

TECHNICAL REPORT

BROWARD COUNTY SEA TURTLE CONSERVATION PROGRAM 2016 REPORT

**For the
BROWARD COUNTY BOARD OF COMMISSIONERS**



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ACKNOWLEDGEMENTS

We would like to thank and acknowledge the tireless and dedicated efforts of the Nova Southeastern University Broward County Sea Turtle Conservation Program (BCSTCP) staff. Their expertise, dedication and hard work have made the program a success.

A program of this magnitude cannot be accomplished without the assistance and cooperation of numerous individuals, groups and organizations. We would like to thank Rich Pick for servicing and transporting our all-terrain vehicles (ATVs) at all hours of the day and night to keep the team operating throughout the season. We are grateful to the following individuals and groups for logistical support: Mr. Dan Dodge of the Hillsboro Club who provided a storage area for our ATVs, the Hollywood Beach and Hallandale Beach Maintenance Departments, Fort Lauderdale Beach Maintenance and Public Works Departments, Fort Lauderdale and Pompano Beach Rakers, the Deerfield Beach Parks and Recreation Department and the Pompano Beach Fire House for providing a storage area for our ATV. The Sea Turtle Conservancy has provided sea turtle and environmental awareness products to aid our outreach efforts. Thanks to the Responsible Pier Initiative and Loggerhead Marinelife Center for helping to keep our fishing piers clean and educating people about ways to respond to a sea turtle that has been hooked. We also acknowledge the park employees of the Broward County Parks and Recreation Division at Anne Kolb Nature Center who assisted in the Sea Turtles and Their Babies hatchling release programs.

We acknowledge and thank the following agencies and local governments for their support and guidance in the continuation of this program: the Florida Department of Environmental Protection, Division of Recreation and Parks; the Florida Fish and Wildlife Conservation Commission (FWC), Florida Marine Research Institute; the Cities and Police Departments of Hallandale Beach, Hollywood, Dania Beach, Fort Lauderdale, Pompano Beach, Deerfield Beach; the Towns of Lauderdale-By-The-Sea and Hillsboro Beach; the Code Enforcement Departments in Deerfield Beach, Hillsboro, Pompano Beach, Lauderdale-By-The-Sea, Fort Lauderdale, Hollywood and Hallandale Beach.

We would like to thank the Broward County Board of Commissioners for program funding and administration. We thank the National Save the Sea Turtle Foundation for organizing, executing, and donating funds via the Adopt-a-Nest program. We would like to thank Downtown Hollywood's Party with a Purpose and the CHIVE Fort Lauderdale for hosting events to benefit the BCSTCP.

We would like to thank Richard and Zen Whitecloud and the staff and volunteers of the Sea Turtle Oversight Protection (STOP) program, Doug Young and the staff and volunteers of South Florida Audubon Society (SFAS) program, and Kristine Halager and the staff and volunteers of the Sea Turtle Awareness Rescue Stranding (STARS) group for their dedicated hard work and assistance with nest cage monitoring and support throughout the season.

Finally we would like to thank all of the individuals and groups that participated in our education and outreach efforts this year, making another great season for the BCSTCP and for Broward County's sea turtles!

EXECUTIVE SUMMARY

The BCSTCP is funded and administered by the Broward County Board of Commissioners through the Environmental Planning and Community Resilience Division (BCEPCRD) and carried out by Nova Southeastern University (NSU) to conduct sea turtle nesting surveys daily from March 1–October 31, 2016 for all Broward County beaches excluding Dr. Von D. Mizell-Eula Johnson State Park (Mizell-Eula State Park; monitored by Park staff). All loggerhead, green and leatherback turtle crawls (nests and false crawls) were identified to species and recorded by Geographic Positioning System (GPS). All nests were marked using wooden stakes and Red-Glo flagging tape and monitored throughout the season until they hatched or reached a maximum incubation time determined by FWC guidelines.

The 2016 sea turtle nesting season set a record for the highest number of nests since the inception of the BCSTCP in 1981, although earlier years may have varied slightly in survey area and season length. A total of 3,567 (3,400 loggerhead, 137 green, 27 leatherback, and 3 unknown species) nests were deposited in Broward County from April 12 to September 8, 2016. This is 327 more nests for all species than 2015, and 27 more nests than the previous record season in 2012. Loggerhead turtles led the nesting again this year with 3,400 nests, which is 659 more than last year and 116 more than the previous record season in 2012 (3,284 nests). Loggerheads fell well above the five-year average of 2,952 nests per season. Green turtles laid 137 nests, which was far below the record 2013 season of 495 nests. This was anticipated since the local population of green turtles appears to have a biennial reproductive cycle where an individual may only return to nest every two years in most cases. The 2015 season was a high nesting year for green turtles, and so low green turtle nesting was expected in 2016. This season was lower than the five-year average of 288 nests. Leatherback turtles are the least common nesters in Broward County, laying 27 nests in 2016. This season, leatherback nesting fell below the five-year average of 33 nests. Some measured leatherback track widths were quite small this season, suggesting the possibility of some new nesting mothers in the area.

Nesting success (nests/(nests + false crawls)) averaged 43.64% for all species combined, 2% higher than the 2015 season but nearly 4% lower than the five-year average of 47.53%. Loggerhead nesting success was 43.38%, slightly higher than 2015 (39.86%), and about 4% lower than the five-year average of 46.91%. Green turtle nesting success was 45.97%, about 5% lower than 2015 (50.99%) and slightly lower than the five-year average of 49.20%. Leatherbacks showed a decreased nesting success of 84.38%, compared to the very successful 2015 season at 97.22% and fell about 4% below the five-year average of 88.28%.

Reproductive success was investigated for a total of 2,274 nests after hatch out (2,191 *in situ*, 83 relocated, 75 restraining cage nests; because restraining cages were not installed until day 45 of the incubation period, they were counted in either the *in situ* or relocated categories based on their primary treatment, but were analyzed separately as well). Emergence success for *in situ* loggerhead nests in 2016 (57.29%) was slightly lower compared to 2015 (63.05%). This trend was not observed among *in situ* green and

leatherback nests. Emergence success for *in situ* green nests in 2016 was 75.83% whereas 2015 had an emergence success of 73.16%. *In situ* leatherback nests had an emergence success of 60.84% in 2016 which was higher than 2015 (51.48%).

The Hillsboro/Deerfield Beach survey zone had the most active nesting in Broward County with an average of 260.70 nests/mile (160.14 nests/km; all species combined). The Hollywood Beach survey zone had the lowest nesting density with an average of 33.62 nests/mile (20.74 nests/km; all species combined). This nesting distribution could be influenced by a number of factors. Historically, Hillsboro housed an active sea turtle “hatchery” facility where nests were transported from other areas of Broward County and relocated into a fenced facility until hatchout. Likewise, nests have historically been relocated out of Hollywood Beach. Additionally, Florida’s east coast exhibits a general nesting trend of increasing nesting densities moving south to north from Miami to Brevard Counties. The same trend might be occurring within Broward County, as Hollywood is the southernmost zone while Hillsboro/Deerfield is the northernmost zone. Both historical relocations into hatcheries and the south-north nesting trend may influence the nest distributions seen in Broward County.

