

Field Testing the Use DIDSON Technology as a Tool for Beach Spawning Ground Surveys



February 2, 2012

Background

- Beach and tributary spawning sockeye are counted at the Ozette River weir from May through July.
- Sockeye spend up to six months in the lake prior to spawning.
- Determining the abundance and distribution of beach spawners has been problematic due to adverse viewing conditions.
- The lack of consistent and reliable beach spawning estimates makes it difficult to assess the current status of the beach spawners.

Past Methods Used to Enumerate Beach Spawning Lake Ozette Sockeye

- Seine and gill netting (mostly for broodstock collection, but also used to retrieve tissue samples for various genetic collections),
- Foot,
- Snorkel,
- SCUBA,
- Boat surveys.
- Data from 1973 through 2004 are summarized in the Limiting Factors Analysis.

Project Concepts

- Poor visibility makes counting fish from the surface difficult.
- Dive surveys are limited by viewing conditions and are labor intensive.
- Sockeye are listed under the ESA, therefore standard mark and recapture techniques to assess the beach spawning population have been discouraged by fishery managers and are unlikely to be permitted.

Project Objective

Field test methods to count sockeye salmon on the spawning beaches using DIDSON.

What is DIDSON?

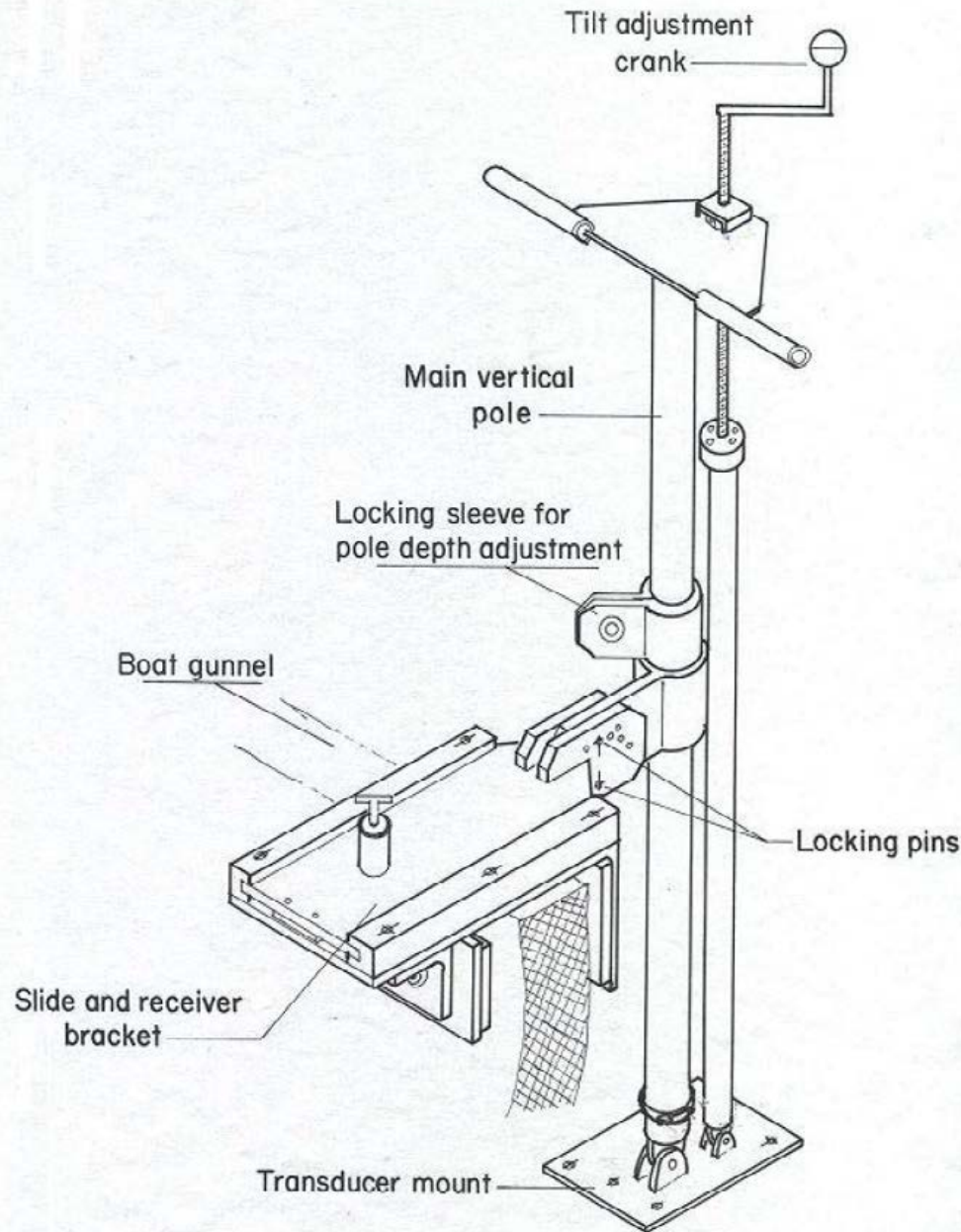
- DIDSON- Dual Frequency Identification Sonar.
- DIDSON uses sound pulses and converts the returning echoes into digital images, similar to the technology used in ultrasounds.
- DIDSON does not use or need light to “see” and therefore can be used in dark and turbid waters with limited or no visibility.

Equipment Used

- DIDSON Model 300 LR
 - Specifications in Identification Mode
 - Operating frequency 1.2 Mhz
 - 96 beams spaced at 0.3°
 - Beam width 0.3° H by 14° V



DIDSON Adjustable Pole Mount, mounted on boat.



- Boat with main outboard, small outboard, and electric motor
- DIDSON and GPS attached to weather proof laptop
- Equipment powered by small generator



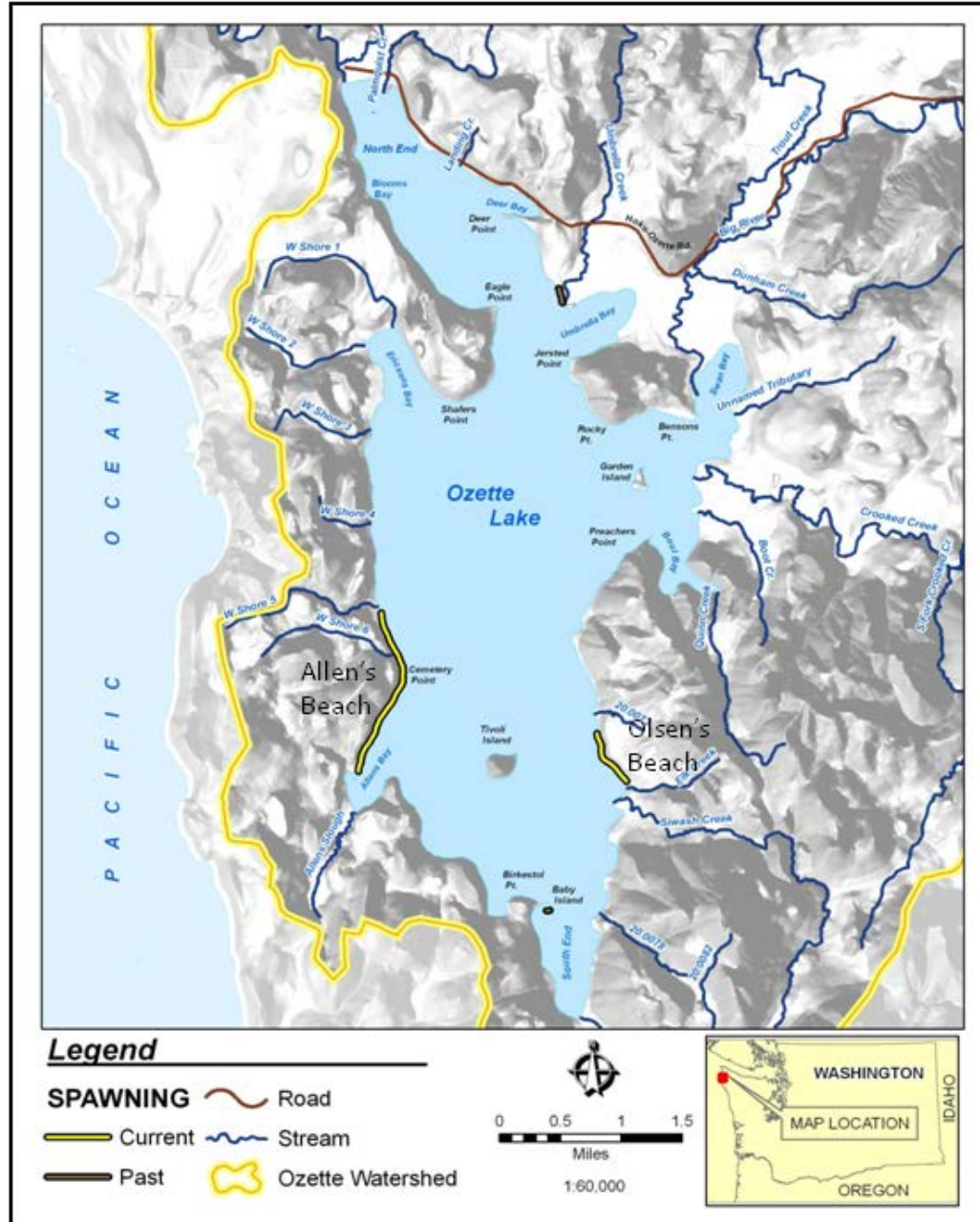


Methods Tested

We tested two survey methods: station and slow pass.

