Black Lake

Integrated Aquatic Vegetation

Management Plan

Prepared for: Washington State Department of Ecology
And
City of Ilwaco, Pacific County, Washington

Prepared by: Jane Greene Co-Chair Black Lake Steering Committee
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Turnstone Environmental Consultants

The Black Lake Steering Committee appreciates and is grateful for continued support from individuals and groups that have assisted us in the development and completion of the Integrated Aquatic Vegetation Management Plan to eradicate Brazilian elodea from Black Lake. Being co-chairs of a Committee is a great responsibility but the burden is lightened when individuals such as those listed below provide great support! Our thanks to all of you... Ardell McPhail and Jane Greene, Co-Chairs Black Lake Steering Committee.

Melanie Tyler, Department of Ecology

Ilwaco City Government
- Mike Cassinelli, Mayor
- Will Greene, City Councilor
- David Jensen, City Councilor
- Gary Forner, City Councilor
- Gini Chin, City Councilor
- Elaine McMillan, City Treasurer
- Normandie Hand, City Clerk

Private Citizens
- Kim Patten (WSU)
- Tim Crose (Pacific County Weed Board)
- Al Harper (Lion's Club)
- Chuck Cameron
- David Johnson
- Mary Atherton (Audubon Society)
- Kevin Heimbigner (Chinook Observer), Reporter
- Charlotte Kelly (Junior High Science Teacher) and participating students

Volunteers prior to re-forming of Committee and other supporting participants
- Brandy Ferguson (original author of Grant application and prior City Clerk)
- Steve Hill (prior City Treasurer)
- Richard Ereth (guest speaker-Fish and Wildlife)
- Tammie Herman (prior City Clerk)
- Randy LaVold (prior City employee)
- Don Berger
- Richard Patana
- Evin LaPlatney
- Malcolm McPhail
- Casey Kellar
- Sarah Raaymakers
- Martha Jordan
- Chinook Indian Nation

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Executive Summary

Black Lake is a 33 acre essential water body, located in Ilwaco Washington on the Long Beach Peninsula in Pacific County that provides water for agriculture, recreation and is an emergency backup drinking water source for the city. After an extensive plant survey of the lake it was determined that over 97% of the aquatic plant life in the lake is the invasive aquatic weed Brazilian elodea.

With the help of experts including Washington State University, Pacific County Noxious Weed Board, Turnstone Environmental Consultants and informed local residents, a plan was developed to control the Brazilian elodea and other non-native invasive plant species in Black Lake. This is a multi-year, multi-part, multi-phase planned approach. The priorities of this plan are to control the weeds, protect the ecosystem, and restore the lakes usability.

This project is faced with some unique challenges. The Brazilian elodea is pervasive being 97% of the plant life in the lake. Weed eradication must take place over a period of time to allow for native plant life to become re-established. A healthy established native aquatic plant life in the lake is essential to avoid adverse impacts to the insect, bird, animal and fish populations and maintain a healthy ecosystem. Available windows of opportunity for chemical weed control and the type of chemicals used is limited by the human consumed agriculture production needs of water from the lake.

A guiding principal of this effort is to follow the PDCA Quality Program, Plan – Do – Check – Act. The team has planned extensively and with funding approval, will do the first steps of the plan, check the results, modify the plan according to the results and move to the next logical step in the plan. PDCA is a dynamic system managing necessary changes to the plan as the circumstances evolve to achieve the priorities of the project.

The essential elements of this plan are: (Year 1) kill the Brazilian elodea with diquat in one third to one half of the lake, rebuild the lakes' outfall, verify the effectiveness of the treatment and modify the plan as needed. (Year 2) kill the Brazilian elodea with diquat in one third to one half of the lake, verify the results and modify the plan as needed. (Year 3) spot treat remaining areas with diquat, verify results and modify the plan accordingly. (Year 4) treat the remaining areas of invasive weeds with diquat. All of these diquat applications will be in accordance with acquired permits and manufacturers specifications during the open windows established by our agriculture committee.

Alternatives to be added to the plan as required are: to add diver suction dredging in the latter half of Year 1 if diquat was not effective in reaching the impacted area goals. Year 2 would add the installation of bottom barriers to the two docks and outfall areas if the diquat or diver suction dredging was ineffective in those areas. Year 2 also holds the remote possibility of adding a small limited number of mature sterile grass carp to the lake if all the other methods fail to achieve expected goals. Year 3 contains possible diver suction dredging if weed

eradication goals are not reached. Year 4 contains optional diver suction dredging and a second addition of a limited amount of mature sterile grass carp.

This plan is intended to be a careful gradual conservative approach to address a large problem. Intervening in an established ecosystem can lead to unintended consequences which could be detrimental to the community, the local economy and the lakes' users. The Black Lake Steering Committee, with the support of the Ilwaco City Council, has crafted this safer approach to avoid some of the pitfalls experienced in other projects of this type.

Funding is key to any project. The Washington State Department of Ecology (DOE) has been instrumental by supporting and funding the development of this Integrated Aquatic Vegetation Management Plan (IAVMP). Melanie Tyler of DOE has been a strong supporter of this effort providing advice, guidance and subject matter expertise.

Next steps, with the acceptance of this IAVMP by DOE, are to craft an implementation grant application to fund this plan. The funding outlined in this project has a worst case scenario of $125,000. The more likely outcome will cost $75,000. An implementation grant from the Washington State Department of Ecology will be vital to the City of Ilwaco and its' ability to achieve the goals of this plan. The city does not have the fiscal resources to achieve this plan without the direct financial support of the Department of Ecology.

INTRODUCTION

Black Lake is located within the Long Beach Peninsula in Pacific County. It is a major natural asset and place of beauty in the small rural town of Ilwaco, Washington. Black Lake is a 32.8 acre lake and is part of the Willapa Bay Watershed. Black Lake, situated directly adjacent to Highway 101, drains into the Tarlatt Slough and eventually enters Willapa Bay. The lake is surrounded by numerous hiking trails and undeveloped wilderness with only two private residences directly abutting the lake's shores.

Black Lake provides many resources to the community. It offers recreational opportunities such as hiking, non-motorized boating, swimming, kayaking, and fishing. Black Lake offers "hands-on" opportunities for the local students to develop and learn about nature since the school facilities are located close to Black Lake's shores. High School students are participating in senior projects to enhance community knowledge and use of Black Lake and its surrounding trails. For example, student Evin LaPlatney mapped coordinates and posted signage for several trails surrounding Black Lake.

Local youth enjoy and participate in the annual Black Lake Fishing Derby which is extremely popular and a source of tourism interest and revenue. Sixteen cranberry farms utilize the water in Black Lake for seasonal crop production and harvesting. Black Lake's public boat launch facility is located on the east side of the lake. There is a public park area on the southwest side of the lake provided by the City of Ilwaco. The park consists of a public parking lot, covered picnic area, picnic tables, restrooms, fishing dock and a handicap accessible fishing platform. Many people park at the lake or use trails to observe and enjoy the varied wildlife which populates Black Lake and its shores. Animals such as black bear, swans, osprey, great blue heron, Canadian geese and porcupine can often be seen.

In the last few years, citizens have been increasingly concerned with the presence of the invasive aquatic weed known as Brazilian elodea (B. elodea). A plan was initiated to apply for a grant to eradicate the weed. In 2009, Turnstone Environmental Consultants were employed to survey the lake and report on its condition. The survey revealed the lake is infested by Brazilian elodea which is now the dominant species in the lake. The infestation is so overwhelming that almost all native plants have been eliminated creating a monoculture lacking in biodiversity and creating additional impacts. Boats and swimmers are no longer able to navigate the waters due to entanglement in the weeds. In 2009, a historical naval model vessel club from Longview, Washington, investigated Black Lake as a possible site for historical naval battle reenactments. The club determined the lake was not an appropriate site as the weed mass would interfere with the navigation of the model vessels. Fishing is a challenge because fishermen frequently snag weeds with their lines. Participation in the Black Lake Fishing Derby has declined in the last few years due to the presence of B. elodea. Cranberry farmers incur increased costs as B. elodea escapes Black Lake and infests cranberry ponds requiring treatment. Irrigation inlets become clogged with the weed mass and require continuous maintenance. An ongoing concern

is that the infestation will continue to spread to other water bodies via boats, trailers, and fishing gear if left untreated.

The Black Lake Steering Committee was formed by a group of citizens and the City of Ilwaco to address the eradication of Brazilian elodea from Black Lake and halt the spread of this invasive species to other water bodies.

The Steering Committee favors a multi-faceted, conservative approach to the elimination and control of Brazilian elodea. The Committee wants to avoid large scale algae blooms and is highly sensitive to the fact that the water is used by the cranberry farms for food production. The 5 year plan favored by the Committee includes the following steps: community education, yearly monitoring, herbicide treatment, diver suction dredging, replacement of outfall and weir, bottom barrier (as needed), and grass carp (as needed and in very limited amounts). This conservative approach is considered both effective and least harmful to the lake, its inhabitants and local agriculture.

The Steering Committee recognizes that the effective management of Brazilian elodea will be an on-going concern and will require a long-term commitment. On-going monitoring of the plant community is important. This aquatic plant management plan is not static and will change as conditions change.

Public education and involvement are important elements in the control of aquatic invasive plant species. Signs alerting individuals to the presence of the invasive weed and tips for prevention of spread are posted in appropriate high use areas around the lake. Local newspaper articles have been published regarding Brazilian elodea. A manned information booth was present at the Black Lake Fishing Derby to provide published and verbal education about the presence of B. elodea. Charlotte Kelly, a local middle school teacher, has initiated student water monitoring exercises for Black Lake and is monitoring four areas at specific intervals as requested by the Black Lake Steering Committee. Ms. Kelly and her students attended a City Council meeting on May 24, 2010 to report their initial findings. They reported on temperature, Ph, turbidity, and levels of nitrate, phosphate, and dissolved oxygen. Ms. Kelly is in the process of procuring test materials for presence of E. coli. Additional educational opportunities are planned such as an information and fundraising booth at the summer Saturday market in Ilwaco

This IAVMP is a result of the work of a dedicated group of people comprised of local citizens and the City of Ilwaco. Many thanks go to all who have contributed volunteer time for all aspects of the process. This includes hours on, in, and around the lake visually surveying aquatic plants, monitoring water quality, researching and demonstrating weed control methods, attending meetings, "spreading the word" and asking questions and getting answers. We could not have accomplished this without all of your support!

LAKE HISTORY

Black Lake has a long history dating back to 1805, when it was first documented by the Lewis and Clark expedition. Black Lake was named for the black appearance of the lake, but at times it was called Johnson Lake or Whealdon's Pond, after the previous landowners. After 1888, the Ilwaco Railway and Navigation Company operated a narrow gauge railway line which included a stop at Black Lake. A cranberry warehouse adjacent to the railway was built at the lake in 1915. B.A. Seaborg built a sawmill on the lake, where he cut boards to make crates to pack the salmon he canned at the Aberdeen Packing Company on Main Street in Ilwaco. The railway, warehouse, and sawmill are no longer present at Black Lake.

Water had been supplied to the town of Ilwaco from Black Lake since the early 1900's. Water treatment was introduced to the system in 1942. Black Lake was replaced as a source by Indian Creek, but is still retained as an emergency water supply. In 1903, the City of Ilwaco granted Black Lake water rights to local cranberry farmers for the purpose of routine seasonal irrigation of cranberry bogs.

Community involvement with the aquatic weed situation in Black Lake first occurred in the early 1990's, when the weed problem was noted and concerned citizens joined together to do something about it. The City of Ilwaco began to explore management options to control the vegetation in the lake, and settled on the introduction of sterile, triploid grass carp. The Washington State Department of Fish and Wildlife performed a lake survey in 1997, prior to the introduction of grass carp as a solution to the Brazilian elodea crowding the lake. The purpose of this survey was to document baseline conditions present within the lake with regards to the fish species. Through a permit with the WDFW, 150 grass carp measuring 9" to 10" in length were introduced in the lake in 1997, at a density of 4.5 fish per acre.

No follow up studies were completed to document the success of the grass carp introduction, but it is largely believed that the introduction effort was unsuccessful. Many residents believe that the outfall in the north of the lake failed, causing the grass carp to exit the lake through Tarlatt Slough.

In 2008, the City of Ilwaco was awarded a grant by the Washington State Department of Ecology Aquatic Weeds Management Fund to develop an IAVMP for Black Lake. The Black Lake Steering Committee was formed from a diverse base of concerned community members, and the Committee issued a Request for Proposals for assistance with conducting an aquatic plant survey and writing the IAVMP with the Committee. It is the goal of the Committee and the City of Ilwaco to develop a successful plan that can be implemented in 2011 to control the non-native aquatic vegetation within the lake.

Problem Statement

Black Lake is located on Highway 101 within the city of Ilwaco, Washington, in Pacific County. Black Lake is within the Long Beach sub-basin of the Willapa Bay Watershed and comprises approximately 33 acres. The lake drains into Tarlatt Slough and eventually enters the Willapa Bay. Black Lake has been a popular recreation site in the past. Fishing opportunities, a youth fishing derby, kayaking and birding are a few of the activities enjoyed by visitors to Black Lake.

Black Lake is infested by invasive aquatic weeds, with Brazilian elodea *(Egeria densa)* the dominant plant species in the lake. Because of the infestation of Brazilian elodea, the native biodiversity of the lake has been disrupted, recreational use has decreased, and the region has suffered economically.

Biodiversity Impacts

The Brazilian elodea forms dense stands out to 14 feet in depth, and few other native species have an ability to grow within the lake. The plant has crowded out almost all native plants, creating a monoculture lacking in biodiversity. Additionally, the plant is a threat to adjoining ecosystems, as it has spread to other lakes and ponds.

Recreational Impacts

Opportunities to use Black Lake have been restricted and use has declined since the infestation. Recreational issues include:

- Swimmers may become entangled in the weed.
- Fishing and boating is challenging due to the difficulty of maneuvering watercraft through the Brazilian elodea.
- Participation in the Black Lake Fishing Derby has decreased dramatically in recent years.

Economic Impacts

Negative impacts have also been felt by the community economically due to the weed infestation.

- Sixteen local cranberry farmers have established water rights, granted by the City of Ilwaco in 1903, which they use on a yearly basis from March through October for agricultural production. For years, weed fragments have traveled through the outfall into Tarlatt Slough and infested ditches of neighboring cranberry farms. Ditch maintenance can cost cranberry farmers up to $5000 per year. To treat an infested pond would be a huge expense.
- Foot valves on cranberry farm irrigation systems become clogged with the weed and continuous maintenance is required at a least cost of $500 per year.
- The proposed Black Lake outfall replacement cost of $15,000 will support grass carp.

Management Goals

The main management goal is to control noxious weeds in Black Lake in a sustainable way, while improving recreational use of the lake and re-establishing native plant communities. Specific management goals for Black Lake established by the Black Lake Steering Committee include:

- To improve the native habitat of the lake by eliminating or significantly reducing the levels of Brazilian elodea or other non-native species
- To establish a maintenance plan that will effectively control invasive species while managing the ecological balance of the lake ecosystem
- To prevent re-infestation by increasing public awareness
- To decrease the spread of Brazilian elodea to other water bodies, including local cranberry farms, ponds and ditches
- To assess, design, and rebuild the outfall of Black Lake
- To enhance educational and recreational use of the lake and surrounding area
- To improve safety for users of the lake

Community Involvement

Community Commitment

The community surrounding Black Lake has long been committed to improving the health and recreational quality of the lake. Black Lake is in a unique position, as it is surrounded by only a handful of landowners yet it has broad community use. Many local citizens use the trails around Black Lake. It plays host to a popular youth fishing derby, and the lake's proximity to both the high school and Highway 101 insure that its shores are a popular spot offering both educational and recreational opportunities.

The community has long been concerned with the aquatic weed problem in Black Lake, although the Black Lake Steering Committee has only recently been formed to develop this plan and find a solution to the aquatic weed infestations plaguing the lake's waters. Since Black Lake does not have many residents along the shoreline, the lake does not benefit from having a lake management district as some other lakes in the state do. It has fallen to the City of Ilwaco to organize the citizens and pursue monitoring and control efforts. The Black Lake Steering Committee is composed of a diverse group of well informed and concerned lake users from the surrounding community including several City Council members, cranberry farmers, a member of the local chapter of the Lions Club, the president of the Rainland Fly Casters, and a professor from Washington State University. The members of the Committee have shown dedication and tenacity in seeing this project through.

The success of weed control efforts at Black Lake will ultimately depend on providing a funding mechanism for monitoring and continual maintenance of the lake. The lake should be surveyed each year for new infestations, and these infestations should receive a rapid control effort to maintain the weed-free lake.

Steering Committee, Outreach, and Educational Process

Community participation and interest have been key components in the development of the Black Lake IAVMP. Community involvement educates and perpetuates interest about the potential problems caused by infestation of Brazilian elodea and other noxious aquatic weeds. Peninsula residents were encouraged and welcomed to all meetings, both public and planning, throughout the process to garner community support for planning efforts. Meeting agendas, minutes, summaries, public notices and news articles are contained in Appendix A. Early events leading to the completion of the IAVMP were difficult to obtain as the City Clerk spear-heading the project was no longer employed by the city and records were lost. Listed below is a summation of events leading to the completion of the IAVMP:

- December 14, 2007: Letter from DOE confirming Grant funding for development of Integrated Aquatic Vegetation Management Plan (IAVMP).
- 2008: Black Lake Steering committee formed, bids requested for aquatic plant survey of Black Lake.
- 2009: Turnstone Environmental Consultants were selected and conducted an Aquatic Plant Survey in October, City Clerk resigned-requested extension of contract to June 2010, Steering Committee dissolved.
- November 2009: Revitalization of interest in Black Lake restoration. New Black Lake Steering Committee formed. Turnstone Environmental Consultants were asked to provide cost options for additional support for completion of IAVMP. Steering Committee meetings were conducted on 11/4/09 and 11/12/09 for the development and finalization of a problem statement and management goals.
- December 2009: Public meeting held for discussion and formal acceptance of problem statement and management goals. Option 1 with Turnstone Environmental consultants agreed and accepted for additional assistance in creating IAVMP. Chinook Observer (local newspaper) reporter, Kevin Heimbigner present and reporting on meeting. Tim Crose (Pacific County Invasive Species Coordinator) present and expressed interest in re-forming Loomis Lake Committee to eradicate B. elodea. December 14, Melanie Tyler (DOE) met with key committee members regarding paperwork related to the IAVMP grant.
- January 2010: Public meeting held for review and discussion of draft copy of Phase 1 A-H of the IAVMP as presented by Stephanie McDowell from Turnstone Environmental Consultants.
- February 2010: Steering committee meeting with Rick Ereth (Washington State Fish and Wildlife) biologist present to provide information regarding use of grass carp for controlling invasive weeds. Changes and corrections to the draft plan Phase 1 A-H noted

and completed. Research questions regarding control options assigned to various committee members.

- March 2010: Two public meetings held for continuation of discussion and research results of various treatment options. A multi-faceted, conservative approach was agreed upon by committee members and provided to Turnstone Environmental consultants for inclusion in the IAVMP.
- April 2010: A working draft of the IAVMP was presented by Stephanie McDowell (Turnstone Environmental Consultants) during a public meeting. Comments, suggestions and questions were addressed and it was agreed that another public meeting for April 14 would be needed to completely address residual concerns and details.
- May 2010: Draft of final IAVMP submitted to Melanie Tyler for review.
- June 2010: Draft comments received from Department of Ecology. Request for extension of Grant period approved for thorough revision of IAVMP.

PUBLIC COMMENT

The public has actively supported this project and requested information be emailed even when unable to attend meetings personally. The public is eager to see the project underway and discussions are ensuing regarding ways to raise funds in advance, prior to approval of the Grant, to initiate the first application of the herbicide. Black Lake is unique in that there are few opportunities to apply the herbicide as the lake water is used by local cranberry farms for crop irrigation. Many people vocalized that it "would be a shame to have to wait additional months before the herbicide can be used". Although some thoughts were raised that the Audubon society may be concerned about the use of herbicide, objections were not raised. Local chapter Audubon representative, Mary Atherton, attended several meetings about the use of herbicide and when pointedly asked if any of their members expressed concerns when details were provided, the response was "no", they had no objections to the plan. The prior test treatments of barrel contained herbicides by Washington State University Professor, Kim Patten revealed the small treated areas did produce effective results and many people felt comfortable that it "had already been tried and seemed to work." The public was reassured that all the proper permits and steps to provide warnings to the public regarding safety when chemicals are used would be provided prior to application. A binder containing complete data regarding diquat was placed in City Hall for the public to review upon request.

PUBLIC CONSENSUS

The City of Ilwaco and surrounding area residents have voiced support of the IAVMP. To date, there have been no objections and the public has continually been made aware of the meetings via newspaper articles, posted meetings and verbal reports through conversation with Committee members. Given the community's small size, and their dedication and enthusiasm for keeping Black Lake healthy and revitalizing the use of the lake, none of the Steering Committee members anticipate resistance to the proposed project prior to, during, or after implementation. Given the generous donation of manpower, herbicide treatment application, excavator and operator donation, and Committee involvement, in-kind matches are expected

to be met providing a welcome relief to a small town that suffers financial woes as many other cities do in this current economic environment.

CONTINUING COMMUNITY EDUCATION

- The Black Lake Steering Committee will continue to educate the public through written literature (pamphlets and newspaper articles), and maintain proper signage.
- The Steering Committee will remain intact for continuity, with some possible changes in membership.
- There is active discussion of forming an Ilwaco City Parks Commission via a new ordinance to insure completion of this project and provide assistance in developing other city parks.
- Committee members will continue to assist the Loomis Lake Steering Committee in their pursuit to rid Loomis Lake of the B. elodea. Reducing cross-contamination in area lakes will take a cooperative community effort.
- A cleaning station at the east side lake boat launch with a hose, hand pump, and a catchment and drain to encourage the proper cleaning of boats and trailers, has been discussed. The Black Lake Steering Committee may pursue this issue with the Washington State Department of Fish and Wildlife, who have developed pilot programs for lakes with similar issues.
- Outreach to younger members of the community will be insured through an agreement with local junior high classes committed to providing valuable tests to the Committee and interacting with the Black Lake Steering Committee. Their project contributions are outlined under the April summary of community involvement.
- The Lion's club is actively participating to raise funds for present Black Lake needs as well as possible future grass carp purchases, with the intent of asking local school children to participate in the purchase and release process. The Lion's club is dedicated to maintaining a healthy lake environment for access to disabled fishermen, local fishing clubs, and educational opportunities for children.
- A table space at the local Ilwaco Saturday Market will provide information to attendees regarding the B. elodea infestation eradication and prevention. Raffle items will be provided to raise monies and elicit donations for costs incurred for this project.
- We will also conduct yearly aquatic weed surveys each growing season to assess effectiveness of the treatment and control methods. Monitoring will be provided either by professional aquatic plant specialists or by trained volunteers.