The BCSTCP monitored sea turtle nesting activity relative to three renourishment projects in recent years and one active maintenance/bypass project:

- Broward County Segment II Beach Renourishment and Restoration Project (R36-R41, R51-R72), active as of December 2016.
- Flood Control and Coastal Emergency Beach Erosion Control (FCCE) Truck Haul Project in Pompano Beach (R26-R53), sand placement concluded in November 2013.
- Hillsboro/Deerfield Beach Nourishment Project (R6-R8), sand placement concluded on April 11, 2011 but an amendment allowed additional sand to be placed in 2015.
- Hillsboro Inlet Maintenance & Sand Bypass Project (R25-R26).

INTRODUCTION

Since 1978, the BCEPCRD and Broward County Board of Commissioners have provided for the conservation of endangered and threatened sea turtles in Broward County, Florida. Florida's coastline experiences the densest sea turtle nesting in the United States. Broward County is classified by FWC as a medium-density nesting area in Florida and is in the normal nesting ranges of three species of sea turtles: loggerhead (*Caretta caretta*), green (*Chelonia mydas*), and leatherback (*Dermochelys coriacea*) turtles. In the coastal waters around Broward County, Kemp's ridley (*Lepidochelys kempii*) and hawksbill (*Eretmochelys imbricata*) sea turtles can also be found, but do not nest regularly in the area. The leatherback is categorized as endangered in this region, while the loggerhead and green turtles are listed as threatened. The North Atlantic distinct population segment of green turtles (includes Florida) was recently down-listed from endangered to threatened in 2016. All species of sea turtles in U.S. waters are protected under the U.S. Endangered Species Act of 1973 and Florida's Marine Turtle Protection Act (379.2431, Florida Statutes).

These statutes protect all life history stages of sea turtles and therefore all conservation, monitoring, or research efforts require permitting by FWC. Permitting is administered by the U.S. Fish and Wildlife Service for sea turtles on land and the National Oceanic and Atmospheric Association (NOAA) protects all in-water turtles. All monitoring and conservation efforts for this program were administered and supported by the BCEPCRD and conducted by Nova Southeastern University as part of the BCSTCP.

Beach Renourishment Projects

Coastal development alters the natural accumulation and loss of sand on natural beaches. Broward County's highly developed and armored coastline and beachfront calls for needed maintenance of beach profiles, beach width, and dune structures. To help mitigate erosion along sections of Broward County beaches, intermittent beach renourishment projects have been established in some areas of the County to ensure the continuation of coastal preservation, beach recreation and infrastructure protection. The BCEPCRD has maintained the sea turtle conservation and monitoring program in years with and without sand placement projects, to better understand the long- and short-term impacts of sand placement projects on nesting sea turtles. There have been four County-sponsored renourishment projects in recent years:

- Broward County Segment II Beach Renourishment and Restoration Project (R36-R41, R51-R72), approximately 607,000 cubic yards of sand was placed in January–April 2016. More sand was placed in November–December 2016.
- FCCE Truck Haul Project in Pompano Beach (R26-R53), approximately 115,000 cubic yards of sand was placed in this area. Sand placement concluded in November 2013.
- Hillsboro/Deerfield Beach Nourishment Project (R6-R8), approximately 375,000 cubic yards of sand was placed. Sand placement concluded on April 11, 2011. In

2015, an amendment to this project permitted an additional 50,000 cubic yards of sand to be placed in the same area.

- Hillsboro Inlet Maintenance and Sand Bypass Project in Hillsboro Beach (R25-R26).

Project Goals

The BCSTCP goals in 2016 were to:

- 1) Conduct daily sea turtle nesting surveys and beach monitoring for mechanical beach cleaning and various permitted projects and beach events.
- 2) Relocate or protect imperiled sea turtle nests to maximize hatchling survival.
- 3) Conduct nest evaluations to examine hatching success.
- 4) Conduct stranding and salvage activities and maintain a 24-hour sea turtle emergency hotline.
- 5) Inform and educate the public through educational seminars, public hatchling releases, and table events about sea turtles and sea turtle conservation/management.
- 6) Provide accurate and timely reporting.

MATERIALS AND METHODS

Personnel

The BCSTCP works with a protected species, therefore all sea turtle monitoring and work is authorized by FWC's Imperiled Species Management section (ISM), and was conducted by permitted individuals under Marine Turtle Permits #214, #215, #148 issued to Curtis Slagle (January 1–December 31, 2016). The FWC Marine Turtle Permit, Guidelines, and the contract with Broward County were used to set procedures for all monitoring, stranding, and survey protocols for this program.

2016 BCSTCP Staff:

Stephanie Kedzuf – Broward County Contract Administrator
Courtney Kiel – Broward County Contract Administrator
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Curtis Slagle – Project Manager / Permit Holder
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Sea Turtle Nesting Surveys

Daily sea turtle nesting surveys were conducted by BCSTCP staff from March 1–October 31, 2016 for all Broward County beaches (24 miles) excluding Mizell-Eula State Park (previously John U. Lloyd State Park; 2.4 miles; Figure 1). Mizell-Eula State Park is an FWC Index Beach that is used by researchers following a standardized set of survey protocols and specific beaches to monitor the long-term nesting trends of marine turtles in Florida. Survey protocols and data collected on FWC Index Beaches are slightly different from the data that is collected throughout the rest of Broward’s beaches, so some information may not be recorded in this area and therefore will be left out of parts of this technical report. Park rangers carried out surveys in Mizell-Eula State Park and they provided all data for this survey area.

Surveys began 30 minutes before sunrise each day and were conducted using ATVs (Honda Rancher 420, Honda Pioneer 500 Side x Side, Polaris Sportsman Touring 570). For survey purposes, Broward County was divided into five survey zones: Hillsboro-

Deerfield Beach (Hillsboro), Pompano Beach including Lauderdale-By-The-Sea (Pompano), Fort Lauderdale, Mizell-Eula State Park, and Hollywood-Hallandale including Dania Beach (Hollywood; Table 1; Figure 2). For all survey zones, except Mizell-Eula State Park, nest locations were referenced to Florida Department of Environmental Protection (FDEP) range monuments (R-zone) numbered consecutively (north to south) from R1-R128.

Data Collection, Management and Analysis

All nesting and non-nesting emergences (false crawls) were recorded and locations marked by GPS when they were first encountered on the survey. Data was recorded on paper data sheets and electronically using a Sonim XP-7 device with the VJGames GPS Coordinates Application in the field. This tablet system uses GPS, Wi-Fi, and mobile networks to determine location. All nests were additionally marked with a Trimble GeoExplorer 6000 Series or Trimble GeoExplorer 2008 Series (<1 m accuracy) to allow for precise nest reestablishment throughout the season if necessary (stakes lost, nest washout, vandalism, etc.). Nest GPS was taken over the center of the clutch when it was verified, the approximate clutch location when it was not known, or at the apex of a false crawl. To ensure crawls were not double counted, after all data was collected from a crawl and it was marked accordingly, the tracks (not the nest site) were driven over with an ATV to indicate they have already been documented.

