

2012 San Juan Islands Marine Sediment Monitoring



Sediment Quality Triad Data Summary

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Results

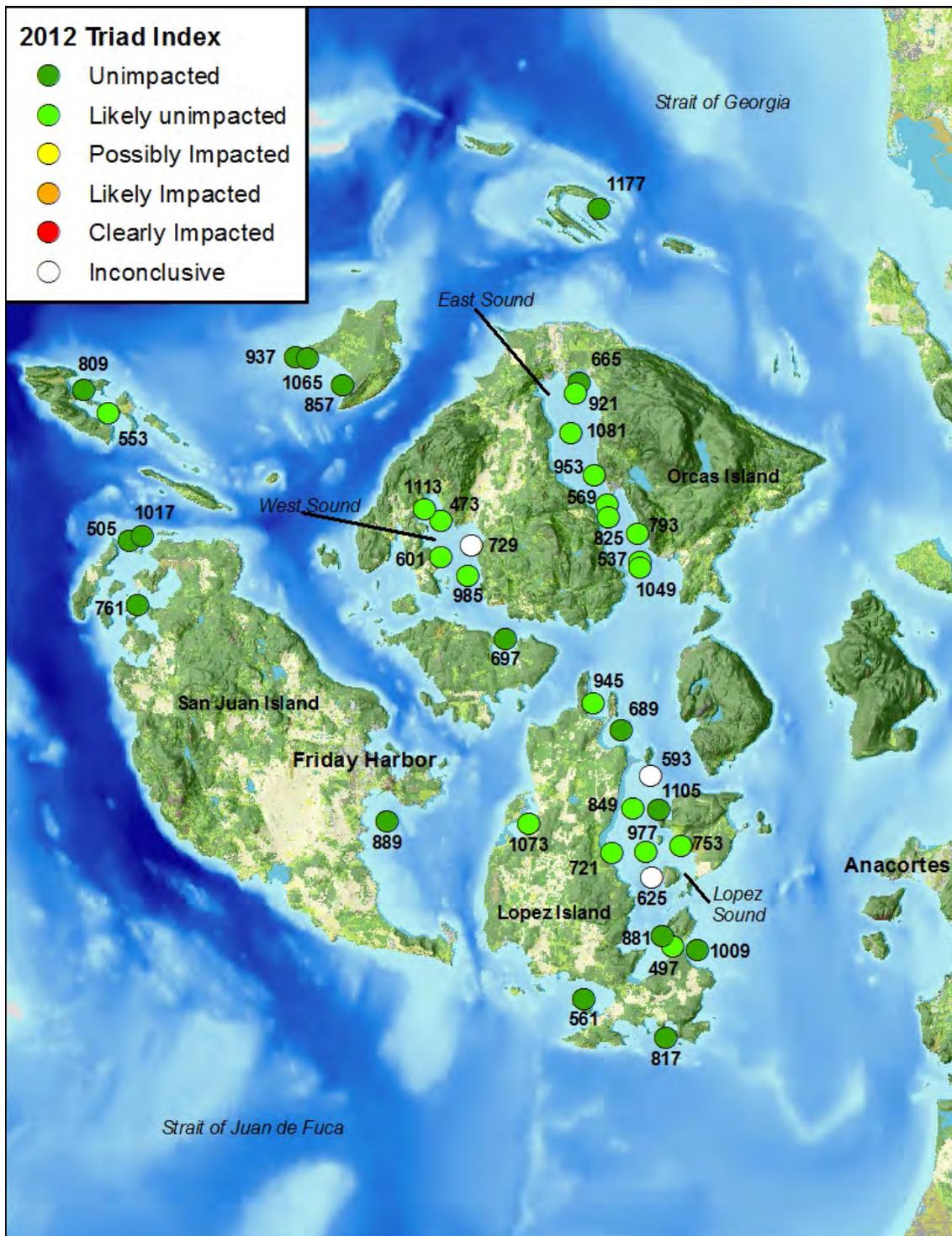
Sediment Triad Quality Index categories identified for stations in the 2012 San Juan Islands monitoring region.

