

# Devils Lake 2019 Aquatic Plants Survey Report And Biobase Mapping

*Prepared by AquaTechnex, LLC.*



## **Introduction**

AquaTechnex was contracted Devils Lake Water Improvement District (DLWID) to provide Biobase Mapping and aquatic plant survey services at Devils Lake. Our mapping and survey efforts in 2019 focused on updating Devils Lake's bathymetric data and aquatic plant identification and presence.

## **2019 Aquatic Plant Survey**

Prior to conducting the aquatic plant identification and presence survey it was known and clarified aquatic plants at the time of survey may have senesced beyond identification or have completely decomposed for the season. However, the importance of finding and identifying any invasive aquatic plants warranted a preliminary inspection of the lake. Upon review of littoral zone of the lake we concluded most of the lake bottom was barren

of aquatic plants. Thus, completing transects and rake tosses would not provide requested aquatic plant data and would require visually searching for remaining plants.

While completing the first pass around the lake plant findings were noted and recorded with a Trimble GPS. A data dictionary with aquatic plant names as features was used to record plant species. Noted plant species included American waterweed (*Elodea canadensis*), Naiad (*Najas spp.*), Water celery (*Valasenaria americana*), Yellow cow lily (*Nuphar spp.*), Water starwort (*Callitriche spp.*), and Parrotfeather (*Myriophyllum aquaticum*). The map following this report on page 4 provides location/distribution of plants around Devils Lake.



All current noted plants are native, except parrotfeather (Image: left). This plant species is listed in the State of Oregon as a Class B invasive noxious weed. Special attention was given to locating all locations still present around the lake. Many fragments of the plant were seen during the inspection. Fragmentation/vegetatively is parrotfeather's mode of reproduction. Wind and current driven fragments spread this plant to new locations. Current population in the lake is low. However, the spread to new locations is quick and expansion will likely double or greater in one year.

## Biobase Mapping of Devils Lake

BioBase is a cloud-based platform that automates processing and map creation of spatial data. BioBase processes sonar log files to create detailed bathymetric, submerged aquatic vegetation, and bottom hardness maps. AquaTechnex utilized this technology to generate the following bathymetric, Submerged aquatic vegetation and bottom hardness maps on pages 6 – 10. The Devils Lake Biobase survey report is found at the end of this report or at the following link, <https://noxreportprod.s3.amazonaws.com/48123221-3fc8-47dd-9479-a21ba7242c85/Report.html>.

