Jefferson County Marine Resources Committee
Grant No: SEANWS-2015-JeCoWS-00007
September 30, 2016

Task 6 – Olympia Oyster Restoration

6.1 - Olympia Oyster Seeded cultch delivery 2016
6.2 - Olympia Oyster Project Report 2016
6.3 - Olympia Oyster Data Summary Report 2016

PUGETSOUND PARTNERSHIP

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County: Jefferson
Grant No: SEANWS-2015-JeCoWS-00007

PROJECT TITLE: Northwest Straits Project: Jefferson County Marine Resources Committee (Operations and Projects)

DELIVERABLES FOR TASK NO: Task 6- Olympia Oysters.
Deliverable 6.1: Olympia Oyster Summary Report on delivery and distribution of seeded cultch

PROGRESS REPORT: [X] FINAL REPORT [ ]

PERIOD COVERED: July 1, 2016 – Sept 30, 2016

DATE SUBMITTED: Oct. 10, 2016

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Task 6- Olympia Oysters.
Deliverable 6.1 (as per Amendment 1, signed Sept 29, 2016):

Olympia Oyster Summary Report On Delivery And Distribution Of Seeded Cultch

Seeded cultch was purchased from the Puget Sound Restoration Fund for the MRC's Quilcene Bay Olympia Oyster project. Delays in production prompted a change in schedule, but fortunately for the MRC, John Adams (Taylor Shellfish) had been experimenting with wild-seeded Olympia oyster cultch in another Hood Canal location and was willing to donate 11 bags of overwintered, wild-seeded cultch for spring 2016 deployment to get this pilot project started on schedule.

All bags have the standard 250-300 shells/bag. Here is a summary of the delivery and distribution of the seeded cultch.

May 24, 2016
Taylor Shellfish delivered 11 bags of wild-seeded cultch on May 24, 2016 to the site by boat. The cultch had been sitting in north Hood Canal waters over the winter, and had a good set of Olympia oysters on it. MRC volunteers and WDFW staff met John out there at low tide to break open the bags, collect data (numbers and size of spat) on a representative sub-sample (10 shells/bag) and spread out the shell in the five test plots. We also placed three PSRF shell-stacks at the Quilcene Bay project site as part of a regional Olympia larval set monitoring study.

MRC volunteers and staff from partner organizations (Jackie Gardner, Wade Crouch, Amy Does, Sarah Fisken, WDFW biologist Brady Blake, TS John Adams and Gordon King, NWSC Lucas Hart and MRC staff Cheryl Lowe did the work. We followed the QAPP protocols and placed shell in 5 test plots.

June 8, 2016
We placed three PSRF shell-stacks at the Discovery Bay site as part of a regional Olympia larval set monitoring study.

June 22, 2016
In fall 2015, we had placed an order with Puget Sound Restoration Fund (PSRF) for 50 bags of seeded cultch (Hood Canal provenance) to be produced in their hatchery. Due to delays in hatchery production, we did not take delivery of PSRF seeded cultch until June 2016. This cultch still needed to be beach hardened (3 months) and our advisory committee also recommended that we overwintered the cultch in bags in increase survivability. Taylor Shellfish offered to beach harden and overwinter at their Quilcene/Dabob hatchery, a site approved by Brady Blake, WDFW shellfish biologist. Gordon King, MRC member and Taylor Shellfish employee, arranged for pick-up and delivery to the Taylor Shellfish hatchery on June 23, 2016. He picked up the 50 bags of cultch plus maybe 30 more that had minimal set. Taylor Shellfish donated 1 hour of backhoe time for moving the seed into its beach hardening location.

We did not collect baseline data about the hatchery-seeded cultch. This young seed is very small, and some mortality is expected over the next 6 months. We will collect data before distributing the seeded cultch at the test plot location in spring 2017. PSRF reported that the 50 bags had an average seed count of 11.8 Olympias/shell and the extra 30 bags had seed counts of about 1.8 Olympias/shell.

PSRF's description of their counting process is noted as follows because it is different than the QAPP protocols used for the wild-seeded cultch (see below): PSRF took 15 shells/bag from various parts of the bag, taking bag samples from 4 different quadrants in their tank.

August 18, 2016
Jackie Gardner collected the PSRF shell stacks from Quilcene Bay for counting.

Aug 30, 2016
Cheryl Lowe collected the PSRF shell stacks from Discovery Bay.

September 2016
Taylor Shellfish is over-wintering the hatchery-seeded cultch at their hatchery site for placement in spring 2017. Our advisory committee said survival would be higher if they stayed in the bags over the winter and grew to a larger size before distribution.

County: Jefferson
Grant No: SEANWS-2015-JeCoWS-00007

PROJECT TITLE: Northwest Straits Project: Jefferson County Marine Resources Committee (Operations and Projects)

DELIVERABLES FOR TASK NO: Task 6- Olympia Oysters.
Deliverable 6.2: Final project report on Olympia Oysters

PROGRESS REPORT: [ ] FINAL REPORT [X]

PERIOD COVERED: Oct. 1, 2015 – Sept 30, 2016

DATE SUBMITTED: Oct 21, 2016

NOTE: The Task numbers were changed in the approved September 2016 Amendment. This is the amended Task number.

