

Summary of *Z. marina* Monitoring Results in the San Juan Archipelago

2000 – 2006

Submerged Vegetation Monitoring Project (SVMP)

Nearshore Habitat Program
Washington State Department of Natural Resources

Table 1 – Inventory of DNR site-level data (1=sampled; 0=not sampled) and results of tests for change and trend in *Z. marina* area utilizing all available data. When only two years of data were available for a site, a two-tailed test of significant (non-zero) relative change was applied to the two years of data (“Change” test). When three or more years were available, a test for significant linear regression slope was applied to the data (“Trend” test). Results are mapped in Figure 1. The TYPE field indicates the sampling stratum for each site: cor=core; fl=flats; frw=wide fringe; fr=narrow fringe.

Site	TYPE	2000	2001	2002	2003	2004	2005	2006	Total No.Yrs	Latest <i>Z. marina</i> area estimate (ha) (95% CI)	Test	Two-Tailed Test Result based on DNR data only	notes
core002	cor	1	1	1	1	1	1	1	7	2.8 ± 0.5	Trend	Not sig. (p>0.05)	
flats51	fl	0	0	0	0	1	0	0	1	11.2 ± 1.7			
flats52	fl	0	0	0	0	1	0	0	1	14.9 ± 1.7			
flats53	fl	1	1	0	0	0	0	0	2	0	Change	Not sig. (p>0.05)	WDFW herring spawn survey showed <i>Z. marina</i> to be virtually absent by 2003; Confirmed by Friends of San Juans 2005 survey.
flats55	fl	0	0	0	0	1	0	0	1	3.5 ± 1.1			
flats56	fl	0	0	0	0	1	0	0	1	6.9 ± 2.0			
flats58	fl	0	0	0	0	1	0	0	1	7.4 ± 0.8			
flats60	fl	1	1	1	0	0	0	0	3	2.3 ± 0.5	Trend	Not sig. (p>0.05)	
flats61	fl	0	0	0	0	1	0	0	1	6.3 ± 0.8			
flats62	fl	1	1	1	1	1	0	0	5	9.4 ± 2.8	Trend	Not sig. (p>0.05)	
flats63	fl	0	0	0	0	1	0	0	1	5.5 ± 2.2			
flats64	fl	0	0	0	0	0	0	1	1	1.4 ± 2.3			
flats67	fl	0	0	0	0	1	1	1	3	4.7 ± 2.6	Trend	Not sig. (p>0.05)	
flats73	fl	0	0	0	0	0	0	0	0	163.9 ± 41.2			Estimate based on 2003 data provided by Friends of the San Juans.
sj0002	fr	0	0	0	0	1	0	0	1	5.4 ± 0.7			
sj0005	frw	0	1	1	1	0	0	0	3	0	No <i>Z. marina</i>		
sj0081	fr	1	1	1	1	1	1	0	6	1.2 ± 0.4	Trend	Not sig. (p>0.05)	Overall site trend marginally significant (p=0.074). Examination of spatial pattern reveals clear sub area in decline within site. Regression slope: -0.1 ha/year (-9%/year).
sj0115	fr	0	0	0	0	1	0	0	1	15.7 ± 1.5			
sj0118	fr	0	0	0	0	0	0	1	1	24.1 ± 3.3			
sj0138	fr	0	0	0	0	1	0	0	1	1.5 ± 0.8			
sj0140	fr	0	0	0	0	1	0	0	1	2.2 ± 0.3			
sj0153	fr	0	0	0	0	1	0	0	1	0	No <i>Z. marina</i>		
sj0154	fr	0	0	0	0	1	0	0	1	0.2 ± 0.0			
sj0182	fr	0	0	0	0	1	0	0	1	0.3 ± 0.0			
sj0192	fr	0	0	0	0	1	0	0	1	0.5 ± 0.2			
sj0205	fr	0	0	0	0	0	1	1	2	12.6 ± 1.0	Change	Not sig. (p>0.05)	
sj0311	fr	1	1	1	1	1	0	0	5	1.9 ± 0.4	Trend	Not sig. (p>0.05)	
sj0335	fr	1	1	0	0	0	0	0	2	0.7 ± 0.3	Change	Not sig. (p>0.05)	
sj0345	fr	0	0	0	0	1	0	0	1	0	No <i>Z. marina</i>		
sj0346	fr	0	0	0	0	1	0	0	1	3.4 ± 0.5			
sj0351	frw	0	1	1	1	1	0	0	4	24.6 ± 0.9	Trend	Not sig. (p>0.05)	
sj0359	fr	0	0	0	0	1	0	0	1	0.2 ± 0.1			
sj0365	fr	1	1	1	1	0	0	0	4	1.6 ± 0.2	Trend	Not sig. (p>0.05)	
sj0392	fr	0	0	0	0	1	0	0	1	0.3 ± 0.1			
sj0400	fr	0	0	0	0	1	0	0	1	0	No <i>Z. marina</i>		

