

Summary of *Z. marina* Monitoring Results in Hood Canal

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 or trend in *Z. marina* based on 2000-2006 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). The result field is red for the four cases with statistically significant ($p < 0.05$) measures of decline. The result field is yellow for the three additional cases where inspection of the data suggests decline even though the initial test results were not significant (see notes field). Confidence intervals, where specified, are 95% confidence intervals. There were no significant or marginally significant gains in *Z. marina* area using these tests. 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	notes
core004	cor	1	1	1	1	1	1	1	7	132 ± 39 ha	Trend	Not sig. ($p > 0.05$)	
flats41	fl	0	0	0	0	1	1	1	3	92 ± 16 ha	Trend	Not sig. ($p > 0.05$)	
flats42	fl	0	0	0	0	0	1	1	2	92 ± 11 ha	Change	Not sig. ($p > 0.05$)	
flats43	fl	1	1	1	1	1	1	0	6	12 ± 3 ha	Trend	Not sig. ($p > 0.05$)	Marginal significance ($p = 0.083$). Significant decline under one-tailed test ($p < 0.05$). Regression slope: -5%/year.
flats44	fl	0	0	0	0	0	1	0	1	19 ± 6 ha			
flats45	fl	0	0	0	0	0	1	0	1	7.0 ± 2.1 ha			
hdc2239	frw	0	0	1	1	1	1	1	5	6.9 ± 1.0 ha	Trend	Significant ($p < 0.05$)	Declining trend. Regression slope: -13%/year.
hdc2240	frw	0	1	0	0	0	1	0	2	10 ± 1 ha	Change	Significant ($p < 0.05$)	Decline of -27 ± 15%.
hdc2253	frw	0	0	0	0	0	1	0	1	18 ± 1 ha			
hdc2262	fr	0	0	0	0	0	1	0	1	1.7 ± 0.8 ha			
hdc2277	fr	0	0	0	0	0	1	0	1	1.2 ± 0.6 ha			
hdc2283	frw	0	0	0	0	0	0	1	1	12 ± 2 ha			
hdc2284	fw	0	0	0	0	0	1	1	2	7.1 ± 1.2 ha	Change	Not sig. ($p > 0.05$)	
hdc2308	fr	0	0	0	0	0	1	0	1	13 ± 3 ha			
hdc2310	fr	1	1	1	0	0	0	0	3	2.5 ± 0.3 ha	Trend	Not sig. ($p > 0.05$)	
hdc2314	frw	0	0	0	0	0	1	0	1	0.22 ± 0.16 ha			
hdc2323	fr	0	0	0	0	0	1	0	1	0.07 ± 0.11 ha			
hdc2331	fr	0	0	0	0	0	1	0	1	0.60 ± 0.37 ha			
hdc2338	fr	1	1	1	1	1	1	0	6	1.0 ± 0.2 ha	Trend	Significant ($p < 0.05$)	Declining trend. Regression slope: -11%/year.
hdc2344	fr	0	0	0	1	1	1	1	4	0.7 ± 0.3 ha	Trend	Not sig. ($p > 0.05$)	Marginal significance ($p = 0.095$), but sig. annual declines (see Table 2). Significant decline under one-tailed test ($p < 0.05$). Regression slope: -43%/year.
hdc2345	fr	1	1	0	0	0	0	0	2	0.6 ± 0.3 ha	Change	Not sig. ($p > 0.05$)	Results of annual monitoring show no change but special survey in March 2007 showed total loss.
hdc2353	fr	0	0	0	0	0	1	0	1	1.5 ± 0.7 ha			
hdc2355	frw	0	0	0	0	0	1	0	1	2.9 ± 1.1 ha			
hdc2356	frw	0	0	0	0	0	1	0	1	7.3 ± 1.6 ha			
hdc2359	fr	1	1	1	1	1	1	0	6	9.0 ± 0.6 ha	Trend	Significant ($p < 0.05$)	Declining trend. Regression slope: -5%/year.
hdc2364	fr	0	0	0	0	0	1	0	1	1.2 ± 0.6 ha			
hdc2365	fr	0	0	0	0	0	1	0	1	1.9 ± 0.9 ha			
hdc2380	frw	0	0	0	0	0	1	0	1	32 ± 5 ha			
hdc2381	frw	0	0	0	0	0	1	0	1	26 ± 2 ha			
hdc2383	frw	0	0	0	0	1	1	1	3	2.9 ± 1.3 ha	Trend	Not sig. ($p > 0.05$)	

