United States Department of the Interior

FISH AND WILDLIFE SERVICE

Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

August 3, 2022

William T. Walker
Chief, Regulatory Branch
U.S. Army Corps of Engineers, Norfolk District
Fort Norfolk
803 Front Street
Norfolk, VA 23510-1096

Re: Hole in the Wall Channel Dredge and Haven Beach Beneficial Use, Mathews County, VA, Project # 2022-0027423

Dear William T. Walker:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion (Opinion) based on our review of the referenced project and its effects on the federally listed threatened northeastern beach tiger beetle (*Habroscelimorpha dorsalis dorsalis*) (NBTB) in accordance with Section 7 of the Endangered Species Act (16 U.S.C. 1531-1544, 87 Stat. 884), as amended (ESA). Your request for formal consultation and all information required to initiate formal consultation was received on February 18, 2022.

This Opinion is based on information provided by U.S. Army Corps of Engineers (Corps) in the February 17, 2022, biological assessment (BA), Joint Permit Application (JPA), telephone conversations, email correspondence, and field investigations. The consultation history is located after the literature cited. A complete administrative record of this consultation is on file in this office.

The BA included a request for Service concurrence with a "not likely to adversely affect" determination. The Corps determined the proposed action is not likely to adversely affect the federally listed threatened eastern black rail (*Laterallus jamaicensis ssp. jamaicensis*). Because beach renourishment, breakwater construction, and beach grass planting will not occur within eastern black rail habitat, the action, as proposed, will not affect the eastern black rail.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

As defined in the ESA Section 7 regulations (50 CFR 402.02), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas."

The following is a summary of the proposed action and a detailed description can be found in the BA (Corps 2022), JPA, and email correspondence.

The Corps is proposing to issue a permit to Mathews County to hydrologically dredge the Hole in the Wall (HITW) Channel and use dredged material to renourish Haven Beach. The proposed action includes the installation/expansion of a breakwater system and beach grass planting at Haven Beach. The HITW Channel is located in Mathews County, VA, southeast of Gwynn's Island, connecting eastern Milford Haven to the western Chesapeake Bay. Haven Beach is located approximately 2.5 miles (mi) south of the HITW Channel (Figure 1). The purpose of the proposed action is to allow for safe navigation of vessels utilizing Milford Haven while also providing beneficial use of the dredged material (Corps 2022).

Figure 1. Satellite map image showing the location of HITW Channel in relation to Gwynn's Island, Milford Haven, and the Chesapeake Bay. Haven Beach is the proposed sand placement site (denoted by yellow lines) and is located south of the HITW.

The proposed action will occur in 2 phases. Phase 1 consists of dredging the HITW Channel and renourishing Haven Beach and will take 1 to 5 months to complete. Phase 2 consists of planting beach grass and constructing breakwaters and will take 5 months to complete. Phase 2 will not begin until phase 1 is complete. It is assumed that all work will occur when adult NBTBs are present due to the uncertainty of timing for phase 1. Project equipment will include a hydraulic dredging plant, dredge pipeline, 3 support vessels, site trucks to move material, 2 bulldozers to shape the beach, and an excavator to load site trucks, move pipeline and build structures. The dredge will access the HITW Channel via the Chesapeake Bay (Figure 1), and the beach will be accessed through the parking area located at the terminus of Haven Beach Road (Figure 5). The parking area will be used as the staging area (Figure 5).

During the beach renourishment process, sand will be added to 204,770 square feet (ft) of open water, 33,559 ft^2 of intertidal waters between mean high water (MHW) and mean low water (MLW), 88,534 ft^2 of beach between MHW and the dune, and 7,997 ft^2 of dune. Beach renourishment is expected to create a total of 122,124 ft^2, 140,102 ft^2, and 35,890 ft^2 of dune,

beach, and intertidal habitat, respectively. Once beach renourishment is complete, breakwater construction and beach grass planting will occur within 334,860 ft^2 (204,770 ft^2 + 33,559 ft^2 + 88,534 ft^2 +7,997 ft^2) of area at Haven Beach. The proposed breakwaters and breakwater extension will impact 22,200 ft^2 of the subaqueous bottom (E. Brooks, Corps, telephone conversation, R. Case, Service, May 26, 2022). All disturbance (beach renourishment, the breakwaters and their construction, and beach grass planting) will occur within 357,060 ft^2 (334,860 ft^2 + 22,200 ft^2) at Haven Beach.

Phase 1

Dredging – The HITW Channel is 18,000 ft long and 150 ft wide (Figure 1). Approximately 40,000 cubic yards of material will be hydraulically dredged from 5,709 linear ft of the channel. The channel will be dredged to the permitted depth of -7 ft mean lower low water. Material dredged from the channel will be pumped through 13,000 ft of pipeline and deposited along 2,400 linear ft of shoreline (Figure 4). The pipeline will be submerged and anchored to the seabed until it reaches the shoreline where a spreader will be placed at the outfall pipe to diffuse slurry. The pipeline will be moved up or downdrift of the shoreline to extend the fill material as necessary.

Beach renourishment – Beach renourishment consists of pumping sand onto Haven Beach and the use of heavy equipment to move sand. Sand will be pumped onto Haven Beach beginning at the north end of the project (latitude: 37.4386, longitude: -76.254) and continue to the south end (latitude: 37.4319, longitude: -76.2531) until complete. Sand pumped onto Haven Beach will be moved by bulldozers to achieve the permitted design, which includes placing the sand at a 1:10 slope between terraces from the existing dune to the breakwaters (Figure 2). A temporary retaining dike may be constructed at the beginning of the renourishment process using dredged sand. The dredged sand would be placed parallel to the shoreline and just below MLW to contain flow as pumping moves from north to south.

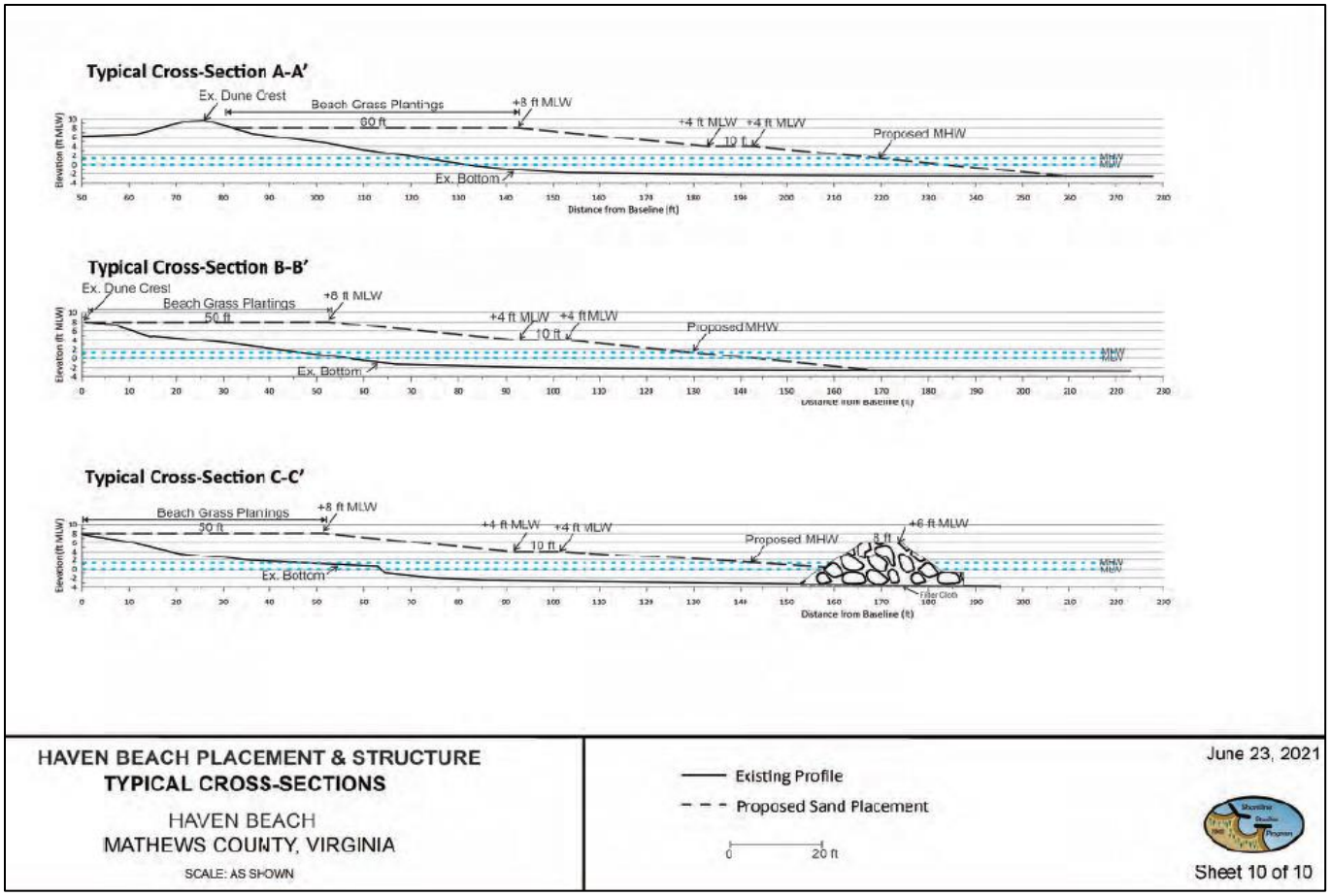

Figure 2. Cross-section of sand placement between terraces at a 1:10 slope from the existing dune to the breakwaters.

Phase 2

Breakwaters – There are 2 existing breakwaters at the project location (Figure 3). Breakwater 1 is 280 ft in length, and breakwater 2 is 100 ft in length. Breakwater 2 will be extended by 50 ft (Figure 3). Three additional breakwaters (breakwaters 3, 4, and 5) will be installed (Figure 3). The proposed breakwaters will be 230 ft long by 30 ft wide and have a maximum channelward encroachment of 203 ft from MHW. At their crest, each breakwater will be 200 ft in length and have an elevation of 6 ft above MLW.

Breakwater construction – Breakwater construction will occur from land. Rock will be brought in via the access point at Haven Beach and stockpiled approximately 100 ft landward of breakwater 1. During breakwater construction, project equipment will traverse the beach between breakwaters 1 and 5 to move rock from the stockpile location to each of the proposed breakwater locations (Figure 3).

