Non-Chemical Combination Control Methods Test Summary Report for the Tahoe Keys Property Owners Association

Final
May 15, 2018

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Prepared for

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TAHOE KEYS INTEGRATED MANAGEMENT PLAN

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SUMMARY

The Tahoe Keys, a residential development in South Lake Tahoe, has 172 acres of waterways that are 80-90% filled with aquatic invasive weeds (TKPOA 2017a). In order to better manage the aquatic weed problem within the Tahoe Keys Lagoons (Lagoons), the Tahoe Keys Property Owners Association (TKPOA) has been conducting research and field trials on various control methods based on input and guidance from experts and regional stakeholders. As part of this research, the TKPOA proposed the use of rotovation and bottom barriers in a non-chemical combination control methods test for the summer of 2017.

After scoping and bidding the project, and consulting with regulatory agencies, it was determined that rotovation could have potentially significant environmental impacts and was therefore deemed infeasible for use in the Lagoons. The scope of the project was revised to only focus on large-scale bottom barriers with installation in July 2017.

Before and after installation, monitoring included a plant survey, hydroacoustic scanning, and water quality parameters. This data, along with additional plant surveys to be conducted in Spring 2018, will help determine the overall efficacy of the control method and better inform the aquatic weed management program for the Lagoons.

1.0 INTRODUCTION

As part of the Integrated Management Plan (IMP), the TKPOA has been researching and testing various control methods that can be used in combination to reduce the growth and spread of macrophytes in the Lagoons. In 2017, the TKPOA proposed using a combination of bottom barriers and rotovating to assess the effectiveness of the two methods, both on their own and in combination. Results of the study will be included in the 2017 update of the IMP and will also aid in the finalization of a long-term IMP for the Tahoe Keys Lagoons, scheduled for completion by 2020.

The homeowner's bottom barrier program, which was initiated in 2015, is separate from the combination control methods test. The homeowner program is part of the Waste Discharge Requirements permit (WDRs) and allows for individual homeowners to install barriers around boat docks. Information on the homeowners program is available in the 2017 Bottom Barrier Monitoring Report prepared by TKPOA (TKPOA 2017b).

2.0 PROJECT DESCRIPTION

In the summer of 2017, the TKPOA proposed to undertake a project that would use a combination of aquatic macrophyte control methods, including rotovation and bottom barrier installation, to evaluate and compare the efficacy of each method alone and in combination with each other. The proposed project was set to cover a 3-year study period, where treated and control areas would be compared for aquatic plant regrowth.

Rotovating is a control method that uses a large metal tined head, inserted into the sediment, to dislodge plants and their root masses. This method was previously determined to be infeasible for the Tahoe Keys Lagoons in the Evaluation of Mechanical Control Methods for Aquatic Weeds in the Tahoe Keys Lagoons (TKPOA 2016b); however, requests from project stakeholders and community members led to this control method being proposed for field testing in 2017 and TKPOA released a Request for Proposals (RFP) on May 30, 2017.

On June 14, 2017 TKPOA met with several regulatory stakeholders to discuss the possible rotovation trial as a treatment method for aquatic weed control in the Tahoe Keys lagoons. Representatives from LRWQCB, TRPA, U.S. Army Corps of Engineers (USACE) and California Department of Fish and Wildlife (CDFW) were in attendance at the meeting. Regulators expressed concern regarding multiple potentially significant environmental impacts associated with rotovation as an aquatic weed control method. These concerns included: potential spread of aquatic invasive weeds due to the rotovation activity, potential for rotovation to remobilize alum trapped in the Tahoe Keys substrate leading to potentially toxic concentrations, and impacts to benthic invertebrates and fish associated with rotovation trauma. CDFW noted the potential for fish kill within the rotovated treatment area, pointing out that the turbidity curtains could trap fish that would otherwise migrate out of the area of disturbance.

Due to the potentially significant impacts associated with rotovation, the rotovation trial would require substantial environmental and permitting review requirements including a Nationwide 404 Permit from USACE, 401 Water Quality Certification (WQC) from the LRWQCB, a Lake and Streambed Alteration (LSA) Agreement from CDFW, and potentially a Shorezone permit from TRPA. Evaluation of environmental impacts per CEQA and TRPA regulations would also be required.