The following information was recorded for each crawl:

- 1) Survey zone referenced to nearest property and R-zone monument marker.
- 2) Crawl type (nest or false crawl).
- 3) A unique identifying number (generated using beach code and nest or false crawl number).
- 4) Date crawl was discovered.
- 5) Species identification.
- 6) Measurement from nest or apex of false crawl to the previous night's high tide line.
- 7) Crawl characteristics (e.g. crawl width, number of body pits or abandoned egg chambers, orientation circles, etc.).
- 8) Final nest treatment (*in situ*, relocation, restraining cage).
- 9) If the turtle encountered an obstruction (ONA).
- 10) If the turtle disoriented.

The Data Manager entered data daily into an Excel spreadsheet, all data sheets were photocopied and originals were held until all analysis and reporting requirements were complete. All data was verified by at least one additional senior staff member once the data was entered and before analysis. Data analyzed and presented in this report were compiled using Microsoft Excel 2008 for Mac and JMP Pro 12. All maps were constructed in ESRI ArcMap 10.3 (GCS North American NAD 1983 projection). Historical nesting, nesting success, hatching success trends, and reproductive success were analyzed using analysis of variance for linear regression.

All data collected for this program was reported to FWC as per permitting guidelines. The yearly reports provided to FWC are shown in Appendix 1.

Treatment Zones

Survey zones were further broken down into treatment zones based on different management tools/strategies to minimize unwanted natural and anthropogenic influences in the area. Treatment zones were broken down into “donor,” “*in situ* & recipient,” “restraining cage,” or “*in situ*” categories (Table 2, Figure 3).

All nests classified as “*in situ*” (did not undergo nest relocation) were marked with a minimum of four stakes (one signed stake [see Appendix 2 for example of nest sign], at least three non-signed stakes) with a circle of bright Red-Glo flagging tape with a radius of at least three feet centered on the clutch. The top of the signed stake was painted white to facilitate clear data recording on the stake. For sites where a clear dig sight could not be identified, the whole area of disturbed sand was encircled with bright tape. If during the course of the season the nest markers were lost, washed away, vandalized, etc. the nest was re-established using the Trimble sub-meter GPS units. Upon reestablishment, nests were marked with a circle of bright Red-Glo flagging tape with at least a five foot radius centered on the nest site.

Nest Relocation

Nests deposited in areas that were deemed “donor zones” by FWC or that were laid below the previous night’s high tide line were relocated to the nearest recipient zone or west of the original nest location, respectfully, to ensure the highest possible hatching success. All nests were relocated before 9 am the morning after they were deposited. Each nest was carefully dug by hand and the eggs were transported in buckets containing damp sand from the original nest chamber. Special care was taken to leave eggs in their natural orientation (how they were sitting in the original chamber created by the nesting mother) to minimize possible injury to the embryos during transportation. A new “nest chamber” was dug by hand to the same depth/width/shape as the original nest chamber and eggs were placed in the chamber and reburied following the FWC Marine Turtle Handbook (2016).

Relocated nests were marked with three stakes (one signed stake, two unsigned stakes) in a triangle with the egg chamber in the middle and surrounded with bright Red-Glo flagging tape. All relocated nests were evaluated post-hatching for hatching success unless extenuating circumstances (washout, vandalism, etc.) made post-hatching analysis impossible.

Restraining Cages

Restraining cages were used as a temporary management tool for zones of high artificial lighting trespass on the beach (Figure 3). In all “restraining cage” zones, egg chambers

were located for each nest during the daily survey and nests were marked as per standard procedures for “*in situ*” nests. Restraining cages were constructed for every other loggerhead nest in the “restraining cage” zones. Cages were deployed at 45 days (the beginning of the hatch out window) and monitored until at least 72 hours post-emergence or until the nest reached 70 days incubation time. In either instance, all caged nests were excavated and assessed for reproductive success.

Cages were constructed of a thick plastic mesh (¾ inch x ¾ inch mesh) lined with window screen on the inside of the cage to minimize hatchling entanglement in the cage and protect hatchlings from predators that may reach through the mesh. Cages were a cylinder (24 inch diameter and height), with a flat mesh top secured in place and an access hatch in the top to facilitate hatchling retrieval. Additionally a door was cut into the eastern side of the cage that was opened during the day, so hatchlings that may emerge during the day can leave the cage on their own and not desiccate in the cage during the heat of the day (Appendix 3A). An informative sign was affixed to the outside of the cage with the pertinent response phone numbers if a turtle was found in the cage (Appendix 3B).

For cage construction, the enclosure was placed centered over the top of the egg chamber, a trench was dug around the base of the cage, and the base of the cage was buried in the ground 4-6 inches and then secured to stakes to hold it in place. Daily cage monitoring consisted of closing the eastern door at sunset each day, checking the cage for hatchling activity at least once between 23:00 and 01:00 each night (any hatchlings encountered were removed from the cage and released), and opening the eastern door at sunrise each morning.

Reproductive Success Evaluations

When possible, nests were excavated and assessed for reproductive success at least 72 hours post-hatchout. If a hatchout was not observed, nests were excavated and assessed after a 70-day incubation period for green and loggerhead nests and 80 days for leatherback turtles; after this time the nests are no longer considered viable (FWC Handbook, 2016). Each nest was carefully dug by hand.

The following data were collected for each inventoried nest:

- 1) Number of hatched eggs
- 2) Live in nest (LIN)
- 3) Dead in nest (DIN)
- 4) Live pipped hatchlings (LPIP)
- 5) Dead pipped hatchlings (DPIP)
- 6) Unhatched egg with visual development (VD)
- 7) Unhatched egg with no visual development (NVD)
- 8) Unhatched egg, white (fertilized egg)

Clutch size was calculated as: $Hatched\ eggs + LPIP + DPIP + VD + NVD$

Emergence success for each nest was calculated as: $\frac{(Hatched\ eggs - LIN + DIN)}{Clutch\ size}$

Hatchlings released for each nest was calculated as: $Hatched\ eggs - DIN + LPIP$

Lighting Surveys

Surveys for artificial lighting on Broward County beaches were conducted once each month from March–September 2016 for all survey zones. Surveyors walked each section of beach after dark (commencing between 22:00 and 00:00) to document light fixtures that were not in compliance with local lighting ordinances. Surveyors worked the same section of beach each month to allow the highest level of familiarity with the properties surveyed, minimizing human error and discretion thus providing a better long-term tracking of lighting non-compliance throughout the season. Survey protocols followed standard techniques as described by the FWC Technical Report: Understanding, Assessing, and Resolving Light-Pollution Problems on Sea Turtle Nesting Beaches (Witherington, Martin and Trindell, 2014) and Chapter 62B-55, Florida Administrative Code Model Ordinance for Marine Turtle Protection; both documents identify compliant and noncompliant fixtures/bulbs depending on fixture type, bulb type, light wavelength, etc. Properties that exhibited potentially impactful lighting were photographed to better track individual property lighting throughout the season. All lights/fixtures that may impact sea turtle nesting or hatchling behavior were documented on a standardized “BCSTCP Lighting Survey Data Sheet” which is broken down by light/fixture type and property/address (Appendix 4). Each coastal municipality in Broward County has adopted and enforces their local Sea Turtle Friendly Lighting Ordinance. These ordinances vary slightly, but follow the general recommendations outlined in the Model Ordinance. A list of common lighting types found in Broward County can be found in Appendix 5 and are more fully outlined in the Technical Report Supplement: Broward County Sea Turtle Conservation Program Lighting Survey 2014 Report (Kiel, 2015).