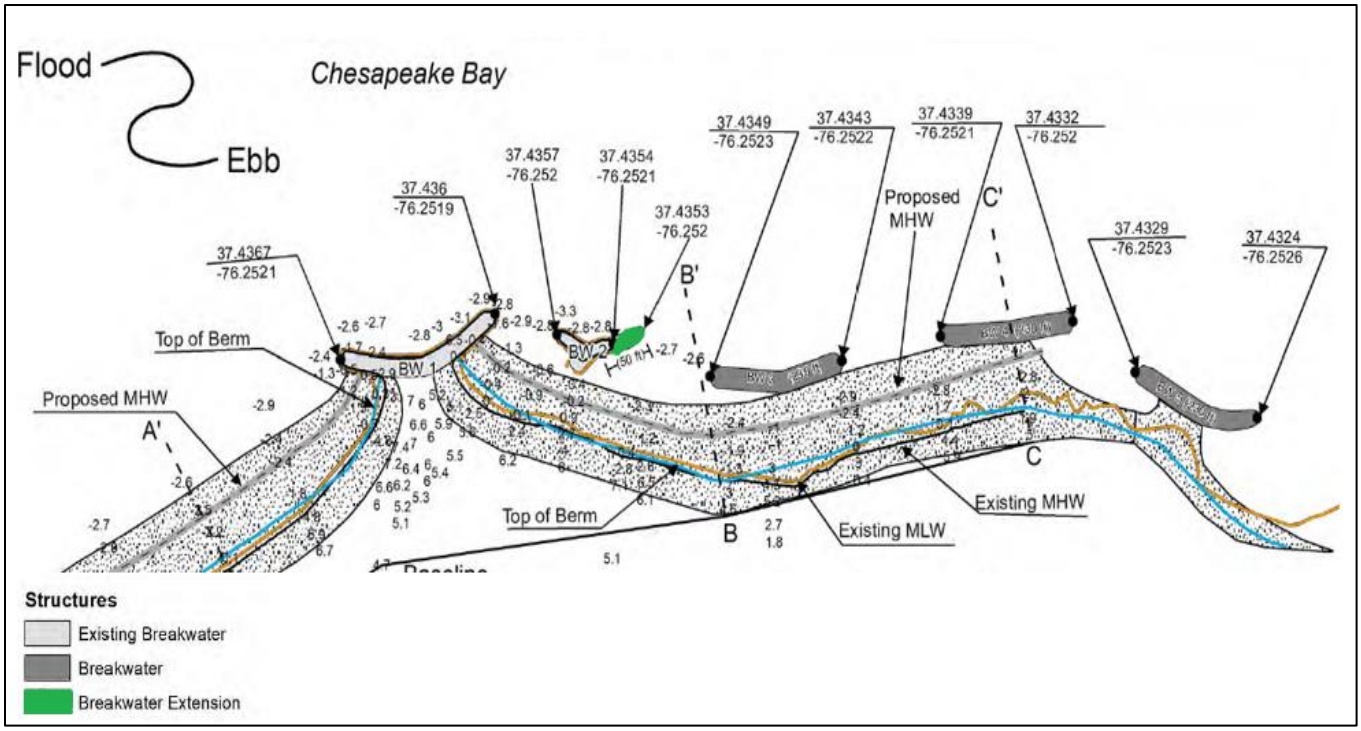

Figure 3. Site location of existing breakwaters 1 and 2 (shown in white); the breakwater extension (shown in green); and the proposed breakwaters (shown in grey).

Beach grass planting –To plant beach grass, heavy equipment will transport materials from the staging area to the planting location. Approximately 67,000 plants will be planted on the upper terrace of the dredged material on a 1.5 ft grid.

Conservation Measures

- No refueling of equipment on the beach.

ACTION AREA

The action area is defined (50 CFR 402.02) as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." The Service has determined that the action area for this project is:

- Approximately 5,709 linear ft of the HITW Channel;
- Approximately 13,000 linear ft of subaqueous bottom for the pipeline;
- Approximately 22,200 ft^2 of subaqueous bottom covered by the proposed breakwaters and breakwater extension;
- Approximately 334,860 ft^2 of area for beach renouishment, beach grass planting, and breakwater construction;
- 10,000 ft^2 of uplands for the staging area and project access; and

- The shoreline 300 meters south of breakwater 5 where indirect effects associated with breakwater construction are anticipated (Figures 4 and 5).

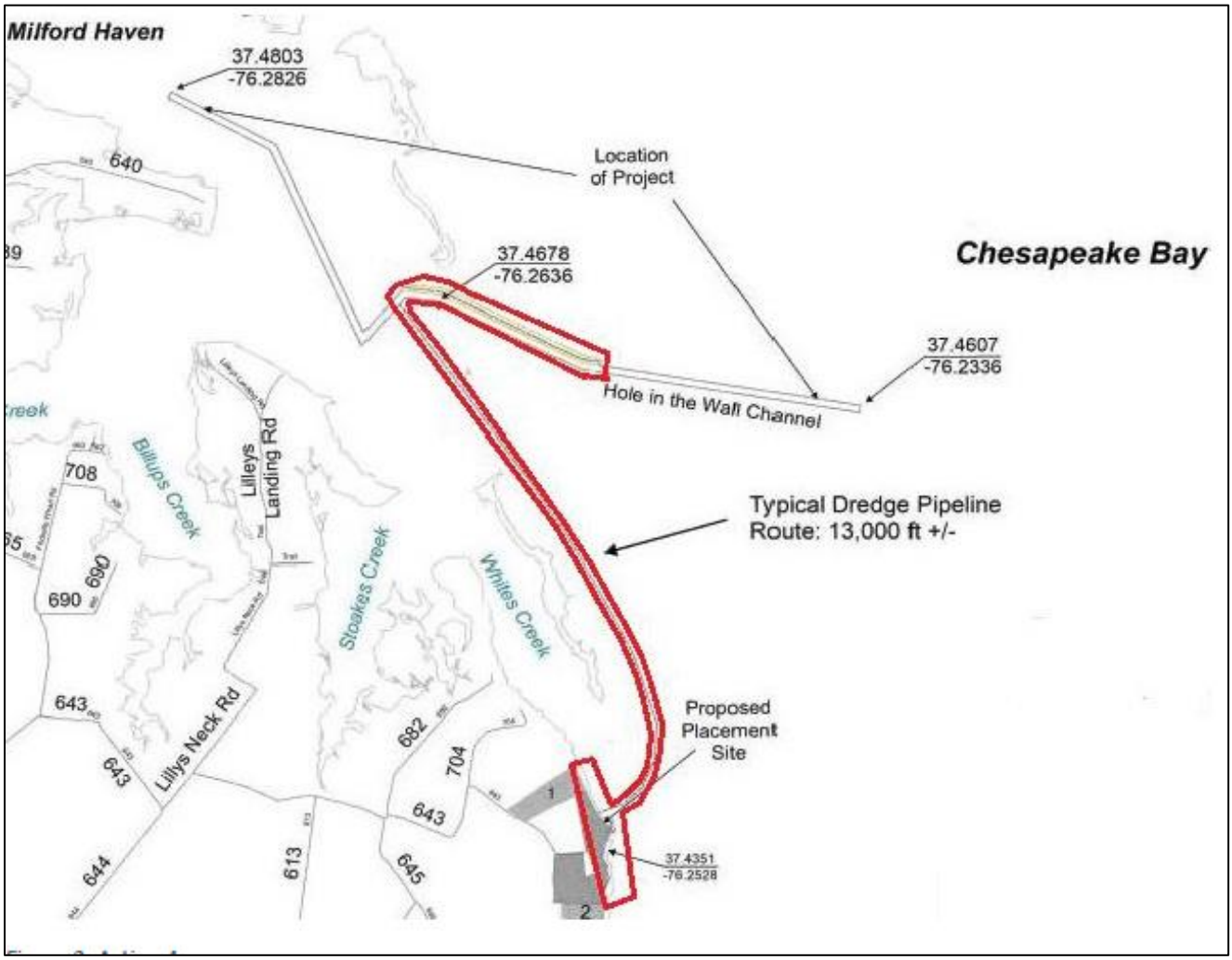

Figure 4. Large-scale view of the action area. The portion of the HITW Channel that will be dredged (5,709 linear ft), the dredge pipeline (13,000 linear ft), and the placement site (Haven Beach) denoted by the red lines.

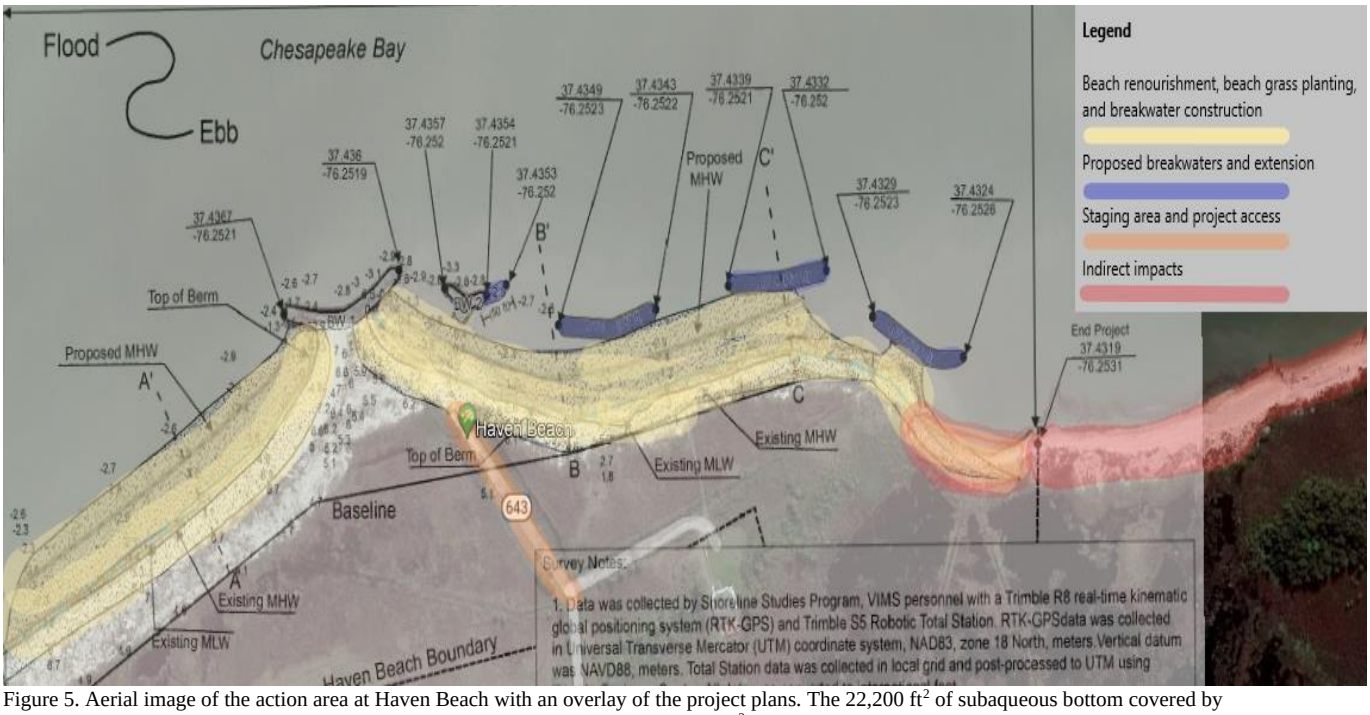

Figure 5. Aerial image of the action area at Haven Beach with an overlay of the project plans. The 22,200 ft^2 of subaqueous bottom covered by the proposed breakwaters and breakwater extension are shown in purple; the 10,000 ft^2 of uplands for the staging area and project access are shown in orange; the 334,860 ft^2 of area for beach renourishment, breakwater construction, and beach grass planting shown in yellow; and the 300 m of shoreline associated with indirect effects shown in red.

