



Avian Use of Northeast Creek and Bass Harbor Marsh in Acadia National Park 2001-2002

Natural Resource Report NPS/NETN/NRR—2009/144



ON THE COVER

Bass Harbor Marsh, Acadia National Park

Photograph by: Courtesy of Acadia National Park

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Paul U. Wilson
National Park Service
Acadia National Park
P.O. Box 177
Bar Harbor, Maine 04609

Jerry R. Longcore
U.S. Geological Survey
Biological Resources Division
U.S.G.S. Patuxent Wildlife Research Center
5768 South Annex A
Orono, Maine 04469–5768

John R. Sauer
U.S. Geological Survey
Biological Resources Division
U.S.G.S. Patuxent Wildlife Research Center
1210 Beech Forest Road
Laurel, Maryland 20708–4039

Karen Anderson
National Park Service
Acadia National Park
P.O. Box 177
Bar Harbor, Maine 04609

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Executive Summary

We surveyed avian communities of two estuarine-influenced wetlands, Bass Harbor Marsh (BHM) and Northeast Creek (NEC), located on Mount Desert Island, Maine. We ascertained community composition of avifauna, relative abundance of species, and seasonal distribution of species in these wetlands during 2001 and 2002. Our intent was to determine which marsh habitats were especially valuable for species diversity, which supported high breeding densities, and which supported regionally uncommon species. Our findings address management interests and identify those areas of these wetlands that are the most ecologically valuable as bird habitat. Some unprotected, but quality wetland habitat areas may be appropriate for acquisition by Acadia National Park (ANP), National Park Service (NPS).

Our surveys located 152 species of which 123 species were located in Bass Harbor Marsh and 135 were recorded in Northeast Creek. Sixty-two species were determined to be confirmed, possible, or probable breeders, whereas 90 were non-breeders. Bass Harbor Marsh contained 47 confirmed, possible, or probable breeding species and 75 non-breeding species, and Northeast Creek contained 53 confirmed, possible, or probable breeding species and 82 non-breeding species. Species richness of breeders was not different between BHM and NEC for 2001 but was different in 2002. Species richness was significantly higher in NEC as compared with BHM during 2002. Similarly, species richness was significantly higher in NEC in 2002 as compared with NEC in 2001. Maximum diversity and evenness were similar between years and marshes. Based on point count data, we present relative abundance of species for both marshes. Ascertainment of breeding was primarily based on data collected during point count surveys unless nests were located. In both wetlands we detected greater density and diversity of breeding species in forested habitat (i.e., forested wetland and forested upland) and shrub-dominated habitats than species breeding in other wetland habitats. Counts of individual breeders were high in grassland-like, forested, and shrub-dominated habitats. Regionally common wetland breeding species (e.g., Common Yellowthroat (*Geothlypis trichas*), Yellow Warbler (*Dendroica petechia*), Swamp Sparrow (*Melospiza Georgiana*)) were detected in higher abundance than regionally less common wetland breeders (e.g., Virginia Rail (*Rallus limicola*), Pied-billed Grebe (*Podilymbus podiceps*)). Regionally uncommon species nesting in the wetlands included Least Bittern (*Ixobrychus exilis*), Nelson's Sharp-tailed Sparrow (*Ammodramus nelsoni*), and Northern Harrier (*Circus cyaneus*). The Virginia Rail was a possible breeder. Duck productivity was lower than expected, although American Black Duck (*Anas rubripes*) and Mallard (*Anas platyrhynchos*) were common nesting species. Two species listed as Maine state or federal endangered or threatened birds were recorded during the survey. The Bald Eagle (*Haliaeetus leucephalus*), a Maine state endangered and federally threatened species, was a rare species in BHM and an uncommon species in NEC. Peregrine Falcon (*Falco peregrinus*) (Maine state endangered and federally delisted) was a rare species in NEC.

Many non-breeding species used both wetlands for diverse activities, including foraging, migration stopover, and roosting. Arrival dates of migrant species in Mount Desert areas were similar to that reported for other coastal Biophysical Regions of Maine (Wilson et al. 1997), but varied between years. Both marshes contained similar numbers and diversity of migratory songbirds and raptors. Considerable variation existed between marshes and between years for abundance and diversity of use by migratory waterfowl. BHM contained consistently greater and

more diverse migratory shorebird use than NEC, reflecting the greater area of salt marsh panne habitat.

Birds observed were grouped into guilds based on similar habitat preferences. More loons, geese, ducks, wading birds, and shorebirds were seen at BHM than NEC. More passerines and near-passerines (those species taxonomically close in relation to passerine species) were observed at NEC than BHM.

Composition of the avian community in these marshes revealed minor between-year variations. We believe that our surveys reliably reflect avian species that seasonally used these marshes in 2001 and 2002 and probably are representative of the avian communities that will continue to use these wetlands.

Acknowledgments

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Many landowners gave us either verbal or written permission to access their property; without their generosity we would have been unable to accurately assess the abundance and diversity of birds that inhabit these wetlands. W. Pettegrow and P. Pinkham granted access to their lands near Bass Harbor Marsh. R. and J. Doliver, Downeast Audubon (conveyed via J. Gormley), J. D. Hopkins, E. King, H. and M. Owen, and Talaria Company, LLC granted access to their land near Northeast Creek. We thank them all.

Also, we thank Cornell Laboratory of Ornithology, Library of Natural Sounds for creating the broadcast call tape.

Introduction

Knowing the status of natural resources within national parks is essential to the National Park Service for its personnel to manage and protect these resources (Fancy 1999). In 1991, the National Park Service (NPS) initiated a program designed to implement the inventory and monitoring (I&M) of natural resources throughout agency lands (Williams 1999). In 1998, the United States Congress, in Title II of the National Parks Omnibus Management Act, directed the NPS to establish an inventory and monitoring program (Williams 1999). The goals were to establish baseline information about park resources and provide information about long-term trends of NPS resources.

Resource managers at Acadia National Park needed information on presence and abundance of avian species in two marshland habitats (Bass Harbor Marsh, Northeast Creek; hereafter BHM and NEC) to assist in either decision-making related to land acquisition or for management (i.e., inventory and monitoring). Usually, composition of avian communities can be inferred by using presumed associations of species within different habitat types. Determining actual composition of avian communities, however, requires surveys designed to answer specific questions. Surveys seek to answer questions about abundance, diversity, and distribution of breeding species, seasonal presence and habitat use by species, and presence of rare or difficult-to-detect species. Such surveys are necessary because a permanent boundary for Acadia National Park was established in 1986 (Public Law 99-420—Sept. 25, 1986), and all new conservation easements to be added to the park must possess important ecological characteristics, among other attributes.

To obtain data to describe avian communities in BHM and NEC, we surveyed for migratory and breeding avian species in these marshes and adjacent uplands during 2001 and 2002. Survey methods we used are suitable for long-term monitoring and compatible with other nationwide bird surveys.

Study objectives were: (1) to determine distribution of breeding birds and their relative abundance, density, and diversity in associated marshes of BHM and NEC, (2) to record seasonal avian use of both marshes during migration and for other non-breeding use, (3) to identify any uncommon or special-interest bird species observed in these marshes and habitats important to these species within the marshes, and (4) to relate distribution of groups of bird species (guilds) to structural vegetation composition. We undertook two additional tasks. We associated spatial distribution of breeding birds with specific habitat types, which have been delineated for these sites on existing GIS maps. And, we compared random (2001) versus non-random (2002) point counts of breeding birds.

Study Areas

We surveyed habitats associated with Bass Harbor Marsh and in Northeast Creek on Mount Desert Island (MDI), Hancock County, Maine (Figure 1). These two marshes encompass approximately 310 ha (766 acres) within the legislated fee boundary of the park; of this area, only about 274 ha (677 acres) were owned by the NPS at the time of the study.

Bass Harbor Marsh is located on the southern edge of MDI (approximate center: UTM, 552232 E, 4901135 N, NAD83 [meters]) in the towns of Southwest Harbor and Tremont. The study area was approximately 88 ha (217 acres); 61 ha (151 acres) fell within the legislated fee boundary of the park, of which 52 ha (128 acres) were owned by the NPS at the time of the study.

Bass Harbor Marsh is an estuarine system with riverine and palustrine components (Cowardin et al., 1979). The creek channel at the Route 102 bridge outlet was ~12.5 m (41 feet) wide but narrowed to <2 m (~7 feet) at the inlet and at low tide is generally shallow (<2–4 m) (~7–13 feet) throughout its length. This marsh is strongly tidally influenced and contains a regionally large salt marsh and many salt pannes. In addition to salt marsh, scrub–shrub is an abundant habitat type along wetland borders. Included within the Bass Harbor Marsh study site is an adjacent but disjunct freshwater wetland. This small wetland, a distinct, palustrine freshwater cattail (*Typha sp.*) marsh impounded by beaver (*Castor canadensis*), is not affected by tidal flow and contains a substantially different freshwater habitat from the rest of Bass Harbor Marsh.

Northeast Creek is located on the northwest side of MDI (approximate center UTM 554697 E, 4918418 N NAD83 [meters]) in the town of Bar Harbor and covers 222 ha (~549 acres), all of which is within the legislated boundary of ANP. A variety of ownership exists for this wetland, including some land owned by ANP. Northeast Creek is an estuarine wetland with riverine and palustrine components (Cowardin et al., 1979). The tidally influenced creek channel at the Route 3 bridge outlet is ~10 m (~33 feet) wide but narrows to <2 m (~7 feet) at the inlet and is generally shallow (<2 m) (~7 feet) throughout its winding length. A relatively small area of salt marsh and scattered salt pannes occupy the wetlands near the channel. The dominant shoreline vegetation is scrub–shrub plants that transition into coniferous or hardwood forests. A portion, ~57 ha, (~141 acres) of the wetland has characteristics of a raised peatland (Davis and Anderson 2001). Plants in this area include *Sphagnum* spp. and bog shrubs (e.g., *Chamaedaphne calyculata*, *Kalmia sp.*, *Myrica gale*, *Ilex verticellata*) as well as scattered black spruce (*Picea mariana*).

Both marshes are estuarine systems with a riverine component. The hydrological heterogeneity within the two marshes supports diverse wetland vegetation communities and diverse avian communities. The vegetation provides varied structural habitats for avian breeding and foraging. As an example of how wetland hydrology affects marshbird community composition, consider the Bass Harbor Marsh *Spartina patens* marsh and salt pannes. Here, daily tidal saltwater inflow and outflow support the plant communities and salt panne mud flats. The salt pannes seasonally provide habitat for avian communities including migrating shorebirds and ducks, and the surrounding salt marsh provides habitat for breeding Nelson's Sharp-tailed Sparrows and Savannah Sparrows (*Passerculus sandwichensis*), and foraging Northern Harriers. Another example of how different hydrologic conditions support different vegetation and avian

communities is found within a freshwater pond adjacent to Bass Harbor Marsh. Here, dams created by beavers flood the wetland, creating hydrologic conditions that support freshwater cattails, shrubs, and *Sphagnum* spp. moss growing in and around the freshwater pond. These plants provide foraging opportunities and/or breeding substrates for American Black Duck, Mallard Duck, and Wood Duck (*Aix sponsa*), Least Bittern, and passerine species, including Common Yellowthroat, Swamp Sparrow, Eastern Kingbird (*Tryannus tryannus*), and Red-winged Blackbird (*Agelaius phoeniceus*).

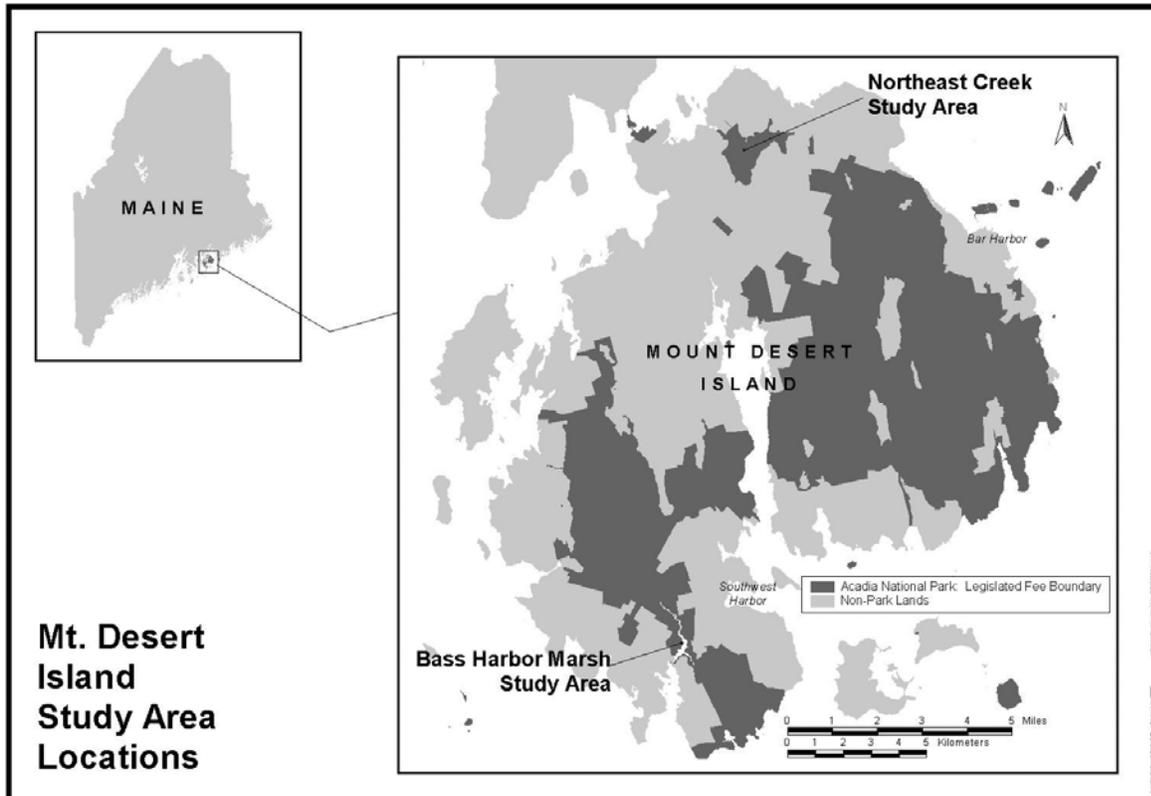


Figure 1. Location of Bass Harbor Marsh and Northeast Creek study areas on Mount Desert Island, Maine, 2001-2002.

Methods

We conducted surveys between April – October 2001 and March – August 2002. Survey methods varied depending on our objective and on time of year, and what species of birds we expected to see. We surveyed within the legislated boundary as specified by ANP, but included additional area of a ~100-meter (328 feet) margin into the surrounding upland. Examples of data sheets and observation codes for all survey methods are shown in Appendices A – D.

Point Count Surveys

Point count surveys can be used to sample bird populations to make inferences about population size, species composition, and population changes that may occur over time. We used fixed-radius point count surveys that entail counting all birds seen and heard within a predetermined size plot and for a predetermined length of time. Point counts serve as indices of abundance because detection rates are unknown and they do not estimate absolute population densities. Our point count surveys lasted for five-minutes and sampled a 250-meter (820 feet), fixed-diameter circle. We recorded data (Appendix B) on species, number detected, detection method (i.e., visual or aural), group proximity (i.e., within either 0–50 m or 51–125 m), time interval within which a bird was located (i.e., 1–3 min, 4–5 min), and habitat type in which each bird was located based on Acadia National Park vegetation maps.

We conducted three sets of point count surveys in Northeast Creek and in Bass Harbor Marsh (Figures 2–5). In 2001, each survey sampled a different set of 10 to 14 random points, whereas in 2002 the same set of points was used for each survey. In 2001 at Northeast Creek, Survey One sampled 14 points, Survey Two sampled 14 points, and Survey Three sampled 13 points. In 2002 at Northeast Creek, all surveys sampled 14 points. In 2001 at Bass Harbor Marsh, Survey One sampled 11 points, Survey Two sampled 10 points, and Survey Three sampled 12 points. In 2002 at Bass Harbor Marsh, all surveys sampled 12 points. In 2001 we generated 100 potential sampling plots for each marsh by using Acadia National Park's Geographic Information System (GIS). We randomly selected plots for each survey so that none of the 250-meter circles overlapped. Many plots of the point count surveys included forested habitats, because the 250-meter diameter circular plots covered parts of the adjacent uplands and forested wetlands. We used a Global Positioning System (GPS) to set center points in the field and we marked them with numbered stakes. In 2002, non-random point count surveys were conducted in both marshes with the same methodology as in 2001. We placed non-random plots along the primary water channels in both marshes in an effort to use survey methods typical (and less time/effort intensive) of how bird surveys are often conducted. Traveling by canoe, we established plots close to the water channel, but ensured that plot circles did not overlap.

Our surveys started at the first point thirty minutes before sunrise and continued until four hours after sunrise. The visitation order to points was not considered important within a survey. In 2001 we needed to complete three or four points of a survey the following morning because the additional 15 minutes per point used for the concomitant broadcast call survey prevented us from finishing within the protocol time period. We conducted each of the three random and the three non-random surveys following the same order each time. We conducted surveys in both

marshes, starting in mid-May; the following two surveys were separated by a minimum of ten days and concluded by June 30th. We did not conduct surveys during rain or in wind that exceeded four on the Beaufort Scale.

Broadcast Call Surveys

In conjunction with the 2001 point count surveys, we conducted broadcast surveys following the methods of Gibbs and Melvin (1993). Immediately after completing a station of the point count survey, calls of 10 wetland-dependent species were played. We surveyed for secretive, difficult-to-detect species and those species whose detectability can be enhanced by broadcasting their primary songs. Examples include Sora (*Porzana carolina*), Virginia Rail, Least Bittern, and Sedge Wren (*Cistothorus platensis*). For consistency with methods of previous investigators (Maine Department of Inland Fisheries and Wildlife, T. Hodgman - Biologist, unpubl. data, 1999), we included songs of Yellow Rail (*Coturnicops noveboracensis*), Green Heron (*Butorides virescens*), American Bittern (*Botaurus lentiginosus*), Common Moorhen (*Gallinula chloropus*), American Coot, and Pied-billed Grebe in our broadcasts. At each survey point within both marshes we broadcast all songs of these 10 species in the order of Least Bittern, Yellow Rail, Virginia Rail, Sora, Green Heron, Sedge Wren, American Bittern, Common Moorhen, American Coot (*Fulica americana*), and Pied-billed Grebe. The tape was sequenced to play primary songs of each species for 30 seconds followed by 30 seconds of silence. Songs were broadcast at 80 decibels and ordered from species with the quietest to the loudest call. The set of 10 playback songs was broadcast one time following each point count. Broadcast order remained the same (softest to loudest call) at each broadcast call survey. We recorded all species responding during song playback as well as all species observed during the passive (point count) listening period. Because we recorded a positive Least Bittern response to a broadcast call survey at the disjunct cattail marsh (we named Two-Moose Pond) in 2001, we repeated the call at this location in 2002.

Quiet Observation Surveys

We conducted quiet observation surveys primarily to detect use of wetlands during migration and Anatidae brooding season. This technique was also useful for observing raptors and some hard-to-detect species (e.g., Virginia Rail and Least Bittern). We conducted quiet observation surveys from commercial tree stands that we placed 10–20 m (~ 33–66 feet) high in trees, which we documented by GPS locations. We placed tree stands to maximize viewing area of the marsh, which allowed us to observe across the entire marsh from most stands. We observed study sites for two-hour periods with morning visits beginning one-half hour before sunrise and evening visits extended one-half hour after sunset (Longcore et al. 1998). The method of species identification, either aural or visual, was noted. We recorded distance from observer to individual birds when first identified as determined on scaled maps. To avoid double counting of individual birds—an important consideration in bird counts—we based our counts on the greatest number of individuals seen at one time and we compared species seen among observers. To assess habitat usage, we identified and noted the first substrate (GIS vegetation types of ANP) with which the bird was associated, unless the bird was flying. If a bird was flying, we identified, if possible, the substrate on which the bird landed. Also, we noted the group type, behavior, time observed (based on 24-hr clock), breeding indications (e.g., territorial behavior, copulation, feeding young), wind velocity, temperature, cloud cover, and precipitation.

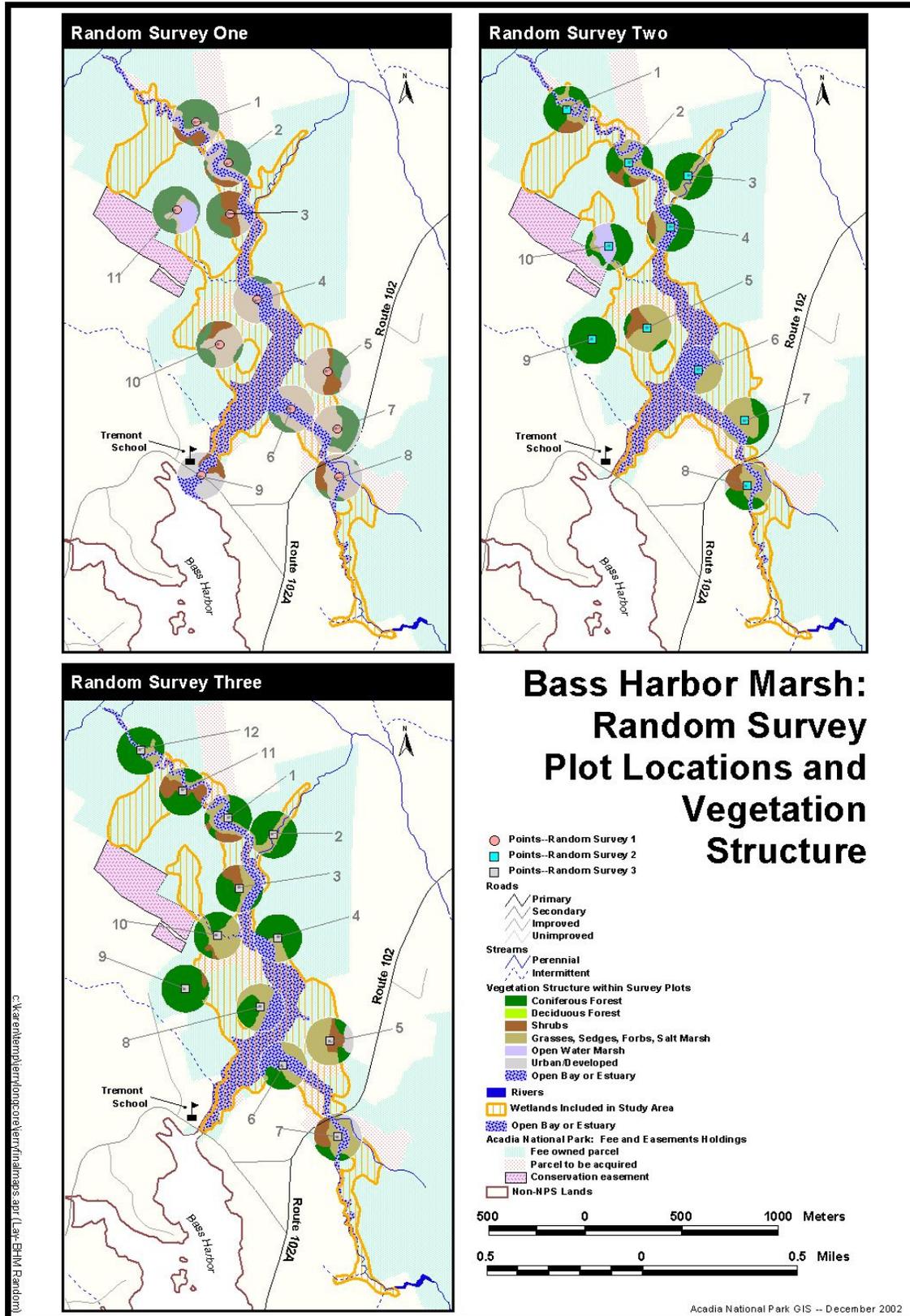


Figure 2. Locations of random point count survey plots and vegetation structure in Bass Harbor Marsh, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

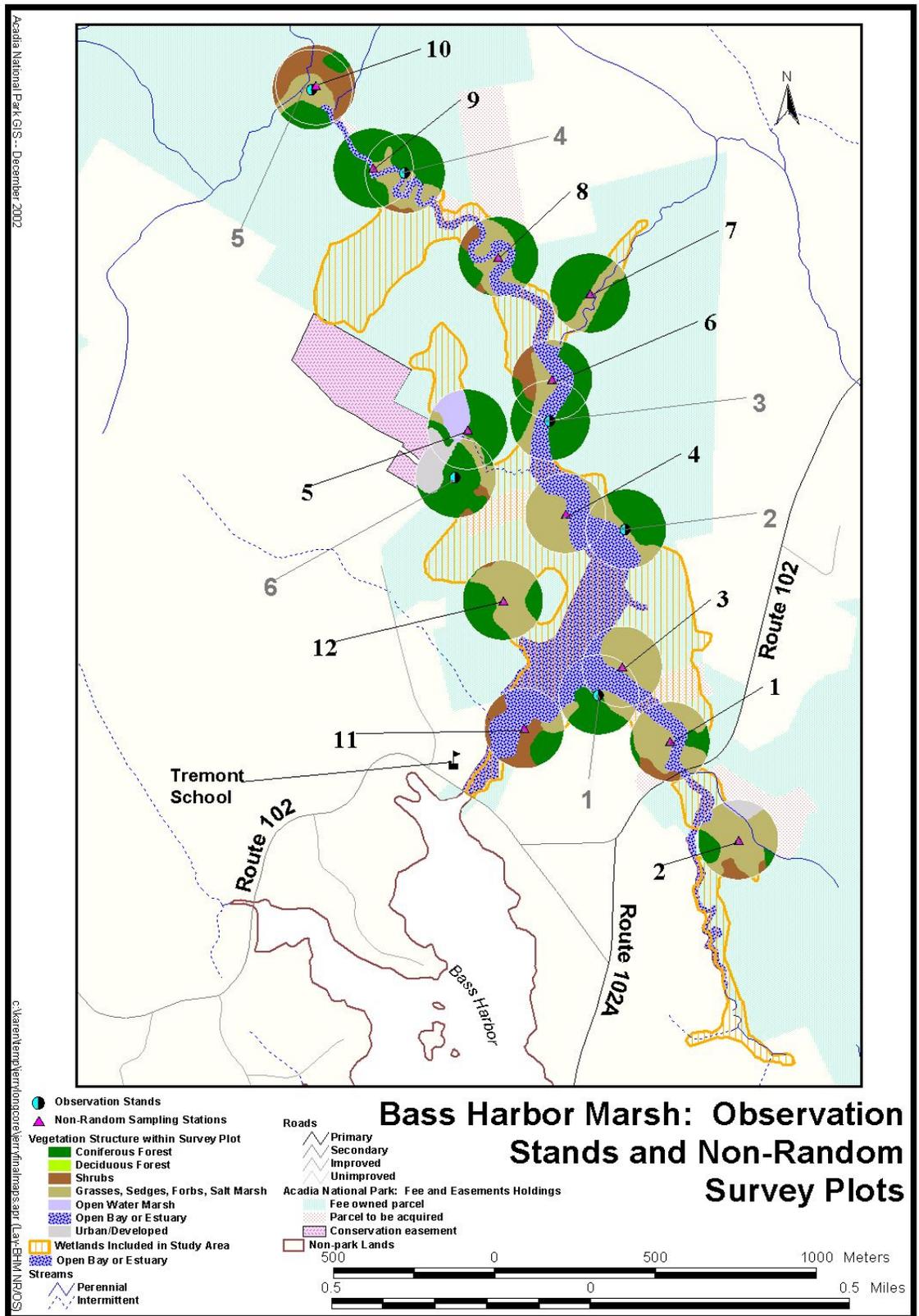


Figure 3. Locations of observation stands and non-random survey plots in Bass Harbor Marsh, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