Site	TYPE	2000	2001	2002	2003	2004	2005	2006	Total No.Yrs	Latest <i>Z. marina</i> area estimate (ha) (95% CI)	Test	Two-Tailed Test Result based on DNR data only	notes
sjs0434	fr	0	0	0	0	1	0	0	1	4.0 ± 0.7			
sjs0437	fr	0	0	0	0	1	0	0	1	0.7 ± 0.1			
sjs0448	fr	0	0	0	0	0	0	1	1	5.3 ± 1.0			
sjs0452	fr	0	0	0	0	0	0	1	1	13.6 ± 1.9			
sjs0453	fr	0	0	0	0	1	0	0	1	3.8 ± 0.6			
sjs0480	fr	1	1	0	0	0	0	0	2	2.6 ± 0.5	Change	Not sig. (p>0.05)	
sjs0488	fr	0	0	0	0	0	0	1	1	0	No <i>Z. marina</i>		
sjs0499	fr	0	0	0	0	1	0	0	1	2.1 ± 0.4			
sjs0557	fr	0	0	0	0	1	0	0	1	4.5 ± 0.9			
sjs0600	fr	0	0	0	0	0	0	1	1	2.9 ± 3.4			
sjs0617	fr	0	0	1	1	1	1	1	5	2.4 ± 0.7	Trend	Significant (p<0.05)	Increasing trend. Regression slope: +.2 ha/year (+11%/year) Inspection of transects reveals no obvious bed expansion.
sjs0622	fr	1	1	0	0	0	0	0	2	0.1 ± 0.1	Change	Not sig. (p>0.05)	
sjs0635	fr	0	0	0	1	1	1	1	4	1.5 ± 0.4	Trend	Significant (p<0.05)	Decreasing trend. Regression slope: -0.6 ha/year (-27%/year). Inspection of transects indicates loss from shallow edge in southern bed.
sjs0637	fr	1	1	1	0	0	0	0	3	3.0 ± 0.9	Trend	Not sig. (p>0.05)	
sjs0639	fr	0	0	0	0	0	1	1	2	0	No <i>Z. marina</i>		
sjs0649	fr	0	0	1	1	1	1	1	5	0	Trend	Not sig. (p>0.05)	
sjs0683	fr	0	0	0	1	1	1	1	4	0.8 ± 0.3	Trend	Not sig. (p>0.05)	
sjs0695	fr	1	1	1	1	1	1	0	6	0	No <i>Z. marina</i>		
sjs0736	fr	1	1	1	0	0	0	0	3	0	No <i>Z. marina</i>		