STATUS OF THE SPECIES

Per ESA Section 7 regulations (50 CFR 402.14(g)(2)), it is the Service's responsibility to "evaluate the current status of the listed species or critical habitat." The Service listed the NBTB as threatened on August 7, 1990 (55 FR 32088-32094). The following is a summary of NBTB general life history drawn from the NBTB recovery plan (Service 1994), NBTB 5-year reviews (Service 2009, 2019), peer-reviewed publications, and survey reports.

The NBTB is a beach-dwelling insect measuring approximately 0.5 inches in length. It has white to light tan wing covers, often with several fine grayish-green lines, and a bronze-green head and thorax (Service 1994). It currently occurs on beaches of the Chesapeake Bay in Virginia and Maryland and Martha's Vineyard and Monomoy National Wildlife Refuge in Massachusetts (Service 2019). It is extirpated from Rhode Island, Connecticut, New York (Long Island), and New Jersey.

Adults: Adult tiger beetles are active, diurnal surface predators. They forage along the water's edge on small amphipods, flies, and other beach arthropods, or scavenge on dead amphipods, crabs, and fish (Knisley et al. 1987, Service 1994). Most foraging occurs in the damp sand of the intertidal zone and scavenging has been observed to occur more often than predation (Knisley et al. 1987). Adult tiger beetles are present on beaches (e.g., from the base of the dune to low tide line) from early June through early September, sometimes into October, and they spend most of the day along the water's edge (Knisley et al. 1987). Adults are active on warm, sunny days

when they can be seen feeding, mating, or basking (Service 1994). They are less active on rainy, cool, or cloudy days because they cannot maintain their body temperature (C.B. Knisley, Randolph-Macon College, pers. comm. 1994 *in* Service 2012). They rely on a variety of behaviors, such as foraging, basking, body positioning, and shuttling among different substrates to maintain their high body temperatures (Knisley et al. 1987).

Adult beetles mate and lay eggs on the beach during the summer (starting in June and ending by mid-July). Eggs are most often deposited at or within several meters above the high tide line just below the sand surface or in shallow pits excavated by adults, usually within 1 inch of the beach surface (Knisley 1997). The eggs hatch in 10-14 days, depending on soil moisture. Adequate moisture may allow a shorter hatch period (C.B. Knisley, pers. comm. 2008 *in* Service 2012).

Larvae: Larvae pass through 3 instar stages, pupate, and emerge as adults 2 years following hatching which takes place within a larval burrow in the sand (Knisley et al. 1987, Service 1994). Some larvae that hatch early and find sufficient food may develop more rapidly and emerge as adults after only 1 year (Service 1994). First instars generally occur from late August through September, second instars from September to late fall, and third instars from late fall to early spring and through the second year (Knisley et al. 1987). Larvae overwinter or hibernate in their burrows until mid-March; therefore they are present year-around and time-of-year restrictions (e.g., May 15-October 1) are not protective of larvae. Larvae are active in April and May but the highest, most predictable periods of larval activity are from late August through early November. Knisley et al. (1987) found that first emergence of adults ranged from June 5-13 in Virginia, but recent observation documented first emergence on May 30 (K. Braun, landowner/volunteer surveyor, email to J. Stanhope, Service, May 30, 2020). Rainfall appears to enhance emergence since numbers of adults usually increase after a rainfall. Larvae lack a hard cuticle and are susceptible to desiccation. They are usually inactive and plug their burrows during hot, dry conditions (Service 1994). During warm periods larvae are most active at night and plug their burrows during most of the day. Generally, when larval burrows are plugged their presence cannot be determined.

Larvae are most commonly found in the intertidal zone to 2-3 m above the high tide line (i.e., above intertidal zone). The area where larvae occur above the high tide line may be wider in areas of washover or where the upper beach is flat and is periodically inundated by high tides, and thus may occur farther than 2-3 m above the high tide line (Service 1994). Larvae may periodically relocate their burrows, apparently due to changing tidal conditions. Because they are frequently located in the mid- to upper-portion of the intertidal zone, burrows will be underwater during high tide, but larvae can survive flooding for 3-6 days (Service 1994); they are likely to survive longer because this timeframe is based on a study of larvae being fully immersed in a vial of water at room temperature and they would likely trap air within their burrows (B. Knisley, Randolph Macon College [RMC], email to J. Stanhope, Service, May 27, 2022). Larval burrow depths ranged from 3.5-9.5 inches and increased with distance from the water's edge, suggesting that burrow depth may be related to subsurface moisture (Knisley et al. 1987).

Larvae feed by ambushing passing prey. Little is known about the precise types of

microarthropods eaten by larvae but identified prey include beach fleas, lice, flies, ants, and other small insects (Pearson et. al. 2006; C.B. Knisley, pers. comm. 2008 *in* Service 2012). While little information on the necessary prey abundance is known, lack of prey base may explain why NBTBs are not found in certain areas.

Dispersal: Adult NBTBs are highly vagile and know to readily disperse short or longer distances. In Northumberland County, VA, a total of 10,131 adults were marked and released; 91 beetles dispersed to new sites, up to 8 mi away, but mainly between 2 sites approximately 1 mi apart (Hill and Knisley 1994). In 2021, a new site was detected that was approximately 3 linear mi over water from the nearest occupied site (Knisley and Meyer 2022). Large sites seem to serve as recruitment areas, while small sites serve as stopovers during dispersal (Hill and Knisley 1994). This dispersal serves to exchange genetic material, allow for colonization of unoccupied sites, and enable beetles to leave eroding sites.

Habitat: Adult and larval beetles are typically found on highly dynamic beaches with back beach vegetation, and they prefer long, wide beaches that have low human and vehicular activity, fine sand particle size, and a high degree of exposure (Knisley et al. 1987). Beach width is a critical indicator of suitable habitat, with natural and wider beaches (>2 m wide) supporting higher densities of adult and larval NBTBs, likely because they provide more habitat and decreased mortality risk caused by erosion and storm events (Fenster et al. 2006, Knisley 2011, Knisley et al. 2016). Contrary to the 2009 5-year review indicating that adult and larval NBTBs are rarely found on beaches <2 m wide, Knisley et al. (2016) also found that beaches with mean widths of 1.4 and 1.5 m and groins had mean larvae densities of 1 and 1.6 larvae per 2 m and mean adult densities of 1.3 and 5.6 adults per 10 m, respectively. Third instar larvae have been observed at beaches <2 m wide and may be found at narrower beaches, especially if the beaches were wider during the ovipositional period then recessed during erosional events (B. Knisley, RMC, email to J. Stanhope, Service, April 28, 2019; J. Stanhope, Service, pers. obs. 2019 *in* Service 2019). However, these larvae may have higher mortality rates, due to less beach habitat available to relocate to avoid long periods of inundation from high tide and erosional events during storms over their 2-year life cycle. Larval NBTB are typically found on beaches with lengths of at least 100 m (Service 2009). Sand grain size is also an important beach parameter where beaches with predominantly very coarse sands ($\geq$1 millimeter sand grain size) are unsuitable habitat (Knisley 2021a). Most sites where adult and larval NBTB occur have mean grain sizes $\leq$0.55 mm and sand grain size distribution predominantly in the range of 0.15 to 0.71 mm; Knisley (2021a) recommended that for grain size at NBTB sites that support larvae, the mean % of a sample >0.71 mm is less than 18% and mean % of a sample <0.125 mm is less than 5%.

To assess the current status of the species, it is helpful to understand the species' conservation needs. The Service frequently describes conservation needs via the conservation principles of resiliency (ability of species/populations to withstand stochastic events which is measured in metrics such as numbers, growth rates), redundancy (ability of a species to withstand catastrophic events which is measured in metrics such as number of populations and their distribution), and representation (variation/ability of a species to adapt to changing conditions

which may include behavioral, morphological, genetics, or other variation) (collectively known as the three Rs) (Wolf et al. 2015, Smith et al. 2018). The Service can then apply the appropriate regulatory framework and standards to these principals to address a variety of ESA-related decisions (e.g., listing status, recovery criteria, jeopardy and adverse modification analysis). For Section 7(a)(2) purposes, the 3 Rs can be translated into the reproduction, numbers, and distribution (RND) of a species.

Recovery plans can also serve as a resource to describe species conservation needs. The Service finalized a recovery plan for the NBTB in 1994. The recovery objective for NBTB is to restore this species to a secure status within its historical range, thereby enabling its removal from the Federal list of endangered and threatened wildlife and plants. The Service outlined the following conditions that we believed would result in the species no longer meeting the definition of a threatened species (Service 1994):

1. At least 3 populations have been established[1] and permanently protected[2] within each of the 4 designated Geographic Recovery Areas (GRA) covering the historical range of the subspecies in the Northeast, with each GRA having 1 or more sites with large populations (peak count >500 adults) with sufficient protected habitat for expansion and genetic interchange.
    - GRA-1 Coastal Massachusetts and Islands.
    - GRA-2 Rhode Island, Block Island, and Long Island Sound.
    - GRA-3 Long Island. NY.
    - GRA-4 Sandy Hook to Little Egg Inlet, NJ.
2. At least 26 populations are permanently protected at extant sites distributed among the 5 Chesapeake Bay GRAs as follows:
    - GRA-5 Calvert County, MD - 4 largest populations.
    - GRA-6 Tangier Sound, MD - 2 large (>500 adults) populations.
    - GRA-7 Eastern Shore of Chesapeake Bay, VA - 4 large populations, 4 others.
    - GRA-8 Western Shore of Chesapeake Bay (Rappahannock River north), VA- 3 large populations, 3 others
    - GRA-9 Western Shore of Chesapeake Bay (Rappahannock River south), VA - 3 large populations, 3 others.
3. Life history parameters (including population genetics and taxonomy), human impacts, and factors causing decline are understood well enough to provide needed protection and management.
4. There exists an established, long-term management program in all states where the species occurs or is reintroduced.

[1] "Established" is defined as self-maintaining for at least five years, with no foreseeable threats.

