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GODA

Benthic Eelgrass (*Zostera marina*) Survey in Horseshoe Bay,

Golden Gate National Recreation Area

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Eric Crandall and Darren Fong

Introduction

The purpose of this survey was to take a census of eelgrass (*Zostera marina*) in Horseshoe Bay, California, which is a part of the Golden Gate National Recreation Area. It is important to keep track of this flowering plant's local population, since a variety of proposed management actions could occur here in the near future, including sandy beach restoration and dredging by the Coast Guard. In addition to counting the plants, we measured their length and their depth from the surface relative to mean lower low water. We also made observations regarding the extent of epiphytes and their reproductive state as indicated by the presence or absence of seeds. The data from this survey were compared to those of Kitting (1998), and may be used to compare with future studies.

Methods

The census was taken on May 9 and 10, 2000. Prior to the survey, the clarity of the water was measured with a secchi disc that was lowered off of the end of the floating dock on the northeast side of the bay. Due to rains a few days before the survey, the water clarity was not good enough (2.5 ft) to observe seedlings that were rooted in more than 3 feet of water, even with the use of a mask and snorkel.

On both days, surveys were performed at or around low tide (-0.7 ft. on the first day and -0.5 ft. on the second day). All areas of the bay with a relative MLLW depth of no greater than 3.8 feet were surveyed (Figure 1). This area was broken into three sections: Section A extended from the western tip of the breakwater to the gangway leading to the floating boat docks. Section B went from the gangway to the floating dock extending from the northern side of the bay. Section C went from the floating dock all the way to the Coast Guard station on the far west end of the bay.

Each of these areas was surveyed by wading through them in a zigzag pattern such that there was no more than about 7 feet between each consecutive pass. To compensate for the poor visibility, I swept a 4.5 foot long light-colored measuring stick in front of me so that any eelgrass blades which passed over it would be visible to me. The location of every plant that was found was logged into a GPS data-file (in UTM coordinates) with a Trimble Geoexplorer III which was kept and operated inside a sealed dry bag at all times.

The length of the longest blade was then measured with the measuring stick, as was the depth from the surface of the water to the roots of the plant. The depths were later converted to reflect their depth from the mean lower low water line (MLLW) by using the time after low tide, and the relative rate of water rise. The epiphytic load of each plant was described qualitatively to the best of my abilities, and the presence or absence of seeds was noted by running my hands down the blades from the surface to their first junction and feeling for a telltale swelling there.

Results

A total of 63 eelgrass plants were counted, mapped and measured with 2 in section A, 43 in section B, and 18 in section C. These data can be found in Table 1. Area data for each section can be found in Table 2. Due to the poor visibility it is possible that small plants were overlooked, as well as plants growing in water deeper than 3.8 feet (relative to MLLW). The corrected depths from MLLW were checked against the mapped location of the plant and found to be in agreement with the bathymetry measurements taken by Kitting (1998). The deepest plant was found at -3.38 feet relative to MLLW. The longest plant was 5.75 feet long.

Epiphytes found on the plants included: a brown diatom, foliose and crustose organisms which may have been bryozoans, and a species of the green algae *Ulva*. The epiphytic load was not measured quantitatively, but ranged from plants totally covered with epiphytes to those which were almost wholly free of them. At the end of the survey we observed a pair of Canada Geese (*Branta canadensis*) feeding directly on the eelgrass, ripping up or severely grazing at least one plant which we had just surveyed!

Table 1 - Location, depth and length of all plants counted in census.

