Methodology: Supplemental Document for the Green Sea Turtle (Chelonia mydas) Proposed Critical Habitat Designation in the Terrestrial Environment[1]

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Docket No. FWS-R4-ES-2022-0164

As required by section 4(b)(2) of the Act, we use the best scientific data available to designate critical habitat. In accordance with the Act and our implementing regulations at 50 CFR 424.12(b), we review available information pertaining to the habitat requirements of the species and identify specific areas within the geographical area occupied by the species at the time of listing and any specific areas outside the geographical area occupied by the species to be considered for designation as critical habitat. Within areas of the species' range under U.S. jurisdiction and following our evaluation of all suitable habitat across the species range and within each of the five DPSs, we are not currently proposing to designate any areas outside the geographical area occupied by the species. We have not identified any unoccupied areas that meet the definition of critical habitat and we have determined that the occupied areas are sufficient.

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[1] Recommended citation:

U.S. Fish and Wildlife Service (USFWS). 2023. Methodology; Supplemental document for the green sea turtle (*Chelonia mydas*) proposed critical habitat designation in the terrestrial environment. https://www.regulations.gov, Docket No. FWS-R4-ES-2022-0164. 19 pp.

Although the green turtle has a circumglobal distribution, occurring throughout tropical, subtropical, and, to a lesser extent, temperate waters (Groombridge 1982, p. 151), under our regulations at 50 CFR 424.12(h), critical habitat can only be designated in areas under U.S. jurisdiction. Green turtle nesting in the United States occurs in five distinct population segments (DPSs): the Central North Pacific DPS, Central South Pacific DPS, Central West Pacific DPS, North Atlantic DPS, and South Atlantic DPS. Green turtle basking only occurs in the Central North Pacific DPS. We have defined terrestrial portions of geographical areas occupied for the green turtle as those areas within U.S. jurisdiction where nesting has been documented for the most part annually, since the time the DPSs were listed in 2016 (81 FR 2016, April 6, 2016). This time-period represents the most recent and consistent data sets of nest or track (crawl) count surveys available from within the ranges of each DPS. However, for the three Pacific DPSs, we also relied on additional information to determine occupancy at the time of listing in remote areas and islands where surveys have not regularly occurred, both prior to and after the time of listing in 2016. In these instances where some areas did not include regular or extensive green turtle survey information, these areas were considered occupied by green turtles based on documented nesting activity at adjacent or nearby beaches, islands, or atolls that harbor the same physical or biological features that green turtles rely on.

General Methodology for All DPSs

To determine and select appropriate occupied areas containing physical or biological features essential to conservation of each DPS[2], we evaluated green turtle recovery plans for the DPSs and considered those areas described in the plans as source beaches, primary nesting areas, important nesting beaches, and key nesting beaches (hereafter referred to as "important nesting beaches" and noting that each recovery plan uses slightly different terminology and no clear definitions). Concentrating on these important nesting beaches, along with some additional important areas associated with unique green turtle behavior (i.e., basking) in the Central North Pacific DPS, provides a logical role for a critical habitat designation within the larger overarching conservation strategy for each of the Atlantic and Pacific populations of green turtles. In other words, the role of critical habitat in achieving overarching recovery goals for each DPS is to identify specific areas within each DPS range that provide essential physical or biological features without which each DPS's range-wide recovery could not be achieved. This, in turn, requires an understanding of the fundamental parameters of the species' biology and ecology based on well-accepted conservation-biology and ecological principles for conserving species and their habitats (including basking, nesting, incubation, hatchling emergence and across-beach transit behaviors), such as those described in recovery plans and other significant sources (National Marine F isheries Service (NMFS) and U.S. Fish and Wildlife Service

[2] The criteria (methodology) informs the physical or biological features for the green turtle. We use the information in the physical or biological features (e.g., greatest aggregation of green turtles) to help delineate the specific areas that contain those essential features.

(USFWS) 1991, pp. 2–3; Johnson 1996, entire; NMFS and USFWS 1998, pp. 14–20; Witherington et al. 2006 pp. 94–98; Seminoff et al. 2015, pp. 7–12).