### *Submerged Aquatic Plant Map*

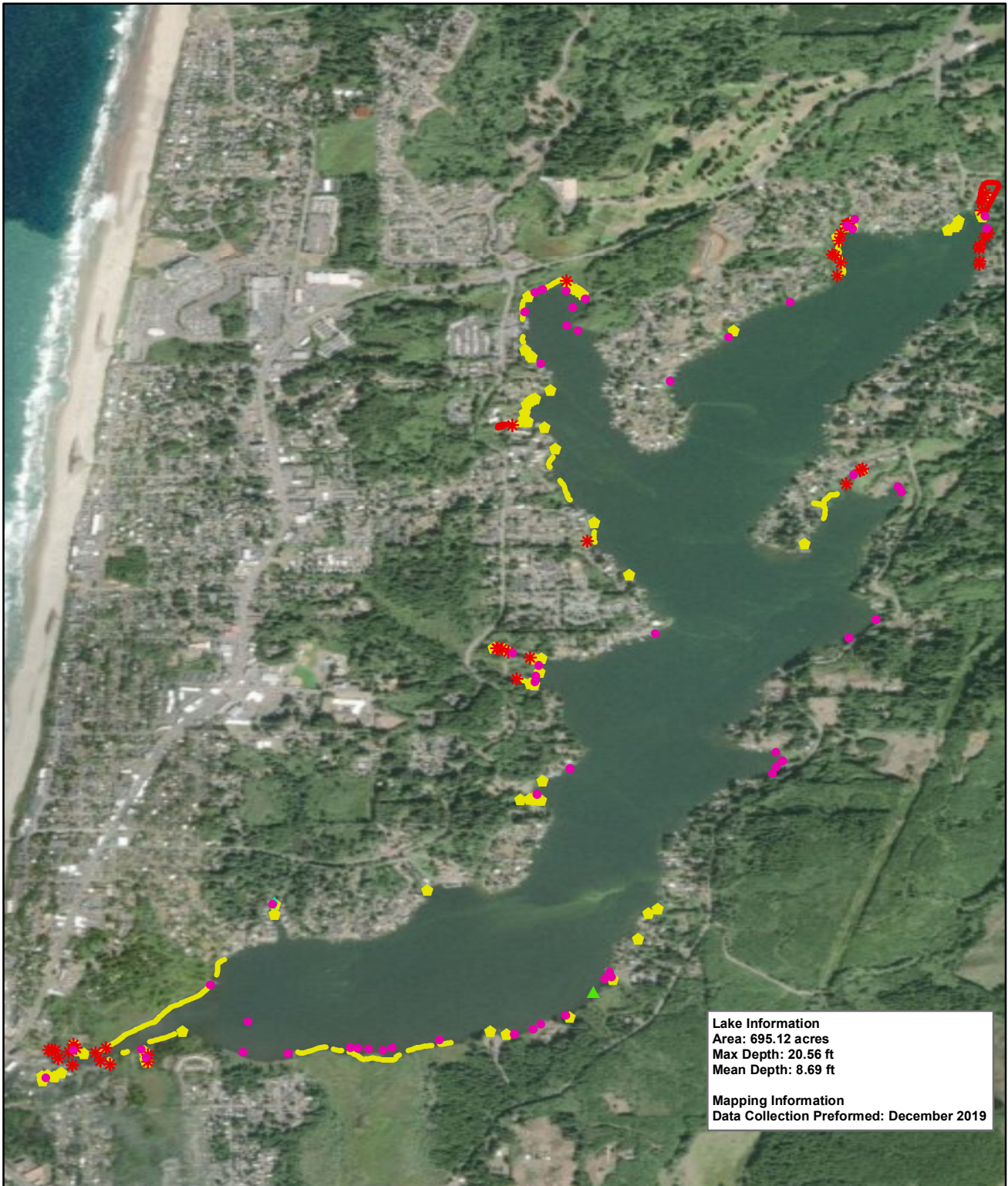
From the biobase report plant data is represented by Veg Avg BV (Average biovolume of the vegetation) and Veg PAC (Percent of the bottom that has plants growing). Biovolume is the amount of the water column (in percent) that is occupied by plants. Sometimes this is described as “how tall the plants are” and is generally a fair description. In the map below, the color scale denotes percentages with red indicating a higher percentage of the water column filled with plants and blue/green indicating very little or no plants at all. During this time of year few submerged aquatic species remain as represented in map below almost entirely blue. See page 5.

### *Biobase Contour Maps*

Two contour maps are provided below. One with blue color shading to depict associated zones of depth and the second with respected depth contours. Devils Lake has an area of 695 acres and volume of 6,042 acre-ft. See pages 6 and 5.

### *Biobase Composition Map*

The composition map provides data on Devils Lake's bottom hardness. The bulk of the lake bottom is depicted soft. Devils Lake near shore areas are shallow and in many areas are wide. AquaTechnex staff frequently had to use oars to free vessels from muck or off wood debris in shallow zones of the lake. During the survey we found near shore areas were mainly soft sediments and organic muck with minimal area being gravel to solid. See page 8.



