Sunrise Wind Farm Project

Appendix P1
Avian and Bat Risk Assessment

Prepared for:

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August 23, 2021

Revision 1 – October 28, 2021

Revision 2 – August 19, 2022

Stantec

Avian and Bat Risk Assessment

Sunrise Wind Farm

August 2022

Prepared for:

Sunrise Wind LLC

Prepared by:

Stantec Consulting Services Inc.

Sunrise Wind | Powered by Ørsted & Eversource

August 2022

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Abbreviations

ADLS	Aircraft Detection Lighting System
AOCS	Atlantic Outer Continental Shelf
AS	adult survival
BCC	Bird of Conservation Concern
BOEM	Bureau of Ocean Energy Management
BMP	best management practice
BR	breeding status
BRI	Biodiversity Research Institute
C	Celsius
C	USFWS Candidate Species
CE	cumulative effects vulnerability
CeV	coefficient of variation
COP	Construction and Operations Plan
CV	collision vulnerability
dBA	decibels adjusted
DC	direct current
DFA	diurnal flight activity
DV	Displacement Vulnerability
EI	exposure index
Elu	Uncertainty values
ESA	Endangered Species Act
Eversource	Eversource Investment LLC
F	Fahrenheit

FAA	Federal Aviation Administration
FE	Federally Endangered
FINS	Fire Island National Seashore
FSR	Federal Status Review
FT	Federally Threatened
ft	feet
G&G	geological and geophysical
HDD	horizontal directional drilling
HF	habitat flexibility
IAC	Inter-Array Cables
IPaC	Information for Planning and Consultation
IPF	impact producing factor
ISMP	Invasive Species Management Plan
IUCN	International Union for Conservation of Nature
IVM	Integrated Vegetation Management
km	kilometer(s)
kW	kilowatt(s)
LAT	Lowest Astronomical Tide
Lease Area	BOEM Renewable Energy Lease Areas OCS-A 0487
m	meter(s)
MAc	collision vulnerability macro-avoidance behavior
MAd	displacement vulnerability macro-avoidance behavior
MassCEC	Massachusetts Clean Energy Center
MDAT	Marine Life Data and Analysis Team
MHHW	Mean Higher High Water

mi	mile(s)
MOU	Memorandum of Understanding
msl	mean sea level
MW	Megawatt
NFA	nocturnal flight activity
NL	non-listed
nm	nautical mile(s)
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NYNHP	New York Natural Heritage Program
NYS BBA	New York State Breeding Bird Atlas
NYSDEC	New York State Department of Environmental Conservation
NYSERDA	New York State Energy Research and Development Authority
O&M	operations and maintenance
OCS	Outer Continental Shelf
OCS–DC	Offshore Converter Station
OnCS–DC	Onshore Converter Station
Orsted NA	Orsted North America Inc.
OSAMP	Ocean Special Area Management Plan
OSRP	Oil Spill Response Plan
POP	global population
Project	Sunrise Wind Farm Project
PV	population vulnerability
ROW	right-of-way
RSZ	rotor-swept zone

RSZt	proportion of time in rotor-swept zone
SE	State Endangered
SGCN	State Species of Greatest Conservation Need
SGCN-HP	High Priority State Species of Greatest Conservation Need
SRWEC	Sunrise Wind Export Cable
SRWEC–NYS	Sunrise Wind Export Cable-New York State
SRWEC–OCS	Sunrise Wind Export Cable-Outer Continental Shelf
SRWF	Sunrise Wind Farm
SSC	State Species of Special Concern
ST	State Threatened
Stantec	Stantec Consulting Services Inc.
Sunrise Wind	Sunrise Wind LLC
RTE	rare, threatened, and endangered
TJB	transition joint bay
TSmax	threat status
USFWS	United States Fish and Wildlife Service
VHF	very high frequency
WEA	Wind Energy Area
WNS	white-nose syndrome
WTG	wind turbine generator

1.0 INTRODUCTION

1.1 PROJECT BACKGROUND AND DESCRIPTION

Sunrise Wind LLC (Sunrise Wind), a 50/50 joint venture between Orsted North America Inc. (Orsted NA) and Eversource Investment LLC (Eversource), is planning for the development of the Sunrise Wind Farm (SRWF) and the Sunrise Wind Export Cable (SRWEC), collectively, the Sunrise Wind Farm Project (Project). The wind farm portion of the Project (i.e., SRWF) will be located on the Outer Continental Shelf (OCS) in the designated BOEM Renewable Energy Lease Areas OCS–A 0487 (Lease Area)[1]. The Lease Area is approximately 18.9 statute miles (mi) (16.4 nautical miles [nm]; 30.4 kilometers [km]) south of Martha's Vineyard, Massachusetts, approximately 30.5 mi (26.5 nm; 48.1 km) east of Montauk, New York, and 16.7 mi (14.5 nm; 26.8 km) from Block Island, Rhode Island (Figure 1-1).

The Lease Area contains portions of areas that were originally awarded through the BOEM competitive renewable energy lease auctions of the Wind Energy Area (WEA) off the shores of Rhode Island and Massachusetts. The SRWF and a portion of the SRWEC will be located on the OCS, and other components of the Project will be located in state waters of New York and onshore in the Town of Brookhaven, Long Island, New York. The proposed interconnection location for the Project is the Holbrook Substation (Figure 1-1), which is owned and operated by Long Island Power Authority.

Sunrise Wind contracted Stantec Consulting Services Inc. (Stantec) to conduct an avian and bat risk assessment to inform potential impacts for the Project's Construction and Operations Plan (COP), and to ultimately provide information to the Bureau of Ocean Energy Management (BOEM) and other federal and state agencies. Potential impacts to avian and bat species may occur during Project construction, operations and maintenance (O&M), and decommissioning (decommissioning impacts are expected to be similar to or less than those proposed for construction). Below is a summary of Project description information, including construction activities, habitats that may be impacted, and Project design features that are pertinent to this avian and bat risk assessment.

[1]A portion of Lease Area OCS-A 0500 (Bay State Wind LLC) and the entirety of Lease Area OCS-A 0487 (formerly Deepwater Wind New England LLC) were assigned to Sunrise Wind LLC on September 3, 2020, and the two areas were merged and a revised Lease OCS-A 0487 was issued on March 15, 2021. Thus, in this report, the term "Lease Area" refers to the new merged Lease Area OCS-A 0487.

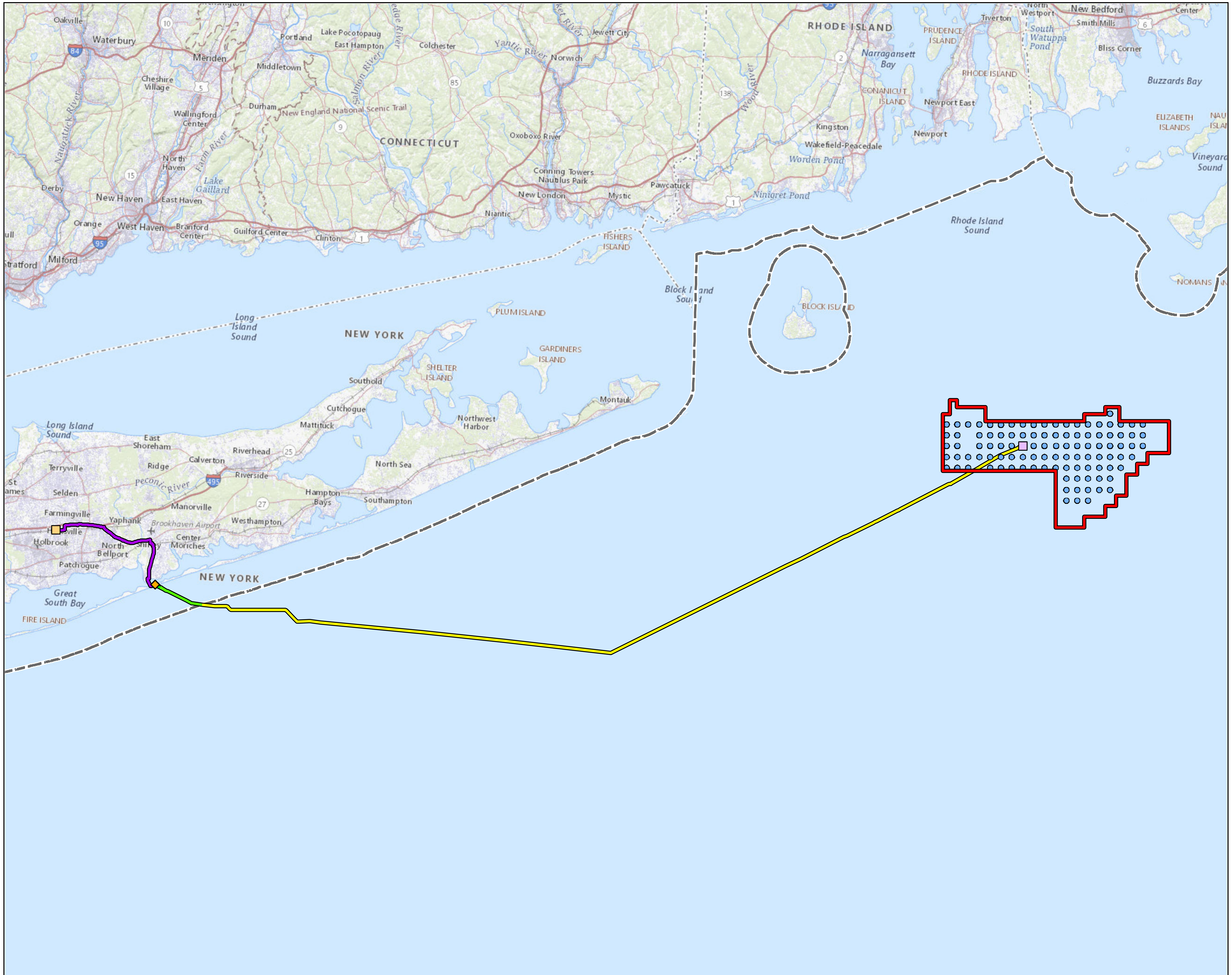


Figure 1-1
Project Area Location

Sunrise Wind | Powered by Ørsted & Eversource

Legend

- Sunrise Wind Farm (SRWF)
- Offshore Converter Station (OCS–DC)
- SRWEC Landfall Location
- Onshore Converter Station (OnCS–DC)
- Indicative Turbine Layout (WTG)
- Sunrise Wind Export Cable (SRWEC–OCS)
- Sunrise Wind Export Cable (SRWEC–NYS)
- Onshore Transmission Cable LIE Service Road Route
- 3-nm State Waters Boundary

Note
Routes are indicative and subject to engineering design changes.

Sources
1. Base map: USGS The National Map

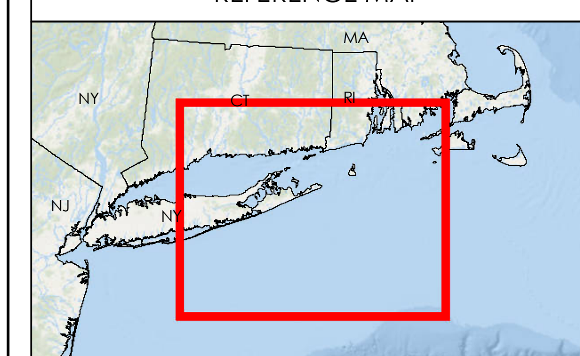
Date	10/15/2021
Project Number	2028113199
Prepared By	GC
Reviewed By	LJ

0 10 miles
0 8 nm
0 16 km

N

Scale at 11x17: 1:676,500
NAD 1983 2011 UTM Zone 19N

REFERENCE MAP



The Project will consist of the following onshore and offshore infrastructure. Table 1.1 describes the timing and duration of construction activities by Project location (*relevant to avian and bat species seasonal occurrence and potential impacts*). Table 1.2 provides the range of water depths in each of the offshore Project locations (*relevant to avian species foraging habitats and potential impacts*). The types of habitats and potential impacts during construction and O&M of the Onshore Facilities are discussed in Section 2.1.

- Onshore:
  - Onshore Transmission Cable, transition joint bays (TJBs) and concrete and/or direct buried joint bays and associated components;
  - Onshore Interconnection Cable;
  - Fiber optic cable co-located with the Onshore Transmission and Onshore Interconnection Cables; and
  - One Onshore Converter Station (OnCS–DC).
- Offshore:
  - Up to 94 WTGs at 102 potential positions;
  - Up to 95 foundations (for WTGs and one Offshore Converter Station [OCS–DC]);
  - Up to 180 mi (290 km) of Inter-Array Cables (IAC);
  - One OCS–DC; and
  - One DC SRWEC located within an up to 104.6-mi (168.4-km)-long corridor.

Table 1.1 Planned Duration and Timing of Construction Activities by Project Location

Project Location	Indicative Schedule	Duration (Approximate Number of Months, Including Commissioning)
Onshore Facilities (OnCS–DC and Onshore Transmission Cable and Onshore Interconnection Cable)	Q3 2023 to Q3 2025	24
SWREC	Q4 2024 to Q2 2025	8
Foundations	Q3 2024 to Q4 2024	4–5
WTGs	Q3 2024 to Q2 2025; Q4 2025	10
OCS–DC	Q4 2024 to Q4 2025	12

Table 1.2 Range of Water Depths in Offshore Project Area Locations

Project Area	Maximum Water Depth (msl[1])[2]
SRWF	190 ft (58 m)
OCS–DC	164 ft (50 m)
SRWEC–OCS	220 ft (67 m)
SRWEC–NYS	105 ft (32 m)
[1] msl = mean sea level; [1] Based on NOAA Coastal Relief Model data	

The SRWF Lease Area is approximately 176.7 square mi. Sunrise Wind has committed to an indicative layout scenario with WTGs and OCS–DC sited in a uniform east-west/north-south grid with 1.15- by 1.15-mi (1- by 1-nm; 1.85- by 1.85-km) spacing that aligns with other proposed adjacent offshore wind projects in the RI-MA WEA and MA WEA. The selected turbine size has a minimum blade swept height above mean sea level (msl) of 131.2 feet (ft; 40 meters [m]) and a maximum blade swept height of 787 ft (240 m), resulting in a rotor-swept zone (RSZ) of 131.2 to 787 ft (40 to 240 m)[2]. The OCS–DC would have a maximum height of 289 ft (88 m) above msl (Table 1.3).

Table 1.3 Offshore Project Infrastructure Dimensions

WTG Component/Parameter	Selected Turbine (11 MW[1])
Turbine Height (from msl[2])	787 ft (240 m)
Hub Height (from msl)	459 ft (140 m)
Air Gap (from msl) to the Bottom of the Blade Tip	131.2 ft (40 m)
Base Height (foundation height – top of TP) (from msl)	89 ft (27 m)
Base (tower) Width (at the bottom)	23 ft (7 m)
Base (tower) Width (at the top)	16 ft (5 m)
Nacelle Dimensions (length x width x height)	69 ft x 33 ft x 36 ft (21 m x 10 m x 11 m)
Blade Length	318 ft (97 m)
Maximum Blade Width	19 ft (5.8 m)
Rotor Diameter	656 ft (200 m)
Operation Cut-in Wind Speed	7 to 11 mph (3 to 5 m/s)
Operational Cut-out Wind Speed	56 to 63 mph (25 to 28 m/s)

[2] Collision risk was assessed prior to selection of WTG locations, WTG height, and structure height of the OCS–DC. Based on the Project component updates, our assessment of collision risk is considered conservative as the Project reduced the number of turbines from 122 to 94 at 102 potential positions, the RSZ used in the collision risk model was larger (98 to 968 ft [30 to 295 m]) due to the blade swept heights of WTGs under consideration at the time, and the total structure height of the OCS–DC was reduced from 361 ft (110.0 m) to up to 295 ft (90 m).

Table 1.3 Offshore Project Infrastructure Dimensions

OCS–DC Parameters	Maximum Design Scenario
Number of OCSs	1
Topside – main structure length and width	328 ft x 262 ft (100.0 m x 80.0 m)
Topside – main structure height	197 ft (60.0 m)
Air gap (MHHW to bottom of topside)	78 ft (23.8 m)
Topside – height (excluding lightning protection) (highest astronomical tide [LAT])	295 ft (90.0 m)
Height of lightning protection & ancillary structures (LAT)	361ft (110.0 m)
NOTES: [1] Megawatt [2] msl = mean sea level [3] MHHW = Mean Higher High Water [4] LAT = Lowest Astronomical Tide	

1.2 REGIONAL OVERVIEW

The SRWEC will make landfall on Fire Island, a barrier island that runs parallel to Long Island within the North Atlantic Coast Ecoregion of New York (NYSDEC n.d.-b). This Ecoregion is characterized by marine, estuarine and coastal habitats, as well as grasslands, shrublands, forested uplands, pine barrens, coastal plain ponds and dunes, and extensive salt marshes. The ecosystems on Long Island provide habitat for a variety of avian species and bats. The wetland, beach, field, and forest habitats of Fire Island provide breeding and roosting habitat for a variety of land birds (raptors, passerines, woodpeckers, gamebirds), wading birds, shorebirds, and bats. The Onshore Transmission Cable and Onshore Interconnection Cable will generally follow paved portions of existing roadways and rights-of way (ROWs) to the OnCS–DC. Inland landcover types in the region of the Onshore Facilities on Long Island are characterized by a variety of forest, field, and wetland habitats, as well as areas of dense residential and commercial development. The Town of Brookhaven consists of some forested habitats but also developed residential areas, parking lots, roads, and commercial and industrial areas.

The SRWF is located within the Mid-Atlantic Bight, which extends from Cape Cod, Massachusetts to Cape Hatteras, North Carolina (USGS, n.d.). The Mid-Atlantic Bight is a portion of the gently sloping, sandy-bottomed continental shelf. The shelf extends out to 93 mi (150 km) offshore, where the water depths are approximately 650 ft (200 m) deep. Beyond the shelf edge, water depths increase dramatically to 10,000 ft (3,000 m). The relatively shallow Mid-Atlantic Bight coastal region receives an influx of cold Artic waters circulated by the Labrador Current. At the southern extent of this region the cold waters mix with warmer waters of the Gulf Stream. The region experiences a seasonal fluctuation in sea surface temperatures ranging from 39 to 79 degrees Fahrenheit (°F; 4–26 degrees Celsius [°C]; Jossi and Benway 2003). The variety of physical, chemical, and biological conditions within this region dictate the distribution and activity of marine biological resources, both seasonally and annually.

Water depth influences where food resources occur and, therefore, is one of the primary physical features affecting avian species distribution. Other factors such as substrate, water temperature, salinity, and currents all affect resource availability and, consequently, species distribution and abundance.

The closest islands to the SRWF include Block Island off of Rhode Island and Nomans Island off of Massachusetts, approximately 16.7 mi (14.5 nm; 26.8 km) to the northwest and 15.0 mi (13.0 nm; 24.1 km) to the northeast, respectively. These islands provide nesting habitat for a variety of terrestrial, marshland, and beach-nesting birds as well as important stopover habitat for migratory birds (USFWS 2010a, 2002). On Nomans Island, there are historical observations of nesting attempts by piping plover (*Charadrius melodus;* federally threatened), as well as historical records of breeding roseate terns (*Sterna dougallii;* federally endangered), least terns (*Sternula antillarum*), common terns (*Sterna hirundo*), and artic terns (*Sterna paradisaea*); however, recent formal nest surveys have not been conducted (USFWS 2010a). Additional shorebird and seabird species are known to nest on the island include (but are not limited to) American oystercatcher (*Haematopus palliatus*), double-crested cormorant (*Phalacrocorax auritus*), herring gull (*Larus argentatus*), great-black backed gull (*Larus marinus*), and Leach's storm-petrel (*Oceanodroma leucorhoa*). Nomans Island is considered the most important peregrine falcon (*Falco peregrinus*) stopover location in Massachusetts (USFWS 2010a). In addition to a gull colony, heron rookery, and a variety of terrestrial birds, there are historical records of breeding piping plover on Block Island National Wildlife Refuge (USFWS 2002).

1.3 PURPOSE AND APPROACH

This avian and bat risk assessment informs the COP and serves to ultimately provide information to BOEM and other federal and state agencies regarding potential impacts to avian species and bats. The following section provides the regulatory framework relevant to listed avian species and bats applicable to renewable energy projects.

1.3.1 Regulatory Framework

Under 30 Code of Federal Regulations 585, applicants for federal projects are required to characterize avian resources in a Lease Area through development and submittal of a COP. Specifically required under § 585.626 and § 585.627 is a description of biological resources, including *Endangered Species Act* (ESA)-listed species and sensitive habitats, and a description of those resources that could be affected by the proposed project activities.

BOEM will be the lead federal agency during the review of the SRWF under the *National Environmental Policy Act* (42 USC 4321 *et seq*.) for environmental effects, including beneficial effects. Section 7 of the ESA of 1973 (16 U.S.C. § 1531 et seq.) is the mechanism by which federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any listed species. Federal agencies must consult with the United States Fish and Wildlife Service (USFWS) to assess how proposed actions may harm federally endangered or threatened species and/or their designated critical habitat. Biological assessments, or some other form of analysis, are typically prepared for projects requiring federal actions that may affect listed species.

If a proposed activity is determined likely to have a significant adverse effect on a federally listed species, then the acting agency, along with the project proponent, must either work with the USFWS to find ways to eliminate the potential for adverse effects or initiate formal consultation whereby the USFWS prepares a Biological Opinion and Incidental Take Statement. Mitigation in some cases is required to compensate take of listed species.

BOEM is required to protect the environment and natural resources of the OCS under the *Outer Continental Shelf Lands Act* (43 USC § 1337). BOEM has a Memorandum of Understanding (MOU) with USFWS, established in 2009 (Executive Order 13186: Responsibilities of Federal Agencies to Protect Migratory Birds), to assess potential impacts to wildlife and implement mitigation measures, if needed, for offshore renewable energy projects.

Native migratory birds are afforded protection under the federal *Migratory Bird Treaty Act* of 1918 (16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755) and eagles are further protected under the federal *Bald and Golden Eagle Protection Act* (16 U.S.C. 668-668c) of 1940.

The New York Public Service Commission will lead the review of the Sunrise Wind Export Cable-New York State (SRWEC–NYS) and Onshore Transmission components of the Project under Article VII of The New York Public Service Law. Multiple federal and state governmental authorities will be cooperating or consulting agencies during the state permitting process. The federal and state regulations that are relevant to the assessment of risk for birds and bats are described in Table 1.4.

Table 1.4 Applicable Avian and Bat Regulations and Definitions

Regulation	Details	Definition
Migratory Bird Treaty Act, 1918	Over 800 species protected, as listed under Title 50, section 10.13, of the Code of Federal Regulations	Illegal to “pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect”
Endangered Species Act (ESA; 16 U.S.C. 1531 et seq.), 1973	1,930 species of US and US waters listed (including piping plover, roseate tern, and red knot)	Section 7 of the ESA specifies that Federal Agencies (e.g., BOEM) consult with the Secretary of Commerce (via National Marine Fisheries Service and/or Interior (via USFWS) to determine that any "agency action is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of an endangered or threatened species' critical habitat"
Section 4(d) of the *Endangered Species Act*	The federally threatened northern long-eared bat is protected under the 4(d) Rule.	Section 4(d) of the *Endangered Species Act* allows the Service to issue custom regulations for species listed as threatened (not endangered) to allow for case-by-case flexibility in implementing the ESA
Bald and Golden Eagle Protection Act, 1940	16 U.S.C. 668-668c	Prohibits "taking" of eagles (their parts, nests, or eggs) without a permit from the Secretary of the Interior

Table 1.4 Applicable Avian and Bat Regulations and Definitions

Regulation	Details	Definition
Environmental Conservation Law of New York, Section 11-0535 and 6 New York Code of Rules and Regulations Part 182, 1999	State endangered species: section 182.2(g) of 6 New York Code of Rules Part 182; state threatened species: section 182.2(h); and state special concern: section 182.2(i)	Prohibited is the "taking, importation, transportation, possession or sale of any endangered or threatened species of fish, shellfish, crustacea or wildlife, or hides or other parts thereof, or the sale or possession with intent to sell any article made in whole or in part from the skin, hide or other parts of any endangered or threatened species of fish, shellfish, crustacea or wildlife is prohibited, except under license or permit from the department"
BOEM Memorandum of Understanding (MOU) with USFWS, 2009	BOEM follows *National Environmental Policy Act* of 1969 (42 U.S.C. 4321-4347) process to assess impacts to migratory birds and their habitats	MOU indicates that "potential impacts be thoroughly assessed and that mitigation measures be considered and implemented as appropriate"

1.3.2 Biological Resources Covered

The following sections describe avian and bat species and species groups that have the potential to occur within the offshore and onshore portions of the Project and surrounding region. Avian species groups discussed include marine birds, coastal birds, and land birds, and bat species groups discussed include cave-hibernating bats and migratory tree bats.

1.3.2.1 Avian

Several different avian species groups may occur within the offshore and onshore portions of the Project and surrounding region over the course of a year, including marine (pelagic) birds (petrels and shearwaters, loons and grebes, gannets, cormorants, sea ducks, skuas and jaegers, kittiwakes and gulls, terns and skimmers, and alcids), coastal birds (shorebirds, waterfowl [geese, bay ducks, dabblers], and wading birds), and land birds (raptors, passerines and woodpeckers, and game birds). Table 1.4 lists taxonomic groups, seasons of occurrence, location (onshore, nearshore [< 3 nm {3.5 mi, 5.6 km} from shoreline], offshore [> 3 nm {3.5 mi, 5.6 km} from shoreline]) and general abundance in the region. In general, avian abundance, for all bird types and seasons combined, is greater closer to the coast and decreases with increasing distance from shore (Figure 1-2; Curtice et al. 2019; NYSERDA 2017a).

Three species listed under the ESA use coastal habitats for breeding in the region, and also may occur offshore during migration: piping plover (federally threatened), red knot (*Calidris canutus rufa;* federally threatened), and roseate tern (federally endangered). Piping plovers nest on sandy coastal beaches in the region, and both piping plovers and red knots pass through the region during spring and fall migration (Loring et al. 2018 and 2019, NYSDEC 2015d). Roseate terns also breed on islands off Long Island (NYSDEC 2015a) and have historically nested on Fire Island at Fire Island National Seashore (FINS; NPS 2018a; Peters 2008) and other locations in New England and Atlantic Canada, and also migrate through the region on their way to and from breeding grounds (Loring et al. 2019).

The black-capped petrel (*Pterodroma hasitata*) is proposed for listing under the ESA and may occur very rarely offshore in the region during the summer/fall (USFWS 2019a).

Table 1.5 Timing, Distribution, and General Abundance of Avian Species Groups Known to Occur in the Region

Avian Group	Seasonal Use	Primary Location[1]	General Abundance[2]
petrels and shearwaters	summer, fall	offshore	common
loons	migrant, winter resident	offshore, nearshore	common
grebes	migrant, winter resident	nearshore	occasional
gannets	migrant, winter resident	offshore	common
cormorants	summer breeder; winter resident	nearshore	common (except great cormorant, occasional in winter)
sea ducks	winter resident	offshore, nearshore	common
geese, bay ducks, dabblers	migrant, winter resident	offshore, nearshore	common
shorebirds	breeding, migrant	nearshore, onshore	common
wading birds	breeding, migrant	nearshore, onshore	common
skuas and jaegers	migrant, winter resident	offshore	uncommon to rare
gulls	breeding, migrant, winter resident	offshore, nearshore, onshore	abundant
kittiwakes	winter resident	offshore	occasional
terns and skimmers	breeding, migrant	nearshore, onshore	common
alcids	winter resident	offshore	uncommon
raptors	breeding, migrant, winter resident	onshore (and nearshore and rarely offshore during migration)	common
passerines	breeding, migrant, winter resident	onshore (and nearshore and rarely offshore during migration)	common
woodpeckers	breeding, migrant, winter resident	onshore (and nearshore)	common
game birds	breeding, migrant, winter resident	onshore (and nearshore)	common

SOURCES:

Paton et al. 2010; Winiarski et al. 2012; Viet and Perkins 2014; Veit et al. 2016; Bay State Wind 2019; Normandeau and APEM 2019.

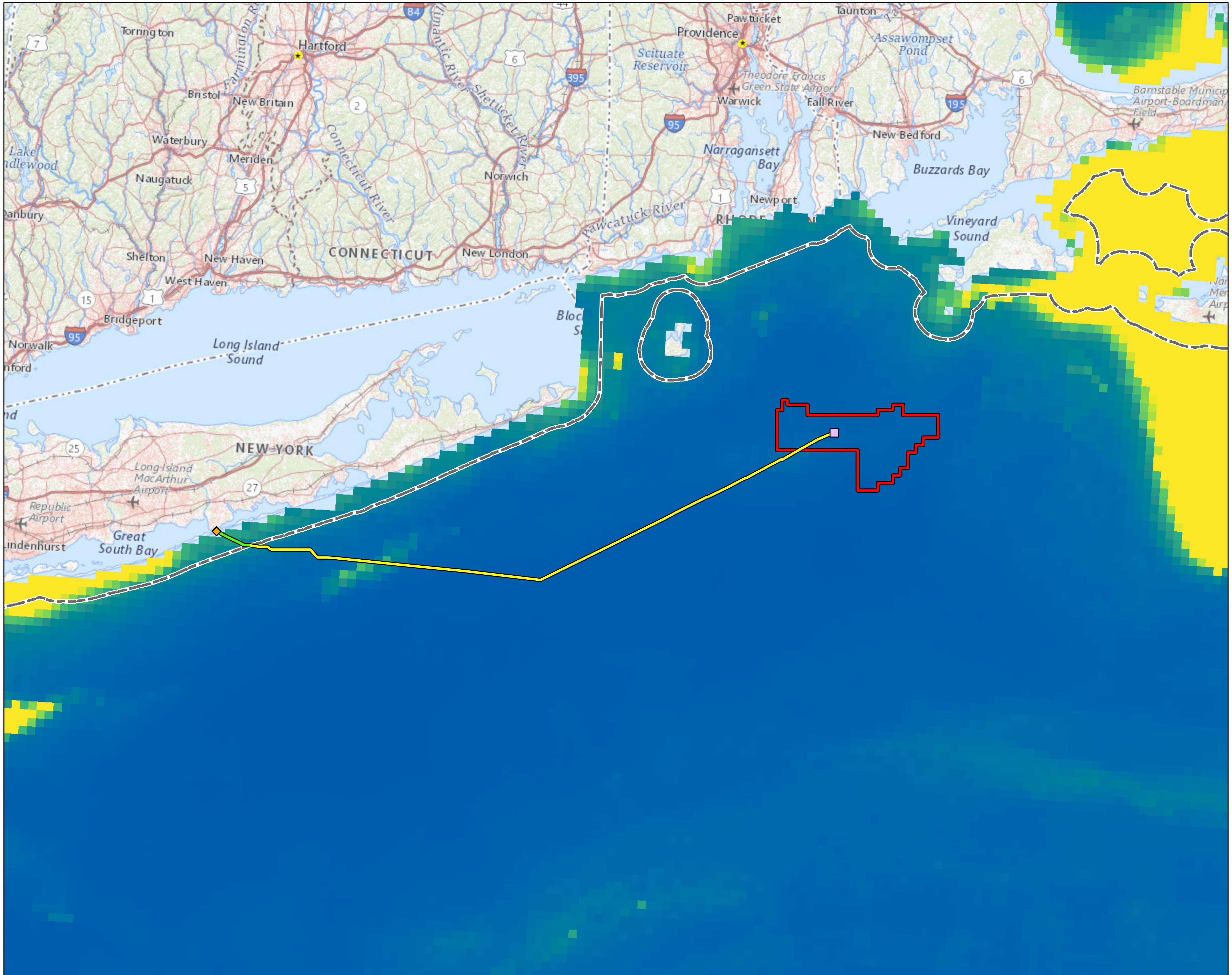
NOTES:

[1]Offshore = in waters > 3 nm from the shoreline, may occur within the SRWEC or SRWF; Nearshore = waters < 3 nm to the shoreline, may occur within the SRWEC–NYS as it approaches land; Onshore = on land, may occur at the shoreline or further inland.

[2]Abundant = occurring regularly in greater numbers relative to other species during given season(s); Common = occurring regularly during given season(s); Occasional = occurring infrequently during given season(s); Uncommon = occurring very infrequently in given season(s), may occur sporadically; Rare = very seldom occurring.

Figure 1-2
MDAT Regional Bird Abundance Estimates (All Species All Seasons)

Sunrise Wind | Powered by Ørsted & Eversource



Legend

- Sunrise Wind Farm (SRWF)
- Offshore Converter Station (OCS–DC)
- SRWEC Landfall Location
- Sunrise Wind Export Cable (SRWEC–OCS)
- Sunrise Wind Export Cable (SRWEC–NYS)
- 3-nm State Waters Boundary

Total Bird Abundance (see note)

High

Low

Note

For all species together and for each group of species, the total bird abundance is total relative number of individuals per grid 2-km x 2-km cell normalized by the mean of each grid cell. The result is the total predicted relative density in that cell.

Sources

Total Bird Abundance data developed by NOAA National Centers for Coastal Ocean Science (NCCOS), prepared by the Marine-life Data and Analysis Team (MDAT).

Date	09/01/2020 Revised: 12/18/2020
Project Number	2028113199
Prepared By	GAC
Reviewed By	JLC

0 15 miles

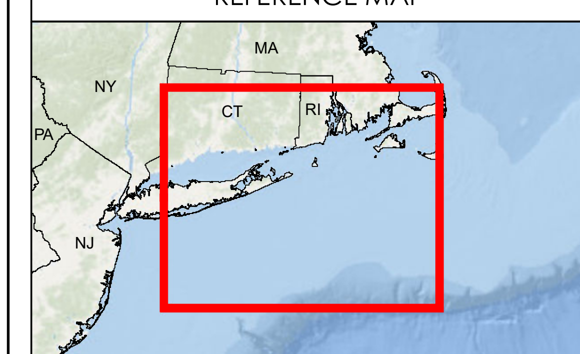
0 15 nm

0 20 km

N

Scale at 11x17: 1:950,400
NAD 1983 2011 UTM Zone 19N

REFERENCE MAP



V:\1956\active_Task Owner and other Non-BC1956 Jobs\2028113199\03_data\gis_cad\gis\MXDs\COP\Appendix Figures\Appendix_P_RiskAssessment\2028113199_1-2_BirdAbundance.mxd Revised: 2020-12-07 By: hturner

1.3.2.2 Bat

There are nine species of bats that occur in the northeast, most of which have the potential to occur in the Project Area (Table 1.6; NYSDEC n.d.-a). Based on migratory behavior and roosting habitat, these species are categorized into two groups: cave-hibernating bats and migratory tree bats. Both groups of bats use forested habitats for roosting, and forest edge and open habitats for nocturnal foraging for insect prey (BCI 2001). Bats are active/present in the region generally April through October. In the late-summer and fall, cave-hibernating bats disperse from summer habitat to winter hibernacula (generally caves or abandoned mines) while migratory tree bats migrate longer distances to overwinter in the milder climates of southern states, often along the coast (BCI 2001). They may also occur offshore during migration (Stantec 2016a,b; 2018a,b; 2019a,b,c; 2020a,b,c).

The state- and federally threatened northern long-eared bat (*Myotis septentrionalis*) has the potential to occur in the corridor for the Onshore Facilities during summer (NYNHP 2020; USFWS 2020a).
The October 2, 2013, proposed rule (78 FR 61046) indicated that disease, white-nose syndrome (WNS), was the primary factor for the proposed determination of ESA-status for the species. The species is listed as federally threatened and protected under Section 4(d) of the *Endangered Species Act*, which allows the USFWS to issue regulations, with more flexibility under the ESA, which may be necessary to facilitate conservation of a threatened species. For northern long-eared bat specifically, the 4d ruling prohibits incidental take from tree removal activities within 150 ft (46 m) of a known occupied maternity roost tree during the pup-rearing season (June 1 to July 31), or within a quarter mile of a hibernacula year round in areas affected by WNS. The Onshore Facilities are within the suspected range of WNS based on the August 2019 spread map.[3] While present in New York, the state and federally endangered Indiana bat (*Myotis sodalis*) is not known to occur in Nassau or Suffolk counties (USFWS n.d.) and is not among species of bats documented offshore (Pelletier et al. 2013; Stantec 2016a, 2018a, 2019a,b,c, 2020a,b,c).

[3] https://www.whitenosesyndrome.org/static-spread-map/august-30-2019

Table 1.6 Species and Status of Bats Known to Occur in the Region

Species by Type[1]	Scientific Name; Species Code	Status[2]
Cave-hibernating bats		
eastern small-footed bat	*Myotis leibii*; MYLE	SE (MA), SSC (NY), SGCN (NY)
Indiana bat	*Myotis sodalis;* MYSO	FE, SE (NY, MA), SGCN-HP (NY)
little brown bat	*Myotis lucifugus;* MYLU	SE (MA), SGCN-HP (NY)
northern long-eared bat	*Myotis septentrionalis;* MYSE	FT, SE (MA), ST (NY), SGCN-HP (NY)
tri-colored bat	*Perimyotis subflavus;* PESU	FSR, SE (MA), SGCN-HP (NY)
big brown bat	*Eptesicus fuscus;* EPFU	NL
Migratory tree bats		
eastern red bat	*Lasiurus borealis;* LABO	SGCN (NY)
hoary bat	*Lasiurus cinereus:* LACI	SGCN (NY)
silver-haired bat	*Lasionycteris noctivigans;* LANO	SGCN (NY)

NOTES:

[1] "Type" refers to wintering strategy: cave-hibernating bats disperse shorter distances to caves or mines to overwinter, while migratory tree bats migrate longer distances to milder climates where they roost in trees.

[2] Status: FE = Federally Endangered; FT = Federally Threatened; FSR = Federal Status Review resulting from a petition for listing; SE = State Endangered; ST = State Threatened; SSC = State Species of Special Concern; SGCN = State Species of Greatest Conservation Need; SGCN-HP = High Priority State Species of Greatest Conservation Need; NL = non-listed

1.3.2.3 Summary of Species Covered

This assessment presents discussion of use and potential impacts using the following major avian and bat groups:

- **Marine birds** (petrels and shearwaters, loons and grebes, gannets, cormorants, sea ducks, skuas and jaegers, kittiwakes and gulls, terns and skimmers, and alcids)
- **Coastal birds** (shorebirds, waterfowl [geese, bay ducks, dabblers], and wading birds)
- **Land birds** (raptors and passerines, woodpeckers and game birds)[4]
- **Cave-dwelling bats** (*Myotis, Perimyotis*, and *Eptesicus* species)
- **Migratory tree-roosting bats** (*Lasiurus* and *Lasionycteris* species)

Impacts to rare, threatened, and endangered (RTE) species are addressed explicitly.

[4] Since most woodpeckers and game bird species are year-round onshore residents that do not undertake long-distance migrations, assessments for these species groups are generally limited to discussion of the Onshore Facilities.

1.3.3 Impact Producing Factors

Table 1.7 lists the impact producing factors (IPF) that may result in direct and/or indirect effects during the construction/decommissioning, and operation and maintenance of the SRWF and SRWEC.

Direct effects are those expected to occur at the same location and within the same timeframe as the project activity. Direct effects may include collision resulting in injury or mortality, displacement, or attraction due to visible infrastructure and lighting, as well as noise and traffic.

Indirect effects are those that may occur after the project activity and may result in impacts to a different or larger area than the location of the project activity. Indirect effects may include displacement associated with 'barrier effect' due to visible infrastructure, ultimately resulting in increased energy expenditure or reduced survival if the species is displaced from preferred foraging habitat.

Impacts may be short-term (temporary) or long-term (reoccurring or permanent), depending on the project phase and IPF.

Table 1.7 Potential Impact Producing Factors from the SRWF and SRWEC

Impact Producing Factors	Potential Type(s) of Effect(s)	Project Phase/Duration of Impact Producing Factor	
		Construction (and Decommissioning)	Operations and Maintenance
Visible Infrastructure	Direct: Collision Mortality, Attraction Indirect: Barrier Effect/Displacement	Short-term	Long-term
Lighting	Direct: Attraction, Collision Mortality	Short-term	Long-term
Seafloor and Land Disturbance	Direct: Displacement	Short-term	Short-term
Sediment Suspension and Deposition	Direct: Displacement	Short-term	Short-term
Noise	Direct: Displacement	Short-term	Short-term
Traffic	Direct: Collision Mortality, Displacement	Short-term	Short-term
Trash and Debris	Direct: Mortality	Short-term	Short-term
Discharges and Releases	Direct: Mortality	Short-term	Short-term

Vulnerability to potential effects due to exposure of IPF may range from minimal to high, and are defined as:

- Minimal – limited exposure to IPF and, therefore, little or no vulnerability to impact.
- Low – low exposure to IPF with low to medium vulnerability to impact depending on species conservation status or other factors such as restricted habitat requirements.
- Medium – moderate exposure to IPF with medium to high vulnerability of impact depending on species conservation status or other factors such as restricted habitat requirements.
- High – high exposure to IPF and, therefore, medium to high vulnerability of impact depending on species conservation status or other factors such as restricted habitat requirements. Note that for the purposes of the assessment, impacts are discussed for species groups (based on overlap in potential impacts among species within a group); in cases where multiple species may be exposed to an IPF, the highest effect category among a species group is reported (e.g., low instead of minimal to low).

1.3.4 Risk Assessment Approach

This risk assessment takes a weight-of-evidence approach, drawing from the most current and relevant empirical data collected during biological surveys in the region, and literature primarily from offshore wind projects in Europe as well as from the only currently operational offshore wind project in North America, Block Island Wind Farm in Rhode Island. The goal of this approach is to assess relative risk among avian and bat species that may potentially be impacted by IPF during the different Project phases, and to ultimately determine which species may require more focused monitoring and/or mitigation during construction and/or O&M.

Because of the differences between the biological resources that may be impacted by the SRWEC and SRWF, risk was assessed separately for these Project components and impacts were discussed for each Project phase. Where onshore impacts are primarily concerning disturbances and habitat loss, impacts in the SRWF primarily are risk of collision and displacement. As such, there was an additional layer of analysis for marine birds (which have relatively greater exposure to the SRWF than coastal and land birds) to inform which species are relatively more vulnerable to potential collision or displacement impacts. This approach was originally discussed with BOEM, USFWS, and New York State Department of Environmental Conservation (NYSDEC) on November 19, 2019, discussed with USFWS and NYSDEC on April 24, 2020, and further discussed with USFWS on June 5, 2020. For the vulnerability model, marine bird exposure and vulnerability to collision and displacement due to visible infrastructure was assessed on a scale of minimal to high, and vulnerability level was used to evaluate potential population-level impacts.

For federally protected species, this assessment discusses the potential for population-level impacts. A population-level impact would be one that would potentially threaten the persistence of a regional population. For non-marine birds and marine birds that are not listed, potential impacts are discussed by species group, as impacts among similar species are expected to be similar. The methods for these separate analyses are described in more detail below.

1.3.4.1 Impact Assessment by Project Area Location

The following three key factors influence bird and bat species risk resulting from exposure to IPF at the SRWF, Sunrise Wind Export Cable-Outer Continental Shelf (SRWEC–OCS), SRWEC–NYS and Onshore Facilities:

- **Key Factor 1: Seasonal Occurrence** – timing and duration of exposure
- **Key Factor 2: Use** – behaviors when present (i.e., breeding, foraging, commuting, migrating, staging, flight height)
- **Key Factor 3: Vulnerable Species** – likelihood of use by federally and/or state listed species

These key factors were considered when assessing the potential level of impact resulting from exposure to IPF for each species group, and for federally and state-listed species specifically, for each Project Location. These key factors were used to assess risk/exposure to IPF and were considered in light of relevant Project description information presented in Section 1.1, the most relevant empirical data from regional avian and bat surveys, available literature, as well as the Project's proposed impact minimization measures.

1.3.4.2 SRWF Collision and Displacement Vulnerability Model

Stantec used a collision and displacement species vulnerability model to assess risk to marine birds in particular at the SRWF. The model was designed to inform the relative use or importance of the Lease Area to marine species that may be vulnerable to collision or displacement, and to evaluate if any species may be at risk of population-level impacts. The analysis is largely qualitative due to the developing nature of the US offshore wind industry and very limited availability of post-construction monitoring data from North America at this time.

The vulnerability assessment approach is based on methods developed for BOEM's Relative Collision and Displacement Vulnerability Model for the Atlantic Outer Continental Shelf (AOCS) (Willmott et al. 2013), as well as the Pacific OCS (Kelsey et al. 2018), and is similar to those methods used by Biodiversity Research Institute (BRI) for the Revolution Wind risk assessment (BRI 2019). The SRWF assessment builds off these previous models by using a similar framework while updating model factors (or inputs) to include Project-specific empirical data. This assessment also considers which species may be most vulnerable to cumulative impacts due to the multiple offshore wind development under consideration off the Atlantic East Coast.

Table 1.8 outlines the factors by vulnerability type (population, collision, displacement) and scoring criteria this assessment considered for each component of the vulnerability model. Components of the vulnerability model are explained in more detail below.

Table 1.8 Marine Bird Model Factors by Vulnerability Type and Description

Vulnerability Type	Factor	Definition	Source	Scoring System
Population Vulnerability (PV)	EI (Exposure Index)	Annual mean relative density score: total counts per km of survey distance	Marine Life Data and Analysis Team (MDAT; (Curtice et al. 2019)	1 = ≤ 20%
				3 = > 20% and ≤ 40%
				5 = > 40% and ≤ 60%
				7 = > 60% and ≤ 80%
				9 = > 80%
	TSmax	Threat score based on federal status and/or state status and International Union for Conservation of Nature (IUCN) ranking	IUCN 2020	1 = IUCN Least Concern and USFWS None
				2 = IUCN Near-Threatened
				3 = IUCN Vulnerable and/or USFWS candidate species
				4 = IUCN Endangered and/or USFWS Threatened
				5 = IUCN Critical and/or USFWS Endangered
			Federal and State Status NY: https://www.dec.ny.gov/ MA: https://www.mass.gov/ RI: http://www.dem.ri.gov/	1 = No listing
				2 = state SGCN
				3 = state concern
				4 = state or federally threatened
				5 = state or federally endangered
	POP	Global population estimate score	Willmott et al. 2013	1 = >3 million individuals
				2 = 1–3 million individuals
				3 = >500,000 to <1 million individuals
				4 = 100,000–500,000 individuals
				5 = <100,000 individuals
	AS	Adult survival rate score	Willmott et al. 2013	1 = < 0.75
				2 = 0.75-0.80
				3 = > 0.80-0.85
				4 = > 0.85-0.90
				5 = > 0.90
	BR	Breeding status in the region of the AOCS	Ranking system described by Kelsey et al. 2018 (but applied to AOCS)	1.0 = Species is unlikely to be foraging to feed young in the AOCS
				1.5 = Some individuals of species will forage for young in the AOCS
				2.0 = Species is known to regularly forage to feed young in the AOCS

Table 1.8 Marine Bird Model Factors by Vulnerability Type and Description

Vulnerability Type	Factor	Definition	Source	Scoring System
Population Vulnerability (PV) (cont'd)	CE	Cumulative effects (CE) vulnerability based on guild foraging behavior off the East Coast	Goodale et al. 2019	1 = minimal likelihood CE
				2 = low likelihood CE
				3 = medium likelihood CE
				4 = highest likelihood CE
Collision (CV)	RSZt	% of flight heights in rotor-swept zone	Willmott et al. 2013; Kelsey et al. 2018 for ranking system	1 = <5% RSZ
				3 = 5-20% RSZ
				5 = > 20% in RSZ
	MAc	avoidance rates	Willmott et al. 2013; Kelsey et al. 2018 for ranking system	1 = > 40% avoidance
				2 = 30-40% avoidance
				3 = 18-29% avoidance
				4 = 6-17% avoidance
				5 = 0-5% avoidance
	NFA and DFA	nocturnal flight activity (NFA) and diurnal flight activity (DFA)	Willmott et al. 2013; Kelsey et al. 2018 for ranking system	1 = 0-20%
				2 = 21-40%
				3 = 41-60%
				4 = 61-80%
				5 = 81-100%
Displacement (DV)	MAd	macro-avoidance rates	Willmott et al. 2013; Kelsey et al. 2018 for ranking system	1 = 0-5% avoidance
				2 = 6-17% avoidance
				3 = 18-29% avoidance
				4 = 3-40% avoidance
				5 = > 40% avoidance
	Habitat flexibility (HF)	habitat generalist vs specialist	Willmott et al. 2013; Kelsey et al. 2018 for ranking system	0 = does not forage in AOCS
				1 = species uses a wide range of habitats/prey over larger area
				2 to 4 = grades of behavior between scores 1 and 5
				5 = species with specific habitat/prey requirements with limited flexibility (e.g., depth, prey species)

Exposure Scores

The region of this analysis included the continental shelf from Delaware Bay to southern Cape Cod (Figure 1-3). The following outlines our process for determining annual **exposure index (EI)** for marine species that may occur in the SRWF:

1. To allow for selection of reference locations that would be relatively similar in water depth and distance from shore for comparison to the SRWF, the region included in the analysis was buffered by a 9.4-mi (8.2 nm, 15.1 km) distance extending offshore from the coastline.
2. Inside the offshore buffer, ArcGIS was used to select 13 random points that were spaced at least 18.8 mi (16.3 nm, 30.3 km) apart to create non-overlapping square reference areas in locations that did not extend beyond the edge of the region included in our analysis. Each random point was used as the center of reference areas that were same size as the SRWF Lease Area (approximately 176.7 square mi).
3. Marine Life Data and Analysis Team (MDAT; Curtice et al. 2019) annual relative density values within that databases' 2-km by 2-km grids that occurred within the reference areas and SRWF were averaged to develop mean relative density values per species.
4. Annual mean relative density values within reference areas and the SRWF were categorized into quintiles (the dataset was partitioned into five equal parts and ranked low to high) (Table 1.8).
5. The 20th, 40th, 60th, and 80th quantiles of the reference dataset were calculated, and the quintile into which the relative annual density estimates for the SRWF fell into for a given species was identified. The quintiles and scores were ranked into 5 categories ranging from 1 through 10:

   1 = ≤ 20%
   3 = > 20% and ≤ 40%
   5 = > 40% and ≤ 60%
   7 = > 60% and ≤ 80%
   9 = > 80%.

   The maximum value of 10 could be reached by incorporating uncertainty. **Uncertainty values (EIu)** were derived from the MDAT coefficient of variation (CeV) data layer for the SRWF. Addition and subtraction of uncertainty values was limited to the range of 1 to 10. As such, EIu was evaluated as:

   1 = CeV ≤ 0.33
   2 = CeV > 0.33 and ≤ 0.66
   3 = CeV > 0.66.

