

Intertidal Biota Survey Design for the King County Brightwater Marine Outfall Project

Kimberle Stark, King County Dept. of Natural Resources & Parks
 Dr. Megan Dethier, University of Washington Friday Harbor Labs
 Helen Berry, Washington State Department of Natural Resources

INTRODUCTION

King County's new wastewater treatment plant, the Brightwater Treatment System, will discharge treated effluent to Puget Sound through an outfall placed over a mile offshore at Point Wells, located on the King/Snohomish County line. Open-trench construction will be used to build the outfall in the nearshore, an area that includes about 400 feet (ft) of intertidal habitat. All biological resources will be lost in this area during construction. King County is monitoring intertidal biota in the outfall area to document existing biota and assess recovery following outfall construction, likely in summer of 2008. Project sampling began in June 2006.

METHODS

Site Selection

Intertidal biota is being surveyed at 3 sites, the outfall corridor (impacted site at Point Wells) and reference sites at Point Wells and Richmond Beach, annually between 2006 & 2010 (Figure 1). Three pre-construction surveys will occur between 2006 & 2008 to assess existing biota and interannual variability and 2 times following construction to assess biota recovery.

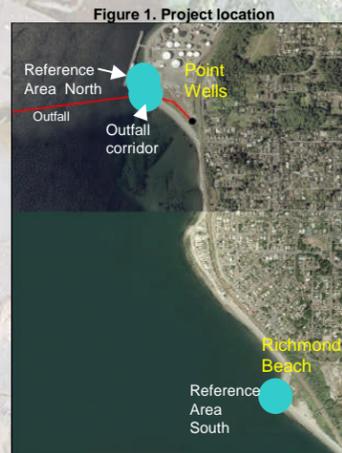
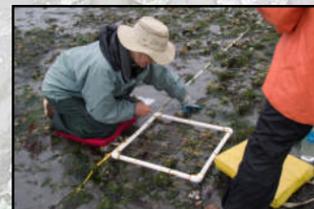


Figure 1. Project location



Survey Methods

A series of intertidal transects 50 meters (m) in length were established parallel to the shoreline at 4 tidal heights: -2 ft Mean Lower Low Water (MLLW), MLLW (0), Mean Low Water (+2.8 MLLW), and Mean Sea Level (+6.6 MLLW). This design concentrates sampling where biota are diverse but provides information on impacts to high intertidal organisms as well.

Along each transect, 10 locations are sampled for biota using 0.25 m² quadrats. Five quadrats are placed on the landward and waterward side of the transect, respectively (Figure 2). All epibiota is enumerated and identified down to species whenever possible. A 10 cm diameter x 15 cm deep sediment core is collected from the opposite side where the epibiota is assessed. Cores are sieved on 2 and 4 mm sieves and all organisms preserved and identified down to species at the Friday Harbor Laboratories. Sediment samples are collected at 3 locations along each transect for grain size analysis.

The sample methodology is similar to Washington Dept. of Natural Resources' SCALE program sampling protocols, with the exception of 3 additional transects. The SCALE program samples at the MLLW tidal height.

Modifications to the sampling plan were made during the initial sampling event. A transect south of the outfall corridor was sampled at the -2 MLLW elevation in 2006 and at both -2 and 0 MLLW in 2007. The initial Richmond Beach reference station was moved further south as the substrate was substantially different from Point Wells and the impact site. The Sampling and Analysis Plan can be downloaded at <http://dnr.metrokc.gov/wlr/waterres/marine/reports/InterTidalBiotaSAP.html>.

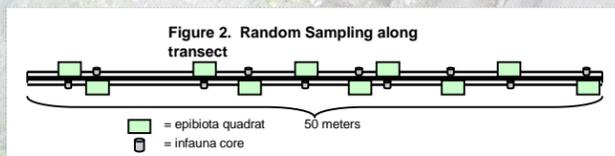


Figure 2. Random Sampling along transect

□ = epibiota quadrat
 ○ = infauna core

RESULTS (to date)

- Little biota was present at +6.6 MLLW.
- SIMPER (similarity percentage) analysis showed that a large recruitment of barnacles and associated species, particularly filamentous algae, caused large biotic shifts from 2006 to 2007. There was also a large increase of the snail *Lacuna vincta* in 2007.
- Table 1 gives mean abundance for selected species at all sites in 2006 and 2007 and Figure 3 shows species richness.

