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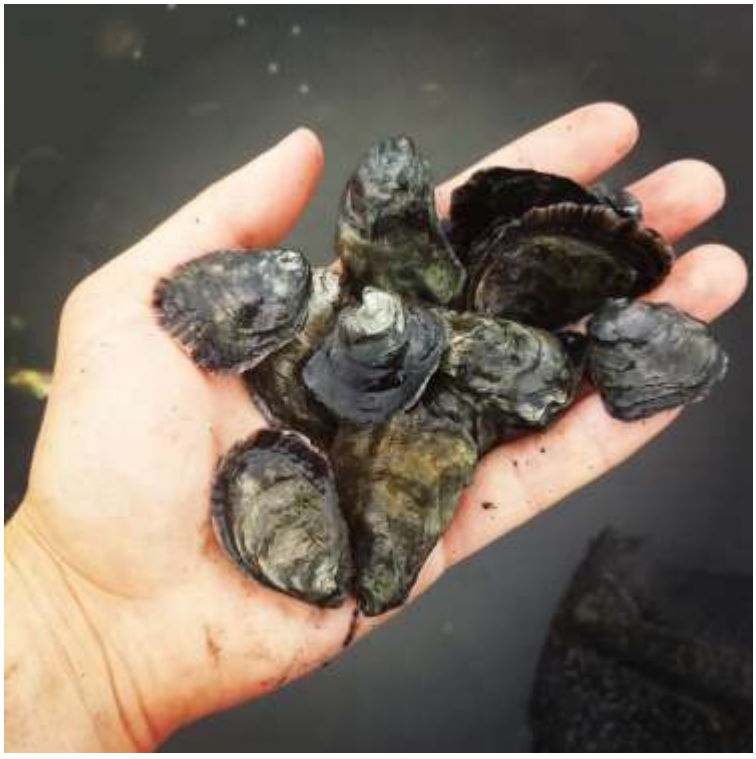
Quality Assurance Project Plan

Olympia Oyster Restoration in Sequim Bay
SEANWS-2014-ClCoCD-00007

May 14, 2015



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Publication Information

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Title Page, Table of Contents, and Distribution List

Quality Assurance Project Plan

Olympia Oyster Restoration in Sequim Bay

May 14, 2015

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Distribution List

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Project Manager
The project will be overseen and coordinated with Cathy Lear, Clallam County MRC Habitat Biologist. Mrs. Lear will be responsible for project oversight and be responsible for maintaining the official, approved QAPP.

Shellfish Biologist
Ralph Riccio, shellfish biologist with Jamestown S'Klallam Tribe, will help execute specific tasks and make recommendations to the project biologist to ensure project milestones are completed.

Project Biologist
Victoria Cantelow, Clallam County Marine Resources Committee Intern, will manage and complete project tasks, relative to the project timeframe and consistent with accomplishing project outputs. Victoria will consult with, and receive guidance from Ralph Riccio. Victoria will also be responsible for completing the project summary.

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

GIS Specialist
Pam Edens, the Jamestown S'Klallam Tribe GIS analyst, will assist the project biologist with storage and analysis of spatial data collected during the project.

Olympia Oyster Specialist
Brian Allen, Puget Sound Restoration Fund, will provide review/input on the survey being conducted as well as placement of shell-string collectors within the Bay.

Project Background

The Olympia oyster (*Ostrea lurida)* is the only native oyster of the North American Pacific Coast and once thrived in coves, inlets and other protected tidelands in Puget Sound. Olympia oysters have been listed as a candidate species by the Washington Department of Fish and Wildlife (WDFW) since 1997(Blake and Bradbury). Although Olympia oysters occur throughout their historic range their relative abundance has been drastically reduced to an estimated 4% of historic core populations due to a combination of over harvesting, pollution and non-native oyster cultivation. The Clallam County Marine Resources Committee, Jamestown S'Klallam Tribe (JST) and Puget Sound Restoration Fund (PSRF) are working together to restore 1.5 acres of self-sustaining Olympia oyster habitat in Sequim Bay. This project is part of a larger goal underway to restore 100 acres of Olympia oyster habitat in the Puget Sound area by 2020.