**Lake Information**  
 Area: 695.12 acres  
 Max Depth: 20.56 ft  
 Mean Depth: 8.69 ft

**Mapping Information**  
 Data Collection Performed: December 2019

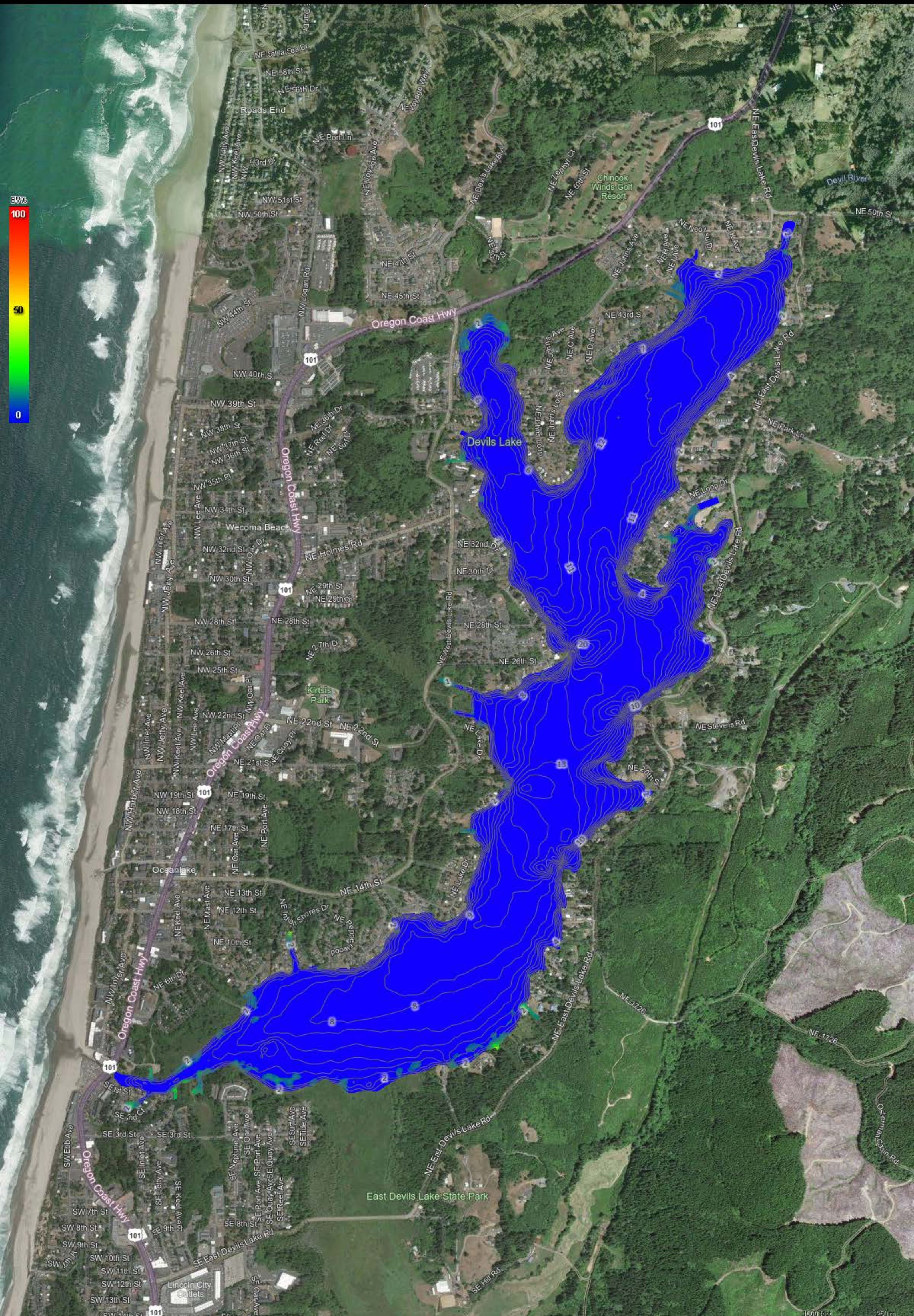
**Devils Lake**  
 Lincoln County, Oregon  
 December, 2019