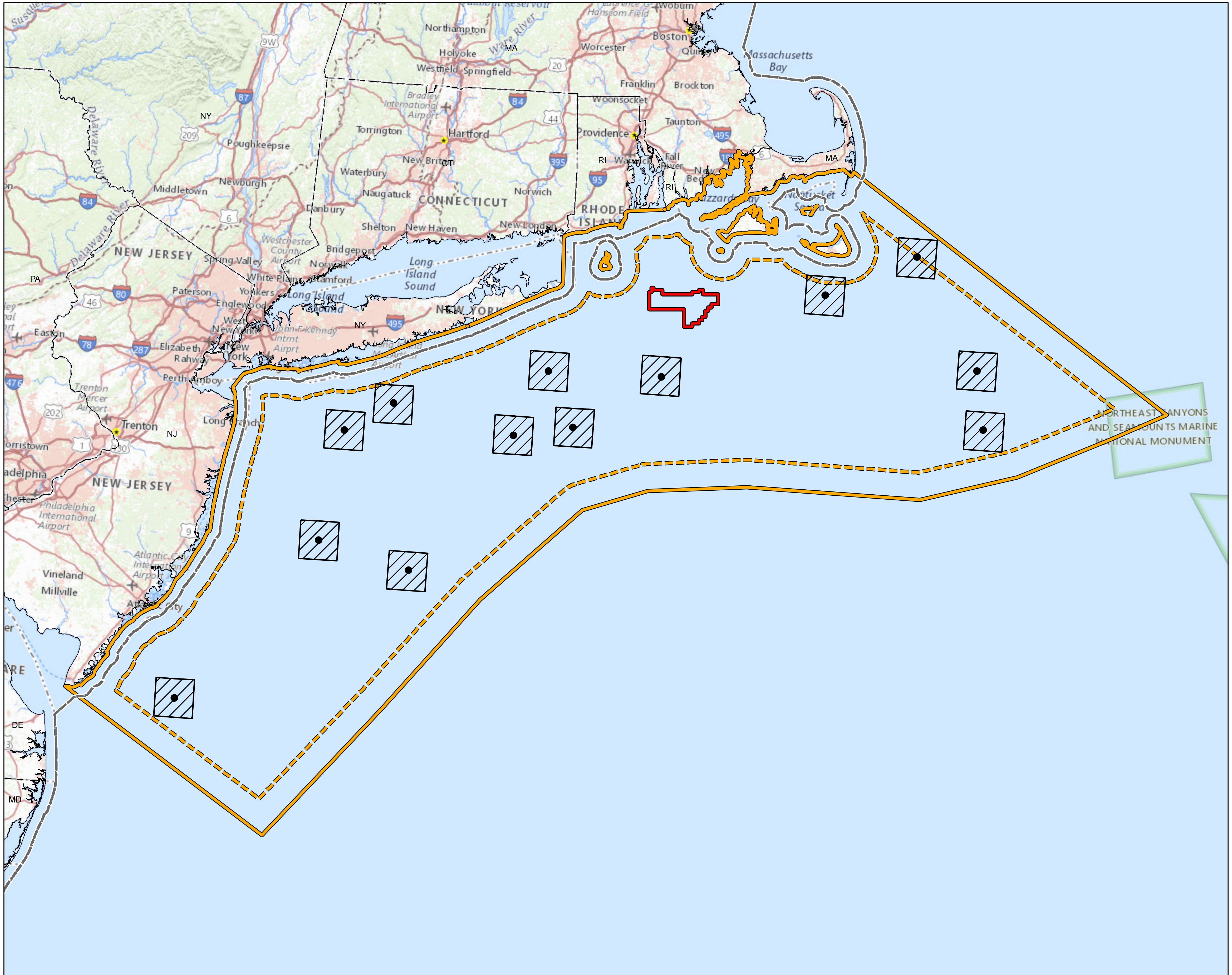


Figure 1-3
Region Included in Assessment of Marine Bird Annual Relative Exposure of SRWF and Reference Areas

Sunrise Wind | Powered by Ørsted & Eversource

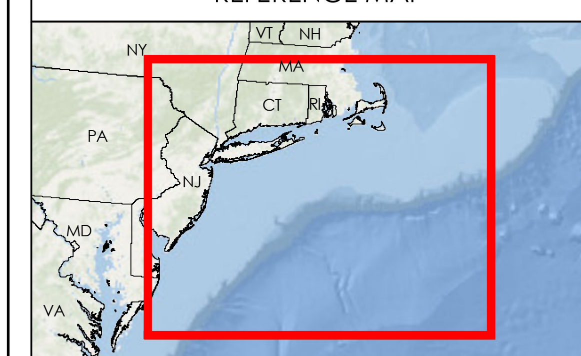
Legend
- Sunrise Wind Farm (SRWF)
- Random Sample Point
- SRWF-sized Sample Area (~13.3 x 13.3 mi)
- 9.4 Mile Interior Buffer
- Study Area
- 3-nm State Waters Boundary

Sources
1. Sources: Stantec, USGS, BOEM
2. Base map: USGS The National Map

Date	09/01/2020 Revised: 12/18/2020
Project Number	2028113199
Prepared By	GC
Reviewed By	LJ

0 35 miles
0 30 nm
0 60 km
N
Scale at 11x17: 1:2,217,600
NAD 1983 2011 UTM Zone 19N

REFERENCE MAP



Population Vulnerability

Population vulnerability (PV) accounts for the following model input factors, as defined by Willmott et al. (2013) and Kelsey et al. (2018) and modified using methods proposed by BRI (2019), and further modified to incorporate species cumulative effects vulnerability into this analysis:

Exposure Index (EI) – Annual exposure scores were derived as described in Exposure Scores above.

Threat Status (TSmax) – Similar to Willmott et al. (2013) and Kelsey et al. (2018), the International Union for Conservation of Nature (IUCN) 2020 scores (as categorized in Table 1.8) and USFWS and/or state threat listings were considered; however, the analysis incorporated the highest status out of the federal, state, and IUCN listings. The federal and state statuses of species of the adjacent states of New York, Rhode Island, and Massachusetts were considered; however, the analysis incorporated the most threatened status on a scale of 1 = no listing, to 5 = endangered (Table 1.8).

Global population (POP) – global population scores were based on Willmott et al. (2013) values (derived from Bird Life International and other sources); the ranking system is described in Table 1.8.

Adult Survival (AS) – because those species with higher adult survival rates are considered more vulnerable to increases in other sources of adult mortality (Kelsey et al. 2018), the AS values and the ranking system for birds based on values from Willmott et al. (2013) were used, as shown in Table 1.8.

Breeding Status (BR) – as described by Kelsey et al. (2018), for those species breeding in the region and whose young may, therefore, also be impacted, were considered more susceptible to collision and/or displacement impacts on the OCS. Therefore, AS values were weighted by BR, with BR rankings as shown in Table 1.8.

Cumulative Effects Vulnerability (CE) – Goodale et al. (2019) modeled which foraging-strategy guilds of marine birds may be more vulnerable to cumulative impacts based on siting scenarios in the WEA along the East Coast from Massachusetts to South Carolina. They considered 36 species of marine birds grouped by foraging strategy:

- Coastal bottom gleaners (sea ducks)
- Coastal divers (loons, mergansers, grebes, and cormorants)
- Coastal plungers (gannets, pelicans, and terns) and coastal surface gleaners (gulls)
- Pelagic divers (alcids)
- Pelagic scavengers (kittiwakes, fulmars, and shearwaters)
- Pelagic surface gleaners (storm-petrels, skuas, jaegers, and phalaropes)

The authors calculated the proportion of each species' population potentially exposed to multiple wind farm siting scenarios; the wind farm siting scenarios varied based on water depth, distance to shore, and high wind speeds (Goodale et al. 2019). Coastal bottom gleaners (sea ducks) and coastal divers (loons, grebes, and cormorants) were predicted to have the highest likelihood of cumulative impacts due to a greater proportion of their populations exposed to the most likely, near future wind development scenarios off the East Coast. Near future wind farms off the East Coast are expected to be built in relatively shallow waters due to currently available foundation technology (Goodale et al. 2019). Species guilds were ranked as likely to be vulnerable to cumulative effects from 1 to 4, with 4 indicating those guilds at highest risk of cumulative impacts.

Where as, **PV = POP(±POPu) + EI(±EIu) + TSmax + (BR x (AS ± ASu) + CE**

Collision Vulnerability

Collision vulnerability (CV) accounts for the following model input factors, defined by Willmott et al. (2013) and Kelsey et al. (2018), which characterize species' behaviors that primarily influence their risk of collision:

Nocturnal Flight Activity (NFA) and Diurnal Flight Activity (DFA) – as described by Willmott et al. (2013), a greater proportion of time in spent in flight, during either nocturnal or diurnal periods, puts a species at greater risk of collision. Species that may be active at night are assumed to be at greater risk of collision due to low visibility. Values provided by Willmott et al. (2013) were used, and the same proportion of nocturnal and diurnal flight activity among the periods during which a species is present in the region were assumed. As proposed by Kelsey et al. (2018), the average of the nocturnal and diurnal flight activity values were used, with rankings as presented in Table 1.8.

Proportion of Time in Rotor-Swept Zone (RSZt) – this factor assumes that a greater proportion of time a species spends in the RSZ equates to greater risk of collision. Willmott et al. (2013) assumed a rotor-swept zone between 66 and 656 ft (20–200 m), which is similar to the RSZ dimensions used in the risk assessment: 98 to 968 ft (30–295 m)[5] (Table 1.3). Scores were ranked as outlined in Table 1.8.

Macro-Avoidance Behavior (MAc) – as described by Kelsey et al. (2018), considers species' avoidance behaviors that influence their risk of collision, where greater rates of avoidance result in lower collision vulnerability. Values presented by Willmott et al. (2013), which were derived from the literature (largely based on observation and radar data), were used. Scores were ranked as outlined in Table 1.8.

[5] The currently proposed SRWF RSZ is 131.2 to 787 ft (40 to 240 m). Collision risk was assessed prior to selection of WTG locations, WTG height, and structure height of the OCS–DC. Based on the Project component updates, our assessment of collision risk is considered conservative as the Project reduced the number of turbines from 122 to 94 at 102 potential positions, the RSZ used in the collision risk model was larger (98 to 968 ft [30 to 295 m]) due to the blade swept heights of WTGs under consideration at the time, and the total structure height of the OCS–DC was reduced from 361 ft (110.0 m) to up to 295 ft (90 m).As such, conclusions of the collision assessment are considered to be conservative.

Where as, **CV = ((NFA ± NFAu) + (DFA ± DFAu))/2 + (RSZt ± RSZtu) + (MAc ± MAcu)**

Displacement Vulnerability

Displacement vulnerability (DV) accounts for the following model input factors, as defined by Willmott et al. (2013) and Kelsey et al. (2018), which characterize species behaviors and habitat restrictions that ultimately influence their risk of displacement:

> Macro-Avoidance Behavior (MAd) – a species' avoidance of a wind farm, while decreasing its collision risk, is also related to its vulnerability to displacement. As proposed by Kelsey et al. (2018), rankings for macro-avoidance behavior as they relate to displacement were essentially the inverse of those avoidance rankings for collision risk (MAc). As such, a greater rank for MAd equates to greater avoidance and displacement vulnerability (Table 1.8).
>
> Habitat Flexibility (HF) – defined as a species' ability to forage for multiple food sources and/or use multiple habitats for foraging. Marine birds were ranked as 0 to 5, with species that do not forage on the AOCS given a score of 0, species that can utilize a wide range of habitats for foraging on diverse prey sources were given a score of 1, and 5 was attributed to those species with limited habitat and/or prey flexibility. HF values provided by Willmott et al. (2013), based on marine birds in the AOCS, were used.

Where as, **DV = (MAd ± MAdu) + (HF ± HFu)**

Uncertainty

As there are information gaps for some species for some model inputs, uncertainty was estimated using methods proposed by Willmott et al. (2013) and Kelsey et al. (2018) (with the exception of EIu, which was derived as described in Exposure Scores above).

Model input scores were weighted as:

> 10% = 0.10 × 4 = 0.4; confidence in data presented in available literature
>
> 25% = 0.25 × 4 = 1.0; an element of uncertainty because of conflicting information
>
> 50% = 0.50 × 4 = 2.0; where no data are available and an assumption was made based on similar species

Upper and lower scores for relevant model factors were derived as

> Lower value = score - uncertainty value
>
> Upper value = score + uncertainty value

Final Vulnerability Scores

Minimal to high final vulnerability scores for PV, CV, and DV were based on calculated values compared to maximum possible values. Broken into quarters, anything less than 2.5 is Minimal, 2.5-5 is Low, 5-7.5 is Medium, and 7.5-10 is High. The best estimate for collision vulnerability and displacement vulnerability was upgraded, downgraded, or maintained based on the best estimate for population vulnerability: the final scores for CV or DV were upgraded to higher vulnerability when PV = 4 (high), alternatively final scores for CV or DV were downgraded to lower vulnerability for CV or DV when PV = 1 (minimal).

2.0 ASSESSMENT

Primary Information Sources

Table 2.1 lists the primary avian and bat information sources that inform the assessment of risk, including a summary of methods and how results were used in the assessment. Figure 2-1 and Figure 2-2 depict the locations of regional surveys in relation to the Project Area.

Primary avian data sources for assessing impacts at the Onshore Facilities and SRWEC–NYS include results of 2018 colonial marine bird and beach nesting bird surveys (Jennings 2018) and the New York State Breeding Bird Atlas 2000 to 2005 dataset (NYS BBA; NYS BBA 2007), as well as a New York Natural Heritage Program (NYNHP) Project-specific inquiry response letter dated March 27, 2020, and a USFWS Information for Planning and Consultation (IPaC) database inquiry response letter dated March 11, 2020.

Primary empirical avian data sources for assessing impacts at the SRWEC–OCS and SRWF include survey observation data compiled during the New York State Energy Research and Development Authority (NYSERDA) Remote Marine and Onshore Technology aerial avian surveys (Normandeau and APEM 2019), survey observation data compiled by National Oceanic and Atmospheric Administration (NOAA) National Centers for Coastal Ocean Science and prepared by the Marine-life Data and Analysis Team (MDAT; Curtice et al. 2019), and the following regional offshore avian studies that overlap with the Project Area: Bay State Wind vessel-based surveys (Bay State Wind 2019), Massachusetts Clean Energy Center (MassCEC) aerial surveys (Veit and Perkins 2014; Veit et al. 2016), Ocean Special Area Management Plan (OSAMP) vessel-based surveys and aerial surveys (Paton et al. 2010; Winiarski et al. 2012), regional tern and shorebird telemetry surveys (Loring et al. 2017a,b, 2018, 2019), and Block Island Wind Farm construction and post-construction acoustic avian surveys (Stantec 2016a, 2018b) (Figure 2-1). Note that the MassCEC and OSAMP data have been incorporated into the latest data layers of the MDAT dataset. Available empirical avian data sources provide information for the SRWF that is consistent with the requirements in BOEM’s 2020 Guidelines for Providing Avian Survey Information for Renewable Energy Development on the Outer Continental Shelf (BOEM 2020).

Primary data sources for assessing impacts to bats at the Onshore Facilities include the NYNHP Project-specific inquiry response letter dated March 27, 2020, and a USFWS IPaC database inquiry response letter dated March 11, 2020. The National Park Service (NPS) is coordinating an ongoing mist-netting and acoustic bat survey at FINS including the unit at the William Floyd Estate on Long Island (NPS 2018b).

The NYSDEC has been coordinating mist-netting and telemetry roost surveys for northern long-eared bat (NPS 2020; Stantec 2018c) and acoustic surveys at FINS (NPS 2020) (Figure 2-2).

While BOEM does not have similar guidelines to the Guidelines for Avian Survey Information for bats, the agency has recognized the potential for renewable energy projects to impact bats on the OCS. Primary empirical data sources for assessing impacts to bats at the SRWEC–NYS and SRWEC–OCS, and SRWF include vessel-based acoustic bat surveys. These vessel-based acoustic surveys were conducted within the SRWF and the nearby Revolution Wind and South Fork Wind project areas (Stantec 2018a; 2019a,b,c, 2020a,b,c). In addition, Block Island Wind Farm construction and post-construction acoustic bat surveys (Stantec 2016a, 2018b) and bat telemetry studies conducted from Martha's Vineyard (Dowling et al. 2017) were used.

Table 2.1 Primary Information Sources for Avian and Bat Risk Assessment

Data Source	Description	Applicability to Risk Assessment	Project Component
Avian			
New York State Breeding Bird Atlas 2000 to 2005 dataset (NYS BBA 2007)	Statewide, volunteer-based survey of distribution of breeding birds, most recent survey was 2000–2005. Surveys conducted in 3-mi x 3-mi (5-km x 5-km) blocks during breeding period to document breeding behaviors of species observed	Species occurrence	Onshore Facilities
NY Natural Heritage Program inquiry response 2020 (NYNHP 2020)	NYSDEC Natural Heritage Program maintains an ongoing inventory of mapped occurrences of RTE species in the state. NHP provides records of significant natural communities, plants, and wildlife including records of rare bats within 40 mi and rare birds within 10 mi.	Species occurrence	Onshore Facilities
IPaC inquiry response (USFWS 2020a)	The USFWS IPaC online tool provides a resource list and an official species list for endangered species, critical habitat, migratory birds, wildlife refuges, fish hatcheries, and wetlands under USFWS jurisdiction that may occur in an area of interest	Species occurrence	Onshore Facilities
2018 colonial waterbird and beach nesting bird surveys (Jennings 2018)	Results of annual state focal species nest monitoring	Species occurrence and use	Onshore Facilities

Table 2.1 Primary Information Sources for Avian and Bat Risk Assessment

Data Source	Description	Applicability to Risk Assessment	Project Component
NOAA National Centers for Coastal Ocean Science and prepared by the Marine-life Data and Analysis Team (MDAT; Curtice et al. 2019)	Seabird survey data 1978–2016 from Northwest Atlantic Seabird Catalog and the Eastern Canada Seabirds at Sea. Regional dataset extending from Florida to Maine and ranging 0.5–1.1 nm (0.6–1.3 mi) out to 200 nm (230 mi) from shore. Models of relative density (long-term average annual or seasonal estimates), demonstrating predicted abundance of a species in one area compared to other areas. Indices of density in 2 km x 2 km (1.1 nm x 1.1 nm) cells. Authors normalized individual species by their mean values so species were weighted equally, and they distinguished areas with no survey effort	Species exposure (annual relative density estimates for marine bird vulnerability model)	SRWF
Bay State Wind vessel-based surveys (Bay State Wind, 2019)	10 vessel-based surveys from late-May to mid-October 2017 (conducted surveys every 2 weeks when terns may be present in region)	Species occurrence and seasonal use; species flight height data	SRWF
Rhode Island OSAMP vessel-based and aerial surveys (Paton et al. 2010)	54 vessel-based transect surveys between June 10, 2009, and February 13, 2010; 10 aerial surveys between November 18, 2009, and February 22, 2010	Species occurrence and seasonal use; species flight height data (from vessel-based data only) (note dataset is included in MDAT data models)	SRWF
OSAMP aerial surveys (Winiarski et al. 2012)	41 aerial surveys from October 20, 2010, to July 22, 2012 (conducted surveys 3 times per month/14 total rounds per transect)	Species occurrence and seasonal use (note dataset is included in MDAT data models)	SRWF
MassCEC aerial surveys (Veit et al. 2016)	38 aerial surveys from November 22, 2011, and January 14, 2015 (average of 4 seasons per survey)	Seasonal occurrence information in the Project Area for annual exposure (note dataset is included in MDAT data models)	SRWF
USFWS and BOEM diving bird telemetry surveys (Spiegel et al. 2017)	Satellite telemetry tracking of red-throated loons, surf scoter, and northern gannet in federal waters off the mid-Atlantic (southern Long Island to southern North Carolina)	Species occurrence and seasonal use	SRWF
USFWS satellite telemetry survey for black scoter (Loring et al. 2014)	Satellite telemetry tracking of black scoters off the coast of southern New England	Species occurrence and seasonal use	SRWF

Table 2.1 Primary Information Sources for Avian and Bat Risk Assessment

Data Source	Description	Applicability to Risk Assessment	Project Component
USFWS and BOEM red knot telemetry surveys (Loring et al. 2018)	Very high frequency (VHF) transmitter tracking of red knots during fall migration from Cape Cod to Virginia	Species occurrence and seasonal use; species flight height data	SRWF
USFWS and BOEM piping plover and tern telemetry surveys (Loring et al. 2019)	VHF transmitter tracking of piping plovers and terns departing US Atlantic nesting areas from 2014 to 2017	Species occurrence and seasonal use; species flight height data.	SRWF
NYSERDA digital aerial surveys (Normandeau and APEM, 2019)	Digital aerial surveys from 2016 to 2019 covering the area off the coast of Long Island and New York City to the continental shelf	Species occurrence and seasonal use	SRWEC–OCS & NYS
Block Island Wind Farm construction and post-construction acoustic avian surveys (Stantec 2016a, 2018b)	Vessel-based (construction) and turbine-based (post-construction) acoustic bat survey	Species occurrence and seasonal use	SRWF
Bat			
National Park Services bat surveys at Fire Island National Seashore (NPS 2018b)	The NPS ongoing mist-netting and acoustic bat survey at the Fire Island National Seashore including the unit at the William Floyd Estate on Long Island	Species occurrence and seasonal use	Onshore Facilities
NYSDEC Long Island northern long-eared bat mist-netting and telemetry (Stantec 2018c)	July 2018 mist-netting, telemetry, and roost study on park lands in Suffolk County, Long Island. Closest location to Onshore Facilities was the survey work at Terrell River County Park, approximately 5 mi (8 km) east of the Onshore Transmission Cable	Species occurrence and seasonal use	Onshore Facilities
NY Natural Heritage Program inquiry response 2020 (NYNHP 2020)	NYSDEC Natural Heritage Program maintains an ongoing inventory of mapped occurrences of RTE species in the state. NHP provides records of significant natural communities, plants, and wildlife including records of rare bats within 40 mi and rare birds within 10 mi	Species occurrence	Onshore Facilities
Information for Planning and Consultation (IPaC) inquiry response (USFWS 2020a)	The USFWS IPaC online tool provides a resource list and an official species list for endangered species, critical habitat, migratory birds, wildlife refuges, fish hatcheries, and wetlands under USFWS jurisdiction that may occur in an area of interest.	Species occurrence	Onshore Facilities

Table 2.1 Primary Information Sources for Avian and Bat Risk Assessment

Data Source	Description	Applicability to Risk Assessment	Project Component
Vessel-based acoustic bat surveys at the SRWF, Revolution Wind, and South Fork (Stantec 2018a, 2019a,b,c, 2020a,b,c)	Opportunistic acoustic bat surveys conducted from geological and geophysical vessels in respective project areas	Species occurrence and seasonal use	SRWF
Block Island Wind Farm construction and post-construction acoustic bat surveys (Stantec 2016a, 2018b)	Vessel-based (construction) and turbine-based (post-construction) acoustic bat survey	Species occurrence and seasonal use	SRWF
Martha's Vineyard bat telemetry study (Dowling et al. 2017)	Late summer and early fall 2016 telemetry study to track northern long-eared bat and other species from island to investigate occurrence offshore	Species occurrence	SRWF

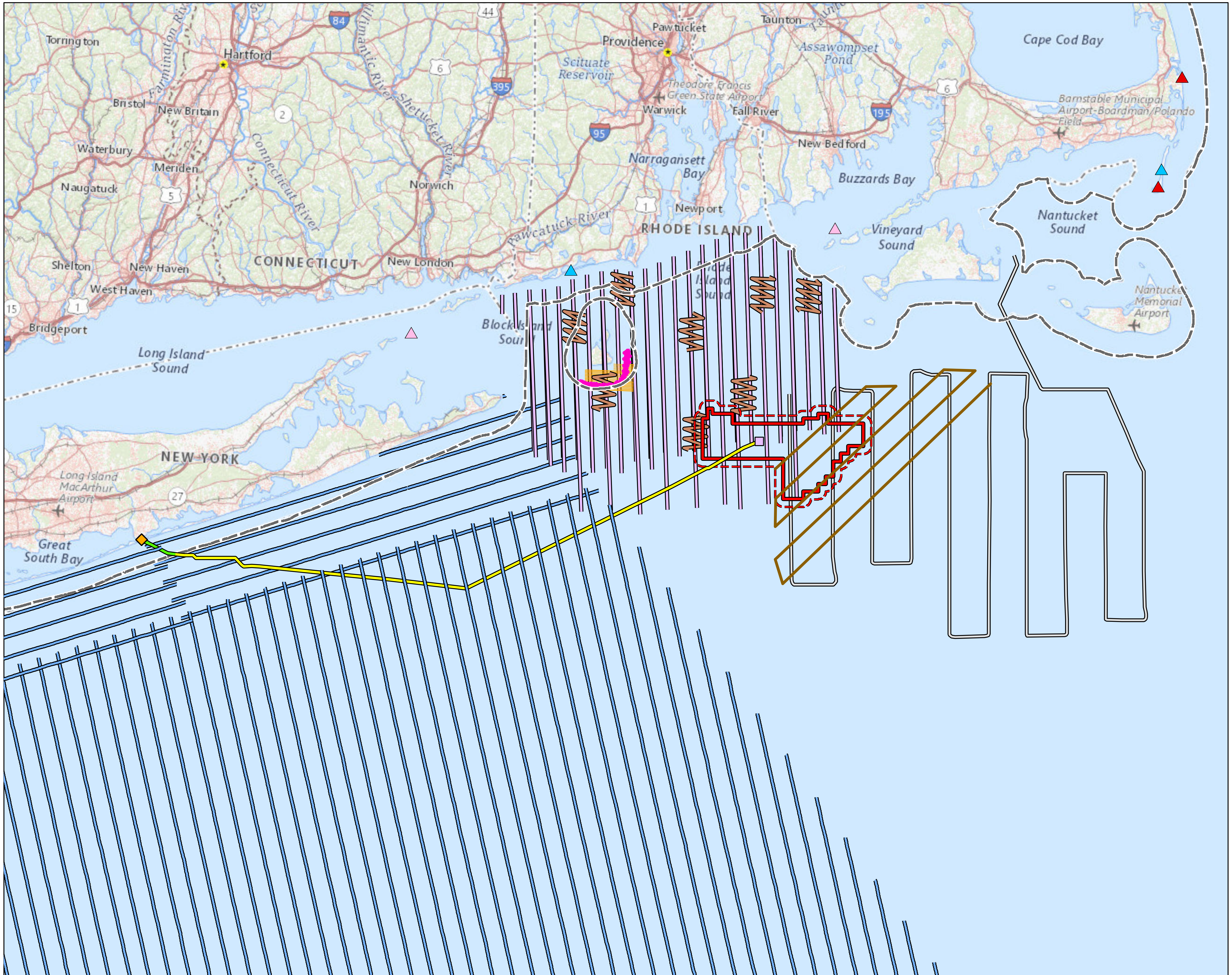


Figure 2-1
Regional Avian Studies

Sunrise Wind | Powered by Ørsted & Eversource

Legend

- Sunrise Wind Farm (SRWF)
- 1-nm from SRWF
- Offshore Converter Station (OCS–DC)
- SRWEC Landfall Location
- Sunrise Wind Export Cable (SRWEC–OCS)
- Sunrise Wind Export Cable (SRWEC–NYS)
- 3-nm State Waters Boundary
- BIWF Offshore Pre and Post Construction Boat-based Avian Surveys
- BIWF Offshore Aerial HD Video Surveys
- OSAMP Ship Surveys (July 2009–August 2010)
- OSAMP Aerial Surveys (December 2009–July 2012)
- NYSERDA OPA Digital Aerial Surveys (2016–2019)
- MassCEC Aerial Surveys (November 2011–January 2015)
- Bay State Wind Avian Ship Surveys (May 2017–October 2017)

BOEM Telemetry Studies

- Piping Plover Capture Location
- Roseate Tern Capture Location
- Red Knot Capture Location

Sources
Base Map: USGS The National Map

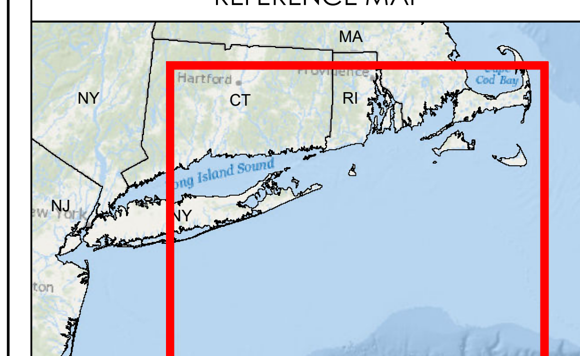
Date	09/01/2020 Revised: 12/18/2020
Project Number	2028113199
Prepared By	GC
Reviewed By	LJ

0 — 15 miles
0 — 15 nm
0 — 25 km

N

Scale at 11x17: 1:950,400
NAD 1983 2011 UTM Zone 19N

REFERENCE MAP



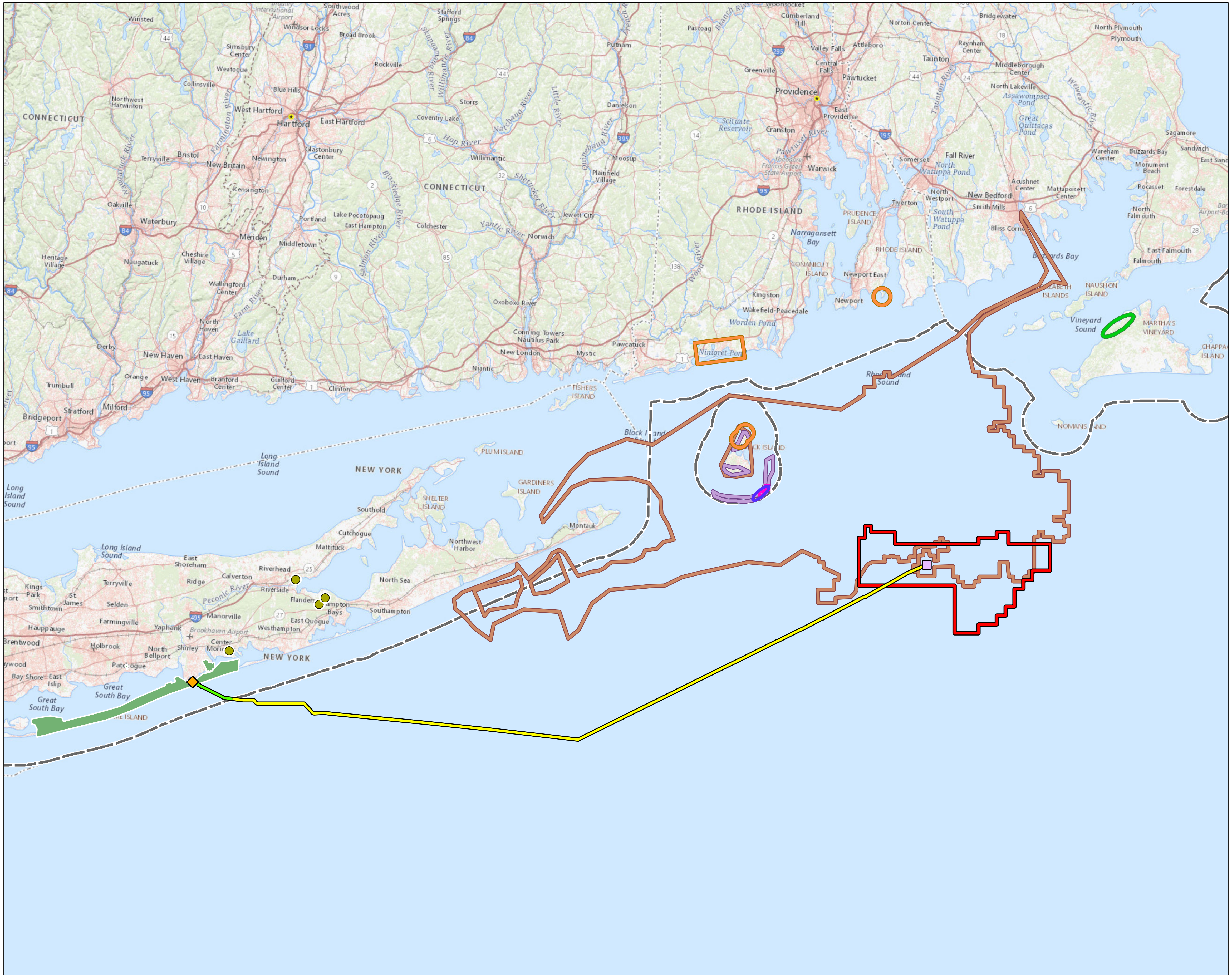


Figure 2-2
Regional Bat Studies

Sunrise Wind | Powered by Ørsted & Eversource

Legend

- Sunrise Wind Farm (SRWF)
- Offshore Converter Station (OCS–DC)
- SRWEC Landfall Location
- Sunrise Wind Export Cable (SRWEC–OCS)
- Sunrise Wind Export Cable (SRWEC–NYS)
- 3-nm State Waters Boundary
- NLEB Mist Netting Survey Location
- NPS Fire Island Bat Monitoring Project
- BIWF Post-construction Acoustic Surveys
- BIWF Construction Phase Vessel-based Acoustic Surveys
- OSAMP Acoustic Surveys
- BIWF Pre-construction Acoustic Surveys
- Martha's Vineyard Telemetry Study Capture Locations
- 2017-2019 Regional Vessel-Based Acoustic Bat Surveys

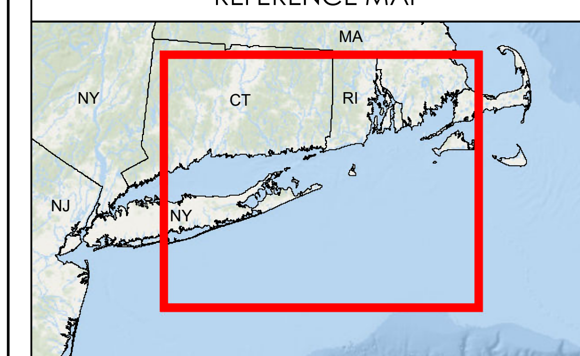
Sources
Base Map: USGS The National Map, SFWF: Stantec 2018, Stantec 2019a, b, c; SRWF: Stantec 2020a; Revolution Wind Stantec 2020b

Date	09/01/2020 Revised: 12/18/2020
Project Number	2028113199
Prepared By	GC
Reviewed By	LJ

0 — 10 miles
0 — 8 nm
0 — 16 km
N

Scale at 11x17: 1:800,000
NAD 1983 2011 UTM Zone 19N

REFERENCE MAP



V:\1956\active_Task Owner and other Non-BC1956 Jobs\2028113199\03_data\gis_cad\gis\MXDs\COP\Appendix Figures\Appendix_P_RiskAssessment\2028113199_2-2_BatStudies.mxd Revised: 2020-12-07 By: hturner

2.1 ONSHORE FACILITIES

The following sections discuss key risk factors and potential impacts to avian and bat species that may potentially occur within the Onshore Facilities. For the purpose of the analysis in the following sections, the Onshore Facilities include the portion of the SRWEC–NYS between mean high water line and the TJBs, the Landfall/ICW Work Areas, the Onshore Transmission Cable, the OnCS–DC, and the Onshore Interconnection Cable.

2.1.1 Avian

Key risk factors for avian species include seasonal occurrence, use, and vulnerable species likely to occur within the Onshore Facilities.

2.1.1.1 Key Factor 1: Seasonal Occurrence

Several avian species groups occur in in the intertidal, beach, terrestrial wetland, and upland habitats where the Onshore Facilities are sited, including shorebirds, wading birds, and passerines and other land birds. Shorebirds, terns, gulls, and cormorants may occur in the intertidal and beach habitats of Fire Island, Great South Bay, Narrow Bay, and Bellport Bay in the vicinity of the Landfall/ICW Work Area. The Onshore Transmission Cable and Onshore Interconnection Cable is mainly sited in areas of medium to high density development; however, it does run adjacent to patches of mixed forest, field, emergent and woody wetland habitats where wading birds, passerines, and raptors may occur (Table 2.2). The OnCS–DC occurs in a developed area but contains or is adjacent to mixed forest habitat.

Some species within the groups listed in Table 2.2 are year-round residents such as several species of gulls (e.g., herring gull) and some passerines (e.g., black-capped chickadee, American crow) and other land birds (e.g., red-tailed hawk, ruffed grouse); many species within these groups such as shorebirds (e.g., American oystercatcher, piping plover), terns (e.g., common tern, least tern, roseate tern), and most passerine species (e.g., warblers, thrushes, sparrows) are only present during the breeding and migratory seasons; while other species within these groups are primarily present in the winter including some species of shorebirds (e.g., sanderling, ruddy turnstone) and some species of gull (e.g., black-legged kittiwake and Bonaparte's gull) (Table 2.2).

Table 2.2 Timing, Distribution, and General Abundance of Avian Species Groups Likely to Occur within or Proximate to the Onshore Facilities

Taxonomic Group/Species[1]	Seasonal Use	Primary Habitat (beach/intertidal, terrestrial wetland, upland)	General Abundance[2]
shorebirds	summer breeding, migrant, winter resident	beach/intertidal	common
wading birds	summer breeding, migrant, winter resident	beach/intertidal, terrestrial wetland	common
gulls	summer breeding, migrant, winter resident	beach/intertidal	abundant
terns	summer breeding, migrant	beach/intertidal	common
passerines	summer breeding, migrant, winter resident	upland, terrestrial wetland	abundant
raptors	summer breeding, migrant, winter resident	upland (except osprey, primary habitat is beach/ intertidal, and terrestrial wetland)	common

NOTES:

[1] Source: New York State Breeding Bird Atlas, 2000–2005 (NYS BBA 2007).

[2] Abundant = occurring regularly in greater numbers relative to other species during given season(s); Common = occurring regularly during given season(s); Occasional = occurring infrequently during given season(s); Uncommon = occurring very infrequently in given season(s), may occur sporadically; Rare = very seldom occurring.

2.1.1.2 Key Factor 2: Use

Bird use within the Onshore Facilities includes foraging, breeding, and loafing/roosting. Shorebirds will forage in the intertidal zones of beaches for invertebrates, small crustaceans, bivalve mollusks, small polychaete worms, insects, and talitrid amphipods (Macwhirter et al. 2002). Terns and related species, and cormorants will forage over shallow waters and sandspits near shore for small prey fish (Nisbet et al. 2017; Dorr et al. 2020). Gulls may feed on small fish and invertebrates in intertidal and beach habitats (Nisbet et al. 2020b).

Some species of shorebirds may use beach habitats of Fire Island for breeding; other shorebirds, terns, gulls and cormorants may use beach habitats for loafing/roosting. Potential habitats adjacent to the Onshore Facilities include marsh and terrestrial wetlands where wading birds may occur; and riparian zones, residential, woodland, small fields, and other upland habitats where passerines and raptors may occur. Terrestrial wetlands and upland habitats may be used for foraging, breeding, and roosting by wading birds, raptors, passerines and other land birds. Most of the Onshore Transmission Cable, Onshore Interconnection Cable, and OnCS–DC occur adjacent to marginal or unsuitable habitat for breeding birds (Stantec 2020d). And, while not breeding in beach or coastal habitats where the SRWEC will make landfall, there are a variety of other bird groups such as gulls and cormorants that may use habitats proximate to the Onshore Facilities for roosting and/or foraging.

2.1.1.3 Key Factor 3: Vulnerable Species

There is no designated Critical Habitat for any ESA-listed species within components of the Onshore Facilities (USFWS 2020a). The Official Species List generated from the IPaC database as well as the NYNHP response letter indicated that federally-listed piping plover, red knot, and roseate tern have the potential to occur in the Project Area (USFWS 2020a; NYNHP 2020), and all three species have the potential to utilize beach or other coastal habitats adjacent to the Onshore Facilities. Table 2.3 lists the species of conservation concern observed within NYS BBA survey blocks (NYS BBA 2007) that overlap with Onshore Facilities.

Table 2.3 Species of Conservation Concern Observed within New York State Breeding Bird Atlas Survey Blocks that Overlap with Onshore Facilities

Species	Scientific Name	Status[1]	Location
black skimmer	*Rynchops niger*	SSC, BCC	predominantly on shoreline, observed at or near Smith Point Park and Fire Island
common tern	*Sterna hirundo*	ST, SGCN	predominantly on shoreline, observed at or near Smith Point Park and Fire Island
Cooper's hawk	*Accipiter cooperii*	SSC	predominantly inland, observed at or near Smith Point Park and Fire Island
grasshopper sparrow	*Ammodramus savannarum*	SSC, SGCN-HP	inland near waterbody
horned lark	*Eremophila alpestris*	SSC, SGCN-HP	inland near waterbody
least tern	*Sternula antillarum*	ST, SGCN, BCC	predominantly onshore, observed at or near Smith Point Park and Fire Island
northern harrier	*Circus cyaneus*	ST, SGCN	predominantly inland, but also onshore, including Smith Point Park and Fire Island
osprey	*Pandion haliaetus*	SSC	inland near waterbody and on shoreline, observed at or near Smith Point Park, Bellport Marina, and Fire Island
pied-billed grebe	*Podilymbus podiceps*	ST, BCC, SGCN	inland near waterbody, on shoreline near Bellport Marina
piping plover	*Charadrius melodus*	FT, SE, SGCN-HP	observed at or near Smith Point Park and Fire Island
red-headed woodpecker	*Melanerpes erythrocephalus*	SSC, BCC, SGCN-HP	inland

Table 2.3 Species of Conservation Concern Observed within New York State Breeding Bird Atlas Survey Blocks that Overlap with Onshore Facilities

Species	Scientific Name	Status[1]	Location
seaside sparrow	*Ammodramus maritimus*	SSC, BCC, SGCN-HP	inland near waterbody and on shoreline, observed at or near Smith Point Park and Fire Island
whip-poor-will	*Antrostomus vociferus*	SSC, SGCN-HP	predominantly inland, also on shoreline, observed at or near Smith Point Park and Fire Island

SOURCE:
New York State Breeding Bird Atlas, 2000–2005 (NYS BBA 2007).
NOTE:
[1]Status: FE = Federally Endangered, FT = Federally Threatened, SE = State Endangered, ST = State Threatened, SSC = State Species of Special Concern, SGCN = State Species of Greatest Conservation Need, SGCN-HP = High Priority State Species of Greatest Conservation Need, BCC = USFWS Bird of Conservation Concern for Region 30.

Piping plover

The piping plover Atlantic subspecies is listed as Threatened under the ESA (Elliott-Smith and Haig 2004), listed as State Endangered in New York (NYSDEC 2015c), and State Threatened in Massachusetts (MDFW 2015a). This species of shorebird nests above the high tide line and below dunes on sandy beaches and spoil banks along the Atlantic east coast and winters along the Atlantic southeast coast and the Caribbean (Elliott-Smith and Haig 2004; USFWS 2009; BOEM 2014). Piping plover are present in the region from March through September, and nest on beaches on Long Island from April through August (NYSDEC 2015c). Results of the 2018 Long Island colonial waterbird surveys found 82 active piping plover breeding sites and 404 breeding pairs along the coast and barrier islands (Jennings 2018). Fire Island at Smith Point County Park had 25 breeding pairs of piping plover in 2018 (Jennings 2018). The piping plover has also been documented as nesting within the Great South Bay area (NYSERDA 2017b)

Red Knot

The Atlantic flyway subspecies of red knot is listed as Threatened under the ESA (USFWS 2019b), State Threatened in New York (NYSDEC 2015e), and State Threatened in Massachusetts (MDFW 2020). This species of shorebird undertakes long distance migratory flights (up to 5,000 mi [8,000 km]; Baker et al. 2013) between breeding grounds in the Arctic and wintering grounds in the southeastern US, Caribbean, Northern Brazil, and Tierra del Fuego–Argentina (Baker et al. 2013). The red knot may be present along the East Coast including New York, Rhode Island, and Massachusetts, during spring and fall migratory periods (NYSERDA 2017a); the subspecies' primary stopover during spring migration is Delaware Bay (Niles et al. 2009). Red knots may stopover to forage in salt meadows and mudflats of the South Shore of Long Island (NYSDEC 2015e; Burger et al. 2012) and may stopover to forage in intertidal areas and roost on beach habitats near the Landfall/ICW Work Area at Smith Point.

Roseate Tern

The Northwest Atlantic population of roseate tern is listed as Endangered under the ESA, State Endangered in New York (NYSDEC 2015a), State Endangered in Massachusetts (MDFW 2015b), and State Historical in Rhode Island; however, the last documented occurrence was in 1979 (RINHP 2006). This species of seabird breeds in colonies on coastal islands of the northeastern Atlantic Coast and Atlantic Canada, and winters in South America (USFWS 2010b; Nisbet et al. 2020a). Ninety percent of the roseate tern population breeds in the Cape Cod-Long Island area on rocky coastal islands, outer beaches, or salt marsh islands with protective vegetation to conceal nests (Veit and Petersen 1993; USFWS 2001). On Long Island, most breeding pairs nest on Great Gull Island (NYSDEC 2015b; Jennings 2018; NYSERDA 2017a), which is located off the eastern end of the North Fork of Long Island. Results of the 2018 Long Island colonial seabird surveys found over 2,000 roseate tern breeding pairs on Great Gull Island (Jennings 2018), approximately 48 mi (42 nm, 77 km) east-northeast of Smith Point Park. Roseate terns have historically nested along the barrier beach at FINS (NYSERDA 2017b), and potentially in the vicinity of the cable landfall location at Smith Point County Park (NPS 2018a; Peters 2008), and they may forage over shallow waters or loaf in the area. Fire Island Inlet, approximately 25 mi (22 nm, 40 km) west-southwest of Smith Point County Park, has also provided important foraging habitat (Peters 2008).

State Listed Species

Colonial seabird and piping plover surveys on coastal Long Island also reported active breeding sites for least tern (state threatened), common tern, Forster's tern (*Sterna forsteri*), black skimmer (*Rynchops niger*, state Special Concern), and gull-billed tern (*Gelochelidon nilotica*, state species of Greatest Conservation Need) (Jennings 2018). Each of these species has the potential to utilize resources at or adjacent to the Onshore Facilities, by means of foraging, nesting, or migrating through the area. During the April 24, 2020 call with NYSDEC and USFWS, NYSDEC indicated that terns have historically nested on dredged material adjacent to the Smith Point Marina parking lot.

The NYS BBA 2000-2005 survey results indicate that the state threatened northern harrier (*Circus cyaneus*) and pied-billed grebe (*Podilymbus podiceps*) may breed at locations in the vicinity of the Onshore Transmission Cable/Interconnection Cable (NYS BBA 2007). Northern harrier may also occur along the shoreline to hunt for avian and rodent prey (Smith et al. 2020).

2.1.1.4 Potential Impacts

The following sections address potential impacts to avian species during construction and O&M phases of the Project.

Construction

Land Disturbance

Potential direct impacts to avian species resulting from land disturbance generated by construction of the Onshore Facilities include habitat loss and potential direct mortality/injury of individuals. Habitat loss is defined as when an area previously supporting wildlife is converted to non-habitat that lacks the natural resources to support occupancy by any species, such as paved areas.

OnCS–DC:

The OnCS–DC construction in the Town of Brookhaven will result in land disturbance and minimal tree clearing. The Union Avenue Site is primarily a developed industrial/commercial site with small narrow rows of trees along parcel boundaries; minimal vegetation clearing would be required at this location (Stantec 2020d). Sunrise Wind will use mechanical clearing methods for the construction of the Project and does not intend to use any herbicides/pesticides during the construction phase and thus direct (potential exposure to toxins) and indirect (potential impacts to habitat) impacts to birds related to herbicides/pesticides will be avoided during construction.

Onshore Transmission Cable/Interconnection Cable Route:

The Onshore Transmission Route/Interconnection Cable is generally located within the paved portion of existing roadway or utility-owned or controlled property and previously disturbed and developed areas to the extent practicable to minimize impacts to natural locations. The duct bank for the Onshore Transmission Cable will be installed via open trench excavation for the majority of the Cable. Terrestrial land cover types adjacent to the Onshore Transmission Cable mainly consists of developed residential or industrial land uses, with the exception of forested wetlands and waterways at the Carmans River crossing (Stantec 2020d). The Project will utilize trenchless crossing installation to avoid sensitive environmental resources or other physical obstructions (i.e., railroads) at certain crossing locations. The use of trenchless crossings for installation of portions of the Onshore Transmission Cable/Interconnection Cable, such as in the vicinity of the Carmans River, will minimize impacts to terrestrial habitats.

Landfall/ICW Work Area:

Coastal habitats associated with the Landfall/ICW Work Area on Fire Island include foreshore, backshore, dune, and interdunal areas (Stantec 2020d). The Landfall Work Area occupies a portion of the parking lot at Smith Point County Park on Fire Island, an approximately 425-acre (172-ha) public beach and recreation area.

The work spaces at the Landfall/ICW Work Area at Smith Point County Park and Smith Point Marina will be located within paved areas of the parking lots or open land used for recreational activities. The use of horizontal directional drilling (HDD) for installation will minimize impacts to onshore habitats.

Vegetation clearing and grading required for the Landfall/ICW Work Area at Smith Point is not expected to alter beach habitat utilized by shorebirds and other species including terns, because most activity will occur within an existing parking lot or open land utilized by the park for recreational purposes.

There will be no direct impacts to intertidal and beach areas during installation of the Landfall HDD and ICW HDD. HDD conduit stringing may occur on Burma Road within Smith Point County Park; this action would require welding and short-term placement (i.e., two to three weeks per duct) of assembled HDD conduit sections on Burma Road between December and March, outside of the nesting period for shorebirds, before the duct is maneuvered offshore and installed via HDD. If work is anticipated to occur outside of these time of year restriction periods, Sunrise Wind will work with state and federal agencies to develop construction monitoring and impact minimization plans or mitigation plans, as appropriate.

Temporary Landfall/Staging Areas:

Early successional habitat in the temporary workspace and access locations will initially revegetate as a grass/forb and herbaceous cover, then will gradually transition to shrub and sapling cover. Habitat loss will be minimal in the Town of Brookhaven area because in addition to forested areas, the baseline habitat conditions of this general area include developed residential areas, mowed lawns, parking lots, roads, and commercial and industrial areas.

All Onshore Facilities:

Land disturbance from construction of the Onshore Facilities may result in the direct injury or mortality of avian species. Mobile individuals (e.g., adults and fledglings) are able to temporarily vacate an area of disturbance and, therefore, are less susceptible to mortality or injury compared to less mobile stages including eggs and nestlings. Direct mortality and injury would only occur during the construction phase. Construction of the OnCS–DC, Onshore Transmission Cable, and Onshore Interconnection Cable is expected to result in approximately 2.3 acres (0.9 ha) of permanent tree clearing. Sunrise Wind will use mechanical clearing methods for the construction of the Project and does not intend to use any herbicides/pesticides during the construction phase and thus direct (potential exposure to toxins) and indirect (potential impacts to habitat) impacts to birds related to herbicides/pesticides will be avoided during construction.

Time of year restrictions for certain work activities (e.g., HDD conduit stringing and tree removal) and adherence to other protective measures for avian habitat, will be employed to the extent feasible to avoid or minimize direct impacts to terrestrial habitat and RTE species during construction of the Onshore Facilities. If work is anticipated to occur outside of these time of year restriction periods, Sunrise Wind will work with state and federal agencies to develop construction monitoring and impact minimization plans or mitigation plans, as appropriate.

The amount of habitat loss is small relative to the amount of similar habitat that will remain unimpacted in the general region. Sunrise Wind will comply with state and federal regulations, and the Project's Invasive Species Management Plan (ISMP), to manage the spread of invasive plant species. Therefore, there may only be minimal impacts associated with land disturbance during construction.

Sediment Suspension and Disposition

Some minimal seafloor disturbance would occur along the northern shoreline of Smith Point County Park from the spuds, piles or anchors of the temporary landing structure itself as well as the spuds from the barge as it arrives to offload equipment. However, this would be a temporary impact and considered a minimal impact to foraging birds, if present, and limited to the periods when these activities are actively taking place.

There will be no direct impacts to intertidal and beach areas during installation of the Landfall HDD and ICW HDD. Resulting sediment suspension and disposition may cause disturbances to the benthic and intertidal areas that could potentially indirectly impact birds that forage in the nearshore area by temporarily displacing prey (i.e., invertebrates preyed on by shorebirds, and small fish preyed on by terns) and/or reducing visibility and inhibiting prey detection (Gill 2005). Potential indirect effects on prey species are expected to be temporary and limited to a small area around work activities, and birds will likely only need to fly a short distance to find alternative prey sources in similar adjacent habitats.

The Project will utilize trenchless crossing installation to avoid sensitive environmental resources at certain crossing locations, which will avoid direct impacts to surface waters and wetlands. Any sediment impacts to waterbodies crossed at the ICW are, therefore, expected to be temporary, with the habitat returning to pre-existing conditions after construction activities cease.

Best management practices (BMPs) will be in place to minimize the opportunity for turbid discharges to leave construction work areas. Sediment suspension and deposition for the Landfall HDD/ICW HDD are expected to occur only during construction activities and are considered short-term and **minimal.**

Noise

Construction activities at the Onshore Facilities that will temporarily increase ambient noise will include use of equipment for HDD and trenchless crossings installation, trenching, cable pulling, and typical construction vehicles (e.g., excavators, dump trucks, and paving equipment). Construction activities will occur along the Onshore Transmission Cable and Onshore Interconnection Cable during both daytime and nighttime periods.

