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SCIENCE IN SUPPORT OF STEWARDSHIP



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Casco Bay Shorebird Monitoring Project

2009 Report

Submitted 1 December 2009

Revised 5 May 2010

Introduction and Purpose

The objective of this project was to initiate a multi-year, collaborative shorebird monitoring program under the auspices of the Casco Bay Estuary Partnership. Project partners are provided in Appendix A. This first year of the project focused primarily on a subset of Casco Bay shorebird areas previously designated by the Maine Department of Inland Fisheries and Wildlife (MDIFW). Although some knowledge exists of shorebird habitat within the Casco Bay region, several years of uninterrupted annual monitoring by this project is anticipated to more accurately characterize shorebird use of distinct sites in this system. Depending on the length of this time series (i.e., the number of uninterrupted survey years), identification of trends in the use of given areas by individual shorebird species may also be possible. These data can inform the development of adaptive management/conservation strategies that promote resilience of intertidal communities, which are particularly vulnerable to climate change-induced environmental shifts (Galbraith et al. 2005; Durrel et al. 2006).

Methods

Site Selection

As a result of discussions with MDIFW shorebird biologist Lindsay Tudor, several state-designated shorebird areas were selected as monitoring sites for their relative importance to shorebirds in the Casco Bay region. Monitoring sites included the following MDIFW shorebird staging areas: Upper New Meadows River, Maquoit Bay, Cousins River marshes, Royal River, Lower Presumpscot River, Back Bay, Mackworth Island Flats, Upper Fore River, and Stroudwater River (Appendix B). In addition to these sites, a subset of Casco Bay islands was scouted by US Fish and Wildlife Service (USFWS) vessel (operated by Robert Houston, USFWS) during one high tide to identify the presence of important roosting areas.

Timing and Location of Observations

Prior to surveys of state-designated shorebird areas, the Project Leader (Biological Conservation) performed field visits to confirm access and site conditions at each shorebird area. The survey methodology and protocol for these 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 for our needs, requiring surveys once in July between the 11th and 31st, twice in August, twice in September and once in October before the 15th. Field crew maintained at least one week between surveys of the same shorebird area and attempted on several occasions to coordinate monitoring of adjacent sites simultaneously to increase our understanding of whether multiple areas are servicing the same group of birds.

Surveys were often scheduled in the morning, because many species initiate night migrations in the afternoon. In this first year of the project, surveyors were asked 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. Surveyors used their own knowledge of local conditions and notes from previous surveys to determine when and where to establish points. Most effort focused on the portions of each shorebird site that offered feeding habitat, because these areas supported the greatest densities and diversity of readily observable birds. Several surveys were also devoted to evaluating shorebird use of designated roosting areas. Other recommendations for field crew included avoidance backlighting of shorebirds during observations and re-scheduling surveys when high winds or heavy rain were likely to introduce undesirable variability into surveys.

During this first year of the monitoring project, we also sought to investigate the potential for roosting habitat that islands and ledges in Casco Bay might provide. On 3 September 2009, we scouted 17 islands and ledges by boat within 2-2.5 hours of high tide. These surveys were conducted with assistance from USFWS, particularly Stewart Fefer and Robert Houston of the Gulf of Maine Program.

Observations

Observations were recorded on the data sheets provided to field crew (Appendix C). 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 actual counts unfeasible. In such instances, systematic estimates were made, where one or more portions of a flock were counted and that number was then extrapolated over the rest of the flock where bird densities of the same species or type appeared similar to the sample that was originally counted. At other times, birds could not be identified to species, usually due to the distance to birds, which interfered with identification of necessary diagnostic features. For instance, the smallest species of the genera *Calidris* (6-7.5 in. total body length), which include the least, semipalmated, and western sandpipers, present a particular identification challenge when being viewed at great distances. When identification to species is not possible, these species are collectively called “peeps”.

Along with counts/estimates, surveyors also documented the timing of notable bird movements such as ingress/egress. Along with each day’s data sheet/s, surveyors provided an annotated map of their shorebird area that indicated the locations of relatively large bird aggregations and observation sites.

Quality Assurance and Data Handling

Surveyors were asked to review data sheets for missing/erroneous entries immediately following each survey. The Project Coordinator reviewed incoming data

sheets to identify any discrepancies between filed procedures being used and the designated field protocol. After data entry was complete, data sheets corresponding to one or more surveys at each monitoring site were compared against keyed data by the Project Coordinator to ensure the accuracy of data entry. Data were summarized to provide a baseline for subsequent year's surveys.