- Station method: anchored boat at different stations along the spawning beaches. The number of fish observed over a one to five minute period are recorded.
- Slow pass method: pointing the DIDSON onto spawning beaches with the boat being driven very slowly parallel to the spawning beach. All fish passing through imaging area are counted.


Ozette Spawning Beaches





Olsen's Beach

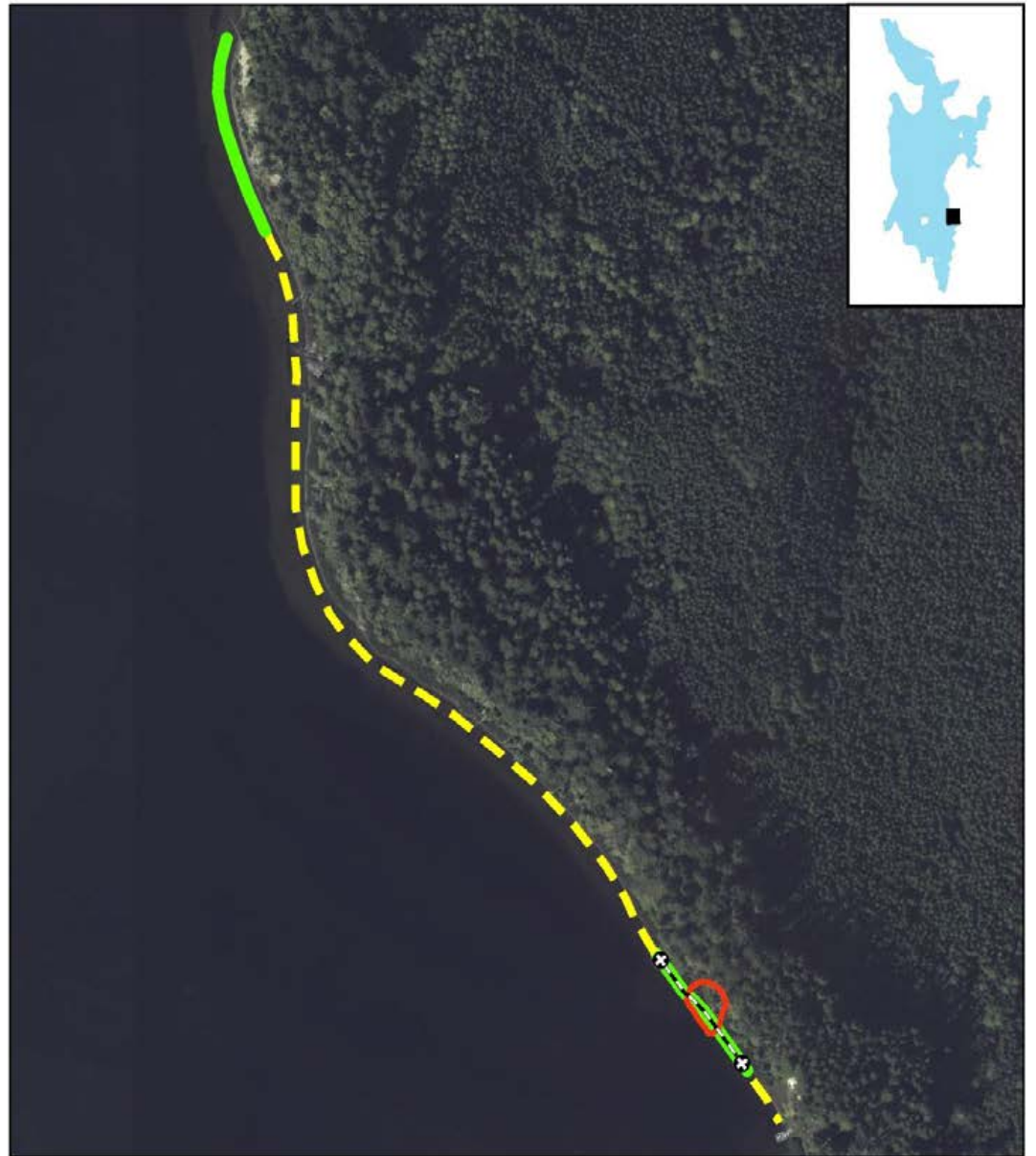
Olsen's Beach Spawning Use

Core 

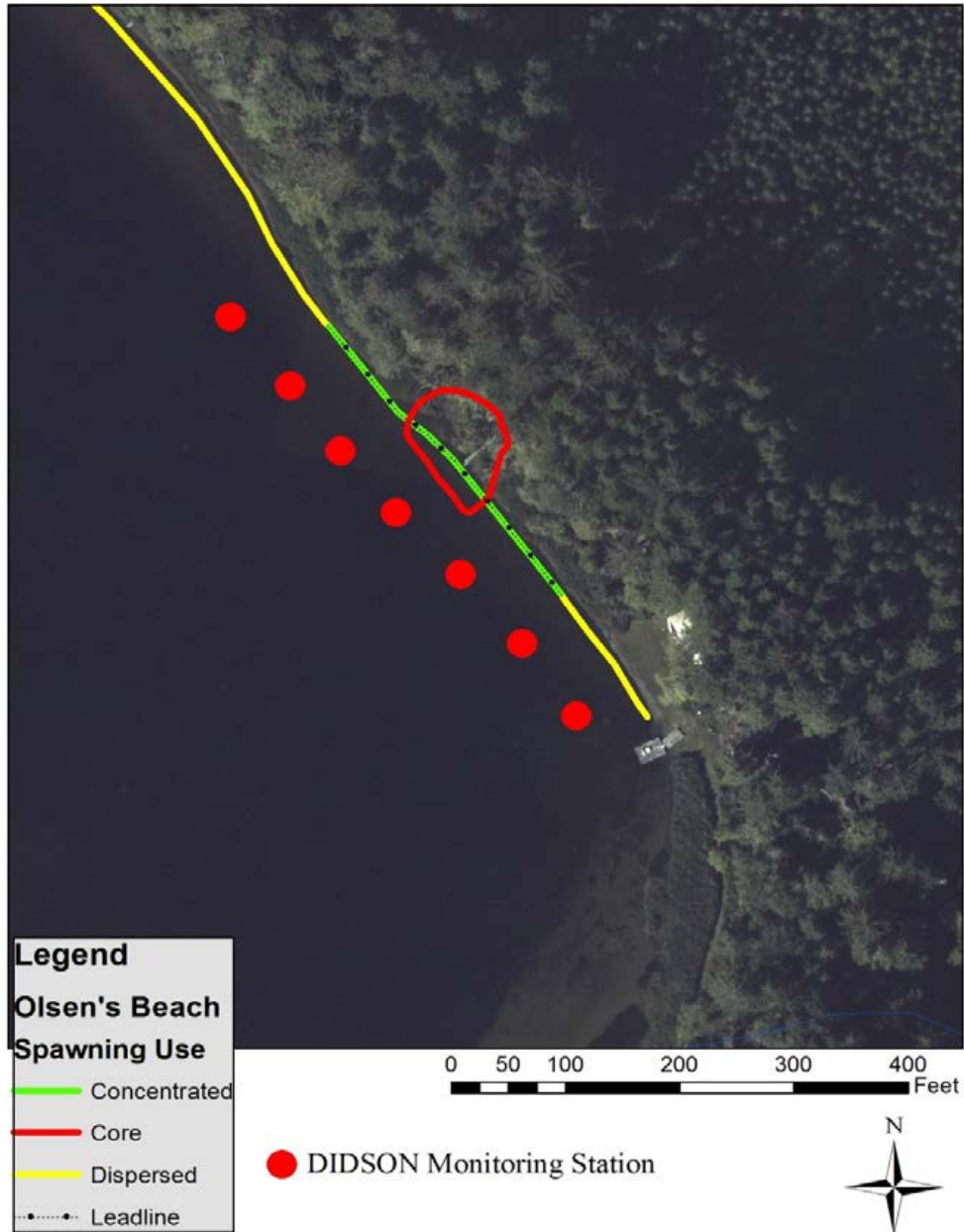
