End of Season Harvesting and AIS Report
Summer 2016

April 28, 2017
End of Season Harvesting and AIS Report
Summer 2016

Prepared for

Tahoe Keys Property Owners Association
South Lake Tahoe, California

Prepared by

Gregory J Hoover
TKPOA AIS Management Coordinator/Water Quality Manager

TAHOE KEYS INTEGRATED MANAGEMENT PLAN

April 28, 2017
# Table of Contents

1.0 **Introduction** .................................................................................................................. 1

2.0 **2015 AIS Report Recommendations** ............................................................................ 1
   2.1 Harvesting Operations ..................................................................................................... 1
      2.1.1 Reduction of Down Time ......................................................................................... 1
      2.1.2 Focus on High Density Areas ................................................................................... 2
      2.1.3 Improved Skimming Activities ................................................................................. 2
      2.1.4 Additional Control Methods .................................................................................... 2
   2.2 Future Coordinator Activities .......................................................................................... 2

3.0 **2016 Harvesting Scope and Direction** ......................................................................... 4

4.0 **2016 Harvesting Season Strengths** .............................................................................. 4

5.0 **2016 Harvesting Season Challenges and Shortfalls** .................................................. 4
   5.1 Staffing ........................................................................................................................... 4
   5.2 Harvesters ....................................................................................................................... 5
   5.3 Maintenance Practices ..................................................................................................... 5
   5.4 Fragment Control Methods ............................................................................................. 6
   5.5 Collection and Disposal of Harvested Plants ................................................................. 6
   5.6 Lack of Systems/Schedule ............................................................................................... 6
   5.7 Communication with TKPOA ......................................................................................... 7
   5.8 Quality Assurance Program ............................................................................................ 7

6.0 **Lessons Learned** .......................................................................................................... 7

7.0 **2017 Recommendations / Implementation** ................................................................ 8
   7.1 Recruitment ................................................................................................................... 8
   7.2 Initial Training ............................................................................................................... 8
   7.3 Harvesting and Pile Pick-up Days .................................................................................. 8
   7.4 Harvesting Crew Schedule and Duties ........................................................................... 9
   7.5 Communication and Logistics ....................................................................................... 9
   7.6 Equipment ..................................................................................................................... 10
   7.7 Spills and Spill Cleanup .................................................................................................. 11
   7.8 End of Season Shutdown Plan ....................................................................................... 11
   7.9 License .......................................................................................................................... 12
8.0 Weed Removal ........................................................................................................ 12
8.1 Discussion .............................................................................................................. 12
8.2 Weight Scale on Trailer: ....................................................................................... 12
9.0 Scientific Studies ..................................................................................................... 13
  9.1 Hydro-Acoustic Scanning ...................................................................................... 13
  9.2 Sampling .............................................................................................................. 13
  9.3 Macrophyte Surveys (June 28-30 and July 6-7) .................................................. 13
  9.4 Mapping .............................................................................................................. 13
10.0 Collaborations ...................................................................................................... 14
  10.1 League to Save Lake Tahoe .............................................................................. 14
11.0 List of Preparers ................................................................................................... 14
12.0 Abbreviations and Acronyms ............................................................................. 15
13.0 References ........................................................................................................... 15

List of Appendices
Appendix A: Preventative Maintenance Checklist
Appendix B: 2017 Proposed Harvesting Operations Plan
Appendix C: 2017 Recommended and Implementation Matrix
1.0 INTRODUCTION

The Tahoe Keys Property Owners Association (TKPOA) Water Quality Manager / Aquatic Invasive Species Coordinator job positions were combined creating an increased level of responsibility for the 2016 harvesting season. This position was responsible for the day to day harvesting operations; acted as a liaison for consulting companies, independent contractors and regulating agencies; and provided public outreach and education on the Tahoe Keys vision which is to reduce the threat of Aquatic Invasive Species to Lake Tahoe.

During the 2016 harvesting season substantial data was collected on harvesting operations and the water quality of the Tahoe Keys Lagoons (Keys). This information will be used to adapt the program for future years in order to provide better service for the homeowners and better comply with the Waste Discharge Requirements (WDRs) issued by the Lahontan Regional Water Quality Control Board. Specifically, for the 2016 season, the goal was to assess the current practices including harvesting and fragment collection schedules and equipment maintenance.

2.0 2015 AIS REPORT RECOMMENDATIONS

The Integrated Weed Management Plan Coordinator position is a new position within the Tahoe Keys Property Owners Association (TKPOA) that focuses on Integrated Management Plan (IMP) activities as the plan develops in the upcoming years. For the 2015 summer season the main duties of the coordinator were to collect hydroacoustic data, observe harvesting operations, and provide recommendations for program improvement.

2.1 Harvesting Operations

2.1.1 Reduction of Down Time

One of the main problems the harvesting program faces is down time. The harvesters often have to wait for the truck to finish unloading another machine, offload at the maintenance yard, and then drive to their location. While providing adequate notice to the truck driver of an impending pick up will help lower the amount of time spent waiting, the addition of another truck and trailer would allow more pickups to be done throughout the day and increase the amount of time the harvesters can spend in their designated areas. Also, it is recommended that the Water Quality (WQ) staff have a better use of radios to improve communications and timing.

Integrating more maintenance ramps around the Keys for unloading harvesters would also improve efficiency. It can take up to 30 minutes for a harvester to travel from where it is actively harvesting to the maintenance ramp. By reducing the travel distance and travel time for unloading, the amount of time spent actively harvesting will increase;
however, not all ramps may be suitable for unloading. An assessment of each location will be needed.

2.1.2 Focus on High Density Areas

The current schedule for harvesting allows the maximum area of the Keys to be serviced every week. However, some areas of the Keys do not have a high amount of growth and do not need to be harvested extensively. Based on the hydro-acoustic data collected every week, the harvesters can be directed to those areas where there is a high volume of plant matter.