WATERSHED AND LAKE CHARACTERISTICS

WATERSHED CHARACTERISTICS

Black Lake's watershed is located in southwest Pacific County, Washington. Black Lake is located on the Long Beach Peninsula and is a part of the Willapa WRIA (WRIA 24).

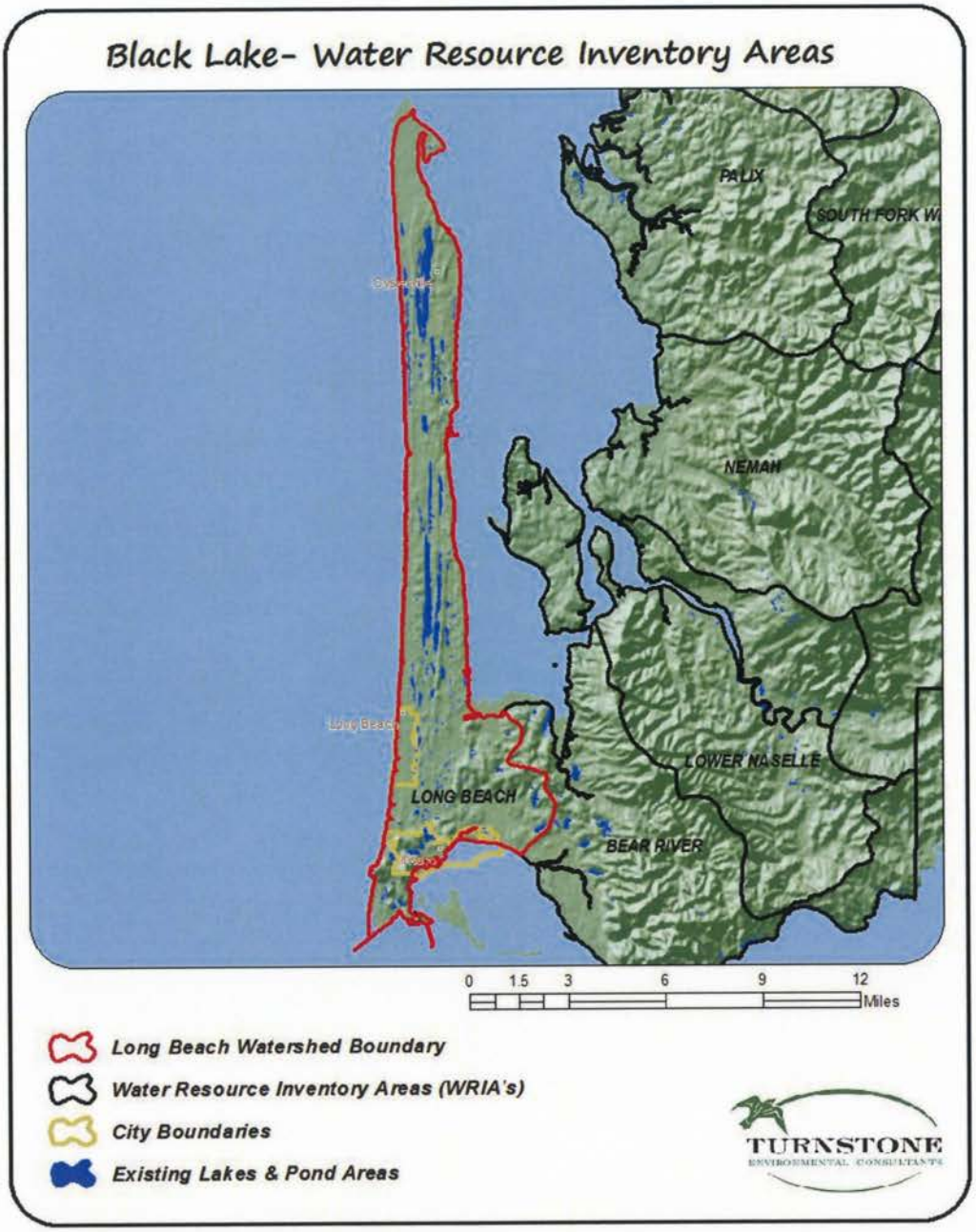

Figure 1. Black Lake Willapa WRIA 24 Map

The Long Beach sub-basin constitutes approximately 32,000 acres of the Willapa Bay watershed, and Black Lake in particular constitutes 32.8 acres of the Long Beach sub-basin. The

region receives a mean annual rainfall of 60 to 90 inches. The Black Lake watershed receives drainage from the steeply sloping areas surrounding the lake on the east, south, and southwest sides. The lake is surrounded to the west, south and east by forested hills. To the north of the lake, the terrain flattens and is occupied by many acres of cranberry farms. Water exits the lake through an outfall in the northern part of the lake which is connected to Tarlatt Slough. Water from Tarlatt Slough eventually enters Willapa Bay approximately 4.2 miles to the north.

Well-sorted fine sand occurs throughout the Willapa Bay watershed, with increasing silt and clay present on the tidal flats near the south end of the bay. Spits and shoals forming inside the bay entrance are a result of a net influx of fine sand into the bay from the eroding cape. Heavy minerals in the soils indicate source areas for the sediment from the Columbia River drainage basin as well as the Willapa Bay drainage basin. Fine sand on the tidal flats east of Long Beach Peninsula is a relic of the growth of the spit.

According to the Soil Survey for the Pacific County Area, Washington, the soils in the Long Beach watershed are composed of several major soil series. The primary soils are Palix silt loam in both 8 to 30 percent and 30 to 65 percent slopes, and Lebam silt loam (6 to 30 percent slopes). The well-drained Palix and Lebam series soils are derived from weathered siltstone and sandstone, respectively, and are located in the forested hills to the southwest and east of Black Lake.

Three soil types in the Long Beach watershed are derived from organic materials: Seastrand mucky peat, Seastrand variant muck, and Orcas peat. The poorly drained Seastrand and Orcas soils are located in the low-lying areas to the north and northwest of Black Lake. The City of Ilwaco, to the south, rests on moderately well drained Udorthents, which are derived from dredgings from the Columbia River.

Lake Characteristics

Black Lake is a shallow, L-shaped body of water, fed by precipitation and groundwater. Surface water flows out a drainage channel at the north end, through Tarlatt Slough, eventually discharging into Willapa Bay. The lake has a mean depth of 13.1 feet and a maximum depth of 32.1 feet (Figure 2). There are no surface inflows to Black Lake, with outflow into Tarlatt Slough occurring year round.

There is a significant amount of shoreline which is undeveloped at Black Lake. This limits the non-point source pollution that could enter the lake. There are two near-shore houses around Black Lake. One is located at the foot of the hills in the southwest corner of the lake. The second home is situated at the north end of the lake close to the outfall. The near-shore homes are hooked up to the city sewer.

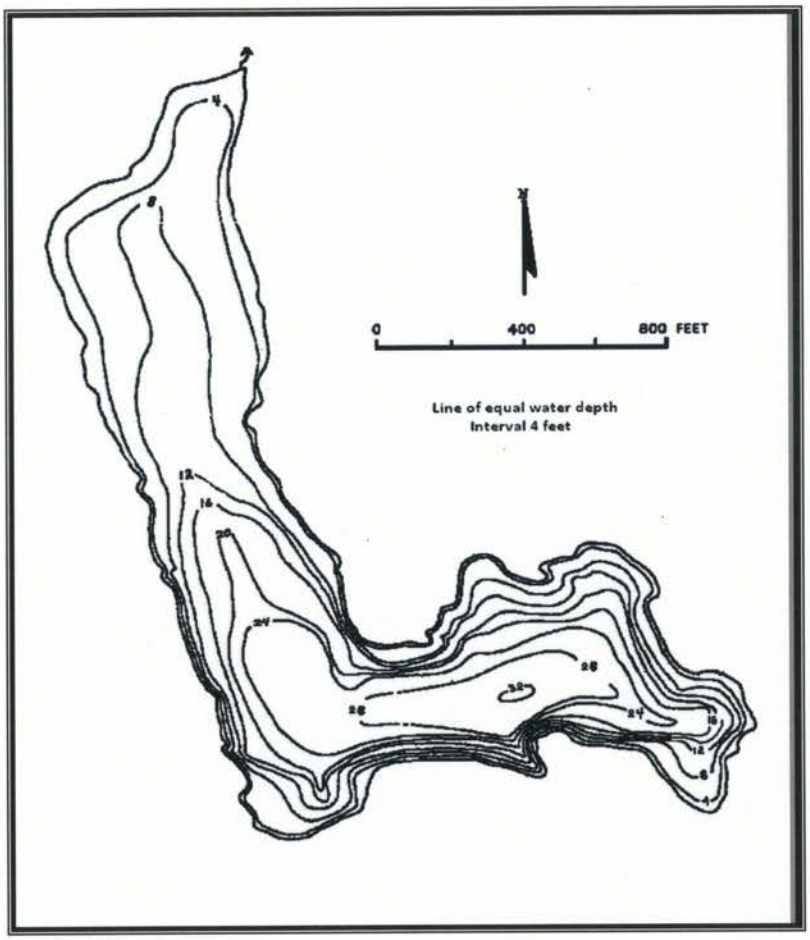

Figure 2. Bathymetric Map Black Lake, maximum depth of over 32 feet.

Provo Park, on the southwest shore of Black Lake, was once a state park and is now owned by the City of Ilwaco. The park occupies approximately 1.25 acres with surrounding city-owned property that could be used for expansion of running/biking trails and picnic areas.

Highway 101 is immediately adjacent to the lake to the west, running parallel to the former Ilwaco Railway. Runoff from the highway is filtered through bio-swales. A cranberry farm located along the north shore of the lake routinely draws water for irrigation and harvest purposes from March through October via a pump system. The water then runs through Tarlatt Slough to fifteen additional cranberry farms further from the lake. No motorboats are permitted on the lake.

Incoming water from the eastern shore of the lake is filtered through native vegetation that borders the lake. South of the lake, the local high school with a large football field, is within approximately 400 feet of the lake. Water from the lake is used periodically to water the high school football field and fertilizers are applied to the football field in the spring.

WATER QUALITY

In 1975, water quality was monitored at Black Lake by the USGS and recorded in the national Water Information System (NWIS). The Washington Department of Fish and Wildlife took water quality measurements during midday at three locations in August, 1997. Water samples were collected at varying depths in the 1997 study, giving a range of values for the mid and southeast sample collection locations (Table 1).

Table 1. Water Quality Measurements Black Lake 1975 and 1997

Year (location)	Temp (C)	pH	Nitrate & Nitrite (mg/L)	Chloride (mg/L)	Dissolved Oxygen	Iron (ug/L)	Coliform (col/100mL)
1975 (unknown)	18.6	6.6	0.01	25.0	--	120	<1
1997 (north)	19.6	7.5	--	--	7.35	--	--
1997 (mid)	22.2 to 19.74	6.9 to 6.8	--	--	7.44 to 3.99	--	--
1997 (southeast)	21.63 to 14.85	6.7 to 6.3	--	--	6.60 to 0.85	--	--

Temperature and dissolved oxygen levels were greatest near the surface of the water. In the southeast portion of the lake at a depth of approximately 16 feet, the dissolved oxygen content reached nearly zero (0.85) in the 1997 sampling effort.

Fish, Plant and Wildlife Communities

Fish Community

Black Lake and its surrounding habitats support a variety of fish, birds, and mammals by providing nesting, foraging, and cover. Black Lake is open for part of the year to recreational angling. A kids-only fishing derby takes place each April at the lake. Black Lake's fishing regulations fall under the General Statewide Regulations for limits and size restrictions set by the Washington Department of Fish and Wildlife (WDFW). In the summer of 1997, the WDFW evaluated the fish community at Black lake. At that time the lake was dominated by largemouth bass *(Micropterus salmoides)* and yellow perch *(Perca flavescens).* Largemouth bass accounted for 65 percent by weight of the catch during the study; whereas, yellow perch accounted for 76 percent of the catch by number. Other species documented include: black crappie *(Poxoxis nigromaculatus)* with seven percent of the catch in biomass and abundance, brown bullhead *(Ameiurus nebulosus)* and bluegill *(Lepomis macrochirus)* with less than two percent. In addition, the City of Ilwaco plants rainbow trout (*Oncorhynchus mykiss*) each year to enhance fishing prospects for the annual Children's Black Lake Fishing Derby.

Bird Community

The Willapa Bay National Wildlife Refuge, located approximately 6 miles to the northeast, has identified over 200 bird species that use Willapa Bay, the Long Beach Peninsula and the Columbia River, west of the Astoria-Megler Bridge (Appendix B). While many of the birds contained in Appendix B do not frequent Black Lake specifically, several others have been observed in the area. Birds observed by local citizens and members of the Black Lake Steering Committee include: cormorant, geese, robins, sparrows, black birds, crows, swans and owls. The Washington Department of Fish and Wildlife "Species of Concern" observed at Black Lake include: the great blue heron *(Ardea Herodias)*"watch" list, the osprey (*Pandion Haliaetus*) "state monitored", the marbled murrelet *(Brachyramphus marmoratus)* Federal threatened/State threatened, and the bald eagle *(Haliaeetus leucocephalus)* Federal species of concern/State sensitive. The Washington Audubon organization publishes a "Birding Trail map" which identifies Black Lake as site number 20 and lists the golden-crowned Kinglet (*Regulus setrapa*), chestnut-backed chickadee (*Poecile rufescens*), red crossbill (*Loxia curvirosta*), and western gull (*Larus occidentalis*) as commonly observed at Black Lake.

Amphibian and Reptile Community

The high quality forest and lowland plant communities surrounding the lake provide good breeding habitat for a diverse assemblage of lowland amphibian species. Amphibian and reptile species have not been formally documented at the lake, but on-site observations include: the rough-skinned newt (*Taricha granulose*), the Pacific chorus frog *(Pseudacris regilla),* the northern red-legged frog *(Rana aurora),* and the garter snake *(Thamnophis sirtalis).*

Mammal Community

Mammal species supported by the adjacent forest and observed by local citizens and committee members includes: coyote (*Canis Latrans*), chipmunk (*Tamias*), Douglas squirrel *(Tamiasciurus douglasii),* porcupine (*Erethizon dorsatum)*, raccoon (*Procyon*), skunk (*Mephitis*), cougar (*Puma concolor)*, river otter (*Lontra canadensis),* black bear *(Ursus americanus),* Columbian black-tailed deer *(Odocoileus hemionus columbianus),* and beaver *(Castor canadensis).* None of the above mammal species appear on the Department of Fish and Wildlife "Species of Concern" list.

Plant and Vegetation Community

The forested areas in the Long Beach watershed are comprised of a Sitka spruce *(Picea sitchensis)*, Douglas fir *(Psuedotsuga menzesii)*, and western hemlock *(Tsuga heterophylla)* overstory. The understory in the forested areas is predominately salal *(Gaultheria shallon)* and sword fern *(Polysticum munitum)*.

The Washington State Department of Fish and Wildlife lists priority habitats for Black Lake as "freshwater wetlands and deep freshwater as well as surrounding riparian forests". The lush forest and lowland areas provide an excellent growing medium for a large variety of plants. The Washington Department of Natural Resources (WDNR) web-based "Rare Plant List" for Pacific County was reviewed and four species based on habitat, range and location markers on "known distribution" maps per species were identified as possible inhabitants of the Black Lake area. The species names are: bog club moss (Lycopodiella inundata) State "sensitive, vulnerable, or declining", loose-flowered bluegrass (Poa laxiflora Buckley) State "sensitive, vulnerable or declining", pink fawn-lily (Erythronium revolutum) State "sensitive, vulnerable or declining", and queen of the forest (Filipendula occidentalis) State "threatened" and Federal "species of concern". These species have not been observed by committee members who frequent Black Lake trails, but may exist in adjacent areas of the forest. Herbicide applications applied directly to Black Lake water and hand pulling or suction dredging activities should not directly affect any of the above listed species should they exist in remote areas of the forest. A detailed report specific to Black Lake and adjoining land can be obtained from the Washington Department of Natural Resources prior to herbicide application.

Beneficial and Recreational Uses

Black Lake and its surroundings support a variety of beneficial uses to humans. Recreational activities include fishing, boating (no combustion motors), bird watching, wildlife viewing, kayaking, rowing, and hiking (Figure 3). Residents access the lake for these activities from Provo Park and the road leading to the public boat launch facility. There is a swimming area with a grassy beach as well as a covered picnic area with restrooms located on the south end of Black Lake.

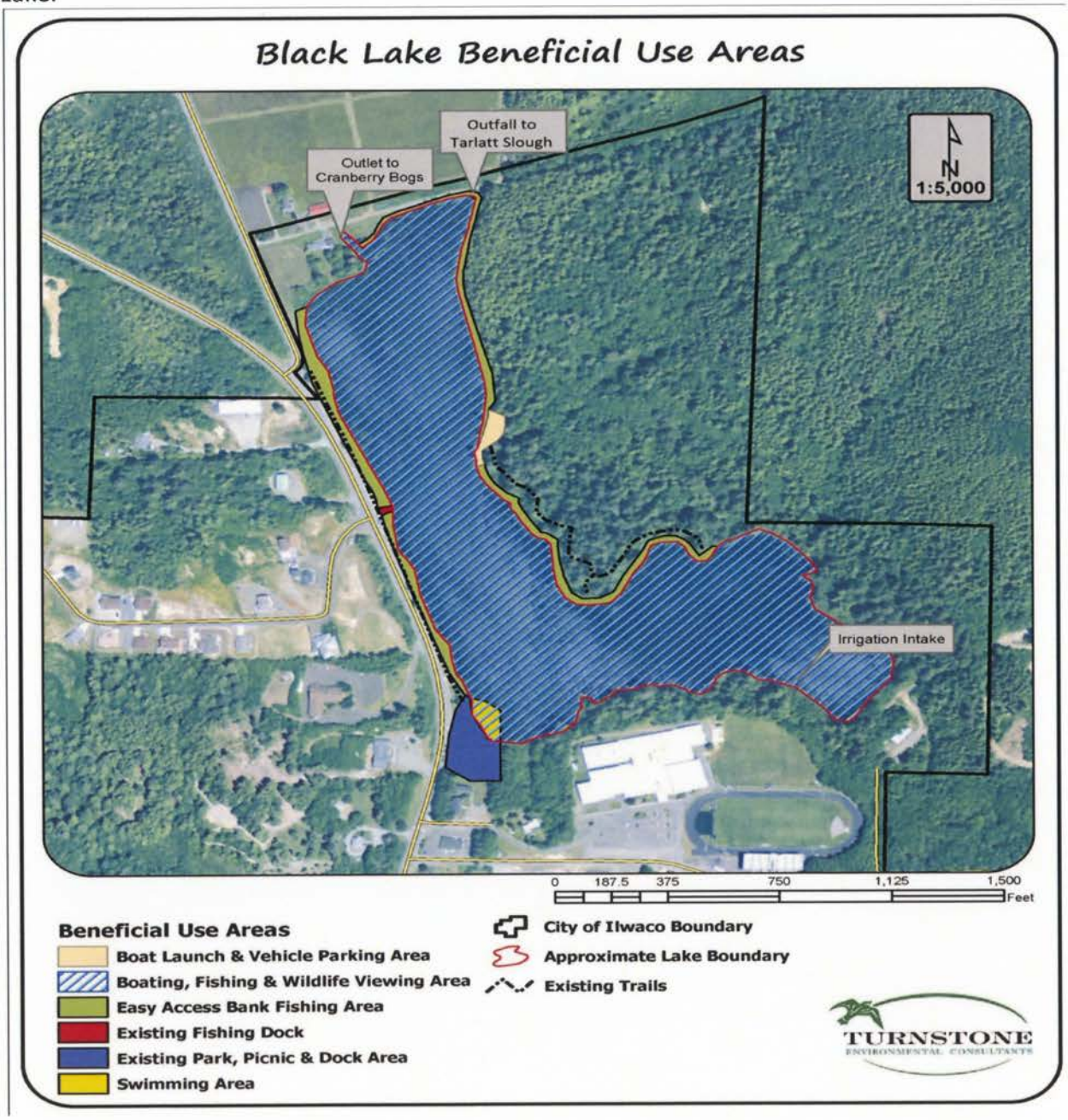

Figure 3. Beneficial Use Area Map of Black Lake. Includes fishing, hiking, and bird watching.

AQUATIC SURVEY RESULTS

CHARACTERIZATION OF AQUATIC PLANTS IN BLACK LAKE

A Black Lake Aquatic Plant Survey was completed by Turnstone Environmental Consultants in October, 2009. A copy of the summary report is contained in Appendix C.

The most dominant plant species in Black Lake is by far Brazilian elodea *(Egeria densa),* which is an invasive aquatic weed native to parts of South America. The plant occupies nearly the entirety of the littoral zone of the lake, and in some of the more shallow areas has achieved such high biomass that maneuvering small watercraft in the lake is impossible (Figure 4). Brazilian elodea dominates the lake from the emergent vegetation zone (1-2' in depth) to about 14' in depth, beginning to lose density at about 11' as light availability becomes reduced. There are only a few small pockets remaining within Black Lake that contain plant species other than Brazilian elodea. The species forms dense mats within the water column.

While Brazilian elodea is present throughout the lake, the species seems to attain its highest density in the shallow northern end of the lake. The plant grows to the surface throughout the littoral zone, with the exception of one area adjacent to the culvert to Tarlatt Slough where native species are still present.

Through the diver and surface inventories and the rake toss sampling, four distinct plant communities were mapped within the aquatic and emergent vegetation zones of Black Lake: Brazilian elodea dominant, Bladderwort dominant, Brazilian elodea/yellow pond lily co-dominant, and Brazilian elodea/cat-tail co-dominant. Descriptions of the four plant communities follow below.

Brazilian elodea *(Egeria densa)* dominant

In this plant community, Brazilian elodea is the dominant species of macrophyte present within the water column. In most areas within this community, no other plant species are present besides the Brazilian elodea, but some areas do contain small amounts of native species, particularly bladderwort (*Utricularia vulgaris).* Brazilian elodea is an extremely aggressive aquatic weed that has changed the species composition of Black Lake.

