					
7/7/2021	LSB	2	B	Bare	79						
7/7/2021	LSB	2	B	Algae	20	17					
7/7/2021	LSB	2	B	Najas	1	5					
7/7/2021	LSB	2	C	bare	75						
7/7/2021	LSB	2	C	Algae	25	10					
7/7/2021	LSB	2	D	bare	79						
7/7/2021	LSB	2	D	Algae	20	8					
7/7/2021	LSB	2	D	milfoil	1	12					
7/7/2021	LSB	2	E	bare	98						
7/7/2021	LSB	2	E	milfoil	2	17					
7/7/2021	LSB	3	A	bare	100						
7/7/2021	LSB	3	B	bare	100						
7/7/2021	LSB	3	C	bare	89						
7/7/2021	LSB	3	C	Algae	10	10					
7/7/2021	LSB	3	C	milfoil	1	4					
7/7/2021	LSB	3	D	bare	84						
7/7/2021	LSB	3	D	Algae	10	10					
7/7/2021	LSB	3	D	milfoil	5	33					
7/7/2021	LSB	3	D	Najas	1	3					
7/7/2021	LSB	3	E	bare	90						

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
7/7/2021	LSB	3	E	Algae	5	7					
7/7/2021	LSB	3	E	milfoil	5	34					
7/7/2021	LSB	4	A	bare	100						
7/7/2021	LSB	4	B	bare	45						
7/7/2021	LSB	4	B	Algae	40	13					
7/7/2021	LSB	4	B	Isoetes	5	3					
7/7/2021	LSB	4	B	Najas	10	2					
7/7/2021	LSB	4	C	bare	64						
7/7/2021	LSB	4	C	Algae	15	6					
7/7/2021	LSB	4	C	milfoil	1	3					
7/7/2021	LSB	4	C	Isoetes	5	2					
7/7/2021	LSB	4	C	Najas	5	2					
7/7/2021	LSB	4	D	Bare	65						
7/7/2021	LSB	4	D	Algae	10	6					
7/7/2021	LSB	4	D	milfoil	15	20					
7/7/2021	LSB	4	D	Isoetes	5	2					
7/7/2021	LSB	4	D	Najas	5	2					
7/7/2021	LSB	4	E	Bare	70						
7/7/2021	LSB	4	E	Algae	5	4					
7/7/2021	LSB	4	E	milfoil	25	17					milfoil looks unhealthy
7/7/2021	LSB	5	A	Bare	100						
7/7/2021	LSB	5	B	Bare	35						
7/7/2021	LSB	5	B	Algae	30	10					
7/7/2021	LSB	5	B	Isoetes	25	2					
7/7/2021	LSB	5	B	Najas	10	3					
7/7/2021	LSB	5	C	bare	50						
7/7/2021	LSB	5	C	Algae	5	1					
7/7/2021	LSB	5	C	Isoetes	35	2					
7/7/2021	LSB	5	C	Najas	20	3					
7/7/2021	LSB	5	D	bare	42						
7/7/2021	LSB	5	D	Algae	5	3					
7/7/2021	LSB	5	D	milfoil	3	3					
7/7/2021	LSB	5	D	Isoetes	30	3					
7/7/2021	LSB	5	D	Najas	20	3					
7/7/2021	LSB	5	E	bare	40						
7/7/2021	LSB	5	E	milfoil	60	36					milfoil mostly brown, some green tips
7/7/2021	LSB	6	A	bare	100						

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
7/7/2021	LSB	6	B	bare	65						
7/7/2021	LSB	6	B	Algae	30	10					
7/7/2021	LSB	6	B	Isoetes	5	1					
7/7/2021	LSB	6	C	Bare	60						
7/7/2021	LSB	6	C	Algae	35	9					
7/7/2021	LSB	6	C	Najas	5	6					
7/7/2021	LSB	6	D	Bare	60						
7/7/2021	LSB	6	D	Algae	40	4					
7/7/2021	LSB	6	E	bare	70						
7/7/2021	LSB	6	E	Isoetes	30	2					
7/7/2021	LSB	7	A	bare	19						
7/7/2021	LSB	7	A	Algae	80	10					
7/7/2021	LSB	7	A	Najas	1	4					
7/7/2021	LSB	7	B	bare	5						
7/7/2021	LSB	7	B	Algae	80	10					
7/7/2021	LSB	7	B	Najas	15	5					
7/7/2021	LSB	7	C	Algae	80	12					
7/7/2021	LSB	7	C	Bare	10						
7/7/2021	LSB	7	C	milfoil	10	22					
7/7/2021	LSB	7	D	Algae	50	13					
7/7/2021	LSB	7	D	milfoil	50	34					
7/7/2021	LSB	7	E	Bare	20						
7/7/2021	LSB	7	E	Algae	70	9					
7/7/2021	LSB	7	E	Najas	10	7					
7/7/2021	LSB	8	A	Bare	50						
7/7/2021	LSB	8	A	Algae	30	10					
7/7/2021	LSB	8	A	Isoetes	20	8					
7/7/2021	LSB	8	B	Bare	50						
7/7/2021	LSB	8	B	Algae	20	10					
7/7/2021	LSB	8	B	Isoetes	30	12					
7/7/2021	LSB	8	C	Bare	50						
7/7/2021	LSB	8	C	Algae	20	10					
7/7/2021	LSB	8	C	milfoil	10	23					
7/7/2021	LSB	8	C	Isoetes	10	11					
7/7/2021	LSB	8	C	CLPW	10	11					
7/7/2021	LSB	8	D	Bare	90						
7/7/2021	LSB	8	D	Algae	5	10					

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
7/7/2021	LSB	8	D	Isoetes	5	11					
7/7/2021	LSB	8	E	bare	65						
7/7/2021	LSB	8	E	Algae	10	10					
7/7/2021	LSB	8	E	milfoil	25	28					
7/7/2021	LSB	9	A	bare	100						
7/7/2021	LSB	9	B	bare	40						
7/7/2021	LSB	9	B	Algae	60	14					
7/7/2021	LSB	9	C	Bare	27						
7/7/2021	LSB	9	C	Algae	70	13					
7/7/2021	LSB	9	C	Najas	3	7					
7/7/2021	LSB	9	D	bare	60						
7/7/2021	LSB	9	D	Algae	40	9					
7/7/2021	LSB	9	E	bare	98						
7/7/2021	LSB	9	E	milfoil	2	14					
7/9/2021	LSM		A	bare	50		1.83				lots of bare patches (prop wash?) plants mostly dying, plants come up when touched
7/9/2021	LSM		A	LPW	49	36					
7/9/2021	LSM		A	milfoil	1	27					
7/9/2021	LSM		B	bare	99		1.83				
7/9/2021	LSM		B	milfoil	1	19					
7/9/2021	LSM		C	bare	98		1.83				
7/9/2021	LSM		C	milfoil	1	53					
7/9/2021	LSM		C	LPW	1	24					
7/9/2021	LSM		D	bare	45		1.83				
7/9/2021	LSM		D	milfoil	35	17					
7/9/2021	LSM		D	LPW	20	9					
7/9/2021	LSM		E	bare	100		2.74				lots of silt and decay, hole from prop wash?
9/25/2021	LSB	1	A	bare	100		0.88				
9/25/2021	LSB	1	B	bare	97		0.87				
9/25/2021	LSB	1	B	Algae	3	2	0.87				
9/25/2021	LSB	1	C	bare	92		0.83				
9/25/2021	LSB	1	C	Algae	2	1	0.83				
9/25/2021	LSB	1	C	milfoil	5	5	0.83				
9/25/2021	LSB	1	C	Najas	3	4	0.83				
9/25/2021	LSB	1	D	bare	98		0.85				some filamentous puffs in D + E
9/25/2021	LSB	1	D	Algae	2	1	0.85				
9/25/2021	LSB	1	E	bare	100		0.6				

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
9/25/2021	LSB	2	A	Bare	100		0.6				
9/25/2021	LSB	2	B	Bare	95		0.87				
9/25/2021	LSB	2	B	Algae	5	2	0.87				
9/25/2021	LSB	2	C	Bare	92		0.76				
9/25/2021	LSB	2	C	Algae	2	1	0.76				
9/25/2021	LSB	2	C	Isoetes	4	2	0.76				
9/25/2021	LSB	2	C	Najas	2	3	0.76				
9/25/2021	LSB	2	D	Bare	99		0.69				
9/25/2021	LSB	2	D	milfoil	1	11	0.69				
9/25/2021	LSB	2	E	Bare	100		0.68				
9/25/2021	LSB	3	A	Bare	100		0.82				
9/25/2021	LSB	3	B	Bare	100		0.78				
9/25/2021	LSB	3	C	Bare	95		0.77				
9/25/2021	LSB	3	C	Algae	5	3	0.77				
9/25/2021	LSB	3	D	bare	90		0.73				
9/25/2021	LSB	3	D	milfoil	10	56	0.73				
9/25/2021	LSB	3	E	bare	75		0.78				
9/25/2021	LSB	3	E	milfoil	15	26	0.78				
9/25/2021	LSB	3	E	CLPW	10	15	0.78				
9/25/2021	LSB	4	A	bare	100		0.78				
9/25/2021	LSB	4	B	bare	100		0.68				
9/25/2021	LSB	4	C	bare	93		0.67				
9/25/2021	LSB	4	C	Algae	3	2	0.67				
9/25/2021	LSB	4	C	CLPW	3	6	0.67				
9/25/2021	LSB	4	C	Najas	1	2	0.67				
9/25/2021	LSB	4	D	bare	72		0.73				
9/25/2021	LSB	4	D	milfoil	3	37	0.73				
9/25/2021	LSB	4	D	Najas	15	1	0.73				
9/25/2021	LSB	4	E	bare	93		0.74				
9/25/2021	LSB	4	E	milfoil	7	0.33	0.74				
9/25/2021	LSB	5	A	Bare	100		0.75				giant patch of milfoil by bulkhead
9/25/2021	LSB	5	B	Bare	80		0.7				
9/25/2021	LSB	5	B	Algae	5	3	0.7				
9/25/2021	LSB	5	B	milfoil	2	8	0.7				
9/25/2021	LSB	5	B	Isoetes	3	6	0.7				
9/25/2021	LSB	5	B	Najas	10	3	0.7				
9/25/2021	LSB	5	C	bare	30		0.68				

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
9/25/2021	LSB	5	C	Algae	10	4	0.68				
9/25/2021	LSB	5	C	Isoetes	10	4	0.68				
9/25/2021	LSB	5	C	Najas	50	3	0.68				
9/25/2021	LSB	5	D	bare	54		0.76				
9/25/2021	LSB	5	D	milfoil	6	21	0.76				
9/25/2021	LSB	5	D	Najas	40	1	0.76				
9/25/2021	LSB	5	E	Bare	60		0.82				
9/25/2021	LSB	5	E	milfoil	40	25	0.82				
9/25/2021	LSB	6	A	Bare	96		0.83				
9/25/2021	LSB	6	A	Algae	4	1	0.83				
9/25/2021	LSB	6	B	Bare	92		0.82				
9/25/2021	LSB	6	B	Algae	8	1	0.82				
9/25/2021	LSB	6	C	Bare	79		0.74				
9/25/2021	LSB	6	C	Algae	5	1	0.74				
9/25/2021	LSB	6	C	milfoil	8	26	0.74				
9/25/2021	LSB	6	C	CLPW	2	8	0.74				
9/25/2021	LSB	6	C	Najas	6	7	0.74				
9/25/2021	LSB	6	D	Bare	98		0.82				
9/25/2021	LSB	6	D	Algae	1	1	0.82				
9/25/2021	LSB	6	D	Isoetes	1	1	0.82				
9/25/2021	LSB	6	E	Bare	99		0.82				
9/25/2021	LSB	6	E	Algae	1	1	0.82				
9/25/2021	LSB	7	A	Bare	65						camera died after 7A
9/25/2021	LSB	7	A	Algae	5	4					
9/25/2021	LSB	7	A	Isoetes	10	5					
9/25/2021	LSB	7	A	Najas	20	3					
9/25/2021	LSB	7	B	Bare	50		0.8				
9/25/2021	LSB	7	B	Algae	29	1	0.8				
9/25/2021	LSB	7	B	milfoil	1	9	0.8				
9/25/2021	LSB	7	B	Isoetes	30	1	0.8				
9/25/2021	LSB	7	C	bare	50		0.99				C+D middle of giant milfoil patch
9/25/2021	LSB	7	C	milfoil	50	62	0.99				
9/25/2021	LSB	7	D	bare	50		0.86				
9/25/2021	LSB	7	D	Algae	3	1	0.86				
9/25/2021	LSB	7	D	milfoil	47	40	0.86				
9/25/2021	LSB	7	E	Bare	85		0.79				
9/25/2021	LSB	7	E	milfoil	5	38	0.79				

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
9/25/2021	LSB	7	E	Isoetes	10	1	0.79				
9/25/2021	LSB	8	A	bare	95						
9/25/2021	LSB	8	A	Algae	5	1					
9/25/2021	LSB	8	B	bare	84		0.98				
9/25/2021	LSB	8	B	milfoil	15	36	0.98				
9/25/2021	LSB	8	B	RPW	1		0.98				
9/25/2021	LSB	8	C	bare	91		1.05				
9/25/2021	LSB	8	C	Algae	2		1.05				
9/25/2021	LSB	8	C	milfoil	5		1.05				
9/25/2021	LSB	8	C	RPW	2		1.05				
9/25/2021	LSB	8	D	bare	88		0.93				
9/25/2021	LSB	8	D	Algae	10	1	0.93				
9/25/2021	LSB	8	D	milfoil	2	20	0.93				
9/25/2021	LSB	8	E	bare	99		0.85				
9/25/2021	LSB	8	E	Algae	1	1	0.85				
9/25/2021	LSB	9	A	bare	100		1.17				
9/25/2021	LSB	9	B	bare	80						
9/25/2021	LSB	9	B	Algae	20	5					
9/25/2021	LSB	9	C	bare	85		1.2				
9/25/2021	LSB	9	C	Algae	15	6	1.2				
9/25/2021	LSB	9	D	bare	93						D+E very silty
9/25/2021	LSB	9	D	Algae	5	6					some filamentous algae
9/25/2021	LSB	9	D	milfoil	2	10					
9/25/2021	LSB	9	E	bare	85		1.07				
9/25/2021	LSB	9	E	milfoil	15	41	1.07				
9/25/2021	LSM		A	bare	93		0.98				
9/25/2021	LSM		A	milfoil	7	25	0.98				
9/25/2021	LSM		B	Bare	97		1.29				
9/25/2021	LSM		B	Algae	1	4	1.29				
9/25/2021	LSM		B	milfoil	2	17	1.29				
9/25/2021	LSM		C	Bare	80		1.2				
9/25/2021	LSM		C	milfoil	20	23	1.2				
9/25/2021	LSM		D	Bare	85		1.7				
9/25/2021	LSM		D	milfoil	15	26	1.7				
9/25/2021	LSM		E	Bare	70		2.45		58		
9/25/2021	LSM		E	milfoil	30	17	2.45				
11/18/2021	LSB	1	A	bare	100		0.87				

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
11/18/2021	LSB	1	B	BARE	90		0.94				
11/18/2021	LSB	1	B	algae	10	2	0.94				
11/18/2021	LSB	1	C	bare	98		0.92				
11/18/2021	LSB	1	C	Algae	2	1	0.92				
11/18/2021	LSB	1	D	bare	100		0.94				filamentous algae poufs
11/18/2021	LSB	1	E	bare	98		0.91				
11/18/2021	LSB	1	E	Algae	2	1	0.91				
11/18/2021	LSB	2	A	bare	100		0.94				
11/18/2021	LSB	2	B	bare	100		0.94				
11/18/2021	LSB	2	C	bare	85		0.94				
11/18/2021	LSB	2	C	Algae	15	2	0.94				
11/18/2021	LSB	2	D	bare	85		0.9				
11/18/2021	LSB	2	D	Algae	5	2	0.9				
11/18/2021	LSB	2	D	Najas	10	2	0.9				
11/18/2021	LSB	2	E	bare	95		0.82				
11/18/2021	LSB	2	E	Algae	5	2	0.82				
11/18/2021	LSB	3	A	bare	100		0.88				
11/18/2021	LSB	3	B	bare	100		0.85				
11/18/2021	LSB	3	C	bare	49		0.82				
11/18/2021	LSB	3	C	milfoil	1	7	0.82				
11/18/2021	LSB	3	C	Najas	50	2	0.82				
11/18/2021	LSB	3	D	Bare	70		0.78				
11/18/2021	LSB	3	D	Algae	5	1	0.78				
11/18/2021	LSB	3	D	milfoil	20	50	0.78				
11/18/2021	LSB	3	D	CLPW	5	3	0.78				
11/18/2021	LSB	3	E	bare	35		1				
11/18/2021	LSB	3	E	milfoil	65	17	1				
11/18/2021	LSB	4	A	bare	100		0.78				
11/18/2021	LSB	4	B	bare	94		0.79				
11/18/2021	LSB	4	B	Algae	1	1	0.79				
11/18/2021	LSB	4	B	Najas	5	1	0.79				
11/18/2021	LSB	4	C	Bare	60		0.8				dead filamentous
11/18/2021	LSB	4	C	Algae	5	1	0.8				
11/18/2021	LSB	4	C	Najas	30	1	0.8				
11/18/2021	LSB	4	C	CLPW	5	3	0.8				
11/18/2021	LSB	4	D	Bare	65		0.85				dead filamentous
11/18/2021	LSB	4	D	Algae	5		0.85				

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
11/18/2021	LSB	4	D	milfoil	15	10	0.85				
11/18/2021	LSB	4	D	Najas	15	1	0.85				
11/18/2021	LSB	4	E	Bare	68		0.78				
11/18/2021	LSB	4	E	Algae	5	1	0.78				
11/18/2021	LSB	4	E	milfoil	10	14	0.78				
11/18/2021	LSB	4	E	Najas	15	2	0.78				
11/18/2021	LSB	4	E	CLPW	3	3	0.78				
11/18/2021	LSB	5	A	Bare	100		0.72				
11/18/2021	LSB	5	B	Bare	50		0.85				dead filamentous, patchy milfoil nearby
11/18/2021	LSB	5	B	Algae	15	1	0.85				
11/18/2021	LSB	5	B	Najas	35	1	0.85				2
11/18/2021	LSB	5	C	Bare	70		0.87				dead filamentous
11/18/2021	LSB	5	C	Najas	30	1	0.87				
11/18/2021	LSB	5	D	Bare	53		0.82				
11/18/2021	LSB	5	D	Algae	5	2	0.82				
11/18/2021	LSB	5	D	milfoil	2	7	0.82				
11/18/2021	LSB	5	D	Najas	40	1	0.82				
11/18/2021	LSB	5	E	bare	15		0.94				
11/18/2021	LSB	5	E	milfoil	85	35	0.94				
11/18/2021	LSB	6	A	bare	99		0.9				
11/18/2021	LSB	6	A	Algae	1	1	0.9				
11/18/2021	LSB	6	B	bare	75		0.98				
11/18/2021	LSB	6	B	Najas	25	2	0.98				
11/18/2021	LSB	6	C	Bare	85		0.92				
11/18/2021	LSB	6	C	Najas	15	1	0.92				
11/18/2021	LSB	6	D	Bare	99		0.89				
11/18/2021	LSB	6	D	Algae	1	2	0.89				
11/18/2021	LSB	6	E	bare	100		0.83				
11/18/2021	LSB	7	A	bare	99		0.9				
11/18/2021	LSB	7	A	Algae	1	1	0.9				
11/18/2021	LSB	7	B	bare	25		0.96				all covered in dead filamentous algae
11/18/2021	LSB	7	B	milfoil	5	9	0.96				
11/18/2021	LSB	7	B	Najas	70	1	0.96				
11/18/2021	LSB	7	C	bare	90		1.03				
11/18/2021	LSB	7	C	Najas	10		1.03				
11/18/2021	LSB	7	D	bare	10		0.93				
11/18/2021	LSB	7	D	milfoil	90	39	0.93				

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat/ RakePull	Taxa	Percent Composition	Height (cm)	Depth (m)	Temp (C)	Depth (ft)	Temp (F)	Notes
11/18/2021	LSB	7	E	bare	60		0.95				
11/18/2021	LSB	7	E	milfoil	10	27	0.95				
11/18/2021	LSB	7	E	Najas	30	1	0.95				
11/18/2021	LSB	8	A	bare	100		0.86				
11/18/2021	LSB	8	B	bare	93		1.02				
11/18/2021	LSB	8	B	Algae	5	4	1.02				
11/18/2021	LSB	8	B	Najas	2	1	1.02				
11/18/2021	LSB	8	C	bare	90		1.28				
11/18/2021	LSB	8	C	milfoil	5	6	1.28				
11/18/2021	LSB	8	C	Najas	5	1	1.28				
11/18/2021	LSB	8	D	bare	60		1.19				
11/18/2021	LSB	8	D	milfoil	10	6	1.19				
11/18/2021	LSB	8	D	Najas	30	2	1.19				
11/18/2021	LSB	8	E	bare	87		1.03				
11/18/2021	LSB	8	E	Algae	8	3	1.03				
11/18/2021	LSB	8	E	Najas	5	1	1.03				
11/18/2021	LSB	9	A	Bare	100		0.66				
11/18/2021	LSB	9	B	Bare	97		1.23				
11/18/2021	LSB	9	B	Algae	3	2	1.23				
11/18/2021	LSB	9	C	Bare	100		1.31				
11/18/2021	LSB	9	D	Bare	100		1.19				
11/18/2021	LSB	9	E	Bare	100		1.22				
11/18/2021	LSM		A	Bare	100						
11/18/2021	LSM		B	Bare	100						
11/18/2021	LSM		C	Bare	100						
11/18/2021	LSM		D	bare	100						
11/18/2021	LSM		E	bare	100						

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat	Species	Bag	BW	WW	WW-chl.a	TDW	FW	DW	sum of quad	% of weight
7/27/2020	TK	E	A	CLPW	1	2.8	3.9		3	1.1	0.20		1.32
7/27/2020	TK	E	A	Coontail	1	2.8	16.9		3.9	14.1	1.10		7.28
7/27/2020	TK	E	A	Elodea	1	2.8	6.4		3.2	3.6	0.40		2.65
7/27/2020	TK	E	A	LPW	1	3.1	13.8		4.5	10.7	1.40		9.27
7/27/2020	TK	E	A	Milfoil	1	10.6	79.7		14.6	69.1	4.00		26.49
7/27/2020	TK	E	A	Nitella	1	10.6	109		16.4	98.4	5.80		38.41
7/27/2020	TK	E	A	RPW	1	10.3	30.5		12.5	20.2	2.20	15.10	14.57
7/27/2020	TK	E	B	CLPW	1	3.0	6.9	4.6	3.1	3.9	0.2		2.82
7/27/2020	TK	E	B	Coontail	1	1.3	4.9			3.6	0.28		3.25
7/27/2020	TK	E	B	LPW	1	3.0	16.8	12.7	3.5	13.8	0.7		8.22
7/27/2020	TK	E	B	Milfoil	1	10.5	30.2	24.1	11.4	19.7	1.3		15.07
7/27/2020	TK	E	B	Nitella	1	3.0	32.7	24.6	4.2	29.7	1.7		19.08
7/27/2020	TK	E	B	RPW	1	10.5	69.6	52.9	13.7	59.1	4.5	8.6	51.57
7/27/2020	TK	E	C	CLPW	1	7.6	51.2	48.6	9.7	43.6	2.2		49.9
7/27/2020	TK	E	C	Coontail	1	1.3	1.5			0.2	0.02		0.3
7/27/2020	TK	E	C	Elodea	1	2.4	5.2	4.7	2.9	2.8	0.6		13.6
7/27/2020	TK	E	C	LPW	1	2.8	5.1	4.6	2.9	2.3	0.1		2.9
7/27/2020	TK	E	C	Milfoil	1	7.6	22.4	20.5	8.2	14.8	0.7		15.4
7/27/2020	TK	E	C	Nitella	1	2.9	6.5	5.8	3	3.6	0.1		2.8
7/27/2020	TK	E	C	RPW	1	7.6	23.4	21.6	8.2	15.8	0.7	4.47	15.1
7/27/2020	TK	E	D	CLPW	1	3.1	5.2			2.1	0.13		10.29
7/27/2020	TK	E	D	Coontail	1	3.2	5			1.8	0.14		11.01
7/27/2020	TK	E	D	LPW	1	3.2	4			0.8	0.04		3.49
7/27/2020	TK	E	D	Milfoil	1	3.1	9	7.1	3.5	5.9	0.6		46.28
7/27/2020	TK	E	D	Nitella	1	3.2	5.5			2.3	0.13		10.02
7/27/2020	TK	E	D	RPW	1	3.1	7.8	7	3.3	4.7	0.2	1.27	18.91
7/27/2020	TK	T	A	Coontail	1	3.1	13.2			10.1	0.79		27.28
7/27/2020	TK	T	A	LPW	1	10.8	45.8		12.9	35	2.10	2.89	72.72
7/27/2020	TK	T	B	CLPW	1	7.6	33.7	31.9	10.8	26.1	3.4		12.75
7/27/2020	TK	T	B	Coontail	1	2.8	9.3	7.8	3.2	6.5	0.5		1.93
7/27/2020	TK	T	B	LPW	1	7.6	109.6	107.5	18	102	10.6		39.39
7/27/2020	TK	T	B	LPW	2	7.6	103.5		19.5	95.9	11.90		44.15
7/27/2020	TK	T	B	Milfoil	1	2.9	4			1.1	0.11		0.41
7/27/2020	TK	T	B	RPW	1	2.9	6.3			3.4	0.37	26.96	1.37

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat	Species	Bag	BW	WW	WW-chl.a	TDW	FW	DW	sum of quad	% of weight
7/27/2020	TK	T	C	CLPW	1	1.2	7.5			6.3	0.83		9.06
7/27/2020	TK	T	C	Coontail	1	7.7	91.9	90.8	11.8	84.2	4.2		45.34
7/27/2020	Tk	T	C	Elodea	1	2.4	12.4	11.7	2.9	10	0.5		5.87
7/27/2020	TK	T	C	LPW	1	3.1	35.3	34.5	6.1	32.2	3.1		33.58
7/27/2020	TK	T	C	Nitella	1	1.3	8.7			7.4	0.41		4.49
7/27/2020	TK	T	C	RPW	1	1.2	2.6			1.4	0.15	9.16	1.66
7/27/2020	TK	T	D	CLPW	1	7.6	231.6	228.6	35.3	224	28.1		54.3
7/27/2020	TK	T	D	CLPW	2	7.6	112.8		18.3	105.2	10.70		20.7
7/27/2020	TK	T	D	Elodea	1	2.9	7.3	6.5	3.1	4.4	0.2		0.5
7/27/2020	TK	T	D	LPW	1	7.6	72	70.6	11.5	64.4	4.0		7.7
7/27/2020	TK	T	D	LPW	2	7.6	101.5		15.1	93.9	7.50		14.5
7/27/2020	TK	T	D	Milfoil	1	1.3	7.2			5.9	0.08		0.2
7/27/2020	TK	T	D	Milfoil	2	1.3	10.1	7.2	1.3808	8.8	0.1		0.2
7/27/2020	TK	T	D	RPW	1	1.3	10.1			8.8	0.96	51.67	1.9
7/27/2020	TK	U	A	CLPW	1	1.4	2.7	2.4	1.4755	1.3	0.1		0.36
7/27/2020	TK	U	A	Coontail	1	7.7	314.7	310.5	21.6	307	14.1		52.02
7/27/2020	TK	U	A	Coontail	2	7.5	297		20.4	289.5	12.90	27.09	47.62
7/27/2020	TK	U	B	CLPW	1	2.9	9.1		3.8	6.2	0.90		1.44
7/27/2020	TK	U	B	Coontail	1	10.5	300.5		30.1	290	19.60		98.56
7/27/2020	TK	U	B	Coontail	1	10.5	214.5		23.6	204	13.10		
7/27/2020	TK	U	B	Coontail	1		776.2			776.2			
7/27/2020	TK	U	B	Coontail	2	10.5	276.2		27.4	265.7	16.90		
7/27/2020	TK	U	B	Coontail	3	10.6	199.5		22.6	188.9	12.00	62.50	
7/27/2020	TK	U	C	Coontail	2	10.6	340.6		30.8	330	20.20		100.00
7/27/2020	TK	U	C	Coontail	3	10.5	506.5		38.6	496	28.10		
7/27/2020	TK	U	C	Coontail	4	10.6	440.7		36.1	430.1	25.50		
7/27/2020	TK	U	C	Coontail	5	10.5	297.4		27.1	286.9	16.60	90.40	
7/27/2020	TK	U	D	CLPW	1	10.6	47		14.1	36.4	3.50		4.36
7/27/2020	TK	U	D	Coontail	1	10.6	312.6		29.2	302	18.60		95.64
7/27/2020	TK	U	D	Coontail	1		1292.2			1292.2			
7/27/2020	TK	U	D	Coontail	2	10.6	265.6		26.3	255	15.70		
7/27/2020	TK	U	D	Coontail	3	10.6	286.6		29.7	276	19.10		
7/27/2020	TK	U	D	Coontail	4	10.4	236.1		23.1	225.7	12.70		
7/27/2020	TK	U	D	Coontail	5	10.5	191.3		21.1	180.8	10.60	80.20	

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat	Species	Bag	BW	WW	WW-chl.a	TDW	FW	DW	sum of quad	% of weight
8/24/2020	TK	E	A	Coontail	1	7.6	79.2	74.6	12	71.6	4.7		22.1
8/24/2020	TK	E	A	Elodea	1	7.6	39.3	35.7	10	31.7	2.7		12.7
8/24/2020	TK	E	A	Milfoil	1	7.7	183.6	178.7	20.4	175.9	13.1		61.3
8/24/2020	TK	E	A	RPW	1	3.4	11.3	10.1	4.1	7.9	0.8	21.30	3.9
8/24/2020	TK	E	B	algae	1	7.6	21.9	21	8.5	14.3	1.0		25.60
8/24/2020	TK	E	B	CLPW	1	7.5	18.1	16.7	8.2	10.6	0.8		21.50
8/24/2020	TK	E	B	Milfoil	1	7.5	37.6	34.8	9.3	30.1	2.0	3.8	52.90
8/24/2020	TK	E	C	algae	1	7.5	38.5	36.2	9.3	31	1.9		22.2
8/24/2020	TK	E	C	Coontail	1	7.6	19.8	18.2	8.1	12.2	0.6		6.6
8/24/2020	TK	E	C	Elodea	1	3.4	4.2	4	3.5	0.8	0.1		1.5
8/24/2020	TK	E	C	Milfoil	1	7.7	18.1	16.9		10.4	0.84		9.6
8/24/2020	TK	E	C	Milfoil	1	7.6	47.9	46	10.7	40.3	3.3		37.1
8/24/2020	TK	E	C	RPW	1	7.5	30	28.7	9.4	22.5	2.0	8.76	23.0
8/24/2020	TK	E	D	algae	1	7.5	15.9	14.9	7.9	8.4	0.5		29.63
8/24/2020	TK	E	D	CLPW	1	7.6	11.8	11.3	7.7	4.2	0.1		7.41
8/24/2020	TK	E	D	Elodea	1	1.4	4.3	4.1	1.6	2.9	0.2		14.02
8/24/2020	TK	E	D	Milfoil	1	7.5	19.1	18.7	8.2	11.6	0.7		47.31
8/24/2020	TK	E	D	Milfoil	1	1.9	2.3			0.4	0.03	1.53	1.63
8/24/2020	TK	T	A	Coontail	1	7.6	178.6	174.6	18	171	10.6		
8/24/2020	TK	T	A	Coontail	2	7.5	133.5		15.9	126	8.4		98.74
8/24/2020	TK	T	A	Elodea	1	3.9	10.1	9	4.1	6.2	0.2	19.29	1.26
8/24/2020	TK	T	B	Decay	1	2.4	13.4	12.2	3.9	11	1.7	0.00	0.00
8/24/2020	TK	T	C	Coontail	1	7.5	77.1	75.6	12	69.6	4.6		91.0
8/24/2020	TK	T	C	Milfoil	1	7.7	18.1	16.9	8.1	10.4	0.5	5.05	8.95
8/24/2020	TK	T	D	Decay	1	3.4	10.3	9.7	3.7	6.9	0.3	0.00	0.00
8/24/2020	TK	T	D	CLPW	1		1.5			1.5			
9/22/2020	TK	E	A	Coontail	1	1.3	10.5	8.9	1.7	9.2	0.5		3.46
9/22/2020	TK	E	A	Coontail	chl.a	1.3	3.3			2	0.1053		0.75
9/22/2020	TK	E	A	Elodea	1	7.4	50.8	49.4	10.7	43.4	3.4		24.40
9/22/2020	TK	E	A	Elodea	chl.a	1.4	2.8			1.4	0.11		0.79
9/22/2020	TK	E	A	Milfoil	1	7.4	135.9	130.6	16.1	128.5	9.1		64.93
9/22/2020	TK	E	A	Milfoil	chl.a	1.3	6.3			5	0.3531		2.53
9/22/2020	TK	E	A	RPW	1	7.5	18.3	16.1	7.8	10.8	0.4		2.70
9/22/2020	TK	E	A	RPW	chl.a	1.3	3.1			1.8	0.0628	13.98	0.45

Plant Transect Data/Rake Pulls

Date	Location	Transect	Quadrat	Species	Bag	BW	WW	WW-chl.a	TDW	FW	DW	sum of quad	% of weight
9/22/2020	TK	E	A	Turions	1	1.3	2.3		1.4	1	0.10		
9/22/2020	TK	E	B	Coontail	chl.a	1.3	5.9			4.6	0.2421		1.17
9/22/2020	TK	E	B	Elodea	1	7.4	18.7	17	7.5	11.3	0.1		0.57
9/22/2020	TK	E	B	Elodea	chl.a	1.3	2.6			1.3	0.0135		0.07
9/22/2020	TK	E	B	Milfoil	1	7.4	73.9	71.6	11	66.5	3.7		18.09
9/22/2020	TK	E	B	Milfoil	chl.a	1.3	3.6			2.3	0.129		0.63
9/22/2020	TK	E	B	RPW	1	7.5	141.7	138.4	15.5	134.2	8.2		39.79
9/22/2020	TK	E	B	RPW	1	7.5	141.7		15.5	134.2	8.00		38.81
9/22/2020	TK	E	B	RPW	chl.a	1.3	4.3			3	0.1788	20.61181742	0.87
8/24/2020	TK	E	C	CLPW	1		1.1			1.1			
9/22/2020	TK	E	C	Coontail	1	7.5	86.3	83.2	11.6	78.8	4.3		84.2
9/22/2020	TK	E	C	Coontail	chl.a	1.3	3.7			2.4	0.13		2.6
9/22/2020	TK	E	C	Coontail	chl.a	1.3	2.8			1.5	0.0812		1.6
9/22/2020	TK	E	C	Decay	chl.a	1.3	20.6			19.3			0.0
9/22/2020	TK	E	C	Elodea	chl.a	1.3	2.6			1.3	0.0135		0.3
9/22/2020	TK	E	C	Milfoil	1	7.5	30.4	28.5	8	22.9	0.5		10.8
9/22/2020	TK	E	C	Milfoil	chl.a	1.3	2.7			1.4	0.0333	5.1	0.7
9/22/2020	TK	E	D	Coontail	1	7.5	27.9	25	7.8	20.4	0.3		35.31
9/22/2020	TK	E	D	Coontail	chl.a	1.3	3.8			2.5	0.0429		4.33
9/22/2020	TK	E	D	Elodea	chl.a	1.3	1.8			0.5	0.0052		0.53
9/22/2020	TK	E	D	Milfoil	1	7.4	17.6	15.5	7.8	10.2	0.5		50.86
9/22/2020	TK	E	D	Milfoil	chl.a	1.3	3.1			1.8	0.0889	0.99	8.98
9/22/2020	TK	T	A	Coontail	1	49.8	714	708.1	97.3	664.2	47.9		39.9
9/22/2020	TK	T	A	Coontail	2	49.8	485.9		80.4	436.1	30.60		25.5
9/22/2020	TK	T	A	Coontail	3	7.4	333.8		30.6	326.4	23.20		19.3
9/22/2020	TK	T	A	Coontail	4	7.4	304.3		25.5	296.9	18.10		15.1
9/22/2020	TK	T	A	Coontail	chl.a	1.2	6.1			4.9	0.2987		0.2
9/22/2020	TK	T	A	Milfoil	chl.a	1.3	2.4			1.1	0.0543	120.2	0.0
9/22/2020	TK	T	A	Turions	1	1.3	2.3		1.6	1	0.30		52.98
9/22/2020	TK	T	B	Coontail	chl.a	1.3	5.1			3.8	0.2317		40.91
9/22/2020	TK	T	B	Decay	1	1.3	5.9			4.6			0.00
9/22/2020	TK	T	B	Milfoil	chl.a	1.3	2			0.7	0.0346	0.57	6.10
9/22/2020	TK	T	B	Turions	1	1.3	3.4			2.1			
9/22/2020	TK	T	C	Coontail	chl.a	1.3	3.1			1.8	0.1097	0.11	100