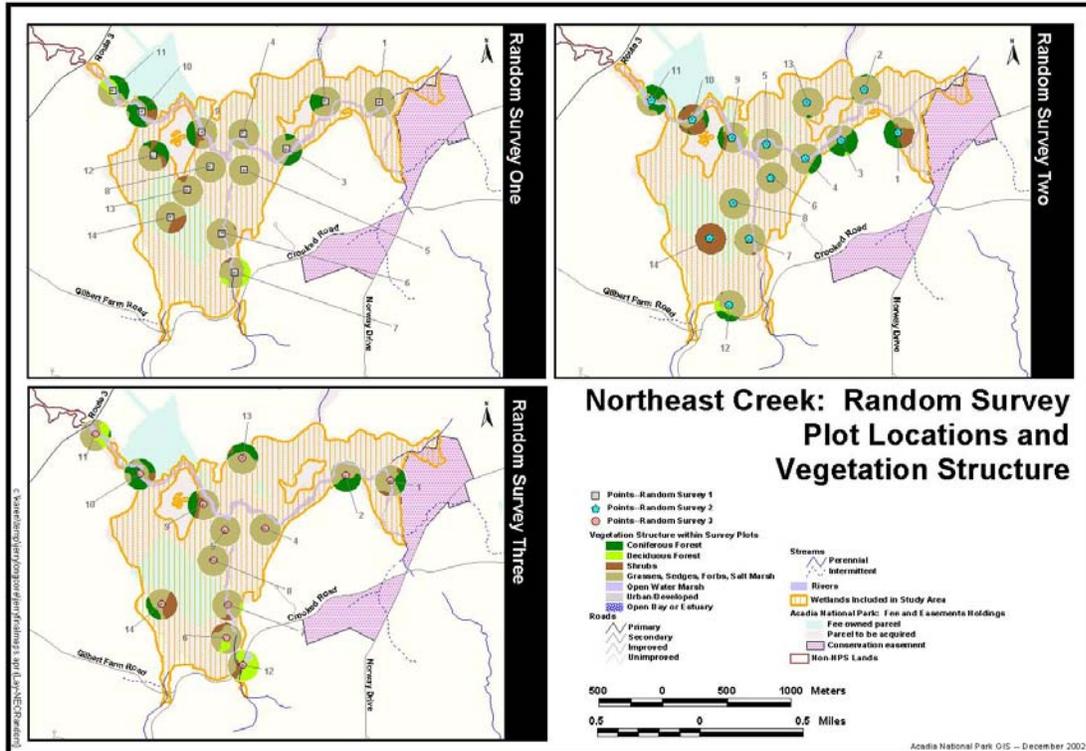


Figure 4. Locations of random point count survey plots and vegetation structure in Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

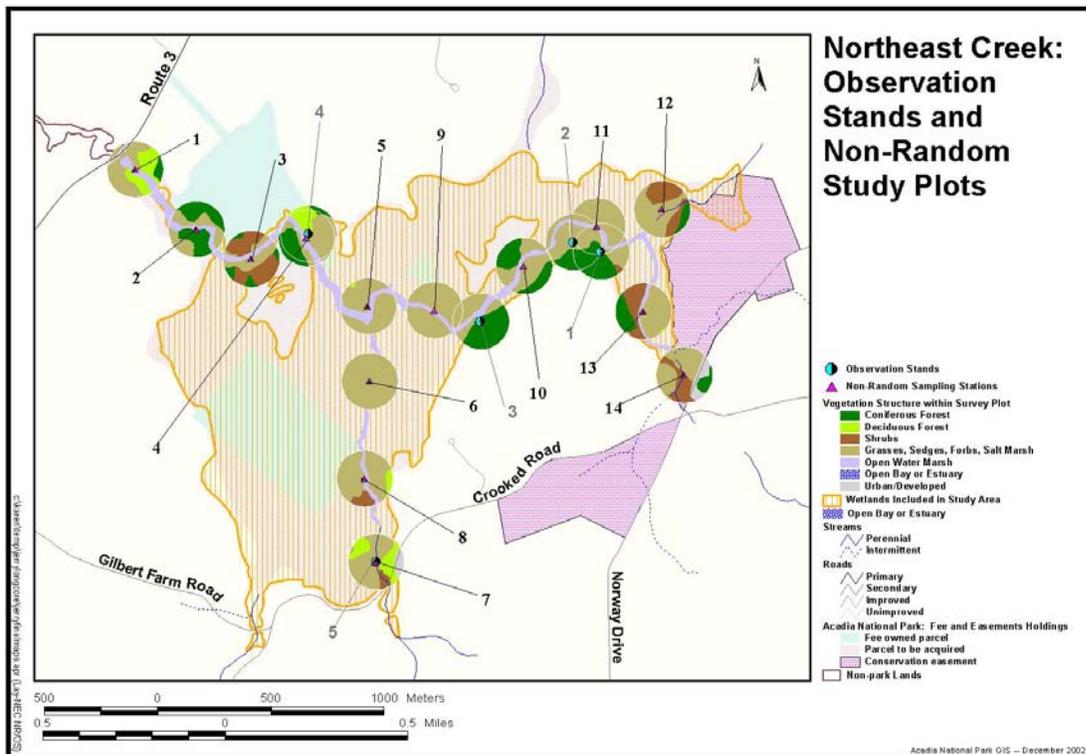


Figure 5. Locations of observation stands and non–random point count survey plots in Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Incidental Observations

We considered an incidental observation as one made any time we were counting and identifying birds in the field but not engaged in other standardized surveys. We tried to cover a broad spectrum of habitat types within the two marshes and to survey at times and places that were not being covered by other surveys. The uses of incidental observations were (1) to determine dates of occurrence for all bird species that used the marshes, (2) to determine the maximum group size for all species found in a given day, and (3) to ensure that we were surveying for all bird species, at all locations, and at most times of day. We conducted incidental observations in all weather conditions, including snow, rain, and high wind when other surveys could not be conducted because of extreme variability in detecting species. In an effort to avoid double counting of individual birds, we did not attempt to measure total abundance of bird species observed at the survey site for each day. We used scaled vegetation maps to link location where a bird species was found to vegetation at that location. This allowed us to make associations between bird location and habitat type inhabited. These maps also allowed us to estimate distances accurately using a ruler and the scale provided on the map. We chose to use incidental observations as a survey method to provide information on spring and fall migration periods. We examined closely those habitats that we expected to be favorable for harboring certain groups of birds (e.g., salt marsh vegetation for shorebirds, the ecotone between marsh and upland for warblers and other passerines, scrub–shrub vegetation for sparrows, and open water for ducks and waders).

Reconnaissance for Raptors

In early spring we examined surrounding uplands and searched marsh areas wherever we believed a possibility existed to locate a nesting raptor species. We surveyed for raptors during incidental observations and quiet observation surveys.

Searching for Nests

In conjunction with incidental observations, we searched for nests of breeding birds with a focus on species of conservation concern, such as the Least Bittern and Nelson's Sharp-tailed Sparrow. Searching for nests was both intentional and ancillary to other fieldwork and some nests were found by accident. The intention was to document breeding and to ascertain nesting success, especially for species of conservation concern. Information collected about each nest included: identification of species, date, description of the nest and substrate, location, and number of eggs or young. Photographs of nests were obtained for some species. Nests were revisited to determine breeding success, albeit with an emphasis on minimizing disturbance of the breeding process and to avoid attracting predators.

Data Management

Observers recorded data in either field notebooks (i.e., Incidental Observations, Quiet Observations, Raptor Reconnaissance) or directly on printed forms (i.e., Point Count Survey, Broadcast Call Survey). Data were transferred from field notebooks to standard forms by each observer. We created an Access database, as was mandated by NPS. The structure of the database followed that suggested by NPS based on the guidance provided (Anon., 2004). P. Wilson verified all data and codes and entered all data into the Access database. The data in the Access database was then verified with the original paper data sheets, and corrected if necessary, to ensure agreement. The original paper data sheets were retained along with electronic data files.

Data Summaries

We summarized data in several ways. First, we present all point count records for each survey by habitat type for all avian species observed. For an overall view of species that used marshes, we prepared tables of weekly occurrence of species observed in each marsh based on all data collected for each year. We present the relationship between a species' activities (i.e., roosting, breeding, foraging) and habitat types. This relationship depicts how species use habitats that they inhabit. We grouped bird species into 7 guilds based mostly on taxonomic classifications. Guilds contained species as follows: (1) loons, geese, ducks, (2) wading birds, (3) raptors, (4) shorebirds, (5) gulls, (6) other non–passerine species, and (7) passerine species (Appendix E, Table 5). We determined avian habitat associations by noting in which habitat type each individual bird was located during each point count survey. The habitat composition of each point was ascertained by grouping GIS analysis of each point from existing vegetation maps of Acadia National Park into structural habitat guilds based on habitat groupings appropriate to avian use of vegetation as structures for nesting and foraging. Based primarily on point counts, we present breeding status, abundance, and frequency of guilds of bird species with data combined for the two marshes.

Data Analysis

For point count survey data we provide an index of relative abundance of individual species, which we determined by comparing total number of individuals of each species divided by the sum of all individuals of all species observed during point counts. Also, we present densities of combined species for habitat types for each year and wetland based on amount of each habitat type sampled during the 3 point count surveys each year (Kus and Beck, 2003). The indices for individual species, however, may be underestimated because detectability may be different among species. Additionally we provide species richness, maximum diversity, and evenness using the Shannon index of diversity (Zar, 1984), although we do not statistically compare these values between marshes or years. The Shannon index of diversity takes into account species richness and evenness. Maximum diversity is a theoretical maximum value allowing comparison of different samples. Evenness compares the distribution of species in an area based on how much all species share dominance. Species richness is a measure allowing comparison of different samples and based on the assumptions that (1) the true species richness is unknown, and, (2) different species differ in their abundance and detectability and thus not all species and individuals are observed. We compared species diversity and evenness between marshes and years using the program CONTRAST based on methods of Sauer and Williams (1989) and written by J.E. Hines and J.R. Sauer (1989). Because measures of diversity provide a limited summary of data (ter Braak, 1968) we applied the SPECRICH program based on methods of Burnham and Overton (1979) and written by J. E. Hines (PWRC) to obtain interpolated values for species richness and standard error for each marsh and year. We used the program CONTRAST to test for differences in interpolated species richness among marshes and years. To evaluate which variable (i.e., wetland, year, habitat type) affected bird abundance most between years and the two wetlands, and to see if interactions existed between these variables, we tested for differences between wetlands, years, and habitat types. We estimated densities of all individuals for each of the 3 surveys and numbers of different species for each survey, and then determined an overall mean for each year and wetland. Based on these data, we used SAS, PROC GLM and PROC UNIVARIATE procedures (SAS, 1989) to evaluate normality of residuals and we log transformed two variables; ALLSP (density of combined individual birds) and GSHSP (density of combined species in grass–sedge–herbaceous vegetative type) and then

we reanalyzed data. The explanatory variables were wetland, year, and wetland*year interaction. We applied univariate and multivariate Repeated Measures Analysis to the same data to test for differences among mean densities for combined individual birds and for combined species. Based on a line plot of data, one type (variable URBAN) was determined to be an outlier and was deleted before reanalysis. With years combined we made pair-wise comparisons among types for each wetland. Thus, our analyses include descriptive analysis of species composition of both marshes, including species richness, relative abundance, maximum diversity, evenness, and densities of birds and different species for habitat types for both marshes each year.

Results

We determined presence of breeding and non-breeding species from early spring to late fall (2001–2002), relative abundance of breeding species between marshes and years, and diversity of species for each marsh. We present timing of surveys by type, location, and year in Bass Harbor Marsh (Figure 6) and Northeast Creek (Figure 7). Although greater coverage was achieved late in 2001 and early in 2002, substantial overlap occurred during the breeding period. Universal Transverse Mercator Grid values for all sampling stations and observation stands are presented in Appendix E, Table 2.

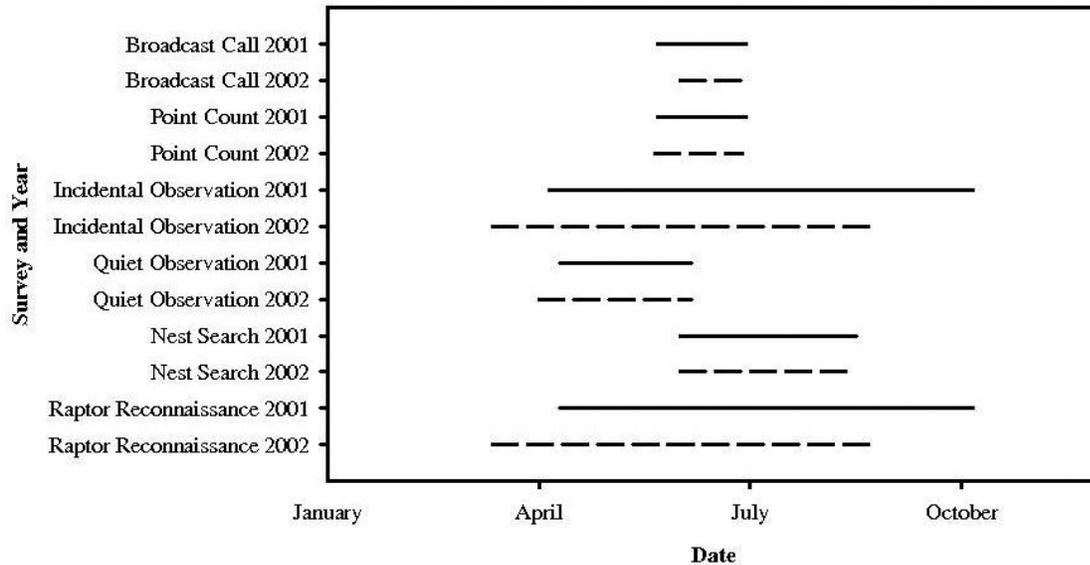


Figure 6. Chronology of avian surveys at Bass Harbor Marsh, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

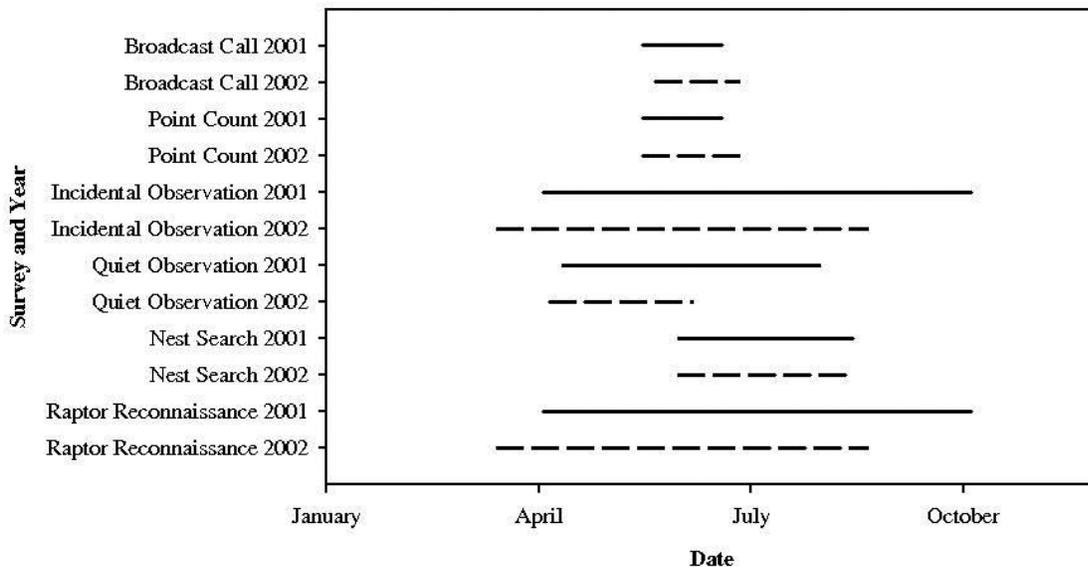


Figure 7. Chronology of avian surveys at Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Our surveys located 152 species of which 123 species were located in Bass Harbor Marsh and 134 were recorded in Northeast Creek. Sixty-two species were determined to be confirmed, possible, or probable breeders, whereas 90 were non-breeders. Bass Harbor Marsh contained 47 confirmed, possible, or probable breeding species and 76 non-breeding species, and Northeast Creek contained 53 confirmed, possible, or probable breeding species and 82 non-breeding species. Some non-breeding species were known to breed locally although not in the study site, whereas others were exclusively using these wetlands for migration stopover. The numbers of detected individuals of each species varied between marshes; this is noted as a relative index of frequency. Various organizations (e.g., Partners-In-Flight, Maine Department of Inland Fisheries and Wildlife) have determined the conservation risks facing bird species that occur in Maine. Conservation rankings note the relative risk facing each species. This ranking can be compared with frequency of occurrence in each wetland to elucidate apparent value of each wetland to specific species. The frequency of use reveals that both wetlands are important for both breeding and non-breeding (i.e., migratory and winter-use) birds (Table 1).

Table 1. Summary of avian occurrence, type of use, relative frequency, and ranking of conservation need of birds observed during all avian surveys at Bass Harbor Marsh and at Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Common Name	Scientific Name	Alpha	Status ¹		Frequency ²		Priority
		Code	BHM	NEC	BHM	NEC	Ranking ³
Common Loon	<i>Gavia immer</i>	COLO	N	N	U	R	High
Great Cormorant	<i>Phalacrocorax carbo</i>	GRCO	N	–	R	–	
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	DCCO	N	N	C	C	
Least Bittern	<i>Ixobrychus exilis</i>	LEBI	CO	–	U	–	High
American Bittern	<i>Botaurus lentiginosus</i>	AMBI	N	PR	R	C	High
Green Heron	<i>Butorides virescens</i>	GRHE	N	N	R	R	
Great Egret	<i>Ardea alba</i>	GREG	N	–	R	–	Moderate
Great Blue Heron	<i>Ardea herodias</i>	GBHE	N	N	C	C	Moderate
Canada Goose	<i>Branta Canadensis</i>	CAGO	N	N	U	R	
Mallard	<i>Anas platyrhynchos</i>	MALL	CO	CO	C	C	
American Black Duck	<i>Anas rubripes</i>	ABDU	CO	CO	C	C	III; High
American Green-winged Teal	<i>Anas crecca</i>	AGWT	N	PO	U	U	
American Wigeon	<i>Anas Americana</i>	AMWI	–	N	–	R	
Blue-wing Teal	<i>Anas discors</i>	BWTE	N	PR	R	R	
Ruddy Duck	<i>Oxyura jamaicensis</i>	RUDU	N	–	R	–	Moderate
Wood Duck	<i>Aix sponsa</i>	WODU	PO	PO	C	C	
Ring-necked Duck	<i>Aythya collaris</i>	RIDI	N	N	R	U	
Greater Scaup	<i>Aythya marila</i>	GRSC	N	–	R	–	High
Bufflehead	<i>Bucephala albeola</i>	BUFF	N	N	C	U	
Common Merganser	<i>Mergus merganser</i>	COME	N	N	U	R	
Red-breasted Merganser	<i>Mergus serrator</i>	RBME	N	–	U	–	
Hooded Merganser	<i>Lophodytes cucullatus</i>	HOME	N	N	R	U	
Virginia Rail	<i>Rallus limicola</i>	VIRA	–	PO	–	U	
Semipalmated Plover	<i>Charadrius semipalmatus</i>	SEPL	N	–	R	–	
Killdeer	<i>Charadrius vociferous</i>	KILL	N	N	R	R	
Greater Yellowlegs	<i>Tringa melanoleuca</i>	GRYE	N	N	U	U	High
Lesser Yellowlegs	<i>Tringa flavipes</i>	LEYE	N	N	U	R	
Solitary Sandpiper	<i>Tringa solitaria</i>	SOSA	N	N	U	R	
Spotted Sandpiper	<i>Tringa macularia</i>	SPSA	N	N	R	R	
Common Snipe	<i>Gallinago gallinago</i>	COSN	N	N	U	U	
American Woodcock	<i>Scolopax minor</i>	AMWO	CO	CO	U	U	I A; High
Semipalmated Sandpiper	<i>Calidris pusilla</i>	SESA	N	N	U	R	High
Least Sandpiper	<i>Calidris minutilla</i>	LESA	N	N	U	U	
Pectoral Sandpiper	<i>Calidris melanotos</i>	PESA	N	–	R	–	
Laughing Gull	<i>Larus atricilla</i>	LAGU	N	–	R	–	
Ring-billed Gull	<i>Larus delawarensis</i>	RBGU	N	N	U	R	
Herring Gull	<i>Larus argentatus</i>	HEGU	N	N	C	C	
Great Black-backed Gull	<i>Larus marinus</i>	GBBG	N	N	C	R	
Turkey Vulture	<i>Cathartes aura</i>	TUVU	N	N	R	C	
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BAEA	N	N	U	C	ST, FT; High
Northern Harrier	<i>Circus cyaneus</i>	NOHA	N	CO	U	C	
Sharp-shinned Hawk	<i>Accipiter striatus</i>	SSHA	PR	N	U	U	
Cooper's Hawk	<i>Accipiter cooperii</i>	COHA	–	N	–	R	
Northern Goshawk	<i>Accipiter gentiles</i>	NOGO	N	–	R	–	
Broad-winged Hawk	<i>Buteo platypterus</i>	BWHA	N	N	U	U	
Osprey	<i>Pandion haliaetus</i>	OSPR	N	N	U	U	
American Kestrel	<i>Falco sparverius</i>	AMKE	N	N	R	U	
Merlin	<i>Falco columbais</i>	MERL	N	N	R	R	
Peregrine Falcon	<i>Falco peregrinus</i>	PEFA	–	N	–	R	SE; High

Table 1. Summary of avian occurrence, type of use, relative frequency, and ranking of conservation need of birds observed during all avian surveys at Bass Harbor Marsh and at Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002 (continued).

Common Name	Scientific Name	Alpha Code	Status ¹		Frequency ²		Priority Ranking ³
			BHM	NEC	BHM	NEC	
Ruffed Grouse	<i>Bonasa umbellus</i>	RUGR	N	N	R	U	
Rock Dove	<i>Columba livia</i>	RODO	N	N	R	R	
Mourning Dove	<i>Zenaida macroura</i>	MODO	PR	CO	C	C	
Black-Billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	BBCU	–	N	–	R	High
Short-eared Owl	<i>Asio flammeus</i>	SEOW	N	–	R	–	Highest
Great Horned Owl	<i>Bubo virginianus</i>	GHOW	–	N	–	R	
Barred Owl	<i>Stix varia</i>	BDOW	N	N	R	R	High
Common Nighthawk	<i>Chordeiles minor</i>	CONI	–	N	–	U	High
Chimney Swift	<i>Chaetura pelagica</i>	CHSW	N	N	C	R	II C; High
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	RTHU	N	N	R	R	
Belted Kingfisher	<i>Ceryle alcyon</i>	BEKI	PR	N	C	U	
Yellow-shafted Flicker	<i>Colaptes auratus</i>	YSFL	PR	PR	C	C	High
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	YBSA	N	N	R	R	High
Downy Woodpecker	<i>Picoides pubescens</i>	DOWO	PR	PR	C	C	
Hairy Woodpecker	<i>Picoides villosus</i>	HAWO	PR	CO	U	U	
Pileated Woodpecker	<i>Dryocopus pileatus</i>	PIWO	N	CO	U	C	
Eastern Kingbird	<i>Tyrannus tyrannus</i>	EAKI	N	N	R	R	High
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	GCFL	–	N	–	U	High
Eastern Wood-Pewee	<i>Contopis virens</i>	EAWP	N	PO	R	U	II A
Eastern Phoebe	<i>Sayornis phoebe</i>	EAPH	N	N	U	C	
Least Flycatcher	<i>Empidonax minimus</i>	LEFL	N	N	R	R	II A
Willow Flycatcher	<i>Empidonax traillii</i>	WIFL	–	N	–	R	High
Alder Flycatcher	<i>Empidonax alnorum</i>	ALFL	PR	PR	C	C	
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	YBFL	PO	–	U	–	
Tree Swallow	<i>Tachycineta bicolor</i>	TRES	N	N	U	C	
Bank Swallow	<i>Riparia riparia</i>	BANS	–	N	–	R	
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	NRWS	N	N	R	R	
Cliff Swallow	<i>Hirundo pyrrhonota</i>	CLSW	–	N	–	R	
Barn Swallow	<i>Hirundo rustica</i>	BARS	N	N	U	C	High
Blue Jay	<i>Cyanocitta cristata</i>	BLJA	PR	CO	C	C	
Gray Jay	<i>Perisoreus canadensis</i>	GRAJ	N	–	R	–	
American Crow	<i>Corvus brachyrhynchos</i>	AMCR	PO	PO	C	C	
Common Raven	<i>Corvus corax</i>	CORA	N	N	C	C	
Eastern Tufted Titmouse	<i>Baeolophus bicolor</i>	ETTI	–	N	–	R	
Black-capped Chickadee	<i>Parus atricapillus</i>	BCCH	PR	PO	C	C	
Brown Creeper	<i>Certhia americana</i>	BRCR	PR	PR	C	U	
White-breasted Nuthatch	<i>Sitta carolinensis</i>	WBNU	–	N	–	R	
Red-breasted Nuthatch	<i>Sitta canadensis</i>	RBNU	PR	PR	C	C	
Winter Wren	<i>Troglodytes troglodytes</i>	WIWR	PR	N	C	R	
Marsh Wren	<i>Cistothorus palustris</i>	MAWR	N	–	R	–	High
Golden-crowned Kinglet	<i>Regulus satrapa</i>	GCKI	PR	CO	C	C	
Ruby-crowned Kinglet	<i>Regulus calendula</i>	RCKI	PR	N	C	C	
Blue-gray Gnatcatcher	<i>Poliptila caerulea</i>	BGGN	–	N	–	R	High
Wood Thrush	<i>Hylocichla mustelina</i>	WOTH	–	N	–	R	I A; High
Veery	<i>Catharus fuscescens</i>	VEER	N	PR	R	U	II B; High
Swainson's Thrush	<i>Catharus ustulatus</i>	SWTH	PR	N	U	R	
Hermit Thrush	<i>Catharus guttatus</i>	HETH	PR	PR	C	C	
American Robin	<i>Turdus migratorius</i>	AMRO	PR	PR	C	C	

Table 1. Summary of avian occurrence, type of use, relative frequency, and ranking of conservation need of birds observed during all avian surveys at Bass Harbor Marsh and at Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002 (continued).

