Atlas of Sea Duck Key Habitat Sites in North America

A Publication of the Sea Duck Joint Venture

Sea Duck Joint Venture
Plan Conjoint des Canards de Mer

Sea Duck
Key Habitat Site

All cover photos by Tim Bowman. Clockwise from top: Scoters and Long-tailed Ducks, Prince William Sound, Alaska; Surf Scoters, Juneau, Alaska; molting Steller's Eiders, Seal Islands, Alaska; Spectacled Eiders wintering in pack ice in Bering Sea; Barrow's Goldeneyes, Juneau, Alaska.

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Atlas of Sea Duck Key Habitat Sites in North America

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A product of the Sea Duck Joint Venture

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Contents

Abstract

This atlas describes 85 sites throughout North America that constitute important sea duck habitats. It is intended to heighten awareness of valuable sea duck habitats, aid in prioritizing habitat conservation and protection efforts, and help in evaluating environmental assessments. Criteria for inclusion in this atlas were strict, relative to criteria used for other bird habitat designations, to highlight those habitats most critical to sea ducks during at least one season. Key habitat site descriptions include a synopsis of sea duck abundance and temporal importance of the site to sea ducks, as well as sensitivities or potential conflicts that may impact sea ducks or their habitats.

Introduction

Sea ducks are a unique group of waterfowl that inhabit arctic, subarctic, boreal, and coastal habitats. They are members of the tribe *Mergini* and, in North America, include eiders, scoters, mergansers, goldeneyes, Bufflehead, Long-tailed Duck, and Harlequin Duck. Sea ducks are the most poorly understood group of waterfowl and available evidence suggests that numbers of several sea duck species are declining or are below historical levels of abundance (Bowman et al. 2015). Four populations of sea ducks are currently federally listed as threatened or endangered in the U.S. or Canada.

The Sea Duck Joint Venture (SDJV) is a conservation partnership that was formed under the auspices of the North American Waterfowl Management Plan (NAWMP) to advance our knowledge about sea ducks and improve their conservation and management. The SDJV promotes science, in part, by providing funding to partners in support of sea duck research and monitoring. Since 2001, SDJV partners have completed many surveys and studies of sea ducks that have provided information on the distribution and abundance of sea ducks throughout the annual cycle and throughout North America. This information, until now, has not been consolidated or made readily available to stakeholders.

The North American Waterfowl Management Plan (NAWMP) Plan Committee (NAWMP 2012) encouraged more collaboration between the SDJV and habitat Joint Ventures (JV)—conservation partnerships that are focused primarily on protecting and restoring habitat for the benefit of birds. The SDJV reached out to habitat JVs that cover coastal habitats as well as the Great Lakes, and they indicated that they needed information on sea duck distribution and key habitats to help protect or conserve habitats important to sea ducks. Potential users include several habitat JVs, marine and land use planners, aboriginal groups with jurisdiction over lands or coastal areas, developers, environmental consultants, natural resource agencies, wildlife conservation groups, and other stakeholders.

The purpose of this atlas is to identify areas in North America that are essential to the welfare of sea ducks. We view this as a first step for ensuring that adequate quantity and quality of sea duck habitat remains intact. This report is modeled after Key Marine Habitat Sites for Migratory Birds in Nunavut and the Northwest Territories (Mallory and Fontaine 2004), but with a focus on sea ducks and with stricter criteria for inclusion in the atlas. These criteria required that a site supported a minimum number of sea ducks and/or a minimum percentage of the North American population of a particular species, and a minimum density.

The intent of these criteria was to restrict key site designation to areas that are vital to sea ducks at a scale that is meaningful and practical in terms of habitat conservation and protection. The minimum density criterion was included to ensure that large geographic areas of low bird density were not included, for example, an entire species range, or an area as broad as the Canadian boreal forest, which is certainly important to sea ducks (e.g., scoters) but is so expansive that it dilutes the focus we hoped to provide by identifying key sites.

This document is complementary to other efforts to identify or classify important bird habitats, including NAWMP (NAWMP 2012), Important Bird Areas (IBA Canada 2021, National Audubon Society 2021), RAMSAR (RAMSAR 2021), as well as provincial, state, or regional designations. As new information becomes available, sites currently identified here will be re-evaluated and newly discovered sites that warrant "key sites" designation will be added. In addition, the SDJV is currently investigating options for making geo-referenced data on sea duck distribution and abundance available through an online queryable geospatial database. Check https://seaduckjv.org/science-resources/sea-duck-key-habitat-sites-atlas/ for updates on these efforts.

This document is available online at https://seaduckjv.org/science-resources/sea-duck-key-habitat-sites-atlas/. For more information, please contact:

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Methods

The process of identifying key habitat sites began with a pencil and paper exercise at the November 2014 meeting of the Sea Duck Joint Venture Continental Technical Team and Management Board. This exercise was intended to identify sites that should be further evaluated to see if they met criteria for inclusion in the atlas. To be included in this atlas, sites had to meet the following minimum criteria:

1a. The area supports at least 5% of the continental population of a sea duck species, ***or***

1b. The area supports, or has recently supported, a total of 20,000 sea ducks (any species) during any season,

and

2. The density of sea ducks within the area is at least 10 birds per square kilometer.

We emphasized use of key sites by sea ducks, although many sites are occupied by other waterfowl and nonwaterfowl species and complement a site's overall significance. For example, the North American Waterfowl Management Plan (NAWMP) 2012 revision includes a map depicting "Areas of Greatest Continental Significance to North American Ducks, Geese, and Swans" (NAWMP 2012). This map (Fig. 1) includes several areas that were justified largely because of their importance to sea ducks. Although objective criteria for "continental significance" was difficult to establish, particularly in terms of relative scale and bird densities, the NAWMP map included several relatively large, low-density areas for waterfowl, including sea ducks. We have included the NAWMP map (Fig. 1) to draw attention to some of those areas and describe which areas were included in part because of their value to sea ducks (Table 1). This document differs from the NAWMP map primarily because it strives to provide *more focus on areas of importance specifically to sea ducks*. Similarly, BirdLife International, National Audubon Society (U.S.), and Audubon Canada have identified Important Bird Areas (IBA) that are recognized as being continentally or globally significant for bird populations (http://web4.audubon.org/bird/iba/). Criteria for inclusion in the IBA network are less stringent (e.g., 1% of a species population) than criteria used for this atlas. Many IBAs overlap with sea duck key sites, although the geographic extent of IBAs often differs from those of sea duck key sites because of the focus on sea ducks in this atlas and more restrictive criteria.

It should also be noted that this atlas does not include descriptions of several habitat sites beyond North America, primarily in Russia and Greenland, that are important to North American sea ducks. Such sites are outside the scope of this document but include significant habitats for certain population segments of North American sea ducks (e.g., eiders and Long-tailed Ducks using Russia or Asian coastal sites; Harlequin Ducks and King Eiders using sites in Greenland for molting and wintering).

Abundance Estimates: Abundance was estimated or calculated using a variety of methods and sources. Continental Technical Team members and other sea duck experts provided sea duck abundance data and other site information. For sites with a recent history of surveys, we restricted abundance estimates to the maximum observed abundance over the last 20 years (i.e., since 2000), although we used any available historical information if there were no recent abundance data available for a site.

For sites where detection rates have been estimated, or for habitats where detection rates estimated for other areas can reasonably be applied, visibility correction factors were used to adjust indices of abundance. For sites where detection rates were unknown or it was believed inappropriate to apply adjustments derived from other areas, abundance estimates were not adjusted and should be considered minimum estimates. Each site description includes an explanation of how abundance estimates were treated and how they should be interpreted. Due to the paucity of survey-based abundance estimates for sea ducks in many areas and in various seasons, expert opinion was often used as a basis for abundance estimates.

Site Boundaries and Mapping: Site boundaries were generated differently for each site based on the

Figure 1. Map from North American Waterfowl Management Plan (2012) depicting areas of greatest continental significance to North American ducks, geese, and swans. See Table 1 for descriptions of areas with particular relevance to sea ducks.

Table 1. Areas included in the NAWMP (2012) map of areas of greatest continental significance to North American ducks, geese, and swans with noteworthy relevance to sea ducks.

Area #	Area Name	Justification Relative to Sea Ducks
2	Boreal Plain and Shield	Important for breeding Common Goldeneye, Bufflehead, Surf and White-winged Scoters.
3	Taiga Plain and Shield	Particularly important for breeding eastern Black Scoter, White-winged Scoter, Surf Scoter.
17	San Francisco Bay	Important area for wintering Surf Scoter in particular.
18	Pacific Coast	Significant numbers of wintering and migrating Barrow's Goldeneye, Harlequin Duck, scoters, Long-tailed Duck, and molting area for Surf and White-winged scoters.
24	Central Plateau	Important area for breeding Barrow's Goldeneye, Hooded Merganser, and Bufflehead.
26	Atlantic Coast	Important wintering area for all three species or scoters, Long-tailed Duck, Common Eider, Bufflehead, eastern Harlequin Duck.
27	Coastal Newfoundland	Large numbers of nesting and wintering Common Eider.
28	Coastal Maritimes and St. Lawrence Gulf	Important breeding and wintering area for Common Eider; also supports large numbers of wintering Long-tailed Duck, Red-breasted Merganser. Bay of Chaleur and North Shore Gulf are important spring and fall staging sites for scoters, and molting sites for Surf and White-winged Scoter.
29	Eastern Boreal Hardwood Transition	Relatively high densities of breeding Hooded Merganser, Common Merganser, and Common Goldeneye.
30	Lower Great Lakes and St. Lawrence River	Important wintering area for Long-tailed Duck and to lesser extent White-winged Scoter.
32	Hudson and James Bays	All three species of scoters molt there, including most male eastern Black Scoter; important staging area for scoters. Hudson Bay Common Eider spends entire year in this area; Belcher Islands an important wintering site.
33	Ungava Peninsula and Killinek/ Button Islands	Large portion of Northern Common Eider stage and breed here. Large concentration of King Eider winter around Killinek/Button Islands. Ungava Bay is an important molting site for several species of sea ducks.
34	East Bay and Harry Gibbons	Important breeding area for Common Eider, also fair numbers of Long-tailed Duck and King Eider.
35	Baffin Island Complex	Key nesting, molting, and wintering area for sea ducks, most notably Northern Common Eider, also King Eider.
36	Queen Maud Gulf	Important area for nesting King Eider.
37	Lambert Channel Polynya	Staging area for Pacific Common Eider, King Eider, and Long-tailed Duck.
39	North Slope and Beaufort Sea	Coastal lagoon systems particularly important molting areas for Surf and White-winged Scoters and Long-tailed Duck. Polynya and other ice-free areas important for migrating Common Eider, King Eider, and Long-tailed Duck.
40	Old Crow Flats	Significant numbers of Surf and White-winged scoters nest there, and also molt along Tuktoyaktuk Peninsula.
41	Yukon Flats	Significant numbers of White-winged Scoter nest there.
43	Coastal Alaska and Bering Sea	Important migration, staging, and wintering area for Pacific Common Eider, western King Eider, Steller's Eider, Spectacled Eider, Long-tailed Duck, all three scoter species, Red-breasted Merganser, Harlequin Duck, Common and Barrow's Goldeneye, Bufflehead.

availability and precision of source and ancillary data. Initial site boundaries were provided by site experts in various formats, including GIS polygons, hand-drawn maps and verbal descriptions. Various geoprocessing steps were undertaken to produce and/or finalize boundaries, including georeferencing and digitizing drawn maps, smoothing boundaries of provided GIS polygons, clipping boundaries to shorelines, and removing terrestrial areas. Site area was calculated using the North American Albers Equal Area Conic coordinate system (WKID: 102008).

Narrative site maps show key habitat sites overlain on the Esri World Light Gray Base basemap (Esri 2021; Sources: Esri, HERE, Garmin, © OpenStreetMap contributors, and the GIS User Community). Maps use the North America Lambert Conformal Conic coordinate system (WKID: 102009) and are rotated to display north at the top. Overview and regional site maps show key habitat sites overlain on the Esri World Oceans basemap (Esri; Sources: Esri, GEBCO, NOAA, National Geographic, DeLorme, HERE, Geonames.org, and other contributors).

For Atlantic Canada, prospective key sites were identified in different ways depending on the survey data available. For sites with wintering Common Eider, georeferenced winter survey data were used in an R shiny application to define polygon boundaries; these included the largest area where eiders were counted while meeting minimum criteria for inclusion in the atlas. Eastern Harlequin Duck data were not georeferenced and only available by coastal block so key sites were defined by buffering polygons to a minimum distance (500 m) from all coastlines and coastal islands based on expert knowledge of habitat use. Key site boundaries were also delineated or modified based on survey data and expert knowledge of other sea duck species abundance or temporal use of the site (e.g., scoter and eider molting).

For Atlantic U.S., prospective sites were initially identified using data from U.S. Fish and Wildlife Service exploratory aerial winter sea duck surveys conducted between January and March in 2008 to 2014 (see Silverman et al. 2012). Survey flight lines were divided into 5-mi segments and the segment centroid was used to indicate the location of birds in the subsequent analyses. The presence-absence and count of all sea ducks were summarized for each segment, as well as the total survey effort in the segment. Kernel densities were estimated from segments with sea ducks present; the kernel estimates were weighted based on the number of surveys that detected sea ducks and the survey effort within the segment, and included a border adjustment to account for the coastline constraint. Areas of peak sea duck occupancy were identified by determining the optimal kernel isopleth, defined as the percent area beyond which abundance increases more slowly than area surveyed. The optimal kernel isopleth created a series of high-occupancy polygons. Because there were a reasonably large number of small polygons created by this procedure, all polygons within 40 km were combined into single multi-polygon candidate key sites (40 km was a natural break in the distribution of all pairwise distances between isopleth polygons). Finally, sea duck density was estimated for all segments in each potential key site, and total polygon abundance was calculated as average polygon density multiplied by the area of the polygon.

Minimum abundance estimates were based largely on data from the Atlantic Coast Wintering Sea Duck Survey (Silverman et al. 2012) complemented with data from related surveys as appropriate (Mid-Winter Survey [MWS; Eggeman and Johnson 1989] or Atlantic Marine Assessment Program for Protected Species (AMAPPS; a cooperative survey by U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, and Bureau of Ocean Energy Management; [AMAPPS 2015]). Because the survey counts were not corrected for incomplete detection, mis-counting, or availability bias, they likely underestimate the true numbers of sea ducks present.

Site Narratives: After abundance data were summarized and initial site boundaries were drawn, and the site was determined to meet qualifying criteria, site narratives were written by one or more site or species experts. Site descriptions and draft polygons for key sites were then reviewed by at least one biologist familiar with the area and with waterfowl use of that area (Table 2). Boundaries were modified as appropriate, and abundance estimates or indices were adjusted based on any additional information available for a site (e.g., some areas along the Atlantic U.S. coast were not surveyed during the winter sea duck survey so other data were used in those areas).

Key sea duck habitat site descriptions were summarized using this format, similar to that used by Mallory and Fontaine (2004):

Table 2. Sea duck key habitat site narrative authors and reviewers.

Region	Site #	Site name	Author(s)	Reviewer(s)
BC/WA/CA	1	San Francisco Bay	Kyle Spragens	Cheryl Strong, Susan De La Cruz
BC/WA/CA	2	Salish Sea	Angela Palmer/ Kyle Spragens	Joe Evenson, Sean Boyd, Dan Esler, Andre Breault
BC/WA/CA	3	Dogfish Banks - Haida Gwai	Rian Dickson	Sean Boyd, Tim Bowman
Alaska	4	Annette-Breton-Cleveland	Rian Dickson	Deb Groves
Alaska	5	Eastern Chichagof	Rian Dickson	Debbie Groves
Alaska	6	Lynn Canal - Frederick Sound	Rian Dickson	Debbie Groves
Alaska	7	Glacier Bay	Rian Dickson	Dan Esler
Alaska	8	Lost Coast Alaska	Rian Dickson	Tim Bowman
Alaska	9	Kodiak Archipelago	Denny Zwiefelhofer Doug Forsell	Tim Bowman
Alaska	10	Izembek	Tim Bowman	Heather Wilson
Alaska	11	Nelson Lagoon	Tim Bowman	Heather Wilson
Alaska	12	Seal Islands	Tim Bowman	Heather Wilson
Alaska	13	Nushagak-Kvichak Bays	Tim Bowman	Bill Larned
Alaska	14	Kuskokwim Shoals	Tim Spivey	Tim Bowman, Kristine Sowl
Alaska	15	Yukon-Kuskokwim Delta	Tim Bowman	Kristine Sowl
Alaska	16	Norton Sound	Tim Spivey	Tim Bowman
Alaska	17	Northern Bering Sea	Shiway Wang	Tim Bowman
Alaska	18	Ledyard Bay	Tim Spivey	Kate Martin
Alaska	19	Beaufort Coastal Lagoons Alaska	Rian Dickson	Tim Bowman, Kate Martin
Western Canadian Arctic	20	Kukjutkuk&Hutchison Bays	Kirsten Pearson, Megan Ross	Eric Reed
Western Canadian Arctic	21	McKinley Bay & Phillips Is	Mallory and Fontaine (2004), Kirsten Pearson, Megan Ross	Eric Reed
Western Canadian Arctic	22	Cape Bathurst Polynya	Cindy Wood	Eric Reed
Western Canadian Arctic	23	Cape Parry	Latour et al. (2008), Kirsten Pearson, Megan Ross	Eric Reed
Western Canadian Arctic	24	West Banks Island Lead	Cindy Wood	Eric Reed
Western Canadian Arctic	25	Lambert Channel	Mallory and Fontaine (2004), Kirsten Pearson, Megan Ross	Eric Reed
Eastern Canadian Arctic and Hudson Bay	26	Southwestern Hudson Bay	Shannon Badzinski	Ken Abraham, Rod Brook
Eastern Canadian Arctic and Hudson Bay	27	Western James Bay	Shannon Badzinski	Ken Abraham, Rod Brook
Eastern Canadian Arctic and Hudson Bay	28	Southeast James Bay	Christine Lepage	Jean-Pierre Savard, Richard Cotter, Shannon Badzinski
Eastern Canadian Arctic and Hudson Bay	29	Northeast James Bay and Adjacent Coastal Lowlands	Christine Lepage	Jean-Pierre Savard, Richard Cotter, Shannon Badzinski
Eastern Canadian Arctic and Hudson Bay	30	Belcher Islands	Mark Mallory	Shannon Badzinski
Eastern Canadian Arctic and Hudson Bay	31	Sleeper Islands	Mallory and Fontaine (2004), Kirsten Pearson, Megan Ross	Eric Reed
Eastern Canadian Arctic and Hudson Bay	32	Nastapoka Islands and Sound—Lac Guillaume-Delisle	Christine Lepage	Jean-Pierre Savard, Richard Cotter, Shannon Badzinski
Eastern Canadian Arctic and Hudson Bay	33	Buchan Gulf	Mallory and Fontaine (2004), Kirsten Pearson, Megan Ross	Eric Reed
Eastern Canadian Arctic and Hudson Bay	34	Scott Inlet	Mallory and Fontaine (2004), Kirsten Pearson, Megan Ross	Eric Reed
Eastern Canadian Arctic and Hudson Bay	35	Markham Bay	Mallory and Fontaine (2004), Kirsten Pearson, Megan Ross	Eric Reed
Eastern Canadian Arctic and Hudson Bay	36	Frobisher Bay	Mallory and Fontaine (2004), Kirsten Pearson, Megan Ross	Eric Reed
Eastern Canadian Arctic and Hudson Bay	37	Ungava Bay	Christine Lepage	Jean-Pierre Savard
Eastern Canadian Arctic and Hudson Bay	38	Killiniq-Button Islands	Christine Lepage	Jean-Pierre Savard
Atlantic Canada	39	Northern Labrador	Scott Gilliland, James Churchill	Nic McLellan
Atlantic Canada	40	Nain	Scott Gilliland, James Churchill, Nic McLellan	Nic McLellan
Atlantic Canada	41	Backway	Scott Gilliland, James Churchill, Nic McLellan	Nic McLellan

(continued on next page)

Table 2 (continued)

Region	Site #	Site name	Author(s)	Reviewer(s)
Atlantic Canada	42	Quirpon Island to Grey Islands	Scott Gilliland, James Churchill	Nic McLellan
Atlantic Canada	43	Twillingate to Little Fogo Islands	Lauren Gilpatrick, Scott Gilliland	Scott Gilliland
Atlantic Canada	44	Wadham to Penguin Islands	Lauren Gilpatrick, Scott Gilliland	Nic McLellan
Atlantic Canada	45	Western Bonavista Bay	Lauren Gilpatrick, James Churchill	Scott Gilliland, Nic McLellan
Atlantic Canada	46	Cape Bonavista	Lauren Gilpatrick, James Churchill	Scott Gilliland, Nic McLellan
Atlantic Canada	47	Northeast Avalon	Lauren Gilpatrick, Scott Gilliland	Scott Gilliland, Nic McLellan
Atlantic Canada	48	Avalon Peninsula, Cape Spear to St. Shotts	Lauren Gilpatrick, Scott Gilliland	Scott Gilliland, Nic McLellan
Atlantic Canada	49	Saint-Pierre and Miquelon to Cape St. Mary’s	Lauren Gilpatrick	Scott Gilliland, Nic McLellan
Atlantic Canada	50	Southwestern St. Lawrence Estuary	Christine Lepage	Jean-Pierre Savard
Atlantic Canada	51	Baie des Rochers	Christine Lepage	Jean-Pierre Savard
Atlantic Canada	52	Southeastern St. Lawrence Estuary	Christine Lepage	Jean-Pierre Savard
Atlantic Canada	53	Baie des Bacon–Pointe Lebel	Christine Lepage	Jean-Pierre Savard
Atlantic Canada	54	Bais des Anglais	Christine Lepage	Jean-Pierre Savard
Atlantic Canada	55	Baie de la Trinité–Magpie Bay	Christine Lepage	Jean-Pierre Savard
Atlantic Canada	56	Mingan Islands–Pointe Pashashibou	Christine Lepage	Jean-Pierre Savard
Atlantic Canada	57	Western–Southwestern Anticosti Island	Christine Lepage	Jean-Pierre Savard
Atlantic Canada	58	Southeastern Anticosti Island	Christine Lepage	Jean-Pierre Savard
Atlantic Canada	59	Port-Daniel–Newport Point	Christine Lepage	Jean-Pierre Savard
Atlantic Canada	60	Chaleur Bay	Christine Lepage	Jean-Pierre Savard, Scott Gilliland, Nic McLellan, Tim Bowman
Atlantic Canada	61	Magdalen Islands	Christine Lepage	Jean-Pierre Savard
Atlantic Canada	62	Eastern Shore Nova Scotia	James Churchill, Nic McLellan	Rob Ronconi, Glen Parsons, Scott Gilliland
Atlantic Canada	63	Prospect	James Churchill, Nic McLellan	Rob Ronconi, Glen Parsons, Scott Gilliland
Atlantic Canada	64	South Shore Nova Scotia	James Churchill, Nic McLellan	Rob Ronconi, Glen Parsons
Atlantic Canada	65	Digby Neck	James Churchill, Nic McLellan	Rob Ronconi, Glen Parsons
Atlantic Canada	66	Southwestern Bay of Fundy	Nic McLellan, James Churchill	Rob Ronconi, Scott Gilliland
Great Lakes	67	Sturgeon Bay to Manitowoc	William Mueller	Luke Fara
Great Lakes	68	Green Bay and Bay de Nocs	Kevin Kenow, Luke Fara, Steven Houdek, Brian Lubinski	Alicia Berlin, Allison Sussman
Great Lakes	69	Garden Peninsula	Kevin Kenow, Luke Fara, Steven Houdek, Brian Lubinski	Alicia Berlin, Allison Sussman
Great Lakes	70	Sleeping Bear Dunes National Lakeshore	Kevin Kenow, Luke Fara, Steven Houdek, Brian Lubinski	Alicia Berlin, Allison Sussman
Great Lakes	71	Southeast Lake Michigan	Kevin Kenow, Luke Fara, Steven Houdek, Brian Lubinski	Alicia Berlin, Allison Sussman
Great Lakes	72	Western Lake Erie	Shannon Badzinski	Brigitte Collins, Jack Hughes, Shawn Meyer
Great Lakes	73	Central Lake Erie - Long Point Bay	Shannon Badzinski	Brigitte Collins, Jack Hughes, Shawn Meyer
Great Lakes	74	Eastern Lake Erie	Shannon Badzinski	Brigitte Collins, Jack Hughes, Shawn Meyer
Great Lakes	75	Western Lake Ontario	Shannon Badzinski	Brigitte Collins, Jack Hughes, Shawn Meyer
Great Lakes	76	Eastern Lake Ontario	Shannon Badzinski	Brigitte Collins, Jack Hughes, Shawn Meyer
Great Lakes	77	Upper St. Lawrence River	Shannon Badzinski	Brigitte Collins, Jack Hughes, Shawn Meyer

(continued)

Table 2 (continued)

Region	Site #	Site name	Author(s)	Reviewer(s)
U.S. Atlantic Coast	78	Coastal Maine	Anastasia Krainyk, Emily Silverman	Kelsey Sullivan, Mark Koneff, Tim Bowman
U.S. Atlantic Coast	79	Nantucket Sound and Shoals	Dustin Meattey, Anastasia Krainyk, Emily Silverman	H Heusman, Taber Allison
U.S. Atlantic Coast	80	South Shore Long Island	Anastasia Krainyk, Emily Silverman	Josh Stiller, Tony Roberts
U.S. Atlantic Coast	81	Delaware Bay	Anastasia Krainyk, Emily Silverman	Ted Nichols, Justyn Foth
U.S. Atlantic Coast	82	Upper Chesapeake Bay	Anastasia Krainyk, Emily Silverman	Josh Homyack
U.S. Atlantic Coast	83	Lower Chesapeake Bay	Anastasia Krainyk, Emily Silverman	Gary Costanzo
U.S. Atlantic Coast	84	Pamlico Sound	Anastasia Krainyk, Emily Silverman	Doug Howell, Sally Yannuzzi
U.S. Atlantic Coast	85	Southern Coast, SC-GA	Anastasia Krainyk, Emily Silverman	Walt Rhodes

Site Number: A number that references each site.

Name: A prominent topographical feature of the nearby terrestrial area, or known names for sites.

Location: The latitude and longitude of the approximate geographic center of each site.

Size: The approximate area, in square kilometers, of each site.

Description: A brief description of the site, indicating its location relative to prominent land or oceanic features, and any relevant physical characteristics of the site.

Precision and Correction of Abundance Estimates Presented: An indication of how abundance estimates were calculated for the key site. Where possible, we encouraged use of visibility-corrected estimates. Where not adjusted for detection or observer error, estimates are conservative.

Biological Value: A synopsis of the numbers of sea ducks documented at the site, their seasonal occupation and life stages or activities (e.g., nesting, staging, molting, foraging, overwintering). Supplementary information, such as the presence of other wildlife species that contribute to the biological importance of the key site, may be included.

Sensitivities: Types of activities that could destroy or degrade the biological value of the site. Some habitats or species may be particularly susceptible to various factors even if there are no immediate threats known for the key site.

Potential Conflicts: Present or proposed activities that could have a negative impact on the site

Status: Any "conservation area" designations (e.g., IBAs, marine protected areas, fishery exclusion zones) that overlap with the key site. Identify which government agency or nongovernment entity has jurisdiction or management authority over the near-shore waters as well as intertidal and subtidal lands—areas that are most important to sea ducks.

References: Pertinent literature cited in the text as the scientific basis for the identification of the site, but not a complete literature review for each site.

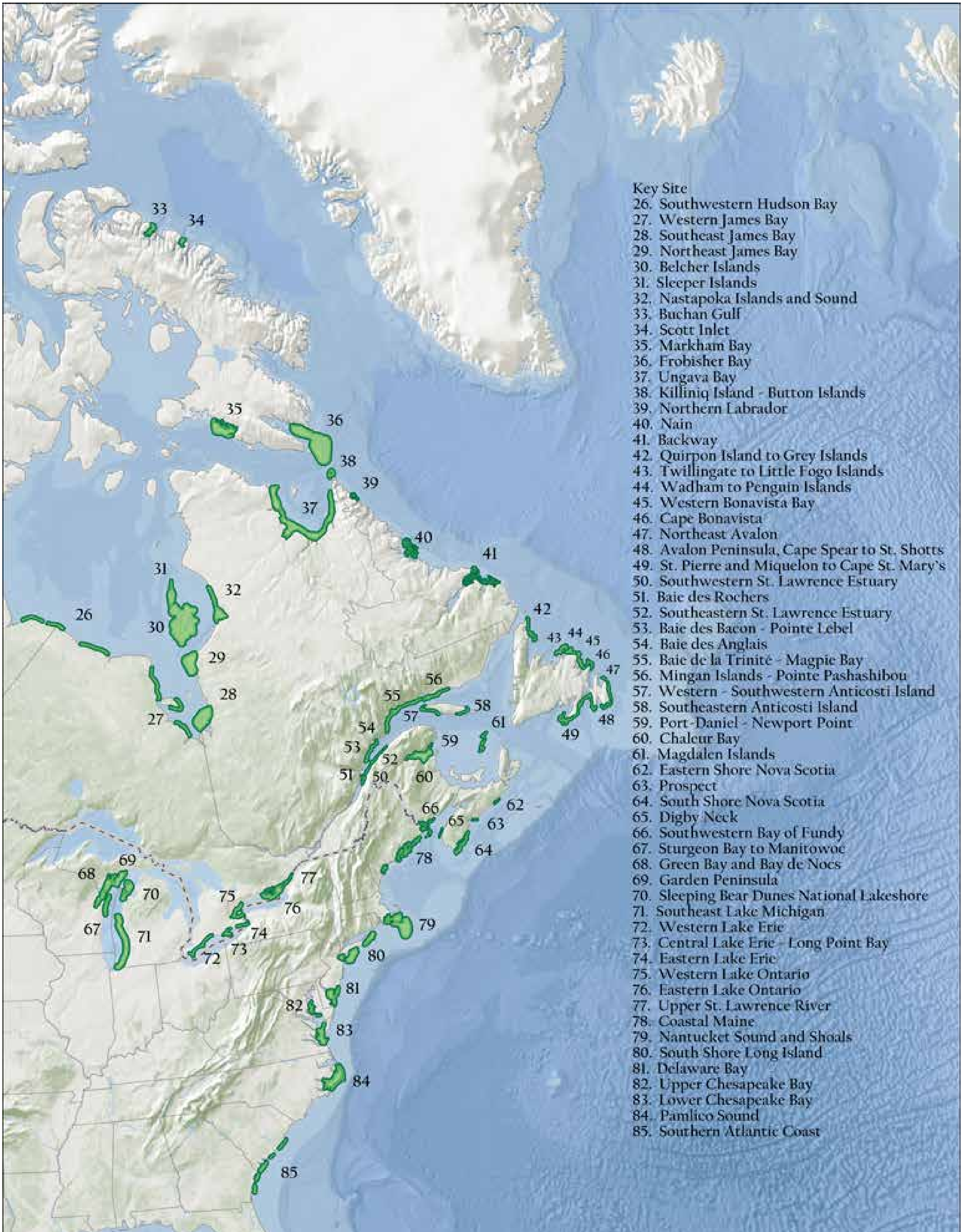
Map: Each site summary is accompanied by an appropriate map. Insets in the large maps indicate the position of the key site in relation to larger geographic features or political boundaries.

Appendices (if applicable): Supplementary materials such as additional maps or data summaries that are referenced within the key site narrative. Appendices are available online only and are hyperlinked within the site narrative.

Key Site Narratives

Eighty-five key sites are documented in the atlas (Figure 2). Site narratives and maps follow.

Figure 2. Key habitat sites for sea ducks in North America.


Key Site
26. Southwestern Hudson Bay
27. Western James Bay
28. Southeast James Bay
29. Northeast James Bay
30. Belcher Islands
31. Sleeper Islands
32. Nastapoka Islands and Sound
33. Buchan Gulf
34. Scott Inlet
35. Markham Bay
36. Frobisher Bay
37. Ungava Bay
38. Killiniq Island - Button Islands
39. Northern Labrador
40. Nain
41. Backway
42. Quirpon Island to Grey Islands
43. Twillingate to Little Fogo Islands
44. Wadham to Penguin Islands
45. Western Bonavista Bay
46. Cape Bonavista
47. Northeast Avalon
48. Avalon Peninsula, Cape Spear to St. Shotts
49. St. Pierre and Miquelon to Cape St. Mary's
50. Southwestern St. Lawrence Estuary
51. Baie des Rochers
52. Southeastern St. Lawrence Estuary
53. Baie des Bacon - Pointe Lebel
54. Baie des Anglais
55. Baie de la Trinité - Magpie Bay
56. Mingan Islands - Pointe Pashashibou
57. Western - Southwestern Anticosti Island
58. Southeastern Anticosti Island
59. Port-Daniel - Newport Point
60. Chaleur Bay
61. Magdalen Islands
62. Eastern Shore Nova Scotia
63. Prospect
64. South Shore Nova Scotia
65. Digby Neck
66. Southwestern Bay of Fundy
67. Sturgeon Bay to Manitowoc
68. Green Bay and Bay de Nocs
69. Garden Peninsula
70. Sleeping Bear Dunes National Lakeshore
71. Southeast Lake Michigan
72. Western Lake Erie
73. Central Lake Erie - Long Point Bay
74. Eastern Lake Erie
75. Western Lake Ontario
76. Eastern Lake Ontario
77. Upper St. Lawrence River
78. Coastal Maine
79. Nantucket Sound and Shoals
80. South Shore Long Island
81. Delaware Bay
82. Upper Chesapeake Bay
83. Lower Chesapeake Bay
84. Pamlico Sound
85. Southern Atlantic Coast

Scoters and Long-tailed Ducks. Photo: Tim Bowman.

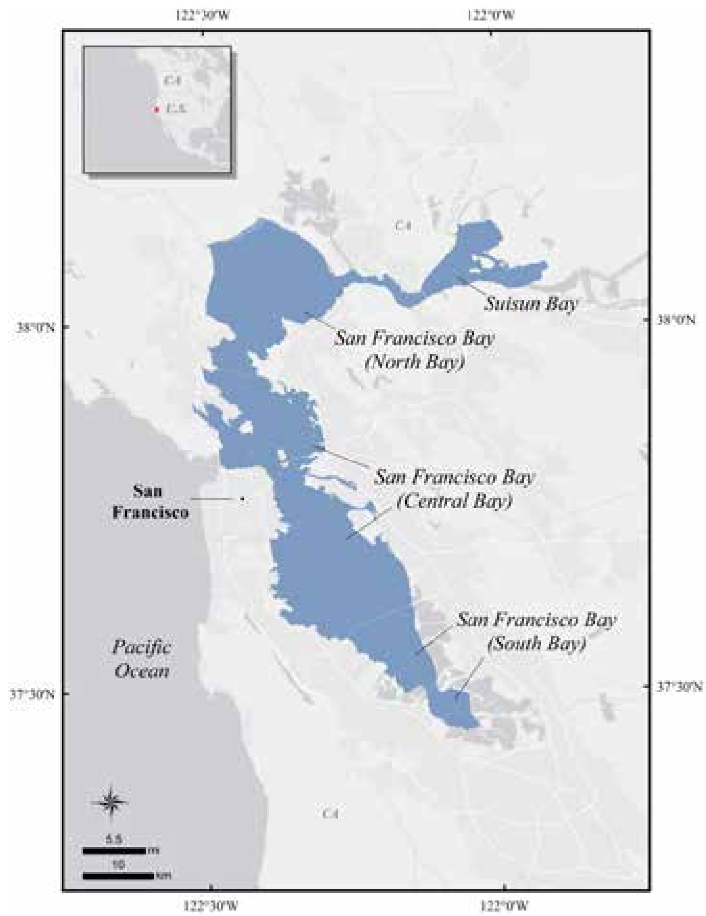
California, Washington, and British Columbia Key Sites

Figure 3. **Key habitat sites for sea ducks in California, Washington, and British Columbia.**

Key Site 1: San Francisco Bay, California

Location: 37°47'39"N, 122°20'60"W

Size: 1081 km^2



Description: San Francisco Bay and Delta is the largest estuary on the Pacific Coast of North America and drains nearly 40% of California's watersheds, including those in the Sierra Nevada mountains (Conomos 1979). San Francisco Bay-Delta has long been recognized as a site of continental importance to waterfowl by the North American Waterfowl Management Plan (North American Waterfowl Management Plan 2018) and is designated a Ramsar Wetland of International Importance (Ramsar 2021). San Francisco Bay is comprised of four adjacent regions that facilitate freshwater runoff from the Sacramento and San Joaquin rivers and smaller regional creeks, with regular tidal interchange through the Golden Gate strait to the Pacific Ocean. Each of the open bay regions, including Suisun Bay, North (or San Pablo) Bay, Central Bay, and South Bay, are characterized by a unique combination of tidal range, water depth, salinity, and sediments, as well as adjacent tidal channel networks, marsh and intertidal mudflats creating a rich diversity of wetland habitats and food resources. For consistency and comparison with long-term Mid-Winter Waterfowl Surveys (MWS), the San Francisco Bay key habitat site is limited to these four open bay portions of the estuary (Accurso 1992), which constitute the most important areas for sea ducks within San Francisco Bay-Delta. Suisun Bay (116.9 km^2), with a mean depth of 4.3 m (Monroe et al. 1992), experiences relatively small fluctuations in salinity dependent upon the amount of freshwater runoff coming through the Sacrament-San Joaquin Delta. An adjacent network of channels interspersed among managed wetlands of the Suisun Marsh provide shelter and food for Bufflehead (*Bucephala albeola*) and goldeneyes (*Bucephala clangula* and B. *islandica*), while the open shallow waters of Suisun Bay provide benthic foods for Surf Scoter (*Melanitta perspicillata*) and other diving ducks.

North Bay, also referred to as San Pablo Bay (303.7 km^2), with a mean depth of 2.7 m, is characterized by broad shallow mudflats to the north and large eelgrass beds along the southern shoreline, with the greatest fluctuation in salinity levels between the Carquinez Strait and the San Rafael-Richmond bridge. The shallow mudflats of northern San Pablo Bay and adjacent Napa-Sonoma marshes provide an extensive network of sloughs and protected shorelines between the Napa and Petaluma Rivers. Seasonal fresh water from smaller regional creeks create ideal habitats for bivalve beds, which are critical to foraging sea ducks. Bufflehead and goldeneyes, and other waterfowl, likely move between open bay and adjacent marsh and pond habitats depending on seasonal and daily wind and tide conditions.

Central Bay (528.2 km^2), between San Rafael-Richmond and San Mateo bridges, has a mean depth of 10.7 m and is the deepest of the four regions with strong alternating tidal currents, which limit suitable foraging habitats to shorelines and protected embayments, particularly along the western shoreline. Notably, Richardson Bay supports about 80% of all spawning Pacific herring in San Francisco Bay and contains the second largest eelgrass bed in San Francisco Bay and is the most consistently used herring spawning site (California Department of Fish and Game 2019), supporting large concentrations of scoters, Bufflehead and scaups (*Aythya affinis* and *A. marila*) during spawning events. Additionally, the eastern shoreline between San Leandro and the San Mateo bridge consistently supports Surf Scoters throughout the season (Accurso 1992, De La Cruz et al. 2014). For these reasons, both sites are listed as Audubon Important Bird Areas (IBA Audubon 2021).

South Bay (130.8 km^2), includes the open waters and intertidal mudflats south of the San Mateo Bridge South Bay and is characterized by shallow waters (mean depth of 3.4 m) ringed by intertidal mudflats and adjacent ponds including some that are managed for migratory birds.

Precision and Correction of Abundance Estimates Presented: Bird abundance and density estimates presented for this key habitat site are based upon aerial surveys designed to maximize coverage of shallow subtidal and intertidal waters in the four open bay regions of San Francisco Bay (Accurso 1992, Richmond et al. 2014, Strong 2018). No species-specific visibility correction factors (VCF) have been generated for these data. Therefore, abundance and density values provided should be considered minimum estimates.

Biological Value: Sea duck distribution and abundance data were collected through the MWS following the same transects from 1988 to 2020 (Accurso 1992), and periodically summarized by sub-region and surrounding saltmarsh and managed pond habitats (Richmond et al 2014, Strong 2018). While these counts focus on the midwinter period, Accurso (1992) and subsequent studies have demonstrated the seasonal nature of habitat use throughout San Francisco Bay. Distribution and abundance of birds among regions in San Francisco Bay is driven largely by dynamics in prey abundance and distribution (Rowan et al. 2011), which enables sea ducks to meet their energetic requirements from October through March (Accurso 1992, Lovvorn et al. 2013, De La Cruz et al. 2014).

San Francisco Bay is a dynamic and diverse estuarine system comprised of a wide variety of wetland habitats including subtidal and intertidal zones, and freshwater river estuaries, resulting in conditions especially important to Surf Scoters of the Pacific Flyway during winter and migration. The site is a major wintering location for Surf Scoter and Bufflehead, with nine other species of sea ducks observed in low abundance, or with infrequent or rare sightings, including White-winged Scoter (*Melanitta deglandi*) and Black Scoter (*Melanitta americana*), both goldeneyes, all three merganser species (*Mergus* spp.), Long-tailed Duck (*Clangula hyemalis*), and Harlequin Duck (*Histrionicus histrionicus*). The wintering count of sea ducks in the open and intertidal reaches of San Francisco Bay was estimated at 50,616 birds in 1989–1990 (Appendix 1; subset from Accurso 1992), but this estimate is a minimum count. Even these minimum estimates indicate high sea duck density, greater than 47 birds per km^2. The most abundant species were Surf Scoter and Bufflehead, with lesser abundance of goldeneyes (Appendix 1). Richmond et al. (2014) and Strong (2018) summarized more recent estimates following the same aerial survey protocols for San Francisco Bay, where the 'open bay' components of the MWS were identifiable, highlighting the variability in abundance of the less commonly encountered species groups in open water portions of San Francisco Bay (Appendix 1). Species-specific descriptions follow:

Scoters. During the MWS, scoters are lumped as a group and not identified to species. Surf Scoter is the most abundant sea duck species in San Francisco Bay. White-winged Scoter are regularly detected in low numbers and Black Scoter are a predictable rarity during winter but these two species combined make up less than 1% of the total scoter count (Accurso 1992). Repeated estimates from all four open bay regions of San Francisco Bay repeatedly report minimum densities greater than 10.0 scoters per km^2, with a high winter count of 48,203 scoters in January 1990 (Appendix 1). Richmond et al. (2014) documented 15,204 scoters in these same open bay regions during January 2012, which was 63% below scoter population target identified by the San Francisco Bay Joint Venture (SFBJV; SFBJV 1999), and reported a significant negative trend for scoter species counts in San Francisco Estuary in January between 1981–2012. A comparable survey effort was conducted in January 2018, documenting 13,068 scoters (Strong 2018). Despite these low counts, minimum scoter densities have ranged between 12.1 to 14.1 scoters per km^2 in San Francisco Bay, with highest densities documented in North (9.0 to 27.0

per km^2), Central (9.2 to 16.6 per km^2), and South Bays (12 to 16.4 per km^2; Appendix 1). Scoters were the only species group to show significant declining trends, exceeding 7% decline per year in North, Central and South Bays since 1989 (Nur et al. 2015).

Bufflehead. Bufflehead are consistently abundant in San Francisco Bay, scattered across all four regions with distribution likely influenced by the surrounding tidal sloughs, wetland and managed pond systems. Minimum densities of 7.1 birds per km^2 were recorded during January 2012, with the highest density of 18.8 birds per km^2 in South Bay (Richmond et al. 2014).

Goldeneye. Goldeneyes are thought to be predominantly Common Goldeneye, with Barrow's Goldeneye comprising less than 1% of the total goldeneye count (Accurso 1992). Peak density of goldeneyes was recorded as at least 39.9 birds per km^2 in Suisun Bay during January 2018 (Strong 2018).

Other Sea Duck Species. No reliable winter estimates exist for the other species of sea ducks encountered in San Francisco Bay. Mergansers were the only other sea ducks detected during aerial MWS surveys, but very few individuals were counted. Ancillary information from Christmas Bird Counts and eBird sightings includes limited, but confirmed, sightings of all three merganser species, Barrow's Goldeneye, White-winged Scoter, Black Scoter, Long-tailed Duck, and Harlequin Duck ranging from small flocks to individuals, particularly in the Central Bay region.

While aerial winter survey estimates clearly indicate the importance of the San Francisco Bay during winter months, this site also hosts thousands of sea ducks, particularly scoters, during fall and spring migration. De La Cruz et al. (2009, 2014) documented interannual movements among the four regions and intra-annual site fidelity by Surf Scoter marked with VHF and PTT transmitters throughout San Francisco Bay. Several studies describe seasonal distribution patterns; for example, Suisun and San Pablo Bays predictably experience use by sea ducks during periods of constrained freshwater inflows from the Sacramento and San Joaquin River Delta during the fall and early winter period. Surf Scoter distribution shifts in December and January, corresponding with declines in bivalve densities in San Pablo Bay and when seasonal patterns of precipitation and runoff lowers the salinity gradient throughout San Francisco Bay (Lovvorn et al. 2013, De La Cruz et al. 2014). Selection and use of sites within Central Bay were correlated with the seasonal presence of Pacific herring spawn, particularly in Richardson Bay near Sausalito, CA (De La Cruz et al. 2014). The most consistent use occurs along the eastern shoreline of South Bay north of the San Mateo bridge near San Leandro, CA, a region of high bivalve densities (De La Cruz et al. 2014).

Sensitivities: Sea ducks in San Francisco Bay are vulnerable to habitat degradation from chronic contaminants (Ohlendorf et al. 1986, 1991, Ackerman et al. 2014), oil spill events (De La Cruz et al. 2013, Golightly et al. 2019), changes in profitable prey due to competition with invasive species (Poulton et al. 2004, Richman and Lovvorn 2004, Lovvorn et al. 2013), and lesser documented diseases (Skerrat et al. 2005) which may be exacerbated by climate change. These perturbations may potentially cause reduced body condition and survival which in turn negatively influence migration schedules and reproductive potential. Additionally, future development around San Francisco Bay increases the likelihood that disturbance from shipping, ferry traffic, recreational boating (De La Cruz et al. 2014), and other influences will reduce roosting areas or foraging area profitability (Lovvorn et al. 2013). These threats have the greatest potential impact during spring when energetic demands are high and birds are more vulnerable to cross-seasonal impacts, and when herring spawn events concentrate birds in the Central Bay.

Potential Conflicts: This key habitat site is adjacent to major urban population centers that are inhabited by over 7.7 million people as of 2020 (U.S. Census Bureau 2020). Run-off from major port cities of San Francisco and Oakland, along with San Jose and numerous other expanding bayside urban centers, may degrade water quality and sea duck habitats, as documented by the San Francisco Bay Conservation and Development Commission (2020). Urban storm water is the largest source of pollution to San Francisco Bay, with oil, pesticides, fertilizers and household chemicals reaching Bay waters (State Water Resources Control Board 2006). Additional potential impacts on sea ducks include marine boat traffic, habitat loss, degraded food resources, oil spills, and climate change (see Sensitivities). Contaminant studies in the 1980s documented that

Surf Scoters in San Francisco Bay had high liver concentrations of mercury, selenium, certain heavy metals and organocholorines that increase the longer birds the birds were in the Bay (Ohlendorf et al. 1986, 1991). Eagles-Smith et al. (2009) showed that mercury concentrations remained elevated in Surf Scoters just prior to spring migration, inferring potential cross-seasonal burdens. It is not understood how climate change impacts including sea-level rise and salinity changes in San Francisco Bay will affect the availability and profitability of sea duck prey, food densities, and competition among sea ducks and other benthic foraging waterfowl and fish species (State Coastal Conservancy 2010, Lovvorn et al. 2013), emphasizing the need for future monitoring of benthic resources (Rowan et al. 2011).

Status: The SFBJV established population targets for focal waterfowl species in the San Francisco Bay based on peak abundance estimates from surveys conducted from October–April 1988–1990 (Accurso 1992). The SFBJV's primary waterfowl goal is to provide enough high-quality wetland and open water habitat to consistently support wintering populations of canvasback, greater and lesser scaup, and scoters at peak population levels recorded in 1989–90. Because the timing of peak abundance varies by species, the MWS tends to underestimate the actual peak abundance for some species. To account for this, Accurso's data from the 1988–1990 period was used to derive species-specific correction factors that convert MWS abundance estimates to annual peak estimates (Richmond et al. 2014). The conversion factors are based on data from three years of fall through spring surveys conducted by Accurso (1992). To obtain the annual peak estimate, the MWS abundance estimate is multiplied by the corresponding conversion factor (SFBJV 1999). Therefore, a population target of 61,248 scoters for San Francisco Bay would correspond to a MWS count of 41,481; this target has not been met since 2001 (Richmond et al. 2014).

This key site includes 10 Important Bird Areas (IBAs) associated with San Francisco Bay, with three designated as Globally Significant, justified in part because of their importance to Surf Scoters. The IBAs in this key site include extensive intertidal mudflats and adjacent marshes, but also include three open water IBAs acknowledging the importance of benthic food resources and eelgrass beds that provide substrate for Pacific herring spawn. Surf Scoter is one of ten priority bird species in the San Francisco Bay Program (Audubon 2020).

Three National Wildlife Refuges, managed by the U.S. Fish and Wildlife Service, and ten state Wildlife Areas and Ecological Reserves, managed by the California Department of Fish and Wildlife, are within the San Francisco Bay region, consisting of managed tidal wetlands, managed ponds, extensive networks of tidal sloughs, and some of the largest expanses of tidal marsh remaining on the Pacific Coast of North America. Tidal restoration projects have targeted intertidal mudflat and tidal marsh habitats that have benefits to a variety of wetland-dependent wildlife, including Surf Scoter, Bufflehead, and other benthic foraging waterfowl species. Uniquely, the San Pablo Bay National Wildlife Refuge and San Pablo Bay Wildlife Area both include open water regions of San Pablo Bay within their boundaries. The revised and updated San Francisco Bay Plan recognized that habitats of the open bay provide essential resting and feeding places for waterfowl during winter and migration (San Francisco Bay Conservation and Development Commission 2020). Restoration goals and adaptation strategies for these important habitats are guided by several regional efforts, including the San Francisco Bay Subtidal Habitat Goals Project (State Coastal Conservancy 2010), the USFWS Recovery Plan for Tidal Marsh Ecosystems of Northern and Central California (U.S. Fish and Wildlife Service 2013), the Baylands Ecosystem Habitat Goals Science Update (Goals Project 2015) and the San Francisco Bay Shoreline Adaptation Atlas (Beagle et al. 2019).

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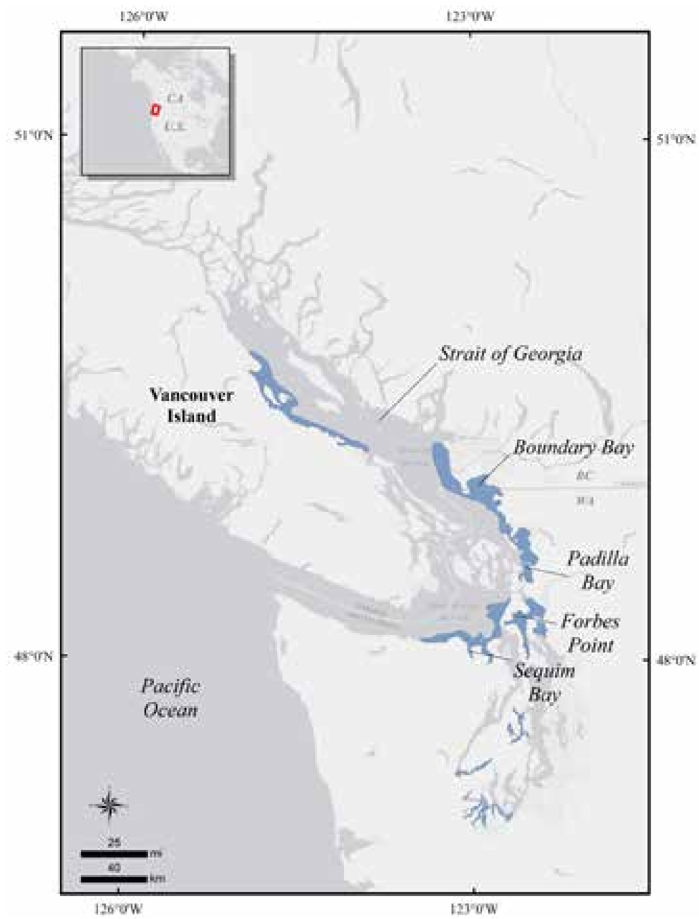
Key Site 2: Salish Sea, Washington and British Columbia

Location: 49°2'35"N, 123°4'22"W

Size: 18,000 km^2

Description: The Salish Sea is a fjord estuary network of coastal marine waters located in southwestern British Columbia (BC), Canada, and northwestern Washington, United States, that includes four major water bodies: the Strait of Georgia, Desolation Sound, Puget Sound, and the Strait of Juan de Fuca (Appendix 1). The name Salish Sea is a relatively new term for the region that unifies this ecosystem across its international border. The Salish Sea extends from Desolation Sound and Discovery Passage at the northern end of the Strait of Georgia along the eastern side of Vancouver Island, and south to Olympia, Washington in Puget Sound. The northern portion is comprised of more "typical" fjord characteristics of steep slopes with deep basins and the southern portion is comprised of less steep slopes with shallower basins. To the west, the Salish Sea opens to the Pacific Ocean via the Strait of Juan de Fuca. It is one of the largest estuarine ecosystems in North America. The Salish Sea key site does not include the entire watershed, but several areas within the Salish Sea watershed that are extremely important to sea ducks. Those areas include a portion of the Strait of Georgia on the east side of Vancouver Island, and Boundary Bay in British Columbia waters, and Padilla Bay, Sequim Bay, and the Forbes Point area in Washington waters.



The Strait of Georgia is roughly 200 km long and 40 km wide, with a maximum depth of 400 m. The Vancouver Island Range to the west and the Coast Range to the east border the Strait of Georgia. Archipelagos and narrow channels mark each end of the Strait of Georgia, the Discovery Islands within Desolation Sound in the north, including a narrow ocean influence, and the Gulf Islands and San Juan Islands in the South. The Fraser River Delta, in the southeast accounts for 80% of the fresh water entering the Strait of Georgia.

Puget Sound is characterized by five deep basins including Whidbey Basin, Central Puget Sound, South Puget Sound, Hood Canal, and Admiralty Inlet. The maximum depth of Puget Sound is 280 m (Freelan 2018). The Strait of Juan de Fuca is approximately 25 km wide and 150 km long, connecting northern Puget Sound to the Pacific Ocean. The majority of ocean influence enters the Salish Sea through the Strait of Juan de Fuca. The Strait is bisected by the international boundary between the United States and Canada.

Precision and Correction of Abundance Estimates Presented: Data on the distribution and abundance of sea ducks have been collected for the inner marine waters of Washington State during a long-term annual aerial winter survey conducted by the Washington Department of Fish and Wildlife (WDFW) (WDFW 2020, Appendix 2). Canadian waters are surveyed periodically by Canadian Wildlife Service (CWS) in collaboration with the WDFW survey protocol and crew (Appendix 2). Winter bird abundance and density estimates presented for this key habitat do not account for incomplete detection by applying species-specific visibility correction factors, and do not include estimates of several known important areas for sea ducks in Canadian waters including Boundary Bay and the Fraser River estuary, therefore the winter abundance figures (Appendix 3) provided should be considered minimum estimates.

Biological Value: The Salish Sea is a biologically rich and dynamic system comprised of a wide variety of habitats including intertidal zones, pelagic waters, rocky reefs, coastal wetlands, and freshwater river estuaries. It is especially important to sea ducks of the Pacific Flyway during wintering, staging, spring migration, and molting. The site is a major wintering location for 11 species of sea ducks, including Surf Scoter (*Melanitta perspicillita*), White-winged Scoter (*Melanitta deglandi*), Black Scoter (*Melanitta americana*), Bufflehead (*Bucephala albeola*), Common Goldeneye (*Bucephala clangula*), Barrow's Goldeneye (*Bucephala islandica*), all three mergansers (*Mergus* spp.), Long-tailed Duck (*Clangula hyemalis*), and Harlequin Duck (*Histrionicus histrionicus*) (Appendix 3). The total wintering population of sea ducks in surveyed areas of the Salish Sea (Appendix 2) was estimated to be a minimum abundance of about 247,000 birds in 2013 (Appendix 3; Evenson et al. 2013, WDFW 2020). This estimate is biased low because the survey area in British Columbia did not include Boundary Bay or the Fraser River estuary, both high density sea duck areas (Evenson et al 2013). The most abundant species or species group was scoters, followed by Bufflehead, goldeneyes, mergansers, Long-tailed Duck, and Harlequin Duck (Appendix 3). Nyeswander et al. (2005) and Evenson et al. (2013) summarized abundance estimates by species and species groups in near-shore versus off-shore waters, and, in the case of Puget Sound, among basins. WDFW (2020) summarized sea duck trends in Washington marine waters of the Salish Sea from 1994 to 2019. Trends in BC areas of the Salish Sea are less understood.

While winter survey estimates clearly indicate the importance of the Salish Sea during winter, this site also hosts thousands of sea ducks, particularly scoters, during spring staging and during late summer molt. Several areas in the Salish Sea are particularly important to sea ducks at various times of the year. In British Columbia, Baynes Sound, in the northwest of the Strait of Georgia, hosts tens of thousands of sea ducks in winter and especially during herring spawning in spring, particularly around Hornby and Denman Islands (D. Esler, USGS pers. comm). Recent CWS surveys in coastal BC have identified sea duck use of estuaries and rivers where Eulachon (*Thaleichthys pacificus*) spawn. Mergansers are particularly abundant on estuaries and rivers where Eulachon spawn. Bufflehead is the most common sea duck species in BC coastal estuaries and large aggregations of goldeneyes have been observed in the estuaries at the head of some mainland coast inlets (Toba, Knight and Kingcome Inlets) in late March, suggesting that these estuaries are the last coastal stop prior to inland migration. Other areas in BC important to sea ducks in spring include Boundary Bay, Fraser River Delta, and Howe Sound (Evenson et al. 2007).

Herring spawning is important to several species of sea ducks during spring, but habitats lacking herring spawn and bivalves, like eelgrass beds where soft-bodied prey are found (e.g., polychaetes) are also important to sea ducks (Anderson et al. 2008). In Salish Sea waters in Washington, Padilla Bay supports one of the largest continuous native eelgrass (*Zostera marina*) beds on the Pacific Coast (Bulthuis 1995), and as such is important particularly for molting scoters that return in thousands during late-July and August. Areas of particular importance to sea ducks in Washington during spring included Padilla Bay north through Lummi Bay, and Boundary Bay dominated by Surf Scoter, White-winged Scoter, Harlequin Duck, and the only consistent concentrations of Long-tailed Duck found in Washington waters (Evenson et al. 2007).

Detailed information about abundance and site use for species or species groups is as follows.

Scoters. Surf, White-winged, and Black Scoters are common species in the Salish Sea, with Surf Scoter being the predominant species of the three (Evenson et al. 2013, 2020). Numbers of scoters wintering in inner marine waters of Washington have declined significantly since the late 1970s (Nysewander et al. 2005). Nysewander et al. (2005) reported higher densities of scoters in near-shore habitats (<20 m) than in deep waters (>20 m), and that scoters used most near-shore marine waters in the survey area. Highest winter densities of scoters occurred in southern and central Puget Sound. Hot spots for scoters also included the Washington portion of Boundary Bay, Bellingham Bay and Padilla-Samish Bay. Densities ranged annually from 55.0 to 70.4 scoters per km^2 in near-shore waters. In BC, the majority of Scoters are also found in near-shore waters. Hot spots in BC for scoters include Boundary Bay, the Fraser River Delta, Baynes Sound, and the east

Coast of Vancouver Island from Campbell River to Nanaimo. Numbers of scoters in Baynes Sound in the early 2000s were much higher than during a CWS survey in 1981 (D. Esler, CWS, pers. comm.).

In summer, Nysewander et al. (2005) found high densities of scoters in Padilla Bay, Crescent Harbor, Penn Cove, and in three locations in the Strait of Juan de Fuca: Dungeness Bay, Crescent Bay and Neah Bay and Boundary Bay, on the Washington border with British Columbia. Anderson et al. (2006) documented year-round use by Surf and White-winged Scoters among three sites in Puget Sound: Penn Cove, Birch Bay, and Padilla Bay. Penn Cove largely lacks vegetation and has extensive mussel beds over sand and gravel and harbors roughly 5000–7000 Surf Scoters during early winter. Scoter use of Birch Bay peaked during spring staging when herring spawn was available. Padilla Bay was used during both spring staging and molting in summer. Molt surveys in 2007–2009 revealed roughly 8000 scoters in Padilla Bay, 2500–3000 at Forbes Point (between Oak Harbor and Crescent Bay, Washington), approximately 6000–8000 in Boundary Bay, and 8000–10,000 in the Fraser River Delta (Joe Evenson, WDFW pers. comms.). Only Birch Bay held substantial numbers of White-winged Scoters. Telemetry revealed scoters that wintered from Mexico to British Columbia used the Salish Sea from mid-March to mid-May (Evenson et al. 2007). The southern Gulf Islands of British Columbia are important to Surf Scoters during spring migration including Gabriola Island, Porlier Pass, Active Pass and Saturna Island, as well as the northern entrance of Howe Sound (Evenson et al. 2007).

Bufflehead. Bufflehead occur in Washington waters in similar densities to scoters, but tend to favor shallower waters and heads of bays or inlets (Nysewander et al. 2005). The shoreline of southern Strait of Juan de Fuca is important to Bufflehead in some years. Densities of Bufflehead ranged from 34.1 to 64.3 birds per km^2 in near-shore waters. In British Columbia, Bufflehead were primarily associated with estuaries and near-shore waters, with less than 10% associated with offshore waters (Evenson et al. 2013). Wintering Bufflehead populations have been generally stable since the late 1970s (Nysewander et al. 2005).

Goldeneyes. Goldeneye species (Barrow's Goldeneye and Common Goldeneye) are widely distributed in Washington (Nysewander et al. 2005, WDFW 2020). Densities ranged from 17.3 to 38.3 birds per km^2, much lower than Bufflehead and scoters (Nysewander et al. 2005). Goldeneye densities were higher in southern and central regions than in northern areas of Puget Sound, and they were often found where no other sea duck species were present (Nysewander et al. 2005). Numbers of goldeneye have declined in Puget Sound (Nysewander et al. 2005, WDFW 2020). In British Columbia, goldeneyes were more abundant in fjords and less abundant along the exposed waters of the Strait of Georgia and Strait Juan de Fuca (Evenson et al. 2013). Hot spots for Barrow's Goldeneye in BC include Burrard Inlet, Desolation Sound, and Mainland Coast Inlets (particularly Toba, Kingcome, Knight, and Jervis Inlets).

Mergansers. Mergansers were common throughout Washington marine waters, but occurred in lower numbers compared to other sea duck species, except Long-tailed Duck and Harlequin Duck. Of the merganser species, Red-Breasted Mergansers (*M. serrator*) were most common during winter surveys, followed by Common (*M. merganser*) and Hooded Mergansers (*Lophodytes cucullatus*) in both Washington and British Columbia, but only Common and Hooded Mergansers also breed in this region (Nysewander et al. 2005, Evenson et al. 2013, WDFW 2020). In Washington, Hooded Merganser favored the San Juan Islands and selected portions of south and central Puget Sound (Nysewander et al. 2005). In British Columbia, Red-breasted Merganser were evenly distributed among coastal and fjord habitats, and Common and Hooded Mergansers were most common in near-shore habitats (Evenson et al. 2013). Mergansers in Puget Sound are considered stable to increasing (Nysewander et al. 2005), WDFW 2020).

Long-Tailed Duck. Nysewander et al. (2005) reported Long-tailed Duck distribution differed from other sea ducks in that they were found in eastern portions of Strait of Juan de Fuca and Georgia Strait in deeper near-shore waters. Similarly, in British Columbia, Evenson et al. (2013) found Long-tailed Duck exclusively near the coastline of the Strait of Georgia and Strait Juan de Fuca. Numbers of Long-tailed Duck have declined substantially over the past few decades (Nysewander et al. 2005, WDFW 2020).

Harlequin Duck. Harlequin Duck were associated with intertidal habitats as well as kelp beds along the southern shore of the Strait of Juan de

Fuca (Nysewander et al. 2005). Similarly, Evenson et al. (2013) found Harlequin Duck predominantly along coastlines of the Straits and were less commonly observed in the deeper fjords. WDFW (2020) reported relatively stable Harlequin Duck population in the Washington portions of the Salish Sea between 1999 through 2019. Harlequin Ducks are widespread throughout the BC portion of the key site. Of note, large numbers of Harlequin Ducks congregate around Hornby Island and nearby areas in BC during herring spawn. The shores of nearby Hornby Island are a major roost site for molting Harlequin Ducks (K'omoks IBA CANADA).

Sensitivities: Sea duck populations may be vulnerable to habitat loss, loss of prey due to climate change, ocean acidification, marine pollution, disease, harmful algal bloom events (Phillips et al. 2011), and disturbance from shipping and recreational boating (De La Cruz et al. 2014). These threats have the greatest potential impact during the flightless molt period in late summer and spring foraging events when energetic demands are high and birds are more vulnerable and sensitive to disturbance.

Potential Conflicts: This site is adjacent to major urban population centers with over 7 million people as of 2012 (Salish Sea Marine Sanctuary 2018) and projected to be over 9 million in 2025 (U.S. Environmental Protection Agency 2017). Major coastal cities include Victoria and Vancouver in British Columbia, and Seattle and Tacoma in Washington. These large port cities, as well as extensive coastline development of other urban centers, present many potential conflicts with sea ducks and the habitats they rely on, such as degraded water quality and habitats, as documented by the Puget Sound Partnership (2018). Specific sources of pollution include oil, gas, paint, fertilizer, flame-retardants, heavy metals, and sewage. Many of these pollutants enter the Salish Sea via storm-water runoff (Ecology and King County 2011). Additional potential impacts on sea ducks include marine boat traffic, mariculture, habitat loss, oil spills, and climate change. The Health of the Salish Sea Report, a joint initiative between the U.S. Environmental Protection Agency (2017) and Environment and Climate Change Canada, tracks ten environmental indicators such as air quality, water quality, species at risk, and toxins in the food web, and found 6 of the 10 indicators were either neutral or worsening in the Salish Sea. For instance, mussels have been used to study toxins in Puget Sound's nearshore biota, and Lanksbury et al. (2014) observed Poly-aromatic hydrocarbons (PAHs) from oil pollution were widespread with highest levels in urban areas. Willie et al. (2017) found that Barrow's Goldeneyes wintering in BC had higher exposure of PAHs in coastal areas with greater anthropogenic influence versus more pristine areas. Finally, expansion of the non-native eelgrass (*Zostera japonica*) threatens intertidal mudflats and bivalve beds, with uncertain implications for competition with the native eelgrass beds (*Z. marina*) and the invertebrate species found to provide food resources for several of the sea duck species in these zones (Ray 1997, Anderson et al. 2008).

Status: This key site includes 21 Important Bird Areas (IBAs) within the state of Washington and 14 IBAs in British Columbia. The IBAs in this key site include bays, inlets, marshes, bends, passes, harbors, coves, lagoons, and a brackish lake important for water birds (IBA Audubon 2018, and IBA Canada https://ibacanada.org/). Additionally, the Washington Department of Fish and Wildlife (WDFW) has designated Marine Protected Areas (MPAs) including Conservation Areas (no take allowed) and Marine Preserves (limited take allowed). The MPAs provide protection for important fisheries in Puget Sound that are often important to sea ducks as well (e.g., herring).

In Washington State, local governments must meet state requirements for development in near-shore waters (Shoreline Management Act (RCW 90.58) and the Growth Management Act (RCW 36.70A)). These regulations require collection of information about critical areas (MRSC website), including eelgrass beds, to characterize shoreline function and ecosystem wide processes. Adopted in 1971 as citizen's initiatives, local governments are tasked with identifying measures to protect and/or restore impacted ecosystems (Envirovision, Herrera Environmental, and Aquatic Habitat Guidelines Program 2010).

The Washington State constitution stipulated that all citizens, not individuals, own aquatic lands; however, until 1971, landowners could purchase tidelands or shore-lands from the state (Washington DNR https://www.dnr.wa.gov/). Tideland usually refers to ownership between the lower low water mark and the mean high water mark. Shore-lands are submerged lands lying along the edge of rivers or lakes. In 1971 the legislature voted to stop sale of the state's aquatic lands. At present, 70% of tidelands remain privately owned. The state monitors jurisdiction over 75% of shore-lands, all navigable waters, and all bed-lands. Bed-lands are those aquatic lands that are submerged at all times.

Additional state legislation to restore the health of Puget Sound was enacted in 2007 through the Puget Sound Water Quality Protection program (RCW 90.71), designed to use science to develop and meet measurable goals for the recovery of the sound through the Puget Sound Partnership (2018).

In Canada, the jurisdiction of near shore waters lies with both local and provincial governments (Green Shores 2009). Local governments are responsible for land use planning and regulation and the Provincial government issues permits of all near-shore areas in inland seas such as the Strait of Georgia and Strait of Juan de Fuca.

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Key Site 3: Dogfish Banks and Rose Spit, Haida Gwaii, British Columbia

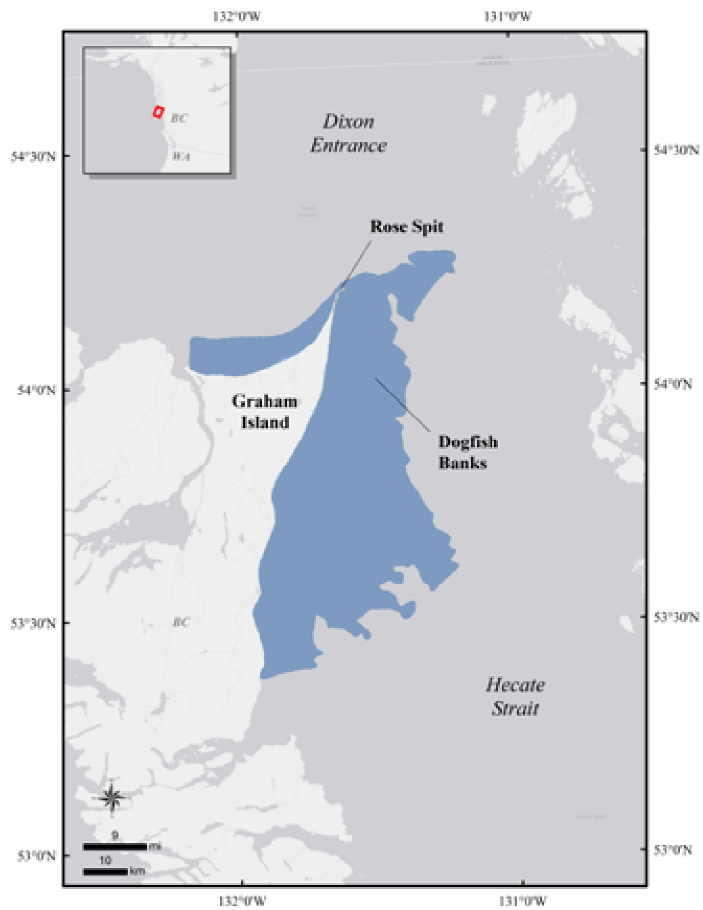
Location: 53°51'56"N, 131°34'53"W

Size: 2821 km^2

Description: Dogfish Banks and Rose Spit are located at the intersection of Dixon Entrance and Hecate Strait, on the north coast of British Columbia. Rose Spit is the most northeastern point of Graham Island in Haida Gwaii (formerly known as the Queen Charlotte Islands). This site includes the nearshore area of McIntyre Bay from Old Masset to Rose Spit and extends out to the northeast and south along the east coast of Graham Island, encompassing Dogfish Banks, a shallow offshore area east of Haida Gwaii. Large sandy beaches with isolated rocky headlands form the shoreline of McIntyre Bay. Rose Spit is the longest sand spit in British Columbia, with a large, well-developed dune system, extensive sandy beaches and offshore bars (IBA Canada 2016). The eastern shoreline of Graham Island consists of rocky shores, mud and sand flats, sheltered bays and points extending out into Hecate Strait (IBA Canada 2016). The waters of Dogfish Banks are unusually exposed sea duck habitat, with depths of 4 to 20 m extending over 20 km from shore (Palm et al. 2013). The waters are often turbulent, with frequent, high-intensity southeast winds and storm wave heights over 10 m, particularly during October to March (RPS Energy 2009). Glacial sands and gravels deposited adjacent to the flat coastal plain of eastern Graham Island create a sandy, gravelly seafloor with highly mobile sediment (RPS Energy 2009).

The region experiences cool, wet winters, with relatively warmer and drier summers. Average sea surface temperatures are around 6°C in winter and 12 to 13°C in summer (Irvine and Crawford 2011). The adjoining terrestrial habitat falls within the wet hypermaritime subzone of the Coastal Western Hemlock biogeoclimatic zone, with temperate rainforest dominated by Western Hemlock, Western Red Cedar, and Sitka Spruce and extensive low-lying wetland areas (Government of British Columbia 2014).

Precision and Correction of Abundance Estimates Presented: Abundance estimates from Hodges et al. (2005) have been adjusted to account for incomplete detection by applying species-specific visibility correction factors based on boat-to-air



ratios calculated from similar surveys in southeast Alaska (Hodges et al. 2008) and the estimates were expanded based on transect area relative to total survey area.

Biological Value: Dogfish Banks and Rose Spit provide a wintering area for an estimated 30,000 to 50,000 sea ducks, including 15,000 to 25,000 White-winged Scoters (*Melanitta deglandi*) and 15,000 to 20,000 Long-tailed Ducks (*Clangula hyemalis*) as well as 2000 to 3000 Surf Scoters (*Melanitta perspicillata*) and 500 to 1000 Black Scoters (*Melanitta americana*) (Hodges et al. 2005). Hodges et al. (2005) speculated that the area would be used by even larger numbers of sea ducks during migration, and recommended further surveys. Satellite telemetry studies indicate that a large proportion of White-winged Scoters and Black Scoters wintering in southern British Columbia stage around Rose Spit in spring, with some individuals using the area for five to six weeks (S. Boyd unpublished data). In spring, scoters congregate to feed on eggs of spawning herring, and major aggregations of Surf Scoters have been reported at Lawn Point and McIntyre Bay (Harfenist et al. 2002). However, herring biomass in Haida Gwaii has been depressed in recent years, to the extent that fisheries have been closed (Irvine and Crawford 2011). Significant numbers of Harlequin Ducks (*Histrionicus histrionicus*) and Surf and White-winged scoters have been reported to molt off the eastern coast of Haida Gwaii (summarized in Harfenist et al. 2002). Molting Surf Scoters and White-winged Scoters in flocks of over 1000 have been observed at Rose Spit and McIntyre Bay, respectively (Savard 1988) but more recent summer surveys have not detected large numbers of scoters (LGL et al. 2009).

In December 1987, a single count of greater than 20,000 Long-tailed Ducks was recorded at Rose Spit (Harfenist et al. 2002). Scoters and Long-tailed Ducks were found throughout Dogfish Banks, but scoters were particularly abundant in the shallower areas of western Dogfish Banks while Long-tailed Ducks were more common in the deeper waters over the eastern banks (LGL et al. 2009, Hodges et al. 2005). Densities of scoters were high through autumn, winter, and spring, while Long-tailed Ducks used the area mainly in autumn and winter (LGL et al. 2009). Dogfish Banks was one of only three major wintering areas identified for scoters in northern British Columbia (Savard 1979). McIntyre Bay to Rose Spit may also be an important fall and wintering area for goldeneye, particularly Common Goldeneye (Harfenist et al. 2002). Large inter- and intra-annual fluctuations in abundance of sea ducks wintering at this site have been observed (Palm et al. 2013, LGL et al. 2009, Hodges et al. 2005). In this region, Surf Scoters commonly used areas with rocky, cobble, or sandy substrates during molt in fall and winter, while White-winged Scoters were primarily in sandy areas (Harfenist et al. 2002, Savard 1988). Surf and White-winged scoters were relatively more common in inlets during fall and winter but also continued to use open water. Long-tailed Ducks were more abundant in open water than in inlets (Harfenist et al. 2002).

While Bald Eagles are present along the shorelines of Haida Gwaii, they are almost completely absent from the offshore areas of Dogfish Banks, providing sea ducks a large foraging area with low predation danger (Palm et al. 2013). McIntyre Bay and Dogfish Banks exhibit high productivity and dense and diverse aggregations of plankton and are important larval rearing areas for invertebrates (Marine Planning Partnership Initiative 2015, Clarke and Jamieson 2006).

Sensitivities: At Dogfish Banks, White-winged Scoters were found to carry large lipid reserves, likely to buffer against reduced time for foraging and elevated thermoregulatory costs at this exposed site (Palm et al. 2013). Large aggregations of migrating or molting sea ducks may be particularly sensitive to disturbance and marine pollution events. Mortality rates may be higher during winter, especially for female and immature sea ducks wintering near the northern extent of their range (Uher-Koch et al. 2016). The value of this site during spring is greatly enhanced by herring spawn, which has declined in recent years.

Potential Conflicts: Dixon Entrance is an important transportation route, and large container ships en route between Asian ports and Prince Rupert and Kitimat often anchor near McIntyre Bay; proposed industrial projects in mainland ports may lead to increases in tanker and/or freighter traffic (Marine Planning Partnership Initiative 2015). In addition, cruise ships regularly transit waters around Haida Gwaii, and there are concerns about large vessel bilge and wastewater discharge as well as negative effects of smaller freight or log boom towing vessels (Marine Planning Partnership Initiative 2015). Long-standing concern about the risks of oil spills in this region (Marine Planning Partnership Initiative 2015, IBA Canada 2016) has been somewhat alleviated by the Canadian federal government's recent commitment to legislate a moratorium on crude oil tankers (carrying more than 12,500 tonnes) on the north coast of British Columbia (Government of Canada 2016). NaiKun Wind Energy Group maintains an active tenure license and has provincial and federal environmental assessment approval for a large-scale offshore wind energy project (up to 110 turbines) on Dogfish Banks; however, the project is stalled due to lack of an electricity purchase agreement and limited support within the Haida community (Marine Planning Partnership Initiative 2015).

Status: There are no existing marine protected areas at this site, but the Haida Gwaii Marine Plan designated several proposed marine Protection Management Zones and a marine Special Management Zone in the area (Marine Planning Partnership Initiative 2015). Much of the adjoining terrestrial areas are protected in Naikoon Provincial Park, Rose Spit Ecological Reserve, and Tow Hill Ecological Reserve; the boundary of Naikoon Provincial Park extends up to 200 m beyond the high tide line into the waters of Dixon Entrance and Hecate Strait; Rose Spit Ecological Reserve is limited to the terrestrial area while Tow Hill Ecological Reserve extends into the nearshore area of McIntyre Bay (BC Parks 2016). Waterfowl hunting is permitted within Naikoon Provincial Park but not in the ecological reserves.

The northern portion of this habitat site overlaps with the McIntyre Beach and Rose Spit Important Bird Area (IBA) and the southern portion overlaps with the Lawn Point IBA. Designation as an IBA does not confer legal protection of a site (IBA Canada 2016). McIntyre Bay and Dogfish Banks have been identified by the Department of Fisheries and Oceans as Ecologically and Biologically Sensitive Areas (EBSAs), in part because of their importance to birds, including seabirds, geese, and ducks. EBSAs do not have special legal status but identification is intended to guide management decisions (Clarke and Jamieson 2006).

This site falls within the area claimed as territory by the Haida Nation, which has never ceded rights, title, ownership, or jurisdiction over Haida Gwaii. The site is also included in the Pacific North Coast Integrated Management Area (PNCIMA), which is subject to a governance agreement between the governments of Canada, British Columbia, and First Nations (PNCIMA Initiative 2018). In British Columbia, the province owns most of the foreshore (i.e., intertidal zone) as well as coastal waters (both submerged land and the water column above it), including Dixon Entrance and Hecate Strait, but provincial legislation does not provide at-sea protection of marine birds (Harfenist et al. 2002). The Canadian federal government has jurisdiction over offshore waters (from the low water mark outwards) and over the regulation of migratory bird management, fisheries, shipping, and navigation in all marine waters.

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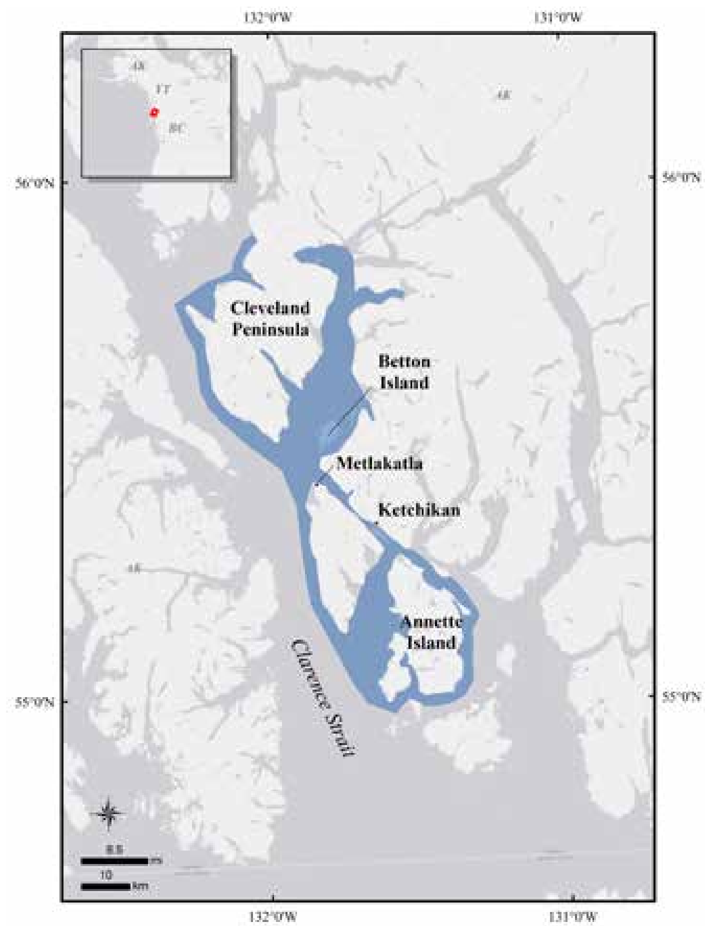
Alaska Key Sites

Figure 4. Key habitat sites for sea ducks in Alaska.

Key Site 4: Annette-Betton-Cleveland Islands, Alaska



Location: 55°27'24"N, 131°54'16"W

Size: 1288 km^2

Description: This key habitat site is located just north of the border between British Columbia and Alaska, at the southern extent of the Alexander Archipelago, north of Dixon Entrance, and is within the Inside Passage, about 100 km from open Pacific Ocean. It includes most of the shoreline of Annette Island, west Behm Canal (particularly Betton Island and Helm Bay), and Vixen Inlet on the north side of Cleveland Peninsula. It is bordered on the north by Ernest Sound, to the west by Clarence Strait, and to the south and east by Felice Strait and Revillagigedo Channel. The communities of Ketchikan (population ~14,000) and Metlakatla (population ~1,400) border this key habitat site.

This area is one of the wettest regions in Southeast Alaska, with average annual precipitation of 386 cm and generally mild temperatures ranging from a mean of 1°C in January to 14°C in July (Carstenson et al. 2007). The region is characterized by convoluted shorelines, with numerous islands, bays, inlets, and channels (Heinl and Piston 2009). The surrounding land is hilly and mountainous, with a relatively high proportion of intact old-growth coastal temperate rainforest (especially on the Cleveland Peninsula) and widespread wetlands (Smith 2016).

Precision and Correction of Abundance Estimates Presented: Estimates given from aerial survey data have had no correction factors applied.

Biological Value: This area provides important spring migration stopover habitat for Surf Scoters (*Melanitta perspicillata*) on the Pacific coast (Lok et al. 2011, 2012; Heinl and Piston 2009). During late April to early May, Pacific herring (*Clupea pallasi*) spawn in this region, providing an abundant, rich food source at which Surf Scoters and other sea duck species are known to congregate (Heinl and Piston 2009). Flocks of over 10,000 Surf Scoters have been observed, along with smaller numbers of Harlequin Ducks (*Histrionicus histrionicus*) and Barrow's Goldeneye (*Bucephala islandica*) (Heinl and Piston 2009). Aerial surveys in late April 2006 documented 77,860 Surf Scoters on a 540 km survey route in this region (Lok et al. 2012). Almost all (98%) Surf Scoters were located within 1 km of a herring spawn site, and the density of scoters at spawn sites was 1938 scoters per linear kilometer (Lok et al. 2012). Although these aerial survey data were from a single year, locations from satellite-tagged Surf Scoters marked on wintering areas in 2002 to 2006 also identified important stopover sites at Annette Island, west Behm Canal, and Vixen Inlet (Lok et al. 2011, 2012). Of 37 individual satellite-tagged Surf Scoters that made spring migratory stopovers in southeast Alaska, eight used Annette Island, four used west Behm Canal, and three used Vixen Inlet; Annette Island was used as a stopover site in all four years of the study, and west Behm Canal and Vixen Inlet were each used in two of the four years (Lok et al. 2011). These areas were more likely to be used for short stopovers (two to seven days) rather than for longer staging (greater than seven days) during spring migration (Lok et al. 2011). Annette Island, west Behm Canal, and Vixen Inlet are well-documented herring spawn sites (Lok et al. 2011). In late April and early May, there may be nearly constant migration of Surf Scoters northwards through Tongass Narrows, with flocks of 50 to several hundred flying through (Heinl and Piston 2009).

Several sea duck species are found in this area throughout the winter as well; Surf Scoters are the most abundant, but White-winged Scoters (*Melanitta deglandi*), Bufflehead (*Bucephala albeola*), Common (*B. clangula*) and Barrow's goldeneyes, Long-tailed Ducks (*Clangula hyem*alis), and Common Mergansers (*Mergus merganser*) are also common (Heinl and Piston 2009). Abundance of Surf Scoters begins to increase in late March and peaks in late April to early May (Heinl and Piston 2009). White-winged Scoters are common during winter, but numbers decline through April and May, and, unlike Surf Scoters, they do not congregate in large numbers at herring spawn sites in this area (Heinl and Piston 2009). Barrow's Goldeneye have been observed in flocks of up to 100 during winter and 500 at herring spawn sites (Heinl and Piston 2009). Long-tailed Ducks and Common Mergansers are abundant during winter with around 1000 of each species observed in the Ketchikan vicinity (Heinl and Piston 2009). Creeks provide important habitat for Common Mergansers and protected nearshore waters are important for Barrow's Goldeneye and Common Merganser (Heinl and Piston 2009).

Sensitivities: The value of this key habitat site as a spring migratory stopover is likely due in large part to the predictable occurrence of herring spawn events. Pacific herring abundance has declined throughout many parts of its range, and the location and size of spawn sites may change over time, impacting the value of this rich but ephemeral food source. Additionally, the very large and dense aggregations of Surf Scoters at herring spawn sites in this area could be vulnerable to disturbance and to stochastic events such as oil spills.

Potential Conflicts: This key site lies within the Alaska portion of the Inside Passage waterway and consequently experiences frequent marine traffic, including ferries, freighters, cruise ships, tugs, fishing boats, and recreational craft, which could disturb sea ducks and contribute to the potential for oil spills or chronic contamination. The communities of Ketchikan and Metlakatla are located within this site.

Status: This site falls within the Revilla/Cleveland biogeographic province, in which 23% of the land is congressionally protected in Land Use Designation II areas (Misty Fiords Wilderness, Naha River, and Anan Creek); 35% is protected under the Tongass Land Management Plan and 42% is available for development (Carstensen et al. 2007). Annette Island is under jurisdiction of the Annette Island Indian Reservation, the only remaining Indian reservation in Alaska (Carstenson et al. 2007, Metlakatla Indian Community 2017). Metlakatla Indian Community has exclusive commercial and subsistence fishing rights to the waterways of the Annette Islands Reserve, extending to 3000 feet from mean low tide (Metlakatla Indian Community 2017). The State of Alaska has jurisdiction over tidelands (between mean high water and mean low water) and submerged lands (from mean low water to the three-nautical-mile line) with the authority to manage, develop, and lease resources. However, the federal government regulates commerce, navigation, power generation, national defense, and international affairs throughout state waters.

