Programmatic Biological Opinion
Regarding the Effects of the Proposed Issuance of 10(a)(1)(A) Permits to
Conduct Rescue, Rehabilitation, and Release Activities
for the Conservation of
Pacific Green, Olive Ridley, Loggerhead, Leatherback, and Hawksbill Sea Turtles

(FWS Reference Number 01EOFW00-2016-F-0371)

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INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service's (USFWS) Biological Opinion (Opinion) based on our review of the proposed action and its effects on the federally endangered olive ridley sea turtle (*Lepidochelys olivacea*) (olive ridley), loggerhead sea turtle (*Caretta caretta*)(loggerhead), leatherback sea turtle (*Dermochelys coriacea*)(leatherback), and hawksbill sea turtle (*Eretmochelys imbricata*)(hawksbill); and the threatened Eastern Pacific and North Central Pacific DPS of the green sea turtle (*Chelonia mydas*). Critical habitat for leatherbacks has been designated in the action area, but the action will have no impact on habitat, only individual animals, and is therefore not considered in this biological opinion. This document was prepared in accordance with section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq*.).

This Opinion is based on information provided in SeaWorld LLC's (applicant) November 13, 2015, application for a permit to conduct collection, rehabilitation, transfer, and release of wild, incapacitated sea turtles expected to strand along the coastline of the Eastern Pacific. The proposed permit for the enhancement of propagation or survival (i.e., Recovery Permit) would be authorized under section 10(a)(1)(A) of the Act. In addition to the application, we incorporated information from our files, as cited. In addition to specific information provided by the applicant, we have incorporated information from the Marine Mammal Stranding Network that responds to sea turtle stranding on the U.S. west coast. The information from these sources provided background regarding the programmatic response to stranding on the U.S. west coast.

The USFWS and National Marine Fisheries Service (NMFS) share responsibilities for sea turtle recovery and management. The USFWS has jurisdiction for sea turtles when in the terrestrial environment and for activities affecting sea turtles and their habitats in the terrestrial environment (USFWS and NMFS 2015). NMFS has jurisdiction for sea turtles when in the marine environment ("marine environment" means oceans and seas, bays, estuaries, brackish or riparian water areas, and any other marine waters adjacent to the terrestrial environment) and for activities affecting sea turtles and their habitats in the marine environment (USFWS and NMFS 2015). Due to the shared jurisdiction over sea turtles, we coordinated with NMFS, and much of the information in the species' accounts was derived from biological opinions previously completed by NMFS (NMFS 2014b, 2016), and other sources as described in the individual accounts below.

CONSULTATION HISTORY

The Recovery Permit application, dated November 6, 2015, and updated on November 13, 2015, was received in our Carlsbad Fish and Wildlife Office in the Pacific Southwest Region on November 16, 2015. The permit was reviewed to ensure the information was complete and forwarded to the Pacific Region and all of the affected field offices in both regions on March 9, 2016. On March 22, 2016, the Pacific Southwest Region and Pacific Region agreed to complete a programmatic section 7 consultation for all west coast sea turtle emergency response in the Newport Field Office. The current application will be administered by Region 8, and all future applications will be administered by the region within which treatment facilities proposes to conduct activities. The Newport Field Office initiated the consultation on March 22, 2016.

BIOLOGICAL OPINION

1. DESCRIPTION OF THE PROPOSED ACTION

The proposed issuance of Recovery Permits to authorize response to incapacitated sea turtles consists of rescue, rehabilitation, and release of wild sea turtles; display for education purposes; veterinary care and research; tagging/tracking research; media coordination; storage, handling, transfer, and/or disposal of sea turtles that have died; and a release of captive-bred sea turtles, currently housed at SeaWorld San Diego.

1.1. Wild Turtle Rescue

The proposed action consists of responding to incapacitated wild sea turtles in need of temporary care and treatment prior to release. Sea turtles may become stranded due to interactions with fishing gear, vessel collisions, cold-stunning, interactions with human development such as power plant intakes, and other unknown reasons. If alive when found on U.S. west coast beaches, sea turtles are likely incapacitated and require treatment. Stranding animals are evaluated by a qualified individual and if further treatment is required, they are brought to a care facility for intensive, veterinary care and rehabilitation as described below.

These incapacitated turtles have generally been stranded sea turtles on the U.S. West Coast, but could include injured, oiled, or other debilitated wild turtles that require veterinary care at treatment to allow eventual return to the wild. The most common species that require assistance have been olive ridley and green sea turtles, but leatherback, loggerhead, or hawksbill sea turtles have been known to strand on the west coast in the past (LeRoux et al., in prep.). These five species are likely candidates for future rescue and treatment by treatment facilities and are the five species considered in this opinion.

Rehabilitation of sea turtles is comprised of the following activities:

1.1.1. *Rescue operations:*

1. The rescue along the west coast of stranded sea turtles
2. Rescue operations could take place in the following areas
    a. Beach rescue
    b. Bay/ estuary rescue
    c. Open water rescue (as permitted and coordinated by NMFS)
3. Rescue operations will be conducted by designated personnel for delivery to a care facility

1.1.2. *Rehabilitation operations:*

1. Provide critical care and rehabilitation to any sea turtles in need along the west coast.
2. Rehabilitation goals are first to provide necessary care and support to be able to return the sea turtle to the wild, and if animal is unable to be returned then provide necessary long term care.
3. Provide necessary rehabilitation space for multiple sea turtle cases

1.1.3. *Release operations:*

1. Release operations consist of returning a rehabilitated turtle to the wild and could take place in the following areas
   a. Beach return
   b. Bay/ estuary return
   c. Open water return
2. Return operations includes cooperation with NFMS, USFWS, and other partners to prescribe the timing and location and to track the progress and success of release.

1.1.4. *Display for Educational Purposes*

1. Provide display exhibits for captive sea turtles
2. Provide display exhibits for rescued sea turtle species deemed non-releasable
3. All exhibits will contain educational and interpretative aspects

1.1.5. *Veterinary Care /Research*

1. In the process of caring for both rescued and non-releasable turtles the following veterinary practices could take place
   a. Blood and tissue sampling
   b. Scute sampling
   c. Esophageal lavages and fecal sampling
   d. Ultrasound/CT scan/MRI scan procedures
   e. Tetracycline injection for aging studies
   f. Cloacal and buccal swabbing
   g. Other samples and/or procedures as deemed necessary in coordination with the USFWS or NMFS.
2. Veterinary research areas could include
   a. Pharmacokinetics
   b. DNA studies
   c. Metabolomic studies
   d. Health assessments
   e. Infectious disease monitoring

1.1.6. *Tagging/Tracking Research*

1. Tagging of sea turtles could include
   a. Metal Inconel tags
   b. Passive Integrated Transponder (PIT) tags
2. Tracking devices on sea turtles could include
   a. Ultrasonic transmitter
   b. Satellite transmitter
   c. Time-Depth Recorder
   d. Video-Time-Depth Recorder
   e. Critter-Cam

1.1.7. *Non-essential media operations*

1. On occasion, non-essential media options might be used during sea turtle rescue/rehab/release operations.
2. Media could include photography, filming, audio recording, documentary film crews, and social media applications.

1.2. Salvage

1.2.1. *Collection/Storage*

1. Turtles that do not survive rescue or rehabilitation attempts will be stored frozen until disposition of the carcass is determined in coordination with the USFWS and NMFS.
2. Necropsies will be performed on all turtles that have been in the care of the facility.
3. Samples will be provided to NMFS according to protocol. These may include:
   a. Tissue samples
   b. Scute samples
   c. Esophageal lavages and fecal sampling
   d. Ultrasound/CT scan/MRI scan procedures
   e. Cloacal and buccal swabbing
   f. Provision of front flippers for humeri
   g. Other samples as deemed necessary in coordination with the USFWS or NMFS
4. Carcasses may be prepared for educational purposes with the written approval of the USFWS in coordination with NMFS.

1.3. Captive Green Sea Turtle Release

In addition to the programmatic consideration of sea turtle rescue and rehabilitation on the west coast, this opinion will consider the release of captive-bred sea turtles held by SeaWorld San Diego. During the summer and fall of 2016, 44 captive green sea turtles are proposed to be released to the wild. These turtles were all hatched at SeaWorld, without human assistance, from two Eastern Pacific green sea turtles that were exhibited prior to listing as a threatened species. This release is a one-time event and no additional similar releases are anticipated.

The 44 turtles were from two clutches, hatched October 6 and 19, 2009, that resulted in 80 live hatchlings. Over six years since hatching, there have been 20 mortalities. Of the remaining 60 turtles, a total of 31 were transferred to other facilities under permission of the USFWS: 4 at Chula Vista Nature Center, 15 to SeaWorld Orlando, and 12 to Monterey Bay Aquarium. Ten of the Monterey Bay Aquarium turtles were eventually returned to SeaWorld San Diego, and three of the SeaWorld Orlando turtles were among the 20 mortalities.

A majority of the turtles have had genetic and blood chemistry tests to determine parentage and sex. The genetic testing confirmed the parentage from the two turtles acquired prior to listing, and the blood chemistry assays determined that all of the captive hatched turtles are male.

The release of the 44 captive turtles is proposed to enhance recovery of green sea turtles by providing information about the behavior and outcome of released, captive-bred turtles via monitoring of their post-release progress. The proposed release will also increase space availability for turtles that remain in captivity and for future rehabilitated sea turtles that need immediate care.

The applicant proposes a phased release of the 44 turtles. With batches of 15, 15, and 14 turtles released between July 2016 and November 2017. The turtles are proposed to be released into open water at least 5 miles (8 km) offshore of San Diego, California, and monitored following release. The disposition of the first batch will inform the locations of subsequent releases. The proposal considers release offshore, but it is unclear where or under what criteria that release would occur.

The applicant will collaborate with the NMFS' Southwest Fisheries Science Center (SWFSC) to conduct health assessments and evaluate blood samples to collect baseline information. All animals will be tagged with flipper and passive integrated transponder (PIT) tags. SWFSC will confirm that genetic samples have been taken or will obtain skin samples prior to release to genetically identify each individual. And SWFSC may also administer a tetracycline injection to the turtles to provide a baseline for aging the turtles (Zug et al. 2002, 2006; Snover et al. 2011). The applicant, in coordination with SWFSC, will attach satellite tags to a total of six tagged turtles, two tagged in each of the three phased release groups. The satellite tags will allow the applicant to track their movements and compare these with the movements of similarly equipped wild turtles.

2. ACTION AREA

The action area is defined in the implementing regulations for section 7 at 50 CFR 402 as, "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action."

The action area likely to be affected by the proposed activities consists of the west coast of the United States and Canada and the area within the U.S. Exclusive Economic Zone.

3. ANALYTICAL FRAMEWORK FOR THE JEOPARDY DETERMINATIONS

In accordance with policy and regulation, the jeopardy analysis in this opinion relies on four components: (1) the status of the five sea turtle species, which evaluates the species' range-wide condition, the factors responsible for that condition, and their survival and recovery needs; (2) the environmental baseline, which evaluates the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the sea turtles; (3) the effects of the action, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the sea turtles; and (4) cumulative effects, which evaluates the effects of future, non-Federal activities in the action area on Pacific green, olive ridley, loggerhead, leatherback, and hawksbill sea turtles.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the species' current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the species in the wild.

The jeopardy analysis in this Opinion emphasizes consideration of the rangewide survival and recovery needs of Pacific green, olive ridley, loggerhead, leatherback, and hawksbill sea turtles, and the role of the action area in the survival and recovery of these species. It is within this context that we evaluate the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

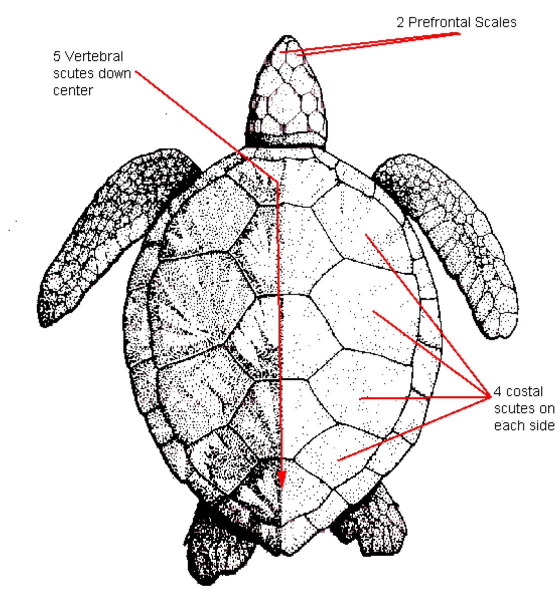
4. STATUS OF THE SPECIES

4.1. Green Sea Turtle

Information in this section is summarized from the 2015 Status Review (Seminoff et al. 2015) and the 2016 final rule listing 11 distinct population segments (DPSs) of green sea turtle, the biological opinions previously completed by NMFS (NMFS 2014b, 2016) and other sources as described below. The 2015 Status Review focused on whether populations of green sea turtles met the standards for DPSs and was used to support the proposed rule to designate 11 DPSs of green sea turtles as described below.

4.1.1. *Taxonomy and Species Description*

Green sea turtles are the largest hard-shelled turtle. Adults can grow to about 1 m (3 feet) long and weigh up to 200 kg (440 lb). Green sea turtles are most easily distinguished by their five vertebral scutes, four pairs of costal scutes, and 12 pairs of marginal scutes as well as by the configuration of scales on their relatively small head (two elongated prefrontal scales between the eyes) (Figure 1) (Carr 1952, Hirth 1997, Seminoff et al. 2015).



Data suggest that the genetics of green sea turtles have been shaped by geographic separation (Bowen et al. 1992; Encalada et al. 1996) and by natal homing behavior (Meylan et al. 1990). Each nesting region appears to have genetically distinct mitochondrial DNA (mtDNA) properties (Bowen et al. 1992). Within the eastern Pacific Ocean, specific or subspecific status has been applied to green sea turtles (also known as black turtles; [C. mydas agassizii]) ranging from Baja California south to the Republic of Peru (Peru) and west to the Revillagigedos Islands and Galápagos Archipelago (Márquez-Millán 1990; Pritchard 1997); however, genetic analyses do not support such taxonomic distinctiveness (Bowen et al. 1992; Karl et al. 1992), and the recent Green Sea Turtle Status Review concluded that the global green sea turtle population is a single species, C. mydas, with 11 DPSs (Seminoff et al. 2015) (see Page 14: 4.1.8 Population for further discussion).

Adult green sea turtles are unique among sea turtles in that they are mostly herbivorous, feeding on sea grasses, algae and in some populations, invertebrates (Bjorndal 1980, 1985; Seminoff et al 2015). This diet is thought to give them greenish colored fat, from which they take their name. A green sea turtle's carapace (top shell) is smooth and can be shades of black, gray, green, brown, and yellow. Their plastron (bottom shell) is yellowish white.

Other than during hatching and adult nesting, most green sea turtles spend the majority of their lives at sea. The green sea turtle is present in all tropical and temperate ocean basins and has a life history that involves nesting on beaches and foraging in neritic and oceanic habitats, as well as long-distance migrations between and within these areas.

Green sea turtle young hatch from their buried nests and emerge over a period of several days (Carr and Ogren 1960). Hatchlings emerge as a group at night and move toward the shoreline, cuing on the brightest horizon, until they are swept into the surf (Limpus 1971, Salmon et al. 1992, Witherington and Martin 1996, Witherington 1997). Juveniles live in an oceanic stage until they begin to enter their neritic stage, moving into coastal foraging grounds.

Knowledge of post-hatchling turtles is limited due to the difficulty in tracking turtles until they return to the nesting grounds and are large enough to support telemetry equipment. Upon leaving the nesting beach and entering the marine environment post-hatchling green sea turtles begin an oceanic juvenile phase. During the juvenile phase, they are presumed to primarily inhabit areas where surface waters converge to form local downwellings, resulting in linear accumulations of floating material, especially Sargassum sp. This association with downwellings is well-documented for loggerheads, as well as for some post-hatchling green sea turtles (Witherington et al. 2006; 2012). In the eastern Pacific Ocean, green sea turtles reportedly forage on a greater proportion of invertebrate foods, with omnivorous diets reported in turtles throughout the region (Seminoff et al. 2003; López-Mendilaharsu et al. 2005; Amorocho and Reina, 2007; Carrión-Cortez et al. 2010; Lemons et al. 2011).

After migrating to the neritic zone, (i.e., open coastline and protected bays and lagoons) juveniles continue maturing until they reach adulthood, and some may periodically move between the neritic and oceanic zones (NMFS and USFWS 2007a, Parker et al. 2011). The neritic zone provides important foraging habitat, internesting habitat, and migratory habitat for adult green sea turtles (Plotkin 2003; NMFS and USFWS 2007a).

Finally, green sea turtles return to their natal nesting areas to nest as adults. Green sea turtles exhibit slow growth rates, and age-to-maturity for the green sea turtles appears to be the longest of any sea turtle species (Chaloupka and Musick 1997, Hirth 1997, Seminoff et al. 2015). East Pacific green sea turtles are known to mature at smaller sizes (Seminoff et al. 2002) than conspecifics in the Northwestern Atlantic, Hawaii, and Australia (Avens and Snover 2013). However, adult green sea turtles begin nesting somewhere between 15 and 50 years, depending on the nesting location (Seminoff et al. 2015). Turtles in the Eastern Pacific are generally at the lower end of the range, nesting at 15-25 years of age (Seminoff et al. 2002). Nesting life span is variable between DPSs and was found to range from 25-35 years in Hawaii with a maximum nesting span of 37-38 years (Seminoff et al. 2015).

Seminoff et al. (2015) summarized the knowledge of green sea turtles, particularly for the juvenile and subadult oceanic and neritic life stages, in the following passage:

> Despite the fact that sea turtles have been the focus of research and conservation efforts for several decades in various places around the world (Frazier 2003), there are still very large gaps in our understanding of green sea turtle life history and demography. These gaps likely owe to logistical challenges of studying sea turtles when they are dispersed in the open ocean and to the long time spans from hatchling to maturity. However, even as our knowledge about green sea turtle biology increases, as a long-lived and slow-maturing species, the traits that make green sea turtles so vulnerable to reduced survival rates also make them very slow to recover once depleted, leaving them vulnerable to other threats even if the impact that initially caused their depletion is addressed (see Congdon et al. 1993)

4.1.2. *Listing Status*

On April 6, 2016, NMFS and the USFWS published a final rule to identify 11 distinct population segments (DPSs) across the global range of the green sea turtle (Figure 2) (USFWS and NMFS 2016). Of these, three are proposed for listing as endangered, the rest as threatened under the ESA. The proposed Central North Pacific and East Pacific DPSs are the two most likely to occur in the action area and likely to be adversely affected by the proposed action. Both of these DPSs are listed as threatened.

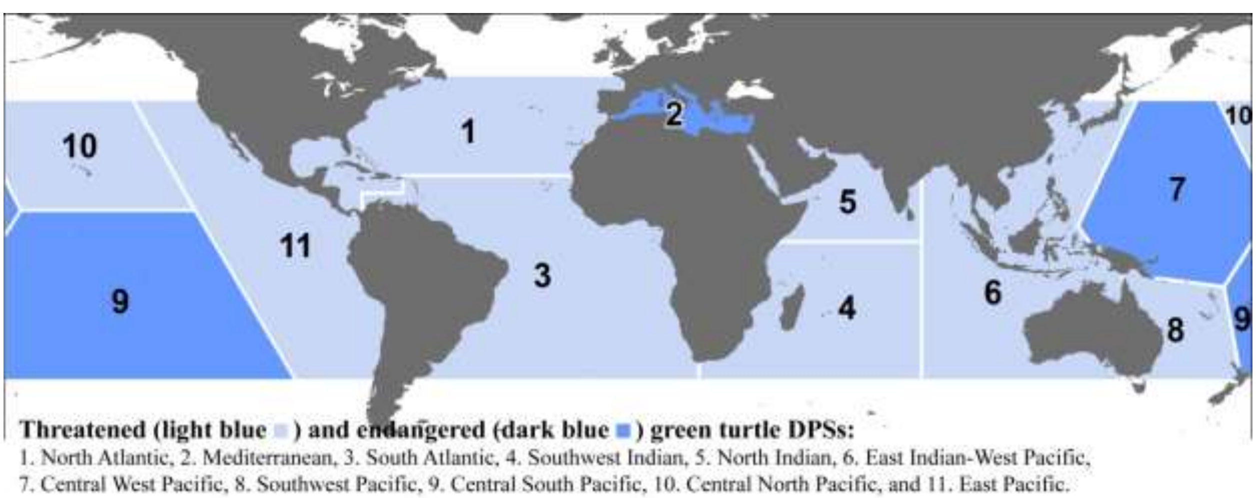


Figure 2. Map of the 11 distinct population segments (DPSs) of the green sea turtle (graphic by NOAA, http://www.nmfs.noaa.gov/pr/species/turtles/green.html, 2016).

4.1.3. *Distribution*

Green sea turtles nest on beaches in over 80 countries worldwide and are found in the Pacific Ocean, Atlantic Ocean, Indian Ocean, Caribbean Sea, and Mediterranean Sea, primarily in tropical or, to a lesser extent, subtropical waters (Figure 3). These regions can be further divided into nesting aggregations within the eastern, central, and western Pacific Ocean; the western, northern, and eastern Indian Ocean; Mediterranean Sea; and eastern, southern, and western Atlantic Ocean, including the Caribbean Sea.

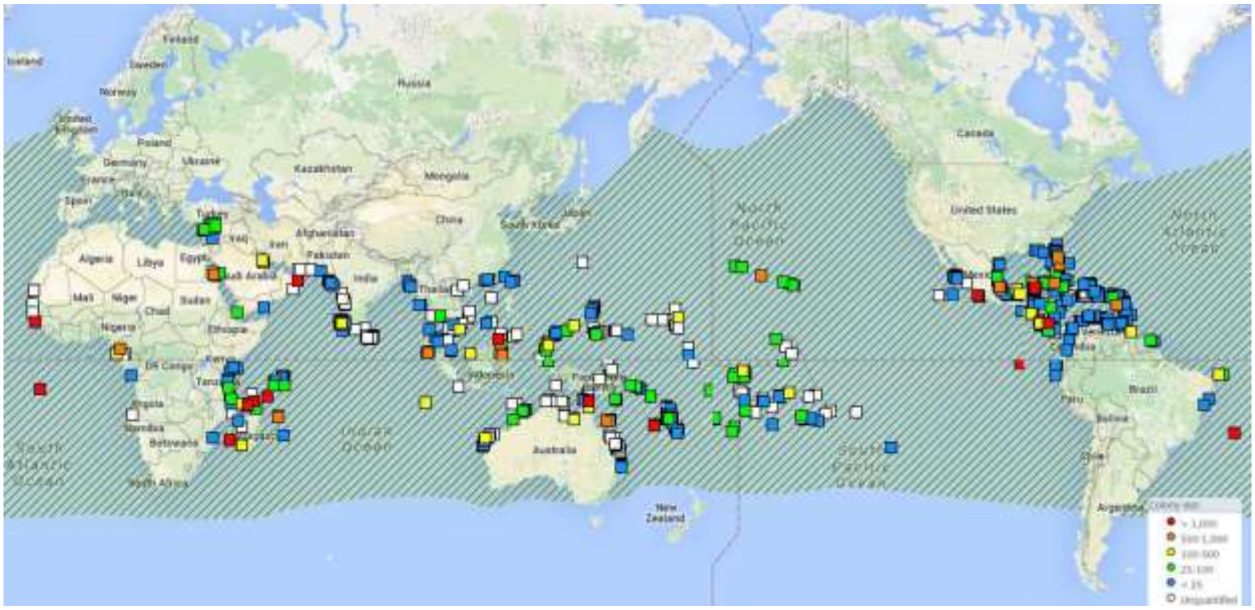


Figure 3. Range and nesting locations of green sea turtles (Data provided by the SWOT Team and hosted on OBIS-SEAMAP. Oceanic Society, IUCN Marine Turtle Specialist Group (MTSG), and Marine Geospatial Ecology Lab, Duke University.. Wallace et al. 2010 , Kot et al. 2016, Halpin et al. 2009. Retrieved from http:// seamap.env.duke.edu/swot).

Green sea turtles are widely distributed in the subtropical coastal waters of southern Baja California, Mexico, and Central America (NMFS and USFWS 1998). The main group of eastern Pacific Ocean green sea turtles is found on the breeding grounds of Michoacán, Mexico, from August through January and year-round in the feeding areas, such as those on the western coast of Baja California, along the coast of Oaxaca, and in the Gulf of California (the Sea of Cortez) (NMFS and USFWS 1998). Bahía de Los Angeles in the Gulf of California has been identified as an important foraging area for green sea turtles (Seminoff et al. 2003). Eastern Pacific Ocean green sea turtles have been reported as far north as British Columbia (48.15° N) (Eckert 1993; NMFS and USFWS 1998). The western coasts of Central America, Mexico, and the United States constitute a shared habitat for this population (NMFS and USFWS 1998). The green sea turtle is not known to nest on Southern California beaches.

San Diego Bay is home to a resident sub-population of green sea turtles (Dutton and McDonald 1990; Stinson 1984). A 20-year monitoring program of these turtles indicates an annual abundance of between 16 and 61 turtles (Eguchi et al. 2010). Eelgrass beds and marine algae are particularly abundant in the southern half of the bay, and green sea turtles are frequently observed foraging on these items (Dutton et al. 2002). Until December 2010, the southern part of San Diego Bay was warmed by the effluent from the Duke Energy power plant, a fossil fuel power generation facility in operation since 1960. Green sea turtles are known to congregate in this area. The closure of the power plant may impact these resident turtles and alter movement patterns.

Ultrasonic tracking studies have shown that green sea turtles in southern San Diego Bay have relatively small home ranges (Benson and Dutton 2012). Between 2009 and 2011, MacDonald et al. (2012) used acoustic telemetry to track 25 green sea turtles in San Diego Bay. The results of the study suggest that resident turtles likely do not spend much, if any, time foraging in central or northern San Diego Bay, where human activities are greatest (including Navy activities). A few sea turtles have been observed in northern San Diego Bay, but these are likely transient green sea turtles that enter the bay in warmer months (MacDonald et al. 2012). Another green sea turtle population resides in Long Beach, California, although less is known about this population (Eguchi et al. 2010).

In general, turtle sightings in the eastern Pacific Ocean increase during summer as warm water moves northward along the coast (NMFS and USFWS 1998). Sightings may also be more numerous in warmer years compared to colder years. In waters south of Point Conception, Stinson (Stinson 1984) found this seasonal sighting pattern to be independent of interannual temperature fluctuations. More sightings occurred during warmer years north of Point Conception, and most occur in shallow areas (less than 165 ft. [50 m] depth), often near areas of eelgrass along the shore.

Ocean waters off Southern California and northern Baja California are also designated as areas of occurrence because of the presence of rocky ridges and channels and floating kelp habitats suitable for green sea turtle foraging and resting (Stinson 1984); however, these waters are often at temperatures below the thermal preferences of this primarily tropical species.

Molecular genetic techniques have helped researchers gain insight into the distribution and ecology of migrating and nesting green sea turtles. In the Pacific Ocean, green sea turtles group into two distinct regional clades: (1) western Pacific and South Pacific islands, and (2) eastern Pacific and central Pacific, including the rookery at French Frigate Shoals, Hawaii. In the eastern Pacific, greens forage coastally from San Diego Bay, California, in the north to Mejillones, Chile, in the South. Based on mtDNA analyses, green sea turtles foraging in San Diego Bay and along the Pacific coast of Baja California originate primarily from rookeries of the Islas Revillagigedo (Dutton et al. 2003).

4.1.4. *Habitat Description*

Habitat Distribution

Green sea turtles appear to prefer waters that usually remain around 20°C in the coldest month. During warm spells (e.g., El Niño), green sea turtles may be found considerably north of their normal distribution. Stinson (1984) found green sea turtles to appear most frequently in U.S. coastal waters with temperatures exceeding 18°C. Further, green sea turtles seem to occur preferentially in drift lines or surface current convergences, probably because of the prevalence of cover and higher densities of their food items associated with these oceanic phenomena. Underwater resting sites include coral recesses, the underside of ledges, and sand bottom areas that are relatively free of strong currents and disturbance from natural predators and humans. Available information indicates that green sea turtle resting areas are in proximity to their feeding areas (NMFS and USFWS 1998).

Additionally, it is presumed that drift lines or surface current convergences are preferential zones due to increased densities of likely food items. In the western Atlantic, drift lines commonly contain floating *Sargassum* capable of providing small turtles with shelter and sufficient buoyancy to raft upon (NMFS and USFWS 1998).

Foraging Ecology and Diet

As described in Seminoff et al. (2015), green sea turtles have been shown to consume a wide variety of seagrass, marine algae, and invertebrates (see Bjorndal 1997). Limited studies on oceanic adults have shown them to be primarily carnivorous (Arthur et al. 2008, Parker et al. 2011). Neritic stage juvenile and adult green sea turtles are primarily herbivorous, foraging on seagrasses and/or marine algae, although some populations appear to forage heavily on invertebrates (Bjorndal 1997, Jones and Seminoff 2013).

Some populations may exhibit one or more ontogenetic shifts in diet after recruitment to the neritic zone (Arthur et al. 2008, Howell et al. 2013). At least one population is known to have integrated invasive plant species into its diet (Russell and Balazs 2009). Detailed diet characterizations have been conducted for relatively few coastal regions, however, and little information is available about differences or similarities in diet at various life stages. Disruptions in weather patterns, such as El Niño events, can limit availability of forage species and impact the distribution of green sea turtles (Carballo et al. 2002).

Breeding Habitat

The breeding habitat of green sea turtles consists of sandy beaches on tropical and subtropical seas. Primary nesting aggregations of green sea turtles (i.e. sites with greater than 500 nesting females per year) include: Ascension Island (south Atlantic Ocean), Australia, Brazil, Comoros Islands, Costa Rica, Ecuador (Galapagos Archipelago), Equatorial Guinea (Bioko Island), Guinea-Gissau (Bijagos Archipelago), Îles Éparses Islands (Tromelin Island, Europa Island), Indonesia, Malaysia, Myanmar, Oman, Philippines, Saudi Arabia, Seychelles Islands, Suriname, and United States (Florida) (Seminoff 2002).

Smaller nesting aggregations include: Angola, Bangladesh, Bikar Atoll, Brazil, Chagos Archipelago, China, Costa Rica, Cuba, Cyprus, Democratic Republic of Yemen, Dominican Republic, d'Entrecasteaux Reef, French Guiana, Ghana, Guyana, India, Iran, Japan, Kenya, Madagascar, Maldives Islands, Mayotte Archipelago, Mexico, Micronesia, Pakistan, Palmerston Atoll, Papua New Guinea, Primieras Islands, Sao Tome é Principe, Sierra Leone, Solomon Islands, Somalia, Sri Lanka, Taiwan, Tanzania, Thailand, Turkey, Scilly Atoll, United States (Hawaii, Guam, American Samoa, Northern Mariana Islands), Venezuela, and Vietnam (Seminoff 2002).

4.1.5. *Threats*

A thorough discussion of threats to green sea turtles worldwide can be found in the most recent status review (Seminoff et al. 2015) , the five-year status review (NMFS and USFWS 2007a), and the final rule listing 11 DPSs as endangered or threatened (NFMFS and USFWS 2016).

Major threats include: coastal development and loss of nesting and foraging habitat; incidental capture by fisheries; the harvest of eggs, sub-adults and adults. Climate change is also emerging as a critical issue.

Destruction, alteration, and/or degradation of nesting and near shore foraging habitat is occurring throughout the range of green sea turtles. These problems are particularly acute in areas with substantial or growing coastal development, beach armoring, beachfront lighting, and recreational use of beaches.

In addition to damage to the nesting beaches, pollution and impacts to foraging habitat becomes a concern. Pollution run-off can degrade sea grass beds that are the primary forage of green sea turtles. Due to green sea turtles' more coastal lifestyle, collisions with boat traffic are known to cause significant numbers of mortality every year (NMFS and USFWS 2007a).

Worldwide, the bycatch of green sea turtles, especially in coastal fisheries, is a serious problem because in the Pacific, many of the small-scale artisanal gillnet, setnet, and longline coastal fisheries are not well regulated. These are the fisheries that are active in areas with the highest densities of green sea turtles (NMFS and USFWS 2007a). This makes it difficult to assess what impacts they are having on this population. Most of the available information on green sea turtle bycatch comes from coastal areas or within a country's Exclusive Economic Zone (EEZ, 12-200 miles seaward of the coastline) and not on the high seas (Seminoff et al. 2015)

The meat and eggs of green sea turtles has long been favored throughout much of the world that has interacted with this species. As late as the mid-1970s, upwards of 80,000 eggs were harvested every night during nesting season in Michoacán (Cliffton et al. 1982). Even though Mexico has implemented bans on the harvest of all turtle species in its waters and on the beaches, poaching of eggs, females on the beach, and animals in coastal water continues to happen. In some places throughout Mexico and the whole of the eastern Pacific, consumption of green sea turtles remain a part of the cultural fabric and tradition (Seminoff et al. 2015).

Marine debris and pollution are an anthropogenic threat to green sea turtles. Marine debris, including fishing line and nets, plastics (e.g., bags, 6 pack rings, polystyrene) can entangle turtles and can be consumed. Impacts from marine debris are particularly acute at nesting beaches where debris and garbage disposal into coastal waters is a serious problem (Seminoff et al. 2015) Stranding information from the Hawaiian Islands indicate that entanglement or ingestion of fishing line was one of the major causes for strandings and mortality (Francke 2014 as described in Seminoff et al. 2015). Impacts from marine pollution includes contamination from herbicides, pesticides, oil spills, other chemicals as well as effects on water quality from activities like boating, anchoring and dredging in habitats used by green sea turtles.

Based upon available information, it is likely that green sea turtles are being affected by climate change. Like other sea turtle species, increasing temperatures have the potential to skew sex ratios of hatchling and many rookeries are already showing a strong female bias as warmer temperatures in the nest chamber leads to more female hatchlings (Kaska et al. 2006; Chan and Liew 1995, Allen et al 2015). Increased temperatures also lead to higher levels of embryonic mortality (Matsuzawa et al. 2002). An increase in typhoon frequency and severity, a predicted consequence of climate change (Webster el al. 2005, Knutson et al. 2010) can cause erosion (Johnson et al. 2015) which leads to high nest failure (Van Houtan and Bass 2007). Green sea turtles feeding may also be affected by climate change. Seagrasses are a major food source for green sea turtles and may be affected by changing water temperature and salinity (Short and Neckles 1999; Duarte 2002). Climate change could cause shifts in ocean productivity (Hayes et al. 2005), which may affect foraging behavior and reproductive capacity for green sea turtles (Solow et al. 2002).

Global Climate and Ecological Change

At this time, it is not possible to reliably predict the magnitude of future climate change and the impacts on green sea turtles. The existing data and current scientific methods and analysis are not able to predict the future effects of climate change on this species or allow us to predict or quantify this threat to the species (Hawkes et al. 2009). Given this lack of available information and within the context of the temporal scale of the proposed action, climate change related impacts are not considered significant.

4.1.6. *Recovery Plan Delisting Criteria*

To consider de-listing, all of the following criteria must be met (NMFS and USFWS 1998):

1. All regional stocks that use U.S. waters have been identified to source beaches based on reasonable geographic parameters.
2. Each stock must average 5,000 (or a biologically reasonable estimate based on the goal of maintaining a stable population in perpetuity) females estimated to nest annually (FENA) over six years.
3. Nesting populations at "source beaches" are either stable or increasing over a 25-year monitoring period.
4. Existing foraging areas are maintained as healthy environments.
5. Foraging populations are exhibiting statistically significant increases at several key foraging grounds within each stock region.
6. All Priority #1 tasks have been implemented.
7. A management plan to maintain sustained populations of turtles is in place.
8. International agreements are in place to protect shared stocks.

4.1.7. *Recovery Actions*

Extensive conservation efforts that have developed over the last 30 years appear to be having an impact on this species, as nesting populations have stabilized or are increasing in a number of regions, including some in the Pacific (NMFS and USFWS 2007a; Seminoff et al. 2015). In the eastern Pacific, prohibitions on the harvest and exploitation of green sea turtles have been placed into effect in many places. Measures to reduce bycatch are being implemented through many local, national, and international agreements and instruments. Notable measures include: the publication of a FAO Technical Consultation on Sea Turtle – Fishery Interactions; the formation of the Inter-American Convention for the Protection and Conservation of Sea Turtles, and the Convention on International Trade in Endangered Species of Wild Fauna and Flora, which bans the importation of any sea turtle species or their parts. Due to these and other measures, the harvest of green sea turtles has been reduced and nesting beach conservation and community based initiatives have been put in place to protect green sea turtles in nesting and nearshore foraging areas (Gilman et al. 2007).

4.1.8. *Population*

The population dynamics of green sea turtles and all of the other sea turtles we consider in this Opinion are usually described based on the distribution and habit of nesting females, rather than their male counterparts. The spatial structure of male sea turtles and their fidelity to specific coastal areas is unknown; however, we describe sea turtle populations based on the nesting beaches that female sea turtles return to when they mature. Because the patterns of increase or decrease in the abundance of sea turtle nests over time are determined by internal dynamics rather than external dynamics, we make inferences about the growth or decline of sea turtle populations based on the status and trend of their nests.

NMFS and USFWS (2007) provided population estimates and trend status for 46 green sea turtle nesting beaches around the world. Of these, twelve sites had increasing populations (based upon an increase in the number of nests over 20 or more years ago), four sites had decreasing populations, and ten sites were considered stable. For twenty sites, there are insufficient data to make a trend determination or the most recently available information is too old (15 years or older) (NMFS 2007). The overall nesting female population, based upon the mean annual reproductive effort, is estimated to be between 108,761 and 150,521. A more complete review of the most current information on green sea turtles is available in the 5-Year Status Review document published in 2007 by the USFWS and NMFS at: www.nmfs.noaa.gov/pr/pdfs/species/greenturtle_5yearreview.pdf.

On February 16, 2012, USFWS and NMFS received a petition from the Association of Hawaiian Civic Clubs to identify the Hawaiian green sea turtle population as a DPS and delist the DPS under the Act. On August 1, 2012, NMFS (with USFWS concurrence) determined that the petition presented substantial information indicating that the petitioned action may be warranted and initiated a status review to determine whether the petitioned action is warranted. The Services decided to review the Hawaiian population in the context of examining green sea turtles globally with regard to application of the DPS policy and in light of significant new information since the listing of the species in 1978. This is consistent with the recommendation in the 2007 review.

