Casco Bay Shorebird Monitoring Project

Year-Two (2010) Progress Report

Semipalmated Sandpipers (*Calidris pusilla*) and Semipalmated Plovers (*Charadrius semipalmatus*) roosting at the Stepping Stones ledge complex in western Casco Bay.

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INTRODUCTION

This document provides a summary of shorebird-use during the second field season of the Casco Bay Shorebird Monitoring Project. Casco Bay shorebird habitats are particularly vulnerable to degradation, given the heightened potential for coastal development, disturbance, and other factors in a landscape where industrial and residential land-use patterns prevail. This multi-year, collaborative project provides enhanced monitoring resolution at key shorebird feeding and roosting areas designated as Significant Wildlife Habitat by the Maine Department of Inland Fisheries and Wildlife. Specific project objectives include:

1. Evaluate the effectiveness of existing Significant Wildlife Habitat mapping and other habitat protection measures for shorebirds in Casco Bay, based on the most current data demonstrating status and trends in habitat-use. Analysis of trends in shorebird abundances will be completed in year five and if funding continues, at the completion of year 10.

2. Identify and map sites used by shorebirds that are not currently documented as shorebird feeding or roosting areas in Casco Bay, including habitats located on islands and ledges where data are currently lacking.

3. Apply enhanced knowledge of shorebird use in Casco Bay by the following means:

    a. distribute key findings of the project to coastal municipalities to inform local planning decisions
    b. integrate refined and updated shorebird status, distributional data, and trends into State of Maine permit review processes
    c. submit data to the Manomet Center for Conservation Sciences for inclusion in the International Shorebird Survey database.

METHODS

Survey Sites

The following mainland shorebird areas were surveyed: Upper New Meadows River, Maquoit Bay, Cousins River, Royal River, Lower Presumpscot River, Back Cove, Mackworth Island Flats, Upper Fore River, and Stroudwater River (Appendix A). In addition to mainland sites, Biological Conservation surveyed 24 Casco Bay island and ledge complexes (Appendix B).

Mainland Shorebird Surveys

The survey methodology and protocol for mainland sites adopted the basic framework for field methods/protocols provided by the Program for Regional and International Shorebird Monitoring Manager's Monitoring Manual (Skagen et al. 2009) and the International Shorebird Survey (ISS). ISS "Option 2" guidelines were adapted to reflect regional shorebird phenology and migration patterns, requiring one survey in July 15-31, two surveys each in August and September (no less than 7 days apart), and one survey during the October 1-15 period.

Most surveys were scheduled in the morning, because many species initiate night migrations in the afternoon. Field crew used the previous year's experience to identify the tidal stage and observation points affording the most representative and efficient counts of birds at each site, keeping aware that timing and location of best observation points may change as the season progresses and also as a result of weather and moon phase. Most survey effort focused on feeding habitat, because these areas supported the greatest densities and diversity of readily observable birds. Field crew rescheduled surveys when high winds or heavy rains might have influenced less habitat-use by shorebirds or survey accuracy.

The year-one report (Moore 2010) noted that some sites might warrant a survey team rather than a single observer, due to excessive habitat acreage or conditions (dense, herbaceous marsh cover) at some sites, both of which can hinder accurate shorebird counts. As a result, on several survey dates multiple field crew provided roosting habitat surveys at the Cousins River Marshes (three crew) and feeding habitat surveys at Presumpscot River flats (two crew) and Stroudwater flats (two crew).