2.1.3 Improved Skimming Activities

Fragments created by harvesting and boat traffic can settle in new areas and create new infestations and fragments that make their way outside of the Keys can potentially create new infestations around Lake Tahoe. In order to help limit the amount of fragments that eventually make it out into the lake, it will be important to train staff on effective fragment collection and implement new fragment collection measures.

In 2014, a fragment study was conducted in the Tahoe Keys (Characterization of Aquatic Plant Fragments in the Tahoe Keys Lagoons). The results of the study showed that harvesting increases the amount of fragments present in the channels and also encourages dense canopy growth. The report included several recommendations for increasing fragment capture including the use of mechanical nets on the front of the skimming boats to increase in rate and depth of collection. This and the other recommendations for harvesting and skimming practices should be implemented in 2016.

2.1.4 Additional Control Methods

Past research and observation has shown that harvesting alone will not effectively control aquatic plant growth and may potentially create higher densities of plant material. In order to better control the plant populations in the Keys additional control methods will need to be considered.

Implementation of the IMP in the upcoming season will be an important step towards better control of the weeds in the Tahoe Keys. Taking an integrated approach and collecting year to year data will better inform the TKPOA and lead to improved control of the infestations.

2.2 Future Coordinator Activities

2015 was the first year an IWMP coordinator was utilized to collect data and record observations of control practices. In the upcoming years, the role of the coordinator will need to expand to oversee and collect data on all control measures implemented as part of the IMP.
In 2016, it was recommended that the role of the IMP coordinator be expanded to include the following:

1. **Daily observations** – a daily log of observations may include locations of large amounts of fragments, algal growth, harvesting operations, skimming operations, homeowner comments, and other general comments as deemed necessary.

2. **Point sampling** – random point sampling on a weekly basis will help with assessing the pattern of plant growth and can be added to the hydroacoustic data to show what plants contribute to higher densities of growth.

3. **Geographic Information System (GIS) database creation and mapping** – all of the data being collected will need to be saved to and cataloged in a GIS database for ease of access. This will provide the WQ Staff with a more accurate system for harvesting operations, bottom barriers layouts, water hazards, drain pipe flows, buoy placements and ongoing scientific projects. This will require the purchase of a mapping program such as ArcGIS or use of open source GIS programs and knowledge of how to effectively create and manage the database. This software can then be used to create detailed maps of harvesting activity, plant growth, lagoon contours, and more as deemed necessary.

4. **Global Positioning System (GPS) Data Collection Program** – the newly purchased GPS units for the boats and harvesters will need to be collected on a daily basis and the data downloaded. The coordinator can collect and manage the data and direct crewmembers on use of the units.

5. **Bottom barrier installation assistance** – the coordinator can be used to oversee and/or assist homeowners with bottom barrier installation as directed by the Water Quality Committee. In addition, the coordinator, or other water quality staff can survey the sites on a regular basis to monitor the effectiveness and any shortfalls of the barriers. This will also provide accurate and up to date information for the barrier program end of season reporting that is required.

6. **Public outreach** – regular attendance at League to Save Lake Tahoe trainings, Town Hall Forums, and other community events will help increase awareness about the efforts the TKPOA is taking to control the weeds in the Keys. In addition, regular contact with various organizations including the League, TWSA, TRCD, NAWWG and others will promote cooperation among all stakeholders.

In addition to the expanded duties recommended above the coordinator should attend water quality committee meetings, conduct regular conference calls with Sierra Ecosystem Associates (SEA) staff about pilot projects and data collection efforts, and meet on a biweekly basis with the water quality department supervisors to discuss harvesting and skimming practices.
3.0 2016 HARVESTING SCOPE AND DIRECTION

The Board of Directors and the Water Quality Committee changed the scope and direction for the 2016 harvesting season to establish one level of service that was based upon the height of growth of aquatic invasive species (AIS) weeds that was supported with scientific data; furthermore, this was based on the recommendations from the 2015 TKPOA AIS program and end of the season report.

This scope of harvesting was designed to provide one level of service that would be based around a weekly schedule so that each homeowner received the same amount of harvesting/collection. In prior years of service, the harvesting schedule was based upon homeowner requests and/or complaints rather than having a dedicated schedule; unfortunately this service favored permanent residents vice the seasonal resident/property rental homes. The 2016 scope and direction established a priority of work for the Water Quality Crew to execute on a daily and weekly basis. The priority of work for the waterways was to:

- Harvest the navigational channels first,
- Shorelines second and then docks thereafter (if boats are not present and harvester fits), and
- Individual slips (if boats were not present and the harvester could fit).

The standard of service would be to maintain the weeds between a three to five (3-5) foot heights from the surface of the water. This would ensure all watercrafts could maneuver safely through the navigational lanes. In addition to the direction of harvesting, the final goal was to improve AIS weed fragment collection and control.

4.0 2016 HARVESTING SEASON STRENGTHS

The 2016 harvesting crew, more specifically the harvester operators, began the season with a great deal of knowledge in-terms of equipment: past standard operating procedure, the TKPOA waterway hydrology and bathymetry which aided in the transition to the new system of harvest operations, and proposed idea’s that were purposeful to our operations. This led to the ability for the entire crew to cross train throughout the season and created a more flexible work environment as changes and challenges were faced.

5.0 2016 HARVESTING SEASON CHALLENGES AND SHORTFALLS

5.1 Staffing

The 2016 Water Quality Crew was not completely filled until the first week of August (more than half way through the season) which created many effects on the overall mission accomplishment for the season. Most of the potential applicants that were
interviewed became prospects, but could not pass the Drug Test Screening that is required by the TKPOA.