Plant #	UTM Coordinates		Depth in Feet Relative to MLLW	Plant Length in Feet	Seeds?
	Easting	Northing			
A1	546305.540	4187368.030	-0.273	0.820	
A2	546319.550	4187333.160	-0.887	1.148	
B1	546261.145	4187457.207	-1.780	0.820	
B2	546264.011	4187449.312	-2.466	3.281	
B3	546263.293	4187447.461	-3.303	3.839	
B4	546262.380	4187445.919	-2.684	3.445	
B5	546263.265	4187445.496	-2.307	3.281	
B6	546264.299	4187444.701	-2.550	3.346	
B7	546264.605	4187443.119	-2.464	3.281	
B8	546269.986	4187449.950	-1.230	2.887	
B9	546270.689	4187446.728	-1.386	2.953	
B10	546265.920	4187443.306	-2.494	3.609	y
B11	546265.920	4187443.306	-2.068	3.510	
B12	546265.920	4187443.306	-2.166	3.773	
B13	546266.605	4187442.857	-2.122	4.921	y
B14	546266.605	4187442.857	-2.122	4.757	
B15	546266.605	4187442.857	-1.958	5.577	y
B16	546266.605	4187442.857	-2.023	4.593	y
B17	546265.023	4187441.314	-2.844	5.413	
B18	546265.023	4187441.314	-3.008	4.757	y
B19	546265.632	4187439.252	-3.087	4.429	
B20	546265.632	4187439.252	-3.251	5.249	
B21	546265.632	4187439.252	-3.087	4.757	
B22	546266.515	4187438.994	-2.041	4.593	
B23	546266.515	4187438.994	-2.566	4.265	y
B24	546266.515	4187438.994	-2.566	2.953	
B25	546267.414	4187437.278	-3.096	4.429	
B26	546267.414	4187437.278	-2.702	4.593	
B27	546267.414	4187437.278	-2.144	4.429	y
B28	546272.128	4187440.781	-1.591	4.757	
B29	546272.128	4187440.781	-1.591	3.445	
B30	546270.183	4187434.021	-2.633	5.249	
B31	546268.898	4187433.113	-3.273	4.921	
B32	546274.640	4187432.350	-2.228	4.593	
B33	546273.360	4187433.534	-2.015	3.773	

B34	546273.360	4187433.534	-1.687	3.773	
B35	546275.047	4187421.228	-2.446	4.593	
B36	546277.342	4187417.159	-3.381	5.741	y
B37	546293.146	4187391.302	-1.745	4.265	
B38	546293.146	4187391.302	-1.581	3.773	
B39	546296.501	4187385.907	-1.291	2.625	
B40	546255.505	4187477.582	-0.413	0.656	
B41	546264.181	4187473.687	-0.413	0.656	
B42	546264.712	4187472.979	-0.413	0.656	
B43	546272.680	4187447.481	-0.413	0.656	
C1	545942.460	4187383.203	-0.062	1.312	
C2	545942.460	4187383.203	-0.062	1.312	
C3	546110.298	4187493.703	-2.717	3.117	
C4	546116.836	4187496.033	-2.929	3.281	
C5	546116.836	4187496.033	-2.929	3.117	
C6	546123.565	4187498.304	-2.495	3.150	
C7	546123.049	4187497.385	-2.273	2.986	
C8	546123.049	4187497.385	-2.273	3.150	
C9	546123.049	4187497.385	-2.273	2.953	
C10	546167.535	4187499.404	-2.667	3.510	
C11	546166.463	4187488.904	-2.989	2.133	
C12	546196.919	4187482.012	-2.857	4.101	
C13	546196.919	4187482.012	-2.857	3.281	
C14	546197.425	4187495.147	-2.797	3.281	
C15	546208.810	4187485.760	-2.550	1.640	
C16	546203.510	4187478.130	-2.550	1.640	
C17	546204.150	4187486.180	-2.222	1.312	
C18	546247.810	4187368.030	-2.222	1.312	

