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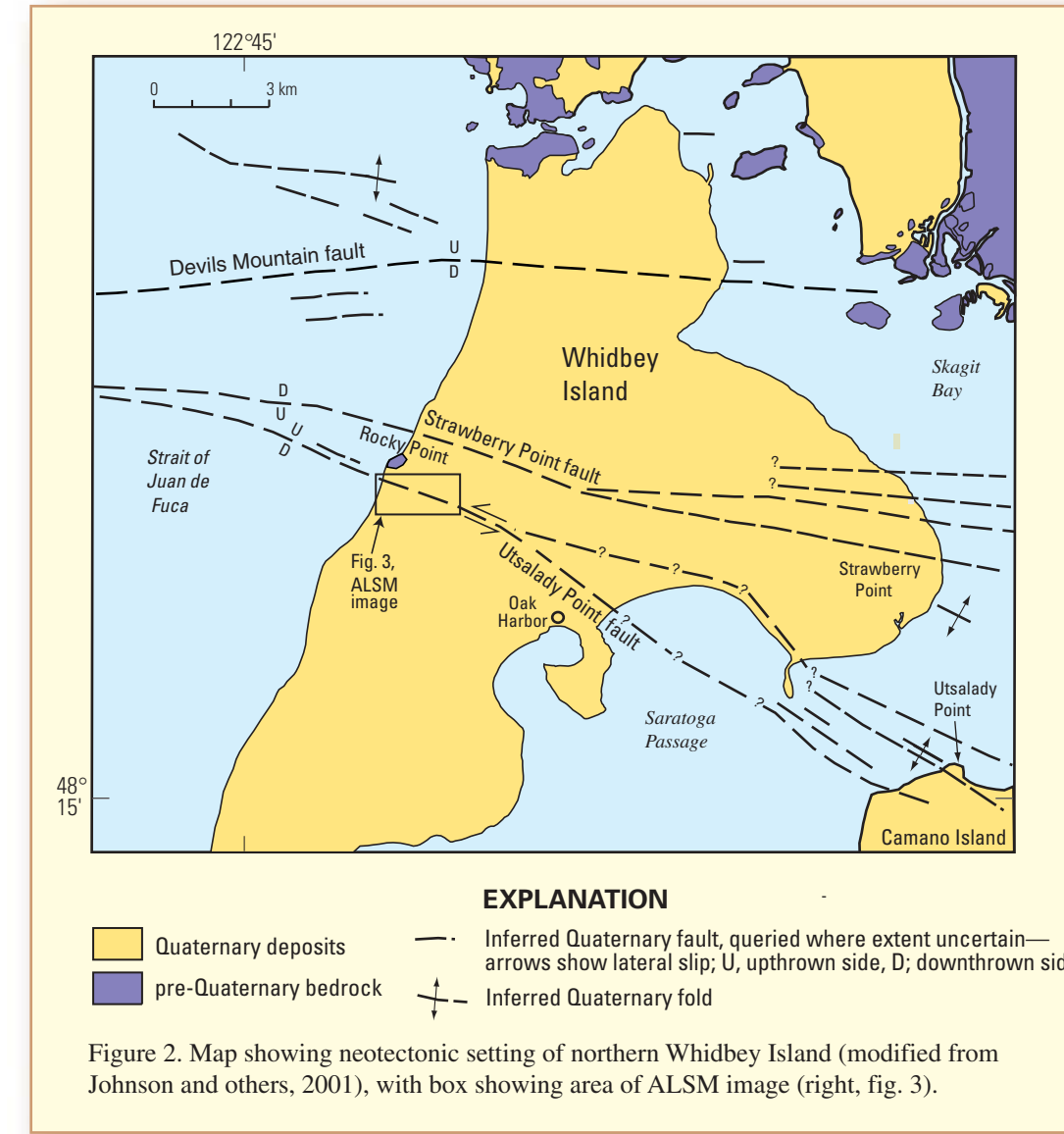


Figure 4. View to north-northeast of Teeka trench. Log of steep west trench wall (on left) is shown in Figure 7. Logs of terraced walls on east side of trench are shown in Figure 8.