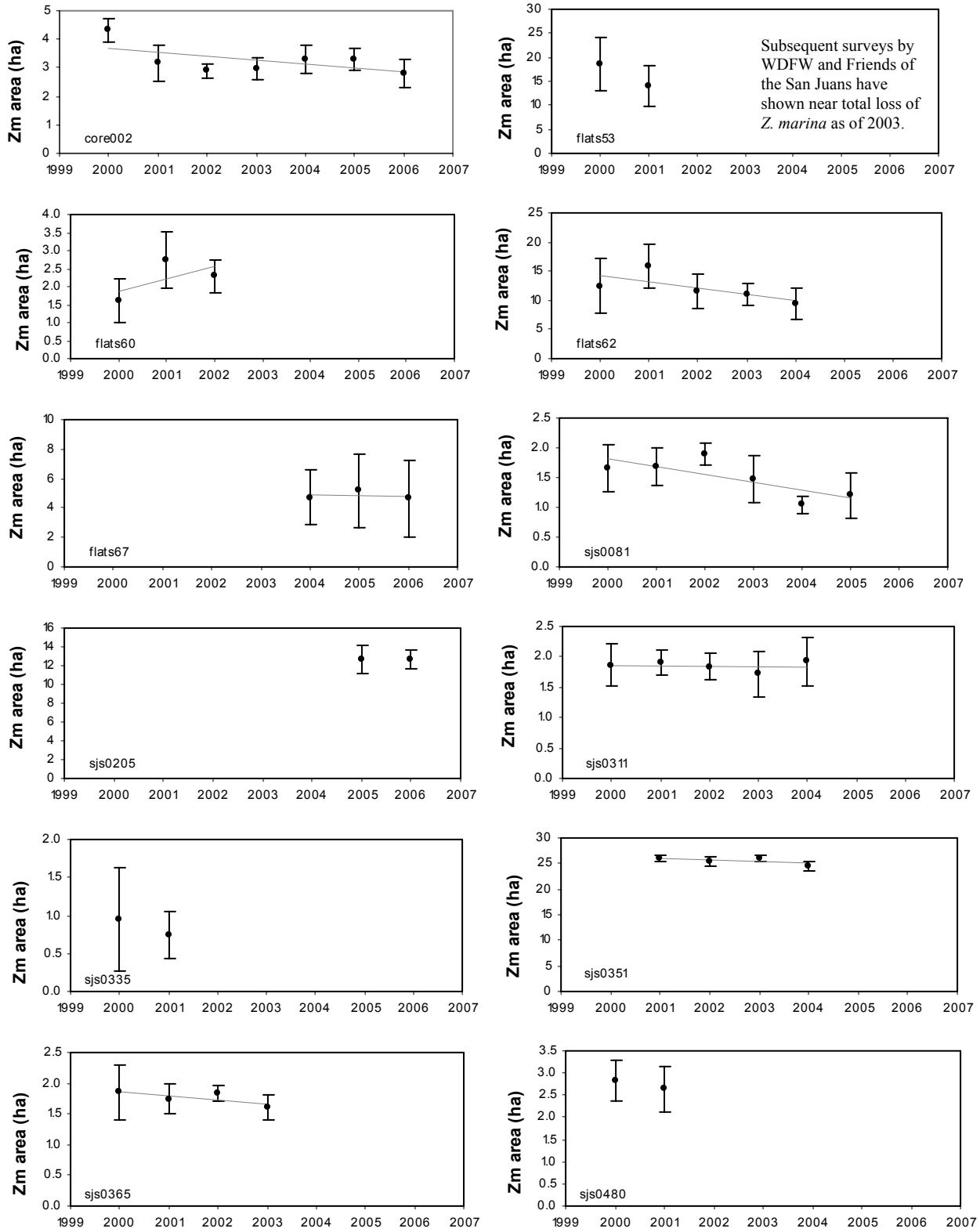


Figure 1 . Site data for sites with at least two years of data. Linear regression lines are shown for sites with at least three years of data. Error bars are 95% confidence intervals.