Island and Ledge Shorebird Surveys

During the first year of the project, 17 islands and ledges were scouted by Robert Houston (United States Fish and Wildlife Service) and Slade Moore (Biological Conservation) within 2.5 hours of high tide to observe use of roosting shorebirds. In 2010, Biological Conservation surveyed 24 island and ledge groups between Jaquish Island (Harpswell) to the northeast and Ram Island Ledge to the southwest. This area roughly included the western half of Casco Bay. Most sites were relatively small, unpopulated islands or ledges, chosen based on the presumption that they offered disturbance-free roosting conditions. Surveys were conducted within two hours of high tide, which limited the number of sites that could be visited given the eight-mile straight-line distance from one end of the entire area to the other. Over half of the sites (14) were surveyed only once. Some of these were not subject to subsequent surveys because they were deemed unlikely to support significant numbers of roosting birds. Many were outside of the range of efficient operations centering around the one site (Stepping Stones) where field crew observed considerable numbers of roosting birds. Surveys required two crew: one observer and one person who had the helm when operating at close quarters to rocky intertidal zones and submerged hazards

Observations

Observations were recorded on the data sheets provided to field crew. When possible, actual counts of individual birds were documented, but large numbers of birds, distance of birds from surveyors, and birds in flight sometimes made estimates necessary. At other times, observer's distance to birds precluded identification of diagnostic features necessary for species identification. For instance, the smallest species of the genera *Calidris*, which include the Semipalmated (*C. pusilla*), Western (*C. mauri*), and Least (*C. minutilla*) sandpipers, among others, present a particular identification challenge when being viewed at great distances (and even at close range for some species, depending on plumage phase observed). When identification to species is not possible, the small calidrid species were collectively referred to as "peeps".

Along with counts and estimates, survey crew also documented the timing of notable bird movements such as ingress/egress from the site. Along with each day's data sheets, crew provided annotated maps indicating the locations of observation sites and concentrations of shorebirds.

Quality Assurance and Data Handling

Surveyors were asked to review data sheets for missing and/or erroneous entries immediately following each survey. The Project Coordinator reviewed incoming data sheets to ensure fidelity to the established data collection protocol. Data were entered by site and date, with the appropriate ISS tide code appended to each code. After data entry was complete, the Project Coordinator compared data sheets corresponding to one or more surveys at each monitoring site against keyed data to ensure the accuracy of data entry. Feeding habitat data were summarized by seasonal total numbers of individual species observed at each site. Mainland and island-ledge roosting area data were summarized by seasonal mean for each species at each site, because the number of visits to each site differed.

RESULTS AND DISCUSSION

Mainland Shorebird Feeding Areas

Results of feeding surveys are provided in Table 1. The most notable trend in 2010 was a sharp increase in the abundance of Semipalmated Sandpipers and also unidentified peeps (many of which were likely Semipalmated Sandpipers). The total number of

Table 1. Total number of shorebirds observed during six visits each to designated shorebird feeding areas in Casco Bay during July - October, 2009-2010.

	Upper New Meadows		Maquoit Bay		Presumpscot River		Stroudwater River		Royal River		Mackworth Flats		Back Cove		Upper Fore River		*Total by species*	
Species observed	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010
Black-bellied Plover	0	1	155	179	118	219	0	2	17	2	0	4	83	65	21	28	394	500
Semipalmated plover	0	0	53	93	9	28	27	60	74	114	259	12	90	64	1	0	513	371
Killdeer	0	0	0	0	0	0	0	7	0	0	0	0	2	0	0	0	2	7
Greater Yellowlegs	7	16	85	71	7	32	1	1	14	17	0	1	96	50	6	7	216	195
Lesser Yellowlegs	0	5	33	37	3	9	3	1	6	1	1	0	2	1	2	0	50	54
Unidentified Yellowlegs *spp*.	0	0	9	0	0	0	0	0	0	2	0	0	0	0	0	0	9	2
Solitary Sandpiper	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Willet	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0
Spotted Sandpiper	1	3	1	6	1	9	0	2	1	0	0	1	1	0	0	0	5	21
Hudsonian Godwit	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Ruddy Turnstone	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0
Semipalmated Sandpiper	2	2	130	609	308	3,513	259	936	237	458	47	1,900	656	798	0	0	1,639	8,216
Western Sandpiper	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Least Sandpiper	25	11	60	78	1	19	13	12	29	55	1	18	18	16	0	1	147	210
White-rumped Sandpiper	0	3	0	12	0	0	1	0	1	0	0	0	0	1	0	0	2	16
Baird's Sandpiper	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	1	1
Pectoral Sandpiper	1	5	0	4	0	0	0	0	0	0	0	0	0	3	0	0	1	12
Unidentified peep *spp*.[a]	0	0	0	0	2,665	3,491	719	587	307	1,874	0	11	0	49	2	5	3,693	6,017
Dunlin	0	0	18	38	0	0	0	0	0	0	0	0	0	2	0	0	18	40
Short-billed Dowitcher	0	0	76	48	13	12	0	0	0	0	2	10	1	10	1	0	93	80
Long-billed Dowitcher	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Unidentified Dowitcher *spp*.	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Total individuals, by site	36	46	627	1,179	3,125	7,332	1,023	1,608	688	2,523	310	1,957	951	1,059	33	42	6,793	15,746