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	notes
hdc2386	frw	0	0	0	0	0	1	0	1	9.6 ± 0.8 ha			
hdc2398	fr	0	0	0	0	0	1	0	1	2.0 ± 0.6 ha			
hdc2409	frw	0	0	0	0	0	1	0	1	3.6 ± 1.2 ha			
hdc2418	fr	0	0	0	0	0	1	0	1	1.8 ± 0.3 ha			
hdc2433	fr	1	1	1	0	0	0	0	3	1.9 ± 0.1 ha	Trend	Not sig. (p>0.05)	
hdc2447	fr	0	0	0	0	0	1	0	1	3.1 ± 1.0 ha			
hdc2449	fr	0	0	0	0	0	1	0	1	1.2 ± 0.3 ha			
hdc2450	fr	0	0	0	0	0	1	0	1	0.28 ± 0.31 ha			
hdc2465	fr	0	0	0	0	1	1	1	3	6.4 ± 0.9 ha	Trend	Not sig. (p>0.05)	
hdc2468	fr	0	0	0	0	0	1	0	1	5.1 ± 1.1 ha			
hdc2478	fr	0	0	0	0	0	1	0	1	1.4 ± 0.7 ha			
hdc2479	fr	0	0	0	0	1	1	1	3	7.1 ± 1.0 ha	Trend	Not sig. (p>0.05)	Marginal significance (p=0.07). Significant decline under one-tailed test (p<0.05). Regression slope: -5%/year.
hdc2487	fr	1	1	0	0	0	0	0	2	1.7 ± 0.5 ha	Change	Not sig. (p>0.05)	
hdc2504	fr	1	1	0	0	0	0	0	2	5.0 ± 1.1 ha	Change	Not sig. (p>0.05)	
hdc2507	frw	0	0	0	0	0	1	0	1	12 ± 3 ha			
hdc2518	fr	0	0	0	0	0	1	0	1	5.0 ± 2.6 ha			
hdc2529	fr	1	1	1	1	1	1	0	6	5.4 ± 0.8 ha	Trend	Not sig. (p>0.05)	