The experienced staff which has huge benefits also created many challenges with the harvesting operations in the overall big picture. Change, like anywhere, was at time met with hesitation and resistance to the new schedule and policy that was set forth. The transitions were rough mainly because it was difficult to draw a connection to and instill awareness of such methods needing reevaluation. At the beginning of the season the crew’s education of the new schedule and why the TKPOA went in this direction was not adequately communicated to them. When confronted by the homeowners about the new policy, our employees did not have a true understanding of it and could not express mission the way it needed to be.

Along with both of these, our seasonal jobs in the past have been labeled as “dead end”. There was work for a few months and then it would be gone. Due to this, many of our employees did not care about the big picture. They were here to collect a pay check for a few months and then be on their way. This created an even larger challenge when it came to fragment control and ensuring the cleanup was completed properly and in timely manner.

5.2 Harvester

At the beginning of the 2016 season, a total of five mechanical harvesters were available for the TKPOA Water Quality Staff. However, of the five harvesters only three were operational. One harvester was inoperable due to the lack of maintenance at the end of last season. This machine was fixed within the first two weeks of the season, however was not put into operations due the lack of staffing. The association bought a new harvester in 2015 with a partially rebuilt engine that required parts and maintenance before it was operational. It was inoperable for the first half of the season because its requirements could not be completed due to the maintenance issues that the crew had with the remainder of the equipment because the scope of the work was outside the knowledge/experience level of the TKPOA staff. All harvesting equipment was operational in the middle of August which was over half way through the season.

5.3 Maintenance Practices

Entering the 2016 harvesting season, there was no maintenance schedule in place for any of the TKPOA equipment. The machines would work up until the end of shift, unload and shut down. The duration of this cycle in the past is unknown because maintenance records for each machine did not exist. The maintenance that was completed was just enough to get by and keep the machine running. Due to the non-existent maintenance cycle most of the machines issues were always reactive where a proactive schedule could detect a potential problem.
5.4 Fragment Control Methods

According to the Waste Discharge Requirements (WDRs), “if continued use of mechanical aquatic weed harvesting is proposed, then the TKPOA must develop and implement best management practice control measures to limit the spread of viable plant fragments” (Lahontan 2014). This is to ensure that plant fragments do not make their way into Lake Tahoe.

In order to comply with the WDR, fragment control and collection should be the main focus of the entire harvesting operation but it is not. The methods that are utilized to execute the fragment control are crude, rudimentary, and inadequate for the size of the work area. The skimming methods and equipment are not fast enough and do not cover enough space to keep the main channels and open areas clean and fragment free. The methods that the TKPOA utilize work extremely well in tight areas (i.e. in and around docks, slips and shorelines) where fragments consolidate and collect.

5.5 Collection and Disposal of Harvested Plants

The back side logistical support for the harvest operations was at best marginal at the beginning of the season. The timing of loading and unloading of the harvesters/skimmer boats was out of sync with unnecessary travel time to a designated ramp and/or unnecessary wait time because of the trailer could not get the designated ramp in a timely fashion. Space and timing considerations were never identified and/or factored in to a schedule to reduce the amount to “do nothing time” or “hurry up and wait.”

Along with the space and timing considerations, there was not a system in place for machines that went inoperable due to maintenance issues. The operator would wait around until the machine / boat was fixed or would be released from shift. Very seldom was maintenance outsourced to expedite the progress of the repair, rather is was tried to be completed in house. The cost effectiveness of hiring outside labor (cost, proficiency, speed of getting equipment back into the operation) versus doing it in house was not considered.

5.6 Lack of Systems/Schedule

The change in scope and direction for the 2016 harvesting schedule was the first time that the harvesting crews followed a set schedule for the daily and weekly operations. In the past, the schedule (for the most part) was based upon the call in or complaints from homeowners requesting service to their area or the navigational lanes were overcome with plants. The amount of time required to harvest a certain area was only known to those returning harvester operators and was not in any form of documentation. The spacing of the different zones was a crude and inaccurate method to identify which areas were to be harvested. On many harvesting days, the zones were not completed due to the space being too large to be finished in the allotted amount of time. Most of the zones required multiple days to complete in a proficient manner.
5.7 Communication with TKPOA

One of the biggest challenges that were faced during the harvesting season was the interaction with the homeowners. The number of homeowners currently on the email list is approximately one third of the 1500 plus residence that are in the association. A majority of the members were not aware of the level of service change, the new schedule, or the way that the waterways were broken into zones. The standard of service in the past was for the homeowner to make a call and the Water Quality Crew would come and service that specific area. Without this level of service, many of the homeowners became combative towards the policy and towards the crew. At times this created a hostile work environment for many of our employees. Most of the complaints that we received were due to plant infestation in and around docks/ slips, pile pickups not aligning with the homeowners schedule and not knowing the harvesters schedule.

5.8 Quality Assurance Program

The biggest issue that we dealt with at the beginning of the season was the lack of a quality assurance program for the entire harvesting operations. Most of the issues could have been eliminated or reduced if there was a program in place. The program that was utilized was completely reactive, most of which dealt with homeowner complaints and maintenance issues. "Inspect what you expect" was not a utilized concept.

6.0 LESSONS LEARNED

1. Inadequate initial training and required briefs
2. Harvesting days / timeline
3. Work shift hours not conducive with harvesting operations
4. Map zones are too big and unrealistic for adequate harvesting
5. Reduction of unnecessary travel and wait time
6. Pile pickups not in line with harvesting schedule
7. Inadequate / insufficient/ non-existent maintenance cycle
8. Inadequate and insufficient reporting procedures
9. Ground truth from Water Operations Crew as to what was happening on the water
10. Lack of hazardous material spill knowledge and training
7.0 2017 RECOMMENDATIONS / IMPLEMENTATION

7.1 Recruitment

It is recommended for the 2017 harvesting season that the TKPOA recruit and hire through three phases.

