

2007 Whidbey Basin Marine Sediment Monitoring



Sediment Quality Triad Data Summary

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Results

Sediment Triad Quality Index categories identified for stations in the 2007 Whidbey Basin survey.

Sample	Location	SCI Category	STI Category	Interim SBI Category	SQTI Category
5	Saratoga Pass (North)	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
7	Saratoga Pass	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
15	Possession Sound	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
27	Holmes Harbor	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
39	Saratoga Pass	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
49	Saratoga Pass (North)	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
55	Possession Sound	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
59	Saratoga Passage	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
69	Skagit Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
71	Port Susan	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
81	Saratoga Passage	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
87	Everett Harbor (Outer)	Low exposure	Non-Toxic	Unaffected	Unimpacted
91	Saratoga Pass	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
107	Holmes Harbor	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
121	Skagit Bay	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
123	Port Susan	Minimum exposure	Low toxicity	Adversely affected	Inconclusive
133	Skagit Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
135	Port Susan	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
145	Saratoga Passage	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
151	Everett Harbor (Outer)	Low exposure	Non-Toxic	Unaffected	Unimpacted
155	Holmes Harbor	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
167	Port Susan	Low exposure	Non-Toxic	Unaffected	Unimpacted
183	Possession Sound	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
185	Skagit Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
187	Port Susan	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted

Sample	Location	SCI Category	STI Category	Interim SBI Category	SQTI Category
197	Crescent Harbor	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
199	Saratoga Pass	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
209	Saratoga Passage	Minimum exposure	Moderate toxicity	Adversely affected	Possibly impacted
215	Port Gardner	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
219	Saratoga Pass	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
231	Possession Sound	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
247	Possession Sound	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
263	Snohomish River Delta	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
303	Possession Sound	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
319	Port Susan	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
335	Possession Sound	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
351	Port Susan	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
359	Port Gardner	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
367	Middle Everett Harbor	Low exposure	High toxicity	Adversely affected	Likely impacted
371	Holmes Harbor	Minimum exposure	Non-Toxic	Unaffected	Unimpacted

Spatial extent of Sediment Triad Quality Index categories for the 2007 Whidbey Basin survey.

SCI Category	STI Category	Interim SBI Category	SQTI Category	Spatial Extent (% of Area)
Minimum exposure	Non-Toxic	Unaffected	Unimpacted	45.0%
Low exposure	Non-Toxic	Unaffected	Unimpacted	2.5%
Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted	46.9%
Minimum exposure	Moderate toxicity	Adversely affected	Possibly impacted	3.3%
Low exposure	High toxicity	Adversely affected	Likely impacted	0.1%
Minimum exposure	Low toxicity	Adversely affected	Inconclusive	2.3%



Spatial patterns of sediment condition in the 2007 Whidbey Basin monitoring region.

Incidence and spatial extent of sediment condition, as measured by the Sediment Quality Triad Index, in the 2007 Whidbey Basin monitoring region.