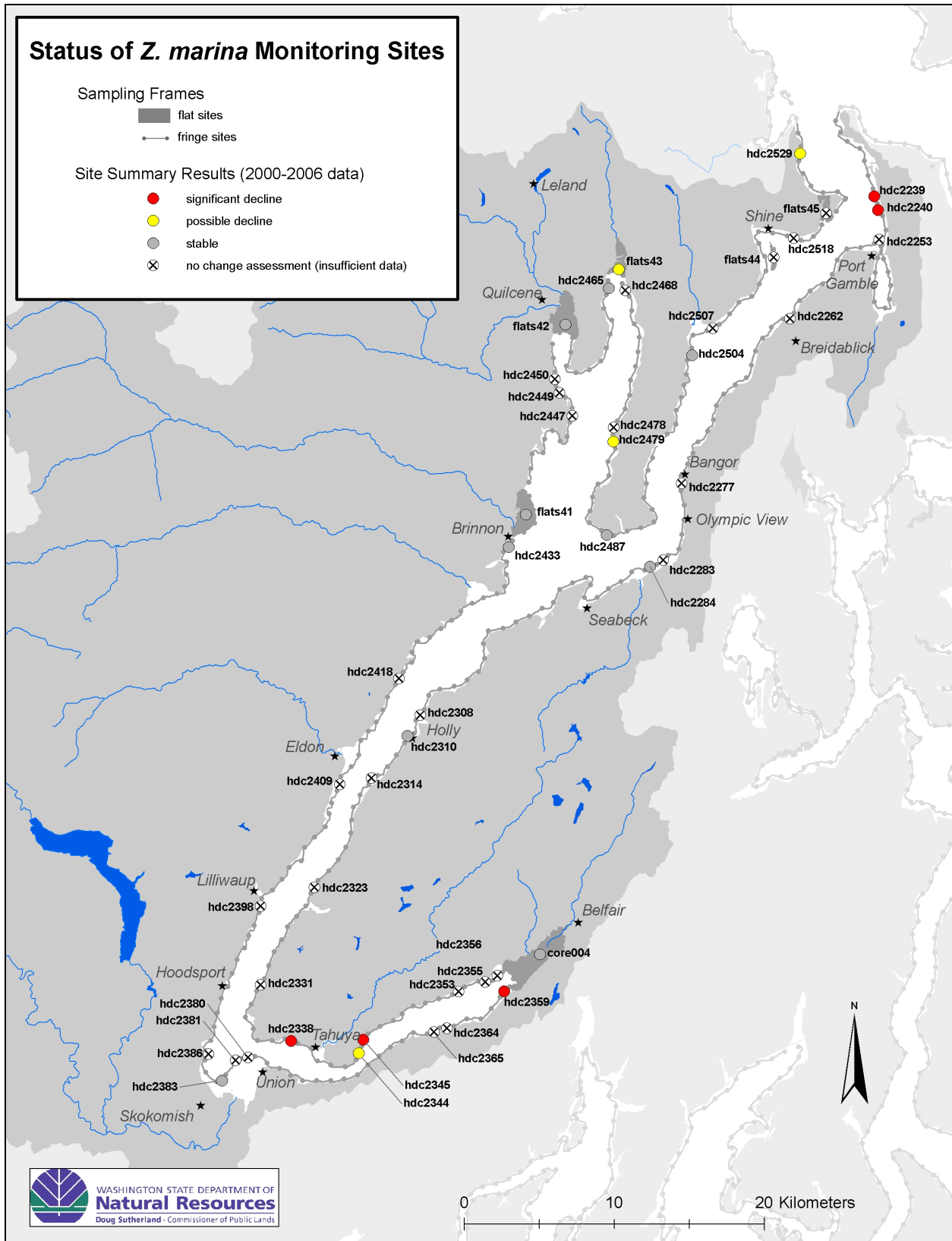


Figure 1. Status of DNR *Z. marina* monitoring sites in Hood Canal. See Table 1 for details on site categories.