Results and Discussion

We conducted shorebird monitoring surveys 23 July-14 October 2009. Overall, early-mid season (through August) conditions were marked by high water that required surveyors to reevaluate the optimal timing of surveys as the season progressed. Bird numbers were also slow to increase at most sites and appeared depressed based on our surveyors' local experience. All shorebird feeding areas but one were surveyed six times during the monitoring season. One site, Mackworth Flats, was surveyed four times. Observations obtained during several additional survey visits were not incorporated into the data because onshore winds and astronomically high tides created high water conditions that were not representative of the norm.

Results of feeding and roosting surveys are provided in Tables 1-4. At 1,639 individuals observed, semipalmated sandpipers (*Calidris pusilla*) ranked highest in abundance among birds identified to species (Table 1). Black bellied plover (*Pluvialis squatarola*), semipalmated plover (*Charadrius semipalmatus*), greater yellowlegs (*Tringa melanoleuca*) and least sandpiper (*Calidris minutilla*) comprised the most abundant species. At 3,693 individuals, the taxonomic group having greatest abundance was the so-called "peeps", the small calidrid sandpipers (such as the semipalmated and least) that had

Table 1. Shorebirds observed at Casco Bay sites during July 23-October 14, 2009 surveys of shorebird feeding areas.

| | Upper New Meadows | Maquoit Bay | Royal River | Presumpscot River | Mackworth Flats | Back Cove | Stroudwater River | Upper Fore River | Total |
|------------------------|----------------------|----------------|-------------|----------------------|--------------------|-----------|----------------------|---------------------|-------|
| Black-bellied plover | 0 | 155 | 17 | 118 | 0 | 83 | 0 | 21 | 394 |
| Semipalmated plover | 0 | 53 | 74 | 9 | 259 | 90 | 27 | 1 | 513 |
| Killdeer | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 |
| Greater yellowlegs | 7 | 85 | 14 | 7 | 0 | 96 | 1 | 6 | 216 |
| Lesser yellowlegs | 0 | 33 | 6 | 3 | 1 | 2 | 3 | 2 | 50 |
| Yellowlegs spp. | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 9 |
| Solitary sandpiper | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Willet | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| Spotted sandpiper | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 5 |
| Ruddy turnstone | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Semipalmated sandpiper | 2 | 130 | 237 | 308 | 47 | 656 | 259 | 0 | 1639 |
| Western sandpiper | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Least sandpiper | 25 | 60 | 29 | 1 | 1 | 18 | 13 | 0 | 147 |
| White-rumped sandpiper | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 2 |
| Baird's sandpiper | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Pectoral sandpiper | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Peep spp. | 0 | 0 | 307 | 2665 | 0 | 0 | 719 | 2 | 3693 |
| Dunlin | 0 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 18 |
| Short-bill. dowitcher | 0 | 76 | 0 | 13 | 2 | 1 | 0 | 1 | 93 |
| Dowitcher spp. | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| | 36 | 627 | 688 | 3125 | 310 | 951 | 1023 | 33 | 6793 |

Table 2. Non-shorebird species observed at Casco Bay sites during July 23-October 14, 2009 surveys of shorebird feeding areas.