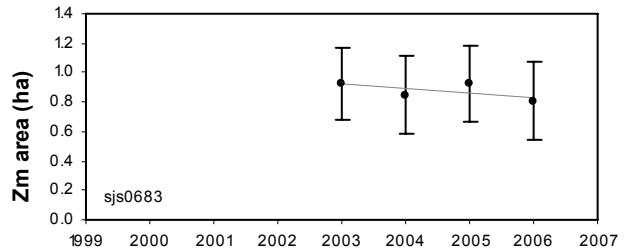
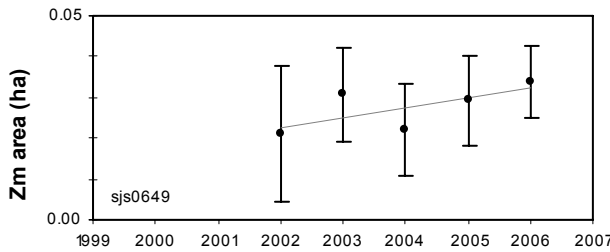
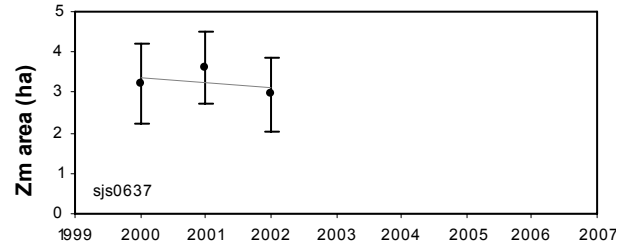
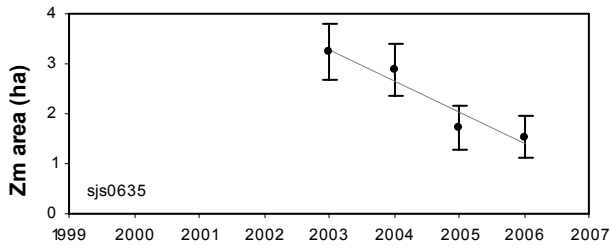
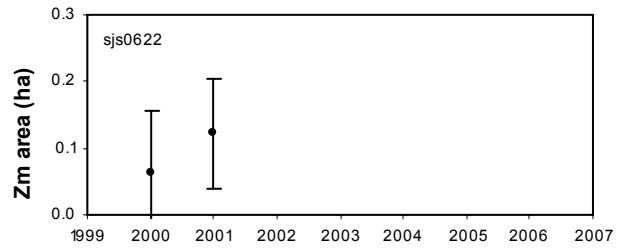
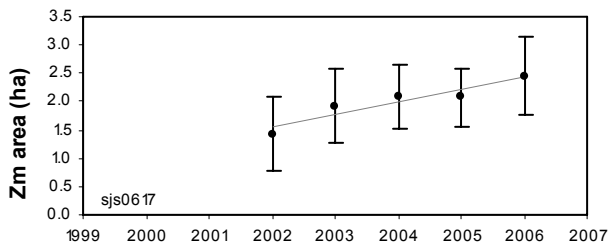


Figure 1 (continued).