**Legend**

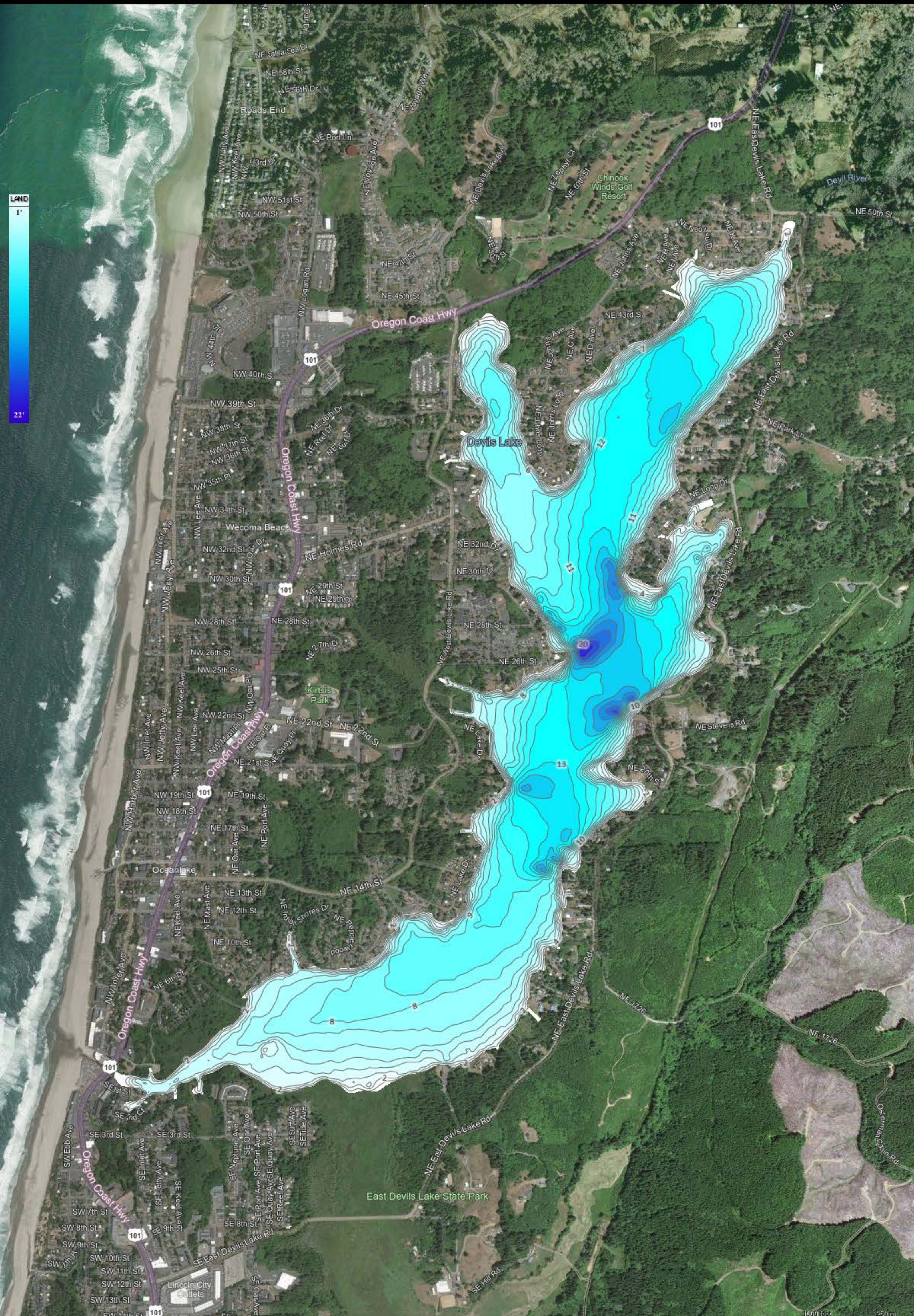
- Najas/Callitriche spp.
- ◆ Vallisneria americana
- ▲ Elodea canadensis
- Myriophyllum aquaticum
- \* Myriophyllum aquaticum
- Nuphar spp.
- ◆ Nuphar spp.

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0 550 1,100 2,200 3,300 4,400  
 Feet



