Ocean Shores

2021 Duck Lake and Canal Waterways
Aquatic Macrophyte Control Program

Prepared For
City of Ocean Shores
Ocean Shores, Washington

Prepared By
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Project Overview

Located in Ocean Shores WA, the Duck Lake and canal system waterways are moderately shallow water-bodies consisting of numerous narrow canals that link with Duck Lake. The canals are anywhere from 75 to 150 feet wide and 500 feet to 4.25 miles in length. Duck Lake consists of approximately 248 acres and allows high speed boat use throughout a number of sections of the lake. The majority of the lake, however, supports no wake recreational water use. Historically, the canals have been evaluated on a yearly basis while Duck Lake only recent survey was undertaken during 2008. The city has consistently exhibited an effort to provide a waterway system that promotes safe recreational opportunities to the local residents and surrounding communities. As financial resources became available and the need to control nuisance macrophytes was apparent, selected canal areas were targeted for control utilizing approved aquatic herbicides. Herbicide selection and use was in accordance with the NPDES permit issued to the City of Ocean Shores through the Washington State Department of Ecology. Treatment site selection and treatment threshold levels were evaluated on a yearly basis through industry standard survey protocol. Once a survey was completed, data was submitted to the City and Waterways Board for review and evaluation. Final program site selection was determined by the City of Ocean Shores and the Waterways Advisory Board.

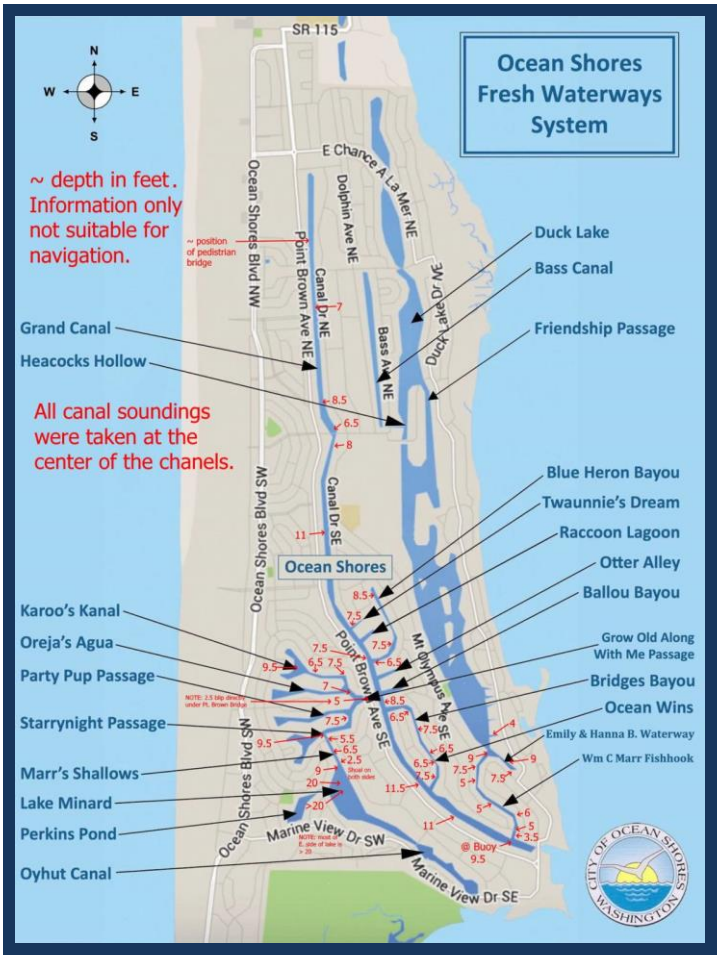
The City of Ocean Shores has a long history of protecting the waterways and instituting programs that facilitate healthy biological water communities. Fluridone was applied to Duck Lake during 2007 and 2008 in an effort to eradicate Brazilian elodea from the Duck Lake system. Brazilian elodea is recognized throughout Washington State as a Class A non-native species. Prior to treatment Brazilian elodea densities had achieved concentrations that restricted fishing and boat use lake-wide. Since 2008 no Brazilian elodea has been observed within the lake or canal waterways. Grass carp were planted throughout the system during 2009 and 2010 and yearly herbicide treatments were performed starting in 2015. Most recently the Department of Fish and Wildlife has encouraged the removal of all grass carp from the system.

As the current program evolves, efforts are currently underway to develop an integrated approach for the management of Duck Lake and the waterways. This integrated approach initiates a new path for the City to travel while continuing to research all alternatives available for the proper management of the waterways. Once viable alternatives are recognized, how they might be implemented in accordance with budgetary restraints will then need to be resolved.

Established Lake & Canal Zones

The majority of the waterway system consists of recreational and residential shoreline components. The canal system supports a no wake policy. This mandate protects the shorelines from erosion and reduces sediment suspension within the water column. The entire canal system is designated for fishing, swimming and boating. The extreme

northern portion of the Grand Canal is shallow with limited recreational opportunities. An established wetland occupies this portion of the canal.



Survey Protocol

The first phase of the 2021 plan focused on the collection of data associated with aquatic plant growth. Northwest Aquatic Ecosystems mobilized a hydro-acoustic mapping vessel to the lake on May 22, 23 & 28 2021 to collect data on the potential presence and distribution of aquatic plant growth throughout the system.

The NWAE plotting protocol utilizes state of the art Bio Base mapping technology. Algorithms process the 200 kHz broadband down-looking signal. The transducer unit emits 10-20 signals or "pulses" per second and the onboard computer then evaluates each signal. Some signals are obviously wrong and they are automatically discarded, good signals are retained. This system produces three map types consisting of a bathymetric contour, a sediment composition profile and a macrophyte density map. All maps are GIS friendly and can be exported into any GIS program. Maps are color coded so they can be easily evaluated by any viewer.

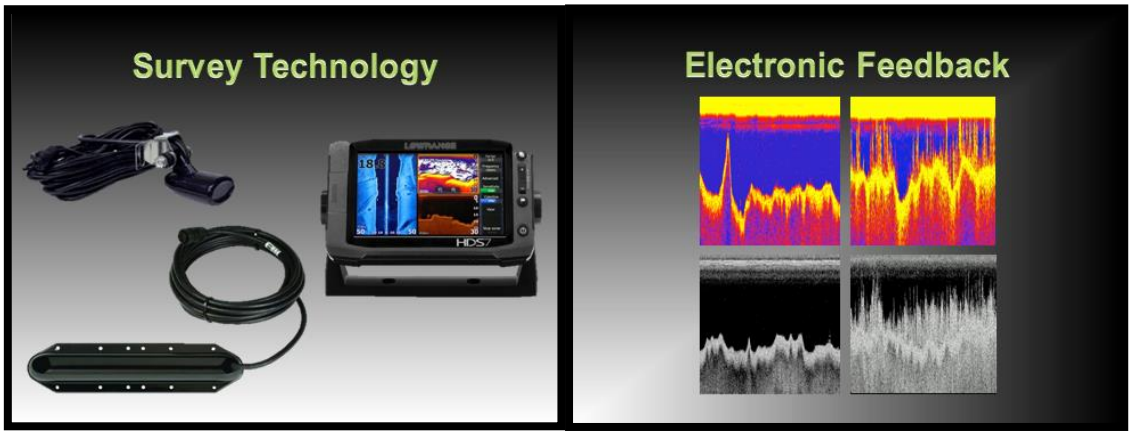
Mapping technology utilizes specialized transducers that electronically collect thousands of data points as the survey boat transects the lake's littoral zone. Data is recorded and viewed onboard. Each file contains one hour of survey data. A completed survey may be comprised of one or more files. Upon completion, all the program files are downloaded and processed. The survey and sonar log produces a stored electronic file of the lake bottom that can be viewed in house at any time and allows the ability to view plant growth along the boats entire survey track.

Survey vessel tracks

Our protocol encompasses a surface vehicle transecting the lake along the entire littoral zone. Boat tracks are designed to be approximately 150 feet apart. Sonar beam data collection extends approximately 150 feet from all directions surrounding the boat. To ensure the efficacy of the survey, a bottom sampling rake is thrown from the boat at various locations lake-wide. The rake is then drawn across the lake bottom, brought to the surface and into the boat. Plants attached to the rake are identified and confirmed as being the same species as noted through the structure scan or visually noted through the water column. This sampling point is then incorporated into the file data log as a single point reference noting the species captured during the rake tow. These points are then added to the final project map.

Noted below is the equipment utilized during a survey event. The survey technology picture below identifies the chart recorder, transducer and structure scan electronics. The

electronic feedback picture displays real time data as being recorded and viewed on screen. Color and black/white photos identify a lake bed bottom without weed growth on the left, while pictures on the right depict weed growth throughout the water column.



Our program provides for a straight forward format for the interpretation of pre and post treatment results. **Another favorable component of this program is the ability to clearly define whether a treatment has successfully controlled the targeted species at an acceptable level, employing both visual and analytical tools to quantify treatment results.**

Data can be evaluated utilizing the following analytical tools:

BVw

Biovolume (All water): Refers to the average percentage of the water column taken up by vegetation regardless of whether vegetation exists. In areas where no vegetation exists, a zero value is entered into the calculation, thus reducing the overall biovolume of the entire area covered by the survey.

PAC

Percent Area Covered: Refers to the overall surface area that has vegetation growing.

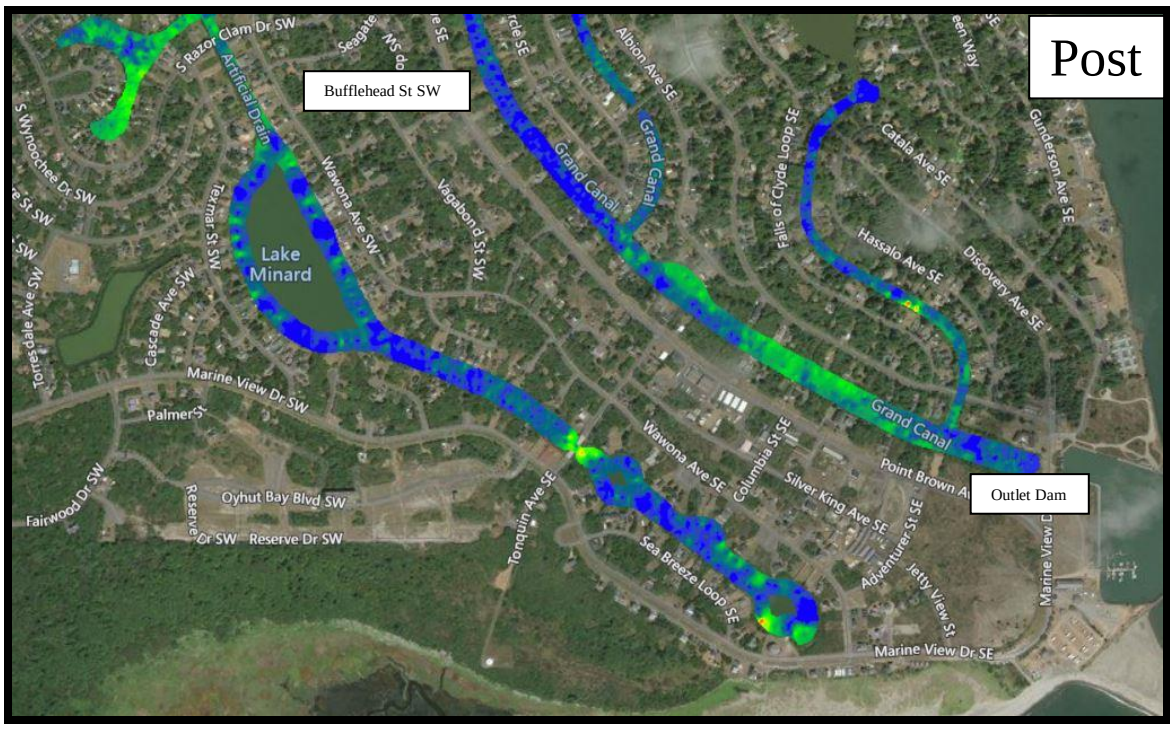
Pre-Treatment Survey - General Observations

1. Results and observations were similar to those noted during past yearly surveys
2. The entire canal system can be classified as a littoral zone. While littoral zone characteristics associated with Duck Lake are contained within the sixteen foot contour line.
3. Elodea and pondweeds inhabit most of the canals while only minor pondweed growth was noted in Duck Lake. Both systems support macro algae species.
4. Milfoil was noted within isolated occurrences of the Bell Canals and in the northern half of the Grand Canal.
5. Sporadic associated planktonic algae presence was noted throughout the entire system. No attempt was made to identify the species.

Pre & Post Electronic Survey Results - Canal Waterways

Survey interpretations can be visually evaluated utilizing color based scaling units. Blue areas categorize weed growth areas where no macrophytes were present while red zones identify weed growth at 100 percent coverage.

