County: Clallam
Grant No: SEANWS-2017-ClCoCD-00006

PROJECT TITLE: Forage Fish Monitoring

DELIVERABLE: 2.1 – Forage Fish Quality Assurance Project Plan

PERIOD COVERED: October 2016 - January 2018

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QUALITY ASSURANCE PROJECT PLAN:

Clallam County Marine Resources Committee Intertidal Forage Fish Spawning Survey

Prepared for: Washington Department of Ecology

Prepared by: Helle Andersen – Clallam County MRC

January 2018

Based on EPA guidance CIO 2106-G-05 (2012)

Publication Information

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Each study conducted for the EPA or Ecology must have an approved Quality Assurance Project Plan (QAPP) describing the objectives of the study and the procedures to be followed to achieve those objectives. This QAPP serves as an umbrella under which multiple data collection, production and use activities will be conducted over an extended period of time at several different project sites. The QAPP will be available on Clallam County Marine Resources Committee's website at http://www.clallamcountymrc.org/

Data for this project will be available on the SoundIQ website at www.iqmap.org/SoundIQ/

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For more information see: Clallam County Marine Resources Committee:
http://www.clallamcountymrc.org/

Quality Assurance Project Plan
Clallam County Marine Resources Committee Intertidal Forage Fish Spawning Survey

January 2018

Approved by

Signature: _____

Date: _____

Sasha Horst, Project Officer, Washington State Department of Ecology

Signature: _____

Date: _____

Lucas Hart, NWSC Project Manager, Northwest Straits Commission

Signature: _____

Date: _____

Jeff Ward, Chair, Clallam County Marine Resources Committee

Signature: _____

Date: _____

Ed Bowlby, Project Lead, Clallam County Marine Resources Committee

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Date: _____

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Project Background

Forage fish are a vital part of the Puget Sound ecosystem, and the monitoring of their status is an important component to the recovery of Puget Sound and the Salish Sea. They are intermediaries in the food chain, passing energy from primary producers (phytoplankton) and primary consumers like invertebrate larvae and shrimp to higher trophic levels, including marine birds, mammals and fish. The latter include salmon, some of which are listed as endangered under the Endangered Species Act. This project of the Clallam County Marine Resources Committee reestablishes forage fish beach surveys at select locations in Clallam County. The sampling will be conducted by citizen-science volunteers who have received training from Washington Department of Fish and Wildlife (WDFW) and will use sampling and processing protocols established by WDFW.

Clallam County Marine Resources Committee is one of seven MRCs in the counties of northern Puget Sound created in 1998 when Congress authorized the Northwest Straits Marine Conservation Initiative. This initiative resulted from the 1998 Murray-Metcalf Northwest Straits Citizens Advisory Commission Report. The MRCs were created to provide local, broad-based, bottom-up input to the Northwest Straits Commission (NWSC) and affiliated county governments.

In 1998, WDFW established a policy (POL-C3012) on the management of forage fish that requires management policies based on monitoring data. A Northwest Straits Commission symposium on forage fish was held in September 2012 (Liedtke, 2013) that both summarized current work and presented new research. One of the conclusions of the symposium was that:

"The lack of reliable, and stock-specific, abundance estimates is a large data gap for most forage fish species in the Salish Sea. It is difficult to assess whether forage fish populations are stable, growing, or declining without a baseline population estimate and a means of assessing abundance on a relevant time scale. Herring are the only forage fish species in Puget Sound that are regularly monitored (by WDFW), and the group recommended that future effort be more balanced across all forage fish species."

Forage fish beach spawning surveys have been recognized as a reliable way of monitoring forage fish spawning abundance and determining critical spawning habitat sites. (Moulton and Penttila, 2001).

Project Description

The goals of the intertidal forage fish spawning surveys in Clallam County are to:

- Enhance baseline data
- Document changes over time in forage fish usage of Clallam County beaches using established methods that will provide data comparable across monitoring years.

The objectives of this project are to:

- Train and empower citizen scientists to conduct surveys using a standardized protocol
- Implement the surveys on a regular and consistent basis which can contribute to the time series from previous monitoring studies, and supplement the Sound-wide survey led by WDFW

- Create a sustainable, locally-operated structure in Clallam County to continue this work after the end of this grant.