1. Recruit and hire the known return workers. The benefit of these employees is that they understand the job and have the experience to train in and assist newer team members.

2. Recruitment focuses in the local colleges for those students that need internships or work experience, in order to facilitate their degree program. The benefit of this is that the quality of the potential employee is higher due to fact that they have something to gain / loose when it comes to their end goal.

3. If staffing is not met by a designated date, the TKPOA announces the job via Craigslist and indeed to the general public.

7.2 Initial Training

The following topics will be introduced during the initial training for all seasonal employees for the upcoming season:

1. League to Save Lake Tahoe Eyes on the Lake
2. TKPOA Boat safety and regulations
3. TKPOA Illness and Injury Prevention Program (IIPP)
4. TKPOA Spill identification and response
5. Harvester supervised training and sign-off
6. Boat crew supervised training and sign-off

7.3 Harvesting and Pile Pick-up Days

1. Harvesting

   • 19 days for the west side with three harvesters (trying to get this down to 15 days)
   • 13 days for the east side with one harvester
   • 11 days for the Lake Tallac Lagoon

2. Pile Pick-up

The pile pick up schedule will be twice a week on based on zones. This will complement the harvesting schedule and homeowners that conduct fragment control and collection in and around their dock, slip and shoreline. The times will be designated between the hours of 0800-1100 and the breakdown of days will be the following:
• Monday and Thursday- East Channel and middle to eastern zones of the West Channel
• Tuesday and Friday- Western zones of the West Channel

7.4 Harvesting Crew Schedule and Duties

The harvesting crew’s schedules will be conducted into three different shifts depending on duties. These shifts will facilitate five days a week of harvesting and seven days of continuous fragment control.

1. Schedule- These shifts will be broken down as such:
   • Harvesters- 0730-1600
   • Fragment Boat Crews- 0800-1630
     o (2) crews Monday thru Friday
     o crew Tuesday thru Saturday
     o crew Sunday thru Thursday
   • Truck Driver- 0800-1630 or 0830-1700

2. Loads / piles need to be dropped and cleaned before break and the end of the day. Weeds will not be left on any Harvester or Fragment Boats. There is adequate time in the day for all vessels to be unloaded prior to breaks and close of business.

3. Flexible and variable break / lunch times- Daily lunch breaks will be taken no earlier than the fourth hour of shift and before the start of the fifth hour. Harvester crews will have the flexibility, depending on work assignments to take their lunch break within the established timeline above. Fragment Boat Crews will have assigned timelines based off of the work assign established by the Water Quality Supervisor.

7.5 Communication and Logistics

1. Map broken down into smaller sections for more accurate harvesting results. Currently the Water Quality staff is using a Tahoe Keys map that is broken down into zones to identify the areas that we will be operating in. The current breakdown of these map zones is too large and gives an unrealistic approach to the harvesting operations, for both the operators and the homeowners. For 2017, the harvesting map will be broken down into smaller more realistic zones; this breakdown will be done through the GIS program during the offseason.

2. Reduction of unnecessary travel time. One of the main problems the harvesting program still faces is down time and unnecessary travel time.

The use of more of the maintenance ramps and improvising an unloading site via a conveyor belt around the Keys for unloading harvesters would also improve
efficiency. It can take up to 30 minutes for a harvester to travel from where it is actively harvesting to the maintenance ramp. By reducing the travel distance and travel time for unloading, the amount of time spent actively harvesting will increase. The following concepts will reduce travel time for the crews:

- Keeping trailer at the Lake Tallac Lagoon, at the conveyor on the east channel, and at designated ramps around the waters in order to reduce travel time
- Conveyor Belts
  - Alpine / Venice- During an eighteen (18) harvesting period for the West Channel this area (if purchased and placed) would cut down travel time for three machines during six days by up to fifty percent.
  - East Channel- Already present
- Harvester parking (Breaks and Overnight)
  - Currently- East Garmish, West Garmish, Christie Ramp,
  - 2017- Same as above along with Alpine/ Venice, Community dock and permission granted docks

3. Weekly crew meetings and training. The Water Quality staff began having weekly meetings near the midseason. The purpose of these meeting was to ensure that there was a two way communication with the entire Water Quality Staff on current / upcoming events or operations and to receive ground truth as to what was happening on the water and equipment. This proved to be a force multiplier and very effective. Weekly meetings will be held on Thursdays at 0800 for the 2017 Season. The WQ staff will also conduct bi-weekly “tailgate” safety meetings as well as regular TKPOA monthly safety meetings.

7.6 Equipment

1. Maintenance schedule (daily, weekly, monthly, end of season). During this season, a maintenance schedule was implemented on a daily, weekly and monthly basis. In the past, maintenance was conducted on a need-to basis and many of the machines were lacking basic requirements. The maintenance schedules consisted of:
   - Daily- Checks: engine oil / hydraulic fluid and pressure / radiator fluid / fuel level/
   - Weekly- Repeat daily checklist / deep clean/ sickle teeth maintenance / tie rod ends / belt check / grease points
   - Monthly- All of the above / fluid changes / replacement of filters / replacement of miscellaneous parts as needed

2. Tracking/reporting. Also during the season, equipment folders were created to track and report:
   - Maintenance issues / solutions
   - Parts ordered / received / replaced
7.7 Spills and Spill Cleanup

Each year in the Tahoe Keys Waterways, the Water Quality Department responds to some variation of a spill in the water. Currently, the staff has no official training to respond to an incident in an effective manner. The Water Quality Staff will implement the following for the 2017 season:

1. Training: Currently, the Water Quality Staff does not have current hazmat incident response capability. There are current Incident Commander and staffing certifications but not specific to fuel in water. There are several local agencies that offer hazmat and hazmat response training at all levels. A training budget has been requested for the 2017 season.

