

2006 Strait of Georgia Marine Sediment Monitoring



Sediment Quality Triad Data Summary

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Results

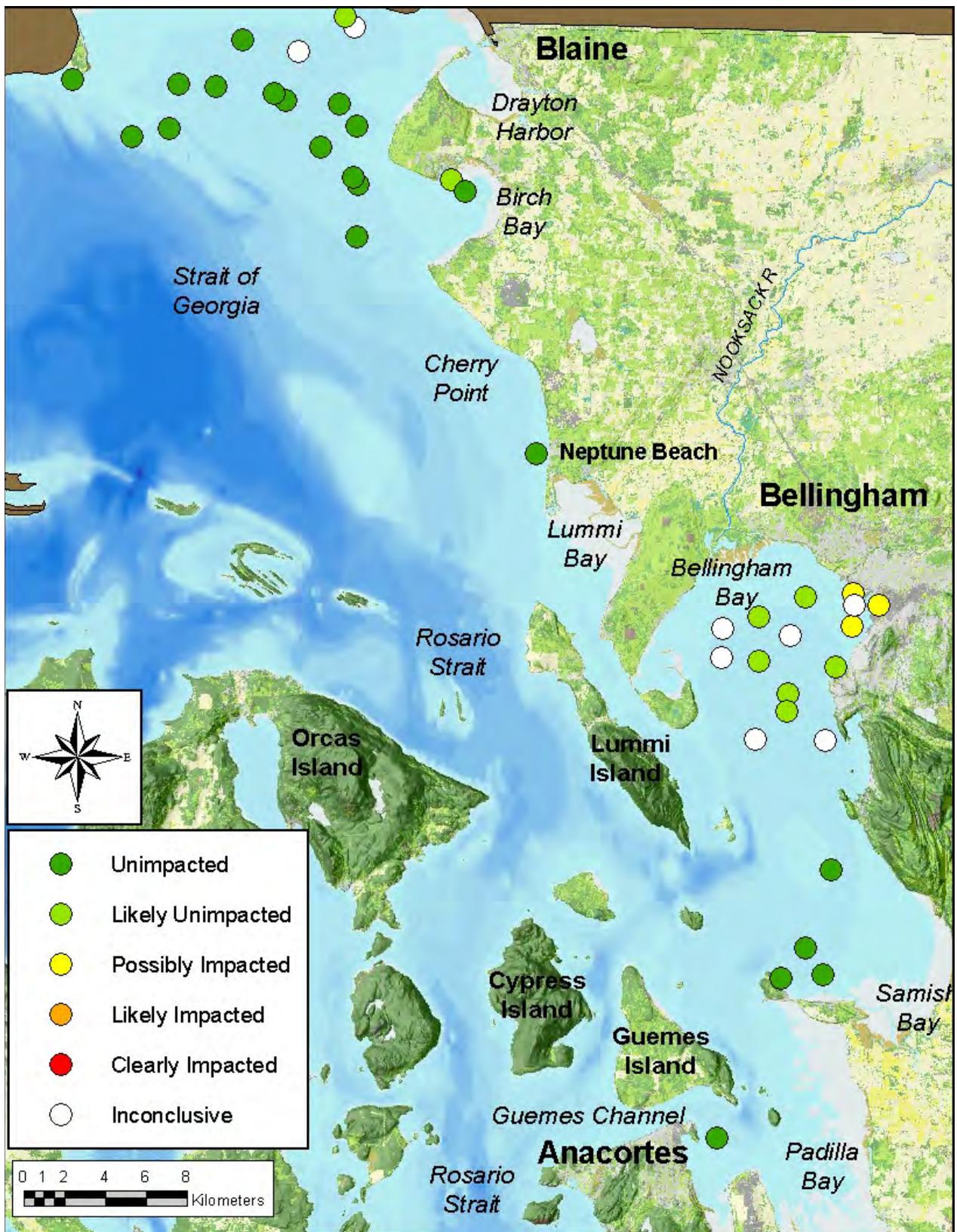
Sediment Triad Quality Index categories identified for stations in the 2006 Strait of Georgia monitoring region.