Sample	Location	SCI Category	Toxicity Category	Benthos Hit	SQTI Category
473	West Sound and Massacre Bay	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
497	Lopez Sound, Hunter and Mud Bay	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
505	Roche Harbor	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
537	East Sound	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
553	Reid Harbor	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
561	Mackaye Harbor and Outer Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
569	East Sound	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
593	Lopez Sound, Hunter and Mud Bay	Minimum exposure	Low	Adversely affected	Inconclusive
601	West Sound and Massacre Bay	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
625	Lopez Sound, Hunter and Mud Bay	Minimum exposure	Low	Adversely affected	Inconclusive
665	East Sound	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
689	Swifts Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
697	Blind Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
721	Lopez Sound, Hunter and Mud Bay	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
729	West Sound and Massacre Bay	Minimum exposure	Low	Adversely affected	Inconclusive
753	Lopez Sound, Hunter and Mud Bay	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
761	Westcott Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
793	East Sound	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
809	Prevost Harbor	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
817	Aleck, Hughes and McArdle Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
825	East Sound	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted

Sample	Location	SCI Category	Toxicity Category	Benthos Hit	SQTI Category
849	Lopez Sound, Hunter and Mud Bay	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
857	West of Wadron Island, North and Cowlitz Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
881	Lopez Sound, Hunter and Mud Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
889	Griffin and North Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
921	East Sound	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
937	West of Waldron Island, North and Cowlitz Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
945	Shoal Bay	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
953	East Sound	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
977	Lopez Sound, Hunter and Mud Bay	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
985	West Sound and Massacre Bay	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
1009	Shoal Bight	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
1017	Roche Harbor	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
1049	East Sound	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
1065	West of Waldron Island, North and Cowlitz Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
1073	Fisherman Bay	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
1081	East Sound	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
1105	Lopez Sound, Hunter and Mud Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted
1113	West Sound and Massacre Bay	Minimum exposure	Non-Toxic	Adversely affected	Likely unimpacted
1177	Echo and Fossil Bay	Minimum exposure	Non-Toxic	Unaffected	Unimpacted

Spatial extent of Sediment Triad Quality Index categories for the 2012 San Juan Islands monitoring region.

Chemistry Index	Toxicity Index	Benthic Index	Triad Index	% of Area
Minimum exposure	Non-Toxic	Unaffected	Unimpacted	42.5%
		Adversely affected	Likely unimpacted	50.0%
	Low		Inconclusive	7.5%



Spatial patterns of sediment condition in the 2012 San Juan Islands monitoring region. *The numbers on the map are the station identifications.*

Incidence and spatial extent of sediment condition in the 2012 San Juan Islands monitoring region.