[a] Any of five small sandpiper species of the genus *Calidris,* which are often lumped under the heading "peeps" when distance from the observer or other factors prevent confident identification to species. In order of abundance, the most common peep species observed in our study area are Semipalmated, Least, and to a lesser degree, Wester, White-

shorebirds observed in 2010 was 15,7461, versus 6,793 for 2009. The total number of peeps observed in 2010 was 14,472, or about 2.6 times 2009 peep abundances (5,484). Among sites contributing to increases in peeps were Maquoit Bay (3.7 times 2009 abundance), Presumpscot River (2009 x 2.4), Stroudwater River (2009 x 1.5), Royal River (2009 x 4.2), and Back Cove (2009 x 1.3). At 40 times greater than 2009 abundances, the number of Mackworth Island peeps reported increased especially dramatically. Peak abundances of peeps were observed between mid August and late September (Figure 1).

Discussions with MDIFW shorebird specialist Lindsay Tudor indicate that 2010 was, in fact, a banner year for shorebirds in other Maine regions. Some portion of the increases observed in Casco Bay may be explained by better survey coverage at large sites like Presumpscot and Stroudwater, where two people surveyed simultaneously in 2010 instead of just one. Adjustments in the timing of surveys may also partially explain larger numbers of shorebirds observed at Mackworth Island flats and possibly Maquoit Bay. However, shorebird abundance at the Royal River was also considerably elevated, with no apparent explanation other than more birds staged there during 2010 than 2009.

Based on the total number of birds observed at feeding areas, some sites experienced shifts from their 2009 ranking position (Table 2). The Presumpscot River, which consistently contributes the greatest abundance of shorebirds observed at Casco Bay sites (Lindsay Tudor, personal communication), held its position. Likewise, Upper New Meadows River and Fore River showed relatively low numbers of birds for a second year. At 14 species identified, Maquoit Bay continued to demonstrate relatively high species richness compared to the mean of 8 species for all sites.

Table 2. Ranking of Casco Bay shorebird feeding areas based on total number of birds observed in 2009 and 2010.

	2009		2010	
Feeding Area	No. birds	Rank	No. birds	Rank
Presumpscot River	3,125	1	7,332	1
Stroudwater River	1,023	2	1,608	4
Back Cove	951	3	1,059	6
Royal River	688	4	2,523	2
Maquoit Bay	627	5	1,179	5
Mackworth Flats	310	6	1,957	3
Upper New Meadows River	36	7	46	7
Upper Fore River	33	8	42	8