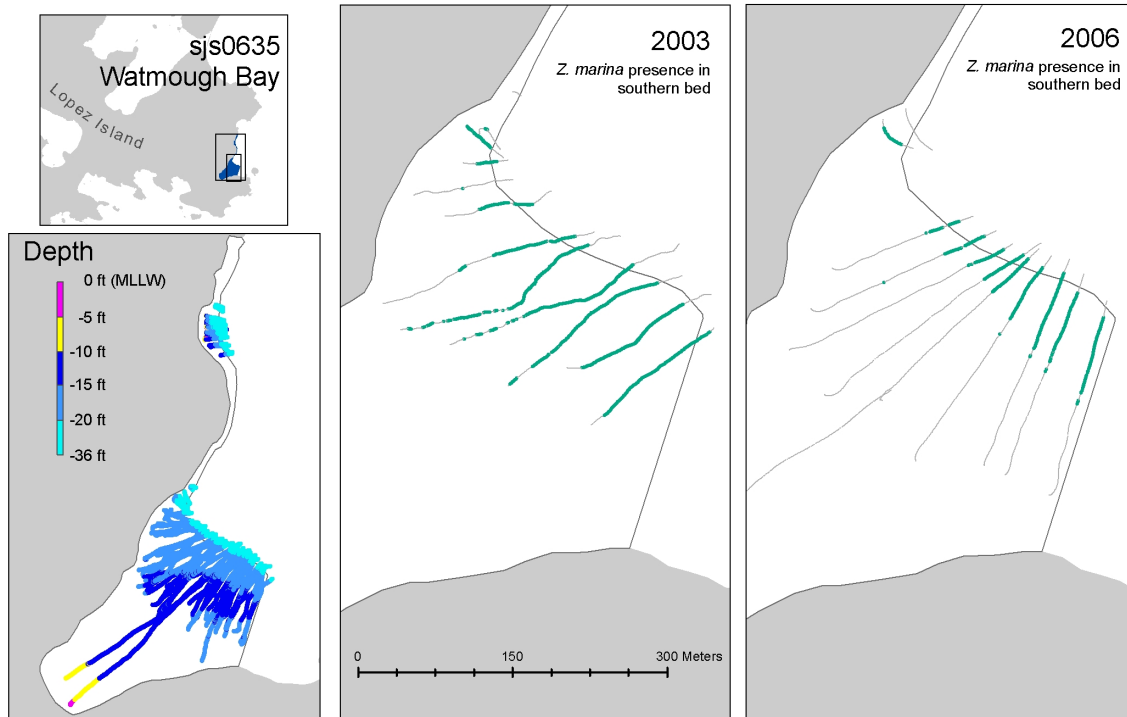


Figure 2. Loss at Watmough Bay (sjs0635) is from the shallow edge even though this is a deep bed overall.

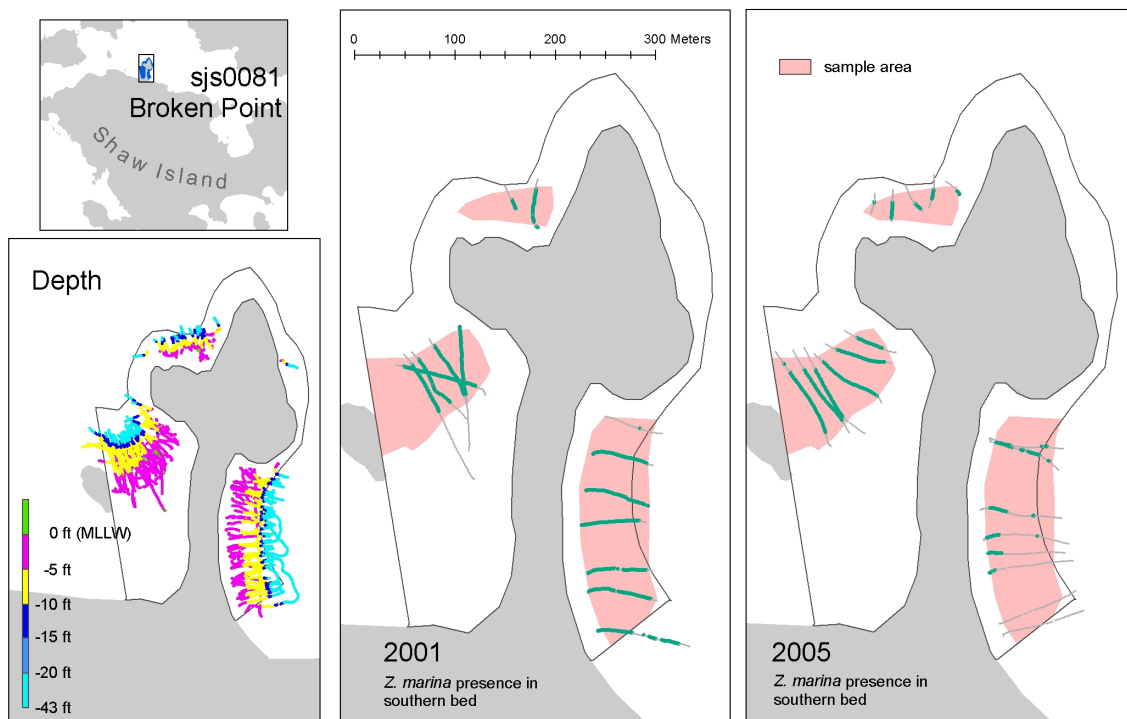


Figure 3. Loss in eastern bed at Broken Point (sjs0081) is from the deep edge.