Designating these important nesting beaches supports the conservation strategy for the North Atlantic and South Atlantic DPSs, which includes the delisting criteria of increasing the level of nesting in Florida to an average of 5,000 nests per year for at least 6 years (nesting data based on standardized surveys) and successfully implementing all priority one tasks (NMFS and USFWS 1991, p. iii). Critical habitat designation supports priority one tasks specific to protection and management of habitats (NMFS and USFWS 1991, pp. 16–19). Similarly, designating important nesting beaches (and other important features like basking habitat in the Central North Pacific DPS) supports the conservation strategy for the Central North Pacific DPS, Central South Pacific DPS, and Central West Pacific DPS , which includes maintaining an average of 5,000 nesting females (or a biologically reasonable estimate) per population. We also note that these important areas and other suitable habitat within the ranges of the DPSs are subject to potential habitat destruction or modification due to development pressures, climate change (including extreme weather events), military needs, and, in some locations, somewhat limited local support for conservation.

We consider the green turtle's resiliency, redundancy, and representation within each DPS as well as together across the populations as a measure of the species' health as a whole. Resiliency is the ability of a species to withstand environmental stochasticity (normal year-to-year variations in environmental conditions (such as temperature or rainfall), periodic disturbances within normal ranges of variation (such as floods or storms), and demographic stochasticity (normal variation in demographic rates such as mortality and fecundity (Redford et

al. 2011, p. 40). Redundancy is the ability of a species to withstand catastrophes, which are stochastic events that are expected to lead to population collapse regardless of population health and for which adaptation is unlikely (Mangel and Tier 1993, p. 1,083). Representation is the ability of a species to adapt to both near-term and long-term changes in its physical (climate conditions, habitat conditions, habitat structure, etc.) and biological (pathogens, competitors, predators, etc.) environments. This ability to adapt to new environments—referred to as adaptive capacity—is essential for viability, as species need to continually adapt to their continuously changing environments (Nicotra et al. 2015, p. 1,269).

To define areas we consider occupied at the time of listing, we conducted a literature search, and corresponded with stakeholders within the five DPSs to obtain the best available nesting beach data. We identified the extent of nesting beaches as the area from the mean high-water line (MHWL) to its deepest extent inland, including all beach crest vegetation for nesting, incubation, hatching, and hatchling emergence from the sand. We also considered dry and wet sands leading back to the ocean to support hatchling transit to the sea, in addition to allowing for post-nesting and basking turtles to return to the ocean (noting that National Oceanic and Atmospheric Administration (NOAA) Fisheries is conducting a concurrent process of designating critical habitat that will provide offshore internesting habitat connecting with beach areas designated by USFWS; thus, the NOAA Fisheries shoreward boundary will align with the USFWS nesting/basking seaward boundary). When considering all potential nesting and basking beaches, some areas of coastline lack the physical or biological features of critical habitat because these areas are inaccessible to green turtles in all DPSs for nesting and in the Central North Pacific for basking. These coastline areas, which include cliffs and manmade structures in

existence prior to the effective date of the final rule, are not considered critical habitat. Important nesting beaches, in general, are known by species experts who have shared information with us; we considered their expertise and on-the-ground feedback from reports and inquiries when drawing boundary lines.

To translate the selection process above to areas on-the-ground, we used the following general methodology to identify mapped boundaries of critical habitat for the Central North Pacific, Central South Pacific, Central West Pacific, North Atlantic, and South Atlantic DPSs. Other DPS-specific methodology follows.

(1) Data layers defining map units were created using Environmental Systems Research Institute (ESRI) ArcGIS Pro, MAXAR-derived mosaiced satellite imagery, and existing land cover and shoreline products including the NOAA Continually Updated Shoreline Product (CUSP), NOAA Coastal Change Analysis Program (CCAP), NOAA Composite Shoreline, USGS MHW shoreline, NOAA Gulf Atlantic Environmental Sensitivity Index (ESI), and Florida Cooperative Land Cover, Version 3.5. The team also used Google Earth Imagery collected at different times to confirm the areas delineated based on the ESRI imagery. If an existing shoreline or landcover product was not available or accurate for the area, the shoreline was hand digitized from the imagery. Nesting habitat for the Atlantic, as described above, was delineated from the MHWL to the toe of the secondary dune, any man-made structure, natural obstructions (e.g., cliffs, rock outcrops), or to 10 meters (m) (33 feet (ft)) inland of vegetation. Nesting habitat for the Pacific DPSs, as described above, was delineated from the MHWL to any man-made structure, or 15 m (50 ft) inland of the MHWL. The larger distance in the Pacific DPS is to account for beaches that stretch inland on remote islands with little to no vegetation. Where no

physical obstructions were present on small predominantly sand islands, the whole island may have been designated.