Lighting survey reports were submitted to the Broward County contract administrator and FWC ISM staff monthly. These reports were ultimately sent to code enforcers in each Broward County coastal municipality for targeted rectification and enforcement actions if necessary.

Strandings

A Sea Turtle Emergency Line is monitored year-round 24 hours a day in Broward County and most members of the BCSTCP are trained in sea turtle stranding response. The emergency line receives many calls throughout the year (Appendix 6), including turtle stranding calls. When a stranding call is received on the emergency line, a member of the sea turtle stranding team is dispatched with a stranding kit, which contains all of the necessary equipment (tag reader, measuring tape, data sheets, scalpel, forceps, camera, pens/pencils, spray paint, GPS unit, etc.) to document the event. Each stranding event is documented using a standardized form from FWC (Appendix 7), and similar information is collected whether the animal is alive or deceased. Some of these data include species, sex (if mature), morphometrics, injuries, presence of tags, etc. If the turtle has

fibropapilloma tumors, an additional form is filled out (Appendix 8). Each stranding event is reported to the FWC Sea Turtle Stranding and Salvage Network Coordinator within 24 hours; depending on the state of the turtle, instructions are given on transportation to a rehabilitation facility (live stranding) or salvage/burial (deceased). If possible, deceased turtles are marked with spray paint to indicate that the animal has been documented and then are buried on or off the beach. A summary of the BCSTCP stranding responses in 2016 can be found in Appendix 9.

Disorientation Events and Obstructed Nesting Attempts

Three volunteer organizations: STOP, SFAS, and STARS had a strong presence on Broward County beaches again this year. The programs monitored nest hatchouts at night and reported disorientation events separately from the BCSTCP. A disorientation event is defined as either an adult or hatchling sea turtle that does not orient or travel toward the sea, but instead will travel in a direction that is more than 45 degrees from the beach-ocean interface. Most of these events can be tied to a bright anthropogenic light source that may be misleading from what would naturally be the brightest point on the horizon (how the nesting mothers and hatchlings typically orient themselves). Historically, the brightest point on the horizon was the moon and stars over the ocean. The STOP, SFAS, and STARS groups monitor the majority of County beaches; however their efforts are focused in the areas most impacted by anthropogenic lighting.

When an organization (BCSTCP, STOP, SFAS, or STARS) observed a disorientation event, the nest was marked with the date of hatchout on colored flagging tape to avoid report duplication among groups. In addition, a Marine Turtle Hatchling Disorientation Incident Report Form (Appendix 10) was filed for each disorientation event. Analyses were conducted using BCSTCP data only (Figure 11) as well as all of the disorientation reports logged by all groups in Broward County (Figure 12).

When a nesting female encountered an obstruction (escarpment, beach furniture, sea wall, rocks, etc.) that impacted her nesting attempt, an ONA form was submitted to FWC (Appendix 11). An impact to the female's nesting attempt was characterized by the obstruction causing her to change direction, become entangled, etc.

Education and Outreach Initiatives

One of the leading missions of the BCSTCP is community outreach and education. In 2016, a total of 142 education and outreach events were held. Each event educated residents and visitors of Broward County about sea turtles. With all of these events, the BCSTCP was able to reach out to over 50,000 individuals (Appendix 12).

RESULTS

Sea Turtle Nesting Surveys

The 2016 sea turtle nesting surveys in Broward County started on March 1, 2016, and the first crawl of the season was a leatherback nest discovered on April 12, 2016. A total of 8,170 emergences were documented for all of Broward County resulting in a record high 3,567 nests and 4,603 false crawls (Figure 4) or a 43.64% nesting success for all species (Figure 5). This is slightly above last year's nesting success at 41.41%, and is still well below the five-year average nesting success for all species of 47.53%.

Following the general trend, leatherback turtles were the first species to nest in Broward County in 2016, followed by loggerhead turtles, and then green turtles (Figure 6).

Leatherback Sea Turtles (*Dermochelys coriacea*)

Overall Nesting Activity

Leatherback turtles are historically the least frequent nesting species in Broward County. This trend continued again for the 2016 season. A total of 32 crawls were recorded in all of Broward County resulting in 27 nests and 5 false crawls for a County-wide nesting success for leatherback turtles of 84.38% (Table 3). This represents a 13% decrease in nesting success compared to 2015 and is 4% lower than the five-year average leatherback nesting success of 88.28%. Since 2000, nesting success has remained fairly stable over the years and regression analysis does not show a significant positive or negative trend over this time period (Figure 7). Leatherback nesting has experienced a significant increase over the life of the program with an average increase of 0.75 nests per year from 1981-2016. Regression shows a highly significant positive trend ($F(1,32) = 12.54$, $P = 0.001$; Figure 8).

Temporal Patterns

The first leatherback nest was deposited on April 12, 2016 (nearly a full month later than in 2015) and the first leatherback false crawl was documented on April 19, 2016. Highest daily nesting was recorded on April 9, June 10, and June 21 when two leatherback nests were discovered each morning in Broward County (Figure 6). The last leatherback nest was deposited on June 30, 2016, and the last false crawl was recorded on June 10, 2016.

Spatial Patterns

Leatherback crawls were recorded in all survey zones; however Hollywood and Fort Lauderdale received only nests and no false crawls. County-wide, leatherback turtles laid an average of 1.13 nests/mile (0.70 nests/km). The highest leatherback nesting density was seen in Pompano with 2.50 nests/mile (1.56 nests/km) and was lowest in Hollywood with 0.34 nests/mile (0.21 nests/km; Table 4).

Incubation Periods

Incubation periods were determined for 18 leatherback nests left *in situ* on Broward County beaches (excluding Mizell-Eula State Park) in 2016. The overall 2016 season incubation periods ranged from 51-69 days with a mean incubation period of 62.78 days.

Reproductive Success

Reproductive success was assessed for 16 leatherback nests left *in situ* in Broward County. The 16 nests resulted in 1,283 eggs and 786 hatchlings released for an emergence success of 60.84% (Table 5). This represents a nearly 10% higher emergence success than 2015 with an emergence success of 51.48%. Hillsboro Beach had the lowest hatchling emerged percentages at 49.23% and Hollywood Beach had the highest percentage at 89.53%; however, the small sample sizes make it difficult to compare among beaches (Table 8).

Loggerhead Sea Turtles (*Caretta caretta*)

Overall Nesting Activity

Loggerhead nesting made up the majority of the nesting activity in Broward County in 2016. A total of 7,837 crawls were recorded for loggerhead turtles in all of Broward County: record high 3,400 nests and 4,437 false crawls resulted in a nesting success of 43.38% (Table 3). This represents a ~3.5% increase in nesting success from last year (39.86%) but is ~3.5% lower than the five-year average of 46.91%. Since 2000, loggerhead nesting success has remained fairly stable; however regression analysis does not show a significant positive or negative trend over this time period (Figure 7). Loggerhead nesting has experienced a significant increase over the life of the program with an average increase of 35.17 nests per year from 1981-2016. Regression shows a highly significant positive trend ($F(1,34) = 25.05, P < 0.001$; Figure 8).

