C1: Draft Final Sampling and Analysis Report by Anchor QEA (Anchor, 2021a)

November 2021
Mid-Chesapeake Bay Island Environmental Surveys

Sampling and Analysis Report

Prepared for Maryland Environmental Service

In coordination with Maryland Department of Transportation, Maryland Port Administration

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TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ABBREVIATIONS

µg/L	micrograms per liter
B-IBI	Benthic Index of Biotic Integrity
CBWQM	Chesapeake Bay Water Quality Monitoring Program
COMAR	Maryland Code of Regulations
DGPS	differential global positioning system
DO	dissolved oxygen
EIS	environmental impact statement
FS	feasibility study
ft	feet
g	gram
m^2	square meter
MDNR	Maryland Department of Natural Resources
MDOT MPA	Maryland Department of Transportation Maryland Port Administration
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NTU	Nephelometric Turbidity Unit
ppt	parts per thousand
Project	Mid-Chesapeake Bay Island Ecosystem Restoration Project
RGI	Restoration Goal Index
SAR	Sampling and Analysis Report
SAV	submerged aquatic vegetation
su	standard unit
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers

1 Introduction

Maryland Environmental Service, Maryland Department of Transportation Maryland Port Administration (MDOT MPA), and the U.S. Army Corps of Engineers (USACE) Baltimore District are proposing to restore 2,144 acres of remote island habitat in the Chesapeake Bay. In 2009, USACE Baltimore District prepared an integrated feasibility study (FS) and environmental impact statement (EIS) for the Mid-Chesapeake Bay Island Ecosystem Restoration Project (Project), which focuses on restoring and expanding island habitat to provide hundreds of acres of wetland and terrestrial habitat for fish, shellfish, reptiles, amphibians, birds, and mammals through the beneficial use of dredged material (USACE 2009). The FS/EIS identified James Island and Barren Island, located in western Dorchester County, Maryland, as the preferred alternatives for island restoration (Figure 1-1).

James Island is a privately owned, uninhabited island, situated near the mouth of the Little Choptank River, approximately 1 mile north of Taylors Island. Since 1847, more than 800 acres have eroded from the privately owned island, approximately 89% of its historical acreage. Since 1847, more than 800 acres have eroded, and James Island currently consists of three eroding island remnants totaling approximately 3 acres. The Project will restore 2,072 acres of this island.

Barren Island is an uninhabited island, located in the Chesapeake Bay in Dorchester County, Maryland, near the Honga River and immediately west of Hoopers Island. At the time of the FS (2004), Barren Island consisted of three eroding island remnants totaling approximately 180 acres in size (197 acres including tidal flats). Based on 2020 surveys, only 138 acres of Barren Island remains. Barren Island experiences a long-term erosion rate of 14 feet per year (3 to 4 feet per year in recent years) or approximately 4.1 acres per year. At this rate, Barren Island could be completely lost by the early 2050s (2050-2055) without ongoing and future protection measures. The Project will restore 72 acres of Barren Island while also protecting approximately 1,325 acres of potential submerged aquatic vegetation (SAV) habitat adjacent to the island.

USACE and MDOT MPA began the Project in the 1990s to achieve the following three main goals:

1. Restore remote island habitat within the Mid-Chesapeake Bay.
2. Optimize the placement capacity for sediment dredged from shipping channels.
3. Cause no harm to the environment around the restoration site.

As part of the FS, a sampling program was implemented to document the existing environmental conditions on and adjacent to James Island and Barren Island (USACE 2009). Four seasonal studies were completed in 2002 and 2003 to document baseline environmental conditions. Both aquatic and terrestrial sampling were conducted, and the environmental surveys included water quality and nutrient analyses, fish and plankton sampling, benthic sampling and sediment testing, vegetation identification and mapping (both aquatic and terrestrial), SAV surveys, avian and other wildlife observations (both aquatic and terrestrial), horseshoe crab spawning surveys, diamondback terrapin nesting surveys, crab pot surveys, clam surveys, and pound net fishers phone surveys (USACE 2009).

Currently, the FS/EIS is being updated to provide timely data to support design of the Project elements at James Island and Barren Island. The purpose of this Sampling and Analysis Report (SAR) is to summarize the results of site-specific environmental surveys that were conducted consistent with the baseline sampling program completed in 2002 and 2003 and to document the current environmental conditions at the Project area. Design for the island restoration is ongoing, and the conditions documented in this SAR will serve as the baseline environmental conditions of the Project area prior to the initiation of restoration activities.

The purpose of this sampling effort is to sample benthic communities, fish assemblages, and clam populations to provide the data necessary to document the existing environmental conditions in the Project area during each of the four seasons.

The specific objectives of the Mid-Chesapeake Bay Island Environmental Surveys sampling program are as follows:

- In the spring, summer, and fall seasons, collect benthic community samples to document baseline (pre-construction) seasonal benthic communities in the vicinity of James Island and Barren Island.
- In each season (spring, summer, fall, and winter), collect surface water samples to measure baseline (pre-construction) seasonal water quality conditions in the vicinity of James Island and Barren Island.
- In each season (spring, summer, fall, and winter), conduct fisheries surveys using a variety of sampling gear (including beach seines, trawls, gillnets, and pop nets) to document baseline (pre-construction) seasonal fish and crab communities in the vicinity of James Island and Barren Island.
- In the fall, conduct soft-shell and razor clam surveys to document baseline (pre-construction) clam populations in the vicinity of James Island and Barren Island.
- Conduct monthly crab pot surveys during the months of May, June, July, August, and September in the proposed restoration footprint (plus an additional 0.25-mile perimeter) to document crab fishing in the vicinity of James Island and Barren Island.
- In the spring, conduct pound net telephone surveys of licensed pound net owners in the vicinity of James Island and Barren Island to document ownership and use of pound nets and harvest amounts in the Project area.
- In the spring and summer, conduct avian surveys to document baseline (pre-construction) bird populations and behaviors in the vicinity of James Island and Barren Island.

Figure 1-1
Mid-Chesapeake Bay Island Ecosystem Restoration Project Area

1.1 Project Overview

The environmental sampling framework for the Project includes water quality, benthic community sampling, fish and crab assemblage documentation, bivalve population study, and avian surveys. These pre-construction environmental sampling studies will determine the baseline environmental conditions in the Project. The results of this investigation will be used to compare to post-construction environmental monitoring that will be conducted after island restoration is completed and to document environmental conditions or changes, if any, in the Project area.

Surface water sampling documents water quality in the vicinity of James Island and Barren Island each season, measures nutrient concentrations, and supports the interpretation of biological (benthic, fish, and clam) data. Water quality samples were tested for the same parameters tested in the Chesapeake Bay Program (Chesapeake Bay Program 2017).

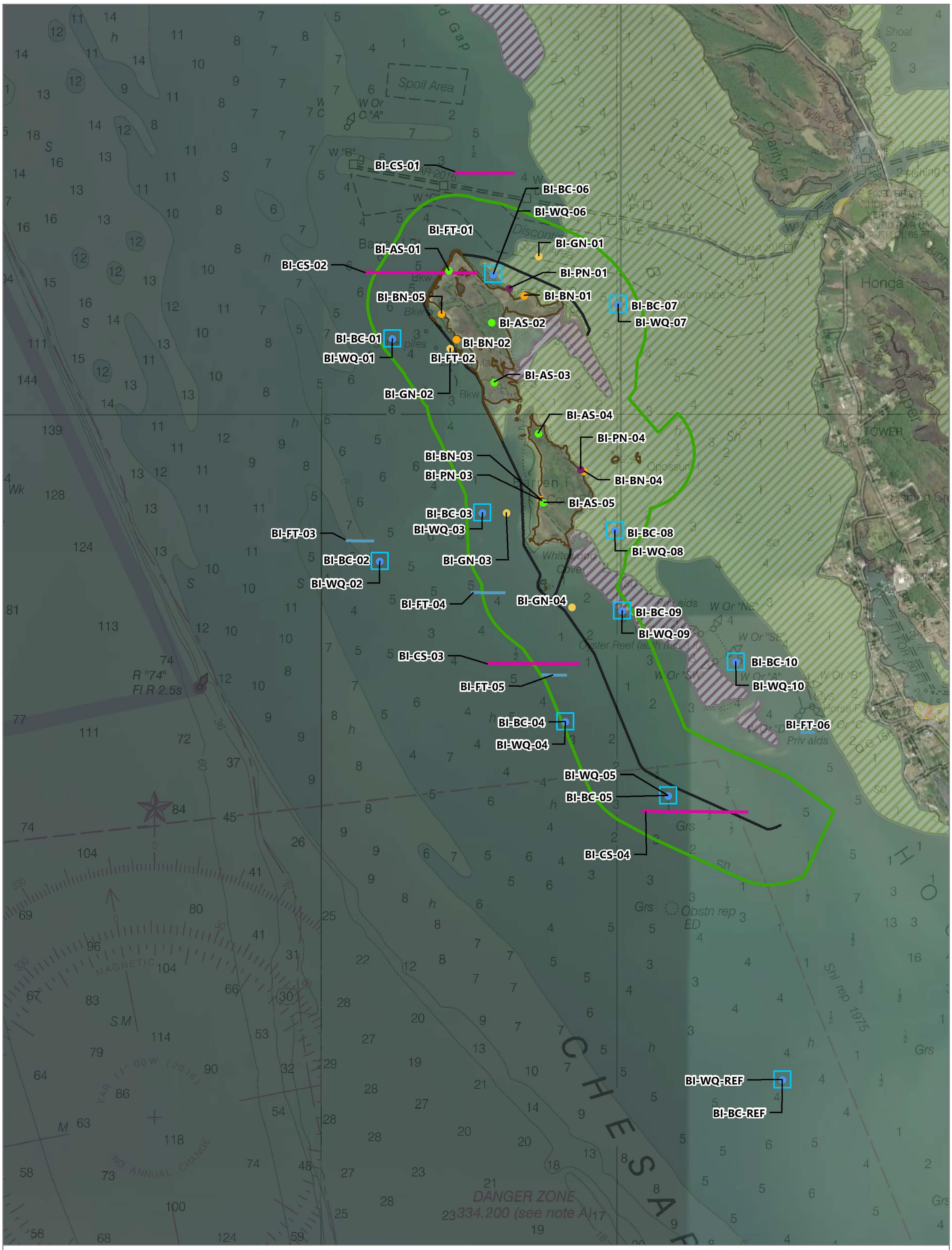
Benthic community sampling characterizes the benthic community in the Project area at James Island and Barren Island. Community composition, abundance, and diversity are documented in each sample. During the summer seasonal sampling event, additional sediment from each benthic community sampling location was collected and analyzed for grain size and total organic carbon.

Fisheries surveys document the use of proximal waters in the Project area by measuring fish and crab populations and densities in a variety of habitats. The waters in the vicinity of James Island and Barren Island were sampled using beach seines, trawls, gillnets, and pop nets.

Avian surveys document species and numbers of birds nesting on or using James Island and Barren Island. These baseline avian surveys will be used to evaluate if there is an increase in number and diversity of waterfowl in the vicinity of James Island and Barren Island area after island restoration is completed.

The data collected through the fisheries, bivalve, and avian surveys will be used in conjunction with the results of previous seasonal fisheries surveys (USACE 2009) to establish baseline information on the fish and crab communities in the area of the Chesapeake Bay surrounding Barren Island and James Island. All components of the environmental sampling framework and sampling locations are shown in Figures 1-2 and 1-3 for Barren Island and James Island, respectively.

Figure 1-2
Barren Island Environmental Survey Components



LEGEND:

● Avian Survey	▬ Fisheries Trawl	**Existing SAV Bed**
● Beach Seine	▬ Soft-Shell and Razor Clam Trawl	▨ Dense 70-100% cover
☐ Benthic Community	☐ Crabpot Survey	▨ Moderate 40-70% cover
● Gill Net	— Barren Island Remnants	▨ Sparse 10-20% cover
● Pop Net	▬ Proposed Barren Island Protection	
● Water Quality		

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.
2. Crabpot survey boundary includes the area within 0.25 mile of the proposed restoration footprint and Barren Island remnants.

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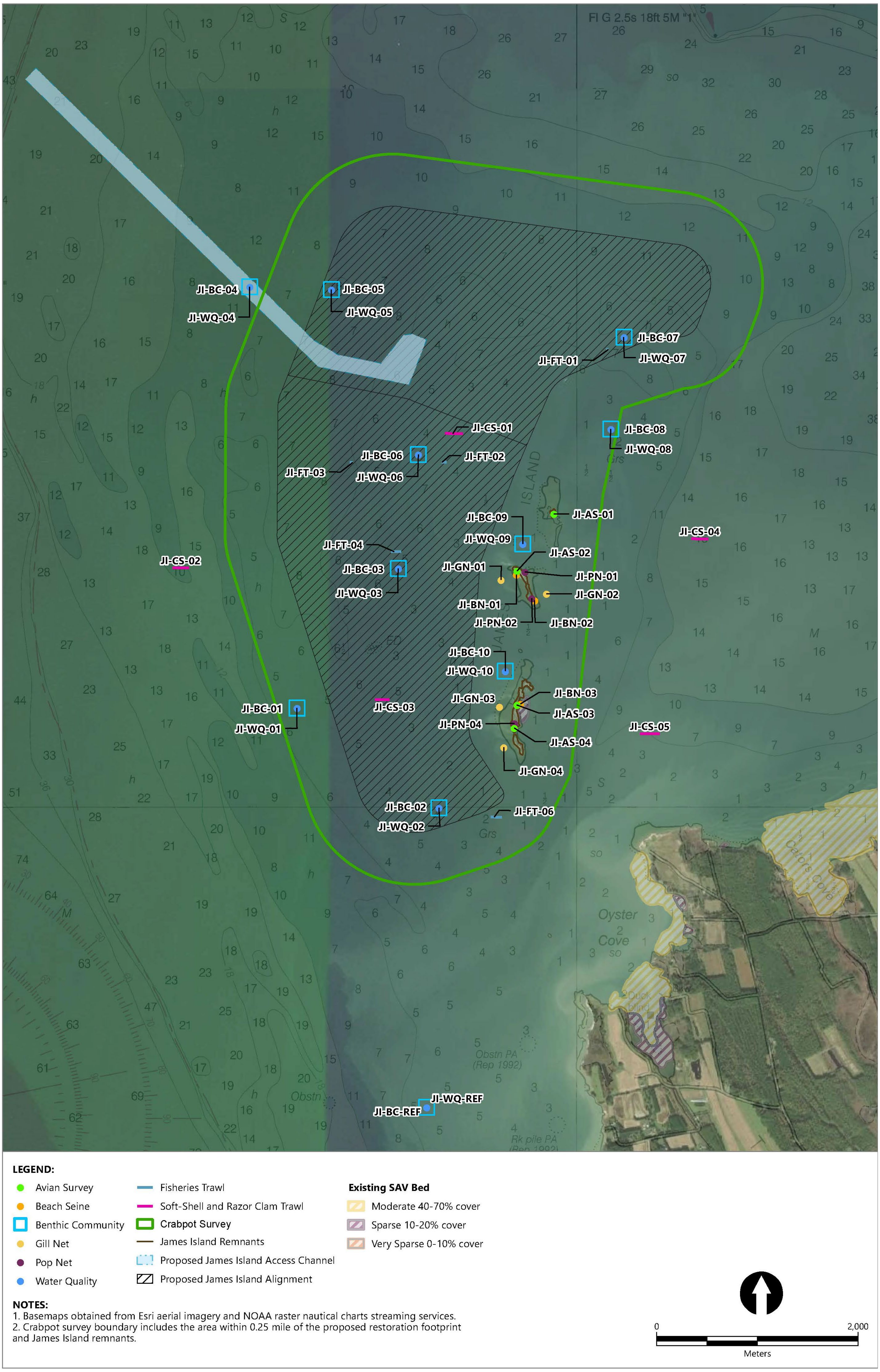
Figure 1-3
James Island Environmental Survey Components



NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.
2. Crabpot survey boundary includes the area within 0.25 mile of the proposed restoration footprint and James Island remnants.

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1.2 Project Schedule

Sampling to evaluate existing conditions is conducted seasonally, consistent with the timing of the sampling completed in 2002 and 2003 as part of the FS (USACE 2009). The sampling conducted to complete the environmental surveys occurs during the following seasons:

- Summer 2020: June, July, and August
- Fall 2020: September, October, and November
- Winter 2021: December, January, and February
- Spring 2021: March, April, and May

A summary and schedule of the completed Project components completed is provided in Table 1-1.

Table 1-1
Mid-Chesapeake Bay Island Ecosystem Restoration Project Sampling Schedule

Season	Task	Dates Completed
Summer (June, July, and August)	Water quality sampling	August 31, 2020, to September 1, 2020
	Benthic community sampling (including grain size and total organic carbon analyses)	August 24 to 28, 2020
	Fisheries surveys	August 25, 2020, to September 4, 2020
	Beach seining	
	Bottom trawling	
	Gillnetting	
	· Pop netting	
	Crab pot survey	June 23, 2021
		July 22, 2021
		August 30, 2020
	Avian surveys	September 2 to 3, 2020
Fall (September, October, and November)	Water quality sampling	October 21, to 22, 2020
	Benthic community sampling	October 19 to 23, 2020
	Fisheries surveys	November 4 to 9, 2020
	Beach seining	
	Bottom trawling	
	Gillnetting	
	Crab pot survey	September 29, 2020
	Bivalve surveys	December 14 and 19, 2020

Season	Task	Dates Completed
Winter (December, January, and February)	Water quality sampling	March 9 to 10, 2021
	Fisheries surveys	February 25 to 28, 2021
	Beach seining	
	Bottom trawling	
	Gillnetting	
Spring (March, April, and May)	Water quality sampling	May 24 to 25, 2021
	Benthic community sampling	May 24 to 28, 2021
	Fisheries surveys	May 4 to 10, 2021
	Beach seining	
	Bottom trawling	
	Gillnetting	
	Pop netting	
	Avian surveys	May 26 to 27, 2021
	Crab pot surveys	May 18, 2021

2 Sampling Methodology

This section provides a brief description of the methodology used for each Project component and a summary of the results. Details regarding sampling methodology are provided in the *Sampling and Analysis Plan and Quality Assurance Project Plan* (Anchor QEA 2020).

2.1 Water Quality Sampling

Water quality issues in the Chesapeake Bay range from variation in physical properties, such as temperature, salinity, dissolved oxygen (DO), and turbidity to loadings of nutrients. Excessive nutrients, such as nitrogen and phosphorus, cause the greatest impairments of water quality in the Chesapeake Bay. Surface water samples were collected from Barren Island and James Island to measure water quality. Standard protocols provided in *Methods and Quality Assurance for Chesapeake Bay Water Quality Monitoring Programs* (Chesapeake Bay Program 2017) were followed for target analytes, detection limits, methodologies, and sample holding times for the water samples.

Surface water samples were collected at 22 locations around James Island and Barren Island during the summer, fall, winter, and spring seasonal sampling events. Eleven locations were sampled from the area surrounding Barren Island (Figure 2-1) and 11 locations were sampled from the area surrounding James Island (Figure 2-2) during each of the seasonal sampling events (summer, fall, winter, and spring). A summary of the water quality sampling program, including sample locations and analyses, is provided in Table 2-1.

Water quality was analyzed by measuring a variety of physical properties and chemical constituents that can affect the health of the ecosystem and its living resources. During in situ water quality sampling, physical properties including temperature, pH, conductivity, salinity, DO, and turbidity were recorded using a water quality instrument placed directly in the waterbody. Water quality parameters were recorded at the surface, mid-depth, and bottom (within 1 foot) of the water column at each location.

Water was collected from the mid-depth of the water column, with care not to disturb the sediment, using a peristaltic pump and Tygon tubing. After the tubing was lowered to the appropriate depth, the water sample was then pumped directly into the appropriate pre-labeled sample containers. One 2-liter bottle of whole water was collected from each location. A 250-milliliter aliquot of water was filtered in the field using a syringe filter. All samples were placed in an ice filled cooler immediately after collection to ensure samples do not exceed the 4°C holding temperature. Samples were hand-delivered to Chesapeake Biological Laboratory in Solomons, Maryland for analysis on the same day as sample collection.

Sample filtration was conducted in the laboratory for particulate nitrogen, particulate phosphorus, particulate carbon, and total suspended solids analysis requirements within 8 hours of sample collection. The water samples were analyzed for total dissolved nitrogen, particulate nitrogen, nitrite, nitrate+nitrite, organic nitrogen, total dissolved phosphorus, orthophosphate, particulate phosphorus, particulate carbon, dissolved organic carbon, total nitrogen, total phosphorus, chlorophyll *a*, phaeophytin *a*, and total suspended solids (Table 2-1).

The Maryland Department of Natural Resources (MDNR) has a Chesapeake Bay Water Quality Monitoring Program (CBWQM) that has routinely sampled year-round in the Chesapeake Bay since 1985 and in the Coastal Bays since 1999. Five years of water quality data (2016 to 2020) from the CBWQM were summarized for the fixed monitoring stations closest to Barren Island (station CB5.1) and James Island (station EE2.2) (Figure 2-3) to provide context to the data collected during this effort.

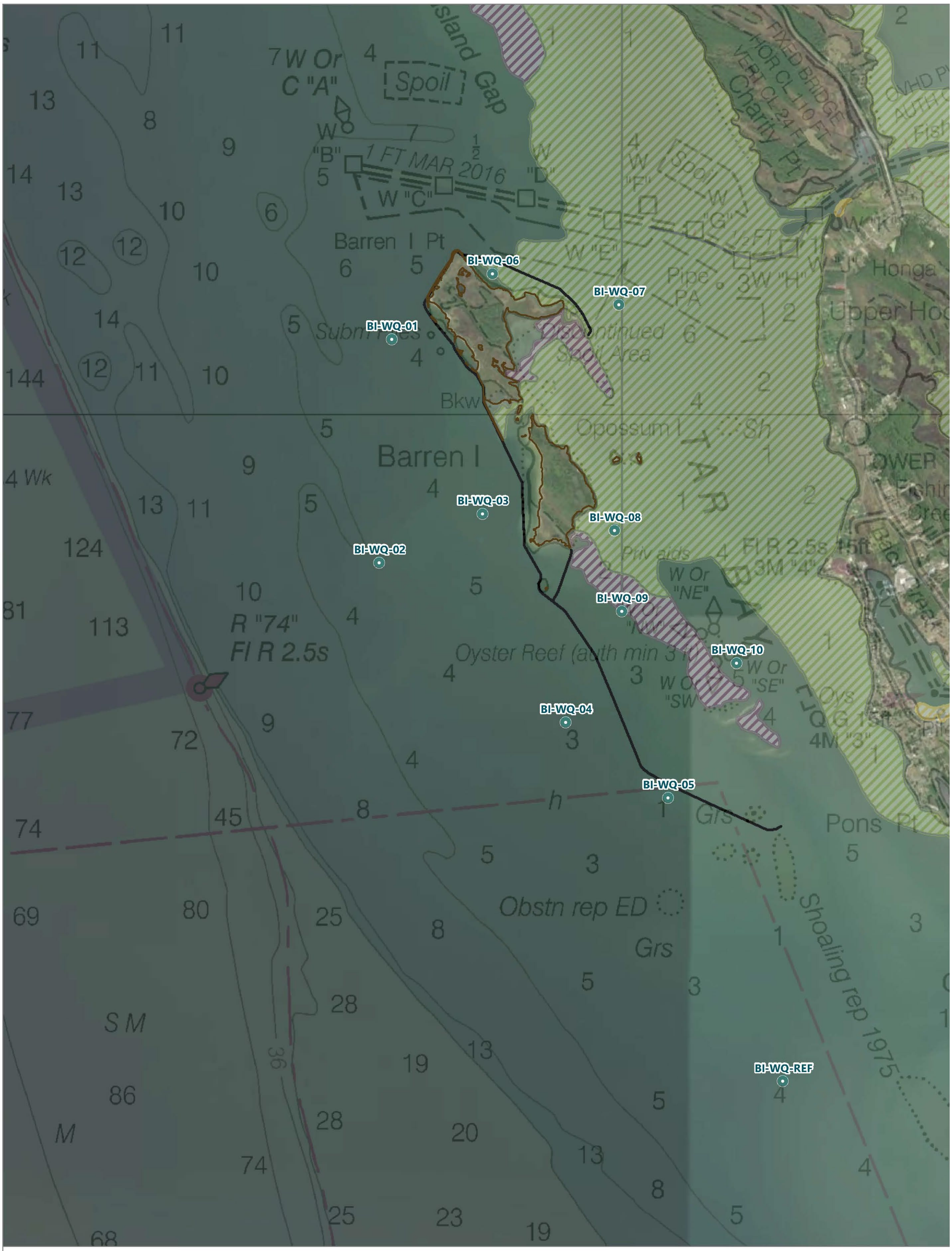
Station CB5.1 is located in the Mid-Chesapeake Bay, west of Barren Island in approximately 34.7 m (114 feet) of water. Station EE2.2 is located in approximately 12.5 m (41 feet) of water, near the mouth of the Little Choptank River approximately 1 mile northeast of James Island. The most recent 5 years of surface water quality data were used as a representative comparison to existing seasonal conditions because these samples most closely resemble the conditions during the sampling conducted for this study

Table 2-1
Surface Water Sampling and Analysis Program

		Coordinates		Analyses																	
Area	Location	Northing	Easting	Chlorophyll, Active	Phaeophytin	Chlorophyll	Dissolved Organic Carbon	Organic nitrogen	Organic phosphorus	Ammonium	Nitrite	Nitrite + Nitrate	Particulate Carbon	Particulate Nitrogen	Ortho Phosphate	Particulate Phosphorus	Dissolved Nitrogen	Dissolved Phosphorus	Total Nitrogen	Total Phosphorus	TSS
Barren Island	BI-WQ-01	245397.89	1522101.17	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	BI-WQ-02	240208.01	1522056.52	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	BI-WQ-03	241336.39	1524267.20	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	BI-WQ-04	236431.80	1526327.91	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	BI-WQ-05	234724.12	1528713.04	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	BI-WQ-06	247001.33	1524609.28	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	BI-WQ-07	246287.87	1527478.70	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	BI-WQ-08	240986.37	1527469.03	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	BI-WQ-09	239083.25	1527615.61	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	BI-WQ-10	237930.38	1530390.49	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	BI-WQ-REF	228030.52	1531651.51	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Area	Location	Coordinates		Analyses																	
		Northing	Easting	Chlorophyll, Active	Phaeophytin	Chlorophyll	Dissolved Organic Carbon	Organic nitrogen	Organic phosphorus	Ammonium	Nitrite	Nitrite + Nitrate	Particulate Carbon	Particulate Nitrogen	Ortho Phosphate	Particulate Phosphorus	Dissolved Nitrogen	Dissolved Phosphorus	Total Nitrogen	Total Phosphorus	TSS
James Island	JI-WQ-01	306620.99	1495951.99	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	JI-WQ-02	304226.65	1499644.99	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	JI-WQ-03	310221.64	1498541.50	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	JI-WQ-04	317348.69	1494645.77	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	JI-WQ-05	317283.65	1496764.28	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	JI-WQ-06	313107.53	1499020.16	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	JI-WQ-07	316178.11	1504175.97	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	JI-WQ-08	313848.94	1503823.15	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	JI-WQ-09	310872.55	1501695.80	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	JI-WQ-10	307629.99	1501284.99	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	JI-WQ-REF	228030.14	1531605.27	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Figure 2-1
Barren Island Water Quality Locations



LEGEND:

● Water Quality Sampling Location
— Barren Island Remnants
— Proposed Barren Island Protection

Existing SAV Bed

▨ Dense 70-100% cover
▨ Moderate 40-70% cover
▨ Sparse 10-20% cover

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.

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Figure 2-2
James Island Water Quality Locations

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.

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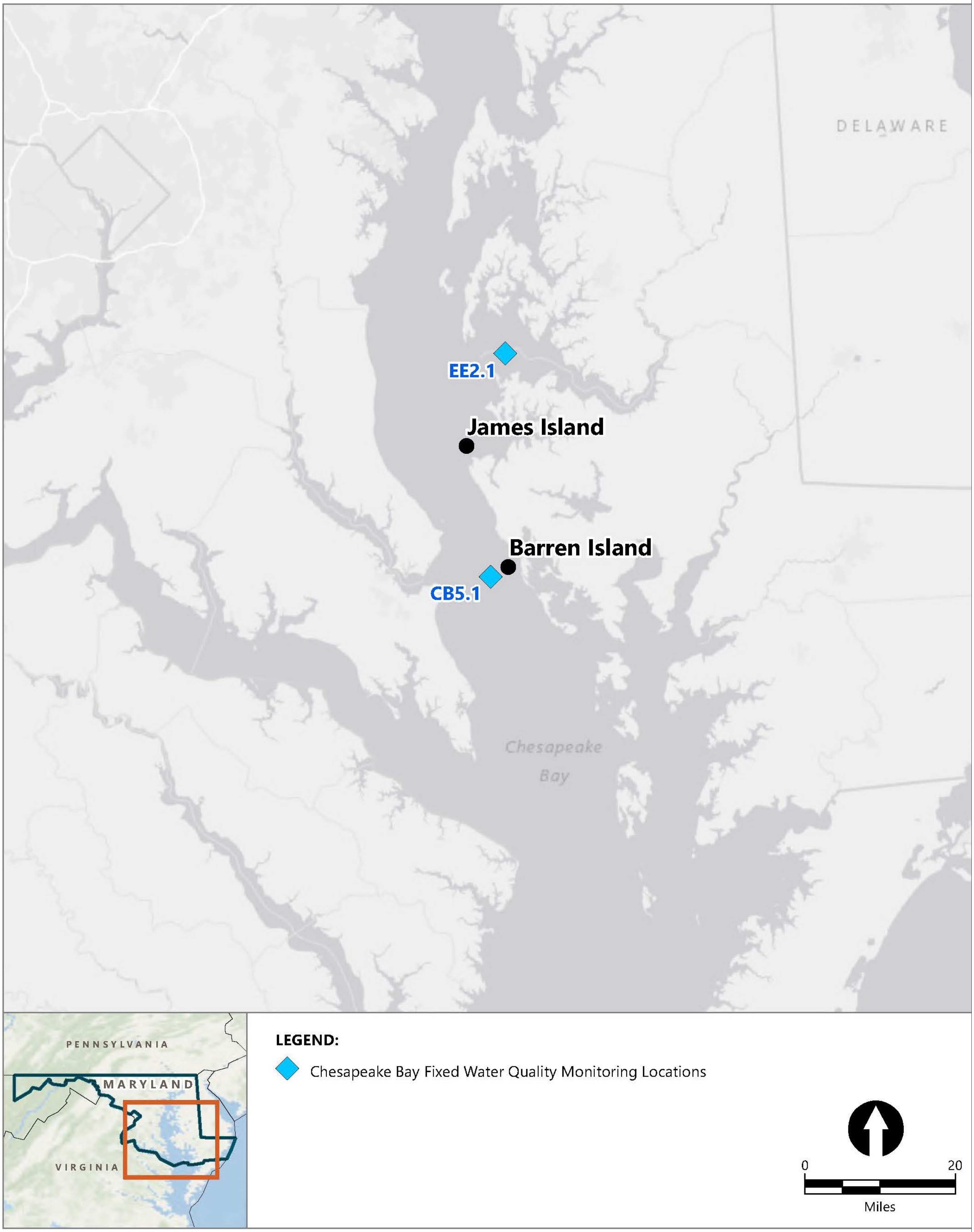
Figure 2-3
Chesapeake Bay Fixed Water Quality Monitoring Locations



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2.2 Benthic Community Sampling

Benthic community sample locations were colocated with the surface water sample locations. Ten locations were sampled from the area surrounding James Island (Figure 2-4), and 10 locations were all sampled from the area surrounding Barren Island (Figure 2-5) during the summer, fall, and spring sampling events. Additionally, benthic community reference sites were sampled for each island to evaluate the data collected from the sampling locations. Reference sites were sampled at the same time as the sampling locations to assess benthic community conditions outside the influence of restoration activities for each of the islands. The Barren Island reference sample was located approximately 1.5 miles south of the Project site (Figure 2-4). The James Island reference sample was located approximately 2 miles south of the Project site (Figure 2-5).

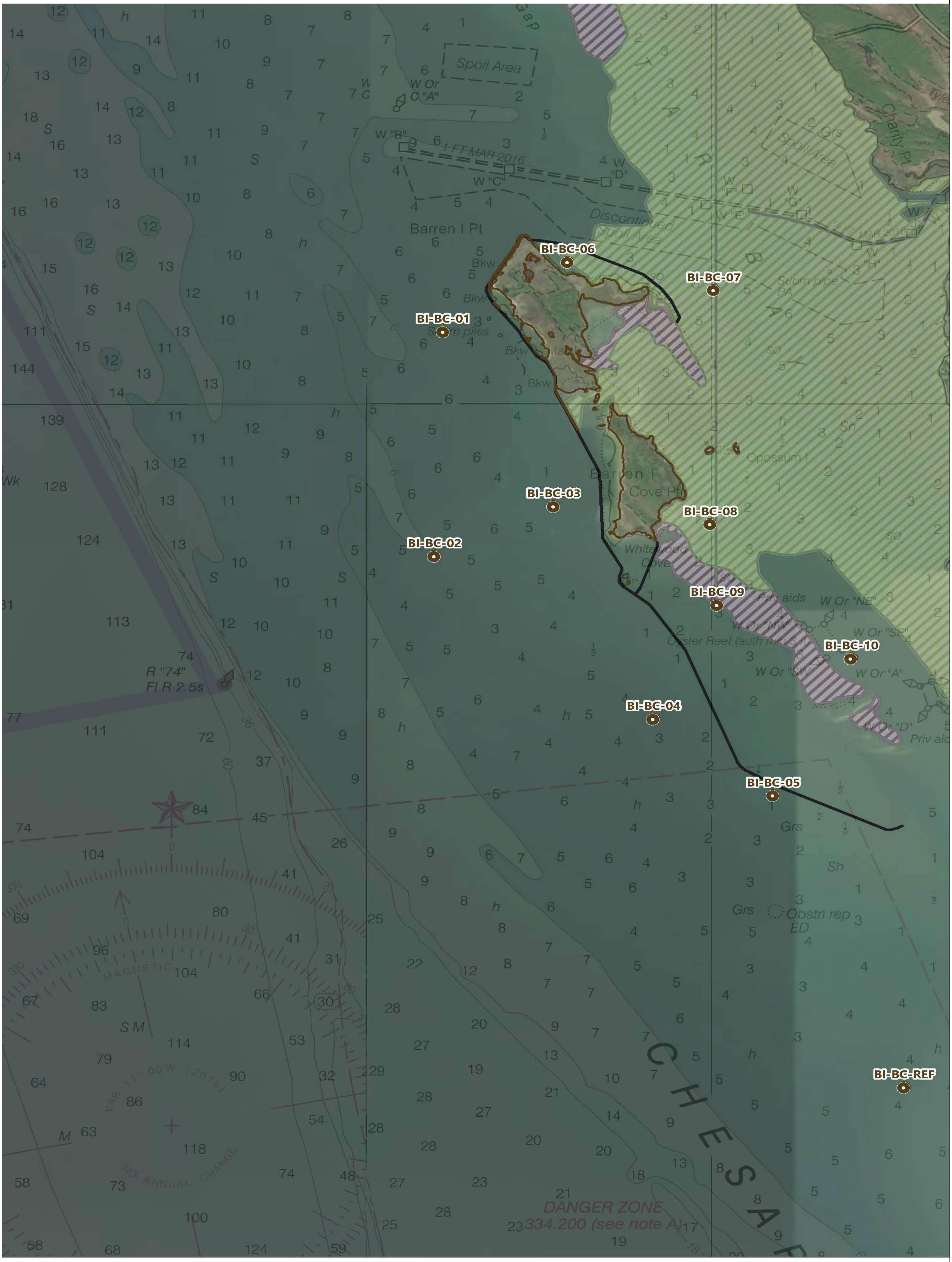
At each location, the water depth and in situ water quality parameters (including salinity, temperature, DO, and pH) were measured and recorded.

Sediment samples were collected using a stainless-steel sediment grab sampler (Ponar or equivalent), which is used to collect large-volume, undisturbed surficial sediment samples representative of the top 0 to 6 inches of the sediment. Triplicate grab samples were collected at each location to determine the benthic community composition. The top 0 to 6 inches of the sediment was collected and sieved in the field through a 500-micron screen to remove fine sediment particles. Individual replicates were transferred to sample containers and preserved in the field using buffered 10% formalin and rose-bengal solution. During the summer sampling event, sediment was collected at each location prior to the benthic community sample collection and submitted to an analytical laboratory for grain size and total organic carbon analysis.

The benthic community samples were delivered to Cove Corporation in properly preserved conditions and according to the requirements of the chain-of-custody protocols for sorting and identification. Cove Corporation conducted benthic sorting and taxonomic identification of organisms to the lowest practicable taxon for each of the samples.

In the laboratory, each sample was washed with tap water through a 500-micron sieve to remove the preservation in preparation for laboratory processing. All organisms were removed from the sample material. Representative organisms of each species from each location were collected and identified to the lowest practical taxonomic level. Because James Island and Barren Island are in the mesohaline portion of the Chesapeake Bay, determination of species biomass was required (Versar 2002).

Figure 2-4
Barren Island Benthic Community Locations



LEGEND:

- ● Benthic Community Sampling Location
- — Barren Island Remnants
- — Proposed Barren Island Protection

Existing SAV Bed

- ▨ Dense 70-100% cover
- ▨ Moderate 40-70% cover
- ▨ Sparse 10-20% cover

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.

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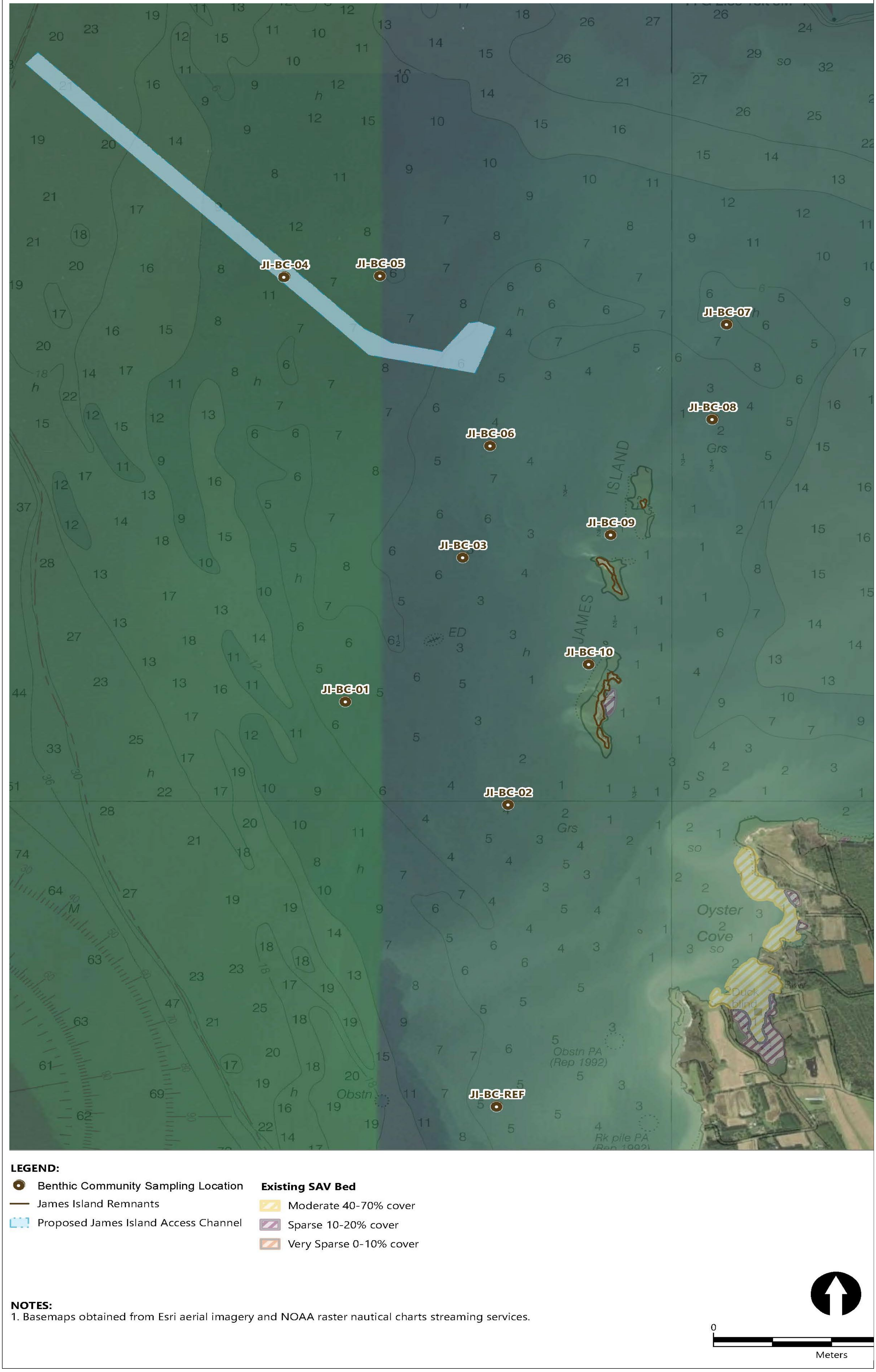
Meters

Figure 2-5
James Island Benthic Community Locations



LEGEND:

● Benthic Community Sampling Location

— James Island Remnants

▭ Proposed James Island Access Channel

Existing SAV Bed

▨ Moderate 40-70% cover

▨ Sparse 10-20% cover

▨ Very Sparse 0-10% cover

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.

2.2.1 Benthic Community Data Analysis

Results of the benthic community analysis from James Island and Barren Island were compared to Project-specific reference locations (JI-BC-REF and BI-BC-REF), to regional Chesapeake Bay Benthic Index of Biotic Integrity (B-IBI) values and the Chesapeake Bay Restoration Goal Index (RGI).

The following metrics were used to characterize the benthic community at sampling and reference locations at Barren Island and James Island:

- **Total Number of Taxa**: This is the total number of distinct taxa. This metric reflects the health of the community through a measurement of the variety of taxa present.
- **Shannon-Wiener Species Diversity Index (H')**: This index is one of the most widely used indices in the ecology community. The Shannon-Wiener Species Diversity index is calculated as shown in Equation 2-1:

Equation 2-1

$$H' = -\sum_{i=1}^{S} p_i \times \ln(p_i)$$

where:

H' = Shannon-Wiener Species Diversity Index
S = number of species per sample
p_i = proportion of total individuals in the ith species

- **Simpson's Dominance Index (c):** This varies from 0 to 1 and gives the probability that two individuals drawn at random from a population belong to the same species (Ludwig and Reynolds 1988). Simpson's Dominance Index incorporates species richness and evenness into a single value. The Simpson's Dominance Index is calculated as shown in Equation 2-2:

Equation 2-2

$$c = \sum \left(\frac{n_i}{N}\right)^2$$

where:

c = Simpson's Dominance Index
n_i = number of individuals in species i
N = total number of species

- **Species richness (d)**: This is the number of species in the community and is dependent on the sample size (Ludwig and Reynolds 1988). This index expresses the variety of one component of species diversity. Species richness at each location is the ratio between the total number of species (taxa) and the total number of individuals. It removes abundance variability among locations so that comparisons between locations are possible. This index expresses variety independent of an evenness index, which is incorporated in general indices of diversity. The Species Richness Index is calculated as shown in Equation 2-3:

Equation 2-3

$$d = \frac{\mathrm{S} - 1}{\log N}$$

where:

d = species richness

S = number of species

N = number of individuals

- **Evenness (e)**: This is how the species abundances (e.g., the number of individuals, biomass) are distributed among the species (Ludwig and Reynolds 1988). Evenness is a measurement of the similarity of the abundances of different species. When all species are equally abundant, then evenness is 1, but when the abundances are very dissimilar (some rare and some common species), the value increases. Evenness is calculated as shown in Equation 2-4:

Equation 2-4

$$e = \frac{\overline{H}}{\log S}$$

where:

e = evenness

$\overline{H}$ = Shannon-Wiener Species Diversity Index value

S = number of species

2.2.2 *Chesapeake Bay Benthic Index of Biotic Integrity*

Benthic invertebrates are used extensively as indicators of estuarine environmental status and trends because numerous studies have demonstrated that benthos respond predictably to many kinds of natural and anthropogenic stresses (Weisberg et al. 1997). The Chesapeake Bay B-IBI was developed by Weisberg et al. (1997) to assess benthic community health and environmental quality in the Chesapeake Bay. The Chesapeake Bay B-IBI evaluates the ecological condition of a sample by comparing values of key benthic community attributes, or metrics, to reference values expected under nondegraded conditions in similar habitat types (Versar 2002). Alden et al. (2002) conducted a series of statistical and simulation studies to evaluate and optimize the B-IBI. The results of Alden et al. (2002) indicated the Chesapeake Bay B-IBI is sensitive, stable, robust, and statistically sound.

Because the major factors that control the structure of benthic communities in the Chesapeake Bay are salinity and sediment type (Versar 2002), results of the grain size analysis and bottom salinity data were used to classify habitats for sampling locations at James Island and Barren Island. These habitat classifications were used to determine the metrics used to calculate the B-IBI for each location. Before Chesapeake Bay B-IBI metrics were calculated, samples were assigned to one of the following five salinity classes (Weisberg et al. 1997):

- Tidal freshwater (0 to 0.5 parts per thousand [ppt])
- Oligohaline (≥0.5 to 5 ppt)
- Low mesohaline (≥5 to 12 ppt)
- High mesohaline (≥12 to 18 ppt)
- Polyhaline (≥18 ppt)

The results of the salinity levels measured during the summer and fall benthic community sampling events and the grain size results from samples collected during the summer benthic community sampling event are provided in Table 2-2. All but one of the James Island sampling locations were classified high mesohaline sand (JI-BC-09 was classified as mesohaline mud) and the Barren Island benthic community sampling locations were classified as either high mesohaline mud or high mesohaline sand.

Table 2-2
Habitat Classification for Benthic Index of Biotic Integrity (B-IBI) Calculation

Area	Location	Salinity		Silt + Clay (%)	Habitat Classification
		Summer	Fall		
James Island	JI-01	13.4	15.8	2.1	High mesohaline sand
	JI-02	13.2	15.9	5.5	High mesohaline sand
	JI-03	13.2	16.5	7.2	High mesohaline sand
	JI-04	13.6	16.7	3.8	High mesohaline sand
	JI-05	13.4	16.6	6.1	High mesohaline sand
	JI-06	13.4	14.2	3.2	High mesohaline sand
	JI-07	13.4	16.5	2.5	High mesohaline sand
	JI-08	13.2	16	3.3	High mesohaline sand
	JI-09	13.2	16.3	49	High mesohaline mud
	JI-10	13.2	15.9	2.9	High mesohaline sand
	JI-REF	13.6	16	8.6	High mesohaline sand
Barren Island	BI-01	13	16.3	15.8	High mesohaline sand
	BI-02	13.3	16.5	5.5	High mesohaline sand
	BI-03	12.8	16	3.8	High mesohaline sand
	BI-04	13	15.7	5.4	High mesohaline sand
	BI-05	13.3	15.7	8.5	High mesohaline sand
	BI-06	12.9	15.5	72.9	High mesohaline mud
	BI-07	12.8	15.5	45.5	High mesohaline mud
	BI-08	13.1	15.7	48.6	High mesohaline mud
	BI-09	13	15.9	7.2	High mesohaline sand
	BI-10	13.5	15.6	66.6	High mesohaline mud
	BI-REF	13.7	16	5.2	High mesohaline sand

Notes:
salinity between 12 and 18 ppt = high mesohaline
silt + clay: <40% = sand; >40% = mud

The following are metrics used in the B-IBI calculations for mesohaline habitats:

1. **Shannon-Wiener Species Diversity Index (*H′*):** This index is one of the most widely used indices in ecology community. The Shannon-Wiener Species Diversity Index is calculated using Equation 2-1.
2. **Total Species Abundance:** Total number of organisms present in a sample after dropping the epifauna and incidental species excluded from the B-IBI calculation (Versar 2002). The total species abundance will be normalized to the number of organisms per unit area. The conversion factor for the Ponar grab is 1 count = 20.4 individuals per square meter (m^2).

3. **Total Species Biomass:** The total biomass (measured as ash free dry weight) of organisms present in a sample after dropping the epifauna and incidental species excluded from the B-IBI calculation (Versar 2002). The total biomass is normalized to the biomass of organisms per unit area.
4. **Percent Abundance of Carnivores and Omnivores:** Percent abundance contribution of taxa classified as carnivores or omnivores to the total abundance of organisms in a sample. The list of taxa that are defined as carnivores or omnivores is provided in Versar (2002).
5. **Percent Abundance of Stress-Indicative Taxa:** This metric will be calculated as the percentage of total abundance represented by stress-indicative taxa. This metric is included only in the high mesohaline sand classification for the B-IBI. This metric is not appropriate for use in areas of high mesohaline mud because the metric may not be sensitive (or indicative) in all benthic habitats. Benthic communities differ significantly according to habitat type, and the metrics appropriate to each type were chosen based upon their sensitivity within various benthic habitats. The list of taxa that are defined as pollution-indicative for the Chesapeake Bay is provided in Versar (2002).
6. **Percent Abundance of Stress-Sensitive Taxa:** This metric will be calculated as the percentage of total abundance represented by stress-sensitive taxa. This metric is included only in the high mesohaline sand classification for the B-IBI. The list of taxa that are defined as pollution-indicative for the Chesapeake Bay is provided in Versar (2002).

Based on the habitat type, the results from the appropriate metrics specific to the habitat type were used to calculate the B-IBI for each benthic community sampling location. The metrics and resulting scores for high mesohaline sand and high mesohaline mud habitats used to calculate the Chesapeake Bay B-IBI are presented in Table 2-3.

The Chesapeake Bay B-IBI approach involves scoring each metric as 5, 3, or 1, depending on whether its value at a location approximates (5), deviates slightly (3), or deviates greatly (1) from conditions at reference sites (Weisberg et al. 1997). The final Chesapeake Bay B-IBI score is derived by summing individual scores for each metric and calculating an average score.

Table 2-3
Scoring Criteria for Biotic Integrity (B-IBI) Calculations

Metric	Scoring Criteria for Mesohaline Habitat		
	5	**3**	**1**
High Mesohaline Sand			
Shannon-Wiener Species Diversity Index	≥3.2	2.5 to 3.2	<2.5
Abundance (organisms/m^2)	≥1,500 to 3,000	1,000 to 1,500 or ≥3,000 to 5,000	<1,000 or ≥5,000

Metric	Scoring Criteria for Mesohaline Habitat		
	5	3	1
Biomass (g/m^2)	≥3 to 15	1 to 3 or ≥15 to 50	<1 or ≥50
Abundance pollution-indicative taxa (%)	≤10	10 to 25	>25
Abundance pollution-sensitive taxa (%)	≥40	10 to 40	<10
Abundance of carnivores and omnivores (%)	≥35	20 to 35	<20
High Mesohaline Mud			
Shannon-Wiener Species Diversity Index	≥3.0	2.0 to 3.0	<2.0
Abundance (organisms/m^2)	≥1,500 to 2,500	1,000 to 1,500 or ≥2,500 to 5,000	<1,000 or ≥5,000
Biomass (g/m^2)	≥2 to 10	0.5 to 2 or ≥10 to 50	<0.5 or ≥50
Abundance pollution-indicative taxa (%)	≤5	5 to 30	>30
Abundance pollution-sensitive taxa (%)	≥60	30 to 60	<30
Abundance of carnivores and omnivores (%)	≥25	10 to 25	<10
Biomass deeper than 5 centimeters (%)	≥60	10 to 60	<10

The B-IBI is used to establish benthic restoration goals for the Chesapeake Bay (Weisberg et al. 1997). The Chesapeake Bay RGI (Ranasinghe et al. 1994) was patterned after the same approach used to develop the IBI for freshwater systems (Karr et al. 1986). A Chesapeake Bay RGI value of 3.0 represents the minimum restoration goal, and Chesapeake Bay RGI values of less than 3.0 are indicative of a stressed community. Values of 3.0 or greater indicate habitats that meet or exceed the restoration goals (Ranasinghe et al. 1994).

Based on the Chesapeake Bay RGI, the Chesapeake Bay Benthic Monitoring Program classifies the benthic community in four levels (Versar 2002):

- Meets restoration goals (Chesapeake Bay B-IBI that is ≥3.0)
- Marginal (Chesapeake Bay B-IBI of 2.7 to 2.9)
- Degraded (Chesapeake Bay B-IBI of 2.1 to 2.6)
- Severely degraded (Chesapeake Bay B-IBI that is ≤2.0)

A Chesapeake Bay B-IBI value of 3.0 is the threshold value between degraded and nondegraded conditions at a location.

2.3 Fisheries Surveys

Littoral and subtidal habitats support diverse populations of numerous species of finfish and macroinvertebrates. These habitats are used as rearing areas, migration corridors, spawning areas, and places of refuge from predators. Fisheries surveys were conducted to document existing fish and blue crab (*Callinectes sapidus*) communities in the vicinity of James Island and Barren Island.

The fish community surveys were completed using multiple types of fish collection gear, depending on the habitat in which the sampling gear will be used. Sample gear will include beach seines, bottom trawls, gillnets, and pop nets. Sample locations for Barren Island and James Island fisheries surveys are provided in Figures 2-6a and b and 2-7a and b, respectively.

Beach seining, bottom trawls, and gillnets were used during all four sampling seasons (summer, fall, winter, and spring). Pop nets were used only during the summer sampling season (August 2020) and the spring sampling season (May 2021). All captured species were returned to the water immediately following processing.

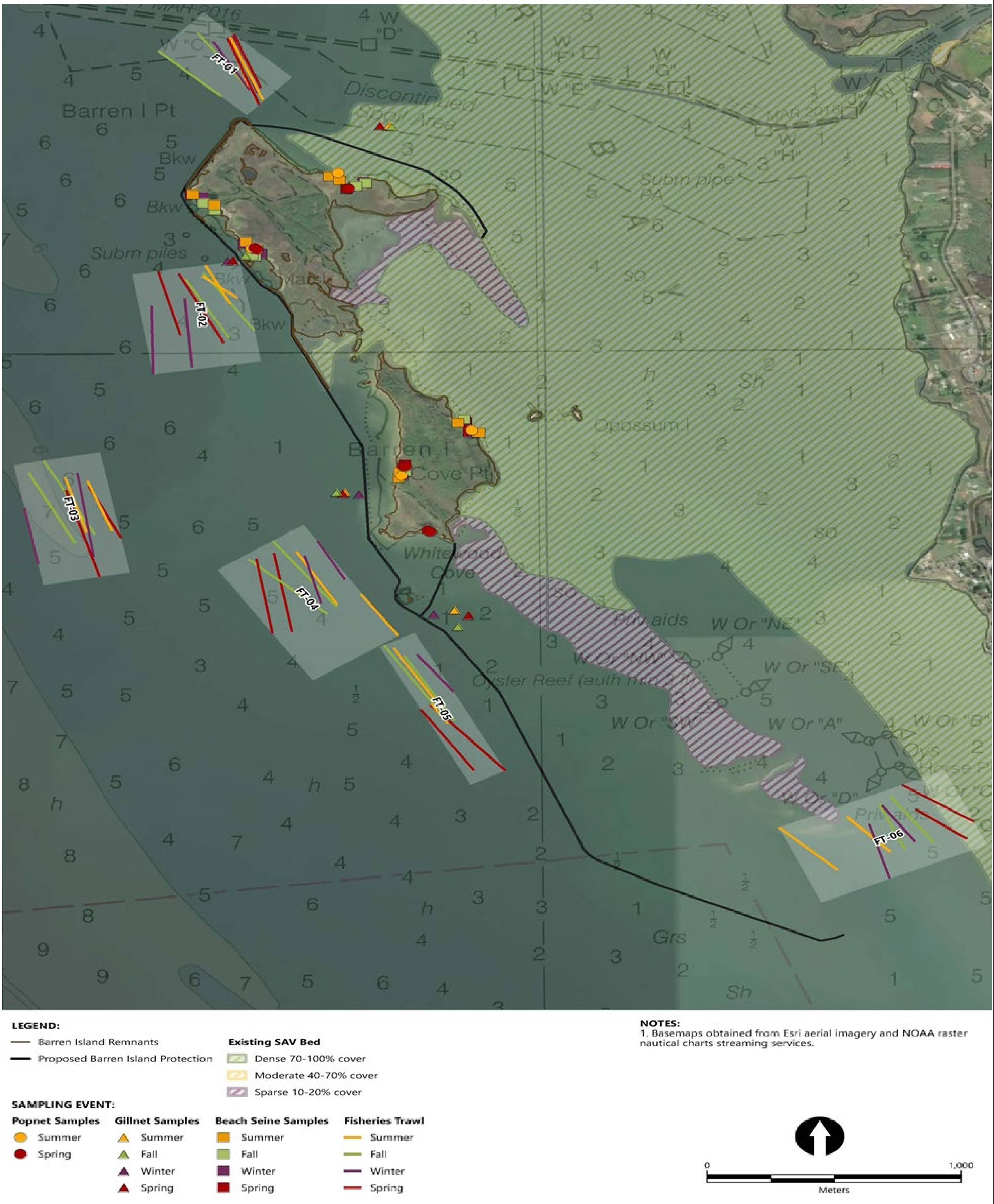
At each location for each type of sampling, water depth, and water quality parameters (temperature, pH, DO, turbidity, and salinity) were measured from the mid-depth of the water column.

Figure 2-6a
Barren Island Fisheries Survey Locations

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.

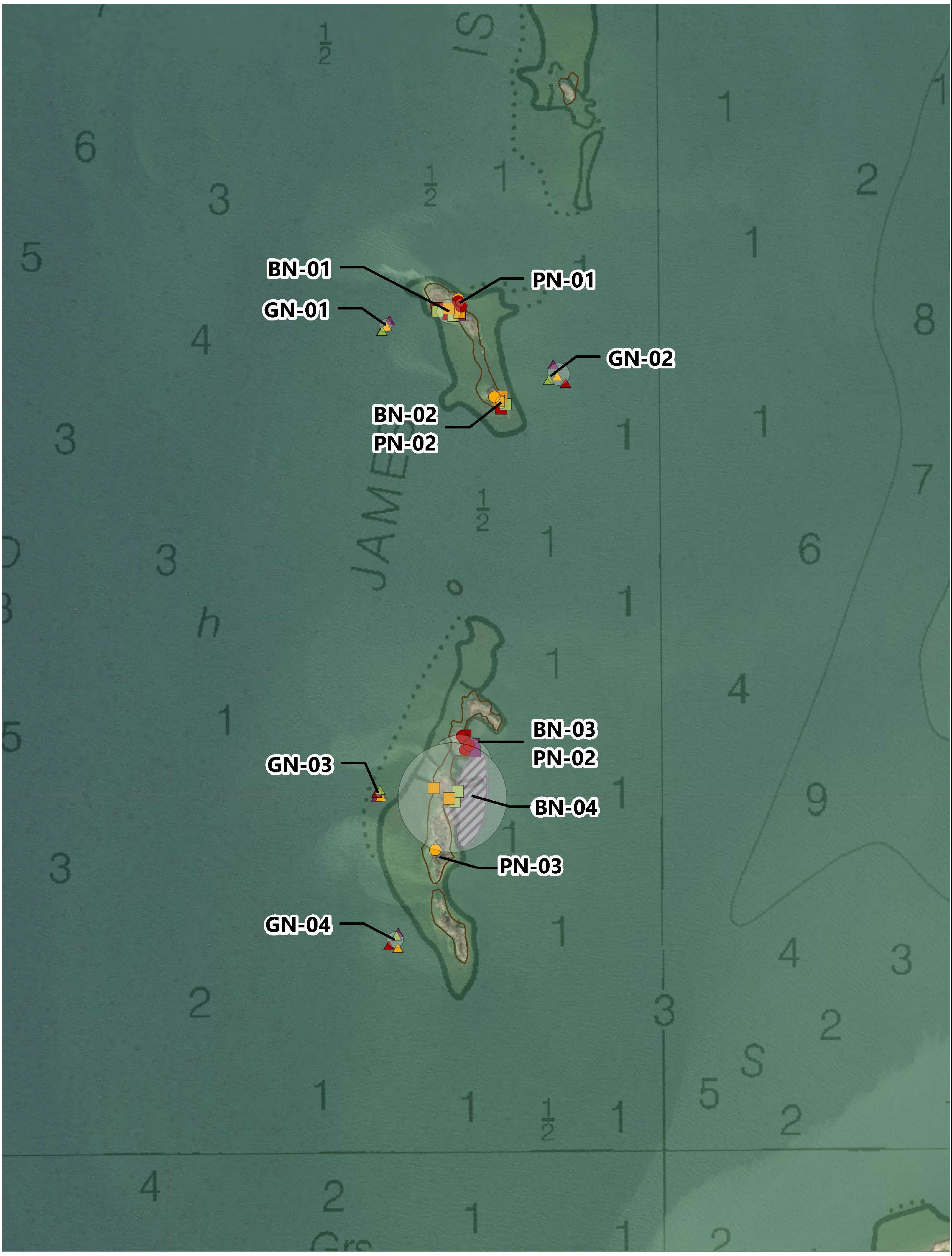
2. PN-04 was re-located during the spring sampling event due to changes in habitat conditions at the original sampling location.

Figure 2-6b
Barren Island Fisheries Survey Locations



NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.

Figure 2-7a
James Island Fisheries Survey Locations



LEGEND:

— James Island Remnants

Existing SAV Bed

▨ Sparse 10-20% cover

NOTES:

1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.

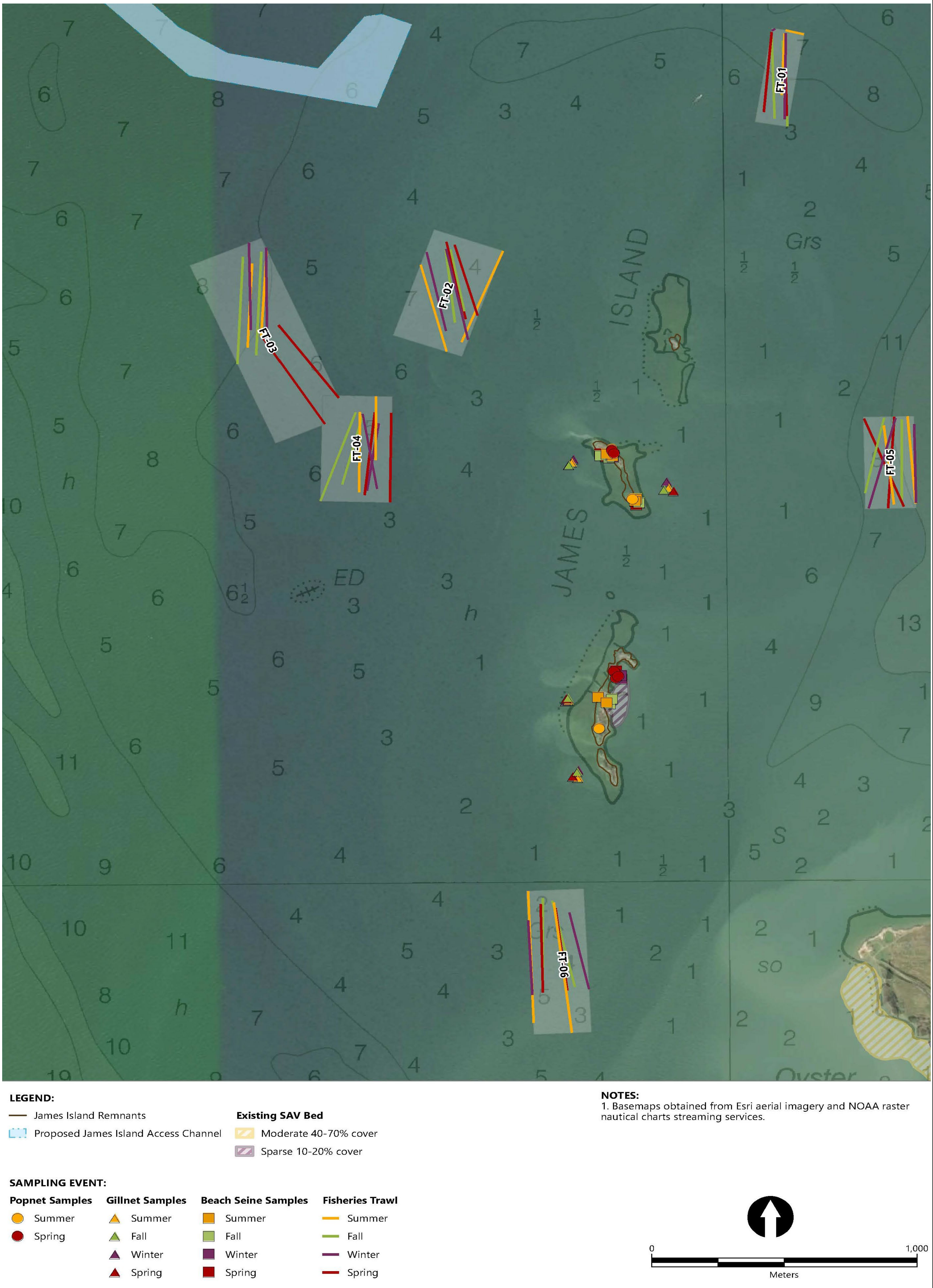
2. PN-02 was re-located during the spring sampling event due to changes in habitat conditions at the original sampling location.

SAMPLING EVENT:

Popnet Samples	**Gillnet Samples**	**Beach Seine Samples**	**Fisheries Trawl**
● Summer	▲ Summer	■ Summer	— Summer
● Spring	▲ Fall	■ Fall	— Fall
	▲ Winter	■ Winter	— Winter
	▲ Spring	■ Spring	— Spring

0 400
Meters

Figure 2-7b
James Island Fisheries Survey Locations



NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.

2.3.1 Beach Seining

Beach seines were used to collect data on nearshore fish assemblages in the Project area. Locations were chosen to represent various types of offshore-zone habitat as well as the eastern and western sides of the islands. Three locations were sampled at James Island (Figure 2-7a and b), and five locations were sampled at Barren Island (Figure 2-6a and b) during all seasons. Coordinates for all sampling locations were documented by differential global positioning system (DGPS).

A 100-foot seine net was used to sample the seine locations. The net was deployed in an arc, perpendicular to the shoreline, to sample approximately 30 meters of shoreline. Two consecutive and adjacent hauls were made at each of the locations for a combined shoreline distance of approximately 60 meters.

All fish and crab collected in the seine net were identified to the lowest practicable taxon and counted before being returned to the water. A representative subsample of up to 50 individuals for each species for each haul were measured to the nearest millimeter. For each location, the total number of organisms collected during the two hauls were summed for a total count. During the spring sampling event only, a representative subsample of up to 50 individuals for each species for each haul was weighed to the nearest 0.1 gram (g).

2.3.2 Bottom Trawling

Bottom trawls were used to collect data on the benthic or demersal assemblages present in the vicinity of the Project. Bottom trawl surveys were conducted during all four seasons (summer, fall, winter, and spring).

Bottom trawling was conducted at 12 locations: six at Barren Island (Figure 2-6a and b) and six at James Island (Figure 2-7a and b). Locations were chosen to represent various types of offshore-zone habitat as well as the eastern and western sides of the islands. Two separate 5-minute otter trawl tows were conducted at each location. For each location, the total number of organisms collected during the two trawl tows were summed to represent 10 minutes of total effort. All fish and crab collected in the bottom trawls were identified to the lowest practicable taxon and counted before being returned to the water. A representative subsample of up to 50 individuals for each species at each location were measured to the nearest millimeter. During the spring sampling event only, a representative subsample of up to 50 individuals for each species for each haul was weighed to the nearest 0.1 g.

2.3.3 Gillnetting

Gillnetting was used to collect data on fish present throughout the water column near James Island and Barren Island. Gillnet surveys were conducted during all four seasons (summer, fall, winter, and spring).

Gillnets were set at eight locations, four at James Island (Figure 2-7a and b) and four at Barren Island (Figure 2-6a and b). Coordinates for all sampling locations were documented by DGPS. One gillnet was set per location. The gillnets were 100 feet in length with five panels of varying mesh sizes ranging from 0.75 inch to 2.5 inches to target all fish species. All organisms collected in the gillnets were identified to the lowest practicable taxon and counted before being returned to the water. A representative subsample of up to 50 individuals for each species from each location was measured to the nearest millimeter. During the spring sampling event only, a representative subsample of up to 50 individuals for each species was weighed to the nearest 0.1 g.

2.3.4 Pop Nets

Pop nets were used to collect data on nearshore fish assemblages and blue crab communities present near the Project area. Pop nets were used only during the summer sampling season (August 2020) and the spring sampling season (May 2021).

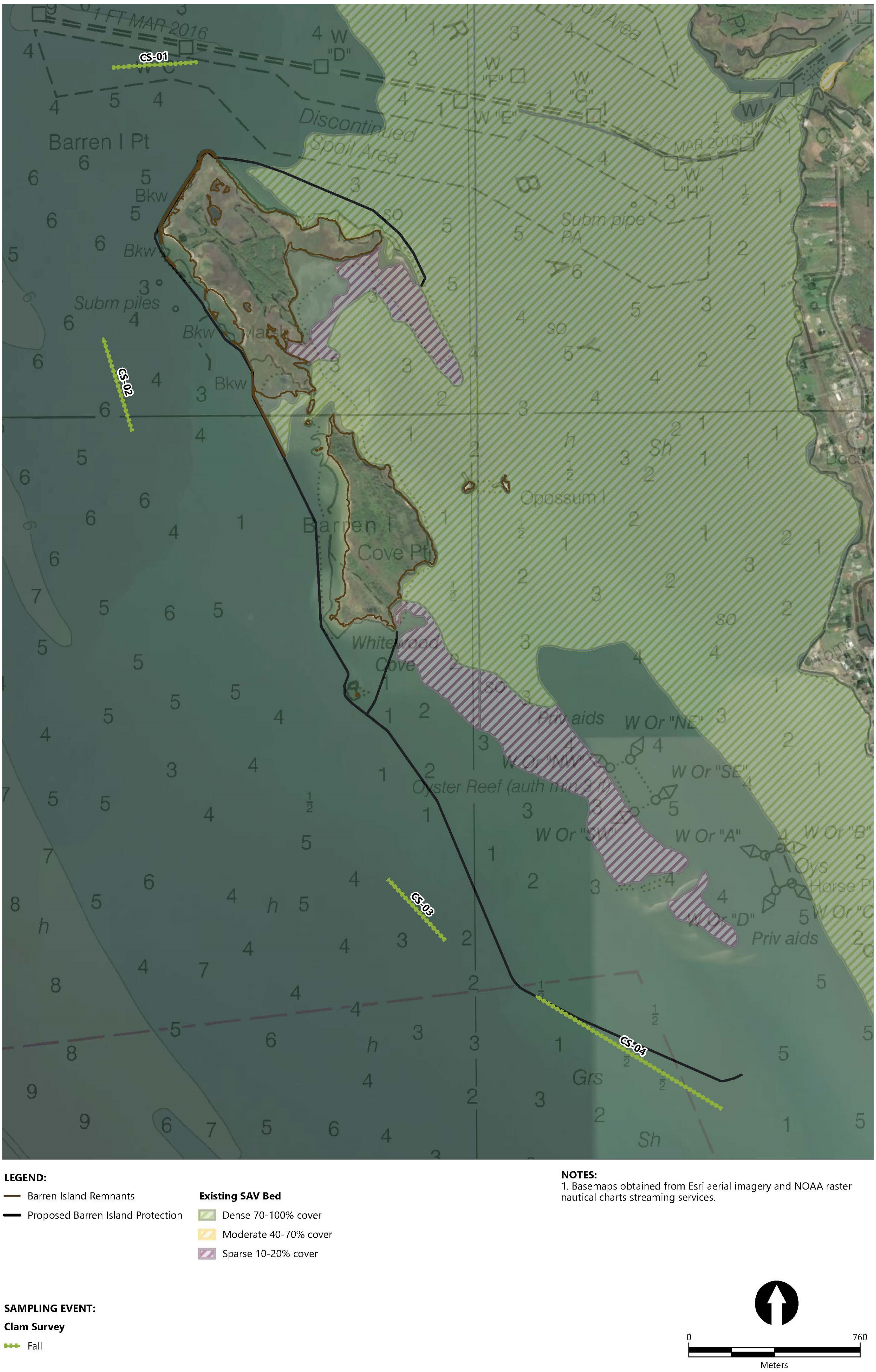
Pop nets were deployed at seven locations, three at James Island (Figure 2-7a and b) and four at Barren Island (Figure 2-6a and b). Coordinates for all sampling locations were documented by DGPS. Pop nets were set in areas as close to the beach seine locations as possible and in areas of SAV, if present. Two pop nets were set at each sampling location to collect two consecutive samples during the daytime high tide. Pop nets were set for at least one full tidal cycle to reduce interference from deploying the pop net. The pop nets were released approximately 2 hours after peak daytime high tide. All organisms collected in the pop nets were identified to the lowest practicable taxon and counted before being returned to the water. The total length of a representative subsample of up to 50 individuals for each species was measured from each pop net. During the spring sampling event, a representative subsample of up to 50 individuals for each species for each haul was weighed to the nearest 0.1 g.

2.4 Bivalve Surveys

A commercial clammer licensed to catch soft-shell clams was contracted to perform the bivalve surveys in the Project area. This survey was completed during the fall season only. Nine transects were surveyed in total: four transects at Barren Island (Figure 2-8) and five transects at James Island (Figure 2-9). The transects were approximately 100 to 200 meters in length and required approximately 15 minutes to complete. For each transect, the water depth and in situ water quality parameters were measured. The water quality parameters were measured from the mid-depth of the water column and included temperature, salinity, pH, and DO.

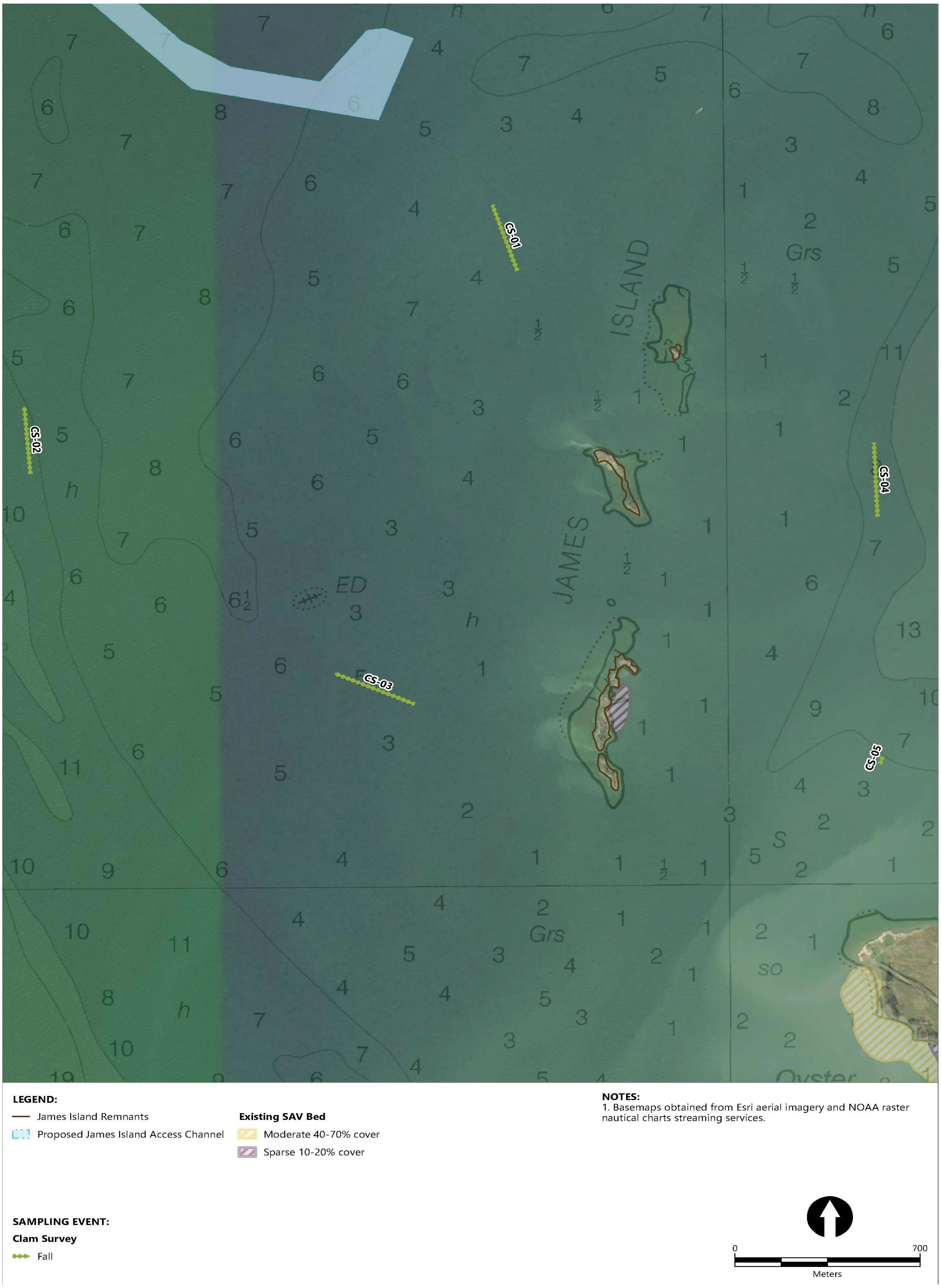
A hydraulic dredge was used to conduct the bivalve surveys. After each transect had been completed, the bivalves collected during the survey were processed. Soft-shell clams were sorted into two categories based on size: 1) legal harvestable size of 2 inches or greater; and 2) sublegal size less than 2 inches. The number of individuals in each size class were counted. All other bivalves were identified, counted, and measured.

Figure 2-8
Barren Island Bivalve Survey Locations



NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.

Figure 2-9
James Island Bivalve Survey Locations



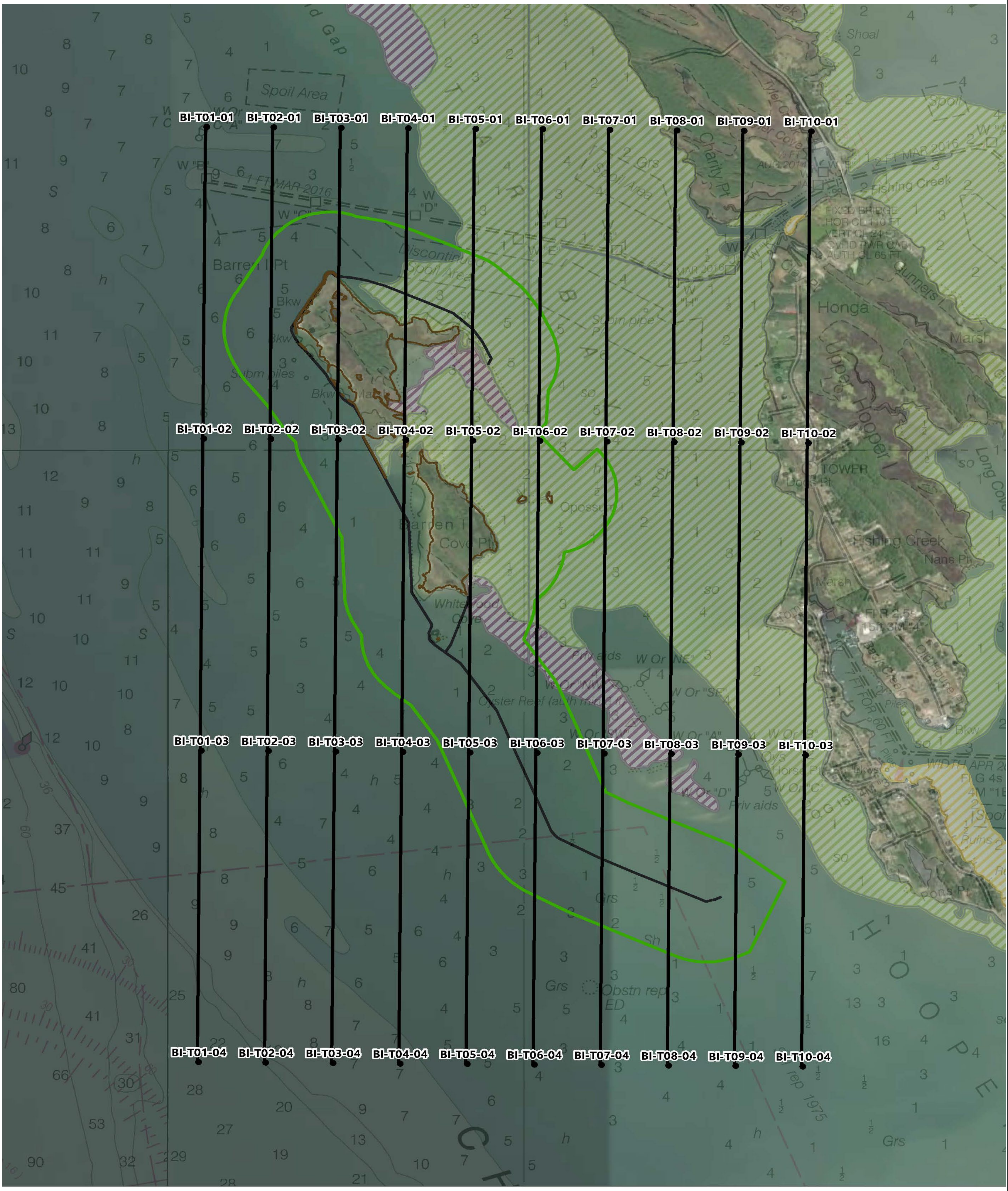
NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.

2.5 Crab Pot Surveys

Crab pot surveys were completed in August 2020, September 2020, May 2021, June 2021, and July 2021 at Barren Island and James Island. The survey area included the proposed restoration footprint plus a 0.25-mile perimeter. The crab pot survey area at Barren Island is 1,619 acres, and the survey area at James Island covers a total of 3,846 acres.

Crab pots were enumerated by counting the visible buoys marking the locations of crab pots. Transects were established within the survey area to ensure complete coverage of the crab pot survey area. Transects were drawn from north to south over the survey area, and two mid-transect points were used to document the location and relative density of the crab pots observed between the points along each transect. Figures 2-10 and 2-11 show the survey transects and survey areas for Barren Island and James Island, respectively. Only crab pots within the survey boundary were included in the total counts for the survey.

Figure 2-10
Barren Island Crab Pot Survey Transects



LEGEND:

— Barren Island Remnants

— Proposed Barren Island Protection

▭ Crabpot Survey Footprint

● Crabpot Survey Point

— Crabpot Survey Transect

Existing SAV Bed

▨ Dense 70-100% cover

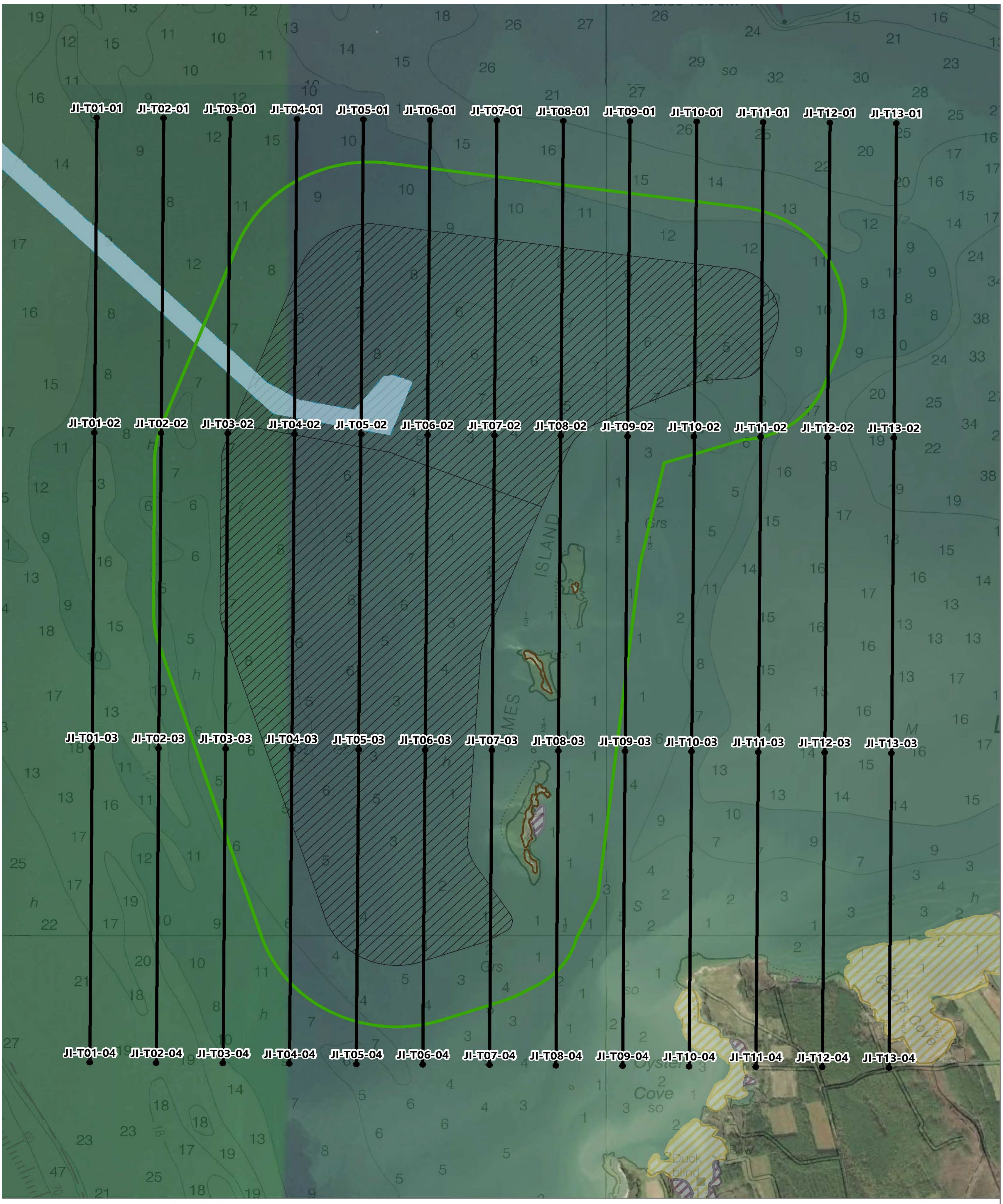
▨ Moderate 40-70% cover

▨ Sparse 10-20% cover

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.
2. Crabpot survey boundary includes the area within 0.25 mile of the proposed restoration footprint and remnants.

0
2,000
Meters

Figure 2-11
James Island Crab Pot Survey Transects



LEGEND:

— James Island Remnants

▭ Proposed James Island Access Channel

▨ Proposed James Island Alignment

▭ Crabpot Survey Footprint

● Crabpot Survey Point

— Crabpot Survey Transect

Existing SAV Bed

▨ Moderate 40-70% cover

▨ Sparse 10-20% cover

▨ Very Sparse 0-10% cover

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.
2. Crabpot survey boundary includes the area within 0.25 mile of the proposed restoration footprint and remnants.

0 2,000
Meters

2.6 Avian Surveys

Avian surveys were conducted at nine locations in summer 2020: four at James Island and five at Barren Island. Sampling locations aimed to capture the range of habitats available (e.g., forest, scrub-shrub, salt marsh, open water, mudflat, and shoreline). Final locations were determined in the field based on site conditions, site access, and representativeness of the habitat conditions. The Barren Island avian survey locations are provided in Figure 2-12. The avian survey locations for the northern and southern remnants of James Island are provided in Figures 2-13 and 2-14, respectively.

At each sampling location, two 15-minute timed observations were conducted to provide a survey of the entire 360° viewshed. The first observation was oriented in a 180° arc along the shoreline and running out to open water. For the second observation, the observer turned 180° to observe the remaining shoreline and an arc running over the island. The pair of timed observations were conducted twice at each location during the surveys, once in the early morning and once at midday, so that surveys were conducted during both high- and low-tide conditions. At each of the sampling locations during the observation period, all birds heard or observed with binoculars or a spotting scope were identified and counted, and behavioral observations were recorded. Incidental bird observations made outside the survey periods were also noted.

Figure 2-12
Barren Island Avian Observation Locations

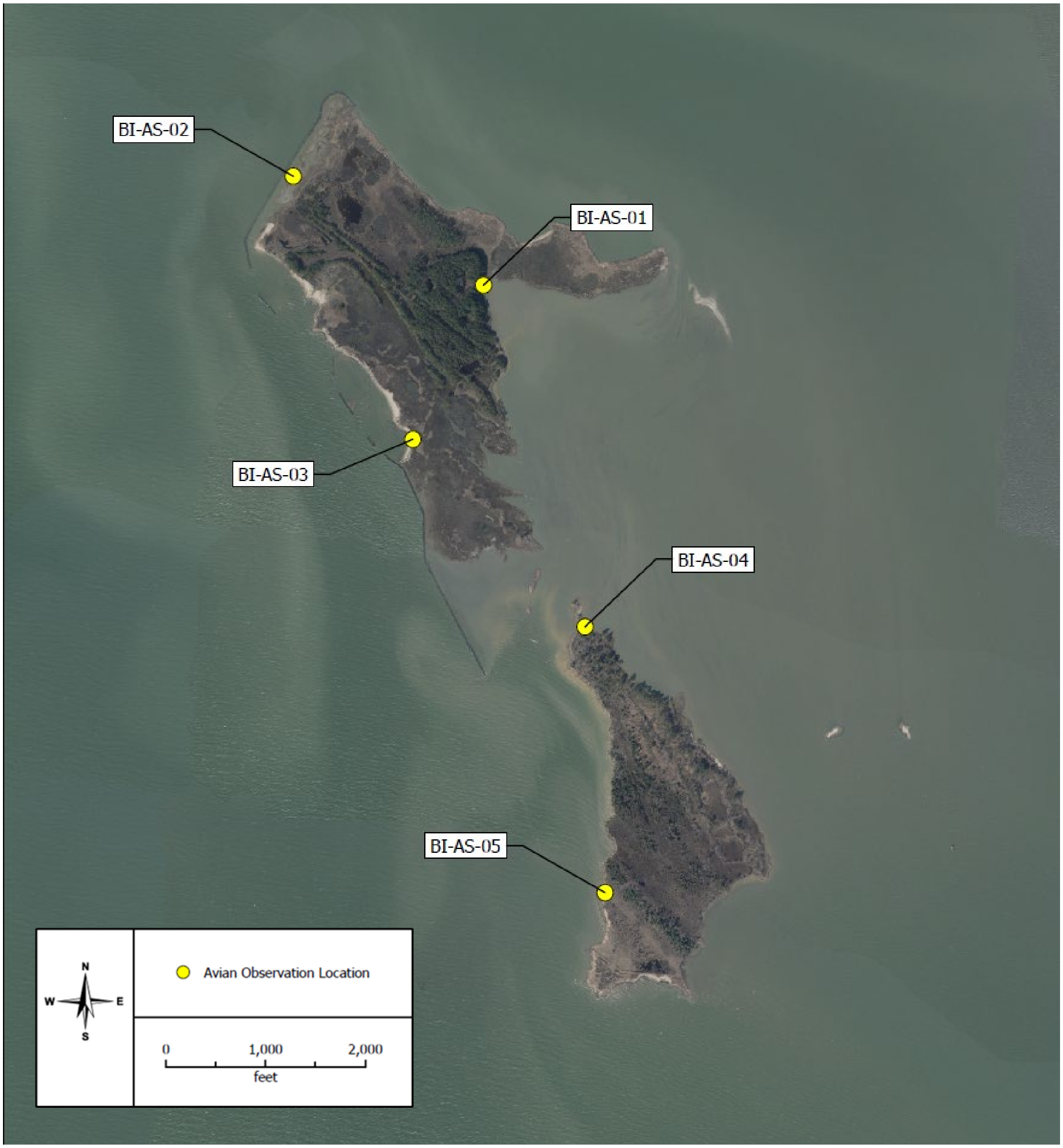


Figure 2-13
James Island Avian Observation Locations (Northern Remnants)

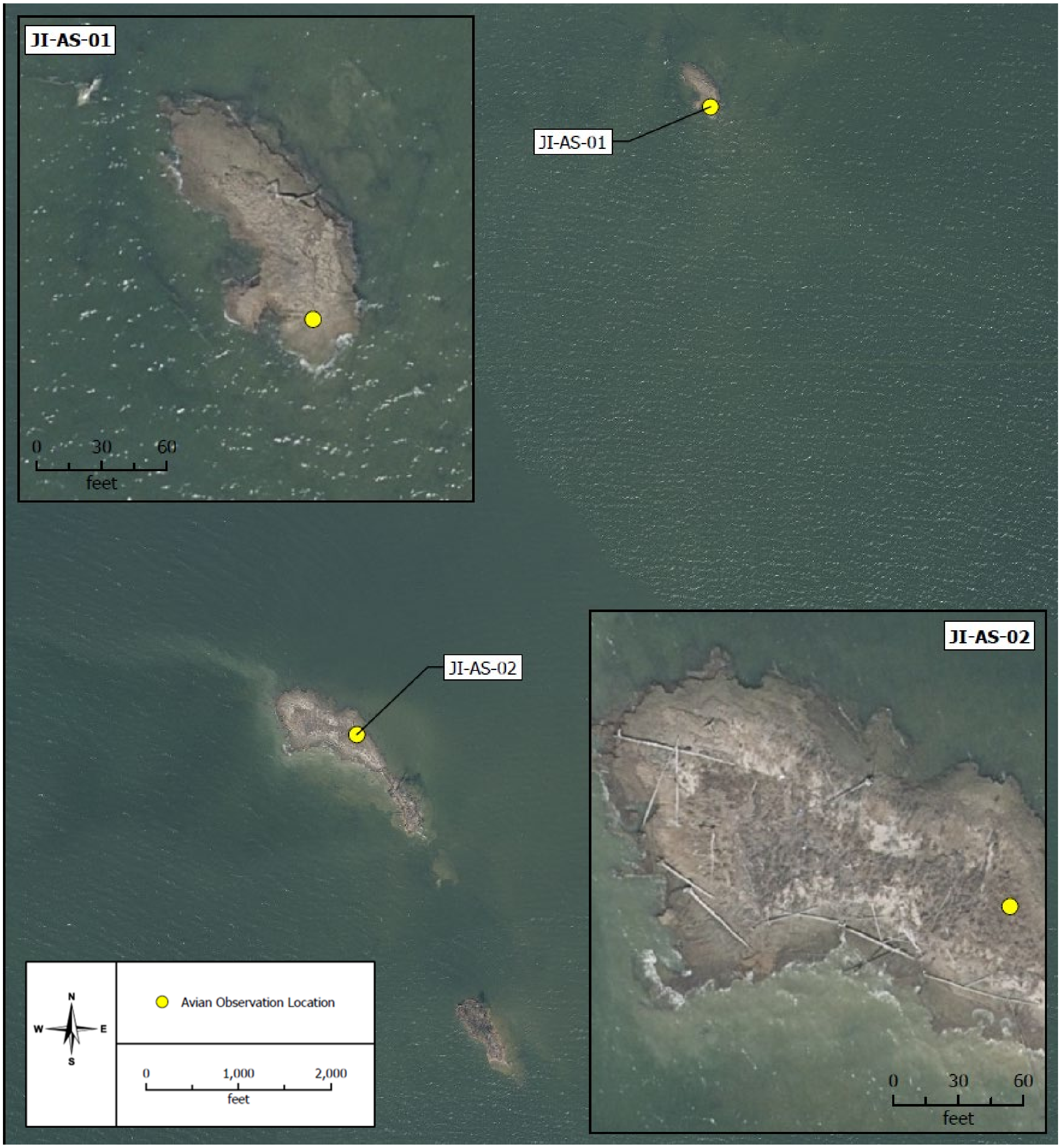
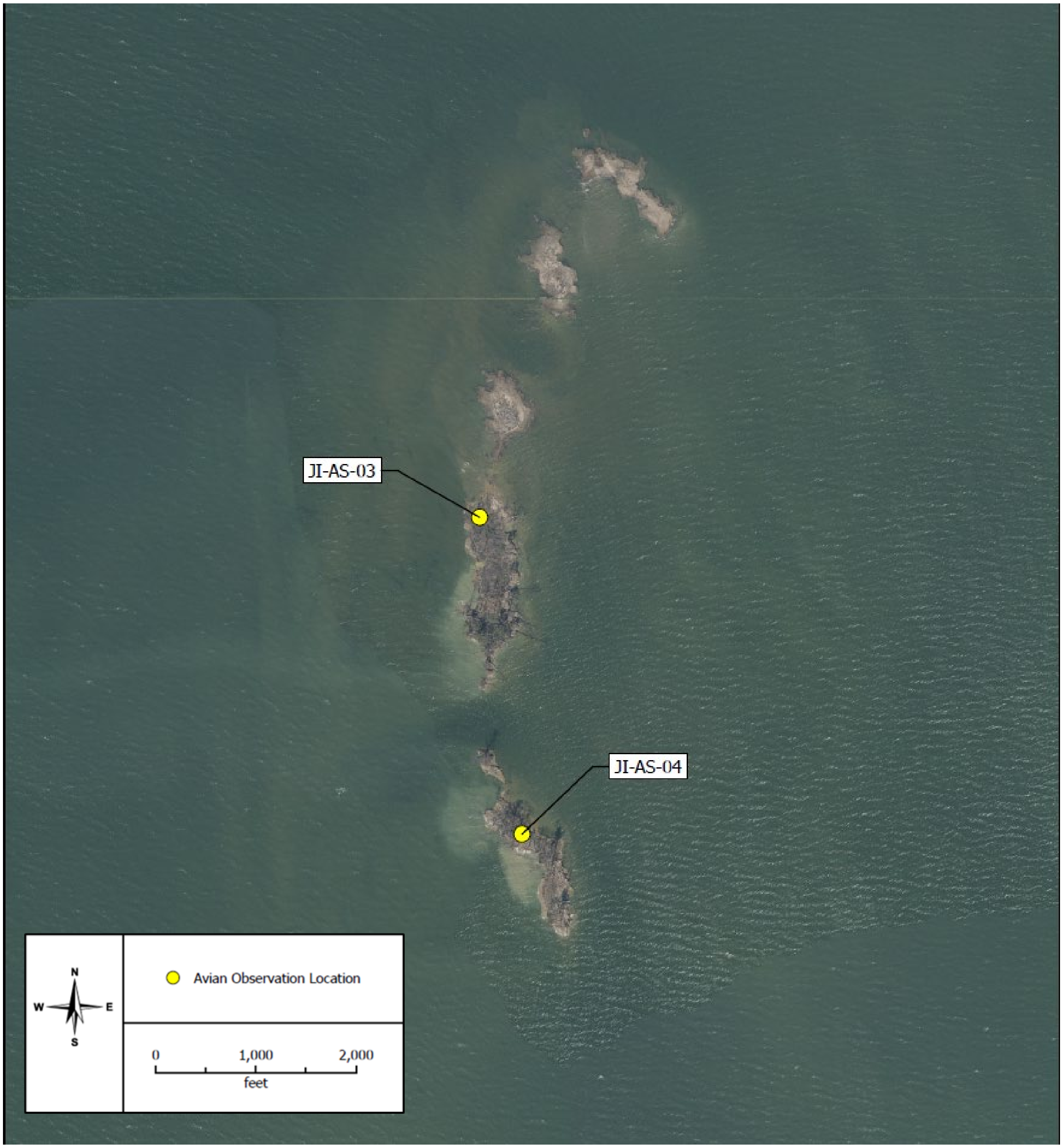


Figure 2-14
James Island Avian Observations Locations (Southern Remnants)



3 Barren Island Results

This section presents the results for all environmental surveys conducted at Barren Island during each season that sampling was conducted.

