Monitoring Plan

Shannon Point Revetment Removal

Version 2.0

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Prepared for Skagit County Marine Resources Committee

Prepared by Northwest Straits Marine Conservation Foundation

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Contents

Introduction

The Northwest Straits Foundation has prepared a monitoring plan as part of the Shannon Point Rock Revetment Removal Project. The project site is located on the southwest shore of Shannon Point within the Rosario Strait, south of the Bellingham Channel in Skagit County, Washington. The site consists of an undeveloped parcel owned by Western Washington University and tidelands owned by the City of Anacortes. The project site has a railroad causeway, consisting partially of non-native fill, and a rock revetment along 766 ft. of shoreline (CGS, 2014). The railroad causeway was constructed in 1890 and is no longer in use (CGS, 2014).

Skagit Marine Resources Committee recently identified Shannon Point as one of the top three restoration priorities in the North Fidalgo Island region. Pacific sand lance and surf smelt spawning have been documented on the intertidal shores of Shannon Point during winter and summer months. Sand lance and surf smelt are an important food source for marine fishes including salmon, seabirds and mammals.

The rock revetment currently covers up intertidal habitat which is a potential site for forage fish spawning. The project will remove a portion of the rip rap with the goal of restoring and improving nearshore habitat for forage fish spawning and salmon migration. Physical and biological parameters will be monitored to determine the success and long-term effects of the restoration project.

Existing Site Conditions

Coastal Geologic Services performed a feasibility analysis documenting existing conditions. Analysis included performing a site assessment and topographical survey to determine the feasibility of the project and potential benefits. The site is comprised of an approximately 6.1 to 18.5 ft. high bank from north to south, some of which appears to be native material and some of which was fill added to build up the railroad causeway (CGS, 2014).The existing rock revetment extends 766 ft. along the shore. A housing development lies to the south and Western Washington University's Shannon Point Marine Center to the north. A trail with access to the housing development runs along the top of the causeway and a small wetland lies upland from there.

Upland from the rip rap is a healthy abundance of riparian vegetation. This vegetation is an important resource for shading needed to moderate temperatures of surf smelt spawning grounds during summer months. Once rip rap has been removed, it is likely some of the vegetation will fall on the beach providing large woody debris habitat for aquatic insects and wildlife. The project will remove rip rap uncovering intertidal habitat exposing it to riparian shading and woody debris accumulation.

Project Description

The restoration project is designed to restore natural erosion and sediment transport along the shoreline, creating a viable habitat for forage fish spawning and juvenile salmon migration. Rip rap armoring increases turbulence and wave energy resulting in a poor habitat for juvenile salmon and coarse beach sediment unsuitable for forage fish spawning. The project is currently in a redesign phase to accommodate homeowner concerns and will involve removing the majority of rip rap armoring along 766 feet of shoreline. Above the rip rap is natural riparian vegetation which is expected to provide large woody debris and shading to cool potential forage fish spawning grounds.

Monitoring Plan

The monitoring plan is designed to determine the effectiveness of the restoration project and learn more about the effects of shoreline armoring. Pre and post-construction monitoring will be performed to determine what changes in habitat and habitat usage have occurred. The length of the monitoring period is subject to available funding. Post-construction monitoring should occur for 10 years after construction is complete, with monitoring activities being completed during years 1-5, 7, and 10 post-construction. The length of the monitoring period is subject to available funding. Monitoring should occur for 5 years after construction is complete.

This document is an update to the 2014 Shannon Point Monitoring Plan to reflect changes in monitoring protocols.

Physical Monitoring

Project Goal

Enhance nearshore physical habitat conditions by removing rip rap armoring along 766 ft. of shoreline.

Project Objectives

1. Restore a beach profile that will accumulate large woody debris and retain substrates which are suitable for forage fish spawning.
2. Improve sediment transport processes.
3. Increase forage fish spawning area.
4. Increase density and complexity of large woody debris and beach wrack.

Performance Standards

Monitoring data will be used to evaluate the following hypotheses in determining the long-term effects of the restoration project, and document and verify that physical performance standards are met.