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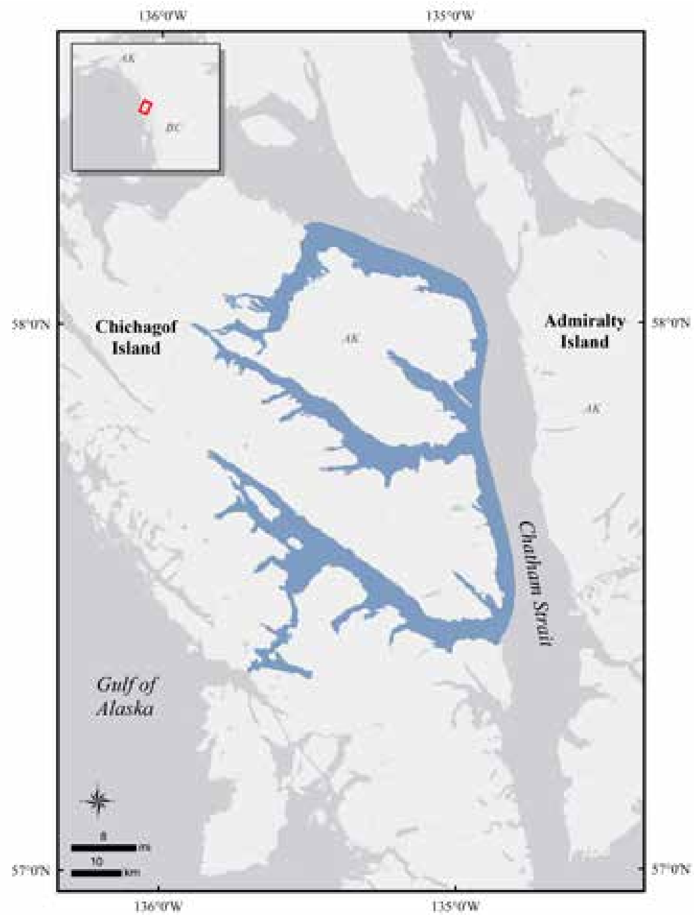
Key Site 5: Eastern Chichagof Island, Alaska

Location: 57°46'10"N, 135°15'12"W

Size: 1247 km^2

Description: Chichagof Island is one of the largest islands of the Alexander Archipelago in Southeast Alaska. This archipelago is comprised of more than 1000 islands and is characterized by deep channels and fjords. Surrounding terrestrial areas are mostly mountainous, reaching elevations of almost 1200 m on Chichagof Island (Carstensen et al. 2007). Steep-sided valleys and extensive estuaries punctuate the landscape, and temperate rainforests are the dominant vegetation type. Temperatures are moderated by the Pacific Ocean, producing cool summers, mild winters, and high levels of precipitation. Coastal waters are generally ice-free but areas with significant freshwater input (e.g., heads of bays and inlets) occasionally freeze.

This key habitat site is bounded on the north by southeastern Icy Strait, on the east by Chatham Strait (separating Chichagof and Admiralty islands), and on the south by Baranof Island. The convoluted coastline includes Port Frederick, Freshwater Bay, Tenakee Inlet, Sitkoh Bay, and Hoonah Sound, as well as numerous smaller bays, channels, inlets, islands, and reefs. The communities of Hoonah and Tenakee Springs are located within this key site.



Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have been adjusted to account for incomplete detection by applying species-specific visibility correction factors (VCF) estimated for surveys specific to this area (Hodges et al. 2008).

Biological Value: The near-shore waters of East Chichagof Island provide wintering habitat for a variety of sea duck species, most notably approximately 12,000 Barrow's Goldeneyes (*Bucephala islandica*) (Hodges et al. 2008), representing almost 5% of the western North America population. This area also supports thousands of Harlequin Ducks (*Histrionicus histrionicus*), Surf Scoters (*Melanitta perspicillata*), Bufflehead (*B. albeola*), and Red-breasted (*Mergus serrator*) and Common mergansers (*Mergus merganser*), as well as hundreds of White-winged Scoters (*Melanitta deglandi*) and Common Goldeneyes (*B. clangula*) (Hodges et al. 2008, D. Groves, USFWS unpublished data; Appendix 1). Within this site, particularly high densities of wintering sea ducks were observed in upper Port Frederick, near Tenakee Springs, Sitkoh Bay, Catherine Island, Otstoia Island, and Vixen Islands (Gunn et al. 2008). During winter, several sea duck species tend to choose sheltered locations close to large freshwater streams (Gunn 2009).

Some species, such as Harlequin Ducks and Common Mergansers, may also breed and molt in this area, while scoters likely molt here as well. Densities of sea ducks in this region are lower during the summer, but may still reach 10 to 50 ducks per square kilometer in some areas (Gunn et al. 2008).

Sensitivities: Sea ducks wintering at the northern periphery of their range may experience lower over-winter survival; Uher-Koch et al. (2016) found that female and immature Surf Scoters had lower survival rates in Southeast Alaska than in the southern part of their range and suggested poor body condition and/or increased predation rates as contributing factors.

Potential Conflicts: Chatham, Peril, and Icy straits are major elements of the Alaska portion of the Inside Passage waterway and consequently have frequent marine traffic, including ferries, freighters, cruise ships, tugs, fishing boats, and recreational craft, which could disturb wintering sea ducks. There is also the potential for oil spills or chronic contamination.

Status: Most of the terrestrial area surrounding this key habitat site falls within the East Chichagof Island biogeographic province. In this region, 53% of the land area is available for development, 25% is congressionally protected Roadless Wildlands (Land Use Designation II), 6% is congressionally designated wilderness, and 16% is administratively protected by the U.S. Forest Service (Carstensen et al. 2007). The State of Alaska has jurisdiction over tidelands (between mean high water and mean low water) and submerged lands (from mean low water to the three-nautical-mile line), with the authority to manage, develop, and lease resources. However, the federal government regulates commerce, navigation, power generation, national defense, and international affairs throughout state waters.

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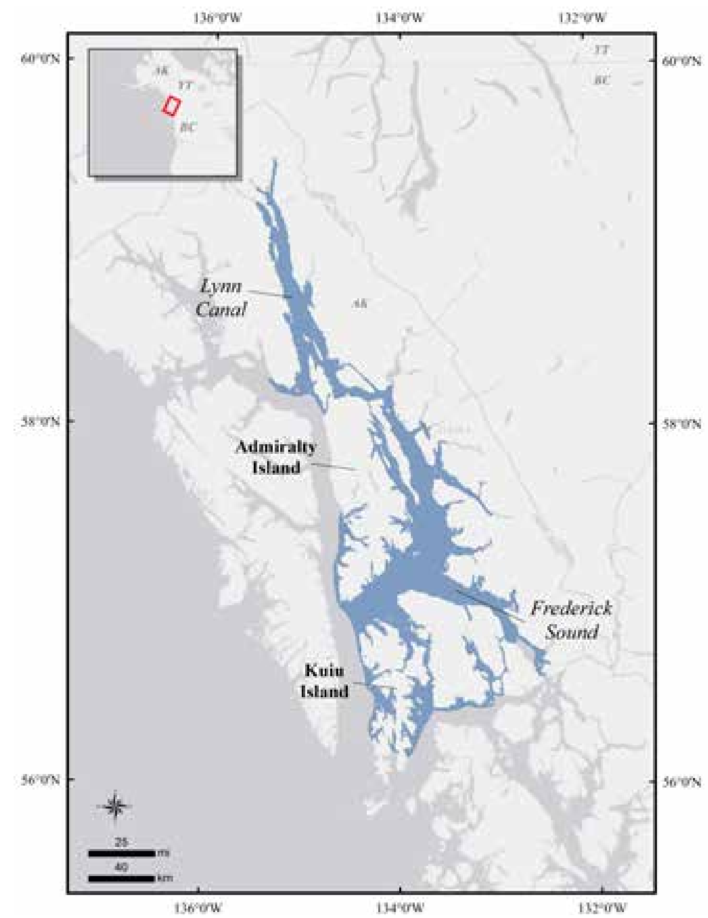
Uher-Koch, B. D., D. Esler, S. A. Iverson, D. H. Ward, W. S. Boyd, M. Kirk, T. L. Lewis, C. S. VanStratt, K. M. Brodhead, J. W. Hupp, and J. A. Schmutz. 2016. Interacting effects of latitude, mass, age, and sex on winter survival of Surf Scoters (*Melanitta perspicillata*): Implications for differential migration. Canadian Journal of Zoology 94:233–41.

Key Site 6: Lynn Canal–Frederick Sound, Alaska

Location: 57°52'59"N, 133°53'45"W

Size: 8933 km²



Description: This site extends nearly 400 km from north to south, encompassing much of the coastline of Southeast Alaska. It includes most of the Alexander Archipelago (Admiralty, Kuiu, Kupreanof, Mitkof, and many smaller islands) and the mainland coast from the head of Lynn Canal to the Stikine River Delta. This region is characterized by fjords, high mountains, numerous glaciers, productive estuaries, and complex rocky shorelines. Chichagof and Baranof islands provide protection from the open waters of the Gulf of Alaska, but the proximity of the Pacific Ocean contributes to a moderate maritime climate, with sea and air temperatures relatively cool in summer and warm in winter. The complex topography results in variable precipitation levels, with annual rainfall ranging from <100 cm to >500 cm, depending on location (Carstensen et al. 2007). The low-elevation coastal temperate rainforest is dominated by Sitka Spruce and Western Hemlock. Coastal waters generally remain ice-free, but areas with significant freshwater input (e.g., heads of bays and inlets) occasionally freeze, and some mainland fjords contain large quantities of ice calved from tidewater glaciers.

Lynn Canal, with depths of >600 m, is one of the deepest and longest fjords in the world. In addition to its steep rocky coasts, the area includes estuaries and a variety of soft-bottom shorelines. The mainland coast of Stephens Passage is mountainous, with narrow inlets and glacial rivers in Port Snettisham and Tracy and Endicott arms. Southern Frederick Sound separates Kupreanof and Mitkof islands from the mainland coast and borders the northern portion of the Stikine River Delta. Duncan Canal is a narrow waterway that almost bisects Kupreanof Island, and Keku Strait is a convoluted channel separating Kupreanof and Kuiu islands.

Communities within the region include the state capital of Juneau (population >30,000), Haines, Skagway, Kake, Petersburg, and Angoon.

Precision and Correction of Abundance Estimates Presented: Abundance estimates from Hodges et al. (2008) have been adjusted to account for incomplete detection by applying species-specific visibility correction factors estimated for surveys specific to this area. Scoters (*Melanitta* spp.), goldeneyes (*Bucephala* spp.) and mergansers (*Mergus* spp.) were not identified to species during aerial surveys; species composition ratios were based on boat surveys in the same areas.

Biological Value: The Lynn Canal–Frederick Sound region is important wintering habitat for several species of sea ducks, while during spring and summermore localized concentrations of sea ducks occur. Of particular importance during spring staging, the Lynn Canal area extends from Chilkat, Chilkoot, and Taiya inlets down the eastern side of Lynn Canal, including Berners Bay, Gastineau Channel, northern Stephens Passage, and Seymour Canal. Within this large region, areas vary in importance depending on season and species (Appendix 1, Appendix 2, Appendix 3).

Winter: Lynn Canal to Frederick Sound. Based on surveys during February–March, this region supports almost 170,000 sea ducks at a density of >20 ducks per km^2 (Hodges et al. 2008). Estimated counts are 44,000 Barrow's Goldeneyes (*Bucephala islandica*) (~18% of the western population), 30,000 Harlequin Ducks (*Histrionicus histrionicus*) (~12% of the western population), 26,000 Surf Scoters (*M. perspicillata*), 23,000 Buffleheads (*Bucephala albeola*), 20,000 White-winged Scoters (*M. deglandi*) (~5% of the continental population), 11,000 Long-tailed Ducks (*Clangula hyemalis*), 6800 Red-breasted Mergansers (*M. serrator*), and 4800 Common Mergansers (*M. merganser*) (Hodges et al. 2008, D. Groves, USFWS unpublished data). Mergansers, Bufflehead, goldeneyes, and scoters tend to be found in less exposed areas (Gunn 2008). Mergansers, Bufflehead, and goldeneyes are usually closer to large streams whereas scoters, Bufflehead, and Harlequin Duck are found in areas with more small islets (Gunn 2008).

Spring staging: Lynn Canal. During the spring staging period, Lynn Canal is used by about 25% of the continental population of Surf Scoters (Appendix 1 and Appendix 3). Aerial surveys in May 2006 counted >170,000 Surf Scoters (no visibility correction factors applied) along about 850 km of shoreline near Juneau and Haines, at densities of about 300 per km^2 (Lok et al. 2012). Many of the Surf Scoters using Southeast Alaska in spring congregate at herring spawn sites, which provide an important seasonal food resource (Lok et al. 2011, 2012). Herring runs were formerly widespread throughout Lynn Canal but now mainly occur in Berners Bay (Lok et al. 2011). Berners Bay is one of the most productive watersheds in Lynn Canal, partially due to spawning aggregations of herring and eulachon (Carstensen et al. 2007). The Lynn Canal area, and Taiya Inlet in particular, serve as a final coastal staging area for Surf Scoters before they migrate to inland breeding areas in the boreal forest (Appendix 3; De La Cruz et al. 2009, Lok et al. 2012). Abundance of Surf Scoters likely peaks in early to mid-May, with most individuals departing to inland breeding areas by the end of May (De La Cruz et al. 2009, Lok et al. 2012). This area is likely used by other sea duck species as well, but spring survey data are not available.

Summer/molt: Lynn Canal to Frederick Sound. During the summer/molting period, Surf and White-winged scoters and Harlequin Ducks are particularly abundant in Southeast Alaska, with Common and Red-breasted mergansers present as well. Scoters and Harlequin Ducks generally migrate from inland breeding areas to the coast before undergoing annual feather molt and may remain in this area throughout the winter or move to more southern coastal wintering areas. While the flightless period of wing molt lasts around one month for individuals, intraspecific timing is quite variable, and molting Surf and White-winged scoters can be found in Southeast Alaska from late June to late October (Dickson et al. 2012). Early in the summer, subadults of both sexes and adult males outnumber adult females; the frequency of adult females increases in the late summer/fall (Dickson et al. 2012). Numbers of White-winged Scoters also increase during the molt period (R. Dickson unpublished data).

Surveys during late July and early August indicated there were >70,000 Surf Scoters, >9000 White-winged Scoters, almost 9000 Harlequin Ducks, 2000 Red-breasted Mergansers, and 1500 Common Mergansers in the Lynn Canal/Stephens Passage/Admiralty Island area (Appendix 2; Hodges et al. 2008, D. Groves, USFWS unpublished data). Particularly high densities of sea ducks have been recorded along the north shore of Admiralty Island, the east side of the Glass Peninsula, Seymour Canal, Holkham Bay, and Tracy and Endicott arms (Gunn et al. 2008). In Keku Strait/Duncan Canal there were >14,000 Surf Scoters, almost 2000 White-winged Scoters, 4000 Harlequin Ducks, and several hundred Red-breasted and Common mergansers during summer (Hodges et al. 2008, D. Groves, USFWS unpublished data). The head of Duncan Canal and northern Keku Strait had the highest densities, with Harlequin Ducks especially abundant in northern Keku Strait (Gunn et al. 2008, Hodges et al. 2008). The mainland coast of Frederick Sound, from Port Houghton to the Stikine River Delta, provides summer/molting habitat for >14,000 Surf Scoters, 1800 White-winged Scoters, >3000 Harlequin Ducks, and several hundred Red-breasted and Common mergansers (Hodges et al. 2008, D. Groves, USFWS unpublished data). Hotspots within this area include Point Vandeput at the mouth of Thomas Bay, the northern side of the Stikine Delta, and around Petersburg, with mergansers more abundant near the Stikine Delta and Harlequin Ducks more concentrated in the northern half of this area (Gunn et al. 2008, Hodges et al. 2008).

Sensitivities: Sea ducks wintering at the northern periphery of their range may experience lower over-winter survival; Uher-Koch et al. (2016) found that female and immature Surf Scoters had lower survival rates in Southeast Alaska than in the southern part of their range and suggested poor body condition and/or increased predation rates as contributing factors. During spring staging, sea ducks may be concentrated in very large flocks (tens of thousands), thus significant numbers could be negatively affected by localized threats. During the summer molting period, sea ducks are incapable of flight and particularly sensitive to disturbance but cannot easily relocate in response to negative pressures.

Potential conflicts: Frederick Sound, Stephens Passage, and Lynn Canal are major elements of the Alaska portion of the Inside Passage waterway and consequently have frequent marine traffic, including ferries, freighters, cruise ships, tugs, fishing boats, and recreational craft, which could disturb sea ducks. The communities of Juneau, Haines, Skagway, Kake, Petersburg, and Angoon are located in this area. Cruise ship itineraries often include travel to Juneau, Skagway, and Tracy and Endicott arms. Mining activity in the area has diminished and less freight is now being shipped through Lynn Canal. There are concerns about the re-opening of a gold mine on the north side of Berners Bay and possibly other areas. The Greens Creek Mine near Hawk Inlet on Admiralty Island is the largest silver mine in the U.S.; recent approval of expanded tailings storage has raised concerns regarding discharge of contaminants such as cadmium, copper, mercury, and lead (Audubon Alaska 2016). Throughout the Lynn Canal–Frederick Sound area there is the potential for oil spills or chronic contamination.

Status: Extent of protected areas varies widely throughout this region. In the Lynn Canal area, only 2% of land is legislatively protected and 10% is administratively protected in the Chilkat River Complex biogeographic province, whereas 90% of Admiralty Island is legislatively protected within the Admiralty Island National Monument and Kootznoowoo Wilderness with only 4% in development status (Audubon Alaska 2016). Protected areas within or partially overlapping this region include the Alaska Chilkat Bald Eagle Preserve, Klondike Gold Rush National Park (at head of Taiya Inlet), Tracy Arm–Fords Terror Wilderness, Chuck River Wilderness, Stikine–LeConte Wilderness, Petersburg Creek–Duncan Salt Chuck Wilderness, Tebenkof Bay Wilderness, and Kuiu Island Wilderness (Audubon Alaska 2016).

Several Important Bird Areas including Berners Bay, Mendenhall Wetlands, Stephens Passage, Frederick Sound to Duncan Canal, Stikine River Delta, Sumner Strait, Outside Islands Marine, and Tebenkof Bay are within or overlap Lynn Canal–Frederick Sound (Audubon Alaska 2016). Designation as an Important Bird Area does not imply any protected status but does emphasize the importance of this area to waterfowl and other marine birds.

The State of Alaska has jurisdiction over tidelands (between mean high water and mean low water) and submerged lands (from mean low water to the three-nautical-mile line), with the authority to manage, develop, and lease resources. However, the federal government regulates commerce, navigation, power generation, national defense, and international affairs throughout state waters.

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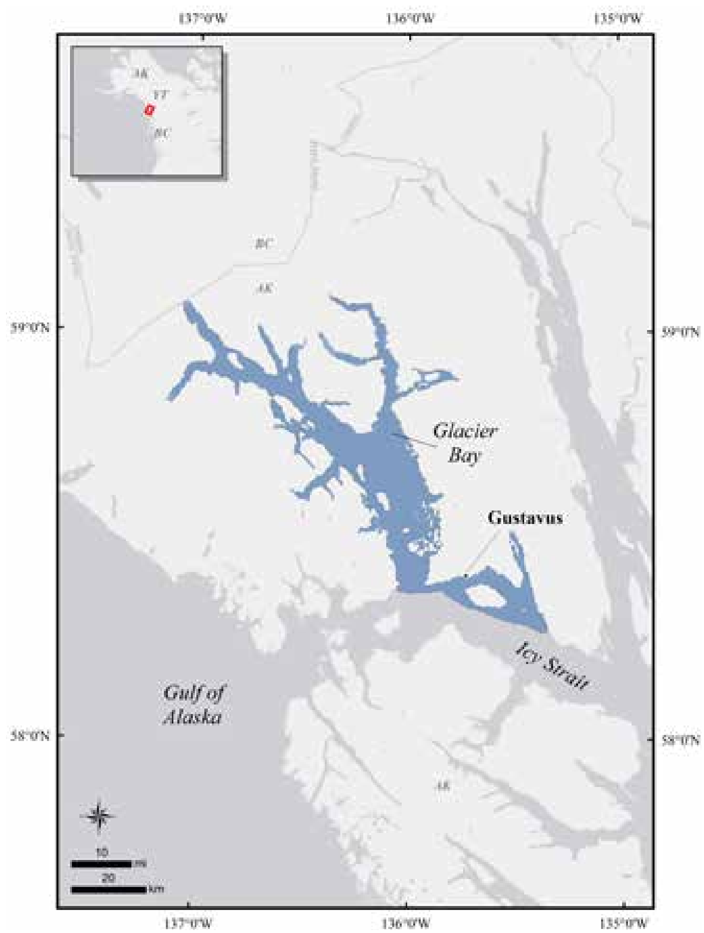
Surf Scoters. Photo: Tim Bowman.

Key Site 7: Glacier Bay, Alaska

Location: 58°40'28"N, 136°6'30"W

Size: 1588 km²

Description: Glacier Bay is a complex fjord system, connected to the Gulf of Alaska by the waters of Icy Strait and Cross Sound. Most of the key habitat site falls within Glacier Bay National Park and Preserve and includes Glacier Bay (to the heads of the East and West arms) and the northeastern part of Icy Strait, around Gustavus, Pleasant Island, and Porpoise Islands, extending up into Excursion Inlet east of Gustavus. About 27% of Glacier Bay National Park is covered by glaciers, including seven active tidewater glaciers, but the area is undergoing recent and very rapid deglaciation (National Park Service 2016). The region has a wet and moderate maritime climate with about 175 to 200 cm of rain annually (Audubon Alaska 2016a). Freshwater input from glacier and snowfield melt as well as precipitation runoff combined with strong tidal mixing contributes to high levels of productivity in Glacier Bay (Etherington et al. 2007).



Precision and Correction of Abundance Estimates Presented: Abundance estimates based on data from Hodges et al. (2008) have been adjusted to account for incomplete detection by applying species-specific visibility correction factors (VCFs) estimated for aerial surveys specific to this area (Appendix 1).

Biological Value: The waters of Glacier Bay regularly support at least 10 species of sea ducks, some in great abundance (Nadeau et al. 2017). Sea ducks accounted for about half of all marine birds surveyed during summer and winter (Robards et al. 2003). During winter (mid-February to mid-March), there were estimated to be >14,000 Barrow's Goldeneyes (*Bucephala islandica*) (>5% of the western population), >3,000 Surf Scoters (*Melanitta perspicillata*), >2,000 White-winged Scoters (*M. deglandi*), >1,500 Bufflehead (*B. albeola*), and lesser numbers of Harlequin Ducks (*Histrionicus histrionicus*), Long-tailed Ducks (*Clangula hyemalis*), Common Goldeneyes (*B. clangula*), and Red-breasted (*Mergus serrator*) and Common mergansers (*M. merganser*) (Hodges et al. 2008, D. Groves, USFWS unpublished data; Appendix 1). In the summer molting period (late July to early August), nearly 49,000 Surf Scoters (~7% of the continental population), >6,000 White-winged Scoters, >6,000 Harlequin Ducks, >3,000 Red-breasted Mergansers, and >2,000 Common Mergansers used this site (Hodges et al. 2008, D. Groves, USFWS unpublished data). Although Drew et al. (2008) did not apply VCFs to their boat-based survey data, they reported much higher densities of sea ducks in Glacier Bay than did Hodges et al. (2008). Differences in survey and analysis methodologies make comparisons difficult, but sea ducks may be even more abundant in this area than indicated by Hodges et al. (2008). Additionally, some surveys have found that during summer White-winged Scoters were up to three times more abundant than Surf Scoters, so there may be high variability across seasons and years (Nadeau et al. 2017). Barrow's Goldeneyes were found throughout Glacier Bay but consistently used the same areas over a five-year period. Harlequin Ducks were mostly in the upper Bay during summer and shifted south in winter. Common Mergansers were particularly numerous in the Beardslee Islands, Berg Bay, and Adams Inlet, and Surf and White-winged scoters were more frequent in the northern Bay, especially Muir Inlet and West Arm (Robards et al. 2003, Drew et al. 2008). Numbers of Long-tailed Ducks may fluctuate significantly between years (Drew et al. 2008, National Park Service 2016).

High and sustained primary productivity (phytoplankton, seaweed, and kelp) supports sustained zooplankton abundance from spring through fall (Robards et al. 2003, Etherington et al. 2007), as well as large numbers of forage fish, benthic invertebrates, waterbirds, and marine mammals (Drew et al. 2008).

Sensitivities: Large aggregations of molting sea ducks may be particularly sensitive to disturbance. Mortality rates may be higher during winter, especially for female and immature sea ducks wintering near the northern extent of their range (Uher-Koch et al. 2016).

Potential Conflicts: Glacier Bay National Park receives about 350,000 visitors each year, mostly on cruise ships and tour boats (Etherington et al. 2007, National Park Service 2016). The majority of these visitors arrive during June through August (Nadeau et al. 2017), when the bay is also used by tens of thousands of molting sea ducks, which are sensitive to disturbance by vessels large and small, including kayaks. In addition to disturbance, vessel traffic also increases the risk of exposure to petroleum pollution and other contaminants (Nadeau et al. 2017). The community of Gustavus is located within this site.

Sea otter abundance has increased dramatically in Glacier Bay since the mid-1990s, and their foraging activity may reduce the availability of important sea duck prey species (e.g., clams, mussels) as well as impacting the structure and function of nearshore ecosystems (Nadeau et al. 2017).

Status: The majority of this Key Habitat site is encompassed by Glacier Bay National Park, which was established as a national monument in 1925 and expanded and given national park status in 1980. It has also been designated as part of a World Biosphere Reserve and World Heritage Site. About 80% of the park is designated Wilderness and access to some areas is restricted or prohibited to protect wildlife (National Park Service 2016). From June 1 to August 31, permits are required for vessels entering the park, and there are daily quotas on the number of vessels allowed (National Park Service 2016). There were important commercial fish and crab harvests in Glacier Bay, but these are now restricted or prohibited. However, these activities continue to be permitted within the Key Habitat site east of the park. There is a lot of overlap between this Key Habitat site and the Glacier Bay and Icy Strait Important Bird Area, although that IBA also covers large areas of Icy Strait, Cross Sound, and the Gulf of Alaska coastline (Audubon Alaska 2016b). Within Glacier Bay, marine waters are protected within the national park, but in the area to the east of the park the State of Alaska has jurisdiction over tidelands (between mean high water and mean low water) and submerged lands (from mean low water to the three nautical mile line), with the authority to manage, develop, and lease resources. However, the federal government regulates commerce, navigation, power generation, national defense, and international affairs throughout state waters.

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White-winged Scoter and Long-tailed Ducks. Photo: Tim Bowman.

Key Site 8: Lost Coast, Alaska

Location: 59°46'19"N, 141°2'34"W

Size: 4879 km^2

Description: This site extends for about 200 km along the coast of the Gulf of Alaska, from the Kaliakh River to the Situk River, and includes the outer portions of Icy Bay and Yakutat Bay and the south end of Russell Fiord. Most of this shoreline is highly exposed, with large beaches, sand dunes, grasslands, and lagoons, while Icy Bay and Yakutat Bay offer the only protected waters in the region. This remote and isolated region is separated from the rest of the continent by high coastal mountains and some of the largest nonpolar glaciers and snowfields in the world. The structure of the coastline is highly influenced by activity of dynamic coastal glaciers that dominate the landscape: Icy Bay was formed by rapid glacial retreat in the past century, and large, ever-changing shoal areas are created by glacial run-off and deposits (Hood et al. 2006). The Hubbard Glacier occasionally creates an ice dam across the mouth of Russell Fiord (most recently in 1986 and 2002); if this dam becomes permanent, the fiord would be transformed into a lake, likely negatively affecting its value as sea duck habitat. From Kaliakh River to Cape Yakataga, the land is relatively flat and forested, with rugged mountains rising to the south and east. Forests are dominated by Sitka Spruce and Western Hemlock, interspersed with willow, alder, and cottonwood stands and muskeg meadows.

The proximity of the Pacific Ocean creates a cool, wet maritime climate, with a mean annual temperature of ~4°C (Hood et al. 2006). Annual rainfall exceeds 300 cm (Patten 1981). Frequent and intense winter storms can cause dunes and river channels to shift dramatically (Patten 1981). Most of the human population of this region is concentrated in the community of Yakutat, with a population of ~800 (Hood et al. 2006).

Precision and Correction of Abundance Estimates Presented: Abundance estimates from Hodges 2011 have been adjusted to account for incomplete detection by applying species-specific visibility correction factors based on boat-to-air ratios calculated from similar surveys in southeast Alaska (Hodges et al. 2008) and the estimates were expanded based on transect area relative to total survey area.

Biological Value: The bays and exposed shorelines of Alaska's Lost Coast support about 150,000 to 200,000 wintering sea ducks. White-winged Scoters (*Melanitta deglandi*) were the most numerous, with an estimated 55,000 to 70,000 present (13.75 to 17.5% of the continental population), as well as 30,000 to 39,000 Long-tailed Ducks (*Clangula hyemalis*) (3 to 4% of the continental population), 17,000 to 22,000 Pacific Black Scoters (*M. americana*) (8.5 to 11% of the Pacific population), and 13,000 to 17,000 mergansers (Red-breasted and Common; *Mergus serrator* and *M. merganser*) (Hodges 2011). There were also 24,000 to 28,000 unidentified scoters and 7000 to 9200 Surf Scoters (*M. perspicillata*) as well as several thousand Harlequin Ducks (*Histrionicus histrionicus*), Barrow's Goldeneye (*Bucephala islandica*) and Bufflehead (*B. albeola*), and a few hundred Common Goldeneye (*B. clangula*) (Hodges 2011). White-winged Scoters were observed up to the extent of the survey transects at 5.6 km offshore, and it is possible that significant numbers would be found farther offshore as well (Hodges 2011). Other species, such as Black Scoters and mergansers, were mostly observed within 300 m of the shoreline, with few present on offshore transects (Hodges 2011). In Yakutat Bay, large groups of scoters were observed at the north and south ends of Khaantak Island and from Point Latouche to Knight Island (Patten 1981).

This region may also support significant numbers of sea ducks during other seasons, but few surveys have been conducted here. The Yakutat coastal zone is considered the most important area in Southeast Alaska for migrating birds, and tens of thousands of waterfowl use the lagoons, estuaries, and fiords during spring, molting, and fall migration (Patten 1981). Thousands of scoters and other sea ducks use Yakutat Bay during herring spawn in April. Sea ducks, including Harlequin Ducks, Long-tailed Ducks, and White-winged Scoter, were present in the Yakutat Bay region during June, with a density of 12.3 per km^2 observed for Harlequin Ducks (Stephensen and Andres 2001). About 3000 scoters (all three species) were observed near Sitkagi Bluffs in June 1980, 5000 scoters in Russell Fiord in July (Arneson 1976 in Patten 1981), and large groups of scoters and other diving ducks in the south end of Russell Fiord in late September (Patten 1981).

Sensitivities: Sea ducks wintering at the northern periphery of their range may experience lower over-winter survival; Uher-Koch et al. (2016) found that female and immature Surf Scoters had lower survival rates in Southeast Alaska than in the southern part of their range and suggested poor body condition and/or increased predation rates as contributing factors.

Potential Conflicts: This remote and isolated area has a very small human population, and the potential for conflict with sea duck habitat requirements is relatively low compared to other key sites. There are several offshore exploratory petroleum wells west and southwest of Icy Bay, and there is additional risk of petroleum spills from marine vessels, small aircraft, fuel storage facilities, ATVs, and historic drilling sites/storage areas (Hood et al. 2006). Some areas in Yakutat Bay were considered sensitive to oil and gas exploration and development due to large concentrations of birds (Patten 1981). The Gulf of Alaska is a major shipping route, and accidental petroleum release and wastewater discharge from vessels are of concern (Hood et al. 2006). Studies from Glacier Bay and Gulf of Alaska indicate a possible risk of increased mercury and persistent organic pollutants in the marine environment (Hood et al. 2006). Commercial and recreational fisheries are economically important, as well as subsistence hunting, trapping, and fishing. Subsistence hunting of Harlequin Ducks, Long-tailed Ducks, goldeneye, and other waterfowl occurs in Icy Bay, Yakutat Bay, and the Malaspina Forelands (Hood et al. 2006). Although mining in the coastal region is extremely limited (Hood et al. 2006), small-scale placer mining has occurred on sandy beaches and there is potential for offshore placer mining (Alaska DNR 1995). Recreation and tourism are limited, but kayaking, camping, hiking, flightseeing, and cruise ships are becoming more common in Icy and Yakutat bays (Hood et al. 2006).

Status: Much of the surrounding terrestrial area is protected within the Tongass National Forest, the Russell Fiord Wilderness, and Wrangell-St. Elias National Park and Preserve. The Kluane/Wrangell-St. Elias/Glacier Bay/Tatshenshini-Alsek region, which partially overlaps this site, has been designated a UNESCO World Heritage Site. The State of Alaska has jurisdiction over tidelands (between mean high water and mean low water) and submerged lands (from mean low water to the three-nautical-mile line), with the authority to manage, develop, and lease resources. However, the federal government regulates commerce, navigation, power generation, national defense, and international affairs throughout state waters.

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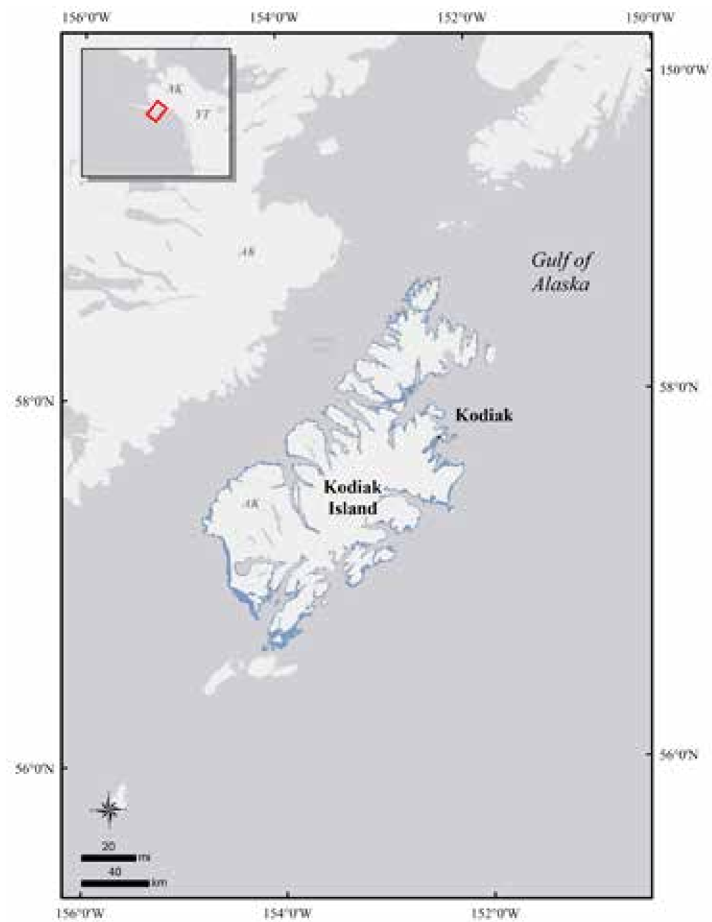
Long-tailed Ducks and scoters. Photo: Tim Bowman.

Key Site 9: Kodiak Archipelago, Alaska

Location: 57°43'3"N, 153°21'16"W

Size: 1883 km^2

Description: The Kodiak Archipelago is in the northwest Gulf of Alaska, in the North Pacific Ocean. The key site consists of nearshore areas around the perimeter of the archipelago's islands but is mostly confined to sea duck coastal habitats of depths less than 20 m. The area's rich marine ecosystem is influenced by a variety of oceanographic features, including the Alaska Coastal Current, the Alaska Stream, and large amounts of freshwater runoff into its bays and inlets. The Whale Pass and Afognak Strait area has tidal flows as high as 7.5 knots that produce large upwellings over an extensive shallow bottom, providing foraging areas for some wintering sea ducks. Large tidal ranges (up to 9 m) in most bays produce local productive upwelling areas and feeding habitats accessible to birds at low tides. Most of the inner bays, lagoons, and estuaries are relatively ice-free during winter. Steep mountains and convoluted shorelines provide waterfowl with shelter from high winds and rough seas even in the worst winter storms (Zwiefelhofer and Forsell 1989).



Precision and Correction of Abundance Estimates Presented: Estimates of sea duck abundance are based on winter boat strip transects using methods described by Gould and Forsell (1989) and shoreline aerial surveys of most of the area conducted in 1980 (Forsell and Gould 1981). The accuracy of sea duck counts is high because most sea ducks inhabit nearshore protected waters where detection of birds is high. Because Forsell and Gould (1981) did not estimate abundance for northern Afognak Island (about 20% of the water area), population estimates from 1980 were increased by 20% to represent the entire archipelago. Trends were derived from 28 years of boat surveys that sampled about 17% of Uyak and Uganik Bays, and Sitkalidak Strait, and abundance compared between 1980–1983 and 2004–2008.

Biological Value: Forsell and Gould (1981) estimated that more than 200,000 sea ducks of 14 species wintered in the archipelago. Appendix 1 lists the most abundant sea ducks as estimated in 1980, with 2008 populations estimated by adjusting the 1980 numbers by the percent change on long-term monitoring surveys of selected bays. More than 5% of the continental populations of Black Scoter (*Melanitta americana*), White-winged Scoter (*M. fusca*), Harlequin Duck (*Histrionicus histrionicus*), and Barrow's Goldeneye (*Bucephala islandica*) winter in the Kodak Archipelago. Long-tailed Ducks (*Clangula hyemalis*) were, and remain, the most abundant sea duck, although their numbers appear to have declined by about 50%. Other abundant species included Black Scoter and White-winged Scoter, whose numbers also appear to be declining but remain the third and fourth most abundant sea ducks. Steller's Eider (*Polysticta stelleri*) and King Eider (*Somateria spectabilis*) do not occur in high enough numbers in areas where boat surveys were conducted to determine a trend, but anecdotal evidence indicates that there are far fewer eiders now. Barrow's Goldeneye appear to have increased substantially and now are the second most-abundant sea duck. Bufflehead (*Bucephala albeola*), Surf Scoter (*M. perspicillata*), Harlequin Duck, Red-breasted

Merganser (*Mergus serrator*), and Common Merganser (*M. merganser*) are also increasing. In addition to wintering and migratory stopover habitats, the marine waters of the Kodiak Archipelago provide breeding and molting habitat for over 20,000 Harlequin Ducks, Barrow's Goldeneyes, and Red-breasted and Common Mergansers (Corcoran 2016). Kodiak Island is the southernmost wintering area for Steller's Eider in the U.S., where it is listed as a threatened species. Radio-telemetry of wintering birds indicated that most eiders subsequently flew to breeding areas in Russia (Rosenberg et al. 2014).

Sensitivities: Declining numbers of wintering Black Scoter and White-winged Scoter, along with Long-tailed Duck and Steller's Eider, may be due to climate change. Kodiak is located toward the middle or southern end of the winter ranges of Black Scoter and White-winged Scoter and the southern edge of Steller's Eider range. The waters to the north seldom freeze as they did 35 years ago. Increasing numbers of Bufflehead, Harlequin Duck, Barrow's Goldeneye, and Red-breasted and Common Merganser may be a result of changes in distribution due to climate change, the recovery of pollock and herring stocks, increased survival of breeding birds, and/or better management of illegal take and overharvest. Because of the unique 1980–2008 dataset and its northern location, Kodiak Archipelago should be considered as a monitoring site for measuring response of sea ducks and seabirds to climate change. No large-scale winter surveys of sea ducks have been conducted since 2008.

Potential Conflicts: Kodiak Island is within a major marine transportation corridor and has frequent ferries, freighters, and barges in the outer waters. Kodiak is home to more than 700 commercial fishing vessels, including large trawl, longline, and crab vessels, plus at least 16 land-based seafood processing plants (Kodiak Chamber of Commerce 2009). Within the bays, hundreds of fishing boats and recreational craft can disturb wintering sea ducks. In addition to disturbance and oil spills, some types of fishing present further threats to sea ducks from entanglement in both actively fished and derelict gillnets, crab pots, or trawl nets.

The Kodiak Archipelago has 32 sea duck hunting guides registered with the state and the highest sport sea duck harvest in Alaska (USFWS 1999). Mortality from hunting and poaching may have caused localized depletion of sea ducks, although the actual contribution of harvest to declines in sea duck populations has not been quantified.

Some waters and shoreline of the Kodiak Archipelago were oiled by the 1989 *Exxon Valdez* Oil Spill, and the potential exists for additional oil spills from sinking boats and chronic oil contamination. Offshore areas have been considered for oil and gas leasing in the past, but there was little industry interest in developing resources there.

Status: The terrestrial area falls within multiple agency and corporate jurisdictions, including four Federal (USCG, USFWS, BLM, and FAA), four state (ADFG, DNR, DOT, and the University of Alaska), 12 Alaska Native corporations, and seven municipalities. The state of Alaska has jurisdiction over submerged lands between mean high water and 5.6 km from shore, with the authority to manage, develop, and lease resources, except the tidal waters surrounding Afognak Island that are part of the Alaska Maritime National Wildlife Refuge.

The Kodiak Archipelago has five coastal and two marine IBAs (Audubon Alaska 2016). The importance of Kodiak as a wintering area for sea ducks may change as birds shift their winter ranges northward in response climate change.

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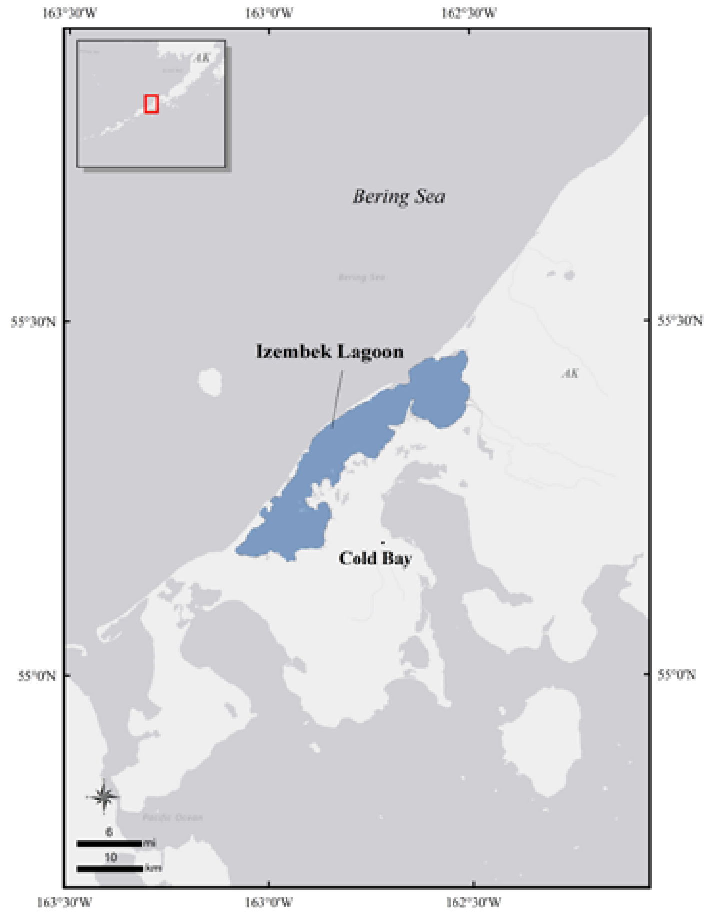
Barrow's Goldeneyes. Photo: Tim Bowman.

Key Site 10: Izembek Lagoon, Alaska

Location: 55°19'11"N, 162°50'36"W

Size: 322 km²

Description: Izembek Lagoon is a marine body of water located on the north side of the Alaska Peninsula near its western tip, about 10 km north of the city of Cold Bay, Alaska. Long, narrow, sparsely vegetated barrier islands form a shallow lagoon on the south side of the Bering Sea (Appendix 1). The lagoon contains extensive eelgrass beds that are exposed at low tide, along with sand and mudflats, with a few deeper channels connecting the lagoon to the Bering Sea. Izembek Lagoon contains the largest eelgrass beds in the world; about 60 to 70% of the lagoon is vegetated with eelgrass. The upland area surrounding the lagoon includes wet sedge meadows and upland tundra with numerous ponds and lakes.



Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on either single counts or an average of within-year repeated counts from aerial surveys of waterfowl *coducted from fall through* early spring *(*i.e., September to April; Wilson 2016, 2017a, 2017b, 2019, Dooley et al. 2016). This was intended to illustrate maximum value of the area to sea ducks during the fall-to-spring nonbreeding period. During those surveys, all birds observed are tallied but there is no estimate of detection rate or adjustment for counting error. Thus, counts are considered indices and are not adjusted for incomplete detection.

Biological Value: This site is an important molting and staging area for several species of waterfowl, including Steller's Eiders (*Polysticta stelleri*) that breed in Russia and northern Alaska. Steller's Eiders are present in this area from mid-August through April; wing molt occurs from August into October. Izembek is one of the few important molting sites for Steller's Eiders in Alaska, with about 2500 to 7000 birds seen during August/September surveys from 2012 to 2016 (Williams et al. 2016). Based on data from fall goose surveys (Wilson et al. 2017a), numbers of molting Steller's Eiders seem to be decreasing from estimates over the past two decades.

During January to March winter surveys, 6000 to 43,000 Steller's Eiders have been observed in the lagoon on a single day (Wilson et al. 2017b), although the total number of Steller's Eiders that pass through the area during fall and spring migration is undoubtedly much larger, perhaps 70,000 or more, and represents a significant proportion of the Pacific population.

In addition to Steller's Eiders, several thousand Black Scoters (*Melanitta americana*), Long-tailed Ducks (*Clangula hyemalis*), as well as smaller numbers of Red-breasted Mergansers (*Mergus serrator*) and Harlequin Ducks (*Histrionicus histrionicus*) inhabit this area during fall and winter. Izembek is along a major migration route for sea ducks wintering further west in the Aleutian Islands. The abundance of eelgrass throughout the lagoon makes this a particularly productive habitat for waterfowl.

Sensitivities: The barrier islands that separate the adjacent Bering Sea from the lagoon are subject to erosion, which may increase due to sea level rise, reduced ice coverage in the southern Bering Sea, and increased frequency of storm tides as a result of climate change. It is not known how this may affect the protected lagoon system, or benthic prey communities, upon which Steller's Eiders rely during much of the nonbreeding season. Eelgrass beds may be harmed by increases in sea level, and the marine invertebrate community could be impacted by increasing ocean temperatures and acidification.

Steller's Eiders that molt in this area are sensitive to disturbance from boaters, particularly when flightless. Although there is little motorboat use until fall-winter hunting season starts September 1, and flightless eiders are present into October. Steller's Eiders are identified as "vulnerable" by the International Union for Conservation of Nature (BirdLife International 2012). Greater than 90% of the Pacific population of Steller's Eiders molts and winters in Alaska. Alaska-breeding Steller's Eiders (a subset of the Pacific population) are listed as a threatened species in Alaska under the Endangered Species Act (ESA; USFWS 1997). Currently, Steller's Eiders are closed to harvest during both the fall-winter and spring-summer hunting seasons.

Potential Conflicts: Izembek Lagoon is remote and there is little human use of the area, with the exception of fishing in the waters outside the lagoon in the Bering Sea. Birds that molt in this area would be particularly vulnerable to oil spills because they cannot fly and leave the area.

The area of the Outer Continental Shelf currently designated by BOEM as the North Aleutian Basin Planning Area, including Bristol Bay, was withdrawn from federal offshore oil and gas leasing and development in 2014 for an indefinite period of time due to the area's importance to Alaska Native subsistence users, fish and wildlife species, and commercial and recreational fisheries. The withdrawn area includes Izembek Lagoon. A road through Izembek National Wildlife Refuge connecting the communities of King Cove and Cold Bay has been proposed, but plans are currently on hold. The existence of the road could increase hunting access and increase disturbance of Steller's eiders during molt and wintering periods.

Status: Izembek Lagoon comprises most of the Izembek Lagoon and Bechevin Bay Important Bird Area (IBA) and is considered an IBA of global importance (Audubon 2017) because of its importance to waterfowl and shorebirds. It is also designated as a wetland of international importance under the Ramsar Convention (Ramsar 2018). Izembek Lagoon is designated critical habitat for Steller's eiders under the ESA. The lagoon and intertidal habitats are managed by the State of Alaska as Izembek State Game Refuge, while the surrounding uplands are managed by the U.S. Fish and Wildlife Service as part of Izembek National Wildlife Refuge. Parts of the refuge are designated wilderness. There are a few small sections within this area that are considered "selected" under the Alaska Native Claims Settlement Act, but not yet conveyed, which means they are currently managed as refuge lands.

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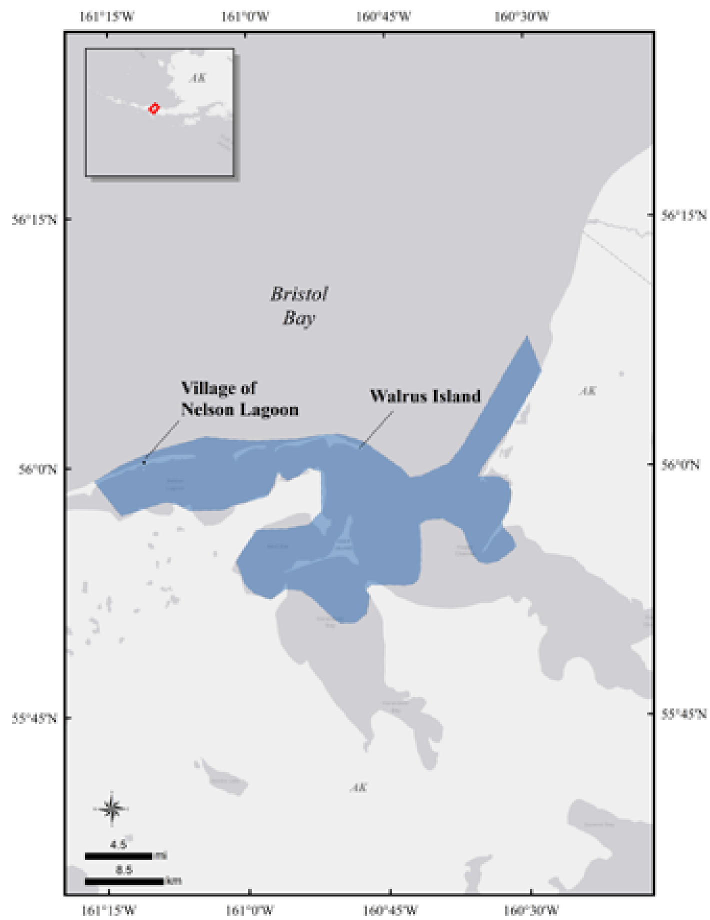
Key Site 11: Nelson Lagoon, Alaska

Location: 56°0'19"N, 160°47'55"W

Size: 525 km^2



Description: Nelson Lagoon lies 14 to 23 km east of the village of Nelson Lagoon (2016 summer pop. ~120) on the Alaska Peninsula. Nelson Lagoon is a shallow bay protected by a series of long, narrow, and partially vegetated barrier islands and often remains ice-free during winter. The area is at the southern potential extent of the sea ice in winter. The high biological productivity of the area is generated by the exchange of nutrients and physical dynamics between the Bering Sea and freshwater and terrestrial habitats. Tide ranges average 2.4 to 3 m.

Precision and Correction of Abundance Estimates Presented: Abundance estimates for Steller's Eiders (*Polysticta stelleri*) at Nelson Lagoon are based on aerial photographic surveys. For other species, abundance numbers have been adjusted to account for incomplete detection, either by applying species-specific visibility correction factors estimated from other similar areas and surveys, or based on expert and local knowledge.

Biological Value: Nelson Lagoon supports high concentrations of wintering, staging, and molting sea ducks, most notably Steller's Eider and Black Scoter (*Melanitta americana*) (Bowman et al. 2021) with lesser numbers (<1500 per species) of Pacific Common Eider (*Somateria mollissima v-nigra*), King Eider (*S. spectabilis*), and Surf Scoter (*M. perspicillata*). It has historically been used by Steller's Eiders for spring and fall staging, as well as fall molt. Nelson Lagoon is currently the primary molting area for Steller's Eiders in Alaska; 20,000 to 47,000 Steller's Eiders have been observed there in late August and early September 2012–2016 (Williams et al. 2016), possibly representing more than half of the Pacific population (Wetlands International 2006). Steller's Eiders are known to molt in this area from mid-August through early October (Williams et al. 2016). Within this key site, the most important molting sites are immediately south (inside) and adjacent to Walrus Island, which is part of the Kudobin Islands chain. Many Steller's Eiders and Black Scoters remain in this area throughout the fall and winter, and up to 50,000 birds of both species stage there during spring migration, as do an estimated 10,000 King Eiders (Larned 2012). This area is also important for other waterfowl, particularly Emperor Geese (*Anser canagicus*) and shorebirds. Large eelgrass beds and abundant benthic resources, including shellfish (e.g., *Macoma* and *Mytilus* spp.), occur in Nelson Lagoon and adjacent areas.

Sensitivities: Steller's Eiders are identified as "vulnerable" by the International Union for Conservation of Nature (BirdLife International 2012). Greater than 90% of the Pacific population of Steller's Eider are believed to molt and winter in Alaska. The Alaska-breeding population was listed as threatened under the Endangered Species Act in 1997 due to population decline and range contraction (USFWS 1997), and some of these birds are known to molt in Nelson Lagoon (Martin et al. 2015).

The coastal barrier islands that create the sheltered lagoons are highly dynamic. Climate change and subsequent effects, including increased storm frequency, sea level rise, and erosion, have the potential to alter these natural features, but it is not clear whether effects would be adverse (i.e., threatening the barrier islands and lagoon) or beneficial (i.e., creating more lagoon habitat) to sea ducks and other wildlife that use this area. Increasing water temperature and ocean acidification may affect the marine invertebrate community, an important source of prey for Steller's eider.

Potential conflicts: Major threats include the risk of oil contamination from spills in the Bering Sea and potential habitat degradation or ecosystem-level changes associated with climate change. Offshore oil and gas resources exist in the vicinity, but there is currently no active oil drilling. The area of the Outer Continental Shelf currently designated by BOEM as the North Aleutian Basin Planning Area, including Bristol Bay, was withdrawn from federal offshore oil and gas leasing and development in 2014 for an indefinite period of time due to the area's importance to Alaska Native subsistence users, fish and wildlife species, and commercial and recreational fisheries. The withdrawn area includes Nelson Lagoon. There are known coal reserves near Nelson Lagoon but no active mining.

Commercial fishing for salmon and subsistence activities are major components of the village of Nelson Lagoon's economy. A fish processing plant was recently completed in Nelson Lagoon but is not yet functional. Because Nelson Lagoon is nearly drained of water at low tide, navigation is difficult and there is little boat traffic or human use of the lagoon, where most sea ducks congregate, or adjacent uplands.

Status: Nelson Lagoon is part of the Port Moller Important Bird Area (Audubon Alaska 2016). Lands in this area also fall within the boundaries of the Port Moller Critical Habitat Area (Alaska Department of Fish and Game 2011) and the Alaska Peninsula National Wildlife Refuge. State Critical Habitat Areas are managed to maintain and protect naturally occurring resident and migrant fish and wildlife populations and their habitats, and a Special Areas Permit is required from Alaska Department of Fish and Game for any activity that may affect fish and wildlife habitat. Nelson Lagoon was designated as Critical Habitat for Steller's Eiders under the Endangered Species Act in 2001 (USFWS 2001).

The northern Alaska Peninsula region is a mix of state and federal lands with extensive Native regional (Aleut Corporation) and village corporation lands and numerous Native allotments. Jurisdiction of intertidal and subtidal areas is under the State of Alaska.

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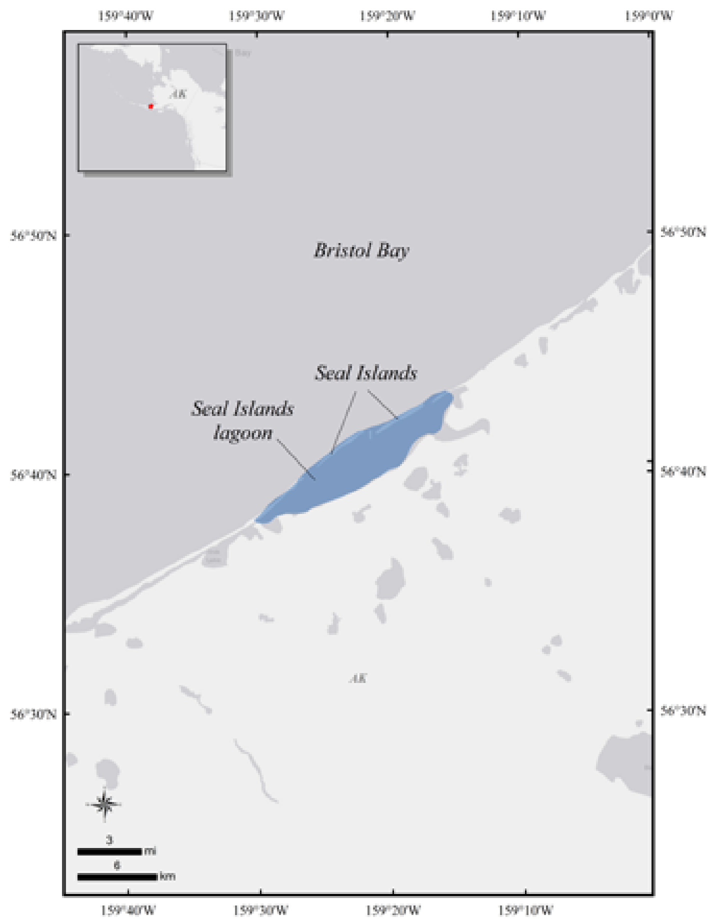
Key Site 12: Seal Islands, Alaska

Location: 56°40'28"N, 159°22'28"W

Size: 47 km²

Description: Seal Islands is composed of a series of sparsely vegetated barrier islands that form a shallow lagoon on the north side of the Alaska Peninsula, about 50 km (Appendix 1) west of the village of Port Heiden. Several partially vegetated islands occur within the lagoon. At low tide, most of the Seal Islands lagoon is exposed sand/mud, with a few deeper channels. The upland area surrounding the lagoon is mostly wet sedge meadows with numerous ponds and lakes.

Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on numbers of sea ducks observed during a fall survey of molting Steller's Eiders (*Polysticta stelleri*). During that survey, all birds are photographed and manually counted using imaging software. Thus, counts are considered a fairly accurate census and are not adjusted for incomplete detection.



Biological Value: This site is an important molting and staging area for Steller's Eiders that breed in Russia and northern Alaska. They are present in this area from mid-August through October. Between 4000 and 20,000 molting Steller's Eiders have been observed in the lagoon in August and September 2012–2016 (Williams et al. 2016; Appendix 2). Seal Islands is among the few known molting sites on the Alaska Peninsula, and numbers of Steller's Eiders using the area seem to be increasing in recent years (Williams et al. 2016).

In addition to Steller's Eiders, several hundred Pacific Common Eiders (*Somateria mollissima v-nigra*) and smaller numbers of Red-breasted Merganser (*Mergus serrator*) also inhabit this area during late summer and fall.

Sensitivities: The barrier islands that form a protective shield from the adjacent Bering Sea are subject to erosion, which may increase due to sea level rise, reduced ice coverage in the southern Bering Sea, and increased frequency of storm tides as a result of climate change.

Alaska-breeding Steller's Eiders are listed as a threatened species under the Endangered Species Act (USFWS 1997), and this area is designated as critical habitat for the species (USFWS 2001).

Potential conflicts: Seal Islands is remote and there is little human use of the area, with the exception of fishing in the waters outside the lagoon on the Bering Sea side. Birds that molt in this area would be particularly vulnerable to oil spills because they cannot fly and leave the area. The area of the Outer Continental Shelf currently designated by BOEM as the North Aleutian Basin Planning Area, including Bristol Bay, was withdrawn from federal offshore oil and gas leasing and development in 2014 for an indefinite period of time due to the area's importance to Alaska Native subsistence users, fish and wildlife species, and commercial and recreational fisheries. The withdrawn area includes the Seal Islands.

Status: Seal Islands is a designated Important Bird Area of Global importance (National Audubon

Society 2017) because of its importance to waterfowl and shorebirds. This key site falls within the boundary of the Alaska Maritime National Wildlife Refuge but is under the jurisdiction of the State of Alaska, as are the adjacent uplands and subtidal lands. There are no private inholdings within this area.

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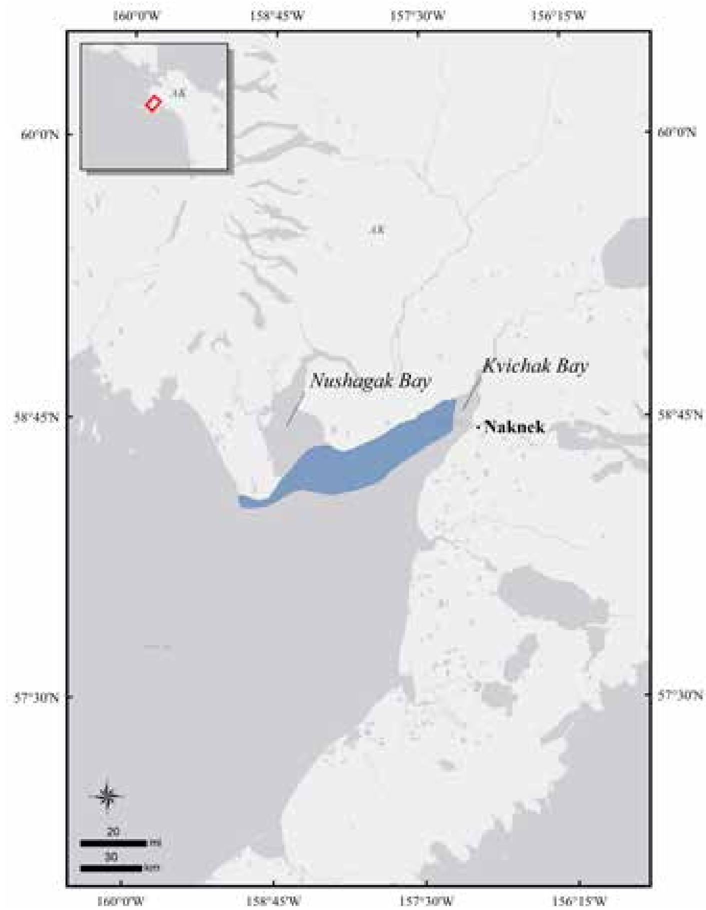
Steller's Eiders. Photo: Tim Bowman.

Key Site 13: Nushagak and Kvichak Bays, Alaska

Location: 58°34'56"N, 158°5'4"W

Size: 1732 km^2



Description: Nushagak and Kvichak bays represent the northern and northeast arms, respectively, of Bristol Bay adjacent to the north side of the base of the Alaska Peninsula in southwestern Alaska. These major estuary areas encompass waters from the tip of Cape Constantine at the southwest corner of Nushagak Bay eastward to nearshore and offshore areas of Half Moon Bay in Kvichak Bay. Kvichak Bay receives two major rivers: the Kvichak River, which runs southwest from Lake Iliamna, and the Naknek River, which empties Naknek Lake, as well as several smaller drainages. Both of these rivers, and the Nushagak River, are major salmon-producing rivers. The bay is shallow, with unvegetated intertidal mud flats and sand flats exposed at low tide. Tides range 4.6 to 8 m. Benthic invertebrates, particularly bivalves (e.g., *Macoma* and *Mytilus* spp.), are numerous (Coyle et al. 2007). During winter and early spring, this area is sometimes covered with ice, concentrating sea ducks in small patches of open water or forcing them to move to other ice-free areas.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have been adjusted to reflect actual abundance (not indices), using periodic high observed counts for the area and species or based on expert and local knowledge.

Biological Value: This is a highly productive estuarine system with abundant mollusks and other invertebrates that are utilized heavily by sea ducks seasonally, particularly during migration and staging, and also during winter as ice conditions allow. Up to 125,000 King Eiders, 100,000 Black Scoters, 12,000 Long-tailed Ducks, and 50,000 Steller's Eiders stage there during spring migration (Larned 2012, J. Schamber, Alaska Department of Fish and Game unpublished data); however, these are likely minimum estimates of the number of sea ducks that the area, because spring surveys upon which most of these estimates are based provide only a snapshot of abundance, not total use over the migration period. For example, >75% of 70 Black Scoters marked with satellite transmitters during winter from British Columbia to the Aleutian Islands used this area in May and >60% during October (Schamber et al. 2010), spending one to three weeks there. Extrapolating this to the entire western Black Scoter population, this equates to a total use by 90,000 to 120,000 individual Black Scoters during spring. Sea ducks likely use this food-rich area to acquire reserves during migration. The area is also a significant molting area for Black Scoters and some King Eiders during late summer and fall (August through September; Schamber et al. 2010). During winter, tens of thousands of King Eiders may be present, depending in large part on ice coverage (Larned 2012). King Eiders breeding in northern Alaska, the western Canadian Arctic, and Russia use this area (Oppel et al. 2008, Dickson 2012a, 2012b), suggesting the international importance of northeastern Bristol Bay. Black Scoters use relatively shallow areas whereas King Eiders and Long-tailed Ducks use deeper waters. The Nushagak and Kvichak Bay area is part of an Important Bird Area (Audubon Alaska 2014) because of its importance to waterfowl and shorebirds.

Sensitivities: This area is used by large numbers of King Eiders and Black Scoters, particularly during the spring and fall seasons when physiologic condition may have strong fitness-related consequences (Anteau and Afton 2009). Northeastern Bristol Bay is an important area for a large segment of the Pacific populations of King Eiders and Black Scoters (Bowman et al. 2021) during the annual cycle. Thus, future impacts from resource development or environmental change could have significant effects on population levels of both species. Shifts in benthic community structure or reductions in benthic biomass could have adverse consequences for birds that rely heavily on those resources; such changes have been linked to warmer sea temperatures in the Bering Sea (Grebmeier et al. 2006, Coyle et al. 2007). Steller's Eiders, which are listed as a threatened species under the Endangered Species Act (USFWS 1997), also use this area during migration.

Potential Conflicts: Major threats include the risk of oil contamination from spills in the Bering Sea and Bristol Bay and potential habitat degradation or ecosystem-level changes associated with climate change. The area of the Outer Continental Shelf currently designated by BOEM as the North Aleutian Basin Planning Area, including Bristol Bay, was withdrawn from federal offshore oil and gas leasing and development in 2014 for an indefinite period of time due to the area's importance to Alaska Native subsistence users, fish and wildlife species, and commercial and recreational fisheries. The withdrawn area includes Nushagak and Kvichak Bays.

Significant mining activities have been proposed within the bay's watershed that could impact Bristol Bay chemistry and biology. The largest proposed mine is the open pit Pebble Mine, which is currently stalled in planning and permitting processes and has met with significant opposition due to environmental concerns.

Tourism within the estuary is minimal; at low tide, navigation is difficult and there is little recreational boat traffic or human use. Commercial salmon fishing is a huge industry, with boat traffic mostly confined to deep water channels. Most shore-based fish processing plants are located in the village of Naknek and city of King Salmon.

Status: King Eiders breeding in northern Alaska, the western Canadian Arctic, and Russia use this area (Oppel et al. 2008, Dickson 2012a, 2012b), suggesting the international importance of northeastern Bristol Bay. Kvichak Bay was recently designated as one of only 49 sites within the Western Hemispheric Shorebird Reserve Network, which was established to protect critical shorebird habitat across the Americas. Nushagak and Kvichak Bays are designated as a coastal Important Bird Area (Audubon Alaska 2016).

Nushagak and Kvichak Bays are part of two boroughs, Bristol Bay and Lake and Peninsula, to the south and east, and the Dillingham Census Area to the north and west. Surrounding lands are under the jurisdiction of various entities, including the Bristol Bay Borough, Bristol Bay Native Association, Bristol Bay Native Corporation, Bureau of Land Management, Alaska Department of Natural Resources, Alaska Department of Fish and Game, and several Native villages. Intertidal and subtidal lands are administratively regulated by the State of Alaska. There is currently little commercial development surrounding Nushagak and Kvichak Bays, although the waters support one of the largest wild salmon fisheries in the world with commercial fishing and processing and subsistence fishing. Much of the estuary is managed as a fisheries conservation zone.

The Nushagak and Kvichak Bay area is part of an Important Bird Area (Audubon Alaska 2014) because of its importance to waterfowl and shorebirds.

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Key Site 14: Kuskokwim Shoals, Alaska

Location: 59°37'60"N, 163°46'46"W

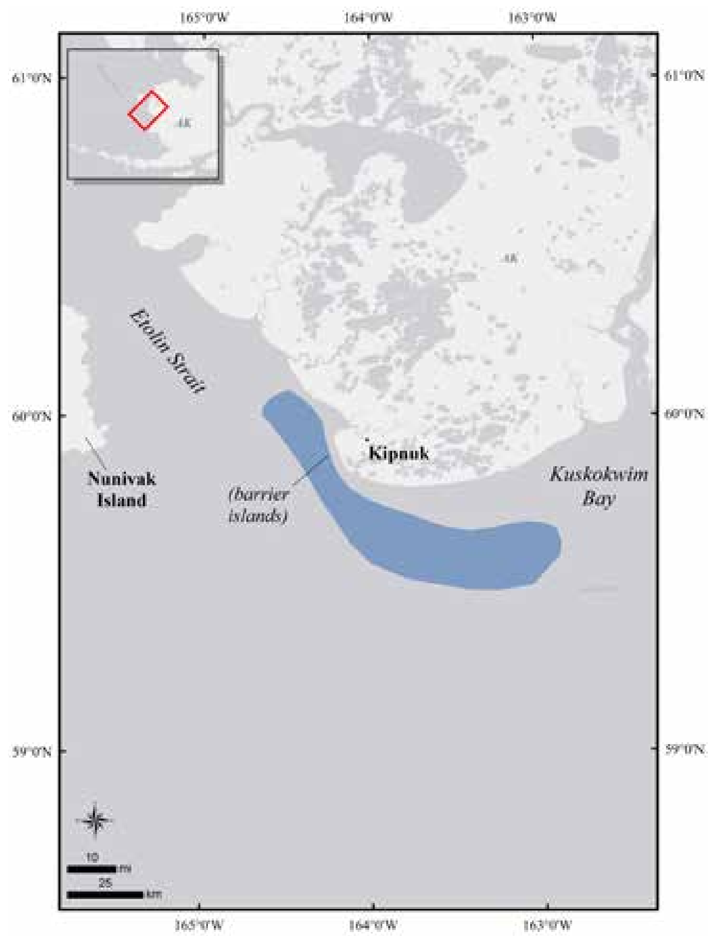
Size: 1918 km^2

Description: The Kuskokwim Shoals key sea duck habitat site extends southeast from Etolin Strait into Kuskokwim Bay, offshore from the village of Kipnuk and Cape Avinof. This coastal marine habitat is shallow (<10 m), with extensive tidal flats supporting substantial eelgrass beds. Barrier islands, including Kikegtek, Pingurbek, and Kwigluk islands, lie within this key site. Freshwater input is mainly from the Kuskokwim River. The neighboring coastline consists of intertidal wetland ecosystems with prolific graminoid vegetation.

Precision and Correction of Abundance Estimates Presented: Fall and spring abundance estimates have not been adjusted to account for incomplete detection or other biases and can be treated as minimum estimates (Larned and Tiplady 1996, Larned 2012).

Biological Value: The shoals of northwestern Kuskokwim Bay provide critical staging habitat for migrating Steller's Eiders (*Polysticta stelleri*) and a variety of other sea duck species. Aerial survey data suggest highest use by most sea duck species takes place in marine waters near the prominent barrier islands in the northwest portion of this site (Larned and Tiplady 1996, Larned 2012). Up to 11,000 Steller's Eiders have been observed there during the fall molt and migration period (B. McCaffery, USFWS, pers comm.).

Nearly the entire Pacific population of Steller's Eiders (>80,000 birds) passes through this area in the spring after wintering in areas of southwestern and southcentral Alaska (Larned 2012, Rosenberg et al. 2014, Martin et al. 2015); they use this key habitat site for three to five weeks before dispersing to breeding grounds in Russia and northern Alaska (Rosenberg et al. 2014, Martin et al. 2015). This key habitat site also represents an important staging location for thousands of Pacific Common Eiders (*Somateria mollissima v-nigra*) and tens of thousands of King Eiders (*Somateria spectabilis*) during spring and fall migration periods (Larned and Tiplady 1996, Larned 2012). This coastal shoal habitat also supports thousands of fall-staging Black



Scoters (*Melanitta americana*) and Long-tailed Ducks (*Clangula hyemalis*) (Larned and Tiplady 1996, Larned 2012, J. Schamber, Alaska Department Fish and Game unpublished data).

While this is not a primary migration corridor, smaller numbers of Spectacled Eiders (*Somateria fischeri*), Surf Scoters (*Melanitta perspicillata*), and White-winged Scoters (*Melanitta deglandi*) occupy this offshore habitat during migration and molt periods (Larned and Tiplady 1996, Rosenberg et al. 2006a, 2006b). Aerial survey data suggest species-specific use and distribution across this key habitat site, with eiders and Long-tailed Ducks frequenting the mainland side of the barrier islands and scoters occupying shoal habitat, as well as deep-water habitat further east in Kuskokwim Bay (Larned and Tiplady 1996).

Sensitivities: Near-shore marine ecosystems may be at risk for contamination associated with transportation of petroleum and mining products by ocean-going vessels (National Audubon Society

2017). Molting sea ducks (e.g., Steller's Eiders, scoters) in this area may be especially vulnerable to disturbance and collisions from local vessel traffic and associated cultural use activities. Sea duck species using the Kuskokwim Shoals area may be vulnerable to changing sea ice distribution and major regime shifts in the North Pacific and Bering Sea (Grebmeier et al. 2006, Flint 2013, Lovvorn et al. 2014). Because much of the Yukon-Kuskokwim River Delta is relatively low-lying, rising sea level and/or frequency of storm surges may advance erosion of the coastline and offshore barrier islands in this area (Jorgenson and Ely 2001).

Potential Conflicts: This key site lies within a high traffic area for ocean-going vessels representing a variety of different industries (Nuka Research and Planning Group 2016). It is likely that vessel traffic will increase due to several factors, including (1) loss of sea ice opening up the northwest passage to ship traffic, (2) possible development of deepwater ports in western Alaska (U.S. Army Corps of Engineers 2015), and (3) shipping associated with the Donlin Gold mine (Donlin Gold 2019). Additional boat traffic may be seasonally present as local residents hunt, fish, and commute between villages bordering Kuskokwim Bay. Because sea ducks exhibit interspecific variation in response to disturbance from ocean-going vessel traffic (Schwemmer et al. 2011), further elucidating seasonal use patterns may help reduce disturbance effects on more vulnerable species that use the Kuskokwim Shoals key site.

Status: The Kuskokwim Shoals key habitat site lies within state and federally regulated waters. The barrier islands in the northwest portion of this site fall under state jurisdiction of submerged lands (from mean low water to the three-nautical-mile line; NOAA 2017). Under this jurisdiction, the Alaska Department of Natural Resources has the authority to manage, develop, and lease resources within this boundary (Alaska Department of Natural Resources 2000). However, the majority of the Kuskokwim Shoals key site falls within both the Territorial Sea (0 to 12 nautical mile line) and Contiguous Zone (12 to 24 nautical mile line) of U.S. government jurisdiction (NOAA 2017). Therefore, the federal government exercises authority over most domestic and foreign affairs occurring within these boundaries. Kuskokwim Shoals have been designated critical habitat for Steller's Eiders under the Endangered Species Act (USFWS 2001). This area also falls within the Kuskokwim Bay Important Bird Area (IBA), identified as a high-priority conservation area of global significance (National Audubon Society 2017), largely because of its use by migrating Steller's Eiders and other sea duck species. Adjacent to this offshore site, the shoreline represents the border of the Yukon Delta National Wildlife Refuge (YDNWR), which includes the Kuskokwim River Delta, another globally significant IBA (National Audubon Society 2017). The YDNWR provides nesting habitat for Spectacled Eiders as well as significant numbers of the Pacific populations of Common Eiders, Black Scoters, and Long-tailed Ducks (Fischer et al. 2017).

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Key Site 15: Yukon-Kuskokwim Delta, Alaska

Location: 61°8'3"N, 165°3'48"W

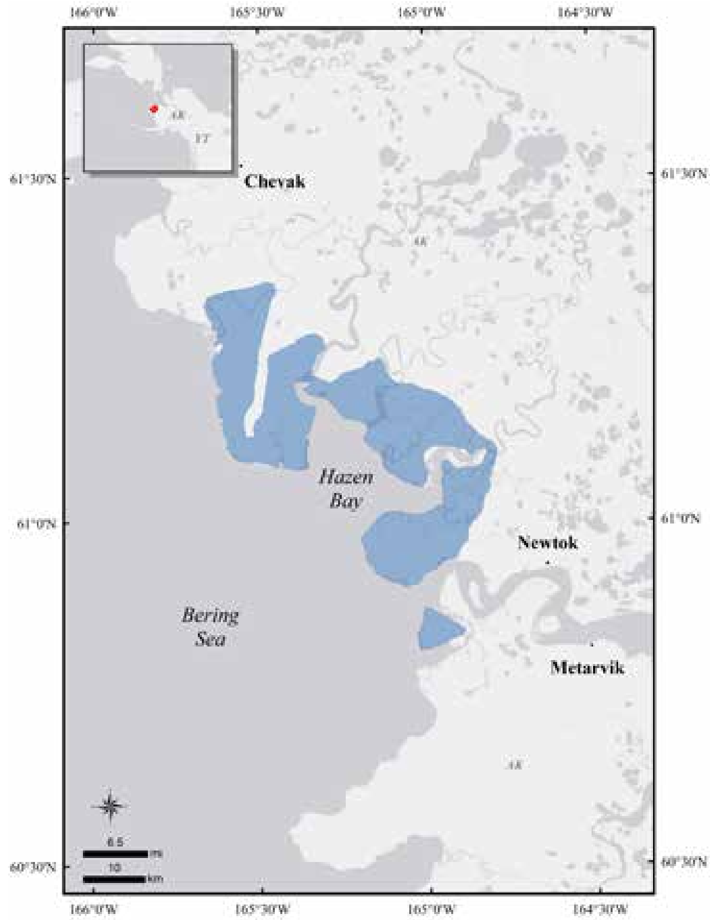
Size: 861 km²

Description: The Yukon-Kuskokwim Delta Key Habitat Site lies within the Yukon Delta National Wildlife Refuge and includes the near-coastal areas in the vicinity of Hazen Bay, where high densities of waterfowl nest. Both the Yukon and Kuskokwim rivers traverse the refuge, and over time these rivers have created one of the largest river deltas in the world. The coastal area of the Yukon-Kuskokwim Delta is generally a flat plain containing innumerable lakes and ponds, as well as tidal rivers and sloughs with extensive mud and sandflats (Appendix 1). Tide heights are up to about 2 m, and storm-driven high tides during spring and fall sometimes inundate large areas with salt water (Terenzi et al. 2014). Upland areas include sedge-graminoid meadows, palsas, and limited upland tundra (Tande and Jennings 1986). The communities of Chevak, Newtok, and Metarvik are located near this key site, and subsistence harvest activities of community members (e.g., fish camps, waterfowl hunting) do occur within the area.

Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on ground-based nest surveys and aerial surveys of waterfowl during early spring (Fischer et al. 2017, Swaim 2017). Estimates have been adjusted for incomplete detection of nests and/or birds (Fischer et al. 2018).

Biological Value: This site is an important breeding area for several species of waterfowl, including Spectacled Eider (*Somateria fischeri*) and Pacific Common Eider (*S. mollisima v-nigra*). Spectacled Eiders and Common Eiders are present in this area from mid-May through August. The Yukon-Kuskokwim Delta is one of two primary breeding areas for Spectacled Eiders in Alaska, with about 15,000 birds present during the breeding season (Fischer et al. 2017); their numbers remain well below historic levels but seem to have increased since the mid-1980s (Dunham et al. 2021).

Pacific Common Eiders breed in coastal areas, with about 8000 birds present during the breeding season (Fischer et al. 2017). Several thousand Long-tailed Ducks (*Clangula hyemalis*) also occur and likely nest within the coastal area (Swaim 2017).



Sensitivities: Spectacled Eiders are listed as a threatened species, and this area is designated critical habitat for the species under the Endangered Species Act (USFWS 1993, 2001). Hunting of Spectacled Eiders has been prohibited since 1991, but some harvest does occur.

This low-lying habitat is particularly sensitive to increases in sea level rise due to climate change. Increased severity of storm surges has already been documented (Terenzi et al. 2014); the resulting changes in salinity of coastal ponds could impact many species that rear young in these ponds and require fresh water.

Ingestion of lead shot deposited in wetlands has been documented to cause mortality and sublethal effects in Spectacled Eiders (Grand et al. 1998, USFWS 2020). Lead shot has been banned for waterfowl hunting since 1991, and the State of Alaska prohibited use of lead shot for hunting of upland game birds and small game on the Yukon-Kuskokwim Delta. Still, illegal use of lead shot for hunting waterfowl and upland game birds (e.g., ptarmigan) near wetlands has contributed to continued deposition and exposure of birds to lead shot. Education efforts are underway to help ensure use of steel shot for hunting in this area.

Potential Conflicts: Offshore oil and gas development is currently (as of 2022) not a significant threat, although leasing plans are subject to change based on politics. Because most of this area falls within the boundaries of the Yukon Delta National Wildlife Refuge, activities that would adversely affect waterfowl and their habitats are largely regulated. Subsistence take occurs in the area, mainly in the form of egg collection, but is focused largely on geese and gulls and is considered an insignificant threat to Spectacled or Common Eiders. Predation of waterfowl eggs and young by foxes, gulls, and jaegers can be significant (Bowman et al. 2004).

Status: The coastal area of the Yukon-Kuskokwim Delta is within the Central Yukon-Kuskokwim Important Bird Area (National Audubon Society 2018) because of its importance to waterfowl and shorebirds. The entire refuge is also designated as a Marine Protected Area (NOAA 2018). Intertidal habitats are managed by the State of Alaska, while the surrounding wetlands and uplands are managed by the U.S. Fish and Wildlife Service as part of the Yukon Delta National Wildlife Refuge. Several small terrestrial sections within this area have been conveyed or remain "selected" under the Alaska Native Claims Settlement Act, but there has been little or no development of these lands. The primary Alaska Native Regional Corporation in the area is the Calista Corporation.

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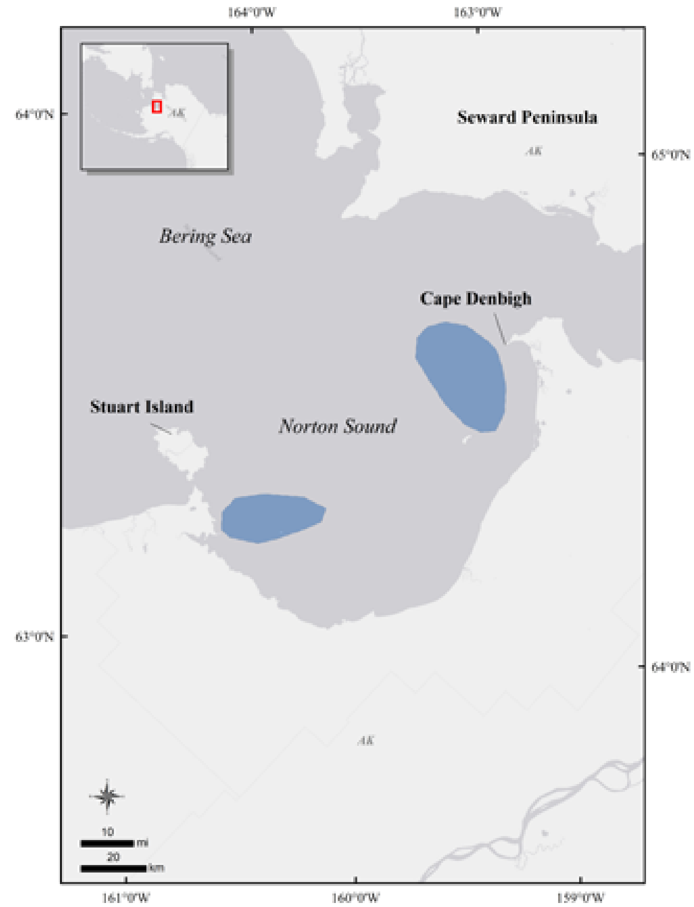
Key Site 16: Norton Sound, Alaska

Location: 63°57'22"N, 161°47'20"W

Size: 937 km^2

Description: Norton Sound is one of the largest coastal water bodies along the Bering Sea coast of northwest Alaska. Lying between the Seward Peninsula to the north, the Nulato Hills to the east, and the Yukon River delta to the south, this key habitat site includes an array of coastal habitat features. Several islands, including Stuart, Egg, and Besboro Islands, lie within this key site. Many large rivers empty into Norton Sound, including the Unalakleet and Shaktoolik rivers. The adjacent coastline is comprised of variable terrain with steep cliffs, low-lying hills, and extensive river deltas. Nearshore water depths remain relatively shallow (<5 to 20 m) as far as 40 km from the shoreline.

Aerial survey and telemetry data suggest that sea ducks use marine habitats near Stuart Island on the southern portion of the sound and shallow water habitat around Cape Denbigh in the northeast portion of this site (D. Rosenberg and J. Schamber, Alaska Department Fish and Game unpublished data, Bollinger and Platte 2012, Martin et al. 2015, Bartzen et al. 2016, Sexson et al. 2016).



Precision and Correction of Abundance Estimates Presented: Summer abundance estimates have not been adjusted to account for incomplete detection or other biases and can be treated as minimum estimates (Bollinger and Platte 2012).

Biological Value: The coastal waters of Norton Sound provide critical molting habitat for threatened Spectacled Eiders (*Somateria fischeri*; USFWS 2001). Telemetry data from individuals marked on the Yukon-Kuskokwim Delta indicated that most (45 of 46) females traveled to Norton Sound to molt after the breeding period (Sexson et al. 2014). Thus, nearly all western Alaska breeding females (>7000) molt in Norton Sound before wintering with the entire world population on polynyas in the Bering Sea (Petersen et al. 1999, 2000, Sexson et al. 2016).

Aerial surveys were conducted from 2006 to 2009 to determine the presence of Common Eiders (*S. mollissima v-nigra*) and other waterbird species along the Norton Sound and Seward Peninsula shoreline (Bollinger and Platte 2012). Within the Norton Sound key habitat area, up to 1064 Common Eiders have been observed during the breeding period (Bollinger and Platte 2012).

Telemetry data indicate this key habitat site also supports Steller's Eiders (*Polysticta stelleri*), Black Scoters (*Melanitta americana*), Surf Scoters (*M. perspicillata*), and Long-tailed Ducks (*Clangula hyemalis*) that stage in the key site during migration events (D. Rosenberg and J. Schamber, Alaska Department Fish and Game unpublished data, Martin et al. 2015, Bartzen et al. 2016).

Sensitivities: The marine ecosystem of Norton Sound may be at risk of contamination from mining and the transportation of petroleum products (National Audubon Society 2018a). Because the molting period is energetically expensive for sea ducks, distribution of Spectacled Eiders typically follows the distribution of prey (Sexson et al. 2016). Oscillating ocean conditions within Norton Sound could impact the density of prey species within this key habitat site (Lovvorn et al. 2014, Sexson et al. 2016).

Potential Conflicts: Molting Spectacled Eiders may be sensitive to disturbance and collisions from commercial fishing and vessel traffic in Norton Sound, as this is a high-traffic area for vessels operating in Norton Sound and the Bering Sea (Nuka Research and Planning Group 2016). Interest in offshore natural gas production in the Norton Sound could continue to increase, especially as remote communities in Alaska strive for energy independence (Reitmeier 2005).

Status: Norton Sound lies within state and federally regulated waters. Nearshore islands within 5.6 km of land fall under state jurisdiction of submerged lands (NOAA 2017); the Alaska Department of Natural Resources has the authority to manage, develop, and lease resources within this boundary (Alaska Department Natural Resources 2000). However, the majority of the area designated as key habitat for sea ducks falls within both the Territorial Sea (0 to 12 nautical mile line) and Contiguous Zone (12 to 24 nautical mile line) under U.S. government jurisdiction (NOAA 2017). Norton Sound has been designated critical habitat for molting Spectacled Eiders under the Endangered Species Act (USFWS 2001). Norton Sound includes multiple Important Bird Areas, including the East Norton Sound IBA, listed as a high-priority conservation area of global significance (National Audubon Society 2018a). The Stebbins–St. Michael Important Bird Area, with state-level significance, occurs here and also falls within the Yukon Delta National Wildlife Refuge (National Audubon Society 2018b). Additional areas with habitat protection include segments of shoreline and islands that are designated as part of the Alaska Maritime National Wildlife Refuge.