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Final Project Report On Olympia Oysters
Olympia Oysters Task 6.2

Overview & Summary

The MRC has two very different strategies for Olympia oyster restoration in Discovery Bay and Quilcene Bay. **Discovery Bay** already has a small but healthy natural Olympia oyster population. The MRC's goal there is to enhance and expand that population by providing more appropriate substrate (clean cultch). **Quilcene Bay** has small numbers of Olympia oysters that are widely dispersed around the Bay. The MRC's long-term goal there is to rebuild a few smaller populations that will serve as source material to grow a sustainable meta-population in that Bay.

This report describes the MRC's activities related to this project, monitoring summaries, and project photos. Data tally sheets can be found in the 2016 Olympia Oyster Data Summary Report. So far, there have been no media reports other than information posted on the Jefferson County's MRC website.

Discovery Bay:
2016 was our second year of monitoring for Discovery Bay natural recruitment near the small but healthy Olympia oyster population at Maynard Beach. Shell was first placed at the project site in summer of 2014. Three shell stacks that are part of a Puget Sound Restoration Fund (PSRF) study were also placed at this location; this is a slightly different approach for measuring recruitment, and allows PSRF to compare results from various sites around Puget Sound, while we focus on information that is of interest to the MRC and WDFW.

On **June 8, 2016**, we installed the PSRF shell stacks. Annual monitoring took place on **August 1, 2016**, with eight volunteers and one MRC staff. PSRF shells stacks were collected on **Aug 18th**. Monitoring data and shell stack data were compiled in September.

The Discovery Bay project is also testing the effectiveness of a low-density application of shell as a way to jump-start a population expansion. In August 2015 (during our first year of monitoring), Brady Blake, our WDFW advisor, recommended adding more clean cultch to the site in 2016 to bring the available shell density back up to an average of 2 shells/sq ft. Tides had moved some of the initial shell out of the project area, and some shell had settled deep into the mud. On July 21, 2016, 13 MRC volunteers dispersed an additional 80 bags of clean cultch to the Discovery Bay site. We did not do this earlier in the year because our original installation permits prohibited in-water activity before July 15th.

This adaptive management action meant that a direct comparison of 2015 and 2016 data was influenced by the recent addition of new, clean shell. Some comparisons are still possible and the 2016 data sets a new baseline for 2017 monitoring. In addition to the comparisons made below, we did find several Pacific oyster shells with large numbers of Olympia oyster just outside of the project

boundaries. These had to be the Pacific oyster shell we placed there in 2014, as there was almost no substrate present on or near the project site before the MRC began its work.

Quilcene Bay is a new Olympia Oyster project location for the MRC. Our goal here is to test survival of seeded cultch with Olympia oyster spat in Quilcene Bay. Our first site is a location provided by WDFW. The test plots are located on WDFW tidelands and are being planned in cooperation with WDFW, Tribal Co-Managers (shellfish biologists from Jamestown S'Klallam and Skokomish Tribes) and the MRC. The project is considered a WDFW experimental test plot, and did not need federal and state agency permits at this stage. The MRC is a partner as team facilitator, coordinating volunteers, and obtaining donated and purchased seeded cultch. We know oyster drills are present in the vicinity. This may or may not impact survival of the introduced Olympia oysters in the test plots. If drills are a problem, we will consult with the Co-Managers about next steps, including whether or not we move on to another, more promising location elsewhere in the Bay for future tests.

On May 24, 2016, we collected data on a sample number of shells from 11 bags of overwintered, wild-seeded cultch, as per the protocols, and placed them in five plots near commercial clam beds on the southwest side of Quilcene Bay. See map. Taylor Shellfish donated the cultch and delivered it by boat. Team members included four MRC volunteers and one staff member each from WDFW, MRC and Taylor Shellfish. PSRF shell stacks were placed at the site at the same time.

Additional hatchery-seeded Hood Canal cultch purchased from PSRF was beach-hardened in summer 2016 and overwintered in Quilcene Bay in 2016-17 before placement in spring of 2017. Our advisory group recommended this approach to increase likelihood of survival of the oysters. Shell stacks were collected on August 30, 2016 and data was compiled in September.

Data & Observations

Data summaries from both Discovery Bay and Quilcene Bay locations are included in the Data Summary Report, along with monitoring protocols for each site. The Quilcene Bay work is baseline data, so we have no observations to report as yet. A few comparisons of 2015 and 2016 Discovery Bay data are as follows:

Data Collected	2015	2016
# of quadrats monitored	43	46
Average % shell cover per quadrat	5%	7%
Total # spat counted	215	83
Total # of adult Olympia oysters found	2	13

Both years we counted about the same number of quadrats. Percent shell coverage per quadrat was close, although a look at the actual 2016 data shows one transect with a high density of new shell (21% average shell coverage/quadrat) and very high numbers of spat (66 of the total 83 spat counted), while

other transects had low numbers of shell and spat. Total spat count is much higher in 2015 than 2016, which reflects the shorter time that the newly placed shell was available for larval settlement. The much higher number of adult Olympia oysters found in the 2016 quadrats, however, supports the idea that the Olympias are growing to maturity in their new location.

PSRF shell string monitoring data for both Discovery Bay and Quilcene Bay are included in the Data Summary Report. The data sheets are sent to PSRF for analysis. We have not received any reports from them yet.

MRC volunteer Amy Does did the microscope work and completed the data sheets for Discovery Bay and Quilcene Bay shell stacks. Cheryl Lowe compiled the Discovery Bay and Quilcene Bay data collected by the MRC monitoring team.