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Date	Location	Transect	Quadrat	Species	Bag	BW	WW	WW-chl.a	TDW	FW	DW	sum of quad	% of weight
9/22/2020	TK	T	C	Decay	1	1.2	7.6			6.4			
9/22/2020	TK	U	A	Coontail	1	49.9	1050	1044.9	186.2	1000.1	137.0		72.6
9/22/2020	TK	U	A	Coontail	2	49.6	938.5		100.9	888.9	51.30		27.2
9/22/2020	TK	U	A	Coontail	chl.a	1.3	5.4			4.1	0.2366		0.1
9/22/2020	TK	U	A	Milfoil	chl.a	1.3	2.6			1.3	0.0642	188.6	0.0
9/22/2020	TK	U	B	Coontail	1	7.5	188.4		19.4	180.9	11.90		
9/22/2020	TK	U	B	Coontail	2	7.5	168.8		17.6	161.3	10.10		
9/22/2020	TK	U	B	Coontail	3	7.5	233.1		20.3	225.6	12.80		
9/22/2020	TK	U	B	Coontail	4	7.4	203.3		18.4	195.9	11.00		
9/22/2020	TK	U	B	Coontail	5	7.6	390.4		31.5	382.8	23.90		
9/22/2020	TK	U	B	Coontail	6	7.5	292.1		24.5	284.6	17.00		
9/22/2020	TK	U	B	Coontail	7	7.5	341.6		27.1	334.1	19.60		
9/22/2020	TK	U	B	Coontail	8	7.5	293.2		22.6	285.7	15.10		
9/22/2020	TK	U	B	Coontail	9	7.5	389.4		29	381.9	21.50		
9/22/2020	TK	U	B	Coontail	10	7.5	331.6		27	324.1	19.50		
9/22/2020	TK	U	B	Coontail	11	7.5	221.4		20	213.9	12.50		
9/22/2020	TK	U	B	Coontail	chl.a	1.3	13.2			11.9	0.6954		99.98312904
9/22/2020	TK	U	B	Milfoil	chl.a	1.4	2			0.6	0.0296	175.63	0.016870959
9/22/2020	TK	U	C	Coontail	chl.a	1.3	7.6			6.3	0.3111		
9/22/2020	TK	U	D	Coontail	1	7.5	239.4	232.7	20.1	231.9	13.0		12.9
9/22/2020	TK	U	D	Coontail	2	48.8	908.2		94.4	859.4	45.60		45.3
9/22/2020	TK	U	D	Coontail	3	7.4	22.4		19.6	15	12.20		12.1
9/22/2020	TK	U	D	Coontail	4	7.4	193.3		17.9	185.9	10.50		10.4
9/22/2020	TK	U	D	Coontail	5	7.5	219		19.2	211.5	11.70		11.6
9/22/2020	TK	U	D	Coontail	6	7.5	143.3		14.9	135.8	7.40		7.3
9/22/2020	TK	U	D	Coontail	chl.a	1.3	6.9			5.6	0.3273		0.3
9/22/2020	TK	U	D	Elodea	chl.a	1.3	1.4			0.1	0.001	100.7	0.0
10/13/2020	TK	E	A	Coontail	1	10.2	51.3	47.6	12.4	41.1	2.4		
10/13/2020	TK	E	A	Coontail	chl.a	1.3	4.7			3.4			
10/13/2020	TK	E	A	Elodea	1	10.3	80.9	79.2	14.3	70.6	4.1		
10/13/2020	TK	E	A	Elodea	chl.a	1.3	2.8			1.5			
10/13/2020	TK	E	A	Milfoil	1	10.3	93.1	88.7	15.2	82.8	5.2		
10/13/2020	TK	E	A	Milfoil	chl.a	1.3	5.6			4.3			
10/13/2020	TK	E	A	RPW	1	10.2	101.7	98	17	91.5	7.1		

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Date	Location	Transect	Quadrat	Species	Bag	BW	WW	WW-chl.a	TDW	FW	DW	sum of quad	% of weight
10/13/2020	TK	E	A	RPW	chl.a	1.3	4.7			3.4			
10/13/2020	TK	E	B	Coontail	1	10.2	23.2	22.1	11.1	13	1.0		
10/13/2020	TK	E	B	Elodea	1	10.2	41.6	40.9	12.6	31.4	2.5		
10/13/2020	TK	E	B	Milfoil	1	10.2	50.9	49.6	13.9	40.7	3.8		
10/13/2020	TK	E	B	RPW	1	10.3	47.7	46	15.5	37.4	5.4		
10/13/2020	TK	E	C	CLPW	1	1.2	1.6			0.4			
10/13/2020	TK	E	C	CLPW	chl.a	1.3	1.7			0.4			
10/13/2020	TK	E	C	Decay	1	1.3	18.4		2	17.1	0.70		
10/13/2020	TK	E	D	CLPW	1	1.3	2.2			0.9			
10/13/2020	TK	E	D	CLPW	chl.a	1.3	2.3			1			
10/13/2020	TK	E	D	Coontail	1	10.5	65.2	57.4	13.6	54.7	3.6		
10/13/2020	TK	E	D	Coontail	chl.a	1.3	8.8			7.5			
10/13/2020	TK	E	D	Elodea	chl.a	1.3	3.9			2.6			
10/13/2020	TK	E	D	Milfoil	chl.a	1.2	8.3			7.1			
10/13/2020	TK	T	A	CLPW	1	1.3	2.1		1.5	0.8	0.20		
10/13/2020	TK	T	A	CLPW	chl.a	1.3	1.5			0.2			
10/13/2020	TK	T	A	Coontail	1	58.4	663.4	652	108.6	605	51.2		
10/13/2020	TK	T	A	Coontail	2	55.9	485.7		85.6	429.8	29.70		
10/13/2020	TK	T	A	Coontail	chl.a	1.3	11.9			10.6			
10/13/2020	TK	T	A	Elodea	chl.a	1.3	4.8			3.5			
10/13/2020	TK	T	A	Milfoil	chl.a	1.3	8.5			7.2			
10/13/2020	TK	T	B	CLPW	1	1.3	3.3			2			
10/13/2020	TK	T	B	CLPW	chl.a	1.3	2.3			1			
10/13/2020	TK	T	B	Coontail	1	10.2	416.2	405.3	30.9	406	21.3		
10/13/2020	TK	T	B	Coontail	2	55.4	814.1		92.8	758.7	37.40		
10/13/2020	TK	T	B	Coontail	chl.a	1.3	11.3			10			
10/13/2020	TK	T	B	Elodea	chl.a	1.3	1.9			0.6			
10/13/2020	TK	T	B	Milfoil	chl.a	1.3	4.6			3.3			
10/13/2020	TK	T	C	Coontail	chl.a	1.3	3.6			2.3			
10/13/2020	TK	T	D	CLPW	1	1.4	2.2		1.6	0.8	0.20		
10/13/2020	TK	T	D	CLPW	chl.a	1.2	2.4			1.2			
10/13/2020	TK	T	D	Decay	1	1.3	23.6		2	22.3	0.70		
10/13/2020	TK	U	B	Coontail	1	52.9	739.7		94.3	686.8	41.40		
10/13/2020	TK	U	B	Coontail	2	56.2	1016.7		114.6	960.5	58.40		

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Date	Location	Transect	Quadrat	Species	Bag	BW	WW	WW-chl.a	TDW	FW	DW	sum of quad	% of weight
10/13/2020	TK	U	B	Coontail	3	58.0	1018.6		124.8	960.6	66.80		
10/13/2020	TK	U	B	Coontail	4	58.4	764		100.8	705.6	42.40		
10/13/2020	TK	U	B	Coontail	5	57.2	1011.3		116.2	954.1	59.00		
10/13/2020	TK	U	B	Coontail	chl.a	1.3	15.5			14.2			
10/13/2020	TK	U	C	CLPW	1	1.3	2.9			1.6			
10/13/2020	TK	U	C	CLPW	chl.a	1.3	1.7			0.4			
10/13/2020	TK	U	C	Coontail	1	58.5	1008.5	1000.1	130.4	950	72.5		
10/13/2020	TK	U	C	Coontail	2	59.3	692.2		92.2	632.9	32.90		
10/13/2020	TK	U	C	Coontail	chl.a	1.3	9.6			8.3			
10/13/2020	TK	U	D	Coontail	1	57.5	1061	1045	120.4	1003.5	63.9		
12/4/2020	TK	T	A	Elodea							0.0066	2.2785	0.29
12/4/2020	TK	T	A	CLPW							0.0522		2.29
12/4/2020	TK	T	A	Coontail							2.2197		97.42
12/4/2020	TK	T	B	Coontail							6.3232	6.3267	99.94
12/4/2020	TK	T	B	Elodea							0.0032		0.05
12/4/2020	TK	T	B	Milfoil							0.0003		0.00
12/4/2020	TK	T	C	CLPW							0.0534	0.05	100
12/4/2020	TK	T	D	PW (w/ turion)							0.0098	0.3961	2.47
12/4/2020	TK	T	D	Coontail							0.3831		96.72
12/4/2020	TK	T	D	Elodea							0.0032		0.81
5/4/2021	TK	U	A	coontail							0.823		100.00
5/4/2021	TK	U	B	coontail							0.4666		100.00
5/4/2021	TK	U	C	coontail							0.6416		100.00
5/4/2021	TK	U	D	algae							0.0286	1.281	2.23
5/4/2021	TK	U	D	CLPW							0.045		3.51
5/4/2021	TK	U	D	coontail							0.9847		76.86
5/4/2021	TK	U	D	elodea							0.0811		6.33
5/4/2021	TK	U	D	LPW							0.0705		5.50
5/4/2021	TK	U	D	milfoil							0.0713		5.56
5/4/2021	TK	T	A	algae							0.0729	0.9831	7.42
5/4/2021	TK	T	A	CLPW							0.4903		49.87
5/4/2021	TK	T	A	coontail							0.2622		26.67
5/4/2021	TK	T	A	elodea							0.0874		8.89
5/4/2021	TK	T	A	LPW							0.0704		7.16

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Date	Location	Transect	Quadrat	Species	Bag	BW	WW	WW-chl.a	TDW	FW	DW	sum of quad	% of weight
5/4/2021	TK	T	B	algae							0.22	1.077	20.42
5/4/2021	TK	T	B	CLPW							0.4694		43.58
5/4/2021	TK	T	B	coontail							0.2914		27.05
5/4/2021	TK	T	B	LPW							0.0964		8.95
5/4/2021	TK	T	C	algae							1.1697	1.623	72.07
5/4/2021	TK	T	C	CLPW							0.0472		2.91
5/4/2021	TK	T	C	coontail							0.2483		15.30
5/4/2021	TK	T	C	LPW							0.1577		9.72
5/4/2021	TK	T	D	CLPW							0.1242	0.444	27.99
5/4/2021	TK	T	D	coontail							0.2451		55.23
5/4/2021	TK	T	D	LPW							0.0745		16.78
5/4/2021	TK	E	A	algae							0.5681	1.444	39.35
5/4/2021	TK	E	A	CLPW							0.2772		19.20
5/4/2021	TK	E	A	coontail							0.1446		10.02
5/4/2021	TK	E	A	elodea							0.1352		9.36
5/4/2021	TK	E	A	LPW							0.0993		6.88
5/4/2021	TK	E	A	milfoil							0.2194		15.19
5/4/2021	TK	E	B	algae							0.094	0.483	19.46
5/4/2021	TK	E	B	CLPW							0.0431		8.91
5/4/2021	TK	E	B	coontail							0.0494		10.22
5/4/2021	TK	E	B	LPW							0.1642		33.97
5/4/2021	TK	E	B	milfoil							0.1326		27.44
5/4/2021	TK	E	B	brouted turion							0.0208		4.30
5/4/2021	TK	E	C	algae							0.4783	1.098	43.55
5/4/2021	TK	E	C	CLPW							0.0703		6.40
5/4/2021	TK	E	C	coontail							0.1439		13.10
5/4/2021	TK	E	C	LPW							0.3163		28.80
5/4/2021	TK	E	C	milfoil							0.0894		8.14
5/4/2021	TK	E	D	algae							0.4276	1.068	40.05
5/4/2021	TK	E	D	coontail							0.2744		25.70
5/4/2021	TK	E	D	LPW							0.0832		7.79
5/4/2021	TK	E	D	milfoil							0.2825		26.46
6/30/2021	TK	E	A	CLPW	1	7.3	64.7	56.1		57.4	4.964	25.85	19.21
6/30/2021	TK	E	A	Coontail	1	7.2	242.7	231.3		235.5	20.882		80.79

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Date	Location	Transect	Quadrat	Species	Bag	BW	WW	WW-chl.a	TDW	FW	DW	sum of quad	% of weight
6/30/2021	TK	E	B	CLPW	1	7.3	43.5	41.8	10	36.2	2.8	22.2	12.74
6/30/2021	TK	E	B	Coontail	1	57.3	248.5	241.4	72.9	191.2	16.2		72.86
6/30/2021	TK	E	B	Elodea	1	1.3	15.5	10.9	2	14.2	1.0		4.66
6/30/2021	TK	E	B	LPW	1	1.3	5.4	4.1	1.6	4.1	0.4		1.98
6/30/2021	TK	E	B	Milfoil	1	7.3	29.3	26.4	8.8	22	1.7		7.77
6/30/2021	TK	E	C	CLPW	1	7.3	35.8	33.7	9.8	28.5	2.7	13.4	20.21
6/30/2021	TK	E	C	Coontail	1	7.4	93.1	75.5	13.6	85.7	7.8		58.41
6/30/2021	TK	E	C	Elodea	1	7.4	11.6	9.6	7.5	4.2	0.2		1.43
6/30/2021	TK	E	C	LPW	1	1.2	4.4			3.2	0.3427		2.57
6/30/2021	TK	E	C	Milfoil	1	7.3	27.1	23.5	8.4	19.8	1.3		10.07
6/30/2021	TK	E	C	RPW	1	7.3	16.1	12.7	7.9	8.8	1.0		7.32
6/30/2021	TK	E	D	CLPW	1	1.3	3.2			1.9	0.1643	7.07	2.32
6/30/2021	TK	E	D	Coontail	1	7.2	51	48.2	10.9	43.8	4.0		55.88
6/30/2021	TK	E	D	Elodea	1	7.2	16.4	14.4	7.9	9.2	0.9		12.65
6/30/2021	TK	E	D	LPW	1	1.3	2.7			1.4	0.1499		2.12
6/30/2021	TK	E	D	Milfoil	1	7.3	34.4	31.4	9	27.1	1.9		27.03
6/30/2021	TK	T	B	algae	1	1.3	3.4			2.1	0.1	6.39	1.56
6/30/2021	TK	T	B	CLPW	1	7.4	18.7	13.8	7.7	11.3	0.5		8.28
6/30/2021	TK	T	B	Coontail	1	7.4	37.7	30.6	9	30.3	2.1		32.68
6/30/2021	TK	T	B	Elodea	1	7.2	14.5	10.9	7.3	7.3	0.2		3.09
6/30/2021	TK	T	B	LPW	1	7.4	20.5	16.7	8	13.1	0.8		13.22
6/30/2021	TK	T	B	Milfoil	1	7.5	48.3	38.5	9.5	40.8	2.6		41.17
6/30/2021	TK	T	C	CLPW	1	7.3	28.3	23		21	1.9	12.5	15.15
6/30/2021	TK	T	C	Coontail	1	7.3	133.2	126.3		125.9	10.4		83.75
6/30/2021	TK	T	C	LPW	1	1.3	3.2			1.9	0.1381		1.11
6/30/2021	TK	T	D	CLPW	1	7.2	41.2	39.8	11.7	34	4.7	34.3	18.39
6/30/2021	TK	T	D	CLPW	2	7.3	28.3	23	8.5	21	1.6		
6/30/2021	TK	T	D	Coontail	1	7.2	36.8	33.7	9.7	29.6	2.8		39.65
6/30/2021	TK	T	D	Coontail	2	7.3	133.2	126.3	17.5	125.9	10.8		
6/30/2021	TK	T	D	Elodea	1	7.2	74.5	71.4	13.1	67.3	6.2		18.06
6/30/2021	TK	T	D	LPW	1	7.3	92.9	91.4	14.1	85.6	6.9		20.21
6/30/2021	TK	T	D	Milfoil	1	7.1	12.8	10.7	7.9	5.7	1.3		3.70
6/30/2021	TK	U	A	CLPW	1	7.5	25.9	23.7	9	18.4	1.7	26.4	17.6
6/30/2021	TK	U	A	CLPW	2	7.3	64.7	56.1	9.8	57.4	2.9		

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Date	Location	Transect	Quadrat	Species	Bag	BW	WW	WW-chl.a	TDW	FW	DW	sum of quad	% of weight
6/30/2021	TK	U	A	Coontail	1	7.5	149	143	17	141.5	9.9		81.9
6/30/2021	TK	U	A	Coontail	1	7.2	242.7	231.1	18.3	235.5	11.7		
6/30/2021	TK	U	A	Elodea	1	2.8	4.9	4.5	2.9	2.1	0.1		0.47
6/30/2021	TK	U	B	Coontail	1	58.7	426	415.5	76.1	367.3	17.9	17.9	100
6/30/2021	TK	U	C	Coontail	1	7.5	107.1	103.5	11.2	99.6	3.8	3.8	100
6/30/2021	TK	U	D	Coontail	1	7.5	401.2	387.7	31.2	393.7	24.5	34.5	100
6/30/2021	TK	U	D	Coontail	2	7.5	163.9	161.5	17.3	156.4	10.0		