Percent

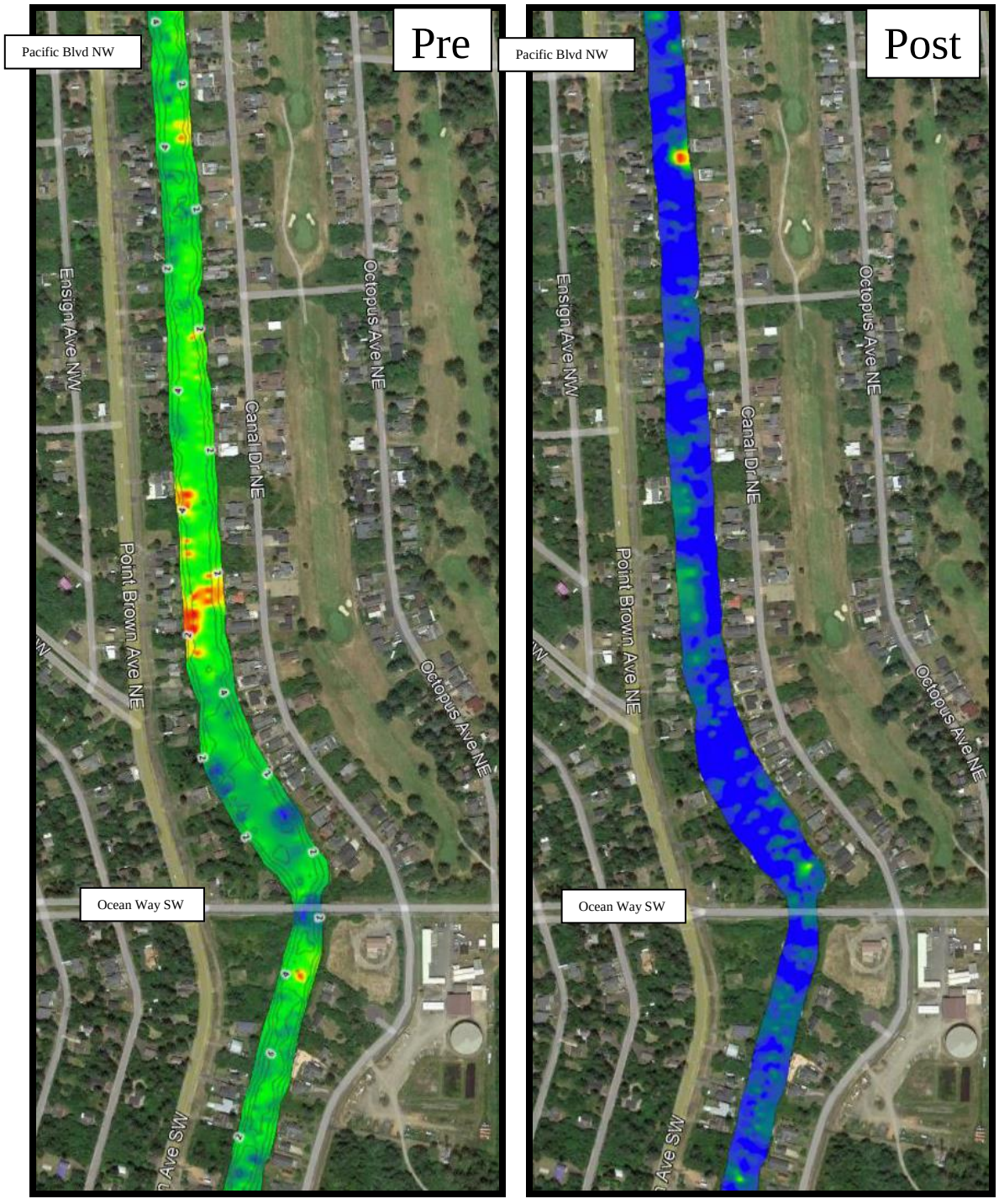



Pre
N Wynoochee Dr SW
Bufflehead St SW
Google Earth

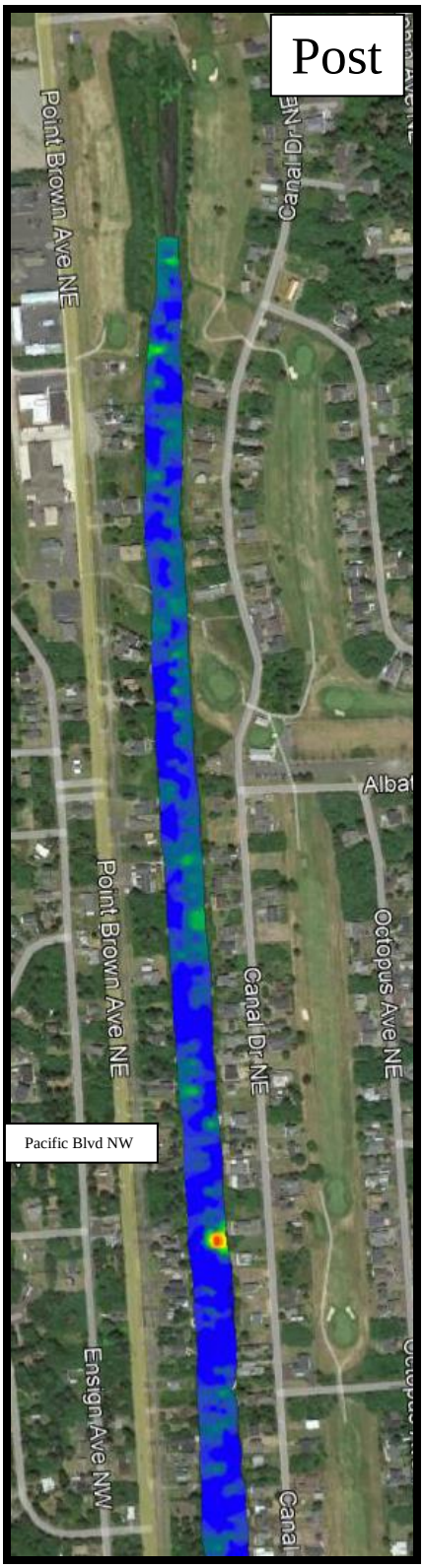

Post
N Wynoochee Dr SW
Bufflehead St SW
N Razor Clam Dr SW
N Wynoochee Dr SW
Cockle St SW
N Butterclam St SW
S Butterclam St SW
Otsego St SW
S Razor Clam Dr SW
S Wynoochee Dr SW
Seashore St
Artificial Drain
Wawona
Point Brown Ave SE
Grand Canal
Quinault Ave SE
Skamokawa Ct
Cakesosta Ave SE
Sollecks Ave SE
Mount Olympus Ave SE
Albion Ave SE
Island Circle SE
Woodduck Ct SE
Seagate St SW


Pre
Ocean Way SW
Point Brown Ave SW
N Wynoochee Dr SW

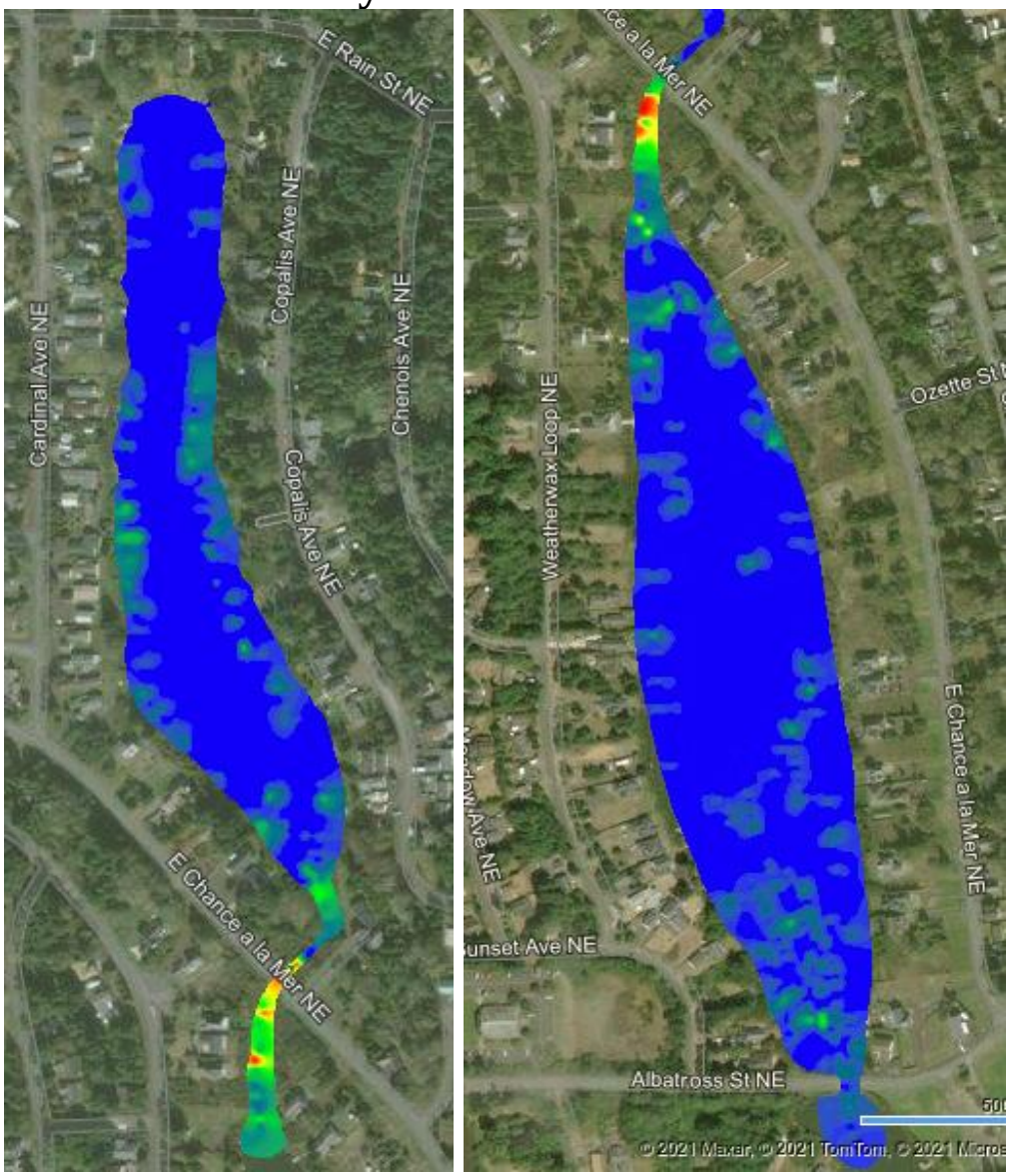

Post
Ocean Way SW
Ocean Lake Way NE
Point Brown Ave SE
Canal Dr SE
S Narwhal Loop SW
Dorado Ave SW
Grand Canal
Mount Olympus Ave SE
Eridani Loop SE
Snahapish Ave SE
Quinault Ave SE
Lotloh St SE
Skookumchuck St SE
Mud Hen Loop SE
Malaah Ave SE
Wishkah St SW
Calawah St SW
Point Brown Ave SW
Quinault Ave SE
N Wynoochee Dr SW


Pre
Pacific Blvd NW
Ensign Ave NW
Point Brown Ave NE
Canal Dr NE
Octopus Ave NE
Octopus Ave NE
Ocean Way SW
Post
Pacific Blvd NW
Ensign Ave NW
Point Brown Ave NE
Canal Dr NE
Octopus Ave NE
Octopus Ave NE
Ocean Way SW

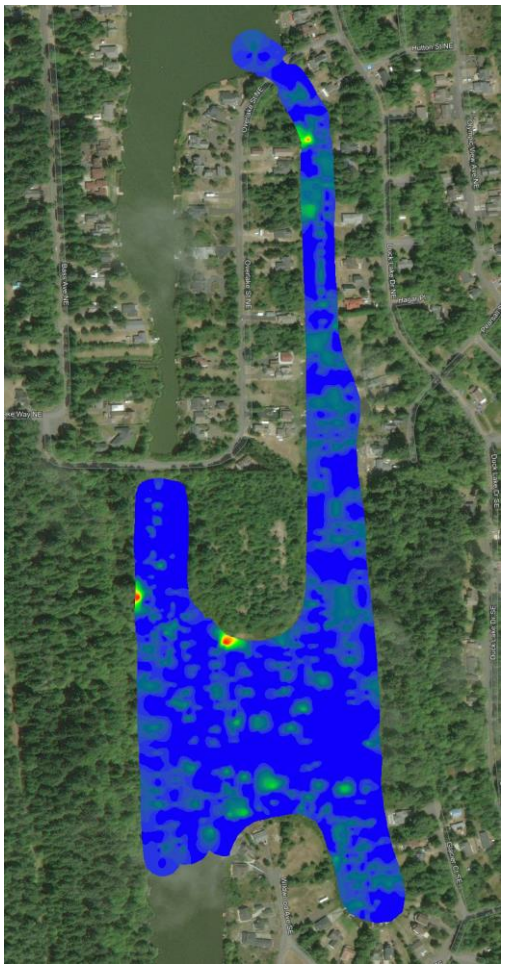

Pre
Point Brown Ave NE
Canal Dr NE
Albatros
Point Brown Ave NE
Canal Dr NE
Octopus Ave NE
Pacific Blvd NW
Ensign Ave NW
Octopus Ave NE
Canal Dr N

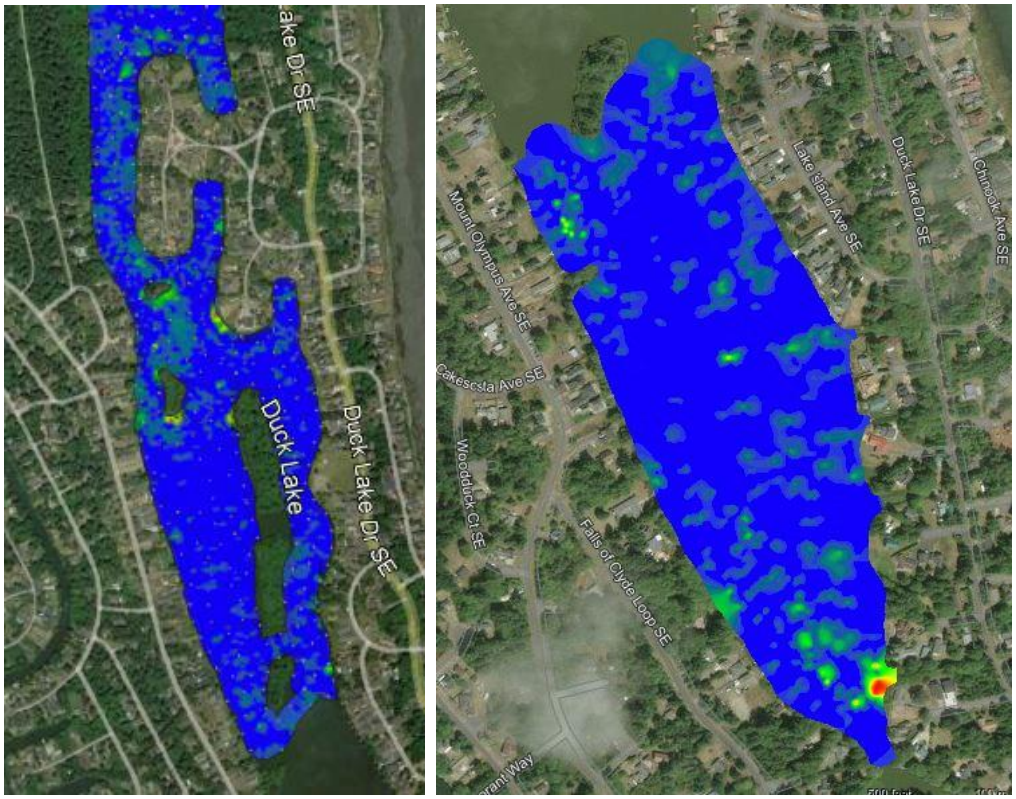

Post
Point Brown Ave NE
Canal Dr NE
Alba
Point Brown Ave NE
Canal Dr NE
Octopus Ave NE
Pacific Blvd NW
Ensign Ave NW
Canal

Electronic Survey Results Duck Lake




Albatross St NE
Lakeview Loop NE
Bass Ave NE
Duck Lake
Dolphin Ave NE
Bass Ave NE
Lakeview Loop NE
Duck Lake Dr NE
Olympic View Ave NE
Fisher Ave NE
Overlake St NE
Pearsall St
Lake Way NE





Pre-Treatment Residential Notice

Residential treatment notices were mailed out to all property owners within the waterways systems on June 30, 2021. The mailing list was generated from a list of legal property owners within the waterways system. The list consisted of nearly 2,300 property owners currently on file with the City of Ocean Shores. Notification contained information directed at potential treatment sites, dates of treatment and materials approved for use. All of the information included within the notification was required as per the NPDES permit issued for the project.