It was determined that rotovating could have potentially significant environmental impacts that may trigger an Environmental Impact Report under the California Environmental Quality Act; additionally, permitting for the project may not have been possible based on potential impacts. For these reasons, rotovating was again determined to be an infeasible control method for the Tahoe Keys Lagoons.

The second of the two methods proposed, namely bottom barriers, is a known control method for aquatic macrophytes that has been used previously around Lake Tahoe for controlling limited areas of macrophytes. Barriers, which typically have dimensions of 10 feet x 10 feet or 10 feet x 40 feet, have been used in the Tahoe Keys for small areas (typically under 500 sq. ft.), both by TKPOA and by homeowners, but not for larger areas. For 2017 as part of this study, the TKPOA proposed the use of bottom barriers, covering approximately 0.75 acre (over 30,000 sq. ft.), to test the potential effectiveness of large scale use in the lagoons.

Bottom barriers were loaned by the Tahoe Resource Conservation District (TRCD) for the test. TKPOA prepared (cleaned and rolled) the barriers for installation. The originally proposed one acre test was reduced to 0.75 acre in order to fit within budget constraints

(due to the high cost of diving labor to install and remove barriers). The barriers were placed by Hiuga Diving Company between White Sands and Balboa Drives (Figure 1) starting July 7th and took approximately one week to install.

The divers installed the barriers by rolling them out along the channel bottom and securing them in place with rebar u-stakes. Where stakes could not be used due to bottom sediment conditons, sand bags were used instead. The barriers were overlapped to help minimize growth of macrophytes between the barriers.

The barriers were allowed to remain in place until the end of the growing season and were pulled out by Hiuga Diving Company the first week of October.

Figure 1. Large Scale Bottom Barrier Installation 2017

3.0 PROJECT IMPLEMENTATION

Project implementation consisted of permitting, installation, and removal of the barriers. Each step of implementation was documented to help assess the feasibly of large scale bottom barrier applications within the Tahoe Keys Lagoons.

3.1 Permitting

Permitting for the project was limited. As previously mentioned, rotovating was determined to have potentially significant environmental impacts during the regulatory review process. This eliminated rotovating from the project. Under the Tahoe Keys WDRs permit, the TKPOA can install up to 5 acres of bottom barriers without further permitting from the Lahontan Regional Water Quality Control Board. Additionally, the TKPOA was able to qualify the project under the TRCD's Lakebed/Stream Alteration Agreement with the California Department of Fish and Wildlife by submitting a Verification Request Form and applicable fee.