This survey is designed to establish continuity with existing Washington Department of Natural Resources (WDNR) and WDFW data in an effort to define trends and develop an understanding of the conditions and processes affecting the study areas over time. To achieve this, all surveys will use established standards and sampling methodologies developed and made available by WDFW. As the planned monitoring program is implemented over succeeding years, it will generate data that can be used to establish baseline conditions, define trends, document changes, and identify potential shoreline protection and restoration opportunities.

Monitoring within Clallam County is constrained by two primary factors: human resources to conduct the monitoring and public access.

The analysis of samples for identification of species and the number of eggs present requires scientific expertise that is beyond the capacity of this citizen science program. Therefore, the samples will collected and preprocessed to concentrate fine material, then provided to WDFW along with field data sheets and other information for laboratory analysis. An appropriate chain of custody will be maintained and documented throughout this process. All samples will include an identification tag referencing data sheets completed on site. Samples will be concentrated following the vortex method protocol and shipped to WDFW. Data sheets, photos and sample accounting forms will be provided to WDFW (Erin Dilworth) via email.

Project Goal and Objectives

The overall goal for this project is to provide high quality data on forage fish usage of select Clallam County beaches and restoration projects. The primary objective is to train and mobilize citizen scientists to collect environmental samples and ancillary information to achieve this goal.

The sampling locations and tidal elevations where sampling will occur where various species of forage fish are expected to spawn based on information from Dan Penttila and WDFW personnel during citizen scientist training sessions. To achieve comparability over time, samples will be collected, preprocessed using the vortex method, handled, stored, and transported following standard protocols approved and disseminated by WDFW as described below. The target for completeness is to successfully collect beach samples for 95% of the planned monthly sampling events.

Project Sites

The monthly monitoring effort in Clallam County started with two index sites in October 2016 and was expanded with four restoration monitoring sites in 2017. These sites are:

- Pitship Point adjacent to John Wayne Marina in Sequim Bay
- Old Town on Dungeness Bay
- Two locations at the Lower Elwha restoration site on Ediz Hook
- Two locations on the Elwha Beach east of the river mouth

Pitship Point and Old Town were identified as index sites by WDFW based on historical forage fish spawning surveys. The locations of the index sites are shown in Figure 1. The index sites will be monitoring monthly for 18 month at which point the data will be assessed and in collaboration with WDFW a decision will be made to continue monitoring at these locations or move the index sites to other locations.