Common Name	Scientific Name	Alpha Code	Status ¹		Frequency ²		Priority Ranking ³
			BHM	NEC	BHM	NEC	
Northern Shrike	<i>Lanius excubitor</i>	NOSH	N	N	R	R	
Gray Catbird	<i>Dumetella carolinensis</i>	GRCA	PR	CO	C	C	II A
Brown Thrasher	<i>Toxostoma rufum</i>	BRTH	–	N	–	R	High
American Pipit	<i>Anthus rubescens</i>	AMPI	N	–	R	–	
Cedar Waxwing	<i>Bombycilla cedrorum</i>	CEDW	CO	PO	C	C	
European Starling	<i>Sturnus vulgaris</i>	EUST	–	N	–	C	
Blue-headed Vireo	<i>Vireo solitarius</i>	BHVI	PR	PR	C	C	
Red-eyed Vireo	<i>Vireo olivaceus</i>	REVI	N	PR	R	C	
Warbling Vireo	<i>Vireo gilvus</i>	WAVI	–	N	–	R	
Tennessee Warbler	<i>Vermivora peregrina</i>	TEWA	N	N	C	R	
Nashville Warbler	<i>Vermivora ruficapilla</i>	NAWA	PR	CO	C	C	
Northern Parula	<i>Parula americana</i>	NOPA	PR	CO	C	C	High
Black-and-White Warbler	<i>Mniotilta varia</i>	BAWW	PR	PR	C	C	High
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	BTBW	–	N	–	R	I A; High
Blackburnian Warbler	<i>Dendroica fusca</i>	BLBW	–	PO	–	R	I A; High
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	CSWA	PR	PR	C	C	I A
Cape May Warbler	<i>Dendroica tigrina</i>	CMWA	–	N	–	R	High
Magnolia Warbler	<i>Dendroica magnolia</i>	MAWA	PR	CO	C	C	
Myrtle Warbler	<i>Dendroica coronata</i>	MYWA	PR	CO	C	C	
Black-throated Green Warbler	<i>Dendroica virens</i>	BTNW	CO	PR	C	C	High
Bay-breasted Warbler	<i>Dendroica castanea</i>	BBWA	N	N	R	R	I B; High
Blackpoll Warbler	<i>Dendroica striata</i>	BLPW	N	–	R	–	
Pine Warbler	<i>Dendroica pinus</i>	PIWA	–	CO	–	U	
Yellow Palm Warbler	<i>Dendroica palmarum</i>	YPWA	PR	PR	C	C	
Yellow Warbler	<i>Dendroica petechia</i>	YWAR	PR	CO	C	C	
Mourning Warbler	<i>Oporornis philadelphia</i>	MOWA	–	N	–	R	
Canada Warbler	<i>Wilsonia canadensis</i>	CAWA	–	N	–	R	I A; High
Wilson's Warbler	<i>Wilsonia pusilla</i>	WIWA	N	N	R	R	
Ovenbird	<i>Seiurus aurocapillus</i>	OVEN	N	PR	R	C	II B
Northern Waterthrush	<i>Seiurus noveboracensis</i>	NOWA	–	N	–	R	
Common Yellowthroat	<i>Geothlypis trichas</i>	COYE	CO	CO	C	C	
American Redstart	<i>Setophaga ruticilla</i>	AMRE	N	N	R	U	
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	ROGR	N	N	R	R	II A; High
Indigo Bunting	<i>Passerina cyanea</i>	INBU	–	N	–	R	
Nelson's Sharp-tailed Sparrow	<i>Ammodramus nelsoni</i>	NSTS	CO	N	C	R	I B; High
Savannah Sparrow	<i>Passerculus sandwichensis</i>	SASP	CO	PR	C	C	
Song Sparrow	<i>Melospiza melodia</i>	SOSP	CO	CO	C	C	
Chipping Sparrow	<i>Spizella passerina</i>	CHSP	–	PO	–	R	
Slate-colored Junco	<i>Junco hyemalis</i>	SCJU	PR	N	C	U	
White-throated Sparrow	<i>Zonotrichia albicollis</i>	WTSP	PR	PR	C	C	
Fox Sparrow	<i>Passerella iliaca</i>	FOSP	–	N	–	R	
Lincoln's Sparrow	<i>Melospiza lincolni</i>	LISP	N	N	R	R	
Swamp Sparrow	<i>Melospiza georgiana</i>	SWSP	CO	CO	C	C	
Bobolink	<i>Dolichonyx oryzivorus</i>	BOBO	–	CO	–	C	II C; High
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	RWBL	CO	CO	C	C	
Rusty Blackbird	<i>Euphagus carolinus</i>	RUBL	N	N	R	R	High
Brown-headed Cowbird	<i>Molothrus ater</i>	BHCO	N	N	R	U	
Common Grackle	<i>Quiscalus quiscula</i>	COGR	PR	PR	C	C	

Table 1. Summary of avian occurrence, type of use, relative frequency, and ranking of conservation need of birds observed during all avian surveys at Bass Harbor Marsh and at Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002 (continued).

Common Name	Scientific Name	Alpha Code	Status ¹		Frequency ²		Priority Ranking ³
			BHM	NEC	BHM	NEC	
Baltimore Oriole	<i>Icterus galbula</i>	BAOR	–	N	–	R	
Pine Siskin	<i>Carduelis pinus</i>	PISI	N	N	R	R	
American Goldfinch	<i>Carduelis tristis</i>	AMGO	PR	CO	C	C	
Red Crossbill	<i>Loxia curvirostra</i>	RECR	N	–	R	–	High
White-winged Crossbill	<i>Loxia leucoptera</i>	WWCR	PR	PR	R	R	
Purple Finch	<i>Carpodacus purpureus</i>	PUFI	PR	CO	C	C	II A; High
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	EVGR	N	N	R	R	

¹ Symbols for Status: CO = Confirmed Breeder; PR = Probable Breeder; PO = Possible Breeder; N = Non-breeder (either migrant, local breeder, or using marshes as non-breeding habitat (i.e., winter habitat)).

² Symbols for Frequency: **Common** = >20 observations; **Uncommon** = 6–19 observations; **Rare** = 1–5 observations.

³ Priority Ranking: Assessment of conservation priority based on Partners-In-Flight Priority Levels for Bird Conservation Region 14 (**I** = High Overall Priority; **II A** = High Regional Concern; **II B** = High Regional Responsibility; **II C** = High Regional Threat; **III** = Watch List Species;), Maine State Species of Greatest Conservation Need: (Highest, High, and Moderate), and Maine state and federally endangered and threatened species lists (**FT** = Federally Threatened; **SE** = State Endangered; **ST** = State Threatened.).

Point Count Surveys

The total numbers of individuals varied within sites between years (2001 vs. 2002) for BHM and NEC (BHM, 379 vs. 494; NEC, 460 vs. 578) (Appendix E, Table 3), although numbers of different species were similar (BHM, 47 vs. 55; NEC, 52 vs. 58) (Table 2), as was the area of each habitat type sampled each year within marshes (Table 6). Species richness was greater ($P = 0.01$) for NEC than for BHM in 2002, and within NEC species richness was greater ($P = 0.03$) in 2002 than in 2001 (Table 2). Within sites, maximum diversity and evenness were similar between years. Relative abundance (Table 3) reflects the relative frequency of occurrence of each species and reveals that the Common Yellowthroat was the most frequently observed species in both marshes. Mean densities (\pm SD) (Table 4 and Table 5) for the surveys ($n = 3$) of combined bird species were not different between years ($F_1 = 2.52$, $P = 0.15$) or between wetlands ($F_1 = 1.47$, $P = 0.26$). The number of species observed in different habitat types was similar within wetlands between years. More species were observed in forest habitat types in BHM than NEC (34 vs. 29), more species were observed in grass, sedges, and herbaceous plants habitat types in NEC than BHM (10 vs. 8), more species were observed in open-water marsh habitat type in BHM than NEC (8 vs. 7), and more species were observed in urban habitat type in NEC than BHM (3 vs. 0). The numbers of species observed in woody shrub habitat type (10) and open-water estuarine habitat type (0) were the same in both wetlands. Appendix E, Table 5 includes additional information about bird habitat groupings.

Table 2. Species richness, maximum diversity, and evenness of avifauna for Bass Harbor Marsh and Northeast Creek, Mount Desert Island, Maine, 2001–2002 based on three random PC surveys in 2001 and three non-random PC surveys in 2002 for both locations.

Location	Year	Species count	Species richness (Interpolated N \pm SE)	Maximum diversity	Evenness
BMH	2001	47	60 \pm 5.1	1.67	0.869
	2002	55	61 \pm 3.5	1.74	0.899
NEC	2001	52	64 \pm 4.9	1.72	0.844
	2002	58	85 \pm 8.7	1.76	0.853

Table 3. Relative abundance of each avian species counted during point count surveys in Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001 and 2002.

Species	BHM - RelativeAbundance¹	Species	NEC - Relative Abundance
COYE	0.086	COYE	0.131
BTNW	0.060	SASP	0.062
WTSP	0.057	SWSP	0.061
SOSP	0.055	YWAR	0.055
MAWA	0.054	RWBL	0.051
RCKI	0.042	AMGO	0.049
ALFL	0.040	ALFL	0.041
NAWA	0.039	WTSP	0.038
NOPA	0.039	SOSP	0.036
MALL	0.039	COGR	0.031
AMGO	0.037	CSWA	0.029
CORA	0.037	OVEN	0.028
NSTS	0.037	NAWA	0.028
MYWA	0.030	AMCR	0.027
SASP	0.026	MALL	0.027
HETH	0.021	BCCH	0.026
BAWW	0.018	MYWA	0.023
HEGU	0.016	BTNW	0.020
BLJA	0.015	HETH	0.017
BCCH	0.014	BLJA	0.017
ABDU	0.014	AMRO	0.016
GCKI	0.014	BAWW	0.016
YWAR	0.014	NOPA	0.014
CEDW	0.014	REVI	0.012
RBNU	0.013	ABDU	0.011
AMCR	0.013	GRCA	0.011
MODO	0.011	CEDW	0.010
PUFI	0.011	MODO	0.010
GRCA	0.010	MAWA	0.009
RWBL	0.010	DCCO	0.008
SWSP	0.010	TRES	0.007
AMRO	0.009	HEGU	0.007
DCCO	0.008	BOBO	0.007
SCJU	0.008	VEER	0.005
CSWA	0.007	YPWA	0.005
BARS	0.006	YSFL	0.004
BHVI	0.006	RBNU	0.004
DOWO	0.005	BHVI	0.003
RBGU	0.005	SPSA	0.003
TRES	0.005	EAPH	0.003
COGR	0.005	BARS	0.003
PESA	0.005	OSPR	0.002
BRCR	0.003	GCFL	0.002
WIWR	0.003	BWHA	0.002
YBFL	0.003	BAEA	0.002
YSFL	0.003	WODU	0.002
GBBG	0.003	AMBI	0.002
AMRE	0.002	HAWO	0.002
OVEN	0.002	WWCR	0.002
LEFL	0.002	CORA	0.002
SWTH	0.002	BEKI	0.002
EAKI	0.001	EUST	0.002
BEKI	0.001	NOHA	0.002

Table 3. Relative abundance of each avian species counted during point count surveys in Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001 and 2002 (continued).

Species	BHM - RelativeAbundance¹	Species	NEC - Relative Abundance
OSPR	0.001	ROGR	0.001
YPWA	0.001	SSHA	0.001
EVGR	0.001	BHCO	0.001
LEBI	0.001	CHSP	0.001
HOME	0.001	CAWA	0.001
LEYE	0.001	PIWA	0.001
WODU	0.001	PEFA	0.001
SSHA	0.001	BLBW	0.001
TUVU	0.001	RCKI	0.001
BHCO	0.000	AMRE	0.001
RUGR	0.000	GCKI	0.001
SPSA	0.000	RTHU	0.001
BAEA	0.000	PUFI	0.001
RTHU	0.000	BTBW	0.001
WAVI	0.000	RUGR	0.001
REVI	0.000	WAVI	0.001
WWCR	0.000	BRCR	0.000
AMBI	0.000	NSTS	0.000
VEER	0.000	EVGR	0.000
BLBW	0.000	LEYE	0.000
BOBO	0.000	HOME	0.000
EUST	0.000	LEBI	0.000
BTBW	0.000	RBGU	0.000
PIWA	0.000	EAKI	0.000
BWHA	0.000	GBBG	0.000
CAWA	0.000	LEFL	0.000
PEFA	0.000	PESA	0.000
CHSP	0.000	SWTH	0.000
NOHA	0.000	SCJU	0.000
HAWO	0.000	DOWO	0.000
GCFL	0.000	TUVU	0.000
EAPH	0.000	YBFL	0.000
TOTAL	1	TOTAL	1

¹Relative abundance is an index comparing the total number of individuals of each species /total numbers of individuals of all species observed during the point counts. This analysis combines counts from years 2001 and 2002 to create the index. Counts from each point count survey are presented in Appendix E, Table 2.

Table 4. Mean densities (\pm SD) of total individual birds per hectare grouped by habitat types as observed during point count surveys in Bass Harbor Marsh and Northeast Creek, Mount Desert Island, Maine, 2001–2002. Mean bird densities for both years combined are significantly different between habitat types if the letter is different between columns.

Location	FOR	SHR	GSH	OWM	OWE	URB ²	ALL
BHM							
2001	3.47 \pm 1.47	5.59 \pm 1.02	1.26 \pm 0.41	nd ³	1.42 \pm 1.37	nd	2.37 \pm 0.35
2002	4.77 \pm 0.70	7.22 \pm 1.16	0.92 \pm 0.18	nd	1.26 \pm 0.80	nd	2.81 \pm 0.5
Both years	4.12 \pm 0.91	6.40 \pm 1.15	1.09 \pm 0.24	nd	1.34 \pm 0.11	nd	2.59 \pm 0.31
	a b	a	d		c d		b c
NEC							
2001	4.08 \pm 0.87	6.90 \pm 1.27	1.27 \pm 0.15	1.78 \pm 0.84	nd	20.80 \pm 26.00	2.29 \pm 0.13
2002	5.81 \pm 1.55	6.44 \pm 1.10	1.40 \pm 0.14	2.23 \pm 1.13	nd	0.70 \pm 0.70	2.89 \pm 0.36
Both years	4.95 \pm 1.22	6.67 \pm 0.32	1.34 \pm 0.09	2.01 \pm 0.32	nd	10.75 \pm 13.40	2.59 \pm 0.42
	a	a	b c	c			b

¹ FOR= coniferous, deciduous, and mixed–forest type; SHR= habitats dominated by low, woody vegetation; GSH= grasses, sedges and other herbaceous plants; OWM= open water estuarine; OWE= open water fresh marsh; URB= within or around urban habitat; ALL= all types combined. Types with the same letter are not significantly different ($P \geq 0.062$ to 1.0) from each other for the comparison among habitat types within a marsh for combined data from both years.

² The type urban (URB) was determined to be an outlier and was excluded form the pair–wise comparisons.

³ nd= no birds observed to calculate a density.

Table 5. Mean densities (\pm SD) of total species per hectare grouped by habitat type as observed during point count surveys in Bass Harbor Marsh and Northeast Creek, Mount Desert Island, Maine, 2001–2002. Mean bird densities for both years combined are significantly different between habitat types if the letter is different between columns.

Location	FOR	SHR	GSH	OWM	OWE	URB ²	ALL
BHM							
2001	0.89 \pm 0.32	1.40 \pm 0.23	0.34 \pm 0.12	nd	0.41 \pm 0.19	nd	0.60 \pm 0.12
2002	1.36 \pm 0.11	1.40 \pm 0.00	0.30 \pm 0.07	nd	0.44 \pm 0.08	nd	0.70 \pm 0.06
Both years	1.12 \pm 0.33	1.40 \pm 0.00	0.32 \pm 0.03	nd	0.42 \pm 0.21	nd	0.65 \pm 0.07
	a b	a	c		c		b
NEC							
2001	1.56 \pm 0.26	1.48 \pm 0.65	0.12 \pm 0.01	0.84 \pm 0.39	nd	20.80 \pm 26.00	0.53 \pm 0.00
2002	1.56 \pm 0.10	0.95 \pm 0.07	0.17 \pm 0.05	0.74 \pm 0.20	nd	0.70 \pm 0.70	0.57 \pm 0.07
Both years	1.56 \pm 0.10	1.21 \pm 0.37	0.14 \pm 0.03	0.79 \pm 0.07	nd	10.75 \pm 13.4	0.55 \pm 0.03
	a	a b		a b			b

¹ FOR= coniferous, deciduous, and mixed–forest type; SHR= habitats dominated by low, woody vegetation; GSH= grasses, sedges and other herbaceous plants; OWM= open water estuarine; OWE= open water fresh marsh; URB= within or around urban habitat; ALL= all types combined. Types with the same letter are not significantly different ($P \geq 0.062$ to 1.0) from each other for the comparison among habitat types within a marsh for combined data from both years.

² The type urban (URB) was determined to be an outlier and was excluded form the pair–wise comparisons.

³ nd= no birds observed to calculate a density.

The area (ha) of habitat types within the 250–m diameter circles surveyed during the 3 random surveys in 2001 and the 3 non–random surveys in 2002 are similar within each marsh (Table 6). The difference between years was ≤ 6.6 ha (16.3 acres) for 10 of 12 comparisons in amount of hectares for habitat type surveyed for the sites. Amount of GSH habitat surveyed was plus 14.1 ha (34.8 acres) for Bass Harbor Marsh and minus 8.3 ha (20.5 acres) for Northeast Creek between years. The differences between marshes in amount of habitat types within sampling plots were striking. All OWE habitat was in BHM, and 45.3 (111.9 acres) more hectares of forest

habitat (+62%) were in BHM than in NEC, whereas 146.2 more hectares (361.3 acres) of GSH habitat (+134%) and 24.2 hectares (59.8 acres) more OWM habitat (+377%) were in NEC plots than in BHM plots.

Observations of species revealed associations between particular vegetation types and density of individual birds. Differences among types were detected ($F_5 = 121.7$, $P = 0.000$) and a type*wetland interaction also was evident ($F_5 = 6.63$, $P = 0.000$). Mean densities of birds among types were highest for shrub and forest types, intermediate for all types combined, and lowest for grass-sedge-herbaceous type, and open water estuarine, and open water marsh (Table 4 and Table 5). Pair-wise comparisons among types for densities of different species revealed a similar pattern. The densities of different species were not different between years ($F_1 = 0.005$, $P = 0.94$) or between wetlands ($F_1 = 1.24$, $P = 0.29$). Mean densities of different species were different among types ($F_5 = 84.2$, $P = 0.000$) and an interaction of type*wetland was evident ($F_5 = 16.5$, $P = 0.000$). Mean densities of different species among types followed nearly the same pattern as that for bird densities.

The mean duration of survey time (min:sec including travel time) per listening station during the random PC surveys in 2001 was slightly lower for BHM (18:39) than for NEC (20:45), whereas the mean survey duration for the non-random PC surveys in 2002 was slightly higher for BHM (18:25) than for NEC (16:17).

Table 6. Hectares of habitat types¹ present in point count stations shown with difference in hectares between years for point count surveys conducted at Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001 and 2002.

Location						
Year	Forested	Shrub	GSH	OWM	OWE	Urban
BHM						
2001	62.0	15.3	47.5	2.94	27.3	6.1
2002	56.4	17.3	61.6	3.48	33.9	2.8
Difference (ha)	5.6	2.0	14.1	0.54	6.6	3.3
NEC						
2001	36.2	18.2	131.8	13.2	0 ²	0.8
2002	36.9	22.9	123.5	17.4	0	4.2
Difference (ha)	0.7	4.7	8.3	4.2	0	3.4

¹ GSH = Grasses, sedges, herbs, OWM = Open water marsh, OWE = Open water estuarine.

² Certain stations included some tidally influenced habitat, but codes of the artificial classification system could not be used to accurately determine correct hectare measurements.

Broadcast Call Surveys

We conducted broadcast call surveys following each point count survey during 2001. Broadcast calls elicited responses from American Bittern and Least Bittern. Detection was especially enhanced for the Least Bittern, which is an extremely secretive species. We conducted a broadcast call survey for the Least Bittern during 2002 at Two–Moose Pond, a disjunct cattail marsh adjacent to BHM where a Least Bittern nested in 2001. It was not detected in 2002.

Quiet Observation Surveys

Quiet observation data reveal that this method of observation from tree stands is an effective means of detecting many avian species inhabiting a marsh. Most of the data collected by quiet observation is summarized in Appendix E, Tables 4 and 5, which serve as the primary summary for anatid breeders. These data also document occupancy periods for species that do not breed in Maine.

Incidental Observations

Ad hoc observations of birds on study areas were combined with all other data (Appendix E, Tables 4 and 5) to document overall frequency of occurrences, including occupancy periods for species that do not breed in these wetlands. Data were collected at all times of the day and at sites not part of standardized plots, which expanded coverage of habitats. These surveys located many species not observed with more standardized measures.

Reconnaissance for Raptors

Although it is probable that our surveys reliably detected most raptor species that used the marshes, our surveys were not designed specifically to survey for each species of raptor. Thus, our surveys probably were not adequate to document all raptor use of these marshes. We did document, however, raptors that frequently used marshes during the day. The Northern Harrier was a likely breeder in NEC during both years, but breeding activity was well documented only in 2001 (Table 7). Sharp–shinned Hawk was a probable breeder at BHM in 2001 (Table 7). Raptors were found infrequently in either marsh during either spring or fall migration, although some occasional usage did occur. Examples of this include Short–eared Owl and the Northern Harrier. Bald Eagles (i.e., an adult and sub–adult) foraged in the marshes and were repeatedly observed attempting to catch staging ducks in spring. Other raptors (e.g., Broad–winged Hawk) were observed flying over the marshes going to and from surrounding uplands.

Guilds of Avian Species

Observed birds were grouped into guilds based on taxonomic affiliations (Appendix E, Table 4) and into guilds based on apparent preferred spatial use (Appendix E, Table 5). This allows another way of examining which birds used the marshes and to what extent they were observed. Numbers of species observed in each wetland were similar. More species of birds commonly associated with open water were observed in BHM than in NEC. More passerine and species taxonomically similar to passerine species were observed at NEC than at BHM. Sixteen species of the loons, geese, and duck guild were seen at BHM and 13 at NEC. Five species of the wading bird guild were seen at BHM and 3 at NEC. Eleven species of raptors were observed at BHM and 12 at NEC. Eleven species of shorebirds were observed at BHM and 9 at NEC. Four species of gulls were found at BHM and 3 at NEC. Eleven species of other species taxonomically similar to passerines were observed at BHM and 12 at NEC. Sixty–three species of passerines were found at BHM and 79 at NEC.

Breeding Species

Breeding birds are listed (Table 7) with the reason(s) they were determined to be breeders, the habitat type they were breeding in, years they were breeders, and an estimation of their abundance as breeders. Of the potential 53 breeders at NEC, 22 were confirmed as breeders. Eleven of the potential 48 breeders at BHM were confirmed as breeding. The rest of the species were considered either probable or possible breeders. Not all of these species bred during both years.

Many songbirds were considered breeders based on singing of territorial males. In addition, our observations yielded some interesting information about species we observed breeding in wetlands. In both wetlands, Wood Ducks were possible breeders based on infrequent but regular observations of males. In both wetlands, White-winged Crossbills were probable breeders and were observed frequently on Mount Desert Island during the winter of 2000/2001 (P. Wilson, ANP, pers. obs.); they were still actively territorial when our study was initiated during spring of 2001. In BHM, American Woodcock were probable breeders based on observation of territorial males in appropriate habitat, as were Purple Finches. Purple Finches are an early breeding species in this area of Maine and territorial males were observed during April and May of both years. Also in BHM, Sharp-shinned Hawks were probable breeders based on infrequent and irregular observations in appropriate habitat.

Nests Found

We found nests of nine species (Table 8); most (7 of 9) of them were in BHM, including the nest of the rare Least Bittern. Although we searched for nests, several nests were found while performing other tasks.