Pre-Treatment Newspaper Notification

A pretreatment notification was published in the Daily World. The information provided within the publication outlined general information about the upcoming treatment and contact numbers for the City of Ocean Shores and Northwest Aquatic Ecosystems.

Pre-Treatment Shoreline Posting

Shoreline posting of the targeted treatment sites occurred over a three day time frame of July 24, 25 & 26, 2021. Two vessels were utilized to complete the task comprising of one or two person crews. Signage entailed two 8.5 x 11 inch posting secured to docks or shoreline trees. One sign faced the water while the other was placed in a visible location

legible from the shoreline. Posting text consisted of information pertaining to treatments dates, material applied and water use restrictions. Larger 3 ft. x 4 ft. postings were placed at all of the public boat launch locations. Public boat launch signage contained all of the same information provided in the smaller shoreline postings but also supported a map indicating the targeted treatment sites. All signage was consistent with the NPDES requirements identified within the permit.

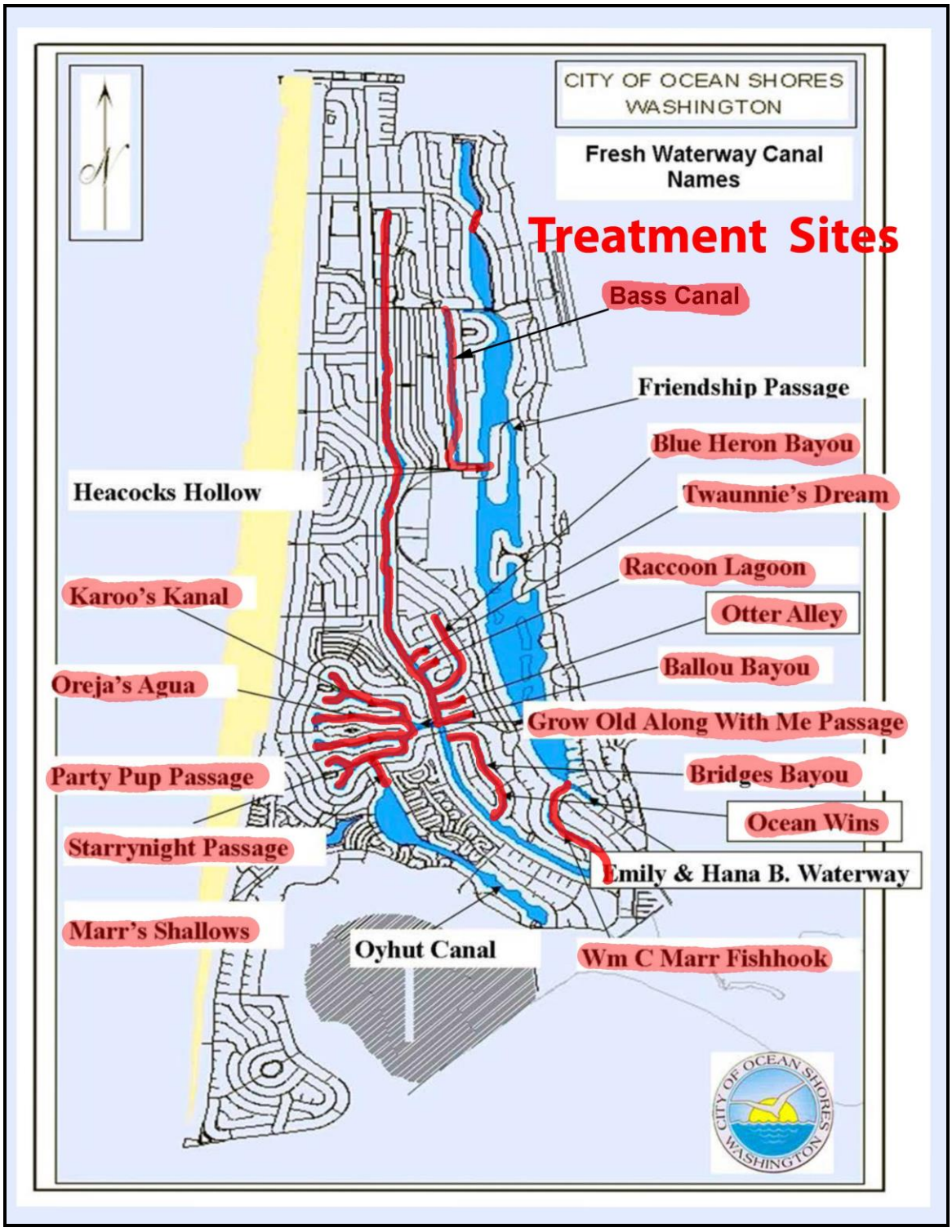
Canal Treatments July 26th & 27th

A private residential property was utilized as the staging area for treatment. Boats were launched from the Marine View Boat launch and moored at the staging area. The 2021 treatment model was designed similar to the prior models with many of the same sites that had been historically targeted were once again identified as treatment locations. The presence of elodea throughout the waterways resulted in only one financially responsible option available for submersed weed control. Diquat was applied at label rates ranging from one to two gallons per surface acre.

Material was offloaded from a locked container truck and transferred into two 25 gallon spray tanks mounted on the application boat. Containers were triple rinsed on site and returned back into the truck empty. Herbicides were applied utilizing an 18 foot Airgator airboat. For submersed weed control, lake water was drawn into the boat through intake ports located in the hull of the boat. Herbicide was then metered into the inflowing lake water via an injection manifold. Once the herbicide was injected, the lake water/herbicide mixture was then discharged back into the lake. Weighted hoses were used to place the material at the appropriate depths in the water column. As weed height changed, the injection hoses were raised and lowered to discharge above the growth canopy.

Prior to treatment, a lake treatment map identifying treatment plots was downloaded into the onboard GPS system. The treatment boat utilized the onboard GPS to identify treatment site boundaries.

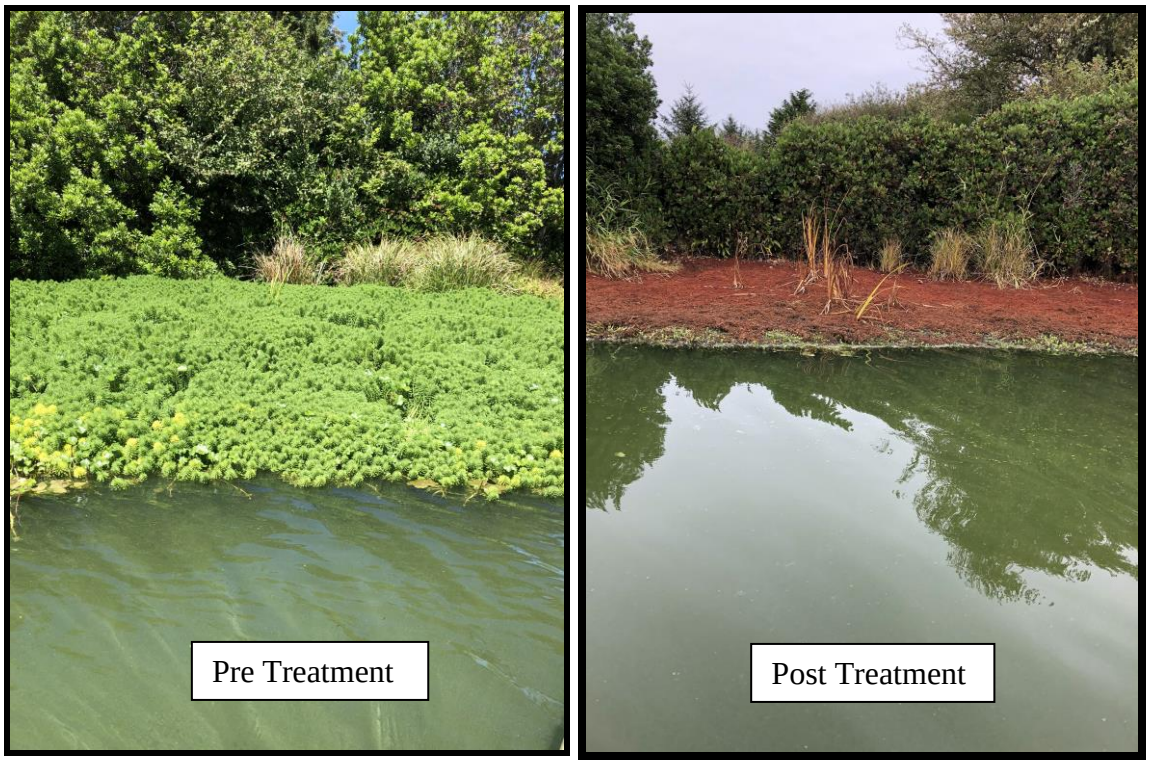
Shoreline floating pennywort control was accomplished with a 1% solution of triclopyr and surfactant. The 25 gallon spray tanks were filled with lake water, herbicide and surfactant. Once mixed, the application boat drove along the shoreline identifying targeted floating plants. The spray mixture was then discharged using a spray gun. When emptied, the tanks were refilled and the process was repeated until all the targeted shoreline sites received treatment. Many of the areas not specifically targeted for penny wort control through the targeted surface application of triclopyr received varying degrees of control resulting from the diquat applications. Diquat is identified on the label as a viable seasonal means to control pennywort.


CITY OF OCEAN SHORES
WASHINGTON
Fresh Waterway Canal Names
Treatment Sites
Bass Canal
Friendship Passage
Blue Heron Bayou
Heacocks Hollow
Twaunnie's Dream
Raccoon Lagoon
Karoo's Kanal
Otter Alley
Ballou Bayou
Oreja's Agua
Grow Old Along With Me Passage
Party Pup Passage
Bridges Bayou
Ocean Wins
Starrynight Passage
Emily & Hana B. Waterway
Marr's Shallows
Oyhut Canal
Wm C Marr Fishhook
CITY OF OCEAN SHORES WASHINGTON

Parrotfeather Treatments July 16th & September 2nd

Parrotfeather treatments were performed utilizing an 18 foot aluminum boat equipped with a 25 gallon on board spray tank. Herbicide was mixed on board and then discharged over the targeted sites with a hand held spray gun. Triclopyr was mixed at a 1% tank solution with adjuvant. Prior to the spray event the shoreline area was posted with signage notifying property owners that the area had been targeted. The spray vehicle traversed along the shoreline, driven by the boat operator, while the applicator applied material when appropriate. The majority of the two spraying events occurred within the extreme southern portion of the canal that enters Lake Minard near the water tower storage facility. Approximately 6-12 smaller sites were targeted within the Bell Canals. Parrotfeather was also identified to be present in the northern wetland area of the Grand Canal later in the season. The initial survey boat was unable to access this area due to a shallow water level and dense pennywort growth. Access was only possible through the use of an airboat.

Primary Parrotfeather Targeted Site

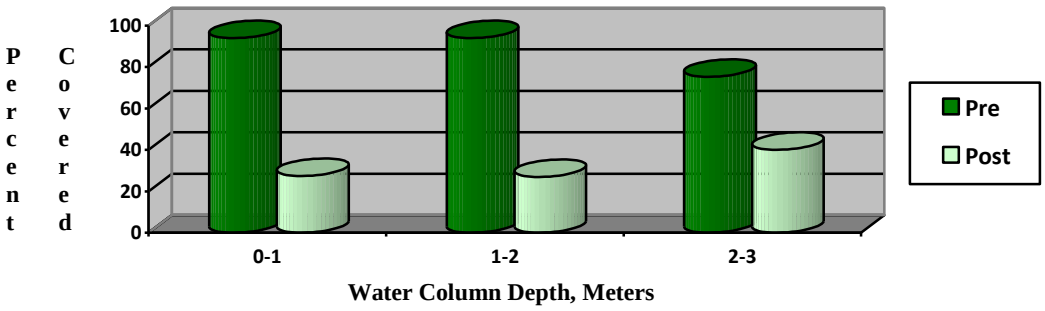


The typical plant response associated with triclopyr consists of an initial wilting and curling of the plants over the weeks following application. Eventually the plants dry and start to degrade while retaining a brown reddish coloration.