3.1 Water Quality

Quarterly water quality sampling was conducted in the vicinity of Barren Island in summer 2020, fall 2020, winter 2021, and spring 2021. A complete description of sampling locations, sample dates, and in situ water quality parameters (including temperature, DO, salinity, pH, and turbidity) are provided in Table 3-1. Water temperatures exhibited typical seasonal trends. The warmer water temperatures were generally recorded during the summer (ranging from 24.2°C to 25.3°C) and coolest water temperatures recorded during the winter (6.2°C to 8.3°C).

Overall, the DO concentrations varied seasonally. Because warm water has less ability to hold DO than cold water, DO concentrations tend to be lower in the summer compared to the winter. The lowest DO levels were measured during the summer season (ranging from 6.9 to 7.3 milligrams per liter [mg/L]) and maximum DO levels were measured in the winter (11.7 to 12.9 mg/L). During all seasons, DO values were greater than 5.0 mg/L, which is considered healthy and allows the Chesapeake Bay's aquatic system to thrive.

The highest salinities were measured during the fall (ranging from 15 to 16.3 ppt) and the lowest salinities occurred during the spring (ranging from 11.3 to 12.9 ppt), which is consistent with typical weather patterns in the area. During spring rains, salinity is usually lower compared to the drier fall months, when salinity is usually higher.

In general, the pH measurements at Barren Island were very similar to each other, both between locations and seasons. The range of pH measurements from all locations and for all seasons was from 7.8 to 8.4.

Turbidity values were recorded in Nephelometric Turbidity Units (NTU). Generally, turbidity levels were lower in the fall (ranging from 1.4 to 4.9 NTU) and winter (ranging from 2.3 to 4.8 NTU), with little variation between sample locations. Higher variability and turbidity levels were recorded during the spring (ranging from 1.5 to 11.0 NTU) and summer (ranging from 4.7 to 18.9 NTU). Secchi depth was also recorded during the spring 2021 sampling event. The maximum Secchi depth reading was 5.7 feet.

Results for the chemical constituents and nutrient parameters measured in Barren Island surface water samples are provided in Table 3-2. Orthophosphate was not detected in most surface water samples during the summer, fall, and winter sampling events. It was detected in most samples in low concentrations during the spring sampling event. Ammonium was generally detected in only the winter and spring sampling events, also at low concentrations. All remaining nutrients were generally detected in low concentrations. Generally, the highest concentrations of chlorophyll, phaeophytin, dissolved organic carbon, organic nitrogen, organic phosphorus, particulate carbon, particulate nitrogen, particulate phosphorus, total dissolved nitrogen, total dissolved phosphorus, total nitrogen, total phosphorus, and total suspended solids were measured during the summer 2020 sampling season. Highest concentrations of nitrite and nitrite+nitrate were measured during the winter 2021 season. Overall, there was little variability in nutrients between sampling location and season, with the exception of sampling location BI-WQ-06 during the spring sampling event. Concentrations of chlorophyll, phaeophytin, particulate carbon, particulate nitrogen, particulate phosphorus, total nitrogen, total phosphorus and total suspended solids were all substantially higher in this sample than all other samples.

Table 3-1
Barren Island Water Quality Sample Locations and Water Quality Parameters

Season	Sample ID	Date	Time	Northing	Easting	Water Depth (feet)	Temp (°C)	DO (mg/L)	Salinity (ppt)	pH	Turbidity (NTU)
Summer	BI-WQ-01	9/1/2020	8:05	245397.89	1522101.17	6	25.1	7	13	8.2	8.7
	BI-WQ-02	9/1/2020	8:40	240208.01	1522056.52	4.5	25.3	7	13.3	8.3	4.8
	BI-WQ-03	9/1/2020	8:22	241336.39	1524267.20	4.5	24.6	7	12.8	8.2	13.3
	BI-WQ-04	9/1/2020	9:00	236431.80	1526327.91	4	24.7	7	13	8.2	10
	BI-WQ-05	9/1/2020	9:15	234724.12	1528713.03	3.3	24.9	7.2	13.3	8.3	7.4
	BI-WQ-06	9/1/2020	7:40	247001.33	1524609.28	2	24.3	7	12.9	8.1	11.9
	BI-WQ-07	9/1/2020	7:13	246287.87	1527478.70	2.3	24.4	6.9	12.8	8	15.2
	BI-WQ-08	9/1/2020	10:30	240986.37	1527469.03	1.8	24.2	7.3	13.1	8.3	18.9
	BI-WQ-09	9/1/2020	10:53	239083.25	1527615.60	2.3	24.4	7.1	13	8.2	11.6
	BI-WQ-10	9/1/2020	10:02	237930.38	1530390.49	3	24.4	7.2	13.5	8.3	11.2
	BI-WQ-REF	9/1/2020	9:38	228030.52	1531651.51	3.5	24.9	7.3	13.7	8.3	4.7
Fall	BI-WQ-01	10/22/2020	12:05	245439.14	1522135.82	11	19.5	8.5	15.9	8.1	3.6
	BI-WQ-02	10/22/2020	11:36	240181.33	1521882.44	7.5	19.9	8.6	16.3	8.2	1.4
	BI-WQ-03	10/22/2020	11:50	241346.89	1524314.12	8.2	19.5	8.5	15.9	8.1	3.8
	BI-WQ-04	10/22/2020	10:55	236458.10	1526314.22	8.7	19.6	8.6	15.9	8.1	1.9
	BI-WQ-05	10/22/2020	10:36	234714.31	1528750.82	5.9	19.5	8.4	15.7	8.1	2.7
	BI-WQ-06	10/22/2020	12:55	246996.96	1524506.69	2.7	20.2	8	15.5	8	4.6
	BI-WQ-07	10/22/2020	12:30	246295.06	1527492.67	3.5	20.2	8.4	15	8.1	4.9
	BI-WQ-08	10/22/2020	8:51	240983.17	1527437.34	3.2	19.2	8.3	15.7	8.1	3.3
	BI-WQ-09	10/22/2020	9:25	239083.02	1527624.61	4.2	19.4	8.5	15.9	8.1	3.4
	BI-WQ-10	10/22/2020	10:10	237885.57	1530343.36	5.1	19.1	8.3	15.6	8.1	4.9
	BI-WQ-REF	10/22/2020	11:17	228063.89	1531516.24	6.5	19	8.2	15.7	8.1	3

Season	Sample ID	Date	Time	Northing	Easting	Water Depth (feet)	Temp (°C)	DO (mg/L)	Salinity (ppt)	pH	Turbidity (NTU)
Winter	BI-WQ-01	3/10/2021	10:47	245422.46	1522149.58	11.8	6.9	12.5	13.4	8.2	3.5
	BI-WQ-02	3/10/2021	10:15	240179.81	1521907.56	9.1	6.2	12.9	13.8	8.2	2.3
	BI-WQ-03	3/10/2021	10:30	241382.73	1524304.91	8.9	6.9	12.6	13.5	8.2	2.9
	BI-WQ-04	3/10/2021	8:22	236440.47	1526298.51	7.2	6.5	12.6	13.6	8.2	2.8
	BI-WQ-05	3/10/2021	8:06	234717.53	1528772.79	5.6	7.0	12.1	13.2	8.0	4.3
	BI-WQ-06	3/10/2021	11:07	246933.52	1524518.61	3.8	8.3	11.7	12.8	8.0	4.8
	BI-WQ-07	3/10/2021	11:33	246302.14	1527479.06	4.5	8.3	11.7	13.2	8.0	4.3
	BI-WQ-08	3/10/2021	9:54	240545.37	1526800.52	1.7	7.3	12.4	13.4	8.2	3.3
	BI-WQ-09	3/10/2021	9:10	239046.61	1527600.37	4.0	6.7	12.5	13.5	8.2	3.3
	BI-WQ-10	3/10/2021	8:50	237861.83	1530323.00	5.0	7.2	11.9	13.1	8.0	4.4
	BI-WQ-REF	3/10/2021	7:42	228064.59	1531503.88	5.2	6.8	12.1	13.2	8.0	3.9
Spring	BI-WQ-01	5/24/2021	9:36	245419.43	1522124.59	10.8	22.1	9.2	11.3	8.4	2.0
	BI-WQ-02	5/24/2021	10:12	240167.83	1521876.89	8.8	22.1	8.8	11.7	8.3	1.5
	BI-WQ-03	5/24/2021	9:53	241364.52	1524255.97	8.2	23.0	8.7	11.6	8.3	2.9
	BI-WQ-04	5/24/2021	10:32	236442.45	1526268.21	7.5	24.7	7.5	12.6	7.8	5.3
	BI-WQ-05	5/24/2021	10:53	234786.67	1528741.85	6.0	23.4	8.0	12.0	8.0	3.5
	BI-WQ-06	5/24/2021	8:34	246909.77	1524546.45	2.8	24.0	7.6	12.6	7.8	10.2
	BI-WQ-07	5/24/2021	9:05	246348.17	1527541.47	3.5	23.8	8.0	11.9	8.1	7.9
	BI-WQ-08	5/24/2021	11:54	240965.10	1527380.11	3.0	23.5	7.8	12.3	7.9	11.0
	BI-WQ-09	5/24/2021	11:32	239063.82	1527577.75	4.3	23.6	7.9	12.3	7.9	5.8
	BI-WQ-10	5/24/2021	11:12	237880.39	1530279.72	5.5	23.2	7.6	12.4	7.8	8.0
	BI-WQ-REF	5/24/2021	12:27	228058.82	1531491.41	7.5	21.8	8.2	12.9	7.9	3.1

Table 3-2
Barren Island Surface Water Quality Sample Results

Analyte	Units	BI-WQ-REF				BI-WQ-01				BI-WQ-02			
		Summer 2020	Fall 2020	Winter 2021	Spring 2021	Summer 2020	Fall 2020	Winter 2021	Spring 2021	Summer 2020	Fall 2020	Winter 2021	Spring 2021
Chlorophyll, active	µg/L	**11.0**	**4.1**	**11.9**	**10.2**	**13.0**	**3.9**	**12.1**	**8.6**	**11.0**	**2.6**	**11.3**	**8.6**
Phaeophytin *a*	µg/L	**3.0**	**1.6**	**1.8**	**2.5**	**3.5**	**1.7**	**2.3**	**1.6**	**2.8**	**1.1**	**2.3**	**1.7**
Chlorophyll *a*	µg/L	**12.6**	**5.0**	**12.9**	**11.6**	**14.9**	**4.8**	**13.4**	**9.5**	**12.6**	**3.2**	**12.6**	**9.5**
Dissolved organic carbon	mg/L	**3.74**	**3.74**	**3.76**	**3.4**	**3.78**	**3.6**	**3.48**	**3.16**	**3.44**	**3.68**	**3.38**	**3.49**
Organic nitrogen	mg/L	**0.34**	**0.3342**	**0.306**	**0.27**	**0.43**	**0.30**	**0.27**	**0.29**	**0.35**	**0.32**	**0.28**	**0.25**
Organic phosphorus	mg/L	**0.013**	**0.013**	**0.009**	**0.012**	**0.017**	**0.012**	**0.007**	**0.011**	**0.016**	**0.013**	**0.007**	**0.009**
Ammonium	mg/L	0.009 U	0.009 U	**0.011**	**0.042**	0.009 U	0.009 U	**0.012**	0.009 U	0.009 U	0.009 U	**0.011**	0.009 U
Nitrite	mg/L	**0.002**	**0.004**	**0.005**	**0.007**	**0.002**	**0.004**	**0.004**	**0.005**	**0.002**	**0.003**	**0.005**	**0.005**
Nitrite + nitrate	mg/L	**0.007**	**0.017**	**0.113**	**0.091**	**0.008**	**0.010**	**0.134**	**0.041**	**0.007**	**0.010**	**0.142**	**0.087**
Particulate carbon	mg/L	**1.61**	**0.683**	**1.79**	**1.42**	**1.81**	**0.809**	**1.95**	**1.34**	**1.54**	**0.713**	**1.79**	**1.22**
Particulate nitrogen	mg/L	**0.27**	**0.124**	**0.235**	**0.226**	**0.34**	**0.14**	**0.25**	**0.24**	**0.29**	**0.12**	**0.22**	**0.21**
Orthophosphate	mg/L	0.0034 U	0.0034 U	**0.0038**	**0.0052**	0.0034 U	0.0034 U	0.0034 U	**0.0228**	0.0034 U	0.0034 U	0.0034 U	**0.0049**
Particulate phosphorus	mg/L	**0.026**	**0.010**	**0.020**	**0.020**	**0.033**	**0.012**	**0.018**	**0.021**	**0.027**	**0.009**	**0.015**	**0.019**
Total dissolved nitrogen	mg/L	**0.36**	**0.36**	**0.43**	**0.4**	**0.45**	**0.32**	**0.42**	**0.34**	**0.37**	**0.34**	**0.43**	**0.35**
Total dissolved phosphorus	mg/L	**0.017**	**0.016**	**0.012**	**0.017**	**0.021**	**0.015**	**0.010**	**0.033**	**0.020**	**0.016**	**0.010**	**0.014**
Total nitrogen	mg/L	**0.61**	**0.4**	**0.59**	**0.62**	**0.63**	**0.43**	**0.63**	**0.53**	**0.59**	**0.42**	**0.59**	**0.52**
Total phosphorus	mg/L	**0.044**	**0.028**	**0.022**	**0.029**	**0.048**	**0.032**	**0.023**	**0.033**	**0.045**	**0.023**	**0.022**	**0.031**

		BI-WQ-REF				BI-WQ-01				BI-WQ-02			
Analyte	Units	Summer 2020	Fall 2020	Winter 2021	Spring 2021	Summer 2020	Fall 2020	Winter 2021	Spring 2021	Summer 2020	Fall 2020	Winter 2021	Spring 2021
Total suspended solids	mg/L	**19.6**	**11**	**32.3**	**32.8**	**25.6**	**13.75**	**12**	**24**	**18.8**	**7.5**	**9.3**	**24.3**

		BI-WQ-03				BI-WQ-04				BI-WQ-05			
Analyte	Units	Summer 2020	Fall 2020	Winter 2021	Spring 2021	Summer 2020	Fall 2020	Winter 2021	Spring 2021	Summer 2020	Fall 2020	Winter 2021	Spring 2021
Chlorophyll, active	µg/L	**16.6**	**3.9**	**13.7**	**7.7**	**14.3**	**2.6**	**11.7**	**6.5**	**13.4**	**2.5**	**13.5**	**7.3**
Phaeophytin *a*	µg/L	**3.6**	**1.7**	**2.0**	**1.5**	**3.2**	**1.2**	**1.8**	**1.3**	**3.1**	**1.2**	**2.0**	**2.3**
Chlorophyll *a*	µg/L	**18.7**	**4.8**	**14.9**	**8.6**	**16.1**	**3.2**	**12.7**	**7.3**	**15.2**	**3.2**	**14.6**	**8.6**
Dissolved organic carbon	mg/L	**4.53**	**3.57**	**4.03**	**3.38**	**4.25**	**3.68**	**3.42**	**3.52**	**3.74**	**3.58**	**3.67**	**3.63**
Organic nitrogen	mg/L	**0.47**	**0.36**	**0.35**	**0.22**	**0.38**	**0.30**	**0.26**	**0.26**	**0.36**	**0.32**	**0.27**	**0.27**
Organic phosphorus	mg/L	**0.019**	**0.018**	**0.009**	**0.010**	**0.016**	**0.011**	**0.002**	**0.014**	**0.022**	**0.011**	**0.003**	**0.010**
Ammonium	mg/L	**0.011**	0.009 U	**0.019**	0.009 U	**0.029**	0.009 U	0.009 U	**0.022**	0.009 U	0.009 U	**0.01**	**0.009**
Nitrite	mg/L	**0.002**	**0.002**	**0.004**	**0.005**	**0.002**	**0.003**	**0.005**	**0.005**	**0.002**	**0.002**	**0.005**	**0.006**
Nitrite + nitrate	mg/L	**0.012**	**0.012**	**0.136**	**0.088**	**0.059**	**0.014**	**0.136**	**0.097**	**0.019**	**0.005**	**0.128**	**0.085**
Particulate carbon	mg/L	**2.27**	**0.841**	**1.93**	**1.27**	**1.83**	**0.614**	**1.86**	**0.898**	**1.86**	**0.588**	**1.85**	**1.3**
Particulate nitrogen	mg/L	**0.42**	**0.15**	**0.25**	**0.21**	**0.34**	**0.11**	**0.24**	**0.15**	**0.34**	**0.11**	**0.24**	**0.22**
Orthophosphate	mg/L	**0.0037**	**0.0049**	0.0034 U	**0.015**	**0.0048**	0.0034 U	0.0034 U	**0.014**	0.0034 U	0.0034 U	0.0034 U	**0.008**
Particulate phosphorus	mg/L	**0.045**	**0.011**	**0.017**	**0.019**	**0.034**	**0.009**	**0.015**	**0.018**	**0.035**	**0.008**	**0.018**	**0.023**
Total dissolved nitrogen	mg/L	**0.49**	**0.38**	**0.50**	**0.32**	**0.47**	**0.32**	**0.40**	**0.38**	**0.39**	**0.33**	**0.41**	**0.36**
Total dissolved phosphorus	mg/L	**0.022**	**0.023**	**0.013**	**0.025**	**0.021**	**0.014**	**0.005**	**0.028**	**0.025**	**0.014**	**0.006**	**0.018**

		BI-WQ-03				BI-WQ-04				BI-WQ-05			
Analyte	**Units**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**
Total nitrogen	mg/L	**0.75**	**0.44**	**0.59**	**0.47**	**0.65**	**0.40**	**0.56**	**0.51**	**0.60**	**0.39**	**0.62**	**0.66**
Total phosphorus	mg/L	**0.057**	**0.028**	**0.021**	**0.025**	**0.049**	**0.024**	**0.021**	**0.034**	**0.047**	**0.023**	**0.023**	**0.055**
Total suspended solids	mg/L	**39.2**	**13.75**	**11.5**	**27**	**26.8**	**8.75**	**10**	**33.8**	**30**	**8.5**	**12.2**	**146.2**

		BI-WQ-06				BI-WQ-07				BI-WQ-08			
Analyte	**Units**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**
Chlorophyll, active	µg/L	**14.4**	**3.3**	**10.1**	**77.1**	**14.9**	**4.7**	**11.2**	**6.3**	**13.8**	**2.8**	**12.5**	**7.1**
Phaeophytin *a*	µg/L	**3.8**	**1.3**	**1.3**	**32.2**	**4.9**	**2.0**	**1.7**	**1.7**	**3.7**	**1.2**	**1.8**	**2.0**
Chlorophyll *a*	µg/L	**16.5**	**4.0**	**10.9**	**94.9**	**17.6**	**5.8**	**12.2**	**7.2**	**15.9**	**3.5**	**13.5**	**8.1**
Dissolved organic carbon	mg/L	**4.11**	**3.57**	**3.86**	**3.93**	**4.35**	**4.09**	**3.51**	**3.27**	**3.39**	**3.7**	**3.38**	**3.34**
Organic nitrogen	mg/L	**0.39**	**0.31**	**0.30**	**0.30**	**0.43**	**0.32**	**0.28**	**0.27**	**0.37**	**0.31**	**0.29**	**0.27**
Organic phosphorus	mg/L	**0.013**	**0.009**	**0.008**	**0.019**	**0.016**	**0.013**	**0.005**	**0.013**	**0.012**	**0.010**	**0.005**	**0.012**
Ammonium	mg/L	0.009 U	0.009 U	**0.016**	**0.027**	0.009 U	**0.01**	**0.018**	**0.009**	0.009 U	0.009 U	0.009 U	**0.015**
Nitrite	mg/L	**0.002**	**0.003**	**0.004**	**0.008**	**0.002**	**0.003**	**0.005**	**0.005**	**0.002**	**0.005**	**0.005**	**0.006**
Nitrite + nitrate	mg/L	**0.008**	**0.017**	**0.102**	**0.074**	**0.007**	**0.008**	**0.123**	**0.059**	**0.008**	**0.014**	**0.142**	**0.082**
Particulate carbon	mg/L	**2.08**	**0.76**	**1.54**	**22**	**2.46**	**0.977**	**1.6**	**1.22**	**2.02**	**0.646**	**1.92**	**1.21**
Particulate nitrogen	mg/L	**0.40**	**0.13**	**0.21**	**3.20**	**0.44**	**0.15**	**0.21**	**0.21**	**0.38**	**0.12**	**0.24**	**0.20**
Orthophosphate	mg/L	0.0034 U	0.0034 U	0.0034 U	**0.0481**	0.0034 U	0.0034 U	0.0034 U	**0.0192**	0.0034 U	0.0034 U	0.0034 U	**0.0066**
Particulate phosphorus	mg/L	**0.041**	**0.011**	**0.015**	**0.240**	**0.042**	**0.012**	**0.014**	**0.022**	**0.039**	**0.009**	**0.017**	**0.025**
Total dissolved nitrogen	mg/L	**0.41**	**0.34**	**0.42**	**0.40**	**0.45**	**0.34**	**0.42**	**0.34**	**0.39**	**0.33**	**0.44**	**0.37**

Analyte	Units	BI-WQ-06				BI-WQ-07				BI-WQ-08			
		Summer 2020	Fall 2020	Winter 2021	Spring 2021	Summer 2020	Fall 2020	Winter 2021	Spring 2021	Summer 2020	Fall 2020	Winter 2021	Spring 2021
Total dissolved phosphorus	mg/L	**0.016**	**0.013**	**0.012**	**0.067**	**0.019**	**0.016**	**0.008**	**0.032**	**0.016**	**0.014**	**0.008**	**0.019**
Total nitrogen	mg/L	**0.76**	**0.42**	**0.59**	**1.57**	**0.79**	**0.47**	**0.61**	**0.51**	**0.65**	**0.40**	**0.60**	**0.51**
Total phosphorus	mg/L	**0.054**	**0.032**	**0.025**	**0.146**	**0.057**	**0.026**	**0.024**	**0.032**	**0.051**	**0.023**	**0.024**	**0.033**
Total suspended solids	mg/L	**60.8**	**12.5**	**11.8**	**2,405**	**40**	**14.5**	**13**	**39**	**42.5**	**10.75**	**14.7**	**54.5**

Analyte	Units	BI-WQ-09				BI-WQ-10			
		Summer 2020	Fall 2020	Winter 2021	Spring 2021	Summer 2020	Fall 2020	Winter 2021	Spring 2021
Chlorophyll, active	µg/L	**18.4**	**2.9**	**13.1**	**7.5**	**15.5**	**2.9**	**11.6**	**6.5**
Phaeophytin *a*	µg/L	**4.4**	**1.3**	**1.7**	**1.7**	**3.5**	**1.2**	**1.7**	**1.8**
Chlorophyll *a*	µg/L	**20.9**	**3.6**	**14.1**	**8.5**	**17.5**	**3.5**	**12.5**	**7.5**
Dissolved organic carbon	mg/L	**4.27**	**3.63**	**3.41**	**3.47**	**3.7**	**3.75**	**3.58**	**3.42**
Organic nitrogen	mg/L	**0.41**	**0.31**	**0.28**	**0.27**	**0.39**	**0.32**	**0.29**	**0.28**
Organic phosphorus	mg/L	**0.017**	**0.010**	**0.006**	**0.013**	**0.016**	**0.009**	**0.005**	**0.011**
Ammonium	mg/L	0.009 U	0.009 U	0.009 U	**0.016**	0.009 U	0.009 U	**0.01**	**0.025**
Nitrite	mg/L	**0.003**	**0.010**	**0.005**	**0.006**	**0.002**	**0.002**	**0.005**	**0.006**
Nitrite + nitrate	mg/L	**0.016**	**0.017**	**0.131**	**0.071**	**0.006**	**0.008**	**0.111**	**0.070**
Particulate carbon	mg/L	**2.72**	**0.619**	**1.88**	**1.02**	**2.05**	**0.616**	**1.67**	**1.04**
Particulate nitrogen	mg/L	**0.56**	**0.11**	**0.24**	**0.18**	**0.38**	**0.14**	**0.22**	**0.18**
Orthophosphate	mg/L	**0.0049**	0.0034 U	0.0034 U	**0.0066**	0.0034 U	0.0034 U	0.0034 U	**0.0074**
Particulate phosphorus	mg/L	**0.070**	**0.011**	**0.019**	**0.024**	**0.038**	**0.007**	**0.014**	**0.023**
Total dissolved nitrogen	mg/L	**0.43**	**0.34**	**0.42**	**0.36**	**0.40**	**0.34**	**0.41**	**0.38**

Analyte	Units	BI-WQ-09				BI-WQ-10			
		Summer 2020	Fall 2020	Winter 2021	Spring 2021	Summer 2020	Fall 2020	Winter 2021	Spring 2021
Total dissolved phosphorus	mg/L	**0.022**	**0.013**	**0.009**	**0.019**	**0.020**	**0.013**	**0.008**	**0.019**
Total nitrogen	mg/L	**0.83**	**0.39**	**0.64**	**0.52**	**0.68**	**0.39**	**0.53**	**0.52**
Total phosphorus	mg/L	**0.070**	**0.024**	**0.027**	**0.032**	**0.053**	**0.027**	**0.023**	**0.034**
Total suspended solids	mg/L	**43**	**11.5**	--R	**42.8**	**37**	**10**	**12.2**	**40.7**

Notes:

Bold cells are detected constituents.

R: Poor replication between pads; sample rejected because the difference is greater than 50%.

U: compound not detected

MDNR has a CBWQM that has routinely sampled year-round in the Chesapeake Bay since 1985 and in the Coastal Bays since 1999. Five years of water quality data (2016 to 2020) from the CBWQM were summarized for the fixed monitoring station closest to Barren Islands (Station CB5.1; MDNR 2021). Station CB5.1 is located in the Mid-Chesapeake Bay, west of Barren Island in approximately 34.7 meters (114 feet) of water. The most recent 5 years of surface (14 feet) water quality data at Station CB5.1 were chosen as a representative comparison to existing seasonal conditions because these samples most closely resemble the conditions of the sampling locations conducted at Barren Island. Means and ranges for physical water quality parameters and nutrients are presented in Tables 3-3 and 3-4, respectively, and are used for comparisons to the existing conditions.

Overall, the seasonal physical in situ water quality and nutrient parameters measured at the islands were similar to and typical of conditions in shallow, mesohaline areas of the middle portion of the Chesapeake Bay (with the exception of BI-WQ-06 during the spring season, as previously noted). Seasonal patterns of water quality and nutrient parameters measured at Barren Island were similar to seasonal distributions at CBWQM Station CB5.1. Additionally, the range in values for both the water quality parameters and nutrient concentrations were similar to the ranges measured at CBWQM Station CB5.1 from 2016 to 2020. Turbidity measurements were not collected at CB5.1 during the dates that coincide with the quarterly sampling at the islands, so comparisons to this data are not possible.

Table 3-3
Average and Range of Water Quality Variables at CBWQM Station CB5.1 (2016–2020)

		Sample Season[a]			
Analyte	**Units**	**Summer (August)**	**Fall (October)**	**Winter (March)**	**Spring (May)**
Temperature	°C	27.2 (24.8–29.1)	20.6 (19.6–21.6)	6.3 (5–8)	17.7 (14.7–20.5)
DO	mg/L	7.1 (4.2–9.3)	8.7 (6.8–10.1)	12.4 (12–12.8)	9.1 (7.5–10.1)
Salinity	ppt	12.6 (7.6–16.8)	15.0 (8.2–17.9)	12.0 (8.6–13.9)	10.4 (6.5–12.7)
pH	su	8.1 (7.7–8.4)	8.0 (7.8–8.2)	8.2 (8.0–8.4)	8.1 (7.8–8.5)
Secchi depth	ft	4.1 (2.6–5.2)	3.9 (2.6–4.9)	6.7 (5.2–7.9)	5.9 (3.3–9.2)

Note:
a. The value provided is the calculated average. The full range of results is provided in parentheses.

Table 3-4
Average and Range of Nutrient Concentrations at CBWQM Station CB5.1 (2016–2020)

Analyte	Units	Sample Season[a]			
		Summer (August)	Fall (October)	Winter (March)	Spring (May)
Phaeophytin *a*	µg/L	1.8 (0.36–3.9)	2.8 (1.5–4.2)	1.1 (0.74–1.7)	0.73 (0.67–0.77)
Chlorophyll *a*	µg/L	11 (7.1–17.5)	12.4 (8.9–15)	8.3 (6.1–9.6)	5 (3.4–7.9)
Particulate carbon	mg/L	1.4 (0.84–1.9)	1.2 (0.93–1.4)	0.89 (0.68–1.1)	0.87 (0.61–1.2)
Organic nitrogen	mg/L	0.51 (0.39–0.62)	0.49 (0.46–0.56)	0.41 (0.32–0.48)	0.39 (0.34–0.43)
Organic phosphorus	mg/L	0.01 (0.006–0.02)	0.013 (0.009–0.017)	0.003 (0.0007–0.005)	0.005 (0.002–0.01)
Ammonium	mg/L	0.009 (0.002–0.016)	0.01 (0.007–0.013)	0.01 (0.006–0.013)	0.023 (0.008–0.048)
Nitrite	mg/L	0.006 (0.0003–0.05)	0.024 (0.001–0.062)	0.005 (0.005–0.006)	0.007 (0.005–0.009)
Nitrite + nitrate	mg/L	0.028 (0.001–0.11)	0.14 (0.002–0.4)	0.38 (0.26–0.66)	0.28 (0.19–0.58)
Particulate nitrogen	mg/L	0.22 (0.17–0.29)	0.21 (0.17–0.25)	0.13 (0.11–0.16)	0.15 (0.11–0.2)
Orthophosphate	mg/L	0.005 (0.002–0.011)	0.004 (0.002–0.005)	0.003 (0.003–0.004)	0.003 (0.002–0.003)
Particulate phosphorus	mg/L	0.02 (0.014–0.025)	0.018 (0.013–0.025)	0.008 (0.007–0.009)	0.01 (0.007–0.016)
Total dissolved nitrogen	mg/L	0.33 (0.28–0.43)	0.42 (0.31–0.72)	0.64 (0.49–1)	0.54 (0.42–0.81)
Total dissolved phosphorus	mg/L	0.016 (0.009–0.031)	0.016 (0.013–0.019)	0.006 (0.005–0.006)	0.007 (0.005–0.012)
Total nitrogen	mg/L	0.55 (0.46–0.72)	0.65 (0.48–1)	0.78 (0.64–1.1)	0.7 (0.58–1)
Total phosphorus	mg/L	0.035 (0.027–0.045)	0.034 (0.026–0.041)	0.014 (0.012–0.015)	0.017 (0.013–0.027)
Total suspended solids	mg/L	5.8 (3–11.2)	7.6 (4.3–11.6)	4.9 (2.8–9.1)	3.6 (2.4–4.5)

Note:
a. The value provided is the calculated average. The full range of results is provided in parentheses.

3.2 Benthic Community

Benthic sampling was conducted in summer 2020, fall 2020, and spring 2021 at 10 locations in the vicinity of Barren Island and at one reference location (Figure 2-4). A complete description of benthic sampling locations, sample dates, and measured water quality parameters is provided in Table 3-5.

3.2.1 Habitat Classification

Sediment was also collected during the summer 2020 sampling event for grain size and total organic carbon content determination. Results of the grain size and total organic carbon analyses are provided in Table 3-6. The sampling locations at Barren Island were predominantly sand, with 8 of the 10 sampling locations composed of more than 50% sand. Sampling locations BI-BC-06 and BI-BC-10 were predominantly silts and clays, which composed 72.9% and 66.6% of the samples, respectively. The Barren Island reference location was also predominantly sand (94.9%; Table 3-6).

The bottom salinities measured at all Barren Island benthic sampling locations during the summer, fall, and spring sampling events were greater than 12 ppt (Table 3-5); therefore, each of the Barren Island benthic sampling locations were classified as high mesohaline. The only exception to this is sampling location BI-BC-10 during the spring sampling event, which had a measured bottom salinity of 11.4 ppt. Therefore, this one location was classified as low mesohaline.

Table 3-5
Barren Island Benthic Community Sample Locations and Water Quality Parameters

Season	Sample ID	Date	Time	Northing	Easting	Water Depth (feet)	Temp (°C)	DO (mg/L)	Salinity (ppt)	pH	Turbidity (NTU)
Summer	BI-BC-01	8/26/2020	1220	245305.87	1522029.64	11.2	27.4	7.1	13	8.5	16.9
	BI-BC-02	8/26/2020	1443	240155.05	1521885.92	8.0	27.7	7.3	13	8.5	6
	BI-BC-03	8/26/2020	1320	241316.71	1524298.52	7.2	27.5	7.3	13.2	8.4	17.6
	BI-BC-04	8/28/2020	837	236461.35	1526353.50	7.1	27.5	6.9	13.6	8.3	5.9
	BI-BC-05	8/27/2020	1438	234732.89	1528795.46	6.0	28.2	7.7	14.1	8.4	14.6
	BI-BC-06	8/26/2020	1038	246921.70	1524532.64	3.5	27.3	7.1	13.3	8.2	42.1
	BI-BC-07	8/28/2020	1027	246299.99	1527500.59	4.7	27.1	6.8	13.4	8.3	22.1
	BI-BC-08	8/27/2020	932	240933.53	1527477.12	4.3	27.1	7.2	13.4	8.1	22.7
	BI-BC-09	8/27/2020	1052	239083.46	1527627.80	5.4	27.5	7.4	13.4	8.2	17.2
	BI-BC-10	8/27/2020	1212	237881.93	1530355.51	5.8	27.6	7.6	13.8	8.3	9.4
	BI-BC-REF	8/27/2020	1322	228058.40	1531513.66	7.4	27.6	7.7	15	8.3	13.2
Fall	BI-BC-01	10/23/2020	1325	245439.14	1522135.82	11.0	20.1	8.5	16.3	8.2	3.5
	BI-BC-02	10/23/2020	1228	240185.34	1521865.67	8.0	20.2	9	16.5	8.2	0.9
	BI-BC-03	10/22/2020	1445	241374.89	1524324.90	8.0	19.7	8.8	16	8.2	5.7
	BI-BC-04	10/23/2020	1120	236434.94	1526303.41	7.5	20.1	8.3	15.7	8.2	1.9
	BI-BC-05	10/23/2020	936	234742.49	1528732.41	6.0	19.7	8.3	15.7	8.1	1.7
	BI-BC-06	10/22/2020	1255	246996.96	1524506.69	2.0	20.2	8	15.5	8.0	4.6
	BI-BC-07	10/21/2020	1454	246310.23	1527516.04	4.0	20.5	8.7	15.5	8.1	10.8
	BI-BC-08	10/22/2020	851	240983.17	1527437.33	2.0	19.2	8.3	15.7	8.1	3.3
	BI-BC-09	10/22/2020	925	239083.02	1527624.61	4.0	19.4	8.5	15.9	8.1	3.3
	BI-BC-10	10/23/2020	1039	237854.77	1530313.81	5.0	19.7	8.2	15.6	8.1	2.6
	BI-BC-REF	10/23/2020	845	228064.15	1531499.73	8.0	19.6	8.5	16	8.1	1.4

Season	Sample ID	Date	Time	Northing	Easting	Water Depth (feet)	Temp (°C)	DO (mg/L)	Salinity (ppt)	pH	Turbidity (NTU)
Spring	BI-BC-01	5/26/2021	740	245438.98	1522115.74	14.0	21.2	7.6	13.0	7.7	15.2
	BI-BC-02	5/26/2021	945	240216.89	1521889.57	9.5	21.5	7.8	13.0	7.7	6.7
	BI-BC-03	5/26/2021	845	241360.93	1524336.48	8.4	21.4	7.6	13.0	7.7	14.1
	BI-BC-04	5/26/2021	1055	236470.45	1526291.17	7.9	21.6	7.9	13.0	7.8	6.2
	BI-BC-05	5/26/2021	1235	234762.61	1528682.10	6.8	22.3	8.2	13.1	7.8	15.5
	BI-BC-06	5/24/2021	1545	247052.17	1524466.97	4.2	21.8	8.2	12.5	7.9	8.5
	BI-BC-07	5/24/2021	1439	246298.28	1527453.43	6.0	23.1	7.9	12.8	7.8	7.4
	BI-BC-08	5/25/2021	1315	240989.94	1527484.86	3.5	21.4	8.1	12.8	7.8	11.2
	BI-BC-09	5/25/2021	1405	239146.59	1527703.15	5.8	21.4	8.4	12.9	7.9	11.2
	BI-BC-10	5/25/2021	1540	237928.74	1530340.05	10.4	20.6	8.8	11.4	8.2	1.0
	BI-BC-REF	5/26/2021	1400	228075.85	1531519.41	8.2	21.3	9.2	12.3	8.3	3.1

Table 3-6
Barren Island Sediment Sample Results

Analyte	Units	Barren Island										
		BI-BC-REF	BI-BC-01	BI-BC-02	BI-BC-03	BI-BC-04	BI-BC-05	BI-BC-06	BI-BC-07	BI-BC-08	BI-BC-09	BI-BC-10
Gravel	%	0	0	0	0	0.3	0.9	0	0	0	0	0.4
Sand	%	94.9	84.2	94.5	96.3	94.2	90.7	27.1	54.5	51.4	92.8	33.1
Silt	%	3.3	9.8	4.1	1.7	4.1	5.9	18.5	37.3	44.6	5.1	61.3
Clay	%	1.9	6	1.4	2.1	1.3	2.6	54.4	8.2	4	2.1	5.3
Percent moisture	%	28.2	25.7	20.9	25.5	23.6	26.8	32.1	33.2	31.7	28.8	32.3
Total organic carbon	mg/kg	1,100	1,200	1,300	1,300	1,300	2,400	1,100	5,400	2,700	1,200	2,400

3.2.2 Benthic Community Metrics

A taxonomic list and abundance (number per m^2) of the benthic fauna collected at the Barren Island benthic sampling locations during the summer 2020, fall 2020, and spring 2021 sampling events are provided in Tables 3-7 through 3-9, respectively. A list of the benthic fauna collected in individual replicates collected at each location is provided in Appendix A.

A total of 33 unique benthic taxa were collected during the summer sampling event (Table 3-7), 34 unique taxa were collected during the fall sampling event (Table 3-8), and 53 unique taxa were collected during the spring sampling event (Table 3-9). Bivalves (specifically mollusk [*Ameritella mitchelli*], amethyst gem clam [*Gemma gemma*], and dwarf surf clam [*Mulinia lateralis*]) and polychaetes (specifically pile worm [*Alitta succinea*] and *Mediomastus ambiseta*) were the dominant taxa during the summer sampling event (Table 3-7). During the fall sampling event, the bivalve mollusk was the dominant taxa at 9 of the 10 benthic community sampling locations and the reference location. The dominant taxon in the remaining benthic community sampling location was also a bivalve, amethyst gem clam (Table 3-8). The most dominant species identified during both the summer and fall sampling events was the bivalve mollusk, representing 25% and 38% of the total count of benthic invertebrate taxa, respectively. In the spring sampling event, bivalves (specifically amethyst gem clam and dwarf surf clam) were also the dominant species at 9 of the 10 benthic community sampling locations and the reference location. The dominant taxon in the remaining benthic community sampling location was a polychaete (*Mediomastus ambiseta*; Table 3-9).

Six metrics were used to describe the overall characteristics of the benthic community at Barren Island—total abundance, unique taxa collected, species richness, evenness, Simpson's Dominance Index, and the Shannon-Wiener Diversity Index. These results are presented in Table 3-10 for all sampling events.

Abundance ranged from 1,818 to 9,517 organisms per m^2 in the summer, from 1,537 to 8,598 organisms per m^2 in the fall sampling event, and from 1,244 to 8,235 organisms per m^2 in the spring sampling event. The total abundance at the reference site was 1,920; 1,569; and 1,244 organisms per m^2 in the summer, fall, and spring sampling events, respectively (Table 3-10). The reference location consistently had the lowest or close to the lowest abundance of all locations during all sampling events.

The number of unique taxa at each benthic sample locations ranged from 9 to 15 taxa during the summer sampling event, from 8 to 18 taxa during the fall sampling event, and from 16 to 35 taxa during the spring sampling event. There was generally little change in the number of unique taxa at a location between the summer and fall events; however, higher numbers of unique taxa were documented during the spring sampling event. There were 10 unique taxa at the reference site during both the summer and fall sampling events and 16 unique taxa during the spring sampling event. The reference location consistently had the lowest numbers of unique taxa for all sampling locations during all sampling events (Table 3-10).

Species richness is a comparison of how many taxa are in a sample compared to how many individuals (Equation 2-3). Lower values indicate that the total benthic abundance at a location is dominated by a few taxa and does not represent a diverse benthic community. Species richness values ranged from 1.8 to 2.8 during the summer sampling event, from 1.7 to 2.8 during the fall sampling event, and from 2.3 to 3.7 during the spring sampling event. The species richness value at the reference site was 2.0 for summer and fall and increased to 2.4 during the spring sampling event. The reference location consistently had among the lowest species richness values of all locations during all sampling events (Table 3-10).

Evenness is a measure of how evenly the individuals collected at a location are distributed among the taxa collected at that location (Equation 2-4), with a maximum value of 1 indicating that the individuals are distributed as evenly as possible. Evenness values ranged from 0.6 to 0.8 during all sampling events. With the exception of BI-BC-09, evenness results either decreased or remained the same at all benthic community sampling locations. Evenness values at the reference site were 0.8, 0.5, and 0.8 for summer, fall, and spring, respectively. Generally, the reference site evenness values were similar to, or slightly greater than, the evenness values measured at the Barren Island locations (Table 3-10).

The Shannon-Wiener Species Diversity Index considers species richness and species evenness (Equation 2-1), with greater values indicating a more diverse benthic community. Shannon-Wiener Species Diversity Indices ranged from 1.6 to 2.0 during the summer sampling event, from 1.3 to 1.9 during the fall sampling event, and from 1.5 to 2.2 during the spring sampling event. Shannon-Wiener Species Diversity Indices at the reference site were 1.8,1.1, and 1.8 for summer, fall, and spring, respectively. The reference site Shannon-Weiner Species Diversity Indices measured at the reference site were within the range of values measured at the sampling locations (Table 3-10).

Simpson's Dominance Index measures the diversity of a sample, with a lower value indicating a more diverse community (Equation 2-2). Simpson's Dominance Indices ranged from 0.2 to 0.3 during the summer sampling event, from 0.2 to 0.4 during the fall sampling event, and from 0.1 to 0.4 during the spring sampling event. Simpson's Dominance Indices at the reference site were 0.2, 0.5, and 0.2 for summer, fall, and spring, respectively (Table 3-10). All values indicate that the benthic communities present at the reference and sampling locations are diverse.

Results for all benthic community metrics measured at the Barren Island benthic community sampling locations were within the range of metrics measured at the Barren Island reference site for all sampling events. Additionally, the high evenness and Shannon-Wiener Species Diversity Indices and low Simpson’s Dominance Indices indicate that the benthic community surrounding Barren Island is a diverse community.

Table 3-7
Barren Island Benthic Community Data: Summer 2020

Species Collected		Abundance (Organisms/m^2)										
Scientific Name	**Common Name**	**BI-BC-REF**	**BI-BC-01**	**BI-BC-02**	**BI-BC-03**	**BI-BC-04**	**BI-BC-05**	**BI-BC-06**	**BI-BC-07**	**BI-BC-08**	**BI-BC-09**	**BI-BC-10**
Alitta succinea	Pile worm	51	57	19	6	64	166	**568**	153	57	57	147
Americamysis almyra	Mysid shrimp	64	32	45	6	13	153	0	38	115	64	51
Ameritella mitchelli	Mollusk	549	**919**	306	**989**	970	**772**	485	976	1,652	663	1926
Ameroculodes spp. Complex	Amphipod	0	0	0	0	6	0	6	0	6	0	0
Amphibalanus improvisus	Bay barnacle	0	6	0	0	0	26	0	0	6	0	0
Amphiporus bioculatus	Round worm	0	0	0	0	0	0	0	0	0	6	0
Carcinoma tremaphoros	Round worm	0	6	19	0	6	6	6	0	0	0	0
Cyathura polita	Isopod	0	13	0	0	0	6	26	96	19	6	0
Cyclaspis varians	Copepod	0	0	0	0	0	0	6	0	0	0	13
Fragilonemertes rosea	Rose worm	38	6	32	26	26	6	0	0	0	13	0
Gemma gemma	Amethyst gem clam	0	319	**772**	313	**1,059**	689	0	0	0	498	0
Glycera dibranchiata	Bloodworm	0	0	0	0	0	6	0	0	0	0	0
Glycinde multidens	Segmented worm	128	230	51	108	115	134	38	651	740	147	995
Haminella solitaria	Gastropod	0	0	0	0	6	6	0	6	13	13	6
Heteromastus filiformis	Bristle worm	83	376	57	115	249	115	0	408	262	96	166
Hypereteone heteropoda	Paddleworm	0	0	0	0	0	0	0	0	0	0	6
Japonactaeon punctostriatus	Pitted baby-bubble	64	26	13	51	159	32	0	57	51	19	440
Leitoscoloplos fragilis	Segmented worm	0	0	6	0	0	0	0	0	0	0	0
Lepidactylus dytiscus	Amphipod	0	0	0	0	0	0	0	0	0	6	0
Limecola petalum	Bivalve	0	0	0	0	0	0	0	13	6	0	0
Loimia medusa	Spaghetti worm	6	0	0	0	6	6	0	0	0	0	0
Marenzelleria viridis	Segmented worm	0	26	45	6	19	32	0	555	6	6	83
Mediomastus ambiseta	Segmented worm	32	332	6	70	128	70	32	**1,505**	338	19	**3,827**
Mulinia lateralis	Dwarf surf clam	**651**	300	364	383	236	721	134	274	**1,977**	**1,033**	1,703
Paraprionospio alata	Segmented worm	0	19	0	0	0	0	0	32	0	0	26
Parvilucina crenella	Many-lined lucine	13	0	0	0	0	0	0	0	0	0	0
Petricolaria pholadiformis	False angel wing	0	0	0	0	0	0	121	0	0	0	0
Polydora cornuta	Whip mudworm	0	0	0	0	13	0	26	0	0	0	0
Siphonenteron bicolour	Round worm	0	0	0	6	6	0	0	38	0	0	0
Streblospio benedicti	Ram's horn worm	242	70	140	51	70	108	370	134	70	26	121
Stylochus ellipticus	Flatworm	0	0	6	0	0	6	0	0	0	0	0
Tagelus plebeius	Stout razor clam	0	0	6	0	19	6	0	0	13	6	0
Tubificoides spp.	Segmented worms	0	45	0	0	13	64	0	38	32	0	6

Note:
Bold values represent the dominant species at each location.

Table 3-8
Barren Island Benthic Community Data: Fall 2020

Species Collected		Abundance (Organisms/m^2)										
Scientific Name	**Common Name**	**BI-BC-REF**	**BI-BC-01**	**BI-BC-02**	**BI-BC-03**	**BI-BC-04**	**BI-BC-05**	**BI-BC-06**	**BI-BC-07**	**BI-BC-08**	**BI-BC-09**	**BI-BC-10**
Alitta succinea	Pile worm	0	64	6	6	115	281	13	45	57	32	83
Americamysis almyra	Mysid shrimp	32	6	13	0	13	6	0	6	0	6	6
Ameritella mitchelli	Mollusk	**1,123**	**1,148**	**1,971**	**1,040**	2,666	**2,475**	**663**	**995**	**663**	**1,180**	**2,169**
Ameroculodes spp. Complex	Amphipod	0	0	19	0	0	0	0	0	0	0	0
Amphibalanus improvisus	Bay barnacle	0	6	0	0	0	0	0	0	0	6	0
Carinoma tremaphoros	Round worm	0	0	0	0	19	6	0	6	6	13	0
Cyathura polita	Isopod	0	6	0	0	6	19	0	26	0	6	0
Cyclaspis varians	Copepod	0	6	0	0	6	6	0	0	0	0	0
Eurypanopeus depressus	Flatback mud crab	0	0	0	0	6	0	0	0	0	0	0
Fragilonemertes rosea	Rose worm	19	0	51	38	32	6	0	0	0	0	0
Gemma gemma	Amethyst gem clam	13	1,008	1,493	727	**3,189**	2,335	147	0	6	823	6
Glycinde multidens	Segmented worm	172	427	262	472	644	281	115	300	549	96	1,116
Haminella solitaria	Gastropod	13	0	89	0	0	6	0	0	0	0	0
Hermundura americana	Segmented worm	0	0	0	6	0	0	0	6	0	0	0
Heteromastus filiformis	Bristle worm	26	179	89	57	281	115	19	38	179	108	134
Hypereteone heteropoda	Paddleworm	0	0	0	0	0	0	0	0	0	0	19
Japonactaeon punctostriatus	Pitted baby-bubble	13	51	26	45	217	45	0	0	0	0	166
Leitoscoloplos fragilis	Segmented worm	0	0	13	0	0	0	0	0	0	0	0
Leitoscoloplos robustus	Segmented worm	0	0	0	0	0	0	0	6	0	0	0
Limecola petalum	Bivalve	0	0	0	6	0	0	0	0	0	0	0
Lyonsia hyalina	Mussel	0	0	0	0	6	0	0	0	0	0	0
Marenzelleria viridis	Segmented worm	0	6	6	6	77	19	19	77	6	0	64
Mediomastus ambiseta	Segmented worm	19	364	26	491	542	185	255	108	587	45	1416
Mulinia lateralis	Dwarf surf clam	26	45	13	57	45	108	13	26	134	45	255
Mya arenaria	Soft-shell clam	0	0	0	0	51	26	0	0	0	0	0
Paraonis fulgens	Segmented worm	0	0	13	0	0	0	0	0	0	0	0
Paraprionospio alata	Segmented worm	0	6	0	6	6	6	0	0	0	0	0
Petricolaria pholadiformis	False angel wing	0	0	0	0	0	6	0	0	0	0	0
Polydora cornuta	Whip mudworm	0	0	0	0	13	6	0	0	0	0	0
Siphonenteron bicolour	Round worm	0	0	0	0	13	0	0	0	0	0	0
Streblospio benedicti	Ram's horn worm	51	172	0	51	172	89	51	51	281	108	338
Stylochus ellipticus	Flatworm	6	0	0	0	57	0	0	0	0	0	0
Tagelus plebeius	Stout razor clam	57	115	351	51	344	402	242	0	6	140	19
Tubificoides spp.	Segmented worms	0	26	0	0	77	57	0	0	13	0	6

Note:

Bold values represent the dominant species at each location.

Table 3-9
Barren Island Benthic Community Data: Spring 2021

Species Collected		Abundance (Organisms/m^2)										
Scientific Name	**Common Name**	**BI-BC-REF**	**BI-BC-01**	**BI-BC-02**	**BI-BC-03**	**BI-BC-04**	**BI-BC-05**	**BI-BC-06**	**BI-BC-07**	**BI-BC-08**	**BI-BC-09**	**BI-BC-10**
Acteocina canaliculata	Channeled barrel-bubble	13	115	32	64	26	13	0	0	6	0	19
Alitta succinea	Pile worm	0	0	0	0	0	0	13	13	0	0	13
Americamysis almyra	Mysid shrimp	0	0	0	0	6	0	6	0	0	0	0
Ameritella mitchelli	Mollusk	364	638	198	338	204	204	313	1314	957	325	842
Ameroculodes spp. complex	Amphipod	172	128	230	249	128	45	313	166	0	300	57
Amphibalanus improvisus	Bay barnacle	0	0	0	0	523	64	32	0	580	0	13
Amphiporus bioculatus	Round worm	0	0	0	0	6	0	0	0	0	0	0
Amphiporus caecus	Round worm	0	0	0	0	0	0	19	0	0	0	0
Apocorophium lacustre	Scud	0	0	0	0	102	0	1014	0	77	0	0
Ascidiacea sp.	Sessile tunicate	0	0	0	0	13	0	0	0	0	0	0
Bodotriidae	Cumacea	0	0	0	0	0	0	6	0	0	0	0
Carinoma tremaphoros	Round worm	0	0	0	0	0	6	0	0	0	0	0
Chironomidae larva	Midge	0	0	0	0	0	0	6	0	0	0	0
Cyathura polita	Isopod	0	0	0	6	0	0	6	19	83	0	38
Cyclaspis varians	Copepod	0	0	0	0	6	0	0	19	38	0	6
Edotia triloba	Isopod	6	45	19	19	0	51	204	45	364	13	140
Edwardsia elegans	Burrowing anemone	0	0	0	0	0	0	6	6	0	0	0
Eulimastoma engonium	Needle odostome	0	0	0	0	0	6	0	0	26	0	0
Fragilonemertes rosea	Rose worm	6	13	77	13	6	19	6	6		26	0
Gammarus mucronatus	Scud	0	0	6	0	19	0	51	0	121	6	0
Gemma gemma	Amethyst gem clam	0	**1990**	344	**1046**	**3661**	**1110**	89	0	26	**2315**	19
Geukensia demissa	Ribbed mussel	0	0	0	0	38	0	13	0	0	0	0
Glycinde multidens	Segmented worm	32	140	19	172	77	89	147	836	785	172	861
Grandidierella japonica	Aorid amphipod	0	0	0	0	13	0	338	108	64	0	64
Heteromastus filiformis	Bristle worm	45	217	625	204	236	26	64	32	26	70	45
Hypereteone foliosa	Paddleworm	0	0	6	0	0	0	0	0	0	0	0
Hypereteone heteropoda	Paddleworm	0	45	26	19	51	6	77	13	204	0	64
Idoteidae	Isopod	0	0	0	0	26	0	0	0	0	0	0
Japonactaeon punctostriatus	Pitted baby-bubble	0	0	0	0	0	0	0	0	19	0	19
Leitoscoloplos fragilis	Segmented worm	13	0	70	6	6	0	6	0	0	13	0
Leptocheirus plumulosus	Amphipod	0	70	13	108	6	6	57	1257	89	102	293
Leucon (Leucon) americanus	Cumacea	0	6	0	0	0	0	0	0	0	0	13
Limecola petalum	Bivalve	26	26	0	13	64	102	6	128	957	64	855
Littoridinops tenuipes	Henscomb hydrobe	0	0	0	0	0	0	6	0	0	0	0
Marenzelleria viridis	Segmented worm	57	70	77	57	255	96	26	6		45	13

Species Collected		Abundance (Organisms/m^2)										
Scientific Name	**Common Name**	**BI-BC-REF**	**BI-BC-01**	**BI-BC-02**	**BI-BC-03**	**BI-BC-04**	**BI-BC-05**	**BI-BC-06**	**BI-BC-07**	**BI-BC-08**	**BI-BC-09**	**BI-BC-10**
Mediomastus ambiseta	Segmented worm	38	268	51	83	153	210	179	**3081**	746	128	893
Mulinia lateralis	Dwarf surf clam	**364**	638	**676**	440	153	108	89	351	**989**	191	**1033**
Mya arenaria	Soft-shell clam	6	38	70	0	45	6	45	26	19	0	6
Neomysis americana	Opossum shrimp	0	6	0	13	0	0	0	0	0	0	0
Oedicerotidae	Amphipod	0	0	0	0	0	0	0	0	153	0	0
Paranthus rapiformis	Onion anemone	0	0	0	0	6	0	0	0	0	0	0
Paraonis fulgens	Segmented worm	0	0	57	6	0	0	6	0	0	6	0
Paraprionospio alata	Segmented worm	0	0	0	0	0	0	0	6	0	0	0
Petricolaria pholadiformis	False angel wing	0	0	0	0	0	0	13	0	0	0	0
Platyhelminthes sp. A	Flatworm	0	0	0	0	0	0	0	0	6	0	0
Polydora cornuta	Whip mudworm	0	6	19	0	651	51	689	0	702	0	0
Polydora websteri	Mud blister worm	0	0	0	0	26	0	0	0	6	0	0
Sayella chesapeakea	Sea snail	0	0	0	0	13	0	0	6	32	6	0
Siphonenteron bicolour	Round worm	0	6	0	0	0	0	6	0	0	0	0
Streblospio benedicti	Ram's horn worm	32	147	274	185	344	281	**1046**	759	274	64	389
Stylochus ellipticus	Flatworm	0	0	0	0	6	0	0	0	0	0	6
Tagelus plebeius	Stout razor clam	64	70	38	89	96	19	45	0	0	51	0
Tubificoides spp.	Segmented worms	6	0	32	0	89	19	6	38	26	6	13

Note:
Bold values represent the dominant species at each location.

Table 3-10
Barren Island Benthic Community Metrics

	Barren Island											
	BI-BC-REF			**BI-BC-01**			**BI-BC-02**			**BI-BC-03**		
Metric	**Summer 2020**	**Fall 2020**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Spring 2021**
Total abundance/m^2	1,920	1,569	1,244	2,781	3,636	4,682	1,888	4,440	2,960	2,130	3,062	3,132
Total biomass (g/m^2)	0.5	0.7	3.2	1.1	0.6	4.5	0.6	0.5	0.8	1.0	0.7	3.4
Unique infaunal taxa	10	10	16	14	13	21	12	12	22	10	11	20
Species richness (Ludwig-Reynolds)	2.0	2.0	2.4	2.6	2.3	2.4	2.4	2.0	2.9	1.9	2.1	2.4
Evenness	0.8	0.5	0.8	0.8	0.7	0.7	0.7	0.6	0.8	0.7	0.7	0.8
Shannon-Wiener H' (ln)	1.8	1.1	1.8	2.0	1.9	1.8	1.7	1.4	2.2	1.6	1.7	2.0
Simpson's dominance	0.2	0.5	0.2	0.2	0.2	0.3	0.2	0.3	0.2	0.3	0.2	0.2
Shannon-Wiener H' (log base 2)	2.6	1.6	2.7	2.9	2.7	2.6	2.5	2.1	3.1	2.3	2.4	2.9
Percent abundance pollution-indicative species	46	5.1	34	12	6.1	17	27	0.7	35	20	3.0	21

	Barren Island											
	BI-BC-REF			BI-BC-01			BI-BC-02			BI-BC-03		
Metric	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021
Percent biomass pollution-indicative species	38	20	33	60	29	65	42	26	7.9	55	45	63
Percent abundance pollution-sensitive species	2.0	4.9	13	13	14	10	3.0	8.5	8.2	3.7	17	8.0
Percent biomass pollution-sensitive species	0.6	1.4	1.9	2.2	8.7	1.6	1.9	8.3	4.5	4.1	1.6	2.3
Percent abundance carnivores and omnivores	9.3	11	2.2	13	15	4.2	3.7	6.0	1.8	5.6	14	6.7

	Barren Island											
	BI-BC-04			BI-BC-05			BI-BC-06			BI-BC-07		
Metric	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021
Total abundance/m²	3,183	8,598	7,055	3,132	6,487	2,539	1,818	1,537	4,950	4,975	1,690	8,235
Total biomass (g/m^2)	2.3	0.9	2.9	1.3	0.7	1.6	0.3	0.7	1.2	0.9	3.1	2.5
Unique infaunal taxa	14	18	33	15	15	22	9	8	35	14	9	22
Species richness (Ludwig-Reynolds)	2.6	2.8	2.9	2.8	2.4	2.8	1.9	1.7	3.7	2.4	1.8	2.3
Evenness	0.7	0.6	0.6	0.7	0.6	0.7	0.8	0.7	0.7	0.8	0.6	0.6
Shannon-Wiener H' (ln)	1.9	1.8	1.6	2.0	1.6	1.9	1.7	1.6	2.2	2.0	1.3	1.7
Simpson's dominance	0.2	0.3	0.4	0.2	0.3	0.3	0.2	0.3	0.2	0.2	0.4	0.3
Shannon-Wiener H' (log base 2)	2.7	2.6	2.3	2.9	2.3	2.7	2.4	2.3	3.2	2.9	1.9	2.4
Percent abundance pollution-indicative species	10	2.6	7.2	26	3.2	16	26	3.9	31	8	4.0	16
Percent biomass pollution-indicative species	43	30	48	48	22	39	40	5.1	57	16	2.4	39
Percent abundance pollution-sensitive species	7.1	12	9.0	4.0	10	14	3.6	34	7.9	43	12	45
Percent biomass pollution-sensitive species	5.7	2.5	8.3	3.2	7.9	4.5	11	1.2	4.6	16	62	4.4
Percent abundance carnivores and omnivores	6.6	10	1.9	12	10	4.2	37	11	8.1	19	21	13

	Barren Island								
	BI-BC-08			BI-BC-09			BI-BC-10		
Metric	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021
Total abundance/m²	5,364	2,488	7,374	2,679	2,609	3,904	9,517	5,798	5,715
Total biomass (g/m^2)	0.9	1.4	12.5	0.6	0.7	4.6	1.1	1.5	12.0
Unique infaunal taxa	14	10	27	12	10	19	12	11	24
Species richness (Ludwig-Reynolds)	2.3	1.8	2.8	2.3	1.9	2.3	1.8	1.8	2.4
Evenness	0.6	0.8	0.8	0.7	0.6	0.6	0.7	0.7	0.7
Shannon-Wiener H' (ln)	1.6	1.8	2.2	1.7	1.5	1.5	1.7	1.7	2.0
Simpson's dominance	0.3	0.2	0.1	0.2	0.3	0.4	0.2	0.2	0.2
Shannon-Wiener H' (log base 2)	2.4	2.5	3.2	2.5	2.1	2.1	2.4	2.4	2.9
Percent abundance pollution-indicative species	38	16	20	37	5.4	7.1	19	10	27
Percent biomass pollution-indicative species	37	59	73	30	24	64	34	36	78
Percent abundance pollution-sensitive species	7.3	25	14	1.9	7.0	5.9	40	26	18
Percent biomass pollution-sensitive species	12	2.0	0.3	1.3	1.1	1.0	15	17	0.4
Percent abundance carnivores and omnivores	16	25	16	8.1	5.2	4.7	13	21	19

3.2.3 Chesapeake Bay Benthic Index of Biotic Integrity

The total B-IBI score for each location is derived by averaging individual scores for each metric. A summary of the benthic community metrics and scores used to calculate the Chesapeake Bay B-IBI are presented in Table 3-11. Only species that met the Chesapeake Bay B-IBI macrofaunal criteria (Versar 2002) were included in the calculation. The B-IBI was derived using data for warmer months and is only indicated for the summer season. However, it was calculated for the fall and spring seasons for comparative purposes. Total scores for all but the summer season should be used with caution.

The calculated B-IBI scores were low for all Barren Island benthic locations for summer 2020 and fall 2020, and spring 2021 ranging from 1.8 to 2.9, with three exceptions. High scores occurred at Barren Island locations BI-BC-03 during fall 2020 (total B-IBI score of 3.0), BI-BC-06 during summer 2020 (total B-IBI score of 3.2), and BI-BC-07 during summer 2020 (total B-IBI score of 3.7), each of which was classified as meeting the restoration goal. Location BI-BC-01 received the classification of marginal during the fall and spring sampling events (total B-IBI scores of 2.9 and 2.7 for fall and spring, respectively). During the spring sampling event, three additional locations were classified as marginal (BI-BC-03, BI-BC-05, and BI-BC-09). All remaining samples were classified as either degraded or severely degraded. The Barren Island reference site was also classified as severely degraded during the summer sampling event (total B-IBI score of 1.9) and degraded during the fall and spring sampling events (total B-IBI score of 2.2 and 2.3 for fall and spring, respectively; Table 3-11).

These results were compared to the B-IBI scores calculated from the benthic sampling conducted in 2002 and 2003 and presented in the FS/EIS (USACE 2009). Total B-IBI scores ranged from 2.2 to 5.0 for all locations at Barren Island. The total B-IBI scores calculated for the summer 2002 samples were all greater than 3.0, resulting in the classification of meets restoration goals for all samples (USACE 2009).

Long-term benthic monitoring has also been part of Maryland's Water Quality Monitoring Program for the Chesapeake Bay since 1984. Currently, 48 sites within Chesapeake Bay are monitored annually by the Chesapeake Bay Long-Term Benthic and Assessment Monitoring Program to assess whether the benthic community condition is changing (Versar 2017). Data for 2015 through 2019 were downloaded from the Chesapeake Bay Benthic Monitoring Program website (2020 data were not yet available; Versar 2020) for comparison to the Barren Island benthic community B-IBI calculations. Three high mesohaline sand and one high mesohaline mud locations in the mainstem portion of the Chesapeake Bay are included in the annual Chesapeake Bay Long-Term Benthic and Assessment Monitoring Program. The three high mesohaline sand monitoring locations are located in the Mid-Bay Mainstem (001, 006, and 015), and the high mesohaline mud monitoring location is in the

Upper Bay Mainstem (024). B-IBI calculations for these long-term monitoring locations for 2015 through 2019 are presented in Table 3-12.

The 5-year averages for the B-IBI for the high mesohaline mud monitoring location (024) and two of the high mesohaline mud monitoring locations (001 and 006) all exceed 3.0, meaning they are classified as meets restoration goals. The 5-year average for one high mesohaline mud location (015) is 2.4, resulting in a classification of degraded. Results of the Barren Island B-IBI calculation were generally consistent with long-term monitoring location 015; however, they were less than the results of the remaining Chesapeake Bay long-term benthic monitoring locations.

Table 3-11
Chesapeake Bay B-IBI Scoring for Barren Island Benthic Locations

	Barren Island											
	BI-BC-REF			BI-BC-01			BI-BC-02			BI-BC-03		
Metric	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021
Salinity regime	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)
Shannon-Wiener H' (log base 2)	2.3	1.0	2.3	3.0	3.0	2.3	2.3	1.0	3.7	1.0	2.3	3.0
Total abundance/m²	5.0	4.3	3.0	4.3	3.7	3.0	5.0	2.3	4.3	5.0	3.7	4.3
Biomass/m²	1.0	1.0	3.7	1.0	1.7	5.0	1.0	1.0	1.0	1.7	2.3	4.3
Percent abundance pollution-indicative species	1.0	5.0	1.0	3.7	5.0	3.0	1.7	5.0	1.0	3.0	5.0	3.0
Percent biomass pollution-indicative species	--	--	--	--	--	--	--	--	--	--	--	--
Percent abundance pollution-sensitive species	1.0	1.0	3.0	2.3	3.0	1.7	1.0	1.0	1.7	1.0	3.0	1.7
Percent biomass pollution-sensitive species	--	--	--	--	--	--	--	--	--	--	--	--
Percent abundance carnivores and omnivores	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.7	1.0
B-IBI	1.9	2.2	2.3	2.6	2.9	2.7	2.0	1.9	2.1	2.1	3.0	2.9
Restoration goal	Severely degraded	Degraded	Degraded	Degraded	Marginal	Marginal	Severely degraded	Severely degraded	Degraded	Degraded	Meets restoration goals	Marginal

	Barren Island											
	BI-BC-04			BI-BC-05			BI-BC-06			BI-BC-07		
Metric	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021
Salinity regime	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (mud)	High Mesohaline (mud)	High Mesohaline (mud)	High Mesohaline (mud)	High Mesohaline (mud)	High Mesohaline (mud)
Shannon-Wiener H' (log base 2)	3.0	2.3	1.7	3.0	1.7	3.0	3.0	2.3	4.3	3.0	1.0	3.0
Total abundance/m²	3.7	1.0	1.7	3.7	1.0	5.0	3.7	2.3	3.7	1.7	4.3	1.0
Biomass/m²	1.7	3.0	3.7	1.0	1.7	2.3	3.0	1.0	3.0	5.0	3.0	4.3
Percent abundance pollution-indicative species	4.3	5.0	4.3	1.0	5.0	3.0	--	--	--	--	--	--
Percent biomass pollution-indicative species	--	--	--	--	--	--	4.3	2.3	1.0	5.0	3.7	1.7
Percent abundance pollution-sensitive species	1.7	2.3	1.7	1.0	2.3	2.3	--	--	--	--	--	--
Percent biomass pollution-sensitive species	--	--	--	--	--	--	1.0	1.0	1.0	4.3	1.0	1.0
Percent abundance carnivores and omnivores	1.0	1.0	1.0	1.0	1.0	1.0	4.3	1.7	1.7	3.0	3.7	3.0
B-IBI	2.6	2.4	2.3	1.8	2.1	2.8	3.2	1.8	2.4	3.7	2.8	2.3
Restoration goal	Degraded	Degraded	Degraded	Severely degraded	Degraded	Marginal	Meets restoration goals	Severely degraded	Degraded	Meets restoration goals	Marginal	Degraded

Metric	Barren Island								
	BI-BC-08			BI-BC-09			BI-BC-10		
	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021
Salinity regime	High Mesohaline (mud)	High Mesohaline (mud)	High Mesohaline (mud)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (sand)	High Mesohaline (mud)	High Mesohaline (mud)	Low Mesohaline (mud)
Shannon-Wiener H' (log base 2)	3.0	3.0	5.0	1.7	1.0	1.0	3.0	3.0	3.7
Total abundance/m²	2.3	3.7	1.7	4.3	4.3	3.0	1.0	1.0	1.7
Biomass/m²	3.0	2.3	3.7	1.7	1.7	5.0	3.0	3.0	3.7
Percent abundance pollution-indicative species	--	--	--	1.0	5.0	5.0	--	--	--
Percent biomass pollution-indicative species	1.0	1.7	1.0	--	--	--	1.0	2.3	1.0
Percent abundance pollution-sensitive species	--	--	--	1.0	1.0	1.0	--	--	--
Percent biomass pollution-sensitive species	1.0	1.0	1.0	--	--	--	1.0	1.0	1.0
Percent abundance carnivores and omnivores	3.0	3.7	3.0	1.0	1.0	1.0	2.3	3.0	3.0
B-IBI	2.2	2.6	2.6	1.8	2.3	2.7	1.9	2.2	2.3
Restoration goal	Degraded	Degraded	Degraded	Severely degraded	Degraded	Marginal	Severely degraded	Degraded	Degraded

Notes:
B-IBI Scores: ≥ 3.0 = meets restoration goals; 2.7-2.9 = marginal; 2.1-2.6 = degraded; ≤ 2.0 = severely degraded
--: Metric was not used for this habitat classification

Table 3-12
Chesapeake Bay B-IBI Scores for the Chesapeake Bay High Mesohaline Long-Term Benthic Monitoring Locations

Year	High Mesohaline Sand Monitoring Locations			
	Mid-Bay (Mainstem – 001)	Mid-Bay (Mainstem – 006)	Mid-Bay (Mainstem – 015)	Upper Bay (Mainstem – 024)
2015	3.7 (Meets restoration goals)	3.6 (Meets restoration goals)	2.7 (Marginal)	3.8 (Meets restoration goals)
2016	3.0 (Meets restoration goals)	3.4 (Meets restoration goals)	1.8 (Severely Degraded)	3.1 (Meets restoration goals)
2017	3.3 (Meets restoration goals)	3.0 (Meets restoration goals)	2.48 (Degraded)	3.7 (Meets restoration goals)
2018	3.0 (Meets restoration goals)	3.0 (Meets restoration goals)	2.7 (Marginal)	3.7 (Meets restoration goals)
2019	2.1 (Degraded)	2.4 (Degraded)	2.7 (Marginal)	3.3 (Meets restoration goals)
Average B-IBI for 2015 to 2019	3.0 (Meets restoration goals)	3.1 (Meets restoration goals)	2.4 (Degraded)	3.5 (Meets restoration goals)

Source: Chesapeake Bay Benthic Monitoring Program (Versar 2020)

3.3 Fisheries Surveys

To identify the fish species using the area around Barren Island, a four-season sampling program was implemented including surveys in summer 2020, fall 2020, winter 2021, and spring 2021. Survey sampling techniques include bottom trawling, beach seining, gillnetting, and pop netting. Bottom trawl, beach seine, and gillnet surveys were conducted during all four seasons. The bottom trawl is used to collect data on the benthic fish assemblages and the beach seine provides data on the nearshore fish assemblages and blue crab assemblages. The gillnet surveys were used to collect data on fish assemblages in the offshore water column. Pop netting, which targets fish that use the submerged aquatic vegetation (SAV) beds in the vicinity of Barren Island as habitat, was conducted in summer 2020 and spring 2021.

As expected, sampling data indicated that beach seine surveys detected juvenile fish, while bottom trawl and gillnet surveys detected larger subadult to adult fish, mainly due to juveniles and smaller fish remaining closer to the shore where they are more likely to be captured in a seine net, while larger fish tend to be in deeper water where they are more likely to be captured in a trawl or gillnet. In addition, beach seine surveys generally collected more species than other sampling gear.

3.3.1 Beach Seine Survey Results

A summary of species collected, number of each species collected, and range of sizes collected in beach seines for each sampling season is provided in Table 3-13. Individual lengths for all fish and crab collected are provided in Appendix B. Overall, 22 different species of fish and one invertebrate were collected throughout all four sampling seasons. The fall survey resulted in the greatest number of fish collected, with the lowest abundance and species diversity observed during the winter survey.

At Barren Island, the summer 2020 beach seine sampling produced 14 different species of fish and one species of invertebrate, the blue crab. Bay anchovy (*Anchor mitchilli*) was the most abundant, and Atlantic menhaden (*Brevoortia tyrannus*) and Atlantic silverside (*Menidia menidia*) were also present in high abundances. Other fish collected in significant numbers include silver perch (*Bairdiella chrysoura*) and spot (*Leiostomus xanthurus*). Five or less of each of the following species were also collected during the summer 2020 event (in order of abundance): weakfish (*Cynoscion regalis*), mummichog (*Fundulus heteroclitus*), striped anchovy (*Anchoa hepsetus*), harvest fish (*Peprilus paru*), spotted seatrout (*Bairdiella chrysoura*), blackcheek tonguefish (*Symphurus plagiusa*), cownose ray (*Rhinoptera bonasus*), striped blenny (*Chasmodes bosquianus*), and striped killifish (*Fundulus majalis*).

The fall 2020 beach seine sampling produced 15 different species of fish and two species of invertebrates (blue crab and unknown crab). The Atlantic silverside was the most abundant fish (making up 92% of the total number of fish collected), and bay anchovy, mummichog, juvenile red drum (*Sciaenops ocellatus*), sheepshead minnow (*Cyprinodon variegatus*), and striped killifish were also present in high abundances. Five or less of each of the following species were also collected during the fall 2020 event (in order of abundance): Atlantic menhaden, spot, spotted seatrout, northern kingfish (*Menticirrhus saxatilis*), banded killifish (*Fundulus diaphanous*), inland silverside (*Menidia beryllina*), northern pipefish (*Syngnathus fuscus*), silver perch, and white perch (*Morone americana*).

Five different fish species were collected during the winter 2021 survey. Atlantic silverside was caught in the greatest numbers, but overall abundance was substantially lower than the fall 2020 survey (63 in the winter versus 3,376 in the fall). Five or less of each of the following species were also collected during the winter 2021 event (in order of abundance): striped killifish, bay anchovy, Atlantic menhaden, and gizzard shad (*Dorosoma cepedianum*).

The spring 2021 survey yielded nine fish species and one species of invertebrate (blue crab). Bay anchovy were caught in the greatest abundance, and Atlantic silverside, Atlantic menhaden, mummichog, striped killifish, spot, and white perch were also caught in relative high numbers. Inland silverside and northern pipefish were also caught during the survey.

The beach seine surveys conducted at Barren Island in 2002 to 2003 and presented in the FS/EIS (USACE 2009) found that bay anchovy and Atlantic silverside were generally present in the greatest abundances, similar to the results from the 2020 and 2021 beach seine surveys. Additionally, the list of species collected during the 2002 and 2003 surveys is similar to the species list from the 2020 and 2021 surveys.

Table 3-13
Barren Island Beach Seine Collection Data

Species Collected		Summer Collection				Fall Collection				Winter Collection			
Scientific Name	**Common Name**	**Total Count**	**Minimum Length (mm)**	**Maximum Length (mm)**	**Average Length (mm)**	**Total Count**	**Minimum Length (mm)**	**Maximum Length (mm)**	**Average Length (mm)**	**Total Count**	**Minimum Length (mm)**	**Maximum Length (mm)**	**Average Length (mm)**
Fish													
Brevoortia tyrannus	Atlantic menhaden	78	58	135	101	5	111	153	126	1	104	104	104
Menidia menidia	Atlantic silverside	58	50	92	71	3,376	49	120	88	63	85	124	104
Fundulus diaphanus	Banded killifish	--	--	--	--	1	44	44	44	--	--	--	--
Anchoa mitchilli	Bay anchovy	234	42	77	50	116	48	83	55	3	51	55	54
Symphurus plagiusa	Blackcheek tonguefish	1	135	135	135	--	--	--	--	--	--	--	--
Rhinoptera bonasus	Cownose ray	1	310	310	310	--	--	--	--	--	--	--	--
Dorosoma cepedianum	Gizzard shad	--	--	--	--	--	--	--	--	1	182	182	182
Peprilus paru	Harvest fish	2	110	120	115	--	--	--	--	--	--	--	--
Menidia beryllina	Inland silverside	--	--	--	--	1	36	36	36	--	--	--	--
Menticirrhus saxatilis	Northern kingfish	--	--	--	--	2	91	100	96	--	--	--	--
Fundulus heteroclitus	Mummichog	4	65	88	79	62	45	81	67	--	--	--	--
Syngnathus fuscus	Northern pipefish	--	--	--	--	1	84	84	84	--	--	--	--
Sciaenops ocellatus	Red drum	--	--	--	--	57	37	89	61	--	--	--	--
Cyprinodon variegatus	Sheepshead minnow	--	--	--	--	40	32	50	39	--	--	--	--
Bairdiella chrysoura	Silver perch	12	40	107	77	1	210	210	210	--	--	--	--
Leiostomus xanthurus	Spot	11	119	144	132	4	119	145	135	--	--	--	--
Cynoscion nebulosus	Spotted seatrout	2	95	100	98	3	107	116	113	--	--	--	--
Anchoa hepsetus	Striped anchovy	4	53	98	76	--	--	--	--	--	--	--	--
Chasmodes bosquianus	Striped blenny	1	50	50	50	--	--	--	--	--	--	--	--
Fundulus majalis	Striped killifish	1	95	95	95	12	45	133	86	5	42	99	62
Cynoscion regalis	Weakfish	5	30	53	45	--	--	--	--	--	--	--	--
Morone americana	White perch	--	--	--	--	1	199	199	199	--	--	--	--
Invertebrate													
Callinectes sapidus	Blue crab	59	5	155	73	11	6	82	24	--	--	--	--
--	Crab (unknown)	--	--	--	--	1	16	16	16	--	--	--	--

Species Collected		Spring Collection						
Scientific Name	Common Name	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Minimum Weight (g)	Maximum Weight (g)	Average Weight (g)
Fish								
Brevoortia tyrannus	Atlantic menhaden	101	5	65	42	0.1	1.1	0.5
Menidia menidia	Atlantic silverside	124	63	128	94	1.7	11.8	5.1
Fundulus diaphanus	Banded killifish	--	--	--	--	--	--	--
Anchoa mitchilli	Bay anchovy	319	38	119	57	0.3	2.3	1.0
Symphurus plagiusa	Blackcheek tonguefish	--	--	--	--	--	--	--
Rhinoptera bonasus	Cownose ray	--	--	--	--	--	--	--
Dorosoma cepedianum	Gizzard shad	--	--	--	--	--	--	--
Peprilus paru	Harvest fish	--	--	--	--	--	--	--
Menidia beryllina	Inland silverside	3	56	114	80	1.6	9.6	4.3
Menticirrhus saxatilis	Northern kingfish	--	--	--	--	--	--	--
Fundulus heteroclitus	Mummichog	75	41	106	60	0.9	17.3	3.4
Syngnathus fuscus	Northern pipefish	1	166	166	166	2.0	2.0	2.0
Sciaenops ocellatus	Red drum	--	--	--	--	--	--	--
Cyprinodon variegatus	Sheepshead minnow	--	--	--	--	--	--	--
Bairdiella chrysoura	Silver perch	--	--	--	--	--	--	--
Leiostomus xanthurus	Spot	50	27	50	36	0.1	1.3	0.5
Cynoscion nebulosus	Spotted seatrout	--	--	--	--	--	--	--
Anchoa hepsetus	Striped anchovy	--	--	--	--	--	--	--
Chasmodes bosquianus	Striped blenny	--	--	--	--	--	--	--
Fundulus majalis	Striped killifish	62	46	114	78	1.0	16.4	5.6
Cynoscion regalis	Weakfish	--	--	--	--	--	--	--
Morone americana	White perch	15	132	258	219	28.1	266.1	155.1
Invertebrates								
Callinectes sapidus	Blue crab	1	85	85	85	34.9	34.9	34.9
--	Crab (unknown)	--	--	--	--	--	--	--

3.3.2 Bottom Trawl Survey Results

A summary of species collected, number of each species collected, and range of sizes collected in bottom trawls for each sampling season is provided in Table 3-14. Individual lengths for all fish and crab collected are provided in Appendix B. Overall, seven different species of fish and one invertebrate were collected throughout all four sampling seasons. The spring survey resulted in the greatest number of fish collected. No fish were collected during the winter bottom trawl survey.

During the summer 2020 bottom trawl survey, six fish, including blackcheek tonguefish, spot, and weakfish, and three blue crabs were collected. During the fall 2020 bottom trawl survey, 15 bay anchovies, one gizzard shad, and four blue crabs were collected. The spring 2021 bottom trawl survey yielded both the highest number of species and greatest abundance collected. Seventy bay anchovy, 29 spot, one butterfish (*Peprilus triacanthus*), and one spotted hake (*Urophycis regia*) were collected.

The bottom trawl surveys conducted at Barren Island in 2002 and 2003 and presented in the FS/EIS (USACE 2009) yielded similar results to those presented in this SAR. Similar to the results found in 2020 and 2021, the number of species and abundance of individuals collected during the 2002 and 2003 bottom trawl surveys were substantially less than the results of the beach seine surveys. Additionally, similar to the 2020 and 2021 results, only one fish was collected during the Barren Island bottom trawl 2002 winter survey.

Table 3-14
Barren Island Bottom Trawl Collection Data

Species Collected		Summer Collection				Fall Collection			
Scientific Name	Common Name	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)
Fish									
Anchoa mitchilli	Bay anchovy	--	--	--	--	15	34	63	55
Symphurus plagiusa	Blackcheek tonguefish	3	98	133	119	--	--	--	--
Peprilus triacanthus	Butterfish	--	--	--	--	--	--	--	--
Dorosoma cepedianum	Gizzard shad	--	--	--	--	1	156	156	156
Leiostomus xanthurus	Spot	2	127	132	130	--	--	--	--
Urophycis regia	Spotted hake	--	--	--	--	--	--	--	--
Cynoscion regalis	Weakfish	1	150	150	150	--	--	--	--
Invertebrate									
Callinectes sapidus	Blue crab	3	65	130	91	4	108	130	117

Species Collected		Spring Collection						
Scientific Name	Common Name	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Minimum Weight (g)	Maximum Weight (g)	Average Weight (g)
Fish								
Anchoa mitchilli	Bay anchovy	70	43	80	57	0.3	3.2	1.1
Symphurus plagiusa	Blackcheek tonguefish	--	--	--	--	--	--	--
Peprilus triacanthus	Butterfish	1	90	90	90	10.7	10.7	10.7
Dorosoma cepedianum	Gizzard shad	--	--	--	--	--	--	--
Leiostomus xanthurus	Spot	29	38	180	147.5	0.5	83.6	42.2
Urophycis regia	Spotted hake	1	151	151	151	31.3	31.3	31.3

Species Collected		Spring Collection						
Scientific Name	Common Name	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Minimum Weight (g)	Maximum Weight (g)	Average Weight (g)
Cynoscion regalis	Weakfish	--	--	--	--	--	--	--
Invertebrate								
Callinectes sapidus	Blue crab	1	150	150	150	146.1	146.1	146.1

Notes:
a. No fish were collected in bottom trawls during the winter collection.
--: no data

3.3.3 Gillnet Survey Results

A summary of species collected, number of each species collected, and range of sizes collected in gillnets for each sampling season is provided in Table 3-15. Individual lengths for all fish and crab collected are provided in Appendix B. Overall, 11 different species of fish and one invertebrate were collected throughout all four sampling seasons. The summer 2020 survey resulted in the greatest number of species and greatest abundance of fish collected.

The summer 2020 gill net surveys produced nine different species of fish and one species of invertebrate, the blue crab. Spot and Atlantic menhaden were present in the greatest abundances. Gizzard shad was also collected in significant numbers. Five or less of each of the following species were also collected during the summer 2020 survey (in order of abundance): Spanish mackerel (*Scomberomorus maculatus*), bluefish (*Pomatomus saltatrix*), harvest fish, striped bass (*Morone saxatilis*), northern sand lance (*Ammodytes dubius*), and silver perch.

Only two fish species were collected during the fall 2020 gill net survey: six spot and two gizzard shad. The winter 2021 gill net survey also yielded only two fish species: four Atlantic menhaden and three alewife (*Alosa pseudoharengus*). Three species of fish were collected during the spring 2021 survey: three bluefish, two spot, and one hickory shad (*Alosa mediocris*).

Atlantic menhaden were also the most abundant fish collected at Barren Island during the 2002 and 2003 gill net surveys, in addition to bluefish and alewife (USACE 2009). However, the number of species collected and fish abundance presented in the FS/EIS for the 2002 and 2003 surveys exceeds the number of species and abundance collected as part of the 2020 and 2021 gillnetting surveys.

Table 3-15
Barren Island Gill Net Collection Data

Species Collected		Summer Collection				Fall Collection				Winter Collection			
Scientific Name	Common Name	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)
Fish													
Alosa pseudoharengus	Alewife	--	--	--	--	--	--	--	--	3	287	300	294
Brevoortia tyrannus	Atlantic menhaden	71	104	340	156	--	--	--	--	4	139	302	201
Pomatomus saltatrix	Bluefish	4	303	345	320	--	--	--	--	--	--	--	--
Dorosoma cepedianum	Gizzard shad	13	225	446	360	2	331	355	343	--	--	--	--
Peprilus paru	Harvest fish	2	127	213	170	--	--	--	--	--	--	--	--
Alosa mediocris	Hickory shad	--	--	--	--	--	--	--	--	--	--	--	--
Ammodytes dubius	Northern sand lance	1	805	805	805	--	--	--	--	--	--	--	--
Bairdiella chrysoura	Silver perch	1	196	196	196	--	--	--	--	--	--	--	--
Scomberomorus maculatus	Spanish mackerel	5	278	512	333	--	--	--	--	--	--	--	--
Leiostomus xanthurus	Spot	98	112	213	142	6	120	151	132	--	--	--	--
Morone saxatilis	Striped bass	2	196	390	293	--	--	--	--	--	--	--	--
Invertebrate													
Callinectes sapidus	Blue crab	17	75	150	113	--	--	--	--	--	--	--	--

Species Collected		Spring Collection						
Scientific Name	Common Name	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Minimum Weight (g)	Maximum Weight (g)	Average Weight (g)
Fish								
Alosa pseudoharengus	Alewife	--	--	--	--	--	--	--
Brevoortia tyrannus	Atlantic menhaden	3	140	153	144	25	25	25
Pomatomus saltatrix	Bluefish	--	--	--	--	--	--	--
Dorosoma cepedianum	Gizzard shad	--	--	--	--	--	--	--
Peprilus paru	Harvest fish	--	--	--	--	--	--	--
Alosa mediocris	Hickory shad	1	460	460	460	689	689	689
Ammodytes dubius	Northern sand lance	--	--	--	--	--	--	--
Bairdiella chrysoura	Silver perch	--	--	--	--	--	--	--
Scomberomorus maculatus	Spanish mackerel	--	--	--	--	--	--	--
Leiostomus xanthurus	Spot	2	160	172	166	56	75	65.5
Morone saxatilis	Striped bass	--	--	--	--	--	--	--

Species Collected		Spring Collection						
Scientific Name	**Common Name**	**Total Count**	**Minimum Length (mm)**	**Maximum Length (mm)**	**Average Length (mm)**	**Minimum Weight (g)**	**Maximum Weight (g)**	**Average Weight (g)**
Invertebrate								
Callinectes sapidus	Blue Crab	--	--	--	--	--	--	--

Note:
--: no data

3.3.4 Pop Net Survey Results

A summary of species collected, number of each species collected, and range of sizes collected in pop nets for the summer 2020 and spring 2021 surveys is provided in Table 3-16. Individual lengths for all fish and crab collected are provided in Appendix B. Overall, three different species of fish and one invertebrate were collected over both sampling seasons. The summer 2020 survey resulted in the greatest number species number of species and greatest abundance of fish collected.

During the summer 2020 pop net survey, 199 bay anchovies, nine Atlantic silversides, and six blue crabs were collected. Eight spot were collected during the spring 2021 pop net survey.

The most common finfish species collected during the 2002/2003 pop net surveys was the bay anchovy (USACE 2009), similar to the results of the pop net surveys conducted as part of this field investigation. However, the 2002/2003 pop net surveys at Barren Island found greater species diversity than the 2020/2021 survey.

Table 3-16
Barren Island Pop Net Collection Data

Species Collected		Summer Collection				Spring Collection						
Scientific Name	Common Name	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Minimum Weight (g)	Maximum Weight (g)	Average Weight (g)
Fish												
Menidia menidia	Atlantic silverside	9	25	79	68	--	--	--	--			
Anchoa mitchilli	Bay anchovy	199	22	59	46	--	--	--	--			
Leiostomus xanthurus	Spot	--	--	--	--	8	22	30	24.6			
Invertebrate												
Callinectes sapidus	Blue crab	6	5	62	20	--	--	--	--	--	--	--

Notes:
--: no data

3.3.5 Summary of Fish Survey Results

The species caught in the fisheries surveys were typical of mesohaline areas of the Mid-Chesapeake Bay Region. Based on the fisheries survey results, the area around Barren Island is attracting fish in the juvenile and adult life stages. As evident from the beach seine surveys, the habitat immediately adjacent to the island is an important habitat to a variety of juvenile finfish.