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
10/8/2019	LSB	1	A	Najas	5	
10/8/2019	LSB	1	A	Elodea	7	
10/8/2019	LSB	1	A	Milfoil	7	
10/8/2019	LSB	1	C	Milfoil	15	
10/8/2019	LSB	1	D	Elodea	7	
10/8/2019	LSB	2	A	Elodea	10	
10/8/2019	LSB	2	A	Milfoil	20	
10/8/2019	LSB	2	B	Najas	10	
10/8/2019	LSB	2	B	Elodea	17	
10/8/2019	LSB	2	B	Milfoil	20	
10/8/2019	LSB	2	C	Milfoil	45	
10/8/2019	LSB	2	D	Najas	10	
10/8/2019	LSB	2	D	Milfoil	40	
10/8/2019	LSB	2	E	Milfoil	30	
10/8/2019	LSM	1	A	Milfoil	30	
10/8/2019	LSM	1	B	Milfoil	42	
10/8/2019	LSM	1	C	Milfoil	10	
10/8/2019	LSM	1	D	Elodea	17	
10/9/2019	LSB	7	A	Elodea	5	
10/9/2019	LSB	7	A	Milfoil	10	
10/9/2019	LSB	7	B	Milfoil	13	
10/9/2019	LSB	7	C	Elodea	5	
10/9/2019	LSB	7	C	Milfoil	10	
10/9/2019	LSB	7	D	Milfoil	2	
10/9/2019	LSB	7	E	Elodea	5	
10/9/2019	LSB	7	E	Milfoil	30	
10/9/2019	LSB	8	B	Najas	3	
10/9/2019	LSB	8	C	Milfoil	10	
10/9/2019	LSB	8	D	Milfoil	15	
10/9/2019	LSB	8	E	Milfoil	7	
10/9/2019	LSB	8	E	Elodea	10	
10/9/2019	LSB	9	A	Elodea	15	
10/9/2019	LSB	9	B	Najas	5	
10/9/2019	LSB	9	B	Milfoil	17	
10/9/2019	LSB	9	D	Milfoil	5	
10/9/2019	LSB	9	D	RPW	7	
10/9/2019	LSB	9	E	Elodea	7	
10/10/2019	LSB	3	A	Elodea	7	
10/10/2019	LSB	3	A	Najas	10	
10/10/2019	LSB	3	A	Milfoil	12	
10/10/2019	LSB	3	B	Najas	7	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
10/10/2019	LSB	3	B	Elodea	15	
10/10/2019	LSB	3	B	Milfoil	20	
10/10/2019	LSB	3	C	Milfoil	20	
10/10/2019	LSB	3	D	Elodea	7	
10/10/2019	LSB	3	D	Milfoil	23	
10/10/2019	LSB	3	E	Milfoil	50	
10/10/2019	LSB	4	A	Elodea	10	
10/10/2019	LSB	4	A	Najas	10	
10/10/2019	LSB	4	A	Milfoil	15	
10/10/2019	LSB	4	B	Milfoil	10	
10/10/2019	LSB	4	B	Najas	10	
10/10/2019	LSB	4	C	Milfoil	25	
10/10/2019	LSB	4	D	Najas	5	
10/10/2019	LSB	4	D	Elodea	7	
10/10/2019	LSB	4	E	Milfoil	20	
10/10/2019	LSB	5	A	Najas	7	
10/10/2019	LSB	5	A	Milfoil	10	
10/10/2019	LSB	5	B	Najas	5	
10/10/2019	LSB	5	B	Elodea	10	
10/10/2019	LSB	5	B	Milfoil	10	
10/10/2019	LSB	5	C	Elodea	7	
10/10/2019	LSB	5	C	Najas	7	
10/10/2019	LSB	5	D	Najas	10	
10/10/2019	LSB	5	E	Elodea	7	
10/10/2019	LSB	5	E	Milfoil	50	
10/10/2019	LSB	6	A	Milfoil	20	
10/10/2019	LSB	6	B	Najas	7	
10/10/2019	LSB	6	B	Milfoil	15	
10/10/2019	LSB	6	C	Elodea	5	
10/10/2019	LSB	6	C	Milfoil	15	
10/10/2019	LSB	6	D	Elodea	10	
10/10/2019	LSB	6	D	Milfoil	50	
10/10/2019	LSB	6	E	Elodea	10	
10/10/2019	LSB	6	E	Najas	15	
10/10/2019	LSB	6	E	Milfoil	45	
10/14/2019	TK	E	A	Milfoil	1.85	
10/14/2019	TK	E	B	Milfoil	1.08	
10/14/2019	TK	E	C	Milfoil	1.28	
10/14/2019	TK	E	D	Milfoil	1.7	
10/14/2019	TK	E	E	Milfoil	1.3	
10/14/2019	TK	E	A	Coontail	1.05	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
10/14/2019	TK	E	B	Coontail	0.6	
10/14/2019	TK	E	C	Coontail	0.65	
10/14/2019	TK	E	D	Coontail	1.11	
10/14/2019	TK	E	A	RPW	0.9	
10/14/2019	TK	E	B	RPW	0.9	
10/14/2019	TK	E	C	RPW	1.07	
10/14/2019	TK	E	D	RPW	1	
10/14/2019	TK	E	E	RPW	1.14	
10/14/2019	TK	E	A	Elodea	0.2	
10/14/2019	TK	E	B	Elodea	0.4	
10/14/2019	TK	U	A	Coontail	130	
10/14/2019	TK	U	B	Coontail	190	
10/14/2019	TK	U	C	Coontail	235	
10/14/2019	TK	U	D	Coontail	270	
10/14/2019	TK	U	E	Coontail	215	
10/14/2019	TK	T	A	Milfoil	2.4	
10/14/2019	TK	T	B	Milfoil	2.3	
10/14/2019	TK	T	C	Milfoil	1.4	
10/14/2019	TK	T	D	Milfoil	1.9	
10/14/2019	TK	T	E	Milfoil	0.9	
10/14/2019	TK	T	F	Milfoil	0.4	
10/14/2019	TK	T	G	Milfoil	0.35	
10/14/2019	TK	T	A	RPW	0.76	
10/14/2019	TK	T	B	RPW	2.45	
11/18/2019	LSB	1	C	Milfoil	5	
11/18/2019	LSB	1	D	Milfoil	10	
11/18/2019	LSB	1	E	Milfoil	13	
11/18/2019	LSB	2	C	Milfoil	10	
11/18/2019	LSB	2	D	Milfoil	5	
11/18/2019	LSB	2	E	Milfoil	10	
11/18/2019	LSB	3	A	Milfoil	5	
11/18/2019	LSB	3	B	Milfoil	8	
11/18/2019	LSB	3	C	Milfoil	11	
11/18/2019	LSB	3	D	Milfoil	16	
11/18/2019	LSB	3	E	Milfoil	35	
11/18/2019	LSB	4	A	Milfoil	5	
11/18/2019	LSB	4	B	Milfoil	13	
11/18/2019	LSB	4	C	Milfoil	15	
11/18/2019	LSB	4	D	Milfoil	10	
11/18/2019	LSB	4	E	Milfoil	25	
11/18/2019	LSB	5	A	UNK - Grass	2	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
11/18/2019	LSB	5	A	Milfoil	11	
11/18/2019	LSB	5	B	Milfoil	8	
11/18/2019	LSB	5	C	Milfoil	11	
11/18/2019	LSB	5	D	Milfoil	27	
11/18/2019	LSB	5	E	Milfoil	7	
11/18/2019	LSB	6	A	Milfoil	8	
11/18/2019	LSB	6	B	Milfoil	5	
11/18/2019	LSB	6	C	Milfoil	10	
11/18/2019	LSB	6	E	Milfoil	35	
11/18/2019	LSB	7	A	Milfoil	8	
11/18/2019	LSB	7	B	Elodea	9	
11/18/2019	LSB	7	B	Milfoil	12	
11/18/2019	LSB	7	C	Milfoil	12	
11/18/2019	LSB	7	D	Elodea	3	
11/18/2019	LSB	7	D	Milfoil	14	
11/18/2019	LSB	7	E	UNK - Grass	2	
11/18/2019	LSB	7	E	Milfoil	14	
11/18/2019	LSB	8	A	Milfoil	10	
11/18/2019	LSB	8	B	Milfoil	10	
11/18/2019	LSB	8	C	Elodea	5	
11/18/2019	LSB	8	C	Milfoil	15	
11/18/2019	LSB	8	D	Milfoil	15	
11/18/2019	LSB	8	E	Milfoil	31	
11/18/2019	LSB	9	A	Milfoil	3	
11/18/2019	LSB	9	B	Milfoil	5	
11/18/2019	LSB	9	C	Milfoil	3	
11/18/2019	LSB	9	D	Milfoil	15	
11/18/2019	LSB	9	E	Elodea	10	
11/18/2019	LSB	9	E	Milfoil	11	
11/18/2019	LSM	1	E	Milfoil	27	
11/18/2019	LSM	1	D	Milfoil	7	
11/18/2019	LSM	1	C	Milfoil	16	
11/18/2019	LSM	1	B	Milfoil	8	
11/18/2019	LSM	1	A	Milfoil	25	
1/30/2020	LSB	1	C	milfoil	5	
1/30/2020	LSB	1	D	milfoil	8	
1/30/2020	LSB	2	D	milfoil	5	
1/30/2020	LSB	2	E	milfoil	8	
1/30/2020	LSB	3	B	milfoil	2.5	
1/30/2020	LSB	3	C	milfoil	8	
1/30/2020	LSB	3	D	milfoil	10	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
1/30/2020	LSB	3	E	milfoil	25	
1/30/2020	LSB	4	C	milfoil	5	
1/30/2020	LSB	4	D	milfoil	8	
1/30/2020	LSB	4	E	milfoil	23	
1/30/2020	LSB	5	C	milfoil	5	
1/30/2020	LSB	6	E	milfoil	20	
1/30/2020	LSB	7	C	milfoil	8	
1/30/2020	LSB	7	E	milfoil	15	
1/30/2020	LSB	8	A	Algae	3	
1/30/2020	LSB	8	A	milfoil	3	
1/30/2020	LSB	8	B	milfoil	8	
1/30/2020	LSB	8	D	milfoil	3	
1/30/2020	LSB	8	D	unk grass	5	
1/30/2020	LSB	8	E	milfoil	13	
1/30/2020	LSB	9	B	Algae	3	
1/30/2020	LSB	9	B	milfoil	3	
1/30/2020	LSB	9	C	milfoil	3	
1/30/2020	LSB	9	E	milfoil	8	
2/25/2020	LSB	1	E	milfoil	8	
2/25/2020	LSB	2	E	milfoil	3	
2/25/2020	LSB	2	E	other	3	
2/25/2020	LSB	3	C	Algae	3	
2/25/2020	LSB	3	C	milfoil	10	
2/25/2020	LSB	3	D	milfoil	15	
2/25/2020	LSB	3	E	milfoil	28	
2/25/2020	LSB	4	C	Algae	5	
2/25/2020	LSB	4	D	Algae	3	
2/25/2020	LSB	4	D	milfoil	10	
2/25/2020	LSB	5	B	Algae	3	
2/25/2020	LSB	5	C	Algae	3	
2/25/2020	LSB	5	C	milfoil	8	
2/25/2020	LSB	5	D	Algae	3	
2/25/2020	LSB	5	E	elodea	8	
2/25/2020	LSB	6	B	Algae	3	
2/25/2020	LSB	7	D	milfoil	10	
2/25/2020	LSB	8	A	other	5	
2/25/2020	LSB	8	C	other	8	
2/25/2020	LSB	8	D	milfoil	10	
2/25/2020	LSB	8	E	milfoil	13	
2/25/2020	LSB	9	C	milfoil	8	
2/25/2020	LSB	9	D	milfoil	5	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
2/25/2020	LSB	9	E	milfoil	13	
4/10/2020	LSB	1	A	Algae	3	
4/10/2020	LSB	1	B	Algae	2	
4/10/2020	LSB	1	C	Algae	2	
4/10/2020	LSB	1	C	milfoil	8	
4/10/2020	LSB	1	D	Algae	3	
4/10/2020	LSB	1	D	milfoil	4	
4/10/2020	LSB	1	E	Algae	4	
4/10/2020	LSB	2	A	Algae	1	
4/10/2020	LSB	2	B	Algae	1	
4/10/2020	LSB	2	C	Algae	1	
4/10/2020	LSB	2	C	milfoil	9	
4/10/2020	LSB	2	D	Algae	2	
4/10/2020	LSB	2	D	milfoil	10	
4/10/2020	LSB	2	E	Algae	2	
4/10/2020	LSB	2	E	milfoil	11	
4/10/2020	LSB	3	B	Algae	2	
4/10/2020	LSB	3	C	Algae	2	
4/10/2020	LSB	3	C	milfoil	6	
4/10/2020	LSB	3	D	Algae	2	
4/10/2020	LSB	3	D	other	3	
4/10/2020	LSB	3	D	milfoil	8	
4/10/2020	LSB	3	E	Algae	2	
4/10/2020	LSB	3	E	other	4	
4/10/2020	LSB	3	E	milfoil	11	
4/10/2020	LSB	4	A	Algae	2	
4/10/2020	LSB	4	B	Algae	2	
4/10/2020	LSB	4	B	milfoil	9	
4/10/2020	LSB	4	C	Algae	1	
4/10/2020	LSB	4	C	milfoil	6	
4/10/2020	LSB	4	D	Algae	2	
4/10/2020	LSB	4	D	other	2	
4/10/2020	LSB	4	D	milfoil	7	
4/10/2020	LSB	4	E	Algae	1	
4/10/2020	LSB	4	E	other	2	
4/10/2020	LSB	5	A	Algae	3	
4/10/2020	LSB	5	B	Algae	2	
4/10/2020	LSB	5	B	milfoil	5	
4/10/2020	LSB	5	C	Algae	2	
4/10/2020	LSB	5	D	Algae	2	
4/10/2020	LSB	5	D	other	2	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
4/10/2020	LSB	5	D	milfoil	16	
4/10/2020	LSB	5	E	Algae	3	
4/10/2020	LSB	5	E	other	5	
4/10/2020	LSB	6	A	Algae	3	
4/10/2020	LSB	6	A	milfoil	8	
4/10/2020	LSB	6	B	Algae	2	
4/10/2020	LSB	6	C	Algae	2	
4/10/2020	LSB	6	C	milfoil	7	
4/10/2020	LSB	6	D	Algae	2	
4/10/2020	LSB	6	D	other	3	
4/10/2020	LSB	6	D	milfoil	8	
4/10/2020	LSB	6	E	Algae	2	
4/10/2020	LSB	6	E	milfoil	11	
4/10/2020	LSB	7	A	Algae	2	
4/10/2020	LSB	7	A	milfoil	6	
4/10/2020	LSB	7	B	Algae	1	
4/10/2020	LSB	7	B	other	3	
4/10/2020	LSB	7	B	milfoil	9	
4/10/2020	LSB	7	C	Algae	2	
4/10/2020	LSB	7	C	other	3	
4/10/2020	LSB	7	C	milfoil	12	
4/10/2020	LSB	7	D	Algae	2	
4/10/2020	LSB	7	D	other	4	
4/10/2020	LSB	7	D	milfoil	9	
4/10/2020	LSB	7	E	Algae	3	
4/10/2020	LSB	8	A	Algae	4	
4/10/2020	LSB	8	A	other	7	
4/10/2020	LSB	8	B	Algae	3	
4/10/2020	LSB	8	B	other	3	
4/10/2020	LSB	8	B	milfoil	11	
4/10/2020	LSB	8	C	Algae	3	
4/10/2020	LSB	8	D	other	2	
4/10/2020	LSB	8	D	Algae	5	
4/10/2020	LSB	8	D	milfoil	15	
4/10/2020	LSB	8	E	other	2	
4/10/2020	LSB	8	E	Algae	3	
4/10/2020	LSB	8	E	milfoil	6	
4/10/2020	LSB	9	A	Algae	3	
4/10/2020	LSB	9	B	Algae	2	
4/10/2020	LSB	9	C	Algae	5	
4/10/2020	LSB	9	D	Algae	5	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
4/10/2020	LSB	9	D	milfoil	9	
4/10/2020	LSB	9	E	Algae	5	
4/10/2020	LSB	9	E	milfoil	11	
4/10/2020	LSM	1	A	Algae	6	
4/10/2020	LSM	1	A	elodea	6	
4/10/2020	LSM	1	B	Algae	4	
4/10/2020	LSM	1	B	other	6	
4/10/2020	LSM	1	C	other	2	
4/10/2020	LSM	1	C	Algae	3	
4/10/2020	LSM	1	D	other	2	
4/10/2020	LSM	1	D	Algae	5	
4/10/2020	LSM	1	E	other	3	
4/10/2020	LSM	1	E	Algae	5	
5/14/2020	LSB	1	A	other	4	
5/14/2020	LSB	1	A	Algae	5	
5/14/2020	LSB	1	B	Algae	4	
5/14/2020	LSB	1	B	milfoil	11	
5/14/2020	LSB	1	C	other	4	
5/14/2020	LSB	1	C	Algae	5	
5/14/2020	LSB	1	D	Algae	4	
5/14/2020	LSB	1	D	milfoil	17	
5/14/2020	LSB	1	E	Algae	2	
5/14/2020	LSB	2	C	other	4	
5/14/2020	LSB	2	D	milfoil	12	
5/14/2020	LSB	3	A	Algae	4	
5/14/2020	LSB	3	A	other	4	
5/14/2020	LSB	3	B	Algae	3	
5/14/2020	LSB	3	B	milfoil	5	
5/14/2020	LSB	3	B	other	5	
5/14/2020	LSB	3	C	milfoil	4	
5/14/2020	LSB	3	C	other	4	
5/14/2020	LSB	3	C	Algae	5	
5/14/2020	LSB	3	D	other	3	
5/14/2020	LSB	3	D	Algae	4	
5/14/2020	LSB	3	E	Algae	3	
5/14/2020	LSB	4	A	other	2	
5/14/2020	LSB	4	A	Algae	3	
5/14/2020	LSB	4	B	Algae	2	
5/14/2020	LSB	4	B	other	2	
5/14/2020	LSB	4	C	Algae	3	
5/14/2020	LSB	4	C	other	4	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
5/14/2020	LSB	4	C	milfoil	6	
5/14/2020	LSB	4	D	Algae	3	
5/14/2020	LSB	4	D	CLPW	7	
5/14/2020	LSB	4	D	other	7	
5/14/2020	LSB	4	E	Algae	4	
5/14/2020	LSB	5	A	Algae	3	
5/14/2020	LSB	5	B	Algae	3	
5/14/2020	LSB	5	B	Other	3	
5/14/2020	LSB	5	B	milfoil	10	
5/14/2020	LSB	5	C	Other	3	
5/14/2020	LSB	5	C	Algae	4	
5/14/2020	LSB	5	D	Algae	3	
5/14/2020	LSB	5	D	milfoil	3	
5/14/2020	LSB	5	D	Other	6	
5/14/2020	LSB	5	E	CLPW	6	
5/14/2020	LSB	5	E	Other	8	
5/14/2020	LSB	6	A	Algae	3	
5/14/2020	LSB	6	B	Algae	5	
5/14/2020	LSB	6	B	milfoil	6	
5/14/2020	LSB	6	C	Other	3	
5/14/2020	LSB	6	C	Algae	5	
5/14/2020	LSB	6	C	milfoil	7	
5/14/2020	LSB	6	D	Other	2	
5/14/2020	LSB	6	D	Algae	4	
5/14/2020	LSB	6	E	CLPW	1	
5/14/2020	LSB	6	E	Algae	4	
5/14/2020	LSB	7	A	Algae	5	
5/14/2020	LSB	7	A	other	6	
5/14/2020	LSB	7	B	other	5	
5/14/2020	LSB	7	B	Algae	6	
5/14/2020	LSB	7	B	milfoil	13	
5/14/2020	LSB	7	C	milfoil	4	
5/14/2020	LSB	7	C	other	10	
5/14/2020	LSB	7	D	Algae	4	
5/14/2020	LSB	7	D	other	4	
5/14/2020	LSB	7	E	Algae	4	
5/14/2020	LSB	7	E	other	4	
5/14/2020	LSB	7	E	milfoil	17	
5/14/2020	LSB	8	A	Algae	4	
5/14/2020	LSB	8	A	other	6	
5/14/2020	LSB	8	B	Algae	4	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
5/14/2020	LSB	8	B	other	5	
5/14/2020	LSB	8	C	other	2	
5/14/2020	LSB	8	C	Algae	4	
5/14/2020	LSB	8	C	CLPW	5	
5/14/2020	LSB	8	D	Algae	4	
5/14/2020	LSB	8	D	milfoil	7	
5/14/2020	LSB	8	E	other	3	
5/14/2020	LSB	8	E	CLPW	4	
5/14/2020	LSB	8	E	Algae	5	
5/14/2020	LSB	8	E	milfoil	9	
5/14/2020	LSB	9	B	Algae	3	
5/14/2020	LSB	9	B	milfoil	5	
5/14/2020	LSB	9	C	Algae	4	
5/14/2020	LSB	9	D	Algae	7	
5/14/2020	LSB	9	E	Algae	4	
5/14/2020	LSB	9	E	other	5	
5/14/2020	LSB	9	E	milfoil	7	
5/14/2020	LSM	1	A	other	10	
5/14/2020	LSM	1	A	milfoil	15	
5/14/2020	LSM	1	B	milfoil	12	
5/14/2020	LSM	1	B	other	15	
5/14/2020	LSM	1	C	other	12	
5/14/2020	LSM	1	D	other	17	
5/14/2020	LSM	1	E	milfoil	13	
5/14/2020	LSM	1	E	other	14	
5/28/2020	TK	E	A	RPW	25	
5/28/2020	TK	E	A	milfoil	54	
5/28/2020	TK	E	A	LPW	90	
5/28/2020	TK	E	A	CLPW	120	
5/28/2020	TK	E	B	milfoil	44	
5/28/2020	TK	E	B	LPW	60	
5/28/2020	TK	E	B	CLPW	100	
5/28/2020	TK	E	C	milfoil	45	
5/28/2020	TK	E	C	LPW	63	
5/28/2020	TK	E	C	CLPW	90	
5/28/2020	TK	E	D	milfoil	35	
5/28/2020	TK	E	D	LPW	70	
5/28/2020	TK	E	D	CLPW	95	
5/28/2020	TK	E	E	milfoil	39	
5/28/2020	TK	E	E	CLPW	70	
5/28/2020	TK	E	E	LPW	85	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
5/28/2020	TK	U	A	LPW	12	
5/28/2020	TK	U	A	CLPW	15	
5/28/2020	TK	U	A	Coontail	97	
5/28/2020	TK	U	B	LPW	70	
5/28/2020	TK	U	B	Coontail	290	
5/28/2020	TK	U	C	Coontail	176	
5/28/2020	TK	U	D	Coontail	342	
5/28/2020	TK	U	E	Coontail	278	
6/16/2020	LSB	1	B	milfoil	7	
6/16/2020	LSB	1	C	milfoil	16	
6/16/2020	LSB	1	D	other	4	
6/16/2020	LSB	1	E	milfoil	5	
6/16/2020	LSB	2	B	milfoil	7	
6/16/2020	LSB	2	C	milfoil	9	
6/16/2020	LSB	2	D	milfoil	17	
6/16/2020	LSB	2	E	milfoil	18	
6/16/2020	LSB	3	B	milfoil	6	
6/16/2020	LSB	3	C	other	4	
6/16/2020	LSB	3	C	milfoil	9	
6/16/2020	LSB	3	D	other	3	
6/16/2020	LSB	3	D	milfoil	6	
6/16/2020	LSB	3	E	milfoil	7	
6/16/2020	LSB	4	A	milfoil	6	
6/16/2020	LSB	4	B	LPW	5	
6/16/2020	LSB	4	B	milfoil	6	
6/16/2020	LSB	4	D	LPW	10	
6/16/2020	LSB	4	D	milfoil	12	
6/16/2020	LSB	4	E	milfoil	13	
6/16/2020	LSB	5	A	milfoil	8	
6/16/2020	LSB	5	B	milfoil	15	
6/16/2020	LSB	5	C	other	1	
6/16/2020	LSB	5	C	milfoil	8	
6/16/2020	LSB	5	D	milfoil	6	
6/16/2020	LSB	5	D	other	16	
6/16/2020	LSB	5	E	milfoil	7	
6/16/2020	LSB	6	A	milfoil	8	
6/16/2020	LSB	6	B	milfoil	7	
6/16/2020	LSB	6	C	milfoil	7	
6/16/2020	LSB	6	D	other	4	
6/16/2020	LSB	6	D	milfoil	5	
6/16/2020	LSB	6	E	milfoil	20	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
6/16/2020	LSB	6	E	other	25	
6/16/2020	LSB	7	A	Algae	6	
6/16/2020	LSB	7	A	LPW	8	
6/16/2020	LSB	7	B	milfoil	2	
6/16/2020	LSB	7	B	LPW	6	
6/16/2020	LSB	7	B	Algae	7	
6/16/2020	LSB	7	C	Algae	6	
6/16/2020	LSB	7	C	milfoil	6	
6/16/2020	LSB	7	C	LPW	14	
6/16/2020	LSB	7	D	milfoil	3	
6/16/2020	LSB	7	D	LPW	11	
6/16/2020	LSB	7	E	Algae	4	
6/16/2020	LSB	8	A	LPW	3	
6/16/2020	LSB	8	A	milfoil	6	
6/16/2020	LSB	8	A	Algae	7	
6/16/2020	LSB	8	B	Algae	7	
6/16/2020	LSB	8	B	LPW	10	
6/16/2020	LSB	8	C	Algae	4	
6/16/2020	LSB	8	C	LPW	5	
6/16/2020	LSB	8	C	milfoil	9	
6/16/2020	LSB	8	D	LPW	5	
6/16/2020	LSB	8	D	Algae	7	
6/16/2020	LSB	8	D	milfoil	10	
6/16/2020	LSB	8	E	LPW	4	
6/16/2020	LSB	8	E	Algae	5	
6/16/2020	LSB	9	B	Algae	8	
6/16/2020	LSB	9	C	Algae	6	
6/16/2020	LSB	9	D	LPW	3	
6/16/2020	LSB	9	D	Algae	5	
6/16/2020	LSB	9	E	Algae	7	
6/16/2020	LSB	9	E	LPW	9	
6/16/2020	LSB	9	E	milfoil	13	
6/16/2020	LSM	1	A	Algae	17	
6/16/2020	LSM	1	A	LPW	34	
6/16/2020	LSM	1	A	CLPW	37	
6/16/2020	LSM	1	B	CLPW	54	
6/16/2020	LSM	1	B	LPW	68	
6/16/2020	LSM	1	C	milfoil	14	
6/16/2020	LSM	1	C	LPW	63	
6/16/2020	LSM	1	D	LPW	60	
6/16/2020	LSM	1	D	milfoil	70	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
6/16/2020	LSM	1	E	LPW	76	
6/16/2020	LSM	1	E	CLPW	90	
6/22/2020	TK	E	A	Coontail	73	
6/22/2020	TK	E	A	milfoil	80	
6/22/2020	TK	E	A	RPW	128	
6/22/2020	TK	E	A	LPW	130	
6/22/2020	TK	E	A	CLPW	208	
6/22/2020	TK	E	B	milfoil	55	
6/22/2020	TK	E	B	RPW	113	
6/22/2020	TK	E	B	LPW	130	
6/22/2020	TK	E	B	CLPW	210	
6/22/2020	TK	E	C	elodea	27	
6/22/2020	TK	E	C	milfoil	54	
6/22/2020	TK	E	C	RPW	104	
6/22/2020	TK	E	C	LPW	109	
6/22/2020	TK	E	C	CLPW	182	
6/22/2020	TK	E	D	milfoil	50	
6/22/2020	TK	E	D	LPW	70	
6/22/2020	TK	E	D	CLPW	165	
6/22/2020	TK	T	A	milfoil	50	
6/22/2020	TK	T	A	Coontail	70	
6/22/2020	TK	T	A	CLPW	186	
6/22/2020	TK	T	B	milfoil	75	
6/22/2020	TK	T	B	Coontail	85	
6/22/2020	TK	T	B	LPW	136	
6/22/2020	TK	T	B	CLPW	250	
6/22/2020	TK	T	C	Coontail	60	
6/22/2020	TK	T	C	LPW	180	
6/22/2020	TK	T	C	CLPW	305	
6/22/2020	TK	T	D	milfoil	85	
6/22/2020	TK	T	D	Coontail	130	
6/22/2020	TK	T	D	LPW	189	
6/22/2020	TK	T	D	CLPW	205	
6/22/2020	TK	U	A	CLPW	190	
6/22/2020	TK	U	A	Coontail	250	
6/22/2020	TK	U	B	CLPW	135	
6/22/2020	TK	U	B	Coontail	290	
6/22/2020	TK	U	C	Coontail	150	
6/22/2020	TK	U	C	CLPW	172	
6/22/2020	TK	U	D	Coontail	212	
6/22/2020	TK	U	D	CLPW	287	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
7/14/2020	LSB	1	A	Algae	6	
7/14/2020	LSB	1	B	Algae	4	
7/14/2020	LSB	1	C	Algae	6	
7/14/2020	LSB	1	D	milfoil	4	
7/14/2020	LSB	1	E	Algae	3	
7/14/2020	LSB	2	A	Algae	7	
7/14/2020	LSB	2	B	Algae	7	
7/14/2020	LSB	2	B	milfoil	11	
7/14/2020	LSB	2	C	Algae	6	
7/14/2020	LSB	2	C	CLPW	11	
7/14/2020	LSB	2	C	milfoil	16	
7/14/2020	LSB	2	D	Algae	7	
7/14/2020	LSB	2	E	Algae	6	
7/14/2020	LSB	2	E	LPW	9	
7/14/2020	LSB	3	A	Algae	6	
7/14/2020	LSB	3	A	milfoil	8	
7/14/2020	LSB	3	B	Algae	11	
7/14/2020	LSB	3	B	LPW	17	
7/14/2020	LSB	3	B	milfoil	18	
7/14/2020	LSB	3	C	Algae	9	
7/14/2020	LSB	3	C	LPW	12	
7/14/2020	LSB	3	C	milfoil	17	
7/14/2020	LSB	3	D	CLPW	6	
7/14/2020	LSB	3	D	Algae	8	
7/14/2020	LSB	3	D	LPW	18	
7/14/2020	LSB	3	D	milfoil	18	
7/14/2020	LSB	3	E	Algae	9	
7/14/2020	LSB	3	E	milfoil	27	
7/14/2020	LSB	4	A	Algae	8	
7/14/2020	LSB	4	B	Algae	7	
7/14/2020	LSB	4	B	milfoil	17	
7/14/2020	LSB	4	C	Algae	6	
7/14/2020	LSB	4	C	LPW	9	
7/14/2020	LSB	4	D	LPW	12	
7/14/2020	LSB	4	D	CLPW	41	
7/14/2020	LSB	4	E	Algae	3	
7/14/2020	LSB	4	E	milfoil	9	
7/14/2020	LSB	4	E	LPW	10	
7/14/2020	LSB	5	A	Algae	8	
7/14/2020	LSB	5	A	milfoil	14	
7/14/2020	LSB	5	B	CLPW	7	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
7/14/2020	LSB	5	B	Algae	9	
7/14/2020	LSB	5	C	Algae	7	
7/14/2020	LSB	5	C	milfoil	12	
7/14/2020	LSB	5	D	elodea	5	
7/14/2020	LSB	5	D	LPW	26	
7/14/2020	LSB	5	D	milfoil	27	
7/14/2020	LSB	5	E	Algae	9	
7/14/2020	LSB	5	E	milfoil	11	
7/14/2020	LSB	5	E	LPW	19	
7/14/2020	LSB	6	A	Algae	5	
7/14/2020	LSB	6	B	Algae	8	
7/14/2020	LSB	6	C	LPW	7	
7/14/2020	LSB	6	C	Algae	9	
7/14/2020	LSB	6	C	milfoil	28	
7/14/2020	LSB	6	D	Algae	7	
7/14/2020	LSB	6	D	LPW	16	
7/14/2020	LSB	6	D	milfoil	16	
7/14/2020	LSB	6	E	LPW	19	
7/14/2020	LSB	6	E	milfoil	24	
7/14/2020	LSB	6	E	CLPW	30	
7/14/2020	LSB	7	A	Algae	8	
7/14/2020	LSB	7	B	Algae	8	
7/14/2020	LSB	7	B	milfoil	19	
7/14/2020	LSB	7	C	Algae	9	
7/14/2020	LSB	7	D	Algae	8	
7/14/2020	LSB	7	E	Algae	7	
7/14/2020	LSB	7	E	milfoil	26	
7/14/2020	LSB	8	A	Algae	6	
7/14/2020	LSB	8	B	Algae	7	
7/14/2020	LSB	8	C	Algae	7	
7/14/2020	LSB	8	C	milfoil	15	
7/14/2020	LSB	8	D	Algae	8	
7/14/2020	LSB	8	D	milfoil	17	
7/14/2020	LSB	8	E	LPW	7	
7/14/2020	LSB	8	E	Algae	9	
7/14/2020	LSB	9	A	Algae	8	
7/14/2020	LSB	9	B	Algae	8	
7/14/2020	LSB	9	B	LPW	12	
7/14/2020	LSB	9	B	milfoil	44	
7/14/2020	LSB	9	C	LPW	13	
7/14/2020	LSB	9	C	Algae	18	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
7/14/2020	LSB	9	C	CLPW	44	
7/14/2020	LSB	9	D	Algae	8	
7/14/2020	LSB	9	E	LPW	9	
7/14/2020	LSB	9	E	Algae	11	
7/14/2020	LSM	1	A	milfoil	14	
7/14/2020	LSM	1	A	LPW	34	
7/14/2020	LSM	1	A	CLPW	90	
7/14/2020	LSM	1	B	LPW	120	
7/14/2020	LSM	1	B	CLPW	155	
7/14/2020	LSM	1	C	milfoil	18	
7/14/2020	LSM	1	C	LPW	50	
7/14/2020	LSM	1	D	milfoil	22	
7/14/2020	LSM	1	D	CLPW	155	
7/14/2020	LSM	1	D	LPW	170	
7/14/2020	LSM	1	E	milfoil	15	
7/14/2020	LSM	1	E	LPW	140	
7/14/2020	LSM	1	E	CLPW	210	
7/14/2020	TK	E	A	elodea	70	? I think these are the same as below. Wrong date.
7/14/2020	TK	E	A	LPW	120	
7/14/2020	TK	E	A	milfoil	130	
7/14/2020	TK	E	A	RPW	165	
7/14/2020	TK	E	B	milfoil	60	
7/14/2020	TK	E	B	CLPW	90	
7/14/2020	TK	E	B	RPW	120	
7/14/2020	TK	E	C	milfoil	40	
7/14/2020	TK	E	C	CLPW	45	
7/14/2020	TK	E	C	RPW	90	
7/14/2020	TK	E	D	milfoil	80	
7/14/2020	TK	E	D	RPW	110	
7/14/2020	TK	T	A	milfoil	170	
7/14/2020	TK	T	A	LPW	280	
7/14/2020	TK	T	A	CLPW	300	
7/14/2020	TK	T	B	CLPW	300	
7/14/2020	TK	T	B	LPW	310	
7/14/2020	TK	T	C	Coontail	90	
7/14/2020	TK	T	D	LPW	130	
7/14/2020	TK	T	D	CLPW	270	
7/14/2020	TK	U	A	Coontail	310	
7/14/2020	TK	U	B	Coontail	240	
7/14/2020	TK	U	B	CLPW	350	
7/14/2020	TK	U	C	Coontail	290	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
7/14/2020	TK	U	C	CLPW	340	
7/14/2020	TK	U	D	Coontail	335	
7/27/2020	TK	E	A	elodea	70	
7/27/2020	TK	E	A	LPW	120	
7/27/2020	TK	E	A	milfoil	130	
7/27/2020	TK	E	A	RPW	165	
7/27/2020	TK	E	B	CLPW	90	
7/27/2020	TK	E	B	milfoil	60	
7/27/2020	TK	E	B	RPW	120	
7/27/2020	TK	E	C	CLPW	45	
7/27/2020	TK	E	C	milfoil	40	
7/27/2020	TK	E	C	RPW	90	
7/27/2020	TK	E	D	milfoil	80	
7/27/2020	TK	E	D	RPW	110	
7/27/2020	TK	T	A	CLPW	300	
7/27/2020	TK	T	A	LPW	280	
7/27/2020	TK	T	A	milfoil	170	
7/27/2020	TK	T	B	CLPW	300	
7/27/2020	TK	T	B	LPW	310	
7/27/2020	TK	T	C	Coontail	90	
7/27/2020	TK	T	D	CLPW	270	
7/27/2020	TK	T	D	LPW	130	
7/27/2020	TK	U	A	Coontail	310	
7/27/2020	TK	U	B	CLPW	350	
7/27/2020	TK	U	B	Coontail	240	
7/27/2020	TK	U	C	CLPW	340	
7/27/2020	TK	U	C	Coontail	290	
7/27/2020	TK	U	D	Coontail	335	
8/4/2020	LSM	1	A	Algae	3	
8/4/2020	LSM	1	B	elodea	46	
8/4/2020	LSM	1	C	elodea	34	
8/4/2020	LSM	1	A	LPW	5	
8/4/2020	LSM	1	C	LPW	66	
8/4/2020	LSM	1	D	LPW	8	
8/4/2020	LSM	1	E	LPW	43	
8/4/2020	LSM	1	A	milfoil	30	
8/4/2020	LSM	1	B	milfoil	65	
8/4/2020	LSM	1	D	milfoil	16	
8/4/2020	LSM	1	E	milfoil	21	
8/24/2020	TK	U	A	Coontail	360	
8/24/2020	TK	U	B	Coontail	410	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
8/24/2020	TK	U	C	Coontail	390	
8/24/2020	TK	U	D	Coontail	380	
8/24/2020	TK	T	A	Coontail	270	
8/24/2020	TK	T	A	Milfoil	220	
8/24/2020	TK	E	A	RPW	145	
8/24/2020	TK	E	A	milfoil	165	
8/24/2020	TK	E	B	CLPW	65	
8/24/2020	TK	E	B	RPW	190	
8/24/2020	TK	E	B	Coontail	160	
8/24/2020	TK	E	B	milfoil	230	
8/24/2020	TK	E	C	RPW	70	
8/24/2020	TK	E	C	milfoil	80	
8/24/2020	TK	E	D	RPW	85	
8/24/2020	TK	E	E	RPW	55	
8/24/2020	TK	E	E	milfoil	70	
8/26/2020	LSB	7	A	Algae	12	
8/26/2020	LSB	7	A	Isoetes	25	
8/26/2020	LSB	7	A	LPW	7	
8/26/2020	LSB	7	A	milfoil	26.5	
8/26/2020	LSB	7	A	Tufty	3.5	
8/26/2020	LSB	7	B	Algae	8	
8/26/2020	LSB	7	B	milfoil	19	
8/26/2020	LSB	7	B	Tufty	3	
8/26/2020	LSB	7	C	Algae	7	
8/26/2020	LSB	7	C	LPW	17	
8/26/2020	LSB	7	C	milfoil	30	
8/26/2020	LSB	7	C	Tufty	5	
8/26/2020	LSB	7	D	Algae	3	
8/26/2020	LSB	7	D	Isoetes	3	
8/26/2020	LSB	7	D	LPW	10	
8/26/2020	LSB	7	D	milfoil	30	
8/26/2020	LSB	7	D	Tufty	6	
8/26/2020	LSB	7	E	Algae	4	
8/26/2020	LSB	7	E	milfoil	7	
8/26/2020	LSB	7	E	Tufty	5	
8/26/2020	LSB	3	A	Algae	2.5	
8/26/2020	LSB	3	B	Algae	8	
8/26/2020	LSB	3	C	Algae	5	
8/26/2020	LSB	3	D	Algae	7	
8/26/2020	LSB	3	E	Algae	10	
8/26/2020	LSB	3	E	RPW	13	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
8/26/2020	LSB	3	D	Isoetes	2	
8/26/2020	LSB	3	C	milfoil	12	
8/26/2020	LSB	3	D	milfoil	28	
8/26/2020	LSB	3	E	milfoil	12	
8/26/2020	LSB	3	A	Tufty	3	
8/26/2020	LSB	3	B	Tufty	5	
8/26/2020	LSB	3	C	Tufty	4	
8/26/2020	LSB	3	D	Tufty	3.5	
8/26/2020	LSB	3	E	Tufty	6	
8/26/2020	LSB	6	A	Algae	4	
8/26/2020	LSB	6	B	Algae	5	
8/26/2020	LSB	6	C	Algae	4	
8/26/2020	LSB	6	D	Algae	11	
8/26/2020	LSB	6	C	milfoil	5	
8/26/2020	LSB	6	D	milfoil	26	
8/26/2020	LSB	6	A	other	3	
8/26/2020	LSB	6	B	other	4	
8/26/2020	LSB	6	C	Isoetes	5	
8/26/2020	LSB	6	D	LPW	12	
8/26/2020	LSB	6	D	Tufty	5	
8/26/2020	LSB	1	A	Algae	7	
8/26/2020	LSB	1	B	Algae	8	
8/26/2020	LSB	1	C	Algae	3	
8/26/2020	LSB	1	D	Algae	4	
8/26/2020	LSB	1	E	Algae	5	
8/26/2020	LSB	1	D	CLPW	8	
8/26/2020	LSB	1	D	elodea	5	
8/26/2020	LSB	1	C	Isoetes	2	
8/26/2020	LSB	1	D	Isoetes	3	
8/26/2020	LSB	1	B	milfoil	6	
8/26/2020	LSB	1	C	milfoil	6	
8/26/2020	LSB	1	D	milfoil	9	
8/26/2020	LSB	1	B	Tufty	4	
8/26/2020	LSB	1	C	Tufty	2	
8/26/2020	LSB	9	A	Algae	10	
8/26/2020	LSB	9	B	Algae	7	
8/26/2020	LSB	9	C	Algae	1	
8/26/2020	LSB	9	D	Algae	7	
8/26/2020	LSB	9	E	Algae	11	
8/26/2020	LSB	9	A	milfoil	5.5	
8/26/2020	LSB	9	E	milfoil	18	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
8/26/2020	LSB	9	A	Tufty	3.6	
8/26/2020	LSB	9	B	Tufty	2.3	
8/26/2020	LSB	9	D	Tufty	1	
8/26/2020	LSB	9	E	Tufty	2	
8/26/2020	LSB	8	A	Algae	14	
8/26/2020	LSB	8	B	Algae	12	
8/26/2020	LSB	8	C	Algae	6	
8/26/2020	LSB	8	D	Algae	3	
8/26/2020	LSB	8	E	Algae	2	
8/26/2020	LSB	8	C	CLPW	18	
8/26/2020	LSB	8	B	milfoil	8	
8/26/2020	LSB	8	C	milfoil	8	
8/26/2020	LSB	8	A	other	5	
8/26/2020	LSB	8	B	other	3	
8/26/2020	LSB	8	C	other	5	
8/26/2020	LSB	8	D	other	1	
9/22/2020	TK	T	A	Coontail	300	
9/22/2020	TK	E	A	milfoil	170	
9/22/2020	TK	E	A	RPW	140	
9/22/2020	TK	E	B	milfoil	140	
9/22/2020	TK	E	B	RPW	120	
9/22/2020	TK	E	C	milfoil	115	
9/22/2020	TK	E	D	milfoil	130	
9/22/2020	TK	T	A	Coontail	300	
9/22/2020	TK	U	A	Coontail	390	
9/22/2020	TK	U	B	Coontail	350	
9/22/2020	TK	U	C	Coontail	410	
9/22/2020	TK	U	D	Coontail	370	
10/13/2020	TK	T	A	Milfoil	270	
10/13/2020	TK	T	B	Milfoil	60	
10/13/2020	TK	T	A	Coontail	270	
10/13/2020	TK	E	A	milfoil	110	
10/13/2020	TK	E	B	milfoil	114	
10/13/2020	TK	E	C	milfoil	40	
10/13/2020	TK	E	D	milfoil	110	
10/13/2020	TK	E	A	RPW	100	
10/13/2020	TK	E	B	RPW	140	
10/13/2020	TK	U	A	Coontail	310	
10/13/2020	TK	U	B	Coontail	170	
10/13/2020	TK	U	C	Coontail	190	
10/13/2020	TK	U	D	Coontail	290	

Plant Height Data

Date	Location	Transect	Quadrat/RakePull	Taxa	Height (cm)	Notes
5/4/2021	TK	U	A	Coontail	150	
5/4/2021	TK	U	B	Coontail	130	
5/4/2021	TK	U	C	Coontail	160	
5/4/2021	TK	U	D	Coontail	60	
5/4/2021	TK	T	A	CLPW		on video
5/4/2021	TK	T	B	CLPW	70	
5/4/2021	TK	T	C	CLPW	103	
5/4/2021	TK	T	D	CLPW	150	
5/4/2021	TK	E	A	milfoil	55	
5/4/2021	TK	E	B			no height collected (plants too short, visibility too low)
5/4/2021	TK	E	C	milfoil	70	
5/4/2021	TK	E	D			no height collected (plants too short, visibility too low)
6/30/2021	TK	T	A	bare		homeowner pulled or raked, depth = 2.8m
6/30/2021	TK	T	B	CLPW	120	depth = 2.9 m
6/30/2021	TK	T	C	CLPW	220	depth = 2.8m
6/30/2021	TK	T	D	CLPW	200	depth = 2.7 m
6/30/2021	TK	U	A	Coontail	220	depth = 3.5 m
6/30/2021	TK	U	B	Coontail	250	depth = 3.6 m
6/30/2021	TK	U	C	Coontail	300	depth = 3.5 m
6/30/2021	TK	U	D	Coontail	180	depth = 3.3 m
6/30/2021	TK	E	A	CLPW	120	depth = 1.6 m
6/30/2021	TK	E	B	CLPW	130	depth = 1.5 m
6/30/2021	TK	E	C	CLPW	130	depth = 0.8
6/30/2021	TK	E	D	CLPW	100	depth = 1.3 m

APPENDIX

D

PLANT TISSUE CHLOROPHYLL-A, CARBON AND NITROGEN DATA

Plant Tissue Chl-a, N and C Data
Lakeside Beach

sample date	sample location	transect	quadrat	species	mg chloro/ g dw	mg pheo/ g dw	%N	%C
10/8/2019	LSB	1	B	algae	0.23000	0.05000	0.39	5.63
10/8/2019	LSB	2	A	algae	20.45000	4.08000	2.95	37.94
10/8/2019	LSB	2	D	algae	4.90000	1.10000	2.13	37.13
10/10/2019	LSB	4	A	algae	1.24620	0.27501	1.45	29.03
10/10/2019	LSB	4	D	algae	2.84316	0.55636	2.02	35.48
10/10/2019	LSB	5	B,C	algae	2.34807	0.22523	1.64	24.65
10/10/2019	LSB	6	B	algae	1.10000	0.43000	1.18	22.97
10/10/2019	LSB	7	A,C	algae	1.18142	0.23596	1.89	31.36
10/10/2019	LSB	8	A,C,D,E	algae	1.30490	0.13270	1.63	24.78
10/10/2019	LSB	9	C,D	algae	2.64489	0.53148	1.82	34.21
10/10/2019	LSB	9	E	algae			1.57	28.11
11/18/2019	LSB	5	A,B,E	algae	0.98430	0.09470	2.95	34.91
11/18/2019	LSB	9	A-E	algae	0.66029	0.06591	1.29	15.76
1/30/2020	LSB		8A, 9B	algae	0.86000	1.62000	3.61	31.52
2/25/2020	LSB	3	C	algae	1.23000	0.77000	1.83	18.15
2/25/2020	LSB	4	C	algae	1.63000	3.38000	0.20	24.96
2/25/2020	LSB	4	D	algae	1.48000	1.59000	2.54	22.46
2/25/2020	LSB	5	B	algae	1.67000	0.38000	2.85	32.16
2/25/2020	LSB	5	D	algae	1.34000	3.70000	2.70	25.51
2/25/2020	LSB	6	B	algae	2.00000	4.79000	4.40	38.94
4/10/2020	LSB	1	A-E	algae	2.40000	0.46000	3.00	21.95
4/10/2020	LSB	2	A-E	algae	2.31000	0.45000	1.73	19.95
4/10/2020	LSB	3	B-E	algae	1.07000	0.20000	1.19	12.36
4/10/2020	LSB	4	A-E	algae	2.95000	0.57000		
4/10/2020	LSB	5	A-E	algae	2.52781	0.23451	2.46	25.91
4/10/2020	LSB	6	A-E	algae	1.20200	0.04528	2.29	21.03
4/10/2020	LSB	7	A, D, E	algae	1.83615	0.16652	1.97	18.99
4/10/2020	LSB	8	A-E	algae	1.45393	0.05593	2.60	27.33
4/10/2020	LSB	9	A-E	algae	1.48595	0.13683		
5/14/2020	LSB	1	A, B, D, E	algae	0.88000	0.10000	2.25	29.21
5/14/2020	LSB	1	C	algae	1.92000	0.19000	2.51	25.09
5/14/2020	LSB	2	A, B, C, D	algae	2.38000	0.24000	2.70	28.76
5/14/2020	LSB	3	A-D	algae	1.63000	0.36000	2.24	27.10
5/14/2020	LSB	4	A, B, D, E	algae	1.16000	0.13000	2.78	27.51
5/14/2020	LSB	5	A, B, E	algae	0.99000	0.13000	2.61	31.25
5/14/2020	LSB	6	A-D	algae	1.26000	0.30000	3.11	30.15
5/14/2020	LSB	7	A, B, D	algae	1.79000	0.35000	1.68	17.88
5/14/2020	LSB	7	E	algae	5.73000	0.59000	3.57	37.30
5/14/2020	LSB	8	A-E	algae	4.57000	0.19000	2.43	24.60
5/14/2020	LSB	9	B-E	algae	3.16134	0.31309	2.83	28.80
6/16/2020	LSB	1	B,E	algae	1.85378	0.20140	2.37	29.55
6/16/2020	LSB	2	B,C	algae	1.67052	0.17513	2.77	30.87
6/16/2020	LSB	3	B,E	algae	2.07816	0.21994	1.81	22.71
6/16/2020	LSB	4	A,B	algae	1.70203	0.17923	1.32	16.08

Plant Tissue Chl-a, N and C Data
Lakeside Beach

6/16/2020	LSB	5	A,B,C,E	algae	2.17890	0.45174	2.51	28.95
6/16/2020	LSB	6	A,D	algae	2.34144	0.10115	1.68	20.86
6/16/2020	LSB	7	A,B,C,E	algae	1.69727	0.07093	1.93	24.46
6/16/2020	LSB	8	A-E	algae	1.29596	0.05744	2.01	25.91
6/16/2020	LSB	9	A-D	algae	1.94258	0.21509	2.18	30.10
7/14/2020	LSB	1	A,B,C,E	algae	1.57381	0.16283	1.67	23.43
7/14/2020	LSB	2	A	algae			1.35	20.38
7/14/2020	LSB	2	A-E	algae	1.52635	0.15842	1.17	17.13
7/14/2020	LSB	3	A-E	algae	2.44838	0.10499	1.83	23.51
7/14/2020	LSB	4	A-E	algae	0.55887	0.09496	1.82	25.07
7/14/2020	LSB	5	A-D	algae	0.98686	0.21777	1.65	20.93
7/14/2020	LSB	6	A-E	algae	1.59530	0.16414	1.92	28.23
7/14/2020	LSB	7	A-E	algae	1.33422	0.05976	1.71	24.22
7/14/2020	LSB	8	A-E	algae	1.08316	0.04290	1.16	21.00
7/14/2020	LSB	9	A-E	algae	1.47583	0.06049		
8/26/2020	LSB	1	A-E	algae	1.50794	0.15898	1.89	26.94
8/26/2020	LSB	2	B-E	algae	1.28472	0.12843	2.05	32.20
8/26/2020	LSB	3	A	algae			2.93	28.87
8/26/2020	LSB	3	B	algae			2.43	28.21
8/26/2020	LSB	3	C	algae			2.48	28.64
8/26/2020	LSB	3	D	algae			1.81	26.31
8/26/2020	LSB	3	E	algae			2.26	27.23
8/26/2020	LSB	4	A,B,D,E	algae	2.26654	0.22226	2.59	32.14
8/26/2020	LSB	4	C	algae			2.29	29.67
8/26/2020	LSB	5	A	algae	2.43614	0.50550	2.32	27.04
8/26/2020	LSB	5	B	algae			1.73	21.84
8/26/2020	LSB	5	D	algae			3.57	35.23
8/26/2020	LSB	5	E	algae			2.20	24.44
8/26/2020	LSB	6	B	algae			2.37	25.64
8/26/2020	LSB	6	C	algae			2.51	29.05
8/26/2020	LSB	6	D	algae			2.47	26.31
8/26/2020	LSB	7	A-E	algae	1.21458	0.02317	1.62	23.27
8/26/2020	LSB	8	A-D	algae	1.22973	0.12501		
8/26/2020	LSB	9	A-E	algae	0.93045	0.10222	2.03	25.32
10/6/2020	LSB	1	A-C	algae	5.63820	0.53892	3.05	36.97
10/6/2020	LSB		3E,4D	algae	1.87359	1.25481	2.53	39.44
10/6/2020	LSB		7A, 9C,D	algae	3.35286	0.32319	2.49	31.82
11/19/2020	LSB	1	C,D	algae	5.52771	1.12249	2.67	32.21
11/19/2020	LSB	2	C,D	algae	1.35722	0.27786	2.07	27.03
11/19/2020	LSB	5	C	algae	0.82887	0.16803	3.68	40.41
11/19/2020	LSB	9	A,C	algae	2.89813	0.57344	3.06	30.14
4/30/2021	LSB	5	B,D,E	algae	1.30629	0.25921	1.92	25.63
4/30/2021	LSB	6	A-E	algae	1.13389	0.21467	1.23	11.59
4/30/2021	LSB	7	A-C	algae	1.34392	0.27394	1.54	14.46
4/30/2021	LSB	8	A-D	algae	1.18829	0.23463		
4/30/2021	LSB	9	C-E	algae	1.64015	0.32056	2.77	24.51
5/7/2021	LSB	1	A,B,D,E	algae	3.29383	0.31824		

Plant Tissue Chl-a, N and C Data
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5/7/2021	LSB	2	C,E	algae	2.07774	0.20257	2.43	21.87
5/7/2021	LSB	3	B-C	algae	1.07032	0.20626	1.63	13.83
5/7/2021	LSB	4	B-E	algae	0.94488	0.18822	0.98	8.18
6/16/2021	LSB	1	B-C	algae	2.50859	0.51060	1.81	20.15
6/16/2021	LSB	2	C-E	algae	2.87716	0.27679	1.21	13.61
6/16/2021	LSB	3	B,C,E	algae	1.67413	0.16507	1.32	15.91
6/16/2021	LSB	3	D	algae	0.82082	0.16054	1.46	17.36
6/16/2021	LSB	4	B-E	algae	1.70142	0.16667	1.49	17.66
6/16/2021	LSB	5	B-D	algae	1.25196	0.05112	1.28	16.55
6/16/2021	LSB	6	B-E	algae	2.63725	0.50450	1.48	18.30
6/16/2021	LSB	7	A-E	algae	1.52857	0.14708	1.18	13.37
6/16/2021	LSB	8	A-E	algae	2.77991	0.10721	1.79	20.22
6/16/2021	LSB	9	A,B,D,E	algae	2.15848	0.20844	1.79	21.14
10/10/2019	LSB	5	C	CLPW	1.15198	0.23212		
5/14/2020	LSB	4	D	CLPW	1.73000	0.16000	2.71	30.93
5/14/2020	LSB	5	B, E	CLPW	1.73000	0.16000	2.34	27.84
5/14/2020	LSB	8	C	CLPW	4.43000	1.71000		
6/16/2020	LSB	3	D	CLPW	3.34317	1.30553	2.57	36.39
7/14/2020	LSB	2	C	CLPW	2.25906	0.42438	1.22	31.25
7/14/2020	LSB	3	D	CLPW	0.65894	0.41958	1.23	30.57
7/14/2020	LSB	4	D	CLPW	0.61843	0.02414	1.33	29.41
7/14/2020	LSB	5	D	CLPW	0.53474	1.11828	1.62	40.37
7/14/2020	LSB	6	E	CLPW	1.74827	0.16482	0.95	17.35
7/14/2020	LSB	7	A	CLPW	1.63661	0.15570	1.50	39.65
7/14/2020	LSB	9	E	CLPW	20.55576	7.58289	1.55	43.62
8/26/2020	LSB	1	D	CLPW	0.66738	0.41759	2.30	34.81
8/26/2020	LSB	3	E	CLPW			2.93	39.57
8/26/2020	LSB	8	C	CLPW	0.73707	0.28064	1.80	28.97
10/6/2020	LSB	6	D	CLPW	9.96660	0.92061	3.61	46.80
10/10/2020	LSB	5	C	CLPW			1.55	38.86
6/16/2021	LSB	5	D	CLPW	1.25476	0.78667	3.72	42.52
10/8/2019	LSB	1	A	elodea	4.63000	0.47000	2.21	33.84
10/8/2019	LSB	1	D	elodea	3.69000	7.04000	1.38	28.10
10/8/2019	LSB	2	A	elodea	2.66000	0.51000	1.61	35.86
10/8/2019	LSB	2	B	elodea	11.32000	1.20000	1.94	39.98
10/8/2019	LSB	2	C	elodea	1.53000	0.33000	1.06	39.62
10/10/2019	LSB	3	B,D,E	elodea	7.08840	0.28056	2.43	37.83
10/10/2019	LSB	4	A,D	elodea	6.75405	0.66916	1.64	37.45
10/10/2019	LSB	5	B,C,E	elodea	4.31662	0.16938		
10/10/2019	LSB	6	B	elodea	10.23000	3.79000		
10/10/2019	LSB	6	C	elodea	3.69000	0.66000	1.59	37.08
10/10/2019	LSB	6	D	elodea	4.25000	0.83000	3.11	38.41
10/10/2019	LSB	6	E	elodea	4.70000	0.86000	2.74	39.69
10/10/2019	LSB	7	A,C,E	elodea	7.19154	0.27882		
10/10/2019	LSB	8	C,E	elodea	2.63956	0.25601		
10/10/2019	LSB	9	A	elodea	1.27963	0.13162		
10/10/2019	LSB	9	E	elodea	3.09636	0.62432		

