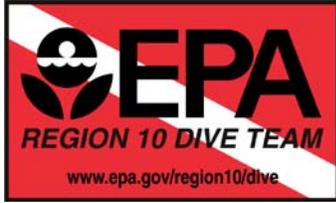


US EPA ARCHIVE DOCUMENT



## [EPA Region 10 Dive Team](http://www.epa.gov/region10/dive)

### **Diver Based Georeferencing Shoreline Inventory/Assessment Technique 2006-2007**

**What:** The EPA Region 10 Dive Team conducted a survey technique for underwater digital photography integrated with GPS location data as part of a shoreline inventory/assessment of Blakely Harbor, the Wyckoff Superfund Site, Bainbridge Island, WA, and the Woodard Bay Conservation Area within Henderson Inlet.

**Why:** An impact analysis and shoreline inventory/assessment was needed for the City of Bainbridge Island to properly assess the state of submerged aquatic resources in Blakely Harbor. Also, an eelgrass extent survey was needed east of the Wyckoff groundwater treatment plant for habitat assessment and possible restoration. Areas where deep holes prevent eelgrass from taking hold may be filled. Woodard Bay habitat assessment in Henderson Inlet was needed to determine what ongoing impacts wood debris might be having on the marine environment there.

**Where:** Blakely Harbor, Wyckoff Superfund Site, Bainbridge Island, WA, and Woodard Bay, WA

**When:** September 2006, September & October 2007.

**How:** A survey procedure was conducted where a two person dive team surveys the underwater environment in search of submerged aquatic resources by documenting the seafloor with digital photos at regular intervals along a contour of the shore covering approximately a mile in total distance. An inexpensive recreational Global Positioning System (GPS) device is towed in a raft directly above the dive team which records positions throughout the dive. Commercial software is later used to relate the GPS information to the digital photos resulting in geo-located digital photos that can be viewed on a map or Geographic Information System (GIS) for later analysis of the seafloor environment.

**Equipment Used:** EPA Vessel "Monitor", GPS device attached to diver-towed GPS raft, Underwater Digital Camera, GIS software & Laptop.

**Results:** Geo-located photo documentation of the underwater shoreline environment. Blakely Harbor survey information determined very little presence of eelgrass. Wyckoff Superfund Site survey information mapped the presence of eelgrass relative to water depth changes. Woodard Bay/Henderson Inlet survey information included documentation of wood waste debris and the presence or absence of expected macrofauna for evaluation in possible future restoration activities as part of the Puget Sound Initiative.

**Contact:** Tim Siwiec, [siwiec.tim@epa.gov](mailto:siwiec.tim@epa.gov); Lisa Macchio, [macchio.lisa@epa.gov](mailto:macchio.lisa@epa.gov); Rob Pedersen, [Pedersen.rob@epa.gov](mailto:Pedersen.rob@epa.gov)

**Video:** [Survey Technique for Underwater Digital Photography with Integrated GPS Location Data \(10 minutes, Total file size 83MB, Windows Media format\)](#)

**More Information:**

[Siwiec, et. al. 2008, Survey Technique for Underwater Digital Photography with Integrated GPS Location Data, EPA Mason Hewitt Award Nominee Presentation, New York City, New York \(PDF\) \(18 pp. 2.1MB\)](#)

[Siwiec, 2007, Survey Technique for Underwater Digital Photography with Integrated GPS Location Data, 2007 ESRI conference proceedings \(PDF\) \(7 pp. 714K\)](#)

[Siwiec T., S. Sheldrake, A. Hess, D. Thompson, L.t Macchio, P. B. Duncan, 2008. Survey Technique for Underwater Digital Photography with Integrated GPS Location Data. Proceeding of the American Academy of Underwater Sciences 27th Symposium pp. 159-166. \(PDF\) \(8 pp. 2.1MB\)](#)

Photos:



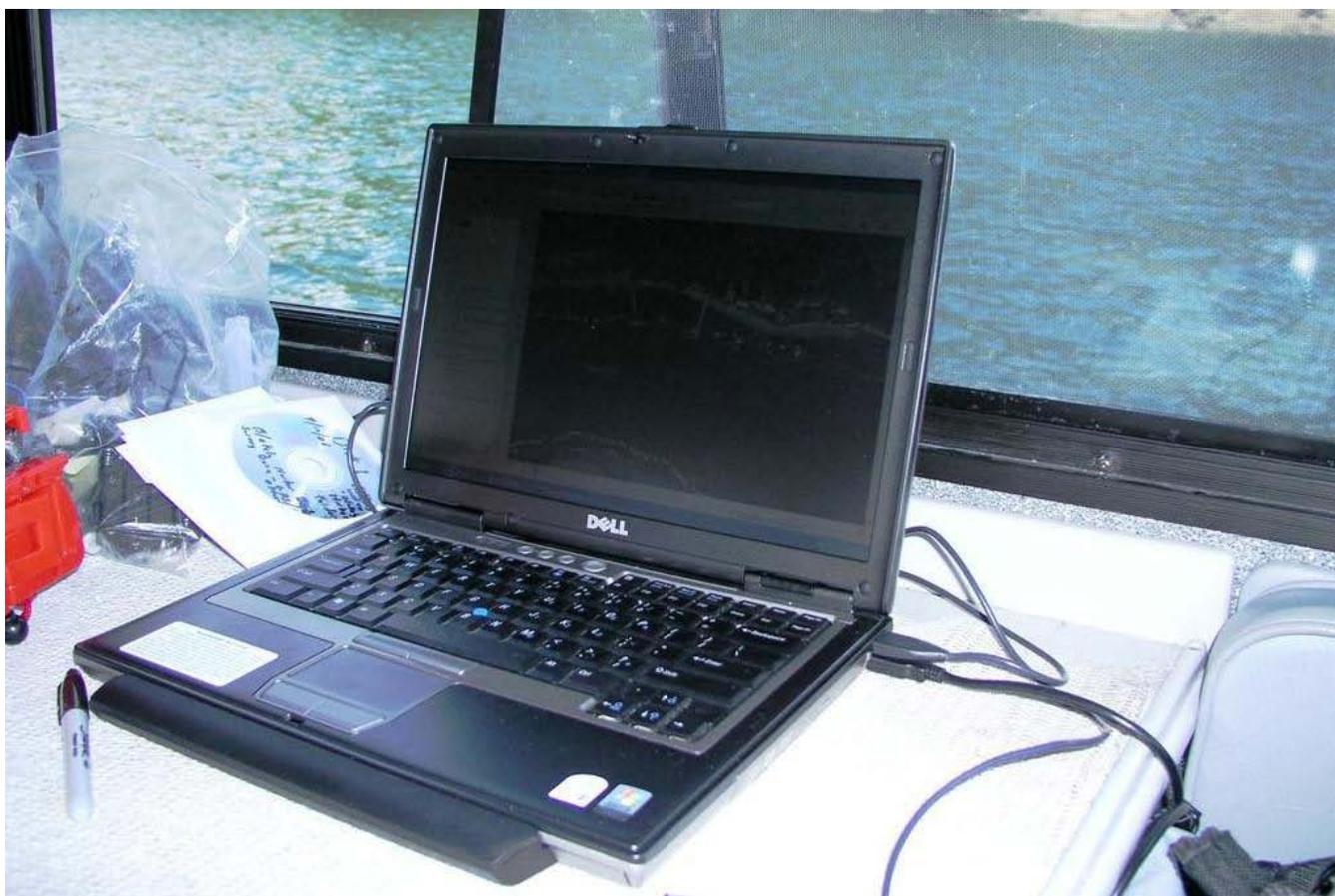
GPS location of eelgrass



GPS in drybag



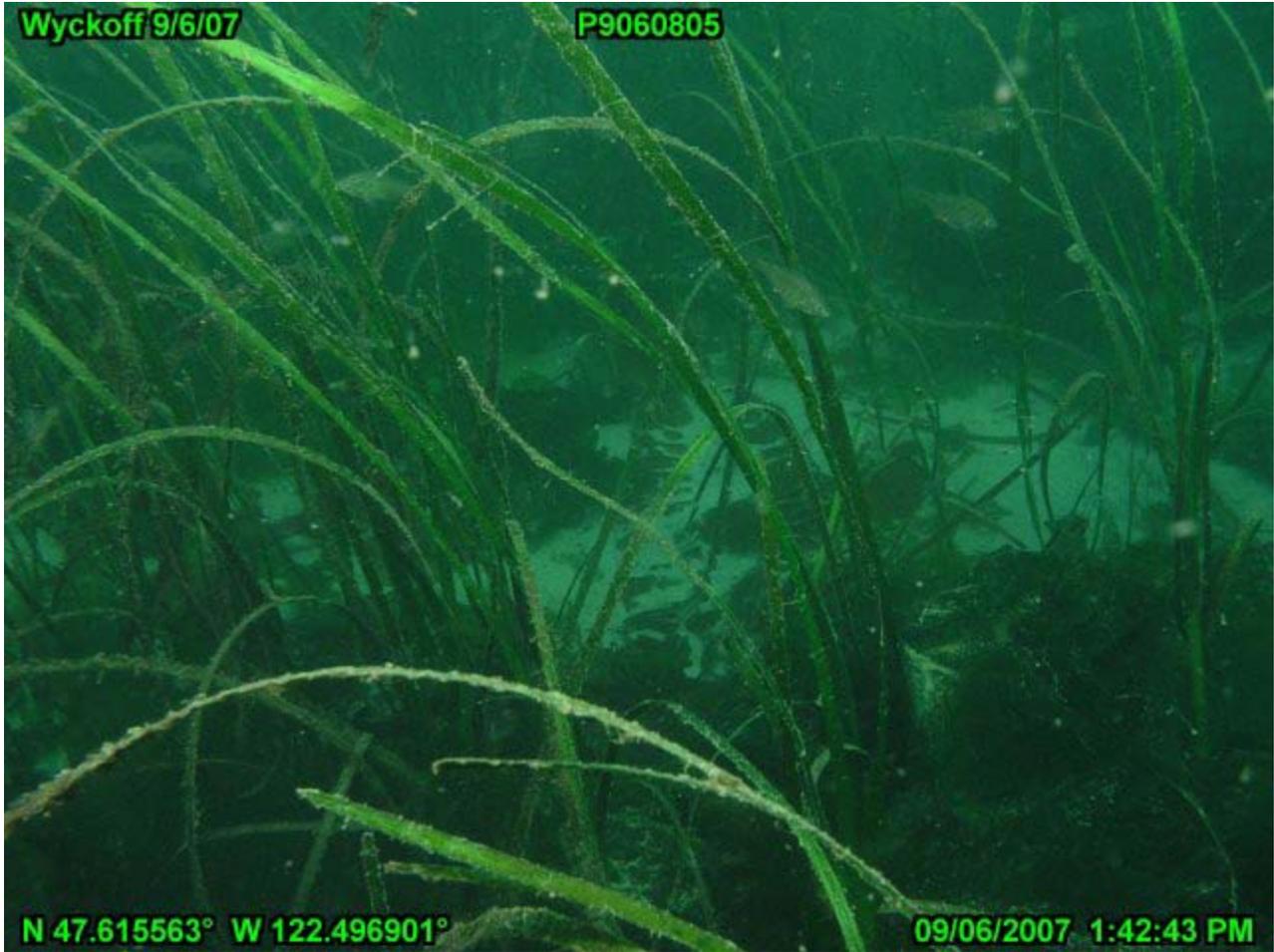