1. As sea level rises, the amount of intertidal habitat will be maintained over the long term. The slope of the upper shore will be reduced allowing fine sediments to settle and become a dominant part of the upper beach substrate.
2. The shoreline will retain a substrate which is suitable for forage fish spawning.
3. Trees along the shoreline will fall once rip rap is removed providing an increased accumulation of woody debris.
4. There will be an increase in wrack volume and complexity providing habitat for invertebrate species important to the nearshore food web.

Monitoring Protocols

Pre-Construction

Pre-Construction monitoring will be conducted to establish baseline data as reference for analyzing changes in physical habitat over time.

Site Photos

Permanent photo points will be established to document changes in physical habitat over time. Locations will be determined based on visibility of key habitat characteristics and documented in relation to and distance from noted permanent features for reference. Photographs will be taken during daytime low tides from multiple angles and directions which will be duplicated during post-construction monitoring.

Beach Profile

Beach profiles will be surveyed once a year during a summer low tide of -1.0 ft. or lower. Permanent profile locations were determined during summer 2015 pre-construction surveys completed by WDFW. Post-construction surveys will completed with trained citizen volunteers using the "Two Stick Method." Two people, each holding a profile pole connected by a 10 ft. rope will work their way down the beach measuring changes in elevation using horizon measurement markings on the poles. General categories of substrate, plants and animals will be surveyed along the profile line. Details for this procedure can be found in the Island County/WSU Beach Watchers' "Beach Monitoring Procedures" manual at http://soundwaterstewards.org/icbw/monitoring/data/manual03.pdf. Beach profiling procedures are located on pages 15 – 19 and a copy of the data form on page 43.

Sediment Characteristics

Specific sediment sizes are targeted by forage fish for spawning grounds and have an effect on the animal and plant life within the substrate. Along each profile line sediment size, plants and animals are surveyed and documented for presence. Protocol for surveying sediment characteristics is included in the previously discussed beach profiling procedures. Baseline data will be collected during the summer 2015 beach profile surveys.

Large Woody Debris

The amount of large woody debris (LWD) present is important for beach stabilization and as a food source and habitat for aquatic insects and wildlife. LWD will be surveyed twice a year during spring and fall along 50 m transects perpendicular to each profile line. Using protocol from Toft's "Shoreline Monitoring Toolbox," the width of the logline perpendicular to the transect line will be measured from 5 randomly selected points along each transect line. The distance from the seaward most edge logs to the landward most edge of logs will be measured as the logline width. An inventory of logs 1 – 2 m, 2 – 5 m, and >5m in length and .1 - .3m, .3 - .8m, and >.8 m in diameters will be recorded along each logline width. Logs will be identified as natural or human-altered, and noted for presence of marine or terrestrial growth. Full protocol details are provided in Appendix A.

Beach Wrack

The availability and composition of beach wrack is an important source of food and shelter for invertebrates and foraging habitat for shorebirds. Beach wrack will be surveyed concurrently with LWD along two 50 m transect lines perpendicular to each profile line, one at the most recent high tide line containing "fresh wrack," and the second just above MHHW. Sampling will occur on an ebbing tide when the upper beach +6' MLLW and above is exposed. Following protocol from Toft's "Shoreline

Monitoring Toolbox," ten random points along the transect line will be selected for wrack sampling. Percent composition of eelgrass, marine algae, terrestrial plant material and human debris will be determined using a .1m² quadrat placed on the beach surface. The quadrat is divided into 25 6x6 cm squares, each representing 4% to aid in percent composition estimates. Full protocol details are provided in Appendix B.

Post-Construction

Monitoring of physical habitat characteristics should continue for 5 years after construction is complete.

Site Photos

Site photographs will be taken from previously determined photo points to visually evaluate habitat change over time. Photographs will be taken around the same time of year during low tides. Previous photos will be on hand to ensure camera directions and angles are duplicated.

Beach Profile

Beach profiles will be surveyed once a year during a summer low tide of -2 ft. or lower. The "Two Stick Method" discussed in pre-construction monitoring will be used and coincide with sediment characteristics, and surface epifauna and algae monitoring.

Sediment Characteristics

Sediment size, plants and animals will be surveyed once a year as part of each beach profile survey. Protocol for surveying sediment characteristics is included in beach profiling procedures.