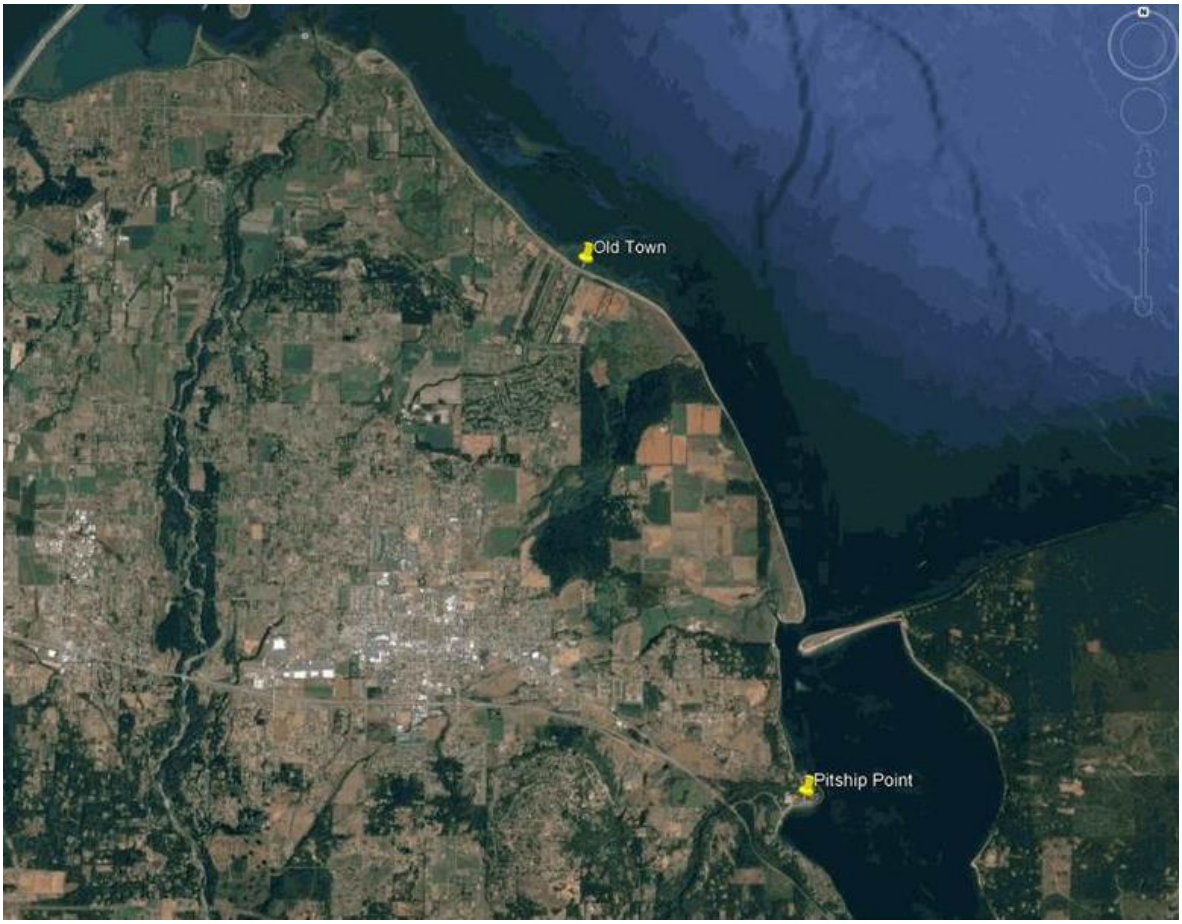


Figure 1. Locations of Pitship and Old Town index sites in Clallam County (Google map).

The Lower Elwha Klallam Tribe has for several years performed restoration work on the inside of Ediz Hook. Restoration activities have included removing old docks and pilings and adding finer sediment and large woody debris along the beach. Two monitoring sites were established in April 2017 next to the radio tower and at the old A-frame log loading site. In October 2017 the sediment at the radio tower site had gotten significantly coarser making it unlikely that forage fish would spawn in this area and the monitoring sampling was moved further into the harbor at the 1st restoration site. In November the sampling effort was moved to a location just east of the rowing club building. Unless the sediment composition changes at the A-frame site and the site east of the rowing club these two locations will be the forage fish monitoring sites. The locations of the restoration monitoring sites at Ediz Hook are shown in Figure 2.

Figure 2. Locations of four restoration monitoring sites on Ediz Hook, Clallam County (Google map).

In July two monthly restoration monitoring sites on the beach east of the mouth of Elwha River were added to the sampling effort. Since the dam removal this beach has changed from cobble and coarse gravel to fine sand and the Lower Elwha Klallam Tribe is interested in knowing if forage fish have returned to the beach to spawn. Sampling at the beach requires permission by the Lower Elwha Klallam Tribe and one or two of their field technicians always participate in the sampling effort. At each monitoring event the site at the mouth of the river is always sampled and the second sample is either taken at the Angeles Point or at the East Beach site. The locations of the restoration monitoring sites at Elwha Beach are shown in Figure 3.

In addition to the monthly monitoring effort Clallam MRC participates in the biannual intensive sampling events led by WDFW. The events are usually scheduled to take place once during the winter months and once during the summer months. During these events a WDFW crew from Olympia spends a week collecting forage fish samples at as many locations along the Strait of Juan de Fuca as possible. Clallam MRC members and staff help with the sampling effort in the Sequim and Port Angeles area.

If additional monitoring sites are added in the future, this QAPP will be updated.

Figure 3. Locations of three restoration monitoring sites at Elwha Beach, Clallam County (Google map).