Overall species diversity appears to have decreased slightly from the 2002/2003 fisheries surveys presented in the FS/EIS (USACE 2009). Whereas results were similar to those reported in the SAR, the 2002/2003 fisheries surveys reported greater number of species for all sample gear types. However, bay anchovy, Atlantic menhaden, and Atlantic silverside continue to be present in the greatest numbers.

3.4 Bivalve Surveys

Two commercially important clams are found in the vicinity of Barren Island: soft-shell and razor clams. Soft-shell and razor clam surveys identified razor clams as more prevalent than soft-shell clams. Bivalve surveys were conducted at four locations around Barren Island on December 14, 2020. Water quality parameters, including temperature, DO, salinity, and pH, were measured at each transect and are provided in Table 3-17.

Fifteen legal harvestable soft-shell clams were collected in the Barren Island transects (11 at transect BI-CS-02 and four at transect BI-CS-04); no sublegal soft-shell clams were collected. The greatest number of bivalves collected was from transect BI-CS-04 (four soft-shell clams and 131 razor clams). The remaining three transects yielded bivalve counts ranging from 36 to 85 (Table 3-17).

In summary, Barren Island surveys identified 15 legal soft-shell clams (no soft-shell clams less than 2 inches in length were identified), 267 razor clams, and 25 oysters (Table 3-17). There were no locations in the Barren Island survey with a productive natural clam bar ranking as defined by the Maryland Code of Regulations (COMAR) 08.02.08.11 criteria (producing 500 hard-shell clams per hour, one-half bushel of soft-shell clams per hour, or one-half bushel of razor clams per hour).

Table 3-17
Barren Island Bivalve Survey Results

Sample Area	Survey Transect	Date	Time	Water Depth (feet)	Temp (°C)	DO (mg/L)	Salinity (ppt)	pH	Bivalve Counts		
									Soft-Shell Clams	Razor Clams	Oysters
Barren Island	BI-CS-01	12/14/2020	11:00	4	9.9	9.5	14.3	6.9	--	16	20
	BI-CS-02	12/14/2020	9:54	8	10.5	9.4	13.8	7	11	69	5
	BI-CS-03	12/14/2020	9:36	5.5	11.6	9.2	14.2	7	--	51	--
	BI-CS-04	12/14/2020	5:50	3	11.6	8.1	14	7.2	4	131	--

Notes:
a. Soft-shell clams greater than 2 inches only.
--: no data

3.5 Crab Pot Surveys

Crab pot surveys in the vicinity of Barren Island were conducted in August 2020, September 2020, May 2021, June 2021, and July 2021. The location and number of crab pots observed in the vicinity of the Barren Island footprint are provided in Figures 3-1 through 3-5 for August 2020, September 2020, May 2021, June 2021, and July 2021, respectively. Sampling points along each transect were used to identify relative crab pot density within subareas. For several of the surveys, areas where crab pots were visibly clustered were noted in the field and are represented on the applicable figures. On each figure, the blue boxes represent the area in which the crab pots were observed. The numbers within the boxes are the number of crab pots counted within the area of the blue box.

The August 2020 survey was conducted on August 30, 2020. Four hundred and ninety crab pots were observed surrounding Barren Island. The majority of the crab pots were observed south of the island, with fewer crab pots observed immediately west and north. No crab pots were observed east of the island. The number of crab pots observed and the general vicinity in which the crab pots were located are provided in Figure 3-1.

During the September 2020 survey, conducted on September 29, 2020, 83 crab pots were observed. The crab pot distribution was similar to the August survey, with most crab pots located south of the southern remnant. Again, no crab pots were observed east of the island. The number of crab pots observed and the general vicinity in which the crab pots were located for the September 2020 survey are provided in Figure 3-2.

A total of 533 crab pots were counted during the May 2021 survey, conducted on May 18, 2021. One hundred and ninety-two crab pots were located on the north side of the island, and a cluster of 231 crab pots were observed due west of the southern part of the island. A dense cluster containing 110 crab pots was located southeast of the island. The number of crab pots observed and the general vicinity in which the crab pots were located for the May 2021 survey are provided in Figure 3-3.

The June 2021 survey was conducted on June 23, 2021. A total of 277 crab pots were observed during this survey. One hundred and twenty crab pots were located along the west side and immediately north of Barren Island. The remaining 157 crab pots were located south of Barren Island. A dense cluster containing 62 crab pots was located on the southeast side of the island. The number of crab pots observed and the general vicinity in which the crab pots were located for the June 2021 survey are provided in Figure 3-4.

The July 2021 survey was conducted on July 22, 2021. A total of 264 crab pots were observed during this survey. One hundred and ninety-eight crab pots were located along the west side and immediately north of Barren Island. The remaining crab pots were located south of Barren Island. The number of crab pots observed and the general vicinity in which the crab pots were located for the July 2021 survey are provided in Figure 3-5.

Table 3-18 presents the relative crab pot numbers observed during each sampling event. The estimated density of crab pots (number of crab pots per acre of area surveyed) ranged from 0.1 pot to 0.4 pot per acre. The greatest crab pot density was measured during the May 2021 survey.

Table 3-18
Crab Pot Estimates Surrounding Barren Island

Survey Month	Total Number of Crab Pots Observed	Harvest Area (acres)	Estimated Density (pots/acre)
August 2020	490	1,619	0.3
September 2020	83	1,619	0.1
May 2021	533	1,619	0.4
June 2021	277	1,619	0.2
July 2021	264	1,619	0.2

Figure 3-1
Barren Island Crab Pot Survey Transects – August 2020

LEGEND:

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.
2. Crabpot survey boundary includes the area within 0.25 mile of the proposed restoration footprint and Barren Island remnants.
3. The numbers provided in the figure represent the number of crab pots observed within in the crab pot survey footprint. See Section 3.5 for additional information.

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Figure 3-2
Barren Island Crab Pot Survey Transects – September 2020

LEGEND:

- Barren Island Remnants
- Proposed Barren Island Protection
- Crab Pot Survey Footprint
- Crab Pot Survey Transect
- Crab Pot Count Area

Existing SAV Bed

- ▨ Dense 70-100% cover
- ▨ Moderate 40-70% cover
- ▨ Sparse 10-20% cover

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.
2. Crabpot survey boundary includes the area within 0.25 mile of the proposed restoration footprint and Barren Island remnants.
3. The numbers provided in the figure represent the number of crab pots observed within in the crab pot survey footprint. See Section 3.5 for additional information.

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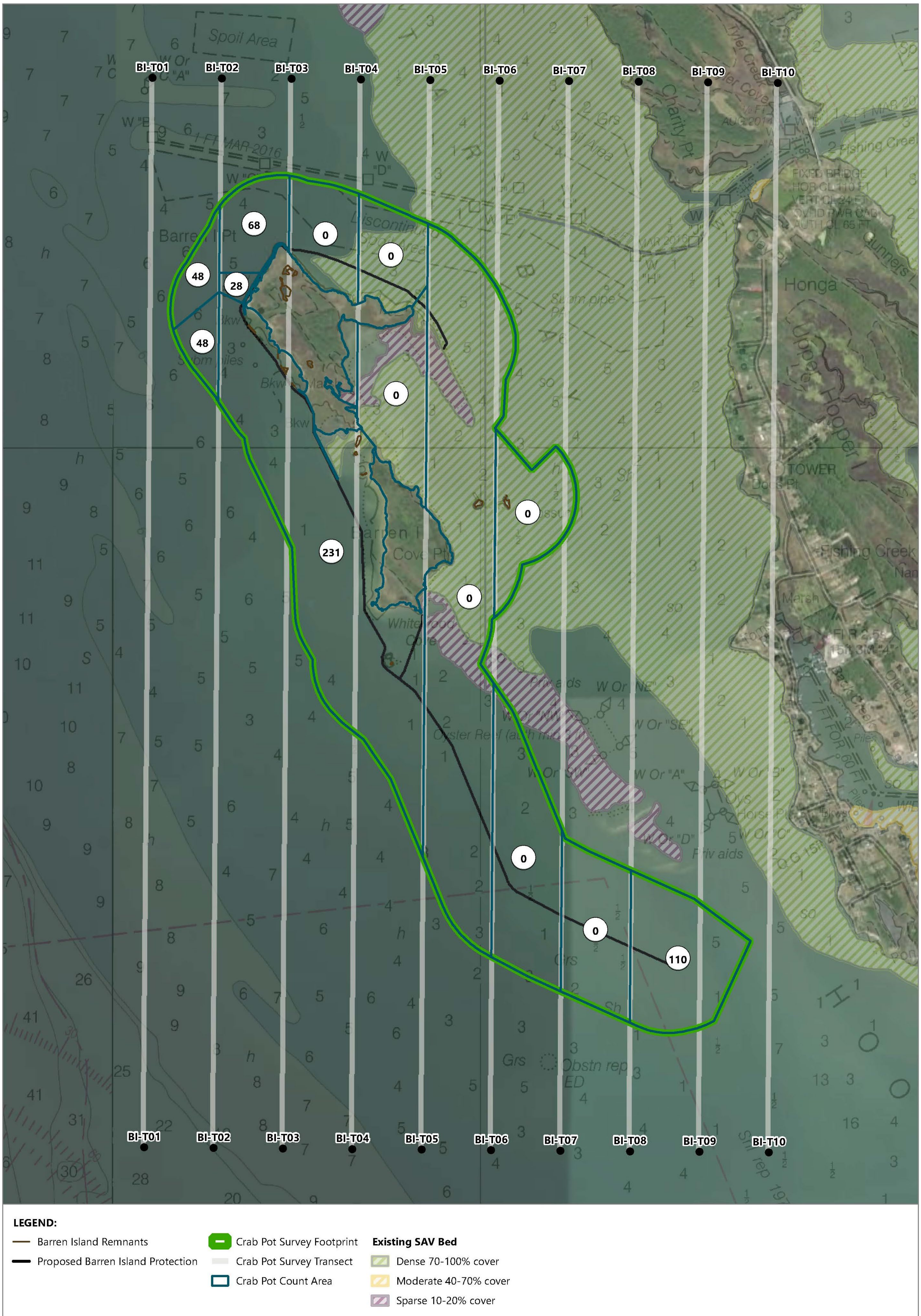
Figure 3-3
Barren Island Crab Pot Survey Transects – May 2021



NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.
2. Crabpot survey boundary includes the area within 0.25 mile of the proposed restoration footprint and Barren Island remnants.
3. The numbers provided in the figure represent the number of crab pots observed within in the crab pot survey footprint. See Section 3.5 for additional information.

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Figure 3-4
Barren Island Crab Pot Survey Transects – June 2021

LEGEND:

- Barren Island Remnants
- Proposed Barren Island Protection
- Crab Pot Survey Footprint
- Crab Pot Survey Transect
- Crab Pot Count Area

Existing SAV Bed

- ▨ Dense 70-100% cover
- ▨ Moderate 40-70% cover
- ▨ Sparse 10-20% cover

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.
2. Crabpot survey boundary includes the area within 0.25 mile of the proposed restoration footprint and Barren Island remnants.
3. The numbers provided in the figure represent the number of crab pots observed within in the crab pot survey footprint. See Section 3.5 for additional information.

0 2,000
Meters

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Figure 3-5
Barren Island Crab Pot Survey Transects – July 2021

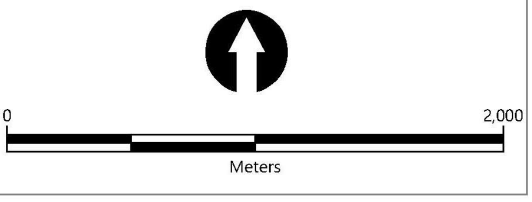
LEGEND:

- Barren Island Remnants
- Proposed Barren Island Protection
- Crab Pot Survey Footprint
- Crab Pot Survey Transect
- Crab Pot Count Area

Existing SAV Bed

- ▨ Dense 70-100% cover
- ▨ Moderate 40-70% cover
- ▨ Sparse 10-20% cover

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.
2. Crabpot survey boundary includes the area within 0.25 mile of the proposed restoration footprint and Barren Island remnants.
3. The numbers provided in the figure represent the number of crab pots observed within in the crab pot survey footprint. See Section 3.5 for additional information.



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3.6 Avian Surveys

Avian surveys were performed in summer 2020 and spring 2021. The surveys covered a representative range of habitats on the island, including forest, saltmarsh, open water, scrub-shrub, and shoreline.

3.6.1 Summer Survey Results

Five locations at Barren Island were included in the summer avian survey conducted on September 3, 2020. Survey locations are shown in Figure 2-12 and were chosen based on site conditions, access, and representativeness of the habitat conditions. A summary of the survey results is provided in Table 3-19.

A total of 37 species and 2,490 individuals were observed at Barren Island during the summer 2020 surveys. Brown pelican (*Pelecanus occidentalis*; 1,192 individual) and double-crested cormorant (*Phalacrocorax auritus;* 723 individuals) accounted for more than 75% of all observations made during the surveys. The majority of brown pelican and double-crested cormorants were observed resting on the riprap breakwater structures, the pound net west of Barren Island, and on the small island fragments on the southeast side of Barren Island. Other individuals were observed foraging over the open waters of the Chesapeake Bay. Great blue heron (*Ardea herodias*) and great egret (*Ardea alba*) were commonly observed foraging along the shoreline and in the salt marsh habitats.

Three migrating shorebird species, semipalmated plover (*Charadrius semipalmatus*), sanderling (*Calidris alba*), and spotted sandpiper (*Actitis macularius*) were observed foraging on the riprap breakwater structures on the western side of Barren Island. Three clapper rails (*Rallus crepitans*) were seen or heard within saltmarsh habitat on the island. This species likely breeds on the Barren Island remnants.

Most songbirds observed during the surveys were likely migrating individuals using the scrub-shrub and forest habitat on the island as a temporary stopover for resting and foraging. However, some species also likely do breed within the loblolly pine and mixed pine and deciduous forest habitat provided on the island, including eastern wood-pewee (*Contopus virens*), great crested flycatcher (*Myiarchus crinitus*), eastern kingbird (*Tyrannus tyrannus*), blue-gray gnatcatcher (*Polioptila caerulea*), and pine warbler (*Setophaga pinus*). Other species are likely year-round residents within the forest habitats, including brown-headed nuthatch (*Sitta pusilla*), Carolina wren (*Thryothorus ludovicianus*), and northern cardinal (*Cardinalis cardinalis*).

Multiple raptor nests were observed in the pines on the southern remnant, including several osprey (*Pandion haliaetus*) nests and one bald eagle (*Haliaeetus leucocephalus*) nest. Other osprey nests were observed on channel marker structures near the island. It is likely that both ospreys and bald eagles nest on this island, and adults and juveniles for both species were observed.

A wide variety of both resident and migratory bird species were observed using all habitats available at Barren Island during the September 2020 avian survey. The late summer survey period did not provide direct evidence of the breeding birds present on Barren Island because of the late date of the surveys in early September. However, the surveys did document the presence of likely resident species and species that use the islands as stopover sites for resting and foraging during migration.

Avian surveys were conducted in 2002 and 2003 as part of the FS/EIS (USACE 2009). During the summer 2002 survey, a total of 230 birds were observed at Barren Island. The number of birds observed during the summer 2020 survey is approximately an order of magnitude greater than the 2002 survey. Most of this is likely due to the high numbers of brown pelican and double-crested cormorant observed during the 2020 survey (totaling 1,915 individuals). Additionally, 37 species were observed in the 2020 survey, as compared to 16 bird species in the 2002 survey (USACE 2009).

Table 3-19
Barren Island Avian Summer Survey Results

Species Observed				
Scientific Name	**Common Name**	**Status**[a]	**Habitat**[b]	**Number Observed Summer 2020**
Corvus brachyrhynchos	American crow	R	FO	6
Setophaga ruticilla	American redstart	M	S/S	1
Haliaeetus leucocephalus	Bald eagle	R, M	F, FO	11
Riparia riparia	Bank swallow	M	FO	9
Hirundo rustica	Barn swallow	M	FO	217
Mniotilta varia	Black-and-white warbler	M	F	2
Polioptila caerulea	Blue-gray gnatcatcher	S, M	S/S	2
Dolichonyx oryzivorus	Bobolink	M	FO	1
Pelecanus occidentalis	Brown pelican	S	O, FO, SH	1192
Sitta pusilla	Brown-headed nuthatch	R	F	3
Thryothorus ludovicianus	Carolina wren	R	F, S/S	10
Rallus crepitans	Clapper rail	R	S	3
Geothlypis trichas	Common yellowthroat	S, M	S/S	1
Phalacrocorax auratus	Double-crested cormorant	S, M	O, FO, SH	723
Tyrannus tyrannus	Eastern kingbird	S, M	S	1
Contopus virens	Eastern wood-pewee	S, M	F	1
Sterna forsteri	Forster's tern	S, M	O, FO	62
Dumetella carolinensis	Gray catbird	S, M	S/S	1
Larus marinus	Great black-backed gull	R, M	O, FO	5
Ardea herodias	Great blue heron	R	F, O, FO, SH	18
Myiarchus crinitus	Great crested flycatcher	S, M	F	3

Species Observed				**Number Observed Summer 2020**
Scientific Name	**Common Name**	**Status**[a]	**Habitat**[b]	
Ardea alba	Great egret	S, M	S, FO, SH	15
Larus argentatus	Herring gull	R, M	O	17
Leucophaeus atricilla	Laughing gull	S, M	O, FO, SH	106
Empidonax minimus	Least flycatcher	M	S	1
Cardinalis cardinalis	Northern cardinal	R	F, S/S	9
Pandion haliaetus	Osprey	S, M	F, O, FO	27
Setophaga pinus	Pine warbler	S, M	F	3
Agelaius phoeniceus	Red-winged blackbird	R	F, S/S	6
Larus delawarensis	Ring-billed gull	M, W	O, FO	3
Thalasseus maximus	Royal tern	S, M	O, FO	10
Archilochus colubris	Ruby-throated hummingbird	M	F, FO, S/S	4
Calidris alba	Sanderling	M	FO, SH	6
Charadrius semipalmatus	Semipalmated plover	M	SH	2
Actitis macularius	Spotted sandpiper	M	SH	1
Tachycineta bicolor	Tree swallow	M	FO	5
Cathartes aura	Turkey vulture	R, M	FO	3

Notes:

a. Status:
- M: migrant
- R: year-round resident
- S: summer resident
- W: winter resident

b. Habitat:
- F: Forest
- S: saltmarsh
- O: open water
- FO: flyover
- MF: mud flat
- SH: shore
- S/S: scrub-shrub

3.6.2 *Spring Survey Results*

Five locations at Barren Island were included in the summer avian survey conducted on May 26, 2021. Survey locations were consistent with the summer 2020 avian survey locations (Figure 2-12) and covered a representative range of habitats on the island, including forest, saltmarsh, open water, scrub-shrub, and shoreline. A summary of the survey results is provided in Table 3-20.

A total of 627 birds from 40 different species were observed during the spring 2021 survey. Double-crested cormorants were observed in the greatest abundance, accounting for 37% of all observations made (236 individuals). Most double-crested cormorants were observed flying over or resting on the pound nets west of Barren Island or foraging over the open waters of the Chesapeake Bay.

One summer resident shorebird species, willet (*Tringa semipalmata*), and one migratory shorebird species, semipalmated plover, were observed on the northern remnant of Barren Island during the timed surveys.

Twenty-three bald eagles and 37 ospreys were observed during the timed surveys. Additionally, multiple raptor nests were observed on Barren Island, including several osprey nests and one bald eagle nest on each island remnant. Other osprey nests were observed on channel marker structures near the island.

Great blue heron and great egret were commonly observed flying over and foraging along the shoreline and in the salt marsh habitats. A heron rookery was observed on the island during avian surveys conducted in 2003 and 2004 (BBL 2004) and nests of both species were observed during these surveys throughout the southern remnant of Barren Island, indicating that nearly the entire southern remnant serves as a rookery for these species. Great blue herons accounted for approximately 10% of the total number of birds observed during the timed surveys.

Most songbirds observed were year-round or summer residents using the scrub-shrub and forest habitat on the island. Evidence of breeding was confirmed during the timed surveys or incidentally for many of these species, including eastern kingbird, brown-headed nuthatch, Carolina wren, eastern bluebird (*Sialia sialis*), European starling (*Sturnus vulgaris*), common grackle (*Quiscalus quiscula*), boat-tailed grackle (*Quiscalus major*), red-winged blackbird (*Agelaius phoeniceus*), and northern cardinal. Downy woodpecker (*Picoides pubescens*) was the only species of woodpecker observed during the spring 2021 surveys, and breeding was confirmed in the pine forests on the northern remnant.

A wide variety of both resident and migratory bird species were observed using all habitats available at Barren Island during the spring 2021 avian survey. Additionally, direct evidence of the presence of a variety of breeding birds was recorded during the survey. Fourteen species were confirmed as breeding on the two Barren Island remnants, and several other species were observed that are likely to breed on the island.

Avian surveys were conducted in 2002 and 2003 as part of the FS/EIS (USACE 2009). During the spring 2003 survey, a total of 298 birds were observed at Barren Island. The number of birds observed during the spring 2021 survey is approximately two times greater than the 2002 survey, likely due to the high number of double-crested cormorants observed during the 2021 survey. In both surveys, double-crested cormorant, great blue heron, and great egret were present in the greatest abundances. Greater diversity was observed during the 2021 survey, with 40 species recorded during the 2021 survey and 20 bird species recorded in the 2003 survey (USACE 2009).

Table 3-20
Barren Island Avian Spring Survey Results

Species Observed				Number Observed[c]	
Scientific Name	Common Name	Status[a]	Habitat[b]	Morning Survey	Afternoon Survey
Corvus brachyrhynchos	American crow	R	F	4	1
Spinus tristis	American goldfinch	R	FO	0	1
Haliaeetus leucocephalus	Bald eagle[d]	R	F, FO	12	11
Hirundo rustica	Barn swallow	M	FO	7	0
Quiscalus major	Boat-tailed grackle[d]	R	FO, S	13	11
Pelecanus occidentalis	Brown pelican	S	O, FO	0	25
Molothrus ater	Brown-headed cowbird	R	FO	2	0
Sitta pusilla	Brown-headed nuthatch[d]	R	F	1	0
Poecile carolinensis	Carolina chickadee	R	F	2	0
Thryothorus ludovicianus	Carolina wren[d]	R	F, S/S	8	3
Rallus crepitans	Clapper rail	R	S	8	0
Quiscalus quiscula	Common grackle[d]	R	FO	4	5
Sterna sp.	Common/Forster’s tern	S, M	O, FO	3	2
Phalacrocorax auritus	Double-crested cormorant	S, M	O, FO, SH	89	147
Picoides pubescens	Downy woodpecker[d]	R	F	1	0
Sialia sialis	Eastern bluebird[d]	R	F	1	0
Tyrannus tyrannus	Eastern kingbird[d]	S, M	S	5	5
Contopus virens	Eastern wood-pewee	S, M	F	1	0
Sturnus vulgaris	European starling[d]	R	FO	2	4
Sterna forsteri	Forster’s tern	S, M	O	0	2
Plegadis falcinellus	Glossy ibis	S, M	FO	0	5
Larus marinus	Great black-backed gull	R, M	O, FO	0	2
Ardea herodias	Great blue heron[d]	R	F, O, FO, SH, S	32	31
Myiarchus crinitus	Great crested flycatcher	S, M	F	6	2
Ardea alba	Great egret[d]	S, M	FO, SH, F	21	15
Larus argentatus	Herring gull	R, M	SH, FO	2	1
Leucophaeus atricilla	Laughing gull	S, M	FO	0	1
Sternula antillarum	Least tern	S, M	FO	1	0
Cardinalis cardinalis	Northern cardinal[d]	R	S/S	3	2
Mimus polyglottos	Northern mockingbird	R	F	2	1
Icterus spurius	Orchard oriole	R, M	F	3	1
Pandion haliaetus	Osprey[d]	S, M	O, FO, SH	17	20
Setophaga pinus	Pine warbler	S, M	F	5	0

Species Observed				Number Observed[c]	
Scientific Name	Common Name	Status[a]	Habitat[b]	Morning Survey	Afternoon Survey
Vireo olivaceus	Red-eyed vireo	S, M	F	2	0
Agelaius phoeniceus	Red-winged blackbird[d]	R	S, S/S	21	20
Thalasseus maximus	Royal tern	S, M	SH	3	0
Charadrius semipalmatus	Semipalmated plover	M	SH	5	0
Tachycineta bicolor	Tree swallow	M	FO	1	3
Cathartes aura	Turkey vulture	R, M	FO	0	10
--	Unidentified gull	--	FO	0	1
Calidris sp.	Unidentified peep	M	SH, FO	6	0
--	Unidentified shorebird	--	FO	1	0
Tringa semipalmata	Willet	S, M	SH	1	0

Notes:
--: unidentified species

a. Status:
- M: migrant
- R: year-round resident
- S: summer resident
- W: winter resident

b. Habitat:
- F: Forest
- S: saltmarsh
- O: open water
- FO: flyover
- MF: mud flat
- SH: shore
- S/S: scrub-shrub

c. Individual birds may have been observed during both surveys
d. Confirmed breeding

4 James Island Results

This section presents the results for all environmental surveys conducted at James Island during all seasons of sampling.

4.1 Water Quality

Quarterly water quality sampling was conducted in the vicinity of James Island in the summer 2020, fall 2020, winter 2021, and spring 2021. A complete description of sampling locations, sample dates, and in situ water quality parameters (including temperature, DO, salinity, pH, and turbidity) are provided in Table 4-1. Water temperatures exhibited typical seasonal trends. The warmer water temperatures were generally recorded during the summer (ranging from 26.1°C to 26.5°C) and coolest water temperatures were recorded during the winter (4.6°C to 5.4°C).

Overall, the DO concentrations varied seasonally. Because warm water has less ability to hold DO than cold water, DO concentrations tend to be lower in the summer compared to the winter. The lowest DO levels were measured during the summer season (ranging from 6.5 to 7.6 mg/L) and maximum DO levels were measured in the winter (12.5 to 12.7 mg/L). During all seasons, DO values were greater than 5.0 mg/L, which is considered healthy and allows the Chesapeake Bay's aquatic system to thrive.

The highest salinities were measured during the fall (ranging from 16.0 to 16.4 ppt) and the lowest salinities occurred during the spring (ranging from 11.2 to 11.7 ppt), which is consistent with typical weather patterns in the area. During spring rains, the salinity is usually lower compared to the drier fall months, when the salinity is usually higher.

In general, the pH measurements at James Island were very similar to each other, both between locations and seasons. The range of pH measurements from all locations and for all seasons was 7.9 to 8.3.

Turbidity values were recorded in NTU. Generally, turbidity levels were lower in the spring (range of 0 to 1.7 NTU); however, turbidity levels were generally low during all seasons for all locations. The maximum turbidity reading was 6.7 NTU, which was measured during the summer sampling event (from JI-WQ-10). Secchi depth was also recorded during the spring 2021 sampling event. The maximum Secchi depth reading was 5.7 feet.

Results for the chemical constituents and nutrient parameters measured in James Island surface water samples are provided in Table 4-2. Orthophosphate was not detected in most surface water samples during each sampling event, and ammonium was detected in less than one-third of the samples during the summer, fall, and winter sampling events. Both were detected at low concentrations in most samples during the spring sampling event. All remaining nutrients were generally detected in low concentrations. Generally, highest concentrations of chlorophyll, phaeophytin, organic phosphorus, particulate carbon, particulate nitrogen, particulate phosphorus, total dissolved phosphorus, and total phosphorus were measured during the summer 2020 season. Highest concentrations of nitrite+nitrate, total nitrogen, and total dissolved nitrogen were measured during the winter 2021 season. Nitrite and total suspended solids were measured in the greatest concentrations in the spring 2021 surface water samples.

MDNR has a CBWQM that has routinely sampled year-round in the Chesapeake Bay since 1985 and in the Coastal Bays since 1999. Five years of water quality data (2015 to 2020) from the CBWQM were summarized for the fixed monitoring stations closest to James Island (stations EE2.2; MDNR 2021). Station EE2.2 is located in approximately 12.5 meters (41 feet) of water, near the mouth of the Little Choptank River approximately 1 mile northeast of James Island. The most recent five years of surface (14 feet) water quality data at stations EE2.2 were chosen as a representative comparison to existing seasonal conditions because these samples most closely resemble the conditions of the sampling locations conducted at James Island. Means and ranges for physical water quality parameters and nutrients are presented in Tables 4-3 and 4-4, respectively, and are used for comparisons to the existing conditions.

Overall, the seasonal physical in situ water quality and nutrient parameters measured at the islands were similar to and typical of conditions in shallow, mesohaline areas of the middle portion of the Chesapeake Bay. Seasonal patterns of water quality and nutrient parameters measured at James Island were similar to seasonal distributions at CBWQM Station EE2.2. Additionally, the range in values for both the water quality parameters and nutrient concentrations were similar to the ranges measured at CBWQM Station EE2.2 from 2016 to 2020. Turbidity measurements were not collected at EE2.2 during the dates that coincide with the quarterly sampling at the islands, so comparisons to this data are not possible.

Table 4-1
James Island Water Quality Sample Locations and Water Quality Parameters

Season	Sample ID	Date	Time	Northing	Easting	Water Depth (feet)	Temp (°C)	DO (mg/L)	Salinity (ppt)	pH	Turbidity (NTU)
Summer	JI-WQ-01	8/31/2020	9:30	306620.99	1495951.99	9.0	26.2	7.4	13.4	8.3	3.8
	JI-WQ-02	8/31/2020	10:05	304226.65	1499644.99	7.0	26.2	7.5	13.2	8.3	5.6
	JI-WQ-03	8/31/2020	9:10	310221.64	1498541.50	8.0	26.1	7.2	13.2	8.2	4.3
	JI-WQ-04	8/31/2020	8:18	317348.69	1494645.773	11.0	26.5	6.5	13.6	8.2	2.4
	JI-WQ-05	8/31/2020	8:02	317283.65	1496764.276	8.5	26.4	6.9	13.4	8.2	2.1
	JI-WQ-06	8/31/2020	8:35	313107.53	1499020.163	8.0	26.3	7.6	13.4	8.3	2.8
	JI-WQ-07	8/31/2020	7:42	316178.11	1504175.971	9.5	26.6	7.0	13.4	8.2	2.3
	JI-WQ-08	8/31/2020	7:30	313848.94	1503823.152	8.0	26.2	7.0	13.2	8.2	3.8
	JI-WQ-09	8/31/2020	8:52	310872.55	1501695.801	5.0	26.2	7.0	13.2	8.2	5.9
	JI-WQ-10	8/31/2020	9:46	307629.99	1501284.987	9.0	26.2	7.3	13.2	8.2	6.7
	JI-WQ-REF	8/31/2020	10:35	228030.14	1531605.267	8.0	26.2	7.3	13.6	8.3	4.2
Fall	JI-WQ-01	10/21/2020	11:34	306654.08	1495968.451	9.7	18.8	8.9	16.4	8.2	1.8
	JI-WQ-02	10/21/2020	11:53	304148.15	1499603.176	6.3	19.0	8.7	16.2	8.1	3.1
	JI-WQ-03	10/21/2020	10:53	310210.18	1498522.902	8.6	18.6	8.7	16.1	8.1	1.7
	JI-WQ-04	10/21/2020	10:02	317343.09	1494698.573	12.7	18.7	8.5	16.4	8.1	1.7
	JI-WQ-05	10/21/2020	9:42	317276.59	1496781.648	10.0	18.6	8.4	16.4	8.1	1.7
	JI-WQ-06	10/21/2020	10:27	313112.24	1499013.295	9.1	18.7	8.6	16.3	8.1	2.1
	JI-WQ-07	10/21/2020	9:17	316141.14	1504224.476	10.5	18.3	8.4	16.1	8.1	1.5
	JI-WQ-08	10/21/2020	8:46	313799.57	1503918.639	10.1	18.3	8.8	16.0	8.1	1.5
	JI-WQ-09	10/21/2020	7:47	310875.17	1501708.181	6.8	18.6	8.8	16.3	8.0	2.3
	JI-WQ-10	10/21/2020	11:15	307648.67	1501251.387	9.2	18.6	8.6	16.2	8.1	2.1
	JI-WQ-REF	10/21/2020	12:12	296538.85	1499356.889	7.5	19.0	8.9	16.4	8.2	2.7

Season	Sample ID	Date	Time	Northing	Easting	Water Depth (feet)	Temp (°C)	DO (mg/L)	Salinity (ppt)	pH	Turbidity (NTU)
Winter	JI-WQ-01	3/9/2021	8:24	306687.90	1496101.36	9.8	4.6	12.5	13.0	8.0	2.1
	JI-WQ-02	3/9/2021	12:04	304136.84	1499619.95	7.5	5.0	12.6	12.9	8.1	1.6
	JI-WQ-03	3/9/2021	11:28	310235.83	1498686.85	9.5	4.9	12.6	12.9	8.1	1.7
	JI-WQ-04	3/9/2021	9:05	317271.25	1494796.89	12.7	5.0	12.6	12.7	8.1	2.4
	JI-WQ-05	3/9/2021	9:31	317275.83	1496831.63	9.8	5.1	12.7	12.7	8.1	2.4
	JI-WQ-06	3/9/2021	10:51	313180.82	1499011.53	9.6	4.9	12.6	13.0	8.1	1.8
	JI-WQ-07	3/9/2021	9:58	316171.91	1504267.56	10.0	4.7	12.7	12.6	8.1	2.6
	JI-WQ-08	3/9/2021	10:00	313814.47	1503950.64	10.0	5.0	12.7	12.7	8.1	2.9
	JI-WQ-09	3/9/2021	11:10	310244.47	1501743.59	6.2	5.0	12.6	13.0	8.1	1.9
	JI-WQ-10	3/9/2021	11:46	307606.42	1501312.50	9.8	5.1	12.6	12.9	8.1	1.7
	JI-WQ-REF	3/9/2021	12:24	296536.29	1499381.48	8.2	5.4	12.6	13.6	8.1	2.0
Spring	JI-WQ-01	5/25/2021	10:15	306680.11	1495958.09	9.3	20.7	7.8	11.3	8.0	0.2
	JI-WQ-02	5/25/2021	10:50	304174.31	1499625.33	6.5	20.6	7.1	11.6	7.9	1.7
	JI-WQ-03	5/25/2021	9:57	310248.25	1498527.88	8.0	20.3	8.2	11.2	8.1	0.0
	JI-WQ-04	5/25/2021	8:55	317366.91	1494661.70	11.8	19.7	7.5	11.7	8.0	0.0
	JI-WQ-05	5/25/2021	8:35	317300.75	1496721.72	9.5	19.7	7.5	11.6	8.0	1.2
	JI-WQ-06	5/25/2021	9:18	313110.63	1499028.49	8.3	19.8	7.6	11.4	8.0	0.0
	JI-WQ-07	5/25/2021	8:18	316142.92	1504191.33	9.7	19.8	7.5	11.4	8.0	1.2
	JI-WQ-08	5/25/2021	8:00	313832.51	1503886.69	9.0	20.2	7.9	11.2	8.1	1.5
	JI-WQ-09	5/25/2021	9:37	310913.43	1501724.44	5.3	20.1	7.9	11.3	8.1	0.1
	JI-WQ-10	5/25/2021	10:33	307702.09	1501322.30	8.5	20.6	7.9	11.3	8.0	1.0
	JI-WQ-REF	5/25/2021	11:07	296546.58	1499347.85	7.0	20.6	8.1	11.4	8.1	0.7

Table 4-2
James Island Surface Water Quality Sample Results

Analyte	Units	JI-WQ-REF				JI-WQ-01				JI-WQ-02			
		Summer 2020	Fall 2020	Winter 2021	Spring 2021	Summer 2020	Fall 2020	Winter 2021	Spring 2021	Summer 2020	Fall 2020	Winter 2021	Spring 2021
Chlorophyll, active	µg/L	**13.1**	**4.6**	**9.97**	**9.4**	**9.0**	**2.9**	**9.2**	**9.2**	**12.8**	**5.5**	**7.8**	**8.5**
Phaeophytin *a*	µg/L	**3.2**	**1.7**	**1.78**	**2.13**	**3.4**	**1.0**	**1.8**	**1.8**	**4.0**	**1.8**	**1.4**	**2.1**
Chlorophyll *a*	µg/L	**14.9**	**5.6**	**11.0**	**10.6**	**10.9**	**3.5**	**10.2**	**10.2**	**15.0**	**6.6**	**8.6**	**9.6**
Dissolved organic carbon	mg/L	**3.37**	**3.79**	**1.28**	**3.37**	**3.31**	**3.22**	**3.06**	**3.61**	**3.7**	**3.5**	**2.74**	**3.51**
Organic nitrogen	mg/L	**0.35**	**0.31**	**0.38**	**0.28**	**0.34**	**0.32**	**0.26**	**0.27**	**0.22**	**0.27**	**0.30**	**0.28**
Organic phosphorus	mg/L	**0.018**	**0.012**	**0.0045**	**0.013**	**0.018**	**0.015**	**0.006**	**0.011**	**0.016**	**0.011**	**0.004**	**0.013**
Ammonium	mg/L	0.009 U	0.009 U	0.009 U	**0.01**	0.009 U	0.009 U	**0.009**	**0.028**	0.009 U	0.009 U	**0.014**	**0.033**
Nitrite	mg/L	**0.001**	**0.003**	**0.0012**	**0.0062**	**0.001**	**0.002**	**0.004**	**0.006**	**0.002**	**0.003**	**0.004**	**0.006**
Nitrite + nitrate	mg/L	**0.026**	**0.017**	**0.055**	**0.084**	**0.006**	**0.015**	**0.259**	**0.095**	**0.132**	**0.028**	**0.244**	**0.084**
Particulate carbon	mg/L	**1.55**	**0.747**	**1.2**	**1.21**	**1.31**	**0.786**	**1.17**	**1.03**	**1.57**	**0.82**	**1.09**	**1.19**
Particulate nitrogen	mg/L	**0.28**	**0.131**	**0.168**	**0.205**	**0.23**	**0.13**	**0.17**	**0.21**	**0.28**	**0.15**	**0.15**	**0.21**
Orthophosphate	mg/L	0.0034 U	0.0034 U	0.0034 U	**0.0055**	0.0034 U	0.0034 U	0.0034 U	**0.0048**	0.0034 U	**0.0075**	0.0034 U	**0.0053**
Particulate phosphorus	mg/L	**0.027**	**0.010**	**0.012**	**0.021**	**0.023**	**0.011**	**0.012**	**0.021**	**0.028**	**0.012**	**0.011**	**0.021**
Total dissolved nitrogen	mg/L	**0.39**	**0.34**	**0.44**	**0.37**	**0.35**	**0.34**	**0.53**	**0.39**	**0.36**	**0.31**	**0.56**	**0.40**
Total dissolved phosphorus	mg/L	**0.021**	**0.016**	**0.0079**	**0.018**	**0.021**	**0.019**	**0.009**	**0.016**	**0.019**	**0.018**	**0.007**	**0.018**
Total nitrogen	mg/L	**0.56**	**0.390**	**0.61**	**0.52**	**0.55**	**0.41**	**0.63**	**0.53**	**0.59**	**0.42**	**0.71**	**0.56**
Total phosphorus	mg/L	**0.043**	**0.030**	**0.0195**	**0.032**	**0.041**	**0.026**	**0.017**	**0.030**	**0.046**	**0.026**	**0.023**	**0.029**

		JI-WQ-REF				JI-WQ-01				JI-WQ-02			
Analyte	**Units**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**
Total suspended solids	mg/L	**16.0**	**10.0**	**8.5**	**26.3**	**11.4**	**6.3**	**7.0**	**24.0**	**15.5**	**12.3**	**7.5**	**28.0**

		JI-WQ-03				JI-WQ-04				JI-WQ-05			
Analyte	**Units**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**
Chlorophyll, active	µg/L	**12.3**	**5.3**	**9.3**	**9.0**	**11.4**	**6.1**	**12.0**	**9.1**	**10.2**	**6.4**	**12.8**	**10.0**
Phaeophytin *a*	µg/L	**4.5**	**1.9**	**1.6**	**2.2**	**4.5**	**2.1**	**1.8**	**2.3**	**4.1**	**2.3**	**2.0**	**2.6**
Chlorophyll *a*	µg/L	**14.8**	**6.4**	**10.2**	**10.2**	**13.9**	**7.3**	**13.0**	**10.4**	**12.5**	**7.7**	**14.0**	**11.5**
Dissolved organic carbon	mg/L	**3.39**	**3.5**	**2.4**	**3.29**	**3.05**	**3.41**	**3.23**	**3.52**	**3.17**	**3.46**	**2.98**	**3.12**
Organic nitrogen	mg/L	**0.36**	**0.31**	**0.20**	**0.27**	**0.32**	**0.29**	**0.28**	**0.27**	**0.34**	**0.30**	**0.21**	**0.26**
Organic phosphorus	mg/L	**0.020**	**0.015**	**0.003**	**0.015**	**0.017**	**0.011**	**0.004**	**0.012**	**0.016**	**0.014**	**0.003**	**0.009**
Ammonium	mg/L	**0.014**	0.009 U	0.009 U	**0.017**	0.009 U	**0.01**	0.009 U	**0.031**	0.009 U	0.009 U	0.009 U	**0.029**
Nitrite	mg/L	**0.002**	**0.003**	**0.003**	**0.004**	**0.006**	**0.002**	**0.004**	**0.006**	**0.004**	**0.003**	**0.003**	**0.004**
Nitrite + nitrate	mg/L	**0.008**	**0.012**	**0.200**	**0.076**	**0.031**	**0.013**	**0.218**	**0.096**	**0.014**	**0.019**	**0.176**	**0.088**
Particulate carbon	mg/L	**1.43**	**0.78**	**1.09**	**1.1**	**1.21**	**0.824**	**1.56**	**1.08**	**1.24**	**0.806**	**1.61**	**1.08**
Particulate nitrogen	mg/L	**0.28**	**0.14**	**0.16**	**0.21**	**0.23**	**0.15**	**0.21**	**0.21**	**0.23**	**0.16**	**0.22**	**0.21**
Orthophosphate	mg/L	0.0034 U	0.0034 U	0.0034 U	**0.004**	**0.0035**	**0.0062**	0.0034 U	**0.0068**	0.0034 U	**0.005**	0.0034 U	**0.0044**
Particulate phosphorus	mg/L	**0.031**	**0.011**	**0.013**	**0.019**	**0.026**	**0.013**	**0.012**	**0.019**	**0.025**	**0.015**	**0.016**	**0.020**
Total dissolved nitrogen	mg/L	**0.38**	**0.33**	**0.41**	**0.36**	**0.36**	**0.31**	**0.51**	**0.40**	**0.36**	**0.33**	**0.39**	**0.38**

		JI-WQ-03				JI-WQ-04				JI-WQ-05			
Analyte	**Units**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**
Total dissolved phosphorus	mg/L	**0.023**	**0.018**	**0.006**	**0.019**	**0.021**	**0.017**	**0.007**	**0.019**	**0.019**	**0.019**	**0.006**	**0.013**
Total nitrogen	mg/L	**0.60**	**0.41**	**0.63**	**0.51**	**0.55**	**0.39**	**0.62**	**0.54**	**0.55**	**0.42**	**0.68**	**0.56**
Total phosphorus	mg/L	**0.045**	**0.026**	**0.015**	**0.026**	**0.045**	**0.029**	**0.017**	**0.027**	**0.045**	**0.025**	**0.021**	**0.031**
Total suspended solids	mg/L	**23.0**	**9.1**	**7.8**	**23.3**	**12.7**	**34.3**	**8.0**	**24.0**	**12.6**	**35.7**	**--**	**23.5**

		JI-WQ-06				JI-WQ-07				JI-WQ-08			
Analyte	**Units**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**
Chlorophyll, active	µg/L	**10.1**	**6.0**	**9.92**	**8.53**	**11.2**	**6.1**	**17.2**	**8.5**	**10.3**	**6.4**	**13.5**	**9.4**
Phaeophytin *a*	µg/L	**3.9**	**2.0**	**1.74**	**1.99**	**4.1**	**2.0**	**2.0**	**2.1**	**4.7**	**1.9**	**2.4**	**2.3**
Chlorophyll *a*	µg/L	**12.3**	**7.1**	**10.89**	**9.63**	**13.5**	**7.2**	**18.3**	**9.6**	**12.9**	**7.4**	**14.8**	**10.6**
Dissolved organic carbon	mg/L	**3.31**	**3.66**	**2.94**	**2.96**	**3.33**	**3.44**	**3.49**	**3.18**	**4.35**	**3.45**	**2.77**	**3.12**
Organic nitrogen	mg/L	**0.38**	**0.28**	**0.30**	**0.24**	**0.33**	**0.28**	**0.28**	**0.24**	**0.42**	**0.29**	**0.64**	**0.25**
Organic phosphorus	mg/L	**0.015**	**0.016**	**0.0036**	**0.0066**	**0.014**	**0.014**	**0.007**	**0.007**	**0.020**	**0.012**	**0.018**	**0.002**
Ammonium	mg/L	**0.01**	0.009 U	**0.009**	**0.029**	0.009 U	0.009 U	0.009 U	**0.028**	**0.016**	0.009 U	0.009 U	**0.021**
Nitrite	mg/L	**0.002**	**0.003**	**0.0042**	**0.0042**	**0.003**	**0.003**	**0.004**	**0.006**	**0.004**	**0.002**	**0.002**	**0.004**
Nitrite + nitrate	mg/L	**0.012**	**0.026**	**0.257**	**0.088**	**0.013**	**0.013**	**0.227**	**0.098**	**0.014**	**0.018**	**0.125**	**0.100**
Particulate carbon	mg/L	**1.29**	**0.737**	**1.05**	**1.02**	**1.17**	**0.699**	**1.83**	**0.991**	**1.31**	**0.738**	**1.79**	**1.1**
Particulate nitrogen	mg/L	**0.24**	**0.14**	**0.153**	**0.197**	**0.24**	**0.14**	**0.25**	**0.19**	**0.26**	**0.14**	**0.25**	**0.22**

		JI-WQ-06				JI-WQ-07				JI-WQ-08			
Analyte	**Units**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**
Orthophosphate	mg/L	0.0034 U	0.0034 U	0.0034 U	0.0034 U	0.0034 U	0.0034 U	**0.0036**	**0.0035**	0.0034 U	0.0034 U	0.0034 U	**0.0088**
Particulate phosphorus	mg/L	**0.028**	**0.011**	**0.012**	**0.019**	**0.026**	**0.011**	**0.016**	**0.019**	**0.028**	**0.012**	**0.019**	**0.020**
Total dissolved nitrogen	mg/L	**0.40**	**0.31**	**0.57**	**0.36**	**0.35**	**0.30**	**0.52**	**0.37**	**0.45**	**0.32**	**0.77**	**0.37**
Total dissolved phosphorus	mg/L	**0.018**	**0.020**	**0.007**	**0.01**	**0.017**	**0.017**	**0.010**	**0.010**	**0.024**	**0.016**	**0.021**	**0.011**
Total nitrogen	mg/L	**0.53**	**0.39**	**0.64**	**0.54**	**0.53**	**0.45**	**0.73**	**0.55**	**0.60**	**0.42**	**0.67**	**0.54**
Total phosphorus	mg/L	**0.042**	**0.032**	**0.017**	**0.032**	**0.043**	**0.031**	**0.026**	**0.029**	**0.047**	**0.035**	**0.023**	**0.028**
Total suspended solids	mg/L	**39.0**	**9.4**	**7.5**	**23.3**	**12.5**	**6.5**	**9.5**	**22.5**	**17.3**	**7.2**	**10.5**	**23.5**

		JI-WQ-09				JI-WQ-10			
Analyte	**Units**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**
Chlorophyll, active	µg/L	**11.1**	**5.3**	**10.1**	**10.3**	**13.5**	**6.0**	**7.6**	**9.2**
Phaeophytin *a*	µg/L	**5.1**	**2.0**	**2.0**	**2.2**	**4.8**	**2.3**	**1.3**	**1.9**
Chlorophyll *a*	µg/L	**13.9**	**6.4**	**11.2**	**11.6**	**16.2**	**7.3**	**8.3**	**10.2**
Dissolved organic carbon	mg/L	**3.57**	**3.34**	**2.04**	**3.03**	**3.51**	**3.27**	**2.74**	**3.16**
Organic nitrogen	mg/L	**0.36**	**0.30**	**0.43**	**0.14**	**0.32**	**0.29**	**0.33**	**0.26**
Organic phosphorus	mg/L	**0.016**	**0.013**	**0.005**	**0.007**	**0.016**	**0.011**	**0.004**	**0.009**
Ammonium	mg/L	**0.015**	0.009 U	0.009 U	**0.022**	0.009 U	0.009 U	0.009 U	**0.019**
Nitrite	mg/L	**0.004**	**0.003**	**0.002**	**0.005**	**0.001**	**0.003**	**0.003**	**0.005**
Nitrite + nitrate	mg/L	**0.010**	**0.014**	**0.153**	**0.192**	**0.049**	**0.010**	**0.222**	**0.081**

Analyte	Units	JI-WQ-09				JI-WQ-10			
		Summer 2020	**Fall 2020**	**Winter 2021**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Winter 2021**	**Spring 2021**
Particulate carbon	mg/L	**1.38**	**0.689**	**1.1**	**1.17**	**1.54**	**0.766**	**1.05**	**1.08**
Particulate nitrogen	mg/L	**0.28**	**0.13**	**0.16**	**0.23**	**0.30**	**0.14**	**0.15**	**0.20**
Orthophosphate	mg/L	0.0034 U	0.0034 U	0.0034 U	**0.0036**	0.0034 U	0.0034 U	0.0034 U	**0.0036**
Particulate phosphorus	mg/L	**0.033**	**0.011**	**0.012**	**0.022**	**0.031**	**0.011**	**0.011**	**0.021**
Total dissolved nitrogen	mg/L	**0.39**	**0.32**	**0.59**	**0.35**	**0.38**	**0.31**	**0.56**	**0.36**
Total dissolved phosphorus	mg/L	**0.020**	**0.016**	**0.009**	**0.011**	**0.020**	**0.015**	**0.008**	**0.013**
Total nitrogen	mg/L	**0.59**	**0.43**	**0.67**	**0.53**	**0.63**	**0.42**	**0.63**	**0.53**
Total phosphorus	mg/L	**0.048**	**0.029**	**0.019**	**0.029**	**0.048**	**0.031**	**0.018**	**0.029**
Total suspended solids	mg/L	**44.3**	**10.3**	**8.0**	**24.5**	**22.0**	**8.8**	**7.2**	**25.0**

Notes:

Bold cells are detected constituents.

R: Poor replication between pads; sample rejected because the difference is greater than 50%.

U: compound not detected

Table 4-3
Average and Range of Water Quality Variables at CBWQM Station EE2.2 (2016–2020)

Analyte	Units	Sample Season[a]			
		Summer (August)	Fall (October)	Winter (March)	Spring (May)
Temperature	°C	27.5 (25.4–29.4)	19.3 (18.8–19.8)	6.5 (5.2–9.2)	17.5 (15.2–21.6)
DO	mg/L	6.9 (5.4–8.3)	8.4 (7.9–9.6)	12.0 (10.4–13)	8.0 (3.8–9.1)
Salinity	ppt	11.6 (7.6–15.3)	14.4 (8–17.7)	11.2 (8.4–13.3)	10.4 (6.9–13.7)
pH	su	8.1 (7.8–8.5)	8.1 (8–8.2)	8.2 (7.7–8.8)	7.9 (7.3–8.2)
Secchi depth	ft	2.6 (2–4.3)	4.6 (2.3–8.2)	4.6 (3.6–6.6)	5.2 (3.3–6.6)

Note:
a. The value provided is the calculated average. The full range of results is provided in parentheses.

Table 4-4
Average and Range of Nutrient Concentrations at CBWQM Station EE2.2 (2016–2020)

Analyte	Units	Sample Season[a]			
		Summer (August)	Fall (October)	Winter (March)	Spring (May)
Phaeophytin *a*	µg/L	2 (1.65–2.2)	3.1 (0.74–6.3)	0.95 (0.74–1.3)	0.74 (0.74–0.74)
Chlorophyll *a*	µg/L	11 (6.4–17.9)	7.4 (3.6–10.9)	10.5 (6.2–13.9)	5.1 (3–9.6)
Particulate carbon	mg/L	1.4 (1.1–2)	0.89 (0.56–1.3)	1.7 (1–2.4)	0.9 (0.61–1.6)
Organic nitrogen	mg/L	0.64 (0.56–0.73)	0.54 (0.49–0.63)	0.61 (0.53–0.69)	0.45 (0.38–0.49)
Organic phosphorus	mg/L	0.013 (0.003–0.023)	0.012 (0.006–0.015)	0.005 (0.003–0.007)	0.005 (0.0008–0.007)
Ammonium	mg/L	0.017 (0.007–0.035)	0.02 (0.011–0.036)	0.019 (0.007–0.046)	0.036 (0.018–0.054)
Nitrite	mg/L	0.001 (0.0007–0.003)	0.015 (0.0009–0.048)	0.005 (0.004–0.005)	0.0064 (0.005–0.008)
Nitrite + nitrate	mg/L	0.01 (0.002–0.02)	0.08 (0.002–0.33)	0.34 (0.11–0.67)	0.29 (0.14–0.65)
Particulate nitrogen	mg/L	0.27 (0.18–0.36)	0.17 (0.1–0.24)	0.27 (0.17–0.34)	0.15 (0.1–0.25)
Orthophosphate	mg/L	0.004 (0.002–0.007)	0.005 (0.004–0.006)	0.003 (0.002–0.004)	0.004 (0.002–0.005)

Analyte	Units	Sample Season[a]			
		Summer (August)	Fall (October)	Winter (March)	Spring (May)
Particulate phosphorus	mg/L	0.022 (0.018–0.025)	0.014 (0.008–0.028)	0.016 (0.009–0.028)	0.009 (0.006–0.015)
Total dissolved nitrogen	mg/L	0.39 (0.35–0.43)	0.51 (0.35–0.75)	0.71 (0.51–1)	0.63 (0.47–0.88)
Total dissolved phosphorus	mg/L	0.015 (0.01–0.025)	0.017 (0.011–0.02)	0.008 (0.006–0.01)	0.008 (0.005–0.011)
Total nitrogen	mg/L	0.66 (0.57–0.78)	0.67 (0.53–0.99)	0.97 (0.8–1.3)	0.77 (0.57–1.13)
Total phosphorus	mg/L	0.037 (0.031–0.048)	0.031 (0.026–0.039)	0.024 (0.018–0.0355)	0.017 (0.012–0.024)
Total suspended solids	mg/L	7 (4.8–9.4)	7.4 (2.4–15.6)	4.9 (3.2–7.7)	3.2 (2.4–4)

Note:
a. The value provided is the calculated average. The full range of results is provided in parentheses.

4.2 Benthic Community

Benthic sampling was conducted in summer 2020, fall 2020, and spring 2021 at 10 locations in the vicinity of James Island and at one reference location (Figure 2-5). A complete description of benthic sampling locations, sample dates, and measured water quality parameters is provided in Table 4-5.

4.2.1 Habitat Classification

Sediment was also collected during the summer 2020 sampling event for grain size and total organic carbon content determination. Results of the grain size and total organic carbon analyses are provided in Table 4-6. With the exception of location of JI-BC-09, all James Island locations and the James Island reference location were composed of more than 90% sand. Location JI-BC-09 was still composed of 51% and 49% silts and clays (Table 4-6).

The bottom salinities measured at all James Island benthic sampling locations during the summer and fall sampling events were greater than 12 ppt (Table 4-5); therefore, each of the James Island benthic sampling locations were classified as high mesohaline during these sampling seasons. The bottom salinities in the spring sampling event ranged from 11.1 to 11.5 ppt; therefore, the spring James Island benthic samples were classified as low mesohaline.

Table 4-5
James Island Benthic Community Sample Locations and Water Quality Parameters

Season	Sample ID	Date	Time	Northing	Easting	Water Depth (feet)	Temp (°C)	DO (mg/L)	Salinity (ppt)	pH	Turbidity (NTU)
Summer	JI-BC-01	8/25/2020	1246	306649.60	1496020.71	9.8	27.7	8.1	13	8.6	4.4
	JI-BC-02	8/26/2020	858	304097.23	1499583.90	6.7	26.6	6.8	13.3	8.2	14.7
	JI-BC-03	8/25/2020	1021	310274.30	1498548.04	9.0	27.4	7.8	13	8.5	1.9
	JI-BC-04	8/24/2020	1239	317277.25	1494613.30	12.5	27.4	7.9	13.3	8	2.6
	JI-BC-05	8/24/2020	1353	317326.62	1496702.71	9.2	27.5	7.9	13.5	8.3	2.5
	JI-BC-06	8/25/2020	820	313079.64	1499123.36	10.7	27.2	7.4	12.9	8.4	4.7
	JI-BC-07	8/24/2020	1515	316161.98	1504252.06	9.5	27	7.5	13.6	8.3	9.4
	JI-BC-08	8/24/2020	1610	313777.18	1503956.23	9.6	27.5	7.5	13.5	8.3	6.7
	JI-BC-09	8/25/2020	918	310867.80	1501765.62	6.5	27.2	7.4	13	8.4	7.8
	JI-BC-10	8/25/2020	1124	307622.92	1501313.97	9.2	27.3	7.6	13	8.5	7.8
	JI-BC-REF	8/25/2020	1522	296522.36	1499384.92	6.8	28.2	8.3	13	8.6	7.5
Fall	JI-BC-01	10/19/2020	1235	306682.33	1495971.432	9.0	17.8	8.9	15.8	8.1	1.6
	JI-BC-02	10/19/2020	1005	304130.94	1499601.311	6.0	17.3	8.8	15.9	7.9	2.7
	JI-BC-03	10/19/2020	1530	310218.77	1498535.160	8.5	18.1	8.9	16.5	8.1	1.6
	JI-BC-04	10/20/2020	1338	317349.37	1494684.227	11.0	18.6	8.7	16.7	8.1	1.5
	JI-BC-05	10/20/2020	1156	317274.13	1496748.213	8.0	18.5	8.5	16.6	8.1	1.6
	JI-BC-06	10/20/2020	1508	313126.03	1499031.952	9.0	18.8	9.6	14.2	8.2	1.4
	JI-BC-07	10/20/2020	1047	316120.50	1504238.057	9.0	18.3	8.1	16.5	8.1	1.3
	JI-BC-08	10/20/2020	845	313789.41	1503913.072	9.0	18	8.4	16	7.9	1.4
	JI-BC-09	10/21/2020	747	310875.17	1501708.181	6.0	18.6	8.7	16.3	8	2.4
	JI-BC-10	10/19/2020	1355	307648.24	1501275.634	8.0	18	9.3	15.9	8.2	2
	JI-BC-REF	10/19/2020	1140	296538.36	1499302.500	7.0	17.4	9.0	16.0	8.2	2.1

Season	Sample ID	Date	Time	Northing	Easting	Water Depth (feet)	Temp (°C)	DO (mg/L)	Salinity (ppt)	pH	Turbidity (NTU)
Spring	JI-BC-01	5/27/2021	9:58	306626.08	1495942.42	9.4	21.6	9.0	11.3	8.0	0.1
	JI-BC-02	5/27/2021	8:40	304121.02	1499586.596	6.8	21.5	8.4	11.4	8.2	3.4
	JI-BC-03	5/27/2021	1115	310193.03	1498529.462	8.1	21.8	9.0	11.3	8.3	1.9
	JI-BC-04	5/27/2021	1255	317334.09	1494655.728	12.8	21.5	8.9	11.1	8.3	1.6
	JI-BC-05	5/27/2021	1430	317341.25	1496812.577	9.4	21.9	9.5	11.1	8.7	1.6
	JI-BC-06	5/28/2021	755	677373.89	1496346.201	9.3	22.7	8.7	11.4	8.2	3.5
	JI-BC-07	5/28/2021	825	316198.21	1504130.133	10.0	21.1	9.3	11.2	8.4	1.6
	JI-BC-08	5/28/2021	855	313919.59	1503814.608	10.3	22.2	9.4	11.2	8.4	1.6
	JI-BC-09	5/27/2021	1555	310890.21	1501730.803	5.6	23.1	9.5	11.5	8.3	2.8
	JI-BC-10	5/25/2021	1537	307720.41	1501253.094	10.4	20.6	8.8	11.4	8.2	1
	JI-BC-REF	5/27/2021	743	296506.50	1499360.302	7.3	22.0	8.2	11.3	8.1	4.2

Table 4-6
James Island Sediment Sample Results

		James Island										
Analyte	Units	JI-BC-REF	JI-BC-01	JI-BC-02	JI-BC-03	JI-BC-04	JI-BC-05	JI-BC-06	JI-BC-07	JI-BC-08	JI-BC-09	JI-BC-10
Gravel	%	0	0	0	0	0	0	0.1	0	1.7	0.4	1.3
Sand	%	91.4	97.9	94.5	92.9	96.2	93.9	96.7	97.6	95	50.6	95.8
Silt	%	6	0.2	4	5.2	2.3	4.8	1.8	1	1.9	29.6	1.1
Clay	%	2.6	1.9	1.5	2	1.5	1.3	1.4	1.5	1.4	19.4	1.8
Percent moisture	%	29.3	22.6	26.6	23.7	26.5	26.6	22.8	26.4	25.2	41.1	23.1
Total organic carbon	mg/kg	1,400	2,600	1,400	1,300	2,300	1,400	1,300	5,900	1,300	12,000	1,300

4.2.2 Benthic Community Metrics

A taxonomic list and abundance (number per m^2) of the benthic fauna collected at the James Island benthic sampling locations during the summer 2020, fall 2020, and spring 2021 sampling events are provided in Tables 4-7 through 4-9, respectively. A list of the benthic fauna collected in individual replicates collected at each location is provided in Appendix C.

A total of 32 unique benthic taxa were collected during the summer sampling event (Table 4-7), 36 unique taxa were collected during the fall sampling event (Table 4-8), and 40 unique taxa were collected during spring sampling event (Table 4-9). Bivalves (specifically mollusk and amethyst gem clam) and polychaetes (specifically pile worm and ram's horn worm [*Streblospio benedicti*]) were the dominant taxa during the summer sampling event (Table 4-7). During the fall sampling event, the bivalve mollusk was the dominant taxon at four of the 10 benthic community locations and the reference location. The dominant taxa at four of the remaining benthic community locations were also bivalves (amethyst gem clam and stout razor clam [*Tagelus plebeius*]), and the polychaete bristle worm (*Heteromastus filiformis*) was the dominant taxon at one benthic location (Table 4-8). The most dominant species identified during both the summer and fall sampling events was the clam mollusk, representing 25% and 46% of the total count of benthic invertebrate taxa, respectively. Bivalves (specifically amethyst gem clam, dwarf surf clam, and stout razor clam) and polychaetes (bristle worm) were also the dominant taxa during the spring sampling event (Table 4-9).

Six metrics were used to describe the overall characteristics of the benthic community at the James Island—total abundance, unique taxa collected, species richness, evenness, Simpson's Dominance Index, and the Shannon-Wiener Diversity Index. These results are presented in Table 4-10 for all sampling events.

Abundance ranged from 1,091 to 6,206 organisms per m^2 in the summer, from 1,595 to 26,726 organisms per m^2 in the fall, and from 746 to 12,732 organisms per m^2 in the spring sampling event. The total abundance at the reference site was 1,690, 3,177, and 2,513 organisms per m^2 in the summer, fall, and spring sampling events, respectively (Table 4-10).

The number of unique taxa at each benthic sample locations ranged from 8 to 15 taxa during the summer sampling event, from 12 to 17 taxa during the fall sampling event, and from 14 to 28 taxa during the spring sampling event. At all locations, the number of taxa between the summer and fall events either increased or stayed the same, and higher numbers of unique taxa were documented during the spring sampling event. There were 12, 13, and 20 unique taxa at the reference site during the summer, fall, and spring sampling events, respectively.

Species richness is a comparison of how many taxa are in a sample compared to how many individuals are in a sample (Equation 2-3). Lower values indicate that the total benthic abundance at a location is dominated by a few taxa and does not represent a diverse benthic community. Species richness values ranged from 1.6 to 3.1 during the summer sampling event, from 2.0 to 2.8 during the fall sampling event, and from 2.2 to 3.6 during the spring sampling event. Of the 10 sampling locations, seven had the greatest species richness values during the spring sampling event (JI-BC-03, JI-BC-04, JI-BC-05, JI-BC-06, JI-BC-08, JI-BC-09, and JI-BC-10). The reference location also had the highest species richness values during the spring sampling event. Generally, the reference site species richness values were similar to species richness values measured at the James Island locations (Table 4-10).

Evenness is a measure of how evenly the individuals collected at a location are distributed among the taxa collected at that location (Equation 2-4), with a maximum value of 1 indicating that the individuals are distributed as evenly as possible. Evenness values ranged from 0.6 to 0.8 during the summer sampling event and from 0.3 to 0.8 during the fall and spring sampling events. The lowest evenness value was reported in the JI-BC-06 sample during the fall and spring sampling events and is likely the result of the high number of amethyst gem clam in the sample (22,835 individuals during the fall sampling event and 10,378 individuals in the spring sampling event). Evenness values were consistent between all sampling events at most locations. Results decreased at two locations, JI-BC-06 and JI-BC-09, likely due to the high abundance of amethyst gem clam in the samples. Evenness values at the reference site were 0.8, 0.7, and 0.8 for summer, fall, and spring, respectively.

The Shannon-Wiener Species Diversity Index considers species richness and species evenness (Equation 2-1), with greater values indicating a more diverse benthic community. Shannon-Wiener Species Diversity Indices ranged from 1.3 to 2.1 during the summer sampling event, from 0.7 to 2.0 during the fall sampling event, and from 0.9 to 2.4 during the spring sampling event. Shannon-Wiener Species Diversity Indices at the reference site were 2.0, 1.9, and 2.0 for summer, fall, and spring, respectively.

Simpson’s Dominance Index measures the diversity of a sample (Equation 2-2), with a lower value indicating a more diverse community. Simpson’s Dominance Indices ranged from 0.1 to 0.4 during the summer sampling event, from 0.2 to 0.7 during the fall sampling event, and from 0.1 to 0.7 during the spring sampling event. Shannon-Wiener Species Diversity Indices were generally consistent for all sampling events at most locations. Results increased at two locations, JI-BC-06 and JI-BC-09, likely due to the high abundance of amethyst gem clam in the samples. The Simpson’s Dominance Index at the reference site was 0.2 during all sampling events.

Results for all benthic community metrics measured at the James Island benthic community sampling locations were within the range of metrics measured at the James Island reference site for both the summer and fall sampling events. Additionally, with the exception of fall and spring sample from JI-BC-06 and the spring sample from JI-BC-09, the high evenness and Shannon-Wiener Species Diversity Indices and low Simpson’s Dominance Indices indicate that the benthic community surrounding James Island is a diverse community. As discussed, the exceptionally high abundance of amethyst gem clam at JI-BC-06 and JI-BC-09 affected the species diversity and dominance in the sample.

Table 4-7
James Island Benthic Community Data: Summer 2020

Species Collected		Abundance (Organisms/m^2)										
Scientific Name	**Common Name**	**JI-BC-REF**	**JI-BC-01**	**JI-BC-02**	**JI-BC-03**	**JI-BC-04**	**JI-BC-05**	**JI-BC-06**	**JI-BC-07**	**JI-BC-08**	**JI-BC-09**	**JI-BC-10**
Alitta succinea	Pile worm	281	83	217	370	89	83	13	96	395	**638**	32
Americamysis almyra	Mysid shrimp	6	19	26	19	13	13	13	0	19	19	19
Ameritella mitchelli	Mollusk	**485**	179	529	861	198	268	255	262	217	485	376
Ameroculodes spp. complex	Amphipod	0	6	0	0	0	0	6	0	0	6	0
Amphibalanus improvisus	Bay barnacle	0	0	0	0	0	0	0	0	0	13	0
Amphiporus ochraceus	Ribbon worm	0	0	0	0	0	0	0	0	0	6	0
Boccardiella ligerica	Segmented worm	0	0	0	0	0	0	0	0	0	13	0
Carinoma tremaphoros	Round worm	6	6	0	0	0	0	0	0	13	6	0
Cyathura polita	Isopod	0	6	13	51	13	0	0	0	19	0	6
Cyclaspis varians	Copepod	6	0	0	19	0	6	0	0	0	13	0
Edwardsia elegans	Elegant burrowing anemone	0	0	0	0	0	0	0	0	0	6	0
Fragilonemertes rosea	Rose worm	70	19	32	140	51	26	6	6	38	6	32
Gemma gemma	Amethyst gem clam	210	38	**593**	**1,639**	**1,537**	**2,360**	102	587	77	230	134
Glycinde multidens	Segmented worm	57	26	26	38	6	51	6	13	0	19	19
Heteromastus filiformis	Bristle worm	434	128	466	976	676	313	121	172	236	96	293
Hypereteone foliosa	Paddle worm	0	0	0	6	0	0	0	0	0	0	6
Hypereteone heteropoda	Paddle worm	26	19	0	38	26	0	13	19	6	6	13
Leitoscoloplos fragilis	Segmented worm	0	0	0	0	0	0	0	0	0	6	0
Lepidactylus dytiscus	Amphipod	0	26	6	0	0	0	0	0	0	6	13
Marenzelleria viridis	Segmented worm	0	45	13	0	6	0	0	0	26	13	13
Mediomastus ambiseta	Segmented worm	51	6	13	6	0	6	13	32	0	6	13
Mulinia lateralis	Dwarf surf clam	38	198	300	115	242	223	45	83	89	434	242
Paraonis fulgens	Segmented worm	0	0	0	6	0	0	0	0	0	0	0
Parvilucina crenella	Many-lined lucine	0	0	0	6	0	0	0	0	0	0	0
Pectinaria gouldii	Fan worm	6	0	0	0	0	0	0	0	0	0	0
Petricolaria pholadiformis	False angel wing	0	0	0	0	0	0	0	0	0	19	0
Phoronis psammophila	Horseshoe worm	0	0	0	6	0	0	0	0	0	0	0
Polydora cornuta	Whip mudworm	0	0	0	0	0	0	0	6	0	172	0
Streblospio benedicti	Ram's horn worm	427	**242**	504	1237	383	421	**542**	**810**	**657**	255	**427**
Stylochus ellipticus	Flatworm	6	0	0	0	0	0	0	0	0	0	0
Tagelus plebeius	Stout razor clam	89	38	83	670	115	19	0	0	51	115	45
Tubificoides spp.	Segmented worms	0	6	32	0	0	6	6	32	13	6	6

Notes:

Bold values represent the dominant species at each location.

Table 4-8
James Island Benthic Community Data: Fall 2020

Species Collected		Abundance (Organisms/m^2)										
Scientific Name	**Common Name**	**JI-BC-REF**	**JI-BC-01**	**JI-BC-02**	**JI-BC-03**	**JI-BC-04**	**JI-BC-05**	**JI-BC-06**	**JI-BC-07**	**JI-BC-08**	**JI-BC-09**	**JI-BC-10**
Alitta succinea	Pile worm	96	32	108	115	45	140	32	121	121	1078	57
Americamysis almyra	Mysid shrimp	0	32	0	0	0	0	6	0	6	0	26
Ameritella mitchelli	Mollusk	804	**1,231**	1,410	**1,550**	1,480	1,709	**421**	2,143	1,065	**1,365**	**1,027**
Ameroculodes spp. complex	Amphipod	13	13	13	32	108	32	6	6	19	45	6
Amphibalanus improvisus	Bay barnacle	0	0	0	0	0	0	0	0	19	0	0
Amphiporus bioculatus	Round worm	51	0	19	0	38	0	0	0	19	13	0
Carinoma tremaphoros	Round worm	19	13	70	57	19	19	26	64	6	6	13
Cyathura polita	Isopod	13	0	0	13	26	6	6	0	13	13	6
Cyclaspis varians	Copepod	6	6	0	26	13	0	0	6	6	0	0
Fragilonemertes rosea	Rose worm	121	77	70	108	77	96	13	57	26	32	70
Gemma gemma	Amethyst gem clam	128	128	1,021	395	1,505	**22,835**	255	**7,457**	**1,295**	1,250	77
Glycinde multidens	Segmented worm	262	121	134	159	153	77	262	249	0	57	447
Haminella solitaria	Gastropod	6	6	6	0	0	0	0	0	0	0	0
Heteromastus filiformis	Bristle worm	**1,052**	344	880	631	517	236	204	785	185	325	427
Hypereteone foliosa	Paddle worm	0	13	0	0	45	32	0	0	32	0	6
Hypereteone heteropoda	Paddle worm	32	6	32	0	6	0	19	26	0	26	0
Japonactaeon punctostriatus	Pitted baby-bubble	0	0	0	0	0	0	0	0	0	0	6
Leitoscoloplos fragilis	Segmented worm	32	13	64	6	45	45	13	45	6	6	19
Lepidactylus dytiscus	Amphipod	0	6	6	0	0	0	0	0	0	0	6
Limecola petalum	Bivalve	0	0	0	0	0	13	0	0	0	0	0
Marenzelleria viridis	Segmented worm	0	6	6	0	0	0	0	6	13	13	0
Mediomastus ambiseta	Segmented worm	64	0	19	19	0	0	0	0	0	0	0
Mulinia lateralis	Dwarf surf clam	19	77	45	32	38	57	32	45	13	32	45
Mya arenaria	Soft-shell clam	0	0	6	0	6	96	6	6	0	57	0
Paraonis fulgens	Segmented worm	0	0	0	13	0	0	0	0	0	6	0
Paraprionospio alata	Segmented worm	0	0	0	6	0	0	0	0	0	6	0
Pectinaria gouldii	Fan worm	0	0	0	0	0	0	6	0	0	6	0
Petricolaria pholadiformis	False angel wing	0	0	0	0	0	0	0	0	0	102	0
Phoronis psammophila	Horseshoe worm	0	0	0	32	0	0	0	0	0	0	0
Polydora cornuta	Whip mudworm	0	0	0	0	0	0	0	0	70	83	0
Siphonenteron bicolour	Worm	0	0	0	0	0	0	0	19	6	0	6
Spiochaetopterus oculatus	Segmented worm	6	0	0	0	0	0	0	0	0	0	0
Streblospio benedicti	Ram's horn worm	408	147	38	19	51	38	115	325	0	325	364
Stylochus ellipticus	Flatworm	13	0	26	83	89	38	0	13	0	6	13
Tagelus plebeius	Stout razor clam	823	848	**1,818**	1,333	**2,373**	1,244	172	1,467	580	1,257	555

Species Collected		Abundance (Organisms/m²)										
Scientific Name	**Common Name**	**JI-BC-REF**	**JI-BC-01**	**JI-BC-02**	**JI-BC-03**	**JI-BC-04**	**JI-BC-05**	**JI-BC-06**	**JI-BC-07**	**JI-BC-08**	**JI-BC-09**	**JI-BC-10**
Tubificoides spp.	Segmented worms	0	0	89	0	6	13	0	19	0	13	0

Notes:
Bold values represent the dominant species at each location.

Table 4-9
James Island Benthic Community Data: Spring 2021

Species Collected		Abundance (Organisms/m²)										
Scientific Name	**Common Name**	**JI-BC-REF**	**JI-BC-01**	**JI-BC-02**	**JI-BC-03**	**JI-BC-04**	**JI-BC-05**	**JI-BC-06**	**JI-BC-07**	**JI-BC-08**	**JI-BC-09**	**JI-BC-10**
Acteocina canaliculata	Channeled barrel-bubble	6	0	0	0	0	0	0	0	0	0	6
Alitta succinea	Pile worm	0	0	0	6	0	0	6	0	6	0	6
Ameritella mitchelli	Mollusk	191	115	51	306	115	45	64	166	172	115	593
Ameroculodes spp. complex	Amphipod	249	204	121	293	179	249	83	274	281	191	223
Amphibalanus improvisus	Bay barnacle	0	0	0	0	6	0	6	364	274	6	6
Amphiporus bioculatus	Round worm	0	0	6	38	45	38	19	6	6	13	6
Apocorophium lacustre	Scud	6	0	0	0	0	0	0	0	6	0	0
Carinoma tremaphoros	Round worm	13	0	0	26	38	13	6	26	0	0	6
Chiridotea coeca	Sand isopod	0	0	0	6	0	0	0	0	0	0	0
Cyathura polita	Isopod	0	0	0	0	6	0	0	0	0	13	6
Edotia triloba	Isopod	0	13	0	6	0	0	13	0	13		13
Fragilonemertes rosea	Rose worm	32	102	13	64	153	147	57	38	6	13	32
Gammarus mucronatus	Scud	0	6	0	0	0	0	0	26	0	0	6
Gemma gemma	Amethyst gem clam	242	0	19	612	70	466	**10,378**	**1,237**	**3,132**	**3,138**	**1,518**
Geukensia demissa	Ribbed mussel	0	0	0	0	0	0	6	0	0	0	0
Glycinde multidens	Segmented worm	13	0	0	6	0	0	0	19	0	0	26
Heteromastus filiformis	Bristle worm	**797**	**746**	121	**1,314**	**529**	485	753	1,021	606	134	453
Hypereteone foliosa	Paddle worm	51	19	0	51	19	102	38	26	26	32	45
Hypereteone heteropoda	Paddle worm	13	77	6	26	26	6	51	38	38	0	38
Leitoscoloplos fragilis	Segmented worm	13	70	0	262	108	57	128	115	77	70	13
Lepidactylus dytiscus	Amphipod	6	0	70	32	0	0	6	0	0	13	13
Leptocheirus plumulosus	Amphipod	96	6	19	0	0	0	0	70	26	0	19
Limecola petalum	Bivalve	13	0	0	6	6	0	13	0	0	6	6
Marenzelleria viridis	Segmented worm	332	153	83	185	313	274	140	306	89	242	325
Mediomastus ambiseta	Segmented worm	0	0	0	0	0	0	0	0	13	0	0
Melita nitida	Amphipod	0	0	0	0	0	0	6	0	0	0	0
Mulinia lateralis	Dwarf surf clam	313	440	**179**	351	198	440	351	683	236	45	147
Mya arenaria	Soft-shell clam	0	0	0	6	6	0	13	0	19	26	96

Species Collected		Abundance (Organisms/m^2)										
Scientific Name	**Common Name**	**JI-BC-REF**	**JI-BC-01**	**JI-BC-02**	**JI-BC-03**	**JI-BC-04**	**JI-BC-05**	**JI-BC-06**	**JI-BC-07**	**JI-BC-08**	**JI-BC-09**	**JI-BC-10**
Naididae sp.	Sludge worm	0	6	0	0	19	0	0	0	0	0	6
Neomysis americana	Possum shrimp	13	6	6	6	6	6	6	6	13	0	0
Paraonis fulgens	Segmented worm	0	0	0	0	26	0	0	0	0	0	0
Phoronis psammophila	Horseshoe worm	0	0	0	0	26	6	0	0	0	0	0
Polydora cornuta	Whip mudworm	0	6	0	0	6	0	26	0	0	6	26
Sayella chesapeakea	Sea snail	0	0	0	0	6	0	0	0	13	0	0
Siphonenteron bicolour	Round worm	0	13	0	6	0	6	0	0	0	0	0
Spilocuma watlingi	Cumacea	0	13	0	32	26	70	6	0	0	13	32
Streblospio benedicti	Ram's horn worm	38	319	19	281	395	38	204	96	70	0	70
Stylochus ellipticus	Flatworm	0	0	0	13	0	6	0	0	0	0	0
Tagelus plebeius	Stout razor clam	77	128	32	472	402	**899**	287	223	102	6	172
Tubificoides spp.	Segmented worms	6	13	0	13	13	0	64	0	6	6	0

Notes:
Bold values represent the dominant species at each location.

Table 4-10
James Island Benthic Community Metrics

	James Island											
	JI-BC-REF			JI-BC-01			JI-BC-02			JI-BC-03		
Metric	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021
Total abundance/m²	1,690	3,177	2,513	2,201	3,967	2,456	1,091	3,119	746	2,851	5,881	4,420
Total biomass (g/m^2)	0.7	0.4	1.3	1.4	0.4	0.6	0.6	0.4	0.3	1.1	0.6	0.9
Unique infaunal taxa	12	13	20	12	15	20	13	13	14	13	16	26
Species richness (Ludwig-Reynolds)	2.5	2.3	2.6	2.3	2.7	2.4	3.1	2.3	2.2	2.4	2.7	3.2
Evenness	0.8	0.7	0.8	0.8	0.7	0.8	0.8	0.7	0.9	0.8	0.7	0.8
Shannon-Wiener H' (ln)	2.0	1.9	2.0	2.0	2.0	2.0	2.1	1.7	1.9	2.0	1.8	2.2
Simpson's dominance	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.3	0.2	0.2	0.2	0.2
Shannon-Wiener H' (log base 2)	2.8	2.7	2.9	2.9	2.9	2.9	3.1	2.5	2.7	2.9	2.6	3.2
Percent abundance pollution-indicative species	40	13	15	22	12	34	40	8.1	28	26	2.3	20
Percent biomass pollution-indicative species	27	11	26	51	13	4.2	19	30	8.8	43	22	7.2
Percent abundance pollution-sensitive species	5.0	18	17	6.4	22	13	8.9	27	17	3.7	31	15
Percent biomass pollution-sensitive species	1.3	3.8	12	1.2	1.2	20	3.7	13	29	4.2	4.6	25
Percent abundance carnivores and omnivores	5.3	16	3.2	16	10	3.6	13	5.3	0.8	11	6.6	2.1

	James Island											
	JI-BC-04			JI-BC-05			JI-BC-06			JI-BC-07		
Metric	**Summer 2020**	**Fall 2020**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Spring 2021**
Total abundance/m²	6,206	4,631	2,743	3,355	6,640	3,355	3,795	26,726	12,732	1,142	1,595	4,739
Total biomass (g/m²)	0.7	1.0	0.8	0.7	0.5	1.2	1.9	0.5	2.1	0.6	0.1	1.4
Unique infaunal taxa	14	15	26	10	16	19	9	15	26	8	13	19
Species richness (Ludwig-Reynolds)	2.2	2.6	3.6	1.9	2.6	2.7	1.6	2.0	2.6	1.7	2.6	2.4
Evenness	0.7	0.7	0.8	0.7	0.6	0.8	0.6	0.3	0.3	0.7	0.8	0.8
Shannon-Wiener H' (ln)	1.9	1.8	2.4	1.6	1.7	2.2	1.3	0.7	0.9	1.5	1.9	2.0
Simpson's dominance	0.2	0.2	0.1	0.3	0.2	0.2	0.4	0.7	0.7	0.3	0.2	0.2
Shannon-Wiener H' (log base 2)	2.7	2.6	3.5	2.4	2.5	3.1	1.9	1.0	1.3	2.2	2.8	2.9
Percent abundance pollution-indicative species	21	1.3	26	21	2.0	15	17	0.6	5.2	51	10	20
Percent biomass pollution-indicative species	19	31	8.6	33	27	16	18	16	1.6	34	40	8.6
Percent abundance pollution-sensitive species	11	30	28	4.0	36	36	0.6	5.1	3.7	1.3	11	12
Percent biomass pollution-sensitive species	8.6	2.7	32	11	5.3	39	1.8	0.2	8.7	0.9	0.6	13
Percent abundance carnivores and omnivores	7.6	6.1	2.4	4.0	4.1	3.3	3.6	1.4	0.7	3.3	21	1.8

	James Island								
	JI-BC-08			JI-BC-09			JI-BC-10		
Metric	**Summer 2020**	**Fall 2020**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Spring 2021**
Total abundance/m²	2,118	12,859	3,132	1,856	3,502	3,138	2,596	6,123	1,518
Total biomass (g/m²)	1.3	0.3	1.2	1.1	1.0	1.4	2.3	0.7	1.9
Unique infaunal taxa	10	14	23	11	12	19	15	17	28
Species richness (Ludwig-Reynolds)	1.9	2.0	2.3	2.2	2.0	2.3	2.9	2.8	3.1
Evenness	0.7	0.5	0.6	0.8	0.6	0.4	0.7	0.7	0.7
Shannon-Wiener H' (ln)	1.6	1.4	1.5	1.8	1.5	1.1	2.0	1.8	2.0
Simpson's dominance	0.3	0.4	0.4	0.2	0.3	0.6	0.2	0.2	0.2
Shannon-Wiener H' (log base 2)	2.3	2.0	2.1	2.7	2.2	1.5	2.8	2.7	2.9
Percent abundance pollution-indicative species	43	3.2	7.4	39	0.6	2.5	28	4.6	6.1
Percent biomass pollution-indicative species	23	48	11	24	13	0.7	17	25	24
Percent abundance pollution-sensitive species	1.5	12	4.4	5.3	18	8.0	5.5	24	15
Percent biomass pollution-sensitive species	1.7	0.7	7.2	4.5	10	13	5.7	2.8	7.0
Percent abundance carnivores and omnivores	7.3	3.2	1.3	22	4.2	1.6	23	14	3.2

4.2.3 Chesapeake Bay Benthic Index of Biotic Integrity

The total B-IBI score for each location is derived by averaging individual scores for each metric. A summary of the benthic community metrics and scores used to calculate the Chesapeake Bay B-IBI are presented in Table 4-11. Only species that met the Chesapeake Bay B-IBI macrofaunal criteria (Versar 2002) were included in the calculation. The B-IBI was derived using data for warmer months and is only indicated for the summer season. However, it was calculated for the fall season for comparative purposes. Total scores for all but the summer season should be used with caution.

The calculated B-IBI scores were low for all James Island benthic locations for summer 2020 and fall 2020, ranging from 1.2 to 2.9, with one exception. The highest score occurred at locations JI-BC-09 during fall 2020 (total B-IBI score of 3.3), which was classified as meeting the restoration goal. During the spring sampling event, two locations (JI-BC-05 and JI-BC-10) and the reference location were classified as meeting the restoration goal. Sampling locations JI-BC-01, JI-BC-03, JI-BC-07, and JI-BC-10 from the summer sampling event and JI-BC-07, JI-BC-08, and JI-BC-09 from the spring sampling event received the classification of marginal. All remaining samples were classified as either degraded or severely degraded. The James Island reference site was also classified as degraded during the summer sampling event (total B-IBI score of 2.4), severely degraded during the fall sampling event (total B-IBI score of 1.8) and increased to meets restoration goal during the spring sampling event (total B-IBI score of 3.0; Table 4-11).

These results were compared to the B-IBI scores calculated from the benthic sampling conducted in 2002 to 2003 and presented in the FS/EIS (USACE 2009). Total B-IBI scores ranged from 1.0 to 3.8 for all locations at James Island. The total B-IBI calculated for the summer 2002 samples were all 1.8 and were classified as severely degraded. The benthic community around James Island was determined to be stressed according to the B-IBI scores. This was attributed to a number of possible factors, including the high abundance of amethyst gem clam (USACE 2009), similar to the benthic community composition determined during the 2020 and 2021 sampling events. Results of the 2020 benthic community sampling are consistent with the 2002 and 2003 sampling results presented in the FS/EIS (USACE 2009).

As discussed in Section 3.2.3, long-term benthic monitoring has also been part of Maryland's Water Quality Monitoring Program for the Chesapeake Bay since 1984. The same long-term benthic monitoring locations described in Section 3.2.3 for comparison the Barren Island B-IBI results are also used for comparison to James Island B-IBI results. B-IBI calculations for these long-term monitoring locations for 2015 through 2019 are presented in Table 3-12.

The 5-year averages for the B-IBI for the high mesohaline mud monitoring location (024) and two of the high mesohaline mud monitoring locations (001 and 006) all exceed 3.0, meaning they are classified as meets restoration goals. The 5-year average for one high mesohaline mud location (015) is 2.4, resulting in a classification of degraded. Results of the James Island B-IBI calculation were generally consistent with long-term monitoring location 015; however, they were less than the results of the remaining Chesapeake Bay long-term benthic monitoring locations.

Table 4-11
Chesapeake Bay B-IBI Scoring for James Island Benthic Locations

Metric	James Island											
	JI-BC-REF			JI-BC-01			JI-BC-02			JI-BC-03		
	Summer 2020	**Fall 2020**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Spring 2021**
Salinity regime	High mesohaline (sand)	High mesohaline (sand)	Low mesohaline	High mesohaline (sand)	High mesohaline (sand)	Low mesohaline	High mesohaline (sand)	High mesohaline (sand)	Low mesohaline	High mesohaline (sand)	High mesohaline (sand)	Low mesohaline
Shannon-Wiener H' (log base 2)	3.0	3.0	5.0	3.0	3.0	50	1.7	3.7	5.0	3.0	3.0	5.0
Total abundance/m²	3.7	3.7	4.3	3.0	5.0	3.7	4.3	2.3	2.3	1.7	3.0	3.0
Biomass/m²	1.0	1.0	2.3	3.0	1.0	1.0	1.0	1.0	1.0	2.3	1.0	1.7
Percent abundance pollution-indicative species	3.0	1.0	2.3	3.0	2.3	1.0	4.3	1.0	1.7	5.0	1.7	1.7
Percent biomass pollution-indicative species	--	--	--	--	--	--	--	--	--	--	--	--
Percent abundance pollution-sensitive species	3.0	1.0	--	3.0	1.0	--	3.0	1.7	--	3.0	1.0	--
Percent biomass pollution-sensitive species	--	--	--	--	--	--	--	--	--	--	--	--
Percent abundance carnivores and omnivores	1.0	1.0	--	1.0	1.7	--	1.0	1.0	--	1.0	1.0	--
B-IBI	2.4	1.8	3.0	2.7	2.3	2.3	2.6	1.8	2.2	2.7	1.8	2.5
Restoration goal	Degraded	Severely degraded	Meets Restoration Goals	Marginal	Degraded	Degraded	Degraded	Severely degraded	Degraded	Marginal	Severely degraded	Degraded

Metric	James Island											
	JI-BC-04			JI-BC-05			JI-BC-06			JI-BC-07		
	Summer 2020	**Fall 2020**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Spring 2021**	**Summer 2020**	**Fall 2020**	**Spring 2021**
Salinity regime	High mesohaline (sand)	High mesohaline (sand)	Low mesohaline	High mesohaline (sand)	High mesohaline (sand)	Low mesohaline	High mesohaline (sand)	High mesohaline (sand)	Low mesohaline	High mesohaline (sand)	High mesohaline (sand)	Low mesohaline
Shannon-Wiener H' (log base 2)	2.3	3.0	5.0	1.7	1.0	5.0	1.0	1.0	1.0	3.0	1.0	5.0
Total abundance/m²	2.3	1.7	3.0	1.0	3.0	3.7	1.0	3.0	1.0	3.7	2.3	3.0
Biomass/m²	1.7	1.7	1.0	1.0	1.0	1.7	3.0	1.0	3.0	1.0	1.0	3.0
Percent abundance pollution-indicative species	5.0	2.3	1.0	5.0	2.3	3.7	5.0	3.0	5.0	4.3	1.0	1.7
Percent biomass pollution-indicative species	--	--	--	--	--	--	--	--	--	--	--	--
Percent abundance pollution-sensitive species	3.0	1.7	--	3.0	1.0	--	1.0	1.0	--	2.3	1.0	--
Percent biomass pollution-sensitive species	--	--	--	--	--	--	--	--	--	--	--	--
Percent abundance carnivores and omnivores	1.0	1.0	--	1.0	1.0	--	1.0	1.0	--	2.3	1.0	--
B-IBI	2.6	1.9	2.2	2.1	1.6	3.3	2.0	1.7	2.2	2.8	1.2	2.7

	James Island											
	JI-BC-04			JI-BC-05			JI-BC-06			JI-BC-07		
Metric	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021
Restoration goal	Degraded	Severely degraded	Degraded	Degraded	Severely degraded	Meets Restoration Goals	Severely degraded	Severely degraded	Degraded	Marginal	Severely degraded	Marginal

	James Island								
	JI-BC-08			JI-BC-09			JI-BC-10		
Metric	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021	Summer 2020	Fall 2020	Spring 2021
Salinity regime	High mesohaline (sand)	High mesohaline (sand)	Low mesohaline	High mesohaline (mud)	High mesohaline (mud)	Low mesohaline	High mesohaline (sand)	High mesohaline (sand)	Low mesohaline
Shannon-Wiener H' (log base 2)	1.0	1.7	3.0	3.0	3.7	1.7	2.3	3.0	5.0
Total abundance/m²	1.0	5.0	3.0	3.0	4.3	3.7	2.3	4.3	3.0
Biomass/m^2	3.0	1.0	2.3	3.0	3.0	2.3	3.0	1.7	3.0
Percent abundance pollution-indicative species	5.0	1.0	4.3	--	--	5.0	5.0	1.7	5.0
Percent biomass pollution-indicative species	--	--	--	3.0	3.7	--	--	--	--
Percent abundance pollution-sensitive species	3.0	1.0	--	--	--	--	3.0	1.0	--
Percent biomass pollution-sensitive species	--	--	--	1.0	1.0	--	--	--	--
Percent abundance carnivores and omnivores	1.0	1.0	--	1.0	4.3	--	1.7	2.3	--
B-IBI	2.3	1.8	2.7	2.3	3.3	2.7	2.9	2.3	3.4
Restoration goal	Degraded	Severely degraded	Marginal	Degraded	Meets restoration goals	Marginal	Marginal	Degraded	Meets restoration goals

Notes:
B-IBI Scores: ≥ 3.0 = meets restoration goals; 2.7-2.9 = marginal; 2.1-2.6 = degraded; ≤ 2.0 = severely degraded
--: Metric was not used for this habitat classification

4.3 Fisheries Surveys

To identify the fish species using the area around James Island, a four-season sampling program was implemented including surveys in summer 2020, fall 2020, winter 2021, and spring 2021. Survey sampling techniques include bottom trawling, beach seining, gillnetting, and pop netting. Bottom trawl, beach seine, and gillnet surveys were conducted during all four seasons. The bottom trawl is used to collect data on the benthic fish assemblages, and the beach seine provides data on the nearshore fish assemblages and blue crab assemblages. The gillnet surveys were used to collect data on fish assemblages in the offshore water column. Pop netting, which targets fish that use the SAV beds in the vicinity of James Island as habitat, was conducted in summer 2020 and spring 2021.

As expected, sampling data indicated that beach seine surveys detected juvenile fish, while bottom trawl and gillnet surveys detected larger subadult to adult fish, mainly due to juveniles and smaller fish remaining closer to the shore where they are more likely to be captured in a seine net, while larger fish tend to be in deeper water where they are more likely to be captured in a trawl or gillnet. In addition, beach seine surveys generally collected more species than other sampling gear.