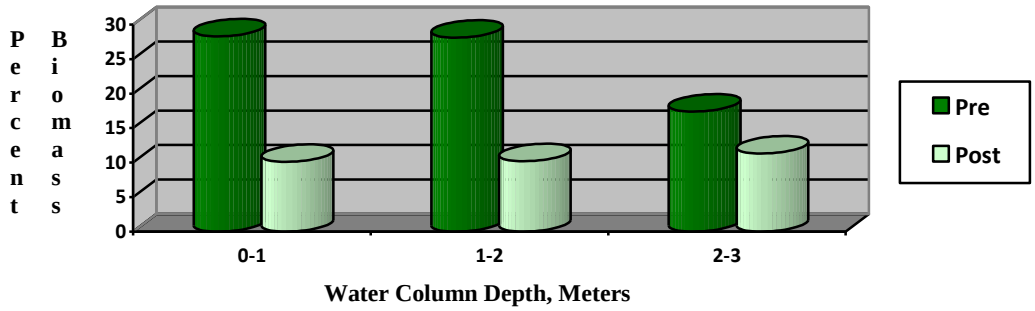
Post Treatment Canal Observations

Grand Canal Treatment Site – Pre treatment bottom plant growth canal average coverage consisted of 91.6% of the Grand Canal bottom sediments supporting macrophyte growth. Post treatment coverage was reduced to 30.6%. Average percentage of the water column taken up by biomass prior to treatment was 25% while post treatment biomass occupied only 3.2% of the water column.

Pre & Post Treatment Canal Macrophyte Bottom Coverage



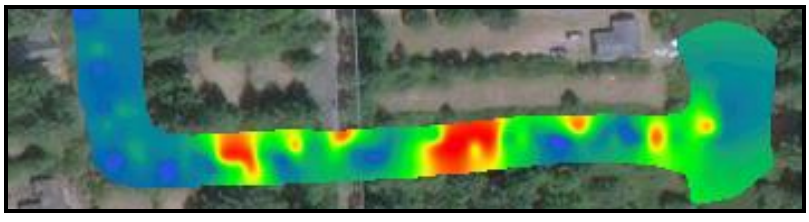
Pre & Post Treatment Macrophyte Water Column Biomass



Most of the plants identified in the Grand Canal were low growing macro algae. Macro algae typically pose no recreational hazards as a result of their low growth profile rarely inhabiting upper level surface waters. Macro algae are not readily susceptible to diquat use and their presence benefits the waterways by providing a species that stabilizes the bottom sediments while also establishing necessary coverage for the smaller fish and fry.

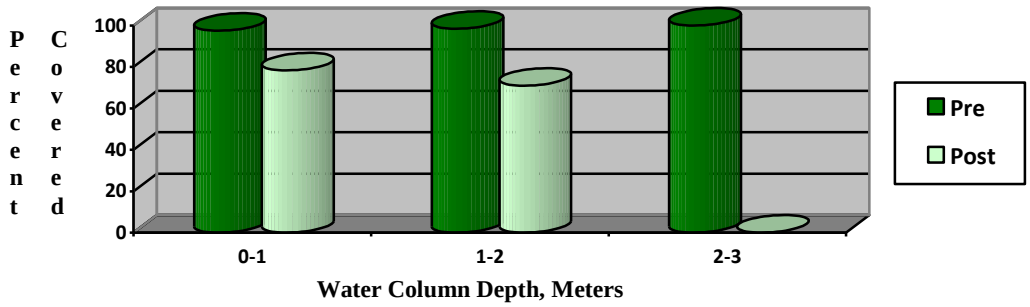
Bass Canal Treatment Site – Bass Canal Pre treatment bottom plant growth consisted of 98.1% of the canal bottom sediments supporting macrophyte growth. Post treatment coverage was reduced to 74.5%. Average percentage of the water column taken up by biomass prior to treatment was 16.2% while post treatment biomass occupied only 8.0% of the water column. Water depth range during the May survey was 0-7 feet with an average depth of 3.5 feet. Bass Canal appears to be one of the shallower canals within the waterway system. At the time of treatment pondweeds had reached the waters' surface at several locations of the canal. Such areas would be represented by the dark green map colorations. Both pondweeds and elodea were dominant throughout the waterway. Bass Canal also supported a heavy growth of macro algae both pre and post treatment. Macro algae may pose recreational fishing issues that are often associated with shallow lake environments.

The entrance to the main canal supports both submersed weed and floating plant growth issues. Floating plants consist of lily pads and spadderdock. The floating plants were targeted only once during the 2021 season and by the close of the season it was hard to distinguish if any progress had been made at reducing biomass.

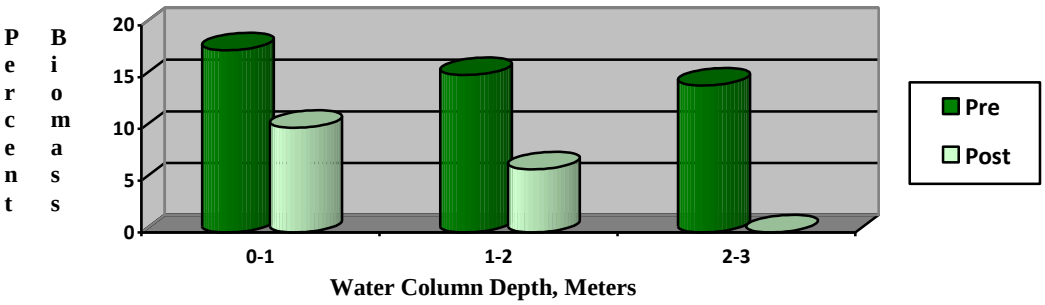


Bass Canal Entrance

Pre & Post Treatment Bass Canal Macrophyte Bottom Coverage



Pre & Post Treatment Bass Canal Macrophyte Water Column Biomass



Bell Canal Treatment Site - This area consists of four finger like canals that interconnect and discharge into the Grand Canal. The area historically has been evaluated as a top tier candidate for weed control activities. Sporadic milfoil is present throughout the four fingers. During the post treatment survey the site was plagued with significant filamentous algae issues.

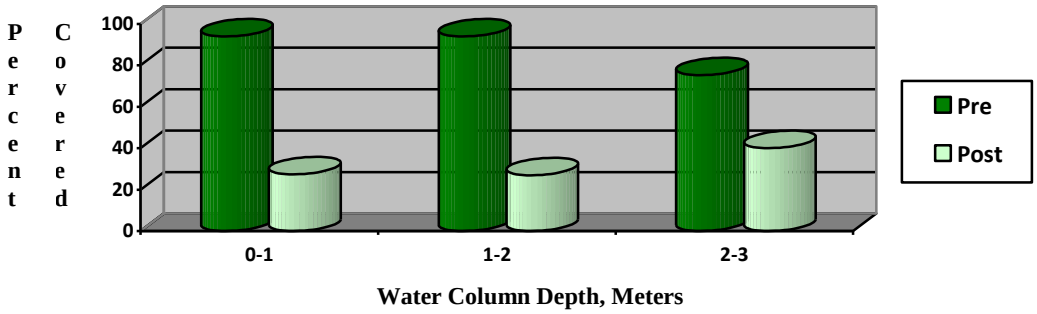
Filamentous mats resulted in poor access to the near shoreline areas resulting from intake ports becoming clogged on the outboard. Bottom substrate throughout the site had extensive nitella and chara filamentous algae growth. These algae types are typically mistaken as aquatic macrophytes.

Nitella

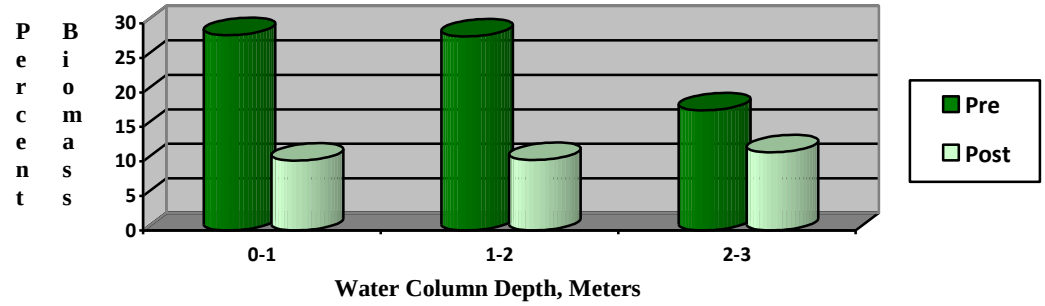
Bell Canal pre treatment bottom plant growth consisted of 74.0% of the canal bottom sediments supporting macrophyte growth. Post treatment coverage was increased to 84.5%. Average percentage of the water column taken up by biomass prior to treatment was 12.8% while post treatment biomass was slightly reduced to 11.6% of the water column.

Post treatment survey results in relation to true aquatic plants present within the systems is a difficult number to evaluate because of all the filamentous algae floating throughout the system and anchored to the bottom. These algae species that were dominant throughout the area during the survey are identified as aquatic plants when the survey data was processed. Survey transducers are heat sensitive so any object emitting heat is stored as a data point. The area was void of pondweeds and had limited elodea shoreline growth.

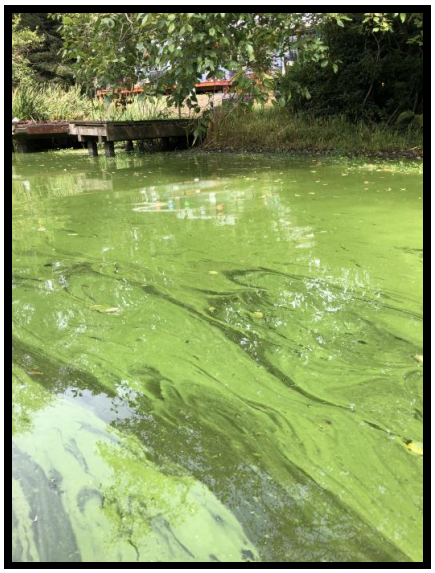
Pre & Post Treatment Bell Canal Macrophyte Bottom Coverage



Pre & Post Treatment Bell Canal Macrophyte Water Column Biomass

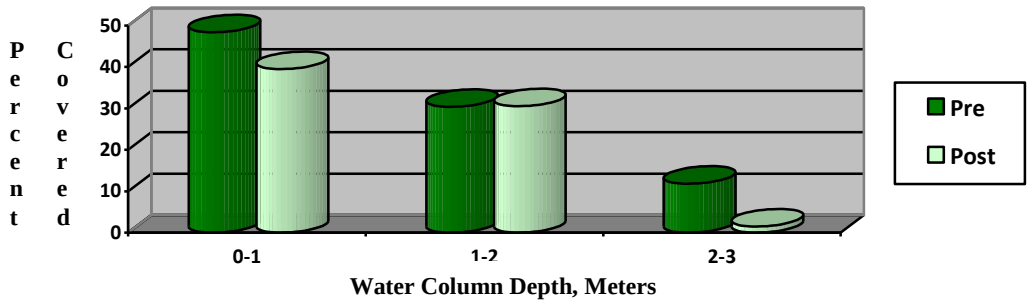


Fishhook Canal Treatment Site – Fishhook Canal is a narrow waterway that connects Duck Lake to the Grand Canal. This canal likely receives the heaviest watercraft activity as vessels journey from Duck Lake to the Grand Canal. The shallow nature of the waterway with an average depth of only 3 feet has historically posed a number of issues associated with plant and algae growth. Shorelines that experience dense pennywort growth at times have created access issues. Stagnant nutrient rich canal waters seasonally are troubled with planktonic related algae issues. Weed and filamentous algae growth pierces the water's surface early during the season as a direct result of the canals shallow depth. Deciduous trees overhanging the waterway create a yearly organic nutrient sink to the historically rich canal bottom sediments.

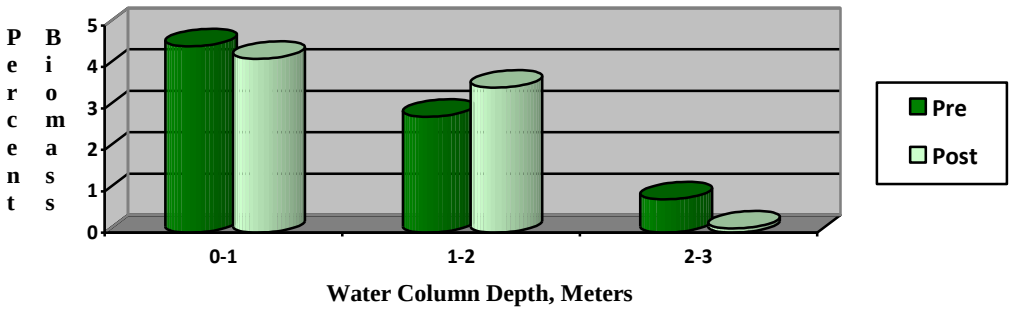


Fishhook Canal Pre treatment bottom plant growth consisted of 37.2% of the canal bottom sediments supporting macrophyte growth. Post treatment coverage was only slightly reduced to 36.6%. Average percentage of the water column taken up by biomass prior to treatment was only 3.4% while post treatment biomass increased to 4.0% of the water column. Bottom emerging filamentous algae replaced macrophytes that had responded favorably to the treatment. Areas once infested with weed growth were now recolonized with macro algae. This ecological progression from aquatic macrophytes to low growing macro algae species is a common occurrence and prevalent throughout the entire canal waterway system.

Pre & Post Treatment Fishhook Canal Macrophyte Bottom Coverage



Pre & Post Fishhook Canal Macrophyte Water Column Biomass



Auxiliary Canals – The smaller canals adjacent to the Grand Canal all contained both pondweeds and elodea. Densities were inconsistent throughout all of these sites.