Project Management

Numerous people are involved in the project to ensure the monthly monitoring is taking place. The following list summarizes the roles, tasks and who is responsible. Each year Clallam MRC produces an overall workplan, which identifies project lead and secondary lead for all the MRC projects. This QAPP will be updated if the roles are filled by other Clallam MRC members.

Clallam MRC Lead

Ed Bowlby, Clallam MRC member, will be the Clallam MRC lead on the forage fish monitoring project. Mr. Bowlby will participate in the monthly and biannual intensive sampling events and ensure that the WDFW receives the monthly samples and data.

Clallam MRC Secondary Lead

Alan Clark, Clallam MRC member, will be the Clallam MRC secondary lead on the forage fish monitoring project. Mr. Clark will participate in the monthly and biannual intensive sampling events and, in Mr. Bowlby absence, ensure that the WDFW receives the monthly samples and data.

Clallam MRC Project Coordinator

Helle Andersen, Clallam MRC staff, will be responsible for project oversight and be responsible for maintaining the official, approved QAPP. Ms. Andersen will participate in the monthly and biannual intensive sampling events. She will compile the required datasheet and site photos and email the

information to Erin Dilworth, WDFW. Ms. Andersen will ship the samples to Lucas Hart, NWSC, or the WDFW office in Port Townsend for transport to the WDFW laboratory for analysis. She will also be responsible for any NWSC grant deliverables associated with the forage fish monitoring project.

Sampling Volunteers

Clallam MRC members will participate in the monthly or biannual intensive sampling events on an as needed basis.

NWSC Project Manager

Lucas Hart, NWSC, is the overall forage fish project manager for the NWSC. Mr. Hart will provide guidance and coordination between the MRCs and WDFW. Each month Mr. Hart will receive the samples collected by Clallam MRC and will deliver them to the WDFW office in Port Townsend.

Project Quality Assurance Officer

Sasha Horst, NWSC, will provide review of this QAPP and ensure that all proposed actions meet the Washington Department of Ecology requirements.

GIS Specialist

Suzanne Shull, NWSC, will assist Lucas Hart and WDFW with storage and analysis of the data collected during the project and upload the data onto SoundIQ (https://www.iqmap.org/geviewer/Html5Viewer/Index.html?viewer=SoundIQ).

Project Schedule and Training

The sampling program requires adequate training of the participating citizen scientists. Once collection has started, it will be performed at each selected site monthly year-round. The sampling is tide dependent and will take place at each site when the tide is lower than 3.5 ft.

Citizen scientists will receive training from WDFW as it is available or by NWSC project manager or Clallam MRC project lead. Citizen science volunteers will be directed to online resources from the 2014-2015 Northwest Straits Commission survey workshops held in partnership with WDFW. These include forage fish beach survey training materials and established protocols, available at http://wdfw.wa.gov/conservation/reseach/projects/marine_beach_spawning/

Data Acquisition

Sampling Design and Procedures

The sampling design follows the WDFW Intertidal Forage Fish Spawning Habitat Survey Protocols, Procedures for Obtaining Bulk Beach Substrate Samples (Philip Dionne, WDFW) based on earlier protocols developed by Dan Penttila (Penttila, 2011) with the San Juan MRC. Complete protocols are included in Appendix A.

Briefly described the sampling effort includes the following steps:

1. At the designated sampling location a 100 ft. measuring line, with reference marks at 0, 33, 66, and 100 feet, is placed at the appropriate beach elevation identified by the project lead, staff and volunteers. For further determination of the sampling band see the protocol in Appendix A.

2. Sediment is sampled at the 0, 33, 66, and 100 ft. mark and combined in a labeled bag. The bag should be 8x24 inch bag and the collected sediment should fill the bag about 2/3-3/4 full.
3. Site coordinates and pictures are taken at the 50 ft. mark and the datasheet provided by WDFW is filled out.
4. The sample is taken to John Wayne Marina, Boat Heaven Marina, or another suitable locations and process using the vortex method (see protocol in Appendix A).
5. The sample is preserved in a Stockard solution and stored at the Clallam MRC project coordinators office until it is delivered to Lucas Hart in Port Townsend.