4.3.1 Beach Seine Survey Results

A summary of species collected, number of each species collected, and range of sizes collected in beach seines for each sampling season is provided in Table 4-12. Individual lengths for all fish and crab collected are provided in Appendix D. Overall, eight different species of fish and one invertebrate were collected throughout all four sampling seasons. The summer survey resulted in the greatest number of fish collected. No fish were collected during the winter 2021 beach seine survey.

At James Island, the summer 2020 beach seine sampling produced six different species of fish and one species of invertebrate, blue crab. Striped anchovy and Atlantic silverside were present in the greatest abundance. Five or less of each of the following species were also collected during the summer 2020 event (in order of abundance): bay anchovy, Atlantic menhaden, Atlantic needlefish (*Strongylura marina*), and Atlantic threadfin (*Polydactylus octonemus*).

The fall 2020 beach seine sampling produced two different species of fish. Atlantic silverside was present in the highest numbers (232 fish) and one red drum was collected. Two species were also collected during the spring 2021 survey: 137 Atlantic silverside and eight spot.

The beach seine surveys conducted at James Island in 2002 to 2003 and presented in the FS/EIS (USACE 2009) found that bay anchovy and Atlantic silverside were generally present in the greatest abundances, similar to the results from the 2020 and 2021 beach seine surveys. Additionally, the list of species collected during the 2002 and 2003 surveys is similar to the species list from the 2020 and 2021 surveys. In the winter 2003 beach seine survey, there were no organisms collected (USACE 2009), again similar to the winter 2021 survey.

Table 4-12
James Island Beach Seine Collection Data

Species Collected		Summer Collection				Fall Collection			
Scientific Name	Common Name	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)
Fish									
Brevoortia tyrannus	Atlantic menhaden	4	83	99	89	--	--	--	--
Strongylura marina	Atlantic needlefish	4	252	380	305	--	--	--	--
Menidia menidia	Atlantic silverside	93	56	100	81	232	64	129	92
Polydactylus octonemus	Atlantic threadfin	2	65	72	69	--	--	--	--
Anchoa mitchilli	Bay anchovy	5	51	54	52	--	--	--	--
Sciaenops ocellatus	Red drum	--	--	--	--	1	39	39	39
Anchoa hepsetus	Striped anchovy	259	54	91	70	--	--	--	--
Leiostomus xanthurus	Spot	--	--	--	--	--	--	--	--
Invertebrate									
Callinectes sapidus	Blue crab	2	60	62	61	--	--	--	--

Species Collected		Spring Collection						
Scientific Name	Common Name	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Minimum Weight (g)	Maximum Weight (g)	Average Weight (g)
Fish								
Brevoortia tyrannus	Atlantic menhaden	--	--	--	--	--	--	--
Strongylura marina	Atlantic needlefish	--	--	--	--	--	--	--
Menidia menidia	Atlantic silverside	137	60	136	109	0.7	17.0	8.3
Polydactylus octonemus	Atlantic threadfin	--	--	--	--	--	--	--
Anchoa mitchilli	Bay anchovy	--	--	--	--	--	--	--

Species Collected		Spring Collection						
Scientific Name	**Common Name**	**Total Count**	**Minimum Length (mm)**	**Maximum Length (mm)**	**Average Length (mm)**	**Minimum Weight (g)**	**Maximum Weight (g)**	**Average Weight (g)**
Sciaenops ocellatus	Red drum	--	--	--	--	--	--	--
Anchoa hepsetus	Striped anchovy	--	--	--	--	--	--	--
Leiostomus xanthurus	Spot	8	34	45	38.25	0.2	0.6	0.4
Invertebrate								
Callinectes sapidus	Blue crab	--	--	--	--	--	--	--

Notes:

a. No fish were collected in seine nets during the winter collection.

--: no data

4.3.2 Bottom Trawl Survey Results

A summary of species collected, number of each species collected, and range of sizes collected in bottom trawls for each sampling season is provided in Table 4-13. Individual lengths for all fish and crab collected are provided in Appendix D. Overall, five different species of fish and one invertebrate were collected throughout all four sampling seasons. The spring survey resulted in the greatest number of fish collected. No fish were collected during the winter bottom trawl survey.

During the summer 2020 bottom trawl survey, one hogchoker (*Trinectes maculatus*) and three blue crabs were collected. During the fall 2020 bottom trawl survey, one skilletfish (*Gobiesox strumosus*) and four blue crabs were collected. The spring 2021 bottom trawl survey yielded both the highest number of species and the greatest abundance collected. Thirteen bay anchovy, one American shad (*Alosa sapidissima*), and one Atlantic menhaden were collected.

The bottom trawl surveys conducted at James Island in 2002 and 2003 and presented in the FS/EIS (USACE 2009) yielded similar results to those presented in this SAR. Bottom trawling yielded few species, and the most dominant finfish in the bottom trawl was the bay anchovy and the dominant shellfish was the blue crab (USACE 2009).

Table 4-13
James Island Bottom Trawl Collection Data

Species Collected		Summer Collection				Fall Collection			
Scientific Name	Common Name	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)
Fish									
Alosa sapidissima	Amercian shad	--	--	--	--	--	--	--	--
Brevoortia tyrannus	Atlantic menhaden	--	--	--	--	--	--	--	--
Anchoa mitchilli	Bay anchovy	--	--	--	--	--	--	--	--
Trinectes maculatus	Hogchoker	1	165	165	165	--	--	--	--
Gobiesox strumosus	Skilletfish	--	--	--	--	1	66	66	66
Invertebrate									
Callinectes sapidus	Blue crab	3	127	164	142	8	129	175	143.75

Species Collected		Spring Collection						
Scientific Name	Common Name	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Minimum Weight (g)	Maximum Weight (g)	Average Weight (g)
Fish								
Alosa sapidissima	Amercian shad	1	130	130	130	17.8	17.8	17.8
Brevoortia tyrannus	Atlantic menhaden	1	39	39	39	0.4	0.4	0.4
Anchoa mitchilli	Bay anchovy	13	42	67	57	0.4	1.9	1.1
Trinectes maculatus	Hogchoker	--	--	--	--	--	--	--
Gobiesox strumosus	Skilletfish	--	--	--	--	--	--	--

Species Collected		Spring Collection						
Scientific Name	Common Name	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Minimum Weight (g)	Maximum Weight (g)	Average Weight (g)
Invertebrate								
Callinectes sapidus	Blue crab	1	145	145	145	--	--	--

Notes:

b. No fish were collected in bottom trawls during the winter collection.

--: no data

4.3.3 Gillnet Survey Results

A summary of species collected, number of each species collected, and range of sizes collected in gill nets for each sampling season is provided in Table 4-14. Individual lengths for all fish and crab collected are provided in Appendix D. Overall, nine different species of fish and one invertebrate were collected throughout all four sampling seasons. The summer 2020 survey resulted in the greatest number species number of species and greatest abundance of fish collected.

The summer 2020 gill net surveys produced eight different species of fish and one species of invertebrate, the blue crab. Spot and Spanish mackerel were present in the greatest abundances. Five or less of each of the following species were also collected during the summer 2020 survey (in order of abundance): Atlantic menhaden, gizzard shad, bluefish, weakfish, striped bass, and summer flounder (*Paralichthys dentatus*).

Only two fish species were collected during the fall 2020 gill net survey: two striped bass and one gizzard shad were collected. The winter 2021 gill net survey also yielded only one alewife. Three striped bass were collected in the spring 2021 survey.

The number of species collected and fish abundance presented in the FS/EIS for the 2002/2003 exceeds the number of species and abundance collected as part of the 2020/2021 gillnetting survey (USACE 2009).

Table 4-14
James Island Gill Net Collection Data

Species Collected		Summer Collection				Fall Collection				Winter Collection			
Scientific Name	Common Name	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)
Fish													
Alosa pseudoharengus	Alewife	--	--	--	--	--	--	--	--	1	280	280	280
Brevoortia tyrannus	Atlantic menhaden	5	280	340	323	--	--	--	--	--	--	--	--
Pomatomus saltatrix	Bluefish	3	266	363	311	--	--	--	--	--	--	--	--
Dorosoma cepedianum	Gizzard shad	4	415	467	438	1	490	490	490	--	--	--	--
Scomberomorus maculatus	Spanish mackerel	6	232	395	301	--	--	--	--	--	--	--	--
Leiostomus xanthurus	Spot	9	122	155	135	--	--	--	--	--	--	--	--
Morone saxatilis	Striped bass	1[a]	--	--	--	2	337	471	404	--	--	--	--
Paralichthys dentatus	Summer flounder	1	208	208	208	--	--	--	--	--	--	--	--
Cynoscion regalis	Weakfish	2[a]	--	--	--	--	--	--	--	--	--	--	--
Invertebrate													
Callinectes sapidus	Blue crab	3	127	132	130	--	--	--	--	--	--	--	--

Species Collected		Spring Collection						
Scientific Name	Common Name	Total Count	Minimum Length (mm)	Maximum Length (mm)	Average Length (mm)	Minimum Weight (g)	Maximum Weight (g)	Average Weight (g)
Fish								
Alosa pseudoharengus	Alewife	--	--	--	--	--	--	--
Brevoortia tyrannus	Atlantic menhaden	--	--	--	--	--	--	--
Pomatomus saltatrix	Bluefish	--	--	--	--	--	--	--
Dorosoma cepedianum	Gizzard shad	--	--	--	--	--	--	--
Scomberomorus maculatus	Spanish mackerel	--	--	--	--	--	--	--
Leiostomus xanthurus	Spot	--	--	--	--	--	--	--
Morone saxatilis	Striped bass	3	360	475	405	488	1145	711
Paralichthys dentatus	Summer flounder	--	--	--	--	--	--	--
Cynoscion regalis	Weakfish	--	--	--	--	--	--	--
Invertebrate								
Callinectes sapidus	Blue crab	--	--	--	--	--	--	--

Notes:

c. Parts of fish were missing upon net retrieval; total lengths could not be measured.

--: no data

4.3.4 Pop Net Survey Results

A summary of species collected, number of each species collected, and range of sizes collected in pop nets for the summer 2020 and spring 2021 surveys is provided in Table 4-15. Individual lengths for all fish and crab collected are provided in Appendix D. Overall, four different species of fish were collected over both sampling seasons. The summer 2020 survey resulted in the greatest number species number of species and greatest abundance of fish collected.

During the summer 2020 pop net survey, 499 bay anchovies, 76 striped anchovy, and six Atlantic silverside were collected. Four spot were collected during the spring 2021 pop net survey.

The most common finfish species collected during the 2002/2003 pop net surveys was the bay anchovy (USACE 2009), similar to the results of the pop net surveys conducted as part of this field investigation. Additionally, the number of species collected was similar between the 2002/2003 and 2020/2021 surveys. However, the total number of fish collected substantially greater in the 2020/2021 surveys. A total of 14 fish were collected in the 2002/2003 pop nets as compared to 585 fish collected in the 2020/2021 surveys.

4.3.5 Summary of Fish Survey Results

The species caught in the fisheries surveys were typical of mesohaline areas of the Mid-Chesapeake Bay Region. Based on the fisheries survey results, the area around James Island is attracting fish in the juvenile and adult life stages. As evident from the beach seine and pop net surveys, the habitat immediately adjacent to the island is an important habitat to a variety of juvenile finfish.

Overall species diversity appears to have decreased slightly from the 2002/2003 fisheries surveys presented in the FS/EIS (USACE 2009). Whereas results were similar to those reported in the SAR, the 2002/2003 fisheries surveys reported greater diversity in species collected for all sample gear types. However, bay anchovy, Atlantic menhaden, and Atlantic silverside continue to be present in the greatest numbers.

Table 4-15
James Island Pop Net Collection Data

Species Collected		Summer Collection				Spring Collection						
Scientific Name	**Common Name**	**Total Count**	**Minimum Length (mm)**	**Maximum Length (mm)**	**Average Length (mm)**	**Total Count**	**Minimum Length (mm)**	**Maximum Length (mm)**	**Average Length (mm)**	**Minimum Weight (g)**	**Maximum Weight (g)**	**Average Weight (g)**
Fish												
Menidia menidia	Atlantic silverside	6	76	85	81	--	--	--	--	--	--	--
Anchoa mitchilli	Bay anchovy	499	36	62	49	--	--	--	--	--	--	--
Leiostomus xanthurus	Spot	--	--	--	--	4	23	25	24	0.1	0.2	0.1
Anchoa hepsetus	Striped anchovy	76	42	68	53	--	--	--	--	--	--	--

Notes:
--: no data

4.4 Bivalve Surveys

Two commercially important clams are found in the vicinity of James Island and include soft-shell and razor clams. Soft-shell and razor clam surveys identified razor clams as more prevalent than soft-shell clams. Bivalve surveys were conducted at five locations around James Island on December 19, 2020. Water quality parameters, including temperature, DO, salinity, and pH, were measured at each transect and are provided in Table 4-16.

Only one legal, harvestable soft-shell clam was collected from all James Island transects; no sublegal soft-shell clams were collected. The bivalve survey at James Island transect JI-CS-05 yielded the greatest number of bivalves: 817 razor clams and one soft-shell clam. The number of bivalves collected at the remaining James Island transects ranged from 35 to 129 bivalves (Table 4-16).

In summary, James Island surveys identified one legal soft-shell clam (no soft-shell clams less than 2 inches in length were identified), 1,175 razor clams, and one oyster (Table 4-16). There were no locations in the James Island survey with a productive natural clam bar ranking as defined by the COMAR 08.02.08.11 criteria (producing 500 hard-shell clams per hour, one-half bushel of soft-shell clams per hour, or one-half bushel of razor clams per hour).

Table 4-16
James Island Bivalve Survey Results

Sample Area	Survey Transect	Date	Time	Water Depth (feet)	Temp (°C)	DO (mg/L)	Salinity (ppt)	pH	Bivalve Counts		
									Soft-Shell Clams	Razor Clams	Oysters
James Island	JI-CS-01	12/19/2020	10:18	6.2	5.8	11.4	14.3	8.2	--	128	1
	JI-CS-02	12/19/2020	9:38	6.1	8	10.9	15	8.1	--	91	--
	JI-CS-03	12/19/2020	8:53	5.9	8	10.9	14.8	8	--	35	--
	JI-CS-04	12/19/2020	11:03	8.5	5.5	11.44	14.1	8.1	--	104	--

Notes:
a. Soft-shell clams greater than 2 inches only.
--: no data

4.5 Crab Pot Surveys

Crab pot surveys in the vicinity of James Island were conducted in August 2020, September 2020, May 2021, June 2021, and July 2021. The location and number of crab pots observed are provided in Figures 4-1 through 4-5 for August 2020, September 2020, May 2021, June 2021, and July 2021, respectively. Sampling points along each transect were used to identify relative crab pot density within subareas. For several of the surveys, areas where crab pots were visibly clustered were noted in the field and are represented on the applicable figures. On each figure, the blue boxes represent the area in which the crab pots were observed. The numbers within the boxes are the number of crab pots counted within the area of the blue box.

The August 2020 survey was conducted on August 30, 2020. One thousand one hundred and twenty-three crab pots were observed surrounding James Island. Crab pots were present in the highest densities in the areas immediately north and immediately south of the island. Crab pots were present within the footprint north and west of the northern remnant and south and west of the southern remnant. Very few crab pots were observed east of the island. The number of crab pots observed and the general vicinity in which the crab pots were located are provided in Figure 4-1.

During the September 2020 survey conducted on September 29, 2020, 971 crab pots were observed. During this survey, most of the crab pots were observed to the north and northwest of the northern remnant. No crab pots were observed south or east of James Island. The number of crab pots observed and the general vicinity in which the crab pots were located for the September 2020 survey are provided in Figure 4-2.

A total of 50 crab pots were counted during the May 2021 survey, conducted on May 18, 2021. The majority of the crab pots were all located northeast of James Island. The number of crab pots observed and the general vicinity in which the crab pots were located for the May 2021 survey are provided in Figure 4-3.

The June 2021 survey was conducted on June 23, 2021. A total of 1,106 crab pots were observed during this survey. The distribution of crab pots was split relatively evenly between the north and south sides of the island. There were no crab pots placed east of James Island. The number of crab pots observed and the general vicinity in which the crab pots were located for the June 2021 survey are provided in Figure 4-4.

The July 2021 survey was conducted on July 22, 2021. A total of 598 crab pots were observed during this survey. A dense cluster of crab pots was observed south and west of the southern remnant of James Island and another cluster was observed immediately north of the island. There were no crab pots placed east of James Island. The number of crab pots observed and the general vicinity in which the crab pots were located for the July 2021 survey are provided in Figure 4-5.

Table 4-17 presents the relative crab pot numbers observed during each sampling event. The estimated density of crab pots (number of crab pots per acre of area surveyed) ranged from 0.01 to 0.29 pot per acre. The greatest crab pot densities were measured during the August 202 and June 2021 surveys.

Table 4-17
Crab Pot Estimates Surrounding James Island

Survey Month	Total Number of Crab Pots Observed	Harvest Area (acres)	Estimated Density (pots/acre)
August 2020	1,123	3,846	0.29
September 2020	971	3,846	0.25
May 2021	50	3,846	0.01
June 2021	1,106	3,846	0.29
July 2021	598	3,846	0.16

Figure 4-1
James Island Crab Pot Survey Transects – August 2020

LEGEND:

— James Island Remnants

▨ Proposed James Island Access Channel

▨ Proposed James Island Alignment

🟩 Crab Pot Survey Footprint

▭ Crab Pot Survey Transect

☐ Crab Pot Count Area

Existing SAV Bed

▨ Moderate 40-70% cover

▨ Sparse 10-20% cover

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.
2. Crabpot survey boundary includes the area within 0.25 mile of the proposed restoration footprint and James Island remnants.
3. The numbers provided in the figure represent the number of crab pots observed within in the crab pot survey footprint. See Section 4.5 for additional information.

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Meters

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Figure 4-2
F James Island Crab Pot Survey Transects – September 2020

LEGEND:

— James Island Remnants

▭ Proposed James Island Access Channel

▨ Proposed James Island Alignment

🟩 Crab Pot Survey Footprint

▬ Crab Pot Survey Transect

▭ Crab Pot Count Area

Existing SAV Bed

▨ Moderate 40-70% cover

▨ Sparse 10-20% cover

NOTES:

1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.
2. Crabpot survey boundary includes the area within 0.25 mile of the proposed restoration footprint and James Island remnants.
3. The numbers provided in the figure represent the number of crab pots observed within in the crab pot survey footprint. See Section 4.5 for additional information.

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Figure 4-3
James Island Crab Pot Survey Transects – May 2021

LEGEND:

- ― James Island Remnants
- ▨ Proposed James Island Access Channel
- ▨ Proposed James Island Alignment
- 🟩 Crab Pot Survey Footprint
- ▭ Crab Pot Survey Transect
- ☐ Crab Pot Count Area

Existing SAV Bed

- ▨ Moderate 40-70% cover
- ▨ Sparse 10-20% cover

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.
2. Crabpot survey boundary includes the area within 0.25 mile of the proposed restoration footprint and James Island remnants.
3. The numbers provided in the figure represent the number of crab pots observed within in the crab pot survey footprint. See Section 4.5 for additional information.

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Figure 4-4
James Island Crab Pot Survey Transects – June 2021

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.
2. Crabpot survey boundary includes the area within 0.25 mile of the proposed restoration footprint and James Island remnants.
3. The numbers provided in the figure represent the number of crab pots observed within in the crab pot survey footprint. See Section 4.5 for additional information.

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Figure 4-5
James Island Crab Pot Survey Transects – July 2021

LEGEND:

— James Island Remnants	🟩 Crab Pot Survey Footprint	**Existing SAV Bed**
▭ Proposed James Island Access Channel	▬ Crab Pot Survey Transect	▨ Moderate 40-70% cover
▨ Proposed James Island Alignment	▭ Crab Pot Count Area	▨ Sparse 10-20% cover

NOTES:
1. Basemaps obtained from Esri aerial imagery and NOAA raster nautical charts streaming services.
2. Crabpot survey boundary includes the area within 0.25 mile of the proposed restoration footprint and James Island remnants.
3. The numbers provided in the figure represent the number of crab pots observed within in the crab pot survey footprint. See Section 4.5 for additional information.

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4.6 Avian Surveys

Avian surveys were performed in summer 2020 and spring 2021. The surveys covered a representative range of habitats on the island, including forest, saltmarsh, open water, scrub-shrub, and shoreline.

4.6.1 Summer Survey Results

Four locations at James Island were included in the summer avian survey conducted on September 2, 2020. On James Island, each survey point occurred on a separate fragment of the island and covered the range of habitats available, including salt marsh, open water, mudflat, and shoreline. Survey points JI-AS-03 and JI-AS-04 had some remaining pine trees and snags that were not present near the other two survey points. Survey locations are shown in Figure 2-13 and 2-14. A summary of the survey results is provided in Table 4-18.

A total of 24 species and 469 individuals were observed on or from James Island during the summer 2020 surveys. Laughing gull (*Leucophaeus atricilla*), Forster's tern (*Sterna forsteri*), and double-crested cormorant were the most abundant species observed from the island fragments during the surveys and represented more than 70% of all observations. Most observations of these species were of individuals flying past the island fragments; however, a few Forester's terns were observed perched along the shoreline.

Several migrating shorebirds were observed feeding on the shoreline and exposed mudflats, including semipalmated plover, ruddy turnstone (*Arenaria interpres*), sanderling, least sandpiper (*Calidris minutilla*), spotted sandpiper, and semipalmated sandpiper (*Calidris pusilla*).

Three raptor species, osprey, bald eagle, and peregrine falcon (*Falco peregrinus*), were observed perching on the remnant trees of the two southernmost fragments of James Island, near survey points JI-AS-03 and JI-AS-04. An intact osprey nest, as well as two partial nests were present in the trees near JI-AS-04. Two unhatched brown pelican eggs were also observed in the sand as well as remnant nests in the shrubs near survey point JI-AS-03.

No terrestrial habitat remains on any of the James Island fragments. Therefore, no typical land birds were observed during the timed surveys or incidental observations.

A wide variety of both resident and migratory bird species were observed using all habitats available at James Island during the September 2020 avian survey. The late summer survey period did not provide direct evidence of the presence of breeding birds because of the late date of the surveys in early September. However, the surveys did document the presence of likely resident species and species that use the islands as stopover sites for resting and foraging during migration.

James Island has eroded from approximately 100 acres to less than 5 acres in less than 20 years. It currently has no remaining upland habitat and is limited to salt marsh, shoreline, and mudflats. These habitats provide only limited opportunities for nesting by a few species.

An avian survey was conducted on James Island in 2002 as part of the FS/EIS (USACE 2009). During the summer 2002 survey, a total of 40 birds were observed at James Island. The number of birds observed during the summer 2020 survey is approximately an order of magnitude greater than the 2002 survey. Most of this is likely due to the high numbers of laughing gulls, Forster's terns, and double-crested cormorants observed during the 2020 survey (totaling 345 individuals). Additionally, 24 species were observed in the 2020 survey, as compared to 18 bird species in the 2002 survey (USACE 2009).

Table 4-18
James Island Avian Summer Survey Results

Species Observed				
Scientific Name	**Common Name**	**Status[a]**	**Habitat[b]**	**Number Observed Summer 2020**
Haliaeetus leucocephalus	Bald eagle	R, M	O, FO	28
Hirundo rustica	Barn swallow	M	FO	1
Pelecanus occidentalis	Brown pelican	S	O, FO	32
Branta canadensis	Canada goose	R	FO	3
Hydroprogne caspia	Caspian tern	M	FO	1
Chaetura pelagica	Chimney swift	M	FO	1
Phalacrocorax auritus	Double-crested cormorant	S, M	O, FO	82
Sterna forsteri	Forster's tern	S, M	S, O, FO, MF, SH	99
Larus marinus	Great black-backed gull	R, M	O, FO	2
Ardea Herodias	Great blue heron	R	FO	1
Larus argentatus	Herring gull	R, M	O	7
Leucophaeus atricilla	Laughing gull	S, M	S, O, FO, MF	164
Calidris minutilla	Least sandpiper	M	MF, SH	8
Pandion haliaetus	Osprey	S, M	O, FO, SH	15
Falco peregrinus	Peregrine falcon	M	SH	1
Larus delawarensis	Ring-Billed gull	M, W	O	1
Archilochus colubris	Ruby-throated hummingbird	M	S	1
Arenaria interpres	Ruddy turnstone	M	FO, MF	4
Calidris alba	Sanderling	M	FO, MF	4
Charadrius semipalmatus	Semipalmated plover	M	FO, MF, SH	4
Actitis macularius	Spotted Sandpiper	M	MF, SH	3
Cathartes aura	Turkey vulture	R, M	FO	5
Corvus sp.	Unidentified crow	R	FO	1

Species Observed		Status[a]	Habitat[b]	Number Observed Summer 2020
Scientific Name	**Common Name**			
Calidris sp.	Unidentified peep	M	FO	1

Notes:

a. Status:

M: migrant
R: year-round resident
S: summer resident
W: winter resident

b. Habitat:

F: Forest
S: saltmarsh
O: open water
FO: flyover
MF: mud flat
SH: shore
S/S: scrub-shrub

4.6.2 Spring Survey Results

Four locations at James Island were included in the spring avian survey conducted on May 27, 2021. The surveys were conducted from the same locations as the summer 2020 avian survey, with the exception of location JI-AS-03. Actively nesting birds were observed at this location, so the survey was conducted from kayaks approximately 200 feet west of the original location to limit disturbance to the nesting birds. Each survey point was located on a separate fragment of the island and covered the range of habitats available, including salt marsh, open water, mudflat, and shoreline. Survey points JI-AS-03 and JI-AS-04 had some remaining pine trees and snags that were not present near the other two survey points. Survey locations are shown in Figure 2-13 and 2-14. A summary of the survey results is provided in Table 4-19.

A total of 309 individual birds representing 18 species were observed during the spring survey. Terns, including common tern (*Sterna hirundo*) and Forster's tern, were observed in the greatest abundance, making up 57% (178 individuals) of the total number of birds surveyed. Most observations of these two species were of individuals courting and nesting on the island fragment just north of JI-AS-03.

Canada goose (*Branta canadensis*), great blue heron, and common grackle were also observed nesting on the southern remnants of James Island near JI-AS-03. A pair of ospreys were also observed nesting in a pine tree near JI-AS-04. Two pairs of American oystercatchers (*Haematopus palliates*), each with two recently fledged young, were also observed on fragments of James Island.

Typical land birds were not observed during the timed surveys or incidental observations due to the lack of remaining terrestrial habitat on the island. One exception was the common grackle, which were observed carrying food from the mainland, southeast of the islands, back to the southern fragments of James Island to feed nestlings. The purple martin (*Progne subis*) and barn swallow (*Hirundo rustica*) were observed flying past the survey locations.

James Island has eroded from approximately 100 acres to less than 5 acres in less than 20 years. It currently has no remaining upland habitat, and is limited to salt marsh, shoreline, and mudflats. These habitats provide only limited opportunities for nesting by a few species. Despite this, seven avian species were confirmed to be breeding on the island remnants.

Avian surveys were conducted in 2002 and 2003 as part of the FS/EIS (USACE 2009). During the spring 2003 survey, a total of 47 birds were observed at James Island. The number of birds observed during the spring 2021 survey is approximately an order of magnitude greater than the 2003 survey. Most of this is likely due to the high numbers of terns observed during the 2021 survey (totaling 178 individuals). Despite the difference in bird abundance, the number of species observed were similar. Eighteen species were observed in the 2021 survey, as compared to 12 bird species in the 2003 survey (USACE 2009).

Table 4-19
James Island Avian Spring Survey Results

Species Observed				Number Observed[c]	
Scientific Name	Common Name	Status[a]	Habitat[b]	Morning Survey	Afternoon Survey
Haematopus palliatus	American oystercatcher[d]	S, M	SH, MF	2	3
Haliaeetus leucocephalus	Bald eagle	R, M	FO	1	2
Hirundo rustica	Barn swallow	M	FO	3	4
Branta canadensis	Canada goose[d]	R	O, SH	6	1
Quiscalus quiscula	Common grackle[d]	R	SH	5	5
Sterna spp.	Common/Forster's tern[d, e]	S, M	O, FO, SH	82	96
Phalacrocorax auritus	Double-crested cormorant	S, M	O, FO	10	16
Larus marinus	Great black-backed gull	R, M	FO, SH	3	6
Ardea herodias	Great blue heron[d]	R	FO, SH	5	6
Larus argentatus	Herring gull	R, M	FO, SH	2	5
Leucophaeus atricilla	Laughing gull	S, M	FO	0	7
Sternula antillarum	Least tern	S, M	FO	1	0
Pandion haliaetus	Osprey[d]	S, M	O, FO, SH	7	7
Progne subis	Purple martin	M	FO	1	0
Larus delawarensis	Ring-billed gull	M, W	O, FO	2	1

Species Observed				Number Observed[c]	
Scientific Name	Common Name	Status[a]	Habitat[b]	Morning Survey	Afternoon Survey
Calidris pusilla	Semipalmated sandpiper	M	SH, MF	2	2
Cathartes aura	Turkey vulture	R, M	FO	0	16

Notes:

a. Status:

M: migrant
R: year-round resident
S: summer resident
W: winter resident

b. Habitat:

F: Forest
S: saltmarsh
O: open water
FO: flyover
MF: mud flat
SH: shore
S/S: scrub-shrub

c. Individual birds may have been observed during both surveys
d. Confirmed breeding

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Appendix A

Barren Island Benthic Community Replicate Sample Results

Table A-1a

Barren Island Summer Benthic Community Counts and Biomass – BI-BC-01

Species List	BI-BC-01 Abundance			BI-BC-01 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Carinoma tremaphoros			1			0.00030
Fragilonemertes rosea			1			0.00520
Alitta succinea	3	1	5	0.00110	0.00050	0.00340
Glycinde multidens	10	15	11	0.00200	0.00300	0.00170
Marenzelleria viridis		3	1		0.00450	0.00290
Paraprionospio alata	1		2	0.00060		0.00150
Streblospio benedicti	2	7	2	0.00005	0.00010	0.00005
Heteromastus filiformis	16	21	22	0.00470	0.01170	0.00500
Mediomastus ambiseta	18	26	8	0.00030	0.00090	0.00020
Tubificoides spp.	3	2	2	0.00010	0.00005	0.00010
Eulimastoma engonium	2		1	0.00005		0.00020
Japonactaeon punctostriatus	1	2	1	0.00005	0.00030	0.00020
Acteocina canaliculata	4	11	4	0.00020	0.00030	0.00010
Geukensia demissa		1			0.00005	
Mulinia lateralis	5	28	14	0.00280	0.01070	0.01480
Ameritella mitchelli	36	61	47	0.00260	0.00150	0.00180
Gemma gemma	13	24	13	0.00160	0.00230	0.00110
Amphibalanus improvisus	1			0.00020		
Americamysis almyra		3	2		0.00020	0.00010
Cyathura polita	1		1	0.00010		0.00020

Notes:

AFDW: ash free dry weight

g: gram

Table A-1b
Barren Island Summer Benthic Community Counts and Biomass – BI-BC-02

Species List	BI-BC-02 Abundance			BI-BC-02 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Stylochus ellipticus			1			0.00030
Carinoma tremaphoros	1		2	0.00010		0.00270
Fragilonemertes rosea	4	1		0.02010	0.00840	
Alitta succinea		frag.	3		0.00010	0.00140
Glycinde multidens	6	1	1	0.00090	0.00020	0.00040
Leitoscoloplos fragilis			1			0.00280
Marenzelleria viridis	2	4	1	0.00180	0.00270	0.00230
Streblospio benedicti	7	11	4	0.00050	0.00040	0.00030
Heteromastus filiformis	4	1	4	0.00250	0.00300	0.00070
Mediomastus ambiseta		1			0.00010	
Eulimastoma engonium		1			0.00005	
Japonactaeon punctostriatus		1	1		0.00005	0.00005
Acteocina canaliculata		1	1		0.00020	0.00005
Mulinia lateralis	22	23	12	0.00320	0.01340	0.00200
Ameritella mitchelli	17	14	17	0.00150	0.00030	0.00620
Tagelus plebeius		1			0.00005	
Gemma gemma	41	41	39	0.00110	0.00320	0.00280
Americamysis almyra	5	1	1	0.00020	0.00030	0.00010

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-1c
Barren Island Summer Benthic Community Counts and Biomass – BI-BC-03

Species List	BI-BC-03 Abundance			BI-BC-03 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Siphonenteron bicolour			1			0.00080
Fragilonemertes rosea	frag.	4		0.00010	0.04150	
Alitta succinea			1			0.00010
Glycinde multidens	5	6	6	0.00060	0.00050	0.00080
Marenzelleria viridis	1			0.00100		
Streblospio benedicti	5	1	2	0.00020	0.00005	0.00010
Heteromastus filiformis	6	3	9	0.00280	0.00110	0.00370
Mediomastus ambiseta	7	2	2	0.00010	0.00010	0.00010
Japonactaeon punctostriatus	1	1	6	0.00005	0.00010	0.00040
Acteocina canaliculata	3	3	10	0.00005	0.00010	0.00030
Mulinia lateralis	22	9	29	0.01700	0.00930	0.01210
Ameritella mitchelli	50	36	69	0.00410	0.00180	0.00380
Gemma gemma	14	21	14	0.00120	0.00140	0.00030
Americamysis almyra		1			0.00020	

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-1d
Barren Island Summer Benthic Community Counts and Biomass – BI-BC-04

Species List	BI-BC-04 Abundance			BI-BC-04 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Carinoma tremaphoros	1			0.00010		
Siphonenteron bicolour		1			0.00030	
Fragilonemertes rosea	frag.	2	2	0.00160	0.00180	0.00310
Alitta succinea	4	3	3	0.00640	0.00390	0.00090
Glycinde multidens	6	7	5	0.00050	0.00120	0.00070
Polydora cornuta	1	1		0.00010	0.00005	
Marenzelleria viridis		1	2		0.00100	0.00070
Streblospio benedicti	7	2	2	0.00030	0.00005	0.00020
Heteromastus filiformis	16	12	11	0.00600	0.00630	0.00340
Mediomastus ambiseta	10	1	9	0.00020	0.00005	0.00030
Loimia medusa	1			0.00110		
Tubificoides spp.	1		1	0.00005		0.00005
Eulimastoma engonium	1	1		0.00010	0.00005	
Japonactaeon punctostriatus	5	15	5	0.00030	0.00030	0.00010
Acteocina canaliculata	1	2	1	0.00010	0.00005	0.00010
Haminella solitaria	1			0.00005		
Geukensia demissa	1	2	1	0.00005	0.00010	0.00005
Mulinia lateralis	12	15	10	0.00700	0.01080	0.01990
Ameritella mitchelli	52	76	24	0.01890	0.01010	0.00590
Tagelus plebeius			3			0.00005
Gemma gemma	77	72	17	0.01280	0.00830	0.00200
Americamysis almyra		2			0.00020	
Edotia triloba	1			0.00005		
Ameroculodes spp. complex			1			0.00020

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-1e

Barren Island Summer Benthic Community Counts and Biomass – BI-BC-05

	BI-BC-05 Abundance			BI-BC-05 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Stylochus ellipticus			1			0.00010
Carinoma tremaphoros			1			0.00020
Fragilonemertes rosea	frag.	frag.	1	0.00010	0.00010	0.00280
Alitta succinea	11	5	10	0.01070	0.00260	0.00720
Glycera dibranchiata		1			0.00730	
Glycinde multidens	8	10	3	0.00110	0.00220	0.00090
Marenzelleria viridis	3	2		0.00660	0.00180	
Streblospio benedicti	5	8	4	0.00020	0.00030	0.00020
Heteromastus filiformis	5	3	10	0.00130	0.00350	0.00470
Mediomastus ambiseta	2	6	3	0.00005	0.00010	0.00005
Loimia medusa		1			0.00040	
Tubificoides spp.		6	4		0.00010	0.00005
Japonactaeon punctostriatus	2	2	1	0.00005	0.00005	0.00005
Acteocina canaliculata			4			0.00010
Haminella solitaria		1			0.00005	
Geukensia demissa	1		1	0.00010		0.00010
Mulinia lateralis	29	38	46	0.01890	0.00330	0.00450
Ameritella mitchelli	32	37	52	0.00400	0.00100	0.00480
Tagelus plebeius			1			0.00005
Gemma gemma	32	24	52	0.00380	0.00330	0.00730
Amphibalanus improvisus	3	1		0.00060	0.00005	
Americamysis almyra	1	18	5	0.00005	0.00150	0.00120
Cyathura polita		1			0.00030	
Edotia triloba	2			0.00010		
Melita nitida	1			0.0002		

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-1f

Barren Island Summer Benthic Community Counts and Biomass – BI-BC-06

	BI-BC-06 Abundance			BI-BC-06 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Carinoma tremaphoros			1			0.00090
Alitta succinea	29	29	31	0.02980	0.03780	0.03080
Glycinde multidens	2	2	2	0.00020	0.00020	0.00010
Polydora cornuta	1		3	0.00005		0.00030
Streblospio benedicti	35	14	9	0.00110	0.00040	0.00020
Mediomastus ambiseta		3	2		0.00010	0.00005
Eulimastoma engonium	1	2	1	0.00010	0.00010	0.00010
Acteocina canaliculata	1			0.00010		
Geukensia demissa		1	2		0.00005	0.00010
Mulinia lateralis	12	3	6	0.00210	0.00040	0.00130
Ameritella mitchelli	42	19	15	0.00090	0.00030	0.00050
Petricolaria pholadiformis	10	7	2	0.00110	0.00090	0.00020
Cyclaspis varians			1			0.00005
Cyathura polita	2	1	1	0.00040	0.00050	0.00030
Ameroculodes spp. complex		1			0.00010	

Notes:

AFDW: ash free dry weight

g: gram

Table A-1g
Barren Island Summer Benthic Community Counts and Biomass – BI-BC-07

	BI-BC-07 Abundance			BI-BC-07 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Lineidae sp. (?*Fragilonemertes*)		frag.			0.00560	
Siphonenteron bicolour		6			0.00420	
Alitta succinea	8	8	8	0.02060	0.02400	0.02050
Glycinde multidens	36	41	25	0.01220	0.01600	0.00850
Marenzelleria viridis	23	35	29	0.07640	0.12990	0.08280
Paraprionospio alata	1	4		0.00110	0.00640	
Streblospio benedicti	6	9	6	0.00020	0.00010	0.00010
Heteromastus filiformis	26	10	28	0.00920	0.00560	0.00920
Mediomastus ambiseta	82	106	48	0.00250	0.00240	0.00180
Tubificoides spp.	1	3	2	0.00005	0.00005	0.00005
Eulimastoma engonium	1	3	1	0.00005	0.00010	0.00010
Japonactaeon punctostriatus	4	2	3	0.00010	0.00010	0.00010
Acteocina canaliculata			1			0.00020
Haminella solitaria	1			0.00005		
Mulinia lateralis	14	17	12	0.00460	0.00340	0.00270
Ameritella mitchelli	54	58	41	0.01240	0.00870	0.00130
Limecola petalum	1	1		0.00180	0.00780	
Americamysis almyra	3	1	2	0.00020	0.00020	0.00040
Cyathura polita	6	5	4	0.00270	0.00110	0.00130
Edotia triloba			1			0.00005

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-1h
Barren Island Summer Benthic Community Counts and Biomass – BI-BC-08

Species List	BI-BC-08 Abundance			BI-BC-08 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Fragilonemertes rosea		frag.			0.00010	
Alitta succinea	4	1	4	0.00240	0.00050	0.00720
Glycinde multidens	54	35	27	0.01470	0.01080	0.01120
Marenzelleria viridis		1	frag.		0.00100	0.00030
Streblospio benedicti	5	4	2	0.00010	0.00005	0.00010
Heteromastus filiformis	11	10	20	0.00120	0.00100	0.00250
Mediomastus ambiseta	13	11	29	0.00020	0.00030	0.00090
Tubificoides spp.	2	1	2	0.00005	0.00005	0.00005
Eulimastoma engonium	4	6	3	0.00020	0.00010	0.00005
Japonactaeon punctostriatus	5	2	1	0.00020	0.00005	0.00030
Acteocina canaliculata		1			0.00005	
Haminella solitaria	1	1		0.00005	0.00005	
Mulinia lateralis	140	78	92	0.06300	0.03230	0.03390
Ameritella mitchelli	131	62	66	0.01290	0.00450	0.00460
Limecola petalum		1			0.00590	
Tagelus plebeius	2			0.00100		
Amphibalanus improvisus		1			0.00020	
Americamysis almyra	2	4	12	0.00005	0.00050	0.00080
Cyathura polita	2		1	0.00040		0.00005
Edotia triloba	2	1	4	0.00030	0.00005	0.00030
Ameroculodes spp. complex		1			0.00005	

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-1i
Barren Island Summer Benthic Community Counts and Biomass – BI-BC-09

Species List	BI-BC-09 Abundance			BI-BC-09 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Fragilonemertes rosea	1		1	0.00980		0.03870
Amphiporus bioculatus		1			0.00020	
Alitta succinea	2	6	1	0.00130	0.00790	0.00040
Glycinde multidens	6	10	7	0.00120	0.00140	0.00030
Marenzelleria viridis		1			0.00020	
Streblospio benedicti	1	1	2	0.00010	0.00005	0.00020
Heteromastus filiformis	5	6	4	0.00140	0.00240	0.00050
Mediomastus ambiseta	3			0.00010		
Japonactaeon punctostriatus	1	1	1	0.00005	0.00005	0.00020
Acteocina canaliculata		1	1		0.00010	0.00005
Haminella solitaria	1	1		0.00005	0.00010	
Geukensia demissa		1			0.00010	
Mulinia lateralis	22	79	61	0.00350	0.01250	0.01040
Ameritella mitchelli	23	37	44	0.00180	0.00300	0.00290
Tagelus plebeius			1			0.00005
Gemma gemma	21	33	24	0.00250	0.00500	0.00360
Americamysis almyra	3	3	4	0.00080	0.00040	0.00060
Cyathura polita	1			0.00050		
Edotia triloba	1		1	0.00020		0.00005
Melita nitida	1			0.00010		
Lepidactylus dytiscus		1			0.00010	

Notes:

AFDW: ash free dry weight

g: gram

Table A-1j
Barren Island Summer Benthic Community Counts and Biomass – BI-BC-10

	BI-BC-10 Abundance			**BI-BC-10 Biomass (g; AFDW)**		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Hypereteone heteropoda	1			0.00020		
Alitta succinea	5	11	7	0.00250	0.01180	0.00940
Glycinde multidens	58	52	46	0.02070	0.01560	0.01680
Marenzelleria viridis	3	7	3	0.01050	0.00910	0.00390
Paraprionospio alata	1	1	2	0.00110	0.00170	0.00150
Streblospio benedicti	8	3	8	0.00030	0.00010	0.00020
Heteromastus filiformis	6	8	12	0.00130	0.00190	0.00120
Mediomastus ambiseta	206	125	269	0.00440	0.00400	0.00730
Tubificoides spp.			1			0.00010
Eulimastoma engonium			1			0.00005
Sayella chesapeakea	1			0.00010		
Japonactaeon punctostriatus	29	12	28	0.00130	0.00040	0.00110
Acteocina canaliculata	1	2	11	0.00010	0.00020	0.00020
Haminella solitaria		1			0.00005	
Geukensia demissa	1			0.00010		
Mulinia lateralis	101	74	92	0.02600	0.02250	0.03800
Ameritella mitchelli	118	68	116	0.00770	0.00460	0.00790
Americamysis almyra	5		3	0.00070		0.00060
Cyclaspis varians			2			0.00010
Edotia triloba		4	4		0.00030	0.00010

Notes:

AFDW: ash free dry weight

g: gram

Table A-1k
Barren Island Summer Benthic Community Counts and Biomass – BI-BC-REF

Species List	BI-BC-REF Abundance			BI-BC-REF Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Fragilonemertes rosea		3	3		0.02560	0.01800
Alitta succinea	3	4	1	0.00050	0.00270	0.00010
Glycinde multidens	7	6	7	0.00080	0.00070	0.00150
Streblospio benedicti	7	9	22	0.00050	0.00060	0.00130
Heteromastus filiformis	4	7	2	0.00390	0.00950	0.00190
Mediomastus ambiseta	frag.	3	2	0.00005	0.00005	0.00010
Loimia medusa	1			0.00060		
Japonactaeon punctostriatus	4	3	3	0.00010	0.00005	0.00010
Acteocina canaliculata		1			0.00005	
Parvilucina crenella		2			0.00030	
Mulinia lateralis	36	31	35	0.00180	0.00560	0.01070
Ameritella mitchelli	37	25	24	0.00820	0.00460	0.00170
Americamysis almyra	3	3	4	0.00030	0.00020	0.00050

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-2a

Barren Island Fall Benthic Community Counts and Biomass – BI-BC-01

Species List	BI-BC-01 Abundance			BI-BC-02 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Alitta succinea	1	4	5	0.00020	0.00350	0.00430
Glycinde multidens	15	30	22	0.00100	0.00230	0.00200
Marenzelleria viridis			1			0.00110
Paraprionospio alata			1			0.00005
Streblospio benedicti	6	11	10	0.00050	0.00040	0.00060
Heteromastus filiformis	11	13	4	0.00570	0.00280	0.00160
Mediomastus ambiseta	14	23	20	0.00050	0.00050	0.00080
Tubificoides spp.	2	1	1	0.00010	0.00010	0.00010
Eulimastoma engonium	1	3		0.00005	0.00010	
Japonactaeon punctostriatus	1	5	2	0.00005	0.00040	0.00010
Acteocina canaliculata		7	5		0.00170	0.00070
Mulinia lateralis	1	4	2	0.02140	0.06470	0.02530
Ameritella mitchelli	44	98	38	0.00930	0.00350	0.00860
Tagelus plebeius	3	9	6	0.00005	0.00020	0.00010
Gemma gemma	41	77	40	0.00070	0.00130	0.00130
Amphibalanus improvisus	1			0.01090		
Americamysis almyra			1			0.00005
Cyclaspis varians		1			0.00005	
Cyathura polita		1			0.00030	
Apocorophium lacustre	1			0.00005		

Notes:

AFDW: ash free dry weight

g: gram

Table A-2b

Barren Island Fall Benthic Community Counts and Biomass – BI-BC-02

Species List	BI-BC-02 Abundance			BI-BC-02 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Fragilonemertes rosea	1	1	6	0.00410	0.00110	0.01490
Alitta succinea			1			0.00005
Glycinde multidens	13	12	16	0.00090	0.00070	0.00100
Leitoscoloplos fragilis		2			0.00220	
Paraonis fulgens		2			0.00010	
Marenzelleria viridis		1			0.00030	
Heteromastus filiformis	6	4	4	0.00120	0.00090	0.00130
Mediomastus ambiseta	2		2	0.00010		0.00010
Eulimastoma engonium		3			0.00030	
Japonactaeon punctostriatus	1		3	0.00005		0.00020
Acteocina canaliculata	4			0.00030		
Haminella solitaria	7	4	3	0.00180	0.00170	0.00160
Mulinia lateralis	1	1		0.01490	0.02130	
Ameritella mitchelli	99	80	130	0.00330	0.00160	0.00420
Tagelus plebeius	19	12	24	0.00030	0.00020	0.00060
Gemma gemma	72	74	88	0.00090	0.00190	0.00300
Americamysis almyra	1		1	0.00005		0.00005
Edotia triloba			1			0.00005
Ameroculodes spp. complex	1	1	1	0.00020	0.00030	0.00005

Notes:

AFDW: ash free dry weight

g: gram

Table A-2c
Barren Island Fall Benthic Community Counts and Biomass – BI-BC-03

Species List	BI-BC-03 Abundance			BI-BC-03 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Fragilonemertes rosea	2	2	2	0.00790	0.00800	0.00140
Hermundura americana		1			0.00040	
Alitta succinea		1			0.00180	
Glycinde multidens	15	50	9	0.00100	0.00380	0.00050
Marenzelleria viridis	1		frag.	0.00080		0.00130
Paraprionospio alata		1			0.00120	
Streblospio benedicti	2	6		0.00005	0.00030	
Heteromastus filiformis	2	5	2	0.00070	0.00280	0.00040
Mediomastus ambiseta	24	41	12	0.00070	0.00190	0.00050
Japonactaeon punctostriatus	5	1	1	0.00010	0.00010	0.00005
Acteocina canaliculata	4	3	9	0.00060	0.00080	0.00140
Geukensia demissa	1	1		0.00010	0.00010	
Mulinia lateralis	3	5	1	0.02570	0.03920	0.01880
Ameritella mitchelli	56	69	38	0.01200	0.00440	0.00340
Limecola petalum		1			0.00520	
Tagelus plebeius	7		1	0.00020		0.00005
Gemma gemma	40	40	34	0.00680	0.00710	0.00140

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-2d
Barren Island Fall Benthic Community Counts and Biomass – BI-BC-04

	BI-BC-04 Abundance			BI-BC-04 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Stylochus ellipticus	4	4	1	0.00090	0.00100	0.00020
Carinoma tremaphoros		3			0.00380	
Siphonenteron bicolour	1		1	0.00020		0.00250
Fragilonemertes rosea	1	1	3	0.00050	0.00240	0.01030
Alitta succinea	7	5	6	0.00480	0.00400	0.00740
Glycinde multidens	40	28	33	0.00290	0.00160	0.00200
Polydora cornuta			2			0.00010
Polydora websteri	1		5	0.00010		0.00030
Marenzelleria viridis	6	2	4	0.00580	0.00250	0.00640
Paraprionospio alata	1			0.00060		
Streblospio benedicti	12	6	9	0.00070	0.00040	0.00070
Heteromastus filiformis	13	20	11	0.01090	0.00580	0.00460
Mediomastus ambiseta	35	18	32	0.00100	0.00040	0.00100
Tubificoides spp.	2	5	5	0.00005	0.00010	0.00010
Eulimastoma engonium	5	6	6	0.00010	0.00030	0.00030
Sayella chesapeakea	2	1		0.00020	0.00010	
Japonactaeon punctostriatus	18	6	10	0.00040	0.00010	0.00030
Acteocina canaliculata	6	3	2	0.00290	0.00050	0.00030
Geukensia demissa	6	13	14	0.00030	0.00020	0.00050
Mulinia lateralis	4		3	0.08920		0.10810
Ameritella mitchelli	92	193	133	0.00350	0.00180	0.00630
Tagelus plebeius	22	18	14	0.00050	0.00030	0.00030
Gemma gemma	169	187	144	0.01540	0.02520	0.01450
Mya arenaria	4	2	2	0.00020	0.00005	0.00010
Lyonsia hyalina			1			0.00020
Americamysis almyra	1	1		0.00005	0.00005	
Cyclaspis varians			1			0.00005
Cyathura polita	1			0.00070		
Edotia triloba	1	1	1	0.00030	0.00010	0.00005
Apocorophium lacustre			10			0.00060
Melita nitida			2			0.00010
Eurypanopeus depressus			1			0.00630

Notes:

AFDW: ash free dry weight

g: gram

Table A-2e
Barren Island Fall Benthic Community Counts and Biomass – BI-BC-05

Species List	BI-BC-05 Abundance			BI-BC-05 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Carinoma tremaphoros			1			0.00030
Fragilonemertes rosea	frag.	1	frag.	0.00190	0.00530	0.00040
Alitta succinea	11	31	2	0.00950	0.01780	0.00260
Glycinde multidens	17	17	10	0.00110	0.00110	0.00080
Polydora cornuta		1			0.00020	
Polydora websteri		2			0.00005	
Marenzelleria viridis		2	1		0.00360	0.00100
Paraprionospio alata	1			0.00040		
Streblospio benedicti	5	3	6	0.00030	0.00020	0.00030
Heteromastus filiformis	6	8	4	0.00330	0.00360	0.00320
Mediomastus ambiseta	5	19	5	0.00005	0.00070	0.00010
Tubificoides spp.		9			0.00040	
Eulimastoma engonium	2	3	1	0.00005	0.00020	0.00010
Japonactaeon punctostriatus		5	2		0.00020	0.00010
Acteocina canaliculata	4	2	4	0.00050	0.00040	0.00070
Haminella solitaria	1			0.00010		
Geukensia demissa	1	1	2	0.00005	0.00010	0.00040
Mulinia lateralis	1	9	7	0.01220	0.07620	0.02450
Ameritella mitchelli	131	107	150	0.00440	0.00460	0.00520
Tagelus plebeius	18	23	22	0.00030	0.00030	0.00020
Gemma gemma	183	114	69	0.00760	0.00280	0.01220
Petricolaria pholadiformis		1			0.00010	
Mya arenaria	3		1	0.00020		0.00005
Americamysis almyra			1			0.00005
Cyclaspis varians			1			0.00005
Cyathura polita	3			0.00070		
Edotia triloba	1	1		0.00005	0.00010	
Apocorophium lacustre	1			0.00020		

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-2f
Barren Island Fall Benthic Community Counts and Biomass – BI-BC-06

Species List	BI-BC-06 Abundance			BI-BC-06 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Alitta succinea		1	1		0.00110	0.00080
Glycinde multidens	6	5	7	0.00090	0.00100	0.00040
Marenzelleria viridis	2		1	0.00200		0.00040
Streblospio benedicti		6	2		0.00030	0.00005
Heteromastus filiformis	1		2	0.00040		0.00130
Mediomastus ambiseta	1	29	10	0.00005	0.00070	0.00010
Acteocina canaliculata	1	1		0.00010	0.00040	
Mulinia lateralis	1	1		0.01680	0.00540	
Ameritella mitchelli	40	54	10	0.00200	0.00340	0.00110
Tagelus plebeius	9	21	8	0.00020	0.00050	0.00010
Gemma gemma	7	15	1	0.00010	0.00020	0.00010

Notes:

AFDW: ash free dry weight

g: gram

Table A-2g
Barren Island Fall Benthic Community Counts and Biomass – BI-BC-07

Species List	BI-BC-07 Abundance			BI-BC-07 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Carinoma tremaphoros	frag.		1	0.00360		0.00540
Hermundura americana	1			0.00020		
Alitta succinea	3	2	2	0.00590	0.01050	0.00490
Glycinde multidens	25	16	6	0.00570	0.00350	0.00170
Leitoscoloplos robustus			1			0.00700
Marenzelleria viridis	3	7	2	0.00580	0.00900	0.00300
Streblospio benedicti	8			0.00020		
Heteromastus filiformis		6			0.00200	
Mediomastus ambiseta	13	2	2	0.00030	0.00005	0.00005
Acteocina canaliculata	2	1	2	0.00010	0.00020	0.00010
Mulinia lateralis		3	1		0.03450	0.00005
Ameritella mitchelli	62	57	37	0.00450	0.01340	0.01100
Americamysis almyra		1			0.00040	
Cyathura polita	1	2	1	0.00005	0.00200	0.00060
Edotia triloba	1	1		0.00010	0.00010	

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-2h

Barren Island Fall Benthic Community Counts and Biomass – BI-BC-08

Species List	BI-BC-08 Abundance			BI-BC-08 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Carinoma tremaphoros	1			0.00020		
Alitta succinea	4	3	2	0.01070	0.00580	0.00160
Glycinde multidens	39	13	34	0.00360	0.00190	0.00590
Marenzelleria viridis	frag.	1	frag.	0.00240	0.00270	0.00510
Streblospio benedicti	19	7	18	0.00080	0.00030	0.00080
Heteromastus filiformis	12	5	11	0.00440	0.00110	0.00390
Mediomastus ambiseta	27	23	42	0.00130	0.00110	0.00270
Tubificoides spp.		1	1		0.00005	0.00005
Eulimastoma engonium		1	2		0.00020	0.00010
Acteocina canaliculata			1			0.00005
Mulinia lateralis	7	2	12	0.03280	0.00870	0.00830
Ameritella mitchelli	30	25	49	0.00250	0.00420	0.02050
Tagelus plebeius	1			0.00005		
Gemma gemma		1			0.00005	
Edotia triloba			2			0.00020

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-2i
Barren Island Fall Benthic Community Counts and Biomass – BI-BC-09

Species List	BI-BC-09 Abundance			BI-BC-09 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Carinoma tremaphoros	1	1		0.00060	0.00005	
Alitta succinea	1	4		0.00005	0.00270	
Glycinde multidens	7	3	5	0.00100	0.00030	0.00030
Streblospio benedicti	3	11	3	0.00010	0.00070	0.00030
Heteromastus filiformis	3	12	2	0.00210	0.00990	0.00160
Mediomastus ambiseta	3	3	1	0.00010	0.00010	0.00005
Acteocina canaliculata	1			0.00030		
Mulinia lateralis	2	4	1	0.00290	0.04330	0.00005
Ameritella mitchelli	52	83	50	0.00350	0.00380	0.00080
Tagelus plebeius	3	13	6	0.00010	0.00020	0.00010
Gemma gemma	47	38	44	0.00330	0.00160	0.00370
Amphibalanus improvisus	1			0.00790		
Americamysis almyra	1			0.00010		
Cyathura polita		1			0.00020	

Notes:

AFDW: ash free dry weight

g: gram

Table A-2j
Barren Island Fall Benthic Community Counts and Biomass – BI-BC-10

Species List	BI-BC-10 Abundance			BI-BC-10 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Hypereteone heteropoda	2		1	0.00010		0.00010
Alitta succinea	7	4	2	0.00730	0.00390	0.00490
Glycinde multidens	56	49	70	0.00870	0.00760	0.00870
Marenzelleria viridis	3	5	2	0.00390	0.00490	0.00390
Streblospio benedicti	14	21	18	0.00070	0.00110	0.00070
Heteromastus filiformis	7	9	5	0.00210	0.00430	0.00180
Mediomastus ambiseta	74	70	78	0.00290	0.00240	0.00270
Tubificoides spp.			1			0.00005
Eulimastoma engonium	2	3	4	0.00005	0.00010	0.00030
Japonactaeon punctostriatus	9	12	5	0.00040	0.00070	0.00020
Acteocina canaliculata	2	2	5	0.00030	0.00040	0.00060
Mulinia lateralis	15	9	16	0.04980	0.00050	0.01860
Ameritella mitchelli	108	114	118	0.00870	0.00720	0.00870
Tagelus plebeius	2	1		0.00005	0.00005	
Gemma gemma		1			0.00005	
Americamysis almyra		1			0.00005	
Edotia triloba	1	1	2	0.00005	0.00010	0.00010
Apocorophium lacustre	1			0.00010		

Notes:

AFDW: ash free dry weight

g: gram

Table A-2k
Barren Island Fall Benthic Community Counts and Biomass – BI-BC-REF

Species List	BI-BC-REF Abundance			BI-BC-REF Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Stylochus ellipticus		1			0.00020	
Fragilonemertes rosea	1	2	frag.	0.00220	0.00470	0.00270
Glycinde multidens	8	12	7	0.00040	0.00090	0.00060
Streblospio benedicti	3	3	2	0.00030	0.00010	0.00010
Heteromastus filiformis	2	2		0.00100	0.00090	
Mediomastus ambiseta	1		2	0.00010		0.00010
Japonactaeon punctostriatus		1	1		0.00005	0.00005
Acteocina canaliculata	4		2	0.00070		0.00005
Haminella solitaria	1	1		0.00005	0.00005	
Mulinia lateralis	1		3	0.00820		0.03150
Ameritella mitchelli	68	63	45	0.01100	0.00190	0.00550
Tagelus plebeius	6	1	2	0.00010	0.00005	0.00005
Gemma gemma			2			0.00050
Americamysis almyra	1	1	3	0.00050	0.00040	0.00010

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-3a
Barren Island Spring Benthic Community Counts and Biomass – BI-BC-01

Species List	BI-BC-01 Abundance			BI-BC-01 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Siphonenteron bicolour		1			0.00010	
Fragilonemertes rosea	1	1		0.00160	0.00240	
Hypereteone heteropoda	2	1	4	0.00010	0.00010	0.00030
Glycinde multidens	8	8	6	0.00300	0.00350	0.00220
Polydora cornuta			1			0.00005
Marenzelleria viridis	5	5	1	0.00260	0.00150	0.00050
Streblospio benedicti	9	6	8	0.00040	0.00005	0.00010
Heteromastus filiformis	9	14	11	0.00160	0.00430	0.00310
Mediomastus ambiseta	30	4	8	0.00150	0.00005	0.00020
Acteocina canaliculata	1	8	9	0.00080	0.00550	0.00490
Mulinia lateralis	22	51	27	0.08850	0.23620	0.15420
Ameritella mitchelli	32	35	33	0.06760	0.05590	0.04380
Limecola petalum	2	2		0.00180	0.00140	
Tagelus plebeius	3	8		0.00080	0.00390	
Gemma gemma	94	96	122	0.00450	0.01270	0.00800
Mya arenaria	1	1	4	0.00010	0.00005	0.00005
Neomysis americana		1			0.00150	
Leucon (*Leucon*) *americanus*			1			0.00005
Edotia triloba	2	2	3	0.00005	0.00020	0.00020
Leptocheirus plumulosus	5	5	1	0.00120	0.00140	0.00020
Ameroculodes spp. complex	6	11	3	0.00040	0.00140	0.00020

Notes:
AFDW: ash free dry weight
g: gram

Table A-3b

Barren Island Spring Benthic Community Counts and Biomass – BI-BC-02

Species List	**BI-BC-02 Abundance**			**BI-BC-02 Biomass (g; AFDW)**		
	Replicate A	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Fragilonemertes rosea	3	6	3	0.00700	0.01750	0.00580
Hypereteone heteropoda	3		1	0.00010		0.00030
Hypereteone foliosa	1			0.00050		
Glycinde multidens	2	1		0.00070	0.00020	
Leitoscoloplos fragilis	2	4	5	0.00020	0.00010	0.00710
Paraonis fulgens	4	2	3	0.00020	0.00030	0.00030
Polydora cornuta	2	1		0.00020	0.00005	
Marenzelleria viridis		6	6		0.00150	0.00140
Streblospio benedicti	10	24	9	0.00030	0.00050	0.00050
Heteromastus filiformis	38	24	36	0.00650	0.00500	0.00720
Mediomastus ambiseta	3	5		0.00005	0.00020	
Tubificoides spp.	2	3		0.00010	0.00005	
Acteocina canaliculata		2	3		0.00080	0.00290
Mulinia lateralis	42	37	27	0.00050	0.00030	0.00030
Ameritella mitchelli	15	10	6	0.02950	0.01110	0.01370
Tagelus plebeius	2	1	3	0.00090	0.00020	0.00130
Gemma gemma	11	36	7	0.00120	0.00510	0.00080
Mya arenaria	3	4	4	0.00005	0.00010	0.00010
Edotia triloba	1	2		0.00005	0.00020	
Leptocheirus plumulosus			2			0.00020
Gammarus mucronatus		1			0.00020	
Ameroculodes spp. complex	5	11	20	0.00020	0.00200	0.00160

Notes:

AFDW: ash free dry weight

g: gram

Table A-3c
Barren Island Spring Benthic Community Counts and Biomass – BI-BC-03

Species List	BI-BC-03 Abundance			BI-BC-03 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Fragilonemertes rosea		1	1		0.01060	0.00430
Hypereteone heteropoda	2	1		0.00010	0.00010	
Glycinde multidens	8	10	9	0.00360	0.00370	0.00370
Leitoscoloplos fragilis	1			0.00020		
Paraonis fulgens	1			0.00020		
Marenzelleria viridis	2	3	4	0.00070	0.00060	0.00090
Streblospio benedicti	14	7	8	0.00030	0.00005	0.00030
Heteromastus filiformis	8	11	13	0.00180	0.00100	0.00260
Mediomastus ambiseta	10		3	0.00005		0.00020
Acteocina canaliculata	5	2	3	0.00340	0.00100	0.00170
Mulinia lateralis	18	19	32	0.11600	0.10940	0.10280
Ameritella mitchelli	16	14	23	0.05190	0.01900	0.06110
Limecola petalum	1	1		0.00150	0.00050	
Tagelus plebeius	6	4	4	0.00310	0.00200	0.00220
Gemma gemma	50	60	54	0.00870	0.00380	0.00540
Neomysis americana			2			0.00170
Cyathura polita			1			0.00280
Edotia triloba	1	1	1	0.00010	0.00010	0.00020
Leptocheirus plumulosus	8	5	4	0.00140	0.00100	0.00130
Ameroculodes spp. complex	13	18	8	0.00150	0.00210	0.00110

Notes:
AFDW: ash free dry weight
g: gram

Table A-3d

Barren Island Spring Benthic Community Counts and Biomass – BI-BC-04

	BI-BC-04 Abundance			**BI-BC-04 Biomass (g; AFDW)**		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Paranthus rapiformis	1			0.00470		
Stylochus ellipticus			1			0.00005
Fragilonemertes rosea	frag.			0.00240		
Amphiporus bioculatus		1			0.00150	
Hypereteone heteropoda	4	2	2	0.00020	0.00005	0.00005
Glycinde multidens	6	5	1	0.00490	0.00290	0.00010
Leitoscoloplos fragilis	1			0.00060		
Polydora cornuta		98	4		0.00160	0.00010
Polydora websteri		4			0.00030	
Marenzelleria viridis	19	8	13	0.00570	0.00440	0.00660
Streblospio benedicti	13	32	9	0.00040	0.00090	0.00020
Heteromastus filiformis	21	7	9	0.00490	0.00120	0.00380
Mediomastus ambiseta	8	7	9	0.00020	0.00010	0.00040
Tubificoides spp.	3	8	3	0.00010	0.00010	0.00010
Sayella chesapeakea	1		1	0.00020		0.00020
Acteocina canaliculata	3	1		0.00260	0.00130	
Geukensia demissa	1	2	3	0.00005	0.00050	0.00020
Mulinia lateralis	8	12	4	0.02820	0.15010	0.03990
Ameritella mitchelli	19	9	4	0.00970	0.00270	0.00150
Limecola petalum	8	2		0.03920	0.00290	
Tagelus plebeius	5	6	4	0.00340	0.00490	0.00180
Gemma gemma	304	129	141	0.02480	0.01290	0.00760
Mya arenaria	4		3	0.00030		0.00005
Amphibalanus improvisus	1	75	6	0.00010	0.07370	0.00140
Americamysis almyra		1			0.00070	
Cyclaspis varians		1			0.00030	
Idoteidae	2	1	1	0.00020	0.00005	0.00010
Leptocheirus plumulosus	1			0.00010		
Apocorophium lacustre		14	2		0.00060	0.00010
Grandidierella japonica		2			0.00060	
Gammarus mucronatus	1	1	1	0.00010	0.00040	0.00005
Ameroculodes spp. complex	7	11	2	0.00030	0.00040	0.00030
Ascidiacea sp.		2			0.0004	

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-3e
Barren Island Spring Benthic Community Counts and Biomass – BI-BC-05

Species List	BI-BC-05 Abundance			BI-BC-05 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Carinoma tremaphoros			1			0.00020
Fragilonemertes rosea	2		frag.	0.01170		0.00140
Hypereteone heteropoda			1			0.00020
Glycinde multidens	6	5	3	0.00400	0.00310	0.00160
Polydora cornuta	1	5	2	0.00005	0.00030	0.00010
Marenzelleria viridis	3	6	6	0.00070	0.00270	0.00520
Streblospio benedicti	7	8	29	0.00010	0.00020	0.00050
Heteromastus filiformis	1	2	frag.	0.00020	0.00040	0.00010
Mediomastus ambiseta	5	5	23	0.00020	0.00020	0.00070
Tubificoides spp.	1		2	0.00005		0.00005
Eulimastoma engonium		1			0.00005	
Acteocina canaliculata	2			0.00070		
Mulinia lateralis	8	6	3	0.01310	0.08970	0.01120
Ameritella mitchelli	8	9	15	0.00480	0.01440	0.01980
Limecola petalum	2	5	9	0.00160	0.00910	0.02950
Tagelus plebeius	2	1		0.00050	0.00040	
Gemma gemma	98	26	50	0.00710	0.00630	0.00540
Mya arenaria		1			0.00010	
Amphibalanus improvisus	2	8		0.00005	0.00010	
Edotia triloba	7		1	0.00070		0.00005
Leptocheirus plumulosus		1			0.00030	
Ameroculodes spp. complex	3		4	0.00040		0.00060

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-3f

Barren Island Spring Benthic Community Counts and Biomass – BI-BC-06

Species List	BI-BC-06 Abundance			BI-BC-06 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Edwardsia elegans	1			0.00010		
Siphonenteron bicolour		1			0.00070	
Fragilonemertes rosea			1			0.00430
Amphiporus caecus	2	1		0.00020	0.00020	
Hypereteone heteropoda	6	1	5	0.00050	0.00020	0.00040
Alitta succinea	1		1	0.00340		0.01050
Glycinde multidens	11	6	6	0.00360	0.00290	0.00230
Leitoscoloplos fragilis		1			0.00120	
Paraonis fulgens		1			0.00005	
Polydora cornuta	48	46	14	0.00180	0.00160	0.00060
Marenzelleria viridis	1	2	1	0.00005	0.00140	0.00005
Streblospio benedicti	36	100	28	0.00110	0.00200	0.00080
Heteromastus filiformis	2	7	frag.	0.00050	0.00510	0.00080
Mediomastus ambiseta	12	15	1	0.00020	0.00030	0.00005
Tubificoides spp.		1			0.00005	
Littoridinops tenuipes			1			0.00010
Geukensia demissa	1	1		0.00005	0.00005	
Mulinia lateralis	6	4	4	0.03830	0.03020	0.03630
Ameritella mitchelli	19	19	11	0.00950	0.00600	0.01010
Limecola petalum			1			0.00100
Tagelus plebeius	3	1	3	0.00120	0.00040	0.00150
Gemma gemma	6	2	6	0.00070	0.00030	0.00060
Petricolaria pholadiformis	1		1	0.00120		0.00090
Mya arenaria	4	3		0.00190	0.00010	
Amphibalanus improvisus	3	1	1	0.00005	0.00005	0.00010
Americamysis almyra		1			0.00005	
Bodotriidae	1			0.00005		
Cyathura polita			1			0.00190
Edotia triloba	15	13	4	0.00200	0.00100	0.00060
Leptocheirus plumulosus	3	4	2	0.00020	0.00080	0.00005
Apocorophium lacustre	58	68	33	0.00440	0.00670	0.00380
Grandidierella japonica	18	17	18	0.00000	0.00000	0.00000
Gammarus mucronatus	5	3		0.00030	0.00020	
Ameroculodes spp. complex	23	19	7	0.00260	0.00140	0.00080
Chironomidae larva		1			0.00040	

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-3g
Barren Island Spring Benthic Community Counts and Biomass – BI-BC-07

Species List	BI-BC-07 Abundance			BI-BC-07 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Edwardsia elegans	1			0.00070		
Fragilonemertes rosea	1			0.00010		
Hypereteone heteropoda		2			0.00010	
Alitta succinea	1		frag.	0.00400		0.00060
Glycinde multidens	46	48	37	0.01800	0.01870	0.01410
Marenzelleria viridis	1			0.00030		
Paraprionospio alata		1			0.00180	
Streblospio benedicti	21	64	34	0.00040	0.00090	0.00070
Heteromastus filiformis	1	1	3	0.00080	0.00080	0.00640
Mediomastus ambiseta	133	169	181	0.00320	0.00360	0.00780
Tubificoides spp.	1	3	2	0.00005	0.00005	0.00005
Sayella chesapeakea	1			0.00010		
Mulinia lateralis	21	22	12	0.07080	0.06550	0.02200
Ameritella mitchelli	78	86	42	0.03070	0.05520	0.02100
Limecola petalum	7	6	7	0.01300	0.00740	0.02250
Mya arenaria	2	1	1	0.00010	0.00010	0.00005
Cyclaspis varians	1		2	0.00005		0.00005
Cyathura polita	3			0.00020		
Edotia triloba	4	1	2	0.00020	0.00005	0.00030
Leptocheirus plumulosus	40	69	88	0.00640	0.01350	0.02270
Grandidierella japonica	6	3	8	0.00100	0.00005	0.00000
Ameroculodes spp. complex	7	5	14	0.00050	0.00030	0.00070

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-3h
Barren Island Spring Benthic Community Counts and Biomass – BI-BC-08

	BI-BC-08 Abundance			BI-BC-08 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Platyhelminthes sp. A			1			0.00040
Hypereteone heteropoda	15	5	12	0.00190	0.00060	0.00160
Glycinde multidens	51	23	49	0.03690	0.01460	0.03860
Polydora cornuta	8	4	98	0.00010	0.00010	0.00090
Polydora websteri			1			0.00080
Streblospio benedicti	13	7	23	0.00020	0.00005	0.00030
Heteromastus filiformis	2	frag.	1	0.00040	0.00030	0.00020
Mediomastus ambiseta	48	33	36	0.00230	0.00190	0.00100
Tubificoides spp.	1	2	1	0.00005	0.00005	0.00005
Eulimastoma engonium	2	2		0.00050	0.00030	
Sayella chesapeakea	3	1	1	0.00040	0.00020	0.00005
Japonactaeon punctostriatus	2		1	0.00060		0.00030
Acteocina canaliculata	1			0.00050		
Mulinia lateralis	78	31	46	0.81070	0.24220	0.39890
Ameritella mitchelli	57	37	56	0.03110	0.01490	0.03180
Limecola petalum	71	34	45	0.16820	0.05760	0.06310
Gemma gemma	1	1	2	0.00005	0.00080	0.00010
Mya arenaria	1		2	0.00005		0.00020
Amphibalanus improvisus	12	11	68	0.00580	0.00250	0.01880
Cyclaspis varians		1	5		0.00005	0.00040
Cyathura polita	1	5	7	0.00005	0.00005	0.00005
Edotia triloba	8	6	43	0.00100	0.00090	0.00340
Leptocheirus plumulosus	9	2	3	0.00100	0.02770	0.00005
Apocorophium lacustre	10		2	0.00080		0.00005
Grandidierella japonica		2	8		0.00010	0.00070
Gammarus mucronatus	2	2	15	0.00005	0.00005	0.00070
Oedicerotidae	4	2	18	0.00090	0.00010	0.00180

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-3i
Barren Island Spring Benthic Community Counts and Biomass – BI-BC-09

	BI-BC-09 Abundance			BI-BC-09 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Fragilonemertes rosea	frag.	3		0.00120	0.03440	
Glycinde multidens	8	12	7	0.00300	0.00540	0.00330
Leitoscoloplos fragilis	1	frag.		0.00005	0.00070	
Paraonis fulgens		1			0.00010	
Marenzelleria viridis	2	3	2	0.00140	0.00190	0.00020
Streblospio benedicti	2	4	4	0.00005	0.00020	0.00030
Heteromastus filiformis	4	5	2	0.00190	0.00400	0.00060
Mediomastus ambiseta	11	5	4	0.00040	0.00020	0.00020
Tubificoides spp.			1			0.00005
Sayella chesapeakea			1			0.00020
Mulinia lateralis	10	10	10	0.10550	0.10240	0.28640
Ameritella mitchelli	18	17	16	0.04620	0.02730	0.02150
Limecola petalum	3	5	2	0.00330	0.01460	0.00240
Tagelus plebeius	2	4	2	0.00040	0.00120	0.00050
Gemma gemma	150	108	105	0.02570	0.01070	0.01180
Edotia triloba	1		1	0.00020		0.00010
Leptocheirus plumulosus	5	4	7	0.00040	0.00020	0.00030
Gammarus mucronatus			1			0.00020
Ameroculodes spp. complex	20	9	18	0.00240	0.00060	0.00280

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table A-3j
Barren Island Spring Benthic Community Counts and Biomass – BI-BC-10

	BI-BC-10 Abundance			BI-BC-10 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Stylochus ellipticus	1			0.00340		
Hypereteone heteropoda	3	3	4	0.00070	0.00100	0.00090
Alitta succinea	2			0.01900		
Glycinde multidens	55	44	36	0.02760	0.02140	0.01640
Marenzelleria viridis		2			0.00160	
Streblospio benedicti	15	35	11	0.00010	0.00070	0.00030
Heteromastus filiformis	1	3	3	0.00040	0.00040	0.00130
Mediomastus ambiseta	56	44	40	0.00220	0.00180	0.00190
Tubificoides spp.		2			0.00005	
Japonactaeon punctostriatus	2		1	0.00060		0.00010
Acteocina canaliculata	1	1	1	0.00030	0.00110	0.00050
Mulinia lateralis	44	73	45	0.48890	0.56090	0.40680
Ameritella mitchelli	37	56	39	0.00880	0.01650	0.00870
Limecola petalum	48	46	40	0.11890	0.08470	0.07830
Gemma gemma		3			0.00005	
Mya arenaria	1			0.00030		
Amphibalanus improvisus	1	1		0.00010	0.00005	
Leucon (*Leucon*) *americanus*	1		1	0.00005		0.00005
Cyclaspis varians			1			0.00020
Cyathura polita	1	4	1	0.00005	0.00060	0.00005
Edotia triloba	9	9	4	0.00070	0.00080	0.00090
Leptocheirus plumulosus	8	20	18	0.00120	0.00490	0.00400
Grandidierella japonica	3	5	2	0.00000	0.00000	0.00010
Ameroculodes spp. complex	2	5	2	0.00020	0.00040	0.00005

Notes:

AFDW: ash free dry weight

g: gram

Table A-3k

Barren Island Spring Benthic Community Counts and Biomass – BI-BC-REF

	BI-BC-REF Abundance			BI-BC-REF Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Fragilonemertes rosea		1			0.00040	
Glycinde multidens	frag.	2	2	0.00005	0.00170	0.00080
Leitoscoloplos fragilis	1	1		0.00005	0.00020	
Marenzelleria viridis	5	1	3	0.00130	0.00040	0.00210
Streblospio benedicti		1	4		0.00010	0.00010
Heteromastus filiformis	2	2	3	0.00080	0.00020	0.00260
Mediomastus ambiseta	2	1	3	0.00005	0.00005	0.00005
Tubificoides spp.			1			0.00005
Acteocina canaliculata		1	1		0.00090	0.00060
Mulinia lateralis	24	17	16	0.13420	0.00150	0.04830
Ameritella mitchelli	22	15	20	0.06390	0.13680	0.07490
Limecola petalum	1		3	0.00640		0.01480
Tagelus plebeius	4	3	3	0.00090	0.00120	0.00290
Mya arenaria		1			0.00010	
Edotia triloba			1			0.00005
Ameroculodes spp. complex	8	10	9	0.00120	0.00100	0.00070

Notes:
AFDW: ash free dry weight
frag.: fragment
g: gram

Appendix B

Barren Island Fish Collection Data

Table B-1a

Barren Island Seine Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
BI-BN-01a	Bay anchovy	49	
BI-BN-01a	Bay anchovy	50	
BI-BN-01a	Bay anchovy	55	
BI-BN-01a	Bay anchovy	47	
BI-BN-01a	Bay anchovy	49	
BI-BN-01a	Bay anchovy	50	
BI-BN-01a	Bay anchovy	51	
BI-BN-01a	Bay anchovy	49	
BI-BN-01a	Bay anchovy	50	
BI-BN-01a	Bay anchovy	52	
BI-BN-01a	Bay anchovy	48	
BI-BN-01a	Bay anchovy	55	
BI-BN-01a	Bay anchovy	46	
BI-BN-01a	Bay anchovy	52	
BI-BN-01a	Bay anchovy	49	
BI-BN-01a	Bay anchovy	50	
BI-BN-01a	Bay anchovy	51	
BI-BN-01a	Bay anchovy	48	
BI-BN-01a	Bay anchovy	50	
BI-BN-01a	Bay anchovy	43	
BI-BN-01a	Bay anchovy	50	
BI-BN-01a	Bay anchovy	50	
BI-BN-01a	Bay anchovy	42	
BI-BN-01a	Bay anchovy	48	
BI-BN-01a	Bay anchovy	52	
BI-BN-01a	Bay anchovy	45	
BI-BN-01a	Bay anchovy	52	
BI-BN-01a	Bay anchovy	49	
BI-BN-01a	Bay anchovy	53	
BI-BN-01a	Bay anchovy	54	
BI-BN-01a	Bay anchovy	50	
BI-BN-01a	Bay anchovy	48	
BI-BN-01a	Bay anchovy	53	
BI-BN-01a	Bay anchovy	49	
BI-BN-01a	Bay anchovy	44	
BI-BN-01a	Bay anchovy	48	
BI-BN-01a	Bay anchovy	45	
BI-BN-01a	Bay anchovy	45	
BI-BN-01a	Bay anchovy	53	
BI-BN-01a	Bay anchovy	50	
BI-BN-01a	Bay anchovy	55	
BI-BN-01a	Bay anchovy	51	
BI-BN-01a	Bay anchovy	51	
BI-BN-01a	Bay anchovy	49	
BI-BN-01a	Bay anchovy	49	
BI-BN-01a	Bay anchovy	45	
BI-BN-01a	Bay anchovy	49	
BI-BN-01a	Bay anchovy	50	

Table B-1a

Barren Island Seine Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
BI-BN-01a	Bay anchovy	48	
BI-BN-01a	Bay anchovy	47	
BI-BN-01a	Atlantic menhaden	105	
BI-BN-01a	Atlantic menhaden	95	
BI-BN-01a	Atlantic menhaden	98	
BI-BN-01a	Atlantic menhaden	93	
BI-BN-01a	Atlantic menhaden	100	
BI-BN-01a	Atlantic menhaden	99	
BI-BN-01a	Atlantic menhaden	97	
BI-BN-01a	Atlantic menhaden	93	
BI-BN-01a	Atlantic menhaden	110	
BI-BN-01a	Atlantic menhaden	106	
BI-BN-01a	Atlantic menhaden	118	
BI-BN-01a	Atlantic menhaden	108	
BI-BN-01a	Atlantic menhaden	103	
BI-BN-01a	Atlantic menhaden	104	
BI-BN-01a	Atlantic menhaden	128	
BI-BN-01a	Atlantic menhaden	106	
BI-BN-01a	Atlantic menhaden	135	
BI-BN-01a	Atlantic menhaden	104	
BI-BN-01a	Atlantic menhaden	105	
BI-BN-01a	Atlantic menhaden	101	
BI-BN-01a	Atlantic menhaden	90	
BI-BN-01a	Atlantic menhaden	102	
BI-BN-01a	Atlantic menhaden	113	
BI-BN-01a	Atlantic menhaden	105	
BI-BN-01a	Atlantic menhaden	104	
BI-BN-01a	Atlantic menhaden	107	
BI-BN-01a	Atlantic menhaden	101	
BI-BN-01a	Atlantic menhaden	90	
BI-BN-01a	Atlantic menhaden	100	
BI-BN-01a	Atlantic menhaden	109	
BI-BN-01a	Atlantic menhaden	100	
BI-BN-01a	Atlantic menhaden	99	
BI-BN-01a	Atlantic menhaden	94	
BI-BN-01a	Atlantic menhaden	108	
BI-BN-01a	Atlantic menhaden	97	
BI-BN-01a	Atlantic menhaden	115	
BI-BN-01a	Atlantic menhaden	103	
BI-BN-01a	Atlantic menhaden	94	
BI-BN-01a	Atlantic menhaden	89	
BI-BN-01a	Atlantic menhaden	87	
BI-BN-01a	Atlantic menhaden	105	
BI-BN-01a	Atlantic menhaden	102	
BI-BN-01a	Atlantic menhaden	126	
BI-BN-01a	Atlantic menhaden	97	
BI-BN-01a	Atlantic menhaden	105	
BI-BN-01a	Atlantic menhaden	105	

Table B-1a
Barren Island Seine Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
BI-BN-01a	Atlantic menhaden	96	
BI-BN-01a	Atlantic menhaden	100	
BI-BN-01a	Atlantic menhaden	119	
BI-BN-01a	Atlantic menhaden	99	
BI-BN-01a	Cownose ray	310	
BI-BN-01a	Spot	140	
BI-BN-01a	Harvest fish	110	
BI-BN-01a	Harvest fish	120	
BI-BN-01a	Blue crab	95	
BI-BN-01a	Silver perch	75	
BI-BN-01a	Blue crab	52	
BI-BN-01a	Blue crab	68	
BI-BN-01a	Atlantic silverside	69	
BI-BN-01a	Atlantic silverside	57	
BI-BN-01b	Atlantic menhaden	92	
BI-BN-01b	Atlantic menhaden	96	
BI-BN-01b	Atlantic menhaden	111	
BI-BN-01b	Atlantic menhaden	86	
BI-BN-01b	Atlantic menhaden	86	
BI-BN-01b	Atlantic menhaden	90	
BI-BN-01b	Atlantic menhaden	92	
BI-BN-01b	Atlantic menhaden	89	
BI-BN-01b	Atlantic menhaden	80	
BI-BN-01b	Atlantic menhaden	107	
BI-BN-01b	Atlantic menhaden	88	
BI-BN-01b	Atlantic menhaden	120	
BI-BN-01b	Atlantic menhaden	58	
BI-BN-01b	Atlantic menhaden	93	
BI-BN-01b	Atlantic menhaden	85	
BI-BN-01b	Bay anchovy	50	
BI-BN-01b	Bay anchovy	52	
BI-BN-01b	Bay anchovy	47	
BI-BN-01b	Bay anchovy	52	
BI-BN-01b	Bay anchovy	55	
BI-BN-01b	Bay anchovy	77	
BI-BN-01b	Bay anchovy	48	
BI-BN-01b	Bay anchovy	48	
BI-BN-01b	Blue crab	90	
BI-BN-01b	Blue crab	28	
BI-BN-01b	Silver perch	107	
BI-BN-01b	Blue crab	155	
BI-BN-01b	Blue crab	110	
BI-BN-01b	Blue crab	68	
BI-BN-01b	Blue crab	43	
BI-BN-01b	Spot	135	
BI-BN-01b	Silver perch	80	
BI-BN-01b	Blue crab	20	
BI-BN-01b	Blue crab	42	

Table B-1a
Barren Island Seine Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
BI-BN-01b	Blue crab	88	
BI-BN-01b	Blue crab	5	
BI-BN-01b	Blue crab	110	
BI-BN-01b	Blue crab	98	
BI-BN-01b	Blackcheek tonguefish	135	
BI-BN-01b	Blue crab	115	
BI-BN-01b	Silver perch	75	
BI-BN-01b	Blue crab	70	
BI-BN-01b	Atlantic silverside	50	
BI-BN-02a	Bay anchovy	50	
BI-BN-02a	Blue crab	102	
BI-BN-02a	Atlantic silverside	85	
BI-BN-02a	Spot	131	
BI-BN-02a	Atlantic silverside	80	
BI-BN-02a	Atlantic silverside	86	
BI-BN-02a	Atlantic silverside	84	
BI-BN-02a	Atlantic silverside	86	
BI-BN-02a	Atlantic silverside	91	
BI-BN-02a	Blue crab	73	
BI-BN-02a	Blue crab	65	
BI-BN-02a	Blue crab	68	
BI-BN-02a	Atlantic silverside	86	
BI-BN-02a	Atlantic silverside	77	
BI-BN-02a	Atlantic silverside	80	
BI-BN-02a	Spot	136	
BI-BN-02a	Spot	144	
BI-BN-02a	Spot	134	
BI-BN-02a	Blue crab	65	
BI-BN-02a	Blue crab	55	
BI-BN-02a	Blue crab	70	
BI-BN-02a	Atlantic silverside	87	
BI-BN-02a	Blue crab	50	
BI-BN-02a	Blue crab	50	
BI-BN-02a	Blue crab	65	
BI-BN-02a	Blue crab	57	
BI-BN-02a	Atlantic silverside	65	
BI-BN-02a	Striped killifish	95	
BI-BN-02a	Blue crab	99	
BI-BN-02a	Atlantic silverside	92	
BI-BN-02a	Atlantic silverside	83	
BI-BN-02a	Atlantic silverside	82	
BI-BN-02a	Atlantic silverside	83	
BI-BN-02a	Atlantic silverside	69	
BI-BN-02a	Blue crab	75	
BI-BN-02a	Blue crab	62	
BI-BN-02a	Blue crab	66	
BI-BN-02a	Blue crab	103	

Table B-1a

Barren Island Seine Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
BI-BN-02a	Blue crab	67	
BI-BN-02a	Atlantic silverside	82	
BI-BN-03a	Bay anchovy	51	
BI-BN-03a	Atlantic silverside	54	
BI-BN-03a	Atlantic silverside	67	
BI-BN-03a	Bay anchovy	62	
BI-BN-03a	Spot	126	
BI-BN-03a	Silver perch	94	
BI-BN-03a	Spot	130	
BI-BN-03a	Bay anchovy	64	
BI-BN-03a	Bay anchovy	55	
BI-BN-03a	Spot	127	
BI-BN-03a	Bay anchovy	51	
BI-BN-03a	Blue crab	65	
BI-BN-03a	Atlantic silverside	54	
BI-BN-04a	Bay anchovy	49	
BI-BN-04a	Bay anchovy	50	
BI-BN-04a	Atlantic silverside	63	
BI-BN-04a	Atlantic silverside	74	
BI-BN-04a	Bay anchovy	50	
BI-BN-04a	Atlantic silverside	60	
BI-BN-04a	Bay anchovy	49	
BI-BN-04a	Atlantic silverside	60	
BI-BN-04a	Atlantic silverside	62	
BI-BN-04a	Atlantic silverside	71	
BI-BN-04a	Bay anchovy	47	
BI-BN-04a	Atlantic silverside	79	
BI-BN-04a	Spot	119	
BI-BN-04a	Bay anchovy	50	
BI-BN-04a	Blue crab	60	
BI-BN-04a	Atlantic silverside	56	
BI-BN-04a	Blue crab	13	
BI-BN-04a	Bay anchovy	50	
BI-BN-04a	Atlantic silverside	60	
BI-BN-04a	Bay anchovy	51	
BI-BN-04a	Bay anchovy	48	
BI-BN-04a	Bay anchovy	47	
BI-BN-04a	Atlantic silverside	50	
BI-BN-04a	Atlantic silverside	60	
BI-BN-04b	Blue crab	63	
BI-BN-04b	Blue crab	50	
BI-BN-04b	Blue crab	143	
BI-BN-04b	Blue crab	88	
BI-BN-04b	Blue crab	113	
BI-BN-04b	Bay anchovy	55	
BI-BN-04b	Blue crab	62	
BI-BN-04b	Blue crab	152	
BI-BN-04b	Blue crab	84	

Table B-1a
Barren Island Seine Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
BI-BN-04b	Bay anchovy	50	
BI-BN-04b	Bay anchovy	47	
BI-BN-04b	Bay anchovy	46	
BI-BN-04b	Blue crab	135	
BI-BN-04b	Bay anchovy	47	
BI-BN-04b	Atlantic silverside	55	
BI-BN-04b	Bay anchovy	49	
BI-BN-04b	Bay anchovy	55	
BI-BN-04b	Silver perch	100	
BI-BN-04b	Bay anchovy	50	
BI-BN-04b	Mummichog	78	
BI-BN-04b	Blue crab	52	
BI-BN-04b	Mummichog	65	
BI-BN-04b	Atlantic silverside	65	
BI-BN-04b	Weakfish	53	
BI-BN-04b	Mummichog	84	
BI-BN-04b	Atlantic silverside	53	
BI-BN-04b	Atlantic silverside	70	
BI-BN-04b	Atlantic silverside	57	
BI-BN-04b	Atlantic silverside	70	
BI-BN-04b	Atlantic silverside	75	
BI-BN-04b	Atlantic silverside	68	
BI-BN-04b	Blue crab	96	
BI-BN-04b	Atlantic silverside	77	
BI-BN-04b	Spotted seatrout	95	
BI-BN-04b	Blue crab	42	
BI-BN-04b	Mummichog	88	
BI-BN-04b	Blue crab	76	
BI-BN-04b	Atlantic silverside	62	
BI-BN-04b	Blue crab	32	
BI-BN-04b	Atlantic silverside	86	
BI-BN-04b	Blue crab	48	
BI-BN-04b	Atlantic silverside	64	
BI-BN-04b	Atlantic silverside	66	
BI-BN-04b	Striped blenny	50	
BI-BN-04b	Atlantic silverside	83	
BI-BN-04b	Blue crab	43	
BI-BN-04b	Blue crab	53	
BI-BN-04b	Blue crab	60	
BI-BN-05a	Atlantic silverside	63	

Table B-1a
Barren Island Seine Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
BI-BN-05a	Bay anchovy	50	
BI-BN-05a	Atlantic silverside	66	
BI-BN-05a	Bay anchovy	48	
BI-BN-05a	Atlantic silverside	62	
BI-BN-05a	Blue crab	55	
BI-BN-05a	Silver perch	40	
BI-BN-05a	Atlantic silverside	81	
BI-BN-05a	Atlantic silverside	62	
BI-BN-05a	Blue crab	73	
BI-BN-05a	Silver perch	82	Parasite on gills
BI-BN-05a	Spotted seatrout	100	
BI-BN-05a	Blue crab	105	
BI-BN-05a	Weakfish	48	
BI-BN-05a	Weakfish	30	
BI-BN-05a	Weakfish	42	
BI-BN-05a	Weakfish	50	
BI-BN-05b	Bay anchovy	55	
BI-BN-05b	Striped Anchovy	98	
BI-BN-05b	Atlantic silverside	65	
BI-BN-05b	Bay anchovy	49	
BI-BN-05b	Bay anchovy	49	
BI-BN-05b	Bay anchovy	54	
BI-BN-05b	Atlantic menhaden	100	
BI-BN-05b	Striped Anchovy	76	
BI-BN-05b	Atlantic silverside	84	
BI-BN-05b	Striped Anchovy	53	
BI-BN-05b	Atlantic silverside	82	
BI-BN-05b	Blue crab	76	
BI-BN-05b	Bay anchovy	47	
BI-BN-05b	Atlantic silverside	85	
BI-BN-05b	Bay anchovy	50	
BI-BN-05b	Bay anchovy	59	
BI-BN-05b	Bay anchovy	53	
BI-BN-05b	Silver perch	88	
BI-BN-05b	Bay anchovy	48	
BI-BN-05b	Atlantic silverside	72	
BI-BN-05b	Silver perch	88	
BI-BN-05b	Silver perch	48	
BI-BN-05b	Spot	127	
BI-BN-05b	Silver perch	51	