Recommendations and Thoughts for 2022

This is the first year the weed control program has been elevated to a greater presence and awareness within the city government and local residents. Increased awareness from all residents provides for a larger pool of comments, thoughts and recommendations to consider and for the city to evaluate. Although this report is not designed to elaborate on all potential control alternatives as an IAVMP might, the City of Ocean Shores has been examining aquatic weed harvesting opportunities. In conjunction with the cities research, Northwest will provide potential waterway locations that may prove viable as a harvesting demonstration project for the 2022 campaign.

1. Elodea is the dominant species throughout the system. Chemical control of elodea can only be accomplished in a fiscally responsible fashion through the use of diquat. Diquat is used throughout the United States annually to control aquatic plants and is permitted for use within Washington State. Fluridone could be considered as a control alternative. However, it would increase the per acre expense nearly fourfold requiring a yearly budget in the range of $250,000.00.

2. Nitella and Chara, both low growing filamentous algae species, were noted throughout the waterways recolonizing areas once inundated with aquatic plants. As bottom sediments become exposed, due to the loss of vegetation, these low growing species typically respond quickly to the available habitat and form thick mats along the bottom. Identification is important when evaluating the success or failure of treatment.

3. Continue control of parrotfeather consisting of two spraying events system wide. Current targeted locations will need to be increased to include the northern wetland area at the far end of the Grand Canal.

4. Mailing of residential treatment notices.

5. No spraying has been requested for the Bass Canal for either submersed or shoreline plant control for the 2022 season. NWAE would recommend, however, that the entrance to the Bass Canal east of the Bass Ave NE bridge be surface sprayed for floating plants twice during the season or manual cutting of the submersed floating plants. Without intervention, access to Bass Canal may be restricted later in the season.

6. The passage way under the E Chance A La Mer NE bridge was mistakenly not addressed during the 2021 season. Although the area was targeted and budgeted for both emergent and floating plant control, none occurred. Either spraying of the site or manual control should be rescheduled for the 2022 season. Without intervention, access will prove to be difficult.

7. Continue pre and post electronic surveys similar to those performed in prior years within all waterways except Duck Lake. Duck Lake is not scheduled for treatment during 2022. Little change in plant diversity or range has occurred over the last ten years. If conditions change that may warrant a survey, then discussions addressing such would be prudent.
8. The 2022 Spring survey will be used to delineate potential treatment sites. There likely will not be a major shift to include other sites for 2022 other than those sites that had been historically treated but did not receive treatment during 2021. A new one acre site directly under the Tonquin Ave bridge should be considered as a potential candidate for the 2022 season.

9. The outlet dam structure requires either manual or chemical control of cattails, pennywort and other emergent vegetation to ensure outflow is not restricted.
10. During the fall survey, problematic duckweed issues were noted in Bridges Bayou Canal. Although duckweed is a common occurrence throughout the waterways, various canals throughout the years have developed dense growth mid to late season. Once established, this floating plant has a tendency to remain viable for weeks to months floating from one portion of the canal to another. Not as problematic as submersed weed growth or current issues confronting Fishhook Canal but perhaps budgetary overflow could be directed to potential duckweed issues.

11. Northwest Aquatic Ecosystems over the last fifteen years has expended countless hours traveling the Ocean Shores canal waterways. Fishhook Canal likely supports and maintains the most problematic planktonic algae issues system wide. Blooms typically result in foul smelling canal waters and render the area as a recreational eyesore. As the main waterway connecting Duck Lake to the Grand Canal, this waterway is traveled heavily by tourists and the local community during the summer months. Minimal effort has been undertaken in the past to curtail these unsightly blooms. No long term solution may be available, however, efforts should be undertaken to curtail such blooms or reduce their intensity. Stripping the water column of its nutrients is one option. The other approach would be to treat the onset of a bloom with a peroxide based algaecide. Either approach would be at best seasonal in nature. Either treatment approach may only provide a few days or months of control. One experimental application of a nutrient reduction product or peroxide based algaecide should be considered as a first step effort at reducing further blooms within the canal.

Fishhook Canal Summer Algal Bloom

12. Harvesting as a non-chemical approach would also appear to be an option that could be implemented on a small scale experimental pilot program during 2022. Numerous issues that could possibly eliminate this option as a viable alternative would first need to be evaluated on a small scale basis. The long narrow canal design poses a unique set of problems not associated with typical lake configurations. Any harvesting site would need to be isolated from potential herbicide drift that may skew the data collected during the seasonal harvesting

program. NWAE has identified three potential harvesting sites that should be considered if harvesting is performed during 2022.
The sites are as follows:

- Grand Canal north of Pacific Blvd NW. This is approximately an 8 acre site located at the north end of the Grand Canal.
- Oreja's Agua and or Party Pup Passage canals. These two sites are approximately 6 acres located in the middle of the Bell Canals.

All three sites would be buffered from any potential herbicide application.

13. The Project budget for the 2022 season appears to be in the $60,000.00 range. Once treatment priorities are discussed and determined, a final budget and 2022 plan will be established. If all the recommended treatment options are approved, the budget would be exceeded. It is not anticipated that all options will be approved.

Project Costs For 2022

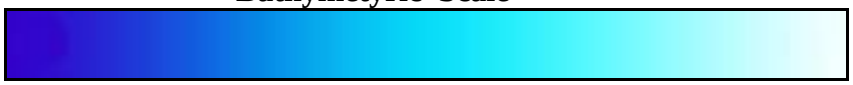
Anticipated expenses on a per site basis have not yet been determined. Material pricing is expected to increase at the onset of the new year. Some materials may be unavailable. Transportation issues occurring nationally and experienced during 2021 may also persist in the 2022 season. Labor force reduction nationwide and the ability to retain hard working employees may also pose program expense issues. Although we are confident of the budget amount ($60,000.00), how those funds will be administered within the program still needs to be determined.

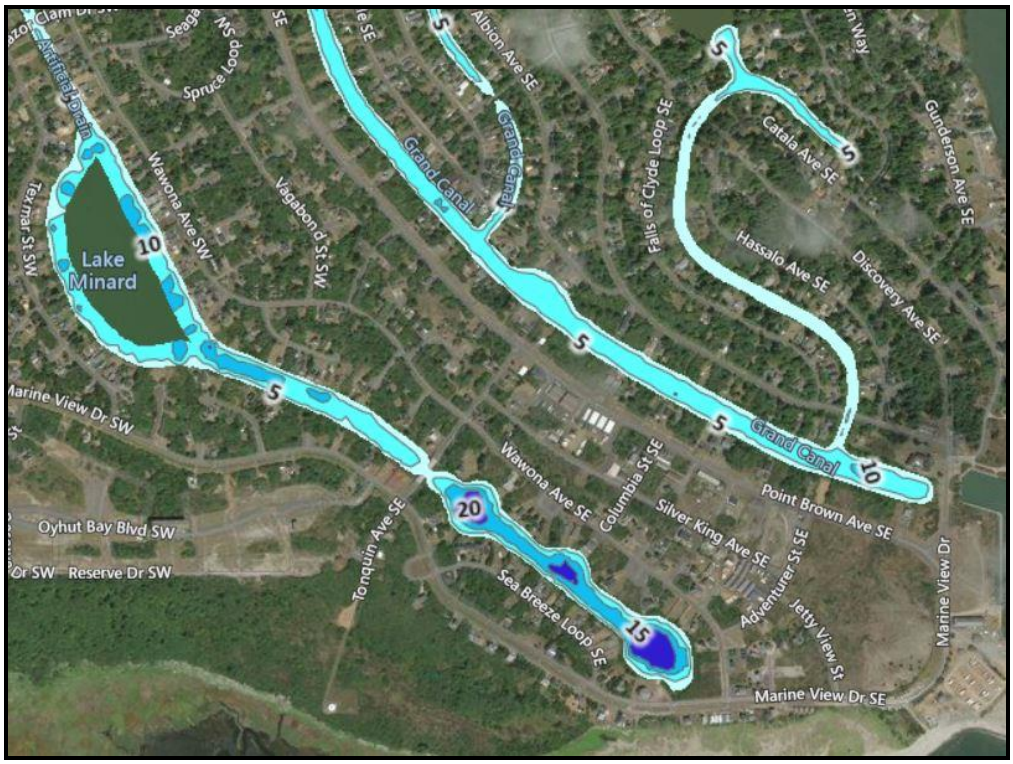
Bathymetric & Sediment Composition

Sediment Composition Scale

Hard  Soft

Bathymetyric Scale

20 Feet  Shoreline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Grand Canal
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Spruce Loop SW
Artificial Drain
Wawona Ave SW
Vagabond St SW
Texmar St SW
Falls of Clyde Loop SE
Catala Ave SE
Gunderson Ave SE
Hassalo Ave SE
Discovery Ave SE
Marine View Dr SW
Wawona Ave SE
Columbia St SE
Silver King Ave SE
Point Brown Ave SE
Oyhut Bay Blvd SW
Reserve Dr SW
Tonquin Ave SE
Sea Breeze Loop SE
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Jetty View St
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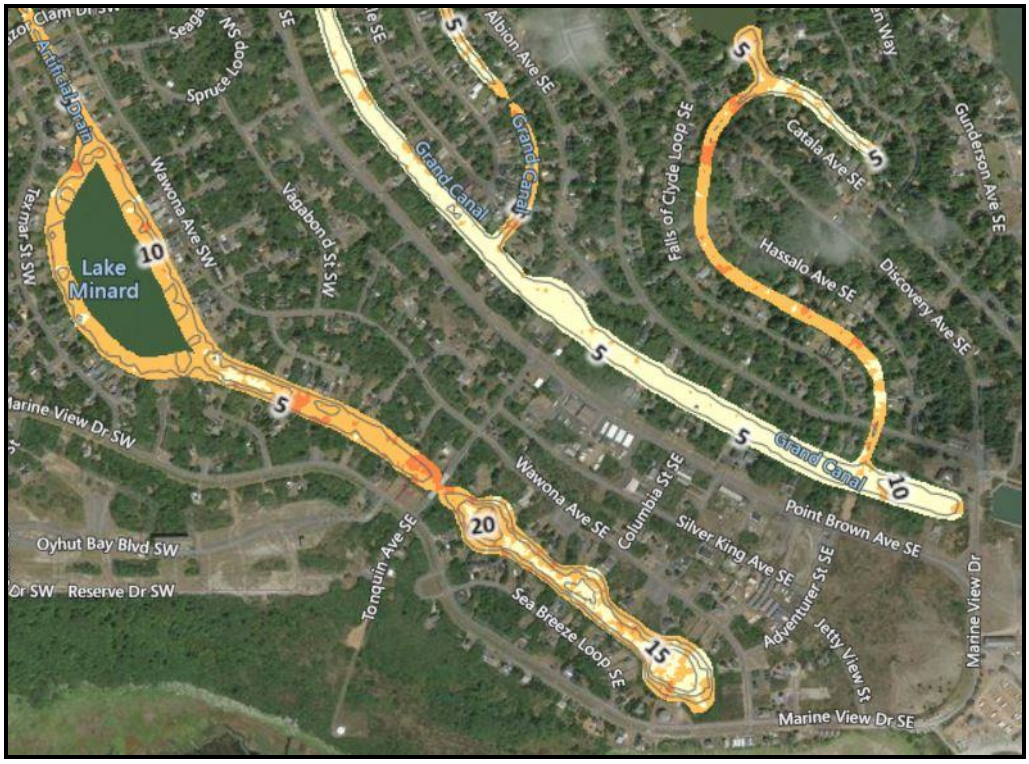
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Discovery Ave SE
Marine View Dr SW
Wawona Ave SE
Columbia St SE
Silver King Ave SE
Point Brown Ave SE
Oyhut Bay Blvd SW
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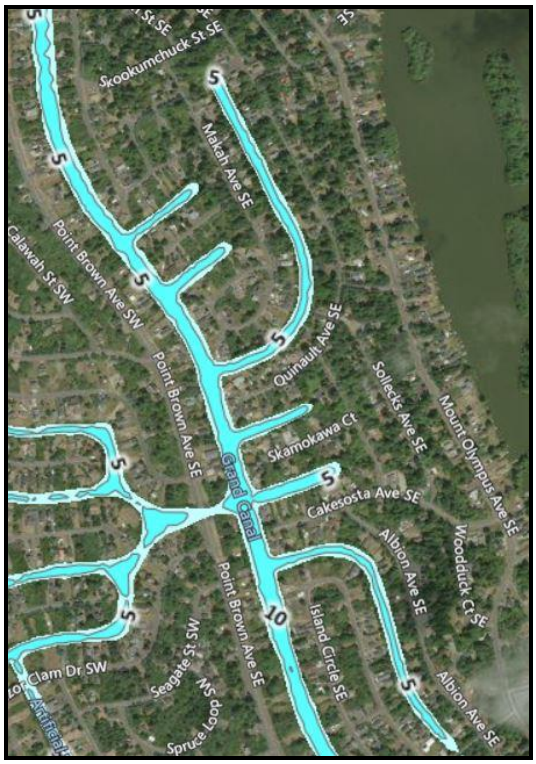
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Makah Ave SE
Calawah St SW
Point Brown Ave SW
Point Brown Ave SE
Quinault Ave SE
Sollecks Ave SE
Mount Olympus Ave SE
Skamokawa Ct
Grand Canal
Cakesosta Ave SE
Albion Ave SE
Woodduck Ct SE
Island Circle SE
Clam Dr SW
Seagate St SW
Spruce Loop SW
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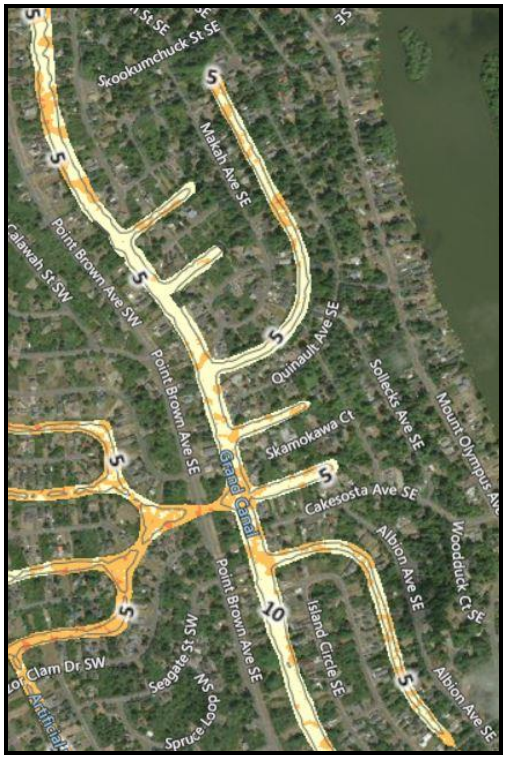
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Albion Ave SE
Woodduck Ct SE
Island Circle SE
Clam Dr SW
Seagate St SW
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Ocean Lake
Canal Dr SE
Point Brown Ave SW
Grand Canal
Point Brown Ave SE
Canal Dr SE
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Ocean La
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Grand Canal
Point Brown Ave SE
Canal Dr SE
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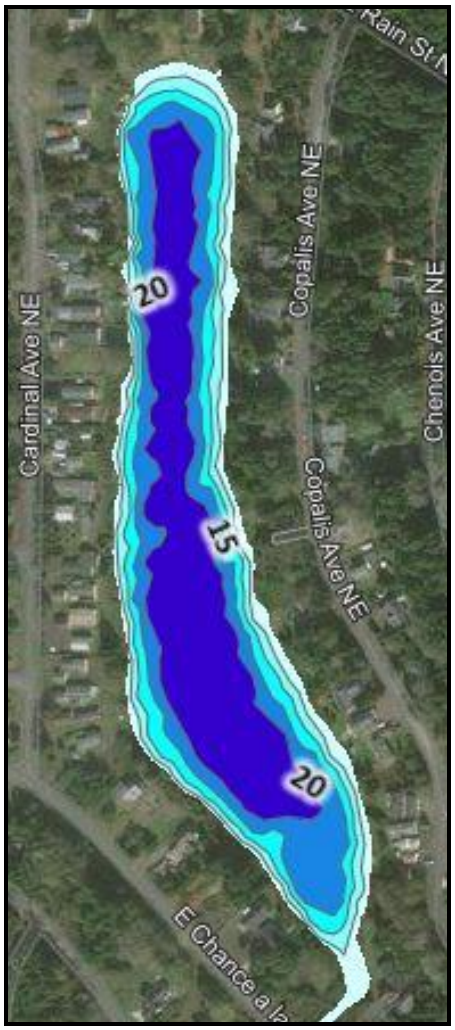
Point Brown Ave NE
Ensign Ave NW
Canal Dr NE
Octopus Ave NE
Perch St
Grand Canal
Ocean