Temporal Patterns

The first loggerhead nest was deposited on April 20, 2016 and the first loggerhead false crawl was documented on April 22, 2016. Highest daily nesting was recorded on June 15, 20, and 30 when 66 loggerhead nests were discovered each morning in Broward County (Figure 6). The last loggerhead nest was deposited on September 8, 2016, and the last false crawl was recorded on August 27, 2016.

Spatial Patterns

Loggerhead nests and false crawls were recorded in all survey zones with an average of 142.26 nests/mile (88.08 nests/km) across the entire survey area. Hillsboro experienced the highest loggerhead nesting with 241.86 nests/mile (148.57 nests/km) and Hollywood

showed the lowest loggerhead nesting density with 33.10 nests/mile (20.43 nests/km; Table 4).

Incubation Periods

Incubation periods were determined for 2,068 loggerhead nests left *in situ* on Broward County Beaches (excluding Mizell-Eula State Park) in 2016. Incubation ranged from 40-66 days with a mean incubation period of 50.36 days.

Reproductive Success

Reproductive success was investigated in 2,109 *in situ* loggerhead nests across Broward County (excluding Mizell-Eula State Park) in 2016. In these evaluated nests 214,386 eggs were laid resulting in 125,849 hatchlings released for an emergence success of 57.29% (Table 5). This is nearly 300 more nests evaluated than during the 2015 season, but represents nearly a 6% lower emergence success than last year (63.05%).

Table 6 shows the fate of each egg deposited in the evaluated loggerhead nests left *in situ*, relocated, and nests outfitted with restraining cages. The highest emergence success in nests left *in situ* were those evaluated in Fort Lauderdale with an emergence success of 62.94%; the lowest emergence success of *in situ* nests was in Hillsboro Beach at 48.73%. This may be attributed to the higher predation rates in Hillsboro Beach.

Green Sea Turtles (*Chelonia mydas*)

Overall Nesting Activity

Green turtles are historically the second most frequent nesters in Broward County. This trend continued again for the 2016 nesting season. A total of 298 crawls were recorded for green turtles in all of Broward County. 137 nests and 161 false crawls resulted in a County-wide green turtle nesting success of 45.97% (Table 3). This represents a 5% drop in nesting success compared to 2015 and is 3.2% lower than the five-year average green turtle nesting success of 49.20%. Since 2000, green turtle nesting success has seen a moderate increase over the years; regression analysis shows a moderately significant positive trend over this time period ($P = 0.10$; Figure 7). Like the other species, green nesting has experienced a significant increase over the life of the program with an average increase of 7.9 nests per year from 1981-2016. Regression shows a highly significant positive trend ($F(1,34) = 34.87$, $P < 0.001$; Figure 8).

Temporal Patterns

The first green turtle nest was deposited on June 13, 2016 and the first green turtle false crawl was documented on June 16, 2016. Highest daily nesting was recorded on June 29, July 1, 11, and 14 when five green nests were discovered each morning in Broward County (Figure 6). The last green turtle nest was deposited on September 7, 2016, and the last false crawl was recorded on August 26, 2016.

Spatial Patterns

Green turtle nests and false crawls were recorded in all survey zones with a County-wide green turtle average nesting density of 5.73 nests/mile (3.55 nests/km). The highest green nesting density was in Hillsboro with 16.74 nests/mile (10.29 nests/km), and the lowest in Hollywood with 0.17 nests/mile (0.11 nests/km; Table 4).

Incubation Periods

Incubation periods were determined for 65 green turtle nests left *in situ* on Broward County Beaches (excluding Mizell-Eula State Park) in 2016. Incubation ranged from 44-62 days with a mean incubation period of 50.68 days.

Reproductive Success

Reproductive success was evaluated for 66 green turtle nests that were left *in situ* in 2016. There were 7,416 eggs deposited in the evaluated nests resulting in 5,744 hatchlings released for an emergence success of 75.83% (Table 5). The 2016 season had a much lower number of green turtle nests deposited compared to 2015 and therefore had less nests evaluated (251 in 2015), but the emergence success was about 2% more than that recorded in 2015.

Table 7 shows the fate of each egg in evaluated green turtle nests broken down by beach location, *in situ*, and relocated nests. The highest emergence success for *in situ* nests was 86.36%; however this was based on only a single nest laid in Hollywood. Fort Lauderdale had the next highest average emergence success of 80.82% (35 nests evaluated). The lowest emergence success of *in situ* nests was 65.45%, and was observed in Pompano.

Beach Renourishment Projects

Broward County Segment II Project

The Broward County Segment II Project (R36-R41; R51-R72) placed approximately 607,000 cubic yards of upland sourced sand from January–April 2016. More sand was placed in November–December 2016 to reach the goal of placing 706,700 cubic yards of sand across 4.9 miles of beach.

Nesting Success

Within the project area, there were 773 loggerhead nests and 967 false crawls documented for a nesting success rate of 44.4%. Green turtles laid 23 nests in the fill area and 15 false crawls for a nesting success of 60.53%; there were 2 leatherback nests and 1 false crawl for a nesting success of 66.67% in the project area (Table 9).

Reproductive Success

The Broward County Segment II Project had 608 loggerhead nests that were evaluated for reproductive success. These nests resulted in 63,265 eggs laid and 48,356 hatchlings released for an emergence success of 74.91%. There were 16 green turtle nests evaluated resulting in 1,790 eggs and 1,457 hatchlings released for an emergence success of 81.21%. There was 1 leatherback nest evaluated resulting in 104 eggs and 96 hatchlings released for an emergence success of 91.35% (Table 10).

FCCE Truck Haul Project

This is the third year of post-project monitoring (construction completed in 2013) for the FCCE Truck Haul Project at Pompano Beach (R26-R53). This project impacted one of the longest extents of beach of any of the recent projects with 115,000 cubic yards of sand being placed across 5.1 miles of critically eroded coastline.

Nesting Success

The fill area had 687 loggerhead nests and 787 false crawls for a loggerhead nesting success in the fill zone of 46.61%. Green turtles laid 4 nests and 14 false crawls for a nesting success of 22.22%. Leatherbacks laid 12 nests and 0 false crawls for a nesting success of 100% in the project area (Table 9).

Reproductive Success

The FCCE Truck Haul Project had 508 loggerhead nests that were evaluated for reproductive success. These nests resulted in 51,478 eggs and 30,623 hatchlings released for an emergence success of 57.67%. There were 3 green turtle nests evaluated for reproductive success resulting in 404 eggs and 199 hatchlings released for an emergence success of 46.44%. There were 8 leatherback nests evaluated for reproductive success resulting in 690 eggs and 439 hatchlings released for an emergence success of 62.56% (Table 10).

Hillsboro/Deerfield Beach Nourishment Project

The Hillsboro/Deerfield Beach Nourishment Project (R6-R8) was a small renourishment project that placed approximately 375,000 cubic yards of sand across 7,175 linear feet of shoreline miles. This project concluded on April 11, 2011 but in 2015, an amendment to this project proposed placing an additional 50,000 cubic yards of truck haul fill from Broward County Borrow Area 1 in the same 7,175 linear feet of shoreline.