Bladderwort *(Utricularia vulgaris)* dominant

This is a small plant community located along the north shore of the lake that is dominated by native vegetation, with bladderwort *(Utricularia vulgaris)* the dominant species. Bladderwort is a common species found in ponds and slow-moving streams, and can be identified by its small bladder-like traps and delicate, finely-divided underwater leaves (Cooke, 1997). Bladderwort achieves up to 75% cover in this community. Other native plants in this community include muskgrass *(Chara sp.),* and yellow pond lily (*Nuphar polysepalum).* Small amounts of Brazilian elodea were found within this community, but at low densities.

Brazilian elodea/yellow pond lily *(Egeria densa/Nuphar polysepalum)* co-dominant

Brazilian elodea is abundant within this plant community with yellow pond lily *(Nuphar polysepalum)* present as a co-dominant. The yellow pond lily is able to occupy a different portion of the water column, its leaves and flowers floating on the surface of the water above the Brazilian elodea. The presence of the yellow pond lily provides additional structure in the plant community, and shelter and food for fish and wildlife.

Brazilian elodea/cat-tail *(Egeria densa/Typha latifolia)* co-dominant

This community occurs in one small area of the lake where the common cat-tail *(Typha latifolia)* has established itself within the emergent plant zone along with the Brazilian elodea, at water depths of up to 2'. This community also contains other species of emergent vegetation closer to the shore, including slough sedge *(Carex obnupta),* reed canary grass *(Phalaris arundinacea),* and soft rush *(Juncus effusus).*

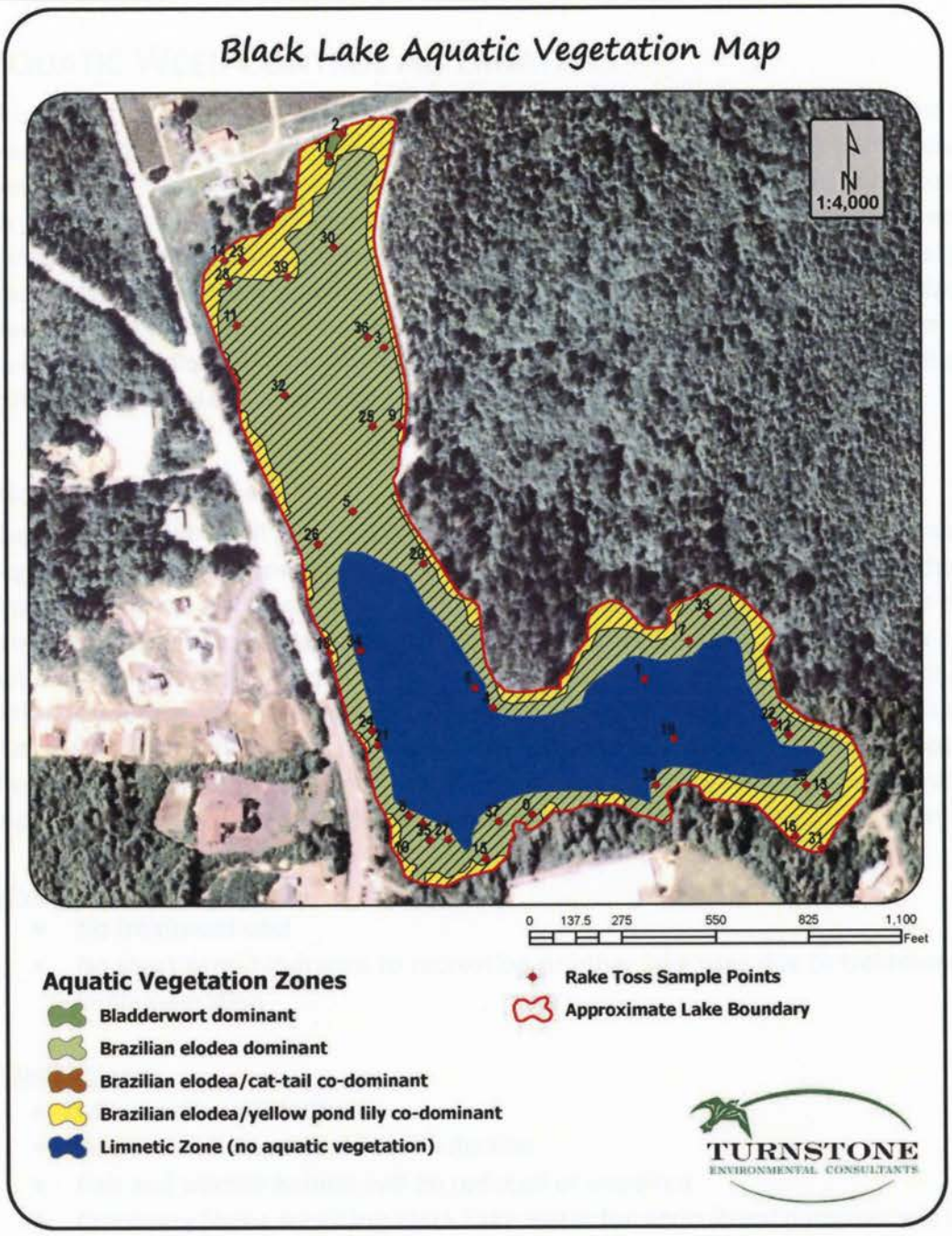

Figure 4. Aquatic Vegetation Map of Black Lake.

AQUATIC HERBICIDES ALTERNATIVE

Aquatic herbicides are chemicals specifically formulated for use in water to kill or control aquatic plants. Herbicides approved for aquatic use by the United States Environmental Protection Agency (EPA) have been reviewed and are considered compatible with the aquatic environment when used according to label directions. However, the State of Washington imposes additional constraints on their use.

Aquatic herbicides are sprayed directly onto floating or emergent aquatic plants or are applied to the water in either a liquid or pellet form. Systemic herbicides are capable of killing the entire plant. Contact herbicides cause the parts of the plant in contact with the herbicide to die back, leaving the roots alive and able to re-grow. Non-selective, broad spectrum herbicides will generally affect all plants that they come in contact with. Selective herbicides will affect only some plants. Often dicots, broad leafed plants like Eurasian watermilfoil (*Myriophyllum spicatum*), will be affected by selective herbicides whereas; monocots like Brazilian elodea (*Egeria densa*) may not be affected. Most aquatic plants are monocots.

Because of environmental risks from improper application, aquatic herbicide application in Washington state waters is regulated and has the following restrictions:

- Applicators must be licensed by the Washington State Department of Agriculture
- Applicants must obtain coverage under a discharge permit called a National Pollutant Elimination System Discharge (NPDES) permit before they can legally apply aquatic herbicides to the waters of the state
- Ecology requires notification and posting before treatment. There are additional mitigation measures required to protect rare plants or threatened and endangered species.

Ecology issued a "lake" NPDES general permit March 1, 2006 to cover the management of in-lake noxious weeds and native aquatic plants and algae. The Washington Department of Agriculture also has a general NPDES permit for the management of noxious weeds growing in wet areas such as freshwater wetlands, rivers, and estuaries. In-lake projects must obtain coverage under Ecology's Aquatic Plant and Algae Management NPDES permit before applying herbicides.

Black Lake is unique in that its water is used for a human-consumed food crop, cranberries. In 1903, the City of Ilwaco granted priority water rights to local cranberry farmers. CranMac Farm, located directly adjacent to Black Lake, pumps water on a yearly basis from approximately March through October. The water is used for irrigation, frost protection and harvesting. CranMac Farm, in turn, directs the pumped water to fifteen other cranberry farms further located from Black Lake so they may use the water for the same purposes. Use of aquatic herbicides is limited to the off-season when the lake water is not being utilized by the cranberry

farmers. This restricts the use of herbicides to one that is safe to use with food crops and has efficacy in winter months when treatment can be applied.

Pacific County Noxious Weed specialist, Tim Crose, and Kim Patten, Washington State University licensed aquatic herbicide applicator, recommended diquat as the most effective and appropriate herbicide for elimination of B. elodea in Black Lake. Their recommendation is based on a 2008 herbicide research study conducted in Black Lake for the control of B. elodea. A general summary of results is provided in Table 2.

Table 2: Summary of Results Herbicide Trials Black Lake 2008, provided by Kim Patten, Washington State University licensed aquatic herbicide applicator

Herbicide	Efficacy	Comments
Clearcast™	Moderate	Inadequate efficacy to warrant use, labeled in WA but not on NDPES, can be used with irrigation but only in low concentrations
Sonar® (Fluridone)	Good in summer, poor in winter	Cannot be used if water is used for irrigation, OK in winter, but too cold of temperature at that time for efficacy
Diquat	Good in summer or winter	Cannot be used if water is used for irrigation of food crops unless a maximum of 5 days of non-irrigation is observed following application
Others	Poor to good	Not available for use in Washington Lakes

Diquat

Diquat is a fast acting, broad spectrum contact herbicide and algaecide found in the product Reward® which is manufactured by Syngenta. Typically diquat is used primarily for short term (one season) control of a variety of submersed aquatic plants. It is very fast-acting and is suitable for spot treatment. However, turbid water or dense algal blooms can interfere with its effectiveness. Diquat was allowed for use in Washington in 2003, and Ecology collected information about its efficacy against Brazilian elodea in 2003. A littoral zone treatment in Battle Ground Lake in Clark County, Washington in 2003 resulted in nearly complete removal of Brazilian elodea in that water body. The diquat label states "Treatment of dense weed areas may result in oxygen loss from decomposition of dead weeds. This loss of oxygen may cause fish suffocation". Therefore, "treat only one-half to one third of the water body area one time and wait 14 days between treatments". In addition, application instructions indicate the herbicide is most effective during the spring or summer months when the plants are actively growing and the water is 50 degrees or warmer. The diquat instructions indicate food crop irrigation can resume after a maximum waiting period of five days after application. It is not feasible to treat during the most "effective time" of early spring through summer as the cranberry farmers use the water on a daily basis. There are times when natural rainfall provides

the needed water for farming, but local area weather is too inconsistent and unpredictable to reliably select a 6 day period for application without need for irrigation water.

Advantages

- Effective against many plant species
- Rapid action
- No fishing or swimming restriction
- Inexpensive
- Can be used year-round
- Short-lived

Disadvantages

- Water use restrictions in place
- Persistent, especially in sediments
- Potentially toxic to aquatic organisms
- Repeat applications may be needed

Costs for Diquat Application

- $4,000 per treatment (estimate based on a pro rated bulk purchase of diquat from WSU) possibility of two treatments in two year span
- $397 herbicide application permit (valid for two year period)
- Application costs minimal to none. Tim Crose (Pacific County Noxious Weed Specialist) and Kim Patten (Washington State University licensed aquatic herbicide applicator) to provide application of herbicide and equipment to disperse herbicide on pro bono basis

Appropriateness for Black Lake

Diquat is the most appropriate herbicide treatment for elimination of B. elodea in Black Lake. Diquat is: relatively low in cost, short lived, applied and effective in winter-fall months when Black Lake water is not being utilized by local cranberry farms, effective for eliminating B. elodea and has been barrel tested for efficacy during a Black Lake research study producing effective results. The "L" shape of Black Lake, with predominance of B. elodea located on the north leg of the lake, provides an opportunity to concentrate the first treatment to affect approximately one-third to one-half of the entire water body as recommended by label instructions. The process of treating one portion of the lake decreases the likelihood of deoxygenating the water which can harm or kill aquatic life. Black Lake will need to be closely monitored to assess effectiveness of treatment. An additional application of diquat may be required the following year if B. elodea persists and if additional removal and preventative measures have failed. Diquat spot treatments will also be considered in years three and four if diver surveys reveal areas of dense infestation that are too large for diver suction dredging.

WATER LEVEL DRAWDOWN ALTERNATIVE

Water level drawdown can have a dramatic impact on the reduction or elimination of some aquatic weeds. Water level drawdown in the winter exposes the weed to freezing which can be fatal to the plant. Drawdown in summer months can expose the plants to warmer temperatures and can kill some aquatic plants. If the drawdown does not occur on a regular basis, plants will re-colonize and reestablish in previously established areas. Water level drawdown, while effective against elimination of many weeds, also places species such as frogs, turtles and invertebrates as well as native aquatic plants in jeopardy.

Advantages

- With water control structure in place, drawdown can be cost effective in controlling invasive aquatic weeds such as B. elodea
- Following drawdown, native aquatic plants can extend in areas formally occupied by invasive species
- Game fish reportedly experience enhanced populations after drawdown
- Loose, flocculent sediments can become consolidated after drawdown
- Lower water levels following drawdown provides opportunities to repair or replace docks and other marine structures

Disadvantages

- A water level control structure must be in place to be cost effective
- Other aquatic plants may experience enhanced growth following drawdown, including other invasive species
- Unpredictable winter weather may influence the success or failure of killing exposed plants
- With drawdown, it may not be possible to launch boats from docks and the lake may not be visually appealing
- Fish and aquatic wildlife may be negatively impacted by the drawdown when sediment is exposed
- Algal blooms have been reported following drawdown
- Water levels in wells may be significantly reduced during drawdown

Appropriateness for Black Lake

Sixteen local cranberry farms have established water rights (1903) for purposes of cranberry food crop irrigation. Drawdown would violate water rights and negatively impact growth production as the farms would not have sufficient water to irrigate crops. Black Lake has some drawdown in spring, summer, and fall when water is used for cranberry frost protection, irrigation, and harvest with little effect on Brazilian elodea reduction. The current culvert, outfall, and weir is not capable of controlling drawdown. System upgrades would cost approximately $15,000 (see Appendix D for proposed outfall modifications). The City of Ilwaco is suffering economically and does not have funding to upgrade the existing structure. Funding would be provided through donations of labor, equipment and materials.

HAND PULLING ALTERNATIVE

Hand removal of submerged vegetation via digging or pulling is labor-intensive. Hand pulling is useful as a maintenance tool when the infestation is minimal and/or when small scale management is an option. The entire plant must be removed, collected in a storage bag, and transported to shore for proper disposal. Water depth greater than three feet typically requires the use of SCUBA divers.

The cost and management effectiveness of plant removal depends on: availability of trained volunteers, water clarity, sediment type, plant species, and removal of entire plant, retention of plant fragments and density of vegetation removal. When herbicide treatments are applied to eliminate the bulk of an invasive weed, divers can do periodic inspections to determine effectiveness of the treatment and at the same time carefully hand pull any viable remaining plants.

Advantages

- Species specific
- Site specific
- Minimum impact on native plants
- Use near obstructions
- Immediate plant removal

Disadvantages

- Water visibility may restrict effectiveness
- Can be costly
- Slow, labor intensive
- Fragments may be generated
- Short-term increase in turbidity

Costs of Hand Pulling

- No cost if performed by trained volunteers
- $800-$1,600 per day for two divers with a support boat and operator
- Typical coverage ranges from 400 to 2,000 square feet per day

Appropriateness for Black Lake

Professional diver hand pulling to remove B. elodea for Black Lake would be cost prohibitive and labor intensive given the current amount of infestation. Trained volunteers could be useful around the parameter of the lake; however, the sediment bed close to the shore reportedly ranges from one to five feet deep creating a potential safety hazard. Visibility is also a concern and may significantly increase labor time. Hand pulling is not an effective control method while B. elodea is widespread in the lake but may be useful as the weed mass is reduced. Divers employed to survey the lake for effectiveness of weed control can also use the opportunity to hand pull in some areas and is therefore included in the plan.

Diver Dredging Alternative

Diver dredging (suction dredging) is a method whereby SCUBA divers use hoses attached to small dredges (often dredges used by miners for mining gold from streams) to suck plant material from the sediment. The purpose of diver dredging is to remove all parts of the plant including the roots. A good operator can accurately remove target plants, like Brazilian elodea, while leaving native species untouched. The suction hose pumps the plant material and the sediments to the surface where they are deposited into a screened basket. The water and sediment are returned back to the water column (if the permit allows this) and the plant material is retained. Turbid water is generally reduced by trained divers, as the divers pull plants from the sediment and direct the plant into the suction intake. Turbid water can be discharged to an area curtained off from the rest of the lake by a silt curtain, however, placement of sediment curtains is time consuming and costly. The plants are disposed of on shore. Removal rates vary from approximately 0.25 acres per day to one acre per day depending on plant density, sediment type, and diver efficiency. Diver dredging is more effective where softer sediment allows easy removal of the entire plant, although water turbidity is increased with softer sediments. Harder sediment may require the use of a knife or tool to help loosen sediment from around the roots. In very hard sediments, B. elodea plants tend to break off leaving the roots behind and defeating the purpose of diver dredging.

Advantages

- Diver dredging provides site-specific and species selective control
- Divers can remove plants around docks and in other difficult to reach areas
- Diver dredging can be used in situations where herbicide use is not an option for aquatic plant management
- Use of suction results in reduced release of plant fragments
- Effective in large areas with light plant growth

Disadvantages

- Labor intensive and costly
- Dredging stirs up sediments. This may lead to the release of nutrients or long-buried toxic materials into the water column
- The tops of plants growing in rocky or hard sediments may be removed, leaving a viable root crown behind to initiate growth
- Not appropriate for large, densely infested areas
- Entire plant removal difficult in rocky/gravel areas
- Potential short-term increased turbidity

Costs of Diver Dredging

- $1,000 to $2,000 a day for two divers and support boat. With $10,000 per year, two divers can provide five days of suction dredging, covering .25 to 1.0 acres per day.
- Typical coverage areas range from .25 to 1.0 acres per day.

Appropriateness for Black Lake

Diver dredging (suction dredging) is appropriate for Black Lake and is included in the IAVMP. The soft sediment in Black Lake is conducive to plant removal by diver dredging. Diver dredging will be most effective following herbicide treatment when plant density is reduced. Diver dredging can be used during yearly surveys of the lake for identification and location of new infestations, effectiveness of herbicide applications and clean up of residual existing invasive plants.

Bottom Screens or Benthic Barriers Alternative

A bottom screen or benthic barrier covers the sediment like a blanket, compressing aquatic plants while reducing or blocking light. Materials such as burlap, plastics, perforated black Mylar, and woven synthetics can all be used as bottom screens. Some people report success using pond liner materials. There is also a commercial bottom screen fabric called Texel™, a heavy, felt-like polyester material which is specifically designed for aquatic plant control and a product called the noWEEDmat™ which is sold by a Canadian firm.

An ideal bottom screen should be durable, heavier than water, reduce or block light, prevent plants from growing into and under the fabric, be easy to install and maintain, and should readily allow gases produced by rotting weeds to escape without "ballooning" the fabric upwards. Even the most porous materials, such as window screen, will billow due to gas buildup. Therefore, it is very important to anchor the bottom barrier securely to the bottom. Unsecured screens can create navigation hazards and are dangerous to swimmers. Anchors must be effective in keeping the material down and must be regularly checked. Natural materials such as rocks or sandbags are preferred as anchors.

The duration of weed control depends on the rate that weeds can grow through or on top of the bottom screen, the rate that new sediment is deposited on the barrier, and the durability and longevity of the material. For example, burlap may rot within two years; plants can grow through window screening material, and can grow on top of felt-like Texel™ fabric. Regular maintenance is essential and can extend the life of most bottom barriers.

In addition to controlling nuisance weeds around docks and in swimming beaches, bottom screening has become an important tool to help eradicate and contain early infestations of noxious weeds such as Eurasian watermilfoil and Brazilian elodea. Pioneering colonies that are too extensive to be hand pulled can sometimes be covered with bottom screening material. Divers should recheck the screen within a few weeks to make sure that all elodea plants remain covered and that no new fragments have taken root nearby.

<u>Advantages</u>

- Not toxic
- Installation of a bottom screen creates an immediate open area of water
- Bottom screens are easily installed around docks and in swimming areas
- Properly installed bottom screens can control up to 100 percent of aquatic plants
- Screen materials are readily available and can be installed by divers
- Barriers can be moved, removed, cleaned and used in other water bodies

<u>Disadvantages</u>

- Because bottom screens reduce habitat by covering the sediment, they are suitable only for localized control

- For safety and performance reasons, bottom screens must be regularly inspected and maintained.
- Boat anchors, fishing gear, or paddles may damage or dislodge bottom screens.
- Improperly anchored bottom screens may create safety hazards for boaters and swimmers.
- Swimmers may be injured by poorly maintained anchors used to pin bottom screens to the sediment.
- Some bottom screens are difficult to anchor on deep muck sediments.
- Bottom screens interfere with fish spawning and bottom-dwelling animals.
- Without regular maintenance, aquatic plants may quickly colonize bottom screens.

Costs of Bottom Barriers

- $0.35 to $0.85 per square foot for geotextile or burlap material
- $0.35 to $0.60 per square foot for labor to install barriers
- $0.30 to $0.50 per square foot for removal costs

Appropriateness for Black Lake

It is appropriate to install bottom screens under existing docks and in areas that may be difficult to reach with herbicide treatments and/or suction dredging. Bottom screens will be used on a limited and "as needed" basis as identified during diver surveys of the lake after herbicide and diver dredging treatments. Areas possibly requiring bottom barriers are: the south end fishing dock, northeast public boat launch dock, and the Tarlatt Slough outfall area (See Figure 5). Bottom barriers will be checked on a regular basis during diver hand-pulling to assure they are properly anchored and plants have not colonized on top of the screen.