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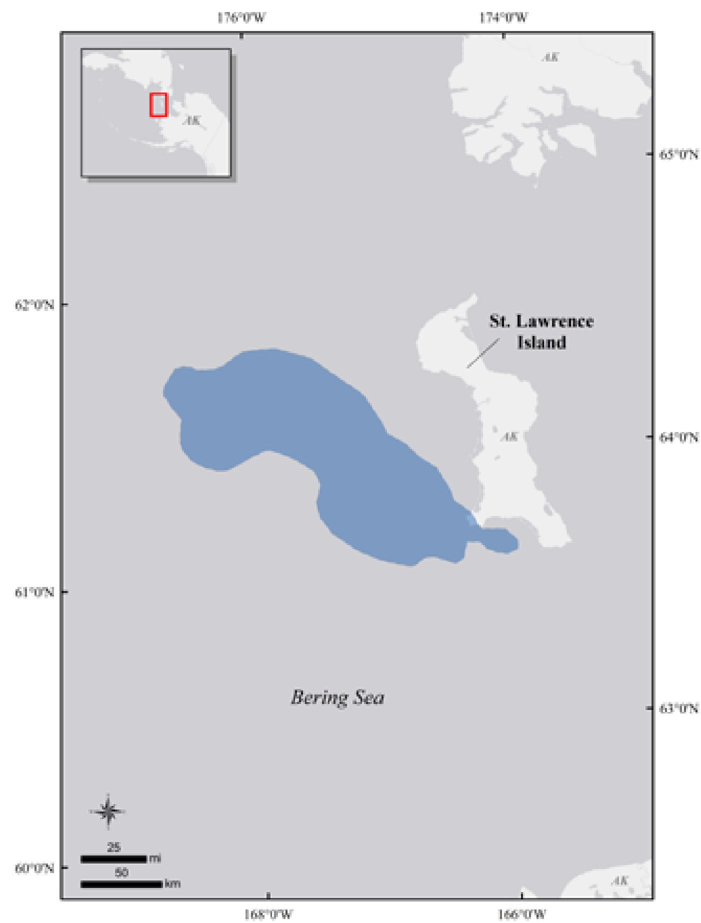
Spectacled Eiders in pack ice. Photo: Tim Bowman.

Key Site 17: Northern Bering Sea, Alaska

Location: 62°39'5"N, 171°16'53"W

Size: 12,644 km^2

Description: This key habitat site lies about 200 km off the southern and western coast of St. Lawrence Island, Alaska. The Anadyr Current from the western side of the Bering Sea controls nutrient distributions in this region. The high productivity in this area along with the shallow shelf of the Bering Sea result in large quantities of carbon available to support productive benthic communities, which in turn support marine animals. In winter, sea ice is a dominant physical feature in the northern Bering Sea.



Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection. Within this area, bird abundance estimates were based on aerial oblique photos, in which birds were manually counted. These photos were taken over a geographic area delineated based on the distribution of radio-tagged Spectacled Eiders (*Somateria fischeri*) (Larned et al. 2012) and should be considered an approximate or minimum estimate.

Biological value: Benthic communities in the northern Bering Sea support organisms that forage on benthic food sources, including several sea duck species, most notably Spectacled Eiders (Grebmeier et al. 2006, Grebemeier 2012). This key site supports the entire world population of Spectacled Eiders (~370,000 birds; Larned et al. 2012) during winter (Petersen et al. 1999, Sexson et al. 2014). Spectacled Eiders spend a maximum of nine months in this region, arriving as early as the last week of September and departing by late May (Sexson et al. 2014). The distribution of wintering eiders is controlled to some extent by the location of open water leads and polynyas, which provide areas for foraging and resurfacing after dives (Bump and Lovvorn 2004, Lovvorn et al. 2014). In addition, the distribution and location of eiders also appears to respond to changes in sea ice concentration (Cooper et al. 2013). Sea ice provides a critical habitat as a resting platform between foraging bouts because sea ducks lose heat at a greater rate in water than when exposed to air (De Vries and Van Eerden 1995). The use of this key site as an exclusive wintering area appears to be unique to Spectacled Eiders. Other sea ducks, such as Common Eiders (*S. mollissima v-nigra*), King Eiders (*S. spectabilis*), and Long-tailed Ducks (*Clangula hyemalis*), have been observed during winter within the key site boundaries (particularly in the northern portion of this site), but most use other areas throughout the Bering Sea and farther south near western Alaska (Petersen and Flint 2002, Petersen et al. 2003, 2012, Phillips et al. 2006, Oppel et al. 2008).

Sensitivities: In 1993, Spectacled Eiders were listed as threatened under the provisions of the U.S. Endangered Species Act due to population decline on its principal breeding areas in Alaska (Federal Register 1993). This key wintering area, along with breeding, migration, and molting areas, are designated as critical habitat for Spectacled Eiders (Federal Register 2000).

Changes in climate have been linked to large-scale decadal regime shifts in the Bering Sea ecosystem (Hare and Mantua 2000, Grebmeier et al. 2006). Within this key site, shifts in the once-dominant bivalve *Macoma calcarea* to *Nuculana radiata* over the last 40 years (Richman and Lovvorn 2003, Lovvorn et al. 2009) coincided with population declines of Spectacled Eiders (Flint 2013). Other effects of climate change include variation in sea ice conditions and shifts in prevailing winds, which can affect Spectacled Eiders' access to feeding areas and availability of ice as resting platforms and thus increase energetic costs (De Vries and Van Eerden 1995, Lovvorn et al. 2014). Higher energy costs and restricted access to preferred feeding habitat and food items might affect not only short-term survival but also future breeding success (Petersen and Douglas 2004, Lovvorn et al. 2014). Dramatic decreases in ice in the Northern Bering Sea were observed during the winters of 2018 and 2019, and in the winter of 2019–2020 a sample of radio-tagged eiders allowed documentation of dispersion of wintering birds to marine areas far outside the traditional wintering area (i.e., coastal Russia, eastern Chukchi Sea); the consequences of these shifts are not known.

Potential conflicts: Major threats include the risk of oil contamination from vessel spills in the Bering Sea and potential habitat changes (i.e., sea ice) or ecosystem-level (i.e., food web and diet items) changes associated with climate change. Ship traffic through the Bering Strait is expected to increase as decreased sea ice opens the Arctic to shipping and resource development. Threats also include disturbance or harvesting of benthic communities in this area.

Status: This key wintering area in the northern Bering Sea south of St. Lawrence Island was designated as Critical Habitat for Spectacled Eiders in 2001 (U.S. Department of Interior 2001). Of the 7,393,700 hectares in this area, approximately 98.6% is under federal ownership while the remaining 1.4% is owned by the State of Alaska (Federal Register 2000). In December 2016, an executive order was issued designating the Northern Bering Sea Climate Resilience Area in Alaska (Federal Register 2016). The executive order maintained the current prohibition on bottom trawling in this area, required additional steps to protect important places from the impacts associated with human-related activities (i.e., shipping), and prohibited oil, gas, and mineral leasing in specific areas, including this key wintering area for Spectacled Eiders (http://usa.oceana.org/northern-bering-sea-climate-resilience-area).

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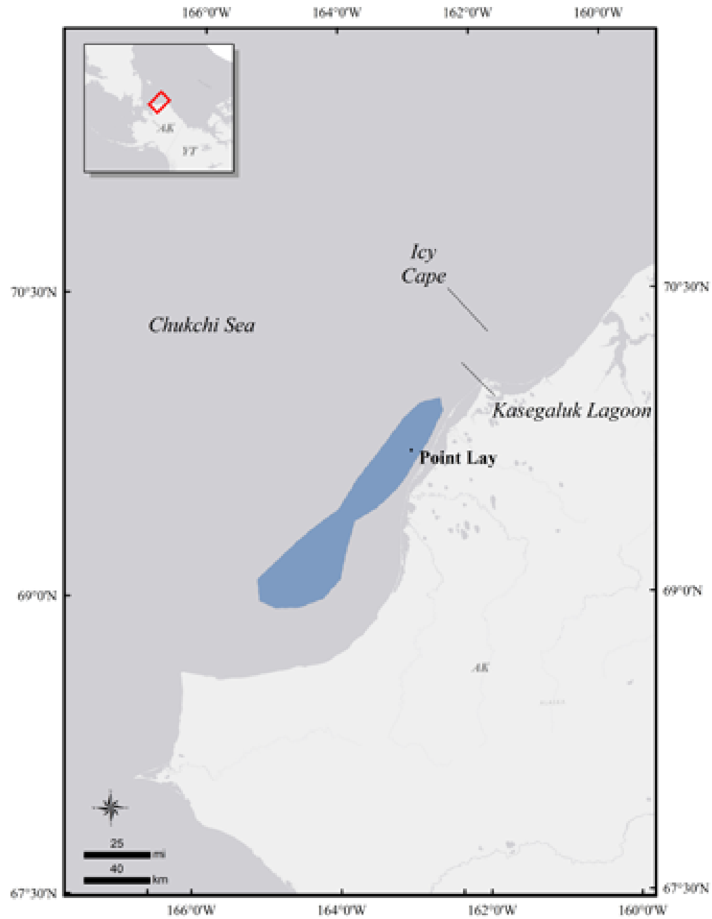
Key Site 18: Ledyard Bay, Alaska

Location: 69°43'1"N, 163°47'43"W

Size: 3065 km²

Description: Ledyard Bay includes near- and offshore coastal waters between Cape Lisburne and Icy Cape on the Arctic coast of Alaska. This remote marine site on the eastern edge of the Chukchi Sea provides shallow (<30 m) water staging and molting habitat for a variety of sea duck species. Just outside the northeast portion of this site, Solivik Island and several other unnamed islands form the outer barrier of Kasegaluk Lagoon. The adjacent shoreline includes steep cliffs at Cape Lisburne, gradually descending towards wetland ecosystems, with many thermokarst lakes near Kasegaluk Lagoon. In addition to numerous small creeks emptying into Ledyard Bay, major rivers such as the Avak, Utukok, Kokolik, and Kukpowruk also provide substantial freshwater input.

Telemetry and aerial survey data suggest use by sea duck species takes place throughout marine waters of Ledyard Bay, with concentrations occurring near Kasegaluk Lagoon in the northeast portion of this site (Larned et al. 1995, Petersen and Flint 2002, Oppel et al. 2009, Bartzen et al. 2016, Sexson et al. 2016). Also see description for Beaufort Sea Lagoons Key Site, which includes part of Kasegaluk Lagoon.



Precision and Correction of Abundance Estimates Presented: Fall abundance estimates for this key habitat site have not been adjusted to account for incomplete detection or other biases and can be treated as minimum estimates of population size (Larned et al. 1995).

Biological Value: The coastal waters of Ledyard Bay provide critical staging habitat for all four eider species (*Somateria* and *Polysticta* spp.) (Larned et al. 1995, Petersen and Flint 2002, Oppel et al. 2009, Martin et al. 2015). In particular, this area provides important staging and molting habitat for Spectacled Eiders (*S. fischeri*) breeding on the Arctic Coastal Plain of Alaska (Sexson et al. 2014, 2016). As many as 33,192 Spectacled Eiders have been observed in Ledyard Bay during the fall molting period (Larned et al. 1995), and it is likely that all female Spectacled Eiders breeding on the Arctic Coastal Plain molt there, along with males from the Russia and Alaska breeding populations (Petersen et al. 1999, Sexson et al. 2014). This habitat also represents important staging habitat for threatened Steller's Eiders (*P. stelleri*) during spring migration (Martin et al. 2015).

Aerial survey data provide limited insight into species-specific seasonal use of this area. However, results from telemetry studies indicate use by all four eider species, as well as Long-tailed Ducks (*Clangula hyemalis*), which stage in the northwest portion of this key site during spring and fall migration (Bartzen et al. 2016). This key site may also provide important foraging and loafing habitat for eiders, Long-tailed Ducks, White-winged Scoters (*Melanitta deglandi*), and Red-breasted Mergansers (*Mergus serrator*) breeding nearby on the Arctic Coastal Plain (Amundson et al. 2019).

Sensitivities: Threatened populations of sea ducks (i.e., Steller's Eiders, Spectacled Eiders) using this area are vulnerable to disturbance or unintentional take associated with subsistence harvest of nonthreatened sea ducks (e.g., King and Pacific Common eiders (*S. spectabilis* and *S. mollissima v-nigrum*) migrating through this corridor (Lovvorn et al. 2018). Changing distribution and abundance of benthic prey within Ledyard Bay may ultimately influence use by, and seasonal movement of, eiders within this key site (Lovvorn et al. 2015, Sexson et al. 2016).

Potential Conflicts: Arctic marine ecosystems may be under increasing risk of contamination associated with increased vessel traffic and transportation of petroleum products, as the ice-free period continues to lengthen (Wang et al. 2009, National Audubon Society 2018a, 2018b), increasing risk of oil spills and bird collisions with vessels. Sea ducks provide an important subsistence resource, and conservation of this key habitat site requires consideration of subsistence hunting traditions by residents of the village of Point Lay (Lovvorn et al. 2018).

Status: The Ledyard Bay key habitat site lies within federally regulated waters and falls within both the Territorial Sea (0 to 12 nautical mile line) and Contiguous Zone (12 to 24 nautical mile line) of U.S. government jurisdiction (NOAA 2018). The federal government exercises authority over oil and gas exploration in these waters, and a small portion of this key site falls within the Chukchi Sea Sale Area (BOEM 2018). Ledyard Bay is designated critical habitat for Spectacled Eiders under the Endangered Species Act (USFWS 2001). This area also falls within the Ledyard Bay Important Bird Area (IBA), identified as a high-priority conservation area of global significance (National Audubon Society 2018a), largely because of its use by molting Spectacled Eiders and other staging waterfowl. Kasegaluk Lagoon, adjacent to this key site, is another globally significant IBA (National Audubon Society 2018b). The adjacent Arctic Coastal Plain provides nesting habitat for Spectacled, Steller's, and King eiders, as well as Long-tailed Ducks, White-winged Scoters, and Red-breasted Mergansers (Amundson et al. 2019, Wilson and Swaim 2018).

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Key Site 19: Beaufort Sea Coastal Lagoons, Alaska

Location: 70°30'7"N, 151°18'58"W

Size: 6145 km^2

Description: This key habitat site encompasses a narrow strip of Alaska's Arctic coastline from Icy Cape on the Chukchi Sea eastward along the Beaufort Sea to the Canadian border. The site is about 850 km long and extends up to 20 km from the mainland coast. Barrier islands and spits enclose lagoons, bays, and estuaries along the coast (Boggs et al. 2016). Despite the name of this key site, it also borders the Chukchi Sea at its western end. The Chukchi is a very productive shallow Arctic sea separated from the Beaufort by the Barrow Canyon (Smith et al. 2017). This deep trough in the continental shelf creates mixing and upwelling, contributing to the area's tremendous productivity, including high benthic biomass (mainly polychaetes, mollusks, and crustaceans; Smith et al. 2017). The Beaufort has lower overall productivity than the Chukchi, but with strong benthic-pelagic coupling there are rich resources for bottom feeders such as sea ducks (Smith et al. 2017).

In this dynamic ecosystem, barrier islands and spits are composed of sand and gravel, with deposition determined by prevailing winds and waves and longshore drift (Boggs et al. 2016). Barrier islands and spits, up to 9 km in length, are low (<2 m) and narrow (50 to 200 m) and almost completely unvegetated due to ice scour and mobility of the sediment (Boggs et al. 2016). Lagoons and estuaries are generally shallow, with tidal flats and marshes along the landward shoreline (Boggs et al. 2016). The dry, cold Arctic climate here has very short summers and long winters. Mean annual precipitation is 10 to 26 cm, mostly as snow, with freezing temperatures possible in any month (Boggs et al. 2016). Lagoons and brackish waters usually remain frozen from October to June, while there is generally some open water present between the coast and pack ice from July to October (Willms and Crowley 1990).

Communities within this region include Wainwright, Utqiaġvik (formerly Barrow), Nuiqsut, and Kaktovik. There are also several petroleum drilling and production facilities in the area (Alpine, Prudhoe Bay, NorthStar, etc.) which may have thousands of workers on-site at any time.

Precision and Correction of Abundance Estimates Presented: Correction factors have not been applied to abundance estimates presented for this key habitat site, thus abundance estimates should be considered minimal indices.

Biological Value: This site provides important habitat for molting sea ducks, particularly Long-tailed Ducks (*Clangula hyemalis*). Surveys conducted during 1999 to 2003 indicate that in late July and early August there are, on average, >80,000 sea ducks present at this site (Lysne et al. 2004). Long-tailed Ducks are by far the most abundant species, with >70,000 individuals (~7% of continental population). The site is also used by about 4500 Pacific Common Eiders (*Somateria mollissima v-nigrum*), 4000 Surf Scoters (*Melanitta perspicillata*), and 2500 King Eiders (*S. spectabilis*), with <100 Black Scoters (*M. americana*) as well as a few White-winged Scoters (*M. deglandi*) and Spectacled and Steller's eiders (*S. fischeri* and *Polysticta stelleri*) (Lysne et al. 2004). The highest numbers and densities of Long-tailed Ducks were observed in northeastern Kasegaluk Lagoon, Elson Lagoon, McClure and Stockton islands, and lagoons of the Arctic National Wildlife Refuge (Arctic Refuge); there were also significant numbers at Jones and Return islands, Peard Bay, Admiralty Bay, and Smith Bay (Lysne et al. 2004). In 1985, there were nearly 25,000 Long-tailed Ducks observed in the Arctic Refuge lagoons; during 1999 to 2003 the mean count in this area was less than 16,000 but in 2003 nearly 28,000 were observed with particularly high densities (>40 birds/km^2) in the eastern Arctic Refuge, from around Barter Island to Beaufort Lagoon (Brackney et al. 1987, Lysne et al. 2004). Pacific Common Eiders were most abundant in Peard Bay (in 2003, about 4000 birds were observed in this area alone), as well as Kasegaluk Lagoon and McClure and Stockton islands (Lysne et al. 2004). The distribution of King Eiders and Surf Scoters varied annually; highest numbers of King Eiders were seen at Peard Bay, Elson Lagoon, and McClure and Stockton islands, while Surf Scoters were most abundant at Harrison Bay and Jones and Return islands (Lysne et al. 2004).

Within this site, Long-tailed Ducks and Pacific Common Eiders (*v-nigrum*) are particularly associated with lagoon habitats inside barrier islands (Fischer et al. 2002). While some Long-tailed Ducks nest in the surrounding uplands, the lagoons are used primarily as molting and staging areas by Long-tailed Ducks that breed elsewhere in Alaska and Arctic Canada (Lysne et al. 2004, Bartzen et al. 2017); peak abundance of Long-tailed Ducks occurs in early August, with numbers declining through mid-September (Brackney et al. 1987). More than 50% of Long-tailed Ducks marked with satellite transmitters during molt in the Northwest Territories, Canada, used this area during their westward fall migration through the Beaufort and Chukchi seas (Bartzen et al. 2017).

This site provides important breeding habitat for Pacific Common Eiders, with 500 to 1000 pairs nesting along this stretch of coastline, usually among driftwood on low-elevation barrier islands (Flint et al. 2004, Dau and Bollinger 2009). This region is also used by King and Spectacled eiders during breeding, staging, and molting, and by Steller's Eiders during breeding and staging (Smith et al. 2017). Male Spectacled Eiders captured during the breeding season in the Prudhoe Bay area spent several weeks in coastal waters of the Beaufort and Chukchi seas, which may provide important staging and foraging habitat during post-breeding migration (Petersen et al. 1999). Adult and juvenile Spectacled Eiders marked in the Colville River delta used the western Beaufort Sea important area during breeding or post-fledging dispersal, respectively (Sexson et al. 2014). Adult female and juvenile Spectacled Eiders from fledged broods used nearshore marine waters (Elson Lagoon) near Utqiaġvik, Alaska, in late August and early September (Safine 2012).

Seaward of the barrier islands, just outside this key site, high densities of Long-tailed Ducks (35 to 50 birds/km^2) have also been observed (Brackney et al. 1987), along with fewer numbers of King Eider, scoter, Common Eider, and Spectacled Eider (Fischer et al. 2002).

Sensitivities: Lagoon habitats within this site are particularly important, with tens of thousands of molting Long-tailed Ducks feeding primarily in the open-water areas of the lagoons and resting in sheltered areas near the barrier islands at night (Flint et al. 2016). This system may be vulnerable to the impacts of climate change; as sea ice diminishes and sea levels rise, storm surges and erosion become more frequent and significant. Due to these changes, combined with permafrost thaw in coastal tundra, the barrier island lagoon systems may change dramatically. The total surface area of barrier islands in the central Beaufort Sea has decreased about 4% from the 1940s to 2000s (Boggs et al. 2016). Furthermore, with warming ocean temperatures and changes in sea ice cover, altered timing of phytoplankton blooms may cause marine ecosystems to shift from benthic-driven to pelagic-driven systems, which could have negative consequences for benthic-feeding sea ducks (Smith et al. 2017).

Large aggregations of migrating or molting sea ducks may be particularly sensitive to disturbance and marine pollution events. The barrier island lagoon system is also considered to be highly susceptible to damage from oil spills and human use (Boggs et al. 2016). However, proximity to oil field activity in Beaufort Sea lagoons did not appear to affect foraging activity of molting male Long-tailed Ducks (Flint et al. 2016).

Potential Conflicts: Although most of the terrestrial area bordering this key habitat site is undeveloped and sparsely populated, there are major petroleum production facilities present. In the 1970s, oil was discovered near Prudhoe Bay; operated by BP in partnership with ExxonMobil and ConocoPhillips Alaska, it became the largest oilfield in North America. Since then, various other oil and gas production facilities have been developed, both on- and offshore. There has recntly been renewed interest in development in the National Petroleum Reserve-Alaska (Houseknecht et al. 2017) as well as in the Arctic Refuge.

Oil and gas exploration and development can negatively affect sea ducks by causing loss or alteration of habitat, disturbance, disorientation from or collision with offshore structures, and contamination from oil spills or other pollutants (including chronic exposure to low-level pollution) (Bartzen et al. 2017). During spring migration, Long-tailed Ducks staged in the Alaska Chukchi Sea less than 80 km from offshore oil and gas leases, and during fall migration some staged nearshore (less than 50 km) and were in or near oil and gas leases and active drilling platforms (Bartzen et al. 2017).

In addition, as Arctic sea ice decreases due to climate change, this area will likely experience increased shipping traffic associated with transportation, resource development, and tourism, thereby increasing the risk of oil spills or other contamination, disturbance, and collisions.

Sea ducks provide an important subsistence resource, and conservation of this key habitat site requires consideration of subsistence hunting traditions by residents of coastal communities.

Status: The State of Alaska has jurisdiction over tidelands (between mean high water and mean low water) and nearshore submerged lands (from mean low water to the three-nautical-mile line), with the authority to manage, develop, and lease resources. However, the federal government regulates commerce, navigation, power generation, national defense, and international affairs throughout state waters. The federal government administers the Outer Continental Shelf (OCS), which includes all submerged lands seaward of the state limit. The Bureau of Ocean Energy Management (BOEM) is mandated to develop energy and mineral resources on the OCS in an environmentally and economically responsible manner. An executive order in 2016 declared federal waters in the Arctic Ocean (including the entire Chukchi and most of the Beaufort) off-limits to oil and gas development, due to significant risk of oil spills and limited clean-up ability. However, in 2018 the Department of the Interior released a draft proposal that would open up almost all of Alaska's waters for offshore oil development. Subsequently, this was halted in court and as of 2022, the 2016 restrictions hold. The Alaska Division of Oil and Gas currently leases state lands (including Prudhoe Bay oil field and nearshore marine waters) for oil, gas, and geothermal exploration.

A variety of government bodies are responsible for administering lands adjacent to this site. Village lands, owned by Native corporations, surround each of the four small communities in the area: Wainwright (Olgoonik Corporation), Utqiaġvik (formerly Barrow; Ukpeaġvik Iñupiat Corporation), Nuiqsut (Kuukpik Native Corporation), and Kaktovik (Kaktovik Inupiat Corporation) (ASRC 2013).

Bordering the western segment of this site is the 22-million-acre National Petroleum Reserve-Alaska (NPR-A): federally managed by the Bureau of Land Management (BLM), it is the largest tract of undisturbed public land in the United States. Within the NPR-A, there are five designated Special Areas (Kasegaluk Lagoon, Peard Bay, Teshekpuk Lake, Colville River, and Utukok River Uplands) with Kasegaluk Lagoon, Peard Bay, and Teshekpuk Lake specifically managed to protect waterbird habitat in nearshore and onshore areas (BLM 2013). With the exception of the eastern part of the Teshekpuk Lake Special Area, oil and gas leasing is prohibited in these areas, as are drilling pads or processing facilities in coastal waters or on lands within one mile of the coast. Currently, 52% of the land is available for oil and gas leasing, primarily in the northeastern portion of the reserve, near Teshekpuk Lake and the Colville River. Infrastructure regulations would also permit pipelines to pass through the Peard Bay Special Area, if required to support development of offshore leases in the Chukchi and Beaufort seas (BLM 2013).

The BLM is currently (March 2022) evaluating a new Integrated Activity Plan and Environmental Impact Statement for the NPR-A, which could open new areas to leasing, examine current boundaries of Special Areas, and alter lease stipulations and best management practices. The process will also consider the options of building pipelines and other infrastructure to transport oil and gas resources from offshore leases to the Trans-Alaska Pipeline System and consider potential for a road system connecting North Slope communities (BLM 2018).

The BLM is currently (March 2022) reviewing a 2020 Integrated Activity Plan and Environmental Impact Statement for the NPR-A. If BLM's preferred alternative is confirmed, conservation measures of the 2013 IAP/EIS will remain.

Along the eastern portion of this site, the U.S. Fish and Wildlife Service manages the 19-million-acre Arctic National Wildlife Refuge (Arctic Refuge). When the refuge was created in 1980, a large portion was designated as wilderness and the 1.5-million-acre coastal plain (the "1002 area") was identified as very important wildlife habitat that also has potentially enormous oil and gas reserves. The Tax Cuts and Jobs Act of 2017 directs the secretary of the interior to establish and administer a competitive oil and gas program in the 1002 area, with a maximum of 2000 surface acres to be authorized. In August 2020, the Department of Interior released a final record of decision for the Coastal Plain Oil and Gas Leasing Program, but the program was blocked in late 2020 by several lawsuits. In June 2021, the Department of Interior suspended all activities related to the oil and gas leasing program in the Arctic Refuge, pending completion of a comprehensive analysis under the National Environmental Policy Act, which was started in January 2022.

Essentially this entire key habitat site overlaps with several Important Bird Areas (IBAs): Kasegaluk Lagoon IBA, Chukchi Sea Nearshore IBA, Barrow Canyon and Smith Bay IBA, Teshekpuk Lake-East Dease Inlet IBA, Colville River Delta IBA, Beaufort Sea Nearshore IBA, Northeast Arctic Coastal Plain IBA (Audubon Alaska 2016). Designation as an IBA recognizes important avian resources, but does not confer any legal protection of a site.

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Western Canadian Arctic Key Sites

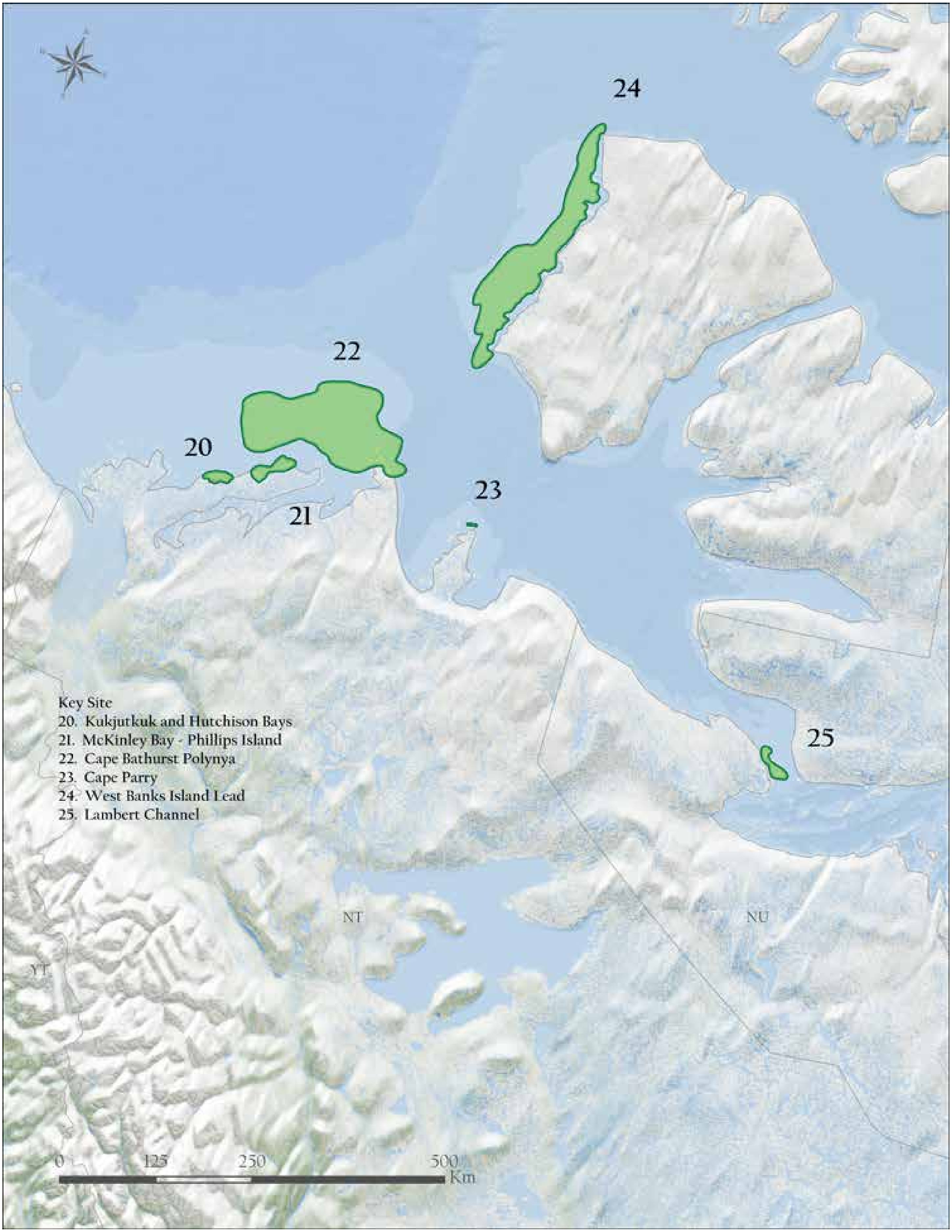


Figure 5. Key habitat sites for sea ducks in the Western Canadian Arctic.

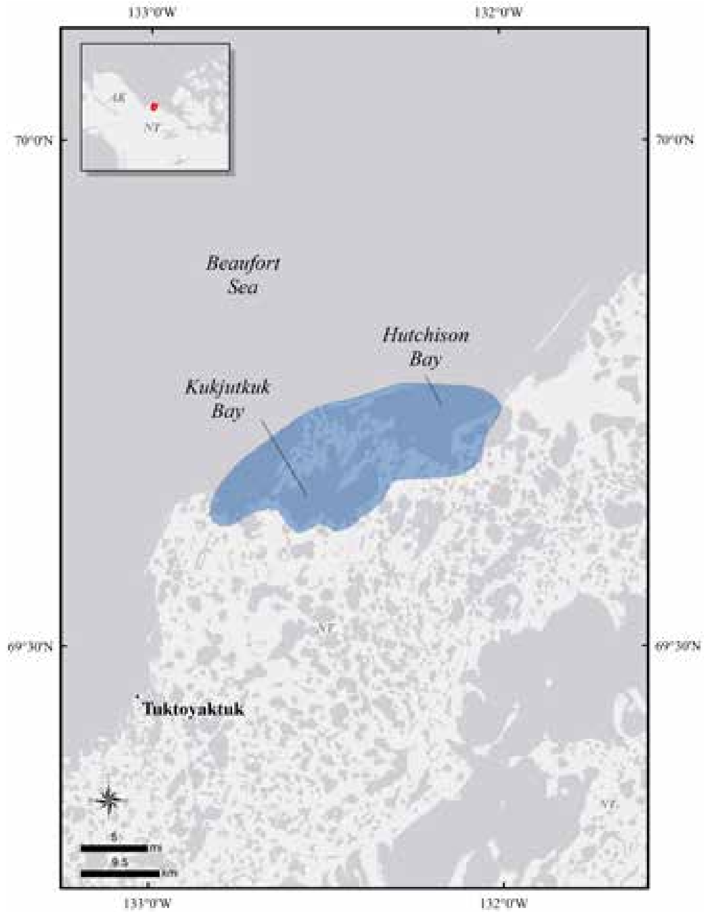
Key Site 20: Kukjutkuk and Hutchison Bays, Northwest Territories

Location: 69°41'10"N, 132°24'41"W

Size: 315 km²

Description: Kukjutkuk and Hutchison bays are located on the northern coast of the Tuktoyaktuk Peninsula, 25 to 50 km northeast of the community of Tuktoyaktuk. This and other parts of the northern Tuktoyaktuk Peninsula have a highly irregular coastline and diverse geographic features, including sandy barrier islands, sand spits, and sheltered bays and lagoons. Inland from the coast, the relief is low and the landscape is characterized by numerous ponds and lakes, abundant tundra polygons, extensive wetlands, and lowland tundra with numerous pingos.

Kukjutkuk Bay and Hutchison Bay are each approximately 100 km² in area. These shallow bays provide molting waterfowl with protection from terrestrial predators, shelter from wind and rough seas, and, in the case of sea ducks, abundant food at an accessible depth.



Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: The area is used by waterfowl at all times during the spring and summer but is especially important to molting or pre-molting diving ducks. Hutchison Bay annually supports over 15,000 molting or pre-molting diving ducks, mainly Long-tailed Ducks (*Clangula hyemalis*), Surf Scoters (*Melanitta perspicillata*), and White-winged Scoters (*M. deglandi*), with lesser numbers of Red-breasted Mergansers (*Mergus serrator*) and Common Mergansers (*M. merganser*) in late summer (Barry and Barry 1982, Sirois and Dickson 1989, Cornish and Dickson 1994). Similar quantitative surveys have not been carried out at Kukjutkuk Bay, but reconnaissance surveys suggest that molting waterfowl are probably as numerous there as at Hutchison Bay. Thus, a conservative estimate of the number of diving ducks using the overall key habitat site (marine and terrestrial) in late summer is 30,000 birds, of which a high proportion are Long-tailed Ducks and Scoters (Cornish and Dickson 1994).

Populations of many sea duck species have been in decline in the western Arctic since the 1970s (Dickson and Gilchrist 2002), making recognition and conservation of their habitat of even greater importance.

Sensitivities: Lowland habitats are susceptible to terrain disturbance. Sea ducks are sensitive to disturbance during the nesting, brood-rearing, and molting periods.

Potential Conflicts: The general region has been subject to extensive seismic and exploratory drilling activity. Development of gas processing plants and a pipeline network is likely in the near future.

Status: This key site has been identified as Class D ("lands and waters where cultural or renewable resources are of particular significance and sensitivity throughout the year") in the Tuktoyaktuk Community Conservation Plan (WMAC 2016).

Kukjutkuk and Hutchinson bays are part of a Key Terrestrial Habitat Site (Site 11; Latour et al. 2008). Terrestrial areas are situated on Inuvialuit lands, while marine waters fall under federal jurisdiction.

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Key Site 21: McKinley Bay–Phillips Island, Northwest Territories

Location: 70°07'23"N, 130°57'3"W

Size: 593 km^2

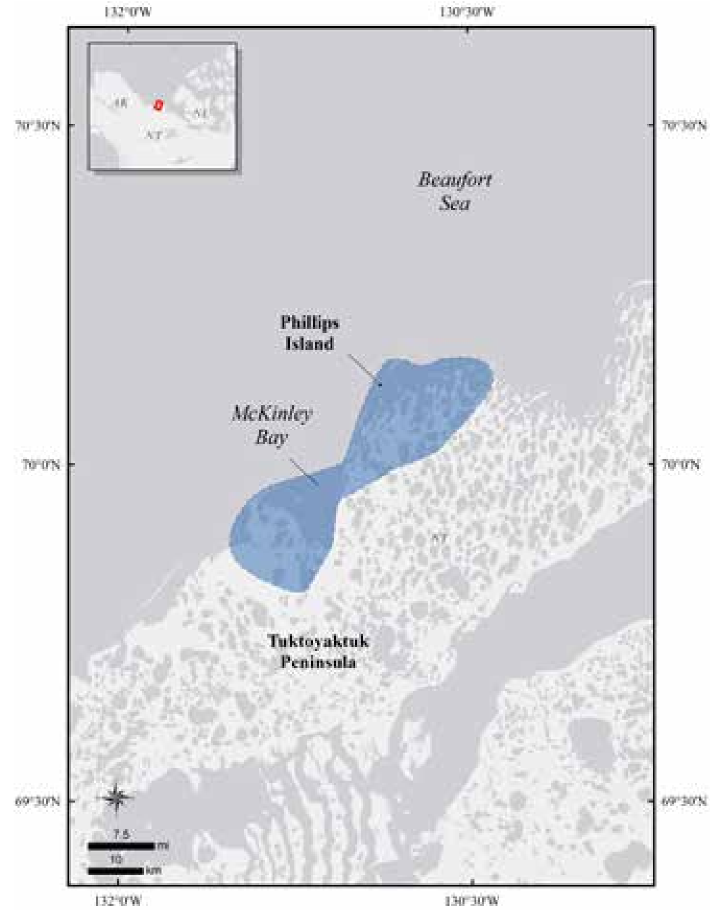
Description: The McKinley Bay–Phillips Island area is located on the northern coast of the Tuktoyaktuk Peninsula, 120 km northeast of Tuktoyaktuk. It is an area of convoluted coastline, numerous sand barrier islands, and sheltered bays and lagoons. Inland from the Beaufort Sea coast, the relief is low and the landscape characterized by numerous ponds and lakes, abundant tundra polygons, extensive wetlands, and lowland tundra.

McKinley Bay is a large (>100 km^2), shallow, and sheltered bay. Since 1979, the outer part of the bay has been used as a harbor and support base for offshore drilling operations in the Beaufort Sea. An entrance channel and mooring basin were dredged in the outer bay, and an artificial island (Phillips Island) was constructed to shelter ships. An airstrip, accommodations for crews, and a number of related facilities were constructed on the island as well. The use of McKinley Bay for harboring ships peaked in 1982 to 1985, and use of the area fell off greatly in the early 1990s. Some industry-related structures and facilities used by reindeer herders also occur on the northwestern side of McKinley Bay, near Atkinson Point.

The area near Phillips Island, like much of the northern coastline of the Tuktoyaktuk Peninsula, features a diversity of coastal landforms, including bays and lagoons of various sizes, offshore barrier beaches and sand bars, projecting and recurved sand spits, muddy tidal flats and marshes, numerous islands, and sandy/gravelly shoreline beaches. The lowlands near the coast contain numerous grass ponds and lakes and wetland communities dominated by grasses and sedges.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: McKinley Bay and the various bays and lagoons near the coast are heavily used by



molting and pre-molting ducks (Arner et al. 1985, Alexander et al. 1988, Cornish and Dickson 1994, Bartzen et al. 2017). Historically, well over 25,000 molting diving ducks (sea ducks and Scaup) have been present in the McKinley Bay–Phillips Island area during most years, including than 20,000 sea ducks—primarily Long-tailed Duck (*Clangula hyemalis*), Surf Scoter (*Melanitta perspicillata*) and White-winged Scoter (*M. deglandi*), which use the marine part of McKinley Bay during most years (Alexander et al. 1988a, 1988b, Cornish and Dickson 1994). Research conducted there in 2001–2002 (Bartzen et al. 2017) indicated fewer than 10,000 sea ducks.

Populations of many sea duck species have been in decline in the western Arctic since the 1970s (Dickson and Gilchrist 2002), making recognition and conservation of their habitat of even greater importance.

Approximately 7300 Western King Eiders (*Somateria spectabilis*) and Pacific Common Eiders (*S. mollissima v-nigra*) are found in this area in small colonies

(Alexander and Hawkings 1988, Alexander et al. 1988a, 1988b).

Sensitivities: Lowland habitats are susceptible to terrain disturbance through the disruption of natural drainage patterns and the melting of permafrost. Sea ducks are sensitive to disturbance during the nesting, brood-rearing, and molting periods.

Potential Conflicts: The general region has been subject to extensive seismic and exploratory drilling activity. Development of gas processing plants and a pipeline network is possible in the near future. Additional dredging of the harbor and/or development of facilities at McKinley Bay could have an impact on migratory birds and their habitat. In 2016 Canada designated the Arctic waters indefinitely off limits to new offshore oil and gas activities and in 2019 suspended the terms of all active oil and gas licenses in the western and eastern Arctic offshore areas. The moratorium will be in place until a review process for existing licenses is completed, which is expected in 2022.

Status: This key site has been identified as Class D ("lands and waters where cultural or renewable resources are of particular significance and sensitivity throughout the year") in the Tuktoyaktuk Community Conservation Plan (WMAC 2016). McKinley Bay is part of a Key Terrestrial Habitat Site (Site 10; Latour et al. 2008). The terrestrial areas are under territorial jurisdiction while the marine waters are under federal jurisdiction.

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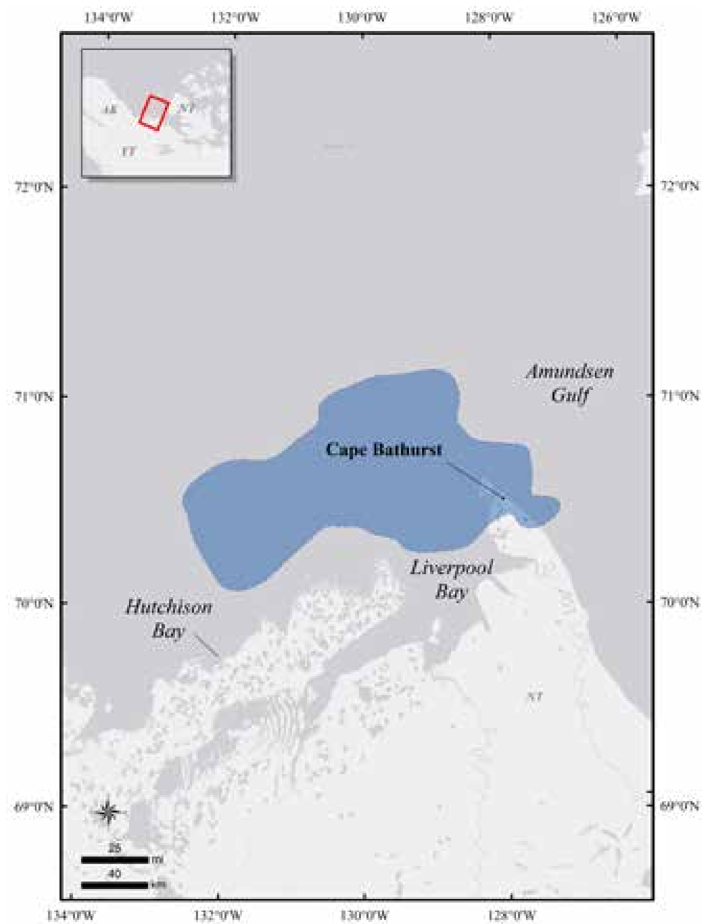
Key Site 22: Cape Bathurst Polynya, Northwest Territories



Location: 70°40'51"N, 129°45'51"W

Size: 12,835 km^2

Description: This key site includes the portion of the recurring polynya that forms in the western Amundsen Gulf north of Tuktoyaktuk Peninsula. It is situated offshore of McKinley Bay and Cape Dalhousie and extends southeast to the Baillie Islands, covering the northern tip of the Bathurst Peninsula.

This site lies in the Low Arctic oceanographic zone (Nettleship and Evans 1985). A recurrent crack and lead system develops in the Beaufort Sea between the landfast ice and Arctic pack ice. This persistent lead coincides with the 30-m depth contour and changes its position very little from year to year (Marko 1975). Freeze-up occurs between mid-October and mid-November, but patches of open water and new ice occur frequently during the winter. An open lead develops on the eastern side of Cape Bathurst sometime in January. By mid-May, open water is continuous from Cape Bathurst to Mackenzie Bay. Open water remains in the general area until late May or early June, when the ice between Cape Bathurst and Cape Kellett begins to disintegrate. With the advance of breakup in mid-June, the open water between Cape Bathurst and Cape Kellett enlarges into Amundsen Gulf (Smith and Rigby 1981, Alexander et al. 1997).

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: While few seabirds use this marine site (Wong et al. 2014), it is a critical area for sea ducks (Alexander et al. 1988). Populations of many sea duck species have been in decline in the western Arctic since the 1970s (Dickson and Gilchrist 2002), making recognition and conservation of their habitat of even greater importance.

The recurrent leads in this area serve as a migration corridor and staging area for large numbers of King Eider (*Somateria spectabilis*), Common Eider (*Somateria mollissima v-nigra*), and Long-tailed Duck (*Clangula hyemalis*) (Alexander et al. 1997, Dickson and Smith 2013). The most critical areas for eiders are patches of open water with depths between 10 and 40 meters (Dickson and Smith 2013). Common and King eider stage at this site in mid-May to early June before arriving on the breeding grounds (Dickson 2012a, 2012b). Post-breeding usage of this area occurs throughout mid-spring to early fall due to differences in timing of molt migration between male and female eiders (Dickson 2012a).

Populations of many sea duck species have been in decline in the western Arctic since the 1970s (Dickson and Gilchrist 2002), making recognition and conservation of their habitat of even greater importance.

In 1974, 50,000 Common Eiders were observed in a large lead near Cape Dalhousie (33% of the continental population of *v-nigra*; Barry 1976), and 75,000 were observed in leads north of Liverpool Bay at the same time (50% of the continental population;

Searing et al. 1975). Approximately 25,000 Common Eiders were observed near the Baillie Islands in 1993 (17% of continental *v-nigra* population; Alexander et al. 1997). Single-day surveys in 1992 and 1993 recorded 63,000 King Eiders in this area (16% of the continental population; Alexander et al. 1997). These eiders form a key component of the traditional diet of indigenous residents of nearby communities (Byers and Dickson 2001).

In 1974, over 24,000 Long-tailed Ducks were observed in the open-water lead north of Liverpool Bay (Searing et al. 1975) and approximately 17,000 Long-tailed Ducks were observed in the large lead near Cape Dalhousie (Barry 1976).

Sensitivities: Migrating sea ducks are heavily dependent upon open leads for feeding and resting. In a warming and increasingly variable climate, unpredictability of access to leads and open water areas may be greater due to effects of shifting winds on unconsolidated ice, which could result in severe negative impacts on the birds (Lovvorn et al. 2015). Sea ducks using these offshore foraging areas are susceptible to pollution, disturbance, and collisions from increased ship traffic.

Potential Conflicts: Extensive offshore drilling and ship traffic occur throughout the area, although mostly west of Hutchison Bay (Alexander et al. 1997). Exploitation of hydrocarbon resources in the Beaufort Sea increases the possibilities of oil spills in these sensitive areas. Warming temperatures in the Arctic may change the size and location of the sites and alter the food resources within these sites for sea ducks (Dickson and Gilchrist 2002). In 2016 Canada designated the Arctic waters indefinitely off limits to new offshore oil and gas activities and in 2019 suspended the terms of all active oil and gas licenses in the western and eastern Arctic offshore areas. The moratorium will be in place until a review process for existing licenses is completed, which is expected in 2022.

Status: The Bathurst Polynya is a Canadian Important Bird Area due to its large waterfowl concentrations (NT039; CEC 1999). The Cape Bathurst/Baillie Island Polynya, Liverpool Bay, Mackenzie Estuary/Nearshore Beaufort Shelf, and the Kugmallit Canyon have all been identified as Ecologically and Biologically Significant Areas (EBSA) in the Beaufort Sea (DFO 2014).

Cape Bathurst is Inuvialuit land, while the surrounding marine waters fall under federal jurisdiction.

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Key Site 23: Cape Parry, Northwest Territories

Location: 70°11'33"N, 124°40'2"W

Size: 8.2 km²

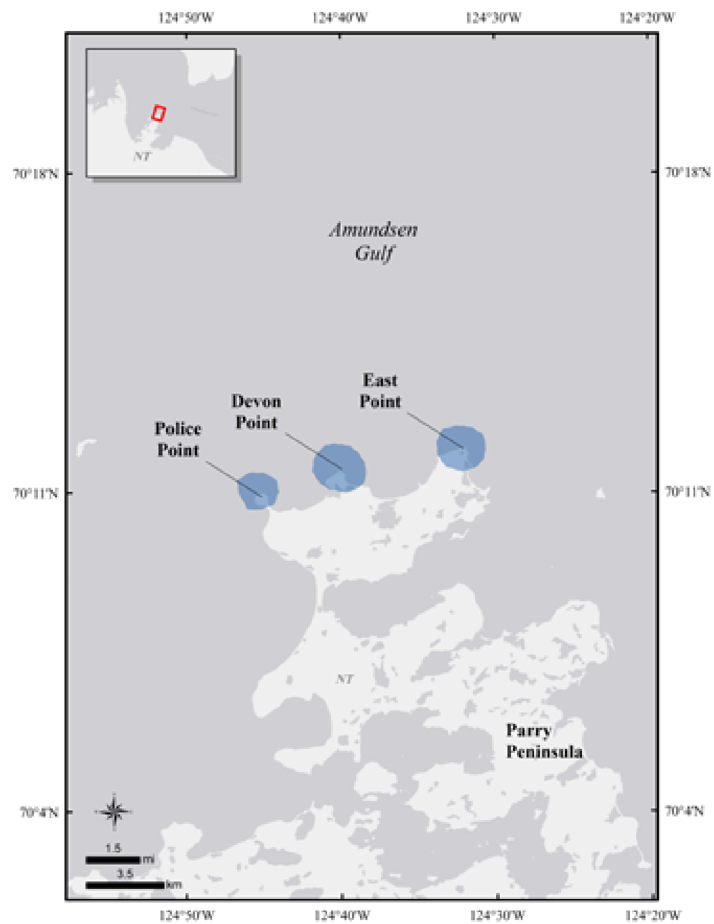
Description: Cape Parry consists of three points at the northern tip of the Parry Peninsula, 100 km north of Paulatuk. The underlying limestone forms three outcrops of coastal cliffs that rise 20 m above sea level. The coastline has beaches of sand and gravel and is deeply incised, forming numerous bays and small inlets. The peninsula is sparsely vegetated and is dotted with small lakes and ponds. A Distant Early Warning (DEW) site was located 3 km south of Police (West) Point from the 1950s to the 1980s.

Marine currents and a variable bathymetry result in marine upwellings that produce a rich marine environment in the vicinity of Cape Parry. Offshore, a series of lead and polynya systems form annually, typically coinciding with the 30-m depth contour (Marko 1975). These provide critical habitat for migrating sea ducks (summarized in Mallory and Fontaine 2004). Open water usually persists between May and November (Smith and Rigby 1981).

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: The recurrent leads immediately north of Cape Parry serve as a migration corridor for 20,000 Western King Eiders (*Somateria spectabilis*), Pacific Common Eiders (*S. mollissima v-nigra*), and Long-tailed Ducks (*Clangula hyemalis*) (Barry and Barry 1982, Alexander et al. 1988, Alexander et al. 1991). Densities at this site can reach 8500 sea ducks per square kilometer in spring and represent over 1% of these species' continental populations (NAWMP 2012).

Sensitivities: Migrating sea ducks are heavily dependent on open leads for feeding and resting. In a warming and increasingly variable climate, unpredictability of access to leads and open water areas may be greater due to effects of shifting winds on unconsolidated ice, which could result in severe negative impacts on the birds (Lovvorn et al. 2015).



Sea ducks using these offshore foraging areas are susceptible to pollution, disturbance, and collisions from increased vessel traffic.

Potential Conflicts: Extensive offshore drilling and ship traffic occur throughout the area, although mostly west of Hutchison Bay on the Tuktoyaktuk Peninsula (Alexander et al. 1997). Exploitation of hydrocarbon resources in the Beaufort Sea increases the possibility of oil spills in these sensitive areas. In 2016 Canada designated the Arctic waters indefinitely off limits to new offshore oil and gas activities and in 2019 suspended the terms of all active oil and gas licenses in the western and eastern Arctic offshore areas. The moratorium will be in place until a review process for existing licenses is completed, which is expected in 2022.

Status: This key site is within the Cape Parry Migratory Bird Sanctuary, an International Biological Programme Site (Site 4-11; Eng et al. 1989), an Important Bird Area in Canada (NT041; IBA Canada 2004), a Key Marine Habitat Site (Site 19;

Mallory and Fontaine 2004), and the Anguniaqvia Niqiqyuam Marine Protected Area. It has been identified as Class D ("lands where cultural or renewable resources are of particular significance and sensitivity throughout the year") in the Paulatuk Community Conservation Plan (WMAC 2016). Marine waters surrounding Cape Parry are under federal jurisdiction.

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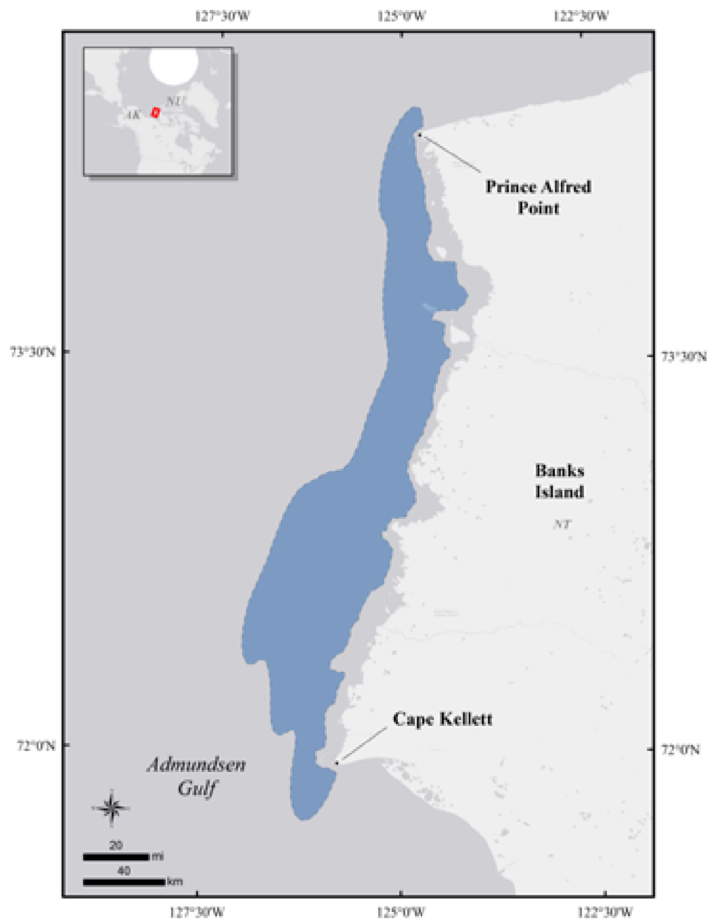
Key Site 24: West Banks Island Lead, Northwest Territories

Location: 73°13'23"N, 125°6'38"W

Size: 8540 km²

Description: The West Banks Island Lead is located along the western coastline of Banks Island, in the eastern Beaufort Sea. It is characterized by a flaw lead (open water between mobile pack ice and stationary landfast ice) along the island's coast that extends from Cape Prince Alfred at the northwest tip, south to Cape Kellett. Open water typically appears in late May and persists until freeze-up in December, with small patches remaining through most of the winter. The open water off Banks Island may join with the Admundsen Gulf–Cape Bathurst polynya or other leads that occur along the south coast (Stirling and Cleator 1981). Breakup, characterized by progressive widening of the lead, occurs rapidly in June, beginning at the southernmost tip and progressing northward (Smith and Rigby 1981, Alexander et al. 1997).

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.



Biological Value: Historically, ice conditions in the Beaufort Sea have been consistent from year to year (Alexander et al. 1994). The recurrent flaw lead off the western coast of Banks Island is an important staging area for migrating sea ducks. The most critical areas within the lead are those with depths between 10 and 40 m (Dickson and Smith 2013). King Eiders (*Somateria spectabilis*) stage at this site during the first two weeks in June before arriving on the breeding grounds (Dickson 2012a). More than 16,000 King Eiders were observed in the area north of Cape Kellet (Barry and Barry 1982) and as many as 95,000 birds were observed in a single day along the coast (Barry 1986). Surveys during the early 1990s observed 39,000 birds in the same area (Alexander et al. 1997). Larger numbers of King Eiders and Common Eiders (*Somateria mollissima*) use the Banks Island lead in years when ice conditions are unfavorable in the southeastern Beaufort Sea (Barry and Barry 1982).

Locally breeding King Eiders also use the flaw lead as a primary staging area prior to molt migration (Dickson 2012a). Male birds arrive in this area in late June, and females typically arrive by mid to late July and stage for two to four weeks (Dickson 2012b).

More than 1000 Common Eiders have been observed along the western coast of Banks Island north of Cape Kellett (Alexander et al. 1988a). Although occurring in higher densities inland on Banks Island, Long-tailed Ducks (*Clangula hyemalis*) are present in low numbers along this site (Alexander et al. 1988b).

Populations of many sea duck species have been in decline in the western Arctic since the 1970s (Dickson and Gilchrist 2002), making recognition and conservation of their habitat of even greater importance.

Sensitivities: Migrating sea ducks are heavily dependent on open leads for feeding and resting.

In a warming and increasingly variable climate, unpredictability of access to leads and open water areas may be enhanced by greater effects of shifting winds on unconsolidated ice, which could result in severe negative impacts on the birds (Lovvorn et al. 2015). Sea ducks aggregate in large flocks at offshore foraging areas, increasing their vulnerability to pollution and disturbance from increased ship traffic. The degradation of these open water areas could result in substantial negative impacts on western King Eider populations.

Potential Conflicts: The area west of Banks Island is subject to comparatively little resource exploration compared to the offshore drilling and ship traffic that occurs throughout the Mackenzie Delta and Tuktoyaktuk Peninsula areas to the south (Alexander et al. 1997). The area currently has no active exploration licenses for oil and gas development (Dickson and Smith 2013). Potential exploitation of hydrocarbon resources in the Beaufort Sea increases the possibilities of oil spills in these sensitive areas. In 2016 Canada designated the Arctic waters indefinitely off limits to new offshore oil and gas activities and in 2019 suspended the terms of all active oil and gas licenses in the western and eastern Arctic offshore areas. The moratorium will be in place until a review process for existing licenses is completed, which is expected in 2022. Warming temperatures in the Arctic may change the size and location of leads and alter the food resources within these sites for sea ducks (Dickson and Gilchrist 2002).

Status: This key site is within the Western Banks Island Ecologically and Biologically Significant Area (EBSA) in the northern region of the Beaufort Sea Large Ocean Management Area (LOMA) (DFO 2014). The area also falls within Banks Island Westerly Gradient Eco-Unit, characterized by 29% fast ice and mixed depths throughout its area (Hodgson et al. 2015). This site overlaps with three proposed Priority Conservation Areas (PCAs): the Banks Island slope, the Banks Marine Bird Sanctuary, and the Cape Prince Alfred area (DFO 2015). Marine waters of the West Banks Island lead are under federal jurisdiction.

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King Eiders. Photo: Tim Bowman.

Key Site 25: Lambert Channel, Nunavut

Location: 68°35'33"N, 114°5'32"W

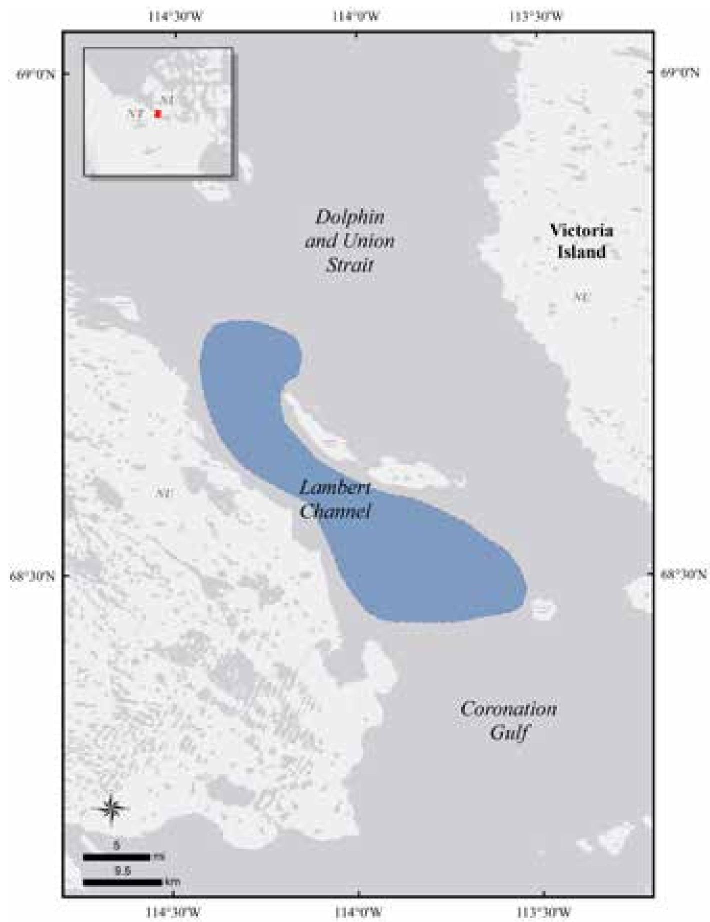
Size: 423 km²

Description: Lambert Channel is a narrow stretch of water between Dolphin and Union Strait and Coronation Gulf, near the community of Kugluktuk (aka Coppermine). It lies in the Low Arctic oceanographic zone (Nettleship and Evans 1985). A small polynya occurs in southern Dolphin and Union Strait between Victoria Island and the mainland. The appearance of open water is variable, ranging from February to June. Open water usually appears first on the southwestern side of Lambert and Camping islands and remains until breakup commences in the first part of July. Lambert Channel begins to freeze before the eastern side of Dolphin and Union Strait and is usually ice-covered by the end of October or the beginning of November (Smith and Rigby 1981). Lambert Channel is very shallow in places and contains numerous shoals. Hydrographic charts indicate that it has a strong current with heavy tidal rips (Smith and Rigby 1981).

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: More than 70,000 Common Eiders (*Somateria mollissima v-nigra*) were observed in this area from June 6 to 19, 1980, with roughly 18,000 eiders observed in one day. About 90% of the birds were resting and feeding, suggesting that it is a critical feeding area prior to nest initiation (Allen 1982). That survey also recorded approximately 5000 Long-tailed Ducks (*Clangula hyemalis)*, with more than 2000 birds observed on one day (Allen 1982). On June 9, 1993, 64,000 Common Eiders (at least 64% of the Canadian *v-nigra* population at that time) were observed in the polynya, most concentrated in the shallow, southeast end (Alexander et al. 1997).

Sensitivities: Migrating marine waterfowl are heavily dependent on shore leads and polynyas for feeding and resting (Dickson and Smith 2013). The degradation of these open-water areas could result in severe negative impacts on the birds. In a warming and increasingly variable climate, unpredictability of access to leads and open water areas may be greater due to shifting winds on unconsolidated ice, which could result in severe negative impacts on the birds (Lovvorn et al. 2015). Offshore foraging areas for marine birds are susceptible to pollution and disturbance from increased ship traffic. Degradation of this site could have a significant impact on populations moving through the area.



Potential Conflicts: Changes in ice patterns due to climate change, and increased shipping activity related to mineral exploitation and cruise ships in the region, could have an impact on birds using Lambert Channel. In 2016 Canada designated the Arctic waters indefinitely off limits to new offshore oil and gas activities and in 2019 suspended the terms of all active oil and gas licenses in the western and eastern Arctic offshore areas.

Status: Lambert Channel has been designated an Ecologically and Biologically Significant Area by Fisheries and Oceans Canada (DFO 2011). This key site also overlaps with a Key Marine Habitat Site (Site 20; Mallory and Fontaine 2004). Marine waters of Lambert Channel are under federal jurisdiction.

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Eastern Canadian Arctic and Hudson Bay Key Sites

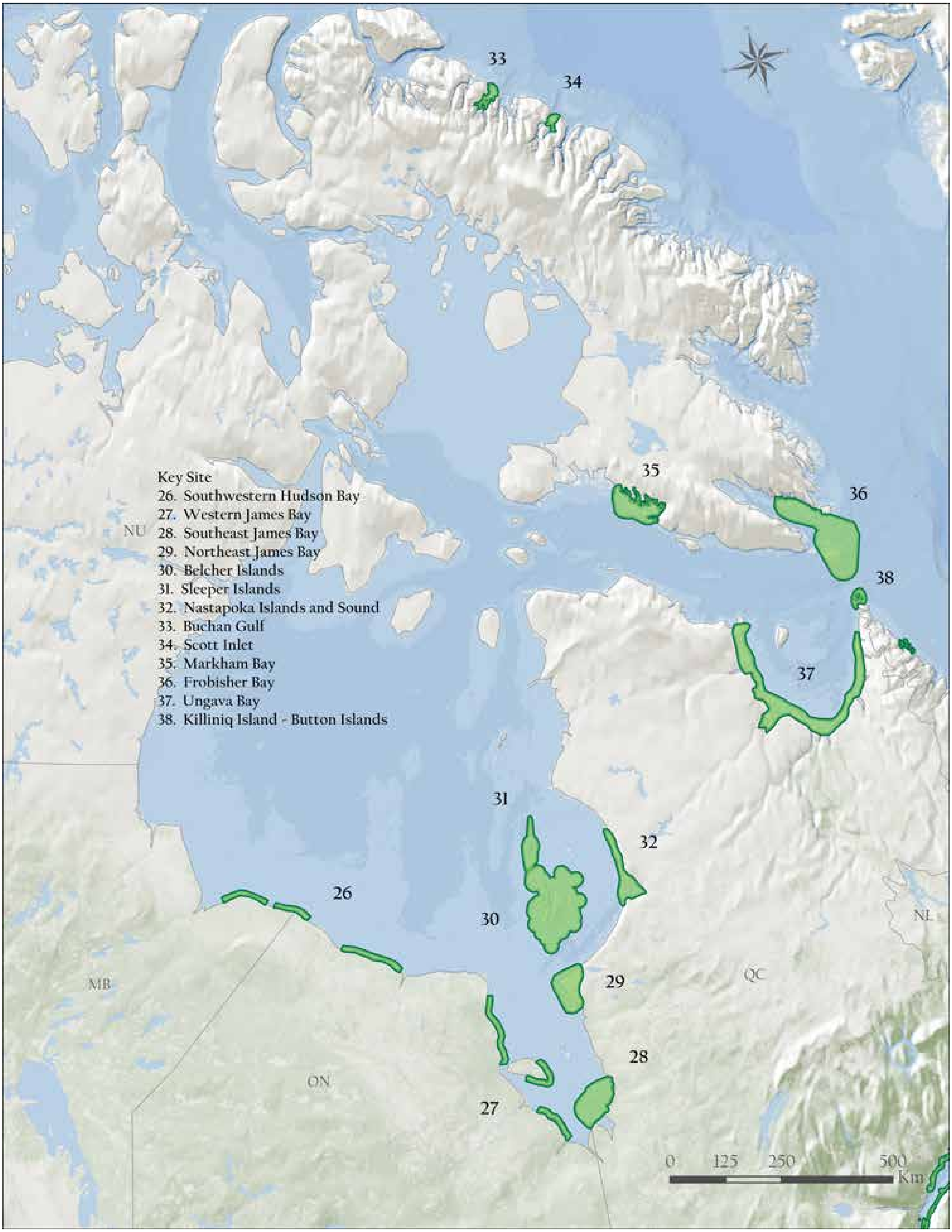


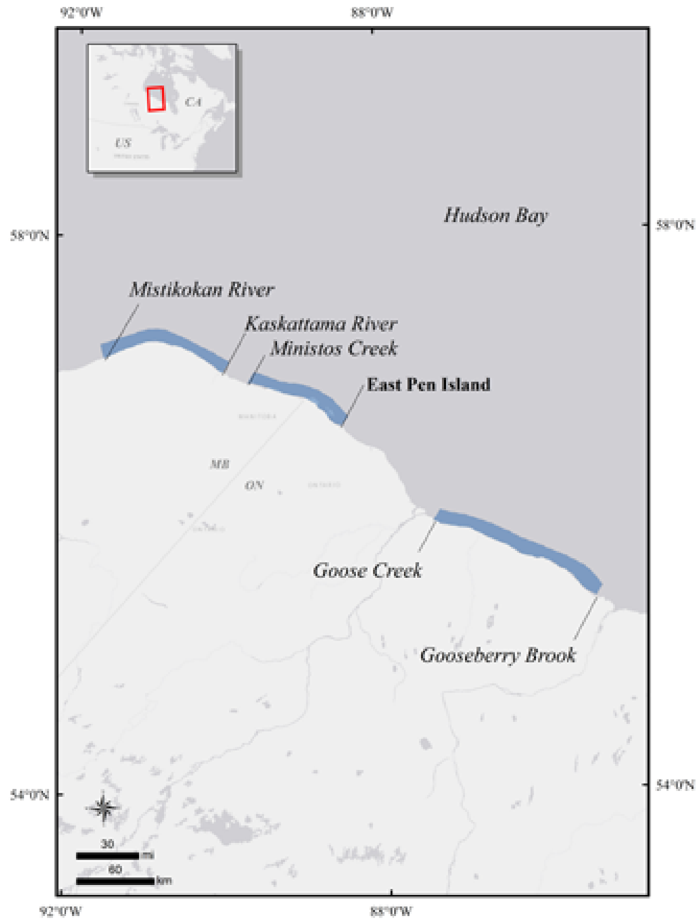
Figure 6. Key habitat sites for sea ducks in the Eastern Canadian Arctic and Hudson Bay.

Key Site 26: Southwestern Hudson Bay, Manitoba and Ontario

Location: 56°32'18"N, 87°55'28"W

Size: 3315 km^2

Description: There are several locales along the Hudson Bay coastlines of Manitoba and Ontario where sea ducks have congregated in relatively high numbers over the past several decades. These locales occur in the marine habitat adjacent to one of the most extensive wetland complexes in the world, the Hudson Bay Lowland. Hudson Bay is an inland brackish sea, with low range semidiurnal tides, which receives salt water from the Arctic and Atlantic oceans via the Fury and Hecla Strait and Hudson Strait and freshwater inputs via numerous rivers; some of the larger rivers in this area include the Seal, Churchill, Nelson, Hayes, Severn, and Winisk rivers (Stewart and Lockhart 2005).



Coastlines throughout this area are generally characterized by a seaward to landward progression of offshore and nearshore marine waters to subtidal flats grading to often extensive tidal mudflats, intertidal and supratidal salt marsh habitats, or coastal raised gravel/sand beach ridges (Martini et al. 1980). The relatively high rate of isostatic rebound occurring in this area continually causes the land along the Hudson Bay coast and further inland to rise and become vegetated (Sella et al. 2007); over time this has led to the formation of an expansive complex of freshwater wetlands, typically bogs and fens, among the remnant low coastal beach features now vegetated with tundra-associated vegetation near the coast and grading inland to boreal-associated vegetation (Martini et al. 1980).

Hudson Bay undergoes a complete cryogenic (ice) cycle each year, and this part of the bay has noticeable areas of open water or is ice-free from about early/mid-July to early/mid-November (Gagnon and Gough 2005). Ice typically begins to form along the coastlines of southern Hudson Bay in late October and early November, freeze-up occurs by mid-November or early December, and ice covers much of Hudson Bay by mid-to-late December (Gagnon and Gough 2005, Stewart and Lockhart 2005), with the exception of a few leads and polynyas that typically remain ice-free throughout winter (Jonkel 1969, Gilchrist and Robertson 2000). Ice break-up typically occurs in mid-to-late July and in most years this part of Hudson Bay is relatively ice-free by early to mid-August (Gagnon and Gough 2005, Stewart and Lockhart 2005).

Precision and Correction of Estimates Presented: Molting scoter data were obtained between mid-July and mid-August of 2013 during aerial surveys flown within about 15 km of the Ontario and Manitoba coastlines (Appendix 1). Abundance data for scoters were obtained either from digital images of flocks within which individuals were subsequently counted; if photographs/images were not taken or useable, visual estimates (based on a single observer) and regression techniques were used to obtain an estimate of individuals within observed flocks. No correction for visibility or other biases were applied to molting scoter data. See Badzinski et al. (2013) for more detailed information about data collection and analytical methodologies applied to these datasets.

Biological Value: Relatively little information is available for sea duck abundance and distribution within the marine habitat of Hudson and James bays or the adjacent Hudson Bay Lowland, particularly during the spring migration/staging, breeding, and fall migration/staging periods (Ross 1982, 1983, 1987, Bordage and Savard 1995, Reed et al. 1996, Cadman et al. 2007, Abraham et al. 2008, Brook et al. 2012). To date, all species abundance and geographic distribution data contributing to the identification of these key sites have been from offshore surveys (aerial photographic counts) flown during summer (mid-July to mid-August) to periodically monitor molting scoters throughout various portions of James Bay and southern Hudson Bay (Ross 1983, 1994, Ross et al. 2009, Badzinski et al. 2013). Satellite telemetry data from the Sea Duck Joint Venture (SDJV) Atlantic and Great Lakes Sea Duck Migration Study (2015) have confirmed continued use of many previously known molting sites (Ross 1994, Ross et al. 2009) and have provided insight into residence times of birds at specific areas, local movement patterns within and among molt sites, faithfulness of birds to specific sites from year to year, as well as for spring and fall migration to, from, or through these areas (SDJV 2014).

The vast majority of scoters (>90 to 95%) observed at these locales appear to be Black Scoter (*Melanitta americana*), predominantly adult males (Ross 1994, Badzinski et al. 2013). Molting flocks of Black Scoter at these locales are commonly observed within the range of hundreds to thousands (occasionally 10,000 to 15,000) of birds. Surf Scoter (*Melanitta perspicillata*) and White-winged Scoter (*Melanitta deglandi*) are less common but have been observed in relatively smaller numbers within flocks of Black Scoter or in species-specific flocks of tens to hundreds of birds. Presently, it is unknown why scoters traditionally congregate in substantial numbers at these key sites to molt their wing feathers and/or use until the fall migration, but is probably related to the availability and abundance of preferred forage or prey species in the area, likely bivalves *Macoma* spp. or *Mytilus* spp. (Ross 1994, Reed et al. 1996).

In addition to scoters, several other sea duck species use these sites at various times of the year, but specific estimates of abundance for these species are limited (see Ross 1982, Canadian Wildlife Service unpublished data). Common Eiders (*Somateria mollissima sedentaria*), which are year-round residents of Hudson and James bays (Abraham and Finney 1986), have been observed during January and February in open water leads in the ice off the Ontario coast near the juncture of Hudson and James bays at Cape Henrietta Maria (K. Abraham, pers. obs.); between 3 and 332 eiders also have been observed during spring, summer, and fall in this area (Canadian Wildlife Service unpublished data). Relatively small numbers (2 to 132) of eiders (20 identified as Common Eiders) also have been observed near the Pen Islands during summer and fall (Canadian Wildlife Service unpublished data). Bufflehead (*Bucephala albeola*), Common Goldeneye (*Bucephala clangula*), Long-tailed Duck (*Clangula hyemalis*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), Hooded Merganser (*Lophodytes cucullatus*), Black Scoter, Surf Scoter, and White-winged Scoter have been observed in this part of the bay and at some of these sites during spring and fall migration and summer molt periods in varying abundances (SDJV 2014, Wilson and McRae 1993, Abraham and Wilson 1997, Canadian Wildlife Service unpublished data).

A survey conducted during early to mid-August 2013 in southwestern Hudson Bay along the Manitoba and Ontario coastlines (<15 km offshore) between the Seal River delta (Manitoba) and the Sutton River/Cape Henrietta Maria area (Ontario) reported site-specific abundances of molting scoters ranging from 541 to 44,593, with a total of 121,942 scoters for the entire area (Badzinski et al. 2013; Appendix 1). The western coastline of Manitoba, specifically the area from Hayes River north to the Seal River delta, had relatively fewer molting scoters during 2013 (8,948) than did areas in the province farther south and east; the largest concentration in this region was located in the southern portion between the Nelson River/Hayes River and White Bear Creek (6,575). The largest molting concentrations occurred east of the Nelson River and Hayes River along the Manitoba coastline in southwestern Hudson Bay at three adjacent locales between the Mistokokan River and Naytow Creek (18,924), Naytow Creek and Anabusko River (44,593), and the Anabusko and Kaskattama rivers (17,880) where 81,397 molting scoters were observed in 2013. Notable numbers of molting scoters also were found along the extreme northeastern Manitoba and northwestern Ontario coastlines at adjacent locales between the Kettle and Black Duck rivers (12,500) in Manitoba and in the West Pen Island (1660) and East Pen Island (1,119) areas of Ontario where a total of 15,279 birds were recorded during 2013. During a 1991 survey, a total of 23,720 scoters were recorded in the Kettle River/Pen Islands area (Kettle River to Black Duck River = 17,620; West Pen Island area = 2210; East Pen Island area = 3950) in mid-July. Surveys reported 43,700 in 1977, 6180 in 1991, and 11,836 in 2013 molting sea ducks (predominantly Black Scoters) between Shell Brook and Wood Creek (mostly in the vicinity of Shell Brook) along the Ontario coastline of southern Hudson Bay in July and August (Ross 1994, Badzinski et al. 2013).

Sensitivities: Sea ducks are sensitive to degradation of their staging, molting and foraging areas. Human disturbance can have negative effects on birds, particularly while foraging or during the molting period.

Potential Conflicts: Oil exploration, transoceanic shipping, and mining are potential sources of disturbance, habitat degradation, or pollution. Hydroelectric development (dams, etc.) on the bays or rivers on the adjacent mainland could impact the water regime and salinity of the James and Hudson Bay marine ecosystems. Climate change could change seasonal distribution (e.g., northward shifts in range) of birds and the distribution and abundance of sea duck foods.

Status: Polar Bear Provincial Park (PBPP), largely established to protect terrestrial and some marine habitat critical for the southern Hudson Bay population of polar bears, lies in the northeast corner of Ontario inland from the James Bay and Hudson Bay shorelines (Obbard and Walton 2004). There is a federal migratory bird sanctuary along the eastern two-thirds of Akimiski Island coast; most of the island's coastline has been identified as a Key Migratory Bird Terrestrial Habitat site by the Canadian Wildlife Service (Latour et al. 2008). There is a federal migratory bird sanctuary, the Shipsands Migratory Bird Sanctuary, located in the Moose River Estuary. There are also several Important Bird Areas designated within this part of James Bay, including Cape Henrietta Maria (lies within Polar Bear Provincial Park), Ekwan to Lakitusaki Shores (north half lies within Polar Bear Provincial Park), Akimiski Strait, Akimiski Island, Albany River Estuary and Associated Coastline, Longridge Point and Associated Coastline, Big Piskwanish Point, North Point (also a proposed Western Hemisphere Shorebird Reserve Network Site of International Significance), Moose River Estuary (also a RAMSAR site wetland of international importance). For more information on individual important bird areas see site descriptions at http://ibacanada.ca/. A comprehensive list of protected areas in the Hudson Bay Lowland is found in Abraham et al. (2011).

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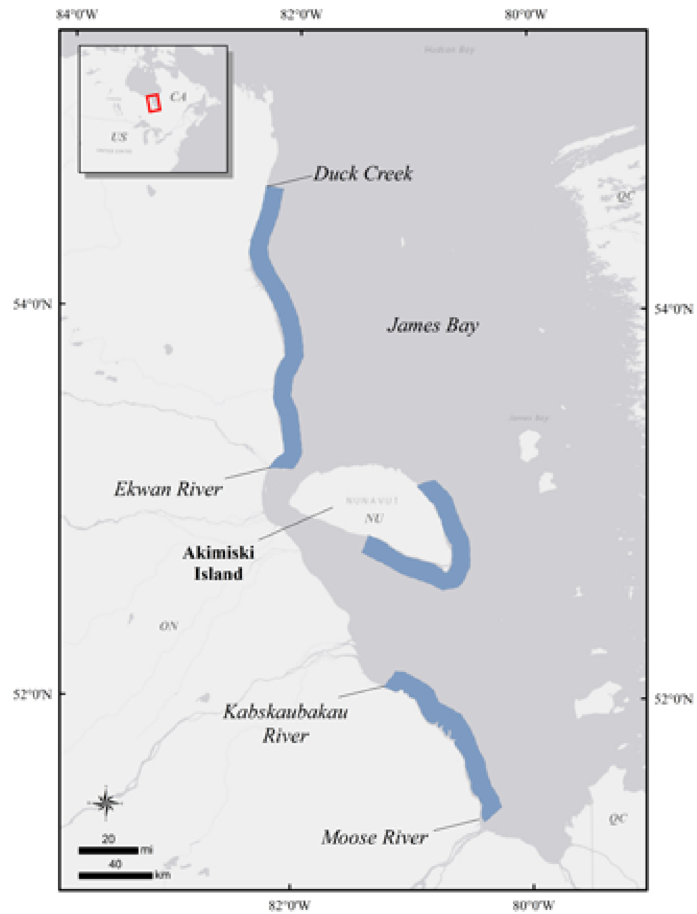
Key Site 27: Western James Bay, Ontario, and Nunavut



Location: 53°00'37"N, 81°16'5"W

Size: 4150 km^2

Description: The nearshore and offshore marine habitats of western James Bay along the coastlines of Ontario and nearby (approximately 15 km) Akimiski Island (Nunavut) contain large seasonal concentrations of sea ducks. These habitats are adjacent to one of the most extensive wetland complexes in the world, the Hudson Bay Lowland. James Bay is a relatively shallow inland brackish sea with low range semidiurnal tides. The bay receives salt water from the Arctic and Atlantic oceans via the Fury and Hecla Strait and Hudson Strait and freshwater inputs via numerous streams and rivers; some of the larger in this area include the Lakitusaki, Opinnagau, Swan, Ekwan, Attawapiskat, Kapiskau, Albany, and Moose rivers (Stewart and Lockhart 2005).

Coastlines throughout this area are generally characterized by a seaward to landward progression of offshore and nearshore marine waters to subtidal flats grading to often extensive tidal mudflats, intertidal and supratidal salt marsh habitats, or coastal raised gravel/sand beach ridges (Martini et al. 1980). The relatively high rate of isostatic rebound occurring in this area continually causes the land along the James Bay coast and further inland to rise and become vegetated (Sella et al. 2007); over time this has led to the formation of an expansive complex of freshwater wetlands, typically bogs and fens, among the remnant low coastal beach features now vegetated with spruce and other boreal terrestrial plants or wetland-associated vegetation (Martini et al. 1980).

James Bay undergoes a complete cryogenic (ice) cycle each year, and this part of the bay has noticeable areas of open water or is ice-free from about late May to early December (Gagnon and Gough 2005). Ice typically begins to form along the coastlines of western James Bay in mid-to-late November, freeze-up occurs by late November to early December, and by mid-to-late December ice covers much of James Bay (Gagnon and Gough 2005, Stewart and Lockhart 2005), with the exception of a few leads and polynyas that remain ice-free throughout winter (Jonkel 1969, Gilchrist and Robertson 2000). Ice break-up typically occurs in mid-/late May south of Akimiski Island and early/mid-June elsewhere along the Ontario coast (Gagnon and Gough 2005, Stewart and Lockhart 2005). For more detail on the oceanography, geomorphology, soils, sediments, climate, vegetation, and wildlife of James Bay, see Martini et al. (1980), Wilson and McRae (1993), Abraham et al. (2011), Abraham and Keddy (2005), Stewart and Lockhart (2005) and Martini (2017).

Precision and Correction of Estimates Presented: Molting scoter data were obtained between mid-July and mid-August in 2006, 2009, 2012, and 2013 during cruise-style, aerial surveys flown within about 15 km of the Quebec, Ontario, Manitoba, and Akimiski Island – Nunavut coastlines. Abundance estimates were obtained from digital images of flocks within which individuals were subsequently counted; if images were not taken or useable, visual estimates (based on a single observer) and regression techniques were used to obtain an estimate of individuals within observed flocks. No correction for visibility or other biases was applied to molting scoter data. See Ross and Abraham (2009), Ross et al. (2009), and Badzinski et al. (2013) for more detailed information about data collection and analytical methodologies applied to these datasets.

Biological Value: Relatively little information is available for sea duck abundance and distribution within the marine habitat of Hudson and James bays or the adjacent Hudson Bay Lowland, particularly during the spring migration and staging, breeding, and fall migration and staging periods (Ross 1982, 1983, 1987, Bordage and Savard 1995, Reed et al. 1996, Cadman et al. 2007, Abraham et al. 2008, Brook et al. 2012). Data used to identify key sites resulted from aerial photographic surveys flown during summer (mid-July to mid-August) of 2006, 2009, and 2012 undertaken periodically to monitor scoters undergoing remigial (wing feather) molt in James Bay and southern Hudson Bay (Appendix 1) (Ross and Abraham 2009, Ross et al. 2009, Badzinski et al. 2013; see Ross 1982, 1994 for earlier survey results). Satellite telemetry data from the Sea Duck Joint Venture (SDJV) Atlantic and Great Lakes Sea Duck Migration Study (Bowman et al. 2021, Lamb et al. 2021) have confirmed continued use of many previously known molting sites (Ross 1994, Ross et al. 2009). Satellite telemetry data also have provided insight into residence times of birds at specific areas, local movement patterns within and among molt sites, faithfulness of birds to specific sites from year to year, and spring and fall migration to, from, or through these areas (SDJV 2015).

The vast majority of scoters (>90 to 95%) observed in western James Bay appear to be Black Scoter (*Melanitta americana*), predominantly adult males (Ross 1994, Badzinski et al. 2013). Molting flocks of Black Scoter at these locales are commonly observed within the range of hundreds to thousands (occasionally 10,000 to 15,000) of birds. Surf Scoter (*Melanitta perspicillata*) and White-winged Scoter (*Melanitta deglandi*) appear to be less common but have been observed in relatively smaller numbers within flocks of Black Scoter or in species-specific flocks that number in the tens to hundreds of birds. It is unknown why scoters congregate in substantial numbers at these key sites to molt their wing feathers and/or remain until the fall migration, but it is presumably related to factors influencing the availability and abundance of preferred forage or prey species in the area, likely bivalves *Macoma* spp. or *Mytilus* spp. (Ross 1994, Reed et al. 1996).

Surveys of molting scoters were conducted within the marine habitat along the Ontario coastline in northwestern James Bay during mid-to-late July in 2006, 2009, and 2013 (Ross and Abraham 2009, Ross et al. 2009, Badzinski et al. 2013). The majority of scoters were found between Duck Creek and the Ekwan River, where 46,570 (2006), 40,160 (2009), and 46,870 (2012) were observed throughout the area. Sites within this area with the largest congregations of scoters included the areas between Nowashe Creek and Swan River (25,947 in 2009, 13,905 in 2012) and Swan River and Ekwan River (16,119 in 2006, 27,388 in 2012).

Surveys of the marine habitat adjacent to Akimiski Island conducted in 2006, 2009, and 2012 determined there were 33,665, 21,850 and 31,393 scoters, respectively, along its southeastern and northeastern coastlines (Ross and Abraham 2009, Ross et al. 2009, Badzinski et al. 2013).

The most recent aerial photographic surveys of molting scoters were conducted during 2006, 2009, and 2013 in marine waters along the Ontario coastline of southwestern James Bay (Ross and Abraham 2009, Ross 1994, Ross et al. 2009, Badzinski et al. 2013). The vast majority of molting scoters occurred between the Moose and Albany rivers, where 9814 (2006), 44,935 (2009), and 47,106 (2013) total scoters were observed at several sites within the area during mid-to-late July. Sites with notable concentrations of birds included the areas between Big Piskwanish Point and Moose River (2009 = 17,496, 2012 = 45,478) and Halfway Point and Big Piskwanish Point (1977 = 8590, 2006 = 9416, 2009 = 27,439).

In addition to scoters, several other sea duck species use these sites at various times of the year, but specific estimates of abundance for these species are limited and available only from surveys conducted during the 1970s, 1980s, and 1990s (see Ross 1982, Canadian Wildlife Service unpublished data). Common Eiders (*Somateria mollissima sedentaria*), which are year-round residents of Hudson and James bays (Abraham and Finney 1986), have been observed during January to February in open-water leads in the ice off the Ontario coast near the juncture of Hudson and James bays at Cape Henrietta Maria (K. Abraham, pers. obs.). Bufflehead (*Buecephala albeola*), Common Goldeneye (*Buecephala clangula*), Long-tailed Duck (*Clangula hyemalis*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), Hooded Merganser (*Lophodytes cucullatus*), Black Scoter, Surf Scoter, and White-winged Scoter have been observed in varying abundances during spring migration, fall migration, and summer molt periods in this part of the bay and at some of these sites (Wilson and McRae 1993, Abraham and Wilson 1997, SDJV 2015, Canadian Wildlife Service unpublished data, Ontario Ministry of Natural Resources and Forestry unpublished data).

Sensitivities: Sea ducks are sensitive to degradation of their staging, molting and foraging areas. Human disturbance can have negative effects on birds, particularly while foraging or during the molting period.