USFWS and NMFS convened a status review team (SRT) in November 2012 to review the best available scientific information, determine if DPSs exist, and assess the extinction risk of any identified DPS. The SRT evaluated genetic evidence, distribution, demographics, oceanographic features, and geographic barriers. The 11 DPS are separated from each other due to ecological, behavioral, and oceanographic factors and based on genetic and morphological evidence. Further, each DPS is genetically unique and the loss of any one DPS would represent a significant loss of genetic diversity. Each DPS covers a large range, so its loss would result in a significant gap in the distribution of the species. These population segments are not legally DPSs until final rule making is complete, but consistent with the proposed rule and status review, we use the DPS term.

Based on the evaluation of the SRT, NMFS and USFWS (2016) identified the following 11 green sea turtle DPSs distributed globally:

1. North Atlantic DPS
2. Mediterranean DPS
3. South Atlantic DPS
4. Southwest Indian DPS
5. North Indian DPS
6. East Indian - West Pacific DPS
7. Central West Pacific DPS
8. Southwest Pacific DPS
9. Central South Pacific DPS
10. Central North Pacific DPS
11. East Pacific DPS

The level of information varies by locations and is based solely on nesting beach counts. Based on evaluation of existing data, threats and population vulnerability by an expert panel, three DPSs, (the Central South Pacific, Central West Pacific and Mediterranean) are classified as endangered and the other eight are classified as threatened (NMFS and USFWS 2016) . Although precise numbers are not available on the number of individuals in all of the DPSs that make up the global population, the majority of the DPSs are considered threatened, not endangered. Those DPS likely to be impacted by this proposed project, the Central North Pacific and East Pacific DPSs are both listed as threatened.

4.2. Olive Ridley Sea Turtle

Information in this section is summarized from the 5-year status reviews (NMFS and USFWS 2014 and 2007b), biological opinions previously completed by NMFS (NMFS 2014b 2016) and other sources as described below. The 2014 status review concluded with a set of recommendations including a review of available information to determine the application of the DPS policy to olive ridley sea turtles and review and update recovery plans.

4.2.1. *Taxonomy and Species Description*

Olive ridley sea turtles (olive ridleys) are one of the smallest sea turtles, with adults reaching 2 to 2½ feet in length and weighing 80 to 110 pounds. This species was originally described as *Testudo mydas* minor Suckow 1798, later renamed *Chelonia olivacea* Eschscholtz 1829, and eventually *Lepidochelys olivacea* Fitzinger 1843. There are no currently accepted named subspecies (NMFS and USFWS 1998).

The species is easily distinguished from other sea turtles in the action area by the variable numbers of vertebral and costal scutes and the four prefrontal scales between the eyes (Figure 4). Although some individuals have only five pairs of costals, in nearly all cases some division of costal scutes occurs, so that as many as six to nine pairs may be present. In addition, the vertebral scutes also show frequent division, as do the scales on the dorsal surface of the head. The prefrontal scales, however, typically number two pairs.

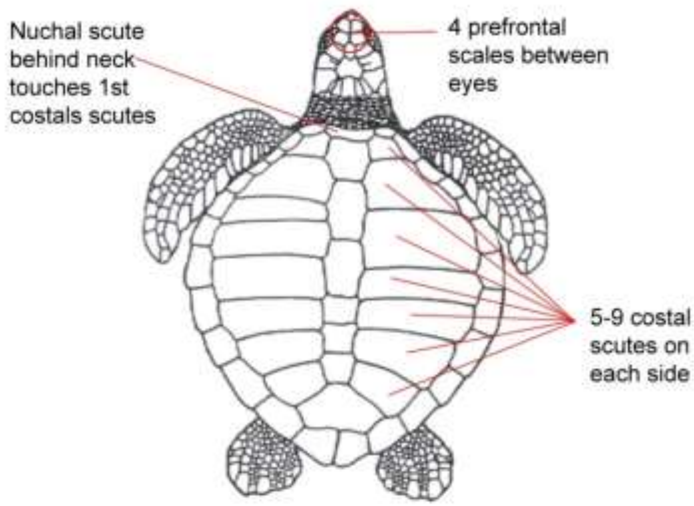


Figure 4. Some of the distinguishing characteristics of olive ridley sea turtles (drawing courtesy of the Vancouver Aquarium, Vancouver, B.C.).

In addition to their appearance, olive ridleys (along with the other member of its genus, Kemp's ridley sea turtle, *Lepidochelys kempii*) exhibit the unique nesting behavior of synchronized mass nesting at a an arribida, or mass nesting site (Carr 1967, Hughes and Richard 1974, Bernardo and Plotkin 2007). This behavior is distinguished from nesting of other large numbers of sea turtles in the synchronization of arrival at the site and the short interval (2-7 days over which nesting is completed (Bernardo and Plotkin 2007).

The post-reproductive migrations of olive ridleys in the eastern Pacific Ocean are unique and complex. Their migratory pathways vary annually (Plotkin 1994, 2010), there is no spatial and temporal overlap in migratory pathways among groups or cohorts of turtles (Plotkin et al. 1994, 1995), and no apparent migration corridors exist (Plotkin 2010). Unlike other sea turtles that migrate from a breeding ground to a single feeding area, where they reside until the next breeding season, olive ridleys are nomadic migrants that swim hundreds to thousands of kilometers over vast oceanic areas (Parker et al. 2003; Plotkin 1994, 2010; Plotkin et al. 1994, 1995). This nomadic behavior may be unique to olive ridleys in the eastern Pacific Ocean as studies in other ocean basins indicate olive ridleys occupy neritic waters and do not make the extensive migrations observed in this region (Plotkin 2010).

Polovina et al. (2003, 2004) tracked 10 olive ridleys caught in the Hawaii-based pelagic longline fishery. The olive ridleys identified as originating from the eastern Pacific populations stayed south of major currents in the central North Pacific-southern edge of the Kuroshio Extension

Current, North Equatorial Current, and Equatorial Counter Current; whereas, olive ridleys identified from the western Pacific associated with these major currents, suggesting that olive ridleys from different populations may occupy different oceanic habitats (Polovina *et al.* 2003, 2004).

Data are lacking on post-hatchling and juvenile dispersal. Pitman (1990) observed sea turtles from vessels from 1975 through 1990 for a total of 4,179 days at-sea. He found the olive ridley to be the most common turtle south of the Baja Peninsula, and many sightings were of adults mating. It is unknown what portion of sightings were juveniles, if any. Eleven juveniles were sighted in the Revillagigedo Archipelago offshore Mexico during four surveys carried out between November 1999 and December 2000. All were sighted in deep, pelagic water and algae had not accumulated on their carapaces, indicating offshore habitat use (Juárez-Cerón and Sarti-Martínez, 2003).

4.2.2. *Listing Status*

Populations of olive ridleys that breed in Mexico are listed as endangered, and all other population are listed as threatened (NMFS and USFWS 1978). The following is excerpted from the most recent 5-year review of the status of the species (NMFS and USFWS 2014).

<u>Endangered Populations (Mexico breeding populations)</u>

The current population of olive ridleys compared with historical populations at each of the large arribada beaches indicates the populations experienced steep declines due to over-exploitation. The only exception may be Ixtapilla, which was not discovered until 1994 and for which long-term nesting trends are unknown.

Based on the current number of olive ridleys nesting in Mexico (Table 1), three populations appear to be stable, two increasing, and one decreasing. Where known, non-arribada nesting trends in Mexico are stable or increasing in recent years.

The nesting trend data are generally less than the 10-year period specified in delisting recovery criterion in the recovery plan (NMFS and USFWS 1998b). Recent at-sea estimates of density and abundance of the olive ridley show a yearly estimate of 1.39 million (Confidence Interval: 1.15 to 1.62 million), which is consistent with the increases seen on the eastern Pacific nesting beaches as a result of protection programs that began in the 1990s. The closure of the olive ridley turtle fishery and ban on egg harvest has decreased the threat to the population. Although illegal harvest continues, the Endangered populations appear to have stabilized from the previous population collapse due to over exploitation.

<u>Threatened Populations (globally except Mexico breeding populations)</u>

In the eastern Pacific, the large arribada nesting populations have declined since the 1970s. Nesting at some arribada beaches continues to decline (e.g., Nancite in Costa Rica) and is stable or increasing at others (e.g., Ostional in Costa Rica). There are too few data available from solitary nesting beaches to confirm the declining trend that has been described for numerous countries throughout the region including El Salvador, Guatemala, Costa Rica, and Panama.

Table 1. Endangered populations of olive ridley arribada and solitary nesting beaches in Mexico, and estimates of annual abundance at each site and current trends (Abreu-Grobois and Plotkin 2008, R. Briseño, BITMAR, and A. Abreu, Unidad Academica Mazatlan, pers. comms. 2006, Maldonado-Gasca and Hart 2012, Rodríguez et al. 2010 as summarized in NMFS and USFWS 2014).

Location	Years	Annual Number	Trend
ARRIBADA			
Mismaloya[1]	2001-2006	2,328 protected[2] nests	stable
Tlacoyunque[1]	1997	608 protected[2] nests	stable
Ixtapilla[3]	1999-2005	2,900-10,000nests	increasing
Chacahua[1]	2001-2005	2,042 nests	decreasing
La Escobilla	2001-2005	1,013,034 females	increasing
Moro Ayuta	2006	10,000 - 100,000 nests	stable
SOLITARY			
El Verde	2000-2005	1,160 protected[2] nests	stable
Platanitos	2000-2005	1,301 nests	increasing
Cuyutlán	1999-2003	1,257 nests	increasing
Maruata-Colola	1999-2003	4,198 nests	stable
Puerto Arista	1999-2004	707 nests	stable
Moro Ayuta		No estimate available	stable
Nuevo Vallarta	~2000-2010	~4,900 nests[4]	unknown
San Cristóbal	1995-2006	89 nests	unknown
El Suspiro	1995-2006	220 nests	unknown

1 Large arribadas once occurred at these beaches but no longer do (Abreu-Grobois and Plotkin 2008; Cliffton et al. 1979; Hoekert et al. 1996).
2 Protected nests are defined as those nests that would not be poached, predated, and otherwise lost (Abreu-Grobois and Plotkin 2008).
3Olive ridley nesting at this site was not recorded prior to 1994 (Abreu-Grobois and Plotkin 2008). It is unknown whether the population is depleted from historical abundance.
4 Based on reported monitoring of 14 km of beach and nesting density of >350 nests/km/year (Maldonado-Gasca and Hart 2012).

Western Atlantic arribada nesting populations are currently very small. Data indicate the Suriname/French Guiana nesting population may still be threatened by incidental capture in the shrimp trawl fishery. The Suriname olive ridley population is currently small and has declined by more than 90% since the late 1960s. However, nesting is reported to be increasing in French Guiana. The other nesting population in Brazil, for which no long term data are available, is small, but increasing. In the eastern Atlantic, long-term data are not available and thus the abundance and trends of this population cannot be assessed at this time. However, the threats associated with growing commercial and artisanal (i.e., generally smaller scale local, noncommercial) fisheries in the region are serious and warrant close attention.

In the northern Indian Ocean, arribada nesting populations are still large, but trend data are ambiguous and major threats continue. Development of nesting beaches and high levels of fisheries bycatch from shrimp trawl and gillnets continues off nesting beaches, along migratory routes and on foraging grounds are a concern. Declines of solitary nesting olive ridleys have been reported in Bangladesh, Myanmar, Malaysia, Pakistan, and southwest India.

4.2.3. *Historic and Current Distribution*

Olive ridley turtles occur throughout the world, primarily in tropical and sub-tropical waters. (Pritchard 1969) (Figure 5). Four main lineages of olive ridleys have been identified, east India

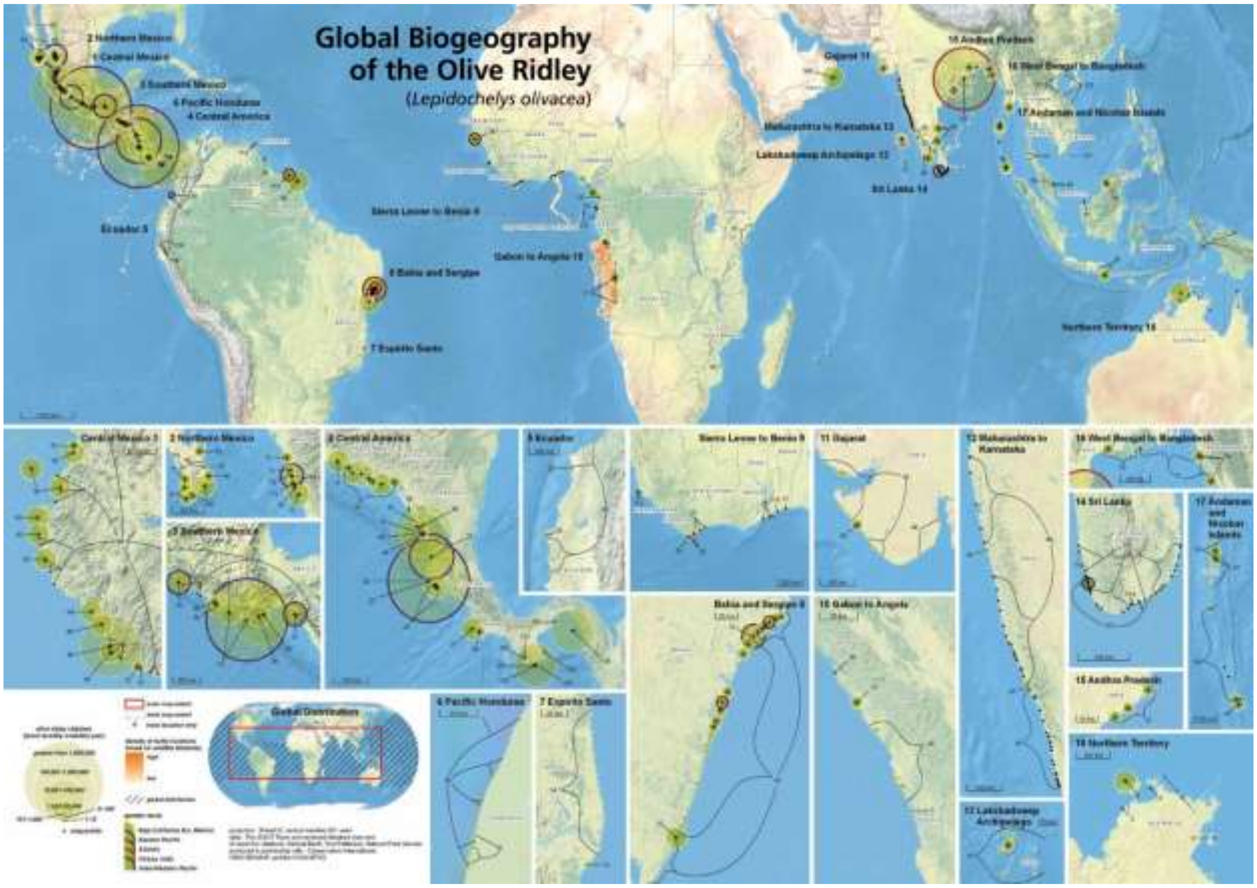


Figure 5. Range and nesting (arribida) locations of the olive ridley sea turtles (turtles (Data provided by the SWOT Team and hosted on OBIS-SEAMAP. Oceanic Society, IUCN Marine Turtle Specialist Group (MTSG), and Marine Geospatial Ecology Lab, Duke University.. Wallace et al. 2010 , Kot et al. 2016, Halpin et al. 2009. Retrieved from http:// seamap.env.duke.edu/swot).

(believed to be the ancestral lineage), the Indo-Western Pacific lineage, the Atlantic lineage, and the eastern Pacific lineage (Bowen et al. 1998; Hahn et al. 2012; Shanker et al. 2003).

In the Pacific, olive ridleys live within two distinct oceanic regions including the subtropical gyre and oceanic currents. The gyre contains warm surface waters and a deep thermocline preferred by olive ridleys. The currents bordering the subtropical gyre, the Kuroshio Extension Current, North Equatorial Current and the Equatorial Counter Current, all provide for advantages in movement with zonal currents and location of prey species (Polovina et al. 2004). Nesting aggregations in the Pacific Ocean are found in the Marianas Islands, Australia, Indonesia, Malaysia, and Japan (western Pacific), and Mexico, Costa Rica, Guatemala, and South America (eastern Pacific).

Olive ridleys do not nest in the United States. In the eastern Pacific, olive ridleys typically occur in tropical and subtropical waters, as far south as Peru and as far north as California, but occasionally have been documented as far north as Alaska (Hodge and Wing 2000). The Endangered breeding colony populations on the Pacific coast of Mexico include key arribada nesting beaches at Mismaloya, Ixtapilla, and La Escobilla. Solitary nesting occurs along the entire Pacific coast of Mexico.

4.2.4. *Habitat Description*

Distribution

As mentioned previously, the olive ridley has a circumtropical distribution, occurring in the Atlantic, Pacific, and Indian Oceans (Pritchard 1969) (Figure 5). Olive ridleys are not known to move between or among ocean basins.

In the eastern Pacific, olive ridleys are highly migratory and appear to spend most of their nonbreeding life cycle in the oceanic zone (Arenas and Hall 1992; Beavers and Cassano 1996, Pitman 1990 1991; Plotkin 1994 2010; Plotkin et al. 1993, 1994).

Most olive ridley turtles lead a primarily pelagic existence (Plotkin et al. 1993). Olive ridleys in the Pacific migrate throughout the ocean, from their nesting grounds in Mexico and Central America to the deep waters of the Pacific that are used as foraging areas (Plotkin et al. 1994). While olive ridleys generally have a tropical to subtropical range, with a distribution from Baja California, Mexico to Chile (Silva-Batiz et al. 1996), individuals do occasionally venture north, some as far as the Gulf of Alaska (Hodge and Wing 2000). Olive ridleys are usually found in warm waters, 23-28° C, often within or near equatorial waters (Polovina et al. 2004).

The El Niño Southern Oscillation, which is an irregular pattern of periodic variation between warm and cool sea surface temperatures, is probably the most significant ecosystem condition that may affect the survival status of olive ridleys in the eastern Pacific Ocean. The cool, nutrient rich and biologically productive waters characteristic of this region become warmer and less productive during an El Niño. This warming phenomenon impacts lower trophic levels in the ocean (i.e., planktonic communities) and eventually, the upper trophic levels as well (i.e., nekton). Warming trends in the Pacific, caused by the frequent occurrence of El Niños since 1976, may be responsible for the decline in zooplankton in the California Current and the corresponding decline in higher trophic level vertebrates of this marine ecosystem (Soto 2002, Hill 1995).

The direct impact of El Niños on olive ridleys is unknown, but olive ridleys appear to change migration pathways in response to shifts in food availability during El Niños (Plotkin 2010**).** Because olive ridleys in the eastern Pacific are highly mobile, and seemingly adaptable to fluctuating environmental conditions, they possess the ability to shift from an unproductive habitat to one where the waters are biologically productive (Plotkin 1994, 2010).

A more complete review of current information can be found in the status review documents published in 2014 and 2007 by the USFWS and NMFS (NMFS and USFWS 2007b, 2014).

Foraging Ecology and Diet

Olive ridleys from the eastern Pacific are thought to be primarily oceanic in their behavior and feeding patterns (Jones and Seminoff 2013). The olive ridley's diet includes crabs, shrimp, lobsters, jellyfish, mollusks, and tunicates. In some parts of the world, algae have been reported as its principal food (Jones and Seminoff 2013, Bjorndal 1997). While little information exists on olive ridley life history patterns, foraging habitat, and diet, they are believed to maintain a mostly omnivorous diet (Jones and Seminoff 2013).

Breeding Habitat

Olive ridleys occupy the neritic zone during the breeding season. Some reproductively active males and females migrate toward the coast and aggregate at nearshore breeding grounds located near nesting beaches (Hughes and Richard 1974; Pritchard 1969; Plotkin et al. 1991, 1996, 1997). A significant proportion of the breeding also takes place far from shore (Kopitsky et al. 2000; Pitman 1990), and some males and females may not migrate to nearshore breeding aggregations at all. Some males appear to remain in oceanic waters, are non-aggregated, and mate opportunistically as they intercept females en route to near shore breeding grounds and nesting beaches (Kopitsky et al. 2000; Parker et al. 2003; Plotkin 1994; Plotkin, et al. 1994, 1996).

Olive ridleys have three different nesting strategies: mass or arribada nesting, dispersed or solitary nesting, and a mixed strategy of both (Bernardo and Plotkin 2007; Fonseca et al. 2013). These different strategies result in different reproductive characteristics including higher rates of multiple paternity at arribada beaches (Jensen et al. 2006). At Nancite Beach, Costa Rica, larger clutch sizes were observed at arribada beaches than at beaches with solitary nesters (Plotkin and Bernardo 2003) although it's not known if this is common among all beaches. In some areas, solitary nesters use multiple beaches whereas arribada nesters generally lay all nests at the same beach (Kalb 1999). However, other studies indicate that this is not true of other populations as some arribada nesters nest at different beaches (Fonseca et al. 2013; Shanker et al. 2003b), and some solitary nesters show strong site fidelity (Whiting et al. 2007). The differences in nesting also effects hatchling success with generally higher density dependent mortality and lower overall hatchling survival at arribada beaches (Cornelius et al. 1991) compared to hatchling survival at solitary nester beaches (Dornfield et al. 2015, Dornfeld and Paladino 2012; Gaos et al. 2006).

4.2.5. *Threats*

Threats to olive ridleys are described in the most recent five-year status review (NMFS and USFWS 2014). Direct harvest and fishery bycatch are considered the two biggest threats. Egg collection and turtle fishing has resulted in historical and recent direct harvest of olive ridleys, and restriction of these activities has been inconsistent, particularly in the threatened populations (NMFS and USFWS 2014). Throughout 1950s to 1970s, it is estimated that millions of olive ridleys were killed for meat and leather, and millions of eggs were collected at nesting beaches in Mexico, Costa Rica, and other locations in Central and South America. Harvest has been reduced in the 1980's and 1990's, although eggs are still harvested in parts of Costa Rica and there is an illegal harvest of eggs in parts of Central America and India (NMFS and UWFWS 2007b).

Olive ridleys have been incidentally caught in a variety of fishing gear including longline, drift gillnet, set gillnet, bottom trawl, dredge and trap net. They are the species most commonly observed captured in the Hawaii-based deep-set long line fishery. Fisheries operating in coastal waters near arribadas can kill tens of thousands of adults. This is evident on the east coast of India where thousands of carcasses wash ashore after drowning in coastal trawl and drift gillnets fishing near the huge arribada (NMFS and USFWS 2007b).

Olive ridleys are also impacted by construction and beach alterations within their nesting habitat, decreasing the amount of nesting area available (NMFS and USFWS 2014). In addition, such development may include artificial lighting which can alter the behavior of nesting adults (Witherington 1992) and is often fatal to emerging hatchlings as they are attracted to light sources, which may direct them away from the water (Witherington and Bjorndal 1991).

Marine debris, including debris resulting from the 2011 earthquake and tsunami that took place off Japan, threatens olive ridleys through ingestion and entanglement.

Global Climate and Ecological Change

Based upon available information, it is likely that olive ridley sea turtles are being affected by climate change. Similar to other sea turtle species, olive ridleys are likely to be affected by rising temperatures that may affect nesting success and skew sex ratios and rising sea surface temperatures that may affect available nesting beach areas as well as ocean productivity. The El Niño Southern Oscillation is likely the most significant ecosystem impact on the survival of olive ridleys in the eastern Pacific Ocean. The frequent occurrence of El Niño conditions (i.e., warmer than normal water temperatures) may be responsible for declines in zooplankton and in turn higher level vertebrates in the marine ecosystem (Hill 1995). Olive ridleys have been known to change migration pathways to find food resources during El Nino events. Because olive ridleys appear to be highly agile, they may be able to adapt to fluctuating environmental conditions and move from unproductive to more productive feeding areas (Plotkin 1994, 2010).

4.2.6. *Recovery Plan Delisting Criteria*

To consider delisting all of the following recovery criteria must be met (NMFS and USFWS 1998b):

1. All regional stocks that use U.S. waters have been identified to source beaches based on reasonable geographic parameters.

2. Foraging populations are statistically significantly increasing at several key foraging grounds within each stock region.

3. All females estimated to nest annually (FENA) at "source beaches" are either stable or increasing for over 10 years.

4. A management plan based on maintaining sustained populations for turtles is in effect.

5. International agreements are in place to protect shared stocks.

4.2.7. *Recovery Actions*

While it is known that some illegal captures of olive ridley eggs and likely adults still occurs, this threat to the species is considered much reduced and conservation efforts are focused on reducing bycatch in commercial fisheries. In some parts of Central America, fishing is prohibited offshore of arribadas to protect nesting adults (Frazier et al. 2007). Similarly, there are restrictions on fisheries on the east coast of India, the site of very large arribadas (Shanker et al. 2004). Unfortunately, enforcement of the fishing regulations is very limited in both areas.

Olive ridleys are highly migratory and do not nest at U.S. beaches. Conservation and recovery requires multi-lateral cooperation and agreements. Among the existing international instruments are the Indian Ocean Southeast Asia Marine Turtle Memorandum of Understanding, the Inter-American Convention for the Protection and Conservation of Sea Turtles and CITES (NMFS and USFWS 2007b). As a result of these actions and others, the harvest of eggs and adults at nesting beaches has been reduced (Gilman et al. 2007b; NMFS and USFWS 2007b). There have been international efforts to exchange traditional “j” hooks typically used in longline fisheries, with circle hooks that have been shown to reduce both the capture rate and mortality of turtles that interact with longline gear. These efforts should benefit olive ridleys by reducing the impact of longline fisheries on the populations, particularly in the Pacific.

Since large-scale direct harvest of adult olive ridleys became illegal, conservation efforts have focused on reducing bycatch in fisheries, especially those operating near arribadas such as the Pacific coast of Mexico/Central America and the east coast of India. Some areas offshore of Central American arribadas are closed to fishing in order to reduce turtle bycatch (Frazier et al. 2007), and trawl fishing which was estimated to catch over 15,000 turtles per year (90 percent of which were olive ridleys), was banned in Costa Rica in September 2013 (Arias 2013). Likewise, no mechanized fishing is allowed within 20 km of the arribada in India, and turtle excluder devices are mandatory on trawlers operating out of Orissa state (Shanker et al. 2003). However, enforcement is reported to be lacking in both areas (Frazier et al. 2007, Shanker et al. 2003).

In India, the Odisha Government has enacted a seven-month ban (November 1 to May 31) restricting fishing near the Gahirmatha marine sanctuary in Kendrapara district along the 20 km stretch of the Dhamra-Rushikulya river mouth to protect nesting olive ridleys. An estimated 26,000 traditional marine fishermen in coastal Kendrapara and Jagatsinghpur districts are likely to be affected by the measure. Trawl operators are prohibited in the protected zone, and orders are being enforced with nearly 100 trawls and vessels were seized and their crew arrested during the ban in 2011 (The Hindu Business Line News 2011).

Between 2004 and 2007, the IATTC coordinated and implemented a circle hook exchange program to experimentally test and introduce circle hooks and safe handling measures to reduce sea turtle bycatch in mahi-mahi and tuna/billfish artisanal longline fisheries in Ecuador, Peru, Panama, Costa Rica, Guatemala, and El Salvador. Almost all (99 percent) of fishery/turtle interactions identified by this program were with green and olive ridley sea turtles. By the end of 2006, over 1.5 million J hooks had been exchanged for turtle-friendly circle hooks (approximately 100 boats). Overall, circle hooks were found to reduce interaction rates by 40 to 80 percent in artisanal fisheries that switched gear types, with deep hookings reduced by 20 to 50 percent. Experiments to reduce longline gear entanglements were also successful. This project ended in 2007 and no follow up study has been initiated to assess continued use of circle hooks or dehooking and safe handling methods in fisheries where these measures were introduced.

The conservation and recovery of olive ridleys is facilitated by a number of regulatory mechanisms at international, regional, national, and local levels, such as the Indian Ocean Southeast Asian Marine Turtle Memorandum of Understanding, the Inter-American Convention for the Protection and Conservation of Sea Turtles, CITES, and others. Within the WCPFC, NMFS has worked to modify and improve international bycatch mitigation requirements and aided in establishing a binding Sea Turtle Conservation Measure implementing the FAO Guidelines (e.g., circle hooks and safe handling measures) which has likely helped reduce interactions and improve survivorship in international longline fisheries. As a result of these designations and agreements, many of the intentional impacts on olive ridleys have been reduced: harvest of eggs and adults have been reduced at several nesting areas through nesting beach conservation efforts and an increasing number of community-based initiatives are in place to reduce the take of turtles in foraging areas (Gilman et al. 2007b, NMFS and USFWS 2014).

4.2.8. *Population*

For the 2014 five year status review, NMFS and USFWS provided population estimates and trends at nesting beaches for both the endangered (some Eastern Pacific nesters) and threatened (all other nesters) populations and further divided the estimates based on the nesting strategies, arribadas and non-arribada (or solitary) nesters. Detailed information on populations at nesting beaches and trends in populations can be found in Tables 1 and 2 in the five year status review (NMFS and USFWS 2014).

At the major arribada beaches in the Eastern Pacific, three populations appear to be stable, two increasing and one decreasing although together these beaches have not reached the pre-exploitation estimate of 10 million adults prior to 1950 Cliffton et al. (1982). The most recent estimate of nesting females on the Eastern Pacific arribada beaches is 1.39 million (confidence interval: 1.15 to 1.62 million) (Eguchi et al. 2007).

The numbers of endangered arribada nesters is consistent with at-sea abundance estimates conducted by shipboard line-transect surveys conducted along the Mexico and Central American coasts in 1992, 1998, 1999, 2000, 2003, and 2006 (Eguchi et al. 2007). The weighted average of the yearly estimate of olive ridley abundance was 1.39 million (confidence interval: 1.15 to 1.62 million) which is consistent with nesting number increases and likely the result of conservation programs that began in the 1990s (Eguchi et al. 2007).

The number of endangered non-arribada nesters is highly variable. Nesting occurs along the entire coast, but is concentrated in a few areas and near arribadas. At the surveyed beaches, trends indicate that the populations are stable or increasing.

Threatened population of olive ridleys occur around the world with populations in the Western and Eastern Atlantic, Western and Eastern Pacific and the Indian Ocean. Arribada populations are identified in the Western Atlantic, Indian Ocean and Eastern Pacific. In the Western Atlantic, the two major arribada beaches had estimated nest numbers of 335 and 2,015 nests in Suriname and French Guiana, respectively (NMFS and USFWS 2014). In the Eastern Pacific female olive ridleys nest annually at eight known arribada beaches. It is difficult to estimate nesting populations in some areas, but at known beaches population estimates vary from 256 to over 475,000 females nesting annually (NMFS and USFWS 2014). In the Indian Ocean, the available information indicates nesting females in the range of 150 to 200,000 (Abreu-Grobois and Plotkin 2008). Of the 11 identified arribadas with threatened olive ridleys, two are increasing, three are decreasing, two are stable and the rest are unknown.

Nesting numbers at non-arribada beaches are not well known. Of the eight beaches in the Eastern Pacific, only one beach in Guatemala has an estimate of nesting females (1,004) and the population trend is declining; for all other populations the trend is unknown (NMFS and USFWS 2014).

In the western Pacific the once large nesting populations of olive ridleys that occurred in peninsular Malaysia and Thailand have been decimated through long term over-harvest of eggs (Limpus and Miller 2008). The species nests in low numbers at many sites in Indonesia and is only rarely encountered nesting in the Republic of the Philippines or Papua New Guinea (Limpus et al. 2008). While the Australian olive ridley nesting distribution and population size remains to be fully evaluated, a few thousand females may nest annually in the Northern Territory (Limpus and Miller 2008).

A number of locations in western and eastern India are also described as sites of potential solitary nesting activity, but nesting activity is unquantified at these locations (NMFS and USFWS 2007). Survey effort on Indian beaches has fluctuated over the years and methods used to census nesting populations have also changed. As a result, reported trends and abundance numbers may be somewhat speculative and potentially unreliable. Only half of the sites have population estimates and they range from 30 to 700 nesters, although the population trend is generally negative or unknown.

In the Atlantic, numerous non-arribada sites have been identified, but few surveys are available to estimate nester population or trends. The highest number of nesters occurs in Brazil, where surveys from the 2002-2003 indicated over 2600 nesters (da Silva et al. 2007). In the Eastern Atlantic, the few available nest survey counts numbered from a low of 57 nests annually to 620 nests (NMFS and USFWS 2014).

Because the proposed action is most likely to occur primarily east of 140° west longitude, thus closer to the Eastern Pacific nesting and foraging sites, it is reasonable to assume that this population would be more likely to be affected by the proposed action. This is a large population. The largest known arribadas in the eastern Pacific are off the coast of Costa Rica (~475,000 - 650,000 females estimated nesting annually) and in southern Mexico (~1,000,000+ nests/year at La Escobilla, in Oaxaca) (Marquez- Millán et al. 2005). As noted above, the estimated population along the Mexican coast alone was over a million olive ridleys.

Although the olive ridley turtle is regarded as the most abundant sea turtle in the world, olive ridley nesting populations on the Pacific coast of Mexico are listed as endangered under the ESA; all other populations are listed as threatened. Population structure and genetics are poorly understood for this species. Unlike other sea turtle species, most female olive ridleys nest annually. According to the Marine Turtle Specialist Group of the IUCN, there has been a 50 percent decline in olive ridleys worldwide since the 1960s, although that have recently been substantial increases at some nesting sites (NMFS and USFWS 2007b and 2014).

4.3. Loggerhead Turtle, North Pacific DPS

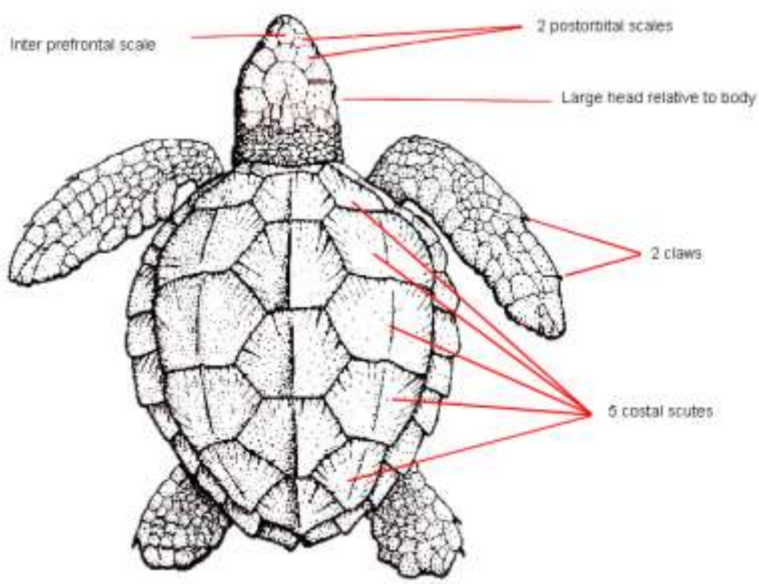
Information in this section is summarized from the 2009 Status Review (Conant et al. 2009) the 2011 Loggerhead DPS listing, and biological opinions previously completed by NMFS (NMFS

2014b, 2016) and other sources as described below. NMFS designated critical habitat for the Northwest Atlantic Ocean DPS of loggerheads (NMFS 2014c), but did not designate critical habitat for the North Pacific DPS.

4.3.1. *Taxonomy and Species Description*

The loggerhead sea turtle (*Caretta caretta,* loggerhead) belongs to the family Cheloniidae. The loggerhead was first described by Linnaeus in 1758 and named *Testudo caretta*. Over the next two centuries more than 35 names were applied to the species (Dodd 1988), but there is now general agreement on *Caretta caretta* as the valid name. Thorough synonymies and taxonomic reviews of this form are given most recently by Pritchard and Trebbau (1984) and Dodd (1988). Subspecies assignments are not supported based on genetic evidence (Bowen 2003)

Loggerheads can be distinguished by their relatively large head and beak compared to other hard-shelled turtles (Figure 6), and the carapace of adult and juvenile loggerheads is reddish-brown. Mean straight carapace length (SCL) of nesting females in Japan ranged from 83.2 to 85.6 centimeters (Kamezaki et al. 2003) and an average weight of about 200 pounds (91 kg).



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The life history of loggerheads, at least in the Atlantic population, has been more thoroughly investigated than any other sea turtle, including the early life stages of the species (Bolton 2003).. As summarized in the Recovery Plan for the Northwest Atlantic Population of the Loggerhead Sea Turtle (NMFS and USFWS 2008), loggerheads have a complex life history that encompasses terrestrial, nearshore, and open ocean habitats (Table 2). The life history of the Pacific population has not been as completely described as the Atlantic population (NMFS and

USFWS 1998, 2008, 2009). However due to their likely similarity, the known Atlantic life history is described below to inform our incomplete understanding of the Pacific population.

Table 2. Typical values of life history parameters for loggerheads nesting in the U.S. (NMFS and USFWS 2008).

Life History Parameter	**Data**
Clutch size	100-126 eggs
Egg incubation duration (varies depending on time of year and latitude)	42-75 days
Pivotal temperature (incubation temperature that produces an equal number of males and females)	29.0˚C
Nest productivity (emerged hatchlings/total eggs) x 100 (varies depending on site specific factors)	45-70%
Clutch frequency (number of nests/female/season)	3-5.5 nests
Internesting interval (number of days between successive nests within a season)	12-15 days
Juvenile (<87 cm CCL) sex ratio	65-70% female
Remigration interval (number of years between successive nesting migrations)	2.5-3.7 years
Nesting season	late April-early September
Hatching season	late June-early November
Age at sexual maturity	32-35 years
Life span	>57 years

There are three basic ecosystems in which loggerheads live:

1. Terrestrial zone (supralittoral) - the nesting beach where both oviposition (egg laying) and embryonic development and hatching occur.
2. Neritic zone - the nearshore marine environment (from the surface to the sea floor) where water depths do not exceed 200 meters. The neritic zone generally includes the continental shelf, but in areas where the continental shelf is very narrow or nonexistent, the neritic zone conventionally extends to areas where water depths are less than 200 meters.

Within the neritic zone or oceanic zone (Bolten 2003, Lalli and Parsons 1997):

1. Organisms are pelagic if they occupy the water column, but not the sea floor. Organisms are epipelagic if they occupy the upper 200 meters in the oceanic zone.
2. Organisms are described as benthic or demersal when on the sea floor . reviews this terminology with respect to sea turtle life history; see) for review of basic oceanographic terminology.

Bolten (2003) describes the generalized life history of loggerheads as the oceanic-neritic developmental pattern (Figure 7). This pattern is characterized by early development in the neritic zone (Bolten 2003).