GPS Raft with Dive Flag



Laptop used during documentation



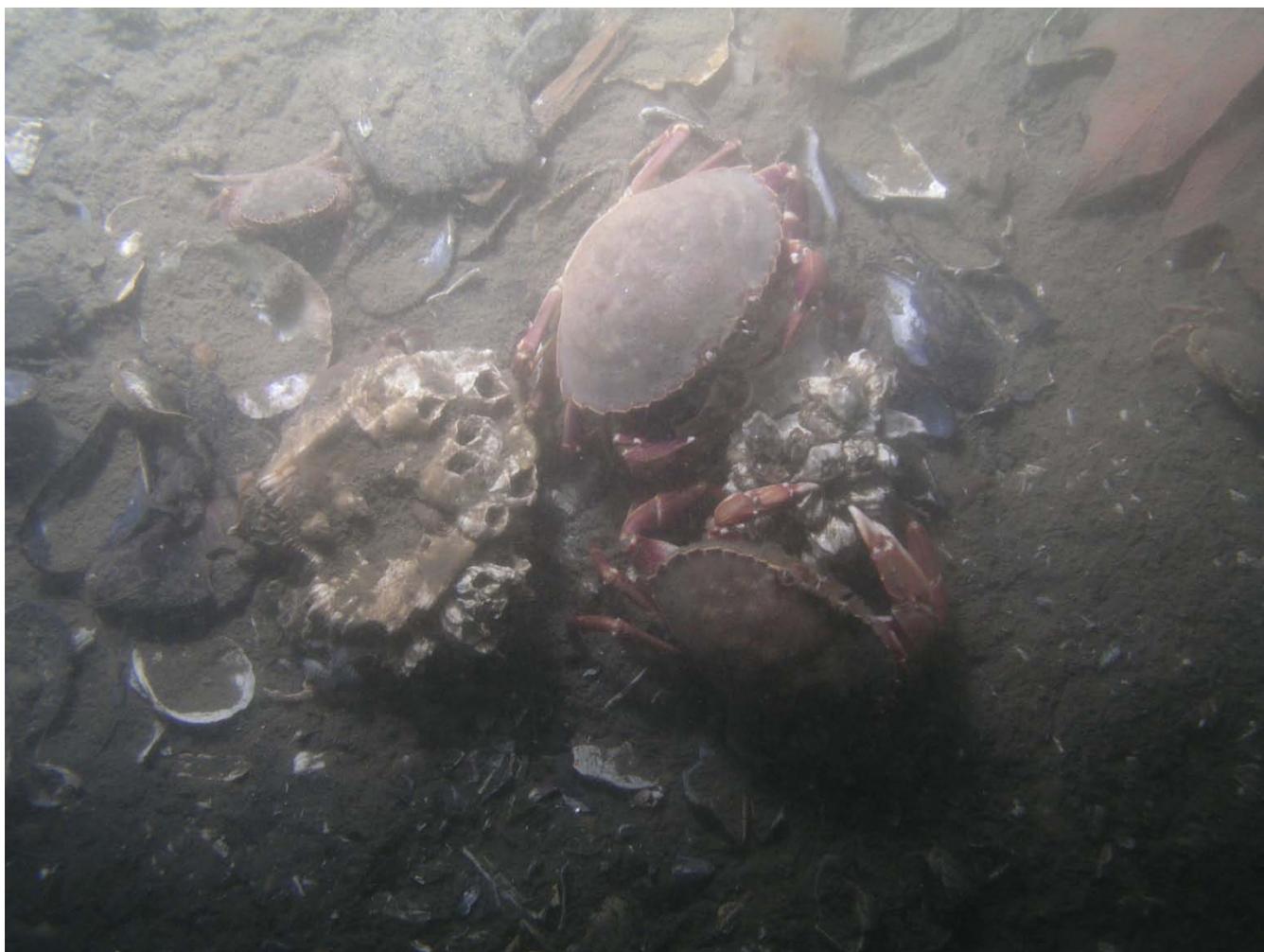
Diver taking gps located bottom sample for gradation analysis.



Geolocated eelgrass bed.