HDD activities for the Landfall HDD and ICW HDD at the Landfall and ICW Work Area will generate noise and vibrations that could disturb shorebirds. Piping plovers and red knots are among species sensitive to disturbances and may flush in response (USFWS 1996; Peters and Otis 2007). Construction activities at the Landfall HDD and ICW HDD Work Areas are expected to be completed outside of the nesting period for shorebirds.

Noise and vibrations associated with the operation of equipment for HDD or limited vegetation removal along the Onshore Transmission Cable and Onshore Interconnection Cable may temporarily displace land birds. Noise generated by construction has the potential to flush land birds and may also ‘mask’ bird calls potentially reducing the ability of birds to forage, communicate, or detect predators (Ortega 2012; Bottalico et al. 2015). These effects could potentially lead to decreased breeding success. However, infrastructure associated with the Onshore Facilities will generally be sited within previously disturbed and developed areas, and noise disturbances will be limited to construction periods. Time of year restrictions for certain work activities (e.g., HDD conduit stringing and tree removal) during the avian nesting period, and adherence to other protective measures for avian habitat identified, will be employed to the extent feasible to avoid and minimize direct species impacts during construction of the Onshore Facilities. If work is anticipated to occur outside of these time of year restriction periods, Sunrise Wind will work with state and federal agencies to develop construction monitoring and impact minimization plans or mitigation plans, as appropriate. Therefore, impacts associated with noise are considered short-term and **minimal.**

Traffic

Traffic from construction vehicles (e.g., excavators, dump trucks, and paving equipment) will occur during construction of the Onshore Facilities. Potential direct impacts to land bird species from traffic include collisions with construction equipment or loss of nests. Traffic may also result in indirect effects such as displacement of land birds from construction areas, or disruption of normal behaviors within the vicinity of construction activities. However, due to adherence of time of year restrictions to the extent possible for vegetation clearing for RTE species, which will overlap with the breeding period for land birds, as well as the siting of the Onshore Transmission Cable and Onshore Interconnection Cable along public roadways where there is a lack of suitable habitat for many land bird species, direct and indirect impacts to birds due to traffic will be **minimal**.

Visible Infrastructure

Visible infrastructure during construction of the Onshore Facilities will include the temporary landing structure which may be installed at Smith Point County Park, other construction equipment, and the OnCS–DC. Birds are expected to avoid collisions with stationary structures during periods of good visibility but may be at risk of collision at night (particularly when disoriented by lighting, as described below). In very rare cases, birds may be at risk of collision with moving construction equipment. However, the potential for impacts associated with collision with visible infrastructure during construction is minimal. In very rare cases, birds may be at risk of collision with moving construction equipment. Impacts associated with collision risk with visible structures is considered short-term and **minimal**.

The temporary landing structure may also displace migratory shorebirds and wading birds from foraging within the intertidal areas within its footprint. However, this would be a temporary impact and considered a minimal loss of potential foraging habitat limited to the period when the landing structure may be present.

Lighting

Temporary lighting on construction equipment and the OnCS–DC during certain phases of construction may be needed. Nighttime lighting on construction equipment during specialized construction activities (i.e., HDD) facilities may attract birds at night, particularly during periods of low visibility, and indirectly result in collision mortality or injury. However, nighttime lighting will be limited to the minimal required for safety. As construction activities will largely occur during daylight hours and will be short-term, potential impacts are considered **minimal**.

Discharges and Releases

Accidental discharges, releases, and improper disposal of wastes could indirectly impact birds (e.g., ingestion of toxins could reduce survival). However, as described in Section 3.0, BMPs and an Inadvertent Return Plan will be in place during construction of the Onshore Facilities to minimize the potential risks associated with an accidental drilling fluid return/release and other discharges/releases. Therefore, indirect impacts associated with discharges and releases during construction are considered short-term and **minimal**.

Trash and Debris

Accidental disposal of trash into the habitat surrounding the construction site represents a risk to birds as they could potentially ingest or become entangled in debris. However, all solid and liquid trash and debris will be stored in designated receptacles and will be disposed of at an appropriate facility. Therefore, potential indirect impacts associated with trash and debris are considered short-term and **minimal**.

Summary of Construction Impacts at Onshore Facilities

As outlined in Table 2.4, impacts during construction activities to shorebirds and land birds, including RTE species, will largely be avoided (**minimal**) due to the time of year restrictions for construction activities with potential to impact listed species and BMPs that will be in place.

Table 2.4 Impact Producing Factors and Potential Levels of Impact on Avian Species from the Onshore Facilities during Construction

IPF	Project Activity	Potential Impact
Land Disturbance	Vegetation clearing and grading, Construction at Landfall/ICW Work Area, Cable Installation, OnCS–DC Construction	Direct mortality or indirect displacement, short-term, minimal
Sediment Suspension and Deposition	SRWEC–NYS connection to Landfall and ICW Work Area, Construction of Onshore Facilities	Indirect displacement/disturbance, short-term, minimal
Noise	Construction-related noise	Indirect displacement, short-term, minimal
Traffic	Construction-related traffic	Indirect displacement, short-term, minimal
Visible Infrastructure	OnCS–DC and construction equipment	Direct mortality or injury/indirect displacement, short-term, minimal
Lighting	OnCS–DC and construction equipment	Direct mortality or injury/indirect displacement, short-term, minimal
Discharges and Releases	General construction activities	Direct mortality or injury/indirect disturbance (reduced fitness), short-term, minimal
Trash and Debris	General construction activities	Direct mortality, short-term, minimal

Operations and Maintenance

Land Disturbance

The vegetation management requirements for the Project during operations and maintenance are expected to be minimal, as the majority of the Onshore Facilities have been sited within the paved portion of existing roadway or maintained utility-owned or controlled property. Integrated Vegetation Management (IVM) practices may include manual cutting, mowing and the prescriptive use of federally-approved and state-registered herbicides to eliminate targeted plant species within the ROW. Sunrise Wind does not intend to use pesticides during operation of the Project. Herbicides would be applied, using federally-approved, NYS-listed herbicides, following all NYS and local regulations and label restrictions; therefore direct (potential exposure to toxins) and indirect (potential impacts to habitat) impacts to birds related to herbicide use during operations and maintenance is expected to be minimal.

Noise

During O&M, the proposed OnCS–DC will introduce new sources of sound including transformers, shunt reactors, harmonic filters, and cooling and ventilation associated with the outdoor converter station equipment, as well as condensers, pumps, skids and auxiliary transformers associated with the synchronous condenser building. Anthropogenic sources of noise can have negative impacts on fitness and breeding success of land birds (Kleist et al. 2018). Other sources of temporary noise may occasionally be generated during routine and non-routine maintenance activities (i.e., use of maintenance vehicles or equipment). In such cases, short-term displacement of land birds may occur due to disruptions caused by noise. However, the OnCS–DC are sited in an already developed area and sources of noise during O&M are expected to be comparable to general commercial and industrial activities already occurring in the area. Therefore, potential impacts associated with O&M noise are considered short-term and **minimal**.

Traffic

Temporary traffic (i.e., maintenance vehicles) may occasionally be generated for routine and non-routine maintenance activities. In such cases, short-term displacement of land birds may occur due to disruptions caused by traffic. Additionally, in very rare cases, birds may be at risk of collision with moving vehicles. However, due to the short-term nature of maintenance activities, impacts associated with displacement or collision due to temporary maintenance traffic is considered short-term and **minimal**.

Visible Infrastructure

The presence of the OnCS–DC may pose risk of mortality or injury to land birds due to collision with the OnCS–DC. These risks will exist throughout the O&M phase of the Project. However, birds outside of migration are mainly diurnal and would be able to visually detect OnCS–DC structures during the day. Therefore, collision risk with OnCS–DC structures is expected to be **low** due to minimization of nighttime lighting as explained below. The Onshore Transmission Cable and Onshore Interconnection Cable will be underground, thereby eliminating collision risk of land birds with overhead lines.

Lighting

The presence of the OnCS–DC and the use of infrequent nighttime lighting may pose risk of mortality or injury due to collision with the OnCS–DC. Nighttime lighting, particularly during periods of inclement weather during migration could serve as an attractant to disoriented birds and increase their risk of collision with OnCS–DC infrastructure. These risks will exist throughout the O&M phase of the Project. However, as described in Section 3.0, nighttime lighting at the OnCS–DC will be limited to periods when O&M activities are occurring and is expected to be infrequent. The level of lighting is anticipated to be consistent with other adjacent commercial and industrial properties located in the immediate area. Therefore, collision risk due to lighting at the OnCS–DC is expected to be **minimal** due to minimization of nighttime lighting.

Discharges and Releases

As described above in the construction section, accidental discharges, releases, and disposal during routine and non-routine maintenance activities at the OnCS–DC and other Onshore Facilities could indirectly affect land birds. Short-term, routine and non-routine maintenance activities of the OnCS–DC and Onshore Transmission Cable/Interconnection Cable may result in accidental discharges and releases. However, risks will be mitigated through implementation of the spill prevention and control measures and associated BMPs. Therefore, potential discharges and releases associated with the O&M of the Onshore Facilities are considered long-term but **minimal**.

Summary of O&M Impacts at Onshore Facilities

As outlined in Table 2.5, impacts during O&M activities to land birds will largely be avoided due to the short-term nature of maintenance activities as well as the BMPs that will be in place.

Table 2.5 Impact Producing Factors and Potential Levels of Impact on Avian Species from the Onshore Facilities during Operations and Maintenance

IPF	Project Activity	Potential Impact
Noise	O&M-related noise (OnCS–DC)	Indirect displacement, short-term and long-term, minimal
Traffic	Maintenance-related traffic	Indirect displacement, short-term, minimal
Visible Infrastructure	OnCS–DC structures	Direct mortality, short-term, minimal
Lighting	OnCS–DC nighttime safety lighting, general maintenance activities	Direct mortality, short-term, low
Discharges and Releases	Accidental discharge and release during maintenance activities	Direct mortality, short-term, minimal

2.1.2 Bats

Key risk factors for bat species include seasonal occurrence, use, and vulnerable species likely to occur within the Onshore Facilities.

2.1.2.1 Key Factor 1: Seasonal Occurrence

Bats are active/present in the region generally April through October. In the late-summer and fall, cave-hibernating bats disperse from summer habitat to winter hibernacula (generally caves or abandoned mines) while migratory tree bats migrate longer distances to overwinter in the milder climates of southern states, often along the coast (BCI 2001). The NYNHP typically screens projects for bat hibernacula out to 40 mi (64.4 km) and there were no hibernacula occurrences reported in the NYNHP Project-specific inquiry response letter (NYNHP 2020).

Summer roosting habitat is typically occupied from mid-May through mid-August each year; the pup-rearing season (i.e., when young raised by females in maternity roosts) extends from early May through the end of July (Kunz 1982; Shump and Shump 1982a,b).

2.1.2.2 Key Factor 2: Use

Both cave-dwelling and migratory groups of bats use forested habitats for roosting, and forest edge and open habitats for nocturnal foraging for insect prey (BCI 2001). There are several fragmented forested locations in the vicinity of the Onshore Transmission Cable that provide potentially suitable summer habitat for bats, including the forested swamp areas along the Carmans River and partially forested areas near the OnCS–DC (Stantec 2020d).

Other species of bats, including other cave-hibernating and tree roosting bats, will also use forested habitats for roosting and/or foraging, and cave-hibernating species such as big brown bats, little brown bats, and tri-colored bats will also roost in man-made structures such as attics or barns (BCI 2001).

The NPS is coordinating an ongoing mist-netting and acoustic bat survey at the FINS including the unit at the William Floyd Estate on Long Island, which is within 2 mi (3.2 km) of the Onshore Transmission Cable and 2.5 mi (4 km) of the Landfall/ICW Work Area. As of 2017, seven species of bats have been detected on FINS and at the William Floyd Estate, including both cave-dwelling (big brown bat, eastern small-footed bat, northern long-eared bat, and tri-colored bat) and migratory bats (eastern red bat, hoary bat, and silver-haired bat) (NPS 2018b; NPS 2020).

2.1.2.3 Key Factor 3: Vulnerable Species

Terrestrial habitats in the vicinity of Onshore Facilities may provide summer roosting, pup-rearing and foraging habitat for bats, including species such as big brown bats, little brown bats, and tri-colored bats; these species will also roost in man-made structures such as attics or barns (BCI 2001). The pup-rearing season for these species of bats is typically May through July (Kunz 1982; Shump and Shump 1982a, 1982b) but may be longer in this region based on discussions with NYSDEC. Terrestrial habitats associated with the Onshore Facilities may provide summer roosting, pup-rearing (i.e., caring for young), and foraging habitat for the state and federally threatened northern long-eared bat. According to the most recent (2020) USFWS Summer Bat Survey Guidelines (Guidelines), suitable summer habitat for northern long-eared bat consists of a wide variety of forest types where they roost, forage, and travel, and may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields, and pastures (USFWS 2020a).

There are several fragmented forested locations within the corridor for the Onshore Facilities that may provide summer habitat for bats, including the forested swamp areas along the Carmans River and forested areas along Victory Avenue and Horseblock Road and north of Union Avenue. The summer roosting habitat for northern long-eared bats is typically occupied from mid-May through mid-August each year; the pup-rearing season (i.e., when young raised by females in maternity roosts) extends from early June through the end of July (USFWS 2020b).

The NYNHP identified presence of the northern long-eared bat, specifically maternity roosts and other summer locations, at several locations within 0.5 mi (0.8 km) of the Onshore Transmission Cable and additional locations within 1.5 mi (2.4 km) (NYNHP 2020). According to the NYNHP, individuals may travel 1.5 mi (2.4 km) or more from documented roost locations (NYNHP 2020). The official species list generated from the IPaC database also indicated that northern long-eared bat has the potential to occur in proximity to the Onshore Facilities (USFWS 2020a). As a follow-up to an April 24, 2020 meeting, NYSDEC indicated that several areas along the Onshore Transmission Cable route have acoustic detections for northern long-eared bat and there are roost trees documented within the Wertheim National Wildlife Refuge (K. Gaidasz, NYSDEC, email comm.), which is located to the south of the Onshore Transmission Cable and is approximately 1 mi (0.9 nm, 1.6 km) from the Landfall Work Area. No critical habitat exists in the vicinity of the Onshore Facilities as critical habitat has not been designated for northern long-eared bat (USFWS 2020a). There are no known hibernacula sites in the vicinity of the Project (NYNHP 2020).

During a July 2018 mist-netting, telemetry, and roost study on park lands in Suffolk County, Long Island, the closest location to the Onshore Facilities was the Terrell River County Park, approximately 5 mi (8 km) east of the Onshore Transmission Cable (Stantec 2018c). At this study location, big brown bats and eastern red bats were the two species captured (Stantec 2018c). Of the four study locations, northern long-eared bats (n=2) were only captured at Indian Island County Park, approximately 17 mi (27 km) east of the Onshore Facilities, where they were tracked to multiple roost tree locations within the park (Stantec 2018c).

In 2015, 12 northern-long eared bats were captured at the William Floyd Estate, and in 2017, 2018, and 2019, northern long-eared bats were detected during acoustic surveys (NPS 2019 and 2020). In 2018, northern-long eared bats were observed to be reproducing at the William Floyd Estate (NPS 2018b). In 2015, northern long-eared bats were observed to be reproducing at Wertheim National Wildlife Refuge (USFWS 2016), which is approximately 1 mi (1.6 km) of the Landfall/ICW Work Area.

2.1.2.4 Potential Impacts

Construction

Land Disturbance

Potential direct impacts to bat species resulting from land disturbance generated by construction of the Onshore Facilities include habitat loss, and potential direct mortality/injury of individuals.

OnCS–DC:

The OnCS–DC construction in the Town of Brookhaven will require tree and vegetation clearing, potentially including suitable summer roosting habitat. The Union Avenue Site is primarily a developed industrial/commercial site with small narrow forested areas along parcel boundaries. As a result, very limited vegetation clearing would be required at this location (Stantec 2020d).

Construction of the OnCS–DC will impact up to 7 acres (2.8 ha) of land currently utilized for industrial/commercial activities; however, the operational footprint will be no more than 6 acres (2.4 ha). The general area in the vicinity of OnCS–DC is largely developed, and limited existing suitable summer bat habitat is expected in these areas. This change in the visible landscape presents a minimal change to available habitats in the broader region.

Onshore Transmission Cable/Onshore Interconnection Cable:

The Onshore Transmission Route/Interconnection Cable is generally located within the paved portion of existing roadway or utility-owned or controlled property and previously disturbed and developed areas to the extent practicable to minimize impacts to natural locations. The duct bank for the Onshore Transmission Cable will be installed via open trench excavation for the majority of the Cable. Terrestrial land cover types adjacent to the Onshore Transmission Cable mainly consists of developed residential or industrial land uses, with the exception of forested wetlands and waterways at the Carmans River crossing (Stantec 2020d). The Project will utilize trenchless crossing installation to avoid sensitive environmental resources or other physical obstructions (i.e., railroads) at certain crossing locations. The use of trenchless crossings for installation of portions of the Onshore Transmission Cable/Interconnection Cable, such as in the vicinity of the Carmans River, will minimize impacts to terrestrial habitats.

Landfall/ICW Work Area:

Coastal habitats associated with the Landfall/ICW Work Area on Fire Island include foreshore, backshore, dune, and interdunal areas (Stantec 2020d). The Landfall/ICW Work Area occupies a portion of the parking lot at Smith Point County Park on Fire Island, an approximately 425-acre (172 ha) public beach and recreation area.

Suitable summer roosting habitat for bats is not present within beach and intertidal habitats due to the lack of roost trees. The work spaces at the Landfall/ICW Work Area at Smith Point County Park and Smith Point Marina will be located within paved areas of the parking lots or open land used for recreational activities. The use of HDD for installation will minimize impacts to onshore habitats.

Temporary Landfall/Staging Areas:

Early successional habitat in the temporary workspace and access locations will initially revegetate as a grass/forb and herbaceous cover, then will gradually transition to shrub and sapling cover. Habitat loss will be minimal in the Town of Brookhaven area because in addition to forested areas, the baseline habitat conditions of this general area include developed residential areas, mowed lawns, parking lots, roads, and commercial and industrial areas. The early successional habitat that will replace the cleared areas and temporary workspace locations outside of the operational footprint of infrastructure may not provide the same benefit to bats in terms of roosting and pupping habitat; however, it may provide new foraging opportunities since many species prefer traveling and foraging along edge habitats, such as tree lines, hedgerows, forest edges, and linear water features (Nelson and Gillam 2017; Verboom 1998).

All Onshore Facilities:

Direct changes in habitat that may affect roosting and foraging opportunities as a result of land disturbance during construction of the Onshore Facilities are considered long-term but localized and minimal, based on the small operational footprint of Onshore Facilities compared to the broader landscape.

Vegetation/tree clearing during construction has the potential to cause mortality or injury to bat individuals that are less mobile (e.g., pups). Impacts resulting in mortality and injury from construction activities will be minimized as the Project will conduct activities consistent with the 4(d) Rule for northern long-eared bat, which prohibits incidental take from tree removal activities within 150 ft (45.7 m) of a known occupied maternity roost tree . To the extent feasible, tree removal for the Onshore Facilities will occur between December 1 and February 28, as identified by the NYSDEC specifically for the Project to avoid the northern long-eared bat active periods (K. Gaidasz, NYSDEC, email comm.).

Construction of the OnCS–DC, Onshore Transmission Cable, and Onshore Interconnection Cable is expected to result in approximately 2.3 acres (0.9 ha) of permanent tree clearing. Sunrise Wind will use mechanical clearing methods for the construction of the Project and does not intend to use any herbicides/pesticides during the construction phase and thus direct (potential exposure to toxins) and indirect (potential impacts to habitat) impacts to bats related to herbicides/pesticides will be avoided during construction.

If work is anticipated to occur outside of these time of year restriction periods and if it is determined to be necessary to take occupied habitat or individuals of northern long-eared bat, Sunrise Wind will develop a Net Conservation Benefit Plan in consultation with and accepted by NYSDEC and DPS staff that satisfies the requirements of 6 NYCRR Part 182. Further, per the State's P*rotective Measures Required for Northern Long-eared Bats When Projects Occur within Occupied Habitat* (Requirements for Projects that Result in a Change of Land Use Within Occupied Habitat; NYSDEC n.d.-b), there will be no cutting of any trees within 0.25-mi (0.4-km) buffer around a hibernation site (year-round) and no cutting of documented roost trees or any trees within a 150-ft (45.7-m) radius of a documented summer occurrence. As such, direct mortality or injury impacts to bat species as a result of clearing activities and land disturbances during construction are not expected.

Land disturbance may indirectly result in the spread of invasive species and the displacement of individuals. A study that evaluated ways to improve foraging opportunities for bats found that *Myotis* sp. activity was greater near waterways that included native plants and were clear of invasive species (Lintott et al. 2015). Invasive plants can clutter the understory of a forest, suppress native tree regeneration and physically reduce the amount of unobstructed subcanopy space where many bats prefer to forage (King 2019). However, the spread of invasive plant species will be managed in compliance with state and federal regulations, and the Project's ISMP.

In summary, the amount of habitat loss is small relative to the amount of similar habitat that will remain unimpacted in the general region. Therefore, there may only be minimal impacts associated with land disturbance during construction. As such, direct mortality or injury impacts to bat species as a result of clearing activities and land disturbances during construction are short-term and **low**.

Noise

Noise resulting from construction activities for the Onshore Facilities may create indirect impacts to bats. Though some night work is planned, most construction activity for the Onshore Facilities will take place during the day, when bats are in an energy conserving state of torpor (Geiser 2004; Speakman and Thomas 2003). To determine bat response to anthropogenic sound, a study evaluated the effect of noise on torpid bats by subjecting them to a series of natural and anthropogenic playback sound files, as well as no recording to serve as a control, while the bats were in torpor; results showed that bats responded most notably (awoke from torpor) to colony noise and vegetation noise (e.g., wind blowing through vegetation, rustling sounds made by prey), and most weakly to traffic noise (Luo et al. 2014). The study also indicated that bats can quickly habituate to continuous or repeating noise disturbances (Luo et al. 2014). Another study investigating impacts of anthropogenic noise on bat foraging behavior found that bats avoided areas subjected to loud noises, suggesting foraging areas close to highways and other sources of loud noise are less suitable for foraging bats (Schaub et al. 2008). Noise generated from installation of the Onshore Transmission Cable and Onshore Interconnection Cable is expected to be similar to highway noise impacts. Noise and construction traffic noise may temporarily displace roosting and/or foraging bats. Construction activities for Onshore Facilities will be temporary and localized; therefore, impacts due to noise is expected to be **minimal**.

Traffic

Traffic resulting from construction activities for the Onshore Facilities may result direct impacts to bats in the form of mortality or injury in the rare event that a bat may collide with a moving construction vehicle. The approach of moving vehicles may also temporarily displace bats. Though some night work is planned, most construction traffic for the Onshore Facilities will occur during the day while bats are in torpor, outside of the active foraging period between twilight and sunrise. HDD activity at the Landfall/ICW Work Areas may occur at night during active foraging periods, but the equipment is not expected to significantly disrupt bats because the HDD equipment will be stationary within the HDD Work Areas. Traffic during construction activities is not expected to pose a significant source of mortality or disturbance, and associated impacts are considered short-term and **minimal**.

Visible Infrastructure

Visible structures present during the Onshore Facilities construction activities will include construction equipment and the OnCS–DC. Transmission facilities will be installed underground and, therefore, are not considered visible infrastructure. Construction equipment and the OnCS–DC may present the potential for collision mortality or injury for bats. There is little evidence regarding collision risk of bats with onshore transmission facilities such as the OnCS–DC, though there are documented bat fatalities in other onshore electric utilities, such as above-ground transmission and powerline corridors (Manville II 2016). However, the Onshore Transmission Cable is expected to be installed underground. Construction equipment and the OnCS–DC are similar to other types of man-made structures are already present throughout the developed and residential areas on Long Island. Bats use echolocation to navigate and detect prey (Schnitzler et al. 2003; Potenza 2017). Therefore, bats are expected to avoid obstacles while foraging at night. However, Potenza (2017) noted that some smooth, vertical surfaces such as glass and metal reflect bat’s high frequency sounds away from the bat, not toward it, which could hamper their detection of these types of structures, possibly leading to collision mortality or injury. Because construction activities will be short-term, mortality or injury as a result of the presence of construction equipment are considered **minimal**.

Lighting

Temporary lighting during certain phases of construction of the Onshore Facilities may be required. While most of the onshore construction will occur during the daylight hours, some overnight lighting may occasionally be necessary, including lighting for HDD work. Potential indirect impacts to bats resulting from lighting during some construction activities at the Onshore Facilities may include temporary displacement or attraction of individuals (if insect prey concentrate around light sources), or disruption of normal behavior (e.g., foraging, breeding). In some cases, bright illumination of areas can potentially prevent or reduce foraging activity, causing bats to pass quickly through the lit area or avoid it completely (Polak et al. 2011). Additionally, certain types of lighting can disrupt the composition and abundance of insect prey (Davies et al. 2012), which may in turn reduce foraging opportunities for bats. Most construction activities will occur during the day when bats are in torpor; therefore, impacts due to nighttime lighting during HDD will be short-term and **minimal**.

Table 2.6 Impact Producing Factors and Potential Levels of Impact on Bat Species from Onshore Facilities during Construction

IPF	Project Activity	Potential Impact
Land Disturbance	Mortality/injury or displacement during vegetation clearing and grading, construction at the Onshore Transmission Cable/Interconnection Cable and the OnCS–DC	Direct/indirect, long-term/short-term, low
Noise	Displacement due to construction-related noise, including HDD-related noise	Indirect, short-term, minimal
Traffic	Collision mortality/or injury with construction equipment; displacement from approach of moving vehicles	Direct, short-term, minimal
Visible Infrastructure	Collision mortality/or injury with the OnCS–DC	Direct/indirect, short-term, minimal
Lighting	Attraction and/or displacement during general construction activities	Indirect, short-term, minimal

Operations and Maintenance

Land Disturbance

The vegetation management requirements for the Project during operations and maintenance are expected to be minimal. IVM practices may include manual cutting, mowing and the prescriptive use of federally-approved and state-registered herbicides to eliminate targeted plant species within the ROW. Sunrise Wind does not intend to use pesticides during operation of the Project. Herbicides would be applied, using federally-approved, NYS-listed herbicides, following all NYS and local regulations and label restrictions; therefore direct (potential exposure to toxins) and indirect (potential impacts to habitat) impacts to bats related to herbicide use during operations and maintenance is expected to be minimal.

Noise

During O&M, the proposed OnCS–DC would introduce new sources of sound including transformers, shunt reactors, harmonic filters, cooling, and ventilation associated with the outdoor converter station equipment, as well as condensers, pumps, skids, and auxiliary transformers associated with the synchronous condenser building. Temporary noise may occasionally be generated due to routine and non-routine maintenance during O&M. As described in Onshore Facilities Construction section above, bat responses to repeated and/or continuous anthropogenic sounds suggests that noises similar to traffic are less disturbing to torpid bats than natural sources of noise (Luo et al. 2014), and that bats may quickly habituate to prolonged noise disturbances. Noise could potentially cause temporary avoidance behavior and/or displacement of bat species; however, most noise impacts would be short-term. Some sources of noise at the OnCS–DC will be long-term and repeated; however, based on available information, noise impacts are considered **minimal**.

Traffic

Traffic will occasionally occur in association with routine and non-routine maintenance at the Onshore Facilities. Impacts associated with moving maintenance vehicles may include temporary displacement of bat species from sites undergoing maintenance activities. Traffic may also result in mortality/injury in the rare event that a bat was to collide with a moving maintenance vehicle. However, most maintenance activities are anticipated to occur during daylight periods when bats are inactive; therefore, impacts related to traffic are considered short-term and **minimal**.

Visible Infrastructure

As indicated in the Construction section above, the OnCS–DC will represent visible infrastructure. This change in the landscape presents a low likelihood of mortality or injury due to the ability of bats to typically detect and avoid collision with stationary structures. This low risk of collision mortality or injury is considered long-term but **minimal**. The Onshore Transmission Cable will be buried; therefore, collision with overhead lines will not occur.

Bats may be attracted to the OnCS–DC for roosting opportunities as some species including big brown bats often take advantage of man-made structures. It is expected that access to the interior of the OnCS–DC will be prevented, potentially by the use of screens or other similar measures; therefore, impacts associated with bats being attracted to the OnCS–DC for roosting opportunities will be long-term but **minimal**.

Lighting

During the operation and maintenance of the OnCS–DC, general yard lighting will be used within the OnCS–DC for assessment of equipment. In general, the lighting will be minimal at night unless there is work in progress or lights are left on for safety and security purposes. As during construction of the Onshore Facilities, lighting at night has the potential to temporarily displace or indirectly attract bats if insect prey concentrates near lighting – either behavioral response represents a disruption of normal behavior. However, lighting at the OnCS–DC will be limited to periods when O&M activities are occurring and is expected to be infrequent. Since the use of lighting at night is expected to be limited, the potential for temporary bat displacement and/or other behavioral changes are considered long-term but **minimal**.

Table 2.7 Impact Producing Factors and Potential Levels of Impact on Bat Species from Onshore Facilities during Operations and Maintenance

IPF	Project Activity	Potential Impact
Noise	Disturbance or displacement due to routine and non-routine maintenance	Indirect, long-term and short-term, minimal
Traffic	Collision mortality/or injury with maintenance vehicles; displacement from approach of moving vehicles	Indirect, short-term, minimal
Visible Infrastructure	Collision risk with permanent above ground components, and equipment during routine and non-routine maintenance; potential attraction for roosting opportunities at the OnCS–DC	Direct/indirect, short-term and long-term, minimal
Lighting	Attraction and/or displacement	Indirect, long-term, minimal

2.2 SUNRISE WIND EXPORT CABLE

The following sections discuss key risk factors and potential impacts to avian and bat species that may potentially occur within the SRWEC–NYS and SRWEC–OCS.

2.2.1 Avian

Key risk factors for avian species include seasonal occurrence, use, and vulnerable species likely to occur within the SRWEC–NYS and SRWEC–OCS. The IAC, while located in the SRWF, will have impacts that are considered similar to those associated with the SRWEC–OCS and are, therefore, included here as well.

2.2.1.1 Key Factor 1: Seasonal Occurrence

Coastal birds may be present where the SRWEC–NYS approaches the landfall location at Smith Point County Park on Fire Island. The SRWEC–OCS is within federal offshore waters in a pelagic environment where a variety of marine birds and/or non-marine migratory bird species may seasonally occur, similar to those described in the next section addressing the SRWF. There is overlap in species occurrence among these Project Area locations. The results of NYSERDA 2016–2019 digital aerial surveys of the NY Bight (Normandeau and APEM 2019) indicate which species may occur within the SRWEC–OCS. Many of the species observed during the NYSERDA digital aerial surveys were the same as those listed in the SRWF species Table (Table 2.11). Therefore, Table 2.8 summarizes only those additional species detected during the NYSERDA digital aerial surveys and not during the Bay State Wind or MassCEC surveys, which overlapped with the SRWF. Table 2.8 lists the species by group that may occur in vicinity of the SRWEC–NYS and SRWEC–OCS, as well as their seasons of occurrence, general abundance offshore, and status. Species groups will vary in relative density along the SRWEC–NYS and SRWEC–OCS depending on the distance from shore (Figure 1-2).

Table 2.8 Timing, Distribution, and General Abundance of Avian Species Groups Likely to Occur within or Proximate to the SRWEC

Taxonomic Group	Species	Regional Use	Season Offshore	General Abundance Offshore[1]	Status[2]
Grebes					
horned grebe	*Podiceps auritus*	migrant, winter resident	winter	occasional	SGCN, BCC
Petrels and Shearwaters					
Audubon's shearwater	*Puffinus lherminieri*	migrant	summer, fall	occasional	BCC
black-capped petrel	*Pterodroma hasitata*	migrant	summer, fall	very rare	Candidate for federal listing
Wading birds					
great blue heron	*Ardea herodias*	summer breeder, migrant, winter resident	spring, fall	occasional	NL
snowy egret	*Egretta thula*	summer breeder, migrant, winter resident	spring, fall	occasional	SGCN, BCC
Swans and Geese					
Canada goose	*Branta canadensis*	migrant, winter resident	fall	occasional	NL
tundra swan	*Cygnus columbianus*	migrant, winter resident	fall	occasional	NL
Ducks					
American black duck	*Anas rubripes*	migrant, winter resident	fall	occasional	SGCN-HP
bufflehead	*Bucephala albeola*	migrant, winter resident	fall	occasional	NL
common goldeneye	*Bucephala clangula*	migrant, winter resident	fall	occasional	SGCN
common merganser	*Mergus merganser*	migrant, winter resident	fall	occasional	NL
gadwall	*Anas strepera*	migrant, winter resident	fall	occasional	NL
lesser scaup	*Aythya affinis*	migrant, winter resident	fall	occasional	SGCN
mallard	*Anas platyrhynchos*	migrant, winter resident	fall	occasional	NL
Sea Ducks					
black scoter	*Melanitta americana*	winter resident	winter	common	SGCN
common eider	*Somateria mollissima*	winter resident	winter	common	SGCN
king eider	*Somateria spectabilis*	winter resident	winter	uncommon	NL
Raptors					
bald eagle	*Haliaeetus leucocephalus*	migrant	spring, fall	occasional	ST, SGCN, BCC
osprey	*Pandion haliaetus*	migrant	spring, fall	occasional	SSC

Table 2.8 Timing, Distribution, and General Abundance of Avian Species Groups Likely to Occur within or Proximate to the SRWEC

Taxonomic Group	Species	Regional Use	Season Offshore	General Abundance Offshore[1]	Status[2]
Shorebirds and Phalaropes					
American oystercatcher	*Haematopus palliatus*	summer breeder	summer, fall	occasional	SGCN, BCC
black-bellied plover	*Pluvialis squatarola*	winter resident	summer, fall	occasional	SGCN
dunlin	*Calidris alpina*	winter resident	summer, fall	occasional	NL
piping plover	*Charadrius melodus*	summer breeder, migrant	summer, fall	occasional	FT, SE, SGCN-HP
red phalarope	*Phalaropus fulicarius*	migrant	summer, fall	uncommon	NL
red-necked phalarope	*Phalaropus lobatus*	migrant	summer, fall	uncommon	NL
ruddy turnstone	*Arenaria interpres*	winter resident	summer, fall	occasional	SGCN
sanderling	*Calidris alba*	winter resident	summer, fall	occasional	NL
semipalmated plover	*Charadrius semipalmatus*	migrant	summer, fall	occasional	NL
Skuas and Jaegers					
great skua	*Stercorarius skua*	winter resident	winter	rare	NL
parasitic jaeger	*Stercorarius parasiticus*	migrant	spring, fall	uncommon	NL
pomarine jaeger	*Stercorarius pomarinus*	migrant	spring, fall	uncommon	NL
south polar skua	*Stercorarius maccormicki*	migrant	spring, fall	rare	NL
Gulls					
Bonaparte's gull	*Chroicocephalus philadelphia*	winter resident	winter	common	SGCN
glaucous gull	*Larus hyperboreus*	winter resident	winter	rare	NL
Iceland gull	*Larus glaucoides*	winter resident	winter	rare	NL
lesser black-backed gull	*Larus fuscus*	winter resident	winter	rare	NL
little gull	*Hydrocoloeus minutus*	winter resident	winter	rare	NL
ring-billed gull	*Larus delawarensis*	breeding, migrant, winter resident	spring, summer	occasional	NL

Table 2.8 Timing, Distribution, and General Abundance of Avian Species Groups Likely to Occur within or Proximate to the SRWEC

Taxonomic Group	Species	Regional Use	Season Offshore	General Abundance Offshore[1]	Status[2]
Terns and Skimmers					
black tern	*Chlidonias niger*	migrant	spring, fall	rare	SE
Forster's tern	*Sterna forsteri*	breeding, migrant	summer, fall	occasional	SGCN
least tern	*Sternula antillarum*	breeding, migrant	summer, fall	occasional	ST, SGCN, BCC
roseate tern	*Sterna dougallii*	breeding, migrant	summer, fall	occasional	FE, SE
royal tern	*Thalasseus maximus*	migrant	spring, fall	occasional	NL
Alcids					
Atlantic puffin	*Fratercula arctica*	winter resident	winter	uncommon	NL
black guillemot	*Cepphus grylle*	winter resident	winter	uncommon	NL
thick-billed murre	*Uria lomvia*	winter resident	winter	common	NL
Nightjars					
common nighthawk	*Chordeiles minor*	migrant	spring, fall	occasional	SSC
Passerines					
snow bunting	*Plectrophenax nivalis*	winter resident	spring, fall	occasional	NL

NOTES:

This table does not include those species observed during the NYSERDA surveys (Normandeau and APEM 2019) that are not expected to occur as far north as the SRWEC–OCS and NYS (i.e., some species of petrels, storm-petrel, booby, and pelican).

[1] Abundant = occurring regularly in greater numbers relative to other species during given season(s); Common = occurring regularly during given season(s); Occasional = occurring infrequently during given season(s) and in relatively small numbers; Uncommon = occurring very infrequently in given season(s), may occur sporadically in small numbers; Rare = very seldom occurring.

[2] Status: FE = Federally Endangered, FT = Federally Threatened, SE = State Endangered, ST = State Threatened, SSC = State Species of Special Concern, SGCN = State Species of Greatest Conservation Need, SGCN-HP = High Priority State Species of Greatest Conservation Need, BCC = USFWS Bird of Conservation Concern for Region 30, NL = non-listed.

2.2.1.2 Key Factor 2: Use

Bird groups such as raptors, shorebirds (with the exception of phalaropes), wading birds, and passerines may only pass over the SRWEC–NYS and SRWEC–OCS while migrating. Coastal and marine species may forage and/or loaf in these Project Areas.

Coastal birds typically forage within relative proximity to land due to shallower water depths and species foraging strategies. Marine species typically forage along or beyond the continental shelf break (Furness and Monaghan 1987; Schrieber and Burger 2001; Gaston 2004). Small fish and zooplankton in the water column may provide foraging opportunities for terns, phalaropes, gulls, cormorants, loons and grebes, and petrels and shearwaters. Benthic organisms, such as mollusks and crustaceans, may provide foraging opportunities for sea ducks and alcids. Goodale et al. (2019) classified coastal and marine species into foraging guilds based on foraging strategy: coastal divers, plungers, and surface or bottom gleaners; and pelagic divers, surface gleaner, or scavenger. Table 2.9 outlines representative species by group and foraging guild that may occur in the SRWEC–NYS and SRWEC–OCS, as well as a description of foraging behavior, habitat, and water depth.

Table 2.9 Species Group Foraging Habitat and Strategies that May Occur in Coastal Marine and Pelagic Environments Along the SRWEC

Group/Example Species[1]	Foraging Guild (as categorized by Goodale et al. 2019)	Foraging Behavior/Habitat	Water Depth (msl)	References
Petrels and Shearwaters				
Leach's storm-petrel	pelagic surface gleaner	Pecks at small organisms while hovering over surface, occasionally will patter feet on surface. Will use smell to locate food	Surface	Huntington et al. 1996
manx shearwater	pelagic scavenger	Flies low (3–7 ft [1–2 m]) over sea surface while foraging. Dives while either sitting on sea surface or aerial plunges from <5 ft (1.5 m)	Shallow surface dives (<10 ft [3 m])	Lee and Haney 1996
Loons and Grebes				
common loon	coastal diver	Visually detects prey while swimming under water	Relatively shallow	Evers et al. 2010
red-throated loon	coastal diver	Locates prey visually from surface or when swimming underwater	Relatively shallow	Barr et al. 2000
Gannets				
northern gannet	coastal plunger	Plunge-dives from a height of 33–131 ft (10–40 m), enters water at speeds >100 km/h (62 mph). Also feeds on scraps around fishing vessels	Dives 9–16 ft (3–5 m) below surface; occasionally descends to 39–49 ft (12–15 m) by swimming	Mowbray 2002
Cormorants				
double-crested cormorant	coastal diver	Dives from surface and chases prey underwater; usually close to shore (<5 km [3 nm] offshore)	Shallow open water (<33 ft [10 m]); deepest dive recorded at 84.6 ft (25.8 m)	Dorr et al. 2020
great cormorant	coastal diver	Dives from surface and chases prey underwater.	Maximum depth 105 ft (32 m)	Hatch et al. 2000

Table 2.9 Species Group Foraging Habitat and Strategies that May Occur in Coastal Marine and Pelagic Environments Along the SRWEC

Group/Example Species[1]	Foraging Guild (as categorized by Goodale et al. 2019)	Foraging Behavior/Habitat	Water Depth (msl)	References
Sea Ducks				
common eider	coastal bottom gleaner	Feeds in marine waters (<66 ft [20 m]) by diving and taking food from bottom	Typically forages in water depths less than 33 ft (10 m)	USGS 2001; Goudie et al. 2000
red-breasted merganser	coastal diver	Feeds at water's surface or by diving	Shallow dives in waters <6–16 ft (2–5 m) deep	Craik et al. 2015
white-winged scoter	coastal bottom gleaner	Foraging sites ~16–66 ft (95–20 m) deep, usually <33 ft (10 m)	Typically forage in water depths less than 33 ft (10 m), dive for prey on or near bottom	USGS 2001; Brown and Fredrickson 1997
Gulls and Kittiwakes				
black-legged kittiwake	pelagic scavenger	Feeds by surface-plunging, often observed around fishing vessels or other ships to forage on scraps; also steals from other species	Plunge dives from 3–20 ft (1–6 m) above the water, may reach depths of 1.6–3.2 ft (0.5–1.0 m)	Hatch et al. 2009
herring gull	coastal surface gleaner	Often observed around fishing vessels or other ships to forage on scraps; feeds on prey that comes to the surface at sandbanks or other locations with upwellings	Shallow plunge-dives or sits on the water to forage for prey at surface	Nisbet et al. 2020b
Skuas and Jaegers				
parasitic jaeger	pelagic surface gleaners	Kleptoparasitism (steels prey from other birds)	Surface	Wiley and Lee 1999
pomarine jaeger	pelagic surface gleaners	Often observed around fishing vessels or other ships, forages on fishing scraps but also steals from other species	Surface	Wiley and Lee 2000
Shorebirds (Phalaropes)				
red-necked phalarope	pelagic surface gleaners	Normally pecks at, or just below, surface for prey; will spin on water to bring prey to surface (creates small upwellings)	Surface	Rubega et al. 2000

Table 2.9 Species Group Foraging Habitat and Strategies that May Occur in Coastal Marine and Pelagic Environments Along the SRWEC

Group/Example Species[1]	Foraging Guild (as categorized by Goodale et al. 2019)	Foraging Behavior/Habitat	Water Depth (msl)	References
Terns and Skimmers				
common tern	coastal plunger	Plunge diving from relatively low heights above water	Dives 20 in (50 cm) below the surface	Nisbet et al. 2017
roseate tern	coastal plunger	Plunge diving from relatively low heights above water	Dives briefly just below surface	Nisbet et al. 2020a
Alcids				
dovekie	pelagic diver	Bounce dives and chases prey underwater	Diving as deep as 98 ft (30 m)	Montevecchi and Stenhouse 2002
razorbill	pelagic diver	Surface diver; often feeds at upwellings	Rarely dives >328 ft (100 m), generally 66–98 ft (20–30 m) deep	Lavers et al. 2009
thick-billed murre	pelagic diver	Surface diver to bottom for 30–75 seconds	Rarely dives up to 689 ft (210 m), generally 23–108 ft (7–33 m) deep	Gaston and Hipfner 2000

NOTE:
[1] Does not list all species that may occur in the area, rather a sample of representative species.

2.2.1.3 Key Factor 3: Vulnerable Species

Federally listed roseate terns may forage for small prey fish (e.g., sand lance) (Nisbet et al. 2020a) in the shallower waters near the SRWEC–NYS and may occur over the SRWEC–NYS and SRWEC–OCS during migration. Other ESA-listed species, including piping plover and red knot, may only occur over these areas as migrants and would not stopover on the water. The black-capped petrel under consideration for listing under the ESA may only occur in the region of the SRWEC–NYS and SRWEC–OCS on very rare occasions. State listed species such as common and least tern would also forage the shallower waters near the SRWEC–NYS and may occur over the SRWEC–NYS and -OCS during migration.

2.2.1.4 Potential Impacts

Construction

Seafloor Disturbance and Sediment Suspension and Deposition

Indirect impacts from construction activities during installation of the SRWEC–NYS and SRWEC–OCS to marine and coastal birds may result from sediment suspension and disposition, which may cause disturbances to the benthic and intertidal areas. These disturbances could temporarily displace avian prey (i.e., mollusks, invertebrates, and small fish) and/or reduce visibility and inhibit prey detection (Gill 2005).

Potential indirect effects on prey species are expected to be temporary and limited to a small area around work activities, and birds will likely only need to fly a short distance to find alternative prey sources in similar adjacent habitats. Sediment suspended during submarine cable installation is expected to be localized and to quickly resettle. Potential indirect effects associated with prey displacement and reduced prey detection from increased sediment suspension and deposition are expected to occur only during construction activities and are considered short-term and **minimal**.

Noise

Above and below water noise generated by cable installation activities at the SRWEC–NYS and SRWEC–OCS could lead to indirect effects including temporary displacement of marine and coastal birds from construction areas. Since construction noise will be temporary it is not likely to cause long-term displacement. Therefore, potential indirect impacts on marine and coastal birds resulting from construction noise are considered short-term and **minimal**.

Traffic

Vessel traffic associated with construction of the SRWEC–NYS and SRWEC–OCS and could temporarily attract some marine birds and result in others to avoid the area, or in some very rare cases, traffic could result the direct effect of birds colliding with the vessels at night. Some species such as gulls may be attracted to vessel traffic as they are known to be attracted to fishing vessels (Nisbet et al. 2020b; Hatch et al. 2009; Wiley and Lee 2000; Dierschke et al. 2016). However, these impacts will be short-term and similar to normal, non-Project-related vessel traffic and are not likely to cause any permanent displacement or significant collision mortality. Therefore, potential direct and indirect impacts to marine species resulting from construction traffic are considered short-term and **minimal**.

Visible Infrastructure

During construction of the SRWEC–NYS and SRWEC–OCS the presence of construction equipment and vessels could present collision hazards, particularly at night and during periods of poor visibility. However, construction activities will be short-term and will be generally confined to periods with good weather; therefore, impacts associated with visible infrastructure are considered short-term and **low**. There may be some activities that will occur at night during which these structures may be lit for navigation and safety purposes; potential effects related to lighting are discussed below.

Lighting

During construction activities of the SRWEC–NYS and SRWEC–OCS, lighting on vessels or construction equipment has the potential to attract birds, increasing collision risk during poor weather (Fox et al. 2006). Brightly illuminated structures offshore, such as research platforms, pose a risk to birds migrating at night, particularly during rain or fog when birds can become disoriented by sources of artificial light (Hüppop et al. 2006; Fox and Petersen 2019; Kerlinger et al. 2010). Since construction activities are short-term and are generally confined to good weather, potential impacts are considered minimal. Furthermore, lighting during construction activities will be limited to the minimum required for safety during construction activities to minimize impacts to wildlife, as described in Section 3.0. Therefore, the indirect effects associated with lighting are considered short-term and **low**.

Discharges and Releases

During construction of the SRWEC–NYS and SRWEC–OCS, sanitary and other waste fluids will be generated by equipment and support vessels. However, all wastes will be properly managed in accordance with applicable federal and state laws. Accidental discharges, releases, and disposal could indirectly (spatially and temporally removed from the activity) affect marine birds (e.g., low levels of oiling of feathers and ingestion of toxins could reduce fitness), but risks will be avoided through implementation of BMPs. Therefore, potential indirect impacts associated with discharges and releases are considered short-term and **minimal**.

Trash and Debris

Trash and debris will be generated by construction and support vessels during installation the SRWEC–NYS and SRWEC–OCS. Accidental disposal of trash and debris into the water could result in the potential ingestion or entanglement of birds. Ingestion of trash can negatively impact foraging and/or the ability to fly, and ultimately could reduce survival (Gochfeld 1973). However, trash and debris during construction will be properly managed in accordance with federal and state laws and accidental improper disposal is unlikely. Therefore, potential indirect impacts associated with trash and debris are considered short-term and **minimal**.

Summary of Construction Impacts at SRWEC–NYS and SRWEC–OCS

As outlined in Table 2.10, impacts during construction activities to marine birds will largely be avoided due to the short-term nature of construction activities as well as the BMPs that will be in place.

Table 2.10 Impact Producing Factors and Potential Levels of Impact on Avian Species from the SRWEC during Construction

IPF	Project Activity	Potential Impact
Seafloor Disturbance	Cable installation	Direct displacement, short-term, minimal
Sediment Suspension and Deposition	Cable installation	Direct displacement, short-term, minimal
Noise	Cable installation	Direct displacement, short-term, minimal
Traffic	Cable installation	Direct displacement, short-term, minimal
Visible Infrastructure	Construction vessels and equipment	Direct injury or mortality/displacement, short-term, low
Lighting	Collision risk with construction vessels and equipment	Direct injury or mortality/displacement, short-term, low
Discharges and Releases	Cable installation	Direct injury or mortality/indirect decreased breeding success, short-term, minimal
Trash and Debris	Cable installation	Direct injury or mortality/indirect decreased fitness, short-term, minimal

Operations and Maintenance

Regular O&M activities are not expected to result in adverse impacts to avian species at the SRWEC–OCS and SRWEC–NYS. There will be periodic vessel use to monitor the cable for proper burial depth; however, associated traffic will be comparable to or less frequent than other, non-Project related traffic and will, therefore, be **minimal**. In the event that maintenance of the cable is required, potential IPFs and impacts will be temporary and similar to those discussed for Construction.

2.2.2 Bats

Key risk factors for bat species include seasonal occurrence, use, and vulnerable species likely to occur within the SRWEC–NYS and SRWEC–OCS.

2.2.2.1 Key Factor 1: Occurrence

Available regional data suggests bats (primarily migratory tree roosting species) are infrequently expected to occur in the SRWEC–NYS and SRWEC–OCS and would mainly only occur during migratory periods, particularly in August and September (Pelletier et al. 2013; Stantec 2016b, 2018a, 2019a,b,c, 2020a,b,c). Bat activity is relatively much greater onshore due to bat foraging and roost habitat requirements.

2.2.2.2 Key Factor 2: Use

Similar behaviors (e.g., migrating, potential foraging) as expected in the SRWF (detailed in Section 2.3.2 below) would be expected in the SRWEC–NYS and SRWEC–OCS; however, available information for both migratory tree bats and cave-hibernating bats suggests that activity is likely to increase with proximity to shore, and that cave-hibernating bats rarely occur offshore (Peterson et al. 2014; Stantec 2016b, 2018a, 2019a,b,c, 2020a,b,c) (Figure 2-3).

2.2.2.3 Key Factor 3: Vulnerable Species

Available information from the recent regional vessel-based acoustic surveys suggests northern long-eared bats may occur only very rarely at greater distances offshore (e.g., beyond 8.7 mi [7.6 nm, 14 km], as described below). The single northern long-eared bat call at South Fork Wind detected during the 2017 Enterprise vessel-based survey was recorded 21.1 mi (18.3 nm, 34 km) offshore from the closest point of land (Stantec 2018a; Figure 2-3). Other northern long-eared bat passes detected during the 2017 survey (n=33) were between 3.1 and 8.7 mi (2.7–7.6 nm, 5–14 km) from shore (Stantec 2018a). None of the other recent regional vessel-based acoustic surveys documented northern long-eared bats. Therefore, occurrences of northern long-eared bat in the SRWF are expected to be rare.