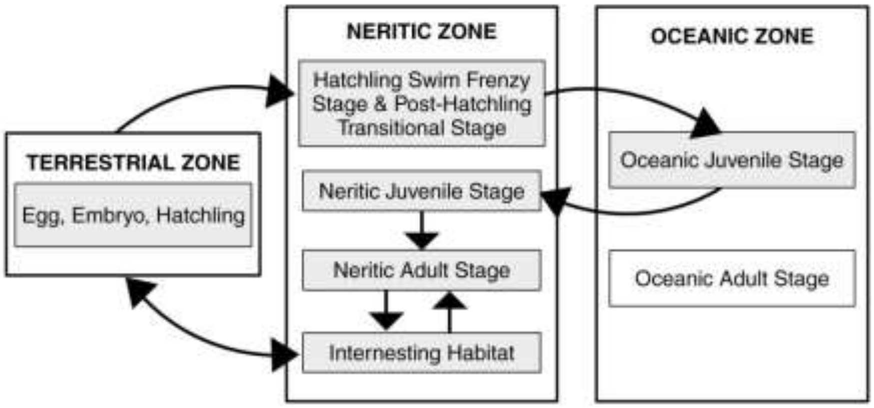

Figure 7. The oceanic-neritic developmental pattern of loggerhead sea turtles (Bolton 2003).

Egg to Hatchling Stage

Loggerheads nest on ocean beaches and occasionally on estuarine shorelines with suitable sand. Loggerhead hatchlings pip and escape from their eggs over a 1- to 3-day interval and move upward and out of the nest over a 2- to 4-day interval (Christens 1990). The time from pipping to emergence ranges from 4 to 7 days with an average of 4.1 days (Godfrey and Mrosovsky 1997). Hatchlings emerge from their nests en masse almost exclusively at night, and presumably using decreasing sand temperature as a cue (Witherington et al. 1990, Moran et al. 1999).

Hatchlings use a progression of orientation cues to guide their movement from the nest to the marine environments where they spend their early years (Lohmann and Lohmann 2003), particularly light cues to find the ocean (Daniel and Smith 1947, Limpus 1971, Salmon et al. 1992, Witherington 1997, Witherington and Martin 1996, Stewart and Wyneken 2004).

Swim Frenzy

Immediately after hatchlings emerge from the nest, they begin a period of frenzied activity. During this active period, hatchlings move from their nest to the surf, swim and are swept through the surf zone, and continue swimming away from land for approximately 20 to 30 hours (Carr and Ogren 1960; Carr 1962, 1982; Wyneken and Salmon 1992; Witherington 1995). In addition to swimming, hatchlings may stop briefly to move within the floating seaweeds in the genus *Sargassum* located in their path (Witherington and Salmon 1992, Witherington 1995). Hatchlings swimming from land rely on an approximately 5-day store of energy and nutrients within their retained yolk sac (Kraemer and Bennett 1981).

Post-hatchling Transition

Neonate loggerheads that have migrated away from land differ from swim frenzy stage hatchlings in that they are infrequently low-energy swimmers and they have begun to feed, no longer relying on their retained yolk (Witherington 2002). As post-hatchlings, loggerheads are pelagic and are best known from neritic waters along the continental shelf. This neritic posthatchling stage is weeks or months long (Witherington 2002) and may be a transition to the oceanic stage that loggerheads enter as they grow and are carried within ocean currents (Bolten 2003).

Post-hatchling loggerheads inhabit areas where surface waters converge to form local downwellings (Witherington 2002). These areas are characterized by linear accumulations of floating material, especially *Sargassum*, and are common between the Gulf Stream and the southeast U.S. coast, and between the Loop Current and the Florida coast in the Gulf of Mexico. Post-hatchlings within this habitat are observed to be low-energy float-and-wait foragers that feed on a wide variety of floating items (Witherington 2002). Witherington (2002) found that small animals commonly associated with the *Sargassum* community, such as hydroids and copepods, were most commonly found in esophageal lavage samples. As post-hatchlings, loggerheads may linger for months in waters just off the nesting beach or become transported by ocean currents within the Gulf of Mexico and North Atlantic.

Juveniles

The oceanic stage begins when loggerheads enter the oceanic zone and, in the North Atlantic, has been primarily studied in the waters around the Azores and Madeira (Bolten 2003). Turtle movements in this stage are both active and passive relative to surface and subsurface oceanic currents and winds. In the vicinity of seamounts, oceanic banks or ridges that come close to the surface, or around oceanic islands, loggerheads may become epibenthic/demersal by feeding or spending time on the bottom, and may exhibit long periods of residency in areas with optimal habitat (Bolten 2003).

The size distribution of oceanic-stage loggerheads in the Atlantic ranges between 8.5 and 64 cm curved carapace length (Bolten 2003, NMFS and USFWS 2008). Analyses by Bjorndal et al. (2000 and 2003a) estimate the duration of this stage to be 7-11.5 years in the Atlantic. Similar data are not available for Pacific populations, but incidental catches of juvenile loggerheads in the Central Pacific have ranged between 12-74 cm carapace length, and ages have been estimated at 10 years and older (NMFS and USFWS 1998).

Juveniles transition from the oceanic stage to neritic stage, possibly due to changes in morphology and feeding behavior (Kamezaki and Matsui 1997). These changes may occur in regions where major oceanic current approach or enter the neritic zone (NMFS and USFWS 2008) and may be of variable duration (Bjorndal et al. 2000, 2001) and may suggest that a transitional stage occurs between the oceanic and neritic stages during which turtles may enter and leave the zones in the Atlantic (Laurent et al. 1998, Eckert and Martins 1989, Tiwari et al. 2002, McClellan and Read 2007, Witzell 2002, Bolten 2003). Juvenile loggerheads continue to mature into adults in the neritic foraging areas, focusing on benthic invertebrates for their primary food items (Burke *et al*. 1993, Youngkin 2001, Seney and Musick 2003). Estimates for the duration of this neritic juveniles stage range from 13-24 (Bjorndal et al. 2001, Heppell et al. 2003b).

Adult Stage

Loggerhead adults inhabit both neritic and oceanic habitats. In the Atlantic, habitat preferences of non-nesting adult loggerheads in the neritic zone differ from the juvenile stage in that relatively enclosed, shallow water estuarine habitats with limited ocean access are less frequently used (NMFS and USFWS 2008). Based on stable isotope analyses and satellite telemetry, Hatase *et al*. (2002b) demonstrated that some adult female loggerheads nesting in Japan inhabit oceanic habitats rather than neritic habitats. Preliminary results from stable isotope analyses suggest that some loggerheads nesting in Florida may also inhabit oceanic habitats (Reich et al. 2007). In both Japan and Florida, the females inhabiting oceanic habitats were significantly smaller than those in neritic habitats (NMFS and USFWS 2008).

As described in the Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle, the life history of the Pacific population is probably similar to the more fully-described life history of Atlantic loggerheads (NMFS and USFWS 1998). Developmental habitats, especially for small juveniles and to a lesser extent for large juveniles, may be widely separated from rookery sites. Most loggerheads do not recruit to the primary feeding grounds in eastern Australia until they reach 70 cm CCL (Limpus and Reimer 1992). Intermediate sizes are known to occur in large numbers in the waters of Baja California, Mexico, and occasionally as far south as Chile; however, no nesting occurs in the eastern Pacific. One explanation is that west Pacific hatchlings are entrained in the central ocean gyre, and ultimately drift south with the California Current to Mexico.

4.3.2. *Listing Status*

The USFWS and NMFS determined that the loggerhead sea turtle is composed of nine distinct population segments (DPS) that make up the species and that each DPS may be listed as threatened or endangered under the ESA. The North Pacific Ocean DPS occurs in the action area and is likely to be affected by the proposed action. This DPS is listed as endangered (NMFS and USFWS 2011).

The nine DPSs of loggerhead sea turtles distributed globally and their status (Figure 8):

1. North Pacific Ocean DPS – endangered
2. South Pacific Ocean DPS - endangered
3. North Indian Ocean DPS - endangered
4. Southeast Indo-Pacific Ocean DPS - endangered
5. Southwest Indian Ocean DPS - threatened
6. Northwest Atlantic Ocean DPS - endangered
7. Northeast Atlantic Ocean DPS - endangered

8. Mediterranean Sea DPS - endangered
9. South Atlantic Ocean DPS – threatened

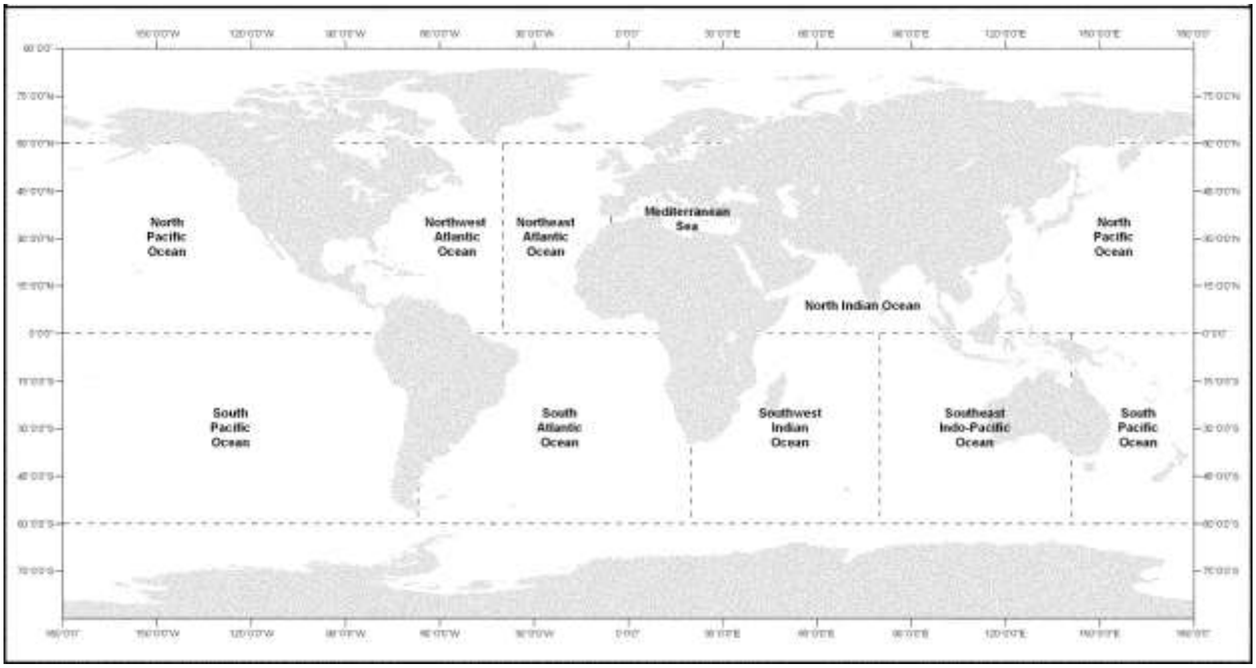

Figure 8. Map of the nine distinct population segments of loggerhead sea turtles (NMFS and USFWS 2011).

To detect trends in the population, a population viability analysis (PVA) was conducted; one used a classical model and the other used a climate based model (Van Houtan 2011). The classical PVA projected increases in the population over the next 100 years whereas the climate based model forecasted a decline in the population (Van Houtan 2011). The climate based PVA was limited to 25 years due to the inability to predict environmental conditions beyond 25 years.

4.3.3. *Historic and Current Distribution*

Loggerheads are circumglobal and widely distributed within its range, inhabiting continental shelves, bays, estuaries, and lagoons in temperate, subtropical, and tropical waters (Figure 9). It may be found hundreds of miles out to sea, as well as in inshore areas such as bays, lagoons, salt marshes, creeks, ship channels, and the mouths of large rivers. Coral reefs, rocky places, and ship wrecks are often used as feeding areas. Major nesting grounds are generally located in temperate and subtropical regions, with scattered nesting in the tropics. Natal homing of female loggerheads to nesting beaches maintains regional population structure.

Juvenile loggerheads originating from nesting beaches in the western Pacific Ocean appear to use oceanic developmental habitats and move with the predominant ocean gyres for several years before returning to their neritic foraging habitats (Pitman 1990; Bowen et al. 1995; Musick and Limpus 1997). The actual duration of the juvenile stage varies with loggerheads leaving the oceanic zone over a wide size range. Snover (2002) suggested the species maintains a long oceanic juvenile stage duration for Northwest Atlantic loggerheads with a range of 9–24 years and a mean of 14.8 years over similar size classes. Adults may also periodically move between neritic and oceanic zones (Harrison and Bjorndal 2006).

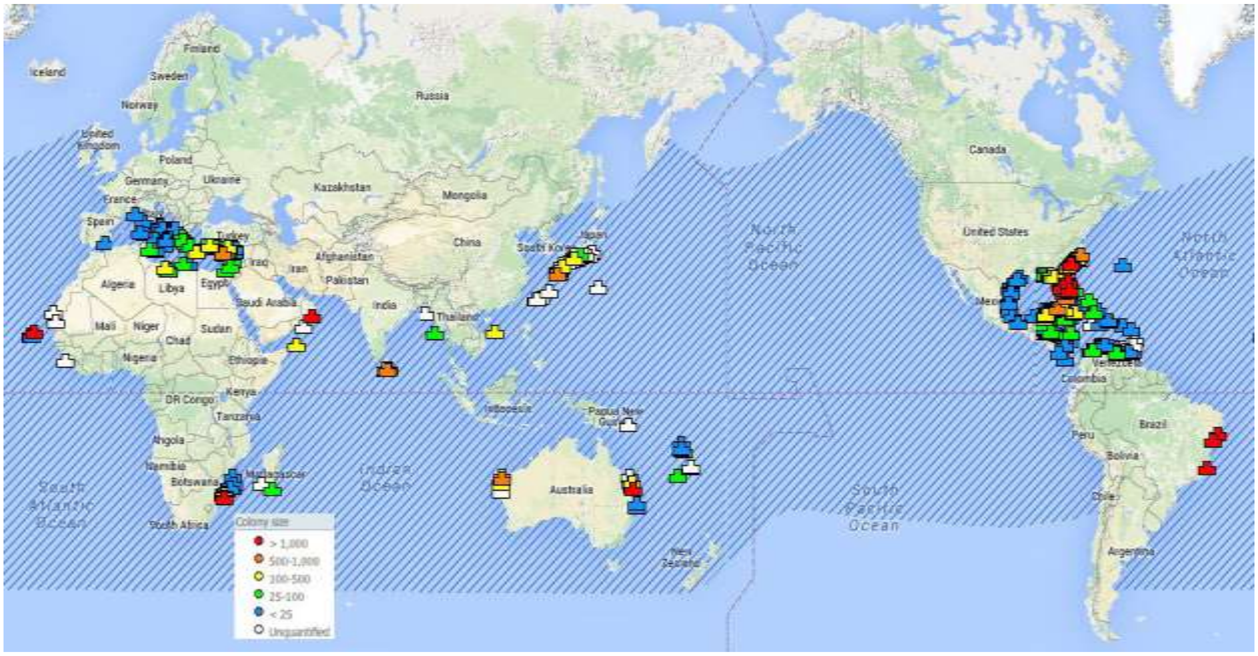

Figure 9. Range and nesting locations of loggerhead sea turtles turtles (Data provided by the SWOT Team and hosted on OBIS-SEAMAP. Oceanic Society, IUCN Marine Turtle Specialist Group (MTSG), and Marine Geospatial Ecology Lab, Duke University.. Wallace et al. 2010 , Kot et al. 2016, Halpin et al. 2009. Retrieved from http://seamap.env.duke.edu/swot).

The North Pacific loggerhead DPS nests primarily in Japan (Kamezaki et al. 2003), although low level nesting may occur outside of Japan in areas surrounding the South China Sea (Conant et al. 2009). Nesting beach monitoring in Japan began in the 1950s on some beaches, and grew to encompass all known nesting beaches starting in 1990 (Kamezaki et al. 2003). Along the Japanese coast, nine major nesting beaches (greater than 100 nests per season) and six “submajor” beaches (10–100 nests per season) exist, including Yakushima Island where 40 percent of nesting occurs (Kamezaki et al. 2003).

Tagging studies in the central North Pacific indicate that juvenile loggerheads are shallow divers that forage at depths between 0 and 100 m (0 and 328 ft) (Polovina et al. 2003; Polovina et al. 2004). Analysis of data from 17 juvenile loggerheads equipped with satellite-linked depth recorders foraging within the Kuroshio Extension Bifurcation Region (KEBR) of the North Pacific Transition Zone Chlorophyll Front suggest turtles may spend more than 80 percent of their time at depths less than 5 m (16.4 ft), and more than 90 percent of their time at depths less than 15 m (49.2 ft) (Howell et al. 2010). Diet analysis of 52 loggerhead sea turtles collected as bycatch from 1990 to 1992 in the high-seas driftnet fisheries demonstrated that these turtles fed predominately at the surface (Parker et al. 2005).

4.3.4. *Habitat Description*

Distribution

As described in section "4.3.1 Taxonomy and Species Description," loggerheads inhabit neritic and oceanic habitats depending on their life stage.

Loggerheads can be found throughout tropical to temperate waters in the Pacific. Turtles in the central North Pacific appeared to show synchronous latitudinal movements with the North Pacific Subtropical Front and the associated seasonal, large-scale oceanography (Polovina et al 2001, Howell et al 2010). However, their breeding grounds include a restricted number of sites in the North Pacific and South Pacific. Within the North Pacific, loggerhead nesting has been documented only in Japan (Kamezaki et al. 2003), although low level nesting may occur outside of Japan in areas surrounding the South China Sea (Chan et al. 2007). In the South Pacific, nesting beaches are restricted to eastern Australia and New Caledonia and, to a much lesser extent, Vanuatu and Tokelau (Limpus and Limpus 2003).

In late 2014, scientists with the NMFS SWFSC discovered 70 young loggerheads 200 to 250 miles off of Southern California (NOAA 2015). The sighting was significant as it was one of the first of small (juvenile) loggerheads and provided insight into the distribution of loggerheads during the "lost years" between the time that turtles are born on beaches in Japan and when they appear foraging off of Baja as young adults. The turtles were found along temperature margins where warm eddies meet colder water resulting in highly productive waters. Water temperatures that produce these conditions may not always occur off of California – the sea surface temperatures had been unusually high in the area for months prior to the sighting. We do not know whether young loggerheads regularly occur near the edge and just beyond the EEZ off California based upon this one sighting. However the sighting has led to additional research and the first tracking of a young loggerhead in May 2015 to monitor its migration through the Pacific (http://www.seaturtle.org/tracking/index.shtml?tag_id=126070).

Foraging Ecology and Diet

Loggerhead feeding habits may differ depending on their life stage (Jones and Seminoff 2013), but all life stages are mostly carnivorous (Bjorndal 1997, Jones and Seminoff 2013), feeding on a variety of Cnidarians, Gastropods, crustaceans (crabs and shrimp), and seagrasses (Tomas et al 2001, Witherington 2002, Bolten 2003, Boyle and Limpus 2008, Casale et al. 2008). Peckham et al (2011) found that neritic loggerheads off the coast of Baja California, Mexico fed mostly on fish and crabs. The fish were likely the discarded remains from the local gillnet fishery (Peckham et al. 2011), and the consumption of fish produced by fisheries gear or discards may be a regionally learned behavior that has been observed in several areas (Tomas et al. 2001, Seney and Musick 2007, Peckham et al. 2011, Jones and Seminoff 2013).

The waters off Baja have been identified as a "hot spot" for loggerhead foraging (Seminoff et al. 2014). Surveying for this study was from the nearshore out to 140 km (about 86 miles) and from about 24º N to 27º N. This area is known to be highly productive due to strong upwelling from April through June, which relaxes during July through October (Wingfield et al. 2011). Using line transect surveys, the authors estimated an average annual abundance of about 43,000 loggerheads (95% C.I. is 15,017 – 100,444). All of the loggerheads observed in the area are juveniles, pre-reproductive age animals. The relative importance of this hotspot compared to other areas is not clear. Studies by Kobayashi et al. (2008) and Van Houten and Hally (2011) suggest that it's insignificant to the North Pacific DPS, while Peckham et al. (2007, 2008) and Koch et al. (2013) identify as a very important area for the majority of the North Pacific DPS.

Breeding Habitat

Loggerheads nest on ocean beaches and occasionally on estuarine shorelines. Although specific characteristics vary between rookeries, loggerhead nesting beaches tend to be wide, sandy beaches backed by low dunes and fronted by a flat, sandy approach from the water (Miller et al. 2003). Nests are typically laid between the high tide line and the dune front (Routa 1968, Witherington 1986, Hailman and Elowson 1992). Sea turtle eggs require a high-humidity substrate that allows for sufficient gas exchange and temperatures conducive to egg development (Miller 1997, Miller et al. 2003).

In the North Pacific, the only major nesting beaches are in the southern part of Japan (Dodd 1988, NMFS and USFWS 2011) (Figure 9). In Japan, loggerheads nest on beaches across 13 degrees of latitude (24°N to 37°N), from the mainland island of Honshu south to the Yaeyama Islands, which appear to be the southernmost extent of loggerhead nesting in the western North Pacific. Researchers have separated 42 beaches into five geographic areas: (1) the Nansei Shoto Archipelago (Satsunan Islands and Ryukyu Islands); (2) Kyushu; (3) Shikoku; (4) the Kii Peninsula (Honshu); and (5) east-central Honshu and nearby islands. There are nine "major nesting beaches" (defined as beaches having at least 100 nests in one season within the last decade) and six "submajor nesting beaches" (defined as beaches having 10-100 nests in at least one season within the last decade), which contain approximately 75 percent of the total clutches deposited by loggerheads in Japan (Kamezaki et al. 2003).

4.3.5. *Threats*

A detailed account of threats to loggerhead sea turtles around the world is provided in the 5-year status review (NMFS and USFWS 2007c) and the 2009 Status Review (Conant et al. 2009). The most significant threats facing loggerheads in the North Pacific include coastal development and bycatch in commercial fisheries. Genetic analyses on female loggerheads nesting in Japan suggest that this DPS is comprised of genetically distinct nesting colonies (Hatase et al. 2002a) with precise natal homing of individual females. As a result, Hatase et al. (2002a) indicate that loss of one of these colonies would decrease the genetic diversity of Japanese loggerheads; recolonization of the site would not be expected on an ecological time scale.

Destruction and alteration of loggerhead nesting habitats are occurring throughout the species' range, especially coastal development, beach armoring, beachfront lighting, and vehicular/ pedestrian traffic. Coastal development includes roads, buildings, seawalls, etc., all of which reduce suitability of nesting beaches for nesting by reducing beach size and restricting beach migration in response to environmental variability. Beach armoring is typically done to protect coastal development from erosion during storms, but armoring blocks turtles from accessing nesting areas and often leads to beach loss (NMFS and USFWS 2007c).

In Japan, where the North Pacific loggerhead DPS nests, many nesting beaches are lined with concrete armoring, causing turtles to nest below the high tide line where most eggs are washed away unless they are moved to higher ground (Matsuzawa 2006). Coastal development also increases artificial lighting, which may disorient emerging hatchlings, causing them to crawl inland towards the lights instead of seaward. In Japan, threats to nesting and nest success include light pollution, poorly managed ecotourism operations, and trampling due to the thriving tourist economy on Yakushima Island, and increasing numbers of beachfront hotels and roadways (Kudo et al. 2003). Overall, the Services have concluded that coastal development and coastal armoring on nesting beaches in Japan are significant threats to the persistence of this DPS (NMFS and USFWS 2011).

Deliberate hunting of loggerheads for their meat, shells, and eggs is reduced from previous levels, but still exists. The North Pacific loggerhead DPS nests almost exclusively in Japan, especially on Yakushima Island. In 1973, a law was enacted on Yakushima Island prohibiting harvest of sea turtle eggs. A similar law was enacted in 1988 encompassing most of the other loggerhead nesting beaches in Japan, resulting in great reductions in egg harvest. The 1973 law may in part explain the increasing number of nesting turtles from 2001 to 2011, given that loggerheads mature in about 25 years (Ohmuta 2006). Predation of eggs also occurs, for example by raccoons and feral animals in Japan (NMFS and USFWS 2007c, and Matsuzawa et al. 2011). While sea turtles have been protected in Mexico since 1990 (Conant et al. 2009), studies have shown that loggerheads continue to be caught, both indirectly in fisheries and by a directed harvest of juvenile turtles (Peckham et al. 2007).

For both juvenile and adult individuals in the ocean, bycatch in commercial fisheries, both coastal and pelagic fisheries (including longline, drift gillnet, set-net, bottom trawling, dredge, and trap net) throughout the species' range is a major threat (Conant et al. 2009). Specifically in the Pacific, bycatch continues to be reported in gillnet and longline fisheries operating in 'hotspot" areas where loggerheads are known to congregate (Peckham et al. 2007). Interactions and mortality with coastal and artisanal fisheries in Mexico and the Asian region likely represent the most serious threats to North Pacific loggerheads (Peckham et al. 2007; Ishihara et al. 2009; Conant et al. 2009). More work is necessary to understand and quantify the impact of these Baja fisheries and to develop measures to reduce bycatch mortality. Between 2003 and 2010, annual stranding surveys to assess mortality have documented 3,096 dead loggerhead turtles (with a mean of 420 ± 274/yr) along a 45-km stretch of beach of Playa San Lazaro in Baja California SUR, Mexico (Peckham 2010).

Preliminary research of coastal pound net fisheries in Japan also suggests high mortality of loggerheads and that these fisheries may pose a major threat to mature stage classes of loggerheads due to pound net operations offshore of nesting beaches in coastal foraging areas (Ishihara et al. 2009). Pound nets in Japan operate nearshore in depths up to 100 m and range in size measuring up to 10,000 m3. Nets consist of a leader set perpendicular to the coast that directs fish into standing nets that entrain fish into an enclosed trap mounted either at the surface or midwater. Fish are retrieved at regular intervals (usually daily) from pound nets, enabling live release of turtles and other bycatch from surface traps. However, pound nets with midwater traps prevent sea turtles from reaching the surface to breathe and thus can result in high mortality rates. Hence coastal pound net fisheries off Japan may pose a significant threat to the North Pacific DPS population (Conant et al. 2009).

The shallow set longline component of the HI based longline fishery was closed in 2001 and re-opened in 2004 with mandatory measures to reduce sea turtle bycatch, particularly loggerheads. In 2012, NMFS issued a biological opinion on the shallow-set fishery which anticipates up to 34 interactions with 7 mortalities, per year. Observer records indicate that loggerheads are more susceptible to being taken in the shallow set longline fishery than the deep-set longline fishery. The results of changing fishing techniques in the shallow-set longline fishery, i.e., much lower annual mortalities, are encouraging and many other countries have begun to adopt these or similar measures to reduce sea turtle bycatch.

As mentioned in the leatherback threats section, marine debris, including debris resulting from the 2011 earthquake and tsunami that took place off Japan, threatens the North Pacific DPS of loggerheads through ingestion and entanglement.

Global Climate and Ecological Change

Based upon available information, it is likely that loggerhead sea turtles are being affected by climate change. Matsuzawa et al. (2002) found that the Minabe Senri Beach pre-emergence hatchlings suffered from heat related mortality and concluded that even small changes in temperature could affect loggerhead nest success. Among sea turtle species, warmer nest temperatures produce females, while cooler temperatures in the nest chamber result in males. Hansen et al. (1998) reported that loggerheads nests in the U.S. Atlantic coast have a skewed sex ratio, with high numbers of females produced. As global temperatures rise and sand temperatures rise, it is reasonable to assume that more females will be produced, thus skewing the natural sex ratio of hatchling cohorts to a larger proportion of females. Another effect of climate change on nesting beaches is sea level rise which will likely cause inundation of nesting beaches. On beaches that have not been altered, it is reasonable that turtles could nest higher on the beaches if necessary. However, many loggerhead nesting sites, particularly North Pacific loggerheads that nest in Japan, have been extensively modified and armored (e.g., seawalls) and thus have limited areas for loggerheads to move to in order to nest.

Chaloupka et al. (2008) examined 51 years of nesting numbers in the Pacific along with sea surface temperatures in four key foraging areas used by turtles at these nesting sites. They found that SSTs in the core foraging areas were increasing and that there was a relationship between SSTs and nesting success. In years with higher than normal SST, the number of females that nested was lower than normal. Conversely, in years with lower than normal SSTs, nesting numbers were higher than normal the following year.

Recent efforts have examined potential relationships between significant climate and environmental variables and influences on turtle populations. Van Houtan and Halley (2011) identified correlations between loggerhead nesting patterns and two strong environmental influences: sea surface temperature and the Pacific Decadal Oscillation index of ocean circulation. Relating environmental variance into population dynamics will be an important step in trying to understand the fate of marine species such as sea turtles. However, it is not possible to reliably predict the magnitude of future climate change and the impacts on loggerhead sea turtles. The existing data and current scientific methods and analysis are not able to predict the future effects of climate change on this species or allow us to predict or quantify this threat to the species (Hawkes et al. 2009).

4.3.6. *Recovery Plan Delisting Criteria*

To consider de-listing loggerheads, all of the following criteria must be met (NMFS and USFWS 1998c, 2008):

1. To the best extent possible, reduce the take in international waters (have and enforce agreements).
2. All regional stocks that use U.S. waters have been identified to source beaches based on reasonable geographic parameters.
3. All females estimated to nest annually (FENA) at "source beaches" are either stable or increasing for over 25 years.
4. Each stock must average 5,000 FENA (or a biologically reasonable estimate based on the goal of maintaining a stable population in perpetuity) over six years.
5. Existing foraging areas are maintained as healthy environments.
6. Foraging populations are exhibiting statistically significant increases at several key foraging grounds within each stock region.
7. All Priority #1 tasks have been implemented.
8. A management plan designed to maintain stable or increasing populations of turtles is in place.
9. Ensure formal cooperative relationship with regional sea turtle management programs (SPREP).
10. International agreements are in place to protect shared stocks (e.g., Mexico and Japan).

4.3.7. *Recovery Actions*

Considerable effort has been made to document and address loggerhead bycatch in fisheries around the world. The development of solutions to reduce or mitigate capture, such as the use of circle hooks in longline fisheries and turtle exclusion devices (TEDs) in trawl fisheries, and the use of time-area closures when turtles are known to aggregate, have proven to be effective (NMFS and USFWS 2007c). Conservation and recovery efforts are either ongoing or in development across many different international, regional, and other agreements or conventions across the globe. Recent conservation efforts in the Pacific are detailed in the 2009 Status review (Conant et al. 2009) and summarized below.

While conservation efforts for the North Pacific Ocean loggerhead DPS are substantive and improving and may be reflected in the recent increases in the number of nesting females, they still remain inadequate to ensure the long-term viability of the population. For example, while most of the major nesting beaches are monitored, some of the management measures in place are inadequate and may be inappropriate. On some beaches, hatchling releases are coordinated with the tourist industry or nests are being trampled on or unprotected. The largest threat on the nesting beach, reduced availability of habitat due to heavy beach armament and subsequent erosion, is just beginning to be addressed, but without immediate attention, may ultimately result in the demise of the highest density beaches.

Efforts to reduce loggerhead bycatch in known coastal fisheries off Baja California, Mexico and Japan is encouraging, but concerns remain regarding the mortalities of adults and subadults in mid-water pound nets and the high costs that may be involved in replacing and/or mitigating this gear. With these coastal fishery threats still emerging, there has not yet been sufficient time – or a nation-wide understanding of the threat – to develop appropriate conservation strategies or work to fully engage with the Government of Japan.

Greater international cooperation and implementation of the use of circle hooks in longline fisheries operating in the North Pacific Ocean is necessary, as well as understanding fishery related impacts in the South China Seas. Further, it is suspected that there are substantial impacts from illegal, unreported, and unregulated fishing, which NMFS has the authority to address under the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1801). While conservation projects for this population have been in place since 2004 for some important areas, efforts in other areas are still being developed to address major threats, including fisheries bycatch and long-term nesting habitat protection.

4.3.8. *Population*

Census data from 12 of these 15 beaches provide composite information on longer-term trends in the Japanese nesting assemblage. As a result, Kamezaki et al. (2003) concluded a substantial decline (50–90%) in the size of the annual loggerhead nesting population in Japan since the 1950s. As discussed in the 2011 final ESA listing determination, current nesting in Japan represents a fraction of historical nesting levels (Conant et al. 2009; 76 FR 58868).

Nesting declined steeply from an initial peak of approximately 6,638 nests in 1990–1991, to a low of 2,064 nests in 1997. During the past decade, nesting increased gradually to 5,167 nests in 2005 (Conant et al. 2009), declined and then rose again to 11,082 nests in 2008, and then 7,495 and 10,121 nests in 2009 and 2010, respectively (STAJ 2008, 2009, 2010). The most recent nesting numbers, from 2013, reflect a steady increase up to 15,396 nests (Y. Matsuzawa, pers. comm. 2014 in NMFS 2014b). For the period 1990-2013, the number of annual nests in the North Pacific ranged from 2,064 to 15,396. Van Houtan (2011) assumed a clutch frequency of four nests per females and estimated that 516 to 3,849 females nest annually in the North Pacific. This yields an estimated total adult female population of 6,673 (Van Houtan 2011).

4.4. Leatherback Sea Turtle

Information in this section is summarized from the 2013 Status Review (NMFS and USFWS 2013a), the 5-year status review (NMFS and USFWS 2007c), biological opinions previously completed by NMFS (NMFS 2014b, 2016), the 2012 designation of critical habitat in the West Coast EEZ (NMFS and UFSWS 2016) and other sources cited below. The 2013 status review concluded with a set of recommendations including a review of available information to determine the application of the DPS policy to leatherbacks, review and update recovery plans, research on nesting and in-water populations and demographics, and support for federal grant programs.

4.4.1. *Taxonomy and Species Description*

Leatherback turtles (Figure 10) are the largest of the marine turtles, with an adult curved carapace length (CCL) of about 2 m (6.5 feet) in length (Eckert et al. 2012), front flippers that are proportionately larger than in other sea turtles and may span 270 cm (8.9 feet) in an adult (NMFS and USFWS 2013a), and can weigh up to 900 kg (2,000 lbs). The leatherback is morphologically and physiologically distinct from other sea turtles and easily identifiable on land and at sea. It is the only sea turtle that does not have a hard, bony carapace, but instead has a thick, leathery shell with lengthwise ridges or keels.

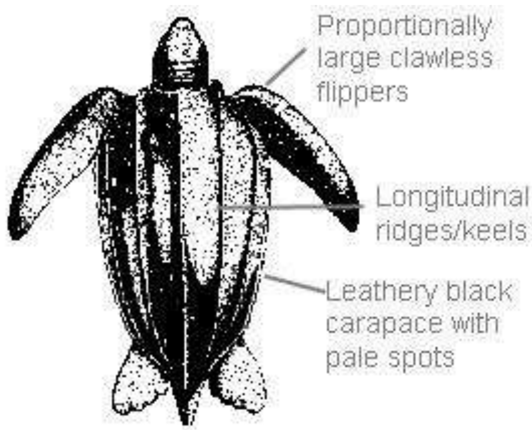

Figure 10. . Some of the distinguishing characteristics of the leatherback sea turtle, *Dermochelys coriacea* (Drawing credit - NOAA, Jack Javech).

Leatherback turtles have the most extensive range of any living reptile and have been reported circumglobally from 71°N to 47°S latitude in the pelagic and neritic Pacific and in all other major pelagic ocean habitats (Figure 11) (NMFS and USFWS 1998d). For this reason, however, studies of their abundance, life history and ecology, and pelagic distribution are exceedingly difficult. Leatherback turtles lead a completely pelagic existence, foraging widely in temperate and tropical waters except during the nesting season, when gravid females return to tropical beaches to lay eggs.

Leatherbacks are highly migratory, exploiting convergence zones and upwelling areas for foraging in the open ocean, along continental margins, and in archipelagic waters (Morreale et al. 1994; Eckert 1998, 2002; Benson et al. 2007, 2011). Satellite telemetry studies have documented transoceanic migrations between nesting beaches and foraging areas in the Atlantic and Pacific Ocean basins (Ferraroli et al. 2004; Hays et al. 2004; James et al. 2005; Eckert 2006; Eckert et al. 2006; Benson et al. 2007a; Benson et al. 2011). In a single year, a leatherback may swim more than 10,000 kilometers (Eckert 1998). In the Pacific, leatherbacks nesting in Central America and Mexico migrate thousands of miles into tropical and temperate waters of the South Pacific (Eckert and Sarti 1997; Shillinger et al. 2008).

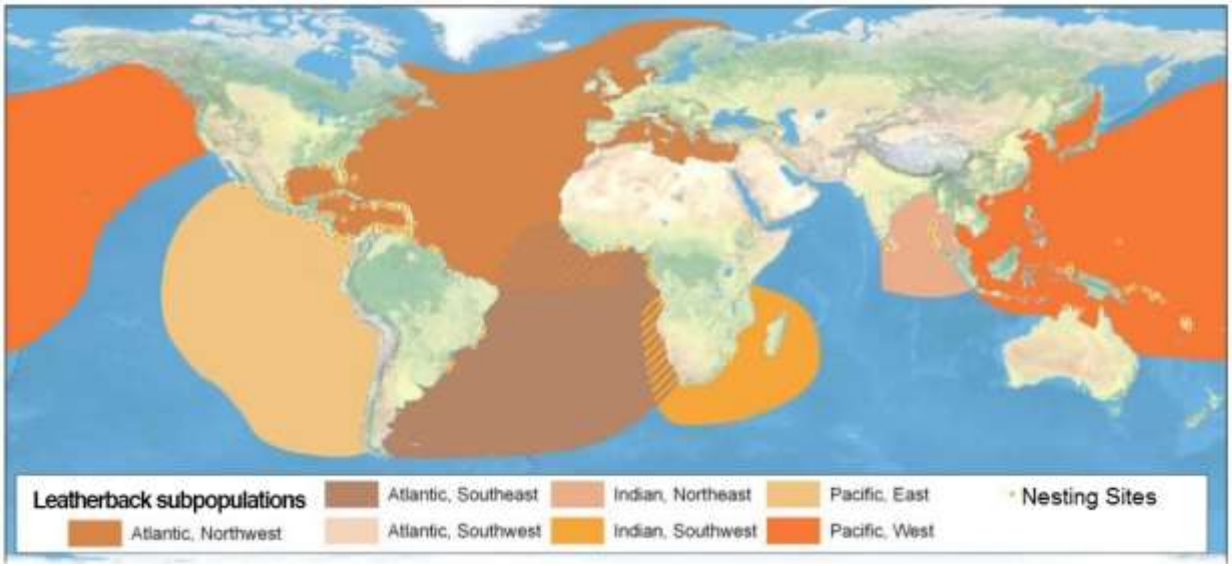

Figure 11. Distribution of leatherback sea turtles and their subpopulations (Wallace et al. 2013).

