



Mail

PO Box 5310
Stateline, NV 89449-5310

Location

128 Market Street
Stateline, NV 89449

Contact

Phone: 775-588-4547
Fax: 775-588-4527
www.trpa.org



March 4, 2011

To: Interested Parties

Subject: Request for Proposals - Lake Tahoe Aquatic Plant Control Project

To Whom It May Concern,

Tahoe Regional Planning Agency is soliciting proposals for professional services related to the management or control of nuisance aquatic plant infestations in the Lake Tahoe Basin.

The Near-shore Aquatic Weed Working Group (NAWWG) with direction from the multi-agency Lake Tahoe Aquatic Invasive Species Management Program (AIS Program), currently implements aquatic invasive plant control at Lake Tahoe to address the threat of infestations and accompanying degradations. The NAWWG membership includes TRPA, Tahoe Resource Conservation District, U.S. Fish and Wildlife Service, U.S. Forest Service – Lake Tahoe Basin Management Unit, California Department of Parks and Recreation, California Department of Fish and Game, Lahontan Regional Water Quality Control Board, Nevada Department of Wildlife, Nevada Division of Environmental Protection, and general improvement districts. Through coordination with the NAWWG, TRPA is seeking to dramatically increase the capacity of the AIS Program by implementing a Lake Tahoe Aquatic Plant Control Project (Project) to manage multiple large infestations of aquatic nuisance plants in the Lake Tahoe Basin.

Given the available resources for 2011, the NAWWG estimates that 15 acres of aquatic plant control can be achieved using multiple technologies including 1) bottom barriers, 2) diver-assisted removal, 3) a combination of 1 & 2, and 4) innovative strategy proposals. If the AIS Program acquires additional resources, the Project could be expanded to accomplish more aquatic plant control than currently estimated.

The focus of this Project is the physical removal of nuisance aquatic plant material in a manner that achieves the greatest environmental gain at Lake Tahoe. Innovative application of aquatic plant control strategies and techniques are an integral part of this project and should be designed to meet the following project objectives:

1. Control or eradicate nuisance aquatic plant infestations in selected sites throughout the Lake Tahoe Basin with focus on the near-shore areas of Lake Tahoe;
2. Execute rapid response control efforts on new or high priority plant infestation sites within the Lake Tahoe Basin; and
3. Coordinate with aquatic plant survey efforts to contribute to baseline effectiveness monitoring studies.

The selection process will be completed within 3 weeks following the submission deadline. The grantee reserves the right to award any part of or the whole proposal to one or multiple companies. TRPA will contract with the combination of parties that will best accomplish the project objectives for the best value and in the best interests of the NAWWG. The process for selecting the Applicant(s) is as follows:

1. General proposal evaluation criteria will include content of the proposal, project approach and understanding, qualifications, references, cost, service availability, and timing.
2. An initial screening of applicants will determine level of knowledge, experience, and qualifications. Only responses from qualified applicants will be evaluated further.
3. Qualified applicants may be invited to an interview. The interview will include, but is not limited to, a brief presentation on project approach and understanding, followed by questions relating to the qualifications and previous experience of the applicant, proposed project scope, management organization, and personnel that will perform specific tasks. It is possible the selection of a consultant will be based solely on the written response.
4. The applicant selected will be notified and asked to submit a draft contract and final scope of work to TRPA based on the RFP, the consultant's proposal for services, interview discussions if any, and project specifications. Should the applicant and TRPA be unable to agree to the terms of a contract, TRPA will reserve the right to disqualify the consultant and select another. Should this process not result in the hiring of a consultant, the RFP may be reissued.

TRPA agrees to, and will require of the applicant if making use of subcontracts, make a "good faith" effort to contract with minority firms, women's business enterprises and labor surplus area firms. Accordingly, TRPA strongly encourages MBE, WBE, and SBE to apply to this RFP

The deadline for submission of proposals for the Project is April 1 and selected parties will be notified on April 15, 2011. Late proposal submissions will not be considered. TRPA estimates that a contract for the Project will be awarded in April and that work will begin in May 2011.

Sincerely,



Patrick Stone

TRPA Project Manager/ Senior Wildlife and Fisheries Biologist

Enclosure



**TAHOE
REGIONAL
PLANNING
AGENCY**

Mail

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www.trpa.org

REQUEST FOR PROPOSALS FOR SERVICES AND EQUIPEMENT

Tahoe Regional Planning Agency
Seeks Bids for Lake Tahoe Aquatic
Plant Control Project

March 4, 2011

imagine. plan. achieve.

BACKGROUND:

Lake Tahoe is a magnificent body of water that is threatened by environmental degradation. The Tahoe Regional Planning Agency (TRPA) is charged with protecting this national treasure for the benefit of current and future generations. As part of this charge, TRPA works with partner agencies to control Aquatic Invasive Species (AIS) in the Lake Tahoe Region. While the establishment of Eurasian watermilfoil (*Myriophyllum spicatum*) and curly-leaf pondweed (*Pontamogeton crispus*) are well known in Lake Tahoe, attention has recently turned to controlling these aquatic invasive plants. Significant habitat disruption, impacts on native plant and animal communities, loss of property value, reduced fishing and recreation opportunities, and large public/private expenditures have accompanied aquatic plant invasions throughout the lower 48 states.

The Near-shore Aquatic Weed Working Group (NAWWG) with direction from the multi-agency Lake Tahoe Aquatic Invasive Species Management Program (AIS Program), currently implements aquatic invasive plant control at Lake Tahoe to address the threat of infestations and accompanying degradations. The NAWWG membership includes TRPA, Tahoe Resource Conservation District, U.S. Fish and Wildlife Service, U.S. Forest Service – Lake Tahoe Basin Management Unit, California Department of Parks and Recreation, California Department of Fish and Game, Lahontan Regional Water Quality Control Board, Nevada Department of Wildlife, Nevada Division of Environmental Protection, and general improvement districts. AIS Program partners will designate *project facilitators* that will be responsible for project oversight and for representing the interests of the various program partners.

The NAWWG is seeking to dramatically increase the capacity of the AIS Program by implementing a Lake Tahoe Aquatic Plant Control Project (Project) to manage multiple large infestations of aquatic nuisance plants. The spread of invasive aquatic plant species in parts of Lake Tahoe has facilitated the excessive growth of some native plant species through habitat alteration. Nuisance species like coontail (*Ceratophyllum demersum*) and invasive species like curly leaf pondweed are therefore referred to collectively in this RFP as aquatic plants.

Successful control of aquatic plants in Lake Tahoe will require synchronizing survey and treatment efforts and conducting repeated treatment of infestations on an annual basis to significantly reduce large source populations and eradicate smaller satellite infestations. This Project is intended to compliment the planning and oversight components of the AIS Program. The primary purpose of this Request for Proposals is to identify a contractor or team of contractors that can accomplish the objectives of the 2011 Project and additional years if resources are available. A secondary purpose of this Request for Proposals is to identify qualified parties interested in contributing to the program's capacity to manage aquatic invasive species in the future.