Note:
mm: millimeter

Table B-1b

Barren Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
BI-BN-01a	Red drum	54	
BI-BN-01a	Bay anchovy	57	
BI-BN-01b	Sheepshead minnow	49	
BI-BN-01b	Sheepshead minnow	40	
BI-BN-01b	Sheepshead minnow	45	
BI-BN-01b	Sheepshead minnow	40	
BI-BN-01b	Sheepshead minnow	50	
BI-BN-01b	Sheepshead minnow	36	
BI-BN-01b	Sheepshead minnow	46	
BI-BN-01b	Sheepshead minnow	39	
BI-BN-01b	Sheepshead minnow	37	
BI-BN-01b	Sheepshead minnow	43	
BI-BN-01b	Sheepshead minnow	34	
BI-BN-01b	Sheepshead minnow	37	
BI-BN-01b	Sheepshead minnow	44	
BI-BN-01b	Sheepshead minnow	37	
BI-BN-01b	Sheepshead minnow	36	
BI-BN-01b	Sheepshead minnow	36	
BI-BN-01b	Sheepshead minnow	35	
BI-BN-01b	Sheepshead minnow	43	
BI-BN-01b	Sheepshead minnow	39	
BI-BN-01b	Sheepshead minnow	40	
BI-BN-01b	Sheepshead minnow	40	
BI-BN-01b	Sheepshead minnow	41	
BI-BN-01b	Sheepshead minnow	37	
BI-BN-01b	Sheepshead minnow	40	
BI-BN-01b	Sheepshead minnow	37	
BI-BN-01b	Sheepshead minnow	43	
BI-BN-01b	Sheepshead minnow	38	
BI-BN-01b	Sheepshead minnow	37	
BI-BN-01b	Sheepshead minnow	37	
BI-BN-01b	Sheepshead minnow	32	
BI-BN-01b	Atlantic silverside	79	
BI-BN-01b	Northern pipefish	84	
BI-BN-01b	Sheepshead minnow	50	
BI-BN-01b	Sheepshead minnow	35	
BI-BN-01b	Sheepshead minnow	35	
BI-BN-01b	Red drum	55	
BI-BN-01b	Sheepshead minnow	36	
BI-BN-01b	Sheepshead minnow	32	
BI-BN-01b	Sheepshead minnow	35	
BI-BN-01b	Sheepshead minnow	42	
BI-BN-02a	Atlantic silverside	79	
BI-BN-02a	Atlantic silverside	116	

Table B-1b

Barren Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
BI-BN-02a	Atlantic silverside	72	
BI-BN-02a	Atlantic silverside	87	
BI-BN-02a	Atlantic silverside	86	
BI-BN-02a	Atlantic silverside	81	
BI-BN-02a	Atlantic silverside	109	
BI-BN-02a	Red drum	69	
BI-BN-02a	Atlantic silverside	114	
BI-BN-02a	Atlantic silverside	79	
BI-BN-02a	Atlantic silverside	95	
BI-BN-02a	Atlantic silverside	111	
BI-BN-02a	Atlantic silverside	86	
BI-BN-02a	Atlantic silverside	90	
BI-BN-02a	Atlantic silverside	76	
BI-BN-02a	Atlantic silverside	94	
BI-BN-02a	Atlantic silverside	79	
BI-BN-02a	Atlantic silverside	91	
BI-BN-02a	Striped killifish	133	
BI-BN-02a	Atlantic silverside	78	
BI-BN-02a	Atlantic silverside	71	
BI-BN-02a	Atlantic silverside	91	
BI-BN-02a	Atlantic silverside	87	
BI-BN-02a	Atlantic silverside	95	
BI-BN-02a	Atlantic silverside	76	
BI-BN-02a	Atlantic silverside	105	
BI-BN-02a	Atlantic silverside	104	
BI-BN-02a	Spot	145	
BI-BN-02a	Atlantic silverside	107	
BI-BN-02a	Atlantic silverside	91	
BI-BN-02a	Atlantic silverside	97	
BI-BN-02a	Atlantic silverside	79	
BI-BN-02a	White Perch	199	
BI-BN-02a	Atlantic silverside	89	
BI-BN-02a	Red drum	61	
BI-BN-02a	Red drum	61	
BI-BN-02a	Red drum	49	
BI-BN-02a	Atlantic silverside	92	
BI-BN-02a	Atlantic silverside	94	
BI-BN-02a	Atlantic silverside	92	
BI-BN-02a	Atlantic silverside	79	
BI-BN-02a	Atlantic silverside	78	
BI-BN-02a	Atlantic silverside	96	
BI-BN-02a	Atlantic silverside	101	
BI-BN-02a	Atlantic silverside	111	
BI-BN-02a	Atlantic silverside	101	

Table B-1b

Barren Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
BI-BN-02a	Atlantic silverside	86	
BI-BN-02a	Atlantic silverside	81	
BI-BN-02a	Atlantic silverside	81	
BI-BN-02a	Atlantic silverside	118	
BI-BN-02a	Atlantic silverside	101	
BI-BN-02a	Crab (unknown)	16	
BI-BN-02a	Blue crab	10	
BI-BN-02a	Blue crab	6	
BI-BN-02a	Blue crab	62	
BI-BN-02a	Spotted seatrout	116	
BI-BN-02a	Atlantic silverside	80	
BI-BN-02a	Atlantic silverside	76	
BI-BN-02a	Red drum	48	
BI-BN-02a	Atlantic silverside	119	
BI-BN-02a	Red drum	70	
BI-BN-02a	Atlantic silverside	89	
BI-BN-02a	Bay anchovy	59	
BI-BN-02a	Bay anchovy	58	
BI-BN-02a	Bay anchovy	66	
BI-BN-02a	Bay anchovy	55	
BI-BN-02a	Bay anchovy	53	
BI-BN-02a	Bay anchovy	55	
BI-BN-02a	Bay anchovy	61	
BI-BN-02a	Bay anchovy	60	
BI-BN-02a	Atlantic silverside	91	
BI-BN-02a	Bay anchovy	52	
BI-BN-02a	Bay anchovy	54	
BI-BN-02a	Bay anchovy	53	
BI-BN-02a	Bay anchovy	52	
BI-BN-02a	Bay anchovy	56	
BI-BN-02a	Bay anchovy	52	
BI-BN-02a	Bay anchovy	54	
BI-BN-02a	Bay anchovy	53	
BI-BN-02a	Bay anchovy	51	
BI-BN-02a	Bay anchovy	55	
BI-BN-02a	Bay anchovy	56	
BI-BN-02a	Bay anchovy	59	
BI-BN-02a	Bay anchovy	50	
BI-BN-02a	Atlantic silverside	113	
BI-BN-02a	Atlantic silverside	84	
BI-BN-02a	Spot	131	
BI-BN-02a	Spot	144	
BI-BN-02a	Bay anchovy	60	
BI-BN-02a	Bay anchovy	56	

Table B-1b
Barren Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
BI-BN-02a	Bay anchovy	58	
BI-BN-02a	Bay anchovy	56	
BI-BN-02a	Bay anchovy	60	
BI-BN-02a	Bay anchovy	54	
BI-BN-02a	Bay anchovy	54	
BI-BN-02a	Bay anchovy	52	
BI-BN-02a	Bay anchovy	55	
BI-BN-02a	Bay anchovy	53	
BI-BN-02a	Bay anchovy	54	
BI-BN-02a	Bay anchovy	54	
BI-BN-02a	Bay anchovy	52	
BI-BN-02a	Bay anchovy	57	
BI-BN-02a	Bay anchovy	57	
BI-BN-02a	Bay anchovy	59	
BI-BN-02a	Bay anchovy	54	
BI-BN-02a	Bay anchovy	60	
BI-BN-02a	Bay anchovy	52	
BI-BN-02a	Spot	119	
BI-BN-02a	Bay anchovy	53	
BI-BN-02a	Bay anchovy	55	
BI-BN-02a	Bay anchovy	64	
BI-BN-02a	Bay anchovy	52	
BI-BN-02a	Bay anchovy	50	
BI-BN-02a	Bay anchovy	50	
BI-BN-02a	Bay anchovy	58	
BI-BN-02a	Bay anchovy	51	
BI-BN-02b	Bay anchovy	54	
BI-BN-02b	Bay anchovy	53	
BI-BN-02b	Atlantic silverside	94	
BI-BN-02b	Bay anchovy	55	
BI-BN-02b	Bay anchovy	54	
BI-BN-02b	Bay anchovy	60	
BI-BN-02b	Bay anchovy	52	
BI-BN-02b	Bay anchovy	54	
BI-BN-02b	Bay anchovy	53	
BI-BN-02b	Red drum	53	
BI-BN-02b	Bay anchovy	55	
BI-BN-02b	Bay anchovy	51	
BI-BN-02b	Bay anchovy	55	
BI-BN-02b	Bay anchovy	57	
BI-BN-02b	Bay anchovy	58	
BI-BN-02b	Kingfish	91	
BI-BN-02b	Blue crab	82	
BI-BN-02b	Red drum	74	

Table B-1b
Barren Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
BI-BN-02b	Atlantic silverside	82	
BI-BN-02b	Atlantic silverside	86	
BI-BN-02b	Atlantic silverside	49	
BI-BN-02b	Atlantic silverside	111	
BI-BN-02b	Atlantic silverside	92	
BI-BN-02b	Atlantic silverside	115	
BI-BN-02b	Atlantic silverside	81	
BI-BN-02b	Atlantic silverside	80	
BI-BN-02b	Atlantic silverside	84	
BI-BN-02b	Atlantic silverside	85	
BI-BN-02b	Atlantic silverside	66	
BI-BN-02b	Atlantic silverside	76	
BI-BN-02b	Atlantic silverside	70	
BI-BN-02b	Atlantic silverside	52	
BI-BN-02b	Atlantic silverside	79	
BI-BN-02b	Atlantic silverside	78	
BI-BN-02b	Atlantic silverside	86	
BI-BN-02b	Atlantic silverside	65	
BI-BN-02b	Atlantic silverside	79	
BI-BN-02b	Atlantic silverside	74	
BI-BN-02b	Atlantic silverside	81	
BI-BN-02b	Atlantic silverside	68	
BI-BN-02b	Atlantic silverside	72	
BI-BN-02b	Atlantic silverside	114	
BI-BN-02b	Atlantic silverside	94	
BI-BN-02b	Atlantic silverside	98	
BI-BN-02b	Atlantic silverside	74	
BI-BN-02b	Atlantic silverside	79	
BI-BN-02b	Atlantic silverside	93	
BI-BN-02b	Atlantic silverside	76	
BI-BN-02b	Atlantic silverside	87	
BI-BN-02b	Atlantic silverside	73	
BI-BN-02b	Atlantic silverside	76	
BI-BN-02b	Atlantic silverside	74	
BI-BN-02b	Atlantic silverside	115	
BI-BN-02b	Atlantic silverside	95	
BI-BN-02b	Atlantic silverside	76	
BI-BN-02b	Atlantic silverside	113	
BI-BN-02b	Atlantic silverside	86	
BI-BN-02b	Atlantic silverside	63	
BI-BN-02b	Atlantic silverside	71	
BI-BN-02b	Atlantic silverside	72	
BI-BN-02b	Atlantic silverside	82	
BI-BN-02b	Atlantic silverside	71	

Table B-1b
Barren Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
BI-BN-02b	Blue crab	17	
BI-BN-03a	Silver perch	210	
BI-BN-03a	Atlantic menhaden	153	
BI-BN-03a	Atlantic silverside	93	
BI-BN-03a	Spotted seatrout	107	
BI-BN-03a	Spotted seatrout	115	
BI-BN-03a	Kingfish	100	
BI-BN-03a	Red drum	49	
BI-BN-03b	Bay anchovy	69	
BI-BN-03b	Bay anchovy	83	
BI-BN-03b	Bay anchovy	71	
BI-BN-03b	Bay anchovy	52	
BI-BN-03b	Red drum	39	
BI-BN-03b	Sheepshead minnow	39	
BI-BN-03b	Red drum	44	
BI-BN-03b	Sheepshead minnow	44	
BI-BN-03b	Sheepshead minnow	34	
BI-BN-03b	Red drum	44	
BI-BN-03b	Striped killifish	45	
BI-BN-04a	Atlantic silverside	97	
BI-BN-04a	Atlantic silverside	78	
BI-BN-04a	Atlantic silverside	95	
BI-BN-04a	Atlantic silverside	104	
BI-BN-04a	Atlantic silverside	77	
BI-BN-04a	Atlantic silverside	78	
BI-BN-04a	Atlantic silverside	90	
BI-BN-04a	Atlantic silverside	98	
BI-BN-04a	Atlantic silverside	85	
BI-BN-04a	Atlantic silverside	105	
BI-BN-04a	Atlantic silverside	97	
BI-BN-04a	Atlantic silverside	108	
BI-BN-04a	Atlantic silverside	86	
BI-BN-04a	Atlantic silverside	89	
BI-BN-04a	Atlantic silverside	96	
BI-BN-04a	Atlantic silverside	75	
BI-BN-04a	Atlantic silverside	114	
BI-BN-04a	Atlantic silverside	85	
BI-BN-04a	Atlantic silverside	76	
BI-BN-04a	Atlantic silverside	111	
BI-BN-04a	Atlantic silverside	75	
BI-BN-04a	Atlantic silverside	73	
BI-BN-04a	Atlantic silverside	83	
BI-BN-04a	Atlantic silverside	80	
BI-BN-04a	Atlantic silverside	68	

Table B-1b
Barren Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
BI-BN-04a	Atlantic silverside	79	
BI-BN-04a	Atlantic silverside	88	
BI-BN-04a	Atlantic silverside	81	
BI-BN-04a	Atlantic silverside	95	
BI-BN-04a	Atlantic silverside	98	
BI-BN-04a	Red drum	59	
BI-BN-04a	Striped killifish	85	
BI-BN-04a	Red drum	89	
BI-BN-04a	Atlantic silverside	77	
BI-BN-04a	Atlantic silverside	84	
BI-BN-04a	Atlantic silverside	95	
BI-BN-04a	Atlantic silverside	91	
BI-BN-04a	Atlantic silverside	78	
BI-BN-04a	Atlantic silverside	84	
BI-BN-04a	Atlantic silverside	91	
BI-BN-04a	Atlantic silverside	79	
BI-BN-04a	Atlantic silverside	84	
BI-BN-04a	Atlantic silverside	84	
BI-BN-04a	Atlantic silverside	95	
BI-BN-04a	Atlantic silverside	82	
BI-BN-04a	Atlantic silverside	88	
BI-BN-04a	Atlantic silverside	84	
BI-BN-04a	Atlantic silverside	95	
BI-BN-04a	Atlantic silverside	86	
BI-BN-04a	Atlantic silverside	81	
BI-BN-04a	Atlantic silverside	91	
BI-BN-04a	Atlantic silverside	81	
BI-BN-04a	Atlantic silverside	74	
BI-BN-04a	Red drum	66	
BI-BN-04a	Mummichog	66	
BI-BN-04a	Red drum	44	
BI-BN-04a	Striped killifish	107	
BI-BN-04a	Mummichog	62	
BI-BN-04a	Mummichog	66	
BI-BN-04a	Mummichog	67	
BI-BN-04a	Striped killifish	77	
BI-BN-04a	Mummichog	72	
BI-BN-04a	Mummichog	72	
BI-BN-04a	Mummichog	70	
BI-BN-04a	Mummichog	62	
BI-BN-04a	Striped killifish	101	
BI-BN-04a	Mummichog	61	
BI-BN-04a	Blue crab	16	
BI-BN-04a	Mummichog	65	

Table B-1b
Barren Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
BI-BN-04a	Striped killifish	95	
BI-BN-04a	Mummichog	81	
BI-BN-04a	Mummichog	47	
BI-BN-04a	Mummichog	66	
BI-BN-04a	Mummichog	75	
BI-BN-04a	Mummichog	57	
BI-BN-04a	Mummichog	80	
BI-BN-04a	Striped killifish	77	
BI-BN-04a	Mummichog	61	
BI-BN-04a	Red drum	37	
BI-BN-04a	Striped killifish	71	
BI-BN-04a	Mummichog	45	
BI-BN-04a	Mummichog	62	
BI-BN-04a	Mummichog	72	
BI-BN-04a	Red drum	48	
BI-BN-04a	Mummichog	70	
BI-BN-04a	Mummichog	63	
BI-BN-04a	Mummichog	72	
BI-BN-04a	Mummichog	71	
BI-BN-04a	Mummichog	58	
BI-BN-04a	Mummichog	71	
BI-BN-04a	Mummichog	68	
BI-BN-04a	Mummichog	69	
BI-BN-04a	Mummichog	66	
BI-BN-04a	Striped killifish	72	
BI-BN-04a	Mummichog	70	
BI-BN-04a	Mummichog	74	
BI-BN-04a	Red drum	52	
BI-BN-04a	Mummichog	80	
BI-BN-04a	Mummichog	66	
BI-BN-04a	Mummichog	69	
BI-BN-04a	Mummichog	78	
BI-BN-04a	Mummichog	78	
BI-BN-04a	Mummichog	68	
BI-BN-04a	Mummichog	64	
BI-BN-04a	Mummichog	64	
BI-BN-04a	Mummichog	70	
BI-BN-04a	Mummichog	78	
BI-BN-04a	Mummichog	58	
BI-BN-04a	Mummichog	81	
BI-BN-04a	Mummichog	72	
BI-BN-04a	Mummichog	74	
BI-BN-04a	Mummichog	60	
BI-BN-04a	Mummichog	66	

Table B-1b
Barren Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
BI-BN-04a	Mummichog	56	
BI-BN-04a	Mummichog	62	
BI-BN-04a	Mummichog	68	
BI-BN-04a	Blue crab	16	
BI-BN-04a	Inland silverside	36	
BI-BN-04b	Red drum	49	
BI-BN-04b	Red drum	66	
BI-BN-04b	Red drum	79	
BI-BN-04b	Red drum	61	
BI-BN-04b	Red drum	66	
BI-BN-04b	Red drum	68	
BI-BN-04b	Red drum	72	
BI-BN-04b	Red drum	80	
BI-BN-04b	Atlantic silverside	82	
BI-BN-04b	Atlantic silverside	76	
BI-BN-04b	Atlantic silverside	108	
BI-BN-04b	Atlantic silverside	101	
BI-BN-04b	Atlantic silverside	76	
BI-BN-04b	Atlantic silverside	82	
BI-BN-04b	Atlantic silverside	99	
BI-BN-04b	Atlantic silverside	104	
BI-BN-04b	Atlantic silverside	115	
BI-BN-04b	Atlantic silverside	114	
BI-BN-04b	Atlantic silverside	91	
BI-BN-04b	Atlantic silverside	79	
BI-BN-04b	Atlantic silverside	76	
BI-BN-04b	Atlantic silverside	80	
BI-BN-04b	Atlantic silverside	92	
BI-BN-04b	Atlantic silverside	87	
BI-BN-04b	Atlantic silverside	110	
BI-BN-04b	Atlantic silverside	108	
BI-BN-04b	Atlantic silverside	72	
BI-BN-04b	Atlantic silverside	106	
BI-BN-04b	Red drum	63	
BI-BN-04b	Red drum	50	
BI-BN-04b	Atlantic silverside	95	
BI-BN-04b	Atlantic silverside	81	
BI-BN-04b	Atlantic silverside	79	
BI-BN-04b	Atlantic silverside	115	
BI-BN-04b	Atlantic silverside	100	
BI-BN-04b	Atlantic silverside	93	
BI-BN-04b	Atlantic silverside	83	
BI-BN-04b	Atlantic silverside	89	
BI-BN-04b	Atlantic silverside	94	

Table B-1b
Barren Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
BI-BN-04b	Atlantic silverside	80	
BI-BN-04b	Atlantic silverside	96	
BI-BN-04b	Atlantic silverside	103	
BI-BN-04b	Atlantic silverside	104	
BI-BN-04b	Atlantic silverside	79	
BI-BN-04b	Atlantic silverside	86	
BI-BN-04b	Atlantic silverside	86	
BI-BN-04b	Atlantic silverside	111	
BI-BN-04b	Atlantic silverside	108	
BI-BN-04b	Atlantic silverside	110	
BI-BN-04b	Atlantic silverside	98	
BI-BN-04b	Atlantic silverside	87	
BI-BN-04b	Atlantic silverside	84	
BI-BN-04b	Atlantic silverside	102	
BI-BN-04b	Atlantic silverside	111	
BI-BN-04b	Atlantic silverside	84	
BI-BN-04b	Atlantic silverside	71	
BI-BN-04b	Atlantic silverside	90	
BI-BN-04b	Atlantic silverside	76	
BI-BN-04b	Atlantic silverside	86	
BI-BN-04b	Atlantic silverside	83	
BI-BN-04b	Red drum	80	
BI-BN-04b	Red drum	66	
BI-BN-04b	Red drum	62	
BI-BN-04b	Red drum	50	
BI-BN-04b	Red drum	46	
BI-BN-04b	Striped killifish	113	
BI-BN-04b	Blue crab	12	
BI-BN-04b	Red drum	66	
BI-BN-04b	Red drum	66	
BI-BN-04b	Red drum	73	
BI-BN-04b	Red drum	64	
BI-BN-04b	Red drum	73	
BI-BN-04b	Red drum	57	
BI-BN-04b	Red drum	65	
BI-BN-04b	Red drum	69	
BI-BN-04b	Red drum	77	
BI-BN-04b	Red drum	59	
BI-BN-04b	Red drum	85	
BI-BN-04b	Red drum	66	
BI-BN-04b	Red drum	74	
BI-BN-04b	Red drum	70	
BI-BN-04b	Red drum	71	
BI-BN-04b	Red drum	65	

Table B-1b
Barren Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
BI-BN-04b	Red drum	44	
BI-BN-04b	Red drum	61	
BI-BN-04b	Red drum	60	
BI-BN-04b	Red drum	56	
BI-BN-04b	Red drum	45	
BI-BN-04b	Blue crab	15	
BI-BN-04b	Blue crab	16	
BI-BN-04b	Blue crab	17	
BI-BN-05a	Atlantic silverside	73	
BI-BN-05a	Atlantic silverside	100	
BI-BN-05a	Atlantic silverside	76	
BI-BN-05a	Atlantic silverside	73	
BI-BN-05a	Atlantic silverside	76	
BI-BN-05a	Atlantic silverside	72	
BI-BN-05a	Atlantic silverside	116	
BI-BN-05a	Atlantic silverside	85	
BI-BN-05a	Atlantic silverside	49	
BI-BN-05a	Atlantic silverside	80	
BI-BN-05a	Atlantic silverside	99	
BI-BN-05a	Atlantic silverside	114	
BI-BN-05a	Bay anchovy	54	
BI-BN-05a	Bay anchovy	53	
BI-BN-05a	Bay anchovy	54	
BI-BN-05a	Bay anchovy	50	
BI-BN-05a	Bay anchovy	56	
BI-BN-05a	Bay anchovy	53	
BI-BN-05a	Bay anchovy	54	
BI-BN-05a	Bay anchovy	55	
BI-BN-05a	Bay anchovy	55	
BI-BN-05a	Bay anchovy	54	
BI-BN-05a	Bay anchovy	51	
BI-BN-05a	Bay anchovy	57	
BI-BN-05a	Bay anchovy	52	
BI-BN-05a	Bay anchovy	54	
BI-BN-05a	Bay anchovy	52	
BI-BN-05a	Bay anchovy	54	
BI-BN-05a	Bay anchovy	50	
BI-BN-05a	Bay anchovy	52	
BI-BN-05a	Bay anchovy	60	
BI-BN-05a	Bay anchovy	54	
BI-BN-05a	Bay anchovy	56	
BI-BN-05a	Bay anchovy	57	
BI-BN-05a	Bay anchovy	60	
BI-BN-05a	Bay anchovy	51	

Table B-1b

Barren Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
BI-BN-05a	Bay anchovy	53	
BI-BN-05a	Bay anchovy	55	
BI-BN-05a	Bay anchovy	57	
BI-BN-05a	Bay anchovy	60	
BI-BN-05a	Bay anchovy	53	
BI-BN-05a	Bay anchovy	58	
BI-BN-05a	Bay anchovy	52	
BI-BN-05a	Bay anchovy	55	
BI-BN-05a	Bay anchovy	54	
BI-BN-05a	Bay anchovy	53	
BI-BN-05a	Bay anchovy	56	
BI-BN-05a	Bay anchovy	48	
BI-BN-05a	Bay anchovy	49	
BI-BN-05a	Bay anchovy	59	
BI-BN-05a	Bay anchovy	50	
BI-BN-05a	Bay anchovy	55	
BI-BN-05a	Bay anchovy	54	
BI-BN-05a	Bay anchovy	52	
BI-BN-05a	Bay anchovy	50	
BI-BN-05a	Bay anchovy	54	
BI-BN-05a	Bay anchovy	52	
BI-BN-05a	Bay anchovy	56	
BI-BN-05a	Bay anchovy	57	
BI-BN-05a	Atlantic silverside	83	
BI-BN-05a	Atlantic silverside	85	
BI-BN-05a	Atlantic silverside	85	
BI-BN-05a	Atlantic silverside	89	
BI-BN-05a	Atlantic silverside	85	
BI-BN-05a	Atlantic silverside	91	
BI-BN-05a	Atlantic silverside	95	
BI-BN-05a	Atlantic silverside	108	
BI-BN-05a	Atlantic silverside	115	
BI-BN-05a	Atlantic silverside	110	
BI-BN-05a	Atlantic silverside	112	
BI-BN-05a	Atlantic silverside	72	
BI-BN-05a	Atlantic silverside	85	
BI-BN-05a	Atlantic silverside	101	
BI-BN-05a	Atlantic silverside	97	
BI-BN-05a	Atlantic silverside	92	
BI-BN-05a	Atlantic silverside	81	
BI-BN-05a	Atlantic silverside	78	
BI-BN-05a	Atlantic silverside	74	
BI-BN-05b	Atlantic menhaden	112	
BI-BN-05b	Atlantic silverside	94	

Table B-1b

Barren Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
BI-BN-05b	Atlantic silverside	73	
BI-BN-05b	Atlantic silverside	82	
BI-BN-05b	Atlantic silverside	72	
BI-BN-05b	Atlantic silverside	99	
BI-BN-05b	Atlantic silverside	71	
BI-BN-05b	Atlantic silverside	71	
BI-BN-05b	Atlantic silverside	62	
BI-BN-05b	Atlantic menhaden	120	
BI-BN-05b	Atlantic silverside	120	
BI-BN-05b	Atlantic silverside	84	
BI-BN-05b	Atlantic silverside	91	
BI-BN-05b	Atlantic silverside	76	
BI-BN-05b	Atlantic silverside	77	
BI-BN-05b	Atlantic silverside	87	
BI-BN-05b	Atlantic silverside	91	
BI-BN-05b	Atlantic silverside	84	
BI-BN-05b	Atlantic silverside	86	
BI-BN-05b	Atlantic silverside	87	
BI-BN-05b	Atlantic silverside	71	
BI-BN-05b	Atlantic silverside	115	
BI-BN-05b	Atlantic silverside	67	
BI-BN-05b	Atlantic silverside	92	
BI-BN-05b	Atlantic silverside	87	
BI-BN-05b	Atlantic silverside	81	
BI-BN-05b	Atlantic silverside	84	
BI-BN-05b	Atlantic silverside	77	
BI-BN-05b	Atlantic silverside	83	
BI-BN-05b	Atlantic silverside	115	
BI-BN-05b	Bay anchovy	55	
BI-BN-05b	Bay anchovy	52	
BI-BN-05b	Bay anchovy	60	
BI-BN-05b	Banded Killifish	44	
BI-BN-05b	Striped killifish	50	
BI-BN-05b	Atlantic menhaden	133	
BI-BN-05b	Atlantic menhaden	111	
BI-BN-05b	Atlantic silverside	108	
BI-BN-05b	Atlantic silverside	99	
BI-BN-05b	Atlantic silverside	81	
BI-BN-05b	Atlantic silverside	78	
BI-BN-05b	Atlantic silverside	66	
BI-BN-05b	Atlantic silverside	85	
BI-BN-05b	Atlantic silverside	90	
BI-BN-05b	Atlantic silverside	109	
BI-BN-05b	Atlantic silverside	102	

Table B-1b

Barren Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
BI-BN-05b	Atlantic silverside	105	
BI-BN-05b	Atlantic silverside	82	
BI-BN-05b	Atlantic silverside	79	
BI-BN-05b	Atlantic silverside	83	
BI-BN-05b	Atlantic silverside	86	
BI-BN-05b	Atlantic silverside	91	
BI-BN-05b	Atlantic silverside	98	
BI-BN-05b	Atlantic silverside	68	
BI-BN-05b	Atlantic silverside	70	
BI-BN-05b	Atlantic silverside	71	
BI-BN-05b	Atlantic silverside	95	
BI-BN-05b	Atlantic silverside	96	
BI-BN-05b	Atlantic silverside	80	

Note:

mm: millimeter

Table B-1c

Barren Island Seine Net Collection Results – Winter

Sample ID	Species	Length (mm)	Notes
BI-BN-01b	Bay anchovy	55	
BI-BN-02a	Atlantic menhaden	104	
BI-BN-02a	Striped killifish	63	
BI-BN-02a	Bay anchovy	55	
BI-BN-02a	Bay anchovy	51	
BI-BN-02b	Striped killifish	42	
BI-BN-03a	Gizzard shad	182	
BI-BN-03a	Atlantic silverside	101	
BI-BN-03a	Atlantic silverside	124	
BI-BN-03a	Atlantic silverside	103	
BI-BN-03a	Atlantic silverside	102	
BI-BN-03a	Atlantic silverside	99	
BI-BN-03b	Atlantic silverside	101	
BI-BN-03b	Atlantic silverside	122	
BI-BN-03b	Atlantic silverside	104	
BI-BN-03b	Atlantic silverside	111	
BI-BN-03b	Atlantic silverside	106	
BI-BN-03b	Atlantic silverside	94	
BI-BN-03b	Atlantic silverside	123	
BI-BN-03b	Atlantic silverside	90	
BI-BN-04a	Atlantic silverside	111	
BI-BN-04b	Striped killifish	46	
BI-BN-05a	Atlantic silverside	110	
BI-BN-05a	Atlantic silverside	95	
BI-BN-05a	Atlantic silverside	119	
BI-BN-05a	Atlantic silverside	108	
BI-BN-05a	Atlantic silverside	104	
BI-BN-05a	Atlantic silverside	109	
BI-BN-05a	Atlantic silverside	100	
BI-BN-05a	Atlantic silverside	115	
BI-BN-05a	Atlantic silverside	87	
BI-BN-05a	Atlantic silverside	119	
BI-BN-05a	Atlantic silverside	104	
BI-BN-05a	Atlantic silverside	118	
BI-BN-05a	Atlantic silverside	92	
BI-BN-05a	Atlantic silverside	96	
BI-BN-05a	Atlantic silverside	103	
BI-BN-05a	Atlantic silverside	100	
BI-BN-05a	Atlantic silverside	115	
BI-BN-05a	Atlantic silverside	116	
BI-BN-05a	Atlantic silverside	103	
BI-BN-05a	Atlantic silverside	110	
BI-BN-05a	Atlantic silverside	124	
BI-BN-05a	Atlantic silverside	94	

Table B-1c
Barren Island Seine Net Collection Results – Winter

Sample ID	Species	Length (mm)	Notes
BI-BN-05a	Atlantic silverside	101	
BI-BN-05a	Atlantic silverside	104	
BI-BN-05a	Atlantic silverside	100	
BI-BN-05a	Atlantic silverside	103	
BI-BN-05a	Atlantic silverside	114	
BI-BN-05a	Atlantic silverside	85	
BI-BN-05a	Atlantic silverside	100	
BI-BN-05a	Atlantic silverside	106	
BI-BN-05a	Atlantic silverside	100	
BI-BN-05a	Atlantic silverside	85	
BI-BN-05a	Atlantic silverside	105	
BI-BN-05a	Atlantic silverside	104	
BI-BN-05a	Atlantic silverside	103	
BI-BN-05a	Atlantic silverside	98	
BI-BN-05a	Atlantic silverside	95	
BI-BN-05a	Atlantic silverside	94	
BI-BN-05a	Atlantic silverside	93	
BI-BN-05a	Atlantic silverside	95	
BI-BN-05a	Atlantic silverside	117	
BI-BN-05a	Atlantic silverside	116	
BI-BN-05a	Atlantic silverside	97	
BI-BN-05a	Atlantic silverside	100	
BI-BN-05a	Atlantic silverside	98	
BI-BN-05a	Atlantic silverside	101	
BI-BN-05a	Atlantic silverside	95	
BI-BN-05a	Atlantic silverside	112	
BI-BN-05a	Atlantic silverside	114	
BI-BN-05a	Striped killifish	60	
BI-BN-05b	Striped killifish	99	

Note:
mm: millimeter

Table B-1d
Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-01a	White perch	250	175.8
BI-BN-01a	White perch	233	176
BI-BN-01a	White perch	233	185.9
BI-BN-01a	White perch	207	126.9
BI-BN-01a	White perch	257	252.8
BI-BN-01a	White perch	236	181.2
BI-BN-01a	White perch	235	161.5
BI-BN-01a	White perch	207	121.2
BI-BN-01a	White perch	258	266.1
BI-BN-01a	White perch	215	136.2
BI-BN-01a	White perch	224	178.8
BI-BN-01a	White perch	175	80.1
BI-BN-01a	White perch	132	28.1
BI-BN-01a	Bay anchovy	63	1.5
BI-BN-01a	Bay anchovy	52	0.6
BI-BN-01a	Bay anchovy	59	0.6
BI-BN-01a	Bay anchovy	57	1.2
BI-BN-01a	Bay anchovy	68	1.9
BI-BN-01a	Bay anchovy	60	1.2
BI-BN-01a	Bay anchovy	65	1.7
BI-BN-01a	Bay anchovy	55	1
BI-BN-01a	Bay anchovy	58	1.1
BI-BN-01a	Bay anchovy	57	1
BI-BN-01a	Bay anchovy	55	0.7
BI-BN-01a	Bay anchovy	56	0.9
BI-BN-01a	Bay anchovy	60	1.5
BI-BN-01a	Bay anchovy	55	1.1
BI-BN-01a	Bay anchovy	57	0.8
BI-BN-01a	Bay anchovy	59	1.1
BI-BN-01a	Bay anchovy	50	0.6
BI-BN-01a	Bay anchovy	62	1.4
BI-BN-01a	Atlantic menhaden	46	0.5
BI-BN-01a	Atlantic menhaden	48	0.6
BI-BN-01a	Atlantic menhaden	44	0.1
BI-BN-01a	Atlantic menhaden	45	0.2
BI-BN-01a	Atlantic menhaden	40	0.5
BI-BN-01a	Atlantic menhaden	42	0.5
BI-BN-01a	Atlantic menhaden	42	0.3
BI-BN-01a	Atlantic menhaden	44	0.7
BI-BN-01a	Atlantic menhaden	42	0.2
BI-BN-01a	Atlantic menhaden	43	0.3
BI-BN-01a	Atlantic menhaden	41	0.3
BI-BN-01a	Atlantic menhaden	65	1
BI-BN-01a	Atlantic menhaden	44	0.6

Table B-1d
Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-01a	Atlantic menhaden	51	0.8
BI-BN-01a	Atlantic menhaden	44	0.4
BI-BN-01a	Atlantic menhaden	42	0.4
BI-BN-01a	Atlantic menhaden	47	0.6
BI-BN-01a	Atlantic silverside	101	6.1
BI-BN-01a	Atlantic silverside	89	4.1
BI-BN-01a	Atlantic silverside	90	4.1
BI-BN-01a	Atlantic silverside	95	5.2
BI-BN-01a	Atlantic silverside	92	4.6
BI-BN-01a	Atlantic silverside	109	8.1
BI-BN-01a	Bay anchovy	54	0.8
BI-BN-01a	Bay anchovy	55	0.9
BI-BN-01a	Bay anchovy	60	1.6
BI-BN-01a	Atlantic menhaden	47	0.4
BI-BN-01a	Atlantic menhaden	44	0.6
BI-BN-01a	Atlantic menhaden	42	0.5
BI-BN-01a	Atlantic menhaden	5.2	1
BI-BN-01a	Atlantic menhaden	40	0.3
BI-BN-01a	Atlantic menhaden	37	0.3
BI-BN-01a	Atlantic menhaden	40	0.3
BI-BN-01a	Atlantic menhaden	40	0.4
BI-BN-01a	Bay anchovy	56	1.1
BI-BN-01a	Bay anchovy	55	0.9
BI-BN-01a	Bay anchovy	55	0.9
BI-BN-01a	Bay anchovy	59	1.3
BI-BN-01a	Bay anchovy	55	0.7
BI-BN-01a	Bay anchovy	62	1.2
BI-BN-01a	Bay anchovy	62	1.4
BI-BN-01a	Bay anchovy	55	0.8
BI-BN-01a	Bay anchovy	57	1
BI-BN-01a	Bay anchovy	60	1.3
BI-BN-01a	Bay anchovy	54	1
BI-BN-01a	Bay anchovy	50	0.7
BI-BN-01a	Bay anchovy	53	0.9
BI-BN-01a	Bay anchovy	50	0.9
BI-BN-01a	Bay anchovy	48	0.6
BI-BN-01a	Bay anchovy	47	0.6
BI-BN-01a	Bay anchovy	50	0.6
BI-BN-01a	Bay anchovy	60	1.4
BI-BN-01a	Bay anchovy	64	1.6
BI-BN-01a	Bay anchovy	60	1.1
BI-BN-01a	Bay anchovy	53	0.9
BI-BN-01a	Bay anchovy	52	1.3
BI-BN-01a	Bay anchovy	56	1.3

Table B-1d
Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-01a	Bay anchovy	52	1
BI-BN-01a	Bay anchovy	55	1.1
BI-BN-01a	Bay anchovy	54	1
BI-BN-01a	Bay anchovy	54	0.9
BI-BN-01a	Bay anchovy	55	0.9
BI-BN-01a	Inland silverside	70	1.8
BI-BN-01a	Atlantic menhaden	39	0.2
BI-BN-01a	Atlantic menhaden	44	0.6
BI-BN-01a	Atlantic menhaden	38	0.4
BI-BN-01a	Atlantic menhaden	45	0.5
BI-BN-01a	Atlantic menhaden	44	0.3
BI-BN-01a	Atlantic menhaden	44	0.6
BI-BN-01a	Atlantic menhaden	40	0.3
BI-BN-01a	Atlantic menhaden	45	0.7
BI-BN-01a	Atlantic menhaden	44	0.3
BI-BN-01a	Atlantic menhaden	40	0.2
BI-BN-01a	Atlantic menhaden	40	0.4
BI-BN-01a	Atlantic menhaden	41	0.6
BI-BN-01a	Atlantic menhaden	40	0.5
BI-BN-01a	Atlantic menhaden	38	0.3
BI-BN-01a	Atlantic menhaden	40	0.2
BI-BN-01a	Atlantic menhaden	40	0.5
BI-BN-01a	Atlantic menhaden	31	0.3
BI-BN-01a	Atlantic menhaden	44	0.6
BI-BN-01a	Atlantic silverside	95	5
BI-BN-01a	Atlantic silverside	90	4.5
BI-BN-01a	Atlantic silverside	95	5
BI-BN-01a	Atlantic silverside	128	11.8
BI-BN-01a	Atlantic silverside	95	4.5
BI-BN-01a	Atlantic silverside	101	6.9
BI-BN-01a	Atlantic silverside	94	4.6
BI-BN-01a	Atlantic silverside	85	3.6
BI-BN-01a	Bay anchovy	55	0.6
BI-BN-01a	Bay anchovy	49	0.4
BI-BN-01a	Atlantic menhaden	42	0.7
BI-BN-01a	Atlantic menhaden	42	0.4
BI-BN-01a	Atlantic menhaden	45	0.7
BI-BN-01a	Atlantic menhaden	46	0.6
BI-BN-01a	Atlantic menhaden	47	0.6
BI-BN-01a	Atlantic menhaden	46	0.6
BI-BN-01a	Atlantic menhaden	45	0.3
BI-BN-01b	Atlantic silverside	84	3.4
BI-BN-01b	Atlantic silverside	105	6.5
BI-BN-01b	Atlantic silverside	90	4.3

Table B-1d
Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-01b	Atlantic silverside	96	5
BI-BN-01b	Atlantic silverside	93	4.2
BI-BN-01b	Atlantic silverside	109	5.5
BI-BN-01b	Atlantic silverside	103	5.9
BI-BN-01b	Atlantic silverside	115	9.4
BI-BN-01b	Atlantic silverside	82	3
BI-BN-01b	Atlantic silverside	97	5.3
BI-BN-01b	Atlantic silverside	101	7.2
BI-BN-01b	Bay anchovy	73	2.1
BI-BN-01b	Bay anchovy	63	1.7
BI-BN-01b	Bay anchovy	57	1
BI-BN-01b	Bay anchovy	55	1
BI-BN-01b	Bay anchovy	58	1.3
BI-BN-01b	Bay anchovy	57	0.9
BI-BN-01b	Bay anchovy	65	2.3
BI-BN-01b	Bay anchovy	70	2.3
BI-BN-01b	Blue crab	85	34.9
BI-BN-01b	Inland silverside	114	9.6
BI-BN-01b	Spot	50	1.1
BI-BN-01b	Atlantic menhaden	41	0.5
BI-BN-01b	Atlantic menhaden	40	0.3
BI-BN-01b	Atlantic menhaden	41	0.5
BI-BN-01b	Atlantic menhaden	45	0.6
BI-BN-01b	Atlantic menhaden	47	0.5
BI-BN-01b	Atlantic menhaden	42	0.4
BI-BN-01b	Atlantic silverside	102	6.4
BI-BN-01b	Atlantic silverside	103	6.6
BI-BN-01b	Atlantic silverside	97	5.6
BI-BN-01b	Atlantic silverside	107	6.1
BI-BN-01b	Atlantic silverside	99	5.6
BI-BN-01b	Atlantic silverside	93	4.4
BI-BN-01b	Atlantic silverside	90	4.6
BI-BN-01b	Atlantic silverside	78	2.8
BI-BN-01b	Atlantic silverside	92	4.4
BI-BN-01b	Atlantic silverside	97	6
BI-BN-01b	Atlantic silverside	94	5
BI-BN-01b	Atlantic silverside	122	11
BI-BN-01b	Atlantic silverside	92	4.5
BI-BN-01b	Atlantic silverside	96	5.9
BI-BN-01b	Atlantic silverside	100	6.3
BI-BN-01b	Atlantic silverside	108	8.5
BI-BN-01b	Atlantic silverside	107	7.6
BI-BN-01b	Atlantic silverside	96	5.7
BI-BN-01b	Atlantic silverside	97	5.3

Table B-1d
Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-01b	Atlantic silverside	98	5.2
BI-BN-01b	Atlantic silverside	100	6.2
BI-BN-01b	Atlantic silverside	95	5
BI-BN-02a	Atlantic silverside	86	3.6
BI-BN-02a	Atlantic silverside	91	4.5
BI-BN-02a	Atlantic silverside	95	5.6
BI-BN-02a	Atlantic silverside	105	7.6
BI-BN-02a	Atlantic silverside	105	7.3
BI-BN-02a	Atlantic silverside	104	6.5
BI-BN-02a	Atlantic silverside	95	6.7
BI-BN-02a	Atlantic silverside	86	3.8
BI-BN-02a	Atlantic silverside	103	5
BI-BN-02a	Atlantic silverside	95	5.1
BI-BN-02a	Atlantic silverside	101	5.8
BI-BN-02a	Atlantic silverside	88	3.8
BI-BN-02a	Atlantic silverside	92	4.4
BI-BN-02a	Atlantic silverside	91	4.4
BI-BN-02a	Atlantic silverside	96	4.8
BI-BN-02a	Atlantic silverside	79	2.6
BI-BN-02a	Atlantic silverside	99	5.6
BI-BN-02a	Atlantic silverside	92	5.3
BI-BN-02a	Atlantic silverside	88	3.8
BI-BN-02a	Atlantic silverside	89	4.4
BI-BN-02a	Atlantic silverside	93	4.6
BI-BN-02a	Atlantic silverside	92	3.4
BI-BN-02a	Atlantic silverside	82	3
BI-BN-02a	Atlantic silverside	93	4.8
BI-BN-02a	Atlantic silverside	86	4.1
BI-BN-02a	Atlantic silverside	93	4.2
BI-BN-02a	Atlantic silverside	89	3.9
BI-BN-02a	Atlantic silverside	85	3.6
BI-BN-02a	Atlantic silverside	104	6.7
BI-BN-02a	Atlantic silverside	100	5.6
BI-BN-02a	Atlantic silverside	88	3.8
BI-BN-02a	Atlantic silverside	91	4.5
BI-BN-02a	Atlantic silverside	95	5.1
BI-BN-02a	Atlantic silverside	85	7.8
BI-BN-02a	Atlantic silverside	82	3
BI-BN-02a	Atlantic silverside	94	4.6
BI-BN-02a	Atlantic silverside	79	3.4
BI-BN-02a	Atlantic silverside	82	3.3
BI-BN-02a	Atlantic silverside	93	4.7
BI-BN-02a	Atlantic silverside	98	5.2
BI-BN-02a	Atlantic silverside	92	4.2

Table B-1d

Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-02a	Spot	34	0.4
BI-BN-02a	Spot	31	0.2
BI-BN-02a	Spot	33	0.3
BI-BN-02a	Bay anchovy	63	1.5
BI-BN-02a	Bay anchovy	56	0.9
BI-BN-02a	Bay anchovy	54	0.9
BI-BN-02a	Bay anchovy	69	1.2
BI-BN-02a	Bay anchovy	62	1.3
BI-BN-02a	Bay anchovy	59	0.8
BI-BN-02a	Bay anchovy	52	0.4
BI-BN-02a	Bay anchovy	60	1.1
BI-BN-02a	Bay anchovy	54	0.7
BI-BN-02a	Bay anchovy	58	0.9
BI-BN-02a	Bay anchovy	60	1.2
BI-BN-02a	Bay anchovy	60	1.2
BI-BN-02a	Bay anchovy	58	0.8
BI-BN-02a	Bay anchovy	59	1
BI-BN-02a	Bay anchovy	56	0.7
BI-BN-02a	Bay anchovy	61	1.1
BI-BN-02a	Bay anchovy	59	1
BI-BN-02a	Bay anchovy	54	0.7
BI-BN-02a	Bay anchovy	56	0.7
BI-BN-02a	Bay anchovy	55	0.8
BI-BN-02a	Bay anchovy	59	1
BI-BN-02a	Bay anchovy	54	0.7
BI-BN-02a	Bay anchovy	59	1.1
BI-BN-02a	Spot	28	0.1
BI-BN-02a	Spot	32	0.4
BI-BN-02a	Spot	32	0.3
BI-BN-02a	Spot	36	0.4
BI-BN-02a	Spot	32	0.3
BI-BN-02a	Spot	36	0.4
BI-BN-02a	Spot	34	0.4
BI-BN-02a	Spot	40	0.5
BI-BN-02a	Spot	35	0.5
BI-BN-02a	Spot	27	0.5
BI-BN-02a	Spot	39	0.6
BI-BN-02a	Spot	34	0.4
BI-BN-02a	Spot	41	0.7
BI-BN-02a	Spot	40	0.7
BI-BN-02a	Spot	33	0.4
BI-BN-02a	Spot	34	0.4
BI-BN-02a	Atlantic menhaden	47	0.2
BI-BN-02a	Pipefish	166	2

Table B-1d
Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-02a	Spot	42	0.8
BI-BN-02a	Spot	36	0.6
BI-BN-02a	Spot	42	0.7
BI-BN-02a	Spot	41	0.7
BI-BN-02a	Spot	36	0.5
BI-BN-02a	Spot	36	0.5
BI-BN-02a	Spot	38	0.5
BI-BN-02a	Spot	46	0.8
BI-BN-02a	Spot	31	0.4
BI-BN-02a	Spot	36	0.5
BI-BN-02a	Spot	31	0.4
BI-BN-02a	Spot	36	0.4
BI-BN-02a	Spot	37	0.3
BI-BN-02a	Spot	36	0.5
BI-BN-02a	Spot	36	0.3
BI-BN-02a	Spot	39	0.4
BI-BN-02a	Spot	37	0.3
BI-BN-02a	Spot	34	0.3
BI-BN-02a	Spot	32	0.2
BI-BN-02a	Spot	31	0.2
BI-BN-02a	Spot	30	0.2
BI-BN-02a	Spot	33	0.2
BI-BN-02a	Spot	31	0.2
BI-BN-02a	Spot	33	0.2
BI-BN-02a	Spot	34	0.2
BI-BN-02b	Atlantic silverside	96	5.4
BI-BN-02b	Atlantic silverside	91	4.5
BI-BN-02b	Atlantic silverside	91	4.2
BI-BN-02b	Atlantic silverside	91	4.3
BI-BN-02b	Atlantic silverside	92	4
BI-BN-02b	Atlantic silverside	89	4
BI-BN-02b	Atlantic silverside	90	4.1
BI-BN-02b	Atlantic silverside	89	4.2
BI-BN-02b	Atlantic silverside	84	3.3
BI-BN-02b	Atlantic silverside	93	4.8
BI-BN-02b	Atlantic silverside	96	4.8
BI-BN-02b	Atlantic silverside	106	7.3
BI-BN-02b	Atlantic silverside	85	3.4
BI-BN-02b	Atlantic silverside	102	5.8
BI-BN-02b	Atlantic silverside	84	3.5
BI-BN-02b	Atlantic silverside	83	3.3
BI-BN-02b	Atlantic silverside	90	4.2
BI-BN-02b	Atlantic silverside	114	8.7
BI-BN-02b	Mummichog	53	3.1

Table B-1d
Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-02b	Bay anchovy	54	0.8
BI-BN-02b	Bay anchovy	52	0.5
BI-BN-02b	Bay anchovy	50	0.5
BI-BN-02b	Bay anchovy	62	1.1
BI-BN-02b	Bay anchovy	60	1.2
BI-BN-02b	Bay anchovy	60	1.3
BI-BN-02b	Bay anchovy	57	0.9
BI-BN-02b	Bay anchovy	65	0.9
BI-BN-02b	Bay anchovy	57	0.8
BI-BN-02b	Bay anchovy	63	1.4
BI-BN-02b	Bay anchovy	56	0.9
BI-BN-02b	Bay anchovy	54	0.7
BI-BN-02b	Bay anchovy	61	1.2
BI-BN-02b	Bay anchovy	56	0.8
BI-BN-02b	Bay anchovy	58	1.6
BI-BN-02b	Bay anchovy	53	0.5
BI-BN-02b	Bay anchovy	51	0.6
BI-BN-02b	Bay anchovy	57	0.8
BI-BN-02b	Bay anchovy	56	1
BI-BN-02b	Bay anchovy	58	0.9
BI-BN-02b	Bay anchovy	55	0.8
BI-BN-02b	Bay anchovy	51	0.7
BI-BN-02b	Bay anchovy	54	0.7
BI-BN-02b	Bay anchovy	58	0.9
BI-BN-02b	Bay anchovy	54	0.7
BI-BN-02b	Bay anchovy	61	1.1
BI-BN-02b	Bay anchovy	66	1.2
BI-BN-02b	Bay anchovy	58	1.1
BI-BN-02b	Bay anchovy	54	0.8
BI-BN-02b	Bay anchovy	52	0.7
BI-BN-02b	Bay anchovy	56	0.9
BI-BN-02b	Bay anchovy	49	0.5
BI-BN-02b	Bay anchovy	54	0.8
BI-BN-02b	Bay anchovy	56	0.9
BI-BN-03a	White perch	219	135.6
BI-BN-03a	White perch	206	119.9
BI-BN-03a	Atlantic silverside	90	5.2
BI-BN-03a	Atlantic silverside	93	3.8
BI-BN-03a	Atlantic silverside	95	4.9
BI-BN-03a	Atlantic menhaden	42	0.5
BI-BN-03a	Atlantic menhaden	42	0.5
BI-BN-03a	Atlantic menhaden	40	0.4
BI-BN-03a	Atlantic menhaden	41	0.5
BI-BN-03a	Bay anchovy	67	1.5

Table B-1d

Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-03a	Bay anchovy	55	0.8
BI-BN-03a	Bay anchovy	55	0.8
BI-BN-03a	Bay anchovy	59	1
BI-BN-03a	Bay anchovy	60	1.4
BI-BN-03a	Bay anchovy	61	1
BI-BN-03a	Bay anchovy	58	1.1
BI-BN-03a	Bay anchovy	67	1.3
BI-BN-03a	Bay anchovy	69	1.5
BI-BN-03a	Bay anchovy	64	1.3
BI-BN-03a	Bay anchovy	59	1.2
BI-BN-03a	Bay anchovy	61	1.2
BI-BN-03a	Bay anchovy	55	0.8
BI-BN-03a	Bay anchovy	60	1.2
BI-BN-03a	Bay anchovy	55	0.8
BI-BN-03a	Bay anchovy	60	1.2
BI-BN-03a	Bay anchovy	61	1.2
BI-BN-03a	Bay anchovy	57	1
BI-BN-03a	Bay anchovy	68	1.5
BI-BN-03a	Bay anchovy	53	0.8
BI-BN-03a	Bay anchovy	61	1.2
BI-BN-03a	Bay anchovy	56	0.8
BI-BN-03a	Bay anchovy	55	1
BI-BN-03a	Bay anchovy	56	0.6
BI-BN-03a	Bay anchovy	51	0.6
BI-BN-03a	Bay anchovy	57	1.2
BI-BN-03a	Bay anchovy	55	1.1
BI-BN-03a	Bay anchovy	57	1.3
BI-BN-03a	Bay anchovy	61	1.2
BI-BN-03a	Bay anchovy	70	2
BI-BN-03a	Bay anchovy	61	1.4
BI-BN-03a	Bay anchovy	56	2
BI-BN-03a	Bay anchovy	55	1
BI-BN-03a	Bay anchovy	60	1.1
BI-BN-03a	Bay anchovy	52	0.8
BI-BN-03a	Bay anchovy	58	0.8
BI-BN-03a	Bay anchovy	56	1
BI-BN-03a	Bay anchovy	60	1
BI-BN-03a	Bay anchovy	60	1.2
BI-BN-03a	Bay anchovy	119	0.7
BI-BN-03a	Bay anchovy	57	0.9
BI-BN-03a	Bay anchovy	55	0.7
BI-BN-03a	Bay anchovy	59	1
BI-BN-03a	Bay anchovy	49	0.6
BI-BN-03a	Bay anchovy	55	0.7

Table B-1d
Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-03a	Bay anchovy	60	1.1
BI-BN-03a	Bay anchovy	60	1.2
BI-BN-03a	Bay anchovy	60	1.4
BI-BN-03a	Bay anchovy	67	1.8
BI-BN-03a	Bay anchovy	60	1.2
BI-BN-03a	Bay anchovy	56	0.8
BI-BN-03a	Bay anchovy	57	1
BI-BN-03b	Bay anchovy	45	0.4
BI-BN-03b	Bay anchovy	54	0.7
BI-BN-03b	Bay anchovy	55	0.9
BI-BN-03b	Bay anchovy	48	0.6
BI-BN-03b	Bay anchovy	55	1.1
BI-BN-03b	Bay anchovy	58	1
BI-BN-03b	Bay anchovy	56	1
BI-BN-03b	Bay anchovy	65	1.8
BI-BN-03b	Bay anchovy	62	1.2
BI-BN-03b	Bay anchovy	50	0.6
BI-BN-03b	Bay anchovy	58	1
BI-BN-03b	Bay anchovy	53	0.7
BI-BN-03b	Bay anchovy	50	0.7
BI-BN-03b	Bay anchovy	60	1.1
BI-BN-03b	Bay anchovy	49	0.5
BI-BN-03b	Bay anchovy	59	1.2
BI-BN-03b	Bay anchovy	60	1.3
BI-BN-03b	Bay anchovy	55	0.9
BI-BN-03b	Bay anchovy	55	0.8
BI-BN-03b	Bay anchovy	52	0.7
BI-BN-03b	Bay anchovy	55	0.7
BI-BN-03b	Bay anchovy	50	0.6
BI-BN-03b	Bay anchovy	58	1.1
BI-BN-03b	Bay anchovy	61	1.4
BI-BN-03b	Bay anchovy	62	1.3
BI-BN-03b	Bay anchovy	51	0.6
BI-BN-03b	Bay anchovy	53	0.7
BI-BN-03b	Bay anchovy	57	1
BI-BN-03b	Bay anchovy	51	0.7
BI-BN-03b	Bay anchovy	58	1.1
BI-BN-03b	Bay anchovy	59	1.1
BI-BN-03b	Bay anchovy	55	0.9
BI-BN-03b	Bay anchovy	62	1.1
BI-BN-03b	Bay anchovy	59	1
BI-BN-03b	Bay anchovy	57	0.9
BI-BN-03b	Bay anchovy	52	0.6
BI-BN-03b	Bay anchovy	55	0.9

Table B-1d
Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-03b	Bay anchovy	58	1
BI-BN-03b	Bay anchovy	57	1
BI-BN-03b	Bay anchovy	49	0.5
BI-BN-03b	Bay anchovy	55	0.9
BI-BN-03b	Bay anchovy	50	0.6
BI-BN-03b	Bay anchovy	66	1.5
BI-BN-03b	Bay anchovy	55	0.8
BI-BN-03b	Bay anchovy	57	1
BI-BN-03b	Bay anchovy	58	1
BI-BN-03b	Bay anchovy	52	0.8
BI-BN-03b	Bay anchovy	51	0.7
BI-BN-03b	Bay anchovy	56	0.9
BI-BN-03b	Bay anchovy	60	1.1
BI-BN-03b	Atlantic menhaden	43	0.2
BI-BN-03b	Atlantic menhaden	41	0.4
BI-BN-03b	Atlantic menhaden	42	0.5
BI-BN-03b	Atlantic silverside	105	6.9
BI-BN-03b	Atlantic silverside	78	3
BI-BN-03b	Atlantic silverside	93	4.8
BI-BN-03b	Atlantic silverside	94	5.4
BI-BN-03b	Atlantic silverside	96	5.5
BI-BN-03b	Atlantic menhaden	39	0.3
BI-BN-03b	Atlantic menhaden	40	0.3
BI-BN-03b	Atlantic menhaden	42	0.3
BI-BN-03b	Atlantic menhaden	40	0.3
BI-BN-03b	Atlantic silverside	95	4.8
BI-BN-04a	Striped killifish	72	3.7
BI-BN-04a	Striped killifish	82	6.4
BI-BN-04a	Striped killifish	82	6.4
BI-BN-04a	Striped killifish	100	10.1
BI-BN-04a	Striped killifish	74	4.2
BI-BN-04a	Striped killifish	82	5.6
BI-BN-04a	Striped killifish	55	2.7
BI-BN-04a	Striped killifish	83	5.9
BI-BN-04a	Striped killifish	70	3.3
BI-BN-04a	Striped killifish	70	3.6
BI-BN-04a	Striped killifish	83	6.9
BI-BN-04a	Striped killifish	58	1.9
BI-BN-04a	Striped killifish	72	4
BI-BN-04a	Striped killifish	90	7.3
BI-BN-04a	Striped killifish	98	11.4
BI-BN-04a	Striped killifish	106	12.4
BI-BN-04a	Striped killifish	71	4
BI-BN-04a	Striped killifish	85	6.1

Table B-1d
Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-04a	Striped killifish	114	16.4
BI-BN-04a	Striped killifish	82	5
BI-BN-04a	Striped killifish	94	8.4
BI-BN-04a	Striped killifish	101	11
BI-BN-04a	Striped killifish	105	12.4
BI-BN-04a	Striped killifish	76	4.3
BI-BN-04a	Striped killifish	75	4.4
BI-BN-04a	Striped killifish	66	3.1
BI-BN-04a	Striped killifish	73	4
BI-BN-04a	Striped killifish	80	5.3
BI-BN-04a	Striped killifish	86	6.5
BI-BN-04a	Striped killifish	76	4.7
BI-BN-04a	Atlantic silverside	115	8.9
BI-BN-04a	Atlantic silverside	90	4.3
BI-BN-04a	Atlantic silverside	63	1.7
BI-BN-04a	Spot	46	1.1
BI-BN-04a	Striped killifish	64	2.4
BI-BN-04a	Mummichog	84	8.7
BI-BN-04a	Mummichog	63	3.5
BI-BN-04a	Mummichog	60	3
BI-BN-04a	Mummichog	106	14.9
BI-BN-04a	Mummichog	106	17.3
BI-BN-04a	Mummichog	57	2.5
BI-BN-04a	Mummichog	69	11.5
BI-BN-04a	Striped killifish	63	2.5
BI-BN-04a	Striped killifish	75	4.2
BI-BN-04a	Striped killifish	75	4.5
BI-BN-04a	Striped killifish	92	8.5
BI-BN-04a	Striped killifish	69	2.1
BI-BN-04a	Striped killifish	86	6.5
BI-BN-04a	Striped killifish	71	4.5
BI-BN-04a	Striped killifish	73	4.1
BI-BN-04a	Striped killifish	95	8.4
BI-BN-04a	Striped killifish	85	6.5
BI-BN-04a	Striped killifish	106	12.9
BI-BN-04a	Striped killifish	74	3.9
BI-BN-04a	Striped killifish	95	9.1
BI-BN-04a	Striped killifish	68	3.1
BI-BN-04a	Striped killifish	83	6.3
BI-BN-04a	Striped killifish	72	3.7
BI-BN-04b	Bay anchovy	54	0.9
BI-BN-04b	Bay anchovy	60	1.2
BI-BN-04b	Bay anchovy	60	1.1
BI-BN-04b	Bay anchovy	56	0.9

Table B-1d
Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-04b	Bay anchovy	59	1.2
BI-BN-04b	Bay anchovy	59	1.2
BI-BN-04b	Bay anchovy	55	0.7
BI-BN-04b	Bay anchovy	55	1
BI-BN-04b	Bay anchovy	61	1.2
BI-BN-04b	Bay anchovy	55	0.9
BI-BN-04b	Mummichog	51	1.7
BI-BN-04b	Mummichog	73	5.6
BI-BN-04b	Mummichog	55	2
BI-BN-04b	Mummichog	73	6.2
BI-BN-04b	Mummichog	61	3.5
BI-BN-04b	Mummichog	55	1.8
BI-BN-04b	Mummichog	58	2.6
BI-BN-04b	Mummichog	81	7
BI-BN-04b	Mummichog	65	4.5
BI-BN-04b	Mummichog	79	7
BI-BN-04b	Mummichog	79	7
BI-BN-04b	Mummichog	61	3
BI-BN-04b	Mummichog	41	0.9
BI-BN-04b	Mummichog	58	2.4
BI-BN-04b	Mummichog	63	3.6
BI-BN-04b	Mummichog	61	3.3
BI-BN-04b	Mummichog	70	6
BI-BN-04b	Mummichog	50	1
BI-BN-04b	Atlantic menhaden	44	1.1
BI-BN-04b	Atlantic menhaden	55	0.5
BI-BN-04b	Mummichog	78	7.5
BI-BN-04b	Mummichog	82	6.3
BI-BN-04b	Mummichog	51	2.4
BI-BN-04b	Mummichog	45	1.2
BI-BN-04b	Mummichog	56	2.1
BI-BN-04b	Striped killifish	52	1.9
BI-BN-04b	Striped killifish	74	4.1
BI-BN-04b	Striped killifish	110	15.5
BI-BN-04b	Striped killifish	74	4.3
BI-BN-04b	Striped killifish	75	5.3
BI-BN-04b	Striped killifish	79	5.5
BI-BN-04b	Mummichog	56	2.2
BI-BN-04b	Mummichog	65	2.3
BI-BN-04b	Mummichog	54	1.8
BI-BN-04b	Mummichog	57	2.2
BI-BN-04b	Mummichog	65	4.3
BI-BN-04b	Mummichog	65	3.7
BI-BN-04b	Mummichog	86	10.7

Table B-1d
Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-04b	Mummichog	55	2.5
BI-BN-04b	Mummichog	48	1.2
BI-BN-04b	Bay anchovy	56	1.6
BI-BN-04b	Bay anchovy	50	0.6
BI-BN-04b	Bay anchovy	58	1.1
BI-BN-04b	Bay anchovy	61	1.3
BI-BN-04b	Striped killifish	59	3.6
BI-BN-04b	Striped killifish	63	2.7
BI-BN-04b	Mummichog	55	2.3
BI-BN-04b	Mummichog	55	2.1
BI-BN-04b	Mummichog	54	3.4
BI-BN-04b	Mummichog	52	1.9
BI-BN-04b	Mummichog	59	2.6
BI-BN-04b	Mummichog	44	1.1
BI-BN-04b	Mummichog	67	4.4
BI-BN-04b	Mummichog	45	1
BI-BN-04b	Mummichog	50	1.6
BI-BN-04b	Mummichog	58	2.3
BI-BN-04b	Mummichog	50	1.7
BI-BN-04b	Mummichog	55	2
BI-BN-04b	Mummichog	58	2
BI-BN-04b	Mummichog	69	4
BI-BN-04b	Mummichog	59	2.6
BI-BN-04b	Mummichog	70	5.2
BI-BN-04b	Mummichog	49	1.3
BI-BN-04b	Mummichog	43	1
BI-BN-04b	Striped killifish	70	2.6
BI-BN-04b	Striped killifish	49	1.6
BI-BN-04b	Striped killifish	69	3.3
BI-BN-04b	Striped killifish	46	1
BI-BN-04b	Spot	50	0.5
BI-BN-04b	Spot	49	1.3
BI-BN-05a	Bay anchovy	54	0.7
BI-BN-05a	Bay anchovy	52	0.6
BI-BN-05a	Bay anchovy	52	0.7
BI-BN-05a	Bay anchovy	56	0.9
BI-BN-05a	Bay anchovy	57	1.1
BI-BN-05a	Bay anchovy	67	1.2
BI-BN-05a	Bay anchovy	57	0.9
BI-BN-05a	Bay anchovy	59	0.8
BI-BN-05a	Bay anchovy	57	0.8
BI-BN-05a	Bay anchovy	59	0.9
BI-BN-05a	Bay anchovy	38	0.3
BI-BN-05a	Bay anchovy	58	0.7

Table B-1d

Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-05a	Bay anchovy	60	1.2
BI-BN-05a	Bay anchovy	57	0.7
BI-BN-05a	Bay anchovy	52	0.8
BI-BN-05a	Bay anchovy	54	0.6
BI-BN-05a	Bay anchovy	55	0.9
BI-BN-05a	Bay anchovy	57	0.8
BI-BN-05a	Bay anchovy	57	0.9
BI-BN-05a	Bay anchovy	51	0.7
BI-BN-05a	Bay anchovy	60	1.2
BI-BN-05a	Bay anchovy	50	0.7
BI-BN-05a	Bay anchovy	57	1
BI-BN-05a	Bay anchovy	55	0.9
BI-BN-05a	Bay anchovy	53	0.6
BI-BN-05a	Bay anchovy	55	0.7
BI-BN-05a	Bay anchovy	54	0.7
BI-BN-05a	Bay anchovy	60	1.1
BI-BN-05a	Bay anchovy	55	0.8
BI-BN-05a	Bay anchovy	54	0.8
BI-BN-05a	Bay anchovy	55	0.8
BI-BN-05a	Bay anchovy	54	0.6
BI-BN-05a	Bay anchovy	53	0.8
BI-BN-05a	Bay anchovy	54	0.8
BI-BN-05a	Bay anchovy	54	1
BI-BN-05a	Bay anchovy	56	1.1
BI-BN-05a	Bay anchovy	56	0.9
BI-BN-05a	Atlantic menhaden	37	0.3
BI-BN-05a	Atlantic menhaden	44	0.6
BI-BN-05a	Atlantic menhaden	40	0.4
BI-BN-05a	Atlantic menhaden	41	0.4
BI-BN-05a	Atlantic menhaden	41	0.5
BI-BN-05a	Atlantic menhaden	39	0.4
BI-BN-05a	Atlantic menhaden	40	0.4
BI-BN-05a	Atlantic menhaden	47	0.7
BI-BN-05a	Atlantic menhaden	48	0.7
BI-BN-05a	Atlantic menhaden	38	0.3
BI-BN-05a	Atlantic menhaden	40	0.4
BI-BN-05a	Atlantic menhaden	40	0.5
BI-BN-05a	Atlantic menhaden	43	0.5
BI-BN-05a	Atlantic menhaden	40	0.4
BI-BN-05a	Atlantic menhaden	41	0.5
BI-BN-05a	Atlantic menhaden	41	0.5
BI-BN-05a	Atlantic menhaden	38	0.3
BI-BN-05a	Atlantic menhaden	39	0.3
BI-BN-05a	Atlantic menhaden	46	0.6

Table B-1d
Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-05a	Atlantic menhaden	38	0.3
BI-BN-05a	Atlantic menhaden	42	0.5
BI-BN-05a	Atlantic menhaden	39	0.3
BI-BN-05a	Atlantic menhaden	43	0.3
BI-BN-05b	Bay anchovy	55	1
BI-BN-05b	Bay anchovy	50	1.5
BI-BN-05b	Bay anchovy	61	1.3
BI-BN-05b	Bay anchovy	54	0.9
BI-BN-05b	Bay anchovy	53	0.8
BI-BN-05b	Bay anchovy	59	1.1
BI-BN-05b	Bay anchovy	60	1.2
BI-BN-05b	Bay anchovy	55	0.9
BI-BN-05b	Bay anchovy	55	0.8
BI-BN-05b	Bay anchovy	55	0.9
BI-BN-05b	Bay anchovy	59	1.1
BI-BN-05b	Bay anchovy	58	0.9
BI-BN-05b	Bay anchovy	55	1
BI-BN-05b	Bay anchovy	55	0.8
BI-BN-05b	Bay anchovy	60	1.2
BI-BN-05b	Bay anchovy	56	1
BI-BN-05b	Bay anchovy	59	1
BI-BN-05b	Bay anchovy	57	1.1
BI-BN-05b	Bay anchovy	60	1.2
BI-BN-05b	Bay anchovy	55	1.1
BI-BN-05b	Bay anchovy	59	1
BI-BN-05b	Bay anchovy	59	1
BI-BN-05b	Bay anchovy	57	1
BI-BN-05b	Bay anchovy	60	1.3
BI-BN-05b	Bay anchovy	67	2.3
BI-BN-05b	Bay anchovy	62	1.4
BI-BN-05b	Bay anchovy	51	0.7
BI-BN-05b	Bay anchovy	57	1
BI-BN-05b	Bay anchovy	57	0.9
BI-BN-05b	Bay anchovy	55	1
BI-BN-05b	Bay anchovy	55	0.8
BI-BN-05b	Bay anchovy	57	1
BI-BN-05b	Bay anchovy	58	1
BI-BN-05b	Bay anchovy	61	1.4
BI-BN-05b	Bay anchovy	54	1
BI-BN-05b	Bay anchovy	55	0.8
BI-BN-05b	Bay anchovy	58	1
BI-BN-05b	Bay anchovy	47	0.5
BI-BN-05b	Bay anchovy	60	1.5
BI-BN-05b	Bay anchovy	57	1.1

Table B-1d
Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-05b	Bay anchovy	55	0.9
BI-BN-05b	Bay anchovy	66	1.9
BI-BN-05b	Bay anchovy	56	0.6
BI-BN-05b	Bay anchovy	57	1
BI-BN-05b	Bay anchovy	66	1
BI-BN-05b	Bay anchovy	61	1.2
BI-BN-05b	Bay anchovy	56	0.8
BI-BN-05b	Bay anchovy	55	0.8
BI-BN-05b	Bay anchovy	55	0.9
BI-BN-05b	Bay anchovy	56	1
BI-BN-05b	Atlantic silverside	87	4
BI-BN-05b	Atlantic silverside	86	4
BI-BN-05b	Atlantic silverside	95	5.1
BI-BN-05b	Atlantic silverside	84	3.6
BI-BN-05b	Atlantic silverside	102	7.5
BI-BN-05b	Atlantic silverside	87	4.6
BI-BN-05b	Mummichog	52	1
BI-BN-05b	Mummichog	55	2
BI-BN-05b	Mummichog	45	1.5
BI-BN-05b	Mummichog	48	1.4
BI-BN-05b	Mummichog	46	1.5
BI-BN-05b	Mummichog	45	1.1
BI-BN-05b	Mummichog	54	2.1
BI-BN-05b	Mummichog	54	2.1
BI-BN-05b	Mummichog	50	1.4
BI-BN-05b	Mummichog	52	1.6
BI-BN-05b	Mummichog	54	1.8
BI-BN-05b	Mummichog	45	1.1
BI-BN-05b	Mummichog	58	2.5
BI-BN-05b	Mummichog	49	1.6
BI-BN-05b	Mummichog	59	2.6
BI-BN-05b	Mummichog	54	1.8
BI-BN-05b	Mummichog	57	2.4
BI-BN-05b	Striped killifish	65	2.8
BI-BN-05b	Striped killifish	57	2.2
BI-BN-05b	Striped killifish	72	4.3
BI-BN-05b	Atlantic menhaden	48	0.6
BI-BN-05b	Atlantic menhaden	41	0.4
BI-BN-05b	Atlantic menhaden	45	0.5
BI-BN-05b	Atlantic menhaden	46	0.5
BI-BN-05b	Atlantic menhaden	45	0.5
BI-BN-05b	Atlantic menhaden	46	0.6
BI-BN-05b	Atlantic menhaden	40	0.4
BI-BN-05b	Atlantic menhaden	40	0.3

Table B-1d

Barren Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
BI-BN-05b	Spot	35	0.5
BI-BN-05b	Spot	45	0.9
BI-BN-05b	Inland silverside	56	1.6

Notes:

g: gram

mm: millimeter

Table B-2a

Barren Island Gill Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
BI-GN-01	Atlantic menhaden	127	
BI-GN-01	Atlantic menhaden	123	
BI-GN-01	Atlantic menhaden	126	
BI-GN-01	Atlantic menhaden	126	
BI-GN-01	Atlantic menhaden	124	
BI-GN-01	Atlantic menhaden	127	
BI-GN-01	Gizzard shad	361	
BI-GN-01	Gizzard shad	363	
BI-GN-01	Gizzard shad	317	
BI-GN-01	Gizzard shad	334	
BI-GN-01	Gizzard shad	389	
BI-GN-01	Gizzard shad	394	
BI-GN-01	Bluefish	313	
BI-GN-01	Bluefish	345	
BI-GN-01	Bluefish	303	
BI-GN-01	Gizzard shad	326	
BI-GN-01	Atlantic menhaden	135	
BI-GN-01	Atlantic menhaden	121	
BI-GN-01	Atlantic menhaden	122	
BI-GN-01	Atlantic menhaden	110	
BI-GN-01	Spot	116	
BI-GN-01	Atlantic menhaden	136	
BI-GN-01	Atlantic menhaden	130	
BI-GN-01	Spot	114	
BI-GN-01	Spot	129	
BI-GN-01	Striped bass	196	
BI-GN-01	Spot	127	
BI-GN-01	Atlantic menhaden	127	
BI-GN-01	Atlantic menhaden	134	
BI-GN-01	Spot	143	
BI-GN-01	Atlantic menhaden	133	
BI-GN-01	Spot	150	
BI-GN-01	Spot	132	
BI-GN-01	Spot	119	
BI-GN-01	Spot	117	
BI-GN-01	Atlantic menhaden	139	
BI-GN-01	Atlantic menhaden	122	
BI-GN-01	Spot	185	
BI-GN-01	Spot	159	
BI-GN-01	Spot	128	
BI-GN-01	Spot	124	
BI-GN-01	Spot	151	
BI-GN-01	Spot	147	
BI-GN-01	Atlantic menhaden	137	

Table B-2a
Barren Island Gill Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
BI-GN-01	Atlantic menhaden	125	
BI-GN-01	Atlantic menhaden	128	
BI-GN-01	Atlantic menhaden	119	
BI-GN-01	Atlantic menhaden	128	
BI-GN-01	Spot	151	
BI-GN-01	Spot	123	
BI-GN-01	Spot	122	
BI-GN-01	Spot	122	
BI-GN-01	Spot	125	
BI-GN-01	Spot	135	
BI-GN-01	Spot	129	
BI-GN-01	Spot	117	
BI-GN-01	Spot	134	
BI-GN-01	Spot	151	
BI-GN-01	Spot	123	
BI-GN-01	Spot	160	
BI-GN-01	Spot	179	
BI-GN-01	Atlantic menhaden	129	
BI-GN-01	Spot	131	
BI-GN-01	Spot	123	
BI-GN-01	spot	129	
BI-GN-01	Gizzard shad	225	
BI-GN-01	Spot	127	
BI-GN-01	Spot	169	
BI-GN-01	Spot	119	
BI-GN-01	Spot	147	
BI-GN-01	Spot	120	
BI-GN-01	Atlantic menhaden	126	
BI-GN-01	Spot	157	
BI-GN-01	Atlantic menhaden	144	
BI-GN-01	Spot	154	
BI-GN-01	Spot	154	
BI-GN-01	Spot	139	
BI-GN-01	Spot	161	
BI-GN-01	Spot	179	
BI-GN-01	Atlantic menhaden	136	
BI-GN-01	Spot	141	
BI-GN-01	Spot	147	
BI-GN-01	Spot	160	
BI-GN-01	Gizzard shad	338	
BI-GN-01	Spot	130	
BI-GN-01	Atlantic menhaden	133	
BI-GN-01	Atlantic menhaden	126	
BI-GN-01	Spot	133	

Table B-2a
Barren Island Gill Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
BI-GN-01	Spot	128	
BI-GN-01	Spot	135	
BI-GN-01	Atlantic menhaden	128	
BI-GN-01	Atlantic menhaden	131	
BI-GN-01	Spot	131	
BI-GN-01	Atlantic menhaden	122	
BI-GN-01	Atlantic menhaden	124	
BI-GN-01	Atlantic menhaden	115	
BI-GN-01	Atlantic menhaden	135	
BI-GN-01	Atlantic menhaden	137	
BI-GN-01	Harvest fish	127	
BI-GN-01	Atlantic menhaden	129	
BI-GN-01	Blue crab	150	
BI-GN-01	Blue crab	135	
BI-GN-01	Blue crab	81	
BI-GN-01	Blue crab	102	
BI-GN-01	Blue crab	142	
BI-GN-01	Blue crab	109	
BI-GN-01	Blue crab	95	
BI-GN-01	Blue crab	117	
BI-GN-01	Atlantic menhaden	121	
BI-GN-01	Atlantic menhaden	137	
BI-GN-01	Atlantic menhaden	136	
BI-GN-01	Spot	120	
BI-GN-01	Spot	114	
BI-GN-01	Spot	124	
BI-GN-01	Atlantic menhaden	128	
BI-GN-01	Atlantic menhaden	139	
BI-GN-01	Atlantic menhaden	121	
BI-GN-01	Spot	126	
BI-GN-01	Spot	176	
BI-GN-01	Spot	118	
BI-GN-01	Atlantic menhaden	121	
BI-GN-01	Atlantic menhaden	119	
BI-GN-01	Atlantic menhaden	104	
BI-GN-02	Spot	145	
BI-GN-02	Blue crab	120	
BI-GN-02	Spot	183	
BI-GN-02	Spot	163	
BI-GN-02	Spot	157	
BI-GN-02	Spot	170	
BI-GN-02	Spot	207	
BI-GN-02	Atlantic menhaden	125	
BI-GN-02	Atlantic menhaden	128	

Table B-2a
Barren Island Gill Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
BI-GN-02	Spot	152	
BI-GN-03	Blue crab	140	
BI-GN-03	Blue crab	125	
BI-GN-03	Gizzard shad	369	
BI-GN-03	Atlantic menhaden	290	
BI-GN-03	Atlantic menhaden	322	
BI-GN-03	Atlantic menhaden	334	
BI-GN-03	Atlantic menhaden	340	
BI-GN-03	Atlantic menhaden	338	
BI-GN-03	Spanish mackerel	512	
BI-GN-03	Atlantic menhaden	215	
BI-GN-03	Atlantic menhaden	320	
BI-GN-03	Atlantic menhaden	140	
BI-GN-03	Atlantic menhaden	250	
BI-GN-03	Atlantic menhaden	143	
BI-GN-03	Atlantic menhaden	217	
BI-GN-03	Silver perch	196	
BI-GN-03	Spanish mackerel	278	
BI-GN-03	Atlantic menhaden	225	
BI-GN-03	Harvest fish	213	
BI-GN-03	Northern sand lance	805	
BI-GN-03	Atlantic menhaden	135	
BI-GN-03	Spanish mackerel	290	
BI-GN-03	Atlantic menhaden	150	
BI-GN-03	Atlantic menhaden	292	
BI-GN-03	Spanish mackerel	296	
BI-GN-03	Blue crab	75	
BI-GN-03	Spanish mackerel	287	
BI-GN-04	Blue crab	93	
BI-GN-04	Striped bass	390	
BI-GN-04	Blue crab	110	
BI-GN-04	Gizzard shad	413	
BI-GN-04	Gizzard shad	409	
BI-GN-04	Spot	128	
BI-GN-04	Spot	163	
BI-GN-04	Spot	168	
BI-GN-04	Gizzard shad	446	
BI-GN-04	Spot	151	
BI-GN-04	Spot	149	
BI-GN-04	Spot	213	
BI-GN-04	Blue crab	100	
BI-GN-04	Spot	124	
BI-GN-04	Spot	155	
BI-GN-04	Spot	150	

Table B-2a
Barren Island Gill Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
BI-GN-04	Spot	118	
BI-GN-04	Spot	155	
BI-GN-04	Spot	159	
BI-GN-04	Atlantic menhaden	120	
BI-GN-04	Spot	125	
BI-GN-04	Spot	158	
BI-GN-04	Spot	147	
BI-GN-04	Blue crab	95	
BI-GN-04	Atlantic menhaden	136	
BI-GN-04	Spot	112	
BI-GN-04	Spot	126	
BI-GN-04	Blue crab	132	

Note:

mm: millimeter

Table B-2b
Barren Island Gill Net Collection Results – Fall, Summer, and Spring

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Fall	BI-GN-01	Spot	122	
	BI-GN-01	Spot	151	
	BI-GN-01	Spot	140	
	BI-GN-02	Gizzard shad	355	
	BI-GN-02	Gizzard shad	331	
	BI-GN-02	Spot	135	
	BI-GN-02	Spot	120	
	BI-GN-02	Spot	125	
Winter	BI-GN-01	Alewife	296	
	BI-GN-02	Atlantic menhaden	302	
	BI-GN-03	Atlantic menhaden	139	
	BI-GN-04	Alewife	287	
	BI-GN-05	Alewife	300	
	BI-GN-03	Atlantic menhaden	192	
	BI-GN-04	Atlantic menhaden	169	
Spring	BI-GN-03	Hickory Shad	460	689
	BI-GN-04	Atlantic menhaden	153	25
	BI-GN-05	Spot	172	75
	BI-GN-06	Spot	160	56
	BI-GN-07	Atlantic menhaden	140	25
	BI-GN-08	Atlantic menhaden	140	25

Notes:

a. Weight was measured during the spring sampling event only.

g: gram

mm: millimeter

Table B-3
Barren Island Bottom Trawl Collection Results – All Seasons

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Summer	BI-FT-01	Weakfish	150	
	BI-FT-02	Blue crab	65	
	BI-FT-04	Blue crab	77	
	BI-FT-04	Blackcheek tonguefish	98	
	BI-FT-04	Blackcheek tonguefish	133	
	BI-FT-05	Blue crab	130	
	BI-FT-05	Blackcheek tonguefish	127	
	BI-FT-06	Spot	127	
	BI-FT-06	Spot	132	
Fall	BI-FT-01	Gizzard shad	156	
	BI-FT-01	Bay anchovy	61	
	BI-FT-02	Blue crab	119	
	BI-FT-02	Blue crab	130	
	BI-FT-02	Blue crab	108	
	BI-FT-03	Bay anchovy	40	
	BI-FT-03	Bay anchovy	34	
	BI-FT-05	Bay anchovy	63	
	BI-FT-05	Bay anchovy	57	
	BI-FT-05	Bay anchovy	60	
	BI-FT-05	Bay anchovy	55	
	BI-FT-05	Bay anchovy	55	
	BI-FT-05	Bay anchovy	57	
	BI-FT-05	Bay anchovy	54	
	BI-FT-05	Bay anchovy	58	
	BI-FT-05	Bay anchovy	58	
	BI-FT-05	Bay anchovy	54	
	BI-FT-05	Bay anchovy	59	
	BI-FT-05	Bay anchovy	56	
	BI-FT-06	Blue crab	109	
Spring	BI-FT-02b	Bay anchovy	64	1.5
	BI-FT-04a	Bay anchovy	59	0.9
	BI-FT-04a	Bay anchovy	43	0.5
	BI-FT-04b	Bay anchovy	59	1.1
	BI-FT-04b	Bay anchovy	53	0.9
	BI-FT-04b	Bay anchovy	61	1.5
	BI-FT-04b	Bay anchovy	58	1.1
	BI-FT-04b	Bay anchovy	80	3.2
	BI-FT-04b	Bay anchovy	56	1.1
	BI-FT-04b	Bay anchovy	62	1.2
	BI-FT-04b	Bay anchovy	60	1.1
	BI-FT-04b	Bay anchovy	65	1.5
	BI-FT-04b	Bay anchovy	64	2
	BI-FT-04b	Bay anchovy	55	1
	BI-FT-04b	Bay anchovy	60	1

Table B-3
Barren Island Bottom Trawl Collection Results – All Seasons

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Spring (continued)	BI-FT-04b	Bay anchovy	58	1
	BI-FT-04b	Bay anchovy	65	1.6
	BI-FT-04b	Bay anchovy	62	1.3
	BI-FT-04b	Bay anchovy	50	0.5
	BI-FT-04b	Bay anchovy	54	0.8
	BI-FT-04b	Bay anchovy	56	1
	BI-FT-04b	Bay anchovy	52	0.9
	BI-FT-04b	Bay anchovy	52	0.7
	BI-FT-04b	Bay anchovy	55	1
	BI-FT-04b	Bay anchovy	58	1
	BI-FT-04b	Bay anchovy	55	1
	BI-FT-04b	Bay anchovy	66	1.9
	BI-FT-04b	Bay anchovy	61	1.4
	BI-FT-04b	Bay anchovy	65	1.6
	BI-FT-04b	Bay anchovy	58	0.9
	BI-FT-04b	Bay anchovy	54	0.8
	BI-FT-04b	Bay anchovy	50	0.6
	BI-FT-04b	Bay anchovy	55	0.9
	BI-FT-04b	Bay anchovy	55	0.8
	BI-FT-04b	Bay anchovy	60	1.3
	BI-FT-05a	Bay anchovy	65	0.5
	BI-FT-05a	Bay anchovy	44	0.3
	BI-FT-05a	Bay anchovy	52	0.9
	BI-FT-05a	Bay anchovy	52	0.8
	BI-FT-05a	Bay anchovy	55	1
	BI-FT-05a	Bay anchovy	54	0.8
	BI-FT-05a	Bay anchovy	68	1.8
	BI-FT-05a	Bay anchovy	57	0.9
	BI-FT-05a	Bay anchovy	58	1
	BI-FT-05a	Bay anchovy	63	1.6
	BI-FT-05a	Bay anchovy	54	0.8
	BI-FT-05a	Bay anchovy	50	0.4
	BI-FT-05a	Bay anchovy	56	1
	BI-FT-05a	Bay anchovy	51	0.6
	BI-FT-05a	Bay anchovy	56	1
	BI-FT-05a	Bay anchovy	60	1.2
	BI-FT-05a	Bay anchovy	45	0.5
	BI-FT-05a	Bay anchovy	51	0.7
	BI-FT-05a	Bay anchovy	60	1
	BI-FT-05a	Bay anchovy	63	1.4
	BI-FT-05a	Bay anchovy	57	0.9
	BI-FT-05a	Bay anchovy	44	0.4
	BI-FT-06a	Spotted hake	151	31.3
	BI-FT-06a	Spot	152	39.4

Table B-3

Barren Island Bottom Trawl Collection Results – All Seasons

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Spring (continued)	BI-FT-06a	Spot	164	56.4
	BI-FT-06a	Spot	147	38.2
	BI-FT-06a	Spot	153	37.8
	BI-FT-06a	Spot	155	43.6
	BI-FT-06a	Spot	149	37.3
	BI-FT-06a	Spot	152	65
	BI-FT-06a	Spot	165	57.5
	BI-FT-06a	Spot	144	39
	BI-FT-06a	Spot	155	48.8
	BI-FT-06a	Spot	158	46.9
	BI-FT-06a	Spot	159	46
	BI-FT-06a	Spot	140	32.8
	BI-FT-06a	Spot	149	39.5
	BI-FT-06a	Spot	134	26.1
	BI-FT-06a	Spot	153	45.2
	BI-FT-06a	Spot	140	32.9
	BI-FT-06a	Spot	145	36.8
	BI-FT-06a	Spot	155	42.4
	BI-FT-06a	Spot	144	36.2
	BI-FT-06a	Spot	128	25
	BI-FT-06a	Spot	151	42.4
	BI-FT-06a	Spot	150	42.1
	BI-FT-06a	Butterfish	90	10.7
	BI-FT-06a	Bay anchovy	64	1.7
	BI-FT-06a	Bay anchovy	56	0.9
	BI-FT-06a	Bay anchovy	63	1.6
	BI-FT-06a	Bay anchovy	58	1.3
	BI-FT-06a	Bay anchovy	54	0.8
	BI-FT-06a	Bay anchovy	52	0.9
	BI-FT-06a	Blue crab	150	146.1
	BI-FT-06b	Spot	147	38.9
	BI-FT-06b	Spot	167	57
	BI-FT-06b	Spot	180	83.6
	BI-FT-06b	Spot	142	34.2
	BI-FT-06b	Spot	161	51.8
	BI-FT-06b	Spot	38	0.5
	BI-FT-06b	Bay anchovy	65	1.9
	BI-FT-06b	Bay anchovy	70	2

Table B-3
Barren Island Bottom Trawl Collection Results – All Seasons

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Spring (continued)	BI-FT-06b	Bay anchovy	50	0.5
	BI-FT-06b	Bay anchovy	62	1.3
	BI-FT-06b	Bay anchovy	56	0.8
	BI-FT-06b	Bay anchovy	62	0.7
	BI-FT-06b	Bay anchovy	48	0.6

Notes:

a. Weight was measured during the spring sampling event only.

g: gram

mm: millimeter

Table B-4
Barren Island Pop Net Collection Results – Summer and Spring

Season	Sample ID	Species	Length (mm)	Weight^{a} (g)
Summer	BI-PN-01a	Bay anchovy	50	
	BI-PN-01a	Bay anchovy	53	
	BI-PN-01a	Bay anchovy	50	
	BI-PN-01a	Bay anchovy	52	
	BI-PN-01a	Bay anchovy	51	
	BI-PN-01a	Bay anchovy	56	
	BI-PN-01a	Bay anchovy	45	
	BI-PN-01a	Bay anchovy	48	
	BI-PN-01a	Bay anchovy	53	
	BI-PN-01a	Bay anchovy	52	
	BI-PN-01a	Bay anchovy	48	
	BI-PN-01a	Bay anchovy	50	
	BI-PN-01a	Bay anchovy	45	
	BI-PN-01a	Bay anchovy	42	
	BI-PN-01a	Bay anchovy	49	
	BI-PN-01a	Bay anchovy	47	
	BI-PN-01a	Bay anchovy	50	
	BI-PN-01a	Bay anchovy	47	
	BI-PN-01a	Bay anchovy	46	
	BI-PN-01a	Bay anchovy	34	
	BI-PN-01a	Bay anchovy	42	
	BI-PN-01a	Bay anchovy	50	
	BI-PN-01a	Bay anchovy	48	
	BI-PN-01a	Bay anchovy	43	
	BI-PN-01a	Bay anchovy	44	
	BI-PN-01a	Bay anchovy	49	
	BI-PN-01a	Bay anchovy	50	
	BI-PN-01a	Bay anchovy	44	
	BI-PN-01a	Bay anchovy	51	
	BI-PN-01a	Bay anchovy	45	
	BI-PN-01a	Bay anchovy	45	
	BI-PN-01a	Bay anchovy	47	
	BI-PN-01a	Bay anchovy	52	
	BI-PN-01a	Bay anchovy	49	
	BI-PN-01a	Bay anchovy	42	
	BI-PN-01a	Bay anchovy	48	
	BI-PN-01a	Bay anchovy	48	
	BI-PN-01a	Bay anchovy	50	
	BI-PN-01a	Bay anchovy	47	
	BI-PN-01a	Bay anchovy	52	
	BI-PN-01a	Bay anchovy	48	
	BI-PN-01a	Bay anchovy	50	
	BI-PN-01a	Bay anchovy	53	
	BI-PN-01a	Bay anchovy	46	

Table B-4
Barren Island Pop Net Collection Results – Summer and Spring

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Summer (continued)	BI-PN-01a	Bay anchovy	52	
	BI-PN-01a	Bay anchovy	51	
	BI-PN-01a	Bay anchovy	48	
	BI-PN-01a	Bay anchovy	49	
	BI-PN-01a	Bay anchovy	47	
	BI-PN-01a	Bay anchovy	55	
	BI-PN-01b	Bay anchovy	54	
	BI-PN-01b	Bay anchovy	52	
	BI-PN-01b	Bay anchovy	35	
	BI-PN-01b	Bay anchovy	55	
	BI-PN-01b	Bay anchovy	48	
	BI-PN-01b	Bay anchovy	46	
	BI-PN-01b	Bay anchovy	55	
	BI-PN-01b	Bay anchovy	57	
	BI-PN-01b	Bay anchovy	48	
	BI-PN-01b	Bay anchovy	55	
	BI-PN-01b	Bay anchovy	47	
	BI-PN-01b	Bay anchovy	57	
	BI-PN-01b	Bay anchovy	53	
	BI-PN-01b	Bay anchovy	53	
	BI-PN-01b	Bay anchovy	51	
	BI-PN-01b	Bay anchovy	52	
	BI-PN-01b	Bay anchovy	48	
	BI-PN-01b	Bay anchovy	50	
	BI-PN-01b	Bay anchovy	55	
	BI-PN-01b	Bay anchovy	54	
	BI-PN-01b	Bay anchovy	42	
	BI-PN-01b	Bay anchovy	49	
	BI-PN-01b	Bay anchovy	45	
	BI-PN-01b	Bay anchovy	48	
	BI-PN-01b	Bay anchovy	47	
	BI-PN-01b	Bay anchovy	50	
	BI-PN-01b	Bay anchovy	48	
	BI-PN-01b	Bay anchovy	43	
	BI-PN-01b	Bay anchovy	42	
	BI-PN-01b	Bay anchovy	52	
	BI-PN-01b	Bay anchovy	46	
	BI-PN-01b	Bay anchovy	45	
	BI-PN-01b	Bay anchovy	48	
	BI-PN-01b	Bay anchovy	45	
	BI-PN-01b	Bay anchovy	52	
	BI-PN-01b	Bay anchovy	49	
	BI-PN-01b	Bay anchovy	47	
	BI-PN-01b	Bay anchovy	40	

