

US EPA ARCHIVE DOCUMENT



## [EPA Region 10 Dive Unit](#)

### **Elwha Dam Removal Survey in the Strait of Juan de Fuca, near Port Angeles, WA**

**What:** The Region 10 dive team was asked to conduct a survey of algae, invertebrates, and fish present near the mouth of the Elwha River to baseline the species present prior to removal of the Elwha River dams, and the associated sediment deposition that will ensue. This is a repeat of the 1994 survey conducted by the team with US Fish and Wildlife Service due to the time that has elapsed between authorization and funding for dam removal.

**Why:** The [EPA Region 10 dive unit](#) was asked to characterize the existing benthic community near the mouth of the Elwha River in partnership with USGS and the Elwha Tribe. A baseline study of the conditions will allow future monitoring to determine the level of success in the manner in which the Elwha dams are removed. Monitoring of sediment stakes placed at the site will also give information on the rate of accretion at sites nearby the Elwha mouth.

**Where:** The survey was conducted around the mouth of the Elwha River, in the Strait of Juan de Fuca (see photo below).

**When:** The original baseline survey was conducted in 1994. Due to the time that had elapsed between authorization for dam removal and funding of their removal by Congress, the USGS needed to do another survey. Starting in 2008, the USGS is used a study plan with updated methods and that does not replicate the 1994 study design. EPA supported this USGS led survey in 2011, 2012, 2013, and 2014 with partners participating from the Lower Elwha Klallam Tribe and Washington Seagrant.

**How:** Divers used surface supplied diving equipment and drysuits to place the permanent sampling stations in July of 2011. Surveys were conducted with buddy teams using SCUBA in August 2011 and in later years. USGS led the surveys which included uniform point counts ([PISCO](#) method) conducted every ½ meter along 30 meters of a 50 meter transect (from the 10 meter mark to the 40 meter mark). Algal surveys were conducted along a 1 meter swath to one side of the transect, while invertebrate counts were conducted on the other side. Each location had two transects, one heading east and one heading west (magnetic).

**Equipment:** EPA vessel Monitor was used as the dive platform. The USGS utilized a separate platform during the survey for their divers as well as the Elwha Tribe.

**Results:** Photos, video, data sheets, and narrative descriptions were conveyed to the project team, including USGS and the Lower Elwha Tribe.

**More details:**

1994 survey:

[Seavey, F. and G. Ging. 1995. Marine resources of the Elwha River Estuary, Clallam County, Washington. Rep. for Nat. Park Ser., prepared by U.S. Fish Wildlife Ser., W. WA Office, N. Pac. Cst. Ecoregion. 29 pp. + 3 Figs., 10 Maps, 1 App. June 1995 \(47 pp, 8 MB pdf\)](#)

Video coverage of 2011 survey:

King 5: <http://www.king5.com/news/local/In-The-Mouth-Of-The-Elwha-127278693.html>

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**Photos:**

**Photo documentation was used to corroborate species identification, such as for tube worms, hydroids, anemones, and algae.**



EPA diver reeling out the tape from the center monument to the end pier block to begin conducting counts



**Example UPC (Uniform Point Contact) form**

<b>Site:</b>		<b>Date:</b>	<b>Dive:</b>	<b>Surveyor:</b>	
<b>Vis at Bottom:</b>		<b>Start time:</b>	<b>Heading:</b>	<b>Buddy:</b>	
<b>Note Direction (degrees) Current Flows FROM</b>					
<b>Current at Bottom</b>		<b>m/s @</b>	<b>Time:</b>	<b>At 15ft:</b>	<b>m/s @ Time:</b>
			<b>10.5 - 20.0 m</b>	<b>20.5 - 30.0 m</b>	<b>30.5 - 40.0 m</b>
<b>Substrate</b>	Bedrock				
	Boulder (>25 cm = 10 in)				
	Cobble (6-25 cm = 2 - 10 in)				
	Gravel (0.2 - 6 cm = 1/8 - 2 in)				
	Sand (< 0.2 cm = 1/8 in)				
<b>Relief</b>	0-10 cm				
	10 cm-1 m				
	1-2 m				
	>2m				
<b>Super-Layer</b>	Drift algae (Unattached)				
	Brown Algae				
	Green Algae				