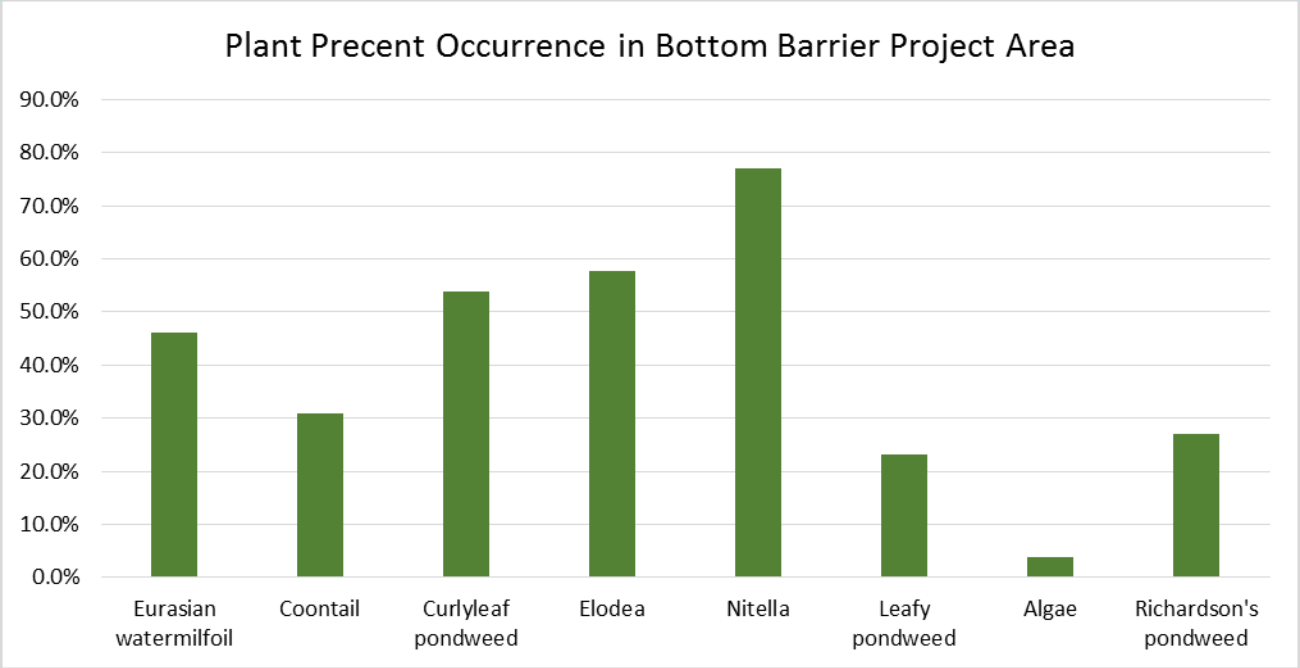
3.2 Installation

Installation of the barriers was more labor intensive than originally estimated by TKPOA and the diving company. Barrier cleaning and repairs, rebar purchase and fabricating for use as anchors and staples, and the logistics of transporting all materials (either by Hiuga Diving Company or TKPOA by truck or OmniCat), required approximately 200 labor hours.

The barriers were installed without much difficulty. There were some homeowner coordination activities that were necessary, but overall the divers were able to install the barriers readily in the project area (with some exceptions around dock piers). Buoys were placed in the lagoon to mark the perimeter of the barriers so that homeowners and visitors could take precautions while boating to not disturb or damage the barriers.

Monitoring was conducted prior to installation that consisted of turbidity and plant point sampling within the project area in addition to hydroacoustic monitoring. Unfortunately, there was an error with the scanning system and no map was generated. The plant survey showed that curlyleaf pondweed was somewhat more present than Eurasian watermilfoil (54% coverage compared to 46% coverage, respectively). There was also a high coverage of nitella (77%), a multicellular algae, and native elodea (58%), as can be seen in Figure 2.

Figure 2. Plant Percent Occurrence in Bottom Barrier Project Area



The water quality data taken in the project area during barrier installation (July 10 – July 14) showed turbidity values between 0.5 and 5.8 FNU with an average of 1.8 FNU. Two outliers were recorded, 10.0 and 12.6 FNU, which were likely due to the disturbance of the sediment layer by the probe when lowered into the water. The water quality objective for Lake Tahoe is 3.0 FNU but it is not uncommon to see higher values in the TKPOA Lagoons (TKPOA 2017c).