Nesting Success

The Hillsboro/Deerfield Beach Nourishment Project accounted for 34 loggerhead nests and 49 false crawls for a nesting success of 40.96%. Green turtles made no crawls in the project area and leatherbacks laid 1 nest and made no false crawls for a 100% nesting success rate in the project area (Table 9).

Reproductive Success

The Hillsboro/Deerfield Beach Nourishment Project had 30 loggerhead nests that were evaluated for reproductive success. The 30 nests resulted in 2,428 eggs with 1,321 hatchlings released for an emergence success of 55.97%. There were no green turtle nests evaluated in the project area and one leatherback nest evaluated that had 81 eggs and 4 hatchlings released for an emergence success of 3.70% (Table 10).

Hillsboro Inlet Maintenance and Sand Bypass Project

The Hillsboro Inlet Maintenance and Sand Bypass Project in Hillsboro Beach (R25-R26) is a small maintenance and sand bypass project at the Hillsboro Inlet and moves sand as necessary across a 0.21 mile stretch of beach.

Nesting Success

The Hillsboro Inlet Maintenance and Sand Bypass Project impacted 13 loggerhead nests and 19 false crawls resulting in a loggerhead nesting success in this project area of 40.63%. There were no green nests but 1 green false crawl in the project area. There were no leatherback crawls in the area this season (Table 9).

Reproductive Success

The Hillsboro Inlet Maintenance and Sand Bypass Project had a total of 12 loggerhead nests evaluated for reproductive success. These 12 nests resulted in 1,318 eggs and 677 hatchlings released for an emergence success of 41.58% (Table 10).

Relocation

A total of 94 nests (92 loggerhead, 2 green) were relocated throughout the 2016 nesting season. This accounted for 2.86% of all nests laid in Broward County. Of these 94 nests, 30 were relocated mid-incubation due to nest chamber washout or egg exposure, 37 were relocated because they were laid below the high tide line, the remaining 27 nests were relocated because they were laid in a “donor” zone as specified by FWC.

Incubation Period

Incubation periods were determined for 72 relocated loggerhead nests (14 relocated mid-incubation due to washover/washout). Relocated loggerhead nests had an incubation range of 44-58 days with a mean incubation period of 49.56 days. Incubation periods were calculated for 2 relocated green nests. Incubation periods for greens ranged from 45-50 days with an average of 47.5 days. There were no leatherback nests relocated in 2016.

Reproductive Success

Reproductive success was calculated for 83 relocated nests (81 loggerhead, 2 green). The 81 loggerhead nests resulted in 8,606 eggs with 4,174 hatchlings released for an emergence success of 44.36% (Table 5). The 2 green turtle nests resulted in 189 eggs with 63 hatchlings released for an emergence success of 6.31%.

Disorientation Events

The BCSTCP surveyors reported 208 (56 adult, 152 hatchling) disorientation events across Broward County on morning surveys (Figure 10). Ninety of these disoriented nests were in the Fort Lauderdale survey zone and an additional 68 disoriented nests were in Pompano survey zone (Figure 11). Together these two survey zones accounted for 76% of the disorientation events reported by BCSTCP staff this season. The 2016 season saw 86 more disorientation events than the 2015 season and was much higher than the five-year Broward County average of 153 events (Figure 10).

To gain a more comprehensive understanding of the number of hatchling disorientation events in the entire County, all disorientation reports submitted by all sea turtle monitoring/volunteer groups (BCSTCP, STOP, SFAS, STARS) in Broward County (except Mizell-Eula State Park) were examined. A total of 1,023 hatchling disorientation events were documented out of 2,247 nests where a hatchout was observed. This yields a percent disorientation of 45.53% (Table 11); however, there was variation among areas within the County. Fort Lauderdale experienced the highest hatchling disorientation rate at 63.28% (598 nests disoriented out of 945 observed hatchouts). Additionally, Lauderdale-By-The-Sea, Sea Ranch Lakes and Pompano all experienced 50% disorientation rates or higher. Dania beach had the lowest hatchling disorientation rate with 0 out of 13 (0.00%) documented hatchouts disorienting (Table 11, Figure 11).

Predation and Poaching

In 2016, 191 nests (or 5.81% of all nests) in Broward County (excluding Mizell-Eula State Park) experienced predation. This is slightly lower than the 2015 season that had an overall predation rate of 6.12% and is 1.38% lower than the five-year predation average percentage of 7.50%. Broward County as a whole has shown little change in predation rates from 2005-2016. A slight rise in predation in the 2013 and 2014 seasons was not continued during the 2015 or 2016 season, but fluctuating numbers suggest that

continued monitoring of predation rates in this area would be beneficial (Figure 12). Foxes are the primary predators of turtle nests in Broward County, but iguanas, raccoons, ants, night heron, crow, and other unknown bird species were also documented preying on nests. The Pompano survey zone experienced the lowest predation impact with no predation events. The Hillsboro survey zone experienced the highest predation rates at 15.86% of nests experiencing predation (Figure 13). This is up slightly from the 2015 season which saw a 12.87% predation rate but is still considerably lower than the 25% predation rate documented in Hillsboro in 2014. Since Hillsboro hosts the highest nesting density in Broward County, this elevated predation impact may warrant some degree of nest protection in future years.

In addition to predation impacts, 9 nests in Broward County were impacted by human disturbance/poaching/vandalism (0.27% of all nests laid). This is down from the last two years which saw 0.5% of nests impacted. Most impacts were light digging in the nest (3 nests) or nest vandalism (5 nests). Nest vandalism included events such as stake removal or cage tampering. One nest however experienced heavy digging/trenching within the nest perimeter which resulted in the entire clutch being removed.

Restraining Cages

In the designated “restraining cage” zones, a total of 82 restraining cages were constructed on loggerhead turtle nests: 43 in Fort Lauderdale, 39 in Hollywood.

Incubation Period

Seventy-five of the 82 nests that received hatchling-restraining cages were excavated. The first cage was constructed June 16, 2016 on Hollywood Beach and the last was constructed September 23, 2016 on Fort Lauderdale Beach. Incubation period for caged nests ranged from 44 days to 54 days with a mean incubation period of 49.29 days. This is very similar to the wider dataset of *in situ* loggerhead nests, which had incubation periods ranging from 40-66 days with a mean incubation period of 50.36 days in 2016.

Reproductive Success

Caged nests were excavated and analyzed for reproductive success. Seven of the 82 caged nests could not be excavated due to washout and/or loss of cage/stakes that required reestablishment (egg chambers ultimately could not be located). A total of 7,802 eggs were deposited with 4,135 hatchlings released for an emergence success rate of 48.11% across all inventoried caged nests (Table 6).

Washover and Washout Events

A total of 1,294 nests were impacted by washover. 112 of these 1,294 nests were washed out completely (clutch completely or partially lost). 39.36% of all nests throughout Broward County (excluding Mizell-Eula State Park) experienced washover at some point over the 2016 season. This is much higher than the 2015 season, which had 806 (25.97%

of nests) nests impacted; this year was also higher than the 5 year average of 33.05% of nests impacted (Figure 14). Tropical Depression #8 and Hurricane Matthew were responsible for 50.31% of the washover and 64.29% of the washout events in 2016.