Potential Conflicts: Oil exploration, transoceanic shipping, and mining activities are potential sources of disturbance, habitat degradation, or pollution. Hydroelectric development (dams, etc.) on the bays or rivers within the adjacent mainland could affect the water regime and salinity that impact portions of the James Bay and Hudson Bay marine ecosystems. Impacts of climate change could change seasonal distribution (e.g., northward shifts in range) of birds and the distribution and abundance of sea duck forage species.

Status: Polar Bear Provincial Park, largely established to protect terrestrial and some marine habitat critical for the southern Hudson Bay population of polar bears, lies in the northeast corner of Ontario inland from the James Bay and Hudson Bay shorelines (Obbard and Walton 2004). There is a federal migratory bird sanctuary located along the eastern two-thirds of Akimiski Island coast; most of the island's coastline has been identified as a key migratory bird terrestrial habitat site by the Canadian Wildlife Service (Latour et al. 2008). The federal Shipsands Migratory Bird Sanctuary is located in the Moose River Estuary. Several important bird areas are designated within this part of James Bay, including Cape Henrietta Maria (lies within Polar Bear Provincial Park), Ekwan to Lakitusaki Shores (north half lies within Polar Bear Provincial Park), Akimiski Strait, Akimiski Island, Albany River Estuary and Associated Coastline, Longridge Point and Associated Coastline, Big Piskwanish Point, North Point (also a proposed Western Hemisphere Shorebird Reserve Network Site of International Significance), Moose River Estuary (also a Ramsar site Wetland of International Importance). For more information on individual important bird areas see site descriptions at http://ibacanada.ca/. A comprehensive list of protected areas in the Hudson Bay Lowland is found in Abraham et al. (2011).

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Key Site 28: Southeast James Bay, Quebec

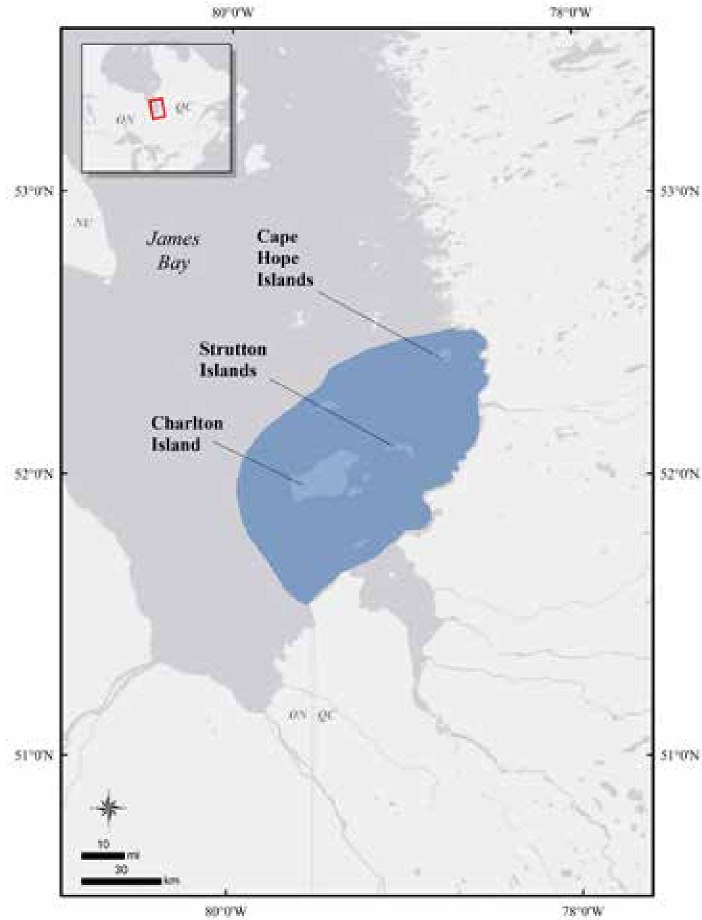
Location: 52°7'9"N, 79°12'25"W

Size: 6532 km²

Description: The Southeast James Bay key site encompasses small bays, islands, and waters from the Ontario–Quebec border east to the Cape Hope Islands, north of the Eastmain River. Several large rivers on the Quebec coast empty into James Bay, including the Nottaway, Broadback, Rupert, and Eastmain rivers. This site contains several islands, with the largest being Charlton Island.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: This site is heavily used by sea ducks during migration as well as for molting (Lamb et al. 2020). Black Scoters (*Melanitta americana*), Surf Scoters (*Melanitta perspicillata*), White-winged Scoters (*Melanitta deglandi*), and Long-tailed Ducks (*Clangula hyemalis*) pass through the site from mid-May to early June on route to their northern breeding areas (SDJV 2015; Appendix 1, Appendix 2, Appendix 3). Other spring migrants include Common Goldeneyes (*Bucephala clangula*), Common Mergansers (*Mergus merganser*), and Red-breasted Mergansers (*Mergus serrator*) (data from Rupert Bay; Foramec 2004). Many ducks wintering along the Atlantic coast and breeding west of Hudson Bay or in the Arctic stage in southeast James Bay in spring and fall (SDJV 2015, Lamb et al. 2019, Lamb et al. 2020).



The site is an important molting area for Black and Surf scoters, among others. Telemetry data collected through the Sea Duck Joint Venture's Atlantic and Great Lakes sea duck migration study illustrate that males and females of both species use the area extensively; males arrive from late June through August followed by the arrival of females in August and September (SDJV 2015, Lamb et al. 2021, Bowman et al. 2021). Telemetry data also suggest some use of this area by White-winged Scoters during the molting period (SDJV 2015, Meattey et al. 2018; Lepage et al. 2020). Areas of highest use within the key site include the waters offshore of Pointe de la Fougère Rouge to Pointe Saouayane, the southwest and northeast ends of Charlton Island, the string of small islands extending from Trodely Island to the Strutton Islands, Boatswain Bay, the waters offshore of the mouth of Eastmain River, and around Cape Hope Islands (Curtis and Allen 1976, Badzinski et al. 2013, Lamb et al. 2021). An aerial survey in late July 2013 documented nearly 35,000 molting (predominantly male) scoters within this key site; most flocks consisted of Black Scoters and/or Surf Scoters and relatively few White-winged Scoters (Badzinski et al. 2013; Appendix 4). On August 23, 2015, approximately 3500 Surf (about 80%), Black (about 18%), and White-winged scoters (about 2%) were observed from the shore along the southern Charlton Island coastline (T. Cheskey, Nature Canada, pers. comm.). Surveys conducted within this site during the 1970s found that sea duck numbers were greatest from mid-August through September (Curtis and Allen 1976). It is therefore possible and likely that use of this site by sea ducks increases during late summer and early fall due to an influx of female scoters and males and females of other sea duck species (SDJV 2015).

The Southeast James Bay key site is also within a migration corridor used by Black Scoters and other sea ducks from late summer until James Bay likely freezes during late fall (mid-November) (SDJV 2015, Lamb et al. 2021). During late summer, molt-migrant sea ducks may use and pass through this area when traveling between breeding and molting areas. For example, female Surf Scoters breeding in northern Manitoba use southeast James Bay as a stopover before heading to their molting areas in the St. Lawrence Estuary, Quebec (Lepage et al. 2020). During fall, migrant scoters coming from other James Bay and Hudson Bay molting areas and inland breeding locales throughout eastern Canada use the site prior to departure to wintering areas further south (SDJV 2015). Some male Black Scoters marked with satellite transmitters used this site for about six months (late May to late November), which encompassed the prebreeding, molting, and fall staging periods for this species (Lamb et al. 2021). Curtis and Allen (1976) also reported rafts of scoters around the islands from late summer through fall.

Sensitivities: Food resource (e.g., mussels) availability and quality could be influenced by changes in water regime (e.g., amount and timing of freshwater output in the bay) and salinity (e.g., climate change, hydroelectric projects). Congregations of birds can be affected by human disturbance, particularly during foraging and molting.

Potential Conflicts: Hydroelectric projects on the adjacent mainland could affect water regime and salinity in portions of James Bay. The Rupert River has already been partially diverted for energy production, and environmental assessments were conducted in the early 1990s to study the potential for hydroelectricity on the Nottaway and Broadback rivers. Climate change predictions for Quebec's Hudson Plains foresee an increasing trend in temperature and precipitation (Berteaux et al. 2014), which could eventually result in changes in waterfowl communities as the marine ecosystem adapts. Increased shipping traffic will increase risk of oil spills. Aboriginal harvest of sea ducks within this site is low, typically fewer than 200 Black Scoters and Long-tailed Ducks (R. Cotter, Canadian Wildlife Service, pers. comm.), and would have negligible effect at the population level.

Status: The offshore waters and islands lie within the Eeyou Marine Region where wildlife is managed by the Eeyou Marine Region Wildlife Board. The Boatswain Bay Migratory Bird Sanctuary is situated within the Southeastern James Bay key site. Established to protect an important nesting and staging area for numerous water birds during spring and fall migrations, this sanctuary encompasses part of the Boatswain Bay coast, including all islands, water, shallow banks, and rocks within 3.2 km of the high water line (Environment Canada 2014). Boatswain Bay has been recognized as an Important Bird Area on the basis of its importance to water birds during migration (IBA Canada 2021). Quebec has three planned biodiversity reserves (baie de Boatswain, Waskaganish, and Péninsule de Ministikawatin) on the mainland adjacent to the key site, but they have not yet been officially designated; these reserves would prohibit any forestry activity, mining, gas or oil exploration and exploitation, or hydraulic energy production (MELCC 2021).

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Key Site 29: Northeast James Bay and Adjacent Coastal Lowlands, Quebec

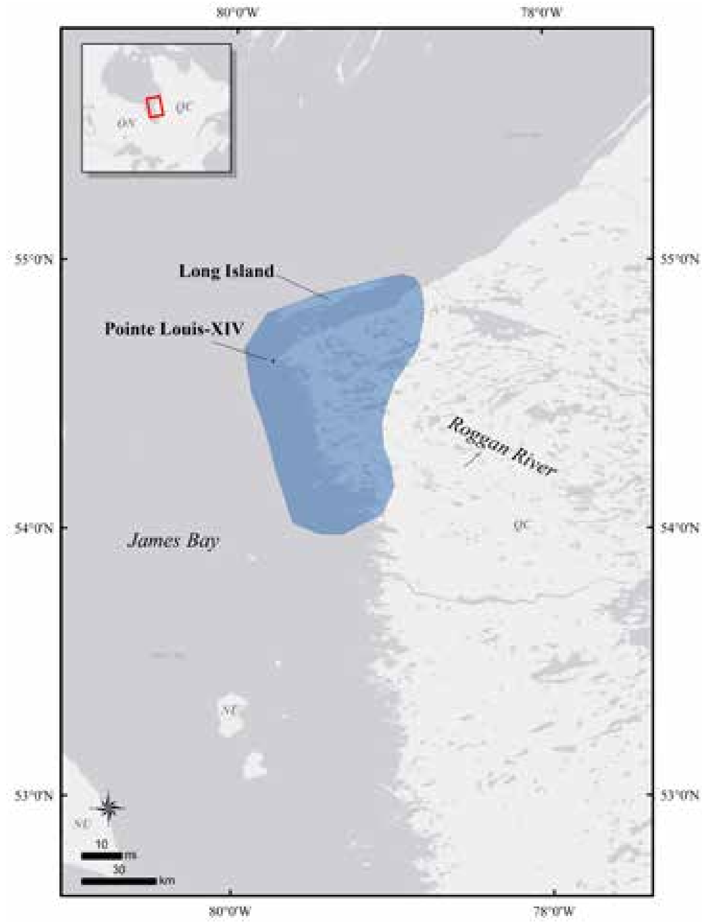
Location: 54°29'40"N, 79°27'31"W

Size: 5463 km^2

Description: Northeast James Bay, located in southeastern Hudson Bay, encompasses numerous bays, islands, and nearshore waters from the Piagochioui River to the east end of Long Island and Long Island Sound. It includes Pointe Louis-XIV (or Cape Jones) as well as a 20 to 35 km wide terrestrial stretch along the coast composed mainly of lowland taiga (open deciduous forest) in the south and tundra shrub habitat in the north, with salt marshes along the coast and numerous ponds, lakes, and rivers in the interior.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: This site is important to sea ducks during migrations, for breeding, and for molting. During spring migration, Black Scoters (*Melanitta americana*), Surf Scoters (*Melanitta perspicillata*), White-winged Scoters (*Melanitta deglandi*), and Long-tailed Ducks (*Clangula hyemalis*) transit through the site for a short stay, mostly in May (Reed et al. 1996, SDJV 2015, Lamb et al. 2020). Other sea ducks observed during spring migration, but in smaller numbers, include Common Goldeneye (*Bucephala clangula*), Common Merganser (*Mergus merganser*), and Red-breasted Merganser (*Mergus serrator*) (Reed et al. 1996).



During the breeding season, more than 500 Common Eiders (*Somateria mollissima sedentaria*) also breed there, mostly dispersed in small colonies (typically having less than about 20 nests) on several of the islands in the area (Reed et al. 1996, Benoit et al. 1993). According to Curtis and Allen (1976), during the 1970s as many as a few thousand Common Eiders and Long-tailed Ducks, some of which were nonbreeders, were present from breakup until freeze-up, with both species nesting on islands in the area. The coastal and interior lowlands (tundra shrub habitat) are an important breeding area for scoters and Long-tailed Ducks (Benoit et al. 1993, Lamb et al. 2020, Lepage et al. 2020). The terrestrial section between the Roggan River and Pointe Louis-XIV is an important area for breeding White-winged Scoters in eastern Canada (the majority of the species' known breeding range occurs primarily west of Hudson Bay); breeding densities are as high as 67 indicated breeding pairs per 100 km^2 or approximately 1700 pairs (Benoit et al. 1993). Other breeding sea ducks include Surf Scoter, Bufflehead, Common Goldeneye, and Red-breasted Merganser; most of these species build their nests next to ponds and lakes (Benoit et al. 1992, 1993, 1994) whereas Common Mergansers nest mostly along rivers (Benoit et al. 1994). Breeding density for all sea duck species combined has been estimated at 94 indicated breeding pairs per 100 km^2 or 2200 pairs in the site (Benoit et al. 1993).

Northeast James Bay is also an important molting area for many sea ducks (Lamb et al. 2020). Scoters molt abundantly in nearshore waters of this site: over 35,000 scoters were estimated in the early 1990s (Benoit et al. 1992, 1993, 1994, Reed et al. 1996), with a more recent estimate of about 20,000 scoters on

July 30–31, 2013 (Appendix 1; Badzinski et al. 2013). Because a single survey during molting provides only a snapshot of temporal abundance, it is likely that molting scoters are much more numerous. Satellite telemetry data indicate that this site is used by males and females of all three species of scoters in August and September (SDJV 2015, Lepage et al. 2020, Lamb et al. 2021). Curtis and Allen (1976) reported rafts of males and nonbreeders in July and August, with females and young joining by late August and overall numbers (tens of thousands, primarily Surf Scoters) peaking in September. Scoters use the open water among the offshore islands (Benoit et al. 1991) and eat blue mussels and other bivalves (Benoit et al. 1993). Other sea duck species molting in the marine portion of this site include mergansers (about 7000 individuals, both Common and Red-breasted; Benoit et al. 1994) as well as thousands of Common Eiders (Benoit et al. 1992). Male and female Barrow's Goldeneye (*Bucephala islandica*) from the eastern population (listed as a species of special concern by the Committee on the Status of Endangered Wildlife in Canada) are also thought to molt in coastal salt or brackish waters along this coast and on coastal freshwater lakes (Robert et al. 2002, Savard and Robert 2013), but numbers of birds are unknown. Hundreds of Hooded Mergansers (*Lophodytes cucullatus*), Common Mergansers, Red-breasted Mergansers, and Common Goldeneyes also molt in the coastal environment (including inland lakes; Benoit et al. 1992, 1993). Bufflehead (*Bucephala albeola*) and Common Goldeneye are also present during molt but are less abundant (Benoit et al. 1991, 1992). The Bay of Many Islands (just north of the Piagochioui River), between Rivière au Phoque and Pointe Louis-XIV, and Long Island Sound harbor the greatest number of molting sea ducks (Badzinski et al. 2013).

As many as 100,000 scoters and a few thousand Common Eiders and Long-tailed Ducks staged along the Northeast James Bay coastline during fall in the 1970s (Curtis and Allen 1976). Recent satellite telemetry data confirmed that the site is still used during fall by scoters and Long-tailed Ducks (SDJV 2015, Lamb et al. 2020, Bowman et al. 2021; Appendix 2, Appendix 3, Appendix 4). Sea ducks molting in James Bay may also stage within this site during fall, and many other birds that breed and molt farther north and west use it as a stopover during fall migration (SDJV 2015). Local Common Eiders may overwinter there (Reed et al. 1996).

Sensitivities: Human and vessel disturbance can affect flocks of birds, particularly while foraging or during the molting period, and can reduce the breeding success of colonial nesting Common Eiders.

Potential Conflicts: Hydroelectric projects on the adjacent mainland could affect the water regime and salinity in portions of James Bay. For example, since construction of the La Grande hydroelectric complex on the La Grande River (about 20 km south of this site) in the late 1970s and early 1980s, there has been an increase in freshwater discharge into James Bay during winter (Messier et al. 1986), which may alter local benthic communities and therefore food availability and have other impacts on the ecosystem. Climate change may also have implications for sea duck habitat and occurrence or abundance within this area. For example, climate change models predict increasing temperature and precipitation for Quebec's Taiga region (Berteaux et al. 2014), which could shift sea duck ranges north, influence prey species and abundance, and increase competition among species for food resources. Increased maritime traffic could increase risks of environmental contamination (e.g., oil spills) and collisions.

Status: Wildlife management in coastal waters is shared by the Eeyou and the Nunavik Marine Region Wildlife Boards. This site is part of the Northeast James Bay Coast Important Bird Area because of its importance for migrating waterfowl and shorebirds. This Important Bird Area covers the coastline from the northeastern corner at Pointe Louis-XIV southward to the Vieux Comptoir River (south of Wemindji; IBA Canada website). Part of this key site has also been proposed as a terrestrial protected area by the Quebec government (Réserve de territoire pour fin d'aire protégée: Lac-Burton-Rivière-Roggan-et-la-Pointe-Louis-XIV; MELCC 2021).

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Key Site 30: Belcher Islands, Nunavut

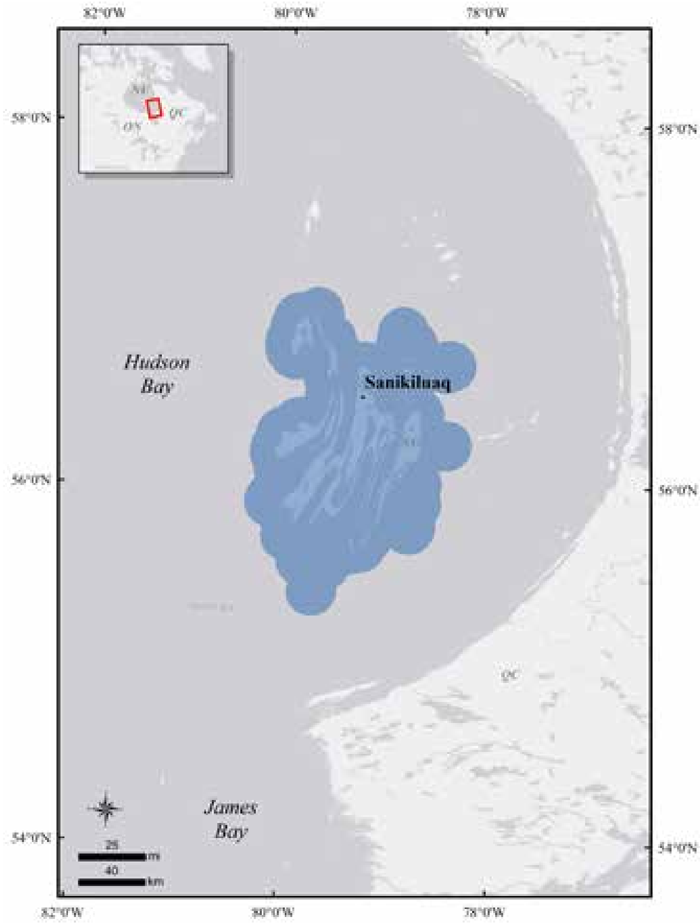
Location: 56°15'18"N, 79°19'43"W

Size: 18,900 km^2

Description: The Belcher Islands are an archipelago consisting of low, bedrock islands rising from southeastern Hudson Bay. Thousands of small islands are in the archipelago and are slowly increasing in size due to isostatic rebound. The community of Sanikiluaq (population of approximately 900) is on Flaherty Island. A more detailed description of the terrestrial habitat is found in Alexander et al. (1991). Waters around the Belcher Islands are relatively shallow and are situated on the boundary between the Low Arctic and Boreal oceanographic zones (Nettleship and Evans 1985). Currents typically flow north past the Belcher Islands, although flood tides move water south and ebb tides draw them back north (McDonald et al. 1997). Traditional Inuit knowledge suggests that currents are weaker now than in the past in this area (McDonald et al. 1997).

Ice forms along shorelines in October and by November may extend outwards for several kilometers. Because the east coast of Hudson Bay is exposed to westerly winds, ice accumulation may be much less than in other areas. The ice forms quickly and continues to expand during November and December. By early January, open water is found only from the Belcher Islands south towards the mouth of James Bay and along the south coast of Hudson Bay from about the Severn River to the Great Whale River (Larnder 1968). Shallow coastal areas break up in May, and in most years Hudson Bay is relatively ice-free by mid-July (Larnder 1968). Tides are only about 0.5 m around the islands but create very strong currents in the shallow water (McDonald et al. 1997). Areas of persistent open water occur around the Belcher Islands (Gilchrist and Robertson 2000), although the number can vary greatly by year. In the 1950s, there were 35 polynyas around the Belcher Islands, but in the early 1990s, there were only three (McDonald et al. 1997).

Precision and Correction of Abundance Estimates Presented: Abundance estimates for this key habitat site have not been adjusted to account for incomplete detection or other biases and can be treated as minimum estimates.



Biological Value: Hudson Bay Common Eiders (*Somateria mollissima sedentaria)* are year-round residents of James and Hudson bays. The population was estimated at 45,000 birds in 1986 (Abraham and Finney 1986), but recent winter surveys suggest 125,000 pairs make up the *sedentaria* subspecies (Bowman et al. 2015). In summer, they inhabit the entire coast of Hudson Bay from Chesterfield Inlet in the northwest to James Bay and north along the east coast of Hudson Bay to Cape Smith. Nakashima and Murray (1988) estimated that about 7000 pairs of eiders nested in the North Belcher and South Flaherty islands in the mid-1980s (7% of the Canadian population), but this number had decreased by 75% by the late 1990s (Robertson and Gilchrist 1998).

In winter, Common Eiders are restricted to areas of open water, and the majority of *sedentaria* apparently concentrate in the vicinity of open cracks and leads near the Belcher and Sleeper islands and the south shore of Hudson Bay (Freeman 1970). Around the Belcher Islands, polynyas and the floe edge support substantial numbers of birds; Gilchrist and Robertson (2000) found up to 300 Common Eiders and 300 Long-tailed Ducks (*Clangula hyemalis)* (Jamieson et al. 2001) in polynyas and over 10,000 eiders wintering off the floe edge. Depending on the ice pattern and winds, thousands of birds may roost in certain polynyas (Gilchrist et al. 2006); wind also dictates distributions of other species (McDonald et al. 1997). Hence, open water around the Belcher Islands may support more than 10% of the Canadian population of the *sedentaria* subspecies in winter. Because these birds do not migrate, they are susceptible to mass starvation and population declines in heavy ice years (Robertson and Gilchrist 1998). In a typical year, wind, ice, and currents all combine to limit foraging time for eiders (Heath et al. 2010).

During summer (late July and early August) molting scoters (*Melanitta* spp.) in varying abundances have been observed using near and offshore areas in the vicinity of the Belcher Islands. During an aerial survey of a portion of the site on July 22, 2009, 1483 scoters (Surf Scoter *M. perspicillata* = 405, White-winged Scoter *M. deglandi* = 16, unidentified scoter = 1062) undergoing remigial molt were observed near the eastern two-thirds of the archipelago (Cotter 2009). During a more comprehensive aerial survey of the area conducted August 5–7, 2013, 25,595 molting scoter (Surf Scoter = 7448, White-winged Scoter = 270, unidentified scoter = 17,877) were observed around the archipelago (Badzinski et al. 2013).

Sensitivities: Eiders are sensitive to the degradation of their staging and foraging areas and to excessive harvest of down from breeding colonies. Local eider populations are a critical source of food and down for the community and have also served as clothing (Flaherty 1918).

Potential Conflicts: Oil exploration in central Hudson Bay is a potential source of pollution. Prevailing west and northwest winds render the east coast of the bay most susceptible to oil damage (Nakashima and Murray 1988).

Status: The North Belcher and South Flaherty islands are Canadian Important Bird Areas (NU031, NU100; CEC 1999). The Belcher Islands and its surrounding waters are part of the Nunavut Settlement Area (Nunavut Agreement 2022). However, jurisdiction over the marine waters around the Belcher Islands is complex and may involve various federal, provincial, territorial, and aboriginal organizations and agencies.

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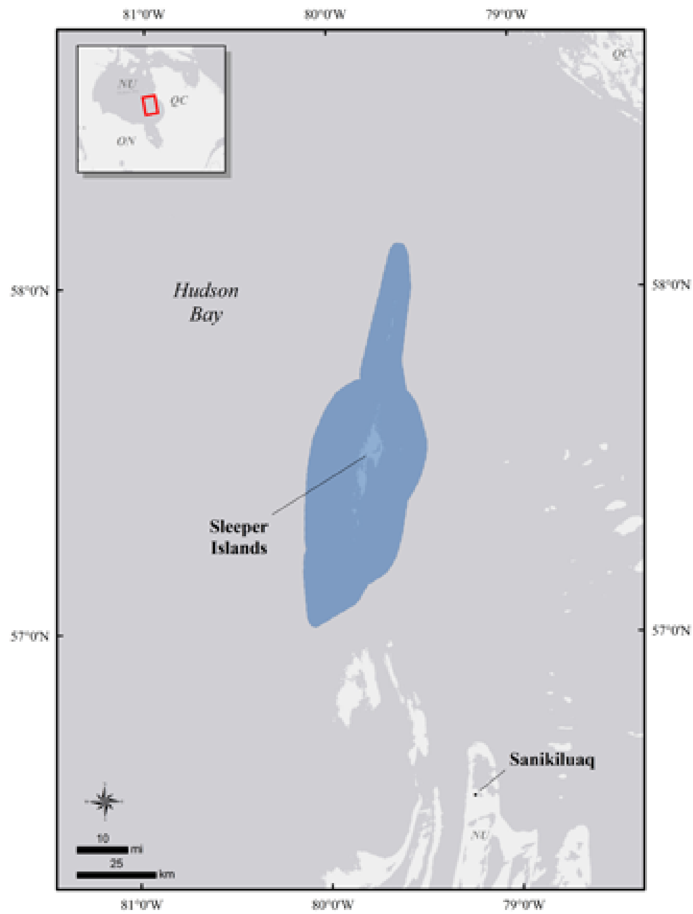
Key Site 31: Sleeper Islands, Nunavut

Location: 57°31'18"N, 79°48'56"W

Size: 2722 km^2

Description: The Sleeper Islands archipelago is in eastern Hudson Bay, about 115 km north of the community of Sanikiluaq. The archipelago includes more than 360 islands and covers about 49 km from north to south. Waters around the Sleeper Islands are relatively shallow and are on the boundary between the Low Arctic and Boreal oceanographic zones (Nettleship and Evans 1985). A more detailed description of the terrestrial habitats is found in Alexander et al. (1991).

Ice forms along shorelines in October and by November may extend offshore for several kilometers. Because the east coast of Hudson Bay is exposed to westerly winds, ice accumulation may be much less than in other areas. Ice forms quickly and continues to expand during November and December. By early January, open water is found only from the Belcher Islands south towards the mouth of James Bay and along the south coast of Hudson Bay from about the Severn River to the Great Whale River (Larnder 1968). Persistent open water occurs west and southwest of the Belcher Islands (Montgomery 1950, Freeman 1970). Shallow coastal areas break up in May, and in most years Hudson Bay is relatively ice-free by mid-July (Larnder 1968).



Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: Hudson Bay Common Eiders (*Somateria mollissima sedentaria*) are year-round residents of James and Hudson bays. The population was estimated to be approximately 45,000 birds (Abraham and Finney 1986), but recent winter surveys suggest 125,000 pairs make up the *sedentaria* subspecies (Bowman et al. 2015). In summer, they inhabit the entire coast of Hudson Bay, from Chesterfield Inlet in the northwest to James Bay and north along the east coast of Hudson Bay to Cape Smith. In 1985, an estimated 5900 pairs of eiders (12% of the *sedentaria* population) nested on the Sleeper Islands.

In winter, Common Eiders are restricted to areas of open water, and the majority of *sedentaria* apparently concentrate in open cracks and leads near the Belcher and Sleeper islands and the south shore of Hudson Bay (Freeman 1970, Prach et al. 1981). In early winter, Common Eiders move in large numbers to permanent open water west and north of the Belcher Islands, off the Sleeper Islands, depending on the distribution of ice (Freeman 1970). In 2000, most Common Eiders were found in open water off the northern tip of the Sleeper Islands, while in 2002, about 100,000 eiders were found in leads approximately 10 km southwest of the islands. Given that few birds were found elsewhere during survey efforts, it is likely that this concentration represented almost all of the *sedentaria* population.

Sensitivities: Eiders are sensitive to the degradation of their staging and foraging areas.

Potential Conflicts: Oil exploration in central Hudson Bay is a potential source of pollution. Prevailing west and northwest winds render the east coast of the bay, including this key site, most susceptible to oil damage (Nakashima and Murray 1988).

Status: The Sleeper Islands are an Important Bird Area site (NU033; CEC 1999).

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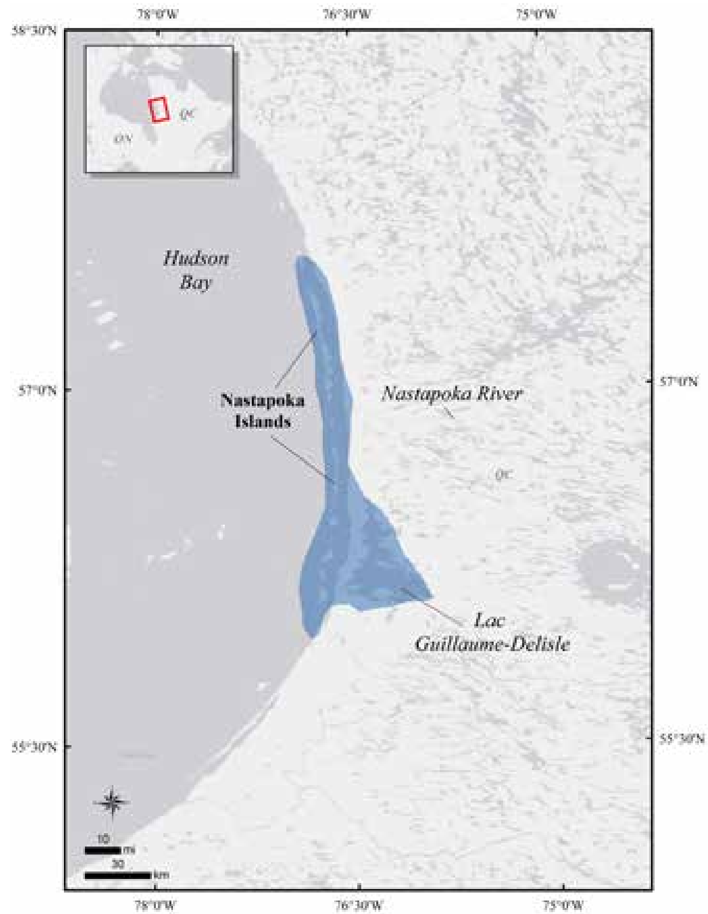
Key Site 32: Nastapoka Islands and Lac Guillaume-Delisle, Quebec

Location: 56°43'53"N, 76°37'42"W

Size: 3887 km^2

Description: The Nastapoka Islands and Sound (or channel) and Lac Guillaume-Delisle are situated on the east coast of Hudson Bay. Nastapoka Sound is a narrow 160 km channel between the Nastapoka Islands and the mainland; it extends from the channel (Le Goulet) of Lac Guillaume-Delisle in the south to the mouth of the Boniface River in the north. Lac Guillaume-Delisle is a large brackish lake (61 km long by 22 km wide; area of 712 km^2) connected to Hudson Bay by a 5 km long channel.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should be treated as minimum estimates.



Biological Value: This key site is particularly important for molting sea ducks, although a few hundred pairs of Common Eiders (*Somateria mollissima sedentaria*) historically breed on the Nastapoka Islands (Consortium Gauthier & Guillemette–GREBE 1990; there are no recent estimates). Both Nastapoka Sound and Lac Guillaume-Delisle host numerous molting scoters (Appendix 1). Male and female Black Scoter (*Melanitta americana*) and Surf Scoter (*Melanitta perspicillata*) use the area (SDJV 2015, Lamb et al. 2020). Black Scoter males arrive in early July and can stay as late as October, whereas females arrive later, peak in August and September, and can stay on site until early November (Lamb et al. 2021, S. Gilliland, Canadian Wildlife Service unpublished data; Appendix 2). Male and female Surf Scoters molt and stage on both waterbodies from late July to late October (SDJV 2015; Appendix 3). Aerial surveys in James and Hudson bays in 2013 reported nearly 10,000 molting Black Scoters within the key site on August 4 (Badzinski et al. 2013); however, this survey was timed optimally for molting male Black Scoters, and it is likely that greater numbers of sea ducks use this site once other cohorts (i.e., females and yearlings) and species (e.g., other scoter species, Common Eiders, mergansers) arrive there later in August or September. Long-tailed Ducks (*Clangula hyemalis*) also molt along the eastern Hudson Bay coast (Lamb et al. 2020), forming rafts of up to 200 birds (Lamothe 1996). It is not known whether Red-breasted Mergansers (*Mergus serrator*), which nest abundantly in areas adjacent to the key site (Lepage et al. 2015), molt in this key site. Similarly, the importance of this key site to Harlequin Ducks (*Histrionicus histrionicus*) that breed in the watersheds of Lac Guillaume-Delisle and Nastapoka River (Morneau et al. 2008), and may use coastal areas for brood-rearing, is unknown.

The Nastapoka Islands and Sound–Lac Guillaume-Delisle key site is also used during spring (late May–early June) and fall migrations by Black and Surf scoters, Long-tailed Ducks (SDJV 2015, Lamb et al. 2020), and Common Eiders (Consortium Gauthier & Guillemette–GREBE 1990). Bufflehead (*Bucephala albeola*), Common Goldeneye (*Bucephala clangula*), Common Merganser (*Mergus merganser*), and Red-breasted Merganser are also believed to use this key site during migration.

Sensitivities: Availability and quality of food resources could be influenced by changes to water regimes and salinity (e.g., climate change, hydroelectric projects). Human disturbance can displace and alter behavior of birds, particularly while foraging or during the molting period.

Potential Conflicts: Hydroelectric projects on the adjacent mainland could affect the water regime and salinity in portions of Hudson Bay. For instance, about 100 km south of the key site, the Grande Rivière de la Baleine (formerly Great Whale River) and the Petite Rivière de la Baleine (formerly Little Whale River) were the subject of environmental assessments in the late 1980s because they were considered as potential sites for a new hydroelectric complex (Grande-Baleine); this project was abandoned in 1994 due to the Cree Tribal Governments' opposition. Berteaux et al. (2014) predict increasing temperature and precipitation within the next few decades in Quebec's taiga due to climate change; impacts will likely affect sea ducks, possibly favoring some species over others. Increases in precipitation that coincide with peak hatching time for sea ducks (early July) could negatively affect reproductive success.

Status: Wildlife management in this region is mostly under the Nunavik Marine Region Wildlife Board and the Eeyou Marine Region Wildlife Board. Parts of this key site fall within Tursujuq National Park (26,107 km^2), which protects Lac Guillaume-Delisle as well as Lac à l'Eau-Claire (KRG 2007, Gouvernement du Québec 2015). Part of the key site also lies within the Rivers of the Lac Guillaume-Delisle Basin Important Bird Area that extends from the coast of Hudson Bay inland to the west side of Lac Eau Claire and mainly covers the rivers of this region. This Important Bird Area was principally identified based on the abundance of breeding Eastern Harlequin Ducks there (IBA Canada website).

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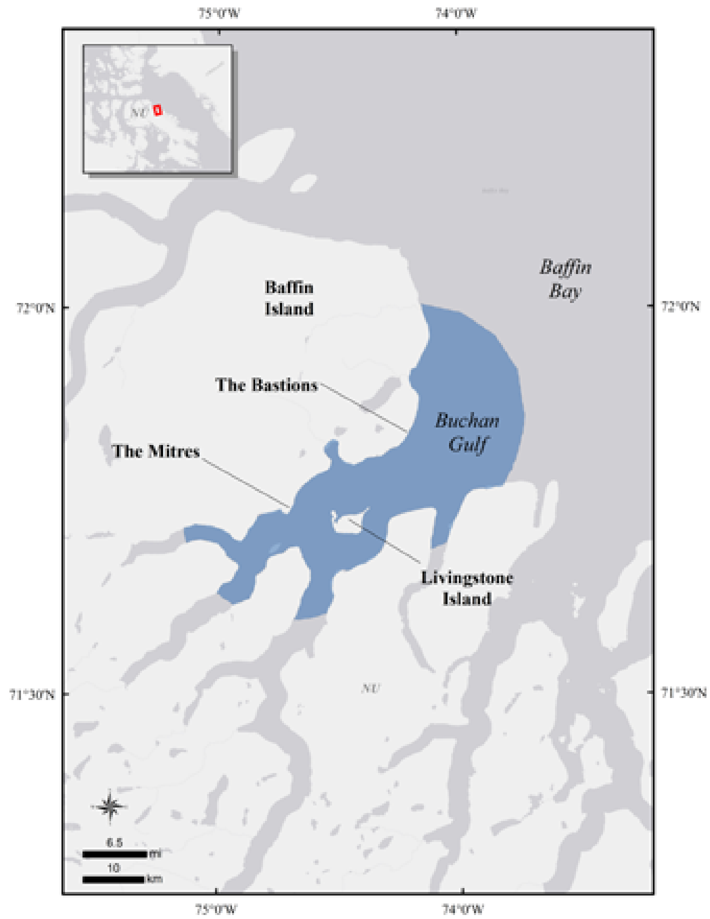
A flock of molting Black Scoters. Photo: Shannon Badzinski.

Key Site 33: Buchan Gulf, Nunavut

Location: 71°47'50"N, 74°7'25"W

Size: 715 km^2

Description: Buchan Gulf is on the eastern coast of north Baffin Island, about 200 km southeast of the community of Pond Inlet (Mittimatalik). The northern coast of the gulf is notable for two promontories, the Bastions and the Mitres. A description of this habitat is found in Alexander et al. (1991) and Latour et al. (2008). Buchan Gulf lies in the High Arctic oceanographic zone (Nettleship and Evans 1985). Over winter, open water develops parallel to the eastern and southeastern coast of Bylot Island (Smith and Rigby 1981). Recurring offshore leads form in sea ice off Buchan Gulf, with a relatively narrow band of landfast ice (although this may vary greatly between years; McLaren 1982); the floe edge is usually not far from shore. However, landfast ice forms in the gulf and along the eastern Baffin Island shore. Shore leads open as early as February but may close again in April or May (Smith and Rigby 1981). Ice breakup may not occur until July, and freeze-up begins in late October.



Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: King Eiders (*Somateria spectabilis)* and Common Eiders (*S. mollissima borealis*) may congregate along the ice edge during migration, usually in May (McLaren and McLaren 1982). King Eiders arrive by May, and Common Eiders return by mid-May. Numbers of both species increase throughout May, with a notable movement of King Eiders along the landfast ice edge bordering east Baffin Island. Numbers decline in late June as individuals move to terrestrial breeding areas. During July and August, numbers again increase along coasts, particularly south Lancaster Sound and the east coasts of Bylot and Baffin islands, as a series of migratory movements occur (McLaren and McLaren 1982). Up to 25,000 migrating eiders have been observed in the eastern Bylot Island/north Baffin Island region during migration (McLaren and Renaud 1979).

Sensitivities: Sea ducks are sensitive to pollution of offshore waters.

Potential Conflicts: Baffin Bay and Davis Strait have potential to become marine shipping routes and areas of hydrocarbon exploration and development (Imperial Oil Ltd. 1978; Petro-Canada Ltd. 1979; DIAND 1982; Arctic Council 2009). In 2016 Canada designated the Arctic waters indefinitely off limits to new offshore oil and gas activities and in 2019 suspended the terms of all active oil and gas licenses in the western and eastern Arctic offshore areas. This area is also of increasing importance as a tourist destination for cruise ships (Hall and Johnston 1995; Wakelyn 2001). Oil spills associated with drilling or shipping activities could endanger large numbers of sea ducks and pollute their feeding areas.

Status: Buchan Gulf is an Important Bird Area in Canada (NU069; CEC 1999), part of a Key Marine Habitat Site (Site 17; Mallory and Fontaine 2004), and will be part of Tallurutiup Imanga National Marine

Conservation Area, a future marine protected area. The marine waters of this key site are under federal jurisdiction.

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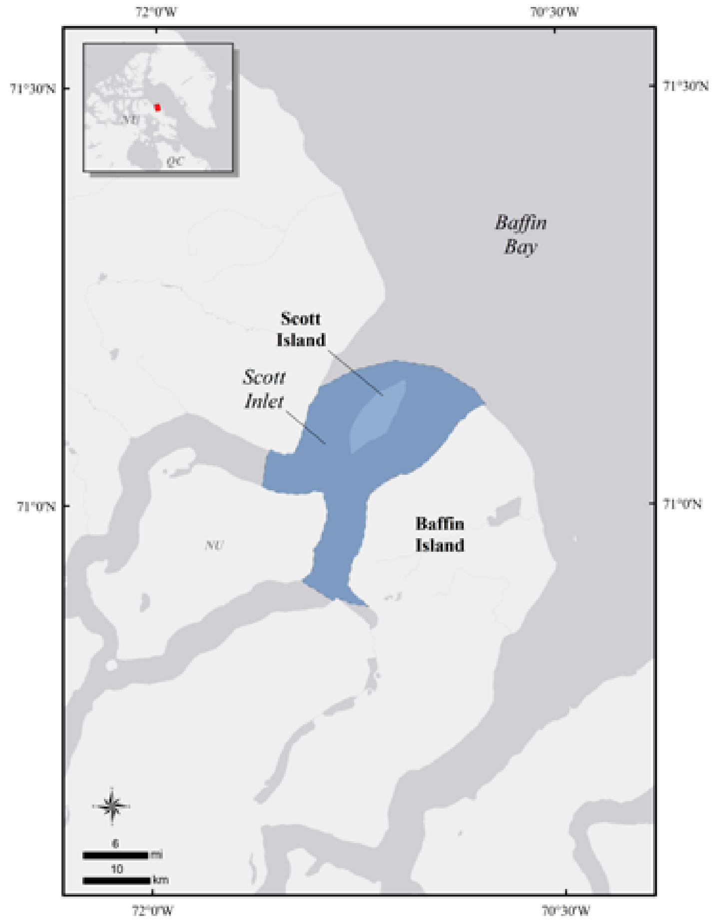
Key Site 34: Scott Inlet, Nunavut

Location: 71°3'17"N, 71°17'15"W

Size: 408 km²

Description: Scott Inlet is located on the east coast of Baffin Island, about 120 km north of Clyde River (Kangiqtugaapik). Scott Island, approximately 11 km long, is in the centre of Scott Inlet. A description of this key terrestrial habitat site is found in Alexander et al. (1991) and Latour et al. (2008).

Scott Inlet lies in the High Arctic oceanographic zone (Nettleship and Evans 1985). Over winter, open water develops parallel to the eastern and southeastern coast of Bylot Island (Smith and Rigby 1981). Recurring offshore leads form in sea ice off Scott Inlet, with a relatively narrow band of landfast ice, although this may vary greatly among years (McLaren 1982). The floe edge is usually not far from shore. However, landfast ice forms in the inlet and along the eastern Baffin Island shore. Shore leads open as early as February but may close again in April or May (Smith and Rigby 1981). Ice breakup may not occur until July, and freeze-up begins in late October.



Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: King Eiders (*Somateria spectabilis)* and Common Eiders (*S. mollissima borealis)* may congregate along the ice edge during migration, usually in May (McLaren and McLaren 1982). Up to 25,000 migrating eiders have been observed along the eastern Bylot Island and north Baffin Island region during migration (McLaren and Renaud 1979).

Sensitivities: Sea ducks are sensitive to disturbance at their colonies and to the pollution of offshore waters.

Potential Conflicts: Baffin Bay and Davis Strait have potential to become marine shipping routes and areas of hydrocarbon exploration and development (Imperial Oil Ltd. 1978, Petro-Canada Ltd. 1979, Arctic Council 2009). In 2016 Canada designated the Arctic waters indefinitely off limits to new offshore oil and gas activities and in 2019 suspended the terms of all active oil and gas licenses in the western and eastern Arctic offshore areas. Baffin Bay is also of increasing importance as a tourist destination for cruise ships (Hall and Johnston 1995, Wakelyn 2001), although Scott Inlet is rarely visited by cruise ships. Oil spills associated with drilling or shipping activities could endanger large numbers of sea ducks and pollute their feeding areas.

Status: Scott Inlet is an Important Bird Area in Canada (NU070; CEC 1999) and a Key Marine Habitat Site (Site 18; Mallory and Fontaine 2004). Surrounding coastlines include crown and Inuit-owned lands, while the marine waters fall under federal jurisdiction.

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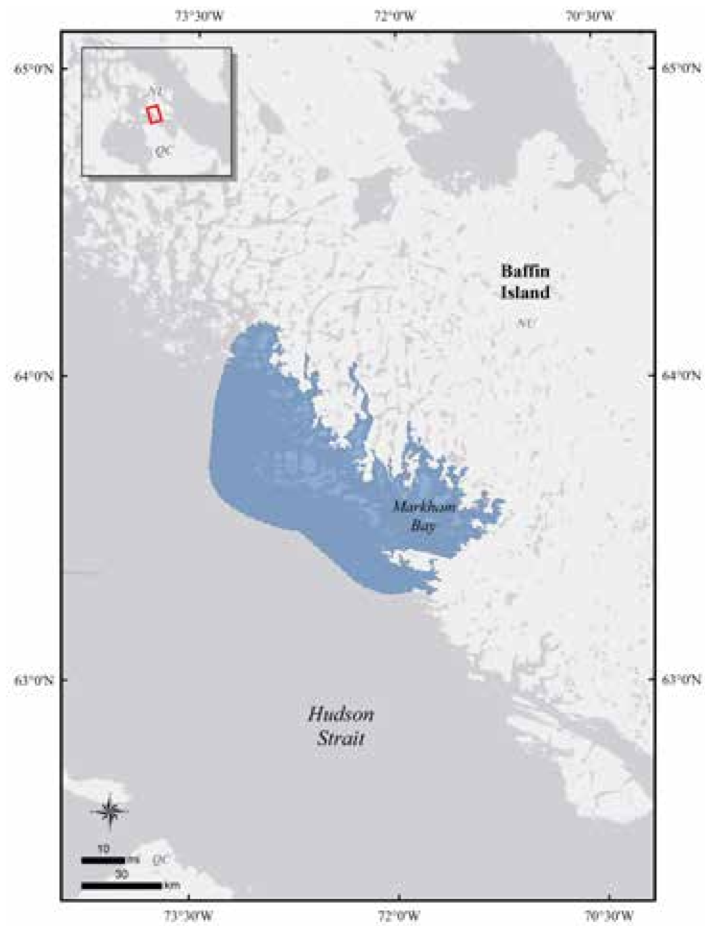
Key Site 35: Markham Bay, Nunavut

Location: 63°39'42"N, 72°30'4"W

Size: 4721 km²

Description: Markham Bay is an island-studded area south of Baffin Island, about midway between the communities of Kimmirut (Lake Harbour) and Kinngait (Cape Dorset). It is located to the east of the former Cape Dorset Migratory Bird Sanctuary and is situated along the northern coast of Hudson Strait.

Markham Bay lies in the Low Arctic oceanographic zone (Nettleship and Evans 1985). Main currents flow east through Hudson Strait (Larnder 1968). Ice freeze-up usually occurs by mid-October, although the ice remains unconsolidated. Mobile pack ice dominates Hudson Strait from January to April, with landfast ice formed around coastlines (Larnder 1968). Ice breakup begins in April near persistent shore leads, such as the lead that opens along southern Baffin Island; by May, large patches of open water occur. Patterns of ice breakup and the location of the floe edge can change considerably in different years (McDonald et al. 1997). Little ice remains by late July.



Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: This site supports a large portion of the breeding population of Northern Common Eider (*Somateria mollissima borealis*) in Hudson Strait. Gaston and Cooch (1986) observed a minimum of 8000 eiders staging off the ice edge between Cape Dorset and Markham Bay in April 1982, and estimated that 10,000 pairs bred along this section of Baffin Island. Aerial and boat surveys conducted in 1997 and 1998 recorded 44,500 Common Eiders (3% of the continental population; NAWMP 2012) along this coast, and over 4000 nests per year in Markham Bay (Gilchrist et al. 1998, Gilchrist et al. 1999). Eider colonies are typically small and distributed across many islands. They are also susceptible to high annual fluctuations in success due to predation, and probably experienced higher use by humans when the settlement of Amadjuak was extant. Common Eiders occur in this area from April through October (MacLaren Marex Ltd. 1979, Gaston and Cooch 1986).

Sensitivities: Sea ducks congregate in open ice leads and over key foraging sites, where they are susceptible to disturbance and to pollution of their foraging and migration areas. Offshore foraging areas are susceptible to pollution and disturbance from increased ship traffic.

Potential Conflicts: Proposed year-round shipping could impact sea ducks in the area, particularly during breeding and molting seasons, when they are most vulnerable to disturbance. Increased ship traffic increases the risk of oil spills, collisions, and habitat degradation.

Status: Markham Bay is part of a Key Marine Habitat Site (Site 25; Mallory and Fontaine 2004) and a Key Terrestrial Habitat Site (Site 48; Latour et al. 2008). Surrounding coastlines include crown and Inuit-owned lands, while the marine waters are under federal jurisdiction.

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Key Site 36: Frobisher Bay, Nunavut

Location: 61°58'38"N, 64°39'31"W

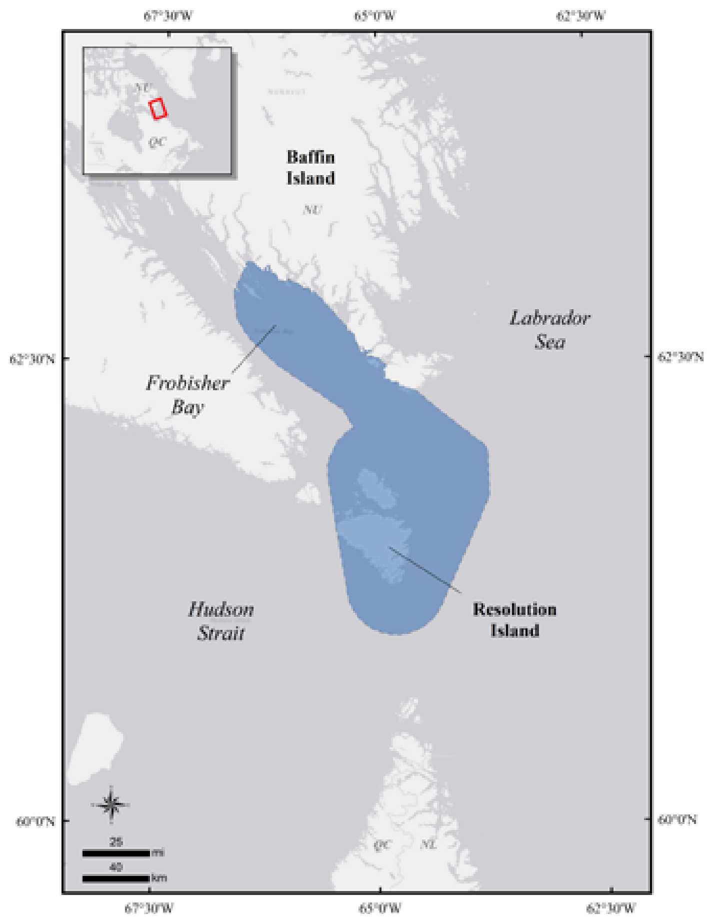
Size: 14,646 km²

Description: Frobisher Bay is a relatively shallow bay running approximately 200 km northwest to southeast in southern Baffin Island, just north of Hudson Strait. A large polynya forms here annually (Stirling and Cleator 1981); its size and shape vary according to ice and wind conditions. Islands are numerous, particularly along the north side of the bay and extending through to Loks Land and Resolution Island. Many small polynyas are found among these islands. A key terrestrial habitat site, Hantzsch Island, occurs here. This is a small, dome-shaped island located approximately 1 km off the northeastern shore of Edgell Island, at the mouth of Frobisher Bay (Alexander et al. 1991, Latour et al. 2008).

Frobisher Bay is in the Low Arctic oceanographic zone (Nettleship and Evans 1985). It exhibits the second highest tides in Canada (regularly over 10 m). Ice freeze-up usually begins in late October or early November, but the timing varies greatly among years. The edge of the polynya may be 20 to 100 km southeast from the city of Iqaluit (M. L. Mallory, pers. obs.). Ice breakup begins in April near open water, and the entire bay is usually navigable by early July, although large pans of ice may persist into late July.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: Significant concentrations of marine birds are distributed throughout this region, depending on the annual patterns of ice breakup and the distribution of prey (McLaren Atlantic Ltd. 1978, Riewe 1992). Frobisher Bay is an important nesting, feeding, and migration stopover for Common Eiders (*Somateria mollissima borealis*) (Abraham and Finney 1986, Fontaine et al. 2001, Iverson et al. 2014). Many thousands of eiders were observed around Resolution Island, Loks Land, and the tips of the Meta Incognita and Hall peninsulas in 1977 (McLaren Atlantic Ltd. 1978). Harlequin Duck



(*Histrionicus histrionicus*), a species at risk in Canada, occurs in Frobisher Bay in unknown numbers (Mallory et al. 2001). Many other species, including Canada Goose (*Branta canadensis*) and Long-tailed Duck (*Clangula hyemalis*), are common in Frobisher Bay, but their abundance and distribution have not been assessed. Sea ducks occur in this marine area with highest concentrations from early May to October, although migrating sea ducks may be found in open water areas earlier or later in the season (Riewe 1992).

Sensitivities: Nesting sea ducks are sensitive to disturbance and the pollution of their feeding areas.

Potential Conflicts: Davis Strait has the potential to become a marine shipping route and an area of hydrocarbon exploration and development (Imperial Oil Ltd. 1978, Petro-Canada Ltd. 1979, Arctic Council 2009). In 2016 Canada designated the Arctic waters indefinitely off limits to new offshore oil and gas activities and in 2019 suspended the terms of all active oil and gas licenses in the western and eastern Arctic offshore areas. The complex nature of currents in the region suggests that oil spills in southern Davis Strait could enter this marine area (Barry 1977). Increased ship traffic attributable to the needs of the growing community of Iqaluit could contribute to higher disturbance of birds, as well as increased chance of pollution and collisions.

Status: Frobisher Bay is part of a Key Marine Habitat Site (Site 28; Mallory and Fontaine 2004) and surrounds a Canadian Important Bird Area on Hantzsch Island (NU025; CEC 1999). Surrounding coastlines include crown and Inuit-owned lands, whereas the marine waters are under federal jurisdiction.

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Key Site 37: Ungava Bay, Quebec

Location: 58°49'11"N, 68°26'37"W

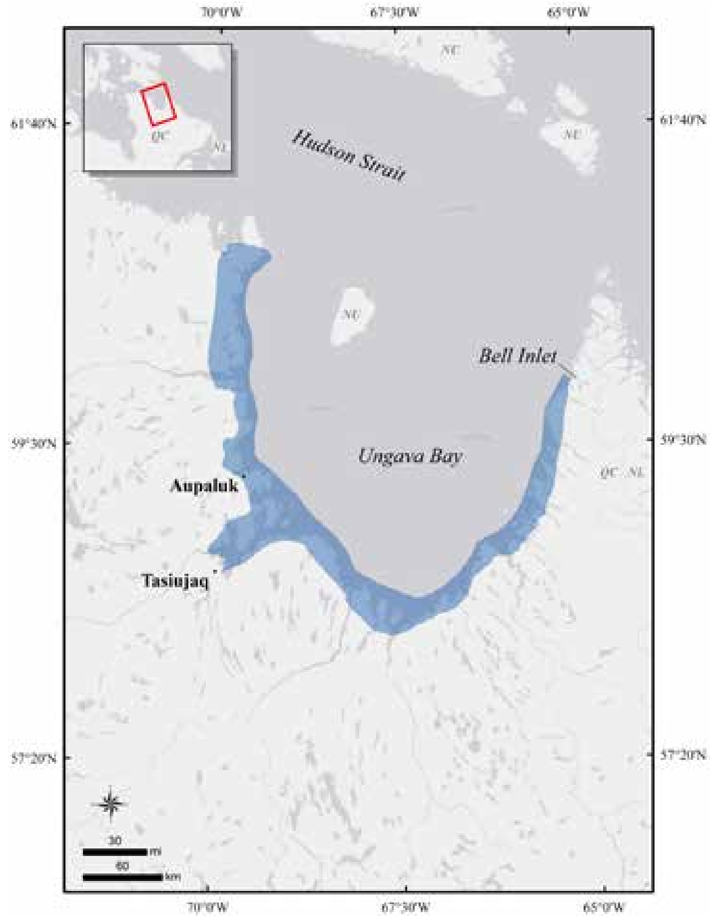
Size: 13,989 km^2

Description: Ungava Bay lies in northeastern Quebec and is bordered by Hudson Strait to the north. The Ungava Peninsula borders its west shore, and the Labrador Peninsula borders its east shore. This key site is composed of an oceanic coastal band from Quaqtaq at its northwestern end, to Kuujjuaq in the south, and to Bell Inlet at its northeastern end. It comprises the myriad of islands and archipelagos near the coast; the numerous deep bays, inlets, and mouths of large rivers that empty into Ungava Bay; and a narrow terrestrial stretch along the coast. Several Inuit communities are located in this key site.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: The importance of this key site to sea ducks is only partially understood due to the remoteness of the site and the lack of organized surveys. However, local Inuit knowledge and other available information provide evidence that the site is used during migrations, breeding, molting, and possibly for wintering. For instance, Ungava Bay supports Common Eiders (*Somateria mollissima borealis)* during about six months (from mid-May to mid-November) (Savard et al. 2011).

During spring migration, Common Eiders that have been wintering in the Gulf of St. Lawrence and around Newfoundland fly north along the Labrador coast and then along the Ungava Bay coast to their breeding islands along the Ungava Peninsula and farther north in eastern Arctic Canada (Nakashima 1986, Mosbech et al. 2006a, Savard et al. 2011). Considering that about one third of *S. m. borealis* (total population estimated at 550,000; NAWMP 2012) use this migration route (Mosbech et al. 2006a, Savard et al. 2011), the segment of the population migrating through Ungava Bay rather than Hudson Strait could number more than 150,000 individuals. Female eiders arrive on the coast of Ungava Bay from about the third week of May to early June (Mosbech



et al. 2006a, Savard et al. 2011). Important spring staging areas include the sector of Kangirsuk (mouth of the Arnaud River), south of Aupaluk and east of Tasiujaq (mouth of the Rivière aux Feuilles), and the stretch from Pointe Le Droit to Bell Inlet on the eastern side of the bay (Nakashima 1986).

During a comprehensive survey of the area in 1978 and 1980, 48,700 breeding pairs were observed on several archipelagos and islands along the Ungava Bay and the Quebec coast of the Hudson Strait (Chapdelaine et al. 1986), with most in Ungava Bay. This likely represents the most important known breeding concentration of *S. m. borealis* in the Canadian Arctic (Savard et al. 2011), accounting for about 25% of the entire population. Some pairs also breed on islets in freshwater lakes on the mainland, generally less than 2.5 km inland (Chapdelaine et al. 1986). The largest known colonies are situated in the following archipelagos: Eider Islands, Plover Islands, Payne Islands and Gyrfalcon Islands along the western coast of the site, islands between Weymouth Inlet and the mouth of the Qijujjuujaq River, and islands from Langley Inlet to Bell Inlet along the eastern coast of the site (Chapdelaine et al. 1986, Nakashima 1986, Falardeau et al. 2003). The Quebec Breeding Bird Atlas provides new insights on other sea ducks breeding, or possibly breeding, on the western coast of Ungava Bay (the eastern coast has not yet been surveyed): Long-tailed Duck (*Clangula hyemalis*) is common and widely dispersed, Red-breasted Merganser (*Mergus serrator*) is scarcer, and Common Merganser (*Mergus merganser*) and King Eider (*Somateria spectabilis*) are rare (Quebec breeding bird atlas 2016). Harlequin Duck (*Histrionicus histrionicus*), a species of special concern in eastern Canada, breed on fast-flowing rivers that empty into the southern half of Ungava Bay (Dancelou, Aux Mélèzes, Caniapiscau, Koksoak, False, Qurlutuq, and George rivers; Savard et al. 2008) and near the coast in the Aupaluk and Kangirsuk sectors (Quebec Breeding Bird Atlas 2016).

Ungava Bay is believed to be of high importance to sea ducks during the molting period. Common Eiders molt in large numbers in Ungava Bay; males leave their nesting area and congregate in July in the numerous bays and estuaries, particularly along the coast between Quaqtaq and Kangirsuk, in the mouth of the Lefroy River, in the Ikattok and Boulder bays south of Aupaluk, near the mouths of the False River and Rivière à la Baleine, and in coastal areas between Pointe Le Droit and Bell Inlet (Driver 1958, Nakashima 1986). Black Scoters and Surf Scoters (*Melanitta* americana and *M. americana*) (Appendix 1, Appendix 2) of both sexes also leave breeding grounds to stage or molt in the southernmost and eastern part of the Ungava Bay (SDJV 2015, Lamb et al. 2020, Lamb et al. 2021).

Male and female Barrow's Goldeneyes (*Bucephala islandica*) from the eastern population, listed as a species of special concern under the Species at Risk Act of Canada, have been confirmed molting in the southern part of the site: males molted in Tasiujaq Bay, the mouth of the Marralik River, and Alukpaluk Bay (Robert et al. 2002); females molted at the mouth of the Koksoak, False, and À la Baleine rivers (Savard and Robert 2013).

Ungava Bay is also very important to sea ducks during the fall staging period; the few data available are based on satellite telemetry studies (SDJV 2015, Lamb et al. 2020). Many birds that molt in Ungava Bay in July and August also stage there for a prolonged period, sometimes as late as October and November. Female Common Eiders stayed in the same general areas they used during premolt and molt for another 30 days on average, with departures from the site between October 21 and November 16 (n = 12; Savard et al. 2011). Ungava Bay, therefore, supports Common Eiders for about six months (i.e., from mid-May to mid-November) (Savard et al. 2011). Some Common Eiders that breed higher in the Canadian Arctic and winter along western Greenland also pass by the north-western coast of Ungava Bay in October (Mosbech et al. 2006a). King Eiders have been tracked to the Quaqtaq area in September and near Aupaluk from October to December (Mosbech et al. 1986b).

Only small groups of eiders (fewer than 50), including Common and King Eiders, have been reported in the key site during winter, including in the Eider Islands off Quaqtaq (Nakashima 1986), off Aupaluk, and around the Gyrfalcon Islands (Mosbech et al. 2006b, Canadian Wildlife Service unpublished data). Long-tailed Ducks have also been observed during an exploratory survey for eiders in February 2010 off Aupaluk, in the Gyrfalcon Islands, and off the mouth of the Koksoak River on the western side of Ungava Bay (Canadian Wildlife Service unpublished data).

Sensitivities: Access and quality of food resources at key foraging sites are of great importance in this site. Colonies are sensitive to human disturbance and predation, and breeding is highly dependent on annual weather conditions in this low Arctic climate. A few communities harvest eiderdown each year.

Avian cholera outbreaks have been documented recently in Arctic Canada; Common Eider mortalities due to this highly virulent disease were confirmed in 2006 and 2011 in the Aupaluk region and suspected in 2006 in the Kangirsuk region, with observed mortality ranging from 1% to 24% in the affected colonies (Iverson 2015). Eggs and eiderdown collection, and subsistence harvest by Inuit, are not considered to have impacts at the population scale.

Potential Conflicts: Berteaux et al. (2014) predict temperature and precipitation increases in Quebec's taiga (south and east coasts of Ungava Bay) and tundra (west coast) due to climate warming. Permafrost thaw is also predicted to have profound effects on the Arctic ecosystem. These climatic changes will likely influence overall sea duck distribution, with species ranges shifting further north. Increases in polar bear populations combined with an earlier ice-free season has led to greater polar bear predation on eider nests; this increase in bear predation has been estimated to be greater than seven-fold since the 1980s in the low Canadian Arctic (Iverson et al. 2014).

Maritime traffic is expected to increase in the near future in Hudson Strait, and perhaps in Ungava Bay, as the ice-free season lengthens. An accidental oil spill could have dramatic effects, particularly near breeding eider colonies or when sea ducks congregate at foraging sites during staging or when molting; furthermore, an increase in the ice-free period will facilitate natural resource development in Nunavut and Nunavik and likely result in increased industrial activities in the Arctic in general.

In 2016 Canada designated the Arctic waters indefinitely off limits to new offshore oil and gas activities and in 2019 suspended the terms of all active oil and gas licenses in the western and eastern Arctic offshore areas.

Avian cholera outbreaks have been documented recently in Arctic Canada; Common Eider mortalities due to this highly virulent disease were confirmed in 2006 and 2011 in the Aupaluk region and suspected in 2006 in the Kangirsuk region, with observed mortality ranging from 1% to 24% in the affected colonies (Iverson 2015). Eggs and eiderdown collection, and subsistence harvest by Inuit, are not considered to have impacts at the population scale.

Status: The Parc National Kuururjuaq falls within the key site; created in 2009, it protects the Koroc River drainage basin that stretches from the interior Torngat Mountains all the way down to Ungava Bay. Part of the planned Parc National du Québec de la Baie-aux-Feuilles, between Aupaluk and Tasiujaq, also overlaps the key site, as does part of the planned Quaqtaq-Kangirsuk biodiversity reserve (MELCC 2021). There are four Important Bird Areas (IBA) included in the key site: Eider Islands IBA, Plover and Payne islands IBA, Gyrfalcon Islands IBA, and Northeast Ungava Bay IBA, all of which support a significant number of breeding Common Eiders (IBA Canada 2021). However, while IBA designation recognizes the area's importance for birds, it provides no legal protections to these areas.

All offshore waters and islands in the key site are part of the Nunavik Marine Region, a zone where Inuit manage wildlife through the Nunavik Marine Region Wildlife Board.

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Key Site 38: Killiniq Island–Button Islands, Nunavut

Location: 60°35'1"N, 64°39'57"W

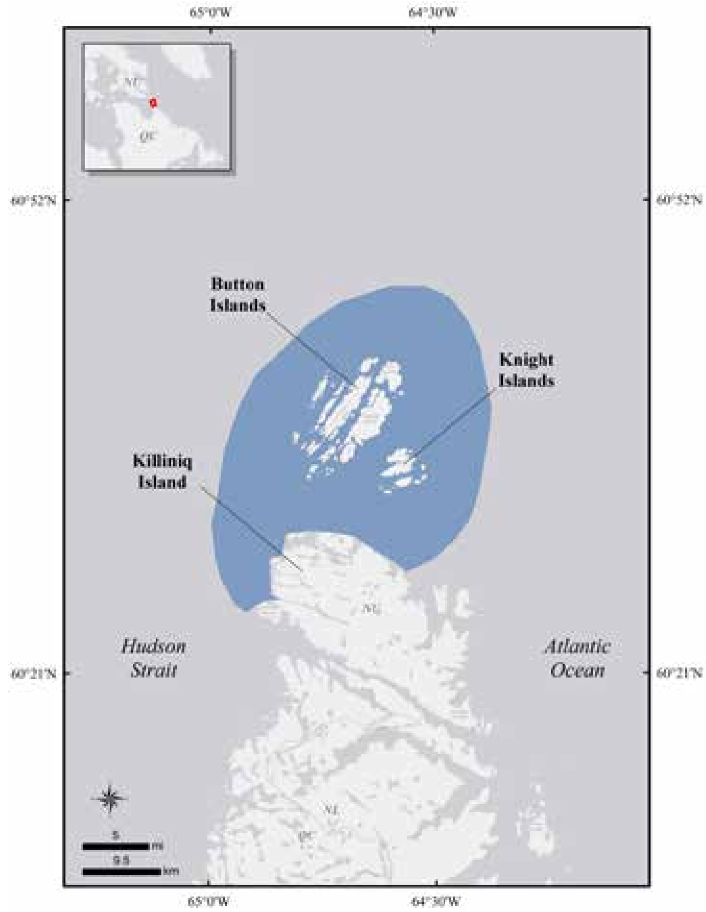
Size: 827 km²

Description: The Killiniq Island–Button Islands key site lies at the northern tip of the Labrador Peninsula, at the northeastern end of continental Canada and the southeast end of Hudson Strait. The site includes Killiniq Island and the Button Islands, Nunavut. Several straits in this site are important corridors for sea ducks flying between the Labrador coast and Ungava Bay: the McLelan and the Lenz straits, south and north of Killiniq Island, respectively, and the Gray Strait between the Killiniq and Button Islands.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: Due to the remoteness of this site, few surveys have been conducted to document use by sea ducks. However, the few data that exist, along with data from telemetry studies, indicate this area is an extremely important seasonal site for sea ducks, particularly during migration and winter. The importance of this site to sea ducks during the breeding season is low (Lock 1986).

Northern Common Eiders (*Somateria mollissima borealis*) breeding in the eastern Canadian Arctic and wintering in the Gulf of St. Lawrence and around Newfoundland fly south along Hudson Strait or Ungava Bay and cross the straits at the tip of the Labrador Peninsula from September to November before continuing south (Nakashima 1986, Mosbech et al. 2006a, Savard et al. 2011). In spring, Common Eiders migrate an opposite path on their return to Arctic breeding grounds, with most birds likely passing through McLelan Strait, but also in Gray Strait (Nakashima 1986). Thousands of Common Eiders pass through these straits daily for about two weeks (Nakashima 1986), peaking the third week of May to early June, based on tracked birds marked just west in Ungava Bay (Mosbech et al. 2006a, Savard et al. 2011). Given that one third of *S. m. borealis* (total population estimated at 550,000; NAWMP



2012) would use this route (Mosbech et al. 2006a; Savard et al. 2011), and that another considerable portion of that population migrates to Greenland to winter (Mosbech et al. 2006a), the contingent of Common Eiders migrating through the straits of the site could easily be more than 200,000 individuals. Other migrants at this site include Long-tailed Duck (*Clangula hyemalis*) and King Eider (*Somateria spectabilis*); both species have been observed during a reconnaissance winter survey (Canadian Wildlife Service unpublished data). Harlequin Ducks (*Histrionicus histrionicus*) (a Species of Concern through the Species at Risk Act) could pass by the Killiniq and Button islands during migration from breeding areas in the Hudson and Ungava bay drainages and Labrador to molting and wintering areas in Greenland (Brodeur et al. 2002, Chubbs et al. 2008).

The key site may be important during the molting period, because there are large colonies of Common Eiders in Ungava Bay southwest of the site (about 6800 nests; Chapdelaine et al. 1986) and smaller colonies along the northern Labrador coast (about 2000 nests; Lock 1986). Bell Inlet, about 50 km south on Ungava Bay, hosts large numbers of molting Common Eider males (Nakashima 1986). Harlequin Ducks may also molt on the site, given that there have been birds molting just south of the site in the Cape Chidley and the Galvano Island areas along the Labrador coast (Brodeur et al. 2002, Gilliland et al. 2002).

Major groups of eiders winter in this key site (Nakashima 1986, Canadian Wildlife Service unpublished data). In 2010, a reconnaissance survey in February reported about 40,000 eiders, half King Eiders and half Common Eiders; most flocks were located west and south of the Button Islands, but also in the Knight Islands and west of Killiniq Island, with only a few more observations east of Killiniq Island (Canadian Wildlife Service unpublished data). Based on a satellite telemetry study, there could be King Eiders in the Killiniq Island–Button Islands area from October to March (Mosbech et al. 1986b, Appendix 1). About 1500 Long-tailed Ducks were also observed in the key site during the 2010 winter survey conducted by the Canadian Wildlife Service.

Sensitivities: Wintering conditions for sea ducks may improve if climate warming leads to more favorable ice conditions in winter. Sea ducks are sensitive to disturbanceat their colonies and to the pollution of offshore waters.

Potential Conflicts: Shipping and cruise ship traffic is expected to increase, and the shipping season may become longer (i.e., earlier in the spring and later into the fall), thereby increasing the possibility of interaction between migrating sea ducks and ships (ENRNT 2015). Expanded shipping and vessel traffic bring a higher risk of contamination from oil, other hazardous and noxious substances, or waste spills (accidental release or illegal discharge), and a risk of collision. Climate change and shipping may alter ice conditions and shipping routes, and cumulative disturbance could increase (ENRNT 2015). Shipping from current and future resource development projects in Hudson Bay (e.g., the deep water port of Churchill, Manitoba) and northern areas (e.g., the Baffinland Mary River Mine in Nunavut) may increase shipping through Hudson Strait (CHARS 2015). In 2016 Canada designated the Arctic waters indefinitely off limits to new offshore oil and gas activities and in 2019 suspended the terms of all active oil and gas licenses in the western and eastern Arctic offshore areas.

Status: The Button Islands is recognized as an International Biological Program site (Eng et al. in Mallory and Fontaine 2004).

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Common Eiders wintering in sea ice. Photo: Christine Lepage.

Atlantic Canada Key Sites

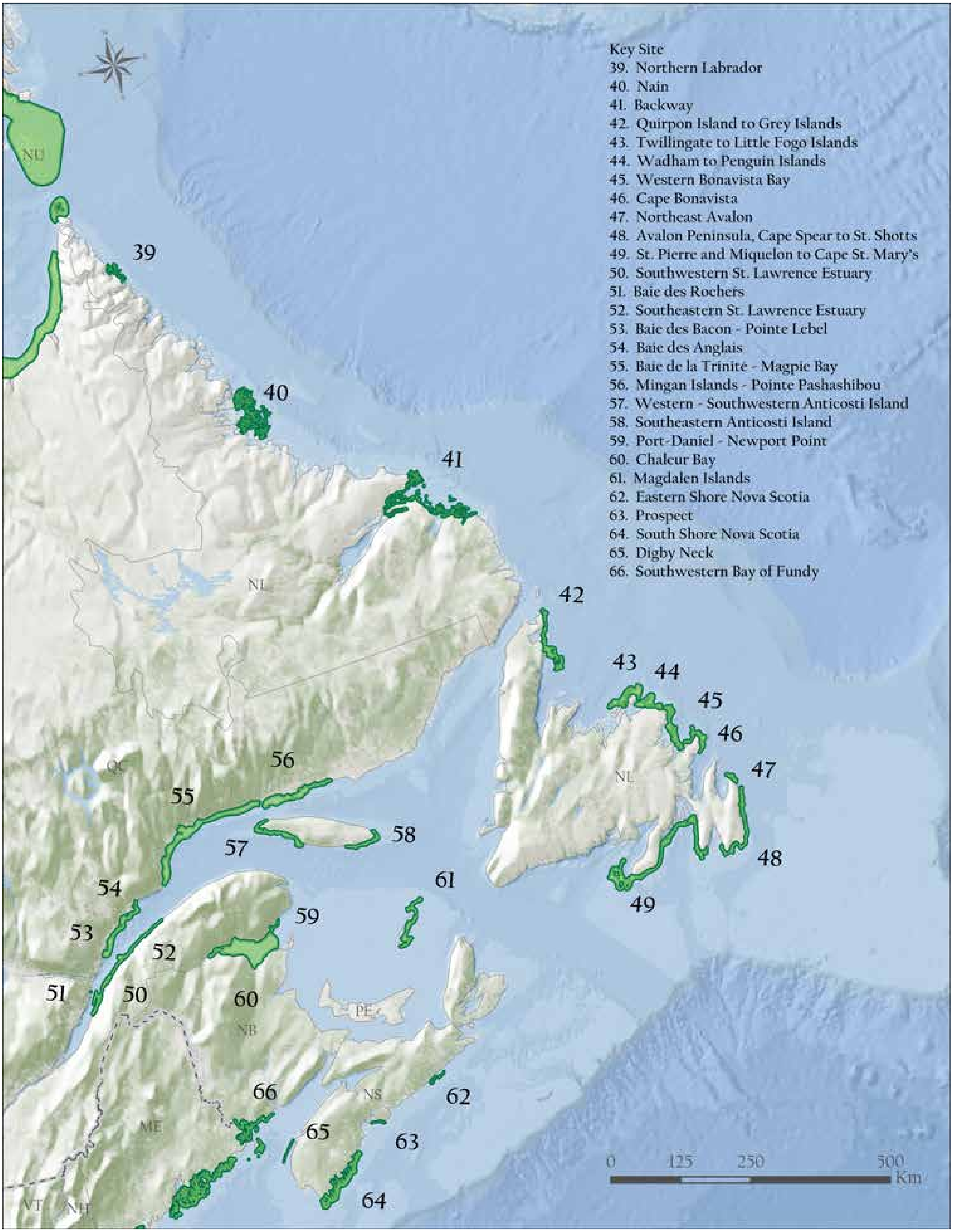


Figure 7. Key habitat sites for sea ducks in Atlantic Canada.

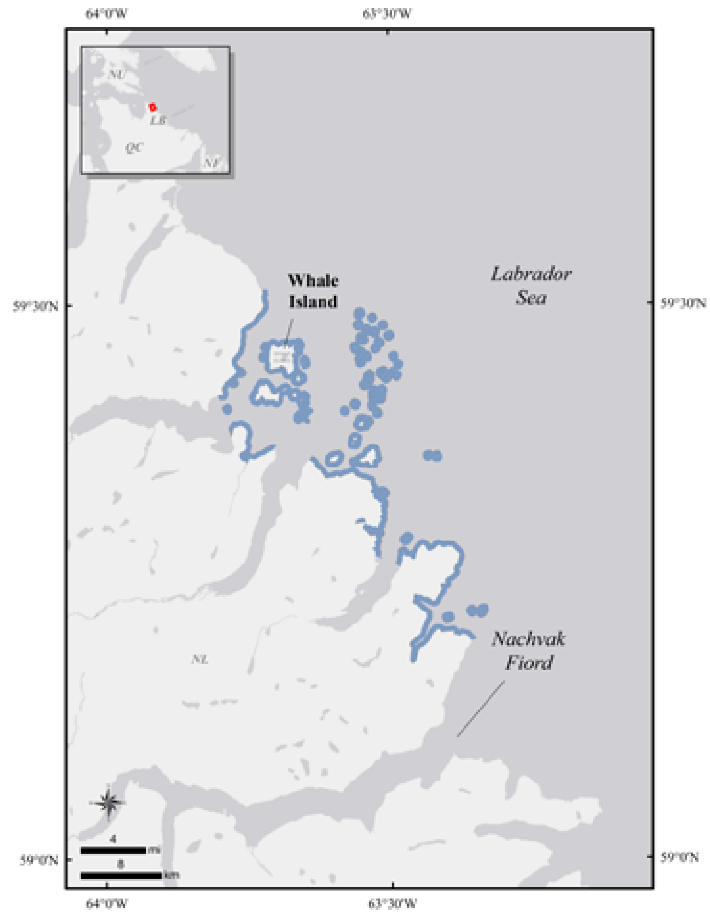
Key Site 39: Northern Labrador, Newfoundland and Labrador

Location: 59°20'46"N, 63°32'54"W

Size: 108 km²

Description: The Northern Labrador key habitat site is located along the Atlantic coast of Nunatsiavut, Labrador, in the province of Newfoundland and Labrador, Canada. The key site is along the northernmost coast of Labrador, which provides important habitat for several species of sea ducks, bird Species at Risk, and concentrations of colonial sea birds encompassing 15 Important Bird Areas (IBAs; Bird Studies Canada 2015).

The Northern Labrador key site encompasses coastal and offshore areas extending from coastal areas near Whale Island in Seven Islands Bay to Nachvak Fiord. It is fed by numerous rivers flowing eastward from the Torngat Mountains. The coastline of MBU 10 is composed of estuaries, islands, bare rocky areas, mudflats, rocky shoreline, and sandflats (Environment Canada 2013). The key site consists of an extensive network of islands that form a classical skerry coast along a deep fjord system that extends seaward for about 25 km (Gilbert et al. 1984). Protected coastlines consist of broad areas of intertidal flats strewn with large boulders, whereas more exposed outer coasts consist of mostly steeply sloped bedrock. Water temperatures are cold, with maximum values of about 4.7°C in August (Gustajtis 1979) although they may reach as high as 6.5 to 7.0°C in shallow waters (Gilbert et al. 1984). The mean tidal amplitude is about 1.7 m.



Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: This site is most important to Eastern Harlequin Duck (*Histrionicus histrionicus*) in June, breeding Northern Common Eider (*Somateria mollissima borealis*) between June and late August, and molting Surf Scoter (*Melanitta perspicillata*) in mid-August.

Harlequin Duck can be found along the majority of the Labrador coast from June to September, and the northern coast of Labrador appears to be an important staging area for birds that are moving between eastern Canada and Greenland (see Brodeur et al. 2002). Two hundred and fifteen pre-molting adult males were detected in the Seven Islands Bay area on July 2, 1994 (Gilliland et al. 2002). This was the largest known concentration of Harlequin Ducks in eastern North America, representing approximately 5.4% of the eastern North America population (NAWMP 2012). Surf Scoters occur in the site (Lock 1986) but numbers are uncertain.

Within the Northern Labrador key site, Common Eider nest on many of the offshore islands (a maximum of 452 male Common Eiders were detected in June 1994 (S. Gilliland unpublished data); accounting for undetected females, the total abundance of eiders using the site at this time is closer to 904. Numbers drop off rapidly by September, with a total of 121 birds detected in September 1980 (A. Lock unpublished data), suggesting that this region is not an important molting area for Common Eider. A maximum of 802 scoters were detected at the key site in September 1980, with counts of 662 Surf Scoter and 140 White-winged Scoter (Canadian Wildlife Service unpublished data).

Sensitivities: Sea ducks are sensitive to degradation of their staging, molting, and foraging areas. Human disturbance can have negative effects on birds, particularly while foraging or during the molting period when birds are flightless. Preliminary observations suggest sea ducks may be sensitive to disturbances during molt (Frimer 1994, O'Conner 2008) and that sea ducks may be particularly sensitive to marine vessel and aircraft traffic. Scoters are ranked second among Anatidae on the oil vulnerability index (King and Sanger 1979, Daigle and Darveau 1995). Scoters are also vulnerable to heavy metals contamination (Savard et al. 1998).

Potential Conflicts: During the establishment of the Torngat National Park, two properties containing rich deposits of garnet sands at the Iron Stand, located 6 km north of the key site, and a third property located at Seven Islands Bay, which is within the key site, were excluded from the park. There are no current plans to develop the sites, but they have a rich source of garnets, which are used in industrial abrasives.

With the establishment of the Torngat National Park, and increased cruise ship activity in the Arctic (Lasserre and Têtu 2015), there may be new sources of anthropogenic disturbances in this region that may have negative impacts on molting sea ducks. Chronic or major oil spills could have large impacts on birds and habitat here (Bird Studies Canada 2015) and oil spills are considered a growing threat with increased oil and gas exploration in MBU 10. There is a continued risk of fishing gear entanglement (Environment Canada 2013). Inuit hunting and egg collecting on the islands within the key site has an unknown but likely minimal impact on birds and their habitat.

Status: This key site is part of Bird Conservation Region 3 (Arctic Plains and Mountains), as well as Marine Biogeographical Unit (MBU) 10 (Newfoundland-Labrador Shelves). The Seven Islands Bay Important Bird Area encompasses the key site and extends along the Labrador coast from Kangardluaksuk Bay to Nachvak Fiord (Bird Studies Canada 2015). The site also intersects the Torngat Mountains National Park, which includes the coastline and intertidal areas of the mainland and islands down to the mean low-low tide level. The key site also falls within the Labrador Inuit Settlement area, and as of 2019 the marine component of the settlement area is being considered as an Indigenous marine protected area by the Nunatsiavut and Canadian governments.

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Surf Scoters. Photo: Tim Bowman.

Key Site 40: Nain, Newfoundland and Labrador

Location: 56°20'7"N, 61°10'33"W

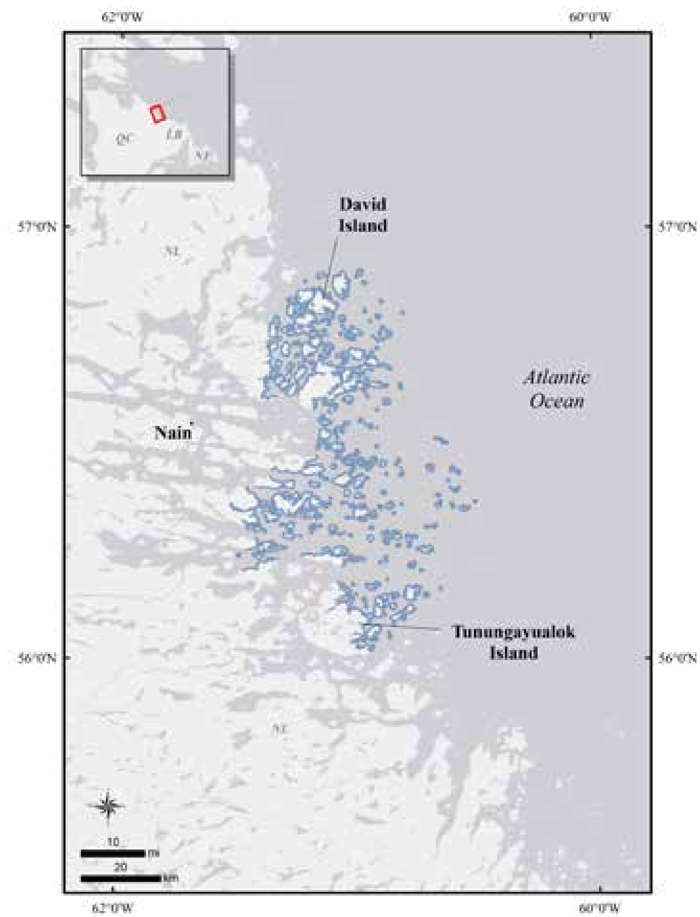
Size: 900 km²

Description: The Nain key site is located along the Atlantic coast of Nunatsiavut, Labrador, in the province of Newfoundland and Labrador, Canada. The key site is along the northern coast of Labrador, which provides important habitat for several species of sea ducks, bird species at risk, and concentrations of colonial sea birds encompassing 15 Important Bird Areas (IBAs; Bird Studies Canada 2015).

The Nain key site encompasses coastal and offshore areas within Labrador Inuit lands near the town of Nain, extending from David Island to Tunungayualok Island. It is fed by numerous rivers flowing eastward from the Torngat Mountains. The key site consists of an extensive network of islands that form a classical skerry coast along a deep fjord system that extends seaward for about 80 km (Gilbert et al. 1984). Protected coastlines consist of broad areas of intertidal flats strewn with large boulders, whereas more exposed outer coasts consist of mostly steeply sloped bedrock. Water temperatures are cold with maximum values of about 4.7°C in August (Gustajtis 1979) although they may reach as high as 6.5 to 7.0°C in shallow waters (Gilbert et al. 1984). The mean tidal amplitude is about 1.7 m.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: This site is most important to molting Surf Scoter (*Melanitta perspicillata*) and breeding Northern Common Eider (*Somateria mollissima borealis*), primarily between June and late August. Todd (1963) first reported large numbers of molting Surf Scoter and lesser numbers of White-winged Scoter (*Melanitta deglandi*) and Black Scoter (*Melanitta americana*) along the Labrador coast. Surveys by Lock (1986) in 1980 and by Gilliland in 1994, 1998, and 1999 (Canadian Wildlife Service unpublished data) estimated more than 20,000 and 41,000 scoters, respectively, and 14,000 and 27,000



Common Eider, respectively, along the Labrador coast in June. Abundance of scoters peaked in mid-August, with a maximum of 57,000 and 55,000 birds detected in August 1998 and 1999, respectively. Along the Labrador coast, there is remarkable consistency in the location of scoter flocks among years, with highest concentrations occurring around Nain and Backway key sites where molting birds coalesce into very large flocks.

Within the Nain key site, scoters begin arriving in late May. Numbers increase in June to between 3450 and 9164 birds and reach more than 19,000 birds by mid-August (with a maximum of 19,837 scoters detected in August 1999). Dispersal from molt sites begins in late August and the majority of birds leave by early September (664 birds detected at the Nain site in September 1980; S. Gilliland unpublished data).