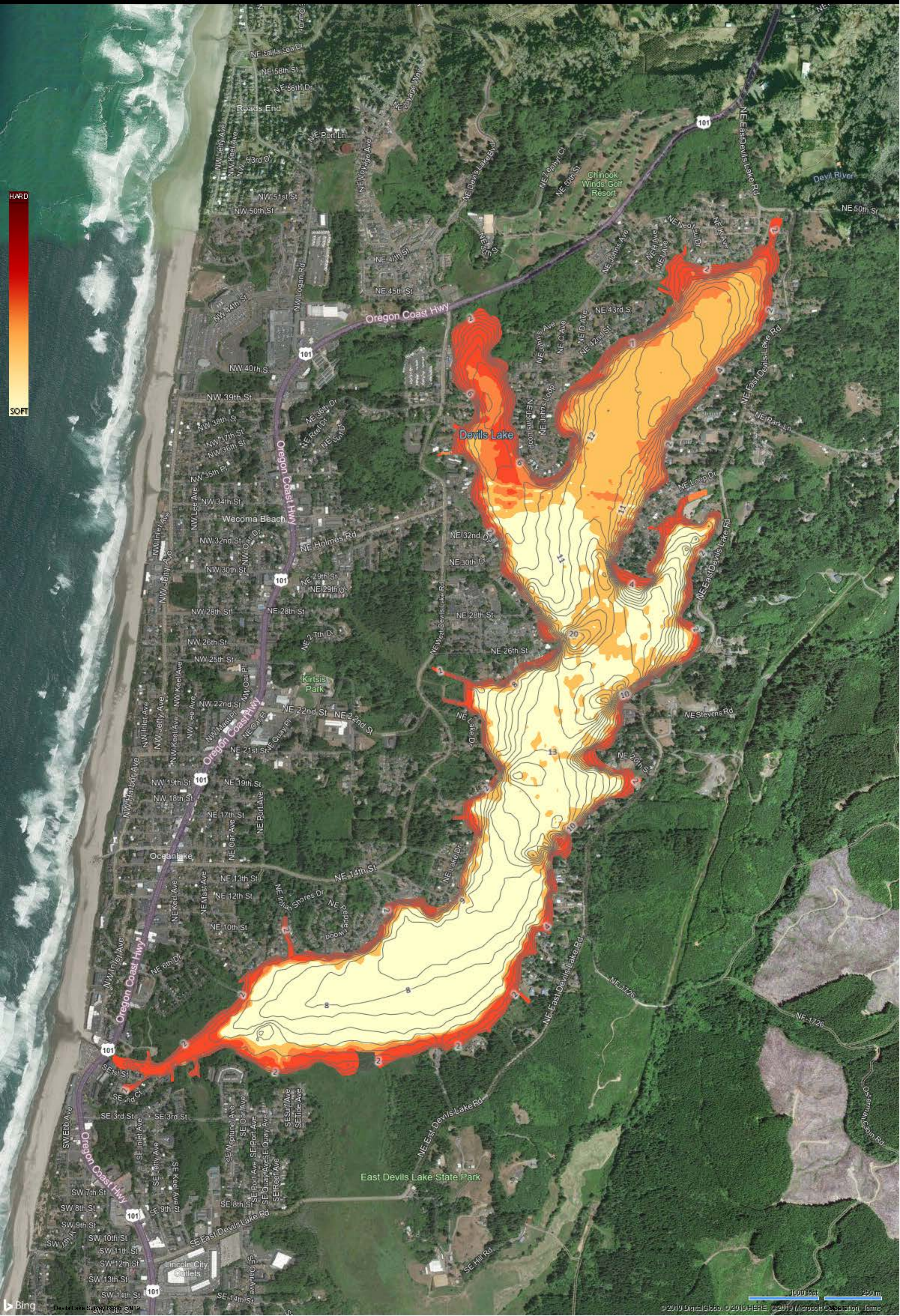
1000 feet 250 m



LAND  
1'  
22'

1000 feet 250 m







Devils Lake, Lincoln Oregon

Generated: 12/11/2019 9:01:25 PM (UTC)

Waterbody Size: 695.12 acres



Data Collector

Kyle Langan

Data Collection Date

12/3/2019 7:48:20 PM (UTC)

Average Water Temperature

45.71° F

Location

Start: 44.96718288,  
-124.01456611  
End: 44.99650351,  
-123.98550700

Survey Size

Area: 694.45 acres  
Percent: 99.90% of  
waterbody  
Volume: 6036.72 acre ft

Est. Waterbody Volume

7453433.86 cu. m  
(6042.60 acre ft)

Settings

Track Buffer: 80 m  
Grid Cell Size: 16.0  
m  
Min.BV Detect: 5%  
Min.Veg Depth: 0.73  
Detect: m