Funding through the Southern Nevada Public Lands Management Act (SNPLMA) has been secured specifically to address the control of aquatic plants in Lake Tahoe. These funds are administered by the U.S. Fish and Wildlife Service to the TRPA.

REQUEST FOR PROPOSAL SCHEDULE:

Date of Announcement:	March 4, 2011
Questions/Inquiries Accepted:	March 16, 2011
Response to Questions Announcement:	March 23, 2011
Deadline for Proposal Submissions:	April 1, 2011 (Postmarked)
Proposals Opened:	April 1, 2011
Interviews:	April 11-12, 2011
Notification of Award(s):	April 15, 2011

Late proposal submissions will not be considered and will be returned unopened to the sender.

PROJECT DESCRIPTION:

Control of aquatic invasive plants implies maintaining populations at a small enough size and density to prevent further growth or spread of the infestation. Eradication indicates the elimination of all life stages of a species. While eradication is often less achievable, it is the objective of this project in situations where specific species and site conditions make it feasible. Often the methods, or *treatments*, used to control aquatic invasive plant infestations are the same as those to eradicate them; however, the intensity of management varies greatly from control to eradication.

Given the available resources for 2011, the NAWWG estimates that 15 acres of aquatic plant control can be achieved using multiple technologies including 1) bottom barriers, 2) diver-assisted removal, 3) a combination of 1 & 2 and 4) innovative strategies proposed in response to this RFP. If the AIS Program acquires additional resources, the Project could be expanded to accomplish more aquatic plant control than currently estimated.

OBJECTIVES:

The objectives of the Project are:

1. Control or eradicate nuisance aquatic plant infestations in selected sites throughout the Lake Tahoe Basin with focus on the near-shore areas of Lake Tahoe; and
2. Execute rapid response control efforts on new or priority invasive aquatic plant infestations in priority sites within the Lake Tahoe Basin;
3. Coordinate with aquatic plant survey efforts to contribute to baseline effectiveness monitoring.

These objectives will be accomplished through implementation of effective aquatic plant removal techniques. Innovative application of aquatic plant control strategies and techniques are an integral part of this project approach and should be designed to meet the project objectives. The focus of this Project is the physical removal of nuisance aquatic plant material in a manner that achieves the greatest environmental gain at Lake Tahoe.

SCOPE:

The successful proposal(s) will demonstrate the ability to complete one or more of the tasks described below. Implementation of the Project is anticipated to require efficient management and operation of numerous plant removal crews, including under water scuba-diving, watercraft and equipment use, data collection and debris containment/disposal abilities.

Task 1: Project Management

The Project is a relatively large control effort that will require effective project management. Essential project management duties for this project include team organization, policy integration, task or subtask evaluation, reporting, permit compliance, and budgeting. Proposals should demonstrate experience and efficiency in performing management duties in similar project efforts.

Subtask 1A: Attend Meetings

Bi-weekly project management meetings will be held at a convenient location or by phone conference for all parties. The purpose of these meetings will be to provide progress/status reports, discuss project challenges, and provide administrative-level direction or decisions. In addition to project managers and site/team supervisors, these meetings will be attended by project facilitators with the authority to provide project direction as NAWWG representatives. It is anticipated that major project challenges will be addressed at these meetings.

Special and/or season-end meetings will be held for all selected parties as determined necessary by project facilitators or project management. Such meetings may be determined necessary when site specific challenges require discussions beyond the scope of bi-weekly meeting or when a summary presentation would facilitate rapid project evaluation.

TRPA has facilities available to support bi-weekly and special meetings at the main office in Stateline, Nevada. Other facilities located around the Tahoe Basin may be available through program partners upon special request.

Subtask 1B: Coordinate with Project Facilitators

In addition to bi-weekly meetings, the project management team will be responsible for coordinating with the project facilitators. The project facilitators and points of contact for project oversight will likely include one staff member from TRPA and one staff member from Tahoe RCD. Project management will be responsible for communicating project challenges, safety concerns, and management decisions to project facilitators in a timely manner. This task will typically entail regular email or phone call correspondence to discuss project evaluation and monitoring. It is anticipated that minor project challenges will be addressed at this level of communication.

Subtask 1C: Supervise Treatment Crew(s)

Project management will provide for and organize supervision of treatment crew(s) for each project site or activity. Supervision must include all necessary safety measures, such as described in the "Special Considerations" section below. Project management will be responsible for ensuring safety plans, on-site coordination measures, and project documentation are implemented correctly. Proposals should include a project team organization structure that addresses the need for on-site supervision and the supervisors' role in the project management task.

Task 1 Deliverables:

- *Efficient Management and Operation of Project Resources*
- *Bi-weekly Progress Reports, provided at bi-weekly meetings*

Task 2: Treat Aquatic Plant Populations

Aquatic plant infestations will be treated over multiple years to achieve the control and eradication objectives of this RFP; however, Task 2 includes only the project efforts that will be proposed for implementation during the 2011 season, which at Lake Tahoe will generally be May or June through October. Critical to this effort will be conducting accurate survey inventories of treated sites as well as clearly documenting treatment methods in a way that facilitates program evaluation.

Under Task 2, survey inventories will be conducted before and after treatment efforts at each project site and will follow standard methods provided in Appendix A. These pre- and post-project surveys will be conducted in addition to a separate but coordinated effort to comprehensively survey Lake Tahoe, which will be solicited through the Lake Tahoe Aquatic Plant Survey RFP. Proposals for this Project should address coordination and logistical needs between treatment crews, project management, and concurrent AIS projects. Proposals should further identify how the Project will utilize resources to achieve annual objectives within the relatively short season.

A multitude of studies have been conducted at Lake Tahoe and abroad to determine the effectiveness of various treatment and control methods for aquatic plant populations. Examples of tools that have been deployed at Lake Tahoe with varying success are: hand removal, diver-assisted hand or suction removal, placement of bottom barriers, and mechanical dredging. Many other studies have been conducted nationally to determine the effectiveness of various treatment and control methods for aquatic plant populations. The uniqueness of substrate type, waterway activities, and weather patterns all play a role in determining the treatment type for a particular site. Proposals should include a strategy to address infestations under the various conditions in Lake Tahoe. Emphasis should be placed on efficiently using established approaches, proposing new strategies that may improve the program, and demonstrating an organizational structure that supports evaluation and adaptive management. Successful proposals will integrate documentation and evaluation of treatment methods with the implementation of all project activities. Project methods will be continually evaluated and modified as necessary to achieve the objectives.