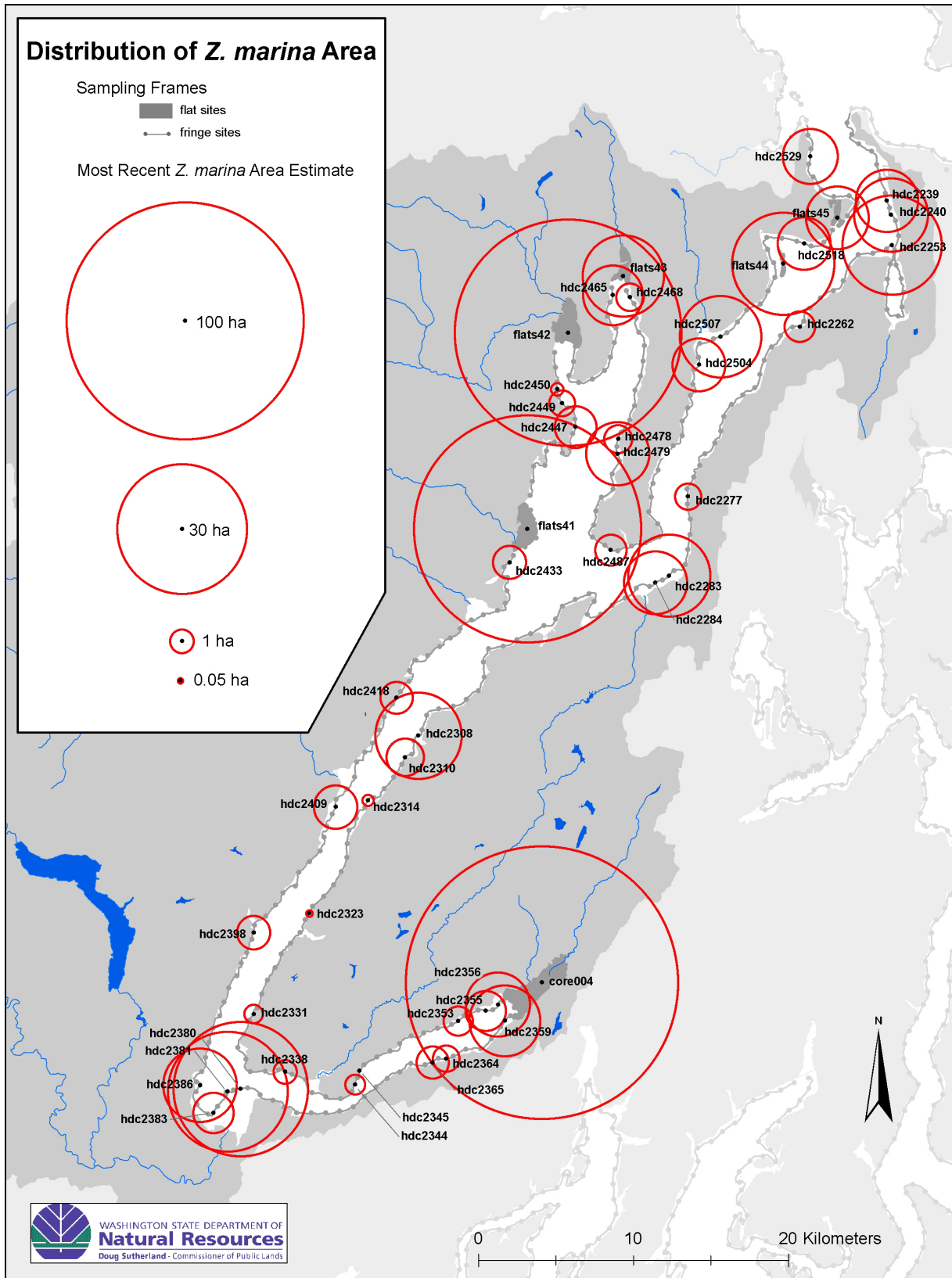


Figure 2. Estimated area of *Z. marina* at DNR monitoring sites. For sites sampled in more than one year, the most recent estimate is depicted. Black dots with no associated red circle had no *Z. marina* present in the most recent survey.