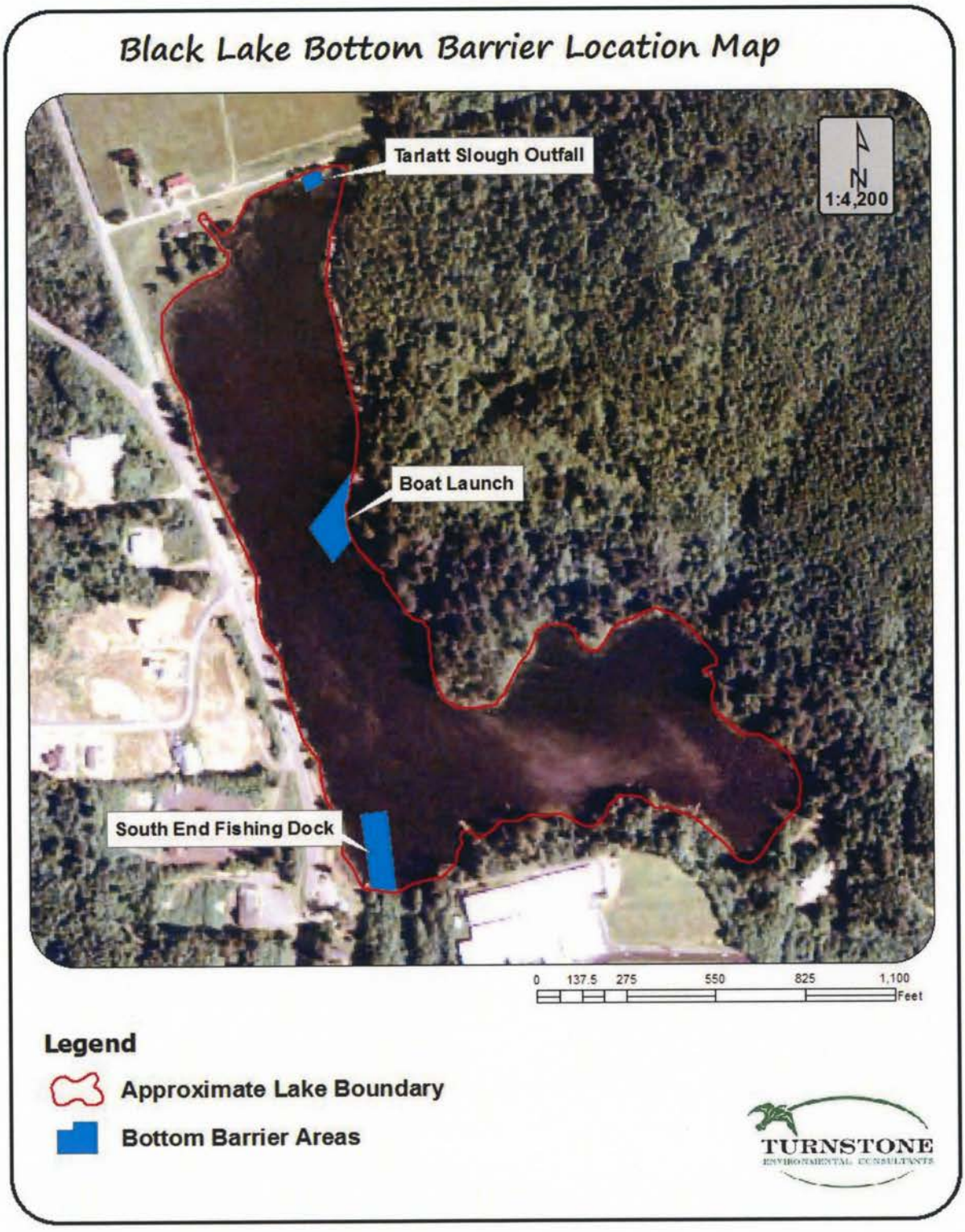

Figure 5. Black Lake Bottom Barrier Location Map

TRIPLOID GRASS CARP (BIOLOGICAL CONTROL) ALTERNATIVE

The grass carp, also known as the white amur, is a vegetarian fish native to the Amur River in Asia. Because this fish feeds on aquatic plants, it can be used as a biological tool to control nuisance aquatic plant growth.

In some situations, sterile grass carp may be permitted for introduction into Washington waters. The objective of using grass carp to control aquatic plant growth is to end up with a lake that has about 20 to 40 percent plant cover, not a lake devoid of plants. In practice in Washington, grass carp often fail to control the plants or all the submersed plants are eliminated from the water body.

The Washington Department of Fish and Wildlife determines the appropriate stocking rate for each water body when they issue the grass carp stocking permit. Stocking rates for Washington lakes generally range from 9 up-to 25 eight- to eleven-inch fish per vegetated acre. This number will depend on the amount and type of plants in the lake as well as spring and summer water temperatures. To prevent stocked grass carp from migrating out of the lake and into streams and rivers, all inlets and outlets to the pond or lake must be screened.

Once grass carp are stocked in a lake, it may take from two to five years for them to control nuisance plants. Survival rates of the fish will vary depending on factors like presence of otters, birds of prey, or fish disease. A lake will probably need restocking about every ten years.

Success with grass carp in Washington has been variable. Sometimes the same stocking rate results in no control, control, or even complete elimination of all underwater plants. The consensus among researchers and aquatic plant managers around the country is that grass carp are an all or nothing control option. They should be stocked only in water bodies where complete elimination of all submersed plant species can be tolerated.

<u>Advantages</u>

- Grass carp are inexpensive and offer long term control, but fish may need to be restocked at intervals. Grass carp offer a biological alternative to aquatic plant control.

<u>Disadvantages</u>

- Depending on plant densities and types, it may take several years to achieve plant control using grass carp and in many cases control may not occur.
- If the water body is overstocked, all submersed aquatic plants may be eliminated.
- Removing excess fish is difficult and expensive.
- The type of plants grass carp prefer may also be those most important for habitat and for waterfowl food.
- If not enough fish are stocked, less-favored plants, such as B. elodea, may take over the lake.
- Stocking grass carp may lead to algae blooms.

- All inlets and outlets to the lake or pond must be screened to prevent grass carp from escaping into streams, rivers, or other lakes.

Costs of Grass Carp

- $10 to $15 per fish plus shipping costs
- Typical stocking rates are 9 to 15 fish per acre.
- Cost for replacing current outfall with appropriate fish screen is $15,000.

Appropriateness for Black Lake

Sterile grass carp are appropriate for Black Lake and are included in the plan. They are to be introduced in a very conservative number (20 in total for 32.8 acres) in Year 2 of treatment following herbicide, bottom barrier and diver-dredging methods. The grass carp will only be introduced if it is determined by yearly inspections that additional measures are needed to keep the population of B. elodea under control. Grass carp introduced to the lake will be mature adults that tend to favor the consumption of B. elodea. An additional total of 20 grass carp will be added in Year 4 if it is determined more are needed to assist with general housekeeping in regards to weed reduction. A new outlet and weir would be required for the containment of grass carp within the lake and will be constructed regardless if grass carp are needed.

Integrated Treatment Plan

Local Involvement

The community of Ilwaco is committed to restoring, preserving and maintaining Black Lake. In a small town of 1,000 residents, it is truly an asset both in natural beauty and recreational and agricultural aspects. The City of Ilwaco and Black Lake Steering Committee will continue community education and community involvement efforts. New signs regarding invasive aquatic species and control methods, received from the Department of Transportation, have already been posted in appropriate areas around Black Lake. The Chinook Observer, a local newspaper, continues to report events pertaining to identification and prevention of contamination by weeds in Black Lake (articles contained in Appendix A). The Ilwaco High School and Ilwaco Middle school are both within walking distance which affords teachers the opportunity to use the lake and adjoining forest for learning experiences. One example is Charlotte Kelly's (science teacher) junior high class, which participates in water testing and reports findings approximately every three months to the Ilwaco City Council and Black Lake Steering Committee. High School seniors, such as Evin LaPlatney, utilize Black Lake as a recipient for community enhancement development projects. The Lions club, local cranberry farmers, local angler groups and kayak clubs support Black Lake restoration endeavors both monetarily and through volunteer efforts.

Integrated Action Plan

The integrated treatment plan for Black Lake will involve considerations for the extent and intensity of the Brazilian elodea infestation, the scale and timing of the treatment, the effectiveness against Brazilian elodea, potential environmental impacts, permit requirements, and project costs. The integrated treatment plan for Black Lake spans four years, with the local community's and committee's understanding that the plan will go forward indefinitely. Due diligence in completing yearly surveys, conducting maintenance and scheduled weed removal, and public education must continue to prevent the current situation of widespread aquatic weed infestation.

Herbicide Treatment

Initial treatment to eradicate B. elodea in Black Lake consists of an application of the aquatic herbicide diquat (Reward®) in February or March 2011, over approximately 14 acres of the north and northwest portions of the lake. Timing of application is controlled by the cranberry farm water rights agreement. Sixteen cranberry farms retain water rights established in 1903 with the City of Ilwaco to use Black Lake water to irrigate, harvest and protect their food crop, cranberries. Timing of application must occur between cranberry farms "no draw" needs which generally happen between November and February dependent on local weather. Although water treated with diquat for irrigation of food crops can be completed when a maximum of 5 days non-usage is observed, the farmers cannot restrict daily access to the lake and rely on local weather to compensate for non-access waiting periods during harvest or growth periods. One

day of missed irrigation can cause damage to growing crops resulting in economic loss. Should weather conditions become favorable for natural crop irrigation or protection towards the end or beginning of the farming season, a diquat application will be initiated at the earliest, most appropriate opportunity.

The diquat herbicide application in February or March, 2011 should take effect within three weeks of treatment. A follow-up survey with a diver or trained volunteers will be conducted at the appropriate time following the application to determine if supplemental treatment is needed. The surface survey will consist of 2-3 trained volunteers; a boat with a weed rake, a hand held GPS unit and a map of Black Lake for plotting coordinates related to locations of weed colonies. If a second treatment of herbicide is required it will be applied in late winter or early spring of 2012.

Diver Suction Dredging

Diver dredging can be employed between herbicide applications to remove Brazilian elodea biomass found after treatment has taken effect. This technique provides additional removal via suction dredging and the ability to identify weed masses requiring further treatment or removal.

Bottom Barrier and Installation

Bottom barriers will be placed sparingly and only when it is determined that confined or obstructed areas are not responding to herbicide treatment or are not accessible to diver dredging.

CONTROL INTENSITY LEVELS

The appropriate levels of plant control in Black Lake were determined by considering areas of beneficial use, existing native and nuisance aquatic vegetation, and the management goals of the community.

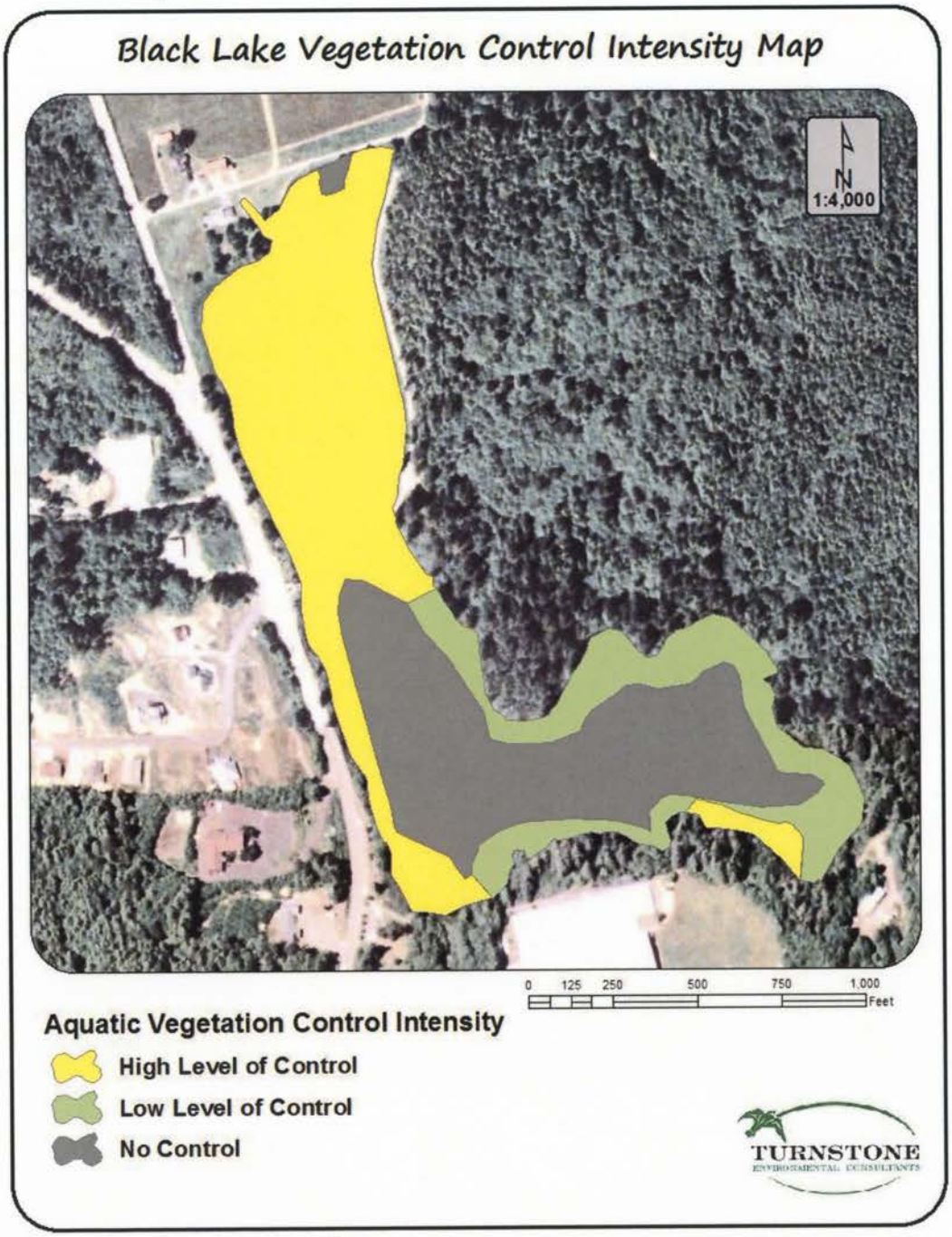

Figure 6. Areas of Intensity for treatment

- **No intensity**: includes the south/southeast portion of the lake as indicated in Figure 6, representing deeper sections (14 to 32.1 feet) of the lake where Brazilian elodea does not exist.
- **Low intensity**: includes less frequented recreational areas and consists of shallow lake shore areas easily accessible for diver suction dredging. It is expected that some Brazilian elodea will be eliminated by dispersal or spread from the initial north portion concentrated treatment. Effectiveness will be closely monitored and retreatment specific to the south to southeast portions will be addressed with an additional application of the herbicide as warranted.
- **High intensity**: includes the north and northwest portion of the lake in the shallow areas (less than 14 feet deep) where greatest concentration of B. elodea is present. The treatment in this area would allow shoreline fishing, swimming and boating access to the deeper portions of the lake.

Outfall Weir and Culvert

An outfall control structure, with fish screen protection, is required for the use of grass carp as the lake drains to adjacent cranberry farms as well as the Tarlatt Slough. The redesigned and enhanced outfall will help prevent the escape of B. elodea into neighboring bodies of water. Improvements in the structure will assist with water level adjustments during drawdown for cranberry irrigation purposes and maintaining a healthy lake. The local community is committed to replacing the outfall, regardless if grass carp are to be added to Black Lake. An excavator and operator donation has been promised for the project. Committee member Dave Johnson is seeking donations of materials for construction of the outfall. Volunteers and Ilwaco city crew will be providing labor. The construction and completion of the outfall is planned for summer, 2011. A diagram of the outfall and weir design is included in Appendix C.

Grass Carp Introduction

Following the construction of the outfall and weir, twenty adult sized sterile grass carp will be released if needed to assist in the eradication of Brazilian elodea. The Washington Department of Fish and Wildlife determines the appropriate stocking rate for the lake when they issue the grass carp stocking permit. However, the local community and committee members wish to plant only twenty grass carp for 32.8 acres, well below recommended stocking rates of 9 to 15 fish per acre. The introduction of a small number of grass carp is to prevent the possibility of creating a barren lake through overconsumption of vegetation by the carp. It is hoped that treatment by herbicide application, bottom barrier and diver dredging will leave a very small amount of B. elodea present for grass carp to act as a "janitorial crew". A survey of presence of B. elodea and health of the lake in 2014 will determine if the addition of grass carp has been beneficial and if another small number needs to be planted.

Additional Treatment Alternatives

Additional treatment alternatives for observations reported during yearly monitoring surveys in subsequent years include:

1. When plants become sparse (10 to 20 plants per acre), the City of Ilwaco will employ divers to hand bag and remove living biomass.
2. If there are small isolated dense patches remaining that are too small to warrant chemical retreatment, then a diver plus dredge will be used to remove these isolated patches.
3. If the density of invasive aquatic plants is too great to warrant hand pulling or diver dredging, infested areas of the lake will be retreated with diquat.

Public Education and Community Outreach

Education and community outreach will need to be an on-going process. Black Lake is situated adjacent to Highway 101 and is visible to all. Local citizens will be notified of diquat applications according to permit requirements as well as by posted public notices, newspaper articles, printed ads and informative brochures available at Ilwaco City Hall. Public notification will be done as diver hand pulling or diver suction dredging is being performed. The road leading to the public boat launch facility will be closed during the construction of the new outfall. This road is currently the only road available for access to hiking trails as well as the public boat launch facility. The public will be notified in advance of the road closure.

Plan Elements, Costs, and Funding

Table 3 outlines the tasks and estimated costs of implementation on an annual basis. Implementation of the Black Lake IAVMP will span four years, with the understanding that invasive aquatic weed control is an ongoing task requiring routine maintenance measures and close monitoring. Total project costs are estimated at $124,674, worst case. The most likely cost will be approximately $75,000. The majority of the costs accrue in the first several years, which is the period of most aggressive treatment. Future costs are directed at detecting and preventing re-introduction of noxious aquatic plant species.

Table 3. Estimated Implementation Project Costs

Task	Year 1 (2011)	Year 2 (2012)	Year 3 (2013)	Year 4 (2014)	Total
Herbicide Treatment and Monitoring	$4,000	$4,000	$1,000	$1,000	$10,000
Herbicide Application Permit	$397		$397		$794
Diver Post-treatment Monitoring with Limited Hand-Pulling	$2,000	$2,000	$2,000	$2,000	$8,000
Diver Suction Dredging	$10,000	$10,000	$10,000	$10,000	$40,000
Construction of Outfall and Weir	$15,000				$15,000
Sterile Grass Carp		$300		$300	$600
Bottom Barrier and Installation		$12,000			$12,000
Education and Outreach	$1,000	$1,000	$500	$500	$3,000
Project Management (15%)	$4,860	$4,395	$2,085	$2,070	$13,409
Totals	$37,257	$33,695	$15,982	$15,870	$102,803
Sales Tax (7.8%)	$2,906	$2,628	$1,247	$1,238	$8,019
Contingency (12.5%)	$5,020	$4,540	$2,154	$2,138	$13,853
Project Total	$45,183	$40,864	$19,382	$19,246	$124,674

Funding Sources

Grants

The Washington State Department of Ecology provides grants for aquatic weed management through its Aquatic Weeds Management Fund (AWMF). To be eligible for one of these grants, a community must complete an Integrated Aquatic Vegetation Management Plan. This plan follows the guidelines and requirements for such a plan provided in *A Citizens Manual for Developing Integrated Aquatic Vegetation Management Plans* (Washington Department of Ecology, 1994).

Matching Funds

Estimates for Ecology's matching funds requirements are outlined in Table 4.

Table 4. Estimated Black Lake Treatment Costs

Item	Amount
Total Project Cost	$124,674
75% of Total Project Cost (not to exceed $75,000)	$75,000
Required match of 25% or the remainder of the project costs	$49,674

Item	Budgeted Match	% of Total
In-kind match	$48,874	39.20%
Cash match for permits	$800	0.65%
Ecology funding after match	$75,000	60.15%

Community-Based Funding

The City of Ilwaco is providing labor to replace the outfall and weir with enhancements for fish retention. An excavator is being provided and operated by Malcolm McPhail. Materials for the outfall and weir will be provided via fundraising and donation. Aquatic weed specialists Tim Crose and Kim Patten are providing the boat and labor for applying diquat. The City is also forming a City Parks Commission to ensure community involvement and completion of the grant project. The City Parks Commission will help offset project management costs for project implementation. The local Lions Club is proposing fundraisers, such as spaghetti feeds, for the purchase of grass carp and other Black Lake improvements. Additional fundraisers such as raffles, yard sales, bake sales, direct fund soliciting from local fishing clubs, and kayak clubs will be conducted to raise monies. See Table 5 for costs associated with community based in-kind time and materials donations.

Table 5. Community Based In-Kind Time and Materials Donations

Item	Cost	Units/year	Years	Notes	Total
Volunteer Hours	$15/hour	300	4	Conduct meetings, develop educational fliers, and assist with project management and other duties	$18,000
Test Materials	$200/year	1	4	Material costs for water samples collected by volunteers	$800
Boat	$110/day	4	4	Rental donated for project implementation	$1,760
Aquatic Weed Specialists (2)	$375/hour	16	4	Provide pro bono diquat applications	$24,000
Excavator and Operator	$1000/day (WA State prevailing wage rate)	5	1	Excavator and operator donated to replace outfall	$5,000
				Total Estimated In-Kind Matching	**$49,560**

Implementation and Evaluation

The implementation of the plan will follow the process outlined below:

Short Term Action Plan

1. Formally convene a project Implementation Committee to write the implementation grant request. Many Steering Committee members have indicated their willingness to transition into this role.
2. Seek Ordinance approval from Ilwaco City Council to form the Ilwaco Parks Commission to address concerns, maintenance, and fundraising for the creation of new parks and benefit of existing parks including Black Lake.
3. Assign tasks to committee members for plan implementation. Review proposed plan and develop timeline for specific tasks. The IAVMP will guide this process.
4. Implement community education plan for treatment.
5. Secure necessary permits. Permit application will be coordinated with the contracted applicator. Application and permit processes will be reviewed for all selected treatment methods and will be assigned a priority level.
6. Apply herbicide treatment. Application of diquat will be completed as prescribed in IAVMP, unless consultation with Ecology and the applicator leads to defensible changes in the plan.
7. Complete construction of outfall.
8. Issue a Request for Proposals for bids for follow-up diver weed survey and treatment methods.
9. Conduct one diver survey or using trained volunteers following initial diquat treatment. Professional contractors and community members who have received adequate training can complete this work.
10. Apply follow-up treatment of herbicide application or diver dredging as needed. Follow-up survey will determine the extent to which this work is necessary and best method of retreatment or plan modification.

Long Term Action Plan

1. Continue community education and fund raising to support restoration projects related to Black Lake.
2. Conduct yearly boat visual inspections during late spring or early summer when aquatic plants are actively growing. Professional contractors and community members who have received adequate training can complete this work. Conduct diver surveys every three years for documentation of health and growth of native species and early identification of presence of weeds. Employ diver dredging to eliminate new small communities of invasive weeds. Continue to monitor the overall health of the lake and the surrounding ecosystem.

REFERENCES

Cooke, Sarah S, editor. 1997. *A Field Guide to the Common Wetland Plants of Western Washington & Northwest Oregon*. Seattle Audubon Society, Trailside Series. 417 pp.

United States Department of Agriculture, Soil Conservation Service. 1973. *Soil Survey Pacific County Area Washington*. U.S. Government Printing Office, Washington D. C.

Washington State Department of Ecology, 1994. *A Citizens Guide for Developing Integrated Aquatic Vegetation Management Plans*. First Edition. 148 pp.