Plant Tissue Chl-a, N and C Data
Lakeside Beach

11/18/2019	LSB	7	B,C,D	elodea	1.82498	0.35678	2.30	33.11
11/18/2019	LSB	8	C	elodea	4.55350	2.89067	2.91	37.58
11/18/2019	LSB	9	E	elodea	0.74633	2.93560	1.43	27.07
2/25/2020	LSB	5	E	elodea	1.84000	0.36000	2.53	23.46
4/10/2020	LSB	5	D	elodea	5.97781	2.19621	2.20	26.07
5/14/2020	LSB	1	C	elodea	0.42000	0.75000	1.22	33.23
6/16/2020	LSB	3D,4E		elodea	2.74156	0.29560	3.01	45.19
7/14/2020	LSB	3	E	elodea	1.26740	0.25015	1.49	39.44
7/14/2020	LSB	4	D	elodea	2.12632	0.21906	1.69	31.57
7/14/2020	LSB	7	B	elodea	4.04279	0.77583	2.35	0.12
8/26/2020	LSB	1	D	elodea	4.56248	0.85970	2.39	39.42
8/26/2020	LSB	4	E	elodea	2.23894	1.47550	2.44	34.99
8/26/2020	LSB	5	B	elodea	11.85510	2.36215	5.69	42.18
8/26/2020	LSB	5	D	elodea			2.64	33.39
10/6/2020	LSB	3	E	elodea	5.02210	0.95675	2.26	38.83
10/6/2020	LSB	6	A,D	elodea	8.07642	0.78822	5.19	45.66
10/6/2020	LSB	8	A	elodea	17.31296	1.62113	2.83	39.97
10/6/2020	LSB		7B,8C	elodea	2.66461	0.25848	2.02	41.29
10/10/2020	LSB	5	BCE	elodea			2.64	39.07
10/10/2020	LSB	7	ACE	elodea			2.34	38.32
10/10/2020	LSB	8	CE	elodea			1.66	34.95
10/10/2020	LSB	9	A	elodea			1.64	38.73
10/10/2020	LSB	9	E	elodea			1.92	37.37
11/19/2020	LSB	3	D	elodea	0.13428	0.02585	2.93	38.81
11/19/2020	LSB	5	C	elodea	0.04395	0.00846	2.50	37.41
11/19/2020	LSB	9	D	elodea	0.38025	0.07419	0.94	14.41
11/18/2019	LSB	5	A-E	isoetes	2.72529	1.69459		
11/18/2019	LSB	7	E	isoetes	2.52917	1.57614	1.89	30.26
1/30/2020	LSB	8	D	isoetes	0.42808	0.79267	2.07	40.40
2/25/2020	LSB	2	E	isoetes	1.29000	0.40000	1.76	42.32
2/25/2020	LSB	8	A+C	isoetes	2.32000	1.06000	3.42	33.34
4/10/2020	LSB	4	B	isoetes	0.16000	0.31000	1.35	29.30
4/10/2020	LSB	5	D	isoetes	0.48963	0.04414	0.71	12.74
4/10/2020	LSB	6	B, D	isoetes	0.65035	0.11861		
5/14/2020	LSB	5	B	isoetes	4.99000	18.54000	1.14	31.73
5/14/2020	LSB	6	D	isoetes	1.11000	0.22000	1.67	35.47
5/14/2020	LSB	8	E	isoetes	4.48997	8.24076	1.20	23.09
7/14/2020	LSB	2	C,E	isoetes	1.05093	0.20619	2.25	26.45
7/14/2020	LSB	4	A-C	isoetes	1.20036	0.24609	2.00	26.41
7/14/2020	LSB	5	A-D	isoetes	0.74182	0.48790	1.30	27.97
7/14/2020	LSB	6	A-C	isoetes	3.19185	0.30696	2.98	34.15
7/14/2020	LSB	7	B-E	isoetes	2.74540	0.52824	2.35	32.46
7/14/2020	LSB	8	A-D	isoetes	1.16403	0.11083	3.77	22.63
7/14/2020	LSB	9	A	isoetes	7.81721	15.99283		
8/26/2020	LSB	1	C	isoetes	7.95074	2.89467	2.76	34.86
8/26/2020	LSB	3	C	isoetes	5.93298	3.53857	1.76	21.19
8/26/2020	LSB	4	B	isoetes			2.68	39.18

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8/26/2020	LSB	4	C	isoetes			2.29	29.04
8/26/2020	LSB	5	B	isoetes			2.25	27.09
8/26/2020	LSB	5	C	isoetes	1.60853	3.11950	1.40	28.99
8/26/2020	LSB	6	C	isoetes	0.48173	0.90456	1.49	28.66
8/26/2020	LSB	7	A	isoetes	2.35627	0.21310	1.52	19.72
8/26/2020	LSB	8	B	isoetes	5.45885	0.94395	2.07	37.31
10/6/2020	LSB	2	C	isoetes	3.30856	2.06060	1.44	15.45
10/6/2020	LSB	5	B,C	isoetes	5.37353	0.80112	2.33	31.78
10/6/2020	LSB	7	D	isoetes	3.99581	0.37301	1.39	18.24
11/19/2020	LSB	3	C	isoetes	3.33196	0.61915	1.35	24.76
11/19/2020	LSB	4	C,D	isoetes	1.60490	0.29550	1.91	29.28
11/19/2020	LSB	5	A,C	isoetes	1.86065	0.17464	1.82	27.76
11/19/2020	LSB	6	B	isoetes	1.72622	0.32201	2.25	35.36
11/19/2020	LSB	7	A	isoetes	2.98075	0.55678	1.44	27.06
11/19/2020	LSB	8	A-E	isoetes	2.36975	1.47982	2.40	29.44
4/30/2021	LSB	5	C	isoetes	0.59542	0.23917	1.67	38.09
4/30/2021	LSB	6	C,E	isoetes	1.09078	0.20058	1.29	24.28
4/30/2021	LSB	8	D	isoetes	0.83895	1.61045	2.27	54.03
6/16/2021	LSB	5	B-E	isoetes	1.22352	0.23423	2.68	24.84
6/16/2021	LSB	7	B-D	isoetes	2.09191	0.39685	1.17	20.66
6/16/2021	LSB	8	C	isoetes	1.91666	1.22281	2.96	36.24
4/10/2020	LSB	2,4	A, BCE	LPW			2.54	36.94
4/10/2020	LSB	5	B-E	LPW	2.22879	0.82702		
4/10/2020	LSB	7	B-D	LPW	2.64268	0.48768		
4/10/2020	LSB	8	A,B,E	LPW	15.81331	2.82832	1.99	26.86
5/14/2020	LSB	1	A+C	LPW	3.86000	7.05000	1.46	39.73
5/14/2020	LSB	2	C	LPW	1.81000	3.32000	2.39	40.51
5/14/2020	LSB	3	A-D	LPW	0.96000	0.18000	2.30	31.70
5/14/2020	LSB	4	A-C	LPW	2.00000	0.33000	2.04	31.71
5/14/2020	LSB	5	D, E	LPW	2.12000	0.20000	2.50	30.95
5/14/2020	LSB	8	A-C, E	LPW	1.42000	0.52000	2.52	31.55
5/14/2020	LSB	6C, 7A-D		LPW	1.96000	0.18000		
6/16/2020	LSB	4	D,E	LPW	2.33065	0.09052		
6/16/2020	LSB	5	C,D	LPW	20.78833	3.88899	3.64	40.76
6/16/2020	LSB	6	E	LPW	1.29002	0.49060	2.96	41.86
6/16/2020	LSB	7	A-D	LPW	2.11871	0.19800	2.32	35.92
6/16/2020	LSB	8	B,C	LPW	0.61092	0.23183	1.66	40.91
6/16/2020	LSB	9	D,E	LPW	1.59421	1.02116	2.17	40.67
6/16/2020	LSB	2C,3C		LPW	6.96797	4.39385	2.48	35.28
7/14/2020	LSB	2	B,E	LPW	1.58952	0.30326	1.63	32.61
7/14/2020	LSB	3	B-E	LPW	1.02287	0.09757	1.44	29.75
7/14/2020	LSB	4	C-E	LPW	1.51895	0.14492	2.53	31.02
7/14/2020	LSB	5	B,C	LPW	2.25144	0.43755		
7/14/2020	LSB	6	C-E	LPW	1.21629	0.11566	1.35	31.75
7/14/2020	LSB	7	A,B,C,E	LPW	1.32457	0.25139	1.51	37.19
7/14/2020	LSB	8	B,E	LPW	0.96082	0.17805	2.62	34.93
7/14/2020	LSB	9	E	LPW	0.75062	0.27694		

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8/26/2020	LSB	1	D	LPW	0.20897	0.14323	1.48	40.45
8/26/2020	LSB	3	D	LPW	0.83324	0.53644	2.52	38.40
8/26/2020	LSB	4	E	LPW	1.52701	0.30491	1.91	23.67
8/26/2020	LSB	5	D	LPW	2.18574	0.41808	2.36	43.70
8/26/2020	LSB	6	D	LPW			1.83	25.65
8/26/2020	LSB	7	B,C,D	LPW	1.88763	0.03347	1.95	34.64
8/26/2020	LSB	8	C	LPW	10.15571	17.75447	3.24	37.01
10/6/2020	LSB	2	E	LPW	9.00227	5.54464	1.93	31.58
10/6/2020	LSB	7	B	LPW	9.78982	0.90176	3.63	49.37
4/30/2021	LSB	5	B,C	LPW	4.38084	1.59182		
4/30/2021	LSB	7	A-D	LPW	1.59685	0.14812	2.36	27.92
4/30/2021	LSB	8	C-E	LPW	1.17840	0.21824	2.08	24.09
5/7/2021	LSB	4	B,D	LPW	0.91491	0.17058	1.61	19.34
6/16/2021	LSB	2	E	LPW	4.23257	2.68143	2.36	41.77
6/16/2021	LSB	5	C	LPW	23.35357	14.89889	1.38	34.82
10/8/2019	LSB	1	A	milfoil	3.07000	0.62000	3.78	42.24
10/8/2019	LSB	1	C	milfoil	0.27000	0.06000		
10/8/2019	LSB	2	A	milfoil	9.35000	1.01000	3.78	40.44
10/8/2019	LSB	2	B	milfoil	1.56000	0.34000	2.38	41.74
10/8/2019	LSB	2	C	milfoil	3.48000	0.39000	2.57	41.61
10/8/2019	LSB	2	D	milfoil	9.58000	2.02000	3.03	42.66
10/8/2019	LSB	2	E	milfoil	4.71000	0.53000	2.39	39.58
10/10/2019	LSB	3	A-E	Milfoil	0.65562	0.07767	2.83	40.27
10/10/2019	LSB	4	A-E	Milfoil	1.14347	0.12487	1.91	41.15
10/10/2019	LSB	5	A,B,E	Milfoil	6.12698	0.24263	2.18	41.61
10/10/2019	LSB	6	A	milfoil	17.24000	1.64000	2.43	39.49
10/10/2019	LSB	6	B	milfoil	1.90000	0.78000	3.52	44.16
10/10/2019	LSB	6	C	milfoil	1.74000	0.18000	2.99	41.29
10/10/2019	LSB	6	D	milfoil	14.16000	2.81000	2.88	38.08
10/10/2019	LSB	6	E	milfoil	2.59000	0.50000	2.89	40.45
10/10/2019	LSB	7	A-E	Milfoil	3.70794	0.14673	2.96	43.56
10/10/2019	LSB	8	B,D,E	Milfoil	6.02139	0.23653	4.36	47.41
10/10/2019	LSB	9	B,D,E	Milfoil	3.03243	0.12203	3.55	42.73
11/18/2019	LSB	1	C-E	Milfoil	1.43010	0.14305	1.89	29.72
11/18/2019	LSB	2	C-E	Milfoil	1.30521	0.12771	2.16	36.87
11/18/2019	LSB	3	A-E	Milfoil	0.56480	0.05492	1.25	20.18
11/18/2019	LSB	4	A-E	Milfoil	2.38747	0.23280	2.73	38.83
11/18/2019	LSB	5	A-E	Milfoil	0.80922	0.07960	2.24	34.07
11/18/2019	LSB	6	A,B,C,E	Milfoil	2.25669	0.21695	1.54	24.92
11/18/2019	LSB	7	A-E	Milfoil	1.42841	0.05664	2.25	28.71
11/18/2019	LSB	8	A-E	Milfoil	2.47686	0.09722	2.66	35.62
11/18/2019	LSB	9	B-E	Milfoil	2.17005	0.08558	1.93	29.80
12/16/2019	LSB	1	B-E	milfoil	4.29859	0.41249	1.81	25.68
12/16/2019	LSB	2	C,E	milfoil	1.75553	0.34958	1.35	17.72
12/16/2019	LSB	3	A-E	Milfoil	1.44233	0.05557	1.29	18.12
12/16/2019	LSB	4	C	milfoil	3.06000	0.60000	1.74	32.37
12/16/2019	LSB	4	D	milfoil	0.46000	0.18000	2.79	23.92

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12/16/2019	LSB	4	E	milfoil	0.09000	0.02000	1.79	25.14
12/16/2019	LSB	5	A-E	milfoil	0.76315	0.07232	1.14	13.53
12/16/2019	LSB	6	B,C,E	milfoil	2.01231	0.19350	2.26	27.34
12/16/2019	LSB	7	A	milfoil	2.56000	0.49000	1.18	19.50
12/16/2019	LSB	7	B	milfoil	1.37000	0.14000	1.37	14.75
12/16/2019	LSB	7	C	milfoil	0.20000	0.05000	1.35	17.81
12/16/2019	LSB	7	D	milfoil	0.79000	0.08000	1.23	19.85
12/16/2019	LSB	7	E	milfoil	0.38000	0.07000	1.35	20.40
12/16/2019	LSB	8	A	milfoil	2.80090	0.56010	1.94	27.89
12/16/2019	LSB	8	E	milfoil	1.75000	0.35000	2.71	28.27
12/16/2019	LSB	9	B	milfoil	2.83000	0.37000	3.68	34.77
12/16/2019	LSB	9	C	milfoil	0.79000	0.18000	0.76	10.79
1/30/2020	LSB	1	C, D	milfoil	5.28000	0.99000	2.16	36.99
1/30/2020	LSB	2	D, E	milfoil	4.88000	0.46000	2.76	35.16
1/30/2020	LSB	3	B, C	milfoil	6.45000	0.61000	2.39	36.11
1/30/2020	LSB	3	D, E	milfoil	2.41000	0.12000	2.85	34.35
1/30/2020	LSB	4	C, D	milfoil	39.27000	3.77000	2.49	39.18
1/30/2020	LSB	4	E	milfoil	2.39000	0.47000	2.76	36.35
1/30/2020	LSB	5	C	milfoil	9.05000	0.86000	2.84	37.09
1/30/2020	LSB	6	E	milfoil	9.98000	0.94000	3.57	41.61
1/30/2020	LSB	7	C, E	milfoil	6.01000	2.30000	2.32	38.49
1/30/2020	LSB	8	B, E	milfoil	6.49000	0.62000	4.12	38.82
1/30/2020	LSB	9	B, C, E	milfoil	8.54000	1.62000	5.40	41.79
2/25/2020	LSB	1	E	milfoil	9.78000	9.43000	1.97	31.30
2/25/2020	LSB	2	E	milfoil	1.21000	1.20000	2.14	39.55
2/25/2020	LSB	3	C	milfoil	3.39000	0.13000	3.78	39.17
2/25/2020	LSB	3	D	milfoil	2.65000	0.26000	2.98	32.53
2/25/2020	LSB	3	E	milfoil	2.46000	0.50000	1.98	36.07
2/25/2020	LSB	4	D	milfoil	2.93000	0.58000	3.58	35.69
2/25/2020	LSB	5	C	milfoil	3.68000	0.74000	1.66	20.61
2/25/2020	LSB	6	E	milfoil	2.86000	0.28000	3.50	36.42
2/25/2020	LSB	7	D	milfoil	4.07000	0.40000	3.82	34.11
2/25/2020	LSB	8	C	milfoil	6.67000	0.66000	3.14	35.76
2/25/2020	LSB	8	E	milfoil	4.01000	0.24000	2.25	29.75
2/25/2020	LSB	9	C+D	milfoil	8.85000	1.57000	2.88	35.41
2/25/2020	LSB	9	E	milfoil	2.60000	0.26000	3.76	40.27
4/10/2020	LSB	1	C-D	milfoil	2.73000	0.53000	1.73	28.50
4/10/2020	LSB	2	A-E	milfoil	-0.17000	0.12000	1.80	31.77
4/10/2020	LSB	3	C-E	milfoil	3.63000	0.35000	2.32	31.25
4/10/2020	LSB	4	B-D	milfoil	2.00000	0.21000	2.52	31.22
4/10/2020	LSB	5	B,D	milfoil	2.32916	0.03629	2.54	35.39
4/10/2020	LSB	6	A,C-E	milfoil	3.58770	0.35413	2.11	30.89
4/10/2020	LSB	7	A-D	milfoil	1.15487	0.02233	2.53	27.62
4/10/2020	LSB	8	B,D,E	milfoil	1.96960	0.08089		
4/10/2020	LSB	9	E	milfoil	1.87986	0.35489	2.46	32.76
5/14/2020	LSB	1	B, D	milfoil	2.72000	0.27000	1.75	30.80
5/14/2020	LSB	2	D	milfoil	2.75000	0.53000	2.33	37.23

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5/14/2020	LSB	3	B, C	milfoil	1.54000	0.10000	3.15	37.04
5/14/2020	LSB	4	C	milfoil	2.24000	0.16000	4.01	39.12
5/14/2020	LSB	5	B, D, E	milfoil	1.32000	0.14000	2.58	31.86
5/14/2020	LSB	6	B-C	milfoil	2.78000	0.57000	2.83	35.18
5/14/2020	LSB	7	B,C,E	milfoil	1.84000	0.19000	2.62	34.15
5/14/2020	LSB	8	D, E	milfoil	1.07000	0.10000		
5/14/2020	LSB	9	E	milfoil	1.88911	0.71025	3.01	30.13
6/16/2020	LSB	1	C	Milfoil	0.73775	0.07575		
6/16/2020	LSB	2	D,E	milfoil	2.67504	0.26227	2.25	34.04
6/16/2020	LSB	3	C	Milfoil	4.38174	0.45158	1.63	33.41
6/16/2020	LSB	4	C-E	milfoil	2.32141	0.09279	1.74	23.09
6/16/2020	LSB	5	C,D	Milfoil	4.27314	0.85989	2.33	35.41
6/16/2020	LSB	6	E	milfoil	3.82055	0.15601	3.29	41.27
6/16/2020	LSB	7	B-D	milfoil	1.19303	0.04976	1.89	26.40
6/16/2020	LSB	8	A,C,D,E	Milfoil	1.79816	0.17746	1.54	22.52
6/16/2020	LSB	9	E	milfoil	1.03756	0.43506	2.00	36.17
7/14/2020	LSB	1	D	milfoil	1.87034	0.36525	1.78	34.18
7/14/2020	LSB	2	B,C	milfoil	1.39724	0.27467	1.72	26.91
7/14/2020	LSB	3	A-E	milfoil	2.89219	0.11637	1.80	29.12
7/14/2020	LSB	4	B,D	milfoil	1.61454	0.06504	1.93	30.74
7/14/2020	LSB	5	A-C	milfoil	2.23972	0.08966	2.85	32.13
7/14/2020	LSB	6	C-E	milfoil	2.07724	0.08155	1.27	26.84
7/14/2020	LSB	7	B,C	milfoil	1.54565	0.14904	2.11	29.47
7/14/2020	LSB	8	B,E	Milfoil	1.20381	0.24313	1.91	33.03
7/14/2020	LSB	9	D	Milfoil	1.35482	0.13737	1.29	20.73
8/26/2020	LSB	1	B-D	milfoil	1.83729	0.17897	2.39	29.05
8/26/2020	LSB	2	D,E	milfoil	3.59076	0.34638		
8/26/2020	LSB	3	C	milfoil			2.35	38.55
8/26/2020	LSB	3	D	milfoil			2.27	36.79
8/26/2020	LSB	3	E	milfoil			2.04	34.37
8/26/2020	LSB	4	C	milfoil			3.99	40.68
8/26/2020	LSB	4	D,E	milfoil	2.09061	0.08649	2.96	36.19
8/26/2020	LSB	5	C	milfoil			2.59	37.72
8/26/2020	LSB	5	D	milfoil			3.00	36.77
8/26/2020	LSB	5	E	milfoil			3.87	41.14
8/26/2020	LSB	6	D	milfoil			3.22	37.72
8/26/2020	LSB	7	A-E	milfoil	3.21891	0.12160	2.30	37.36
8/26/2020	LSB	8	B, C	milfoil	2.44521	0.23939	2.19	30.84
8/26/2020	LSB	9	A,E	milfoil	3.64581	0.34793	1.95	38.44
10/6/2020	LSB	1	E	milfoil	12.50115	1.20838	1.96	40.08
10/6/2020	LSB	2	B-D	milfoil	5.54028	0.21211	2.33	41.12
10/6/2020	LSB	3	C-E	milfoil	5.32843	0.20189	2.54	40.78
10/6/2020	LSB	4	D,E	milfoil	3.98224	0.37972	2.89	43.30
10/6/2020	LSB	5	B-E	milfoil	6.86312	0.26310	3.54	40.77
10/6/2020	LSB	6	A,C,D	milfoil	6.48787	0.24868	2.40	36.08
10/6/2020	LSB	7	B-E	milfoil	5.35752	0.20302		
10/6/2020	LSB	8	A-E	milfoil	4.47243	0.17057		

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10/6/2020	LSB	9	D,E	milfoil	2.50845	0.24532	2.45	38.62
10/16/2020	LSB	8	A-E	milfoil			2.80	39.42
11/19/2020	LSB	2	E	milfoil	2.82050	0.10893		
11/19/2020	LSB	3	C,D,E	milfoil	3.53049	0.13585	0.21	0.35
11/19/2020	LSB	4	C,D,E	milfoil	3.31159	0.12882	2.68	38.66
11/19/2020	LSB	5	B-E	milfoil	6.78354	0.26022	2.90	38.04
11/19/2020	LSB	6	A-C, E	milfoil	2.92206	0.05743	3.22	37.79
11/19/2020	LSB	7	A-D	milfoil	5.15734	0.09940	2.72	39.32
11/19/2020	LSB	8	B-D	milfoil	3.41646	0.13180	2.84	36.68
11/19/2020	LSB	9	A,D,E	milfoil	1.53159	0.15023	2.76	29.32
4/30/2021	LSB	5	C-E	Milfoil	2.08377	0.19903	1.47	19.25
4/30/2021	LSB	6	D	Milfoil	1.84132	0.35695	1.79	25.51
4/30/2021	LSB	7	E	Milfoil	3.51442	0.13819	2.74	33.88
4/30/2021	LSB	8	D-E	Milfoil	3.88431	0.37280	2.75	29.64
5/7/2021	LSB	1	E	milfoil	3.09002	0.30012		
5/7/2021	LSB	3	C-E	Milfoil	1.45319	0.28306	1.79	24.06
5/7/2021	LSB	4	C-E	Milfoil	1.13266	0.22521		
6/16/2021	LSB	2	B,D	milfoil	1.56419	0.15446	1.64	25.94
6/16/2021	LSB	4	D,E	milfoil	2.00996	0.19232	2.24	26.62
6/16/2021	LSB	5	D	milfoil	1.48119	0.15013	1.76	30.39
6/16/2021	LSB	6	C,E	milfoil	3.51775	0.33564	1.48	24.56
6/16/2021	LSB	7	C	milfoil	1.52999	0.14838	1.62	26.85
6/17/2021	LSB	8	D-E	milfoil	1.41979	0.14181	1.74	31.30
6/17/2021	LSB	9	E	milfoil	1.33759	0.26763	1.49	31.26
10/8/2019	LSB	1	A	Najas	0.92000	0.20000	2.22	36.16
10/8/2019	LSB	2	B	najas	11.51000	2.53000	1.85	37.70
10/8/2019	LSB	2	D	najas	14.11000	3.05000		
10/10/2019	LSB	3	A,D	najas	3.28323	0.33222	2.18	39.20
10/10/2019	LSB	4	B,D	najas	1.58246	0.06645	1.68	35.36
10/10/2019	LSB	5	A-D	najas	1.33855	0.05621	1.78	34.19
10/10/2019	LSB	6	E	najas	3.04000	0.59000	1.96	39.70
10/10/2019	LSB	7	A,E	najas	2.82488	0.31532		
10/10/2019	LSB	8	B,D	najas	3.52609	0.34797		
10/10/2019	LSB	9	E	najas	1.23528	0.25438		
11/18/2019	LSB	8	E	najas	0.59972	0.38581	1.57	40.51
12/16/2019	LSB	6	C	najas	10.70976	7.91829	4.25	40.51
2/26/2020	LSB	5	AC	najas			2.46	32.89
7/14/2020	LSB	3	B-E	najas	3.24828	0.31869		
8/26/2020	LSB	1	B,C	najas	1.48316	0.28657		
8/26/2020	LSB	2	B-E	najas	3.02115	0.29031	2.01	32.45
8/26/2020	LSB	3	A-E	najas	0.16098	0.01565	2.32	31.16
8/26/2020	LSB	4	A,D,E	najas	1.30735	0.12848		
8/26/2020	LSB	5	A,C	najas	3.99332	0.77943	2.58	30.51
8/26/2020	LSB	6	A,B	najas	1.83941	0.35650	2.36	37.31
8/26/2020	LSB	7	A,C,D,E	najas	2.02948	0.18159	1.64	26.13
8/26/2020	LSB	8	A	najas	1.16722	0.24535	1.80	29.23
8/26/2020	LSB	8	B, C	Najas	1.10512	0.22272		

Plant Tissue Chl-a, N and C Data
Lakeside Beach

8/26/2020	LSB	9	B,D,E	najas	4.68509	1.87383	2.06	31.38
10/6/2020	LSB	1	A-C	najas	4.35949	0.44250	2.02	38.91
10/6/2020	LSB	3	A,B	najas	2.53069	0.24281	2.35	33.12
10/6/2020	LSB	7	A,D	najas	3.22783	0.62729	2.47	40.01
10/6/2020	LSB	8	A-C	najas	8.24453	0.78905	1.62	28.02
10/6/2020	LSB		4D, 5B	najas	2.77787	0.26782	2.65	40.05
10/10/2020	LSB	7	AE	najas			2.35	40.10
10/10/2020	LSB	8	BD	najas			2.42	38.52
11/19/2020	LSB	9	E	najas	1.73506	0.31895	3.29	32.08
6/16/2021	LSB	2	D	najas	25.68729	99.73158	2.91	41.04
6/16/2021	LSB	7	B	najas	2.36060	4.44841	2.07	59.76
10/8/2019	LSB	2	C	RPW	0.09000	0.02000		
10/10/2019	LSB	4	A	RPW	0.35107	1.11642		
10/10/2019	LSB	5	C	RPW	1.21097	0.24050	2.88	38.37
10/10/2019	LSB	9	D	RPW	3.15621	0.58692	1.55	31.44
11/18/2019	LSB	8	C	RPW	0.59103	0.10782		
4/10/2020	LSB		2A,4B,C,E	RPW (?)	3.10000	5.52000		
4/10/2020	LSB	5	B-E	RPW			3.18	33.05
4/10/2020	LSB	7	B-D	RPW			2.09	24.53
5/14/2020	LSB	3	D	RPW	1.71000	0.17000	2.30	38.82
5/14/2020	LSB	9	E	RPW	0.56897	1.05700	2.38	39.56
7/14/2020	LSB	9	D	RPW	0.72793	0.06823	1.20	39.84
10/6/2020	LSB	3	B,D	RPW	6.46737	0.24329	4.04	48.24
10/6/2020	LSB	4	C	RPW	12.83897	1.18824	3.26	45.59
10/6/2020	LSB	5	C,E	RPW	9.34679	0.34158	2.76	45.60
10/6/2020	LSB	8	B,D	RPW	3.52137	0.65810	2.57	41.45
6/16/2021	LSB	4	C	RPW	1.90954	0.18108	1.77	25.39
6/16/2020	LSB	9	E	utricularia	1.85754	0.38207	3.23	33.95

Plant Tissue Chl-a, N and C Data
Lakeside Marina

sample date	sample location	quadrat	species	mg chloro/g dw	mg pheo/g dw	chloro-pheo	%N	%C
10/10/2019	LSM	D	algae	14.10711	1.26639	12.84	3.74	40.08
10/10/2019	LSM	E	algae	7.30484	1.36108	5.94		
4/10/2020	LSM	A+B	algae	4.27000	0.85000	3.42	3.15	33.35
5/14/2020	LSM	A-D	algae	4.44433	0.44567	4.00		
7/14/2020	LSM	A	algae	1.84559	0.39466	1.45		
8/4/2020	LSM	E	algae	4.75706	0.43603	4.32	2.69	29.80
5/7/2021	LSM	B	algae	1.92973	0.37762	1.55	2.62	27.27
12/16/2019	LSM		CLPW	0.86324	0.53400	0.33	2.32	32.36
6/22/2020	LSM	A	CLPW	5.27169	0.21414	5.06	4.07	44.35
6/22/2020	LSM	B	CLPW	10.47850	0.95338	9.53	4.14	44.72
6/22/2020	LSM	E	CLPW	1.95387	0.19406	1.76	3.56	41.37
7/14/2020	LSM	A	CLPW	7.41782	0.13648	7.28	3.19	40.21
7/14/2020	LSM	B	CLPW	5.51393	0.10341	5.41	2.39	42.12
7/14/2020	LSM	D	CLPW	4.51506	0.16794	4.35	2.40	41.67
7/14/2020	LSM	E	CLPW	4.86425	0.09135	4.77		
8/4/2020	LSM	C	CLPW	5.73230	0.52974	5.20	3.17	39.85
8/4/2020	LSM	E	CLPW	0.82479	0.07579	0.75	1.77	25.51
6/16/2021	LSM	A	CLPW	18.71585	1.71421	17.00	1.82	34.04
10/10/2019	LSM	D	elodea	8.25756	0.74316	7.51	2.32	35.87
4/10/2020	LSM	A	elodea	36.40000	13.93000	22.47	1.94	22.49
8/4/2020	LSM	B	elodea	2.53859	0.23941	2.30	2.63	38.85
8/4/2020	LSM	C	elodea	1.82178	0.10931	1.71	3.13	46.19
6/16/2021	LSM	A	Elodea	5.79424	1.08248	4.71	2.74	33.86
4/10/2020	LSM	A	LPW				1.99	23.36
6/22/2020	LSM	A	LPW	4.18736	0.42094	3.77	3.62	42.79
6/22/2020	LSM	B	LPW	8.43000	0.31000	8.12		
6/22/2020	LSM	C	LPW	13.54340	1.25449	12.29	4.02	39.70
6/22/2020	LSM	D	LPW	6.24479	0.59564	5.65	3.62	39.54
6/22/2020	LSM	E	LPW	7.04735	0.66746	6.38	3.63	43.57
7/14/2020	LSM	A	LPW	4.33284	0.16263	4.17	3.10	40.85
7/14/2020	LSM	B	LPW	3.82621	0.14155	3.68	2.95	42.47
7/14/2020	LSM	C	LPW	11.35760	1.04278	10.31	3.60	41.36
7/14/2020	LSM	D	LPW	7.04517	0.13114	6.91	3.70	41.94
7/14/2020	LSM	E	LPW	8.48600	0.31528	8.17	3.26	42.43
8/4/2020	LSM	A	LPW	1.61237	0.30687	1.31	2.65	36.25
8/4/2020	LSM	B	LPW	1.52468	0.28455	1.24	2.46	37.43
8/4/2020	LSM	C	LPW	4.62244	0.17022	4.45	2.56	38.78
8/4/2020	LSM	D	LPW	7.26068	4.46501	2.80	1.95	24.61
8/4/2020	LSM	E	LPW	1.85703	0.34501	1.51	2.29	28.98
5/7/2021	LSM	A	LPW	1.04700	0.11375	0.93	2.63	26.96
5/7/2021	LSM	B	LPW	2.98562	0.27492	2.71	3.48	31.45
5/7/2021	LSM	C	LPW	1.66037	0.15438	1.51	3.79	29.23
5/7/2021	LSM	D	LPW	1.48665	0.14132	1.35	3.00	29.31
5/7/2021	LSM	E	LPW	1.74271	0.33389	1.41	3.01	30.24
6/16/2021	LSM	A	LPW	1.48979	0.14304	1.35	1.74	36.18

Plant Tissue Chl-a, N and C Data
Lakeside Marina

sample date	sample location	quadrat	species	mg chloro/g dw	mg pheo/g dw	chloro-pheo	%N	%C
6/16/2021	LSM	B	LPW	10.64236	0.39933	10.24	2.72	34.04
6/16/2021	LSM	C	LPW	8.12965	0.30377	7.83	1.78	26.42
6/16/2021	LSM	D	LPW	2.35553	0.43626	1.92	1.95	24.70
10/10/2019	LSM	A	Milfoil	7.15455	0.76296	6.39	2.90	43.37
10/10/2019	LSM	B	Milfoil	3.19870	0.32668	2.87	3.45	43.13
10/10/2019	LSM	C	Milfoil	3.37656	0.71393	2.66	1.89	45.05
11/18/2019	LSM	A	Milfoil	0.47383	0.32510	0.15	0.94	12.19
11/18/2019	LSM	B	Milfoil	12.45593	2.39330	10.06	3.04	30.96
11/18/2019	LSM	C	Milfoil	5.15065	0.19535	4.96	1.89	29.21
11/18/2019	LSM	D	Milfoil	9.25432	6.01332	3.24	3.66	35.30
11/18/2019	LSM	E	Milfoil	5.85332	0.23073	5.62	2.51	38.95
12/16/2019	LSM		milfoil	1.55408	0.29598	1.26	1.54	27.95
5/14/2020	LSM	A,C,D	milfoil	2.35684	0.22835	2.13	2.45	36.10
6/22/2020	LSM	A	Milfoil	4.23316	0.42161	3.81	3.04	37.62
6/22/2020	LSM	C	Milfoil	4.15569	0.16010	4.00	3.61	32.40
6/22/2020	LSM	D	Milfoil	2.88699	0.28284	2.60	3.24	36.56
7/14/2020	LSM	A	Milfoil	1.60208	0.18579	1.42	3.12	43.34
7/14/2020	LSM	C	milfoil	5.97368	0.12094	5.85	3.93	42.00
7/14/2020	LSM	D	milfoil	2.47225	0.10272	2.37	3.11	39.69
8/4/2020	LSM	A	milfoil	0.80420	0.03037	0.77	2.37	38.09
8/4/2020	LSM	B	milfoil	6.67639	0.24762	6.43	2.90	39.07
8/4/2020	LSM	D	milfoil	14.46498	0.53073	13.93		
8/4/2020	LSM	E	milfoil	3.47846	0.64636	2.83	4.39	40.40
10/6/2020	LSM	A	milfoil	9.98474	0.37238	9.61	3.83	43.86
10/6/2020	LSM	B	milfoil	16.73663	0.62063	16.12	4.79	45.50
10/6/2020	LSM	C	milfoil	9.03994	0.84318	8.20	2.67	41.69
10/6/2020	LSM	D	milfoil	20.00601	0.75157	19.25	3.67	43.19
10/6/2020	LSM	E	milfoil	9.31951	0.34579	8.97	4.43	38.65
11/19/2020	LSM	A	milfoil	1.28833	2.50169	-1.21	2.06	35.77
11/19/2020	LSM	C	milfoil	4.97341	0.96648	4.01	2.68	46.35
11/19/2020	LSM	D	milfoil	5.65205	0.54540	5.11	2.30	43.85
11/19/2020	LSM	E	milfoil	6.77186	0.26101	6.51	4.21	41.77
5/7/2021	LSM	A	milfoil	5.53222	0.53706	5.00	2.68	35.45
5/7/2021	LSM	B	milfoil	2.38164	0.47593	1.91	2.30	39.04
5/7/2021	LSM	D	milfoil	1.72636	0.35221	1.37	2.05	30.57
6/16/2021	LSM	D	milfoil	2.42684	0.09153	2.34	1.67	30.23
6/16/2021	LSM	E	milfoil	5.20444	0.09880	5.11	2.88	29.95
6/16/2021	LSM		milfoil	1.84899	0.18048	1.67	2.52	25.99
4/10/2020	LSM	A	RPW	19.22000	36.10000	-16.88		
5/14/2020	LSM	A-E	RPW	3.78391	0.13930	3.64	3.60	36.96
11/19/2020	LSM	A	RPW	1.13792	0.21140	0.93	2.48	37.45
11/19/2020	LSM	C	RPW	1.61665	0.31307	1.30	1.92	41.56
11/19/2020	LSM	D	RPW	2.21325	1.39973	0.81	2.35	43.19