Large Woody Debris

Large woody debris will be surveyed twice a year during April and September, and concurrent with beach wrack surveys. LWD will be surveyed along a 50 m transect line perpendicular to each profile line. Density of LWD will be determined using the protocol discussed in pre-construction monitoring and available in Appendix A.

Beach Wrack

Beach wrack surveys will be conducted twice a year during April and September when high wrack accumulation is common, and concurrent with LWD surveys. Transects are dependent on tide lines and are expected to change over time as beach elevation changes. It is important to sample the "fresh wrack" located at the most recent high tide line and the more permanent wrack just above the MHHW (Toft n.d.). Beach wrack will be surveyed using the protocol discussed in pre-construction monitoring and available in Appendix B.

Biological Monitoring

Project Goal

Restore nearshore habitat conditions to provide a viable site for forage fish spawning, juvenile salmon migration, and a habitat and food source for shorebirds, aquatic insects, other invertebrates and wildlife.

Project Objectives

1. Enhance surf smelt and sand lance spawning activity.
2. Increase nearshore fish use.

Performance Standards

Monitoring data will be used to evaluate the following hypotheses to determine the long-term effects of the restoration project and document and verify that biological performance standards are met.

1. A suitable habitat for forage fish spawning will be provided including appropriate sediment composition and vegetative shading.
2. Surface epifauna and algae abundance and diversity will change over time.
3. Reduced turbulence and wave energy will provide a habitat suitable for juvenile salmon migration.
4. The presence of terrestrial insects as a source of prey will increase as connectivity between terrestrial and intertidal habitat is established.

Monitoring Protocols

Pre-Construction

Pre-Construction monitoring will be conducted to establish baseline data as a reference for analyzing changes in habitat usage over time.

Forage Fish Spawning

Pacific sand lance and surf smelt spawning has been documented during winter and summer months at Shannon Point. Sand lance and surf smelt are an important food source for salmon and other larger fish, marine mammals and shorebirds. Forage fish spawning will be monitored using the bulk sampling method following WDFW established protocols. Beach characteristics and visible presence or absence of eggs are documented at collection sites. Collected samples are winnowed in the field using a series of sieves providing a smaller sample for lab analysis. Detailed protocol handouts including copies of appropriate data forms can be found at http://wdfw.wa.gov/conservation/research/projects/marine_beach_spawning/.

Citizen volunteers, under the guidance of the Skagit Marine Resources Committee, have continued to collect bulk sediment samples once a month since June 2014. The rip rap in place covers the majority of potential forage fish spawning grounds. This prevents the ability to collect sediment samples along transect lines at the appropriate tidal elevations. Bulk sediment samples will continue to be collected in small pocket areas along the beach with suitable tidal elevations for forage fish spawning. Once the rip rap has been removed, bulk sediment samples will be collected along transect lines at the appropriate tidal elevations.

Nearshore Fish Use

To monitor changes in nearshore fish use, beach seining will be conducted once a month February - June. Following protocol from Skagit River System Cooperative Research Department, fish samples are collected using a 24.4 m x 1.8 m 0.3 m mesh knotless nylon net. The net is set by anchoring one end on the beach while the opposite end is deployed from a floating tote while wading "upstream" against the current, returning to the shoreline in a half circle (SRSC 2003).

Fish captured in the net will be identified and counted by species. Catch will be handled with wet bare hands and returned as quickly as possible for minimal impact. Fork length will be recorded for the first 20 of each species. Catch will be stored in a bucket of collected sea water while measurements are taken. Using a YSI meter, temperature and salinity will be measured at the water's surface and at the maximum depth of net deployment. Additional data to be collected includes tidal stage, habitat type, vegetation, and substrate characteristics.

Surface Epifauna and Algae

Surface Epifauna and Algae are important components of the nearshore food web. The plants and animals that live on intertidal substrates require certain physical and biological needs. Monitoring the abundance and biodiversity of surface epifauna and algae provides valuable information for understanding the health of the habitat including its biodiversity and physical parameters (Toft n.d.). Species abundance will be monitored using the quadrat sampling protocol described in Island County Beach Watchers' "Beach Monitoring Procedures." Quadrat sampling will be concurrent with beach profile surveys, initial baseline data was collected during summer 2015 survey with an additional pre-construction survey scheduled for summer 2016. Details for the protocol can be found at http://soundwaterstewards.org/icbw/monitoring/data/manual03.pdf. Quadrat sampling procedures are located on pages 21 – 24 and a copy of the data form on page 44.