Sample	Location	SCI Category	Toxicity Category	Benthos Hit	SQTI Category
3	Birch Bay	Minimal exposure	Non-Toxic	Adversely affected	Likely unimpacted
13	Samish Bay/Bellingham Bay	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
19	Cherry Point	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
21	Bellingham Bay	Minimal exposure	Non-Toxic	Adversely affected	Likely unimpacted
29	Boundary Bay	Minimal exposure	Low	Unaffected	Unimpacted
35	Bellingham Bay	Minimal exposure	Non-Toxic	Adversely affected	Likely unimpacted
37	Samish Bay/Bellingham Bay	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
45	Samish Bay/Bellingham Bay	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
53	Bellingham Bay	Low exposure	Non-Toxic	Adversely affected	Likely unimpacted
61	Boundary Bay	Minimal exposure	Low	Unaffected	Unimpacted
67	Semiahmoo Bay	Minimal exposure	Low	Adversely affected	Inconclusive
85	Bellingham Bay	Minimal exposure	Non-Toxic	Adversely affected	Likely unimpacted
93	Semiahmoo Bay	Minimal exposure	Low	Adversely affected	Inconclusive
101	Bellingham Bay	Minimal exposure	Low	Adversely affected	Inconclusive
109	Semiahmoo Bay	Minimal exposure	Non-Toxic	Adversely affected	Likely unimpacted
117	Samish Bay/Bellingham Bay	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
125	Birch Bay	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
149	Bellingham Bay	Minimal exposure	Non-Toxic	Adversely affected	Likely unimpacted
163	Bellingham Bay	Low exposure	Low	Adversely affected	Possibly impacted
165	Bellingham Bay	Minimal exposure	Low	Adversely affected	Inconclusive
189	Boundary Bay	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
195	Bellingham Bay	Low exposure	Low	Adversely affected	Possibly impacted
213	Bellingham Bay (central)	Minimal exposure	Non-Toxic	Adversely affected	Likely unimpacted
227	Bellingham Bay (central)	Minimal exposure	Low	Adversely affected	Inconclusive

Sample	Location	SCI Category	Toxicity Category	Benthos Hit	SQTI Category
237	Boundary Bay	Minimal exposure	Low	Unaffected	Unimpacted
259	Boundary Bay	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
277	Bellingham Bay (central)	Minimal exposure	Low	Adversely affected	Inconclusive
299	Bellingham Bay	Minimal exposure	Low	Adversely affected	Inconclusive
309	Boundary Bay	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
325	Fidalgo Bay (outer)	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
379	Bellingham Bay	Low exposure	Low	Adversely affected	Possibly impacted
405	Boundary Bay	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
437	Boundary Bay	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
501	Boundary Bay	Minimal exposure	Low	Unaffected	Unimpacted
507	Bellingham Bay	Minimal exposure	Low	Adversely affected	Inconclusive
539	Boundary Bay	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
565	Boundary Bay	Minimal exposure	Low	Unaffected	Unimpacted
597	Boundary Bay	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
645	Boundary Bay	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
667	Boundary Bay	Minimal exposure	Non-Toxic	Unaffected	Unimpacted
3	Birch Bay	Minimal exposure	Non-Toxic	Adversely affected	Likely unimpacted

Spatial extent of Sediment Triad Quality Index categories for the 2006 Strait of Georgia region survey.

SCI Category	STI Category	Interim SBI Category	SQTI Category	Spatial Extent (% of Area)
Minimum exposure	Non-Toxic	Unaffected	Unimpacted	43.9%
Minimum exposure	Low toxicity	Unaffected	Unimpacted	11.9%
Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted	20.8%
Low exposure	Non-Toxic	Adversely affected	Likely unimpacted	1.0%
Low exposure	Low toxicity	Adversely affected	Possibly impacted	1.3%
Minimum exposure	Low toxicity	Adversely affected	Inconclusive	21.0%



Spatial patterns of sediment condition in the 2006 Strait of Georgia monitoring region.

Incidence and spatial extent of sediment condition in the 2006 Strait of Georgia monitoring region.