2. Equipment: On hand, the Water Quality Staff has enough material to isolate most spills that occur in a channelized zone but not one that occurs in open waters. The materials on hand are absorbent pads and absorbent soft booms. Upon the completion of formal training and certification, the Water Quality Staff can increase the equipment and material allocation to better serve larger incidents.

3. Reporting Procedures: The Water Quality Staff will establish a reporting chain of command for any spills that are reported.

4. On call response teams: Currently there is not an on call response team for spills or incidents that occur after hours or on weekends. For the 2017 season the Water Quality Department will establish an on call response team. This team will consist one Supervisor and two boat crews (total of 5 personal) to respond to an incident after hours.

5. Public education and outreach: The Water Quality Staff will provide information on spills to the homeowners through weekly letters, email, E-Blast, (potentially) rack cards, and public outreach.

7.8 End of Season Shutdown Plan

1. The 2016 season the Water Quality introduced an end of the season shutdown plan. This concept was designed to ensure that all equipment was inspected, repaired or parts were replaced, painted, winterized and properly stored.

2. This plan will be implemented in each season hence forth as such:
   - Each boat crew is responsible for the cleaning, repair work, painting, winterizing and packaging of their assigned boat.
Harvester Operators are responsible for the cleaning, repair work, painting, winterizing and packaging of their assigned harvester.

Truck Driver is responsible for the cleaning, repair work, painting, and winterizing the two vehicles that are assigned to the Water Quality Department.

There will also be a small end of season crew that will be responsible for the final cleanup and maintenance of any equipment that needs to be completed.

3. All equipment has been stored for the winter is in a ninety percent solution rate. Minimal amount of work is required at the beginning of the new season to get all machines fully operational.

7.9 License

Currently, the Water Quality staff does not have a certified / licensed employee to drive or operate multiple pieces of heavy equipment. For insurance purposes, it is recommended that the TKPOA allow multiple employees to become certified and licensed in the following:

1. Class B CDL for Truck Driver
2. Certification for backhoe operations

8.0 WEED REMOVAL

Table 1: Volume of Weeds Removed (cubic yards)

<table>
<thead>
<tr>
<th></th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvesters</td>
<td>1,113</td>
<td>1,503</td>
<td>2,462</td>
<td>2,657</td>
<td>432</td>
<td>8,167</td>
</tr>
<tr>
<td>Boats</td>
<td>290</td>
<td>417</td>
<td>894</td>
<td>315</td>
<td>42</td>
<td>1,958</td>
</tr>
<tr>
<td>Total</td>
<td>1,403</td>
<td>1,920</td>
<td>3,356</td>
<td>2,972</td>
<td>474</td>
<td>10,125</td>
</tr>
</tbody>
</table>

8.1 Discussion

The data shows that the extent of the weed coverage is very high. On average, 79% of the East Basin and 85% of the West Basin is covered by plant material.

8.2 Weight Scale on Trailer:

The method for reporting is rudimentary and very subjective. The intent of the Water Quality Staff is to become objective for reporting. It is requested that a weight scale be purchased for the two weed trailers. This would allow for more accurate numbers than the current system in place. The measurements would change from cubic yards to tonnage. This will greatly improve the Water Quality’s monthly numbers.
9.0 SCIENTIFIC STUDIES

9.1 Hydro-Acoustic Scanning

Scanning was completed on a bi-weekly basis throughout the season. These results were published through Bio Base Software Company and were distributed during the weekly AIS Coordination Meeting. These results also identified the areas of greatest Bio-Volume of plants within a specified area. Half way through the season, the software was change from Bio-Volume to plant height. There were technical issues with this change and the decision was made to return to Bio-Volume.

9.2 Sampling

- Water sampling- Water sampling was conducted on bi-weekly basis throughout the season. These samples were sent to and analyzed by Western Environmental Testing Laboratory (WET Lab). These results were published by them and are incorporated into the 2016 Baseline Water Quality Report (TKPOA 2016b).
- Sediment Sampling (May 24-25 and October 11-12) - This sampling was conducted at the beginning and the end of the season to identify the nutrient levels within the sediment that the plants root and live in. These results were published and are incorporated into the 2016 Baseline Sediment Report (TKPOA 2016c).
- Benthic Macro-Invertebrate (BMI) Sampling (July 13-14 and July 21) - This was conduct one time throughout the season. This sampling checks the overall health of the TKPOA water by identifying what animals live and do not live in the lagoons. These results were published and are incorporated into the 2016 Benthic Macroinvertebrate (BMI) Sampling Report (TKPOA 2016d).

9.3 Macrophyte Surveys (June 28-30 and July 6-7)

The Macrophyte Survey was conducted once during the season. The purpose of this is to identify the type and amount of different plants throughout the TKPOA waterways. This is then check against archived data to identify what plants are growing and where (TKPOA 2016e).

9.4 Mapping

The following projects were started towards the end of the season and will continue through beginning of the 2017 season:

- Water hazards identified and marked
- Storm drains identified and catalogued
Upon the completion of the mapping of these two projects, action will be conducted for both. This will be a follow up item in the 2017 End of Season Report.

10.0 COLLABORATIONS

10.1 League to Save Lake Tahoe

Over the summer, TKPOA continued its partnership the League to Save Lake Tahoe. Similar to last summer, several Eyes on the Lake Trainings were held at the pavilion. A strong effort was made to encourage Tahoe Keys homeowners to attend the trainings. Flyers were posted in the pavilion, notices were placed in the Keys Breeze, and e-blasts were sent out to the homeowners a week before each training. This was done in the hopes of better informing homeowners about the aquatic weeds and the problems they pose to the entire lake.