After nesting, females from the Western Pacific nesting beaches make long-distance migrations into the a variety of foraging areas including the central and eastern North Pacific, westward to the Sulawasi and Sulu and South China Seas, or northward to the Sea of Japan (Benson et al. 2007a; Benson et al. 2011). Satellite tagging studies of leatherbacks from the western Pacific nesting population indicate that these turtles nest during different times of the year and have different migration patterns. Summer nesting turtles (July through September) have been tracked traveling to tropical and temperate northern hemisphere foraging regions including Malaysia, the Philippines, Japan and throughout the Pacific to temperate waters of the west coast of North America; inter nesters (November through February) traverse to tropical waters and temperate regions of the southern hemisphere (Benson et al. 2011).

In the Pacific Ocean, genetic studies have identified three distinct populations (Wallace et al. 2010) of leatherback turtles: (1) Mexico and Costa Rica, which are genetically homogenous but distinct from the western populations; (2) Papua Barat in Indonesia, Papua New Guinea, Solomon Islands, and Vanuatu, which comprise a metapopulation representing a single genetic stock; and (3) Malaysia (Barragan *et al*. 1998; Barragan and Dutton 2000; Dutton 2006a, 2006b; Dutton et al. 1999, 2000, 2007). The genetically distinct Malaysia nesting population likely is extirpated (Chan and Liew 1996; Dutton 2006a; Dutton et al. 1999).

Little is known about the early life history of leatherbacks from hatchling to adulthood. However, new technologies have been developed to elucidate hatchling dispersal. Passive drifter models have been used to predict the trajectories of hatchlings offshore (e.g., Gaspar et al. 2012; Hamann et al. 2011; Shillinger et al. 2012). Passive drifter model predictions, combined with analysis of sighting, genetic, bycatch and satellite tracking information, indicate hatchlings emerge from nesting beaches in Jamursba-Medi, Indonesia, and Kamiali, Papua New Guinea, and are entrained by highly variable oceanic currents into the North Pacific, South Pacific, or Indian Oceans (Gaspar et al. 2012).

After 1 to 2 years, these currents may take small juveniles into temperate regions where water temperatures in winter drop well below the minimum temperature likely tolerated by such small individuals. Eckert (2002) summarized the records of nearly 100 sightings of juvenile leatherbacks and found that animals less than 100 cm curved carapace length (CCL) are generally found in water warmer than 26˚C indicating that the first part of a leatherback's life is spent in tropical waters. Gaspar et al. (2012) hypothesize that after an initial period of mostly passive drift, juveniles begin to actively swim towards warmer latitudes before winter and back again towards higher latitudes during spring. This simulated migration pattern is used by adult leatherbacks from Jamursba-Medi and Kamiali (Gaspar et al. 2012). Scientists have theorized that an adult's choice of migration patterns are influenced by the currents they experienced as a hatchling—known as the "hatchling drift scenario" (reviewed by Saba 2013).

Other technologies are being developed and tested to track leatherback hatchlings. Gearheart et al. (2011) tracked hatchlings departing beaches of Papua's Bird's Head Peninsula, Indonesia, using both acoustic and VHF radio tags and found the acoustic tags performed better than the VHF tags, which had poor directionality. Thums et al. (2013) used active and passive acoustic monitoring of flatback sea turtle (*Natator depressus*) hatchlings, which they felt showed great potential as a means to understand the in-water behavior of sea turtle hatchlings.

Migratory routes of leatherback turtles originating from eastern and western Pacific nesting beaches are not entirely known for the entire Pacific population; however, satellite tracking of post-nesting females and foraging males and females, as well as genetic analyses of leatherback turtles caught in U.S. Pacific fisheries or stranded on the West Coast of the U.S. indicate that the leatherbacks found off the U.S. West Coast are from the western Pacific nesting populations, specifically boreal summer nesters. Given the relative size of the nesting populations, it is likely that the animals will be from the Jamursba-Medi nesting beaches, although some may come from the comparatively small number of summer nesters at Wermon in Papua Barat, Indonesia.

Understanding where hatchlings disperse and grow and how it influences their adult migration strategies (e.g., why do females from the western Pacific Ocean make transoceanic journeys to feed in highly productive areas off California while more approximate nesting females from Costa Rica ignore it?) is an essential component to recovering the species.

4.4.2. *Listing Status*

The leatherback sea turtle was listed as endangered throughout its range on June 2, 1970 (USFWS 1970). As described previously, the USFWS has jurisdiction over sea turtles on the land and NMFS has jurisdiction over sea turtles in the marine environment. The USFWS initially designated critical habitat for leatherbacks on September 26, 1978 (USFWS 1978). This critical habitat area consists of a strip of land 0.2 miles (0.32 kilometers) wide (from mean high tide inland) at Sandy Point Beach on the western end of the island of St. Croix in the U.S. Virgin Islands. On March 23, 1979, NMFS designated the marine waters adjacent to Sandy Point Beach as critical habitat (NMFS 1979). Critical habitat was revised in 2012 to include areas in the Pacific Ocean off the coast of California, Oregon, and Washington (Figure 12) (NMFS and USFWS 2012).

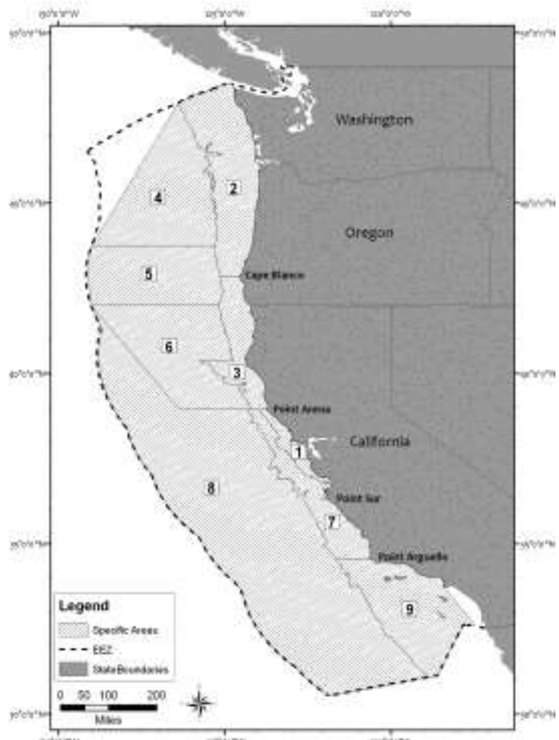

Figure 12. Critical habitat for the leatherback sea turtle in the Pacific Ocean (NMFS and USFWS 2012).

4.4.3. *Historic and Current Distribution*

As previously mentioned, the leatherback sea turtle is globally distributed. Leatherbacks range from ~ 71° N to 47° S, and they nest from 38° N to 34° S latitude, depending on the ocean basin (Eckert et al. 2012). In the Pacific Ocean, leatherback distribution extends from the waters of British Columbia (McAlpine et al. 2004, 2007; Spaven et al. 2009) and the Gulf of Alaska (Hodge and Wing 2000) to the waters of Chile and New Zealand.

Leatherbacks nest on beaches in the tropics and sub-tropics and forage into higher-latitude subpolar waters. The species nests in three main regions of the world: the Pacific, Atlantic (including the Caribbean Sea), and Indian Oceans. Leatherbacks also occur in the Mediterranean Sea, although they are not known to nest there.

The main regional areas may further be divided into nesting populations. In the Pacific, leatherback nesting aggregations are found in the eastern and western Pacific. In the eastern Pacific, major nesting sites are located in Mexico, Costa Rica, and Nicaragua. Nesting in the western Pacific occurs at numerous beaches in Indonesia, the Solomon Islands, Papua New Guinea, and Vanuatu, with a few nesters reported in Malaysia and only occasional reports of nesting in Thailand and Australia (Eckert et al. 2012). In the Atlantic Ocean, leatherbacks are divided into seven groups or nesting populations that are genetically distinct: Florida, Northern Caribbean, Western Caribbean, Southern Caribbean/Guianas, West Africa, South Africa, and Brazil (Turtle Expert Working Group 2007). In the Indian Ocean, leatherback nesting aggregations are reported in the Andaman and Nicobar Islands, India, Sri Lanka, and South Africa.

4.4.4. *Habitat Description*

Distribution

Adult leatherbacks migrate greater distances than adult sea turtles from the family Cheloniidae (Hays and Scott 2013), sometimes travelling up to 11,000 km from their breeding areas (Benson et al. 2011). Leatherbacks possess extraordinary navigational skills and are able to travel great distances and return to their breeding and nesting sites after several years away. The actual navigational mechanisms are not known but several factors may underlie a sea turtle's ability to navigate, including magnetic inclination (Luschi 2013).

Migration patterns differ by region, driven by local oceanographic process, and multiple migration strategies exist within breeding populations. In the eastern Pacific Ocean, studies show that females primarily migrate southward to the southern hemisphere into the South Pacific Gyre in pelagic waters off Peru and Chile (Donoso *et al*. 2000; Dutton 2006a; Shillinger et al. 2008, 2010, 2011). Bycatch data in Peruvian coastal artisanal fisheries indicate leatherbacks are present in coastal areas (Alfaro-Shigueto et al. 2007, 2011). Genetic work has also shown that leatherbacks from the eastern Pacific populations, as well as western Pacific populations, are recorded in the North Pacific Ocean (Dutton *et al*. 1998, 2000, 2002, 2006; Dutton 2006a).

Foraging Ecology and Diet

Leatherbacks feed primarily on gelatinous zooplankton from juveniles through adults (Salmon et al. 2004, Iverson and Yoshida 1956, Bjorndal 1997, Jones and Seminoff 2013) based on direct observations and examination of stomach contents of individuals incidentally caught in fisheries (summarized in Bjorndal 1997, Jones and Seminoff 2013). The diet consists largely of Cnidarians, primarily varieties of jellyfish (Bleakney1965, Hartog and van Nierop 1984, Bjorndal 1997, Jones and Seminoff 2013) with occasional or incidental records of other prey items such as ctenophores, pyrosomes, and gelatinous fish egg sacs (Jones and Seminoff 2013).

Adult leatherbacks feeding in the highly productive areas of the western Atlantic Ocean are estimated to consume 73% of their body mass daily to meet their energetic demands (Heaslip et al. 2012); whereas, in the Pacific Ocean, they consume 26% of their body mass daily (Jones et al. 2012).

Breeding Habitat

During the nesting season, females generally stay within 100 km of the nesting beach but also undergo long distances between nesting events, traveling up to 4,500 km during the entire nesting season (reviewed by Eckert et al. 2012). Internesting movements have been described from several nesting beaches (Almeida et al. 2011; Benson et al. 2007, 2011; Billes et al. 2006; Eckert 2006; Eckert et al. 1996; Eguchi et al. 2006; Fosette et al. 2006, 2009; Fulton et al. 2006; Hitipeuw et al. 2007; Meylan et al. 2013; Myers and Hays 2006; Reina et al. 2005; Shillinger et al. 2006, 2010; Wallace et al. 2005; Witt et al. 2008). For example, females from nesting beaches in Brazil dispersed up to 160 km from the nesting beach using an area of 4,400 km2. Foraging areas were identified in waters off Brazil, Uruguay, and Argentina (Almeida et al. 2011). In the western Pacific Ocean population, leatherbacks generally stayed within 300 km or less from nesting beaches in Indonesia (Jamursba-Medi, Wermon, Papua Barat), Papua New Guinea, and the Solomon Islands (Benson et al. 2011).

4.4.5. *Threats*

Threats to leatherbacks are detailed in the recent 5-year status review (NMFS and USFWS 2013a). The primary threats identified are fishery bycatch and impacts at nesting beaches, including nesting habitat, direct harvest and predation.

Leatherbacks are vulnerable to bycatch in a variety fisheries, including longline, drift gillnet, set gillnet, bottom trawling, dredge, and pot/trap fisheries that are operated on the high seas or in coastal areas throughout the species' range. On the high seas, bycatch in longline fisheries is considered a major threat to leatherbacks. U.S. flagged and international vessels participate in longlining for various HMS species, particularly tuna, shark and swordfish in the Pacific and the Atlantic, which may cause injury or mortality of leatherbacks. In addition, coastal fisheries using gillnets or trap nets also result in high mortality (NMFS and USFWS 2013a).

At nesting sites, population declines are primarily the result of a variety of human activities associated with human settlement and commercial development of coastal areas (e.g., legal harvests and illegal poaching of adults, immature animals, and eggs; incidental capture in coastal and high-seas fisheries; loss and degradation of nesting and foraging habitat as a result of coastal development; and predation by domestic dogs and feral pigs). In addition to anthropogenic factors, natural threats to nesting beaches and marine habitats such as coastal erosion, seasonal storms, predators, temperature variations, and phenomena such as El Niño also affect the survival and recovery of leatherback populations (*in* Eckert et al. 2012).

Marine debris is also a source of mortality to all species of sea turtles because small debris can be ingested and larger debris can entangle animals, leading to death. Marine debris can be any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment. Manmade materials like plastics, micro plastics, and derelict fishing gear (e.g., ghost nets) that may impact turtles via ingestion or entanglement can reduce food intake and digestive capacity, cause distress and/or drowning, expose turtles to contaminants, and in some cases cause direct mortality (Arthur et al. 2009; Bugoni et al. 2001; Parker et al. 2011; Wabnitz and Nichols 2010). All marine turtles have pelagic stages; including when they leave the nesting habitat as hatchlings and enter a period known as the "lost years" that can last for years or decades (Lutz and Musick 1997; Zug 2002). While the impact of marine debris to Pacific turtles during pelagic life stages is currently unquantified, it is quite likely that impacts may be severe given the increase of plastics and other debris and pollution entering the marine environment over the past 20-30 years (NMFS and USFWS 2013a).

The addition of debris from the earthquake and tsunami that hit Japan in March 2011 increased concern due to the large amount of debris that entered the water in a short time. The Japanese government estimated that 25 million tons of debris was generated but there is no confirmed estimate of how much entered the water, and little information as to the type of debris that entered the water. Experts believe that it is highly unlikely that the debris is radioactive for several reasons: the vast majority of the debris was many miles away from the reactor that leaked, the leak of contaminated water from the reactor into the sea started days to weeks after the debris was washed out to sea, and vessels coming into the U.S. from Japan were monitored for radiation, and readings were below the level of concern. The large debris field that was initially generated is no longer visible by satellite, which means that it can no longer be monitored so the location of the debris is unknown and projections of when it will reach shore can only be predicted using models that take into account oceanic and wind conditions (NOAA Marine Debris Program). For leatherbacks, the greatest risk posed by marine debris from the 2011 tsunami is in the pelagic environment but there is no information to quantify what the impact is or will be.

Global Climate and Ecological Change

Based upon available information, it is likely that leatherback sea turtles are being affected by climate change. Similar to other sea turtle species, leatherbacks are likely to be affected by rising temperatures that may affect nesting success and skew sex ratios, and rising sea surface temperatures that may affect available nesting beach areas as well as ocean productivity. Leatherbacks are known to travel within specific isotherms and these could be affected by climate change and cause changes in their bioenergetics, thermoregulation, and foraging success during the oceanic phase of their migration and prey availability (Robinson et al. 2008; Saba et al. 2012). Based on climate change modeling efforts in the eastern tropical Pacific Ocean, for example, Saba et al. (2012) predicted that the Playa Grande (Costa Rica) nesting population would decline 7% per decade over the next 100 years. Changes in beach conditions were the primary driver of the decline, with lower hatchling success and emergence rates (estimated by Santidrian Tomillo et al. (2012) to be a 50-60% decline over 100 years in that area.

Climate change prediction models coupled with satellite tagged leatherbacks in the northeastern Pacific showed slightly favorable habitat over 100 years. Given that they are prey specialists, however, it was researchers found it difficult to how potential changes in prey distribution would affect this foraging population due to climate change (Hazen et al. 2012). Unlike other sea turtle species which may be prey limited due to climate changes to their forage base, leatherbacks feed primarily on jellyfish, and some species are expected to increase in abundance due to ocean warming (Brodeur et al. 1999, 2008; Attrill et al. 2007; Purcell et al. 2007; Richardson et al. 2009).

At this time, it is not possible to reliably predict the magnitude of future climate change and the impacts on leatherback sea turtles. The existing data and current scientific methods and analysis are not able to assess the future effects of climate change on this species or allow us to predict or quantify this threat to the species (Hawkes et al. 2009).

4.4.6. *Recovery Plan Delisting Criteria*

To consider de-listing, all of the following criteria must be met (NMFS and USFWS 1998d):

1) All regional stocks that use U.S. waters have been identified to source beaches based on reasonable geographic parameters.

2) Each stock must average 5,000 (or a biologically reasonable estimate based on the goal of maintaining a stable population in perpetuity) FENA over six years.
3) Nesting populations at "source beaches" are either stable or increasing over a 25 year monitoring period.
4) Existing foraging areas are maintained as healthy environments.
5) Foraging populations are exhibiting statistically significant increases at several key foraging grounds within each stock region.
6) All Priority #1 tasks have been implemented.
7) A management plan designed to maintain sustained populations of turtles is in place.

4.4.7. *Recovery Actions*

A list of conservation efforts to protect and preserve leatherback sea turtles globally can be found in the most recent status review (NMFS and USFWS 2013a). The effectiveness of these measures varies and is often dependent upon funding, lack of information or legal authority to implement, or a lack of long term support. Nonetheless, there have been some successes. Some of the conservation efforts are summarized below.

Since the 1980's considerable effort has been made to document and reduce the amount of bycatch in fisheries, particularly U.S. fisheries. Observer programs have been implemented in most U.S. fisheries that interact with leatherbacks to assist in quantifying impacts and also develop alternative gear and techniques to reduce impacts. These include development and implementation of large circle hooks with alternative bait in longline fisheries, and training in the use of de-hookers, line cutters, and dipnets. In the Hawaii-based shallow set longline fishery, bycatch of leatherbacks has been reduced by 83 percent (Gilman et al. 2007a). On the east coast, Turtle Excluder Devices (TEDs) are used to provide a means of escape for sea turtles (including juvenile leatherbacks) that may get caught in trawl gear. The U.S. has worked internationally to export these gear modifications to other fisheries in order to reduce the overall bycatch of sea turtles globally, including a recent effort to help fishermen in Morocco switch from net fishing to buoy gear to target swordfish (C. Heberer, NMFS, personal communication, 2012).

The conservation and recovery of leatherback turtles is facilitated by a number of regulatory mechanisms at international, regional, national and local levels, such as the FAO Technical Consultation on Sea Turtle-Fishery Interactions, the Inter-American Convention for the Protection and Conservation of Sea Turtles, CITES, and the Convention on Migratory Species. The U.S. is a party of the Inter-American Convention for the Protection and Conservation of Sea Turtles, which is the only international treaty dedicated exclusively to marine turtles. Leatherbacks are also protected under Annex II of the Specially Protected Areas and Wildlife Protocol of the Cartagena Convention.

In 2008 the Western and Central Pacific Fisheries Commission (WCPFC) adopted a Conservation and Management Measure (CMM 2008-03) to mitigate the impacts on turtles from longline swordfish fisheries in the Western Central Pacific Ocean. The measure includes the adoption of FAO guidelines to reduce sea turtle mortality through safe handling practices and to reduce bycatch by implementing one of three methods by January 2010. The three methods to choose from are: 1) use only large circle hooks, 2) use whole finfish bait, or 3) use any other mitigation plan or activity that has been approved by the Commission. As a result of these designations and agreements, many intentional impacts on sea turtles have been reduced: harvest of eggs and adults have been reduced at several nesting areas through nesting beach conservation efforts and an increasing number of community-based initiatives are in place to reduce the take of turtles in foraging areas (Gilman et al. 2007b; NMFS and USFWS 2007c).

Other international agreements include the Indian Ocean South East Asian Marine Turtle Memorandum of Understanding (IOSEA) which provides a mechanisms for the states of the Indian Ocean and Southeast Asia regions and other concerned States to work together to conserve and recover marine turtle populations in the areas. In addition, the Memorandum of Agreement between Tambrauw Indonesia and California strengthens collaboration between the state of California and West Papua (a nesting site for leatherbacks that forage off of California). The Secretariat of the Pacific Regional Environment Programme supports tagging of sea turtles and maintaining a database to collate sea turtle distribution data across the Pacific.

4.4.8. *Population*

Leatherbacks are found throughout the world and populations and trends vary in different regions and nesting beaches. In 1980, the leatherback population was estimated at approximately 115,000 (adult females) globally (Pritchard 1982). By 1995, one estimate claimed this global population of adult females had declined to 34,500 (Spotila et al. 1996). However, this number is too low as population estimates for just the Atlantic Ocean range from 34,000 to 94,000 adult leatherbacks (Turtle Expert Working Group 2007). A current global population estimate is not available at this time, but details on what is known of populations are provided below. The 2013 status review provides additional details as well as locations, abundance and trends of known leatherback nesting sites around the world (see Table 1 in NMFS and USFWS 2013a).

For the Indian Ocean and Southeast Asia, Nel (2012) identified four major areas of leatherback nesting; Southwest Indian Ocean, Northeast and East Indian Ocean, South China Sea and the Southwest Pacific region (discussed further below). For most of these regions, there is insufficient information to determine trends at nesting beaches. Data are available in the Southwestern Indian Ocean where the population has remained stable at less than 100 animals (Nel 2012). In the Eastern Indian Ocean numbers are low. In the South China Sea nesting occurs at remote beaches with little monitoring. This region includes the once very large nesting population at Malaysia which now is down to a few individuals observed each year (Nel 2012). Overall these regions have nesting numbers that are quite low with a total for all known nesting beaches in the low hundreds.

NMFS and the USFWS conducted an extensive review of the status of leatherbacks throughout the Atlantic in 2007. Atlantic leatherbacks are divided into seven genetically distinct populations across the eastern and western Atlantic, including the Caribbean Sea. Nesting data was available for six of the seven nesting sites. In West Africa there are insufficient years of data to determine trends as this is a large and important population with at least 30,000 nests laid along the coast of Gabon (Fretey et al. 2007). The analysis of the other six nesting populations indicated that populations are stable or increasing at all beaches except the Western Caribbean (TEWG 2007). The nesting beaches in the Western Caribbean are in Costa Rica and although there was not a clear increase in population, there was not a significant decline in nesting as has been observed at the nest sites on the Pacific side of Costa Rica. The most recent population estimate for the North Atlantic ranges from 34,000 to 94,000 adult leatherbacks. Overall, the nesting populations throughout the Atlantic are stable or increasing in all areas except the Western Caribbean and West Africa and in these areas there are insufficient long-term data to detect a trend (NMFS and USFWS 2013a). Leatherbacks are found in the Mediterranean Sea although nesting is extremely rare (NMFS and USFWS 2013a).

In the Pacific, leatherback populations are declining at all major Pacific basin nesting beaches, particularly in the last two decades (Table 3) (Spotila et al. 1996; Spotila et al. 2000; NMFS and USFWS 2007c) although surveying of nesting beaches is inconsistent making it difficult to estimate trends (NMFS and USFWS 2013a). In the eastern Pacific, nesting counts indicate that the population has continued to decline since the mid 1990's, leading some researchers to conclude that this leatherback is on the verge of extirpation (Spotila et al. 1996; Spotila et al. 2000). Steep declines have been documented in Mexico and Costa Rica, the two major nesting sites for eastern Pacific leatherbacks. Saba et al. (2008) estimated the number of nesting females/year in Mexico were 200 animals, and similarly for Costa Rica, approximately 200 animals per year.

Table 3. Estimates of annual abundance at leatherback nesting sites and current trends in the Pacific (NMFS and USFWS 2013a).

Location	Years	Annual Number	Trend
Indonesia (Papua-Jamursba-Medi)	1984- 2011	14,522-1,596 nests	declining
Indonesia (Papua-Wermon)	2002-2011	2,994-1,096 nests	declining
Papua New Guinea (Labu Tali)	1989-2011	76–59 nests	declining4
Vanuatu	2002-2010	~50 nests	declining
Malaysia (Terengganu)	1956-2009	10,000-10 nests	declining
Costa Rica (Las Baulas National Marine Park: Playa Grande, Langosta, and Ventanas)	1988-2004	1,504-188 females	declining
Mexico (Mexiquillo, Tierra Colorada, Cahuitán, Barra de la Cruz)	1982-2004	>10,000-120 nests	declining
Nicaragua (Veracruz, Juan Venado, and Salamina)	2002-2010	~53 nests	unkmown

Unlike western Pacific leatherbacks which nest year round, eastern Pacific leatherbacks all nest in the winter (December through March) and postnesting movements indicate that they stay within the eastern South Pacific (Eckert and Sarti 1997; Shillinger et al. 2008) and therefore are not expected to be found within the proposed action area. For this reason, this discussion will further focus on the status of the species in the western Pacific.

Genetic results to date have found that nesting aggregations that comprise the western Pacific population all belong to a single stock (Dutton et al. 2007). The current overall estimate for Indonesia, Papua New Guinea, and Solomon Islands is 5,000 to 10,000 nests per year (Nel 2012), and the area harbors the last remaining nesting aggregation of significant size in the Pacific with approximately 2700–4500 breeding females (Dutton et al. 2007; Hitipeuw et al. 2007). Although there is generally insufficient long term data to calculate population trends, in all of these areas, the number of nesting females is substantially lower than historical records (Nel 2012). This metapopulation is made up of small nesting aggregations scattered throughout the region, with a dense focal point on the northwest coast of Papua Barat, Indonesia; this region is also known as the Bird's Head Peninsula where approximately 75 percent of regional nesting occurs (Hitipieuw et al. 2007).

The most recently available information on nesting numbers in northwest Papua reflects a disturbing decline. Collectively, Tapilatu et al. (2013) estimated that since 1984, these primary western Pacific beaches have experienced a long-term decline in nesting of 5.9 percent per year.

About 20% of nesting activity in the Western Pacific occurs along the east coast of Papua New Guinea along the Huon Coast (NMFS and USFWS 2013a). Since 2006-2007, when surveying methods were standardized, the population appears to be stable (NMFS and USFWS 2013a). Post nesting females from Papua New Guinea were tracked to foraging areas in the Southern Hemisphere, including the Coral Sea and the western south Pacific (Benson et al. 2011).

In the Solomon Islands, nesting over 30 years ago occurred at more than 15 beaches (Vaughan 1981). Primary nesting beaches are now only found on two beaches on Isabel Island (Dutton et al. 2007). Most nesting occurs from November through March. However, there is some summer nesting as evident from a foraging female caught in California in the fall, outfitted with a satellite transmitter and tracked to the Solomons, nested on Santa Isabel in May (Benson et al. 2011). This provides further evidence of a link between summer nesters and foraging areas off the west coast of North America. There is no long-term data to assess trends in the Solomon Islands, but the total number of nesting females is estimated to be around 100 per year (Petro et al. 2007). Unfortunately, recent monitoring of various beaches throughout the Solomon Islands indicates very low hatchling success (NMFS and USFWS 2013a).

Leatherback nesting in Vanuatu has only recently been reported (Dutton et al. 2007). There are low levels of nesting at four to five beaches with a total of about 50 nests laid per year (Petro 2007). Similar to the Solomon Islands, hatchling success is low. Many beaches that may be good habitat for nesting have yet to be thoroughly surveyed, so other nesting may occur in the region.

There is limited sporadic leatherback nesting activity in Vietnam and Thailand. In Australia nesting was sporadic and the last observed nesting event occurred in 1996 (Limpus 2009). The collapse of the nesting population in Malaysia has been documented through systematic beach counts or surveys in Rantau Abang, Terengganu. Malaysia was once the site of an enormous leatherback nesting population which is now considered functionally extinct with only 2-3 females returning annually to nest each year (Chan and Lieu 1996).

4.5. Hawksbill Sea Turtle

4.5.1. *Taxonomy and Species Description*

The hawksbill is a small to medium-sized marine turtle with a mottled brown shell that has overlapping scutes (Figure 13). The hawksbill sea turtle has two pairs of prefrontal scales; thick, posteriorly overlapping scutes on the carapace with serrated edges at back and side marginals; four pairs of costal scutes (the anterior-most are not in contact with the nuchal scute); two claws on each flipper; and a beak-like mouth. In addition, when on land, the hawksbill has an alternating gait, unlike green and leatherback sea turtles. Adults average about 60 - 95 cm (24 – 37 in) in curved carapace length (Limpus et al. 1993, Vaughan 1981, Eckert 1992), and weight may be up to 35-80 kg (about 92-190 lbs) (McKeown 1977, Pritchard et al. 1983, Limpus et al. 1993, NMFS and USFWS 1998e).

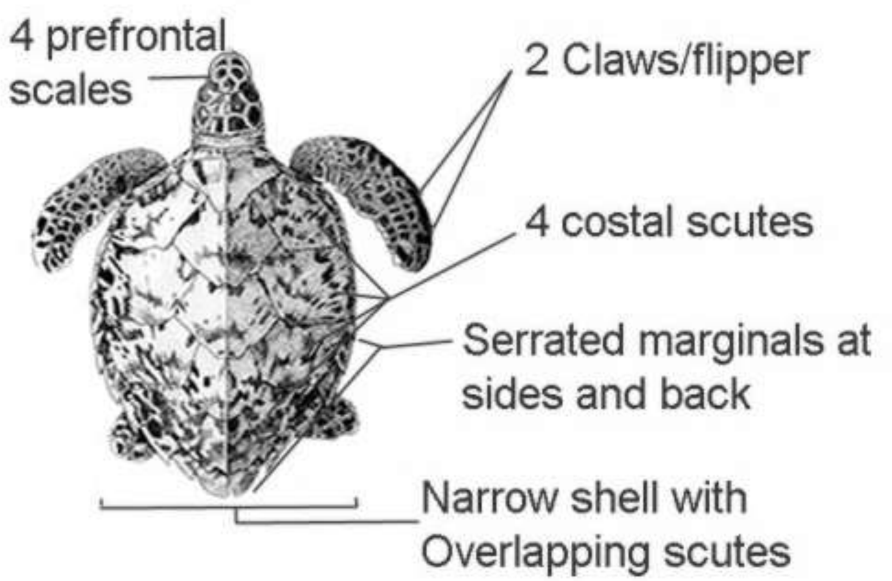

Figure 13. Some of the distinguishing characteristics of the hawksbill sea turtle, *Eretmochelys imbricata* (Drawing credit - NOAA, Jack Javech).

4.5.2. *Listing Status*

The hawksbill sea turtle was listed as endangered throughout its range on June 2, 1970 (USFWS 1970). The IUCN considers the species "Critically Endangered" based on global population declines of over 80 percent during the past three generations (Meylan and Donnelly 1999). Long-term trend data at foraging sites are few, but as with most sea turtles, the primary information source for evaluating trends in global hawksbill populations is nesting beach data. The Pacific Ocean has more nesting hawksbills than the Atlantic or Indian Oceans, but the nesting abundance and population trend in the Pacific is declining severely (NMFS and USFWS 2013b).

4.5.3. *Historic and Current Distribution*

The hawksbill sea turtle occurs in tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans (Figure 14). Within the Central Pacific, nesting is widely distributed but in very

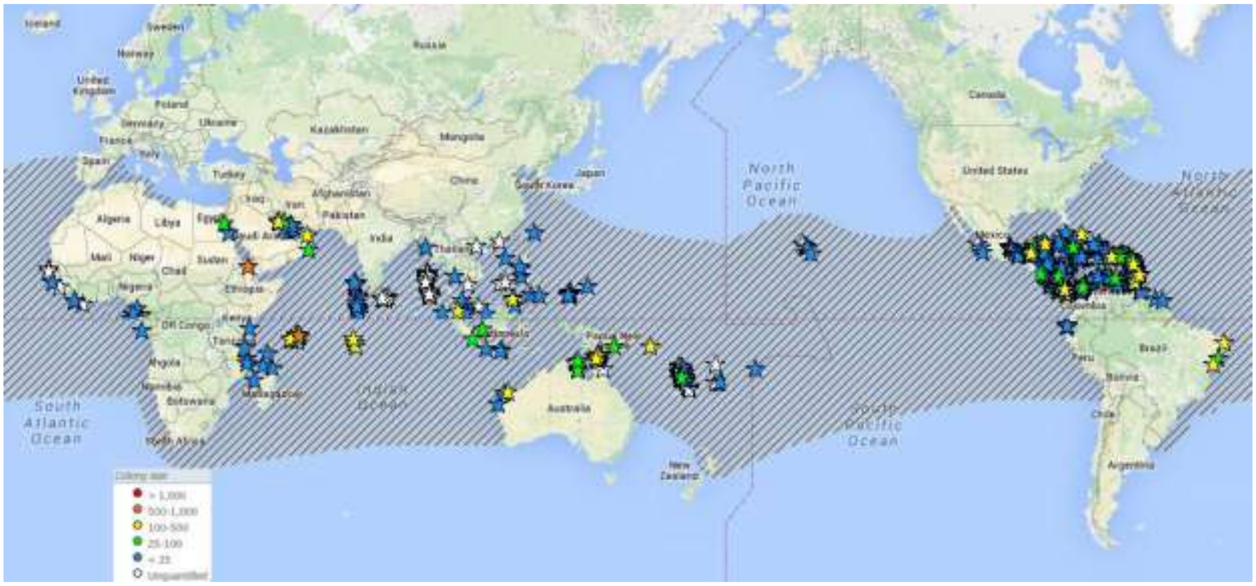

Figure 14. Range and nesting locations of hawksbill sea turtles turtles (Data provided by the SWOT Team and hosted on OBIS-SEAMAP. Oceanic Society, IUCN Marine Turtle Specialist Group (MTSG), and Marine Geospatial Ecology Lab, Duke University.. Wallace et al. 2010 , Kot et al. 2016, Halpin et al. 2009. Retrieved from http:// seamap.env.duke.edu/swot).

low numbers. Foraging hawksbills occur near all the island groups of Oceania from the Galapagos Islands in the eastern Pacific to the Republic of Palau in the western Pacific (Witzell 1983; Pritchard 1982a,b, NMFS and USFWS 2011). American Samoa and Western Samoa host fewer than 30 females annually (Tuato'o- Bartley et al. 1993; Grant et al. 1997). Guam and Hawaii each have only 5-10 nesting females annually, but the Hawaiian population shows signs of a potential increasing trend (NMFS and USFWS 2013b). Along the far western and southwestern Pacific coasts, hawksbills nest on the islands and mainland of southeastern Asia from China and Japan, throughout the Philippines, Malaysia, and Indonesia, to Papua New Guinea (PNG), the Solomon Islands, and northeastern Australia (McKeown 1977; Limpus 1982). Additional populations are known from the eastern Pacific potentially extending from Mexico through Panama.

The best estimate of age at sexual maturity for hawksbill sea turtles is about 20-40 years (Chaloupka and Limpus 1997, Meylan and Donelly 1999). Reproductive females may exhibit a high degree of fidelity to their nest sites, and they nest an average of three to five times per season at regular intervals (Richardson et al. 1999). Average clutch size is higher (about 250 eggs) than that of green sea turtles (Hirth 1980). Nesting site selection in the southwest Pacific appears to favor sites with higher wind and wave exposure, possibly as a means to aid hatchling dispersal (Garcon et al. 2010).

Once hawksbill hatchlings leave the beach, they are pelagic and likely carried long distances by surface gyres (Meylan 1988; Meylan and Donnelly 1999). Hatchlings and small juveniles (5-21 cm straight carapace length) have been found in association with Sargassum in both the Atlantic and Pacific Oceans (Musick and Limpus 1997). When juveniles reach about 30-35 cm straight carapace length, they settle in neritic foraging and developmental habitats including coral reefs or other hard-bottom habitats, sea grass, algal beds, and mangrove bays and creeks (Musick and Limpus 1997; Bjorndal and Bolten 2010). Some larger juveniles may associate with the same feeding locality for more than a decade while others apparently migrate from one site to another (Musick and Limpus 1997). Adult foraging habitat, which may or may not overlap with developmental habitat, is typically coral reefs but occasionally includes other hard-bottom communities and mangrove-fringed bays. Larger individuals may prefer deeper habitats than smaller hawksbills (Blumenthal et al. 2009).

4.5.4. *Habitat Description*

Distribution

Hawksbill sea turtles are highly migratory and use a wide range of broadly separated localities and habitats during their lifetimes (Musick and Limpus 1997; Plotkin 2003). Hawksbills undertake developmental and reproductive migrations that may span hundreds or thousands of kilometers (Meylan 1999). Reproductive females periodically migrate to their natal beach to nest. Movements of reproductive males are less well known but are presumed to involve migrations to the nesting beach or to courtship stations along the migratory corridor.

Foraging Ecology and Diet

Pelagic hatchlings eat Sargassum and its associated flora and fauna, and juveniles and adults shift to benthic feeding, predominantly on sponges although evidence suggests a more omnivorous diet in the Indo-Pacific (NMFS and USFWS 1998e; NMFS and USFWS 2013b). Hawaiian and Caribbean hawksbills are specialist sponge carnivores and eat just a few genera of sponges (Balazs 1978; Meylan 1988; Vicente 1994). Much of the other material found in hawksbill stomachs appears to have been ingested coincidentally while the animal was feeding on sponges.

Hawksbills were once thought to be obligate reef dwellers, but more recent information indicates that they may occupy a range of habitats including other hard bottom habitats, seagrass, algal beds, mangrove bays and creeks (reviewed by Musick and Limpus 1997). Hawksbills support healthy reefs by controlling sponges and macroalgae, which would otherwise outcompete reef-building corals for space (Bjorndal and Jackson 2003; Goatley et al. 2012; Hill 1998; León and Bjorndal 2002).

Hawksbills in the eastern Pacific forage in mangrove saltwater forests and man-made shrimp ponds, an association not reported previously (Gaos et al. 2012a, 2012b). The reason for this novel habitat use is unknown, but appears to be limited to adults, as juveniles tend to forage in nearshore, open-coast habitats in the region (Gaos et al. 2012b). In the Caribbean, seagrass beds, which are thought to be peripheral habitat for hawksbills, sustain hawksbill foraging aggregations comparable to reef habitat (Bjorndal and Bolten 2010). Although not as common as coral reef or hard-bottom habitat, Bjorndal and Bolten (2010) state that hawksbills historically may have used seagrass habitat but abandoned it as green sea turtle populations collapsed and the pastures went ungrazed decreasing the value of the habitat for hawksbills. Nonetheless, seagrass pastures may become more important as coral reefs decline (Bjorndal and Bolten 2010).