Strandings

The BCSTCP responded to 47 marine turtle stranding events from January 1–December 31, 2016. Of these, 19 were live strandings (1 turtle was picked up alive, but died in transport to a rehabilitation facility) and 28 were dead stranded turtles (Appendix 9). Stranding numbers were lower in 2016 compared to the 2015 season (Appendix 13).

Of the 47 strandings, 10 were impacted by fishing hooks (9 of these were live strandings and were able to be transported to a rehabilitation facility to remove the hooks and fishing line).

Obstructed Nesting Attempts

Morning surveys documented 434 ONAs: 411 were loggerhead crawls, 21 green turtle crawls, and 2 leatherback crawls. Of the 433 ONAs, 252 resulted in false crawls and 182 resulted in nests. Turtles encountered various obstructions including escarpments (203), beach furniture (97), seawalls (58), rock outcroppings (14), and rock revetments (12). Turtles also encountered fences, garbage cans, construction walls, lifeguard stands, posts, stairs, etc. (combined total of 67 interactions).

DISCUSSION

Yearly Nesting Trends and Reproductive Success

The 2016 nesting season set a new record as the highest nest count in program history. All three species of nesting turtles in Broward County have shown significant increases in nest deposition over the history of the BCSTCP starting in 1981. Loggerheads are on an increasing trend of +35.2 nests per year since 1981; however, there was a 10-year period of decline from 1997-2007. Since 2007, there has been an increase in loggerhead nesting activity and the rate of increase is higher than the overall program trend. Green turtles have seen a steady positive historic trend in nesting in Broward County. Leatherback nesting is also following an increasing historical trend (Figure 8). Recent historical Broward County nesting data (5 years) has demonstrated patterns of high and low nesting seasons that alternate annually. Both loggerheads and greens followed this trend in 2016. The 2015 season experienced a slight reduction of loggerhead nesting numbers relative to the 2014 nesting season. Although the nesting numbers were still high compared to the program's historical loggerhead nesting data, the oscillating pattern was still present. Green sea turtles demonstrate a far more extreme oscillation between high and low nesting seasons. The 2015 season experienced a high nesting season for greens, and a low green nesting season for 2016 was expected and confirmed. Leatherbacks also demonstrate this nesting pattern between seasons however it is the least consistent based on historical leatherback nesting data. The 2015 leatherback

nesting season experienced a slight decline in nesting numbers relative to the 2014 season. Hence an increase in leatherback nesting in 2016 was expected, however was not met. Although it contradicts predictions, this result is not surprising as similar patterns have been documented in Broward County between seasons 2002 to 2003 and 2010 to 2011.

Extreme temperatures impacted the hatching success of many nests in the 2016 season. As nest incubation temperatures increased, the eggs near the top of the clutch (nearest the surface) did not hatch, likely because they passed the thermal tolerance for incubation (Robert et al. 2014). The results of numerous excavations confirmed this as large numbers of unhatched eggs were discovered near the top of the clutch and hatched eggs were found near the bottom, likely where the temperatures would be a little cooler.

Seasonal Nesting Patterns

The seasonal nesting pattern was consistent with what is normally found in Broward County: the first nesters to arrive were the leatherbacks, followed by the loggerheads and then the green turtles. However, there were some fluctuations in the timing of the first nests deposited for two of the species. The first leatherback nest was deposited a full month later this year (April 12, 2016) than in the 2015 season (March 11, 2015). The first loggerhead nest was deposited on April 20, 2016, just 4 days after the first loggerhead nest of the 2015 season. Green nesting started on June 13, 2016, nearly a month later than the start to the season last year (May 17). Nest deposition over the season followed a normal distribution with the height of the season falling in June and July, which is similar to historic nesting patterns.

Green turtle nesting in 2016 was considerably lower than in 2015 and ended 4 weeks earlier this year. The last nest was deposited on September 7 this year compared to October 10 in 2015.

Countywide Nest Distribution

Nest distributions this season closely resembled patterns that have been seen in Broward County for many years with the highest nesting densities in Hillsboro/Deerfield Beaches, followed by Fort Lauderdale Beach, Pompano Beach, Mizell-Eula State Park and the lowest nesting activity on Hollywood Beach. In addition, there was very little crawl/nest activity directly adjacent to most jetties and inlets. These types of beach armoring constructions disrupt the natural water flow and sand movement and often result in increased beach erosion near the structures, impacting sea turtle nesting (Mosier and Witherington, 2000; Rizkalla and Savage, 2011).

Hillsboro Beach has one of the lowest human population densities and amount of artificial lighting of any of Broward County's beaches. Additionally, a sea turtle hatchery facility was once located near the Hillsboro Beach Club. The hatchery was maintained through the 2005 nesting season and received nests from "donor" zones that were brightly lit by artificial lighting (Burney and Ouellette, 2005). These factors may

play some role in the current high density nesting observed on Hillsboro Beach (Brothers, 2015; Lohmann, 1997). However the reason still remains unknown. Hollywood Beach was a long time “donor” zone since it is one of the brightest areas in Broward County. This may also explain the underutilization of Hollywood beaches for sea turtle nesting in recent years. Female sea turtles return to their natal beaches when they are ready to deposit nests of their own (Lohmann, 1997). Broward County may be experiencing some impact of this long-term movement of nests into the Hillsboro Beach area and may be a question that warrants further investigation in the future.

Nest Relocation

Historically, hatcheries were used quite extensively in Broward County as a management tool to protect marine turtles. An active hatchery facility was maintained near the Hillsboro Beach Club until 2005 (Burney and Ouellette, 2005). Hatchery facilities provide a sound management tool in heavily impacted coastal communities where nests left *in situ* will likely experience very high rates of disorientation, predation, washout, etc. However the hatchery model is not without its complications. The sex of marine turtle hatchlings is dependent on sand temperature during incubation (Standora and Spotila, 1985). A beach with all nests left *in situ* will experience a range of temperatures due to variation in nest placement in relation to the high tide line, shading from dune vegetation, etc.; likewise, different nest chamber depths will likely experience different temperatures during development (Abella, 2008, Van et al., 2006). When all or most of a beach’s nests are relocated into a hatchery facility, this may eliminate some of the natural temperature variation found when nests are left *in situ*. Also, when nests are packed densely together in a hatchery facility they become more vulnerable to disease and disease transmission, predation, and storm events (Izadjoo, 1987). In 2004, Hurricanes Frances and Jeanne had significant negative impacts on the hatchery nest facilities in Broward County (Burney and Ouellette, 2004).