[2] "Permanently protected" is defined as long-range protection from present and foreseeable anthropogenic and natural events that may interfere with their survival. Adequate protection measures include land acquisition, conservation agreements and/or easements, and management measures to protect the species' habitat; this includes accounting for off-site impacts such as littoral sand drift.

The primary actions to address these criteria include (1) monitor known populations and any additional populations that are discovered; (2) determine population and habitat viability; (3) protect viable populations and their habitat; (4) study life history parameters; (5) evaluate human impacts; (6) implement management measures at natural population sites; (7) develop captive rearing techniques and conduct reintroductions; and (8) implement educational activities.

Now that we have described the species basic needs, we can assess its current condition. Since the 1994 recovery plan, NBTB continues to be extirpated from Rhode Island, Connecticut, New York, and New Jersey (GRA-2, 3, and 4) and found only in the Chesapeake Bay of Maryland and Virginia and 2 sites in Massachusetts (GRA-1, 5, 6, 7, 9, and 9). Table 1 summarizes the current status of the NBTB throughout its range from the 2019 5-year review (Service 2019). Except for GRA-1 (Massachusetts) and GRA-6 (Tangier Sound, MD), surveys document a continued decline in number of NBTB adults and occupied sites at the remaining GRAs. The number of occupied sites, in particular those with >500 adults, have continued to decrease in Maryland and Virginia on the western shoreline of the Chesapeake Bay. At the time of the 5-year review based on a 2016 survey (Service 2019), the number of occupied sites had remained relatively stable on Virginia's eastern shoreline, but most sites had declining numbers and there were fewer sites with very large populations (>1,000 adults). A 2020 survey of Virginia's eastern shoreline indicated that both the number of occupied sites and total NBTB adults have declined since 2016 (Knisley 2021b) (Table 3). Virginia's western shoreline of the Chesapeake Bay was resurveyed in 2021 and the number of NBTB adults and occupied sites appear to be relatively similar to 2016 survey data. With increasing fragmentation of contiguous areas of occupied habitat, smaller population segments will become increasingly separated by unsuitable habitat, leading to greater isolation, reduced gene flow, and eventual extirpation, as observed in Calvert County, MD with just 1 viable population remaining. Only 1 of the GRAs, Tangier Sound, MD, meets the recovery criteria. Some occupied sites are permanently protected, owned and managed by state agencies, Federal agencies, or nongovernmental organizations or protected through conservation easements; however, it is likely difficult for these entities to address offsite impacts such as littoral sand drift and sea level rise (SLR).

Table 1. Summary of rangewide NBTB status in 2009 and 2016-2018 (Table 3 from Service 2019).

GRA	State(s)	2009 5-year Review	2016-2018 Status
1	MA	- Westport site extirpated - Martha's Vineyard site numbers appear to be stable - Monomoy National Wildlife Refuge (NWR) site translocation may be failing	- Westport site extirpated - Martha's Vineyard site numbers appear to be declining, more than 90% decrease from 2010 - Monomoy NWR site translocation successful, with expanding range and large population (>8,000 adults in 2016) on South Monomoy Island, expanding northward to Town-owned lands
2 & 3	RI, CT, NY	- At listing extirpated from RI, CT, and NY	- Extirpated from RI, CT, and NY
4	NJ	- Sandy Hook, NJ translocation sites extirpated	- Sandy Hook, NJ translocation sites confirmed extirpated
5	MD – Calvert County (Western Shore)	- 6 of 10 occupied sites extirpated, habitat lost or in very poor condition - 2 of 4 remaining sites with <5 NBTBs in 2005, these sites have marginal habitat - The 2 primary sites (Scientist Cliffs and Western Shores/Calvert Beach) have declined in numbers >75% since 2003	- 8 of 10 occupied sites extirpated - 2 remaining sites (Flag Ponds, Western Shores/Calvert Beach) - Flag Ponds has 2-4 adult NBTBs observed in 2017-2018, likely dispersed from other occupied site - Western Shores/Calvert Beach is only viable population with increasing numbers (>2,000 adults in 2018) since 2009, but not near peak of about 4,000 adults in 1988
6	MD – Tangier	- Both sites (Janes and Cedar Islands) are stable or may be increasing	- Janes Island's numbers increased in recent years (>4,000 adults in 2017), after declining 2006-2014

	Sound (Eastern Shore)		- Cedar Island's numbers relatively stable and no apparent trend, with large fluctuations in numbers (1,000-3,000 adults)
7	VA – Eastern Shore	- Total NBTB numbers stable - 55% of NBTBs found on 2 of 35 occupied sites in 2005 (Parker's Marsh, Savage Neck) - 4 occupied sites extirpated (habitat gone) - 12 occupied sites showing declining numbers and available habitat	- Total NBTB numbers significantly lower in 2016 (43% decline) than peak in 2009, but not certain if trend of decline due to year-to-year variability - 35 occupied sites in 2016 (32-36 sites in 1999-2009) - 7 sites >1,000 adults in 2016 (9-12 sites in 1999-2009) - Most sites had declining numbers - 3 sites had large increases in numbers and a new site was found
8 & 9	VA – Western Shore	- Since 2001 there has been a 20% loss in occupied sites (12 of 58 occupied sites) - The majority of occupied sites show evidence of habitat loss as a result of Hurricane Isabel and Hurricane Ernesto - Total numbers declined 70% since 2001 - Since 2001, the 8 largest sites that support approximately 50% of the total NBTBs in 2001 have declined by 78%	- Total NBTB numbers lower in 2017 than 2008 (22% decline) and significantly lower than peak in 2001 (77% decline) - 37 occupied sites in 2017 (45 sites in 2008 and 64 in 2001) - The number of sites >500 and >1,000 adults in 2017 (6 and 2, respectively) lower than peak in 2001 (21 and 14, respectively) - 7 of 9 sites had declining numbers - The majority of occupied sites showed evidence of severe beach erosion

Table 2. Survey results for eastern shoreline of Chesapeake Bay, VA (Table 1 from Service 2019, modified with data from Knisley 2021b).

Year	Total Number of Adult NBTBs	Number of Sites with >500 Adult NBTBs	Number of Sites with >1,000 Adult NBTBs[1]	Number of Occupied Sites (>1 adult)	Number of Surveyed Sites	Percent of Surveyed Sites Occupied
2020	14,509	9	6	28	40	70
2016	25,488	13	7	35	39	90
2009	46,082	13	9	32	38	84
2005	38,498	13	10	36	38	95
2002	33,469	16	12	33	36	92
1999	32,143	13	9	35	35	100

[1]Includes sites with >500 adult NBTBs.

Table 3. Survey results for western shoreline of Chesapeake Bay, VA (Table 2 from Service 2019, modified with data from Knisley and Meyer 2022).

Year	Total Number of Adult NBTBs	Number of Sites with >500 Adult NBTBs	Number of Sites with >1,000 Adult NBTBs[1]	Number of Occupied Sites (>1 adult)	Number of Surveyed Sites	Percent of Surveyed Sites Occupied
2021	8,802	4	2	31	59	53
2017	7,832	6[2]	2	37	68	54
2014	9,539	5	2	34	57	60
2012	10,171	5	4	37	49	76
2008	10,021	7	0	45	49	92
2005	19,410	9	5	47	47	100
2004	12,185	8	2	48	57	84
2001	33,624	21	14	64	78	82
1998	26,693	15	9	61	74	82

[1]Includes sites with >500 adult NBTBs.
[2]Plum Tree NWR is included in this count of sites with >500 adults because 478 and 702 adults were counted in 2017 and 2018, respectively, by Eastern Virginia Rivers NWR Complex biologists (L. Cruz, Service, email to J. Stanhope, Service, July 30, 2018).

The primary factors or threats influencing the status include the loss of suitable beach habitat due to multiple factors, including increasing development and shoreline structures, hurricanes/large storms, and SLR (Service 2019). Some sites are impacted by high intensity usage and off-road vehicles on public beaches (Knisley et al. 2016, Service 2019). There remains little suitable, functionally available habitat within the NBTB's Northeast range on the Atlantic Ocean coastline, and observations during surveys and preliminary analysis indicate a decreased amount of suitable habitat across both shorelines of the Chesapeake Bay. The decline of numbers and occupied sites on the western shoreline is likely due to greater

habitat loss, development, and hardening of the shoreline than on the eastern shoreline. For the western shoreline of the Chesapeake Bay in Virginia, over half of the sites have shoreline structures while approximately one-fifth of the sites on the eastern shoreline have shoreline structures (Knisley et al. 2016). Shoreline stabilization structures such as groins, jetties, riprap revetments, bulkheads, and breakwaters, which are designed to reduce erosion, may interrupt and capture sand from longshore transport and build up the beach around the structure, but they prevent sand from moving to the downdrift shoreline. Bulkheads and riprap revetments have the greatest negative impact on NBTB, with "almost no beach at high tide and support few adults and no larvae" (Knisley et al. 2016).

Declines on both shorelines of the Chesapeake Bay may also be attributed to several major hurricanes and large storms (i.e., nor'easters), notably Hurricanes Isabel in 2003, Ernesto in 2006, and Sandy in 2012, causing significant erosion and loss of NBTB habitat (Knisley et al. 2016; Service 2009, 2019). However, coastal development and shoreline structures may limit the ability of beaches to recover from hurricanes and storms due to disruption of the sediment budget (i.e., sediment starved due to trapping behind structures and upriver dams) and less natural upland for beaches to migrate landward, thereby causing them to recede or disappear (Defeo et al. 2009, National Academy Press 2000).

Climate change effects of both SLR and more intense and frequent storms and land subsidence (natural and human-induced) and are also exacerbating and increasing beach erosion and shoreline recession (Hinkel et al. 2013, Knisley et al. 2016). Sea level along coastal regions of the United States is projected to continuously increase and predicted to be greater than estimates for global mean sea level (Sweet et al. 2022). For the Northeast region, estimates of median relative SLR (compared to baseline of 2000) range from 0.36 to 0.54 m by 2050 (Sweet et al. 2022). Table 4 provides the estimates by different scenarios of global mean SLR for the Northeast region by 2050 and the probabilities of exceeding each scenario by 2100 (note: probabilities are not provided for 2050).

Table 4. Median [likely ranges] regionalized global mean sea level scenario–based estimates of relative sea level rise in 2050 relative to a baseline of 2000 for the Northeast region of the U.S and probability of exceeding Global Mean Sea Level (GMSL; median value) rise scenarios in 2100. Table adapted from Tables 2.2 and 2.4 in Sweet et al. (2022).