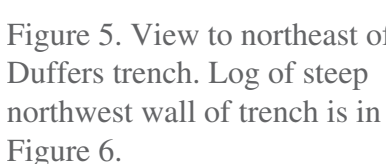


Figure 5. View to northeast of Duffers trench. Log of steep northwest wall of trench is in Figure 6.



The Usuality Point focal area is one of several focal areas that pose potential catastrophic hazards to the Pacific Northwest coast (Fig. 1). Previous studies of this area include Johnson and Johnson (1984, 1998, 1999, 2001; Broecker and others, 2001; Mosker and Johnson, 2001; Bلاكley and others, 2002). The Usuality Point focal area was first recognized by Johnson and others (2001) who considered it part of a broad zone of crustal deformation extending from the Puget Lowland in the north to the Olympic Peninsula, the Island and the Puget Lowland into the Cascade Range (Figs. 1, 2). Other structures in this zone include the Devils Mountain fault and the Strawberry Point fault.

In the winters of 2000–2001 and 2001–2002, Airborne Laser Swath Mapping (ALSM) was conducted in the Puget Lowland and the Strait of Juan de Fuca. The data were provided by NASA, the U.S. Geological Survey, Island County, and the Puget Sound Local Consortium. ALSM data proved to be extremely useful in identification of tectonic landforms in the Puget Lowland (for example, Harding and Bergforth, 2000). For the first time, the ALSM data revealed a previously unrecognized fault structure. The data from the ALSM data led to the discovery of an approximately 1.4-km-long scarp along the Usuality Point focal (Fig. 3) just west-northwest of Oak Harbor on northern Whidbey

Trenching investigations are the most direct way of interpreting the history of large earthquakes on faults (McCalpin, 1998), which are critical in the assessment of regional earthquake hazards (for example, Frankel and others, 2002). In the summer of 2002, the U.S. Geological Survey excavated two trenches, informally named "Duffers" and "Teeka," across the Utsalady Point fault scarp recognized on the ALSM data (figs. 4, 5). Stratigraphic and structural relations in these trenches were mapped (figs. 6-8) on digital photo mosaics using paleoseismologic methods similar to those described in McCalpin (1998) and Nelson and others (2002).

This report presents primary field and laboratory data for the Duffless and Teoka trenches. Trench logs show the distribution of stratigraphic units as well as faults, shears, folds, and other features of possible earthquake origin. Adjacent to each log is a summary explanation of stratigraphic units, briefly describing lithology, texture, stratification, structure, and inferred age and origin. Note that neither the colors nor the numbers used to label stratigraphic units indicate direct correlation between the two trenches. Units are generally numbered from oldest to youngest, however many units overlap in age. Notes outlining important stratigraphic or structural relations are included on the logs. Radiocarbon ages and their inferred relationship to stratigraphic units are plotted on the

This report does not attempt to construct an earthquake history for the Utsalody Point fault, nor does it attempt to show how surface faulting and folding events in each trench may correlate between trenches. Those objectives, and how they impact earthquake hazard assessments in the Puget Lowland, will be the subject of a future report.

ACKNOWLEDGMENTS

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Radiocarbon data for samples from the trenches crossing the Utsalady Point fault