Since 2007, NAWWG has experimented with various treatment methods. Program evaluation will emphasize NAWWG discussion and recommendations. The program has conducted environmental review and permitting for hand removal, diver removal, and application of fabric bottom barriers to treat nuisance aquatic plant infestations. Additional treatment methods are welcome when supported by valid scientific evidence and with approval by permittees.

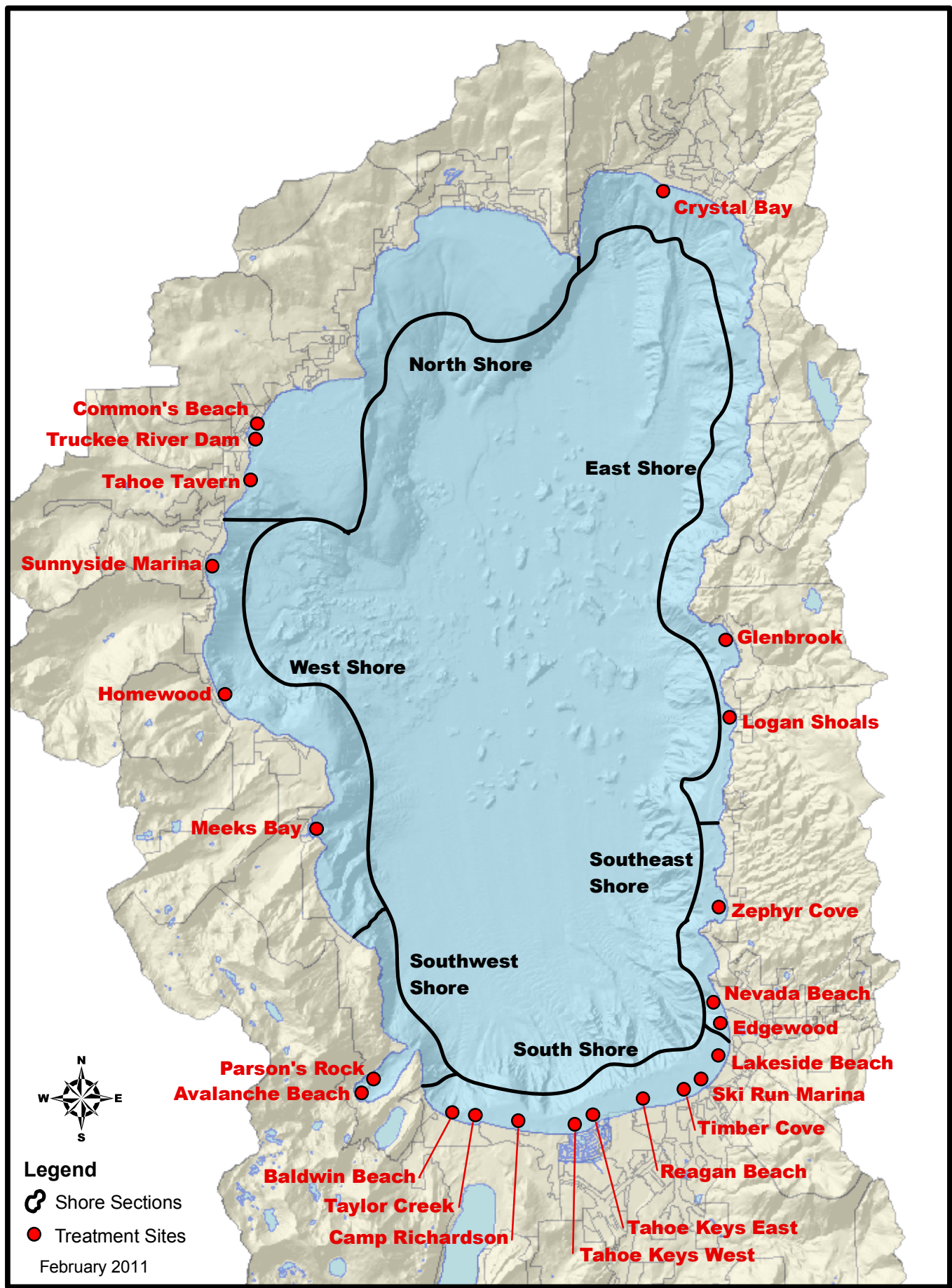
Aquatic plant infestations at Lake Tahoe can be classified as 1) known and/or documented with estimates on size and location or 2) currently unknown or suspected and lacking data on location and size. Identifying new infestations early and responding with aggressive treatment greatly increases the program's ability to eradicate satellite populations and reduce dispersal. New information on plant infestations is likely to become available within the timeline of this task. Therefore, proposals should consider the size and abundance of known infestations to determine capacity needs and also provide a scope and cost estimate that can address unknown infestations. This can be done as a treatment cost per acre. Aquatic plant infestation sites currently known to the program are displayed in Figure 1.

Subtask 2A: Conduct Pre-Treatment and Post-Treatment Site Inventory Surveys

A pre-treatment and a post-treatment inventory survey will be conducted at each project site prior to and immediately following conducting plant control efforts. The purpose of these surveys will be to document the pre- and post-project conditions and to assess the work completed. Typically, site inventory surveys will require the use of divers trained in native and nuisance aquatic plant identification. Global Positioning Satellite (GPS) will be used to document the extent/perimeter of each treatment area. Digital underwater photographs will be collected and divers will record observations on substrate, debris, and vegetative cover. Survey methods and documentation will follow standards provided in Appendix A.

Pre- and post-treatment inventory surveys will entail quantifying the infestation area, percent coverage, density estimates, and species composition. This information shall be documented in the field on standardized project data sheets (Appendix B).

Figure 1. Known Aquatic Plant Infestations in Lake Tahoe



Subtask 2B: Conduct Plant Control Treatments

Treatment crews will conduct plant control at specific infestation sites. Treatment will be accomplished using the best available and most appropriate methods for each infestation. The program currently owns some plant control equipment that would be available for use; these resources are described in the "Equipment" section below. Proposals are encouraged to demonstrate related experience with aquatic plant removal techniques and equipment, a familiarity with the project area, and the ability to effectively implement one or several treatment efforts. Adequate proposals will describe how effective control methods will be implemented and how treatment teams will be deployed.

Based on surveys conducted throughout Lake Tahoe in 2009, Eurasian watermilfoil infestations are located at greater than 25 discrete sites. These infestations range in size from approximately 200 sq. ft. to as much as 500,000 sq. ft. of the lake bottom. Many infestations sites will require the integrated use of underwater divers and "topside" crewmembers in a boat or on shore. Lake Tahoe is a popular destination for boaters with all ranges of experience; boat traffic patterns and tendencies create dangerous situations for divers in many parts of the lake and during times of high volume use. Proper diving and safety procedures are a required element of all project activities and will be the responsibility of the selected parties. Proposals should address diver safety plans, responsibilities, and other necessary conditions related to the safety of professional underwater divers and all crewmembers involved.