Terrestrial Insects

Terrestrial insects are an important food source for juvenile salmon. Passive fallout traps will be used to simulate insects that could fall on the surface of the water and be available as fish prey. At each profile point, three insect fall out traps will be placed along a 50 ft. transect parallel to shore. Fallout traps will remain for approximately 24 hours, with insect presence being documented by total counts the following day. Pre-construction sampling was completed during summer 2015 with an additional survey scheduled for summer 2016. Full protocol details are provided Appendix C.

Post-Construction

Monitoring of habitat usage should continue for 5 years after construction is complete.

Forage Fish Spawning

Post-construction monitoring of forage fish spawning will be conducted approximately every two weeks following protocols discussed in pre-construction monitoring.

Nearshore Fish Use

Beach seine surveys will be completed once a month February – June using the beach seining methods discussed in pre-construction monitoring.

Surface Epifauna and Algae

The abundance and diversity of surface epifauna and algae will be surveyed using the quadrat sampling method described in Island County Beach Watchers' "Beach Monitoring Procedures." Quadrat sampling will take place once a year during summer low tides and concurrent with beach profile surveys.

Terrestrial Insects

Terrestrial insect monitoring will coincide with beach profile surveys in June – July when vegetation and insect communities are developed and juvenile salmon are feeding along the shoreline (Toft n.d.). Terrestrial insects will be sampled using the protocol discussed in pre-construction monitoring and provided in detail in Appendix C.

Quality Assurance/Quality Control

All monitors will be trained by the appropriate parties to ensure standard procedures are followed. It is important that monitors are appropriately trained and understand the importance of careful data collection and recording. Monitoring procedures have been established to assure data collection is consistent and accurate. Any variations from standard procedures will be documented and evaluated to determine if the variations are necessary and meet performance standards.

Salish Sea Stewards will provide trainings for volunteers to conduct beach profile surveys. Included in the beach profiling trainings are methods for identifying sediment characteristics and completing quadrat surveys of surface epifauna and algae. The Northwest Straits Foundation (NWSF) will provide training for large woody debris, beach wrack, insect fallout, and beach seine surveys and coordinate forage fish survey trainings with WDFW and Washington Department of Natural Resources.

Monitoring teams will be accompanied by a team member experienced in the protocols to be used during each site visit. All data will be reviewed for accuracy by monitoring coordinators who will subsequently oversee data entry. Photographs will be analyzed to ensure site locations, monitoring procedures and sample identifications are consistent and accurate.

Forage fish monitoring involves a lab component which requires further quality control measures. A random lab sample from each sampling event plus any lab samples with identified eggs will be sent to WDFW for lab processing and verification of presence or absence of eggs.

References

CGS (Coastal Geologic Services). 2013. Shannon Point Revetment Removal Feasibility and Preliminary Design Report. Prepared for Northwest Straits Foundation, by Jim Johannessen, Stephanie Williams, Jonathan Waggoner and Alexis Blue, Bellingham, WA.

Herrera. 2013. Physical Processes Monitoring Plan – Secret Harbor Estuary Restoration. Prepared for Washington State Department of Natural Resources, by Herrera Environmental Consultants Inc., Seattle, WA

SRSC (Skagit River System Cooperative) Research Department. 2003. Estuarine Fish Sampling Methods, March 2003.

Toft, Jason. n.d. Shoreline Monitoring Toolbox. Washington Sea Grant. Web. 15 Sept. 2014. http://wsg.washington.edu/toolbox

APPENDIX A

Large Woody Debris Survey Protocol

Materials

- Two 50 m Measuring Tapes
- Copy of Beach Profile Reference Points
- GPS
- Camera
- Data Sheets