Concentrated 

Dispersed 

Leadline 



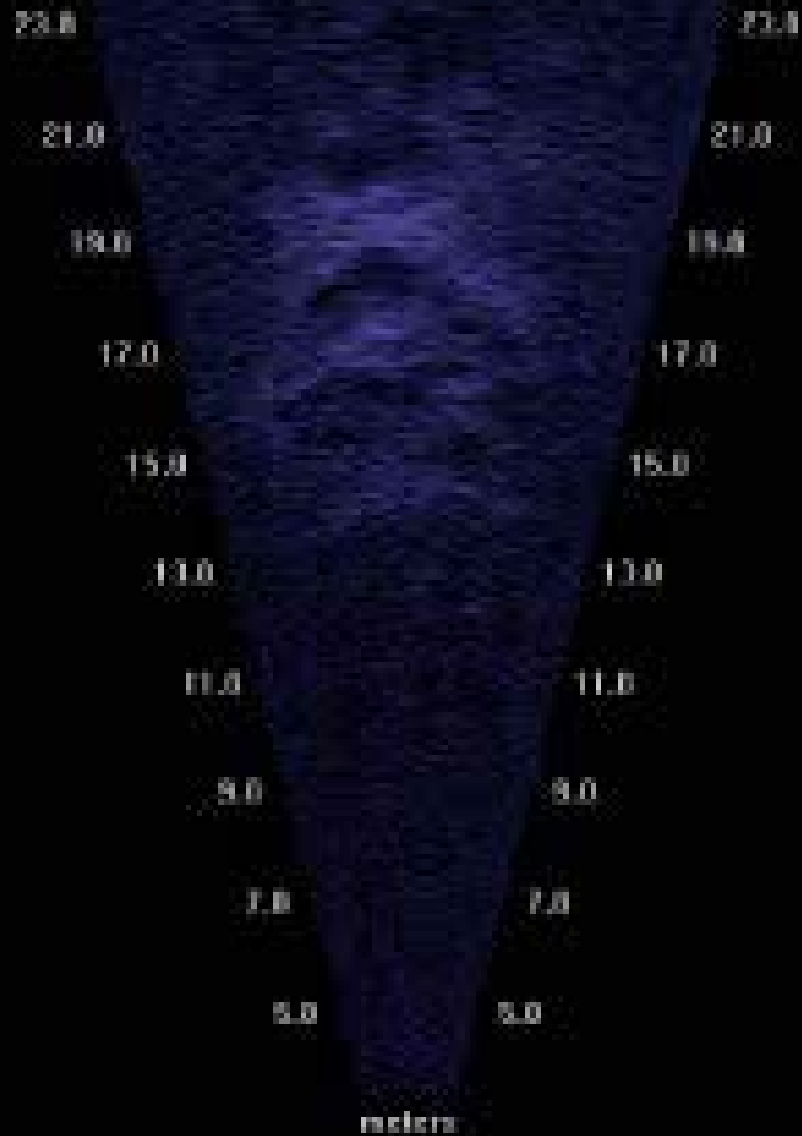
DIDSON monitoring stations



Results from station method test

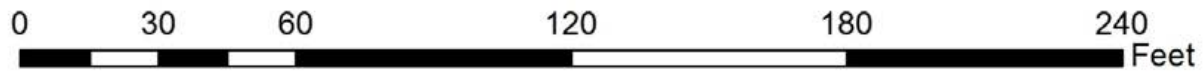
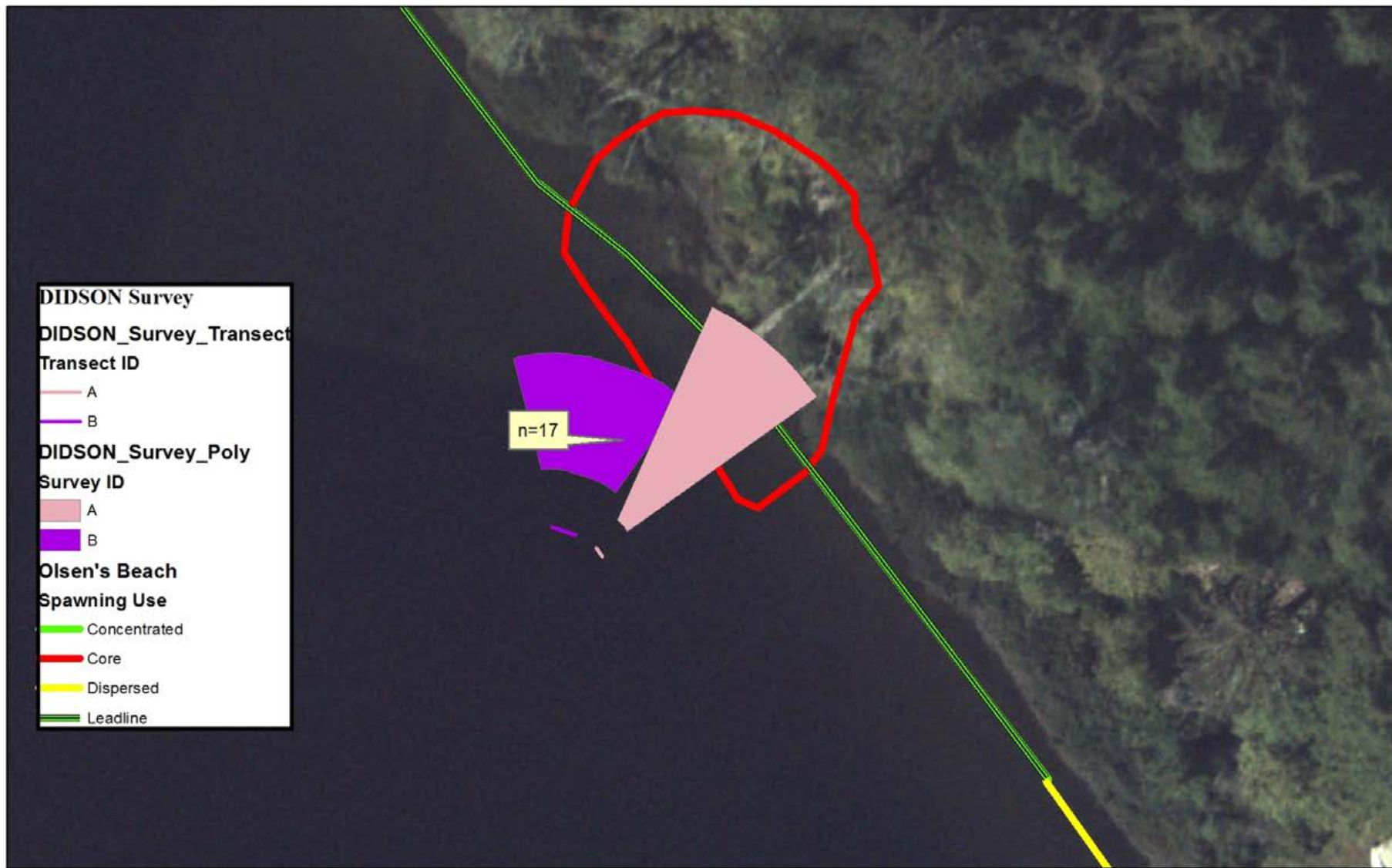
- DIDSON was set to a 20 meter range (3-23 m).
 - The DIDSON was difficult to aim without getting interference from surface and bottom.
 - Images were grainy
 - Fish were detected intermittently making counting and individual fish ID difficult, because fish were milling around.