Point Brown Ave NE
Canal Dr NE
Octopus Ave NE
Perch St
Grand Canal
Ocean


J.K. Lewis Dr
Ocean Shores Golf Course
Grand Canal
Ensign Ave NW
Canal Dr NE
NW


Ocean Shores Golf Course
Grand Canal
Canal Dr NE
Point Brow

Bass Canal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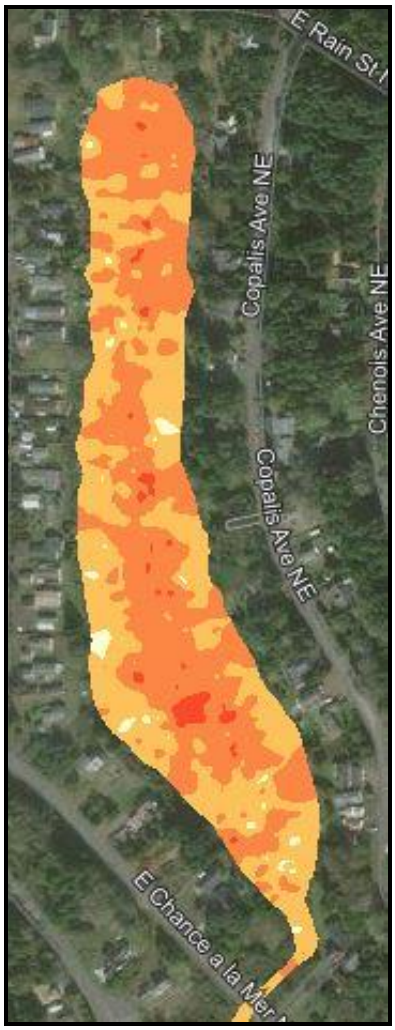
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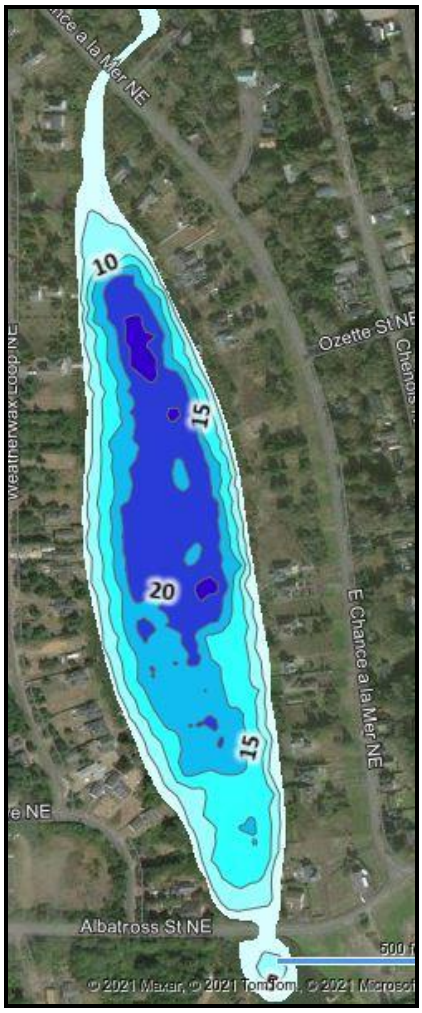
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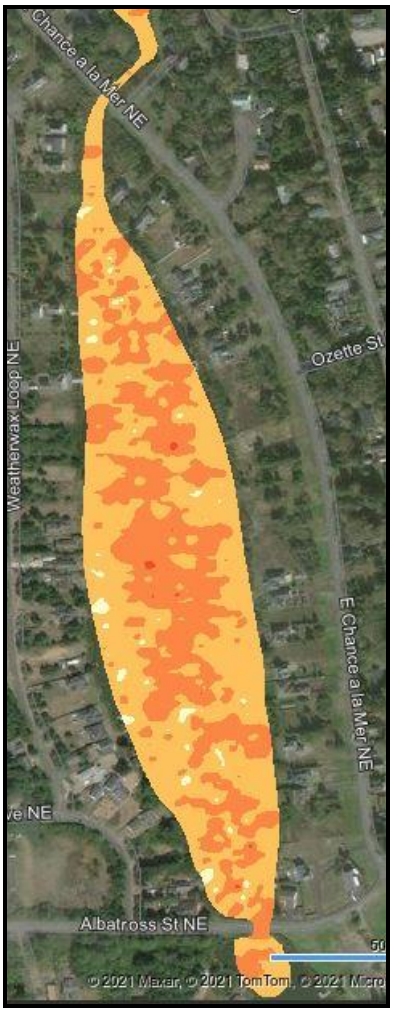
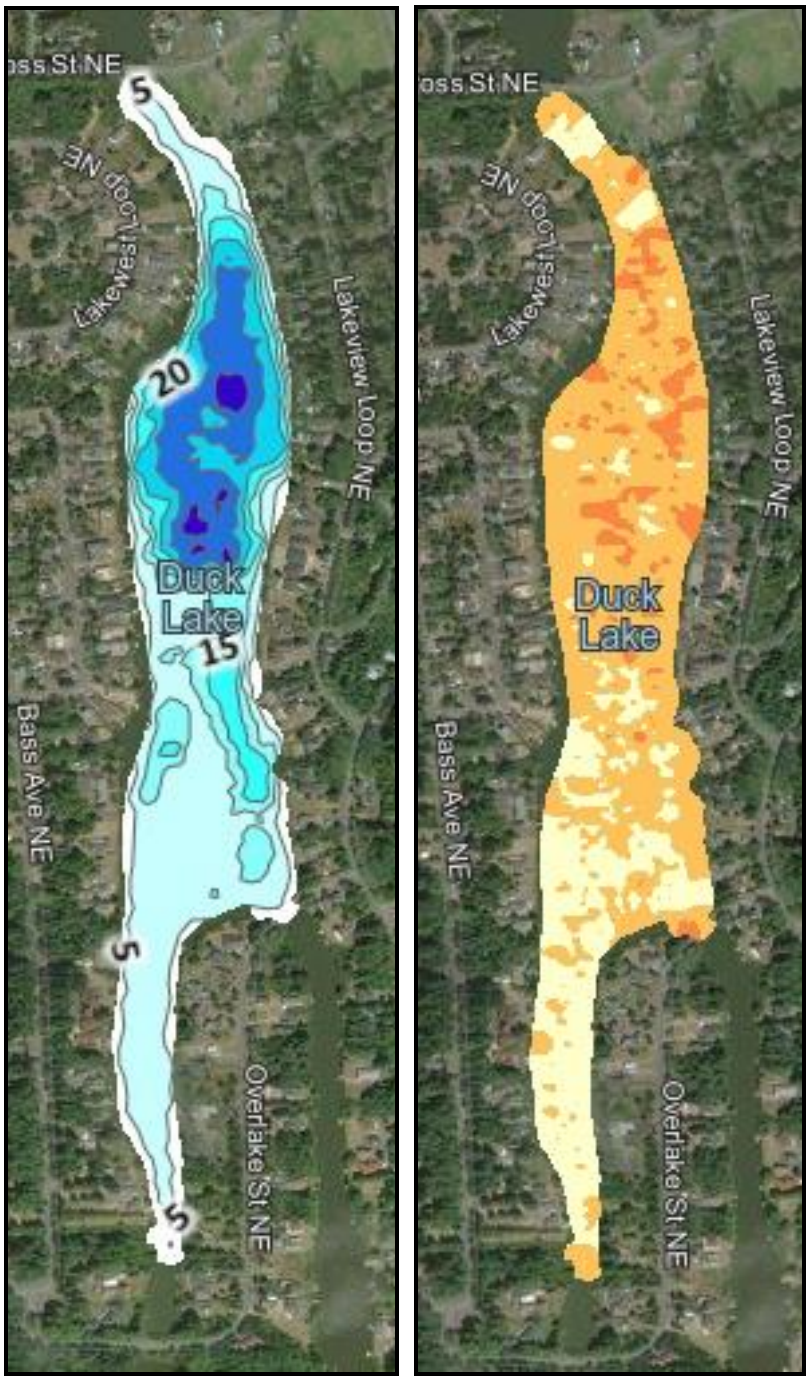
Ozette St NE
E Chance a la Mer NE
Albatross St NE
© 2021 Maxar, © 2021 TomTom, © 2021 Microsoft


Chance a la Mer NE
Weatherwax Loop NE
Ozette St
E Chance a la Mer NE
Albatross St NE
© 2021 Maxar, © 2021 TomTom, © 2021 Micro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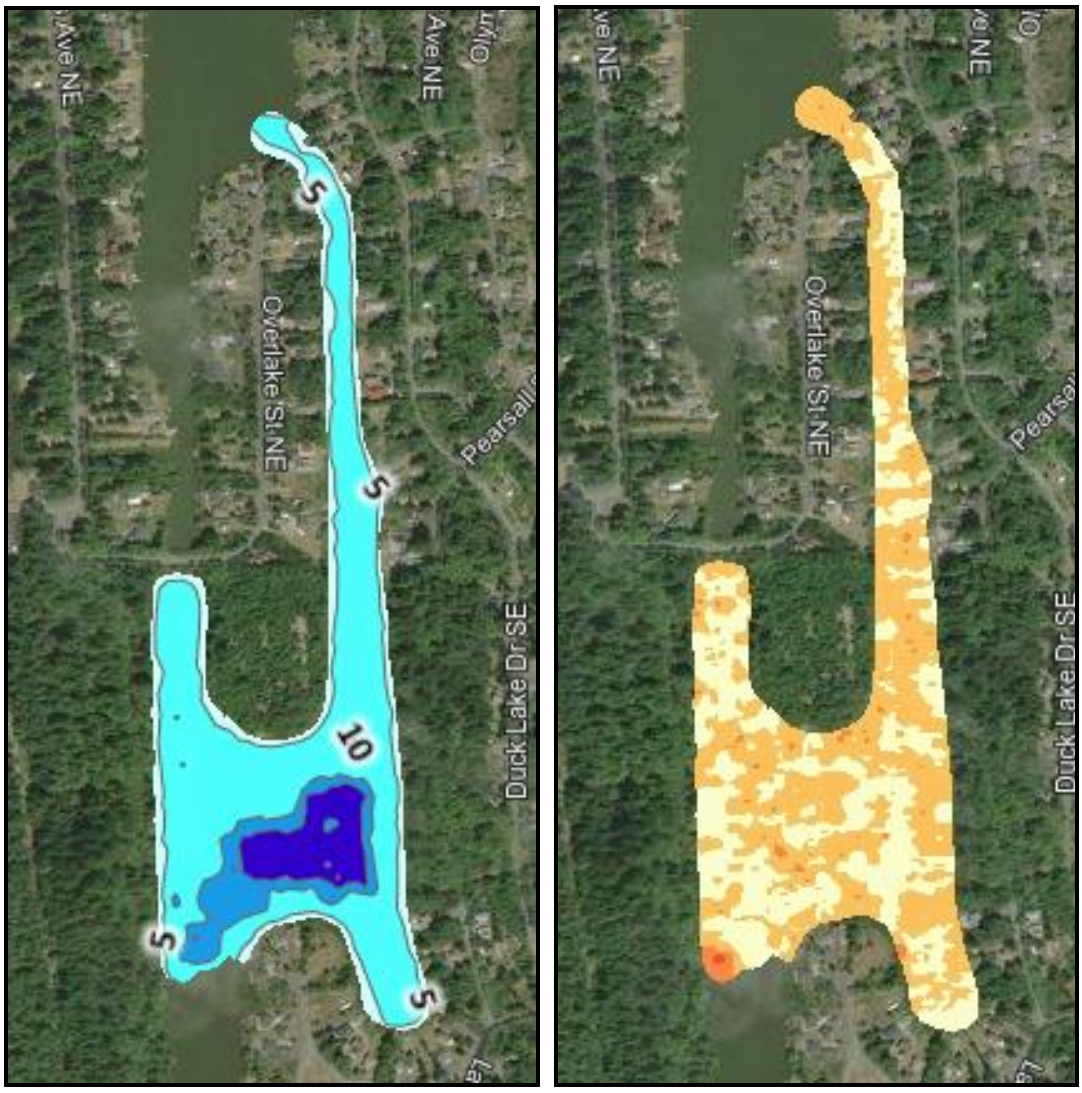
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Chaparral St SE
Wild Wood Ave SE
Lake Bay Loop SE