In addition to hosting the Eyes on the Lake Trainings, League staff were also taken on the water quality departments Boston Whaler to observe the extent of the weed problem in the Tahoe Keys and to collect samples of plants for training activities and to create pressings. The League was also given data from the 2014 Tahoe Keys Aquatic Weed Survey so that they can add it to their online database and mapping tool.

11.0 LIST OF PREPARERS

The following individuals prepared the text presented in this report.

<table>
<thead>
<tr>
<th>Name</th>
<th>Education</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gregory J Hoover</td>
<td>A.A Natural Science</td>
<td>Primary Author</td>
</tr>
<tr>
<td>TKPOA</td>
<td>A.A Liberal Arts: Math and Science</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lake Tahoe Community College</td>
<td></td>
</tr>
<tr>
<td>Brennan Beell</td>
<td>A.A. in Progress</td>
<td>Contributing Author</td>
</tr>
<tr>
<td>TKPOA</td>
<td>Lake Tahoe Community College</td>
<td></td>
</tr>
</tbody>
</table>
12.0 ABBREVIATIONS AND ACRONYMS

AIS  Aquatic Invasive Species
BMI  Benthic Macroinvertebrates
GIS  Geographic Information System
GPS  Global Positioning System
IMP  Integrated Management Plan
IIPP  Illness and Injury Prevention Program
IWMP  Integrated Weed Management Plan
LRWQCB Lahontan Regional Water Quality Control Board
SEA  Sierra Ecosystem Associates
TKPOA  Tahoe Keys Property Owners Association
TRPA  Tahoe Regional Planning Agency
TWSA  Tahoe Water Suppliers Association
WDRs  Waste Discharge Requirements
WET Lab Western Environmental Testing Laboratory

13.0 REFERENCES


End of Season Harvesting and AIS Report
Summer 2016

April 28, 2017
Table of Contents: Appendices

Appendix A: Preventative Maintenance Checklist
Appendix B: 2017 Proposed Harvesting Operations Plan
Appendix C: 2017 Recommendations and Implementations Matrix
Appendix A

Preventative Maintenance Checklist
# Daily Log & Maintenance Check

## Signed By: 

<table>
<thead>
<tr>
<th>CHECK</th>
<th>QTY. ADDED</th>
<th>LUBED</th>
<th>ADJ. NEW</th>
<th>NEEDS</th>
<th>REPLACED O.K.</th>
<th>MISSING</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGINE OIL</td>
<td>IN QUARTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HYDRAULIC OIL</td>
<td>IN GALLONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RADIATOR</td>
<td>IN QUARTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FUEL</td>
<td>IN GALLONS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAN BELT TENSION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIE ROD ENDS (SIX)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONVEYER BEARINGS #1</td>
<td>(SIX)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONVEYER CHAIN COUPLING #1</td>
<td>(FREE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BEARINGS #2</td>
<td>(ONE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONVEYER CHAIN COUPLINGS #2</td>
<td>(TWO)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BEARINGS #3</td>
<td>(SIX)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONVEYER CHAIN COUPLINGS #3</td>
<td>(TWO)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BEARINGS BOOM PIVOT POINTS</td>
<td>(FREE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CYLINDER PIVOT POINTS</td>
<td>(FREE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BELTING TENSION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALL CONVEYERS FOR BELT TRACKING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BROKEN CUTTER KNIVES</td>
<td>(ALL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BENT CLIPS</td>
<td>(ALL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BENT SICKLE GUARDS</td>
<td>(ALL)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIE ROADS ENDS FOR WEAR</td>
<td>(SIX)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HYDRAULIC MOTOR SEAL LEAKS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONVEYOR CUTTER MOTORS #1</td>
<td>(THREE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONVEYOR MOTOR #1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONVEYOR MOTORS #2</td>
<td>(ONE)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONVEYOR MOTORS #3</td>
<td>(TWO)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PADDLE WHEEL MOTOR SEALS</td>
<td>(TWO)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOOM LIFT CYLINDERS</td>
<td>(TWO)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONVEYER LIFT CYLINDERS #3</td>
<td>(TWO)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The daily log & maintenance check should be filled out every day & signed there should be one for every piece of equipment you have including the truck, shore conveyor, trailer conveyor, harvester and loader or shuttle barge.
Appendix B

2017 Proposed Harvesting Operations Plan
2017 Harvesting Season tentative startup / shutdown plan

**January**
- Cost specs for Omni-Cat / Purchase
- Conveyor belt bid / Purchase
- Conveyor belt permit request to TRPA
- Order skimmer boat frames for retrofit
- Order trailer weight scale
- Radar Systems cost spec / Purchase

**February**
- Buoy Purchase
- WQM / WQS uniforms ordered
- Keys Breeze article- Bottom Barriers
- E-Blast for Bottom Barriers

  **Week: 6th -10th**
  - Job posted to colleges

**March**
- Week: 6th -10th
- Post job to general public

  **Week: 13th -17th**
  - NAWWG meeting

  **Week: 20th -24th**
  - Call known return workers

  **Week: 27th -31st**
  - WQ Supervisor Drug Test (24th @ 1030)

**April**
- 2017 WQ Monitoring Plan finalized
- Bottom Barrier applications

  **Week: 3rd –7th**
  - WQ Supervisor on part time
  - Admin and application review
  - WQ Driver Drug Test

  **Week: 10th -14th**
  - WQ Driver on part time
  - Admin and interview preparation
  - Standards of Work contract revised
  - Initial Harvesting Plan created
  - Equipment calibration (**TKPOA and SEA**)
Week: 17th -21st
WQ Supervisor and Driver full time
Paperwork / IIPP
Season Preparation / coordination
Interviews and hiring (21st)
Uniforms and PPE / Inflatable vests ordered