(2) Where physical features to be used as critical habitat unit boundaries were highly dynamic (i.e., inlets, sandy shoals, barrier islands, and oceanfront beaches that are controlled by natural coastal processes and may shift over time), unit boundaries were distinguished using records of green turtles nesting in that specific area.

(3) Where natural, artificial, geopolitical features, or land ownership could not be used for unit boundaries, boundaries were delineated by geographic means (latitude and longitude, decimal degree points).

(4) If applicable, we examined aerial imagery to ensure that areas we include as proposed critical habitat are not currently inundated, as compared to areas that may be underwater decades from now.

(5) We evaluated for inclusion nesting beaches located adjacent to important or high-density beaches (containing physical or biological features essential to the conservation of green turtles) to support internesting behavior and expansion; these adjacent areas also currently support green turtle nesting. Given the life history characteristics of the species returning to the same beach landscape to nest, this adjacent beach habitat serves as expansion area should the current important nesting beach area become significantly degraded, or temporarily or permanently lost, through natural processes or upland development, as well as supports its internesting behavior (i.e., turtles nesting multiple times in a season and across different select areas of the beach landscape).

Methodology Specific to the Three Pacific DPSs

The strategy to designate critical habitat for the three Pacific DPSs differs from the two Atlantic DPSs due to the following:

- Data availability and quality: While surveys have been conducted, they have not been consistent, or in all areas where green turtles may potentially occur (due to lack of resources and isolation of some locations).
- Population size, site distribution, and potential effects of lost habitat: The three Pacific DPSs have a smaller population than the Atlantic population, and they are scattered across different islands and atolls. Important nesting beaches in the three Pacific DPSs tend to be small and somewhat isolated compared to what may be more typical in the Atlantic. Because of their smaller numbers and irregular usage of terrestrial habitats for nesting, loss of even rarely used nesting beaches may have a disproportionate effect on the recovery of the Pacific DPSs. Moreover, in the Central South and Central West Pacific DPSs, jurisdiction for the green turtle spans multiple countries, each with different levels of protection for the green turtle (in some cases, no protections or enforcement as green turtles are commonly used for food). Thus, the nesting beaches within the U.S. jurisdiction are critical for contributing to the recovery of the species.

Therefore, in addition to the general methodology for all DPSs described above, we also applied the following considerations for selecting important nesting beaches for the three Pacific DPSs:

(1) In the absence of available nesting surveys of the nesting populations in the U.S. jurisdiction of these DPSs, beaches were selected using the best available nesting records over a 15-year period between 2005 to 2020.

(2) Using available nesting records, we identified beaches throughout each island, islet, and oceanic atoll with relatively high nesting activity. In some cases, additional nesting beaches with lower nesting activity or beaches with historical reports of green turtle nesting were selected (i.e., expansion areas) to support resiliency, representation, and redundancy within a DPS.

(3) In undeveloped islands or areas, the amount of land inward of the MHWL increased from 15 m (50 ft) to include the entire island if the physical or biological features were present or natural or man-made structures obstructed inward progress.

Methodology Specific to the Central North Pacific DPS

Our consideration of potential critical habitat areas within the Central North Pacific DPS considered this is the only DPS within U.S. jurisdiction where green turtles both nest and bask. To identify nesting habitat, we used the same criteria for selecting potential terrestrial critical habitat areas as described in the two Atlantic DPSs (below), and the Central South Pacific and Central West Pacific DPSs. However, to identify basking habitat, we reviewed basking site information independent from nesting area information, including information provided by local technical experts. Our strategy for selecting shoreline areas for basking follows:

(1) In the absence of regular, overall, basking surveys in the Central North Pacific DPS, important basking areas were selected based on a combination of expert input and the best available basking records from 2005 to 2021. This time period was used based on current and previous efforts to identify basking areas, and accounts for data survey/observation gaps for

locations where basking behavior occurs. Areas with only information from the time of listing were also included.