| | Upper New Meadows | Maquibit Bay | Royal River | Presumpscot River | Mackworth Flats | Back Cove | Stroudwater River | Upper Fore River | Total |
|--|----------------------|-----------------|-------------|----------------------|--------------------|-----------|----------------------|---------------------|-------|
| Common loon | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 0 | 3 |
| Double crested cormorant ^a | 0 | 0 | 3 | 30 | 0 | 14 | 85 | 52 | 184 |
| Great-blue heron | 1 | 0 | 33 | 7 | 6 | 12 | 9 | 9 | 77 |
| Great egret | 1 | 0 | 2 | 1 | 1 | 0 | 0 | 1 | 6 |
| Snowy egret | 0 | 31 | 10 | 13 | 3 | 31 | 0 | 5 | 93 |
| Black-crowned night heron | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Glossy ibis | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| Canada goose | 0 | 0 | 0 | 2 | 0 | 0 | 12 | 0 | 14 |
| Horned grebe | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 |
| Red-necked grebe | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| Mallard | 0 | 0 | 26 | 0 | 0 | 8 | 6 | 0 | 40 |
| American black duck | 0 | 0 | 20 | 1 | 11 | 231 | 40 | 172 | 475 |
| American black duck x mallard | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 |
| Green-winged teal | 0 | 0 | 0 | 0 | 11 | 7 | 0 | 0 | 18 |
| Surf scoter | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 17 |
| Common eider ^a | 0 | 0 | 0 | 0 | 0 | 40 | 2 | 45 | 87 |
| Bufflehead | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 |
| Hooded merganser | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Red-breasted merganser | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 7 |
| Osprey | 0 | 0 | 2 | 4 | 3 | 12 | 1 | 1 | 23 |
| Coopers hawk | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| Red-Tailed Hawk | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 |
| Bald eagle | 0 | 0 | 6 | 2 | 0 | 0 | 0 | 0 | 8 |
| Peregrine falcon | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Bonaparte's gull | 0 | 0 | 0 | 57 | 61 | 9 | 0 | 0 | 127 |
| Laughing gull | 0 | 0 | 0 | 0 | 4 | 3 | 0 | 0 | 7 |
| Ring-billed gull ^a | 0 | 0 | 42 | 471 | 208 | 1 | 902 | 294 | 1918 |
| Herring gull ^a | 0 | 0 | 5 | 12 | 0 | 0 | 67 | 288 | 372 |
| Greater black-backed gull ^a | 0 | 0 | 1 | 2 | 0 | 0 | 3 | 6 | 12 |
| Common tern | 0 | 0 | 6 | 0 | 10 | 10 | 0 | 0 | 26 |
| Black guillemot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Belted kingfisher | 0 | 0 | 2 | 1 | 1 | 0 | 1 | 0 | 5 |
| American crow | 0 | 0 | 11 | 9 | 0 | 0 | 3 | 11 | 34 |
| Neslon's saltmarsh sparrow | 5 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 10 |
| Savannah sparrow | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

^a Some surveys underrepresented abundance of these species or recorded them as "present" rather than employing counts.

Table 3. Species observed at Casco Bay sites during 1-3 roosting surveys per site, July-September 2009.

| | Cousins River Marsh | Mackworth Flats | Back Cove | Stroudwater River | Total |
|--|---------------------------|--------------------|-----------|----------------------|-------|
| Shorebirds | | | | | |
| Black-bellied plover | 0 | 42 | 0 | 0 | 42 |
| Semipalmated plover | 0 | 0 | 0 | 2 | 2 |
| Greater yellowlegs | 1 | 0 | 0 | 0 | 1 |
| Solitary sandpiper | 1 | 0 | 0 | 0 | 1 |
| Spotted sandpiper | 0 | 0 | 0 | 1 | 1 |
| Semipalmated sandpiper | 0 | 40 | 0 | 1 | 41 |
| Least sandpiper | 8 | 3 | 0 | 15 | 26 |
| Peep spp. | 11 | 0 | 0 | 100 | 111 |
| Other species | | | | | |
| Common loon | 0 | 2 | 0 | 0 | 2 |
| Double crested cormorant | 0 | 20 | 0 | 0 | 20 |
| Great-blue heron | 0 | 2 | 0 | 0 | 2 |
| Great egret | 1 | 1 | 0 | 0 | 2 |
| Snowy egret | 5 | 1 | 2 | 0 | 8 |
| Canada goose | 0 | 1 | 0 | 0 | 1 |
| American black duck | 0 | 4 | 0 | 0 | 4 |
| Green-winged teal | 0 | 1 | 0 | 0 | 1 |
| Common eider | 0 | 38 | 0 | 0 | 38 |
| Hooded merganser | 0 | 8 | 0 | 0 | 8 |
| Osprey | 0 | 4 | 0 | 0 | 4 |
| Bonaparte's gull | 0 | 1 | 0 | 0 | 1 |
| Laughing gull | 0 | 2 | 0 | 0 | 2 |
| Ring-billed gull ^a | 0 | 33 | 0 | 0 | 33 |
| Herring gull ^a | 0 | 17 | 0 | 0 | 17 |
| Greater black-backed gull ^a | 0 | 0 | 0 | 0 | 0 |
| Common tern | 0 | 12 | 0 | 0 | 12 |
| Black guillemot | 0 | 2 | 0 | 0 | 2 |
| Belted kingfisher | 0 | 2 | 0 | 0 | 2 |
| Neslon's saltmarsh sparrow | 2 | 0 | 0 | 0 | 2 |
| Savannah sparrow | 0 | 1 | 0 | 0 | 1 |

^a To expedite surveys, these common species were often noted as "present" rather than being counted. We use reported numbers here, acknowledging that their abundance is underrepresented in this table.