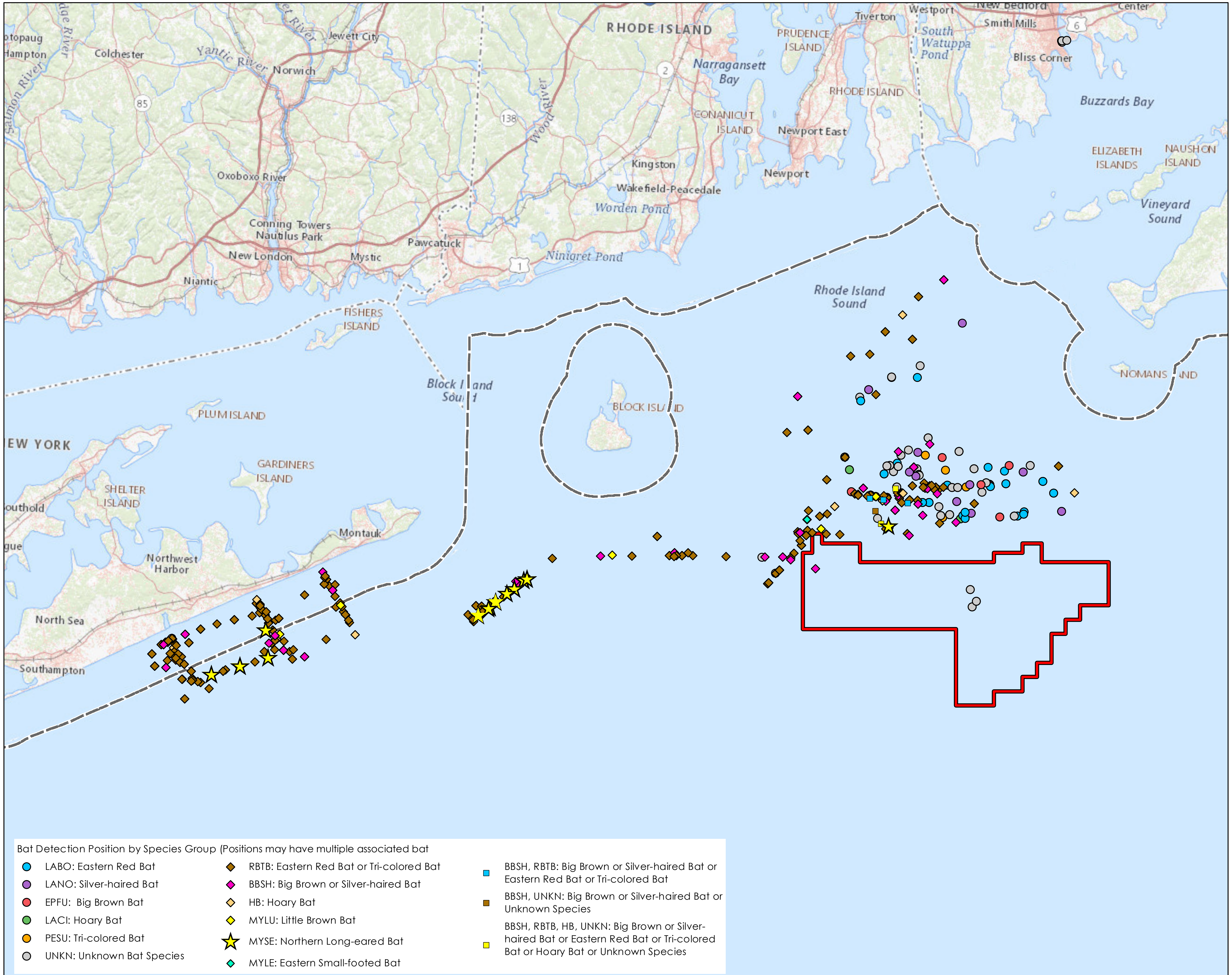
2.2.2.4 Potential Impacts

Construction and O&M

It is possible bats would benefit - in terms of energy conservation - from artificial roosting structures offshore, such as construction or O&M support vessels in the SRWEC–NYS and SRWEC–OCS. This behavior was observed during the construction of the Block Island Wind Farm (Stantec 2016b). Bats may similarly benefit from increased foraging opportunities if insect prey are attracted to artificial light sources in construction or maintenance areas. Therefore, there are no IPF expected to adversely impact bats during construction or O&M of the SRWEC–NYS and SRWEC–OCS.

Figure 2-3
Locations of Bat Detections (Vessel Positions) during Regional Vessel-Based Acoustic Bat Surveys

Sunrise Wind | Powered by Ørsted & Eversource



Legend

- Sunrise Wind Farm (SRWF)
- 3-nm State Waters Boundary

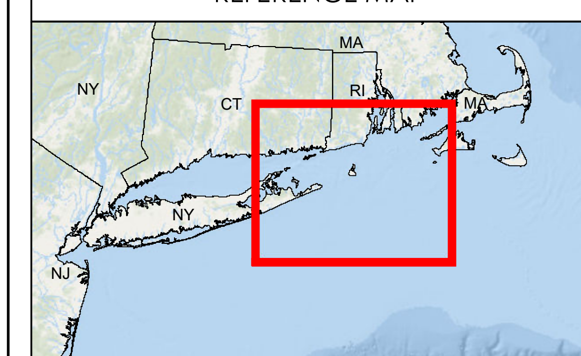
Notes
For details regarding survey methods, locations and level of effort, refer to the references listed in Sources

Sources
SFWF: Stantec 2018, Stantec 2019a, b, c; SRWF: Stantec 2020a; Revolution WF: Stantec 2020b
Base Map: USGS The National Map

Date	09/01/2020 Revised: 12/18/2020
Project Number	2028113199
Prepared By	GC
Reviewed By	LJ

0 7 miles
0 7 nm
0 12 km
N
Scale at 11x17: 1:500,000
NAD 1983 2011 UTM Zone 19N

REFERENCE MAP



2.3 SUNRISE WIND FARM

The following sections discuss key risk factors and potential impacts to avian and bat species that may potentially occur within the SRWF. The SRWF includes the WTGs, OCS–DC, and IAC (however, the impacts associated with the IAC are considered similar to those associated with the SRWEC–OCS).

2.3.1 Avian

Key risk factors for avian species include seasonal occurrence, use, and vulnerable species likely to occur within the SRWF.

2.3.1.1 Key Factor 1: Seasonal Occurrence

The SRWF is within federal offshore waters in a pelagic environment where a variety of marine birds and/or non-marine migratory bird species may seasonally occur. Table 2.11 lists the species by group that may occur in vicinity of the SRWF based on observations of species during the MassCEC and Bay State Wind regional surveys, which overlapped with the SRWF (Veit et al. 2016; Bay State Wind 2019), as well as their seasons of occurrence, general abundance offshore, and status. Appendix A Table 1 includes the mean seasonal and annual density (count/km^2) for marine bird observations from the MDAT dataset. The MDAT density maps for marine bird species are available in Appendix B Figure 1. For all avian groups and all seasons combined, avian abundance and distribution is concentrated closer to shore (Figure 1-2).

Table 2.11 Timing, Distribution, and Status of Avian Species Observed During Regional Surveys that are Likely to Occur within or Proximate to the SRWF

Taxonomic Group	Species	Regional Use	Season Offshore	General Abundance Offshore[1]	Status[2]
Loons					
common loon	*Gavia immer*	migrant, winter resident	fall, winter	common	SSC, SGCN
red-throated loon	*Gavia stellata*	migrant, winter resident	fall, winter	common	BCC
Grebes					
red-necked grebe	*Podiceps grisegena*	migrant, winter resident	winter	occasional	NL
Petrels and Shearwaters					
Cory's shearwater	*Calonectris diomedea*	migrant	summer, fall	common	SGCN
great shearwater	*Puffinus gravis*	migrant	summer, summer	common	BCC
Leach's storm-petrel	*Oceanodroma leucorhoa*	migrant	summer, fall	uncommon	NL
manx shearwater	*Puffinus puffinus*	migrant	summer, fall	uncommon	NL

Table 2.11 Timing, Distribution, and Status of Avian Species Observed During Regional Surveys that are Likely to Occur within or Proximate to the SRWF

Taxonomic Group	Species	Regional Use	Season Offshore	General Abundance Offshore[1]	Status[2]
northern fulmar	*Fulmarus glacialis*	winter resident	winter	uncommon	NL
sooty shearwater	*Puffinus griseus*	migrant	summer, fall	uncommon	NL
Wilson's storm-petrel	*Oceanites oceanicus*	migrant	summer, fall	common	NL
Gannets					
northern gannet	*Morus bassanus*	migrant, winter resident	spring, fall, winter	common	NL
Cormorants					
double-crested cormorant	*Phalacrocorax auritus*	breeding, winter resident	year-round	occasional	NL
Sea Ducks					
black scoter	*Melanitta americana*	winter resident	winter	common	SGCN
common eider	*Somateria mollissima*	winter resident	winter	common	SGCN
surf scoter	*Melanitta perspicillata*	winter resident	winter	common	SGCN
white-winged scoter	*Melanitta fusca*	winter resident	winter	common	SGCN
long-tailed duck	*Clangula hyemalis*	winter resident	winter	common	SGCN
red-breasted merganser	*Mergus serrator*	winter resident	winter	common	NL
Shorebirds					
red phalarope	*Phalaropus fulicarius*	migrant	spring, fall	uncommon	NL
red-necked phalarope	*Phalaropus lobatus*	migrant	spring, fall	common	NL
Gulls					
black-legged kittiwake	*Rissa tridactyla*	winter resident	winter	common	NL
great black-backed gull	*Larus marinus*	breeding, migrant, winter resident	spring, summer	abundant	NL
herring gull	*Larus argentatus*	breeding, migrant, winter resident	spring, summer	abundant	NL
laughing gull	*Leucophaeus atricilla*	breeding, migrant, winter resident	spring, summer	abundant	SGCN

Table 2.11 Timing, Distribution, and Status of Avian Species Observed During Regional Surveys that are Likely to Occur within or Proximate to the SRWF

Taxonomic Group	Species	Regional Use	Season Offshore	General Abundance Offshore[1]	Status[2]
Terns and Skimmers					
common tern	*Sterna hirundo*	migrant	spring, summer, fall	occasional	ST, SGCN
roseate tern	*Sterna dougallii*	breeding, migrant	spring, summer, fall	uncommon	FE, SE
Alcids					
common murre	*Uria aalge*	winter resident	winter	uncommon	NL
dovekie	*Alle alle*	winter resident	winter	uncommon	NL
razorbill	*Alca torda*	winter resident	winter	uncommon	SGCN
Passerines					
American robin	*Turdus migratorius*	migrant	spring, fall	occasional	NL
tree swallow	*Tachycineta bicolor*	migrant	spring, fall	occasional	NL
yellow-rumped warbler	*Setophaga coronata*	migrant	spring, fall	occasional	NL

SOURCES:

Bay State Wind avian ship surveys, May – October 2017 (Bay State Wind 2019, and MassCEC aerial surveys, November 2011 – January 2015 (Veit et al. 2016).

NOTES:

[1] Abundant = occurring regularly in greater numbers relative to other species during given season(s); Common = occurring regularly during given season(s); Occasional = occurring infrequently during given season(s); Uncommon = occurring very infrequently in given season(s), may occur sporadically; Rare = very seldom occurring.

[2] Status: ST = State Threatened, SGCN = State Species of Greatest Conservation Need, BCC = USFWS Bird of Conservation Concern for Region 30, NL = non-listed.

2.3.1.2 Key Factor 2: Use

Bird groups such as raptors, shorebirds (with the exception of phalaropes), wading birds, and passerines may only occasionally pass over the SRWF while migrating. Due to the SRWF distance from shore it is generally beyond the normal migration range of most breeding terrestrial or coastal bird species, though some weather events may occasionally push migrants such as passerines further offshore. Large bodied raptors that commonly using soaring on thermals as a flight strategy during migration – such as eagles, northern goshawk, species in the genus buteo, and large owls – are rarely observed offshore; smaller bodied raptors with relatively more active, flapping flight such as northern harrier, sharp-shinned hawk, northern saw-whet owls, and merlins are regularly observed on islands offshore; and peregrine falcon have been documented hundreds of miles offshore (Voous 1961; McGrady et al. 2006; Johnson et al. 2011; DeSorbo et al. 2012, 2015, 2018 as cited by BRI 2019).

The closest islands to the SRWF include Block Island and Nomans Island, approximately 16.7 mi (14.5 nm, 26.8 km) to the northwest and 15 mi (13 nm, 24 km) to the northeast, respectively, and falcons may use both these locations during migration to feed and rest. Therefore, peregrine falcon and merlins may on occasion travel as far offshore as the SRWF.

Coastal and marine species may forage and/or loaf in the Project areas (refer to Section 2.2.1 for details on these bird foraging habitats in marine environments). The SRWF will be located in water depths ranging from 128 to 200 ft (39 to 61 m). Coastal birds typically forage within relative proximity to land due to shallower water depths and species foraging strategies and marine species typically forage along or beyond the continental shelf break. Small fish and zooplankton in the water column may provide foraging opportunities for terns, phalaropes, gulls, cormorants, loons and grebes, and petrels and shearwaters. Water depths in the SRWF may be at the limit or deeper than most diving bird groups prefer (Goudie et al. 2000; Robertson and Savard 2020; Bordage and Savard 2020); however, benthic organisms, such as mollusks and crustaceans, may provide foraging opportunities for some species of sea ducks and alcids.

While most birds are believed to largely forage during daytime periods, some species of marine birds have been observed to forage at night like black-legged kittiwake (Hatch et al. 2009), or during low light conditions such as common eider and white-winged scoter (Goudie et al. 2000; Brown and Fredrickson, 1997). Murres are known to forage at night while at breeding colonies (Gaston and Hipfner 2000) and, therefore, may also forage at night in wintering areas. Storm-petrels can be attracted to prey using their sense of smell, so they may use this mechanism to forage at night or during other low-light periods (Huntington et al. 1996).

Observations from vessel-based surveys generally provide more accurate flight height information than aerial surveys due to the angle at which birds are observed in relation to the surface of the water. However, birds flying at much greater heights would presumably be less detectable to observers during vessel-based surveys. Appendix C Table 1 summarizes the number of observations of birds by flight height categories (0 m, <10 m, 10–25 m, 25–125 m, and >125 m) during the most relevant vessel-based surveys to the SRWF, the Bay State Wind (Bay State Wind 2019) and OSAMP (Paton et al. 2010) surveys.

Below is a summary of the flight heights observed for those bird groups with potential to occur in the SRWF, detailed results are provided in Appendix C Table 1. Note that these observations were documented during diurnal survey periods and do not reflect flight heights at night.

- Loons and grebes – most less than 25 m
- Petrels and shearwaters – 100% of the time less than 10 m
- Gannets and cormorants – most less than 10 m
- Of one wading bird observed – less than 10 m
- Sea ducks – 100% less than 25 m
- Of one raptor (merlin) observed – 10-25 m
- Shorebirds – 100% less than 10 m
- Gulls, skuas and jaegers – most were below 25 m

- Terns – most were >10 to 25 m
- Alcids – all below 10 m
- Passerines – the majority were below 25 m

The above flight heights were documented during the day when birds were likely commuting for foraging, with land birds that traveled offshore while migrating and potentially flying low in search of land. Nocturnal migratory bird flight heights are expected to be much greater, above the RSZ (Gauthreaux 1991; Harrington 2001).

2.3.1.3 Key Factor 3: Vulnerable Species

Though not observed during the Bay State Wind surveys (BRI 2018) or MassCEC surveys (Veit et al. 2016), piping plover and red knot may pass through the SRWF during migration (Loring et al. 2018 and 2019). Regional telemetry studies conducted from 2014 to 2017 indicate that federally listed piping plover, red knot, roseate tern, and NYS-listed common tern occur over the region, and have the potential to occur over the SRWF while migrating (Loring et al. 2017a, 2017b, 2018, and 2019).

Following breeding, roseate terns move to coastal staging areas and forage up to 10 mi (9 nm, 16 km) from the coast, though most foraging activity occurs closer to shore (Burger et al. 2011). Roseate terns generally migrate over the AOCS between their northwest Atlantic breeding colonies and wintering areas (Loring et al. 2019). Loring et al. (2019) indicated that as roseate terns occur over federal waters (beyond 3.5 mi [3 nm, 5.6 km] from shore) and may be exposed to potential WEAs during both breeding and post-breeding dispersal periods.

The black-capped petrel proposed for listing under the ESA may occur very rarely offshore in the region during the fall (USFWS 2019a); occurrences in the SRWF are expected to be very rare events.

2.3.1.4 Potential Impacts

Construction

Seafloor Disturbance, and Sediment Suspension and Deposition

Construction activities including seafloor preparation, foundation installation, scour protection installation, vessel anchoring, and cable installation will result in seafloor disturbances as well as sediment suspension and deposition. These construction activities and associated IPF may indirectly impact foraging of marine birds by temporarily displacing prey sources or reducing visibility of prey. However, impacts will be localized to active construction areas only and any suspended sediment is expected to resettle within a few hours. Birds are anticipated to be able to fly a short distance to access other suitable habitats for foraging in the broader area during foundation installation. Therefore, the temporary indirect impacts associated with seafloor disturbance and sediment suspension and deposition are considered short-term and **minimal**.

Noise

In-air and underwater noise will be generated during installation of offshore foundations. These construction activities will generate underwater noise in the form high intensity acoustic pulses (Kragefky 2014). Noise from activities such as pile driving may be detected by some species of fish out to distances of 50 mi (43 nm, 80 km) or more (Gill 2005); therefore, these activities could cause prey fish to flee and ultimately reduce foraging success of marine birds in the area. In-air and underwater noises could also temporarily displace marine birds (Fox and Petersen 2019). Marine birds such as razorbills have been observed to flush from sources of loud noise (Lavers et al. 2009). Since construction noise will be short-term and localized to active areas of construction and marine birds are expected to be able to fly a short distance to find alternative foraging areas, long-term impacts are not expected. Short-term impacts associated with noise are considered short-term and **minimal**.

Traffic

Approaching construction vessels could flush some bird species from foraging or staging habitats, causing them to flee the immediate area. Loons and alcids are among marine bird groups that are more sensitive to disturbances (Furness et al. 2013). Razorbills have been observed to flush at the approach of boats (Lavers et al. 2009). Conversely, for other marine species such as gulls, birds may be attracted to maintenance vessel traffic similar to how they are attracted to fishing vessels (Nisbet et al. 2020b; Hatch et al. 2009; Wiley and Lee 2000; Dierschke et al. 2016). In very rare cases, birds may collide with moving vessels at night. However, construction traffic will be short-term and similar to normal, non-Project-related vessel traffic. Therefore, traffic is not likely to cause permanent displacement or significant collision mortality, rather impacts are anticipated to be short-term and **minimal**.

Visible Infrastructure

Construction equipment and components of WTGs and OCS–DC will represent visible infrastructure and may present collision hazards, particularly at night and during periods of poor visibility. However, construction activities will be short-term and will be generally confined to good weather. The potential direct effect of collision mortality or injury during construction is considered **low**. There may be some activities that will occur at night during which structures may be lit for navigation and safety purposes; potential effects related to lighting are discussed below.

Lighting

Lighting required for safety during night construction activities has the potential to cause the indirect effect of attracting birds, particularly during poor weather, and ultimately may increase risk of collision (Fox et al. 2006; Hüppop et al. 2006). Brightly illuminated structures offshore, such as research platforms, pose a risk to marine and land birds migrating at night, particularly passerines (Hüppop et al. in press). However, construction activities will be short-term, localized and generally confined to good weather; therefore, indirect effects associated with lighting are considered **low.**

Discharges and Releases

During construction of the SRWF, sanitary and other waste fluids will be generated by equipment and support vessels. However, as described in Section 3.0, all wastes will be properly managed in accordance with applicable federal and state laws. Accidental discharges, releases, and disposal could directly (i.e., mortality from ingestion of toxins) and indirectly affect marine birds (e.g., oiling of feathers, which could reduce fitness and potentially impact breeding success); risks of discharges and releases will be minimized through implementation of BMPs. Therefore, potential indirect impacts associated with discharges and releases are considered **minimal**.

Trash and Debris

Trash and debris will be generated by construction and support vessels. Accidental disposal of trash and debris into the water could result in the potential ingestion or entanglement of birds. Ingestion of trash can negatively impact foraging and/or the ability to fly, and ultimately could reduce survival (Gochfeld 1973). However, trash and debris during construction will be properly managed in accordance with federal and state laws and accidental improper disposal is unlikely. Therefore, potential indirect impacts associated with trash and debris are considered short-term and **minimal**.

Table 2.12 Impact Producing Factors and Potential Levels of Impact on Avian Species from the SRWF during Construction

Impact Producing Factor	Project Activity	Potential Impact
Seafloor Disturbance	Foundation, WTG, OCS–DC, IAC installation	Direct displacement, short-term, minimal
Sediment Suspension and Deposition	Foundation, WTG, OCS–DC, IAC installation	Direct displacement, short-term, minimal
Noise	Pile-driving, IAC installation	Indirect disturbance/displacement, short-term, minimal
Traffic	Vessel activity	Direct injury or mortality from collision/indirect displacement, short-term, minimal
Visible Structures and Lighting	Construction vessels and equipment and partially installed structures	Direct injury or mortality from collision/indirect displacement, short-term, low
Discharges and Releases	Foundation, WTG, OCS–DC, IAC installation	Indirect injury or mortality/decreased breeding success, short-term, minimal
Trash and Debris	Foundation, WTG, OCS–DC, IAC installation	Indirect mortality/injury from ingestion of trash, short-term, minimal

Operations and Maintenance

Noise

Operating WTGs produce two primary types of noise, aerodynamic blade and mechanical noise (MMS 2008). Operating equipment on the platforms may also generate noise. WTG sound levels are not anticipated to exceed 35 decibels adjusted (dBA) at any area surrounding the WTGs (Stantec 2020e). While onshore WTGs have been found to have measurable effects on land birds (i.e., masking calls and breeding birds adjusting frequency of calls to increase communication in vicinity of WTGs; Whalen 2015), sounds produced by offshore WTGs are expected to largely be drowned out by the sounds of wind and waves. At an operational wind farm in Europe, blade movements and noise did not appear to impact common eider occurrence in the wind farm (Dierschke et al. 2016). Marine bird activities in the SRWF including foraging would not be expected to be impacted by WTG sound because audible detection of prey is not a strategy used by birds in the marine environment, rather they primarily use visual detection and some species including petrels and shearwaters may also use sense of smell (Drucker et al. 2020). The presence of visible infrastructure is more of a factor contributing to avian displacement impacts (as discussed below) and not operational noise. There will be noise associated with the OCS–DC as well including mechanical noises produced by transformers and shunt reactors; however, these sources of noise are also expected to largely be cancelled out by the sounds of wind and waves. Therefore, impacts from operational noise are considered long-term but **minimal**.

Traffic

Approaching maintenance vessels could flush some bird species from foraging or staging habitats, causing them to flee the immediate area. A summary of observations from operational wind farms in Europe indicated that areas with regular vessel and helicopter traffic for maintenance were avoided, either partly or completely, by sensitive species including divers and seaducks (Dierschke et al. 2016). At the Utgrunden wind farm, long-tailed ducks (*Clangula hyemalis*) and red-breasted mergansers (*Mergus serrator*) would flush from vessel traffic, and the long-tailed ducks would return to the same area about 30 minutes after the disturbance (Dierschke et al. 2016). Red-throated divers were believed to be displaced from the Alpha Ventus wind farm due to increases in maintenance vessel traffic after construction (Dierschke et al. 2016).

Conversely, for other marine species, such as gulls, birds may be attracted to maintenance vessel traffic (Nisbet et al. 2020b; Hatch et al. 2009; Wiley and Lee 2000; Dierschke et al. 2016). An increase in the presence of terns and gulls observed in areas around an offshore wind facility in Denmark was believed to be associated with increased boat activity for maintenance (Petersen et al. 2006). However, construction traffic will be short-term and similar to normal, non-Project-related vessel traffic. Therefore, traffic is not likely to cause permanent displacement effects, rather impacts are anticipated to be short-term and **minimal**.

Discharges and Releases

Impacts associated with discharges and releases are expected to be similar to those described above for construction. Any potential operational discharge and release indirect impacts will be minimized through use of BMPs; therefore, these IPF present short-term and **minimal** effects.

Trash and Debris

Impacts associated with trash and debris are expected to be similar to those described above for construction. Any potential operational trash and debris impacts will be minimized through the use of BMPs; therefore, these IPF present short-term and **minimal** effects

Visible Infrastructure

The presence of operational WTGs may result in indirect effects associated with displacement or 'barrier effect' for some species of marine birds (Fox and Petersen 2019). Displacement effects can occur at varying distances from WTGs and may be dependent on species' behaviors and vulnerability, project design features, visibility conditions, and other factors. Scov et al. (2018) defines the distances at which birds may avoid or be displacement from WTGs as macro (avoidance up to 1.8 mi [1.6 nm, 3 km] from a wind farm), meso (avoidance behavior within a wind farm), and micro (avoidance of an individual WTG blade). Displacement effects are complicated and can be difficult to track as the distribution and numbers of marine birds can be influenced by numerous factors including surface water temperatures, water depth, and seasonal distribution of prey sources.

At an offshore wind facility in Kalmar Sound, Sweden the migratory flight paths of waterfowl and cormorants shifted up to 1.2 mi (1.0 nm, 1.9 km) eastward from baseline conditions as the birds made efforts to avoid flying less than 0.6 mi (0.5 nm, 1.0 km) from WTGs representing macro-avoidance; however, the 0.7- to 1.8-mi (0.6- to 1.6-nm, 1.2- to 2.9-km) extension in the birds' migratory flight path resulted in a small (0.2−0.5%) increase in their overall migration distance (Pettersson 2005). Masden et al. (2009) estimated that cumulative increases in energy expenditure for avoiding 100 wind farms during migration would result in increased energy expenditure equating to 1 percent of a migrant bird's body mass; however, energetic demands may be greater for wintering seabirds if avoiding a wind farm while traveling from roosting to foraging locations on a daily basis compared to a single migratory flight. Researchers suggest that impacts on energetics associated with barrier effects due to offshore wind farms may be comparable to other obstacles encountered during migration including adverse weather (Petersen et al. 2006; Dierschke et al. 2016).

During vessel-based avian observation surveys conducted for the Block Island Wind Farm, bird encounter rates, diversity, and abundance for all species combined appeared slightly lower in turbine areas (including a 1 nm-buffer around WTGs) during Year 1 and Year 3 operations as compared to pre-construction (Stantec 2020f). These results suggest potential displacement initially (macro-avoidance); however, these patterns were not statistically significant (Stantec 2020f). Similarly, density of birds and flight heights did not vary systematically before or after Project construction, or inside or outside the turbine area (Stantec 2020f).

Other effects could include attraction to (and potentially collision with; NYSERDA 2017a) above water structures for perching opportunities (Hill et al. 2014; Dierschke et al. 2016) or attraction for foraging opportunities due to changes in prey base around underwater structures known as ‘reef effect’ (Kragefky 2014; Dierschke et al. 2016). Fish are known to congregate around floating or stationary structures in the marine environment, and WTG foundations may create a localized artificial reef effect, where fish may find shelter or food (Kragefky 2014). Turbulence (i.e., waves and shifting currents) at WTGs may force prey sources to the surface, providing potential foraging opportunities for birds (Dierschke et al. 2016).

Razorbill and common guillemot began to occur in wind farms after a few years of operation, possibly due to reef effect and changes in food supply or habituation (Dierschke et al. 2016). Herring gulls were observed foraging around WTGs, and lesser black-backed gulls and great cormorants were observed foraging on invertebrates that had settled on foundations. Other species observed foraging in wind farms included divers and gannets, cormorants, terns, scoters, long-tailed ducks, and guillemots (Dierschke et al. 2016). Above water structures may also present perching opportunities for some species of marine birds: cormorants and large gulls have regularly been observed roosting on above water structures including at offshore wind farms (Hill et al. 2014; Dierschke et al. 2016), and terns have been observed perching on turbine foundations at European offshore facilities before the towers were constructed (Dierschke et al. 2016). At a wind farm in Europe, birds were observed on separate occasions perching on a WTG deck platform, including a group of cormorants, a peregrine falcon, a kestrel, and groups of pigeons (Hill et al. 2014).

The potential for habitat displacement or attraction is species-dependent and is also influenced by a species use of the area (NYSERDA 2017a). Therefore, these potential effects are discussed below by avian group, with additional information on federally protected species. Further, results of the displacement (and collision) vulnerability model is discussed in Section 2.3.1.5.

Displacement Risk

Overall, displacement (macro avoidance) from the SRWF is not expected to affect populations of non-marine birds that do not land on the water and may only occur over the SRWF during migration, such as shorebirds (non-phalaropes), wading birds, raptors, and passerines. Any macro-avoidance behavior/displacement during migration is not likely to substantially increase energetics or reduce fitness due to the relatively small footprint of the SRWF.

Coastal and Land Birds

- Shorebirds (non-phalaropes): Shorebirds would only be expected to occur over the SRWF during migratory periods. Shorebirds have low estimated macro-avoidance rates (27%) (Willmott et al. 2013). Therefore, shorebirds are not considered at risk of displacement impacts.
    - Piping plover and red knot: Telemetry data collected by BOEM and USFWS indicate that piping plover and red knot have the potential to cross the SRWF during migratory periods (Loring et al. 2018 and 2019), although migratory flights over offshore waters are infrequent (NYSERDA 2017a, Burger et al. 2011). Piping plover and red knot exposure to the SRWF is limited to spring and fall migration; therefore, population-level impacts from displacement are unlikely.

- Shorebirds (phalaropes): Viet et al. (2016) documented phalaropes during their spring surveys in areas that overlapped with the SRWF. These species may migrate over the SRWF or may occasionally stopover in the vicinity of the SRWF to forage or rest on the water. Due to the sporadic occurrence of this species group across locations in the broader AOCS region and the relatively small footprint of the SRWF, these species are not significantly at risk of displacement.
- Wading Birds: wading birds spend most of the year in onshore, freshwater ecosystems and nearshore marine ecosystems. Only one wading bird (great blue heron [*Ardea herodias*]) was observed offshore during the regional ship-based surveys (Paton et al. 2010; Bay State Wind 2019). Exposure to the SRWF would be minimal and limited to migratory periods only; therefore, any avoidance behavior is not expected to result in displacement effects.
- Raptors: Like other land bird species, since use of the offshore environment by raptors is generally limited to migration, any avoidance behavior will not result in displacement from important habitat. Species of raptor more likely to occur offshore than other species include falcons, specifically peregrine falcons or merlins, which may be attracted to the above water structures for potential perching opportunities and may launch foraging flights from structures if their avian prey species are also in the area. These occurrences are expected to be rare events given the SRWF distance from shore. Therefore, significant impacts associated with displacement or attraction are unlikely because exposure is expected to be relatively low and limited to migration.
  - Eagles: Eagle exposure to SRWF is expected to be very rare because, similar to other large bodied raptors, eagles generally avoid crossing large expanses of water. Rare occurrences would be during migratory periods only and foraging behavior would not be expected. Therefore, displacement impacts to eagles are not anticipated.
- Passerines: Passerines migrate to and from breeding grounds to wintering grounds over a broad expanse of land (at least as wide as their breeding range) and may occasionally migrate offshore if blown off course by weather. Passerine exposure to SRWF is expected to be minimal as they do not depend on offshore habitats for foraging or staging, and passerine use of the SRWF is expected to be limited to migratory periods. Since use of the offshore environment by passerines is limited to migration, displacement effects are not anticipated.

Marine Birds

Marine birds in general will have greater exposure to the SRWF than coastal and land birds, and certain marine bird groups are more vulnerable to displacement than others. Therefore, there may be medium impacts to some marine bird groups (as described in Section 2.3.1.5 below). Displacement effects are related to macro-avoidance, and avoidance behaviors can occur at considerable distances from offshore wind facilities (Mendel et al. 2014; Hill et al. 2014). Loons and common scoters showed an increased avoidance of both the Horns Rev and Nysted facilities in Europe and this effect was documented at distances between 2 and 4 km (1.2−2.5 mi) from the facility (Petersen et al. 2006). Species with less restricted foraging habitat needs and diverse prey sources would be at less of a risk due to displacement (Willmott et al., 2013). Breeding birds that need to remain within range of nesting areas may be more susceptible to displacement impacts but non-breeding birds that are less restricted in their range may be able to use alternative foraging locations (Busch and Garthe 2016). Overall, displacement from the SRWF is not expected to affect populations of marine birds.

Birds flying within wind farms appear to favor locations where turbines are spaced more widely (Krijgsveld 2014), suggesting that the SRWF spacing of 1.15 by 1.15 mi (1 by 1 nm; 1.85 by 1.85 km) minimizes the potential for impacts such as barrier effects and displacement. A summary of potential effects to marine birds are as follows (see Section 2.3.1.5 for more details).

- Loons: Loon vulnerability to displacement is considered high; however, they have a low to medium population vulnerability (Section 2.3.1.5 below) because loons may travel through SRWF during spring and fall migration and may stage in the area during winter. Loons may find limited foraging opportunities in the SRWF; however, based on water depths, the SRWF is not considered priority foraging habitat for loons. Loons were among species observed in survey areas that overlapped with the SRWF in winter (Veit et al. 2016). Loons are consistently identified as being vulnerable to displacement impacts associated with offshore wind development (Garthe and Hüppop 2004; Furness et al. 2013; Willmott et al. 2013; MMO 2018). Loon macro-avoidance of offshore wind farms is estimated at 52−68 percent (Willmott et al. 2013). However, displacement from the SRWF is unlikely to impact population trends because of the relatively small size of SRWF in relation to available foraging habitat in the larger region. Further, based on water depths, the SRWF is not considered priority foraging habitat for loons.
- Sea Ducks: Sea duck vulnerability to displacement is considered high and they have a medium to high population vulnerability (Section 2.3.1.5). Exposure to the SRWF is expected to primarily occur during migration or commuting flights between wintering sites. Sea ducks may find limited foraging opportunities in the SRFW; however, based on water depths, the SRWF is not considered priority foraging habitat for sea ducks. Sea duck species including scoters, long-tailed ducks, and common eiders were observed in study areas that overlapped with the SRWF during winter (Veit et al. 2016). Sea ducks have consistently been identified as being vulnerable to displacement (MMO 2018; Willmott et al. 2013). Petersen et al. (2006) found that scoters were among species exhibiting complete avoidance of WTG areas yet were numerous in the surrounding waters. However, observed displacement effects at some offshore wind facilities in Europe have generally been temporary (Leonhard et al. 2013). Sea ducks estimated macro-avoidance rates range from 53 to 95.5 percent (Willmott et al. 2013). Displacement effects due to the SRWF are not expected to impact population trends for sea ducks due to the relatively small footprint of SRWF in relation to available foraging habitat in the region.
- Petrels and Shearwaters: The petrel group is common throughout the region during the summer months, and this group of species was observed in survey areas that overlapped with the SRWF in summer (Veit et al. 2016). Petrels, shearwaters, and storm-petrels rank at the bottom of displacement vulnerability assessments in the AOCS and have mid-level estimated macro-avoidance rates (50%) (Willmott et al. 2013). This marine bird group is not restricted to specific water depths for foraging opportunities. Therefore, population-level impacts from displacement to this species group is unlikely.
  - Black-capped Petrel: Black-capped petrels are extremely uncommon in North Atlantic waters (Haney 1987) but may rarely occur in the region of the SRWF after storm events (Lee 2000). Since they are extremely uncommon in northeastern waters, displacement impacts are not expected.

- Gannets and Cormorants: Northern gannets were among species observed during winter surveys that overlapped with the SRWF (Veit et al. 2016). Studies at European offshore wind projects have documented some avoidance behaviors by northern gannets (Krijgsveld et al. 2011; Cook et al. 2012; Hartman et al. 2012; Vanermen et al. 2015; Dierschke et al. 2016; Garthe et al. 2017; Skov et al. 2018), and Willmott et al. (2013) indicated gannets are among those vulnerable to displacement to wind farms on the AOCS; their macro-avoidance rate is estimated to range from 64 to 72 percent. While there is uncertainty on how displacement will affect individual fitness, population-level impacts are unlikely because of a relatively low baseline occurrence in the SRWF. Cormorant exposure is considered minimal as this bird group is more abundant closer to shore (they require perches to warm their body temperature after foraging in cold water), and only one cormorant was observed during Bay State Wind regional avian surveys (BRI 2018). Cormorants are considered to have little vulnerability to displacement because they have been found to be attracted to WTGs based on available studies (Krijgsveld et al. 2011; Lindeboom et al. 2011; Stantec 2020f); they have low estimated macro-avoidance rates (18−23%) (Willmott et al. 2013). Cormorants showed a large increase in abundance while their abundance was minimal during pre-construction at some European offshore wind facilities (Dierschke et al. 2016). Population-level impacts from displacement are unlikely due to gannet and cormorant low baseline exposure.
- Gulls, Skuas, and Jaegers: Skua and jaeger exposure during SRWF operation is considered minimal, while gull exposure is minimal to medium depending on the species (see Section 2.3.1.5). Great-black backed gull and herring gull were among species of gull observed during winter surveys that overlapped with the SRWF (Veit et al. 2016). Gulls have a wide-range of macro-avoidance rates (18−76.4%) while skuas and jaegers have a very low macro-avoidance rate (0%) (Willmott et al. 2013). Gulls and similar species are generally considered to have low vulnerability to displacement (Furness et al. 2013; Willmott et al. 2013); therefore, population-level impacts from displacement are unlikely.
- Terns: Common tern and roseate tern were among species of tern that were observed during late spring/summer surveys that overlapped with the SRWF (Veit et al. 2016). Telemetry data collected by BOEM and USFWS indicate that common and roseate terns have the potential to cross the SRWF (Loring et al. 2019). Terns have a medium to high vulnerability to displacement (Section 2.3.1.5). Terns may be vulnerable to displacement since they have been demonstrated to avoid small (660 kilowatts [kW]) operating onshore WTGs (Vlietstra 2007). They have mid-level estimated macro-avoidance rates (30−69.5%) (Willmott et al. 2013). Post-construction radar studies during migration at the Nysted and Horns Rev wind farms in Denmark indicate that although the greatest levels of movement occurred outside of these offshore wind farms, terns continued to migrate through the wind farm areas (Petersen et al., 2006). Visual data indicated that while most terns generally avoided the direct wind farm area, terns increased their use of the 2-km (1.2-mi) zone surrounding the facility and were observed foraging at the outer edges of the facility around turbine structures (Petersen et al. 2006). While some individual terns will be exposed to the SRWF, if displaced they would be expected to find alternative local foraging options; therefore, population-level impacts from displacement are not expected.

- – Roseate Tern: Roseate tern exposure during SRWF operation is considered low, based on the Bay State Wind (2019) and MassCEC surveys (Veit et al. 2016), as well as BOEM and USFWS telemetry tracking data (Loring et al. 2019). Roseate terns may be vulnerable to displacement since terns have been demonstrated to avoid small (660 kW) operating WTGs (Vlietstra 2007). While some individual terns may be exposed to the SRWF, if displaced, they would be expected to be able to take advantage of other nearby more important foraging areas in the region, such as the Muskeget Channel between Martha's Vineyard and Nantucket Island (Veit et al. 2016); therefore, population-level impacts associated with displacement from the SRWF are unlikely.

- Alcids: Razorbills were among species observed during winter surveys that overlapped with the SRWF (Veit et al. 2016). Alcid vulnerability to displacement is expected to be medium to high (Section 2.3.1.5). Alcids are among species considered vulnerable to displacement on the AOCS and have relatively high macro-avoidance rates (45−68%) (Willmott et al. 2013). Alcids have a high sensitivity to disturbances such as vessel traffic and also have specific habitat restrictions (Furness et al. 2013; Willmott et al. 2013; Dierschke et al. 2016; Wade et al. 2016). The SRWF is not considered priority habitat for alcids (see Section 2.3.1.2) and due to the relatively small footprint of the SRWF, it is unlikely that displacement from the SRWF area will result in population-level impacts given the relatively small size of SRWF relative to available foraging habitat in the broader region.

Collision Risk

The presence of visible infrastructure, including WTGs (RSZ, WTG foundations, tower, and hub) and the OCS–DC, may also result in the direct effect of mortality or injury due to collision. Collision impacts to listed species would be considered a medium impact; however, population level impacts are not expected.

Available information from research platforms, oil platforms, lighthouses, and lightships suggest bird collisions do occur at a variety of types of offshore and coastal structures (Drewitt and Langston 2006; Fox et al. 2006; Goodale and Milman 2016). Hill et al. provide estimates of hundreds of birds per year at individual research platforms; however, lighting (particularly white, steady burning lights) and/or steel cables of towers on these structures are believed to be associated with increased risk (Hill et al., 2014). Currently, collision fatality data from existing offshore WTGs is extremely limited and largely anecdotal given the technical difficulties associated with detecting collisions combined with the loss of carcasses landing in the water. Remote collision detection technologies are still evolving but preliminary studies provide some information regarding collision risk, particularly for larger bodied birds such as gulls and gannets that are more easily detected. At an offshore wind project located 7.5 mi (6.5 nm, 12.1 km) off Margate, Kent in the UK, six collision events (one black-legged kittiwake, one black-backed gull species, three large gull species, and three unidentified gull species) were recorded by video, representing 0.05 percent of recorded birds by the monitoring system over an approximate two-year period (Skov et al. 2018). Tetra Tech conducted a beached-bird survey at Block Island Wind Farm before construction from June to December 2015 (7 months), during construction from January to December 2016 (12 months), and post-construction from January to July 2017 (7 months) and January to December 2019 (12 months). There were 12 carcasses discovered in 2015, 8 carcasses in 2016, 1 carcass in 2017, and 19 carcasses in 2019.

There was no increase in carcasses found post-construction as compared to baseline pre-construction monitoring; rather beached bird discovery rates (carcasses/months of survey) were lower during construction and post-construction periods compared to pre-construction, and 2017 had the lowest bird carcass discovery rate observed during the beached-bird survey period (Tetra Tech 2017, Tetra Tech 2020). Beached-bird carcass counts were conducted at a nearshore wind project off the coast of northeast England during which gull and eider carcasses were most commonly found (though researchers suspected that passerines were likely more difficult to recover); at this facility, the authors estimated 16.5–21.5 bird fatalities/turbine/year (Newton and Little 2009, as cited by Hüppop et al., in press). At a single wind turbine located on the coast near the Cape Cod Canal, researchers estimated 1.8 to 3.3 bird fatalities per year (Gordon 2011), primarily consisting of gull species. The potential for collision events to occur is dependent on species behaviors (flight heights, proportion of time in RSZ, and avoidance behaviors), and is also influenced by weather events and project characteristics including turbine size, spacing, turbine layout, rotor speed, percent of time WTGs are in operation, and artificial sources of lighting (note that Lighting is discussed separately below). The potential effects of the SRWF are discussed below for each avian group, with information on federally protected species specifically provided.

Coastal and Land Birds

- Shorebirds (non-phalaropes): Shorebirds are expected to have minimal exposure to the SRWF and are generally expected to occur at great heights (above 4,000 m [13,123 ft]; Hüppop et al., in press) during migration and are expected to generally occur well above the proposed RSZ if traveling over the SRWF during spring and/or fall migration. Shorebirds demonstrated avoidance behaviors when approaching offshore WTGs at an offshore wind facility in Denmark (Petersen et al. 2006). Based on minimal exposure and documented avoidance behaviors, shorebirds are not considered at significant risk of collision impacts.
  - Piping plover and red knot: Telemetry data collected by BOEM and USFWS indicate that piping plover and red knot have the potential to cross the SRWF during migratory periods (Loring et al. 2018 and 2019), although migratory flights over offshore waters are infrequent (NYSERDA 2017a, Burger et al. 2011). Available information suggests these species depart for migratory flights during fair conditions (Loring et al. 2018 and 2019) and are generally expected to occur over the region of the SRWF at great heights. Telemetry data indicated that offshore flights for piping plover were typically above the RSZ (greater than 820 ft [250 m]), and 21.3 percent of flights over federal waters were estimated to be within the RSZ (Loring et al. 2019); based on red knot telemetry data, the majority of documented flights (77%) that crossed WEAs in federal waters occurred at heights within 66 to 656 ft (20–200 m); however, the authors cautioned that flight height estimates had large margins of error (Loring et al. 2018). USFWS indicated there is a large degree of uncertainty surrounding telemetry flight height data due to the estimation process and these data should be interpreted with caution (P. Loring, USFWS pers. comm.). Other data sources suggest the red knots occur at substantial heights during long-distance migratory movements (Harrington 2001). Exposure to the RSZ for piping plover and red knot is expected to be very minimal and limited to spring and/or fall migration periods; therefore, population impacts from collision risk are unlikely.

- Phalaropes (Shorebirds): Viet et al. (2016) documented phalaropes during spring surveys in areas that overlapped with the SRWF. These species may migrate over the SRWF or may occasionally stopover in the vicinity of the SRWF to forage or rest on the water. If they were to occur in the SRWF, they may be at risk while landing or taking off. However, due to the sporadic occurrence of this species group across locations in the broader AOCS, occurrences within the SRWF are expected to be relatively infrequent and population-level impacts are not expected.
- Wading birds: Crossings of the SRWF by wading birds are expected to be rare as these birds are primarily coastal and land based. Exposure to the SRWF is expected to be minimal and limited to migratory periods only, and population-level impacts due to collision are unlikely.
- Raptors: Like other land bird species, since use of the offshore environment is generally limited to migration, population-level impacts to raptors due to collision are very unlikely. If occurring in the area, falcons (peregrine falcons or merlins) may be attracted to above water structures for perching opportunities and may launch foraging flights from structures if their avian prey species are also present. However, raptor occurrence in the SRWF is expected to be rare given the SRWF distance from shore. Population-level impacts are unlikely because exposure is expected to be low and will be limited to migration.
  - Eagles: Eagle exposure to SRWF is expected to be minimal because, similar to other large bodied raptors, eagles generally avoid crossing large expanses of water. Rare occurrences would be during migration and during daytime periods only when eagles would be expected to visually detect visual infrastructure. Eagle foraging behavior in the SRWF would not be expected. Therefore, collision impacts to eagles are not anticipated.
- Passerines: Passerine exposure to the SRWF is expected to be minimal as this avian group does not use offshore habitats for foraging or staging, and passerine use of the SRWF is expected to be limited to migratory periods. Passerines are the most abundant group of birds in North America and, due to their abundance and nocturnal migration behaviors, species within this group (e.g., warblers, vireos, thrushes, sparrows) account for most (80%) of avian fatalities documented at onshore wind facilities (Erickson et al., 2001; Johnson et al., 2004; Erickson et al., 2014). Carcasses consisting of nocturnal migrant passerines were those most commonly detected at offshore research platforms and oil/gas platforms, with thrushes, starlings, and skylarks most commonly found at European offshore structures, and vireos, kinglets, and wood warblers most commonly found at structures off the coast of North America (Hüppop et al., in press). Passerines typically migrate at night at heights less than 1,640 ft (500 m) over land, but sometimes over 1,640 ft (500 m) in suitable atmospheric conditions (Gauthreaux 1991) but can fly lower during inclement weather or when flying into headwinds, and have been documented at relatively low heights during diurnal vessel-based surveys in the region of the SRWF. Passerines comprise the species most frequently detected during fatality surveys at onshore wind projects in the eastern US (Erickson et al. 2014). As described below in Lighting, passerine collision risk is increased by artificial sources of lighting during inclement weather. While passerines are vulnerable to collision risk, population-level impacts are unlikely because they are considered to have low exposure to the SRWF given the distance from shore.

Marine Birds

Marine birds in general will have greater exposure to the SRWF than coastal and land birds; however, collision risk due to the SRWF is not expected to affect populations of marine bird species. In general, high collision avoidance rates (micro-avoidance behavior) have been estimated for marine birds at approximately 99 percent or greater (Chamberlain et al. 2006; Cleasby et al. 2015; Skov et al. 2018).

The following is a summary of potential collision effects by marine bird species group:

- Loons, Sea Ducks, Petrels and Shearwaters: Since loons demonstrate high macro-avoidance behavior, they are generally not considered to be vulnerable to collision (Wade et al. 2016; Furness et al. 2013). As indicated in Section 2.3.1.5, these groups have low to medium collision vulnerability. Sea ducks, petrels and shearwaters are considered at low risk of collision impacts because they have demonstrated avoidance to WTGs (Willmott et al. 2013) and primarily fly below the RSZ of the shortest WTG model under consideration at the time of the collision risk assessment (Willmott et al. 2013).
  - Black-capped Petrel: As discussed above regarding displacement, this species is expected to occur extremely rarely in northeastern waters and collision impacts are highly unlikely.
- Gannets and Cormorants: Gannets and cormorants have a low to medium vulnerability to collision (Section 2.3.1.5), consistent with other vulnerability assessments (Furness et al. 2013; Wade et al. 2016). Gannets have demonstrated high macro-avoidance behavior, which would ultimately reduce collision risk (Garthe et al. 2017; Skov et al. 2018). Population-level impacts are unlikely due to high avoidance behavior and overall low exposure. Cormorants are considered to be vulnerable to collision because they may be attracted to WTGs for perching opportunities (Krijgsveld et al. 2011; Lindeboom et al. 2011) and often fly at heights within the RSZ (Willmott et al. 2013). Population-level impacts are unlikely to either species group due to their overall low exposure.
- Gulls, Skuas, and Jaegers: skua and jaeger exposure during SRWF operation is considered minimal, while gull exposure may be medium depending on the species. Population level impacts are not expected for skuas and jaegers due to low exposure to the SRWF. However, gull species are considered highly vulnerable to collision due to observed continued use of offshore wind farms during operation (Furness et al. 2013; Willmott et al. 2013). In addition, gulls are known to be attracted to WTGs (Vanermen et al. 2015) and gull collisions with offshore WTGs in Europe have been observed (Skov et al. 2018) or indirectly detected by beached-bird carcasses counts (Hüppop et al. in press). Gulls were among species found during carcass searches at a coastal wind turbine near the Cape Cod Canal (Gordon 2011). While gulls are likely to be exposed to the SRWF and are vulnerable to collision and some species demonstrated a high population vulnerability (Section 2.3.1.5), overall population-level impacts due to collision are unlikely because local gull populations are stable and increasing, and this species group generally shows high reproductive success rates (Good 1998; Pollet et al. 2012; Burger 2015; Nisbet et al. 2020b).

- Terns: Terns rank as moderately vulnerable in offshore wind collision risk assessments (Garthe and Hüppop 2004; Furness et al. 2013; Willmott et al. 2013). Terns have a medium collision vulnerability and high population vulnerability (Section 2.3.1.5). Their vulnerability is generally due to their foraging behaviors and flight heights, as well as potential occurrence offshore during the breeding period and migratory staging periods. However, terns have demonstrated micro-avoidance (avoidance behavior during close pass within RSZ) of operating WTGs (Vlietstra 2007), and have been documented to lower their flight altitude (form of mirco-avoidance) when approaching an offshore wind farm (Krijgsveld et al. 2011). Despite a coastal wind turbine's proximity of 7 mi (6 nm, 12 km) from a tern colony in a location where terns commute and forage, there were no terns found during carcass searches (Vlietstra 2007; Gordon 2011). Outside of migration terns mainly fly below the RSZ (Cook et al. 2012; Bay State Wind 2019) and are expected to have a low risk of collision with larger WTG models that have taller minimum rotor-swept heights. During migration, terns are expected to fly at great heights above the RSZ (Alerstam 1985; Veit and Petersen 1993; Nisbet et al. 2020b) during periods of fair weather but may fly lower during strong head winds (Alerstam 1985), and potentially also during periods of rain/fog. Most tern migration activity is expected to occur during fair weather. Population-level impacts are not anticipated.
  - Roseate Tern: Migrating roseate terns are thought to occur at greater heights than non-migratory periods, likely hundreds to thousands of feet/meters (Perkins et al. 2004; MMS 2008). Therefore, due to limited exposure, population impacts are unlikely.
- Alcids: Alcids have a low to medium collision vulnerability (Section 2.3.1.5). Alcids are generally not considered vulnerable to collision (Wade et al. 2016) because they primarily fly below the RSZ (Bay State Wind 2019; Paton et al. 2010) and demonstrate high avoidance behavior of offshore wind farms (Furness et al. 2013; Willmott et al. 2013).
- Minimization measures will reduce impacts associated with collision risk during operation of the SRWF. Sunrise Wind will take measures to reduce perching opportunities at operating turbines, if appropriate based on further consultations with state and federal agencies. Presumably turbine spacing of 1.15 by 1.15 mi (1 by 1 nm; 1.85 by 1.85 km) will allow for avoidance of collision; however, more information from multiple offshore wind farms with different configurations is needed to confirm this (Krijgsveld 2014). These measures combined with high micro-avoidance rate behaviors observed for most avian species suggests collision risk due to the SRWF will not result in adverse impacts to avian populations.