Recommendations for 2017

Discovery Bay: The quadrats were placed along four transects. These four transects ran the same N-S direction in 2016 as in 2015. The very uneven distribution of data in the 4 transects was a concern. Running the transects in an East-West direction would result in more transects closer together, which would likely give a better, more even coverage of the area. Otherwise, the protocols seem to be working well.

Quilcene Bay: Baseline data was collected from a sample number of wild-seeded shell from the bags before the shells were placed in the test plots, as per the protocols attached to the Data Summary Report. We will follow the same procedures for the overwintered, hatchery-seeded shell in spring 2017. The protocols seemed to work well. The biggest problem was providing accurate location information for delivery of the shell, since the boat skipper had not been on site before delivery.

Outcomes

Anticipated outcome was that data from the Discovery Bay and Quilcene Bay projects would inform future restoration work. We believe we are still on track toward this outcome, with the Discovery Bay project supporting the idea that clean cultch adjacent to established Olympia oyster populations is enough for natural regeneration to occur. The test location for the Quilcene Bay effort should give us useful information about site selection relative to presence of oyster drills. Some people think oyster drills may prefer Pacific oysters over Olympia oysters, and this field testing may give us more information about how to plan for future restoration efforts.

Photos:

Project photos and the MRC website are included below.

Discovery Bay

Shell with many adult Olympia oysters found just outside boundary of project area.

Shell stacks

Quilcene Bay Monitoring

MRC website with Olympia oyster sidebar

Jefferson County
Marine Resources Committee

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Current Projects

Nearshore Restoration
Restoring natural beach functions to improve habitat for marine species.

Eelgrass Protection
Preventing damage to important eelgrass beds in Port Townsend Bay and other shorelines.

Olympia Oyster Restoration
Surveying, monitoring and enhancing native habitat for native oysters to understand factors that limit recovery of native populations.

Marine Stewardship
Working to achieve long-term stewardship for Jefferson County marine resources by building community through citizen involvement.

MRC Fun at Wooden Boat Festival 2016

The MRC's booth at the 2016 Wooden Boat Festival had everyone laughing, even if they just walked by. Over 310 people stopped to talk or play the Poop Toss game (bean bags that looked like dog poop) and win a prize. Some were just cheering for their kids or friends to hit the mark and toss it in the trash can, but everyone was part of the conversation about why it is important to pick up your dog poop and put it in the trash. In Jefferson County, an estimated 8,500 dogs generate about **2.3 million pounds** of poop each year. If buried or left on the ground, rain can carry pathogens into streams, ditches, or even ground water. Septic systems are designed for people, not pet waste, so that's not a good solution either. Prizes included pet waste bag dispensers that clip on a dog leash as well as colorful stickers or Tootsie Rolls.

A number of passers-by also admired the new Fort Townsend interpretive signs on display or asked questions about our Olympia oysters project. We even heard about boaters directing other boaters to anchor outside the Eelgrass Voluntary No-anchor Zone—self-regulation at its best!

For more info about pet waste, read the Dept of Ecology info here or find a great Jefferson WSU Extension bookmark here.

NOTICES & UPCOMING EVENTS

Fort Townsend Restoration Celebration Oct 12, 4:30 - 6 pm

Olympia Oysters Thriving!

In early August, MRC volunteers and partners completed their annual monitoring of our 2014 Olympia oyster habitat enhancement project in Discovery Bay. Everyone was thrilled to see how well some of the Olympias have established on the clean shell we put out just 2 years ago.

County: Jefferson
Grant No: SEANWS-2015-JeCoWS-00007

PROJECT TITLE: Northwest Straits Project: Jefferson County Marine Resources Committee (Operations and Projects)

DELIVERABLES FOR TASK NO: Task 6 – Olympia Oysters.
Deliverable 6.3: Olympia oyster survey data and summary report for Discovery Bay and Quilcene Bay

PROGRESS REPORT: [ ] FINAL REPORT [X]

PERIOD COVERED: Oct 1, 2015– Sept 30, 2016

DATE SUBMITTED: Oct 20, 2016

NOTE: The Task numbers were changed in the approved September 2016 Amendment. This is the amended Task number.

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Olympia Oyster Survey Data & Summary Report
For Discovery Bay And Quilcene Bay

Olympia Oyster Task 6.3

Report compiled by Cheryl Lowe, MRC Coordinator

Overview & Summary

Discovery Bay has a small but healthy natural Olympia oyster population. The MRC's goal is to enhance and expand that population by providing appropriate substrate (clean cultch). 2016 was our second year of monitoring for Discovery Bay natural recruitment from the adjacent population. The three shell stacks we placed for the Puget Sound Restoration Fund (PSRF) study at this location use a different approach for measuring recruitment that allows PSRF to compare results from various sites around Puget Sound.

On **June 8, 2016**, we installed the PSRF shell stacks (regional monitoring tool). Annual monitoring took place on **August 1, 2016**, with eight volunteers and one MRC staff. Shells stacks were collected on Aug 18th. Monitoring data and shell stack data was compiled in September.

The MRC is also testing the effectiveness of a low-density application of shell at Discovery Bay. In August 2015 (during our first year of monitoring), Brady Blake, our WDFW advisor, recommended adding more clean cultch to the site in 2016 to bring the available shell density back up to an average of 2 shells/sq ft. Tides had moved some of the initial shell out of the project area, and some shell had settled deep into the mud. On July 21, 2016, 13 MRC volunteers dispersed an additional 80 bags of clean cultch to the Discovery Bay site. We did not do this earlier in the year because our original installation permits prohibited in-water activity before July 15th.