Breeding Habitat

Hawksbills nest on insular and mainland sandy beaches throughout the tropics and subtropics (Figure 14). Once considered to be naturally rare and to have a more dispersed nesting pattern than other sea turtle species (Groombridge and Luxmoore 1989), it is now believed that the dispersed nesting observed today is the result of overexploitation of previously large colonies (Limpus 1995; Meylan and Donnelly 1999). Sites where aggregated nesting occurs may typify pre-exploitation levels of hawksbill nesting density (NMFS and USFWS 2013). Several sites that formerly held large breeding colonies are known to have been lost once inhabited by humans, and several nesting aggregations have been nearly extirpated (NMFS and USFWS 2013).

4.5.5. *Threats*

Threats to hawksbill sea turtles are similar to those for other sea turtles and include incidental capture by fisheries, habitat modification and loss, disease, predation, and harvest of eggs, subadults, and adults.

Although hawksbills are subject to the suite of threats that affect other marine turtles, the decline of the species is primarily attributed to centuries of exploitation for tortoise shell, the beautifully patterned scales that cover the turtle's shell (Parsons 1972). Hawkbills' predictable nesting sites and timing make them vulnerable to capture on the nesting beach. Poaching of eggs and killing of turtles continue to threaten populations in many areas (NMFS and USFWS 2007b).

Because hawksbills prefer to nest under vegetation (Mortimer 1982; Horrocks and Scott 1991), they are particularly impacted by beachfront development and clearing of dune vegetation. At sea, hawksbills are typically associated with coral reefs, which are among the world's most endangered marine ecosystems (Wilkinson 2002). Finally, while the effects of climate change may be difficult to predict, its potential effects to the sea turtle environment (e.g., nesting habitat) or food sources are of concern (NMFS and USFWS 2007b). Hawksbills exhibit temperature-dependent sex determination (Wibbels 2003), which suggests that the hatchling sex ratio may have a female bias (since warmer temperatures result in more female hatchlings).

Global Climate and Ecological Change

Climate change will impact sea turtles through increased temperatures, sea-level rise, ocean acidification, changes in circulation patterns, and increased cyclonic activity. As global temperatures continue to increase, so will sand temperatures, which in turn will alter the thermal regime of incubating nests and alter natural sex ratios within hatchling cohorts (e.g., Glen and Mrosovsky 2004). Because hawksbill turtles exhibit temperature-dependent sex determination (reviewed by Wibbels 2003), there may be a skewing of future hawksbill cohorts toward strong female bias (since warmer temperatures produce more female embryos).

The effects of global warming are difficult to predict, but changes in reproductive behavior (e.g., remigration intervals, timing and length of nesting season) may occur (reviewed by Hawkes et al. 2009). In the southern Gulf of Mexico, hawksbill nesting data from 1980 to 2010 were analyzed in relation to sea surface temperatures associated with the Atlantic Multidecadal Oscillation (del Monte- Luna et al. 2011). In the past 30 years, overall temperatures have increased in the North

Atlantic, and in years of anomalously warm temperatures, there were proportionately fewer hawksbill nests. Although the causal relationship is unclear, it highlights the complexity of basin-wide decadal environmental processes and long-term hawksbill population trends (del Monte-Luna et al. 2011).

The loss of habitat due to sea-level rise from global warming is also a potential problem for areas with low-lying beaches where sand depth is a limiting factor. For these areas, the sea will inundate nesting sites and decrease available nesting habitat (Daniels et al. 1993; Fish et al. 2005; Fuentes et al. 2010). Sea-level rise is likely to increase the use of shoreline stabilization practices (e.g., sea walls), which may accelerate the loss of suitable nesting habitat (reviewed by Hawkes et al. 2009). The loss of habitat as a result of climate change could be accelerated due to a combination of other environmental and oceanographic changes such as the frequency and timing of storms and/or changes in prevailing currents, both of which could lead to increased beach loss via erosion (Fuentes and Abbs 2010; Van Houtan and Bass 2007).

At sea, hatchling dispersal, adult migration, and prey availability may be affected by changes in surface current and thermohaline circulation patterns (reviewed by Hawkes et al. 2009). Climate change has increased water temperatures and acidity, which cause corals to bleach and lose their ability to calcify. Damage to coral reefs caused by global warming (Sheppard 2006) threatens to impact hawksbill foraging populations at the global level. However, the impact may be beneficial in certain areas where sponge abundance is predicted to increase (reviewed by Hawkes et al. 2009).

4.5.6. *Recovery Plan Delisting Criteria*

To consider de-listing, all of the following criteria must be met (NMFS and USFWS 1998e):

1) All regional stocks that use U.S. waters have been identified to source beaches based on reasonable geographic parameters.

2) Each stock must average 1,000 FENA (or a biologically reasonable estimate based on the goal of maintaining a stable population in perpetuity) over six years.

3) All females estimated to nest annually (FENA) at "source beaches" are either stable or increasing for 25 years.

4) Existing foraging areas are maintained as healthy environments.

5) Foraging populations are exhibiting statistically significant increases at several key foraging grounds within each stock region.

6) All Priority #1 tasks have been implemented.

7) A management plan designed to maintain sustained populations of turtles is in place.

8) Ensure formal cooperative relationship with regional sea turtle management program (SPREP).

9) International agreements are in place to protect shared stocks.

4.5.7. *Recovery Actions*

The conservation and recovery of sea turtles is enhanced by a number of regulatory instruments at international, regional, national, and local levels. The Papahanaumokuakea Marine National Monument in the northwestern Hawaiian Islands was established by Presidential Proclamation 8031 on June 15, 2006, prohibiting oil and gas exploration and vessel anchoring on live or dead coral, which will likely protect hawksbill habitat. In 2014, NMFS added 20 threatened species of corals (5 in the Caribbean and 15 in the Indo-Pacific) (NMFS 2014) to the two threatened and three endangered coral previously listed under the Act. Actions to protect and conserve corals may indirectly benefit hawksbills, especially in the Caribbean where hawksbills are closely associated with coral reefs.

Conservation actions to reduce directed take have also been implemented and were summarized in (NMFS and USFWS 2013b). A number of international agreements and effort to ban harvest and/or protect nesting females have resulted in reductions in the loss of eggs or females at nesting sites. And conservation efforts directed at minimize turtle bycatch in fisheries have been implemented. For example, in 2009, the United States established the Mariana Trench, Rose Atoll, and Pacific Remote Islands National Monuments, which prohibited commercial and recreational fisheries in an area encompassing over 95,000 square miles.

Despite these advances, human impacts continue throughout the world (NMFS and USFWS 2013b). The lack of comprehensive and effective monitoring and bycatch reduction efforts in many pelagic and nearshore fisheries operations still allows substantial direct and indirect mortality, and the uncontrolled development of coastal and marine habitats threatens to destroy the supporting ecosystems of hawksbill turtles. Although several international agreements provide legal protection for sea turtles, additional efforts are needed to ensure they are sufficiently implemented.

4.5.8. *Population*

Although no historical records of abundance are known, hawksbill sea turtles are considered to be severely depleted due to the fragmentation and low use of current nesting beaches (NMFS and USFWS 2013b). Worldwide, an estimated 21,212-28,138 hawksbills nest each year among 83 sites (

Table 4). Among the 58 sites for with historic trends, all show a decline during the past 20 to 100 years. Among 42 sites for which recent trend data are available, 10 (24 percent) are increasing, three (7 percent) are stable and 29 (69 percent) are decreasing. In the Pacific, most populations are declining or of unknown status (although recent records indicate that intensive conservation efforts have resulted stable or increasing nesting along Mexico and Central America, despite very low abundance (Gaos et al. 2010).

Table 4. Numbers of and trends for nesting hawksbill sea turtles estimated at worldwide nesting sites (NMFS and USFWS 2013b).

Location	**Years**	**# nesting (♀/season)**	**Recent Trend**

Location	Years	# nesting (♀/season)	Recent Trend
WESTERN PACIFIC			
Australia (Torres Strait- Northern Great Barrier Reef)	2004	~ 4,000	Declining
Australia (Northeastern Arnhem Land)	2004	~ 2,500	Unknown
Indonesia (entire country)	2006	1,362-3,026	Declining
Japan	1980s	rare	Declining
Malaysia (East) Sabah Turtle Islands	2006	90-150	Stable
Malaysia (West): Terengganu	1992-2000	4-6	Declining
Papua New Guinea	2004	~ 500-1000	Declining
Philippines	1980s	< 500	Declining
Thailand (Gulf of Thailand)	1990-2005	~20	Declining
Vietnam	1980s	100	Declining
CENTRAL PACIFIC			
American Samoa and Western Samoa	1991	< 10-30	Declining
Fiji	2006	100-200	Declining
Mariana Archipelago (Guam and CNMI)	2003	< 5-10	Declining
Hawaii	1989-2009	< 20	Unknown
Micronesia	1998	~ 300	Declining
Palau Republic	2004-2006	15-25	Unknown
Solomon Islands	2004	200-300	Declining
Vanuatu	2004	> 300	Unknown
EASTERN PACIFIC			
Mexico (Baja California)	2007-2009	< 10	Unknown
Guatemala	2007-2009	< 10	Unknown
El Salvador	2007-2009	100-215	Unknown
Nicaragua	2007-2009	~ 15	Unknown
Costa Rica	2007-2009	~ 18	Unknown
Ecuador	2007-2009	~ 15	Unknown
TOTAL		**10,194 -12,770**	

5. ENVIRONMENTAL BASELINE

The environmental baseline is defined as "the past and present impacts of all Federal, state or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State and private actions which are contemporaneous with the consultation in process [50 CFR 402.02]."

5.1. Status of Species in the Action Area

None of the species nest in the action area and are therefore expected to be migratory or feeding in coastal or oceanic waters off the U.S. West Coast. The action consists of responding to incapacitated, injured, and/or stranded turtles that are incidentally captured at sea or on the shoreline. Based on strandings that have occurred since 1958, the five species described in Section 4, "STATUS OF THE SPECIES" may be affected by the proposed action (Figure 15). Despite the lack of nesting in the area, the status of most of the affected turtles is based on the status of nesting animals. Therefore, the description of nesting outside the action area is used to generally describe the status of the species expected to be treated by treatment facilities.

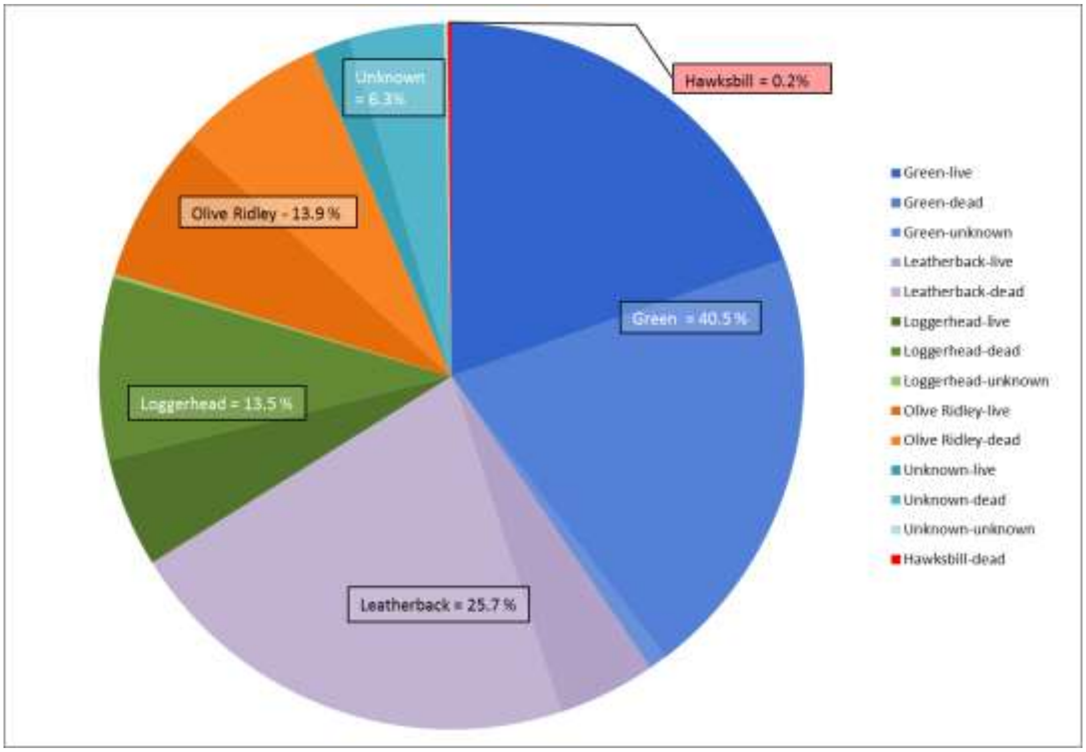

Figure 15. The proportion and condition of the five species of sea turtle that have been observed or stranded in Alaska, Washington, Oregon, and California, 1958-January 2016 (Le Roux et al., in prep.).

5.1.1. *Green Sea Turtle*

Pacific and Central Pacific populations are most likely to be affected by the proposed action. Most rehabilitating green sea turtles treated by treatment facilities are those stranded along the west coast and likely originate from the East Pacific DPS. Although 41ºN latitude marks the northern extent of the East Pacific DPS (NMFS and USFWS 2016), green sea turtles frequently occur north of that boundary. Given the proximity to California, we expect Oregon and Washington turtles likely originate from the East Pacific DPS.

Occasionally, incapacitated or bycaught turtles are captured at sea and treated by treatment facilities. These turtles most likely originate from the Eastern Pacific DPS, but some individuals may originate from the Central North Pacific DPS.

<u>Proposed East Pacific DPS of Green Sea Turtles</u>

Green sea turtles in the East Pacific have widely dispersed nesting sites from Peru to Baja, California, Mexico. Thirty-nine total nesting sites are known for which abundance information is available with the two largest in Mexico and the Galapagos Islands (Seminoff et al. 2015, Zárate et al. 2003, Delgado-Trejo and Alvarado-Figueroa 2012). Secondary nesting areas are found in Costa Rica and the Revillagigedos Archipelago, Mexico. Low level and sporadic nesting occurs at sites throughout the range from Mexico to Peru.

The DPS exhibits an estimated total nesting abundance of 20,112 females at 39 nesting sites (NMFS and USFWS 2016). The following descriptions of locations within the East Pacific are summarized from the 2015 status review (Seminoff et al. 2015):

1. *Mexico*

The nesting aggregation at Colola, Michoacán is the largest in the East Pacific DPS, supporting 58 percent of the nesting in the DPS (Seminoff et al. 2015) Based on these nesting beach monitoring efforts, the current adult female nesting population for Colola, Michoacán is estimated at 11,588 females or nearly 58 percent of the total adult female population, which makes this the largest nesting aggregation in the East Pacific DPS. Maruata Beach is also an important nest site in the Michoacán area, and lower levels of nesting occurs at three additional beaches (Llorona, Motin de Oro, Aguas Blancas), but occurs throughout the state.

The Revillagigedos Islands are a secondary nesting site with three main nesting areas: on Clarion (Brattstrom 1982; Awbrey et al. 1984), and Socorro Islands (Márquez-Millán 1990). From 1999–2001, deposited nests averaged 79 per year at Clarion Island and 47 per year at Socorro Island (Juarez-Ceron et al. 2003).

The nesting trends have been increasing in Mexico since conservation efforts began in the 1970s (Delgado-Trejo and Alvarado-Diaz, 2012). However, the current nesting numbers are still very low compared to historic numbers (Delgado-Trejo and Alvarado-Diaz, 2012). Even the largest site at Colola is still less than half the historic population of around 25,000 nesting turtles (Delgado-Trejo and Alvarado-Diaz, 2012) after forty years of conservation measures have been in place.

2. *Ecuador*

In the Galapagos Islands, nesting at the four primary nesting sites has been stable to slightly increasing since the late 1970s. Based on over 10,000 tagged females on the Galapagos (Zárate 2012), it is apparent that the Galapagos nesting concentration is currently the second largest nesting assemblage for green sea turtles in the eastern Pacific Ocean, following only that of Colola, Michoacán (Delgado-Trejo and Alvarado-Figueroa 2012).

3. *Costa Rica*

Green sea turtles nest throughout Costa Rica at a minimum of 26 nesting sites, supporting over 2,800 nesting females (Seminoff et al 2015). The most significant aggregations in are found on the northern Pacific coast, on the Guanacaste and Tempisque Conservation Areas on the Nicoya Peninsula.

Colola, Mexico was the only site for which sufficient data were available to conduct a population viability analysis (PVA) and obtain an expected population trend for the species. The PVA indicated a likelihood of increase abundance through 2100 (the limit of the model run). Additional information on the PVA and limitations can be found in Seminoff et al. (2015). Nesting beach protections that began in 1979 and protection from sea turtle hunting at foraging areas likely contributed to the observed increases (Cliffton et al. 1982, Alvarado-Díaz et al. 2001, Seminoff et al. 2002).

Although no green sea turtles nest on the U.S. west coast, a small group of green sea turtles reside in South San Diego Bay, formerly using in the warm effluent of a power plant to maintain their body temperatures in the winter (Stinson 1984, Benson and Dutton 2012, MacDonald et al. 2013). This power plant is no longer in operation, and the turtles are expected to alter their distribution in the bay, hibernate, or leave the bay in reaction to the change (Turner- Tmaszewicz and Seminoff 2012). Since the closure, turtles are venturing into areas of the bay where they have not previously been seen, and are at greater risk of boat strike and injury. This change could result in additional strandings and injuries requiring treatment by treatment facilities.

Central North Pacific DPS of green sea turtles

Green sea turtles from the Central North Pacific DPS are unlikely to occur along the west coast, however it is possible that individuals may occasionally venture out of their normal range and stray into other areas. Some oceanic fishing vessels can travel and fish between Hawaii and the eastern Pacific, and if a green sea turtle were inadvertently by-caught in fishing gear, they may be treated by care facilities, depending on the location of the ship and the direction of travel.

Green sea turtles in Hawaii are genetically distinct and geographically isolated from other DPSs based upon mark-recapture studies, PIT tags, satellite tracking and genetic analysis. From 1965 through 2013, 17,536 green sea turtles have been tagged and only three of the 7,360 recaptures have been from within the Hawaiian Archipelago (Seminoff et al. 2015). There are 13 nesting sites within Hawaii and approximately 96 percent of nesting occurs on the French Frigate Shoals.

Since enactment of the ESA in 1973 the nesting population of Hawaiian green sea turtles has shown a gradual but definite increase (Balazs 1996; Balazs and Chaloupka 2004). During the first five years of monitoring (1973-1977) the mean annual nesting abundance at East Island in the French Frigate Shoals in the Northwest Hawaii Islands was 83 nesting females. Long term monitoring of the East Island population indicates that this population is rapidly increasing at a rate of 4.8 percent per year to a total of 3,710 nesting females (Seminoff et al.2015). The current estimate of nesting females for all nesting sites in the Central North Pacific DPS is 3,846 (Seminoff et al. 2015).

A population viability analysis was conducted for the Central North Pacific DPS and found there to be zero percent probability that the population will decline by 50 percent over the next 100 years or that the population will fall below 100 individuals in 100 years. It is expected that the population will continue to increase. A full discussion of the PVA can be found in Section 3.2 of the 2015 Status review (Seminoff et al. 2015). Although the trend is positive, the majority of nesting occurs at only one site, thus making this population vulnerable to random events (e.g., natural disasters, sea level rise, anthropogenic impacts on the nesting site) and this very concentrated population vulnerable despite the observed long term population growth.

5.1.2. *Olive Ridley Sea Turtle*

Due to the highly nomadic, pelagic habits of the Pacific olive ridleys, the origin of the individuals likely to be in the proposed action area is uncertain. At-sea abundance estimates appear to support an overall increase in the endangered breeding colony populations on the Pacific coast of Mexico (Eguchi *et al*. 2007), those located closest to the action area. A weighted average of the yearly estimates of olive ridley abundance was 1.39 million (Confidence Interval: 1.15 to 1.62 million) which is consistent with the increases seen on the eastern Pacific nesting beaches as a result of protection programs that began in the 1990s (Eguchi *et al*. 2007). In the recent 5-year review (NMFS and USFWS 2014), the review concluded that the population may warrant reclassification due to increasing at-sea and nesting trends.

In the eastern Pacific, the large arribada nesting populations have declined since the 1970s. Nesting at some arribada beaches continues to decline (e.g., Nancite in Costa Rica) and is stable or increasing at others (e.g., Ostional in Costa Rica). There are too few data available from solitary nesting beaches to confirm the declining trend that has been described for numerous countries throughout the region including El Salvador, Guatemala, Costa Rica, and Panama. In the recent 5-year review (NMFS and USFWS 2014), the review established that the threatened populations should be examined to determine whether they are a combination of DPSs and then recommended that further analysis be applied to determine whether some of those potential DPSs be reclassified as endangered. The review concluded that none of the threatened populations should be delisted.

5.1.3. *Loggerhead Sea Turtle*

With the exception of four records from Hawaii (see Insular and Pelagic Range), U.S. Pacific sightings are confined to the west coast of the continent. It is not known whether these individuals are resident or transient. No studies of distribution, abundance, or residency have been undertaken. Since there is no documented nesting anywhere in the U.S. Pacific, we can conclude that U.S. waters (principally those off California) are used as foraging grounds and as migratory corridors. Sightings are typically confined to the summer months in the eastern Pacific, peaking in July-September off southern California and southwestern Baja California, Mexico (Stinson 1984; Ramirez-Cruz et al. 1991). The waters of Baja California clearly represent significant foraging grounds for a wide range of juvenile size-classes, and the seasonal sightings in abundance may correspond to a larger, regional movement pattern.

5.1.4. *Leatherback Sea Turtle*

Since no nesting occurs within the project vicinity, all leatherbacks in the area are migratory, foraging off the U.S. west coast. Migratory routes of leatherbacks are not entirely known (NMFS and USFWS 2012). However, they forage widely in temperate and tropical waters and exploit diverse open-ocean and coastal habitat, particularly convergence zones, coastal retention areas, or mesoscale eddies with concentrations of prey (Morreale et al. 1994, Eckert 1998, Benson et al. 2011). Turtles tagged after nesting in July in Indonesia arrived in waters off California Oregon during July-August (Benson et al. 2007, 2011) coincident with the development of seasonal aggregations of jellyfish (Shenker, 1984; Suchman and Brodeur, 2005; Graham, 2009). Other studies similarly have documented leatherback sightings along the Pacific coast of North America during the summer and fall months, when large aggregations of jellyfish form (Bowlby, 1994; Starbird et al., 1993; Benson et al., 2007b; Graham, 2009).

5.1.5. *Hawksbill Sea Turtle*

Hawksbills are extremely rare within the action area. In the Pacific, hawksbills occur within the western and central Pacific (Figure 14) and are only expected to incidentally occur in the western Pacific. No nesting occurs within the action area, and any individuals treated by the applicant would be unusual vagrants in the area. Only one hawksbill has been observed dead in 2013 along the U.S. west coast since 1958 when stranding and observation records were initiated (LeRoux et al., in prep).

5.2. Factors Affecting the Species' Environment Within the Action Area

5.2.1. *All sea turtles*

Since sea turtles can occur anywhere within the marine environment, most factors within the action area that affect the environment have comparable effects on any species of sea turtle. Some species may be affected to a greater or lesser extent, but the factors discussed in this section are expected to occur within the action area and affect sea turtles similarly. Individual factors are described for each species in the sections that follow.

All sea turtles within the action area are likely foraging or migrating animals. For this discussion, the action area is used interchangeably with the U.S. west coast, and the area includes the Alaska coastline. Since no nesting occurs within the action area, the factors affecting the species are only those that occur at sea or when turtles are stranded on shore. According to records from the 1958-2016 (NMFS, unpublished data, 2016), 576 turtles have been observed, incidentally captured by fishing or research vessels, or known to strand on the U.S. west coast, and in most cases the primary cause for stranding is unknown. However, some records provide enough information to determine or conclude a cause related to the stranding or mortality observed (LeRoux et al., in prep.). In the following discussion, we provide the factors that most commonly affect all sea turtles along the U.S. west coast, and follow the discussion with a species-specific description of the reported strandings that have occurred and any species-specific factors if known.

<u>Fisheries-related impacts</u>

As described in the recent final rule listing 11 green sea turtle DPSs (NMFS and USFWS 2016), existing regulatory mechanisms inadequately regulate fisheries bycatch. Incidental capture in artisanal and commercial fisheries (e.g., longline, drift gill net, set gill net, and trawl fisheries) is a significant threat. Approximately 6.4 percent of all turtles captured reported to the stranding network between 1958 and 2016 (37 of 576 turtles) showed signs of bycatch in nets or fishing gear (Table 5). Slightly more (54 percent) were released alive than found dead or later perished (46 percent). Clearly, bycatch of sea turtles can cause death, but many are treated and released. The ultimate outcome of these released animals is uncertain. but capture and handling can increase stress, reduce fitness, and result in harm or injury to the captured animal.

About half the turtles impacted by fisheries were entangled by drift gillnet gear. Drift gillnet gear is used to fish for highly migratory fish species (HMS) and is managed by a limited entry permit system, with mandatory gear standards and seasonal area closures used to address various conservation concerns including sea turtles (PFMC 2016). A Federal permit with a drift gillnet

Table 5. Sea turtles known to have been impacted by fishing gear, 1958-2015(Le Roux et al., in prep.).

Year	Species	Condition	Description	State
1958	Green	Dead	Caught in a gillnet in the Naselle River estuary.*	WA
1963	Leatherback	Dead	Netted & killed	AK
1978	Leatherback	Live	Netted & released	AK
1978	Leatherback	Live	Netted & released	AK
1978	Leatherback	Dead	Netted & killed	AK
1979	Leatherback	Dead	Netted & killed	AK
1979	Leatherback	Live	Netted & released	AK
1983	Olive ridley	Live	Entangled in gillnet. Rehabilitation; outcome unknown.	CA
1984	Green	Live	Entangled in fishing line. Final status unknown.	California
1988	Leatherback	Live	Entangled in buoy line. Released	CA
1989	Leatherback	Live	Entangled in crab pot line. Released.	CA
1989	Olive ridley	Live	Snagged by sport fisherman	California
1990	Leatherback	Live	Entangled in crab pot line. Released.	CA
1991	Leatherback	Live	Entangled in active gillnet. Released.	CA
1991	Green	Dead	Monofilament line lodged in mouth & throat.	CA
1992	Loggerhead	Dead	Entangled in drift gillnet	California
1992	Loggerhead	Live	Entangled in fishing line. Released.	California
1993	Olive ridley	Live	Fishing jig in right front flipper. Broken jaw. Emaciated	CA
1995	Loggerhead	Live	Entangled in abandoned piece of monofilament gillnet. Released.	CA
1998	Leatherback	Dead	Entangled in crab pot gear	California
2000	Green sea turtle	Live	Caught in sea turtle sampling net during research activities. Entangled in discarded monofilament line.	CA
2000	Unidentified	Dead	Yellow nylon rope wrapped around carcass	California
2001	Leatherback	Live	Entangled in pot/trap gear. Released.	CA
2002	Loggerhead	Dead	Gillnet-like scarring on carapace	California
2003	Leatherback	Live	Entangled in crab pot line, line. Released.	CA
2004	Green	Dead	Internally embedded fish hook and monofilament line.	CA
2005	Green	Live	Caught in beach seine net targeting skates & rays.	California
2007	Loggerhead	Dead	Entangled in monofilament line	California
2008	Green	Dead	Caught in sea turtle sampling net during research activities. Entangled in monofilament line.	CA
2008	Leatherback	Dead	Entangled in Groundfish Pot Fishery gear.	CA
2008	Green	Live	Fish hooks in flippers with deep wound in left front flipper.	California
2009	Green	Dead	Entangled in discarded gillnet.	CA
2013	Hawksbill	Dead	Original Length on form was 95.5 CM.	California
2014	Green	Live	Hooked in the flipper by fisherman. Released.	California
2014	Green	Dead	No notes taken	California
2015	Green	Live	Entangled in monofilament. Released	CA
2015	Leatherback	Dead	Entangled in braided line	California

gear endorsement is required for all U.S. vessels that fish for HMS within the West Coast EEZ and for U.S. vessels west of the EEZ and land their catch in California, Oregon, or Washington. About 150 permits were issued when the limited entry program began, and that number has declined to below 50 permits in recent years, likely resulting in a decreasing impact on sea turtles.

Historically, the California drift gillnet fleet, including some vessels from Oregon, operated within EEZ waters adjacent to the state and as far north as the Columbia River during El Nino years. The drift gillnet fishery for swordfish became inactive in Oregon and, the Oregon Fish and

Wildlife Commission removed swordfish from the program, beginning in 2009. Consequently, state permits to fish with drift gillnet gear off Oregon are no longer allowed.

Substantial portions of the U.S. waters of the Pacific Ocean (Figure 16) have regulations implemented to minimize impacts to sea turtles, particularly leatherback and loggerheads, but the restrictions are also likely to conserve other sea turtle species. The turtle conservation measures implemented in the drift gillnet fishery include (50 CFR §660.713):

- Prohibited drift gillnet fishing from August 15 to November 15 in the Leatherback Conservation Area (Figure 16).
- Prohibited large-mesh drift gillnet gear from June 1 to August 31in the Loggerhead Conservation Area in El Nino years.
- Additional closures as depicted in Figure 16.
- Pacific loggerhead conservation area from June through August, in years when an El Niño has been forecasted.
- Provisions for responding to, handling, and releasing bycaught sea turtles.

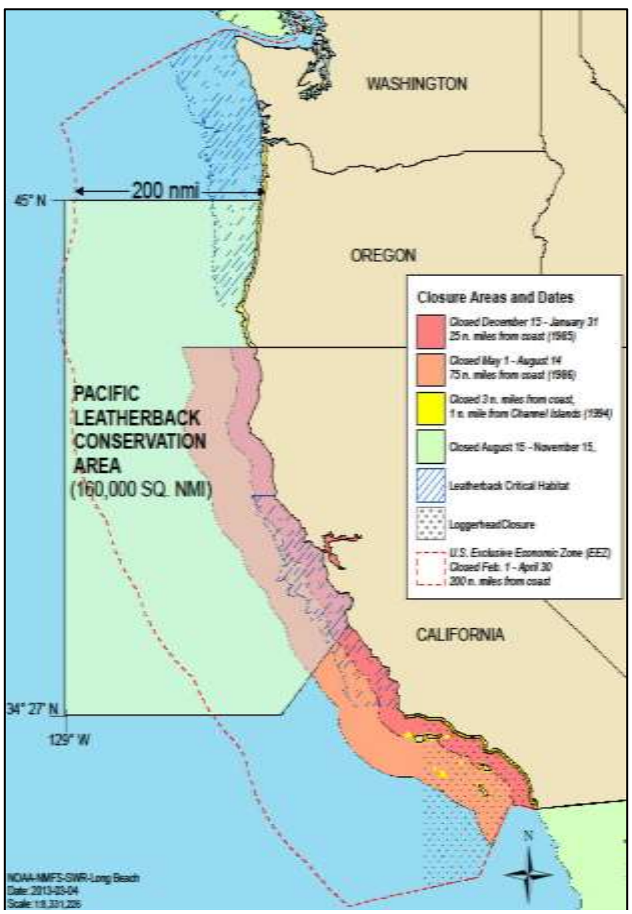

Figure 16. California Drift Gillnet Fishery Closures for sea turtles (NMFS 2015).

According to NMFS (Fahy 2015), these measures have been highly successful, resulting in 90 percent reduction in leatherback interactions, 85 % reduction in loggerhead, and no interactions with green or olive ridley turtles. In addition to the measures already in place, NMFS is in the process of developing a National Bycatch Reduction Strategy, and the draft is currently available for public review (NOAA 2016). The goal of the strategy is "to guide and coordinate NOAA Fisheries' efforts under the Magnuson-Stevens Act, Marine Mammal Protection Act, Endangered Species Act, and other relevant mandates to reduce bycatch and bycatch mortality and to encourage utilization of discards to maintain sustainable fisheries while conserving and recovering protected species."

Some turtles that have been impacted by fishing gear have been brought to treatment facilities for treatment in the past, and we expect treatment may occasionally be required in the future for similarly bycaught turtles. Although treatment may result in successful rehabilitation, some turtles may also die due to their injuries or other secondary infection that can occur in otherwise compromised individuals. We anticipate that any animal requiring treatment may have succumbed to their injuries without intervention, and therefore, the overall effects of treating bycaught turtles are beneficial.

Vessel Collision

Vessel collisions are a potential source of injury and death to sea turtles, and possible boat strike injuries have been noted in records of turtles stranded or observed and reported to the stranding network Table 6). Injuries usually associated with vessel collisions include slashes from

Table 6. Potential vessel collision injuries and mortalities noted in stranding network forms, 1958-2016 (NMFS stranding network unpublished data, 2016).

Year	Species	Condition	Description	State
1988	Green	Dead	Two propeller-like slashes in carapace	CA
1989	Leatherback	Dead	Propeller slashes in carapace & hind limb	CA
1989	Leatherback	Dead	Slash in carapace; head trauma	CA
1989	Leatherback	Dead	1/3 of rear carapace & hind flippers sliced off. Head missing.	CA
1989	Leatherback	Dead	Most of posterior quarter of body missing; possible boat collision	CA
1990	Leatherback	Dead	Gashes in carapace; possible vessel collision	CA
1990	Green	Dead	2 large parallel gashes in carapace	CA
1990	Green	Dead	Carapace split open along center from front to back;	CA
1990	Green	Dead	Carapace cracked & shattered, with parallel cuts. Cut across left eye, penetrating to bone	CA
1990	Leatherback	Dead	Carapace with 3 slashes; half of upper jaw broken off.	CA
1995	Green	Dead	3 propeller cuts on carapace;	CA
1996	Green	Dead	Broken shell.	CA
1997	Green	Dead	Large crack in shell	CA
1998	Leatherback	Dead	4 propeller slashes in neck, skull & left front flipper, 3 carapace slashes. Shark bite on left front flipper;	CA
1999	Green	Dead	7 gashes in carapace	CA
1999	Green	Dead	Healthy turtle; cause of death = boat strike; left side very severe propeller cuts	CA
2002	Green	Dead	Propeller injuries; dehydrated; responsive only to touch.	CA
2004	Green	Live	Propeller-like wounds to carapace & neck; animal captured & transported to SeaWorld	CA
2005	Leatherback	Dead	Deep slashes across carapace	CA
2008	Green	Dead	Healing propeller wound on carapace; ventral carapace entirely cracked & separated (still attached by skin tissue);	CA
2009	Green	Dead	Slash on right side of carapace extending to plastron.	CA

propellers and crushing trauma and are often catastrophic and usually fatal. Of the 21 noted possible interactions between turtles and vessels, based on the nature and location of injuries, all but two have been fatal. Although relatively few interactions have been observed, injuries are often noted on stranded turtles that cannot be definitively attributed to a source. Additionally, injured turtles are only opportunistically found and reported. It is possible that injuries due to vessel strikes are under reported.

Cold-stunning

Cold-stunning is observed in nearly all of the stranded sea turtles on the U.S. west coast. All live turtles that have been found in Oregon, Washington, and Alaska have been hypothermic, and many in California have as well. The percentage of stranded turtles afflicted by hypothermia is unclear because body temperatures are not always recorded in the stranding records, and it is difficult to determine whether hypothermia contributed to death in post-mortem examination. The condition is so common in Oregon and Washington, for example, that special note is seldom made unless the animal is live and transported to a facility with veterinary care that then records body temperature. This condition is one of the most common conditions treated at treatment facilities.

A number of coincidental or associated conditions can affect cold-stunned turtles in the action area. Whether these health conditions are secondary to the cold-stunning or whether they are the primary cause of displacement and eventual cold-stunning is unclear. Hypothermic turtles are unable to forage, consume, and digest food which can lead to emaciation, dehydration, and metabolic problems and other systemic abnormalities (Stacy et al. 2013, Keller et al. 2012). These issues can resolve with treatment for hypothermia, but secondary conditions can result with such a stressed animal.

Many of the treated turtles also present with pneumonia or other respiratory problems. In addition, temporary or persistent buoyancy, air trapped within the body cavity or tissues of live turtles, is often seen prior to capture and treatment, or the condition can develop over time during treatment. The cause of persistent buoyancy is unknown and successful treatment is uncertain.

Other less severe conditions observed in cold-stunned turtles include minor to severe abrasions, limb deformities or fractures, wounds, parasites, digestive tract disorders, and sloughing of damaged tissues or scutes. These conditions seldom result in systemic problems for the animals treated, but often require treatment in the already stressed animals.

Human Development

Human development has been identified as a threat to sea turtles (Seminoff et al. 2015, NMFS and USFWS 2007c, 2011, 2012, 2013a, 2013b, and 2014). Human development tends to impact nesting turtles to a greater extent than turtles occurring in the aquatic environment such as the U.S. west coast. However, aspects of coastal development cause indirect impacts to sea turtles in the action area. For example, one of the most common known reported stranding conditions is the entrainment of turtles in power plant intake systems in California (Table 7). Most of these70 animals were released alive, but six turtles have been found dead in power plant intake systems. Whether these mortalities occurred as a result of entrainment or were entrained following death is unclear. Although stranding associated with entrainment in power plant systems may be one of the most commonly reported incidents, the relative frequency of these events may be misleading. This type of entrainment is easily observed and reported, whereas other impacts may be much less easily observed and attributed to the initial stressor. However, it is clear that human development and resulting infrastructure, such as power plants, can have adverse impacts and some mortality of sea turtles and result in stranding.

Table 7. Entrainment of sea turtles and their status following removal, 1958-2016 (Le Roux et al., in press).

Facility	Year	Species	No.	Status
Avila Beach, Diablo Canyon Nuclear Power Plant, San Luis Obispo County	2007-2012	Green	9	Alive
Carlsbad, Encina Power Plant, San Diego County	2001	Green	1	Dead
	2003-2008	Green	4	Alive
El Segundo, El Segundo Power Plant, Los Angeles County	2004	Green	1	Dead
	1995	Loggerhead	1	Alive
Ormond Beach Generating Station, Ventura County	1998	Green	1	Alive
Playa Del Rey Scattergood Generating Station, Los Angeles County	1989-1991	Green	2	Alive
	1986-1996	Loggerhead	3	Alive
Redondo Beach, Redondo Beach Generating Station, Los Angeles County	1985	Green	1	Dead
	1996 2001	Green	2	Alive
San Onofre, San Onofre Nuclear Power Plant, San Diego County	1983-2013	Green	38	Alive
	1990-1991	Green	2	Dead
	1996	Leatherback	1	Dead
	1993-2010	Loggerhead	3	Alive
	2009	Olive ridley	1	Alive

Climate Change

Based upon available information, it is likely that sea turtles are being affected by climate change. Within the action area, the El Niño Southern Oscillation is likely the most significant ecosystem impact on the sea turtles in the eastern Pacific Ocean. The frequent occurrence of El Niño conditions (i.e., warmer than normal water temperatures) may be responsible for declines in zooplankton and in turn higher level vertebrates in the marine ecosystem (Hill 1995). Turtles may change migration pathways to find food resources during El Nino events or as sea surface temperatures rise in the future.