In addition to physically pulling plant stems or placing bottom barriers, treatment crews in all cases will be responsible for the containment of plant fragments, proper storage of invasive plant material, transport of invasive materials from the site, and proper disposal of all material at an approved facility. Decontamination of equipment and critical control point procedures will also be the responsibility of the treatment crews, see Special Considerations below.

Task 2 Deliverables:

- *Successfully remove aquatic invasive plant material from project sites with the goal of 100% removal within treatment areas following consecutive treatment efforts.*
- *Provide information to project management for bi-weekly progress reports and to project facilitators (see Subtask 1C above).*
- *Provide summary report for each site, including completed pre- and post-survey and treatment data forms, to project management and project facilitators by October 31, 2011.*

Task 3: Permit Compliance

The Project has been permitted through several authorizing agencies, including U.S. Army Corps of Engineers, Lahontan Regional Water Quality Control Board, Nevada Division of Environmental Protection, California Department of Fish and Game, and TRPA. As a condition of these permits, the Project will include water quality monitoring in order to ensure Project impacts do not exceed permit conditions. The parties selected for this task will be responsible for conducting water quality monitoring, sample collection and analysis, and compliance reporting according to permit requirements. Monitoring will include turbidity, temperature, time of observation, and description of project activity. An example water quality monitoring plan is provided in Appendix C.

Task 3 Deliverables:

- *Adequate turbidity and water quality monitoring as described in permit requirements;*
- *Water quality monitoring reports with verbal and graphic summaries of collected data for each site submitted to project management and project facilitators within 30 days of treatment activity;*
- *Project summary report submitted to project facilitators by October 31, 2011.*

Task 4: Reporting

All selected parties will be responsible for reporting. Survey, Treatment, and Water Quality crews will provide adequate progress reports and site summary reports to Project Management. Project Management will provide bi-weekly progress reports, site summary reports, and project reports to the NAWWG. Project Management will be responsible for developing reporting responsibilities and structure as part of project initiation. Proposals should demonstrate an understanding of the reporting structure and responsibilities.

Task 4 Deliverables:

- *Bi-weekly progress reports for each site;*
- *Bi-weekly progress reports for project;*
- *Final summary reports for each site within 30-days of treatment activity;*
- *Draft Project Report for NAWWG review and comment submitted by October 31, 2011;*
- *Final Project Report submitted to project facilitators by November 30, 2011.*

PROJECT SCHEDULE:

Contracts Awarded	April 2011
Planning, Strategy, and Coordination (Task 1)	May 2011
Aquatic Plant Control (Tasks 1, 2, & 3)	May – October 2011
Reporting (Task 4)	October – November 2011

SPECIAL CONSIDERATIONS:

Equipment

The NAWWG maintains a limited supply of equipment that is available for contractor use in this Project. This equipment is:

- (3) Suction Dredges (float mounted and pontoon mounted for diver-assisted removal)
- (12) Bottom barriers (fabric), 10' x 40' strips
- (20) Bottom barriers (fabric), 10' x 10' squares
- (140) Rebar, 10' x 1/4" dia.
- (182) Rebar, 2' x 1/4" dia. "candy-cane" hooks
- (4) Collection bins
- (4) Dive safety buoys

Proposals must address equipment needs and company/agency contributions.

Special Qualifications

Professional under-water diving at Lake Tahoe requires specialized skills and qualifications. In addition, under-water-diving for plant control efforts at Lake Tahoe will require site-specific safety and diver-support planning. Table 1 provides a summary of required or desired safety qualifications, diver certifications, and pertinent information that should be provided in proposals that include diver services.

Table 1. Diver-related Safety Qualifications and Special Certifications

Special Qualifications	Diver Certifications	Pertinent Information
Experience in Scientific Research Experience in Aquatic Plant Control Diver Safety Plan Liability Insurance (Bodily personal injury and property damage with minimal acceptable coverage of \$1 million) Emergency First Responder (optional)	Commercial Altitude Diver Dry Suit Diver Rescue Diver Master Diver	Years of commercial or professional diving experience Proof of Liability Insurance

Hazard Assessment and Critical Control Point (HACCP) Plan

The contractor will be responsible for developing and implementing a hazard assessment and critical point plan (HACCP Plan) according to U.S. Fish & Wildlife Service guidelines, available at <http://haccp-nrm.org>. The purpose of HACCP planning is to identify critical points in controlling the potential spread of invasive species and other environmental hazards. Critical control points for this project may include prior to arriving at a site or prior to moving from one infestation to another. Standard procedures for decontaminating personnel and equipment will be identified in each

Team Organization

Due to the nature of the project scope, complexity of aquatic weed control, and potential for project resources to substantially increase, TRPA recognizes that a combination of two or more proposals may best accomplish the project objectives. Further, the large range of skill sets required for this project may not in available from a single contractor. Therefore, proposals are encouraged to include any combination or subset of tasks and subtasks described in this RFP. TRPA reserves the ability to select the combination of proposals that provides the best services at the lowest cost.

PROPOSAL REQUIREMENTS:

ADDRESS ALL RESPONSES TO:

Tahoe Regional Planning Agency
Attention: Ted Thayer, Aquatic Invasive Species Program Manager

Physical Address (FedEx/UPS Delivery):

128 Market Street
Stateline, NV 89449

Mailing Address (US Mail only):

P.O. Box 5310
Stateline, NV 89449-5310

All proposals must be submitted in a sealed envelope plainly marked "Aquatic Plant Control RFP Response" and "DO NOT OPEN – Sealed Bid Enclosed," name and contact information of bidder, and addressed to the attention of Ted Thayer, Aquatic Invasive Species Program Manager.

Please submit three (3) hard copies and one electronic copy of the RFP response on CD in pdf format. Late proposal submissions will not be considered.

MINIMUM REQUIRED PROPOSAL CONTENTS:

1. Definition of the Project: Indicate your understanding of the Project objectives and of nuisance aquatic plant control at Lake Tahoe.
2. Project approach: Describe how the Project will be managed, implemented, and evaluated to accomplish the objectives and requirements outlined in this request. Innovative and comprehensive approaches that effectively utilize the available control methods are strongly encouraged.
3. Team Organization: Describe how the project team will be organized to facilitate effective management, implementation, and evaluation.
4. Qualifications and Experience: Provide a summary of company and project team qualifications related to AIS control. Describe examples of past experience pertinent to the Project. Refer to Special Qualifications section for required diver safety qualifications and/or certifications.
5. Schedule and Cost: Provide an itemized cost estimate based on the Tasks described in Scope of Work section. Adequate cost estimates will address unique control opportunities that have not yet been quantified, such as with a "per area" or "per time" estimate.
6. References: Provide a list of references with current phone numbers.