Lighting

Lighting on WTGs and OCS–DC, could result in the attraction of both migratory land birds (Loss et al. 2013) and some species of marine birds (particularly alcids and petrels; Huntington et al. 1996; Wiese et al. 2001) at night, particularly during periods of low cloud ceiling, rain and/or fog, when birds may become attracted to sources of steady-burning aviation obstruction lighting, and some other types of lighting, on tall structures, which can result in collisions by attracting or disorienting night migrating birds (Gehring and Kerlinger 2007; Hüppop et al. 2006). There have been reports of large numbers of dovekies being attracted to highly illuminated offshore oil platforms on the Grand Banks off Newfoundland (Montevecchi and Stenhouse 2002).

There have been large fatality events due to lighting and inclement weather during migratory periods at onshore wind projects (Kerns and Kerlinger 2004), and estimates suggest that brightly illuminated oil platforms in the Gulf of Mexico may result in 200,000 bird fatalities per year, and as many as 6 million bird fatalities may occur at oil and gas platforms in the North Sea per year (Hüppop et al. in press). There are estimates of hundreds of birds per year at individual research platforms; however, lighting (particularly white, steady burning lights) and/or steel cables of towers on these structures are believed to be associated with increased risk (Hill et al. 2014).

Less migration activity is expected to occur during periods of inclement weather (Petersen et al. 2006; Tetra Tech and DeTect 2012) when birds may become disoriented by artificial light sources. While most migrants are believed to depart during periods of fair weather, they may encounter inclement weather in route and then rapidly descend to land. In these cases they may follow artificial light sources as was believed to occur during the “fall out” event in May 2011 at the Machias Seal Island lighthouse located approximately 16 km (10 mi) offshore in the Gulf of Maine (Paton and McWilliams 2017) when large numbers of passerines (mainly warblers) were observed on the island the following morning. The Project is evaluating the implementation of methods to limit the visual impact of the aviation light, for example light dimming or the use of a radar-based Aircraft Detection Lighting System (ADLS) to turn on, and off, the aviation obstruction lights in response to detection of aircraft in proximity to the SRWF. Sunrise Wind will use ADLS or related means (e.g., dimming or shielding) to limit visual impact, pursuant to approval by the Federal Aviation Administration (FAA) and BOEM and commercial and technical feasibility at the time of FDR/FIR approval. In addition to limiting visual impact, reducing lighting will also reduce the potential for impacts to birds. Because measures will be taken to minimize artificial lighting on offshore infrastructure, large scale collision events are expected to be avoided and population-level impacts are not expected.

Due to the operational cut-in and cut-out wind speed limitations, the WTGs may not be operating approximately 2 to 3 percent of the time during winter months, approximately 2 to 4 percent of the time during spring and fall months, and approximately 3 to 5 percent of the time during summer months. Avian species would be at less risk of collision when the blades are not spinning; however, collision with stationary WTG structures during periods of low visibility would still be considered a risk.

Table 2.13 Impact Producing Factors and Potential Levels of Impact on Avian Species from the SRWF during Operations and Maintenance

IPF	Project Activity	Potential Impact
Noise	WTG or OCS–DC operation and maintenance, vessel activity	Indirect disturbance, long-term, minimal
Traffic	Maintenance vessel activity	Direct/indirect disturbance, long-term, minimal
Visible Structures and Lighting	WTGs or OCS–DC	Direct collision or displacement, long-term, medium
Discharges and Releases	Maintenance vessel activity at WTGs or OCS–DC	Indirect, short-term, minimal
Trash and Debris	Maintenance vessel activity at WTGs or OCS–DC	Indirect, short-term, minimal

2.3.1.5 Collision and Displacement Vulnerability Results

Marine birds with relatively greater exposure to the SRWF (i.e., greater than land birds/coastal birds) were included in the SRWF vulnerability model. The MDAT density maps for these 38 species are available in Appendix B. Table 2.14 presents the final vulnerability scores for those species groups as well as seasons of risk. Species with high population vulnerability scores (more vulnerability) included one species of sea duck, three species of tern, two species of gull, and two species of alcid (Table 2.14). No species had high collision vulnerability scores. All Shearwaters and petrels, most gulls, and all terns had medium collision vulnerability scores (Table 2.14). Species within the groups of loons and grebes, sea ducks, terns, and alcids had high displacement vulnerability scores (Table 2.14).

Table 2.14 Avian Species Group Final Vulnerability Scores and Seasons of Risk

Species or Group	Applicable Key Factor(s)	Population Vulnerability	Collision Vulnerability (regraded by PV)	Displacement (Macro-Avoidance) Vulnerability (regraded by PV)	Peak Period Risk
Petrels and Shearwaters					
Audubon's shearwater	one of the most abundant species groups in region, low flight heights below RSZ decrease collision risk; petrel attraction to light and potential nighttime feeding increase its risk	Medium	Medium	Medium	late summer/ early fall
Cory's shearwater		Medium	Medium	Medium	
great shearwater		Medium	Medium	Medium	
Leach's storm-petrel		Medium	Medium	Medium	
manx shearwater		Medium	Medium	Medium	
northern fulmar		Low	Medium	Medium	
Wilson's storm-petrel		Medium	Medium	Medium	
Loons and Grebes					
horned grebe	relatively high commuting flights; high macro avoidance of wind farms decreases collision risk while increasing displacement risk	Low	Low	High	winter
common loon		Medium	Low	High	
red-throated loon		Medium	Low	High	
Gannets and Cormorants					
double-crested cormorant	relatively abundant, and flight heights (relatively high commuting flights)	Medium	Medium	Low	summer
northern gannet		Medium	Low	Medium	fall and winter
Sea Ducks					
black scoter	abundant; nighttime roosting offshore, crepuscular flights to and from roosts but high avoidance of wind farms decreases collision risk	Medium	Low	High	winter
common eider		High	Medium	High	
long-tailed duck		Medium	Low	High	
red-breasted merganser		Medium	Low	Low	
surf scoter		Medium	Low	High	
white-winged scoter		Medium	Low	High	

Table 2.14 Avian Species Group Final Vulnerability Scores and Seasons of Risk

Species or Group	Applicable Key Factor(s)	Population Vulnerability	Collision Vulnerability (regraded by PV)	Displacement (Macro-Avoidance) Vulnerability (regraded by PV)	Peak Period Risk
Shorebirds (non-phalaropes)					
piping plover	vulnerable species, uncertain migratory flight heights; migration risk only, expected to occur less frequently offshore during migration	no further assessment due to minimal exposure to SRWF			spring and fall migration
red knot	vulnerable species; migration risk only uncertainty surrounding flight heights offshore	no further assessment due to minimal exposure to SRWF			spring and fall migration
Phalaropes					
red phalarope	can occur in large flocks offshore during migration (flocks of thousands of individuals can be present at one time); attraction to artificial light during fog/rain increases collision risk; sporadic occurrence across AOCS decreases risk	Low	Medium	Medium	late summer/ early fall
red-necked phalarope		Low	Low	Medium	
Wading Birds					
	low exposure, low flight heights	no further assessment due to minimal exposure to SRWF			spring and fall migration
Gulls, Kittiwakes, Skuas and Jaegers					
black-legged kittiwake	abundance; low macro-avoidance of wind farms and flight heights in RSZ	Low	Low	Medium	gulls year round, jaegers spring/ summer/fall
Bonaparte's gull		Medium	Low	Medium	
great black-backed gull		High	Medium	High	
herring gull		High	Medium	Medium	
laughing gull		Medium	Medium	Low	
ring-billed gull		Low	Low	Low	
great skua		Low	Medium	Low	

Table 2.14 Avian Species Group Final Vulnerability Scores and Seasons of Risk

Species or Group	Applicable Key Factor(s)	Population Vulnerability	Collision Vulnerability (regraded by PV)	Displacement (Macro-Avoidance) Vulnerability (regraded by PV)	Peak Period Risk
parasitic jaeger		Low	Medium	Low	
pomarine jaeger		Low	Medium	Low	
Terns					
common tern	vulnerable species, migratory stopover behaviors (landing on water), offshore migration documented	High	Medium	High	summer/ mainly post-breeding
least tern	vulnerable species, largely follows coast during migration but also known to cross bodies of water	High	Medium	Medium	summer/ mainly post-breeding, migration
roseate tern	vulnerable species, potential migratory stopover behaviors (landing on water), offshore migration documented	High	Medium	High	summer/ mainly post-breeding
Alcids					
common murre	sensitive to vessel traffic/disturbances, attracted to artificial lighting at night	Low	Low	High	winter
Atlantic puffin	sensitive to vessel traffic/disturbances, attracted to artificial lighting at night	Medium	Low	High	winter
black guillemot	sensitive to vessel traffic/disturbances, attracted to artificial lighting at night	High	Medium	High	winter
dovekie	sensitive to vessel traffic/disturbances, attracted to artificial lighting at night	Low	Medium	Medium	winter
razorbill	sensitive to vessel traffic/disturbances, attracted to artificial lighting at night	High	Medium	High	winter
thick-billed murre	sensitive to vessel traffic/disturbances, attracted to artificial lighting at night	Low	Low	High	winter
Raptors					
	low exposure	no further assessment due to minimal exposure to SRWF			spring and fall migration

Table 2.14 Avian Species Group Final Vulnerability Scores and Seasons of Risk

Species or Group	Applicable Key Factor(s)	Population Vulnerability	Collision Vulnerability (regraded by PV)	Displacement (Macro-Avoidance) Vulnerability (regraded by PV)	Peak Period Risk
Passerines					
	one of the most abundant terrestrial bird groups; migratory flights expected to be primarily above the RSZ offshore, but attraction to artificial light and potential travel offshore in adverse weather increases collision risk but overall minimal exposure offshore	no further assessment due to minimal exposure to SRWF			spring and fall migration

2.3.2 Bats

Key risk factors for bat species include seasonal occurrence, use, and vulnerable species likely to occur within the SRWF.

2.3.2.1 Key Factor 1: Seasonal Occurrence

Table 2.15 describes the total number of bat passes and detection rate (number of passes per detector-night) by month for all bat species combined during vessel-based acoustic surveys completed for SRWF and nearby wind projects. The highest detection rates generally occurred during August, September, and October; however, it should be noted there were no regional vessel-based surveys conducted in March, April, or May (Table 2.15). However, results of other coastal and island-based acoustic surveys that covered these periods also suggest peak activity periods in marine settings occur in the late-summer and fall (Peterson et al., 2014; Stantec 2016b).

Table 2.15 Monthly Timing of Calls during Vessel-based Acoustic Surveys for Regional Offshore Wind Projects

Project Location	Vessel/Year	Month	Dates Deployed	Calendar Nights[1]	Detector-Nights[2]	Recorded Passes	Detection Rate[3]	Maximum Passes Recorded in a Detector Night[4]
South Fork Wind	Enterprise/2017	July	July 14–31	18	18	7	0.4	3
		August	August 1–31	31	31	534	17.2	190
		September	September 1–30	30	30	274	9.1	116
		October	October 1–31	31	31	91	2.9	44
		November	November 1–15	15	15	5	0.3	3
	Seacor Supporter/2018	August	August 5–31	27	27	1,883	69.7	789
		September	September 1–8	8	8	68	8.5	35
	Discovery/2018	October	October 16–31	7	7	23	3.3	13
		November	November 1–30	21	19	5	0.3	2
		December	December 1–30	22	21	0	0	0
	Conti/2019	January	January 10–31	14	14	0	0	0
		February	February 1–15	5	5	0	0	0
Revolution Wind	Discovery/2019-2020	June	June 12–30	14	14	0	0	0
		July	July 1–31	30	30	6	0.2	4
		August	August 1–31	30	30	56	1.9	14
		September	September 1–30	26	26	76	2.9	26
		October	October 1–30	24	24	171	7.1	142
		November	November 2–30	22	22	0	0	0
		December	December 1–29	19	19	0	0	0
		January	January 2–21	11	11	0	0	0

Table 2.15 Monthly Timing of Calls during Vessel-based Acoustic Surveys for Regional Offshore Wind Projects

Project Location	Vessel/Year	Month	Dates Deployed	Calendar Nights[1]	Detector-Nights[2]	Recorded Passes	Detection Rate[3]	Maximum Passes Recorded in a Detector Night[4]
Sunrise Wind Farm Project	Discovery/2019-2020	June	June 18–30	8	8	0	0	0
		July	July 1–31	21	21	2	0.1	2
		August	August 4–31	20	20	44	2.2	14
		September	September 1–30	24	24	32	1.3	11
		October	October 3–13	6	6	0	0	0
		November	November 4–30	18	18	0	0	0
		December	December 1–27	16	16	0	0	0
		January	January 1–21	9	9	0	0	0
	Enterprise/2019	October	October 10–31	22	22	36	1.6	16
		November	November 1–4	4	4	6	1.5	5
	Searcher/2019	October	October 10–31	22	22	98	4.5	61
		November	November 1–8	8	8	0	0	0

SOURCES:

Stantec 2018a, 2019a,b,c, 2020a,b,c.

NOTES:

[1] Number of calendar nights that vessel was within study area.

[2] One detector-night is equal to one detector successfully operating for at least a portion of the night.

[3] Number of bat passes recorded per detector-night.

[4] Maximum number of bat passes recorded in a detector-night.

Cave-hibernating Bats

Available information suggests that cave-hibernating bats rarely occur offshore in the late-summer and fall (Stantec 2018a, 2019a,b) (Table 2.15). Based on the available vessel-based acoustic data for all bat species combined, detection rates were highest in August followed by September (Table 2.15). While it should be noted that information presented in Table 2.15 is limited to the time periods when the vessel-based surveys were conducted; these results are consistent with the findings of the timing of peak bat activity in the marine environment based on other regional studies (Peterson et al., 2014; Stantec 2016b).

During three years of post-construction acoustic monitoring at the Block Island Wind Farm from August 2017 – February 2020, of the relatively few cave-hibernating species recorded at the WTGs—for big browns and tri-colored bats combined—88 bat passes were detected in August, 118 bat passes were detected in September, and seven bat passes were detected in October; the two little brown bat passes were detected in September 2017. No cave-hibernating species were detected outside of the August–October timeframe (Stantec 2018a; Stantec 2020g).

Cave dwelling bats were primarily detected during the months of August through October during 2017 to 2019 regional vessel-based acoustic surveys (Stantec 2018a, 2019a,b). Available data suggest cave-dwelling bats may have greater exposure to the SRWF during August through October. There were no bats detected during the months of December, January, or February, based on the regional vessel-based acoustic data (Table 2.15); as such, there is no exposure of bats to the SRWF expected during these months.

Migratory Tree Bats

Table 2.15 provides the peak periods of bat detection during vessel-based surveys (where the majority of bats species recorded were migratory tree bats). The months of August, September, and October represent peak periods of bat occurrence offshore (Stantec 2018a, 2019a,b, 2020a,b,c). During August 2017 to early February 2020 post-construction turbine-based acoustic monitoring at the Block Island Wind Farm, bat detection rates (consisting mostly of tree roosting species) were greatest during August and September (Stantec 2018a; Stantec 2020g). There were no bat detections from December through April recorded during post-construction surveys at the Block Island Wind Farm (Stantec 2020g).

Available information suggests that migratory tree bats represent the species that occur relatively most frequently offshore, with peak timing of occurrence in the SRWF in the late-summer and fall. July through September represents the peak fall migration period for bats in North America and the peak period of bat collision risk at terrestrial wind projects (Arnett et al. 2008).

2.3.2.2 Key Factor 2: Use

While there is still some uncertainty on the specific movements and behaviors of bats offshore, there is accumulating evidence of bats, particularly tree roosting species, migrating offshore of the East Coast over the Atlantic (Hatch et al. 2013; Peterson et al. 2014; Stantec 2016a,b, 2018a, 2019a,b,c, 2020a,b,c; Dowling et al. 2017; NYSERDA 2017a). Bats have been observed to temporarily roost on structures such as lighthouses on nearshore islands (Dowling et al. 2017), on a geological survey vessel traversing offshore (Stantec unpubl.), as well as a stationary vessel at the construction site of the Block Island Wind Farm (Stantec 2016a). The literature suggests that during migration offshore, bats may opportunistically forage and may also take advantage of artificial roosting structures, if available (Ahlén 2006; Ahlén et al. 2007, 2009; Hutterer et al. 2005).

There is little information available regarding bat flight heights offshore and flight heights may vary based on weather and species-specific behaviors. Hatch et al. (2013) detected eastern red bats flying several hundred meters above sea level during digital aerial transect surveys over the mid-Atlantic (Hatch et al. 2013); based on their flight height, presumably these bats were migrating. Bat acoustic detectors generally have a maximum radius of detection of approximately 98 ft (30 m), and vessel-based acoustic bat detectors have generally been placed on the upper deck of geological and geophysical (G&G) vessels (approximately 66 ft [20 m] above the water; Stantec 2018a, 2019a,b,c, 2020a,b,c) we can assume that detected bats were occurring at heights of approximately 0 to 164 ft (0–50 m) above the water; however, bat passes above the range of detection would go undetected and we cannot compare bat activity at heights above this range using acoustic surveys. Bat flight behavior was documented during a 2005 to 2006 study at a wind farm in Kalmar Sound, Sweden (located near a lighthouse) using radar, visual surveys, and acoustic surveys to investigate bat activity patterns onshore as well as at the base of offshore turbines: flight heights were believed to be influenced by the presence of insects because bats typically flew at heights of less than 131 ft (40 m) above the surface of the water, and bats were also observed foraging near the top of wind turbines (Ahlén et al. 2007).

The regional vessel-based acoustic bat surveys detected bats as far as 30 mi (50 km) from land (Stantec 2018a, 2019a,b,c, 2020a,b,c; Figure 2-3). It should be noted that the distances bats have been observed offshore may be limited to the distances traveled offshore by survey vessels. Bats have been documented as far as 81 mi (70 nm, 130 km) off the coast of New Jersey (Stantec 2016a); and in the late-summer, 2003, a group of *Myotis* was observed roosting on a fishing vessel 68 mi (59 nm, 110 km) from shore in the Gulf of Maine (Thompson et al. 2015, as cited by Dowling et al. 2017). In Maine, bats have been detected on islands up to 25.8 mi (22.4 nm, 41.6 km) from the mainland (Peterson et al. 2014). In a mid-Atlantic bat acoustic study conducted during the spring and fall of 2009 and 2010 (86 nights), the maximum distance that bats were detected from shore was 13.6 mi (11.8 nm, 21.9 km) and the mean distance was 5.2 mi (4.5 nm, 8.4 km; Sjollema et al. 2014). In addition, eastern red bats were detected in the mid-Atlantic up to 27.3 mi (23.7 nm, 44 km) offshore by high resolution video aerial surveys (Hatch et al. 2013).

The number of bat passes and percentage of all passes detected by species and group during vessel-based acoustic surveys completed for SRWF and nearby wind projects is presented in Table 2.16. Species composition was similar among vessel-based studies, with long-distance migratory bats (eastern red bats, silver-haired bats, and hoary bats) generally representing the species most detected. *Myotis* species were only observed during one vessel-based survey (Table 2.16).

Table 2.16 Bat Species Detected during Vessel-based Acoustic Surveys for Regional Offshore Wind Projects

Project Location	Vessel/Year	Dates	Metric	Group/Species									Total
				BBSH		HB	RBTB		MYSP			UNKN	
				EPFU	LANO	LACI	LABO	PESU	MYLE	MYLU	MYSE	NoID	
South Fork Wind	Enterprise/ 2017	Jul 14–Nov 15	No. passes	44	116	19	620	31	1	31	34	15	911
			%	4.90%	12.90%	2.10%	69.20%	3.50%	0.10%	3.50%	3.80%	-	-
	Seacor Supporter/ 2018	Aug 5–Sept 8	No. passes	16	111	13	1,789	17	0	0	0	5	1,951
			%	0.80%	5.70%	0.70%	91.90%	0.90%	0.00%	0.00%	0.00%	-	
	Discovery/ 2018	Oct 16–Dec 30	No. passes	1	5	1	18	1	0	0	0	2	28
			%	3.80%	19.20%	3.80%	69.20%	3.80%	0.00%	0.00%	0.00%	-	-
	Conti/2019	Jan 10–Feb 15	No. passes	-	-	-	-	-	-	-	-	-	-
			%	-	-	-	-	-	-	-	-	-	-
Revolution Wind	Discovery/ 2019-2020	Jun 12–Jan 21	No. passes	40	113	4	80	4	0	0	0	68	309
			%	16.60%	46.90%	1.70%	33.20%	1.70%	0.00%	0.00%	0.00%	-	-
Sunrise Wind Farm Project	Discovery /2019-2020	Jun 18–Jan 21	No. passes	4	14	4	40	2	0	0	0	14	78
			%	6.30%	21.90%	6.30%	62.50%	3.10%	0.00%	0.00%	0.00%	-	-
	Enterprise/ 2019	Oct 10–Nov 4	No. passes	7	9	1	9	1	0	0	0	15	42
			%	25.90%	33.30%	3.70%	33.30%	3.70%	0.00%	0.00%	0.00%	-	-
	Searcher/ 2019	Oct 10–Nov 8	No. passes	29	26	0	5	0	0	0	0	38	98
			%	48.30%	43.30%	0.00%	8.30%	0.00%	0.00%	0.00%	0.00%	-	-

SOURCES:

Stantec 2018a, 2019a,b,c, 2020a,b,c

NOTE:

[1] Group/Species: BBSH (big brown/silver-haired) = big brown bat (EPFU) and silver-haired bat (LANO); HB = hoary bat (LACI); RBTB (red bat/tri-colored bat) = eastern red bat (LABO) and tri-colored bat (PESU); MYSP (*Myotis* species) = little brown bat (MYLU), northern long-eared bat (MYSE), and eastern small-footed bat (MYLE); and UNKN = unknown species passes labeled as “NoID” by Kaleidoscope software.

Cave-hibernating Bats

Five species of cave-hibernating bat were detected offshore during recent vessel-based acoustic bat surveys for South Fork Wind, Revolution Wind, and SRWF projects—big brown bat, tri-colored bat, eastern small-footed bat, little brown bat, and northern long-eared bat—two of which were detected within the SRWF (big brown bat and tri-colored bat; Table 2.16). During 2017 Enterprise vessel-based surveys at South Fork Wind, one northern long-eared bat call was detected in the offshore project area (Figure 2-3), and 33 were detected between 3.1 and 8.7 mi (2.7–7.6 nm, 5–14 km) offshore. One little brown bat pass and one eastern small-footed bat pass were detected approximately 5 mi (4.3 nm, 8 km) west of South Fork Wind offshore project area (and approximately 15 mi [13 nm, 24 km] off of Block Island). The other detections of Myotids were closer to shore (Stantec 2018a). None of the other recent vessel-based acoustic surveys for South Fork, Revolution Wind, or SRWF projects documented *Myotis* species (Table 2.14).

During vessel-based surveys at the construction site of the Block Island Wind Farm in 2016, of the 1,307 passes identified to species, one pass was labeled as a big brown bat and no passes were identified as *Myotis* species (Stantec 2016a). During three years of post-construction acoustic monitoring at the Block Island Wind Farm from August 2017 – February 2020, among those passes that could be identified to species, 6.8% (n=135) were big brown bats and 4.1% (n=80) were tri-colored bats. There were two little brown bats recorded, representing 0.1% of passes that could be identified to species (Stantec 2018a; Stantec 2020g).

There are limitations to positive identification of some *Myotis* species' calls, particularly northern long-eared bats and little brown bats, due to overlapping call signatures between similar species. Offshore movements of Myotids are considered relatively rare, particularly for northern long-eared bat, and their flights overwater are expected to occur in closer proximity to shore (Stantec 2018a). Acoustic studies conducted onshore at Rhode Island National Wildlife Refuge Complex and at FINS reported greater numbers of passes of cave-hibernating bats compared to those detected during offshore studies (Smith and McWilliams 2016; NPS 2018b; Stantec 2018a, 2019a,b), and acoustic surveys conducted at both offshore and coastal sites in the Gulf of Maine, mid-Atlantic and Great Lakes reported greater activity levels of cave-hibernating bats at coastal sites compared to offshore sites (Stantec 2016b; NYSERDA 2017a, 2017b). However, it should be noted that direct comparisons to moving vessel-based acoustic bat surveys and stationary land-based acoustic bat surveys should be made with caution: detector surveys cannot distinguish between individual bats and stationary surveys would presumably have a greater chance of detecting the same individual bats over the course of a night. Regardless, cave-hibernating bat use of the SRWF is expected to be infrequent to rare.

Migratory Tree Bats

All three species of migratory tree bat (hoary bat, eastern red bat, and silver-haired bat) were detected during all of the vessel-based acoustic surveys for South Fork Wind, Revolution Wind, and SRWF, with the exception of South Fork Wind Conti vessel-based winter survey, which detected no bat passes (Stantec 2018a, 2019a,b,c, 2020a,b,c; Table 2.15). Migratory tree bats represented the bat group most frequently detected among these regional vessel-based surveys, with eastern red bat representing between 8.3 and 91.9 percent of all species of bat passes recorded among each of the vessel-based acoustic surveys (Table 2.14). Species composition was similar among the vessel-based surveys at the construction site of the Block Island Wind Farm, where tree roosting species were most frequently detected (Stantec 2016a). During three years of post-construction turbine-based acoustic monitoring at the Block Island Wind Farm from August 2017 through February 2020, of the 1,974 passes identified to species, eastern red bats accounted for 41.4% (n = 818), silver-haired bats accounted for 35.1% (n = 692), and hoary bats accounted for 12.5% (n = 247) (Stantec 2018a; Stantec 2020g). These data suggest migratory tree bats are at greater risk of exposure to the SRWF than cave-hibernating bats.

Migratory tree bats are expected to be more common in onshore and nearshore locations compared to offshore, based on results of regional acoustic surveys (Pelletier et al. 2013; Stantec 2016a; Figure 2-3). Acoustic surveys conducted onshore at Rhode Island National Wildlife Refuge Complex and FINS reported greater numbers of passes of migratory tree bats compared to those detected during offshore studies (NPS 2019; Smith and McWilliams 2016; Stantec 2018a, 2019a,b), and acoustic surveys conducted at both offshore and coastal sites in the Gulf of Maine, mid-Atlantic and Great Lakes reported greater activity levels of migratory tree bats at coastal sites compared to offshore sites (Stantec 2016b). However, it should be noted that direct comparisons to moving vessel-based acoustic bat surveys and stationary land-based acoustic bat surveys should be made with caution: detector surveys cannot distinguish between individual bats and stationary surveys would presumably have a greater chance of detecting the same individual bats over the course of a night.

2.3.2.3 Key Factor 3: Vulnerable Species

At the South Fork Wind Farm, there was a single northern long-eared bat call detected in the offshore project area during the 2017 Enterprise vessel-based survey (Figure 2-3); the detection was recorded 21.1 mi (18.3 nm, 34 km) offshore (southwest) from the closest point of land (Block Island) (Stantec 2018a). Other northern long-eared bat passes (n = 33) detected during the 2017 survey were between 3.1 and 8.7 mi (2.7–7.6 nm, 5–14 km) offshore (Stantec 2018a). Of the northern long-eared passes detected, most occurred during 2 nights in August (9 passes recorded on the night of August 13 and 23 passes recorded on the night of August 20). None of the other recent vessel-based acoustic surveys for South Fork, Revolution Wind, Block Island Wind Farm, or SRWF projects documented *Myotis* species (Table 2.14).

Northern long-eared bat summer maternity colonies on Martha’s Vineyard were documented in 2015 by Biodiversity Works; survey data suggested that northern long-eared bats may overwinter in small hibernacula on the island; however, it is possible that northern long-eared bats may also migrate to mainland hibernacula from these islands in August and September, though none of the five northern long-eared bats tracked during this study were detected making offshore movements (Dowling et al. 2017). The 2016 nanotag tracking study on Martha’s Vineyard recorded little brown bat movements off the island in late August and early September, with one individual flying from Martha’s Vineyard to Cape Cod (Dowling et al. 2017). Big brown bats (n=2) were also detected migrating from the island in October and November (Dowling et al. 2017). This study further demonstrates the seasonal trends in peak bat activity within the region and demonstrates movement of some cave-hibernating bats from coastal islands to mainland hibernacula.

2.3.2.4 Potential Impacts

Construction

Visible Infrastructure

Bats may seasonally occur in the airspace above the SRWF while migrating. Available information from onshore wind projects suggests that bats are more likely to be attracted to wind farm structures than to be displaced by them (Cryan et al. 2014). Bats may be attracted to support vessels, equipment, or components of the WTGs or OCS–DC while under construction. Visible structures on a previously flat, unusable landscape may provide potential roosting opportunities to bats during migratory movements offshore, which could represent a benefit during construction (however, it may pose a risk of collision during O&M). Bats were observed roosting on support vessels during construction of the Block Island Wind Farm (Stantec 2016a) as well as roosting on G&G vessels (Stantec 2016b), and studies from European offshore wind projects indicate that bats may take advantage of artificial roosting structures, if available (Ahlén 2006; Ahlén et al. 2007, 2009; Hutterer et al. 2005).

Lighting

Nighttime lighting at construction areas may attract insect prey and, therefore, indirectly attract bats to forage, similarly providing a potential benefit to bats during construction. It is possible bats would benefit from artificial roosting structures and foraging opportunities if insect prey were to be attracted to artificial lighting in terms of energy conservation if migrating offshore. As such, visible structures and lighting during construction may benefit instead of adversely impact bats during construction.

Traffic

Temporary construction vessel traffic and construction noise are not expected to substantially disturb bats because if bats do occur in the SRWF, because they would be passing overhead.

Discharges and Releases

Since bats are typically expected to forage for insects in flight if opportunistically foraging while migrating (and may only rarely take prey from the surface of the water; Ahlén et al. 2009), no impacts to bats from discharges or releases at the SRWF are expected.

Operations and Maintenance

Visible Infrastructure

Visible infrastructure (including WTGs and OCS–DC) on a previously flat and unusable landscape may provide potential roosting opportunities to bats during movements offshore. During construction of the WTGs at the Block Island Wind Farm, crew members from the construction vessels made multiple observations of bats roosting on construction vessels during the day (Stantec 2016b). Similar to vessels at sea, offshore structures may provide potential roosting platforms and may benefit exhausted bats during long-distance migration. It is possible bats would benefit from stationary roosting structures in terms of energy conservation if migrating offshore; however, attraction behaviors may increase risk of collision during O&M due to blade rotation. Bat mortality is known to occur at terrestrial wind farms in the US (Arnett et al. 2008; Cryan and Barclay 2009; Hayes 2013; Smallwood 2013; Martin et al. 2017; NYSERDA 2017a; Pettit and O'Keefe 2017; Allison et al. 2019). These fatalities, which predominantly involve migratory tree-roosting bats (Kunz et al. 2007), primarily occur during peak activity period for bats in late summer (Arnett et al. 2008). Long-distance migrants such as eastern red bat, hoary bat and silver-haired bat have represented most fatalities at onshore wind projects in North America; however, other non-migratory species such as *Myotis* (including northern long-eared bat), big brown bat, and tri-colored bat have been documented during onshore fatality surveys as well (Kunz et al. 2007; Gruver and Bishop-Boros 2015). There is some evidence from Europe to suggest that bats foraging low (< 10 m [32 ft]) over the surface of the ocean increase their altitude when foraging around obstacles (i.e., lighthouses and WTGs), thus potentially increasing exposure to turbine blades (Ahlén et al. 2009), suggesting bats may similarly be at risk of collision with WTGs in the SRWF. Bats are known to use echolocation both over land and water for orientation as well as for hunting insect prey (Schnitzler et al. 2003; Ahlén et al. 2009). While bats can generally detect stationary structures, they are not necessarily aware of moving blades. Bat attraction to tall structures potentially for roosting and/or mating has been documented at coastal and offshore lighthouses and other tall, manmade structures (Kunz et al. 2007; Pelletier et al. 2013; Stantec 2016b) as well as offshore wind turbines (Ahlén et al. 2007; Ahlén et al. 2009). Bats may seasonally occur in the SRWF while migrating, but their use of onshore and nearshore environments is known to be relatively much greater than their use of offshore environments, as demonstrated by acoustic detection data collected offshore and onshore (Smith and McWilliams 2016; NPS 2018b; Stantec 2016b, 2018a,b, 2019a,b, 2020a,b,c).

There are reports of bats visiting WTGs close to shore (2.5–4.3 mi [2.2–3.7 nm, 4–6.9 km]) in the Baltic Sea (Ahlén et al. 2009; Rydell and Wickman 2015). At a wind farm in Denmark, researchers recorded 17 thermal video images at one offshore WTG, 2 of these were confirmed images of bats, and 1 animal (bird or bat) was observed to collide with a moving blade and fall out of the video frame (Hüppop et al. in press). However, a relatively low level of bat activity is expected at SRWF because of its distance from shore and bats that may occur there are only expected to occur during migratory periods in the late-summer and fall (BOEM 2012; Stantec 2018d). While there may be individual bat fatalities resulting from operation of the WTGs, the SRWF is unlikely to impact bat populations. Vulnerable species such as northern long-eared bat may occur only very rarely in the SRWF. Therefore, impacts to bats due to attraction to visible infrastructure during O&M are considered long-term but **low** due to the SRWF distance to shore and the bats' relatively low use of offshore environments, particularly by rare bat species such as northern long-eared bat.

Due to the operational cut-in and cut-out wind speed limitations, the WTGs may not be operating approximately 2 to 3 percent of the time during winter months, approximately 2 to 4 percent of the time during spring and fall months, and approximately 3 to 5 percent of the time during summer months. Bats would be at little to no risk of collision when the blades are not spinning (and they would be expected to detect WTG stationary structures and generally avoid collision with them).

Lighting

Artificial sources of nighttime lighting, such as on the WTG decks and OCS–DC, may attract insect prey and, therefore, indirectly attract bats to forage (Cryan and Brown 2007; Pelletier et al. 2013). The WTGs and OCS–DC will be lit with navigation and aviation lighting; however, aviation lighting, has not been found to influence bat collision risk at onshore facilities in North America (Arnett et al., 2008). The Project is evaluating the implementation of methods to limit the visual impact of the aviation light, for example light dimming or the use of a radar-based Aircraft Detection Lighting System (ADLS) to turn on, and off, the aviation obstruction lights in response to detection of aircraft in proximity to the SRWF. Sunrise Wind will use ADLS or related means (e.g., dimming or shielding) to limit visual impact, pursuant to approval by the FAA and BOEM and commercial and technical feasibility at the time of FDR/FIR approval. In addition to limiting visual impact, reducing lighting will also reduce the potential for impacts to bats. In general, bats are not expected to regularly commute (transit between roosting and foraging habitat) or forage at the SRWF, but some may be present during migration, particularly in the late-summer and fall (Stantec 2018a, 2019a,b,c, 2020a,b,c). The exposure of cave-hibernating bats to SRWF is expected to be minimal to low, and occurrences of northern long-eared bats as far offshore as the SRWF are expected to be very rare; therefore, impacts to populations of cave-hibernating bats during O&M are unlikely. Migratory tree bats have the highest potential to pass through SRWF, but relatively lower numbers are expected there given the Project's distance from shore. Therefore, impacts to bats due to attraction to lighting are considered long-term but **low**.

Table 2.17 Impact Producing Factors and Potential Levels of Impact on Bat Species from the SRWF during Operations and Maintenance

IPF	Project Activity	Potential Impact
Visible Infrastructure	WTGs or OCS–DC	Direct collision, long-term, low
Lighting	Lighting at WTGs or OCS–DC	Indirect attraction to lighting/collision risk, long-term, low

Collision risk is considered the only effect that could result in greater than low impacts to bats in the SRWF. Migratory tree bats have a relatively higher potential for exposure to the SRWF and are considered at medium risk of impact. Table 2.18 provides a summary of key factors influencing species group risk as well as potential impact levels.

Table 2.18 Key Factors and Potential Impact Level by Bat Species Group due to Collision Risk at the SRWF

Species or Group	Relavant Key Risk Factor(s)	Risk of Collision	Level of Potential Impact	Peak Period Risk
northern long-eared bat	vulnerable species; relatively low occurrences offshore; increased foraging/roosting opportunities in SRWF	minimal	low	late summer, fall dispersal
cave dwelling (other *Myotis* sp., big brown, tri-colored bat)	relatively low occurrences offshore; increased foraging/roosting opportunities in SRWF	minimal	low	late summer, fall dispersal
migratory tree bats (eastern red, hoary, silver-haired bat)	most abundant group detected by offshore acoustic surveys; increased foraging/roosting opportunities in SRWF	medium	medium	late summer, fall migration

3.0 PROPOSED ENVIRONMENTAL PROTECTION MEASURES

Sunrise Wind will implement the following environmental protection measures to reduce potential impacts on avian and bat species. These measures are based on protocols and procedures implemented for similar offshore projects.

- Sunrise Wind is committed to an indicative layout scenario with WTGs and OCS–DC sited in an east-west/north-south oriented grid with 1.15- by 1.15-mi (1- by 1-nm; 1.85- by 1.85-km) spacing that aligns with other proposed adjacent offshore wind projects in the RI-MA WEA and MA WEA. This wide spacing of WTGs may reduce risk of barrier effects and/or displacement, and may allow avian and bat species to avoid individual WTGs and minimize risk of potential collision. The WTGs will have an air gap from MSL to minimum blade swept height of 98 to 180 ft (30 to 55 m); birds and bats crossing the area within this height range would not be at risk of collision with spinning blades.
- The distance of the SRWF offshore (greater than 15 mi [13 nm, 24.1 km]) avoids coastal and nearshore areas, which are areas where bats typically occur, and are also areas that are known to concentrate birds, particularly shorebirds and sea ducks.
- Sunrise Wind will take measures to reduce perching opportunities at operating turbines, if appropriate based on further consultations with state and federal agencies.
- Sunrise Wind will document any dead (or injured) birds or bats found incidentally on vessels and structures during construction, O&M, and decommissioning and provide an annual report to BOEM and USFWS.
- Construction and operational lighting will be limited to the minimum necessary to ensure safety and compliance with applicable regulations. Limiting lighting to that which is required for safety and compliance with applicable regulations is expected to minimize impacts on avian and bat species.
- Sunrise Wind will use ADLS or related means (e.g., dimming or shielding) to limit visual impact, pursuant to approval by the FAA and BOEM and commercial and technical feasibility at the time of FDR/FIR approval, and dialogue with stakeholders. In addition to limiting visual impact, reducing lighting will also reduce the potential for impacts to birds and bats.
- Time-of-year restrictions for certain work activities such as HDD conduit stringing will be employed to the extent feasible to avoid or minimize direct impacts to RTE avian species during construction of the Landfall. Time of year restrictions for tree removal at the Onshore Facilities to avoid impacts to northern long-eared bats would also benefit breeding birds. If work is anticipated to occur outside of these time-of-year restriction periods, Sunrise Wind will work with state and federal agencies to develop construction monitoring and impact minimization plans or mitigation plans, as appropriate.
- Onshore Facilities are primarily sited within previously disturbed and developed areas (e.g., roadways, ROWs, developed industrial/commercial areas) to the extent feasible, thereby minimizing impacts to undisturbed avian and bat habitat.
- An ISMP will be implemented to manage the spread of invasive plant species that could negatively impact native plants and impact avian and bat habitat.

- The Onshore Transmission Cable and Onshore Interconnection Cable will not include any overhead utility lines, thus minimizing potential impacts to birds and bats associated with collision with overhead lines.
- Sunrise Wind developed an avian post-construction monitoring plan for the Project (COP Appendix P2 – *Sunrise Wind Avian and Bat Post-Construction Monitoring Framework*) that summarizes the approach to monitoring; describes overarching monitoring goals and objectives; identifies the key avian species, priority questions, and data gaps unique to the region and Project area that will be addressed through monitoring; and, describes methods and time frames for data collection, analysis, and reporting. Post-construction monitoring will assess impacts of the Project with the purpose of filling select information gaps and supporting validation of this Avian Risk Assessment. Focus may be placed on improving knowledge of ESA-listed species occurrence and movements offshore, avian collision risk, species/species group displacement, or similar topics. Where practicable, monitoring conducted by Sunrise Wind will build on and align with post-construction monitoring conducted by the other Orsted/Eversource offshore wind projects in the Northeast region. Sunrise Wind will engage with state and federal agencies and environmental non-governmental organizations to identify appropriate monitoring options and technologies, and to facilitate acceptance of a final plan.

4.0 DISCUSSION

Limitations and Uncertainty

There are data gaps associated with the information available for this risk assessment due to the limitations of available technologies to investigate impacts to birds and bats in the offshore environment. For example, vessel-based and aerial avian observation survey results represent diurnal avian activity only as these types of visual observation surveys cannot sample nocturnal periods. Further, these types of surveys are typically conducted under fair conditions with decent visibility and relatively low wind speeds. Consequently, data collected during these types of surveys do not represent potentially variable bird behaviors that may occur during all weather conditions or all times of day (Veit et al. 2016). Additionally, available methods to estimate fatality rates using carcass counts – including shoreline based beached-bird surveys and remote sensing technologies such as radar and thermal cameras – have inherent limitations. While there is a growing information base from European offshore wind projects, available studies have primarily focused on displacement or barrier effects rather than collision mortality, given the current limited ability to detect and record collision events at sea (Hill et al. 2014; Hüppop et al. in press; Molis et al. under review).

While vulnerable species such as piping plover, red knot, roseate tern, least tern, and common tern have the potential to occur in the SRWF area during migration, little information is available regarding the weather conditions when they may occur or their potential flight heights when far offshore. Similarly, little is known regarding the height of flight at which bats may migrate far offshore under a range of weather conditions. Finally, there is limited information regarding species-specific turbine avoidance behaviors, particularly in the offshore environment, and even the data from European offshore wind projects is limited. This assessment took a conservative approach and considered greater vulnerability for those species for which behavioral data are limited.

Birds

Onshore Facilities

Land disturbance during construction of the Onshore Facilities may result in low impacts to breeding terrestrial birds. However, potential direct effects such as mortality/injury of individuals may be limited though implementation of the avoidance and impact minimization measures described in Section 3.0.

SRWF

There may be medium impacts associated with visible infrastructure and lighting at the SRWF if listed species are involved in collision events. Species most vulnerable to impacts include species with vulnerable populations, i.e., species listed as endangered or threatened at either the federal or state level. However, occurrences of listed bird species within the SRWF are expected to be rare and largely limited to migration periods (e.g., March through May and July through October). Risk of collision is greatest at night, particularly during periods of inclement weather, but also during daytime periods of limited visibility. Use of ADLS and minimal required safety lighting will minimize potential impacts to avian species associated with lighting. Due to the operational cut-in and cut-out wind speed limitations, the WTGs may not be operating approximately 2 to 3 percent of the time during winter months, approximately 2 to 4 percent of the time during spring and fall months, and approximately 3 to 5 percent of the time during summer months; during these period birds would be at decreased risk of collision. Risk of barrier effects or avoidance is low for listed species due to their minimal use of the SRWF, as well as the relatively small footprint of the SRWF. Species that travel long distances during migration have been found to be less affected by slight increases in flight distances around offshore infrastructure due to their ability to adapt to other potential obstacles during migration such as getting blown off course or having to avoid adverse weather.

Considering the results of the collision and displacement vulnerability model, terns are a species group that may warrant further consideration due to their medium collision vulnerability scores and high displacement vulnerability scores. Additional species groups that may warrant further consideration include loons and grebes, sea ducks, and alcids as these groups had high displacement vulnerability scores. Sea ducks (coastal bottom gleaners) and loons and grebes (coastal divers), were predicted to have the highest likelihood of cumulative impacts due to a greater proportion of their populations potentially exposed to most likely, near future wind development scenarios off the Atlantic East Coast in relatively shallow waters at relatively closer distances to shore due to currently available technologies for development (Goodale et al. 2019).

Importantly, the potential impacts to birds resulting from offshore wind energy development in the Atlantic should be evaluated within the context of the more global threat of climate change. Avian species will benefit from offshore wind energy development due to its contributions to the reduction of fossil fuel use and reduction of green-house gas emissions. There are several species of shorebird and seabird, including piping plover and roseate tern, whose coastal and island-based breeding habitats are at risk due to sea level rise. Further, birds are at risk of warming ocean temperatures and impacts to prey availability, which can lead to decreased breeding success and mortality.

Bats

<u>Onshore Facilities</u>

There may be low impacts to bats associated with land disturbance during construction at the Onshore Facilities. However, potential direct effects such as mortality/injury may be limited though implementation of the avoidance and impact minimization measures described in Section 3.0.

<u>SRWF</u>

Visible infrastructure and lighting offshore may attract bats directly (for perching opportunities) and indirectly (if insect prey are attracted to lighting sources); both IPF may result in collision risk to bats. Collision risk is considered the only effect that could result in greater than low impacts to bats in the SRWF. Migratory tree bats have a relatively higher potential for exposure to the SRWF and are considered at medium risk of impact. However, listed species such as northern long-eared bat are expected to have a low exposure to the SRWF and are, therefore, considered to have a low risk of impact. Onshore wind power is now being considered a potentially significant source of mortality for migrating bats based on the results of post-construction monitoring studies (Williams 2003; Johnson and Strickland 2004; Kerns and Kerlinger 2004; Arnett et al. 2005; Curry and Kerlinger 2007; Kunz et al. 2007; Arnett et al. 2008). Among the migratory tree bats, hoary bats represent the species most commonly found during fatality surveys at onshore wind projects (Allison and Butryn 2018). Several North American bat populations are declining, and bats are slow to reproduce, with most North American species having only one or two pups per year making them more vulnerable to potential impacts (Arnett et al. 2013). Migratory tree-bats may warrant further consideration due to their medium vulnerability to collision impacts. Potential cumulative impacts to migratory tree bats, which occur more frequently offshore than cave-dwelling bats, warrants consideration due to onshore and potentially offshore wind energy development. Medium impacts to migratory tree bats may occur due to visible infrastructure and lighting at the SRWF. However, use of ADLS and minimal required safety lighting will minimize potential impacts associated with lighting. During seasonal turbine down-time periods, bats would not be at risk of collision with spinning blades; further, bats would not be at risk of collision during hibernation/non-active periods.