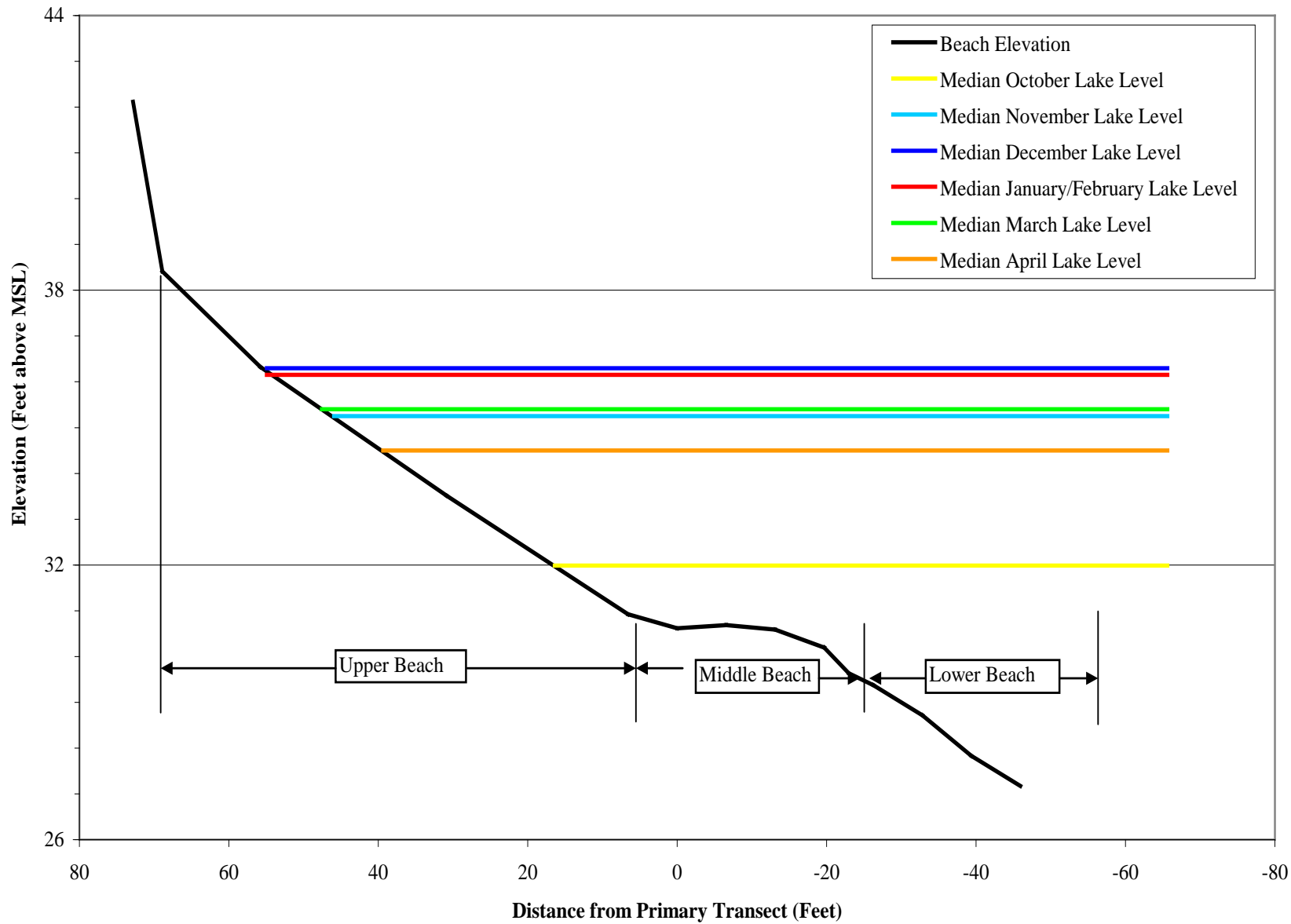
Results from Station Method Test

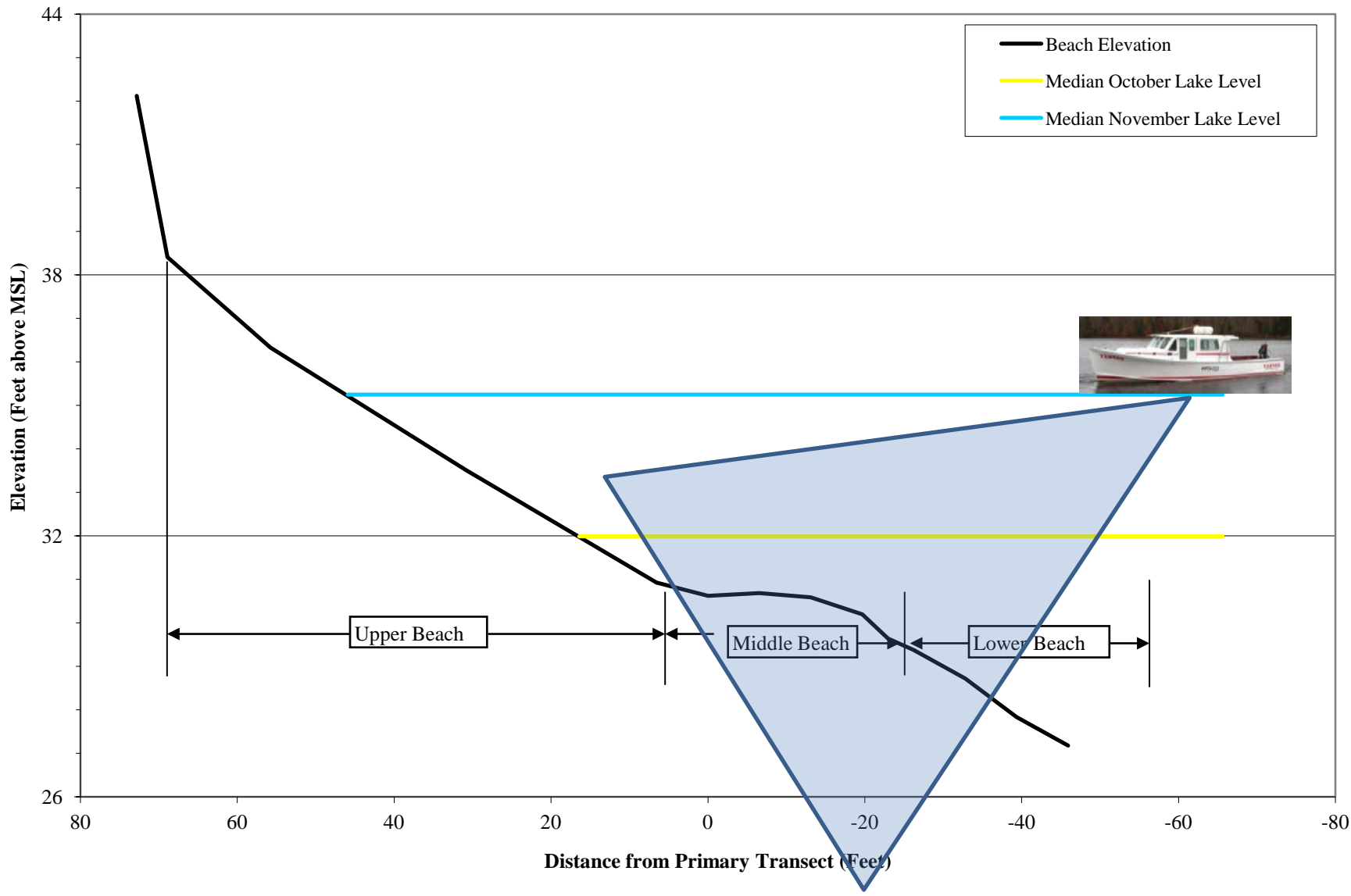


Results from Station Method Test

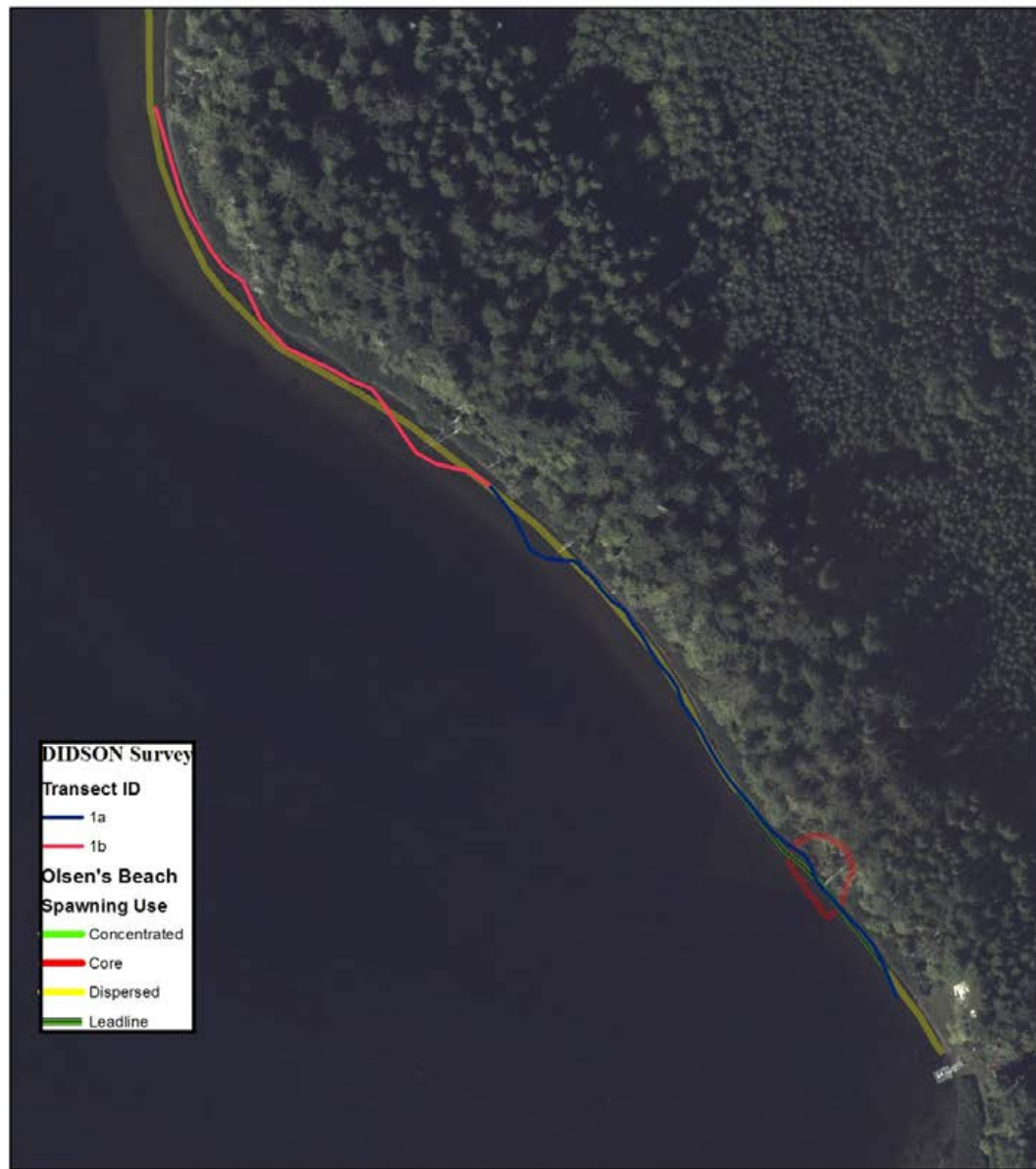
- With a data frame range of 10 meters images were more clear and the DIDSON was easier to aim.
- However the field of view is smaller limiting the area surveyed.
- At the 10 m range, set to detect from 3 to 13 m the horizontal field of view is 6.7 meters. The vertical field at the same settings is 3.3 meters.
- Individual fish were easier to identify.