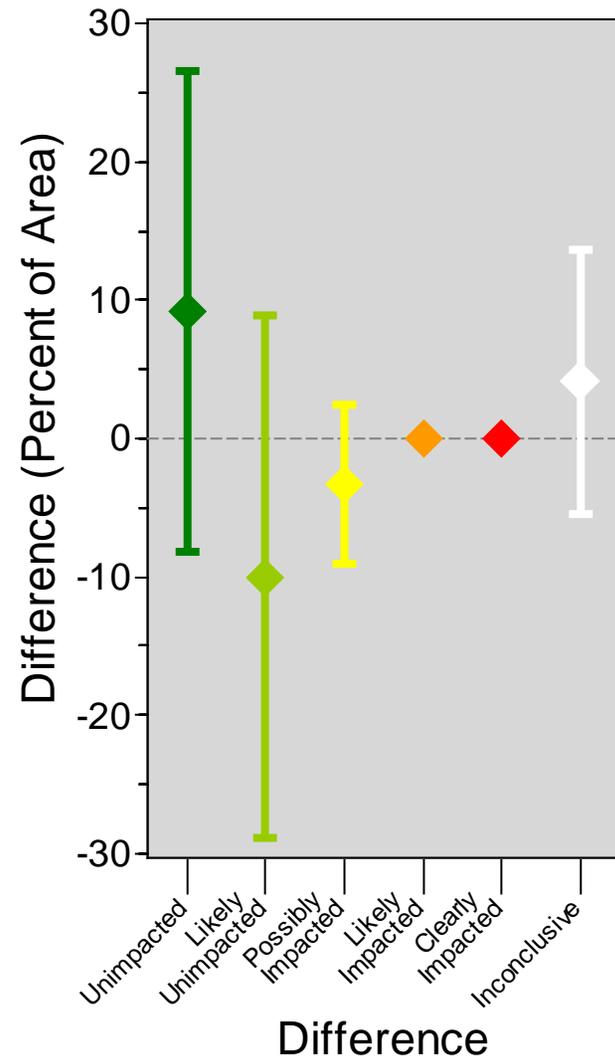
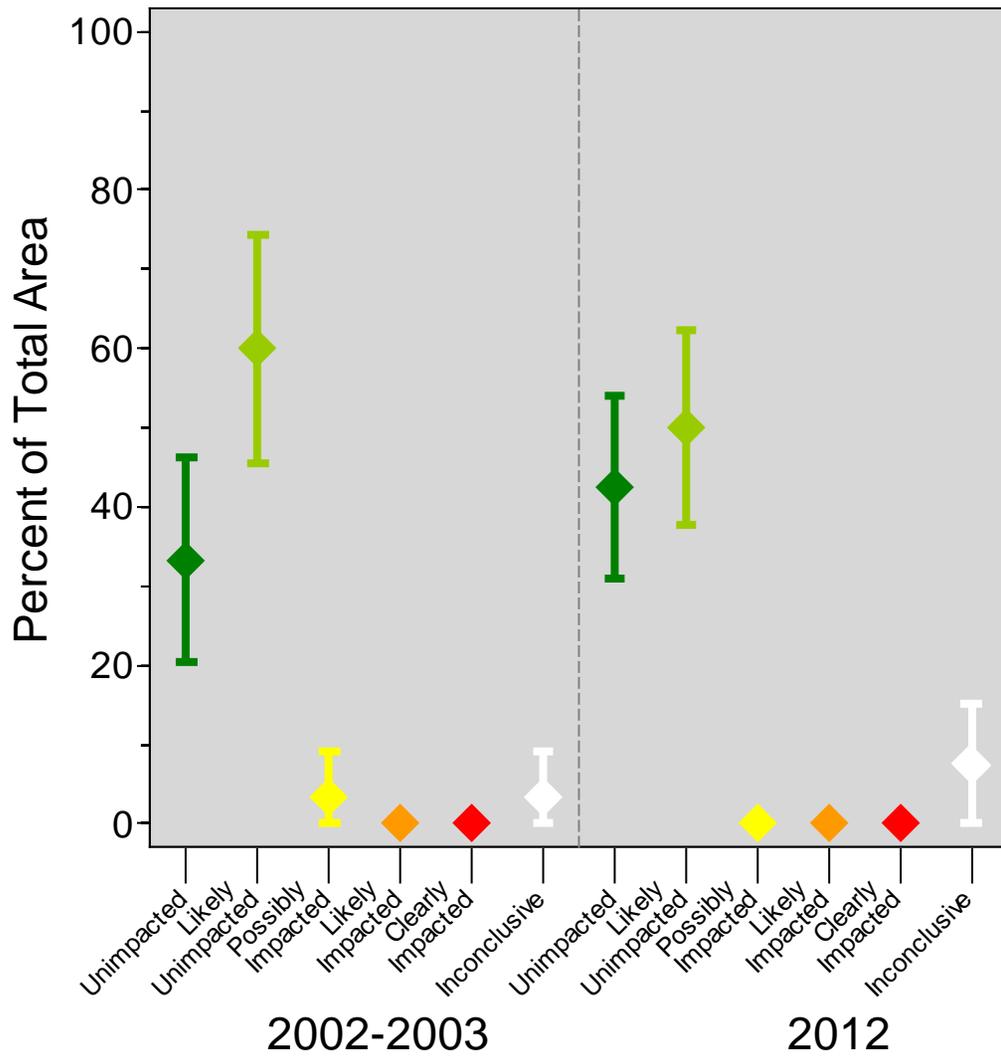
Sediment Triad Index Category	Stations		Area	
	No.	(%)	km ²	(%)
San Juan Islands	40	(100.0)	79.5	(100.0)
Unimpacted	17	(42.5)	33.8	(42.5)
Likely unimpacted	20	(50.0)	39.7	(50.0)
Possibly impacted	0	(0.0)	0.0	(0.0)
Likely impacted	0	(0.0)	0.0	(0.0)
Clearly impacted	0	(0.0)	0.0	(0.0)
Inconclusive	3	(7.5)	6.0	(7.5)