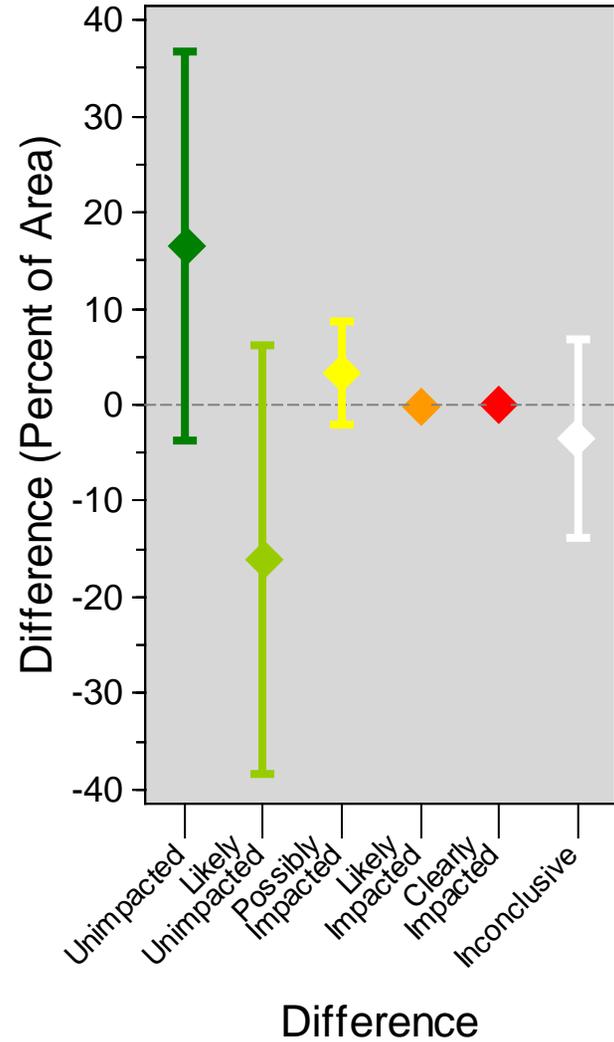
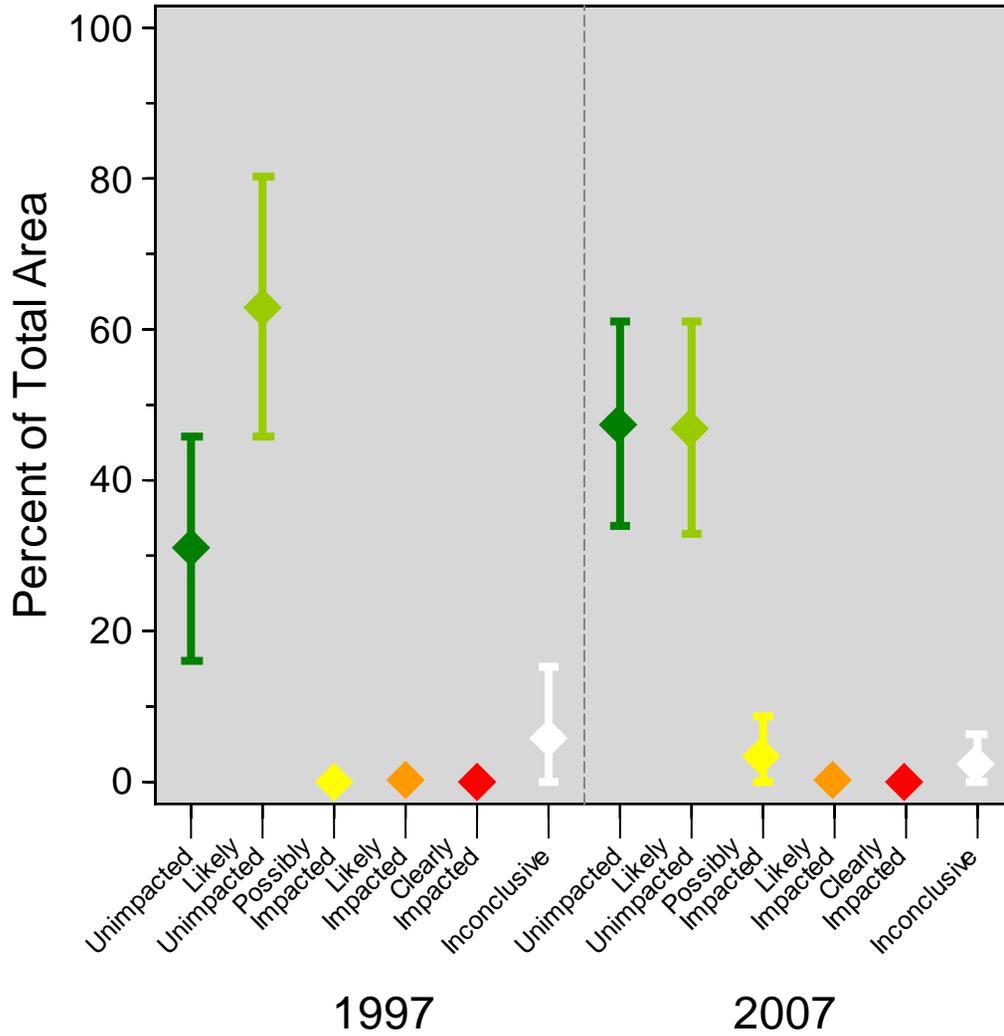
Sediment Triad Index Category	Stations		Area	
	No.	(%)	km ²	(%)
Whidbey Basin	40	(100.0)	353.3	(100.0)
Unimpacted	20	(50.0)	167.7	(47.5)
Likely unimpacted	17	(42.5)	165.7	(46.9)
Possibly impacted	1	(2.5)	11.5	(3.3)
Likely impacted	1	(2.5)	0.3	(0.1)
Clearly impacted	0	(0.0)	0.0	(0.0)
Inconclusive	1	(2.5)	8.2	(2.3)