Plant Tissue Chl-a, N and C Data
TKPOA Research Area

sample date	sample location	transect	quadrat	species	mg chloro/g dw	mg pheo/g dw	chloro-pheo	%N	%C
7/8/2019	TK		1	CLPW	3.99003	0.74869	3.24134		
7/8/2019	TK		2	CLPW	4.32545	0.83156	3.49389		
7/8/2019	TK		3	CLPW	2.83432	0.52086	2.31346		
7/8/2019	TK		4	CLPW	4.17126	0.76529	3.40597		
7/8/2019	TK		5	CLPW	3.33134	0.61395	2.71739		
8/6/2019	TK		1	CLPW	4.38982	0.16131	4.22851		
8/6/2019	TK		2	CLPW	4.80615	0.17288	4.63327		
8/6/2019	TK		3	CLPW	3.75981	0.13724	3.62257		
8/6/2019	TK		4	CLPW	3.20611	0.11758	3.08853		
8/6/2019	TK		5	CLPW	4.94496	0.18959	4.75537		
6/3/2019	TK			coontail	4.01923	0.15672	3.86251		
7/8/2019	TK		1	coontail	9.60741	0.38774	9.21966		
7/8/2019	TK		2	coontail	5.79222	0.55478	5.23744		
7/8/2019	TK		3	coontail	11.70813	0.50796	11.20017		
7/8/2019	TK		4	coontail	8.34455	0.80021	7.54433		
7/8/2019	TK		5	coontail	14.55316	1.37625	13.17691		
7/8/2019	TK		1	Elodea	9.37031	0.88491	8.48540		
7/8/2019	TK		2	elodea	18.45423	1.77874	16.67549		
7/8/2019	TK		3	elodea	1.68337	0.16760	1.51577	1.66	38.62
7/8/2019	TK		4	elodea	2.68139	0.26840	2.41298		
7/8/2019	TK		5	elodea	2.46135	0.24559	2.21576		
7/8/2019	TK		1	LPW	5.90966	0.53956	5.37010		
7/8/2019	TK		2	LPW	4.51378	0.43126	4.08252		
7/8/2019	TK		3	LPW	4.34440	0.82108	3.52332		
7/8/2019	TK		4	LPW	5.03986	0.91385	4.12601		
7/8/2019	TK		5	LPW	3.13948	0.28346	2.85602		
6/3/2019	TK			milfoil	2.07693	0.30111	1.77582	2.04	41.96
7/8/2019	TK		1	Milfoil	6.24172	0.59833	5.64339		
7/8/2019	TK		2	milfoil	4.29504	0.41194	3.88310		
7/8/2019	TK		3	milfoil	4.03083	0.39432	3.63651		
7/8/2019	TK		4	milfoil	6.67287	0.64515	6.02772		
7/8/2019	TK		5	milfoil	4.16295	0.16639	3.99656		
8/6/2019	TK		1	milfoil	2.90131	0.28892	2.61238		
8/6/2019	TK		2	milfoil	7.29981	0.26958	7.03024		
8/6/2019	TK		3	milfoil	7.11807	0.26685	6.85123		
8/6/2019	TK		4	milfoil	7.64742	0.28489	7.36253		
8/6/2019	TK		5	milfoil	4.39543	0.16335	4.23208		
6/3/2019	TK			milfoil (rep 2	3.58892	0.35117	3.23775		
7/8/2019	TK		2	nitella	5.06199	0.41773	4.64426		
7/8/2019	TK		3	nitella	3.05331	0.55349	2.49981		
8/6/2019	TK			nitella	1.54769	0.05443	1.49326		
7/8/2019	TK		1	RPW	3.08072	0.27837	2.80235		
7/8/2019	TK		2	RPW	1.37785	0.12759	1.25026		
7/8/2019	TK		3	RPW	1.82994	0.16102	1.66892		
7/8/2019	TK		4	RPW	2.74060	0.25913	2.48147		

Plant Tissue Chl-a, N and C Data
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7/8/2019	TK		5	RPW	2.90197	0.27329	2.62868		
7/8/2019	TK			spiro gyra	4.68208	0.91845	3.76363		
7/8/2019	TKE	E	2	algae	5.06000	0.42000	4.64000		
7/8/2019	TKE	E	3	algae	3.05000	0.55000	2.50000		
8/6/2019	TKE	E		algae	1.55000	0.05000	1.50000		
9/24/2019	TKE	E	1	algae	5.03000	0.68000	4.35000		
9/24/2019	TKE	E	2	algae	5.03000	0.48000	4.55000		
9/24/2019	TKE	E	3	algae	8.45000	0.33000	8.12000		
9/24/2019	TKE	E	4	algae	12.42000	0.49000	11.93000		
9/24/2019	TKE	E	5	algae	15.84000	0.60000	15.24000		
11/13/2019	TKE			algae	41.36963	25.41270	15.95693	3.75	29.12
4/1/2020	TKE			algae	19.09133	1.80839	17.28295	3.23	40.85
5/28/2020	TKE	E	1	algae	5.49000	1.03000	4.46000		
5/28/2020	TKE	E	2	algae	2.08000	0.38000	1.70000		
5/28/2020	TKE	E	3	algae	1.39000	0.26000	1.13000		
5/28/2020	TKE	E	4	algae	15.49000	2.86000	12.63000		
5/28/2020	TKE	E	5	algae	2.17000	0.08000	2.09000		
6/22/2020	TKE	1		algae	8.67000	0.81000	7.86000	1.69	34.74
6/22/2020	TKE	C		algae	3.13545	0.11948	3.01597	2.32	37.58
6/22/2020	TKE	D		algae	5.69299	0.53483	5.15816	2.36	33.65
6/22/2020	TKE		rake 2	algae	12.01947	1.09275	10.92672	2.00	36.53
6/22/2020	TKE		rake 3	algae	1.67215	0.14832	1.52383	1.05	14.50
7/27/2020	TKE	A		algae	137.98404	5.18706	132.79698	3.21	38.02
7/27/2020	TKE	B		algae	7.60749	0.27108	7.33641	3.18	39.17
7/27/2020	TKE	C		algae	2.25160	0.20521	2.04639	3.73	39.89
7/27/2020	TKE	D		algae	74.26361	2.78896	71.47465	3.05	34.09
8/24/2020	TKE	B		algae	8.44438	0.78236	7.66202	3.48	41.74
8/24/2020	TKE	C		algae	24.56257	2.27039	22.29218	3.36	37.13
8/24/2020	TKE	D		algae	12.16494	0.45045	11.71449	3.90	37.09
5/4/2021	TKE	E	A	algae	2.82741	0.10595			
5/4/2021	TKE	E	B	algae	5.96819	0.55655		2.69	30.78
5/4/2021	TKE	E	C	algae	3.95645	0.36584	3.59061	2.52	33.95
5/4/2021	TKE	E	D	algae	2.73437	0.25127		5.27	49.14
7/8/2019	TKE	E	1	CLPW	3.99000	0.75000	3.24000		
7/8/2019	TKE	E	2	CLPW	4.33000	0.83000	3.50000		
7/8/2019	TKE	E	3	CLPW	2.83000	0.52000	2.31000		
7/8/2019	TKE	E	4	CLPW	4.17000	0.77000	3.40000		
7/8/2019	TKE	E	5	CLPW	3.33000	0.61000	2.72000		
8/6/2019	TKE	E	1	CLPW	4.39000	0.16000	4.23000		
8/6/2019	TKE	E	2	CLPW	4.81000	0.17000	4.64000		
8/6/2019	TKE	E	3	CLPW	3.76000	0.14000	3.62000		
8/6/2019	TKE	E	4	CLPW	3.21000	0.12000	3.09000		
8/6/2019	TKE	E	5	CLPW	4.94000	0.19000	4.75000		
9/24/2019	TKE	E	1	CLPW	1.43000	0.27000	1.16000		
9/24/2019	TKE	E	2	CLPW	2.80000	0.48000	2.32000		
9/24/2019	TKE	E	3	CLPW	1.66000	0.29000	1.37000		
9/24/2019	TKE	E	4	CLPW	1.21000	0.23000	0.98000		

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9/24/2019	TKE	E	5	CLPW	1.81000	0.33000	1.48000		
11/13/2019	TKE			CLPW	1.69516	0.34156	1.35360	2.17	27.51
4/1/2020	TKE	B		CLPW	6.10812	0.23034	5.87778	3.98	48.28
4/1/2020	TKE	C		CLPW	8.53170	0.31811	8.21359		
4/1/2020	TKE			CLPW	3.57161	0.33153	3.24008	4.23	43.48
5/28/2020	TKE	E	1	CLPW	4.83000	0.91000	3.92000		
5/28/2020	TKE	E	2	CLPW	3.31000	0.31000	3.00000		
5/28/2020	TKE	E	3	CLPW	11.44000	0.91000	10.53000		
5/28/2020	TKE	E	5	CLPW	5.47000	0.21000	5.26000		
6/22/2020	TKE	1		CLPW	5.60000	0.66000	4.94000	1.68	38.12
6/22/2020	TKE	B		CLPW	9.88078	0.90885	8.97193	2.26	38.15
6/22/2020	TKE	B		CLPW	7.63402	0.28943	7.34459	2.41	36.79
6/22/2020	TKE	D		CLPW	1.61313	0.22596	1.38717	2.21	36.16
6/22/2020	TKE		rake 2	CLPW	7.87780	0.29530	7.58250	3.42	39.71
6/22/2020	TKE		rake 3	CLPW	2.48860	0.23855	2.25005	2.49	43.95
6/22/2020	TKE		Rake1	CLPW	8.29241	0.30840	7.98400	2.40	39.83
7/27/2020	TKE	A		CLPW	23.52462	4.19374	19.33088	1.77	35.78
7/27/2020	TKE	C		CLPW	41.22756	7.58387	33.64369	2.65	37.63
7/27/2020	TKE	D		CLPW	3.58080	0.32326	3.25754	1.83	35.07
7/27/2020	TKE		B	CLPW	5.29000	0.98000	4.31000	1.75	34.48
8/24/2020	TKE	B		CLPW	31.12874	2.82216	28.30658	2.31	34.80
8/24/2020	TKE	D		CLPW	252.30509	46.59611	205.70897	1.93	34.60
10/13/2020	TKE		C	LPW sprou	11.91340	2.29307	9.62033	3.69	35.46
10/13/2020	TKE		D	LPW sprouts				0.61	40.04
10/13/2020	TK	E	D	CLPW				3.04	35.56
5/4/2021	TKE	E	A	CLPW	2.88502	0.05427			
5/4/2021	TKE	E	B	CLPW	8.47506	15.10150			
5/4/2021	TKE	E	C	CLPW	20.38362	1.82929			
6/30/2021	TKE	E	A	CLPW	9.51209	0.34343		1.24	39.22
6/30/2021	TKE	E	B	CLPW	5.65566	1.04055		1.36	33.95
6/30/2021	TKE	E	C	CLPW	2.87847	0.26870		2.01	30.41
6/30/2021	TKE	E	D	CLPW	3.26047	0.29450		2.37	37.76
6/3/2019	TKE	E		coontail	4.02000	0.16000	3.86000		
6/3/2019	TKE		A	coontail	2.64000	0.26000	2.38000		
6/3/2019	TKE		B	coontail	7.78000	0.71000	7.07000		
6/3/2019	TKE		C	coontail	2.43000	0.24000	2.19000		
6/3/2019	TKE		D	coontail	2.95000	0.29000	2.66000		
7/8/2019	TKE	E	1	coontail	9.61000	0.39000	9.22000		
7/8/2019	TKE	E	2	coontail	5.79000	0.55000	5.24000		
7/8/2019	TKE	E	3	coontail	11.71000	0.51000	11.20000		
7/8/2019	TKE	E	4	coontail	8.34000	0.80000	7.54000		
7/8/2019	TKE	E	5	coontail	14.55000	1.38000	13.17000		
8/6/2019	TKE	E	1	coontail	4.98000	0.18000	4.80000		
8/6/2019	TKE	E	2	coontail	8.24000	0.30000	7.94000		
8/6/2019	TKE	E	3	coontail	7.75000	0.77000	6.98000		
8/6/2019	TKE	E	4	coontail	6.52000	0.69000	5.83000		
8/6/2019	TKE	E	5	coontail	7.44000	0.71000	6.73000		

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9/24/2019	TKE	E	1	coontail	2.92000	0.15000	2.77000		
9/24/2019	TKE	E	2	coontail	4.39000	0.17000	4.22000		
9/24/2019	TKE	E	3	coontail	6.34000	0.56000	5.78000		
9/24/2019	TKE	E	4	coontail	7.03000	0.67000	6.36000		
9/24/2019	TKE	E	5	coontail	10.14000	0.36000	9.78000		
10/14/2019	TKE			coontail	1.29000	0.11000	1.18000	2.27	24.84
11/13/2019	TKE			coontail	1.06041	0.10278	0.95763	2.13	27.89
4/1/2020	TKE			coontail	1.21340	0.11565	1.09775	2.72	30.30
4/1/2020	TKE			coontail	4.83231	0.45356	4.37875	3.35	39.60
6/22/2020	TKE	1		coontail	4.92000	0.87000	4.05000	2.07	35.51
6/22/2020	TKE	D		coontail	3.75081	0.35610	3.39471	1.95	37.06
7/27/2020	TKE	A		coontail	5.84687	0.21928	5.62759	1.87	36.58
7/27/2020	TKE	C		coontail	361.42505	33.41132	328.01372	2.56	35.10
7/27/2020	TKE	D		coontail	110.94134	10.37476	100.56658	2.43	33.74
7/27/2020	TKE		B	coontail	2.75000	0.51000	2.24000	2.80	40.85
8/24/2020	TKE	A		coontail	8.48525	0.32113	8.16413	3.28	35.89
8/24/2020	TKE	C		coontail	11.35404	0.42566	10.92839	3.91	42.43
9/22/2020	TKE	A		coontail	6.96405	0.64967	6.31438	1.71	38.54
9/22/2020	TKE	B		coontail	12.66001	0.47287	12.18714	2.82	37.45
9/22/2020	TKE	C		coontail	8.05514	0.74625	7.30889	2.09	38.99
9/22/2020	TKE	D		coontail	11.07077	1.03704	10.03373	2.77	37.03
10/13/2020	TK	E	A	coontail				1.95	35.43
10/13/2020	TK	E	B	coontail				2.08	35.15
10/13/2020	TK	E	D	coontail				1.92	35.78
5/4/2021	TKE	E	A	coontail	2.62396	0.24406		2.37	37.16
5/4/2021	TKE	E	B	coontail	25.24155	2.35509		3.37	39.89
5/4/2021	TKE	E	C	coontail	5.82184	0.53871		2.72	30.99
5/4/2021	TKE	E	D	coontail	5.53470	0.10436		3.93	40.40
6/30/2021	TKE	E	A	coontail	14.53342	0.54050		2.88	41.06
6/30/2021	TKE	E	B	coontail	1.66775	0.15523		1.14	31.29
6/30/2021	TKE	E	C	coontail	2.27913	0.08270		1.98	32.63
6/30/2021	TKE	E	C	coontail	4.34056	0.39650		2.26	33.25
6/30/2021	TKE	E	D	coontail	6.01871	0.55188		2.30	35.75
7/8/2019	TKE	E	1	Elodea	9.37000	0.88000	8.49000		
7/8/2019	TKE	E	2	elodea	18.45000	1.78000	16.67000		
7/8/2019	TKE	E	3	elodea	1.68000	0.17000	1.51000		
7/8/2019	TKE	E	4	elodea	2.68000	0.27000	2.41000		
7/8/2019	TKE	E	5	elodea	2.46000	0.25000	2.21000		
8/6/2019	TKE	E	1	Elodea	6.32000	0.23000	6.09000		
8/6/2019	TKE	E	2	Elodea	2.81000	0.12000	2.69000		
8/6/2019	TKE	E	3	Elodea	4.23000	0.16000	4.07000		
8/6/2019	TKE	E	4	Elodea	8.26000	0.28000	7.98000		
8/6/2019	TKE	E	5	Elodea	5.82000	0.63000	5.19000		
10/14/2019	TKE			elodea	3.93000	0.67000	3.26000	1.77	29.13
11/13/2019	TKE			elodea	3.04400	0.58904	2.45495	2.47	30.11
4/1/2020	TKE			elodea	4.30668	0.41883	3.88785	2.98	35.02
6/19/2020	TKE	E	1	Elodea	1.58000	0.32000	1.26000		

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6/19/2020	TKE	E	2	Elodea	1.70000	0.39000	1.31000		
6/19/2020	TKE	E	3	Elodea	2.23000	0.47000	1.76000		
6/19/2020	TKE	E	4	Elodea	1.73000	0.38000	1.35000		
6/19/2020	TKE	E	5	Elodea	1.09000	0.26000	0.83000		
6/22/2020	TKE	1		elodea	7.29000	0.69000	6.60000	1.74	36.52
6/22/2020	TKE	B		elodea	3.98451	0.37580	3.60871	2.59	38.80
6/22/2020	TKE	C		elodea	15.37324	1.45661	13.91663	2.21	36.70
6/22/2020	TKE	D		elodea	5.95920	0.56673	5.39247	2.56	38.03
6/22/2020	TKE		Rake1	elodea	9.31854	1.72949	7.58905	2.73	43.80
6/22/2020	TKE		rake 2	elodea	6.33217	0.60982	5.72235	2.80	44.48
6/22/2020	TKE		rake 3	elodea	1.47919	0.28255	1.19664	3.68	48.97
7/27/2020	TKE	A		elodea	8.34656	0.79149	7.55508	2.89	38.40
7/27/2020	TKE	C		elodea	34.47378	6.26940	28.20438	2.15	36.52
8/24/2020	TKE	A		elodea	38.68995	1.42542	37.26453	2.71	34.81
8/24/2020	TKE	B		elodea	10.40546	0.96721	9.43825	2.66	41.19
8/24/2020	TKE	C		elodea	29.00242	2.73619	26.26623	4.60	42.99
8/24/2020	TKE	D		elodea	12.72130	1.10294	11.61836	3.31	35.83
9/22/2020	TKE	A		elodea	29.04907	1.09319	27.95588	3.19	39.01
9/22/2020	TKE	B		elodea	33.15023	1.24696	31.90327	2.09	35.45
9/22/2020	TKE	D		elodea	0.33741	0.06370	0.27371	3.70	35.63
10/13/2020	TK	E	A	elodea				3.57	38.28
10/13/2020	TK	E	B	elodea				2.93	35.54
10/13/2020	TK	E	D	elodea				2.48	34.92
5/4/2021	TKE	E	A	elodea	3.14751	0.29458			
6/30/2021	TKE	E	B	elodea	8.15348	0.72558			
6/30/2021	TKE	E	C	elodea	13.32101	1.23899		2.22	31.66
6/30/2021	TKE	E	D	elodea	12.28809	1.15842		2.63	36.47
7/8/2019	TKE	E	1	LPW	5.91000	0.54000	5.37000		
7/8/2019	TKE	E	2	LPW	4.51000	0.43000	4.08000		
7/8/2019	TKE	E	3	LPW	4.34000	0.82000	3.52000		
7/8/2019	TKE	E	4	LPW	5.04000	0.91000	4.13000		
7/8/2019	TKE	E	5	LPW	3.14000	0.28000	2.86000		
8/6/2019	TKE	E	1	LPW	3.47000	0.32000	3.15000		
8/6/2019	TKE	E	2	LPW	2.99000	0.54000	2.45000		
8/6/2019	TKE	E	3	LPW	2.08000	0.07000	2.01000		
8/6/2019	TKE	E	4	LPW	8.97000	0.84000	8.13000		
8/6/2019	TKE	E	5	LPW	3.59000	0.14000	3.45000		
5/28/2020	TKE	E	1	LPW	5.99000	0.22000	5.77000		
5/28/2020	TKE	E	3	LPW	3.34000	0.30000	3.04000		
5/28/2020	TKE	E	3	LPW	5.40000	0.99000	4.41000		
5/28/2020	TKE	E	4	LPW	1.36000	0.29000	1.07000		
5/28/2020	TKE	E	?	LPW	3.20000	0.30000	2.90000		
6/22/2020	TKE	1		LPW	3.22000	0.31000	2.91000	1.78	37.96
6/22/2020	TKE	B		LPW	8.11432	0.76208	7.35224	2.62	41.18
6/22/2020	TKE	C		LPW	3.65667	0.67849	2.97818		
6/22/2020	TKE	D		LPW	4.34074	0.80506	3.53568	1.98	36.67
6/22/2020	TKE		rake 2	LPW	6.38127	0.24012	6.14115	2.81	39.25

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6/22/2020	TKE		rake 3	LPW	1.82190	0.16923	1.65267	2.33	34.51
6/22/2020	TKE		Rake1	LPW	12.69529	1.16803	11.52725	2.82	39.89
7/27/2020	TKE	A		LPW	6.24330	0.57659	5.66670		
7/27/2020	TKE	C		LPW	18.44929	1.69730	16.75199	2.72	43.93
7/27/2020	TKE	D		LPW	15.06520	2.80234	12.26286	2.31	36.20
7/27/2020	TKE		B	LPW	4.33000	0.81000	3.52000	1.30	40.22
8/24/2020	TKE	D		LPW	402.63404	73.77255	328.86149	4.69	40.35
5/4/2021	TKE	E	A	LPW	2.68030	0.48992			
5/4/2021	TKE	E	B	LPW	4.81381	0.43848		2.33	35.90
5/4/2021	TKE	E	C	LPW	4.64097	0.42241		2.89	35.05
5/4/2021	TKE	E	D	LPW	3.53587	0.64730			
6/30/2021	TKE	E	B	LPW	6.04100	0.21957		1.89	36.32
6/30/2021	TKE	E	D	LPW	14.54733	1.34711		1.85	33.50
6/3/2019	TKE	E		milfoil	2.08000	0.30000	1.78000		
6/3/2019	TKE		A	milfoil	4.56000	0.45000	4.11000		
6/3/2019	TKE		B	milfoil	3.05000	0.65000	2.40000		
6/3/2019	TKE		C	milfoil	11.37000	0.94000	10.43000		
7/8/2019	TKE	E	1	Milfoil	6.24000	0.60000	5.64000		
7/8/2019	TKE	E	2	milfoil	4.30000	0.41000	3.89000		
7/8/2019	TKE	E	3	milfoil	4.03000	0.39000	3.64000		
7/8/2019	TKE	E	4	milfoil	6.67000	0.65000	6.02000		
7/8/2019	TKE	E	5	milfoil	4.16000	0.17000	3.99000		
8/6/2019	TKE	E	1	milfoil	2.90000	0.29000	2.61000		
8/6/2019	TKE	E	2	milfoil	7.30000	0.27000	7.03000		
8/6/2019	TKE	E	3	milfoil	7.12000	0.27000	6.85000		
8/6/2019	TKE	E	4	milfoil	7.65000	0.28000	7.37000		
8/6/2019	TKE	E	5	milfoil	4.40000	0.16000	4.24000		
9/24/2019	TKE	E	1	milfoil	6.67000	0.27000	6.40000		
9/24/2019	TKE	E	2	milfoil	2.71000	0.26000	2.45000		
9/24/2019	TKE	E	3	milfoil	4.29000	0.17000	4.12000		
9/24/2019	TKE	E	4	milfoil	2.35000	0.28000	2.07000		
9/24/2019	TKE	E	5	milfoil	6.19000	0.24000	5.95000		
10/14/2019	TKE			milfoil	1.13000	0.18000	0.95000	1.91	27.49
11/13/2019	TKE			milfoil	7.02123	0.28729	6.73394	3.18	32.82
4/1/2020	TKE	B		milfoil	9.09256	0.86936	8.22320	1.87	40.72
4/1/2020	TKE	C		milfoil	3.66609	0.14298	3.52311		
4/1/2020	TKE			milfoil	5.69322	0.21798	5.47524	3.39	39.01
5/28/2020	TKE	E	1	milfoil	1.88000	0.64000	1.24000		
5/28/2020	TKE	E	2	milfoil	3.07000	0.31000	2.76000		
5/28/2020	TKE	E	3	milfoil	4.76000	0.46000	4.30000		
5/28/2020	TKE	E	4	milfoil	6.39000	1.18000	5.21000		
5/28/2020	TKE	E	5	milfoil	4.01000	0.15000	3.86000		
6/19/2020	TKE	E	1	milfoil	1.38000	0.58000	0.80000		
6/19/2020	TKE	E	2	milfoil	1.03000	0.16000	0.87000		
6/19/2020	TKE	E	3	milfoil	1.05000	0.36000	0.69000		
6/19/2020	TKE	E	4	milfoil	1.36000	0.46000	0.90000		
6/19/2020	TKE	E	5	milfoil	0.90000	0.17000	0.73000		

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6/22/2020	TKE	1		milfoil	4.44000	0.43000	4.01000	1.73	39.11
6/22/2020	TKE	B		Milfoil	3.45808	0.34416	3.11392	2.31	41.16
6/22/2020	TKE	C		Milfoil	0.33221	0.01283	0.31938	2.19	39.32
6/22/2020	TKE	D		Milfoil	1.40854	0.05812	1.35042	2.36	37.59
6/22/2020	TKE		Rake1	milfoil	4.81863	0.44768	4.37095	2.35	40.81
6/22/2020	TKE		rake 2	milfoil	4.19304	0.42094	3.77211	1.99	38.79
6/22/2020	TKE		rake 3	Milfoil	1.18299	0.22443	0.95855	2.17	42.05
7/27/2020	TKE	B		milfoil	16.14900	1.54184	14.60716	2.48	37.76
7/27/2020	TKE	C		milfoil	76.99905	2.93461	74.06444	2.92	39.24
7/27/2020	TKE	D		milfoil	21.85324	0.83833	21.01491	1.93	37.07
7/27/2020	TKE		B	milfoil	5.80000	0.55000	5.25000		
8/24/2020	TKE	A		MIlfoil	7.67272	1.42373	6.24899	2.45	38.41
8/24/2020	TKE	B		milfoil	24.85650	0.92332	23.93318	2.99	38.56
8/24/2020	TKE	C		Milfoil	12.03219	0.45577	11.57642	2.44	42.68
8/24/2020	TKE	D		Milfoil	79.19438	2.99746	76.19692	2.68	37.62
9/22/2020	TK	E	A	milfoil				1.82	38.16
9/22/2020	TKE	B		Milfoil	17.29399	1.63353	15.66046	3.63	43.42
9/22/2020	TKE	C		Milfoil	46.19615	4.32199	41.87416	2.98	38.40
9/22/2020	TKE	D		Milfoil	167.15573	15.72330	151.43243	2.35	38.91
10/1/2020	TK	E	B	milfoil				3.07	42.43
10/13/2021	TK	E	A	milfoil				2.27	40.12
10/13/2020	TK	E	D	milfoil				1.97	38.46
5/4/2021	TKE	E	A	milfoil	5.66162	0.21603			
5/4/2021	TKE	E	B	milfoil	5.54884	0.52474			
5/4/2021	TKE	E	C	milfoil	5.52619	0.52013		3.58	42.36
5/4/2021	TKE	E	D	milfoil	6.61564	0.12672			
6/30/2021	TKE	E	B	Milfoil	8.96362	0.82532		2.96	42.84
6/30/2021	TKE	E	C	milfoil	6.77436	0.26236		2.39	32.68
6/30/2021	TKE	E	D	Milfoil	6.66746	0.24829		3.16	36.19
6/3/2019	TKE	E		milfoil (rep 2	3.59000	0.35000	3.24000		
7/8/2019	TKE	E	1	RPW	3.08000	0.28000	2.80000		
7/8/2019	TKE	E	2	RPW	1.38000	0.13000	1.25000		
7/8/2019	TKE	E	3	RPW	1.83000	0.16000	1.67000		
7/8/2019	TKE	E	4	RPW	2.74000	0.26000	2.48000		
7/8/2019	TKE	E	5	RPW	2.90000	0.27000	2.63000		
8/6/2019	TKE	E	1	RPW	1.46000	0.14000	1.32000		
8/6/2019	TKE	E	2	RPW	7.66000	0.72000	6.94000		
8/6/2019	TKE	E	3	RPW	1.62000	0.16000	1.46000		
8/6/2019	TKE	E	4	RPW	2.30000	0.22000	2.08000		
8/6/2019	TKE	E	5	RPW	4.93000	0.48000	4.45000		
10/14/2019	TKE			RPW	1.02000	0.07000	0.95000	0.99	20.16
11/13/2019	TKE			RPW	1.26950	0.11171	1.15779	1.02	17.49
5/28/2020	TKE	E	1	RPW	5.02000	0.20000	4.82000		
5/28/2020	TKE	E	2	RPW	4.10000	0.16000	3.94000	3.18	-0.21
5/28/2020	TKE	E	3	RPW	5.06000	0.98000	4.08000		
5/28/2020	TKE	E	4	RPW	14.65000	1.36000	13.29000		
5/28/2020	TKE	E	5	RPW	1.10000	0.40000	0.70000	3.16	39.02

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6/19/2020	TKE	E	1	RPW	4.09000	0.41000	3.68000		
6/22/2020	TKE	1		RPW	2.40000	0.25000	2.15000	2.38	36.99
6/22/2020	TKE	B		RPW	3.71700	0.14339	3.57361	2.69	42.20
6/22/2020	TKE		rake 2	RPW	6.17251	0.24087	5.93164	2.90	39.94
6/22/2020	TKE		Rake1	RPW	6.94516	0.25859	6.68657	3.97	41.94
7/27/2020	TKE	A		RPW	4.39891	0.16092	4.23799	1.66	25.23
7/27/2020	TKE		B	RPW	1.55000	0.14000	1.41000	1.36	31.59
7/27/2020	TKE	C		RPW	6.99417	0.25172	6.74245	2.53	40.50
7/27/2020	TKE	D		RPW	4.31840	0.40275	3.91565	1.96	29.83
8/24/2020	TKE	A		RPW	9.98678	0.36999	9.61680	1.67	37.00
8/24/2020	TKE	B		RPW	2.38919	0.22041	2.16878	3.50	41.08
8/24/2020	TKE	C		RPW	6.81806	0.25061	6.56745	3.13	37.60
8/24/2020	TKE	D		RPW	10.44696	0.38529	10.06167	3.35	42.29
9/22/2020	TKE	A		RPW	4.88178	0.44652	4.43526	2.01	38.85
9/22/2020	TKE	B		RPW	5.44838	0.20011	5.24826	2.52	35.08
6/30/2021	TKE	E	C	RPW	4.67570	0.42942		1.62	29.37
10/13/2020	TK	E	A	RPW				2.34	34.49
10/15/2020	TK	E	B	RPW				1.42	36.46
7/8/2019	TKE	E		spiro gyra	4.68000	0.92000	3.76000		
5/4/2021	TKE	E	B	routed turi	2.24246	0.21385		1.62	38.52
6/30/2021	TKE	E	A	turion	7.54740	0.27564		2.06	34.89
6/30/2021	TKE	E	B	turion	2.21133	0.20810		0.82	39.53
6/30/2021	TKE	E	C	turion	1.26544	0.23356		1.81	26.70
6/30/2021	TKE	E	D	turion	3.01145	1.86471		1.05	34.80
8/6/2019	TKE	E		unk?	3.13000	0.63000	2.50000		
9/22/2020	TKE	A		Milfoil	10.02636	0.37535	9.65101		
11/13/2019	TKT			algae	0.28000	0.05000	0.23000	2.91	26.48
4/1/2020	TKT	T	B	algae	0.65000	0.24000	0.41000		
5/28/2020	TKT	T		algae	5.99000	0.23000	5.76000		
6/22/2020	TKT	A		algae	4.38909	0.16747	4.22162	3.17	38.95
6/22/2020	TKT	rake 3		algae	4.38940	1.71648	2.67292	2.80	37.45
6/22/2020	TKT	T	4	algae	14.65000	2.68000	11.97000		
6/22/2020	TKT		2	algae	2.71943	0.10067	2.61876	2.48	34.78
6/22/2020	TKT		3	algae	5.71059	0.11068	5.59991	1.06	44.77
7/27/2020	TKT	C		algae	5.97990	0.58628	5.39362	3.06	36.59
8/24/2020	TKT	A		algae	5.81979	0.55414	5.26565	3.79	40.41
8/24/2020	TKT	C		algae	4.11831	0.15486	3.96345	3.14	35.90
5/4/2021	TKT	T	A	algae	7.77215	0.70370		2.83	34.50
5/4/2021	TKT	T	B	algae	2.29596	0.08528		1.83	38.93
5/4/2021	TKT	T	C	algae	4.85621	0.17380		2.67	37.64
6/30/2021	TKT	T	B	algae	14.51994	1.32962		1.84	28.12
11/13/2019	TKT			CLPW	1.13000	0.42000	0.71000		
4/1/2020	TKT	T	A	CLPW	5.35000	1.01000	4.34000		
4/1/2020	TKT	T	B	CLPW	4.92000	0.46000	4.46000		
4/1/2020	TKT	T	C	CLPW	1.88000	0.39000	1.49000		
5/28/2020	TKT	T		CLPW	4.02000	0.79000	3.23000		
6/22/2020	TKT	A		CLPW	8.90380	0.33220	8.57160	2.59	36.99

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6/22/2020	TKT	rake 1		CLPW	5.28959	0.47627	4.81331	2.66	40.08
6/22/2020	TKT	rake 3		CLPW	5.78779	0.52498	5.26281	2.55	39.28
6/22/2020	TKT	T	4	CLPW	13.24000	0.54000	12.70000		
6/22/2020	TKT	T	rake 2	CLPW	4.72000	0.47000	4.25000		
6/22/2020	TKT		2	CLPW	68.01096	2.49606	65.51490	3.03	37.60
6/22/2020	TKT		3	CLPW	50.06631	0.93099	49.13532	2.32	38.43
7/27/2020	TKT	B		CLPW	28.60825	2.57579	26.03246	1.66	35.67
7/27/2020	TKT	C		CLPW	4.89172	0.92719	3.96453	1.99	35.35
7/27/2020	TKT	D		CLPW	21.31664	1.93252	19.38412	1.51	33.71
10/13/2020	TKT		A	CLPW	17.47349	6.28535	11.18814	2.37	40.67
10/13/2020	TK	T	B	CLPW				3.30	43.69
10/13/2020	TK	T	D	CLPW				2.71	37.19
11/13/2020	TK	T		CLPW				1.84	28.91
12/3/2020	TKT	A		CLPW	1.94129	0.36307	1.57822	2.85	29.86
12/3/2020	TKT	C		CLPW	2.22342	0.41160	1.81182	2.46	43.51
12/3/2020	TK	T	D	CLPW				1.66	43.13
5/4/2021	TKT	T	A	CLPW	5.47156	0.20386		5.05	44.99
5/4/2021	TKT	T	B	CLPW	3.67655	0.13480			
5/4/2021	TKT	T	C	CLPW	21.67960	1.96133		5.83	39.04
5/4/2021	TKT	T	D	CLPW	4.11252	0.37196			
6/30/2021	TKT	T	A	CLPW	4.21347	0.15411		1.83	38.01
6/30/2021	TKT	T	B	CLPW	13.01306	1.16981		1.51	37.22
6/30/2021	TKT	T	D	CLPW	31.19404	1.14739		2.30	31.80
10/13/2020	TKT		D	LPW sprou	9.97718	0.36410	9.61308	0.86	41.38
12/3/2020	TKT	D		CLPW w/ turi	4.75367	2.88042	1.87325		
10/14/2019	TKT			coontail	6.15000	0.59000	5.56000	2.09	34.18
11/13/2019	TKT			coontail	2.18000	0.79000	1.39000		
4/1/2020	TKT	T	B	coontail	2.74000	0.26000	2.48000		
4/1/2020	TKT	T	C	coontail	3.71000	0.13000	3.58000		
6/22/2020	TKT	A		coontail	5.09568	0.19215	4.90353	2.83	37.92
6/22/2020	TKT	rake 1		coontail	9.40184	0.34889	9.05295	3.47	37.37
6/22/2020	TKT	rake 3		coontail	5.50699	0.20770	5.29929	3.66	43.53
6/22/2020	TKT	T	4	coontail	0.07000	0.01000	0.06000		
6/22/2020	TKT	T	rake 2	coontail	3.77000	0.36000	3.41000		
6/22/2020	TKT		2	coontail	5.75603	0.21653	5.53950	2.22	36.24
6/22/2020	TKT		rake 3	coontail	3.82366	0.15289	3.67077		
7/27/2020	TKT	A		coontail	13.26541	0.24826	13.01715	4.00	41.67
7/27/2020	TKT	C		coontail	30.37804	2.84688	27.53116	3.06	38.38
7/27/2020	TKT		B	coontail	74.43000	6.89000	67.54000	2.28	36.57
8/24/2020	TKT	A		coontail	8.33581	0.81692	7.51889	2.03	34.20
8/24/2020	TKT	B		coontail	11.55781	1.10999	10.44782		
8/24/2020	TKT	C		coontail	7.34463	0.67955	6.66508	2.55	35.06
9/22/2020	TKT	A		coontail	3.73491	0.14144	3.59348	2.38	39.20
9/22/2020	TKT	B		coontail	10.05096	0.96442	9.08654	2.58	36.03
9/22/2020	TKT	D		coontail	1.50786	0.28138	1.22647	1.76	37.53
10/13/2020	TKT	A		coontail	7.04055	0.64788	6.39267	2.49	38.98
10/13/2020	TK	T	B	coontail				2.79	35.48