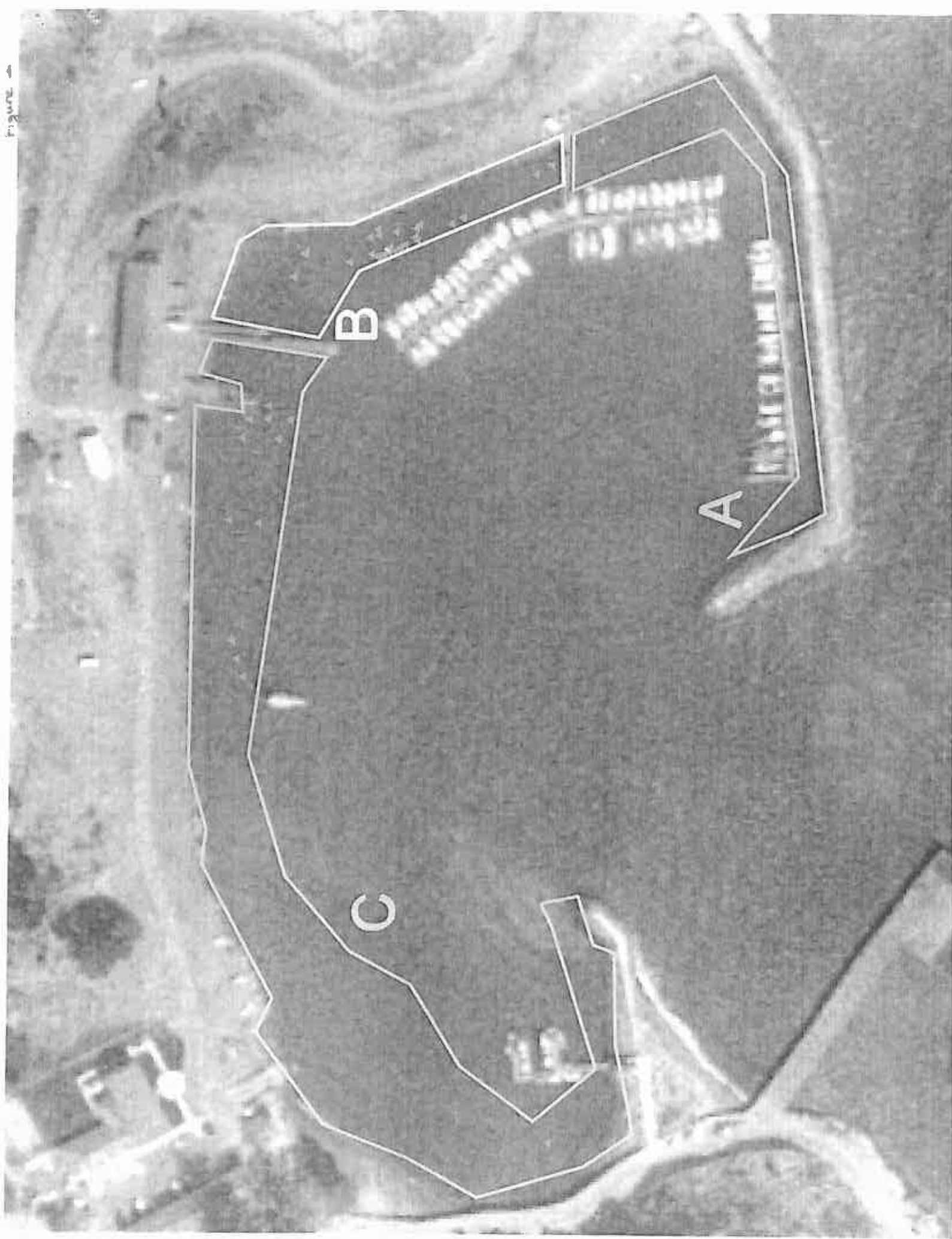
Table 2 - Acreage of the 3 surveyed sections