Table 7. Breeding status of bird species as observed at Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Bass Harbor Marsh

Common Name	Breeding Status¹	Breeding Habitat²	Breeding Frequency	Breeding Abundance³
Least Bittern	Confirmed–N, Y	GSH	2001	Rare
Mallard	Confirmed–N, Y	GSH	2001, 2002	Common
American Black Duck	Confirmed–N, Y	GSH	2001, 2002	Common
Wood Duck	Possible	OWM	2001, 2002	Rare
American Woodcock	Probable	SHB	2001	Uncommon
Sharp–shinned Hawk	Probable	FC	2001	Uncommon
Mourning Dove	Probable	FC/FD	2001, 2002	Common
Belted Kingfisher	Possible		2001, 2002	Uncommon
Yellow–shafted Flicker	Probable	FC/FD	2001, 2002	Uncommon
Downy Woodpecker	Probable	FC/FD	2002	Uncommon
Hairy Woodpecker	Probable	FC/FD	2001, 2002	Common
Alder Flycatcher	Probable	SHB	2001, 2002	Common
Yellow–bellied Flycatcher	Possible	FC	2002	Rare
Blue Jay	Probable	FC/FD	2002	Common
American Crow	Possible	FC/FD	2001, 2002	Common
Black–capped Chickadee	Probable	FC/FD	2001, 2002	Common
Brown Creeper	Probable	FC	2001, 2002	Uncommon
Red–breasted Nuthatch	Probable	FC	2001, 2002	Common
Winter Wren	Probable	FC	2001, 2002	Common
Golden–crowned Kinglet	Probable	FC	2001, 2002	Common
Ruby–crowned Kinglet	Probable	FC	2001, 2002	Common
Swainson’s Thrush	Probable	FC	2001, 2002	Uncommon
Hermit Thrush	Probable	FC	2001, 2002	Common
American Robin	Probable	FC/FD	2001, 2002	Common
Gray Catbird	Probable	SHB	2001, 2002	Uncommon
Cedar Waxwing	Confirmed–N	FC	2001, 2002	Common
Blue–headed Vireo	Probable	FC	2002	Common
Nashville Warbler	Probable	FC	2001, 2002	Uncommon
Northern Parula	Probable	FC	2001, 2002	Common
Black–and–White Warbler	Probable	FC	2001, 2002	Common
Chestnut–sided Warbler	Probable	FD	2002	Uncommon
Magnolia Warbler	Probable	FC	2001, 2002	Common
Myrtle Warbler	Probable	FC	2001, 2002	Common
Black–throated Green Warbler	Confirmed–CF	FC	2001, 2002	Common
Yellow Palm Warbler	Probable	FC	2002	Uncommon
Yellow Warbler	Probable	SHB	2001, 2002	Common
Common Yellowthroat	Confirmed–N, Y	SHB	2001, 2002	Common
Nelson’s Sharp–tailed Sparrow	Confirmed–N	GSH	2001, 2002	Uncommon
Savannah Sparrow	Confirmed–N	GSH	2001, 2002	Common
Song Sparrow	Confirmed–NM	SHB	2001, 2002	Common
Slate–colored Junco	Probable	FC	2001, 2002	Common
White–throated Sparrow	Probable	FC	2001, 2002	Common
Swamp Sparrow	Confirmed–N, CF	GSH	2001, 2002	Common
Red–winged Blackbird	Confirmed–CF	GSH	2001, 2002	Common
Common Grackle	Probable	SHB	2001, 2002	Common
American Goldfinch	Probable	FC	2001, 2002	Common
White–winged Crossbill	Probable	FC	2001	Rare
Purple Finch	Probable	FC	2001, 2002	Uncommon

Table 7. Breeding status of bird species as observed at Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002 (continued).

Northeast Creek

Common Name	Breeding Status¹	Breeding Habitat²	Breeding Frequency	Breeding Abundance³
American Bittern	Probable	GSH	2001, 2002	Uncommon
Mallard	Confirmed–N	GSH	2001, 2002	Common
American Black Duck	Confirmed–Y	GSH	2001, 2002	Common
Blue–winged Teal	Probable–Y	GSH	2001	Uncommon
American Green–winged Teal	Possible	GSH	2002	Unknown
Wood Duck	Possible	Unknown	2001, 2002	Unknown
Virginia Rail	Possible	GSH	2002	Uncommon
American Woodcock	Confirmed–N	SHB	2001, 2002	Uncommon
Northern Harrier	Confirmed–C	GSH	2001, 2002	Uncommon
Mourning Dove	Confirmed–N	FC/FD	2001, 2002	Common
Yellow–shafted Flicker	Probable	FC/FD	2001, 2002	Common
Downy Woodpecker	Probable	FC/FD	2001, 2002	Common
Hairy Woodpecker	Confirmed–CF	FC/FD	2001, 2002	Common
Pileated Woodpecker	Confirmed–N	FC/FD	2001, 2002	Uncommon
Eastern Wood–Pewee	Possible	FD	2002	Uncommon
Alder Flycatcher	Probable	SHB	2001, 2002	Common
Blue Jay	Confirmed–N	FC/FD	2001, 2002	Common
American Crow	Possible	FC/FD	2001, 2002	Common
Black–capped Chickadee	Possible	FC/FD	2001, 2002	Common
Brown Creeper	Probable	FC	2001, 2002	Common
Red–breasted Nuthatch	Probable	FC	2001, 2002	Common
Golden–crowned Kinglet	Confirmed–Y	FC	2002	Uncommon
Veery	Probable	SHB /FD	2001, 2002	Uncommon
Hermit Thrush	Probable	FC/FD	2001, 2002	Common
American Robin	Probable	FC/FD	2001, 2002	Common
Gray Catbird	Confirmed–CF	SHB	2001, 2002	Common
Cedar Waxwing	Possible	FC/FD	2001, 2002	Common
Blue–headed Vireo	Probable	FC	2001, 2002	Common
Red–eyed Vireo	Probable	FD	2001, 2002	Common
Nashville Warbler	Confirmed–Y	FC	2001, 2002	Common
Northern Parula	Confirmed–Y	FC/FD	2001, 2002	Common
Black–and–White Warbler	Probable	FD	2001, 2002	Common
Blackburnian Warbler	Possible	FC	2002	Uncommon
Chestnut–sided Warbler	Probable	SHB	2002	Common
Magnolia Warbler	Confirmed–Y	FC	2001, 2002	Common
Myrtle Warbler	Confirmed–Y	FC/FD	2001, 2002	Common
Black–throated Green Warbler	Probable	FC/FD	2001, 2002	Common
Pine Warbler	Confirmed–CF	FC	2002	Uncommon
Yellow Palm Warbler	Probable	SHB	2001, 2002	Uncommon
Yellow Warbler	Confirmed–N	SHB	2001, 2002	Common
Ovenbird	Probable	FC/FD	2001, 2002	Common
Common Yellowthroat	Confirmed–FY	SHB	2001, 2002	Common
Savannah Sparrow	Probable	GSH	2001, 2002	Common
Song Sparrow	Confirmed–Y	SHB	2001, 2002	Common
Chipping Sparrow	Possible	GSH	2002	Possible
White–throated Sparrow	Probable	FC/FD	2001, 2002	Uncommon
Swamp Sparrow	Confirmed–CF	SHB	2001, 2002	Common
Bobolink	Confirmed–Y	GSH	2001, 2002	Common
Red–winged Blackbird	Confirmed–FY	SHB	2001, 2002	Common
Common Grackle	Probable	GSH	2001, 2002	Common
American Goldfinch	Confirmed–C	FC/FD	2001, 2002	Common
White–winged Crossbill	Probable	GSH	2001	Uncommon
Purple Finch	Confirmed–Y	GSH	2001, 2002	Uncommon

¹ Codes: C = copulate; CF = carry food; FY = feed young; N = nest; NM = carrying nest material, Y = young observed.

² Habitats: FC = forested coniferous, FD = forested deciduous, GSH = grasses, sedges, other herbaceous plants, OWE = open water estuarine, OWM = open water marsh, SHB = woody shrubs, UNK = unknown.

³ Breeding Abundance: Common, Uncommon, or Rare describe the relative frequency of observation of each species in the marsh. Common = >20 observations from 2001–2002. Uncommon = 6–19 observations from 2001–2002. Rare = 1–5 observations from 2001–2002.

Table 8. Nests found in Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Species	Date observed	Location	Count of eggs	Count of young	Nest description
LEBI	7/3/01	BHM	3	2 (3?)	Woven <i>Typha</i> nest w/ loose canopy; nest located 14" above water in a beaver pond
PIWO		NEC	?	?	Cavity – two adults observed.
AMWO	4/15/02	NEC	1	0	Abandoned. One egg on ground; fit AMWO egg/nest description.
MODO	4/9/02	NEC	3	0;	Nest destroyed ~ 4/16/02. Loose stick nest, 10' high in a spruce tree.
BLJA	6/17/02	BHM	0	0	Twig nest in spruce tree.
CEDW	7/2/02	BHM	3	3	Nest made of twigs and <i>Usnea</i> lichen. In spruce tree, 10' up. Tree located in an open area near wetland.
YWAR	6/17/02	NEC	3	3	Open cup nest 5' high in <i>Rosa</i> located next to a stream.
COYE	6/20/02	BHM	4	3	Open cup nest found in <i>Carex</i> spp.
COYE	6/27/02	BHM	?	2	Open cup nest found in <i>Spirea</i> .
SWSP	6/18/02	BHM	?	3	Open cup nest found in <i>Typha</i> and <i>Spirea</i> .
NSTS	8/1/02	BHM	3	?	Nest slightly covered by grasses and in located in <i>Spartina patens</i> .
NSTS	8/9/02	BHM	4	4?	Nest slightly covered by grasses and located in <i>Spartina patens</i> .
SASP	6/6/02	BHM	4	4	Nest slightly covered by grasses and in <i>Spartina patens</i> .

Discussion

Contributions of Different Surveys

Our various surveys allowed us to observe a wide range of species that migrate through or breed in the two marshes. Coverage between years was different, with later (October) seasonal observations in 2001 than in 2002, but earlier (March) observations in 2002 than in 2001 (Figure 6 and Figure 7). Because of the point count protocol, a general morning bias existed, with less time expended in afternoon or evening surveys. This discrepancy was reflected in low counts for some crepuscular species (e.g., American Woodcock, Common Nighthawk).

Point count surveys provided data on the most species of breeding birds. These observations were documented by hearing vocalizations of males on territory and observing associated breeding activities (e.g., birds carrying nest material, pairs copulating). Some differences emerged between the point count survey in 2001, which was established with random points, and that of 2002, which was not. The survey stations for the 2001 survey were randomly selected from 100 randomly generated points for each of the three surveys. In contrast, the survey stations for the 2002 point count survey were arbitrarily established along the waterways for the first survey and those same listening stations were used for the next two rotations of the survey. Thus, no new areas of the marshes were sampled in the next two rotations. Placement of survey stations, however, had little effect on number of hectares of each habitat type sampled between years for either marsh (Table 6). For both marshes, the broadcast call survey of 10 target species in 2001, which immediately followed a point count, elicited responses only from the American Bittern and Least Bittern. Five American Bittern responded at NEC and one American Bittern responded at BHM. One Least Bittern responded positively at Two–Moose Pond at BHM. We broadcasted the call for the Least Bittern at Two–Moose Pond during 2002, but received no response. Thus, most of the 10 species sought by playback calls did not respond and probably are not breeding in the marshes, except for the Virginia Rail. Eleven observations of groups of one-to-two calling male Virginia Rails provide limited evidence of breeding in NEC. The quiet observation survey was especially useful in detecting anatid females with broods. Our efforts to find nests of raptors were largely unsuccessful, but observed behaviors indicated nesting by the Northern Harrier, and a family of Great–horned Owls was heard vocalizing near BHM (J. Longcore, USGS, pers. obs.). Incidental observation surveys provided information about the distribution of birds on a temporal scale, allowing for an understanding of which birds were seasonally present. The incidental observation surveys also provided for observations of many species seen infrequently (e.g., Short–eared Owl, Northern Shrike, and Blue–gray Gnatcatcher).

Status of Breeding and Migrating Birds and BHM and NEC

Numbers of species and numbers of individual birds observed varied substantially among habitat types, marshes, and years (Appendix E, Tables 3 – 5). The numbers of different species recorded during the point count surveys during 2001 and 2002 were 47 and 55 species for BHM and 52 and 58 species for NEC (Table 2). Not all recorded species were considered as breeding. In BHM, of the 48 species classified as confirmed, probable, or possible breeders, only 12 (25%) species were confirmed as breeding. For NEC, 53 species were classified as confirmed, probable, or possible breeders, but only 23 (43%) species were confirmed as breeders (Table 7). For both marshes, ten species were classified as breeding in only one of the survey years. Two of the single–year breeders were confirmed with a nest (Table 8).

Maximum diversity and evenness were nearly identical between years for each marsh (Table 2). Also, densities of individual birds and densities of species did not differ between years (Table 4 and Table 5). Interpolated species richness was higher ($P = 0.03$) at NEC during 2002 when compared with NEC in 2001 and BHM in 2002 ($P = 0.01$) (Table 2). Some difference between NEC 2002 and other years and marshes may be attributed to minor differences in data used to calculate species richness. All available data, including incidental observations, and especially quiet observation survey data, depict weekly seasonal distribution of species that used the two marshes each year (Appendix E, Tables 4 and 5). These tables clearly delineate those species that may be considered breeding birds and those that only stopover in spring and fall. Persistent occurrence of the Mallard and American Black Duck represent breeding ducks, whereas the Wood Duck is a probable breeder but not often observed during the breeding season. Breeding densities of birds in both marshes as determined by the point count surveys varied by habitat type, but densities of birds and different species were higher in shrub and forest habitat types and lower in the other types (Table 4).

Our surveys likely detected most raptors using the marshes, although we did not implement any surveys for a specific species of raptor. Because our surveys covered most of the day cycle and a large part of the year cycle, we conclude that our surveys were adequate to document most of the diurnal use by raptors of these marshes. We infrequently found raptors during the day in either marsh during spring and fall migration, although some occasional use was observed (i.e., Short-eared Owl and Northern Harrier). Bald Eagles occasionally foraged in the marshes but did not nest near either marsh. Although we conducted some extremely early morning surveys, we conducted few nighttime surveys, thus we have few data on abundance and distribution of owls. Barred Owl, Great Horned Owl, and Short-eared Owl were all rare observations (Appendix E, Table 4).

Shorebirds used both marshes as migration stopover sites for resting and foraging. Eleven species of shorebirds were observed in the marshes during 2001 and 2002. The American Woodcock was a confirmed breeder in NEC and a probable breeder at BHM. Shorebirds were observed during both spring and fall migrations, although in differing abundance between seasons. Numbers of species and individuals observed were few for both marshes, although we recorded more frequent and abundant numbers of shorebirds at BHM. Bass Harbor Marsh showed greater shorebird use both in number of times any species of shorebird was seen (BHM = 67; NEC = 43) and total number of individuals of any shorebird species seen (BHM = 232; NEC = 77). This difference in use reflects the presences of open water estuarine (OWE) habitat in BHM and the lack of the same in NEC (Table 6).

Species of High Conservation Concern

The Partners-In-Flight (PIF) 2005 priority list for Bird Conservation Region (BCR) 14 (Ruth, 2004) ranks species of high conservation concern, including both breeders (Table 9) and migrants (Table 10) observed during our study. Observed breeding species that are at highest risk of population decline include Chestnut-sided Warbler, American Woodcock, and Nelson's Sharp-tailed Sparrow. Observed migrant and non-breeding species at risk of population decline include Canada Warbler, Black-throated Blue Warbler, Blackburnian Warbler, Wood Thrush, and Bay-breasted Warbler. Three species, American Black Duck, Gray Catbird, and Nelson's Sharp-tailed Sparrow were commonly observed, whereas other species were either Uncommon or Rare observations. Other PIF BCR 14 listed species and two Maine / Federally listed species

(Bald Eagle and Peregrine Falcon) were observations of Rare migrants or non-breeding birds. Some non-breeders may be local breeders (e.g., Peregrine Falcon). See Appendix E, Tables 5 and 6 for more information about occurrence rates. Additionally, the U.S. Shorebird Conservation Plan (Clark and Niles, 2000) ranks shorebird species of high conservation concern, including two species observed during our study. Semipalmated Sandpiper, which uses muddy intertidal habitats for migration stop-over sites, ranks Highest priority. American Woodcock ranks High priority in addition to the PIF ranking.

Table 9. Partners-In-Flight (PIF) Bird Conservation Region 14 / Area 27 priority species breeding in survey areas.

PIF Level ¹	Species	Frequency ²		Breeding ³	
		BHM	NEC	BHM	NEC
I A	Chestnut-sided Warbler	U	U	PR	CO
I A	American Woodcock	R	R	PR	CO
I A	Blackburnian Warbler	—	R	N	PR
I B	Nelson's Sharp-tailed Sparrow	C	R	CO	N
II A	Purple Finch	U	U	PR	N
II A	Gray Catbird	C	C	PR	CO
II B	Veery	R	R	N	CO
II B	Ovenbird	R	U	N	CO
III	American Black Duck	C	C	CO	CO

¹IA, IB. = High Overall Priority; II A =: High Regional Concern; II B. = High Regional Responsibility; II C. = High Regional Threat; III. = Watch List Species.

² Symbols for Frequency: Common = >20 observations; Uncommon = 6–19 observations; Rare = 1–5 observations.

³ Symbols for Status: CO = Confirmed Breeder; PR = Probable Breeder; PO = Possible Breeder; N = Non-breeder (either migrant, local breeder, or using marshes as non-breeding habitat (i.e., winter habitat)).

Table 10. PIF Bird Conservation Region (BCR) 14 / Area 27 priority species migrant / non-breeding birds found in survey areas.

Risk Level ¹	Species	Frequency ²	
		BHM	NEC
I A	Canada Warbler	—	R
I A	Black-throated Blue Warbler	—	R
I A	Wood Thrush	—	R
I B	Bay-breasted Warbler	—	R
II A	Rose-breasted Grosbeak	R	R
II A	Least Flycatcher	R	R
II A	Eastern Wood-pewee	R	R
II C	Chimney Swift	R	R
II C	Bobolink	—	U
FT / ST	Bald Eagle	R	U
SE	Peregrine Falcon	—	R

¹IA, IB. = High Overall Priority; II A =: High Regional Concern; II B. = High Regional Responsibility; II C. = High Regional Threat; III. = Watch List Species; FT = Federally Threatened Species; ST = Maine State Threatened Species; SE = Maine State Endangered Species.

² Symbols for Frequency: Common = >20 observations; Uncommon = 6–19 observations; Rare = 1–5 observations.

Species of Conservation Concern and Their Habitats

Partners-In-Flight listed species include three species (Gray Catbird, Veery, and American Woodcock) observed breeding in woody shrub vegetation. The American Woodcock reproductive life history is complex; territorial males forage in secondary successional habitats but also use adjacent fields and wetlands to display. The American Woodcock was a rare but confirmed breeder in NEC and a rare, probable breeder (i.e., a displaying male observed) in BHM. Females prefer dense stands of shrubs or hardwoods for nesting. Chestnut-sided Warblers, Ovenbirds, and Purple Finches were observed breeding in forested habitat. Chestnut-sided Warblers are frequently observed in regenerating deciduous forest habitat, whereas Purple Finches use coniferous habitat. Ovenbirds nest on the ground in both coniferous and deciduous habitat. Blackburnian Warbler, a possible breeder in NEC, favors coniferous habitat.

The Least Bittern, a Species of Special Concern in Maine, was an unusual breeding species that nested in BHM in 2001. Of 12 marshes surveyed by broadcast calls at Cape Cod National Seashore, MA, only a single response was recorded on two different dates in 2000 (Erwin et al., 2002) for Least Bittern. The American Black Duck was a common breeding species in both marshes where it nests in scrub-shrub and herbaceous habitats and often in upland sites of forested habitats.

The Nelson's Sharp-tailed Sparrow breeds in *Spartina* spp. grasses in salt-panne areas of Bass Harbor Marsh. Each year we observed nine pairs of birds. The Nelson's Sharp-tailed Sparrow is usually not observed in Maine until June 1 (MDIFW, Tom Hodgman - Biologist, unpubl. data). Our data supports June 1 as the earliest observation date for this species. Nelson's Sharp-tailed Sparrow may raise two broods each summer in Maine. However, Nelson's Sharp-tailed Sparrow nesting is not synchronous with the tidal cycles and nests are often flooded by higher than normal tides (MDIFW, Tom Hodgman - Biologist, pers. comm., 2003).

Associations of Avian Guilds with BHM and NEC

The guild concept facilitates understanding of avian interactions with the environment. The guild concept is an artificial grouping of species with the goal of revealing how members of a guild use resources. The observer defines what constitutes a guild and how observations obtained will serve to define guild membership and function (Verner, 1984). We grouped species into phylogenetic guilds based on relationships of species to summarize information (Appendix E, Table 4). Also, we grouped species into guild groups similar to the 'guild block' concept (Verner, 1984), wherein guilds are defined by how bird species use structural habitat types (e.g., shrubs) for selected behaviors (e.g., foraging, nesting, roosting) (Appendix E, Table 5). Some of the phylogenetic guilds are similar to habitat guilds, whereas others are not. Our applications of the guild concept revealed that some taxonomic groups have an apparent preference for a habitat type (e.g., shorebirds) as compared with taxonomic groups that do not exhibit an apparent preference for a habitat type (e.g., passerines). One utility gained from this exercise is a description of which species, as a group, inhabit which habitat types, and which taxonomic guilds exhibit the same habitat preferences for all or most guild members. Unfortunately, the variability in habitat types used by many species, as shown in our study, limits the applicability of the taxonomic guild concept as germane to only a few groups. One potential use of the guild concept is to predict changes in abundances of birds found within BHM and NEC based on habitat relationships between guilds (e.g., shorebirds) and habitat types (e.g., Grass, Sedges, and

other Herbaceous). Changes in available habitat (e.g., salt marsh pannes) may alter resource availability for specific bird species and potentially affect their abundances.

The implication that taxonomic groups (and species within) may be affected by environmental changes, thereby altering the distribution of habitat types within the park, is important. If, as theorized, global climate change induces sea level rise, information we have collected about guild groups suggests that some taxonomic groups are more likely to be affected than others. The shorebirds guild would likely see reduced habitat, primarily GSH, to use for foraging and roosting during migration. To connect changes in abundance of shorebirds in BHM and NEC with the area of this habitat type available, shorebirds and available habitat could be surveyed simultaneously. A model could be developed to depict how sea level changes may increase or decrease the area of salt panne and GSH habitat available to migratory shorebirds. A decrease in salt panne and GSH area presumes fewer foraging and roosting sites and fewer shorebird sightings. Monitoring area of habitat available to guild groups may provide information on how habitat area changes in the Acadia National Park affect species abundances relative to other ecosystem scale disturbances (e.g., spruce budworm outbreaks, or large-scale wildfires).

Survey Methodology

According to Fancy and Sauer (2000), survey points should be randomly selected from a list of potential points representing the area to be surveyed. This protocol, however, may pose substantial logistical difficulties because plots established randomly may increase time and effort needed to conduct a survey. To test this, we compared average length of time elapsed during randomly and non-randomly placed point count survey plots. In 2001, we conducted random point count surveys in BHM and NEC, but in 2002, we conducted non-random surveys in both wetlands. Our comparison of average survey time per point count for random versus non-random point counts revealed that non-randomly placed points required less time to conduct when they are placed in more easily accessible locations. Results (i.e., numbers of species and individuals) were similar between years (Table 2) but may not fully represent diversity of potential species. For BHM (Figure 3) average length of survey time (min:sec) was nominally the same (BHM random survey 2001 = 18:39; BHM non-random survey 2002 = 18:25). In comparison, average length of survey time for random surveys at NEC was more than four minutes longer than that of non-random surveys (NEC random survey 2001 = 20:45; BHM non-random survey 2002 = 16:17). This difference reflects proximity of point count survey plots to access streams (Figure 5). The smaller and linearly shaped BHM limited distribution of points, whereas random points in the larger, non-linear shaped NEC marsh (Figure 4) were more widely distributed, and required slightly more time to reach than non-random points that were more often closer to the access stream. Because non-random points of NEC in 2002 (Figure 5) were all accessed by canoe, habitat types surveyed were more uniform, and mean survey time was shorter. Faced with a choice of performing a random survey and gathering fewer data because of time-constraints versus conducting a non-random survey and gathering more data, biologists may chose to undertake more surveys and gather more data. Resulting data, however, may be less representative of the actual species composition of survey areas because of bias in the methodology. Data collected from non-random surveys should not be used for inference about the whole population (i.e., of the marsh) but only of individual points (Naimen et al., 1996). Random and non-random surveys detected similar numbers of species inasmuch as, species richness was not different between 2001 and 2002 for either BHM or NEC (Table 3). Some

species observed in random surveys were not detected in non-random surveys. It is possible that these species were not present in the marshes but it is more likely that some habitats supporting less common vegetation types were not surveyed and some breeding birds (e.g., Yellow Palm Warbler at NEC) were not observed.

Detectability of Avian Species

Seeking evidence of regionally uncommon and rare species during surveys is essential, especially in areas such as Bass Harbor Marsh that are known as important nesting or migration stop-over sites for some species. The suite of survey techniques we used was chosen so as to detect the presence of all species in each marsh. We believe that shortcomings of one technique (e.g., point counts) were mitigated by the use of a different technique (e.g., quiet observations). Birds vary greatly in detectability, because of species-specific characteristics and variation in observer skill (i.e., observer bias). Some species that breed in wetlands are notable for being difficult to detect (e.g., Virginia Rail and Least Bittern). Except for the Virginia Rail, even broadcasted calls do not increase detection of most marsh birds over passive point counts (Conway and Gibbs, 2005), although a broadcasted call elicited a response from a Least Bittern during our survey.

The bias of land bird survey methods changes in relation to *coverage* (proportion of the population of interest covered by the sampled population), *closure* (proportion of the target species present in the study found throughout the study period), *surplus birds* (birds not part of the target population—e.g., because they breed north of the study area—that are in the study area for some of the study period), and *detection* (proportion of the target birds, present on the plots when they are surveyed, that are recorded on the survey) (Bart et al, 2004). We used a variety of survey methods to ensure that we detected the majority of species present in the wetlands. Survey methods chosen varied throughout the survey cycle. We believe that the methods used were those most appropriate for assessing abundance and distribution of populations in wetlands at specific times of year from early spring to late fall

Management Implications

Management objectives should include (1) maintenance of existing wetland boundaries, including extensive forested buffers, (2) monitoring of human uses of these wetlands to examine effects of human use on avian populations, and, (3) long-term monitoring (i.e., periodic surveys) of existing bird populations to track population changes.

Importance of Wetland Protection

Protection of wetland habitat in both BHM and NEC, as well as management of lands adjacent to these wetlands, is essential to support existing bird populations. Our surveys indicate that significant numbers of breeding and non-breeding birds use both wetlands for a diversity of purposes. It is important to protect habitat of both common and uncommon species for breeding and non-breeding use.

Bass Harbor Marsh is recognized as a landbird focus area (ME 4) in the Partners-In-Flight Conservation Plan for Bird Conservation, Region 14. Regular observations of a diversity of regionally common and uncommon species at BHM indicate the importance of this wetland as a significant breeding, foraging, and roosting habitat for species guilds, including shorebirds, waterfowl, and passerines. Examples of the most common breeding species at BHM include Common Yellowthroat, Black-throated Green Warbler, White-throated Sparrow, and Song Sparrow. Less common breeding species at BHM include American Black Duck, Nelson's Sharp-tailed Sparrow, Least Bittern, and American Woodcock. Partners-In-Flight Priority listed species that are probable breeders at BHM include Chestnut-sided Warbler, American Woodcock, Purple Finch, Gray Catbird, and American Black Duck. Additionally, the PIF Conservation Plan notes that BHM is a regionally important nesting location for Nelson's Sharp-tailed Sparrow (Dettmers, 2005).