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10/13/2020	TKT		C	coontail	5.49244	1.01741	4.47503	2.32	37.12
12/3/2020	TKT	A		coontail	6.40680	0.59704	5.80975	2.88	36.80
12/3/2020	TKT	B		coontail	4.49874	0.41629	4.08245	2.85	38.11
12/3/2020	TKT	D		coontail	2.64762	0.24731	2.40030	2.53	34.40
5/4/2021	TKT	T	A	coontail	5.23849	0.19116			
5/4/2021	TKT	T	B	coontail	3.28038	0.12347			
5/4/2021	TKT	T	C	coontail	6.06995	0.22943		3.73	41.23
5/4/2021	TKT	T	D	coontail	2.14997	0.07891			
6/30/2021	TKT	T	A	coontail	8.92906	0.32656			
6/30/2021	TKT	T	B	coontail	3.03527	0.11473			
6/30/2021	TKT	T	D	coontail	7.06856	0.24754		2.08	28.90
8/24/2020	TKT	B		decay	7.63821	1.44111	6.19710	2.93	36.80
8/24/2020	TKT	D		decay	7.90222	1.48942	6.41279	2.50	35.10
9/22/2020	TKT	B		decay	2.59117	0.51983	2.07134	2.19	38.61
9/22/2020	TKT	C		decay	0.91298	0.17806	0.73493	2.36	38.74
9/22/2020	TKT	D		decay	3.60368	0.30602	3.29766	2.23	41.69
10/14/2019	TKT			elodea	4.16000	0.82000	3.34000	0.94	35.30
11/13/2019	TKT			elodea	3.90000	0.71000	3.19000	3.10	32.75
4/1/2020	TKT	T	B	elodea	2.40000	0.90000	1.50000		
4/1/2020	TKT	T	C	elodea	6.25000	2.33000	3.92000	2.30	35.88
6/22/2020	TKT	A		elodea	5.71620	0.54876	5.16744	2.58	36.61
6/22/2020	TKT	T	4	elodea	9.80000	0.98000	8.82000		
6/22/2020	TKT		2	elodea	1.23097	0.23273	0.99824	1.70	36.61
7/27/2020	TKT	C		elodea	17.82837	1.67206	16.15630		
7/27/2020	TKT		D	elodea	149.13000	5.48000	143.65000	3.66	36.99
8/24/2020	TKT	A		elodea	21.39442	2.02516	19.36925	2.43	37.07
8/24/2020	TKT	C		elodea	15.34300	0.58001	14.76299	2.81	37.74
9/22/2020	TKT	D		elodea	13.74386	1.31516	12.42869	2.16	38.81
10/13/2020	TKT		A	elodea	8.10522	0.29790	7.80732	2.26	38.02
12/3/2020	TKT	A		elodea	6.48153	1.22971	5.25182	2.69	34.39
12/3/2020	TKT	B		elodea	6.13205	3.83316	2.29889	0.58	44.68
5/4/2021	TKT	T	A	elodea	41.88357	1.54562		3.73	35.59
6/30/2021	TKT	T	B	elodea	11.54183	1.07419		2.06	30.80
6/30/2021	TKT	T	D	elodea	6.31344	0.23735		2.37	33.89
5/28/2020	TKT	T		LPW	1.66000	0.16000	1.50000	3.59	39.86
6/22/2020	TKT	A		LPW	6.40690	0.23929	6.16761	2.92	41.81
6/22/2020	TKT	rake 1		LPW	4.60993	0.83568	3.77424	3.61	42.50
6/22/2020	TKT	rake 3		LPW	4.09339	0.77527	3.31812	3.24	41.33
6/22/2020	TKT	T	4	LPW	5.05000	0.94000	4.11000		
6/22/2020	TKT		2	LPW	4.89211	0.45231	4.43980	2.37	37.85
6/22/2020	TKT		rake 3	LPW	15.02273	0.55815	14.46458		
7/27/2020	TKT	A		LPW	10.44517	0.96776	9.47741	1.91	39.75
7/27/2020	TKT	B		LPW	29.66905	2.72445	26.94460	2.30	39.01
7/27/2020	TKT	C		LPW	27.83640	2.58311	25.25329	2.16	38.71
7/27/2020	TKT	D		LPW	16.51454	3.06227	13.45227	2.39	38.92
8/24/2020	TKT	B		LPW	275.38586	172.98037	102.40549	2.42	37.34
5/4/2021	TKT	T	A	LPW	24.84356	0.89292		3.55	33.01

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5/4/2021	TKT	T	B	LPW	7.29948	0.66186		3.38	38.13
5/4/2021	TKT	T	C	LPW	8.21068	0.29800			
5/4/2021	TKT	T	D	LPW	18.52026	3.33558		2.79	37.50
6/30/2021	TKT	T	A	LPW	14.89666	1.35009		1.34	40.16
6/30/2021	TKT	T	B	LPW	6.79692	0.63039		2.11	36.06
6/30/2021	TKT	T	D	LPW	34.24681	3.15126		2.98	36.66
10/14/2019	TKT			milfoil	8.38000	0.33000	8.05000	2.50	38.39
11/13/2019	TKT			milfoil	2.67000	0.28000	2.39000		
4/1/2020	TKT	T	A	milfoil	5.07000	1.93000	3.14000		
4/1/2020	TKT	T	B	milfoil	2.27000	0.10000	2.17000		
4/1/2020	TKT	T	C	milfoil	3.98000	0.16000	3.82000		
6/22/2020	TKT	A		Milfoil	11.82022	0.22852	11.59170	2.04	36.77
6/22/2020	TKT	rake 3		milfoil	2.11274	0.08097	2.03177	1.76	38.38
6/22/2020	TKT	T	4	milfoil	10.87000	1.03000	9.84000		
6/22/2020	TKT		2	milfoil	3.50393	0.13138	3.37255	2.47	40.24
7/27/2020	TKT	B		milfoil	13.81949	1.28533	12.53416	2.67	35.37
7/27/2020	TKT	D		Milfoil	17.42434	1.63347	15.79087	2.47	36.28
8/24/2020	TKT	B		Milfoil	16.87827	1.58282	15.29545	2.32	33.22
8/24/2020	TKT	C		milfoil	4.69999	0.17735	4.52264	3.70	42.13
9/22/2020	TKT	A		Milfoil	308.51615	29.59407	278.92208	1.96	35.30
9/22/2020	TKT	B		Milfoil	11.63950	1.13817	10.50132	2.14	47.95
10/13/2020	TKT		A	milfoil	6.23601	0.22641	6.00960	2.30	38.75
10/13/2020	TK	T	B	milfoil				2.91	37.97
12/3/2020	TKT	B		milfoil	290.06675	55.36131	234.70544		
6/30/2021	TKT	T	B	Milfoil	8.45160	0.32010		1.98	28.69
6/30/2021	TKT	T	D	Milfoil	9.69951	0.36381		2.98	38.59
10/14/2019	TKT			RPW	4.54000	0.79000	3.75000	1.03	22.90
11/13/2019	TKT			RPW	1.03000	0.19000	0.84000		
7/27/2020	TKT	B		RPW	6.61771	0.60607	6.01164	2.25	29.90
7/27/2020	TKT	C		RPW	3.91130	0.36346	3.54785	1.81	31.42
7/27/2020	TKT	D		RPW	2.04659	0.18412	1.86247		
9/22/2020	TKT	B		turion	0.82942	0.07943	0.74999	0.58	42.77
6/30/2021	TKT	T	A	turion	1.83398	0.17025		2.07	35.22
6/30/2021	TKT	T	B	turion	4.44247	0.41737		1.64	39.85
6/30/2021	TKT	T	D	turion	5.58423	0.20367		2.48	29.92
11/13/2019	TKU		rake	algae	23.28000	4.34000	18.94000	2.73	34.21
5/4/2021	TKU	U	D	algae	38.69447	23.16339		4.27	37.65
5/28/2020	TKU	U	4	CLPW	7.86000	0.73000	7.13000		
6/22/2020	TKU	C		CLPW	17.13317	0.64613	16.48704	3.31	39.50
6/22/2020	TKU		rake 1	CLPW	19.68446	0.75235	18.93211	2.84	39.17
6/22/2020	TKU		rake 3	CLPW	9.55000	0.89000	8.66000	2.64	37.87
7/27/2020	TKU	A		CLPW	2.01137	3.56950	-1.55813	1.29	35.72
7/27/2020	TKU	D		CLPW	9.13000	0.92000	8.21000	2.37	37.85
7/27/2020	TKU		B	CLPW	24.79000	4.39000	20.40000	1.42	31.44
8/24/2020	TKU	rake	1	CLPW	1.39122	0.12115	1.27006	1.17	22.49
10/13/2020	TKU		C	CLPW	3.49947	2.06109	1.43838	2.83	36.49
5/4/2021	TKU	U	D	CLPW	33.02965	19.62612		9.46	152.82

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6/30/2021	TKU	U	A	CLPW	4.05507	0.14886		1.44	30.94
10/14/2019	TKU			coontail	4.25000	0.17000	4.08000		
11/13/2019	TKU		rake	coontail	5.94000	0.24000	5.70000	3.34	33.66
4/1/2020	TKU	U	A	coontail	2.34000	0.21000	2.13000		
4/1/2020	TKU	U	B	coontail	9.47000	0.87000	8.60000		
4/1/2020	TKU	U	C	coontail	1.10000	0.22000	0.88000	3.48	39.63
5/28/2020	TKU	U	rake	coontail	2.98000	0.13000	2.85000		
6/22/2020	TKU	C		coontail	17.81095	0.67035	17.14060		
6/22/2020	TKU	U	1	coontail	9.84000	0.89000	8.95000	2.53	26.31
6/22/2020	TKU	U	2	coontail	6.39000	0.23000	6.16000		
6/22/2020	TKU	U	4	coontail	5.84000	0.54000	5.30000	2.88	33.03
6/22/2020	TKU		rake 1	coontail	17.79705	0.68502	17.11203	4.39	42.50
6/22/2020	TKU		rake 3	coontail	7.08000	0.72000	6.36000	2.80	39.24
7/27/2020	TKU	A		coontail	31.45425	1.18216	30.27208	3.16	39.23
7/27/2020	TKU		B	coontail	11.46000	0.43000	11.03000	3.81	41.61
7/27/2020	TKU		D	coontail	12.05000	1.13000	10.92000	3.65	37.91
8/24/2020	TKU	rake	1	coontail	5.78047	0.11078	5.66969	3.51	40.78
8/24/2020	TKU	rake	2	coontail	6.03954	0.55275	5.48679	2.12	29.87
8/24/2020	TKU	rake	3	coontail	7.14702	0.13684	7.01018	2.68	38.20
9/22/2020	TKU	A		coontail	4.00599	0.37660	3.62938	1.86	38.57
9/22/2020	TKU	B		coontail	5.38456	0.49901	4.88555	1.70	39.24
9/22/2020	TKU	C		coontail	6.74694	0.62665	6.12029		
9/22/2020	TKU	D		coontail	3.49683	0.31844	3.17839	2.01	36.14
10/13/2020	TK	U	D	coontail				2.20	38.22
10/13/2020	TKU		C	coontail	1.75725	0.15997	1.59728	1.96	36.67
10/13/2020	TK	U	B	coontail				1.81	36.94
5/4/2021	TKU	U	A	coontail	11.81237	0.44036		3.12	39.79
5/4/2021	TKU	U	B	coontail	4.28921	0.15588			
5/4/2021	TKU	U	C	coontail	1.42689	0.13191			
5/4/2021	TKU	U	D	coontail	3.13022	0.12064			
6/30/2021	TKU	U	A	coontail	8.77113	0.32938			
6/30/2021	TKU	U	B	coontail	13.43465	0.53442		1.97	40.14
6/30/2021	TKU	U	C	coontail	1.95594	0.36692			
6/30/2021	TKU	U	D	coontail	4.29870	0.40139		0.65	36.44
6/30/2021	TKU	U	D	coontail	1.35506	0.12959			
9/22/2020	TKU	D		elodea	15.66207	2.91798	12.74410	1.59	41.77
5/4/2021	TKU	U	D	elodea	7.07612	0.67541			
6/30/2021	TKU	U	A	elodea	14.63650	1.39873		2.73	38.58
6/22/2020	TKU		rake 1	LPW	19.54652	11.96173	7.58479	4.80	46.23
5/4/2021	TKU	U	D	LPW	4.29877	0.38531		2.68	34.26
10/14/2019	TKU			milfoil	1.76000	0.17000	1.59000		
9/22/2020	TKU	A		Milfoil	6.30759	0.59783	5.70976	1.15	37.67
9/22/2020	TKU	B		Milfoil	11.15856	0.41942	10.73914	2.55	40.01
5/4/2021	TKU	U	D	milfoil	5.66303	0.53770		2.67	29.73
10/13/2020	TKU		C	turion	0.37685	0.07281	0.30404	0.59	40.70
7/27/2020	TKU	C		coontail	4.19685	0.08503	4.11182		

APPENDIX

E

BENTHIC MACROINVERTBRATE DATA

BMI Data 2019-2020

Location	date of collection	timeline	total # of organisms	Oligochaeta	Hirudinea	Turbellaria	Sphaeriidae	Corbiculidae	Trichoptera	Chironomidae	Amphipoda	Planorbidae	Ceratopogonidae	Hydrachnidia
Lakeside Beach	10/7/2019	pre UV Test 2019	97	29	1	2	29	16	0	15	5	0	0	0
Lakeside Marina	10/7/2019	pre UV Test 2019	no benthic sample collected due to presence of barrier mats											
Lakeside Beach- untested	11/22/2019	pre UV Test 2019	86	7	0	0	25	8	0	35	4	0	5	2
Lakeside Beach- tested	11/22/2019	post UV Test 2019	293	226	4	1	11	4	0	43	2	0	2	0
Lakeside Marina	11/22/2019	pre UV Test 2020	no benthic sample collected due to presence of barrier mats											
Lakeside Beach	7/14/2020	pre UV Test #1 2020	41	20	1	0	13	0	0	4	0	0	3	0
Lakeside Marina	7/14/2020	pre UV Test #1 2020	12	11	0	0	0	0	0	1	0	0	0	0
Lakeside Beach	8/27/2020	post UV Test #1 2020	90	82	1	0	2	2	1	2	0	0	0	0
Lakeside Marina	8/4/2020	post UV Test #1 2020	82	76	1	0	1	0	0	3	1	0	0	0
Lakeside Beach	10/7/2020	pre UV Test #2, 1 month post Test #1 2020, 1 year post 2019 test	sample lost											
Lakeside Marina	10/7/2020	pre UV Test #2, 1 month post Test #1 2020, 1 year post 2019 test	4	3	0	0	1	0	0	0	0	0	0	0
Lakeside Beach	12/4/2020	post UV Test #2 2020	474	380	4	16	22	6	0	29	10	0	7	0
Lakeside Marina	12/5/2020	post UV Test #2 2020	204	194	1	1	1	0	0	6	1	0	0	0
Total Number of Organisms			**1383**	**1028**	**13**	**20**	**105**	**36**	**1**	**138**	**23**	**0**	**17**	**2**

Lakeside Beach

date	Oligochaeta	Hirudinea	Turbellaria	Sphaeriidae	Corbiculidae	Trichoptera	Chironomidae	Amphipoda	Planorbidae	Ceratopogonidae	Hydrachnidia
10/7/2019	1261	43	87	1261	696	0	652	217	0	0	0
11/22/2019- untested	304	0	0	1087	348	0	1522	174	0	217	87
11/22/2019- tested	9826	174	43	478	174	0	1870	87	0	87	0
7/14/2020	870	43	0	565	0	0	174	0	0	130	0
8/27/2020	3565	43	0	87	87	43	87	0	0	0	0
12/4/2020	16522	174	696	957	261	0	1261	435	0	304	0

Lakeside Marina

date	Oligochaeta	Hirudinea	Turbellaria	Sphaeriidae	Corbiculidae	Trichoptera	Chironomidae	Amphipoda	Planorbidae	Ceratopogonidae	Hydrachnidia
7/14/2020	478.2608696	0	0	0	0	0	43.47826087	0	0	0	0
8/4/2020	3304.347826	43.47826087	0	43.47826087	0	0	130.4347826	43.47826087	0	0	0
10/7/2020	130.4347826	0	0	43.47826087	0	0	0	0	0	0	0
12/5/2020	8434.782609	43.47826087	43.47826087	43.47826087	0	0	260.8695652	43.47826087	0	0	0

BMI Data 2019-2020

Location	date of collection	timeline	total # of organisms per sq. m	Oligochaeta	Hirudinea	Turbellaria	Sphaeriidae	Corbiculidae	Trichoptera	Chironomidae	Amphipoda	Planorbidae	Ceratopogonidae	Hydrachnidia
Lakeside Beach	10/7/2019	pre UV Test 2019	4217	1261	43	87	1261	696	0	652	217	0	0	0
Lakeside Marina	10/7/2019	pre UV Test 2019	no benthic sample collected due to presence of barrier mats											
Lakeside Beach- untested	11/22/2019	pre UV Test 2019	3739	304	0	0	1087	348	0	1522	174	0	217	87
Lakeside Beach- tested	11/22/2019	post UV Test 2019	12739	9826	174	43	478	174	0	1870	87	0	87	0
Lakeside Marina	11/22/2019	pre UV Test 2020	no benthic sample collected due to presence of barrier mats											
Lakeside Beach	7/14/2020	pre UV Test #1 2020	1783	870	43	0	565	0	0	174	0	0	130	0
Lakeside Marina	7/14/2020	pre UV Test #1 2020	522	478	0	0	0	0	0	43	0	0	0	0
Lakeside Beach	8/27/2020	post UV Test #1 2020	3913	3565	43	0	87	87	43	87	0	0	0	0
Lakeside Marina	8/4/2020	post UV Test #1 2020	3565	3304	43	0	43	0	0	130	43	0	0	0
Lakeside Beach	10/7/2020	pre UV Test #2, 1 month post Test #1 2020, 1 year post 2019 test	sample lost											
Lakeside Marina	10/7/2020	pre UV Test #2, 1 month post Test #1 2020, 1 year post 2019 test	174	130	0	0	43	0	0	0	0	0	0	0
Lakeside Beach	12/4/2020	post UV Test #2 2020	20609	16522	174	696	957	261	0	1261	435	0	304	0
Lakeside Marina	12/5/2020	post UV Test #2 2020	8870	8435	43	43	43	0	0	261	43	0	0	0
Total Number of Organisms			**60130**	**44696**	**565**	**870**	**4565**	**1565**	**43**	**6000**	**1000**	**0**	**739**	**87**

APPENDIX

F

WATER QUALITY DATA

	A	B	C	D	E	F	G	H	I	J	K	L
1	**Date**	**Sampling Location**	**Source**	**Wind Advisory? Y/N**	**Lake Level, ft**	**Water Quality Parameters**						**Notes**
2						**pH**	**EC**	**Turbidity**	**DO**	**Water Temp.**	**Air Temp**	
3							**(uS/cm)**	**(NTU)**	**(mg/L)**	**(°F)**	**(°F)**	
4	7/20/2019	Lakeside Marina	Phone		6229.0	7.41	69	0.35	8.32	66.2	67	Took underwater photos today - Pre-treatment WQ
5	8/7/2019	Lakeside Marina	Phone		6228.9	7.50	72	0.27	7.84	66.2	70	Took underwater photos today - Pre-treament WQ
6	8/19/2019	Lakeside Marina	Phone		6228.7	7.55	69	0.22	8.06	66.8	68	Took underwater photos today - Pre-treatment WQ
7	8/20/2019	Lakeside Marina	Phone		6228.7	7.58	69	0.19	8.10	67.8	68	Took underwater photos today - Pre-treatment WQ
8												
9	9/5/2019	Mobilize to Tahoe	Email		6228.4					-	78	Boat maintenance day, Took underwater photos today. Mobilized to Tahoe.
10	9/6/2019	Lakeside Marina			6228.4	7.61	68	0.24	7.85	65.1	77	Boat maintenance day, Took underwater photos today, Taxi testing - Pre-treatment WQ
11	9/7/2019	Lakeside Marina			6228.4	7.63	67	0.22	7.92	65.4	76	Boat maintenance day, Took underwater photos today, Taxi testing
12	9/8/2019	Lakeside Marina			6228.3	7.62	67	0.19	8.10	65.2	69	Boat maintenance day, Took underwater photos today, Taxi testing -
13	9/9/2019	Lakeside Marina			6228.3	7.63	66	0.27	8.40	65.0	66	Took drone photos today. Moved to Beach tommorow. Ropes working well - Pre-treatment WQ
14	9/10/2019	Lakeside Beach	Log book		6228.3	7.59	59	0.17	8.02	64.9	62	Windy in the afternoon,
15	9/11/2019	Lakeside Beach	Log book		6228.3	7.57	58	0.15	7.98	64.0	68	Array changed, Windy in the afternoon,
16	9/12/2019	Lakeside Beach	Log book		6228.2	7.56	59	0.12	7.95	64.9	75	Windy in the afternoon,
17	9/13/2019	Lakeside Beach	Log book		6228.2	7.55	58	0.18	7.91	65.1	79	Windy in the afternoon, Took underwater photos today,
18	9/16/2019	Lakeside Marina	Daily Log	Y						-	59	High Gusts, no treatment today. Rain today.
19	9/19/2019	Moved boat to Keys	Email		6228.1					-	52	Light sprinkles while moving to Keys via tow.
20	9/20/2019	Tahoe Keys	Map		6228.1	8.80	112	2.90	5.20	59.2	61	Massive plants floating near boat
21	9/21/2019	Maintenance	Phone		6228.1					-	64	Removed vessel at the Keys, cleaned lights and added new depth poles
22	9/22/2019	Tahoe Keys	Log book		6228.0	8.70	130	3.07	6.00	59.3	69	Worked at the Keys, Massive plants floating near boat, need to treat earlier
23	9/23/2019	Tahoe Keys	Log book		6228.0	8.91	128	3.70	5.20	59.5	66	Took underwater photos today, Worked at the Keys
24	9/24/2019	Tahoe Keys	Phone		6228.0	8.98	127	3.10	6.50	59.6	74	Took underwater photos today, Worked at the Keys
25	9/25/2019	Tahoe Keys	Log book		6228.0	9.01	122	2.70	5.90	60.1	76	Took underwater photos today, Worked at the Keys
26	9/26/2019	Tahoe Keys	Log book		6228.0	8.89	129	2.40	6.30	60.6	78	Took underwater photos today, Worked at the Keys
27												
28	10/1/2019	Moved boat to Lakeside	Email		6227.8					-	49	Boat maintenance day, cleaned lights
29	10/2/2019	Lakeside Marina	Log book		6227.9	7.70	44	0.18	8.01	55.1	62	Saw plant fragments floating in, tested handheld UV equipment
30	10/3/2019	Lakeside Marina	Log book		6227.8	7.68	35	0.25	8.10	55.2	59	Took underwater photos today, treated under docks with small array
31	10/4/2019	Lakeside Marina	Log book		6227.8	7.75	38	0.15	8.20	55.2	61	Saw plant fragments floating in, treated under docks with small array
32	10/5/2019	Lakeside Marina	Log book		6227.8	7.80	40	0.11	7.94	54.4	68	Saw plant fragments floating in, treated under docks with small array
33	10/6/2019	Lakeside Marina	Log book		6227.8	7.75	43	0.18	7.40	55.7	66	Took underwater photos today, treated under docks with small array
34	10/7/2019	Lakeside Marina	Log book		6227.8	7.70	44	0.16	8.13	56.1	70	Took underwater photos today, Saw plant fragments floating in. UNR staff is diving on beach today.
35	10/8/2019	Lakeside Beach	Log book		6227.8	7.82	46	0.26	8.50	56.9	70	Windy in the afternoon,
36	10/9/2019	Lakeside Beach	Log book		6227.8	7.79	46	0.27	8.71	55.0	61	Windy in the afternoon,
37	10/10/2019	Lakeside Beach	Log book		6227.7	7.91	39	0.30	7.90	52.9	56	Took underwater photos today,
38	10/11/2019	Lakeside Beach	Log book		6227.7					53.0	62	No sampling; Removed vessel, added cameras, Added beach wheels, added extra pontoon, cleaned array
39	10/12/2019	Lakeside Beach	Log book		6227.7					53.5	65	No sampling, Work on boat repairing floats and adding a pump
40	10/13/2019	Lakeside Beach	Log book		6227.7	7.75	43	0.23	8.52	54.8	60	Windy in the afternoon, Saw plant fragments floating in
41	10/14/2019	Lakeside Beach	Log book		6227.7	7.68	43	0.22	7.87	54.4	64	Windy in the afternoon, lots of pollen on the water yellow in color. Noticed algae dying/turning yellow.
42	10/15/2019	Lakeside Beach	Log book		6227.7	7.65	44	0.31	8.34	54.5	68	Power supplies adjusted to 12V
43	10/16/2019	Lakeside Beach	Log book		6227.6	7.50	44	0.29	8.12	54.5	67	Windy in the afternoon,
44	10/17/2019	Lakeside Beach	Log book		6227.6	7.62	44	0.29	8.59	51.7	54	Took underwater photos today, some chance of precipitation today.
45	10/18/2019	Lakeside Marina	Log book		6227.6	7.61	43	0.35	8.80	53.2	57	Took drone photos today, lots of plants floating into the marina, windy. Some chance of precipation today.
46	10/21/2019	Lakeside Beach	Log book		6227.6	7.80	44	0.26	8.76	52.9	65	Visible plants drifting in to marina.
47	10/22/2019	Lakeside Beach	Log book		6227.6	7.74	45	0.21	8.61	57.7	66	Visit by Sudeep's class, Windy in the afternoon,
48	10/23/2019	Lakeside Beach	Log book	Y	6227.6					53.4	61	10/23 and 10/24 combined datasheet; Markers dropped, Took underwater photos today, Wind advisory today and tomorrow. No treatment today. Cleaning activities instead.
49	10/24/2019	Lakeside Beach	Log book	Y	6227.5					52.1	63	Windy in the afternoon, Wind advisory out. No treatment today. Cleaning activities.
50	10/25/2019	Lakeside Beach	Log book		6227.5	7.65	45	0.22	8.16	52.2	69	Took underwater photos today, Windy in the afternoon,
51	10/26/2019	Lakeside Beach	Log book		6227.5	7.60	45	0.18	8.50	52.6	70	Took drone photos today, Windy in the afternoon,
52	10/27/2019	Lakeside Beach	Log book		6227.5	7.79	44	0.25	8.23	53.0	40	
53	10/29/2019	Lakeside Beach	Log book		6227.4	7.60	48	0.24	8.77	50.7	47	Windy in the afternoon,
54	10/30/2019	Lakeside Beach	Log book		6227.4	7.61	49	0.27	9.01	48.3	48	Windy in the afternoon,
55	10/31/2019	Lakeside Beach	Log book		6227.4	7.59	47	0.29	8.84	51.4	57	Windy in the afternoon,
56												
57	11/1/2019	Lakeside Beach	Log book		6227.4	7.57	47	0.18	9.08	50.6	59	Took underwater photos today,
58	11/2/2019	Lakeside Beach	Log book		6227.4	7.60	46	0.29	7.98	50.3	63	Windy in the afternoon,
59	11/3/2019	Lakeside Beach	Log book		6227.4	7.60	46	0.30	8.30	50.9	63	Windy in the afternoon,
60	11/4/2019	Lakeside Beach	Log book		6227.4	7.64	46	0.34	8.46	50.4	62	Windy in the afternoon,

	A	B	C	D	E	F	G	H	I	J	K	L
1	**Date**	**Sampling Location**	**Source**	**Wind Advisory? Y/N**	**Lake Level, ft**	**Water Quality Parameters**						**Notes**
2						**pH**	**EC**	**Turbidity**	**DO**	**Water Temp.**	**Air Temp**	
3							**(uS/cm)**	**(NTU)**	**(mg/L)**	**(°F)**	**(°F)**	
61	11/5/2019	Lakeside Beach	Log book		6227.4	7.66	44	0.27	8.67	50.7	62	Took drone photos today, Took underwater photos today,
62	11/6/2019	Lakeside Beach	Log book		6227.4	7.69	44	0.22	8.09	50.4	63	Took drone photos today
63	11/7/2020	Lakeside Marina	Log book		6227.4	7.75	44	0.27	7.94	50.3	64	Windy in the afternoon,
64	11/8/2019	Lakeside Beach	Phone		6227.4	7.70	43	0.19	8.66	50.4	63	Wall treatment with small array
65	11/9/2019	Lakeside Beach	Email		6227.4	7.60	43	0.12	8.97	50.2	62	Windy in the afternoon,
66	11/10/2019	Moved boat to Keys	Phone		6227.4					-	62	Took underwater photos today,
67	11/11/2019	Tahoe Keys	Email		6227.3	8.30	55	2.30	5.30	51.0	60	
68	11/12/2019	Tahoe Keys	Email		6227.3	8.34	54	2.75	6.40	50.9	64	Saw plant fragments floating in
69	11/13/2019	Tahoe Keys	Email		6227.3	8.41	55	2.98	6.74	50.9	63	Saw plant fragments floating in
70	11/14/2019	Tahoe Keys	Email		6227.3	8.40	56	3.10	6.90	50.7	61	
71	11/15/2019	Tahoe Keys	Email		6227.3	8.70	55	2.90	6.80	50.6	58	Windy in the afternoon,
72	11/16/2019	Tahoe Keys	Email		6227.3	8.45	56	2.85	6.40	50.7	56	
73	11/17/2019	Tahoe Keys	Email		6227.3	8.90	56	2.60	6.20	50.6	52	Windy in the afternoon,
74	11/18/2019	Tahoe Keys	Email		6227.3	8.75	57	2.90	5.90	50.6	51	
75	11/19/2019	Tahoe Keys	Email	Y	6227.3					50.5		Wind advisory today and tomorrow. No treatment today. Maintenance and cleaning activities
76	11/20/2019	Tahoe Keys	Email	Y	6227.3					50.6		Windy in the afternoon,. Wind Advisory today. No treatment today. Maintenance and cleaning activtities.
77	11/21/2019	Tahoe Keys	Email		6227.3	8.40	58	2.42	5.90	50.5	52	
78	11/22/2019	Tahoe Keys	Email		6227.3	8.30	59	2.16	4.70	50.3	53	Took drone photos today
79	11/23/2019	Moved boat to Lakeside	Email		6227.2					-		
80	11/24/2019	DeMobilize to Salida	Email		6227.2					-		
81												
82	12/11/2019	Site Visit to sites			6227.5					47.1		Took underwater photos today,
83												
84	5/8/2020	Salida	Calibration Log									Calibrated and ready for use.
85												
86	6/15/2020	Salida	Shop Notes									cleaned all the UV lights and set up prior to mobilizing to project site.
87	6/17/2020	Lakeside Marina	Shop Notes									Mobilized to project site. 6/13-18 (operational testing conducted)
88	6/18/2020	Lakeside Marina	Shop Notes									Mobilized to project site. 6/13-18 (operational testing conducted)
89	6/20/2020	Lakeside Marina	Log Book		6227.9	7.67	67	0.35	8.50	57.5	60	**Taxi Area treatment, based on 2019 sampling pt is at Marina;** Circuit breakers on array kept tripping in the afternoon. Possibly heat related.Forward thruster circuit breaker tripped. Might need to buffer load with a battery. Treated Marina area (non slip areas first)
90	6/20/2020	Lakeside Marina	Log Book		6227.9	7.64	67	0.38	8.70	59.0	60	**Taxi Area treatment, based on 2019 sampling pt is at Marina;** Circuit breakers on array kept tripping in the afternoon. Possibly heat related.Forward thruster circuit breaker tripped. Might need to buffer load with a battery
91	6/21/2020	Lakeside Marina	Log Book		6227.9	7.65	67	0.29	8.90	59.9	59	**Taxi Area treatment, based on 2019 sampling pt is at Marina**; Changed one circuit breaker and added batteries to thruster system
92	6/22/2020	Lakeside Marina	Log Book		6227.9	7.61	67	0.31	8.70	59.7	64	Algae blocked inlet to generator causing reduced water flow._Filter disassembled and cleaned
93	6/22/2020	Lakeside Marina	Log Book		6227.9	7.61	67	0.34	8.10	59.9	64	Algae blocked inlet to generator causing reduced water flow._Filter disassembled and cleaned
94	6/23/2020	Lakeside Marina	Log Book		6227.9	7.61	68	0.29	8.40	62.9	67	Algae blocked inlet to generator causing reduced water flow._Filter disassembled and cleaned._____
95	6/23/2020	Lakeside Marina	Log Book		6227.9	7.60	68	0.27	8.60	64.4	67	Algae blocked inlet to generator causing reduced water flow._Filter disassembled and cleaned._____
96	6/24/2020	Lakeside Marina	Log Book		6227.9	7.59	68	0.30	8.70	62.4	65	Generator inlet clogged at startup. Cleaned with brush. Several circuit breakers are intermediately tripping
97	6/24/2020	Lakeside Marina	Log Book		6227.9	7.60	68	0.31	8.60	63.5	65	Generator inlet clogged at startup. Cleaned with brush. Several circuit breakers are intermediately tripping
98	6/24/2020	Lakeside Marina	Log Book		6227.9	7.60	68	0.29	8.60	63.5	65	tripping
99	6/25/2020	Lakeside Marina	Log Book		6227.9	7.62	67	0.35	8.70	64.0	64	**Treated Lakeside taxi area, beach and marina. Where is sampling point**? Several breakers tripped in the morning. Seemed to stabilize in the afternoon. One thruster motor got jammed with debris but was easily cleaned
100	6/25/2020	Lakeside Marina	Log Book		6227.9	7.62	67	0.29	8.40	65.6	64	**Treated Lakeside taxi area, beach and marina. Where is sampling point?** Several breakers tripped in the morning. Seemed to stabilize in the afternoon. One thruster motor got jammed with debris but was easily cleaned
101	6/25/2020	Lakeside Marina	Log Book		6227.9	7.62	67	0.32	8.30	68.1	64	**Treated Lakeside taxi area, beach and marina. Where is sampling point?** Several breakers tripped in the morning. Seemed to stabilize in the afternoon. One thruster motor got jammed with debris but was easily cleaned
102	6/26/2020	Lakeside Marina	Log Book		6227.9	7.65	69	0.29	8.10	65.1	66	Repaired two thruster motors and did some general cleanup. Cleaning/Maintenance of Vessel
103	6/26/2020	Lakeside Marina	Log Book		6227.9	7.64	69	0.32	8.20	65.4	66	Repaired two thruster motors
104	6/26/2020	Lakeside Marina	Log Book		6227.9	7.63	69	0.31	8.10	66.2	66	Repaired two thruster motors
105	6/29/2020	Tahoe Keys	Log Book		6227.8	9.00	130	2.90	6.10	70.8	50	Repaired thruster motor. Treated Tahoe Keys area. Plan to be here a few days.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Date	Sampling Location	Source	Wind Advisory? Y/N	Lake Level, ft	Water Quality Parameters						Notes
2						pH	EC	Turbidity	DO	Water Temp.	Air Temp	
3							(uS/cm)	(NTU)	(mg/L)	(°F)	(°F)	
106	6/30/2020	Tahoe Keys	Log Book		6227.8	8.97	130	3.10	5.90	68.1	54	One array breaker kept tripping in the morning. Started working in the afternoon
107	6/30/2020	Tahoe Keys	Log Book		6227.8	8.98	129	3.10	5.80	68.5	54	One array breaker kept tripping in the morning. Started working in the afternoon
108	6/30/2020	Tahoe Keys	Log Book		6227.8	8.98	130	3.10	5.90	69.9	54	One array breaker kept tripping in the morning. Started working in the afternoon
109												
110	7/1/2020	Tahoe Keys	Log Book		6227.8	8.70	95	2.89	6.00	68.0	55	Breakers all worked in the morning, but several started tripping in the afternoon Calibrated meters and changed batteries.
111	7/1/2020	Tahoe Keys	Log Book		6227.8	8.61	96	2.90	5.90	70.1	55	Breakers all worked in the morning, but several started tripping in the afternoon
112	7/1/2020	Tahoe Keys	Log Book		6227.8	8.61	96	2.91	5.60	71.4	55	Breakers all worked in the morning, but several started tripping in the afternoon
113	7/2/2020	Tahoe Keys	Log Book		6227.8	8.90	92	2.88	5.90	70.5	57	swapped out circuit breakers and added fans to electrical panels
114	7/2/2020	Tahoe Keys	Log Book		6227.8	8.97	91	2.88	5.50	71.7	57	swapped out circuit breakers and added fans to electrical panels
115	7/7/2020	Tahoe Keys	Log Book		6227.7	9.00	89	2.91	5.20	69.4	57	Same three breakers keep tripping
116	7/7/2020	Tahoe Keys	Log Book		6227.7	8.97	89	2.97	5.10	70.3	57	Same three breakers keep tripping
117	7/7/2020	Tahoe Keys	Log Book		6227.7	8.79	89	2.94	5.14	71.6	57	Same three breakers keep tripping
118	7/8/2020	Tahoe Keys	Log Book		6227.7	8.83	90	2.89	5.17	68.9	57	Same three breakers keep tripping
119	7/8/2020	Tahoe Keys	Log Book		6227.7	8.95	90	2.90	5.01	69.6	57	Same three breakers keep tripping
120	7/8/2020	Tahoe Keys	Log Book		6227.7	8.92	90	2.91	5.20	73.0	57	Same three breakers keep tripping
121	7/9/2020	Tahoe Keys	Log Book		6227.7	9.10	85	2.88	5.34	69.2	58	Same two breakers keep tripping
122	7/9/2020	Tahoe Keys	Log Book		6227.7	9.10	85	2.88	5.90	70.5	58	Same two breakers keep tripping
123	7/9/2020	Tahoe Keys	Log Book		6227.7	9.10	84	2.91	5.50	73.0	58	Same two breakers keep tripping
124	7/10/2020	Tahoe Keys	Log Book		6227.7	9.49	84	2.97	5.20	69.1	60	Circuit breakers worked perfectly in the morning. Began randomly tripping in the afternoon.
125	7/10/2020	Tahoe Keys	Log Book		6227.7	9.40	84	2.94	5.10	72.3	60	Circuit breakers worked perfectly in the morning. Began randomly tripping in the afternoon.
126	7/10/2020	Tahoe Keys	Log Book		6227.7	9.45	84	2.89	5.90	73.5	60	Circuit breakers worked perfectly in the morning. Began randomly tripping in the afternoon.
127	7/11/2020	Tahoe Keys	Log Book		6227.7	9.50	82	2.90	5.50	70.1	62	Several props got tangled with plants. Had to clean them before the boat would move again. Boat got stuck in shallow water. Required a lot of force to pull loose.
128	7/11/2020	Tahoe Keys	Log Book		6227.7	9..51	82	2.91	5.20	74.1	62	Several props got tangled with plants. Had to clean them before the boat would move again. Boat got stuck in shallow water. Required a lot of force to pull loose.
129	7/11/2020	Tahoe Keys	Log Book		6227.7	9.50	82	2.88	5.10	73.5	62	Several props got tangled with plants. Had to clean them before the boat would move again. Boat got stuck in shallow water. Required a lot of force to pull loose.
130	7/12/2020	Tahoe Keys	Log Book		6227.6	9.40	79	2.88	5.90	70.8	63	Winch broke near end of day. Fixed same evening
131	7/12/2020	Tahoe Keys	Log Book		6227.6	9.39	79	2.91	5.50	72.6	63	Winch broke near end of day. Fixed same evening
132	7/12/2020	Tahoe Keys	Log Book		6227.6	9.31	79	2.97	5.20	73.9	63	Winch broke near end of day. Fixed same evening
133	7/13/2020	Tahoe Keys	Log Book		6227.6	9.28	83	2.94	5.10	72.1	65	Fixed winch cables and untangled props
134	7/13/2020	Tahoe Keys	Log Book		6227.6	9.30	83	2.89	5.90	73.9	65	Fixed winch cables and untangled props
135	7/13/2020	Tahoe Keys	Log Book		6227.6	9.29	83	2.90	5.50	75.3	65	Fixed winch cables and untangled props
136	7/14/2020	Tahoe Keys	Log Book		6227.6	9.31	84	2.91	5.20	71.6	63	Weeds kept getting tangled in the props
137	7/14/2020	Tahoe Keys	Log Book		6227.6	9.32	84	2.88	5.10	73.4	63	Weeds kept getting tangled in the props
138	7/14/2020	Tahoe Keys	Log Book		6227.6	9.30	84	2.88	4.97	74.6	63	Weeds kept getting tangled in the props
139	7/15/2020	Moved Boat to Lakeside										
140	7/16/2020	Lakeside Marina	Log Book		6227.6	7.60	89	0.27	6.50	65.4	67	_ Only one array not working all day. Stopped early on account of storm
141	7/16/2020	Lakeside Marina	Log Book		6227.6	7.58	89	0.34	6.40	67.4	67	_ Only one array not working all day. Stopped early on account of storm
142	7/16/2020	Lakeside Marina	Log Book		6227.6	7.58	89	0.27	6.10	67.8	67	_ Only one array not working all day. Stopped early on account of storm
143	7/17/2020	Lakeside Marina	Log Book		6227.6	7.56	86	0.21	6.60	68.3	66	One array not working all day. Other two tripping during movements
144	7/17/2020	Lakeside Marina	Log Book		6227.6	7.60	86	0.19	6.70	68.5	66	One array not working all day. Other two tripping during movements
145	7/18/2020	Lakeside Marina	Log Book		6227.6	7.70	85	0.27	6.42	68.7	65	One array not working all day.
146	7/18/2020	Lakeside Marina	Log Book		6227.6	7.70	85	0.25	6.41	67.8	65	One array not working all day.
147	7/21/2020	Lakeside Marina	Log Book		6227.6	7.76	81	0.30	6.47	69.2	66	One array not working all day.
148	7/21/2020	Lakeside Marina	Log Book		6227.6	7.76	81	0.34	6.71	68.5	66	One array not working all day.
149	7/21/2020	Lakeside Marina	Log Book		6227.6	7.75	81	0.37	7.10	70.5	66	One array not working all day.
150	7/22/2020	Lakeside Marina	Log Book		6227.6	7.70	80	0.25	7.30	69.6	64	_ One array not working all day.
151	7/22/2020	Lakeside Marina	Log Book		6227.6	7.70	80	0.30	7.10	70.8	64	_ One array not working all day.
152	7/22/2020	Lakeside Marina	Log Book		6227.6	7.70	80	0.37	7.09	71.0	64	_ One array not working all day.
153	7/23/2020	Lakeside Marina	Log Book		6227.5	7.87	79	0.37	6.98	68.3	62	_ One array not working all day. Generator strainer needed cleaning
154	7/23/2020	Lakeside Marina	Log Book		6227.5	7.90	79	0.34	6.97	68.3	62	_ One array not working all day. Generator strainer needed cleaning
155	7/24/2020	Lakeside Marina	Log Book		6227.5	7.90	77	0.31	6.89	68.0	62	One array not working all day. Did general clean up.
156	7/24/2020	Lakeside Marina	Log Book		6227.5	7.91	77	0.29	6.71	69.9	62	One array not working all day.
157	7/24/2020	Lakeside Marina	Log Book		6227.5	7.80	77	0.27	7.10	69.8	62	One array not working all day.
158	7/27/2020	Lakeside Beach	Log Book		6227.5	7.60	79	0.17	8.10	68.5	63	One array not working all day
159	7/28/2020	Lakeside Beach	Log Book		6227.5	7.82	79	0.12	8.00	67.8	64	_ One array not working all day. Another array started tripping in the afternoon. Divers at Keys
160	7/28/2020	Lakeside Beach	Log Book		6227.5	7.80	79	0.10	8.10	68.9	64	_ One array not working all day. Another array started tripping in the afternoon.
161	7/28/2020	Lakeside Beach	Log Book		6227.5	7.70	79	0.09	7.90	71.2	64	_ One array not working all day. Another array started tripping in the afternoon.
162	7/29/2020	Lakeside Beach	Log Book		6227.5	7.60	78	0.05	8.20	69.2	66	One array not working all day.