Project Goals

1. To monitor population growth between 2014-2015, estimate population size, oyster density, and oyster size distribution
2. To characterize annual recruitment rate by monitoring settlement and juvenile recruitment
3. To collect water temperature data at mean -1 mean low low water (MLLW) in Sequim Bay
4. To expand Olympia oyster habitat and create more dense uniform shell coverage

Documentation and Records Requirements

All project data and documents will be maintained by the Project Biologist. The project documents include this QAPP, data sheets, electronic files, permits, equipment manuals, any photo documentation and annual reports. The Project Biologist will be responsible for compiling the data, maintaining the electronic files, and supplying the data to project partners and funding agencies as necessary. The Project Manager will be responsible for distributing the reports upon request. The Project Manager and Project Biologist will work together to receive necessary permits for data collection. The Project Manager is responsible for ensuring the QAPP is reviewed annually and modified and approved as necessary.

Data Acquisition

Project Site

Sequim Bay (Figure 1), located in Clallam County, Washington, on the Strait of Juan de Fuca east of Sequim and north of Blyn, was chosen as a restoration project site because the bay historically contained native oysters (Blake and Bradbury). Small remnant Olympia oyster beds were present at very low densities before restoration began. The restoration area is located on JST tidelands and the tribe grants upland access and limits the level of disturbance to the project site. Sequim Bay is not inhabited by invasive oyster drills, has limited eel grass coverage and no commercial oyster harvest thus limiting the stressors on the restoration project site. Projected work schedule to accomplish project goals are listed below in Table 1.