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APPENDIX A

Marine Bird MDAT Density Values

Appendix A MARINE BIRD MDAT DENSITY VALUES

Table A-1 Seasonal and Annual Effort Corrected Counts (Count/km of Survey Transect) for All Species within the OCS-A 0487 Lease Area

Taxonomic Grouping	Species	Lease Area Mean Effort Corrected Count (count/km)				
		annual	winter	spring	summer	fall
Loons	common loon	0.041	0.056	0.095	0.001	0.013
	red-throated loon	0.01	0.03	0.01	0	0.001
Grebes	horned grebe	<0.001	0.001	0	0	0
Storm-Petrels	Leach's storm-petrel	0.003	0	0.005	0.005	0.001
	Wilson's storm-petrel	0.185	0	0.002	0.732	0.006
Petrels and Shearwaters	Audubon's shearwater	0.001	<0.001	0.001	0.001	0.002
	black-capped petrel	<0.001	<0.001	<0.001	<0.001	<0.001
	Cory's shearwater	0.094	0	0.001	0.374	0
	great shearwater	0.496	<0.001	0.004	1.3	0.679
	Manx shearwater	0.002	0	0.001	0.006	0.003
	sooty shearwater	0.01	0	0.008	0.03	0.001
Gannets	northern gannet	0.47	0.66	1.088	0.003	0.13
Cormorants	double-crested cormorant	0.011	0.004	0.011	0.007	0.024
Sea Ducks	black scoter	0.047	0.076	0.065	0	0.045
	common eider	30.883	123.53	0	0	0
	long-tailed duck	0.053	0.142	0.068	0	0.001
	red-breasted merganser	0.003	0.01	0.001	0	0
	surf scoter	0.121	0.169	0.159	0	0.155
	white-winged scoter	0.079	0.122	0.187	0	0.008
Phalaropes	red-necked phalarope	0.001	0	0	0.002	0.002
	red phalarope	0.229	0	0.821	0.089	0.006
Skuas and Jaegers	great skua	<0.001	0	0	0	0.001
	parasitic jaeger	0.001	0	<0.001	0.001	0.002
	pomarine jaeger	0.001	0	0.001	0.001	0.003
Small Gulls	Bonaparte's gull	0.013	0.026	0.019	0	0.005
Medium Gulls	black-legged kittiwake	0.046	0.146	0.012	0	0.026
	laughing gull	0.003	<0.001	0.001	0.003	0.01
	ring-billed gull	0.006	0.016	0.002	<0.001	0.004

Table A-1 Seasonal and Annual Effort Corrected Counts (Count/km of Survey Transect) for All Species within the OCS-A 0487 Lease Area

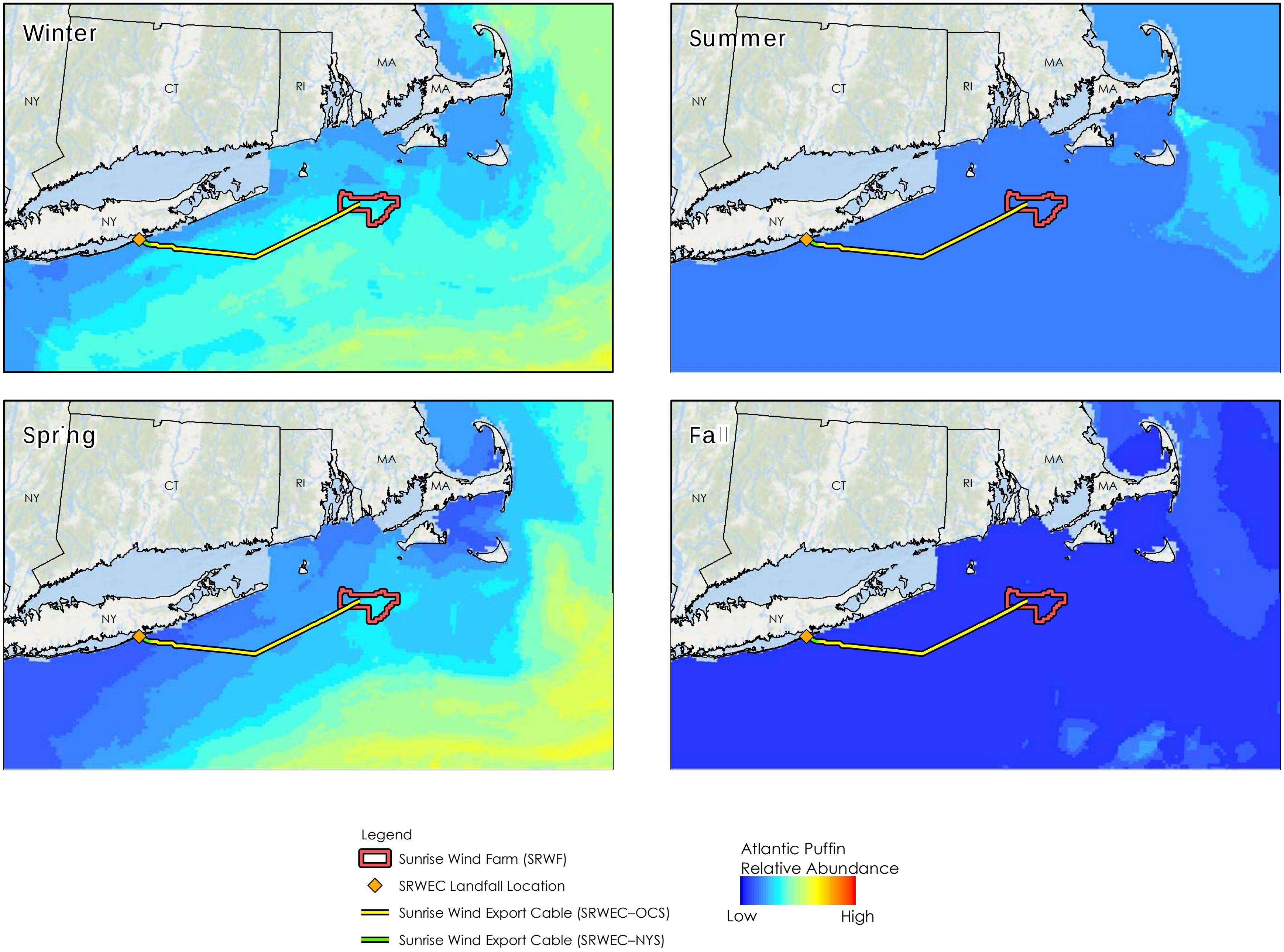
Taxonomic Grouping	Species	Lease Area Mean Effort Corrected Count (count/km)				
		annual	winter	spring	summer	fall
Large Gulls	great black-backed gull	0.115	0.199	0.116	0.051	0.097
	herring gull	0.427	0.12	0.519	0.078	0.992
Small Terns	least tern	<0.001	0	0	0.001	<0.001
Medium Terns	common tern	0.007	0	0.003	0.019	0.008
Auks	Atlantic puffin	0.002	0.002	0.003	0.001	<0.001
	black guillemot	<0.001	0	0	0.001	0
	common murre	0.001	0.002	0.002	0	0
	dovekie	0.017	0.041	0.021	0	0.004
	razorbill	0.028	0.001	0.111	0.001	0.001
	thick-billed murre	0.001	0.001	0.003	0	0

APPENDIX B

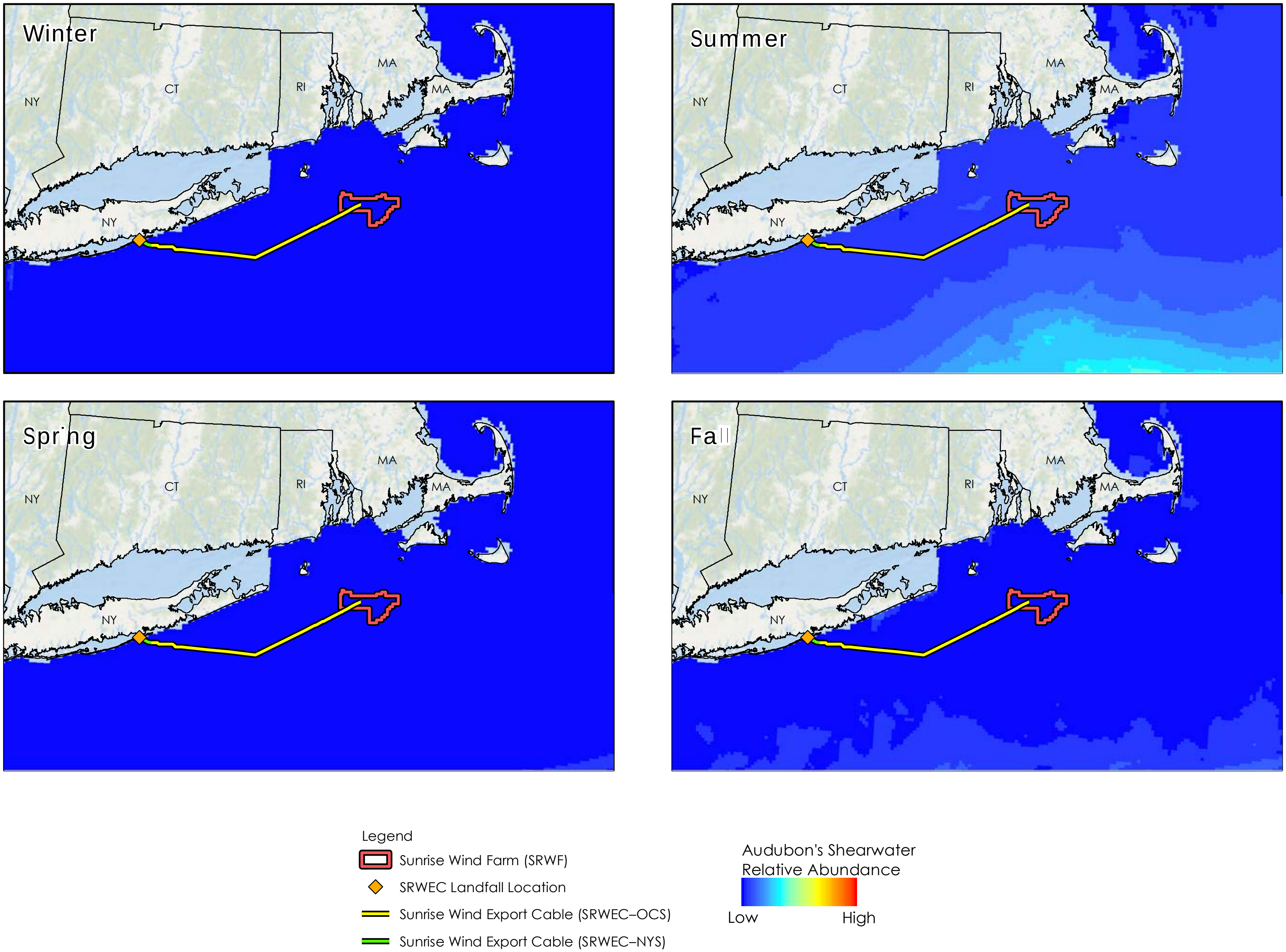
Marine Bird MDAT Density Figures

Appendix B MARINE BIRD MDAT DENSITY FIGURES

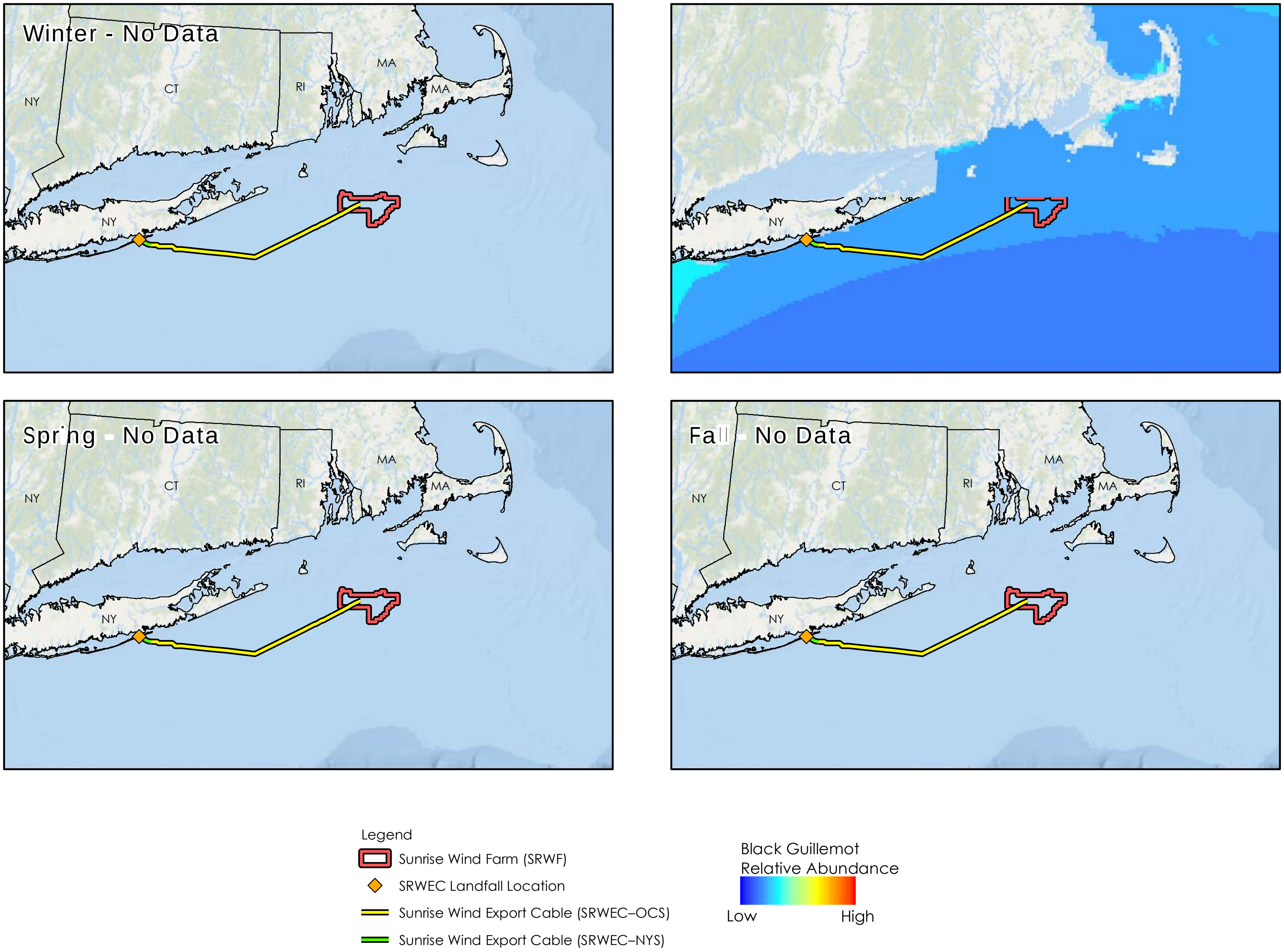
Atlantic Puffin Relative Abundance



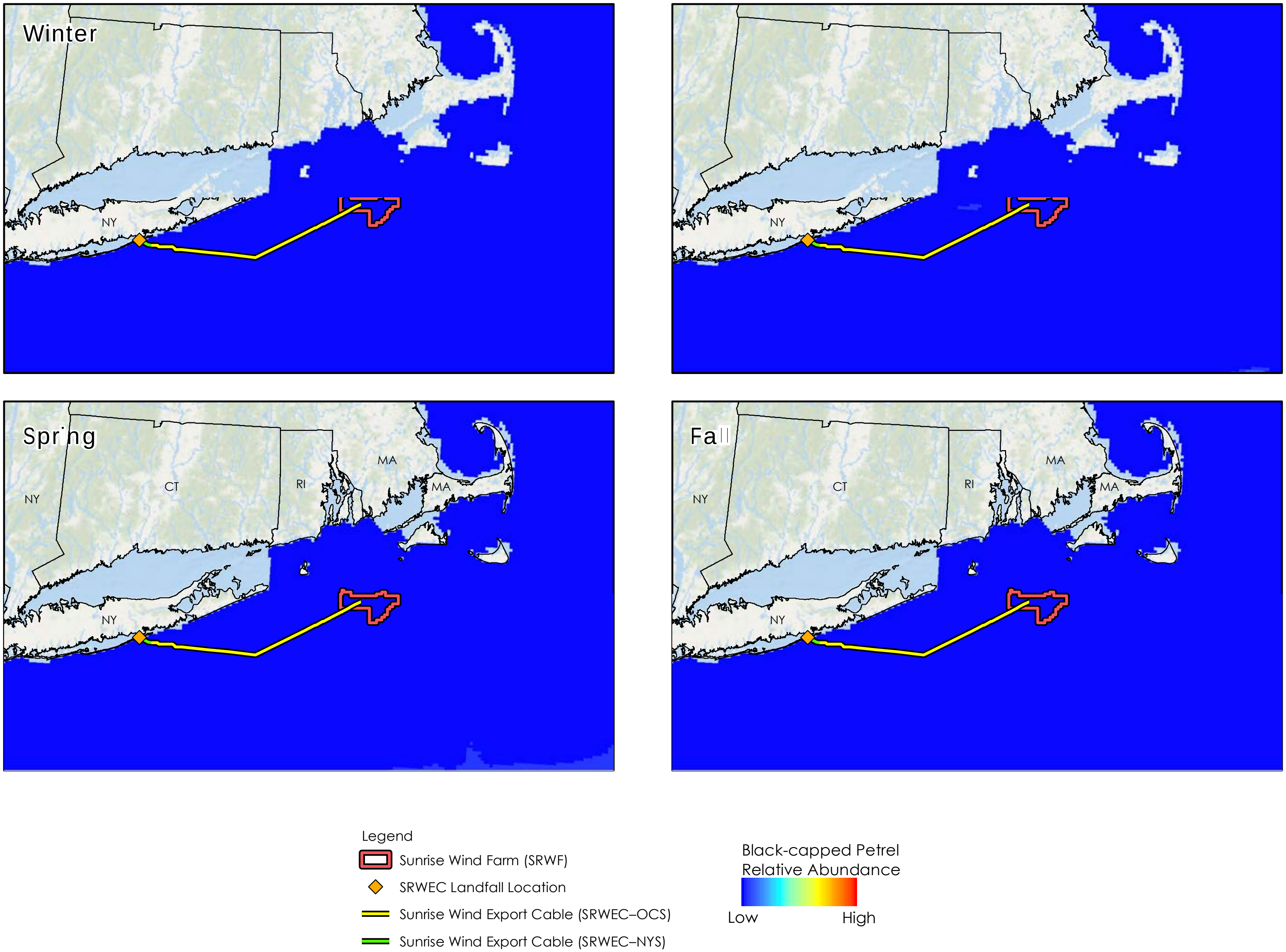
Audubon's Shearwater Relative Abundance



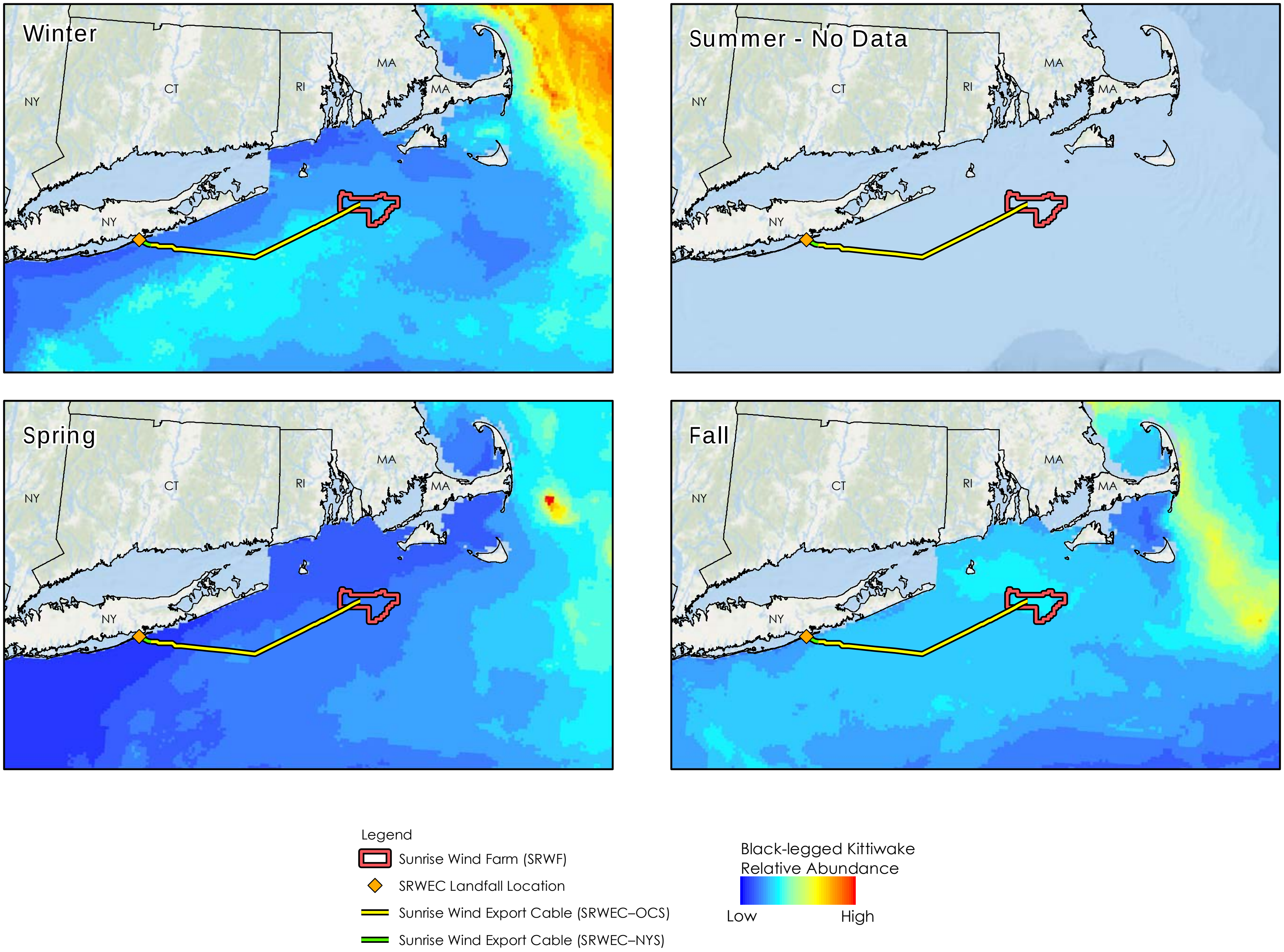
Black Guillemot Relative Abundance



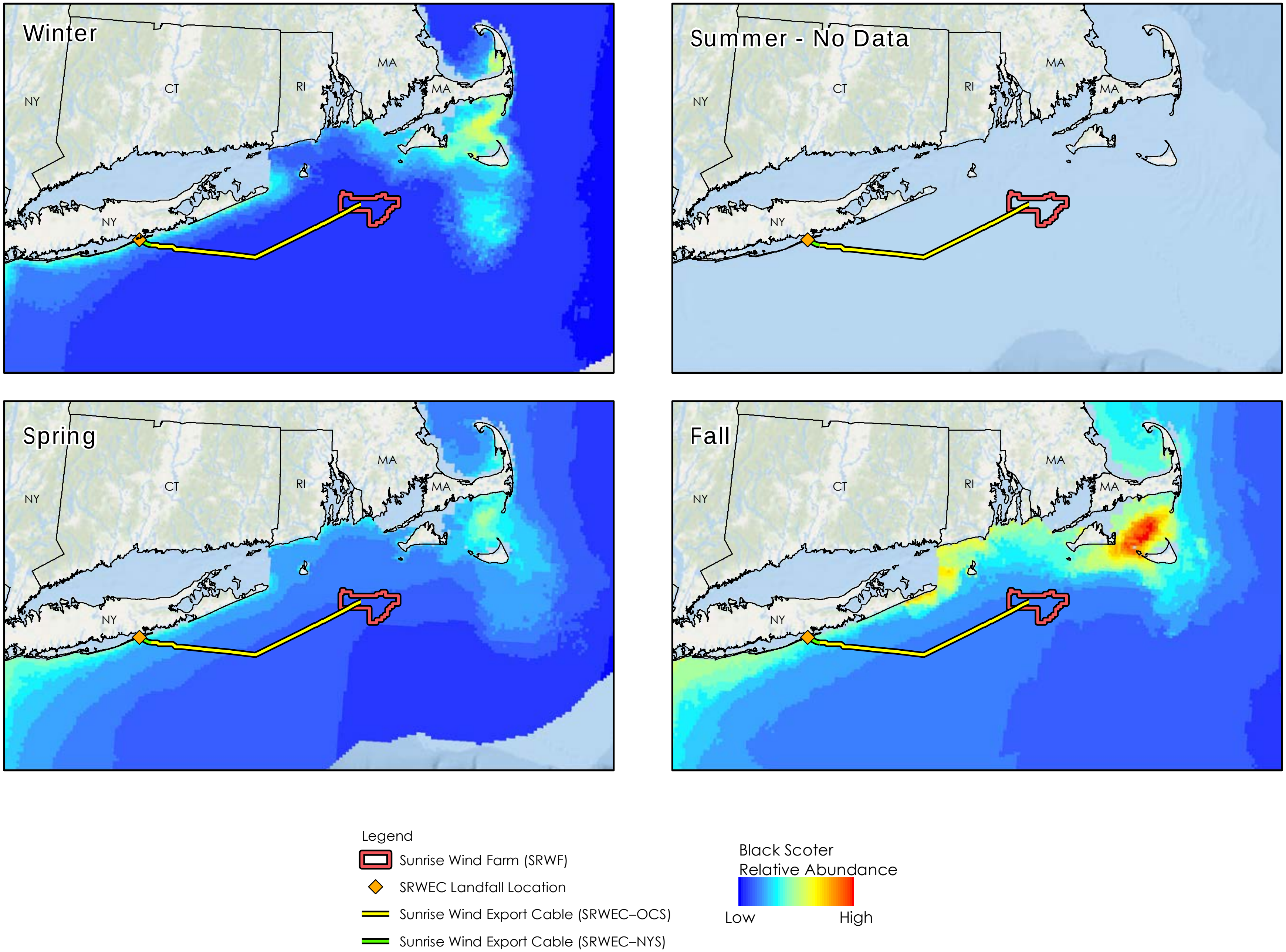
Black-capped Petrel Relative Abundance



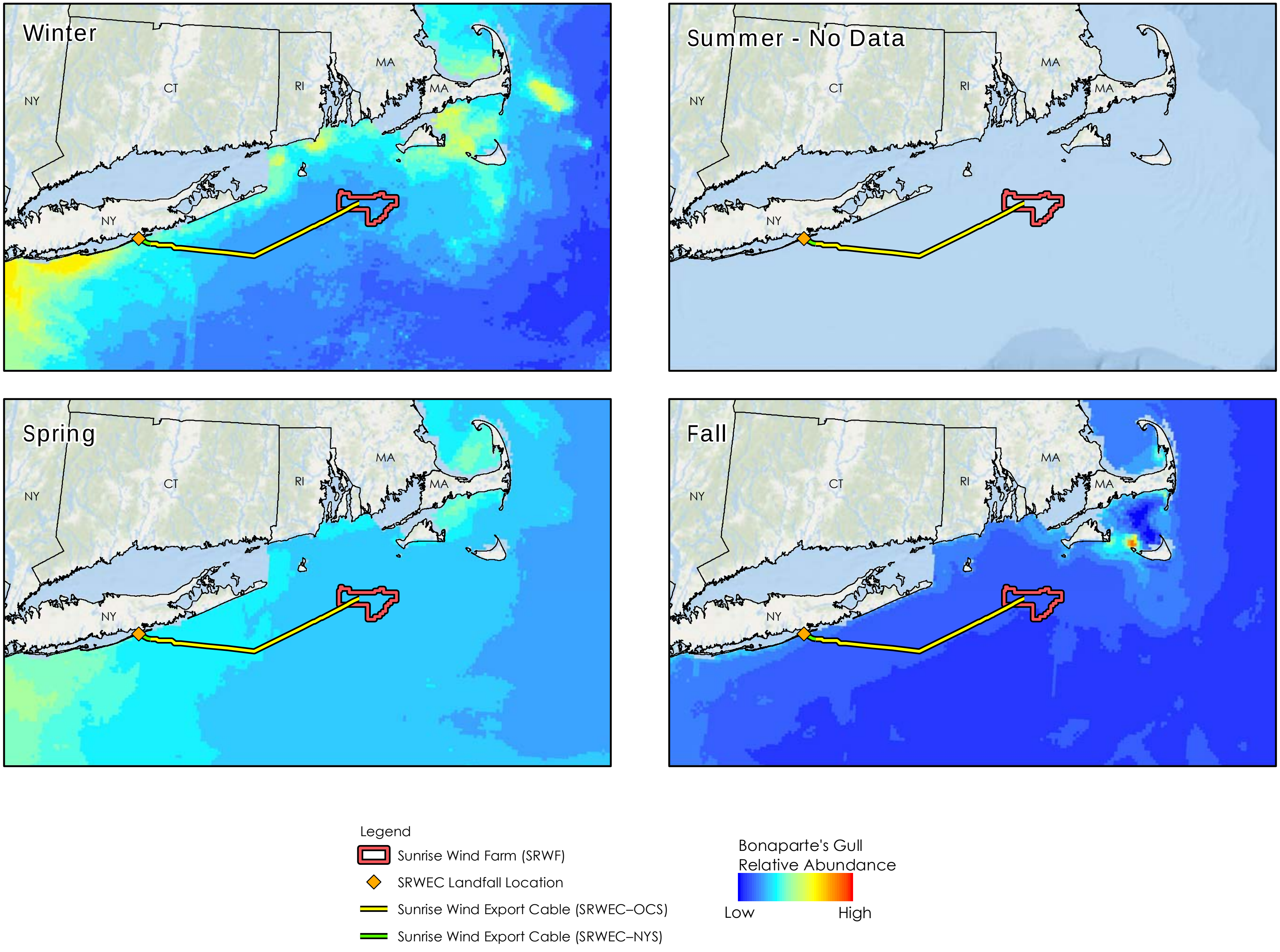
Black-legged Kittiwake Relative Abundance



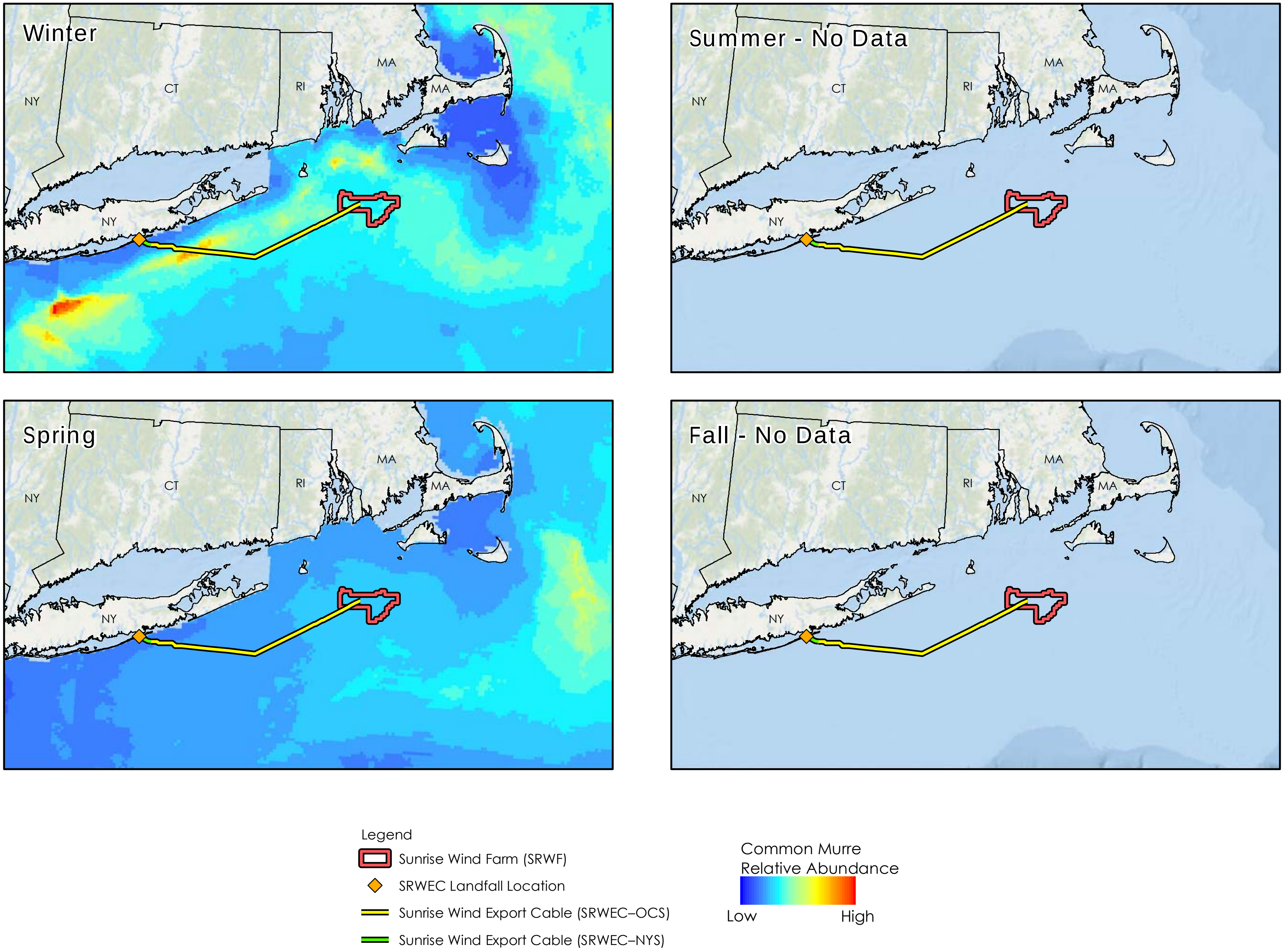
Black Scoter Relative Abundance



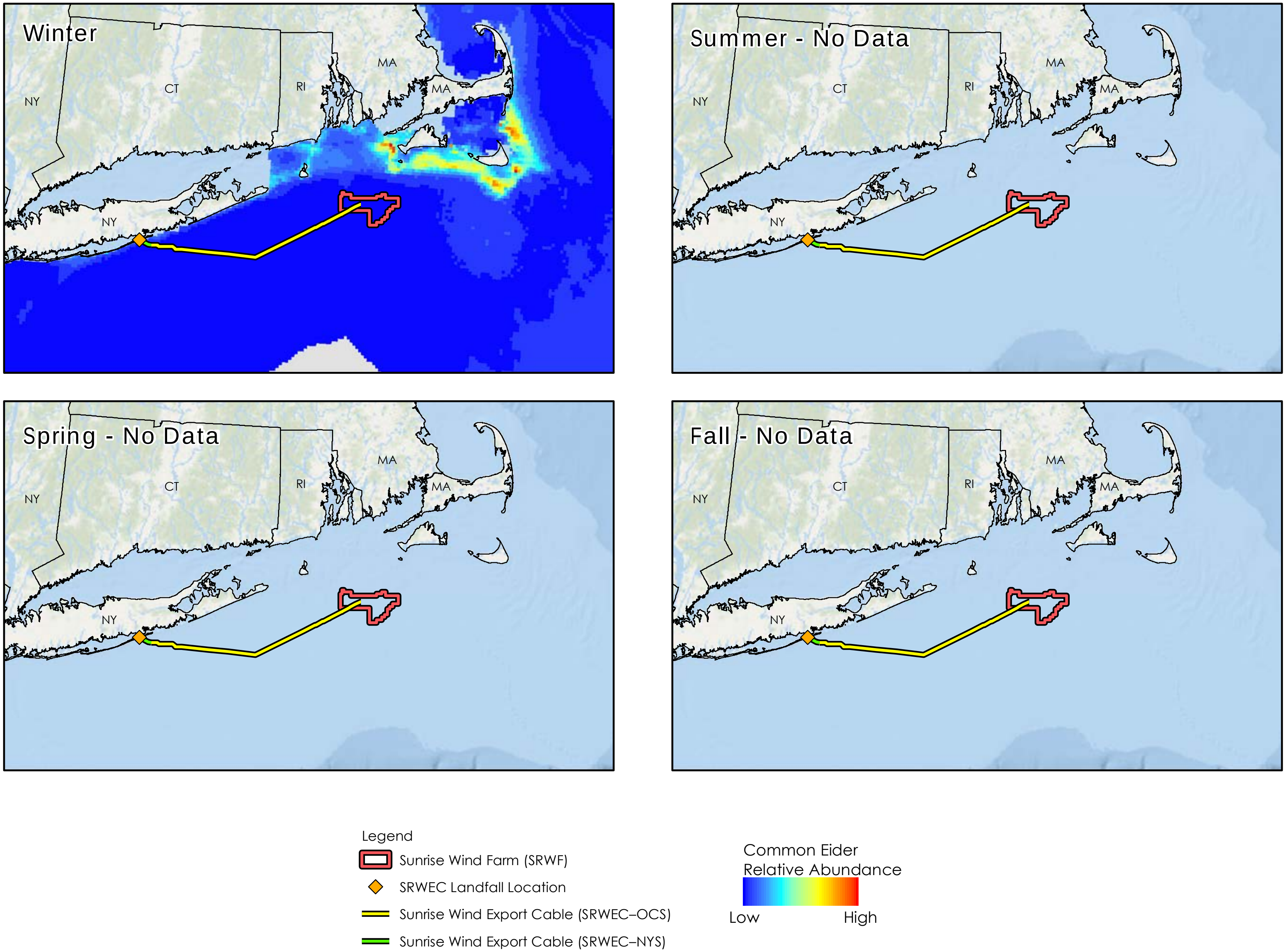
Bonaparte's Gull Relative Abundance



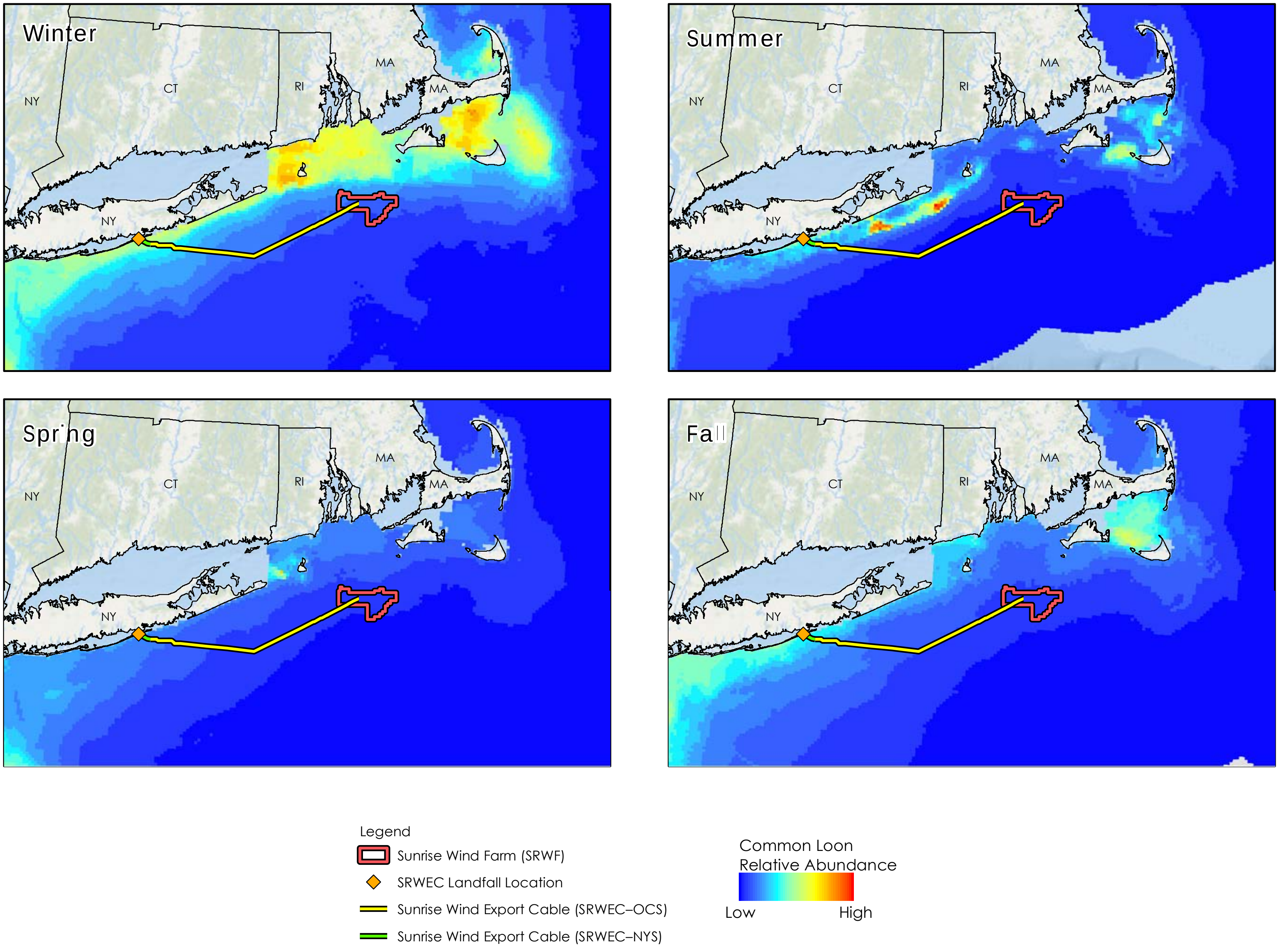
Common Murre Relative Abundance



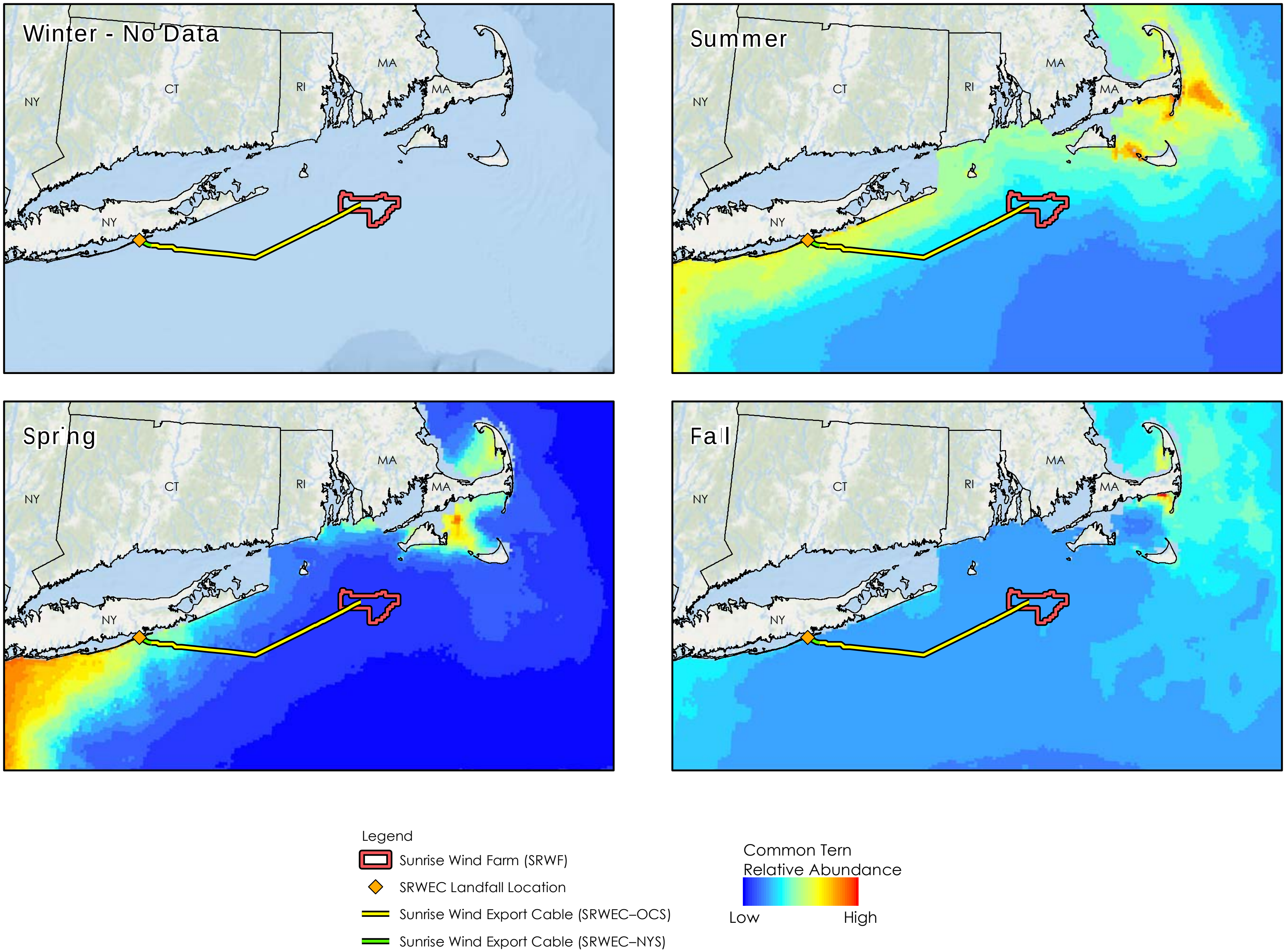
Common Eider Relative Abundance



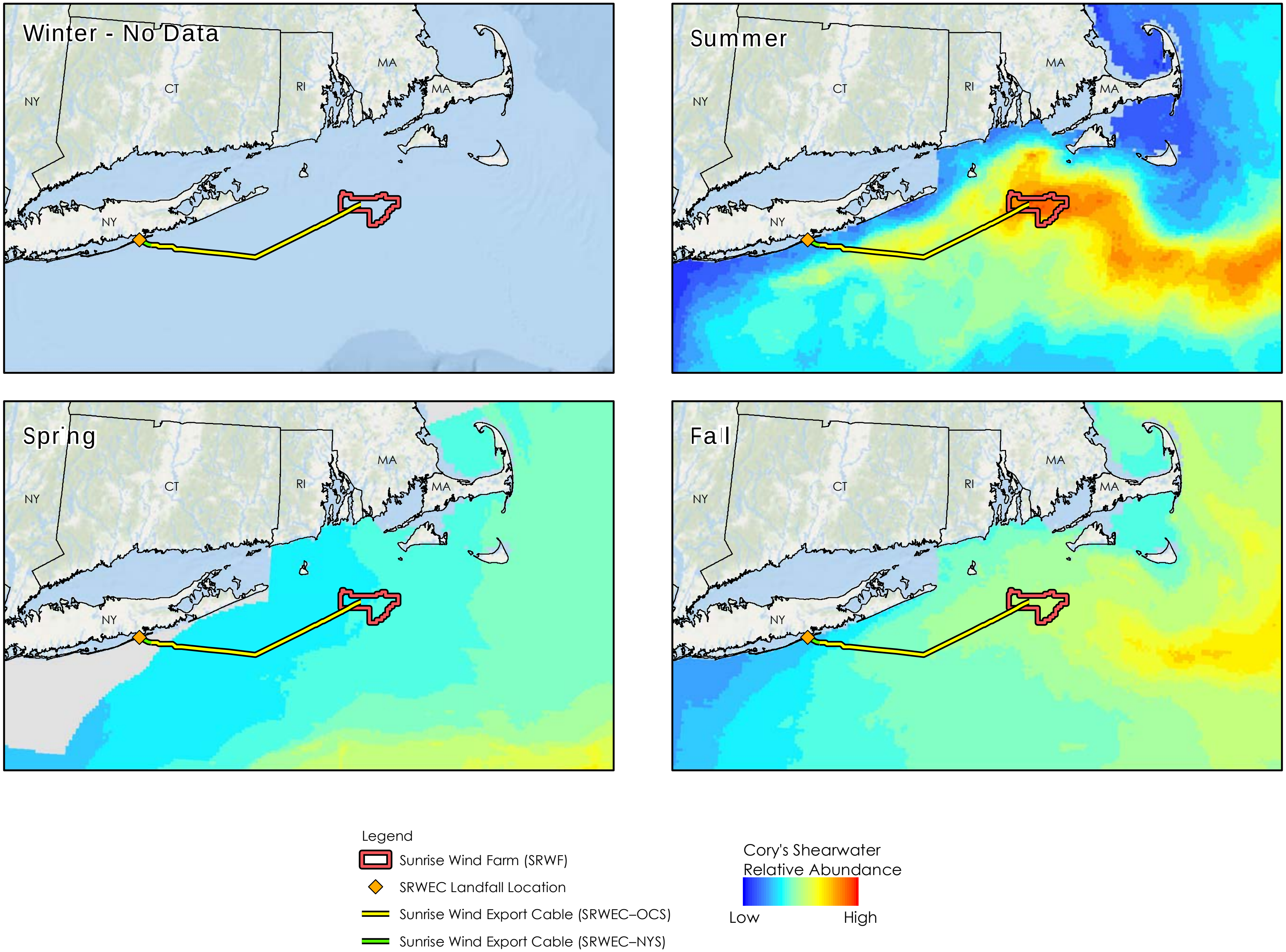
Common Loon Relative Abundance



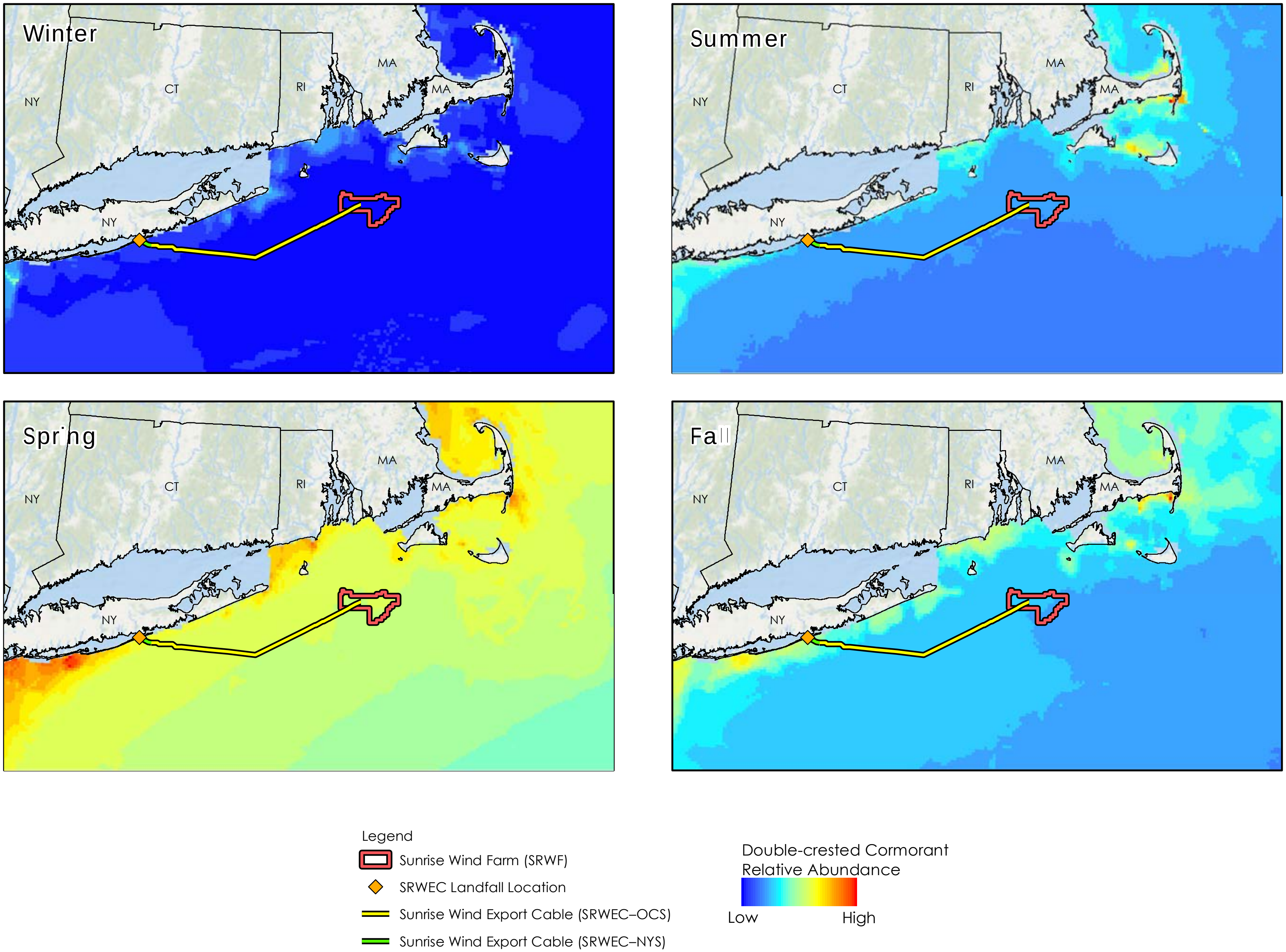
Common Tern Relative Abundance



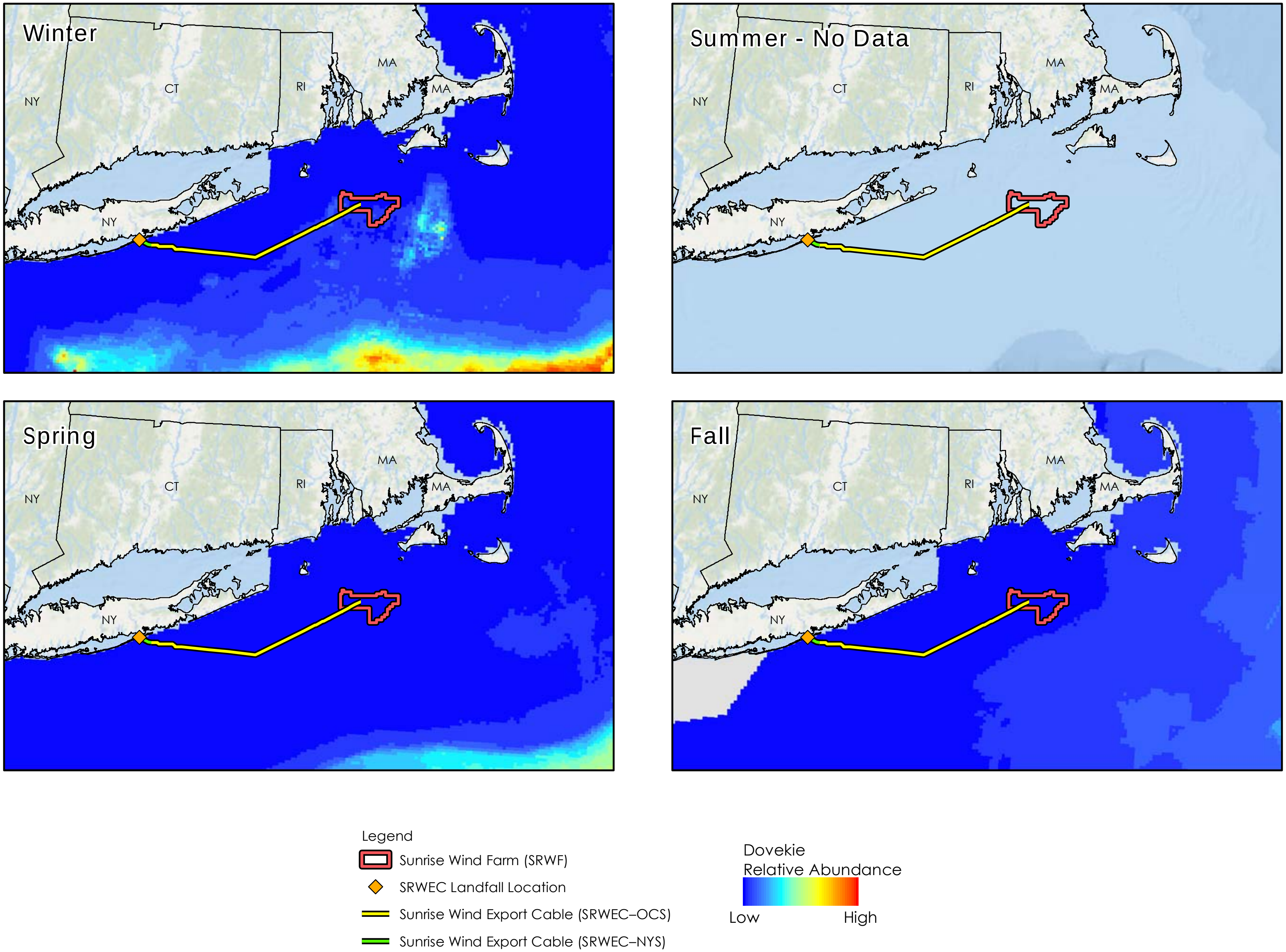
Cory's Shearwater Relative Abundance



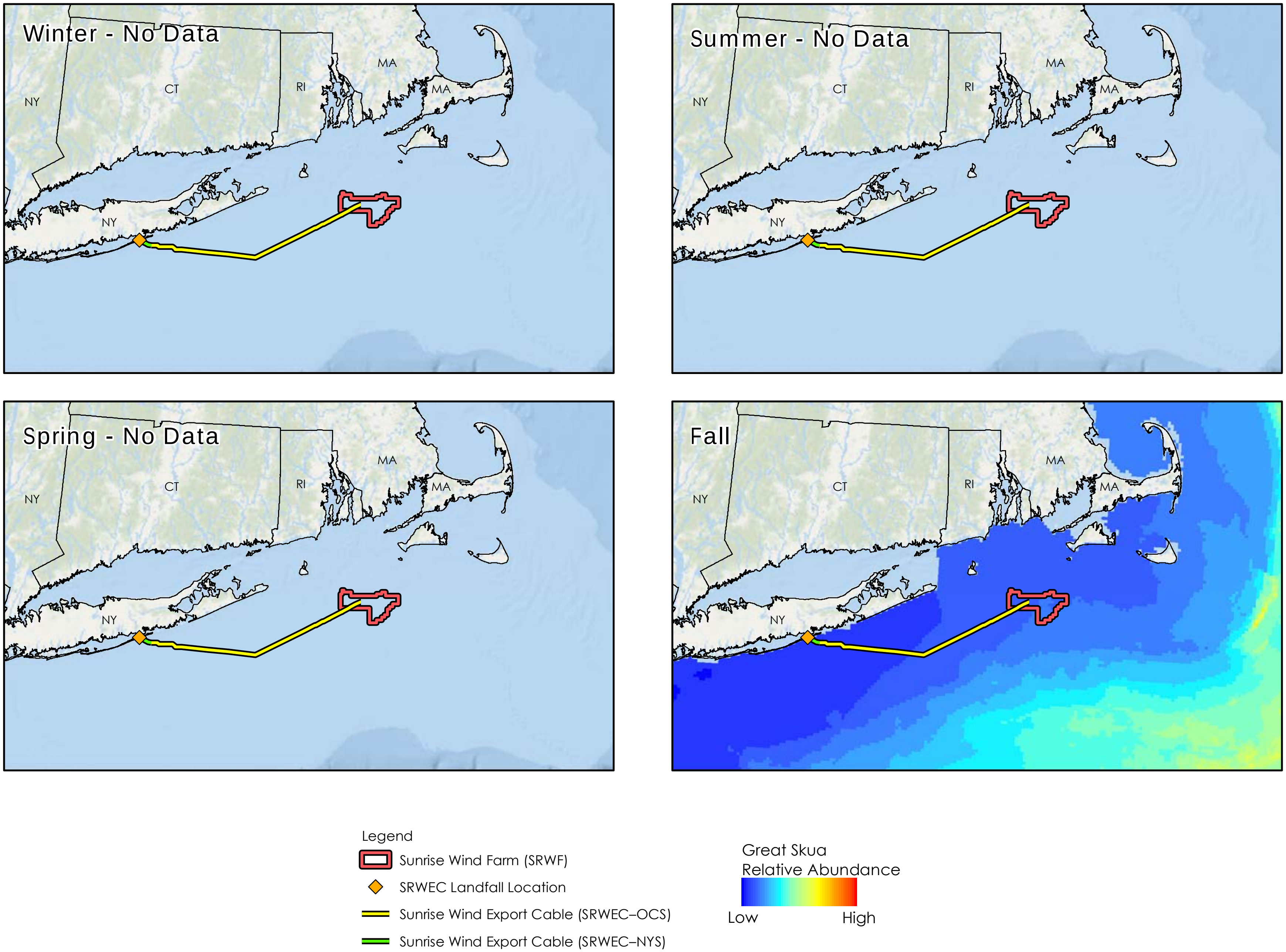
Double-crested Cormorant Relative Abundance