Table 4. Casco Bay island shorebird roost scouting survey results, 0930-1515 hrs on 3 September 2009. Empty cells indicate the species was not observed.

| | <i>W Stepping Stone</i> | <i>E Stepping Stone</i> | <i>Halfway Ledge</i> | <i>W Brown Cow</i> | <i>Eagle</i> | <i>Little Mark</i> | <i>Turnip</i> | <i>Jaquish Is., ledges</i> | <i>Pond</i> | <i>Ragged</i> | <i>Bold-dick Ledge</i> | <i>White Bull</i> | <i>East Brown Cow</i> | <i>Flag</i> | <i>Malaga (partial)</i> |
|--|-------------------------|-------------------------|----------------------|--------------------|--------------|--------------------|---------------|----------------------------|-------------|---------------|------------------------|-------------------|-----------------------|-------------|-------------------------|
| Shorebirds | | | | | | | | | | | | | | | |
| Semipalmated sandpiper | | 97 | | | | | | | | | | | | | |
| Peep spp. | | | | 1 | 7 | 1 | | | | | | | | | |
| Other bird species | | | | | | | | | | | | | | | |
| Double crested cormorant ^a | | | | P | P | P | | | | P | | P | P | P | |
| Great cormorant | | | | 1 | | | | | | | | | | | |
| Common eider ^a | | P | | | | P | | | | | | P | | | |
| Osprey | | | | | | | | | | | | | | | 2 |
| Bald eagle (immature) | | | 1 | | | | | | 2 | | | | | | |
| Herring gull ^a | | | | | | | | | | P | | P | P | P | |
| Greater black-backed gull ^a | | | | | | | 1 | P | | P | | P | P | P | |
| Marine mammals | | | | | | | | | | | | | | | |
| Harbor seal | | | 142 | | | | | | | | | | | | 20 |
| Minke whale | | | | | | | | | | | | | | | 1 |

^a To expedite surveys, these common species were often noted as "present" rather than being counted. In such cases, a "P" is provided in the table to indicate the presence of these species.

not been identified to species. Driven mainly by calidrid sandpiper abundance, Presumpscot, Stroudwater and Back Cove shorebird areas ranked highest based on total numbers of shorebirds observed at each site. Shorebird species richness was highest in Maquoit Bay, Back Cove, Royal River, and Presumpscot River shorebird areas, with each area supporting 9-11 species. An additional 35 non-shorebird taxa were observed during feeding area surveys, the most abundant species being gulls, waterfowl, and cormorants (Table 2).

In contrast with feeding areas, MDIFW-designated shorebird roosting areas produced relatively few observations, although fewer surveys of roosting areas were conducted than were feeding area surveys (Table 3). Also, roosting birds often assumed the cryptic habit of concealment by rocky or grassy habitat features. This presents challenges that further hinder observations and probably leads to under representation of abundance. For instance, at the Cousins River shorebird area, visual observation of calidrid sandpipers is often obscured by high-marsh vegetation unless field crew approach birds close enough to illicit a flushing response. Obtaining confident estimates of roosting birds at that site and other salt marsh-dominated habitat would likely require a crew walking abreast in simultaneous line transects to flush birds. Vocalizations of concealed birds are often noted at these sites, but the use of calls as a credible index for shorebird abundance has not been investigated.

Scouting results for 15 potential island roost sites (two of the original 17 “islands” were dropped because they were mostly submerged at the time of the survey) demonstrate the presence of few shorebirds during this several-hour event (Table 4). Of those sites, East Stepping Stone Island provided the only observed aggregation of shorebirds, a group of approximately 100 peeps (probably semipalmated sandpipers) in a ledge pocket not much more than a few hundred feet² that was likely soon awash in the rising tide.

Conclusions and Recommendations

Owing to the relatively late arrival of shorebirds during the 2009 season, apparently depressed bird numbers throughout the season, and the high water conditions caused by relentless, early-summer rains, this first year of observations may not be representative of a longer-term trend. However, work accomplished during the 2009 monitoring season provided a solid foundation on which to base subsequent work. For instance, by patterning the behavior (e.g. timing and location of habitat use) of shorebirds at the monitored sites, we anticipate even greater efficiency during subsequent monitoring years.

We also demonstrated relatively high densities of shorebirds using areas near, but outside of, currently mapped shorebird area boundaries. Such was the case for flats at the mouth of the Royal River, which are not included in a nearby MDIFW-mapped shorebird area we surveyed. If subsequent work indicates similar patterns of use, expansion of the mapped shorebird area is warranted.

The following recommendations are offered as ways to improve the value of surveys and field crew hours in the 2010 monitoring season:

1. Allot more effort to monitoring shorebird use of MDIFW-designated roosting areas to better refine our understanding of their value.
2. Perform multiple surveys of potential roosting islands to achieve a heightened level of confidence as to their value to shorebirds.
3. Increase the frequency of observations per month at each shorebird site to improve the resolution and confidence of conclusions based on monitoring.