Washington State Department of Ecology, 2001. *An Aquatic Plant Identification Manual for Washington's Freshwater Plants*. 195pp.

Washington Department of Ecology, 2009. Aquatic Plant Management website. Online at: http://www.ecy.wa.gov/programs/wq/plants/management/index.html

Washington State Department of Fish and Wildlife, 2008. Priority Habitats and Species (PHS) List website. Online at: http://wdfw.wa.gov/hab/phslist.htm

Washington State Department of Fish and Wildlife, 2009. Species of Concern List. Online at: http://wdfw.wa.gov/wlm/diversty/soc/soc.htm

Washington State Department of Natural Resources, Washington Natural Heritage Program, 2009. List of Known Occurrences of Rare Plants in Washington, Pacific County. Online at: http://www1.dnr.wa.gov/nhp/refdesk/lists/plantsxco/pacific.html

National Audubon Society, Inc., Audubon Washington, 2010. The Great Washington State Birding Trail Maps, Black Lake Park, Site 20. Online at: http://wa.audubon.org/BirdingTrailMaps/TM_index.html

Syngenta Crop Protection, Inc. 2008. Product label for Reward® landscape and aquatic herbicide. Greensboro, NC.

Washington Department of Ecology (WDOE). Aquatic Weeds Management Fund Grant Guidelines. Online at: http://www.ecy.wa.gov/programs/wq/funding/FundingPrograms/FundingProgramsMain.html

Washington Department of Ecology (WDOE) 1994. Appendix B Invasive, Non-native Aquatic Plant Fact Sheets. *A Citizens Guide for Developing Integrated Aquatic Vegetation Management Plans.* First Edition. 148 pp.

Ereth, Richard. Washington State Department of Fish and Wildlife Biologist. Speaker at November open public meeting regarding use of sterile grass carp to control B. Elodea.

Silver Lake, Spokane County, Integrated Aquatic Vegetation Management Plan, February 2009.

Hamel, Kathy. 2009/2010. Personal email communication regarding dredging and use of grass carp for Black Lake project. Manager, WDOE. Aquatic Weeds Management Fund. Olympia, WA.

Washington State L&I Prevailing Wage Table. On-line at:
http://www.lni.wa.gov/TradesLicensing/PrevWage/WageRates/default.asp

Excavator Rental Rates (320 size) per AG-BAG Forage Solutions. (503) 741-0749-Dennis Green (Owner)

Appendix A: Public Involvement and Meeting Summaries

Appendix A documents the public involvement process throughout the creation of the Black Lake Integrated Aquatic Vegetation Management Plan. During the process, the Steering Committee made decisions built upon input from the Ilwaco community. Appendix A includes documents in their original format from planning activities including steering committee meeting agendas, meeting minutes, fliers, and press releases.

Steering Committee Meetings:

- November 4, 2009
- November 12, 2009
- December 14, 2009
- February 12, 2010
- April 14, 2010

Public Meetings:

- December 3, 2009
- January 13, 2010
- March 12, 2010
- March 26, 2010
- April 8, 2010

Black Lake Steering Committee

Meeting Minutes

November 4, 2009

Present: Jane Greene, Ardell McPhail, Willard Greene, Tammie Herman, Sarah Raaymakers, David Johnson, Charlie Cameron, Al Harper, Randy Lavold, Tim Crose, Kim Patten, Katie Arhangelsky, Melanie Tyler, Stephanie McDowell

Next meeting: November 12, 2009 1 PM Ilwaco Community Center

I. Introductions: Katie Arhangelsky and Stephanie McDowell (Turnstone Environmental Consultants); Melanie Tyler (Storm water Grants Manager DOE); additional meeting attendees as listed above.

II. Discussion: Katie led the discussion as to where the Black Lake Steering Committee is in the Grant process, who is currently on the Committee, and the need for new leadership as the Committee is currently without a Chair. An overview of the Department of Ecology Grant was provided by Melanie Tyler (DOE). Katie Arhangelsky (Turnstone) provided an update of the aquatic plant survey she completed on Black Lake in September, 2009. The problem statement and management goals are required for the next step in developing the IAVMP (Aquatic Vegetation Management Plan). Date and time for next meeting was discussed as well as the assignment of action items (written rough draft of statement/goals); review of proposal from Turnstone for further work on Management Plan.

III. Roundtable: The Black Lake Steering Committee was formally re-established with Jane Greene and Ardell McPhail appointed as Co-Chairs. Attendees provided additional contact information for citizens not present but who may be interested in participating on the Committee. A preliminary problem statement and management goal(s) was crafted. Next meeting November 12, 2009 at 1 PM agreed upon by all attendees.

Agenda

Black Lake Steering Committee Mtg.

Nov. 12, 2009

1:00 PM

1. Introductions and minutes of last meeting.

2. Review sample problem statement
   Edit, adopt final statement

3. Review sample Management Goals for Black Lake
   Edit and adopt goals

4. Proposal from Turnstone for further work on Management Plan
   Discuss and take necessary action

5. Set date and organize for public information meeting

6. Set next steering committee meeting and suggest agenda items

Black Lake Steering Committee

Meeting Minutes

November 12, 2009; 1 PM

Present: Jane Greene, Ardell McPhail, Katie Arhangelsky, Willard Greene, David Jensen, Chuck Cameron, Randy Lavold, Al Harper

Next meeting: Public Meeting, December 3, 2009, 4-6 PM, Ilwaco Community Center

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I. Introductions/Announcements:

Brief introduction of each attendee as listed above.

II. Discussion:

Sample problem statement reviewed, rough draft of problem statement reviewed, minor changes discussed and agreed upon adding actual money figures to problem statement. Sample management goals for Black Lake reviewed, rough draft of management goals reviewed, minor changes discussed. Proposal from Turnstone for further work on Management Plan reviewed and discussed. Date and time for next meeting (Public Meeting) discussed. Next agenda items discussed.

III. Roundtable

Problem statement and management goals adopted by Steering Committee. Turnstone proposal for further work on Management plan accepted (Option 1) with letter to be generated from Steering Committee accepting Option 1 proposal. Next meeting established (Public meeting, December 3, 2009, 4-6 Ilwaco Community Center) with Steering Committee directing City of Ilwaco to publish said meeting in local paper (Chinook Observer) for required two week period prior to meeting. Next agenda items established as 1) introduction of Steering Committee to public; 2) introduction of Katie Arhangelsky of Turnstone to public; 3) provide overview of aquatic survey; 4) present problem statement/management goals for public discussion/comment; 5) present next phase of plan (control alternatives); 6) Establish next meeting (Dec. 3, 2009 4 present next phase of plan (control alternatives); 6) Establish next meeting (Dec. 3, 2009 4-6 PM)

CITY OF ILWACO

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NOTICE OF PUBLIC HEARING

NOTICE IS HEREBY GIVEN that the Ilwaco City Council (Black Lake Steering Committee) will conduct a Public Hearing on Thursday, 3 December 2009, at or soon after 4:00 p.m., in the Community Room of the Ilwaco Community Building, 156 North First Street, Ilwaco.

The purpose of this Hearing is to provide the opportunity for members of the public to comment on the development of an integrated aquatic vegetation management plan for Black Lake in Ilwaco.

All persons interested in this petition are encouraged to comment at the public hearing; those who cannot attend the hearing may present written comments which must be received by Ms. Tammie Herman at Ilwaco City Hall, 120 First Avenue North, PO Box 548, Ilwaco, WA 98624, by 1:00 p.m., Thursday, 3 December, 2009.

Please contact City Hall at 360-642-3145, should you need special accommodations. The public is invited and encouraged to attend.

City of Ilwaco
Tammie Herman
Deputy Clerk for the City of Ilwaco
Published Date: November 18, & 25, 2009

The Council Chambers are ADA accessible.

Black Lake Steering Committee – Public Meeting

Agenda

December 3, 2009

4-6 pm

Community Building

156 First Ave N

Ilwaco, Washington

Goals: to involve the public with the process of the Integrated Vegetation Management Plan, and get input from Black Lake users as the Committee moves forward with developing the plan for the lake.

1. Introductions

2. Black Lake Aquatic Plant Survey Results (Katie Arhangelsky, Turnstone Environmental)

3. Problem Statement and Management Goals (Black Lake Steering Committee)

4. Public Discussion and Comment (All interested parties)

5. Next steps:

   Investigate Control Alternatives

6. Establish next meeting and assign action items

Black Lake Steering Committee
Meeting Minutes

Public Meeting: December 3, 2009; 4-6 PM; Ilwaco Community Center

Present: Jane Greene, Ardell McPhail, Willard Greene, Tim Crose, Steve Hill, Kevin Heimbigner, Dave Johnson, Casey Kellar, Katie Arhangelsky, Stephanie McDowell, Al Harper, David Jensen

Next meeting: Public Meeting January, 2010 (time/day to be determined)

I. Introductions/Announcements

Introductions provided by each attendee listed above.

II. Discussion

Black Lake Aquatic Survey results provided by Katie Arhangelsky (Turnstone). Katie provided overview of process (Brazilian Elodea/main noxious weed); plan created to address problem statement/management goals; and survey results. Current draft of problem statement/management goals provided to public for review/comments. Loomis Lake representatives (Tim Crose/Casey Kellar) present-stated interest in "joining forces" with Ilwaco to eradicate noxious weed from Loomis Lake also, to decrease cross contamination of both Lakes. Brief introduction of control alternatives presented with Katie providing pamphlets/handouts to describe various measures of eradication. Need for watershed maps discussed for next phase of plan to be developed. Preliminary date for next meeting to be established.

III. Roundtable

Problem Statement/Management Goals reviewed/discussed by Committee and Public. Additional uses of Black Lake (paddle boats/rowing competition) generated by public. Citizen Al Harper urged Committee to consider providing local children the opportunity to participate in management plans for environmental educational purposes. Final draft of Problem statement/management goals formally adopted by all present. Loomis Lake representatives assured that Ilwaco welcomes their endeavors to also use DOE grant to clean Loomis Lake to protect both Lakes from cross contamination. Loomis Lake representatives urged to contact Melanie Tyler for possible Grant funding on December 14 as she will be in area meeting with Black Lake Steering committee re: paperwork/reimbursement/Grant conditions. Handouts regarding management plans provided with Committee and public urged to research for discussion in January meeting. Ilwaco City Councilpersons Greene and Jensen suggested and agreed that Black Lake may purchase GPS tiles to provide Turnstone with watershed information necessary to complete requirements of Grant for funding. Under Option 1 with Turnstone, Katie Arhangelsky to provide Black Lake Steering Committee with draft of next portion of plan with Katie attending the Public meeting scheduled for January, 2010 (exact day/time to be determined). Katie will be present to assist/guide/answer questions relating to management options.

Black Lake Steering Committee
Meeting Minutes

December 14, 2009

Present: Jane Greene, Ardell McPhail, Gini Chin, Will Greene, Steve Hill, Melanie Tyler (DOE)

I. Purpose of Meeting:

Melanie Tyler (DOE) presented instructions, recommendations and examples for completing paperwork to fulfill Grant requirements for the Black Lake IAVMP.

II. Roundtable:

Jane Greene and Ardell McPhail present to participate in learning paperwork requirements for maintaining Grant. Steve Hill (Ilwaco City Treasurer) present to learn of City Treasurer requirements for Grant funding. Gini Chin and Will Greene present as private citizens as well as Ilwaco City Council and City Parks Committee Chairs.

Black Lake Steering Committee – Public Meeting

Agenda

January 13, 2010

1-3 pm

Community Building

156 First Ave N

Ilwaco, Washington

Goals: to involve the public with the process of the Integrated Vegetation Management Plan, and get input from Black Lake users as the Committee moves forward with developing the plan for the lake.

1. Introductions

2. Black Lake Watershed/Water Body Features Results (Stephanie McDowell, Turnstone Environmental)

3. Black Lake Beneficial Use Results (Stephanie McDowell, Turnstone Environmental)

4. Presentation of Vegetation Control Alternatives (Stephanie McDowell, Turnstone Environmental)

5. Discuss additional funding mechanisms (Steering committee)

6. Public Discussion and Comment (All interested parties)

7. Next steps:

   Investigate Control Alternatives and Specify Control Intensity

8. Establish next meeting and assign action items

Black Lake Steering Committee- Public Meeting
January 13, 2010
Community Building, Ilwaco

Present: Jane Greene, David Jensen, Dave Johnson, Tim Crose, Will Greene, Gini Chin, Ardell McPhail, and Stephanie McDowell

1. Introductions were made. Stephanie McDowell will be the Turnstone person working on our Black Lake Management Plan now that Katie has terminated.
2. Stephanie began by sharing a Draft copy of Phase 1 A-H of a plan. She will share this with the steering committee online and asked for any comments, corrections, additions concerning the draft to be sent to either of the co-chairs, Jane or Ardell. Once comments have been compiled, they will be sent on to Stephanie for inclusion in the plan.

The Plan also needs to include:

An appendix to document public involvement Minutes of each meeting can be used to show what was discussed and the action taken.

How continuing community education will be accomplished needs to be in the plan, such as signs at the launch area, news articles, etc.

Any additional funding mechanisms should be addressed.

A list of animal species around the lake- Stephanie handed out a comprehensive list of bird species in a wider area that needs to be narrowed down to those that are actually in the Black Lake area.

A baseline water sample report needs to be done. **Jane** agreed to contact Fish and Wildlife to see if they have any such information that is more recent than the 1997 report. The report needs to include dissolved oxygen content, temperature and nutrient load, and light. There was brief discussion of storm water runoff, and questions about the effects that fertilizer from the HS football field might have, whether or not there are bio swells.

3. Black Lake Beneficial Use Results- a list is in the Draft. Stephanie asked that we add any others that need to be put in the Plan. *One suggestion was to add Rowing to the list of beneficial uses.*
4. Vegetation Control Alternatives: Stephanie reviewed a list of vegetation control alternatives with costs, advantages and disadvantages.

After much discussion, it was decided the following action steps will be taken before the next meeting:

-Is dredging a viable option? – **Jane** will check with Melanie at DOE

Dredge spoil sites: If dredging is a viable alternative, where would we put the spoils? **Will** will check on dredge spoil sites and the requirements for this type of material.

Bottom barriers- **Dave Johnson** will investigate feasibility of use of some type of bottom barrier to prevent growth of Elodea. Dave will also review the list of bird and animal species highlight those specific to the area.

Lake outfall replacement- **David Jensen** will check with Nancy Locke, City Engineer, about costs and design structure needed. He will also check on filtration for storm water and bio swells.

IAVMP Steering Committee
Agenda Feb. 12, 2010

1. Introductions
2. Background and review of last month's meeting:

Review the draft plan to date (are there other comments on the draft to send to Stephanie?)
Action steps investigating alternative control methods.

3. Brief report from each member's investigations (save further discussion until after speaker)
   Jane: is dredging a viable option?
   Will: dredge spoil sites and requirements
   Dave: Bottom barriers, review of list of bird and animal species specific to Black Lake area
   David: costs and design of outfall structure; filtration for storm water and bio swells
   Ardell: Chemical management
4. Speaker: Rick Ereth, fish biologist -use of grass carp for elodea control
5. Discussion:
   a. What is the desired intensity of treatment? (Needs to be mapped on lake, i.e. which areas need high intensity, low intensity, or no treatment?) This is Step 1 in the IAVMP Manual.
   b. How do we want to integrate the treatment options?
6. This is Step J in the IAVMP Manual. (limit to two or three alternatives scenarios if we have conflicting ideas)

IAVMP Steering Committee
Minutes of Feb. 12, 2010

Present were: Will Greene, Jane Greene, David Jensen, Rick Ereth, Ardell McPhail, Chuck Cameron, Dave Johnson, Kim Patten, Tim Crose, Mary Atherton

1. Introductions were made.

2. Last month, members were asked to review the draft plan to date and send comments, changes, etc. to Jane or Ardell to be forwarded to Stephanie. Several typos were noted and a few changes were sent. No further comments were given.

3. Members were also asked to investigate several items as we look at alternative control methods for Elodea in Black Lake. Reports were shared as follows:

Jane contacted Melanie at DOE and asked if dredging was a viable option. Melanie said that dredging would NOT be covered under this grant. Dredging would require about 16 permits and take 3-5 years to obtain. Not a short-term solution. Kim suggested that someone contact Gail Thurzey with the Seattle District Wetland division of the Corps of Engineers to discuss the feasibility of even considering dredging. **Will volunteered to contact Gail**.

Will reported that looking into dredge spoil sites and requirements was moot at this time since dredging did not appear to be an option for us.

Dave Johnson reported on the use of bottom barriers. He said the cheapest was 66 cents a square foot. He said it kills everything, it would be a problem to move, and would tear. He didn't think it was a viable option for the whole lake. He also sent a list of birds and animals that are found around the Lake area. Ardell also asked the Audubon society to narrow down the list of birds that Stephanie gave us so that it was specific to Black Lake. Patricia and Mary are working on that now.

David Jensen talked with Nancy Lockett, city engineer, about the outfall structure. He said there was never a plan to put a weir in and there is no design. Suggestion was made to check on the structures at Duck Lake (Ocean Shores) and Surfside outfall. **Dave Johnson volunteered to check these out. David said he would follow up on filtration system and bioswells.**

Ardell checked with Kim Patten about the use of chemicals to kill the Elodea. Kim sent several pieces of information that can be used as appendixes in the plan. He said there are only four chemicals that would be effective and only one of these, Diquat, could actually be used on Black Lake since it is an irrigation source. The Diquat would need to be applied between Nov. and Feb. Chemical treatment would require a 90 day public notice and 60 day approval from DOE.

Black Lake Steering Committee

Meeting Agenda

March 12, 2010
1:30 P.M.

Goals: Review research regarding alternative treatment plans for eradication of Brazilian Elodea in Black Lake for agreement/adoption; review areas of Black Lake map for intensity and areas of treatment for agreement/adoption. Discuss public outreach regarding condition/treatment of Black Lake at Black Lake Fishing Derby.

I. Call to order/Introductions

II. Outfall structure research (Ocean Shores/Surfside) Dave Johnson

III. Follow-up for filtration systems/bio-swells David Jensen

IV. Effects of chemicals on Beaver/Otter/etc. Ardell McPhail

V. Feasibility of future dredging Will Greene

VI. Discuss and identify and adopt areas on map for treatment and intensity level.

VII. Discuss and identify integration and list (3 options) best 3 scenarios for treatment methods (short term high intensity, long term low intensity)

VIII. Next step: Finalize treatment options/set up next meeting (Public if consensus is reached for treatment methods and areas of treatment, Steering Committee meeting if further discussion is warranted).

Additional notes: Stephanie (Turnstone Environmental to attend meeting in which final draft is presented). Need to include monitoring in treatment scenario such as visual inspection during hand pulling in designated areas.

IX. Adjournment

Black Lake Steering Committee

Minutes: March 12, 2010
1:30 P.M.

Goals: Review research regarding alternative treatment plans for eradication of Brazilian Elodea in Black Lake for agreement/adoption; review areas of Black Lake map for intensity and areas of treatment for agreement/adoption. Discuss public outreach regarding condition/treatment of Black Lake at Black Lake Fishing Derby.

Ardell called the meeting to order. Present were: Will Greene, Jane, Greene, Dave Johnson, David Jensen, Gini Chin, Mary Atherton, Chuck Cameron, Melanie Tyler, & Ardell McPhail

Since he had to leave early, Will reported on his meeting with Gail Turzey of the Corps of Engineers, Seattle. Discussion was about the outfall and potential future dredging. Gail told Will that as long as there is no change in elevation, the nationwide permit would be available to us either through Sect. 10 or 404 water. She would want to see Fish & Wildlife involved. She was firm on the need for a permit. She was also open to the idea of some dredging, and special permits would be required for that as well.

Outfall structure research (Ocean Shores/Surfside) Dave Johnson: Dave shared photos from both the Ocean Shore outfall structure and the Surfside one. Ours would not need to be that elaborate. We would not need a tide gate, but we do need a control structure on the culvert for cleaning and water retention. He said it would be an estimated $10,000 to replace the culvert (weir)

David Jensen reported that the filters on the the bioswell system was removed because of constant maintenance required. He will check further. He also reported that a permit was already issued to replace the outfall but it may have lapsed.

Effects of chemicals on Beaver/Otter/etc.: Ardell McPhail checked with Glen McCully who reported that there are at least a couple of beaver in the lake right now. Since beavers eat bark (rather than Elodea), using herbicides on the Elodea will not have an effect on the beavers or the otters.

Discuss and identify and adopt areas on map for treatment and intensity level: Members were asked to map out where they would like intense treatment and where treatment is not needed. Jane presented a map on which she identified intensities. Others agreed in general on where treatment needs to be, namely on the north 1/3 or the lake, around the docks and outfall. **

After much discussion, the group agreed on a cautious combination treatment program of herbicide (Diquat), matting, hand pulling and some carp if needed. Monitoring of the treatments should be included in the plan. The outfall needs to be repaired before carp can be introduced. Ardell will ask Kim Patten to describe a plan for the herbicide treatment-when to do what (permit application, timing for treatment, amounts, & followup treatments/rates.) Jane agreed to check with divers to see if there is anyone interested in hand-pulling. Dave commented that permits would be needed for the mats as well. He will estimate the total amount of matting needed and the cost for next time.

Agenda

Black Lake Steering Committee

March 26, 2010

The purpose of this meeting is to identify the committee's proposed integrated treatment plans for controlling Brazilian Elodea in Black Lake. Treatment methods, priorities, intensity and areas of treatment will be discussed, agreed upon, and submitted to Turnstone to develop a final draft to present to the public for comment.

1. Call to order, introductions
2. Chemical treatment: Ardell- Kim's information for what, when and how on the herbicide treatment method.
3. Hand pulling follow-up- Jane Presentation of information from DOE and Fish & Wildlife for diver pulling and dredging material
4. Matting specific areas: Dave Johnson- amount of matting proposed and costs
5. Outfall project update: David Jensen- new information concerning permits, costs, designs, etc.
6. Carp - Discussion of use of carp, timing, amounts, etc.
7. Agreement on intensity areas for each method of treatment.
8. Other items: Specifics for public meeting April 8 at 5:30 pm . Plans for educational outreach during fishing derby. As part of draft, Turnstone develops costs for treatment, permits and maintenance-- proposed budget?

Black Lake Steering Committee

Minutes

March 26, 2010

The purpose of this meeting was to identify the committee's proposed integrated treatment plans for controlling Brazilian Elodea in Black Lake. Treatment methods, priorities, intensity and areas of treatment will be discussed, agreed upon, and submitted to Turnstone to develop a final draft to present to the public for comment.