Week: 24th -28th
Drug test for initial crew
Season Preparation / coordination / scheduling
Trailer weight installed
Hazmat Training
2017 WQ Monitoring Plan initiated (27 April)

May
Keys Breeze article of 2017 harvesting season
Updated TKPOA website and Keys Weeds Management website
E-Blast to Homeowners
Harvesting segments at both Board of Directors / Cove Advisors Meeting
Propaganda distributed throughout SLT before Memorial Day Weekend
Meeting with Regulatory AIS Board
Bottom Barrier need to be in by 31 May 2017

Week: 1st -5th
Paperwork / IIPP
Boat / Harvester service / Equipment draw and stage

Week: 8th -12th
Harvester / Boats / Conveyor put in
Test run / Maintenance
Skimmer boat retrofit
Mesocosm Study setup @ Water Treatment (Lars and SEA)

Week: 15th -19th
On the water training
Buoy maintenance

Week: 22nd -26th
Aqua-Mog Lake Tallac / Slough (SEA)
Boat Back-up established / Radar System installed
Interview process #2 (if needed)
Harvesters to Lake Tallac
Mesocosm Study begins @ Water Treatment (Lars and SEA)

Week: 29th -June 2nd
Harvest Tallac with 3 harvesters
NLT May 31 - All Bottom Barriers are installed

June
2017 harvesting season letter mailed with 3rd quarter homeowner bills
Week: 5th - 9th
Bottom Barriers into Lake Tallac (SEA)

5th
0800-1200-IIPP / Paperwork (Heather Houston)
1230-1330- 2017 Harvesting Operations (Day to day operations overview) (Greg Hoover)
1330-1400- Water Quality Committee Chair / GM addresses crew (John Larson / Kirk Woolridge)
1400-1500- DOT Hazmat and OSHA Safety Regulations / TKPOA Safety Policy (Desiree Wright / Greg Hoover / Brennan Beell)
1400-1500- Standards of Work requirements and Contract (Greg Hoover)
   Equipment sign-out / PPE requirements (Brennan Beell)

6th
0800-1130- Boat safety (Joe Sherry)
1230-1330- First Aid (Joe Sherry / Greg Hoover)

7th
0930-1330- EOL (League to Save Lake Tahoe)
1400-1630- Spills and Hazmat (Greg Hoover / Brennan Beell)

8th - 9th
Training / Cross-Training- Omni-cat / harvesters/ loading/ unloading (Brennan Beell)
Testing and sign off / Cross Training (Brennan Beell)

Week: 12th - 16th
Harvesting season

Week: 19th - 23rd
Sediment sampling (SEA)

Week: 26th - 30th
Macrophyte Survey

September
Meeting with Regulatory AIS Board
NAWWG meeting

September 15th
Lay #1
   1 harvester
   1 boat crew

September 29th
Lay off #2
   1 harvester
   2 boat crews

October
Week: 2nd - 6th
Sediment Sampling #2 (SEA)
October 13th
Lay off #3
Remaining crew

October 31st
WQ Manager reduced hours
Lay off #4
WQ Supervisor
WQ Driver

October-November
Reports due:
Harvesting
Macrophyte
Bottom Barrier
Boat Backup Station

Pending Issues
Bottom Barrier
Where / When
Homeowners
Designated Plot
Second Conveyor Belt
WQ Monitoring Plan (TKPOA and SEA)
Non-Herbicide Demonstration (SEA)

Administrative Requirement
Staff Meeting- Thursday 0800-0830
Maintenance Stand down- Last Friday of every month
Safety Training- Will be completed monthly during either Staff Meeting or Maintenance Stand down
Appendix C