NOTIFICATION AND SELECTION PROCESS:

The selection process will be completed within 3 weeks following the submission deadline. The process for selecting the Applicant is as follows:

1. General proposal evaluation criteria will include content of the proposal, project approach and understanding, qualifications, references, cost, service availability, and timing.
2. An initial screening of applicants will determine level of knowledge, experience, and qualifications. Only responses from qualified applicants will be evaluated further.
3. Qualified applicants may be invited to an interview. The interview will include, but is not limited to, a brief presentation on project approach and understanding, followed by questions relating to the qualifications and previous experience of the applicant, proposed project scope, management organization, and personnel that will perform specific tasks. It is possible the selection of a consultant will be based solely on the written response.
4. The applicant selected will be notified and asked to submit a draft contract and final scope of work to TRPA based on the RFP, the consultant's proposal for services, interview discussions if any, and project specifications. Should the applicant and TRPA be unable to agree to the terms of a contract, TRPA will reserve the right to disqualify the consultant and select another. Should this process not result in the hiring of a consultant, the RFP may be reissued.
5. TRPA agrees to, and will require of the applicant if making use of subcontracts, make a "good faith" effort to contract with minority firms, women's business enterprises and labor surplus area firms. Accordingly, TRPA strongly encourages MBE, WBE, and SBE to apply to this RFP

The grantee reserves the right to award any part of or the whole proposal to one or multiple companies. TRPA will contract with the combination of parties that will best accomplish the project objectives for the best value and in the best interests of the NAWWG.

OTHER DETAILS:

FOR QUESTIONS:

TRPA Contact: Patrick Stone at 775-589-5213 or pstone@trpa.org.

- All written questions and request for clarification should be directed to Patrick Stone. Questions and responses will be posted for all bidders at <http://www.trpa.org/default.aspx?tabindex=13&tabid=121>.
- Bidder must certify to the best of its knowledge and belief that it and its principals are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any federal department or agency.
- Costs to prepare this proposal will not be reimbursed
- All submittals are public information. Restrictions on any information submitted will render a bid non-responsive.
- Selected consultant(s) will be expected to sign the TRPA Consultant Services Agreement listed on <http://www.trpa.org/default.aspx?tabindex=13&tabid=121>.
- All subcontractors, if any, used by the selected consultant will require prior written consent of TRPA and will be subject to all provisions stipulated in the TRPA Consultant Services Agreement.
- This contract will be funded by federal and state grant awards and is subject to federal and state grant award requirements [including but not limited to cost principles and administrative regulations](#).

APPENDICES

- A. Lake Tahoe Aquatic Plant Survey Protocol Summary
- B. Lake Tahoe Aquatic Plant Survey Forms
- C. Aquatic Invasive Species Turbidity Monitoring Plan

Appendix A

Lake Tahoe Aquatic Plant Survey Protocol Summary

Lake Tahoe Aquatic Plant Survey Protocol Summary

February 2011

Aquatic invasive plant surveys in Lake Tahoe are surveys conducted by divers trained in identification and mapping of aquatic invasive plants. Other surveys can be used, including transect, point-sampling, hydroacoustic, remote sensing, and videographic; however, 'ground-truthing' by trained divers is necessary. This summary has been derived from the November 2009 Protocol for Invasive Aquatic Plant Control and Monitoring in the Nearshore of Lake Tahoe.

Divers are required to verify and accurately assess the extent and composition of a plant infestation because most infestations are submerged in greater than 3 feet of water. The Lake Tahoe Aquatic Plant Survey Form shall be completed for all aquatic invasive plant surveys conducted in the lake. The purpose of this form is to provide documentation of the survey results and to catalogue areas surveyed in the lake. The Survey Form will also provide baseline information on isolated or newly detected infestations to direct future removal activities.

A critical component of any removal effort is to collect an inventory map that delineates the infestation extent so that data can be visually compared with post-treatment conditions and with future aquatic plant surveys. Information to collect includes: species/type, extent and population size, biomass, physical habitat characteristics, hydrology, water quality condition (i.e. turbidity) and restrictions/limitations to be considered.

The protocol has been developed to serve the following purposes:

1. Provide a mechanism to record and inventory invasive aquatic plant species infestations via diver surveys in Lake Tahoe;
2. Document an accurate record of removal/treatment efforts;
3. Provide follow-up monitoring to sites where aquatic plant species are removed to determine the efficacy of the treated areas; and
4. Facilitate early detection of and rapid response to new infestations.

The survey and mapping protocol includes the following:

- All infestations of less than 0.01 acre (436 square feet, or ~ 20ft X 20ft) should be mapped as single points, recorded using a GPS receiver. Record the number of plants and composition within the 'single point' infestation.
- All infestations greater than 0.01 acre should be mapped as polygons with four or more perimeter points recorded using a GPS receiver. Determine an estimated area of infestation (acres or square feet) within the defined perimeter. Record a visual estimate of vegetative cover as a percent of the recorded infestation area.
- If multiple aquatic plant species exist within an infestation, survey will provide approximate composition and percent cover of each species in percent of total infestation size. Where species occur in discreet conglomerations, each species should be mapped and recorded as a separate infestation; however, this separation will not be feasible where the infestation is a ubiquitous composite of several plant species.

- Annual lakewide surveys will be conducted each fall (August – October), and pre- and post-project surveys will be conducted as necessary based on treatment efforts and site conditions.
- All completed Lake Tahoe Aquatic Plant Survey Forms, GIS data, mapped results, and a summary of survey results will be submitted to project managers within 60 days of survey completion.

Appendix B
Lake Tahoe Aquatic Plant Survey Forms

Lake Tahoe Aquatic Plant Survey Forms

Lakewide and Pre-Treatment Data Sheet

Date: _____

Survey Location: _____

County: _____ USGS Quad: _____

Lead Surveyor: _____

Divers & Support: _____

Upland Land Owner(s): _____

Public/Private Structures (piers/bouys): _____ Water/Land Uses: _____

Boating Traffic Densities: Low Medium High

Total Areal Extent Surveyed (ft²): _____ Depth of Survey (ft): min _____ max _____

Shorezone Landmarks of Survey Area: _____

Water Depth (ft): min. _____ max. _____ Lake Water Elevation (ft LTD): _____

Coordinates of Surveyed Extent (Decimal Degrees, NAD 83)

Start	Lat	_____	Long	_____
End	Lat	_____	Long	_____

% Aquatic Plants Present:

Invasive:	_____ % Myriophyllum spicatum	Native:	_____ %
	_____ % Potamogeton crispus		_____ %
	_____ % Other		_____ %

Substrate Composition: _____

Bottom Obstructions: _____

Bottom Sediment: Y N

If invasive plants are observed, provide the following information:

Infestation Area (ft²): _____

Previously Known Location: Y N

Coordinates of Perimeter (Decimal Degrees, NAD 83)

Lat	_____	Long	_____
Lat	_____	Long	_____
Lat	_____	Long	_____
Lat	_____	Long	_____
Lat	_____	Long	_____
Lat	_____	Long	_____
Lat	_____	Long	_____

Est. % Vegetative Cover: _____

Ave. Plant Ht. (ft): _____

Est. Biomass: vol. (cu. ft.) _____

of Fragments Observed: _____

Removal/Treatment Recommendation: _____

If plants are removed, enter data on the Removal/Treatment Data Sheet.