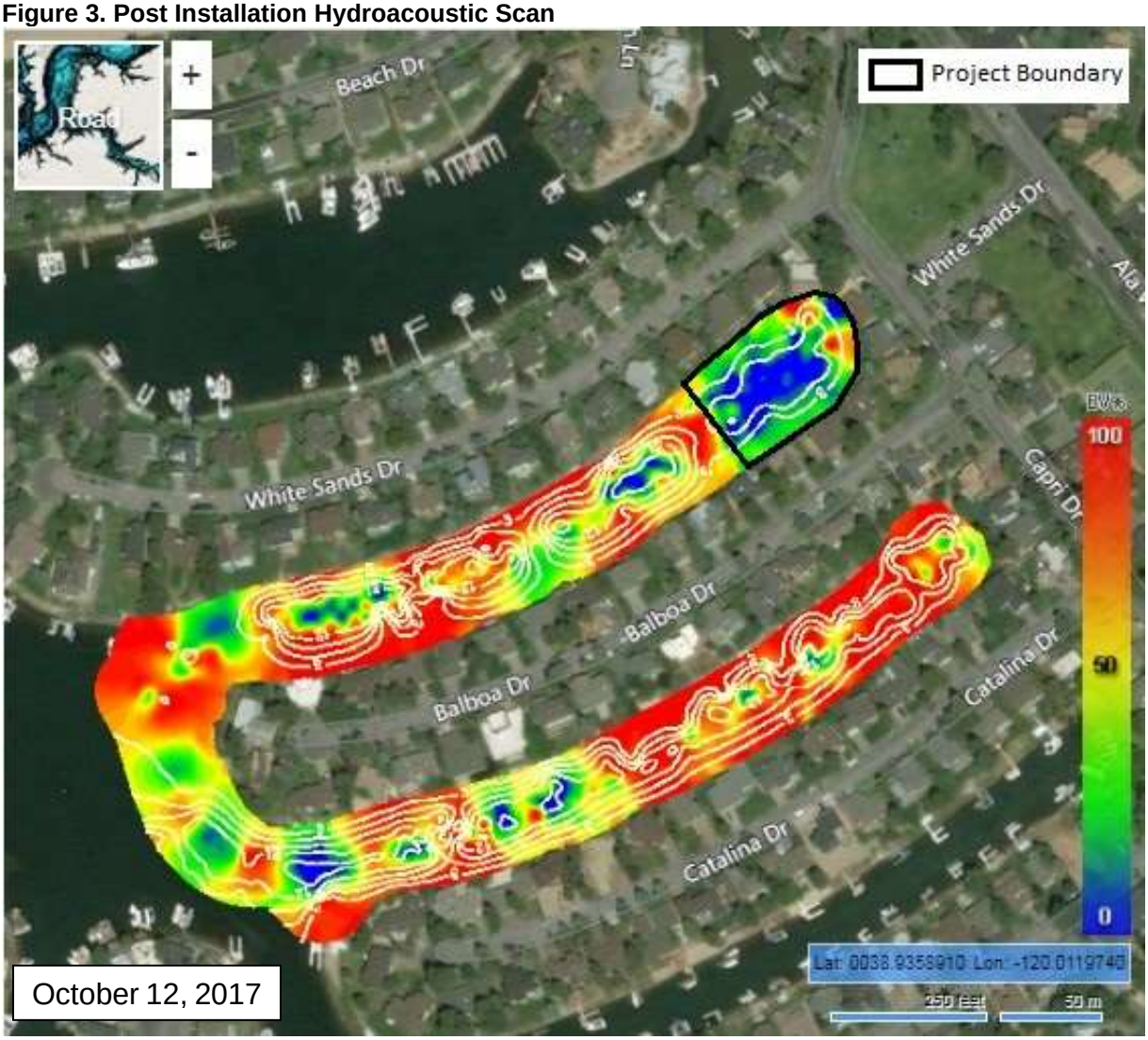
3.3 Removal

Removal of the barriers began the first week of October 2017. Removal was made more difficult by the accumulation of sediment on top of the barriers which ranged from approximately 2 inches to 2 feet. Extra care was taken to limit the amount of sediment that was disturbed to mitigate turbidity increases. After removal, barriers were cleaned, dried, and rolled before returning to the TRCD.

After removal of the barriers, final monitoring was conducted one week later (October 12) that consisted of water quality measurements and hydroacoustic scanning (Figure 3). An equipment malfunction limited the water quality data that was collected during removal, however, monitoring after removal (October 12) was completed and showed turbidity levels between 1.5 and 6.3 FNU. This was towards the end of an algal bloom within the Tahoe Keys lagoons that increased turbidity levels throughout the lagoon system, so the primary cause of the higher turbidity levels is uncertain. pH levels ranged from 6.8 to 7.7 and temperature averaged 11.8 ^{o}C.

Plant monitoring will take place again in the Spring 2018, to assess the effectiveness and impacts of the barriers on plant populations and distribution. The area will be surveyed using the same protocol to determine the plant species presence/absence rates.