Turtles may be able to adapt to fluctuating environmental conditions and move from unproductive to more productive feeding areas (Plotkin 1994, 2010). However, it is possible that as turtles venture further north with warmer sea surface temperatures, they may also become vulnerable to temperature changes, changes in food distribution, or vulnerable to environmental factors such as harmful algal blooms or severe weather events. These changes may result in greater numbers of stranded animals that require treatment by treatment facilities.

Rehabilitation

Many factors, as previously addressed, can lead to the stranding of turtles on the west coast. Some of these turtles are found live (Table 8) and some may require further medical assistance as to treat the cause of their incapacitation. Between 1958 and January 2016, approximately 38 percent of all the turtles located were found alive, and of these less than two thirds were treated at a care facility. While turtles have been treated for a variety of ailments and injuries for more than thirty years, these data are incomplete, particularly the older records, and the exact numbers of turtles requiring rehabilitation are and the conditions for which they were treated are not also available.

Table 8. Condition of sea turtles reported stranded on the U.S. west coast, 1958-2016 (LeRoux et al., in prep.).

	Hawksbill	Green	Leatherback	Loggerhead	Olive Ridley	Unknown
Live	0	112	26	29	40	10
Dead	1	116	122	48	40	25
Unknown	0	5	0	1	0	1
Total	1	233	148	78	80	36

The final disposition of most of the animals is unknown, even if they were released since they are not recaptured and very few have been fitted with transmitters. One olive ridley and one green sea turtle, cold-stunned in Oregon in 2009, were fitted with transmitters when released in 2011 and tracked until the transmitters failed (Figure 17). Although this incident only involved two female turtles, it demonstrated that they survived the initial release and travelled extensively, but it is unknown if they ever returned to nesting grounds. If released alive, we assume turtles have successfully returned to the wild. Some instances where rehabilitation occurred may have been missed in the final stranding reports, and many of the reports have blank fields that would otherwise provide information about the final disposition of the animal. These were classified as "unknown" unless other notes were provided that contained enough information to discern the outcome of the stranding.

5.2.2. *Green Sea Turtle*

Green sea turtles are the most numerous sea turtle species stranded on the U.S. west coast, and the vast majority of the strandings occur in California (Figure 18). These turtles are all expected to originate from the Eastern Pacific DPS, however turtles from the Central Pacific DPS may be infrequently encountered and treated by treatment facilities.

NMFS and USFWS (2016) and Seminoff et al. (2015) summarized the factors affecting the 11 DPSs, including the Eastern Pacific and North Central DPSs. Since green sea turtles do not nest in the action area, all green sea turtles are foraging or moving through the area, and threats specific to nesting turtles are not expected to occur on the U.S. west coast. The factors that affect all sea turtles, discussed previously, are not included in this species specific discussion.

Some foraging areas exhibit high levels of contaminants and reduced seagrass communities (Seminoff et al. 2015, NMFS and USFWS 2016). For example, the green sea turtles in San Diego Bay and Baja California, Mexico have high levels of contaminants including heavy metals and persistent organic pollutants (Gardner et al 2006, Komoroske et al. 2011, 2012). In addition, red tide poisoning or toxic algal blooms are also a threat to this species which may result in unusual mortality events (Walsh et al. 2010, Delgado-Trejo and Alvarado-Figueroa 2012 Fauquier et al. 2013).

Disease is a potential threat specifically to green sea turtles within the action area. The green sea turtle population in the Hawaiian Islands area is afflicted with a tumor disease, fibropapillomatosis (FP), which is of an unknown etiology and often fatal, as well as

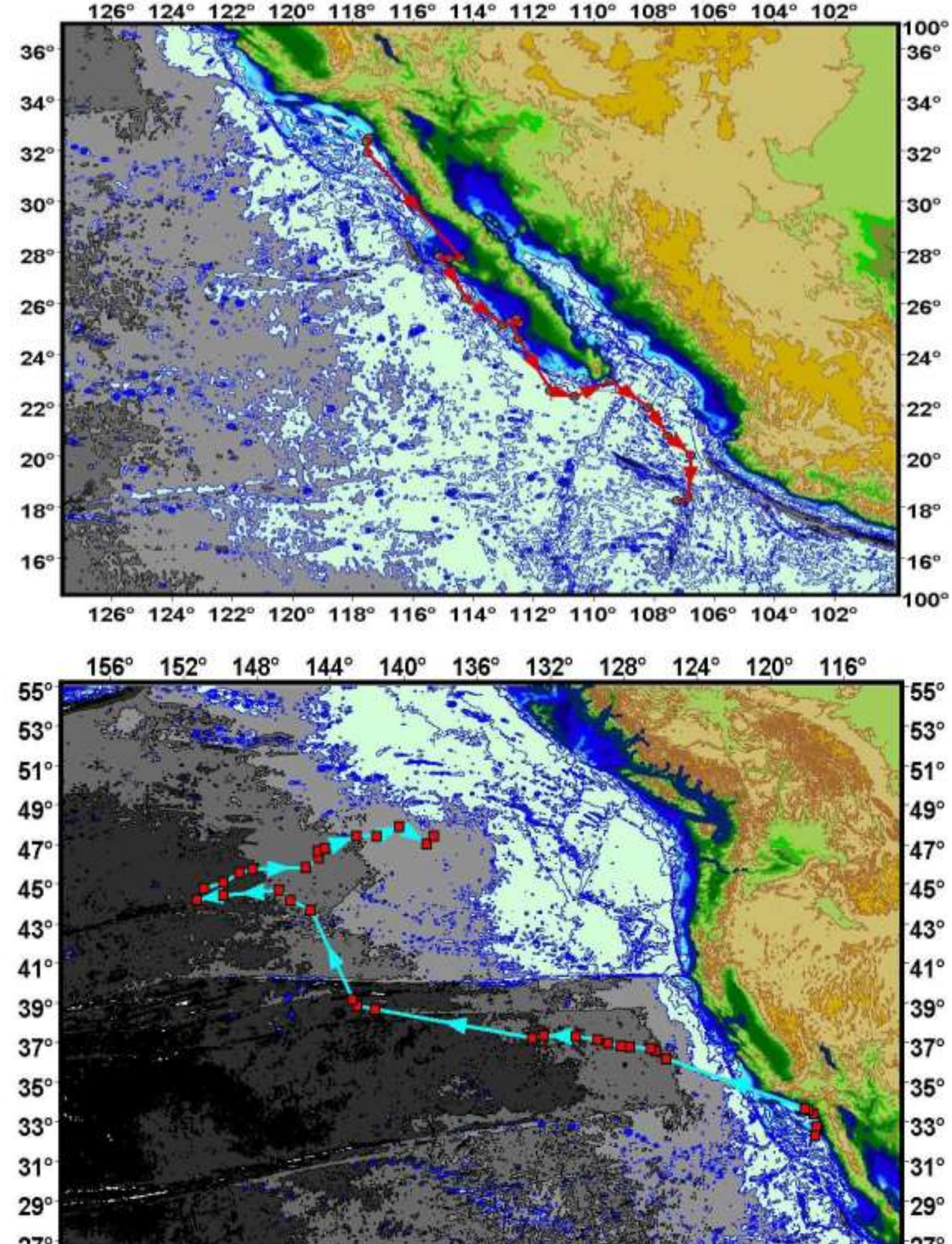

Figure 17. Movements of a rehabilitated green sea turtle (top) and an olive ridley (bottom), stranded in Oregon in 2009 and released in the eastern North Pacific Ocean in 2011 and early 2012 (Stewart et al, in prep. 2012).

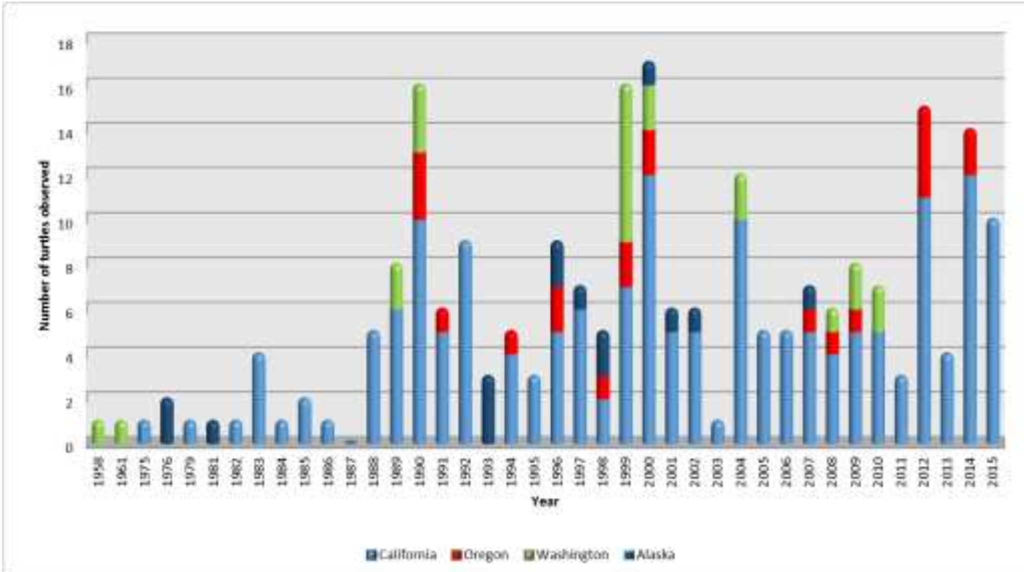

Figure 18. Green sea turtles reported to the marine mammal stranding network by year and state, 1958-2015 (LeRoux et al., in prep.).

spirochidiasis, both of which are the major causes of stranding of this species (Aguirre et al 1998, Van Houtan et al. 2010, Greenblatt et al. 2005, Work et al. 2005). Individuals in the aggregation in San Diego Bay have also tested positive for FP, but the infection is a milder strain, resulting in smaller tumors that appear to grow more slowly than observed in more severe infections such as those in Hawaii (Greenblatt et al. 2005). The turtles from the San Diego area may require treatment on occasion, and the disease may become more prevalent within the DPS over time. It is not anticipated that turtles from Hawaii that are positive for FP would be treated by treatment facilities unless an errant individual is located on the west coast and brought to the facility for treatment.

Of the 234 green sea turtles reported to the stranding network since 1958, 114 of these or 49 percent were reported alive. Of the live turtles, approximately 25 percent reportedly required further examination and/or treatment at a treatment facility.

5.2.3. *Olive Ridley Sea Turtle*

Olive ridleys have historically been stranded in much lower numbers than green sea turtles or leatherbacks, and in similar numbers as loggerheads (Figure 15). However, olive ridley strandings have been increasing, particularly in the Oregon and Washington over the last four or more years (Figure 19). Whether this increase is due to overall population increases, phenomena that resulted in an actual increase in incapacitated turtles, or an increase in reporting is unknown. The underlying causes of these strandings are generally unknown, but about half have been live with approximately 75 percent requiring rehabilitation. Unfortunately, the data for these animals is not complete since the completion and provision of stranding forms to NOAA has not been consistent, and therefore, the outcome of rehabilitation efforts is not entirely certain.

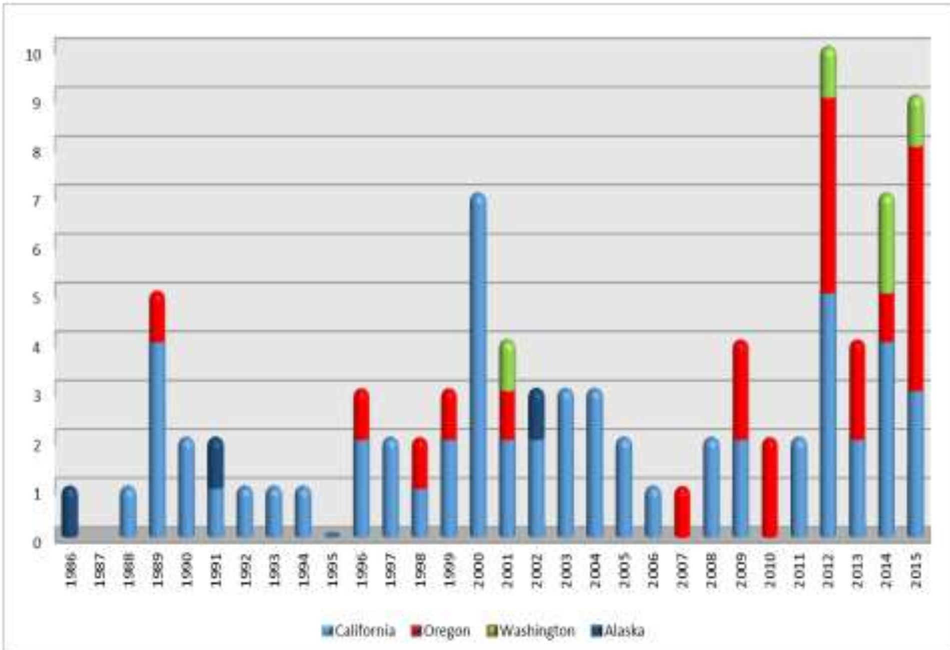

Figure 19. Olive ridley sea turtles reported to the marine mammal stranding network by year and state, 1958-2015 (LeRoux et al., in prep.).

5.2.4. *Loggerhead Sea Turtle*

Loggerheads have stranded in similar numbers as olive ridleys, but the strandings have been more sporadic (LeRoux et al., in prep.). Most loggerhead strandings have occurred in California, and no documented strandings have occurred in Oregon or Washington since 2007 (Figure 20). Loggerhead stranding reports appear to have peaked in the 1990's with incidents occasional occurring since that time. Unlike green and olive ridley sea turtles, most loggerheads (62

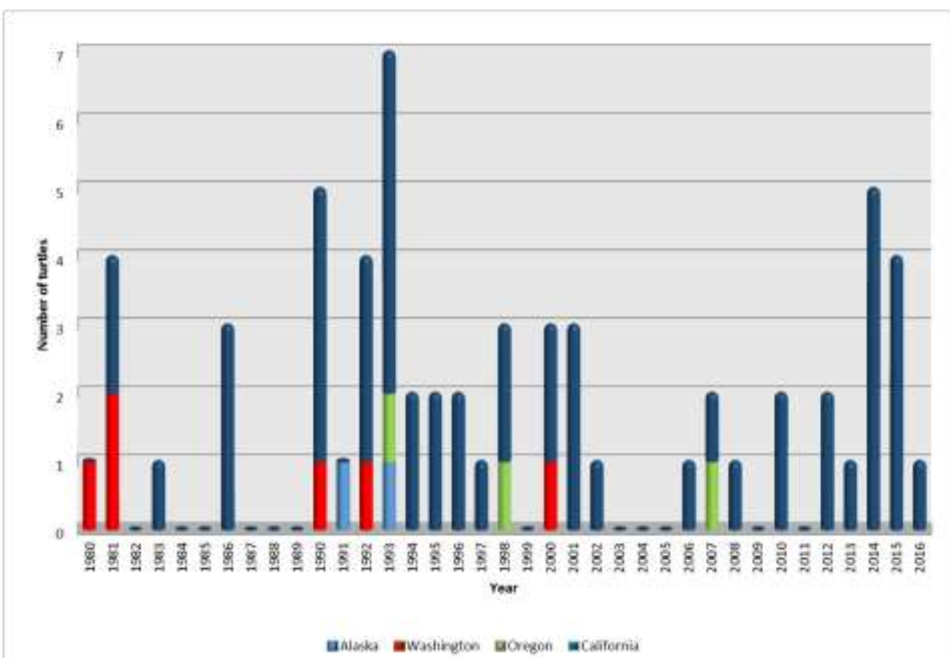

Figure 20. Loggerhead sea turtles reported to the marine mammal stranding network by year and state, 1958-January 2016 (LeRoux et al., in prep.).

percent) are found dead or die soon after locating the stranded animal. Less than a third of the live loggerheads were known to have been successfully released.

5.2.5. *Leatherback Sea Turtle*

Leatherbacks are the second most commonly encountered sea turtle reported to the stranding network on the U.S. west coast. Leatherbacks are unique in their size, physiology, and ability to withstand colder temperatures than hardshell sea turtles, and they are known to frequent much of the west coast in search of jellyfish and similar food resources. For these reasons, they are relatively commonly encountered in the stranding reports. Whether the strandings are a reflection of their relative abundance or their susceptibility to factors that cause strandings is uncertain.

Most reported leatherback strandings occur in California, and none have been reported in Alaska, Washington, or Oregon since 1993 (Figure 21). Although strandings were more frequent and widespread prior to 1993, the number and frequency of strandings since that time have been more similar to those observed in other species.

Most stranded leatherbacks, 82 percent, have been found dead or dying, and no live stranded turtles have been reported since 2003. Prior to 2003, most of the live turtles were either sighted and reported in Alaska, notable due to the unusual occurrence, or were found entangled in fishing gear. Changes in fishing practices 2003 may account for the difference; however, this conclusion is speculative and may be coincidental. Besides the early entanglements and collision, the contributing factors for the 122 dead leatherbacks are not entirely known.

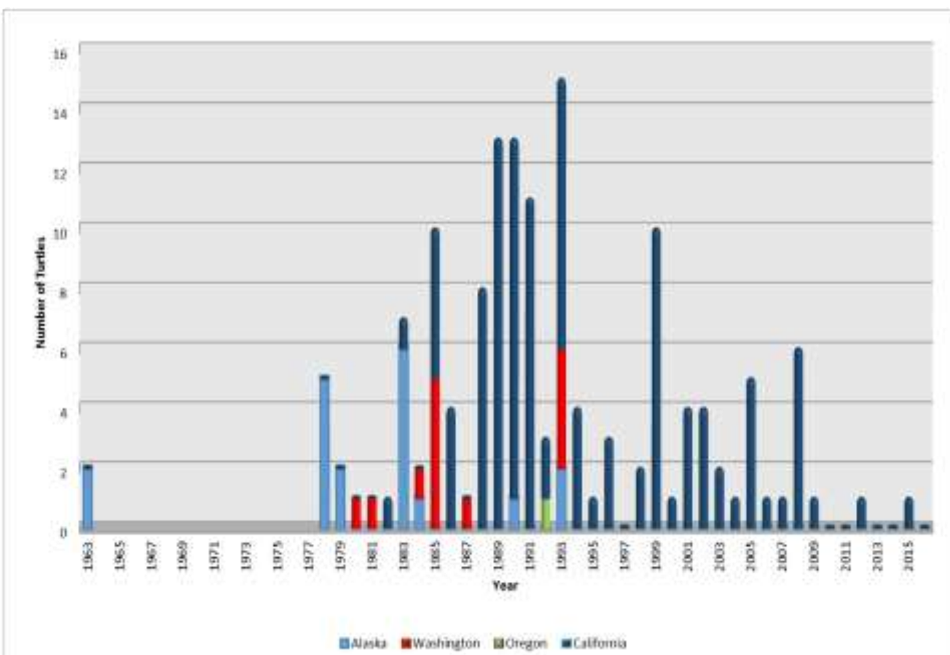

Figure 21. Leatherback sea turtles reported to the marine mammal stranding network by year and state, 1958 - January 2016 (LeRoux et al., in prep.).

Although early records are not always complete, there is no indication that a live leatherback has ever been treated at a rehabilitation facility. The size and biology (feeding on live jellyfish) of leatherbacks makes response and care challenging.

5.2.6. *Hawksbill Sea Turtle*

Only one hawksbill has stranded in the action area in 2013. It was found dead near San Diego, California. The cause of death was uncertain, but the animal was entangled in monofilament line, which had been removed prior to arrival of stranding responders. The likelihood of encountering a live hawksbill in the action area is extremely low, as demonstrated by the fact that only one dead animal had been reported in the nearly 60 years of recorded strandings.

6. EFFECTS OF THE ACTION

Effects of the action refer to the permanent or temporary direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action that will be added to the environmental baseline. Indirect effects are those that are caused by the proposed action, occur later in time, but are still reasonably certain to occur.

7. EFFECTS TO THE SPECIES

Because the action consists of the capture, treatment, and release of incapacitated sea turtles that are found on the U.S. west coast and associated activities, we expect that the effects on all sea turtle species that occur in the action area will likely be similar. The magnitude of the impact on each species may vary, since the application of treatment is far greater for some species than others. The description of these effects will first focus on those effects that are likely to occur to all species, followed by species-specific discussion of any individual effects and the expected magnitude of these effects.

7.1. Direct effects

7.1.1. *All Sea Turtle Species*

As described in the DESCRIPTION OF THE PROPOSED ACTION, rehabilitation of sea turtles is comprised of the following activities: rescue; rehabilitation; release; display for educational purposes; veterinary care and research; tagging/tracking research; and media coordination. Turtles that do not survive rehabilitation attempts may also be salvaged for research and educational purposes. In some cases, captive sea turtles may also be released to the wild for the conservation of the species.

<u>Rehabilitation of Wild Turtles</u>

All rescued turtles have been incapacitated by some physical or environmental factor that resulted in injury or illness and eventual stranding of the animal. Sea turtles do not bask on U.S. west coast beaches, and we anticipate that any reported, stranded animal that is found alive will require capture for further treatment. Although capture seldom causes substantial response in stranded animals, it is possible that a turtle may be inadvertently injured or an existing injury could be exacerbated in the capture and transport process.

Catastrophic events such as contaminant or oil spills, virulent disease, severe weather events, or large-scale oceanic abnormalities such as sea surface temperature anomalies or toxic algal blooms all cause physical stressors that result in turtle stranding. The treatment of turtles affected by these events is not always successful, and the stressor or additive effects of treatment and confinement can result in mortality. However, treatment is likely to result in the alleviation of physical impairment of those turtles that survive and eventually return to the wild.

Incapacitated turtles are generally compromised prior to capture, and the stress of handling and transport can also cause additional harm and could even partially contribute to death. However, it is likely that turtles that are so severely compromised would likely have succumbed to their injury or illness with or without intervention.

During treatment, turtles are treated medically and may require handling, injections, surgery, tissue or other diagnostic sampling, intubation, diagnostic imaging, transport, general management (feeding, housing, enrichment, etc.), and other procedures as necessary. All of these activities may cause stress to a wild turtle, and may rarely result in injury. Additionally, such compromised animals can develop secondary infections as a result of their initial affliction. Facilities take precautions to minimize these occurrences, but as with any animal in critical care, secondary infections can occur and cause additional harm or death.

Turtles that are stranded in northern waters, particularly those found north of San Francisco Bay, California, are not only impacted by physical stressors, but are also at risk of hypothermia or cold-stunning. The treatment of cold-stunning is complicated by co-occurrence of other incapacitating conditions such as pneumonia, metabolic disorders, fractures, wounds, and many others. Cold-stunned turtles that successfully respond to treatment often require transport to warmer waters for eventual release. Transportation via automobile and air requires significant time out of water, is stressful for the animal, and can result in exacerbation or reoccurrence of symptoms. Additional holding time is often required following transportation to ensure the health of the turtle and to release it when sea surface temperatures are optimal for successful return to the wild.

Research activities are an important component of investigating and reducing the causes of sea turtle strandings. Live stranded turtles provide data that is unavailable from carcasses. These activities may require the collection of blood, skin, or other tissue samples, as well as the collection of stomach contents and feces. As with any of the other veterinary procedures, these activities can result in additional stress and discomfort. However, these samples will only be obtained when the procedure can be combined with a medically necessary procedure to minimize stress, or would only be attempted if the animal is deemed healthy enough to withstand the procedure with minimal impact to its recovery.

Turtles that are released to the wild have been housed in a manner that minimizes the likelihood of transmission of disease, and veterinary personnel, USFWS, and NMFS coordinate to establish consensus that turtles are suitable for release. Release, in itself, can be a stressful event, but there is no evidence to suggest that any released turtles have been adversely impacted by the event or have caused any impact to other wild turtles.

Occasionally, turtles that have been treated are deemed non-releasable. Non-releasable turtles are defined as turtles (bycaught, stranded, or congenitally deformed) that have been rehabilitated, but which have permanent handicapping injuries or defects that preclude their survival in the wild. This designation is determined in coordination between veterinarians, the treatment facility, NMFS, and USFWS. These animals can be permanently housed, according to protocol (APPENDIX A), and will contribute to recovery of the species or population through educational interpretation and display.

7.1.2. *Green Sea turtle*

In addition to the direct effects that affect all turtle species, the proposed project may have additional factors that may affect green sea turtles in the action area. Fibropapillomatosis is known to be present in green sea turtles that reside in San Diego Bay. Although the disease has been a mild form that has not caused severe symptoms or grown quickly, the virulence of the disease or the turtles' response could change over time. If the impacts to the species become more extensive, individuals may require additional intervention and potential treatment or research which may include assistance by treatment facilities. Steps to intervene may never be necessary, but would only occur if the risk to the population is substantial enough to require remedial treatment. For these reasons, the treatment of an at-risk population of a potentially catastrophic disease would only be beneficial.

In addition to the programmatic effects of rehabilitation at treatment facilities, the proposed project includes the specific request by the applicant to release 44 captive-bred green sea turtles to the wild. These turtles have been genetically tested to determine origin, will be healthy and free of communicable disease at the time of release, and will be monitored to examine the results of the release. Without release, these 44 turtles would live the remainder of their lives in captivity. There are too many to effectively display for educational purposes and would not even provide additional educational benefits. Some of the captive-raised turtles may not successfully establish themselves within wild populations and some could even perish through events that similarly impact wild turtles, as previously described. However, release would allow for their potential contribution to wild populations and could provide important information about the feasibility and response of releasing captive-bred turtles into wild populations. This release of captive-bred turtles is therefore expected to be beneficial to the species overall.

7.1.3. *Olive Ridley Sea Turtle*

Olive ridley sea turtles are increasing in numbers as conservation measures, particularly on their nesting areas, increase survivorship and productivity. As the population increases, we expect greater abundance of foraging turtles to occur on the U.S. west coast. As olive ridleys encounter unusual ocean conditions or climactic events, as has occurred in Oregon and Washington in recent years, cold-stunning and strandings seem to increase. We expect this trend to continue, and some of these animals will require treatment. Although cold-stunning can be complicated, difficult to treat, and result in mortality, treatment of olive ridleys can be successful, and the release of these animals is a benefit to the species.

7.1.4. *Loggerhead Sea Turtle*

Loggerheads continue to sporadically strand on the U.S. west coast despite the distance from their nesting grounds in the western Pacific. We expect this relatively stable trend to continue and that effects of treatment would be similar to those described for other sea turtles.

7.1.5. *Leatherback Sea Turtle*

Although leatherbacks are second only to green sea turtles in the numbers stranded on the U.S. west coast, we have no record of leatherbacks requiring intensive rehabilitation in the past. Therefore, the direct effects of the action are expected to be minimal on leatherbacks. However, leatherbacks occur in the action area and have been observed dead or incapacitated. Rehabilitation of leatherbacks could be necessary in the future. If rehabilitation of leatherbacks is required, the direct effects are expected to be similar to those described for all sea turtle species, but in lower magnitude than species that are more frequently treated.

7.1.6. *Hawksbill Sea Turtle*

Only one dead hawksbill has been recovered in nearly 60 years of recorded strandings. We expect very few hawksbills, if any, to ever be encountered on the U.S. west coast. However, if an incapacitated hawksbill requires treatment, the direct effects will be similar to those described for all sea turtle species, but at much lower magnitude than other species that are more frequently treated.

7.2. Indirect Effects

7.2.1. *All Sea Turtle Species*

As a result of successful treatment, recovered turtles will be released into the wild. These turtles may have had significant interaction with humans during their treatment and despite measures to minimize interactions, may have some degree of habituation. Some turtles may associate humans with food or may lose their wariness around humans. This habituation can bring released turtles in proximity of humans which can result in inadvertent injury or harm or could make them more susceptible to illegal harvest. Measures will be taken to minimize habituation, as described in “Standard Permit Conditions for Care and Maintenance of Captive Sea Turtles” (APPENDIX B), and this indirect effect of treatment is expected to be minimal.

Release of rescued turtles, particularly those transported long distances, may cause disorientation or difficulty returning to their original range. However, this effect has never been examined, and is extremely difficult to quantify. Equipping released animals with transmitters may help to elucidate how rehabilitated turtles respond to release and may provide information that can improve treatment and release in the future.

7.3. Population Effects

As previously mentioned, turtles that require rehabilitation would likely have perished without intervention. Successful rehabilitation will return individuals to the wild that would have otherwise been lost to future generations and will instead contribute to the recovery of the population. Therefore, the overall effects of treating incapacitated sea turtles are beneficial since any successful rehabilitation and return to the wild is beneficial to the recovery of wild populations.

7.3.1. *Green Sea turtle*

Green sea turtles are the most frequently stranded and treated species in the action area. We anticipate that the prevalence of stranded green sea turtles is likely to continue based on the relative abundance of the species and its proximity to the shoreline and human development. Some incapacitated green sea turtles will occasionally require rehabilitation, and although some do not survive the event that caused the stranding or the subsequent treatment, some green sea turtles will be returned to the wild that would not have otherwise survived. We expect these released turtles will return to their breeding population and contribute to the recovery of their distinct population segment.

7.3.2. *Olive Ridley Sea Turtle*

Although olive ridleys are not the most numerous or frequently stranded species in the action area, recent data suggests that their numbers are increasing due to conservation measures, particularly at their nest sites. Recent climatic events on the U.S. west coast have seemingly resulted in a higher numbers of olive ridley cold-stunning events, and given climate change and population increases, this trend may continue. A few individuals will be annually treated and successfully released to the wild. We expect these released turtles will return to their breeding population and contribute to the recovery of their species.

7.3.3. *Loggerhead Sea Turtle*

We expect the observed stable but sporadic trend in loggerhead stranding to continue. Occasionally, stranded loggerheads may be rehabilitated and returned to the wild. Accordingly, we expect these released turtles will return to their breeding population and contribute to the recovery of their species.

7.3.4. *Leatherback Sea Turtle*

Given the prevalence of leatherbacks and large number of observed stranding on the U.S. west coast, individuals may require intervention and rehabilitation if incapacitated. Most leatherbacks are found dead, and those that are alive are often immediately returned to the wild. Due to their size and physiology, leatherbacks may be challenging to treat, but if successfully treated, we expect released individuals will return to their breeding population and contribute to the recovery of their species.

7.3.5. *Hawksbill Sea Turtle*

Given the extremely rare occurrence of hawksbills in the action area, we expect that treatment of this species to be a highly unusual occurrence. If successfully treated, we expect released individuals will return to their breeding population and contribute to the recovery of their species.

7.4. Consistency with Recovery Plan

7.4.1. *Green Sea turtle*

The Green sea turtle recovery plan (NMFS and USFWS 1998a) includes recovery tasks that can be met with the assistance of stranding response and rehabilitation efforts. One task identifies the need to develop and maintain a carcass stranding network. The plan further indicates that such networks can be useful for alerting managers to incidents causing high mortality, such as an increased fishery take or disease problems, as well as providing some basic biological data. In addition these stranding networks are a key component of locating incapacitated turtles and ensuring they receive care at rehabilitation facilities.

Specifically the recovery plan calls for the designation of rehabilitation facilities that meet appropriate criteria and standards for captivity. The USFWS has further defined standards for these facilities and for all captive and rehabilitating turtle care (APPENDIX B). The proposed action will formally implement this recovery task.

The recovery plan additionally recommends using samples from stranded turtles to identify the origin of these animals and contribute to the understanding of genetic relationships. The proposed action will assist in refining the understanding of genetic relationships among green sea turtle populations.

7.4.2. *Olive Ridley Sea Turtle*

The olive ridley recovery plan (NMFS and USFWS 1998b) includes recovery tasks that can be met with the assistance of stranding response and rehabilitation efforts. One task identifies the need to develop and maintain a carcass stranding network. The plan further indicates that such networks can be useful for alerting managers to incidents causing high mortality, such as an increased fishery take or disease problems, as well as providing some basic biological data. In addition these stranding networks are a key component of locating incapacitated turtles and ensuring they receive care at rehabilitation facilities.

Specifically the recovery plan calls for the designation of rehabilitation facilities that meet appropriate criteria and standards for captivity. The USFWS has further defined standards for these facilities and for all captive and rehabilitating turtle care (APPENDIX B). The proposed action will formally implement this recovery task.

The recovery plan additionally recommends using samples from stranded turtles to identify the origin of these animals and contribute to the understanding of genetic relationships. The proposed action will assist in refining the understanding of genetic relationships among olive ridley populations.

7.4.3. *Loggerhead Sea Turtle*

The loggerhead recovery plan (NMFS and USFWS 1998c) includes recovery tasks that can be met with the assistance of stranding response and rehabilitation efforts. One task identifies the need to develop and maintain a carcass stranding network. The plan further indicates that such networks can be useful for alerting managers to incidents causing high mortality, such as an increased fishery take or disease problems, as well as providing some basic biological data. In addition these stranding networks are a key component of locating incapacitated turtles and ensuring they receive care at rehabilitation facilities.

Specifically the recovery plan calls for the designation of rehabilitation facilities that meet appropriate criteria and standards for captivity. The USFWS has further defined standards for these facilities and for all captive and rehabilitating turtle care (APPENDIX B). The proposed action will formally implement this recovery task.

The recovery plan additionally recommends using samples from stranded turtles to identify the origin of these animals and contribute to the understanding of genetic relationships. The proposed action will assist in refining the understanding of genetic relationships among loggerhead populations.

7.4.4. *Leatherback Sea Turtle*

The leatherback recovery plan (NMFS and USFWS 1998d) includes recovery tasks that can be met with the assistance of stranding response and rehabilitation efforts. One task identifies the need to develop and maintain a carcass stranding network. The plan further indicates that such networks can be useful for alerting managers to incidents causing high mortality, such as an increased fishery take or disease problems, as well as providing some basic biological data. In addition these stranding networks are a key component of locating incapacitated turtles and ensuring they receive care at rehabilitation facilities.

Specifically the recovery plan calls for the designation of rehabilitation facilities that meet appropriate criteria and standards for captivity. The USFWS has further defined standards for these facilities and for all captive and rehabilitating turtle care (APPENDIX B). The proposed action will formally implement this recovery task.

The recovery plan additionally recommends using samples from stranded turtles to identify the origin of these animals and contribute to the understanding of genetic relationships. The proposed action will assist in refining the understanding of genetic relationships among leatherback populations.

7.4.5. *Hawksbill Sea Turtle*

The hawksbill recovery plan (NMFS and USFWS 1998e) includes recovery tasks that can be met with the assistance of stranding response and rehabilitation efforts. One task identifies the need to develop and maintain a carcass stranding network. The plan further indicates that such networks can be useful for alerting managers to incidents causing high mortality, such as an increased fishery take or disease problems, as well as providing some basic biological data. In addition these stranding networks are a key component of locating incapacitated turtles and ensuring they receive care at rehabilitation facilities.

Specifically the recovery plan calls for the designation of rehabilitation facilities that meet appropriate criteria and standards for captivity. The USFWS has further defined standards for these facilities and for all captive and rehabilitating turtle care (APPENDIX B). The proposed action will formally implement this recovery task.

The recovery plan additionally recommends using samples from stranded turtles to identify the origin of these animals and contribute to the understanding of genetic relationships. The proposed action will assist in refining the understanding of genetic relationships among hawksbill populations.

8. CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, Tribal, local or private actions that are reasonably certain to occur within the action area considered in this Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Human impacts on turtles will continue even while rehabilitation efforts are implemented. Some fisheries interactions are permitted by the States, and will not be considered under section 7 of the Act. Fisheries gear (e.g., buoy, pot, and trap lines; longlines; seines, purse, and other nets, etc.) all have the potential to impact sea turtles foraging, migrating, or traveling within the action area. These interactions can result in mortality or injuries that require the rehabilitation considered in this opinion.

Additionally, free-swimming turtles are at risk of vessel collision at any time, and only a small portion of these vessels are authorized, funded, or operated by a Federal agency that would be subject to section 7 of the Act. The injuries related to vessel collision may result in mortality or require the rehabilitation considered in this opinion.

Some intake systems at power plants (i.e., State-managed) along the west coast have not yet acquired Federal permits under section 10(a)(1) of the ESA and therefore, have not been considered under section 7 of the Act.. In the meantime, we consider the entrainment at these facilities to have a cumulative effect on sea turtles. This entrainment is usually non-lethal, and whether those that are found deceased were killed by the event or already dead is not always clear. However, entrainment events prevent feeding and mobility and may result in mortality.

All of these cumulative effects may result in injury or mortality, and can also increase the number of stranded turtles that require rehabilitation described in this opinion.

9. CONCLUSION

After reviewing the current status of the green, olive ridley, loggerhead, leatherback, and hawksbill sea turtles, the environmental baseline for the action area, the effects of the proposed action on green, olive ridley, loggerhead, leatherback, and hawksbill sea turtles, and the cumulative effects, it is the USFWS's biological opinion that the activity, as proposed, is not likely to jeopardize the continued existence of these species.

Our findings are based on the following assumptions and factors:

(1) The turtles that are treated in care facilities are likely to perish without intervention and rehabilitation.

(2) The turtles that are successfully rehabilitated and released to the wild will return to their breeding populations and contribute to the populations and species.

(3) Turtles that survive rehabilitation but are non-releasable due to a condition that would prevent survival in the wild will contribute to public education and scientific knowledge about sea turtle conservation.

(4) Despite unintentional mortality or injury that can occur during temporary captivity, treatment, and transport, the successful treatment of sea turtles will benefit the species and/or distinct populations segments of the turtles considered in this opinion.

This conclusion is consistent with the recovery plans for green, olive ridley, loggerhead, leatherback, and hawksbill sea turtles because the proposed action implements tasks identified as necessary for the recovery of each of these species. Despite mortalities or injuries that may occur, the result of the action is a beneficial contribution to the recovery of all five species.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. “Harm” is further defined by the USFWS 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. “Harass” is defined by the USFWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding or sheltering. 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 a prohibited taking provided that such taking is in compliance with the terms and conditions of this Incidental Take Statements (ITS).

The measures below are non-discretionary, and must be undertaken by FWS so that they become binding conditions of any grant or permit issued to any applicant, as appropriate, for the exemption in section 7(o)(2) to apply. The FWS has a continuing duty to regulate the activities covered by this ITS. If FWS (1) fails to assume and implement the terms and conditions or (2) fails to require cooperators 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. In order to monitor the impact of incidental take, FWS must report the progress of the action and its impact on the species the USFWS as specified in this ITS[50 CFR §402.14(i)(3)].