	A	B	C	D	E	F	G	H	I	J	K	L
1	Date	Sampling Location	Source	Wind Advisory? Y/N	Lake Level, ft	Water Quality Parameters						Notes
2						pH	EC	Turbidity	DO	Water Temp.	Air Temp	
3							(uS/cm)	(NTU)	(mg/L)	(°F)	(°F)	
163	7/30/2020	Lakeside Marina	Log Book		6227.5	7.71	78	0.35	6.70	70.1	66	One array not working all day.
164	7/30/2020	Lakeside Marina	Log Book		6227.5	7.54	78	0.30	6.60	72.1	65	One array not working all day.
165	7/31/2020	Lakeside Marina	Log Book		6227.4	7.50	77	0.29	6.57	69.6	62	One array not working all day. General vessel clean up.
166												
167	8/4/2020	Lakeside Beach	Log Book		6227.4	7.76	81	0.15	7.40	69.9	62	One array not working all day.
168	8/5/2020	Lakeside Beach	Log Book		6227.3	7.76	81	0.18	7.00	69.9	62	One array not working all day.
169	8/5/2020	Lakeside Beach	Log Book		6227.3	7.75	81	0.20	6.90	70.5	62	One array not working all day.
170	8/6/2020	Lakeside Beach	Log Book		6227.3	7.70	80	0.13	7.00	69.4	59	One array not working all day.
171	8/6/2020	Lakeside Beach	Log Book		6227.3	7.70	80	0.16	7.30	71.0	59	One array not working all day.
172	8/7/2020	Lakeside Beach	Log Book		6227.3	7.70	80	0.17	7.10	69.0	61	One array not working all day.
173	8/7/2020	Lakeside Beach	Log Book		6227.3	7.87	79	0.14	7.50	70.3	61	One array not working all day.
174	8/8/2020	Lakeside Beach										
175	8/9/2020	Lakeside Beach										
176	8/10/2020	Lakeside Beach	Log Book		6227.3	7.85	85	0.19	7.20	69.9	66	One array not working all day.
177	8/10/2020	Lakeside Beach	Log Book		6227.3	7.80	82	0.17	6.80	72.5	66	One array not working all day.
178	8/10/2020	Lakeside Beach	Log Book		6227.3	7.58	81	0.14	6.75	72.1	66	One array not working all day.
179	8/11/2020	Lakeside Marina			6227.3	7.56	81	0.20	6.63	71.0	66	Taxi Area also treatmented; based on 2019 sampling point is still Marina; Media Day
180	8/11/2020	Lakeside Marina			6227.3	7.60	80	0.19	6.80	71.0	66	Taxi Area also treatmented; based on 2019 sampling point is still Marina; Media Day
181	8/11/2020	Lakeside Marina	Cleaning Log Log Book		6227.3	7.70	80	0.21	6.90	72.8	66	Taxi Area also treatmented; based on 2019 sampling point is still Marina; General vessel clean up and Karl Keller was on site cleaning the light chamber (diver) in preparation for Media Day.
182	8/12/2020	Lakeside Marina	Cleaning Log Log Book		6227.2	7.70	87	0.17	7.00	69.9	59	
183	8/12/2020	Lakeside Marina	Cleaning Log Log Book		6227.2	7.76	90	0.15	7.20	71.7	59	Taxi Area also treatmented; based on 2019 sampling point is still Marina; General vessel clean up and Karl Keller was on site cleaning the light chamber (diver) in preparation for Media Day.
184	8/13/2020	Lakeside Marina	Log Book		6227.2	7.76	103	0.30	6.80	69.2	62	Taxi Area also treatmented; based on 2019 sampling point is still Marina; One array not working all day. Boat can not operate with wind speeds over 10mph
185	8/13/2020	Lakeside Marina	Log Book		6227.2	7.75	104	0.29	6.85	70.1	62	Taxi Area also treatmented; based on 2019 sampling point is still Marina; One array not working all day. Boat can not operate with wind speeds over 10mph
186	8/14/2020	Lakeside Marina	Log Book		6227.2	7.70	106	0.34	6.91	69.2	70	Taxi Area also treatmented; based on 2019 sampling point is still Marina; One array not working all day.
187	8/14/2020	Lakeside Marina	Log Book		6227.2	7.57	101	0.36	6.87	70.1	70	Taxi Area also treatmented; based on 2019 sampling point is still Marina; One array not working all day.
188	8/14/2020	Lakeside Marina	Log Book		6227.2	7.61	103	0.31	6.89	70.8	70	Taxi Area also treatmented; based on 2019 sampling point is still Marina; One array not working all day.
189	8/15/2020	Lakeside Marina										
190	8/16/2020	Lakeside Marina										
191	8/17/2020	Lakeside Marina	Log Book		6227.2	7.75	100	0.33	6.75	70.1	72	Taxi Area also treatmented; based on 2019 sampling point is still Marina; One array not working all day.
192	8/18/2020	Lakeside Marina	Log Book		6227.2	7.70	95	0.35	6.50	70.8	72	One array not working all day.
193	8/18/2020	Lakeside Marina	Log Book		6227.2	7.57	91	0.38	6.55	72.5	72	One array not working all day.
194	8/18/2020	Lakeside Marina	Log Book		6227.2	7.61	93	0.37	6.52	72.6	72	One array not working all day.
195	8/19/2020	Lakeside Marina										One array not working all day.
196	8/20/2020	Lakeside Marina	Calibration Log		6227.1	7.55	90	0.27	6.51	71.0	67	Calibrated and ready for use.
197	8/21/2020	Lakeside Marina	Log Book		6227.1	7.54	89	0.25	6.49	71.4	66	One array not working all day.
198	8/22/2020	Lakeside										Cleaning and Maintenance
199	8/23/2020	Lakeside										Cleaning and Maintenance
200	8/24/2020	Lakeside										Cleaning and Maintenance
201	8/25/2020	Lakeside										Cleaning and Maintenance
202	8/26/2020	Tahoe Keys										Move Vessle to the Keys
203	8/27/2020	Tahoe Keys										Operational testing at Tahoe Keys
204	8/28/2020	Tahoe Keys										Cleaning and Maintenance
205	8/29/2020	Tahoe Keys										Cleaning and Maintenance
206	8/30/2020	Tahoe Keys										Cleaning and Maintenance
207	8/31/2020	Tahoe Keys										Cleaning and Maintenance
208												
209	9/1/2020	Tahoe Keys										Cleaning and Maintenance
210	9/2/2020	Tahoe Keys										Cleaning and Maintenance
211	9/3/2020	Tahoe Keys										Cleaning and Maintenance
212	9/4/2020	Tahoe Keys	Log Book		6226.9	8.50	120	3.65	8.00	73.9	68	One breaker kept randomly tripping
213	9/4/2020	Tahoe Keys	Log Book		6226.9	8.50	121	3.50	7.95	74.4	68	One breaker kept randomly tripping
214	9/4/2020	Tahoe Keys	Log Book		6226.9	8.70	121	3.62	8.00	73.5	68	One breaker kept randomly tripping

	A	B	C	D	E	F	G	H	I	J	K	L
1	Date	Sampling Location	Source	Wind Advisory? Y/N	Lake Level, ft	Water Quality Parameters						Notes
2						pH	EC	Turbidity	DO	Water Temp.	Air Temp	
3							(uS/cm)	(NTU)	(mg/L)	(°F)	(°F)	
215	9/5/2020	Tahoe Keys	Log Book		6226.9	8.15	119	3.21	8.20	71.2	67	Several breakers kept randomly tripping
216	9/5/2020	Tahoe Keys	Log Book		6226.9	8.15	119	3.18	8.50	71.9	67	Several breakers kept randomly tripping
217	9/5/2020	Tahoe Keys	Log Book		6226.9	8.19	119	3.25	8.09	74.4	67	Several breakers kept randomly tripping
218	9/6/2020	Tahoe Keys	Log Book		6226.9	8.25	115	3.07	9.20	70.7	63	Several breakers kept randomly tripping
219	9/6/2020	Tahoe Keys	Log Book		6226.9	8.25	115	3.14	9.30	71.9	63	Several breakers kept randomly tripping
220	9/6/2020	Tahoe Keys	Log Book		6226.9	8.25	115	3.09	9.21	71.4	63	Several breakers kept randomly tripping
221	9/7/2020	Tahoe Keys										
222	9/8/2020	Tahoe Keys	Log Book		6226.8	8.25	119	2.98	9.80	69.0	54	Several breakers kept randomly tripping
223	9/8/2020	Tahoe Keys	Log Book		6226.8	8.25	119	2.79	9.91	70.1	54	Several breakers kept randomly tripping
224	9/8/2020	Tahoe Keys	Log Book		6226.8	8.25	119	2.82	9.79	72.3	54	Several breakers kept randomly tripping
225	9/9/2020	Tahoe Keys	Calibration Log		6226.8	8.21	118	2.93	9.90	67.4	53	Calibrated and ready for use.
226	9/9/2020	Tahoe Keys			6226.8					68.5	53	
227	9/9/2020	Tahoe Keys			6226.8					69.6	53	
228	9/10/2020	Tahoe Keys	Log Book		6226.8	8.22	110	3.07	7.95	66.5	51	Several breakers kept randomly tripping
229	9/10/2020	Tahoe Keys	Log Book		6226.8	8.22	110	3.14	7.62	66.9	51	Several breakers kept randomly tripping
230	9/10/2020	Tahoe Keys	Log Book		6226.8	8.22	110	3.09	7.58	67.2	51	Several breakers kept randomly tripping
231	9/11/2020	Tahoe Keys	Log Book		6226.7	7.45	112	2.97	4.70	65.3	56	Several breakers kept randomly tripping
232	9/11/2020	Tahoe Keys	Log Book		6226.7	7.23	112	2.92	5.20	66.0	56	Several breakers kept randomly tripping
233	9/12/2020	Tahoe Keys	Log Book		6226.7	7.24	113	2.89	4.70	65.1	57	Depth pole broke
234	9/12/2020	Tahoe Keys	Log Book		6226.7	7.31	113	3.05	6.10	67.2	57	Depth pole broke
235	9/12/2020	Tahoe Keys	Log Book		6226.7	7.38	113	2.99	6.30	66.9	57	Depth pole broke
236	9/13/2020	Tahoe Keys	Log Book		6226.7	7.60	117	3.00	5.40	65.3	57	One circuit breaker that hasn't been working went all day without tripping
237	9/13/2020	Tahoe Keys	Log Book		6226.7	7.50	117	3.10	5.60	66.0	57	One circuit breaker that hasn't been working went all day without tripping
238	9/13/2020	Tahoe Keys	Log Book		6226.7	8.23	117	3.15	6.50	66.7	57	One circuit breaker that hasn't been working went all day without tripping
239	9/14/2020	Tahoe Keys	Log Book		6226.7	7.79	119	2.97	5.20	64.5	58	Another thruster had to be replaced
240	9/14/2020	Tahoe Keys	Log Book		6226.7	7.78	119	2.94	5.60	66.7	58	Another thruster had to be replaced
241	9/14/2020	Tahoe Keys	Log Book		6226.7	8.66	119	2.89	7.60	67.2	58	Another thruster had to be replaced
242	9/15/2020	Tahoe Keys	Log Book		6226.7	7.73	120		5.90	64.0	58	Winch broke at end of treatment day
243	9/15/2020	Tahoe Keys	Log Book		6226.7	7.73	120	2.95	5.50	65.6	58	Still having issues with circuit breakers
244	9/15/2020	Tahoe Keys	Log Book		6226.7	8.41	120	2.97	6.00	67.2	58	Still having issues with circuit breakers
245	9/16/2020	Tahoe Keys	Log Book		6226.7	7.48	123	2.81	5.50	64.2	58	Generator water inlet became clogged and had to be cleaned
246	9/16/2020	Tahoe Keys	Log Book		6226.7	7.98	123	2.89	6.00	65.3	58	Generator water inlet became clogged and had to be cleaned
247	9/16/2020	Tahoe Keys	Log Book		6226.7	8.28	123	2.75	6.50	66.5	58	Generator water inlet became clogged and had to be cleaned
248	9/17/2020	Tahoe Keys	Log Book		6226.6	7.14	125	0.17	5.80	63.8	55	Thruster went out and had to be repaired
249	9/17/2020	Tahoe Keys	Log Book		6226.6	7.12	125	0.20	6.10	64.5	55	Thruster went out and had to be repaired
250	9/17/2020	Tahoe Keys	Log Book		6226.6	7.30	125	0.15	6.60	64.5	55	Thruster went out and had to be repaired
251	9/18/2020	Tahoe Keys										No Treatment, No data taken
252	9/19/2020	Tahoe Keys										No Treatment, No data taken
253	9/20/2020	Tahoe Keys										No Treatment, No data taken
254	9/21/2020	Tahoe Keys	Calibration Log									Calibrated and ready for use.
255	9/22/2020	Tahoe Keys										No Treatment, No data taken
256	9/23/2020	Tahoe Keys										No Treatment, No data taken
257	9/24/2020	Tahoe Keys										No Treatment, No data taken
258	9/25/2020	Tahoe Keys										No Treatment, No data taken
259	**9/26/2020**	Tahoe Keys	**Log Book**		**6226.7**	**7.73**	**90**	**0.20**	**6.90**	**59.0**	**48**	**Missing Log Sheet; Three breakers acting up again.**
260	9/27/2020	Tahoe Keys	Log Book		6226.7	7.38	89	0.24	6.00	62.4	48	Changed to align with Datasheet; Three breakers acting up again.
261	9/27/2020	Tahoe Keys	Log Book		6226.7	7.12	89	0.22	5.20	63.3	48	Changed to align with Datasheet; Three breakers acting up again.
262	9/27/2020	Tahoe Keys	Log Book		6226.7	7.67	89	0.19	6.50	64.5	53	Changed to align with Datasheet; Three breakers acting up again.
263	9/28/2020	Tahoe Keys	Log Book		6226.2	7.01	90	0.27	5.30	62.2	53	Changed to align with Datasheet; Three breakers acting up again.
264	9/28/2020	Tahoe Keys	Log Book		6226.2	7.48	90	0.17	6.20	64.5	53	Changed to align with Datasheet; Internet stopped working._Fixed later in the day
265	9/28/2020	Tahoe Keys	Log Book		6226.2	7.64	90	0.15	6.90	64.0	53	Changed to align with Datasheet; Internet stopped working._Fixed later in the day
266	9/29/2020	Tahoe Keys	Log Book		6226.2	6.76	91	7.20	4.90	61.5	53	Changed to align with Datasheet; Internet stopped working._Fixed later in the day
267	9/29/2020	Tahoe Keys	Log Book		6226.2	7.03	91	6.80	5.90	63.8	51	Changed to align with Datasheet; Internet wouldn't work in the morning
268	9/30/2020	Tahoe Keys	Log Book		6226.4	7.62	93	0.15	6.20	63.1	57	Complete winch assembly replaced
269	9/30/2020	Tahoe Keys	Log Book		6226.4	7.65	93	0.02	6.50	63.6	57	Complete winch assembly replaced
270	9/30/2020	Tahoe Keys	Log Book		6226.4	7.25	93	0.13	6.80	64.4	57	Change to align with Datasheet; Complete winch assembly replaced
271												
272	10/1/2020	Tahoe Keys	Log Book		6226.4	6.97	99	2.51	5.60	61.7	57	One circuit breaker acting up. Continue treatment at Keyes, noted DO is around 5.2 mg/L
273	10/1/2020	Tahoe Keys	Log Book		6226.4	7.74	99	2.47	6.30	63.6	57	One circuit breaker acting up
274	10/1/2020	Tahoe Keys	Log Book		6226.4	7.68	99	2.45	6.60	63.8	57	One circuit breaker acting up
275	10/2/2020	Tahoe Keys	Log Book		6226.4	7.23	102	2.36	5.80	61.5	56	Water inlet filter full and had to be cleaned

	A	B	C	D	E	F	G	H	I	J	K	L
1	Date	Sampling Location	Source	Wind Advisory? Y/N	Lake Level, ft	Water Quality Parameters						Notes
2						pH	EC	Turbidity	DO	Water Temp.	Air Temp	
3							(uS/cm)	(NTU)	(mg/L)	(°F)	(°F)	
276	10/2/2020	Tahoe Keys	Log Book		6226.4	7.32	102	2.50	5.20	52.4	56	Water inlet filter full and had to be cleaned
277	10/2/2020	Tahoe Keys	Log Book		6226.4	7.28	102	2.48	5.20	62.9	56	Changed to align with Datasheet; Water inlet filter full and had to be cleaned
278	10/3/2020											
279	10/4/2020											Performing UV light array cleaning
280	10/5/2020	Employee communication										Karl (Diver) is on project site performing needed cleaning to light array and boat
281	10/6/2020	Lakeside Marina	Log Book		6226.4	8.39	110	2.70	7.80	64.0	53	Replaced broken depth pole and fixed minor problems with boat. Karl (Diver) is on project site, cleaned array
282	10/6/2020	Lakeside Marina	Log Book		6226.4	7.38	110	2.56	7.90	64.0	53	Changed to align with Datasheet; Replaced broken depth pole and fixed minor problems with boat.
283	10/7/2020	Lakeside Marina	Log Book		6226.3	7.78	114	2.67	6.60	61.8	52	_Performed oil change and service on generator
284	10/7/2020	Lakeside Marina	Log Book		6226.3	7.08	114	2.71	7.80	64.0	52	_Performed oil change and service on generator
285	10/8/2020	Lakeside Marina	Log Book		6226.3	7.10	118	2.49	7.70	61.8	50	Finished installing fuses on all thrusters._Winch cable broke, Gnerator is serviced (#2) service by authorized manufacturer
286	10/8/2020	Lakeside Marina	Log Book		6226.3	7.66	118	2.61	7.20	62.4	50	Finished installing fuses on all thrusters._Winch cable broke
287	10/8/2020	Lakeside Marina	Log Book		6226.3	7.27	118	2.42	6.10	62.6	50	Finished installing fuses on all thrusters._Winch cable broke
288	10/12/2020	Lakeside Marina	Log Book		6226.3	7.55	120	2.80	2.30	59.0	52	_All winch cables were replaced yesterday. Working much smoother
289	10/12/2020	Lakeside Marina	Log Book		6226.3	8.10	120	2.97	6.20	60.8	52	_All winch cables were replaced yesterday. Working much smoother
290	10/12/2020	Lakeside Marina	Log Book		6226.3	7.25	120	3.01	6.40	62.0	52	_All winch cables were replaced yesterday. Working much smoother
291	10/13/2020	Lakeside Marina	Log Book		6226.3	7.38	90	0.10	6.90	60.4	53	Changed out a power supply for the thrusters
292	10/13/2020	Lakeside Marina	Log Book		6226.3	7.50	90	0.17	7.00	62.6	53	Changed out a power supply for the thrusters
293	10/13/2020	Lakeside Marina	Log Book		6226.3	7.28	90	0.21	7.40	62.7	53	Changed out a power supply for the thrusters
294	10/14/2020	Lakeside Marina	Log Book		6226.3	7.09	89	0.10	7.20	60.8	53	Several circuit breakers were acting up again
295	10/14/2020	Lakeside Marina	Log Book		6226.3	7.32	89	0.18	7.40	62.2	53	Several circuit breakers were acting up again
296	10/14/2020	Lakeside Marina	Log Book		6226.3	7.04	89	0.21	6.50	63.6	53	Several circuit breakers were acting up again
297	10/15/2020	Lakeside Beach	Log Book		6226.3	7.32	87	0.09	6.70	61.5	50	Thruster motor replaced
298	10/15/2020	Lakeside Beach	Log Book		6226.3	7.29	87	0.04	7.60	62.2	50	Thruster motor replaced
299	10/15/2020	Lakeside Beach	Log Book		6226.3	7.72	87	0.07	8.00	62.6	50	Thruster motor replaced
300	10/16/2020	Lakeside Beach	Log Book		6226.2	7.73	80	0.10	6.90	59.0	48	Three breakers acting up again
301	10/16/2020	Lakeside Beach	Log Book		6226.2	7.30	80	0.20	7.40	60.8	48	Three breakers acting up again
302	10/16/2020	Lakeside Beach	Log Book		6226.2	6.82	80	0.22	7.60	61.5	48	Three breakers acting up again
303	10/17/2020	Lakeside Beach	Log Book		6226.2	6.88	84	0.05	5.90	58.8	53	Three breakers acting up again
304	10/17/2020	Lakeside Beach	Log Book		6226.2	7.31	85	0.03	7.10	61.8	53	Three breakers acting up again
305	10/18/2020	Lakeside Beach	Log Book		6226.2	7.32	84	0.07	6.90	60.2	53	Internet stopped working._Fixed later in the day.
306	10/18/2020	Lakeside Beach	Log Book		6226.2	6.95	84	0.10	6.40	60.8	53	Internet stopped working._Fixed later in the day.
307	10/18/2020	Lakeside Beach	Log Book		6226.2	6.89	84	0.17	7.20	62.2	53	Internet stopped working._Fixed later in the day.
308	10/19/2020	Lakeside Beach	Log Book		6226.2	6.90	87	0.27	6.80	59.9	51	Internet wouldn't work in the morning.
309	10/19/2020	Lakeside Beach	Log Book		6226.2	7.31	87	0.10	6.60	62.0	51	Internet wouldn't work in the morning.
310	10/20/2020	Lakeside Beach	Log Book		6226.2	7.40	89	0.07	7.40	60.0	50	Three breakers not working.
311	10/20/2020	Lakeside Beach	Log Book		6226.2	7.44	89	0.03	6.90	61.5	50	Three breakers not working.
312	10/20/2020	Lakeside Beach	Log Book		6226.2	7.38	89	0.02	6.70	62.7	50	Three breakers not working.
313	10/21/2020	Lakeside Beach	Log Book		6226.2	6.98	90	0.09	6.30	59.9	51	Three breakers out all day.
314	10/21/2020	Lakeside Beach	Log Book		6226.2	7.10	90	0.05	6.70	62.6	51	Three breakers out all day.
315	10/22/2020	Lakeside Beach	Log Book		6226.1	6.99	88	0.02	6.80	58.6	46	Straightened winch cables.
316	10/22/2020	Lakeside Beach	Log Book		6226.1	7.32	88	0.03	6.90	60.0	46	Straightened winch cables.
317	10/22/2020	Lakeside Beach	Log Book		6226.1	7.16	88	0.04	6.90	60.6	46	Straightened winch cables.
318	10/23/2020	Lakeside Beach	Log Book		6226.1	7.08	90	0.04	7.10	57.9	47	Problems with four breakers.
319	10/23/2020	Lakeside Beach	Log Book		6226.1	7.27	90	0.07	6.50	60.4	47	Problems with four breakers.
320	10/23/2020	Lakeside Beach	Log Book		6226.1	7.19	90	0.09	6.90	59.7	47	Problems with four breakers.
321	10/24/2020	Lakeside Beach	Log Book		6226.1	6.85	86	0.17	6.50	58.2	46	Problems with three breakers.
322	10/27/2020	Lakeside Marina	Log Book		6226.0	6.99	81	0.12	5.90	53.4	44	Generator inlet filter was clogged and had to be cleaned.
323	10/27/2020	Lakeside Marina	Log Book		6226.0	6.98	81	0.19	5.70	54.6	44	Generator inlet filter was clogged and had to be cleaned.
324	10/28/2020	Lakeside Beach	Log Book		6226.0	6.85	81	0.10	3.80	55.5	43	Cleaned array and fixed depth pipe._
325	10/28/2020	Lakeside Beach	Log Book		6226.0	6.99	81	0.09	5.90	58.4	43	Cleaned array and fixed depth pipe._
326	10/28/2020	Lakeside Beach	Log Book		6226.0	6.93	81	0.05	5.90	57.7	43	Cleaned array and fixed depth pipe._
327	10/29/2020	Lakeside Beach	Log Book		6226.0	7.01	83	0.02	6.10	56.6	44	Changed out bent thruster motor
328	10/29/2020	Lakeside Beach	Log Book		6226.0	7.36	83	0.03	7.60	58.4	44	Changed out bent thruster motor
329	10/29/2020	Lakeside Beach	Log Book		6226.0	7.09	83	0.04	2.30	57.9	44	Changed out bent thruster motor
330	10/30/2020	Lakeside Beach	Log Book		6226.0	7.29	84	0.10	5.50	56.8	45	Three breakers acting up
331	10/30/2020	Lakeside Beach	Log Book		6226.0	7.48	84	0.14	5.70	58.2	45	Three breakers acting up
332	10/30/2020	Lakeside Beach	Log Book		6226.0	7.50	84	0.20	6.50	57.3	45	Three breakers acting up
333	10/31/2020	Lakeside Beach	Log Book		6225.9	7.62	86	0.21	6.10	56.8	45	_Three breakers acting up
334	10/31/2020	Lakeside Beach	Log Book		6225.9	7.12	86	0.19	5.80	57.0	45	_Three breakers acting up

	A	B	C	D	E	F	G	H	I	J	K	L
1	Date	Sampling Location	Source	Wind Advisory? Y/N	Lake Level, ft	Water Quality Parameters						Notes
2						pH	EC	Turbidity	DO	Water Temp.	Air Temp	
3							(uS/cm)	(NTU)	(mg/L)	(°F)	(°F)	
335	10/31/2020	Lakeside Beach	Log Book		6225.9	7.23	86	0.10	6.00	58.1	45	_Three breakers acting up
336												
337	11/1/2020	Lakeside Beach	Log Book		6225.9	7.28	80	0.18	6.90	56.8	46	Three breakers acting up
338	11/1/2020	Lakeside Beach	Log Book		6225.9	7.21	80	0.20	5.90	59.1	46	Three breakers acting up
339	11/1/2020	Lakeside Beach	Log Book		6225.9	7.43	80	0.13	6.30	59.7	46	Three breakers acting up
340	11/2/2020	Lakeside Beach	Log Book		6225.9	7.06	80	0.16	5.80	55.9	47	Thruster motor stopped working and was replaced
341	11/2/2020	Lakeside Beach	Log Book		6225.9	6.78	80	0.14	5.20	58.1	47	Thruster motor stopped working and was replaced
342	11/3/2020	Lakeside Beach	Log Book		6225.9	7.10	82	0.15	5.50	55.9	47	Thruster motor stopped working and was replaced.
343	11/3/2020	Lakeside Beach	Log Book		6225.9	6.90	82	0.19	5.80	57.9	47	Thruster motor stopped working and was replaced.
344	11/3/2020	Lakeside Beach	Log Book		6225.9	7.31	82	0.10	6.50	57.0	47	Thruster motor stopped working and was replaced.
345	11/4/2020	Lakeside Beach	Log Book		6225.9	6.93	83	0.13	5.00	55.9	46	_One depth pole has come loose.
346	11/4/2020	Lakeside Beach	Log Book		6225.9	6.22	83	0.18	4.80	57.7	46	_One depth pole has come loose.
347	11/4/2020	Lakeside Beach	Log Book		6225.9	6.26	83	0.12	6.00	56.8	46	_One depth pole has come loose.
348	11/5/2020	Lakeside Beach	Log Book		6225.9	6.23	84	0.19	5.40	56.3	48	Four breakers out all day
349	11/5/2020	Lakeside Beach	Log Book		6225.9	6.19	84	0.11	4.50	57.2	48	Four breakers out all day
350	11/5/2020	Lakeside Beach	Log Book		6225.9	6.22	84	0.05	4.80	56.4	48	Four breakers out all day
351	11/10/2020	Lakeside Beach	Log Book		6225.8	6.46	82	0.03	6.90	50.9	28	Last day of treatment
352	11/10/2020	Lakeside Beach	Log Book		6225.8	6.34	82	0.07	5.80	54.6	28	Last day of treatment
353	11/11/2020	Employee communication										Vessel is demobilized from Tahoe
354	11/12/2020	Employee communication										Cleaning of lights, storing and cleaning UV Vessel
355	11/13/2020											
356												
357	5/13/2021	Site Visit, Lakeside Marina										Bubble curtain installed at Lakeside by others.
358	5/27/2021	Shop, Preparation for Mobilization										Loaded UV Vessel on trailer ready for Mobilization
359												
360	6/1/2021	Mobilzation										Arrive at Condo, Tahoe Keys
361	6/13/2021	Preparation for Mobilzation	Personal									Pack up and move trailers to Tahoe
362	6/14/2021	Preparation for Mobilzation	Personal									Pack up and move trailers to Tahoe
363	6/15/2021	Preparation for Mobilzation	Personal									Pack up and move trailers to Tahoe
364	6/16/2021	Mobilzation	Personal Communicatio									Mobilize UV System to Lake Tahoe. UNR is diving at Lakeside Marina and Beach today. UNR shared photos of LS beach plants of Chara, snot algae and milfoil. No curly leaf found during UNR dives.
365	6/17/2021	Mobilzation	Personal									Diver making adjustment to array. Operations testing done by crew today.
366	6/18/2021	Lakeside Beach	Daily Log		6224.9	7.54	210	0.21	9.20	58.7	51	Operation testing, and started treatment today at Lakeside.
367	6/18/2021	Lakeside Beach	Daily Log		6224.9	7.54	211	0.23	9.20	65.4	84	Started treating North end of beach._ UNR Diving the beach Number 30 GFCI breaker tripped._Breaker changed which seemed to fix the problem.
368	6/19/2021											Images taken in the marina today by JJP. Plants present - Leafy Pondweed, Curlyleaft, Milfoil all of varying heights from 12 inches to 5 feet
369	6/20/2021											
370	6/21/2021	Lakeside Beach	Daily Log		6224.8	7.52	120	0.25	8.10	65.8	56	
371	6/21/2021	Lakeside Marina	Daily Log		6224.8	7.52	89	0.32	8.50	68.0	88	Started treating North end of beach 20' from plant line._Then treated D dock in marina.
372	6/21/2021	Lakeside Marina	Daily Log		6224.8	7.51	90	0.34	8.50	70.2	90	
373	6/22/2021	Lakeside Marina	Daily Log		6224.8	7.54	90	0.12	8.90	68.9	61	
374	6/22/2021	Lakeside Marina	Daily Log		6224.8	7.54	92	0.21	8.89	69.8	72	Started treating A dock in marina. Finished treating A, B, and C docks. UV transmittance reading not taken. Two large boats blocking the south end of A dock. The marina looks too murky to see any plants.
375	6/22/2021	Lakeside Marina	Daily Log		6224.8	7.55	92	0.25	8.91	70.9	78	
376	6/23/2021	Lakeside Marina	Daily Log		6224.8	7.49	101	0.12	9.10	67.9	60	
377	6/23/2021	Lakeside Marina	Daily Log		6224.8	7.50	101	0.19	9.25	69.7	76	Lakeside marina Started treating marina entrance._ Treated half of transect and most of C and D docks._UV transmittance reading not taken. Number 37 GFCI started tripping. Replaced and worked for the rest of the day. Plants appear to be one to two feet tall at marina entrance.
378	6/24/2021	Lakeside Marina	Daily Log		6224.8	7.48	127	0.10	8.30	67.4	57	Lightening strikes, thunderstorms, high winds in the afternoon. Noticed lights are starting to show fouling.
379	6/24/2021	Lakeside Marina	Daily Log		6224.8	7.49	127	0.19	8.50	68.4	77	Started treating marina transect. _Treated A dock and the remainder of C dock. _UV transmittance reading not taken. GFCI 14 tripped and was replaced. Worked fine after that.
380	6/25/2021	Lakeside Marina	Daily Log			7.49	92	0.10	8.10	66.6	58	