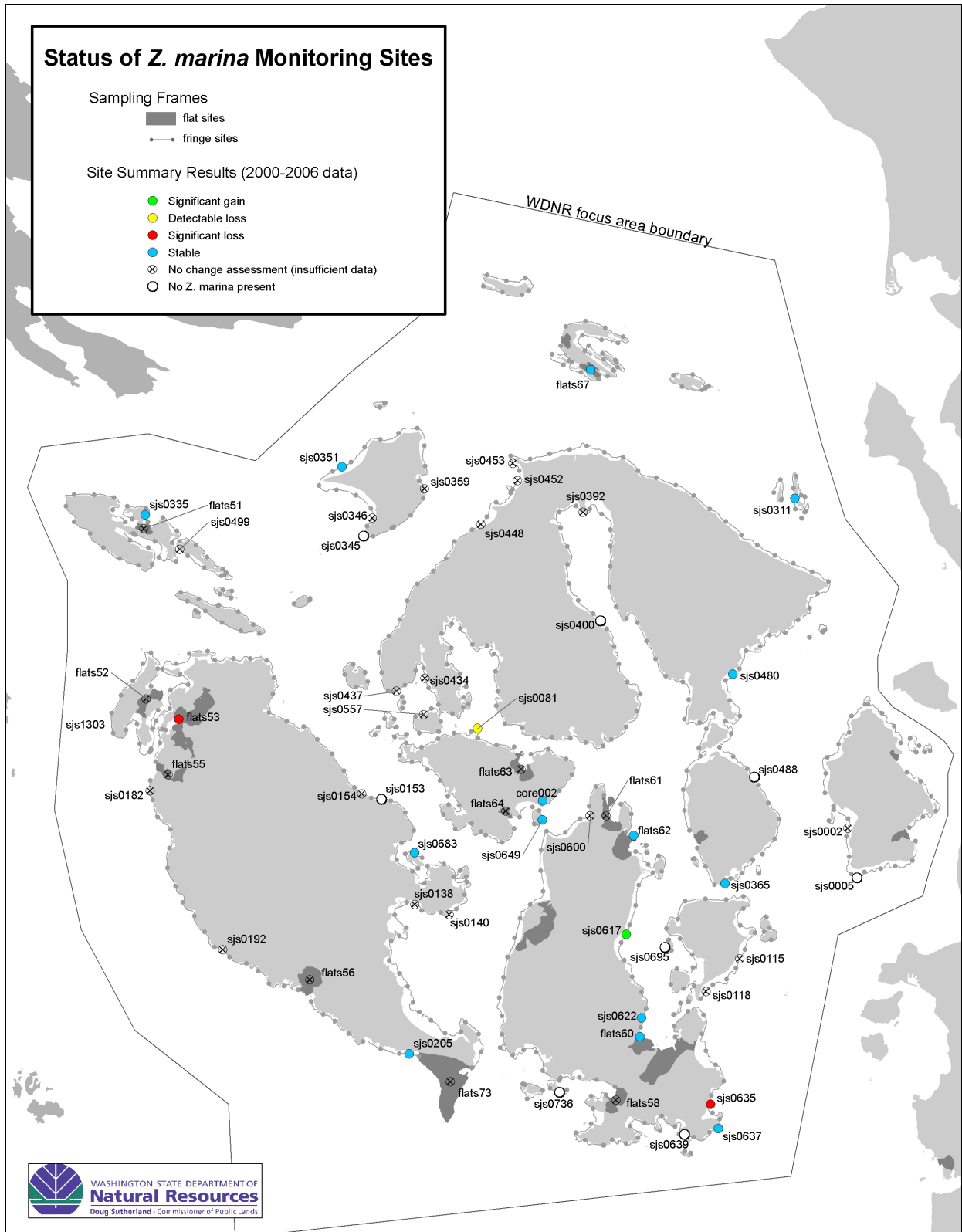


Figure 4. Assessments of *Z. marina* based on available WDNR data. The data record is not consistent across sites (see Table 1). The assessment for Westcott Bay (flats53) relies on supplementary data sources (see Table 1).