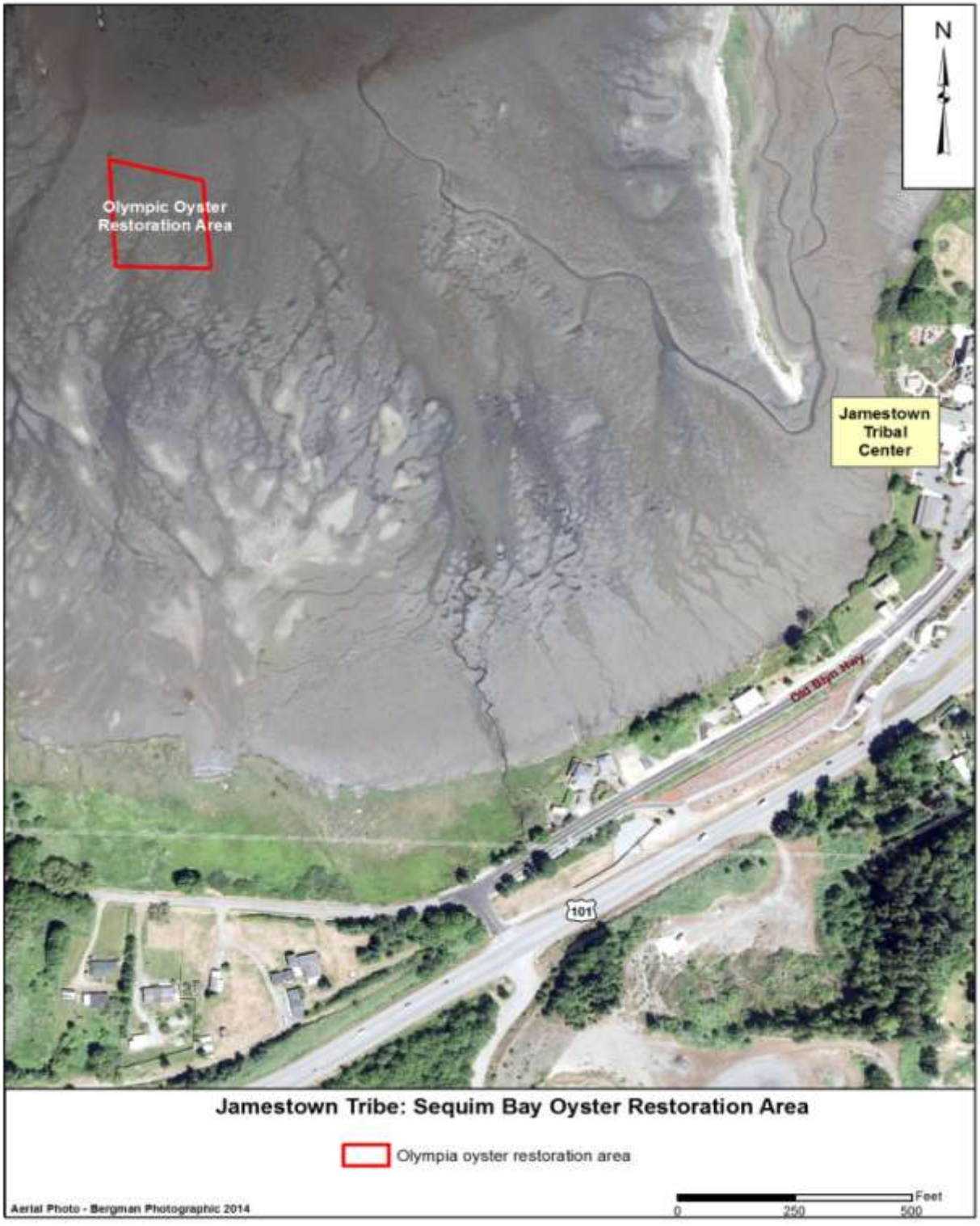

Figure1. Map of JST tidelands with the Olympia oyster restoration area marked.

Table 1.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Habitat Enhancement									
Conduct Population Survey									
*Collect settlement and juvenile recruitment									
Collect water temperature data									
Update Brochure									
Develop Summary Report									

* Half of the shell string collectors will be collected in August the remaining half will be collected May 30th 2016

Sample Collection Procedures

Growth and Survival Survey

Olympia oyster population size will be sampled using haphazard sample placement following protocols established by PSRF. This method is used to eliminate bias and ensure locations are sampled equally, regardless of substrate. The population survey will be conducted at a negative low tide in June.

Recruitment Monitoring

Shell-string collectors will be deployed at the end of May at 3 sampling stations at equal intervals within the restoration area. Each site location will be marked with a survey grade global positioning satellite (GPS.) This will ensure future sampling occurs at the same locations. Half of the shell- strings will be collected in August after a 3 month deployment. The remaining half will be collected after a 12 month deployment in May 2016. A temperature logger will be placed at the benthic surface at one of the sites to record water temperature,

Sampling Procedures

Growth and Survival Survey

Appropriate sample size will be determined following protocols outlined in the Oyster Habitat Restoration Monitoring and Assessment Handbook. The perimeter of the Olympia oyster reef will be

walked while taking continuous measurements with a survey grade GPS. ArcGIS mapping software will be used to determine the reef area in m^2. Subsamples will be collected using a $0.25m^2$ quadrate; all pacific oyster shell within the sample will be examined for presence of Olympia oysters. All of the live and dead Olympia oysters will be counted and shell heights measured to the nearest millimeter with calipers in the field. All data will be recorded in field notebooks.

Recruitment Monitoring

A total of 18 shell-string collectors will be constructed, 6 for each sampling station, using 4-5 inch pacific oyster shells. A 3/8 drill will be used to place a hole in the middle of each shell, 11 shells will be placed nacre side down on to a 22 inch section of 1/4inch wooden dowel with a label at one end . Cloth backed, waterproof adhesive tape (duct tape) and a grease marker will be used to label location, station and replicate on each. The shell strings are installed by pressing the dowel into the substrate so that the shells are nacre-side down and the tag label is at the top. A temperature logger at one site will record water temperature at 30 minute intervals.