**Example invertebrate form**

Site:                      Date:                      Dive:                      Heading:                      Surveyor:                      Buddy:

Time Start:                      Transect width:                      Depth@40m:                      Depth@10m:

Group	40 - 30 m	30 - 20 m	20 - 10 m	40-30m	Status
<b>JELLY:</b> Haliclystus				40-30m	
<b>Tunicate:</b> Styela					
<b>Sponge:</b> Solitary				Orange social tunicate	
<b>Barnacle:</b> Giant				Compound Tunicate	
<b>TUBE WORMS:</b>				Brittle Star	
Unknown soft				Mysids	
Myxicola   Bispira	:	:	:	Fan Hydroids	
E. van   E. poly	:	:	:	White ukn tubes	
Schizobranch   Chone	:	:	:	Bryozoans: Staghorn	
Spagetti   Dioptera	:	:	:	Encrusting Sponge	
Spiochaetop   Pista	:	:	:	30 - 20m	Status
Ukn orange   Ukn Hard	:	:	:		
<b>ANEMONE:</b>				Orange social tunicate	
Stubby   Sand-rose	:	:	:	Compound Tunicate	
White-spot   Fish Eating	:	:	:	Brittle Star	
Stomphia   Epiactis	:	:	:	Mysids	
Halicampa 10-T   12-T	:	:	:	Fan Hydroids	
<b>SNAILS:</b>				White ukn tubes	
Hairy Triton   Moon	:	:	:	Bryozoans: Staghorn	
Leafy Hornmouth   Top	:	:	:	Encrusting Sponge	
Amphissa   Lrg snail	:	:	:	20 - 10m	Status
<b>LIMPET:</b>					
Keyhole   Whitecap	:	:	:	Orange social tunicate	
<b>CHITON:</b> Gumboot				Compound Tunicate	
Lined   Mossy	:	:	:	Brittle Star	
<b>CLAMS:</b>				Mysids	
Geoduck   False Geod.	:	:	:	Fan Hydroids	
Horse   Butter	:	:	:	White ukn tubes	
Mya   H. kennerley	:	:	:	Bryozoans: Staghorn	
Cockle   Piddock	:	:	:	Encrusting Sponge	
<b>Scallop:</b> Pink   Rock				Status: Present = v Absent = - Abundant = A	
<b>NUDIBRANCH:</b>					
Frosted Dirona   Lemon	:	:	:		
Leopard   Clown	:	:	:	Notes:	
<b>CRAB -</b>					
Dungeness   Rd Rock	:	:	:		
C. graceful   C. oregon	:	:	:		
Helmet   Northern kelp	:	:	:		
P. gracilis   Ukn kelp	:	:	:		
Decorator   O. gracilis	:	:	:		
Ukn Hermit - sm   lrg	:	:	:		
P. armatus   kennerly	:	:	:		
Sponge   Wide claw	:	:	:		
<b>SHRIMP:</b>				Fish (Presence/Absence):	

US EPA ARCHIVE DOCUMENT

Pandalus   Crangon			
<b>STARS:</b>			
Pycno   Cushion			
Blood   Fat Blood			
Rainbow   Vermillion			
<b>CUCUMBERS: Giant</b>			
Red   White			
<b>URCHINS: Red</b>			
Green   Purple			