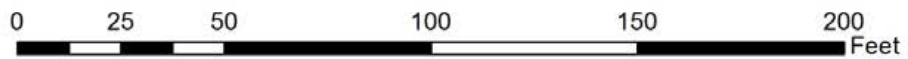
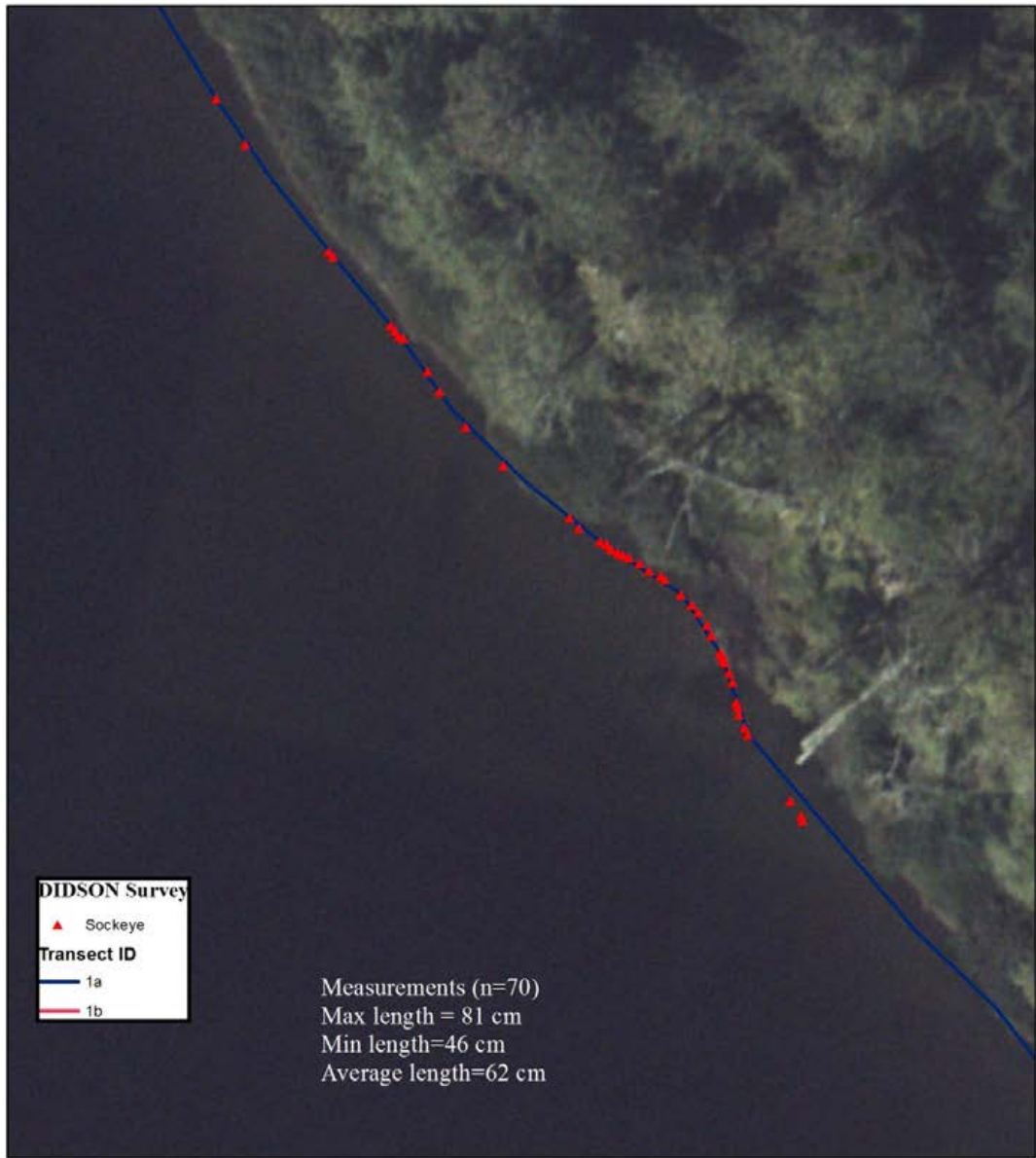


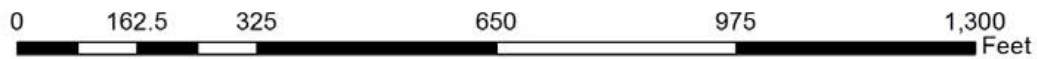
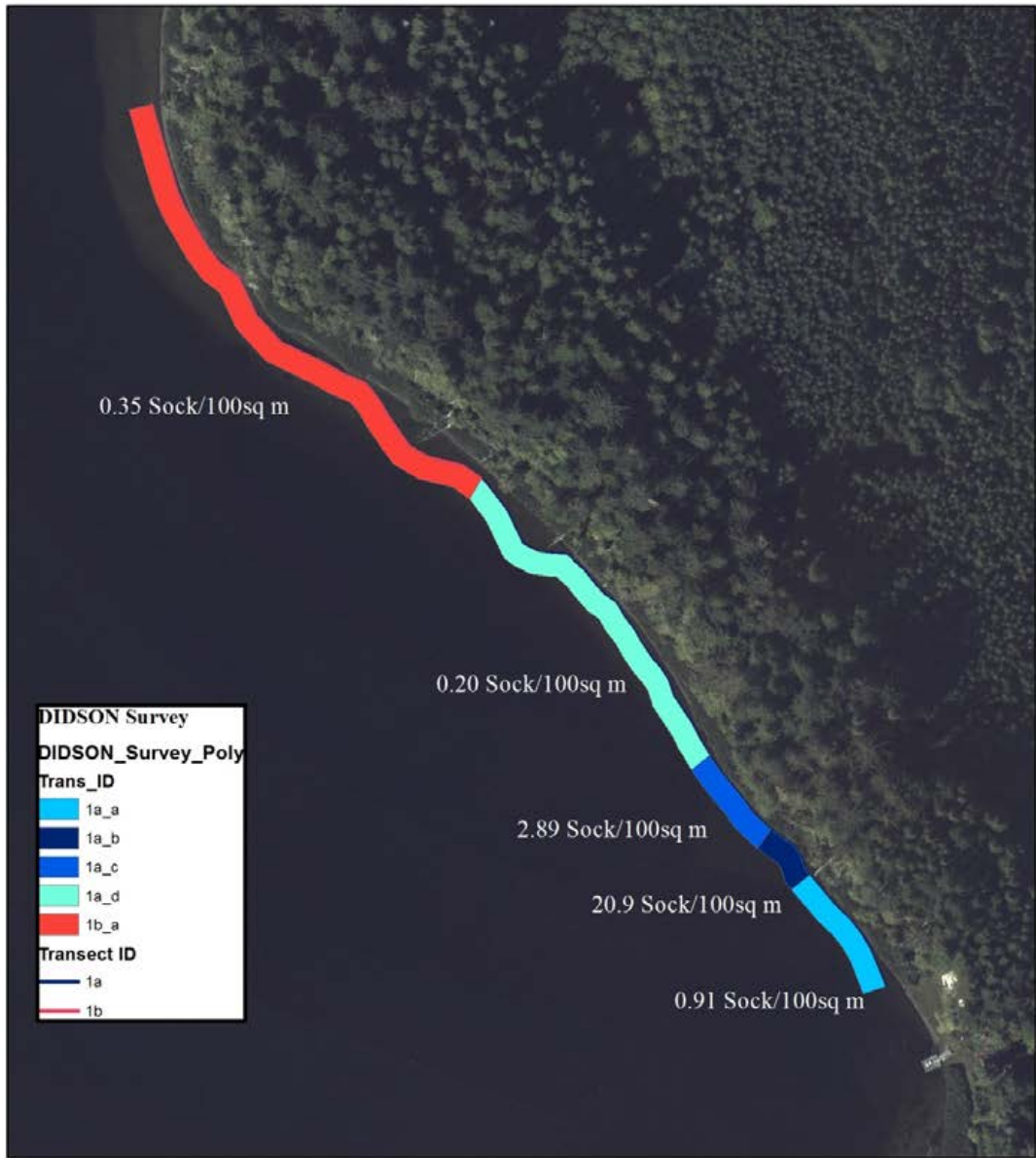