(2) Where physical features to be used as critical habitat unit boundaries were highly dynamic (i.e., sandy shoals, emergent sandy lands, oceanfront beaches, and low shelving reef or rock that are controlled by natural coastal processes and may shift over time), unit boundaries were distinguished using records of green turtles basking in that specific area.

(3) Using the available basking records, we identified shoreline areas throughout each island with relatively high basking activity. In some cases, additional basking areas with lower basking activity or beaches with historical reports of green turtle basking were selected to support resiliency, representation, and redundancy within the DPS.

(4) We considered basking and nesting information within the Central North Pacific DPS because some beaches that can serve as both expansion areas while also providing sufficient habitat to accommodate basking green turtles as the populations recover.

Methodology Specific to the Central South Pacific DPS

Our consideration of potential critical habitat areas within the Central South Pacific DPS took into account that the green turtle population in this portion of its range is characterized by geographically widespread nesting at low levels of abundance, mostly in remote low-lying oceanic atolls. The most abundant nesting area is Scilly Atoll, French Polynesia. The nesting within U.S. jurisdiction occurs in Palmyra Atoll and the U.S. Territory of American Samoa on Swains Island, Ofu Island, Olosega Island, Tau Island, Aunuu Island, and Rose Atoll. Dispersed, low-lying locations of nesting sites in multiple political jurisdictions supports our assessment that all nesting beaches within the U.S. Territories in this small population are essential to the

conservation of this DPS. To ensure spatial distribution of important nesting beaches, each island and atoll in Palmyra and American Samoa with historical records of green turtle nesting, and containing the physical or biological features for nesting, were included as proposed critical habitat.

Methodology Specific to the Central West Pacific DPS

Our consideration of potential critical habitat areas within the Central West Pacific DPS took into account the green turtle population in this portion of its range is dominated by insular nesting (i.e., nesting on a long chain of islands). Specifically, this DPS is characterized by a relatively small nesting population spread across an expansive area that is roughly 4,023 km (2,500 mi) wide (Palau to the Marshall Islands) and 4,023 km (2,500 mi) long (Ogasawara, Japan to the Solomon Islands) (Seminoff et al. 2015, p. 259). Dispersed locations of nesting sites in multiple political jurisdictions and lack of conservation for this species supports our assessment that all nesting beaches within the U.S. territory and commonwealth in this small population are essential to the conservation of this DPS. To ensure spatial distribution of important nesting beaches, each island and islet in the Commonwealth of the Northern Mariana Islands (CNMI) and Guam with historical records of green turtle nesting, and containing the physical or biological features for nesting, were included as proposed critical habitat. Nesting beaches in the CNMI with historical records and surveyed between 2006 to 2016 (Summers et al. 2018, entire) were not selected if nesting was not observed during this time.

Methodology Specific to the North Atlantic DPS

In addition to the general methodology for all DPSs described above, the North Atlantic DPS includes additional steps to identify the critical habitat units. We selected beaches that: (1)

Have the highest nesting densities or nest counts, depending on which were regionally available; and (2) have an adequate geographic spatial distribution of high-density nesting areas to ensure protection of genetic diversity; and (3) collectively contribute to representation of total nesting (which included consideration of select beaches from state index or statewide nesting beach programs, when available).

Additional consideration for this DPS included genetics and geographical features that could influence turtle behavior. The Florida Fish and Wildlife Conservation Commission's (FWC) Fish and Wildlife Research Institute (FWRI) has recognized subunits, described as "management units." These FWRI designated management units incorporate best available science, including published results of genetics research by Shamblin et al. (2015, entire; 2020, entire) and preliminary unpublished analysis of new genetics information (Shamblin 2022, entire). Considerations were given to geography possibly affecting loggerhead sea turtles (*Caretta caretta*), which also may affect green turtles were (Ceriani 2022, pers. comm; Witherington et al. 2009, 31–44), when informing regional resolution of most green turtle aggregations, including those of high density, in Florida. However, through our literature searches, any published separation into management units north of Canaveral, Florida has not been specified for northeast Florida or continuing into Georgia. A management unit has been identified by Shamblin et al. (2018, entire) for northern limits of this DPS. Genetic tagging of clutches laid in northern South Carolina, North Carolina, and Delaware from 2010–2014 had mitochondrial control region haplotype frequencies significantly different from all northern Greater Caribbean subpopulations, including those in Florida, suggesting a unique management status (Shamblin et al. 2018, entire). Green turtles nesting in Texas may represent an emerging