Offset Information

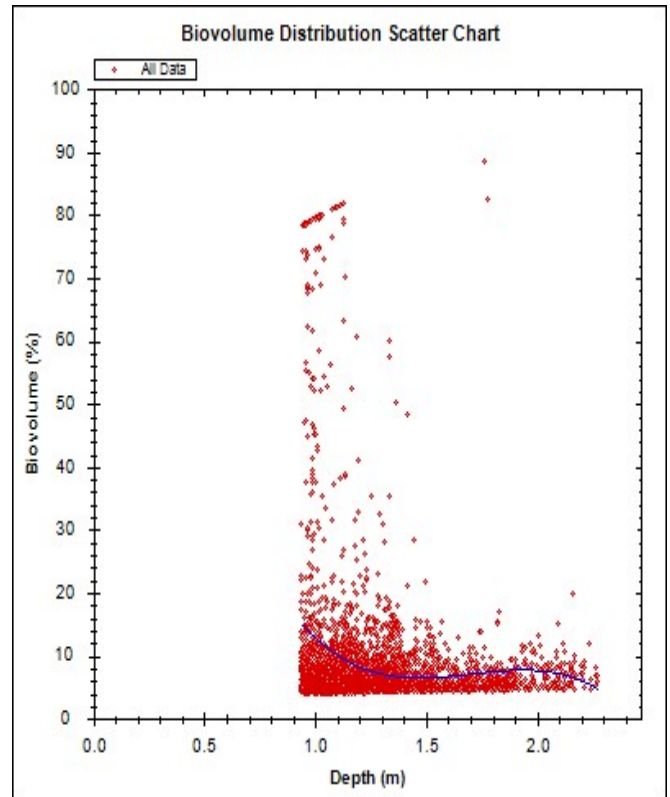
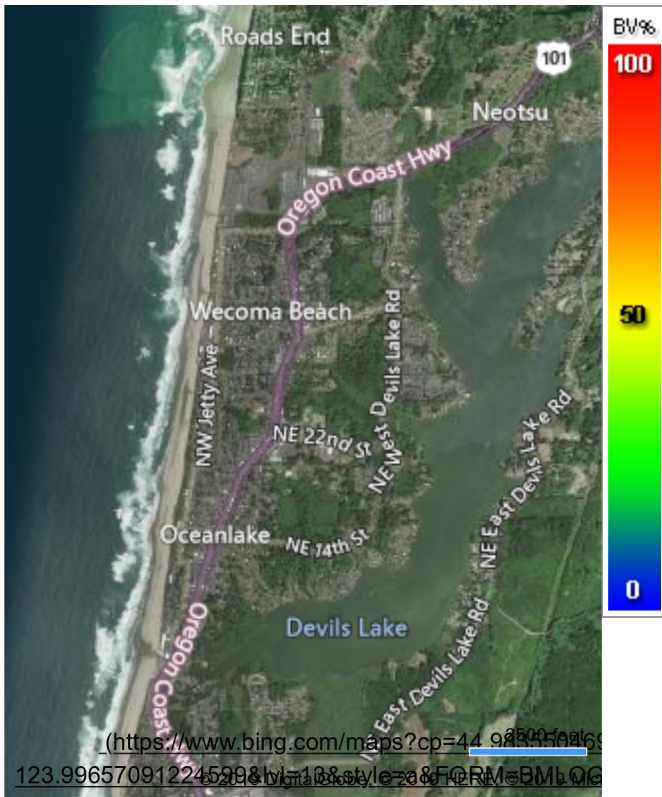
See Below

Survey Summary

	Type	PAC	Avg BVp	SD BVp	Avg BVw	SD BVw	Depth Range	Avg Depth	Distance	No.Points
Full Survey	Point	7.2%	10.6%	±12.0%	0.8%	±4.2%	1.93 - 21.19 ft	7.00 ft	60.34 miles	34591
	Grid	2.2%	8.2%	±4.7%	0.2%	±1.4%	0.19 - 20.56 ft	8.69 ft	-	487

Vegetation Biovolume Heat Map

Biovolume Distribution Scatter Chart



# Manual Vegetation Coordinates

Latitude	Longitude	Biovolume %
44.9660792173059	-124.015022836453	
44.9661095809891	-124.01480842528	
44.966276580959	-124.014518970196	
44.9663069445377	-124.014358161816	
44.9665194891384	-124.014122309525	
44.9664435804428	-124.014079427291	
44.9661741037624	-124.014604734665	
44.966606784014	-124.013934699749	
44.9665612388781	-124.013934699749	
44.9666778711313	-124.013677524294	
44.9666399169008	-124.013795450439	
44.9667765520128	-124.01354887759	
44.9669207776113	-124.013479193959	
44.9670004810759	-124.013355907534	
44.9668980051725	-124.013302304741	
44.9667765520128	-124.013350547255	
44.966655098596	-124.013302304741	
44.9667006436575	-124.013136136081	
44.9668145061528	-124.013109334685	
44.9669435500411	-124.013136136081	
44.9670498212604	-124.013045011333	
44.9669928902745	-124.012932445467	
44.9669018005796	-124.012852041277	
44.9668638464973	-124.012712674014	
44.9669777086688	-124.012691232897	
44.9671257291537	-124.012728754852	
44.9672320000356	-124.012701953455	
44.9672168184931	-124.012605468427	
44.9671333199375	-124.012535784796	
44.9670687982432	-124.012460740885	
44.9671143429761	-124.012332094181	
44.9672244092648	-124.01234628862	
44.9673534522309	-124.012383810575	
44.9674255643502	-124.012276604988	
44.9674179736051	-124.012174759681	
44.9673496568537	-124.01209971577	
44.967250976958	-124.01201931158	
44.9672357954206	-124.011901385435	
44.9673117030678	-124.011794179848	
44.9674331550943	-124.011869223759	
44.9675470161357	-124.011971069066	
44.967668467664	-124.011981789625	