Quality Control and Data Management

The following procedures will be used to maintain quality of the samples and data in this program:

1. Follow the standard procedures as described in the previous section among sites and among monitors. This includes filling out the field form completely.
2. Only individuals who successfully complete training in the collection protocols are allowed to collect samples. Other individuals may participate in other non-collection activities, such as assisting with the establishment of a transect line, but only if they are accompanied and supervised by a trained individual.
3. Project lead, staff, or a single individual who has been successfully trained in the protocol will serve as field lead, and be responsible for the integrity of the sampling. This individual will be identified on the data collection form by being the first name entered under “Samplers.”
4. Sampling locations will be recorded from hand-held GPS units or the coordinates will be identified using an obvious landmark reference point and Google Earth. The make and model of the GPS units will be recorded. The datum for each unit will be set to NAD 83 and positions recorded in decimal degrees. The unit will be calibrated vs. a known reference point at the start of each sampling event. Sampling coordinates are expected to be accurate and repeatable to within 3 meters.
5. An identifying label will be placed inside the sample jar. This label will include: location name, date and beach number/sample number written with a pencil.
6. Prior to leaving each sampling area, the field lead will review field logs and other field notes to identify any unusual or anomalous results. If any are found, they will be resolved (e.g., repeat GPS measurements or sample collections, if necessary) before leaving the field.
7. Data will be provided to WDFW with the necessary oversight/error checking to ensure accuracy of transcription. The forage fish data is viewable on the WDFW website http://wdfw.wa.gov/conservation/research/projects/marine_beach_spawning/, and at SoundIQ https://www.iqmap.org/geviewer/Html5Viewer/Index.html?viewer=SoundIQ.

Assessments

Reports

Progress reports and volunteer hours will be submitted quarterly.

A copy of the QAPP will be developed and reviewed annually.

Raw data and a report on survey activities will be submitted at the end of each fiscal year to the NWSC and Department of Ecology. The report will include:

- A narrative of the field research
- A summary of sampling effort
- Analysis of the presence or absence of eggs by zone for those samples where laboratory analysis is complete.
- Recommendations for any modification of the procedures and the overall program

References

Kammin, 2010. Definition developed or extensively edited by William Kammin, 2010.

Liedtke, Theresa, Gibson, Caroline, Lowry, Dayv, and Fagergren, Duane, eds., 2013, Conservation and Ecology of Marine Forage Fishes—Proceedings of a Research Symposium, September 2012: U.S. Geological Survey Open-File Report 2013- 1035, 24 p.http://www.nwstraits.org/media/1076/nwsc-2012_foragefishsymposiumproceedings.pdf

Moulton, Lawrence L and Penttila, Daniel E. 2001 (Revised 2006). San Juan County Forage Fish Assessment Project Forage Fish Spawning Distribution in San Juan County and Protocols for Sampling Intertidal and Nearshore Regions Final Report June 2000. http://www.sanjuanco.com/cdp/docs/CAO/ForageFishSpawning(MoultonPentilla2000).pdf

Penttila, Dan, 2015, Summary of Information for Development of Plans for Renewed Forage Fish Spawn Surveys) Surf Smelt and Pacific Sand Lance) in Clallam County, WA. Technical report prepared under current NW Straits Initiative/Puget Sound Partnership grant #SEANWS-2014-IsCoPH-00002

Penttila, Dan. 2011. WDFW Intertidal Forage Fish Spawning Habitat Survey Protocols http://wdfw.wa.gov/conservation/research/projects/marine_beach_spawning/

Pierce, Ken; Penttila, Dan; Benson, Brian; Krueger, Kirk; Quinn, Timothy; and Price, David 2012. Spatiotemporal Detection of Forage Fish Eggs Derived from Long- term Spawning Surveys. Poster available at http://wdfw.wa.gov/publications/01211/wdfw01211.pdf

Puget Sound Action Agenda http://www.psp.wa.gov/action_agenda_center.php

WDFW, 2011. Protocol FF-03 Intertidal Forage Fish Spawning Habitat Survey Protocols Laboratory procedure for determining forage fish egg presence/absence from preserved “winnowed light fraction” beach substrate samples. Available at http://wdfw.wa.gov/conservation/research/projects/marine_beach_spawning/training/protocol-lab_spawn_presence_absence.pdf

WDFW, 1998. Forage Fish Management Policy, Goals and Plan. http://wdfw.wa.gov/commission/policies/c3012.html

USEPA, 1997. Glossary of Quality Assurance Terms and Related Acronyms.