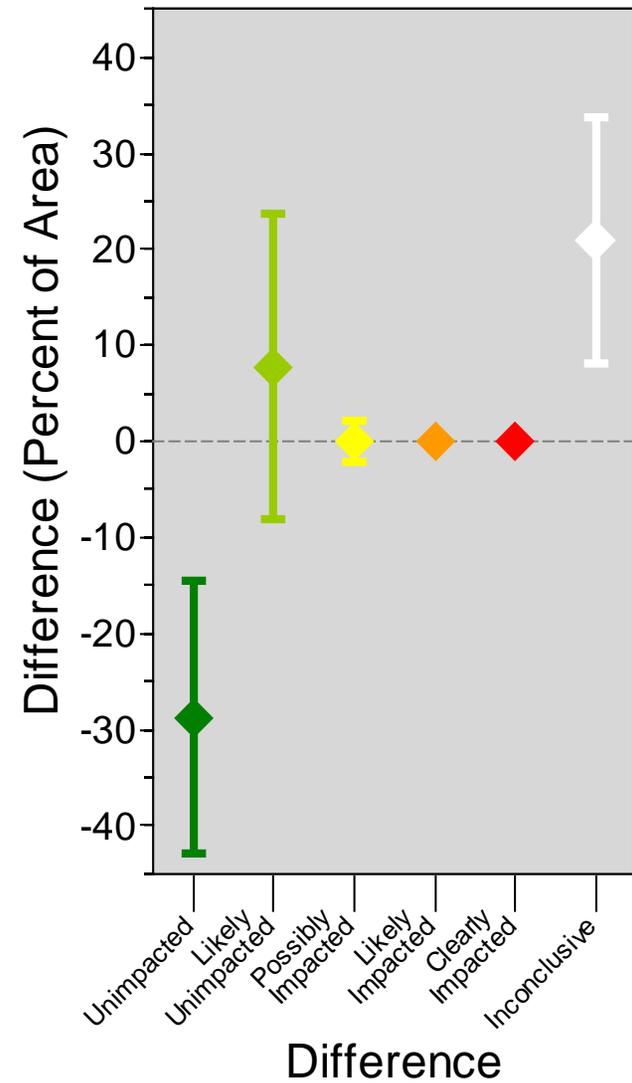
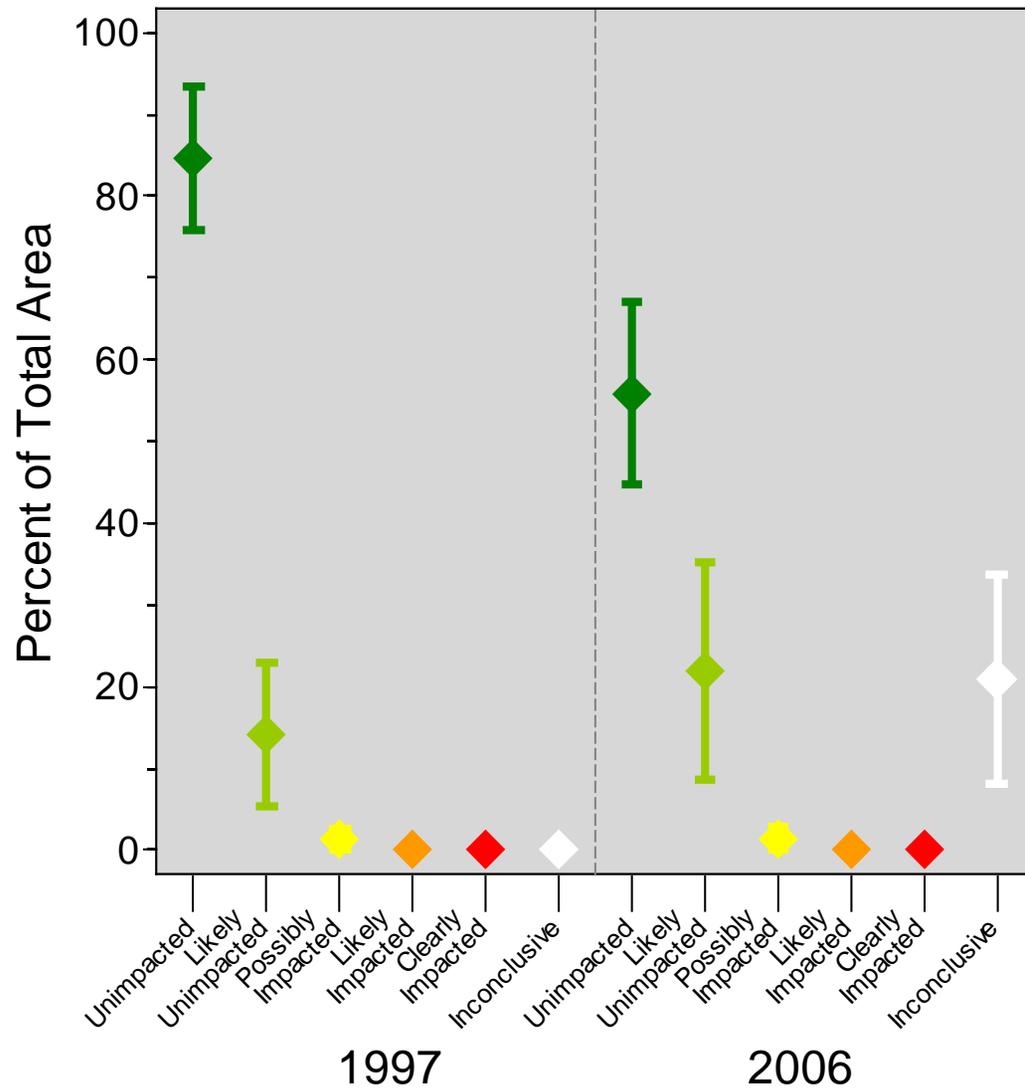
Sediment Triad Index Category	Stations		Area	
	No.	(%)	km ²	(%)
Strait of Georgia	40	(100.0)	360.6	(100.0)
Unimpacted	21	(52.5)	201.6	(55.9)
Likely unimpacted	8	(20.0)	78.8	(21.9)
Possibly impacted	3	(7.5)	4.6	(1.3)
Likely impacted	0	(0.0)	0.0	(0.0)
Clearly impacted	0	(0.0)	0.0	(0.0)
Inconclusive	8	(20.0)	75.6	(21.0)