Slow pass method

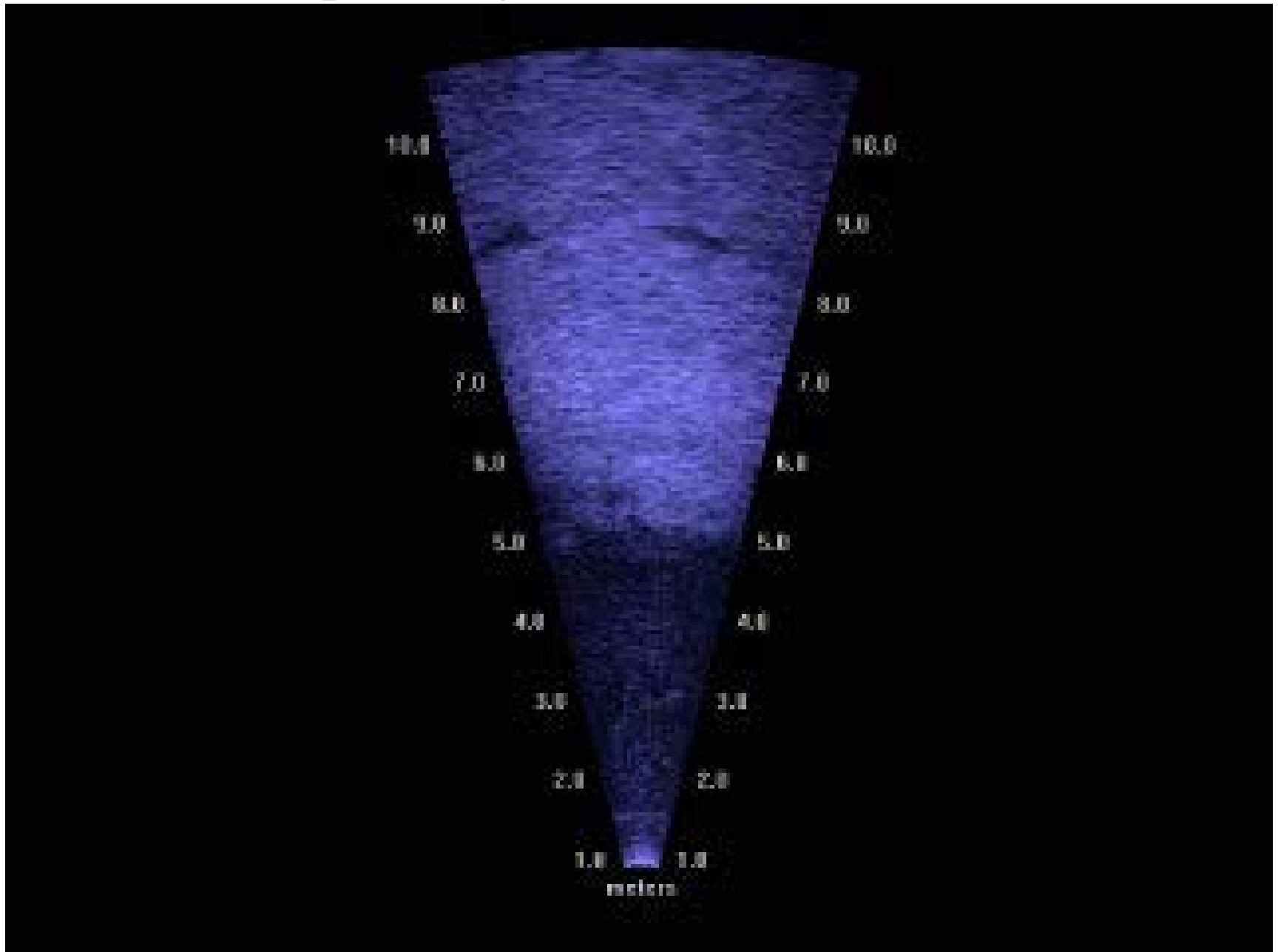


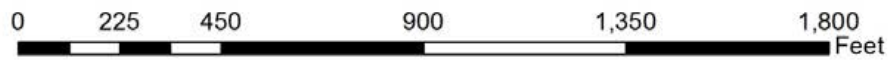
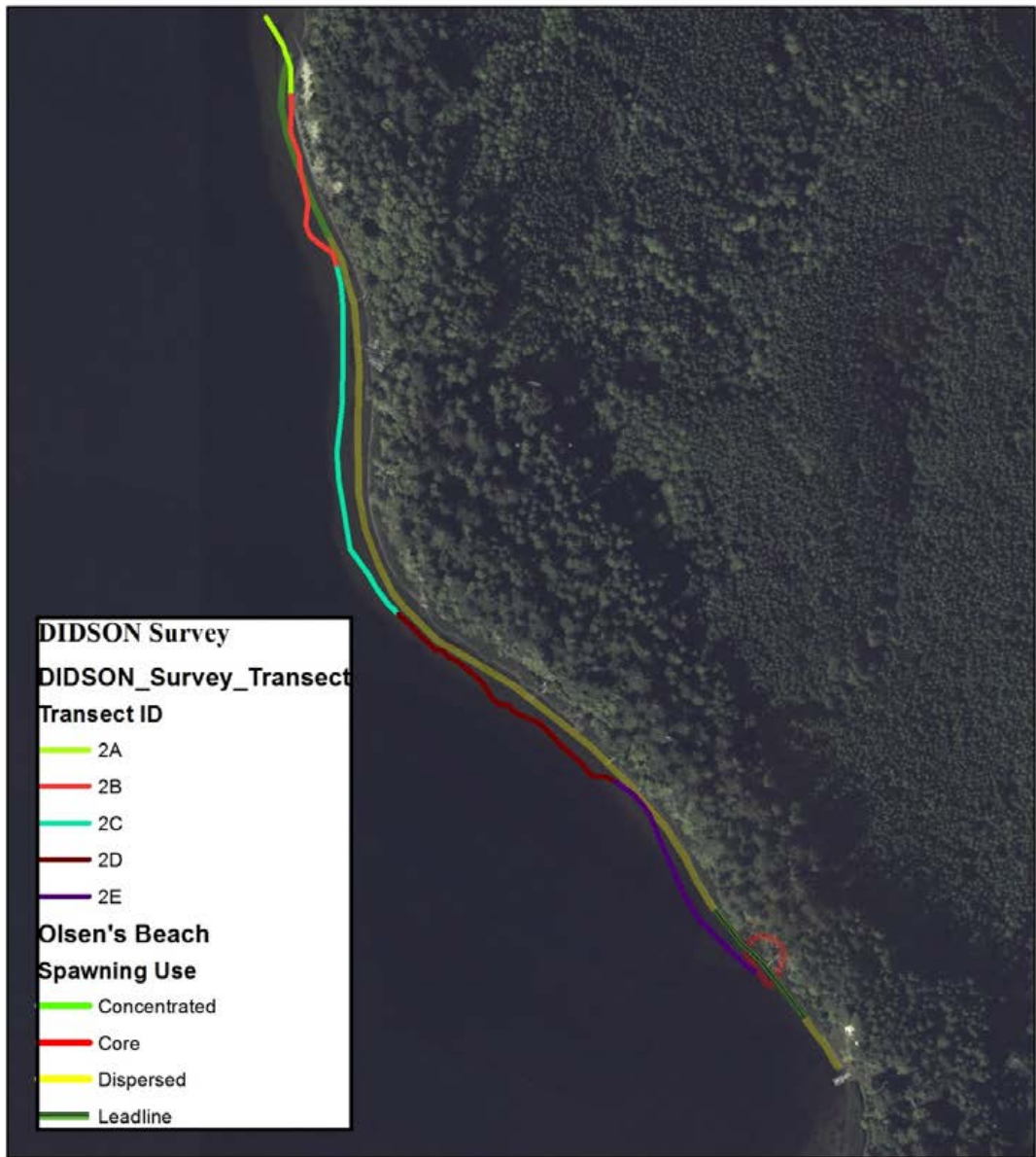
0 162.5 325 650 975 1,300 Feet

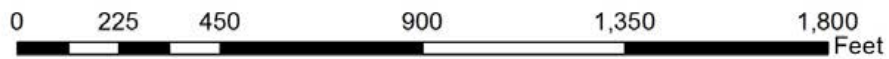
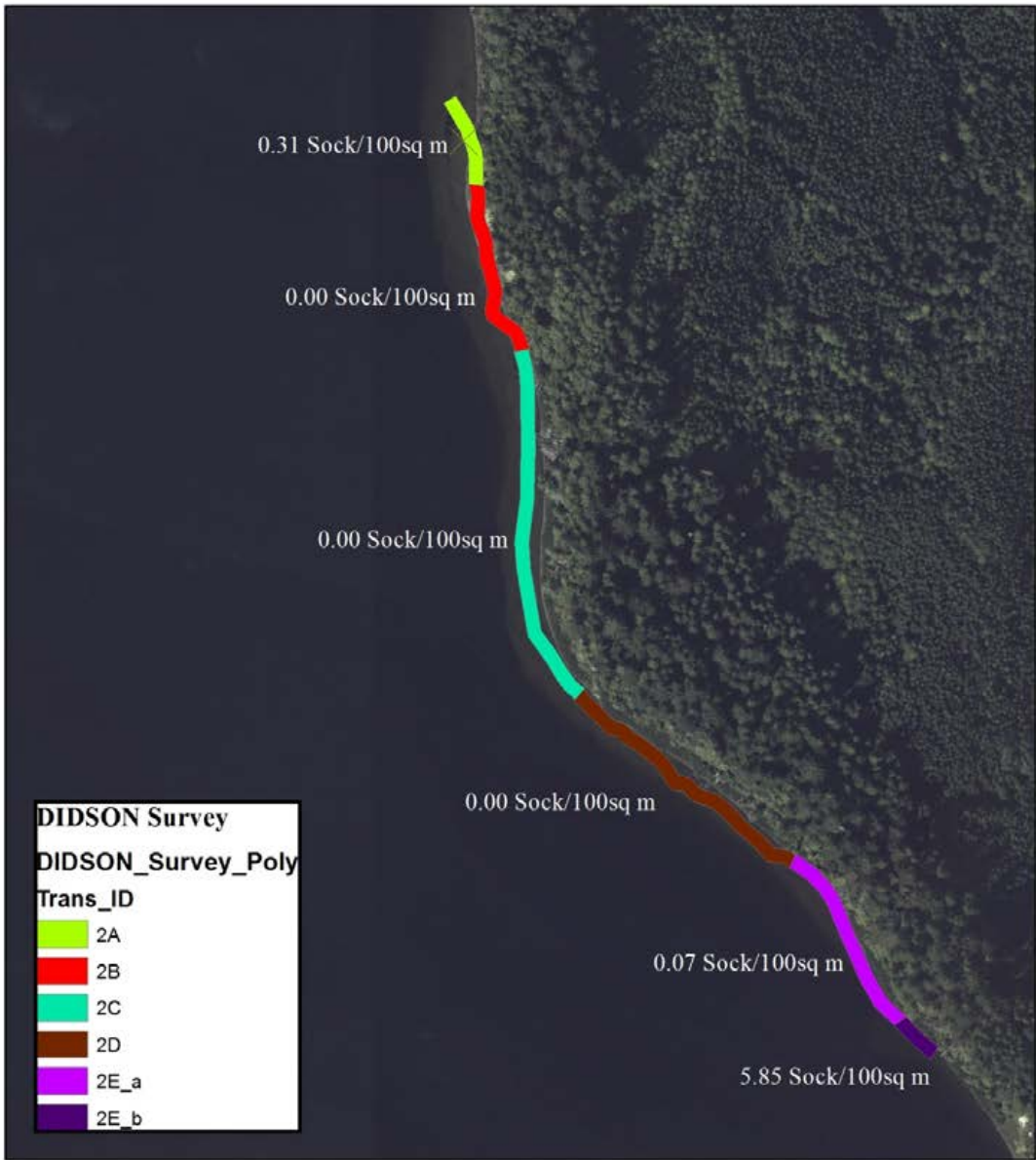