WDFW Intertidal Forage Fish Spawning Habitat Survey Protocols

Procedures for obtaining bulk beach substrate samples

Field materials needed:

Measuring tape (100+ feet)

16-ounce plastic jar or large scoop

8 inch x 24 inch polyethylene bag (or large, sturdy Ziploc)

Handheld GPS device

Tide table

Digital camera (optional)

Hypsometer (if available)

Data sheet (preprint on Write-in-the-Rain paper if possible)

Note: Sampling should occur on the lowest tide practicable. Prior to sampling any site consult tide tables to ensure you will be able to access the +7-9 (surf smelt) and +5-8 (sand lance) tidal height. It may also be necessary to obtain **permission to access the beach** from private or corporate landowners.

Procedure:

1. Upon arriving on the beach, fill out the header information on the attached data sheet. *Do not* fill in "Reviewed by." Before conducting the first sample, describe the character of the upland and beach environment using the codes provided on the back of the data sheet. For additional details on sample codes see Moulton and Penttila (2001)*.
2. Identify a landmark from which you will measure the distance to the bulk substrate sample tidal elevation. Typical landmarks include the upland toe of the beach, the last high tide mark or wrack line, and the edge of the water.
3. Measure the distance from the landmark to the tidal elevation to be surveyed. Note that linear measurements along the beach face serve as an index of tidal height but do not directly quantify *vertical* tidal height. If available, a hypsometer can be used to measure vertical sampling height.
4. Stretch a measuring tape at least 100 feet along the selected tidal height. Note that beach contours may cause the landmark to be "wavy" and that the tape should remain a consistent distance from the landmark.
5. Standing at one end of the measuring tape, record a GPS fix on the data sheet.
6. Using a 16-ounce sample jar or large scoop remove the top 5-10 cm (2-4 in) of sediment from the location recorded in Step 6 above. Place the sediment in an 8 inch x 24 inch polyethylene bag or large, sturdy Ziploc. You may need to take two scoops to get sufficient sediment, depending on the coarseness of the beach.
7. Walk ten paces (single steps) along the measuring tape, repeat the sediment scooping action, and place the sediment in the bag. Move an additional ten paces and repeat. Move an additional ten paces, approximately to the end of the tape, and repeat. The bag should now have sediment from four locations along the tape and be at least ½ to ⅔ full.

8. If additional transects, representing various tidal heights, along the beach are to be surveyed, place the sample bag in a cool, shady place and repeat the above procedures at these additional locations. If no additional samples will be taken, move on to wet sieving and winnowing the sample as described in the companion protocol "Procedures for recovering "winnowed light fractions" subsamples of forage fish egg-sized material from bulk beach substrate samples."
9. If you have a camera, take several photos of the survey area showing sampling locations. Be sure to take photos from several perspectives (i.e., both up and down, as well as along, the beach). For each photo, record the cardinal direction you are facing on the data sheet in the comments field.

* Moulton, L.L., and Penttila, D.E. 2001. Field manual for sampling forage fish spawn in intertidal shore regions. Field Manual, MJM Research and Washington Department of Fish and Wildlife, Lopez Clallam, WA. PDF available on request from Dayv Lowry at WDFW (dayv.lowry@dfw.wa.gov).