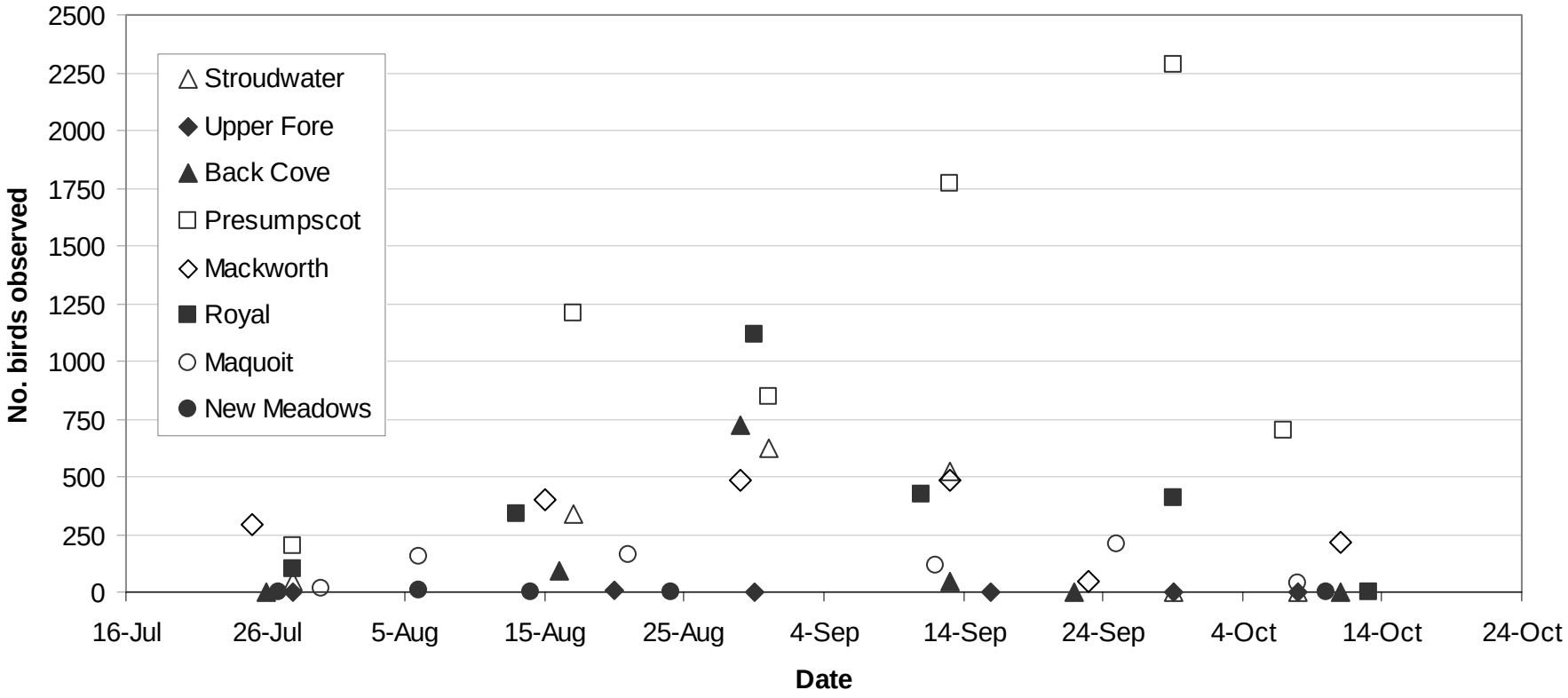

Figure 1. Numbers of small calidrid sandpipers ("peeps") observed at eight designated shorebird feeding areas in Casco Bay, July-October 2011. Each site was visited by field crews six times during the survey season.

Mainland Shorebird Roosting Surveys

Most roosting sites were subject to at least three surveys in 2010 (Table 3). More birds were observed in 2010 than 2009, but observed roosting abundance for the two survey seasons was low relative to abundance at most feeding sites. At the Cousins River marsh, three people teamed-up for surveys on three occasions to test the assumption that a larger crew would enhance the accuracy of counts, especially for Least Sandpipers, which tend to use the marsh surface for cover. There may be some benefit to having multiple observers in the field under those conditions, but the greater number of birds observed in 2010 at the Cousins River marshes may be related more to larger numbers of staging birds than increases in survey effort intensity.