Notes/Observations:

Lake Tahoe Aquatic Plant Survey Forms

Treatment Data Sheet

FORM ID #: _____

Date: _____ Start time: _____ Finish time: _____

Infestation Location: _____ Previously Known Location: Y N
County: _____ USGS Quad: _____

Lead Person: _____

Divers & Support: _____

1. Treatment Method: _____ # of Bottom barriers placed: _____

2. Upland Land Owner: _____

3. Public/Private Structures: _____

Water/Land Uses: _____

4. Boating Traffic Densities: Low Medium High

5. Total Areal Extent Surveyed (ft²): _____

Infestation Area (ft²): _____

6. Coordinates of Perimeter of Treated Area (Decimal Degrees, NAD 83)

Lat	_____	Long	_____
Lat	_____	Long	_____
Lat	_____	Long	_____
Lat	_____	Long	_____
Lat	_____	Long	_____
Lat	_____	Long	_____
Lat	_____	Long	_____
Lat	_____	Long	_____

7. Aquatic Plants Present:

Invasive: _____ *Myriophyllum spicatum*

_____ *Potamogeton crispus*

_____ Other _____

Native: _____

% cover invasive: _____ % cover native: _____

8. Water Depth (ft): min. _____ max. _____

Lake Water Elevation (ft LTD): _____

Substrate Composition: _____

Bottom Obstructions: _____

9. Ave. Plant Ht. (ft): _____

Est. Biomass: vol. (cu. ft.) _____

10. Area Treated (ft²): _____

11. Turbidity Monitoring

Time: _____ NTU: _____

Time: _____ NTU: _____

Time: _____ NTU: _____

12. Photo Taken: Y / N Photo # and Description: _____

13. Activity Log and Notes/Observations:

Lake Tahoe Aquatic Plant Survey Forms

Post-Treatment Data Sheet

Date: _____

FORM ID #: _____

Infestation Location: _____

Treatment Dates: _____ (Attach Pre-Removal/Pre-Treatment Data Sheets)

Total Biomass Removed/Treated: vol. (cu. ft.) _____

Total Area Removed/Treated (ft²): _____

1. Plants Present in Removal/Treatment Area: Y N (If yes go to #2, if no go to #8)

2. Aquatic Plants Present:

Invasive: _____
_____ Myriophyllum spicatum
_____ Potamogeton crispus
_____ Other

Native: _____

3. % Cover in Treatment Area: Invasive: _____ Native: _____

4. # Plants/Stems: _____

5. Ave. Plant Ht. (ft): _____

6. Est. Biomass: vol. (cu. ft.) _____

7. Treatment: Hand Removal Diver-Assisted Suction Bottom Barrier

Est. Haul-out: vol. (cu. ft.) _____ Wet Wt. (lbs.): _____

of Fragments Observed and Removed: _____ Disposal Location: _____

8. Photo Taken: Y / N Photo ID #: _____

9. Activity Log and Notes/Observations:

Appendix C

Aquatic Invasive Species Turbidity Monitoring Plan

AQUATIC INVASIVE SPECIES TURBIDITY MONITORING PLAN

For activities associated with aquatic weeds removal at
Emerald Bay and Ski Run Marina at Lake Tahoe, California

Prepared for Bureau of Reclamation Grant No. 06FG202101

Through the Tahoe Resource Conservation District

870 Emerald Bay Road

South Lake Tahoe, CA 96158

By

Tahoe Regional Planning Agency

128 Market Street

Stateline, NV 89449

TURBIDITY MONITORING GOALS AND OBJECTIVES

Projects for the removal of Aquatic Invasive Species (AIS) have both short term and long term environmental impacts particularly turbidity impacts from the removal activities. The appropriate types of monitoring for the removal operations is cause and effect, with pre, during and post project data collection. The overall goal for this monitoring plan is described as:

TO PROVIDE INFORMATION ON THE WATER QUALITY IMPACTS OF AIS REMOVAL OPERATIONS THROUGH DIVER ASSISTANCE AND INSTALLATION OF BOTTOM BARRIERS.

To implement this goal it is necessary to have well articulated objectives and monitoring strategy. The actions proposed environmental impact of AIS removal and the monitoring should provide the spatial and temporal effects of the project. Some objectives to achieve this end are:

1. Perform pre-removal turbidity measurements in areas where removal of AIS is to occur.
2. Implement the removal according to a specific plan that includes a timeline and resource allocation and contingency plans for inclement weather and equipment failure.
3. Monitoring and record for turbidity during removal activities.
4. Conduct post removal turbidity measurements.

TURBIDITY MONITORING APPROACH RATIONALE

Turbidity is a measure of water clarity. Water with high turbidity is cloudy, while water with low turbidity is clear. Suspended materials including soil particles (clay, silt and fine sand) algae, organics and other material all contribute; therefore, the more particles in the water, the higher the turbidity.

While many factors can contribute to the turbidity of surface waters in Lake Tahoe, the lake itself has very low turbidity values. Some of the sources listed in Table 1 may discharge to the lake, but not in sufficient concentrations to elevate the turbidity for more than brief periods. Spring snowmelt runoff is the single largest source of natural turbidity, while stormwater runoff, construction activities, dredging and shorezone projects are some unnatural causes.

High turbidity will decrease the amount of sunlight able to penetrate the water, thereby decreasing the photosynthetic rate. Reduced clarity also makes the

Table 1. Sources of Turbidity

- | |
|---|
| <ul style="list-style-type: none"> • Soil erosion <ul style="list-style-type: none"> - silt - clay • Urban runoff <ul style="list-style-type: none"> - road grime - rooftops - parking lots • Industrial waste <ul style="list-style-type: none"> - sewage treatment effluent - particulates • Abundant bottom-dwellers <ul style="list-style-type: none"> - stirring up sediments • Organics <ul style="list-style-type: none"> - microorganisms - decaying plants and animals - gasoline or oil from roads |
|---|

water less aesthetically pleasing, and can impact the drinking water sources using lake intakes. This impact to clarity also contributes to algal production with resuspension of nutrients and long term clarity loss.

Turbidity is measured in *Nephelometric Turbidity Units*, NTU. According to the USGS, the turbidity of surface water is usually between 1 NTU and 50 NTU. Turbidity is often higher than this, however, especially after heavy rain when water levels are high.