Procedure

- Survey large woody debris on an ebbing tide when the upper beach +6' MLLW and above is exposed.
- Locate site using a copy of the beach profile reference points and GPS.
- Establish transect by laying a 50 m measuring tape on the beach parallel to shore. The profile reference point should be in line with the center of the 50 m transect.
- Count the number of fallen trees along the 50 m transect.
- Select five random points along the 50 m transect.
    - Using the random number table on back of the field data sheet, select a random number between 1 and 10. The number selected will determine how far down the transect line the first transect point will be, this will be transect point #1. Each following transect point will be an additional 10 m down the transect line.
    - For example: Using the random number table you randomly select the number 4. You measure 4 m along the transect line to establish transect point #1. Transect point #2 will be at 14 m, transect point #3 at 24 m, transect point #4 at 34 m, and transect point #5 at 44 m.
- At each transect point collect the following data, all measurements should be to the nearest .10 m.
- Measure the distance from the seaward-most edge of logs to the landward-most edge. This will be the logline width.
- Count the number of logs 1 – 2 m in length according to the following diameters: .1 - .3 m; .3 - .8 m; >.8 m. Repeat this process for logs 2 – 5 m in length and >5 m in length.
- Count the total number of logs determined to be natural or human-altered (e.g. poles, dock material).
- Count the total number of logs with marine growth. Note any identified species in 'Comments' field.
- Count the total number of logs with terrestrial growth. Note any identified species in 'Comments' field.

APPENDIX B

Beach Wrack Survey Protocol

Materials

- 50 m Measuring Tape
- 32 cm × 32 cm Quadrat – divided with string into 25 - 6 cm × 6 cm squares
- Copy of Beach Profile Reference Points
- GPS
- Camera
- Data Sheets

Procedure

- Sample beach wrack on an ebbing tide when the upper beach +6' MLLW and above is exposed.
- Locate site using a copy of the beach profile reference points and GPS.
- Establish two transects by identifying the most recent high tide line that has fresh wrack, and just above MHHW in the older wrack. If there is a bluff or armoring within the MHHW, sample at the base.
- Start with the most recent high tide line, or fresh "F" wrack line, and lay a 50 m measuring tape on the beach parallel to shore. The profile point should be located at the center of the 50 m transect.
- Select ten random points within the wrack along the 50 m transect.
    - Using the random number table on back of the field data sheet, select a random number between 1 and 4. The number selected will determine how far down the transect line the first transect point will be, this will be transect point #1. Each following transect point will be an additional 5 m down the transect line.
    - For example: Using the random number table you randomly select the number 4. You measure 4 m along the transect line to establish transect point #1. Transect point #2 will be at 9m, transect point #3 at 14 m, transect point #4 at 19 m etc.
- With your back to the water, line the left side of quadrats with measured transect points and place in the center of the wrack line.
- Visually estimate the total combined percent coverage of eelgrass, marine algae, terrestrial material, and human debris within quadrats. Visually estimate percent composition of eelgrass, marine algae, terrestrial material, and human debris within quadrats (should add up to total percent coverage). Each 6 cm × 6 cm square represents 4% of the quadrat to aid in estimating percent composition.
- Place a "✓" in the appropriate columns for presence of green, red, and brown algae.
- Move on to the MHHW mark and repeat data collection procedures for the older "O" wrack line.

APPENDIX C

Insect Fallout Survey Protocol

Materials

- Three 13 in. × 8 in. × 5 in. Plastic Storage Bins
- Natural Dishwashing Soap (biodegradable and odorless)
- Fine Mesh Sieve
- Two 5 Gallon Buckets
- Measuring Tape
- Spray Bottle
- 1 ft. x 1 ft. white painted board
- Three sample jars
- Bottle of Isopropyl Alcohol
- Permanent Marker

Procedure for Setting Fallout Traps

- Fallout traps should be set up approximately 24 hours prior to collection of samples.
- Place three bins randomly along a 50 ft. transect parallel to shore. The bins should be placed past the high tide mark, above the influence of tides.
- Fill one 5 gallon bucket with water. Sieve the collected water into the empty 5 gallon bucket. This will insure no invertebrates will contaminate the sample.
- Pour a few drops of natural odorless dishwashing soap into the bottom of the bins. Fill the bins with about 2 ½ in. of sieved water.

Procedure for Data Collection

- Drain collection bin through fine mesh sieve.
- Fill spray bottle with sieved water. Spray insects from sieve onto 1 ft. x 1 ft. board.
- Spray insects off board into a mason jar.
- Fill sample jar with alcohol, screw lid on tight and write site location information on the lid with permanent marker.
- Sample jars will be sent to a lab for analysis.