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 Strait of Georgia region in 2006, compared to 1997. The difference between the years for the unimpacted category is statistically significant, as indicated by the difference confidence interval *not* containing the value zero. The differences for the other categories are not statistically significant.

Sediment Quality Triad Index Category	1997			2006			Difference (2006-1997)			* = significantly different (alpha=0.05)
	Estimate	Confidence Limit		Estimate	Confidence Limit		Estimate	Confidence Limit		
		Lower	Upper		Lower	Upper		Lower	Upper	
Unimpacted	84.64	75.87	93.42	55.89	44.69	67.09	-28.75	-42.98	-14.53	*
Likely unimpacted	14.11	5.42	22.81	21.86	8.51	35.21	7.74	-8.19	23.68	
Possibly impacted	1.24	0.00	2.59	1.28	0.00	2.92	0.04	-2.08	2.16	
Likely impacted	0.00	n.a.	n.a.	0.00	n.a.	n.a.	0.00	n.a.	n.a.	
Clearly impacted	0.00	n.a.	n.a.	0.00	n.a.	n.a.	0.00	n.a.	n.a.	
Inconclusive	0.00	n.a.	n.a.	20.97	8.18	33.76	20.97	8.18	33.76	

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



Comparisons with Other Regions

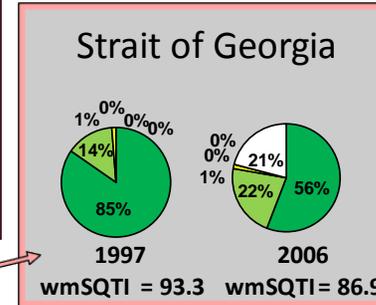
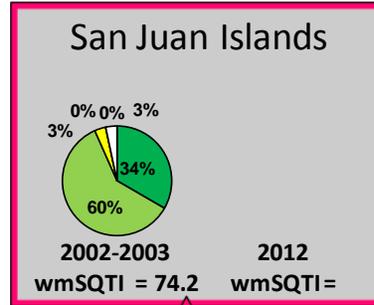
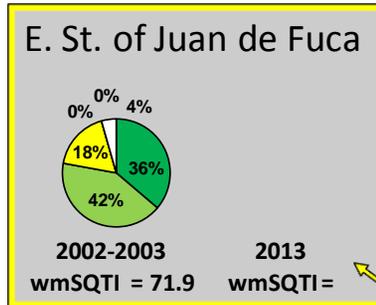
Incidence and spatial extent of sediment condition in eight sediment monitoring regions and all of Puget Sound.