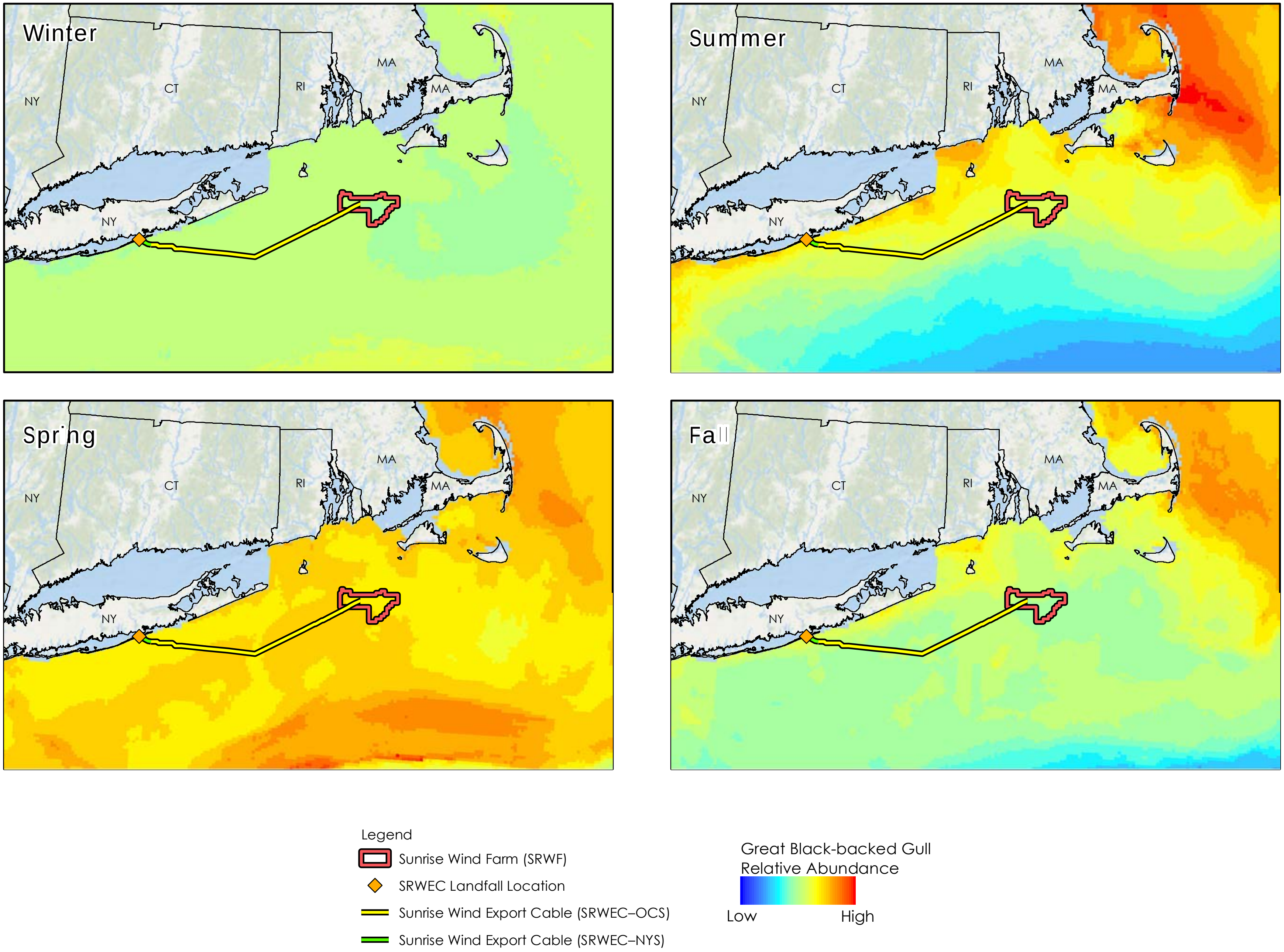
Dovekie Relative Abundance



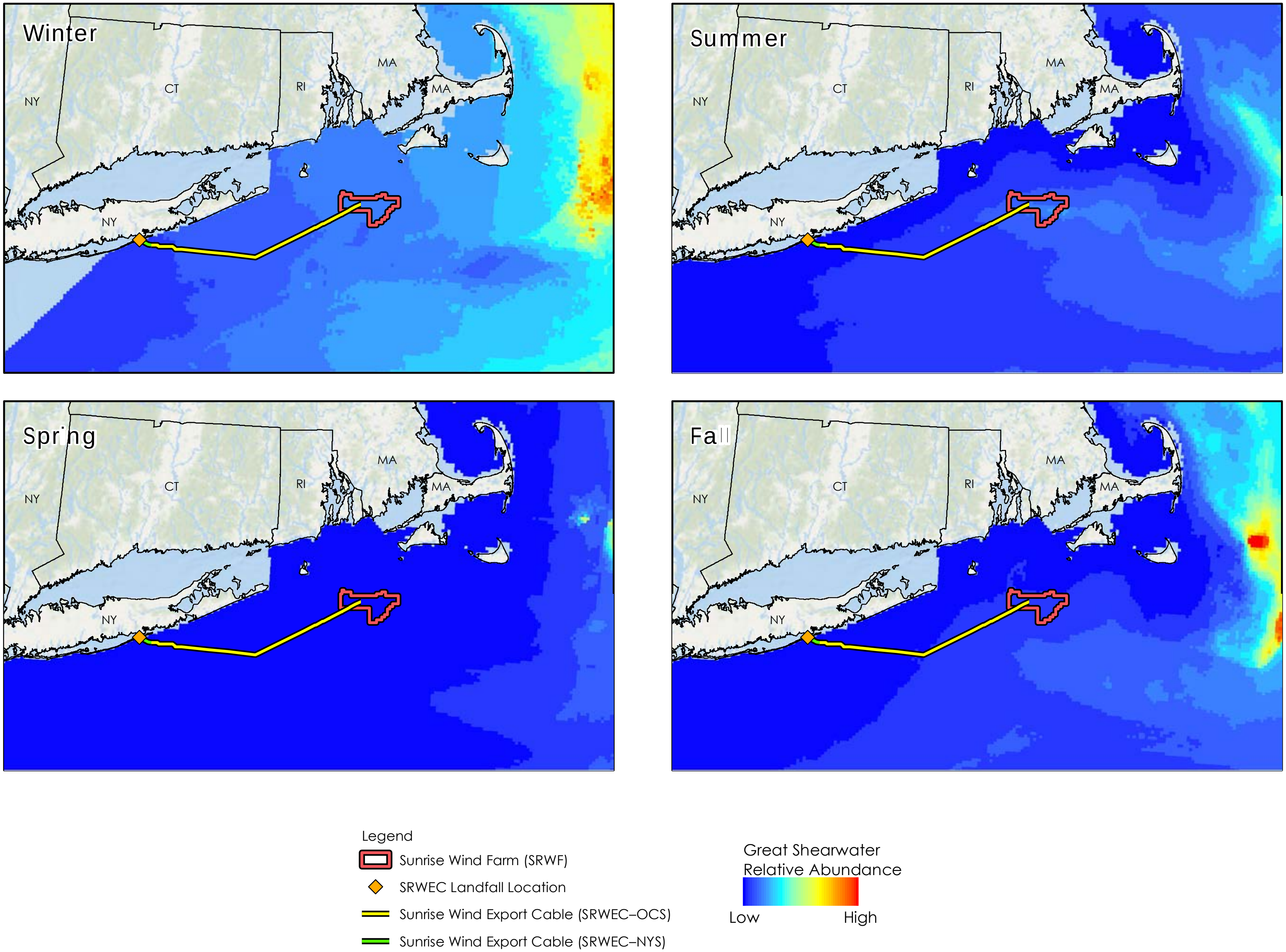
Great Skua Relative Abundance



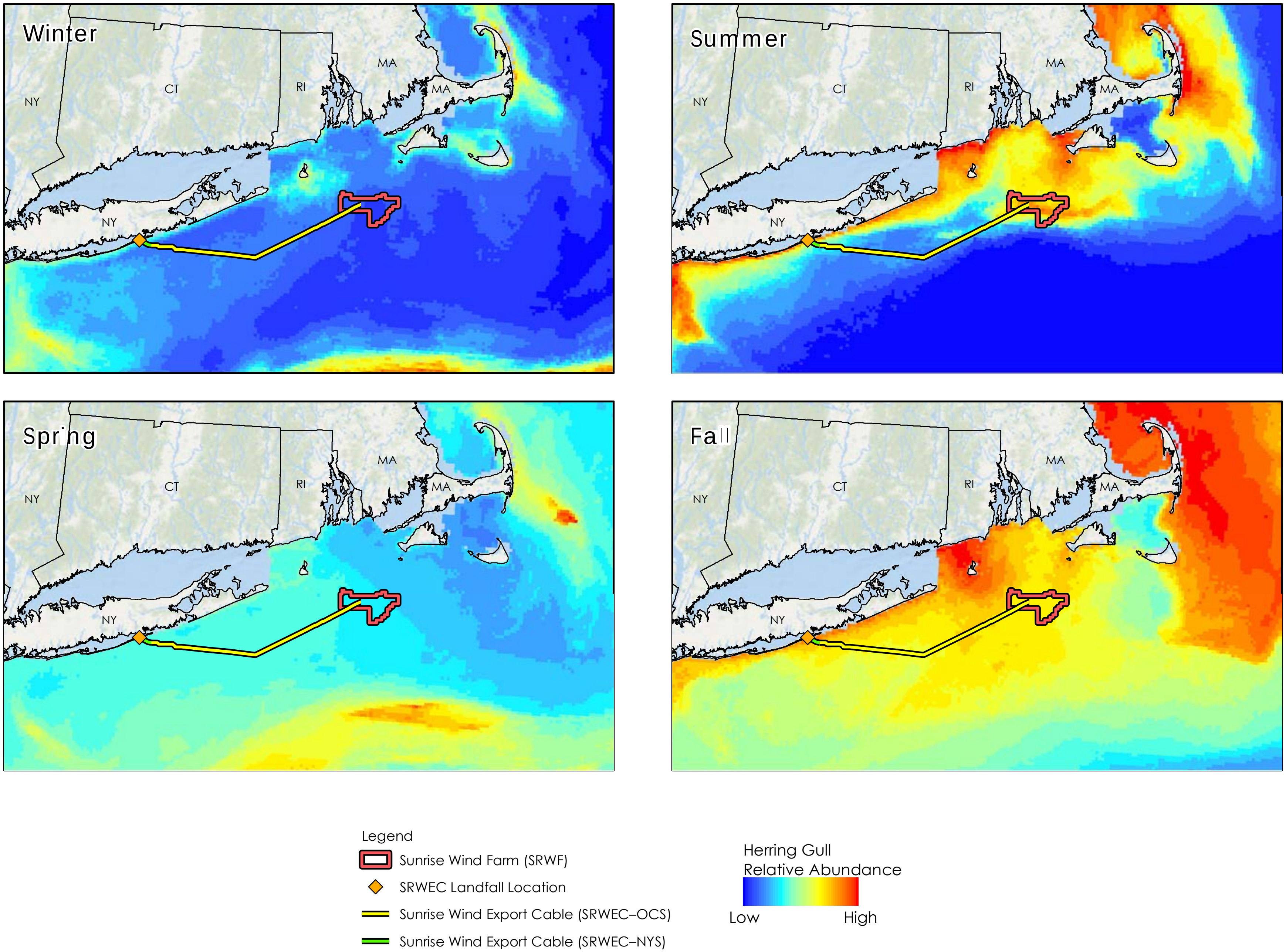
Great Black-backed Gull Relative Abundance



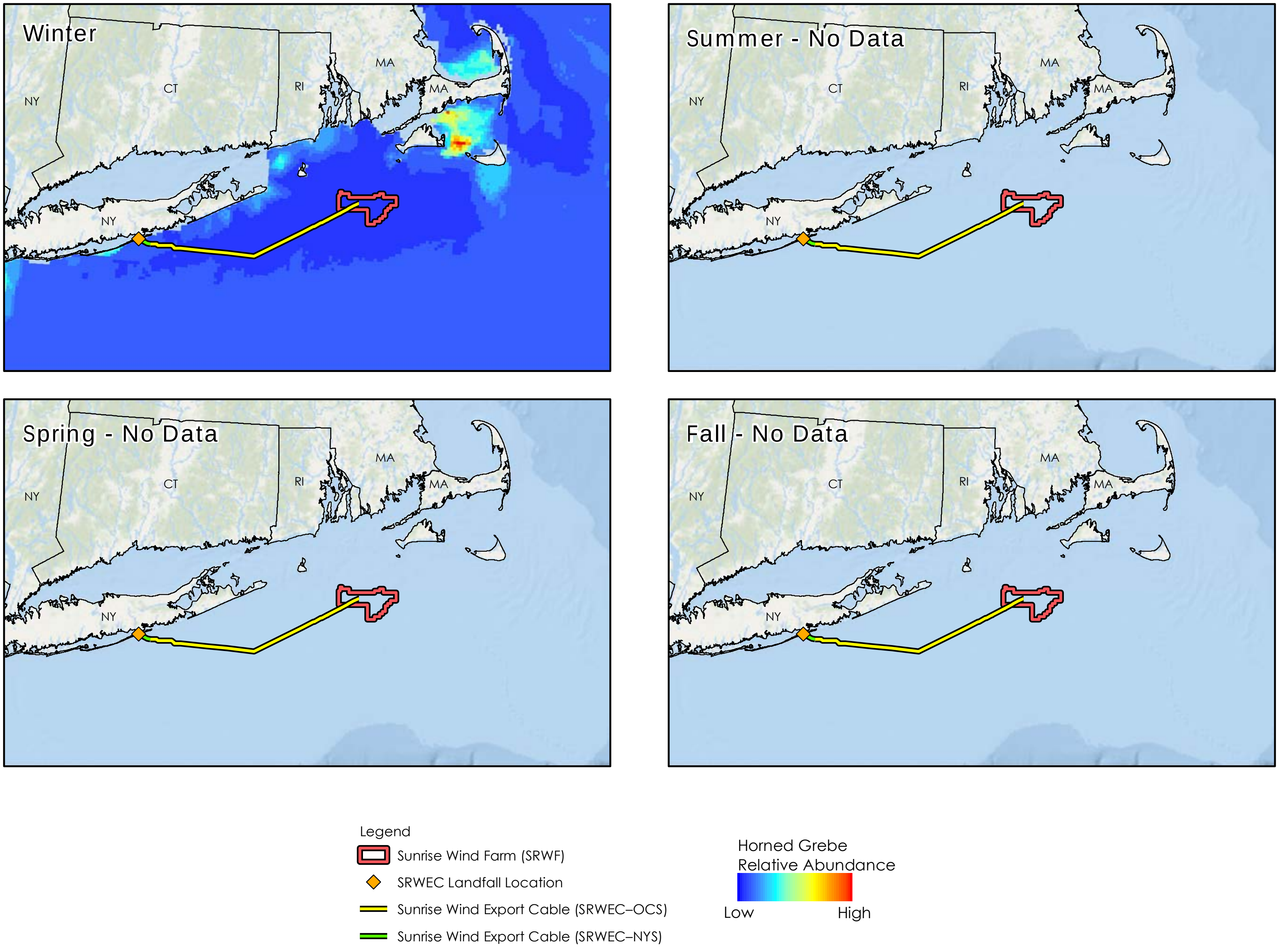
Great Shearwater Relative Abundance



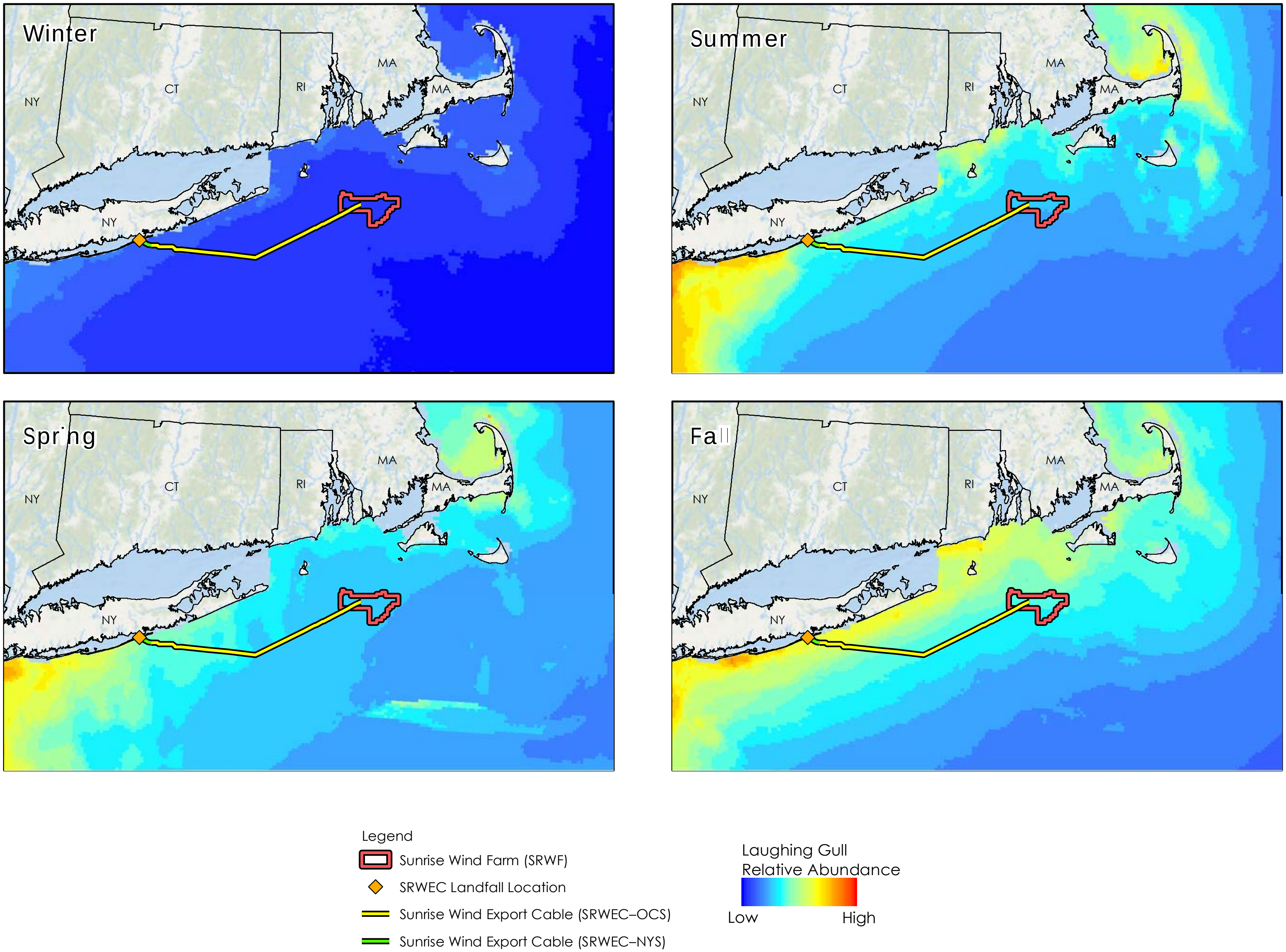
Herring Gull Relative Abundance



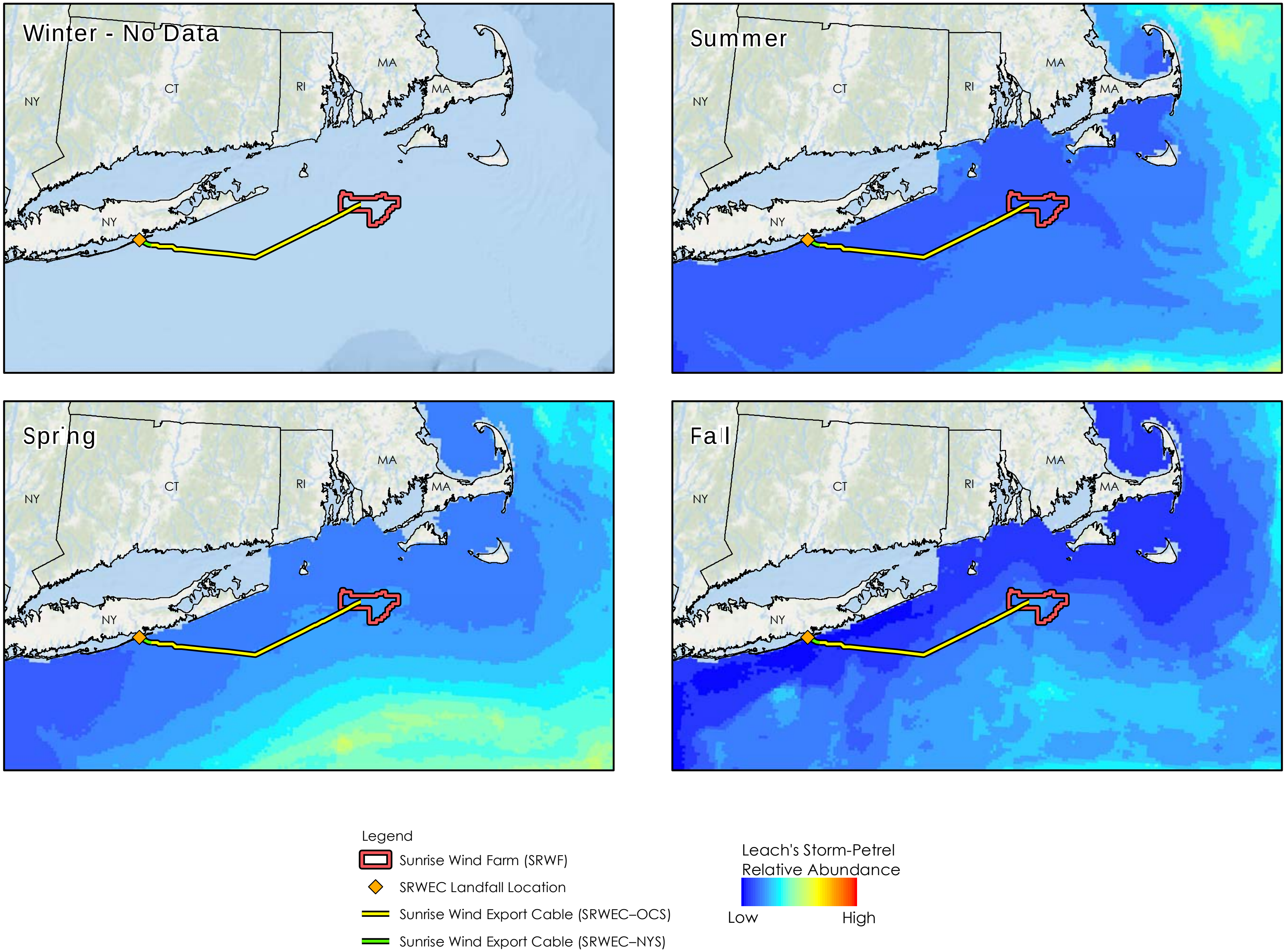
Horned Grebe Relative Abundance



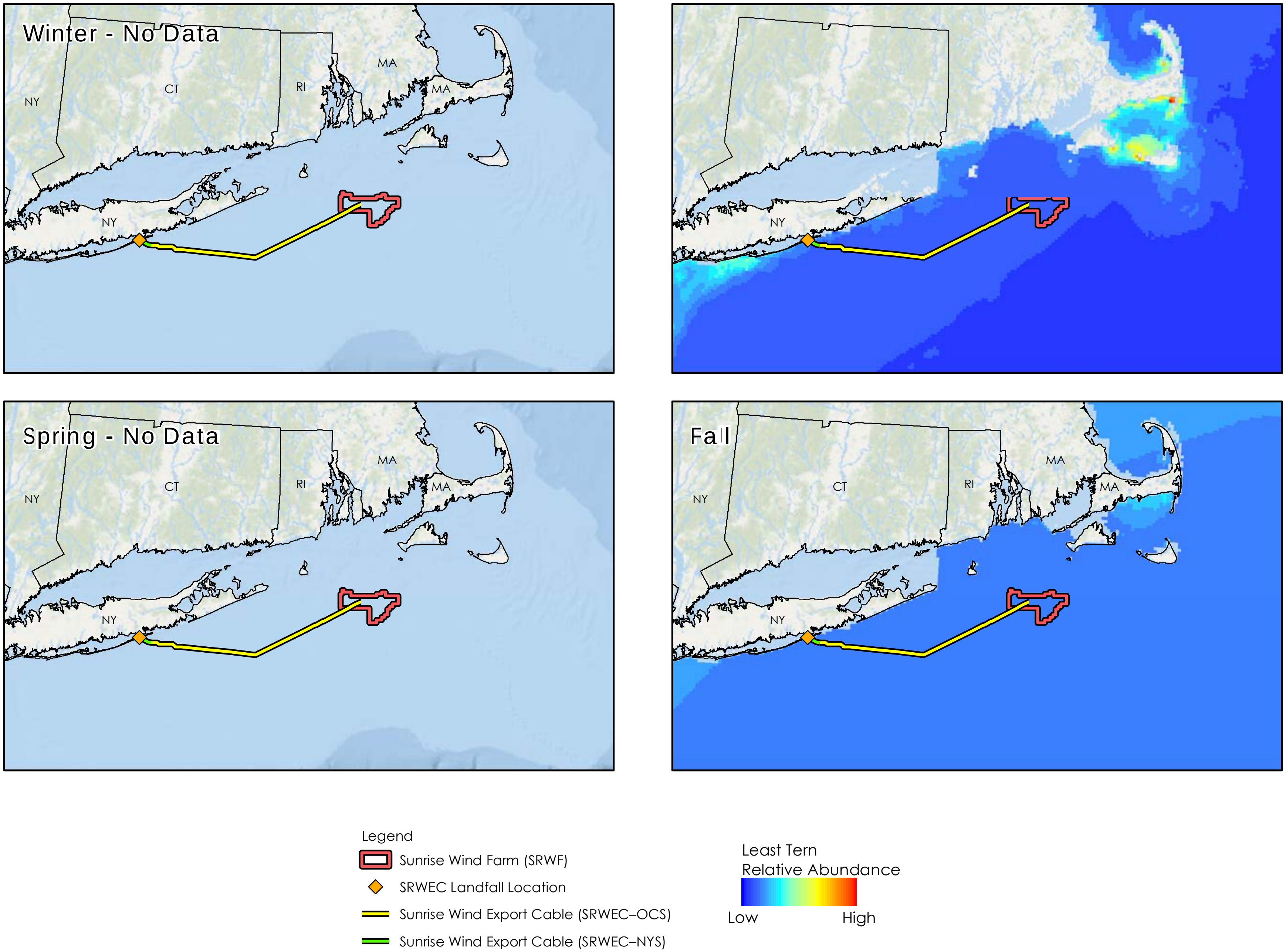
Laughing Gull Relative Abundance



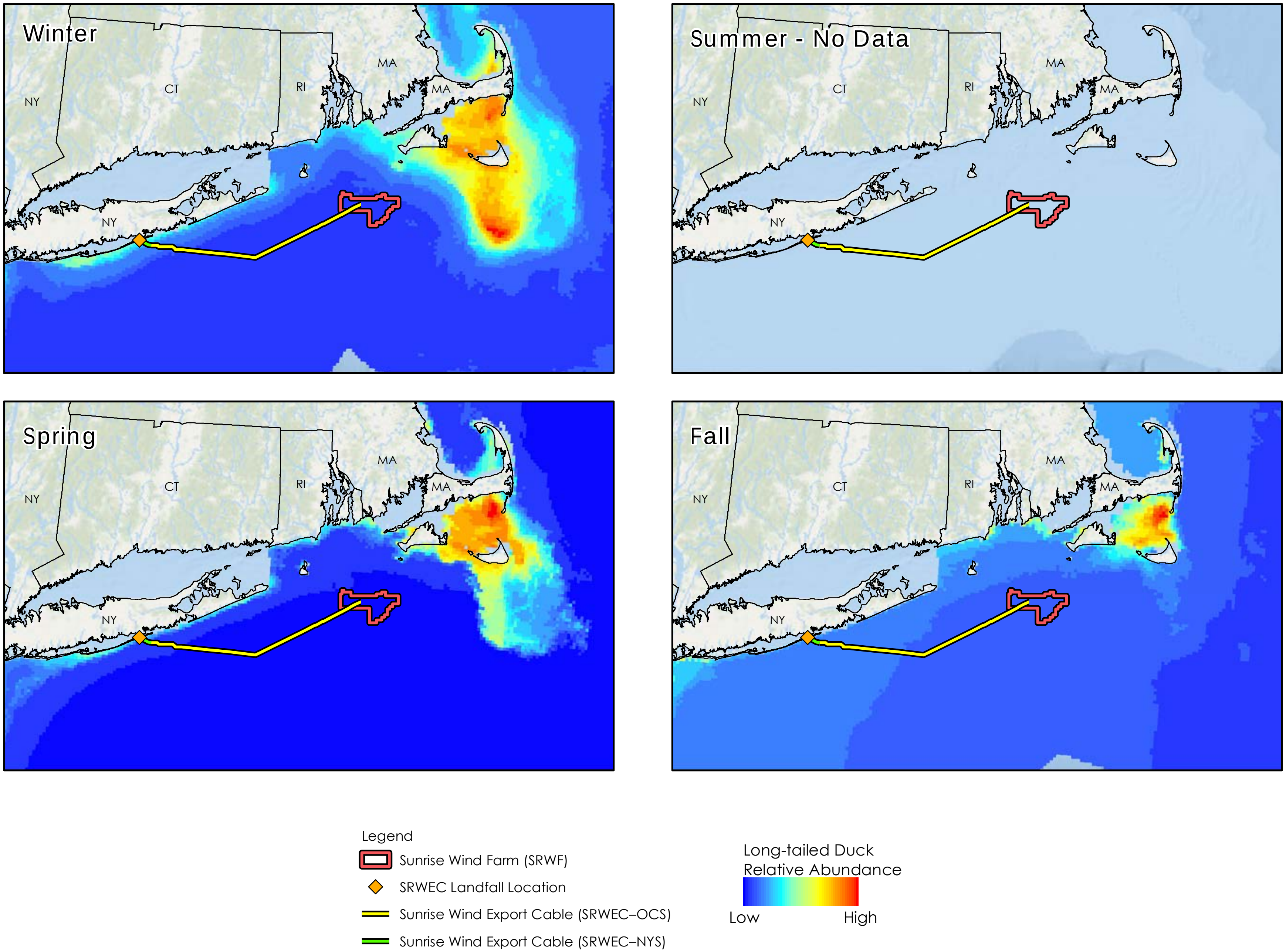
Leach's Storm-Petrel Relative Abundance



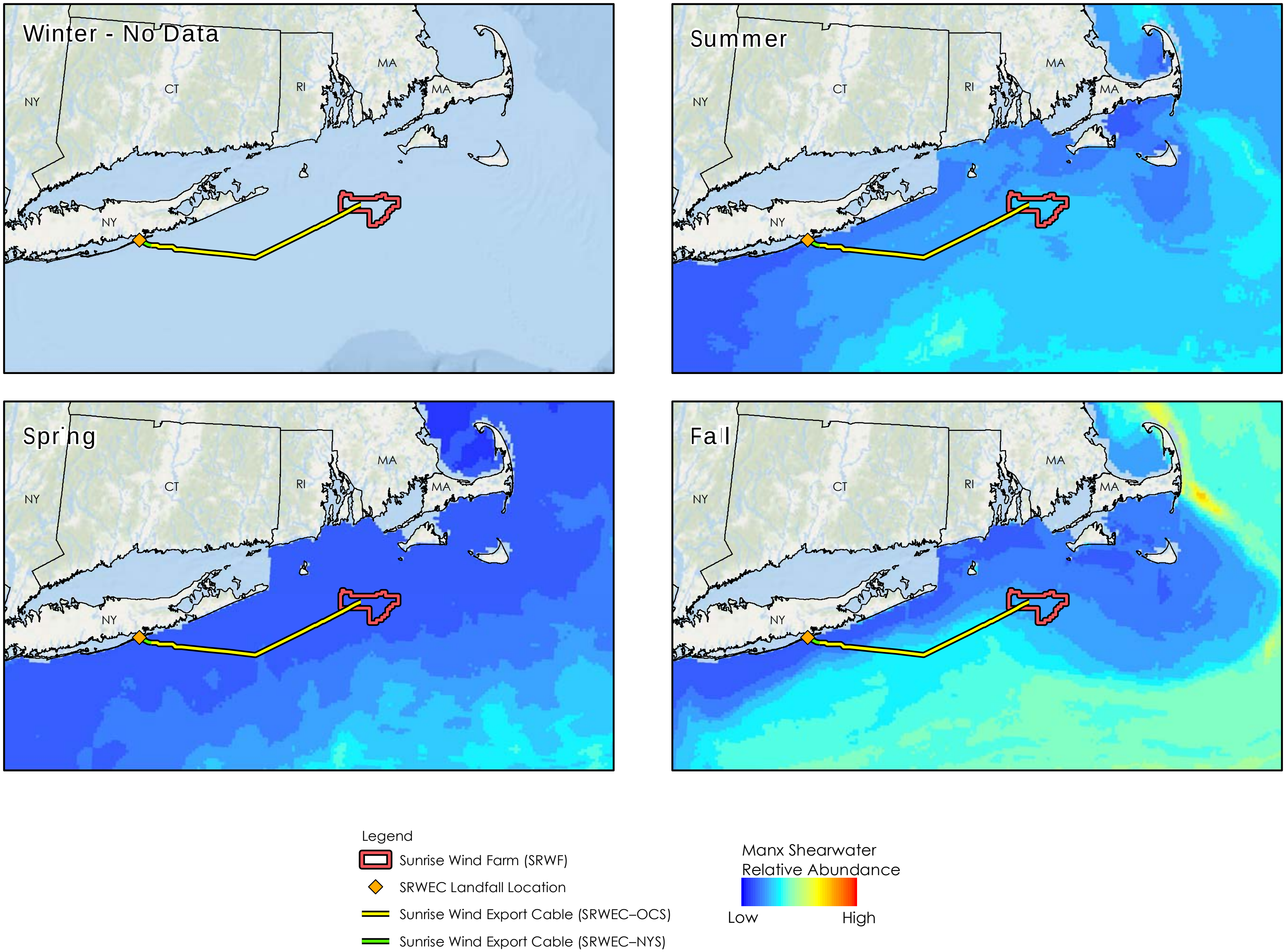
Least Tern Relative Abundance



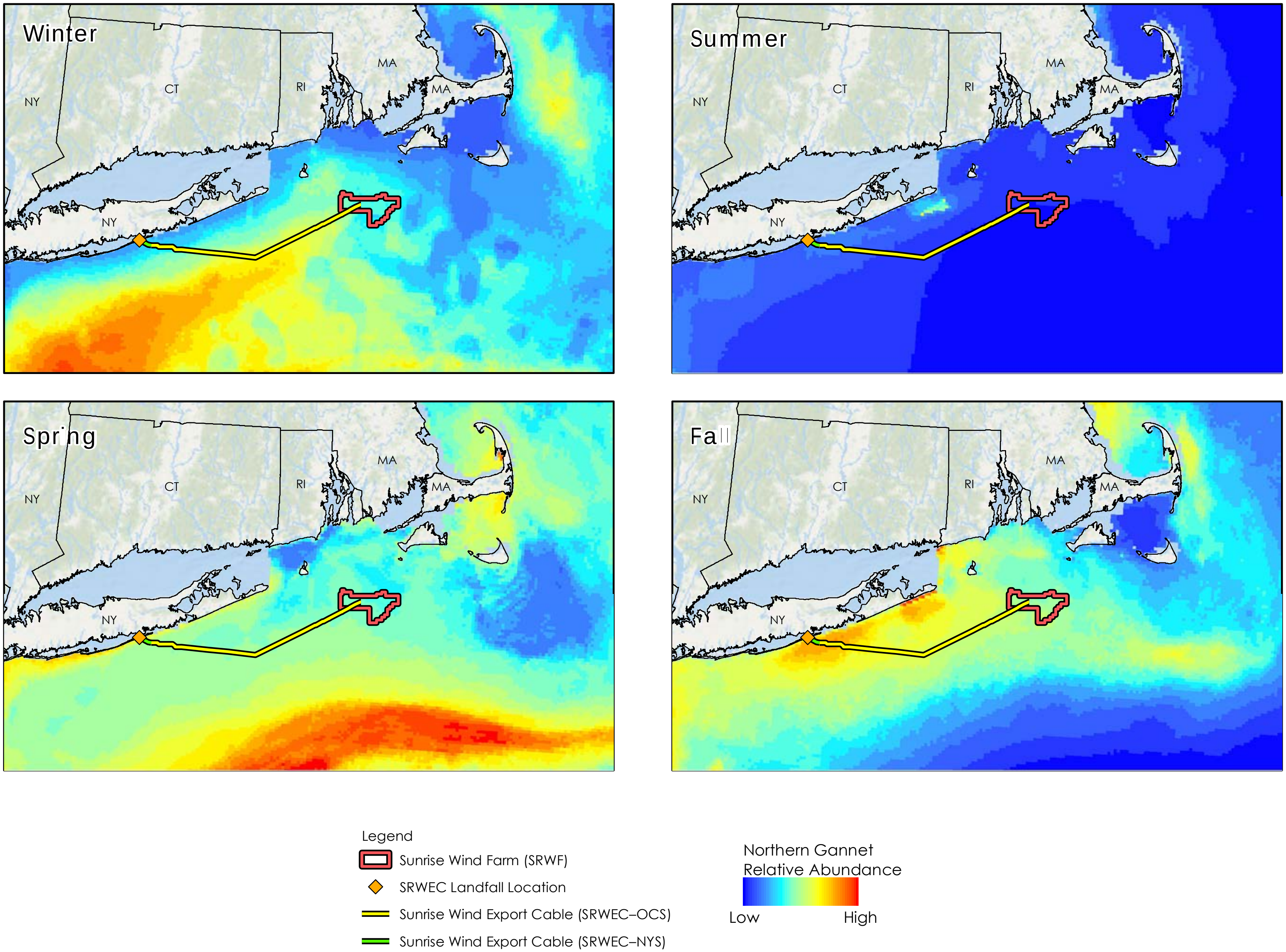
Long-tailed Duck Relative Abundance



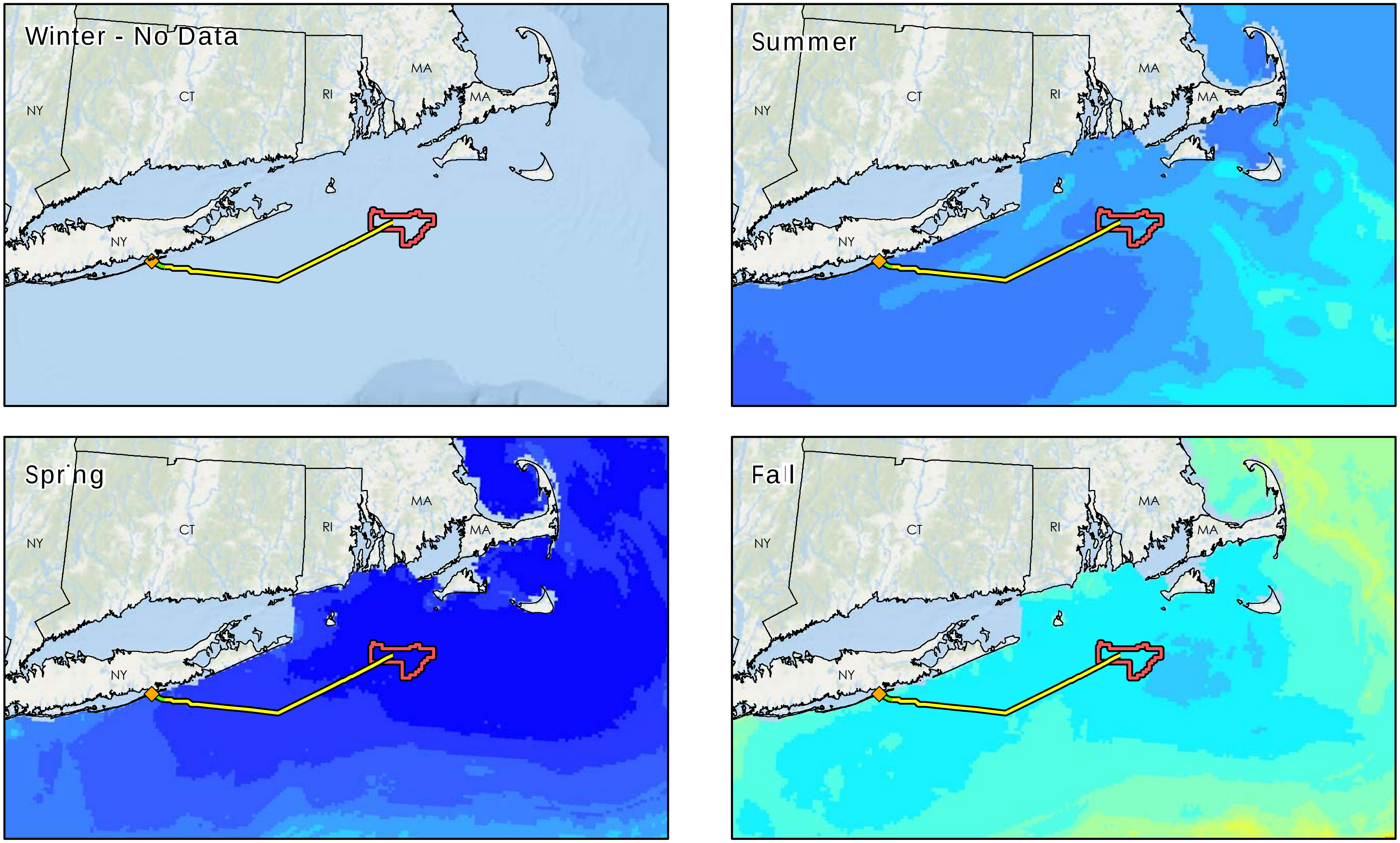
Manx Shearwater Relative Abundance



Northern Gannet Relative Abundance



Parasitic Jaeger Relative Abundance



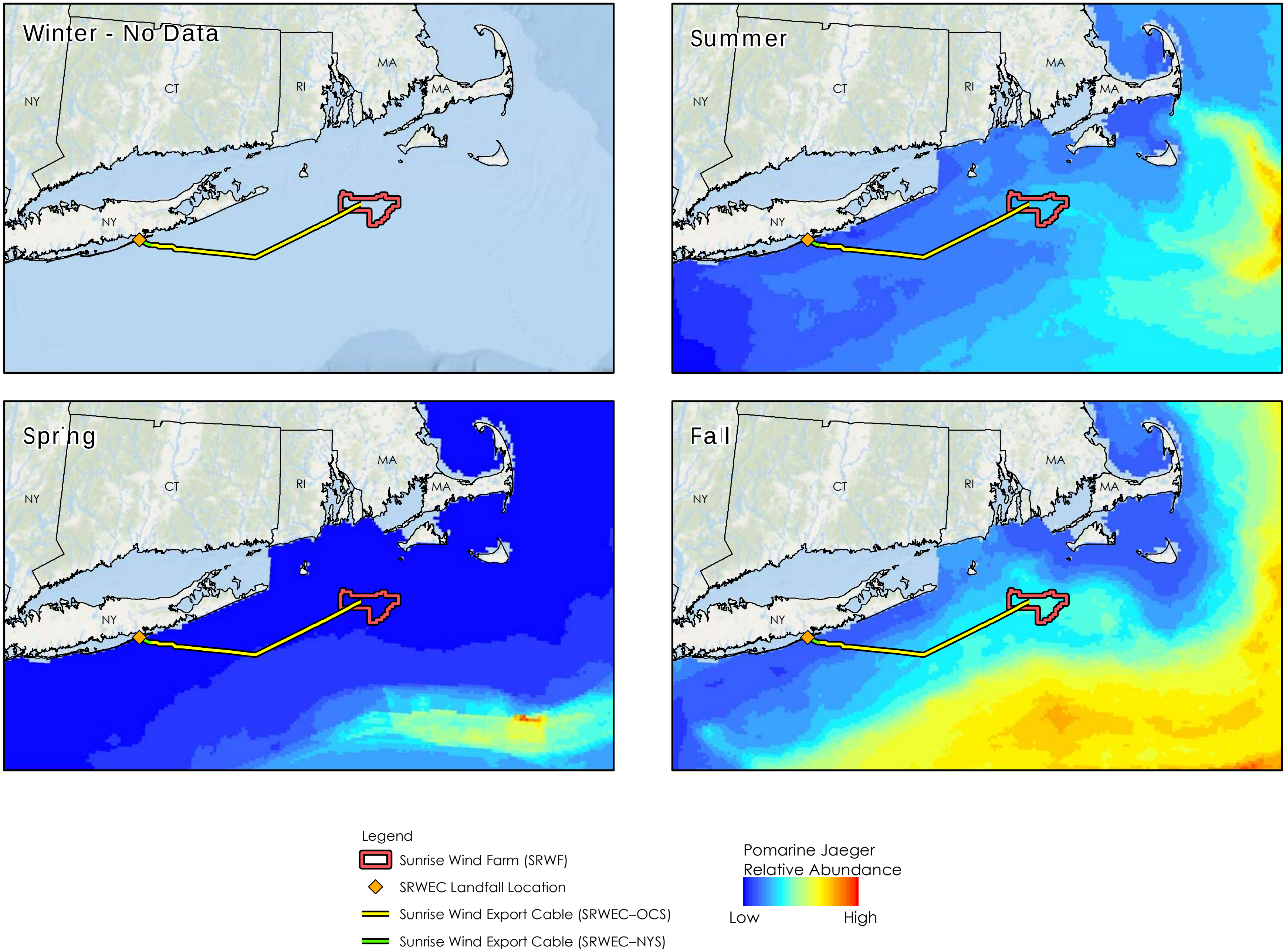
Legend

- Sunrise Wind Farm (SRWF)
- SRWEC Landfall Location
- Sunrise Wind Export Cable (SRWEC–OCS)
- Sunrise Wind Export Cable (SRWEC–NYS)