Example images from Transect 1a_b

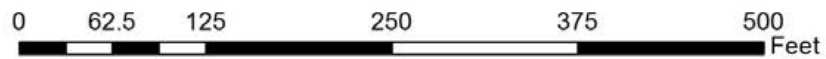
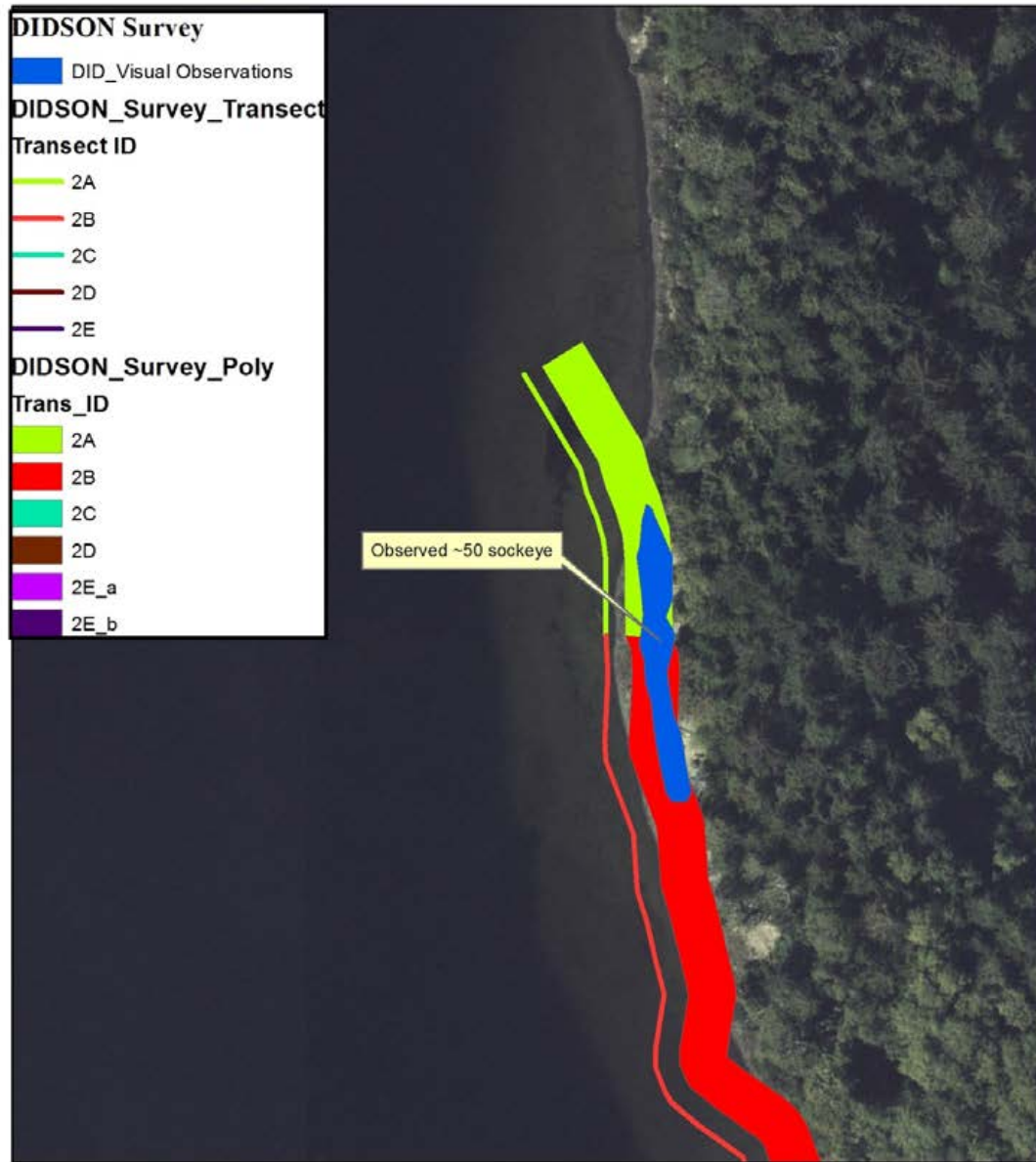






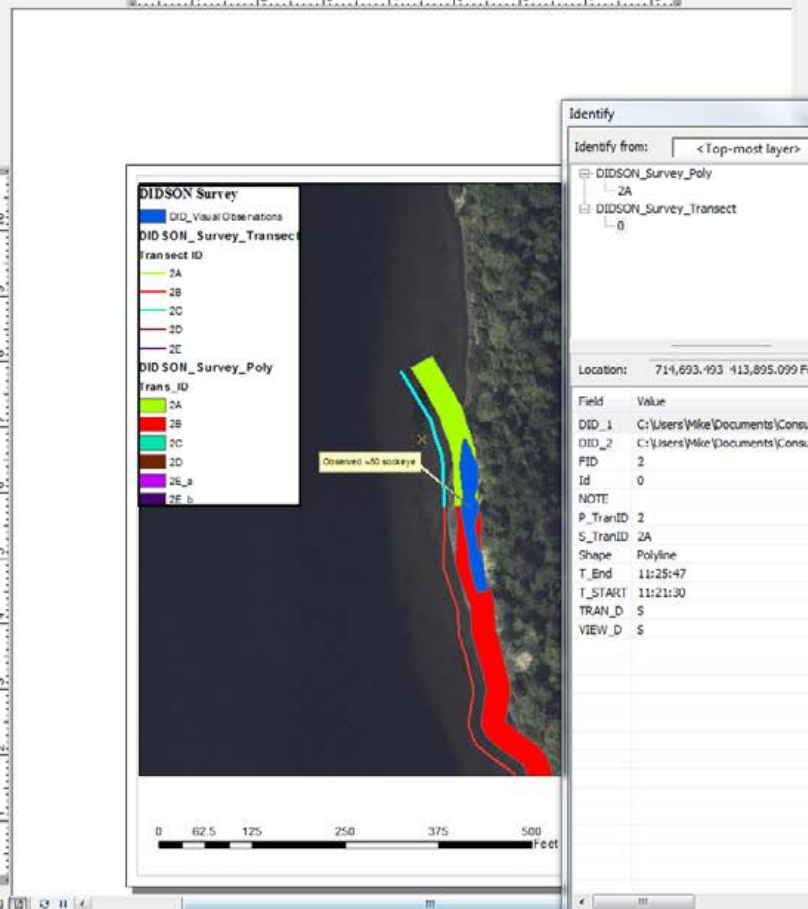
Observations from Slow Pass Testing- Olsen's Beach

- The best results came from transects looking lakeward from the brush line.
- Many of the targets were visually seen directly below the boat and shoreward of the boat.
- Image quality is better looking down the beach than up the beach.
- When looking up the beach the DIDSON images become less and less clear. Target density was significantly higher also.





- GPS TRACK_Points
- Aug06Survey.csv Events
- DID_Visual Observations
- DIDSON_Survey_Transect
 - Transect ID
 - 2A
 - 2B
 - 2C
 - 2D
 - 2E
- DIDSON_Survey_Transect
 - Transect ID
 - A
 - B
- DIDSON_Survey_Poly
 - Transect ID
 - 2A
 - 2B
 - 2C
 - 2D
 - 2E_a
 - 2E_b
- DIDSON_Survey_Poly
 - Transect ID
 - 1a_a
 - 1a_b
 - 1a_c
 - 1a_d
 - 1b_a
- DIDSON_Survey_Transect
 - Transect ID
 - 1a
 - 1b
- DIDSON_Survey_Poly
 - Sockeye per 100 sq. Meters
 - 0.000000
 - 0.000001 - 0.196162
 - 0.196163 - 0.910343
 - 0.910344 - 2.893694
 - 2.893695 - 20.904732



Identify

Identify from: < Top-most layer >

- DIDSON_Survey_Poly
 - 2A
 - DIDSON_Survey_Transect
 - 0

Location: 714,693.193 413,895.099 Feet

Field	Value
DID_1	C:\Users\Mike\Documents\Consulting\Cof
DID_2	C:\Users\Mike\Documents\Consulting\Cof
FID	2
Id	0
NOTE	
P_TransID	2
S_TransID	2A
Shape	Polyline
T_End	11:25:47
T_START	11:21:30
TRAN_D	S
VIEW_D	S