1. Meeting was called to order at 1:33 pm by Ardell. Will stated that the meeting would be recorded since there was a quorum of City council members present. Present: Chuck Cameron, Dave Johnson, Gary Forner, Mike Cassinelli, David Jensen, Al Harper, Will Greene, Ardell McPhail, Joe Cook, Jane Greene, Don Berger and Kim Patten.

2. Chemical treatment: Ardell contacted Kim for a timeline of sorts for chemical treatment of the lake with Diquat. Kim shared his information about permits, costs, application timings and rates. (His information will be sent to Turnstone.) He said that it would cost around $2000 for the chemical and that if he and/or Tim Crose from the County did the treatment pro bono, it would possibly be inexpensive enough to not need a grant for the initial part. The herbicide treatment would be the first step in the integrated plan and ideally would be applied the last part of Oct. 2010.

3. Hand pulling follow-up- Jane contacted various diving groups, the Chinook Indians, and DOE about hand-pulling operations and their viability. Joe Cook said he has done diving on the Chinook water supply. Jane learned of a suction method where the diver pulls the weed and it is sucked up onto a barge of sorts and the water goes back into the lake. Joe thought a system could be built. Kim has a barge that would work. He also said there is a company out of Olympia that does this very thing. He will get the information for us. It was agreed that someone licensed and bonded to do the work would be best.

4. Matting specific areas: Dave Johnson presented a handout showing costs of labor and materials for matting certain areas of the lake. He also marked the specific spots on the map which will be included with our treatment proposal map. He estimated about 10,200 sq ft of matting would be needed. The lowest price he found was $.66 a sq/ft. but it was agreed that the grant request use the $.75/per sq ft amount indicated in the DOE resource Table 10-1. There was a brief discussion of how the matting would be put down.

5. Outfall project update: David Jensen reported that a permit was applied for in 2008 and granted. He is still checking how long it is good for. The cost estimate from the city engineer is that the culvert replacement would cost about $10,000 and the weir $5000. He also reported that the storm water filters had been taken out. He presented a sample design for catch basin inserts.

6. Carp - Discussion of use of carp, timing, amounts, etc. It is agreed that we need to be careful with the amount of carp used and move cautiously with their introduction. As monitoring continues of the other treatments, we may be looking at carp in the summer of 2011. Al Harper said the Lyons club would like to purchase the carp and need to begin fundraising for them as soon as possible. They would like to get young people and the press involved in this effort.

7. Agreement on intensity areas for each method of treatment: The group made a few changes to the map that Jane presented last meeting which shows the area for herbicide treatment. It was also agreed to add the identification of areas for matting from Dave's map. This way all the proposed treatments will show on one map.

8. Public meeting: The public meeting is scheduled for April 8 at 5:30 pm. Turnstone will prepare a final draft of the plan and present it to the public for comments at that meeting. It is hoped that Turnstone will also include a proposed budget with which to implement the plan.

9. Plans for educational outreach during fishing derby: Mike said that Laurie Hazen would be available to help with an aquatic weed id table. Dave Johnson will also talk with a friend about doing some bug identification as well. Jane reported that we also have pamphlets about Elodea to hand out at the derby.

Meeting adjourned 2:45 pm.

Respectfully submitted:

Ardell McPhail

PUBLIC MEETING NOTICE

BLACK LAKE RESTORATION PROJECT STEERING COMMITTEE

April 8, 2010 at 5:30 p.m.in the Ilwaco Community Building Meeting Room, 158 1st Ave North

The City of Ilwaco's Black Lake Restoration Project Steering Committee will meet to share and discuss the final draft of a plan to eliminate the weeds in Black Lake. When finalized, the plan will be submitted to the Washington State Department of Ecology for the grant.

Please contact City Hall at 360-642-3145, should you need special accommodations. The public is invited and encouraged to attend.

Published Date: 03-19-2010

Agenda

Black Lake Steering Committee Public Meeting

April 8, 2010; 5:30 PM Ilwaco Community Center Meeting Room

The purpose of this meeting is to share the Black Lake Steering Committee's proposed integrated treatment plans for controlling Brazilian Elodea in Black Lake. The final draft of the Plan prepared by Turnstone Environmental Consultants will be reviewed and discussed with the public for final changes prior to submission to the Department of Ecology for Grant purposes.

1. Call to order
2. Introductions
3. Brief overview of final draft and plan by Stephanie McDowell, Turnstone Environmental Consultants.
4. Open floor for public input/discussion
5. Wrap up/final discussion of changes/suggestions
6. Introduction of Evin Laplatney, Black Lake Senior Project
7. Final thoughts/wrap-up

Minutes of April 8, 2010 Public Meeting of the Black Lake Steering Committee

1. Meeting was called to order by Co-Chair Ardell McPhail at 5:35 pm.

2. All present introduced.

Present were: Committee members Will Greene, Kim Patten, Tim Crose, Ardell McPhail, Dave Johnson, David Jensen, Stephanie McDowell of Turnstone Environmental Consultants, Ilwaco Mayor Mike Cassinelli, Councilman Forner, Malcolm McPhail, Kevin Heimbigner, Evin Laplatney, Richard Patana and Don Berger from the public at large.

3. Stephanie gave a brief overview of the final draft and integrated plan. She reviewed the four control methods that the committee proposed which include *1) initial herbicide treatment of the lake with Diquat, 2) use of barrier mats in specified areas such as near the boat launch, main fishing dock, and around the outfall; 3) follow-up diver hand-dredging and monitoring, and 4) use of carp if needed after the outfall structure is repaired.* She also shared a proposed budget for the project.

4. Ardell then asked for comments about the plan.

Kim reported that Ecology was concerned that we get as much of the weed treated with Diquat initially as possible. They and he suggested that the whole lake be treated with concentration being on the north end and the areas around the edges of the lake. If we were to treat more

Will asked for clarification about the selectivity of Diquat. Kim answered that the chemical is semi-selective and does kill more than just Elodea. However, he pointed out that the other predominant plants that exist in Black Lake are charra, yellow flag iris and bladderwort which will not be harmed by the Diquat.

It was also asked if Diquat is systemic and will kill the roots. Kim said it was not, but the biomass would essentially cover up the roots so they could not re-grow very soon. Kim indicated that the estimated cost in the plan for chemical was $ 2000. That is based on only treating 14 acres of the lake. He said if the whole lake is treated the first year (as he recommends) it would be more like $4000. The cost of the chemical is $68/gal and the recommended amount is 2 gal/acre. The committee will need to agree on specifically how and where the herbicide treatment will be done before the budget can be finalized.

Malcolm, cranberry grower, commented that the areas where Kim had done the experiments with Diquat have remained virtually clear of Elodea for about three years now. Referring to the timing of treatment of mid-October, he pointed out that he is not finished with harvest until about the third week in October. So it should be stated that the herbicide treatment will be applied after the cranberry harvest and pumps are turned off. Kim suggested there also be a contingency plan to this timing in case we don't make the fall treatment. There is still opportunity in the spring to treat in early March prior to the cranberry farmers starting pumps up for frost protection. This should be included in the

plan. Kevin asked why the herbicide treatment was chosen first rather than the carp. Stephanie answered that due to the intensity of the infestation, the carp simply can't control it fast enough. It is important to get ahead of the weed and then monitor for re-growth and do yearly maintenance.

Concerning the proposed budget, Mike C. noted that the tax % indicated for our area was incorrect. It should be 7.8% tax.

Malcolm commented on the need for the outlet to be repaired. He offered to use his excavator to help with the installation of the culverts. He said it would require 40 ft of culvert- the existing culvert is 36". David Jensen said that the outfall permit says 32". Malcolm also said that with past attempts to control the Elodea, pieces of the plant that broke off would plug up the grates to the outfall. He thought that the pictures of the sample system that Dave Johnson brought to the committee looked good because it had both a lot of surface area and also board controls for holding the water in the summer – two key features of the type of outfall structure needed.

Richard Patana suggested that a traveling screen be considered. Malcolm asked him if it required electricity. Will commented that if something like that were used before killing the Elodea first, it would cause the plant to fracture and break off, thus growing more Elodea. Dave Johnson said that it might be something to consider around the outfall since the biomass would migrate toward the outfall. Cost would need to be considered.

With no further comments from the public, the committee agreed to meet on Wed. April 14 at 1:30 pm to iron out the specifics concerning herbicide treatment and revise the budget.

5. Evin Laplatney next told the group about his senior project. He has been mapping the Black Lake trails with GPS and intends to put up signage on each trail to help hikers find their way. He gave the specific about the size of signs and posts and indicated that he would be installing all of them. He said he is paying for it himself in order to complete the project and then seek donations. Many positive comments were given about his project.

Meeting was adjourned at 6:40 pm

Agenda

Black Lake Steering Committee Meeting

April 14, 2010, 2 PM; Ilwaco Community Center Meeting Room

The purpose of this meeting is to discuss and finalize details pertaining to the Treatment Plan Grant which is to be submitted to Turnstone Environmental by 4/23/10 for the final completion of the plan.

1. Call to order.
2. Introductions as needed.
3. Discussion/final agreement for details of herbicide (Diquat) treatment.
4. Review/amendments/changes to proposed budget.
5. Outfall/Weir Discussion/details
6. Additional proposed changes/corrections to draft submitted to Committee by Turnstone Environmental.
7. Final thoughts/wrap-up
8. Adjourn

Black Lake Steering Committee

Minutes of April 14, 2010

Present were: Will Greene, Jane Greene, Dave Johnson, David Jensen, Charlotte Kelly, Ardell McPhail, and Don Berger.

1. Ardell called the meeting to order at 2:03 pm. Introductions were made.

2. The committee discussed the map showing intensity for the herbicide treatment. It was agreed that the 14 acres be treated at the full rate of 2 gal/acre of Diquat the first year (area shown in yellow on the map) and re-treat when necessary. A stepped herbicide plan was preferred so as not to run the chance of an algae bloom.

3. The committee reviewed the Table of tasks and costs. The following changes were made:

The only figures that should show in year one (2010) are $2,000 for herbicide treatment and $350 for the herbicide application.

Post-treatment monitoring will not be conducted in year 1. It will begin early in year

4. The costs will be $1000/ year starting year 2.

The costs for the ground barrier/matting should include installation. The figure for barrier costs and installation should be $12,000. The entire cost for this should be in year 2 only.

The committee questioned where the Project Management amount of $7650 came from as well as amounts for Education Outreach. We will ask Stephanie for clarification. Once answered, we would like to see Project Management starting in year 2 and spread the Education Outreach amounts out for three years.

The sterile grass carp item costs should be moved to years 2,3 and 4 after the outfall is constructed.

The costs for the ground barrier/matting should be moved to year 2.

5. Further discussion concerned a map for the ground matting. If it's not too difficult, we would like to see a map with the ground matting only and another map with the ground matting integrated onto the intensity map. It was decided that the ground matting does not need to include a section from the boat ramp to the deep end. It should only include the area around the outfall, area around and beneath the boat launch and area around and beneath the south end fishing dock.

6. The outfall and weir details were discussed. Dave Johnson drew a conceptual design to show our intention so an engineer can draw up the specs.

7. Charlotte Kelly, middle school science teacher, has received a Place Based Learning grant through State Parks for outdoor education. She would like to have a project that is meaningful to students in real world terms. The committee was excited about her proposed project. Students will conduct water sample testing each month on 4 specified sections of Black Lake. Some tests they will conduct include monitoring ph, nitrates, depth, temperature, dissolved oxygen and turbidity. They will report to the committee monthly. The monitoring will include pre and post treatment results. Students may also do some shoreline weed pulling in the shallow waters. She would also like members of the committee or people in the field talk with the kids about their jobs.

8. Discussion of Table 3, the in-kind availability to support the next grant. The committee asked that the Excavator Rental plus operator should be $800 a day.

The Aquatic weed specialist amount seemed quite low. Ardell will ask Kim what the rates should be and send on to Stephanie for this section.

9. Jane will send all the minutes and executive summaries to Stephanie by Monday. There may still be changes in the budget that need to get to Stephanie.

10. With no further discussion, the meeting was adjourned at 4:10 pm.

Respectfully submitted,

Ardell McPhail

Articles related to Black Lake enhancement and weed eradication. As printed in the Chinook Observer, local newspaper for the Long Beach Peninsula and surrounding areas.

Brazilian elodea choking Black Lake; more weed news

ILWACO - Katie Arhangelsky, botanist and wetland ecologist donned scuba gear Wednesday and Thursday to survey the pervasiveness of Brazilian elodea in Black Lake. She was accompanied by Darren Bolen, boat and GPS operator from Turnstone Environmental Consultants out of Portland.

The survey of the invasive weed was done for the City of Ilwaco. Turnstone will produce a comprehensive plan to help the City decide what to do to eradicate Brazilian elodea from Black Lake. The survey is being done in conjunction with the Washington Department of Ecology and its guidelines.

Arhangelsky found elodea at a depth of almost 14 feet Thursday and she said the entire northern half of the lake is matted with elodea, with some covering the entire water mass from the surface to eight feet deep. Arhangelsky and Bolen did not find elodea in the depths up to 32 feet in the southern part of Black Lake and they were to survey the lake's "boot" to the east later Thursday.

"The weed is nasty," Arhangelsky related. "Wednesday we saw a little boy fall in the water from the dock and he came out covered with Brazilian elodea and mud. Luckily he was OK." The incident graphically shows how a great deal of Black Lake cannot be used in its present state for recreational purposes.

Loomis Lake is also a virtual biomass of Brazilian elodea in many places, with a generous dose of milfoil, another invasive weed, also found in its waters. Tim Crose, Pacific County Vegetation Management director, said, "Unfortunately we just don't have the funds or the manpower to get rid of spartina in Willapa Bay and also battle milfoil and elodea in Loomis at the same time. However, we are well aware of the problems in Loomis Lake."

Pacific County Vegetation Management department has concentrated on the eradication of spartina from Willapa Bay this summer. Crose explained, "We are one of four agencies involved in getting rid of spartina in the Bay and we are in the third pass in our designated area. Things are going well this summer as far as getting rid of the spartina is concerned." Washington Department of Fish and Wildlife, Willapa National Wildlife Refuge, and the Department of Natural Resources are also applying herbicide to get rid of the now Class A noxious weed, spartina.

Crose related, "The knotweed on the Naselle River watershed is a monster. The Pacific Conservation District is using grant money to eradicate knotweed and their efforts began at the headwaters and then they are working their way downstream. It's a big job." Crose said that purple loose strife, another invasive Class A weed, is rampant in some areas along the Columbia River and Deep River. The Red River that runs through Seaview and drains that area is in danger of being "choked" by parrot feather weed according to Crose. "There is the potential for flooding if parrot feather blocks that drainage. Each year we work to get rid of it, but it is a constant problem," he pointed out.

On a positive note Crose stated, "We have had nearly 40 parcels of land where the owners have worked with us to get rid of gorse." Anyone interested in more information on the Black Lake Brazilian elodea weed problem or who would like to become involved with its eradication is urged to call Ilwaco City Hall at 360-642-3145.

Vegetation Management Plan moving ahead on Black Lake weed woes

Loomis Lake plan in works

ILWACO - A public hearing was held Thursday by the Ilwaco City Council (Black Lake Steering Committee) to discuss the Integrated Vegetation Management Plan (IVMP) concerning the eradication and control of invasive Brazilian elodea in the lake.

The meeting's purpose was to discuss the problem statement and management goals, which is part of a thorough process to receive funding and support from the Department of Ecology and other government agencies. The City of Ilwaco has received a $22,000 grant to develop the IVM Plan.

In late August, Arhangelsky in scuba gear and working for Turnstone Environmental Consultants of Portland surveyed Black Lake and found Brazilian elodea infestation in every part of the lake to a depth of 14 to 15 feet. Only the deepest area of the lake's bottom was not covered with a thick mat of the noxious weed. Arhangelsky said, "Total eradication may be impossible and will likely require regular maintenance to make Black Lake useful for the public."

Casey Keller asked the group at the hearing if combining treatment for a similar Brazilian elodea and milfoil problem in Loomis Lake would be a sound idea. The consensus was that fighting the noxious weeds at both lakes made economic and biological sense. One way the weeds are introduced to lakes is by attaching to small boats and then being spread. Arhangelsky said, "Receiving a (IVMP) for Loomis Lake within six months of completion of the Black Lake plan would allow the projects to be carried out together."

Present at the meeting were co-chairs Ardell McPhail and Jane Greene, Keller, Tim Crose, Steve Hill, Al Harper, Dave Johnson, Will Greene, David Jensen, Stephanie McDowell, and Arhangelsky. Questions concerning the cost of the project, availability of grants, and possible harmful affects were brought up for further discussion. Suggestions on how to secure funding and volunteers were made, including providing educational opportunities for local students.

Next on the agenda will be a grant-writing seminar and Arhangelsky and Turnstone will do a technical survey of the watershed, including what goes into Black Lake and what goes out, and where. The next Black Lake Steering Committee public hearing is set for Thursday, Jan. 7 at 1:30 p.m. in the Ilwaco Community Building at 156 N. First Street. For more information call 360-642-3145.

The topics of that hearing will be the watershed survey results and discussion of possible ways to eradicate the Class I noxious weed, Brazilian elodea. Among the methods that will be considered are water column dye, herbicides, harvesting, dredging, hand-pulling, bottom barriers, drawdown, and the introduction of grass carp.

The problem statement says Brazilian elodea is the dominant plant species in Black Lake and few other plant species have an ability to grow in the lake. This infestation restricts recreational opportunities for swimmers, fishers, and boaters. The annual youth fishing derby has decreased as a result.

The problem statement also says there is a negative economic impact to farmers and the City of Ilwaco. For years bits of weeds have traveled through the outfall and into Tarlatt Slough, infesting ditches, ponds, and neighboring cranberry farms. Ditch maintenance costs farmers $5,000 per year and clearing foot valves on cranberry irrigation systems costs farmers an additional $500 per year. The weed is a safety liability to the City of Ilwaco and also causes loss of tourist dollars. To repair the Black Lake outfall will cost about $30,000.

Management goals are to improve the native habitat by significantly reducing Brazilian elodea and establishing a maintenance plan to control the weed. Public awareness and a possible "wash station" for boaters would help alleviate the spread of the weed. The outfall needs to be rebuilt, possibly with a new design. The overall goals would be to improve safety, and to enhance educational and recreational use of Black Lake and the surrounding area.

Brazilian elodea illegal to sell in Washington

Brazilian elodea was first used to "oxygenate" small, in-home aquariums, but its sale is now illegal in Washington. The bright green weed is attractive in aquariums, but in lakes and slow-moving streams it forms massive, dense, monospecific mats that restrict water movement, trap sediment, and cause dramatic decreases in water quality. Native vegetation is virtually non-existent within the matted stands of Brazilian elodea according to the Department of Ecology.

Such recreational pursuits as fishing, swimming, water skiing, and boating can become impossible when elodea takes over a body of water. The cost to get rid of Brazilian elodea in Silver Lake in Cowlitz County has reached over $1 million and spraying in Loomis Lake of Sonar (Fluridone) has proven effective, but only in the short run. Other methods to get rid of elodea include draining the body of water and having the ground freeze to a depth of a foot, which is impractical in the coast's temperate winter climate.

Light-proof mats can be put down to kill Brazilian elodea and all other vegetation in smaller areas such as near docks or swimming areas, but is cost-prohibitive for larger areas. Grass carp have also been used with some success in getting rid of elodea in Oregon and Washington, but native vegetation is also consumed. Watersheds must be completely enclosed because grass carp can become a problem if they escape to other bodies of water.

Mechanical methods such as cutting or rotovating are counter-productive for Brazilian elodea and knotweed because the weeds readily spread when fragmented. A fragment of the weeds as small as one inch can produce a submerged forest of Brazilian elodea or a stand of knotweed a dozen feet tall in just one summer.

LaPlatney's senior project to map, mark Black Lake trails

ILWACO - When Evin LaPlatney ran his first cross country race as a seventh grader on the Black Lake Trail he got lost. Now as an Ilwaco High School senior he is dedicating his culminating project to making sure that that doesn't happen again and he is also helping make the three trails by Black Lake more accessible and safer for everyone.

"I used GPS (global position system) to help map the three trails by Black Lake and then with the help of Jon Schmidt from the Parks Department we placed the trail points on a map from the program Google Earth," LaPlatney explained. "I am hoping to let more people know about the trails and to make the trails more user friendly."

LaPlatney presented his project to the Black Lake Steering Committee at a public meeting April 8. He told the group that he plans to make several signs at the trail heads and at places where one could lose direction. He will also have signs at various mile markers to help people along the trails. "I will make the signs out of laminated aluminum, put them on six-by-six pressure treated posts and use stainless steel screws so the signs will last."

LaPlatney stated, "The cost of the project will be about $300 and I'm using my own money because I believe it is important." Ilwaco Mayor Mike Cassinelli volunteered that LaPlatney could put his maps of the three trails--Black Lake Trail, Josh's Trail, and Salamander Trail--on the city's Web site, www.ilwacowashington.com.

Several people at the meeting then gave LaPlatney cash donations as a gesture of their appreciation and faith in the project. For more information or to make a donation to help LaPlatney defray costs of the signage you can call him at 360-244-1890.

Black Lake committee nearing decision on weed eradication

ILWACO - The Black Lake Steering Committee moved closer to implementing a plan of action to eradicate invasive Brazilian elodea at a public hearing Thursday, April 8. Stephanie McDowell of Turnstone Environmental Consultants presented her findings and the committee heard comments from citizens Malcolm McPhail, Richard Patana and Kim Patten, WSU extension agent.

The committee will finalize their integrated treatment plan soon and the hope is to begin treatment in mid to late October after the cranberry harvest is completed. Approximately 14 acres of Black Lake were choked last summer with elodea to a depth of 14 feet. The thick aquatic weed made swimming and boating almost impossible. Electric motors (gas-powered motors are not allowed) and paddle boats could not navigate the areas with the weeds and the weeds were a safety hazard to swimmers. Fishing was also negatively affected by Brazilian elodea.

McDowell explained that the aquatic herbicide diquat, trade name Reward, was tested and was the best intense treatment for the overwhelming infestation of elodea in Black Lake. She cited usage in Battle Ground Lake in Clark County and Patten testified to its effectiveness in sample areas of Black Lake and Tarlatt Slough over a two year period of time.

Councilman Will Greene said, "We are trying to have the most moderate approach to getting rid of the problem of Brazilian elodea. Our goal is to make Black Lake a healthy ecosystem once again."