GMSL Rise Scenario	**Relative SLR (m) in 2050**	**Probability of exceeding scenario by global mean surface air temperature increase in 2100**		
		2.0ºC [1]	**3.0ºC [2]**	**4.0ºC [3]**
Low (0.3 m)	0.36 [0.27, 0.45]	98%	>99%	>99%
Intermediate-Low (0.5 m)	0.40 [0.31, 0.49]	50%	82%	97%
Intermediate (1.0 m)	0.43 [0.34, 0.54]	2%	5%	10%
Intermediate-High (1.5 m)	0.49 [0.38, 0.64]	<1%	<1%	1%
High (2.0 m)	0.54 [0.40, 0.69]	<1%	<1%	<1%

[1] The closest emissions scenario-based GMSL projection is Intermediate (Shared Socio-Economic Pathways [SSP] 1-2.6) to Intermediate (SSP 2-4.5). SSP is based on the Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment (2022).
[2] The closest emissions scenario-based GMSL projection is Intermediate (SSP 2-4.5) to High (SSP 3-7.0).
[3] The closest emissions scenario-based GMSL projection is High (SSP 3-7.0).

The following main concerns of SLR for low-lying coastal regions, such as the beaches of the Chesapeake Bay and Massachusetts, would also be a concern for NBTB habitat: "(i) permanent submergence of land by mean sea levels or mean high tides; (ii) more frequent or intense flooding; (iii) enhanced erosion; (iv) loss and change of ecosystems" (Oppenheimer et al. 2019).

Leatherman et al. (2000) linked SLR to shoreline retreat along the U.S. Atlantic coast, finding that the long-term shoreline retreat rate was averaging approximately 150 times that of SLR. Multiple authors (Boon et al. 2010, Ezer and Corlett 2012, Boon and Mitchell 2015, Boon et al. 2018) have also found that relative SLR rates are high or accelerating in the U.S. Mid-Atlantic region along the Atlantic coast and the Chesapeake Bay. Furthermore, in the Chesapeake Bay, Boon et al. (2010) found that local subsidence contributed on average about 53% of relative SLR. With a warming climate, some studies predict an increase in the frequency of more intense hurricanes (i.e., category 4 and 5) by the end of the 21st century, in particular in the western Atlantic Ocean north of 20ºN latitude (i.e., Cuba and north), which would likely cause increased coastal erosion, resulting in further loss of NBTB habitat (Bender et al. 2010, Knutson et al. 2010). Therefore, the threats of SLR and hurricanes and associated coastal erosion are likely increasing in the range of the NBTB. In addition, existing regulatory mechanisms are inadequate in addressing the threats of development and shoreline structures and subsequent loss of habitat in the Chesapeake Bay.

In summary, as a whole, the rangewide status of the species is declining and the Service recommended that the NBTB continues to meet the definition of a threatened species under the ESA in its last 5-year review (Service 2019). There are multiple (redundancy) populations within the Chesapeake Bay in Virginia, but redundancy and representation are very limited in the northeastern portion of the range with only 2 populations (i.e., occupied sites) in Massachusetts and central portion of the range with only 3 populations in the Chesapeake Bay in Maryland. On both shorelines of the Chesapeake Bay in Maryland, approximately 67% of sites are extirpated. The health (resiliency) of populations varies across the range, with approximately 32% and 13% of occupied sites in the eastern and western shorelines of the Chesapeake Bay in Virginia, respectively, having more than 500 adults observed in the most recent surveys (e.g., 2020-2021).

For a more detailed account of the species description, life history, population dynamics, threats, and conservation needs, refer to https://ecos.fws.gov/ecp/species/8105.

STATUS OF CRITICAL HABITAT

No critical habitat has been designated for this species.

ENVIRONMENTAL BASELINE

Regulations implementing the ESA (50 CFR 402.02) define the environmental baseline as the past and present impacts of all federal, state, or private actions and other human activities in the Action Area. Also included in the environmental baseline are the anticipated and/or ongoing impacts of all proposed federal projects in the Action Area that have undergone Section 7 consultation, and the impacts of state and private actions which are contemporaneous with the consultation in progress.

Status of the Species within the Action Area

Haven Beach is located within the section of shoreline referenced by Knisley and Meyer (2022) as the Bethel Beach North Site. The total number of adult NBTBs at the Bethel Beach North site has fluctuated over the years; adult NBTB numbers have ranged from a low of 259 adults in 2012 to a high of 2,301 adults in 2001 (Table 5) (Knisley and Meyer 2022). The action area is located between waypoint (WP) 198 and 258; WP 208, 218, 228, 238, and 248 are located in the action area (Figure 6). In 2021, 15 adults were documented between WP 198 and 208; 16 adults between WP 208 and 218; 0 adults between WP 218 and 228; 0 adults between WP 228 and 238; 66 adults between WP 238 and 248; and 71 adults between WP 248 and 258 (Kinsley and Meyer 2022). The shoreline between WP 228 and 238 is unlikely to support larval habitat due to serve shoreline erosion and areas of exposed peat in the intertidal zone; however, adult beetles have been seen foraging in this area (B. Knisley, RMC, email to R. Case, Service, May 19, 2022). Areas south of WP 238 and north of the breakwaters support the best NBTB habitat. A survey was not conducted for the proposed project; therefore, the presence of larval NBTBs is assumed given the presence of adult NBTBs.

Table 5. Survey results of the Bethel Beach North NBTB site (Table 5 from Knisley and Meyer 2022).

Year	Total Number of Adult NBTBs
2021	922
2017	284
2014	427
2012	259
2008	371
2007	664
2005	360
2004	801
2001	2301
1998	996

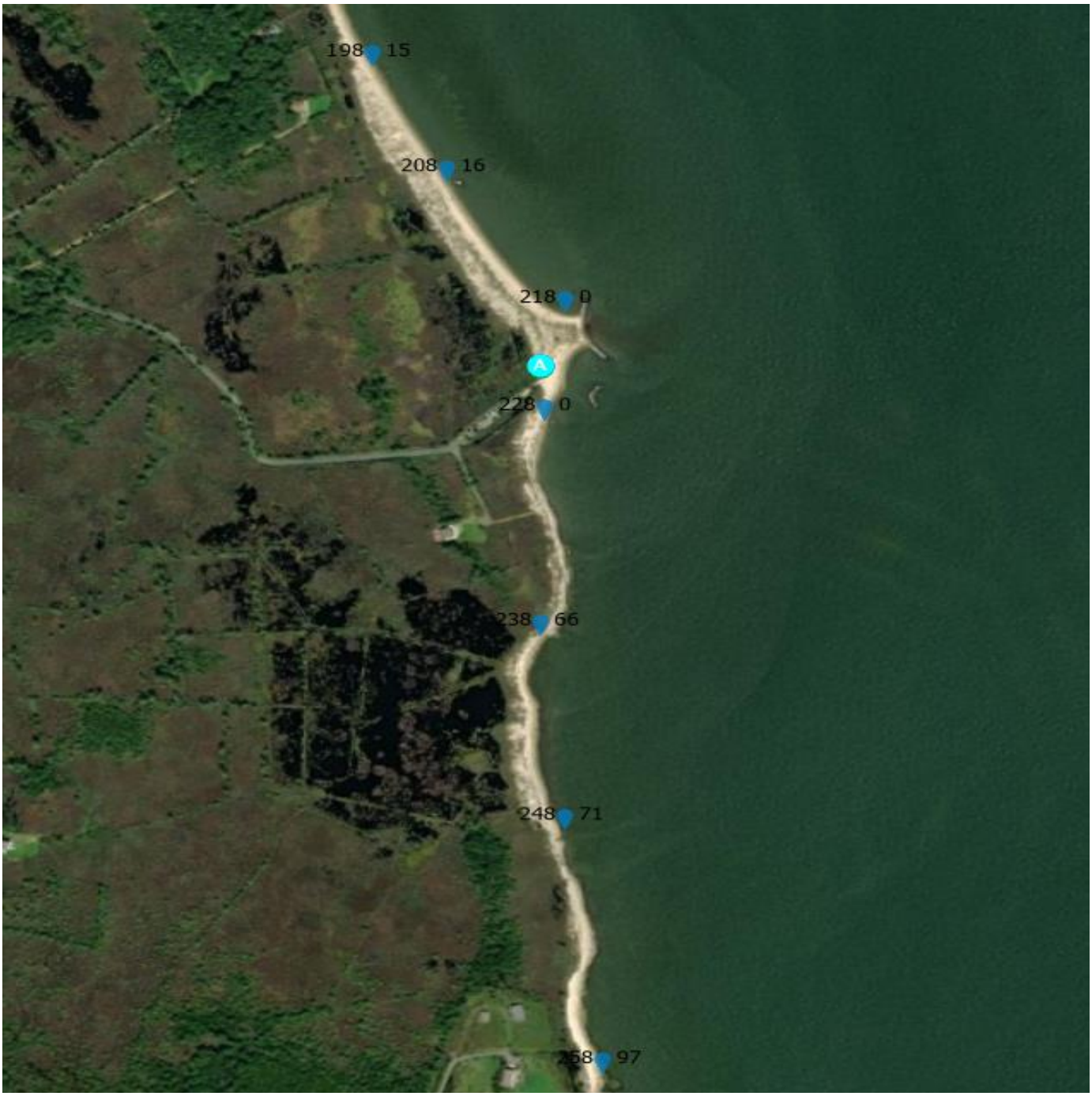

Figure 6. Results of most recent (2021) adult NBTB survey in the action area (Knisley 2021). WP number label on the left side of thumbtack (blue); adult NBTB number label on the right.

The action area contains 122,093 ft^2 (33,559 ft^2 of intertidal + 88,534 ft^2 of beach) of NBTB habitat between MLW and the dune within the area denoted in yellow in Figure 5 and 300 m of NBTB habitat south of breakwater 5 (area shown in red in Figure 5).

Haven Beach is a public beach with moderate human beach activity. Beach activities typically occur between WP 218 and 228 (B. Knisley, RMC, email to R. Case, Service, May 19, 2022) (Figure 6). Activities include foot traffic, swimming, beach games, sun-bathing, events, and parties. Beetles can tolerate moderate levels of human activity but not high-density use (Knisley 2011).

The shoreline in the action area is experiencing erosion (Figure 8). Haven Beach shoreline erosion rates average between -5 to -10 ft per year (Hardaway et al. 2010). Shoreline erosion in the action area is likely a result of natural and anthropogenic causes. Natural causes impacting the NBTB in the action area include SLR and large storms. The action area is in the Chesapeake Bay. Data collected from Chesapeake Bay tide-gage records and paleo-sea-level records from tidal marshes and the bay's mainstem between 1995 to 2006 show rates of SLR in the Chesapeake Bay range from about 3.2 to 4.7 mm/year (Eggleston and Pope 2013). When sea levels rise, waves gradually reach higher elevations on the beach, which over time, can erode the shoreline (U.S. Geological Survey 1998). Several storms have also impacted the shoreline at Haven Beach (e.g., Hurricane Isabel in 2003, Ernesto in 2006, and Sandy in 2012). During large storm events, storm surges shift the erosive force of the waves higher onto the beach enhancing shoreline erosion (Eggleston and Pope 2013). In 2005, anthropogenic structures, breakwaters 1 and 2, were installed along with beach nourishment to protect against shoreline erosion. Between 2006 and 2021, the shoreline north and south of the breakwaters changed in topography (Figure 8). North of breakwater 1, the general trend has been sand accretion, while south of breakwater 1, the general trend has been erosion. It is unclear if/how much the breakwaters have contributed to downdrift erosion. However, a tombolo has formed behind breakwater 1 and has remained relativity stable over the years. When a stable tombolo forms behind a breakwater, sediment transport in and out of a system is minimal, and longshore sediment transport is reduced or stopped altogether, which can result in downdrift erosion and updrift accretion (Pope and Dean 1986 *in* Edwards 2006). Sediment transfer along this reach of the coast is from north to south (Corps 2022).