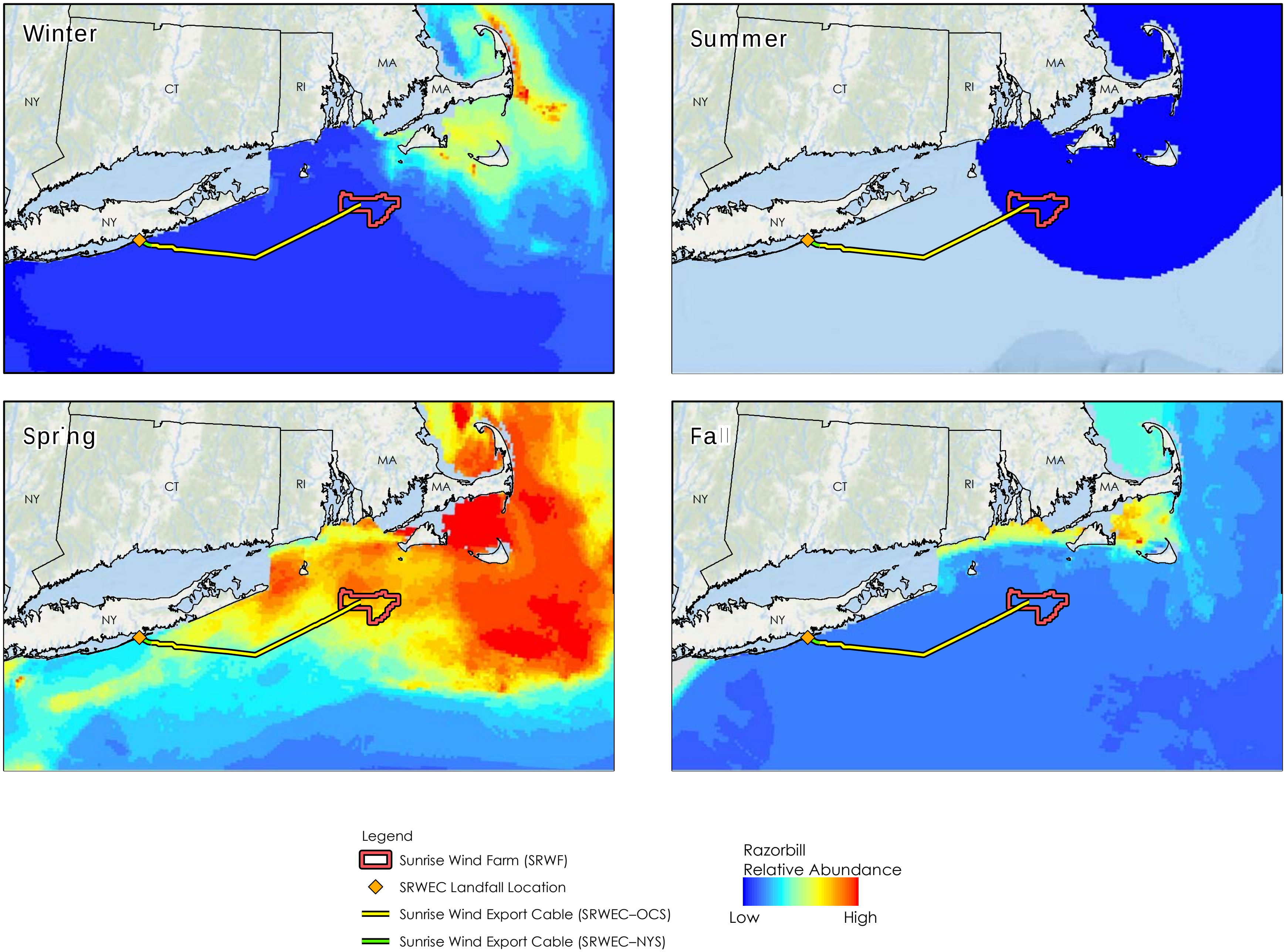
Parasitic Jaeger Relative Abundance

Low High

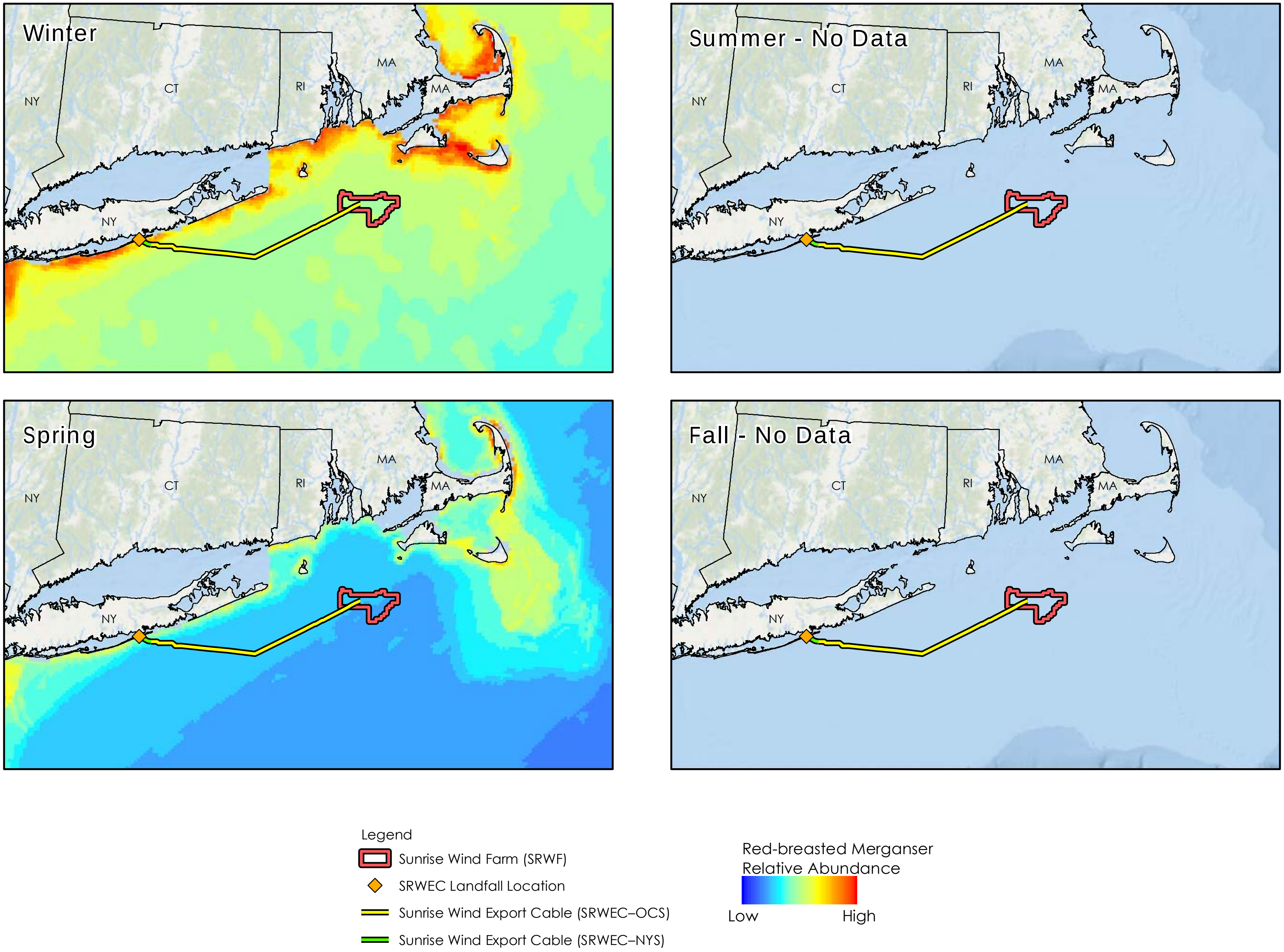
Pomarine Jaeger Relative Abundance



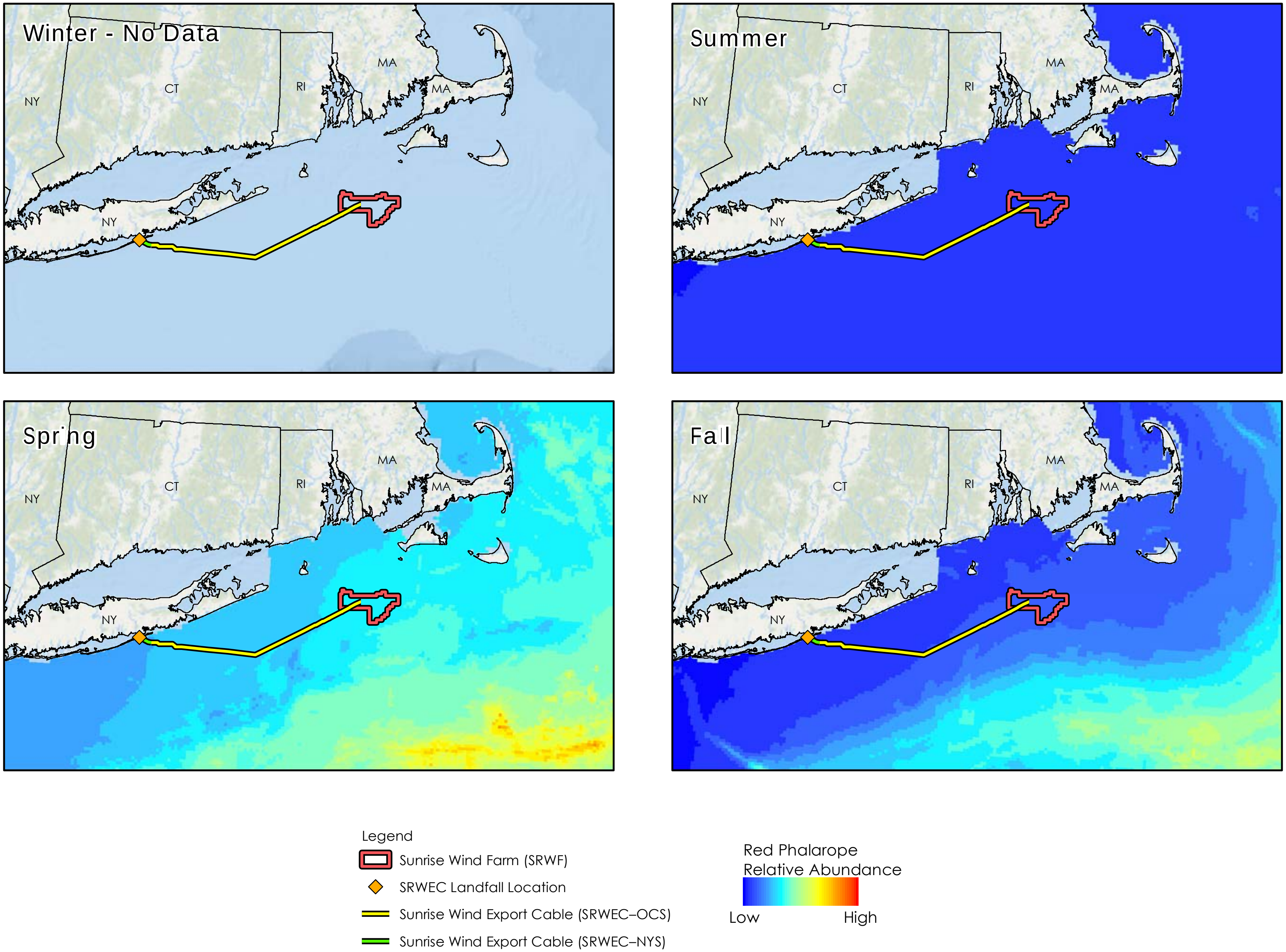
Razorbill Relative Abundance



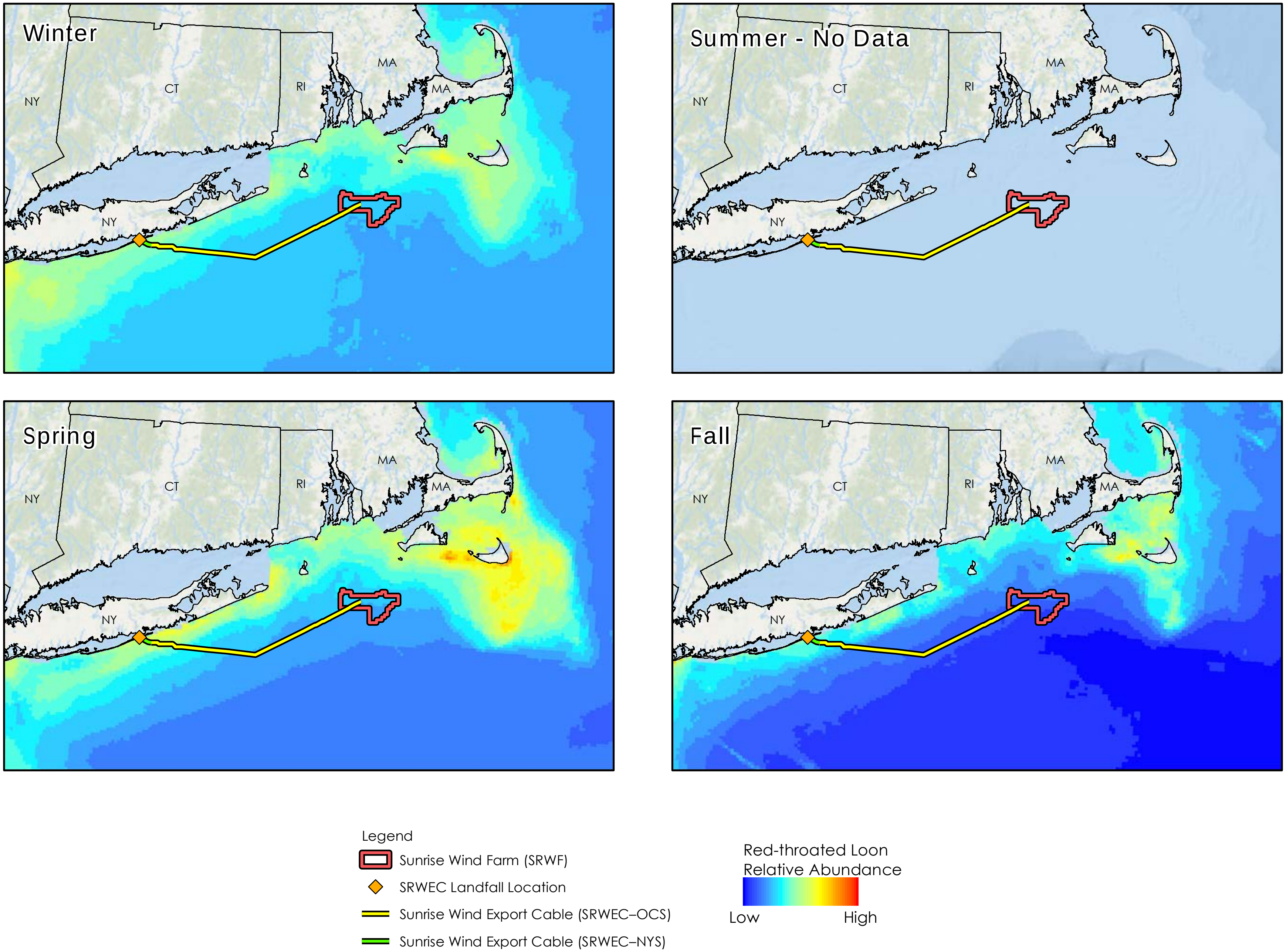
Red-breasted Merganser Relative Abundance



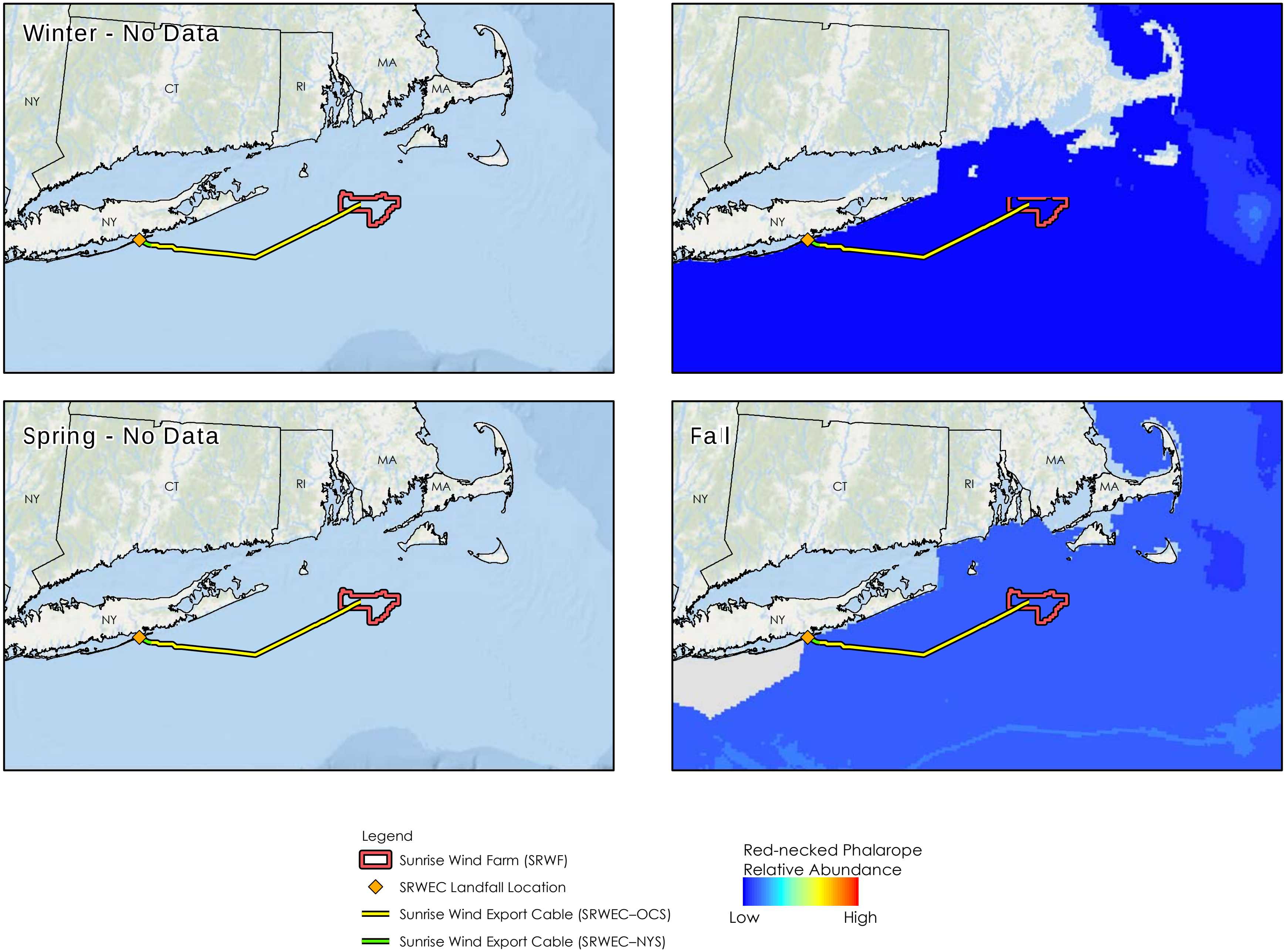
Red Phalarope Relative Abundance



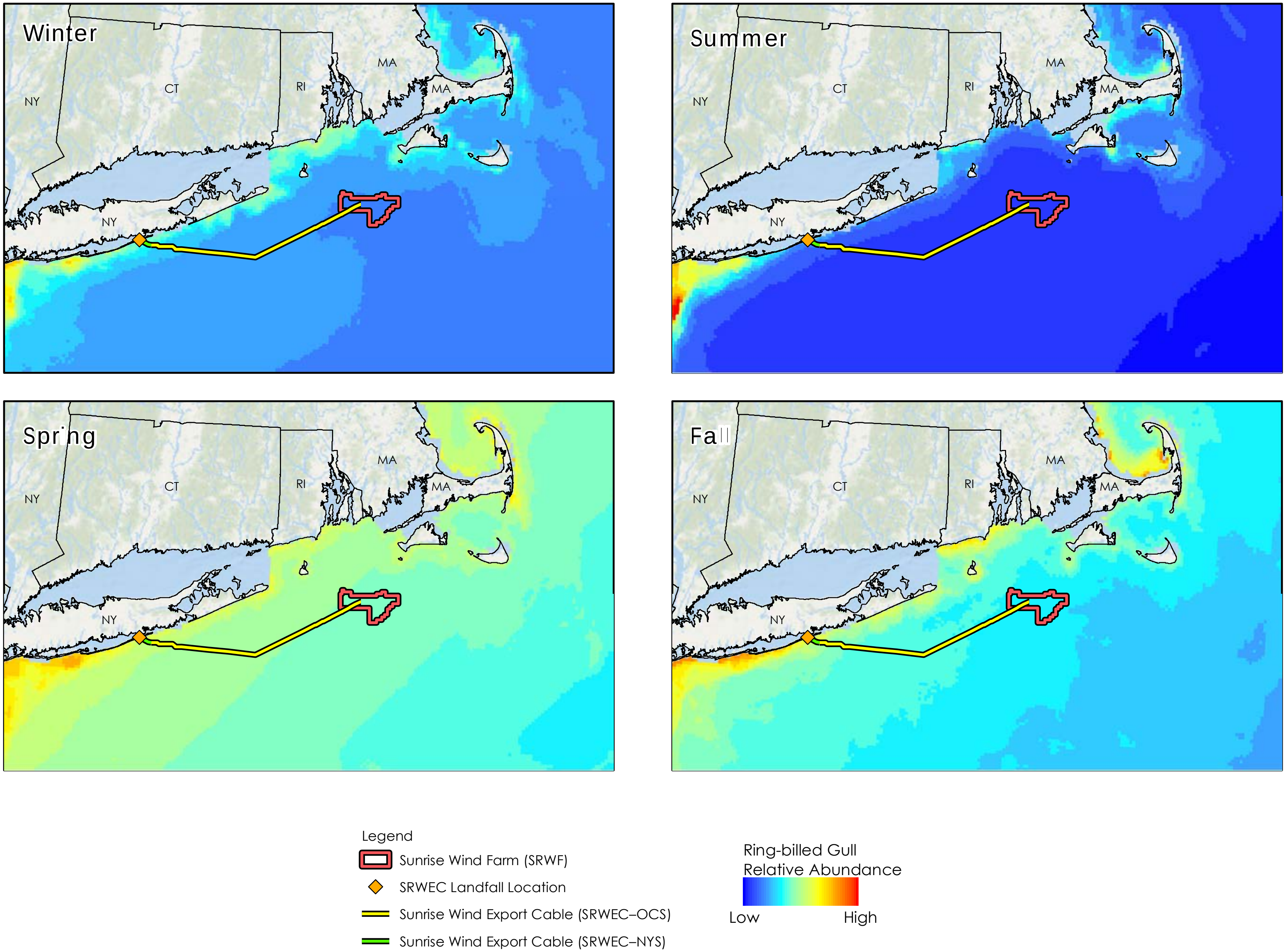
Red-throated Loon Relative Abundance



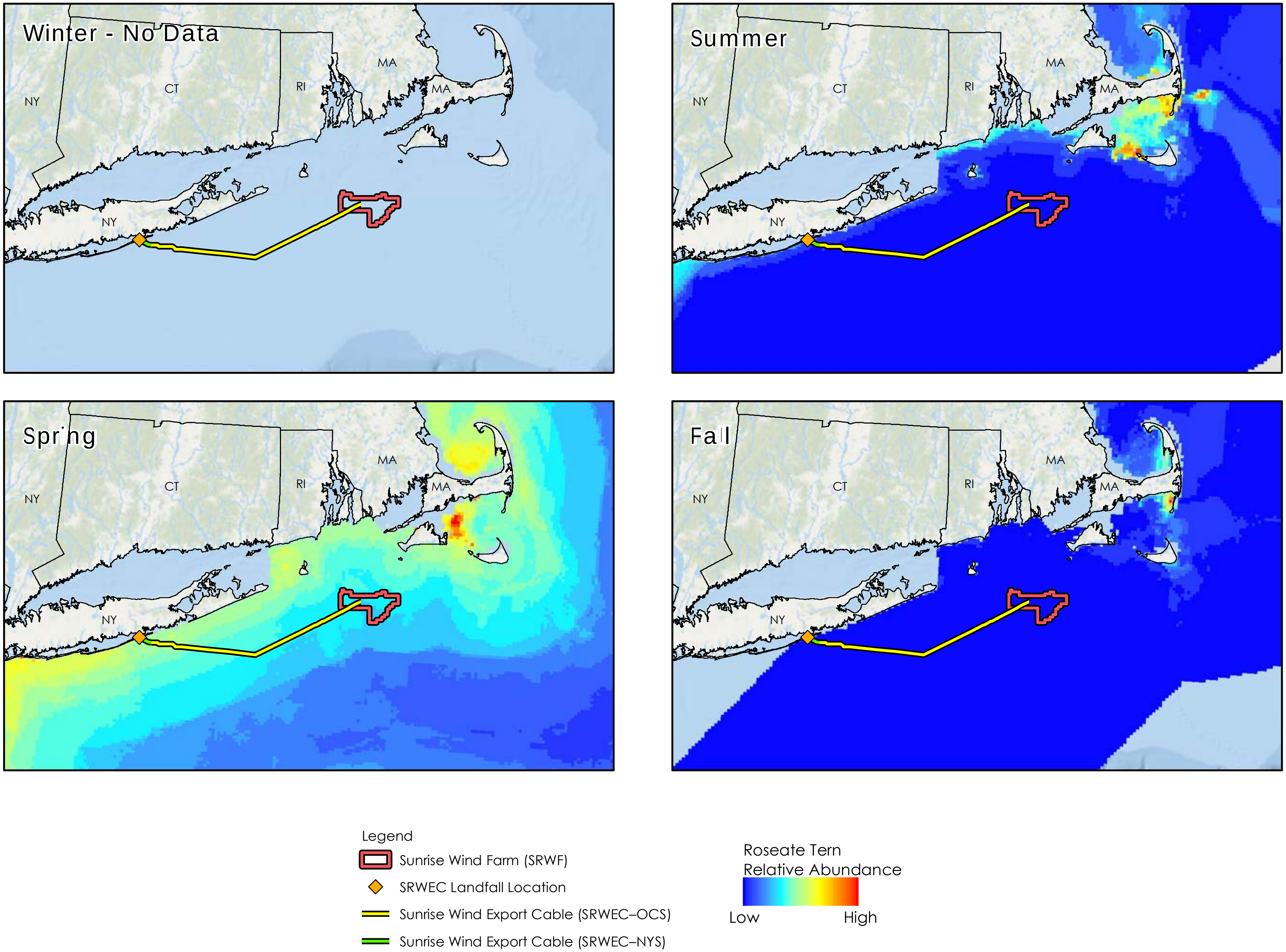
Red-necked Phalarope Relative Abundance



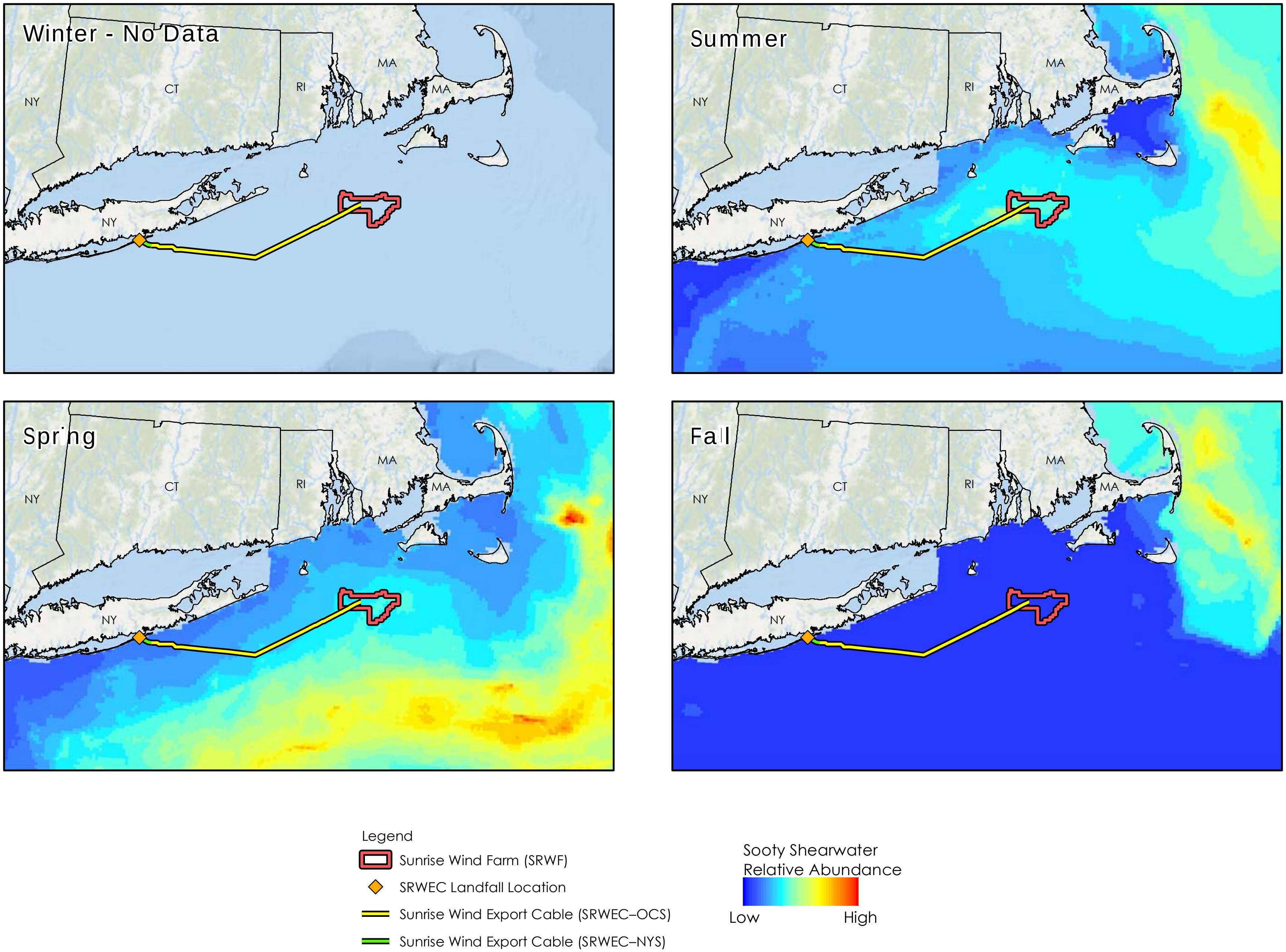
Ring-billed Gull Relative Abundance



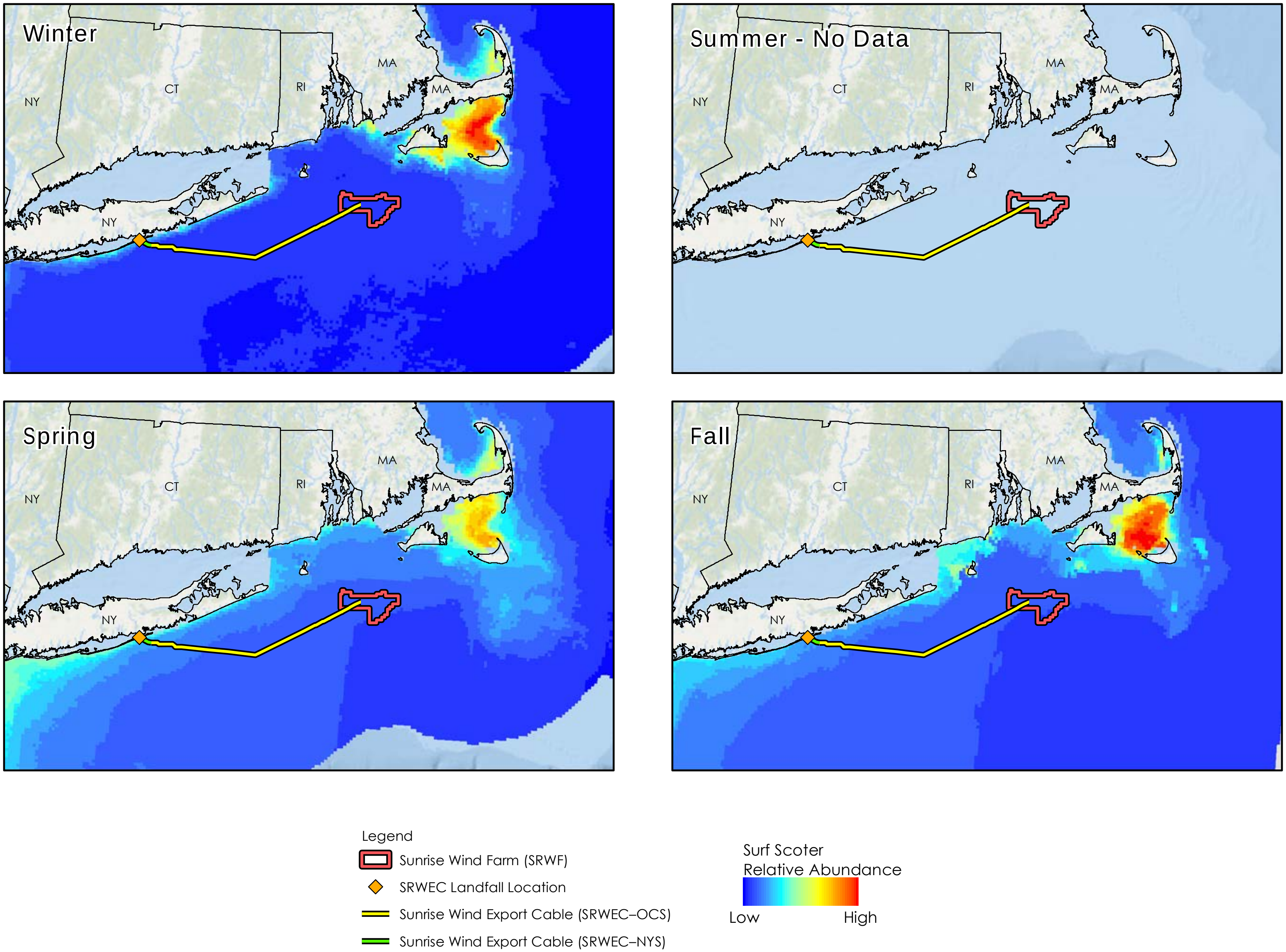
Roseate Tern Relative Abundance



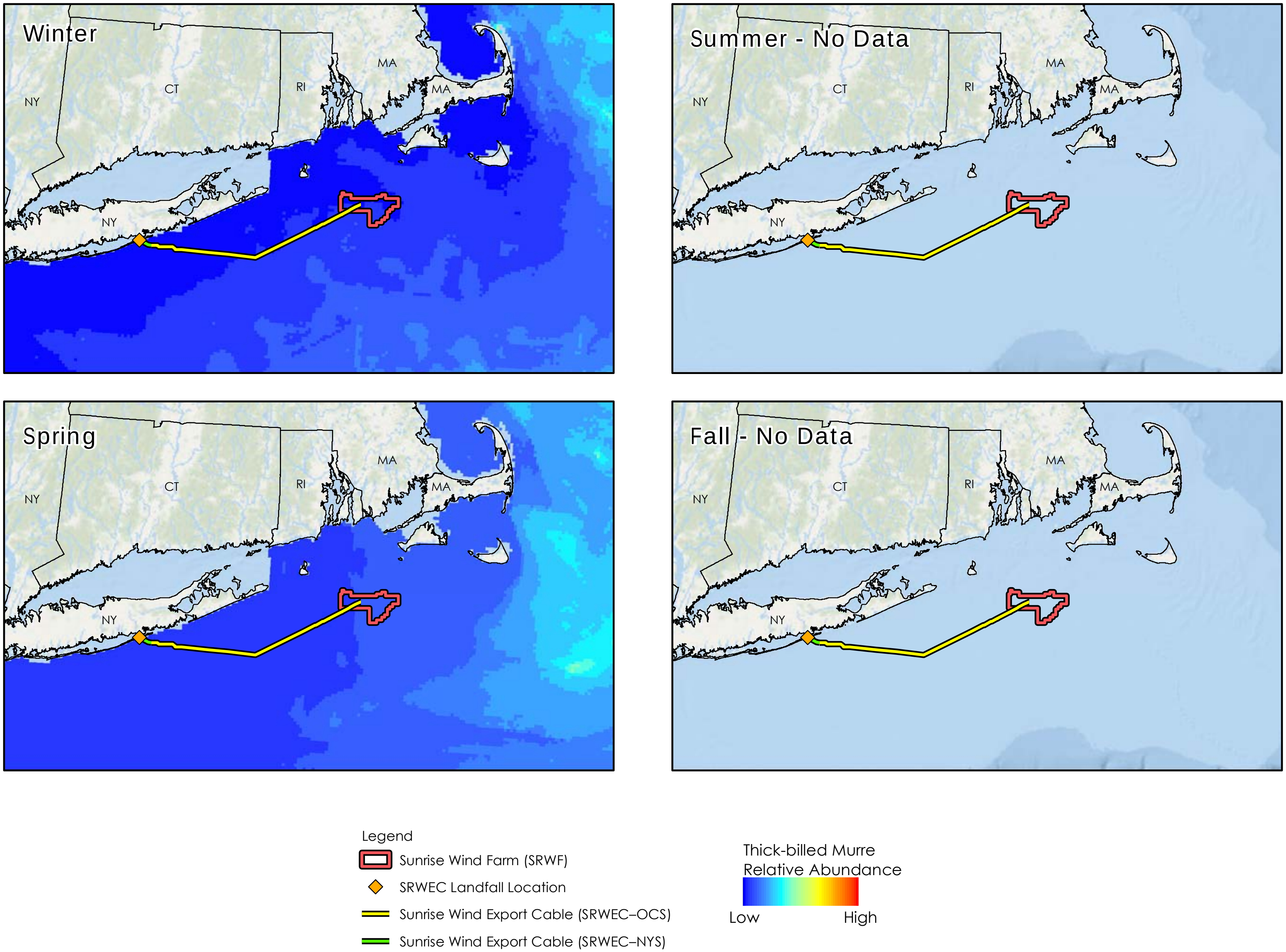
Sooty Shearwater Relative Abundance



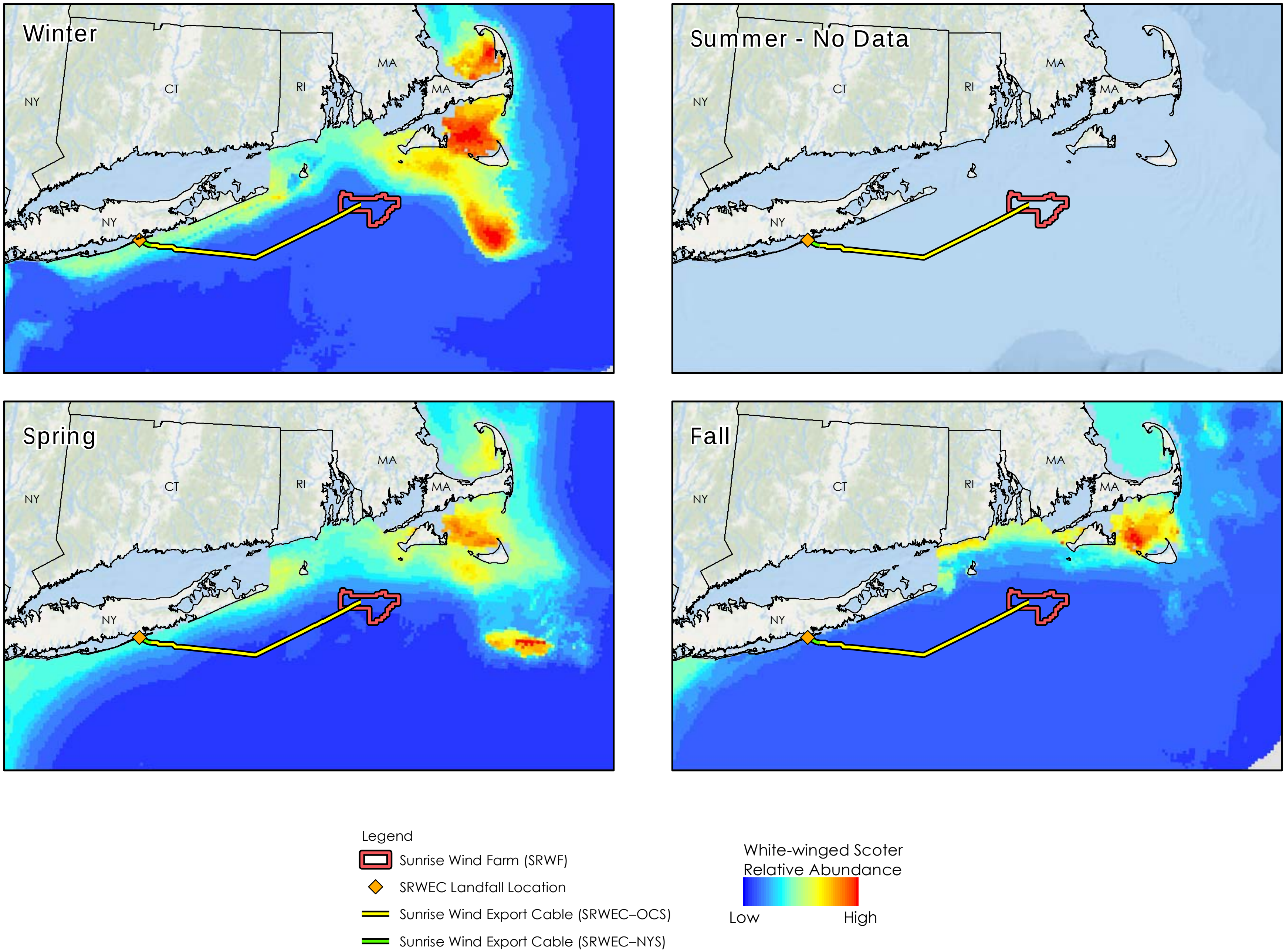
Surf Scoter Relative Abundance



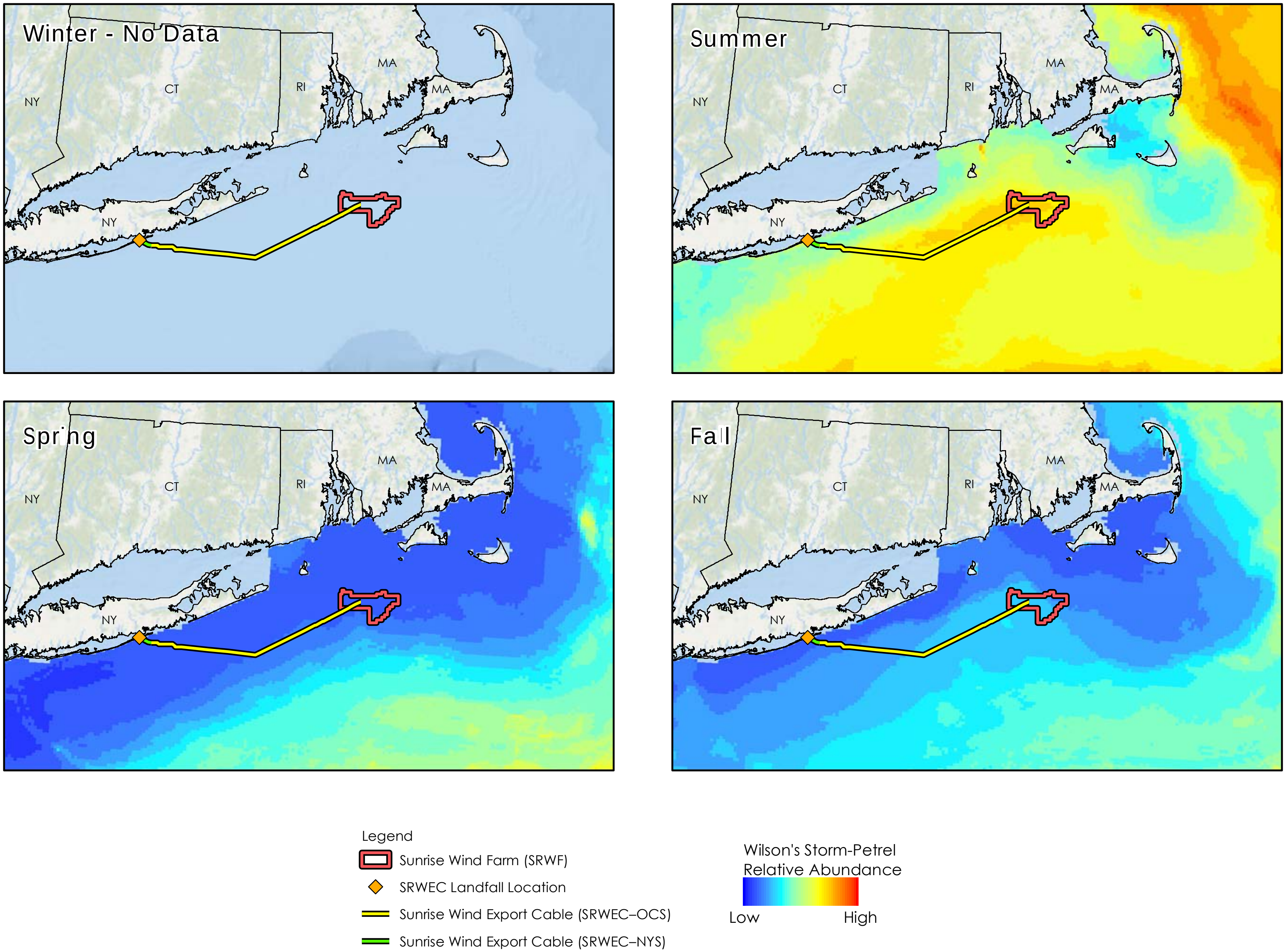
Thick-billed Murre Relative Abundance



White-winged Scoter Relative Abundance



Wilson's Storm-Petrel Relative Abundance



APPENDIX C

Avian Flight Heights

Appendix C AVIAN FLIGHT HEIGHTS

Table C-1 Percentages of Birds Detected within Flight Height Categories during Vessel-based Surveys in the Bay State Wind Lease Area and the Rhode Island OSAMP

Species	Scientific Name	Bay State Ship Surveys (May–October 2017)[1]					OSAMP Ship Surveys (June 2009–February 2010)[2]					
		Number observed	% Detected within Flight Height Categories (m)				Number observed	% Detected within Flight Height Categories (m)				
			<10	10–25	25–125	>125		0	<10	10–25	25–125	>125
Loons												
common loon	*Gavia immer*	--	--	--	--	--	292	81.8	7.9	4.5	5.1	0.7
red-throated loon	*Gavia stellata*	--	--	--	--	--	106	5.7	30.2	35.8	21.7	6.6
Grebes												
red-necked grebe	*Podiceps grisegena*	--	--	--	--	--	1	100.0	0.0	0.0	0.0	0.0
Shearwaters, Petrels, and Storm-Petrels												
Cory's shearwater	*Calonectris diomedea*	552	100.0	0.0	0.0	0.0	520	21.7	78.3	0.0	0.0	0.0
great shearwater	*Puffinus gravis*	1,128	95.5	0.1	4.4	0.0	239	9.6	90.4	0.0	0.0	0.0
manx shearwater	*Puffinus puffinus*	8	100.0	0.0	0.0	0.0	2	50.0	50.0	0.0	0.0	0.0
sooty shearwater	*Puffinus griseus*	36	100.0	0.0	0.0	0.0	16	0.0	100.0	0.0	0.0	0.0
northern fulmar	*Fulmarus glacialis*	67	100.0	0.0	0.0	0.0	5	20.0	80.0	0.0	0.0	0.0
Leach's storm-petrel	*Oceanodroma leucorhoa*	3	100.0	0.0	0.0	0.0	--	--	--	--	--	--
Wilson's storm-petrel	*Oceanites oceanicus*	1,010	100.0	0.0	0.0	0.0	1,511	49.8	50.2	0.0	0.0	0.0
Gannet and Cormorants												
northern gannet	*Morus bassanus*	131	41.2	0.0	35.1	23.7	1278	9.0	46.1	38.1	6.7	0.2
double-crested cormorant	*Phalacrocorax auritus*	1	0.0	0.0	0.0	100.0	10	30.0	70.0	0.0	0.0	0.0
great cormorant	*Phalacrocorax carbo*	--	--	--	--	--	15	13.3	80.0	6.7	0.0	0.0
Wading Birds												
great blue heron	*Ardea herodias*	--	--	--	--	--	1	0.0	100.0	0.0	0.0	0.0
Ducks and Geese												
brant	*Branta bernicla*	--	--	--	--	--	17	0.0	100.0	0.0	0.0	0.0
mallard	*Anas platyrhynchos*	--	--	--	--	--	1	0.0	0.0	100.0	0.0	0.0
green-winged teal	*Anas crecca*	--	--	--	--	--	10	0.0	100.0	0.0	0.0	0.0
Seaducks												
common eider	*Somateria mollissima*	--	--	--	--	--	294	8.8	90.8	0.3	0.0	0.0
black scoter	*Melanitta americana*	--	--	--	--	--	277	0.0	92.4	7.6	0.0	0.0
surf scoter	*Melanitta perspicillata*	3	100.0	0.0	0.0	0.0	209	0.0	9.6	90.4	0.0	0.0
white-winged scoter	*Melanitta fusca*	2	100.0	0.0	0.0	0.0	161	2.5	70.2	27.3	0.0	0.0
red-breasted merganser	*Mergus serrator*	--	--	--	--	--	2	0.0	0.0	100.0	0.0	0.0
long-tailed duck	*Clangula hyemalis*	12	100.0	0.0	0.0	0.0	21	9.5	76.2	14.3	0.0	0.0

Table C-1 Percentages of Birds Detected within Flight Height Categories during Vessel-based Surveys in the Bay State Wind Lease Area and the Rhode Island OSAMP

Species	Scientific Name	Bay State Ship Surveys (May–October 2017)[1]					OSAMP Ship Surveys (June 2009–February 2010)[2]					
		Number observed	% Detected within Flight Height Categories (m)				Number observed	% Detected within Flight Height Categories (m)				
			<10	10–25	25–125	>125		0	<10	10–25	25–125	>125
Raptors												
merlin	*Falco columbarius*	--	--	--	--	--	1	0.0	0.0	100.0	0.0	0.0
Shorebirds and Phalaropes												
semipalmated plover	*Charadrius semipalmatus*	--	--	--	--	--	2	0.0	100.0	0.0	0.0	0.0
least sandpiper	*Calidris minutilla*	--	--	--	--	--	2	0.0	100.0	0.0	0.0	0.0
purple sandpiper	*Calidris maritima*	--	--	--	--	--	4	0.0	100.0	0.0	0.0	0.0
lesser yellowlegs	*Tringa flavipes*	--	--	--	--	--	4	0.0	100.0	0.0	0.0	0.0
whimbrel	*Numenius phaeopus*	--	--	--	--	--	5	0.0	100.0	0.0	0.0	0.0
short-billed dowitcher	*Limnodromus griseus*	--	--	--	--	--	5	0.0	100.0	0.0	0.0	0.0
red-necked phalarope	*Phalaropus lobatus*	--	--	--	--	--	24	95.8	4.2	0.0	0.0	0.0
Gulls, Skuas, and Jaegers												
black-legged kittiwake	*Rissa tridactyla*	--	--	--	--	--	55	9.1	32.7	47.3	10.9	0.0
Bonaparte's gull	*Chroicocephalus philadelphia*	--	--	--	--	--	18	27.8	50.0	22.2	0.0	0.0
great black-backed gull	*Larus marinus*	142	31.7	4.2	21.1	43.0	1,001	15.8	67.3	8.1	8.0	0.8
herring gull	*Larus argentatus*	199	29.2	3.0	22.6	45.2	1,652	7.6	64.7	13.9	12.8	1.0
laughing gull	*Leucophaeus atricilla*	1	0.0	0.0	100.0	0.0	170	31.2	48.2	17.6	2.9	0.0
ring-billed gull	*Larus delawarensis*	--	--	--	--	--	32	3.1	37.5	37.5	18.8	3.1
long-tailed jaeger	*Stercorarius longicaudus*	--	--	--	--	--	1	0.0	0.0	100.0	0.0	0.0
parasitic jaeger	*Stercorarius parasiticus*	--	--	--	--	--	1	0.0	100.0	0.0	0.0	0.0
pomarine jaeger	*Stercorarius pomarinus*	--	--	--	--	--	1	0.0	100.0	0.0	0.0	0.0
Terns												
common tern	*Sterna hirundo*	2	100.0	0.0	0.0	0.0	61	4.9	36.1	47.5	11.5	0.0
roseate tern	*Sterna dougallii*	--	--	--	--	--	8	0.0	37.5	50.0	12.5	0.0
Alcids												
Atlantic puffin	*Fratercula arctica*	--	--	--	--	--	5	100.0	0.0	0.0	0.0	0.0
common murre	*Uria aalge*	--	--	--	--	--	131	55.0	45.0	0.0	0.0	0.0
thick-billed murre	*Uria lomvia*	--	--	--	--	--	3	33.3	66.7	0.0	0.0	0.0
dovekie	*Alle alle*	--	--	--	--	--	125	77.6	22.4	0.0	0.0	0.0
razorbill	*Alca torda*	--	--	--	--	--	93	41.9	58.1	0.0	0.0	0.0
Songbirds												
American robin	*Turdus migratorius*	1	100.0	0.0	0.0	0.0	--	--	--	--	--	--
bank swallow	*Riparia riparia*	--	--	--	--	--	2	0.0	100.0	0.0	0.0	0.0
blackpoll warbler	*Setophaga striata*	--	--	--	--	--	2	0.0	100.0	0.0	0.0	0.0
dark-eyed junco	*Junco hyemalis*	--	--	--	--	--	2	0.0	0.0	100.0	0.0	0.0
mourning dove	*Zenaida macroura*	--	--	--	--	--	1	0.0	100.0	0.0	0.0	0.0
yellow-rumped warbler	*Setophaga coronata*	1	100.0	0.0	0.0	0.0	1	0.0	100.0	0.0	0.0	0.0

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		Bay State Ship Surveys (May–October 2017)[1]					OSAMP Ship Surveys (June 2009–February 2010)[2]					
			% Detected within Flight Height Categories (m)					% Detected within Flight Height Categories (m)				
Species	***Scientific Name***	**Number observed**	**<10**	**10–25**	**25–125**	**>125**	**Number observed**	**0**	**<10**	**10–25**	**25–125**	**>125**
Savannah sparrow	*Passerculus sandwichensis*	--	--	--	--	--	1	0.0	100.0	0.0	0.0	0.0
snow bunting	*Plectrophenax nivalis*	--	--	--	--	--	1	0.0	100.0	0.0	0.0	0.0
tree swallow	*Tachycineta bicolor*	2	0.0	0.0	0.0	100.0	8	0.0	50.0	37.5	12.5	0.0

NOTES:
[1] Reference: BRI 2018
[2] Reference: Paton et al. 2010