	A	B	C	D	E	F	G	H	I	J	K	L
1	Date	Sampling Location	Source	Wind Advisory? Y/N	Lake Level, ft	Water Quality Parameters						Notes
2						pH	EC	Turbidity	DO	Water Temp.	Air Temp	
3							(uS/cm)	(NTU)	(mg/L)	(°F)	(°F)	
381	6/25/2021	Lakeside Beach	Daily Log		6224.8	7.50	92	0.16	7.90	67.4	82	Started treating marina transect. Then treated shoreline of beach. UV transmittance reading not taken.
382	6/26/2021	Lakeside Marina/Beach										Tested GPS and worked on treatment maps
383	6/27/2021	Lakeside Marina/Beach										Tested GPS and worked on treatment maps
384	6/28/2021	Lakeside Beach	Daily Log		6224.8	7.90	92	0.10	7.90	68.3	61	
385	6/28/2021	Lakeside Beach	Daily Log		6224.8	7.80	92	0.19	7.80	72.0	99	Started treating shoreline of beach._Treated most of the beach area.
386	6/28/2021	Lakeside Marina	Daily Log		6224.8	7.40	98	0.29	7.40	72.5	99	
387	6/29/2021	Lakeside Marina	Daily Log		6224.8	7.47	201	0.19	7.50	71.6	64	
388	6/29/2021	Lakeside Beach	Daily Log		6224.8	7.48	92	0.25	8.20	73.4	87	Started treating fuel area of marina._Finished treating north end of beach. Port stern winch temporarily stopped working. Cycling power several times got it working again._One GFCI tripped in the afternoon, but worked after being turned back on.
389	6/29/2021	Lakeside Beach	Daily Log		6224.8	7.48	92	0.25	8.20	75.0	91	
390	6/30/2021	Lakeside Beach	Daily Log		6224.8	7.48	82	0.19	9.10	70.7	84	
391	6/30/2021	Lakeside Beach	Daily Log		6224.8	7.48	82	0.22	9.20	74.4	82	Started treating transect in marina._Treated breakwall on beach. GFCI 27 tripped again and was replaced. _Kayaker crashed into boat.
392	06/30/21	Lakeside Marina	Daily Log		6224.8	7.47	99	0.29	8.90	74.8	83	
393												
394	7/1/2021	Lakeside Beach	Daily Log		6224.7	7.49	92	0.10	8.70	71.6	85	
395	7/1/2021	Lakeside Beach	Daily Log		6224.7	7.49	92	0.14	8.72	74.7	85	Started treating marina entrance._Treated shoreline of beach. GFCI #7 tripped and was replaced, but continued to trip even with higher amp GFCI.
396	7/1/2021	Lakeside Marina	Daily Log		6224.7	7.47	98	0.29	8.23	75.0	83	
397	7/2/2021	Maintenance/Clean										Drove around taking bathroom scanning
398	7/3/2021	Maintenance/Clean										Worked on bubble curtain / Removed boat
399	7/4/2021	Maintenance/Clean										Changes all lamps
400	7/5/2021	Maintenance/Clean										Changes all lamps
401	7/6/2021	Maintenance/Clean										Drove boat to Keys
402	7/7/2021	Tahoe Keys Site 24	Daily Log		6224.7	8.71	125	2.75	5.61	74.5	72	
403	7/7/2021	Tahoe Keys Site 24	Daily Log		6224.7	8.79	130	2.92	5.65	72.4	82	Started treating boat ramp._Treated north side of site 24.Starboard bow winch would not start first thing in the morning. Cycling the kill switch got it working. _Water thermometer appears to be giving false readings.__Generator filter and inlet pipe became clogged with weeds and had to be cleaned._Filter had to be cleaned several more times during the day. Bubble Curtain at Lakeside was removed today by diver. Noted damage on bubble curtain for Sudeeps fragment study
404	7/7/2021	Tahoe Keyes Site 24	Daily Log		6224.7	8.80	129	3.21	5.52	73.4	87	
405	7/8/2021		Daily Log		6224.6					73.4		
406	7/8/2021	Tahoe Keyes Site 24	Daily Log		6244.6					74.5		Continued treating north side of site 24. GFCI #36 is tripping._Thruster relay burned out and was replaced.
407	7/9/2021	Tahoe Keyes Site 24	Daily Log		6224.6	8.70	125	2.50	5.13	76.2	68	
408	7/9/2021	Tahoe Keys Site 24	Daily Log		6224.6	8.70	125	2.10	5.15	74.0	82	Continued treating north side of site 24. Port aft battery replaced. _#20 GFCI was replaced, but started tripping again._Large plant sucked into generator intake and took multiple cleanings to remove.
409	7/9/2021	Tahoe Keyes Site 24	Daily Log		6224.6	8.70	126	2.70	5.11	74.3	88	
410	7/10/2021											Changed Port Bow Winch
411	7/11/2021											
412	7/12/2021		Daily Log		6224.6					75.4		Continued treatment on Site 24.
413	7/12/2021	Tahoe Keys Site 24	Daily Log		6224.6					75.1		Continued treating north side of site 24. One depth pole came loose. Treatment ended early on account of high winds.
414	7/13/2021	Tahoe Keys site 24	Daily Log		6224.6	8.65	130	2.20	5.60	74.8	73	
415	7/13/2021	Tahoe Keys Site 24	Daily Log		6224.6	8.70	130	2.50	5.70	75.9	85	Continued treating north side of site 24. Reinstalled depth pole that fell out yesterday._GFCI #29 started tripping and was replaced, worked for rest of day.
416	7/13/2021	Tahoe Keys Site 24	Daily Log		6224.6	8.70	130	2.20	5.80	75.7	86	
417	7/14/2021	Tahoe Keys Site 24	Daily Log		6224.6	8.70	129	2.10	5.50	76.7	69	
418	7/14/2021	Tahoe Keys Site 24	Daily Log		6224.6	8.70	129	2.60	5.60	78.1	89	Started treating south side of site 24. Underwater photos taken today Water inlet got clogged and had to be cleaned.
419	7/14/2021	Tahoe Keys Site 24	Daily Log		6224.6	8.70	129	2.80	5.40	78.7	89	
420	7/15/2021	Tahoe Keys Site 24	Daily Log		6224.6	8.72	151	2.60	6.20	79.6	68	
421	7/15/2021	Tahoe Keys Site 24	Daily Log		6224.6	8.70	151	3.00	6.17	80.7	86	Treated south side of site 24. Large mass of plants got stuck to bottom of boat and clogged generator coolent inlet.
422	7/15/2021	Tahoe Keys Site 24	Daily Log		6224.6	5.90	151	2.80	5.90	80.5	84	
423	7/16/2021	Tahoe Keys Site 24	Daily Log		6224.6	8.50	201	2.40	6.70	75.2	79.6	

	A	B	C	D	E	F	G	H	I	J	K	L
1	**Date**	**Sampling Location**	**Source**	**Wind Advisory? Y/N**	**Lake Level, ft**	**Water Quality Parameters**						**Notes**
2						**pH**	**EC**	**Turbidity**	**DO**	**Water Temp.**	**Air Temp**	
3							**(uS/cm)**	**(NTU)**	**(mg/L)**	**(°F)**	**(°F)**	
424	7/16/2021	Tahoe Keys Site 24	Daily Log		6224.5	8.50	201	2.80	6.55	75.2	83	Treated south side of site 24. Added valve to water strainer. Water inlet was clogged and was cleaned before starting generator._Inlet became clogged again several times during the day._A bear swam across the cove.
425	7/16/2021	Tahoe Keys Site 24	Daily Log		6224.5	8.50	201	2.90	6.55	74.5	81.7	
426	7/17/2021	Tahoe Keys Site 24	Phone									Added new batteries and realigned cables
427	7/18/2021	Tahoe Keys Site 24										
428	7/19/2021	Tahoe Keys Site 24	Daily Log		6224.5	8.55	200	2.70	6.00	74.1	81	
429	7/19/2021	Tahoe Keys Site 24	Daily Log		6224.5	8.56	199	2.80	5.75	74.1	81	Treated south side of site 24. Had to clean out water inlet twice._GFCI #14 tripped and was replaced.
430	7/19/2021	Tahoe Keys Site 24	Daily Log		6224.5	8.55	199	2.90	5.80	74.3	83	
431	7/20/2021	Tahoe Keys Site 24	Daily Log		6224.4	8.70	182	2.51	5.90	72.8	79	Treated south side of site 24. Replaced UPS. _Added bypass to generator inlet.
432	7/21/2021	Tahoe Keys Site 24	Daily Log		6224.4	8.70	172	2.15	6.80	72.7	63	
433	7/21/2021	Tahoe Keys Site 24	Daily Log		6224.4	8.70	172	2.70	6.52	73.7	80	Treated East end of site 24. Generator inlet hoses both became clogged and had to be cleaned.
434	7/22/2021	Tahoe Keys Site 24	Daily Log									Changed winch cables
435	7/23/2021	Tahoe Keys Site 24										
436	7/24/2021	Tahoe Keys Site 24	Daily Log		6224.3	8.70	170	2.70	6.90	72.2	77	Treated East end of site 24. Generator water pump failed and had to be replaced.__Screens added to intake hoses.
437	7/25/2021	Tahoe Keys Site 24	Daily Log		6224.3	8.80	169	2.20	5.90	71.8	83	Treated East end of site 24. Water strainers and water pump are working. Replaced winch cables
438	7/26/2021	Tahoe Keys Site 24	Daily Log		6224.3	8.60	172	1.90	5.90	71.2	78	
439	7/26/2021	Tahoe Keys Site 23	Daily Log		6224.3	8.60	172	2.20	5.75	72.2	90	Started West end of site 23. GFCIs 7 and 14 were replaced. Replaced motors.
440	7/26/2021	Tahoe Keys Site 23	Daily Log		6224.3	8.58	172	2.40	5.72	72.4	91	
441	7/27/2021	Tahoe Keys Site 23	Daily Log		6224.3	8.89	223	1.75	6.20	70.8	65	
442	7/27/2021	Tahoe Keys Site 23	Daily Log		6224.3	8.90	223	2.30	5.97	70.5	81	Treated West end of site 23. GFCI #14 started tripping again. Was replaced yesterday.
443	7/27/2021	Tahoe Keys Site 23	Daily Log		6224.3	8.90	223	2.40	5.82	71.3	82	
444	7/28/2021	Tahoe Keys Site 23	Daily Log		6224.3	8.63	163	2.01	6.30	68.9	57	
445	7/28/2021	Tahoe Keys Site 23	Daily Log		6224.3	8.69	163	2.25	6.01	70.4	90	Treated West end of site 23. Spotted giant invasive goldfish swimming in middle of Port Cove.
446	7/28/2021	Tahoe Keys Site 23	Daily Log		6224.3	8.64	163	2.60	5.90	70.1	86	
447	7/29/2021	Tahoe Keys Site 23	Daily Log		6224.3	8.90	172	1.90	6.20	69.4	65	
448	7/29/2021	Tahoe Keys Site 23	Daily Log		6224.3	8.82	172	1.85	5.90	70.2	88	Treated East end of site 23. Everything working normally.
449	7/29/2021	Tahoe Keys Site 23	Daily Log		6224.3	8.75	171	2.03	5.85	70.5	89	
450	7/30/2021	Tahoe Keys Site 23	Daily Log		6224.3	8.72	123	1.90	6.41	69.5	61	
451	7/30/2021	Tahoe Keys Site 23	Daily Log		6224.3	8.67	123	2.20	6.26	69.6	83	Treated East end of site 23. Replaced port stern battery and power supply._East end of Site 23 is very shallow (Array down at 2' mark).
452	7/31/2021											
453												
454												
455	8/1/2021											
456	8/2/2021	Tahoe Keys Site 23	Daily Log		6224.2	8.70	137	2.20	5.20	69.2	67	
457	8/2/2021	Tahoe Keys Site 23	Daily Log		6224.2	8.70	137	2.00	5.13	70.3	79	Treated East end of site 23. Buoy got stuck to thruster motor._Starboard bow forward thruster fuse replaced. Repaired Winch cables
458	8/2/2021	Tahoe Keys Site 23	Daily Log		6224.2	8.70	137	1.93	5.02	70.4	85	
459	8/3/2021	Tahoe Keys Site 23	Daily Log		6224.2	8.63	162	2.40	5.70	69.3	61	
460	8/3/2021	Tahoe Keys Site 23	Daily Log		6224.2	8.59	162	2.60	5.50	70.8	83	Treated West end of site 23. Winch switches are sticking.
461	8/3/2021	Tahoe Keys Site 23	Daily Log		6224.2	8.57	162	2.20	5.42	71.0	88	
462	8/4/2021	Tahoe Keys Site 23	Daily Log		6224.2	8.80	172	2.20	5.90	69.5	61	
463	8/4/2021	Tahoe Keys Site 23	Daily Log		6224.2	8.80	173	2.50	5.87	71.0	84	Treated North side of site 23. Another GFCI started tripping and was replaced with no change.
464	8/4/2021	Tahoe Keys Site 23	Daily Log		6224.2	8.80	173	2.32	5.85	70.9	85	
465	8/5/2021	Tahoe Keys Site 23	Daily Log		6224.2	8.59	152	2.50	6.00	69.3	69	Treated North side of site 23. Losing control of boat with wind speeds over 20mph.
466	8/6/2021	Tahoe Keys Site 23	Daily Log		6224.2	8.27	162	2.30	6.07	69.8	54	Treated North side of site 23. Water depth from 11' in the center to 0' at the shoreline.
467	8/7/2021											
468	8/8/2021											
469	8/9/2021	Tahoe Keys Site 23	Daily Log		6224.1	8.92	149	2.00	5.76	69.0	69	
470	8/9/2021	Tahoe Keys Site 23	Daily Log		6224.1	8.87	149	2.20	5.62	69.9	75	Treated North side of site 23._Then started treating south side near entrance. Port bow power supply went out. Running it with a jumper cable. Water depth from 12' in the center to 0' at the shoreline.
471	8/9/2021	Tahoe Keys Site 23	Daily Log		6224.1	8.74	149	2.70	5.49	71.1	71	
472	8/10/2021	Tahoe Keys Site 23	Daily Log		6224.1	8.67	150	2.50	6.30	70.2	59	
473	8/10/2021	Tahoe Keys Site 23	Daily Log		6224.1	8.59	151	2.70	5.90	71.1	84	Treated South side of site 23. Light bulbs were checked and found to be very dirty. Water depth from 12' in the center to 0' at the shoreline.
474	8/11/2021											
475	8/12/2021	Cleaning/Maintenance										Removed Vessel for cleaning
476	8/13/2021	Cleaning/Maintenance										Removed Vessel for cleaning

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1	**Date**	**Sampling Location**	**Source**	**Wind Advisory? Y/N**	**Lake Level, ft**	**Water Quality Parameters**						**Notes**
2						**pH**	**EC**	**Turbidity**	**DO**	**Water Temp.**	**Air Temp**	
3							**(uS/cm)**	**(NTU)**	**(mg/L)**	**(°F)**	**(°F)**	
477	8/14/2021	Cleaning/Maintenance										Removed Vessel for cleaning
478	8/15/2021	Cleaning/Maintenance										Added new electrical meter monitoring
479	8/16/2021	Lakeside Marina	Daily Log		6224.0	7.51	72	0.11	65.50	73.9	66	
480	8/16/2021	Lakeside Marina	Daily Log		6224.0	7.52	72	0.27	84.60	72.3	85	Treated Lakeside Marina A dock and D dock. Cleaned array and attached protective screens. Heavy smoke over entire lake. Water depth from 5' in the center to 4' at the shoreline. Voltage in water 0.56V.
481	8/17/2021	Lakeside Marina	Daily Log		6224.0	7.55	82	0.19	9.20	66.0	80	Treated Lakeside Marina B dock and entrance. Heavy smoke over entire lake. Water depth from 5' in the center to 4' at the shoreline. Voltage in water 0.44V.
482	8/18/2021	Lakeside Marina	Daily Log		6223.9	7.52	62	0.20	8.72	72.2	71	
483	8/18/2021	Lakeside Marina	Daily Log		6223.9	7.52	62	0.18	8.70	70.7	71	Treated Lakeside beach and Marina A dock. Water depth from 5' in the center to 0' at the shoreline. Voltage in water 0.45V.
484	8/19/2021	Lakeside Marina	Daily Log		6223.9	7.53	42	0.21	8.73	70.3	72	Treated Lakeside Marina C dock. Both aft winches broke while driving to the beach. Spent most of the day repairing them. Water depth from 5' in the center to 3' at the edge. Voltage in water 0.49V.
485	8/20/2021	Lakeside Beach	Daily Log		6223.9	7.56	51	0.09	8.20	67.2	55	
486	8/20/2021	Lakeside Marina	Daily Log		6223.9	7.52	63	0.15	7.92	68.2	77	in the center to 1' at the shoreline. Voltage in water 0.72V.
487	8/21/2021											
488	8/22/2021											
489	8/23/2021	Lakeside Beach	Daily Log		6223.8	7.53	33	0.21	8.24	68.9	86	
490	8/23/2021	Lakeside Beach	Daily Log		6223.8	7.54	33	0.20	8.31	69.7	86	Treated Lakeside Beach. Water depth from 4' in the center to 1' at the shoreline. Voltage in water 0.58V.
491	8/24/2021	Lakeside Beach	Daily Log		6223.8	7.53	36	0.24	8.42	67.0	54	
492	8/24/2021	Lakeside Beach	Daily Log		6223.8	7.53	36	0.26	8.20	68.6	92	Treated Lakeside Beach. Water depth around 4'. Voltage in water 0.77V.
493	8/24/2021	Lakeside Marina	Daily Log		6223.8	7.49	47	0.21	6.20	67.9	85	
494	8/25/2021	Lakeside Beach	Daily Log		6223.8	7.53	23	0.09	9.27	67.5	52	
495	8/25/2021	Lakeside Marina	Daily Log		6223.8	7.51	34	0.19	8.14	68.0	85	Treated Lakeside Beach. Water depth around 4'. Voltage in water 0.70V.
496	8/25/2021	Lakeside Marina	Daily Log		6223.8	7.49	35	0.23	7.92	68.3	75	
497	8/26/2021	Lakeside Beach	Daily Log		6223.8	7.53	40	0.19	9.29	67.4	50	
498	8/26/2021	Lakeside Beach	Daily Log		6223.8	7.53	42	0.22	8.82	69.6	89	Treated Lakeside Beach. Water depth around 3'. Voltage in water 0.82V.
499	8/26/2021	Lakeside Beach	Daily Log		6223.8	7.53	42	0.21	8.79	70.1	91	
500	8/27/2021	Lakeside Marina	Daily Log		6223.8	7.51	33	0.21	8.50	67.6	69	
501	8/27/2021	Lakeside Marina	Daily Log		6223.8	7.51	33	0.20	8.52	67.4	76	Treated Lakeside Beach and marina. Water depth around 3'. Voltage in water 0.73V.
502	8/28/2021	No Treatment/ Caldor Fires/Haz. Smoke										Leave Tahoe due to smoke
503	8/29/2021	No Treatment/ Caldor Fires/Haz. Smoke										Work on mapping and report data
504	8/30/2021	No Treatment/ Caldor Fires/Haz. Smoke										Vessel improvements for 2022
505	8/31/2021	No Treatment/ Caldor Fires/Haz. Smoke										Vessel improvements for 2022
506												
507												
508	9/1/2021	No Treatment/ Caldor Fires/Haz. Smoke										Work on mapping and report data
509	9/2/2021											
510	9/3/2021											
511	9/4/2021											
512	9/5/2021											
513	9/6/2021											
514	9/7/2021											
515	9/8/2021											
516	9/9/2021											Equipment testing marina
517	9/10/2021											Equipment testing marina
518	9/11/2021											Remove array for lamp repair – Tow boat to Keys
519	9/12/2021											
520	9/13/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.6	8.79	132	2.40	5.10	63.3	58	

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2						**pH**	**EC**	**Turbidity**	**DO**	**Water Temp.**	**Air Temp**	
3							**(uS/cm)**	**(NTU)**	**(mg/L)**	**(°F)**	**(°F)**	
521	9/13/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.6	8.83	132	2.53	5.20	63.8	64	Treated Keys entrance channel. Water depth around 3' at the edge of the channel and 10' at the center. Voltage in water 0.42V. Treatment – Took photos of fragments left from harvester
522	9/13/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.6	8.95	132	2.75	5.30	66.1	75	
523	9/14/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.6	8.50	147	2.29	5.70	63.1	53	
524	9/14/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.6	8.97	147	2.58	5.82	64.4	69	Treated Keys entrance channel. Water depth around 3' at the edge of the channel and 11' at the center. Voltage in water 0.42V. Images taken of underwater plant status at TK entrance channel
525	9/14/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.6	8.99	147	2.64	5.79	67.1	81	
526	9/15/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.6	8.62	151	2.82	5.99	64.3	54	
527	9/15/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.6	8.70	151	2.29	5.92	67.4	78	Treated Keys entrance channel. Water depth around 3' at the edge of the channel and 10' at the center. Voltage in water 0.42V._Generator inlet filter became clogged and had to be cleaned.
528	9/15/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.6	8.72	150	2.39	5.89	68.2	83	
529	9/16/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.5	7.30	152	2.72	6.42	63.8	49	
530	9/16/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.5	6.32	171	2.98	6.27	66.8	81	Treated Keys entrance channel. Water depth around 3' at the edge of the channel and 7' at the center. Voltage in water 0.78V.
531	9/16/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.5	7.50	152	2.37	6.09	66.8	84	
532	9/17/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.5	8.79	139	2.19	6.20	63.1	74	
533	9/17/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.5	8.76	139	2.27	6.10	65.2	81	Treated Keys entrance channel. Water depth around 3' at the edge of the channel and 8' at the center. Voltage in water 0.50V. Images with drone taken of vessel at this site.
534	9/17/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.5	8.76	139	2.40	6.26	64.9	87	
535	9/18/2021	Tahoe Keys Entrance/Channel										
536	9/19/2021	Tahoe Keys Entrance/Channel										
537	9/20/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.4	7.70	131	1.97	5.61	59.3	45	
538	9/20/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.4	7.01	120	2.34	6.89	64.7	79	Treated Keys entrance channel. Water depth around 3' at the edge of the channel and 7' at the center. Voltage in water 0.59V.
539	9/20/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.4	7.90	130	2.62	5.90	63.0	75	
540	9/21/2021	Tahoe Keys Entrance/Channel	Daily Log		6223.4	6.99	119	2.37	6.57	61.2	91	Treated Keys entrance channel. Water depth around 3' at the edge of the channel and 9' at the center. Voltage in water 0.48V._A family of bears swam in front of the boat. Images taken at Lakeside with drone.
541	9/22/2021	Cleaning/Maintenance										Removed Vessel at Keys marina for Lamp change
542	9/23/2021	Tahoe Keys Anchor Cove	Daily Log		6223.4	6.72	149	1.98	5.03	61.7	60	
543	9/23/2021	Tahoe Keys Anchor Cove	Daily Log		6223.4	6.67	149	2.10	5.20	62.3	76	Treated Keys anchor cove. Water depth around 12' at the edge of the channel and 13' at the center. Voltage in water 0.47V.
544	9/24/2021	Tahoe Keys Anchor Cove	Daily Log		6223.4	7.10	139	1.92	6.92	60.3	46	
545	9/24/2021	Tahoe Keys Anchor Cove	Daily Log		6223.4	7.03	139	1.99	6.87	60.6	76	Treated Keys anchor cove. Water depth around 9' at the edge of the channel and 13' at the center. Voltage in water 0.35V._GFCI #35 tripped are startup but worked for the rest of the day.
546	9/25/2021	Maintenance										Repaired winch cables
547	9/26/2021											
548	9/27/2021	Tahoe Keys Anchor Cove	Daily Log	Y	6223.3	6.91	141	1.92	6.80	60.1	57	Treated Keys anchor cove. Water depth around 13' at the edge of the channel and 15' at the center. Voltage in water 0.34V._GFCI #35 tripped are startup but worked for the rest of the day._Had to stop early because of high winds.
549	9/28/2021	Tahoe Keys Anchor Cove	Daily Log		6223.3	7.05	147	1.92	5.56	59.7	48	
550	9/28/2021	Tahoe Keys Anchor Cove	Daily Log		6223.3	7.10	147	1.97	5.52	59.9	65	Treated Keys anchor cove. Water depth around 8' at the edge of the channel and 15' at the center. Voltage in water 0.44V._GFCI #40 started tripping.
551	9/29/2021	Tahoe Keys Anchor Cove	Daily Log		6223.3	6.90	151	1.87	6.20	58.8	38	
552	9/29/2021	Tahoe Keys Anchor Cove	Daily Log		6223.3	6.85	151	1.92	6.14	60.8	64	Treated Keys anchor cove. Water depth around 8' at the edge of the channel and 15' at the center. Voltage in water 0.69V._GFCIs 35 and 40 started tripping.
553	9/30/2021	Tahoe Keys Anchor Cove	Daily Log		6223.2	7.10	149	2.10	6.92	59.7	38	
554	9/30/2021	Tahoe Keys Anchor Cove	Daily Log		6223.2	7.07	149	2.13	6.87	58.7	66	Treated Keys anchor cove. Water depth around 7' at the edge of the channel and 10' at the center. Voltage in water 0.98V.
555	09/30/21	Tahoe Keys Anchor Cove	Daily Log		6223.2	7.12	149	2.05	6.20	61.6	74	
556												
557	10/1/2021	Tahoe Keys Anchor Cove	Daily Log		6223.2	6.79	182	2.10	6.10	57.9	40	Treated Keys anchor cove. Water depth around 8' at the edge of the channel and 9' at the center. Voltage in water 0.71V.
558	10/2/2021											
559	10/3/2021											
560	10/4/2021	Tahoe Keyes Port Cove	Daily Log		6223.2	6.82	191	2.11	6.30	56.6	42	

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2						**pH**	**EC**	**Turbidity**	**DO**	**Water Temp.**	**Air Temp**	
3							**(uS/cm)**	**(NTU)**	**(mg/L)**	**(°F)**	**(°F)**	
561	10/4/2021	Tahoe Keyes Port Cove	Daily Log		6223.2	6.98	191	2.17	6.19	57.4	71	Treated Keys port cove. Water depth around 8' at the edge of the channel and 11' at the center. Voltage in water 0.38V.
562	10/5/2021	Tahoe Keyes Port Cove	Daily Log		6223.2	6.91	170	2.15	6.91	56.3	45	
563	10/5/2021	Tahoe Keyes Port Cove	Daily Log		6223.2	6.93	170	2.17	6.93	57.3	70	Treated Keys port cove. Water depth around 7' at the edge of the channel and 12' at the center. Voltage in water 0.66V.
564	10//5/2021	Tahoe Keyes Port Cove	Daily Log		6223.2	6.99	170	2.19	6.99	58.4	73	
565	10/6/2021	Tahoe Keyes Port Cove	Daily Log		6223.2	6.78	170	2..2	6.78	58.1	53	
566	10/6/2021	Tahoe Keyes Port Cove	Daily Log		6223.2	6.62	170	2.21	6.62	59.1	70	Treated Keys port cove. Water depth around 5' at the edge of the channel and 11' at the center. Voltage in water 0.61V.
567	10/7/2021	Tahoe Keyes Port Cove	Daily Log		6223.1	6.98	190	2.10	5.75	59.1	69	Treated Keys port cove. Water depth around 6' at the edge of the channel and 10' at the center. Voltage in water 0.77V.
568	10/8/2021	Tahoe Keyes Port Cove	Daily Log		6223.1	6.92	169	2.29	5.30	58.1	47	
569	10/8/2021	Tahoe Keyes Port Cove	Daily Log		6223.1	6.98	169	2.30	5.39	58.9	57	Treated Keys port cove. Water depth around 7' at the edge of the channel and 10' at the center. Voltage in water 0.58V.
570	10/9/2021											
571	10/10/2021											
572	10/11/2021	Tahoe Keys Entrance Channel	Daily Log									Hail and snow
573	10/12/2021	Tahoe Keys Entrance Channel	Daily Log		6223.0	8.00	129	2.49	7.16	48.0	35	Treated Keys entrance channel. Water depth around 5' at the edge of the channel and 10' at the center. Voltage in water 0.90V._High winds made controlling the boat difficult.
574	10/13/2021	Tahoe Keys Entrance Channel	Daily Log		6223.0	8.30	130	2.72	7.01	50.8	57	Treated Keys entrance channel. Water depth around 8' at the edge of the channel and 10' at the center. Voltage in water 0.95V.
575	10/14/2021	Tahoe Keys Entrance Channel	Daily Log		6223.0	8.30	135	2.30	6.30	51.0	39	
576	10/14/2021	Tahoe Keys Entrance Channel	Daily Log		6223.0	8.30	135	2.29	6.11	52.6	47	Treated Keys entrance channel. Water depth around 5' at the edge of the channel and 7' at the center. Voltage in water 0.88V.
577	10/15/2021	Tahoe Keys Entrance Channel	Daily Log		6223.0	8.20	132	2.70	6.89	51.2	33	
578	10/15/2021	Tahoe Keys Entrance Channel	Daily Log		6223.0	8.30	132	2.65	6.75	52.4	52	Treated Keys entrance channel. Water depth around 3' at the edge of the channel and 7' at the center. Voltage in water 0.88V. Plants along aray pretty thick.
579	10/16/2021	Maintenance										Barge on ramp hit vessel, damaged prop
580	10/17/2021	Maintenance										Repaired prop
581	10/18/2021	Tahoe Keys Entrance Channel	Daily Log		6223.0	8.30	132	2.50	8.00	49.8	33	
582	10/18/2021	Tahoe Keys Entrance Channel	Daily Log		6223.0	8.30	132	2.40	7.20	51.1	51	Treated Keys entrance channel. Water depth around 3' at the edge of the channel and 6' at the center. Voltage in water 1.01V.
583	10/19/2021	Tahoe Keys Entrance Channel	Daily Log		6222.9	8.15	129	2.49	7.20	49.8	38	Treated Keys entrance channel. Took images of all sites today.
584	10/20/2021	Plan move to Lakeside marina										
585	10/21/2021	Demobilization										
586	10/22/2021											
587	10/23/2021	Moved trailer back to Salida										
588	10/24/2021											
589	10/25/2021											
590	10/26/2021											
591	10/27/2021											
592	10/28/2021	Drove boat to Tahoe Keys for Removal										
593	10/29/2021	Vessel arrives in Salida for breakdown										
594	10/30/2021											
595	10/31/2021											
596												
597												
598	11/1/2021											
599	11/2/2021											
600	11/3/2021											
601	11/4/2021											
602	11/5/2021											
603	11/6/2021											
604	11/7/2021											
605	11/8/2021											
606	11/9/2021	Crane removed generator from vessel										
607	11/10/2021											
608	11/11/2021											

Lakeside Beach 2019-2021	Lake Level	Water Quality Parameters						
		pH	EC	Turbidity	DO	DOC	Water Temp.	Air Temp
	feet LTD		(uS/cm)	(NTU)	(mg/L)	(mg/L)	(°F)	(°F)
2019 Count	30	28	28	28	28		30	30
2019 Max	6228.3	7.80	59	0.34	9.08		65.1	79
2019 Min	6227.4	7.50	43	0.12	7.80		48.3	40
2019 Mean	6227.6	7.65	47	0.23	8.37		53.8	62
2019 Median	6227.5	7.63	45	0.24	8.32		52.4	63
2019 UNR Reference (October)		7.84	43	0.08		5.03		
2019 UNR Reference (November)		7.61	198	0.00		5.08		
2020 Count	68	68	68	68	68		68	68
2020 Max	6227.5	7.87	90	0.27	8.20		72.5	66
2020 Min	6225.8	6.19	78	0.02	2.30		50.9	28
2020 Mean	6226.2	7.17	84	0.12	6.38		60.6	49
2020 Median	6226.1	7.29	83	0.10	6.73		59.8	48
2020 UNR Reference (June)		7.95	72	0.13		5.18		
2020 UNR Reference (August)		7.80	92	0.00		6.31		
2020 UNR Reference (October)		7.99	88	0.00		5.89		
2020 UNR Reference (December)		7.81	60	0.00		7.37		
2021 Count	21	21	21	21	21		21	20
2021 Max	6224.9	7.90	211	0.26	9.29		75.0	99
2021 Min	6223.8	7.48	23	0.09	7.80		58.7	50
2021 Mean	6224.4	7.55	80	0.19	8.56		69.2	77
2021 Median	6224.7	7.53	82	0.21	8.42		68.9	84
2021 UNR Reference (May)		7.87	196	0		4.64		
2021 UNR Reference (June)		7.78	84	0.09		5.22		
2021 UNR Reference (July)		8.21	84	0.24		5.54		
2021 UNR Reference (September)		8.00	96	0.02		6.44		
2021 UNR Reference (November)		7.85	88	0		7.07		

Lakeside Marina 2019-2021	Lake Level	Water Quality Parameters						
		pH	EC	Turbidity	DO	DOC	Water Temp.	Air Temp
	feet LTD		(uS/cm)	(NTU)	(mg/L)	(mg/L)	(°F)	(°F)
2019 Count	20	18	18	18	18		18	21
2019 Max	6229.0	7.91	72	0.35	8.80		67.8	78
2019 Min	6227.6	7.41	35	0.11	7.40		52.9	49
2019 Mean	6228.1	7.67	54	0.23	8.13		59.9	66
2019 Median	6227.9	7.66	46	0.23	8.10		56.5	67
2019 UNR Reference (October)		7.80	43	0.12		5.54		
2019 UNR Refernce (November)		7.52	88	0.00		6.29		
2020 Count	71	71	71	71	71		71	71
2020 Max	6227.9	8.39	120	3.01	8.90		72.8	72
2020 Min	6226.0	6.98	67	0.10	2.30		53.4	44
2020 Mean	6227.2	7.60	87	0.62	7.12		66.1	62
2020 Median	6227.5	7.61	85	0.30	6.90		67.8	64
2020 UNR Reference (June)		7.87	102	0.24		6.05		
2020 UNR Reference (August)		7.61	84	0.00		6.31		
2020 UNR Reference (October)		7.77	90	0.00		10.27		
2020 UNR Reference (December)		7.64	84	0.00		7.42		
2021 Count	25	25	25	25	25		25	25
2021 Max	6224.8	7.55	201	0.34	84.60		74.8	99
2021 Min	6223.8	7.40	33	0.10	6.20		66.0	57
2021 Mean	6224.4	7.51	81	0.20	13.74		69.6	75
2021 Median	6224.8	7.51	89	0.20	8.52		68.9	76
2021 UNR Reference (May)		7.64	178	0.10		5.32		
2021 UNR Reference (June)		7.86	88	0.14		4.69		
2021 UNR Reference (July)		7.62	100	0.26		5.06		
2021 UNR Reference (September)		7.50	116	0.00		6.97		
2021 UNR Reference (November)		7.79	112	0.40		7.17		

TKPOA Research Area, 2019-2021	Lake Level	Water Quality Parameters						Air Temp
		pH	EC	Turbidity	DO	DOC	Water Temp.	
	feet LTD		(uS/cm)	(NTU)	(mg/L)	(mg/L)	(°F)	(°F)
2019 Count	22	16	16	16	16		18	19
2019 Max	6228.1	9.01	130	3.70	6.90		60.6	78
2019 Min	6227.2	8.30	54	2.16	4.70		50.3	51
2019 Mean	6227.6	8.64	82	2.80	6.02		53.7	62
2019 Median	6227.3	8.70	58	2.88	6.10		50.8	61
2019 TKPOA Research Test (October)		9.15	51	2.38		8.51		
2019 TKPOA Research Test (November)		8.21	96	2.12		9.01		
2019 TKPOA UNR Established (October)		9.08	47	3.92		8.25		
2019 TKPOA UNR Established (November)		8.11	114	2.96		9.91		
2019 TKPOA Reference (October)		9.09	44	2.15		8.91		
2019 TKPOA Reference (November)		8.20	128	2.27		9.09		
2020 Count	88	85	86	85	86		88	88
2020 Max	6227.8	9.50	130	7.20	9.91		75.3	68
2020 Min	6226.2	6.76	62	0.02	4.70		52.4	48
2020 Mean	6227.0	8.26	102	2.65	6.25		68.2	58
2020 Median	6226.8	8.25	101	2.91	5.90		68.5	57
2020 TKPOA Research Test (April)		7.80	104	0.35	8.73	8.73		
2020 TKPOA Research Test (June)		9.13	78	0.45	5.79	5.39		
2020 TKPOA Research Test (July)		9.31	80	2.87	7.14	7.14		
2020 TKPOA Research Test (August)		8.73	98	0.32	8.87	8.87		
2020 TKPOA Research Test (September)		8.17	116	2.99	10.67	10.67		
2020 TKPOA Research Test (October)		7.76	120	2.45	11.12	11.12		
2020 TKPOA UNR Established (April)		7.84	104	0.31	7.64	7.64		
2020 TKPOA UNR Established (June)		9.21	76	0.13	5.33	5.33		
2020 TKPOA UNR Established (July)		9.53	78	1.82	7.35	7.35		
2020 TKPOA UNR Established (August)		9.13	98	0.32	9.11	9.11		
2020 TKPOA UNR Established (September)		8.34	104	3.33	10.61	10.61		
2020 TKPOA UNR Established (October)		7.96	120	1.86	11.39	11.39		
2020 TKPOA Reference (April)		7.80	102	0.34	7.41	7.41		
2020 TKPOA Reference (June)		8.37	70	0.10	6.21	6.21		
2020 TKPOA Reference (July)								
2020 TKPOA Reference (August)		9.23	100	0.33	8.91	8.91		
2020 TKPOA Reference (September)		8.33	116	3.01	10.54	10.40		
2020 TKPOA Reference (October)		7.83	108	2.22	11.45	11.45		
2021 Count	111	107	107	106	107		111	107
2021 Max	6244.6	8.99	223	3.21	8.00		80.7	91
2021 Min	6222.9	6.32	119	1.75	5.02		48.0	33
2021 Mean	6224.1	8.19	155	2.36	6.05		66.7	70
2021 Median	6224.1	8.60	150	2.30	5.92		69.3	73
2021 TKPOA Research Test (May)		8.23	158	0.42		8.16		
2021 TKPOA Research Test (June)		10.17	82	0.13		7.04		
2021 TKPOA UNR Established (May)		8.32	130	0.41		9.41		
2021 TKPOA UNR Established (June)		10.14	110	0.09		6.96		
2021 TKPOA Reference (May)		8.29	138	0.25		8.73		
2021 TKPOA Reference (June)		10.17	108	0.02		6.27		