Original protocol by Dan Penttila, WDFW. Reformatted by Dayv Lowry, WDFW.Version 2.0, July 2011

Forage Fish Spawning Beach Survey (see back for codes)

Month	Day	Year
Camera ID:		

Last High Tide
Time (24-hr):
Elevation:

2nd Effective High Tide
Time (24-hr):
Elevation:

Location:

County:

Page ___ of ___

	Beach Station #	Time (24-hr)	Latitude (decimal degrees)	Longitude (decimal degrees)	Beach	Uplands	Width	Length	Sample #	Landmark	Sample Zone	Tidal Elevation	Shading	Sample Type	Smelt	Sand lance	Rock sole	Photo #	Comments
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			

Samplers: **Organization:** _____

(print names here, sign back) _____ Reviewer: _____

Field Observation Sampling Code

Beach: Sediment character of the upper beach (particle size range in inches)
0 = mud (<0.0025)
1 = pure sand (0.0025-0.079)
2 = pea gravel (0.079-0.31, "fine gravel") with sand base
3 = medium gravel (0.31-0.63) with sand base
4 = coarse gravel (0.63-2.5) with sand base
5 = cobble (2.5-10.1) with sand base
7 = boulder (>10.1) with sand base
8 = gravel to boulders without sand base
9 = rock, no habitat

Uplands: Character of the uplands (up to 100 ft. from high water mark)
1 = natural, 0% impacted (no bulkhead, rip-rap, housing, etc.)
2 = 25% impacted
3 = 50% impacted
4 = 75% impacted
5 = 100% impacted

Width: Width of the potential spawning substrate band to the nearest foot. Judged by character of sediment and presence of spawn, when possible.

Length: Length of the beach up to 1,000 feet (500 feet on either side of the station).

Landmark: landmark for determining sample zone where collection occurs
1 = down beach from last high tide mark
2 = up beach from last high tide mark
3 = down beach from second to last high tide mark
4 = down beach from upland toe
5 = up beach from waterline at the time noted

Sample Zone: Distance of sample zone transect parallel to the landmark, in feet to the nearest ½ foot. Used to determine the tidal elevation of the spawn deposit.

Tidal Elevation: Determined in the office using location and time data provided.

Shading: Shading of spawning substrate zone, averaged over the 1,000 foot station and best interpretation for the entire day and season
1 = fully exposed
2 = 25% shaded
3 = 50% shaded
4 = 75% shaded
5 = 100% shaded

Sample Type: S=Scoop; V=Visual; B=Bulk; E=Elevation; C=Core; 3=3S-Bulk

Smelt, Sand Lance, Rock Sole: subjective field assessment of spawn intensity apparent to the naked eye:
0 = no eggs visible
L = light, but apparent
M= medium, readily visible
H = heavy, broadly abundant
W = eggs observed in winnow