The turbidity of Lake Tahoe ranges from a high of 1-2 NTU's near stream mouths and urban runoff sources to a low of .20-.50 NTU in most areas of the lake. Turbidity levels in active dredging can be several hundred NTU's. Turbidity is also a relatively simple measurement with established standards and calibration procedures. It can be performed under a variety of conditions and can be easily taught to personnel. The continuous turbidity proposed in this plan is superior to single discrete measurements by:

- the ability to gain constant readings as the project progresses;
- the setting of trigger points to cease operations at recommended exceedences;
- an electronic record of the operation;
- continuous reading allows monitor to gain additional information such as photos or assistance to divers.

SAMPLING DESIGN

The sampling design for turbidity monitoring is to establish target thresholds for each removal or installation method and monitor throughout the activity. Continuous monitoring is preferred for a complete record and ease in sample collection. Dip or grab samples can also be taken, and can be preferred to obtain samples at depth and for nutrient or sediment analysis, but is much more time consuming and cumbersome.

The target threshold for turbidity is based on earlier efforts and testing and are intended to be modified as more information is collected. The cumulative effects of all day removal are not yet known and a 'recovery to background levels in 24 hours' threshold may need to be adopted, or a next day starting level threshold may be imposed. The HACH 1720e turbidimeter is a low range turbidity instrument designed for ambient lake conditions and the upper range is 100 NTU. When this level is reached, operations may be stopped or grab samples can be taken to continue monitoring. At present the monitoring shows sufficient reduction in

TABLE 2: Effects of Turbidity

- | |
|--|
| <ul style="list-style-type: none"> • Reduces water clarity • Aesthetically displeasing • Contributes to algae production • Increases water temperature |
|--|

30 minutes to use the following table as a draft design.

AIS removal is divided by the separate techniques that can be utilized, as there are great differences in the levels of disturbance. Diver hand removal without suction assistance is by far the most disturbing in relation to elevated turbidity caused by diver motions. Diver's using the suction hose help by directing the plant material and subsequently much of the turbidity into the suction dredge. Although this does not ultimately remove the sediment particles, it does reduce the suspension in the water column. The least disturbance is from bottom barrier installation, though the duration time may be longer depending on the diver experience.

TABLE 3:

TURBIDITY EXCEEDANCE THRESHOLD	10 MINUTES	20 MINUTES	30 MINUTES
DIVER ASSISTED SUCTION	100 NTU	20 NTU	1 NTU
BOTTOM BARRIER INSTALLATION	50 NTU	20 NTU	1 NTU
HAND REMOVAL, NO SUCTION	100 NTU	25 NTU	5 NTU
AT ANY POINT THE TURBIDITY REACHES 200 NTU OPERATIONS WILL CEASE IMMEDIATELY!	This may well correspond to the visibility limit of divers.		

TURBIDITY DATA COLLECTION

Turbidity monitoring is a standard measurement, having established procedures for data collection and calibration of instruments. The operation and calibration will be according to the instrument manufacturer's specifications. Both the EPA and *Standard Methods for the Examination of Water and Wastewater* specify formazin as the primary standard for calibration of turbidity instruments¹. The general procedure for sample collection is as follows:

- ✓ Calibrate instrument according to manufacturer's specification prior to field run and record in a calibration book that is dedicated to that instrument.
- ✓ Collect any water grab samples in clean rinsed sample bottle, either by dip or swing sampler.
- ✓ Samples should be taken no further than 25 feet from the control activities. Document distance samples are taken from, control activities.
- ✓ For continuous reading turbidimeter use clean clear tubing with the sample line as direct as possible to the sampling point. Be sure the flow rate is adjusted to avoid air bubbles.
- ✓ Record grab samples on a designated field form and/or download the continuous readings to a laptop for inspection. The continuous turbidimeter should be monitored during the removal operations to ensure compliance with the exceedance thresholds.
- ✓ Data and reporting format and management is discussed in a subsequent section.

¹ Turbidity Standards, Technical Information Series- Booklet No. 12, M. Sadar.

DATA ANALYSIS

There are several separate data collection items that will be generated by each removal project: the field forms for each operation (Attachment A) and the continuous turbidity record downloaded from the HACH. The field form can also include the amounts of material removal and other information but separate data forms will be used to document the removal efforts. Part of the data analysis is real time, by monitoring of the HACH as it is taking readings, with the operator watching for signs of unstable or erratic readings and also the upper meter limit trigger to cease operations. While a laptop may be on board for downloads, it is more advisable to wait for the end of the day when the boat is anchored or on a buoy for transfer. Download should be daily in the first year of operations to establish set procedures and troubleshooting. In the future the download may be at the end of the removal period 1 or 2 weeks in duration. A sample procedure is listed below:

1. Data collections of both field observations, possible grab samples for comparison to the 1720e and continuous monitoring.
2. Download of 1720e to laptop, a hard copy is printed and added to field binder with field sheets.
3. Brief review of record for obvious outliers and errors for any immediate need for attention or correction, comparison of any grab samples taken to recorded readings.
4. Determine probable cause of any discrepancies in samples if possible, with notations and discussion in field book (i.e. too high of rate on peristaltic causing bubbles, clogged intake, intake on bottom). Unexplained readings should be flagged and documented.
5. Graphs and/or statistical analysis to show each removal activity and to compare with future projects included for each project.

REPORTING PROTOCOL, FORMAT, AND DATA MANAGEMENT

The reporting procedure is a continuation of the above analysis into small individual removal projects combined into an annual report. Both field sheets and 1720e data are recorded in excel spreadsheets for graphing and comparison between projects and overall. Additional steps are:

6. Compile each removal project or session into a brief report for review by the AIS working group.
7. Distribution of removal projects after review and corrections into an annual report for grant partners, agencies and the general public, with posting on the TIIMS website

www.TIIMS.org and the TRCD Invasive Weed website <http://tahoercd.org/invasive-weeds.php> with accompanying metadata documentation.

8. A long-term trend and data summary at the end of the grant period and the TRPA five year evaluation, with a review of this document and changes as needed.
- 9.

DATA MANAGEMENT & STORAGE PROTOCOL

As discussed in the Reporting protocol section, the data products from this monitoring will be in three basic forms:

1. Field sheets from each day of operation, transferred to an excel spreadsheet;
2. Electronic backup copies of field sheets;
3. Electronic files generated by HACH turbidimeter, also saved on back up disc's.

The data is then reviewed by the field operator, compiled into a summary report per each operation and sent for review to the AIS working group. Any comments, questions or changes are clearly noted and final summary report generated into annual reports. The temporary storage for raw data will be with the boat and monitoring personnel (TRPA), with subsequent review and final copies onto a designated portal on the TIIMS website. The TIIMS working portal is a shared workplace with login access only to those in the review group, with final reports posted on a public site.