Surf Scoter is the predominant species of scoter on the coast of Labrador during the molt period, comprising 80 to 90% of birds, with the remainder being Black Scoter and White-winged Scoter (Gilliland and Savard 2021). It is not known why scoters prefer these areas over other areas of coastal Labrador. Scoters specialize on mollusks during molt (Bédard et al. 1997; Savard et al. 1998), and these areas likely have substrate and bathymetry favorable for mollusks (S. Gilliland unpublished data).

Common Eiders use the Nain site for breeding and nest on many of the islands in the key site (Lock 1986, Savard et al. 1999). A maximum of 3729 male Common Eider were detected in June 2006; accounting for undetected females, the total abundance of birds using the site at this time is closer to 7458. Numbers drop off rapidly by September (a total of 81 detected in September 1980), suggesting that this region is not an important molting area for Common Eider. Birds breeding here could molt along Anticosti Island where large numbers of molting eiders have been found (Rail and Savard 2003).

A total of 40 presumably premolt Eastern Harlequin Ducks (*Histrionicus histrionicus*) were detected in coastal areas around Nain in late June 1994. Subsequent surveys did not detect molting individuals, however, it is possible that a few birds do molt here (Gilliland et al. 2002).

Sensitivities: Sea ducks are sensitive to degradation of their staging, molting, and foraging areas. Human disturbance can have negative effects on birds, particularly while foraging or during the molting period when birds are flightless. Scoters are ranked second among Anatidae on the oil vulnerability index (King and Sanger 1979, Daigle and Darveau 1995). Scoters are also vulnerable to heavy metals contamination and hunting (Savard et al. 1998).

Potential Conflicts: The shipping route for the Voisey Bay nickel deposit passes near large molting aggregations of scoters, and preliminary observations suggest scoters may be sensitive to this type of disturbance during molt (O'Connor 2008). Also within the key site are the shipping lanes into Nain, which are used by the Labrador Coastal Service and increasingly by cruise ships. Chronic or major oil spills could have major impacts on birds and habitat here (Bird Studies Canada 2015). Oil spills are considered a growing threat with increased oil and gas exploration in Marine Geographic Unit 10 and there is also a continued risk of fishing gear entanglement (Environment Canada 2013). Inuit hunting and egg collecting in the islands southeast of Nain has an unknown but likely minimal impact on birds and their habitat.

Status: This key site is part of Bird Conservation Region 7, Taiga Shield and Hudson Plains, as well as the Marine Geographic Unit 10, Newfoundland-Labrador Shelves. Two IBAs have been designated within this area, including the Nain Coastline IBA (located along the Labrador coastline from the western and northern edges of Paul Island, Humbys Island to the south, and Dog Island to the north) and the Offshore Islands Southeast of Nain IBA (southeast of Nain, including Pyramid, Barbican, the Castle, Negro, Ukallik, Kidlit, and Nunaksuk Islands) (Bird Studies Canada 2015).

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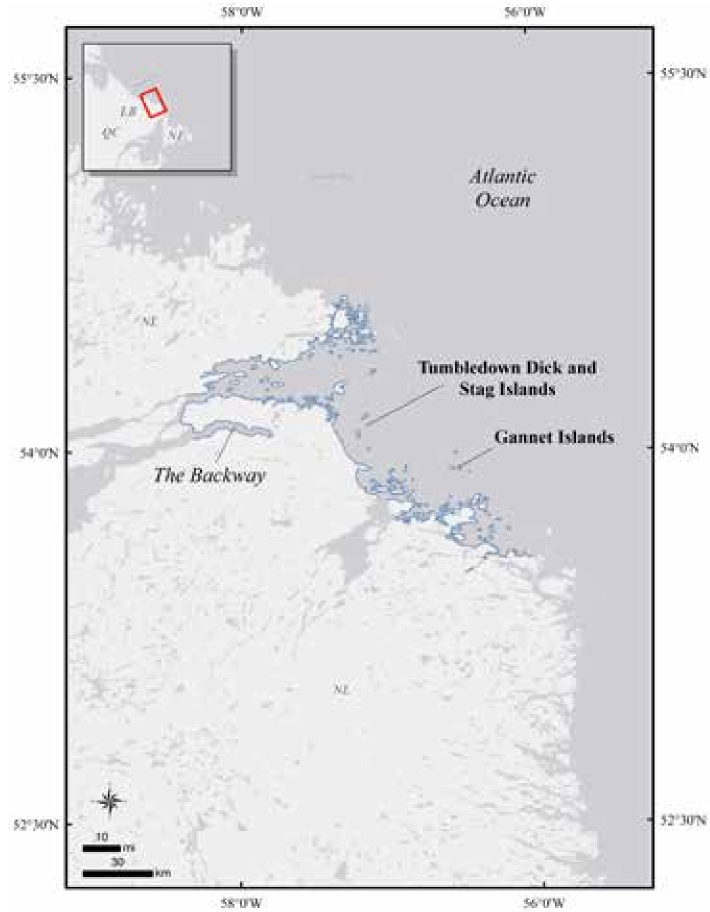
Key Site 41: Backway, Newfoundland and Labrador

Location: 54°5'22"N, 56°54'50"W

Size: 828 km²

Description: The Backway key site is located along the Atlantic coast of Labrador in the province of Newfoundland and Labrador, Canada. The northern part of this key site is in Nunatsiavut (Fish Cove Point and north) and the southern part (The Strand, etc.) is in Nunatuviut. The Labrador coast provides important habitat for numerous congregatory bird species, bird species at risk, and concentrations of colonial seabird and waterfowl species comprising 15 Important Bird areas (IBAs; Bird Studies Canada 2015), 10 of which intersect the Backway site.

The Backway key site encompasses coastal and offshore areas with Labrador Inuit Lands and Labrador Inuit Settlement Areas from Chance Island and Holton Island at the northern extent to Indian Tickle in the south, and extending inland to include Groswater Bay, Hamilton Inlet, and the Backway. It is fed by numerous rivers. It is also part of Bird Conservation Region (BCR) 8 (Boreal Softwood Shield), as well as the Marine Biogeographic Unit (MBU) 10 (Newfoundland-Labrador Shelves). Coastal habitat in MBU 10 includes estuaries, islands, bare areas, mudflats, rocky shoreline, saltmarshes, and sandflats (Environment Canada 2013).



Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: This site is most important to molting Surf Scoter (*Melanitta perspicillata*), breeding Common Eider (*Somateria mollissima*), and molting Harlequin Duck (*Histrionicus histrionicus*) primarily between June and late August. The key site occurs at the approximate boundary between the breeding ranges of Northern (*S. m. borealis*) and American (*S. m. dresseri*) Common Eiders (Mendall 1980). Todd (1963) first reported large numbers of molting Surf Scoter and lesser numbers of White-winged Scoter (*Melanitta deglandi*) and Black Scoter (*M. americana*) along the Labrador coast. Surveys by Lock (1986) in 1980 and by Gilliland in 1994 (unpublished data) found more than 20,000 and 41,000 scoters, respectively, and 14,000 and 27,000 Common Eider, respectively, along the Labrador coast in June. Abundance of scoters peaked in mid-August, with a maximum of 57,000 and 55,000 birds detected in August 1998 and 1999 (Gilliland unpublished data), respectively. There is remarkable consistency in the location of scoter flocks among years, with highest concentrations occurring around Nain and Backway key sites where molting birds coalesce into very large flocks.

Within the key site, scoters begin arriving in late May. Numbers of birds increase to 5500 to 17,900 birds in June and have reached a maximum of about 38,000 scoters by mid-August in 1998. During the molting period, concentrations of scoters are highest in the Backway (a maximum of 36,500 scoters in August 1999), between North Point and Cape Porcupine (a maximum of 5211 scoters in August 1998), and Table Bay (a maximum of 2603 scoters in August 1998). Dispersal from molt sites begins in late

August, with many birds leaving by early September (a maximum of 10,479 and 10,853 birds detected at the Backway key site in September 1980 and September 2001, respectively; Gilliland unpublished data). The number of scoters in the Backway IBA is the largest ever recorded in eastern Canada (Bird Studies Canada 2015).

Surf Scoter is the predominant species of scoter, comprising between 80 to 90% of birds on the coast of Labrador and in the Backway key site during the molt period, with the remainder comprising Black and White-winged Scoter (Gilliland and Savard 2021). Scoters specialize on mollusks during this part of the annual cycle (Bédard et al. 1997, Savard et al. 1998), and they are commonly observed feeding in the surf within a few meters of shore (Bird Studies Canada 2015).

Common Eider breed at the Backway site, particularly on the many islands in Groswater Bay and the outer coast of the key site (Lock 1986, Savard et al. 1999). A maximum of 13,314 male Common Eiders were detected in June 1994; accounting for undetected females, the total abundance of birds using the site at this time is estimated at 26,628. Numbers drop off rapidly by September (a total of 31 males detected in September 1980), suggesting that this region is not an important molting area for Common Eider. Birds breeding here could molt along Anticosti Island, where large numbers of molting eiders have been found (Rail and Savard 2003).

The Gannet Islands, Tumbledown Dick Island, and Stag Islands regions of the Backway key site are three of the most important regions in North America for molting Eastern Harlequin Ducks, supporting at least 5.6% of the continental population in August: Gannet Islands, 166 birds in August 1999; Tumbledown Dick Island, 55 birds in August 1998; Stag Islands, 47 birds in August 1998 (Gilliland et al. 2002).

Sensitivities: Sea ducks are sensitive to degradation of their staging, molting, and foraging habitats. Human disturbance such as boating can have negative effects on birds, particularly while birds are foraging or during the molting period when birds are flightless. Scoters are ranked second among Anatidae on the oil vulnerability index (King and Sanger 1979, Daigle and Darveau 1995). Scoters are also vulnerable to heavy metals contamination and hunting (Savard et al. 1998).

Potential Conflicts: Marine transportation of goods and petroleum products through the Lake Melville area is probably the greatest potential threat. Small illegal oil discharges and large accidental oil spills could have major impacts on birds and habitat here (Bird Studies Canada 2015). Oil spills are a growing threat with increased oil and gas exploration in MBU 10, and there is also a continued risk of fishing gear entanglement (Environment Canada 2013). Inuit hunting and egg collecting in the islands southeast of Nain has an unknown but likely minimal impact on birds and their habitat.

Status: Ten IBAs have been designated within this area: Gannet Islands, Quaker Hat Island, Goose Brook, Northeast Groswater Bay, South Groswater Bay Coastline, Bird Island, Cape Porcupine, Tumbledown Dick Islands, and Stag Islands. Backway and Table Bay provide breeding habitat for all alcid species occurring in eastern Canada (Bird Studies Canada 2015) and include important nesting areas for Common Eider. The site also includes the Gannet Island Ecological Reserve (both marine and terrestrial zones), which protects the largest Razorbill colony in North America and the largest and most diverse seabird colony in Labrador (Bird Studies Canada 2015).

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Key Site 42: Quirpon Island to Grey Islands, Newfoundland

Location: 51°11'55"N, 55°40'1"W

Size: 1045 km^2

Description: This key site is located off the Great Northern Peninsula along the eastern coast of Newfoundland. The northern end of this key area begins at the southeastern edge of the Strait of Belle Isle around Quirpon Island, extends south encompassing the Fishchot Islands, and continues south to include the Grey Islands. Most of the area is exposed to the open Atlantic Ocean to the east. The Fishchot Islands are a chain of small isolated rocks and low rocky islands located 15 km north of Croque. The Grey Islands (Bell Island and Groais Island) are located approximately 20 km east of Conche. Bell Island (88 km^2) is located to the south of the smaller, uninhabited Groais Island (41 km^2). Both Bell and Groais islands have areas of forested hills, rocky shores, and coastal bluffs. The ocean in this area is covered with sea ice during winter, though prevailing westerly winds often create open water around the eastern side of the Fischot Islands and Bell Island.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have been adjusted to account for incomplete detection, either by applying species-specific visibility correction factors estimated for surveys specific to this area, or from visibility correction factors estimated from other similar areas and surveys (see Bordage et al. 1998).

Biological Value: This key area is predominately important to Common Eider (*Somateria mollissima*) but also supports other sea duck species. The Fischot Islands provide important habitat for wintering eiders (NF008; IBA Canada website). During winter, eiders congregate in areas of open water, which may vary among years, or within a winter depending on the extent of sea ice cover. Eiders forage primarily on benthic invertebrates, including intertidal and subtidal mollusks (especially blue mussels, *Mytilus edulis*), crustaceans, and echinoderms (Goudie et al. 2000). Winter surveys conducted in this area by the Canadian Wildlife Service produced estimates ranging from 1575 Common Eiders in 2015 to 70,970 in 2012. Over six years of winter survey data (2003, 2006, 2009, 2012, 2015, and 2018), an average of 37,515 individuals were estimated in this area (Canadian Wildlife Service Waterfowl Committee 2020). About 90% of the eiders that overwinter in this area are Northern Common Eiders (*Somateria mollissima borealis*), with the remaining being American Common Eiders (*Somateria mollissima dresseri*) and small numbers of King Eiders (*Somateria spectabilis*) (Gilliland and Robertson 2009). This represents about 6% of the continental population of *S. m. borealis* (NAWMP 2012). The Grey Islands host a breeding population of American Common Eiders (*Somateria mollissima dresseri*) and are also important for the northern *borealis* eider subspecies during winter (NF010; IBA Canada 2021). The Grey Islands are a key molting site for Harlequin Ducks (*Histrionicus histrionicus*) (Gilliland et al. 2002). Several thousand wintering eiders congregate in the open water leads around the Grey Islands (NF008; IBA Canada 2021). The islands south of Bell Island support the largest known colony of nesting Common Eiders (at least 1000 pairs) on insular Newfoundland (NF010; IBA

Canada website). The number of eider nests in the Bell Island South Coast area increased from 12 in 1975 to 350 in 1988 and to 1291 in 2001 (Government of Canada 2019).

Sensitivities: Waterfowl are sensitive to human disturbance, mostly small vessel or ship traffic. Common Eiders aggregate in dense flocks in this area and can be susceptible to hunting pressure and oil spills. Unintentional introduction of invasive species in this area could influence food resource availability and quality. The largest breeding colony of Common Eiders in insular Newfoundland was located in Isle aux Canes which is part of the Grey Islands Archipelago. The colony has had periodic visits by polar bears, and Arctic and red fox which results in years of complete nest failure. More recently, bald eagles have taken up year-round residency and not only disrupt breeding, but local hunters have reported that the presence of eagles has resulted in nocturnal feeding of eiders using the archipelago in winter (S. Gilliland pers. comm.).

Potential Conflicts: There is relatively little shipping traffic within the key site, but just to the north of this key site, the Strait of Belle Isle is a busy shipping route linking North America to Europe. The Fischot Islands are known to local hunters as a winter Common Eider congregation area (NF008; IBA Canada website). There is a history of duck hunting on the northern end of Groais Island, although the magnitude of the harvest is unknown (Russell and Fifield 2001). The age, sex, and subspecific composition of Newfoundland's hunted Common Eider population is not well quantified (Gilliland and Robertson 2009).

Status: The Fischot Islands are designated as an Important Bird Area. The area off the southern coast of Bell Island is included in the Southern Grey Island Migratory Bird Sanctuary and is protected from hunting year-round (NF010; IBA Canada 2021). Two federal Migratory Bird Sanctuaries were established in 1991 off the coast of Bell Island: Shepherd Island and Isle aux Canes. Together, these two sanctuaries provide one of the largest breeding site for Common Eider in Newfoundland (Government of Canada 2019). The northern coast of Groais Island is also designated as an IBA and provides both breeding and wintering habitat for eiders. The Canadian Wildlife Service is responsible for managing these IBAs.

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Key Site 43: Twillingate to Little Fogo Islands, Newfoundland

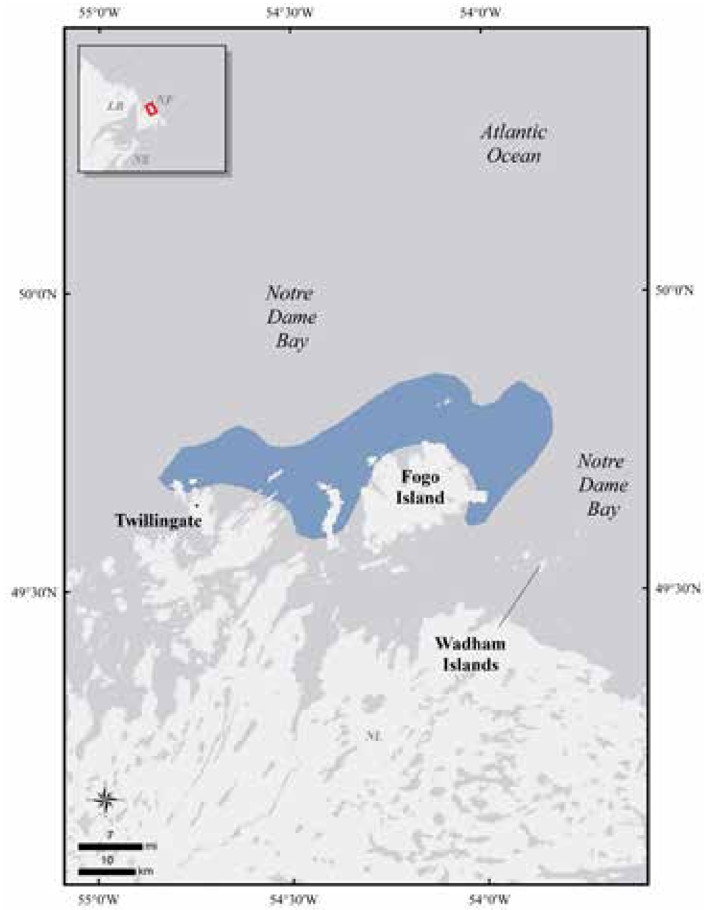
Location: 49°45'2"N, 54°19'9"W

Size: 955 km²

Description: This key site is located in Notre Dame Bay on the northeast coast of Newfoundland. The key site begins at the New World Islands, approximately 5 km northwest of the town of Twillingate, stretches east across the Change Islands, encompasses the Little Fogo Islands (an archipelago with over 100 small islands), and covers about half of the coastal waters around Fogo Island. The irregular coastline in this area is scattered with small settlements and fishing villages. There are numerous low rocky islands, shallow waters, and isolated rocks and shoals throughout the area.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have been adjusted to account for observer error in flock size, following methods developed by Bordage et al. (1998).

Biological Value: This key area is predominately important for wintering Common Eider (*Somateria mollissima*). Winter surveys conducted in this area by the Canadian Wildlife Service produced estimates ranging from 10,707 individuals in 2003 to 96,583 individuals in 2012. Over six years of winter survey data (2003, 2006, 2009, 2012, 2015, and 2018), an average of 27,725 individuals were estimated in this area (Canadian Wildlife Service Waterfowl Committee 2020). About 90% of the eiders that overwinter in this area are Northern Common Eider (*Somateria mollissima borealis*), with the remaining being American Common Eider (*Somateria mollissima dresseri*) and small numbers of King Eider (*Somateria spectabilis*) (Gilliland and Robertson 2009). This represents about 16% of the continental population of Northern Common Eider (NAWMP 2012). During winter, Common Eiders congregate in areas of open water, which can change over space and time. Common Eiders forage primarily on benthic invertebrates, including intertidal and subtidal mollusks (especially blue mussels, *Mytilus edulis*), crustaceans, and echinoderms (Goudie et al. 2000). Common Eiders wintering near the Wadham Islands Important Bird Area (15 km southeast of Fogo Island) may shift among foraging areas within this key area



depending on ice conditions and location of open water. Breeding Common Eiders in the Little Fogo Island area are believed to be birds that are unable to migrate due to injuries sustained during the hunting season but are still capable of breeding (S. Gilliland pers. comm.).

Other sea duck species that use this area include Long-tailed Duck (*Clangula hyemalis*), Common Goldeneye (*Bucephala clangula*), Common Merganser (*Mergus merganser*), and Red-breasted Merganser (*Mergus serrator*) (eBird 2020).

Sensitivities: Waterfowl can be sensitive to small vessel and ship traffic. Wintering eiders aggregate in dense flocks and, depending on sea ice conditions, hunting pressure can be intense in this area (Gilliland and Robertson 2009, Gilliland et al. 2009). Unintentional introduction of invasive species in this area could influence food resource availability and quality. Oil spills, both catastrophic and chronic, can have severe impacts on sea ducks. There is historical documentation of oil spills affecting Common

Eiders and other waterbird species in the inshore waters of southeastern Newfoundland (Wiese and Ryan 2003, Robertson et al. 2014).

Potential Conflicts: Nearby areas have a history of poaching, though in recent years it is believed that illegal hunting has decreased (NF013; IBA Canada 2021). Boat traffic in the area may cause disturbance and added risk of oil spills. Vessels operating at night in the sea ice in this area use high-intensity lighting, and operators have reported collisions with eiders that have damaged vessels and killed eiders. Any future increase in commercial fishing quotas may increase boat traffic in the area. Future increases in water temperature due to climate change could threaten the biological diversity of prey species that are critical to wintering sea ducks.

Status: There are no designated Important Birds Areas or sanctuaries in this area, although the eastern end is adjacent to other protected seabird areas (Wadham Islands and Funk Island). This key area is part of the Fogo Shelf Ecologically and Biologically Significant Area (Wells et al. 2017) and considered a top-priority Special Marine Area site for future conservation (CPAWS 2019). Most of the islands in the key site are under provincial ownership, with some private inholdings.

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Key Site 44: Wadham to Penguin Islands, Newfoundland

Location: 49°31'0"N, 53°48'12"W

Size: 658 km^2

Description: This key site is located in Notre Dame Bay on the northeast coast of Newfoundland, between Fogo Island and the town of Cape Freels North. The Wadham Islands consist of seven islands (Peckford, Green, White, Copper, Duck, James, and Outer Wadham Islands) with numerous rocky shoals. The larger islands are vegetated with shrubs and grasses and the small islands are low with rocky terrain.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have been adjusted to account for observer error in flock size estimation following methods developed by Bordage et al. (1998).

Biological Value: This key site is predominately important for wintering Common Eider (*Somateria mollissima*). Winter surveys conducted in this area by the Canadian Wildlife Service (CWS) produced estimates ranging from 7784 individuals in 2015 to 54,411 individuals in 2003. Over six years of winter survey data (2003, 2006, 2009, 2012, 2015, and 2018), an average of 27,800 individuals were estimated in this area (CWS Waterfowl Committee 2020). About 90% of the eiders that overwinter in this area are Northern Common Eiders (*Somateria mollissima borealis*), with the remaining being American Common Eiders (*Somateria mollissima dresseri*) and small numbers of King Eiders (*Somateria spectabilis*) (Gilliland and Robertson 2009). This represents about 9% of the continental population of Northern Common Eiders (NAWMP 2012). During winter, eiders congregate in areas of open water, which can change over space and time. Adults forage primarily on benthic invertebrates, including intertidal and subtidal mollusks (especially blue mussels, *Mytilus edulis*), crustaceans, and echinoderms (Goudie et al. 2000).

Other sea duckspecies that use this area include Long-tailed Duck (*Clangula hyemalis*), Common Goldeneye (*Bucephala clangula*), Common Merganser (*Mergus merganser*), and Red-breasted Merganser (*Mergus serrator*) (eBird 2020).

Sensitivities: Waterfowl can be sensitive to small vessel and ship traffic. Wintering eiders aggregate in dense flocks, and depending on sea ice conditions, hunting pressure can be intense in this area (Gilliland and Robertson 2009, Gilliland et al. 2009). Unintentional introduction of invasive species in this area could influence food resource availability and quality. Oil spills, both catastrophic and chronic, can have severe impacts on sea ducks. There is historical documentation of oil spills affecting Common Eiders and other waterbird species in the inshore waters of southeastern Newfoundland (Wiese and Ryan 2003, Robertson et al. 2014).

Potential Conflicts: Nearby areas have a history of poaching, though in recent years it is believed that illegal hunting has decreased (NF013; IBA Canada 2021). Boat traffic in the area may cause disturbance and added risk of oil spill. Vessels operating at night in the sea ice in this area use high-intensity lighting, and operators have reported collisions with eiders that have damaged vessels and killed eiders. Any future increase in commercial fishing quotas may increase boat traffic in the area. Future increases in water temperature due to climate change could threaten the biological diversity of prey species that are critical to wintering sea ducks.

Status: This key area contains one Important Bird Area (IBA), the Wadham Islands and Adjacent Marine Area IBA (IBA Canada 2021). This IBA is considered globally significant for congregatory species, including waterfowl and colonial waterbirds. This key site is part of the Fogo Shelf Ecologically and Biologically Significant Area (Wells et al. 2017) and considered a top priority Special Marine Area site for future conservation (CPAWS 2019). Most of the islands in the key site are under provincial ownership, with some private inholdings.

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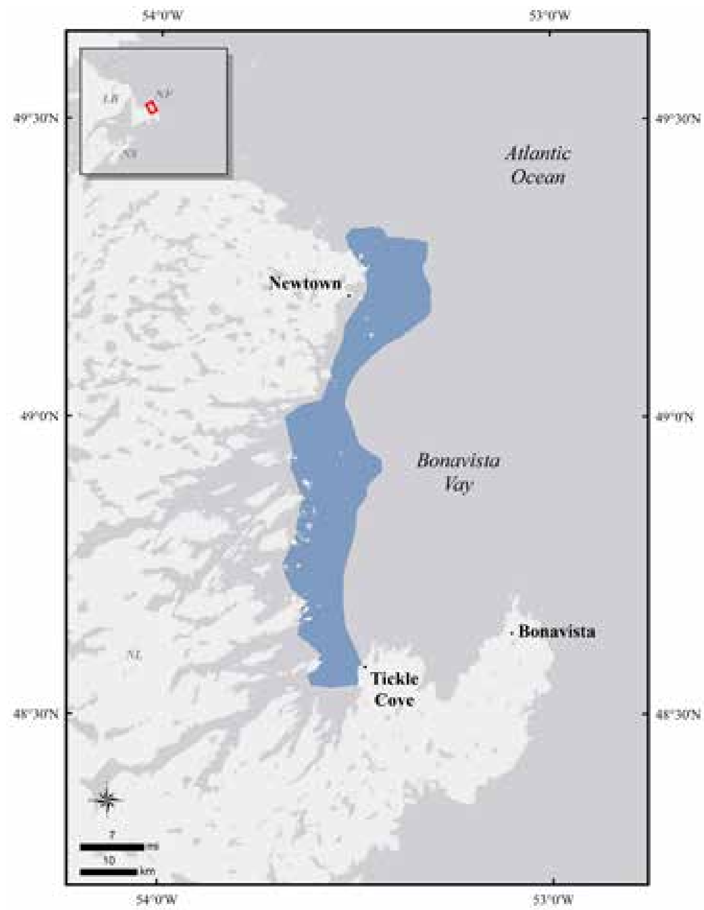
Key Site 45: Western Bonavista Bay, Newfoundland

Location: 48°55'19"N, 53°33'32"W

Size: 879 km²

Description: This key site is located along the western side of Bonavista Bay on the northeast coast of Newfoundland, an area that provides important habitat for numerous congregatory bird species, including colonial birds and waterfowl, and bird species at risk. It includes several Important Bird Areas. This key site begins near the town of Tickle Cove and continues north to Cape Freels North near Newtown. The area contains open sea, coastal cliffs, rocky shores, coves, shoals, and islands.



Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have been adjusted to account for observer error in flock size estimation following methods developed by Bordage et al. (1998).

Biological Value: This key site is primarily important for migrating and wintering Common Eider (*Somateria mollissima*) from late fall through April. In this region, fall migration occurs in October and November and waterfowl numbers reach peak abundance by mid-December (Goudie et al. 2000). Winter surveys conducted in this area by the Canadian Wildlife Service (CWS) produced estimates ranging from 8700 individuals in 2009 to 49,000 birds in 2012. Over six years of winter survey data (2003, 2006, 2009, 2012, 2015, and 2018), an average of 18,282 individuals were estimated in this area (CWS Waterfowl Committee 2020). About 90% of the eiders that overwinter in this area are Northern Common Eiders (*Somateria mollissima borealis*), with the remaining being American Common Eiders (*Somateria mollissima dresseri*), along with a few King Eiders (*Somateria spectabilis)* (Gilliland and Robertson 2009). This represents about 6% of the continental population of Northern Common Eiders (NAWMP 2012). During winter, eiders congregate in areas of open water, which can change over space and time. Adults forage primarily on benthic invertebrates, including intertidal and subtidal mollusks (especially blue mussels, *Mytilus edulis*), crustaceans, and echinoderms (Goudie et al. 2000).

Other sea duck species that use this area include Long-tailed Duck (*Clangula hyemalis*), Common Goldeneye (*Bucephala clangula*), Common Merganser (*Mergus merganser*), and Red-breasted Merganser (*Mergus serrator*) (eBird 2020).

Sensitivities: Waterfowl can be sensitive to small vessel and ship traffic. Wintering eiders aggregate in dense flocks, and depending on sea ice conditions, hunting pressure can be intense in this area (Gilliland and Robertson 2009, Gilliland et al 2009). Unintentional introduction of invasive species in this area could influence food resource availability and quality.

Potential Conflicts: Nearby areas have a history of poaching, although in recent years it is believed that illegal hunting has decreased (NF013; IBA Canada 2021). Boat traffic in the area may disturb birds and increase the risk of oil spills. Vessels operating at night in the sea ice in this area use high-intensity lighting, and operators have reported collisions with eiders that have damaged vessels and killed eiders. Any future increase in commercial fishing quotas may increase boat traffic in the area.

Status: The site intersects the Cape Freels Coastline and Cabot Island IBA, which is considered globally significant for waterfowl concentrations and continentally significant for congregatory species. It is adjacent to the Terra Nova National Park IBA, which is nationally significant for two restricted-range terrestrial species (IBA Canada 2021). The site also intersects the Eastport Marine Protected Area established for protection of American Lobster and species at risk (e.g., Atlantic wolffish; *Anarhichas lupus*). Most of the islands in the key site are under provincial ownership, with some private inholdings.

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Key Site 46: Cape Bonavista, Newfoundland

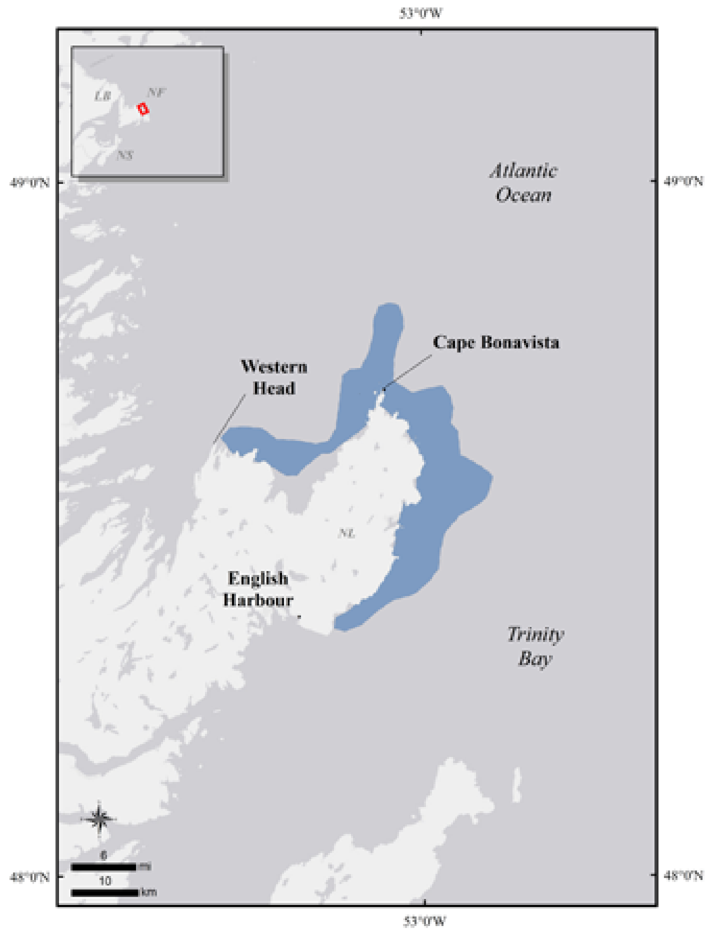
Location: 48°39'52"N, 53°0'17"W

Size: 504 km^2

Description: This key habitat site is located around the northern end of the Bonavista Peninsula in eastern Newfoundland. The Newfoundland coast provides important habitat for numerous congregatory bird species and bird species at risk and includes several Important Bird Areas. The key site begins east of the town of English Harbour and continues around the peninsula, ending past the town of Keels near Western Head. Bonavista Bay lies to the northwest of Cape Bonavista, and the open Atlantic Ocean lies to the north and to the east. The area contains open sea, coastal cliffs, rocky shores, coves, shoals, and islands.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have been adjusted to account for observer error in flock size estimation following methods developed by Bordage et al. (1998).

Biological Value: This key site is primarily important for migrating and wintering Common Eider (*Somateria mollissima*) from late fall through April. In this region, fall migration occurs in October and November and sea ducks reach peak abundance by mid-December (Goudie et al. 2000). Winter surveys conducted in this area by the Canadian Wildlife Service produced estimates ranging from 2507 individuals in 2012 to 44,180 individuals in 2015. Use of the site is affected by sea ice, and over six years of winter survey data (2003, 2006, 2009, 2012, 2015, and 2018) an average of 16,815 individuals were estimated in this area (Canadian Wildlife Service Waterfowl Committee 2020). About 90% of the eiders that over-winter in this area are Northern Common Eider (*Somateria mollissima borealis*), with the remainder being American Common Eider (*Somateria mollissima dresseri*) and small numbers of King Eider (*Somateria spectabilis*; Gilliland and Robertson 2009). This represents about 7.2% of the continental population of Northern Common Eiders (NAWMP 2012). During winter, eiders congregate in areas of open water that can change over space and time. Eiders forage primarily on benthic invertebrates, including intertidal and subtidal mollusks



(especially blue mussels *Mytilus edulis*), crustaceans, and echinoderms (Goudie et al. 2000).

Other sea duck species that use this area include Long-tailed Duck (*Clangula hyemalis*), Common Goldeneye (*Bucephala clangula*), Common Merganser (*Mergus merganser*), and Red-breasted Merganser (*Mergus serrator*) (eBird 2020).

Sensitivities: Waterfowl can be sensitive to disturbance from small vessel and ship traffic. Wintering eiders aggregate in dense flocks, and, depending on sea ice conditions, hunting pressure can be intense in this area (Gilliland and Robertson 2009, Gilliland et al 2009). Unintentional introduction of invasive species in this area could influence food resource availability and quality.

Potential Conflicts: Nearby areas have a history of poaching, though in recent years it is believed that illegal hunting has decreased (NF013; IBA Canada Website). Boat traffic in the area may cause disturbance and increase the risk of oil spills. Vessels navigating at night in the sea ice in this area use high intensity lighting and operators have reported collisions with eiders, which have damaged vessels and killed eiders. Any future increase in commercial fishing quotas may increase boat traffic, and potentially disturbance, in the area.

Status: The site lies adjacent to Dungeon Provincial Park. No Important Bird Areas intersect the site.

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Key Site 47: Northeast Avalon, Newfoundland

Location: 47°45'21"N, 52°40'16"W

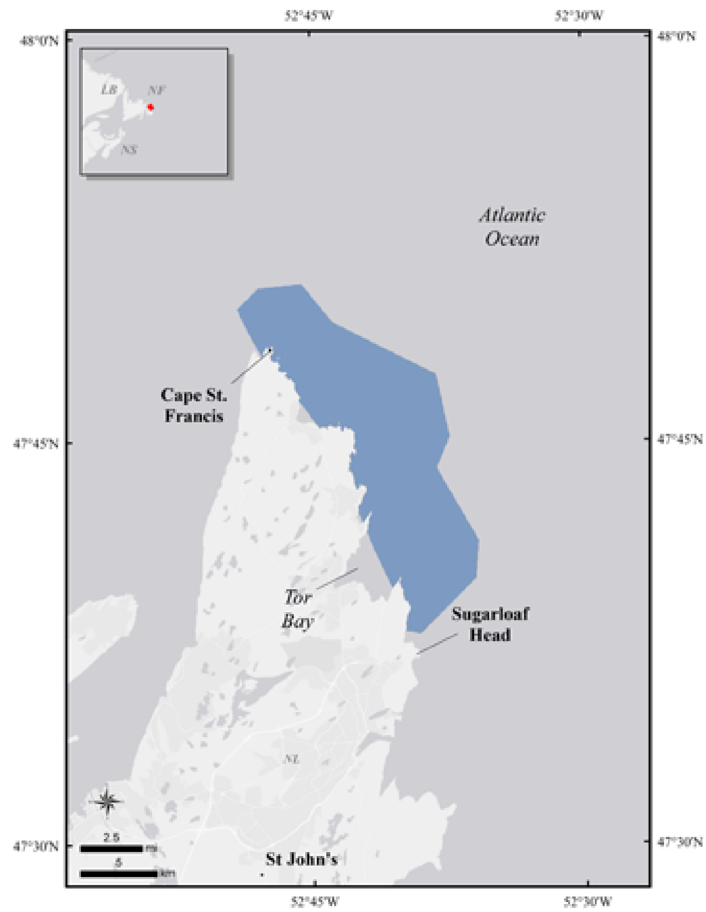
Size: 157 km²

Description: This key site is located at the northern end and eastern side of the Avalon Peninsula in southeast Newfoundland. The southern edge of the key area begins near the coast at Logy Bay (approximately 25 km north of the capital city of St. John's) and continues north and northwest to Cape St. Francis at the northern tip of the peninsula. Conception Bay lies to the west and the open Atlantic Ocean to the east. The area has numerous coves, shoals, and offshore rocks, and sea ice is present during most winters. The area is part of the Northern Grand Banks marine ecoregion where cold waters of the Labrador Current mix with warm waters of the Gulf Stream. The Grand Banks are one of the richest fishing grounds in the world (Park and Mercier 2014).

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have been adjusted to account for observer error in flock size estimation following methods developed by Bordage et al. (1998).

Biological Value: This area is primarily important for wintering Common Eiders (*Somateria mollissima*). Winter surveys conducted in this area by the Canadian Wildlife Service produced estimates ranging from 3589 individuals in 2012 to 41,189 individuals in 2015 (Canadian Wildlife Service Waterfowl Committee 2020). Over six years of winter survey data (surveys were conducted in 2003, 2006, 2009, 2012, 2015, and 2018), an average of 15,557 individuals were estimated in this area (Canadian Wildlife Service Waterfowl Committee 2020).

Historical data suggest that about 75% of the eiders wintering in this area are Northern Common Eider (*Somateria mollissima borealis*) with the remaining being American Common Eiders (*Somateria mollissima dresseri*) and small numbers of King Eiders (*Somateria spectabilis*; Gilliland and Robertson 2009). This represents about 5.6% of the continental population of Northern Common Eiders (NAWMP 2012). Flocks of up to 5000 eiders (approximately 1.7% of the *borealis* subspecies) have been observed in the waters off Cape St. Francis prior to spring migration (Russell and Fifield 2001).



Other sea duck species that use this area include Harlequin Duck (*Histrionicus histrionicus*), Long-tailed Duck (*Clangula hyemalis*), Common Goldeneye (*Bucephala clangula*), Common Merganser (*Mergus merganser*), and Red-breasted Merganser (*Mergus serrator*) (eBird 2020).

Sensitivities: Waterfowl can be sensitive to small vessel and ship traffic. Wintering eiders aggregate in dense flocks and, depending on sea ice conditions, hunting pressure can be intense in this area (Gilliland and Robertson 2009, Gilliland et al. 2009). Unintentional introduction of invasive species in this area could influence food resource availability and quality. Oil spills, both catastrophic and chronic, can have severe impacts on sea ducks. There is historical documentation of oil spills affecting Common Eiders and other water bird species in the nearshore waters of southeastern Newfoundland (Wiese and Ryan 2003, Robertson et al. 2014).

Potential Conflicts: Heavy shipping traffic into St. John's Harbor may increase the risk of disturbance and oil spills, and bird collisions with vessels in this area.

Status: There is one Important Bird Area (IBA) in this key area: Cape St. Francis IBA (IBA Canada 2021). This IBA is considered continentally significant for congregatory species including Common Eider.

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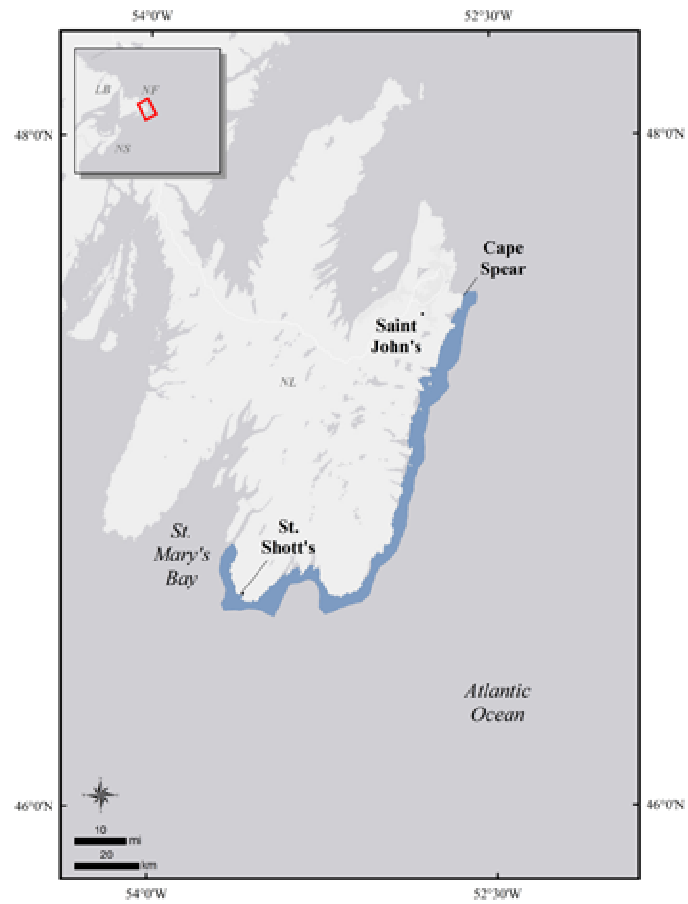
Key Site 48: Avalon Peninsula, Cape Spear to St. Shotts, Newfoundland

Location: 46°59'46"N, 52°51'17"W

Size: 791 km²



Description: This key area is located along the south and east coast of the Avalon Peninsula in southeastern Newfoundland. The southern boundary begins near the town of St. Vincent's-St. Stephen's-Peter's River, encompasses the southern end of the Avalon Peninsula around the towns of St. Shott's and Cape Race, then continues north to the town of Cape Spear. The coastal area has numerous coves, inlets, islands, and harbors with adjacent rocky shores and open ocean. Land cover on the islands ranges from coniferous forest to grassy meadows to rocky shores and barrens. The area is part of the Northern Grand Banks marine ecoregion, where cold waters of the Labrador Current mix with warm waters of the Gulf Stream. The Grand Banks are one of the richest fishing grounds in the world (Park and Mercier 2014).

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have been adjusted to account for observer error in flock size estimation following methods developed by Bordage et al. (1998).

Biological Value: This key area is primarily important for migrating and wintering Common Eiders (*Somateria mollissima*). Winter surveys conducted in this area by the Canadian Wildlife Service (CWS) produced estimates ranging from 13,047 individuals in 2012 to 43,840 individuals in 2015 (Canadian Wildlife Service Waterfowl Committee 2020). Over six years of winter survey data (surveys were conducted in 2003, 2006, 2009, 2012, 2015, and 2018), an average of 20,430 individuals were estimated in this area (Canadian Wildlife Service Waterfowl Committee 2020).

Historical data suggest about 75% of the eiders wintering in this area are the northern subspecies (*Somateria mollissima borealis*) with the remainder being the American subspecies (*Somateria mollissima dresseri*) and small numbers of King Eiders (*Somateria spectabilis*; Gilliland and Robertson 2009). This represents about 6% of the continental population of Northern Common Eiders (NAWMP 2012). During the winter of 1987, a large flock of 12,000 *borealis* eiders was observed at the edge of pack ice around Mistaken Point, although counts in the 1990s estimated fewer than 1000 eiders (NF024; IBA Canada Website). Up to 1000 King Eiders winter in the area of Witless Bay (Government of Newfoundland and Labrador 1994). Harlequin Ducks (*Histrionicus histrionicus*) overwinter along the coast at Cape Spear, Cape Race, St. Shott's, and Black Rocks near Chance Cove (eBird 2020).

Other sea duck species that use this area include Surf Scoter (*Melanitta perspicillata*), Black Scoter (*Melanitta americana*), White-winged Scoter (*Melanitta deglandi*), Long-tailed Duck (*Clangula hyemalis*), Common Goldeneye (*Bucephala clangula*), Common Merganser (*Mergus merganser*), and Red-breasted Merganser (*Mergus serrator*) (eBird 2020).

Sensitivities: Waterfowl can be sensitive to small vessel and ship traffic. Wintering eiders aggregate in dense flocks and, depending on sea-ice conditions, hunting pressure can be intense in this area (Gilliland and Robertson 2009, Gilliland et al. 2009). Unintentional introduction of invasive species in this area could influence food resource availability and quality. Oil spills, both catastrophic and chronic, can have severe impacts on sea ducks. There is historical documentation of oil spills affecting Common Eiders and other waterbird species in the inshore waters of southeastern Newfoundland (Wiese and Ryan 2003, Robertson et al. 2014). Sea ducks can be susceptible to vessel strikes, particularly in poor weather conditions.

Potential Conflicts: Oil spills from large ships and oil production facilities are a threat in the eastern part of this key area due to its proximity to busy shipping routes and the offshore production areas on the Grand Banks. Any future raising of commercial fishing quotas may increase boat traffic in the area.

Status: There are three Important Bird Areas (IBAs) in this key area: Cape Pine and St. Shotts Barren IBA, Mistaken Point IBA, and Witless Bay Islands IBA. Witless Bay is also a Provincial Ecological Reserve that is closed to shooting and protects the largest colony of Atlantic Puffins in eastern North America (NF002; IBA Canada Website).

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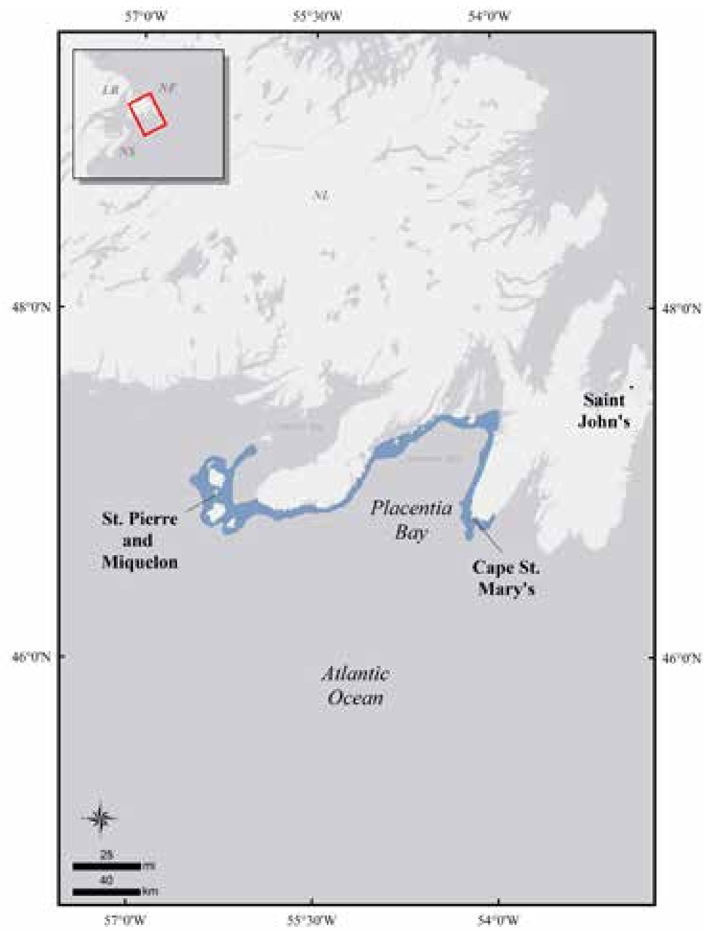
Key Site 49: St. Pierre and Miquelon to Cape St. Mary's, Newfoundland

Location: 47°2'39"N, 55°5'42"W

Size: 2408 km^2

Description: This key area is located along the south coast of Newfoundland. The western edge of the area begins at the islands of St. Pierre and Miquelon, France, continues east-northeast along the southeast coast of the Burin Peninsula toward Rock Harbor, encompasses Jude Island and a portion of Placentia Bay, then continues south along the west coast of the Avalon Peninsula, ending beyond Point Lance. This area has numerous coves, harbors, islands, and islets with adjacent open ocean. Land cover on the islands ranges from rocky and nonvegetated to grassy with low shrubs.



Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have been adjusted to account for observer error in flock size estimation following methods developed by Bordage et al. (1998).

Biological Value: This area is important for migrating and wintering Common Eiders (*Somateria mollissima*) and Harlequin Ducks (*Histrionicus histrionicus*). Winter surveys conducted in this area by the Canadian Wildlife Service (CWS) produced estimates ranging from 23,698 eiders in 2006 to 7107 eiders in 2009 (CWS unpublished data). Over six years of winter survey data (2003, 2006, 2009, 2012, 2015, and 2018), an average of 15,705 individuals were estimated in this area (CWS Waterfowl Committee 2020). About 90% of the eiders that overwinter in this area are Northern Common Eiders (*Somateria mollissima borealis*), with the remaining being American Common Eiders (*Somateria mollissima dresseri*) and small numbers of King Eiders (*Somateria spectabilis*; Gilliland and Robertson 2009). This represents about 4% of the continental population of Northern Common Eiders (NAWMP 2012). During winter, eiders congregate in areas of open water, which can change over space and time. Adults forage primarily on benthic invertebrates, including intertidal and subtidal mollusks (especially blue mussels, *Mytilus edulis*), crustaceans, and echinoderms (Goudie et al. 2000).

The Cape St. Mary's/Point Lance area is one of the most important sites in North America for overwintering Eastern Harlequin Ducks, supporting up to 4% of the eastern North America population (a maximum of 156 birds estimated in February 8–14, 2007; CWS unpublished data). Black Scoters (*Melanitta americana*) and Long-tailed Ducks (*Clangula hyemalis*) also use the Cape St. Mary's area during spring and fall migration (Goudie and Ankney 1988).

Other sea duck species that use this area include Surf Scoter (*Melanitta perspicillata*), White-winged Scoter (*Melanitta deglandi*), Common Goldeneye (*Bucephala clangula*), Common Merganser (*Mergus merganser*), and Red-breasted Merganser (*Mergus serrator*) (eBird 2020).

Sensitivities: Waterfowl can be sensitive to small vessel and ship traffic. Wintering eiders aggregate in dense flocks, and hunting pressure can be intense in this area (Gilliland and Robertson 2009, Gilliland et al. 2009). Unintentional introduction of invasive species in this area could influence food resource availability and quality. Oil spills, both catastrophic and chronic, can have severe impacts on sea ducks.

There is historical documentation of oil spills affecting Common Eiders and other waterbird species in the inshore waters of southeastern Newfoundland (Wiese and Ryan 2003, Robertson et al. 2014). Sea ducks can be susceptible to vessel strikes, particularly in poor weather conditions.

Potential Conflicts: Placentia Bay is a busy shipping route and has year-round oil-tanker traffic to and from an oil refinery at Come by Chance. A nickel processing plant in Long Harbour and associated ship traffic in the area are potential sources of pollution (NF028; IBA Canada 2021). Oil spills, illegal oil discharge, and pollution are risks in this area. Commercial fishing vessels operate in much of the coastal area (Russell and Fifield 2001).

Status: There are seven Important Bird Areas (IBAs) in this key area; Miquelon Island (northeast coast) IBA, Grand Columbier Island IBA, Green Island IBA, Middle Lawn Island IBA, Corbin Island IBA, Placentia Bay IBA, and Cape St. Mary's IBA (IBA Canada 2021). There is also a Provincial Ecological Reserve at Cape St. Mary's. St. Pierre and Miquelon and Grand Columbier Island are in French territory but are included in the Canadian IBA program due to close proximity to Canadian territory and lack of coverage by other IBA programs (NF034; IBA Canada 2021).

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Robertson, G. J., S. G. Gilliland, P. C. Ryan, J. Dussureault, K. Power, and B. C. Turner. 2014. Mortality of Common Eider, *Somateria mollissima* (Linnaeus, 1758), and other water birds during two inshore oiling events in southeastern Newfoundland, 2005 and 2006. Canadian Field-Naturalist 128:235–242.

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Key Site 50: Southwestern St. Lawrence Estuary (Kamouraska–Trois-Pistoles), Quebec

Location: 47°51'58"N, 69°34'16"W

Size: 496 km^2

Description: This key site measures about 75 km by 10 km along the south shore of the upper estuary of the St. Lawrence River, Quebec, between Kamouraska and Trois-Pistoles. It contains many islands, including the Kamouraska Islands, Île aux Fraises, Les Pèlerins, Île aux Lièvres, Île Blanche, Île aux Pommes, and Île aux Basques, most of which fall within the Estuary Islands National Wildlife Area (Appendix 1). While some islands are nearshore, others are 10 to 12 km offshore in the St. Lawrence Estuary. Île aux Fraises, Île aux Lièvres, and Île Blanche are separated from the south shore by a channel with depths of less than 20 m.

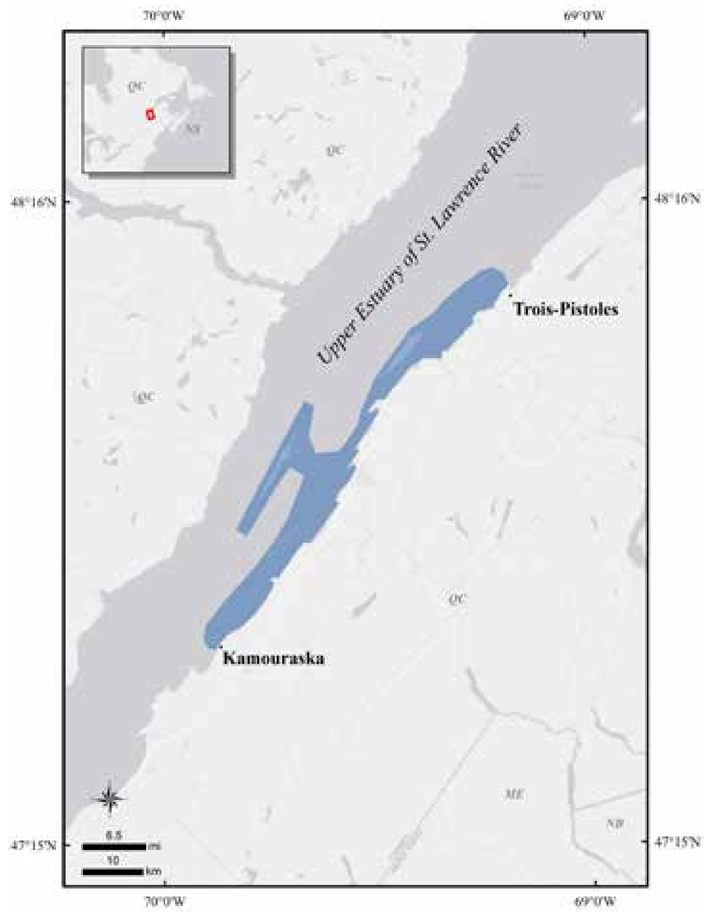
The southwestern St. Lawrence Estuary is situated where fresh water from the St. Lawrence River intermixes with saltwater from the Gulf of St. Lawrence. It is characterized by semidiurnal tides of 5 to 6 m amplitude. The coast has a low profile and is bordered by a wide littoral terrace less than 10 m deep; extended mudflats become exposed at low tide. There are numerous salt marshes in the key site.

Coastal waters generally freeze in midwinter, but ice is usually thin in that portion of the estuary, and icebreakers maintain the main shipping lane between the Gulf of St. Lawrence and the St. Lawrence Seaway.

The largest city bordering the key site is Rivière-du-Loup (population about 18,000). Many touristic villages are dispersed along this portion of the south shore of the St. Lawrence Estuary.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should be treated as minimum estimates.

Biological Value: American Common Eider (*Somateria mollissima dresseri*) is the primary sea duck species in this key site. Thousands breed on



the islands, and many eiders breeding in other parts of southern Quebec transit through the key site during spring and fall migration, to and from wintering areas further south.

During the breeding season, 10,000 to 15,000 Common Eider pairs nest in colonies on islands in the key site, approximately 15% of the continental breeding population of *S. m. dresseri*. Four islands host 87% of pairs in the key site: Île aux Fraises, Îles du Pot à l'Eau-de-Vie, Île Blanche, and Île aux Pommes (Joint Working Group on the Management of the Common Eider 2004, Lepage 2019). Successful breeding females and ducklings leave breeding islands soon after hatch and move either south along the estuary shore (Gauthier and Bédard 1976, Diéval et al. 2011) or along Île aux Lièvres (Falardeau et al. 2000) where foraging areas abound and avian predation (mainly gulls) is less severe. The shoreline of the key site includes large stretches of rocky substrates with macrophytes harboring invertebrates on which the ducklings feed. During brood-rearing, 30 to 97% of the broods' diet consists of gastropods (*Littorina* spp.; Cantin et al. 1974).

During spring migration, Common Eiders, scoters (*Melanitta* spp.), and mergansers (*Mergus* spp.) use the area, including the Passe de l'Île aux Lièvres (channel) where herring spawn in some years, providing abundant food (Falardeau et al. 2000). Local breeders and transient eiders arrive in the key site from late April to early May. Counting locally breeding eiders plus a portion of the eiders that breed along Quebec's north shore, it is likely that more than 40,000 eiders pass through the key site in spring (C. Lepage, Canadian Wildlife Service, pers. comm.). Scoters (mostly Surf [*M. perspicillata*], but also Black [*M. americana*]) are present in the second half of May (Lamb et al. 2020). Scoters number 2500 to 5000 individuals, but with regular turnover, total use is likely higher (Canadian Wildlife Service unpublished data).

Some breeding females molt onsite in late summer to early fall. Hundreds of Surf Scoters gather in early July in the Passe de l'Île aux Lièvres prior to molt (Falardeau et al. 2000), and small flocks of goldeneyes (*Bucephala* spp.) and Red-breasted Mergansers (*Mergus serrator*) molt in the key site during July and August (Canadian Wildlife Service unpublished data).

During late summer and through fall, Common Eiders *dresseri* remain abundant, with individuals from other breeding areas joining local birds before migrating to wintering sites along the coasts of Nova Scotia and New England. Eiders may remain in the estuary until December or January (S. Gilliland pers. comm.). Surf Scoters also stage in the key site in the fall, with some passing through in late August to early September and others staying through October (SDJV 2015, Lamb et al. 2020, Canadian Wildlife Service unpublished data).

In winter most of the coastal waters in this key site are frozen; however, up to 235 Barrow's Goldeneye (*Bucephala islandica,* from the eastern population listed as of "special concern" by the Committee on the Status of Endangered Wildlife in Canada) and 115 Common Goldeneye have been observed in ice-free areas around Pointe de l'Anse Double at Île aux Lièvres and by Îles du Pot à l'Eau-de-Vie (Robert et al. 2003).

Sensitivities: Recent reductions in ice and increased frequency and severity of storms in the St. Lawrence Estuary will likely increase erosion and coastal flooding episodes in the key site (Conseil du Saint-Laurent 2018). It is predicted that by 2060, due to sea level rise, nearly 80% of the coastal ecosystems of the south shore of the upper St. Lawrence Estuary will be affected by coastal squeeze (i.e., a narrowing of the marsh or intertidal zones), likely leading to the degradation or loss of these ecosystems (Conseil du Saint-Laurent 2018). This could affect benthic communities, including particularly important foods for sea ducks, such as blue mussels (*Mytilus edulis*) or gastropods (Diéval et al. 2011). Adverse weather conditions (e.g., precipitation and high winds) during the hatch for Common Eider may decrease duckling survival (Joint Working Group on the Management of the Common Eider 2004, Diéval et al. 2011). Breeding females and foraging broods are very sensitive to disturbance from recreational boating and kayaking around breeding islands (Bolduc and Guillemette 2003) as well as from people harvesting sea products near some islands. Predation of Common Eider ducklings by Great Black-backed and Herring gulls is substantial in some years. Overall duckling survival is generally low, with less than 15% of class IA ducklings produced on breeding areas subsequently observed on foraging sites along the St. Lawrence Estuary's south shore (Diéval 2006). The irregular presence of Red Fox (*Vulpes vulpes*) on islands often results in temporary abandonment of colonies by breeding female eiders; however, the Société Duvetnor usually controls foxes on several of the major colonies. Avian cholera outbreaks regularly strike eider colonies on the south shore; the last large outbreak was in 2002 and killed nearly 20% of females breeding in the St. Lawrence Estuary (Joint Working Group on the Management of the Common Eider 2004). Generally, water quality in this part of the St. Lawrence is poor due to wastewater from municipalities or remote residences and the presence of agricultural activity; anthropogenic bacterial contamination leads to regular harvest closures for softshell clams and mussels (Working Group on the State of the St. Lawrence Monitoring 2015).

Potential Conflicts: The St. Lawrence River is one of the most important and heavily travelled waterways in North America. Marine traffic is expected to increase in the future (MTQ 2021), which will likely increase the risk of pollution (e.g., chemical or oil spills), disturbance, and bird collisions with vessels. The Port of Gros-Cacouna, situated within the key site, has been identified for development of several new marine facilities (e.g., gas terminals, marina, cruise ship port). Tourist and recreational activities, including sea kayaking around the islands, are popu- lar within this key site and despite being prohibited, some tourists land on islands during the nesting season (Environment Canada 2014). The area has also been identified as having high potential for development of shellfish aquaculture, and harvest of urchins and seaweed occurs in the area, which may disturb eiders during the brood-rearing and molting periods (Diéval et al. 2011, Savard and Lepage 2013) and degrade foraging habitat. Eiderdown is collected commercially on most of the islands in the key site, but permit holders must follow strict directives (Bédard et al. 2008) to protect eider females and broods.

Status: The Estuary Islands National Wildlife Area (Appendix 1) was established in 1986 by Environment Canada to protect important nesting sites for migratory birds, particularly colonial sea birds and especially Common Eider. This national wildlife area comprises about 10 islands or portions of islands, including the Kamouraska Islands, Les Pèlerins, Île aux Fraises, and Île Blanche. The Société Duvetnor collects eiderdown throughout the estuary and uses profits from the sale of down for the conservation, public awareness, and research programs on Common Eiders in the lower St. Lawrence Estuary. In addition, Société Duvetnor owns several islands (Île aux Lièvres, which is designated as a Quebec's Réserve de biodiversité projetée [planned biodiversity reserve], two of the five islands in the Les Pèlerins Archipelago, and both of the islands in the Îles du Pot à l'Eau-de-Vie archipelago). While the three other islands of the five that form the Les Pèlerins Archipelago belong to Nature Conservancy Canada, the Société Duvetnor manages all islands of this archipelago. Île aux Basques Migratory Bird Sanctuary includes Île aux Basques which, along with waters within 500 m of the island, is owned by the Société Provancher. The Île aux Pommes, privately owned, is designated a natural reserve. The islands in the center of the St. Lawrence Estuary within the key site (Île aux Fraises, Île aux Lièvres, Îles du Pot à l'Eau-de-Vie, and Île Blanche) lie within the Saguenay–St. Lawrence Marine Park (provincial status). At the coastal limit of the key site, Baie de L'Isle-Verte National Wildlife Area, the L'Isle-Verte Migratory Bird Sanctuary, and the Site ornithologique du marais de Gros-Cacouna (Cacouna marsh birdwatching site) are also under jurisdiction of Environment Canada. The Parc Côtier Kiskotuk is a linear coastal park of about 30 km from Cacouna to L'Isle-Verte. The Société d'écologie de la batture du Kamouraska owns approximately 2 km of coastal habitat on the Saint-André's flats. Forty-two Aquatic Birds Concentration Areas, a Quebec government designation, cover about 90% of the coastline of this key site, including that of the islands and those along the mainland (*Aires de concentration d'oiseaux aquatiques*; MDDELCC 2018). The key site includes nine Important Bird Areas; six of them are on islands, mostly due to their importance to seabird colonies (QC042, QC043, QC046, QC047, QC048, QC49, QC050, QC052, QC055; IBA Canada).

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Key Site 51: Baie des Rochers, Quebec

Location: 47°57'26"N, 69°48'4"W

Size: 2 km^2

Description: The Baie des Rochers lies on the north shore of the St. Lawrence upper estuary, about 15 km north of Saint-Siméon, Quebec. This bay is approximately 2.4 km^2. A wooded island lies in the center of the bay, and its rocky shores and mudflats are exposed at low tide.

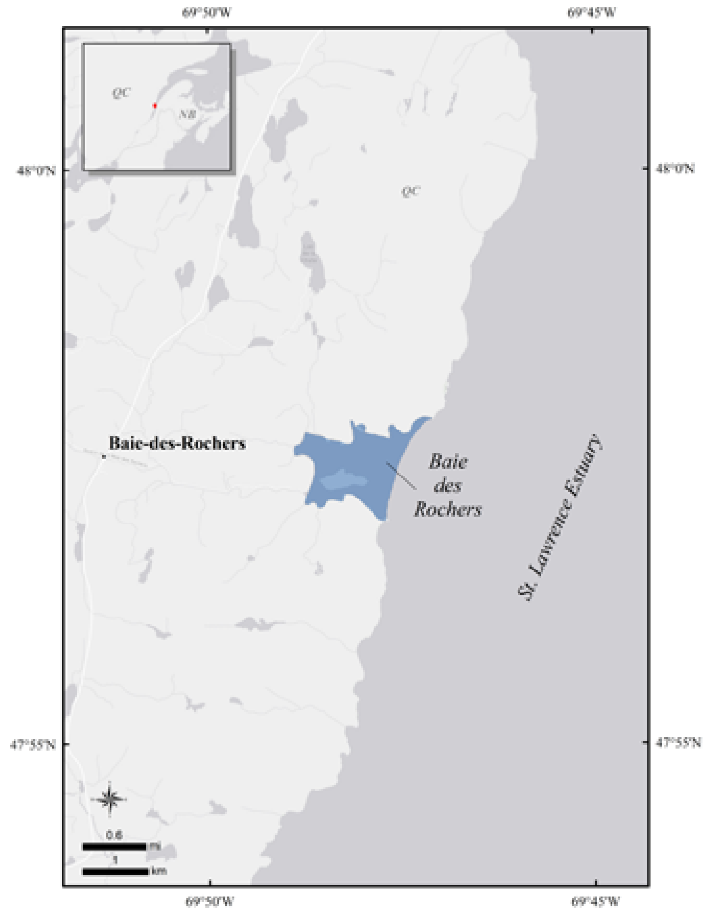
In winter, due to wind patterns and tides, the outer portion of the bay usually freezes while the interior of the bay remains ice-free. This bay also periodically fills with wind driven pack ice.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: This site is second most important wintering site for eastern Barrow's Goldeneye (*Bucephala islandica*), which are listed as a species of special concern (Environment Canada 2013). The site supports about 10% the eastern Barrow's Goldeneye population during winter. From early December to late April, up to 600 individuals may be found in the ice-free waters of the bay (Robert et al. 2003). Shallow water, intertidal areas, and river mouths are important habitats for Barrow's Goldeneyes, where they tend to use hard-bottom habitats (Ouellet et al. 2010) and feed on *Littorina* spp. and *Gamarus oceanicus* associated with extensive stands of rockweed (Laforge 2010).

During winter, 30 to 200 Common Goldeneyes (*Bucephala clangula*) use this site (Robert et al. 2003).

In late April and early May, migrating sea ducks stage at this site, with daily counts of up to 300 Common Eiders (*Somateria mollissima*), 60 Surf Scoters (*Melanitta perspicillata*), 50 Black Scoters (*Melanitta americana*), 40 Common Goldeneyes, 80 Common Mergansers (*Mergus merganser*), and 600 Red-breasted Mergansers (*Mergus serrator*) (Robert et al. 2003).



Sensitivities: Habitat deterioration or alteration of ecological processes underlying the food chain is of concern. Food resource availability and quality could be influenced by pollution. In very cold winters, landfast ice can cover most of the bay or during periods of strong southerly winds dense pack ice can restrict feeding areas available for forging.

Potential Conflicts: Oil spills could be detrimental, particularly during winter, given the highly clustered distribution of Barrow's Goldeneyes at this site. Human disturbance associated with recreational boat traffic or hikers along coastal trails may displace birds, although much of this activity occurs in summer and fall rather than winter when use by sea ducks is greatest. There are numerous recreational facilities surrounding the bay, including a municipal park with a wharf and boat ramp (Appendix 1).

Status: The Baie des Rochers lies within the Saguenay–St. Lawrence Marine Park (federal-provincial status) and is also recognized as an Aquatic Birds Concentration Area (*Aire de concentration* *d'oiseaux aquatiques*; MELCC 2018). The key site has also been identified as a Canadian Important Bird Area, mostly because of its importance to wintering Barrow's Goldeneye (IBA Canada 2021).

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Barrow's Goldeneyes. Photo: Tim Bowman.

Key Site 52: Cap Marteau–Matane (Southeastern St. Lawrence Estuary), Quebec

Location: 48°32'44"N, 68°24'12"W

Size: 489 km^2

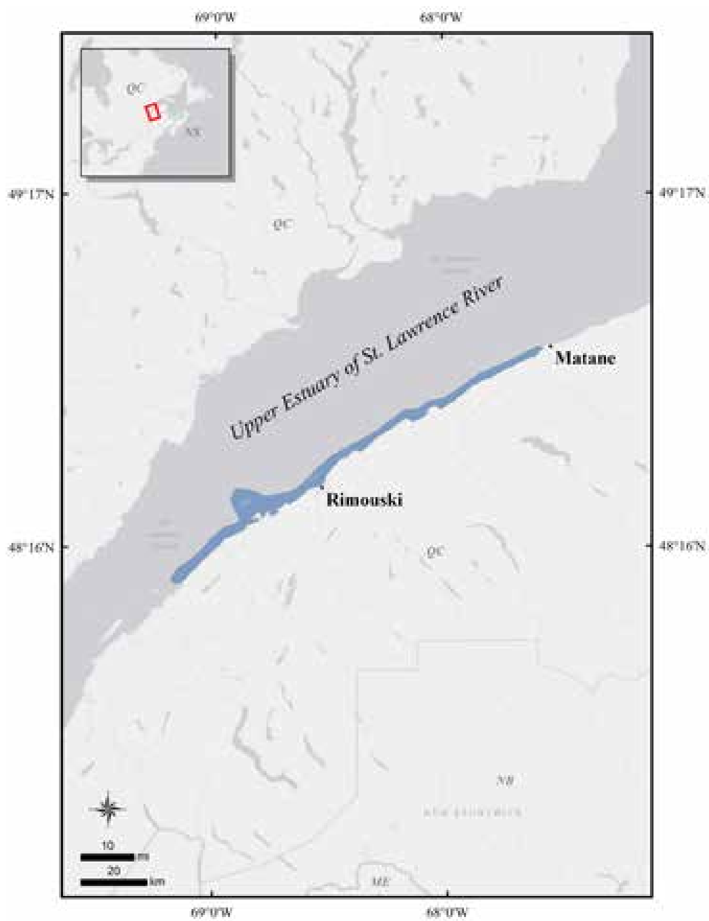
Description: This key site covers the shoreline and subtidal areas for 140 km along the south shore of the Lower Estuary of the St. Lawrence River, Quebec. It extends from Cap Marteau eastward to Matane, and includes Bicquette Island (17 ha), a forested island with rocky shore about 8 km offshore. The key site has a shallow, gradually sloping shoreline with substrates that vary from mud in the western section to bedrock in the eastern section. Rimouski is the largest city in the key site and there are also many smaller touristic villages along the south shore of the St. Lawrence Estuary.

This portion of the estuary is generally frozen during the winter or covered by wind-driven pack ice in winter; however, icebreakers maintain the shipping lane between the Gulf of St. Lawrence and the St. Lawrence Seaway.

Precision and Correction of Abundance Estimates Presented: Visual estimates of molting scoters have been photo-corrected (Rail and Savard 2003). Otherwise, abundance numbers presented for this key habitat site have not been adjusted to account for incomplete detection or other biases and should, therefore, be considered minimum estimates of population size.

Biological Value: This key site supports continentally significant numbers of breeding Common Eiders (*Somateria mollissima dresseri*), spring and fall staging Barrow's Goldeneyes (*Bucephala islandica*), as well as molting and staging scoters (*Melanitta* spp.).

The largest Common Eider colony in North America is on Bicquette Island, Quebec. From 1997 through 2001, the colony averaged 12,300 ± 900 nests (Canadian Wildlife Service unpublished data), but numbers were reduced through a severe avian cholera event in the St. Lawrence Estuary in 2002. The size of the colony has been slowly increasing between 2002 and 2019 (Giroux et al. 2021) with an average colony size of 5000 ± 480 nests between 2014 and 2018 (Canadian Wildlife Service unpublished data). There are 800 to 1000 Common Eider nests on La Razade d'en Haut and La Razade d'en



Bas (Duvetnor unpublished data), two rocky islands about 2 km offshore, and another 350 nests on smaller islets (BIOMQ 2018), resulting in about 15% of the continental population of *S. m. dresseri* breeding within the key site. The extensive intertidal areas along the mainland coast are rich in marine invertebrates and are the primary brood-rearing area for Common Eider (Diéval et al. 2011). During this critical period, the ducklings' diet consists of 30 to 97% gastropods (Littorina spp.; Cantin et al. 1974). The area around Matane also supports nonbreeding and failed breeding female and molting male Common Eiders. rapidly leave Bicquette Island after hatching to flee heavy gull predation and move to the south shore where foraging areas abound and avian predation diminishes (Diéval et al. 2011). During this critical period, the ducklings' diet consists of 30 to 97% gastropods (*Littorina* spp.; Cantin et al. 1974).

During spring migration, maximum counts of about 3000 Common Eiders and about 3000 scoters (*Melanitta* spp.) have been observed in the key site (Canadian Wildlife Service unpublished data).

These counts greatly underestimate the use of the key site by migrating sea ducks, because large portions of the Common Eider and Atlantic populations of scoters pass through this region in spring (Lamb et al 2020, Lamb et al. 2021). As many as 30,000 Common Eiders and 30,000 to 50,000 scoters may pass through the site (C. Lepage, Canadian Wildlife Service, pers. comm.). Smaller numbers (a few dozen) of Red-breasted and Common mergansers (*Mergus serrator* and *M. merganser*) and Common Goldeneyes (*Bucephala clangula*) also transit through the key site (Canadian Wildlife Service unpublished data). About 800 Barrow's Goldeneye, whose eastern population is listed as a species of special concern by the Committee on the Status of Endangered Wildlife in Canada, stage during spring in a few spots in the key site, including Anse à Mercier, Rocher Blanc, and Baie Mitis (Robert et al. 2003, Bourget et al. 2007); individuals may be observed on site as early as late February (or as soon as intertidal areas become ice-free, depending on yearly conditions) until late April or early May (Bourget et al. 2007, Savard and Robert 2013).

Scoters also molt in the key site: about 12,000 individuals were estimated in this part of the estuary during an aerial survey in 1998, most of which were thought to be Surf Scoters (Rail and Savard 2003). These molting birds were concentrated from Cap Marteau and the Razade islands to Cap à l'Orignal. White-winged Scoters (*M. fusca*) also molt in July and August in the key site, including the Razade islands, Saint-Simon-sur-Mer, and Anse à Mercier (SDJV 2015, Lepage et al. 2020).

From late summer through late fall, Common Eiders occur in the key site, with dozens to hundreds seen at Anse à Mercier, Baie Mitis, Anse du Petit Mitis, and Sainte-Flavie (Robert et al. 2003). Hundreds of Common Goldeneyes, Long-tailed Ducks (*Clangula hyemalis*), and Red-breasted Mergansers also frequent the key site during late summer and fall (Robert et al. 2003, Bourget et al. 2007).

Barrow's Goldeneyes arrive during the first two weeks of October, with 400 to 500 using the areas at Anse à Mercier, Baie du Ha! Ha!, Baie Mitis, and Anse à Capelans up to late December (Robert et al. 2003) or until they are forced out by ice conditions (Bourget et al. 2007).

Many Surf Scoters and White-winged scoters also stage in the key site during fall, most from late September to early November (SDJV 2015, Lamb et al. 2020). Some White-winged Scoters molt and stage in the key site, arriving in early July and leaving in late fall (Lepage et al. 2020). Among the preferred fall staging sites are the Razade islands, Saint-Simon-sur-Mer, Anse à Mercier, offshore Havre du Bic, offshore Île Saint-Barnabé, and Baie Mitis (Canadian Wildlife Service unpublished data). Groups of 3000 to 4000 Surf Scoters have been reported at Anse à Mercier in October 2001 (Robert et al. 2003).

Sensitivities: The south shore of the St. Lawrence Estuary is vulnerable to coastal erosion and subsidence as a consequence of recent reductions in ice cover on the St. Lawrence and the higher frequency and severity of winter storms (Conseil du Saint-Laurent 2018). This will likely affect littoral characteristics and benthic communities important to sea ducks. Common Eider colonies are vulnerable to avian cholera outbreaks in the St. Lawrence Estuary: a significant outbreak in 2002 killed nearly 20% of breeding females (Joint Working Group on the Management of the Common Eider 2004). Great Black-backed Gulls take large numbers Common Eider ducklings as they depart the colony on Bicquette Island. The impact of gull predation on annual production from the colony is unknown but may limit the colonies' potential to recover from cholera. Breeding females and foraging broods are very sensitive to disturbance from recreational boating and kayaking (Bolduc and Guillemette 2003). There is also disturbance and loss of habitat associated with harvests of sea urchins and rockweed. In warm years (expected more often due to global warming), blooms of phytoplankton in the St. Lawrence increase the risk of toxic algal blooms which has resulted in mortalities of Common Eiders (Starr et al. 2017).

Water quality in this part of the St. Lawrence is compromised due to anthropogenic bacterial contamination, consumption softshell clams and mussels is regularly closed because of human health risks (Working Group on the State of the St. Lawrence Monitoring 2015).

Potential Conflicts: The St. Lawrence River is among the world's most important commercial waterways, linking the Atlantic Ocean to the Great Lakes. There is an ever-present risk of oil spills due to the high volume of marine traffic, and traffic will likely increase given the 2015–2030 Quebec Maritime Strategy for the St. Lawrence system (MTQ 2021). Harvesting of sea urchins and rockweeds, and potential mussel farming, can create conflicts with locally foraging eider broods and molting eiders (Diéval et al. 2011, Savard and Lepage 2013). There are high levels of use of the coastline by recreational boaters and kayakers, and although visitation of migratory bird colony islands is prohibited during the nesting season, there are disturbances caused by some uninformed recreationists who visit colonies. Eiderdown harvest is allowed on Bicquette Island by permit only, which requires the holder to follow strict guidelines to limit disturbance of eider females and broods (Bédard et al. 2008).

Status: Large portions of the key site are under some level of protective status. Biquette Island is part of the Estuary Islands National Wildlife and the Pointe-au-Père National Wildlife Area, coastal areas that support thousands of migratory birds during their migration and nesting periods. Île aux Basques Migratory Bird Sanctuary includes two of the Razade Islands, which are owned by the Société Provancher. The Quebec Parc National du Bic protects 33.2 km^2 of terrestrial and marine habitats between Saint-Fabien and Le Bic. The marine section of the park encompasses several bays that become large tidal flats at low tides. There are also 44 Aquatic Birds Concentration Areas, designated by the Quebec government, cover almost all the coastlines within this key site, including islands (*Aires de concentration d'oiseaux aquatiques*; MELCC 2021). Finally, four Important Bird Areas are found in the key site, including one for Bicquette Island and one for the Razade islands, due to their importance for colonial breeding Common Eiders and other birds (QC040, QC041, QC045 and QC046; IBA Canada 2021).

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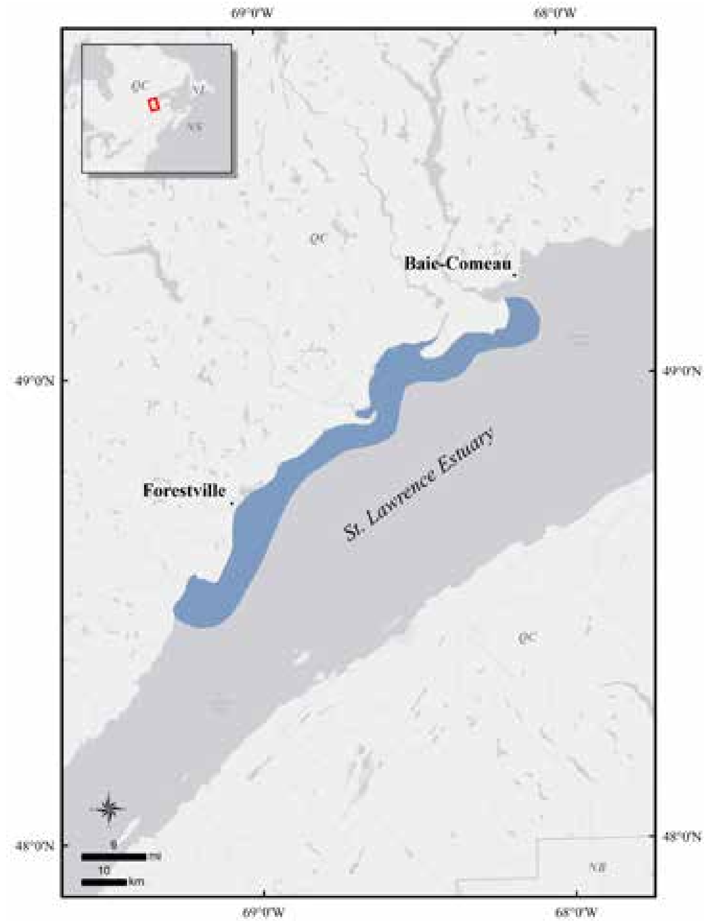
Key Site 53: Baie des Bacon–Pointe Lebel, Quebec



Location: 48°52'18"N, 68°42'7"W

Size: 913 km^2

Description: This key site stretches along the north shore of the St. Lawrence Estuary, Quebec, from the Baie des Bacon west to the Pointe Lebel, at the eastern end of the Manicouagan Peninsula. About 140 km long, it extends 5 to 12 km offshore. There are large areas of shoal water over sandy plateaus, including the Baie de Mille-Vaches, the section from Pointe à Boisvert to the mouth of the Portneuf River, the area nearby the Île Patte de Lièvre, the section from Baie des Plongeurs to the mouth of the Betsiamites River, the Papinachois sector, and the Baie aux Outardes.

Precision and Correction of Abundance Estimates Presented: Visual estimates of scoters and eiders from spring and molting surveys (Rail and Savard 2003) have been photo-corrected. Otherwise, abundance numbers presented for this key habitat site have not been adjusted to account for incomplete detection or other biases and should, therefore, be treated as minimum estimates.

Biological Value: This key site hosts tens of thousands of sea ducks during spring staging, molting, and fall staging (Lamb et al. 2020). During spring migration, scoters are by far the most numerous sea ducks transiting or staging. Conservative estimates of 15,000 Black Scoters (*Melanitta americana*) and 65,000 Surf Scoters (*Melanitta perspicillata*) can be extrapolated to this key site based on numbers found in a larger survey region in 1998 (Rail and Savard 2003); the sector within the key site with the greatest abundance was observed from Îlets Jérémie to Pointe Lebel, with an estimated 40,000 scoters. Based on estimates from wintering scoter surveys along the Atlantic coast (Silverman et al. 2012), we can estimate that at least 25% of the entire eastern population of Surf Scoters and at least 10% of the eastern population of Black Scoters pass through this key site during spring. The migration in this portion of the St. Lawrence Estuary peaks on May 8 to 10, with Black Scoters passing about a week earlier than Surf Scoters (Falardeau and Savard 2003). There may be spawning sites for Atlantic Herring near the mouths of the Rivière aux Outardes and Manicouagan River that influence distribution of scoters in spring (MDDEFP 2013). White-winged Scoters (*Melanitta deglandi*), Long-tailed Ducks (*Clangula hyemalis*), and Barrow's Goldeneye also use this key site (SDJV 2015, Meattey et al. 2018, Lamb et al. 2020, Lepage et al. 2020), but numbers are unknown.

About 3500 Common Eiders (*Somateria mollissima*) and hundreds of Common Goldeneyes (*Bucephala clangula*), Common Mergansers (*Mergus merganser*), and Red-breasted Mergansers (*Mergus serrator*) have also been reported during spring aerial surveys in the key site (Canadian Wildlife Service unpublished data).

The Baie des Bacon–Pointe Lebel key site includes Common Eider (*S. m. dresseri)* breeding colonies on Île Laval (about 1700 nests) and islands in the Ragueneau area (1400 nests) (2020 counts; Duvetnor unpublished data), which together likely represents about 3% of the total *S. m. dresseri* population.

During the molting period, about 10,000 to 12,000 Surf Scoters and 4000 to 5000 White-winged Scoters use the key site (Lepage and Savard 2013). Scoter abundance is especially high from Pointe à Boisvert to Île Patte de Lièvre and from Cape Colombier to Pointe aux Outardes (Rail and Savard 2003; Lepage and Savard 2013). Nonbreeding male scoters arrive first, as early as June, and there is a build-up of birds with breeding males arriving in July and breeding females arriving from August to mid-September (SDJV 2015; Lepage et al. 2020). Flightless scoters may be found in this key site over a three-month period (Lepage et al. 2020). Black Scoters are seen in very small numbers during that period (Rail and Savard 2003). Common Eiders also molt in the key site: nearly 10,000 birds have been estimated far offshore in the Baie de Mille-Vaches, as well as 3000 birds from Pointe aux Outardes to Pointe Lebel (Rail and Savard 2003). Important areas for hundreds of molting goldeneyes and mergansers occur a few kilometers offshore of the mouth of Rivière aux Outardes and Manicouagan River (J.-P.L. Savard, Canadian Wildlife Service pers. comm.). Two of five radio-tagged female Barrow's Goldeneyes molted at the mouth of the Rivière aux Outardes and stayed there from early August to late October or early November (Savard and Robert 2013).

This key site is also important during fall migration and fall staging (Lamb et al. 2020). For instance, a high proportion of the eastern Surf Scoter population is thought to stage in the St. Lawrence Estuary during that period (SDJV 2015, Lamb et al. 2019, Lamb et al. 2020). Given the importance of this key site relative to the entire estuary, it is likely that 150,000 to 175,000 Surf Scoters must be passing through (C. Lepage, Canadian Wildlife Service, pers. comm.). White-winged and Black scoters are far less numerous during fall staging, with estimated combined numbers of 20,000 to 30,000 (Canadian Wildlife Service unpublished data). Approximately 12,000 to 15,000 Common Eiders are also believed to use the key site during fall (S. Gilliland pers. comm.). A few thousand each of Long-tailed Ducks, goldeneyes (mostly Common Goldeneye), Common and Red-breasted mergansers, as well as a few dozen Harlequin Ducks (from the eastern population of special concern) have also been reported during irregular fall aerial surveys over the key site (Canadian Wildlife Service unpublished data).

Sea ducks that regularly overwinter in the key site include Common and Barrow's goldeneyes, Red-breasted Mergansers, and Long-tailed Ducks, about 1000 to 1500 each (Canadian Wildlife Service unpublished data). Barrow's Goldeneyes have been reported in small numbers in the Baie de Mille-Vaches and in the Forestville sector (Robert et al. 2003), but they can form groups of 250 to 500 individuals in the Pointe aux Outardes–Pointe Lebel section, often at Pointe Paradis (Canadian Wildlife Service unpublished data).

Sensitivities: Prey densities, primarily softshell clam (*Mya arenaria*), are among the highest in Quebec (MDDEFP 2013). Availability and quality of food resources could be influenced by shellfish overharvesting, pollution, ice conditions in winter, environmental events (e.g., breaking waves, storms, and shoreline erosion; DFO 2017). Human disturbance from commercial softshell clam harvesting activities can displace foraging sea duck flocks from prime feeding locations. Flightless molting sea ducks are especially sensitive to disturbance (O'Connor 2008).

Potential Conflicts: Softshell clams are exploited by commercial and recreational harvesters in the key site. Although commercial harvest is regulated by the Department of Fisheries and Oceans Canada, there was a high level of harvest on the upper north shore in 2000, followed by a reduction until 2009, but several areas in the key site (e.g., Pointe à Boisvert and Pointe de Mille-Vaches) have not yet recovered (DFO 2017). Maritime traffic is expected to increase in the St. Lawrence Seaway (MTQ 2021); this comes with a concomitant increased chance of pollution (e.g., chemical or oil spills), and bird collisions with vessels. Disturbance associated with small vessel and all-terrain vehicles on the beach remains a potential conflict, especially for molting sea ducks. Aboriginal harvest of sea ducks (scoters, Long-tailed Ducks and eiders) in spring and fall within this site is low (R. Cotter, Canadian Wildlife Service, pers. comm.).