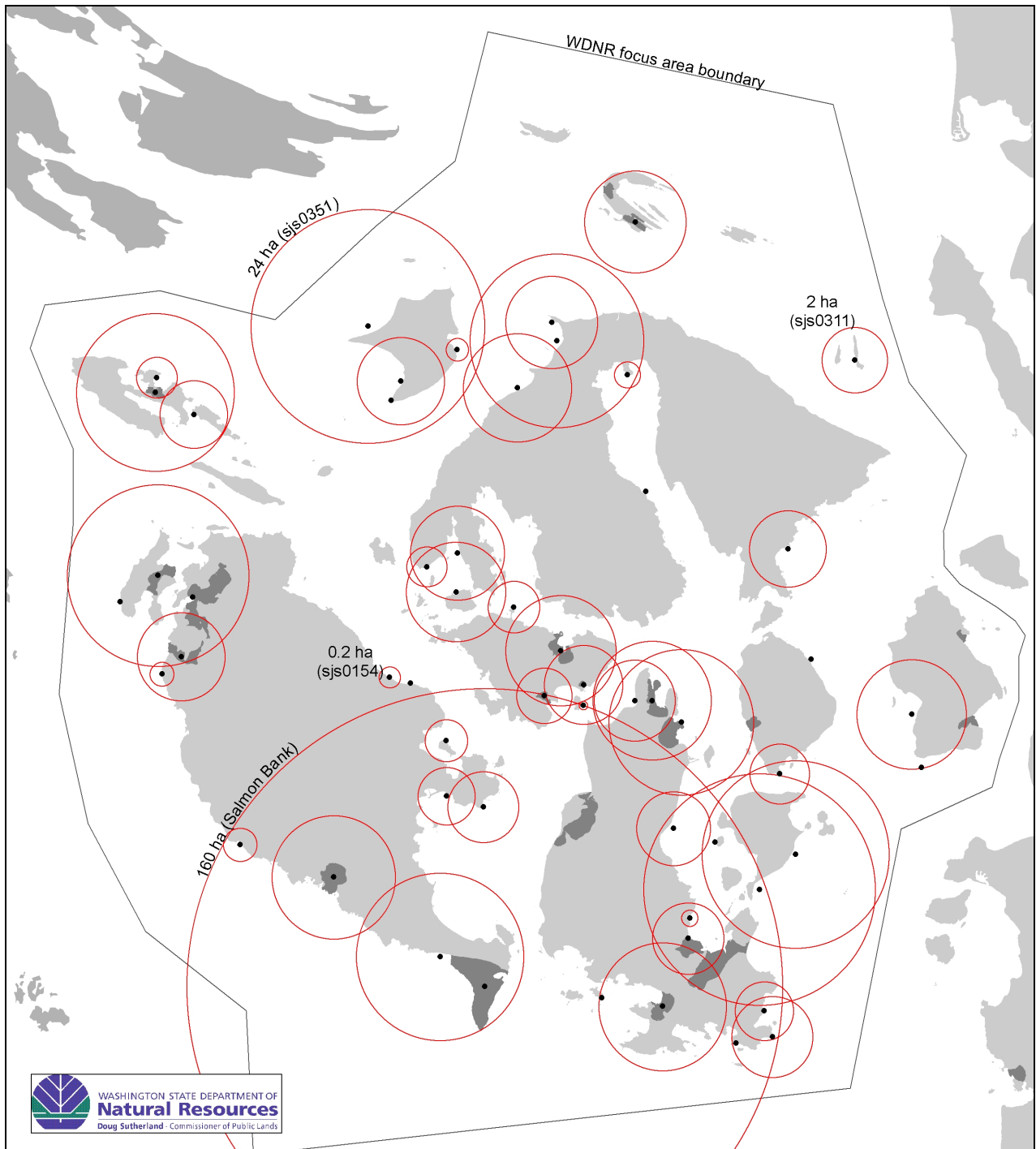


Figure 5. Abundance of *Z. marina* at all sites sampled. The diameter of the circles varies with the latest available *Z. marina* area estimate for each site. The circles are centered on dots which indicate the exact site location. Salmon Bank (flats73) has not been sampled by WDNR – the estimate here is based on data from 2003 provided by Friends of the San Juans. Sites without circles have no *Z. marina* present.