Figure 8. Aerial image of Haven Beach shoreline in 2021 (outlined in black) with image overlay of Haven Beach shoreline in 2006 (outlined in red).

EFFECTS OF THE ACTION

Direct effects are the direct or immediate effects of the project on the species, its habitat, or designated/proposed critical habitat. Indirect effects are defined as those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). An interrelated activity is an activity that is part of the proposed action and depends on the

proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. Direct and indirect effects of the proposed action along with the effects of interrelated/interdependent activities are all considered together as the "effects of the action."

The potential effects of the proposed action are described in Table 6. Those components of the proposed action determined to result in "no effect" are described in Table 6 and will not be further discussed in this Opinion. Components of the project that are likely to adversely affect NBTB are described in Table 6 and include:

- Beach renourishment
- Breakwater construction
- Breakwaters
- Beach grass planting

Table 6. Potential effects of the proposed action. "No effect" (NE) rows are green, "likely to adversely affect" (LAA) rows are red.

Project Activity	Environmental impact or threat	Stressor	Stressor pathway (optional)	Exposure (resource affected)	Range of Response	Conservation need affected	Demographic Consequences	NE, NLAA, or LAA
Phase 1								
Dredging	NA	NA	NA	NA	NA	NA	NA	NE
	Comments: The operation of the dredge is limited to offshore areas and will not occur in NBTB habitat.							
Beach renourishment	temporary loss of habitat, habitat alteration, disturbance, physical impacts	sand placement and movement, crushing and smothering of adults, entombment of larvae, increased noise/vibrations, restricted access to water; change in tidal flow dynamics, shadows, movement	pumping sand onto the beach, operation of heavy equipment	habitat, individual (all life stages), population	harm, kill	breeding, feeding, sheltering	numbers, reproduction, distribution	LAA
	Comments: During the beach renourishment process, some adult NBTBs will disperse from the renourishment area and will avoid being crushed or smothered by the placement/movement of sand and equipment traversing the beach, which may result in increased energy expenditure and reduced fitness. Adults that do not disperse may experience direct mortality from crushing or smothering. Adults in the action area but outside of the beach renourishment area may experience disruption to their daily activity patterns (e.g., foraging, mating, basking, and egg-laying) due to equipment presence, increased noise/vibrations, restricted access to water, and potential changes in tidal flow dynamics, resulting in increased energy expenditure and reduced fitness and survivorship. Larvae are less likely than adults to be crushed by the placement/movement of sand and equipment traversing the beach because they can retreat into their burrows (Knisley 2011). However, any larvae in the renourishment area will be entombed in their burrows, resulting in mortality. Larvae in the action area but outside the renourishment area may be prevented from feeding due to their sensitivity to vibrations, movements, and shadows, resulting in reduced survivorship. Initially, the beach habitat in renourished areas will be unsuitable for NBTB because the dredge material will be anoxic and contain silt and organic material (Wade et al. 2002). The Service anticipates that the habitat will become suitable after the exposed dredged material is oxidized, organic material decomposes, and silt is washed away during rain events and multiple tidal cycles (Wade et al. 2002). Within weeks, the Service anticipates that adult NBTBs from surrounding areas will recolonize the renourished area and resume their daily activities (e.g., foraging, mating, basking, egg-laying) (Fenster et al. 2006). Beach renourishment will occur in 204,770 ft^2 of open water, 33,559 ft^2 of intertidal waters, 88,534 ft^2 of beach, and 7,997 ft^2 of dune (total 334,860 ft^2). Of that 334,860 ft^2, beach renourishment will negatively impact 122,093 ft^2 of NBTB habitat (33,559 ft^2 of intertidal waters + 88,534 ft^2 of beach). The Service anticipates that a total of 175,992 ft^2 (35,890 ft^2 of intertidal + 140,102 ft^2 of beach, see Description of Proposed Action section) of NBTB habitat will result from beach renourishment (53,899 ft^2 increase in NBTB habitat, 175,992 ft^2 - 122,093 ft^2).							
Phase 2								
Breakwater construction	habitat degradation, physical impacts, disturbance	compaction of habitat, crushing of adults, entombment of larvae, increased	operation of heavy equipment	habitat, individual (all life stages), population	harm, kill	breeding, feeding, sheltering	numbers, reproduction, distribution	LAA

Project Activity	Environmental impact or threat	Stressor	Stressor pathway (optional)	Exposure (resource affected)	Range of Response	Conservation need affected	Demographic Consequences	NE, NLAA, or LAA
		noise/vibrations, shadows, movement						
	Comments: Breakwater construction will occur within the 334,860 ft^2 renourished area. When breakwater construction begins, the Service anticipates that adult NBTBs will have recolonized 175,992 ft^2 (35,890 ft^2 of intertidal + 140,102 ft^2 of beach) of the renourished area and will have resumed their daily activities, such as foraging, mating, basking, and egg-laying (see beach renourishment comment section). During breakwater construction, project equipment will traverse the beach to move rock from the staging area to the stockpile location (100 ft landward of breakwater 1, see Description of Proposed Action section) and then from the stockpile location to each of the proposed breakwater locations (Figure 5). To avoid being crushed by equipment traversing the beach and the stockpiling of rocks onto the beach, some adults will disperse from the area, which could result in increased energy expenditure and reduced fitness. Adults that do not disperse may experience direct mortality from crushing. Adults in the action area but outside the construction area may experience a disruption to their daily activity patterns (e.g., foraging, mating, basking, and egg-laying) due to equipment presence, increased noise/vibrations, and sand compaction, resulting in increased energy expenditure and reduced fitness and survivorship. To avoid being crushed, larvae will retreat into their burrows (Knisley 2011); however, larvae will be entombed in their burrows by equipment traversing the beach and the stockpiling of rock onto the beach. Larvae in the action area but outside the construction area may be prevented from feeding due to their sensitivity to vibrations, movements, and shadows, resulting in reduced survivorship.							
Breakwaters	habitat degradation, habitat alteration, loss of habitat	erosion, distribution of sand, inundation	alteration of longshore sand transport	habitat, individual (all life stages), population	harm, kill	breeding, feeding, sheltering	numbers, reproduction, distribution	LAA
	Comments: The breakwaters will connect to the shore creating a tombolo. Tombolos interfere with longshore sediment transport causing downdrift erosion and updrift accretion (Pope and Dean 1986 *in* Edwards 2006). Sediment transport along this reach of the coast is from north to south (Corps 2022). The Service anticipates that the proposed breakwaters will stop or reduce longshore sand transport from the north, starving sand replenishment to the south. Based on external expert opinion (M. Fenster, RMC, telephone conversation with R. Case et al., Service, May 13, 2022), other breakwater projects, and an informal desktop analysis performed by the Service (T. Meader, Virginia Department of Conservation and Recreation [VDCR], memo to R. Rhur, VDCR, March 7, 2022; J. Stanhope, Service, email to R. Case, Service, July 8, 2022), the Service estimates that the shoreline 300 m south of the project site (area denoted in red in Figure 5) will be altered or displaced in width, profile, and sand distribution due to erosion, resulting in the degradation of NBTB habitat. Beach width is a critical indicator of suitable NBTB habitat (see Status of the Species section). As the shoreline erodes, adult NBTBs utilizing the area will disperse in search of more suitable habitat, resulting in increased energy expenditure and reduced fitness. During increased/prolonged inundation periods and due to a loss in beach width (i.e., increased erosion), larvae will be unable to relocate their burrows and/or their burrows will be washed away, resulting in mortality. Over time, suitable NBTB habitat in this area may be lost permanently. The Service does not anticipate a significant change to the shoreline north of breakwater 1 (existing breakwater, Figure 3) because the breakwater was constructed in 2005 and this section of shoreline has likely reached equilibrium. The other breakwaters are anticipated to maintain the additional NBTB habitat created behind and between them following beach renourishment after the shoreline reaches equilibrium. The proposed breakwaters and extension will impact 22,200 ft^2 of the subaqueous bottom (E. Brooks, Corps, telephone conversation, R. Case, Service, May 26, 2022).							
Beach grass planting	habitat degradation, disturbance, physical impacts	compaction of habitat, crushing of adults and larvae, entombment of larvae, increased noise/vibrations, shadows, movement	operation of heavy equipment, digging up sand	habitat, individual (all life stages), population	harm, kill	breeding, feeding, sheltering	numbers, reproduction, distribution	LAA
	Comments: Beach grass planting will occur within the 334,860 ft^2 renourished area. When beach grass planting begins, the Service anticipates that adult NBTBs will have recolonized 175,992 ft^2 (35,890 ft^2 of intertidal + 140,102 ft^2 of beach) of the renourished area and will have resumed their daily activities such as foraging, mating, basking, and egg-laying (see beach renourishment comment section). During beach grass planting, project equipment will traverse the beach to move materials from the staging area to the planting location. To avoid being crushed by equipment, adults will disperse from the area, which could result in increased energy expenditure and reduced fitness. Adults that do not disperse may experience direct mortality from crushing. Adults in the action area but outside the beach grass planting area may experience a disruption to their daily activity patterns (e.g., foraging, mating, basking, and egg-laying) due to equipment presence, increased noise/vibrations, and sand compaction. To avoid being crushed, larvae will retreat into their burrows; however, they will be entombed in their burrows by equipment traversing the beach. Larvae may also be crushed/dug up during planting, resulting in direct mortality. Larvae in the action area but outside the beach grass planting area may be prevented from feeding due to their sensitivity to vibrations, movements, and shadows, resulting in reduced survivorship.							

CUMULATIVE EFFECTS

Cumulative effects are those “effects of future State or private activities, not involving federal activities, that are reasonably certain to occur within the action area” considered in this Opinion (50 CFR 402.02).

The Service is not aware of any future State, tribal, local, or private actions that are reasonably certain to occur within the action area at this time; therefore, no cumulative effects are anticipated.

JEOPARDY ANALYSIS

Section 7(a)(2) of the ESA requires that federal agencies ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species.