P = photo documented

**Example algae form**

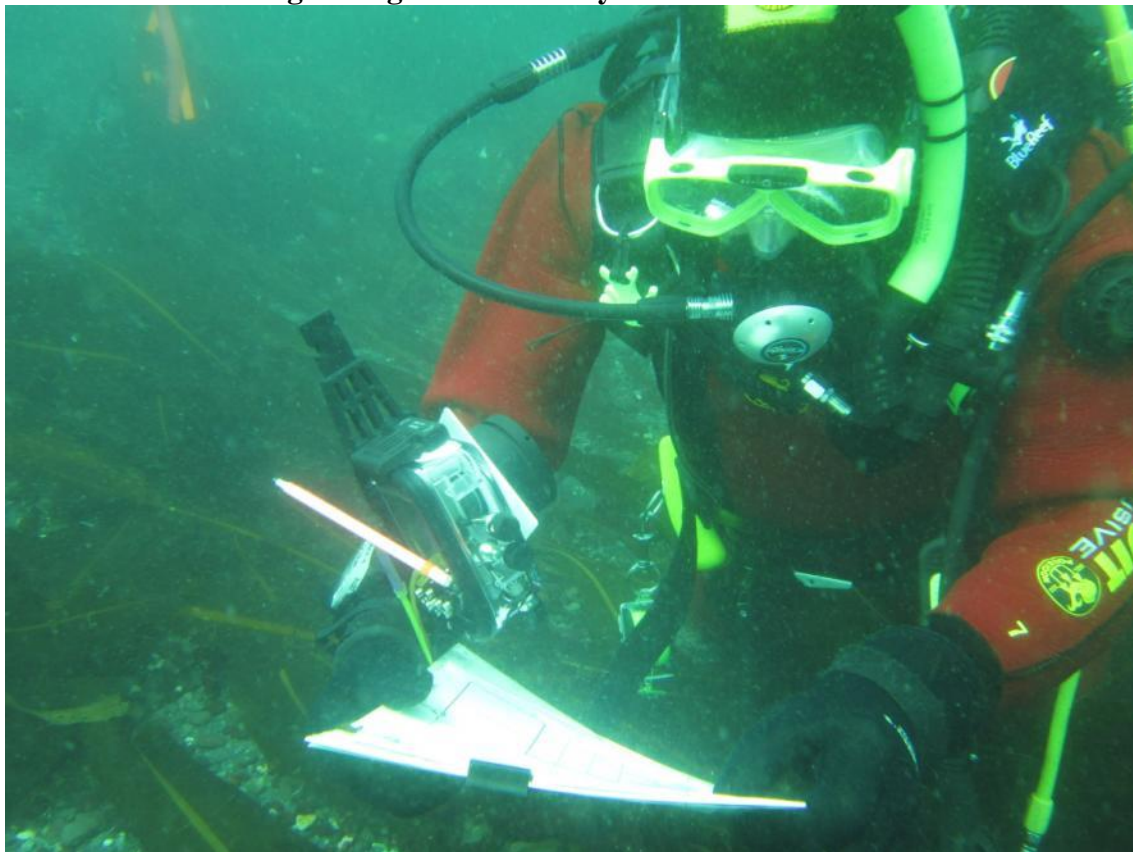
Date : Site:	Dive: Strt time:	Heading:	Surveyor: Buddy:	Dpth@40m:	Dpth@10m:	Algae tra
<b>Flatfish</b>		<b>Gunnel</b>		<b>Rockfish</b>		<b>Surfperchl</b>
C-O sole		Crescent		Black		Pile
Starry flounder		Longfin		Copper		Striped
Right eyed unk sp		Penpoint		Rockfish juv unk sp		Surfperchl
Left eyed unk sp		Saddleback		Rockfish unk sp		<b>Other</b>
Flatfish unk sp		Gunnel unk sp		<b>Sculpin</b>		Blackeye
<b>Greenling</b>		<b>Prickleback</b>		Buffalo		Pacific co
Kelp		Mosshead warbonnet		Longfin		Pacific sa
Whitespotted		Prickleback unk sp		Manacled		Spotted ra
Lingcod juv		<i>Write-in</i>		Red Irish Lord		<i>Write-in</i>
Lingcod adult		<i>Write-in</i>		Scalyhead		<i>Write-in</i>
Greenling unk sp		<i>Write-in</i>		Silverspotted		<i>Write-in</i>
<b>Algae taxa (tally if &gt;24 cm TL)</b>						
		<b>40-30 m</b>		<b>30-20 m</b>		
<b>Agarum fimbriatum</b>						
<b>Alaria marginata</b>						
<b>Costaria costata</b>						
<b>Cymathere triplicate</b>						
<b>Desmarestia aculeate</b>						
<b>Desmarestia spp. (flat blade)</b>						
<b>Laminaria setchelli</b>						
<b>Nereocystis luetkeana (bull k.)</b>						
<b>Pleurophycus gardneri</b>						
<b>Pterygophora californica</b>						
<b>Saccharina spp. (latis/subsim)</b>						
<b>Sargassum muticum</b>						
<b>Red - Branch (enter 1 if presnt)</b>		<b>40-35m</b>	<b>35-30m</b>	<b>30-25m</b>	<b>25-20m</b>	<b>20-15m</b>
<b>Red - Leaf (enter 1 if presnt)</b>		<b>40-35m</b>	<b>35-30m</b>	<b>30-25m</b>	<b>25-20m</b>	<b>20-15m</b>
<b>Red - Bushy (enter 1 if presnt)</b>		<b>40-35m</b>	<b>35-30m</b>	<b>30-25m</b>	<b>25-20m</b>	<b>20-15m</b>
<b>Red - Lacy (enter 1 if presnt)</b>		<b>40-35m</b>	<b>35-30m</b>	<b>30-25m</b>	<b>25-20m</b>	<b>20-15m</b>
<b>Green - Tissue (enter 1 if presnt)</b>		<b>40-35m</b>	<b>35-30m</b>	<b>30-25m</b>	<b>25-20m</b>	<b>20-15m</b>
<b>Eelgrass shoots</b>						
<i>Write-in</i>						
<i>Write-in</i>						
<i>Write-in</i>						