Status: The eastern portion of the key site is proposed as the Manicouagan Aquatic Reserve (MDDEFP 2013). If adopted, this reserve would extend from the mouth of the Betsiamites River to the mouth of the Manicouagan River. Almost all coastlines within the key site have been designated as Aquatic Birds Concentration Areas (*Aires de concentration d'oiseaux aquatiques*; MELCC 2018). The Waters of Île Patte de Lièvre Important Bird Area lies within the key site and was identified as an IBA primarily because of its importance for staging and molting scoters (QC151; IBA Canada 2018).

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Key Site 54: Baie des Anglais, Quebec

Location: 49°13'3"N, 68°7'10"W

Size: 36.4 km²

Description: The Baie des Anglais is located on the north shore of the St. Lawrence lower estuary, immediately northeast of Baie-Comeau, a municipality with approximately 10,000 residents.

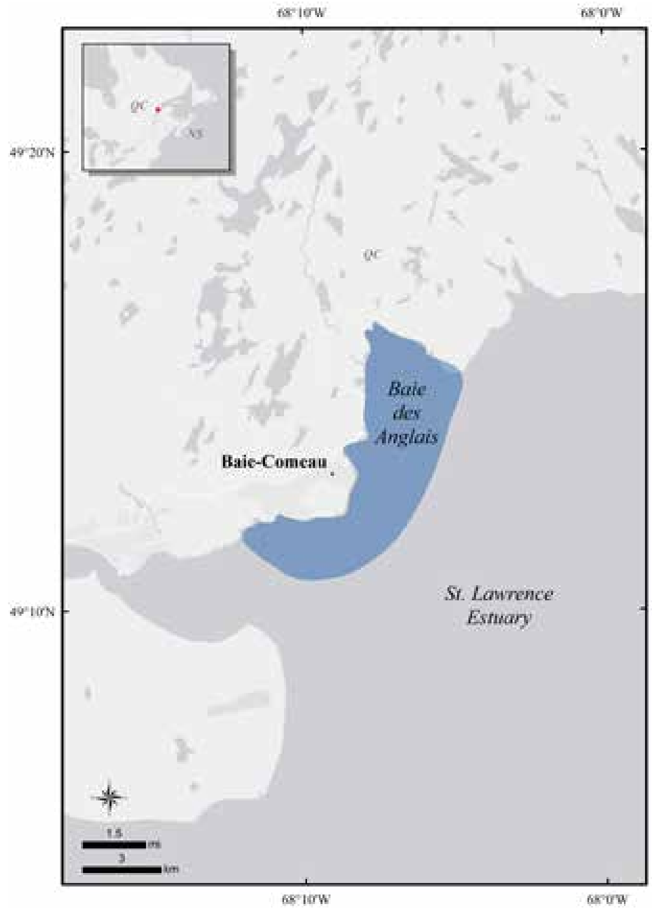
The mouth of the bay stretches about 3.5 km from Pointe Saint-Gilles in the east to the mouth of Manicouagan River in the west. The west side of the bay is heavily industrialized with North America's largest aluminum smelters and grain transfer terminal. Baie-Comeau also has a deepwater port and a nautical club. The mouth of the small Rivière aux Anglais' lies in the west-northwest of the bay.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: This site is the most important wintering site for eastern Barrow's Goldeneye (*Bucephala islandica*), which are listed as a species of special concern (Environment Canada 2013). The site supports about 15% of the eastern Barrow's Goldeneye population during winter. From early November to late April, up to 1,000 individuals may be found in the ice-free waters of the bay (Robert et al. 2003). Barrow's Goldeneyes mostly occupy the littoral zones to the west of Pointe Saint-Gilles and between Pointe Saint-Gilles and the areas near the Baie-Comeau wharf, as well as the vicinity of the mouth of the Rivière aux Anglais (Robert et al. 2003).

Other sea ducks overwintering in the Baie des Anglais include up to 3000 Common Goldeneyes (*Bucephala clangula*), 500 Common Mergansers (*Mergus merganser*), and 2000 Red-Breasted Mergansers (*Mergus serrator*) (Robert et al. 2003, Canadian Wildlife Service unpublished data).

During spring, the key site also attracts many migrating sea ducks, including Common Eider (*Somateria mollissima*), Surf Scoter (*Melanitta perspicillata*), Black Scoter (*Melanitta americana*),



Long-tailed Duck (*Clangula hyemalis*), Common Goldeneye, Common Merganser, and Red-Breasted Merganser (Robert et al. 2003; Canadian Wildlife Service unpublished data).

There are few data on the occupancy of the key site at other times of the year; however, it is plausible that there are numerous sea ducks present during the molting and the fall migrating periods. For instance, 2000 Common Eiders and 2000 Surf Scoters have been reported by birders in September and October, respectively (Regroupement Québec Oiseaux et al. 2018).

Sensitivities: Availability and quality of food resources could be influenced by pollution. Given the regular marine traffic in this key site (e.g., ferries), human disturbance is also of concern.

Potential Conflicts: Because of the industrial activities in this bay and significant marine traffic, including ferries and cruise ships, there are increased chances of water pollution (e.g., oil spills, chronic contamination). For instance, the Baie des Anglais is known to be one of the most severely PCB-contaminated sites in eastern Canada due to past releases from nearby industrial plants; however, contaminants in Barrow's Goldeneye using the site have been assessed and levels were generally low and not of toxicological concern (Ouellet et al. 2012). That said, risks of contamination exist. Human disturbances (e.g., recreational boating), and bird collisions with vessels, also present potential conflict.

Status: The southwest part of the key site has been recognized as an Aquatic Birds Concentration Area (*Aire de concentration d'oiseaux aquatiques*; 578 ha; MELCC 2021). Part of the Baie des Anglais is also designated as a Canadian Important Bird Area, principally because of its crucial importance to the wintering population of Barrow's Goldeneyes (QC082; IBA Canada 2021).

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Key Site 55: Baie de la Trinité–Magpie Bay, Quebec

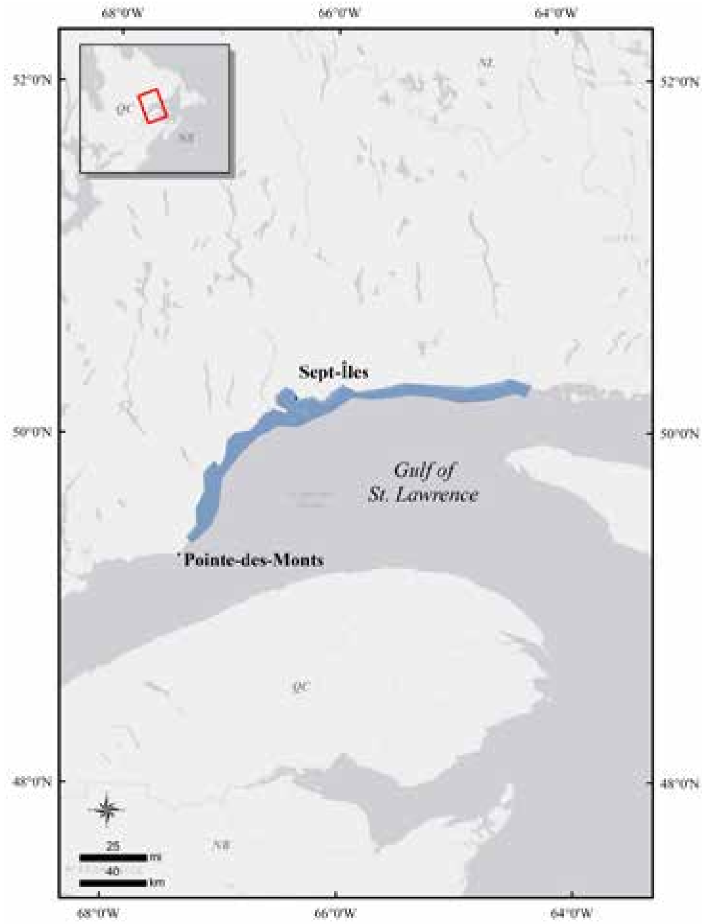
Location: 50°14'8"N, 65°56'27"W

Size: 2603 km^2

Description: This key site is a 270 km coastal stretch along the north shore of the Gulf of St. Lawrence in Quebec, from Baie de la Trinité to Magpie Bay. The key site includes Baie des Sept Îles and the seven nearby islands that form a natural barrier at its entrance. Several large rivers (Sainte-Marguerite, Moisie, Sheldrake, and Magpie) empty into the gulf within the key site. The sea bottom is sandy in most of the key site and supports high densities of invertebrates. There is also a mix of supralittoral flats, salt marshes, mud flats, and eelgrass beds.

Depending on coast orientation, wind exposure, and winter severity, coastal waters generally freeze in late January and February, but small polynyas usually remain around some of the seven islands.

Several villages and towns are spread out along this coast; the largest town is Sept-Îles, with approximately 22,000 inhabitants.



Precision and Correction of Abundance Estimates Presented: Visual estimates of scoters and eiders from spring and molting surveys have been photo-corrected (Rail and Savard 2003; Bolduc and Savard 2011). Otherwise, abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates are thus minimum estimates.

Biological Value: This key site supports large concentrations of scoters, eiders, Long-tailed Ducks, goldeneyes, and mergansers that stage at this site during spring migration. For example, about 80,000 Surf Scoters (*Melanitta perspicillata*) and 35,000 Black Scoters (*Melanitta americana*) have been recorded in the key site in spring (Rail and Savard 2003). These counts do not account for turnover rates thus the number of sea ducks that use the site is much greater. Most of the Atlantic populaltion of the three scoter species funnels through the St. Lawrence Gulf and Estuary (Lamb et al. 2020, Lamb et al. 2021, Lepage et al. 2020) during spring, and 50% of scoters counted in the St. Lawrence Gulf and Estuary are found in the key site (Rail and Savard 2003); hundreds of thousands of scoters likely transit through this site. Daily estimates of 3500 to 4000 Common Eiders, 1000 Long-tailed Ducks, 500 Red-breasted and Common mergansers (*Mergus serrator* and *M. merganser*), and 200 Common Goldeneyes (*Bucephala clangula*) are typical for this section of the Gulf of St. Lawrence in spring (Canadian Wildlife Service unpublished data). White-winged Scoters (*Melanitta deglandi*) are less abundant. Hundreds of individuals of two populations of special concern, eastern Barrow's Goldeneye (*Bucephala islandica*) and eastern Harlequin Duck (*Histrionicus histrionicus*), are also present during spring migration and may represent a substantial proportion of their relatively small populations.

This key site includes two known Common Eider breeding colonies, representing about 3% of the total *dresseri* population. There are approximately 4120 nests on Île aux Œufs, 2 km offshore southeast of Pointe-aux-Anglais, and 380 nests on Corossol Island Bird Sanctuary, one of the seven islands in the Baie des Sept Îles (2019 counts; Duvetnor unpublished data).

During the molting period, this section of the St. Lawrence hosts more than 12,000 Common Eiders (Bolduc and Savard 2011). Scoters, goldeneyes, and mergansers likely molt in this key site too.

Sea ducks transit through this key site during fall migration, and some spend one or two months there (September and/or October; SDJV 2015, Lepage et al. 2020, Lamb et al. 2020, Lamb et al. 2001) before migrating to more southerly wintering grounds. Groups of 1000 birds have been estimated at some localities in the key site for each of Surf and White-winged scoters, Red-breasted Mergansers, and Common Eiders (RQO et al. 2018). Long-tailed Ducks, goldeneyes, and Common Mergansers have also been reported during occasional fall aerial surveys in the area (Canadian Wildlife Service unpublished data).

Sea ducks regularly overwinter in the polynyas of the key site, including 11,800 Common Eiders (CWS Waterfowl Committee 2022), Long-tailed Ducks, and goldeneyes.

Sensitivities: Pollution and climate change could affect the availability and quality of food resources. For example, warming waters are projected to reduce the extent of ice and the length of the ice-free season for shoreline between Sept-Îles and Moisie and may accelerate coastal erosion (Bernatchez et al. 2008). The littoral erosion, paired with the lesser extent of ice in winter, could affect benthic communities, particularly clam beds that attract sea ducks (DFO 2017). Birds are also subject to disturbance from industrial and marine activities in the Baie des Sept Îles.

Potential Conflicts: Large industrial ports are located at Port-Cartier and Sept-Îles. The deepwater port in Sept Îles is the most important iron ore handling port in North America and has two important nearby mining facilities. These sites are potential sources of industrial contamination and oil spills. In 2013, 450,000 liters of bunker oil were spilled in the Port of Sept-Îles during a transfer between tanks. An estimated 5000 to 8000 liters reached the bay, covering about 5 km of coastline. Eelgrass beds and salt marshes were partially covered in oil, and about 100 birds were oiled and died. Maritime traffic will increase in the St. Lawrence Seaway given the Quebec maritime strategy for 2020–2025 (MTQ 2021), leading to a higher risk of pollution (e.g., chemical or oil spills), disturbance, and bird collisions with vessels.

Status: The Corossol Island Migratory Bird Sanctuary lies within this key site. Almost the entire coastline of the key site has been designated as Aquatic Birds Concentration Areas by the Quebec government (*Aires de concentration d'oiseaux aquatiques*; MELCC 2021). Baie des Sept-Îles and the seven islands also constitute an Important Bird Area, due to their importance to seabird colonies and for migrating Surf and Black scoters (QC162; IBA Canada 2021).

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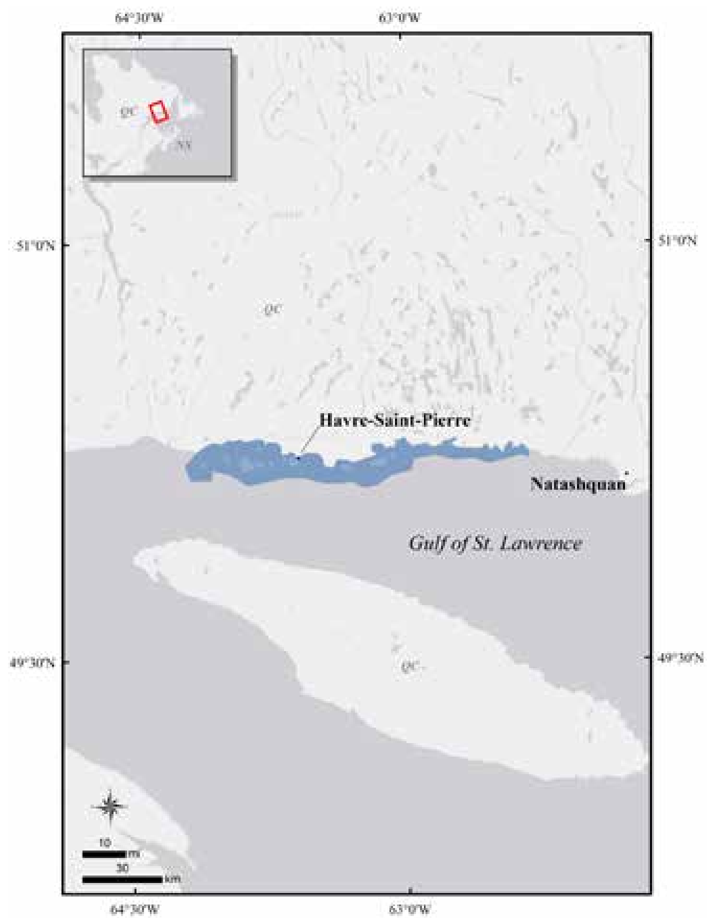
Key Site 56: Mingan Islands–Pointe Pashashibou, Quebec



Location: 50°11'28"N, 63°16'28"W

Size: 1328 km^2

Description: This key site represents a 150 km-long stretch of coastline along the north shore of the Gulf of St. Lawrence that is entirely within the Mingan Archipelago National Park Reserve. In its western half, from about Longue-Pointe-de-Mingan to 20 km west of Baie-Johan-Beetz, this key site encompasses a huge plateau of limestone bedrock consisting of 47 islands, most of which are forested, and islets, rocks, cays, and shoals. Most of the islands in the western half are located 1 to 6 km off-shore. In its eastern half, from about 20 km west of Baie-Johan-Beetz to Pointe Pashashibou, the coast is mostly flat, granitic, and includes deep bays as well as numerous small islands, islets, and rocky shoals, most of which are more than 1 km from coast; terrestrial features consist mainly of rocky outcrops, mosses, and lichens.

Climate on the north shore is characterized by cold, long winters and short, cool summers. Waters around all the islands are biologically rich due to cold water upwellings, bringing great amounts of nutrients to the surface. The shoreline is generally locked up in land-fast ice during the winter, with areas of open water within the Mingan Archipelago and pack ice in surrounding waters. The largest village in the key site is Havre-Saint-Pierre (about 3000 inhabitants).

Precision and Correction of Abundance Estimates Presented: Abundance estimates for scoters and eiders from spring and molting surveys (Rail and Savard 2003, Bolduc and Savard 2011), and the winter surveys for Common Eider, have been adjusted to account for observer error in flock size estimation and incomplete detection following methods developed by Bordage et al. (1998). Otherwise, abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should be treated as minimum estimates.

Biological Value: This key site is of high value for American Common Eiders (*Somateria mollissima dresseri*), which breed on the islands in large numbers during summer, and for Northern Common Eiders (*S. m. borealis*) that winter in the Mingan Archipelago. Both subspecies overlap for a few weeks in spring and fall. In spring, *S. m. dresseri* arrive in the key site from more southerly wintering grounds and *S. m. borealis* leave the area for more northerly breeding grounds; in fall, the opposite movement occurs, *S. m. borealis* replacing *S. m. dresseri* on site, so that there are Common Eiders present almost all year long in this key site.

In 2008, 2150 Common Eider nests were estimated on heath-covered islands and 4200 nests on forested islands of the western half of the key site (Troutet 2015, Troutet and Samson 2015). In 2010, 2135 nests were counted in the eastern half of the site (Y. Troutet, Parks Canada, pers. comm.), excluding two migratory bird sanctuaries that hosted 1650 nests and 3000 nests in 2015 (Canadian Wildlife Service unpublished data). Therefore, a rough estimate of at least 13,000 pairs breed in this key site; this corresponds to approximately 10% of the continental breeding population of *S. m. dresseri*. Two islands within the key site are of particular importance for breeding

Common Eiders, Innu and Fantôme, with 100 nests per hectare and 66 nests per hectare, respectively (Troutet and Samson 2015). A few pairs of Common Goldeneye (*Bucephala clangula*) and Common and Red-breasted mergansers (*Mergus merganser* and *M. serrator*) also nest near shallow ponds on the islands (Quebec Breeding Bird Atlas 2018).

Use of the key site during winter varies within and among years depending on the extent of sea ice cover. Winter surveys conducted in this area by the Canadian Wildlife Service produced estimates ranging from 23,131 Common Eider in 2009 to 55,226 in 2003. Over six years of winter survey data (2003, 2006, 2009, 2012, 2015, and 2018), an average of 41,105 Common Eider were estimated in this area (Canadian Wildlife Service Waterfowl Committee 2022).

Subspecies composition of wintering Common Eiders includes *borealis, dresseri,* and hybrid *borealis-dresseri*, but predominantly *borealis* (Canadian Wildlife Service unpublished data). Birds from the *borealis* population occupy the site for up to six months, from December until May (Mosbech et al. 2006). Long-tailed Ducks (*Clangula hyemalis*) are also seen in winter in groups of a few dozen to a few hundred. Red-breasted Mergansers, Common Goldeneyes, and King Eiders (*Somateria spectabilis*) are present in smaller numbers (Canadian Wildlife Service unpublished data).

During spring and fall migration, this key site supports large numbers of sea ducks (Lamb et al. 2020), especially Common Eiders, scoters, Long-tailed Ducks, and Red-breasted Mergansers. In spring, aerial surveys conducted between 2004 and 2010 provided minimal estimates of abundance within the key site: 11,500 eiders, 2800 scoters (*Melanitta* spp.), 800 mergansers (*Mergus* spp.), 400 Long-tailed Ducks, and more than 200 goldeneyes (*Bucephala* spp.) (Canadian Wildlife Service unpublished data). These counts do not account for turnover rates and the number of birds that use the site are much greater. Surf Scoters (*Melanitta perspicillata*) stage there in the fall (SDJV 2015, Lamb et al. 2020).

The key site is also an important molting area. More than 10,000 male Common Eiders molted there in August 2010 (Bolduc and Savard 2011). Other sea duck species using the key site in July and August include a few hundred each of Red-breasted Merganser, Surf Scoter, and White-winged Scoters (*M. fusca* and *M. perspicillata*; RQO et al. 2018). A few Harlequin Ducks (*Histrionicus histrionicus*), a species of concern, have been reported during fall around the Mingan Islands (RQO et al. 2018).

Sensitivities: Climate change could change vegetation characteristics on nesting islands (Parks Canada 2011). Abundant food resources allow for high seasonal use by sea ducks in this portion of the Gulf of St. Lawrence. Changes in these food resources (e.g., range shifts or local extinctions) could affect the entire food web; for example, blue mussels (*Mytilus edulis*) in the Gulf of Maine have already experienced a decrease of more than 60%, partly due to the increasing sea temperature (Sorte et al. 2017). Also, stretches of coast along the Gulf of St. Lawrence face erosion attributed to climate change, mostly related to reductions in ice cover (Bernatchez et al. 2008). Eiders nesting on heath-covered islands are more vulnerable than eiders breeding on forested islands because they are more exposed to wind and cold, predators, and poaching (Parks Canada 2011). Breeding and molting sea ducks are subject to disturbance from recreational boating and kayaking in the Mingan Islands; when disturbed, Common Eider crèches become more vulnerable to avian predators (Bolduc and Guillemette 2003). Aboriginal traditional eider egg collection occurs in portions of this key site.

Potential Conflicts: The port of Havre-Saint-Pierre receives large ships and barges as well as cruise liners; there is also an ilmenite ore terminal in the port. An oil spill happened in this port and the surrounding areas in April 1999: only 49 tons of bunker C were spilled from an ore carrier but local meteorological conditions aggravated the situation and many dozens of kilometers became oiled; about 1000 spring-staging Common Eiders were killed (Roberge and Chapdelaine 2000). Risks of aquatic pollution (e.g., chemical or oil spills), as well as disturbance and bird collisions, would undoubtedly increase as maritime traffic in the St. Lawrence Seaway increases, as proposed through the Quebec maritime strategy for 2020–2025 (MTQ 2021). This key site falls within a national park reserve that hosts about 35,000 visitors from June to August each year (Parks Canada 2011). Recreational boating and kayaking is an important activity within the National Park which disturbs eiders during the brood-rearing and molting periods. Poaching of seabird eggs and of ducks (mostly eiders) has decreased due to increased surveillance by park personnel but remains a threat in this part of the Gulf of St. Lawrence.

Status: The Mingan Archipelago National Park Reserve (under Parks Canada), covers this entire key site. There are Migratory Bird Sanctuaries at Betchouane Archipelago (462 ha of islands and 500 m of surrounding marine waters) and the Watshishou Migratory Bird Sanctuary (10,673 ha; 90% water and 10% rocky outcrops). Both were established in 1925 to protect nesting areas for Common Eider and seabird colonies. Twenty-five Aquatic Birds Concentration Areas, designated by the Quebec government, cover about 75% of the coastline of this key site (*Aires de concentration d'oiseaux aquatiques*; MELCC 2021). There are eight Important Bird Areas included in this key site, mostly for their importance to seabird colonies (QC066, QC072, QC073, QC074, QC076, QC078, QC149, and QC159; IBA Canada2021).

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Common Eiders wintering in sea ice. Photo: Christine Lepage.

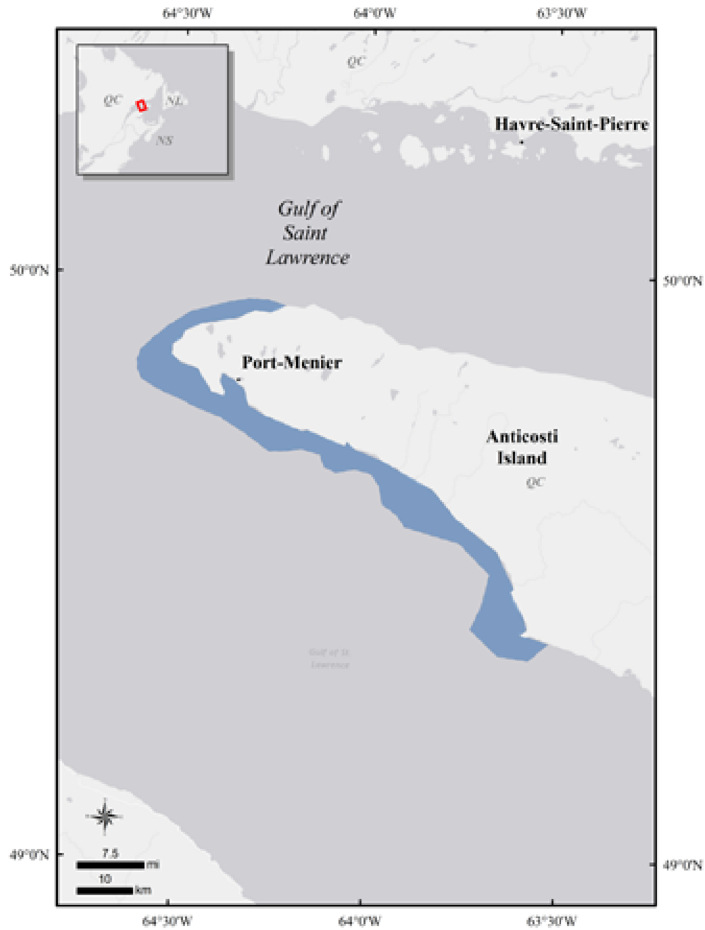
Key Site 57: Western–Southwestern Anticosti Island, Quebec

Location: 49°41'40"N, 64°3'51"W

Size: 630 km^2

Description: Anticosti Island is a 222-km-long island situated at the intersection of the St. Lawrence Estuary and the Gulf of St. Lawrence where it empties in the Atlantic Ocean. The key site consists of waters adjacent to the west and south coasts of the island, from Cap-de-Rabast north to Sud-Ouest Point, a coastal stretch approximately 130 km long by 5 km wide. Anticosti Island has an overall low topography, and the south side presents very gradually sloped underwater limestone plateaus. Several large but shallow rivers (e.g., Jupiter, à la Loutre, Sainte-Marie, Bec-Scie, aux Canards) along the south side of Anticosti empty into the gulf. Anticosti Island has only one village, Port-Menier, with about 250 inhabitants.

Coastal waters generally freeze in winter, but a few areas remain ice-free at both ends of the island where currents and winds usually prevent icing. Large stretches along the south shore also remain ice-free some years, depending on winter severity.



Precision and Correction of Abundance Estimates Presented: Visual estimates of scoters and eiders from spring and molting surveys have been photo-corrected (Rail and Savard 2003, Bolduc and Savard 2011). Numbers of birds from the Common Eider winter survey have also been photo-corrected, unless stated otherwise. Otherwise, abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Thus, they should be treated as minimum estimates.

Biological Value: This key site is particularly important to sea ducks during the molting and wintering periods. Large contingents of male Common Eiders (*Somateria mollissima dresseri*) spend the molting period at the edge of the extensive underwater plateaus of Anticosti Island; 35,000 and 25,000 Common Eiders were estimated in the key site from surveys conducted in 1998 and 2010, respectively (Rail and Savard 2003, Bolduc and Savard 2011). Use of the key site during winter varies within and among years depending on the extent of sea ice cover. Winter surveys conducted in this area by the Canadian Wildlife Service produced estimates ranging from 4505 individuals in 2018 to 29,044 individuals in 2012. Over six years of winter survey data (2003, 2006, 2009, 2012, 2015, and 2018), an average of 12,216 individuals were estimated in this area (Canadian Wildlife Service Waterfowl Committee 2020).

Female Common Eiders molt in the key site. Ground and boat surveys in the key area in July and August 2005 found 3000 molting Red-breasted Mergansers (*Mergus serrator*; Lepage 2013), 2000 molting Surf Scoters (*Melanitta perspicillata*; Lepage and Savard 2013), and 150 molting Harlequin Ducks (*Histrionicus histrionicus*, a species of special concern in eastern Canada; Lepage et al. 2015).

Northern Common Eiders (*S. m. borealis*) are present from early December to late May (Mosbech et al. 2006). Also present during this period are a few hundred Long-tailed Ducks (*Clangula hyemalis*), Red-breasted Mergansers, and Common and Barrow's goldeneyes (*Bucephala clangula* and *B. islandica*). A few King Eiders (*Somateria spectabilis*) can usually be observed mixed in with Common Eider flocks (Canadian Wildlife Service unpublished data).

Aerial surveys conducted during spring 2004 to 2010 reported only about 200 Common and Red-breasted mergansers in the key site (Canadian Wildlife Service unpublished data). In fall, molting *S. m. dresseri* can stage at this site from late October to early November before migrating to more southerly wintering grounds along the Atlantic coast. This site is also used as a fall staging stopover by *S. m. borealis*.

Sensitivities: Common Eiders feed almost exclusively on blue mussels (*Mytilus edulis*) during molt and winter, and the potential decline of this food resource could have major consequences. For instance, a mussel decrease of more than 60% in the Gulf of Maine has been attributed in part to increasing sea surface temperature (Sorte et al. 2017).

Potential Conflicts: Although Anticosti Island does not have any major ports, thousands of ships and barges pass by yearly. The St. Lawrence Seaway is one of the busiest waterways in North America, therefore, there is a risk of oil spills, disturbance, and bird collisions in this key site. This risk may increase given the intention of the Quebec government to increase maritime traffic in the St. Lawrence Seaway (MTQQ 2021). Given the large numbers of molting and wintering sea ducks using this key site, any gill net fisheries could result in significant by-catch casualties.

Status: There are four Aquatic Birds Concentration Areas, a provincial designation, giving a certain level of protection to about 60% of the coastline of this key site (MELCC 2021).

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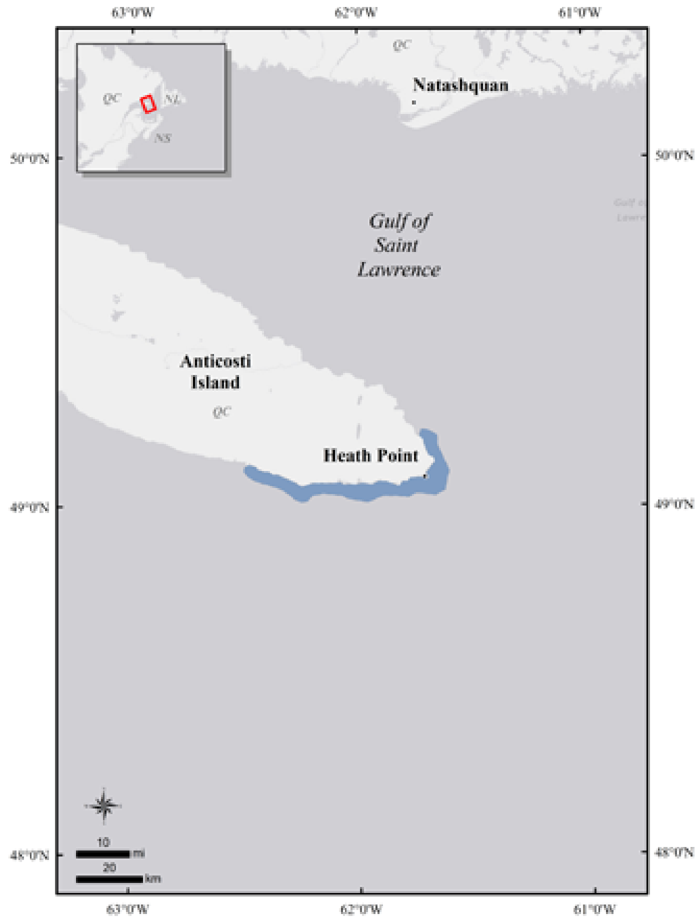
Key Site 58: Southeastern Anticosti Island, Quebec



Location: 49°3'5"N, 61°54'8"W

Size: 368 km^2

Description: The 222-km long Anticosti Island is situated at the intersection of the St. Lawrence River and the Gulf of St. Lawrence, which empties in the North Atlantic Ocean. The key site is a 75-km long by 5-km wide stretch of coastal waters from Dauphiné Point to Falaise aux Goélands along the south and east coasts of the island. This stretch of water consists of extensive underwater limestone plateaus and includes the mouth of a few large but shallow rivers (e.g., Dauphiné, Bell) that empty into the Gulf.

Coastal waters may freeze in winter depending on winter severity, but strong currents and winds usually prevent complete icing at Heath Point, which typically has ice-free patches.

Precision and Correction of Abundance Estimates Presented: For the Common Eider winter survey, numbers have been photo-corrected. Otherwise, abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should therefore be treated as minimum estimates.

Biological Value: This key site is an important Common Eider (*Somateria mollissima borealis*) overwintering area. Other sea ducks that frequent this key site during winter include Long-tailed Duck (*Clangula hyemalis*), Red-breasted Merganser (*Mergus serrator*), and Common Goldeneye (*Bucephala clangula*). Some King Eiders (*Somateria spectabilis*) are often present within Common Eider flocks (Canadian Wildlife Service unpublished data).

Use of the key site by breeding sea ducks has not been documented (Quebec Breeding Bird Atlas 2018) and use during molt and spring is apparently light. Common Eiders (*S. m. dresseri*) transit through this key site (Lamb et al. 2020), but numbers are not known. Aerial surveys conducted in the second half of May 2004–2010 along the St. Lawrence River documented daily totals of about 600 Long-tailed Ducks, 200 Common and Red-breasted mergansers, 200 Common Goldeneyes, and 100 scoters (*Melanitta* spp.) (Canadian Wildlife Service unpublished data).

Sensitivities: Because Common Eiders forage almost exclusively on blue mussels (*Mytilus edulis*) during winter, variation in numbers of this benthic prey could affect numbers of eiders using the key site.

Potential Conflicts: Given that the St. Lawrence Seaway is one of the busiest waterways in North America and that thousands of ships and barges pass by Anticosti Island yearly, the risk of oil spills, disturbance, and ship strikes in this key site are of concern. By-catch in gill net fisheries is also a concern.

Status: The entire coastline of this key site designated as Aquatic Birds Concentration Areas recognized by the Quebec government (MELCC 2021). On the adjacent land, the Réserve écologique de la Pointe-Heath was established mostly to protect the numerous peatlands.

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Key Site 59: Port-Daniel–Newport Point, Quebec

Location: 48°11'28"N, 64°49'58"W

Size: 55 km^2

Description: This key site lies at the northeast mouth of Chaleur Bay along the south coast of the Gaspé Peninsula, Quebec. It extends from Port-Daniel-Ouest to Newport Point and measures about 40 km long by 3 to 5 km wide. Baie de Port-Daniel includes several coves, points, and cliffs. Two small rocky islets, named Les Îlots, are important to sea ducks. Coastal cliffs are made of sedimentary rocks that erode easily, and the sea bottom varies from coarse sand to sand mixed with fine sediments. There is an estuarine lagoon (170 ha) in Baie de Port-Daniel with eelgrass beds. On lands adjacent to the key site, human density is low (about 2200 residents) and most of the landscape is rural.

Generally, Chaleur Bay is protected from winds and in summer experiences a warmer microclimate relative to adjacent areas of the Gulf of St. Lawrence. The pelagic zone is one of the most productive in the Gulf of St. Lawrence due to the abundance of zooplankton. Ice usually starts to form in late December and breaks up in mid- to late March in that section of the Chaleur Bay. However, in years with mild weather, some coastal areas remain ice-free year-round.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented have not been adjusted to account for incomplete detection or other biases. Abundance estimates are thus minimum estimates of population size.

Biological Value: This key site's primary importance is because of the year-round presence of Harlequin Duck (*Histrionicus histrionicus*), whose eastern population is listed as of "special concern" by the Committee on the Status of Endangered Wildlife in Canada. Spring staging scoters (*Melanitta* spp.) also abound in the area. Blue mussels (*Mytilus edulis*) and softshell clams (*Mya arenaria*) are abundant prey available to sea ducks there (Gagnon 1997, Perry and McAloney 2005).

In February, counts of Harlequin Ducks ranged from 40 in 2009 to 275 most recently in 2020 (Robert 2013, Canadian Wildlife Service unpublished data). Harlequin Ducks are usually present at Pointe du Sud-Ouest near Port-Daniel, and at Pointe au Maquereau. Other sea duck species present in small numbers during winter include Barrow's Goldeneye (*Bucephala islandica*), Common Goldeneye (*Bucephala clangula*), Red-breasted Merganser (*Mergus serrator*), and Long-tailed Duck (*Clangula hyemalis*) (Canadian Wildlife Service unpublished data).

The Port-Daniel–Newport sector has been identified as a spring staging area of great importance to Harlequin Ducks, which breed regionally in inland rivers (Robert et al. 2008, Quebec Breeding Bird Atlas 2018). Counts of 30 to 35 individuals are frequent in March and April (RQO et al. 2018, Canadian Wildlife Service unpublished data), although actual numbers of individuals may be greater because Maine wintering birds also pass through in spring (Robert et al. 2008). Hundreds of Common Eiders (*Somateria mollissima*), scoters (mostly Black and Surf scoters [*Melanitta americana* and *M. perspicillata*]), Long-tailed Ducks, and Common Mergansers

(*Mergus merganser*) also transit on a regular basis along this coast in April and May, as well as dozens of Common Goldeneyes and Red-breasted Mergansers (Lamb et al. 2020, Canadian Wildlife Service unpublished data). Overall, the total number of sea ducks using the key site during spring migration may be 15,000 to 20,000 individuals (C. Lepage, Canadian Wildlife Service, pers. comm.).

Les Îlots, two small rocky islets near Newport, host one of the few small colonies of Common Eiders (*Somateria mollissima dresseri*) along the south coast of the Gaspé Peninsula; 570 pairs bred there in 2018 (BIOMQ 2019). Common Goldeneye and Common Merganser nest near the mouth of the Port-Daniel River (Quebec Breeding Bird Atlas 2018).

Small Common Eider, Common Merganser, and Red-breasted merganser molt there (Quebec Breeding Bird Atlas 2018), but the key site is an important molting location for Harlequin Duckswith 56-86 individuals counted in 1989, 2003, and 2004 (Langlois 2006, Gilliland et al. 2002, S. Gilliland, Canadian Wildlife Service unpublished data). In late August, some female Harlequin Ducks with broods move downriver from breeding areas on the Gaspé Peninsula and reach the sea in Chaleur Bay, including the Port-Daniel and Newport sector (Brodeur et al. 2008). About 100 Harlequin Ducks are present by late August and numbers remain relatively stable until mid-October (Langlois 2006). Smaller numbers of other sea duck species may molt there, including Common Eider and Common and Red-breasted merganser (Quebec Breeding Bird Atlas 2018).

Nearly 300 Harlequin Ducks congregate there between mid-October and mid-November (Langlois 2006). This represents at least 9% of the population wintering in eastern North America (COSEWIC 2013) but likely more considering probable turnover among individuals. Scoters are far less abundant during fall than spring; groups of 1000 Red-breasted Mergansers, 200 Common Eiders, and 150 Common Goldeneyes have been observed during fall (Canadian Wildlife Service unpublished data).

Sensitivities: This key site lies in a portion of the Gaspé Peninsula subject to bacterial contamination of coastal waters from municipal wastewater and agricultural runoff. Consequently, local shellfish have high concentrations of toxins, and human harvest of softshell clams and mussels is often prohibited (Working Group on the State of the St. Lawrence Monitoring 2015). This is also of concern for sea ducks that feed on these shellfish.

Potential Conflicts: There are concerns that Chaleur Bay will become polluted from sulfur dioxide released in the atmosphere by the new McInnis cement factory at Port-Daniel-Gascon. Because Harlequin Ducks are of special concern and are present almost all year in this key site, and because they are very site-faithful, coastal development (aquaculture and fisheries) and human use (boat traffic, recreational activities), particularly near the mouth of the Port-Daniel River, could be detrimental to the species.

Status: Six Aquatic Birds Concentration Areas, established by the Quebec government, cover about half the coast within the key site, including Les Îlots (*Aires de concentration d'oiseaux aquatiques*; MELCC 2021). The Shigawake-Newport Important Bird Area, occupying most of the key site, was established largely based on the great numbers of sea ducks during spring migration and the year-round presence of the eastern Harlequin Duck (QC031; IBA Canada 2021).

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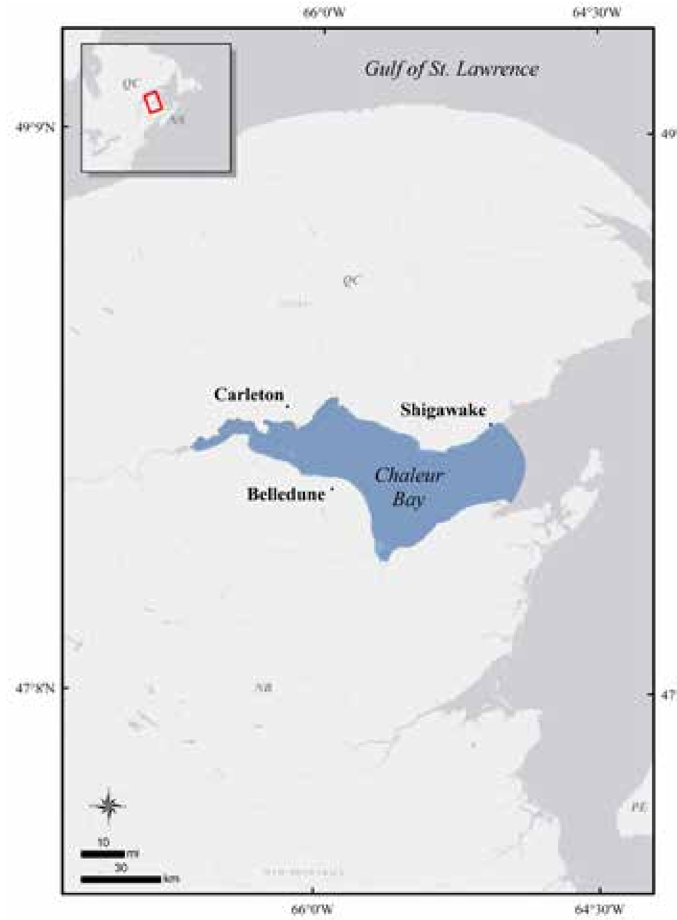
Key Site 60: Chaleur Bay, New Brunswick and Quebec

Location: 47°58'37"N, 65°45'37"W

Size: 3300 km²

Description: Chaleur Bay is the largest bay in the Gulf of St. Lawrence, lying between the provinces of New Brunswick and Quebec. This key site extends east in New Brunswick from Campbellton towards Caraquet and in Quebec from Listuguj to Shigawake. Several large rivers empty into the bay, including the Restigouche, Nepisiguit, Matapédia and Cascapédia rivers. This site includes a few islands, with the largest being Heron Island, a recognized important colonial nesting waterbird site (IBA Canada website).



Precision and Correction of Abundance Estimates Presented: Estimates of Black and Surf scoters from aerial surveys have been photo-corrected. Other estimates of sea ducks during spring migration are based on shoreline transects surveyed by helicopter, without any visibility correction factor applied, and should therefore be considered minimum estimates.

Biological Value: This site is important to several species of sea ducks, especially during spring migration (Lamb et al. 2020). It is of particular importance to the Atlantic population of Black Scoters (*Melanitta americana*) because most adults are thought to stage there for two to three weeks before moving to northern breeding grounds (SDJV 2015, Lamb et al. 2021, Bowman et al. 2021). Indeed, Black Scoters are the most common scoter species staging at this site (representing more than 90% of scoters), with an estimated 53,200 individuals on a given day (McAloney et al. 2005). However, this estimate only provides a daily snapshot, considering that most of the Atlantic population passes through Chaleur Bay during the spring migration period (SDJV 2015, Lamb et al. 2021). Telemetry data suggest that areas of highest use by sea ducks occurs on the Quebec side of the bay along the Escuminac shore and in Cascapedia Bay and around the west side of Heron Island on the New Brunswick side. They use this site to feed on blue mussel (*Mytilus edulis*), Baltic clam (*Macoma balthica*), and herring spawn (Perry and McAloney 2005). Data collected as part of the Sea Duck Joint Venture's Atlantic and Great Lakes Sea Duck Migration Study show that birds arrived as early as April 27, with a mean arrival date of May 2. Mean departure date was May 11, although some birds delayed departure until June 15 (n = 47; Gilliland et al. unpublished data). An earlier study found the migration peak for scoters in the Chaleur Bay occurred on May 3 (Falardeau and Savard 2003).

This site is also important to Surf Scoter (*Melanitta perspicillata*) during spring migration; 3300 individuals have been estimated on a given day from aerial surveys (McAloney et al. 2005), but considering the bird turnaround during migration, more Surf Scoters obviously use this area (Lepage et al. 2015). Based on satellite telemetry, the Belledune–Pointe-Verte sector is frequented by White-winged Scoters (*Melanitta deglandi*) at this time of year (SDJV 2015). Additional sea duck species staging at this key site during spring migration include Long-tailed Duck (*Clangula hyemalis*), Common Merganser (*Mergus merganser*), and Red-breasted Merganser (*Mergus serrator*); at least 10,000 individuals of each species has been estimated, along with about 5000 Common Goldeneyes (*Bucephala clangula*) (Canadian Wildlife Service unpublished data).

During the breeding season, 131 pairs of Common Eider (*Somateria mollissima dresseri*) were counted on Laviolette Island in the Saint-Omer Migratory Bird Sanctuary in June 2018 (BIOMQ 2019). Scattered pairs of Common Goldeneyes, Hooded Mergansers (*Lophodytes lophodytes*), and Common Mergansers nest near the mouth of large rivers on the south shore of the Gaspé Peninsula (Quebec Breeding Bird Atlas 2018), adjacent to the key site. Red-breasted Mergansers historically bred along this shore as well, but no evidence of recent breeding was noted during field work in 2010–2014 (Quebec Breeding Bird Atlas 2018).

This bay is also used as a regular wintering area for a component of the eastern population of the Barrow's Goldeneye, a species of special concern. The Quebec coast of Chaleur Bay annually hosts about 10 to 14% of the wintering population (Environment Canada 2013; Canadian Wildlife Service unpublished data).

Sensitivities: Food resource availability and quality (e.g., blue mussels, herring spawn) could be influenced by pollution as well as by aquaculture.

Potential Conflicts: Disturbance associated with boat traffic remains a potential conflict. The development of a petroleum handling facility at the port of Belledune, New Brunswick, will result in increased boat traffic and risk of oil spills. Conflicts exist with aquaculture, particularly near Carleton where scoters feed at mussel farms during spring migration. Predation of mussel lines has led growers to deter birds and to seek measures to protect their installations (Richman 2013). Because aquaculture sites are often established in natural sea duck feeding areas, hazing activities can exclude birds from some of their traditional, important, feeding sites.

Status: The key site includes the Saint-Omer Migratory Bird Sanctuary along the north shore of the bay; this sanctuary was mostly designated to protect nesting colonial birds, such as gulls and eiders (ECCC 2017). There are four Important Bird Areas identified within the bay, including the Restigouche River Estuary, which was identified because of its importance to Black Scoters. The other three sites—Heron Island, Banc de Carleton, and Pokeshaw Rock—are important for colonial nesting water birds (e.g., Double-crested Cormorant, *Phalacrocorax auritus*) (IBA Canada website). The province of Quebec has also identified 20 *Aires de concentration d'oiseaux aquatiques* disseminated along the Chaleur Bay north shore (90.5 km^2 of coastline; MELCC 2021).

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Key Site 61: Îles de la Madeleine (Magdalen Islands), Quebec

Location: 47°31'14"N, 61°35'37"W

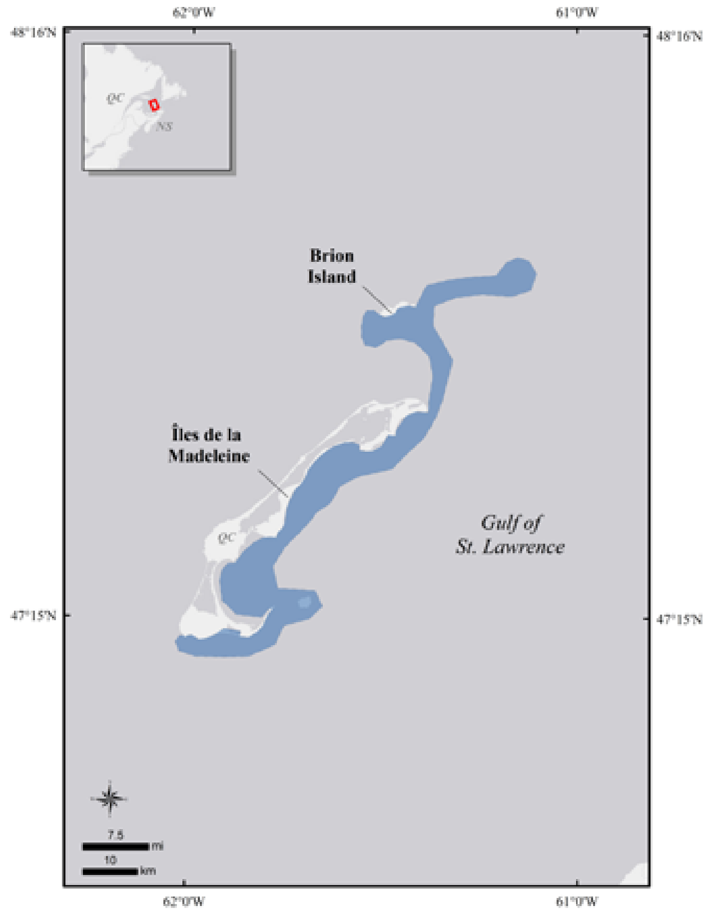
Size: 729 km^2

Description: The Îles de la Madeleine, unofficially known as the Magdalen Islands, are in the southern part of the Gulf of St. Lawrence, Quebec, Canada. More precisely, this small, isolated archipelago lies on an undersea ridge named the Magdalen Shallows, between the Gaspé Peninsula (Quebec) and Cape Breton Island (Nova Scotia), about 120 km north of Prince Edward Island and 150 km southwest of Newfoundland. It is made up of six or seven (disputably) inhabited islands linked by either bridges or dunes, and of four other islands, including Brion Island, separated from the principal group. Several other tiny islands and rocks are also included in the archipelago. About 12,000 inhabitants live on the archipelago. The sand substrate is omnipresent on the islands: tombolos, sand bars, spits, and dune systems occupy most of the landscape. The key site consists of a narrow stretch of water, about 200 km long, to the east and south of the principal group of islands, as well as southeast of Brion Island and around the Rochers aux Oiseaux (Bird Rocks); the latter is situated about 30 km northeast of the principal group of islands. The key site also includes shorelines of islands and rocky shoals adjacent to the nearshore waters.

The Îles de la Madeleine are situated next to the Laurentian Abyss (> 300 m deep), where benthic invertebrate diversity and primary productivity is high with upwelling and mixing of water (UQAR 2014). The vast water masses that surround the archipelago create a moderate climate, with currents that keep large stretches of water ice-free during winter.

Precision and Correction of Abundance Estimates Presented: Estimates of eiders counted during the Common Eider winter survey have been photo-corrected, unless stated otherwise. Otherwise, abundance estimates presented have not been adjusted to account for incomplete detection or other biases. Therefore, abundance estimates should be treated as minimum estimates.

Biological Value: This key site is one of the most important Common Eider (*Somateria mollissima*) overwintering areas in eastern Canada. A triennial winter Common Eider survey in the Gulf of St. Lawrence estimated 12,000 to 19,000 eiders in the key site in 2006–2015 (photo-corrected; four surveys), and a 2018 survey provided a preliminary visual estimate of 32,400 birds in ice-free waters (Canadian Wildlife Service unpublished data). Depending on annual ice conditions, birds forage in large groups near Brion Island, from south of Île de l'Est to south of Pointe-Basse, in the Baie de Plaisance, around Île d'Entrée, and south of Île du Havre Aubert (Canadian Wildlife Service unpublished data). Based on measurements of heads collected in the key site during the 2016–2017 hunting season (n = 248), 90% of wintering Common Eiders were from the *dresseri* population, 4% *borealis*, and 6% intergrade *borealis-dresseri* (Canadian Wildlife Service unpublished data). Also reported during the winter Common Eider survey in February 2013 were 125 White-winged Scoters (*Melanitta deglandi*) and 80 Surf Scoters (*Melanitta perspicillata*) east of Brion Island (Canadian Wildlife Service unpublished data). A few King Eiders (*Somateria spectabilis*) were



also observed among Common Eider flocks. Groups of dozens to hundreds of Common Goldeneyes (*Bucephala clangula*), Long-tailed Ducks (*Clangula hyemalis*), and Red-breasted Mergansers (*Mergus serrator*) are regularly seen along the shores during winter (Fradette 1992, RQO et al. 2019); their presence and numbers depend on the annual ice conditions around the archipelago. Long-tailed Ducks are also present far offshore (Canadian Wildlife Service unpublished data) since they can dive to 60 m deep to feed on pelagic prey. Up to 10 Harlequin Ducks (*Histrionicus histrionicus*) from the eastern population, listed as of special concern by the Committee on the Status of Endangered Wildlife in Canada, have been reported during winter at a few spots along the principal group of islands (RQO et al. 2019).

Due to the strategic position of the Îles de la Madeleine in the middle of the Gulf of St. Lawrence, many ducks transit through during spring and fall migrations (Lamb et al. 2020). Peak eider abundance occurs in mid-March, and birds are seen until May (Fradette 1992). Common Goldeneye, Long-tailed Duck, and Red-breasted Merganser are common in spring; for instance, thousands of Long-tailed Ducks are observed in the coastal zone, including the Baie de Plaisance (Fradette 1992). Surf and White-winged scoters are rare migrants during spring (Fradette 1992), contrary to fall. Up to 62 Harlequin Duck were observed at Old Harry Point in 2012 (RQO 2019).

In fall, Common Eiders pass through the archipelago and some remain there for the winter. Long-tailed Ducks increase in abundance from mid-October to mid-December (Fradette 1992). Scoters migrate through the key site at the end of September and in October, with White-winged Scoter more abundant than Surf Scoter (Fradette 1992). Black Scoters (*Melanitta americana*) have also been reported during fall in groups of up to 300 individuals, but less frequently and apparently later (i.e., from mid-October to December) (RQO et al. 2019).

Few sea ducks currently breed in or adjacent to the key site (Quebec Breeding Bird Atlas 2018; but see Fradette 1992 and Munro 1996).

There is little documentation of sea ducks molting in the key site. However, in the past groups of thousands of nonbreeding White-winged Scoters were observed in the Baie de Plaisance and south of the Île du Havre aux Maisons in late June to early July, with some birds staying well into the molting period (Fradette 1992). Birders recently reported groups of 100 to 250 White-winged Scoters in July and August scattered throughout the archipelago (RQO et al. 2019).

Sensitivities: Climate change processes are increasing coastal erosion in the Îles de la Madeleine: 68% of the coast is being affected. In addition, winter ice cover and ice season length are decreasing in the Gulf of St. Lawrence, and the frequency and severity of winter storms are predicted to increase in the future, further exacerbating coastal erosion (Bernatchez et al. 2008). By 2060, coastal erosion is predicted to affect 81% of the coast due to storms, subsidence, and increased sea level (Bernatchez et al. 2012). Availability and quality of food resources for sea ducks could be influenced by shellfish over-harvesting, pollution, biogeographic dynamics, environmental events (e.g., winter storms), and ice conditions in winter.

Potential Conflicts: Oil pollution is a concern due to the proximity of the Îles de la Madeleine to the main shipping route to and from the St. Lawrence Seaway. Illegal oil dumping (e.g., bilge wastes) and accidental spills threaten the fragile islands' ecosystem. For instance, in 1970, the barge Irving Whale spilled bunker oil between Prince Edward Island and the Îles de la Madeleine, oiled about 5000 Common Eiders, and contaminated 35 km of the archipelago's coasts (Brown and Lock 2003). As recently as 2016, bags of contaminated sand, collected during cleanup, were found buried in some of the Îles de la Madeleine dunes.

Overfishing could disrupt the food chain and affect sea duck food resources, particularly bivalves. Aquaculture is also active in the key site (see Appendix 1); as of 2016, there were four producers for blue mussels, scallops, and oysters, as well as developmental activities to grow algae commercially (Bourque 2016). Most aquaculture operations are set up in lagoons, but there is one offshore site in the Baie de Plaisance where Common Eiders overwinter. Studies have been conducted to try to mitigate predation of cultivated mussels by Common Eiders, as some local producers lost their entire crop. The Quebec government wishes to increase sea product exports under a durable framework according to the 2018–2025 bio-food strategy (MAPAQ 2018). Coastal habitats on the Îles de la Madeleine are subjected to important recreational activities (e.g., all-terrain vehicles on beaches) that can disturb breeding ducks and displace local foraging and migrating flocks.

Status: Pointe de l'Est National Wildlife Area, situated at the northeastern tip of the principal group of islands, was created in 1978 by Environment Canada and covers an expanse of dunes, barrens, and ponds. It was designated to protect important habitats that serve as staging areas for migratory birds. The Bird Rocks Migratory Bird Sanctuary (650 ha), declared in 1919 by the Canadian government, lies approximately 30 km north of the principal archipelago, near Brion Island, and consists of three main rocky islands: the Rocher aux Oiseaux and two smaller rocky islands together known as Rochers aux Margaulx. Waters within 1 km of the islands are included in the sanctuary. Most of Brion Island is protected as an ecological reserve, managed by the provincial government; it is host to 166 bird species, of which more than half breed locally. There are two Aquatic Birds Concentration Areas, one in the principal group of islands and the other near Brion Island (*Aires de concentration d'oiseaux aquatiques*; MELCC 2021). Nine Important Bird Areas overlap the Îles de la Madeleine key site, but two are more relevant to sea ducks, namely the Brion Island and the Rochers aux Oiseaux IBAs (IBA Canada website). The Îles de la Madeleine and surrounding waters are proposed for a Protected Marine Area, both by the federal and provincial governments, due to the abundance of wildlife and high biodiversity there (see UQAR 2014).

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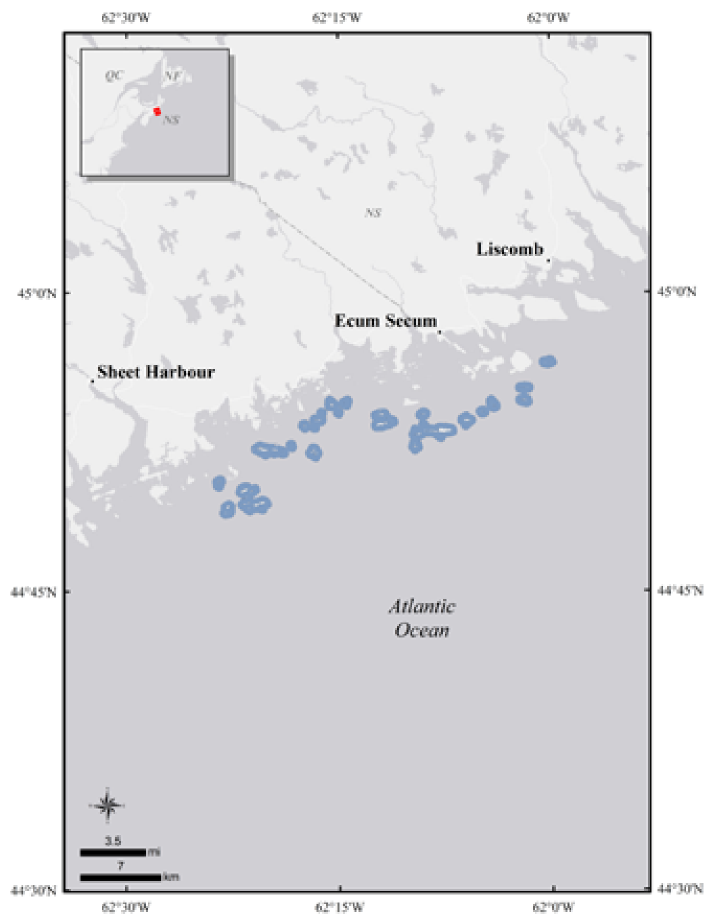
American Common Eiders. Photo: Christine Lepage.

Key Site 62: Eastern Shore, Nova Scotia



Location: 44°53'26"N, 62°11'55"W

Size: 45 km²

Description: Nova Scotia is the easternmost province in Canada's Maritime Provinces, bordered by the Gulf of Maine to the southwest and the Atlantic Ocean to the south and east. The Eastern Shore key habitat site is located along the eastern shore of Nova Scotia and includes offshore islands and ledges from Southern Island and Pumpkin Island off Beaver Harbour northeast to Seal Ledges off Barren Island near Liscomb. The site includes several additional islands and ledges, including Harbour Islands, Bird Islands, Gunning Rocks, Halibut Islands, Dogfish Ledge, White Islands, Bowens Ledge, Little White Island, The Nightcap, and Gull Rock.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: This site is predominantly important to overwintering Eastern Harlequin Ducks (*Histrionicus histrionicus*) but also supports wintering and breeeding American Common Eider (*Somateria mollissima dresseri*) and other sea duck species.

Harlequin Ducks breed in only a very small number of rivers in the Maritime Provinces (Stewart et al. 2015) and no molting sites have been found here (Boyne 2008). However, a third of the eastern North American population winters in Nova Scotia and New Brunswick (Boyne 2008). During winter, Harlequin Ducks use shallow, coastal rocky shorelines at exposed headlands and over subtidal ledges where suitable prey (primarily marine invertebrates including crabs, amphipods, and gastropods) is found and may use boulders, rocks, and shorelines as haul outs (Robertson and Goudie 1999, Gutowsky et al. 2019). Birds primarily stay very close to shorelines but can roost on open water farther from shore at night (Robertson and Goudie 1999).

Winter occupation has been documented in the region since at least 1966 (Boyne 2008), but surveys primarily since 1994 by boat, plane, and helicopter have identified a number of locations where birds regularly congregate between December and April (Bird Studies Canada 2015, Gutowsky et al. 2019, Canadian Wildlife Service unpublished data).

February/March surveys of the Eastern Shore site by boat and helicopter between 2001 and 2015 have detected at least 156 Harlequin Ducks per survey, with an approximately equal number of males and females. A maximum of 647 birds was detected on March 18, 2005, representing approximately 16% of the eastern North American population of Harlequin Ducks (NAWMP 2012). Because aerial surveys can cause birds to flush early, stay close to shore, and flock in tight groups, they tend to underestimate bird abundance (Boyne 2008); therefore, maximum abundance at this site is likely higher. The highest concentrations of birds occur near ledges and islands south of Sutherland Island, around Big Harbour Island, and from around Big Halibut Island to Seal Ledges.

Other sea duck species found here in winter include American Common Eider (100 to 500 birds; Canadian Wildlife Service unpublished data), Surf Scoter (*Melanitta perspicillata*), Black Scoter (*Melanitta americana*), Long-tailed Duck (*Clangula hyemalis*), Bufflehead (*Bucephala albeola*), Common Goldeneye (*Bucephala clangula*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), and rarely, Barrow's Goldeneye (*Bucephala islandica*) and Hooded Merganser (*Lophodytes cucullatus*) (Bird Studies Canada 2015, eBird 2019).

The numerous islands in this area provide nesting habitat to declining numbers of breeding American Common Eider. Within the Eastern Shore Island Wildlife Management Area, their numbers have declined from approximately 2000 breeding pairs in 1977 to about 1000 pairs in 2013–2016 (Province of Nova Scotia unpublished data).

Sensitivities: Waterfowl are sensitive to human disturbance, mostly small vessel or ship traffic, during winter. Food resource availability and quality could be influenced by industrial, urban, and agricultural pollution and by invasive species.

Potential Conflicts: Disturbance and collisions associated with small vessel and ship traffic remains a potential conflict. Chemical and oil spills and water contamination from several sources, including shipping, urban, industry, and agriculture might be of concern. Despite a ban on hunting of Harlequin Ducks, some are still shot by hunters who misidentify birds as other species or lack vigilance when hunting. Coastal development can disturb birds or their habitat as shoreline development can occur near coastlines where birds haul out (Boyne 2008). There is growing interest in eco-tourism which may disturb nesting and brood-rearing eiders (e.g., kayakers approaching nesting islands and broods).

Status: The majority of the site falls within the Eastern Shore Islands Wildlife Management Area which protects nesting habitat critical for various species of colonial nesting birds (Province of Nova Scotia 2018). The area is also part of Bird Conservation Region 14, Atlantic Northern Forest and Marine Biogeographic Unit 11, Scotian Shelf and Bay of Fundy (Environment Canada 2013). It also intersects the Eastern Shore Islands Important Bird Area—including inshore islands between Clam Harbour and Ecum Secum—an area that supports high numbers of Common Eider in spring migration, breeding, and fall migration and thousands of scoters during spring migration (Bird Studies Canada 2015). The site also intersects the Eastern Shore Archipelago Ecologically or Biologically Significant Area (delineated based on uniqueness, aggregation, and fitness consequences criteria; Hastings et al. 2014).

Two protected areas intersect or lie adjacent to the site, including the Eastern Shore Islands Wilderness Area and Liscomb Point Provincial Park. In 2018, the region between Clam Bay and Barren Island was designated by Fisheries and Oceans Canada as the Eastern Shore Islands Area of Interest to conserve and protect habitat for marine species and nesting and foraging grounds for many colonial seabirds and shorebirds, including Harlequin Ducks.

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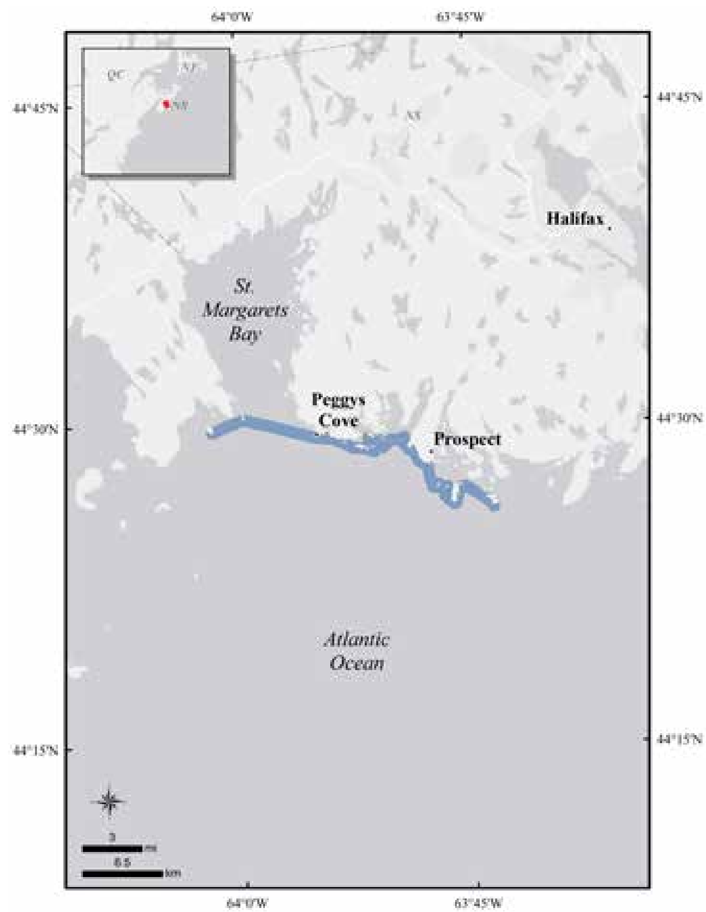
Harlequin Ducks. Photo: Tim Bowman.

Key Site 63: Prospect, Nova Scotia



Location: 44°28'53"N; 63°52'19"W

Size: 20 km^2

Description: Nova Scotia is the easternmost province in Canada's Maritime Provinces, bordered by the Gulf of Maine to the southwest and the Atlantic Ocean to the south and east. The Prospect key habitat site is located along the south shore of Nova Scotia and includes coastal and island shorelines extending from Gravel Island near Aspotogan to Marrs Island near Terrence Bay. The site includes several islands such as Betty Island, Duck Island, Hopson Island, and Dover Island.

Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: This site is predominantly important to overwintering Eastern Harlequin Duck (*Histrionicus histrionicus*) but also supports wintering American Common Eider (*Somateria mollissima dresseri*) and other sea duck species.

Harlequin Ducks breed in only a very small number of rivers in the Maritime Provinces (Stewart et al. 2015) and no molting sites have been found here (Boyne 2008); however, a third of the eastern North American population winters in Nova Scotia and New Brunswick (Boyne 2008). During this period, birds use shallow, coastal rocky shorelines at exposed headlands and over subtidal ledges where suitable prey (primarily marine invertebrates including crabs, amphipods, and gastropods) is found. Harlequin Ducks may use boulders, rocks, and shorelines as haul outs (Robertson and Goudie 1999, Gutowsky et al. 2019). Birds stay very close to shorelines but can roost on open water farther from shore at night (Robertson and Goudie 1999).

Winter occupation by Harlequin Ducks has been documented in the region since at least 1966 (Boyne 2008), but surveys primarily since 1994 by boat, plane, and helicopter have identified a number of locations at which birds regularly congregate between December and April (Bird Studies Canada 2015, Canadian Wildlife Service unpublished data, Gutowsky et al. 2019, Nova Scotia Lands and Forestry [NSLAF] unpublished midwinter survey data).

Surveys of the Prospect site by boat and helicopter in February and March between 2002 and 2015 have detected at least 57 birds per survey, comprising an approximately equal number of males and females. A maximum of 182 birds was detected on an aerial survey on March 6, 2013. Waterfowl often flush or dive in response to disturbance caused by the aircraft, resulting in relatively low detection rates relative to ground-based surveys and therefore underestimates of abundance (P. Thomas unpublished data). Hence the actual abundance at this site is likely at least 200 birds, representing approximately 5% of the continental population (NAWMP 2012). The highest concentrations of birds occur between Peggy's Cove and Marr's Island.

Other sea duck species found here in winter include American Common Eider (400 to 600 birds; Canadian Wildlife Service unpublished data; NSLAF unpublished midwinter survey data), Surf Scoter

(*Melanitta perspicillata*), Black Scoter (*Melanitta americana*), White-winged Scoter (*Melanitta deglandi*), Long-tailed Duck (*Clangula hyemalis*), Bufflehead (*Bucephala albeola*), Common Goldeneye (*Bucephala clangula*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), Hooded Merganser (*Lophodytes cucullatus*) and, rarely, Barrow's Goldeneye (*Bucephala islandica*) (Bird Studies Canada 2015, eBird 2019).

Sensitivities: Waterfowl are sensitive to human disturbance, mostly small vessel or ship traffic, during winter periods. Food availability and quality could be influenced by industrial, urban, and agricultural pollution and invasive species.

Potential Conflicts: Disturbance, collisions, and contamination associated with small vessel and ship traffic remains a potential conflict. Chemical and oil spills and water contamination from several sources, including shipping, urban, industry, and agriculture might be of concern. Presence of a shipping route to Halifax could increase the risk of oil pollution and spills. Despite a ban on hunting of Harlequin Ducks, some are still shot by hunters that misidentify birds as other species or lack vigilance when hunting. Coastal development can disturb birds or their habitat as shoreline development can occur very near coastlines and where birds haul out (Boyne 2008).

Status: The west end of the site intersects the St. Margaret's Bay Ecologically or Biologically Significant Area (Hastings et al. 2014). Three protected areas lie onshore, immediately adjacent to the site, including West Dover Provincial Park, the Dr. Bill Freedman Nature Reserve, and Rogue's Roost Wilderness Area. This area is part of Bird Conservation Region 14 (Atlantic Northern Forests) and Marine Biogeographic Unit 11 (Scotian Shelf and Bay of Fundy of Nova Scotia) (Environment Canada 2013).

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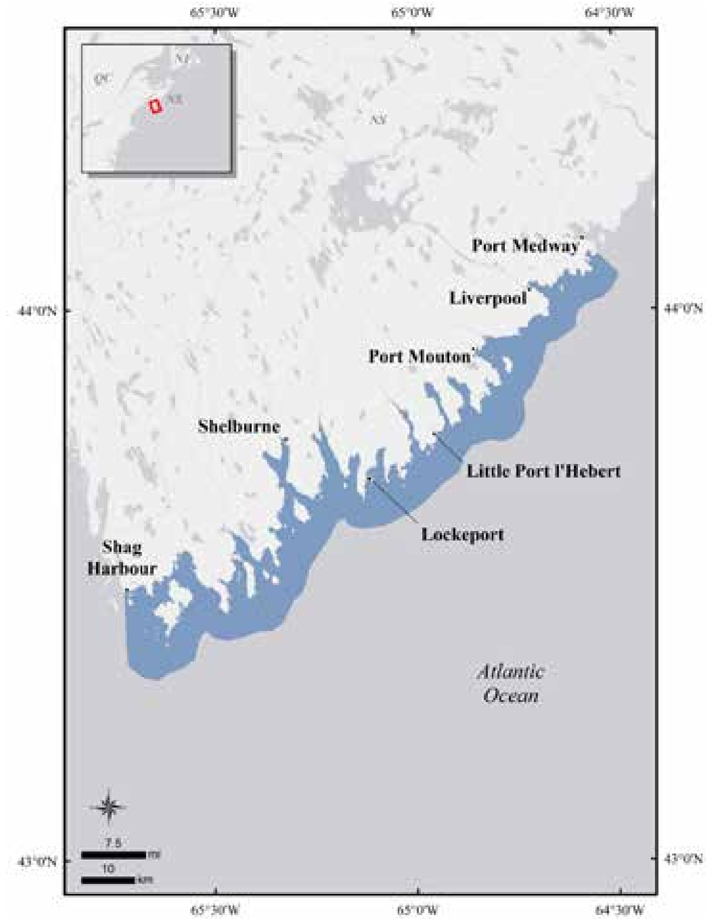
Key Site 64: South Shore, Nova Scotia

Location: 43°45'41"N, 64°56'17"W

Size: 1357 km²

Description: Nova Scotia is the easternmost province in Canada's Maritime Provinces, bordered by the Gulf of Maine to the southwest and the Atlantic Ocean to the south and east. The South Shore key habitat site is located on the south shore of Nova Scotia, extending from Shag Harbour in the south, northeast to Port Medway. It encompasses coastal areas, islands, and many estuaries, harbors, and bays around Cape Sable, Barrington, Lockeport, Port Mouton, and Liverpool. Several rivers flow into the area, including the Barrington River, Clyde River, Roseway River, Sable River, Tidney River, Mersey River, and the Medway River.



Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have been adjusted to account for incomplete detection, either by applying species-specific visibility correction factors (VCF) estimated for surveys specific to this area, or from VCFs estimated from other similar areas and surveys (Canadian Wildlife Service unpublished data, Nova Scotia Department of Lands and Forestry unpublished data).

Biological Value: This site is predominantly important to molting American Common Eider (*Somateria mollissima dresseri*) from August to early September and to overwintering Eastern Harlequin Ducks (*Histrionicus histrionicus*).

Common Eider: Common Eider can be found on Nova Scotia's Atlantic and Bay of Fundy coasts throughout the year. During the breeding season, eiders nest in colonies along marine coasts, primarily on islands, islets, and narrow points of land (Goudie et al. 2000). Nesting islands are typically uninhabited by people and have rocky shorelines (Milton et al. 2016). During July and August, while females incubate, males congregate in large molting flocks along the Atlantic coast (Milton et al. 2006) primarily in the general area of nesting colonies, although farther offshore (Goudie et al. 2000). Fall migration occurs in October and November and peak abundance of eiders is reached by mid-December (Goudie et al. 2000). Adults forage primarily on benthic invertebrates, including intertidal and subtidal mollusks (especially blue mussels, *Mytilus edulis*), crustaceans, and echinoderms (Goudie et al. 2000).

During the molting period, the number of Common Eiders at the site exceeded 20,000 birds in 2001 and 2002. A total of 21,045 and 23,730 birds were detected in August and September 2001, respectively, between Clark's Harbour and West Berlin. Photo-interpreted counts from an August 2002 aerial survey detected 38,830 birds, of which less than 1.5% were female (Milton et al. 2006). This represents between 7% and 13% of the continental population of American Common Eider in 2001 and 2002, respectively (NAWMP 2012). During the molting period, flocks of eiders are fairly evenly distributed throughout the site, with the highest concentrations of eiders variable annually but usually focused in offshore areas between Clark's Harbour and Kejimkujik National Park Seaside Adjunct. There has been a considerable decline in eider abundance at the site since 2002, with 11,275 birds detected in August 2008 and between 200 and 4415 birds between 2014 and 2017 (Canadian Wildlife Service unpublished data, Nova Scotia Department of Lands and Forestry unpublished midwinter survey data).

Common Eider winter at the site between December and April (eBird 2019), and winter (January to March) eider surveys by the Canadian Wildlife Service and Nova Scotia Department of Lands and Forestry have detected between 645 and 5381 overwintering eiders (Canadian Wildlife Service unpublished data, Nova Scotia Department of Lands and Forestry unpublished midwinter survey data).

Harlequin Duck: Harlequin Ducks breed in only a very small number of rivers in the Maritime Provinces (Stewart et al. 2015) and no molting sites have been found here (Boyne 2008); however, a third of the eastern North American population winters in Nova Scotia and New Brunswick (Boyne 2008). During this period, birds use shallow, coastal rocky shorelines at exposed headlands and over subtidal ledges, where suitable prey (primarily marine invertebrates including crabs, amphipods, and gastropods) is found. They may also use boulders, rocks, and shorelines as haul outs (Robertson and Goudie 1999). Birds primarily stay very close to shorelines but can roost on open water farther from shore at night (Robertson and Goudie 1999).

Winter occupation by Harlequin Duck has been documented in the region since at least the 1960s (Boyne 2008), but surveys primarily since 1994 by boat, plane, and helicopter have identified a number of locations at which birds regularly congregate between December and April (Bird Studies Canada 2015, Canadian Wildlife Service unpublished data, Nova Scotia Department of Lands and Forestry unpublished midwinter survey data, Gutowsky et al. 2019) (Appendix 1).

January through March surveys of the Little Port L'Hebert site by boat and helicopter between 2002 and 2019 have detected at least 78 Harlequin Ducks per survey (Canadian Wildlife Service unpublished data, Nova Scotia Department of Lands and Forestry unpublished midwinter survey data). A maximum of 224 birds was detected on March 6, 2013, representing approximately 5.6% of the continental population (NAWMP 2012). Because aerial surveys may cause birds to flush early, stay close to shore, and flock in tight groups, they tend to underestimate bird abundance (Boyne 2008); therefore, maximum abundance at this site is likely higher. The highest concentrations of Harlequin Duck occur from Hardings Island to L'Hebert Rocks and around Ram Island.

Other species. Other sea duck species found here uncommonly during August and early September include Hooded Merganser (*Lophodytes cucullatus*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), Surf Scoter (*Melanitta perspicillata*), Black Scoter (*Melanitta americana*), and White-winged Scoter (*Melanitta deglandi*) (Bird Studies Canada 2015, eBird 2019). Other species found here in winter include Surf Scoter (*Melanitta perspicillata*), Black Scoter, White-winged Scoter, Long-tailed Duck (*Clangula hyemalis*), Bufflehead (*Buecephala albeola*), Common Goldeneye (*Bucephala clangula*), Common Merganser, Red-breasted Merganser, and rarely, Barrow's Goldeneye (*Bucephala islandica*) and Hooded Merganser (Bird Studies Canada 2015, eBird 2019).

Sensitivities: Waterfowl are sensitive to human disturbance, particularly small vessel or ship traffic, during winter periods. Food resource availability and quality could be influenced by industrial, urban, and agricultural pollution and invasive species. Because Common Eider aggregate in dense flocks, they can be susceptible to hunting pressure, disease, predation, oil spills, vessel collisions, and pollution.

Potential Conflicts: Commercial fisheries, aquaculture, and rock weed harvesting might reduce habitat quality and quantity. Harvest in Nova Scotia has declined dramatically from 10,000 to 15,000 Common Eiders in the early 1990s to fewer than 1000 per year since 2011 (Canadian Wildlife Service 2017), but harvest along the Atlantic coast is still above a sustainable limit at approximately 18,000 annually (2011 to 2014 average; Canadian Wildlife Service 2017). Disturbance associated with small vessel and ship traffic remains a potential conflict. Chemical and oil spills and water contamination from several sources, including shipping, urban, industry, and agriculture, might be of concern. Coastal development could reduce habitat quantity and quality in near-shore areas. For example, Little Port L'Hebert is currently undergoing heavy summer home development. Common Eider food availability is a growing concern as large declines in blue mussels (*Mytilus edulis*) have been reported in the Gulf of Maine (Sorte et al. 2016). High mortality of female Common Eider at breeding islands within the site could be caused by high rates of mammalian and avian predators, some of which is the result of human activity such as mink farm escapes (Milton et al. 2016). Despite a ban on hunting of Harlequin Ducks, some are still shot by hunters who misidentify birds as other species or lack vigilance when hunting.

Status: This area is part of Bird Conservation Region 14, Atlantic Northern Forest, and Marine Biogeographic Unit 11, Scotian Shelf and Bay of Fundy (Environment Canada 2013). The site intersects four Important Bird Areas: Eastern Cape Sable Island, South Shore (Barrington Bay Sector), South Shore (Roseway to Baccaro), South Shore (Port Joli Sector), and Kejimkujik National Park Seaside. It is adjacent to the Bon Portage Island Important Bird Area. The site also intersects five Ecologically or Biologically Significant Areas: Port Joli and Surrounding Areas, Green Point to Ram Island, Southwest Scotian Shelf, Cape Sable Island, and Medway Harbour (Hastings et al. 2014).

Numerous protected areas lie within or immediately adjacent to the site, including six land trusts or conservation easements, one national park, two nature reserves, and five provincial parks.

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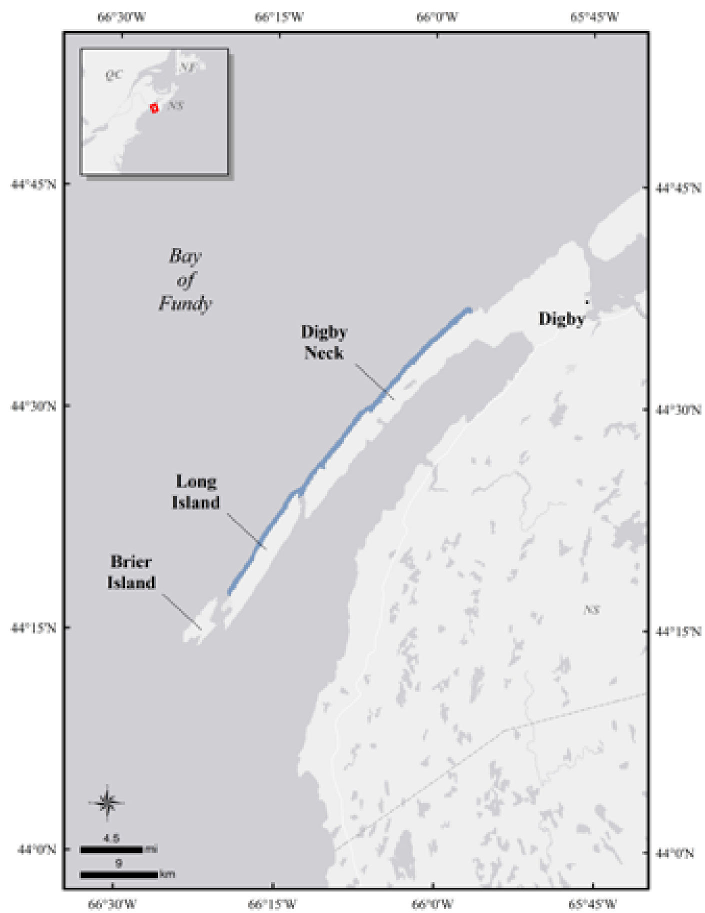
American Common Eiders. Photo: Tim Bowman.

Key Site 65: Digby Neck, Nova Scotia

Location: 44°27'47"N, 66°8'57"W

Size: 29 km²

Description: Nova Scotia is the easternmost province in Canada's Maritime Provinces, bordered by the Gulf of Maine to the southwest and the Atlantic Ocean to the south and east. The Digby Neck key habitat site is located along Nova Scotia's northwest Bay of Fundy coastline and includes rocky shorelines encompassing the majority of the seaward side of Long Island and Digby Neck.



Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: This site is predominantly important to overwintering Eastern Harlequin Ducks (*Histrionicus histrionicus*) but also supports wintering American Common Eider (*Somateria mollissima dresseri*) and other sea duck species.

Harlequin Ducks breed in only a very small number of rivers in the Maritime Provinces (Stewart 2015) and no molting sites have been found here (Boyne 2008); however, a third of the eastern North American population winters in Nova Scotia and New Brunswick (Boyne 2008). During winter, Harlequin Ducks use shallow, coastal rocky shorelines at exposed headlands and over subtidal ledges where suitable prey (primarily marine invertebrates including crabs, amphipods, and gastropods) is found and where Harlequin Ducks may use boulders, rocks, and shorelines as haul outs (Robertson and Goudie 1999, Gutowsky et al. 2019). They primarily stay very close to shorelines but can roost on open water farther from shore at night (Robertson and Goudie 1999).

Winter occupation has been documented in the region since at least 1966 (Boyne 2008), but surveys primarily since 1994 by boat, plane, and helicopter have identified a number of locations at which birds regularly congregate between December and April (Canadian Wildlife Service [CWS] unpublished data, Nova Scotia Department of Lands and Forestry unpublished midwinter survey data, Bird Studies Canada 2015, Gutowsky et al. 2019).

January through March surveys of the Digby Neck site by boat and helicopter between 2003 and 2019 have detected at least 48 birds per survey with approximately equal numbers of males and females. A maximum of 295 Harlequin Ducks were detected during a helicopter survey on March 7, 2013, representing approximately 7.4% of the Eastern North America population (NAWMP 2012). Aerial surveys can tend to underestimate bird abundance because they cause birds to flush early or stay close to shore and flock in tight groups (Boyne 2008); therefore, maximum abundance at this site is likely higher. Up to five Harlequin Ducks have also been observed during winter, adjacent to the Digby Neck key habitat site around Brier Island and Peter Island.

Other sea duck species found here in winter include American Common Eider (300–600 birds; CWS unpublished data), Surf Scoter (*Melanitta perspicillata*), Black Scoter (*Melanitta Americana*), White-winged Scoter (*Melanitta deglandi*), Long-tailed Duck (*Clangula hyemalis*), Bufflehead (*Bucephala albeola*), Common Goldeneye (*Bucephala clangula*), Red-breasted Merganser (*Mergus serrator*), and rarely, Barrow's Goldeneye (*Bucephala islandica*) (Bird Studies Canada 2015, eBird 2019).

Sensitivities: Waterfowl are sensitive to human disturbance, particularly small vessel or ship traffic, during winter periods. Food availability and quality could be influenced by industrial, urban, and agricultural pollution and invasive species.

Potential Conflicts: Chemical and oil spills and water contamination from several sources, including shipping, urban, industry, and agriculture, are a concern. Despite a ban on hunting of Harlequin Ducks, some are still shot by hunters that misidentify Harlequin Ducks as other species or lack vigilance when hunting. Coastal development can disturb birds or degrade their habitat as shoreline development can occur very near coastlines and where birds haul out (Boyne 2008).

Status: This area is part of Bird Conservation Region 14, Atlantic Northern Forest and Marine Biogeographic Unit 11, Scotian Shelf and Bay of Fundy (Environment Canada 2013). At its southwest end the site intersects the Brier Island and Offshore Waters Important Bird Area, which supports high concentrations of seabirds and is one of the most important areas for Red-necked and Red Phalaropes in North America, and the Brier Island, Digby Neck Ecologically or Biologically Significant Area (EBSA; based on uniqueness, aggregation, and fitness consequences criteria; Westhead et al. 2013). Two protected areas lie onshore immediately adjacent to the site: Central Grove Provincial Park and Boar's Head Conservation Lands.