Table B-4
Barren Island Pop Net Collection Results – Summer and Spring

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Summer (continued)	BI-PN-01b	Bay anchovy	42	
	BI-PN-01b	Bay anchovy	50	
	BI-PN-01b	Bay anchovy	48	
	BI-PN-01b	Bay anchovy	45	
	BI-PN-01b	Bay anchovy	49	
	BI-PN-01b	Bay anchovy	49	
	BI-PN-01b	Bay anchovy	44	
	BI-PN-01b	Bay anchovy	43	
	BI-PN-01b	Bay anchovy	50	
	BI-PN-01b	Bay anchovy	50	
	BI-PN-01b	Bay anchovy	47	
	BI-PN-01b	Blue crab	62	
	BI-PN-02a	Bay anchovy	29	
	BI-PN-02a	Bay anchovy	30	
	BI-PN-02b	Bay anchovy	40	
	BI-PN-02b	Bay anchovy	25	
	BI-PN-02b	Bay anchovy	27	
	BI-PN-02b	Atlantic silverside	25	
	BI-PN-02b	Bay anchovy	28	
	BI-PN-02b	Bay anchovy	22	
	BI-PN-02b	Bay anchovy	27	
	BI-PN-03a	Bay anchovy	50	
	BI-PN-03a	Bay anchovy	47	
	BI-PN-03a	Bay anchovy	44	
	BI-PN-03a	Bay anchovy	31	
	BI-PN-03a	Bay anchovy	30	
	BI-PN-03a	Bay anchovy	35	
	BI-PN-03a	Bay anchovy	35	
	BI-PN-03a	Bay anchovy	42	
	BI-PN-03b	Bay anchovy	43	
	BI-PN-03b	Bay anchovy	30	
	BI-PN-03b	Bay anchovy	39	
	BI-PN-03b	Bay anchovy	46	
	BI-PN-03b	Bay anchovy	42	
	BI-PN-03b	Atlantic silverside	66	
	BI-PN-03b	Bay anchovy	40	
	BI-PN-03b	Bay anchovy	36	
	BI-PN-03b	Bay anchovy	22	
	BI-PN-03b	Bay anchovy	37	
	BI-PN-03b	Bay anchovy	40	
	BI-PN-03b	Blue crab	22	
	BI-PN-04a	Bay anchovy	47	
	BI-PN-04a	Blue crab	10	
	BI-PN-04a	Bay anchovy	48	

Table B-4
Barren Island Pop Net Collection Results – Summer and Spring

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Summer (continued)	BI-PN-04a	Bay anchovy	52	
	BI-PN-04a	Blue crab	8	
	BI-PN-04a	Bay anchovy	52	
	BI-PN-04b	Bay anchovy	50	
	BI-PN-04b	Atlantic silverside	75	
	BI-PN-04b	Bay anchovy	57	
	BI-PN-04b	Bay anchovy	57	
	BI-PN-04b	Bay anchovy	55	
	BI-PN-04b	Atlantic silverside	66	
	BI-PN-04b	Bay anchovy	52	
	BI-PN-04b	Bay anchovy	49	
	BI-PN-04b	Bay anchovy	48	
	BI-PN-04b	Bay anchovy	45	
	BI-PN-04b	Bay anchovy	48	
	BI-PN-04b	Bay anchovy	46	
	BI-PN-04b	Bay anchovy	42	
	BI-PN-04b	Bay anchovy	59	
	BI-PN-04b	Bay anchovy	50	
	BI-PN-04b	Bay anchovy	51	
	BI-PN-04b	Bay anchovy	56	
	BI-PN-04b	Bay anchovy	46	
	BI-PN-04b	Bay anchovy	49	
	BI-PN-04b	Bay anchovy	50	
	BI-PN-04b	Bay anchovy	53	
	BI-PN-04b	Atlantic silverside	78	
	BI-PN-04b	Bay anchovy	45	
	BI-PN-04b	Bay anchovy	40	
	BI-PN-04b	Bay anchovy	55	
	BI-PN-04b	Atlantic silverside	67	
	BI-PN-04b	Bay anchovy	30	
	BI-PN-04b	Bay anchovy	47	
	BI-PN-04b	Atlantic silverside	79	
	BI-PN-04b	Atlantic silverside	75	
	BI-PN-04b	Bay anchovy	50	
	BI-PN-04b	Atlantic silverside	78	
	BI-PN-04b	Bay anchovy	53	
	BI-PN-04b	Blue crab	15	
	BI-PN-04b	Blue crab	5	
	BI-PN-04b	Bay anchovy	40	

Table B-4
Barren Island Pop Net Collection Results – Summer and Spring

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Spring	BI-PN-01a	Spot	23	0.2
	BI-PN-01a	Spot	27	0.2
	BI-PN-01a	Spot	22	0.1
	BI-PN-01a	Spot	22	0.1
	BI-PN-01a	Spot	23	0.1
	BI-PN-01a	Spot	25	0.2
	BI-PN-01a	Spot	25	0.2
	BI-PN-01a	Spot	30	0.3

Notes:

a. Weight was measured during the spring sampling event only.

g: gram

mm: millimeter

Appendix C

James Island Benthic Community Replicate Sample Results

Table C-1a
James Island Summer Benthic Community Counts and Biomass – JI-BC-01

Species List	JI-BC-01 Abundance			JI-BC-01 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Stylochus ellipticus		1			0.00010	
Carinoma tremaphoros		1			0.00010	
Fragilonemertes rosea	3	2	6	0.00100	0.00350	0.00500
Hypereteone heteropoda	2	2		0.00005	0.00005	
Alitta succinea	20	22	2	0.00120	0.00260	0.00010
Glycinde multidens	1	1	7	0.00030	0.00005	0.00040
Streblospio benedicti	17	24	26	0.00040	0.00090	0.00120
Heteromastus filiformis	19	29	20	0.00510	0.00390	0.00530
Mediomastus ambiseta	3	2	3	0.00005	0.00005	0.00020
Pectinaria gouldii		1			0.00010	
Acteocina canaliculata			1			0.00010
Mulinia lateralis	3	3		0.00005	0.00730	
Ameritella mitchelli	27	31	18	0.00080	0.01070	0.00040
Tagelus plebeius	4	7	3	0.00010	0.00010	0.00005
Gemma gemma	7	17	9	0.00050	0.00190	0.00200
Americamysis almyra	1			0.00005		
Cyclaspis varians		1			0.00010	
Apocorophium lacustre	1			0.00005		

Notes:

AFDW: ash free dry weight

g: gram

Table C-1b
James Island Summer Benthic Community Counts and Biomass – JI-BC-02

Species List	JI-BC-02 Abundance			JI-BC-02 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Carinoma tremaphoros	1			0.00005		
Fragilonemertes rosea	1	1	1	0.00170	0.00070	0.00090
Hypereteone heteropoda	1		2	0.00020		0.00010
Alitta succinea	8	1	4	0.00160	0.00010	0.00190
Glycinde multidens	3	1		0.00020	0.00060	
Marenzelleria viridis	1	5	1	0.00140	0.00330	0.00100
Streblospio benedicti	18	10	10	0.00100	0.00030	0.00050
Heteromastus filiformis	2	10	8	0.00010	0.00160	0.00040
Mediomastus ambiseta		1			0.00020	
Tubificoides spp.			1			0.00010
Mulinia lateralis	15	10	6	0.00150	0.00670	0.00820
Ameritella mitchelli	14	8	6	0.00590	0.00490	0.00840
Tagelus plebeius	2	3	1	0.00060	0.00010	0.00060
Gemma gemma	4	2		0.00010	0.00005	
Americamysis almyra	2	1		0.00020	0.00020	
Cyathura polita		1			0.00030	
Lepidactylus dytiscus	1	2	1	0.00020	0.00070	0.00040
Ameroculodes spp. complex	1			0.00010		

Notes:

AFDW: ash free dry weight

g: gram

Table C-1c
James Island Summer Benthic Community Counts and Biomass – JI-BC-03

	JI-BC-03 Abundance			JI-BC-03 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Fragilonemertes rosea	2	1	2	0.00250	0.00020	0.00940
Alitta succinea	15	13	6	0.00340	0.00190	0.00150
Glycinde multidens	1	2	1	0.00020	0.00050	0.00020
Marenzelleria viridis	1	1		0.00140	0.00120	
Streblospio benedicti	43	28	8	0.00230	0.00170	0.00050
Heteromastus filiformis	31	25	17	0.00590	0.00510	0.00880
Mediomastus ambiseta	2			0.00005		
Tubificoides spp.	1	2	2	0.00005	0.00020	0.00050
Mulinia lateralis	20	21	6	0.01970	0.00090	0.00030
Ameritella mitchelli	36	34	13	0.00100	0.00140	0.00060
Tagelus plebeius	5	8		0.00020	0.00010	
Gemma gemma	27	46	20	0.00780	0.00380	0.00150
Americamysis almyra	1	1	2	0.00040	0.00020	0.00050
Cyathura polita	1		1	0.00030		0.00050
Lepidactylus dytiscus	1			0.0003		

Notes:

AFDW: ash free dry weight

g: gram

Table C-1d
James Island Summer Benthic Community Counts and Biomass – JI-BC-04

Species List	JI-BC-04 Abundance			JI-BC-04 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Fragilonemertes rosea	7	7	8	0.01110	0.00450	0.01160
Hypereteone heteropoda	3	2	1	0.00030	0.00010	0.00030
Hypereteone foliosa	1			0.00040		
Alitta succinea	27	24	7	0.00340	0.00270	0.00090
Glycinde multidens	2	3	1	0.00080	0.00090	0.00040
Paraonis fulgens	1			0.00010		
Streblospio benedicti	105	65	24	0.00440	0.00330	0.00100
Heteromastus filiformis	68	61	24	0.00680	0.01620	0.00420
Mediomastus ambiseta		1			0.00010	
Acteocina canaliculata		1			0.00010	
Parvilucina crenella		1			0.00010	
Mulinia lateralis	4	8	6	0.00680	0.02060	0.01170
Ameritella mitchelli	29	62	44	0.00110	0.00130	0.00120
Tagelus plebeius	30	54	21	0.00040	0.00070	0.00060
Gemma gemma	80	68	109	0.00910	0.01790	0.00500
Americamysis almyra		2	1		0.00100	0.00050
Cyclaspis varians	1		2	0.00005		0.00030
Cyathura polita	4	4		0.00080	0.00160	
Phoronis psammophila		1			0.00040	

Notes:

AFDW: ash free dry weight

g: gram

Table C-1e
James Island Summer Benthic Community Counts and Biomass – JI-BC-05

	JI-BC-05 Abundance			JI-BC-05 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Fragilonemertes rosea	2	2	4	0.00220	0.00330	0.00290
Hypereteone heteropoda	2	2		0.00030	0.00030	
Alitta succinea	9	4	1	0.00180	0.00090	0.00030
Glycinde multidens		1			0.00010	
Marenzelleria viridis		1			0.00160	
Streblospio benedicti	23	22	15	0.00110	0.00120	0.00050
Heteromastus filiformis	42	54	10	0.00380	0.01120	0.00050
Mulinia lateralis	18	14	6	0.00470	0.00450	0.00350
Ameritella mitchelli	14	14	3	0.00060	0.00150	0.00010
Tagelus plebeius	7	10	1	0.00030	0.00020	0.00005
Gemma gemma	112	96	33	0.01070	0.01140	0.00080
Americamysis almyra		1	1		0.00060	0.00005
Cyathura polita			2			0.00090

Notes:

AFDW: ash free dry weight

g: gram

Table C-1f
James Island Summer Benthic Community Counts and Biomass – JI-BC-06

Species List	JI-BC-06 Abundance			JI-BC-06 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Fragilonemertes rosea	2	2		0.00110	0.00170	
Alitta succinea	5	4	4	0.00190	0.00190	0.00010
Glycinde multidens	3	5		0.00040	0.00060	
Streblospio benedicti	24	30	12	0.00140	0.00190	0.00040
Heteromastus filiformis	15	27	7	0.00310	0.01220	0.00150
Mediomastus ambiseta	1			0.00010		
Tubificoides spp.		1			0.00005	
Acteocina canaliculata		1			0.00005	
Mulinia lateralis	19	7	9	0.00970	0.00120	0.00040
Ameritella mitchelli	15	19	8	0.00030	0.00340	0.00020
Tagelus plebeius	1	2		0.00005	0.00010	
Gemma gemma	143	106	121	0.01410	0.01360	0.01280
Americamysis almyra	2			0.00020		
Cyclaspis varians		1			0.00020	
Edotia triloba	2			0.00030		

Notes:

AFDW: ash free dry weight

g: gram

Table C-1g

James Island Summer Benthic Community Counts and Biomass – JI-BC-07

Species List	JI-BC-07 Abundance			JI-BC-07 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Fragilonemertes rosea			1			0.00370
Hypereteone heteropoda	1	1		0.00020	0.00020	
Alitta succinea			2			0.00005
Glycinde multidens		1			0.00010	
Streblospio benedicti	16	43	26	0.00060	0.00190	0.00100
Heteromastus filiformis	6	8	5	0.00070	0.00210	0.00020
Mediomastus ambiseta			2			0.00010
Tubificoides spp.		1			0.00005	
Mulinia lateralis	4	3		0.00440	0.00110	
Ameritella mitchelli	11	18	11	0.00140	0.00200	0.00050
Gemma gemma	3	10	3	0.00020	0.00060	0.00005
Americamysis almyra		1	1		0.00005	0.00040
Ameroculodes spp. complex	1			0.00005		

Notes:

AFDW: ash free dry weight

g: gram

Table C-1h
James Island Summer Benthic Community Counts and Biomass – JI-BC-08

Species List	JI-BC-08 Abundance			JI-BC-08 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Fragilonemertes rosea		1			0.00060	
Hypereteone heteropoda	1	1	1	0.00010	0.00005	0.00010
Alitta succinea	1	8	6	0.00005	0.00200	0.00050
Glycinde multidens		1	1		0.00010	0.00010
Polydora cornuta		1			0.00020	
Streblospio benedicti	49	37	41	0.00190	0.00180	0.00190
Heteromastus filiformis	11	10	6	0.00230	0.00190	0.00120
Mediomastus ambiseta	2	2	1	0.00010	0.00010	0.00005
Tubificoides spp.		1	4		0.00005	0.00020
Mulinia lateralis	3	5	5	0.00030	0.00390	0.01250
Ameritella mitchelli	13	17	11	0.00320	0.00130	0.00030
Gemma gemma	17	46	29	0.00040	0.00240	0.00160

Notes:

AFDW: ash free dry weight

g: gram

Table C-1i
James Island Summer Benthic Community Counts and Biomass – JI-BC-09

Species List	JI-BC-09 Abundance			JI-BC-09 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Carinoma tremaphoros	1		1	0.00020		0.00060
Fragilonemertes rosea	3	3		0.01010	0.00300	
Hypereteone heteropoda			1			0.00040
Alitta succinea	6	23	33	0.00690	0.02780	0.03370
Marenzelleria viridis	1		3	0.00250		0.00950
Streblospio benedicti	18	32	53	0.00110	0.00230	0.00280
Heteromastus filiformis	14	9	14	0.00730	0.00350	0.01020
Tubificoides spp.		1	1		0.00010	0.00020
Mulinia lateralis	3	4	7	0.00040	0.00170	0.01730
Ameritella mitchelli	13	13	8	0.00110	0.00120	0.00080
Tagelus plebeius	2	4	2	0.00120	0.00180	0.00080
Gemma gemma	8	3	1	0.00200	0.00160	0.00030
Americamysis almyra	3			0.00030		
Cyathura polita	2		1	0.00060		0.00030
Edotia triloba	1	1		0.00020	0.00030	

Notes:

AFDW: ash free dry weight

g: gram

Table C-1j

James Island Summer Benthic Community Counts and Biomass – JI-BC-10

Species List	JI-BC-10 Abundance			JI-BC-10 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Edwardsia elegans	1			0.00005		
Carinoma tremaphoros			1			0.00070
Fragilonemertes rosea	1		frag.	0.00110		0.00080
Amphiporus ochraceus	1			0.00030		
Hypereteone heteropoda			1			0.00040
Alitta succinea	76	20	4	0.04450	0.01000	0.00190
Glycinde multidens	1		2	0.00060		0.00010
Leitoscoloplos fragilis			1			0.00005
Boccardiella ligerica	2			0.00030		
Polydora cornuta	20	6	1	0.00070	0.00030	0.00005
Marenzelleria viridis	1	1		0.00100	0.00120	
Streblospio benedicti	12	22	6	0.00040	0.00070	0.00040
Heteromastus filiformis	5	8	2	0.00120	0.00120	0.00040
Mediomastus ambiseta	1			0.00020		
Tubificoides spp.	1			0.00010		
Geukensia demissa	1	1		0.00005	0.00005	
Mulinia lateralis	14	18	36	0.00660	0.01380	0.00170
Ameritella mitchelli	13	26	37	0.00090	0.00210	0.00690
Tagelus plebeius	2	7	9	0.00010	0.00030	0.00020
Gemma gemma	7	19	10	0.00020	0.00060	0.00020
Petricolaria pholadiformis	3			0.00070		
Amphibalanus improvisus	2			0.00010		
Americamysis almyra	1	2		0.00005	0.00020	
Cyclaspis varians		1	1		0.00005	0.00005
Edotia triloba	1			0.00005		
Melita nitida		1			0.00005	
Lepidactylus dytiscus			1			0.00040
Ameroculodes spp. complex			1			0.00010

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table C-1k

James Island Summer Benthic Community Counts and Biomass – JI-BC-REF

Species List	JI-BC-REF Abundance			JI-BC-REF Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Fragilonemertes rosea	2	2	1	0.00560	0.00560	0.00240
Hypereteone heteropoda	2			0.00010		
Hypereteone foliosa	1			0.00010		
Alitta succinea	3	1	1	0.00310	0.00020	0.00030
Glycinde multidens		1	2		0.00070	0.00005
Marenzelleria viridis	1	1		0.00110	0.00060	
Streblospio benedicti	25	30	12	0.00080	0.00170	0.00060
Heteromastus filiformis	22	17	7	0.00730	0.00650	0.00200
Mediomastus ambiseta	1	1		0.00005	0.00010	
Tubificoides spp.		1			0.00005	
Eulimastoma engonium	1			0.00005		
Acteocina canaliculata	1			0.00005		
Mulinia lateralis	11	20	7	0.00050	0.00170	0.00050
Ameritella mitchelli	23	28	8	0.00710	0.00250	0.00280
Tagelus plebeius	3	1	3	0.00005	0.00005	0.00020
Gemma gemma	7	10	4	0.00130	0.00080	0.00030
Americamysis almyra		3			0.00050	
Cyathura polita	1			0.00040		
Lepidactylus dytiscus	2			0.00050		

Notes:

AFDW: ash free dry weight

g: gram

Table C-2a
James Island Fall Benthic Community Counts and Biomass – JI-BC-01

Species List	JI-BC-01 Abundance			JI-BC-01 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Stylochus ellipticus		2			0.00010	
Carinoma tremaphoros	2	1		0.00060	0.00010	
Fragilonemertes rosea	3	9	7	0.00830	0.01660	0.01160
Amphiporus bioculatus		5	3		0.00150	0.00180
Hypereteone heteropoda	1	4		0.00010	0.00020	
Alitta succinea	6	4	5	0.00160	0.00130	0.00360
Glycinde multidens	15	12	14	0.00170	0.00180	0.00220
Leitoscoloplos fragilis	3	1	1	0.00770	0.00030	0.00010
Streblospio benedicti	22	19	23	0.00100	0.00100	0.00130
Spiochaetopterus oculatus			1			0.00005
Heteromastus filiformis	60	53	52	0.01390	0.00890	0.00610
Mediomastus ambiseta	6	4		0.00020	0.00010	
Acteocina canaliculata		2			0.00005	
Haminella solitaria		1			0.00010	
Mulinia lateralis	frag.	1	2	0.00830	0.02890	0.06850
Ameritella mitchelli	48	42	36	0.00040	0.00040	0.00070
Tagelus plebeius	61	40	28	0.00080	0.00020	0.00030
Gemma gemma	4	8	8	0.00850	0.00010	0.00010
Cyclaspis varians		1			0.00005	
Cyathura polita	1		1	0.00030		0.00050
Edotia triloba		1			0.00005	
Apocorophium lacustre		1			0.00005	
Ameroculodes spp. complex		1	1		0.00005	0.00040

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table C-2b

James Island Fall Benthic Community Counts and Biomass – JI-BC-02

Species List	JI-BC-02 Abundance			JI-BC-02 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Carinoma tremaphoros		2			0.00120	
Fragilonemertes rosea	6	4	2	0.02100	0.01550	0.00340
Hypereteone heteropoda		1			0.00005	
Hypereteone foliosa	1	1		0.00020	0.00040	
Alitta succinea	3		2	0.00080		0.00100
Glycinde multidens	10	2	7	0.00110	0.00010	0.00070
Leitoscoloplos fragilis		1	1		0.00010	0.00005
Marenzelleria viridis			1			0.00180
Streblospio benedicti	8	8	7	0.00050	0.00040	0.00050
Heteromastus filiformis	13	24	17	0.00360	0.00510	0.00470
Acteocina canaliculata	1			0.00010		
Haminella solitaria	1			0.00005		
Mulinia lateralis	2	7	3	0.00040	0.00100	0.01530
Ameritella mitchelli	88	60	45	0.00220	0.00100	0.00390
Tagelus plebeius	61	24	48	0.00100	0.00030	0.00060
Gemma gemma	17		3	0.00360		0.00110
Americamysis almyra	3	2		0.00140	0.00090	
Cyclaspis varians	1			0.00040		
Edotia triloba			1			0.00005
Lepidactylus dytiscus		1			0.00050	
Ameroculodes spp. complex	2			0.00030		

Notes:

AFDW: ash free dry weight

g: gram

Table C-2c
James Island Fall Benthic Community Counts and Biomass – JI-BC-03

	JI-BC-03 Abundance			JI-BC-03 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Stylochus ellipticus	1	1	2	0.00050	0.00050	0.00040
Carinoma tremaphoros	3	3	5	0.00090	0.00020	0.00005
Fragilonemertes rosea	4	4	3	0.01610	0.00790	0.00280
Amphiporus bioculatus	2		1	0.00010		0.00005
Hypereteone heteropoda	1		4	0.00005		0.00010
Alitta succinea	2	6	9	0.01420	0.01110	0.00510
Glycinde multidens	9	4	8	0.00040	0.00030	0.00060
Leitoscoloplos fragilis	2	1	7	0.00950	0.00090	0.00060
Marenzelleria viridis	1			0.00270		
Streblospio benedicti		2	4		0.00010	0.00020
Heteromastus filiformis	61	34	43	0.00810	0.00520	0.00700
Mediomastus ambiseta	1		2	0.00010		0.00010
Tubificoides spp.	10	4		0.00020	0.00005	
Haminella solitaria			1			0.00010
Mulinia lateralis	1	1	5	0.00005	0.01880	0.05090
Ameritella mitchelli	74	48	99	0.00120	0.00090	0.00180
Tagelus plebeius	77	59	149	0.00120	0.00100	0.00240
Gemma gemma	36	18	106	0.00040	0.00010	0.00140
Mya arenaria			1			0.00010
Edotia triloba			1			0.00010
Lepidactylus dytiscus			1			0.00040
Ameroculodes spp. complex	1		1	0.00040		0.00040

Notes:

AFDW: ash free dry weight

g: gram

Table C-2d

James Island Fall Benthic Community Counts and Biomass – JI-BC-04

Species List	JI-BC-04 Abundance			JI-BC-04 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Stylochus ellipticus	8	3	2	0.00140	0.00040	0.00020
Carinoma tremaphoros	3	4	2	0.00010	0.00010	0.00010
Fragilonemertes rosea	6	7	4	0.01000	0.00570	0.00300
Alitta succinea	7	4	7	0.00270	0.00260	0.00150
Glycinde multidens	14	4	7	0.00130	0.00040	0.00030
Leitoscoloplos fragilis		1			0.00020	
Paraonis fulgens	1	1		0.00010	0.00020	
Paraprionospio alata		1			0.00160	
Streblospio benedicti		2	1		0.00020	0.00010
Heteromastus filiformis	36	30	33	0.00770	0.00560	0.00580
Mediomastus ambiseta	2		1	0.00020		0.00005
Acteocina canaliculata		1	1		0.00005	0.00030
Mulinia lateralis	1	1	3	0.03620	0.00005	0.00010
Ameritella mitchelli	83	67	93	0.00120	0.00090	0.00240
Tagelus plebeius	63	60	86	0.00130	0.00110	0.00170
Gemma gemma	16	19	27	0.00280	0.00030	0.00030
Cyclaspis varians	2	2		0.00010	0.00005	
Cyathura polita	1	1		0.00040	0.00080	
Ameroculodes spp. complex	4		1	0.00050		0.00005
Phoronis psammophila	2		3	0.00010		0.00040
Ascidiacea sp.		2	2		0.00010	0.00010

Notes:

AFDW: ash free dry weight

g: gram

Table C-2e
James Island Fall Benthic Community Counts and Biomass – JI-BC-05

Species List	JI-BC-05 Abundance			JI-BC-05 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Stylochus ellipticus	5	4	5	0.00110	0.00150	0.00100
Carinoma tremaphoros	2		1	0.00010		0.00040
Fragilonemertes rosea	2	7	3	0.00330	0.01600	0.00360
Amphiporus bioculatus	3	3		0.00030	0.00070	
Hypereteone heteropoda	1			0.00005		
Hypereteone foliosa	2	2	3	0.00020	0.00020	0.00020
Alitta succinea	4		3	0.00040		0.00130
Glycinde multidens	13	3	8	0.00090	0.00040	0.00070
Leitoscoloplos fragilis	4		3	0.00020		0.00010
Streblospio benedicti	3	4	1	0.00010	0.00010	0.00005
Heteromastus filiformis	33	22	26	0.00510	0.00290	0.00440
Tubificoides spp.		1			0.00005	
Acteocina canaliculata			1			0.00010
Mulinia lateralis	1	3	2	0.00005	0.01610	0.03030
Ameritella mitchelli	72	83	77	0.00120	0.00390	0.00090
Tagelus plebeius	136	117	119	0.00260	0.00250	0.00230
Gemma gemma	87	59	90	0.00160	0.00080	0.00130
Mya arenaria		1			0.00005	
Cyclaspis varians		2			0.00010	
Cyathura polita	2	1	1	0.00130	0.00040	0.00040
Ameroculodes spp. complex	7	4	6	0.00130	0.00070	0.00140

Notes:

AFDW: ash free dry weight

g: gram

Table C-2f
James Island Fall Benthic Community Counts and Biomass – JI-BC-06

	JI-BC-06 Abundance			JI-BC-06 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Stylochus ellipticus		4	2		0.00080	0.00030
Carinoma tremaphoros	1		2	0.00010		0.00010
Fragilonemertes rosea	6	2	7	0.01340	0.00440	0.01080
Hypereteone foliosa	2	1	2	0.00030	0.00020	0.00040
Alitta succinea	6	8	8	0.01090	0.00430	0.00880
Glycinde multidens	8	1	3	0.00060	0.00010	0.00050
Leitoscoloplos fragilis	2	3	2	0.00130	0.00570	0.00150
Streblospio benedicti	1	2	3	0.00005	0.00010	0.00010
Heteromastus filiformis	13	15	9	0.00350	0.00230	0.00150
Tubificoides spp.	2			0.00010		
Eulimastoma engonium			1			0.00005
Geukensia demissa			1			0.00010
Mulinia lateralis	2	4	3	0.01380	0.02830	0.00020
Ameritella mitchelli	69	88	111	0.00680	0.00280	0.01320
Limecola petalum	2			0.01420		
Tagelus plebeius	36	101	58	0.00070	0.00220	0.00130
Gemma gemma	500	1,693	1,387	0.02180	0.04230	0.07020
Mya arenaria	1	4	10	0.00005	0.00005	0.00030
Cyathura polita			1			0.00070
Edotia triloba			1			0.00005
Ameroculodes spp. complex	1	1	3	0.00040	0.00020	0.00020
Ascidiacea sp.	1		1	0.00005		0.00005

Notes:

AFDW: ash free dry weight

g: gram

Table C-2g
James Island Fall Benthic Community Counts and Biomass – JI-BC-07

	JI-BC-07 Abundance			JI-BC-07 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Carinoma tremaphoros	2		2	0.00080		0.00060
Fragilonemertes rosea		1	1		0.01910	0.00220
Hypereteone heteropoda	1	1	1	0.00005	0.00020	0.00010
Alitta succinea	2	1	2	0.00140	0.00150	0.00300
Glycinde multidens	17	14	10	0.00180	0.00270	0.00170
Leitoscoloplos fragilis	1	1		0.00005	0.00005	
Streblospio benedicti	3	7	8	0.00010	0.00040	0.00050
Heteromastus filiformis	19	11	2	0.00770	0.00640	0.00040
Pectinaria gouldii			1			0.00010
Acteocina canaliculata	1		1	0.00040		0.00010
Mulinia lateralis	1	2	2	0.01260	0.00005	0.01540
Ameritella mitchelli	23	16	27	0.00390	0.00850	0.00260
Tagelus plebeius	4	8	15	0.00010	0.00005	0.00030
Gemma gemma	4	2	34	0.00010	0.00005	0.00090
Mya arenaria			1			0.00005
Americamysis almyra			1			0.00020
Cyathura polita	1			0.00030		
Edotia triloba		1	1		0.00010	0.00005
Ameroculodes spp. complex			1			0.00010

Notes:

AFDW: ash free dry weight

g: gram

Table C-2h
James Island Fall Benthic Community Counts and Biomass – JI-BC-08

	JI-BC-08 Abundance			JI-BC-08 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Stylochus ellipticus	1		1	0.00005		0.00010
Carinoma tremaphoros	1	6	3	0.00005	0.00110	0.00080
Siphonenteron bicolour		1	2		0.00030	0.00130
Fragilonemertes rosea	3	2	4	0.03030	0.00050	0.04170
Hypereteone heteropoda		4			0.00020	
Alitta succinea	1	13	5	0.00260	0.01110	0.00220
Glycinde multidens	20	11	8	0.00200	0.00110	0.00110
Leitoscoloplos fragilis	3	1	3	0.00020	0.00010	0.00030
Marenzelleria viridis		1			0.00010	
Streblospio benedicti	14	19	18	0.00070	0.00080	0.00090
Heteromastus filiformis	59	39	25	0.00530	0.00460	0.00360
Tubificoides spp.		3			0.00005	
Acteocina canaliculata			1			0.00010
Geukensia demissa		1			0.00010	
Mulinia lateralis	1	3	3	0.00010	0.02130	0.02570
Ameritella mitchelli	89	126	121	0.00820	0.00290	0.00630
Tagelus plebeius	73	81	76	0.00100	0.00120	0.00100
Gemma gemma	300	474	395	0.00380	0.01570	0.00600
Mya arenaria	1			0.00010		
Cyclaspis varians		1			0.00005	
Edotia triloba	1	1	1	0.00005	0.00010	0.00005
Ameroculodes spp. complex		1			0.00010	

Notes:

AFDW: ash free dry weight

g: gram

Table C-2i

James Island Fall Benthic Community Counts and Biomass – JI-BC-09

Species List	JI-BC-09 Abundance			JI-BC-09 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Carinoma tremaphoros		1			0.00005	
Siphonenteron bicolour			1			0.00080
Fragilonemertes rosea		1	3		0.00110	0.00660
Amphiporus bioculatus	2	1		0.00030	0.00005	
Hypereteone foliosa		5			0.00060	
Alitta succinea	2	12	5	0.00380	0.00590	0.00780
Leitoscoloplos fragilis		1			0.00180	
Polydora cornuta		11			0.00020	
Polydora websteri		35			0.00120	
Marenzelleria viridis		1	1		0.00170	0.00370
Heteromastus filiformis	8	14	7	0.00190	0.00470	0.00350
Corambe obscura		2			0.00100	
Geukensia demissa		7			0.00200	
Mulinia lateralis	1		1	0.02500		0.00980
Ameritella mitchelli	50	48	69	0.01480	0.01250	0.01400
Tagelus plebeius	16	41	34	0.00020	0.00070	0.00060
Gemma gemma	25	131	47	0.00240	0.01060	0.00790
Amphibalanus improvisus		3			0.02720	
Americamysis almyra		1			0.00050	
Cyclaspis varians		1			0.00010	
Cyathura polita	1		1	0.00030		0.00060
Edotia triloba		1			0.00010	
Apocorophium lacustre		7			0.00020	
Melita nitida		1			0.00010	
Ameroculodes spp. complex	2	1		0.00070	0.00030	

Notes:

AFDW: ash free dry weight

g: gram

Table C-2j
James Island Fall Benthic Community Counts and Biomass – JI-BC-10

Species List	JI-BC-10 Abundance			JI-BC-10 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Diadumene leucolena	1		8	0.00380		0.01380
Stylochus ellipticus			1			0.00010
Carinoma tremaphoros			1			0.00010
Fragilonemertes rosea	3	1	1	0.00810	0.01420	0.01270
Amphiporus bioculatus			2			0.00010
Hypereteone heteropoda	1		3	0.00010		0.00010
Alitta succinea	3	16	150	0.00250	0.02650	0.14240
Glycinde multidens	6	1	2	0.00090	0.00010	0.00030
Leitoscoloplos fragilis			1			0.00050
Paraonis fulgens			1			0.00005
Polydora cornuta	3		10	0.00005		0.00040
Marenzelleria viridis	frag.	frag.	2	0.00010	0.00190	0.01080
Paraprionospio alata			1			0.00140
Streblospio benedicti	4	4	43	0.00010	0.00030	0.00120
Heteromastus filiformis	7	15	29	0.00070	0.00400	0.00370
Pectinaria gouldii			1			0.00010
Tubificoides spp.			2			0.00005
Gyroscala rupicola	2		1	0.00080		0.00010
Acteocina canaliculata	1			0.00010		
Geukensia demissa	2		8	0.00050		0.00280
Mulinia lateralis	2	1	2	0.00010	0.02240	0.05350
Ameritella mitchelli	81	45	88	0.00420	0.00670	0.00190
Tagelus plebeius	63	46	88	0.00110	0.00080	0.00140
Gemma gemma	53	52	91	0.00130	0.00270	0.00140
Petricolaria pholadiformis	1	2	13	0.00020	0.00010	0.01660
Mya arenaria	4	1	4	0.00010	0.00005	0.00010
Cyathura polita			2			0.00580
Paracerceis caudata		1			0.00010	
Edotia triloba	1		2	0.00005		0.00020
Apocorophium lacustre			2			0.00005
Ameroculodes spp. complex	3	3	1	0.00020	0.00020	0.00070

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Table C-2k
James Island Fall Benthic Community Counts and Biomass – JI-BC-REF

	JI-BC-REF Abundance			JI-BC-REF Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Stylochus ellipticus		2			0.00040	
Carinoma tremaphoros		2			0.00020	
Siphonenteron bicolour	1			0.00060		
Fragilonemertes rosea	6	2	3	0.01960	0.00580	0.00710
Hypereteone foliosa			1			0.00030
Alitta succinea	2		7	0.00110		0.00330
Glycinde multidens	23	25	22	0.00210	0.00250	0.00200
Leitoscoloplos fragilis	2		1	0.00420		0.00005
Streblospio benedicti	26	13	18	0.00120	0.00100	0.00090
Heteromastus filiformis	20	13	34	0.00420	0.00280	0.00610
Japonactaeon punctostriatus			1			0.00010
Acteocina canaliculata	1			0.00005		
Mulinia lateralis	1	4	2	0.00010	0.02540	0.00040
Ameritella mitchelli	55	49	57	0.00170	0.00200	0.00460
Tagelus plebeius	27	23	37	0.00030	0.00030	0.00040
Gemma gemma	2	6	4	0.00005	0.00160	0.00005
Americamysis almyra	1	2	1	0.00050	0.00080	0.00010
Cyathura polita		1			0.00030	
Lepidactylus dytiscus			1			0.00030
Ameroculodes spp. complex			1			0.00060

Notes:

AFDW: ash free dry weight

g: gram

Table C-3a
James Island Spring Benthic Community Counts and Biomass – JI-BC-01

	JI-BC-01 Abundance			**JI-BC-01 Biomass (g; AFDW)**		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Siphonenteron bicolour	2			0.00020		
Fragilonemertes rosea	8	5	3	0.02800	0.00140	0.00900
Hypereteone heteropoda	9	3		0.00005	0.00005	
Hypereteone foliosa		2	1		0.00150	0.00140
Leitoscoloplos fragilis	11			0.00060		
Polydora cornuta	1			0.00030		
Marenzelleria viridis	10	7	7	0.00470	0.00230	0.00340
Streblospio benedicti	23	12	15	0.00040	0.00020	0.00030
Heteromastus filiformis	73	25	19	0.00780	0.00320	0.00200
Tubificoides spp.	1	1		0.00005	0.00005	
Naididae sp.	1			0.00005		
Mulinia lateralis	40	13	16	0.00050	0.00110	0.00020
Ameritella mitchelli	5	12	1	0.00390	0.00570	0.00070
Tagelus plebeius	9	5	6	0.00080	0.00170	0.00210
Neomysis americana	frag.			0.00005		
Spilocuma watlingi	1		1	ND		ND
Edotia triloba	1	1		0.00010	0.00005	
Leptocheirus plumulosus	1			0.00060		
Gammarus mucronatus	1			0.00050		
Ameroculodes spp. complex	13	15	4	0.00080	0.00120	0.00080

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

ND: no data; Specimens were vouchered so there is no AFDW measurement.

Table C-3b
James Island Spring Benthic Community Counts and Biomass – JI-BC-02

Species List	JI-BC-02 Abundance			JI-BC-02 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Fragilonemertes rosea		2			0.00930	
Amphiporus bioculatus	1			0.00010		
Hypereteone heteropoda	1			0.00060		
Marenzelleria viridis	3	6	4	0.00150	0.00790	0.00120
Streblospio benedicti	1	1	1	0.00010	0.00300	0.00005
Heteromastus filiformis	7	3	9	0.00080	0.00030	0.00170
Mulinia lateralis	5	7	16	0.00005	0.00060	0.00080
Ameritella mitchelli	3		5	0.00140		0.00450
Tagelus plebeius			5			0.00190
Gemma gemma		1	2		0.00005	0.00040
Neomysis americana		1			0.00020	
Leptocheirus plumulosus	1		2	0.00005		0.00050
Lepidactylus dytiscus	6	1	4	0.00010	0.00010	0.00050
Ameroculodes spp. complex	15	2	2	0.00150	0.00040	0.00040

Notes:

AFDW: ash free dry weight

g: gram

Table C-3c
James Island Spring Benthic Community Counts and Biomass – JI-BC-03

Species List	JI-BC-03 Abundance			JI-BC-03 Biomass (g; AFDW)		
	Replicate A	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Stylochus ellipticus	1	1		0.00170	0.00150	
Carinoma tremaphoros	1	1	2	0.00010	0.00020	0.00050
Siphonenteron bicolour			1			0.00010
Fragilonemertes rosea	3	2	5	0.00240	0.00720	0.00320
Amphiporus bioculatus	3		3	0.00060		0.00100
Hypereteone heteropoda	4			0.00020		
Hypereteone foliosa	2	1	5	0.00110	0.00060	0.00170
Alitta succinea			1			0.00010
Glycinde multidens		1			0.00040	
Leitoscoloplos fragilis	16	9	16	0.00740	0.00050	0.00080
Marenzelleria viridis	11	12	6	0.00280	0.00400	0.00140
Streblospio benedicti	15	15	14	0.00030	0.00030	0.00020
Heteromastus filiformis	81	55	70	0.00540	0.00370	0.00710
Tubificoides spp.	1	1		0.00005	0.00020	
Mulinia lateralis	22	16	17	0.00040	0.00110	0.00010
Ameritella mitchelli	19	12	17	0.01920	0.01100	0.01450
Limecola petalum	1			0.00020		
Tagelus plebeius	33	16	25	0.01120	0.00500	0.01100
Gemma gemma	26	10	60	0.00180	0.00040	0.00300
Mya arenaria			1			0.00005
Neomysis americana		1			0.00005	
Spilocuma watlingi	3	2		ND	ND	
Chiridotea coeca		1			0.00100	
Edotia triloba		1			0.00010	
Lepidactylus dytiscus	2	2	1	0.00005	0.00030	0.00005
Ameroculodes spp. complex	13	21	12	0.00130	0.00220	0.00150

Notes:

AFDW: ash free dry weight

g: gram

ND: no data; Specimens were vouchered so there is no AFDW measurement.

Table C-3d
James Island Spring Benthic Community Counts and Biomass – JI-BC-04

Species List	JI-BC-04 Abundance			JI-BC-04 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Carinoma tremaphoros	3	2	1	0.00070	0.00070	0.00040
Fragilonemertes rosea	14	5	5	0.02340	0.00560	0.00450
Amphiporus bioculatus	2	2	3	0.00020	0.00090	0.00050
Hypereteone heteropoda	1	1	2	0.00005	0.00010	0.00040
Hypereteone foliosa	1	2		0.00050	0.00050	
Leitoscoloplos fragilis	5	7	5	0.00010	0.00410	0.00150
Paraonis fulgens	2	2		0.00005	0.00005	
Polydora cornuta		1			0.00005	
Marenzelleria viridis	18	22	9	0.00680	0.00650	0.00160
Streblospio benedicti	16	33	13	0.00010	0.00060	0.00010
Heteromastus filiformis	33	40	10	0.00650	0.00610	0.00220
Tubificoides spp.	1	1		0.00005	0.00005	
Naididae sp.		3			0.00005	
Sayella chesapeakea			1			0.00060
Mulinia lateralis	11	18	2	0.00010	0.00300	0.00010
Ameritella mitchelli	8	8	2	0.00690	0.00460	0.00030
Limecola petalum		1			0.00040	
Tagelus plebeius	19	32	12	0.00410	0.01160	0.00390
Gemma gemma	9	1	1	0.00050	0.00010	0.00020
Mya arenaria	1			0.00005		
Amphibalanus improvisus	1			0.00005		
Neomysis americana			1			0.00150
Spilocuma watlingi	2	2		ND	ND	
Cyathura polita			1			0.00160
Ameroculodes spp. complex	9	18	1	0.00050	0.00200	0.00020
Phoronis psammophila	3	1		0.00090	0.00040	

Notes:

AFDW: ash free dry weight

g: gram

ND: no data; Specimens were vouchered so there is no AFDW measurement.

Table C-3e
James Island Spring Benthic Community Counts and Biomass – JI-BC-05

	JI-BC-05 Abundance			JI-BC-05 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Stylochus ellipticus		1			0.00130	
Carinoma tremaphoros	1		1	0.00020		0.00020
Siphonenteron bicolour		1			0.00040	
Fragilonemertes rosea	6	9	8	0.00800	0.02070	0.01580
Amphiporus bioculatus	1	2	3	0.00060	0.00100	0.00070
Hypereteone heteropoda	1			0.00010		
Hypereteone foliosa	8	3	5	0.00140	0.00060	0.00070
Leitoscoloplos fragilis	1	6	2	0.00170	0.00050	0.00010
Marenzelleria viridis	15	14	14	0.00620	0.00520	0.00530
Streblospio benedicti	2	4		0.00010	0.00010	
Heteromastus filiformis	28	32	16	0.00410	0.00560	0.00280
Mulinia lateralis	36	25	8	0.00060	0.03890	0.00020
Ameritella mitchelli	3	2	2	0.00110	0.00010	0.00350
Tagelus plebeius	57	43	41	0.02140	0.01600	0.01460
Gemma gemma	36	22	15	0.00490	0.00220	0.00150
Neomysis americana		1			0.00060	
Spilocuma watlingi	2	5	4	ND	ND	ND
Ameroculodes spp. complex	17	16	6	0.00150	0.00170	0.00080
Phoronis psammophila			1			0.00030

Notes:

AFDW: ash free dry weight

g: gram

ND: no data; Specimens were vouchered so there is no AFDW measurement.

Table C-3f
James Island Spring Benthic Community Counts and Biomass – JI-BC-06

Species List	JI-BC-06 Abundance			JI-BC-06 Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Carinoma tremaphoros			1			0.00020
Fragilonemertes rosea	5	2	2	0.03350	0.00170	0.00170
Amphiporus bioculatus	2		1	0.00010		0.00030
Hypereteone heteropoda	5	1	2	0.00010	0.00005	0.00005
Hypereteone foliosa	2	1	3	0.00030	0.00110	0.00180
Alitta succinea			1			0.00005
Leitoscoloplos fragilis	7	6	7	0.00050	0.00240	0.00030
Polydora cornuta	1	1	2	0.00010	0.00005	0.00005
Marenzelleria viridis	4	10	8	0.00080	0.00260	0.00320
Streblospio benedicti	13	2	17	0.00020	0.00005	0.00040
Heteromastus filiformis	52	33	33	0.00600	0.00390	0.00260
Tubificoides spp.	4	2	4	0.00010	0.00005	0.00005
Geukensia demissa	1			0.00005		
Mulinia lateralis	22	7	26	0.00020	0.00010	0.00040
Ameritella mitchelli	1	4	5	0.00040	0.00720	0.00640
Limecola petalum		2			0.00040	
Tagelus plebeius	17	13	15	0.00680	0.00640	0.00630
Gemma gemma	696	383	548	0.10830	0.05040	0.06900
Mya arenaria	1	1		0.00005	0.00005	
Amphibalanus improvisus		1			0.00460	
Neomysis americana			1			0.00020
Spilocuma watlingi	1			0.00005		
Edotia triloba	1	1		0.00005	0.00005	
Melita nitida			1			0.00040
Lepidactylus dytiscus	1			0.00005		
Ameroculodes spp. complex	7	2	4	0.00070	0.00040	0.00020

Notes:

AFDW: ash free dry weight

g: gram

Table C-3g
James Island Spring Benthic Community Counts and Biomass – JI-BC-07

	JI-BC-07 Abundance			JI-BC-07 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Carinoma tremaphoros	1	1	2	0.00005	0.00060	0.00020
Fragilonemertes rosea	2	3	1	0.00290	0.01030	0.00020
Amphiporus bioculatus	1			0.00010		
Hypereteone heteropoda	3		3	0.00020		0.00005
Hypereteone foliosa	1		3	0.00090		0.00270
Glycinde multidens	1	1	1	0.00080	0.00040	0.00010
Leitoscoloplos fragilis	1	7	10	0.00030	0.00380	0.00530
Marenzelleria viridis	22	12	14	0.00860	0.00510	0.00320
Streblospio benedicti	5	6	4	0.00030	0.00040	0.00005
Heteromastus filiformis	77	32	51	0.00990	0.00460	0.00390
Mulinia lateralis	35	37	35	0.00120	0.00580	0.00070
Ameritella mitchelli	9	8	9	0.04750	0.02980	0.03380
Tagelus plebeius	10	16	9	0.00320	0.00580	0.00300
Gemma gemma	64	74	56	0.00570	0.00640	0.00500
Amphibalanus improvisus	57			0.00340		
Neomysis americana	1			0.00020		
Leptocheirus plumulosus	4	3	4	0.00050	0.00220	0.00020
Gammarus mucronatus	4			0.00270		
Ameroculodes spp. complex	18	7	18	0.00210	0.00100	0.00110

Notes:

AFDW: ash free dry weight

g: gram

Table C-3h
James Island Spring Benthic Community Counts and Biomass – JI-BC-08

	JI-BC-08 Abundance			JI-BC-08 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Fragilonemertes rosea			1			0.01110
Amphiporus bioculatus		1			0.00060	
Hypereteone heteropoda	4		2	0.00030		0.00050
Hypereteone foliosa	1		3	0.00210		0.00390
Alitta succinea	1			0.02100		
Leitoscoloplos fragilis	9		3	0.00040		0.00020
Marenzelleria viridis	3	7	4	0.00160	0.00210	0.00230
Streblospio benedicti	7	2	2	0.00560	0.00060	0.00010
Heteromastus filiformis	31	39	25	0.00270	0.00500	0.00260
Mediomastus ambiseta		2			0.00030	
Tubificoides spp.			1			0.00005
Sayella chesapeakea	2			0.00030		
Mulinia lateralis	10	8	19	0.00020	0.00030	0.01590
Ameritella mitchelli	5	11	11	0.00700	0.02100	0.01930
Tagelus plebeius	4	5	7	0.00120	0.00150	0.00370
Gemma gemma	136	173	182	0.01380	0.01040	0.01740
Mya arenaria	1	2		0.00005	0.00010	
Amphibalanus improvisus	21	1	21	0.00030	0.00005	0.00050
Neomysis americana	2			0.00080		
Edotia triloba	2			0.00030		
Leptocheirus plumulosus	1	1	2	0.00020	0.00020	0.00040
Apocorophium lacustre			1			0.00020
Ameroculodes spp. complex	17	4	23	0.00130	0.00040	0.00340

Notes:

AFDW: ash free dry weight

g: gram

Table C-3i
James Island Spring Benthic Community Counts and Biomass – JI-BC-09

	JI-BC-09 Abundance			JI-BC-09 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Fragilonemertes rosea		1	1		0.00060	0.00440
Amphiporus bioculatus		1	1		0.00100	0.00050
Hypereteone foliosa	3	1	1	0.00140	0.00050	0.00130
Leitoscoloplos fragilis	1	6	4	0.00010	0.00060	0.00080
Polydora cornuta			1			0.00005
Marenzelleria viridis	10	11	17	0.00470	0.00480	0.00840
Heteromastus filiformis	6	5	10	0.00140	0.00180	0.00260
Tubificoides spp.	1			0.00020		
Mulinia lateralis		3	4		0.00005	0.00020
Ameritella mitchelli	4	6	8	0.00720	0.02430	0.08060
Limecola petalum	1			0.00030		
Tagelus plebeius			1			0.00030
Gemma gemma	58	201	233	0.00590	0.03140	0.03140
Mya arenaria		1	3		0.00005	0.00020
Amphibalanus improvisus	1			0.00070		
Spilocuma watlingi		1	1		0.00005	0.00010
Cyathura polita			2			0.00390
Lepidactylus dytiscus		1	1		0.00005	0.00005
Ameroculodes spp. complex	2	15	13	0.00020	0.00240	0.00240

Notes:

AFDW: ash free dry weight

g: gram

Table C-3j
James Island Spring Benthic Community Counts and Biomass – JI-BC-10

	JI-BC-10 Abundance			JI-BC-10 Biomass (g; AFDW)		
Species List	**Replicate A**	**Replicate B**	**Replicate C**	**Replicate A**	**Replicate B**	**Replicate C**
Carinoma tremaphoros		1			0.00020	
Fragilonemertes rosea	1	2	2	0.00560	0.00200	0.00820
Amphiporus bioculatus		1			0.00005	
Hypereteone heteropoda		3	3		0.00005	0.00020
Hypereteone foliosa	2	4	1	0.00130	0.00110	0.00060
Alitta succinea	1			0.00270		
Glycinde multidens	1	2	1	0.00020	0.00070	0.00050
Leitoscoloplos fragilis		1	1		0.00005	0.00005
Polydora cornuta		1	3		0.00005	0.00010
Marenzelleria viridis	10	22	19	0.00220	0.00500	0.00390
Streblospio benedicti	3	1	7	0.00010	0.00005	0.00020
Heteromastus filiformis	21	24	26	0.00340	0.00210	0.00410
Naididae sp.			1			0.00040
Acteocina canaliculata	1			0.00060		
Mulinia lateralis	8	10	5	0.02580	0.05460	0.00005
Ameritella mitchelli	28	31	34	0.04580	0.04290	0.04710
Limecola petalum		1			0.00020	
Tagelus plebeius	10	5	12	0.00270	0.00170	0.00190
Gemma gemma	52	98	88	0.00920	0.00790	0.00600
Mya arenaria	2	6	7	0.00005	0.00010	0.00010
Amphibalanus improvisus	1			0.00005		
Spilocuma watlingi	1	1	3	0.00010	0.00005	0.00030
Cyathura polita	1			0.00290		
Edotia triloba			2			0.00050
Leptocheirus plumulosus			3			0.00020
Gammarus mucronatus		1			0.00005	
Lepidactylus dytiscus			2			0.00020
Ameroculodes spp. complex	9	13	13	0.00140	0.00180	0.00180

Notes:
AFDW: ash free dry weight
g: gram

Table C-3k
James Island Spring Benthic Community Counts and Biomass – JI-BC-REF

Species List	JI-BC-REF Abundance			JI-BC-REF Biomass (g; AFDW)		
	Replicate A	Replicate B	Replicate C	Replicate A	Replicate B	Replicate C
Carinoma tremaphoros			2			0.00060
Fragilonemertes rosea	2	1	2	0.00160	0.00110	0.00200
Hypereteone heteropoda	1	1		0.00010	0.00060	
Hypereteone foliosa	3	3	2	0.00200	0.00170	0.00230
Glycinde multidens		1	1		0.00040	0.00020
Leitoscoloplos fragilis	1	frag.		0.00110	0.00070	
Marenzelleria viridis	21	23	8	0.00810	0.00960	0.00260
Streblospio benedicti	3	2	1	0.00005	0.00010	0.00005
Heteromastus filiformis	29	51	45	0.00410	0.01060	0.00530
Acteocina canaliculata	1			0.00030		
Mulinia lateralis	12	11	26	0.04120	0.01320	0.00470
Ameritella mitchelli	13	8	9	0.03050	0.02390	0.01640
Limecola petalum	1	1		0.00050	0.00190	
Tagelus plebeius	7	1	4	0.00220	0.00040	0.00120
Gemma gemma	16	10	12	0.00090	0.00100	0.00100
Neomysis americana			2			0.00020
Leptocheirus plumulosus	4	7	4	0.00020	0.00060	0.00050
Apocorophium lacustre	1			0.00030		
Lepidactylus dytiscus		1			0.00080	
Ameroculodes spp. complex	12	8	19	0.00140	0.00070	0.00160

Notes:

AFDW: ash free dry weight

frag.: fragment

g: gram

Appendix D

James Island Fish Collection Data

Table D-1a
James Island Seine Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
JI-BN-01a	Striped anchovy	68	
JI-BN-01a	Striped anchovy	65	
JI-BN-01a	Striped anchovy	76	
JI-BN-01a	Striped anchovy	73	
JI-BN-01a	Striped anchovy	80	
JI-BN-01a	Striped anchovy	67	
JI-BN-01a	Striped anchovy	66	
JI-BN-01a	Striped anchovy	66	
JI-BN-01a	Striped anchovy	61	
JI-BN-01a	Striped anchovy	72	
JI-BN-01a	Striped anchovy	70	
JI-BN-01a	Striped anchovy	80	
JI-BN-01a	Striped anchovy	65	
JI-BN-01a	Striped anchovy	83	
JI-BN-01a	Striped anchovy	72	
JI-BN-01a	Striped anchovy	67	
JI-BN-01a	Striped anchovy	68	
JI-BN-01a	Striped anchovy	75	
JI-BN-01a	Striped anchovy	68	
JI-BN-01a	Striped anchovy	76	
JI-BN-01a	Striped anchovy	72	
JI-BN-01a	Striped anchovy	63	
JI-BN-01a	Striped anchovy	69	
JI-BN-01a	Striped anchovy	70	
JI-BN-01a	Striped anchovy	76	
JI-BN-01a	Striped anchovy	80	
JI-BN-01a	Striped anchovy	70	
JI-BN-01a	Striped anchovy	76	
JI-BN-01a	Striped anchovy	71	
JI-BN-01a	Striped anchovy	70	
JI-BN-01a	Striped anchovy	66	
JI-BN-01a	Striped anchovy	70	
JI-BN-01a	Striped anchovy	70	
JI-BN-01a	Striped anchovy	73	
JI-BN-01a	Striped anchovy	69	
JI-BN-01a	Striped anchovy	76	
JI-BN-01a	Striped anchovy	76	
JI-BN-01a	Striped anchovy	74	
JI-BN-01a	Striped anchovy	67	
JI-BN-01a	Striped anchovy	77	
JI-BN-01a	Striped anchovy	70	
JI-BN-01a	Striped anchovy	76	
JI-BN-01a	Striped anchovy	68	
JI-BN-01a	Striped anchovy	72	

Table D-1a
James Island Seine Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
JI-BN-01a	Striped anchovy	70	
JI-BN-01a	Striped anchovy	75	
JI-BN-01a	Striped anchovy	69	
JI-BN-01a	Striped anchovy	77	
JI-BN-01a	Striped anchovy	69	
JI-BN-01a	Striped anchovy	70	
JI-BN-01a	Atlantic needlefish	252	
JI-BN-01b	Striped anchovy	80	
JI-BN-01b	Striped anchovy	67	
JI-BN-01b	Striped anchovy	66	
JI-BN-01b	Striped anchovy	77	
JI-BN-01b	Striped anchovy	75	
JI-BN-01b	Striped anchovy	70	
JI-BN-01b	Striped anchovy	77	
JI-BN-01b	Striped anchovy	80	
JI-BN-01b	Striped anchovy	71	
JI-BN-01b	Striped anchovy	73	
JI-BN-01b	Striped anchovy	79	
JI-BN-01b	Striped anchovy	74	
JI-BN-01b	Striped anchovy	81	
JI-BN-01b	Striped anchovy	69	
JI-BN-01b	Striped anchovy	77	
JI-BN-01b	Striped anchovy	55	
JI-BN-01b	Striped anchovy	80	
JI-BN-01b	Striped anchovy	78	
JI-BN-01b	Striped anchovy	70	
JI-BN-01b	Striped anchovy	70	
JI-BN-01b	Striped anchovy	72	
JI-BN-01b	Striped anchovy	78	
JI-BN-02a	Atlantic silverside	90	
JI-BN-02a	Striped anchovy	69	
JI-BN-02a	Striped anchovy	71	
JI-BN-02a	Atlantic silverside	98	
JI-BN-02a	Atlantic silverside	86	
JI-BN-02a	Atlantic silverside	80	
JI-BN-02a	Atlantic silverside	75	
JI-BN-02a	Atlantic silverside	83	
JI-BN-02a	Striped anchovy	72	
JI-BN-02a	Atlantic silverside	68	
JI-BN-02a	Striped anchovy	69	
JI-BN-02a	Striped anchovy	70	
JI-BN-02a	Atlantic silverside	78	
JI-BN-02a	Striped anchovy	72	
JI-BN-02a	Striped anchovy	62	

Table D-1a
James Island Seine Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
JI-BN-02a	Atlantic silverside	78	
JI-BN-02a	Atlantic silverside	86	
JI-BN-02a	Atlantic silverside	85	
JI-BN-02a	Atlantic silverside	92	
JI-BN-02a	Atlantic silverside	87	
JI-BN-02a	Atlantic silverside	80	
JI-BN-02a	Atlantic silverside	84	
JI-BN-02a	Atlantic silverside	71	
JI-BN-02a	Striped anchovy	61	
JI-BN-02a	Striped anchovy	67	
JI-BN-02a	Striped anchovy	70	
JI-BN-02a	Atlantic silverside	88	
JI-BN-02a	Atlantic silverside	99	
JI-BN-02a	Atlantic silverside	74	
JI-BN-02a	Striped anchovy	65	
JI-BN-02a	Atlantic silverside	82	
JI-BN-02a	Atlantic silverside	80	
JI-BN-02a	Atlantic silverside	85	
JI-BN-02a	Striped anchovy	65	
JI-BN-02a	Atlantic silverside	87	
JI-BN-02a	Atlantic silverside	69	
JI-BN-02a	Atlantic silverside	77	
JI-BN-02a	Striped anchovy	66	
JI-BN-02a	Striped anchovy	57	
JI-BN-02a	Striped anchovy	62	
JI-BN-02a	Atlantic threadfin	65	
JI-BN-02a	Atlantic threadfin	72	
JI-BN-02a	Striped anchovy	69	
JI-BN-02a	Atlantic silverside	80	
JI-BN-02a	Striped anchovy	54	
JI-BN-02a	Striped anchovy	72	
JI-BN-02a	Striped anchovy	75	
JI-BN-02a	Striped anchovy	61	
JI-BN-02a	Striped anchovy	65	
JI-BN-02a	Striped anchovy	68	
JI-BN-02a	Striped anchovy	73	
JI-BN-02a	Atlantic silverside	67	
JI-BN-02a	Striped anchovy	62	
JI-BN-02a	Striped anchovy	66	
JI-BN-02a	Striped anchovy	64	
JI-BN-02a	Atlantic silverside	85	
JI-BN-02a	Atlantic silverside	67	
JI-BN-02a	Striped anchovy	69	
JI-BN-02a	Striped anchovy	67	

Table D-1a

James Island Seine Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
JI-BN-02a	Atlantic silverside	69	
JI-BN-02a	Striped anchovy	63	
JI-BN-02a	Striped anchovy	63	
JI-BN-02a	Striped anchovy	69	
JI-BN-02a	Striped anchovy	69	
JI-BN-02a	Striped anchovy	56	
JI-BN-02a	Striped anchovy	67	
JI-BN-02a	Striped anchovy	66	
JI-BN-02a	Striped anchovy	65	
JI-BN-02a	Striped anchovy	71	
JI-BN-02a	Atlantic silverside	76	
JI-BN-02a	Striped anchovy	62	
JI-BN-02a	Striped anchovy	64	
JI-BN-02a	Atlantic silverside	78	
JI-BN-02a	Striped anchovy	67	
JI-BN-02a	Atlantic silverside	83	
JI-BN-02a	Atlantic silverside	86	
JI-BN-02b	Blue crab	62	
JI-BN-02b	Blue crab	60	
JI-BN-02b	Striped anchovy	65	
JI-BN-02b	Atlantic silverside	84	
JI-BN-02b	Striped anchovy	60	
JI-BN-02b	Atlantic silverside	85	
JI-BN-02b	Atlantic silverside	94	
JI-BN-02b	Striped anchovy	79	
JI-BN-02b	Atlantic silverside	88	
JI-BN-02b	Atlantic silverside	80	
JI-BN-02b	Atlantic silverside	88	
JI-BN-02b	Atlantic silverside	100	
JI-BN-02b	Atlantic silverside	97	
JI-BN-02b	Atlantic silverside	96	
JI-BN-02b	Striped anchovy	74	
JI-BN-02b	Atlantic silverside	81	
JI-BN-02b	Atlantic silverside	79	
JI-BN-02b	Atlantic silverside	80	
JI-BN-02b	Atlantic silverside	76	
JI-BN-02b	Atlantic silverside	75	
JI-BN-02b	Atlantic silverside	85	
JI-BN-02b	Atlantic silverside	90	
JI-BN-02b	Atlantic silverside	89	
JI-BN-02b	Atlantic silverside	78	
JI-BN-02b	Atlantic silverside	87	
JI-BN-02b	Atlantic silverside	75	parasite
JI-BN-02b	Atlantic silverside	90	

Table D-1a

James Island Seine Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
JI-BN-02b	Atlantic silverside	90	
JI-BN-02b	Atlantic silverside	84	
JI-BN-02b	Atlantic silverside	93	
JI-BN-02b	Atlantic silverside	67	
JI-BN-02b	Atlantic silverside	77	
JI-BN-02b	Atlantic silverside	92	
JI-BN-02b	Atlantic silverside	84	
JI-BN-02b	Atlantic silverside	86	
JI-BN-02b	Atlantic silverside	89	
JI-BN-02b	Atlantic silverside	88	
JI-BN-02b	Striped anchovy	64	
JI-BN-02b	Atlantic silverside	66	
JI-BN-02b	Atlantic silverside	81	
JI-BN-02b	Atlantic silverside	76	
JI-BN-02b	Striped anchovy	59	
JI-BN-02b	Atlantic silverside	80	
JI-BN-02b	Atlantic silverside	72	
JI-BN-02b	Atlantic silverside	63	
JI-BN-02b	Atlantic silverside	73	
JI-BN-02b	Atlantic silverside	92	
JI-BN-02b	Atlantic silverside	85	
JI-BN-02b	Atlantic silverside	63	
JI-BN-02b	Atlantic silverside	74	
JI-BN-02b	Atlantic silverside	64	
JI-BN-02b	Atlantic silverside	70	
JI-BN-02b	Atlantic silverside	67	
JI-BN-02b	Atlantic silverside	90	
JI-BN-02b	Atlantic silverside	85	
JI-BN-02b	Atlantic silverside	85	
JI-BN-02b	Atlantic silverside	82	
JI-BN-02b	Atlantic silverside	80	
JI-BN-02b	Atlantic silverside	56	
JI-BN-02b	Atlantic silverside	79	
JI-BN-02b	Atlantic silverside	77	
JI-BN-02b	Atlantic silverside	76	
JI-BN-02b	Atlantic silverside	84	
JI-BN-02b	Atlantic silverside	91	
JI-BN-02b	Striped anchovy	65	
JI-BN-02b	Atlantic silverside	73	
JI-BN-02b	Striped anchovy	55	
JI-BN-02b	Atlantic silverside	78	
JI-BN-03a	Striped anchovy	91	
JI-BN-03a	Striped anchovy	75	
JI-BN-03a	Striped anchovy	76	

Table D-1a
James Island Seine Net Collection Results – Summer

Sample ID	Species	Length (mm)	Notes
JI-BN-03a	Striped anchovy	76	
JI-BN-03a	Striped anchovy	80	
JI-BN-03a	Striped anchovy	75	
JI-BN-03a	Striped anchovy	72	
JI-BN-03a	Striped anchovy	71	
JI-BN-03a	Striped anchovy	82	
JI-BN-03a	Atlantic menhaden	99	
JI-BN-03a	Atlantic needlefish	380	
JI-BN-03a	Atlantic needlefish	306	
JI-BN-03a	Atlantic needlefish	280	
JI-BN-03b	Striped anchovy	73	
JI-BN-03b	Striped anchovy	75	
JI-BN-03b	Atlantic menhaden	83	
JI-BN-03b	Atlantic menhaden	85	
JI-BN-03b	Atlantic menhaden	90	
JI-BN-03b	Striped anchovy	62	
JI-BN-03b	Striped anchovy	76	
JI-BN-03b	Striped anchovy	60	
JI-BN-03b	Striped anchovy	64	
JI-BN-03b	Bay anchovy	51	
JI-BN-03b	Bay anchovy	53	
JI-BN-03b	Bay anchovy	52	
JI-BN-03b	Bay anchovy	54	
JI-BN-03b	Atlantic silverside	60	
JI-BN-03b	Bay anchovy	51	

Note:
mm: millimeter

Table D-1b

James Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
JI-BN-01a	Atlantic silverside	86	
JI-BN-01a	Atlantic silverside	94	
JI-BN-01a	Atlantic silverside	109	
JI-BN-01a	Atlantic silverside	76	
JI-BN-01a	Atlantic silverside	87	
JI-BN-01a	Atlantic silverside	84	
JI-BN-01a	Atlantic silverside	97	
JI-BN-01a	Atlantic silverside	111	
JI-BN-01a	Atlantic silverside	64	
JI-BN-01a	Atlantic silverside	98	
JI-BN-01a	Atlantic silverside	77	
JI-BN-01a	Atlantic silverside	75	
JI-BN-01a	Atlantic silverside	97	
JI-BN-01a	Atlantic silverside	89	
JI-BN-01a	Atlantic silverside	85	
JI-BN-01a	Atlantic silverside	112	
JI-BN-01a	Atlantic silverside	71	
JI-BN-01a	Atlantic silverside	101	
JI-BN-01a	Atlantic silverside	79	
JI-BN-01a	Atlantic silverside	94	
JI-BN-01a	Atlantic silverside	76	
JI-BN-01a	Atlantic silverside	83	
JI-BN-01a	Atlantic silverside	86	
JI-BN-01a	Atlantic silverside	80	
JI-BN-01a	Atlantic silverside	107	
JI-BN-01a	Atlantic silverside	92	
JI-BN-01a	Atlantic silverside	106	
JI-BN-01a	Atlantic silverside	83	
JI-BN-01a	Atlantic silverside	85	
JI-BN-01a	Atlantic silverside	102	
JI-BN-01a	Atlantic silverside	72	
JI-BN-01a	Atlantic silverside	96	
JI-BN-01a	Atlantic silverside	85	
JI-BN-01a	Atlantic silverside	76	
JI-BN-01a	Atlantic silverside	70	
JI-BN-01a	Atlantic silverside	126	
JI-BN-01a	Atlantic silverside	91	
JI-BN-01a	Atlantic silverside	72	
JI-BN-01a	Atlantic silverside	85	
JI-BN-01a	Atlantic silverside	74	
JI-BN-01a	Atlantic silverside	107	
JI-BN-01a	Atlantic silverside	75	
JI-BN-01a	Atlantic silverside	129	
JI-BN-01a	Atlantic silverside	101	

Table D-1b
James Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
JI-BN-01a	Atlantic silverside	114	
JI-BN-01a	Atlantic silverside	89	
JI-BN-01a	Atlantic silverside	71	
JI-BN-01a	Atlantic silverside	105	
JI-BN-01a	Atlantic silverside	86	
JI-BN-01a	Atlantic silverside	110	
JI-BN-01b	Red drum	39	
JI-BN-01b	Atlantic silverside	102	
JI-BN-01b	Atlantic silverside	114	
JI-BN-01b	Atlantic silverside	80	
JI-BN-01b	Atlantic silverside	114	
JI-BN-01b	Atlantic silverside	74	
JI-BN-01b	Atlantic silverside	106	
JI-BN-01b	Atlantic silverside	100	
JI-BN-01b	Atlantic silverside	106	
JI-BN-01b	Atlantic silverside	105	
JI-BN-01b	Atlantic silverside	94	
JI-BN-01b	Atlantic silverside	95	
JI-BN-01b	Atlantic silverside	128	
JI-BN-01b	Atlantic silverside	96	
JI-BN-01b	Atlantic silverside	113	
JI-BN-01b	Atlantic silverside	86	
JI-BN-01b	Atlantic silverside	85	
JI-BN-01b	Atlantic silverside	96	
JI-BN-01b	Atlantic silverside	72	
JI-BN-01b	Atlantic silverside	86	
JI-BN-01b	Atlantic silverside	83	
JI-BN-01b	Atlantic silverside	91	
JI-BN-01b	Atlantic silverside	69	
JI-BN-01b	Atlantic silverside	75	
JI-BN-01b	Atlantic silverside	74	
JI-BN-01b	Atlantic silverside	89	
JI-BN-01b	Atlantic silverside	72	
JI-BN-01b	Atlantic silverside	88	
JI-BN-01b	Atlantic silverside	94	
JI-BN-01b	Atlantic silverside	112	
JI-BN-01b	Atlantic silverside	91	
JI-BN-01b	Atlantic silverside	96	
JI-BN-01b	Atlantic silverside	96	
JI-BN-01b	Atlantic silverside	91	
JI-BN-01b	Atlantic silverside	86	
JI-BN-01b	Atlantic silverside	87	
JI-BN-01b	Atlantic silverside	73	
JI-BN-01b	Atlantic silverside	74	

Table D-1b
James Island Seine Net Collection Results – Fall

Sample ID	Species	Length (mm)	Notes
JI-BN-01b	Atlantic silverside	124	
JI-BN-01b	Atlantic silverside	99	
JI-BN-01b	Atlantic silverside	104	
JI-BN-01b	Atlantic silverside	88	
JI-BN-01b	Atlantic silverside	114	
JI-BN-01b	Atlantic silverside	86	
JI-BN-01b	Atlantic silverside	117	
JI-BN-01b	Atlantic silverside	78	
JI-BN-01b	Atlantic silverside	74	
JI-BN-01b	Atlantic silverside	87	
JI-BN-01b	Atlantic silverside	108	
JI-BN-01b	Atlantic silverside	116	
JI-BN-01b	Atlantic silverside	101	
JI-BN-02a	Atlantic silverside	117	
JI-BN-02a	Atlantic silverside	84	
JI-BN-03b	Atlantic silverside	76	
JI-BN-03b	Atlantic silverside	120	
JI-BN-03b	Atlantic silverside	68	
JI-BN-03b	Atlantic silverside	105	

Note:
mm: millimeter

Table D-1c

James Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
JI-BN-01b	Atlantic silverside	115	9.3
JI-BN-01b	Atlantic silverside	96	5.3
JI-BN-01b	Atlantic silverside	118	8.9
JI-BN-01b	Atlantic silverside	107	7
JI-BN-01b	Atlantic silverside	110	7.2
JI-BN-01b	Atlantic silverside	105	6.7
JI-BN-01b	Atlantic silverside	90	4.6
JI-BN-01b	Atlantic silverside	110	9.2
JI-BN-01b	Atlantic silverside	129	11.6
JI-BN-01b	Atlantic silverside	115	10
JI-BN-01b	Atlantic silverside	100	5.5
JI-BN-01b	Atlantic silverside	117	11.4
JI-BN-01b	Atlantic silverside	100	6.5
JI-BN-01b	Atlantic silverside	117	9.5
JI-BN-01b	Atlantic silverside	123	11
JI-BN-01b	Atlantic silverside	98	5.4
JI-BN-01b	Atlantic silverside	107	8.2
JI-BN-01b	Atlantic silverside	125	12.5
JI-BN-01b	Atlantic silverside	107	4.5
JI-BN-01b	Atlantic silverside	91	5.2
JI-BN-01b	Atlantic silverside	115	9.6
JI-BN-01b	Atlantic silverside	120	11.3
JI-BN-01b	Atlantic silverside	106	6.6
JI-BN-01b	Atlantic silverside	99	6.1
JI-BN-01b	Atlantic silverside	104	6.4
JI-BN-01b	Atlantic silverside	127	12.4
JI-BN-01b	Atlantic silverside	132	13.5
JI-BN-01b	Atlantic silverside	121	10.9
JI-BN-01b	Atlantic silverside	112	8.4
JI-BN-01b	Atlantic silverside	106	7.8
JI-BN-01b	Atlantic silverside	110	8.9
JI-BN-02a	Atlantic silverside	90	4
JI-BN-02b	Atlantic silverside	66	0.7
JI-BN-02b	Atlantic silverside	1211	13
JI-BN-02b	Atlantic silverside	107	4.4
JI-BN-02b	Atlantic silverside	60	1
JI-BN-02b	Atlantic silverside	106	8.7
JI-BN-03a	Atlantic silverside	116	80
JI-BN-03a	Atlantic silverside	122	10.3
JI-BN-03a	Atlantic silverside	107	6.6
JI-BN-03a	Atlantic silverside	117	10
JI-BN-03a	Atlantic silverside	99	6.7
JI-BN-03a	Atlantic silverside	121	10.6
JI-BN-03a	Atlantic silverside	102	6.8

Table D-1c
James Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
JI-BN-03a	Atlantic silverside	115	11.1
JI-BN-03a	Atlantic silverside	133	16
JI-BN-03a	Atlantic silverside	113	9.1
JI-BN-03a	Atlantic silverside	110	8.3
JI-BN-03a	Atlantic silverside	104	7
JI-BN-03a	Atlantic silverside	76	2.9
JI-BN-03a	Atlantic silverside	126	12.4
JI-BN-03a	Atlantic silverside	123	11.5
JI-BN-03a	Atlantic silverside	128	13.7
JI-BN-03a	Atlantic silverside	111	8.2
JI-BN-03a	Atlantic silverside	95	5.6
JI-BN-03a	Atlantic silverside	120	11.1
JI-BN-03a	Atlantic silverside	133	14.2
JI-BN-03a	Atlantic silverside	95	6.1
JI-BN-03a	Atlantic silverside	101	6.3
JI-BN-03a	Atlantic silverside	97	6.4
JI-BN-03a	Atlantic silverside	121	13.1
JI-BN-03a	Atlantic silverside	95	6
JI-BN-03a	Atlantic silverside	112	8.9
JI-BN-03a	Atlantic silverside	116	9.4
JI-BN-03a	Atlantic silverside	121	10.5
JI-BN-03a	Atlantic silverside	107	7.5
JI-BN-03a	Atlantic silverside	109	8.3
JI-BN-03a	Atlantic silverside	100	6.3
JI-BN-03a	Atlantic silverside	117	11.1
JI-BN-03a	Atlantic silverside	110	8.2
JI-BN-03a	Atlantic silverside	115	9.2
JI-BN-03a	Atlantic silverside	130	13.7
JI-BN-03a	Atlantic silverside	129	12.4
JI-BN-03a	Atlantic silverside	115	8.6
JI-BN-03a	Atlantic silverside	102	7
JI-BN-03a	Atlantic silverside	131	15
JI-BN-03a	Atlantic silverside	129	13
JI-BN-03a	Atlantic silverside	113	8.4
JI-BN-03a	Atlantic silverside	108	7.8
JI-BN-03a	Atlantic silverside	102	6.9
JI-BN-03a	Atlantic silverside	100	5.8
JI-BN-03a	Atlantic silverside	96	5.4
JI-BN-03a	Atlantic silverside	112	9.9
JI-BN-03a	Atlantic silverside	118	10.3
JI-BN-03a	Atlantic silverside	80	2.4
JI-BN-03a	Atlantic silverside	93	4.8
JI-BN-03a	Atlantic silverside	93	4.5
JI-BN-03b	Atlantic silverside	113	8.2

Table D-1c
James Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
JI-BN-03b	Atlantic silverside	128	11.6
JI-BN-03b	Atlantic silverside	102	6.2
JI-BN-03b	Atlantic silverside	102	6.3
JI-BN-03b	Atlantic silverside	105	6.9
JI-BN-03b	Atlantic silverside	94	5
JI-BN-03b	Atlantic silverside	102	6.3
JI-BN-03b	Atlantic silverside	104	6
JI-BN-03b	Atlantic silverside	104	5.9
JI-BN-03b	Atlantic silverside	107	7.2
JI-BN-03b	Atlantic silverside	115	6.5
JI-BN-03b	Atlantic silverside	106	7.3
JI-BN-03b	Atlantic silverside	106	7.6
JI-BN-03b	Atlantic silverside	99	5.8
JI-BN-03b	Atlantic silverside	103	5.8
JI-BN-03b	Atlantic silverside	109	7.4
JI-BN-03b	Atlantic silverside	112	8.8
JI-BN-03b	Atlantic silverside	118	9.2
JI-BN-03b	Atlantic silverside	100	6.4
JI-BN-03b	Atlantic silverside	101	6.1
JI-BN-03b	Atlantic silverside	115	8.5
JI-BN-03b	Atlantic silverside	107	7.5
JI-BN-03b	Atlantic silverside	136	17
JI-BN-03b	Atlantic silverside	121	11.5
JI-BN-03b	Atlantic silverside	97	5.6
JI-BN-03b	Atlantic silverside	110	8.2
JI-BN-03b	Atlantic silverside	111	8.4
JI-BN-03b	Atlantic silverside	112	9.3
JI-BN-03b	Atlantic silverside	87	4.5
JI-BN-03b	Atlantic silverside	87	4.7
JI-BN-03b	Atlantic silverside	135	15.9
JI-BN-03b	Atlantic silverside	122	11.6
JI-BN-03b	Atlantic silverside	119	9.6
JI-BN-03b	Atlantic silverside	104	7.3
JI-BN-03b	Atlantic silverside	114	9
JI-BN-03b	Atlantic silverside	118	10.4
JI-BN-03b	Atlantic silverside	121	10.2
JI-BN-03b	Atlantic silverside	94	5.4
JI-BN-03b	Atlantic silverside	107	7.3
JI-BN-03b	Atlantic silverside	90	4.4
JI-BN-03b	Atlantic silverside	105	6.7
JI-BN-03b	Atlantic silverside	109	7.2
JI-BN-03b	Atlantic silverside	95	5.7
JI-BN-03b	Atlantic silverside	116	10.7
JI-BN-03b	Atlantic silverside	96	5.9

Table D-1c
James Island Seine Net Collection Results – Spring

Sample ID	Species	Length (mm)	Weight (g)
JI-BN-03b	Atlantic silverside	110	7.5
JI-BN-03b	Atlantic silverside	109	7.7
JI-BN-03b	Atlantic silverside	126	12.6
JI-BN-03b	Atlantic silverside	120	12
JI-BN-03b	Atlantic silverside	120	11.3
JI-BN-03b	Spot	45	0.6
JI-BN-03b	Spot	39	0.3
JI-BN-03b	Spot	36	0.3
JI-BN-03b	Spot	38	0.3
JI-BN-03b	Spot	35	0.4
JI-BN-03b	Spot	34	0.2
JI-BN-03b	Spot	39	0.5
JI-BN-03b	Spot	40	0.4

Notes:

g: gram

mm: millimeter

Table D-2
James Island Gill Net Collection Results – All Seasons

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Summer	JI-GN-01	Blue crab	127	
	JI-GN-01	Blue crab	131	
	JI-GN-01	Spot	135	
	JI-GN-01	Gizzard shad	467	
	JI-GN-01	Gizzard shad	444	
	JI-GN-01	Gizzard shad	415	
	JI-GN-01	Bluefish	363	
	JI-GN-01	Spot	136	
	JI-GN-01	Spanish mackerel	232	
	JI-GN-01	Spot	134	
	JI-GN-01	Spot	122	
	JI-GN-01	Summer flounder	208	
	JI-GN-01	Spot	130	
	JI-GN-02	Gizzard shad	424	
	JI-GN-02	Atlantic menhaden	335	
	JI-GN-02	Atlantic menhaden	338	
	JI-GN-02	Bluefish	266	
	JI-GN-02	Blue crab	132	
	JI-GN-02	Bluefish	305	
	JI-GN-02	Atlantic menhaden	340	
	JI-GN-02	Spanish mackerel	289	
	JI-GN-03	Spanish mackerel	289	
	JI-GN-03	Spanish mackerel	298	
	JI-GN-03	Spot	155	
	JI-GN-04	Atlantic menhaden	280	
	JI-GN-04	Spanish mackerel	395	
Fall	JI-GN-03	Striped bass	471	
	JI-GN-03	Striped bass	337	
	JI-GN-04	Gizzard shad	490	
Winter	JI-GN-02	Alewife	280	
Spring	JI-GN-03	Striped bass	475	1145
	JI-GN-03	Striped bass	381	488
	JI-GN-03	Striped bass	360	500

Notes:

a. Weight was measured during the spring sampling event only

g: gram

mm: millimeter

Table D-3

James Island Bottom Trawl Collection Results – All Seasons

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Summer	JI-FT-03	Blue crab	164	
	JI-FT-03	Blue crab	127	
	JI-FT-03	Blue crab	135	
	JI-FT-06	Hogchoker	165	
Fall	JI-FT-01	Skilletfish	66	
	JI-FT-04	Blue crab	139	
	JI-FT-04	Blue crab	175	
	JI-FT-05	Blue crab	145	
	JI-FT-05	Blue crab	140	
	JI-FT-05	Blue crab	151	
	JI-FT-06	Blue crab	134	
	JI-FT-06	Blue crab	137	
	JI-FT-06	Blue crab	129	
Spring	JI-FT-03a	American shad	130	17.8
	JI-FT-03a	Bay anchovy	57	1.2
	JI-FT-04a	Bay anchovy	60	1.5
	JI-FT-05a	Blue crab	145	
	JI-FT-05b	Bay anchovy	60	1.2
	JI-FT-05b	Bay anchovy	59	1.1
	JI-FT-05b	Bay anchovy	57	0.9
	JI-FT-05b	Bay anchovy	59	1.4
	JI-FT-05b	Bay anchovy	60	1.3
	JI-FT-05b	Bay anchovy	67	1.9
	JI-FT-05b	Bay anchovy	60	1.2
	JI-FT-05b	Bay anchovy	61	1.2
	JI-FT-05b	Bay anchovy	55	0.9
	JI-FT-06a	Bay anchovy	42	0.4
	JI-FT-06a	Atlantic menhaden	39	0.4
	JI-FT-06b	Bay anchovy	44	0.4

Notes:

a. Weight was measured during the spring sampling event only

g: gram

mm: millimeter

Table D-4
James Island Pop Net Collection Results – Summer/Spring

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Summer	JI-PN-01a	Bay anchovy	52	
	JI-PN-01a	Striped anchovy	62	
	JI-PN-01a	Bay anchovy	50	
	JI-PN-01a	Striped anchovy	48	
	JI-PN-01a	Striped anchovy	55	
	JI-PN-01a	Bay anchovy	53	
	JI-PN-01a	Bay anchovy	52	
	JI-PN-01a	Bay anchovy	46	
	JI-PN-01a	Striped anchovy	56	
	JI-PN-01a	Striped anchovy	50	
	JI-PN-01a	Bay anchovy	53	
	JI-PN-01a	Bay anchovy	50	
	JI-PN-01a	Striped anchovy	59	
	JI-PN-01a	Bay anchovy	53	
	JI-PN-01a	Bay anchovy	52	
	JI-PN-01a	Striped anchovy	54	
	JI-PN-01a	Bay anchovy	45	
	JI-PN-01a	Striped anchovy	60	
	JI-PN-01a	Striped anchovy	50	
	JI-PN-01a	Striped anchovy	51	
	JI-PN-01a	Bay anchovy	50	
	JI-PN-01a	Bay anchovy	51	
	JI-PN-01a	Bay anchovy	52	
	JI-PN-01a	Striped anchovy	50	
	JI-PN-01a	Bay anchovy	50	
	JI-PN-01a	Striped anchovy	53	
	JI-PN-01a	Striped anchovy	50	
	JI-PN-01a	Bay anchovy	47	
	JI-PN-01a	Striped anchovy	48	
	JI-PN-01a	Bay anchovy	46	
	JI-PN-01a	Striped anchovy	56	
	JI-PN-01a	Bay anchovy	53	
	JI-PN-01a	Striped anchovy	67	
	JI-PN-01a	Striped anchovy	54	
	JI-PN-01a	Bay anchovy	49	
	JI-PN-01a	Bay anchovy	45	
	JI-PN-01a	Bay anchovy	51	
	JI-PN-01a	Bay anchovy	55	
	JI-PN-01a	Bay anchovy	49	
	JI-PN-01a	Striped anchovy	50	
	JI-PN-01a	Bay anchovy	50	
	JI-PN-01a	Striped anchovy	52	
	JI-PN-01a	Bay anchovy	51	
	JI-PN-01a	Striped anchovy	56	

Table D-4
James Island Pop Net Collection Results – Summer/Spring

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Summer (continued)	JI-PN-01a	Striped anchovy	57	
	JI-PN-01a	Striped anchovy	58	
	JI-PN-01a	Striped anchovy	55	
	JI-PN-01a	Striped anchovy	51	
	JI-PN-01a	Striped anchovy	48	
	JI-PN-01a	Striped anchovy	50	
	JI-PN-01a	Bay anchovy	48	
	JI-PN-01a	Bay anchovy	49	
	JI-PN-01a	Striped anchovy	50	
	JI-PN-01a	Bay anchovy	48	
	JI-PN-01a	Bay anchovy	49	
	JI-PN-01a	Striped anchovy	56	
	JI-PN-01a	Bay anchovy	52	
	JI-PN-01a	Bay anchovy	60	
	JI-PN-01a	Striped anchovy	55	
	JI-PN-01a	Bay anchovy	51	
	JI-PN-01a	Striped anchovy	54	
	JI-PN-01a	Bay anchovy	47	
	JI-PN-01a	Bay anchovy	46	
	JI-PN-01a	Striped anchovy	52	
	JI-PN-01a	Striped anchovy	50	
	JI-PN-01a	Bay anchovy	43	
	JI-PN-01a	Bay anchovy	50	
	JI-PN-01a	Striped anchovy	47	
	JI-PN-01a	Striped anchovy	55	
	JI-PN-01a	Striped anchovy	51	
	JI-PN-01a	Bay anchovy	47	
	JI-PN-01a	Striped anchovy	46	
	JI-PN-01a	Striped anchovy	54	
	JI-PN-01a	Striped anchovy	50	
	JI-PN-01a	Striped anchovy	51	
	JI-PN-01a	Bay anchovy	50	
	JI-PN-01a	Bay anchovy	50	
	JI-PN-01a	Striped anchovy	47	
	JI-PN-01a	Bay anchovy	55	
	JI-PN-01a	Bay anchovy	50	
	JI-PN-01a	Striped anchovy	57	
	JI-PN-01a	Striped anchovy	50	
	JI-PN-01a	Bay anchovy	50	
	JI-PN-01a	Bay anchovy	50	
	JI-PN-01a	Striped anchovy	48	
	JI-PN-01a	Bay anchovy	45	
	JI-PN-01a	Bay anchovy	50	
	JI-PN-01a	Striped anchovy	58	

Table D-4
James Island Pop Net Collection Results – Summer/Spring

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Summer (continued)	JI-PN-01a	Bay anchovy	46	
	JI-PN-01a	Bay anchovy	46	
	JI-PN-01a	Striped anchovy	51	
	JI-PN-01a	Bay anchovy	49	
	JI-PN-01a	Bay anchovy	48	
	JI-PN-01a	Bay anchovy	47	
	JI-PN-01b	Atlantic silverside	85	
	JI-PN-01b	Bay anchovy	50	
	JI-PN-01b	Atlantic silverside	83	
	JI-PN-01b	Striped anchovy	50	
	JI-PN-01b	Striped anchovy	51	
	JI-PN-01b	Striped anchovy	48	
	JI-PN-01b	Striped anchovy	51	
	JI-PN-01b	Atlantic silverside	78	
	JI-PN-01b	Striped anchovy	48	
	JI-PN-01b	Striped anchovy	53	
	JI-PN-01b	Bay anchovy	45	
	JI-PN-01b	Bay anchovy	51	
	JI-PN-01b	Atlantic silverside	79	
	JI-PN-01b	Striped anchovy	42	
	JI-PN-01b	Striped anchovy	49	
	JI-PN-01b	Bay anchovy	45	
	JI-PN-01b	Bay anchovy	51	
	JI-PN-01b	Atlantic silverside	76	
	JI-PN-01b	Bay anchovy	49	
	JI-PN-02a	Bay anchovy	47	
	JI-PN-02a	Bay anchovy	56	
	JI-PN-02a	Bay anchovy	50	
	JI-PN-02a	Bay anchovy	49	
	JI-PN-02a	Bay anchovy	50	
	JI-PN-02a	Bay anchovy	55	
	JI-PN-02a	Bay anchovy	43	
	JI-PN-02a	Bay anchovy	50	
	JI-PN-02a	Bay anchovy	50	
	JI-PN-02a	Bay anchovy	51	
	JI-PN-02a	Bay anchovy	62	
	JI-PN-02a	Bay anchovy	47	
	JI-PN-02a	Bay anchovy	48	
	JI-PN-02a	Bay anchovy	42	
	JI-PN-02a	Bay anchovy	49	
	JI-PN-02a	Bay anchovy	56	
	JI-PN-02a	Bay anchovy	48	
	JI-PN-02a	Bay anchovy	52	
	JI-PN-02a	Bay anchovy	51	

Table D-4
James Island Pop Net Collection Results – Summer/Spring

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Summer (continued)	JI-PN-02a	Bay anchovy	48	
	JI-PN-02a	Bay anchovy	48	
	JI-PN-02a	Bay anchovy	47	
	JI-PN-02a	Bay anchovy	50	
	JI-PN-02a	Bay anchovy	49	
	JI-PN-02a	Bay anchovy	46	
	JI-PN-02a	Bay anchovy	50	
	JI-PN-02a	Bay anchovy	50	
	JI-PN-02a	Striped anchovy	50	
	JI-PN-02a	Striped anchovy	52	
	JI-PN-02a	Striped anchovy	55	
	JI-PN-02a	Striped anchovy	56	
	JI-PN-02a	Striped anchovy	56	
	JI-PN-02a	Striped anchovy	49	
	JI-PN-02a	Striped anchovy	50	
	JI-PN-02a	Striped anchovy	49	
	JI-PN-02a	Striped anchovy	50	
	JI-PN-02a	Striped anchovy	57	
	JI-PN-02a	Striped anchovy	59	
	JI-PN-02a	Striped anchovy	68	
	JI-PN-02a	Striped anchovy	56	
	JI-PN-02a	Striped anchovy	53	
	JI-PN-02a	Bay anchovy	36	
	JI-PN-02a	Bay anchovy	50	
	JI-PN-02a	Bay anchovy	52	
	JI-PN-02a	Bay anchovy	52	
	JI-PN-02a	Bay anchovy	50	
	JI-PN-02a	Bay anchovy	53	
	JI-PN-02a	Bay anchovy	56	
	JI-PN-02a	Bay anchovy	47	
	JI-PN-02a	Bay anchovy	50	
	JI-PN-02a	Bay anchovy	54	
	JI-PN-02a	Bay anchovy	43	
	JI-PN-02a	Bay anchovy	48	
	JI-PN-02a	Bay anchovy	44	
	JI-PN-02a	Bay anchovy	51	
	JI-PN-02a	Bay anchovy	47	
	JI-PN-02a	Bay anchovy	48	
	JI-PN-02a	Bay anchovy	56	
	JI-PN-02a	Bay anchovy	50	
	JI-PN-02a	Bay anchovy	51	
	JI-PN-02a	Bay anchovy	49	
	JI-PN-02a	Bay anchovy	48	
	JI-PN-02a	Bay anchovy	46	

Table D-4
James Island Pop Net Collection Results – Summer/Spring

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Summer (continued)	JI-PN-02a	Bay anchovy	44	
	JI-PN-02b	Bay anchovy	48	
	JI-PN-02b	Bay anchovy	46	
	JI-PN-02b	Bay anchovy	49	
	JI-PN-02b	Bay anchovy	48	
	JI-PN-02b	Bay anchovy	50	
	JI-PN-02b	Bay anchovy	49	
	JI-PN-02b	Bay anchovy	51	
	JI-PN-02b	Bay anchovy	53	
	JI-PN-02b	Bay anchovy	50	
	JI-PN-02b	Bay anchovy	48	
	JI-PN-02b	Bay anchovy	48	
	JI-PN-02b	Bay anchovy	52	
	JI-PN-02b	Bay anchovy	46	
	JI-PN-02b	Bay anchovy	47	
	JI-PN-02b	Bay anchovy	45	
	JI-PN-02b	Bay anchovy	54	
	JI-PN-02b	Bay anchovy	48	
	JI-PN-02b	Bay anchovy	45	
	JI-PN-02b	Bay anchovy	52	
	JI-PN-02b	Bay anchovy	53	
	JI-PN-02b	Bay anchovy	47	
	JI-PN-02b	Bay anchovy	48	
	JI-PN-02b	Bay anchovy	50	
	JI-PN-02b	Bay anchovy	49	
	JI-PN-02b	Bay anchovy	50	
	JI-PN-02b	Bay anchovy	49	
	JI-PN-02b	Bay anchovy	50	
	JI-PN-02b	Striped anchovy	50	
	JI-PN-02b	Striped anchovy	49	
	JI-PN-02b	Striped anchovy	50	
	JI-PN-02b	Striped anchovy	55	
	JI-PN-02b	Striped anchovy	56	
	JI-PN-02b	Striped anchovy	50	
	JI-PN-02b	Bay anchovy	49	
	JI-PN-02b	Bay anchovy	50	
	JI-PN-02b	Bay anchovy	43	
	JI-PN-02b	Bay anchovy	44	
	JI-PN-04b	Bay anchovy	43	
	JI-PN-04b	Bay anchovy	50	
	JI-PN-04b	Atlantic silverside	82	
	JI-PN-04b	Bay anchovy	54	
	JI-PN-04b	Bay anchovy	53	
	JI-PN-04b	Striped anchovy	57	

Table D-4
James Island Pop Net Collection Results – Summer/Spring

Season	Sample ID	Species	Length (mm)	Weight[a] (g)
Summer (continued)	JI-PN-04b	Bay anchovy	53	
	JI-PN-04b	Bay anchovy	49	
	JI-PN-04b	Bay anchovy	49	
	JI-PN-04b	Striped anchovy	50	
	JI-PN-04b	Bay anchovy	46	
	JI-PN-04b	Striped anchovy	52	
Spring	JI-PN-01a	Spot	25	0.2
	JI-PN-03a	Spot	24	0.1
	JI-PN-03a	Spot	25	0.1
	JI-PN-03a	Spot	23	0.1

Notes:

a. Weight was measured during the spring sampling event only

g: gram

mm: millimeter

C2: Mid-Chesapeake Bay Islands Bird and Mammals Survey Report (APHIS, 2021)

2021 Mid-Chesapeake-Bay Islands Bird and Mammal Surveys Report

Submitted to: United States Army Corps of Engineers (USACE) and United States Fish and Wildlife Service (USFWS)

Submitted by: Trevor Michaels, District Supervisor, USDA APHIS Wildlife Services (USDA WS)

Background:

Photo 1. James Island view looking North

The Mid-Chesapeake Bay Island Ecosystem Restoration Project (Mid-Bay Island), located in Dorchester County Maryland (MD), specifically encompasses the islands of James, in the Little Choptank River, and Barren, directly west of Upper Hooper Island in the Chesapeake Bay. The purpose of the project is to restore and expand wetland and terrestrial habitat for fish, shellfish, reptiles, amphibians, birds, and mammals. This habitat will be formed using dredged material from the Port of Baltimore (United States Army Corps of Engineers 2021).