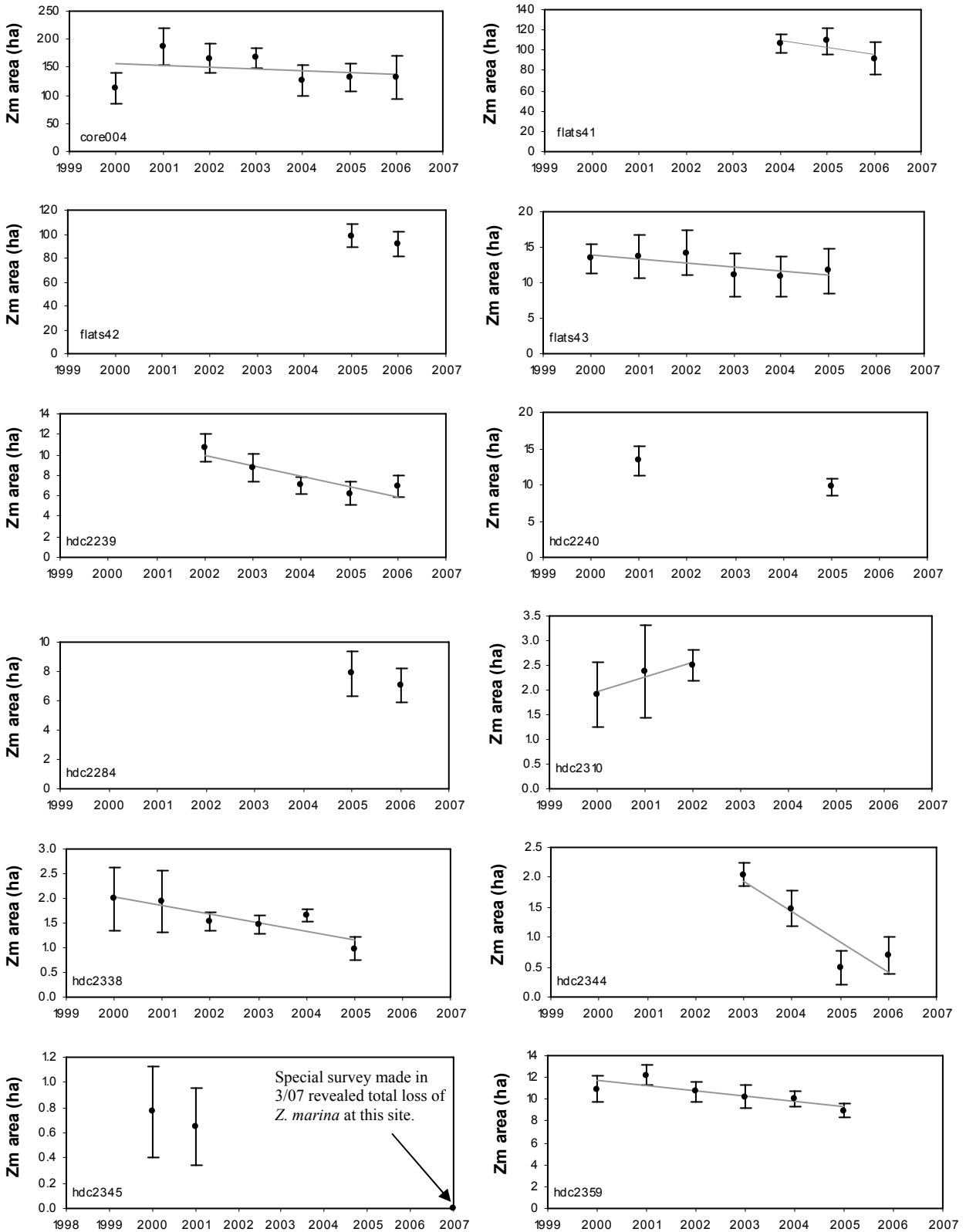


Figure 3. Site data for sites with at least two years of data. Linear regression lines are shown for sites with at least three years of data. Error bars are 95% confidence intervals.