subpopulation and warrant recognition as a unique management unit separate from the turtles nesting in Mexico (Shamblin et al. 2017, entire; Shaver et al. 2022, entire). Further study is needed to identify the degree of demographic partitioning among green turtle rookeries along the western Gulf of Mexico coast (Shaver et al. 2020, pp. 9–11). At the time of this analysis, there were no published genetics data to inform management units for Puerto Rico.

Through our analysis of the best available information, in concert with conversations with USFWS regional experts, we were able to determine that no known green turtle nesting occurs in Louisiana (Hodges 2021, pers. comm.) and Mississippi (Necaise 2022, pers. comm.). Limited nesting of green turtles has been documented in Alabama (Share the Beach and USFWS 2021, unpublished data). There is some nesting and some cases documenting increased nesting within Texas (Ardizzone 2021, pers. comm.), Georgia (Dodd 2021 pers. comm.), South Carolina (Pate 2021, pers. comm.; Godfrey and Pate 2021, unpublished data), and North Carolina (Godfrey and Pate 2021, unpublished data), as well as rare nesting to the north of these states in Virginia (VDWR 2022, unpublished data; Argo 2022, pers. comm.), Maryland (Hulslander 2022, pers. comm.), Delaware (Pearl 2022, pers. comm.), New York (Shaver *et al*. 2019, p. 555), and a nesting attempt on Nantucket Island, MA in 2022 (Frutchey 2022, pers. comm.). However, these areas were not determined to have sufficient green turtle nesting or PBFs such that they meet the definition of critical habitat (Wikoff 2022, pers. comm.; Ardizzone 2021, pers. comm.; Chaplin and Hammond 2022, pers. comm.). Most of the nesting activity for the North Atlantic DPS occurs within Florida and Puerto Rico.

When considering areas north of Canaveral, Florida, green turtles nest in much lower densities than in southeast Florida. When our USFWS species biologists from field offices in each of these states reviewed these available data, along with the most recent science

(publications), the best available information indicated low nesting densities, or the PBFs were of lower overall quality or quantity in areas north of Florida, such that no areas north of Canaveral, Florida met the definition of critical habitat for this DPS. North of Florida, nests generally number in the tens of nests as compared with up to tens of thousands within the state of Florida.

- Over the past 32 years, Georgia has hosted slightly more green turtles on Cumberland Island and Little Cumberland Island (south Georgia) compared to the other nine barrier islands with green turtle nesting. Cumberland Island, the barrier island with the highest number of green sea turtle nests in Georgia, had a mean number of 0.13 nests per km (0.21 nests per mi) over the 10-year analysis period (2011–2020) (Wikoff 2021, pers. comm.). There is a detectible increase of nesting in Georgia; however, the maximum number of nests in one year has only reached 25 (Dodd 2021, pers. comm.).
- South Carolina has limited but increasing nesting with a peak of 20 nests recorded in 2019 (Pate 2021 pers. comm.).
- Some North Carolina beaches provide suitable green turtle nesting habitat, with nesting documented within the past 10 years on at least 10 municipal beaches, 2 state parks, Pea Island National Wildlife Refuge (NWR), and at both Cape Hatteras and Cape Lookout National Seashores (Hammond 2022, pers comm.; Godfrey 2021, unpublished data). Green turtle nesting is slightly higher in North Carolina as compared to Georgia and South Carolina, with annual nests ranging from 15–63 per year and a total of 326 nests over 10 years (Godfrey and Pate 2021, unpublished data). Masonboro Island, North Carolina, as a part of the upper percentile for nesting beaches north of Florida, receives only episodic green turtle nesting from season to

season. Masonboro Island is 8.4 mi (13.5 km) long and existing conservation in practice has proven sufficient to enable nesting green turtles to use PBFs there (Hammond 2021, pers comm.).

After our review of Shamblin et al. (2018, entire) regarding a management unit in the northern reaches of the North Atlantic DPS, we agree there is suitable green turtle nesting habitat north of Canaveral, Florida; however, none of these areas currently meet the definition of critical habitat, as described in this document.