**Diver on the marker buoy awaiting vessel pickup**



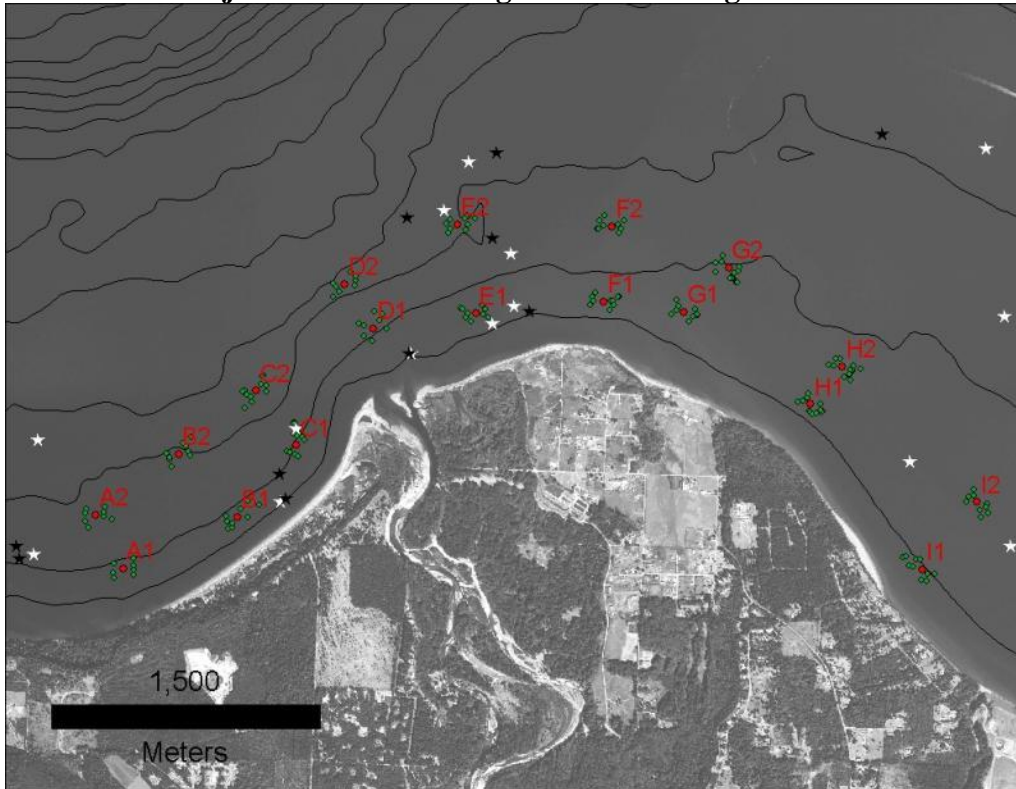
**EPA diver conducting the algal swath survey**