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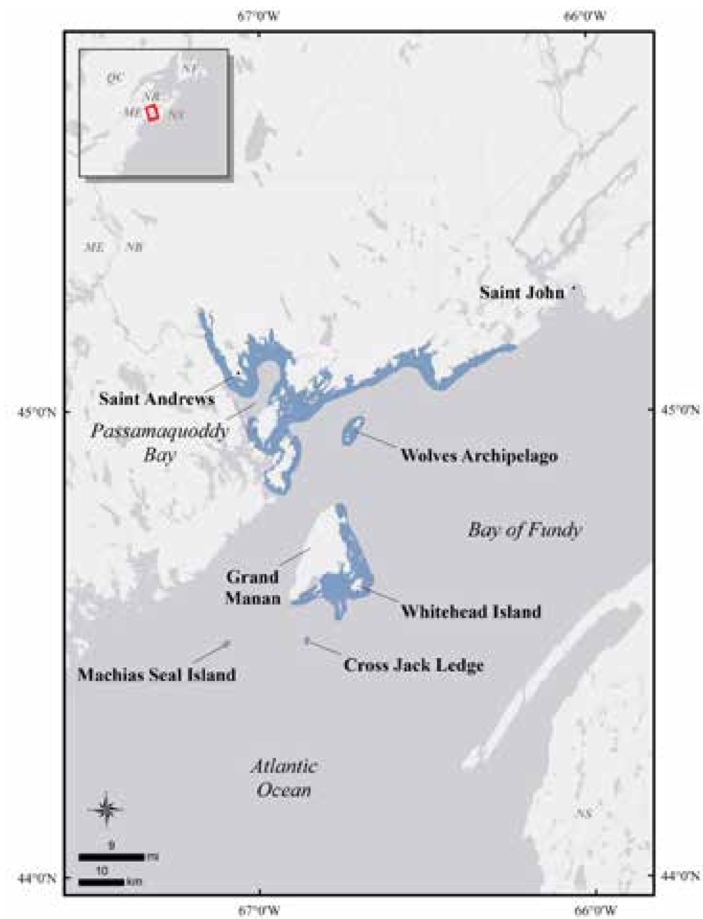
Key Site 66: Southwestern Bay of Fundy, New Brunswick

Location: 45°1'46"N, 66°51'57"W

Size: 611 km^2

Description: The Southwestern Bay of Fundy key habitat site is located on the southwest coast of New Brunswick between Grand Manan Island in the south to St. Andrews in the northwest, and Musquash Estuary to the northeast. It encompasses coastal areas, islands, and many estuaries, harbors, and bays around Machias Seal Island, Cross Jack Ledge, Grand Manan, Whitehead Island, the Wolves Archipelago, Saint George, Black's Harbour, and Maces Bay. Several rivers flow into the area, including the St. Croix River, Digdeguash River, Magaguadavic River, New River, and the Musquash River.



Precision and Correction of Abundance Estimates Presented: Abundance estimates presented for this key habitat site have been adjusted only for Common Eider (*Somateria mollissima dresseri*) to account for incomplete detection, by applying species-specific visibility correction factors estimated for surveys estimated from other similar areas and surveys. A VCF of 1.42 was applied to Common Eider counts and was calculated from a visual versus photo interpretation (Bordage et al. 1998). No adjustments were made for counts of Harlequin Duck. Because aerial surveys may cause birds to flush early or stay close to shore and flock in tight groups (Boyne 2008), maximum abundance of Harlequin Duck at this site is likely greater than reported counts.

Biological Value: This site is predominantly important to overwintering American Common Eider and Eastern Harlequin Ducks (*Histrionicus histrionicus*) from late fall through March.

Common Eider can be found in the southern Bay of Fundy throughout the year. During the breeding season, eiders nest in colonies along marine coasts, primarily on islands, islets, and narrow points of land (Goudie et al. 2000). During July and August eiders, primarily males, congregate in large molting flocks, as they do along the Atlantic coast (Milton et al. 2006), usually in the general area of nesting colonies but farther offshore (Goudie et al. 2000). Fall migration occurs in October and November, and most wintering areas reach peak abundance by mid-December (Goudie et al. 2000). Adult eiders forage primarily on benthic invertebrates, including intertidal and subtidal mollusks (especially blue mussels, *Mytilus edulis*), crustaceans, and echinoderms (Goudie et al. 2000).

During the wintering period (mid-February surveys), Common Eider abundance at this site reached 24,774 birds in 2006, representing approximately 8.3% of the continental population of American Common Eider (NAWMP 2012). More recent numbers are lower, with 8835 and 10,937 observed in 2012 and 2016, respectively, although 18,201 birds were observed in 2018. During winter, flocks concentrate along the coastline; highest concentrations of birds vary among years but are usually along the western part of Grand Manan Island, in Passamaquoddy Bay, and Maces Bay.

This site is important for breeding Common Eider, although they have experienced declines of about 3% per year over a long term (K. Connor, New Brunswick Department Natural Resources unpublished data). Male Common Eider counts for The Wolves Archipelago were 709 in 1998 and declined to 129 and 132 males in 2014 and 2017, respectively (Canadian Wildlife Service New Brunswick unpublished data). Grand Manan Archipelago also supported breeding populations of Common Eider estimated at more than 3300 pairs in 2001 (Ronconi and Wong 2003) but with recent declines. Male counts for the entire key site for the years 1996–2000 included approximately 4000 males, but 2014 and 2017 counts included 2285 and 1990 males, respectively (Canadian Wildlife Service New Brunswick unpublished data).

American Common Eiders appear to be declining in the southern part of their breeding and wintering range in New Brunswick, Nova Scotia, and Maine (Noel et al. 2021), including at this site. Potential causes of decline include Wellfleet Bay virus (Ballard et al. 2017); increasing predator populations on breeding grounds, including mink, river otter, bald eagles, and greater black-backed gulls (Canadian Wildlife Service 2017); large, long-term declines of their preferred prey, blue mussels, in the Gulf of Maine (Sorte et al. 2017) and within this key habitat site (Canadian Wildlife Service 2017).

This site is also continentally important for the eastern North American population of Harlequin Ducks. Harlequin Ducks breed in only a very small number of rivers in the Maritime Provinces (Stewart 2015) and no molting sites have been found here (Boyne 2008); however, a third of the eastern North American population winters in Nova Scotia and New Brunswick (Boyne 2008). During winter, Harlequins use shallow, coastal rocky shorelines at exposed headlands and over subtidal ledges where suitable prey (primarily marine invertebrates including crabs, amphipods, and gastropods) is found. They may also use boulders, rocks, and shorelines as haul outs (Robertson and Goudie 1999, Gutowsky et al. 2019). They may roost on open water farther from shore at night (Robertson and Goudie 1999).

Surveys since 1994 by boat, plane, and helicopter have identified a number of locations at which Harlequin Ducks regularly congregate between December and April (Bird Studies Canada 2015; Canadian Wildlife Service unpublished data, Gutowsky et al. 2019). The highest concentrations of Harlequin Ducks occur off The Wolves Archipelago, White Head Island, Cross Jack Ledge, and Machias Seal Island (Appendix 1). A maximum of 229 Harlequin Ducks were detected across the key site on March 6, 2013, representing approximately 5.7% of the eastern population (NAWMP 2012).

Other sea duck species found here during winter include Hooded Merganser (*Lophodytes cucullatus*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), Surf Scoter (*Melanitta perspicillata*), Black Scoter (*Melanitta americana*), White-winged Scoter (*Melanitta deglandi*), Long-tailed Duck (*Clangula hyemalis*), Bufflehead (*Bucephala albeola*), Common Goldeneye (*Bucephala clangula*), and Barrow's Goldeneye (*Bucephala islandica*) (Bird Studies Canada 2015, eBird 2019). This site is also a major spring migration corridor for sea ducks, especially for scoters. Spring survey average estimates (1996–2004) were 175,254, 89,708, and 5896 for Black, Surf, and White-winged Scoters respectively (Bond et al. 2007).

Sensitivities: Waterfowl are sensitive to human disturbance, particularly small vessel or ship traffic, during winter. Food availability and quality could be influenced by industrial, urban, and agricultural pollution and invasive species such as European green crab (*Carcinus maenas*), which feed on traditional waterfowl foods such as mollusks, worms, and small crustaceans. Because Common Eiders aggregate in dense flocks, they can be susceptible to hunting pressure, local environmental threats, and disease outbreaks.

Potential Conflicts: Commercial fisheries, aquaculture, and rockweed harvesting might reduce habitat quality and quantity (Bird Studies Canada 2015). Sport hunting along the Atlantic Coast is estimated at 18,000 Common Eiders (2011–2014 average), which is below the estimated sustainable harvest (Canadian Wildlife Service 2017). Disturbance and bird collisions associated with small vessel and ship traffic remain a potential conflict. The impact on birds from whale-watching and seabird-watching boat operations from Grand Manan is unknown. Chemical and oil spills and water contamination from several sources, including shipping, urban, and industry are of concern. Coastal development could reduce habitat quantity and quality in near-shore areas or on shorelines where Harlequin Ducks haul out (Boyne 2008). The existing shipping route to

Saint John, New Brunswick, increases the risk of oil pollution and spills. Contaminants from the Point Lepreau Nuclear Plant in New Brunswick and other industrial sources could threaten bird survival or degrade habitat quality. Despite a ban on hunting of Harlequin Ducks in eastern Canada, some are still shot by hunters that misidentify Harlequin Ducks as other species or lack vigilance when hunting.

Status: This area is part of Bird Conservation Region 14, Atlantic Northern Forest, and Marine Biogeographic Unit 11, Scotian Shelf and Bay of Fundy (Environment Canada 2013). The site intersects four Important Bird Areas (IBAs; IBA Canada 2021): Point Lepreau/Maces Bay, The Wolves Archipelago, Quoddy Region, and Grand Manan Archipelago. It falls immediately adjacent to the Machias Seal Island, Manawagonish Island and Saint's Rest Marsh, and Beach IBAs. It also intersects four Ecologically or Biologically Significant Areas (EBSAs): Machias Seal Island, Southwest Grand Manan, The Wolves, White Island, and the Whole of Quoddy Region (Westhead et al. 2013).

The site includes both Grand Manan and Machias Seal Island Migratory Bird Sanctuaries (managed by Environment and Climate Change Canada [2021]) as well as Musquash Estuary Marine Protected Area (managed by the Department of Fisheries and Ocean [2021]).

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Great Lakes Key Sites

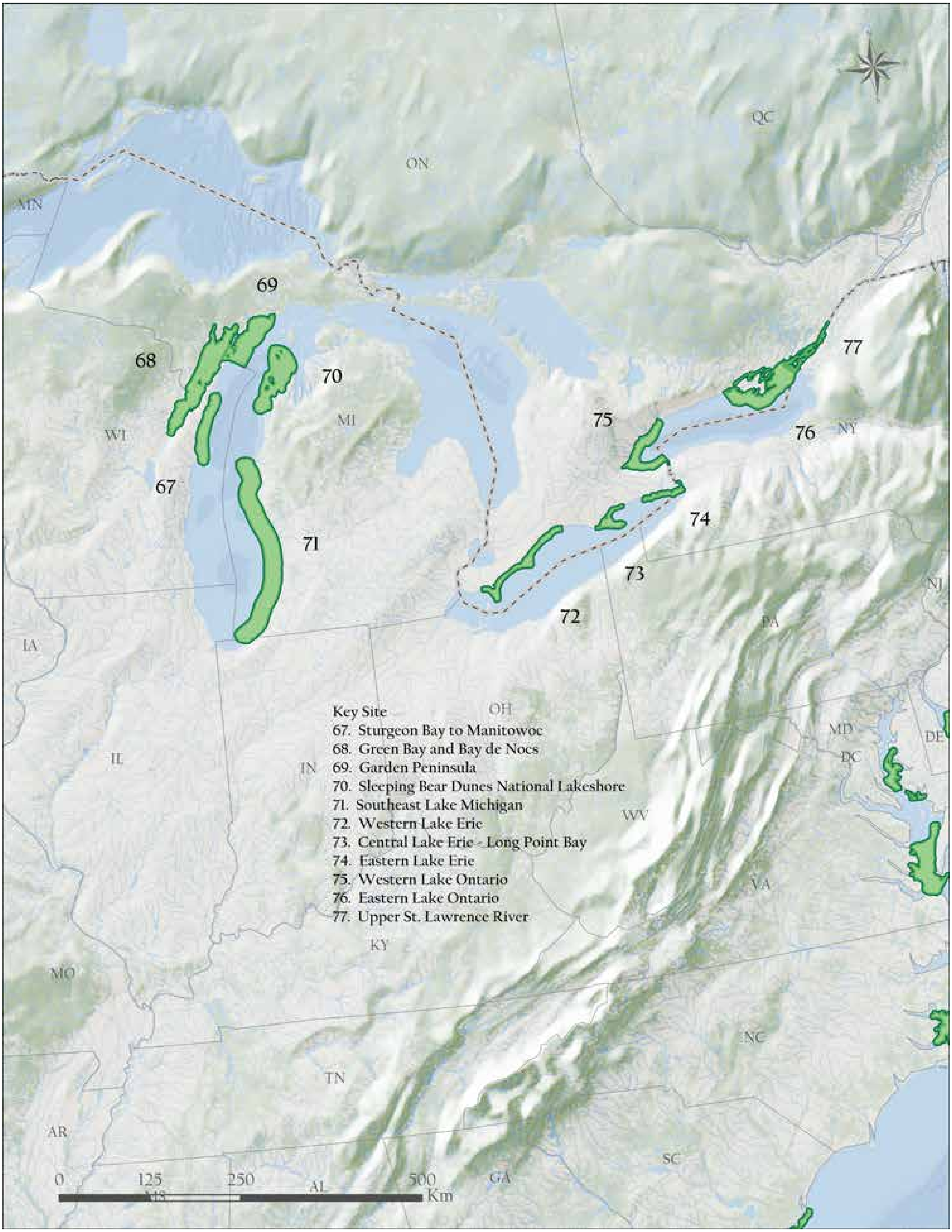


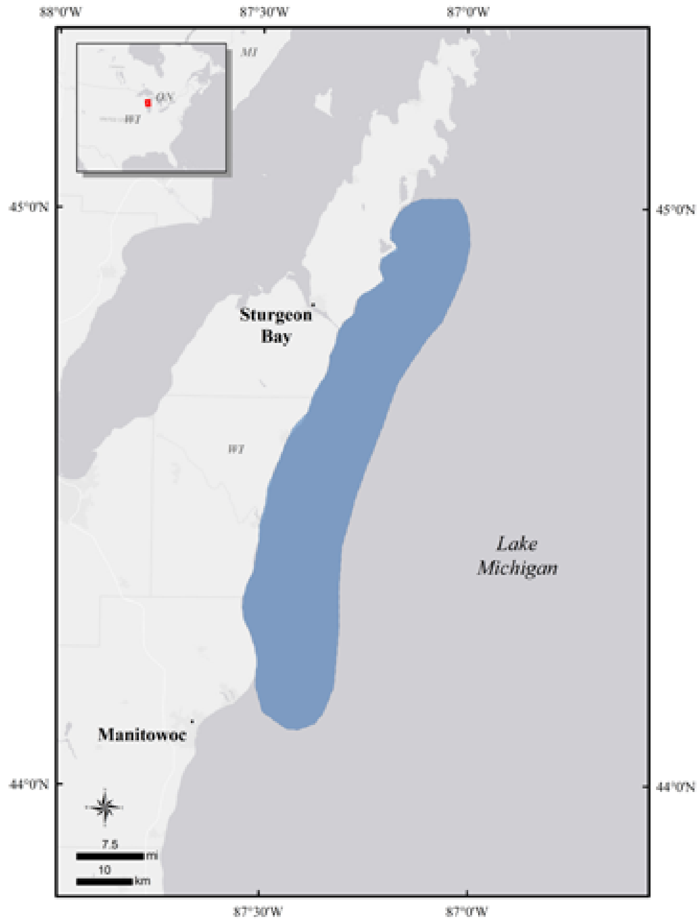
Figure 8. Key habitat sites for sea ducks in the Great Lakes.

Key Site 67: Sturgeon Bay to Manitowoc, Wisconsin

Location: 44°35'2"N, 87°19'11"W

Size: 1639 km²

Description: This site extends 0 to 15 km offshore from Sturgeon Bay, Wisconsin, south to Manitowoc County, Wisconsin. Minor ports can be found at Algoma, Kewaunee, and Two Rivers, Wisconsin. Underwater reefs and drop-offs create a variety of feeding concentration areas for sea ducks and other diving waterfowl, and piscivorous diver species feed in the water column. Depths range from 0 to 120 m; prey species include a range of native freshwater fishes, plus introduced trout and salmon, and the exotic (introduced) round goby, crayfishes, and both zebra and quagga (*Dressenid*) mussels. Ice masses form in discontinuous aggregations between late December and March during the coldest winters.



Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on high numbers of any species of sea ducks observed during aerial surveys conducted from 2010 to 2015. Ongoing analyses are incomplete as of 2022, but abundance estimates are intended to illustrate the importance of the area to sea ducks during the fall-to-spring nonbreeding period. All birds were tallied and distance sampling was utilized, but because analyses have not been completed, for the purpose of this document we include no adjustment for counting error or detection probability, so estimates should be considered minimum indices. Bird distribution and abundance data were obtained by flying parallel transects, spaced 3.2 km apart, north and south along the west shore of Lake Michigan, 3.2 to 16 km offshore, from the Wisconsin–Illinois border to northern Door County, Wisconsin. A double-observer protocol (Conant and Groves 2005), with distance sampling—in bands of distance away from the centerline of the aircraft—was used to eliminate potential detectability concerns potentially affecting survey results.

Biological Value: During migration as well as during parts of most winters (i.e., from October through early May), the area hosts flocks of sea ducks, chiefly Long-tailed Duck (*Clangula hyemalis*), Common Goldeneye (*Bucephala clangula*), all three scoter species (*Melanitta* spp.), Red-breasted and Common Merganser (*Mergus serrator* and *M. merganser*), and Bufflehead (*Bucephala albeola*). Peak numbers of sea ducks in November can be >10,000 birds on individual days, with Long-tailed Duck peaking from early November to early December (Appendix 1) and Red-breasted Merganser peaking in October. In August through October 2013, a total of 52,704 sea ducks were tallied in this area.

More than 100,000 Red-breasted Mergansers pass though this offshore zone during both autumn and spring migration seasons. Use of distribution data from these surveys caused boundaries of a group of Wisconsin Important Bird Areas (Wisconsin Bird Conservation Initiative 2018) to be extended further from shore, as depicted in Appendix 2.

Sensitivities: Flocks of sea ducks are sensitive to disturbance by commercial shipping and offshore hunting. Extensive ice cover in some years has a strong effect on presence, survival, distribution, and movements of sea ducks and other divers in this offshore zone (Engel 2014, Washington Post 2014; see also Appendix 3). Ongoing invasive mussel concentrations (Dressenids) and invasive small fishes such as round goby form part of the diet of waterfowl both nearshore and offshore. Invasive mussels provide a feeding opportunity, but this opportunity comes along with the potential for sublethal effects from contaminants taken up by mussel species (Kimbrough et al. 2014). Some measured declines in formerly abundant native amphipods (*Diporeia* spp.) preferred by Long-tailed Ducks may have impacted the nonbreeding population present here (Nalepa et al. 2009), but data on nonbreeding numbers of Long-tailed Duck in the Great Lakes are not sufficient to establish trends. There has been concern in recent years regarding the sustainability of sport harvest for some sea duck species, chiefly Long-tailed Duck.

Potential Conflicts: Offshore wind power installations are being considered in some offshore areas, which could potentially displace waterfowl (Smith and Dwyer 2016) and pose a collision threat. Commercial vessels, including ore barges and other tankers, pass through this offshore zone. There was a proposal to increase mesh size of gill nets for commercial fishing in Wisconsin waters south of Bailey's Harbor (Eggold and Kalish 2017), with potential for by-catch of nontarget fish species (Wisconsin DNR 2017) and possibly diving birds. Long-tailed Ducks have been accidentally caught in gill nets (Robertson and Savard 2002).

Status: This key site encompasses or is partially within three Wisconsin state priority important bird areas (IBAs). Those IBAs are the Whitefish Dunes–Shivering Sands IBA (Audubon 2017a), Door-Kewaunee Lakeshore Migration Corridor IBA (Audubon 2017b), and Point Beach State Forest IBA (Audubon 2017c). The open waters of Lake Michigan and connecting waterbodies are managed by the State of Wisconsin for this key site, but oversight is provided by the United States government to regulate navigation, interstate commerce, access, pollution, and water quality and use. Due to their sovereignty from federal and state governments, tribal nations also provide input on the management and utilization of Lake Michigan resources, including governance through the Chippewa Ottawa Resource Authority and the Great Lakes Indian Fish and Wildlife Commission (Hall and Houston 2014). Uplands surrounding this key site are managed by a variety of parties including federal, state, county, city, and private land owners.

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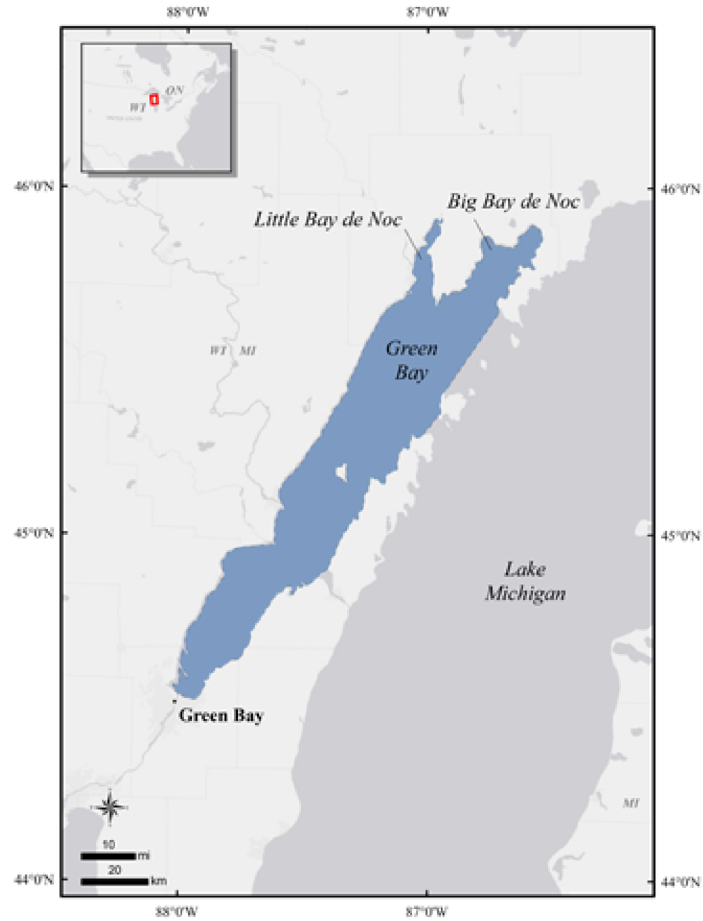
Key Site 68: Green Bay, Wisconsin, and Bay de Nocs, Michigan

Location: 45°15'25"N, 87°17'39"W

Size: 3934 km^2

Description: Lake Michigan is one of the Laurentian Great Lakes and the only Great Lake located entirely within the United States, bounded by the states of Illinois, Indiana, Michigan, and Wisconsin, USA. Waters within Green Bay, Little Bay de Noc, and Big Bay de Noc constitute this key site. Major shipping ports within this key site include Green Bay, Sturgeon Bay, and Marinette, Wisconsin, and Menominee and Escanaba, Michigan. Smaller ports include Oconto, Suamico, Dyckesville, Little Sturgeon, Egg Harbor, Fish Creek, Ephraim, Sister Bay, Ellison Bay, Gills Rock, and Washington Island (four ports), Wisconsin, along with Gladstone and Nahma, Michigan. For more detailed information about waterfowl in the Great Lakes region and the benthic community, limnology, and geomorphology of Green Bay and Lake Michigan, see Prince et al. (1992), National Oceanic and Atmospheric Administration (2006), Nalepa et al. (2009), Madenjian et al. (2015), Yurista et al. (2015), Rowe et al. (2017), De Stasio et al. (2018), and Harris et al. (2018).



Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on the peak number of all species of sea duck observed during aerial surveys of waterbirds conducted during fall through spring (i.e., September–May) 2009–2014 (Kenow et al. 2021) and aerial surveys of waterfowl conducted during November and December 2017 and December 2018 by the Wisconsin Department of Natural Resources (DNR; Wisconsin DNR 2019). Observed counts were adjusted by species-specific or species group detection rates estimated for aerial fixed-wing surveys by Hodges et al. (2008) for coastal surveys in Alaska. Observed and visibility-adjusted abundance estimates, as well as distribution maps, by month, are included in Appendix 1.

Biological Value: This site is important for a variety of sea ducks during fall migration and likely during spring migration, with limited use during winter when habitat becomes limited or unavailable due to ice cover. Common Goldeneye (*Bucephala clangula*) constitutes the largest proportion of sea ducks within this key site, followed by merganser species (*Mergus* spp.) and Bufflehead (*Bucephala albeola*), with lesser numbers of Long-tailed Ducks (*Clangula hyemalis*) and scoter species (*Melanitta* spp.) observed during fall and early winter. Information regarding spring use of this site is lacking, but high use of this area was documented among radiomarked Long-tailed Ducks during April (Fara 2018).

Aerial survey data (Kenow et al. 2021, Wisconsin DNR 2019) indicate that Common Goldeneye was the most abundant species during fall migration, with total numbers estimated at roughly 33,000 birds (September–November, 2011–2018) when corrected for visibility (Hodges et al. 2008). Lesser numbers of fall migrating sea ducks included merganser species (~7500 est. birds), Bufflehead (~5900 est. birds), and Long-tailed Ducks (~2000 est. birds). White-winged Scoters (*Melanitta deglandi*) were infrequently encountered during fall surveys and were the only scoter species observed. The combined fall density estimate for all surveys in this key site was 26.4 sea ducks/km^2, with individual survey estimates ranging from 0 (September 12–13, 2011; Kenow et al. 2021) to 126.0 (November 3, 2017; Wisconsin DNR 2019) sea ducks/km^2 when adjusted for visibility (Hodges et al. 2008).

Aerial survey data (Wisconsin DNR 2019) indicate that Common Goldeneye was the most abundant species observed during winter within this site, with preliminary total numbers estimated at 11,500 birds (December 2017) when corrected for visibility (Hodges et al. 2008). Bufflehead (~3700 est. birds) was the only other species to exceed 1000 birds in total during winter. The estimated density for this survey was 57.8 sea ducks/km^2 when adjusted for visibility (Hodges et al. 2008).

Few sea ducks were present at this site during September, and only a few small concentrations were located near Big Bay de Noc, Michigan. Sea duck numbers increased in October and were widely distributed throughout the key site with no major concentrations apparent. Peak counts occurred in November with the largest concentrations of sea ducks occurring south of Marinette, Wisconsin, and Menominee, Michigan, with smaller concentrations evenly distributed throughout the rest of the key site. Sea duck counts decreased in December and it is likely that very few sea ducks remained at this site through winter due to ice cover. Without spring counts, it is difficult to determine how important this key site may be to spring migrating sea ducks; however, radiomarked Long-tailed Ducks used this site throughout April (Fara 2018), and anecdotal reports from fishermen and biologists indicate that many sea ducks use this site from ice-out through early May.

Sensitivities: Waterfowl and other waterbirds are sensitive to human disturbance, mostly small vessel and/or shipping traffic during migration and the wintering period on the Great Lakes (Prince et al. 1992). By-catch from commercial fishing operations is of concern, as Ellarson (1956) estimated that by-catch of Long-tailed Ducks in large mesh gill nets could reach 100,000 individuals (see also Baldassare 2014). Commercial fishing operations have declined dramatically over the last 50 years in Michigan (Michigan DNR 2019), but commercial and tribal fishing operations still occur north of Grand Haven, Michigan (Michigan Department of Technology, Management and Budget 2013). Commercial fishing operations in Wisconsin have also declined. The Wisconsin DNR has placed emphasis on supporting commercial operations through science and data, but by-catch estimates for Wisconsin waters of Lake Michigan are outdated (Wisconsin DNR 2017). Although entrapment methods have for the most part changed from gill nets to trap nets, there is still concern about by-catch of Common Loons (*Gavia immer*; Johnson et al. 2004), and perhaps other waterbirds including sea ducks.

Food resource availability and aquatic functions in Lake Michigan appear to be changing due to invasive and introduced species (Nalepa et al. 2009), and shifts in food web dynamics have had a negative effect on the health of predatory fish species (Pothoven et al. 2001, Madenjian et al. 2006, Nalepa et al. 2009, Mandenjian et al. 2015) and perhaps waterfowl. Food resource availability and quality could also be influenced by contamination from industrial activities, urban development, and agricultural practices that occur near the lakeshore or within the Lake Michigan watershed (U.S. Environmental Protection Agency 2008).

Type E botulism (*Clostridium botulinum*) outbreaks occur periodically in Lake Michigan and have been associated with the mortality of more than 100,000 birds throughout the Great Lakes since the 1960s, including sea ducks (Chipault et al. 2015). Outbreaks of type-E avian botulism have been a common occurrence in northern Lake Michigan since the early 2000s (Lafrancois et al. 2011, Chipault et al. 2015), in contrast to Green Bay where avian botulism outbreaks have not been documented in recent decades. Botulism outbreaks were last documented in Green Bay during 1964–1966 and in 1983 (Zuccarino-Crowe 2009) and occurred prior to dreissenid mussel (*Dreissena* spp.) and round goby (*Neogobius melanostomus*) invasions.

Lake Michigan, including Green Bay, has been identified as a suitable location, with above adequate wind resources, for nearshore and offshore wind energy development (Beiter et al. 2017). Although no offshore wind energy sites have been developed within the Lake Michigan basin, there is a potential for negative effects to sea ducks and other birds through displacement and/or direct mortality (Arnett et al. 2007).

Extensive ice cover during severe winters can have a strong effect on the presence, survival, distribution, and movements of sea ducks and waterbirds that winter on Lake Michigan (Ellarson 1956, Prince et al. 1992). Green Bay is completely ice covered during a typical winter (U.S. Department of Commerce 2020).

Potential Conflicts: Disturbance associated with small vessel and shipping traffic, potential for near-shore and offshore wind energy development, and effects from commercial fishing operations remain potential conflicts at this site.

Status: This key site encompasses nine state priority Important Bird Areas (IBAs). Areas within Michigan are the Snake Island (Big Bay de Noc) IBA (Audubon 2017a), Round Island (Bay de Noc) IBA (Audubon 2017b), St. Vital Island IBA (Audubon 2017c), Ogontz Bay Marshes IBA (Audubon 2017d), and Little Bay de Noc (including Portage Marsh and Aronson Island sandbar) IBA (Audubon 2017e). Areas within Wisconsin are the Seagull Bar IBA (Audubon 2017f), Lower Peshtigo River IBA (Audubon 2017g), Green Bay West Shore Wetlands IBA (Audubon 2017h), and Lower Green Bay Islands–Bay Beach Wildlife Sanctuary IBA (Audubon 2017i). The open waters of Lake Michigan, including Green Bay, Big and Little Bay de Nocs, and connecting waterbodies are managed by the states of Wisconsin and Michigan for this key site, but oversight is provided by the United States government to regulate navigation, interstate commerce, access, contamination, and water quality and use. Due to their sovereignty from federal and state governments, tribal nations also provide input on the management and utilization of Lake Michigan resources, including governance through the Chippewa Ottawa Resource Authority and the Great Lakes Indian Fish and Wildlife Commission (Hall and Houston 2014). Uplands surrounding this key site are managed by a variety of parties including federal, state, county, city, and private land owners.

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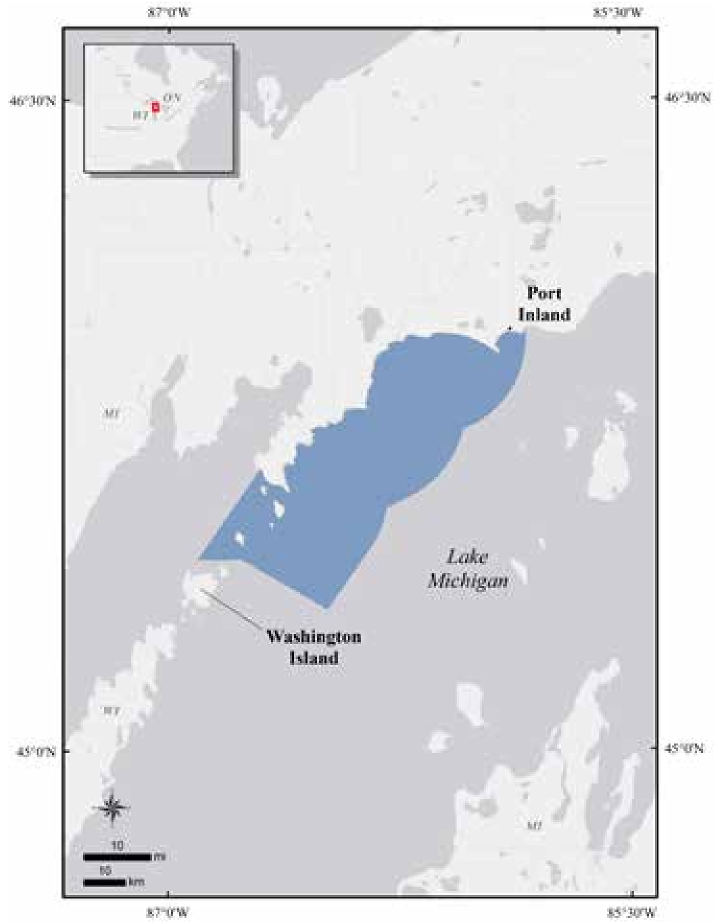
Common Goldeneyes. Photo: Tim Bowman.

Key Site 69: Garden Peninsula, Michigan

Location: 45°40'05"N, 86°20'37"W

Size: 2391 km²



Description: Lake Michigan is one of the Laurentian Great Lakes and the only Great Lake located entirely within the United States, bounded by the states of Illinois, Indiana, Michigan, and Wisconsin, USA. The Garden Peninsula, of Lake Michigan that constitutes this key site extends southwest along the shoreline from 3 km east of Port Inland, Michigan, to the Michigan–Wisconsin border (4 km north of Washington Island, Wisconsin) and extends 25 km offshore. The site encompasses islands and shoals in Michigan waters south of the Garden Peninsula. The only major port within the key site is Port Inland, Michigan, and minor ports can be found at Fairport and Manistique, Michigan. For more detailed information about waterfowl in the Great Lakes region and the benthic community, limnology, and geomorphology of Lake Michigan, see Prince et al. (1992), National Oceanic and Atmospheric Administration (2006), Nalepa et al. (2009), Madenjian et al. (2015), Yurista et al. (2015), and Rowe et al. (2017).

Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on the peak number of all species of sea duck observed during aerial surveys of waterbirds conducted during fall through spring (i.e., September–May) 2009–2014 (Kenow et al. 2021). Observed counts were adjusted by species-specific or species group detection rates estimated for aerial fixed-wing surveys by Hodges et al. (2008) for coastal surveys in Alaska. Observed and visibility-adjusted abundance estimates, as well as distribution maps by month, are included in Appendix 1.

Biological Value: This site is important for Long-tailed Ducks (*Clangula hyemalis*), but other sea ducks, such as Common Goldeneye (*Bucephala clangula*), Bufflehead (*Bucephala albeola*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), Black Scoter (*Melanitta americana*), White-winged Scoter (*Melanitta deglandi*), and Surf Scoter (*Melanitta perspicillata*) migrate through and winter here in smaller numbers. High use of this area was documented among radiomarked Long-tailed Ducks during fall (November) and spring (March–May), with no observed use during the wintering months (December–February; Fara 2018). These Long-tailed Ducks exhibited diel movements, using shallower water closer to shore during the day and deeper water farther from shore at night.

Aerial survey data (Kenow et al. 2021) indicate that Long-tailed Ducks were the most abundant species during spring migration with total numbers estimated at least 33,000 birds (April, 2011–2012) when corrected for visibility (Hodges et al. 2008); nearly all these birds were encountered in 2011 and represented 92% of all sea ducks tallied during spring surveys. Total mergansers were estimated at slightly more than 1950 birds within the same period. Approximately three-quarters of all mergansers were identified as Common Mergansers. Numbers of most other sea duck species were generally considered low. The total spring density estimate for surveys in this key site was 66.9 sea ducks per km^2.

Aerial survey data (Kenow et al. 2021) indicate that Long-tailed Ducks were the most abundant species wintering within this site, with total numbers estimated at more than 12,000 birds (December–February, 2011–2012) when corrected for visibility (Hodges et al. 2008). Common Merganser numbers were estimated at slightly more than 4000 birds within the same period (92% of all mergansers tallied), and most other wintering sea ducks had species counts of less than 1000 birds each. Scoters, particularly White-winged, were infrequently detected during winter. The total winter density estimate for surveys in this key site was 22.6 sea ducks per km^2, with individual surveys ranging from 11.2 (February 14, 2012) to 26.5 (January 13, 2011) sea ducks per km^2.

Fall migration survey data indicate that the total number of Long-tailed Ducks was estimated at greater than 25,300 birds (September–November, 2010–2014) when corrected for visibility (Hodges et al. 2008). Common Mergansers (~1860 est. birds) represented at least 60% of total mergansers tallied during fall migration at this site. Most other sea duck species had fall counts totaling less than 600 birds over 11 surveys. The total fall density estimate for surveys in this key site was 10.6 sea ducks per km^2, with individual surveys ranging from 0.2 (October 5, 2011) to 90.4 (October 21, 2014) sea ducks per km^2.

Few sea ducks were present at this site during September, but large concentrations were observed during October surveys, with the highest concentrations located near Manistique, Michigan (Kenow et al. 2021). During November, sea ducks tended to occupy most of the key site and were evenly distributed throughout with no major concentrations. Sea duck concentrations decreased after November, and concentrations were generally lower from December through February. The one exception was a January 2011 flight that indicated large concentrations near Manistique, Michigan. Ice cover during winter likely forces birds out of this area from December through February. Surveys conducted in April indicate that sea duck numbers increased throughout the key site with the heaviest concentrations near Manistique, Michigan.

Sensitivities: Waterfowl and other waterbirds are sensitive to human disturbance, mostly small vessel and shipping traffic during migration and the wintering period on the Great Lakes (Prince et al. 1992). By-catch from commercial fishing operations is of concern: Ellarson (1956) estimated that by-catch of Long-tailed Ducks in large mesh gill nets could reach 100,000 (see also Baldassare 2014) individuals. Commercial fishing operations have declined dramatically over the last 50 years in Michigan (Michigan Department of Natural Resources 2019), but commercial and tribal fishing operations still occur north of Grand Haven, Michigan (Michigan Department of Technology, Management and Budget 2013). Although entrapment methods have for the most part changed from gill nets to trap nets, there is still concern about by-catch of Common Loons (*Gavia immer*; Johnson et al. 2004), and perhaps other waterbirds including sea ducks.

Food resource availability and aquatic functions in Lake Michigan appear to be changing due to invasive and introduced species (Nalepa et al. 2009), and shifts in food web dynamics have had a negative effect on the health of predatory fish species (Pothoven et al. 2001; Madenjian et al. 2006; Nalepa et al. 2009; Mandenjian et al. 2015) and perhaps waterfowl. Food resource availability and quality could also be influenced by contamination from industrial activities, urban development, and agricultural practices that occur near the lakeshore or within the Lake Michigan watershed (U.S. Environmental Protection Agency 2008).

Type E botulism (*Clostridium botulinum*) outbreaks occur periodically in Lake Michigan and have been associated with the mortality of more than 100,000 birds throughout the Great Lakes since the 1960s, including sea ducks (Chipault et al. 2015). Outbreaks of type E avian botulism have been a common occurrence in northern Lake Michigan since the early 2000s (Lafrancois et al. 2011, Chipault et al. 2015).

Lake Michigan has been identified as a suitable location, with above adequate wind resources, for nearshore and offshore wind energy development (Beiter et al. 2017) and although no offshore wind energy sites have been developed, there is a potential for negative effects to sea ducks and other birds through displacement and/or direct mortality (Arnett et al. 2007).

Extensive ice cover during severe winters can have a strong effect on the presence, survival, distribution, and movements of sea ducks and waterbirds that winter on Lake Michigan (Ellarson 1956; Prince et al. 1992). The Garden Peninsula area of Lake Michigan, representing this key site, experiences a range of ice coverages from limited ice coverage during mild winters to completely frozen during severe winters (U.S. Department of Commerce 2020).

Potential Conflicts: Disturbance associated with small vessel and shipping traffic, potential for nearshore and offshore wind energy development, and effects from commercial fishing operations remain potential conflicts at this site.

Status: This key site encompasses the Rocky Island (Lake Michigan) Important Bird Area (IBA) in Michigan (Audubon 2017). The open waters of Lake Michigan and connecting waterbodies are managed by the State of Michigan for this key site, but oversight is provided by the United States government to regulate navigation, interstate commerce, access, contamination, and water quality and use. Due to their sovereignty from federal and state governments, tribal nations also provide input on the management and utilization of Lake Michigan resources, including governance provided through the Chippewa Ottawa Resource Authority and the Great Lakes Indian Fish and Wildlife Commission (Hall and Houston 2014). Uplands surrounding this key site are managed by a variety of parties including federal, state, county, city, and private land owners.

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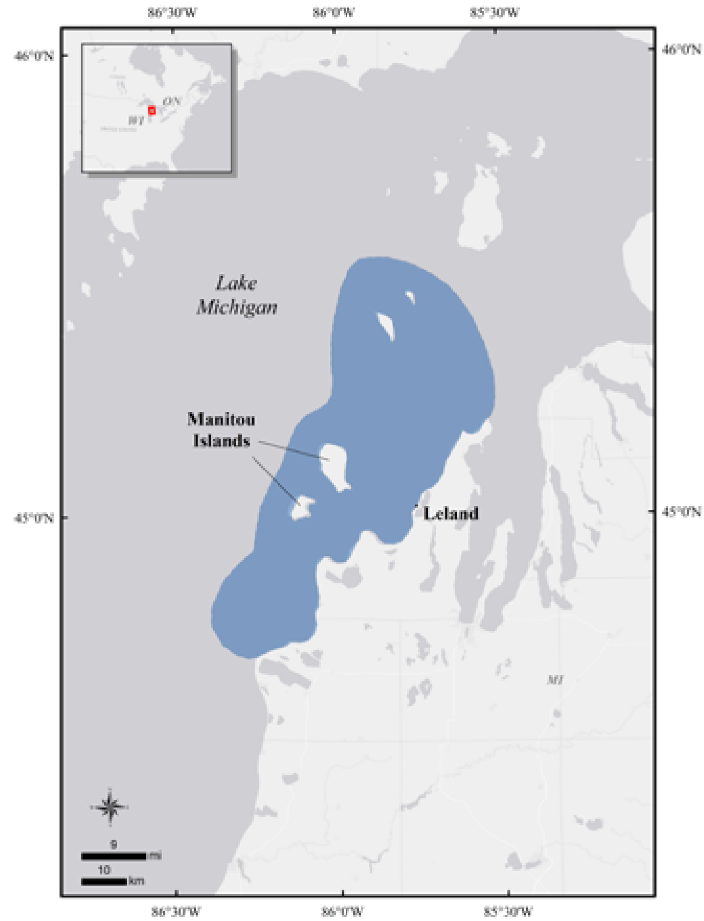
Key Site 70: Sleeping Bear Dunes National Lakeshore, Michigan

Location: 45°09'02"N, 85°55'47"W

Size: 2945 km^2

Description: Lake Michigan is one of the Laurentian Great Lakes and the only Great Lake located entirely within the United States, bounded by the states of Illinois, Indiana, Michigan, and Wisconsin. The Sleeping Bear Dunes National Lakeshore portion of Lake Michigan that constitutes this key site extends north along the shoreline from Point Betsie Lighthouse (50 km southwest of Leland, Michigan) to Grand Traverse Lighthouse (25 km north-northeast of Leland, Michigan) and extends 15–50 km offshore, encompassing North Fox, South Fox, North Manitou, and South Manitou Islands. This area includes only one minor port at Leland, Michigan. For more detailed information about waterfowl in the Great Lakes region, Sleeping Bear Dunes National Lakeshore, and the benthic community, limnology, and geomorphology of Lake Michigan, see Prince et al. (1992), National Park Service (2019), National Oceanic and Atmospheric Administration (2006), Nalepa et al. (2009), Madenjian et al. (2015), Yurista et al. (2015), and Rowe et al. (2017).



Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on the peak number of all species of sea duck observed during aerial surveys of waterbirds conducted during fall through spring (i.e., September–May) 2009–2014 (Kenow et al. 2021). Observed counts were adjusted by species-specific or species group detection rates estimated for aerial fixed-wing surveys by Hodges et al. (2008) for coastal surveys in Alaska. Observed and visibility-adjusted abundance estimates, as well as distribution maps by month, are included in Appendix 1.

Biological Value: This site is important for Long-tailed Ducks (*Clangula hyemalis*) but does support a good number of White-winged Scoters (*Melanitta deglandi*), Common Goldeneyes (*Bucephala clangula*), and Common Mergansers (*Mergus merganser*). Other sea ducks, such as Bufflehead (*Bucephala albeola*), Black Scoter (*Melanitta americana*), Surf Scoter (*Melanitta perspicillata*), and Red-breasted Mergansers (*Mergus serrator*) migrate through and winter here in smaller numbers.

Use of this area was documented by one radiomarked Long-tailed Duck from December 2016 through May 2017 (Fara 2018). This duck exhibited diel movements, using shallower water closer to shore during the day and deeper water farther from shore at night. This record is consistent with the observed distribution of Long-tailed Ducks during aerial surveys in this region of Lake Michigan.

Aerial survey data (Kenow et al. 2021) indicate that Long-tailed Ducks were the most abundant species wintering within this site, with total numbers estimated at roughly 65,000 birds (December–February, 2010–2014) when corrected for visibility (Hodges et al. 2008). Lesser numbers of wintering sea ducks included White-winged Scoter (~12,000 est. birds), Common Goldeneye (~5000 est. birds), and Common Merganser (~3500 est. birds). White-winged Scoters and Common Mergansers each represented approximately 81% of total scoters and total mergansers tallied, respectively. Buffleheads were infrequently encountered. The total winter density estimate for surveys in this key site was 49.3 sea ducks/km^2, with individual surveys ranging from 18.3 (December 6, 2011) to 77.6 (December 1–2, 2009) sea ducks/km^2.

Aerial survey data (Kenow et al. 2021) indicate that Long-tailed Ducks were the most abundant species during fall migration, with total numbers estimated at roughly 35,000 birds (September–November, 2009–2014) when corrected for visibility (Hodges et al. 2008). White-winged Scoters represented at least 18% of total sea duck numbers counted within the same period at this site (~9200 est. birds). Other sea duck species tended to be more abundant during fall migration than during the spring season; however, there was greater survey effort during the fall months and sea duck numbers were generally much higher in years where survey data included late October to late November flights. Spring data were limited to the same calendar day in April between two consecutive years (2012–2013), with total numbers of Long-tailed Ducks estimated at approximately 3500 birds when corrected for visibility (Hodges et al. 2008). Merganser species, when combined, were the only other sea ducks to exceed 1000 birds in total for spring (~1700 est. birds), and White-winged Scoters were infrequently encountered by early April at this site. The total fall density estimate for surveys in this key site was 16.6 sea ducks/km^2, while the total spring density estimate was 12.8 sea ducks/km^2. Fall density estimates for individual surveys ranged from 0.1 (September 18–19, 2013) to 79.7 (November 28–29, 2012) sea ducks/km^2, and individual spring survey density estimates ranged from 5.4 (April 5, 2012) to 20.2 (April 5, 2013) sea ducks/km^2.

Few sea ducks were present at this site during September and the few concentrations present tended to be near the Fox Islands and Manitou Islands. Sea duck numbers increased during October and November, but concentrations were generally small and well-spaced, with only a few larger concentrations found southwest of South Manitou Island and near Pyramid Point, Michigan (~15 km southwest of Leland, Michigan). December provided the highest counts for this key site, and large concentrations of sea ducks were near the shoals of South Fox Island, around North and South Manitou Islands, within Sleeping Bear Bay (~25 km southwest of Leland, Michigan), and near Leland, Michigan. Sea duck numbers declined in January and concentrations present were reduced to the southern portion of the key site. Concentrations were smaller and more evenly distributed throughout the site during February and April. It is important to note that ice cover could greatly affect the distribution of birds within this site and even preclude sea duck use during severe winters.

Sensitivities: Waterfowl and other waterbirds are sensitive to human disturbance, mostly small vessel and/or shipping traffic during migration and the wintering period on the Great Lakes (Prince et al. 1992). By-catch from commercial fishing operations is of concern, as Ellarson (1956) estimated that by-catch of Long-tailed Ducks in large-mesh gill nets could reach 100,000 individuals (see also Baldassare 2014). Commercial fishing operations have declined dramatically over the last 50 years in Michigan (Michigan Department of Natural Resources 2019), but commercial and tribal fishing operations still occur north of Grand Haven, Michigan, and this area is subject to commercial operations from both state and tribal operations (Michigan Department of Technology, Management and Budget 2013). Although entrapment methods have for the most part changed from gill nets to trap nets, there is still concern about by-catch of Common Loons (*Gavia immer*; Johnson et al. 2004) and perhaps other waterbirds, including sea ducks.

Food resource availability and aquatic functions in Lake Michigan appear to be changing due to invasive and introduced species (Nalepa et al. 2009), and shifts in the energy balance have had a negative impact on the health of predatory fish species (Pothoven et al. 2001, Madenjian et al. 2006, Nalepa et al. 2009, Mandenjian et al. 2015) and perhaps waterfowl. Food resource availability and quality could also be influenced by pollution from industrial activities, urban development, and agricultural practices that occur near the lakeshore or within the Lake Michigan watershed (U.S. Environmental Protection Agency 2008).

Type E botulism (*Clostridium botulinum*) outbreaks occur periodically in Lake Michigan and have been associated with the mortality of more than 100,000 birds throughout the Great Lakes since the 1960s, including sea ducks (Chipault et al. 2015). Outbreaks of type E avian botulism have been a common occurrence in northern Lake Michigan since the early 2000's (Lafrancois et al. 2011, Chipault et al. 2015).

Lake Michigan has been identified as a suitable location, with above adequate wind resources, for nearshore and offshore wind energy development (Beiter et al. 2017) and although no offshore wind energy sites have been developed, there is potential for negative effects to sea ducks and other birds through displacement and/or direct mortality (Arnett et al. 2007).

Extensive ice cover during severe winters can have a strong effect on the presence, survival, distribution, and movements of sea ducks and waterbirds that winter on Lake Michigan (Ellarson 1956, Prince et al. 1992). The Sleeping Bear Dunes National Lakeshore area of Lake Michigan, representing this key site, experiences a range of ice coverages from limited ice coverage during mild winters to completely frozen during severe winters (U.S. Department of Commerce 2020).

Potential Conflicts: Disturbance associated with small vessel and shipping traffic, potential for nearshore and offshore wind energy development, and effects from commercial fishing operations remain potential conflicts at this site.

Status: The southern portion of this key site includes the northernmost portion of the Lake Michigan Long-tailed Duck Important Bird Area (IBA), a global priority, that extends along the eastern shore of Lake Michigan from Empire to South Haven, Michigan (Audubon 2017a). The key site also abuts the Sleeping Bear Dunes National Lakeshore IBA, which is considered a global priority (Audubon 2017b) and the Grand Traverse Bay basin IBA, which is considered a state priority (Audubon 2017c). The open waters of Lake Michigan and connecting waterbodies are managed by the state of Michigan for this key site, but oversight is provided by the United States government to regulate navigation, interstate commerce, access, contamination, and water quality and use. Due to their sovereignty from federal and state governments, tribal nations also provide input on the management and utilization of Lake Michigan resources, including governance provided through the Chippewa Ottawa Resource Authority and the Great Lakes Indian Fish and Wildlife Commission (Hall and Houston 2014). Uplands surrounding this key site are managed by a variety of parties including federal, state, county, city, and private land owners.

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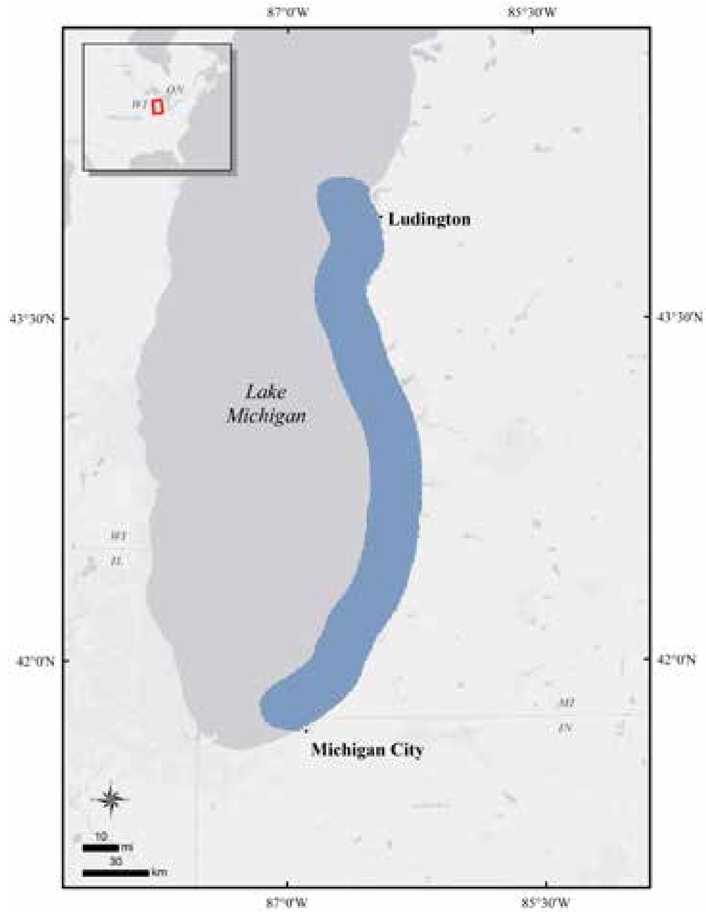
Key Site 71: Southeast Lake Michigan, Michigan and Indiana

Location: 42°52'43"N, 86°34'27"W

Size: 7337 km^2



Description: Lake Michigan is one of the Laurentian Great Lakes and the only Great Lake located entirely within the United States, bounded by the states of Illinois, Indiana, Michigan, and Wisconsin. The southeastern portion of Lake Michigan that constitutes this key site extends south along the shoreline from Big Sable Point Lighthouse (15 km north-northwest of Ludington, Michigan) to Michigan City, Indiana, and extends 25 km offshore. Major shipping ports within this key site include Ludington, Muskegon, Grand Haven, Holland, and St. Joseph-Benton Harbor, Michigan. Smaller ports include Pentwater, Whitehall, Port Sheldon, Saugatuck, South Haven, and New Buffalo, Michigan, and Michigan City, Indiana. For more detailed information about waterfowl in the Great Lakes region and the benthic community, limnology, and geomorphology of Lake Michigan, see Prince et al. (1992), National Oceanic and Atmospheric Administration (2006), Nalepa et al. (2009), Madenjian et al. (2015), Yurista et al. (2015), and Rowe et al. (2017).

Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on the peak number of all species of sea ducks observed during aerial surveys of waterbirds conducted during fall through spring (i.e., September–May) 2009–2014 (Kenow et al. 2020). Observed counts were adjusted by species-specific or species group detection rates estimated for aerial fixed-wing surveys by Hodges et al. (2008) for coastal surveys in Alaska. Observed and visibility-adjusted abundance estimates, as well as distribution maps by month, are included in Appendix 1.

Biological Value: This site is important specifically for Long-tailed Ducks (*Clangula hyemalis*), but other sea ducks, such as Common Goldeneye (*Bucephala clangula*), Bufflehead (*Bucephala albeola*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), Black Scoter (*Melanitta americana*), White-winged Scoter (*Melanitta deglandi*), and Surf Scoter (*Melanitta perspicillata*) migrate through and winter here in smaller numbers. High use of this area was documented among radiomarked Long-tailed Ducks during November through February (Fara 2018). These ducks exhibited diel movements, using shallower water closer to shore during the day and deeper water farther from shore at night.

Aerial survey data (Kenow et al. 2021) indicate that Long-tailed Ducks were the most abundant species wintering within this site, with total numbers estimated at 240,000 birds (December–February, 2010–2014) when corrected for visibility (Hodges et al. 2008). Lesser numbers of wintering sea ducks included Common Goldeneye (~16,000 est. birds), Common Merganser (~6000 est. birds), White-winged Scoter (~800 est. birds), and Red-breasted Merganser (~550 est. birds). Common Mergansers and White-winged Scoters represented approximately 71% and 31% of total mergansers and scoters tallied, respectively (most scoters were identified to genus). Buffleheads were infrequently encountered during surveys throughout any season. The total winter density estimate for surveys in this key site was 107.2 sea ducks/km^2, with individual survey density estimates ranging from 5.2 (December 8, 2011) to 566.0 (February 3, 2014) sea ducks/km^2 when adjusted for visibility (Hodges et al. 2008).

Aerial survey data (Kenow et al. 2020) indicate that Long-tailed Ducks were the most abundant species during spring and fall migration within this site, with total numbers estimated at slightly over 50,000 birds for each season (March–May, 2010–2014 and September–November, 2010–2013, respectively) when corrected for visibility (Hodges et al. 2008). Other sea duck species tended to be more abundant during spring migration than during the fall passage; however, overall numbers of each species within these seasons are generally considered low. Common Merganser (~1490 est. birds) was the only other species to exceed 1000 birds in total for either season. Fall and spring density estimates for all sea ducks when combined and adjusted for visibility (Hodges et al. 2008) was 26.2 sea ducks/km^2 in both seasons.

Few sea ducks were present at this site during September and October, and the small concentrations present were typically north of Grand Haven, Michigan. Sea duck concentrations started to build in November, with the largest concentrations occurring north of Grand Haven, Michigan, with smaller concentrations farther south. By December, large concentrations could be found as far south as Saugatuck, Michigan, whereas in January larger concentrations could be found as far south as St. Joseph–Benton Harbor, Michigan. Large concentrations of sea ducks were observed throughout this site in February. During March and April, the largest concentrations of sea ducks tended to be south of Grand Haven, Michigan, with smaller concentrations to the north. Only small concentrations of sea ducks were tallied at this site in May.

Sensitivities: Waterfowl and other waterbirds are sensitive to human disturbance, mostly small vessel and/or shipping traffic during migration and the wintering period on the Great Lakes (Prince et al. 1992). By-catch from commercial fishing operations is of concern, as Ellarson (1956) estimated that by-catch of Long-tailed Ducks in large mesh gill nets could reach 100,000 individuals (see also Baldassare 2014). Commercial fishing operations have declined dramatically over the last 50 years in Michigan (Michigan Department of Natural Resources 2019), but commercial and tribal fishing operations still occur north of Grand Haven, Michigan (Michigan Department of Technology, Management and Budget 2013). Although entrapment methods have for the most part changed from gill nets to trap nets, there is still concern about by-catch of Common Loons (*Gavia immer*; Johnson et al. 2004) and perhaps other waterbirds, including sea ducks.

Food resource availability and aquatic functions in Lake Michigan appear to be changing due to invasive and introduced species (Nalepa et al. 2009) and shifts in the energy balance have had a negative impact on the health of predatory fish species (Pothoven et al. 2001, Madenjian et al. 2006, Nalepa et al. 2009, Mandenjian et al. 2015) and perhaps waterfowl. Food resource availability and quality could also be influenced by contamination from industrial activities, urban development, and agricultural practices that occur near the lakeshore or within the Lake Michigan watershed (U.S. Environmental Protection Agency 2008).

Type E botulism (*Clostridium botulinum*) outbreaks occur periodically in Lake Michigan and have been associated with the mortality of more than 100,000 birds throughout the Great Lakes since the 1960s, including sea ducks (Chipault et al. 2015). Outbreaks of type-E avian botulism have been a common occurrence in northern Lake Michigan since the early 2000s (Lafrancois et al. 2011, Chipault et al. 2015).

Lake Michigan has been identified as a suitable location, with above adequate wind resources, for nearshore and offshore wind energy development (Beiter et al. 2017) and although no offshore wind energy sites have been developed, there is a potential for negative effects to sea ducks and other birds through displacement and/or direct mortality (Arnett et al. 2007).

Extensive ice cover during severe winters can have a strong effect on the presence, survival, distribution, and movements of sea ducks and waterbirds that winter on Lake Michigan (Ellarson 1956, Prince et al. 1992). The southeast Lake Michigan area of Lake Michigan, representing this key site, experiences a range of ice coverages from limited ice coverage during mild winters to completely frozen during severe winters (U.S. Department of Commerce 2020).

Potential Conflicts: Disturbance associated with small vessel and shipping traffic, potential for nearshore and offshore wind energy development, and effects from commercial fishing operations remain potential conflicts at this site.

Status: This key site encompasses a major portion of the Lake Michigan Long-tailed Duck Important Bird Area (IBA), a global priority, that extends along the eastern shore of Lake Michigan from Empire to South Haven, Michigan (Audubon 2017a). State priority IBAs along the Michigan shoreline adjacent to this key site include Lake Macatawa near Holland (Audubon 2017b), and Warren Dunes State Park south of St. Joseph (Audubon 2017c). The open waters of Lake Michigan and connecting waterbodies are managed by the states of Indiana and Michigan for this key site, but oversight is provided by the United States government to regulate navigation, interstate commerce, access, pollution, and water quality and use. Due to their sovereignty from federal and state governments, tribal nations also provide input on the management and utilization of Lake Michigan resources, including governance provided through the Chippewa Ottawa Resource Authority and the Great Lakes Indian Fish and Wildlife Commission (Hall and Houston 2014). Uplands surrounding this key site are managed by a variety of parties including state, county, city, and private land owners.

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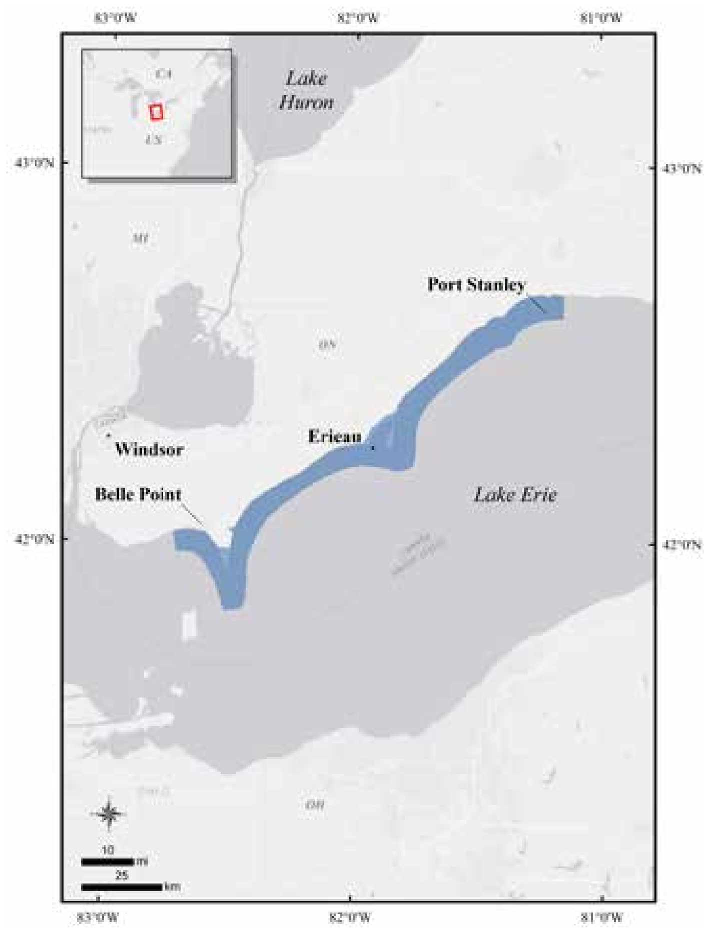
Key Site 72: Western Lake Erie, Ontario

Location: 42°16'59"N, 81°48'6"W

Size: 1332 km²

Description: Lake Erie is one of the lower Laurentian Great Lakes, located between the province of Ontario, Canada, and the states of New York, Pennsylvania, Ohio, and Michigan, USA. The western portion of the Canadian side of Lake Erie that constitutes this site extends west from the harbor at Port Stanley, Ontario, to Belle Point/Leamington, Ontario, and includes Rondeau Bay, Hillman Marsh, and Point Pelee. For more detailed information about waterfowl and wetland habitats in the Great Lakes region, and the benthic community, limnology, and geomorphology of this part of Lake Erie, see Prince et al. (1992), Bolsenga and Herdendorf (1993), Makarewicz et al. (2000), and Holcombe et al. (2005).



Precision and Correction of Abundance Estimates Presented: Abundance values are based on several sources: (1) Shoreline surveys conducted as part of the Mid-Winter Waterfowl Survey (MWS) (Environment and Climate Change Canada/Canadian Wildlife Service, Ontario) and the Lower Great Lakes Migrant Waterfowl Survey (LGLMWS) (Environment and Climate Change Canada/Canadian Wildlife Service, Ontario. Observed counts were adjusted by species-specific or species group detection rates estimated for aerial fixed-wing surveys by Hodges et al. (2008) for coastal surveys in Alaska. (2) Ground-based estimates made during Christmas bird counts (CBC) (National Audubon Society 2015) from 1997 to 2015. Observed counts (not adjusted for incomplete detection) were derived from summing annual data from CBC circles included within the key site boundaries.

Biological Value: This site is important to several species of sea ducks during spring, fall, and winter seasons. Long-tailed Duck (*Clangula hyemalis*), White-winged Scoter (*Melanitta deglandi*), Black Scoter (*Melanitta americana*), Surf Scoter (*Melanitta perspicillata*), Hooded Merganser (*Lophodytes cucullatis*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), Common Goldeneye (*Bucephala clangula*), and Bufflehead (*Bucephala albeola*) have been commonly observed in varying abundances since the 1990s at this site (Appendix 1). Sea duck numbers at this and other sites across the lower Great Lakes have increased substantially since the mid-1980s and the early 1990s (Petrie and Schummer 2002). The establishment of dreissenid (zebra) musssels at Lake Erie in the mid-1980s provided an abundant food source for sea ducks and other diving duck species (Custer and Custer 1996, Schummer et al. 2008a, b). Dreissenid mussels also may provide favorable microhabitats for other important aquatic invertebrate prey items, such as amphipods and chironomids, and may have improved water quality and clarity that benefits forage fish species, such as gizzard shad (*Dorosoma cepedianum*), emerald shiner (*Notropis antherinoides*), and round goby (*Neogobius melanostomus*) and improved the foraging efficiency of many sea ducks (Wisden and Bailey 1995, Ross et al. 2005, Bur et al. 2008, Schummer et al. 2008b).

Spring: During aerial surveys of the lower Great Lakes shorelines of Ontario conducted during 2002 and 2011, the maximum peak abundance of sea ducks at this site was estimated at 44,300 birds (Environment and Climate Change Canada/ Canadian Wildlife Service unpublished data [LGLMWS]). Mergansers, primarily Common Merganser and Red-breasted Merganser, were the most common species at this site, with maximum estimated peak numbers of 30,700 and 14,800 birds, respectively. Other sea duck species observed at lower maximum estimated peak abundances within this site included Common Goldeneye (5,500), Bufflehead (4,100), Long-tailed Duck (1,100), and Hooded Merganser (100).

Fall: During aerial surveys of the Ontario shorelines of the lower Great Lakes conducted during 2001 and 2011, maximum peak abundances of sea ducks at this site were estimated to be as high as 34,000 (Environment and Climate Change Canada/ Canadian Wildlife Service unpublished data [LGLMWS]). Common Goldeneye (maximum estimated peak abundance 17,800), Common Merganser (11,700), Red-breasted Merganser (13,800), Bufflehead (2,000), and Long-tailed Duck (300) were the most common species at this site during fall.

Winter: During annual aerial waterfowl surveys of the Ontario shorelines of the lower Great Lakes conducted during January 2002 through 2018, the maximum peak sea duck abundance at this site was estimated at 46,400 birds (Environment and Climate Change Canada/Canadian Wildlife Service unpublished data [MWS]). CBC circles surveyed annually within this site reported a maximum count of 50,600 sea ducks between 1997 and 2015 (National Audubon Society and Bird Studies Canada unpublished data [CBC]). Common Goldeneye (maximum estimated peak abundance 11,300 [MWS]), Bufflehead (7,200 [MWS]), Common Merganser (9,200 [MWS]), Red-breasted Merganser (47,400 [CBC]) were the most abundant species at this site during winter. Other species observed during winter, typically at much lower abundances relative to other sea ducks, included Long-tailed Duck (maximum estimated peak abundance 400) as well as Black Scoter (9,500) and White-winged Scoter (4,000).

Sensitivities: Waterfowl are sensitive to human disturbance, mostly small vessel and/or shipping traffic, during migration and winter periods. Food resource availability and quality could be influenced by industrial, urban or cottage development, agricultural pollution, and invasive and other problematic species. Type E botulism (*Clostridium botulinum*) outbreaks that can kill large numbers of sea ducks and waterbirds occur periodically at the lower Great Lakes (Canadian Cooperative Wildlife Health Centre 2003, 2005), particularly during fall migration, as well as other epizootic disease outbreaks that can occur where large numbers of waterfowl congregate.

Potential Conflicts: Disturbance associated with small vessel and shipping traffic remains a potential conflict at this site. Chemical and oil spills and water contamination from several sources, including shipping, urban, industry, and agriculture can impact sea ducks. There is potential for offshore wind development within high sea-duck use areas throughout the lower Great Lakes region.

Status: Several important bird areas have been designated within this area (http://www.ibacanada.ca/mapviewer.jsp) including the Southwest Elgin Forest Complex, Clear Creek, Greater Rondeau Area, and Point Pelee.

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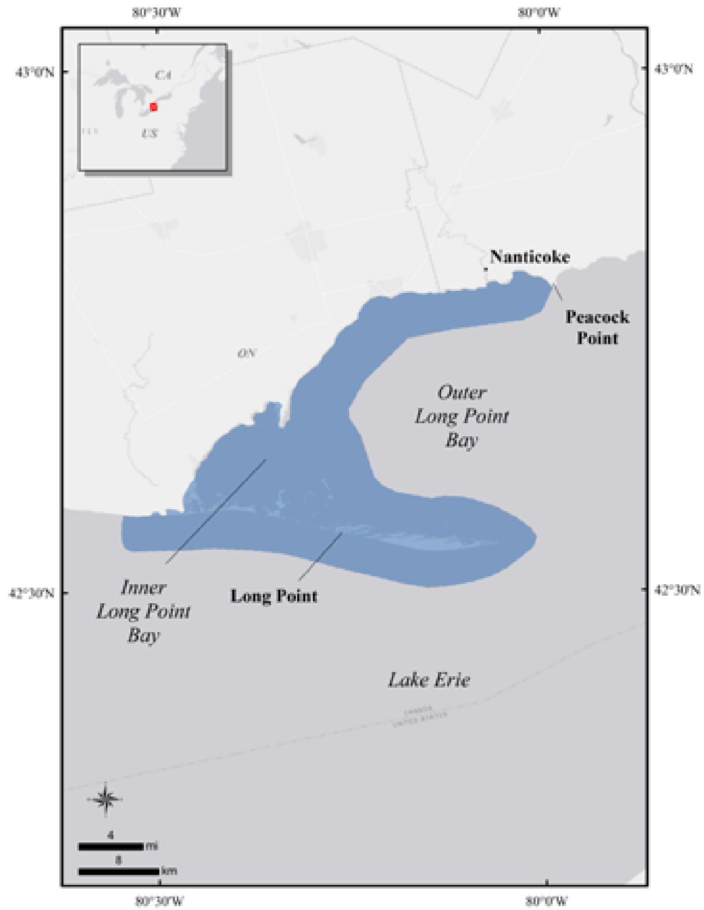
Key Site 73: Central Lake Erie–Long Point Bay, Ontario

Location: 42°37'9"N, 80°17'37"W

Size: 585 km²

Description: Lake Erie is one of the lower Laurentian Great Lakes, located between the province of Ontario, Canada, and the states of New York, Pennsylvania, Ohio, and Michigan, USA. Long Point Bay is in the central portion of the Canadian side of Lake Erie. This site extends west from Peacock Point near Nanticoke, Ontario, to the base of the Long Point peninsula near Clear Creek, Ontario. Several creeks flow into the area, including Nanticoke Creek, Black Creek, Hay Creek, Young's Creek, Fisher's Creek, Normandale Creek, Dedrick's Creek, and Big Creek. Outer Long Point Bay is an open, deep water embayment with extensive emergent marsh habitat predominantly along the north side of the Long Point peninsula from Pottohawk Point to its tip. Inner Long Point Bay, located south of the Pottohawk sand bar between Turkey Point and Pottohawk Point, is a shallow embayment that contains extensive beds of submerged aquatic plants bordered by extensive emergent marsh habitats, including the Long Point Company Marsh, Long Point National Wildlife Area Thoroughfare and Crown Marsh units (south), Big Creek National Wildlife Area (west), and Turkey Point Marsh (north). The south shoreline of the Long Point peninsula is exposed to prevailing winds and associated wave action so this area is predominantly an open, deep water habitat with little emergent marsh or submerged aquatic vegetation. For more detailed information about waterfowl and wetland habitats in the Great Lakes region and the benthic community, limnology, and geomorphology of this part of Lake Erie, see Prince et al. (1992), Bolsenga and Herdendorf (1993), Petrie (1998), Makarewicz et al. (2000), and Holcombe et al. (2005).



Precision and Correction of Abundance Estimates Presented: Abundance values are based on several sources: (1) Shoreline surveys conducted as part of the Mid-Winter Waterfowl Survey [MWS] (Environment and Climate Change Canada/Canadian Wildlife Service, Ontario), Lower Great Lakes Migrant Waterfowl Survey [LGLMWS] (Environment and Climate Change Canada/Canadian Wildlife Service, Ontario), and Long Point Waterfowl Surveys [LPWS] (Bird Studies Canada/Long Point Waterfowl and Wetlands Research Program). Observed counts were adjusted by species-specific or species group detection rates estimated for aerial fixed-wing surveys by Hodges et al. (2008) for coastal surveys in Alaska. (2) Ground-based estimates made during Christmas bird counts (CBC) (National Audubon Society 2015) from 1997 to 2015 and from Canadian Migration Monitoring Network Daily Estimated Totals (CMMN-DET) (Bird Studies Canada/Long Point Bird Observatory). Observed counts (not adjusted for incomplete detection) were derived from summing annual data from CBC circles included within the key site boundaries or summing the daily total estimated counts from the three banding stations located along the Long Point peninsula.

Biological Value: This site is important to several species of sea ducks during spring, fall, and winter. Long-tailed Duck (*Clangula hyemalis*), White-winged Scoter (*Melanitta deglandi*), Black Scoter (*Melanitta americana*), Surf Scoter (*Melanitta perspicillata), Hooded Merganser (*Lophodytes cucullatis*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), Common Goldeneye (*Bucephala clangula*), and Bufflehead (*Bucephala albeola*) have been observed in varying abundances since the 1990s at this site (Appendix 1). Sea duck numbers at this site and others across the lower Great Lakes have increased substantially since the mid-1980s and the early 1990s (Petrie and Schummer 2002). The establishment of dreissenid (zebra) mussels at Lake Erie in the mid-1980s provided an abundant food source for sea ducks and other diving duck species (Custer and Custer 1996, Schummer et al. 2008a, b). Dreissenid mussels also may provide favorable microhabitats for other important aquatic invertebrates eaten by waterfowl, such as amphipods and chironomids, and may have improved water quality and clarity that benefits merganser forage fish species, such as gizzard shad (*Dorosoma cepedianum*), emerald shiner (*Notropis antherinoides*), and round goby (*Neogobius melanostomus*) and that improves the foraging efficiency of many sea ducks (Wisden and Bailey 1995, Ross et al. 2005, Bur et al. 2008, Schummer et al. 2008b).

Spring: During aerial surveys of the lower Great Lakes shorelines of Ontario conducted during 1999, 2001, 2009, and 2010, the maximum peak abundance of sea ducks at this site has been estimated at 16,900 birds (Environment and Climate Change Canada/Canadian Wildlife Service unpublished data [LGLMWS]). Aerial surveys conducted during migration from 1998 to 2006 annually by Long Point Waterfowl/Bird Studies Canada have generated an estimated maximum peak abundance of 20,608 sea ducks (Bird Studies Canada unpublished data [LPWS]). Ground-based estimates of daily total numbers of sea ducks observed at three bird banding stations along the Long Point peninsula during spring migration (1997–2017) has provided a maximum peak abundance estimate of 16,500 birds (Long Point Bird Observatory/Bird Studies Canada unpublished data, Canadian Migration Monitoring Network, Daily Estimated Totals [CMMN-DET]). Red-breasted Merganser (max. estimated peak abundance: 14,500 [CMMN-DET]), Common Merganser (10,000 [LPMWS]), Common Goldeneye (8,500 [LPWS]), Bufflehead (7,700 [LPWS]), and Long-tailed Duck (2,100 [CMMN-DET] were among the most abundant species at this site. Hooded Merganser (200 [LGLMWS]), Black Scoter (40 [CMMN-DET]), Surf Scoter (800 [CMMN-DET]), and White-winged Scoter (400 [CMMN-DET]) were other sea duck species observed at lower maximum estimated peak abundances.

Fall: Maximum peak abundances of sea ducks at this site were estimated to be 9400, 14,800 and 24,100, respectively, from LGLMWS (1999, 2000, 2009, 2010), LPWS (1998–2006), and CMMN-DET (1997–2017) data collected within this site. Red-breasted Merganser (max. estimated peak abundance 23,400 [CMMN-DET]), Common Merganser (3000 [LGLMWS]), Bufflehead (7500 [LPWS]), Common Goldeneye (1,800 [LPWS]), and Long-tailed Duck (1,400 [LGLMWS]) were the most common and abundant species at this site during winter. Hooded Merganser (300 [LGLMWS]), Black Scoter (700 [CMMN-DET]), Surf Scoter (1,000 [CMMN-DET]), and White-winged Scoter (800 [CMMN-DET]) were other sea duck species observed at lower maximum estimated peak abundances.

Winter: During annual aerial waterfowl surveys of the Ontario shorelines of the lower Great Lakes conducted during January 2002–2018, the maximum peak sea duck abundance at this site was estimated at 32,400 birds (Environment and Climate Change Canada/Canadian Wildlife Service unpublished data [MWS]). CBC circles surveyed annually within this site reported a maximum count of 11,500 sea ducks between 1997 and 2015 (National Audubon Society and Bird Studies Canada unpublished data [CBC]). Red-breasted Merganser (max. estimated peak abundance 30,800 [MWS]), Common Merganser (5,900 [CBC]), Bufflehead (3,700 [MWS]), and Common Goldeneye (1,900 [MWS]) were among the most common species at this site during winter. Other species commonly observed at lower maximum estimated peak abundances at this site during winter included Hooded Merganser (100 [CBC] Long-tailed Duck (600 [MWS]), Black Scoter (70 [MWS]), Surf Scoter (1 [CBC]), and White-winged Scoter (800 [MWS]).

Sensitivities: Waterfowl are sensitive to human disturbance, mostly small vessel and/or shipping traffic, during migration and winter periods. Food resource availability and quality could be influenced by industrial, urban or cottage development, and agricultural pollution and invasive and other problematic species. Type E botulism (*Clostridium botulinum*) outbreaks that can kill large numbers of sea ducks and/or waterbirds occur periodically at the lower Great Lakes (Canadian Cooperative Wildlife Health Centre 2003, 2005), particularly during fall migration. Other epizootic disease outbreaks can also occur where large numbers of waterfowl congregate.

Potential Conflicts: Disturbance associated with small vessel and shipping traffic remains a potential conflict at this site. Chemical and oil spills, water contamination, and eutrophication from several sources, including shipping, urban or cottage development, industry, and agriculture can also impact waterfowl. There is potential for offshore wind development within high sea duck use areas throughout the lower Great Lakes region.

Status: Two Important Bird Areas (IBA) have been designated within this area (http://www.ibacanada.ca/mapviewer.jsp), including the Norfolk Forest Complex (located along the shoreline of Outer Long Point Bay between Fisher's Glen and Turkey Point) and the Long Point Peninsula and Marshes. The Long Point peninsula and marshes are also designated as an International Monarch Butterfly Reserve, a Ramsar Site (Wetland of International Significance), and a World Biosphere Reserve. The area also contains Long Point Provincial Park, the Long Point National Wildlife Area (Thoroughfare and Long Point units), and the Big Creek National Wildlife Area (Big Creek and Hahn Marsh units).

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Red-breasted Mergansers. Photo: William Larned.

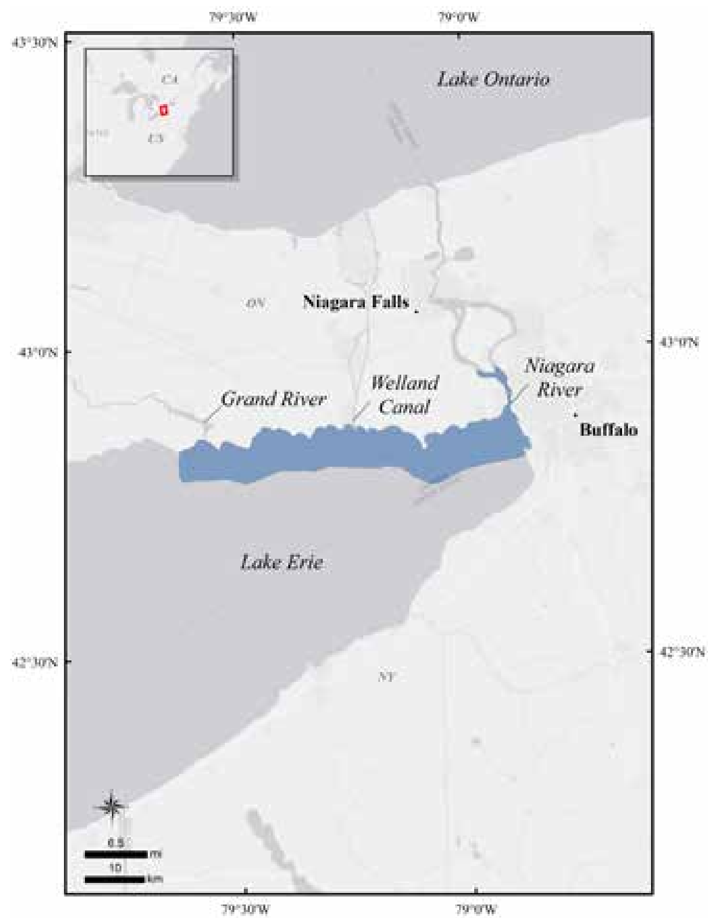
Location: 42°50'15"N, 79°10'47"W

Size: 464 km²

Description: Lake Erie is one of the lower Laurentian Great Lakes, located between the province of Ontario, Canada, and the states of New York, Pennsylvania, Ohio, and Michigan, USA. The eastern portion of the Canadian side of Lake Erie that constitutes this site extends west from the inflow of the Niagara River at Fort Erie, Ontario, to the outflow of the Grand River near Dunnville, Ontario. The Welland Canal is located in the middle of this area and connects Lake Erie to Lake Ontario, allowing ships to travel between the Great Lakes. For more detailed information about waterfowl and wetland habitats in the Great Lakes region and the benthic community, limnology, and geomorphology of this part of Lake Erie, see Prince et al. (1992), Bolsenga and Herdendorf (1993), Makarewicz et al. (2000), and Holcombe et al. (2005).

Precision and Correction of Abundance Estimates presented: Abundance values are based on several sources: (1) Shoreline surveys conducted as part of the Mid-Winter Waterfowl Survey (MWS) (Environment and Climate Change Canada/ Canadian Wildlife Service, Ontario) and the Lower Great Lakes Migrant Waterfowl Survey (LGLMWS) (Environment and Climate Change Canada/ Canadian Wildlife Service, Ontario. Observed counts were adjusted by species-specific or species group detection rates estimated for aerial fixed-wing surveys by Hodges et al. (2008) for coastal surveys in Alaska. (2) Ground-based estimates made during Christmas bird counts (CBC) (National Audubon Society 2015) from 1997 to 2015. Observed counts (not adjusted for incomplete detection) were derived by summing annual data from Christmas bird count circles included within the key site boundaries.

Biological Value: This site is important to several species of sea ducks during spring, fall, and winter. Long-tailed Duck (*Clangula hyemalis*), White-winged Scoter (*Melanitta deglandi*), Black Scoter (*Melanitta americana*), Surf Scoter (*Melanitta perspicillata*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), Common Goldeneye (*Bucephala clangula*), and



Bufflehead (*Bucephala albeola*) have been observed in varying abundances since the 1990s at this site (Appendix 1). Sea duck numbers at this site and others across the lower Great Lakes have increased substantially since the mid-1980s and the early 1990s (Petrie and Schummer 2002). The establishment of dreissenid (zebra) mussels at Lake Erie in the mid-1980s provided an abundant food source for sea ducks and other diving duck species (Custer and Custer 1996, Schummer et al. 2008a, b). Dreissenid mussels also may provide favorable microhabitats for other important aquatic invertebrate prey items, such as amphipods and chironomids, and may have improved water quality and clarity that benefits merganser forage fish species, such as gizzard shad (*Dorosoma cepedianum*), emerald shiner (*Notropis antherinoides*), and round goby (*Neogobius melanostomus*), and that improves the foraging efficiency of many sea ducks (Wisden and Bailey 1995, Ross et al. 2005, Bur et al. 2008, Schummer et al. 2008b).

Spring: During aerial surveys of the lower Great Lakes shorelines of Ontario in 2001 and 2010, the maximum peak abundance of sea ducks at this site was estimated at approximately 34,800 birds (Environment and Climate Change Canada/ Canadian Wildlife Service unpublished data [LGLMWS]). Mergansers, primarily Common Mergansers, were the most abundant species at this site, with a maximum average estimated peak abundance of approximately 17,400 birds. Other sea duck species commonly observed at lower maximum peak abundances included Bufflehead (10,200), Common Goldeneye (8,400), and Red-breasted Merganser (2,500).

Fall: During aerial surveys of the Ontario shorelines of the lower Great Lakes in 2000 and 2010, the maximum peak abundance of sea ducks at this site was estimated to be 109,700 (Environment and Climate Change Canada/Canadian Wildlife Service unpublished data [LGLMWS]). Estimated maximum peak abundances varied considerably among species between surveys, with Bufflehead (39,800), Long-tailed Duck (33,700), Red-breasted Merganser (18,400), Common Goldeneye (17,100), and Common Merganser (4,700) being among the most abundant species. No Black Scoter or Surf Scoter and only relatively few White-winged Scoters (80) were observed during fall aerial surveys.

Winter: During annual aerial waterfowl surveys along the Ontario shorelines of the lower Great Lakes during January 2002 to 2018, the maximum peak sea duck abundance at this site was estimated at 22,900 birds (Environment and Climate Change Canada/Canadian Wildlife Service unpublished data [MWS]). CBC circles within this site reported a maximum count of 16,500 sea ducks between 1997 and 2015 (National Audubon Society and Bird Studies Canada unpublished data [CBC]). Bufflehead (11,100 [MWS]), Common Goldeneye (9,700 [MWS]), Common Merganser (7,900 [CBC]), Red-breasted Merganser (6,700 [MWS]), and Long-tailed Duck (2,200 [MWS]) were among the most common species at this site during winter. Scoter species were observed at this site but at relatively low maximum estimated peak numbers (White-winged Scoter = 221 [MWS], Black Scoter = 122 [MWS], and Surf Scoter = 1 [CBC]).

Sensitivities: Waterfowl are sensitive to human disturbance, mostly small vessel and/or shipping traffic, during migration and winter periods. Food resource availability and quality could be influenced by industrial activities, urban or cottage development, agricultural pollution, and invasive and/or other problematic species. Type E botulism (*Clostridium botulinum*) outbreaks that can kill large numbers of sea ducks and/or waterbirds occur periodically in the lower Great Lakes (Canadian Cooperative Wildlife Health Centre 2003, 2005), particularly during fall migration. Other epizootic disease outbreaks can also occur where large numbers of waterfowl congregate.

Potential Conflicts: Disturbance associated with small vessel and shipping traffic remains a potential conflict at this site. Chemical and oil spills, water contamination, and eutrophication from several sources, including shipping, urban or cottage development, industry, and agriculture could also impact waterfowl. There is potential for offshore wind development within areas of high sea-duck use throughout the lower Great Lakes region.

Status: Several Important Bird Areas (IBA) have been designated within this area (http://www.ibacanada.ca/mapviewer.jsp), including the Niagara River Corridor (south section), Point Abino, and Port Colbourne (breakwater and mainland).

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Key Site 75: Western Lake Ontario, Ontario

Location: 43°20'21"N, 79°37'8W

Size: 1346 km^2

Description: Lake Ontario is one of the lower Laurentian Great Lakes, located between the province of Ontario, Canada, and the state of New York, USA. The western portion of the Canadian side of Lake Ontario that constitutes this site extends west from downtown Toronto, Ontario, at Ashbridges Bay Park/Toronto Harbour to the outflow of the Niagara River near Niagara-on-the-Lake, Ontario, and includes Hamilton Harbour at Hamilton, Ontario. Several rivers and creeks flow into the area, including the Don River, Humber River, Credit River, Etobicoke Creek, Sixteen Mile Creek, Bronte Creek, Fifteen Mile Creek, Twelve Mile Creek, and the Niagara River at the extreme eastern part of the area. The Welland Canal also is located in the middle of this area and connects Lake Erie to Lake Ontario, allowing ships to travel among the Great Lakes. For more detailed information about waterfowl and wetland habitats in the Great Lakes region and the benthic community, limnology, and geomorphology of this part of Lake Ontario, see Barton (1986), Prince et al. (1992), Mills et al. (2003), Schummer (2005), Wilson et al. (2006), and Remiz (2012).