1. AMOUNT OR EXTENT OF TAKE

The amount estimated for each species is based on the maximum live strandings recorded over any 5-year period for the last ten years by the West Coast Stranding Network (LeRoux et al., in prep.)(APPENDIX A). An additional consideration has been made for the increasing rate that olive ridleys have been stranding in recent years. Live strandings have increased at a rate of approximately 40 percent/year for the last 10 years, and therefore, the estimated take is elevated by approximately 40 percent (or 2 turtles/5 years) over current 5-year maximum (16 turtles/5 years) to account for future increases. Hawksbills have only had one reported stranding in nearly 60 years, and this condition is not expected to change.

The USFWS anticipates an annually reported take of green, olive ridley, loggerhead, leatherback, and hawksbill sea turtles as a result of the proposed action, as described in Table 9. Take will be calculated annually over moving 5-year totals to allow for annual variability in stranding numbers.

Table 9. The anticipated amount and form of incidental take expected to occur as a result of treating live incapacitated turtles at treatment facilities on the U.S. west coast.

Species of sea turtle	Amount of take (turtles/period)	Form of take
Green	20/5 years	Harm or mortality
Olive ridley	18/5 years	Harm or mortality
Loggerhead	3/5 years	Harm or mortality
Leatherback	1/10 years	Harm or mortality
Hawksbill	1/50 years	Harm or mortality
Captive Green sea turtles	44	Harm or mortality

2. EFFECT OF THE TAKE

In the accompanying biological opinion, the USFWS determined that this level of anticipated take is not likely to result in jeopardy to the five sea turtles species.

3. REASONABLE AND PRUDENT MEASURES

The USFWS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of green, olive ridley, loggerhead, leatherback, and hawksbill sea turtles. The USFWS will require responders or permitted rehabilitation facilities to:

(1) Minimize the risk of injury or death that may occur as a result of rescuing and transporting incapacitated turtles on the U.S. west coast.

(2) Minimize the likelihood of injury to or death of captive turtles in rehabilitation facilities on the U.S. west coast.

(3) Minimize the risk of injury or death of sea turtles released to the wild.

(4) Monitor and report all take that occurs as a result of rehabilitation activities.

4. TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, the USFWS 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.

Terms and conditions include monitoring, review, reporting, (see 50 CFR 402.14(i)(3)) and disposition of specimens (see 50 CFR 402.14(i)(1)(v)).

(1) To minimize the risk of injury or death that may occur as a result of rescuing and transporting incapacitated turtles on the U.S. west coast, the following terms and conditions apply:

a. The USFWS will ensure responders and rehabilitation facilities will conform to the most current, approved West Coast Stranding Network protocol for stranded turtles.

b. USFWS will work with NMFS to continue to improve standard operating procedures implemented when turtle strandings are reported.

(2) To minimize the likelihood of injury to or death of captive turtles in rehabilitation facilities on the U.S. west coast, the following terms and conditions apply:

a. The USFWS will ensure facilities that hold turtles in captivity must conform with the conditions listed in Standard Permit Conditions for Care and Maintenance of Captive Sea Turtles (USFWS 2013)(APPENDIX B) and as revised and approved in the future by the USFWS.

b. The USFWS will ensure facilities that take wild turtles into captivity must only do so for the purposes of rehabilitation and return to the wild.

c. The USFWS will require that blood, genetic, tissue, skin, feces, or other biological samples will be provided to NMFS and/or USFWS upon request.

d. The USFWS will require that turtles deemed non-releasable must be confirmed by the USFWS and NMFS, and the disposition of these animals will be determined and approved by the USFWS.

e. The USFWS will require that the disposition of turtles that die in captivity while undergoing rehabilitation care at a facility will be determined and approved by the USFWS.

f. The USFWS will ensure only those sea turtles deemed "non-releasable" by the USFWS may be held long term in a facility.

(3) To minimize the risk of injury or death of sea turtles released to the wild, the following terms and conditions apply:

a. The USFWS will require the rehabilitation facility will notify the USFWS and NMFS when rehabilitated turtles are deemed suitable for release. Water temperatures (ideally greater than 65ºF [18ºC]) and the turtles’ medical condition (alert, swimming strongly, unmedicated, feeding and otherwise behaving normally) will determine the suitability for release.

b. The USFWS will ensure that the rehabilitation facility will coordinate with the USFWS at least seven days prior to proposed release to confirm the condition of the turtle, the proposed release location, and report identification tag numbers and/or satellite tag information.

c. The USFWS will ensure that flipper tags will be fixed according to protocol (APPENDIX B).

d. The USFWS will ensure that satellite tags will be attached to released animals whenever feasible and safe for the animal. The rehabilitation facility will work with NMFS and USFWS to determine the feasibility and safety of the application of satellite tags.

e. The USFWS will ensure all radio-telemetry monitoring will be conducted in cooperation with NMFS, and results will be provided to the USFWS annually.

(4) To monitor and report all take that occurs as a result of rehabilitation activities, the following terms and conditions apply:

a. The USFWS will ensure take of turtles (i.e., numbers of animals collected/captured, transported, rehabilitated, released, retained, transferred, and/or deposited) will be reported annually by each applicant. USFWS will calculate take over moving 5-year totals to allow for annual variability in stranding numbers and will share the calculations with NMFS.

b. The USFWS will ensure that a West Coast Stranding Report will be provided to NMFS for each stranded turtle, and a copy will be provided to USFWS for all live stranded turtles.

c. The USFWS will require that a necropsy report, using the attached form (APPENDIX C), will be prepared and provided to NMFS and USFWS no later than six months from date of death for any turtle that dies while in rehabilitation. Biological samples will be provided to NMFS and/or USFWS upon request.

d. The USFWS will ensure that, when a turtle is in captivity, the rehabilitation facility must send monthly progress reports to USFWS and NMFS via email and complete the "Sea Turtle Rehabilitation Quarterly Report" (APPENDIX D) regarding the condition of all rehabilitating turtles in their care until the animal is released or deemed non-releasable.

e. The USFWS will require that all non-releasable animals held will be reported annually to the USFWS. Complete the "Non-Releasable Sea Turtle Annual Report" (APPENDIX E).

5. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by implementing conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities designed to minimize or avoid adverse effects of a proposed action on listed species or designated critical habitat, to assist in the implementation of recovery plans or to obtain information.

The USFWS believes the following conservation recommendations will reduce the impact of the proposed action on listed species within the action area:

(1) Consider establishment of a local or regional turtle stranding network that consists of:

   a. Trained immediate responders that will locate and confirm identity of reported stranded turtles and transport incapacitated animals to the nearest rehabilitation facility through coordination with NMFS and USFWS.

   b. Trained intermediate response facilities that can hold turtles short-term if rehabilitation space is limited or immediate transport is infeasible.

   c. Network of rehabilitation facilities that:

      i. Meet the conditions described in the Standard Permit Conditions for Care and Maintenance of Captive Sea Turtles (USFWS 2013) and as revised and approved in the future by the USFWS.

      ii. Each has the capacity to hold up to 10 turtles at 4 different ambient air/water temperatures.

         - Immediate intensive care dry tanks
         - Intermediate critical care dry/partial wet warming tank
         - Intermediate critical care wet warming tanks
         - Optimal temperature holding and rehabilitation tank

      iii. Are located a maximum distance of 300 road miles from the next nearest rehabilitation facility.

(2) Minimize stranding by promoting turtle and ocean conservation with education and outreach efforts:

   a. Educate the public about the threats to the species and measures that will help recover turtles.

   b. Work with the USFWS, NMFS, and other partners to establish outreach materials that will inform the media and public about stranding causes and potential conservation measures that could reduce stranding, especially during notable events such as turtle intake, transfer, and release.

c. Continue to provide the public information about what to do if they encounter a turtle on the beach or interacting with fishing gear.

In order for the USFWS to be kept informed of actions that minimize or avoid adverse effects or benefit listed species or their habitats, the USFWS requests notification regarding the implementation of any conservation recommendation.

6. REINITIATION NOTICE

This concludes formal consultation on the actions outlined in your Biological Assessment. As provided in (50 CFR § 402.16), reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agencies' action that may affect listed species or critical habitat in a manner or to an extent not considered in this BO; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this BO; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending re-initiation of formal consultation.

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APPENDICES:
APPENDIX A.

Table 10. Strandings recorded on the U.S. west coast and Alaska, 1958-2016 (LeRoux et al., in prep.)

Year	Common Name	Condition	State
1958	Green	Live	Washington
1961	Green	Unknown	Washington
1963	Leatherback	Live	Alaska
1963	Leatherback	Unknown	Alaska
1963	Unidentified	Live	Washington
1974	Unidentified	Live	Alaska
1975	Green	Live	California
1976	Green	Live	Alaska
1976	Green	Unknown	Alaska
1978	Leatherback	Live	Alaska
1978	Leatherback	Live	Alaska
1978	Leatherback	Live	Alaska
1978	Leatherback	Unknown	Alaska
1978	Leatherback	Live	Alaska
1979	Green	Live	California
1979	Leatherback	Unknown	Alaska
1979	Leatherback	Live	Alaska
1979	Unidentified	Live	Alaska
1980	Leatherback	Live	Washington
1980	Olive ridley	Live	California
1980	Unidentified	Live	Washington
1980	Loggerhead	Unknown	Washington
1981	Loggerhead	Unknown	Washington
1981	Loggerhead	Live	Washington
1981	Loggerhead	Live	California
1981	Loggerhead	Live	California
1981	Green	Live	Alaska
1981	Leatherback	Unknown	Washington
1982	Green	Live	California
1982	Leatherback	Dead	California
1983	Leatherback	Unknown	Alaska
1983	Green	Dead	California
1983	Green	Live	California
1983	Green	Live	California
1983	Leatherback	Dead	California
1983	Leatherback	Live	Alaska
1983	Green	Live	California
1983	Leatherback	Live	Alaska
1983	Leatherback	Live	Alaska
1983	Leatherback	Live	Alaska
1983	Leatherback	Live	Alaska
1983	Olive ridley	Live	California
1983	Loggerhead	Live	California
1984	Unidentified	Dead	California
1984	Green	Live	California
1984	Leatherback	Live	Alaska
1984	Olive ridley	Live	California
1984	Leatherback	Live	Washington

1985	Leatherback	Dead	California
1985	Leatherback	Live	Washington
1985	Leatherback	Unknown	Washington
1985	Leatherback	Dead	California
1985	Olive ridley	Dead	California
1985	Green	Dead	California
1985	Leatherback	Unknown	Washington
1985	Leatherback	Unknown	Washington
1985	Green	Dead	California
1985	Leatherback	Dead	California
1985	Leatherback	Unknown	Washington
1985	Leatherback	Dead	California
1985	Leatherback	Dead	California
1986	Olive ridley	Unknown	Alaska
1986	Loggerhead	Live	California
1986	Loggerhead	Live	California
1986	Leatherback	Dead	California
1986	Loggerhead	Dead	California
1986	Leatherback	Dead	California
1986	Leatherback	Dead	California
1986	Green	Live	California
1986	Leatherback	Dead	California
1987	Unidentified	Unknown	Washington
1987	Leatherback	Unknown	Washington
1988	Leatherback	Dead	California
1988	Leatherback	Live	California
1988	Green	Dead	California
1988	Leatherback	Dead	California
1988	Olive ridley	Dead	California
1988	Leatherback	Dead	California
1988	Green	Dead	California
1988	Leatherback	Dead	California
1988	Leatherback	Dead	California
1988	Green	Live	California
1988	Leatherback	Dead	California
1988	Leatherback	Dead	California
1988	Green	Live	California
1988	Green	Live	California
1989	Green	Live	California
1989	Green	Unknown	California
1989	Green	Live	California
1989	Green	Dead	California
1989	Olive ridley	Live	California
1989	Olive ridley	Live	California
1989	Olive ridley	Dead	California
1989	Leatherback	Dead	California
1989	Leatherback	Dead	California
1989	Leatherback	Dead	California
1989	Green	Dead	California
1989	Leatherback	Live	California
1989	Green	Live	California
1989	Leatherback	Dead	California
1989	Olive ridley	Dead	California

1989	Leatherback	Dead	California
1989	Leatherback	Dead	California
1989	Leatherback	Dead	California
1989	Leatherback	Dead	California
1989	Leatherback	Dead	California
1989	Leatherback	Dead	California
1989	Leatherback	Dead	California
1989	Unidentified	Dead	California
1989	Unidentified	Unknown	Washington
1989	Green	Live	Washington
1989	Leatherback	Dead	California
1989	Olive ridley	Live	Oregon
1989	Unidentified	Unknown	Washington
1989	Green	Live	Washington
1990	Leatherback	Dead	California
1990	Green	Unknown	Oregon
1990	Green	Unknown	Oregon
1990	Green	Live	Washington
1990	Green	Unknown	Washington
1990	Leatherback	Unknown	Alaska
1990	Green	Unknown	Washington
1990	Green	Live	Oregon
1990	Unidentified	Live	California
1990	Leatherback	Dead	California
1990	Unidentified	Dead	California
1990	Leatherback	Dead	California
1990	Unidentified	Dead	California
1990	Loggerhead	Dead	California
1990	Loggerhead	Dead	California
1990	Green	Dead	California
1990	Loggerhead	Dead	California
1990	Leatherback	Dead	California
1990	Olive ridley	Dead	California
1990	Green	Dead	California
1990	Green	Dead	California
1990	Green	Dead	California
1990	Leatherback	Dead	California
1990	Leatherback	Dead	California
1990	Leatherback	Dead	California
1990	Green	Live	California
1990	Leatherback	Dead	California
1990	Green	Live	California
1990	Leatherback	Dead	California
1990	Green	Dead	California
1990	Loggerhead	Dead	California
1990	Olive ridley	Live	California
1990	Green	Dead	California
1990	Green	Live	California
1990	Unidentified	Dead	California
1990	Leatherback	Dead	California
1990	Leatherback	Dead	California
1990	Unidentified	Dead	California
1990	Loggerhead	Live	Washington

1990	Leatherback	Live	California
1990	Green	Dead	California
1991	Green	Live	California
1991	Green	Dead	California
1991	Leatherback	Dead	California
1991	Olive ridley	Unknown	Alaska
1991	Leatherback	Dead	California
1991	Leatherback	Dead	California
1991	Leatherback	Live	California
1991	Leatherback	Dead	California
1991	Leatherback	Dead	California
1991	Green	Live	California
1991	Leatherback	Dead	California
1991	Leatherback	Dead	California
1991	Leatherback	Dead	California
1991	Leatherback	Dead	California
1991	Green	Live	California
1991	Unidentified	Dead	California
1991	Green	Dead	California
1991	Leatherback	Dead	California
1991	Olive ridley	Live	California
1991	Green	Live	Oregon
1991	Loggerhead	Unknown	Alaska
1992	Leatherback	Dead	California
1992	Loggerhead	Dead	California
1992	Loggerhead	Dead	California
1992	Green	Dead	California
1992	Green	Live	California
1992	Olive ridley	Dead	California
1992	Green	Live	California
1992	Green	Live	California
1992	Leatherback	Unknown	Oregon
1992	Green	Live	California
1992	Unidentified	Live	Washington
1992	Green	Live	California
1992	Loggerhead	Live	Washington
1992	Loggerhead	Live	California
1992	Green	Live	California
1992	Green	Live	California
1992	Leatherback	Dead	California
1992	Green	Dead	California
1993	Loggerhead	Live	California
1993	Loggerhead	Dead	California
1993	Loggerhead	Live	Oregon
1993	Leatherback	Dead	California
1993	Leatherback	Dead	California
1993	Leatherback	Dead	California
1993	Loggerhead	Dead	California
1993	Leatherback	Unknown	Washington
1993	Leatherback	Live	Alaska
1993	Loggerhead	Live	Alaska
1993	Leatherback	Dead	California
1993	Leatherback	Dead	California

1993	Leatherback	Dead	California
1993	Leatherback	Live	Washington
1993	Leatherback	Dead	California
1993	Leatherback	Dead	California
1993	Loggerhead	Dead	California
1993	Leatherback	Live	Alaska
1993	Loggerhead	Dead	California
1993	Leatherback	Unknown	Washington
1993	Leatherback	Unknown	Washington
1993	Leatherback	Dead	California
1993	Green	Unknown	Alaska
1993	Green	Unknown	Alaska
1993	Green	Live	Alaska
1993	Olive ridley	Live	California
1994	Loggerhead	Unknown	California
1994	Green	Unknown	Oregon
1994	Green	Unknown	California
1994	Leatherback	Dead	California
1994	Leatherback	Dead	California
1994	Loggerhead	Dead	California
1994	Leatherback	Dead	California
1994	Green	Live	California
1994	Green	Dead	California
1994	Leatherback	Dead	California
1994	Green	Live	California
1994	Olive ridley	Dead	California
1995	Loggerhead	Live	California
1995	Leatherback	Dead	California
1995	Green	Dead	California
1995	Green	Dead	California
1995	Unidentified	Unknown	Oregon
1995	Loggerhead	Live	California
1995	Green	Dead	California
1996	Green	Dead	California
1996	Green	Live	California
1996	Green	Live	California
1996	Leatherback	Dead	California
1996	Green	Live	California
1996	Leatherback	Dead	California
1996	Loggerhead	Live	California
1996	Green	Dead	California
1996	Leatherback	Dead	California
1996	Loggerhead	Live	California
1996	Olive ridley	Live	California
1996	Green	Unknown	Oregon
1996	Olive ridley	Unknown	Oregon
1996	Olive ridley	Live	California
1996	Green	Live	Alaska
1996	Green	Live	Alaska
1996	Green	Unknown	Oregon
1997	Green	Live	California
1997	Green	Unknown	California
1997	Green	Live	Alaska

1997	Unidentified	Live	Oregon
1997	Green	Unknown	California
1997	Green	Unknown	California
1997	Unidentified	Unknown	California
1997	Olive ridley	Unknown	California
1997	Loggerhead	Unknown	California
1997	Green	Unknown	California
1997	Unidentified	Unknown	California
1997	Olive ridley	Unknown	California
1997	Green	Live	California
1998	Green	Live	Oregon
1998	Loggerhead	Live	Oregon
1998	Olive ridley	Dead	California
1998	Unidentified	Unknown	Oregon
1998	Green	Unknown	Alaska
1998	Leatherback	Dead	California
1998		Unknown	California
1998	Loggerhead	Dead	California
1998	Green	Dead	California
1998	Green	Live	California
1998	Loggerhead	Dead	California
1998	Leatherback	Dead	California
1998	Green	Unknown	Alaska
1998	Olive ridley	Live	Oregon
1999	Unidentified	Unknown	Washington
1999	Olive ridley	Dead	California
1999	Green	Dead	California
1999	Green	Live	California
1999	Green	Dead	California
1999	Green	Dead	California
1999	Leatherback	Dead	California
1999	Leatherback	Dead	California
1999	Leatherback	Dead	California
1999	Leatherback	Dead	California
1999	Leatherback	Dead	California
1999	Leatherback	Dead	California
1999	Green	Live	California
1999	Leatherback	Dead	California
1999	Leatherback	Dead	California
1999	Green	Live	California
1999	Leatherback	Dead	California
1999	Leatherback	Dead	California
1999	Green	Live	Washington
1999	Olive ridley	Live	California
1999	Green	Live	Washington
1999	Olive ridley	Live	Oregon
1999	Green	Live	Oregon
1999	Green	Live	Washington
1999	Green	Live	Oregon
1999	Green	Live	California
1999	Green	Unknown	Washington
1999	Green	Unknown	Washington
1999	Green	Unknown	Washington

1999	Green	Live	Washington
2000	Loggerhead	Unknown	Washington
2000	Green	Unknown	Washington
2000	Green	Unknown	Oregon
2000	Green	Unknown	Washington
2000	Green	Unknown	Alaska
2000	Unidentified	Dead	California
2000	Olive ridley	Dead	California
2000	Green	Live	California
2000	Olive ridley	Dead	California
2000	Olive ridley	Dead	California
2000	Leatherback	Dead	California
2000	Green	Live	Oregon
2000	Green	Live	California
2000	Olive ridley	Live	California
2000	Loggerhead	Live	California
2000	Green	Live	California
2000	Green	Live	California
2000	Green	Live	California
2000	Green	Dead	California
2000	Green	Dead	California
2000	Green	Live	California
2000	Loggerhead	Dead	California
2000	Green	Dead	California
2000	Olive ridley	Dead	California
2000	Olive ridley	Dead	California
2000	Green	Live	California
2000	Green	Live	California
2000	Olive ridley	Live	California
2000	Green	Live	California
2001	Green	Live	California
2001	Unidentified	Unknown	Washington
2001	Unidentified	Live	Washington
2001	Olive ridley	Live	California
2001	Green	Live	California
2001	Olive ridley	Dead	California
2001	Green	Dead	California
2001	Leatherback	Live	California
2001	Leatherback	Dead	California
2001	Leatherback	Dead	California
2001	Green	Dead	California
2001	Loggerhead	Dead	California
2001	Leatherback	Live	California
2001	Loggerhead	Dead	California
2001	Green	Live	California
2001	Olive ridley	Live	Washington
2001	Green	Unknown	Alaska
2001	Loggerhead	Dead	California
2001	Olive ridley	Live	Oregon
2002	Green	Dead	California
2002	Unidentified	Dead	California
2002	Loggerhead	Dead	California
2002	Green	Dead	California

2002	Olive ridley	Live	Alaska
2002	Green	Dead	California
2002	Green	Live	California
2002	Leatherback	Dead	California
2002	Leatherback	Dead	California
2002	Green	Live	California
2002	Leatherback	Dead	California
2002	Leatherback	Dead	California
2002	Green	Unknown	Alaska
2002	Olive ridley	Live	California
2002	Olive ridley	Live	California
2003	Leatherback	Live	California
2003	Olive ridley	Dead	California
2003	Leatherback	Dead	California
2003	Olive ridley	Live	California
2003	Green	Live	California
2003	Olive ridley	Dead	California
2004	Olive ridley	Live	California
2004	Green	Live	Washington
2004	Olive ridley	Live	California
2004	Olive ridley	Dead	California
2004	Green	Live	California
2004	Green	Live	California
2004	Leatherback	Dead	California
2004	Green	Live	Washington
2004	Green	Dead	California
2004	Unidentified	Dead	California
2004	Green	Dead	California
2004	Green	Dead	California
2004	Green	Live	California
2004	Green	Unknown	California
2004	Green	Unknown	California
2004	Green	Unknown	California
2004	Green	Unknown	California
2005	Olive ridley	Live	California
2005	Green	Live	California
2005	Green	Live	California
2005	Leatherback	Dead	California
2005	Leatherback	Dead	California
2005	Green	Dead	California
2005	Leatherback	Dead	California
2005	Leatherback	Dead	California
2005	Green	Live	California
2005	Leatherback	Dead	California
2005	Green	Live	California
2005	Olive ridley	Live	California
2006	Unidentified	Unknown	California
2006	Green	Live	California
2006	Green	Live	California
2006	Loggerhead	Live	California
2006	Leatherback	Dead	California
2006	Green	Live	California
2006	Green	Live	California

2006	Green	Dead	California
2006	Olive ridley	Live	California
2007	Green	Live	Oregon
2007	Olive ridley	Unknown	Oregon
2007	Green	Dead	California
2007	Unidentified	Dead	California
2007	Green	Live	California
2007	Loggerhead	Dead	California
2007	Green	Live	California
2007	Green	Dead	California
2007	Green	Live	California
2007	Leatherback	Dead	California
2007	Green	Unknown	Alaska
2007	Loggerhead	Live	Oregon
2008	Olive ridley	Live	California
2008	Green	Dead	California
2008	Green	Unknown	Washington
2008	Green	Dead	California
2008	Olive ridley	Dead	California
2008	Leatherback	Dead	California
2008	Green	Live	California
2008	Green	Live	California
2008	Leatherback	Dead	California
2008	Leatherback	Dead	California
2008	Leatherback	Unknown	California
2008	Leatherback	Dead	California
2008	Leatherback	Dead	California
2008	Green	Live	Oregon
2008	Loggerhead	Live	California
2009	Green	Unknown	Washington
2009	Leatherback	Dead	California
2009	Green	Live	California
2009	Unidentified	Dead	California
2009	Olive ridley	Live	California
2009	Green	Dead	California
2009	Green	Dead	California
2009	Olive ridley	Live	Oregon
2009	Olive ridley	Live	California
2009	Green	Live	Oregon
2009	Olive ridley	Live	Oregon
2009	Green	Live	Washington
2009	Green	Live	California
2009	Green	Live	California
2010	Green	Dead	California
2010	Unidentified	Dead	California
2010	Loggerhead	Live	California
2010	Green	Live	California
2010	Green	Live	California
2010	Green	Live	California
2010	Green	Dead	California
2010	Olive ridley	Unknown	Oregon
2010	Olive ridley	Dead	Oregon
2010	Green	Live	Washington

2010	Green	Live	Washington
2010	Loggerhead	Live	California
2011	Green	Live	California
2011	Green	Dead	California
2011	Green	Live	California
2011	Olive ridley	Live	California
2011	Olive ridley	Dead	California
2012	Olive ridley	Live	California
2012	Loggerhead	Dead	California
2012	Olive ridley	Dead	California
2012	Green	Live	California
2012	Olive ridley	Live	California
2012	Green	Live	California
2012	Green	Dead	California
2012	Olive ridley	Dead	California
2012	Green	Dead	California
2012	Green	Dead	California
2012	Green	Live	Oregon
2012	Green	Live	Oregon
2012	Leatherback	Dead	California
2012	Olive ridley	Live	California
2012	Loggerhead	Dead	California
2012	Green	Live	California
2012	Green	Live	California
2012	Green	Live	California
2012	Green	Live	California
2012	Green	Dead	California
2012	Green	Live	California
2012	Olive ridley	Live	Oregon
2012	Green	Live	Oregon
2012	Olive ridley	Live	Oregon
2012	Olive ridley	Dead	Oregon
2012	Olive ridley	Unknown	Washington
2012	Olive ridley	Dead	Oregon
2012	Green	Dead	Oregon
2013	Olive ridley	Unknown	California
2013	Hawksbill	Dead	California
2013	Unidentified	Live	Oregon
2013	Green	Live	California
2013	Green	Dead	California
2013	Loggerhead	Unknown	California
2013	Unidentified	Live	Oregon
2013	Green	Dead	California
2013	Olive ridley	Dead	California
2013	Olive ridley	Live	Oregon
2013	Olive ridley	Live	Oregon
2013	Green	Dead	California
2014	Olive ridley	Dead	California
2014	Olive ridley	Live	California
2014	Green	Dead	California
2014	Green	Live	California
2014	Loggerhead	Dead	California
2014	Green	Unknown	Oregon

2014	Green	Dead	California
2014	Loggerhead	Dead	California
2014	Loggerhead	Dead	California
2014	Green	Dead	California
2014	Green	Dead	California
2014	Loggerhead	Dead	California
2014	Green	Dead	California
2014	Green	Live	Oregon
2014	Green	Dead	California
2014	Green	Live	California
2014	Green	Dead	California
2014	Loggerhead	Dead	California
2014	Green	Dead	California
2014	Olive ridley	Dead	California
2014	Green	Dead	California
2014	Olive ridley	Dead	California
2014	Unidentified hardshell	Unknown	California
2014	Unidentified hardshell	Dead	California
2014	Olive ridley	Dead	Oregon
2014	Green	Dead	California
2014	Olive ridley	Live	Washington
2014	Olive ridley	Dead	Washington
2015		Unknown	Washington
2015	Green	Dead	California
2015	Green	Live	California
2015	Olive ridley	Unknown	Oregon
2015	Green	Dead	California
2015	Loggerhead	Live	California
2015	Olive ridley	Dead	Oregon
2015	Loggerhead	Dead	California
2015	Loggerhead	Unknown	California
2015	Green	Live	California
2015	Green	Live	California
2015	Green	Dead	California
2015	Green	Dead	California
2015	Olive ridley	Dead	California
2015	Leatherback	Dead	California
2015	Loggerhead	Unknown	
2015	Green	Dead	California
2015	Green	Dead	California
2015	Olive ridley	Dead	California
2015	Olive ridley	Dead	California
2015	Olive ridley	Live	Oregon
2015	Olive ridley	Live	Oregon
2015	Green	Dead	California
2015	Olive ridley	Live	
2016	Green	Dead	California
2016	Green	Dead	California
2016	Green	Dead	California
2016	Loggerhead	Dead	California
2016	Green	Dead	California

APPENDIX B.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

STANDARD PERMIT CONDITIONS FOR CARE AND MAINTENANCE OF CAPTIVE SEA TURTLES

February 13, 2013

The following conditions must be met for all species of sea turtles held in captivity in the United States under the authority of a U.S. Fish and Wildlife Service (Service) permit issued in accordance with section 10(a)(1)(A) of the Endangered Species Act of 1973, as amended. Conditions are also included for the transport, rehabilitation, and disposition of sea turtles.

The individual/institution to whom a Service permit has been issued must notify the appropriate Service Field Office or Regional Office (http://www.fws.gov/endangered/regions/index.html) that issued the permit in writing of any inability to meet or maintain these conditions within 60 days. This notification must include a description of all shortcomings and emergency provisions, back-up systems, and filtration if not previously submitted. ***Failure to do so maybe considered a violation of the Service permit.***

TYPES OF CAPTIVE MAINTENANCE

Education

Depending upon the display capabilities of a facility and proper justification (specific benefit to the conservation of the species in the wild), threatened loggerhead turtles (*Caretta caretta*) and/or threatened green turtles (*Chelonia mydas*) may be displayed for educational purposes by a facility that is primarily educational in nature. Education facilities include those open to the general public at least 5 days a week and receive no less than an average of 100 visitors per week. Public encounters (e.g., feeding, touching, swimming, etc.) with turtles is not allowed. Note: Limited interactive programs may be permitted if specifically reviewed and approved by the Service.

Educational Display of Captive Turtles:

1. Turtles on display must be accompanied by interpretive signage or other interactive methods of communications such as live lectures, displays, and self-guided audio tours. These displays must include the following: species identification, protection status under the Endangered Species Act, general life history, and current conservation issues (e.g., incidental

capture in fisheries, boat strikes, ingestion of debris, ocean dumping, loss of nesting beaches, loss of developmental habitats and adult foraging grounds, beachfront lighting, etc.).

2. For any rehabilitating turtle proposed for public display, the veterinarian responsible for the care of the animal must deem that the turtle is stable and the additional stress associated with public display will not affect the turtle's health. The release of the turtle must not be delayed or expedited to facilitate the public display.
3. It is the responsibility of the individual/institution to which a permit is issued to ensure that their facility has the necessary tank space to accommodate the sea turtles until it is ready for release. Turtles obtained as hatchlings should not need to be moved to another facility because of inadequate tank space.
4. Any facility holding sea turtles for educational display must also meet all conditions that follow under Care and Maintenance Requirements.

Educational Tours of Captive Turtles:

1. Tours must only be conducted during hours when the turtles would normally be exposed to light. The light exposure can be modified for seasonal photoperiods but must have consecutive hours of darkness as found in the natural environment during that period.
2. Educational topics must include species identification, protection status under the Endangered Species Act, general life history, and current conservation issues (e.g., incidental capture in fisheries, boat strikes, ingestion of debris, ocean dumping, loss of nesting beaches, loss of developmental habitats and adult foraging grounds, beachfront lighting, etc.).
3. Each tour must have at least one staff/volunteer present at the time of the tour for every 15 guests. More staff/volunteers may be needed as appropriate to ensure guests are not in contact with the tank or medical equipment.
4. Visitors must be given clear instructions to minimize disturbance and stress to turtles, including no touching of turtles or their tanks, minimal noise, and no flash photography.
5. Tanks must be half covered or have a hiding spot for turtles to decrease stress from tours.
6. The following information must be included in the annual report – number of tours; number of people, dates, and times of the tours; medical condition of each turtle involved in the tours; and the release date of the turtles.

Additional Requirements for Educational Tours of Rehabilitating Turtles:

Educational tours and the display of rehabilitating animals are not authorized for turtles in critical care. The veterinarian responsible for the care of a turtle must deem that the turtle is stable and that the tours will not affect the turtle's health. The release of the turtle must not be delayed to facilitate the tours. To conduct tours, facilities must meet the following conditions:

1. The timing of the tour must not interfere with the treatment and care of the turtle.

2. Tours may be conducted while a turtle is in treatment if the veterinarian responsible for the care of the turtle approves, and guests are kept at a far enough distance from the turtle and staff working with the turtle so as to minimize the potential for additional stress and not interfere with treatment.

Research

Unless a specific exception is granted because of research conditions, anyone holding turtles for scientific research must follow all conditions listed below under *Care and Maintenance Requirements*. The release of rehabilitated turtles must not be delayed to obtain permits or to facilitate a research project unless authorized in a Service permit.

Rehabilitation

Any facility holding sea turtles for rehabilitation must meet all conditions listed below under *Care and Maintenance Requirements*. All facilities conducting rehabilitation must obtain a Service and/or State permit for euthanasia or have access to a veterinarian that has a Service and/or State permit for euthanasia. Note: Euthanasia of endangered turtles may only be authorized by the Service.

Transport:

1. Sea turtles must be transported in a climate-controlled environment, protected from extremes of heat and cold, and kept moist. In general, the best range of temperatures for transport is between 21°C and 27°C (70°F and 80°F; see additional conditions for cold-stunned turtles below). If a turtle is transported at temperatures greater than or equal to 23.9°C (75°F), it must be cooled by keeping a wet towel on the carapace and by periodically applying water. Water and wet towels must not be used when transporting turtles at temperatures less than 23.9°C (75°F) or at any time they are exposed to an air-conditioned environment (exception: open wounds must be kept moist with clean freshwater regardless of temperature). At temperatures less than 23.9°C (75°F), juvenile turtles (less than 30 cm straight carapace length) may be kept from drying out during transport by applying a thin layer of a water-based, water soluble, non- petroleum lubricant (e.g., K-Y Jelly) to the carapace and all the soft tissues (except the eyes and any open wounds). Larger turtles (≥30 cm straight carapace length) do not need a lubricant because they are less likely to dry out due to their low surface to volume ratio: use of a lubricant should be avoided to minimize handling injuries. If transport is longer than 45 minutes, ophthalmic gel may be used to maintain moisture in the turtle's eyes to avoid eye damage.

2. During transport, housing, and/or subsequent treatment, cold-stunned turtles must be exposed to gradually rising air and water temperatures over many days, and not exposed to temperatures that would thermally shock them.

3. Turtles must be placed in closed containers with sufficient holes for adequate ventilation during transport. Turtles must not be transported in water. The containers housing turtles during transport must be padded and must not contain any material that could be accidentally ingested. Hatchlings (sea turtles with a straight carapace length ≤ 4 cm) must be transported in a container with moist sand. Post-hatchlings (sea turtles with a straight carapace length > 4

cm and ≤ 6 cm for all species except leatherbacks) must be transported in a container with a damp towel or cloth at the bottom of the container. The containers must be secured during transport so they do not slide around or tip over. The Service permit must accompany turtles during transport.

CARE AND MAINTENANCE REQUIREMENTS

Facility Construction

Tank Size Requirements:

Holding tank sizes for turtles must be based upon the size of the largest specimen in the tank as described below. Use straight carapace measurements to determine the appropriate tank size.

Note: For a long-term, non-releasable turtle, the facility must have a tank or tanks of sufficient size to accommodate the turtle through all life stages. If a facility cannot hold the non-releasable turtle as it grows, it must provide the following information to the Service: (a) a letter from another facility that has agreed to permanently hold the turtle once it reaches a size that the facility can no longer accommodate, (b) a description of how the turtle will be transported to the other facility, and (c) tank size(s) of the facility where the turtle will be transported and remain.

1. Hatchlings and post-hatchlings (up to 6 centimeters straight carapace length) – for one hatchling, a tank or sub-section of a tank with a surface area of at least five times the shell length by two times the shell straight carapace width of the turtle plus a minimum water depth of 1 foot. The minimum tank width must be no less than two times the shell width. Hatchlings must be housed separately.

2. Turtles greater than 6 centimeters and up to 50 centimeters straight carapace length – for one turtle, a tank with a surface area of at least seven times the shell length by two times the shell straight carapace width of the turtle plus a minimum water depth of 2½ feet. For each additional turtle, increase the original surface area by 50%. The minimum tank width must be no less than two times the shell(s) width (i.e., for multiple turtles, the sum of the shell straight carapace widths must be multiplied by two to determine the minimum tank width).

3. Turtles greater than 50 centimeters and up to 65 centimeters straight carapace length – for one turtle, a tank with a surface area of at least seven times the shell length by two times the shell width of the turtle plus a minimum water depth of 3 feet. For each additional turtle, increase the original surface area by 50%. The minimum tank width must be no less than two times the shell(s) straight carapace width (i.e., for multiple turtles, the sum of the shell straight carapace widths must be multiplied by two to determine the minimum tank width).

4. Turtles with a straight carapace length greater than 65 centimeters – for one turtle, a tank with a surface area of at least nine times the shell length by two times the shell straight carapace width of the turtle plus a minimum water depth of 4 feet. For each additional turtle, increase the original surface area by 100%. The minimum tank width must be no less than two times the shell(s) width (i.e., for multiple turtles, the sum of the shell straight carapace widths must be multiplied by two to determine the minimum tank width).

Exceptions:

a. Sick or injured turtles may be held in a smaller isolation tank if determined by a veterinarian to facilitate treatments. Any turtles held for this purpose must be protected from desiccation and moved to an appropriate tank as soon as health allows.

b. If necessary, healthy turtles may be held in a tank with dimensions less than those required for no more than 1 week every 3 months. The tank must be large enough to allow complete submergence and unimpeded turning.

If necessary, hatchlings or post-hatchlings being held short term (to allow time to arrange safe release to the wild) may be held in a tank with dimensions less than those required above. They must be separated if aggression is observed between the hatchlings.

Tank Condition Requirements:

1. The inside surfaces of any holding tank must be non-abrasive, free of burrs or projections that could cause harm to turtles, and free of toxic heavy metals and organics, such as lead or copper paints. Any tank with painted surfaces must be free of biological hazardous material and must not be actively chipping or flaking. The tank must also be free of anything small enough to allow turtles access to bite or swallow. Use of non-finished concrete tanks must be avoided.

2. A holding tank must not contain any non-food items that may be ingested by a turtle or any items that would obstruct a turtle's ability to surface either to breathe or to float.