Island and Ledge Shorebird Surveys

Of the 24 island-ledge complexes surveyed, only Stepping Stones demonstrated somewhat consistent use by shorebirds (Tables 4 and 5). This particular site was also was unique among others in showing notable use by roosting shorebirds during our one island and ledge survey in 2009. In 2010, the number of calidrid sandpipers observed (including Semipalmated Sandpipers) at both east and west Stepping Stones was 398 (August 8), 508 (August 20), 0 (August 28), 4 (September 9), and 0 (September 19). The lack of demonstrated use by concentrations of shorebirds at other sites may by due to relatively low survey effort at over half of the islands and ledges visited – most were only surveyed once. Given the large number of islands and ledges potentially representing roosting habitat, additional survey effort by vessel and/or aircraft may be warranted to confidently characterize use of islands and ledges by shorebirds in Casco Bay.

CONCLUSIONS AND RECOMMENDATIONS

2010 represented what may be termed as a “banner year” for fall-staging shorebirds in Maine. Consequently, reported abundances were considerably higher at most mainland sites than in 2009, which was marked by relatively low shorebird numbers. Our growing knowledge of when and where birds concentrate can enhance current shorebird conservation measures, but heightened levels of survey effort, over five (and ideally, ten) years, are warranted. Increasing survey effort at mainland and island sites can only be realized with increased capacity of the project partners, but may be necessary to fully meet the objectives of the project. One of the larger, looming challenges is our inability so far to identify where most of these birds (thousands during a single tide) roost. The vulnerability of roosts to disturbance and the importance of roosting habitat to these long-distance migrants warrant prompt action to overcome that challenge.

The following recommendations are offered to fully meet project objectives during subsequent years of this project:

Table 3. Abundance of shorebird species observed per survey of designated shorebird roosting areas in Casco Bay, July - October 2009-2010. The number of surveys per site is indicated in parentheses. Mean abundance is reported for sites subject to more than one survey. Empty cells indicate no surveys conducted.

	Upper New Meadows Marsh		Stroudwater River		Cousins River Marsh		Royal River Marsh		Mackworth Flats Marsh		Back Cove		Upper Fore River	
Species observed	2009	2010 (1)	2009 (2)	2010 (4)	2009 (3)	2010 (6)	2009	2010 (3)	2009 (2)	2010 (3)	2009 (1)	2010 (1)	2009	2010 (3)
Black-bellied Plover		0.0	0.0	0.0	0.0	0.0		0.0	21.0	0.0	0.0	24.0		0.0
Semipalmated Plover		0.0	1.0	4.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0
Greater Yellowlegs		1.0	0.0	0.5	0.0	6.8		0.0	0.0	0.0	0.0	0.0		0.0
Lesser Yellowlegs		2.0	0.0	0.0	0.3	8.4		0.0	0.0	0.0	0.0	0.0		0.0
Yellowlegs Spp.		0.0	0.0	0.0	0.0	2.0		0.0	0.0	0.0	0.0	0.0		0.0
Willet		0.0	0.0	0.0	0.3	0.0		0.0	0.0	0.0	0.0	0.0		0.0
Spotted Sandpiper		0.0	0.5	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0
Semipalmated Sandpiper		2.0	0.5	17.8	0.0	3.2		0.0	20.0	0.0	0.0	0.0		0.0
Least Sandpiper		47.0	7.5	2.7	2.7	26.3		0.0	1.5	0.7	0.0	0.0		0.0
White-rumped Sandpiper		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	3.0		0.0
Unidentified peep s*pp*.		0.0	50.0	275.0	3.7	40.8		48.3	0.0	0.0	0.0	0.0		0.0
Wilson's Snipe			0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	1.0		0.0

[a] Any of five small sandpiper species of the genus *Calidris,* which are often lumped under the heading "peeps" when distance from the observer or other factors prevent confident identification to species. In order of abundance, the most common peep species observed in our study area are Semipalmated, Least, and to a lesser degree, Western, White-rumped, and Baird's sandpipers.

Table 4. Summary of shorebirds and other bird species[a] observed at island and ledge groups in Casco Bay during one survey each, August-September 2010.