2017 Recommendations and Implementations Matrix
<table>
<thead>
<tr>
<th>Task</th>
<th>Responsibility</th>
<th>TKPOA Impact</th>
<th>Cost</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment</td>
<td>WQ Manager / Supervisor</td>
<td>None- College will screen and filter qualified applicants as part of the Work Study / Internship Program</td>
<td>None</td>
<td>Potentially better quality employee that has a vested interest in excelling due to a school program</td>
</tr>
<tr>
<td>Initial Training</td>
<td>TKPOA Staff</td>
<td>More backside planning and coordination to ensure that all of the training is executed in a proper and timely manner</td>
<td>Within 2017 Operating Budget</td>
<td>More educated and trained seasonal staff less loss of work due to training standdowns less likely for mishaps</td>
</tr>
<tr>
<td>Harvesting Schedule</td>
<td>WQ Manager / Supervisor</td>
<td>Communication, outreach and education to POA leadership, supervision and QA Program to ensure schedule is maintained</td>
<td>Within 2017 Operating Budget</td>
<td>Routine Schedule with one level of service</td>
</tr>
<tr>
<td>Weed Pile Pickup</td>
<td>WQ Manager / Supervisor</td>
<td>Leadership, supervision and QA Program to ensure schedule is maintained</td>
<td>Within 2017 Operating Budget</td>
<td>Flexibility for homeowners to conduct fragment control and collection in / around their dock area. TKPOA staff will increase pile pick up from 10 hrs a week to 12 hours but will decrease fragment crews from 3 boats a day to one that are responsible for pickup</td>
</tr>
<tr>
<td>Water Quality Staff Schedules</td>
<td>WQ Supervisor</td>
<td>Harvesters-No Impact Fragment Boat Crews- Seven days a week Fragment Control Service Truck Driver- No Impact</td>
<td>Within 2017 Operating Budget</td>
<td>POA will receive seven days a week of Fragment Control service in the all waterways and lagoons</td>
</tr>
<tr>
<td>Harvester Operator Flexible Lunch Break</td>
<td>WQ Supervisor</td>
<td>No Impact</td>
<td>Within 2017 Operating Budget</td>
<td>Reduction in travel time increase productivity</td>
</tr>
<tr>
<td>TKPOA Map Redone In GIS</td>
<td>WQ Manager</td>
<td>May need to have outside source create map</td>
<td>TBD</td>
<td>More realistic timeline for harvesting areas fine tuned level of service for the harvest shedule</td>
</tr>
<tr>
<td>Reduction of Unnecessary GIS Travel Time - Conveyor Belt</td>
<td>WQ Manager / Supervisor</td>
<td>Installation of a Conveyor Belt at Alpine and Venice Temporary permit through TRPA</td>
<td>$26,000</td>
<td>Loads and piles will be cleaned before break and COB faster turn around time from unloading</td>
</tr>
<tr>
<td>Reduction of Unnecessary GIS Travel Time - Parking</td>
<td>WQ Manager / Supervisor</td>
<td>Permission from TKPOA homeowners to park harvester on shoreline / dock for breaks or overnight parking</td>
<td>Within 2017 Operating Budget</td>
<td>Reduction in travel time</td>
</tr>
<tr>
<td>Weekly Crew Meeting and Training</td>
<td>WQ Manager / Supervisor</td>
<td>One day a week, harvesting operation begin 30 minutes late</td>
<td>Within 2017 Operating Budget</td>
<td>Up to date Preventive Maintenance be proactive: Fix when you can not when you have to, training of staff on equipment, Records</td>
</tr>
<tr>
<td>Maintenance Schedule</td>
<td>WQ Supervisor / Staff</td>
<td>Fridays- Harvesting operation will cease 2 hours early Monthly (last Friday of the month)- No Harvesting will be conducted</td>
<td>Within 2017 Operating Budget</td>
<td>2 way communication for the entire department Ground truth from those on water education and placement of the bigger picture</td>
</tr>
<tr>
<td>Tracking / Reporting</td>
<td>WQ Manager / Supervisor / Staff</td>
<td>No Impact</td>
<td>Within 2017 Operating Budget</td>
<td>Folders that track all maintenance issues / solutions, parts ordered / received / replaced, PM Checklist, Work orders and Operator Hours</td>
</tr>
<tr>
<td>Tracking / Reporting Scales on Trailers</td>
<td>WQ Manager / Supervisor / Staff</td>
<td>No Impact</td>
<td>$1,500.00</td>
<td>Accurate and non subjective reporting of wees harvest Would change reporting from Cubic Yard to Tonneage</td>
</tr>
<tr>
<td>Spills and Clean-up</td>
<td>WQ Manager / Supervisor</td>
<td>No Impact</td>
<td>TBD</td>
<td>Educated staff that has ability to identify, respond, and make sound decisions for the appropriate action needed. Increase response time and lessens the need to outsource environmental cleanup teams</td>
</tr>
<tr>
<td>Training / Equipment</td>
<td>WQ Manager / Supervisor</td>
<td>No Impact</td>
<td>TBD</td>
<td>Training would ensure that the materials on hand are what is needed for any type of spill, materials used during a spill are appropriate and ensure there is no unnecessary waste in usage and ordering of materials</td>
</tr>
<tr>
<td>Spills and Clean-up Equipment</td>
<td>WQ Manager / Supervisor</td>
<td>No Impact</td>
<td>TBD</td>
<td>Training would ensure that the materials on hand are what is needed for any type of spill, materials used during a spill are appropriate and ensure there is no unnecessary waste in usage and ordering of materials</td>
</tr>
<tr>
<td>Spills and Clean-up On call response team</td>
<td>WQ Supervisor / Staff</td>
<td>No Impact</td>
<td>Standby Time / Potential Overtime</td>
<td>After hours and weekend response team (1) Supervisor and (4) Crew Members</td>
</tr>
<tr>
<td>Spills and Clean-up Public Outreach / Education</td>
<td>WQ Manager / Fresh Tracks / SEA</td>
<td>Weekly letters, Email, E-blast, rack cards, public outreach</td>
<td>Fresh Tracks Contract / open purchase</td>
<td>Public Education</td>
</tr>
<tr>
<td>End of Season Shutdown</td>
<td>WQ Manager / Supervisor</td>
<td>Reduced harvesting and fragment control and collection as season ends</td>
<td>Within 2017 Operating Budget</td>
<td>End result is a 90 percent maintenance solution on all equipment. Minimal amount of work will be required at the beginning of the new season to get all equipment fully operational Moat Crews, Harvester Operators and Truck Driver are responsible for the cleaning, repair work, painting, winterizing assigned equipment *Rain Party will be responsible for any work not completed and the final clean-up</td>
</tr>
<tr>
<td>License- Class B</td>
<td>WQ Manager / Supervisor</td>
<td>No Impact</td>
<td>$72.00 Per</td>
<td>Ability to legally drive fully loaded truck and trailer Covers TKPOA for insurance purposes</td>
</tr>
<tr>
<td>License- Backhoe</td>
<td>WQ Manager / Supervisor</td>
<td>No Impact</td>
<td>$800.00 Per</td>
<td>Ability to legally operate backhoe Covers TKPOA for insurance purposes</td>
</tr>
<tr>
<td>Mapping- Water Hazards</td>
<td>WQ Manager / Supervisor / Staff</td>
<td>Once completed, TKPOA waterways will be safer to navigate</td>
<td>Within 2017 Operating Budget</td>
<td>All water hazards will be identified in the TKPOA waterways All water hazards will be marked and potentially removed</td>
</tr>
<tr>
<td>Mapping- Storm Drains</td>
<td>WQ Manager / Supervisor</td>
<td>Once completed, TKPOA Homeowners will be able to complete the BMP Certification through TRPA</td>
<td>Within 2017 Operating Budget</td>
<td>All pipes that flow into the waterways will be identified insure verification of responsible party for each pipe (City or TKPOA)</td>
</tr>
</tbody>
</table>