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 San Juan Islands monitoring region in 2012, compared to 2002-2003. 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	2002-2003			2012			Difference (2012 – 2002/3)			* = significantly different (alpha=0.05)
	Estimate (% area)	Confidence Limit		Estimate (% area)	Confidence Limit		Estimate (% area)	Confidence Limit		
		Lower	Upper		Lower	Upper		Lower	Upper	
Unimpacted	33.33	20.34	46.32	42.5	30.99	54.01	9.17	-8.19	26.52	
Likely unimpacted	60.00	45.61	74.39	50	37.73	62.27	-10	-28.91	8.91	
Possibly impacted	3.33	0.00	9.08	0.00	0.49	12.04	-3.33	n.a.	n.a.	
Likely impacted	0.00	n.a.	n.a.	0.00	0.00	1.77	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	3.33	0.00	9.07	7.50	0.00	15.13	4.17	-5.38	13.72	

* 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	(%)
San Juan Islands	30	(100.0)	80.7	(100.0)	40	(100.0)	79.5	(100.0)
Unimpacted	10	(33.3)	26.9	(33.3)	17	(42.5)	33.8	(42.5)
Likely unimpacted	18	(60.0)	48.4	(60.0)	20	(50.0)	39.7	(50.0)
Possibly impacted	1	(3.3)	2.7	(3.3)	0	(0.0)	0.0	(0.0)
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	1	(3.3)	2.7	(3.3)	3	(7.5)	6.0	(7.5)
Hood Canal	21	(100.0)	331.7	(100.0)	30	(100.0)	294.8	(100.0)
Unimpacted	7	(33.3)	106.1	(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)	2	(6.7)	18.5	(6.3)
Likely impacted	0	(0.0)	0.0	(0.0)	3	(10.0)	33.7	(11.4)
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)
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)	9	(22.5)	82.5	(22.9)
Possibly impacted	3	(4.9)	4.8	(1.2)	2	(5.0)	1.0	(0.3)
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	2	(5.1)	0.1	(0.0)	1	(2.5)	11.5	(3.3)
Likely impacted	6	(15.4)	0.6	(0.2)	1	(2.5)	0.3	(0.1)
Clearly impacted	1	(2.6)	0.1	(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)	16	(20.0)	126.9	(19.0)
Possibly impacted	11	(8.6)	5.1	(0.7)	4	(5.0)	7.5	(1.1)
Likely impacted	6	(4.7)	1.9	(0.3)	4	(5.0)	5.7	(0.9)
Clearly impacted	1	(0.8)	0.1	(0.0)	0	(0.0)	0.0	(0.0)