In Florida (i.e., the main nesting range for green turtles in the North Atlantic DPS), nesting occurs in all coastal areas except the Big Bend area of west central Florida with the bulk of nesting along the Atlantic coast of eastern central Florida. Beaches, specific to the Florida analysis, are defined as survey areas of varying lengths that are surveyed on a regular basis through Statewide Nesting Beach Survey programs (FWC 2022, entire). We determined the average nest density (nests/year/kilometer (km)) per surveyed beach using the 10-year nesting dataset (2011–2020). Any surveyed beach that had zero total nests was removed from further analysis. Within each management unit, as described below, the average beach densities were separated into quartiles- four parts, each containing a quarter of the density values – to develop density classifications.

The FWRI-identified management units were informed by the best available published science on genetics (Shamblin et al. 2015; 2020 entire), the best available preliminary unpublished analysis of genetics information (Shamblin 2022, entire), and geography considerations (Ceriani 2022, pers. comm.; Witherington et al. 2009, 31–44). Management units used in this analysis and support for their delineation include:

(1) Northeast Florida (NE) - St. Mary's River (Georgia/Florida border) to Ponce De Leon Inlet in Volusia County. This segment requires more data to be resolved from a genetics perspective (Shamblin 2022, entire). FWRI considers NE separate from Central Eastern FL (CE) but requires additional data to inform extent along the NE FL coast and possibly beyond FL (Ceriani 2022, pers. comm.).

(2) Central Eastern FL - Ponce De Leon Inlet in Volusia County to St. Lucie Inlet in Martin County (Shamblin et al. 2015, p. 680).

(3) Southeast FL (SE) - St. Lucie Inlet in Martin County to Miami-Dade/Monroe County Line (Shamblin et al. 2015, p. 680; Ceriani 2022, pers comm.).

(4) Monroe/FL Keys - Lower Matecumbe Key through Key West (Shamblin 2022, entire; Ceriani 2022, pers. comm.).

(5) Marquesas - Marquesas and Boca Grande Keys (Shamblin et al. 2020, p. 166).

(6) Dry Tortugas - Dry Tortugas keys (Shamblin et al. 2020, p. 166).

(7) West FL (W) - Anclote Key in Pasco County south to Everglades National Park to South Cape Sable in Monroe County (Shamblin 2022, entire; Ceriani 2022, pers. comm.; Witherington et al. 2009, p. 32).

(8) Northwest FL (NW) - Franklin County to FL/AL border (Ceriani 2022, pers. comm.).

Beaches that were in the top 25 percent for nesting density were included as critical habitat. However, for CE and SE management units, beaches in the top 50 percent were included as critical habitat. Since the CE and SE beaches include a significantly higher number of green turtle nests overall, and represent the largest green turtle nesting assemblage in U.S., we applied

a broader density criteria to capture more beaches that can serve as "recovery beaches." Protecting these recovery beaches will provide sufficient habitat to accommodate nesting females whose primary nesting beach has been lost, allows for expansion as the population recovers and allows turtles space along the beach to support internesting activities throughout a nesting season. The Florida Keys were also analyzed separately due to uniqueness of the nesting habitat (i.e., small spatial extent along with low elevation islands (Shamblin et al. 2020, p. 168). Beaches surveyed in the Marquesas and beaches with the highest density from the Dry Tortugas were included.

Finally, we looked at these critical habitat segments and determined if occupied areas between these designated areas should be connected based on green turtle internesting behavior. Based on a study of green turtles in Melbourne Beach, Florida, green turtles may have an average of 3.2 km (2 miles (mi)) between beach inter-nesting activities, as determined by encountering individual tagged turtles (Johnson 1994, p. 64). Recent global positioning system (GPS) linked satellite telemetry of nesting green turtles places this average between nesting events at 10.7 km (6.6 mi) for green turtles on the west coast of Florida (Mazzarella 2022, pers. comm.). Thus, if two segments of determined critical habitat were separated by a beach occupied by nesting turtles of less than 10.7 km (6.6 mi), these beaches were connected to support green turtle internesting behavior.