Significant numbers of birds from shorebird, waterfowl, and passerine species guilds were observed in Northeast Creek, indicating that it supports valuable habitat for many regionally common and uncommon breeding and migrant species. Common breeding species at NEC included Common Yellowthroat, Yellow Warbler, Song Sparrow, Swamp Sparrow, and Alder Flycatcher. Less common species breeding in NEC may include Northern Harrier, Yellow Palm Warbler, Virginia Rail, American Bittern, and other waterbirds. Shorebirds, waterfowl, and passerine species regularly use NEC as non-breeding habitat, including wintering and migration stop-over sites.

Protection of Marsh Habitat and Surrounding Lands

Managers should strive to maintain existing forested and vegetated buffers around the marshes because these adjacent lands are important to BHM and NEC wetlands, which serve as migration and breeding habitat. These lands, consisting of upland forests and ecotone habitats provide foraging, roosting, and nesting habitat for a variety of bird guilds. The forest-marsh ecotone is used by migrant songbirds and by species that establish territories and breed locally. Scrub-shrub vegetation is commonly found in ecotone habitat and density of species observed during point counts (mostly breeders) was highest in scrub-shrub vegetation (Table 4 and Table 5). Species of conservation concern, such as American Woodcock, Gray Catbird, Veery, and American Black Duck, use scrub-shrub vegetation for nesting, foraging, and cover. Similarly, common species

such as Common Yellowthroat and Mallard Duck use scrub–shrub vegetation for like functions. Conservation of scrub–shrub habitat is essential to maintain both abundance and diversity of species inhabiting these wetlands. Additionally, both ecotone and surrounding forested uplands function as a buffer between marsh and surrounding land use (e.g., development), minimize human disruption of avian activities within the wetlands, and are important visual components of wetlands. A minimum buffer of 250 feet is necessary to minimize or prevent disruption to migrant waterfowl, wading birds, and shorebirds foraging in wetlands as documented in the Natural Resource Protection Act (NRPA, 2006). The forest edge habitat is used for a diversity of functions by a variety of species. For example, many raptors (e.g., including an adult and a sub–adult Bald Eagles) perch in the forested edge from which they search the marsh for prey.

Many species observed during this survey are best described as forest songbirds. They were observed during surveys because marshes often grade abruptly into forest habitat, whether upland or forested wetland. Preservation of forests adjacent to BHM and NEC will help maintain existing populations of forest-breeding songbirds. Preservation of these lands also will provide habitat for use by migrant birds. The largest buffer possible surrounding these wetlands (Rodewald and Bakermans, 2006) should be conserved. Ideally, the forest buffer width should be substantially larger than the minimum suggested (i.e., 250 feet) to protect wetlands from adjacent land-use changes.

Human Disruption of Avian Use

Managers should strive to minimize disruption to birds, especially during breeding on these wetlands. Conservation of lands that surround these wetlands and regulation of access or education of people entering either BHM or NEC are methods that may assuage disturbance and maintain existing levels of avian use. Types of detrimental activities we observed included canoeing and kayaking (both legal uses) and illegal use of all–terrain vehicles on BHM.

People commonly canoe and kayak in both marshes, however, this type of intrusion during brood-rearing is disruptive to females with broods and may affect productivity. Intrusions in spring and mid–to–late summer may affect feeding by shorebirds and other birds that have stopped for rest during migration. Use of the marshes by paddlers should be monitored and effects assessed to determine if access should be curtailed during critical migration or brood–rearing periods. Informational signs could be used to educate the public or parking could be restricted to reduce disturbance of birds during critical seasonal periods. The most important times of year include the breeding season from mid–April (American Black Ducks) to mid–July (songbirds), and from mid–July to late–September for shorebird migration. While some species (e.g., Mallards) can habituate to human intrusions, others are less tolerant (e.g., Black Ducks, shorebirds). Managers should strive to moderate human intrusion, and balance human recreation needs against the need to protect bird habitat in a multiple use park.

At BHM, some evidence exists that persons with all–terrain vehicles intrude on the salt marsh at low tide and compact vegetation and create compaction of the substrate. Use of these vehicles is potentially disruptive to breeding birds (e.g., Nelson’s Sharp–tailed Sparrow) and to non–breeders found in all seasons (e.g., shorebirds, waterfowl).

Monitoring

Monitoring of avian populations can best be undertaken following the protocols used in this study (or following the current National Park Service landbird survey protocol). Monitoring should occur at 5–10 year intervals. Monitoring of human uses that potentially disrupt avian populations (e.g., shorebirds) may be accomplished through experimental surveys to determine at what levels human usage causes unacceptable levels of avian disruption. Human use thresholds could be experimentally tested through measurements of avian disruption in response to different experimental levels of human intrusion (Gutzwiller and Anderson, 1999). A potential experiment may record how frequently birds stopped their activity in response to different group sizes of canoeists and kayakers or frequency of passage by human users. From this information, human use thresholds could be established.

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Appendix E. Detailed Data Tables and Figures.

Table E.1. Bird species observed in Bass Harbor Marsh and Northeast Creek.

Common Name	Scientific Name	Alpha Code
Common Loon	<i>Gavia immer</i>	COLO
Great Cormorant	<i>Phalacrocorax carbo</i>	GRCO
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	DCCO
Least Bittern	<i>Ixobrychus exilis</i>	LEBI
American Bittern	<i>Botaurus lentiginosus</i>	AMBI
Green Heron	<i>Butorides virescens</i>	GRHE
Great Egret	<i>Ardea alba</i>	GREG
Great Blue Heron	<i>Ardea herodias</i>	GBHE
Canada Goose	<i>Branta Canadensis</i>	CAGO
Mallard	<i>Anas platyrhynchos</i>	MALL
American Black Duck	<i>Anas rubripes</i>	ABDU
America Green-winged Teal	<i>Anas crecca</i>	AGWT
American Wigeon	<i>Anas Americana</i>	AMWI
Blue-wing Teal	<i>Anas discors</i>	BWTE
Ruddy Duck	<i>Oxyura jamaicensis</i>	RUDU
Wood Duck	<i>Aix sponsa</i>	WODU
Ring-necked Duck	<i>Aythya collaris</i>	RIDI
Greater Scaup	<i>Aythya marila</i>	GRSC
Bufflehead	<i>Bucephala albeola</i>	BUFF
Common Merganser	<i>Mergus merganser</i>	COME
Red-breasted Merganser	<i>Mergus serrator</i>	RBME
Hooded Merganser	<i>Lophodytes cucullatus</i>	HOME
Virginia Rail	<i>Rallus limicola</i>	VIRA
Semipalmated Plover	<i>Charadius semipalmatus</i>	SEPL
Killdeer	<i>Charadrius vociferous</i>	KILL
Greater Yellowlegs	<i>Tringa melanoleuca</i>	GRYE
Lesser Yellowlegs	<i>Tringa flavipes</i>	LEYE
Solitary Sandpiper	<i>Tringa solitaria</i>	SOSA
Spotted Sandpiper	<i>Tringa macularia</i>	SPSA
Common Snipe	<i>Gallinago gallinago</i>	COSN
American Woodcock	<i>Scolopax minor</i>	AMWO
Semipalmated Sandpiper	<i>Calidris pusilla</i>	SESA
Least Sandpiper	<i>Calidris minutilla</i>	LESA
Pectoral Sandpiper	<i>Calidris melanotos</i>	PESA
Laughing Gull	<i>Larus atricilla</i>	LAGU
Ring-billed Gull	<i>Larus delawarensis</i>	RBGU
Herring Gull	<i>Larus argentatus</i>	HEGU
Great Black-backed Gull	<i>Larus marinus</i>	GBBG
Turkey Vulture	<i>Cathartes aura</i>	TUVU
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BAEA
Northern Harrier	<i>Circus cyaneus</i>	NOHA
Sharp-shinned Hawk	<i>Accipiter striatus</i>	SSHA
Cooper's Hawk	<i>Accipiter cooperii</i>	COHA
Northern Goshawk	<i>Accipiter gentiles</i>	NOGO
Broad-winged Hawk	<i>Buteo platypterus</i>	BWHA
Osprey	<i>Pandion haliaetus</i>	OSPR
American Kestrel	<i>Falco sparverius</i>	AMKE
Merlin	<i>Falco columbaius</i>	MERL
Peregrine Falcon	<i>Falco peregrinus</i>	PEFA
Ruffed Grouse	<i>Bonasa umbellus</i>	RUGR
Rock Dove	<i>Columba livia</i>	RODO
Mourning Dove	<i>Zenaida macroura</i>	MODO
Black-Billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	BBCU
Short-eared Owl	<i>Asio flammeus</i>	SEOW
Great Horned Owl	<i>Bubo virginianus</i>	GHOW
Barred Owl	<i>Stix varia</i>	BDOW
Common Nighthawk	<i>Chordeiles minor</i>	CONI

Table E.1. Bird species observed in Bass Harbor Marsh and Northeast Creek (continued).

Common Name	Scientific Name	Alpha Code
Chimney Swift	<i>Chaetura pelagica</i>	CHSW
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	RTHU
Belted Kingfisher	<i>Ceryle alcyon</i>	BEKI
Yellow-shafted Flicker	<i>Colaptes auratus</i>	YSFL
Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	YBSA
Downy Woodpecker	<i>Picoides pubescens</i>	DOWO
Hairy Woodpecker	<i>Picoides villosus</i>	HAWO
Pileated Woodpecker	<i>Dryocopus pileatus</i>	PIWO
Eastern Kingbird	<i>Tyrannus tyrannus</i>	EAKI
Great Crested Flycatcher	<i>Myiarchus crinitus</i>	GCFL
Eastern Wood-Pewee	<i>Contopis virens</i>	EAWP
Eastern Phoebe	<i>Sayornis phoebe</i>	EAPH
Least Flycatcher	<i>Empidonax minimus</i>	LEFL
Willow Flycatcher	<i>Empidonax traillii</i>	WIFL
Alder Flycatcher	<i>Empidonax alnorum</i>	ALFL
Yellow-bellied Flycatcher	<i>Empidonax flaviventris</i>	YBFL
Tree Swallow	<i>Tachycineta bicolor</i>	TRES
Bank Swallow	<i>Riparia riparia</i>	BANS
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>	NRWS
Cliff Swallow	<i>Hirundo pyrrhonota</i>	CLSW
Barn Swallow	<i>Hirundo rustica</i>	BARS
Blue Jay	<i>Cyanocitta cristata</i>	BLJA
Gray Jay	<i>Perisoreus canadensis</i>	GRAJ
American Crow	<i>Corvus brachyrhynchos</i>	AMCR
Common Raven	<i>Corvus corax</i>	CORA
Eastern Tufted Titmouse	<i>Baeolophus bicolor</i>	ETTI
Black-capped Chickadee	<i>Parus atricapillus</i>	BCCH
Brown Creeper	<i>Certhia americana</i>	BRCR
White-breasted Nuthatch	<i>Sitta carolinensis</i>	WBNU
Red-breasted Nuthatch	<i>Sitta canadensis</i>	RBNU
Winter Wren	<i>Troglodytes troglodytes</i>	WIWR
Marsh Wren	<i>Cistothorus palustris</i>	MAWR
Golden-crowned Kinglet	<i>Regulus satrapa</i>	GCKI
Ruby-crowned Kinglet	<i>Regulus calendula</i>	RCKI
Blue-gray Gnatcatcher	<i>Poliottila caerulea</i>	BGGN
Wood Thrush	<i>Hylocichla mustelina</i>	WOTH
Veery	<i>Catharus fuscescens</i>	VEER
Swainson's Thrush	<i>Catharus ustulatus</i>	SWTH
Hermit Thrush	<i>Catharus guttatus</i>	HETH
American Robin	<i>Turdus migratorius</i>	AMRO
Northern Shrike	<i>Lanius excubitor</i>	NOSH
Gray Catbird	<i>Dumetella carolinensis</i>	GRCA
Brown Thrasher	<i>Toxostoma rufum</i>	BRTH
American Pipit	<i>Anthus rubescens</i>	AMPI
Cedar Waxwing	<i>Bombycilla cedrorum</i>	CEDW
European Starling	<i>Sturnus vulgaris</i>	EUST
Blue-headed Vireo	<i>Vireo solitarius</i>	BHVI
Red-eyed Vireo	<i>Vireo olivaceus</i>	REVI
Warbling Vireo	<i>Vireo gilvus</i>	WAVI
Tennessee Warbler	<i>Vermivora peregrina</i>	TEWA
Nashville Warbler	<i>Vermivora ruficapilla</i>	NAWA
Northern Parula	<i>Parula americana</i>	NOPA
Black-and-White Warbler	<i>Mniotilta varia</i>	BAWW
Black-throated Blue Warbler	<i>Dendroica caerulescens</i>	BTBW
Blackburnian Warbler	<i>Dendroica fusca</i>	BLBW
Chestnut-sided Warbler	<i>Dendroica pensylvanica</i>	CSWA
Cape May Warbler	<i>Dendroica tigrina</i>	CMWA
Magnolia Warbler	<i>Dendroica magnolia</i>	MAWA
Myrtle Warbler	<i>Dendroica coronata</i>	MYWA

Table E.1. Bird species observed in Bass Harbor Marsh and Northeast Creek (continued).

Common Name	Scientific Name	Alpha Code
Black-throated Green Warbler	<i>Dendroica virens</i>	BTNW
Bay-breasted Warbler	<i>Dendroica castanea</i>	BBWA
Blackpoll Warbler	<i>Dendroica striata</i>	BLPW
Pine Warbler	<i>Dendroica pinus</i>	PIWA
Yellow Palm Warbler	<i>Dendroica palmarum</i>	YPWA
Yellow Warbler	<i>Dendroica petechia</i>	YWAR
Mourning Warbler	<i>Oporornis philadelphia</i>	MOWA
Canada Warbler	<i>Wilsonia canadensis</i>	CAWA
Wilson's Warbler	<i>Wilsonia pusilla</i>	WIWA
Ovenbird	<i>Seiurus aurocapillus</i>	OVEN
Northern Waterthrush	<i>Seiurus noveboracensis</i>	NOWA
Common Yellowthroat	<i>Geothlypis trichas</i>	COYE
American Redstart	<i>Setophaga ruticilla</i>	AMRE
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	ROGR
Indigo Bunting	<i>Passerina cyanea</i>	INBU
Nelson's Sharp-tailed Sparrow	<i>Ammodramus nelsoni</i>	NSTS
Savannah Sparrow	<i>Passerculus sandwichensis</i>	SASP
Song Sparrow	<i>Melospiza melodia</i>	SOSP
Chipping Sparrow	<i>Spizella passerina</i>	CHSP
Slate-colored Junco	<i>Junco hyemalis</i>	SCJU
White-throated Sparrow	<i>Zonotrichia albicollis</i>	WTSP
Fox Sparrow	<i>Passerella iliaca</i>	FOSP
Lincoln's Sparrow	<i>Melospiza lincolni</i>	LISP
Swamp Sparrow	<i>Melospiza georgiana</i>	SWSP
Bobolink	<i>Dolichonyx oryzivorus</i>	BOBO
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	RWBL
Rusty Blackbird	<i>Euphagus carolinus</i>	RUBL
Brown-headed Cowbird	<i>Molothrus ater</i>	BHCO
Common Grackle	<i>Quiscalus quiscula</i>	COGR
Baltimore Oriole	<i>Icterus galbula</i>	BAOR
Pine Siskin	<i>Carduelis pinus</i>	PISI
American Goldfinch	<i>Carduelis tristis</i>	AMGO
Red Crossbill	<i>Loxia curvirostra</i>	RECR
White-winged Crossbill	<i>Loxia leucoptera</i>	WWCR
Purple Finch	<i>Carpodacus purpureus</i>	PUFI
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	EVGR

Table E.2. Universal Transverse Mercator Grid values for random sampling stations of point count surveys and for quiet observation surveys conducted in 2001 and sampling stations for non-random surveys in 2002 at Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine.

Station	UTM E.	UTM N.	Random Point	Station	UTM E.	UTM N.	Random Point
<u>Bass Harbor Marsh, Point Count Survey 1, 2001</u>				<u>Northeast Creek, Point Count Survey 1, 2001</u>			
1	551941	4901982	17	1	555866	4918960	18
2	552105	4901771	39	2	555442	4918965	6
3	552116	4901507	13	3	555141	4918592	39
4	552256	4901065	2	4	554808	4918712	4
5	552620	4900694	3	5	554813	4918430	19
6	552433	4900501	10	6	554637	4917932	32
7	552671	4900397	8	7	554737	4917631	20
8	552678	4900146	16	8	554547	4918455	25
9	551969	4900155	29	9	554482	4918721	10
10	552064	4900834	1	10	554014	4918886	26
11	551840	4901530	9	11*	553793	4919048	74*
				12	554104	4918542	98
				13	554369	4918273	91
				14	554239	4918062	99
				15	554433	4917520	87
				* Non-accessible, #87 substituted			
<u>Bass Harbor Marsh, Point Count Survey 2, 2001</u>				<u>Northeast Creek, Point Count Survey 2, 2001</u>			
1	551711	4902045	92	1	555801	4918724	17
2	552033	4901768	100	2	555539	4919059	5
3	551339	4901702	99	3	555357	4918662	24
4	552245	4901436	74	4	555075	4918519	22
5	552126	4900917	96	5	554773	4918633	6
6	552389	4900702	95	6	554809	4918371	42
7	552630	4900439	78	7	554639	4917891	25
8	552644	4900102	43	8	554517	4918172	2
9	552841	4901856	97	9	554505	4918685	10
10	551929	4901338	98	10	554196	4918825	74
				11	553874	4918975	46
				12	554331	4917896	88
				13	555090	4918958	96
				14	554482	4917375	97
<u>Bass Harbor Marsh, Point Count Survey 3, 2001</u>				<u>Northeast Creek, Point Count Survey 3, 2001</u>			
1	552097	4901762	19	1	555942	4918835	81
2	552328	4901680	42	2	555594	4918874	74
3	552154	4901404	54	3	No point	three	
4	552352	4901149	5	4	554963	4918458	79
5	552617	4900620	2	5	554367	4918445	96
6	552379	4900495	8	6	554658	4917605	50
7	552658	4900130	81	7	554669	4917866	99
8	552261	4900794	3	8	554556	4918213	26
9	551878	4900890	38	9	554481	4918650	78
10	552043	4901162	7	10	553984	4918889	98
11	551866	4901900	6	11	553635	4919194	39
12	551649	4902110	1	12	554791	4917394	6

Table E.2. Universal Transverse Mercator Grid values for random sampling stations of point count surveys and for quiet observation surveys conducted in 2001 and sampling stations for non-random surveys in 2002 at Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine (continued).

Station	UTM E.	UTM N.	Random Point	Station	UTM E.	UTM N.	Random Point
				<u>Northeast Creek, Point Count Survey 3, 2001</u>			
				13	554786	4919010	1
				14	554155	4917871	5
<u>Bass Harbor Marsh, Quiet Observation Stand</u>				<u>Northeast Creek, Quiet Observation Stand</u>			
1	552364	4900466		1	555712	4918846	
2	552449	4900981		2	555591	4918887	
3	552213	4901318		3	555182	4918538	
4	551764	4902086		4	554422	4918925	
5	551488	4902239		5	554720	4917480	
6	551921	4901141					
<u>Bass Harbor Marsh, Point Count Surveys, 2002¹</u>				<u>Northeast Creek, Point Count Surveys, 2002¹</u>			
1	552586	4900322		1	553658	4919208	
2	552797	4900017		2	553928	4918944	
3	552437	4900554		3	554170	4918813	
4	552261	4901029		4	554413	4918905	
5	551957	4901291		5	554685	4918605	
6	552220	4901445		6	554692	4918275	
7	552338	4901714		7	554718	4917477	
8	552053	4901827		8	554670	4917845	
9	551664	4902103		9	554977	4918587	
10	551487	4902360		10	555372	4919782	
11	552133	4900363		11	555695	4918958	
12	552067	4900760		12	555980	4919032	
				13	555898	4918583	
				14	556078	4918302	

¹ During 2002 the same non-random point count stations were used for all three surveys.

Table E.3. Number of birds observed at Bass Harbor Marsh and Northeast Creek by habitat type during each point count survey and each point count survey replicate, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Bass Harbor Marsh, 2001																		
Species	Forest ¹			Shrub			GSH			OWM			OWE			Urban		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
DCCO													1		1			
LEBI								1										
MALL													5	14				
ABDU													4	6				
HEGU													1					
GBBG															1			
SSHA	1																	
OSPR													1					
MODO	5																	
BEKI													1					
YSFL	3																	
EAKI					1													
LEFL				1		1												
ALFL					7	9												
BARS									2									
TRES													2					
AMCR		2	2				1	1	2									
BCCH	1	1	3															
BRCR		1																
RBNU	1	1	2															
WIWR			1															
GCKI	2	1																
RCKI	6	7	4															
HETH	2	5	4															
AMRO	2		1															
GRCA				2		2												
CEDW		6	3															
BHVI		1																
NAWA	5	4	6															
NOPA	5	2	3															
BAWW	5	3	1															
CSWA				1														
MAWA	8	8	12															
MYWA	1	2	3															
BTNW	12	3	7															
YWAR				2	2	1												
COYE				8	4	6	7	3	6									
NSTS								9	9									
SASP							5	7	3									
SOSP				10	6	9												
SCJU		1																
WTSP	11	5	12															
SWSP									1									
RWBL							1	1										
COGR				4	5	1												
AMGO	7	4				1												
PUFI	1	1																
Total	78	58	64	28	25	30	14	24	21	0	0	0	11	24	2	0	0	0
Total (3 surveys)			200			83			59			0			37			0
Total species			24			10			0			8			0			8
Area/ survey ²	15.16	19.93	26.93	6.14	3.78	5.35	17.11	14.61	15.78	1.31	1.63	0.00	9.66	8.22	9.47	4.34	0.70	1.10

¹Counts are presented for each of three replicate surveys conducted in each wetland and each year. Codes for habitat type are: Forest = forested, either coniferous or deciduous, GSH = grasses, sedges, other herbaceous plants, OWE = open water estuarine, OWM = open water marsh, Shrub = woody shrubs, UNK = activity unknown, URB = urban.

²Areas are presented in hectares for each habitat type found in point count plots surveyed in each survey replicate.

Table E.3. Number of birds observed at Bass Harbor Marsh and Northeast Creek by habitat type during each point count survey and each point count survey replicate, Acadia National Park, Mount Desert Island, Maine, 2001–2002 (continued).

Bass Harbor Marsh, 2002																		
Species	Forest			Shrub			GSH			OWM			OWE			Urban		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
DCCO													2		3			
MALL													8	2	5			
ABDU													2					
WODU														1				
HOME													1					
LEYE							1											
PESA							4											
RBGU													4					
HEGU													6	1	6			
GBBG														1	1			
TUVU							1											
MODO	2	2	1															
DOWO	3	1																
ALFL					12	7												
YBFL		2	1															
TRES								2										
BARS							3											
BLJA	3	1	9															
AMCR	1	1	1															
CORA		1	3															
BCCH	4	2	1															
BRCR	1	1																
RBNU	3	4																
WIWR		1	1															
GCKI	4	3	2															
RCKI	6	6	6	1		1												
SWTH		1	1															
HETH	1	2	4															
AMRO	1	3	1															
GRCA				2	3													
CEDW		1	2															
BHVI	1	1	2															
NAWA	7	5	7															
NOPA	8	6	10															
BAWW	1	5	1															
CSWA	1			1	2	1												
MAWA	11	5	3															
MYWA	9	6	5															
BTNW	11	11	8															
YPWA		1																
YWAR				3	3	1												
OVEN			2															
COYE				12	8	12	3	3	3									
AMRE	2																	
NSTS								5	9									
SASP							2	2	4									
SOSP				11	2	10												
SCJU	3	2	1															
WTSP	8	5	9															
SWSP							5	1	2									
RWBL							3	2	2									
COGR				11	9	2												
AMGO	7	1	1	8	1	2												
PUFI	6	2																
EVGR	1																	
Total	105	82	82	49	40	36	22	15	20	0	0	0	23	5	15	0	0	0
Total (3 surveys)			269			125			57				0		43			0
Total species			34			9			8				0		8			0
Area / survey ²	18.80	18.80	18.80	5.77	5.77	5.77	20.55	20.55	20.55	1.16	1.16	1.16	11.33	11.33	11.33	0.96	0.96	0.96

Table E.3. Number of birds observed at Bass Harbor Marsh and Northeast Creek by habitat type during each point count survey and each point count survey replicate, Acadia National Park, Mount Desert Island, Maine, 2001–2002 (continued).

Northeast Creek, 2001																		
Species	Forest ¹			Shrub			GSH			OWM			OWE			Urban		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
DCCO										1	2	1						
AMBI								1										
MALL										8	3	2						
ABDU										3		1						
WODU												1						
BAEA							2											
BWHA	1																	
RUGR	1																	
MODO	1		2															
RTHU		1																
BEKI										1		1						
YSFL	2	1																
HAWO		1																
GCFL		1	1															
EAPH				1														1
ALFL					15	10												
TRES								3	2									
BLJA		2	2															
AMCR		1	2				2											
BCCH	4	1	4															
RBNU	1		2															
RCKI			1															
VEER				2	2													
HETH	3	1	6															
AMRO	2																	
GRCA					3	2												
CEDW		1	4															
EUST																		1
BHVI	1																	
REVI		5	1															
WAVI			1															
NAWA	6	4	3															
NOPA	2	2	4															
BAWW	4	2	1															
BLBW		1																
CSWA	5	2																
MAWA		2	3															
MYWA	4	2	5															
BTNW	6	2																
YPWA				3	1	1												
YWAR				5	9	9												
OVEN	6	5	1															
COYE							24	28	22									
SASP							13	13	8									
SOSP				3	6	3												
WTSP	5	6	4															
SWSP							12	12	6									
BHCO				1														
RWBL							7	6	8									
COGR				4	13	5												
AMGO				8	5	8												
WWCR	2																	
Total	56	43	47	27	54	38	60	63	46	13	5	6	0	0	0	0	1	1
Total (3 surveys)			146			119			169			0			24			2
Total species			29			10			8			0			5			2
Area / survey ²	11.07	11.17	14.00	3.75	9.71	4.71	48.80	43.07	39.96	4.76	4.41	4.06	0	0	0	0	0.02	0.08

Table E.3. Number of birds observed at Bass Harbor Marsh and Northeast Creek by habitat type during each point count survey and each point count survey replicate, Acadia National Park, Mount Desert Island, Maine, 2001–2002 (continued).