This adaptive management action meant that data from a direct comparison of 2015 and 2016 data was influenced by the recent addition of new, clean shell. Some comparisons are still possible and the 2016 data sets a new baseline for 2017 monitoring. In addition to the comparisons made below we did observe several Pacific oyster shells with large numbers of Olympia oyster on them just outside of the project boundaries. These had to be the Pacific oyster shell we placed there in 2014, as there was almost no substrate present on or near the project site before the MRC began its work. See photo below.

Quilcene Bay is a new Olympia Oyster project location for the MRC. Our goal here is to test Olympia oysters survival in Quilcene Bay, starting with a location provided by WDFW. The test plots are located on WDFW tidelands and are being planned in cooperation with WDFW and Tribal Co-Managers (shellfish biologists from Jamestown S'Klallam and Skokomish Tribes) and the MRC. The project is similar to other WDFW experimental test plots, and does not need a federal and state agency permits.

The MRC is a partner as team facilitator, coordinating volunteers, and obtaining donated and purchased seeded cultch. We found oyster drills present in the vicinity. This may or may not affect the new Olympia oysters in the test plots. If drills are a problem, we will consult with the Co-Managers about next steps, including whether or not we move on to another, more promising location elsewhere in the Bay.

On May 24, 2016, we collected data on a sample number of shells from 11 bags of overwintered, wild-seeded cultch (donated by Taylor Shellfish) and placed them in five plots near commercial clam beds on the southwest side of Quilcene Bay. Team members included four MRC volunteers and one staff member each from WDFW, MRC and Taylor Shellfish. PSRF shell stacks were placed nearby at the same time. Additional hatchery-seeded Hood Canal cultch purchased from PSRF was beach-hardened in summer 2016 and overwintered in Quilcene Bay in 2016-17 before placement in spring of 2017 to increase likelihood of survival of the oysters. Shell stacks were collected in August 30, 2016 and data was compiled in September.

Data & Observations

Data summaries from both Discovery Bay and Quilcene Bay locations are included in the Data Summary Report, along with monitoring protocols for each site. The Quilcene Bay work is baseline data, so we have no observations to report as yet. A few comparisons of 2015 and 2016 Discovery Bay data are as follows:

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PSRF shell string monitoring data for both Discovery Bay and Quilcene Bay are also attached. Original data sheets are stored at the MRC office. No comparisons are provided here.

Amy Does did the microscope work and completed the data sheets for Discovery Bay and Quilcene Bay shell stacks. Cheryl Lowe compiled the Discovery Bay and Quilcene Bay data collected by the MRC monitoring team.

Recommendations for 2017

Discovery Bay: The quadrats were placed along four transects. These four transects ran the same N-S direction in 2016 as in 2015. Running the transects in an East-West direction would result in more transects closer together, which would give a better, more even coverage of the area. Otherwise, the protocols seem to be working well.

Quilcene Bay: Baseline data was collected from a sample number of wild-seeded shell from the bags before the shells were placed in the test plots. We will follow the same procedures for the overwintered, hatchery-seeded shell in spring 2017. The protocols seemed to work fairly well, with some field notes added to the protocols as we plan for 2017 monitoring.

Discovery Bay shell with many adult Olympia oysters found just outside boundary of project area.

2016 MRC Olympia Oyster Monitoring - Discovery Bay

Summary					
Date:	Aug. 1, 2016				
Start Time:	8:00 AM	**End time:**	10:30 AM		
Monitors:	Amy Does	Beth Ely	Peter Ely		
	Laura Inouye	Lucas Hart	Peach Stebbins		
	Brady Blake	Cheryl Lowe			

NOTE: New clean shell was added to this area July 21, 2016, which makes it difficult to compare 2016 to 2015 data.

NOTE: The 4 transects ran same N-S direction as 2015, which didn't sample shell distribution evenly. 6 E-W transects would give more even coverage of shell distribution.

Transect	**Q with no shells:**	**# of Quads TOTAL**	**Av. Shell coverage of quad (%)**	**Total spat <15mm**	**Total spat >15mm**	**Total spat**	**Spat not on Pacific or Olympias**	**% of all spat not on Pacific Oyster shell**	**adult olys**	**total shell w/spat itemized**	total non-Oyster shells w/ spat itemized
1	**2**	11	1.96	1	3	5	1	20%	3	4	1
2	**1**	15	20.80	19	47	66	24	36%	9	26	7
3	**5**	15	1.47	0	8	8	2	25%	0	3	1
4	**0**	5	3.80	2	2	4	3	75%	1	2	1
TOTAL		**46**	**7.01**	**22**	**60**	**83**	**30**	**39%**	**13**	**35**	**10**

NOTES: total spat is all Oly spat on all kinds of shells

Each quadrant is 0.5 square meters (1.64 ft^2).