QUALITY ASSURANCE AND QUALITY CONTROL PLAN

Quality assurance and quality control (QA/QC) are both integral parts of any good monitoring plan. The main purpose of monitoring is to define changes over time, and cannot be accomplished without consistent, repetitive, and standardized methods of collections and documentation.

Quality Assurance

"Quality Assurance can be defined as "the policy, procedures, and systematic actions established for the purpose of providing and maintaining a specified degree of confidence in data integrity and accuracy throughout the lifecycle of the data, which includes input, update, manipulation, and output." (Fancy, 2002).

To this end, this monitoring plan will be a work in progress with refinement annually until the proposed protocols and procedures have been tried and field tested. The National Park Service and the USDA have extensive references, workshop materials and documents on monitoring with specific's on invasive species (see links under references). Much of this document was produced with these tools, however, as this plan is specific to the removal activities described, definitive protocols are not yet fully developed, and refinement is expected and necessary. Data comparability is difficult without similar projects, yet extensive search was attempted. The proposal to establish something similar to the USFS work on Turbidity Threshold Sampling (<http://www.fs.fed.us/psw/topics/water/tts/>). This procedure establishes a direct relationship between flow discharge, turbidity and sediment concentration, This technique may or may not be possible in this aquatic environment, and there is no funding to collect concurrent sediment samples to establish a 'rating curve' for these removal operations.

The preceding narrative gives the general overview and the numbered and bulleted items can be considered the essence of the Standard Operating Procedures (SOP) for this plan. There is only field measurements proposed, no lab SOP's are included. The EPA reference to turbidity measurements is reproduced in Appendix C. Some field measurements may be taken with the TRPA multi-probe YSI 556 and a reference to EPA measurement sensitivity is copied below:

The measurement quality objectives (MQOs) for accuracy/bias (same as systematic error using NIST standardized terminology) for field measurements (including data logger/continuous monitoring units), based on comparison of the unit's performance against reference standards or instruments, are:

Dissolved oxygen ± 0.5 mg/L

Salinity ± 1.0 ppt

pH ± 0.3 units

Temperature ± 1.0 °C

Depth ± 0.5 m (~ 2 ft)

Note from Roy Irwin: if calibration for pH is done with two standards as recommended by EPA, a third standard (NIST or other high quality standard) could be taken to the field for a final check of real-world systematic error/bias.

The precision repeatability MQO for all field parameters (including those listed above and Secchi depth and PAR) is a maximum allowable goal (presumably relative percent difference based on duplicate measures of the same sample) of 10% (Table A7-1 of the EPA QAPP at http://www.epa.gov/emap/nca/html/docs/c2k_qapp.pdf).

Some might react that these MQOs are not especially stringent, but the outdoor marine environment (bouncing around in boats, exposed to wind and sunlight etc.) is a difficult measurement environment, and the critical thing is that QC performance standards be stated, not that they necessarily be the world's most stringent. Measurement in the field is more difficult than in the lab, so the QC standards given are probably at least realistic. In fact, since it is hard to find comparably standardized QC performance standards for freshwater environments, and since probes in that environment often bounce around in pickups before being used, there was some discussion that the EMAP marine QC standards might even be considered as a default starting point for freshwater QC limits for field probe measures as well.

Quality Control

Most QA/QC plans include certain standard QC objectives, and while not all are applicable, they are listed to provide some documentation.

- (1) *Representativeness (Target Population):* The target population is confined to the two pilot locations and is not a lakewide assessment. The sampled population will be those areas involved in direct removal activities and a control area where harvest is not performed. The monitoring of turbidity is cause and effect of the removal operations and related disturbance, background levels of turbidity compared to the continuous monitoring during and post operation will be complied. Each project run or operation will then be complied to compare to previous runs, and it may take several years of data collection for true representativeness to be determined.
- (2) *Measurement Sensitivity:* The HACH 1720e is the low range turbidimeter and has a range from .001 to 100 NTU's. The complete specifics are found in Appendix D.
- (3) *Measurement Precision :* Manufactures estimate of meter accuracy is $\pm 2\%$ of reading or ± 0.015 NTU (whichever is greater) from 0 to 40 NTU; $\pm 5\%$ of the reading from 40 to 100NTU.
- (4) *Blank Control:* While no lab work will be completed comparison to the HACH 2100P turbidimeter will be done periodically through the sampling period, at least once each trip. The range on the 1720e is designed to be lower than the 2100p so only gross differences can be made.

ATTACHMENT A

Field Turbidity Monitoring Data Sheets

INVASIVE WEED TURBIDITY MONITORING FOR DIVER SUCTION

Date:	Calibration Date	Sampler	Lake Level
CREW/VESSEL		STAGING AREA	
METER:	TIME	NTU	
LOCATION AND INITIAL CONDITIONS	BEFORE START		
	5 MINUTES		
	10 MINUTES		
	15 MINUTES		
	20 MINUTES		
	30 MINUTES		
LOCATION AND INITIAL CONDITIONS	BEFORE START		
	5 MINUTES		
	10 MINUTES		
	15 MINUTES		
	20 MINUTES		
	30 MINUTES		
LOCATION AND INITIAL CONDITIONS	BEFORE START		
	5 MINUTES		
	10 MINUTES		
	15 MINUTES		
	20 MINUTES		
	30 MINUTES		
LOCATION AND INITIAL CONDITIONS	BEFORE START		
	5 MINUTES		
	10 MINUTES		
	15 MINUTES		
	20 MINUTES		
	30 MINUTES		
Volume of material removed for disposal	lbs		
Field Observations (e.g., wind and weather, lake conditions, other aquatic vegetation,)			

INVASIVE WEED TURBIDITY MONITORING FOR BOTTOM BARRIERS

Date:	Calibration Date	Sampler	Lake Level
CREW/VESSEL		STAGING AREA	
METER:		TIME	NTU
LOCATION AND INITIAL CONDITIONS		BEFORE START	
		5 MINUTES	
		10 MINUTES	
		15 MINUTES	
		20 MINUTES	
		30 MINUTES	
LOCATION AND INITIAL CONDITIONS		BEFORE START	
		5 MINUTES	
		10 MINUTES	
		15 MINUTES	
		20 MINUTES	
		30 MINUTES	
LOCATION AND INITIAL CONDITIONS		BEFORE START	
		5 MINUTES	
		10 MINUTES	
		15 MINUTES	
		20 MINUTES	
		30 MINUTES	
LOCATION AND INITIAL CONDITIONS		BEFORE START	
		5 MINUTES	
		10 MINUTES	
		15 MINUTES	
		20 MINUTES	
		30 MINUTES	
Field Observations (e.g., wind and weather, lake conditions, other aquatic vegetation,)			