McDowell said Turnstone's recommendations include applying diquat over the 14 acres affected by the elodea in October. In March of 2011 she recommended doing a diver follow-up survey and possibly using diver dredging or employing triploid grass carp to control any trouble spots left after the chemical treatment. Diver dredging is a process where divers hand-pull the elodea and then either bag it or use a suction tube to take the plants to the surface.

Patana suggested using a traveling steel chain screen to remove the Brazilian elodea, but Greene pointed out that fragments of the living plants will readily reproduce, making the weed problem even worse. The committee did take his suggesting into consideration if removing the dead plants becomes a problem after diquat is applied.

McDowell also recommended that a bottom barrier be put down at the boat launch and fishing dock at Black Lake to keep those areas free of elodea. The barrier would block sunlight and thereby kill the plants and would also

keep fragments that were accidentally brought in from getting a start in the lake. Patten said that diquat would also kill some other aquatic plants, but would not kill many of the native plants in the lake.

Signs at the boat launch to educate the public that transporting invasive weeds is against the law have been provided by the Department of Transportation.

Significant improvements to the outfall to the north of Black Lake will also be implemented. McPhail suggested widening the outfall. He explained that several years ago grass carp were introduced into the lake, but the then four-foot wide outfall became blocked with decaying elodea and when the barrier was removed the carp escaped into Tarlatt Slough. He agreed to work with the city to help maintain the new outfall barrier in working condition when it is put into place.

McPhail said, "The diquat works. It has kept Tarlatt Slough and the outfall area clean the last two years since Kim (Patten) used it." The steering committee discussed using diquat on the nine acres that are deeper than 14 feet with the concern that some of the rapidly-reproducing weed might show up there and later spread to the shallows. A decision on using herbicide on the entire lake was not made.

The committee asked McDowell to be more specific on a few items in her report and to consider using diquat on the entire lake rather than just the 14 acres currently affected. Cost estimates of the four-year project were around $45,000, with about $37,000 of that expense coming in the first two years. It was estimated that about $2,000 would be needed to continue to maintain a Brazilian elodea-free and usable Black Lake beyond 2013.

The next steering committee meeting will be April 14 at 1:30 p.m. at the Ilwaco Community Meeting Center and is open to the public.

Appendix B. Birds of Willapa Bay, Long Beach Peninsula, and Columbia River

Common Name		Spring	Summer	Fall	Winter
Loons					
	Red-throated loon	C[1]	-	C	C
	Pacific loon	C	R	C	U
	Common loon	C	R	C	U
Grebes					
	Pied-billed grebe*	U	U	U	U
	Horned grebe	C	R	C	C
	Red-necked grebe	R	-	O	O
	Western grebe	A	U	A	A
Fulmars, petrels and shearwaters					
	Northern fulmar	-	R	R	U
	Pink-footed shearwater	-	-	R	-
	Sooty shearwater	U	C	A	-
	Short-tailed shearwater	-	-	-	O
Storm petrels					
	Fork-tailed storm-petrel	-	-	R	-
	Leach's storm-petrel*	-	-	R	-
Pelicans and cormorants					
	Brown pelican	O	C	C	-
	Double-crested cormorant*	C	C	C	C
	Brandt's cormorant*	C	C	C	C
Bitterns, herons, and egrets					
	American bittern*	O	U	U	O
	Great blue heron*	C	C	C	C
	Great egret	O	-	O	-
	Cattle egret	-	-	R	-
	Green heron	R	R	R	-
Waterfowl					
	Tundra swan	-	-	U	U
	Trumpeter swan	-	-	U	U
	Greater white-fronted goose	O	-	O	O
	Snow goose	O	-	O	O
	Ross' goose	R	-	-	-
	Emperor goose	R	-	O	R
	Brant	A	O	C	C
	Canada goose*	A	C	A	A
	Wood duck*	U	U	U	-
	Green-winged teal	C	R	C	C
	Mallard*	C	C	C	C
	Northern pintail	U	R	A	C
	Blue-winged teal	U	R	U	-
	Cinnamon teal*	U	U	U	-
	Northern shoveler	U	R	U	O
	Gadwall	U	R	U	U
	Eurasian widgeon	-	-	O	O

[1] C = common; A = abundant; U = uncommon; O = occasional; R = rare; * = known to nest in watershed

Common Name		Spring	Summer	Fall	Winter
Waterfowl (cont.)					
	American widgeon	C	R	A	C
	Canvasback	U	-	U	U
	Ring-necked duck	U	-	U	U
	Tufted duck	-	-	-	R
	Greater scaup	U	-	U	U
	Lesser scaup	C	-	C	C
	Harlequin duck	R	-	R	R
	Oldsquaw	O	-	R	O
	Black scoter	U	-	U	U
	Surf scoter	C	O	C	C
	White-winged scoter	C	O	C	C
	Common goldeneye	U	-	U	C
	Barrow's goldeneye	R	-	-	R
	Bufflehead	C	-	C	C
	Hooded merganser*	U	O	U	U
	Common merganser*	C	U	U	U
	Red-breasted merganser	C	R	C	C
	Ruddy duck	O	-	U	U
Vultures					
	Turkey vulture	U	U	U	R
Osprey, kites, eagles and hawks					
	Osprey*	U	U	U	R
	White-tailed kite	O	U	O	O
	Bald eagle*	U	U	U	U
	Northern harrier*	C	C	C	C
	Sharp-shinned hawk	U	R	U	U
	Cooper's hawk	U	R	U	U
	Northern goshawk	R	-	R	R
	Red-tailed hawk	C	C	C	C
	Rough-legged hawk	U	-	U	U
Falcons					
	American kestrel	U	R	U	U
	Merlin	U	-	U	U
	Peregrine falcon	U	-	U	U
	Gyrfalcon	-	-	R	R
Gallinaceous birds					
	Ring-necked pheasant*	U	U	U	U
	Blue grouse*	U	U	U	R
	Ruffed grouse*	U	U	U	U
	Wild turkey	R	R	R	R
	Northern bobwhite*	U	U	O	O
Rails					
	Virginia rail*	U	U	U	R
	Sora	R	-	R	-
	American coot	U	-	U	C
Plovers					
	Black-bellied plover	C	U	A	C
	American golden plover	R	R	U	R

Common Name		Spring	Summer	Fall	Winter
Plovers (cont.)					
	Snowy plover*	U	U	U	R
	Semipalmated plover	C	C	C	R
	Killdeer*	U	U	C	U
Oystercatchers					
	American oystercatcher*	U	U	U	-
Shorebirds					
	Greater yellowlegs	C	U	C	C
	Lesser scaup yellowlegs	-	-	R	-
	Willet	R	-	O	O
	Wandering tattler	U	O	U	-
	Spotted sandpiper	U	O	U	-
	Whimbrel	C	O	C	-
	Long-billed curlew	U	-	U	O
	Bar-tailed godwit	-	-	O	-
	Marbled godwit	U	O	U	R
	Ruddy turnstone	C	O	C	R
	Black turnstone	U	U	U	U
	Surfbird	C	R	C	R
	Red knot	C	-	U	-
	Sanderling	A	C	A	C
	Semipalmated sandpiper	O	R	-	-
	Western sandpiper	A	A	A	C
	Least sandpiper	C	C	A	U
	Pectoral sandpiper	-	-	C	-
	Sharp-tailed sandpiper	R	-	U	-
	Dunlin	A	U	A	A
	Stilt sandpiper	-	-	R	-
	Ruff	-	-	R	-
	Short-billed dowitcher	A	A	C	-
	Long-billed dowitcher	U	R	C	U
Snipe					
	Common snipe	C	R	C	U
Phalaropes					
	Wilson's phalarope	-	-	R	-
	Red-necked phalarope	U	O	U	-
	Red phalarope	R	R	O	-
Jaegers					
	Parasitic jaeger	R	R	U	-
Gulls and terns					
	Bonaparte's gull	C	U	C	R
	Heermann's gull	O	C	C	-
	Mew gull	C	R	C	C
	Ring-billed gull	C	U	C	U
	California gull	C	U	A	U
	Herring gull	-	-	-	R
	Thayer's gull	-	-	-	R
	Western gull*	C	C	C	C
	Glaucous-winged gull*	C	C	C	C

Common Name		Spring	Summer	Fall	Winter
Gulls and Terns (cont.)					
	Black-legged kittiwake	U	R	U	U
	Sabine's gull	R	R	R	-
	Caspian tern*	C	C	C	-
	Common tern	U	R	U	-
	Arctic tern	R	-	R	-
Seabirds					
	Common murre	U	C	C	U
	Pigeon guillemot*	C	C	U	R
	Marbled murrelet*	U	U	U	U
	Ancient murrelet	-	-	R	R
	Cassin's auklet	-	-	R	R
	Rhinoceros auklet	O	U	O	O
	Tufted puffin	O	U	O	O
	Horned puffin	-	-	-	O
Doves					
	Rock dove*	U	U	U	U
	Band-tailed pigeon*	C	C	C	-
	Mourning dove	R	R	R	-
Owls					
	Barn owl*	U	U	U	U
	Western screech-owl*	U	U	U	U
	Great horned owl*	U	U	U	U
	Snowy owl	-	-	-	R
	Northern pygmy-owl*	U	U	U	U
	Burrowing owl	R	-	R	R
	Barred owl*	U	U	U	U
	Long-eared owl	R	-	R	R
	Short-eared owl	U	O	U	U
	Northern saw-whet owl*	U	U	U	U
Goatsuckers					
	Common nighthawk*	R	U	U	-
Swifts					
	Vaux's swift*	C	C	C	-
Hummingbirds					
	Anna's hummingbird	-	-	-	R
	Rufous hummingbird*	A	A	O	R
Kingfishers					
	Belted kingfisher*	U	U	U	O
Woodpeckers					
	Red-breasted sapsucker	U	-	U	U
	Downy woodpecker*	U	U	U	U
	Hairy woodpecker*	U	U	U	U
	Northern flicker*	C	C	C	C
	Pileated woodpecker*	U	U	U	U
Flycatchers					
	Olive-sided flycatcher*	C	C	O	-
	Western wood-peewee*	U	U	O	-
	Willow flycatcher*	U	U	O	-

Common Name	Spring	Summer	Fall	Winter
Flycatchers (Cont.)				
Pacific-slope flycatcher*	C	C	U	-
Larks				
Horned lark*	U	U	U	O
Swallows				
Tree swallow*	C	C	U	O
Violet-green swallow*	C	C	U	O
Northern rough-winged swallow*	U	U	O	-
Cliff swallow*	C	C	O	-
Barn swallow*	C	A	O	-
Jays, magpies and crows				
Gray jay	O	O	O	O
Steller's jay*	U	U	C	U
American crow*	C	C	C	C
Common raven*	U	U	U	U
Chickadees and titmice				
Black-capped chickadee*	C	C	C	C
Chestnut-backed chickadee*	C	C	C	C
Bushtits				
Bushtit*	O	R	O	O
Nuthatches				
Red-breasted nuthatch	U	R	U	U
Creepers				
Brown creeper*	U	U	U	U
Wrens				
Bewick's wren*	U	U	U	U
Winter wren*	C	C	C	C
Marsh wren*	C	C	C	U
Kinglets, bluebirds and thrushes				
Golden-crowned kinglet*	C	C	C	C
Ruby-crowned kinglet	C	R	C	U
Western bluebird	R	-	R	-
Mountain bluebird	R	-	R	-
Townsend's solitare	O	R	R	-
Swainson's thrush*	C	C	U	-
Hermit thrush	U	-	U	U
American robin*	C	C	C	U
Varied thrush*	C	U	C	C
Wagtails and pipits				
American pipit	-	-	O	-
Waxwings				
Cedar waxwing*	U	C	U	R
Shrikes				
Northern shrike	O	-	U	U
Starlings and mynas				
European starling*	C	C	C	C
Vireos				
Solitary vireo*	R	-	R	-
Hutton's vireo*	U	U	U	U

Common Name		Spring	Summer	Fall	Winter
Vireos (cont.)					
	Warbling vireo*	U	U	O	-
Warblers					
	Orange-crowned warbler*	C	C	U	-
	Yellow warbler*	U	U	R	-
	Yellow-rumped warbler*	C	U	U	C
	Black-throated gray warbler*	C	C	U	-
	Townsend warbler	C	-	U	U
	Hermit warbler	R	R	-	-
	Palm warbler	-	-	R	R
	MacGillivray's warbler	R	R	-	-
	Common yellowthroat*	C	C	U	-
	Wilson's warbler*	C	C	U	-
Tanagers					
	Western tanager*	U	U	O	-
Grosbeaks and buntings					
	Black-headed grosbeak*	U	U	R	-
Towhees and sparrows					
	Rufous-sided towhee*	U	U	C	C
	Chippingsparrow	R	-	R	-
	Savannah sparrow*	C	C	U	-
	Fox sparrow	U	-	U	U
	Song sparrow*	C	C	C	C
	Lincoln's sparrow	R	-	R	-
	White-throated sparrow	O	O	-	-
	Golden-crowned sparrow	C	-	C	C
	White-crowned sparrow*	C	C	C	U
	Dark-eyed junco*	C	C	C	C
	Lapland longspur	R	-	C	R
	Snow bunting	-	-	O	O
Blackbirds, meadowlarks and orioles					
	Red-winged blackbird*	C	C	C	C
	Western meadowlark*	U	U	U	U
	Yellow-headed blackbird	R	-	-	-
	Brewer's blackbird*	C	C	U	U
	Brown-headed cowbird*	C	C	U	R
Finches					
	Purple finch*	C	C	U	U
	House finch*	C	C	C	C
	Red crossbill*	U	C	U	U
	Common redpoll	-	-	-	R
	Pine siskin*	C	O	C	C
	American goldfinch*	U	C	C	R
Weaver finches					
	House sparrow*	C	C	C	C

[1] C = common; A = abundant; U = uncommon; O = occasional; R = rare; * = known to nest in watershed

[All data in Appendix B was provided by the Willapa Bay National Wildlife Refuge.]

Appendix C

Black Lake Aquatic Survey Summary Report

October, 2009

Prepared by

Turnstone Environmental Consultants

For the

City of Ilwaco, Washington

Black Lake Aquatic Plant Survey
Summary Report

October 2009

Prepared for:
City of Ilwaco
Ilwaco, WA

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1.0 Introduction

Invasive, exotic plants can degrade water quality and fish habitat when they invade lakes, ponds, and streams. Invasions of non-native aquatic vegetation can cause dramatic changes in plant community structure and composition, which results in the loss of native plant biodiversity and the reduction of water quality. In response to the presence of invasive species in Black Lake within the City of Ilwaco, an aquatic plant survey was conducted in September 2009.

The purpose of this aquatic plant survey was to identify and map the aquatic vegetation present within the lake. The survey will be used as the basis for development of an Integrated Aquatic Vegetation Management Plan (IAVMP) for Black Lake, with the eventual goal to eradicate or reduce to very low levels Brazilian elodea (*Egeria densa)* and other non-native, invasive species. Successful management of lakes infested with exotic species begins with a concrete understanding of the species present within the lake.

1.1 Project Location

Black Lake is located north of the City of Ilwaco, which is on the Long Beach Peninsula in Pacific County, Washington. Black Lake is a 32.86 acre lake, with a mean depth of 13 feet and a maximum depth of 32 feet. The lake is fed primarily by precipitation and ground water. The surface runoff exits the lake through Tarlett Slough, a drainage channel on the north end of the lake. Tarlett Slough eventually drains into Willapa Bay.

The lake is bordered by highway 101 to the west, by a cranberry farm to the north, and by a park with a primitive boat launch and trail system to the east and south. A public pier has been constructed over the lake off of Highway 101, and the lake is utilized for recreational fishing and small watercraft use. The cranberry farm on the north shore of the lake occasionally draws water for irrigation and harvesting purposes.

1.2 Background

The aquatic plant communities of Black Lake have become dominated by invasive species in recent years, raising community concern about water quality and habitat for warm water fish species. Invasive aquatic weeds, particularly Brazilian elodea *(Egeria densa)* had grown to such a density that access to and use of certain parts of the lake became difficult.

The City of Ilwaco began to explore management options to control the vegetation in Black Lake during the mid-1990's, and settled on the introduction of sterile, triploid grass carp. It has been shown that grass carp can be an effective aquatic plant management tool in the Pacific Northwest (Pauley et al. 1994). In 1997, 150 grass carp measuring 9 to 10" in length were released into the lake, at a density of 4.5 fish per acre. Washington State Department of Fish and Wildlife performed a fish survey prior to the introduction of grass carp to document the baseline conditions present within the lake with regards to the fish species.

No follow up studies were completed to document the success of the grass carp introduction (Ferguson, personal communication), but it is largely believed that the introduction effort was unsuccessful. Many residents believe that the culvert in the north of the lake was in disrepair, and the grass carp were able to exit the lake through Tarlett Slough.

In 2008, the City of Ilwaco was awarded a grant by the Washington State Department of Ecology Aquatic Weeds Management Fund for the purpose of developing an IAVMP for Black Lake. An accurate and thorough lake survey of the aquatic vegetation is within the lake is the first step of beginning this process. It is the goal of the City to develop a successful plan that can be implemented in 2010 to control the non-native aquatic vegetation within the lake.

Location Map
Black Lake
Ilwaco, Washington

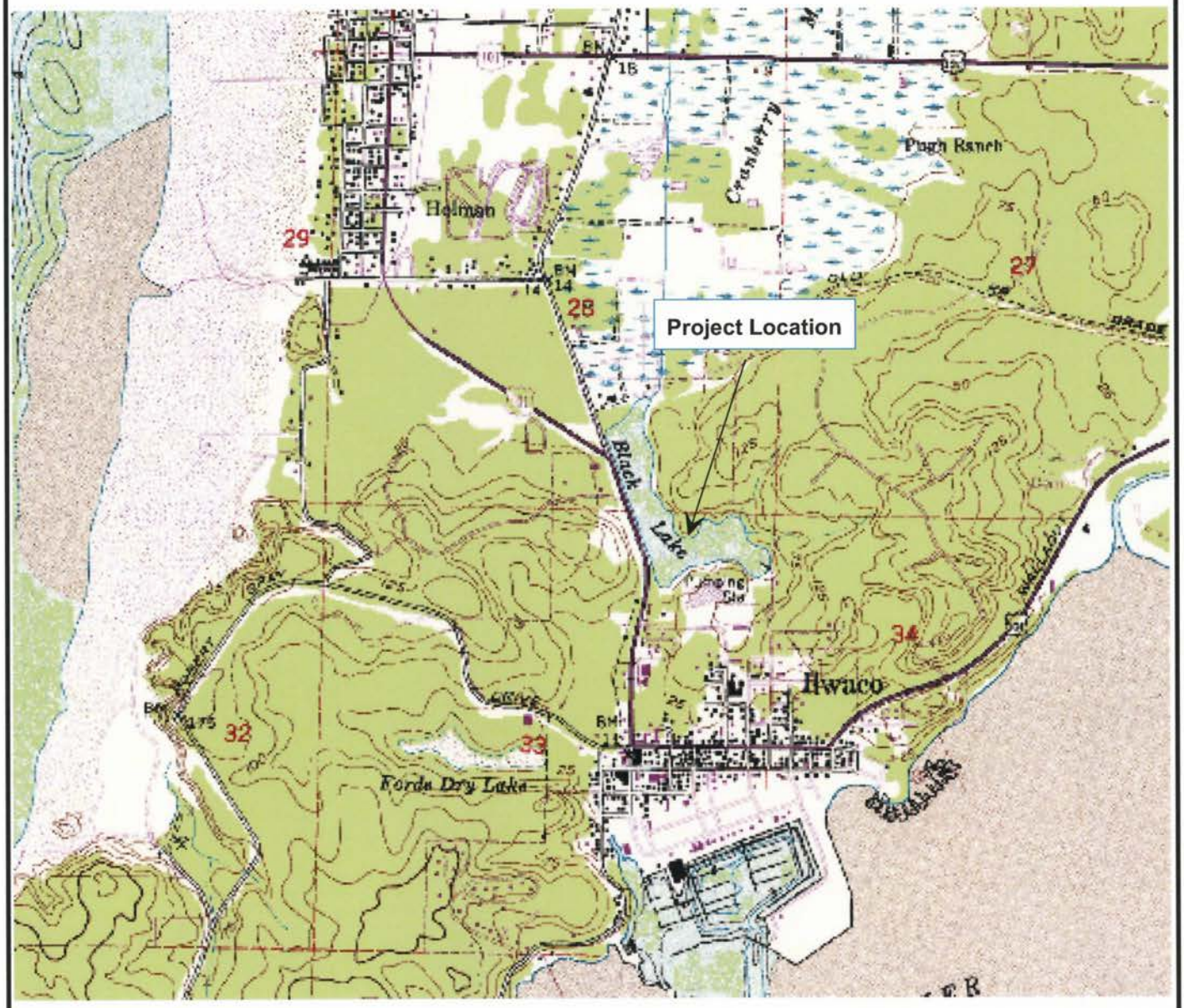


FIGURE 1

2.0 Methods

The specific goals of the 2009 aquatic plant survey were to find invasive species, create a species list for the lake, assess the infestation to determine appropriate control methods, and develop a plant community map that shows the distribution of aquatic vegetation within the lake. The survey of Black Lake was conducted on September 2nd and 3rd, 2009, when biomass of aquatic vegetation is typically at its highest, using survey methods described in the Washington State Department of Ecology's Aquatic Plant Sampling Protocols (2001).

To effectively achieve the goals of the survey effort, it was decided to use a combination of survey techniques on Black Lake. The aquatic plant survey was focused on the lake's littoral zone, which is the near shore area where sunlight penetrates all the way to the sediment and allows aquatic plants (macrophytes) to grow. The relatively small size of the lake's littoral zone allowed the survey team to utilize a combination of surface inventory, diver inventory, diver mapping, and frequency data from points to survey the aquatic plant communities of the lake.

Survey methodology utilized a diver inventory in conjunction with a surface inventory of Black Lake to create a plant community map and inventory of aquatic species. Using a boat capable of maneuvering in shallow, plant-filled water, a SCUBA-certified botanist, and sampling rakes, the boat traversed the littoral zone of the lake. The biologists collected data on plant communities using a surface inventory and random tosses of a sampling rake. The SCUBA diver followed along to confirm observations and collect further observations when visibility is difficult for the surface inventory, swimming perpendicular lines to and from the shore across the littoral zone. A technician on board the boat recorded plant community data in a GPS unit based on surface and diver observations. After a preliminary plant community map has been created, the survey team refined results by investigating transition areas with the SCUBA diver. Despite low visibility in the lake, the SCUBA diver proved useful for determining the extent of the littoral zone of the lake and the overall coverage of the Brazilian elodea within the deeper areas within the littoral zone. Bathymetric maps were also used to assist with mapping the aquatic plant communities within the lake and these were refined with depth measurements taken by the diver/technician team.