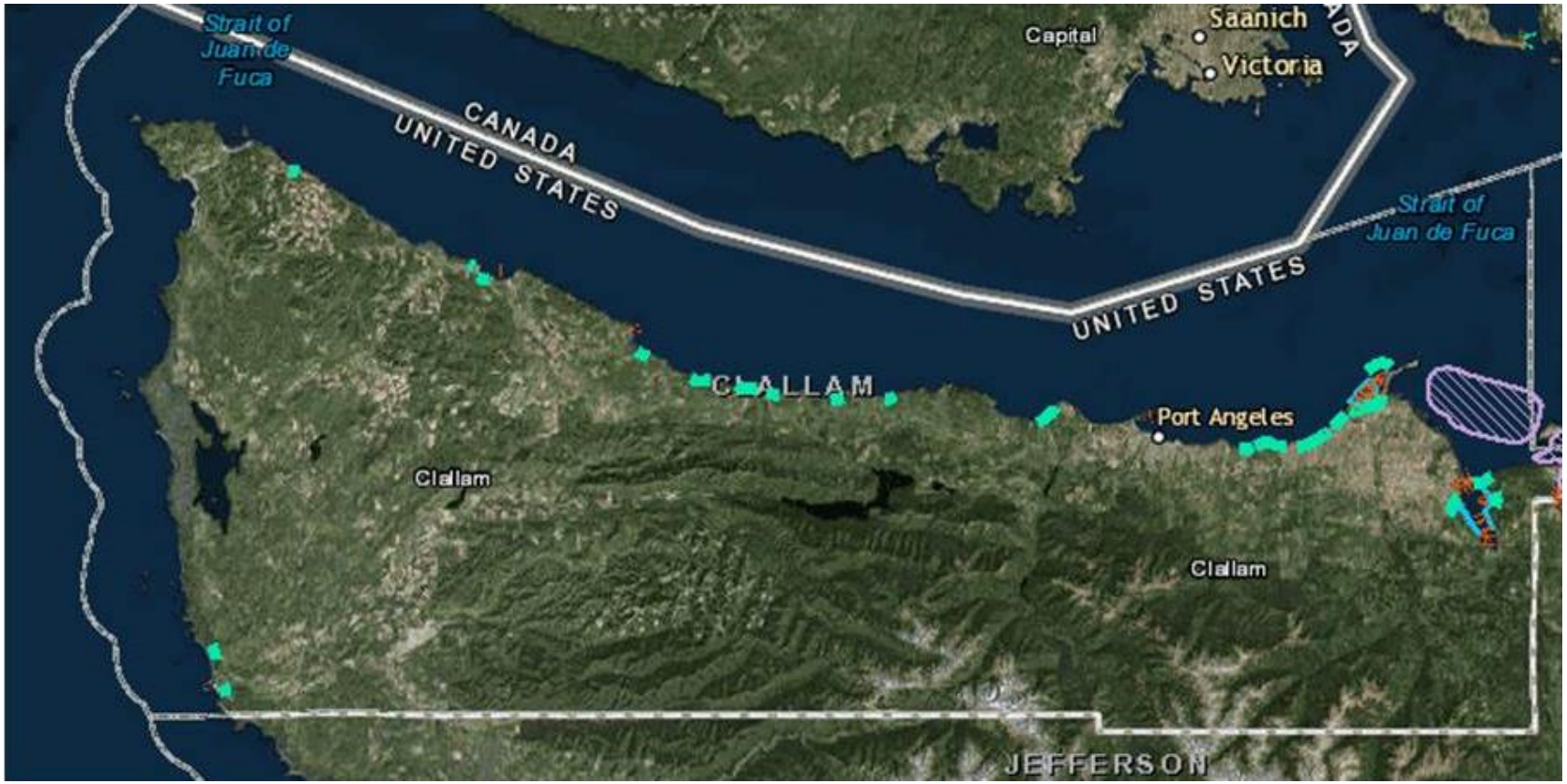
Photos: Take 6 site photos standing at the center of the site, and record the file number of the 1st photo in the 6 photo series.
***Photo 1:** Completed sample tag
***Photo 2:** Sediment w/ scale at transect
Photo 3: Beach backshore
Photo 4: Beach right
Photo 5: Beach foreshore (towards water)
Photo 6: Beach left
**If multiple samples are collected at a single station, then only photos 1 and 2 need be repeated for each sample.*

****I certify that to the best of my abilities, the surveys recorded on this data sheet and the associated samples were collected and documented in accordance with WDFW approved protocols, and the information I am providing are the true and accurate results of the these surveys.**

Lead Signature: _____

Appendix B: Protocols and Data Forms: Vortex Method for Separation of Forage Fish Eggs from Beach Sediment

Appendix C: Map of Forage Fish Spawning Areas in Clallam County



Map downloaded from WDFW website December 2017.

Appendix D: Acronyms and Glossary

Acronyms

DO – Dissolved Oxygen

ESA – Endangered Species Act

GPS – Global Positioning Satellites

MRC – Marine Resources Committee

NWSC – Northwest Straits Commission

QAPP – Quality Assurance Project Plan

WDFW – Washington Department of Fish and Wildlife

WDNR – Washington Department of Natural Resources

Glossary

Completeness - The amount of valid data obtained from a data collection project compared to the planned amount. Completeness is usually expressed as a percentage. A data quality indicator. (USEPA, 1997)

Quality Assurance (QA) - A set of activities designed to establish and document the reliability and usability of measurement data. (Kammin, 2010)

Quality Assurance Project Plan (QAPP) - A document that describes the objectives of a project, and the processes and activities necessary to develop data that will support those objectives. (Kammin, 2010; Ecology, 2004)

Stockard's Solution - A formalin-based preservative that also include acetic acid, glycerin, and water (Moulton and Penttila, 2001)