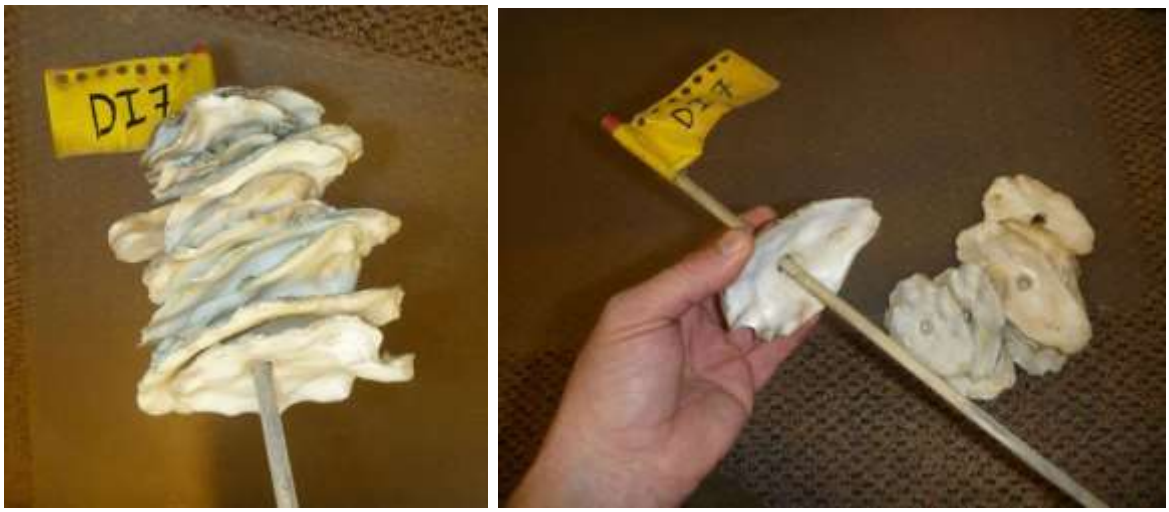

Figure 2. Shell-string collector assembly.

Half of the shell strings from each station will be retrieved around August 30th. The top 10 shells (nacre side only) from each shell string will be analyzed under a dissecting microscope at 10x magnification in a systematic fashion. The number of live Olympia oyster settlers and post settlement mortalities will be recorded from each shell. Once a settler is observed magnification is increased to 32x to confirm identification and marked with a pencil to prevent double counts. Remaining shell strings will be collected around May 30th of 2016. Shells will be thoroughly rinsed to remove sediment build up. No microscope is needed to process the shell strings, as oysters by then will be visible to the naked eye. All live oyster juveniles and oyster mortalities will be counted. Shell heights of up to 10 live and dead oysters encountered on each shell will be measured using calipers to the nearest millimeter and recorded.

Sample Documentation

Data are recorded in waterproof field notebooks. The data books are kept by the Project Biologist and entered into an excel spreadsheet after the population survey. Data sheets are archived by year and maintained by the Shellfish Biologist.

Analytical Methods Requirements

The Project Biologist and Shellfish Biologist will enter all formulas for calculation of parameters and basic statistics to determine the results of the population survey which include population growth from 2014-2015, population size estimate, density, and size distribution. The Shellfish Biologist will check all the formulas. If any errors are found, the Project Biologist will correct the errors and the Shellfish Biologist will verify corrections have been made. The Project Biologist will periodically retrieve the water temperature logger, download the data files and send the files to PSRF. The Project Biologist will organize and write the final report.

Quality Control Requirements

The standardized 0.25 m^2 size of the quadrate will result in consistent subsample sizes during the population survey. If any species identification comes into question while analyzing shell strings for Olympia oyster settlement, shells will be saved for further examination by Brian Allen from PSRF. The temperature logger will be calibrated according to the service manual before deployment.

Data Management: Validation and Verification Methods

The Project Biologist will ensure the data forms are completed and check for any errors. The Project Biologist will enter the data into Excel spreadsheet files. The Shellfish Biologist will use pictures of the datasheets and enter data into an Excel spreadsheet. Spreadsheets will be cross checked for errors and all errors will be corrected. The Project Biologist will summarize the data and provide PSRF with a copy of the results. The Shellfish Biologist will verify the summaries and collaborate with the Project Biologist to produce the final report, which will be proofed by the Project Manager and two peer reviewers.

References

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