Puget Sound Olympia Oyster 2016

PSRF Recruitment Monitoring Datasheet

			Station Information		
Recorder:	Amy Does		Waterbody:	**Discovery Bay**	
Contact Information:	adoes2@frontier.com		Station Name:	Discovery Bay	
Deployment date:	8-Jun-16		Station Position (Lat/Long; WGS 84):	47.99599, 122.87823	
Recovery Date:	18-Aug-16		Elevation (MLLW):	Est. 0-1	
Processing Dates:	Counted Sept 23, 2016		**Notes:**		
			Samples were dried.		
			Olympia (O) Pacific (P)		

Shellstring ID:	DSC 1		Shell height units= microns or **mm**		
Valve Number	Live count	Dead count	First 10 shell heights for Live (L) and Dead (D)		
1	5	1	LO: 5.5,6.6,3.6,8.3,4.2 DO: 3.5		
2	1	0	LO: 4.0		
3	2	1	DP: 5.3 L.P: 2.3, 9.7		
4	3	0	LP: 10, 6.3, 2, 3.7		
5	2	0	LO: 5.6, 4.3		
6	3	0	LO: 2.1, 1, 1		
7	0	1	D?: 5.5		
8	5	1	LO: 4.5,5.7,3.6, 4.0,7.5 LP: 3.1 difficult shell. lots of dead spat ?		
9	0	0			
10	0	0	this is the topmost shell — away from the sand/mud		

Shellstring ID:	DSC2		Shell height units= microns or **mm**?	
Valve Number	Live count	Dead count	First 10 shell heights for Live (L) and Dead (D)	
1	0	4	D*: 9.4, 3.4, 4.3, 8.3	*could not ID species
2	8	0	LP: 5.4, LO: 5.6, 3.4, 3.4, 2.2, 3.4, 2.9,1.7	
3	7	0	LO: 5.0, 3.5, 2.9, 5.2, 7.3 LP: 6.0, 3.6, 4.4	
4	5	3	LP: 6.7 LO: 4.1, 5.9, 3.6, 1.6, D*: 4.1, 4.8, 3.7	
5	0	0		
6	3	0	LO: 6.5, 2.5 LP: 6.0	
7	0	8	D*:4.1, 10.2, 7.0, 5.7, 4.0, 5.3, 6.7, 7.6	
8	1	0	LO: 2.0	
9	3	0	LP: 1.8, 2.8, 1.2	
10	0	0	this is the topmost shell — away from the sand/mud	

Shellstring ID:			Shell height units= microns or **mm**?	
Valve Number	Live count	Dead count	First 10 shell heights for Live (L) and Dead (D)	
1	7	1	DP: 3.5 LP: 2.0 LO 2.0, 1.5, 1.5, 2.3, 2.5, 1.7	
2	2	0	LO: 2.6, 2.5	
3	0	0		
4	3	0	LP: 2.2 LO: 1.7, 1.4	
5	0	0		
6	0	0		
7	0	0		
8	0	0		
9	4	0	LP: 6.3, 5.0, LO: 1.8, 3.0	
10	0	0	this is the topmost shell - away from the sand/mud	

Olympia Oyster Monitoring--Discovery Bay 2016
Jefferson County Marine Resources Committee

August 1, 2016

Protocols approved by WDFW Shellfish Biologist Brady Blake, August 2015.

Goal:

To monitor oyster spat set on clean Pacific oyster shells placed in August 2014 & July 2016 in a ½ acre area in lower Discovery Bay. Shell placement is to test effectiveness of a low-impact strategy to encourage natural seed set from a nearby existing Olympia Oyster population. For more details about initial work, see Jefferson MRC's Olympia oyster project report and maps.

Equipment:

- GPS & notebook for writing notes
- 100' tape measure
- camera (or two) for quadrat pix
- data sheets (on waterproof paper), pencils, clipboards
- Stakes or pin flags to mark transect start, end and quadrat centers.
- Flagging and 20 wire flags
- Volunteer sign-in forms

Random points for August 1, 2016: **5, 8, 9, 6, 4**

Protocols:

Note: we are using random numbers and paces to locate start of transects and quadrats (pace = one step of one leg)

1. Use the Powerlines as the SW Baseline.

2. Beginning at the South corner of the plot (GPS lat-long_____) walk 4 [random number] of paces in a NW direction along the power line to beginning point of Transect 1. Mark with a stake for beginning of Transect #1. Record the GPS coordinates for start of Transect.

3. Walk 10 paces along powerline and mark beginning of transect #2. Record the GPS coordinates for start of Transect.

4. Walk 10 more paces along powerline and mark beginning of transect #3. Record the GPS coordinates for start of Transect.

5. Walk 10 more paces along powerline and mark beginning of transect #4. Record the GPS coordinates for start of Transect.

6. From each Transect starting point, facing 45 degrees NE (the center of the photo below, at the left side of the bottom of the bigger hill as a directional marker) lay out a tape to the end of the visible shell, or when you reach the edge of the eelgrass. **OR** walk strait out to the end of the visible shell, or when you reach the edge of the eelgrass, sighting on that hill and place another stake at that point. Record the GPS coordinates of the end point of each Transect.
7. 

8. Go back to the southern starting point of the Transect #1 and **walk 6 [random number] of pace**s. Put a wire flag at that point. You will place the quadrat frames on the ground with the stake at the center and the tape running through the center of the quadrat. Walk 5 more paces and place another wire flag/quadrat in the same orientation. Repeat to the end of the Transect #1.