Jeopardy Analysis Framework

“Jeopardize the continued existence of” means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). In accordance with policy and regulation, the jeopardy analysis in this Opinion relies on 4 components: (1) Status of the Species, which evaluates the NBTB rangewide condition, the factors responsible for that condition, and its survival and recovery needs; (2) Environmental Baseline, which evaluates the status of the NBTB in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the NBTB, (3) Effects of the Action, which determines impacts of the proposed action, and (4) Cumulative Effects, which evaluates the effects of future, non-federal activities in the action area on the NBTB. The jeopardy analysis in this Opinion emphasizes the rangewide survival and recovery needs of the listed species and the role of the action area in providing for those needs. It is within this context that we evaluate the significance of the proposed federal action, taken together with cumulative effects, for purposes of making the jeopardy determination (see 50 CFR 402.14(g)).

In this section, we add the effects of the action and the cumulative effects to the status of the species and critical habitat and to the environmental baseline to formulate our Opinion as to whether the proposed action is likely to appreciably: (1) reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing the RND of that species; or (2) appreciably diminish the value of critical habitat for both the survival and recovery of a listed species.

Per the Service’s consultation handbook (Service and National Marine Fisheries Service 1998), survival is defined as “the species' persistence as listed or as a recovery unit, beyond the conditions leading to its endangerment, with sufficient resilience to allow for the potential recovery from endangerment. Said another way, survival is the condition in which a species

continues to exist into the future while retaining the potential for recovery. This condition is characterized by a species with a sufficient population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species' entire life cycle, including reproduction, sustenance, and shelter."

Per the Service's consultation handbook (Service and National Marine Fisheries Service 1998), recovery is defined as "improvement in the status of listed species to the point at which listing is no longer appropriate under the criteria set out in Section 4(a)(1) of the ESA." The "criteria set out in Section 4(a)(1)" means determining when a species no longer meets the definition of an "endangered species" or a "threatened species" because of any of the following factors:

(A) present or threatened destruction, modification, or curtailment of habitat or range;
(B) overutilization for commercial, recreational, scientific, or educational purposes;
(C) disease or predation;
(D) inadequate existing regulatory mechanisms; and
(E) other natural or manmade factors affecting the species continued existence.

An endangered species is "in danger of extinction throughout all or a significant portion of its range" (see ESA Section 3(6)). A threatened species is "likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (see ESA Section 3(20)).

To conduct this analysis, we begin by assessing whether there are effects to any individuals of the species of interest (as discussed in the effects analysis section above). If all effects are insignificant, discountable, or wholly beneficial, no further consultation is required. In other words, if we conclude that individuals are *not* likely to experience reductions in reproductive success or survival likelihood, fitness consequences for the species rangewide would not be expected as well. In this case, the agency has ensured that their action is not likely to jeopardize the continued existence of the species and our analysis is completed. Conversely, if we are unable to show that individuals are unlikely to experience reductions in their reproductive success or survival likelihood, we are required to assess how those effects are or are not anticipated to result in an appreciable reduction in the likelihood of both the survival and recovery of the species. We do not assess appreciable reduction of reproduction, numbers or distribution at an individual level because we do not assess appreciable reduction of survival and recovery at an individual level.

Because many species are composed of multiple populations and there may be meaningful differences in those populations (e.g., genetics, morphology, size) to the overall species survival and recovery, it is a logical intermediate step to evaluate the effects of impacts to individuals on the population(s) they are associated with. If our analyses indicate that reductions in the fitness of the population(s) are not likely to occur then there can be no appreciable reductions in reproduction, numbers, or distribution at a species level and we conclude that the agency has ensured that their action is not likely to jeopardize the continued existence of the species. If there are reductions in the fitness of the population(s) impacted, we then assess whether those changes

affect the overall species survival and recovery rangewide based on the importance of the population(s) for species level representation, resiliency and redundancy, the level of impact, and the status of the species.

Analysis for Jeopardy

Impacts to Individuals – In this step we determine whether any individuals of the species will be exposed to stressors from the various activities that are part of the proposed action. If exposure is likely, the next step is to determine the fitness consequences of individuals exposed to those stressors. The fitness of an individual can be measured by its reproductive success (which is determined by vital rates such as fertility rates, age at first reproduction, and reproductive intervals) and its survival likelihood. To assess whether fitness consequences may occur, we determine whether and how individuals are likely to respond[3] upon exposure to the stressors and beneficial actions associated with the proposed action. As the response of individuals upon exposure depends upon their condition (i.e., their health and resiliency), we must first establish the baseline conditions for those individuals. If the baseline condition of the individuals is unknown, generally we can use information about the status of the population or of the species as a whole (depending on the information available) to infer the degree of resiliency possessed by the individuals.

The proposed action includes beach renourishment, beach grass planting, breakwaters and their construction. As discussed in the Effects of the Action, effects of the action include effects to individual adult NBTBs during their breeding season and to larvae NBTB present within the action area year-round (Table 6). Effects to adult NBTBs include 1) mortality from crushing or smothering resulting from the placement/movement of sand; 2) mortality from crushing resulting from equipment traversing the beach and the stockpiling of rock onto the beach; 3) reduced fitness due to increased energy expenditures resulting from dispersal and from searching out alternative habitats due to a loss in habitat both temporarily and permanently; and 4) reduced fitness and survivorship due to a disruption in daily activity patterns, such as foraging, mating, basking, and egg-laying resulting from equipment presence, increased noise/vibrations, restricted access to water, potential changes in tidal flow dynamics, and increased energy expenditures.

Effects to larval NBTBs include 1) mortality from entombment resulting from sand placement/movement, equipment traversing the beach, and rock stockpiling; 2) mortality from inundation resulting from shoreline erosion; and 3) reduced survivorship due to disruption in feeding from increased noise/vibrations, movements, and shadows.

In summary, we anticipate impacts to individual NBTBs in either their survival or reproductive rates.

[3] There are many possible biological responses (such as startle, alarm, flee, avoid, abandon/displace, reduced feeding success, reduced growth, reduced reproductive success, reproductive failure, and increased mortality) and many of these represent a form of take and thus must be expressed and evaluated in our Opinions. For our jeopardy analyses, however, reproductive success and survival are two metrics that may lead to population level consequences and are thus most relevant.

Impacts to Populations – In this section, we evaluate the aggregated consequences of the reductions in the fitness of individuals on the population(s) to which those individuals belong. Specifically, we are analyzing how the reductions in individual fitness affect the population's abundance, reproduction, or growth rates to make inferences about the population's future reproductive success and its viability. Whether a population can withstand the consequences of aggregated fitness reductions in individuals depends upon its baseline status (i.e., its resiliency). Thus, our analysis entails defining the population(s) the individuals comprise and determining the current and future baseline condition of that population.

As we have concluded that individual NBTBs are likely to experience some reductions in their annual survival or reproductive rates, we need to assess the aggregated consequences of the anticipated impacts on the population(s) to which these individuals belong.

The action area is in the Bethel Beach North population. The Bethel Beach North shoreline is approximately 2.39 mi in length (note: total area data is not available due to lack of on-the-ground measurements of beach width). The action area (Figure 5) is approximately 0.65 mi in length. During phase 1 of the project, approximately 0.45 mi (18.8%) of NBTB habitat within the Bethel Beach North population will be rendered unsuitable due to beach renourishment activities (see Effects of the Action section, Table 6). However, the Service anticipates that within weeks following beach renourishment, the habitat will become suitable and adult NBTBs from surrounding areas will recolonize the area and resume their daily activities (e.g., foraging, mating, basking, and egg-laying) (see Effects of the Action section, Table 6). The Service also anticipates that the project will create an additional 53,899 ft^2 (total amount of NBTB habitat created by beach renourishment minus the current amount in the action area, see Effects of the Action section, Table 6) (44.1% increase) of NBTB habitat within the 0.45 mi of shoreline where beach renourishment will occur (area denoted by yellow in Figure 5). Following phase 2 of the project, the Services anticipates that the shoreline 300 m (0.19 mi) south of breakwater 5 (area denoted in red in Figure 5) will experience erosion, and over time, could be lost permanently. However, this area contains only 7.9% (0.19 mi of 2.39 mi) of habitat available to the Bethel Beach North population; therefore, the potential loss of this habitat is unlikely to pose a significant threat to the population as a whole. Moreover, Knisley and Meyer (2022) noted that the Bethel Beach North population has been viable and large in most surveys, which will likely make this population more resilient to change. The most recent survey of the Bethel Beach North population (2021, see Environmental Baseline section) documented 922 adult NBTBs, the highest count since 2001 (Table 5). Of the 922 adults documented, 168 were documented in the action area (18.2%). We expect decreased fitness of the Bethel Beach North population; however, the majority of the population level impacts will be short-term and small because of the anticipated net increase in habitat, the ability of NBTBs from surrounding areas to recolonize the area, and the amount (18.2%) of the Bethel Beach North population within the action area in 2021. As such, we have concluded that the Bethel Beach North population of NBTB is unlikely to experience long-term reductions in fitness and there will be no reduction in RND on the NBTB as a whole.

CONCLUSION

We considered the current overall declining rangewide status of NBTB and the stable condition of the species within the action area (environmental baseline). We then assessed the effects of the proposed action and the potential for cumulative effects in the action area on individuals and the populations, and the species as a whole. As stated in the Jeopardy Analysis, we do not anticipate any reductions in the overall RND of the NBTB. It is the Service's Opinion that the Corps' issuance of a permit to dredge the HITW Channel, renourish Haven Beach, construct breakwaters, and plant beach grass, as proposed, is not likely to jeopardize the continued existence of the NBTB.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulation pursuant to Section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined in Section 3 of the ESA as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns including breeding, feeding, or sheltering (50 CFR § 17.3). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement (ITS).

The measures described below are nondiscretionary and must be undertaken by the Corps so that they become binding conditions of any grant or permit issued to Mathews County, as appropriate, for the exemption in Section 7(o)(2) to apply. The Crops has a continuing duty to regulate the activity covered by this ITS. If the Corps: (1) fails to assume and implement the terms and conditions or (2) fails to require Mathews County to adhere to the terms and conditions of the ITS through enforceable terms that are added to the permit or grant document, the protective coverage of Section 7(o)(2) may lapse. To monitor the impact of incidental take, the Corps must report the progress of the action and its impact on the species to the Service as specified in the ITS [50 CFR 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE ANTICIPATED

The Service analyzed the effects to the species above.