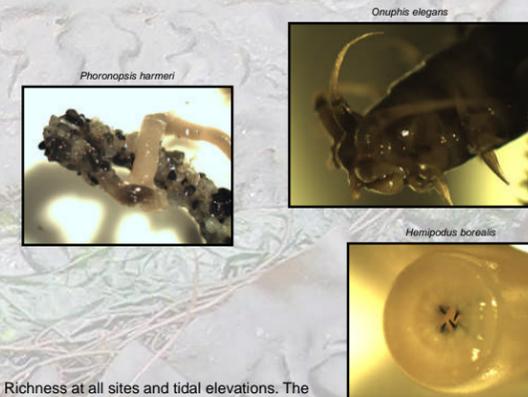
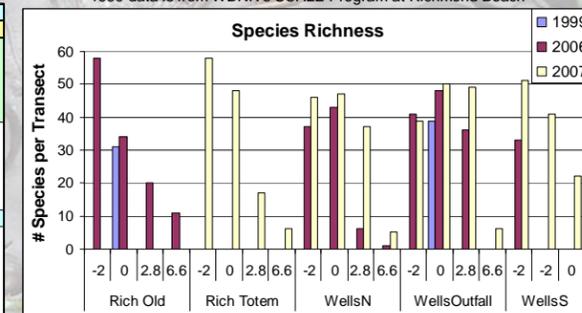


Table 1. Mean abundance for selected species at 3 tidal elevations. Diatoms and *Acrosiphonia* spp. abundance is % cover, all others are counts.

	2006														
	-2 MLLW				0 MLLW				+2.8 MLLW						
	Acrosiphonia spp.	Amphiglena spp.	Diatoms	Hemigrapsus spp.	Lacuna vincta	Acrosiphonia spp.	Amphiglena spp.	Diatoms	Hemigrapsus spp.	Lacuna vincta	Acrosiphonia spp.	Amphiglena spp.	Diatoms	Hemigrapsus spp.	Lacuna vincta
Point Wells outfall	0.3	0.1	0.1	0	0.7	7.1	0.2	3.9	0.1	0.6	0.3	0.3	7.8	0.4	0
Point Wells reference-N	0.3	0.1	0.1	0	1	1.9	1.3	2.3	0.2	1.3	0	0	0	0	0
Point Wells reference-S	0.5	0.5	0.8	0	0.1	--	--	--	--	--	--	--	--	--	--
Richmond Beach	2.5	0.2	5.7	0.9	3.3	3.3	0.6	2.1	7.3	0.8	0	8.6	0	6.3	0
Richmond Beach totem	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	2007														
Point Wells outfall	2.2	0.1	0.3	0	13.7	0	0.2	0.5	0	13.9	3.8	1.3	0.1	0.6	1.3
Point Wells reference-N	1.5	0.1	1.1	0	15.5	1	0.7	1.4	0.6	6.9	8.4	2.2	0.5	5.8	3.1
Point Wells reference-S	0.8	0.1	3.3	0	38.3	2.6	0.2	0.7	1.4	27.6	--	--	--	--	--
Richmond reference	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Richmond reference totem	2.5	0.5	1.6	0	31	2.4	0.8	0.4	0	13.3	0.2	0.2	0	0.6	0

Figure 3. Species Richness at all sites and tidal elevations. The 1999 data is from WDNR's SCALE Program at Richmond Beach



CONCLUSIONS (to date)

- High interannual variation is evident at all sites, however, biota at a given tidal elevation trends to 'shift' in the same way at all sites.
- Diversity decreases with increasing tidal elevation
- Infauna abundance is greatest at the 0 and +2.8 MLLW tidal elevations, with polychaetes making up most of the abundance
- 0 and -2 MLLW tidal elevations are biologically more similar than the higher tidal elevations (+2.8 and +6.6 MLLW)
- Juvenile *Cancer* sp. crabs were consistently present along the entire -2 MLLW transect in 2006 at two Point Wells sites (the outfall and north reference) but not at other sites nor in 2007.
- It's very important to have reference stations!



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