9. Repeat for each transect, starting at:
    - **7 paces for #2**
    - **3 paces for #3**
    - **2 paces for #4**

10. For each quadrat placed along the transect, you will:
    a. Take a photo
    b. Record the approximate size of each spat found on each shell piece (is the spat less than or greater than 15 mm)
    c. Estimate the percent cover of oyster shell (see below)

Quadrat Instructions

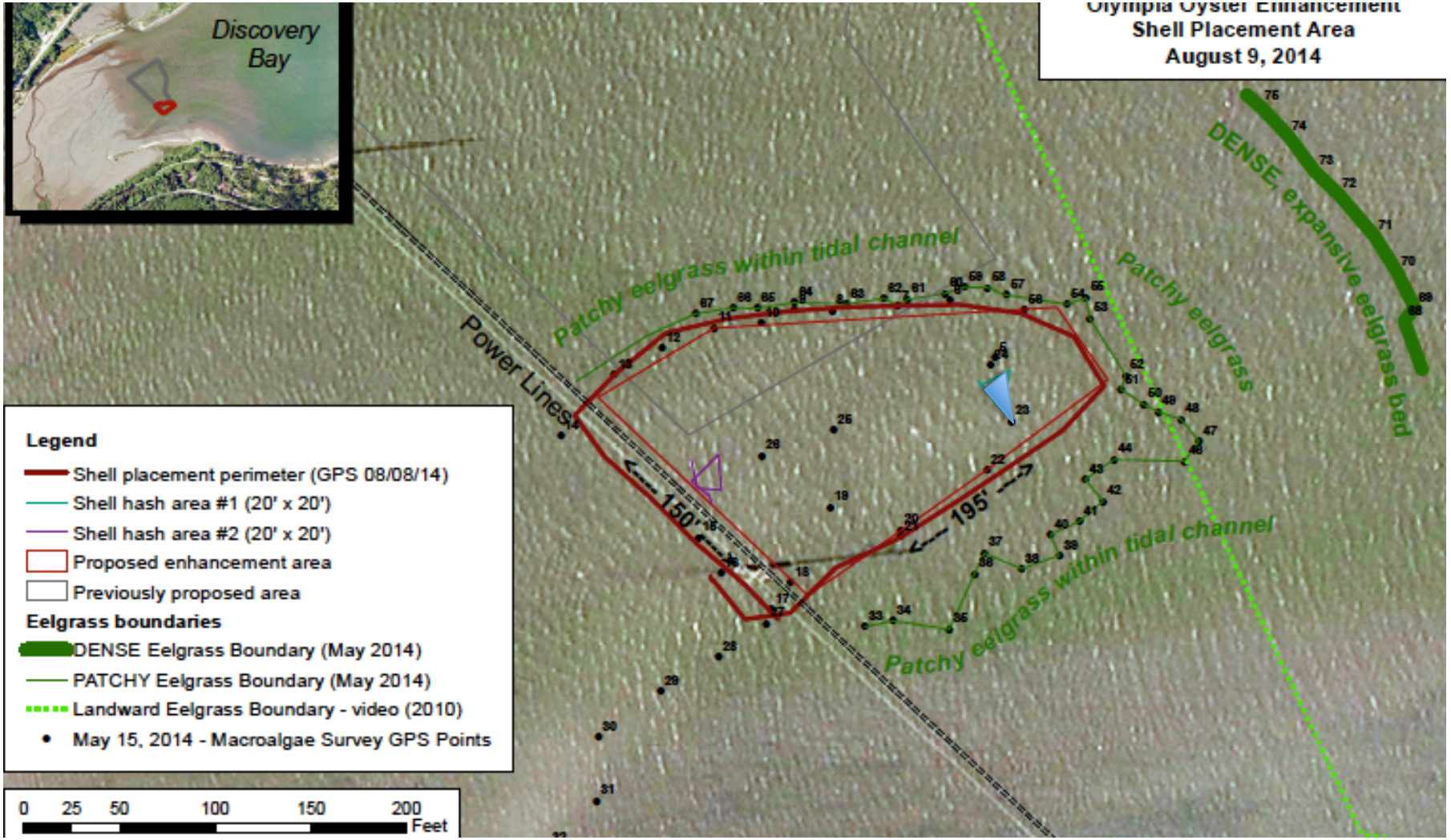
11. Record on the data sheet the Transect # & quadrat #. Start by taking a photo & time that the photo was taken, so we can match them up.

12. Start with the lower right quarter section of each quadrat. Pick up each shell piece and inspect it for Olympia oyster spat. After you record all the spat sizes found on each shell, set it aside in a bucket or container. OR, just move all the shell out of one quarter section and then start inspecting and moving them into that first quarter section. All remaining counted shells can be placed on the ground in that first quarter section.

13. To estimate overall coverage, place all the counted shells with edges touching so you can easily estimate the total % cover for that quadrat. **Record the % cover estimate on the data sheet at the top of the shell count for that quadrat, then proceed to the next quadrat in that Transect.**

14. If you have more quadrats than room on the form, start another sheet and **renumber the quadrats.**

15. Repeat for each quadrat in the Transect. When you get to the end of the Transect line, make sure you have recorded the End Point on the GPS . Then move to the next transect.