Northeast Creek, 2002																		
Species	Forest ¹			Shrub			GSH			OWM			OWE			Urban		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
DCCO										2	1	1						
AMBI							1											
MALL										1	14							
ABDU										7								
WODU											1							
SPSA										3								
HEGU										1	2	4						
NOHA							2											
SSHA			1															
BWHA		1																
OSPR											1	1						
PEFA									1									
MODO	1	5	1															
YSFL		1																
HAWO		1																
EAPH																		1
ALFL					9	9												
TRES							1	1										
BARS							2	1										
BLJA	10	3	1															
AMCR	9	10	4															
CORA			2															
BCCH	7	5	6															
RBNU	1																	
GCKI	1																	
VEER								1										
HETH	5	2	1															
AMRO	3	8	4															
GRCA				3	1	2												
CEDW			5															
EUST																		1
BHVI	1	1																
REVI		3	3															
NAWA	11	3	2															
NOPA	3	3	1															
BAWW	6	4																
BTBW	1																	
CSWA				10	11	2												
MAWA	2	1	1															
MYWA	5	3	5															
BTNW	5	3	5															
PIWA	1																	
YWAR				12	11	11												
CAWA				1														
OVEN	8	6	3															
COYE									19	24	19							
AMRE	1																	
ROGR		1																
SASP									11	8	11							
SOSP				5	9	11												
CHSP																		1
WTSP	10	7	7															
SWSP									12	10	11							
BOBO									2	3	2							
RWBL									11	13	8							
COGR				2	3	5												
AMGO				12	15	3												

Table E.3. Number of birds observed at Bass Harbor Marsh and Northeast Creek by habitat type during each point count survey and each point count survey replicate, Acadia National Park, Mount Desert Island, ME, 2001–2002 (continued).

Northeast Creek, 2002

Species	Forest ¹			Shrub			GSH			OWM			OWE			Urban			
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	
PUFI				1															
Total	91	71	53	45	59	44	61	61	51	14	19	6	0	0	0	1	2	0	
Total (3 Surveys)			215			148			173			0			39			3	
Total species			29			9			10			0			7			3	
Area / Survey ²	12.33	12.33	12.33	7.66	7.66	7.66	41.17	41.17	41.17	5.81	5.81	5.81	0	0	0	1.41	1.41	1.41	

¹Counts are presented for each of three replicate surveys conducted in each wetland and each year. Codes for habitat type are: Forest = forested, either coniferous or deciduous, GSH = grasses, sedges, other herbaceous plants, OWE = open water estuarine, OWM = open water marsh, Shrub = woody shrubs, UNK = activity unknown, URB = urban.

²Areas are presented in hectares for each habitat type found in point count plots surveyed in each survey replicate.

Table E.4. Species attributes by guilds at Bass Harbor and Northeast Creek, Acadia National Park, based on combined year (2001, 2002) survey data.

Loons, Geese, and Ducks observed at Bass Harbor Marsh

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
COLO	U	7	1-1, 1.0 ± 0, 7	A	FLY	FO
GRCO	R	1	2-2, 2.0 ± 0, 2	UNK	OWE	UNK
DCCO	C	58	1-25, 2.4 ± 3.9, 139	A	FLY	FRG
				J	OWE	FO
CAGO	U	7	1-1, 1.0 ± 0, 7	A	OWE	FRG
MALL	C	110	1-45, 5.6 ± 6.4, 618	A	GSH	FRG
				J	OWM	N
					OWE	R
ABDU	C	83	1-35, 6.8 ± 7.6, 568	A	GSH	FRG
				J	OWM	
					OWE	
AGWT	U	7	1-7, 2.3 ± 2.1, 16	A	OWE	UNK
BWTE	R	4	1-6, 3.3 ± 2.2, 13	A	GSH	UNK
RUDU	R	1	1-1, 1.0 ± 0, 1	A	OWE	UNK
WODU	C	25	1-7, 2.2 ± 1.8, 55	A	OWM	FRG
				J	OWE	
RIDU	R	2	2-4, 3.0 ± 1.4, 6	A	OWE	UNK
GRSC	R	2	1-2, 1.5 ± 0.5, 2	A	OWE	UNK
BUFF	C	20	2-21, 8.8 ± 6.2, 175	A	OWE	UNK
				S		
COME	U	8	1-6, 2.5 ± 1.9, 20	A	OWE	UNK
RBME	U	21	1-12, 4.7 ± 3.3, 98	A	OWE	UNK
				S		
HOME	R	3	1-3, 2.0 ± 1.0, 6	S	OWE	UNK

Loons, Geese, And Ducks observed At Northeast Creek

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
COLO	R	2	1-1, 1.0 ± 0, 2	A	FLY	UNK
DCCO	C	38	1-9, 1.5 ± 1.6, 57	A	OWM	FRG
				J		
CAGO	R	5	1-10, 3.0 ± 3.9, 15	A	FLY	UNK
MALL	C	139	1-24, 3.6 ± 3.6, 498	A	FLY	FRG
				J	OWM	
MBDH	R	1	1-1, 1.0 ± 0, 2	A	OWM	UNK
ABDU	C	91	1-20, 3.6 ± 3.7, 330	A	GSH	N
				J	OWM	FRG
						R
AGWT	U	6	1-12, 4.0 ± 4.0, 24	A	OWM	UNK
AMWI	R	4	2-7, 3.25 ± 2.5, 13	A	OWM	UNK
BWTE	R	3	1-4, 2.7 ± 1.5, 8	A	OWM	UNK
				J		
WODU	C	30	1-6, 2.0 ± 1.0, 59	A	OWM	FRG
				J		
RIDU	U	6	5-17, 8.3 ± 4.5, 50	A	OWM	UNK
BUFF	U	7	2-5, 2.4 ± 1.1, 17	A	OWM	UNK
COME	R	3	1-1, 1.0 ± 0, 3	A	OWM	UNK

Loons, Geese, And Ducks observed At Northeast Creek (continued)

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
HOME	U	12	2-10, 3.0 ± 2.3, 36	A	OWM	FRG
				J		

Table E.4. Species attributes by guilds at Bass Harbor and Northeast Creek, Acadia National Park, based on combined year (2001, 2002) survey data (continued).

Wading birds observed at Bass Harbor Marsh

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
LEBI	U	6	1-2, 1.2 ± 0.4, 7	A J	OWM	S
AMBI	R	3	1-1, 1.0 ± 0, 5	A	GSH	FRG S
GRHE	R	1	1-1, 1, 1	A	OWM	FRG
GREG	R	5	1-1, 1.0 ± 0, 5	A	OWE GSH	FRG R
GBHE	C	53	1-7, 1.9 ± 1.4, 100	A J	OWM OWE	FRG

Wading birds observed at Northeast Creek

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
AMBI	C	45	1-2, 1.1 ± 0.3, 49	A	GSH	FRG S
GRHE	R	1	1-1, 1, 1	A	OWM	FRG
GBHE	C	27	1-2, 1.1 ± 0.4, 31	A J	GSH OWM	FRG

Raptors observed at Bass Harbor Marsh

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
TUVU	R	4	1-2, 1.3 ± 0.5, 5	A	FLY	FO
BAEA	U	19	1-2, 1.1 ± 0.3, 21	A J S	FLY	FO
NOHA	U	15	1-2, 1.1 ± 0.3, 16	A	FLY	FRG
SSHA	U	14	1-1, 1.0 ± 0, 14	A	FLY FOR CON	FO
NOGO	R	3	1-2, 1.3 ± 0.6, 4	A S	FLY	UNK
BWHA	U	8	1-3, 1.4 ± 0.7, 11	A J	FOR FLY	UNK
OSPR	U	19	1-2, 1.3 ± 0.5, 24	A J	FLY OWE	FO FRG
AMKE	R	1	1-1, 1, 1	A	FLY	FO
MERL	R	2	1-1, 1.0 ± 0, 2	A	FOR CON	UNK
SEOW	R	1	1-1, 1, 1	A	GSH	FRG
BDOW	R	1	1-1, 1, 1	UNK	FOR CON	UNK

Table E.4. Species attributes by guilds at Bass Harbor and Northeast Creek, Acadia National Park, based on combined year (2001, 2002) survey data (continued).

Raptors observed at Northeast Creek

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
TUVU	C	20	1-4, 1.6 ± 1.0, 32	A	FLY GSH	FRG
				J		FO
BAEA	C	21	1-2, 1.3 ± 0.5, 27	A	FLY GSH	FRG
				J		FO
				SA		
NOHA	C	61	1-3, 1.3 ± 0.5, 77	A	FLY GSH	FRG
				J		FO
SSHA	U	14	1-3, 1.1 ± 0.5, 16	A	FLY FOR CON	FRG FO
COHA	R	5	1-1, 1.0 ± 0, 4	A	FLY FOR DEC	FRG FO
BWHA	U	15	1-4, 1.2 ± 0.8, 18	A	FOR	FRG
				J	FLY	FO
OSPR	U	17	1-2, 1.1 ± 0.2, 18	A	FLY	FRG
				SA	OWE	FO
					OWM	
AMKE	U	12	1-4, 1.3 ± 0.9, 15	A	FLY GSH	FRG
				J		FO
MERL	R	1	1-1, 1, 1	UNK	FLY	FO
PEFA	R	1	1-1, 1, 1	A	FLY	FO
GHOW	R	1	1-1, 1, 1	A	FOR	UNK
BDOW	R	3	1-1, 1.0 ± 0, 3	A	FOR	UNK

Shorebird Use of Bass Harbor Marsh

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
SEPL	R	1	1-1, 1.0, 1	UNK	GSH	FRG
KILL	R	2	1-2, 1.5 ± 0.7, 3	A	GSH	FRG
GRYE	U	15	1-9, 2.3 ± 2.6, 34	A	GSH	FRG
				J		
LEYE	U	13	1-5, 2.2 ± 1.3, 28	A	GSH	FRG
				J		
SOSA	U	6	1-6, 2.3 ± 2.2, 14	A	GSH	FRG
						R
SPSA	R	2	1-1, 1.0 ± 0, 2	A	GSH	FRG
COSN	U	8	1-3, 1.4 ± 0.7, 11	A	GSH	FRG
						R
AMWO	U	4	1-2, 1.25 ± 0.5, 5	A	GSH	FRG
					SHB	R
SESA	U	5	1-8, 3.8 ± 2.8, 19	A	GSH	FRG
						R
LESA	U	11	2-40, 13.6 ± 13.4, 150	A	GSH	FRG
				J		R
PESA	R	3	1-4, 2.7 ± 1.5, 8	A	GSH	FRG
				J		
KILL	U	5	1-1, 1.0 ± 0, 5	A	GSH	FRG
GRYE	U	8	1-5, 2.3 ± 1.4, 18	A	GSH	FRG

Shorebird Use of Bass Harbor Marsh (continued)

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
LEYE	R	2	1-1, 1.0 ± 0, 1	A	GSH	FRG

Table E.4. Species attributes by guilds at Bass Harbor and Northeast Creek, Acadia National Park, based on combined year (2001, 2002) survey data (continued).

Shorebird use at Northeast Creek

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
SOSA	R	3	1-3, 1.7 ± 1.2, 5	A	GSH	FRG
SPSA	R	4	1-2, 1.3 ± 0.5, 5	A	OWM	FRG
COSN	U	8	1-5, 2.1 ± 1.8, 17	A	GSH	FRG
AMWO	U	14	1-3, 1.2 ± 0.6, 17	A	GSH SHB	FRG R D
SESA	R	1	1-1, 1.0, 1	UNK	GSH	FRG
LESA	U	7	1-8, 3.1 ± 2.5, 22	A	GSH	FRG

Gulls observed at Bass Harbor Marsh

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
LAGU	R	2	2-3, 2.5 ± 0.7, 5	A	FLY OWE	FRG R
RBGU	U	20	1-30, 6.7 ± 8.3, 133	A	FLY OWE	FO FRG
HEGU	C	66	1-40, 4.6 ± 7.6, 304	A J	FLY OWE	FO FRG
GBBG	C	28	1-13, 2.0 ± 2.4, 56	SA A	FLY OWE	R FO R

Gulls observed at Northeast Creek

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
RBGU	R	5	1-70, 15.2 ± 30.6, 76	A	FLY GSH	FO R
HEGU	C	32	1-200, 9.4 ± 35.3, 300	A	FLY OWM	FO R
GBBG	R	2	1-1, 1.0 ± 0, 2	A	FLY	FO

Passerine species observed at Bass Harbor Marsh

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
RUGR	R	3	1-1, 1.0 ± 0, 3	A	FOR	D
RODO	R	2	2-3, 2.5 ± 0.7, 5	A	FLY	C
MODO	C	62	1-3, 1.2 ± 0.4, 72	A	FLY	C

Table E.4. Species attributes by guilds at Bass Harbor and Northeast Creek, Acadia National Park, based on combined year (2001, 2002) survey data (continued).

Passerine species observed at Bass Harbor Marsh (continued)

Species	Frequency	Abundance	Age Class	Habitat	Behavior
MODO				FOR	FO
				SHB	
CHSW	R 2	1-1, 1.0 ± 0, 2	A	FLY	FO
RTHU	R 4	1-1, 1.0 ± 0, 4	A	FLY	FO
BEKI	C 39	1-2, 1.1 ± 0.3, 43	A	FLY	FO
			J	OWM	FRG
				OWE	
YSFL	C 45	1-3, 1.1 ± 0.4, 51	A	FOR	C
				GSH	
				SHB	
YBSA	R 1	1-1, 1, 1	A	FOR DEC	C
DOWO	C 23	1-2, 1.1 ± 0.3, 25	A	FOR	C
					FRG
HAWO	U 9	1-1, 1.0 ± 0, 9	A	FOR	UNK
PIWO	U 6	1-1, 1.0 ± 0, 6	A	FOR	C
EAKI	R 5	1-3, 1.8 ± 0.8, 9	A	FOR DEC	FRG
				GSH	S
EAWP	R 1	1-1, 1, 1	A	FOR DEC	S
EAPH	U 6	1-3, 1.5 ± 0.8, 9	A	FOR	C
LEFL	R 4	1-1, 1.0 ± 0, 4	A	FOR DEC	S
ALFL	C 56	1-3, 1.3 ± 0.5, 72	A	SHB	C
					S
YBFL	U 8	1-2, 1.1 ± 0.4, 9	A	FOR	FRG
					S
TRES	U 15	1-5, 2.1 ± 1.4, 32	A	FLY	FRG
NRWS	R 1	1-1, 1, 1	A	FLY	FRG
BARS	U 15	1-5, 1.9 ± 1.3, 29	A	FLY	FRG
			J		
BLJA	C 71	1-5, 1.2 ± 0.7, 71	A	FOR	C
					FRG
GRAJ	R 1	1-1, 1, 1	A	FOR CON	UNK
AMCR	C 81	1-20, 3.0 ± 3.9, 241	A	FLY FOR	C
				GSH	FO
CORA	C 72	1-13, 1.7 ± 1.7, 121	A	FLY	C
				FOR CON	FO
BCCH	C 73	1-6, 1.8 ± 1.2, 128	A	FOR	C
			J	SHB	FRG S
BRCR	C 24	1-2, 1.1 ± 0.3, 26	A	FOR CON	C
					FRG
					S
RBNU	C 59	1-1, 1.0 ± 0, 59	A	FOR	C
WIWR	C 40	1-1, 1.0 ± 0, 40	A	FOR CON	S
MAWR	R 2	1-1, 1.0 ± 0, 2	A	SHB	S
GCKI	C 62	1-5, 1.5 ± 0.4, 102	A	FOR CON	C
			J		FRG
GCKI					S
RCKI	C 78	1-4, 1.2 ± 0.6, 95	A	FOR CON	C

Table E.4. Species attributes by guilds at Bass Harbor and Northeast Creek, Acadia National Park, based on combined year (2001, 2002) survey data (continued).

Passerine species observed at Bass Harbor Marsh (continued)

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
RCKI				J		FRG S
VEER	R	1	1-1, 1, 1	A	SHB	UNK
SWTH	U	8	1-2, 1.1 ± 0.4, 9	A	FOR CON	S
HETH	C	59	1-3, 1.2 ± 0.4, 69	A	FOR	C
						S
AMRO	C	48	1-8, 1.2 ± 1.1, 59	A	FOR	C
						S
NOSH	R	1	1-1, 1, 1	A	FOR	UNK
GRCA	C	27	1-1, 1.0 ± 0, 27	A	SHB	S
AMPI	R	1	5-5, 5, 5	UNK	GSH	R
CEDW	C	43	1-20, 2.0 ± 2.9, 88	A	FLY	C
					FOR CON	FRG
						FO
						N
BHVI	C	23	1-2, 1.0 ± 0.2, 24	A	FOR CON	S
REVI	R	3	1-1, 1.0 ± 0, 3	A	FOR	S
TEWA	R	1	1-1, 1, 1	A	SHB	S
NAWA	C	46	1-2, 1.1 ± 0.3, 52	A	FOR	S
NOPA	C	57	1-2, 1.1 ± 0.2, 60	A	FOR	S
BAWW	C	40	1-2, 1.1 ± 0.3, 43	A	FOR	S
CSWA	U	12	1-1, 1.0 ± 0, 12	A	FOR DEC	S
					SHB	
MAWA	C	79	1-3, 1.2 ± 0.4, 93	A	FOR	FRG
						S
MYWA	C	64	1-4, 1.2 ± 0.5, 78	A	FOR	FRG
						S
BTNW	C	86	1-5, 1.2 ± 0.6, 102	A	FOR CON	S
						J
BBWA	R	1	1-1, 1, 1	A	FOR CON	S
BLPW	R	1	2-2, 2, 2	A	FOR CON	S
YPWA	C	20	1-6, 1.3 ± 1.1, 26	A	SHB	S
YWAR	C	27	1-2, 1.0 ± 0.2, 28	A	SHB	FRG
						S
WIWA	R	1	1-1, 1, 1	A	SHB	S
OVEN	R	5	1-1, 1.0 ± 0, 5	A	FOR	S
COYE	C	117	1-3, 1.2 ± 0.5, 143	A	SHB	FRG
						N
						J
AMRE	R	4	1-2, 1.3 ± 0.5, 3	A	SHB	UNK
ROGR	R	1	1-1, 1, 1	A	FOR DEC	S
NSTS	C	66	1-7, 2.2 ± 1.7, 146	A	GSH	FRG
						J
						S
SASP	C	55	1-5, 1.4 ± 0.9, 77	A	GSH	Y
						FRG
						N
						S
SASP						FY
SOSP	C	106	1-4, 1.3 ± 0.6, 141	A	FOR DEC	S

Table E.4. Species attributes by guilds at Bass Harbor and Northeast Creek, Acadia National Park, based on combined year (2001, 2002) survey data (continued).

Passerine species observed at Bass Harbor Marsh (continued)

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
SOSP				J	SHB	
SCJU	C	35	1-3, 1.1 ± 0.4, 39	A	FOR	FY S
WTSP	C	107	1-4, 1.3 ± 0.7, 138	A	FOR	FRG
LISP	R	2	1-3, 2.0 ± 1.4, 4	J	SHB	J
SWSP	C	40	1-6, 1.8 ± 1.2, 70	A	GSH	UNK
				A	GSH	FRG
				J	SHB	N
RWBL	C	51	1-10, 2.7 ± 2.2, 138	A	GSH	S
				J	SHB	C
						FRG
						S
RUBL	R	1	1-1, 1, 1	UNK	SHB	T
BHCO	R	1	1-1, 1, 1	A	FOR CON	UNK
COGR	C	85	1-45, 4.4 ± 7.8, 377	A	FLY	U
					GSH	C
						FO
						T
PISI	R	3	1-4, 2.3 ± 1.5, 7	A	FOR CON	UNK
AMGO	C	90	1-4, 1.4 ± 0.7, 128	A	FOR SHB	C
						S
RECR	R	4	1-6, 3 ± 2.4, 12	A	FOR CON	C
						S
WWCR	R	4	1-4, 2.3 ± 1.3, 9	A	FOR CON	S
PUFI	C	36	1-4, 1.2 ± 0.6, 42	A	FOR	S
				J		
EVGR	R	2	1-2, 1.5 ± 0.7, 3	A	FLY	FO

Passerine species observed at Northeast Creek

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
VIRA	U	13	1-2, 1.2 ± 0.4, 15	A	GSH	S
RUGR	U	10	1-1, 1.0 ± 0, 10	A	FOR	FRG
						D
RODO	R	4	1-2, 1.3 ± 0.5, 5	A	FLY	FO
MODO	C	98	1-33, 1.8 ± 3.4, 174	A	FLY	C
				J	FOR	FO
					SHB	N
						R
	R	1	1-1, 1.0, 1	A	FOR	S
BBCU	R	1	1-1, 1.0, 1	A	FOR	S
CONI	U	6	1-3, 1.7 ± 0.8, 10	A	FLY	C
						FRG
CHSW	R	5	1-2, 1.4 ± 0.5, 7	A	FLY	FRG
RTHU	R	3	1-1, 1.0 ± 0, 3	A	FLY	FO
				J	FOR	R
BEKI	U	18	1-2, 1.1 ± 0.3, 20	A	FLY	FRG

Table E.4. Species attributes by guilds at Bass Harbor and Northeast Creek, Acadia National Park, based on combined year (2001, 2002) survey data (continued).

Passerine species observed at Northeast Creek (continued)

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
BEKI				J	OWM	
YSFL	C	46	1-2, 1.1 ± 0.2, 49	A	FOR	C
					GSH	FRG
YBSA	R	3	1-1, 1.0 ± 0, 3	A	FOR	UNK
DOWO	C	31	1-2, 1.1 ± 0.3, 35	A	FOR	C
						FRG
HAWO	U	14	1-2, 1.1 ± 0.4, 16	A	FOR	FY
						FRG
PIWO	C	26	1-2, 1.0 ± 0.2, 27	A	FOR	C
						FRG
EAKI	R	3	1-2, 1.3 ± 0.6, 4	A	FOR	S
					GSH	
GCFL	U	7	1-2, 1.1 ± 0.4, 8	UNK	U	UNK
EAWP	U	12	1-1, 1.0 ± 0, 12	A	FOR	S
EAPH	C	25	1-4, 1.2 ± 0.6, 25	A	FOR	C
				J	SHB	S
LEFL	R	1	1-1, 1.0, 1	A	FOR DEC	S
WIFL	R	1	1-1, 1.0, 1	A	SHB	S
TRFL	R	1	2-2, 2.0, 2	UNK	SHB	UNK
ALFL	C	75	1-3, 1.2 ± 0.5, 93	A	SHB	C
						FRG
						S
TRES	C	57	1-50, 5.1 ± 8.4, 291	A	FLY	FRG
BANS	R	2	2-6, 4 ± 2.8, 8	A	FLY	FRG
				J		
NRWS	R	3	1-15, 5.7 ± 8.1, 17	A	FLY	UNK
CLSW	R	5	1-10, 5.4 ± 3.6, 27	A	FLY	FRG
BARS	C	31	1-10, 2.3 ± 2.4, 70	A	FLY	FRG
				J		
BLJA	C	88	1-20, 2.1 ± 3.0, 182	A	FLY	C
					FOR	FRG
					SHB	FO
AMCR	C	125	1-75, 4.2 ± 7.9, 525	A	FLY	C
				J	FOR	FRG
					GSH	FO
					SHB	
CORA	C	30	1-6, 1.5 ± 1.0, 46	A	FLY	C
						FO
ETTI	R	2	1-1, 1.0 ± 0, 2	A	FOR	S
BCCH	C	113	1-10, 1.8 ± 1.4, 207	A	FOR	C
				J	SHB	FRG
BRCR	U	19	1-2, 1.2 ± 0.4, 22	A	FOR	FRG
						S
WBNU	R	1	1-1, 1.0, 1	UNK	FOR CON	UNK
RBNU	C	42	1-5, 1.1 ± 0.6, 46	A	FOR CON	C
				J		FRG
WIWR	R	4	1-1, 1.0 ± 0, 4	A	FOR	S

Table E.4. Species attributes by guilds at Bass Harbor and Northeast Creek, Acadia National Park, based on combined year (2001, 2002) survey data (continued).

Passerine species observed at Northeast Creek (continued)

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
BGGN	R	1	1-1, 1, 1	A	SHB	UNK
GCKI	C	39	1-5, 1.6 ± 1.0, 61	A J	FOR	C FRG S
RCKI	C	22	1-3, 1.4 ± 0.7, 30	A	FOR SHB	S
WOTH	R	2	1-1, 1.0 ± 0, 2	A	FOR DEC	S
VEER	U	14	1-2, 1.1 ± 0.4, 16	A	FOR	S
SWTH	R	1	1-1, 1.0, 1	UNK	GSH	UNK
HETH	C	88	1-3, 1.2 ± 0.4, 102	A J	FOR	C FRG S
AMRO	C	69	1-3, 1.2 ± 0.6, 86	A J	FOR SHB	C FRG S
NOSH	R	3	1-1, 1.0 ± 0, 3	A	SHB	UNK
GRCA	C	61	1-4, 1.3 ± 0.6, 77	A J	SHB	CF S
BRTH	R	2	1-1, 1.0 ± 0, 2	A	SHB	UNK
CEDW	C	45	1-10, 2.0 ± 2.0, 91	A	FOR FLY SHB	C FO FRG
EUST	C	41	1-50, 9.0 ± 13.0, 367	A	FOR SHB	FRG R
BHVI	C	42	1-2, 1.0 ± 0.2, 43	A	FOR	S
REVI	C	40	1-2, 1.1 ± 0.3, 43	A J	FOR DEC	S
WAVI	R	2	1-1, 1.0 ± 0, 1	A	SHB	S
TEWA	R	1	1-1, 1.0, 1	UNK	FOR CON	UNK
NAWA	C	53	1-10, 1.3 ± 1.3, 71	A J	FOR	FRG S
NOPA	C	50	1-4, 1.1 ± 0.4, 54	A J	FOR	FRG S
BAWW	C	70	1-10, 1.2 ± 1.1, 83	A J	FOR	FRG S
CSWA	C	48	1-2, 1.1 ± 0.3, 54	A	FOR	FRG S
CMWA	R	1	1-1, 1.0, 1	UNK	FOR CON	UNK
CAWA	R	3	1-1, 1.0 ± 0, 1	A	SHB	FRG
BTBW	R	3	1-1, 1.0 ± 0, 3	A	FOR	S
BLBW	R	5	1-2, 1.6 ± 0.5, 8	A J	FOR	S
MAWA	C	20	1-4, 1.4 ± 0.8, 27	A J	FOR	S
MYWA	C	62	1-20, 2.0 ± 2.8, 123	A J	FOR	S
BTNW	C	54	1-4, 1.2 ± 0.6, 64	A	FOR	S

Table E.4. Species attributes by guilds at Bass Harbor and Northeast Creek, Acadia National Park, based on combined year (2001, 2002) survey data (continued).