After the plant community map was created, the survey effort collected further data on species distribution and abundance by using a point-intercept sampling method, which was adapted from a previously described method (Madsen 1999). This survey data was collected primarily to test the accuracy and refine the plant community map, but the data points that were established can be surveyed again in subsequent years to monitor changes in the plant community. This method uses regularly spaced sampling points laid out in a grid pattern throughout the littoral zone. The grid was created before going into the field using a computerized mapping program, and the grid was loaded onto a handheld GPS unit so that the points could be located within the field. The points on the grid were randomly selected by the GIS program. It was decided to randomly choose 40 points within the grid as a way of further verifying the plant community map and to collect additional presence/absence data.

The same sample method was used at each sample point: the sampling rake was tossed two times at each point from the starboard side of the boat. At each sampling

point, all the species present and percentage of species composition were recorded, along with the depth at each point. When Brazilian elodea was recorded, notes were also made on the perceived density of the species- low, medium, or high.

3.0 Results

The most dominant plant species in Black Lake is by far Brazilian elodea *(Egeria densa),* which is an invasive aquatic weed native to parts of South America. The plant occupies nearly the entirety of the littoral zone of the lake, and in some of the more shallow areas has achieved such high biomass that maneuvering small watercraft in the lake is impossible. Brazilian elodea dominates the lake from the emergent vegetation zone (1-2' in depth) to about 14' in depth, beginning to lose density at about 11' as light availability becomes reduced. There are only a few small pockets remaining within Black Lake that contain plant species other then Brazilian elodea. The species forms dense mats within the water column.

While Brazilian elodea is present throughout the lake, the species seems to attain its highest density in the shallow northern end of the lake. The plant grows to the surface throughout the littoral zone, with the exception of one area adjacent to the culvert to Tarlett Slough where native species are still present.

Photo 1. Taken in the southeastern part of Black Lake at about 8' in depth, depicting typical conditions throughout the littoral zone of the lake. Brazilian elodea is shown growing to the surface of the lake.

3.1 Plant Community Map

Through the diver and surface inventories and the rake toss sampling, four distinct plant communities were mapped within the aquatic and emergent vegetation zones of Black Lake: Brazilian elodea dominant, Bladderwort dominant, Brazilian elodea/yellow pond lily co-dominant, and Brazilian elodea/cat-tail co-dominant. Descriptions of the four plant communities follow below.

3.1.1 Brazilian elodea *(Egeria densa)* dominant

In this plant community, Brazilian elodea is the dominant species of macrophyte present within the water column. In most areas within this community, no other plant species are present besides the Brazilian elodea, but some areas do contain small amounts of native species, particularly bladderwort (*Utricularia vulgaris).* Brazilian elodea is an extremely aggressive aquatic weed that has changed the species composition of Black Lake.

3.1.2 Bladderwort *(Utricularia vulgaris)* dominant

This is a small plant community located along the north shore of the lake that is dominated by native vegetation, with bladderwort *(Utricularia vulgaris)* the primary dominant species. Bladderwort is a common species found in ponds and slow-moving streams, and can be identified by its small bladder-like traps and delicate, finely-divided underwater leaves (Cooke, 1997). Bladderwort achieves up to 75% cover in this community. Other native plants in this community include muskgrass *(Chara sp.),* and yellow pond lily (*Nuphar polysepalum).* Small amount of Brazilian elodea were found within this community, but at low densities.

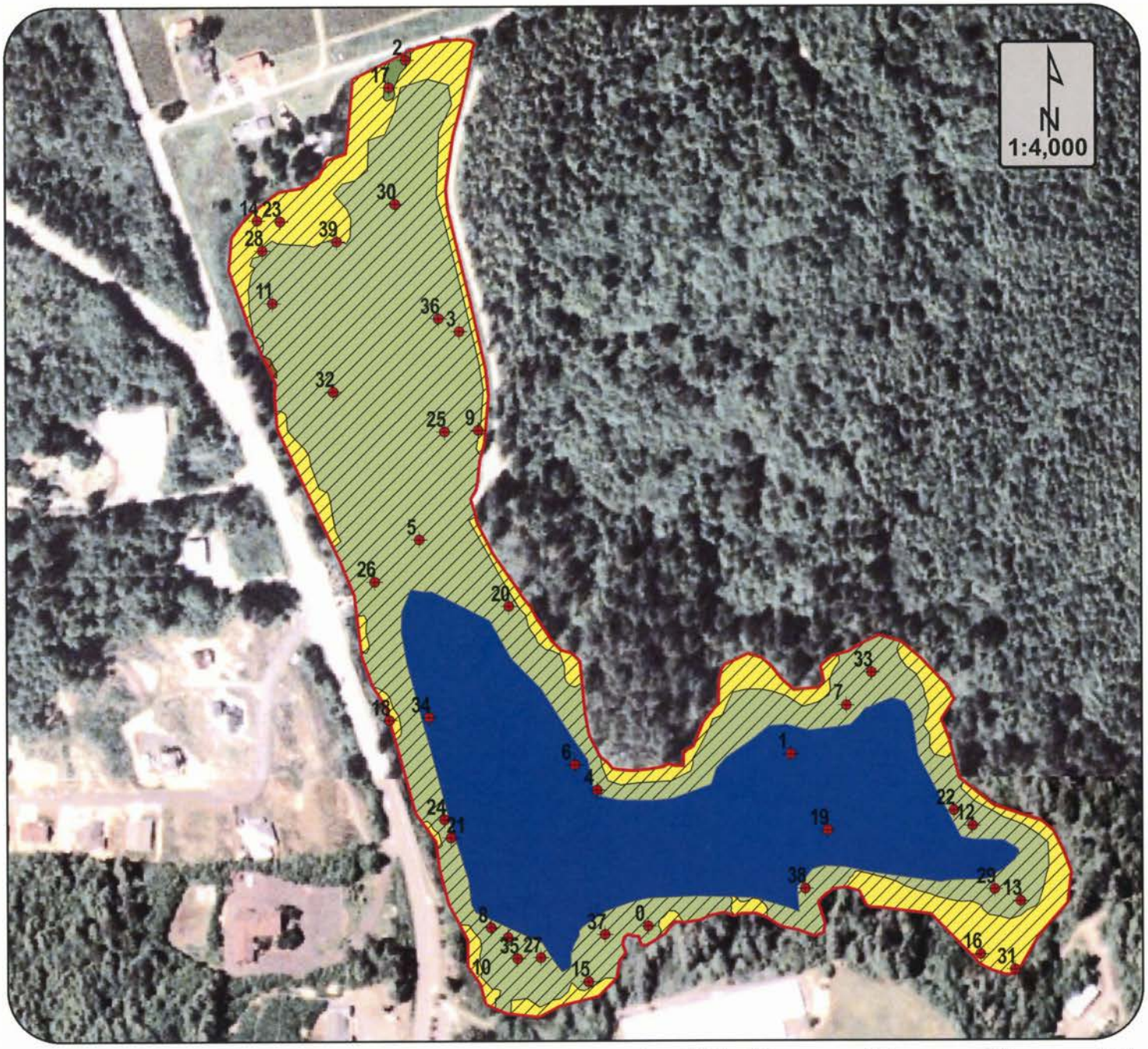
3.1.3. Brazilian elodea/yellow pond lily *(Egeria densa/Nuphar polysepalum)* co-dominant

Brazilian elodea is abundant within this plant community with yellow pond lily *(Nuphar polysepalum)* is present as a dominant as well. The yellow pond lily is able to occupy a different portion of the water column, its leaves and flowers floating on the surface of the water above the Brazilian elodea. The presence of the yellow pond lily provides additional structure in the plant community, and shelter and food for fish and wildlife.

3.1.4. Brazilian elodea/cat-tail *(Egeria densa/Typha latifolia)* co-dominant

This community occurs in one small area of the lake where the common cat-tail *(Typha latifolia)* has established itself within the emergent plant zone along with the Brazilian elodea, at water depths of up to 2'. This community also contains other species of emergent vegetation closer to the shore, including slough sedge *(Carex obnupta),* reed canary grass *(Phalaris arundinacea),* and soft rush *(Juncus effusus).*

Black Lake Aquatic Vegetation Map



0 137.5 275 550 825 1,100 Feet

Aquatic Vegetation Zones

- Bladderwort dominant
- Brazilian elodea dominant
- Brazilian elodea/cat-tail co-dominant
- Brazilian elodea/yellow pond lily co-dominant
- Limnetic Zone (no aquatic vegetation)

- Rake Toss Sample Points
- Approximate Lake Boundary

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3.2 Species List

There are several distinct zones in ponds or lakes, which are characterized by their own species of plants. During the survey, a list was created of all plant species growing in the littoral zone of the lake. Plant species that were growing in areas of the lake that are only seasonally inundated were not included in our species list. Some species on the list, such as slough sedge *(Carex obnupta)* and soft rush *(Juncus effusus)*, were observed growing as emergent vegetation with the littoral zone of the lake, but were also observed farther up on shore in seasonally inundated areas.

Table 1. Black Lake Aquatic Plant Survey – Species List

Scientific Name	Common Name	Notes on distribution
Carex obnupta	slough sedge	most common in northern end of lake, within emergent plant zone.
Chara sp.	muskgrass	noted in the northern part of the lake, and in shallow area adjacent to pier
Egeria densa	Brazilian elodea	dominant plant throughout littoral zone of lake
Eleocharis palustris	creeping spikerush	common in emergent zone of lake
Equisetum arvense	common horsetail	common in emergent zone of lake
Glyceria elata	tall manna grass	uncommon on lake margin, noted in southeastern part of lake
Juncus effusus	soft rush	scattered throughout emergent vegetation zone of lake
Lemna minor	duckweed	uncommon at time of survey, around margins of lake
Myriophyllum spaciatum	Eurasian milfoil	uncommon, a few plants noted by boat launch. Appears to have been mostly outcompeted by Brazilian elodea.
Nuphar polysepalum	yellow pond-lily	common around edges of lake within aquatic plant zone, occasionally is the dominant plant species.
Phalaris arundinacea	reed canary grass	common in emergent zone of lake, especially on southern and northeastern shores.
Polygonum hydropiper	waterpepper	noted in the northern part of the lake
Potamogeton spp.	pond weed	uncommon around margins of lake, not in flower and unable to identify to species.
Potentilla palustris	marsh cinquefoil	common throughout emergent zone of lake
Typha latifolia	cat-tail	uncommon on lake margin, noted on western side of lake.
Utriculata vulgaris	bladderwort	aquatic plant common in northern end of lake where it is the dominant species in a small pocket, also sporadically recorded elsewhere.

3.3 Point Intercept Sampling

In addition to the plant community map and the species list, data was taken at a series of sampling points throughout the lake using the point intercept method described previously in Section 2.0. This data was utilized to verify the accuracy of the plant community map, and to detect any other species present in the lake that escaped observation with the surface and diver inventory methods. The results from the point intercept sampling are below in Table 2. Point numbers correspond to those identified in Figure 2 as Rake Toss Sample Points.

Table 2. Results from Point Intercept Sampling Points in Black Lake

Plot #	Depth	Species	% cover	notes on *Egeria* density
0	2	Egeria densa	100	medium
1	15'	-	-	
2	2'	Chara sp.	25	
		Utriculata vulgaris	65	
		Egeria densa	10	
		Nuphar polysepala	10	
3	3'	Egeria densa	100	heavy
4	9.5'	Egeria densa	100	medium
5	7.5'	Egeria densa	100	heavy
6	16'	-	-	
7	10'	Egeria densa	100	heavy
8	10.5'	Egeria densa	100	heavy
9	2'	Egeria densa	100	heavy
10	11'	Egeria densa	100	medium
11	3'	Egeria densa	100	heavy
12	11'	Egeria densa	100	heavy
13	12'	Egeria densa	100	heavy
14	2'	Egeria densa	95	heavy
		Utriculata vulgaris	5	
		Nuphar polysepala	25	
15	2.5'	Egeria densa	100	heavy
16	4'	Egeria densa	100	heavy
17	3'	Utriculata vulgaris	75	
		Nuphar polysepala	10	
		Chara sp.	15	
18	4'	Egeria densa	100	heavy
19	21'	-	-	-
20	5'	Egeria densa	100	heavy
21	21'	-	-	
22	7'	Egeria densa	100	heavy
23	2.5'	Egeria densa	95	heavy
		Chara sp.	5	
		Nuphar polysepala	20	

Plot #	Depth	Species	% cover	notes on *Egeria* density
24	9'	Egeria densa	100	medium
25	4'	Egeria densa	100	heavy
26	9'	Egeria densa	100	heavy
27	16'	-	-	
28	2.5'	Egeria densa	95	heavy
		Nuphar polysepala	5	sparse
29	14'	Egeria densa	100	sparse
30	4'	Egeria densa	100	medium
31	2'	Egeria densa	95	heavy
		Utriculata vulgaris	3	sparse
		Nuphar polysepala	2	sparse
32	4'	Egeria densa	100	heavy
33	8'	Egeria densa	100	heavy
34	16'	-	-	-
35	18'	-	-	
36	2'	Egeria densa	100	heavy
37	7.5'	Egeria densa	100	heavy
38	4'	Egeria densa	100	heavy
39	3.5'	Egeria densa	100	heavy

4.0 Conclusions and Recommendations

The aquatic plant survey conducted in 2009 and associated Aquatic Vegetation Map (Figure 2) serves as a baseline of lake conditions prior to any management activities occur to control the non-native vegetation present in the lake. The results of this report reveal that Brazilian elodea *(Egeria densa)* dominates nearly the entire littoral zone of the lake in its current condition and only some small populations of native aquatic species remain.

Eurasian milfoil *(Myriophyllum spicatum)* was first observed in the lake in 1999, and several plants were again observed in the 2009 surveys. It does appear that the Eurasian milfoil has been outcompeted by the Brazilian elodea, as the plants were not numerous and difficult to locate in the 2009 survey. Brazilian elodea has appeared much more aggressive and successful in dominating the lake's littoral zone, and has established itself as the biggest concern for management goals.

Once an Integrated Aquatic Vegetation Management Plan (IAVMP) is adopted by the City, it is important to continue to monitor the aquatic plants in the lake through future survey efforts on an annual or bi-annual basis. A thorough monitoring plan is recommended as part of the IAVMP. A strong monitoring program would include the establishment of a more intensive sampling grid as well as the inclusion of biomass studies to track the success of potential control and management activities.

5.0 Project Contacts

Several staff members of Turnstone Environmental Consultants worked on the Black Lake Aquatic Plant Survey. The project was managed by Tom Williamson, who also edited the report. Katie Arhangelsky conducted the field survey effort and is the author of the report. Devin Sahl is responsible for GIS data and provided field support. Darren Bolen was the boat operator and logistical specialist for the field work. Contact information is provided below.

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6.0 Bibliography

Cooke, S.S. 1997. A Field Guide to the Common Wetland Plants of Western Washington & Northwestern Oregon. Seattle Audubon Society, Seattle, Washington.

Gibbons, M.V, H.L. Gibbons, M.D. Systma, 1994. A Citizens Manual for Developing Integrated Aquatic Vegetation Management Plans. Washington Department of Ecology, Water Quality Financial Assistance Program.

Hitchcock, L.C., and A. Cronquist, 1973. Flora of the Pacific Northwest. University of Oregon Press.

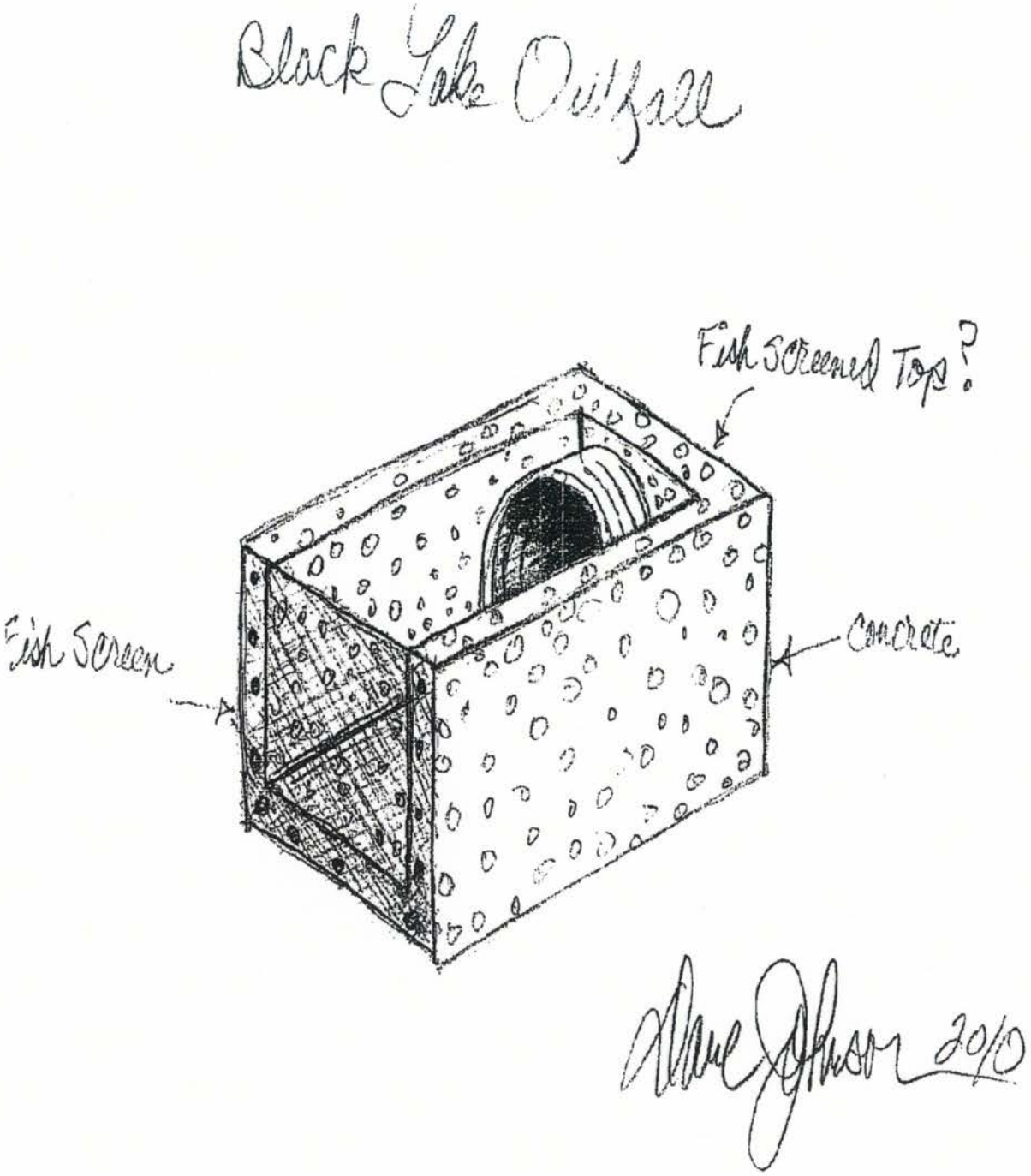
Madsen, J. 1999. Aquatic Plant Control Technical Note MI-02: Point intercept and line intercept methods for aquatic plant management. US Army Waterways Experiment Station. Published on the internet at www.wes.army.mil/el/aqua/pdf/apcmi-02.pdf

Mueller, K.W, and M.R. Downen, 2000. 1997 Black Lake Survey: A Coastal Warmwater Fish Community Before the Introduction of Grass Carp. Warmwater Enhancement Program, Washington Department of Fish and Wildlife. La Conner, Washington.

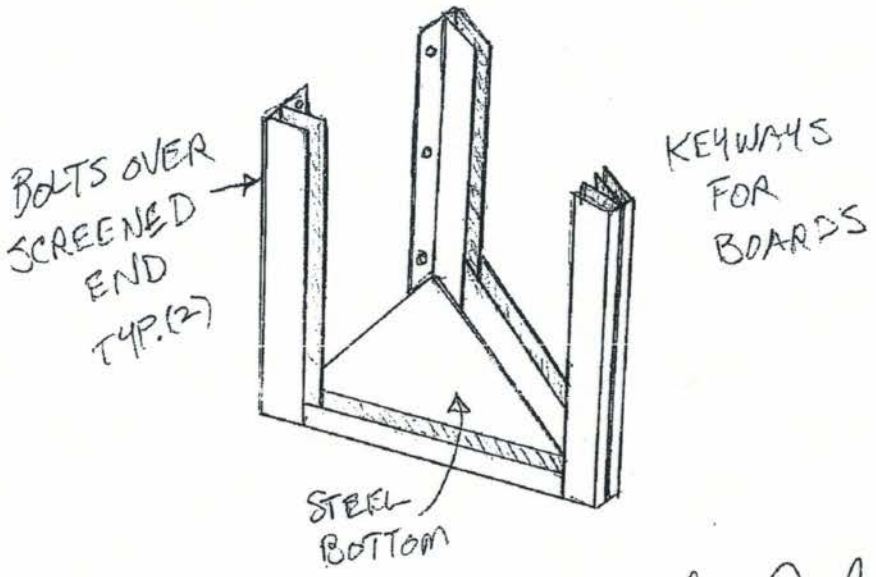
Parsons, J. 2001. Aquatic Plant Sampling Protocols. Washington Department of Ecology Environmental Assessment Program. Publication No. 01-01-017. Olympia, Washington.

Pauley, G.B., G.L. Thomas, S.A. Bonar, J.D. Frodge, D.A. Marino, S.L. Thiesfeld, S. Vecht, K.L. Bowers, and H. Sehgal. 1994. An overview of the use and efficiency of triploid grass carp (Ctenopharyngodon idella) as a biological control of aquatic macrophytes in Oregon and Washington State lakes. Pages 46-54 in Proceedings of the Grass Carp Symposium, March 7-9, 1994, Gainesville, Florida. U.S. Army Corps of Engineers, Waterways Experimental Station, Vicksburg, VA.

Appendix D – Preliminary Sketch of Proposed Outfall



WELDED
CHANNEL IRON
FRAME



Dave Johnson 4/10

1ST LINE SCREEN
REPLACE W/ FLOW BOARDS