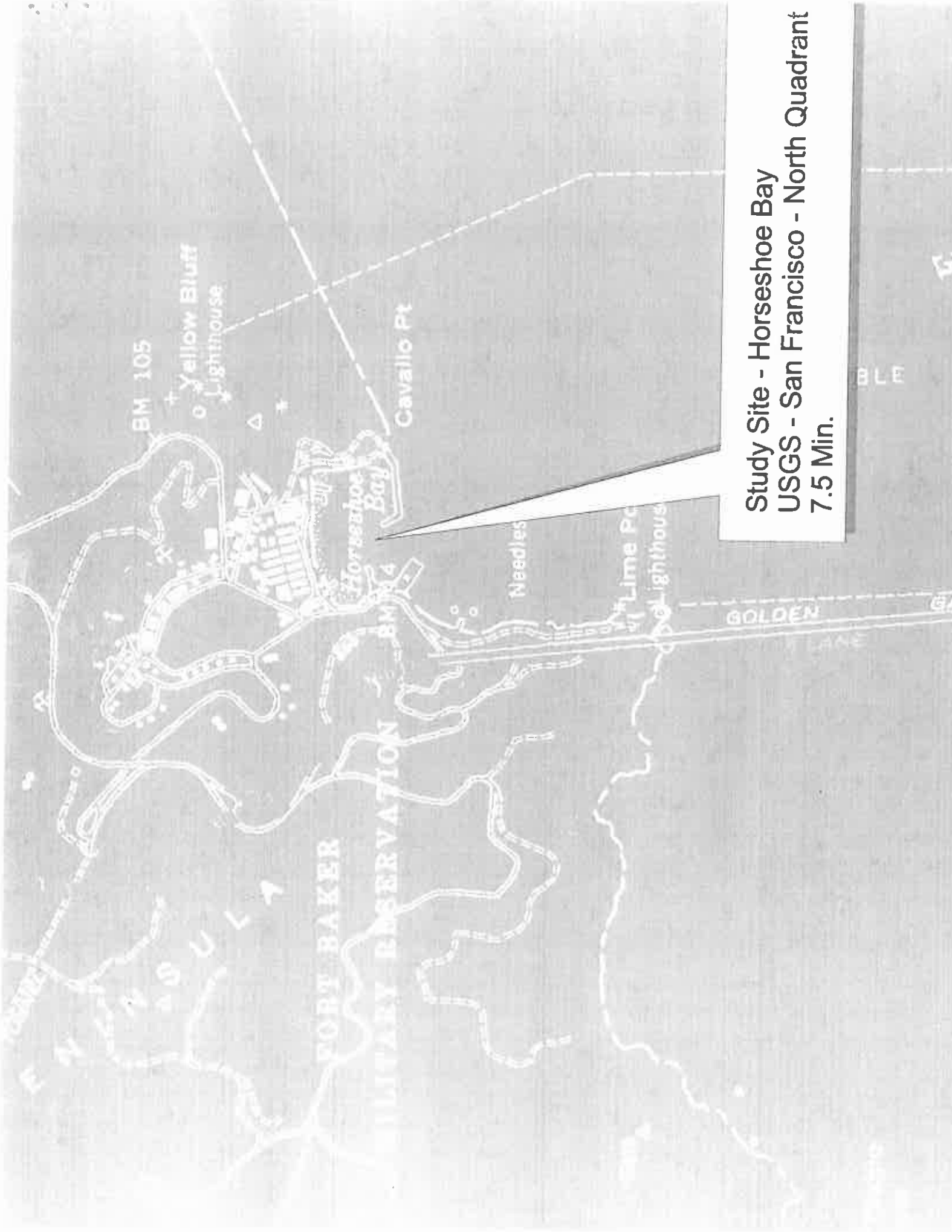
Section	Area (acres)	# Plants
A	0.64	2
B	0.72	43
C	3.21	18

Literature Cited

Kitting, Christopher L. (1998) Bathymetry and Underwater Vegetation Mapping in Horseshoe Bay, Golden Gate National Recreation Area. Report to the Golden Gate National Recreation Area.

Figure 4





Study Site - Horseshoe Bay
USGS - San Francisco - North Quadrant
7.5 Min.