Comparison of Sediment Quality Triad Index Categories by Year

Estimated spatial extent (percent of area) and 95% confidence intervals for each of the SQTI categories for the Whidbey Basin region in 2007, compared to 1997. The differences between the years are not statistically significant, as indicated by the difference confidence intervals containing the value zero.

Sediment Quality Triad Index Category	1997			2007			Difference (2007-1997)			* = significantly different (alpha=0.05)
	Estimate	Confidence Limit		Estimate	Confidence Limit		Estimate	Confidence Limit		
		Lower	Upper		Lower	Upper		Lower	Upper	
Unimpacted	31.00	16.12	45.88	47.46	33.85	61.07	16.46	-3.71	36.62	
Likely unimpacted	63.00	45.70	80.30	46.90	32.85	60.95	-16.10	-38.38	6.19	
Possibly impacted	0.00	n.a.	n.a.	3.26	0.00	8.63	3.26	-2.11	8.63	
Likely impacted	0.20	0.15	0.26	0.07	0.00	0.19	-0.13	-0.26	0.00	
Clearly impacted	0.02	0.00	0.05	0.00	n.a.	n.a.	-0.02	-0.05	0.01	
Inconclusive	5.78	0.00	15.26	2.31	0.00	6.27	-3.47	-13.74	6.81	