44.9677216026268	-124.011820981245
44.9676267187302	-124.01169769482
44.9674976763788	-124.01161729063
44.9674065874855	-124.011569048116
44.9673534522309	-124.01146184253
44.9673791960851	-124.011253165686
44.9675575784507	-124.011247805407
44.967709392793	-124.011349650714
44.9678460253575	-124.011478297418
44.967971271589	-124.011537260491
44.9680319969362	-124.011403253508
44.967971271589	-124.011231724569
44.9678308439775	-124.011156680658
44.9677131881464	-124.011070916189
44.9675651691774	-124.010990511999
44.9675158294361	-124.010808262501
44.967606918156	-124.010647454121
44.9677397556132	-124.01073857887
44.9678915694733	-124.010851144736
44.9680395876001	-124.010958350323
44.9681686287323	-124.011028033954
44.9682597164155	-124.010883306412
44.9682065819512	-124.010722498032
44.968050973594	-124.010620652725
44.9678991601558	-124.010540248535
44.9677549370173	-124.010422322389
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44.9679445906792	-124.010095287277
44.9676903024714	-124.010143529791
44.9678117536964	-124.010047044763
44.9680698366956	-124.010191772305
44.9681761058283	-124.010250735378
44.9682861700796	-124.010347220406
44.9684114153501	-124.010465146551
44.9686391333231	-124.010282897054
44.9685480462424	-124.01047586711
44.9685670227295	-124.010159610629
44.9679711580389	-124.009773670517
44.9679294093253	-124.009602141579
44.9689109026176	-124.009862880836
44.96899256572	-124.009738919027
44.9700565684309	-124.008323805282
44.9701172915704	-124.008248761372
44.9706827727198	-124.007962780167
44.9707510855013	-124.007785890949

44.9708118079055	-124.007635803128
44.9708459642296	-124.007480355027
44.9678561043432	-124.008892486101
44.9677299324747	-124.008745740814
44.9676616160949	-124.008574211875
44.9676881835856	-124.008349080143
44.9677868627291	-124.008236514277
44.9679424718028	-124.008300837629
44.967953857816	-124.007791611092
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44.9676074012792	-124.007550376579
44.9674821542531	-124.007480692948
44.9673569069536	-124.007378847641
44.9672430455348	-124.007309164009
44.9671329792819	-124.007207318702
44.9670267082166	-124.007126914512
44.9669394139799	-124.006966106132
44.9669052553294	-124.006794577193
44.9669090507361	-124.006548004344
44.966981163414	-124.006397916523
44.9671215931057	-124.006510482389
44.9672696132194	-124.006590886579
44.9674684947591	-124.006738035723
44.9676886257662	-124.006855961869
44.9678783931977	-124.007027490808
44.9679087559285	-124.007118615556
44.9678897792236	-124.007418791199
44.9679998440244	-124.007617121534
44.9680795459897	-124.007499195389
44.9680074346925	-124.00732766645
44.9680188206928	-124.007129336115
44.9681782244599	-124.007231181422
44.9682844933918	-124.006952446897
44.9681554525203	-124.007000689411
44.9680757506605	-124.006979248293
44.9682199729924	-124.006829160472
44.9682047917114	-124.006673712371
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44.9673090890197	-124.004200737199
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44.9673873984259	-124.003350420878
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44.9674557151323	-124.002750069592
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44.967442852946	-124.00079100324
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44.9674276714593	-124.000319298659
44.9678527515679	-123.999783270725

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44.9680832280047	-123.996214380212
44.9682326542853	-123.99583761218
44.9680201160325	-123.996566610169
44.9687184530488	-123.994744115196
44.9689613508877	-123.994336733966
44.9708285936756	-123.992878737987
44.979047766174	-123.987514761039
44.9791691933489	-123.987922142268
44.9793513336293	-123.988286641263