Differed traces							
File No.	Unit No.	Station (m)	RadioCarbon Laboratory No.	Lab-reported age (1 σ C yr BP at 2 σ)	Cultural age (cal yr BP at 2 σ)	Sample weight (g)	1 σ (C) (%)
DF-03	7B8	2,490, 103	RN-170979	400-40	530-330	54.8	-21.8
DF-09	7B8	3,738, 119	RN-172252	300-30	510-310	48.2	-29
DF-08	7A	6,652, 230	RN-170978	310-30	490-300	40.9	-25.1
DF-10	6B	9,411, 375	RN-174108	3150-40	3470-3200	46.2	-25.0
DF-14	6B	9,435, 369	RN-170977	3110-40	3450-3210	125.9	-24.8
DF-15	6A18	8,282, 100	RN-170978	1280-40	1260-1000	Part of 200.00 gm charcoal rest	
DF-21	4B1C3	6,653, 347	RN-172254	1310-40	1310-1170	20.6	-24.0
DF-22	4B1C3	2,482, 382	RN-172253	410-40	470-290	23.4	-25.6
DF-13	4A	9,535, 408	RN-172253	1220-40	1270-1050	71.2	-21.9
DF-08	4A	7,957, 541	RN-172250	2730-40	2730-2450	66.2	-22.9
DF-08	4A	9,111, 351	RN-170981	2170-40	2235-2040	140.0	-22.2

Traces		Description of dated material ¹	
DF-03	7B8	5x83 mm fragment	
DF-09	7B8	80x4 mm fragment	
DF-08	7A	11x5.5 mm fragment	
DF-10	6B	11x4 mm fragment	
DF-14	6B	4x3.2 mm fragment	
DF-15	6A18	Part of 200.00 gm charcoal rest	
DF-21	4B1C3	20x40.10 mm fragment	
DF-22	4B1C3	Four 10x10.10 mm pieces	
DF-13	4A	60x65 mm fragment	
DF-08	4A	60x2 mm fragment	
DF-08	4A	17x17x2 mm fragment	

Field No.	Unit No.	Station (m) ¹	Radiocarbon Laboratory No. ²	Lab-reported age (¹⁴ C yr BP at 1σ) ³	Calibrated age (cal yr BP at 2σ) ⁴	Sample weight (mg) ⁵	δC (‰)	Description of dated material ⁶
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T-36	SAB	10-40, 3.00	Beta-170982	160±40	290-0	60.5	-23.9	Charcoal, part of 5x10x10 mm fragment
T-39	SAB	9.30, 2.85	Beta-172555	1550±40	1530-1340	76.3	-24.9	Charred flaked wood, possibly bark; part of 30x50x1 mm rod
T-45	SAB	9-68, 2.90	Beta-170984	1620±40	1610-1410	38.0	-25.4	Charcoal, part of 40x40x10 mm fragment
T-46	SAB	9-50, 2.90	Beta-170985	400±40	520-310	113.9	-22.9	Charcoal, part of 20x10x5 mm fragment

T-40	6	9.17, 2.96	Beta-170983	1540±40	1530-1330	89.4	-25.3	Detrital charcoal, flaky, part of 8x5x1 mm fragment
T-42	6	8.12, 2.99	Beta-172556	350±40	500-310	63.2	-25.2	Detrital charcoal, part of 15x10x5 mm fragment
T-44	6	7.85, 2.80	Beta-172557	2450±40	2720-2350	62.3	-25.6	Detrital charcoal, part of 20x10x5 mm fragment

³Quoted error for each AMS (accelerator mass spectrometer) analysis is the larger of counting error or target reproducibility error.

Ages in calibrated (approximate solar) years calculated using OxCal (version 3.4, Bronk Ramsey, 1998; probability method) and the INTCAL98 dataset of Stuiver and others (1998). Beta Analytic, Inc., states that no additional laboratory variance (error multiplier, for example, Taylor and others, 1996) need be added to ages for calibration. Calibrated ages show time intervals of >95% probability distribution at 2 σ . Ages shown on Figures 6 and 7 are midpoints of time intervals rounded to nearest 100 years. "s" indicates samples with adhering sediment when submitted; weight is a maximum for organic material in the sample.

Unless indicated otherwise, ages are on angular, unabraded fragments of charcoal with distinct wood cellular structure. In each sample, the largest, most angular, least decayed fragments of charcoal were selected to minimize the chance of analyzing carbon much older than the host sediment. Sediment adhering to fragments was removed with brushes or dental tools in distilled water. Charcoal was picked directly from sediment collected from the trench wall.

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