* Olsen et al. (in prep.), $\alpha = 0.05$



Comparisons with Other Regions

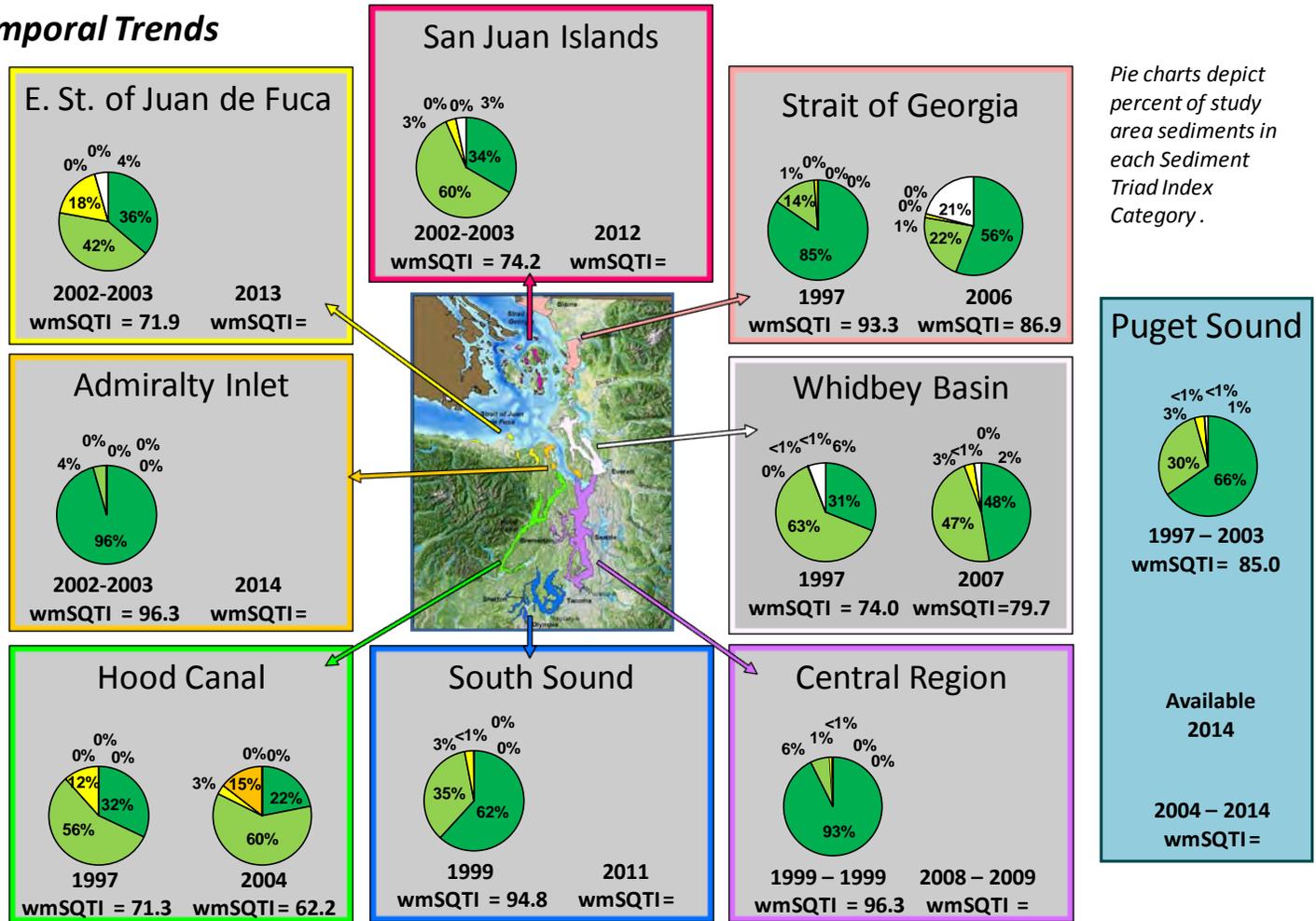
Incidence and spatial extent of sediment condition in eight sediment monitoring regions and all of Puget Sound as measured with the Sediment Quality Triad Index.

Sediment Triad Index Category	Regional Baseline				Second Baseline			
	Stations		Area		Stations		Area	
	No.	(%)	km ²	(%)	No.	(%)	km ²	(%)
Strait of Georgia	61	(100.0)	386.9	(100.0)	40	(100.0)	360.6	(100.0)
Unimpacted	51	(83.6)	327.5	(84.6)	21	(52.5)	201.6	(55.9)
Likely unimpacted	7	(11.5)	54.6	(14.1)	8	(20.0)	78.8	(21.9)
Possibly impacted	3	(4.9)	4.81	(1.2)	3	(7.5)	4.6	(1.3)
Likely impacted	0	(0.0)	0.0	(0.0)	0	(0.0)	0.0	(0.0)
Clearly impacted	0	(0.0)	0.0	(0.0)	0	(0.0)	0.0	(0.0)
Inconclusive	0	(0.0)	0.0	(0.0)	8	(20.0)	75.6	(21.0)
Whidbey Basin	39	(100.0)	338.1	(100.0)	40	(100.0)	353.3	(100.0)
Unimpacted	10	(25.6)	104.8	(31.0)	20	(50.0)	167.7	(47.5)
Likely unimpacted	19	(48.7)	213.0	(63.0)	17	(42.5)	165.7	(46.9)
Possibly impacted	0	(0.0)	0.0	(0.0)	1	(2.5)	11.5	(3.3)
Likely impacted	8	(20.5)	0.7	(0.2)	1	(2.5)	0.3	(0.1)
Clearly impacted	1	(2.6)	0.06	(0.0)	0	(0.0)	0.0	(0.0)
Inconclusive	1	(2.6)	19.6	(5.8)	1	(2.5)	8.2	(2.3)
Central Sound	128	(100.0)	683.9	(100.0)	80	(100.0)	667.4	(100.0)
Unimpacted	76	(59.4)	633.3	(92.6)	53	(66.3)	480.6	(72.0)
Likely unimpacted	34	(26.6)	43.4	(6.4)	11	(13.8)	102.5	(15.4)
Possibly impacted	11	(8.6)	5.1	(0.7)	7	(8.8)	26.8	(4.0)
Likely impacted	6	(4.7)	1.9	(0.3)	6	(7.5)	11.3	(1.7)
Clearly impacted	1	(0.8)	0.1	(0.02)	0	(0.0)	0.0	(0.0)
Inconclusive	0	(0.0)	0.0	(0.0)	3	(3.8)	46.7	(7.0)
South Sound	42	(100.0)	341.6	(100.0)	Results in Preparation			
Unimpacted	24	(57.1)	211.2	(61.8)				
Likely unimpacted	14	(33.3)	120.2	(35.2)				
Possibly impacted	2	(4.8)	9.8	(2.9)				
Likely impacted	2	(4.8)	0.5	(0.2)				
Clearly impacted	0	(0.0)	0.0	(0.0)				
Inconclusive	0	(0.0)	0.0	(0.0)				
Hood Canal	21	(100.0)	331.7	(100.0)	30	(100.0)	294.8	(100.0)
Unimpacted	7	(33.3)	106.2	(32.0)	7	(23.3)	64.6	(21.9)
Likely unimpacted	11	(52.4)	186.8	(56.3)	18	(60.0)	178.1	(60.4)
Possibly impacted	3	(14.3)	38.8	(11.7)	1	(3.3)	9.2	(3.1)
Likely impacted	0	(0.0)	0.0	(0.0)	4	(13.3)	42.9	(14.5)
Clearly impacted	0	(0.0)	0.0	(0.0)	0	(0.0)	0.0	(0.0)
Inconclusive	0	(0.0)	0.0	(0.0)	0	(0.0)	0.0	(0.0)
San Juan Archipelago	30	(100.0)	80.7	(100.0)	Sampling in June 2012			