In Puerto Rico, the main and most consistent green turtle nesting occurs on Vieques Island NWR off the east coast of Puerto Rico, with 100 to 500 crawls per year (Eckert and Eckert 2019, p. 182; Castro-Prieto 2021, p. 32). The second most consistent nesting area occurs on Mona Island Nature Reserve off the west coast of Puerto Rico, with an average of 34 nests

per year from 2016 to 2021 (Diez 2021, pers. comm.). Besides these two areas, there are three additional areas in southeast Puerto Rico (Humacao, Maunabo, and Guayama) where green turtles have nested in lower numbers (on average less than 25 nests per year (Diez 2021, pers. comm.) within the past 10 years. However, data show a general increasing trend of green turtle nesting activity in Maunabo and Guayama with more than 25 nests in 2021 (Diez 2021, pers. comm). These areas were selected as expansion areas (see general criteria #5, above) as the population recovers. Given the relatively low number of nesting areas on Puerto Rico when compared to the main nesting areas within the State of Florida, we selected the most important nesting beaches consistent with the general methodology described above for all DPSs and this DPS (as described in the first paragraph of this section). The selected beaches provide an adequate geographic spatial representation of nesting in Puerto Rico, particularly on Vieques Island. To ensure good spatial distribution of the most consistent nesting beaches for proposed critical habitat, green turtle nesting habitat was selected throughout each region of the island to serve both as important and expansion areas (see general criteria #5 above) as the population recovers.

Methodology Specific to the South Atlantic DPS

In addition to the general methodology for all DPSs described above, we used the same three criteria for selecting potential terrestrial critical habitat areas as the North Atlantic DPS; however, for the U.S. Virgin Islands nest or crawl counts (number of turtle crawling events on the beach without determination if turtles produced a nest or not) were utilized depending on regionally available data. We identified beaches with relatively high nesting activity. In some cases, additional nesting beaches with lower nesting activity or beaches with historical reports of

green turtle nesting were selected (i.e., expansion areas) to support resiliency, representation, and redundancy within a DPS. While surveys have been conducted, they have not been consistent, or in all areas where green turtles may potentially occur (due to lack of resources and isolation of some locations).

In applying these criteria to the main geographic nesting distribution within the South Atlantic DPS (i.e., USVI), only St. Croix has consistent green turtle nesting activity (Dow et al. 2007, p. 251; Eckert and Eckert 2019, p. 230). We then identified 16 nesting beaches (both important and expansion) by mainly using the 25–100 nesting crawls per year category or larger (Dow et al. 2007, p. 13; Eckert and Eckert 2019, p. 13).

The largest nesting green sea turtle aggregation in St. Croix occurs within the Sandy Point NWR on the southeast of the island, with over 1,000 nests per year since 2018 (Lombard 2021, pers. comm.). The other important nesting beaches occur mostly on the eastern half of St. Croix and on Buck Island Reef National Monument off the northeast coast. To ensure good spatial distribution of important nesting beaches for proposed critical habitat, green turtle nesting habitat was selected throughout each region of the island that serve as either important or expansion areas (see general criteria #5 for interesting areas, above) as the population recovers. At the time of this analysis, there were no data available to provide genetics support to management units within this DPS.

Summary

The above criteria used to describe critical habitat for the five green turtle DPSs identifies lands that we have determined are occupied at the time of listing and contain one or more physical or biological features essential to support life-history processes of the species. Some

units contain all identified physical or biological features and support multiple life-history processes, whereas other units contain only some physical or biological features necessary to support the green turtle's particular use of that habitat for basking, nesting, incubation, hatchling emergence and across-beach transit. The proposed critical habitat designation is described in unit descriptions [in the proposed rule] and defined by maps [in the Proposed Regulation Promulgation section of the proposed rule]. When determining proposed critical habitat boundaries, we made every effort to avoid including developed areas such as lands covered by buildings, pavement, and other structures because such lands lack physical or biological features necessary for green turtle nesting and basking. The scale of the maps we prepared under the parameters for publication within the Code of Federal Regulations may not reflect exclusion of such developed lands. Any such lands inadvertently left inside critical habitat boundaries shown on the maps [of the proposed rule] have been excluded by text [in the proposed rule] and are not proposed for designation as critical habitat. Therefore, if critical habitat is finalized as proposed, a Federal action involving these lands would not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification unless the specific action would affect physical or biological features in adjacent critical habitat.