EPA Monitor docked at the Ediz Hook USCG Station



Dive locations—just west of Port Angeles surrounding the mouth of the Elwha River



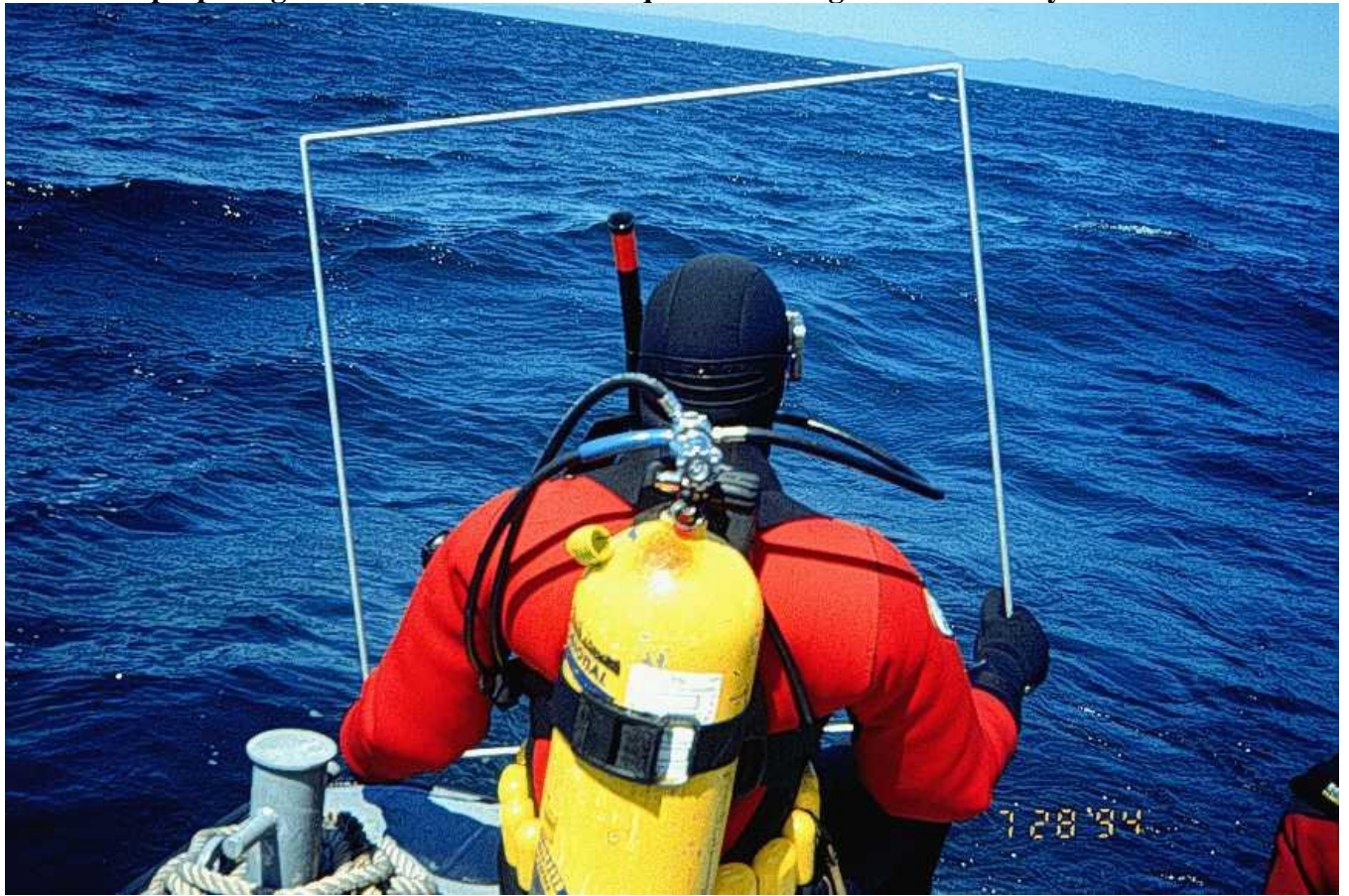