Sediment Triad Index Category	Regional Baseline		Second Baseline	
	Stations		Area	
	No.	(%)	km ²	(%)
Unimpacted	10	(33.3)	26.91	(33.3)
Likely unimpacted	18	(60.0)	48.44	(60.0)
Possibly impacted	1	(3.3)	2.69	(3.3)
Likely impacted	0	(0.0)	0.0	(0.0)
Clearly impacted	0	(0.0)	0.0	(0.0)
Inconclusive	1	(3.3)	2.7	(3.3)
E. Strait of Juan de Fuca	30	(100.0)	61.8	(100.0)
Unimpacted	15	(50.0)	22.4	(36.2)
Likely unimpacted	10	(33.3)	25.76	(41.7)
Possibly impacted	4	(13.3)	10.95	(17.7)
Likely impacted	0	(0.0)	0.0	(0.0)
Clearly impacted	0	(0.0)	0.0	(0.0)
Inconclusive	1	(3.3)	2.7	(4.4)
Admiralty Inlet	30	(100.0)	69.2	(100.0)
Unimpacted	28	(93.3)	66.1	(95.6)
Likely unimpacted	2	(6.7)	3.1	(4.4)
Possibly impacted	0	(0.0)	0.0	(0.0)
Likely impacted	0	(0.0)	0.0	(0.0)
Clearly impacted	0	(0.0)	0.0	(0.0)
Inconclusive	0	(0.0)	0.0	(0.0)
Total Study Area	381	(100.0)	2294.1	(100.0)
Unimpacted	221	(58.0)	1498.3	(65.3)
Likely unimpacted	115	(30.2)	695.3	(30.3)
Possibly impacted	24	(6.3)	72.15	(3.1)
Likely impacted	16	(4.2)	3.15	(0.1)
Clearly impacted	2	(0.5)	0.2	(0.0)
Inconclusive	3	(0.8)	24.98	(1.1)

Puget Sound Sediment Triad Index (SQTI)

Spatial and Temporal Trends



Pie charts depict percent of study area sediments in each Sediment Triad Index Category.

Spatial patterns of sediment condition in eight sediment monitoring regions and all of Puget Sound.