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)

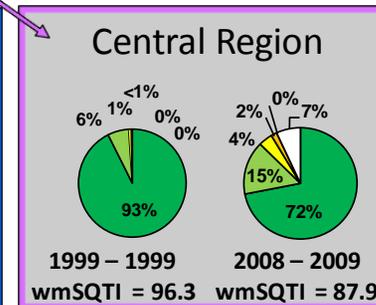
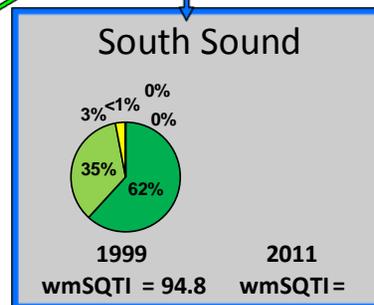
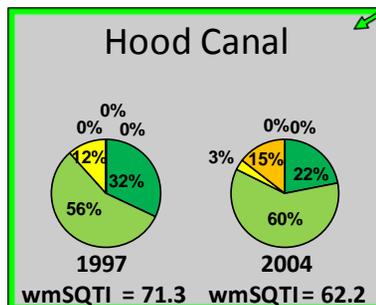
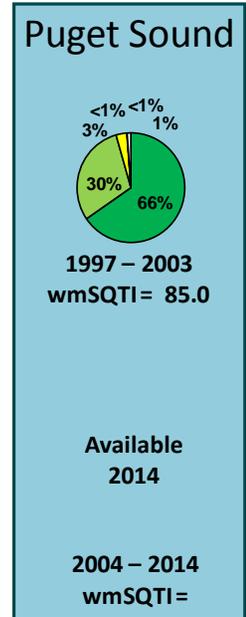
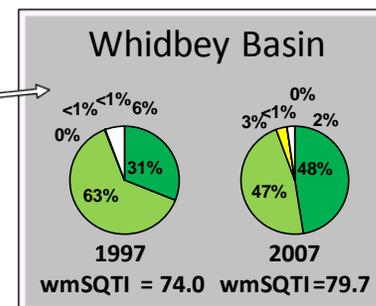
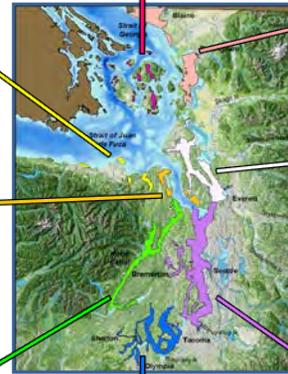
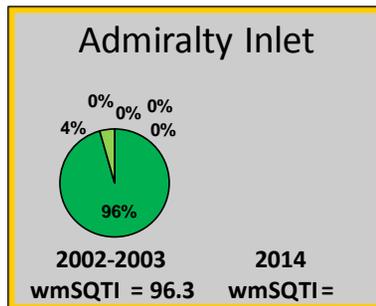
Sediment Triad Index Category	Regional Baseline				Second Baseline			
	Stations		Area		Stations		Area	
	No.	(%)	km ²	(%)	No.	(%)	km ²	(%)
Likely impacted	0	(0.0)	0.0	(0.0)	4	(13.3)	42.9	(14.5)
Clearly impacted	0	(0.0)	0.0	(0.0)	0	(0.0)	0.0	(0.0)
Inconclusive	0	(0.0)	0.0	(0.0)	0	(0.0)	0.0	(0.0)
San Juan Archipelago	30	(100.0)	80.7	(100.0)	Sampling in June 2012			
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)	Available after 2014			
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)	Available after 2014			
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.



Sediment Quality Triad Index Category	Sediment Quality Triad Index Score
Unimpacted	>83-100
Likely unimpacted	>57-83
Possibly impacted	>35-57
Likely impacted	>5-35
Clearly impacted	0-5
Inconclusive	

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