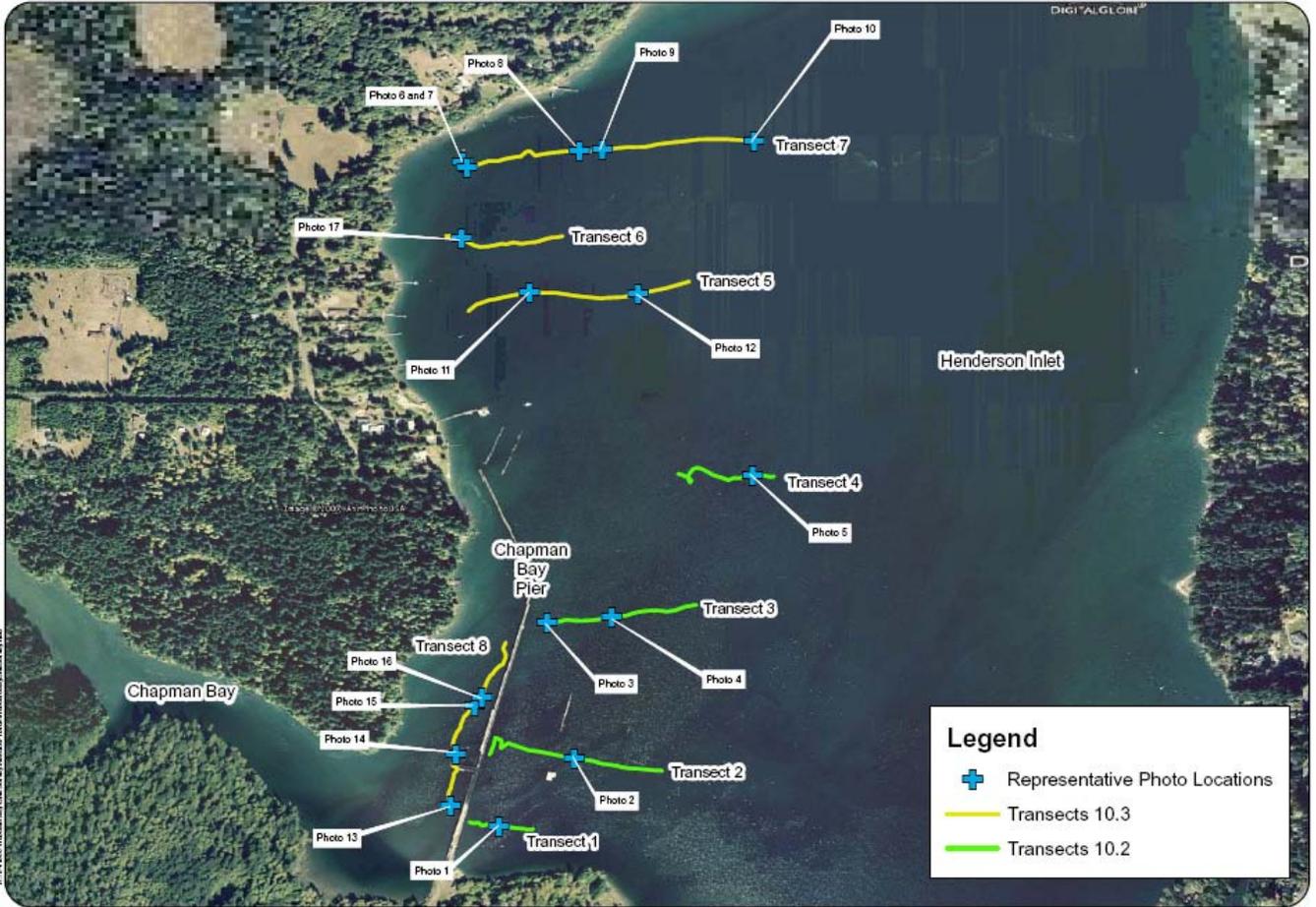
Diver underwater with GPS coordinates



Henderson Inlet Photo 2; Woodard Bay, Rock Crab (*Cancer gracilis*), mussel shell fragments, barnacles, and terrestrial leaf litter adjacent to the Chapman Bay trestle.



Henderson Inlet Photo 9; Woodard Bay, Polychaete egg sacks on muddy surface.