## Biovolume Analysis by Quantity

AOI	0-5%	5-20%	20-40%	40-60%	60-80%	>80%
1	92.82%	6.73%	0.20%	0.09%	0.14%	0.03%

## Biovolume Analysis by Depth

Full Survey	Depth	Type	Count	PAC	Avg BVp	SD BVp	Avg BVw	SD BVw
	0-1m	Point	1655	46.3%	17.4%	±19.7%	14.8%	±0.0%
	1-2m		13817	12.2%	7.5%	±2.6%	2.5%	±0.0%
	2-3m		10491	0.3%	6.6%	±1.0%	0.3%	±0.0%
	3-4m		6850	0.0%	0.0%	±0.0%	0.0%	±0.0%
	4-5m		1637	0.0%	0.0%	±0.0%	0.0%	±0.0%
	5-6m		103	0.0%	0.0%	±0.0%	0.0%	±0.0%
	6-7m		12	0.0%	0.0%	±0.0%	0.0%	±0.0%
	7-8m		3	0.0%	0.0%	±0.0%	0.0%	±0.0%
	8-9m		1	0.0%	0.0%	±0.0%	0.0%	±0.0%
	9-10m		22	0.0%	0.0%	±0.0%	0.0%	±0.0%
	0-1m	Grid	361	18.7%	8.8%	±5.2%	1.6%	±4.1%
	1-2m		125	2.8%	6.6%	±1.8%	0.2%	±1.1%
	2-3m		0	0.0%	5.2%	±0.1%	0.0%	±0.0%
	3-4m		0	0.0%	0.0%	±0.0%	0.0%	±0.0%
	4-5m		0	0.0%	0.0%	±0.0%	0.0%	±0.0%
	5-6m		0	0.0%	0.0%	±0.0%	0.0%	±0.0%
	6-7m		0	0.0%	0.0%	±0.0%	0.0%	±0.0%

# Glossary

## AOI

**Area of Interest:** Defines the individual transects or contiguous data samples as depicted by the color coding of each trip line. Separate areas of interest can be generated through merging of multiple trips, appending data to a single sonar log or lapses in time (greater than five minutes) within a sonar log.

## BVp

**Biovolume (Plant):** Refers to the percentage of the water column taken up by vegetation when vegetation exists. Areas that do not have any vegetation are not taken into consideration for this calculation.

## 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.

## Grid

**Geostatistical Interpolated Grid:** Interpolated and evenly spaced values representing kriged (smoothed) output of aggregated data points. The gridded data is most accurate summary of individual survey areas.

## Point

**Individual Coordinate Point:** A single point represents a summary of sonar pings and the derived bottom and canopy depths. Individual point data create an irregularly spaced dataset that may have overlaps and/or gaps in the data resulting in a increased potential for error.

## Additional Waypoints

No Additional Waypoints

## Offsets

Trip Name	File Name	Trip Date (UTC)	Manual Offset (ft)	Max Tide (ft)	Min Tide (ft)	Ave Tide (ft)	Start Tide (ft)	End Tide (ft)
DEVIL1.sl2	DEVIL1.sl2	12/4/2019 10:29:32 AM	0.67	0	0	0	0	0
DEVIL2.sl2	DEVIL2.sl2	12/4/2019 12:33:57 PM	0.67	0	0	0	0	0
DEVIL3.sl2	DEVIL3.sl2	12/4/2019 2:54:39 PM	0.67	0	0	0	0	0
DEVIL4.sl2	DEVIL4.sl2	12/4/2019 4:49:22 PM	0.67	0	0	0	0	0
DEVIL5.sl2	DEVIL5.sl2	12/4/2019 6:06:31 PM	0.67	0	0	0	0	0
DEVILS3.sl2	DEVILS3.sl2	12/3/2019 10:04:07 PM	0.67	0	0	0	0	0
DEVILS2.sl2	DEVILS2.sl2	12/3/2019 8:50:11 PM	0.67	0	0	0	0	0
DEVILS4.sl2	DEVILS4.sl2	12/3/2019 11:04:50 PM	0.67	0	0	0	0	0

DEVILS5.sl2	DEVILS5.sl2	12/4/2019 4:53:42 PM	0.67	0	0	0	0	0
DEVILS6.sl2	DEVILS6.sl2	12/4/2019 5:59:28 PM	0.67	0	0	0	0	0
DEVILS7.sl2	DEVILS7.sl2	12/4/2019 6:58:30 PM	0.67	0	0	0	0	0
DEVILS8.sl2	DEVILS8.sl2	12/4/2019 7:33:03 PM	0.67	0	0	0	0	0
DEVILS10.sl2	DEVILS10.sl2	12/4/2019 9:03:20 PM	0.67	0	0	0	0	0
Sonar_2019-12-03_13.48.10.sl2	Sonar_2019-12-03_13.48.10.sl2	12/3/2019 7:48:20 PM	0.67	0	0	0	0	0
DEVILS9.sl2	DEVILS9.sl2	12/4/2019 8:01:09 PM	0.67	0	0	0	0	0

Report URL: <https://noxreportprod.s3.amazonaws.com/48123221-3fc8-47dd-9479-a21ba7242c85/Report.html> (<https://noxreportprod.s3.amazonaws.com/48123221-3fc8-47dd-9479-a21ba7242c85/Report.html>)

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