Passerine species observed at Northeast Creek (continued)

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
BTNW				J		
BBWA	R	2	3-5, 4.0 ± 1.4, 8	A	FOR	S
				J		
PIWA	U	14	1-4, 1.4 ± 0.9, 19	A	FOR CON	FY
				J		FRG
PIWA						S
YPWA	C	29	1-10, 2.7 ± 2.3, 77	A	FOR	FRG
					SHB	S
YWAR	C	101	1-5, 1.3 ± 0.6, 134	A	SHB	FRG
				J		N
						S
MOWA	R	1	1-1, 1.0, 1	A	SHB	S
CAWA	R	1	1-1, 1.0, 1	A	SHB	S
WIWA	R	2	1-1, 1.0 ± 0, 2	A	SHB	UNK
OVEN	C	63	1-2, 1.1 ± 0.2, 67	A	FOR	S
						UNK
NOWA	R	1	1-1, 1.0, 1	A	SHB	UNK
COYE	C	177	1-8, 1.6 ± 0.9, 278	A	SHB	FRG
				J		N
						S
AMRE	U	8	1-1, 1.0 ± 0, 8	A	FOR	S
					SHB	
ROGR	R	4	1-1, 1.0 ± 0, 4	A	FOR DEC	S
INBU	R	1	1-1, 1.0, 1	A	SHB	S
FOSP	R	3	1-2, 1.3 ± 0.6, 4	A	FOR	UNK
SASP	C	113	1-7, 1.4 ± 0.9, 159	A	GSH	FRG
				J	SHB	S
SOSP	C	128	1-8, 1.6 ± 1.0, 202	A	FOR	FRG
				J	GSH	S
					SHB	
CHSP	R	1	1-1, 1.0, 1	A	SHB	S
SCJU	U	10	1-3, 1.3 ± 0.7, 13	A	FOR CON	FRG
				J		S
WTSP	C	114	1-10, 1.3 ± 1.0, 144	A	FOR	FY
				J	SHB	FRG
						S
LISP	R	1	1-1, 1.0, 1	UNK	GSH	UNK
SWSP	C	136	1-5, 1.6 ± 0.9, 223	A	GSH	FY
				J	SHB	FRG
						S
NSTS	R	3	1-1, 1.0 ± 0, 3	A	GSH	S
BOBO	C	40	1-10, 2.2 ± 2.1, 89	A	GSH	FRG
				J		S
RWBL	C	123	1-40, 3.3 ± 5.1, 405	A	GSH	FY
				J	SHB	FRG
						S
RUBL	R	2	1-1, 1.0 ± 0, 2	A	FLY	FO

Table E.4. Species attributes by guilds at Bass Harbor and Northeast Creek, Acadia National Park, based on combined year (2001, 2002) survey data (continued).

Passerine species observed at Northeast Creek (continued)

Species	Frequency ¹		Abundance ²	Age Class ³	Habitat ⁴	Behavior ⁵
RUBL					SHB	
BHCO	U	7	1-1, 1.0 ± 0, 4	A	FOR	UNK
					SHB	
COGR	C	95	1-130, 5.7 ± 15.5, 542	A	FLY	C
					FOR	FO
COGR					SHB	
BAOR	R	1	1-1, 1.0, 1	A	SHB	UNK
PISI	R	2	1-1, 1.0 ± 0, 2	A	FOR CON	UNK
AMGO	C	145	1-20, 1.9 ± 2.0, 274	A	FLY	C
				J	FOR	COP
					SHB	FRG
						FO
						S
WWCR	R	3	1-1, 1.0 ± 0, 3	UNK	FOR CON	UNK
PUFI	C	23	1-2, 1.2 ± 0.4, 27	A	FOR CON	S
				J		
EVGR	R	4	1-2, 1.5 ± 0.6, 6	A	FLY	FO

¹ Frequency: Common = >20 observations; Uncommon = 6-19 observations; Rare = 1-5 observations; the numeral equals number days on which species was observed.

² Abundance: Size of groups observed per day: range, mean ± SD, total number of individuals observed.

³ Age class: Adult, Juvenile, SubAdult, UNKnown. Age classes may be observed in all habitat types.

⁴ Habitat: Typical habitats as defined by Acadia National Park vegetation maps that were used by different individuals: FOR = CONiferous, DECiduous; GSH = Grasses, Sedges, other Herbaceous plants; OWE = open water estuarine; OWM = open water marsh; SHB = woody shrubs. If a bird was flying we coded as FLY.

⁵ Behavior: Description of behaviors including Call, COP = copulate, D = display, drum, FY = feeding young, FO = flying over, FRG = foraging, N = nest found, R = roosting, S = territorial song, UNK = activity unknown.

Table E.5. Spatial habitat guilds used by birds observed in Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002 data combined.

Bass Harbor Marsh habitat guilds¹

Common Name	Roosting	Nest/Territorial		Foraging	Other
Common Loon	UNK	N/A	UNK	FO	
Great Cormorant	OWE		N/A	OWE	
Double-crested Cormorant	OWE		N/A	OWE	
Least Bittern	OWM		OWM	OWM	
American Bittern	UNK		GSH	GSH	
			OWM	OWM	
Green Heron	UNK		UNK	OWM	
Great Egret	FOR	N/A	GSH		
			OWE		
Great Blue Heron	FOR		N/A	GSH	
				OWE	
Canada Goose	N/A		N/A	OWE	
Mallard	GSH		GSH	GSH	
	OWE		SHB	OWE	
				OWM	
American Black Duck	GSH				
	OWE		GSH	OWE	
			SHB	OWM	
American Green-winged Teal	OWE		N/A	OWE	
	OWM			OWM	
Blue-wing Teal	GSH		N/A	GSH	
	OWM			OWM	
Ruddy Duck	OWE		N/A	OWE	
Wood Duck	OWE		N/A	OWM	
Ring-necked Duck	OWE		N/A	OWE	
Greater Scaup	OWE		N/A	OWE	
Bufflehead	OWE		N/A	OWE	
Common Merganser	OWE		N/A	OWE	
Red-breasted Merganser	OWE		N/A	OWE	
Hooded Merganser	OWE		N/A	OWE	
Semipalmated Plover	GSH		N/A	GSH	
Killdeer	GSH		GSH	GSH	
Greater Yellowlegs	GSH		N/A	GSH	
Lesser Yellowlegs	GSH		N/A	GSH	
				OWE	
Solitary Sandpiper	GSH		N/A	GSH	
Spotted Sandpiper	UNK		N/A	GSH	
Common Snipe	GSH		N/A	GSH	
American Woodcock	GSH		GSH	GSH	
	SHB		SHB	SHB	
Semipalmated Sandpiper	GSH		N/A	GSH	
Least Sandpiper	GSH		N/A	GSH	
Pectoral Sandpiper	GSH		N/A	GSH	
Laughing Gull	UNK		N/A	OWE	
Ring-billed Gull	OWE		N/A	OWE	
Herring Gull	OWE		N/A	OWE	
Greater Black-backed Gull	OWE		N/A	OWE	
Turkey Vulture	UNK		N/A	UNK	FO
Bald Eagle	N/A	N/A	UNK	FO	
Northern Harrier	UNK		UNK	FLY/GSH	
Sharp-shinned Hawk	FOR		FOR	FOR	
Northern Goshawk	FOR		FOR	FOR	
Broad-winged Hawk	N/A		UNK	FOR	
Osprey	UNK		N/A	FLY/OWE	
American Kestrel	UNK		N/A	FLY/GSH	
Merlin	FOR		N/A	FOR	
Ruffed Grouse	FOR		FOR	FOR	
Rock Dove	UNK		N/A	UNK	FO
Mourning Dove	FOR		FOR	FOR	
Short-eared Owl	UNK		N/A	GSH	
Barred Owl	FOR		UNK	FOR	
Chimney Swift	UNK		N/A	FLY/GSH	
			OWE		
Ruby-throated Hummingbird	UNK	UNK	UNK	FO	

Table E.5. Spatial habitat guilds used by birds observed in Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002 data combined (continued).

Bass Harbor Marsh habitat guilds¹ (continued)

Common Name	Roosting	Nest/Territorial	Foraging	Other
Belted Kingfisher	FOR	UNK	OWE OWM	
Yellow-shafted Flicker	FOR	FOR	FOR	
Yellow-bellied Sapsucker	UNK	UNK	FOR	
Downy Woodpecker	FOR	FOR	FOR	
Hairy Woodpecker	FOR	FOR	FOR	
Pileated Woodpecker	FOR	FOR	FOR	
Eastern Kingbird	UNK	SHB	FOR EDGE	
Eastern Wood-Pewee	FOR	FOR	FOR	
Eastern Phoebe	FOR	UNK	FOR	
			SHB	
Least Flycatcher	FOR	FOR	FOR	
Alder Flycatcher	SHB	SHB	SHB	
Yellow-bellied Flycatcher	FOR	FOR	FOR	
Tree Swallow	N/A	N/A	FLY/GSH OWE OWM	
Barn Swallow	NA	NA	FLY/GSH OWE OWM	
Blue Jay	FOR	FOR	FOR	
Gray Jay	FOR	N/A	FOR	
American Crow	FOR	FOR	FOR	
			GSH	
Common Raven	UNK	UNK	FO	
Black-capped Chickadee	FOR	FOR	FOR	
			SHB	
Brown Creeper	FOR	FOR	FOR	
Red-breasted Nuthatch	FOR	FOR	FOR	
Winter Wren	FOR	FOR	FOR	
Marsh Wren	SHB	SHB	SHB	
Golden-crowned Kinglet	FOR	FOR	FOR	
Ruby-crowned Kinglet	FOR	FOR	FOR	
Veery	SHB	N/A	SHB	
Swainson's Thrush	FOR	FOR	FOR	
Hermit Thrush	FOR	FOR	FOR	
American Robin	FOR	FOR	FOR	
			SHB	
Northern Shrike	FOR	N/A	FOR	
Gray Catbird	SHB	SHB	SHB	
American Pipit	GSH	N/A	GSH	
Cedar Waxwing	FOR	FOR	FOR	
Blue-headed Vireo	FOR	FOR	FOR	
Red-eyed Vireo	FOR	FOR	FOR	
Tennessee Warbler	UNK	N/A	FOR	
Nashville Warbler	FOR	FOR	FOR	
Northern Parula	FOR	FOR	FOR	
Black-and-White Warbler	FOR	FOR	FOR	
Chestnut-sided Warbler	FOR	FOR	FOR	
			SHB	
Magnolia Warbler	FOR	FOR	FOR	
Myrtle Warbler	FOR	FOR	FOR	
Black-throated Green Warbler	FOR	FOR	FOR	
Bay-breasted Warbler	UNK	UNK	SHB	
Blackpoll Warbler	FOR	FOR	FOR	
Yellow Palm Warbler	FOR	FOR	FOR	
			SHB	
Yellow Warbler	SHB	SHB	SHB	
Wilson's Warbler	SHB	SHB	SHB	
Ovenbird	FOR	FOR	FOR	
Common Yellowthroat	SHB	SHB	SHB	
American Redstart	N/A	N/A	FOR	
			SHB	
Rose-breasted Grosbeak	FOR	FOR	FOR	

Table E.5. Spatial habitat guilds used by birds observed in Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002 data combined (continued).

Bass Harbor Marsh habitat guilds¹ (continued)

Common Name	Roosting	Nest/Territorial	Foraging	Other
Nelson's Sharp-tailed Sparrow	GSH	GSH	GSH	
Savannah Sparrow	GSH	GSH	GSH	
Song Sparrow	SHB	SHB	SHB	
			FOR	
Slate-colored Junco	FOR	FOR	FOR	
White-throated Sparrow	FOR	FOR	FOR	
			SHB	
Lincoln's Sparrow	FOR	N/A	FOR	
	SHB		GSH	
			SHB	
Swamp Sparrow	GSH	GSH	GSH	
Red-winged Blackbird	GSH	GSH	GSH	
Rusty Blackbird	UNK	N/A	SHB	
Brown-headed Cowbird	FOR	FOR	FOR	
Common Grackle	FOR	FOR	FOR	
	GSH	GSH	GSH	
Common Grackle	SHB	SHB	SHB	
Pine Siskin	FOR	FOR	FOR	
American Goldfinch	FOR	FOR	FOR	
	SHB	SHB	SHB	
Red Crossbill	FOR	FOR	FOR	
White-winged Crossbill	FOR	FOR	FOR	
Purple Finch	FOR	FOR	FOR	
Evening Grosbeak	FOR	UNK	FOR	

Northeast Creek habitat guilds

Common Name	Roosting	Nest/Territorial	Foraging	Other
Common Loon	UNK	N/A	UNK	FO
Double-crested Cormorant	UNK	N/A	UNK	OWM
American Bittern	UNK	GSH	GSH	GSH
			OWM	
Green Heron	UNK	UNK		OWE
Great Blue Heron	UNK	N/A		GSH
				OWM
Canada Goose				FO
Mallard	GSH	GSH	GSH	GSH
	OWE	SHB	OWE	
	OWM		OWM	
American Black Duck	GSH	GSH	GSH	GSH
	OWE	SHB	OWE	
	OWM		OWM	
American Green-winged Teal	UNK	UNK	OWM	
American Widgeon	UNK	N/A	OWM	
Blue-wing Teal	UNK	UNK	OWM	
Wood Duck	UNK	UNK	OWM	
Ring-necked Duck	UNK	N/A	OWM	
Bufflehead	UNK	N/A	OWM	
Common Merganser	UNK	N/A	OWM	
Red-breasted Merganser	UNK	N/A	OWM	
Hooded Merganser	UNK	N/A	OWM	
Virginia Rail	GSH	GSH	GSH	
Semipalmated Plover	UNK	N/A	GSH	
Killdeer	GSH	GSH	GSH	
Greater Yellowlegs	UNK	N/A	GSH	
Lesser Yellowlegs	UNK	N/A	GSH	
Solitary Sandpiper	UNK	N/A	GSH	
Spotted Sandpiper	UNK	N/A	GSH	
Common Snipe	GSH	GSH	GSH	
American Woodcock	SHB	SHB	FOR	
			GSH	
			SHB	
Semipalmated Sandpiper	UNK	N/A	GSH	

Table E.5. Spatial habitat guilds used by birds observed in Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002 data combined (continued).

Northeast Creek habitat guilds¹ (continued)

Common Name	Roosting	Nest/Territorial		Foraging	Other
Least Sandpiper	UNK	N/A		GSH	
Ring-billed Gull	N/A	N/A		GSH	
Herring Gull	N/A	N/A		GSH	
Greater Black-backed Gull				FO	
Northern Harrier	UNK	GSH		FLY/GSH	
	SHB			FLY/SHB	
Sharp-shinned Hawk	UNK	UNK		FLY/FOR	
Cooper's Hawk	UNK	N/A		FLY/FOR	
Broad-winged Hawk	UNK	UNK		FLY/FOR	
Osprey	N/A	N/A		OWE	
				OWM	
American Kestrel	FOR/GSH	N/A		OWE	
				GSH	
Merlin	UNK	N/A	UNK	FO	
Peregrine Falcon	N/A	N/A		FLY/GSH	
Ruffed Grouse	FOR	FOR		FOR	
Rock Dove	UNK	N/A		UNK	FO
Mourning Dove	FOR	FOR		FOR	
Black-Billed Cuckoo	UNK	FOR		FOR	
Great Horned Owl	FOR	FOR		FOR	
Barred Owl	FOR	FOR		FOR	
Common Nighthawk	UNK	UNK		FLY/FOR	
				FLY/GSH	
Chimney Swift	UNK	UNK		FLY/GSH	
Ruby-throated Hummingbird	FOR	UNK	UNK	FO	
Belted Kingfisher	UNK	UNK		OWM	
Yellow-shafted Flicker	FOR	FOR		FOR	
				SHB	
Yellow-bellied Sapsucker	UNK	UNK		FOR	
Downy Woodpecker	FOR	FOR		FOR	
				SHB	
Hairy Woodpecker	FOR	FOR		FOR	
Pileated Woodpecker	FOR	FOR		FOR	
Eastern Kingbird	UNK	N/AFLY/GSH			
		FLY/SHB			
Great Crested Flycatcher	FOR	FOR		FOR	
Eastern Wood-Pewee	FOR	FOR		FOR	
Eastern Phoebe	SHB	SHB		SHB	
Least Flycatcher	FOR	FOR		FOR	
Willow Flycatcher	UNK	N/A		SHB	
Alder Flycatcher	SHB	SHB		SHB	
Tree Swallow	UNK	N/A		FLY/GSH	
Tree Swallow				FLY/OWM	
Bank Swallow	UNK	N/A		FLY/GSH	
Bank Swallow				FLY/OWM	
Northern Rough-winged Swallow	UNK	N/A		FLY/GSH	
				FLY/OWM	
Cliff Swallow	UNK	N/A		FLY/GSH	
				FLY/OWM	
Barn Swallow	UNK	N/A		FLY/GSH	
				FLY/OWM	
Blue Jay	FOR	FOR		FOR	
				SHB	
				GSH	
American Crow	FOR	FOR		FOR	FO
Common Raven	UNK	N/A	FOR	FO	
				GSH	
Eastern Tufted Titmouse	FOR	FOR		FOR	
Black-capped Chickadee	FOR	FOR		FOR	
				SHB	
Brown Creeper	FOR	FOR		FOR	
Red-breasted Nuthatch	FOR	FOR		FOR	
				SHB	
White-breasted Nuthatch	UNK	UNK		FOR	

Table E.5. Spatial habitat guilds used by birds observed in Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002 data combined (continued).

Northeast Creek habitat guilds¹ (continued)

Common Name	Roosting	Nest/Territorial		Foraging	Other
Winter Wren	UNK	UNK		FOR	
Golden-crowned Kinglet	FOR	FOR		FOR	
Ruby-crowned Kinglet	FOR	FOR		FOR	
				SHB	
Blue-gray Gnatcatcher	UNK	N/A		SHB	
Wood Thrush	FOR	FOR		FOR	
Turkey Vulture	UNK	UNK	GSH	FO	
Bald Eagle	GSH	N/A	GSH	FO	
			OWM		
Veery	SHB	SHB		SHB	
Swainson's Thrush	UNK	N/A		GSH	
Hermit Thrush	FOR	FOR		FOR	
American Robin	FOR	FOR		FOR	
	SHB	SHB		SHB	
Northern Shrike	UNK	N/A		SHB	
Gray Catbird	SHB	SHB		SHB	
Brown Thrasher	UNK	UNK		SHB	
Cedar Waxwing	FOR	FOR		FOR	
	SHB	SHB		SHB	
European Starling	UNK	URB		URB	
				GSH	
				SHB	
Blue-headed Vireo	FOR	FOR		FOR	
Red-eyed Vireo	FOR	FOR		FOR	
Warbling Vireo	UNK	N/A		SHB	
Tennessee Warbler	UNK	N/A		FOR	
Nashville Warbler	FOR	FOR		FOR	
	SHB	SHB		SHB	
Northern Parula	FOR	FOR		FOR	
Black-and-White Warbler	FOR	FOR		FOR	
Black-throated Blue Warbler	FOR	FOR		FOR	
Blackburnian Warbler	FOR	FOR		FOR	
Chestnut-sided Warbler	FOR	FOR		FOR	
	SHB	SHB		SHB	
Cape May Warbler	UNK	N/A		FOR	
Magnolia Warbler	FOR	FOR		FOR	
Myrtle Warbler	FOR	FOR		FOR	
Black-throated Green Warbler	FOR	FOR		FOR	
Bay-breasted Warbler	UNK	N/A		FOR	
Pine Warbler	FOR	FOR		FOR	
Yellow Palm Warbler	SHB	SHB		SHB	
Yellow Warbler	SHB	SHB		SHB	
Mourning Warbler	UNK	N/A		FOR	
Canada Warbler	UNK	N/A		SHB	
Wilson's Warbler	UNK	N/A		SHB	
Ovenbird	FOR	FOR		FOR	
Northern Waterthrush	UNK	N/A		SHB	
Common Yellowthroat	SHB	SHB		SHB	
American Redstart	FOR	FOR		FOR	
	SHB	SHB		SHB	
Rose-breasted Grosbeak	FOR	FOR		FOR	
Indigo Bunting	UNK	FOR		FOR	
Nelson's Sharp-tailed Sparrow	UNK	GSH		GSH	
Savannah Sparrow	GSH	GSH		GSH	
Song Sparrow	SHB	SHB		SHB	
				GSH	
Chipping Sparrow	FOR	FOR		FOR	
	SHB	SHB		SHB	
Slate-colored Junco	FOR	N/A		FOR	
White-throated Sparrow	FOR	FOR		FOR	
Fox Sparrow	FOR	N/A		FOR	
Lincoln's Sparrow	UNK	N/A		GSH	
Swamp Sparrow	GSH	GSH		GSH	
	SHB	SHB		SHB	

Table E.5. Spatial habitat guilds used by birds observed in Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002 data combined (continued).

Northeast Creek habitat guilds¹ (continued)

Common Name	Roosting	Nest/Territorial	Foraging	Other
Bobolink	GSH	GSH	GSH	
Red-winged Blackbird	GSH	GSH	GSH	
	SHB	SHB	SHB	
Rusty Blackbird	UNK	N/A	SHB	
Brown-headed Cowbird	UNK	FOR	FOR	
Common Grackle	SHB	SHB	GSH	
		FOR	SHB	
Baltimore Oriole	UNK	N/A	SHB	
Pine Siskin	UNK	N/A	FOR	
American Goldfinch	FOR	FOR	FOR	
	SHB	SHB	SHB	
White-winged Crossbill	UNK	N/A	FOR	
Purple Finch	FOR	FOR	FOR	
Evening Grosbeak	UNK	N/A	UNK	FO

¹ Codes for habitat guilds are: FLY = flying, FO = flying over, FOR = forested, either coniferous or deciduous, GSH = grasses, sedges, other herbaceous plants, N/A = not applicable, OWE = open water estuarine, OWM = open water marsh, SHB = woody shrubs, UNK = activity unknown, URB = urban.

Appendix F. Figures showing species occurrences of all species observed in Bass Harbor Marsh and Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001-2002.

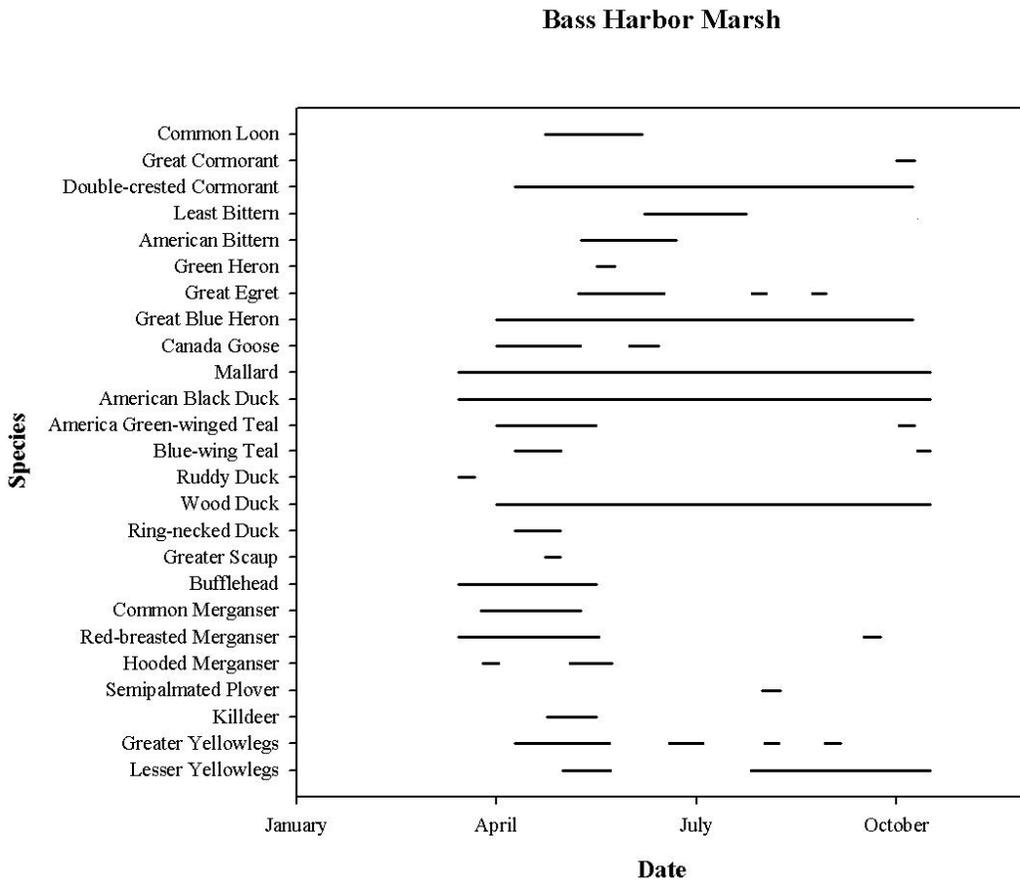


Figure F.1. Occurrence of all bird species on a weekly basis, all surveys combined, Bass Harbor Marsh, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Bass Harbor Marsh