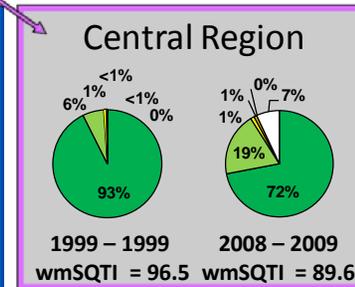
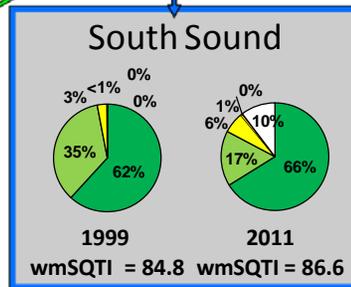
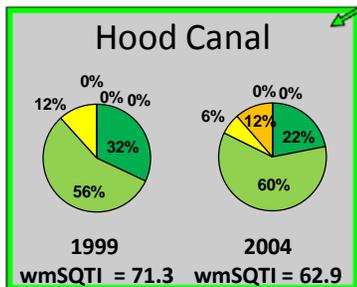
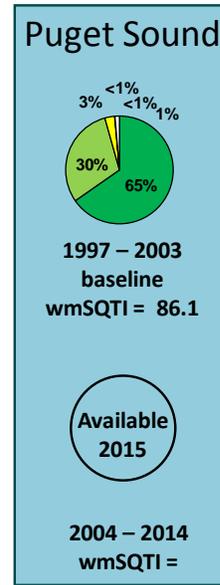
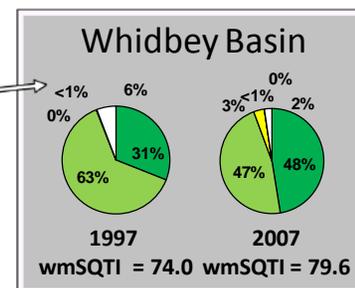
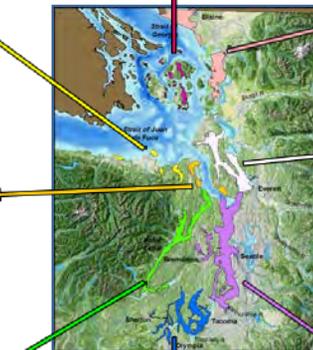
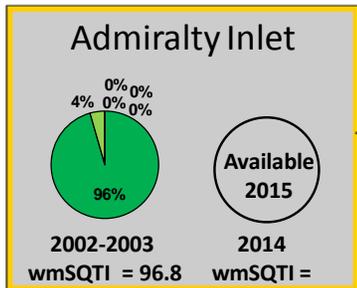
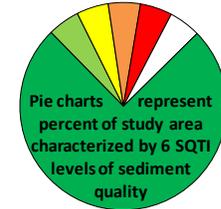
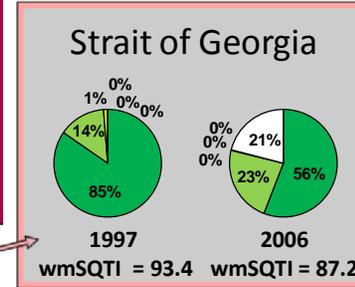
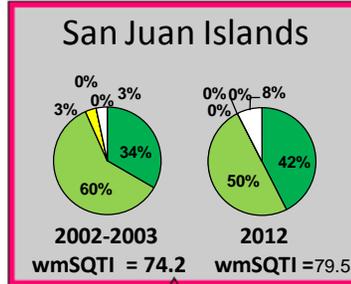
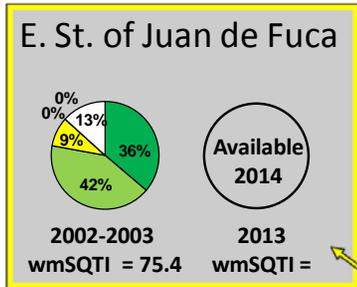
Sediment Triad Index Category	Regional Baseline		Second Baseline	
	Stations		Stations	
	No. (%)	Area km ² (%)	No. (%)	Area km ² (%)
Inconclusive	0 (0.0)	0.0 (0.0)	3 (3.8)	46.7 (7.0)
South Sound	42 (100.0)	341.6 (100.0)	55 (100.0)	317.7 (100.0)
Unimpacted	24 (57.1)	211.2 (61.8)	30 (54.5)	210.2 (66.2)
Likely unimpacted	14 (33.3)	120.2 (35.2)	12 (21.8)	52.7 (16.6)
Possibly impacted	2 (4.8)	9.8 (2.9)	7 (12.7)	19.9 (6.3)
Likely impacted	2 (4.8)	0.5 (0.2)	1 (1.8)	2.1 (0.7)
Clearly impacted	0 (0.0)	0.0 (0.0)	0 (0.0)	0.0 (0.0)
Inconclusive	0 (0.0)	0.0 (0.0)	5 (9.1)	32.8 (10.3)
E. Strait of Juan de Fuca	30 (100.0)	61.8 (100.0)	Results in preparation	
Unimpacted	15 (50.0)	22.4 (36.2)		
Likely unimpacted	10 (33.3)	25.8 (41.7)		
Possibly impacted	2 (6.7)	5.5 (8.8)		
Likely impacted	0 (0.0)	0.0 (0.0)		
Clearly impacted	0 (0.0)	0.0 (0.0)		
Inconclusive	3 (10.0)	8.2 (13.3)		
Admiralty Inlet	30 (100.0)	69.2 (100.0)	Available after 2014	
Unimpacted	28 (93.3)	66.1 (95.5)		
Likely unimpacted	2 (6.7)	3.1 (4.5)		
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)	66.7 (2.9)		
Likely impacted	14 (3.7)	3.0 (0.1)		
Clearly impacted	2 (0.5)	0.2 (0.0)		
Inconclusive	5 (1.3)	30.5 (1.3)		

Puget Sound Sediment Triad Index (SQTI)

Regional & Puget Sound-wide Trends

Regional sediment quality baseline comparison to Puget Sound-wide:

- So. Sound most similar
- Admiralty Inlet has the greatest area of *unimpacted* sediments
- Area of *unimpacted* sediment declined in St. of Georgia, Central, and Hood Canal
- Overall sediment quality increased in the Whidbey Basin and South Sound



Sediment Quality Triad Index Category	Sediment Quality Triad Index Score
Unimpacted	>81-100
Likely unimpacted	>57-81
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.