3. A holding tank must not contain entangling materials. Rock ledges or other habitat-mimicking items in the tank are encouraged to allow turtles to rest. However, these items must be constructed or placed in a manner that ensures a turtle cannot become tightly wedged or trapped underwater. Sea turtles must demonstrate the ability to maneuver safely around all tank items. Enrichment objects especially for resident/non-releasable turtles must be used for the quality of life and prevention of conditioning/pacing behavior. A tank must be designed to ensure the turtle stays within the tank at all times unless removed by facility personnel.

4. A holding tank must use railings/barriers to prevent the public from reaching into the tanks. If it is determined that public presence causes unnecessary stress, turtles must not be accessible to the public.

5. The drains or intakes of a holding tank must be constructed or securely shielded to prevent accidental entrapment. Inflows and drains must be placed to ensure appropriate water turnover and flow rates throughout all areas of the tank.

6. To help prevent the water temperature from becoming too warm (> 30°C/86°F), any outdoor holding tank must be at least 30% shaded. If water is recirculated, shading must be increased to at least 50% shaded.

Lighting

1. All the tanks in which sea turtles are housed must have enough lighting (sunlight and/or artificial lighting) to allow for easy viewing of the animals in all areas of the tank.

2. If artificial lighting is used as a primary light source, regular veterinary evaluation must address any lighting and/or dietary supplement needs based on clinical assessment and best available medical/husbandry information. Good quality full spectrum bulbs (UVA/UVB) (wavelength of UVB -280 nm to 320 nm) must be used to promote general health and avoid potential metabolic problems. If "diffusers" are used, care must be taken to ensure appropriate full spectrum exposure.

3. The photoperiod of captive sea turtles must be similar to a natural photoperiod and mimic the summer and winter season daylight hours. Tanks must not be artificially illuminated to provide a photoperiod of more than 14 hours per 24-hour period to represent the natural seasonal photoperiods.

4. Dark/shaded areas must be provided to allow turtles a choice. Artificial light must not be excessive so as to cause sensitivity.

5. Lights above the top of the tank must have shield guards to prevent accidental breakage.

Water Quality

Good water quality is essential to the health of sea turtles in captivity. Facilities must have written procedures for monitoring and maintaining water quality in all enclosures. At a minimum the following specific parameters must be met:

1. The salinity must be maintained between 20 ppt and 35 ppt. If necessary, sea turtles may be maintained in more or less saline water for up to 24 hours per week. Sick or injured sea turtles may be kept at salinities below 20 ppt or above 35 ppt as prescribed by a veterinarian.

2. Water pH must be maintained between 7.2 and 8.5.

3. Water temperature must be maintained between 20°C and 30°C (68°F and 86°F). High and low extremes may induce disease (particularly fungal), injury, or even death and must be avoided. However, rehabilitation of cold-stunned turtles may require that turtles be placed in waters below 20°C (68°F) to allow them to warm gradually.

4. Chlorine can be used to treat the water to reduce bacterial and algae growth, but levels must be kept below 1.0 part per million (ppm). Chlorine levels greater than 1.0 ppm may cause irritation to turtle eyes. No other chemical may be used to treat water in a tank housing sea turtles if the chemical is not safely ingestible by turtles at the dilution that would be needed for effective treatment.

5. Coliform bacteria must not exceed 1,000 MPN (most probable number) per 100 ml of water. Steps must be taken to prevent the conditions in which coliform bacteria proliferate. Testing

for coliforms is a simple, cheap, preventative/proactive measure; it is recommended testing be conducted monthly on all systems. The steps to prevent coliform proliferation include adequate filtration (removing suspended material and larger pieces of feces and leftover food) and the use of an appropriate sanitizing chemical such as chlorine, or a high turnover rate with fresh, uncontaminated seawater. The Service reserves the right to request total coliform counts monthly or more frequently if conditions warrant it.

6. If ozone is used for water treatment, the oxidation-reduction potential must be monitored and maintained below 400 millivolts (mV) if possible to reduce the potential for irritation.

7. The water must be clear enough to allow easy viewing of sea turtles in any part of the tank to assess health and activity.

8. Facilities holding turtles for rehabilitation must have tanks that maintain water quality by filtration or flow through. Tanks that require complete or near complete water changes as the sole means of maintaining water quality, such that the water level is dropped to the point where the turtle is sitting on the tank floor ("dump and fill"), may only be used for rehabilitation on a "temporary" (defined as an event where the turtle is expected to be medically cleared and ready for release within a 45-day period) or on an "emergency" (defined as an acute mass stranding event or an equipment-related failure at the facility such as power outages) basis as these conditions are not acceptable for long-term rehabilitation due to the additional stress caused by frequent maintenance.

   The ultimate goal for a rehabilitating turtle is a return to and survival in the wild. The additional husbandry needs for a rehabilitating turtle in a "dump and fill" tank may unnecessarily acclimate a turtle to captivity. Therefore, if a turtle held in a "dump and fill" tank is not medically cleared within 45 days; the facility must contact the Service on a case- by-case basis to determine the appropriate course of action for the turtle.

9. Facilities that use "dump and fill" tanks for rehabilitation on a "temporary" or "emergency" basis must:

   a. Ensure there are available tanks nearby so that a turtle can be quickly moved to a clean tank while the dirty tank is dumped, cleaned, and filled. This prevents the turtle from being out of the water for very long and reduces handling;

   b. Remove food that is uneaten. If food must be left unattended, it is recommended that the uneaten food be removed within an hour unless it is live prey; and

   c. Evaluate the turtle skin and shell daily for any abnormalities or worsening of the turtle's condition.

10. Facilities that are expected to hold turtles longer than 45 days with preexisting "dump and fill" tanks for rehabilitating turtles must contact the Service for additional husbandry conditions to reduce stress to the animals during water changes, as well as provide a projected timeline (not to exceed 1 year) for the retrofit of these tanks.

11. Any flow-through seawater system must be maintained to facilitate sufficient turnover of seawater. At a minimum, any flow-through system must have a filtration system on intake. For closed or semi-open systems, filtration must be incorporated into the system to ensure appropriate water quality of recirculated water. Filtration and flow through systems must be able to maintain the minimum water quality parameters.

12. The facility must have the ability to (1) monitor and operate within the parameters described in this document, (2) correct any situation in which the parameters are not met, and (3) properly care for the sea turtles while corrective measures are being taken.

13. Water disposal must be in accordance with all applicable local, State, and Federal laws.

14. Treatment or pre-filtration of fresh seawater is recommended to remove infectious cercariae (parasitic larva of a trematode worm).

15. Facilities that make sea water must ensure that the appropriate variety of salt (without anticaking agents) is used to make and maintain the water quality standards for marine life.

<u>Water Quantity</u>

1. Any facility housing sea turtles must have the ability to provide adequate water quantity under normal and emergency conditions to allow complete submergence and unimpeded turning. In an emergency, sea turtles may be kept out of water for a maximum of 4 hours per week. During this time, they must be kept moist and protected from sun, heat, temperature extremes, and physical damage. This situation should occur only very rarely, if ever. Treatment of seriously ill or injured sea turtles may require they be out of water for more than 4 hours per week (e.g., during anesthesia, when administering fluids, or to ensure they do not drown if too weak to surface to breathe).

2. If sea turtle tanks are regularly drained and cleaned, adequate holding tanks must be available to house the turtles safely during this time.

<u>Food and Feeding</u>

1. Without exception, the food fed to sea turtles must always be of human quality or comparable quality of food that is reflective of their diet in the wild. Food must either be fresh, flash frozen and glazed, or frozen in some other manner that ensures the quality of the food. Any frozen food must be completely thawed in cool air, preferably, or cool water, prior to feeding and used entirely or discarded. Under no circumstances may food be refrozen. If the quality of the food is questionable, it cannot be used as food for sea turtles. This does not prohibit commercially prepared diets (e.g., dry, pelletized, floating or sinking formations), but they must be fresh or stored frozen to maintain nutritional value and to prevent deterioration or microbial growth.

   Reasonable efforts must be made by the holding facility to develop proper diets for sea turtles. Feeding of oily or fatty fish can lead to obesity and cause fatty degeneration of the liver in sea turtles and must be minimized. Also, the quantity of food must be rigidly controlled so turtles do not become obese. It is the responsibility of the holding facility to ensure and justify the adequacy of its feeding regimen for each species and size class.

2. Turtles must be weighed and measured monthly (4-6 times a year for non-releaseable turtles) to ensure they are not overfed. See Whitaker and Krum (1999) for additional information on feeding recommendations.

3. Hand feeding of turtles that will eventually be released is prohibited except when absolutely necessary for rehabilitation. In the latter case, the turtle must be allowed to feed on its own as soon as possible. The use of bottom feeders or other tools mimicking the natural feeding environment is encouraged.

4. Food for groups must be broadcast around the tank to avoid competition and possible injury. Special precautions and vigilant oversight are required when using broadcast feeding for large numbers of turtles.

5. Prior to release, turtles of species that routinely feed on live prey in the wild must be provided with and observed capturing live food prior to release to ensure sufficient foraging capabilities. Live prey that is an immediate host for parasites such as snails must be avoided.

<u>Behavior and Intermixing</u>

1. Some species of sea turtles, especially loggerheads and Kemp’s ridleys, may be very aggressive toward their own and other species, particularly while feeding. Whenever the situation dictates that sea turtles be placed together, they must be closely observed until it is established that they display no aggressive behavior that might result in injury or death. Turtles must be separated at the first sign of aggression. Tank dividers can be used. Smallsea turtles must not be housed with larger turtles, especially of another species, as larger animals can injure or kill smaller animals.

2. Male and female adult turtles must be separated to prevent captive breeding. The approximately adult sizes are as follows: loggerhead turtle straight carapace length ≥ 80cm, green turtle straight carapace length ≥ 83 cm, Kemp’s Ridley turtle (*Lepidochelys kempii*) straight carapace length ≥ 58 cm, hawksbill turtle straight carapace length ≥ 71cm.

3. Turtles on exhibit may be housed with other species that are present in their natural environment. The other species housed with a turtle must be reviewed and approved by the Service. NOTE: In some cases, the permanent injury of a turtle or the size of a turtle may restrict the species that will be authorized for inclusion in the exhibit with a turtle.

Intermixing of Wild and Captive Stock:

1. Existing captive sea turtles must not be exposed to seawater in which newly wild-caught or live-stranded sea turtles are kept without an adequate period of quarantine to prevent disease or parasite transmission. The quarantine period must be at least 60 days.

2. Rehabilitation facilities must provide separate tanks or a tank with a separation for long-term and temporary captive turtles, not only in the physical plant but in seawater maintenance and

treatment systems. This will prevent injury due to aggressive behaviors, or sickness or death through transfer of pathogens or parasites.

3. If a female deposits eggs in an exhibit or shows signs of stress in an attempt to leave the exhibit, the facility must contact the Service that issued the permit under which the turtle is being held within 24 hours to discuss the best course of action for the eggs and/or female.

Fibropapillomatosis:

Fibropapillomatosis (FP) is an infectious disease and the preponderance of scientific evidence supports that a herpesvirus is the causative agent. The high incidence of FP in green turtles in Florida waters is of special concern. Turtles with FP must be isolated from turtles that are not known to have the disease. FP growths are highly vascular when large and appear to be extremely sensitive due to the presence of nerve bundles, especially around the eyes. Facilities that admit turtles with FP must have the capacity for strict biosecurity, including disinfection of equipment, separate water handling systems, and education of staff and caregivers on biosecurity measures. Only experienced veterinary personnel should be treating these individuals.

Veterinary Care

Any facilities holding sea turtles in captivity must have access to a veterinarian who:

1. Has an active veterinary license in the United States (means a person who has graduated from a veterinary school accredited by the American Veterinary Medical Association Council on Education, or has a certificate issued by the American Veterinary Graduates Association’s Education Commission for Foreign Veterinary Graduates).

2. Will be on-call 24-hours a day or identify at least one backup veterinarian or have a contingency plan for when the attending veterinarian is not available.

3. Has documented 1-year clinical experience working with sea turtles and clear demonstration of clinical proficiency or have a written consulting agreement with an experienced sea turtle veterinarian, which assures availability of consultation when needed.

4. Has access to a list of veterinarians with experience working with sea turtles to contact for assistance.

A properly permitted facility may receive for treatment or rehabilitation any sea turtle that is sick or injured. Upon receiving a sick or injured sea turtle, the attending veterinarian is to examine the turtle within 24 hours. If this is not possible, the Service must be contacted to make alternative arrangements, which could include consulting an approved veterinarian at a remote location.

The diagnosis of disease, surgical intervention, and the prescription of medications must be carried out only by a qualified veterinarian. Measures must be taken to preserve the health of captive sea turtles and to prevent injury or spread of disease. Injured or diseased sea turtles must receive appropriate medical care under the supervision of a qualified veterinarian in a method that prevents cross-contamination to other animals. Injured or diseased animals should be physically separated with their own clean seawater source, and all reasonable efforts made to avoid cross-contamination to unaffected animals.

Health records must be kept for each animal. These should include all examination and clinical data, as well as an assessment of the findings. For guidance on veterinary care, see Leong *et al.* (1989), Campbell (1996), and Whitaker and Krum (1999).

Biological Samples for Diagnostics and Health Assessments of Turtles Associated with a Law Enforcement Case or Litigation

1. Samples must remain in the legal custody of the facility holding the Service permit.

2. Only samples specifically taken for diagnostic tests may be sent to laboratories to assist in health assessments.

3. The transfer of biological samples from the facility to any location or individual other than those identified in the facility's permit requires written approval from the Service.

4. Sea turtles may be transported off-site for specific tests such as Magnetic Resonance Imaging (MRI) or Computed Tomography (CT) scans to assist diagnosis for health assessments provided it is a test prescribed by the qualified veterinarian treating the turtle, and the laboratory is listed in the facility's permit.

Euthanasia

All facilities conducting rehabilitation must obtain a Service and/or State permit for euthanasia or have access to a veterinarian that has a Service and/or State permit for euthanasia. Euthanasia is authorized only if, in the judgment of a veterinarian, a turtle's recuperation is unlikely, if an illness or injury is terminal or untreatable, if an illness is communicable and likely to pose a threat to wild populations or captive turtles, or if a turtle's wounds would preclude survival in the wild or a self-maintaining life in captivity. Note: Euthanasia of endangered turtles may only be authorized by the Service.

Release

The final determination of an individual's fitness for survival in the wild will be made with input from the facility's veterinarian, animal care personnel, and other persons with sea turtle expertise, as necessary. The attending veterinarian must perform a hands-on physical examination of the turtle prior to the release determination. The attending veterinarian must review the turtle's complete history including all stranding information, last treatment, and diagnostic test results. When a facility's veterinarian has determined that the turtle has recovered sufficiently from its illness or injury and is ready for release, the principal permit holder, or a designee, must contact the Service that issued the permit under which the turtle is being held within 24 hours to discuss the appropriate time and site for the release. The site for release must be determined based on the latest scientific information on turtle movements and regional knowledge. ***Failure to notify the permitting agency of the releasable status of a turtle or the unnecessary retention of turtles in captivity following medical clearance may be considered a violation of the Service permit and could result in the permit being suspended. Unless there***

are additional complications, turtles are expected to be released within 2 weeks of medical clearance.

Non-releasable Turtles: Non-releasable turtles are defined as turtles (bycaught, stranded, or congenitally deformed) that have been rehabilitated, but which have permanent handicapping injuries or defects that preclude their potential survival in the wild. Many injuries, when healed, will not hamper a turtle's existence in the wild. For example, the loss of a flipper does not prevent a turtle from being able to survive in the wild. Flipper damage is not an unusual occurrence and is often documented in nesting turtles on the beach. Examples of conditions that result in declaration of non-releasable status include blindness in both eyes, loss of more than 75% of three or four flippers, or abnormal buoyancy that prevents normal foraging behavior.

Release of Cold-stunned Turtles: The criteria for determining whether turtles that were cold stunned **with no other medical conditions** can be released must be based on behavior and activity of the turtle. If a turtle is alert, swimming strongly, not on medication(s), and otherwise behaving normally, it must be released as soon as possible in the vicinity of where it was found cold stunned. The ideal release water temperature is approximately 18°C (65°F) and above; however, circumstances may necessitate a release at a lower water temperature. Turtles have been reported to cold stun in water that is approximately 10°C (50°F) (Schwartz 1976). If a turtle has been cleared for release, but the water temperatures in the capture location are still too low, the Service must be contacted to coordinate the release timing and location. Prior to release, turtles must be held in water temperatures that are gradually adjusted to mimic those found in the natural environment so the turtle does not have a shock response upon entering a cooler or warmer natural water temperature.

Release of FP Turtles: Turtles with FP can be released when a facility's veterinarian has determined that the turtle has recovered sufficiently from its illness or injury and is ready for release. The principal permit holder, or a designee, must contact the Service that issued the permit under which the turtle is being held within 24 hours to discuss the appropriate timing and site for the release. The site for release must be determined based on the latest scientific information on turtle movements and regional knowledge regarding prevalence of FP.

All sea turtles must be measured and weighed prior to release following the protocols listed at http://accstr.ufl.edu/cmttp_tag_&_measure_protocols.html. The release protocol or procedure and the release location must be approved in advance by the Service.

External Flipper Tags and Passive Integrated Transponder (PIT) Tags: Flipper and PIT tags must be inserted prior to release only under the following conditions:

1. The turtle is size appropriate for receiving a flipper and/or PIT tag.

2. Tagging does not delay the release of the turtle.

3. The turtle is tagged by animal care staff that has demonstrated tagging expertise and is specifically permitted by the Service to conduct this activity.

4. The turtle is tagged following the protocols listed at http://accstr.ufl.edu/cmttp_tag_&_measure_protocols.html.

Satellite Transmitters: An investigator or facility wanting to attach a satellite transmitter to a sea turtle due for release must first obtain a modification to their Service permit. Each request must be reviewed on a case-by-case basis by the Service. These requests can be submitted prior to obtaining the turtles with appropriate parameters to support the proposal as described below.

The release of a turtle must not be delayed to obtain permits or to facilitate the attachment of a satellite transmitter. Failure to obtain a Service permit modification is considered a violation of the original Service permit.

The following information must be included with satellite transmitter permit application submissions:

1. A letter from the veterinarian caring for the turtle stating that the attachment of the satellite transmitter will not compromise the health of the turtle and its' survival in the wild.

2. A proposal that identifies the benefit to the conservation of the species in the wild including specific Recovery Actions identified in the species' Recovery Plan.

3. A compilation of information for all satellite tagged rehabilitated turtles already released by the facility within the State waters for the species proposed to be tagged. Include the identification of the turtles, date(s) released, information obtained from the previous tagging event(s), and information needs/gaps expected to be gained from the proposed tagging.

4. The species, size, and weight of the turtle that is being proposed for satellite tagging.

5. The size and weight of the transmitter proposed for the turtle.

6. The method of attachment.

7. Information about the individual who will be performing the attachment, including their contact information and a history of their sea turtle transmitter attachment experience.

NOTE: This information will be used to evaluate the benefit to the conservation of the species in the wild with respect to the additional energy cost to that specific animal as a result of the drag of the transmitter.

Necropsy and Disposal of Carcasses

1. Necropsies must be performed on any turtles that die at a captive facility. Necropsies must be performed by or in consultation with a veterinarian, veterinary diagnostic clinic, qualified pathologist of a college or university, or qualified State/Federal resources agency staff. For guidance on conducting necropsies, see Wolke and George (1981), Rainey (1994), and Wyneken (2001).

2. The following documents must be sent to the Service that issued the permit(s):

    a. The Sea Turtle Stranding and Salvage Network - Gross Necropsy report (http://www.seaturtle.org/groups/ncwrc/STSSN.necropsy.pdf), and

b. A copy of any necropsy report that includes the results of pathological, histological, microbiological, virological, and parasitological studies.

Following necropsy, the carcass of any sea turtle that dies while in the custody of a Service or State permitted/authorized facility must be completely destroyed (in accordance with State and local laws) or, subject to the approval of the Service, be offered to a museum, university, or other educational or research facility. Under NO circumstances may a dead sea turtle, or any part thereof, be salvaged for any purpose other than Service or State-approved education and/or research activities.

Conclusion

Inspection:

In order to ensure that facilities holding live sea turtles for rehabilitation, education, and/or research are maintaining the requirements for care and maintenance, and are in compliance with all applicable laws, rules, and guidelines, all facilities are subject to inspection at any time by Service or State personnel. Facilities may be asked to provide a current coliform bacteria count and water quality data upon inspection. Facilities will be provided with a copy of the report generated from the inspection. If the facility does not meet the requirements of their permit, which include the above *Care and Maintenance Requirements*, it will be considered a violation of the Service permit and could result in the permit being suspended.

Reporting:

Quarterly reports (Quarterly Report: APPENDIX D) of the number and species of sea turtles taken to a permitted rehabilitation facility for treatment, and their diagnosis must be emailed to the Service at seaturtle@fws.gov. Information must be emailed on the following dates (April 15, July 15, and October 15) each year.

In addition, an annual report must be submitted no later than January 30 of each year and must include the following:

i. A January through December summary of the number and species of sea turtles taken to the permitted rehabilitation facility for treatment, their diagnosis and current disposition (including those that died, were transferred, or were released).
ii. An account of euthanized specimens along with a description of the circumstances of their capture and reasons for euthanasia.
iii. Evaluations of all non-releasable (resident) turtles (Non-Releasable Turtle Report: APPENDIX E) and current information regarding the care of the turtles including the size and weight.
iv. A list of veterinarians and animal care staff that worked under the Service permit along with a summary of their sea turtle experience.
v. A summary of the number and species of sea turtles in the facility that was collected prior to listing under the Endangered Species Act. Include information confirming that adult male and adult female turtles are maintained separately.

For Service permits, annual reports must be submitted to the office of the Service's National Sea Turtle Coordinator, 7915 Baymeadows Way, Suite 200, Jacksonville, Florida 32256-7517.

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APPENDIX C.

SEA TURTLE STRANDING AND SALVAGE NETWORK – GROSS NECROPSY REPORT

IDENTIFICATION

1. STSSN #: ____________________ **2. Other identifier(s)/#:** ____________________ **3. Rehab:** ☐Yes ☐No

4. Found dead: ☐Yes ☐No **5. In no, date of death** ____/____/______ leave blank if unknown (Use mm/dd/yyyy for dates)

6. Euthanized: ☐Yes ☐No **7. Frozen/Thawed:** ☐Yes ☐No **8. Condition at necropsy:** ☐1 ☐2 ☐3 ☐4 ☐5

9. Date necropsied: ____/____/______ **10. Examiner:** ______________ **11. Affiliation:** ______________

12. Necropsy description: ☐External & internal examination ☐External examination only ☐Incomplete carcass

13. Disposition of carcass: ☐Buried on beach ☐Buried off site ☐Rendered ☐Incinerated ☐Other

14. Species: ☐CC ☐CM ☐DC ☐LK ☐EI ☐LO ☐HYBRID ☐UNK **15. Sex:** ☐Male ☐Female ☐Undetermined

EXTERNAL EXAMINATION

16a. Body weight: _____ ☐kg ☐lb **16b.** ☐actual ☐ est. **17. Eyes sunken:** ☐Yes ☐No **18. Skeletal features prominent:** ☐Yes ☐No

19. Heavily encrusted w/ epibiota: ☐Yes ☐No **20. Leeches:** ☐Yes ☐No **21. Gooseneck barnacles:** ☐Yes ☐No

22. Epibiota coverage: 22a. Head/appendages: ____% **22b. Carapace:** ____% **22c. Plastron:** ____%

23. External Trauma/evidence of Human Interaction (T/HI): ☐Yes ☐No ☐CBD **(If yes, complete 25)** **Use STSSN scale**

24. Other anomalies: ☐Yes ☐No ☐CBD **(If yes, complete 26)** CBD - Cannot Be Determined ☐ PHOTOGRAPHS TAKEN

ANATOMIC LOCATION CODES: Head (H) Neck(N) Eyes(E) Mouth(M) Carapace(C) Plastron(P) Tail(T) Vent(V)
Use for 25a & 26a Front flipper - Right(R) Left(L) Rear flipper - Right(F) Left(G) All appendages(Y) Pectoral girdle(J) Pelvis(I)

25a. T/HI-Type: (check all that apply and diagram in 25c)
Enter anatomic codes in blanks: (Example: ⊗ Parallel slicing wounds(1) _C_)

☐Parallel slicing wounds(1)______ ☐Blunt/crushing(2)______
☐Non-parallel/single linear wounds(3)_____ ☐Dislocations(4) _____
☐Partial/complete amputation(5)______ ☐Paint transfer(6)______
☐Fractures/Broken bones(6)______ ☐Puncture(8)______
☐Probable bite wound(9)______ ☐Tar in mouth(10)
☐Ligature/entanglement-type(11)______*
☐Entangling material attached(12)______*
☐Hook and/or line present (13)______* ***If yes, complete 25d**
☐Other(14) ______ describe under 25c

25b. T/HI- Description: (check all that apply)
Enter 25a. + anatomic codes: (Example: ⊗ Exudate/fibrin _1C_)

☐Exudate/fibrin_______ ☐Fibrous tissue formation_______
☐Bone formation/remodeling_______ ☐Hemorrhage_______
☐Encapsulated sand/debris_______ ☐Blood clots_______
☐Completely healed_______ ☐Other______ describe under 25c
☐ **Diagram wounds/measurements 25c**
☐ PHOTOGRAPHS TAKEN **Use STSSN scale in photos**

3 Standard photos: with scale
1. Perpendicular to wound(s)
2. Wound margins (close-up)
3. Head, neck, shoulder region

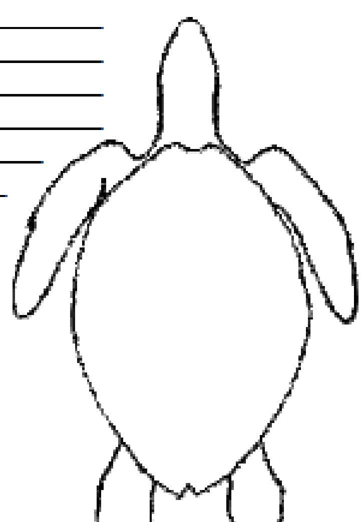
25c. T/HI-Comments & External Diagram (cont. pg 4): ________________________________

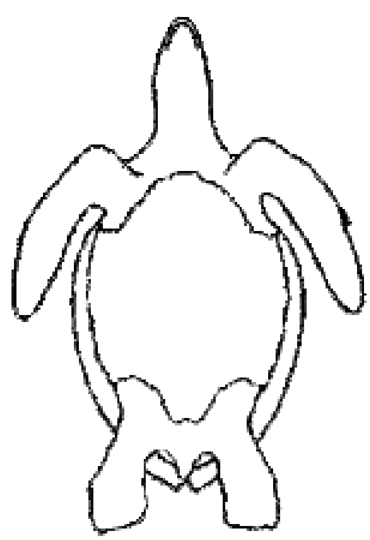
____
____
____
____
____

Parallel slicing wounds (cm):
Straight (chord) cut length
Maximum: ______
Minimum: ______

Example:

Single linear wounds (cm):
Wound length: _______
Width: _______ Depth: _______





EXTERNAL EXAMINATION (CONT.)

25d. T/HI-Fisheries/Entanglement data: (Fisheries gear, other entangling material)
Gear type:
☐Line & pot ☐Line & buoy ☐Line, buoy & pot ☐Unknown gear/line
☐Netting ☐Hook ☐Monofilament ☐Braided line ☐Other
Number of wraps around body part: _____, **location:** _____ 1 (use anatomic codes)
Additional areas:___,___ 2 ; ___,___ 3 ; ___,___ 4 ; ___,___ 5 (Example: 4 , R)

☐Material removed prior to necropsy
Ligature injury: (additional comment under 25c)
☐Ligature – mild, non-penetrating
☐Ligature – skin incised/ulcerated
☐Ligature – full thickness (deep tissue/bone exposed)
☐Ligature – partially/completely healed

T/HI-Material collected*: ☐Yes ☐No **Disposition of material:** ______________________________
Gear description (color, shape, size): ______________________________
Gear identification information: ______________________________

26a. External anomalies-Type: (check all that apply and diagram in 25c)
Enter anatomic codes in blanks: (Example: ⊗ Ulcers(16) Y)
☐Fibropapillomas/Papillomas(15)______ ☐Ulcers(16)______
☐Crust/exudate(17)______ ☐Masses (non-FP or uncertain)(18)______
☐Other(19)________ describe under 26c
☐ PHOTOGRAPHS TAKEN

26b. Other anomalies-Description: (check all that apply)
Extent of observation: *(Refer to Pap Map for FP turtles)*
Enter 26a. + anatomic codes: (Example: ⊗ 10-25% affected 16Y)
☐<5% surface affected______ ☐10-25% affected______
☐>25-50% affected______ ☐>50% affected______
☐Visual field involved______ ☐Both eyes______
☐Mouth obstructed______ ☐Cloaca obstructed______

26c. Anomalies-Comments (cont. pg 4): ______________________________
____
____
____
____

INTERNAL EXAMINATION (comments extended to page 4 – optional)

NUTRITIONAL CONDITION - INTERNAL
27. Muscle status: ☐Well-muscled/No atrophy ☐Mild to moderate atrophy ☐Severe atrophy
28. Fat status: ☐Abundant/No atrophy ☐Mild to moderate atrophy ☐Severe atrophy ☐ PHOTOGRAPHS TAKEN

29a. MUSCULOSKELETAL (internal) – ☐EXAMINED **29b. Joint Fluid:** ☐No findings ☐Cloudy/solid material ☐Blood-tinged
29c. Skeletal Findings: ☐No findings ☐Fractures ☐Dislocation ☐Avulsions ☐Deformities ☐Other (note location(s) in comments)
29d. Musculature findings: ☐No findings ☐Trauma ☐Hemorrhage ☐Pallor ☐Necrosis ☐Other
29e. MUSCULOSKELETAL-Findings/Comments: ______________________________
____
____

30a. COELOMIC CAVITY – ☐EXAMINED **30b. Coelomic Fluid Volume:** _____ml **30c.** ☐actual ☐ est.
30d. Coelomic Fluid: ☐No findings ☐Cloudy/solid material ☐Blood-tinged ☐Blood clots ☐Fibrin ☐Other
30e. Coelomic Lining: ☐No findings ☐Masses (≤2mm) ☐ Masses (>2mm) ☐Hemorrhage ☐Adhesions ☐Other
30f. COELOMIC CAVITY-Findings/Comments: ______________________________
____

31a. CARDIOVASCULAR SYSTEM (heart/major vessels) – ☐EXAMINED **31b. Blood in Heart chambers:** ☐Yes ☐No
31c. Pericardial Fluid: ☐ No findings ☐Cloudy/solid material ☐Blood-tinged ☐Blood clots ☐Fibrin ☐Other
31d. CV Findings: ☐No findings ☐Trauma ☐Endocarditis/arteritis ☐Blood clot(s) ☐Vessels thickened ☐Adhesions ☐Other
31e. CV-Findings/Comments: ______________________________
____

32a. HEPATOBILIARY SYSTEM (liver and gall bladder) – ☐EXAMINED
32b. Liver Findings: ☐No findings ☐Pallor ☐Atrophy (shrunken, black) ☐Trauma ☐Masses (≤2mm) ☐Masses (>2mm) ☐Other
32c. Biliary Findings: ☐No findings ☐Gall bladder thickened ☐Bile ducts thickened ☐Ulcers ☐Exudate ☐Stones ☐Other
32d. HB-Findings/Comments: ______________________________
____
____

INTERNAL EXAMINATION (CONT.)

ANATOMIC LOCATION CODES: Mouth(O) Esophagus(Es) Stomach(St) Small intestine(Si) Colon(Co) Cloaca(Cl)

33a. ALIMENTARY SYSTEM – ☐EXAMINED

33b. GI-Findings: (check all that apply) **Enter anatomic codes in blanks:** (Example: ⊗ Ulcers(20)_Co_)

☐Ulcers(20)________ ☐Perforation (21) ________ ☐Masses(22) ________ ☐Impaction(23) ________

☐Obstruction(24) ________ ☐Intussusception(25) ________ ☐Plication(26) ________ ☐Other(27) ________

33c. GI-percentage of affected area: Enter 33b. + anatomic codes: (Example: ⊗ >25-50 affected_20 Co_)

☐<5%________ ☐10-25%________ ☐>25-50%________ ☐>50%________ ☐N/A

33d. GI-Foreign material: ☐Yes ☐No **(If yes, complete 33k)**

33e. Injury/lesion associated with foreign material: ☐Yes ☐No **If yes, give entry for 33b:**________ (Example: _21 St_)

GI-Contents(include & note any biotic impacted material):

33f. Esophagus: ☐ Empty ☐ Contents, describe: ________

33g. Stomach: ☐ Empty ☐ Contents, describe: ________

33h. Small intestine: ☐ Empty ☐ Contents, describe: ________

33i. Colon: ☐ Empty ☐ Contents, describe: ________

33j. GI-Findings/Comments: ________

33k. GI-Foreign material - type: ☐ PHOTOGRAPHS TAKEN

☐Hook(29) ☐Line(30) ☐Hard plastic(31) ☐Plastic bag(33) ☐Misc soft plastic(33) ☐Balloon(34) ☐Tar(35) ☐Other(36)

Material/lesion location(s): ________ (use anatomic codes)

Material collected*: ☐Yes ☐No **Disposition of material:** ________

Foreign material-Description of material & comments: ________

34a. SPLEEN – ☐EXAMINED **34b. Spleen Findings:** ☐No findings ☐Trauma ☐Enlarged ☐Masses ☐Other

34c. PANCREAS – ☐EXAMINED **34d. Pancreas Findings:** ☐No findings ☐Trauma ☐Masses ☐Congested ☐Other

34e. SPLEEN/PANCREAS-Findings/Comments: ________

35a. UROGENITAL SYSTEM (kidneys, reproductive, urinary bladder) – ☐EXAMINED

35b. Kidneys Findings: ☐No findings ☐Trauma ☐Enlarged ☐Asymmetrical ☐Masses ☐Other

35c. Gonads identified as: ☐Testes(complete 35d-f†) ☐Ovaries(complete 35g-i†) ☐Unknown **(Indicate sex on Page 1, Field 15)**

35d. Testes–characterization: ☐Cylindrical ☐Ellipsoidal ☐Flat **35e. Testes-size:** ________length x ________width (cm)

35f. Epididymis–characterization: ☐Not expanded from wall ☐Distinct ridge ☐Pendulous ☐Obvious white coils

35g. Ovaries–characterization: ☐All follicles <4mm ☐Developing follicles (4-24mm) ☐Corpus luteum (>7mm) ☐Corpus albicans

35h. Ovary length: ________ (cm)

35i. Oviduct–characterization: ☐White, straight (<3mm diameter) ☐Partially convoluted (3-15mm diameter) ☐Very convoluted (>15mm diameter) ☐Contains eggs (>24mm)

† Optional fields by state

35j. UG-Findings/Comments: ________

36a. RESPIRATORY SYSTEM – ☐EXAMINED **36b. Foam/froth in trachea:** ☐Yes ☐No

36c. If froth present: ☐Anterior to bifurcation ☐Posterior to bifurcation **36d. Froth amount:** ☐Small ☐Moderate ☐Copius

36e. Sand/sediment in trachea: ☐Yes ☐No **36f. Trachea/bronchi:** ☐No findings ☐Exudate ☐Masses ☐Ulceration ☐Other

36g. Lungs Findings: ☐No findings ☐Wet/frothy ☐Hemorrhage ☐Trauma ☐Exudate ☐Masses (≤2mm) ☐Masses (>2mm) ☐Aspirated debris ☐Other

36h. RESP-Findings/Comments: ________

INTERNAL EXAMINATION (CONT.)

37a. CENTRAL NERVOUS SYSTEM – ☐Brain EXAMINED **37b. ☐Spinal Cord EXAMINED**

37c. Brain findings: ☐No findings ☐Trauma ☐Hemorrhage ☐Necrosis ☐Exudate ☐Blood fluke eggs ☐Other

37d. Spinal cord findings: ☐No findings ☐Trauma ☐Hemorrhage ☐Necrosis ☐Exudate ☐Blood fluke eggs ☐Other

37e. CNS-Findings/Comments: ______________________________

38. Other Comments (Include any continuation from previous sections & label notes by data field number (e.g. 25c): ______________________________

Specimen (label w/ ID#)	Fixed	Frozen-bagged	Frozen-Foil	Other (specify)	Location

DISCLAIMER

*All fisheries gear should be submitted to Pascagoula (SE) or North Kingston (NE) NOAA laboratories for ID

APPENDIX D.

Sea Turtle Rehabilitation Quarterly Report

Turtle Facility: Turtle Facility ID #

Turtle Facility Address:

City, State:

FWS Permit Number: State Authorization Number:

Reporter Name: Veterinarian Name:

Stranding (STSSN) ID Number | Species: | Date Received at Facility: | Current Curved Carapace Length (cm): | Medically Cleared for Release? | Medically Cleared Date:

Date Released: | PIT Tag Number: | Flipper Tag Number - Left: | Flipper Tag Number - Right: | If not Medically Cleared, Prognosis:

Stranding (STSSN) ID Number | Species: | Date Received at Facility: | Current Curved Carapace Length (cm): | Medically Cleared for Release? | Medically Cleared Date:

Date Released: | PIT Tag Number: | Flipper Tag Number - Left: | Flipper Tag Number - Right: | If not Medically Cleared, Prognosis:

Stranding (STSSN) ID Number | Species: | Date Received at Facility: | Current Curved Carapace Length (cm): | Medically Cleared for Release? | Medically Cleared Date:

Date Released: | PIT Tag Number: | Flipper Tag Number - Left: | Flipper Tag Number - Right: | If not Medically Cleared, Prognosis:

Stranding (STSSN) ID Number | Species: | Date Received at Facility: | Current Curved Carapace Length (cm): | Medically Cleared for Release? | Medically Cleared Date:

Date Released: | PIT Tag Number: | Flipper Tag Number - Left: | Flipper Tag Number - Right: | If not Medically Cleared, Prognosis:

APPENDIX E.

Non-Releasable Sea Turtle Annual Report

Turtle Facility

Turtle Facility ID #

FWS Permit #

State Authorization #

Turtle Facility Address

City, State

Reporter Name

Date Received at Facility

Stranding (STSSN) ID #

Species

Turtle Name

PIT Tag Number

Flipper Tag Number - Left

Flipper Tag Number - Right

Current Curved Carapace Length (cm)

Status

Not Releasable Status Reason

Current Disposition

If Died, Cause of Death (Include necropsy report with final report to FWS)

If Transferred, Transferred to

Transfer Authorization

Medical Evaluation

Veterinarian

Adult males and females separated?

Pre-act turtles separated from other turtles?