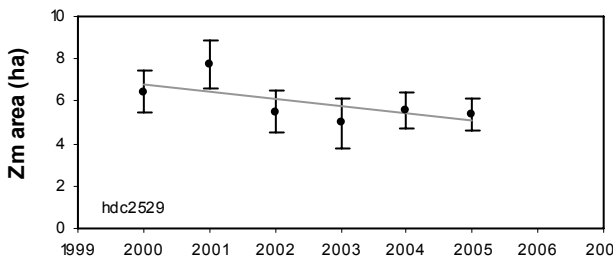
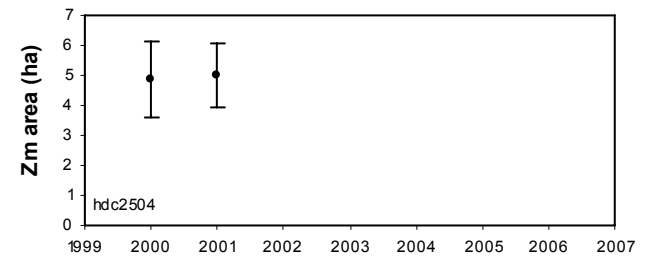
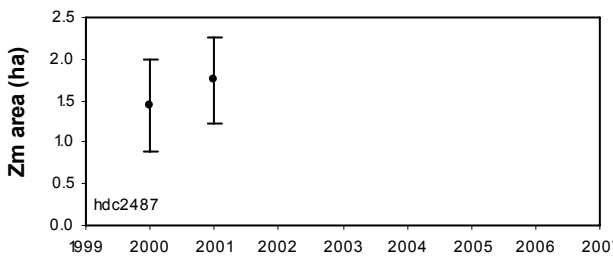
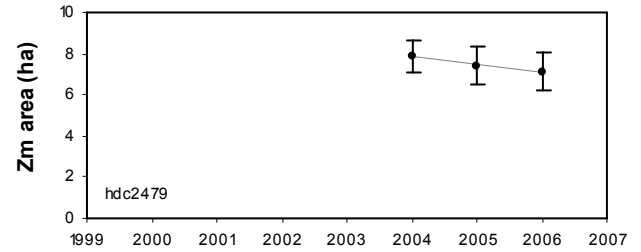
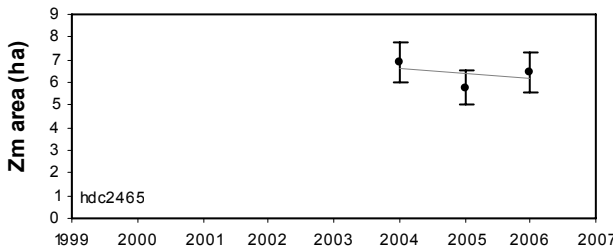
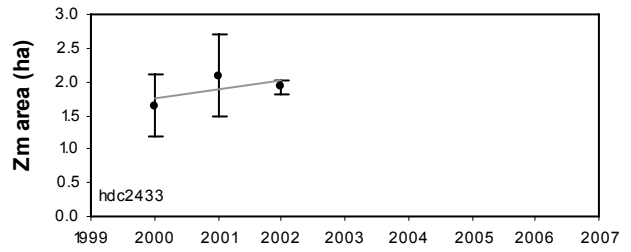
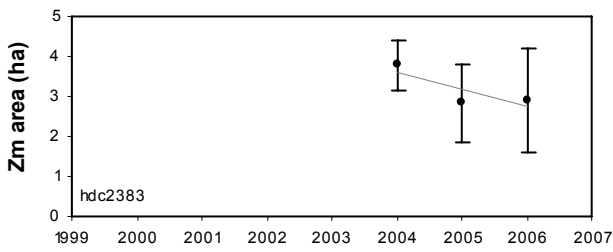


Figure 3 (continued).

Table 2. Summary of estimates of annual relative change in *Z. marina* area for Hood Canal sites. The number of paired sites in each annual interval and their grouping by loss or gain are also shown. (*) indicates statistical significance of $p < 0.05$.

	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006
Number of paired sites	10	7	6	7	11	9
Paired sites with an estimated gain in <i>Z. marina</i> area	core004* flats43 hdc2310 hdc2359 hdc2433 hdc2487 hdc2504 hdc2529	flats43 hdc2310		hdc2338 hdc2529	core004 flats41 flats43	core004 hdc2239 hdc2344 hdc2383 hdc2465
Paired sites with an estimated loss in <i>Z. marina</i> area	hdc2338 hdc2345	core004 hdc2338 hdc2359 * hdc2433 hdc2529 *	flats43 hdc2239* hdc2338 hdc2359 hdc2529	core004* flats43 hdc2239* hdc2344* hdc2359	hdc2239 hdc2338* hdc2344* hdc2359* hdc2383 hdc2465* hdc2479 hdc2529	flats41 flats42 hdc2284 hdc2479
Paired sites an estimate of no change in <i>Z. marina</i> area (<1% change)			core004			