Species observed	The Brothers	Mack-worth Island	Halfway Rock	Fort Gorges Ledge	Little Diamond Ledges	Ram Island Ledge	Outer Great Island	Junk of Pork	Inner Great Island	Jaquish Island	Turnip Island	Great Mark Island	Little Mark Island	Upper Flag Island
Shorebirds														
Semipalmated Plover														
Spotted Sandpiper									40					
Ruddy Turnstone						22								
Semipalmated Sandpiper														
Unidentified peep *spp*.[b]						8								
Other species														
Double-crested Cormorant	150		P	P	P	P	30	32	42	27	25	30	75	37
Common Eider				P	P		240		60	30	150		40	
Bald Eagle														
Laughing Gull														
Herring Gull							35	38	5		25	10		
Greater Black-backed Gull							9	10	3		25		30	1
Gull *spp*.			P	P	P	P			2					
Common Tern	30		35											
Black Guillemot							5							
American Crow														
Northern Gannet								1						

[a] "P" denotes that the species was present, but not counted.

[b] Any of five small sandpiper species of the genus *Calidris,* which are often lumped under the heading "peeps" when distance from the observer or other factors prevent confident identification to species. In order of abundance, the most common peep species observed in our study area are Semipalmated, Least, and to a lesser degree, Western, White-rumped, and Baird's sandpipers.

Table 5. Mean counts of shorebirds and other bird species[a] observed at island and ledge complexes visited 2-5 times in Casco Bay, August - September 2010.

	Two surveys		Three surveys				Four surveys		Five surveys	
Species observed	Obeds Rock	Vail Island	Haddock Rock	Broken Cove	Rogue Island	Sand Island	Whale Rock	West Brown Cow	Stepping Stones (east)	Stepping Stones (west)
Shorebirds										
Semipalmated Plover									28.4	
Spotted Sandpiper										0.2
Ruddy Turnstone				6.0			0.3		0.2	3.2
Semipalmated Sandpiper									69.8	32.0
Unidentified peep *spp*.[b]		6.0					0.8		80.2	
Other species										
Double-crested Cormorant	9.0	58.0	4.7	39.0	25.7	0.3	27.0	72.3	5.0	20.8
Common Eider			60.0		4.0	8.3	180.0	50.0	11.0	44.0
Bald Eagle			0.7							
Laughing Gull		1.0								
Herring Gull	3.5	25.5	11.3	17.3	4.3	30.0	4.8	7.3	13.0	1.8
Greater Black-backed Gull	3.5	5.5		1.3	4.3	50.3	1.0	2.3	2.0	2.0
Gull *spp*.										
Common Tern										
Black Guillemot			1.7					1.3		
American Crow			0.7	0.7						
Northern Gannet										

[a] "P" denotes that the species was present, but not counted. Note that reported means for all surveys can considerably under-represent the number of any species observed on a single day. For instance, on August 8th and 20th, field crew at Stepping Stones observed 398 and 508 peeps, respectively.

[b] Any of five small sandpiper species of the genus *Calidris,* which are often lumped under the heading "peeps" when distance from the observer or other factors prevent confident identification to species. In order of abundance, the most common peep species observed in our study area are Semipalmated, Least, and to a lesser degree, Western, White-rumped, and Baird's sandpipers.

1. Increase survey effort at mainland feeding and roosting areas to better track shorebird numbers and refine our understanding of habitat value and vulnerability.

2. Perform several survey flights over Casco Bay islands and ledges to identify if sites other than Stepping Stones support roosting shorebird concentrations.

3. Increase vessel survey effort at potential roosting islands and ledges to achieve a heightened level of confidence as to their value to shorebirds.

4. Develop and implement a monitoring component using tagging (bands and electronic tracking) to identify where birds at even just one of the larger sites (e.g. Presumpscot River) are roosting.