Barren Island, documented at 582 acres in 1848 (Cronin 2005) is most recently estimated to encompass 138 acres (United States Army Corps of Engineers 2020). James Island was once estimated at 1,350 acres in the 17th century (Cronin 2005) and is now less than two acres in size and quickly diminishing. This project will seek to restore these islands to a combination of wetland and upland habitat encompassing 2,144 acres (United States Army Corps of Engineers 2020). This interagency project includes the USACE, USFWS, MDNR and the Maryland Department of Transportation Maryland Port Administration (MDOT MPA), amongst other partners. USFWS reached out to Wildlife Services (WS) in 2020 to conduct bird and predatory mammal surveys on the islands during the calendar year of 2021. These surveys would serve to document existing species currently using the islands.

Project Area:

James Island consists of eight separate fragmented islands directly north of Taylor's Island in the Little Choptank River in Dorchester County, MD. Total land area is roughly two acres. Barren Island is located to the south of Taylor's island, directly west of Upper Hooper Island in the Chesapeake Bay. Total land area is roughly 138 acres.

Map 1. James Island Camera and Sample locations

Map 2. Barren Island Camera and Sample locations

Methods:

WS used four observation types while conducting work on James and Barren Islands: 1) point counts, 2) flush surveys, 3) opportunistic surveys, and 4) remote sensing camera traps. All data collection was performed using custom-made forms in ESRI Survey123 application. A handheld Kestrel unit was used to obtain real time weather data. Vegetation data for sampling locations was taken during initial setup.

Sampling Locations

ArcPro Desktop was used to identify sampling locations for point counts. WS parcel data was used to isolate property boundaries and create polygons for James and Barren Islands. We then used Grid Index Features in the ESRI Cartography Tools to overlay a 0.2 x 0.2-mile grid and used the resulting intersections as our sampling locations (see Maps 1 & 2).

Point Count Surveys

Point count surveys were conducted at each of the identified sampling locations. The total number of bird species were recorded during a passive 5-minute survey. Records specify whether birds were less than or greater than 50 meters away when detected. Birds occurring further than 100 meters away were not reported in the point count survey.

Flush Surveys

These surveys consisted of two observers walking an established 100-meter flushing transect in suitable areas. A total of four flush survey transects were established adjacent to sampling location 1, 5, 6, and 10 on Barren Island as these were the locations with suitable habitat for a flush survey.

Opportunistic Surveys

These are observations made onsite but not during specific surveys or at an identified sampling location. Observations were made from boat (adjacent to Island) or by foot.

Camera Traps

Cameras were set up at intersections, crossings, or trails based on the biologist's professional opinion (see Map 1 & 2). Cabela's Outfitter Gen 3 Model CAB30MP-BLKIR and Bushnell Bandit Model 119637 cameras were used. Both models employ black infrared for nighttime pictures. Cameras were set to take a one-minute video on a one second interval. A two-foot section of bamboo was inserted into the ground four feet in front of each camera. A craft pipe cleaner (chenille stem) was attached to the top of the bamboo. Leggett's beaver lure, commercially available, was applied to the pipe cleaner. This lure contains primarily castor, a near universal mammal attractant. A total of eight camera traps were set on Barren Island and a total of two camera locations were set on James Island.

Mammals are recorded within three nights of the camera deployment. Duplicate species ***were not recorded***.

Results:

WS conducted eight rounds of surveys, a round consisting of visiting both Barren and James Islands. This resulted in a total of 17 sampling events. All sampling locations were set up on January 7th 2021.

Table 1. Mid-Bay Island trip dates and rounds

Sampling Date	Island	Round
1/13/2021	Barren	1
1/13/2021	James	1
1/15/2021	Barren	1

2/24/2021	Barren	2
3/3/2021	James	2
3/9/2021	Barren	3
3/11/2021	James	3
4/7/2021	Barren	4
4/21/2021	James	4
8/6/2021	Barren	5
8/6/2021	James	5
8/27/2021	Barren	6
9/7/2021	James	6
9/20/2021	Barren	7
9/21/2021	James	7
10/7/2021	James	8
10/14/2021	Barren	8

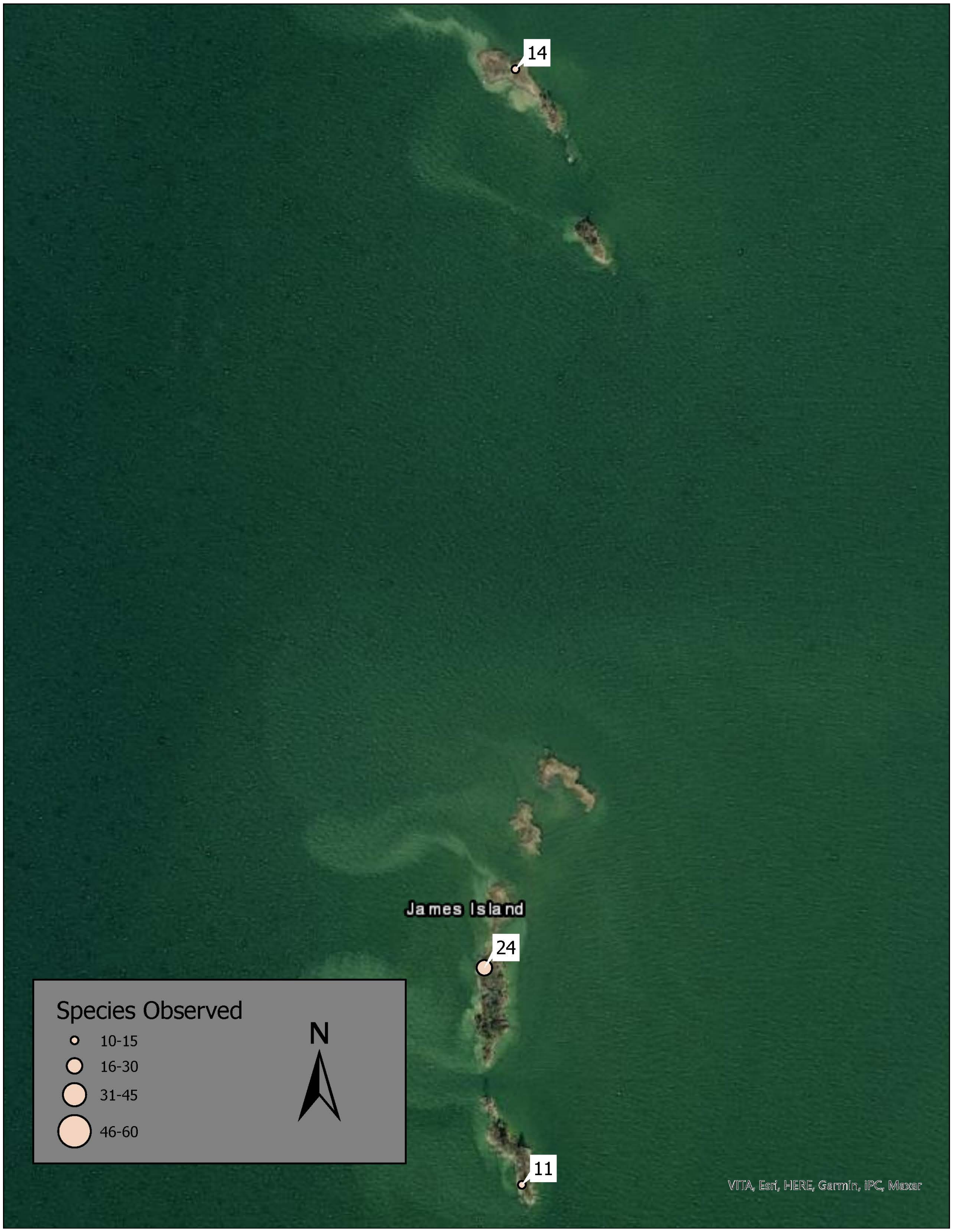
On James Island there were 22 different species of birds observed. Of these, three were observed nesting on James Island; 1) American oystercatcher (*Haematopus palliates)*, 2) Canada goose (*Branta canadensis)*, and 3) great blue heron (*Ardea Herodias)*.

Table 2. Avian species observed on James Island

Common name	***Latin name***	**State Conservation Status***
American Black Duck	*Anas rubripes*	Demonstrably secure
American Oystercatcher	*Haematopus palliatus*	Vulnerable/watchlist
Bald Eagle	*Haliaeetus leucocephalus*	Apparently secure
Black Scoter	*Melanitta americana*	Demonstrably secure
Bufflehead	*Bucephala albeola*	Demonstrably secure
Canada Goose	*Branta canadensis*	Demonstrably secure
Common Grackle	*Quiscalus quiscula*	Demonstrably secure
Common Tern	*Sterna hirundo*	Endangered
Double-crested Cormorant	*Phalacrocorax auritus*	Demonstrably secure
Forster's Tern	*Sterna forsteri*	In Need of Conservation
Great Blue Heron	*Ardea herodias*	Demonstrably secure
Herring Gull	*Larus argentatus*	Demonstrably secure
Laughing Gull	*Leucophaeus atricilla*	Demonstrably secure
Least Sandpiper	*Calidris minutilla*	Demonstrably secure
Long-tailed Duck	*Clangula hyemalis*	Demonstrably secure
Osprey	*Pandion haliaetus*	Demonstrably secure
Red-winged Blackbird	*Agelaius phoeniceus*	Demonstrably secure
Ruddy Turnstone	*Arenaria interpres*	Demonstrably secure
Sanderling	*Calidris alba*	Demonstrably secure
Semipalmated Plover	*Charadrius semipalmatus*	Demonstrably secure

Semipalmated Sandpiper	*Calidris pusilla*	Demonstrably secure
Surf Scoter	*Melanitta perspicillata*	Demonstrably secure

*State Conservation Status is 2016 data obtained from MD Department of Natural Resources



Map 3. Number of species observed by sampling location on James Island

Photo 2. American oystercatcher nests on James Island

On James Island no mammals were observed on camera and no mammal sign was observed.

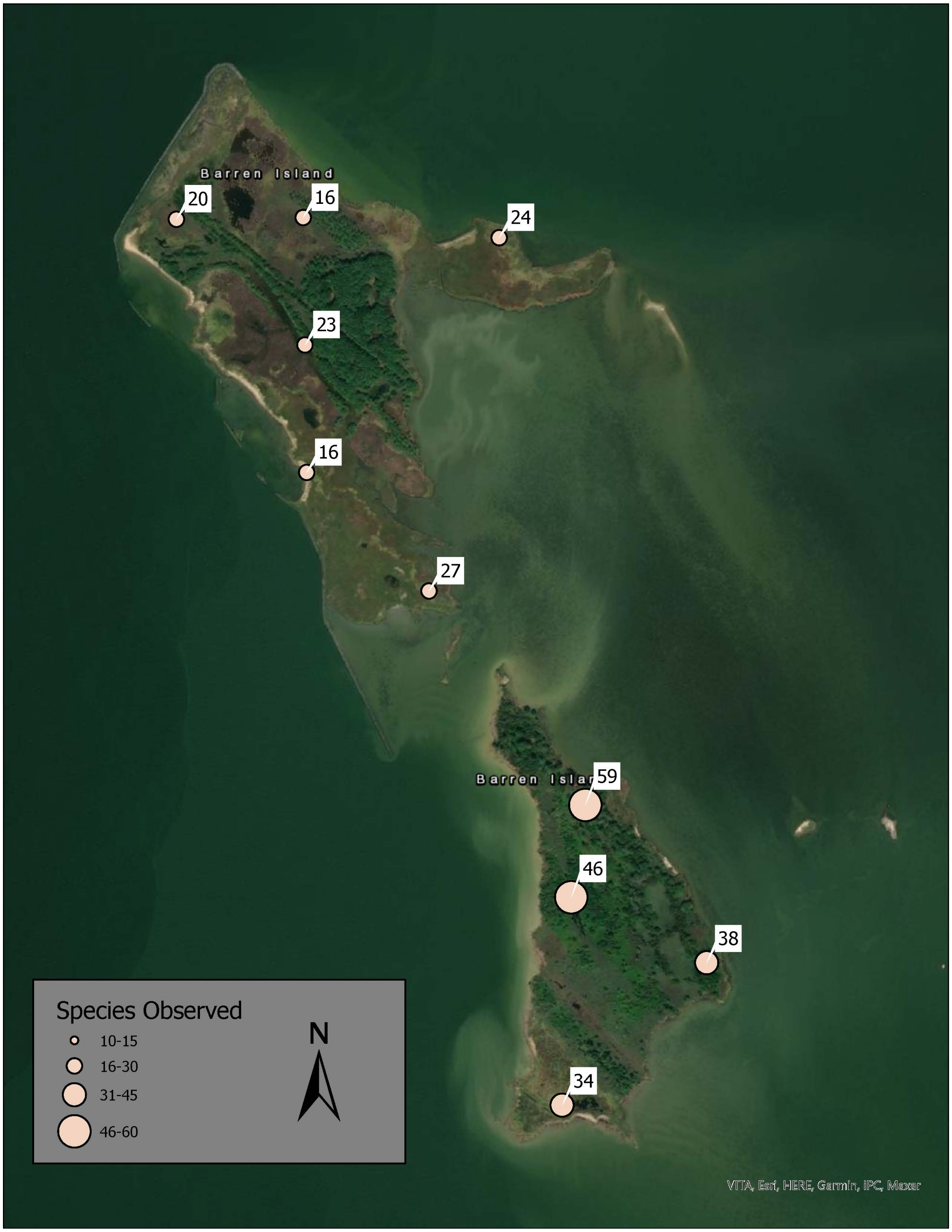
On Barren Island, 65 bird species were observed with the highest number observed on the southern half of the Island. (See Map 3. Number of species observed by sampling location on Barren Island). A large rookery of great blue herons and great egrets (*Ardea alba*) were observed on the southern end of Barren Island. Two Canada goose nests were also observed on the southern end of the Island. A bald eagle (*Haliaeetus leucocephalus)* nest was observed on the northern end of the Island.

Table 3. Avian species observed on Barren island

Common name	**Latin name**	**State Conservation Status***
American Bittern	*Botaurus lentiginosus*	Threatened
American Black Duck	*Anas rubripes*	Demonstrably secure
American Crow	*Corvus brachyrhynchos*	Demonstrably secure
American Goldfinch	*Spinus tristis*	Demonstrably secure
American Redstart	*Setophaga ruticilla*	Demonstrably secure
Bald Eagle	*Haliaeetus leucocephalus*	Apparently secure
Barn Swallow	*Hirundo rustica*	Demonstrably secure
Belted Kingfisher	*Megaceryle alcyon*	Demonstrably secure
Black-and-white Warbler	*Mniotilta varia*	Demonstrably secure
Black-crowned Night-Heron	*Nycticorax nycticorax*	Demonstrably secure
Blue Grosbeak	*Passerina caerulea*	Demonstrably secure
Brown-headed Cowbird	*Molothrus ater*	Demonstrably secure
Brown-headed Nuthatch	*Sitta pusilla*	Demonstrably secure
Brown Pelican	*Pelecanus occidentalis*	Apparently secure
Bufflehead	*Bucephala albeola*	Demonstrably secure
Canada Goose	*Branta canadensis*	Demonstrably secure
Carolina Chickadee	*Poecile carolinensis*	Demonstrably secure
Carolina Wren	*Thryothorus ludovicianus*	Demonstrably secure
Clapper Rail	*Rallus crepitans*	Demonstrably secure
Common Grackle	*Quiscalus quiscula*	Demonstrably secure
Common Yellowthroat	*Geothlypis trichas*	Demonstrably secure

Cooper's Hawk	*Accipiter cooperii*	Demonstrably secure
Double-crested Cormorant	*Phalacrocorax auritus*	Demonstrably secure
Downy Woodpecker	*Picoides pubescens*	Demonstrably secure
Eastern Bluebird	*Sialia sialis*	Demonstrably secure
Eastern Kingbird	*Tyrannus tyrannus*	Demonstrably secure
Eastern Phoebe	*Sayornis phoebe*	Demonstrably secure
European Starling	*Sturnus vulgaris*	Demonstrably secure
Forster's Tern	*Sterna forsteri*	In Need of Conservation
Golden-crowned Kinglet	*Regulus satrapa*	Vulnerable/watchlist
Gray Catbird	*Dumetella carolinensis*	Demonstrably secure
Great Blue Heron	*Ardea herodias*	Demonstrably secure
Great Crested Flycatcher	*Myiarchus crinitus*	Demonstrably secure
Great Egret	*Ardea alba*	Demonstrably secure
Greater Yellowlegs	*Tringa melanoleuca*	Demonstrably secure
Green Heron	*Butorides virescens*	Demonstrably secure
Herring Gull	*Larus argentatus*	Demonstrably secure
Laughing Gull	*Leucophaeus atricilla*	Demonstrably secure
Mallard	*Anas platyrhynchos*	Demonstrably secure
Marsh Wren	*Cistothorus palustris*	Demonstrably secure
Mute Swan	*Cygnus olor*	Demonstrably secure
Northern Cardinal	*Cardinalis cardinalis*	Demonstrably secure
Northern Flicker	*Colaptes auratus*	Demonstrably secure
Northern Mockingbird	*Mimus polyglottos*	Demonstrably secure
Osprey	*Pandion haliaetus*	Demonstrably secure
Pine Warbler	*Setophaga pinus*	Demonstrably secure
Purple Martin	*Progne subis*	Demonstrably secure
Red-bellied Woodpecker	*Melanerpes carolinus*	Demonstrably secure
Red-eyed Vireo	*Vireo olivaceus*	Demonstrably secure
Red-winged Blackbird	*Agelaius phoeniceus*	Demonstrably secure
Royal Tern	*Thalasseus maximus*	Endangered
Ruby-crowned Kinglet	*Regulus calendula*	Demonstrably secure
Ruby-throated Hummingbird	*Archilochus colubris*	Demonstrably secure
Sanderling	*Calidris alba*	Demonstrably secure
Seaside Sparrow	*Ammodramus maritimus*	Demonstrably secure
Song Sparrow	*Melospiza melodia*	Demonstrably secure
Summer Tanager	*Piranga rubra*	Demonstrably secure
Swamp Sparrow	*Melospiza georgiana*	Demonstrably secure
Tufted Titmouse	*Baeolophus bicolor*	Demonstrably secure
Tundra Swan	*Cygnus columbianus*	Demonstrably secure
Turkey Vulture	*Cathartes aura*	Demonstrably secure
Virginia Rail	*Rallus limicola*	Demonstrably secure
White-throated Sparrow	*Zonotrichia albicollis*	Demonstrably secure
Yellow-rumped Warbler	*Setophaga coronata*	Demonstrably secure
Yellow Warbler	*Setophaga petechia*	Demonstrably secure

*State Conservation Status is 2016 data obtained from MD Department of Natural Resources.



Map 4. Number of species observed by sampling location on Barren Island

The camera surveys conducted on Barren Island revealed white-tailed deer (*Odocoileus virginianus)*, red fox (*Vulpes vulpes)*, and river otter (*Lontra canadensis)*. WS also observed raccoon (*Procyon lotor*) and muskrat (*Ondatra zibethicus*) sign while conducting surveys.

Table 4. Mammal species observed on Barren Island

Common name	**Latin name**	**State Conservation* Status**
Red Fox	*Vulpes*	Demonstrably secure
White-tailed Deer	*Odocoileus virginianus*	Demonstrably secure
River Otter	*Lontra canadensis*	Demonstrably secure

*State Conservation Status is 2016 data obtained from MD Department of Natural Resources.

Diamondback terrapin (*Malaclemys terrapin*) was the only reptile observed on James Island. A deceased loggerhead turtle (*Caretta caretta*) was also discovered on the northernmost island of James.

Photo 3. Spotted turtles on Barren Island

On Barren Island, six reptile species were observed during opportunistic surveys.

Table 5. Reptile species observed on Barren Island

Species	***Latin***	**State Conservation Status***
Black Racer	*Coluber constrictor*	Demonstrably secure
Black Rat Snake	*Pantherophis obsoletus*	Demonstrably secure
Eastern Box Turtle	*Terrapene carolina*	Demonstrably secure
Spotted Turtle	*Clemmys guttata*	Demonstrably secure
Diamondback Terrapin	*Malaclemys terrapin*	Demonstrably secure
Mud Turtle	*Kinosternon subrubrum*	Demonstrably secure

*State Conservation Status is 2016 data obtained from MD Department of Natural Resources.

Photo 4. Diamondback terrapin (L) and eastern box turtle (R) observed on Barren Island

Constraints

We attempted to perform all surveys at both Barren and James on the same day or in very close proximity. However, due to weather and time constraints, the surveys were occasionally a couple of weeks apart. At minimum, we attempted to complete all the surveys on a single Island in one day. There was only one occasion, January 13th, 2021 that we were not able to complete all Barren surveys on the same day. This was due to tide limitations.

Water levels on the eastern side of Barren Island were extremely shallow making boat access difficult; we planned for this by monitoring for the best wind/tide combinations, and in some situations, this delayed the surveys. In addition, data from three point counts on March 11, 2021 at James Island were lost due to technical issues.

Photo 5. James Island January 2021

Photo 6. James Island August 2021- notice the results of erosion in 8 months

Discussion/Recommendations:

James Island is eroding at such a fast rate WS doesn't expect it to last much longer than a year. During our survey period (January 2021-October 2021), WS estimated it lost over half of the existing ground. Therefore, any additional work conducted on James should be conducted soon. (See Photo 5 & 6)

WS never observed squirrels (*Sciurus carolinensis*) or squirrel sign on Barren Island, either in person or on camera. Raccoon sign was observed on Barren, no raccoons were observed on camera. Based on lack of sign and video, there did not appear to be a large raccoon population on the Island.

Some additional discoveries of note were the five spotted turtles (*Clemmys guttata)* found on Barren Island. Observations were in different locations, and therefore most of these were most likely different individuals. WS also discovered two recently deceased eastern box turtles (*Terrapene carolina Carolina)* on the north end of Barren Island before later finding a live eastern box turtle on the very southern end of the Island.

James Island has breeding pairs of American oystercatchers, one was located on a southern sand island and one located on a sand island to the north. WS also discovered a deceased loggerhead turtle on the northernmost island.

Photo 7. Loggerhead turtle carcass discovered on James Island

Acknowledgements

WS is grateful for the opportunity to work with USACE and USFWS on such an extensive Chesapeake Bay restoration project. If any other wildlife survey or protection work arises, WS would be happy to assist. Additional questions should be directed to District Supervisor, Trevor Michaels at 443-205-2726 or via email at trevor.a.michaels@usda.gov

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C3: Draft Report- Breeding Bird Monitoring at Barren Island (Audobon, 2021)

Audubon | MID-ATLANTIC

Breeding Bird Monitoring at Barren Island, 2021

Draft Report – September 28, 2021

David Curson, Director of Bird Conservation

Introduction

A breeding season survey of birds was completed at Barren Island during 2021 using SHARP marshbird survey protocol in order to collect baseline data on marshbirds prior to the application of dredged materials as part of the Mid-Bay project. The bird survey was completed by David Curson of Audubon Mid-Atlantic, under contract from USFWS Chesapeake Bay Field Office (CBF0). Christina Olson of the USACE Baltimore District assisted with survey planning, field data collection, and data entry and created the location map, while interning at CBFO. Boat transport to Barren Island was provided by CBFO staff.

Methods

Birds at Barren Island were surveyed during the breeding season (May – July), using the SHARP marshbird monitoring protocol (Saltmarsh Habitat and Avian Research Project – see http://www.tidalmarshbirds.org/). This protocol consists of point count surveys, and includes call broadcasts to elicit responses from secretive marshbirds and other selected species. In Maryland, 7 species are included in the broadcast: Black Rail, Least Bittern, Virginia Rail, King Rail, Clapper Rail, Common Moorhen, Song Sparrow. The broadcast section of the survey is preceded by a 5-minute period of silence and the entire point count survey lasted 12 minutes. Surveys were conducted in morning hours between sunrise (5:45am) and 10am at five points across Barren Island. Two replicate surveys were completed at each point. The first survey visit at all points was on May 18 and the second survey visit was on June 7.

A vegetation survey was completed within a 50m-radius circle centered on each bird survey point, following SHARP protocol. The vegetation survey measured the approximate extent (in six categories) of different wetland habitats including: low marsh, high marsh, salt marsh terrestrial border, brackish marsh terrestrial border, invasive species (*Phragmites*), “pannes, pools and creeks”, open water, upland, and wrack. The number of dead snags was counted and the extent (percentage cover) of any dominant plant species was estimated by eye on the ground. This methodology describes the vegetation types sufficiently to interpret bird abundance measurements.

Survey points were selected in order to maximize the coverage of potential habitat for tidal marsh birds across the two remaining fragments of Barren Island. Initial inspection of aerial imagery yielded six potential survey points, but one of these (on the southern island fragment) was rejected after a field reconnaissance visit found it to be dominated by *Phragmites* and regenerating loblolly pine. Of the final array of five survey points, four points were located on the northern island fragment and one was located on the southern island fragment (see Figure 1). During surveys, all birds detected over an unlimited distance were counted, and these were recorded in one of three distance categories: 0-50 m, 51-100 m, and >100 m. The aerial image in Figure 1. indicates that a little over half of the marsh habitat on Barren Island lies within 100m of a survey point, and virtually all of the marsh habitat lies within 200m of a survey point. Since most marshbirds can be detected up to 200 m, our survey covered the great majority of marsh habitat on the island.

Figure 1. SHARP marshbird survey points at Barren Island in 2021.

Table 1 shows the dominant marsh vegetation at each of the survey points. In the northwestern portion of the island, at points BAR1 and BAR2, the marsh is dominated by black needlerush (*Juncus roemerianus)*. In the southeastern part of the island at points BAR3, BAR4 and BAR5, meadows of *Spartina patens*, *Spartina alterniflora* (shortform), and *Distichlis spicata* predominate.

Table 1. Percentage extent of dominant plant species at each of five survey points at Barren Island in 2021.

	Cover (%) within 50 m-radius circle				
Plant species	**BAR1**	**BAR2**	**BAR3**	**BAR4**	**BAR5**
Iva frutescens	0	0	0	0	5
Juncus roemerianus	75	75	0	0	0
Distichlis spicata	10	0	0	0	30
Spartina patens	10	10	5	50	45
Spartina alterniflora (short)	0	0	95	50	15

Results and Discussion

A total of 37 bird species was observed on Barren Island during the two days on which surveys were conducted in 2021. Table 2 shows the mean relative abundance of each species across the five survey points. Although tidal marsh birds were the focus of the surveys, the survey points were close enough to neighboring forest, shrub and open water habitats to document species in these habitats. Of the 37 species detected, 13 species predominantly use marsh habitats, 13 inhabit forest or forest edge habitats, seven species are habitat generalists and four species are aerial insectivores (swallows and swifts). Two of the forest species, Blackpoll Warbler and Blackburnian Warbler, were migrant individuals on their way to breeding grounds in Appalachian/Boreal coniferous forest further north. All other forest and generalist bird species were within range of breeding habitat and could have been breeding on the island.

Table 2. Mean relative abundance (detections/survey point) of birds at Barren Island in 2021. P indicates species observed but not within the 12-minute survey period.

Species	**Habitat Assemblage**	**Detections <100m/survey visit (n=10 pts)**	**Detections all distances /survey visit (n=10 pts)**
American Crow	Generalist	0	0.2
Bald Eagle	Generalist	0.1	0.2
Barn Swallow	Aerial	0.2	0.2
Blackburnian Warbler	Forest	0.1	0.1
Black-crowned Night Heron	Marsh	0	0.1
Blackpoll Warbler	Forest	0	0.1
Boat-tailed Grackle	Marsh	0.8	1.2
Canada Goose	Marsh	0.2	0.2
Carolina Chickadee	Forest	0	0.1
Carolina Wren	Forest	0.4	1.5
Chimney Swift	Aerial	0.1	0.1
Clapper Rail	Marsh	2.3	2.9

Common Grackle	Generalist	0.3	0.3
Common Yellowthroat	Marsh	0.2	0.4
Double-crested Cormorant	Marsh	0.1	0.1
Eastern Kingbird	Generalist	0.6	0.9
European Starling	Generalist	0.1	0.1
Great Blue Heron	Marsh	1.3	2.3
Great Egret	Marsh	0	0.6
Great-crested Flycatcher	Forest	0.1	0.4
Least sandpiper	Marsh	1.1	2.1
Mallard	Marsh	0.3	0.3
Northern Cardinal	Forest	0	0.4
Northern Mockingbird	Forest	0.1	0.1
Northern Parula	Forest	0.1	0.1
Orchard Oriole	Forest	0	0.6
Osprey	Generalist	0.2	0.3
Pine Warbler	Forest	0.2	0.6
Prairie Warbler	Forest	0	0.1
Purple Martin	Aerial	0.4	0.4
Red-winged Blackbird	Marsh	5.7	7.5
Summer Tanager	Forest	0	0.1
Tree Swallow	Aerial	0.3	0.3
Tricolored Heron	Marsh	0	0.1
Turkey Vulture	Generalist	0	0.2
Willet	Marsh	P	P
Yellow Warbler	Forest	0.2	0.3

Marshbird Community

Table 3 shows relative abundance of marshbirds at each survey point individually in order to show variation across the marsh habitat patches on the island. Not all of the 13 species breed on Barren Island. Least Sandpiper is a long-distance migrant that nests in the American sub-arctic region. The nearest known nesting colonies of Black-crowned Night Heron and Tricolored Heron are on Bloodsworth Island and birds from these colonies visit other islands to forage. Most of the remaining species in Table 3 are common birds which use a wide variety of wetland habitat types. Great Blue Heron and Great Egret nest in trees on Barren Island and are documented more fully by Maryland DNR's colonial waterbird survey.

Only one salt marsh obligate species, Clapper Rail, was detected on the surveys. Clapper Rails were common at points BAR3 and BAR4 in the *Spartina* meadows of the southern and eastern portions of the northern island fragment. Clapper Rails were detected much less frequently in the needlerush marsh, and were not detected in the small patch of *Spartina* meadow at the southern tip of the island (BAR5). Another salt marsh obligate breeder, Willet, was not detected during the surveys but two individuals were present at point BAR1 outside the survey period on May 18. These may have been migrants or may have been prospecting for a nest site – however they were not detected on the second visit on June 7.

Table 3. Mean relative abundance (detections/survey point) of marshbirds at each of five survey points at Barren Island in 2021. P indicates species observed but not within the 12-minute survey period.

		Mean detections/survey visit (n=2) at each survey point				
Species	**Habitat assemblage**	**BAR1**	**BAR2**	**BAR3**	**BAR4**	**BAR5**
Black-crowned Night Heron	Marsh	0	0	0.5	0	0
Boat-tailed Grackle	Marsh	2	1.5	1	1.5	0
Canada Goose	Marsh	1	0	0	0	0
Clapper Rail	Marsh	0	1	5.5	8	0
Common Yellowthroat	Marsh	1.5	0	0.5	0	0
Double-crested Cormorant	Marsh	0	0.5	0	0	0
Great Blue Heron	Marsh	0	0	3	2	6.5
Great Egret	Marsh	0.5	0.5	2	0	0
Least sandpiper	Marsh	3	6.5	0	0	1
Mallard	Marsh	0	0	0	1	0.5
Red-winged Blackbird	Marsh	9.5	9	4.5	7.5	7
Tricolored Heron	Marsh	0	0	0	0.5	0
Willet	Marsh	P	0	0	0	0

The absence of tidal marsh sparrows and Marsh Wrens during the surveys was notable. Seaside Sparrow was found historically on Barren Island, during both Breeding Bird Atlas projects (1983-1987 and 2002-2006) and more recently (M. Whitbeck, pers.comm). This species' apparent absence from Barren Island in 2021 is likely due to the small size of the remaining patches of marsh habitat as well as the island's isolation from populations in mainland Dorchester County. Saltmarsh Sparrows were not recorded on Barren Island during earlier Breeding Bird Atlas projects. Marsh Wren was recorded as probably breeding on the southern portion of Barren Island during the first Breeding Bird Atlas (1983-1987), but was not detected during 2002-2006.

Overall, the marshird community at Barren Island is depauperate compared to similar marsh habitat in mainland Dorchester County, and this reflects the small size of the remaining marsh patches and their isolation from the nearest areas of similar habitat on the mainland.

Field datasheets are stored at the offices of Audubon Mid-Atlantic in Baltimore, digital data from the surveys are in Excel files available from Audubon Mid-Atlantic. For questions on this project please contact David Curson by email at david.curson@audbon.org.

C4: Compiled Survey Data- Avian, Mammals, and Herpetofauna Tables

Birds

Bird Point Counts: Observations for each point count were separated by species observed within 50 yds and between 50-100 yds. No observations were counted at greater than 100 yds. Surveys have been conducted by USDA Animal and Plant Health Inspection Service (APHIS), Anchor QEA, and Audubon Mid-Atlantic.

Monthly Summary of Bird Count Surveys for Observations Greater than 50 Yards (APHIS)

	Survey Month (2021)							
Species	**January**	**February**	**March**	**April**	**August**	**September**	**October**	**Total**
American Crow		1	3					4
Bald Eagle	1			1	2		6	10
Blue Grosbeak					1			1
Brown Pelican					4		1	5
Brown-headed Cowbird				4				4
Brown-headed Nuthatch		1						1
Bufflehead			2					2
Canada Goose			145	2				147
Carolina Wren	3	3	1	6	1			14
Clapper Rail					1			1
Common Yellowthroat					2			2
Cooper's Hawk							2	2
Double-crested Cormorant				59		10	85	154
Eastern Bluebird			2	1				3
Eastern Kingbird					2			2
Forster's Tern				1	2			3
Great Blue Heron	1		1	28	24			54
Great Egret				26	7	3		36
Greater Yellowlegs				2				2
Herring Gull		2			2			4
Laughing Gull					1			1
Northern Cardinal			2	3	2			7
Northern Flicker		1	1					2
Northern Mockingbird				1		1		2
Osprey					11			11
Pine Warbler				1				1
Red-winged Blackbird		4	9	8				21
Royal Tern							3	3
Ruby-throated Hummingbird					1			1
Song Sparrow	1		1					2
Summer Tanager					1			1
Swamp Sparrow				1				1
SURVEY TOTAL	**6**	**12**	**167**	**144**	**64**	**14**	**97**	**504**

Monthly Summary of Bird Count Surveys for Observations Less than 50 Yards (APHIS)

	Survey Month (2021)							
Species	**January**	**February**	**March**	**April**	**August**	**September**	**October**	**Total**
American Goldfinch	2							2
American Redstart					1			1
Bald Eagle				1			1	2
Barn Swallow					5			5
Black-and-white Warbler					1			1
Black-crowned Night-Heron							1	1
Brown-headed Cowbird				2				2
Brown-headed Nuthatch	4	4	3	6	2		6	25
Carolina Chickadee	1	1	1				2	5
Carolina Wren	7	5	5	9	13		4	43
Common Grackle				1				1
Cooper's Hawk							1	1
Double-crested Cormorant					5		84	89
Downy Woodpecker	1							1
Eastern Bluebird	11	10	1	1				23
Eastern Kingbird					6	1		7
Eastern Phoebe							3	3
European Starling		8	1	1	1		6	17
Forster's Tern				2			20	22
Golden-crowned Kinglet	1	1				3	9	14
Gray Catbird					1			1
Great Blue Heron			6	32	8			46
Great Crested Flycatcher					1		2	3
Great Egret				37	6			43
Green Heron					1			1
Laughing Gull				1				1
Marsh Wren					1			1
Northern Cardinal	5	7	1	2	11	1	1	28
Northern Flicker							1	1
Northern Mockingbird		1						1
Osprey				1	14			15
Purple Martin					3			3
Red-bellied Woodpecker	1							1
Red-eyed Vireo						6		6
Red-winged Blackbird		1		2	25	1		29
Ruby-crowned Kinglet			1	1				2
Ruby-throated Hummingbird					3			3

	Survey Month (2021)							
Species	**January**	**February**	**March**	**April**	**August**	**September**	**October**	**Total**
Sanderling							20	20
Seaside Sparrow					1			1
Song Sparrow	8	6	9	1			4	28
Summer Tanager					1			1
Swamp Sparrow	9	4	5	1				19
Tufted Titmouse		1						1
Turkey Vulture					1			1
Virginia Rail						1		1
White-throated Sparrow			5	1				6
Yellow Warbler						2		2
Yellow-rumped Warbler	8	4	8	6		2		28
SURVEY TOTAL	**58**	**53**	**46**	**108**	**111**	**17**	**165**	**558**

Compilation by Species for Bird Count Surveys (APHIS)

Species	Count for Observations Greater than 50 m	Count for Observations Less than 50 m
American Goldfinch	0	2
American Crow	4	0
American Redstart	0	1
Bald Eagle	4	1
Barn Swallow	0	5
Black-and-white Warbler	0	1
Blue Grosbeak	1	0
Brown Pelican	4	0
Brown-headed Cowbird	4	2
Brown-headed Nuthatch	1	19
Bufflehead	2	0
Canada Goose	147	0
Carolina Chickadee	0	3
Carolina Wren	14	39
Clapper Rail	1	0
Common Grackle	0	1
Common Yellowthroat	2	0
Double-crested Cormorant	59	5
Downy Woodpecker	0	1
Eastern Bluebird	3	23
Eastern Kingbird	2	6
European Starling	0	11
Forster's Tern	3	2

Species	Count for Observations Greater than 50 m	Count for Observations Less than 50 m
Golden-crowned Kinglet	0	2
Gray Catbird	0	1
Great Blue Heron	54	46
Great Crested Flycatcher	0	1
Great Egret	33	43
Greater Yellowlegs	2	0
Green Heron	0	1
Herring Gull	4	0
Laughing Gull	1	1
Marsh Wren	0	1
Northern Cardinal	7	26
Northern Flicker	2	0
Northern Mockingbird	1	1
Osprey	11	15
Pine Warbler	1	0
Purple Martin	0	3
Red-bellied Woodpecker	0	1
Red-winged Blackbird	21	28
Ruby-crowned Kinglet	0	2
Ruby-throated Hummingbird	1	3
Seaside Sparrow	0	1
Song Sparrow	2	24
Summer Tanager	1	1
Swamp Sparrow	1	19
Tufted Titmouse	0	1
Turkey Vulture	0	1
White-throated Sparrow	0	6
Yellow-rumped Warbler	0	26
Survey Total	**393**	**376**

Flush Count Survey Results (2021) (APHIS)

	Survey Month (2021)						
Species	**January**	**February**	**March**	**April**	**August**	**October**	**Total**
Clapper Rail						1	1
Great Blue Heron				2			2
Red-winged Blackbird					7		7
Seaside Sparrow					1	1	2
Swamp Sparrow	3	1	5	1			10
Grand Total	**3**	**1**	**5**	**3**	**8**	**2**	**22**

Opportunistic Sampling Survey Results (2021) (APHIS)

	Survey Month (2021)							
Species	**January**	**February**	**March**	**April**	**August**	**September**	**October**	**Total**
American Bittern						1		1
American Black Duck	1		6					7
American Crow		1				1		2
Bald Eagle	3	1	2	2		1		9
Belted Kingfisher						1		1
Brown Pelican				10	250	18	4	282
Brown-headed Nuthatch	2							2
Bufflehead	16							16
Carolina Wren	3							3
Clapper Rail						1		1
Double-crested Cormorant					20	250		270
Downy Woodpecker	1							1
Eastern Bluebird	5							5
Eastern Kingbird						1		1
Gray Catbird	1							1
Great Blue Heron	2 + possible nest	1	27	150		6		186
Great Egret				broken eggs				
Mallard		2	2					4
Mute Swan						2		2
Northern Cardinal	5							5
Northern Flicker	2							2
Red-bellied Woodpecker	2							2
Red-winged Blackbird	2							2
Song Sparrow	2							2
Swamp Sparrow	3							3
Tundra Swan		150	27					177
Virginia Rail						1		1
White-throated Sparrow	1							1
Yellow-rumped Warbler	2							2
SURVEY TOTAL	**53**	**155**	**64**	**162**	**270**	**283**	**4**	**991**

Timed Surveys – September 3, 2020 (Anchor QEA, 2021a)

Species Observed				Number Observed Summer 2020
Scientific Name	Common Name	Status[a]	Habitat[b]	
Corvus brachyrhynchos	American crow	R	FO	6
Setophaga ruticilla	American redstart	M	S/S	1
Haliaeetus leucocephalus	Bald eagle	R, M	F, FO	11
Riparia riparia	Bank swallow	M	FO	9
Hirundo rustica	Barn swallow	M	FO	217
Mniotilta varia	Black-and-white warbler	M	F	2
Polioptila caerulea	Blue-gray gnatcatcher	S, M	S/S	2
Dolichonyx oryzivorus	Bobolink	M	FO	1
Pelecanus occidentalis	Brown pelican	S	O, FO, SH	1192
Sitta pusilla	Brown-headed nuthatch	R	F	3
Thryothorus ludovicianus	Carolina wren	R	F, S/S	10
Rallus crepitans	Clapper rail	R	S	3
Geothlypis trichas	Common yellowthroat	S, M	S/S	1
Phalacrocorax auratus	Double-crested cormorant	S, M	O, FO, SH	723
Tyrannus tyrannus	Eastern kingbird	S, M	S	1
Contopus virens	Eastern wood-pewee	S, M	F	1
Sterna forsteri	Forster's tern	S, M	O, FO	62
Dumetella carolinensis	Gray catbird	S, M	S/S	1
Larus marinus	Great black-backed gull	R, M	O, FO	5
Ardea herodias	Great blue heron	R	F, O, FO, SH	18
Myiarchus crinitus	Great crested flycatcher	S, M	F	3
Ardea alba	Great egret	S, M	S, FO, SH	15
Larus argentatus	Herring gull	R, M	O	17
Leucophaeus atricilla	Laughing gull	S, M	O, FO, SH	106
Empidonax minimus	Least flycatcher	M	S	1
Cardinalis cardinalis	Northern cardinal	R	F, S/S	9
Pandion haliaetus	Osprey	S, M	F, O, FO	27
Setophaga pinus	Pine warbler	S, M	F	3
Agelaius phoeniceus	Red-winged blackbird	R	F, S/S	6
Larus delawarensis	Ring-billed gull	M, W	O, FO	3
Thalasseus maximus	Royal tern	S, M	O, FO	10
Archilochus colubris	Ruby-throated hummingbird	M	F, FO, S/S	4
Calidris alba	Sanderling	M	FO, SH	6
Charadrius semipalmatus	Semipalmated plover	M	SH	2
Actitis macularius	Spotted sandpiper	M	SH	1

Species Observed				Number Observed Summer 2020
Scientific Name	Common Name	Status[a]	Habitat[b]	
Tachycineta bicolor	Tree swallow	M	FO	5
Cathartes aura	Turkey vulture	R, M	FO	3

Notes:

a. Status:
- M: migrant
- R: year-round resident
- S: summer resident
- W: winter resident

b. Habitat:
- F: Forest
- S: saltmarsh
- O: open water
- FO: flyover
- MF: mud flat
- SH: shore
- S/S: scrub-shrub

Timed Surveys – May 26, 2021 (Anchor QEA, 2021a)

Species Observed				Number Observed[c]	
Scientific Name	Common Name	Status[a]	Habitat[b]	Morning Survey	Afternoon Survey
Corvus brachyrhynchos	American crow	R	F	4	1
Spinus tristis	American goldfinch	R	FO	0	1
Haliaeetus leucocephalus	Bald eagle[d]	R	F, FO	12	11
Hirundo rustica	Barn swallow	M	FO	7	0
Quiscalus major	Boat-tailed grackle[d]	R	FO, S	13	11
Pelecanus occidentalis	Brown pelican	S	O, FO	0	25
Molothrus ater	Brown-headed cowbird	R	FO	2	0
Sitta pusilla	Brown-headed nuthatch[d]	R	F	1	0
Poecile carolinensis	Carolina chickadee	R	F	2	0
Thryothorus ludovicianus	Carolina wren[d]	R	F, S/S	8	3
Rallus crepitans	Clapper rail	R	S	8	0
Quiscalus quiscula	Common grackle[d]	R	FO	4	5
Sterna sp.	Common/Forster's tern	S, M	O, FO	3	2
Phalacrocorax auritus	Double-crested cormorant	S, M	O, FO, SH	89	147
Picoides pubescens	Downy woodpecker[d]	R	F	1	0
Sialia sialis	Eastern bluebird[d]	R	F	1	0
Tyrannus tyrannus	Eastern kingbird[d]	S, M	S	5	5
Contopus virens	Eastern wood-pewee	S, M	F	1	0
Sturnus vulgaris	European starling[d]	R	FO	2	4
Sterna forsteri	Forster's tern	S, M	O	0	2
Plegadis falcinellus	Glossy ibis	S, M	FO	0	5
Larus marinus	Great black-backed gull	R, M	O, FO	0	2

Species Observed				**Number Observed**[c]	
Scientific Name	**Common Name**	**Status**[a]	**Habitat**[b]	**Morning Survey**	**Afternoon Survey**
Ardea herodias	Great blue heron[d]	R	F, O, FO, SH, S	32	31
Myiarchus crinitus	Great crested flycatcher	S, M	F	6	2
Ardea alba	Great egret[d]	S, M	FO, SH, F	21	15
Larus argentatus	Herring gull	R, M	SH, FO	2	1
Leucophaeus atricilla	Laughing gull	S, M	FO	0	1
Sternula antillarum	Least tern	S, M	FO	1	0
Cardinalis cardinalis	Northern cardinal[d]	R	S/S	3	2
Mimus polyglottos	Northern mockingbird	R	F	2	1
Icterus spurius	Orchard oriole	R, M	F	3	1
Pandion haliaetus	Osprey[d]	S, M	O, FO, SH	17	20
Setophaga pinus	Pine warbler	S, M	F	5	0
Vireo olivaceus	Red-eyed vireo	S, M	F	2	0
Agelaius phoeniceus	Red-winged blackbird[d]	R	S, S/S	21	20
Thalasseus maximus	Royal tern	S, M	SH	3	0
Charadrius semipalmatus	Semipalmated plover	M	SH	5	0
Tachycineta bicolor	Tree swallow	M	FO	1	3
Cathartes aura	Turkey vulture	R, M	FO	0	10
--	Unidentified gull	--	FO	0	1
Calidris sp.	Unidentified peep	M	SH, FO	6	0
--	Unidentified shorebird	--	FO	1	0
Tringa semipalmata	Willet	S, M	SH	1	0

Notes:

--: unidentified species

a. Status:
- M: migrant
- R: year-round resident
- S: summer resident
- W: winter resident

b. Habitat:
- F: Forest
- S: saltmarsh
- O: open water
- FO: flyover
- MF: mud flat
- SH: shore
- S/S: scrub-shrub

c. Individual birds may have been observed during both surveys

d. Confirmed breeding

SHARP Callback Survey Results (2021) (Audubon)

Species	May	June	Total
American Crow	2		2
Bald Eagle	1	1	2
Barn Swallow	2		2
Blackburnian Warbler	1		1
Black-crowned Night Heron	1		1
Blackpoll Warbler	1		1
Boat-tailed Grackle	3	9	12
Canada Goose		1	1
Carolina Chickadee	2		2
Carolina Wren	9	6	15
Chimney Swift	1		1
Clapper Rail	13	16	29
Common Grackle	3		3
Common Yellowthroat	1	3	4
Double-crested Cormorant	1		1
Eastern Kingbird	8	1	9
European Starling	1		1
Great Blue Heron	9	14	23
Great Egret	4		4
Great-crested Flycatcher	1	5	6
Least sandpiper	21		21
Mallard	5		5
Northern Cardinal	2	2	4
Northern Mockingbird	1		1
Northern Parula	1		1
Orchard Oriole	5	1	6
Osprey	2	1	3
Pine Warbler	2	4	6
Prairie Warbler		1	1
Purple Martin	2	2	4
Red-winged Blackbird	28	47	75
Summer Tanager	1		1
Tree Swallow		1	1
Tricolored Heron	2	1	3
Turkey Vulture		2	2
Willet	2		2
Yellow Warbler	2	1	3
TOTAL	**140**	**119**	**259**

Mammals

Camera Results (APHIS)

	Survey Month (2021)		
Species	**January**	**February**	**March**
Red Fox	√	√	√
River Otter		√	
White-tailed Deer	√	√	√
Canada goose		√	

Opportunistic Sampling Survey Results (APHIS)

	Survey Month (2021)					
Species	**January**	**February**	**March**	**April**	**August**	**Total**
Muskrat	scat					
Red Fox	1					1
River Otter		1				1
White-tailed Deer	1					1

Herpetofauna

Opportunistic Sampling Survey Results (APHIS)

	Survey Month (2021)							
Species	**January**	**February**	**March**	**April**	**August**	**September**	**October**	**Total**
Black Racer				1				1
Black Rat Snake	1							1
Diamondback terrapin							1	1
Eastern Box Turtle		1		1				2
Mud Turtle				1				1
Musk or Mud turtle shell				1				1
Spotted Turtle		2	2	5				9
SURVEY TOTAL	**1**	**3**	**2**	**9**	**0**	**0**	**1**	**16**

C5: Submerged Aquatic Vegetation (SAV) SPRING 2020 Surveys at James and Barren Island (Anchor, 2021b)

November 2021
Mid-Chesapeake Bay Island Environmental Surveys

Submerged Aquatic Vegetation (SAV) Survey James and Barren Islands

Prepared for Maryland Environmental Service

In coordination with Maryland Department of Transportation, Maryland Port Administration

November 2021
Mid-Chesapeake Bay Island Environmental Surveys

Submerged Aquatic Vegetation Survey
James and Barren Islands

Prepared for
Maryland Environmental Service
259 Najoles Road
Millersville, Maryland 21108

Prepared by
Anchor QEA, LLC
300 East Lombard Street, Suite 1510
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TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

ABBREVIATIONS

DGPS	differential global positioning system
DO	dissolved oxygen
EIS	environmental impact statement
ft	feet
FS	feasibility study
m^2	square meter
MDNR	Maryland Department of Natural Resources
MDOT MPA	Maryland Department of Transportation Maryland Port Administration
MES	Maryland Environmental Service
mg/L	milligrams per liter
NTU	Nephelometric Turbidity Unit
ppt	parts per thousand
Project	Mid-Chesapeake Bay Island Ecosystem Restoration Project
SAV	submerged aquatic vegetation
USACE	U.S. Army Corps of Engineers
VIMS	Virginia Institute of Marine Science

1 Introduction

Maryland Department of Transportation Maryland Port Administration (MDOT MPA) and U.S. Army Corps of Engineers (USACE) Baltimore District are proposing to restore 2,144 acres of remote island habitat in the Chesapeake Bay. In 2009, the Baltimore District USACE prepared an integrated feasibility study (FS) and environmental impact statement (EIS) for the Mid-Chesapeake Bay Island Ecosystem Restoration Project (Project), which focuses on restoring and expanding island habitat to provide hundreds of acres of wetland and terrestrial habitat for fish, shellfish, reptiles, amphibians, birds, and mammals through the beneficial use of dredged material (USACE 2009). The FS/EIS identified James Island and Barren Island, located in western Dorchester County, Maryland, as the preferred alternatives for island restoration (Figure 1-1).

James Island is a privately owned uninhabited island, situated near the mouth of the Little Choptank River, approximately 1 mile north of Taylors Island. Since 1847, more than 800 acres have eroded, and James Island currently consists of three eroding island remnants totaling approximately 3 acres. The Project will restore 2,072 acres of this island.

Barren Island is an uninhabited island, located in the Chesapeake Bay in Dorchester County, Maryland, near the Honga River and immediately west of Hoopers Island. At the time of the feasibility study (2004), Barren Island consisted of three eroding island remnants totaling approximately 180 acres in size (197 acres including tidal flats). Based on 2020 surveys, only 138 acres of Barren Island remains. Barren Island experiences a long-term erosion rate of 14 ft per year (3 – 4 ft per year in recent years) or approximately 4.1 acres per year. At this rate, Barren Island could be completely lost by the early 2050s (2050-2055) without ongoing and future protection measures. The Project will restore 72 acres of Barren Island, while also protecting approximately 1,325 acres of potential submerged aquatic vegetation (SAV) habitat adjacent to the island.

USACE and MDOT MPA began the Project in the 1990s to achieve the following three main goals:

1. Restore remote island habitat within the Mid-Chesapeake Bay.
2. Optimize the placement capacity for sediment dredged from shipping channels.
3. Cause no harm to the environment around the restoration site.

As part of the FS, a sampling program was implemented to document the existing environmental conditions on and adjacent to James Island and Barren Island (USACE 2009). Four seasonal studies were completed in 2002 and 2003 to document baseline environmental conditions. Both aquatic and terrestrial sampling were conducted, and the environmental surveys included water quality and nutrient analyses, fish and plankton sampling, benthic sampling and sediment testing, vegetation identification and mapping (both aquatic and terrestrial), submerged aquatic vegetation surveys, avian and other wildlife observations (both aquatic and terrestrial), horseshoe crab spawning surveys, diamondback terrapin nesting surveys, crab pot surveys, clam surveys, and pound net fishers phone surveys (USACE 2009).

Currently, the FS/EIS is being updated to provide timely data to support design of the Project elements at James Island and Barren Island. The purpose of this report is to summarize the results of SAV surveys that were conducted to document the current environmental conditions at the Project area. Design for the island restoration is ongoing and the conditions documented in this report will serve as the baseline environmental conditions of the Project area prior to the initiation of restoration activities.

SAV surveys in the Chesapeake Bay have been conducted since the 1970s in the vicinity of James and Barren Islands. Historic data in the project areas indicates that SAV was documented near James Island as early as 1990 and near Barren Island as early as 1978. Since those initial observations, the extent of the SAV has fluctuated significantly, ranging from 2 to 4 acres near James Island and from 5 to 360 acres around vicinity of the Barren Island.

During the initial studies for the FS/EIS at James Island (USACE 2009), widgeon grass (*Ruppia maritima*) and small patches of sea lettuce (*Ulva lactuca*), a macroalgae were observed in the during the summer study along the eastern shoreline. Horned pondweed (*Zannichellia palustris*) was observed in the spring surveys, along the eastern shoreline in an area similar to where SAV was observed the previous summer.

In the Barren Island studies for the FS/EIS (USACE 2009), widgeon grass (*Ruppia maritima*) (summer only) and horned pondweed (*Zannichellia palustris*) (spring only) were the only species of SAV observed. The wigeon grass was found in patchy beds along the eastern shorelines of Barren Island, and the horned pondweed. was observed in very low densities along the western shoreline and higher densities along the northern and eastern shorelines.

Figure 1
Mid-Chesapeake Bay Island Ecosystem Restoration Project Area

2 Methods

SAV surveys were focused in the area where the proposed restoration of Barren and James Islands overlap with the location and density of SAV as mapped by aerial surveys by Virginia Institute of Marine Science (VIMS) from 2014 to 2019 (Orth et al. 2015 to 2020). At James Island, the eastern shoreline of the southern remnant was the focus area. At Barren Island, the areas to be surveyed for SAV included the northeast shoreline, the area between the northern and southern remnants, and the southern tip of the southern remnant. In each of the target areas, transects were identified with sampling points along each transect to collect SAV data within a quadrat. The location and orientation of target transects sampled for the project were determined through consultation with MES and Maryland Department of Natural Resources (MDNR).

SAV surveys were conducted at James and Barren Islands from June 24th through June 28th, 2020 to sample the potential presence of horned pondweed (*Zannichellia palustris*) and eelgrass (*Zostera marina*). A total of 5 sampling transects were identified for James Island (Figure 2) and 19 transects were identified for Barren Island (Figure 3). A quadrat approach was used to collected SAV data at each location and quadrat spacing was adjusted based on the total length of each transect (Table 1), according to:

- transects between 50 and 300 meters long had quadrats that were spaced approximately 20 meters apart
- transects between 300 and 400 meters long had quadrats that were spaced approximately 30 meters apart
- transects longer than 400 meters had quadrats that were spaced approximately 40 meters apart

Table 1
SAV Transect Spacing

Transect	Length (meters)	Quadrat Spacing	Number of Quadrats Sampled
James Island			
JI-02	140	20	8
JI-03	200	20	11
JI-04	148	20	9
JI-05	156	20	9
JI-06	135	20	8
Barren Island – North Transects			
BI-N-06	379	30	13

Transect	Length (meters)	Quadrat Spacing	Number of Quadrats Sampled
BI-N-09	394	30	14
BI-N-11	325	30	11
BI-N-16	400	40	11
BI-N-20	400	40	11
Barren Island – West Transects			
BI-W-02	83	20	5
BI-W-03	87	20	6
BI-W-04	101	20	6
BI-W-05	96	20	6
BI-W-07	49	20	4
Barren Island – Central Transects			
BI-C-01	459	40	13
BI-C-02	469	40	13
BI-C-03	481	40	13
BI-C-04	486	40	13
Barren Island – South Transects			
BI-S-01	200	20	11
BI-S-03	242	20	13
BI-S-05	418	40	11
BI-S-07	200	20	11
BI-S-09	200	20	11

Once the quadrat was placed on the bottom at the target sampling location, the SAV within the quadrat was documented. For each quadrat, the presence/absence of SAV, total visual percent cover, identification of each SAV species present, and an assessment of SAV density was documented. A total of 45 quadrats at James Island and 196 quadrats at Barren Island were sampled for the project.

In addition to the quadrat data collected along each transect, shallow areas around each island were surveyed by wading and kayaking around the island during low tide to identity any areas of substantial SAV coverage that were not included using the transect approach for the project.

Sampling coordinates and water quality data - water depth, salinity, water temperature, dissolved oxygen, and water clarity (Secchi disk reading) - collected at the beginning, middle, and end of each transect are presented in Table 2 for James Island and Table 3 for Barren Island.

Figure 2
James Island - Target SAV Transects

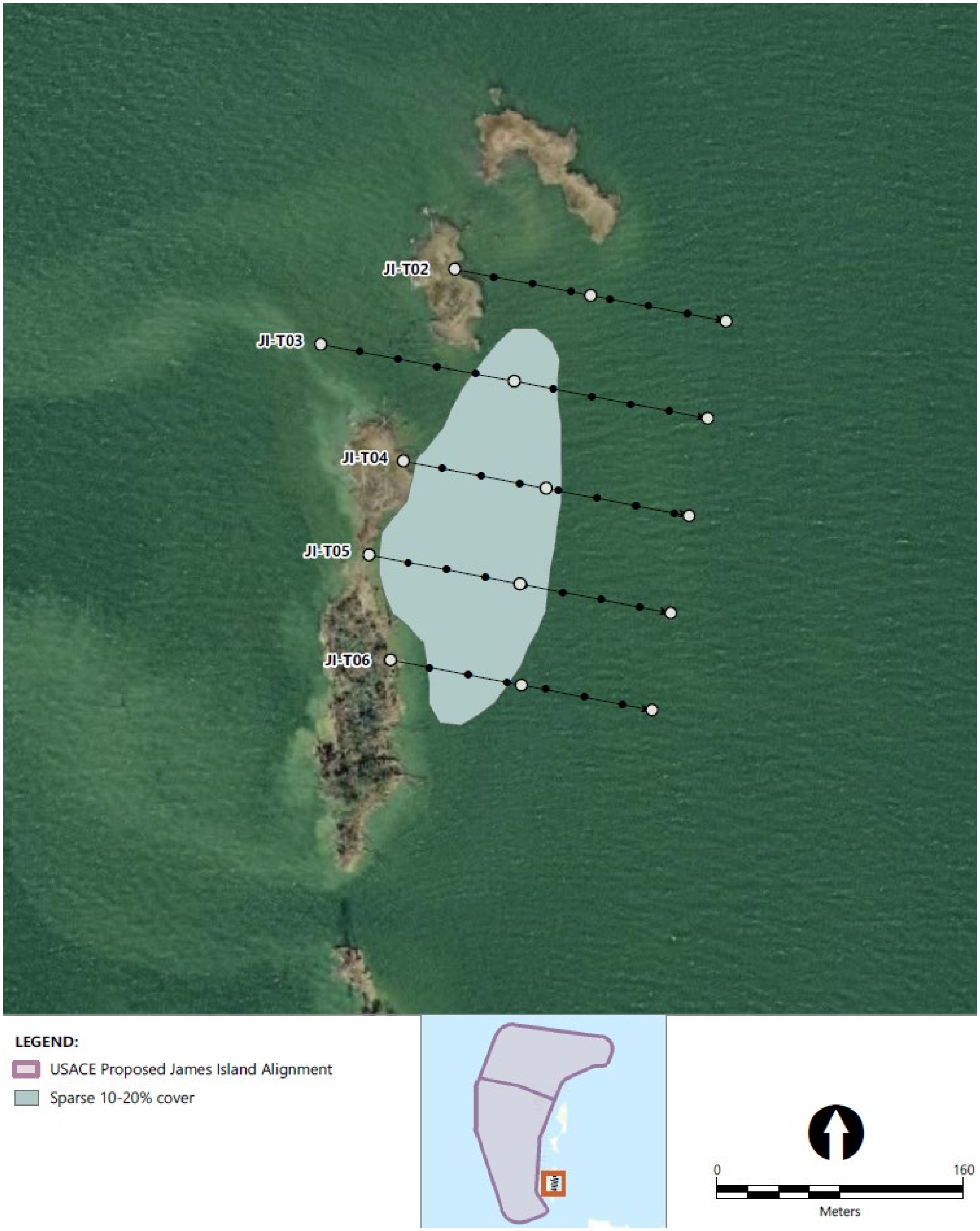


Figure 3
Barren Island - Target SAV Transects

Table 2
James Island - Water Quality Data for SAV Transects

Transect	Location	Water Depth (ft)	Water Clarity (ft)	Temperature (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	Turbidity (NTU)
JI-02	Beginning	1.4	Bottom	27.2	7.58	11.33	17.4
	Middle	2.6	2.0	27.1	7.61	11.34	10.8
	End	3.9	2.3	27.4	7.62	11.34	9.8
JI-03	Beginning	3.1	2.1	27.3	7.60	11.35	9.4
	Middle	3.1	1.7	27.4	7.67	11.53	12.6
	End	3.5	2.3	27.4	7.67	11.34	7.6
JI-04	Beginning	1.5	Bottom	27.2	7.71	11.30	7.5
	Middle	2.7	2.3	27.0	7.71	11.31	7.6
	End	3.8	2.3	27.0	7.69	11.29	8.0
JI-05	Beginning	1.8	1.6	27.6	7.65	11.28	9.4
	Middle	2.4	1.9	27.4	7.62	11.35	8.2
	End	3.1	2.4	27.4	7.67	11.32	9.3
JI-06	Beginning	2.1	1.8	27.2	7.65	11.31	8.0
	Middle	2.5	2.2	27.1	7.64	11.29	9.1
	End	3.6	2.9	27.3	7.68	11.33	7.9

Notes: ft = feet
Mg/L = milligrams per liter
Ppt = parts per thousand
NTU = nephelometric turbidity unit

Table 3
Barren Island - Water Quality Data for SAV Transects

Transect	Location	Water Depth (ft)	Water Clarity (ft)	Temperature (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	Turbidity (NTU)
Barren Island – North Transects							
BI-N-06	Beginning	2.8	1.7	27.4	7.01	12.58	9.8
	Middle	4.2	2.0	27.5	6.93	12.61	8.4
	End	6.5	2.1	27.6	6.88	12.62	9.5
BI-N-09	Beginning	2.3	1.6	26.9	7.20	12.54	9.3
	Middle	4.3	2.0	27.6	7.00	12.63	9.2
	End	6.8	1.9	27.6	6.96	12.64	9.4
BI-N-11	Beginning	2.7	1.9	27.7	7.47	12.54	7.3
	Middle	4.9	2.5	27.8	7.30	12.60	9.2
	End	5.5	1.8	27.6	7.06	12.66	11.1
BI-N-16	Beginning	1.3	Bottom	26.3	7.56	12.53	12.6
	Middle	4.7	2.2	27.7	8.28	12.36	8.7

Transect	Location	Water Depth (ft)	Water Clarity (ft)	Temperature (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	Turbidity (NTU)
	End	5.2	2.3	27.9	7.36	12.67	8.7
BI-N-20	Beginning	1.1	Bottom	26.2	7.40	12.54	8.6
	Middle	2.8	1.6	25.2	7.12	12.57	12.3
	End	4.9	2.0	25.4	6.83	12.81	10.1
Barren Island – West Transects							
BI-W-02	Beginning	1.9	1.9	26.8	6.62	12.53	6.4
	Middle	2.7	1.6	26.8	6.31	12.50	6.9
	End	4.1	2.4	26.8	6.32	12.51	9.0
BI-W-03	Beginning	2.5	2.3	26.8	6.62	12.52	7.7
	Middle	2.9	1.7	27.2	6.25	12.55	11.3
	End	3.0	1.8	27.2	5.89	12.56	7.7
BI-W-04	Beginning	1.7	Bottom	26.6	6.80	12.47	6.7
	Middle	2.2	2.0	26.9	6.13	12.52	6.3
	End	3.9	2.4	26.9	5.67	12.55	8.5
BI-W-05	Beginning	1.3	Bottom	26.5	6.77	12.48	7.5
	Middle	2.5	2.1	26.3	6.56	12.57	8.4
	End	4.9	2.2	26.3	6.01	12.58	8.8
BI-W-07	Beginning	1.4	Bottom	26.4	6.18	12.45	15.7
	Middle	1.3	Bottom	26.4	-	-	-
	End	1.1	Bottom	24.0	5.37	12.48	11.8
Barren Island – Central Transects							
BI-C-01	Beginning	0.9	Bottom	30.3	7.86	12.48	9.2
	Middle	0.6	Bottom	33.4	10.32	12.72	5.8
	End	1.0	Bottom	30.5	9.43	12.54	68.8
BI-C-02	Beginning	1.2	Bottom	29.4	8.25	12.54	8.7
	Middle	1.4	Bottom	29.1	8.28	12.55	8.2
	End	1.6	Bottom	30.1	8.31	12.55	9.7
BI-C-03	Beginning	2.3	1.5	26.9	6.71	12.55	18.1
	Middle	3.5	1.8	26.7	6.98	12.60	12.1
	End	1.6	Bottom	32.9	9.96	12.58	9.6
BI-C-04	Beginning	2.8	1.6	26.9	6.38	12.54	17.5
	Middle	2.7	1.4	26.7	7.02	12.57	16.5
	End	1.8	1.5	27.4	7.51	12.59	10.0
Barren Island – South Transects							
BI-S-01	Beginning	2.1	Bottom	26.8	6.61	12.66	8.5
	Middle	2.4	1.6	26.4	6.23	12.67	12.5
	End	3.1	1.5	26.2	6.43	12.67	11.3

Transect	Location	Water Depth (ft)	Water Clarity (ft)	Temperature (°C)	Dissolved Oxygen (mg/L)	Salinity (ppt)	Turbidity (NTU)
BI-S-03	Beginning	1.2	Bottom	27.0	6.56	12.66	13.1
	Middle	2.7	1.8	26.6	6.79	12.67	11.5
	End	2.7	2.0	27.2	6.88	12.66	9.3
BI-S-05	Beginning	2.7	2.2	28.0	7.61	12.65	10.9
	Middle	3.5	2.3	27.6	7.35	12.65	8.7
	End	3.5	1.6	27.0	7.06	12.66	9.8
BI-S-07	Beginning	4.4	1.6	28.2	7.21	12.66	9.3
	Middle	4.2	2.3	28.2	7.27	12.65	8.5
	End	3.5	2.5	28.2	7.54	12.66	6.6
BI-S-09	Beginning	5.0	1.8	28.9	7.32	12.67	10.7
	Middle	4.6	1.9	28.1	7.23	12.72	9.8
	End	4.5	1.9	28.1	7.28	12.72	8.7

Notes: ft = feet
Mg/L = milligrams per liter
Ppt = parts per thousand
NTU = nephelometric turbidity unit

3 Results

The results of the spring 2020 SAV surveys at James and Barren Islands indicated that no SAV was observed in along the sampling transects or in the shallow water around James Island. For Barren Island, widgeon grass (*Ruppia maritima*) was the only SAV species identified along the sampling transects and it as also identified in in the shallow water on the eastern side of Barren Island (Figure 4). Neither of the two target species - horned pondweed (*Zannichellia palustris*) and eelgrass (*Zostera marina*) – were identified at James or Barren Island.

At James Island, the water depth drops off quickly adjacent to the remaining remnants and is more commonly greater than 5 feet, limiting the potential establishment of any SAV. The James Island remnants are also exposed to wave action with few sheltered or protected areas, which accelerates erosion and contributes to poor water clarity. The combination of water depths beyond optimal depths for SAV establishment, exposure to consistent wave action, and poor water clarity are limiting factors for SAV growth at James Island.

At Barren Island, widgeon grass was identified in only 10 of the quadrats from the northern, southern, western, and central transect areas, which was 0.05% of the total sampled quadrats. Percent cover of widgeon grass observed at quadrat points was low, ranging from 1-35%. SAV were observed at several quadrat locations outside of areas mapped with SAV during the qualitative survey, and these areas consisted of small, isolated patches of SAV and did not represent identifiable beds.

The widgeon grass identified around Barren Island (Table 4, Figure 4) was mostly limited to water depths of less than 4 feet, with dense beds observed in protected areas with water depths less than 2 feet. SAV growth along the transects and shallow areas adjacent to the exposed southeastern portion of Barren Island appear to be limited by wave action.

Table 4
Barren Island – SAV Observations

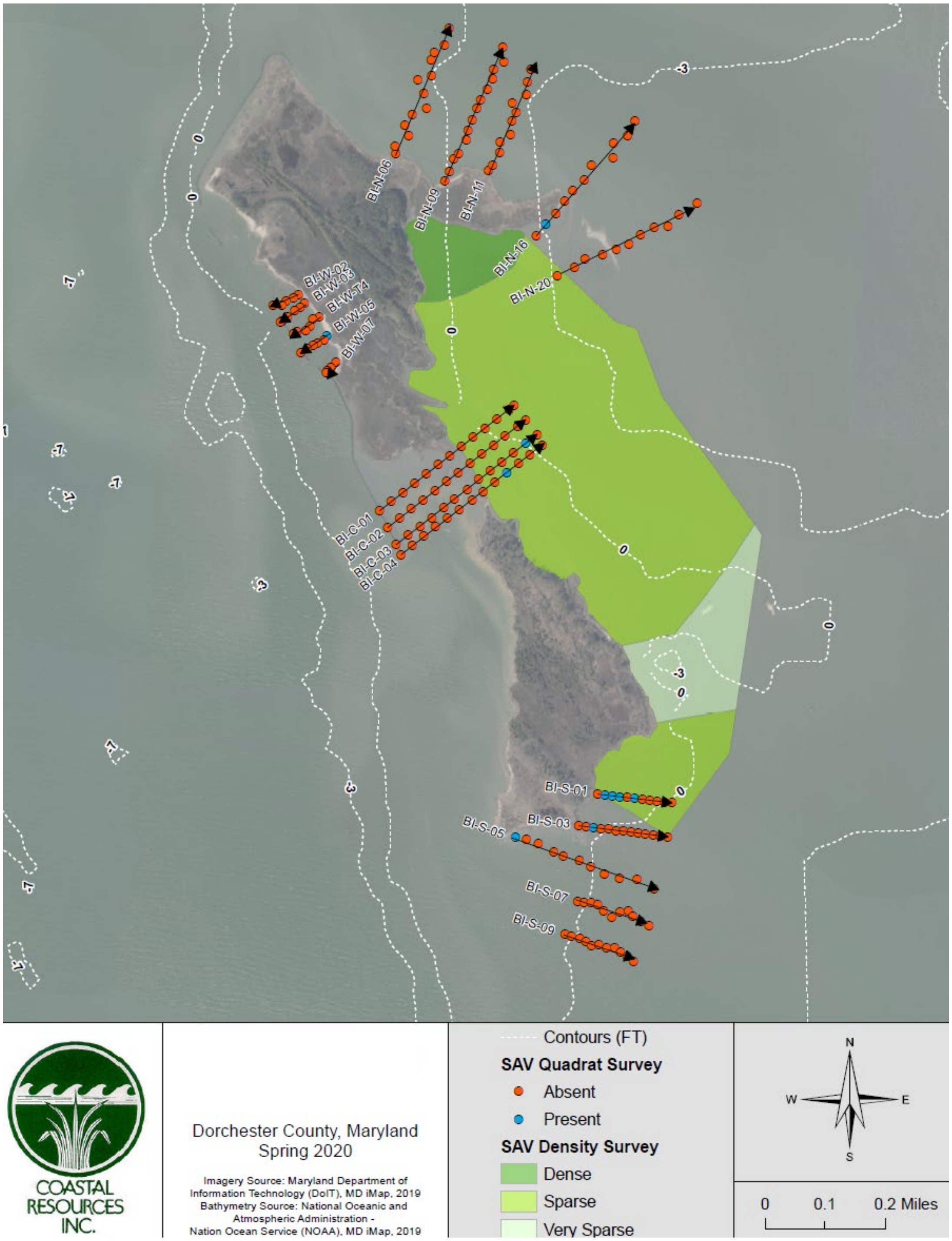
Sampling Area	Sampling Transect and Quadrat	SAV Species	Percent Cover
North	BI-N-16-02	Widgeon Grass	15%
West	BI-W-05-01	Widgeon Grass	8%
Central	BI-C-03-12	Widgeon Grass	8%
	BI-C-04-10	Widgeon Grass	8%
South	BI-S-01-02	Widgeon Grass	10%
	BI-S-01-03	Widgeon Grass	20%
	BI-S-01-04	Widgeon Grass	25%
	BI-S-01-06	Widgeon Grass	35%

Sampling Area	Sampling Transect and Quadrat	SAV Species	Percent Cover
	BI-S-03-02	Widgeon Grass	1%
	BI-S-05-01	Widgeon Grass	1%

Horned pondweed was observed floating in the water near the island, both there were not areas of documented growth. The absence of horned pondweed in the vicinity of James and Barren Islands likely results from the timing of the survey, natural variability in the extent of horned pondweed's growth, or water quality conditions. Horned pondweed grows annually and reproduces primarily by seed formation and is typically one of the first SAV species to appear in the early spring. As water temperatures in the Bay increase through the early summer, the plants release their seeds and die back, usually in the June/July timeframe. Because this survey was conducted at the end of horned pondweed's spring growth period, it is possible that horned pondweed may have gone through its spring senescence and the growing period was already completed by the time the surveys were conducted. Horned pondweed is also susceptible to regimes with substantial wave action, and in some portions of the project area, that may also have been a limiting factor in seed establishment of horned pondweed.

The absence of eelgrass in the vicinity of James and Barren Islands likely results from a combination of water quality parameters, including salinity below the optimal range for the species, poor water clarity, and rising temperatures in the bay. Eelgrass generally prefers regions of the Chesapeake Bay with high salinity (salinities of 20 ppt and higher), with a range from the Honga River south to the mouth of the Chesapeake Bay. Barren Island is located at the most northern extent of eelgrass' documented range and James Island located just north and outside of the documented range. Although eelgrass was historically observed within salt ponds at Barren Island, SAV studies conducted for the FS/EIS did not document eelgrass in the waters surrounding Barren or James Island.

Figure 4
Barren Island – SAV Survey Results



Dorchester County, Maryland
Spring 2020

Imagery Source: Maryland Department of Information Technology (DoIT), MD iMap, 2019
Bathymetry Source: National Oceanic and Atmospheric Administration - Nation Ocean Service (NOAA), MD iMap, 2019

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Appendix A

Quadrat Sampling Coordinates

Table A-1
James Island Quadrat Coordinates

Transect	Quadrat	Northing*	Easting*
JI-T02	1	307082.552	1501711.233
	2	307070.691	1501775.768
	3	307058.830	1501840.304
	4	307046.970	1501904.840
	5	307035.109	1501969.376
	6	307023.248	1502033.912
	7	307011.387	1502098.448
	8	306999.526	1502162.983
JI-T03	1	306956.673	1501488.637
	2	306944.812	1501553.172
	3	306932.951	1501617.708
	4	306921.091	1501682.244
	5	306909.230	1501746.780
	6	306897.369	1501811.316
	7	306885.508	1501875.852
	8	306873.647	1501940.387
	9	306861.787	1502004.923
	10	306849.926	1502069.459
	11	306838.065	1502133.995
JI-T04	1	306764.339	1501627.632
	2	306752.478	1501692.168
	3	306740.617	1501756.704
	4	306728.756	1501821.239
	5	306716.895	1501885.775
	6	306705.034	1501950.311
	7	306693.173	1502014.847
	8	306681.312	1502079.382
	9	306676.725	1502104.343
JI-T05	1	306607.882	1501571.413
	2	306596.021	1501635.949
	3	306584.160	1501700.485
	4	306572.299	1501765.020
	5	306560.438	1501829.556
	6	306548.577	1501894.092
	7	306536.717	1501958.628
	8	306524.856	1502023.164

Transect	Quadrat	Northing*	Easting*
	9	306515.386	1502074.690
JI-T06	1	306434.212	1501608.501
	2	306422.360	1501673.038
	3	306410.509	1501737.576
	4	306398.657	1501802.113
	5	306386.806	1501866.650
	6	306374.954	1501931.188
	7	306363.102	1501995.726
	8	306354.111	1502044.687

*Maryland State Pane, NAD83, US Survey feet

Table A-2
Barren Island North Transect Quadrat Coordinates

Transect	Quadrat	Northing*	Easting*
BI-N-T06	1	246603.471	1524679.773
	2	246694.149	1524718.049
	3	246784.826	1524756.326
	4	246875.504	1524794.601
	5	246966.181	1524832.878
	6	247056.859	1524871.153
	7	247147.537	1524909.429
	8	247238.214	1524947.705
	9	247328.892	1524985.981
	10	247419.569	1525024.257
	11	247510.247	1525062.533
	12	247600.925	1525100.809
	13	247691.602	1525139.085
BI-N-T09	1	246365.594	1525110.400
	2	246455.994	1525149.328
	3	246546.393	1525188.255
	4	246636.793	1525227.183
	5	246727.193	1525266.111
	6	246817.592	1525305.039
	7	246907.992	1525343.967
	8	246998.391	1525382.895
	9	247088.791	1525421.823
	10	247179.191	1525460.751
	11	247269.591	1525499.678
	12	247359.990	1525538.606
	13	247450.390	1525577.534
	14	247540.790	1525616.462
BI-N-T11	1	246442.082	1525501.252
	2	246532.625	1525539.845
	3	246623.168	1525578.438
	4	246713.711	1525617.031
	5	246804.254	1525655.624
	6	246894.798	1525694.216
	7	246985.341	1525732.809
	8	247075.884	1525771.402

Transect	Quadrat	Northing*	Easting*
	9	247166.427	1525809.995
	10	247256.971	1525848.588
	11	247347.514	1525887.181
BI-N-T16	1	245914.067	1525879.889
	2	246004.026	1526006.183
	3	246094.210	1526088.237
	4	246193.852	1526176.020
	5	246292.570	1526262.490
	6	246391.288	1526348.959
	7	246490.006	1526435.428
	8	246588.724	1526521.898
	9	246687.442	1526608.367
	10	246786.160	1526694.836
	11	246884.878	1526781.306
BI-N-T20	1	245565.484	1526130.924
	2	245623.403	1526248.685
	3	245681.321	1526366.446
	4	245739.239	1526484.207
	5	245797.158	1526601.968
	6	245855.077	1526719.729
	7	245912.995	1526837.490
	8	245970.913	1526955.251
	9	246028.832	1527073.012
	10	246086.750	1527190.773
	11	246144.669	1527308.534

*Maryland State Pane, NAD83, US Survey feet

Table A-3
Barren Island Central Transect Quadrat Coordinates

Transect	Quadrat	Northing*	Easting*
BI-C-T01	1	243479.830	1524566.345
	2	243561.886	1524644.656
	3	243637.195	1524744.860
	4	243711.283	1524842.030
	5	243800.271	1524960.868
	6	243890.824	1525066.771
	7	243967.094	1525168.962
	8	244049.579	1525269.610
	9	244125.482	1525362.908
	10	244206.357	1525467.380
	11	244286.358	1525571.118
	12	244366.346	1525680.128
	13	244422.849	1525728.520
BI-C-T02	1	243331.516	1524637.119
	2	243410.415	1524715.487
	3	243492.449	1524819.152
	4	243572.162	1524923.363
	5	243654.980	1525026.281
	6	243721.866	1525152.121
	7	243814.720	1525232.326
	8	243897.261	1525336.076
	9	243978.608	1525438.888
	10	244055.583	1525543.522
	11	244137.420	1525644.479
	12	244220.658	1525754.577
	13	244277.905	1525825.764
BI-C-T03	1	243199.443	1524706.166
	2	243264.030	1524788.849
	3	243341.193	1524897.849
	4	243416.291	1525000.480
	5	243505.290	1525105.700
	6	243577.045	1525197.732
	7	243664.161	1525310.527
	8	243751.760	1525412.442
	9	243842.442	1525515.473

Transect	Quadrat	Northing*	Easting*
	10	243908.770	1525615.600
	11	243987.802	1525718.385
	12	244069.186	1525824.664
	13	244151.032	1525925.454
BI-C-T04	1	243110.671	1524749.077
	2	243176.307	1524827.838
	3	243259.623	1524928.134
	4	243340.113	1525032.426
	5	243414.831	1525136.304
	6	243489.563	1525242.046
	7	243572.929	1525354.335
	8	243647.060	1525451.970
	9	243731.975	1525553.014
	10	243814.052	1525657.282
	11	243893.287	1525763.884
	12	243973.399	1525863.020
	13	244056.588	1525970.168

*Maryland State Pane, NAD83, US Survey feet

Table A-4
Barren Island West Transect Quadrat Coordinates

Transect	Quadrat	Northing*	Easting*
BI-W-T02	1	245381.594	1523827.394
	2	245355.619	1523767.137
	3	245329.644	1523706.881
	4	245303.669	1523646.624
	5	245277.694	1523586.368
BI-W-T03	1	245292.011	1523895.437
	2	245255.279	1523841.066
	3	245218.547	1523786.694
	4	245181.815	1523732.322
	5	245145.083	1523677.950
	6	245131.719	1523658.169
BI-W-T04	1	245182.848	1524024.181
	2	245145.868	1523969.978
	3	245108.888	1523915.775
	4	245071.907	1523861.571
	5	245034.927	1523807.368
	6	244997.947	1523753.164
BI-W-T05	1	245038.439	1524103.484
	2	245001.456	1524049.283
	3	244964.472	1523995.082
	4	244927.489	1523940.880
	5	244890.505	1523886.679
	6	244860.742	1523843.059
BI-W-T07	1	244767.734	1524177.402
	2	244715.401	1524137.819
	3	244663.068	1524098.235
	4	244639.061	1524080.077

*Maryland State Pane, NAD83, US Survey feet

Table A-5
Barren Island South Transect Quadrat Coordinates

Transect	Quadrat	Northing*	Easting*
BI-S-T01	1	240989.756	1526463.111
	2	240978.010	1526520.735
	3	240973.871	1526593.943
	4	240963.682	1526660.336
	5	240950.734	1526719.283
	6	240945.701	1526787.344
	7	240936.517	1526850.540
	8	240931.944	1526915.701
	9	240921.214	1526974.305
	10	240914.342	1527046.601
	11	240914.018	1527116.366
BI-S-T03	1	240706.057	1526305.891
	2	240701.688	1526358.628
	3	240692.482	1526421.002
	4	240679.006	1526486.938
	5	240676.743	1526554.928
	6	240664.694	1526619.583
	7	240657.516	1526683.527
	8	240648.436	1526751.073
	9	240642.625	1526814.917
	10	240635.034	1526876.220
	11	240622.717	1526944.924
	12	240619.420	1527009.108
	13	240608.728	1527072.999
BI-S-T05	1	240603.499	1525700.296
	2	240559.772	1525824.031
	3	240516.046	1525947.765
	4	240472.320	1526071.499
	5	240428.593	1526195.234
	6	240384.867	1526318.968
	7	240341.140	1526442.702
	8	240297.414	1526566.437
	9	240253.687	1526690.171
	10	240209.961	1526813.905
	11	240166.235	1526937.640

Transect	Quadrat	Northing*	Easting*
BI-S-T07	1	240057.128	1526267.244
	2	240036.464	1526329.522
	3	240015.799	1526391.800
	4	239995.134	1526454.077
	5	239974.470	1526516.355
	6	239953.805	1526578.633
	7	239933.140	1526640.911
	8	239912.475	1526703.188
	9	239891.811	1526765.466
	10	239871.146	1526827.744
	11	239850.481	1526890.021
BI-S-T09	1	239747.289	1526159.365
	2	239726.197	1526221.499
	3	239705.106	1526283.633
	4	239684.014	1526345.768
	5	239662.922	1526407.903
	6	239641.831	1526470.037
	7	239620.739	1526532.171
	8	239599.647	1526594.306
	9	239578.556	1526656.440
	10	239557.464	1526718.575
	11	239536.373	1526780.709

*Maryland State Pane, NAD83, US Survey feet

C6: Mid-Chesapeake Bay Islands Ecosystem Restoration Submerged Aquatic Vegetation (SAV) SPRING 2021 Surveys at Barren and James Islands (MDNR, 2021a)

Mid-Chesapeake Bay Islands Ecosystem Restoration Submerged Aquatic Vegetation (SAV) SPRING 2021 Surveys at Barren and James Islands

Contract Number: 09-07-105 Subtask 3.3

July 9, 2021

Project Overview

The Mid-Chesapeake Bay Island Ecosystem Restoration project is located on the islands of James and Barren in western Dorchester County, Maryland. The project is focused on restoring and expanding island habitat to provide hundreds of acres of wetland and terrestrial habitat for fish, shellfish, reptiles, amphibians, birds, and mammals through the beneficial use of dredged material.

Submerged Aquatic Vegetation (SAV) is an important habitat in the Chesapeake Bay and SAV beds have historically surrounded both Barren and James Islands. There is evidence that some shoreline protection structures, including those proposed for the Mid-Bay Island project, can cause unintended declines in adjacent submerged aquatic vegetation (Patrick et al., 2014, 2016; Landry and Golden, 2018). However, creating conditions in which SAV continues to thrive in these shallow water areas is an important objective of the Mid-Bay Island project.

Project Tasks

The subcontractor will provide, manage, and coordinate qualified staff to assist the Maryland Environmental Service (MES) with SAV sampling and reporting efforts at Barren and James Islands to document the current aquatic resources present in and around the islands that are of importance to the Mid- Chesapeake Bay Island Ecosystem Restoration Project.

The primary tasks for this project are to investigate and document SAV occurrence and distribution in the vicinity of both Barren and James Islands. SAV will also be evaluated for species composition and relative density. SAV sampling will be conducted in early to mid-June, 2021 to observe the potential presence of horned pondweed (*Zannichellia palustris*) and eelgrass (*Zostera marina*), and from July 15 to August 30, 2021, to observe the potential presence of widgeon grass (*Ruppia maritima*) and other late-season species.

Methodology

Transect Selection

SAV surveys focused on the surrounding waters of areas where proposed island restoration activities will occur. Transects were identified where the existing SAV beds (2015 – 2019) overlapped with the area to be impacted by the recommended plan. At Barren Island, the areas surveyed for SAV were the northeast shoreline of the northern remnant, the western shoreline of the northern remnant behind the breakwaters, the area between the northern and southern island remnants, and the southern tip of the southern remnant. At James Island, the eastern shoreline of the southern remnant was the focus area.

The number and locations of transects were finalized upon agreement with MES, Maryland Department of Transportation, Maryland Port Authority, and United States Army Corps of Engineers prior to commencing work. The survey plan covered at least 10% of the impact area and transects extended from the shoreline of the island to an extent into the water passed the proposed breakwater/revetment/dike alignment (or to the limit of the SAV 5-year composite coverage, whichever was shorter). Transects were laid out with at least 50 meters between transects.

At Barren Island, the number of transects proposed are listed below and shown in Figure 1.

1. Northeast shoreline: 22 transects identified, 5 randomly selected to be surveyed
2. Span between remnants: 4 transects identified, all to be surveyed
3. Southern breakwater: 12 transects identified, 5 randomly selected to be surveyed
4. Western shoreline behind breakwaters: 7 transects identified, 5 randomly selected to be surveyed

At James Island, the number of transects proposed are listed below and shown in Figure 2.

1. Eastern shoreline: 8 transects identified, 5 randomly selected to be surveyed

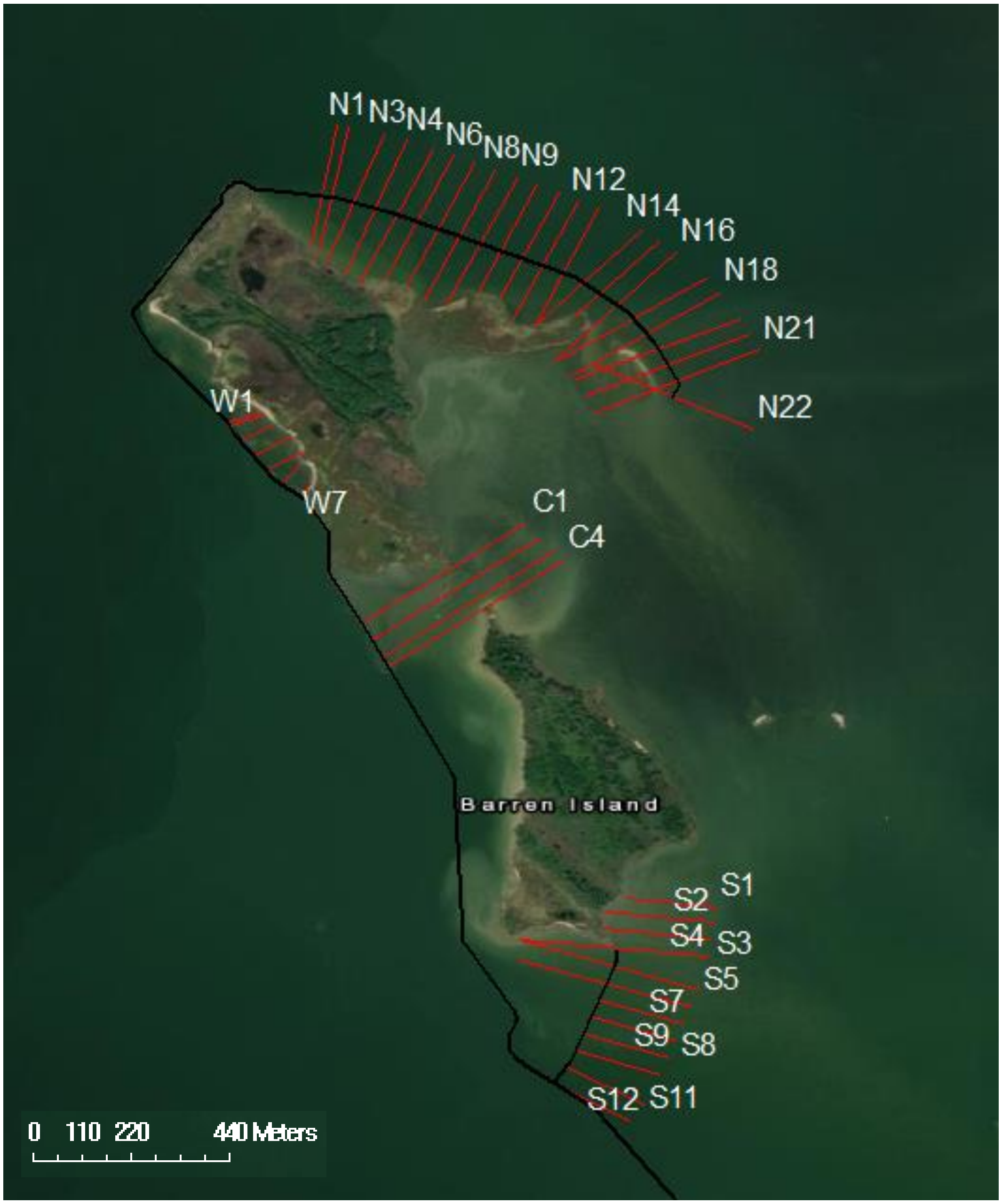

Figure 1. Overview map of Barren Island showing 22 transect locations on the northeastern shoreline, four transect locations between the spans, 12 transect locations on the southern shoreline and seven transect locations inshore of the western breakwater.

Figure 2. Overview map of James Island showing eight transect locations along the eastern shoreline of the southern span.

SAV surveys

Quadrats were placed every 20 meters along each randomly selected transect and were sampled with a ¼ meter square PVC frame. Due to water depths, the survey was conducted via snorkel or wading. Parameters measured included: the presence/absence of SAV, relative water depth, total

SAV visual percent cover, individual SAV species visual percent cover, and canopy height (see detailed methods in Landry and Golden, 2018). Coordinates for each transect (beginning, middle, and end) and quadrat were recorded using handheld Garmin GPSmap 78s units. All data were recorded on task-specific data sheets and entered into Microsoft Excel and Esri ArcMap.

Salinity, water temperature, and water clarity (Secchi disk reading, depending on water depth) were also collected at each location.