Olympia Oyster Enhancement
Shell Placement Area
August 9, 2014
Discovery Bay
Power Lines
Patchy eelgrass within tidal channel
Patchy eelgrass
DENSE, expansive eelgrass bed
Patchy eelgrass within tidal channel
150'
195'
Legend
Shell placement perimeter (GPS 08/08/14)
Shell hash area #1 (20' x 20')
Shell hash area #2 (20' x 20')
Proposed enhancement area
Previously proposed area
Eelgrass boundaries
DENSE Eelgrass Boundary (May 2014)
PATCHY Eelgrass Boundary (May 2014)
Landward Eelgrass Boundary - video (2010)
May 15, 2014 - Macroalgae Survey GPS Points
0 25 50 100 150 200
Feet

Quilcene MRC Olympia Oyster Project

SPAT COUNT - 2016 Seeded Cultch.

of spat/shell for 10 shells/bag @ 2 bags/test plot x 5 test plots

Recorder's Name: **TALLY**

Email or phone:

Deployment Date: 5/24/16

Monitoring Date 5/24/16

Time of Low tide 1:15 PM

Station Information

Waterbody: Hood Canal

Station Name: Quilcene

Lat/Long; Plot 1: 47.80806, 122.86204

Elevation (MLLW):

Test Plot 1 to 5

10/bag x 2 bags	Front			Back		NOTES
PLOT #	# Olympias	# Pacific		# Olympias	# Pacific	
1	35	23		52	9	
2	43	23		78	15	
3	53	13		51	5	
4	53	19		123	6	
5	57	17		65	11	
Total	241	95		369	46	
Both Sides	610	141				
on 100 shells						
ratio 6.1:1.4						

Quilcene MRC Olympia Oyster Project

SIZE OF SPAT - 2016 Seeded Cultch.

Measuring Ht of 100 Olys on random shell from each plot

Station Information

Recorder's Name: **TALLY**
Email or phone:
Deployment Date: 5/24/16
Monitoring Date 5/24/16
Time of Low tide 1:18pm

Waterbody: Hood Canal
Station Name: Quilcene
Lat/Long Plot 1: 47.80806, 122.86204
Elevation (MLLW):

Test Plots 1-5

10/bag x 2 bags **Olys only**	Plot 1 **length in mm**	Plot 2 **length in mm**	Plot 3* **length in mm**	Plot 4 **length in mm**	Plot 5 **length in mm**	Notes * Talliers recorded ht of Pacific spat
1	25	6	15	22	13	
2	22	25	4	15	10	
3	10	10	16	15	13	
4	15	4	6	10	25	
5	10	7		10	8	PL3-26mm Pacific
6	15	6	12	8	10	
7	15	25	13	25	12	
8	13	12		17	14	PL3-25mm Pacific
9	10	15		12	14	PL3-48mm Pacific
10	15	12		10	22	PL3-30mm Pacific
11	18	15	10	7	17	
12	12	12	14	12	27	
13	10	10		17	15	PL3-33mm Pacific
14	13	18	17	10	15	
15	20	10	10	12	13	
16	15	10		19	17	PL3-30mm Pacific
17	13	15	15	13	13	
18	20	10	15	10	20	
19	23	13	8	7	13	
20	15	10	10	13	15	
	309	245	165	264	306	
Averages	**15.45**	**12.25**	**11.79**	**13.2**	**15.3**	
Average height of all Olympia oysters					**13.60**	

Puget Sound Olympia Oyster 2016

PSRF Recruitment Monitoring Datasheet

			Station Information		
Recorder:	Amy Does		Waterbody:	**Quilcene Bay**	
Contact Information:	adoes2@frontier.com		Station Name:	Qulcene Bay	
Deployment date:	24-May-16		Station Position (Lat/Long; WGS 84):	47.80764, 122.86320	
Recovery Date:	30-Aug-16		Elevation (MLLW):	0	
Processing Dates:	Sept. 28, 2016		**Notes:**	* = unknown species	
			Dried samples		
			Pacific (P) Olympia (O)		

Shellstring ID:	QB 1		Shell height units= microns or **mm**
Valve Number	Live count	Dead count	First 10 shell heights for Live (L) and Dead (D)
1	4	0	L*: 1.5, 1.5, 1.5, 1.5
2	11	0	LO: 8.7, 5.1, 4.1, 5.0, 8.5, 3.5, 1.9, 1.6, 2.7, 2.0, 0.9
3	15	0	LO: 5.0, 1.5, 4.3, 3.4, 2.0, 7.0, 1.1, 1.8, 1.5, 1.5, 2.2, 1.5, 2.7, 1.5
4	1	0	LO: 4.0
5	0	4	D*: 4.3, 3.8, 4.3, 3.4
6	0	0	
7	3	0	DO: 2.0, 2.5, 3.0
8	0	0	
9	0	0	
10	0	1	D: can't size This is the topmost shell — away from mud or sand

Shellstring ID:	QB 2		Shell height units= microns or **mm**?
Valve Number	Live count	Dead count	First 10 shell heights for Live (L) and Dead (D)
1	0	0	
2	1	0	LO: 1.6
3	3	0	LO: 7.4, 1.5, 2.8
4	3	0	LO: 3.2, 2.3 LP: 2.7
5	1	1	D*: 2.1 LO: 1.0
6	2	1	LO: 4.4, 1.9 DP: 4.7
7	0	0	
8	0	0	
9	0	0	
10	0	0	This is the topmost shell— away from mud or sand