LITERATURE CITED

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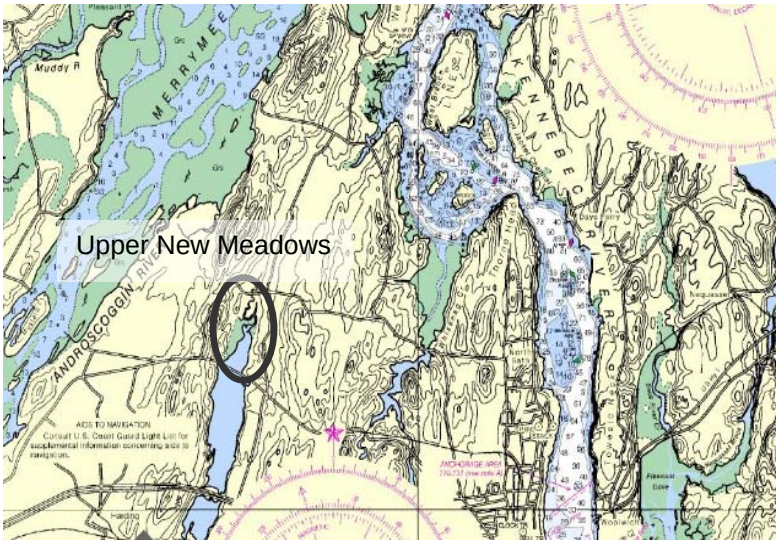
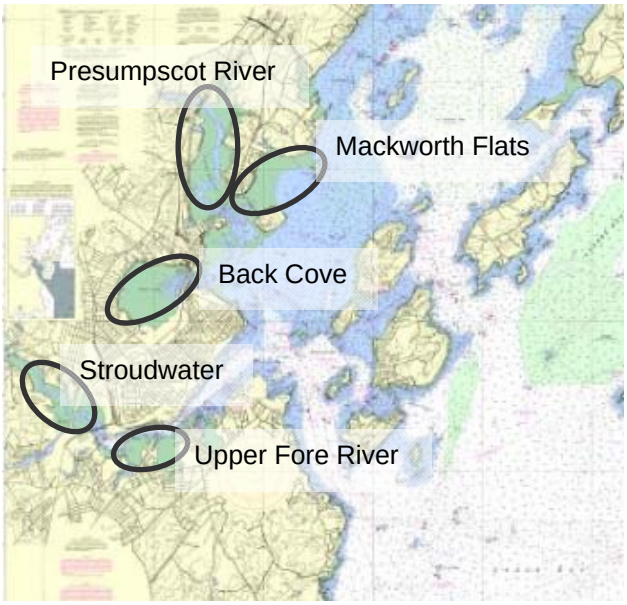
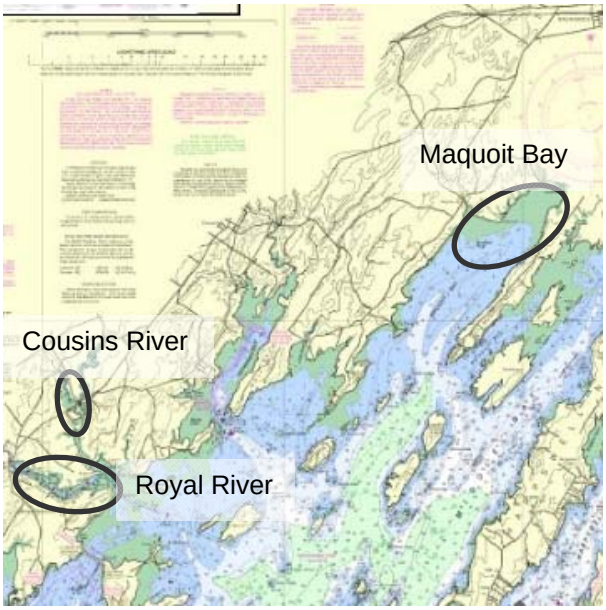
Appendix A. Casco Bay MDIFW-designated shorebird survey sites







Appendix B. Islands and ledge complexes of Casco Bay surveyed in 2010