Precision and Correction of Abundance Estimates Presented: Abundance values are based on several sources: (1) Shoreline surveys conducted as part of the Mid-Winter Waterfowl Survey (MWS) (Environment and Climate Change Canada/ Canadian Wildlife Service, Ontario) and the Lower Great Lakes Migrant Waterfowl Survey (LGLMWS) (Environment and Climate Change Canada/ Canadian Wildlife Service, Ontario. Observed counts were adjusted by species-specific or species group detection rates estimated for aerial fixed-wing surveys by Hodges et al. (2008) for coastal surveys in Alaska. (2) Ground-based estimates made during Christmas bird counts (CBC) (National Audubon Society 2015) from 1997 to 2015. Observed counts (not adjusted for incomplete detection) were derived from summing annual data from CBC circles included within the key site boundaries.

Biological Value: This site is important to several species of sea ducks during spring, fall, and winter seasons. Long-tailed Duck (*Clangula hyemalis*), White-winged Scoter (*Melanitta deglandi*), Black Scoter (*Melanitta americana*), Surf Scoter (*Melanitta perspicillata*), Hooded Merganser (*Lophodytes cucullatis*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), Common Goldeneye (*Bucephala clangula*), and Bufflehead (*Bucephala albeola*) have been observed in varying abundances since the 1990s at this site (Appendix 1). Sea duck numbers at this site and others across the lower Great Lakes have increased substantially since the mid-1980s and the early 1990s (Petrie and Schummer 2002). The establishment of dreissenid (zebra) musssels at Lake Ontario in the early 1990s provided an abundant food source for sea ducks and other diving duck species (Custer and Custer 1996, Schummer et al. 2008a, b). Dreissenid mussels also may provide favorable microhabitats for other important aquatic invertebrate prey items, such as amphipods and chironomids, and may have improved water quality and clarity that benefits merganser forage fish species, such as gizzard shad (*Dorosoma cepedianum*), emerald shiner (*Notropis *antherinoides*), and round goby (*Neogobius melanostomus*) and improves the foraging efficiency of many sea ducks (Wisden and Bailey 1995, Ross et al. 2005, Bur et al. 2008, Schummer et al. 2008b).

Spring: During aerial surveys of the lower Great Lakes shorelines of Ontario conducted during 2001 and 2010, the estimated maximum peak abundance of sea ducks at this site was 68,800 (Environment and Climate Change Canada/Canadian Wildlife Service unpublished data [LGLMWS]). Long-tailed Duck was among the most common and abundant species at this site, with an estimated maximum peak abundance of 35,500, which represents about 4% of the estimated continental population (1,000,000 birds) for this species (NAWMP 2012). Other sea duck species commonly observed in lower maximum estimated peak abundances at this site during spring included Bufflehead (18,600), Common Goldeneye (5,200), Common Merganser (4,100), Red-breasted Merganser (1,500), Surf Scoter (6,000), and White-winged Scoter (2,800).

Fall: During aerial surveys of the Ontario shorelines of the lower Great Lakes conducted during 2000 and 2010, the maximum sea duck peak abundance at this site was estimated to be as high as 262,500 birds (Environment and Climate Change Canada/Canadian Wildlife Service unpublished data [LGLMWS]). Long-tailed Duck was the most abundant species, with a maximum estimated peak number of 216,300, which represents about 22% of the estimated continental population (NAWMP 2012). White-winged Scoter were also a relatively abundant species at this site, with a maximum estimated peak number of 31,600 birds, representing about 8% of the estimated continental population (NAWMP 2012). Other species commonly observed at lower maximum estimated peak abundance included Bufflehead (17,100), Common Merganser (18,900), Common Goldeneye (6,400), and Red-breasted Merganser (850).

Winter: During annual aerial waterfowl surveys of the Ontario shorelines of the lower Great Lakes conducted during January 2002 to 2018, the maximum peak sea duck abundance at this site was estimated at 244,800 birds (Environment and Climate Change Canada/Canadian Wildlife Service unpublished data [MWS]). CBC circles surveyed annually within this site reported a maximum count of 55,300 sea ducks between 1997 and 2015 (National Audubon Society and Bird Studies Canada unpublished data [CBC]). Long-tailed Duck was the most abundant species at this site during winter, with a maximum estimated peak abundance of 228,000, which represents about 23% of the estimated continental population (NAWMP 2012). White-winged Scoter, Black Scoter, and Surf Scoter all have occurred at this site in varying estimated peak abundances from 2001 to 2015, but White-winged Scoter consistently was the most abundant of the three species. The maximum estimated peak abundance of White-winged Scoter was about 21,900 birds, representing about 6% of the estimated continental population (NAWMP 2012). Other species commonly observed at lower maximum estimated peak abundances included Bufflehead (14,800), Common Goldeneye (12,400), Common Merganser (20,100), Red-breasted Merganser (3,500), Black Scoter (1,000), and Surf Scoter (200).

Sensitivities: Waterfowl are sensitive to human disturbance, mostly small vessel and/or shipping traffic, during migration and winter periods. Food resource availability and quality could be influenced by industrial, urban or cottage development, agricultural pollution, and invasive and/or other problematic species. Type E botulism (*Clostridium botulinum*) outbreaks that can kill large numbers of sea ducks and/or waterbirds occur periodically at the lower Great Lakes (Canadian Cooperative Wildlife Health Centre 2003, 2005), particularly during fall migration. Other epizootic disease outbreaks can occur where large numbers of waterfowl congregate.

Potential Conflicts: Disturbance associated with small vessel and shipping traffic remains a potential conflict at this site. The possible expansion of transportation services, such as airports and high speed boat ferries, is also a potential conflict in the future. Chemical and oil spills and water contamination from several sources, including shipping, urban, industry, and agriculture, are also potential conflicts. Offshore wind development is a concern within this site, which has been identified as a wind turbine candidate area.

Status: Several important bird areas have been designated within this area (http://www.ibacanada.ca/mapviewer.jsp) including the Leslie Street Spit, the west end of Lake Ontario, and the Niagara River corridor (north section).

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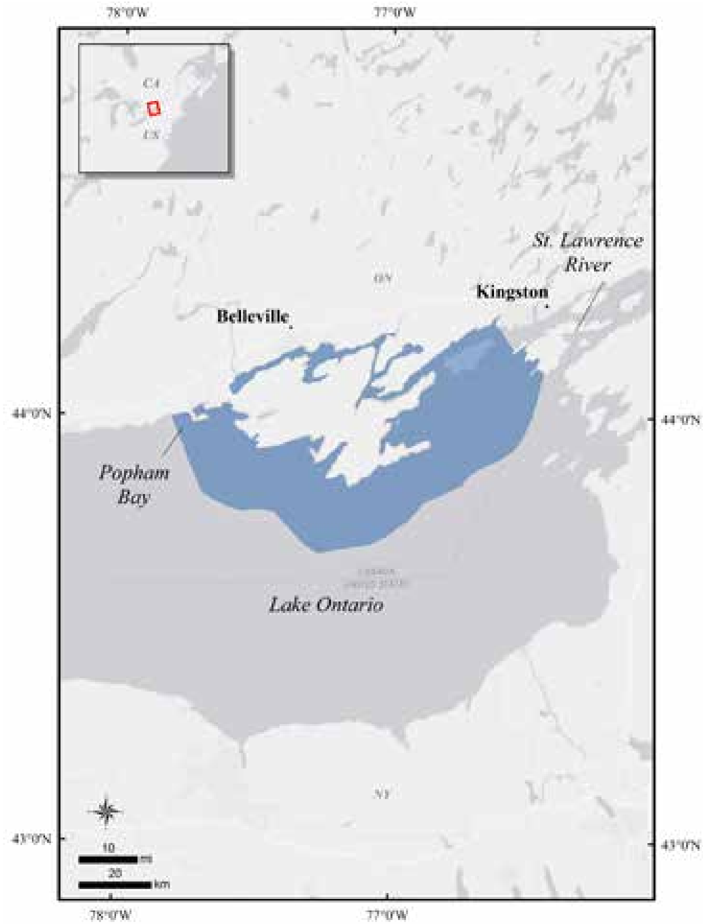
Key Site 76: Eastern Lake Ontario, Ontario

Location: 43°49'33"N, 77°04'56"W

Size: 2510 km²

Description: Lake Ontario is one of the lower Laurentian Great Lakes, located between the province of Ontario, Canada, and the state of New York, USA. The eastern portion of the Canadian side of Lake Ontario that constitutes this site extends west from the St. Lawrence River outflow near Kingston, Ontario, includes the Bay of Quinte and the Prince Edward County south shoreline, to Popham Bay/Spenser Point located approximately 5 km west of Presqu'ile Provincial Park. Several rivers flow into the area, including the Napanee River, Salmon River, Moira River, and the Trent River; the St. Lawrence River flows out from the extreme eastern part of the area. This site includes several islands, including Wolfe Island, Pigeon Island, Amherst Island, Waupoos Island, Timber Island, False Duck Island, and Nicholson Island, as well as numerous shoals, such as the Gull Bar Shoal. For more detailed information about waterfowl and wetland habitats in the Great Lakes region and the benthic community, limnology, and geomorphology of this part of Lake Ontario see Barton (1986), Prince et al. (1992), Mills et al. (2003), Schummer (2005), Wilson et al. (2006), and Remiz (2012).

Precision and Correction of Abundance Estimates Presented: Abundance values are based on several sources: (1) Shoreline surveys conducted as part of the Mid-Winter Waterfowl Survey [MWS] (Environment and Climate Change Canada/Canadian Wildlife Service, Ontario) and the Lower Great Lakes Migrant Waterfowl Survey [LGLMWS] (Environment and Climate Change Canada/Canadian Wildlife Service, Ontario. Observed counts were adjusted by species-specific or species group detection rates estimated for aerial fixed-wing surveys by Hodges et al. (2008) for coastal surveys in Alaska. (2) Ground-based estimates made during Christmas bird counts (CBC) (National Audubon Society 2015) from 1997 to 2015; observed counts (not adjusted for incomplete detection) were derived from summing annual data from CBC circles included within the key site boundaries.



Biological Value: This site is important to several species of sea ducks during spring, fall, and winter. Long-tailed Duck (*Clangula hyemalis*), White-winged Scoter (*Melanitta deglandi*), Black Scoter (*Melanitta americana*), Surf Scoter (*Melanitta perspicillata*), Hooded Merganser (*Lophodytes cucullatus*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), Common Goldeneye (*Bucephala clangula*), and Bufflehead (*Bucephala albeola*) have been observed in varying abundances since the 1990s at this site (Appendix 1). Sea duck numbers at this site and others across the lower Great Lakes have increased substantially since the mid-1980s and the 1990s (Petrie and Schummer 2002). The establishment of dreissenid (zebra) mussels in Lake Ontario in the early 1990s provided an abundant food source for sea ducks and other diving duck species (Custer and Custer 1996, Schummer et al. 2008a, b). Dreissenid mussels also may provide favorable microhabitats for other important aquatic invertebrate prey items, such as amphipods and chironomids, and may have improved water quality and clarity that benefits merganser forage fish species, such as gizzard shad (*Dorosoma cepedianum*), emerald shiner (*Notropis antherinoides*), round goby (*Neogobius melanostomus*), and that improves the foraging efficiency of many sea ducks ability to locate and capture prey (Wisden and Bailey 1995, Ross et al. 2005, Bur et al. 2008, Schummer et al. 2008b). This site has an abundance of sea duck prey species, which ducks use to acquire nutrients and fat for surviving winters at Lake Ontario or fueling migration during spring and fall (Ross et al. 2005, Schummer et al. 2008a, b, Schummer et al. 2012).

Spring: During aerial surveys of the lower Great Lakes shorelines of Ontario conducted during 1999 and 2009, the maximum peak abundance of sea ducks at this site was estimated at 117,300 birds (Environment and Climate Change Canada/Canadian Wildlife Service unpublished data [LGLMWS]). Long-tailed Duck was among the most common species at this site, with an estimated maximum peak number of 95,500, which represents about 10% of the estimated continental population for this species (NAWMP 2012). Other sea duck species commonly observed at lower estimated maximum peak abundances at this site during spring included Common Goldeneye (10,400), Common Merganser (5,400), Red-breasted Merganser (3,800), Bufflehead (6,900), and White-winged Scoter (460).

Fall: During aerial surveys of the Ontario shorelines of the lower Great Lakes conducted during 1999 and 2009, maximum peak abundance of sea ducks at this site was estimated to be 192,800 birds (Environment and Climate Change Canada/Canadian Wildlife Service unpublished data [LGLMWS]). Long-tailed Duck was the most common and abundant species at this site during fall, with an estimated maximum peak abundance of 122,000 birds, which represents about 13% of the estimated continental population (NAWMP 2012). Other species commonly observed at lower maximum estimated peak abundances at this site during fall included White-winged Scoter (23,600), Bufflehead (15,200), Common Goldeneye (12,200), Common Merganser (7,800), and Red-breasted Merganser (3,600).

Winter: During annual aerial waterfowl surveys of the Ontario shorelines of the lower Great Lakes conducted during January 2002–2018, the maximum peak sea duck abundance at this site was estimated to be 156,000 birds (Environment and Climate Change Canada/Canadian Wildlife Service unpublished data [MWS]). CBC circles within this site reported a maximum count of 155,200 sea ducks between 1997 and 2015 (National Audubon Society and Bird Studies Canada unpublished data [CBC]). Long-tailed Duck was the most common and abundant species at this site during winter, with a maximum peak abundance of about 148,900 birds counted during the 2002 CBC, representing 15% of the estimated continental population (NAWMP 2012). Other species commonly observed at lower maximum peak abundances at this site during winter included Bufflehead (10,300 [MWS]), Common Goldeneye (7,300 [MWS]), Common Merganser (8,400 [MWS]), Red-breasted Merganser (3,200 [MWS]), and White-winged Scoter (2,600 [MWS and CBC]).

Sensitivities: Waterfowl are sensitive to human disturbance, mostly related to small vessel and/or shipping traffic, during migration and winter periods. Food resource availability and quality could be influenced by industrial, urban, and agricultural pollution and invasive and/or other problematic species. Type E botulism (*Clostridium botulinum*) outbreaks that can kill large numbers of sea ducks and/or waterbirds occur periodically in the lower Great Lakes (Canadian Cooperative Wildlife Health Centre 2003, 2005), particularly during fall migration. Other epizootic disease outbreaks can also occur where large numbers of waterfowl congregate.

Potential Conflicts: Disturbance associated with small vessel and shipping traffic remains a potential conflict at this site. Chemical and oil spills, water contamination, and eutrophication from several sources, including shipping, urban or cottage development, industry, and agriculture can also impact waterfowl. This site has been identified as a candidate area for offshore wind development.

Status: Several Important Bird Areas (IBA) have been designated within this area (http://www.ibacanada.ca/mapviewer.jsp), including Wolfe Island, Pigeon Island, Amherst Island, the Prince Edward County South Shore, and Presqu'ile Provincial Park. The area also includes the Prince Edward Point National Wildlife Area and the Scotch Bonnet and Weller's Bay National Wildlife Areas.

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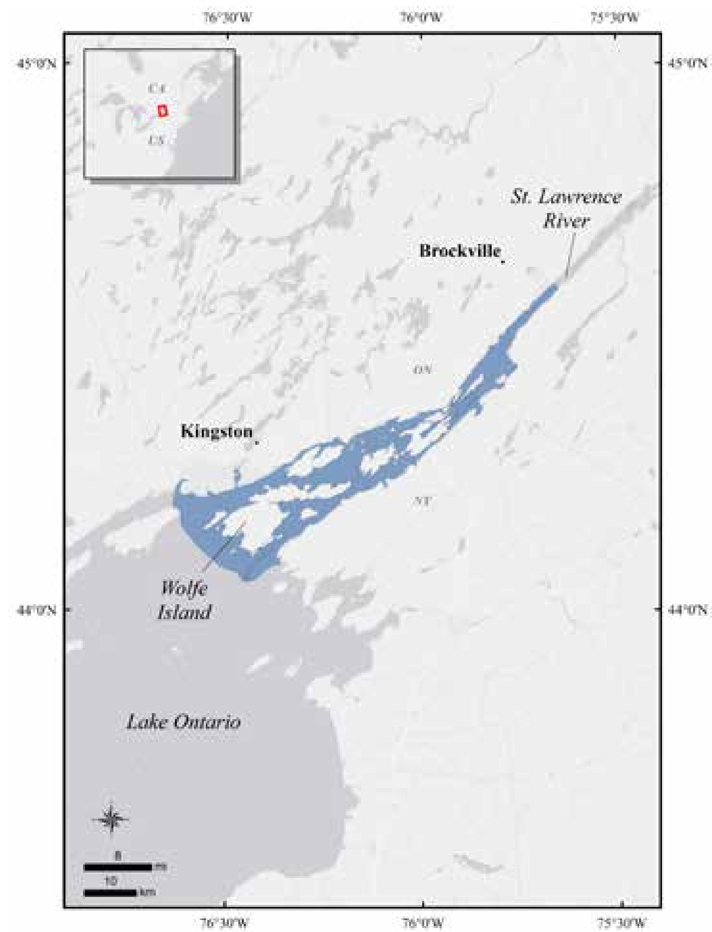
Key Site 77: Upper St. Lawrence River, Ontario

Location: 44°19'19"N, 76°1'26"W

Size: 602 km²

Description: The St. Lawrence River flows northeast from Lake Ontario to the Atlantic Ocean, a distance of about 1200 km, where it forms the Gulf of St. Lawrence. This large river connects the Great Lakes with the Atlantic Ocean and is an important international shipping route. This site is located in the upper portion of the river known as the Thousand Islands – Frontenac Arch region. The Thousand Islands are an archipelago of approximately 1800 islands and numerous shoals within the first 80 km of Canada-U.S. international waters where the river emerges from the northeast corner of Lake Ontario near Wolfe Island and Kingston, Ontario. Specifically, this site includes the Canadian waters of the river extending from the Wolfe Island/Kingston area to Brockville, Ontario. For more detailed information about waterfowl and wetland habitats in the Great Lakes region and the benthic community, limnology, and geomorphology of this part of the St. Lawrence River, see Prince et al. (1992), Lean (2000), Twiss (2007), Farrell et al. (2010), and Marty et al. (2010).



Precision and Correction of Abundance Estimates Presented: Abundance values are based on several sources: (1) Shoreline surveys conducted as part of the Mid-Winter Waterfowl Survey (MWS) (Environment and Climate Change Canada/Canadian Wildlife Service, Ontario) and the Lower Great Lakes Migrant Waterfowl Survey (LGLMWS) (Environment and Climate Change Canada/Canadian Wildlife Service, Ontario. Observed counts were adjusted by species-specific or species group detection rates estimated for aerial fixed-wing surveys by Hodges et al. (2008) for coastal surveys in Alaska. (2) Ground-based estimates made during Christmas bird counts (CBC) (National Audubon Society 2015) from 1997 to 2015. Observed counts (not adjusted for incomplete detection) were derived from summing annual data from CBC circles included within the key site boundaries.

Biological Value: This site is important to several species of sea ducks during spring and fall, but particularly during winter. Long-tailed Duck (*Clangula hyemalis*), White-winged Scoter (*Melanitta deglandi*), Surf Scoter (*Melanitta perspicillata*), Hooded Merganser (*Lophodytes cucullatis*), Common Merganser (*Mergus merganser*), Red-breasted Merganser (*Mergus serrator*), Common Goldeneye (*Buecephala clangula*), and Bufflehead (*Buecephala albeola*) have been observed in varying abundances since the 1990s at this site (Appendix 1). Sea duck numbers at this site and others across the lower Great Lakes have increased substantially since the mid-1980s and the early 1990s (Petrie and Schummer 2002). The establishment of dreissenid (zebra) musssels at Lake Erie in the mid-1980s and at Lake Ontario in the early 1990s provided an abundant food source for sea ducks and other diving duck species (Custer and Custer 1996, Schummer et al. 2008a, b). Dreissenid mussels also may provide favorable microhabitats for other important aquatic invertebrate prey items, such as amphipods and chironomids, and they may have improved water quality and clarity that benefits merganser forage fish species, such as gizzard shad (*Dorosoma cepedianum*), emerald shiner (*Notropis antherinoides*), and round goby

(*Neogobius melanostomus*) and improved the foraging efficiency of many sea ducks (Wisden and Bailey 1995, Ross et al. 2005, Bur et al. 2008, Schummer et al. 2008b).

Spring: During aerial surveys of the lower Great Lakes shorelines of Ontario during 1999 and 2000, the maximum peak abundance of sea ducks at this site has been estimated at 12,200 birds (Environment and Climate Change Canada/Canadian Wildlife Service unpublished data [LGLMWS]). Common Goldeneye, Common Merganser, and Bufflehead were the most common species at this site; the estimated maximum peak number of each species, respectively, was 5700, 3600, and 2800 individuals. Other sea duck species observed in lower maximum peak estimated abundances at this site during spring included Red-breasted Merganser, Long-tailed Duck, Hooded Merganser, and White-winged Scoter.

Fall: During aerial surveys of the lower Great Lakes shorelines of Ontario during 1999 and 2000, sea duck estimated maximum peak abundance at this site was 9000 birds (Environment and Climate Change Canada/Canadian Wildlife Service unpublished data [LGLMWS]). Common Goldeneye and Common Merganser were the most common and abundant species at this site during fall, with estimated maximum peak numbers of about 4800 goldeneyes and 2100 mergansers. Other species commonly observed at lower abundances at this site during fall surveys included Bufflehead, Red-breasted Merganser, Long-tailed Duck, and Hooded Merganser.

Winter: During annual aerial waterfowl surveys of the Ontario shorelines of the lower Great Lakes conducted during January 2002 through 2018, the maximum peak sea duck abundance at this site was estimated at 43,000 birds (Environment and Climate Change Canada/Canadian Wildlife Service unpublished data [MWS]). CBC circles surveyed annually within this site reported a maximum count of about 18,100 sea ducks between 1997 and 2015 (National Audubon Society and Bird Studies Canada unpublished data [CBC]). The largest concentrations of sea ducks, particularly in years when much of the river is frozen, typically occur closest to Lake Ontario where the river originates. Common Merganser, Common Goldeneye, Bufflehead, and Red-Breasted Merganser are among the most common species during this season; maximum peak abundances of those species, respectively, have been estimated at 40,300 (MWS), 4900 (MWS), 2600 (MWS), and 8500 (National Audubon Society and Bird Studies Canada unpublished data [CBC]). Other species observed less regularly on an annual basis and typically at lower maximum peak abundances during winter included Long-tailed Duck (12,200 [MWS]), Hooded Merganser (250 [CBC]), White-winged Scoter (75 [CBC]), Surf Scoter (15 [CBC]), and Black Scoter (26 [MWS]).

Sensitivities: Sea ducks are sensitive to human disturbance, mostly related to small vessel and/or shipping traffic, during migration and winter periods. Food resource availability and quality could be influenced by industrial, urban or cottage development, agricultural pollution, and invasive and/or other problematic species. Type E botulism (*Clostridium botulinum*) outbreaks that can kill large numbers of sea ducks and/or waterbirds occur periodically at the lower Great Lakes (Canadian Cooperative Wildlife Health Centre 2003, 2005), particularly during fall migration. Other epizootic disease outbreaks may be possible where large numbers of waterfowl congregate.

Potential Conflicts: Disturbance associated with small vessel and ship traffic is a potential conflict during spring and fall at this site. Chemical and oil spills and water contamination are possible from several sources, including shipping, urban, industry, and agriculture. Hydroelectric generating capacity/technologies could also be a future potential conflict at this site.

Status: Two areas with conservation designation are located within this site, the Frontenac Arch Biosphere Reserve (part of the UNESCO World Biosphere Reserve program) and St. Lawrence Islands National Park.

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U.S. Atlantic Coast Key Sites

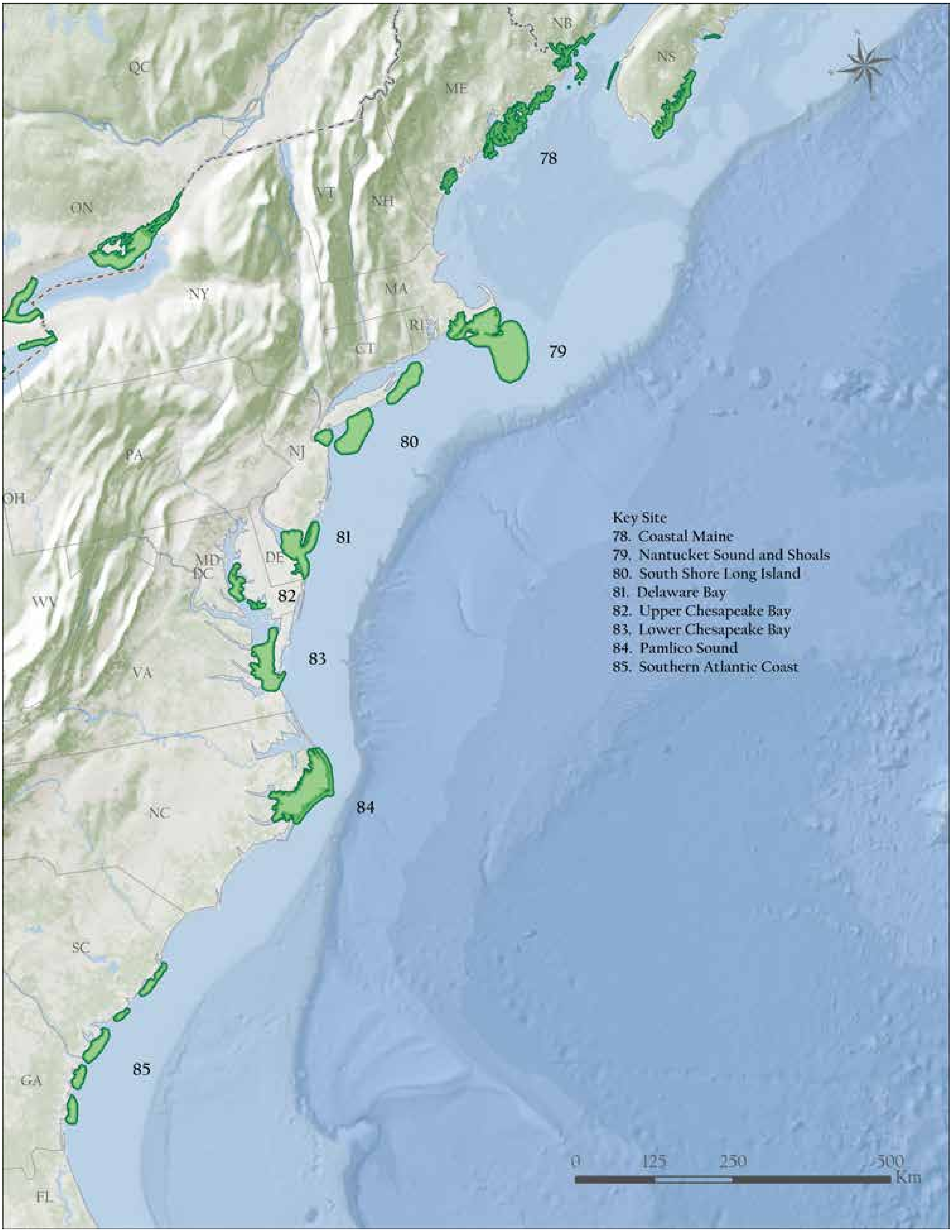
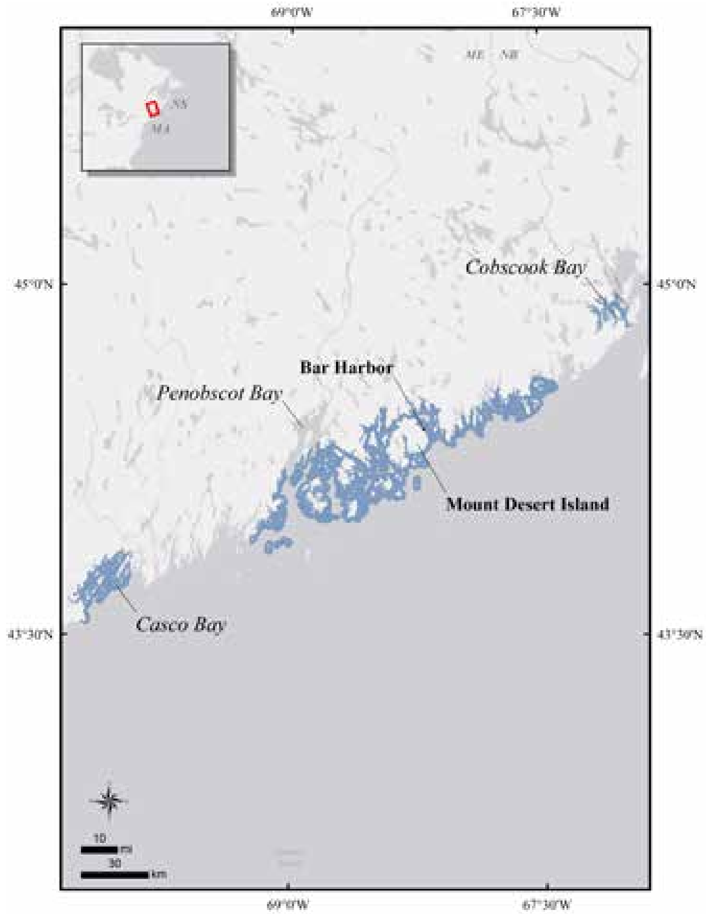


Figure 9. Key habitat sites for sea ducks along the U.S. Atlantic coast.

Key Site 78: Coastal Maine

Location: 44°12'59"N, 68°19'39"W

Size: 1974 km^2



Description: The Coastal Maine key site stretches as a contiguous area from the communities of Jonesport to St. George, and also includes sections of Cobscook Bay to the east and Casco Bay to the west. This area encompasses several bays such as Western Bay, Wohoa Bay, Narraguagus Bay, Dyer Bay, Gouldsboro Bay, Mount Desert Narrows, Frenchman Bay, Blue Hill Bay, Jericho Bay, Isle Au Haut Bay, and east and west Penobscot Bay. Mount Desert Island is the largest island off the coast of Maine. Other islands such as Isle Au Haut, North Haven, Deer Isle, Swan's Island, Sheep Porcupine Island, Ironbound Island, and dozens of smaller islands dot the waters of the coast. Vegetation on the islands is variable, with some islands sparsely vegetated, many treeless, and some grazed by sheep; most of the small islands have no permanent human presence. There are abundant cobble beaches, few sandy beaches, and most of the coast is rugged with small bays, fjords, and inlets. The inlets and narrows that separate the mainland and the coastal islands vary in depth. For example, Frenchman Bay, which separates Bar Harbor and mainland, is approximately 16 km long and 6.4 km wide with depths of 1.8 to 24 m. It includes a deep channel that allows passage for large cruise ships and commercial vessels.

Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on data from the Atlantic Coast Wintering Sea Duck Survey (see Silverman et al. 2012 for methods; also see Methods section in this atlas) and related surveys (Mid-Winter Survey [MWS; Eggeman and Johnson 1989] or Atlantic Marine Assessment Program for Protected Species [AMAPPS 2015]). Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detecting or other biases. Further, abundance estimates do not include the Cobscook Bay section of the key site; therefore, abundance estimates should be considered minimum estimates.

Biological Value: Coastal Maine is an important wintering area for several species of waterfowl. The geography of the coastline includes large intertidal areas that support bivalves, such as blue mussels and crustaceans (Department of Marine Resources: https://www.maine.gov/dmr/science-research/species/bluemussel.html). Mollusks and crustaceans are the most common food item of Common Eider (*Somateria mollissima*), Long-tailed Duck (*Clangula hyemalis*), and scoters (*Melanitta* spp.) (Cantin et al. 1974, Cottam 1939, Krasnov et al. 2009), and blue mussels make up most of their diet in this area, although mussels are becoming less abundant in recent years. Eelgrass beds have expanded greatly since 2007 due to comprehensive restoration projects north of Bar Harbor (Kidder et al. 2015). Eelgrass beds provide excellent habitat for aquatic insects, crustaceans, and mollusks. The varying depths of the bays and inlets accommodate benthic feeders such as White-winged Scoters (*Melanitta deglandi*), which can dive up to 20 m (Brown and Fredrickson 1997) and Long-tailed Ducks (Schorger 1947). The intertidal areas attract shallow divers such as scaup (Kessel et al. 2002) and Surf Scoters (*Melanitta perspicillata*) (Cottam 1939). Silverman et al. (2012; see Methods section in this atlas) estimated a minimum of 3800 scoters, 33,000 Common Eiders, and 10,000 Long-tailed Ducks in the key site.

Sensitivities: The coast of Maine is vulnerable to the same host of threats as other coastal habitat along the Atlantic coast. Shipbuilding, commercial fishing, and tourism are important economic activities on the coast. Commercial shipping creates opportunities for oil spills, pollution, and introduction of invasive species. During the summer, intense tourist and recreational activity may disturb eelgrass beds and wildlife. Commercial fishing for blue mussels via dragging destroys eelgrass beds and can overharvest local stocks (Neckles et al. 2015). Aquatic invasive species are another common threat in this area because of boating and commercial activities, which carry unwanted species on their hulls. The coastal waters of Maine are warming because of climate change; the increase in water temperature allows invasive species such as the green crab to flourish and has negative impacts on eelgrass beds and invertebrate communities important to sea ducks and other waterbirds (Neckles 2005). The apparent decline of blue mussel beds in Maine is likely a major factor in the declines in wintering eiders and scoters. Climate change also increases the acidification of the coastal oceans, reducing the abundance and densities of soft-shell clams, a valuable local resource.

Potential Conflicts: Conflicts with commercial shipping, commercial fishing, and tourism may become more common as population increases, and tourism accounts for a large part of the local economy. One of the most common conflicts in this area is between the mussel fishing industry and eelgrass restoration projects. Several boat launches around the area can serve as introduction points of invasive species. More recently, a wind energy initiative in the Gulf of Maine may create conflicts with sea duck use of this key site.

Status: Coastal Maine is a mosaic of lands under various land ownership, including private, commercial, and residential developments. Land managers include the Maine Department of Inland Fisheries and Wildlife, Maine Bureau of Parks and Lands, National Park Service, Nature Conservancy, U.S. Fish and Wildlife Service, and other nongovernment organizations and municipalities. The previously small fishing communities on the mainland and on the islands are growing into large towns and increasing pressure on the local resources. No designated Marine Protected Areas currently exist within the key site. Commercial fisheries are regulated and monitored by the State of Maine Department of Marine Resources (https://www.maine.gov/dmr/laws-regulations/index.html). This area is open to commercial shipping and to recreational boating.

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American Common Eiders roosting. Photo: Christine Lepage.

Key Site 79: Nantucket Sound and Shoals, Massachusetts

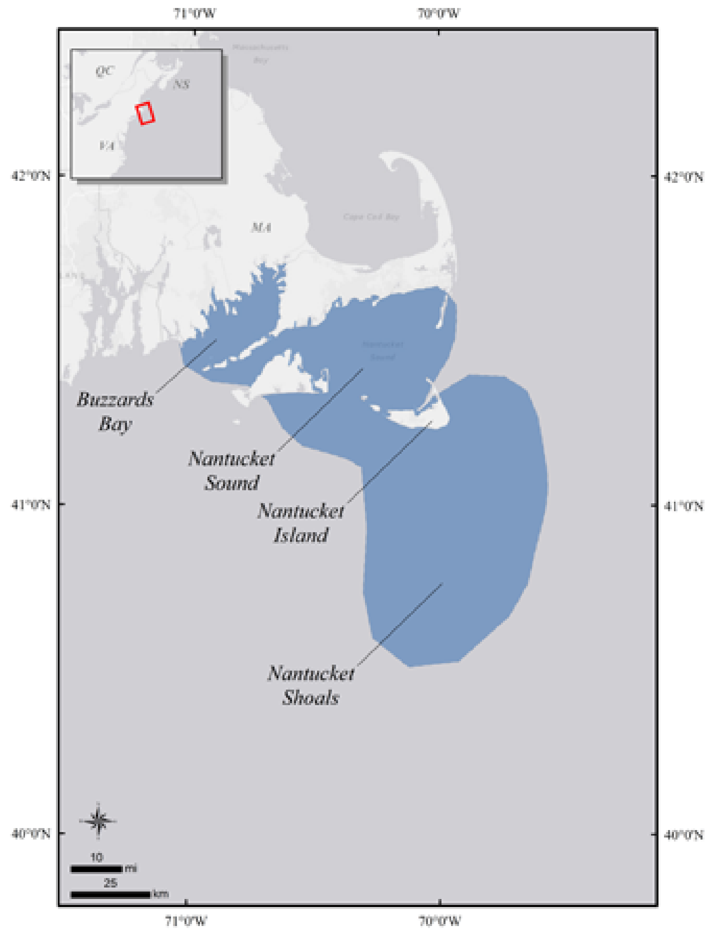
Location: 41°9'35"N, 70°19'57"W

Size: 7855 km²

Description: Nantucket Sound is located between Cape Cod, Martha's Vineyard, and Nantucket Island. It is approximately 48 km long and 40 km wide. The sound is located at the confluence of the cold Labrador currents and the warm Gulf Stream, which creates a coastal habitat broadly representing the southern extent of northern Atlantic marine species and the northern extent of Mid-Atlantic marine species. This area also includes the Nantucket Shoals, a 2000 km² expanse of shallow (4 to 35 m deep), sandy-bottom habitat extending from Nantucket Island eastward for 37 km and southwestward for 64 km. In some places water depth can be as shallow as 1 m, though depth is unpredictable due to shifting bottom sediments caused by strong currents. Air temperatures range from a mean high of 3°C to a mean low of –5°C in winter and a mean high of 26°C to a mean low of 17°C in summer.

Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on data from the Atlantic Coast Wintering Sea Duck Survey, January to March 2009–2014 (see Silverman et al. 2012 for methods; also see Methods section in this atlas) and related surveys (Mid-Winter Survey [MWS; Eggeman and Johnson 1989] or Atlantic Marine Assessment Program for Protected Species [AMAPPS 2015]). Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: Expansive seagrass beds in Buzzards Bay and Nantucket Sound provide critical nursery habitats for fish, shellfish, and crustaceans (Costello and Kenworthy 2011). The shallow waters of Nantucket Shoals create perfect conditions for seasonal phytoplankton blooms, which serve as the base of the marine food web (Saba et al. 2015). The shoals support high concentrations of benthic amphipods and mollusks (Avery et al. 1996), which are important seasonal prey items for several sea duck species (Brown and Fredrickson 1986, Benoit et al. 1996, Haszard and Clark 2007, White et al. 2009).



Nantucket Shoals have been identified through extensive aerial surveys as having a high density of wintering sea ducks and other sea birds (Veit et al. 2016). Silverman et al. (2012; see Methods section in this atlas) estimated a minimum of 73,000 scoters (*Melanitta* spp.), 117,000 Common Eiders (*Somateria mollissima dresseri*), and 159,000 Long-tailed Ducks (*Clangula hyemalis*) in the key site.

Winter distributions of Long-tailed Duck and White-winged Scoter (*Melanitta deglandi*) have been found to closely associate with prey aggregations at Nantucket Shoals (White and Veit 2020). The highest densities of White-winged Scoter along the Atlantic coast occur between Cape Cod and Long Island Sound (Silverman et al. 2013), accounting for approximately 94% of the entire U.S. Atlantic coast wintering population (Silverman et al. 2012). Similarly, a high proportion of scoters radio-tagged during both the wintering and molting periods in southern New England and the St. Lawrence estuary (Quebec) have spent roughly half of the annual cycle in the vicinity of Nantucket Sound and the shoals

(Meattey et al. 2018, Lepage et al. 2020). Aerial surveys from 2011 to 2015 documented high densities of White-winged Scoter along the western edge of the Nantucket Shoals during the spring period (Veit et al. 2016). Several White-winged Scoters tagged with satellite transmitters during the winter period staged at Nantucket Shoals for one to two weeks before spring departure (Meattey et al. 2019). This suggests that the shoals are a seasonally important area for sea ducks, likely due to high densities of high-quality prey (e.g., the pelagic amphipod *Gammarus annulatus*) that sea ducks may rely on for reserve-building before long-distance migration (White et al. 2009). Annual Christmas Bird Counts from Nantucket Island commonly estimate hundreds of thousands of Long-tailed Duck commuting between nighttime roosts on Nantucket Sound and foraging areas on Nantucket Shoals (White et al. 2009). Sea ducks commonly form extensive foraging rafts around Nantucket, numbering in the thousands to tens of thousands of birds. A recent study also suggests that Long-tailed Duck and White-winged Scoter distributions on Nantucket Shoals may be associated in such a way that each species may benefit from noting the foraging locations or aggregations of the other, even though there is little overlap in preferred prey species (White and Veit 2020).

Sensitivities: Nantucket Sound, Nantucket Shoals, and Buzzards Bay are vulnerable to the same host of threats as other Atlantic coastal habitats. Human population growth in Massachusetts has caused an increase in nutrient runoff and subsequent eutrophication events in the bays. These events result in massive fish die-offs and large-scale declines in seagrass meadows (Short and Burdick 1996), which can be important habitats for sea ducks. Commercial shipping also increases the chances of introduction of non-native species and accidental pollution events. For example, first introduced in New Jersey in 1988 through the release of ballast water from a commercial vessel, the invasive Japanese Shore Crab is now common in Buzzards Bay and Nantucket Sound (Ledesma and O'Connor 2001). Climate change also has multiple effects on this region. Sea-level rise is a concern in areas of low elevation near the coast, while changes in water circulation patterns due to slowing of the Gulf Stream may significantly affect nutrient turnover and the overall productivity of the region (Bryden et al. 2005).

The fragile benthic community of Nantucket Shoals and the shallow water make this region particularly sensitive to ecologically destructive fishing methods and climate change. Coastal tourism is a vital part of the year-round economy, and boating is an important recreational activity. Recreational boating can cause resuspension of bottom sediments (Hansen et al. 2019), which can decrease water clarity and negatively impact seagrass productivity (Short and Wyllie-Echeverria 1996, Koch 2002). Coastal development and population growth has significant impacts on water quality, increasing incidences of coastal nutrient loading and nonpoint source pollution (Center for Coastal Studies 2005).

Potential Conflicts: Buzzards Bay and Nantucket Sound fall within a region of heavy commercial activities, recreational beaches and fishing spots, residential development, and state and federal land. Such diverse land ownership creates potential conflicts in resource use and conservation. The largest port in Buzzards Bay is home to a fishing fleet with approximately 270 vessels. Extensive sandy beaches in Cape Cod and Buzzards Bay, as well as the islands of Martha's Vineyard and Nantucket, attract thousands of tourists annually. There are currently several state forests, national wildlife refuges, and other protected lands, but rapid human population growth and expanding development is encroaching on these areas and limiting wildlife habitat.

Nantucket Shoals is rich with natural resources, and potential conflicts arise among competing interests. Oil and gas exploration has historically occurred in this region and the growing demand for energy will likely increase pressure on state and federal agencies to sign new leases for these activities in the shoals, although drilling for oil and gas in federal waters off the Atlantic coast is currently banned until 2022. There are currently approximately 4000 km^2 of commercial offshore wind energy leases and planning areas off the coasts of Massachusetts, Rhode Island, and New York (BOEM 2022). Several of these lease areas have been designated in the waters south of Nantucket Sound and adjacent to Nantucket Shoals. Recent tagging studies suggest that current offshore wind energy lease areas in southern New England do not overlap significantly with White-winged Scoter high-use wintering areas (Meattey et al. 2019). However, White-Winged Scovers often traversed proposed wind energy areas, thus the potential for displacement and obstruction could have compounding effects on the ability of sea ducks to use their entire wintering area (Meattey et al. 2019).

Status: There are several currently protected areas in and around Buzzards Bay and Nantucket Sound. Buzzards Bay is a designated estuary of significance under the National Estuary Program (Center for Coastal Studies 2005). The bay has a comprehensive conservation and management plan that is carried out by several state agencies, federal agencies, and two nonprofit organizations. The Buzzards Bay Coalition is a nongovernment organization that works to protect the area from pollution and degradation and restore ecosystem function and wildlife habitat. Regulations on fishing and trawling are strict, and boating can be limited in certain times of the year to protect marine mammals. Commercial fishing regulations and trawling regulations vary annually, and periodic closures of certain areas is becoming more common as incidences of algal blooms increases in Cape Cod Bay, Buzzards Bay and Nantucket Sound.

Existing ocean protection measures around Nantucket Shoals include the Great South Channel Critical Habitat Area and the Fishery Closure Area to the northwest of the shoals. However, nearshore areas and the shallow waters of Nantucket Shoals are not protected from development. At the federal level, there are several existing management and/or protection options for coastal and marine areas in the Nantucket Shelf region (Recchia et al. 2001), but none of these directly encompass Nantucket Shoals. The critical habitat areas are managed by the federal government and do not necessarily restrict development, but rather focus on habitat critical to the endangered right whale. Regulated or limited activities include marine discharge or dumping, nonrenewable resource extraction, dredging, and cable-laying (Recchia et al. 2001). The Fishery Closure Area east of Nantucket Shoals was established to rebuild the overfished stocks of cod, haddock, and flounder. Other seasonal closures, gear restrictions, and habitat protections are described in Center for Coastal Studies (2005).

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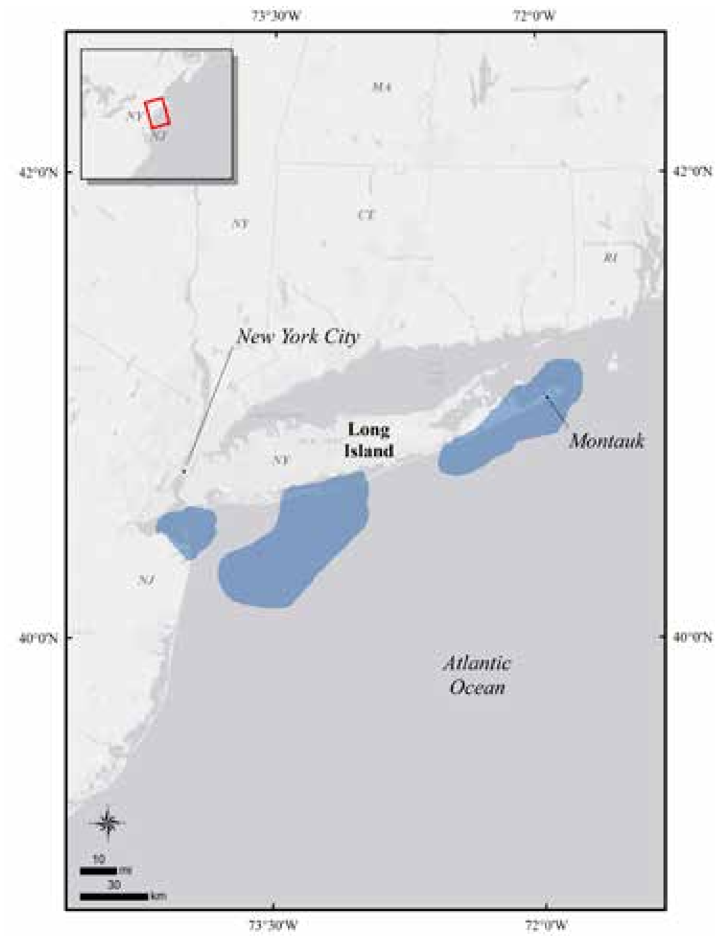
Key Site 80: South Shore Long Island, New York

Location: 40°42'50"N, 73°0'32"W

Size: 4723 km^2



Description: This key site includes the waters south of Long Island that include Lower New York Bay, Sandy Hook Bay, the deep waters of the New York/New Jersey Bight just south of Long Island, the Great South Bay and the area south, Shinnecock Bay and Napeague Bay, and the area surrounding Montauk. The barrier islands along the Atlantic Ocean and the estuary's shallow interconnected bays and tidal tributaries provide highly productive habitat. Water quality in the estuary is crucial to the health of the commercial and recreational fishing and shellfish industries. This region is highly populated with several large urban centers, including Staten Island, Brooklyn, Queens, Hempstead, and many other towns along the Long Island southern coast. Water depths range between <1 m to 30 m, but depth increases rapidly near the New York/New Jersey Bight. Air temperatures in winter range from a mean high of 3°C to a mean low of –4°C and a mean high of 28°C to a mean low of 21°C in the summer.

Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on data from the Atlantic Coast Wintering Sea Duck Survey (see Silverman et al. 2012 for methods; also see Methods section in this atlas) and related surveys (Mid-Winter Survey [MWS; Eggeman and Johnson 1989] or Atlantic Marine Assessment Program for Protected Species [AMAPPS 2015]). Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: The cool waters south of Long Island are open to the Atlantic Ocean and are highly saline. Several large stretches of seagrass beds can be found in the Great South Bay, Moriches Bay, and Shinnecock Bay. However, where there used to be more than 200,000 acres of underwater meadows, there now remains approximately 1% of this productive habitat. These remaining beds serve as critical habitats for fish, shellfish, and crustaceans. Blue mussel, Atlantic surf clam, bay scallop, and eastern oyster are among the most studied and surveyed, but ribbed mussel, hard clam, black sandshell, and eastern pearlshell are also important bivalve species (New York Department of Environmental Conservation 2005). Wintering waterfowl congregate in large concentrations in the bays and in open water south of Long Island barrier islands. Silverman et al. (2012; see Methods section in this atlas) estimated more than 56,000 sea ducks use this area, primarily scoters (*Melanitta* spp.; minimum 16,700) and Long-tailed Duck (*Clangula hyemalis*; minimum 15,200). Areas of particular importance for wintering sea ducks include the New York/New Jersey Bight, the Great South Bay, and around Montauk on the east end of Long Island.

Sensitivities: Tidal marshes and other coastal habitats of Long Island are threatened by rising seas and warming sea surface temperatures resulting from climate change (Tiner et al. 2006, Anisfeld and Hill 2011). Changes in the salinity and temperature of water will have dramatic effects on the already stressed sea grass habitat (Short and Neckles 1999). Development and continued population growth on the coast also threaten water quality. Nitrogen input from runoff causes hypoxic events, killing aquatic vegetation, fish, and other macroinvertebrates. Due to the large number of industrial facilities and power plants, there is also risk of increasing water temperatures from heated effluents discharge, causing die-offs of sea grasses (Thayer et al. 1984). Shellfish harvest in the nineteenth century coupled with disease and changing hydrologic patterns caused a significant decline in oysters (New York Department of Environmental Conservation 2005). Commercial and recreational boating in the bays on the southern coast creates opportunities for introduction of invasive species. Invasive species such as the Asian shore crab, Japanese shore crab, and colonial ascidians have already invaded the marine habitats of Long Island and are negatively affecting the sea floor habitat and coastal habitats and displacing native species (Lohrer and Whitlatch 1997, Kraemer et al. 2007, Mercer et al. 2009).

Potential Conflicts: Development pressure and high recreational and commercial use of the coastal zone may displace sea ducks or impact benthic resources important to sea ducks. Industrial activities on the coast contribute to marine pollution and hypoxic events, which result in large die-offs of seagrass, fish, and other species. Recreational boating traffic is common along the southern coast of Long Island, especially in areas like the Great South Bay, Moriches Bay, and Shinnecock Bay, as these are popular tourist destinations. Potential conflicts exist between the shellfish industry and bivalve recovery efforts. The Long Island Shellfish Recovery Project aims to restore degraded and destroyed clam and oyster beds throughout the waters of Long Island. However, demand for shellfish products continues to increase as populations in nearby urban areas grow. Industrial activities on the coast contribute to marine pollution and hypoxic events, which result in large die-offs of seagrass, fish, and other species. One offshore wind developer is proposing a wind farm that, if approved, would span 80,000 acres in the Atlantic Ocean off Long Island's South Shore, with its closest point to land being 22.5 km south of Long Beach and Jones Beach (NROC 2022). Additional wind planning areas are under consideration in the NY Bight area (BOEM 2022). These proposed developments threaten migratory birds and marine mammals, including an area with high numbers of wintering sea ducks. There are currently no marine protected areas or fishing exclusion zones in this region and as human populations on the coast continue to grow, so does the pressure on the natural resources.

Status: There are few state or federally protected areas in this key site. Among the exceptions are Fire Island National Seashore, Jones Beach Park, Heckscher State Park, and Hither Hills Woods Preserve and State Park. In 1993, the Long Island South Shore Estuary Reserve Act was enacted to establish the Long Island South Shore Estuary Reserve that focuses on the preservation, protection, and enhancement of the natural, recreational, economic, and educational resources of the reserve. However, the reserve does not include areas of the Lower New York Bay, Sandy Hook Bay, and the waters around Montauk. There are local restrictions to fishing, shellfishing, or commercial and recreational boating traffic throughout the area.

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Key Site 81: Delaware Bay, Delaware and New Jersey

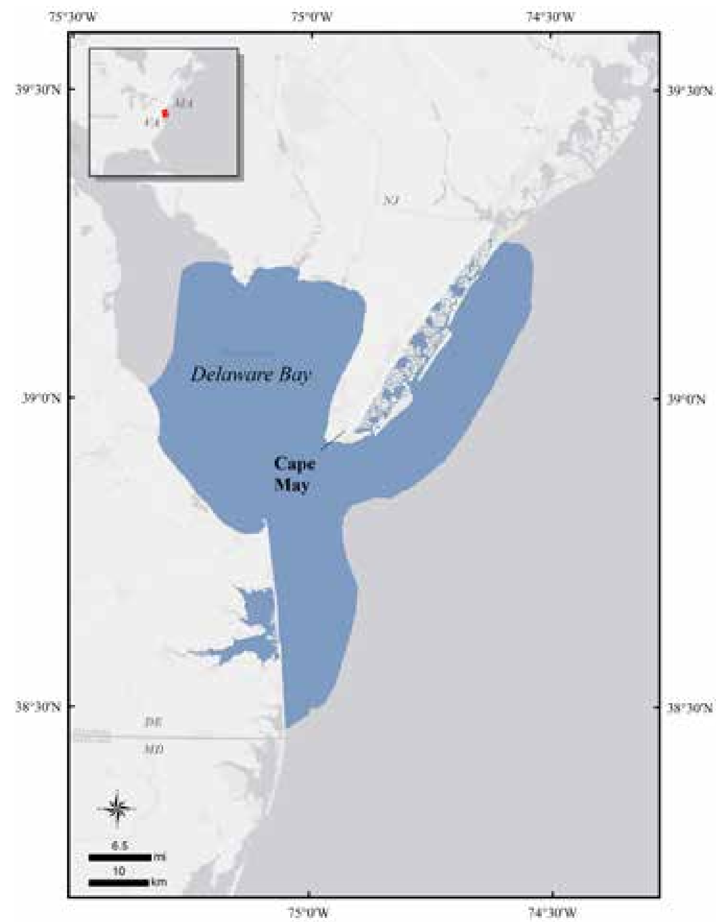
Location: 38°53'23"N, 75°0'21"W

Size: 2550 km²

Description: Delaware Bay is the estuary outlet of the Delaware River. It lies between the states of New Jersey and Delaware. The coastal marshes and shoreline provide diverse habitats for migratory birds. The benthic habitats are also highly diverse in their physical characteristics. Shallow submerged mudflats, rippled sand flats, rocky hard-bottom habitats, silty and sandy shoals, shellfish beds, and tubeworm reefs are all present in Delaware Bay (Kreeger et al. 2010). Much of the coastline is undeveloped, with only a few small towns along the coast. Depths range from as shallow as 0.6 m near the shore to over 30 m near the mouth of the bay where it spills into the Atlantic Ocean.

Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on data from the Atlantic Coast Wintering Sea Duck Survey (see Silverman et al. 2012 for methods; also see Methods section in this atlas) and related surveys (Mid-Winter Survey [MWS; Eggeman and Johnson 1989] or Atlantic Marine Assessment Program for Protected Species [AMAPPS 2015]). Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detecting or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: Delaware Bay has a rich benthic community. There are over 75 species of mollusks (e.g., clams, scallops, snails, etc.) and more than106 species of arthropods (e.g., crabs, shrimp, etc.) and many other annelids and echinoderms (Delaware Department of Natural Resources and Environmental Control 2015) that constitute important foods for sea ducks. Blue mussel beds provide valuable nearshore habitat, attracting thousands of Greater and Lesser Scaup, Surf Scoter (*Melanitta perspicillata*), Black Scoter (*M. americana*), and Long-tailed Duck (*Clangula hyemalis*). During some years in February, large concentrations of dwarf surf clams near the mouth of the Delaware Bay attract thousands of scoters. Silverman et al. (2012; see Methods section in this atlas) found Black Scoter and Surf Scoter present in high densities with an



estimated minimum of 28,000 scoters (*Melanitta* spp.). Significant numbers of scoters are present off Cape May during migration. The lagoon areas of the Atlantic Coast of New Jersey and Delaware (i.e., the small, shallow bays landward of the barrier islands) harbor tens of thousands of Bufflehead (*Bucephala albeola*) and Red-breasted Merganser (*Mergus serrator*) but very few scoters and Long-tailed Ducks (T. Nichols, New Jersey Department of Environmental Protection, pers. comm.). Scoters and Long-tailed Ducks only occur in significant numbers east, or seaward, of the barrier islands.

Sensitivities: Delaware Bay is a major shipping channel in the eastern United States. Therefore, heavy commercial traffic can disturb wildlife habitat and increase the chance of oil spills (NOAA 2021). Bivalve species in the Delaware Bay are particularly sensitive to climate change. Warming sea-surface temperatures are causing outbreaks of epizootics in oysters and can decimate entire reefs (Cook et al. 1998). Overharvest of oysters and other mussels has also occurred in the past and can cause collapses of the bivalve communities on which sea ducks rely. Shipping also poses a high risk of invasive species. The spread of the Asian shore crab has already been documented (Epifanio et al. 2013). These non-natives can drastically change the benthic community and outcompete other native species such as the fiddler crab.

Potential Conflicts: The Delaware estuary is one of the nation's largest petrochemical centers, and the potential for oil spills is an ever-present threat. Direct threats from the energy production industries are associated with cooling water intakes and discharges (Delaware Department of Natural Resources and Environmental Control 2015). There is an active lease area for offshore wind turbines located offshore of the mouth of Delaware Bay and this key site, with additional planning areas under consideration (BOEM 2021). Offshore sand mining occurs in the Delaware Bay and Atlantic Ocean and can have long-term effects on benthic habitats. An increase in the volume and relative size of ship traffic is expected in the Delaware Bay as navigation channels continue to be deepened.

Status: Several of the rivers and streams that flow into Delaware Bay have protected salt marsh bordering the bay. These marshes serve as breeding grounds for many aquatic species. Additionally, the Delaware Bay shore has been protected by the Delaware Coastal Zone Act for the past 40 years, and more than half of the bay-shore acreage remains undeveloped. At the mouth of Delaware Bay, the Carl N. Shuster, Jr. Horseshoe Crab sanctuary was established in 2001. The area is meant to protect the spawning population of horseshoe crab. Inland on the western shore of the bay are Bombay Hook and Prime Hook National Wildlife Refuges. On the eastern shore are Egg Island and Heislerville Wildlife Management areas. The Delaware Bay shore is also protected by numerous state wildlife areas, including, from north to south, Augustine Wildlife Area, Cedar Swamp Wildlife Area, Woodland Beach Wildlife Area, Little Creek Wildlife Area, Ted Harvey Conservation Area, Milford Neck Wildlife Area, Prime Hook Wildlife Area, and also Cape Henlopen State Park.

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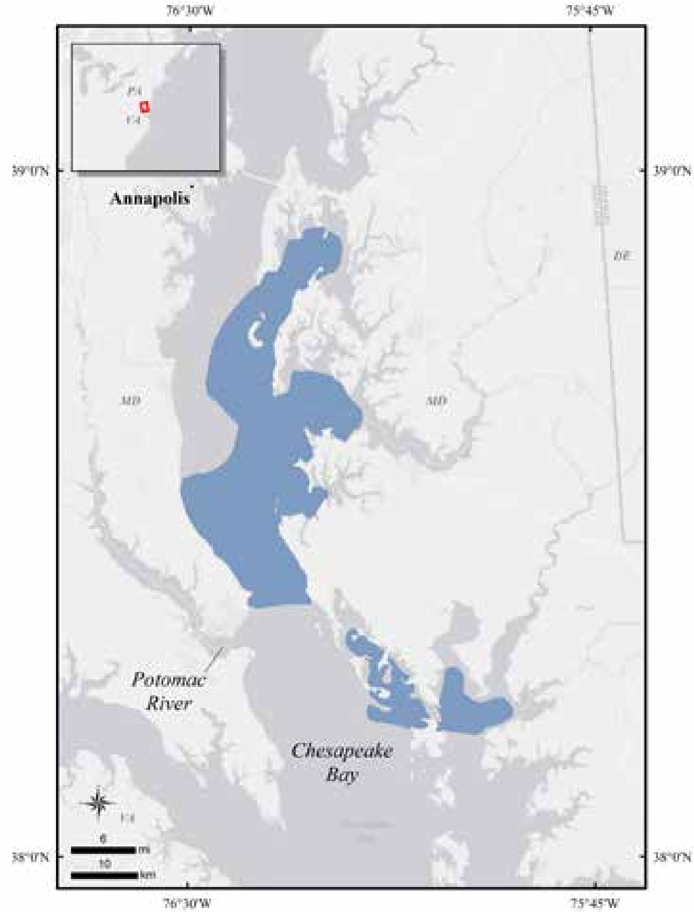
Key Site 82: Upper Chesapeake Bay, Maryland

Location: 38°34'14"N, 76°21'29"W

Size: 963 km²

Description: Chesapeake Bay is the largest estuary in the United States and the third largest in the world. It is more than 320 km long, stretching from Havre de Grace, Maryland, to Virginia Beach, Virginia (Schubel and Pritchard 1986). The bay can be subdivided into upper and lower Chesapeake Bay, because benthic communities and salinity regimes differ substantially. The upper portion of the Bay is located within Maryland and stretches to approximately the confluence of the Potomac River (Schubel and Pritchard 1986). Large islands such as Hart-Miller Island, Pooles Island, and Kent Island dot the upper reaches of the bay. The bay is relatively shallow with an average depth of 6.46 m. Annapolis, a major port city and a naval shipyard, is located on the western bank of the upper bay. The bay is fed by three large rivers: the Susquehanna, Potomac, and James, which provide more than 80% of the fresh water to the bay. This is a highly populated area, with major cities such as Washington, D.C., and Baltimore, Maryland, lying within the watershed. Salinities range from 0 to 15 ppt in the upper bay where many eelgrass beds are found. Average water temperatures in the bay range from a mean of 4°C in the winter to a mean of 24°C in the summer.



Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on data from the Atlantic Coast Wintering Sea Duck Survey (see Silverman et al. 2012 for methods; also see Methods section in this atlas) and related surveys (Mid-Winter Survey [MWS; Eggeman and Johnson 1989] or Atlantic Marine Assessment Program for Protected Species [AMAPPS 2015]). Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: Extensive grass beds (e.g., eelgrass) support a huge diversity of bivalves and crustaceans (Seitz et al. 2006), which are an important food source for scoters (*Melanitta* spp.) and Long-tailed Ducks (*Clangula hyemalis*) (Cottam 1939). Millions of waterfowl use the Chesapeake Bay as their migration stopover and wintering site; the most prominent sea duck species are scoters and Long-tailed Duck. Silverman et al. (2012; see Methods section in this atlas) estimated a minimum of 19,300 sea ducks, including 4400 wintering scoters and more than 5000 wintering Long-tailed Ducks in the upper reaches of the bay. Eastern Bay, the lower Choptank and Nanticoke Rivers, and Fishing Bay are especially important to sea ducks at this site.

Sensitivities: Chesapeake Bay is a major commercial shipping and naval cruiser waterway. Heavy commercial traffic can disturb local wildlife and their habitats. Areas around Chesapeake Bay are highly populated, and the expansion of urban landscapes increases incidents of pollution, nutrient runoff, and sedimentation in the bay. Eutrophication can be a serious problem with adverse effects on fisheries and oyster reefs (Kemp et al. 2005). Climate change may also have drastic impacts on the health of the bay. Extensive tidal marshes, which have served as effective nutrient buffers along the bay margins, are now being lost with rising sea level. In addition, in drier years the decreased inflow of fresh water from rivers can drastically alter the salinity gradients, causing a decline in certain species of submerged aquatic vegetation (Kemp et al. 2004). Warming water temperatures can cause massive die-offs of eelgrass beds and oyster reefs (Cook et al. 1998). Introduction of invasive species such as zebra mussels is also more common as this is a high-traffic shipping channel and tourist location; their spread is exacerbated by increasing water temperatures (Setzler-Hamilton et al. 1995) as a result of climate change.

Potential Conflicts: There are many potential conflicts in the upper reaches of the Chesapeake Bay because this area is highly populated. There is an increasing demand for more boat ramps and waterway access areas, which can increase incidence of invasive species introductions that may alter the prey base for sea ducks. Commercial fishing, crabbing, and oyster economies have seen significant declines due to overharvest since the early nineteenth century (Rothschild et al. 1994, Sharov et al. 2003). Declining bivalve communities due to eutrophication, warming water temperatures, and competition with invasive species can decrease the quality of habitat for wintering sea ducks.

Status: There is a significant amount of protected land in the upper Chesapeake Bay. Most of the land is private and under conservation easement, but there are also federal and state lands such as the Chesapeake Marshlands National Wildlife Refuge Complex, Elk Neck State Park, and Susquehanna State Park, and numerous state wildlife areas (Chesapeake Bay Program 2019). Land and water below the mean high-tide mark is owned and managed by the State of Maryland, with a few exceptions. There are also significant efforts to identify and protect watersheds that are critical to the water quality of the bay. Among the most critical of these is the area surrounding Chesapeake Marshlands National Wildlife Refuge Complex (Chesapeake Bay Program 2019). The Southern Dorchester County Important Bird Area is within this key site. The protection and health of the Chesapeake Bay is closely monitored by the Chesapeake Bay Program (2019).

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Key Site 83: Lower Chesapeake Bay, Virginia

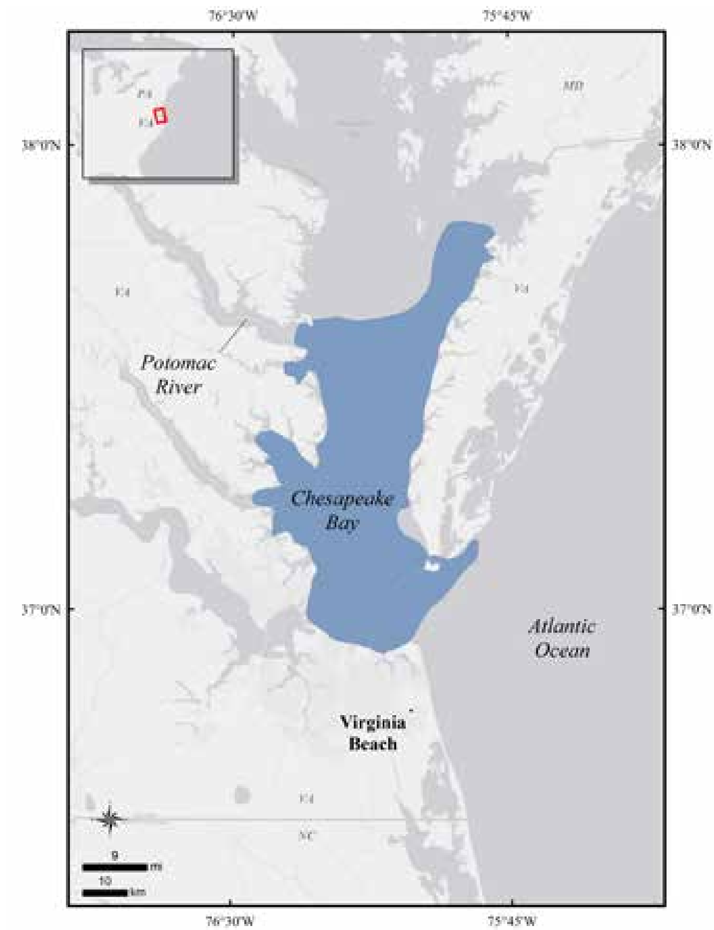
Location: 37°23'41"N, 76°5'51"W

Size: 2655 km²

Description: Chesapeake Bay is the largest estuary in the United States and the third largest in the world. It is more than 320 km long, stretching from Havre de Grace, Maryland, to Virginia Beach, Virginia (Schubel and Pritchard 1986). The bay can be subdivided into upper and lower Chesapeake Bay because benthic communities and salinity regimes differ substantially. The lower portion of the bay stretches from Potomac River to Virginia Beach at the mouth of the bay in the Atlantic Ocean. The lower reach is dotted by several large islands such as Bloodsworth, Smith, and Tangier Islands. The bay is relatively shallow with an average depth of 6.46 m, and lower bay salinities range from 15 to 29 ppt. The bay receives about half of its water volume from the Atlantic Ocean in the form of saltwater. Large rivers such as the Potomac, Rappahannock, York, and James Rivers contribute millions of gallons of fresh water to the lower reaches of the bay (Chesapeake Bay Program 2019). This is a highly populated area with large cities such as Richmond on the James River and Norfolk at the mouth of the bay. Air temperatures range from a mean high of 6°C to a mean low of –2°C in the winter and a mean high of 30°C to a mean low of 22°C in the summer.

Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on data from the Atlantic Coast Wintering Sea Duck Survey (see Silverman et al. 2012 for methods; also see Methods section in this atlas) and related surveys (Mid-Winter Survey [MWS; Eggeman and Johnson 1989] or Atlantic Marine Assessment Program for Protected Species [AMAPPS 2015]). Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Therefore, abundance estimates should be considered minimum estimates.

Biological Value: During winter, this area supports 87 different species of waterbirds and 29 species of waterfowl (Chesapeake Bay Program 2019). The seagrass beds (e.g., eelgrass and widgeon grass) support a huge diversity of bivalves and crustaceans (Seitz et al. 2006), which are an important food source for scoters (*Melanitta* spp.) and Long-tailed Duck (*Clangula hyemalis*) (Cottam 1939), which are the most common sea duck species wintering in the area. Silverman et al. (2012; see Methods section in this atlas) estimated a minimum of 40,000 sea ducks, including 31,000 wintering scoters and more than 4000 wintering Long-tailed Ducks in the lower reaches of the bay. Important features for sea ducks in this key site are relatively shallow areas in and around the mouths of rivers such as the Potomac, Rappahannock, York, and James Rivers.



Sensitivities: The lower Chesapeake Bay is a major commercial shipping and naval cruiser waterway. The mouth of the bay experiences high waterway traffic near Norfolk, primarily from a naval base, and civilian boating traffic near Virginia Beach and Hampton. This high commercial, military, and civilian waterway traffic has the potential for increasing pollution, habitat destruction, and introduction of invasive species. Eutrophication from runoff from residential areas and commercial sites, and warming water temperatures, can be a serious problem with adverse effects on fisheries and oyster reefs (Cook et al. 1998, Kemp et al. 2005). Climate change may also have drastic impacts on the health of the bay. Extensive tidal marshes, which have served as effective nutrient buffers along the bay's margins, are now being lost with rising sea level. Also, in drier years the decreased inflow of fresh water from rivers can drastically alter the salinity gradients, causing a decline in certain species of submerged aquatic vegetation (Kemp et al. 2004). The spread of invasive species is exacerbated by increasing water temperatures (Setzler-Hamilton et al. 1995) as a result of climate change.

Potential Conflicts: There are many potential conflicts in the lower reaches of the Chesapeake Bay because of high human densities. Hard clam aquaculture is a growing industry in the lower Chesapeake Bay and often conflicts with restoration of submerged aquatic vegetation, which is important for fish and blue crab (Hershner and Woods 1999). Declining bivalve communities due to eutrophication, warming water temperatures, and competition with invasive species can decrease the quality of habitat for wintering sea ducks.

Status: Most of the land in the lower Chesapeake Bay is private and under conservation easement, but there are also protected federal and state lands such as Plum Tree Island National Wildlife Refuge, Savage Neck Dunes State Natural Area Reserve, and Saxis Wildlife Management Area (Chesapeake Bay Program 2019). On the eastern shores are Chesapeake Bay National Estuarine Research Reserve, Janes Island State Park, Saxis Wildlife Management Area, and Martin National Wildlife Refuge. There are also significant efforts to identify and protect watersheds that are critical to water quality in the bay. Nonetheless, there are far fewer protected areas in the lower reaches of the bay than in the upper Chesapeake Bay. Areas below mean high tide fall under the jurisdiction of the Commonwealth of Virginia, particularly the Virginia Marine Resources Commission. There are a number of Important Bird Areas (IBA) within the key site. Of particular importance to sea ducks are the Chesapeake Bay Islands and Western Marshes IBAs. The protection and health of the Chesapeake Bay is closely monitored by the Chesapeake Bay Program (2019).

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Kemp, W. M., W. R. Boynton, J. E. Adolf, D. F. Boesch, W. C. Boicourt, G. Brush, J. C. Cornwell, T. R. Fisher, P. M. Glibert, J. D. Hagy, L. W. Harding, E. D. Houde, D. G. Kimmel, W. D. Miller, R. I. E. Newell, M. R. Roman, E. M. Smith, and J. C. Stevenson. 2005. Eutrophication of Chesapeake Bay: Historical trends and ecological interactions. Marine Ecology Progress Series 303:1–29.

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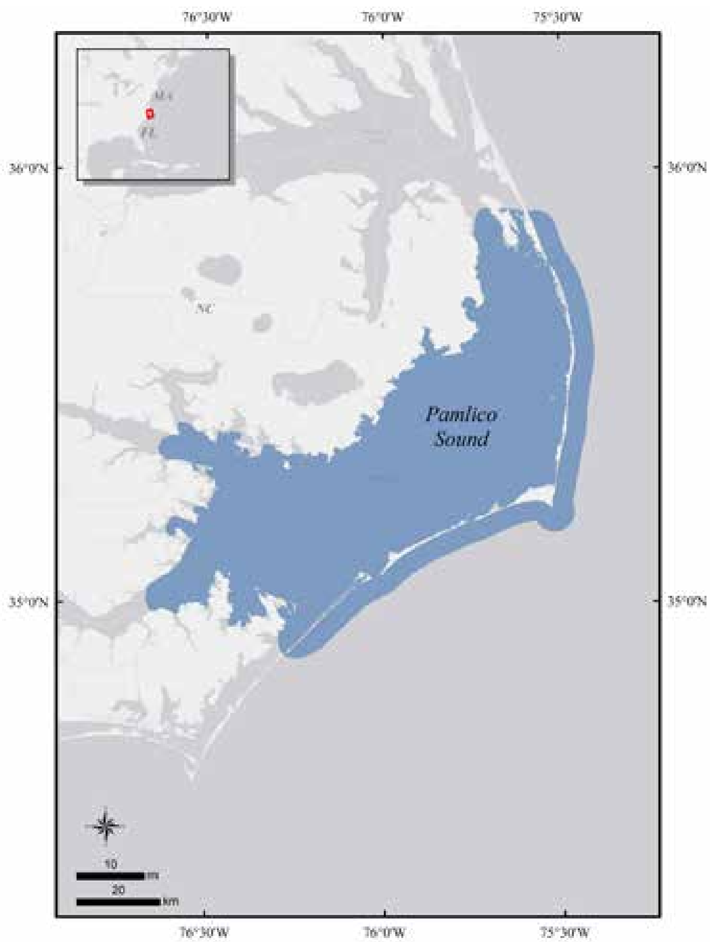
Silverman, E. D., J. B. Leirness, D. T. Saalfeld, M. D. Koneff, and K. D. Richkus. 2012. Atlantic coastal wintering sea duck survey, 2008–2011. U.S. Fish and Wildlife Service: Division of Migratory Bird Management, Laurel, Maryland. https://ecos.fws.gov/ServCat/Reference/Profile/142409.

Key Site 84: Pamlico Sound, North Carolina

Location: 35°22'26"N, 75°51'20"W

Size: 5598 km²



Description: Pamlico Sound in North Carolina is the largest lagoon on the East Coast of North America. It is part of a larger, interconnected network of lagoon estuaries, known as the Albemarle-Pamlico Sound, the second largest in the United States. Ten major rivers, and creeks too numerous to count, drain into Pamlico Sound. The sound is separated from the Atlantic Ocean by a series of sandy barrier islands known as the Outer Banks. The sound is known for its wide expanse of shallow water, generally ranging from 1.5 to 2 m, and for its susceptibility to wind-driven tidal fluctuations. The shallow, warm waters make this area an important recreational destination in the summer and a popular fishing location. There are hundreds of kilometers of sandy beaches where wave action from the Atlantic Ocean constantly redefines the coast. This area is often impacted by hurricane activity but tends to be resilient to major ecosystem changes. Temperatures range from a mean high of 53°F to a mean low of 38°F in the winter and a mean high of 86°F to a mean low of 74°F in the summer.

Precision and Correction of Abundance Estimates Presented: Abundance estimates are from two sources: first, the Atlantic Coast Wintering Sea Duck Survey (ACWSDS), conducted between January 31 and February 13 in 2009 to 2011 (see Silverman et al. 2012 for methods; also see Methods in this atlas); second, abundance data from the Mid-Winter Waterfowl Survey (MWS), including shoreline areas outside the area covered by the ACWSDS were considered when estimating density of sea ducks. Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: Pamlico Sound is a biodiversity hotspot for fish and marine invertebrates (Cooksey et al. 2010). Because the system is mostly enclosed by barrier islands, small amounts of saltwater push in through several inlets, resulting in relatively low salinity levels. The average freshwater residence time is approximately one year in the sound proper, and this promotes effective use and cycling of nutrients, allowing the system to support high rates of primary and secondary production and serve as a vitally important fisheries nursery. There are several diverse habitats such as areas of hard bottom and rocky outcrops as well as soft sand bottoms with submerged aquatic vegetation. The extensive eelgrass and shoal grass beds provide habitat for blue mussels, American oysters, blue crab, and many other bivalve and crustacean species (Taylor et al. 1996, Neves et al. 1997, Paerl et al. 2010). Mollusks and crustaceans make up the majority of the diet of scoters (*Melanitta* spp.) (Cottam 1939). On the Atlantic coast during winter, scoters tend to concentrate at the mouths of estuaries (Stott and Olson 1973), possibly because these places offer a greater diversity of food items. Pamlico Sound is a vital area for wintering Surf Scoter (*M. perspicillata*) and Black Scoter (*M. americana*); most winter at sea near estuaries, bays, and open coastline, all characterized by shallow water and a sandy or gravelly bottom with accompanying shellfish beds (Stott and Olson 1973, Sanger and Jones 1984). Silverman et al. (2012; see Methods section in this atlas) reported a minimum of 59,000 sea ducks in the area of the sound covered by the ACWSDS, including more than 26,000 scoters. An additional 42,000 sea ducks, on average (mainly Bufflehead [*Bucephala albeola*], mergansers [*Mergus* spp.], and scoters) were counted during the MWS in areas outside the ACWSDS area from 2011 to 2015 (D. Howell, North Carolina Wildlife Resources Commission unpublished data).

Sensitivities: The hydrologic characteristics that make the sound such a biodiverse aquatic system also make it very sensitive to over-enrichment and eutrophication (Paerl et al. 2010). The large human population on the coast increases opportunities for pollution, disturbances from recreational activities (e.g., boating), and residential and commercial development. Most of Pamlico Sound is classified as Nutrient Sensitive Waters (North Carolina Department of Water Quality 2006). Agricultural activities inland contribute to nutrient inputs that reduce water quality, may cause algal blooms, and can kill off fish and bivalve communities in the sound (Summerson and Peterson 1990, Uhler et al. 1993, Paerl et al. 2010). The area is also susceptible to the destruction of hurricanes, which makes it very sensitive to the increasing occurrence of such events due to climate change (Paerl et al. 2010).

Potential Conflicts: The area surrounding Pamlico Sound is home to millions of residents and thousands more tourists during the summer months. Recreational activities such as boating cause disturbance to wildlife and habitat. Conflicts between local industry and the North Carolina Recreational Water Quality Program can arise when discharge rates are decreased due to decreasing water quality (North Carolina Department of Water Quality 2006).

Status: Pamlico Sound is an estuarine system, and therefore protections of the watershed inland may be most critical to the sustainability of the sound. Shoreline between the Pamlico and Neuse Rivers is a matrix of state game lands and private lands. There are several national wildlife refuges (e.g., Alligator River, Cedar Island, Swanquarter, and Mattamuskeet), national forests (e.g., Croatan), and national seashores (e.g., Cape Lookout and Cape Hatteras), which provide some protection to uplands impacting waters that eventually run into the sound. However, there are currently no designated marine protected areas in Pamlico Sound, and regulation only extends to fishing industries and restrictions in recreational activities during times of poor water quality. There are several American oyster restoration reefs and limitations on shellfish harvest in eelgrass beds.

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Key Site 85: Southern Atlantic Coast, South Carolina and Georgia

Location: 32°11'37"N, 80°33'37"W

Size: 2730 km^2

Description: The Southern Atlantic Coast key site extends from approximately Myrtle Beach, South Carolina, to Cumberland Island, Georgia. The coast is bisected by major river drainages such as the Santee, Edisto, Savannah, and Altamaha and is characterized by numerous barrier islands separated from the mainland by vast salt marshes (Kovacik and Winberry 1987).

Precision and Correction of Abundance Estimates Presented: Abundance estimates are based on data from the Atlantic Coast Wintering Sea Duck Survey (see Silverman et al. 2012 for methods; also see Methods section in this atlas) and related surveys (Mid-Winter Survey [MWS; Eggeman and Johnson 1989] or Atlantic Marine Assessment Program for Protected Species [AMAPPS 2015]). Abundance estimates presented for this key habitat site have not been adjusted to account for incomplete detection or other biases. Abundance estimates should, therefore, be treated as minimum estimates.

Biological Value: The Southern Coast is an extremely biodiverse region, and the rich waters are critical sites for wintering sea ducks. Estuarine and coastal benthic species richness, abundance, and density are among the highest on the entire Atlantic Coast (Wenner et al. 1983, Cooksey et al. 2010). Benthic bivalve species are key foods for thousands of wintering waterfowl that congregate in this region.

The rich waters are critical sites for wintering sea ducks. Silverman et al. (2012; see Methods section in this atlas) estimated that a minimum of 22,000 scoters (*Melanitta* spp.) winter in this region. Black Scoter (*M. americana*) is by far the most abundant species. They arrive in early to mid-October and often congregate around the Cape Romain area in South Carolina. Some scoters remain in that area and others disperse southward along the coast into Florida; most occur within a mile of the coast.

Sensitivities: The South Carolina and Georgia coasts are relatively low in elevation and have flat topography and large tidal influxes. Therefore, impacts from sea level rise are predicted to be significant (Epanchin-Niell et al. 2017). Potential oil and gas exploration and offshore drilling in this region may have detrimental effects on the benthic community. NOAA ranks the South Atlantic as having the highest relative environmental sensitivity to spilled oil (Coastal Conservation League 2017). Physical burial of surrounding benthic communities from oil platform construction and release of drilling muds is the most deleterious impact (Michel 2013). Two of the largest shipping ports in North America (Charleston and Savannah) are found in the key site. Invasive species introduction is common due to the two large shipping ports and rapidly growing boating and recreational activities. Green mussels, an introduced species, have been observed along coastal Georgia since 2003, which represents an expansion of their range into these southern waters (Power et al. 2004). Additionally, rapid population growth in coastal counties in South Carolina and Georgia (Bailey 1996) has increased human and domestic animal waste input, which affects shellfish beds. This region's sandy beaches make it a popular tourist destination, and recreational activities such as boating and fishing are common. Residential land development, commercial landscaping, and golf courses are sources of fertilizers, pesticides, herbicides, sedimentation, and turbidity (Bailey 1996). Hurricanes can have large impacts on the regional coastline and on wildlife habitat on the Southern Coast (Scott et al. 2003).

Potential Conflicts: Potential conflicts exist between the fishing industry and benthic habitat conservation initiatives. Shrimping is an important commercial activity in the region that occurs in nearshore waters. There are initiatives in South Carolina and Georgia to develop offshore wind turbines (Michel 2013, BOEM 2021a). Development of offshore wind farms could impact migrating birds. Leases for oil and gas exploration and well drilling were issued in several areas in 1978, 1982, and 1983 (Michel 2013). There are no active leases in the area, but future oil and gas exploration can still be a potential conflict with conservation initiatives.

Status: Nearshore state waters are under the jurisdiction of the South Carolina Department of Natural Resources as well as the South Carolina Department of Health and Environmental Control. The coasts of South Carolina and Georgia are part of the South Atlantic Planning Area (BOEM 2021b). Several protected and limited use areas aim to protect this region's natural resources and the area has the highest proportion of protected coastline on the Atlantic seaboard (Epanchin-Niell et al. 2017). The Cumberland Island National Seashore is the only national park unit, which is located in Georgia. It is a barrier island with 6820 hectares of marsh, mudflats, and tidal creeks. Additionally, there are four coastal national wildlife refuges falling within sea duck habitat (Cape Romain, Wassaw, Blackbeard Island, and Wolf Island). Several state (Georgia and South Carolina) wildlife management areas abut the coast. Five marine protected areas have been established since 2009 (Michel 2013) to protect coral and benthic habitat from damage related to fishing activities. Although significant habitat protection measures are in place, energy development, commercial shipping, and human population development within the region pose serious threats to vital habitats.

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Black Scoters. Photo: Tim Bowman.

Discussion and Summary

Knowledge about sea duck population size and trends, and habitats used, has increased since about 2000, in part because of the formation of the SDJV in 1999 and its support of surveys and satellite telemetry studies. Much of the information used to identify key sites in this atlas comes from those data sources, which represents the best available data and our current understanding of habitat needs at this time. However, given that much of the information about sea duck use of these key sites is based on expert opinion and single or infrequent surveys, there is clearly still much to learn about the seasonal distribution, relative densities, and habitat needs for several species of sea ducks.

As noted by Mallory and Fontaine (2004), establishing clear boundaries for a key site is an inexact science because the size and shape of the key site varies seasonally and among years due to factors such as distribution of food resources and ice conditions. Because of the various methods and (im)precision of data used across sites, boundaries of key sites should be interpreted as depicting the general areas of importance to sea ducks and not precise geographic limits. Thus, we caution stakeholders not to view key site boundaries as definitive limits; if an activity occurs outside the drawn site polygon, it may still have consequences to sea ducks.

Climate change will likely affect many of the key habitat sites noted in this atlas but the character and magnitude of such effects remain uncertain. Changes in sea level, temperature, salinity, and acidity, as well as snow and ice conditions, phenology, and transportation routes are occurring, particularly in northern areas where climate change is expected to have the biggest impact (Vavrus et al. 2012, IPCC 2021). Some key sites noted here may become more important to sea ducks, some less important, and new sites may become evident as habitat conditions change and as our knowledge about sea duck distribution and abundance improves through existing or new surveys or other technologies.

Future editions of this atlas may include discreet areas that represent migration corridors or bottlenecks, where sea ducks may not actually land on water, but fly over certain areas. For example, well known migration "pinch points" such as Point Barrow, Alaska, and Point Lepreau, New Brunswick, where hundreds of thousands of sea ducks pass on spring and/or fall migration. Recent telemetry work has also helped identify the locations and magnitude of seasonal use of corridors by sea ducks (Lamb et al. 2019, Lepage et al. 2020). Documenting sites like these (i.e., airspace) may help evaluate risk from development (e.g., wind farms, offshore drilling rigs) or environmental changes.

The SDJV developed this atlas for several reasons. First, the volume of spatial data generated through SDJV-supported and other projects was amassing and needed to be made available where it could be readily accessed by stakeholders. This atlas pulls together data from various sources and addresses the need to identify habitats of greatest significance to sea ducks throughout North America.

Second, the atlas is intended to help improve decision making for resource development and to provide justification for protecting areas of utmost importance to sea ducks. This is timely because of increasing interest in developments such as offshore wind energy, sand mining, arctic shipping, and mining in arctic areas. The relatively strict criteria for inclusion in the atlas were intended to target only the habitat sites most critical to sea ducks. Populations of sea ducks that concentrate in geographic areas during any time during the year, and/or in significant numbers, are potentially more vulnerable to site-specific habitat threats. This is particularly true for endangered and threatened species.

One of the key target audiences for the atlas is the NAWMP habitat JVs that include sea duck habitats, which indicated they needed the type of information in this atlas as a first step toward habitat protection and conservation. Because most of the key habitat sites for sea ducks are in marine and coastal waters, habitat JVs will most likely need to employ conservation tools different from those typically used for conservation of inland and terrestrial bird habitats. This may be a challenge.

The SDJV anticipates making this atlas available online, customizable by geographic region, as well as shapefiles and possibly geo-referenced survey data. The most recent version of the atlas can be found at https://seaduckjv.org/science-resources/sea-duck-key-habitat-sites-atlas/.

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