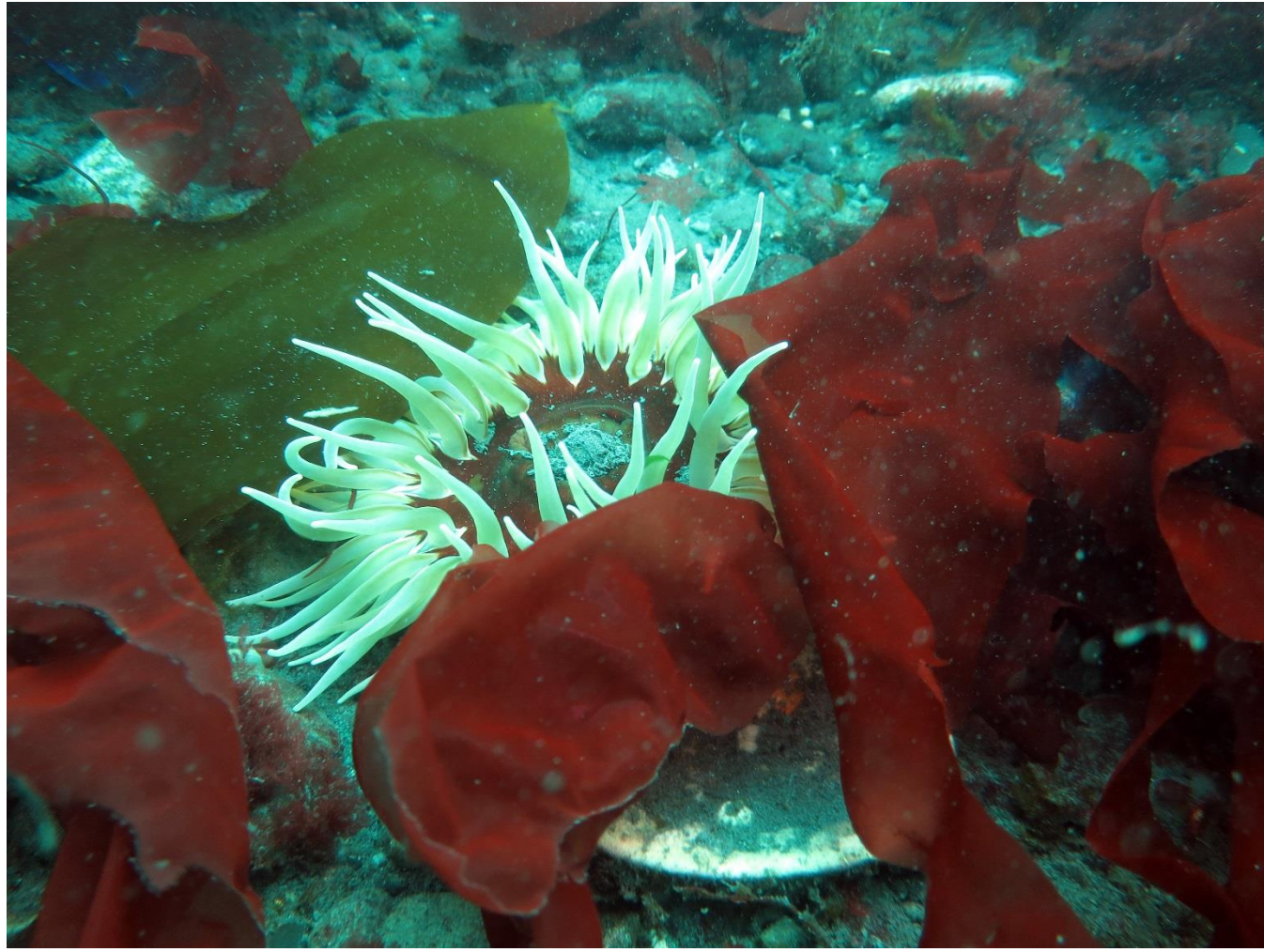
Algal Sample species





EPA diver preparing to enter the water with a quadrat during the 1994 survey









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