Figure 3. Post Installation Hydroacoustic Scan



4.0 PRELIMINARY DISCUSSION

The bottom barrier project was originally one part of a combination control methods test. However, due to anticipated impacts of rotovating, the barriers were installed as a standalone project. To assess the efficacy and feasibility of large-scale bottom barriers in the Tahoe Keys Lagoons the total cost and overall efficacy were reviewed. The below discussion is preliminary and will be updated following the 2018 plant survey in the project area.

4.1 Cost

The bottom barrier project required a considerable amount of pre-project planning. This consisted of consultation with regulatory agency representatives, preparation and submittal of permits and notices, preparation of the Request for Proposal, and pre-project monitoring. The approximate cost for pre-project planning totaled $7,000.

To install the barriers, Hiuga Diving Company was contracted for the amount of $57,400. This included installation and removal of the barriers. In addition, TKPOA spent an additional 400 labor hours for installation, monitoring, and removal of the barriers totaling about $6,000. With the additional cost of rebar and sandbags, the total cost for implementation was approximately $64,250.

The combined costs of pre-project planning, implementation, removal, and monitoring totaled approximately $71,250 for the 0.75 acre project. This equates to approximately $95,000 per acre. If bottom barriers were used for 75% of the waterways (129 acres) in the Tahoe Keys Lagoons, then it would cost over $12,000,000 each year. This assumes that challenges associated with such a large-scale project, including a sufficient number of divers, the logistics of supplies and installation, and permitting for the anticipated environmental impacts to the aquatic ecosystem, could all be overcome.

4.2 Efficacy

Based on the post project hydroacoustic scan, the project was effective in temporarily controlling a majority of the plant growth within the test area (Figure 3). When the project area is compared to the adjacent finger, the volume of plants in the project area is much smaller. This is similar to results seen in previous control efforts in Emerald Bay and Crystal Shores. In these areas (covering up to about 6 acres (Shaw *et al.*2016)), bottom barriers combined with diver assisted hand-pulling of aquatic plants were able to bring the majority of the infestations under control with 4 consecutive years of barrier installations. However, for the Tahoe Keys Lagoons, where sediment accumulates on top of the barriers, there is the added challenge of water quality impacts. Since the lagoons are so densely infested, it is likely that more than 4 years of bottom barriers would be required to bring the invasive plants under control.

4.3 2018 Recommendations

For the 2018 growing season, the project area should be surveyed to assess the effects from the 2017 trial. Even though the control method is effective at temporarily controlling aquatic macrophytes, the likelihood of re-infestation from aquatic plant fragment drift is too high to warrant the further expense of repeated bottom barrier installations. Instead, the site should be monitored to determine the rate of regrowth in the area to help inform the future use bottom barriers following large scale efforts using feasible methods to bring the aquatic plants under control.

5.0 CONCLUSION

Bottom barriers are a proven method for controlling aquatic macrophytes in and around Lake Tahoe within a limited area. The barriers block out the sunlight preventing the vast majority of plant growth and allow for the use of follow up diver pulling or assisted suction dredging to eradicate the rest of the infestation. However, due to the high cost of installation and monitoring, the logistical challenges of large area installations of bottom barriers, along with the high chance of re-infestation from adjoining areas, it is not suitable for large scale control of macrophytes within the Tahoe Keys Lagoons.

Bottom barriers will continue to be part of the TKPOA IMP as a follow-up or spot control method. Following use of some other method for large scale control of invasive macrophtyes in the Tahoe Keys Lagoons, bottom barriers are expected to be effective to treat small-area infestations, or even sensitive areas, with a much greater rate of success.

6.0 REFERENCES

TKPOA 2017a. 2017 Annual Macrophyte Survey Report. Prepared for the Tahoe Keys Property Owners Association by Sierra Ecosystem Associates.

TKPOA 2017b. 2017 Bottom Barrier Monitoring Report. Prepared for the Tahoe Keys Property Owners Association by Sierra Ecosystem Associates.

TKPOA 2017c. 2017 Baseline Water Quality Report for the Tahoe Keys Lagoons. Prepared for the Tahoe Keys Property Owners Association by Sierra Ecosystem Associates.

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