The Service has reviewed available data and is unable to quantify and numerically express anticipated incidental take of NBTB. Haven Beach is within the Bethel Beach North Site (see Status of Species within the Action Area section). Knisley and Meyer (2022) documented a wide fluctuation in the number of adult NBTBs surveyed at this site from 1998 to 2021 (Table 5). Most notable are the year-to-year variations (e.g., 801 NBTB adults were documented in 2004

and 360 adults were documented in 2005). Significant variations in annual adult NBTB survey data are common (Knisley et al. 2016). Factors contributing to high variations in survey data include weather conditions, tide level, survey differences, year-to-year variation in the peak time of abundance, and the alteration of NBTB habitat due to shoreline erosion from storm events (e.g., hurricanes and nor'easters) (Knisley et al. 2016). The last survey of the action area was in 2021 (see Status of the Species in the Action Area section). Based on the information above, survey data from 2021 would not provide an accurate numerical estimate of NBTB in the action area. Furthermore, following the completion of phase 1 beach renourishment, the Service anticipates that within weeks, adult NBTBs will recolonize the area and resume their daily activities (e.g., foraging, mating, basking, and egg-laying) (Table 6). However, there is no data to suggest the exact number of adult NBTBs that will recolonize the area or how many larvae will be recruited during the ovipositional period. Thus, quantifying the specific number of individuals affected during phases 1 or 2 of the project is not practicable. Therefore, the Service uses a surrogate to provide an alternative means of expressing and monitoring the take of NBTB. Reinitiation of consultation will be triggered if the incidental take from the project exceeds the surrogates specified below.

50 CFR 402.14(i)(1)(i) states that surrogates may be used to express the amount or extent of anticipated take provided the Opinion or ITS: (1) describes the causal link between the surrogate and take of the listed species; (2) describes why it is not practical to express the amount of anticipated take or to monitor take-related impacts in terms of individuals of the listed species; and (3) sets a clear standard for determining when the amount or extent of the taking has been exceeded.

Surrogate for Estimating and Monitoring Anticipated Incidental Take

It is not practical to monitor take-related impacts in terms of individual NBTB for the following reasons: the color and the small body size of the NBTB make it difficult to locate, which makes encountering dead or injured individuals unlikely; scavengers may consume the carcass; the carcass may be covered by sand; losses may be masked by annual fluctuations in numbers; and some of the anticipated take, including non-lethal injury of individual NBTBs, is not directly observable.

The incidental take is expected to be in the form of harm or kill.

Disturbance caused by beach renourishment, the proposed breakwaters and their construction, and beach grass planting (357,060 ft^2 between latitude: 37.4386, longitude: -76.254 and latitude: 37.4319, longitude: -76.2531) is being used as a surrogate to express and monitor the extent of authorized take related to these activities because it is not practical to express and monitor take-related impacts in terms of individuals. We calculated the area impacted for beach renourishment as follows: 334,860 ft^2 of disturbance = 204,770 ft^2 open water + 33,559 ft^2 intertidal waters + 88,534 ft^2 beach + 7,997 ft^2 dune. When beach renourishment is complete, breakwater construction and beach grass planting will occur within the same 334,860 ft^2 area described above. The proposed breakwaters will impact 22,200 ft^2 of the subaqueous bottom. We

calculated the total area impacted through disturbance from beach renourishment, the proposed breakwaters and their construction, and beach grass planting as follows: 357,060 ft^2 of disturbance = 334,860 ft^2 of area impacted by beach renourishment, breakwater construction, and beach grass planting + 22,200 ft^2 of area impacted by the proposed breakwaters. These impact areas are described in the Effects of the Action section and depicted in Figure 5. The 357,060 ft^2 of disturbance between latitude: 37.4386, longitude: -76.254 and latitude: 37.4319, longitude: -76.2531 sets a clear, enforceable standard, and disturbance related to beach renourishment, the proposed breakwaters and their construction, and beach grass planting outside of that specific area exceeds take. The anticipated take is described in Table 7.

Table 7. Amount and type of anticipated incidental take.

Species	Amount of Take Anticipated (Surrogate)	Life Stage when Take is Anticipated	Type of Take	Take is Anticipated as a Result of
NBTB	357,060 ft^2 between latitude: 37.4386, longitude: -76.254 and latitude: 37.4319, longitude: -76.2531	All	Harm, Kill	Adults: 1) mortality from crushing or smothering resulting from the placement/movement of sand; 2) mortality from crushing resulting from equipment traversing the beach and stockpiling rock onto the beach; 3) reduced fitness due to increased energy expenditures resulting from dispersal and from searching out alternative habitats due to a loss in habitat both temporarily and permanently; 4) reduced fitness and survivorship due to a disruption in daily activity patterns, such as foraging, mating, basking, and egg-laying resulting from equipment presence, increased noise/vibrations, restricted access to water, potential changes in tidal flow dynamics, and increased energy expenditures. Larvae: 1) mortality from entombment resulting from sand placement/movement, equipment traversing the beach; 2) mortality from inundation resulting from shoreline erosion; and 3) reduced survivorship due to disruption in feeding from increased noise/vibrations, movements, and shadows.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of NBTB:

1. Ensure that construction is conducted in a manner that minimizes disturbance to NBTB.

2. Provide information to all individuals involved in project construction on how to avoid and minimize potential effects to NBTB.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of Section 9 of the ESA, the Corps must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

1. No ground disturbance caused by construction-related foot traffic, equipment, or materials will occur on the beach outside of the project area.

2. No use of pesticides on the beach.

3. Fuel, oil, and hydraulic fluids for equipment used will not be stored within 100 ft of any waterbody or wetland. Refueling of mobile equipment/vehicles will not occur within 100 ft of any waterbody or wetland (including the beach area, which is classified as non-vegetated wetlands). On-site personnel will select appropriate sites for these activities and subsequently use best management practices, secondary containment measures, or other standard spill prevention and countermeasures to manage the activity to prevent these fluids from entering the Chesapeake Bay.

4. Before the start of phase 2 construction, in coordination with the applicant, a Service approved NBTB surveyor will stake out a construction path on the beach that minimizes impacts on NBTB larval areas. During phase 2 construction all equipment will utilize that construction path.

5. No beach grass will be planted outside of the newly created dune area.

MONITORING AND REPORTING REQUIREMENTS

1. Any spills of motor oil, hydraulic fluid, coolant, or similar fluids, not contained before entry into the action area, must be reported to the Service at the contact number/email provided below and National Response Center (800-424-8802) immediately.

2. Notify the Service regarding the projected and actual start dates, progress, and completion of the project; verify that the disturbance of 357,060 ft^2 between latitude: 37.4386, longitude: -76.254 and latitude: 37.4319, longitude: -76.2531was not exceeded by beach renourishment, the proposed breakwaters and their construction, and beach grass planting; and that all conservation measures were followed. Provide a report containing this information by December 31 of each year until the year after construction is complete to the Service contact email provided below.

3. Submit a monitoring plan to the Service contact email provided below for review and approval at least 30 days prior to conducting any work on Haven Beach. The monitoring plan will be sufficient to monitor the impacts of incidental take and to determine if the amount or extent of take is exceeded. Elements of the monitoring plan should include:
    - Aerial imagery of the action area in Figure 5 before initiation of work on Haven Beach, immediately after construction, and at regular annual intervals post-construction;
    - Beach profiles in the area delineated in red in Figure 5 (indirect impacts) and 50 m downdrift of this area before initiation of work on Haven Beach, immediately after construction, and at regular annual intervals post-construction; and

- Adult and larval NBTB surveys in the action area in Figure 5 conducted by a Service approved NBTB surveyor after construction and at regular annual intervals post-construction. A list of pre-approved NBTB surveyors can be found here: https://www.fws.gov/media/collection-approved-surveyor-lists-project-review-process-virginia. If a proposed surveyor not on the list is selected, the proposed surveyor's qualifications must be sent to the Service for review and approval at least 60 days prior to the survey. Adult NBTBs will be inventoried on warm, sunny days between July 1 and July 25. The total number of adults observed must be recorded. Larval inventories will be conducted between October 10 and 30 during low tide on cool and/or cloudy days. The total number of larval burrows must be recorded. An attempt to identify instar stage of larvae will be made. A report will be provided to the Service documenting/including the following for both adult and larval surveys: surveyor and dates, methods, results, photographic monitoring, and any habitat/population observations of significance within 30 days following the competition of the larval survey. Provide the report to the Service contact email provided below.

4. Care must be taken in handling any dead specimens of proposed or listed species to preserve biological material in the best possible state. In conjunction with the preservation of any dead specimens, the finder has the responsibility to ensure that evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. The finding of dead specimens does not imply enforcement proceedings pursuant to the ESA. The reporting of dead specimens is required to enable the Service to determine if take is reached or exceeded and to ensure that the terms and conditions are appropriate and effective. Upon locating a dead specimen, notify the Service's Virginia Law Enforcement Office at 804-771-2883 and the Virginia Field Office at the phone number provided below.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

- Establish a process to mitigate for NBTB habitat loss from shoreline projects. This could include a means to establish conservation easements for the protection of the NBTB and its habitat, restoration of beach habitat in areas where habitat has been altered significantly, or other appropriate measures. This would contribute to recovery efforts for the NBTB by formally protecting sites through conservation easements or natural areas.
- Fund and/or conduct research to better understand the effects of different shoreline structures (groins, breakwaters, revetments/riprap/bulkheads) and nonstructural methods (beach renourishment) on beach habitat quality and persistence for NBTB. Based on this

research, design appropriate structural and nonstructural methods and develop best management practices that will increase or maintain NBTB habitat.

For the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the request. As provided in 50 CFR 402.16, reinitiation of consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of taking specified in the incidental take statement is exceeded; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action.

If you have any questions regarding this Opinion or our response to your concurrence request or our shared responsibilities under the ESA, please contact Rachel Case of this office at 804-824-2416 or rachel_case@fws.gov.

Sincerely,

CYNTHIA SCHULZ
2022.08.03 10:38:01 -04'00'

Cindy Schulz
Field Supervisor
Virginia Ecological Services

cc: Corps, Norfolk, VA (Attn: Emily Brooks, Nancy Davis, and Tucker Smith)
VIMS, Gloucester, VA (Attn: Emily Hein)
VMRC, Ft. Monroe, VA (Attn: Mike Johnson)
MPPDC, Saluda, VA (Attn: Lewis Lawrence and Curtis Smith)
County of Mathews, VA (Attn: James Knighton)

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CONSULTATION HISTORY

11-22-21	The Corps initiated informal consultation.
12-14-21 to 07-01-22	The Service and Corps exchanged emails to discuss project details.
01-14-22	The Service conducted a site visit with the Corps.
02-18-22	The Corps initiated formal consultation.
04-07-22	The Service responded to the Corps' request for formal consultation and notified them that the consultation package was complete.
05-13-22	The Service met with Mike Fenster and Barry Knisley from RMC to discuss project details.
05-19-22	The Service and Barry Knisley exchanged emails.
06-09-22 to 07-07-22	The Service, Corps, and Middle Peninsula Planning District Commission exchanged emails to discuss project details.
07-06-22	The Service, Corps, Middle Peninsula Planning District, and VIMS met to discuss monitoring requirements.