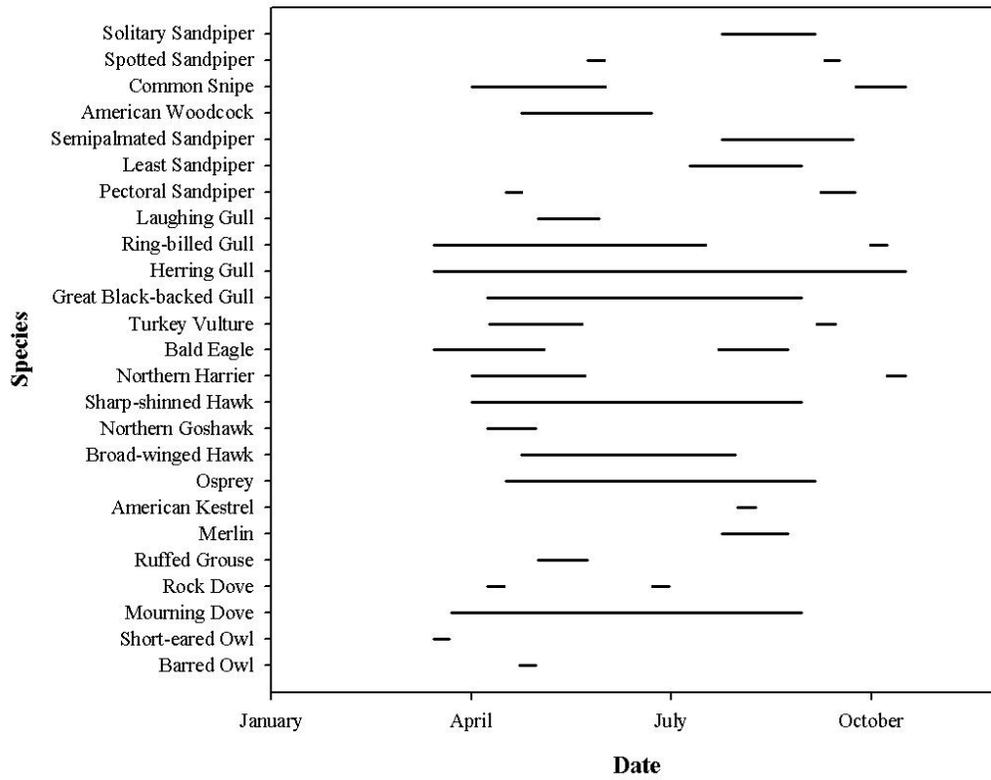


Figure F.2. Occurrence of all bird species on a weekly basis, all surveys combined, Bass Harbor Marsh, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Bass Harbor Marsh

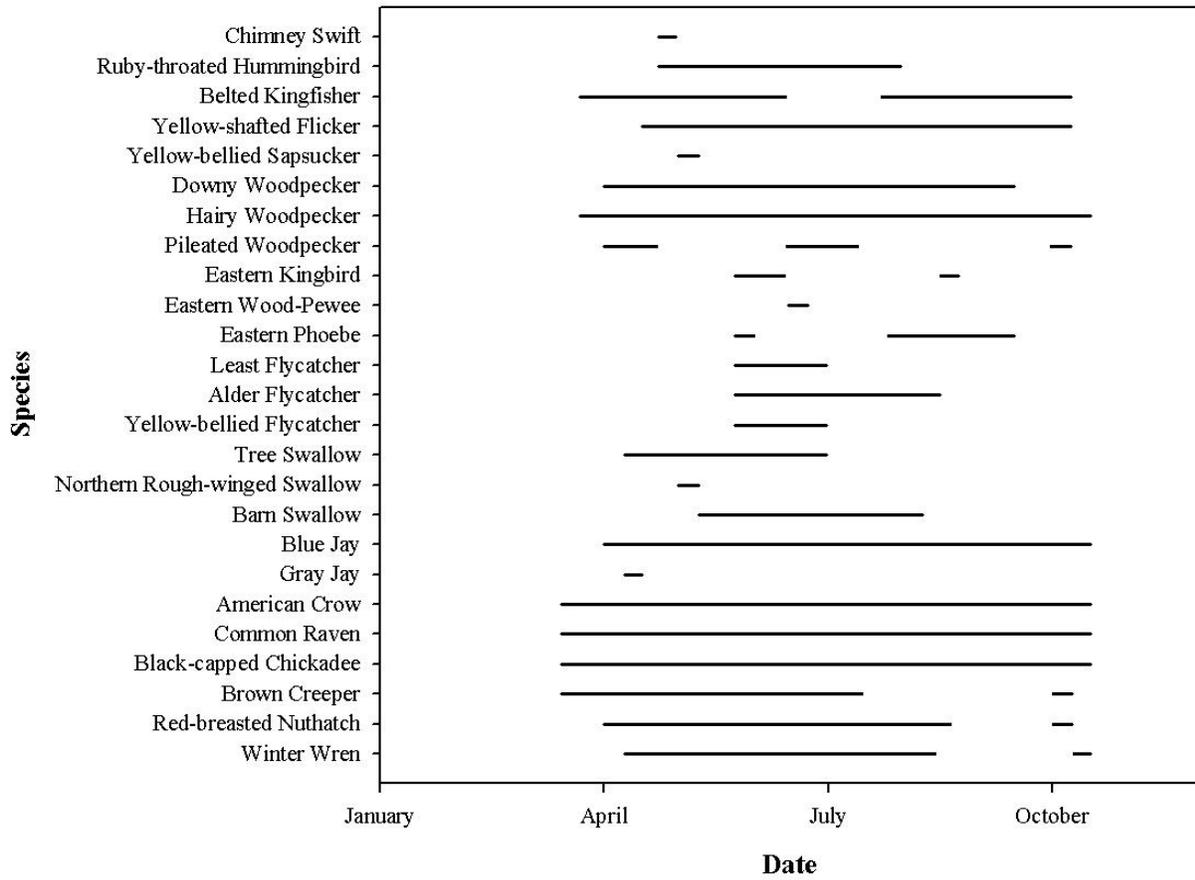


Figure F.3. Occurrence of all bird species on a weekly basis, all surveys combined, Bass Harbor Marsh, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Bass Harbor Marsh

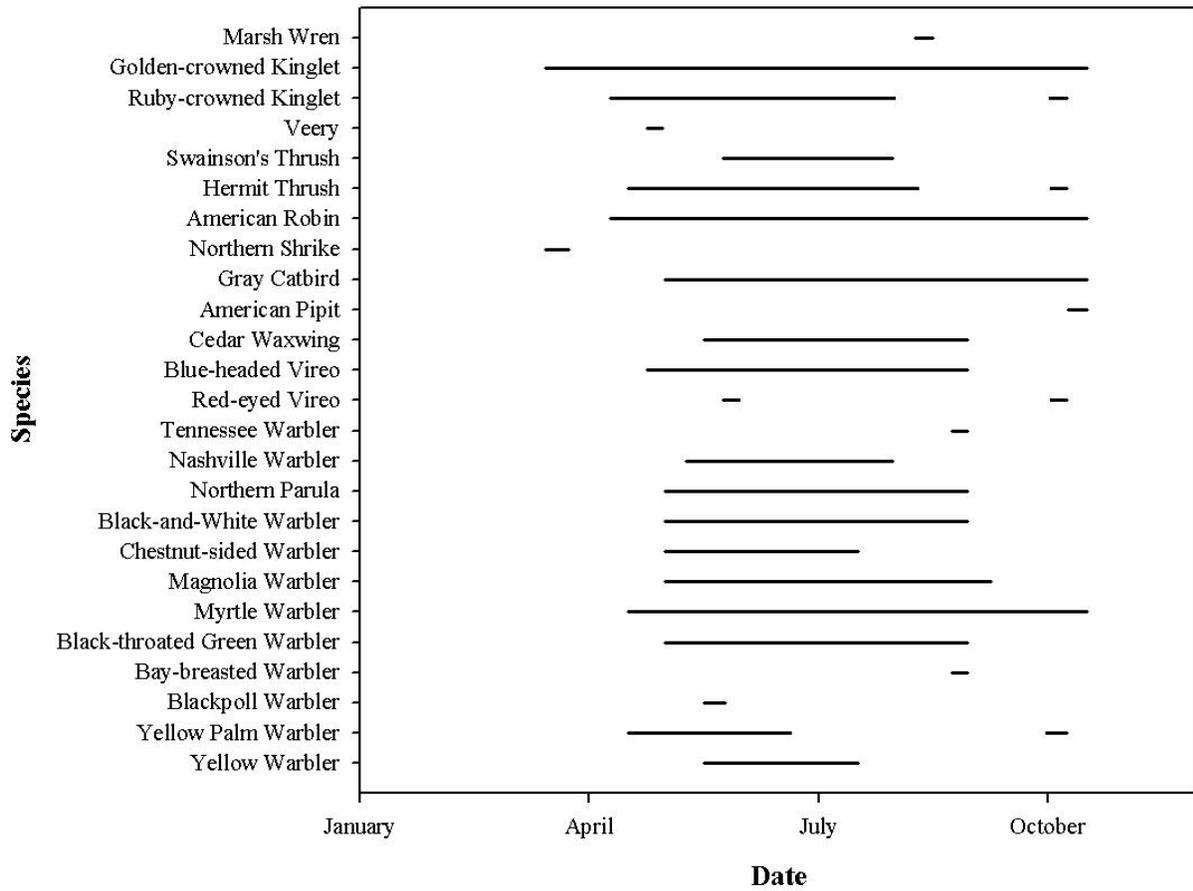


Figure F.4. Occurrence of all bird species on a weekly basis, all surveys combined, Bass Harbor Marsh, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Bass Harbor Marsh

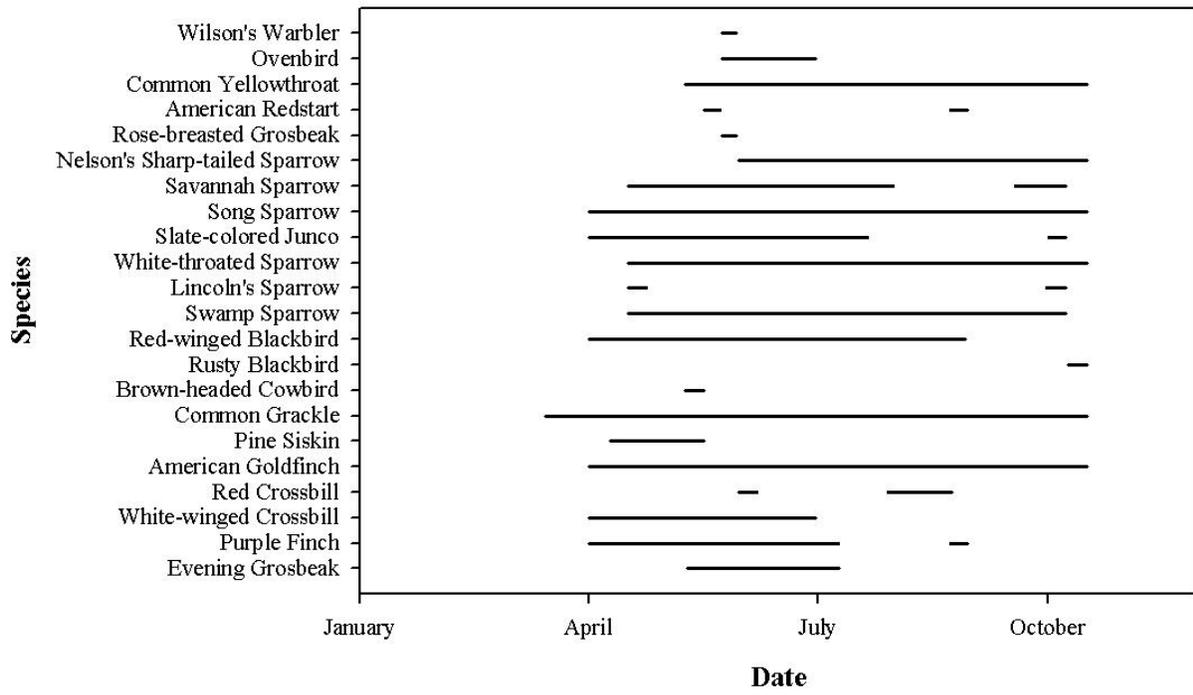


Figure F.5. Occurrence of all bird species on a weekly basis, all surveys combined, Bass Harbor Marsh, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Northeast Creek

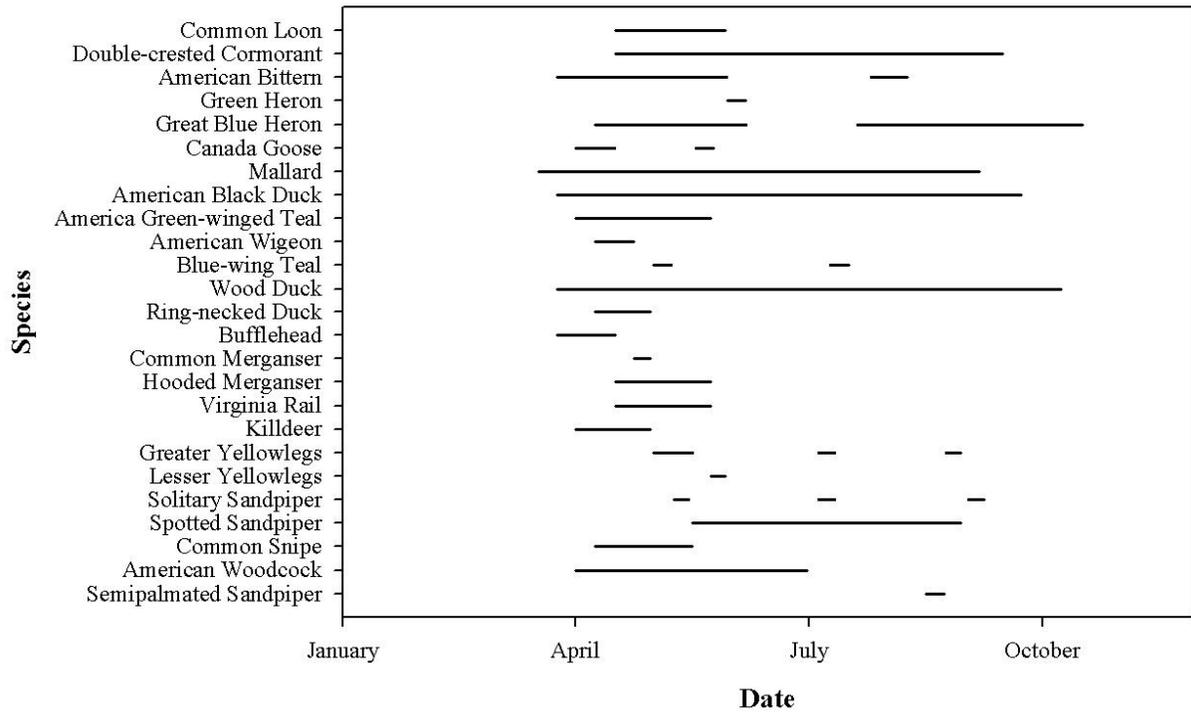


Figure F.6. Occurrence of all bird species on a weekly basis, all surveys combined, Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Northeast Creek

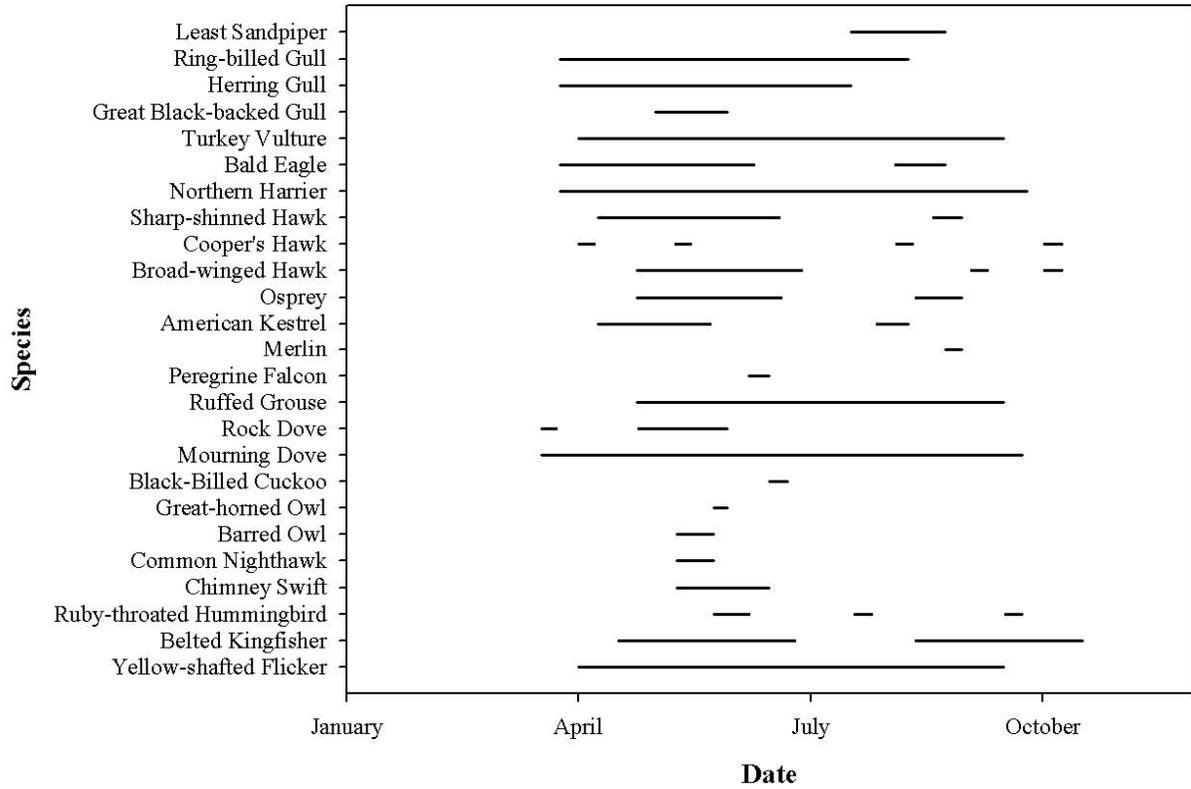


Figure F.7. Occurrence of all bird species on a weekly basis, all surveys combined, Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Northeast Creek

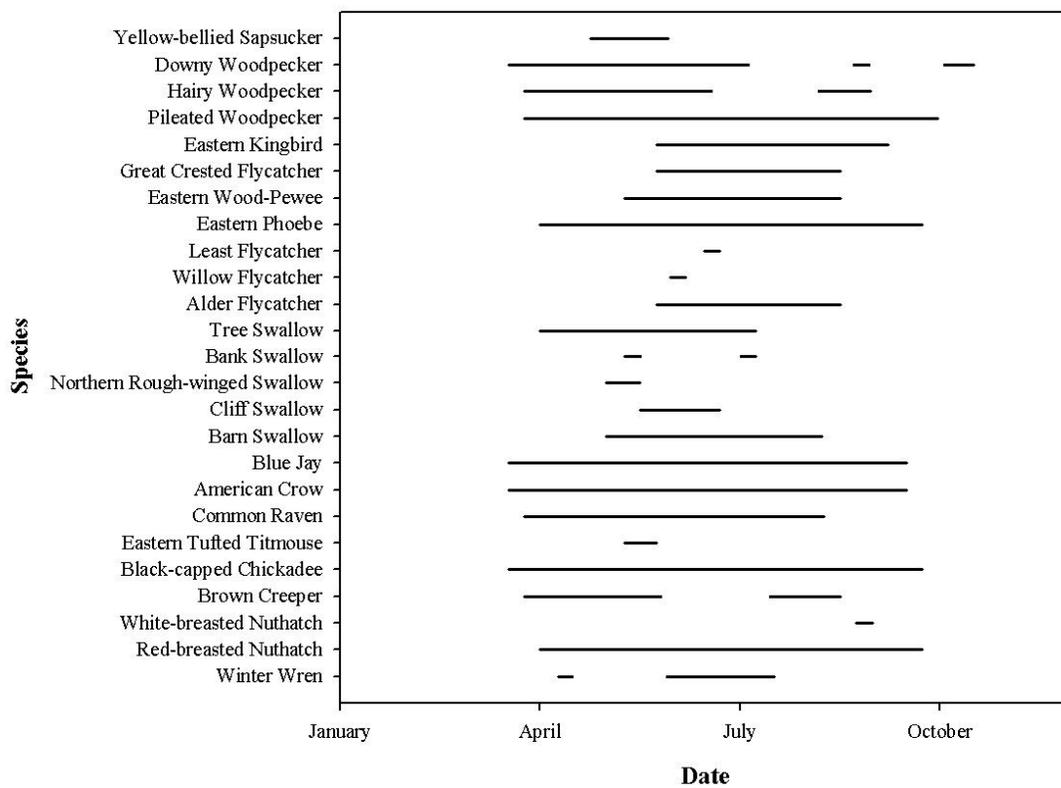


Figure F.8. Occurrence of all bird species on a weekly basis, all surveys combined, Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Northeast Creek

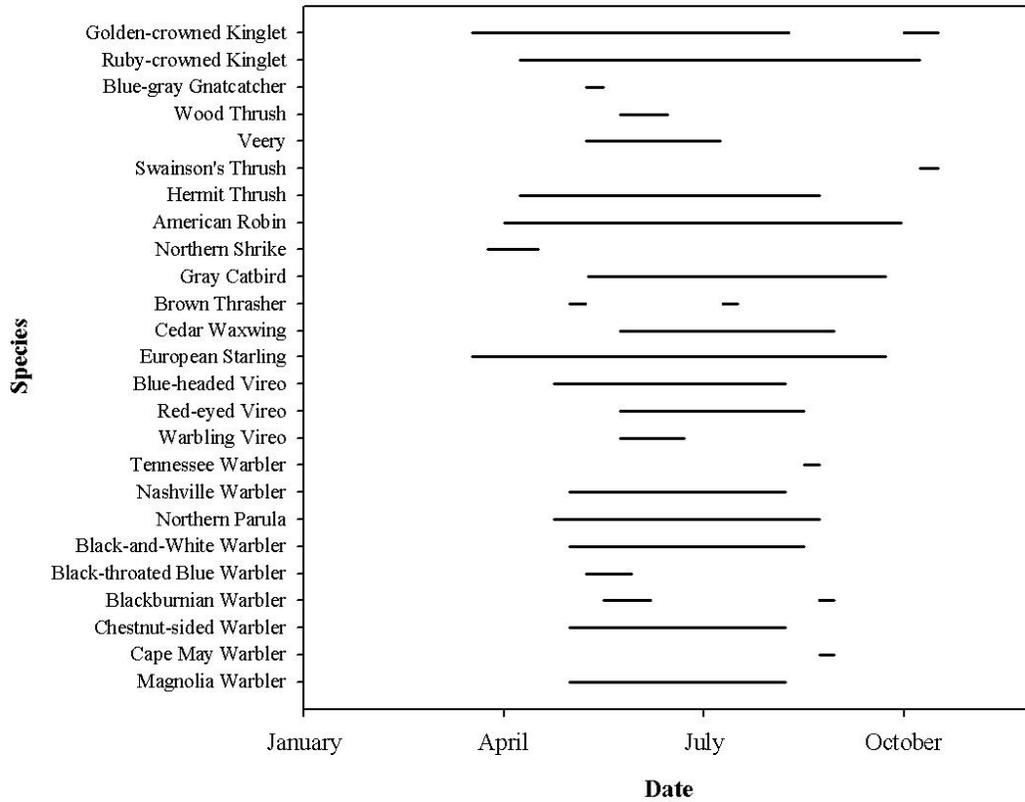


Figure F.9. Occurrence of all bird species on a weekly basis, all surveys combined, Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Northeast Creek

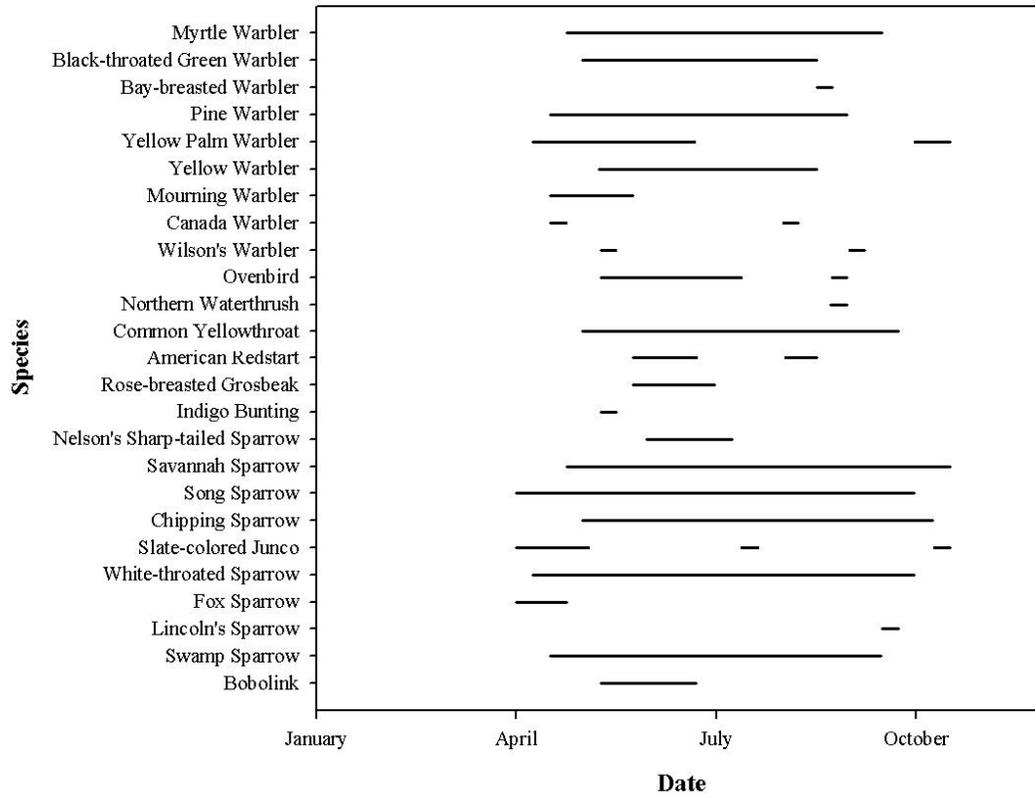


Figure F.10. Occurrence of all bird species on a weekly basis, all surveys combined, Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

Northeast Creek

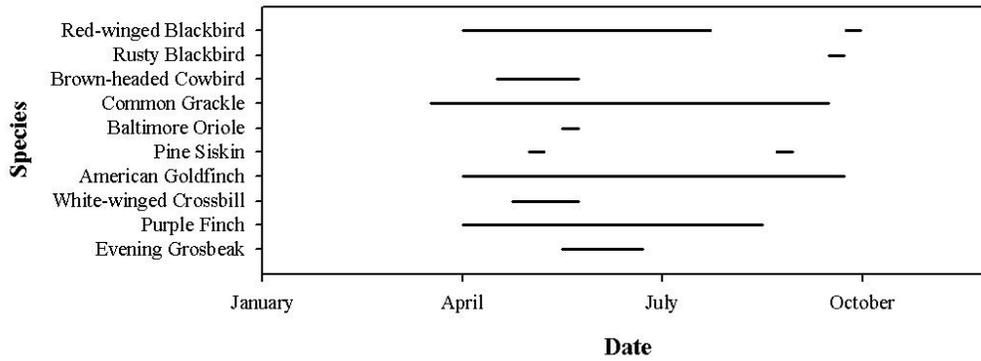


Figure F.11. Occurrence of all bird species on a weekly basis, all surveys combined, Northeast Creek, Acadia National Park, Mount Desert Island, Maine, 2001–2002.

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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Natural Resource Program Center
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

www.nature.nps.gov

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