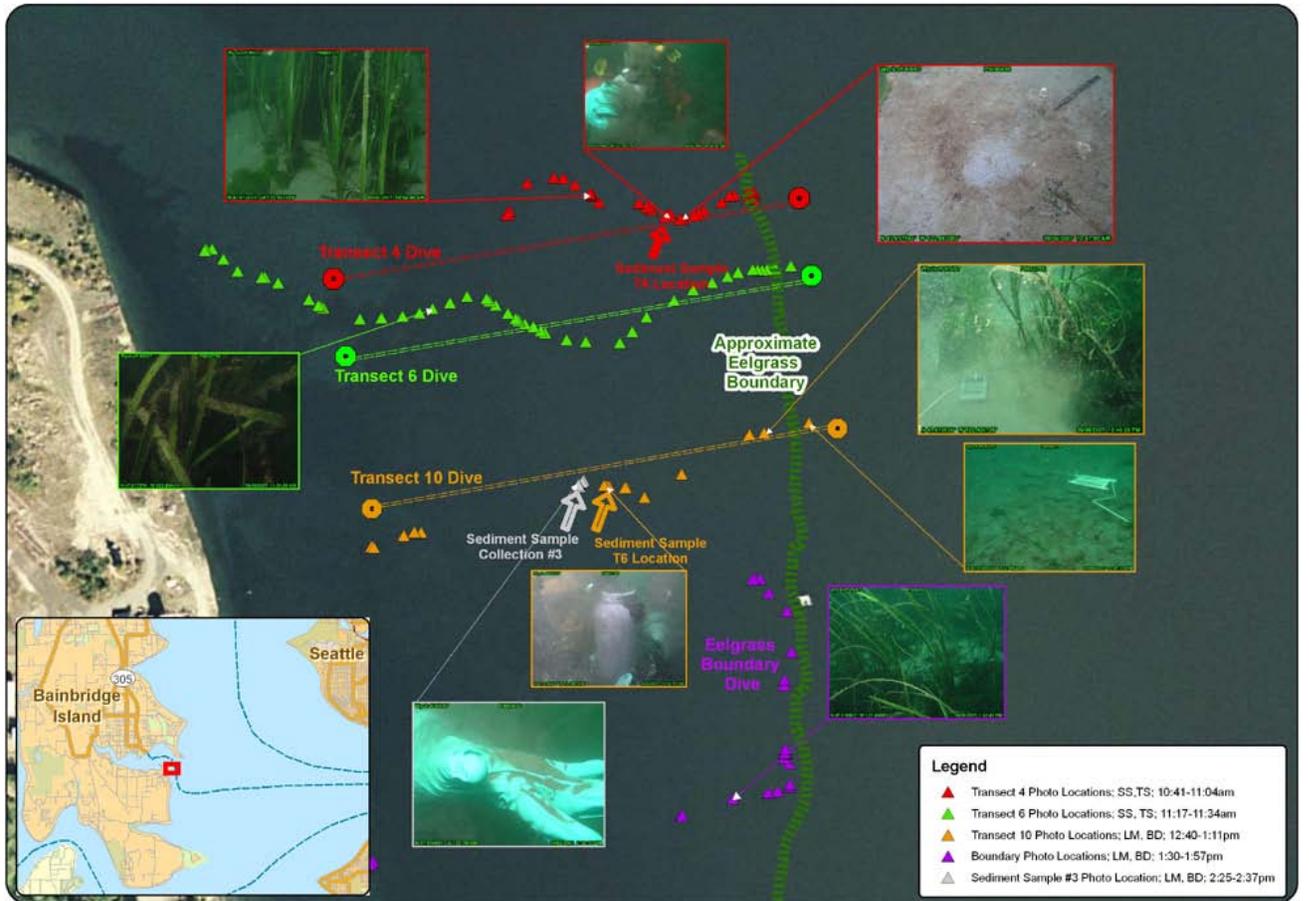
Note: Based on map and GPS coordinates provided by the U.S. Environmental Protection Agency (EPA), EPA has compiled the computer representation from data or information sources that may not have been verified by the EPA. This data is offered here as a general representation only, and is not to be used without verification by an independent professional qualified to verify such data or information. The EPA does not guarantee the accuracy, completeness, or timeliness of the information shown, and shall not be liable for any loss or injury resulting from reliance upon the information shown.

**Figure 1**  
**Transect and Representative Photo Locations**

0 245 490 980 Feet



TS, October 3rd 2007



The U.S. Environmental Protection Agency (EPA) has compiled this computer representation from data or information sources that may not have been verified by the EPA. This data is offered here as a general representation only, and is not to be re-used without verification by an independent professional qualified to verify such data or information. The EPA does not guarantee the accuracy, completeness, or timeliness of the information shown, and shall not be liable for any loss or injury resulting from reliance upon the information shown.

## Wyckoff Eelgrass Survey Sept 6th 2007 US ACE / US EPA



TS, September 6th 2007



Henderson Inlet Photo 7; Woodard Bay, Extensive bark debris coverage and barnacle remnants from adjacent dolphin pilings.

Return to [EPA Region 10 Dive Team](#) homepage.