Chaparral St SE
Wild Wood Ave SE
Lake Bay Loop SE


Duck Lake Dr SE
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Mount Olympus Ave SE
Blue Wing Loop SE
Toleak Ave SE
Sollecks Ave SE
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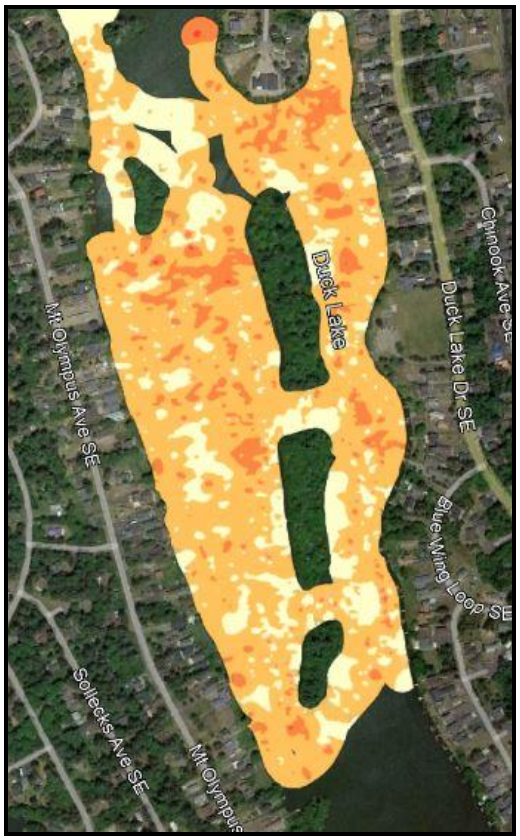
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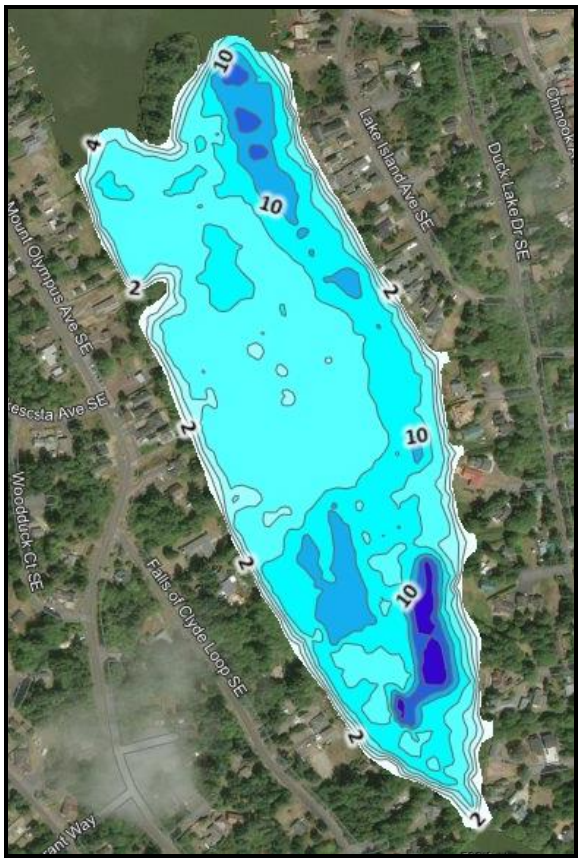
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Lake Island Ave SE
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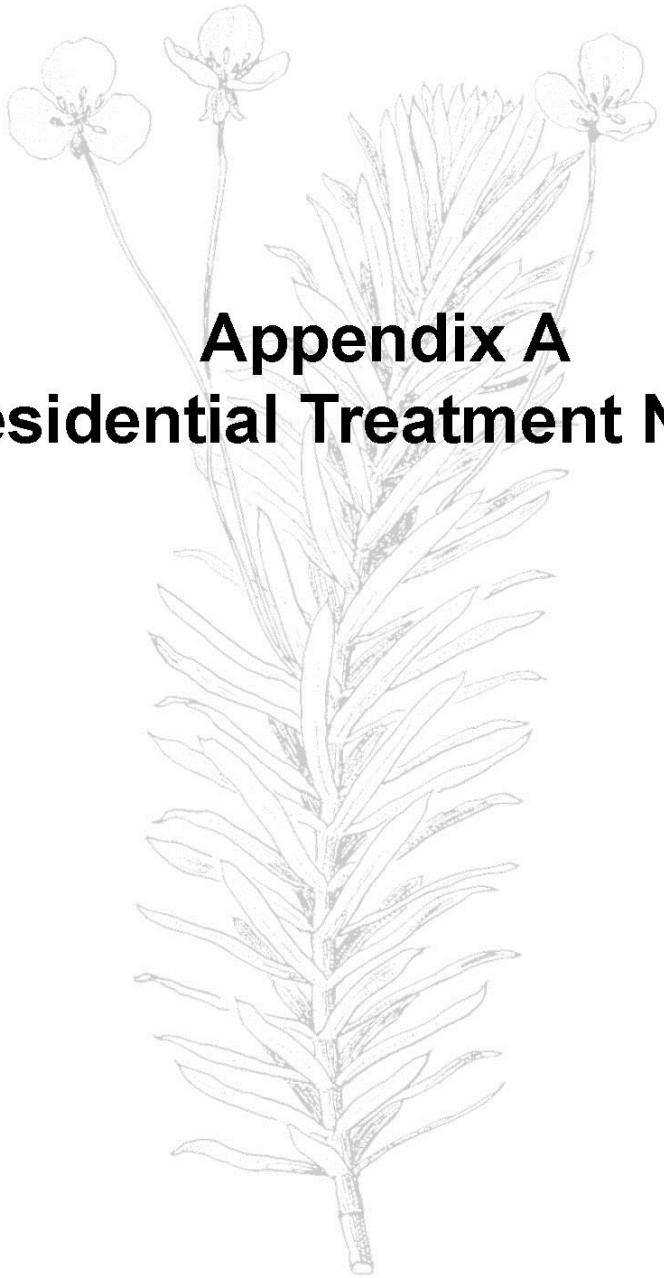


Appendix A
Residential Treatment Notice

Northwest Aquatic Eco-Systems

855 Trosper Road SW #108-313
Tumwater, Washington 98512
Telephone: (360) 357-3285

E-MAIL: PONDWEEDS @ COMCAST.NET

Herbicide Treatment
Business and Residential Notice

Distribution Date: 6 –30-21

Various canals and waterways within the associated canal system may be treated with aquatic herbicide(s) on /or between July 10 through August 10 to control weed growth. If this timeframe is not possible than treatment may occur anytime after August 10 through August 30.**An official treatment date has not yet been determined.** ***Treatment updates will be posted on our Facebook page.*** **No applications will be applied during the week-end or holiday of any given week. All canals and waterways are not targeted.**

Product(s) planned for use: Diquat, Imazamox, Imazapyr, Triclopyr

Location of Treatment(s): Bell Canals, Grand Canal north of Bell Canals, Bass Canal, Fishhook Canal, Marrs Shallows, Blue Heron Bayou, Bridges Bayou, Ocean Wins, Otter Alley, Ballou Bayou, Raccoon Lagoon, Twaunnie's Dream, Wanoona Ave & Sea Breeze Loop, North Grand Canal wetland area and Chance la Mar NE Bridge area.
Plants/Algae Targeted: Pondweeds, elodea, milfoil, pennywort, coontail, parrotfeather, duckweed and other associated free floating species that may produce recreational problems.

The applicator will post signs along the shoreline where possible or attach such to the front door of residents in the treated and potentially affected areas no more than 48 hours prior to treatment. The signs will describe any water use restrictions or advisories.

If you are withdrawing water for potable or domestic water use, livestock watering, or irrigation, and have no alternate water source, please contact the applicator Northwest Aquatic Eco-Systems at 360-357-3285 or pondweeds@comcast.net to arrange an alternate water supply.

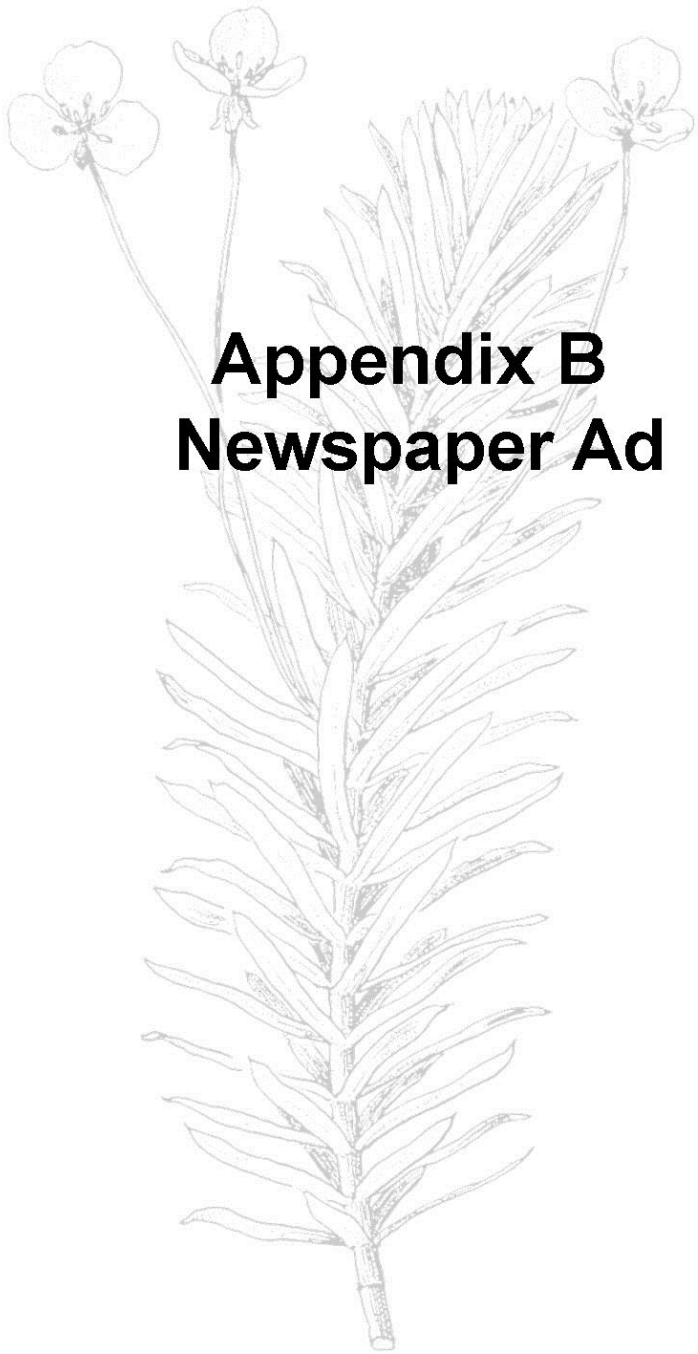
If you would like to request additional notification prior to treatment, or have further questions, please contact NWAE using the information above.

Like us on Facebook

This herbicide treatment is regulated under a permit issued by the Washington State Department of Ecology. Permit No. WAG 994141

Like us on Facebook

Management Practices for Lakes • Watersheds • Aquatic Plants • Wetlands



Appendix B
Newspaper Ad

DATE : 7-18-21

TO : North Coast News

FROM : Douglas Dorling

SUBJECT : Aquatic Weed Treatment

Various canals and waterways within the Duck Lake system will be treated with aquatic herbicide(s) during the week of July 26. A mailing was sent to over 2,100 properties surrounding the waterway notifying them of the pending treatment. The targeted date when treatment will be initiated is July 26th. Posting of the shorelines will occur prior to treatment. Treatment updates will be posted on our Facebook page and no applications will be administered during the weekend. The 2021 program is a diverse program being implemented by the City of Ocean Shores in an effort to maintain safe recreational waters for all residents and visitors. This control component is just one part of an integrated approach for the management of the waterways.