Identified 2 features

DIDSON_Survey_Poly						
Shape*	Id	Trans_ID	Sock no	Area	Sock sq	Sok 100s
Polygon	0	1a_a	5	549.2437	0.009103	0.910343
Polygon	0	1b_a	8	2231.511	0.003585	0.358501
Polygon	0	1a_c	12	414.6940	0.028937	2.893694
Polygon	0	1a_b	51	243.9838	0.209047	20.904732
Polygon	0	1a_d	3	1529.346	0.001962	0.196162
Polygon	0	2A	2	635.8620	0.003145	0.314534
Polygon	0	2B	0	1251.093	0	0
Polygon	0	2C	0	2507.002	0	0
Polygon	0	4A_d	43	3651.046	0.011777	1.177745
Polygon	0	4A_a	1	12129.191	0.00047	0.046988
Polygon	0	4A_b	15	703.2519	0.021329	2.132948
Polygon	0	4A_c	0	1138.412	0	0
Polygon	0	4A_e	0	655.8293	0	0
Polygon	0	3A_a	8	2908.417	0.002753	0.275253
Polygon	0	3B_c	0	3004.136	0	0
Polygon	0	3B_a	0	2237.147	0	0
Polygon	0	3B_b	12	313.6636	0.038258	3.825754
Polygon	0	4B_a	2	11265.20	0.000178	0.017754
Polygon	0	2D	0	1931.869	0	0
Polygon	0	2E_a	1	1370.060	0.00073	0.072909
Polygon	0	2E_b	19	324.4167	0.058567	5.856685
Polygon	0	5A_a	0	4058.545	0	0
Polygon	0	B	0	1727.592	0	0
Polygon	0	B	0	0	0	0
Polygon	0	A	0	0	0	0

Create Feat... 4 X

<Search> 🔍

Did Visual Obsen

Identify

Identify from: <Top-most layer>

- [-] DIDSON_Survey_Poly
 - [-] 2A
- [-] DIDSON_Survey_Transect
 - [-] 0

Location: 714,693.493 413,895.099 Feet

Field	Value
DID_1	C:\Users\Mike\Documents\Consulting\Co
DID_2	C:\Users\Mike\Documents\Consulting\Co
PID	2
Id	0
NOTE	
P_TransID	2
S_TransID	2A
Shape	Polyline
T_End	11:25:47
T_START	11:21:30
TRAN_D	S
VIEW_D	S

Table

DIDSON_Survey_Poly

Shape *	Id	Trans_ID	Sock_no	Area	Sock_sq	Sok_100s
Polygon	0	1a_a	5	549.2437	0.009103	0.910343
Polygon	0	1b_a	8	2231.511	0.003585	0.358501
Polygon	0	1a_c	12	414.6948	0.028937	2.893694
Polygon	0	1a_b	51	243.9838	0.209047	20.904732
Polygon	0	1a_d	3	1529.348	0.001962	0.196162
Polygon	0	2A	2	835.8620	0.003145	0.314534
Polygon	0	2B	0	1251.093	0	0
Polygon	0	2C	0	2507.002	0	0
Polygon	0	4A_d	43	3651.048	0.011777	1.177745
Polygon	0	4A_a	1	2129.191	0.00047	0.046868
Polygon	0	4A_b	15	783.2519	0.021329	2.132948
Polygon	0	4A_c	0	1136.412	0	0
Polygon	0	4A_e	0	653.6293	0	0
Polygon	0	3A_a	8	2908.417	0.002753	0.275253
Polygon	0	3B_c	0	3004.136	0	0
Polygon	0	3B_a	0	2237.147	0	0
Polygon	0	3B_b	12	313.6636	0.038258	3.825754
Polygon	0	4B_a	2	11265.20	0.000178	0.017754
Polygon	0	2D	0	1931.889	0	0
Polygon	0	2E_a	1	1370.080	0.00073	0.072989
Polygon	0	2E_b	19	324.4167	0.058507	5.850665
Polygon	0	5A_a	0	4058.545	0	0
Polygon	0	6	0	1727.592	0	0
Polygon	0	8	0	0	0	0
Polygon	0	A	0	0	0	0

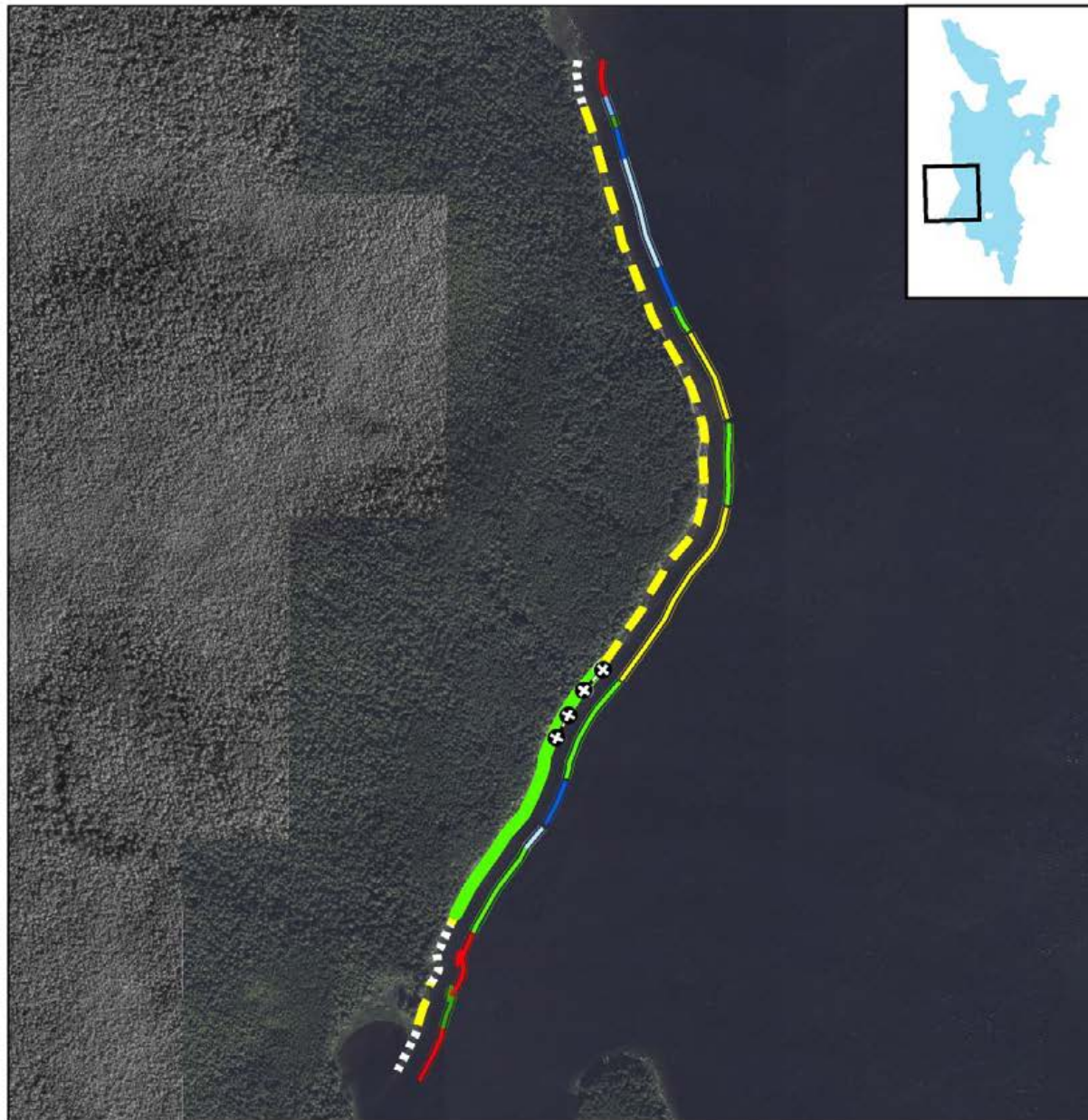
Allen's Beach

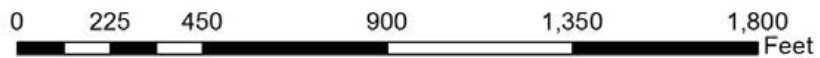
Allen's Beach Spawning Use

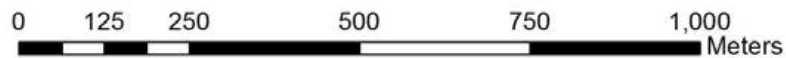
- Concentrated
- Dispersed
- Leadline
- None

Substrate Type

- Cobble
- Cobble/Fines
- Cobble/Gravel
- Gravel
- Gravel/Cobble
- Gravel/Fines
- Silt/Sand







Observations from Slow Pass Testing- Allen's Beach

- Rough water limited our ability to visually observe sockeye at depths greater than 1 meter.
- The DIDSON looking up the beach did good relative to our ability to visually observe sockeye at the south end of Allen's.
- At north Allen's and Cemetery Point the wind was stronger, making it difficult to control the boat at low speeds.
 - Higher travelling speeds and big waves yield low quality images.
 - We visually observed ~40 sockeye spawning high on Cemetery Point that the DIDSON did not detect.

Additional Observations

- 190 live sockeye in three high density concentrations. Dozens of additional sockeye scattered at lower densities at Olsen's and Allen's.
- Makah staff recorded approximately 192 dead sockeye.
- The 6 DIDSON transects and one stationary count yielded 187 targets identified as sockeye.
- No sockeye were observed visually or with the DIDSON at Umbrella Beach or Garden Island.

Questions?