Project Outcomes to Date

Transect Selection

At Barren Island, the randomly selected transects were as follows:

1. Northeast shoreline: Transects 1, 9, 13, 20, and 22 (Figure 3)
2. Span between remnants: Transects 1 – 4 (Figure 4)
3. Southern breakwater: Transects 3, 6, 10, 11, and 12 (Figure 5)
4. Western shoreline behind breakwaters: Transects, 2, 4, 5, 6, and 7 (Figure 6)

At James Island, the randomly selected transects were as follows:

1. Eastern shoreline: Transects 2 - 6 (Figure 7)

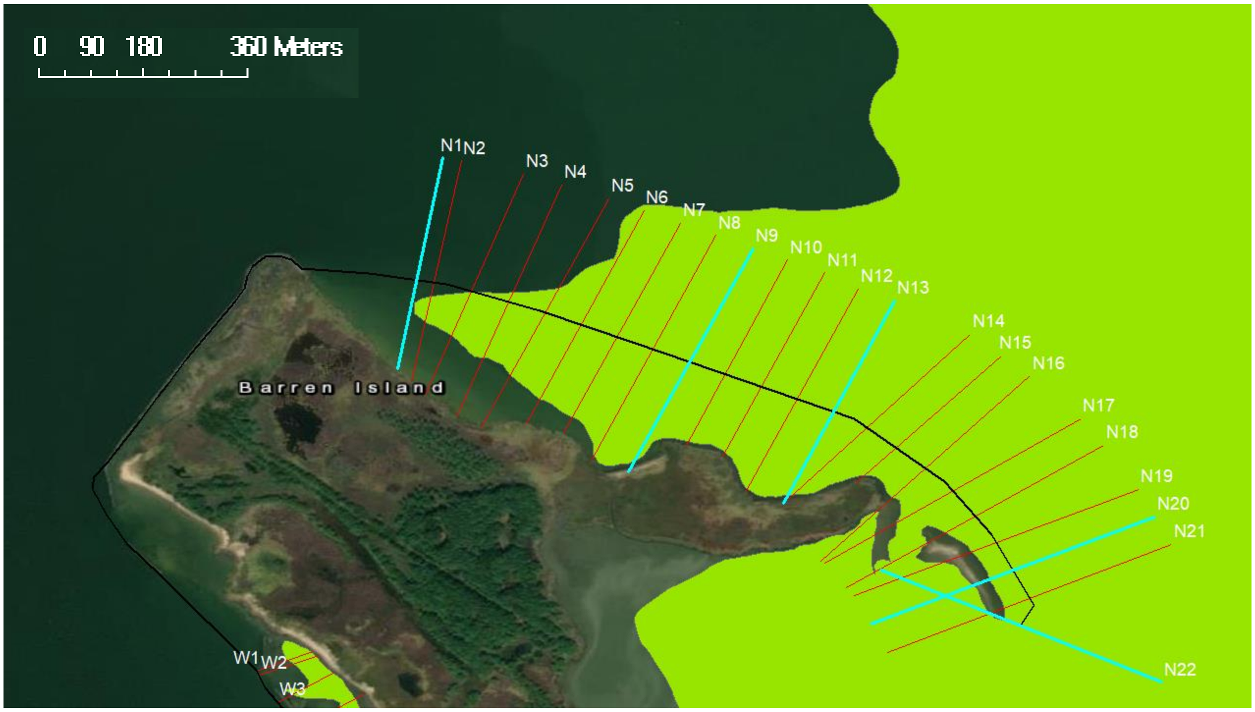

Figure 3. Location of selected transects (blue) on the northeastern shore of Barren Island. 2015 - 2019 SAV locations are shown in green.

Figure 4. Location of selected transects (blue) between the spans of Barren Island. 2015 - 2019 SAV locations are shown in green.

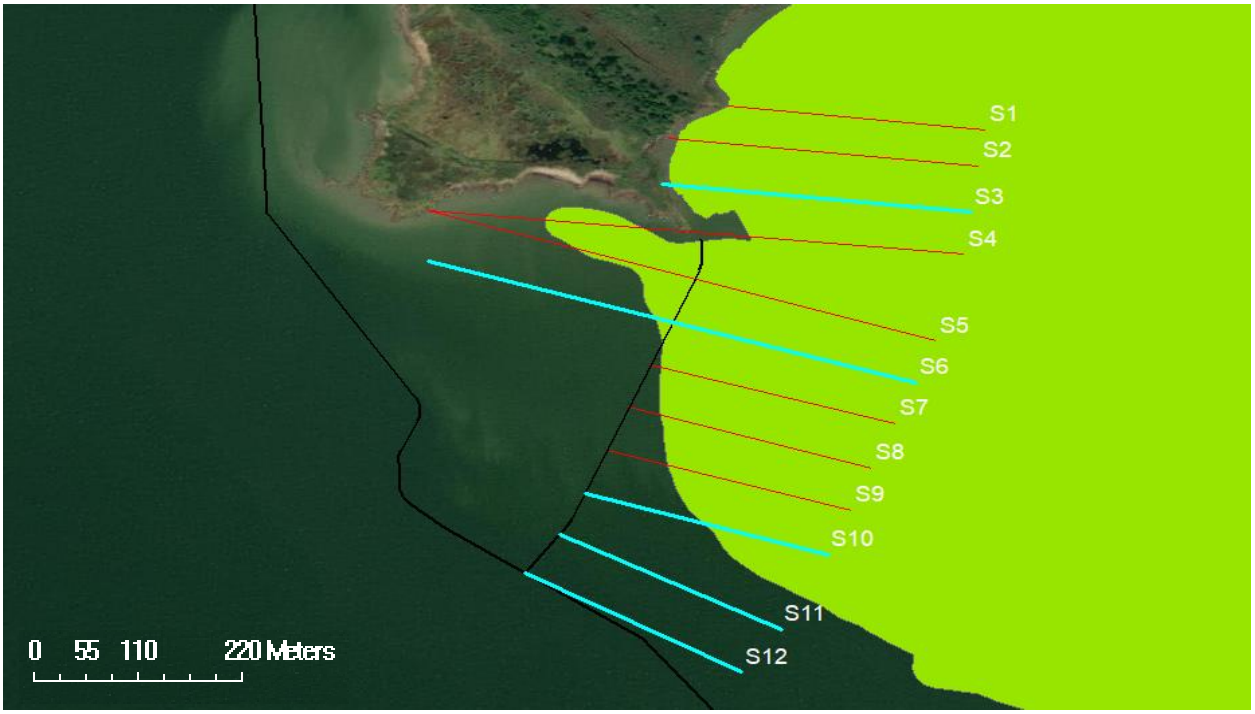

Figure 5. Location of selected transects (blue) on the southern shore of Barren Island. 2015 - 2019 SAV locations are shown in green.

Figure 6. Location of selected transects (blue) on the western shore of Barren Island. 2015 - 2019 SAV locations are shown in green.

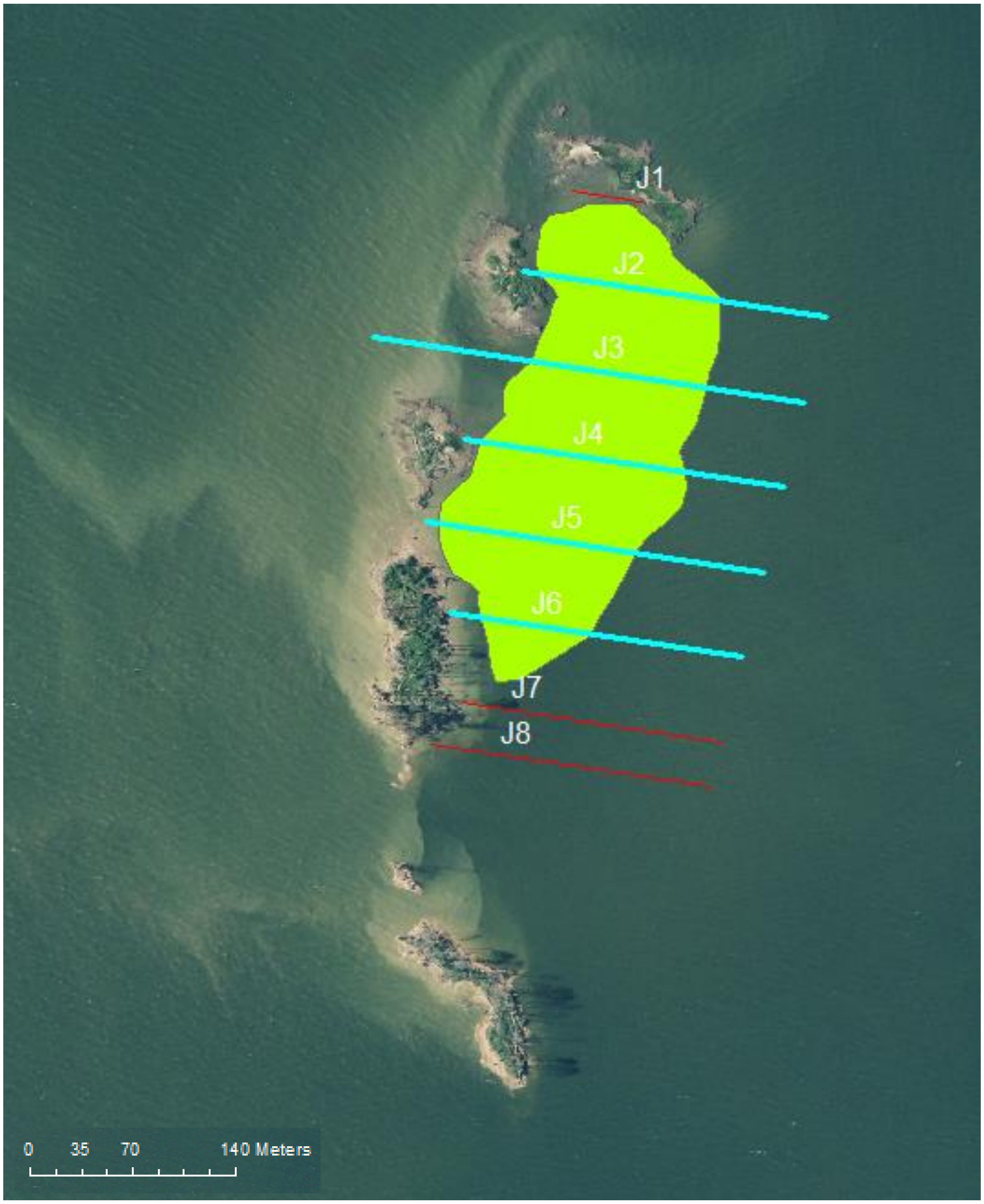

Figure 7. Location of selected transects (blue) on the eastern shore of James Island (southern span). 2015 - 2019 SAV locations are shown in green.

SAV surveys

Barren Island

Northeastern shoreline: SAV surveys were conducted on Barren Island's northeast shoreline on June 1, 2021. Weather conditions went from sunny and calm to overcast and breezy. Water temperatures averaged 70.2 F and salinity was 11. Seas progressed from calm to choppy. Water clarity was poor due to sediment resuspension and Secchi depths averaged 0.7 meters at the deeper edges of the northeastern transects. No SAV was observed on northeastern transects 1, 9 or 13 (Figure 8). Bottom sediment was classified as mud or peat nearshore and sandy or oyster shell offshore. Water depths ranged from 15 to 160 centimeters. Sparse and patchy widgeongrass was found along transects 20 and 22 (Figure 8). SAV percent cover ranged from 0 to 50% along transect 20 and 0 to 70% along transect 22. The bottom type was characterized as sand, shoal and oyster shells and water depths ranged from 0 to 120 centimeters.

Figure 8. Total SAV % cover observed at each quadrat location on the northern shoreline of Barren Island.

Central span: SAV surveys were conducted on the central transects on June 2, 2021. The weather conditions were sunny and breezy. Water temperatures averaged 71.4 F and salinity was 11. Seas were choppy with waves 1 – 2 feet. Given the shallow and more sheltered nature of the central transects, most Secchi depths were "on the bottom". SAV (horned pondweed and widgeongrass) was observed along all four transects, with greater percent cover values on the middle transects (2 and 3) (Figure 9). The bottom type was characterized as sandy or muddy. Water depths ranged from 9 to 85 centimeters, with deeper depths closer to the breakwater.

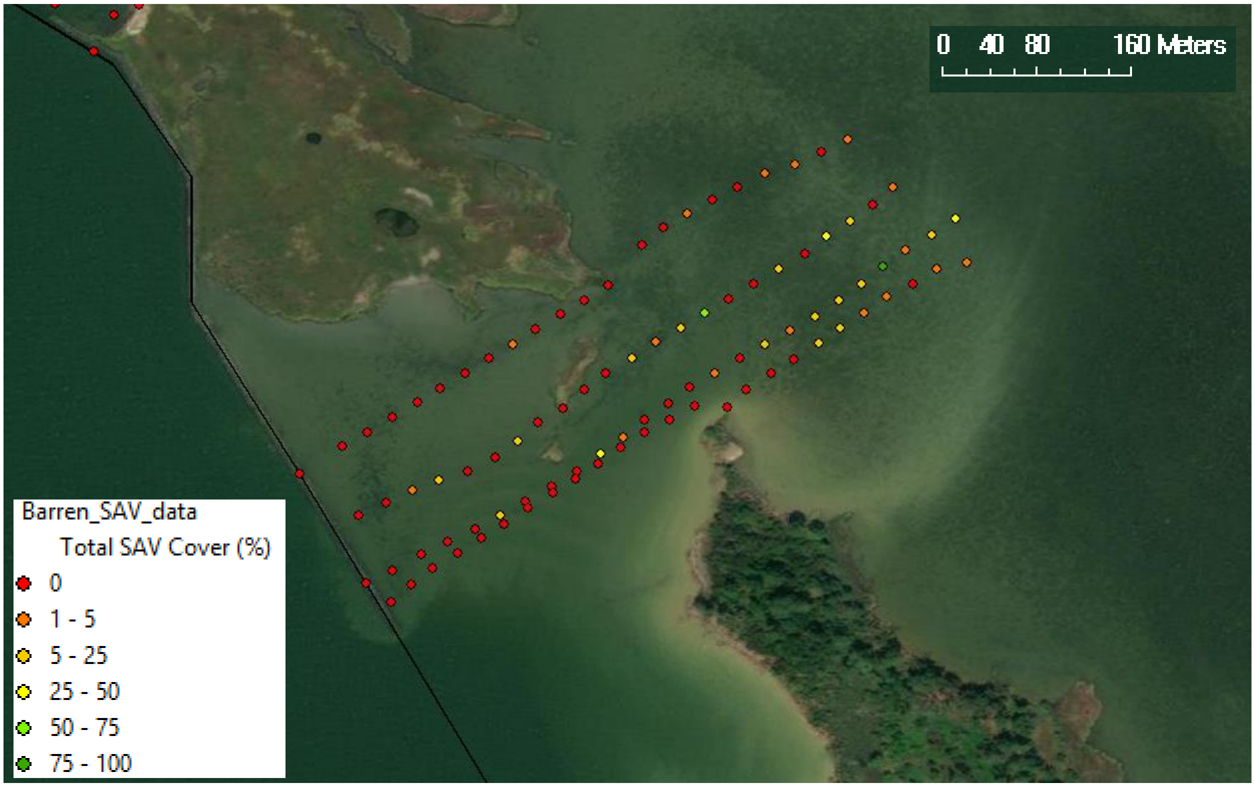

Figure 9. Total SAV percent cover observed at each quadrat location between the spans of Barren Island.

Southern shoreline: SAV surveys were conducted on the southern transects on June 2, 2021. Weather conditions were overcast and windy. Water temperatures averaged 71.0 F and salinity was 11. Seas were choppy with waves 1 – 2 feet. Water clarity was poor and Secchi depths averaged 0.5 meters along the deeper portions of the southern transects. Due to unsafe conditions, only the eastern half of transects 6 and 12 were surveyed. No SAV was observed on southern transects 6, 10, or 11 (Figure 10). One patch (2% cover) of widgeongrass was observed along transect 3, approximately 240 meters from the shoreline (Figure 10). One patch (1% cover) of horned pondweed was observed along transect 12, approximately 175 meters east of the proposed plan (Figure 10). The bottom type was characterized as sandy. Water depths ranged from 0 to 170 centimeters with deeper depths observed along the offshore transects (10-12).

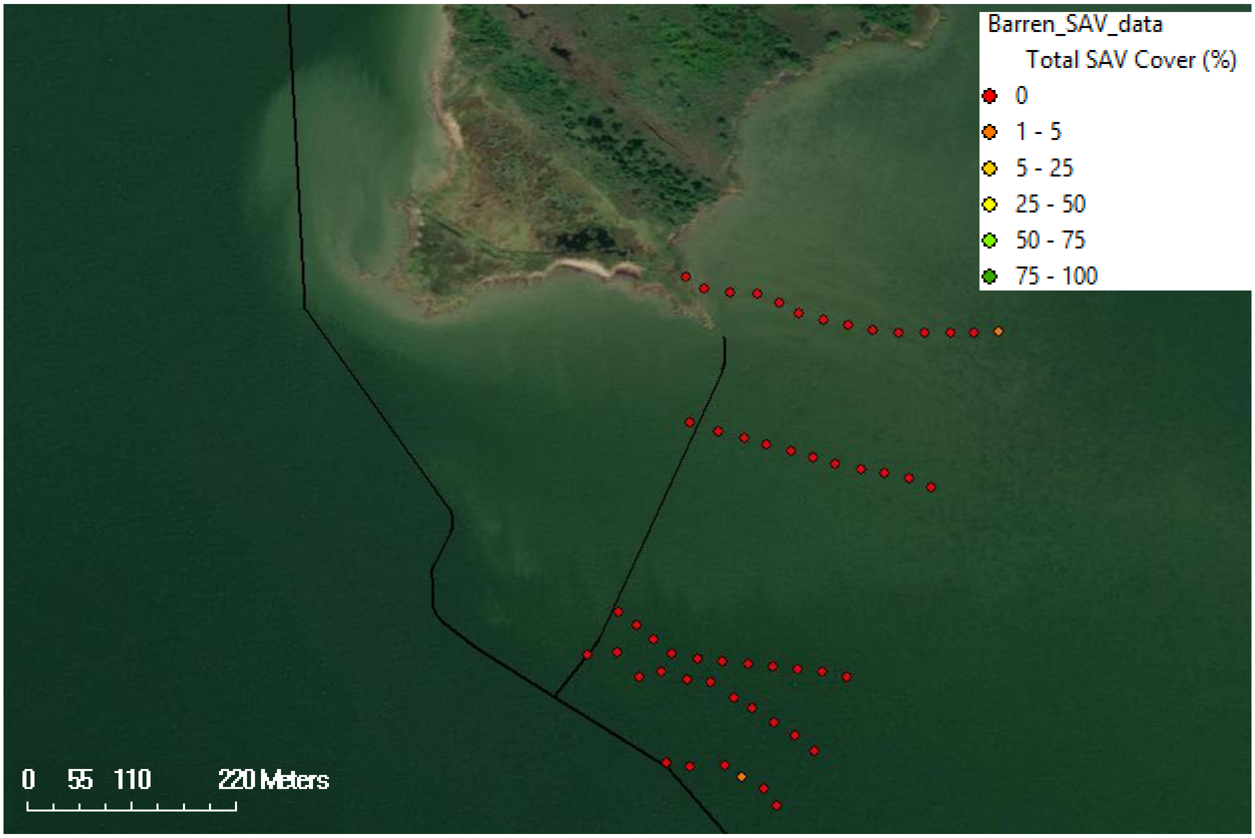

Figure 10. Total SAVpercent cover observed at each quadrat location on the southern shoreline of Barren Island.

Western shoreline: SAV surveys were conducted on the western transects on June 2, 2021. The weather conditions were sunny and breezy. Water temperatures averaged 71.4 F and salinity was 11. Seas were choppy with waves 1 – 2 feet, but calm inshore of the breakwaters. Water clarity was poor and Secchi depths averaged 0.5 meters along the deeper portions of the transects. No SAV was observed on western transects 2, 5, 6, or 7 (Figure 11). One patch (50% cover) of widgeongrass was observed along transect 4 approximately 20 meters from shore (Figure 11). The bottom type was a combination of peat, sand and gravel. Water depths ranged from 0 to 170 centimeters inshore of the breakwater.

Figure 11. Total SAV percent cover observed at each quadrat location on the western shoreline of Barren Island.

James Island

SAV surveys were conducted on the eastern shoreline of the southern portion of James Island on June 16, 2021. The weather conditions were sunny and calm. Water temperatures averaged 76.9 F and salinity was 7. The seas were calm and the water clarity was good. Secchi depths averaged

0.75 meters at the deeper edges of the transects. No SAV was observed on any of the four transects (Figure 12), but floating fragments of both widgeongrass and horned pondweed were observed frequently. Transect 3 was not surveyed between island fragments due to unsafe conditions (underwater obstructions, unstable bottom and shallow, fast-moving water). Bottom sediment was classified as eroding peat nearshore and sandy offshore with the occasional submerged tree or stump. Water depths ranged from 15 to 160 centimeters.

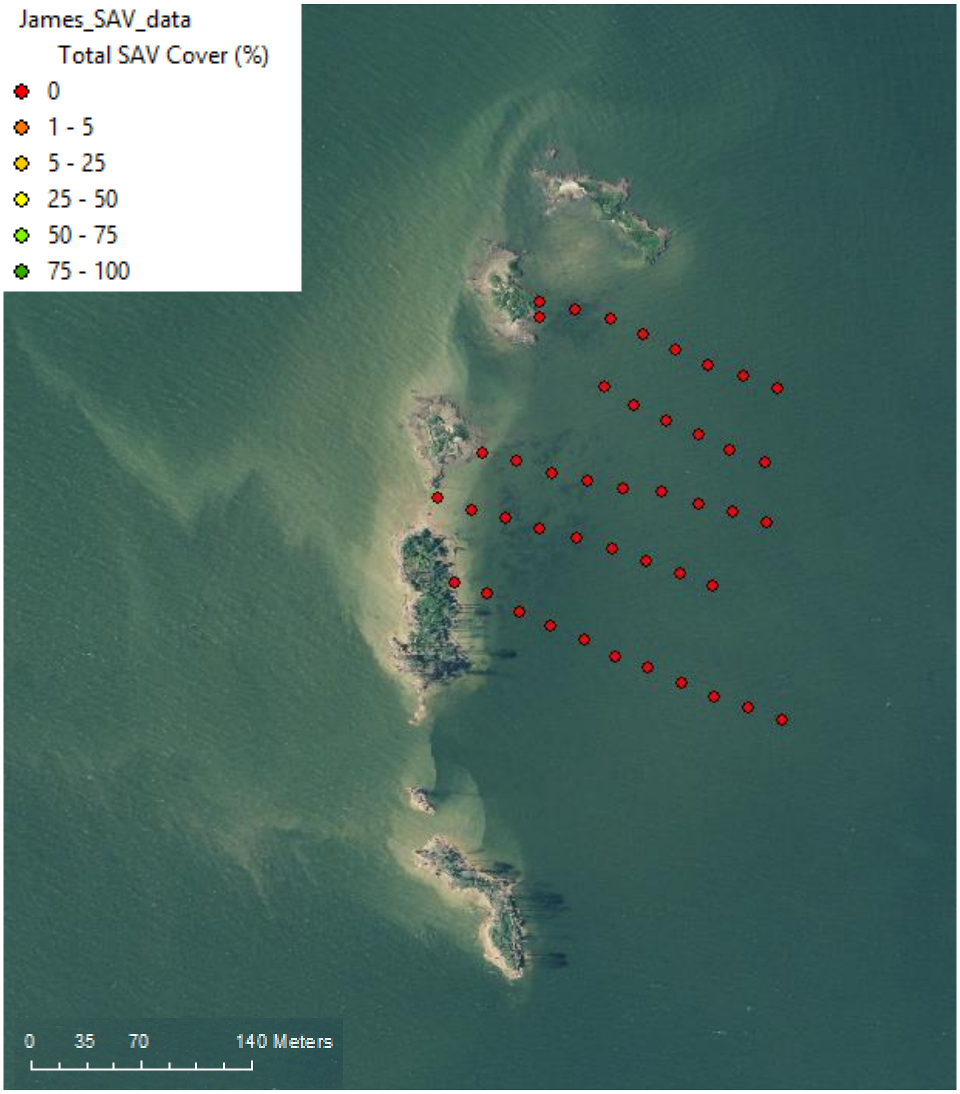

Figure 12. Total SAVpercent cover observed at each quadrat location on the eastern shoreline of the southern span of James Island.

Deliverables included with this report:

- Appendix with site photographs
- Electronic copies of datasheets
- Attributed GIS shapefiles of transect locations

Point Of Contact for Subtask 3.3

Becky Raves Golden (Rebecca.golden@maryland.gov) 410-260-8698

References

Landry, J.B. and R.R. Golden. 2018. In Situ Effects of Shoreline Type and Watershed land Use on Submerged Aquatic Vegetation Habitat Quality in the Chesapeake and Mid-Atlantic Coastal Bays. Estuaries and Coasts. 41(S1): 101–113.

Patrick, C.J., Weller, D.E., X. Li, and M. Ryder. 2014. Effects of shoreline alteration and other stressors on submerged aquatic vegetation in subestuaries of Chesapeake Bay and the Mid-Atlantic Coastal Bays. Estuaries and Coasts. 37: 1516-1531.

Patrick, C.J., Weller, D.E., and M. Ryder. 2016. The relationship between shoreline armoring and adjacent submerged aquatic vegetation in Chesapeake Bay and nearby Atlantic coastal bays. Estuaries and Coasts. 39: 158–170.

Appendix A

Barren and James Islands SAV Survey Photos

Barren Island – Northeastern Shoreline

Transects 1, 9 and 13
June 1, 2021

Barren Island – Northeastern Shoreline

Transects 20 and 22
June 1, 2021

Barren Island – Central

Transects 1 – 4 (offshore facing West)
June 2, 2021

Barren Island – Central

Transects 1 – 4 (middle facing West)
June 2, 2021

Barren Island – Central

Transects 1 – 4 (inshore of breakwater)
June 2, 2021

Barren Island – Southeastern Shoreline

Transects 3 and 6
June 2, 2021

Barren Island – Southeastern Shoreline

Transects 10, 11 and 12
June 2, 2021

Barren Island – Western Shoreline





Transects 2, 4, 5, 6 and 7
June 2, 2021

James Island – Eastern Shoreline

Transects 2 - 6
June 16, 2021

Appendix B

Datasheets

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island Barren James (circle one)

Observer B Sverida

Location N IN BETWEE S W (circle one)

Date 6/1/21 Time ~12:00

Transect N1

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	N/A	0	19	0	–				mud/peat		
2	001	20	56	0	–				〃		
3	002	40	82	0	–						
4	003	60	95	0	–						
5	004	80	97	0	–						
6	005	100	115	0	–						
7	006	120	87	0	–				Sandy		
8	007	140	105	0	–						
9	008	160	120	–	–						
10	009	180	note	0	–	148					
11	010	200	to deep	0	–	180					
12	011	220	Fins Of the bed			190					
13	012	240	" "	0	–	190					
14	013	260	" "	0	–	190					
15	014	280	" "	0	–	190					
16	015	300	" "	0	–	190					
17	016	320	Fins+top	0	–	190					
18	017	340	"	" 0	–	190					
19	018	360	" "	0	–	190					
20											
21											
22											
23											
24											
25											

✓ ✓

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island [✓ Barren] James (circle one)

Observer BRG

Location [✓ N] IN BETWEE S W (circle one)

Date 6/1/21 Time 1.04
low 2ish -.3

Transect 9

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	N9A	Beach	—	—	—						
2	552	20	thigh	—	—		65				
3	553	40	hip	—	—		85				
4	554	60	rib	—	—		85				
5	555	80	waist	—	—	oysters	100				
6	556	100	rib	—	—	oysters	110				
7	557	120	arm pit	—	—	oysters	117				
8	558	140	arm pit	—	—		117				
9	559	160	under arm	—	—		110				
10	560	180	rib	—	—	sand	110				
11	N9B	200	rib	—	—		110				
12	561	220	arm pit	—	—		117				
13	562	240	arm pit	—	—		117				
14	563	260	arm pit	—	—		117				
15	564	280	" "	—	—		117				
16	565	300	" "	—	—		117				
17	566	320	should	—	—		130				
18	567	340	shoulder	—	—		130				
19	568	360	neck	—	—		136				
20	569	~~380~~ 370	neck	—	—		136				
21	N9C	400	neck	—	—		136				
22											
23											
24											
25											

✓✓

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island [✓ Barren] James (circle one)

Observer BROOKE

Location N IN BETWEE S W (circle one)

Date 6/1/21 **Time** 1:16 pm

Transect N13

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
N13A 1	1202	(0) .5m	15cm	0	—						
2	1203	20	63	0	—						
3	1204	40	75	0	—						
4	1205	60	85	0	—						
5	1206	80	103	0	—						
6	1207	100	120	0	—						
7	1208	120	115	0	—						
* SKIP 1210 * 8	1209	140	117	0	—						
9	1211	160	115	0	—						
10	1212	180	110	0	—						
11	1213	200	110	0	—						
12	1214	220	110	0	—						
13	1215	240	110	0	—						
14	1216	260	112	0	—						
15	1217	280	115	0	—						
16	1218	300	118	0	—						
17	1219	320	120	0	—						
18	1220	340	125	0	—						
19	1221	360	125	0	—						
20	1222	380	128	0	—						
21	1223	400	130	0	—						
22											
23											
24											
25											

✓ ✓

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island Barren James (circle one)

Observer B Swerida

Location N IN BETWEE S W (circle one)

Date 6/1/21 **Time** 3:39

Transect N20

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	N20B		67	0	—						
2	019	20 from B	72	0							
3	020	40	75	0							
4	021	60	87	10%	7cm	Ruppia					
5	022	80	B125 [illegible]	125 [illegible]							
6	023	100	[illegible]	100 10%	12	Rm					
7	024		B[illegible]s	111							
8	025		B[illegible]s	111							
9	026		B125b	5 125							
10	027		B125h	5 125							
11	028	C	125								
12											
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Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

✓ ✓

Island: Barren James (circle one)

Observer: RRG

Location: [✓ N] IN BETWEE S W (circle one)

Date: 6/1/21 Time: 3:39 4:13

Transect: 20/22

Pictures: Y N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	RM % cover	% cover	% cover			
1	N20A	0	15	2	7	2	}				
2	1225	20	8	—	—						
3	1226	40	7	10	4	10	[illegible]				
4	1227	60	7	0	—	—					
5	1228	80	5	0	—	—					
6	1229	100	shoal	0	—	—			N20B-N20C done		
7	1230	120	4	0	—	—				by B.S.	
8	1231	140	shoal/oysters		—	—					
9	1232	160	12	0	—	—	oystershell				
10	1233	180	53	50	10	50					
11	N20B	200									
12											
13	N22A	0	9	0	—	—					
14	1234	20	15	0	—	—					
15	1235	40	15	0	—	—		N22B-N22C done by			
16	1236	60	9	2	7	2	~~2~~		B.S.		
17	1237	80	14	3	10	3					
18	1238	100	12	0	—	—					
19	1239	120	14	0	—	—					
20	1240	140	14	0	—	—					
21	1241	160	13	0	—	—					
22	1242	180	12	0	—	—					
23	N22B	200									
24											
25											

Maryland Department of Natural Resources SAV Survey
If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

✓✓

Island [✓ Barren] James (circle one)

Observer RLG

Location [✓ N] IN BETWEE S W (circle one)

Date 6/1 **Time** 4:30

Transect 22

Pictures Y N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	Ru % cover	% cover	% cover			
1	1243	20 frm	22B J2	3	10	3					
2		~~40~~									
3	1244	60	50	1	10	1		Alternated w/ Becky			
4		~~80~~									
5	1245	100	55	1	10	1					
6		~~120~~									
7	1246	140	thigh 65	10	10	10					
8		~~160~~									
9	1247	180	thigh 65	0	—	—					
10	N22C										
11											
12											
13											
14											
15											
16											
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24											
25											

✓✓

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island [✓ Barren] James (circle one)

Observer B-SWIZ

Location [✓ N] IN BETWEE S W (circle one)

Date 6/1/21 **Time** 420

Transect 22 B→C

Pictures Y N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

N

* 5" 12 *

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
N 1	22B		48	70	10	Rm				Sand	
2	029	40?	55	25	9	Rm					
3	030	80	65	10	10	Rm					
4	031	120	68	10	9	Rm					
5	032	140	70	5	12	Rm					
6	033	160	75	40	9	Rm					
7											
8				40							
9											
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If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island Barren James (circle one)

Observer BRG

Location N [✓ IN BETWEE] S W (circle one)

Date 6/2/21 Time 3:18

Transect C1

Pictures Y N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			B
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover Rm	% cover Zp	% cover			
1	C1C		19	1	10	1	—				
2	589	20	19	0	—	—	—				
3	590	40	16	<1	8	<1	—				
4	591	60	16	<1	7	<1	—				
5	592	80	16	0	—	—	—				
6	593	100	15	0	—	—	—				
7	594	120	20	1	8	1	—				
8	595	140	20	0	—	—	—				
9	596	160	16	0	—	—	—				
10	C1B	~185	20	0	—	—	—				
11	597	+20	9	0	—	—	—				
12	589	+40	9	0	—	—	—				
13	599	60	13	0	—	—	—				
14	600	80	17	1	10	1	—				
15	601	100	15	0	—	—	—				
16	602	120	12	0	—	—	—				
17	603	140	15	0	—	—	—				
18	604	160	21	0	—	—	—				
19	605	180	22	0	—	—	—				
20	606	200	21	0	—	—	—				
21	607	220	20	0	—	—	—	green micro ~1%			
22	C1A	245	19	0	—	—	—				
23											
24											
25											

N1

* 5ft 12 *

Maryland Department of Natural Resources SAV Survey
If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Maryland Department of Natural Resources SAV Survey
If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

System Barren Island **Observer** B Swizz

Edge of bed Distance from shore C2 **Date** 6/2/21

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover	% cover	% cover	% cover
1	C2C		20	2	4	Zan					
2	058	20	19	0	–						
3	059	40	17	15	5	Rm					
4	060	60	16	50	11	Rm					
5	061	80	20	0	–						
6	062	100	22	20	9	Rm					
7	063	120	27	0	–						
8	064	140	32	0	–						
9	065	160	37	75	8	Rm					
10	066	180	39	15	7	Rm					
11	067	200	35	5	8	Rm					
12	068	220	27	10	7	Rm					
13	069	240	20	0	–						
14	070	260	23	0	–						
15	071	280	25	0	–						
16	072	300	21	0	–						
17	073	320	35	10	8	Rm					
18	074	340	37	0	–						
19	075	360	30	0	–						
20	076	380	35	15	7	Rm					
21	077	400	35	5	9	Rm					
22	078	420	31	0	–						
23	079	440	35	0				muddy			
24											
25											
26											
27											
28											
29											
30											

✓✓

Maryland Department of Natural Resources SAV Survey
If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

System Barren **Observer** B Swizz

Edge of bed Distance from shore C3 **Date** 6/2/21

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover	% cover	% cover	% cover
			39								
1	9C3A	Just across breakwater					1% green macro				
2	080	20	53	0	–		Rays!				
3	081	40	50	0	–						
4	082	60	45	0	–						
5	083	80	60	0	–						
6	084	100	58	25	9	Rm					
7	085	120	52	0	–						
8	086	140	49	0	–						
9	087	160	57	0	–						
10	088	180	55	30	9	Rm					
11	089	200	53	5	10						
12	090	220	56	0	–						
13	091	240	60	0	–						
14	092	260	64	0	–						
15	093	280	53	5	10	Rm					
16	094	300	46	0	–						
17	095	320	35	10	8	Rm					
18	096	340	30	5	8	Rm					
19	097	360	31	15	8	Rm					
20	098	380	28	20	10	Rm			↑		
21	099	400	25	10	8	Rm			Sand		
22	100	420	27	80	15	Rm			mud		
23	101	440	28	5	8	Rm					
24	102	460	29	10	9	Rm					
25	103	480	34	30	7	Rm					
26											
27											
28											
29											
30											

✓✓

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Observer BRG

Island Barren James (circle one)

Date 6/2/21 Time 4:14

Location N [✓ IN BETWEE] S W (circle one)

Transect 4

0'
75-170

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	Rm % cover	Zp % cover	% cover			
1	C4A	other side of rocks				—	—				
2	608		37	0	—	—	—				
3	609	20	Hip	0	—	—					
4	610	40	53	0	—	—	—				
5	611	60	Hip	0	—	—	—				
6	612	80	53	0	—	—	—				
7	613	100	thigh	0	—	—	—				
8	614	120	35	0	—	—	—				
9	615	140	52	0	—	—	—				
10	616	160	55	0	—	—	—				
11	617	180	55	0	—	—	—				
12	618	200	47	0	—	—	—				
13	619	220	46	0	—	—	—				
14	620	240	52	0	—	—	—				
15	621	260	55	0	—	—	—				
16	C4B		34	0	—	—	—				
17	622	20	22	0	—	—	—				
18	623	40	28	0	—	—	—				
19	624	60	30	0	—	—	—				
20	625	80	29	10	10	10	—				
21	626	100	23	15	9	15	—				
22	627	120	28	1	10	1	—				
23	628	140	28	5	10	5	—				
24	629	160	26	0	—	—	—				
25	630	180	28	1	10	1	—				
	C4C	200	30	1	10	1					

✓ ✓

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island Barren James (circle one)

Location N IN BETWEE [✓ S] W (circle one)

Transect 3

Pictures Y N (circle one)

take pictures of shoreline and offshore!

Observer BBG

Date 6/2/21 **Time** 17:30

	beginning	middle	end
Secchi Depth			
Water Temp	71.0	71.0	71.0
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover Ru	% cover r	% cover			
1	S3A	wrack line		0							
2	575	20	17	0				sand			
3	576	40	47	0				sand			
4	538	60	34	0							
5	577	80	44	0							
6	578	100	53	0							
7	579	120	thigh ^{65}	0							
8	580	140	thigh ^{65}	0							
9	581	160	thigh ^{65}	0							
10	582	180	thigh ^{65}	0							
11	583	200	thigh ^{65}	0							
12	584	220	thigh ^{65}	0							
13	585	240	thigh ^{65}	0							
14	586	260	55	0							
15	587	280	thigh ^{65}	2	10	2		close to S3C			
16		~~300~~									
17		~~320~~									
18		~~340~~									
19		~~360~~									
20		~~380~~									
21	3SC	480									
22											
23											
24											
25											

✓ ✓

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Observer Brooke

Island [✓ Barren] James (circle one)

Date 6/2/21 **Time** 7^{30}

Location N IN BETWEE [✓ S] W (circle one)

Transect S6

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

N

	Waypoint	Quad Distance from LB Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
LB 1	1252	0	110	0							
2	1253	20	105	0							
3	1254	40	100	0							
4	1255	60	100	0							
5	1256	80	95	0							
6	1257	100	85	0							
7	1258	120	85	0							
8	1259	140	80	0							
9	1260	160	80	0							
10	1261	180	75	0							
11	1262	200	75	0							
12											
13											
14											
15											
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21											
22											
23											
24											
25											

* 5" 12 *

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island Barren James (circle one)

Observer B Swirz

Location [✓ N] IN BETWEE [✓ S] W (circle one)

✓ ✓ **Date** 6/2/2 / **Time** 7:20

Transect S10

Pictures Y N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

S10

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	N/A		shoulders		0	134					
2	043	20	neck	0	0	137					
3	044	40	shoulders			134					
4	045	60	chin	0		141					
5	046	80	nose			148					
6	047	100	neck			137					
7	048	120	chin			141					
8	049	140	nose			148					
9	050	160	nose			148					
10	051	180	chin			141					
11	052	200	shoulder			134					
12											
13											
14											
15											
16											
17											
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22											
23											
24											
25											

✓ ✓

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island [✓ Barren] James (circle one)

Observer Brooke L

Location N IN BETWEE [✓ S] W (circle one)

Date 6/2/21 Time 1:49

Transect S11

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

11A

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	1269	40	shoulder	0	—	147					
2	1270	80	" "	0	—	147					
3	1271	120	armpits	0	—	139					
4	1272	160	"	0	—	139					
5	1273	200	"	0	—	139					
6											
7											
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24											
25											

✓ ✓

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island Barren James (circle one)

Location ~~N~~ IN BETWEE [✓ S] W (circle one)

Transect ~~E~~ S11

Pictures Y N (circle one)

take pictures of shoreline and offshore!

Observer B Swiz

Date 6/2/21 **Time** ______

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
S11A 1	N/A		top	0	160						
2	053	20	top		160						
3	054	60	eyes		151						
4	055	100	top		160						
5	056	140	chin		141						
6	057	180	eyes		151						
7											
8											
9											
10											
11											
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✓✓

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island [✓ Barren] James (circle one)

Observer Brooke

Location N IN BETWEE [✓ S] W (circle one)

Date 6/2/21 Time

Transect S12

Pictures Y N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

rer

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover ZP	% cover	% cover			
12C 1	1263	0	ai n 14	0	—	Sand					
2	1264	20	ch n 24	0	—	↓					
3	1265	40	ch n 14	1	15	1					
4	1266	60	eye 55	0	—						
5	1267	80	ah 170	0	—						
6	1268	100	ah 170	0	—						
7	↓ too	Deep	*								
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

✓ ✓

Island Barren James (circle one)

Observer B Suizz

Location N IN BETWEE S [✓ W] (circle one)

Date 6/2/21 **Time**

Transect 1/4

Pictures Y N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	W4B	1m	27	0	–			Sand			
2	038	20	70	50	7	Rm		^			
3	039	40	cratch	0	–						
4	040	60	79	0	–						
5	041	80	+160 Head		0						
6	042	100	Above Head 170		10			gravel			
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
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22											
23											
24											
25											

✓ ✓

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island Barren James (circle one)

Observer B Swizz

Location N IN BETWEE S [✓ W] (circle one)

Date 6/2/21 Time 10:10

Transect W5

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	W5B	0	0	0	-				sand		
2	034	20	36	0	-				chunk of marsh peat		
3	035	40	87	0	-				mud/silt		
4	036	60	125 Boob	0	-				Sand Ripples		
5	037	80	under Boob	0	-				"		
6	W5A	Just beyond stone, Deep									
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
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22											
23											
24											
25											

✓ ✓

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island [✓ Barren] James (circle one)

Observer Brooke L.

Location N IN BETWEE S [✓ W] (circle one)

Date 6/2/21 Time 10:23Am

Transect WLe

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	1248	0	60	—	Dead submerged marsh vegetation (roots + stem bases)						
2	1249	20	85	—	Sand						
3	1250	40	85	—	sand						
4	1251	60	125	5	Fluff	5 macroalgae - red filamentous					
5											
6											
7											
8											
9											
10											
11											
12											
13											
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23											
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25											

✓ ✓

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island Barren James (circle one)

Observer BRG

Location N IN BETWEE S [✓ W] (circle one)

Date 6/2/21 Time 10:15

Transect 7

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover	green macro		
1	WB7	wrack	line	—	—	—					
2	571	20	thigh	65	—		squishy		75%		
3	WBA	40	20	—	—		marsh grass/rocks				
4		60									
5		80									
6		100									
7											
8											
9	W2B	~	20m	shore	thigh	—	sand				
10	572	20	hip 85	—	—		sand				
11	573	40	hip 85	—	—		sand				
12	574	60	ar pit 117	—	—	—	sand				
13	W2A	~~80~~	neck 136		—	—	rock				
14		~~100~~									
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											

Maryland Department of Natural Resources SAV Survey
If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island Barren [✓ James] (circle one)

Observer Brooke

Location ~~N~~ IN BETWEE ~~S~~ W (circle one)

Date 6/16/21 **Time** 3:12 pm

Transect 2

✓ ✓

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

1294 = delete

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	1295	0	—	0	—	2A on land					
2	1296	20	46	0	—						
3	1297	40	75	0	—						
4	1298	60	95	0	—						
5	1299	80	105	0	—						
6	1300	100	105	0	—						
7	1301	120	110	0	—						
8	1302	140	112	0	—						
9											
10											
11											
12											
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20											
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23											
24											
25											

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island Barren [✓ James] (circle one)

~~Location N IN BETWEE S W (circle one)~~

Transect 3

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

✓✓

Observer RMF

Date 6/16/21 Time 03:00

	beginning	middle	end
Secchi Depth	.75	bottom	
Water Temp	76.9	—	
Salinity	7	—	—

	Waypoint	Quad Distance from Shore →	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	J3A					0					
2	J3B	hip	85			↓	lots of peat & trees				
3	640	hip	85			0	Stumps				
4	641	waist	100			0	sand				
5	642	rib	110			0	sand				
6	643	rib	110			0	sand				
7	644	arm pit	117			0	" "		lots of floating Z.P.		
8	645	arm pit	117			0	sand				
9						0	" "				
10											
11											
12						*	Did not complete between				
13							J3A + J3B - incoming tide				
14											
15									lots of submerged		
16										trees	
17									crumbling peat		
18											
19											
20											
21											
22											
23											
24											
25											

Maryland Department of Natural Resources SAV Survey
If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island Barren [✓ James] (circle one)

Observer Brooke

Location N IN BETWEE S W (circle one)

Date 6/16/21 **Time** 2:40

Transect 4

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

11

7

✓

✓

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	1285	0	30	0	—						
2	1286	20	70	0	—						
3	1287	40	75	0	—						
4	1288	60	78	0	—						
5	1289	80	90	0	—						
6	1290	100	100	0	—						
7	1291	120	105	0	—						
8	1292	140	111	0	—						
9	1293	160	130	0	—						
10											
11											
12											
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23											
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25											

✓ ✓

Maryland Department of Natural Resources SAV Survey
If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island Barren [✓ James] (circle one)

Observer RRG

~~**Location** N IN BETWEE S W (circle one)~~

Date 6/16/21 **Time** 1:35

Transect 5

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth		0.8	0.~~765~~.25
Water Temp		76.9	
Salinity		~7	

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	Rm % cover	Zp % cover	% cover			
1	5A										
2	631	0	thigh	0	—	65			eroded marsh / peat		
3	632	20	thigh	0	—	65			"		
4	633	40	hip	0	—	85			sand		
5	634	60	hip	0	—	85			sand		
6	635	80	hip	0	—	85			sand		
7	636	100	waist	0	—	100			sand		
8	637	120	waist	0		100			sand		
9	638	140	arm pit	0		117			sand		
10	639	160	arm pit	0		117			between	J5C	J6C
11		180									
12		200									
13											
14											
15											
16											
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25											

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

~~Louise Pollack 410-923-2329~~

Island Barren [✓ James] (circle one)

Observer Brooke

Location N [✓ IN BETWEE] S W (circle one)

Date 6/16/21 **Time** 139 pm

✓✓

Transect 6

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	1274	0	30	0	—	→ on submerged platform w/ down trees					
2	1275	20	110	0	—						
3	1276	40	108	0	—						
4	1277	60	100	0	—						
5	1278	80	108	0	—						
6	1279	100	113	0	—						
7	1280	120	115	0	—						
8	1281	140	115	0	—						
9	1282	160	115	0	—						
10	1283	160	115	0	—						
11	1284	200	120	0	—						
12											
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C7: Mid-Chesapeake Bay Islands Ecosystem Restoration Submerged Aquatic Vegetation (SAV) SUMMER 2021 Surveys at Barren and James Islands (MDNR, 2021b)

Mid-Chesapeake Bay Islands Ecosystem Restoration Submerged Aquatic Vegetation (SAV) SUMMER 2021 Surveys at Barren and James Islands Final Report

Contract Number: 09-07-105 Subtask 3.3

November 4, 2021

Project Overview

The Mid-Chesapeake Bay Island Ecosystem Restoration project is located on the islands of James and Barren in western Dorchester County, Maryland. The project is focused on restoring and expanding island habitat to provide hundreds of acres of wetland and terrestrial habitat for fish, shellfish, reptiles, amphibians, birds, and mammals through the beneficial use of dredged material.

Submerged Aquatic Vegetation (SAV) is an important habitat in the Chesapeake Bay and SAV beds have historically surrounded both Barren and James Islands. There is evidence that some shoreline protection structures, including those proposed for the Mid-Bay Island project, can cause unintended declines in adjacent submerged aquatic vegetation (Patrick et al., 2014, 2016; Landry and Golden, 2018). However, creating conditions in which SAV continues to thrive in these shallow water areas is an important objective of the Mid-Bay Island project.

Project Tasks

The subcontractor will provide, manage, and coordinate qualified staff to assist the Maryland Environmental Service (MES) with SAV sampling and reporting efforts at Barren and James Islands to document the current aquatic resources present in and around the islands that are of importance to the Mid- Chesapeake Bay Island Ecosystem Restoration Project.

The primary tasks for this project are to investigate and document SAV occurrence and distribution in the vicinity of both Barren and James Islands. SAV will also be evaluated for species composition and relative density. SAV sampling will be conducted in early to mid-June, 2021 to observe the potential presence of horned pondweed (*Zannichellia palustris*) and eelgrass (*Zostera marina*), and from July 15 to August 30, 2021, to observe the potential presence of widgeon grass (*Ruppia maritima*) and other late-season species.

Project Reporting Period

This report details the results of the late summer/early fall 2021 SAV surveys at Barren and James Islands. Results of the early summer 2021 SAV surveys were provided in the previous report.

Methodology

Transect Selection

SAV surveys focused on the surrounding waters of areas where proposed island restoration activities will occur. Transects were identified where the existing SAV beds (2015 – 2020) overlapped with the area to be impacted by the recommended plan. At Barren Island, the areas surveyed for SAV were the northeast shoreline of the northern remnant, the western shoreline of the northern remnant behind the breakwaters, the area between the northern and southern island remnants, and the southern tip of the southern remnant. At James Island, the eastern shoreline of the southern remnant was the focus area.

The number and locations of transects were finalized upon agreement with MES, Maryland Department of Transportation, Maryland Port Authority, and United States Army Corps of Engineers prior to commencing work. The survey plan covered at least 10% of the impact area and transects extended from the shoreline of the island to an extent into the water passed the proposed breakwater/revetment/dike alignment (or to the limit of the SAV 5-year composite coverage, whichever was shorter). Transects were laid out with at least 50 meters between transects.

At Barren Island, the number of transects proposed are listed below and shown in Figure 1.

1. Northeast shoreline: 22 transects identified, 5 randomly selected to be surveyed
2. Span between remnants: 4 transects identified, all to be surveyed
3. Southern breakwater: 12 transects identified, 5 randomly selected to be surveyed
4. Western shoreline behind breakwaters: 7 transects identified, 5 randomly selected to be surveyed

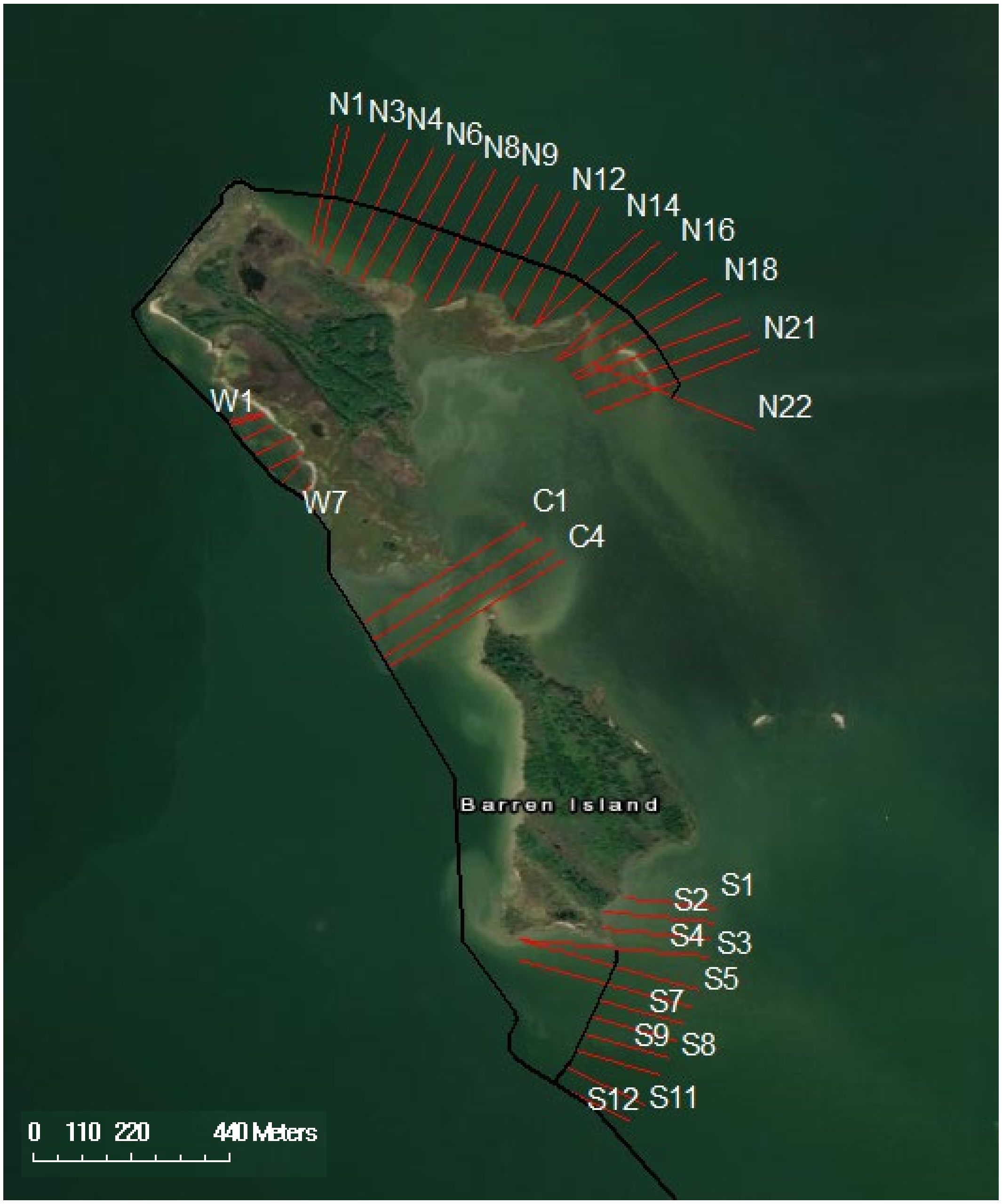

Figure 1. *Overview map of Barren Island showing 22 transect locations on the northeastern shoreline, four transect locations between the spans, 12 transect locations on the southern shoreline and seven transect locations inshore of the western breakwater.*

At James Island, the number of transects proposed are listed below and shown in Figure 2.

1. Eastern shoreline: 8 transects identified, 5 randomly selected to be surveyed

***Figure 2**. Overview map of James Island showing eight transect locations along the eastern shoreline of the southern span.*

SAV surveys

SAV surveys were performed at James Island on August 19, 2021 and on September 15 and 16, 2021 at Barren Island. Quadrats (0.25m^2) were sampled along the length of each transect at even intervals. The number of quadrats sampled per transect was based on the overall length of the transect. For example, a 100 meter transect would contain 11 quadrats spaced every 10 meters. A 200 meter transect would contain 11 quadrats spaced every 20 meters. Due to expected water depths, the survey was conducted via snorkel or wading. Parameters measured included: the presence/absence of SAV, relative water depth, total SAV visual percent cover, individual SAV species visual percent cover, and canopy height (see detailed methods in Landry and Golden, 2018). Coordinates for each transect (beginning, middle, and end) and quadrat were recorded using handheld Garmin GPSmap 78s units. All data were recorded on task-specific data sheets and entered into Microsoft Excel and Esri ArcMap.

Salinity, water temperature, and water clarity (Secchi disk reading, depending on water depth) were also collected at each location.

Project Outcomes

Transect Selection

At Barren Island, the randomly selected transects were as follows:

1. Northeast shoreline: Transects N8, N10, N14, N16, and N18
2. Span between remnants: Transects C1 – 4
3. Southern breakwater: Transects S1, S2, S3, S9, and S11
4. Western shoreline behind breakwaters: Transects W2, W3, W4, W5, and W6

At James Island, the randomly selected transects were as follows:

1. Eastern shoreline: Transects J1, J2, J4, J5, and J6

Transect locations are shown in Figure 1 (Barren Island) and Figure 2 (James Island).

SAV surveys

Barren Island

Our intention was to perform all of the surveys in August, but due to staff illness and several weeks of severe weather, the Barren Island survey was pushed back into September.

Northeastern shoreline: SAV surveys were conducted on Barren Island's northeast shoreline on September 15, 2021. Weather conditions were overcast and windy. Water temperatures averaged 76 °F and salinity was 13. Seas were rough with 0.3 – 0.6 meter waves. Water clarity was poor due to sediment resuspension and Secchi depths averaged 0.25 meters at the deeper edges of the northeastern transects. SAV was observed on northeastern transects N8, N10, N14, N16, and N18 (Figure 3). Bottom sediment was classified as mud or peat nearshore and sandy or oyster shell offshore. Water depths ranged from 0.26 to 2 meters.

Transects N14 and N16 were not surveyed along the deeper offshore portions due to strong currents and 0.6 meter waves.

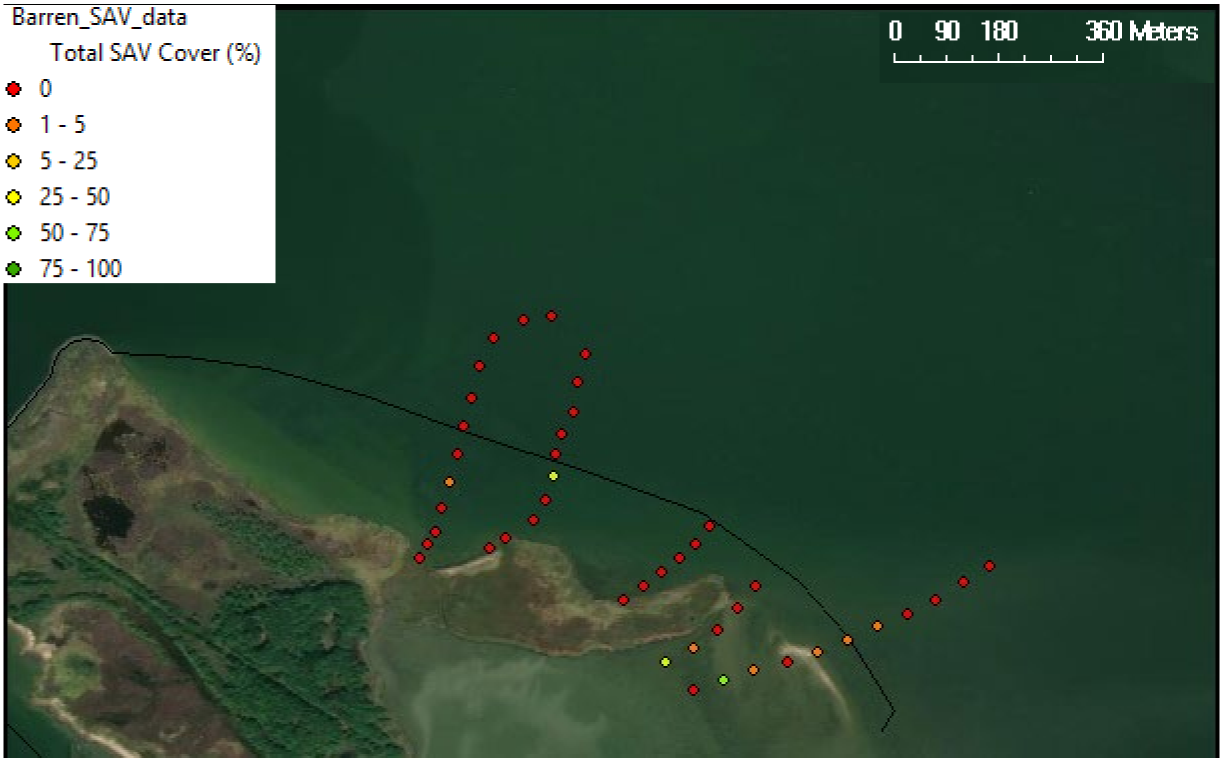

***Figure 3**. Total SAV % cover observed at each quadrat location on the northern shoreline of Barren Island.*

Central span: SAV surveys were conducted on the central transects on September 15, 2021. The weather conditions were sunny and breezy. Water temperatures averaged 77 °F and salinity was 13. Seas were rough with waves 0.3 - 0.6 meters. Secchi depths averaged 0.20 meters due to the shallow depths of the area and poor clarity due to sediment resuspension from the passing storms. Widgeon grass was observed along all four transects, with greater percent cover values on the eastern side of the island remnants (Figure 4). The bottom type was characterized as sandy or muddy. Water depths ranged from 0.15 to 1 meters, with deeper depths closer to the breakwater.

Due to rough seas and high winds, we did not attempt to reach the southern or western areas of the island on September 15th.

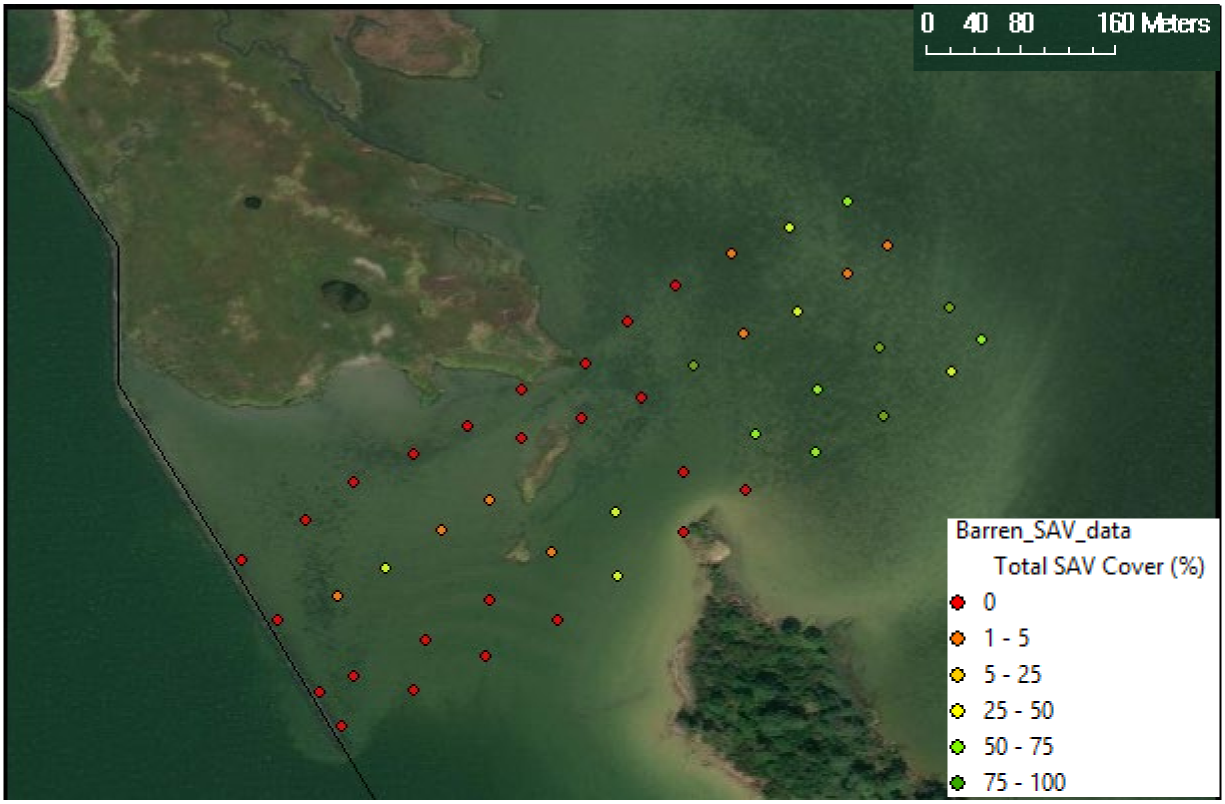

***Figure 4**. Total SAV percent cover observed at each quadrat location between the spans of Barren Island.*

Southern shoreline: SAV surveys were conducted on the southern transects on September 16, 2021. Weather conditions were stormy. Water temperatures averaged 76 °F and salinity was 14. Seas were rough with waves 0.3 – 0.6 meters. Water clarity was poor and Secchi depths averaged 0.6 meters along the deeper portions of the southern transects. We completed three (S1, S2, S3) of the southern transects as thunderstorms approached. Widgeongrass was observed on southern transects 1 and 2 (Figure 5). No SAV was observed along the southern transect S3. The bottom type was characterized as sandy. Water depths ranged from 0.45 to 1.05 meters.

The team decided to forgo the remaining two southern transects (S9, S11) and instead sampled the five western transects before the storms hit. Our decision was based on the following:

- S9 and S11 were located in deeper water (> 1.8m)
- No widgeon grass was observed in that area during our spring sampling
- No SAV was observed when we did a few rake throws in the vicinity of S9 and S11
- No SAV was mapped by VIMS in those areas since 2017
- The alternative would have been no SAV transects on the western side of Barren

Figure 5. Total SAV percent cover observed at each quadrat location on the southern shoreline of Barren Island.

Western shoreline: SAV surveys were conducted on the western transects on September 16, 2021. The weather conditions were stormy. Water temperatures averaged 77 °F and salinity was 13. Seas were choppy with waves 0.3 – 0.6 meters, but calm inshore of the breakwaters. Water clarity was poor and Secchi depths averaged 0.5 meters along the deeper portions of the transects. Widgeon grass was observed on western transects W2, W3, and W4 (Figure 6). No SAV was observed along western transects W5 or W6 (Figure 6). The bottom type was a combination of peat, sand and gravel. Water depths ranged from 0.25 to 1.91 meters inshore of the breakwater.

***Figure 6**. Total SAV percent cover observed at each quadrat location on the western shoreline of Barren Island.*

James Island

SAV surveys were conducted on the eastern shoreline of the southern portion of James Island on August 19, 2021. The weather conditions were sunny and calm, although the remnants of Tropical Storm Fred produced locally heavy rainfall and winds as it moved over the area the day before. Water temperatures averaged 81 °F and salinity was 11. Secchi depth averaged 1 meter at the deeper edges of the transects. Only one patch of widgeon grass was observed along Transect J5 (Figure 7), but floating fragments of both widgeon grass were observed frequently. Bottom sediment was classified as eroding peat nearshore and sandy offshore with the occasional submerged tree or stump. Water depths ranged from 0.41 to 1.47 meters.

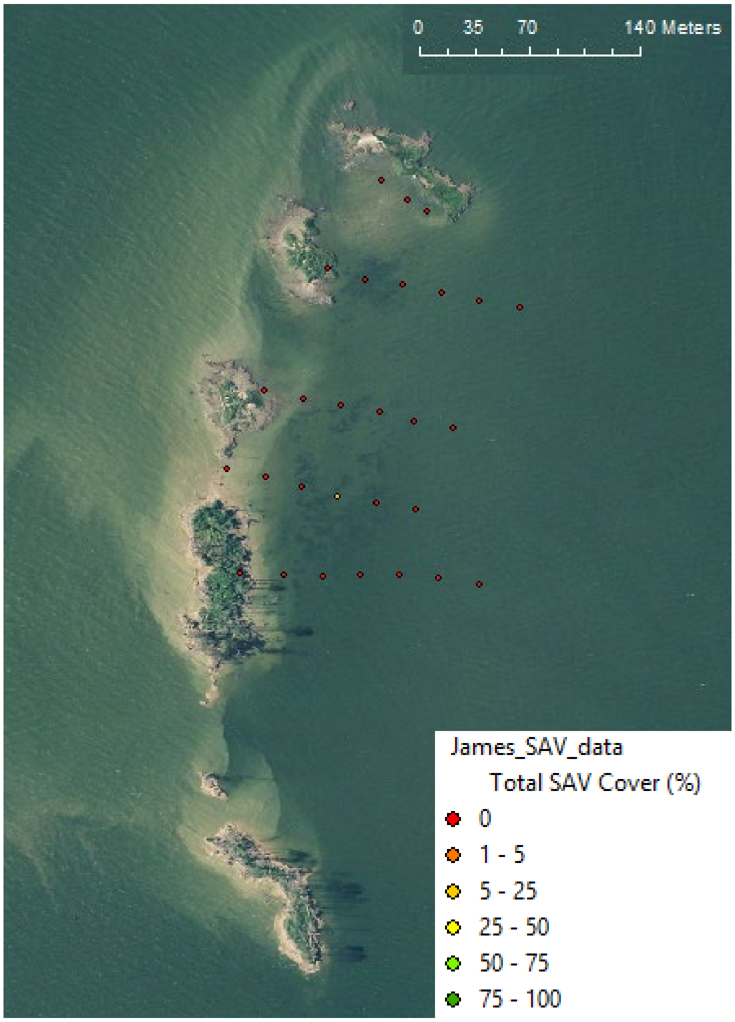

***Figure** 7. Total SAV percent cover observed at each quadrat location on the eastern shoreline of the southern span of James Island.*

Conclusion

The primary objectives of this project were to document SAV occurrence and distribution in the vicinity of both Barren and James Islands, and to evaluate species composition and relative density.

Given the unique site conditions (water depth, wave action, and bottom type), SAV distribution, abundance and composition varied between sampling locations and periods (Table 1, Figures 8 and 9). SAV was observed at both Barren and James Islands during the summer of 2021. *Zannichellia palustris* (horned pondweed) was observed during the June survey and *Ruppia maritima* (widgeon grass) was observed in both the June and September surveys. Observed SAV percent cover and mean canopy height were greater during the September survey due to higher biomass and the presence of reproductive shoots.

Patches of SAV were observed within the breakwaters on the northwestern side, offshore of the southeastern side and offshore of the northeastern side of Barren Island (Figure 8). Denser, more continuous SAV beds were observed within the shallow waters on the southeastern side, along the northeastern side near the oyster bar and between the two island spans (Figure 8).

Floating rafts of both horned pondweed and widgeon grass were observed within the project vicinity of James Island. However, only one small patch of widgeon grass was observed near James Island in September (Figure 9)

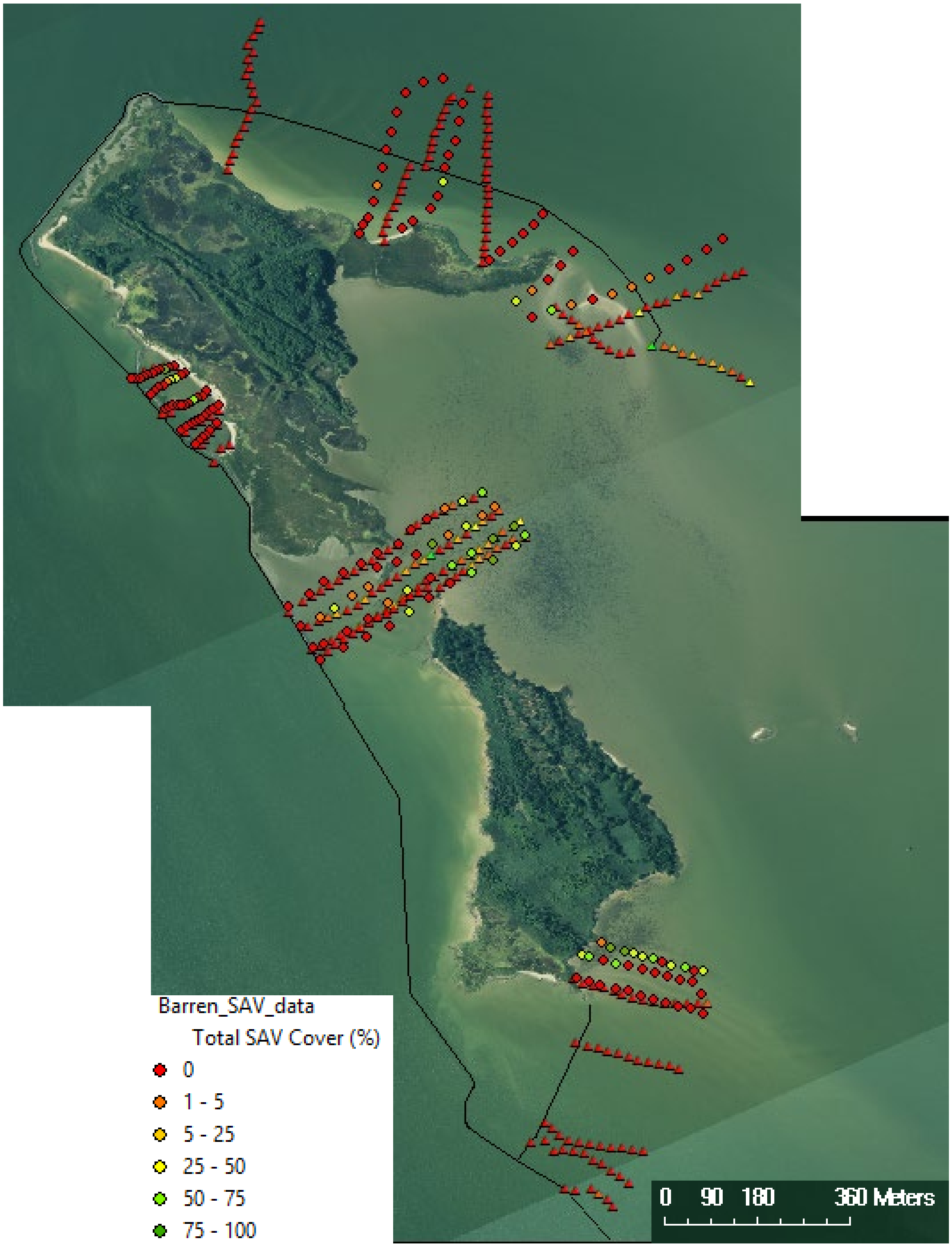

Figure 8. *Total SAV percent cover observed at each quadrat location along Barren Island shoreline. Circles denote June observations. Triangles denote September observations.*

Table 1. *Summary of water depth range (mean), total SAV % cover range (mean) and mean canopy height observed at Barren Island SAV survey locations during June and September, 2021.*

Location	Sampling Period	Water Depth (cm)	Total SAV % Cover	Mean Canopy Height (cm)
Central	Jun-21	9-85 (33.7)	0-80 (5.4)	8.7
	Sep-21	15-100 (42.8)	0-80(13)	21.3
North	Jun-21	0-160 (86.2)	0-70 (2.5)	9.5
	Sep-21	25-200 (122.4)	0-40 (2.3)	10.4
South	Jun-21	0-177 (110.7)	0-2 (0.05)	5.5
	Sep-21	45-110 (75.7)	0-75(13)	18.5
West	Jun-21	0-170 (81.8)	0-50 (2.2)	7
	Sep-21	25-191 (97.3)	0-60 (2.4)	15.4

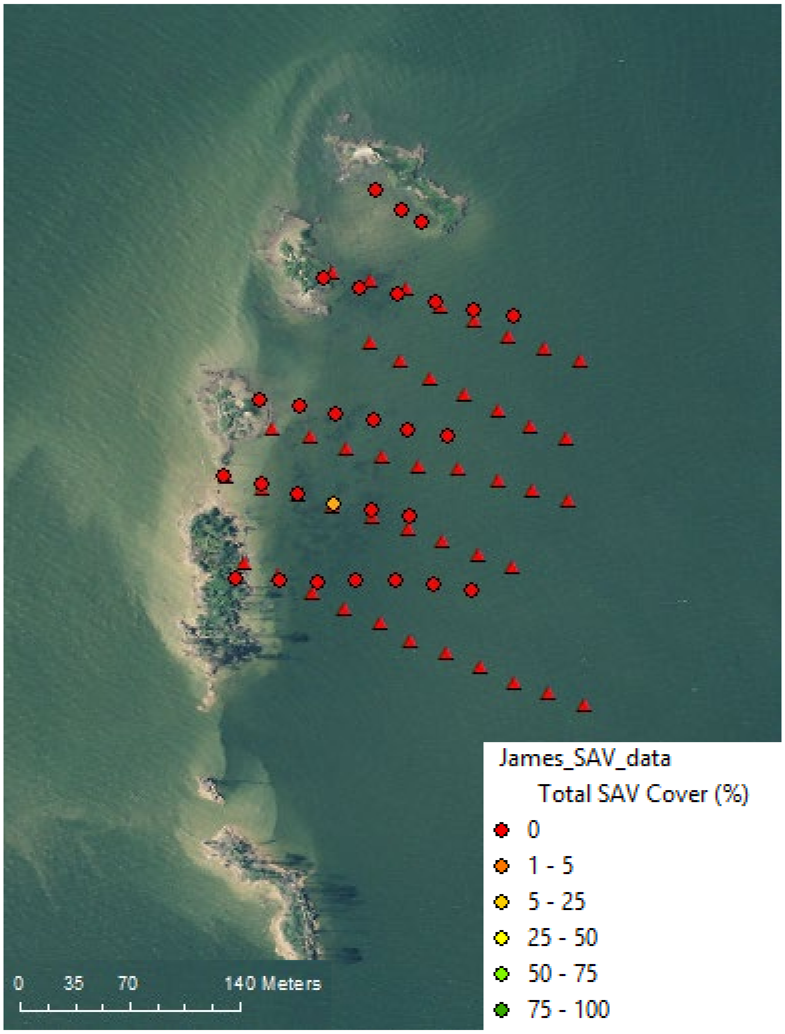

Figure 9. *Total SAV percent cover observed at each quadrat location along James Island shoreline. Circles denote June observations. Triangles denote August observations.*

Deliverables included with this report:

- Appendix with site photographs
- Electronic copies of datasheets
- Attributed GIS shapefiles of transect locations

Point Of Contact for Subtask 3.3

Becky Raves Golden (Rebecca.golden@maryland.gov) 410-260-8698

References

Landry, J.B. and R.R. Golden. 2018. In Situ Effects of Shoreline Type and Watershed land Use on Submerged Aquatic Vegetation Habitat Quality in the Chesapeake and Mid-Atlantic Coastal Bays. Estuaries and Coasts. 41(S1): 101–113.

Patrick, C.J., Weller, D.E., X. Li, and M. Ryder. 2014. Effects of shoreline alteration and other stressors on submerged aquatic vegetation in subestuaries of Chesapeake Bay and the Mid-Atlantic Coastal Bays. Estuaries and Coasts. 37: 1516-1531.

Patrick, C.J., Weller, D.E., and M. Ryder. 2016. The relationship between shoreline armoring and adjacent submerged aquatic vegetation in Chesapeake Bay and nearby Atlantic coastal bays. Estuaries and Coasts. 39: 158–170.

Appendix A

Barren and James Islands SAV Survey Photos

August/September, 2021

Barren Island – Northeastern Shoreline

Transects N8, N10 and N14
September 15, 2021

Barren Island – Northeastern Shoreline

Transects N16 and N18
September 15, 2021

Barren Island – Central

Transects C1 – 4 (offshore facing West)
September 15, 2021

Barren Island – Central

Transects C1 – 4 (middle facing West)
September 15, 2021

Barren Island – Central

Transects C1 – 4 (inshore of breakwater)
September 15, 2021

Barren Island – Southeastern Shoreline

Transects S1, S2 and S3
September 16, 2021

Barren Island – Western Shoreline

Transects W2, W3, W4, W5 and W6
September 16, 2021

James Island – Eastern Shoreline

Transects J1, J2, J4, J5 and J6
August 19, 2021

Appendix B

Datasheets

①2,④5,6

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island Barren [✓ James] (circle one)

Observer RRG

Location N IN BETWEE S W (circle one)

Date 8/19/21 Time 102

Transect 1, 4

Pictures Y N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth	.4	.8	1
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	764		alt 74 ft	0	0	1JB on island		~7m from island			
2	765	20	v110	0	0						
3	766	40	v110	0	0	plot		✓			
4	1JA	60	v110	0	0						
5		80									
6											
7	767	(4JA)	w85	0	0			Secchi 0.5m			
8	768	20	w101t	0	0						
9	769	40	am 117	0	0	✓					
10	770	60	cl 117	0	0			Secchi 0.8m			
11	771	80	s 130m	0	0						
12	772	100	cl 142	0	0			Secchi 1			
13								sand			
14											
15											
16											
17								Secchi Transect 4			
18								.4			
19								.75			
20								1			
21											
22											
23											
24											
25											

12456

Maryland Department of Natural Resources SAV Survey
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Observer Brooke

Island Barren [✓ James] (circle one)

Date 8/ Time 1:00pm

Location N IN BETWEE S W (circle one)

Transect J2

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

J2A was up on the marsh.
1387 was taken right where marsh turns to water.

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	1387	0	41	0	—						
2	1388	20	90	0	—		✓				
3	1389	40	113	0	—						
4	1390	60	130	0	—						
5	1391	80	137	0	—		147cm				
6	1392	100	147	0	—		137cm				
7											
8											
9											
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Maryland Department of Natural Resources SAV Survey

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Observer Brooke

Island Barren [✓ James] (circle one)

Date 8/19 **Time** 1:33 pm

Location N IN BETWEE S W (circle one)

Transect ~~0~~ J5

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover Rm	% cover	% cover			
1	1393	0	117	0	—	eroded hard bottom					
2	1394	20	103	0	—						
3	1395	40	130	0	—						
4	1396	60	127	3	8	3					
5	1397	80	120	0	—		✓				
6	1398	100	130	0	—						
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Island Barren [✓ James] (circle one)

Location N IN BETWEE S W (circle one)

Transect J6

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

Observer Brooke

Date 8/19 **Time** 153

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	1399	120	Shoulder 149	0	—						
2	1400	100	" 147	0	—						
3	1401	80	135	0	—						
4	1402	60	130	0	—		✓				
5	1403	40	130	0	—						
6	1404	20	14 Shoulder	0	—						
7	1405	0	55	0	—						
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Maryland Department of Natural Resources SAV Survey

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Island [✓ Barren] James (circle one)

Observer B Swizz

Location N IN BETWEE S W (circle one)

Date 9/15/21 Time 11:13

Transect N8

Pictures Y N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	104	0	185	0							
2	105	20	125b	0							
3	106	40	125h	0							
4	107	80	141n	0							
5	108	120	153	brown	5%	Ruppia		5cm			
6	109	160	148e	0							
7	110	200	148c	0							
8	111	240	160	f head	0						
9	112	280	191	er head		+ hand		0			
10	113	320	200	hands		0					
11	114	360	191	to	top of	head					
12	115	400	191		0						
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✓

Maryland Department of Natural Resources SAV Survey
If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island [✓ Barren] James (circle one)

Observer RRG

Location N IN BETWEE S W (circle one)

Date 9/15/21 Time 11:20

Transect 10

774 patch Ru

Pictures Y [✓ N] (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			30cm
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	Ru % cover	% cover	% cover			
1	773	~7	117	0							
2	775	40	c142	0							
3	776	80	Fl160 to	Chiro							
4	777	120	160	r	25	20 wn	Chiro up				
5	778	160	160	to chiro	0						
6	779	200	154	to mod	0						
7	780	240	154	n g	0						
8	781	280	160		0						
9	782	320	160		0						
10		360									
11		400									
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Maryland Department of Natural Resources SAV Survey
If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

✓

Island [✓ Barren] James (circle one)

Observer Brooke Landry

Location N IN BETWEE S W (circle one)

Date 9/15/21 Time 11:21 AM

Transcript 14 (13A → 14B)

Pictures [✓ Y] N (circle one)

← Pictures were taken @ 12:53 ish

take pictures of shoreline and offshore!

Rm washed up in area

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover Rm	% cover Zp	% cover Zm	Bottom		
1	1406	0	65	0	—				sand	@ marsh edge	
2	1407	30	115	0	—				muddy sand		
3	1408	60	130	0	—				muddy sand		
4	1409	90	145	0	—	giant pile of racked up Rm			muddy sand/cobbles		
5	1410	120	155	0	—				mud		
6	1411	150	155	1	~5	1			mud		
7		180									
8		210									
9		240									
10		270									
11		300									
12		330									
13		360									
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Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island [✓ Barren] James (circle one) ✓

Observer RRG

Location [✓ N] IN BETWEE S W (circle one)

Date 9/15/21 **Time** 1:15

Transect N16

rough conditions 1-2ftswl

Pictures [✓ Y] N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			20cm
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	Rm % cover	% cover	% cover			
1	784	0	50	10	15	10			close to 16A		
2	785	40	43	5	15	5					
3	786	80	30	0	—	0			hard sand		
4	787	120	25	0	—	0			" "		
5	788	160	[illegible]	0	—	0			very silty		
6		200							too deep & slippy		
7		240							current rough		
8		280									
9		320									
10		360									
11		400									
12		440									
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Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island [✓ Barren] James (circle one)

Observer Brooke L

Location [✓ N] IN BETWEE S W (circle one)

Date 9/5/21 **Time** 1:15 pm

Transect 18A → 18B

Pictures [✓ Y] N (circle one)

pics taken @ 1:13 pm

✓

take pictures of shoreline and offshore!

Transect starts in middle of cove, not on shore

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover Rm	% cover	% cover	Bottom		
1	1412	0	45	0	—	—			sand		
2	1413	40	37	40	30	40			muddy sand		
3	1414	80	48	5	6	5			mud-muddy sand		
4	1415	120	26	0	—	0			hard bottom/sand + oyster bars		
5	1416	160	72	5	20	5			mud/sand/shells		
6	1417	200	110	2	20	2			mud on hard		
7	1418	240	125	2	5	2			soft mud		
8	1419	280	135	0	—	0			soft mud		
9	1420	320	130	0	—	0			soft mud		
10	1421	360	140	0	—	0			soft mud		
11	1422	400	140	0	—	0			soft mud		
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Maryland Department of Natural Resources SAV Survey
If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

✓

System Barren **Observer** RRG

Edge of bed Distance from shore C1B & C2 **Date** 9/15/21 2:56 3:40

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	RM % cover	% cover	% cover	% cover	% cover	% cover
1	789	0	35	30	15	30	C1B				
2	790	40	31	15	20	15					
3	791	80	30	1	20	1	patchy between here				
4	792	120	31	0	—	0		+			
5	793	160	32	0	—	0		here.			
6	794	200	50	0	—	0					
7	795	240	20	0	—	0					
8	796	280	30	0	—	0					
9	797	320	25	0	—	0					
10	798	361	27	0	—	0					
11	799	400	31	0	—	0					
12	800	448	25	0	—	0	C1A	close to			
13											
14	801	0	42	0	—	0	near	C2A by breakwater			
15	802	40	43	3	~~20~~15	3					
16	803	80	36	25	20	25					
17	804	120	40	5	20	5					
18	805	160	36	3	20	3					
19	806	200	15	0	—	0					
20	807	240	22	0	—	0					
21	808	280	38	0	—	0					
22	809	320	27	60	20	60					
23	810	360	30	5	15	5					
24	811	400	28	20	20	20					
25	812	440	25	3	15	3					
26	813	480?	38	1	15	1					
27											
28											
29											
30											

Maryland Department of Natural Resources SAV Survey
If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

✓

Island [✓ Barren] James (circle one) **Observer** B Swizz

Location N IN BETWEE S W (circle one) **Date** 9/15/21 **Time** ~2:30

Transect C3

Pictures Y N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

Beginning at C3B 50m intervals

	Waypoint	Quad Distance from Shore	Water Depth (cm) 36	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	1423	480	Knee 36	60	Rm	29					
2	1424	430	35	75	Rm	35					
3	1425	380	36	50	Rm	24					
4	1426	330	51	50	Rm	26					
5	1427	280	crotch 79	0							
6	1428	230	79	10	Rm	15					
7	1429	180	hip 85	5	Rm	10					
8	1430	130	waist 100	0			very dynamic				
9	1431	80	thigh 65	0							
10	1432	30	crotch 79	0							
11	1433	6	Knee 36	0	edge of sill						
12											
13	C4	A →	B								✓
14	1434	6	∅	~~crotch~~	thigh	edge of riprap			0		
15	1435	hip	50	0							
16	1436	100	hip 85	0							
17	1437	150	thigh 65		0						
18	1438	200	thigh 65		10%	Rm	12				
19	1439	250	thigh 65		0	<1m from marshedge island					
20	1440	300	250	0							
21	1441	350	28	40	Rm	28					
22	1442	400	29	80	Rm	53	(Re pro)				
23	1443	450	33	25	Rm	16					
24	1444	480	36	40	Rm	18					
25											

Maryland Department of Natural Resources SAV Survey

If found, please return to: SAV Group 580 Taylor Ave. C2/TEA Annapolis, MD 21401 or call 410-260-8629

Island [✓ Barren] James (circle one)

Observer Mountain Goat

Location N IN BETWEE S W (circle one)

Date 9/16/21 **Time** ~10:30

Transect NS1

✓

Pictures Y N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	116	0	58	5	12	Rm					
2	117	20	59	70	16	Rm					
3	118	40	59	75	46	Rm	(repro)				
4	119	60	71	20	13	Rm					
5	120	80	73	20	14	Rm					
6	121	100	79 crotch	40	11	Rm					
7	122	120	68	0							
8	123	140	hi 83 crotch	15	10	Rm					
9	124	160	83	50	15	Rm					
10	125	180	h85	0							
11	126	200	h85	20	13	Rm					
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											

Maryland Department of Natural Resources SAV Survey

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Island [✓ Barren] James (circle one)

Observer RRG

Location N IN BETWEE [✓ S] W (circle one)

Date 9/16/21 **Time** 11:12

Transect 2

✓

Pictures Y N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			58 cm
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	Rm % cover	% cover	% cover			
1	814	~15	45	25	20	25			New	S2A	
2	815	25	52	50	20	50					
3	816	50	55	0	—	0			sand		
4	817	75	53	40	30	40					
5	818	100	85	0	—	0					
6	819	125	85	0	—	0.					
7	820	150	85	0	—	0					
8	821	175	165	0	—	0					
9	822	200	100	0	—	0					
10	823	225	160	0	—	0					
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											

Maryland Department of Natural Resources SAV Survey

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Island [✓ Barren] James (circle one)

Observer Brooke

Location N IN BETWEE [✓ S] W (circle one)

Date 9/16/21 Time 11:02

Transect S 3a → 3b (250m, 25m intervals)

Pictures [✓ Y] N (circle one) Pictures taken @ 1106 am 9/16

✓

take pictures of shoreline and offshore!

1445 is @ marsh edge. can't go extra 3 m to S3a.

	beginning	middle	end
Secchi Depth	35 cm	~60 cm	~70
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover Rm	% cover	% cover	Bottom type		
1	1445	0	45	0	—	—			Sand		
2	1446	25	60	0	—	—			sand		
3	1447	50	60	0	—	—			Sand		
4	1448	75	65	0	—	—			Sand		
5	1449	100	80	0	—	—			sand		
6	1450	125	80	0	—	—			sand		
7	1451	150	93	0	—	—			Sand		
8	1452	175	85	0	—	—			sand		
9	1453	200	100	0	—	—			sand		
10	1454	225	100	0	—	—			Sand		
11	1455	250	105	0	—	—			sand		
12	1456	Actual	38 87	0	—	—			sand		
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											

38
55

south side
had flowering
Rm still..

Maryland Department of Natural Resources SAV Survey

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System Barren Is.

Observer Brooke

Edge of bed Distance from shore West 3 B→A
~100m transect –

Date 9/16/21 Time 12:28 pm

– pictures @ 12²⁸ pm of 3 then looking @ 2b-pa

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover Rm	% cover	% cover	Bottom		
1	1457	0	60	0	—	—			Sand		
2	1458	10	85	0	—	—			Sand		
3	1459	20	90	10	12	10			sand		
4	1460	30	90	10	12	10			sand		
5	1461	40	98	5	15	5			sand		
6	1462	50	95	0	—	—			Sand		
7	1463	60	95	0	—	—			Sand		
8	1464	78	100	0	—	—			Sand		
9	1465	80	75	0	—	—			breakwater rocks + sand		
10	stopped @ breakwater										
11							✓				
12											
13											
14											
15											
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Maryland Department of Natural Resources SAV Survey
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System Barren Isl **Observer** Mountaingoat

Edge of bed Distance from shore W2 **Date** 9/16/21

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover Bm	% cover	% cover	% cover	% cover	% cover
1	127	0	c79ch	0							
2	128	8	w100st	0							
3	129	16	h85p	60	←	16					
4	130	24	w104st	0			✓				
5	131	32	83p	flex	0						
6	132	40	185p	0							
7	133	48	w37k	0							
8	134	56	e184s	0							
9	135	64	w130k	0							
10	136	72	d99w	strafe bed up to wrist					0		
11	137	80	[illegible]	0	bed +/ 2 hands						
12			180								
13											
14	W	4									
15	138	0	57	0					✓		
16	139	10	c73tch	0							
17	140	20	73	0							
18	141	30	h83 flex		30%		22cm				
19	142	40	w100st		0						
20	143	50	h83 flex		0						
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											

Maryland Department of Natural Resources SAV Survey

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System Barren **Observer** Brooke

Edge of bed Distance from shore west = 4A → 4B 80m transect **Date** 9/16/21 12^{46} pm

but didn't go beyond break to 4A pictures @ 12:49

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover Rm	% cover	% cover	Bottom		
1	1466	80	125	0	—	—			Sand + big rocks		
2	1467	72	140	0	—	—			Sand		
3	1468	64	125	0	—	—			Sand		
4	1469	56	90	0	—	—			sand		
5	1470	48	80	0	—	—			Sand		
6		40									
7		32								✓	
8		24		The rest is							
9		16		on Becky							
10		8		Swerida's							
11		0		data sheet							
12				but she did							
13				every 10 M							
14											
15											
16											
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29											
30											

Maryland Department of Natural Resources SAV Survey

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Island Barren James (circle one)

Observer RKG

Location N IN BETWEE [✓ S] [✓ W] (circle one)

Date 9/16/21 **Time** 12:29

Transect 6 + 5

Pictures Y N (circle one)

take pictures of shoreline and offshore!

	beginning	middle	end
Secchi Depth			1m
Water Temp			
Salinity			

	Waypoint	Quad Distance from Shore	Water Depth (cm)	Total SAV % cover	Canopy Height	% cover	% cover	% cover			
1	824	~5	50	0	—	0	peat		WUB		
2	825	20	100	0	—	0	squishy	→	nothing	in bottom	
3	826	30	100	0	—	–	sand				
4	827	60	110	0	—	0	sand				
5	828	50	110	0	—	0	-	✓			
6	829	45	160	0	—	0	WCG				
7											
8											
9											
10											
11											
12		WS									
13	830	breake	[illegible]	0	—	0	sand	close to WS A			
14	831	10	110	0	—	0	|				
15	832	20	127	0	—	0	|				
16	833	30	110	0	—	0				✓	
17	834	40	100	0	—	0					
18	835	50	85	0	—	0	peat /	submerged marsh			
19	836	60	50	0	—	0	peat				
20	837	70	85	0	—	0	sand				
21	838	80	50	0	—	0					
22	839	90	25	0	—	0	marsh edge /	[illegible]			
23		100									
24											
25											