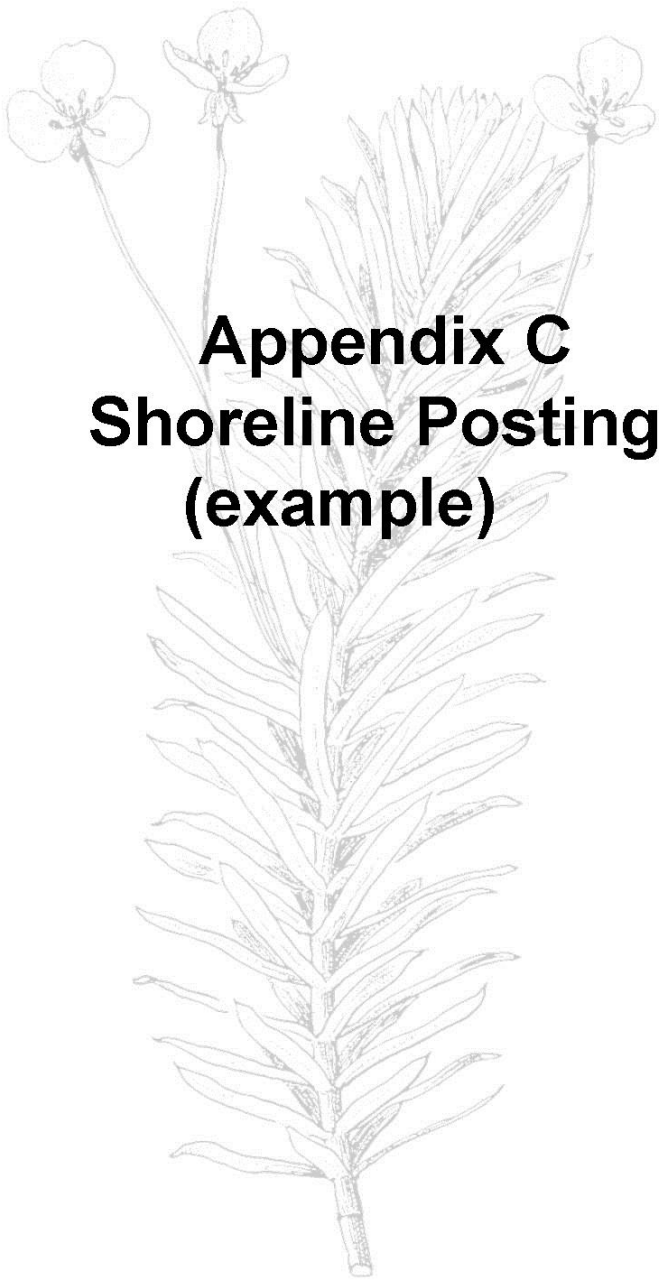
Product(s) planned for use: Diquat, Imazamox, Imazapyr and Triclopyr
Location of Treatment(s): Bell Canals, Grand Canal north of Bell Canals, Bass Canal, Fishhook Canal, Marrs Shallows, Blue Heron Bayou, Bridges Bayou, Ocean Wins, Otter Alley, Ballou Bayou, Raccoon Lagoon, Twaunnie's Dream, Wanoona Ave & Sea Breeze Loop, North Grand Canal wetland area and Chance la Mar NE Bridge area.
Plants/ Targeted: Pondweeds, elodea, milfoil, pennywort, coontail, parrotfeather, duckweed and other associated free floating species that may produce recreational problems.

If you are a water right holder and are withdrawing water from the system for potable or domestic water use, livestock watering, or irrigation, and have no alternate water source, please contact the applicator Northwest Aquatic Eco-Systems at 360-357-3285 or pondweeds@comcast.net to arrange an alternate water supply.

WAG 994141 (City of Ocean Shores NPDES permit that allows for the treatment of the canals and Duck Lake with state approved herbicides to control noxious and nuisance macrophyte growth) is available for review through the Department of Ecology.

Residents are encouraged to limit boating activities during the treatment phases. Dislodged bottom sediments resulting from prop wash typically will neutralize the active ingredient component of the control product. This may reduce the effectiveness of the treatment.

Please follow our Facebook page for program updates and for the specific timeline when each area will be treated. Weather conditions change daily and these factors influence when and where treatments will occur.



Appendix C
Shoreline Posting (example)

CAUTION

Diquat will be applied under permit to these waters **on XX-XX** to control aquatic vegetation.

Use advisories: It has been advised that no swimming occur within the treated area during or for 24 hours following treatment due to possible eye irritation.

Fishing restrictions: **None**

Drinking Water Restrictions: **Do not use for 3 days**

Domestic Animal & Stock Watering Restrictions: **Do not use for 1 day**

Irrigation Restrictions: **No turf or ornamental use for 3 days. No irrigation to food crops for 5 days**

For more information contact the applicator: **NW Aquatic Eco-Systems** Phone number: **360-357-3285**

While Ecology issues the permit to protect all water uses, even if uses are temporarily diminished, the project proponents selected this management method. Permit Information: ecology.wa.gov/AquaticPlants

PLEASE REMOVE THIS SIGN AFTER THE WATER RESTRICTIONS HAVE EXPIRED

Spray Records 2021

State of Washington
Department of Agriculture
Olympia, Washington 98504

PESTICIDE APPLICATION RECORD (Version 3)

NOTE: This form must be completed same day as the application and it must be retained for 7 years. (Ref. RCW 17.21)

1. **Date of Application-Year:** 2021 **Month:** July **Date:** 26 **Time:** 9:00

2. **Name of person for whom the pesticide was applied:** City of Ocean Shores
   Firm Name (if applicable):
   Street Address: PO Box 909 **City:** Ocean Shores 98569

3. **Licensed Applicator's Name (if different from #2 above):** Douglas Dorling
   Firm Name): Northwest Aquatic Eco-Systems
   4426 Bush Mountain Drive SW.
   Olympia, WA. 98512
   360-357-3285
   License # 375

4. **Name of person who applied the pesticide (if different than #3 above):**

   License No(s). if applicable:

5. **Application Crop or Site:** Duck Lake canals

6. **Total Area Treated (acre, sq. ft., etc.):** 135 acres,

7. Was this application made as a result of a WSDA Permit ? No

8. Pesticide information (please list all information for each pesticide in the tank mix):

a) Product Name Pesticide Applied	b) EPA Reg. No.	c) Total Amount of Pesticide Applied in Area Treated	d) Pesticide Applied/Acre (or other measure)	e) Concentration Applied ppm
Tribune	100-1390	250 gallons	1- 2 gal	

9. Address or exact location of application NOTE: If the application made to one acre or more of Agricultural land, the field location must also be shown on the map on page two of this form. Duck Lake canals Ocean Shores WA 98569

10. Date: 7-26-21 **11. Name of person making application:** Douglas Dorling

12. License No: 375 **13. Apparatus License. Plate No.:** G-424

14. Start: 9:00 **Stop:** 7:00

15. Acres completed : 135

16. Wind Direction: SW **Wind Velocity:** 0-05

17. Temperature: 77

Location of Application (If the application covers more than one township or range, please indicate the township & range for the top left section of the map only):

Township: T18N **Township:** T17
Range: E OR W (please indicate) 12W **Range:** 12 W
Section(s): 34 **Section:** 3,10,15,14,23

County: Grays Harbor

PLEASE NOTE:
The map is divided into 4 sections with each section divided into quarter-quarter sections. Please complete it by marking the appropriate section number(s) on the map and indicate as accurately as possible the location of the area treated.

State of Washington
Department of Agriculture
Olympia, Washington 98504

PESTICIDE APPLICATION RECORD (Version 3)

NOTE: This form must be completed same day as the application and it must be retained for 7 years. (Ref. RCW 17.21)

1. **Date of Application-Year:** 2021 **Month:** July **Date:** 27 **Time:** 8:30

2. **Name of person for whom the pesticide was applied:** City of Ocean Shores
   Firm Name (if applicable):
   Street Address: PO Box 909 **City:** Ocean Shores 98569

3. **Licensed Applicator's Name (if different from #2 above):** Douglas Dorling
   Firm Name): Northwest Aquatic Eco-Systems
   4426 Bush Mountain Drive SW.
   Olympia, WA. 98512
   360-357-3285
   License # 375

4. **Name of person who applied the pesticide (if different than #3 above):**

   License No(s). if applicable:

5. **Application Crop or Site:** Duck Lake canals

6. **Total Area Treated (acre, sq. ft., etc.):** 2 acres,

7. **Was this application made as a result of a WSDA Permit ?** No

8. **Pesticide information (please list all information for each pesticide in the tank mix):**

a) Product Name Pesticide Applied	b) EPA Reg. No.	c) Total Amount of Pesticide Applied in Area Treated	d) Pesticide Applied/Acre (or other measure)	e) Concentration Applied ppm
Triclopyr	81927-13	7.5 gallons	7.5 gal	
Triclopyr	81937-13	1.5		1.5%

9. Address or exact location of application NOTE: If the application made to one acre or more of Agricultural land, the field location must also be shown on the map on page two of this form. Duck Lake canals Ocean Shores WA 98569

10. Date: 7-27-21 **11. Name of person making application:** Douglas Dorling

12. License No: 375 **13. Apparatus License. Plate No.:** G-424

14. Start: 8:30 **Stop:** 7:00

15. Acres completed : 2

16. Wind Direction: SW **Wind Velocity:** 0-05

17. Temperature: 75

Location of Application (If the application covers more than one township or range, please indicate the township & range for the top left section of the map only):

Township: T18N **Township:** T17
Range: E OR W (please indicate) 12W **Range:** 12 W
Section(s): 34 **Section:** 3,10,15,14,23

County: Grays Harbor

PLEASE NOTE:
The map is divided into 4 sections with each section divided into quarter-quarter sections. Please complete it by marking the appropriate section number(s) on the map and indicate as accurately as possible the location of the area treated.

State of Washington
Department of Agriculture
Olympia, Washington 98504

PESTICIDE APPLICATION RECORD (Version 3)

NOTE: This form must be completed same day as the application and it must be retained for 7 years. (Ref. RCW 17.21)

1. **Date of Application-Year:** 2021 **Month:** August **Date:** 16 **Time:** 9:00

2. **Name of person for whom the pesticide was applied:** City of Ocean Shores
   Firm Name (if applicable):
   Street Address: PO Box 909 **City:** Ocean Shores 98569

3. **Licensed Applicator's Name (if different from #2 above):** Douglas Dorling
   Firm Name): Northwest Aquatic Eco-Systems
   4426 Bush Mountain Drive SW.
   Olympia, WA. 98512
   360-357-3285
   License # 375

4. **Name of person who applied the pesticide (if different than #3 above):**

   License No(s). if applicable:

5. **Application Crop or Site:** Duck Lake canals

6. **Total Area Treated (acre, sq. ft., etc.):** 3 acres,

7. **Was this application made as a result of a WSDA Permit ?** No

8. **Pesticide information (please list all information for each pesticide in the tank mix):**

a) Product Name Pesticide Applied	b) EPA Reg. No.	c) Total Amount of Pesticide Applied in Area Treated	d) Pesticide Applied/Acre (or other measure)	e) Concentration Applied ppm
Triclopyr	81927-13	2.5 gallons		1.5 %

9. **Address or exact location of application NOTE: If the application made to one acre or more of Agricultural land, the field location must also be shown on the map on page two of this form.** Duck Lake canals Ocean Shores WA 98569

10. Date: 8-16-21 **11. Name of person making application:** Douglas Dorling

12. License No: 375 **13. Apparatus License. Plate No.:** G-424

14. Start: 9:00 **Stop:** 6:00

15. Acres completed : 3

16. Wind Direction: SW **Wind Velocity:** 0-05

17. Temperature: 74

Location of Application (If the application covers more than one township or range, please indicate the township & range for the top left section of the map only):

Township: T18N	**Township:** T17
Range: E OR W (please indicate) 12W	**Range:** 12 W
Section(s): 34	**Section:** 3,10,15,14,23

County: Grays Harbor

PLEASE NOTE:
The map is divided into 4 sections with each section divided into quarter-quarter sections. Please complete it by marking the appropriate section number(s) on the map and indicate as accurately as possible the location of the area treated.

State of Washington
Department of Agriculture
Olympia, Washington 98504

PESTICIDE APPLICATION RECORD (Version 3)

NOTE: This form must be completed same day as the application and it must be retained for 7 years. (Ref. RCW 17.21)

1. **Date of Application-Year:** 2021 **Month:** September **Date:** 02 **Time:** 9:30

2. **Name of person for whom the pesticide was applied:** City of Ocean Shores
   Firm Name (if applicable):
   Street Address: PO Box 909 **City:** Ocean Shores 98569

3. **Licensed Applicator's Name (if different from #2 above):** Douglas Dorling
   Firm Name): Northwest Aquatic Eco-Systems
   4426 Bush Mountain Drive SW.
   Olympia, WA. 98512
   360-357-3285
   License # 375

4. **Name of person who applied the pesticide (if different than #3 above):**

   License No(s). if applicable:

5. **Application Crop or Site:** Duck Lake canals

6. **Total Area Treated (acre, sq. ft., etc.):** 2 acres,

7. **Was this application made as a result of a WSDA Permit ?** No

8. **Pesticide information (please list all information for each pesticide in the tank mix):**

a) Product Name Pesticide Applied	b) EPA Reg. No.	c) Total Amount of Pesticide Applied in Area Treated	d) Pesticide Applied/Acre (or other measure)	e) Concentration Applied ppm
Triclopyr	81927-13	2.5 gallons		1.5 %

9. **Address or exact location of application NOTE: If the application made to one acre or more of Agricultural land, the field location must also be shown on the map on page two of this form.** Duck Lake canals Ocean Shores WA 98569

10. Date: 9-02-21 **11. Name of person making application:** Douglas Dorling

12. License No: 375 **13. Apparatus License. Plate No.:** G-424

14. Start: 9:30 **Stop:** 5:30

15. Acres completed : 2

16. Wind Direction: SW **Wind Velocity:** 0-05

17. Temperature: 68

Location of Application (If the application covers more than one township or range, please indicate the township & range for the top left section of the map only):

Township: T18N **Township:** T17
Range: E OR W (please indicate) 12W **Range:** 12 W
Section(s): 34 **Section:** 3,10,15,14,23

County: Grays Harbor

PLEASE NOTE:
The map is divided into 4 sections with each section divided into quarter-quarter sections. Please complete it by marking the appropriate section number(s) on the map and indicate as accurately as possible the location of the area treated.