Shellstring ID:	QB3		Shell height units= microns or **mm**
Valve Number	Live count	Dead count	First 10 shell heights for Live (L) and Dead (D)
1	1	2	D*: 2.8, 1.8 LO: 2.7
2	6	2	LO: 5.1, 3.2, 4.2, 3.0, 3.0, 2.3 D*: 2.8, 1.8
3	16	5	LO:4.1, 5.6, 2.8, 5.5, 2, 4.4, 4.1, 2.7, 4.2, 2.4 DP:1.7, 2.2,2.2,2.7,2
4	10	0	LO: 8, 2.3, 2.7, 3.4, 7.1, 4, 4.8, 7.7, 7.3, 5.2
5	1	0	LO: 8.2
6	0	0	
7	0	0	
8	0	0	
9	0	3	D*: 1.2, 1.4, 1.5
10	0	0	

Protocols & Field Notes

Quilcene Bay Olympia Oyster

May 24, 2016 Deployment

Time and Location of deployment:

11:30 am at WDFW Indian George Creek beach access on Linger Longer Rd.
Low tide is approximately -1.5 at 1:15 pm.
Post-activity notes added 5/26/16.

Equipment:

- Volunteer sign-in (no particular form needed for this)
- Gloves (to protect from sharp shell edges)
- Mudboots
- Flagging tape when finding old stakes, then remove flagging at end
- 8-10 stakes (15" stakes with orange painted tops)
- Lat-long GPS data of test plot centers
- hammer
- tape measure (1)
- rope with loop and 5 ft length to draw a 10 ft diam circle. *(drawn with heel of boot)*
- mm rulers (2)
- camera
- GPS (2)
- (4) 5-gal buckets
- 2 sets of data sheets on waterproof paper (5 sheets each of two types of data)
- clip-boards
- pencils
- Rite in the Rain Notebook
- Cookies
- Discover Pass
- First Aid Kit
- (3) shell-stacks from PSRF
- knife or sharp blade to cut bags open
- Print map of site with reference points (property corners marked with tall white pvc pipe) *and maybe photos of previous deployment for reference*

Overview

We will distribute 2 bags of seeded cultch per test plot. *(John Adams brought 11 bags, so the extra bag was spread out in the test plots that seemed to have few shell.)* For the baseline, we will measure a sub-sample of 10 shells/bag to get (a) an average of number of Olympia spat placed in the test plots (100 shells inspected and spat counted) and (b) a range of lengths of the spat. The seeded cultch from Taylor Shellfish has both Olympias and Pacifics in an estimated ratio of 3:1 (*Actual ratio was 4.3:1*). We will try to distinguish the two if we can, but it's difficult when they are small. (*Brady was lead on distinguishing the two species, with some guessing on*

smaller spat. Amy Does got pretty good at it, too.) We did not count the number of shells/bag, but assume an average number is 250-300 shells/bag.

Agenda for the day.

1. Volunteer sign-in at parking lot.
2. Safety review and goals for the day.
3. Mark the test plots with stakes: First, look for stakes installed last year. Put a new stake in that location if found or put a new stake in approximate location. If you can't find the stakes, use the GPS and lat/long data from last year to find approximate location and install a new stake. *(We found all five old stubs eventually, using the maps to determine approximate location relative to the property corners marked by tall pvc pipes. The old stakes were very barely showing above the mud, but the orange paint helped identify them.)*
4. Take new GPS coordinates for all 5 stakes.
5. Record new GPS lat-long data and time on data sheets.
6. Using a tape measure or pre-measured rope length with loop, draw a circle around the stake, using a 5' length to draw a 10' diameter circle *using the heel of your boot.*
7. Place two bags near the center of each of the test plots, next to the stakes.
8. Those bags will be split open and a random selection of 10 shells from each bag will be removed and placed in a bucket. (Try to pick shells from various locations throughout the bag.) The rest of the shells can be distributed within the 10' radius circle.
9. Count the number of spat on each shells from the bucket, recording # of Olympias and # of Pacific oysters (if we can tell the difference) found on the front and back of the shells, along with notes.
10. Then, measure and record the length (known as" height') in mm of the first 20 Olympias in your sample bucket. Then disperse the sub-sample within the circle.
11. Install the 3 PSRF shell-strings in the immediate vicinity of the test plots and record GPS locations in the notebook.

NOTES:
WDFW standard protocols use mm for biological measurements, but measure tideland lengths in feet, so we used the same standards.
5 ft radius = 7.3 sq meters (= 78.5 sq ft)
2 m radius = 12.57 sq meters (= 135.26 sq ft)

Once plot centers were marked, Wade and Gordon worked on moving shell bags to sites, getting the sub-samples in the buckets and spreading the rest of the shell. Sarah and Brady recorded number of spat. Amy and Jackie measured and recorded size of spat. Lucas took GPS points and lots of great photos.

We'll need to plan better for the next deployment*. John Adams brought the boat close to the desired location, with help from Gordon and Brady. The GPS coordinates were not as helpful as the tall pvc pipes marking property corners. If you use GPS,*

check ahead of time and make sure everyone is using the same form of decimal lat/long (decimal degrees or decimal minutes/seconds). John's GPS put him in a different place on the tideflats, but with the tides not yet fully out, Brady and Gordon were able to direct him into a closer location.

UPDATED GPS locations for Test Plots

Test Plot #1

N47.80806, W122.86204

Test Plot #2

N47.80796, W122.86237

Test Plot #3

N47.80784, W122.86278

Test Plot #4

N47.80767, W122.86319

Test Plot #5

N47.80779, W122.86340

Shell Stack Locations

QB1: N47.80769, W122.86311

QB2: N47.80777, W122.86323

QB3: N47.80774, W122.86317