Acknowledgements

We thank project partners for their support: Stew Fefer, Bob Houston, and Lindsay Tudor in particular. Access to private lands has been important to our work and we gratefully acknowledge the hospitality of the Otis and the Pfeifly families. Bob Humphrey, David Ladd, and Derek Lovitch provided their expert field ornithology skills as part of our regular field crew.

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Appendix A. Cooperating Project Partners

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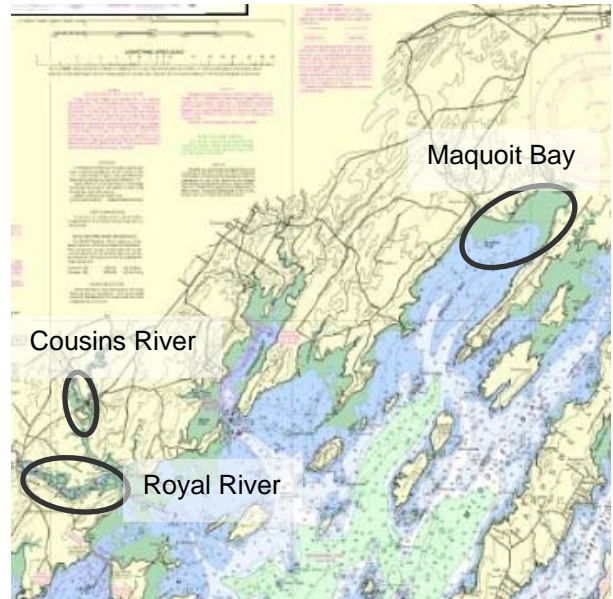
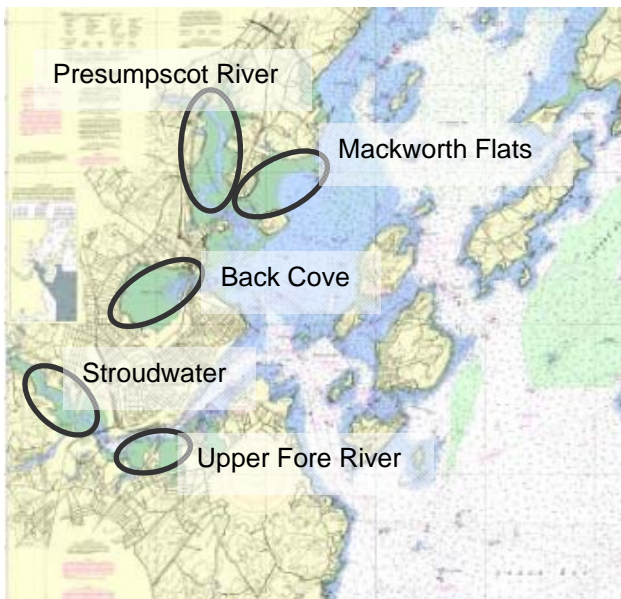
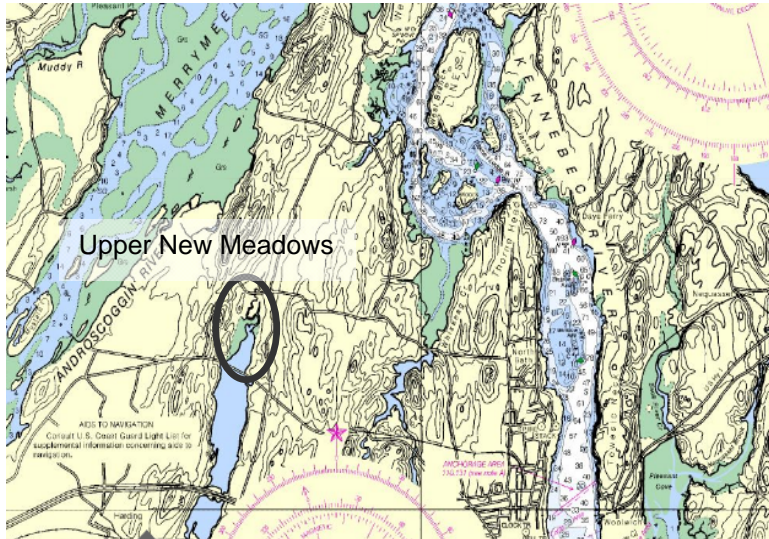
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Appendix B. 2009 Casco Bay MDIFW-designated shorebird survey sites



Appendix D. Casco Bay Shorebird Monitoring Project data sheet