Relocations generally experience lower hatching success than *in situ* nests because the eggs are moved and placed into an artificial chamber (Moody, 1996). This was demonstrated this season as the *in situ* loggerhead emergence success (57.29%) was significantly higher than the relocated loggerhead emergence success of 44.36%. In a hatchery system, some nests may travel a long distance in buckets before they are placed in their new handmade nests, increasing the likelihood of damage to the embryos. The final year of the hatchery facilities in Broward County resulted in loggerhead nests with a release success of 53.30% for relocated nests (N = 1151; Burney and Ouellette, 2005). In comparison, the 2016 season resulted in a relocated release success of 44.36% (N = 94 nests). However, release success was greatly reduced for all nests in 2016 likely due to the hot, dry weather experienced late in the season. Broward County has moved towards a more “hands off” management strategy, relocating less nests due to non-compliant lighting. The final year of the hatchery facilities in the County relocated 56.04% of all nests, compared to just 2.86% in 2016. The five year average for nest relocation is currently 3.93%. As lighting compliance improves in Broward County, the more “hands off” management strategy is strongly recommended. Future nesting, relocation, and

reproductive success data will help determine the most effective suite of management tools for the dynamic and highly utilized beaches of Broward County.

Restraining Cages

Hatchling-restraining cages were found to be an effective short-term mitigation action in areas of bright anthropogenic beachfront lighting to minimize loss of sea turtle hatchlings that would likely disorient in these areas. The cages also provided an effective educational tool in the field with signage and allowing the BCSTCP team to speak to beachgoers about turtle friendly lighting and why the restraining cages were being used in certain areas. While effective as a temporary mitigation action, hatchling-restraining cages are logistically difficult (time and labor) for program staff to ensure hatchlings are not restrained for too long. Considering these challenges, working towards rectifying the underlying lighting issues at the source is recommended as a long-term management solution in these areas.

Disorientation Reports

Disorientation reports provide a mechanism to document nests that experience adult or hatchling disorientation. Broward County has four organizations documenting these events each season: the BCSTCP, STOP, SFAS, and STARS. Having multiple groups recording disorientation events makes it difficult to ensure standardized methodology County-wide that would make disorientation reporting most effective as a management tool. However, all hatchling disorientation reports filed in Broward County this year were used to provide a more succinct and complete look at the impact of coastal lighting on hatchling sea turtles. These disorientation reports and monthly lighting reports show a negative correlation between sea turtle nesting activities and non-compliant anthropogenic lighting. The results of this comprehensive analysis are being used to target future outreach efforts.

Challenges Encountered

Both the nesting and hatching success of Broward County sea turtle nests were impacted by weather driven factors such as Tropical Depression #8, Hurricane Matthew, king tide events as well as extremely hot conditions later in the season. The Atlantic hurricane season was quite benign this year, however Tropical Depression #8 impacted Broward County August 28–September 1, 2016 and Hurricane Matthew impacted Broward County on October 6-9, 2016. Tropical Depression #8 travelled far offshore, however storm surge and wave action resulted in extensive washover and washout events of active sea turtle nests in Broward County. Since this storm formed during the middle of peak nesting season, it impacted a high number of nests. Hurricane Matthew skirted up the east coast of Florida barely offshore, bringing more storm surge and wave action than Tropical Depression #8. Fortunately, the proximity of Tropical Depression #8 and timing of Hurricane Matthew (late season) significantly reduced the potential extent of nest damage these storms were capable of delivering. Additionally, King Tide Event #9 (October 14-21, 2016) impacted Broward County beaches at the end of the season, which

brought high waters and heavy surf resulting in increased beach erosion, escarpment formation, and washout of some remaining nests.

A small degree of vandalism was observed throughout the season that resulted in damage to nest stakes as well as restraining cages. There were even fewer poaching attempts documented. Poaching attempts are considered an attempt to harm or harass sea turtles of any age range. Fortunately three of the four poaching attempts observed only minor digging within the nest perimeter. Once nest however was completely poached on the day of deposition. In all poaching attempts, FWC law enforcement was contacted for further investigation.

Conclusions and Recommendations

Management of endangered nesting sea turtles in Florida is a monumental task. The current “hands-off” approach being used by FWC is working very well to provide the highest nesting and hatching success for the beaches in Broward County. Hopefully as nest numbers continue to rise in this area, this approach will be even more effective and provide less overall impact on the local nesting female population and hatchlings.

The restraining cages currently being used in some zones in Broward County provide a good short-term management strategy for addressing areas of high concern with regard to artificial lighting and light fixtures. These areas experience high rates of hatchling disorientation and the cages help mitigate the negative impacts by allowing sea turtle professionals to ensure the hatchlings are able to safely enter the water; however this is not a feasible long-term solution to these issues. Continued efforts working with code enforcement in each municipality to generate targeted education and enforcement efforts with regard to turtle friendly lighting should be of the utmost priority.

The extreme tide and weather events (storm, drought) that occurred during the 2016 season may have resulted in a slightly lower overall productivity for the season; however, the high rate of nesting activity in Broward County and across Florida this year indicates that local sea turtle populations are continuing their overall positive trend, leaving local scientists cautiously optimistic about the status of the nesting turtle populations in Broward County.

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TABLES & FIGURES

Table 1: Summary of the sea turtle nesting beach survey zones in Broward County, Florida, USA.

BEACH	BEACH LENGTH (miles)	BOUNDARIES	FDEP SURVEY MARKER #
Hillsboro-Deerfield	4.3	Palm Beach Co. line to Hillsboro Inlet	R1-24
Pompano Beach including Lauderdale-By- The-Sea	4.8	Hillsboro Inlet to Commercial Blvd.	R25-50
Fort Lauderdale	6.6	Commercial Blvd. to Port Everglades Inlet	R51-85
Von D. Mizell-Eula Johnson State Park	2.4	Port Everglades Inlet to Dania Beach fence	R86-96
Hollywood-Hallandale including Dania	5.8	Dania Beach fence to Miami Dade Co. line	R97-128

Table 2: Summary of treatment zones by R-monument.

Zone	Donor	<i>In Situ & Recipient</i>	<i>In Situ Only</i>	Restraining Cage
Description	All nests were relocated from this area to the nearest "recipient" zones.	All nests left in place; nests from "donor" zones may be relocated to this area. Cages should not be used.	All nests left in place; nests from "donor" zones may not be relocated in these zones; restraining cages may be used with approval by FWC.	All nests left in place; a restraining cage was installed on every other nest.
R-Monuments	R24 - Hillsboro Inlet R85 - Port Everglades	R6-R24 R26-R34 R39-R50 R51-R53 R58-R64 R80-R84 R102-R107 R124-R128	R1-R6 R25-R26 R34-R39 R50-R51 R53-R58 R64-R74 *R75-R77 R78-R80 R84-R84.7 R97.5-R102 *R107-R124	*R74-R78 *R107-R124

* All restraining cage zones are *in situ only*

Table 3: A summary of the total nests, false crawls (FC) and nesting success (NS) by species and beach.

Beach	Leatherback			Loggerhead			Green		
	<i>Nests</i>	<i>FC</i>	<i>NS</i>	<i>Nests</i>	<i>FC</i>	<i>NS</i>	<i>Nests</i>	<i>FC</i>	<i>NS</i>
Hillsboro	9	3	75.00%	1040	1131	47.90%	72	60	54.55%
Pompano	12	1	92.31%	721	823	46.70%	6	16	27.27%
Ft Lauderdale	3	0	100.00%	1180	1537	43.43%	47	61	43.52%
Mizell-Eula	1	1	50.00%	267	677	28.28%	11	22	33.33%
Hollywood	2	0	100.00%	192	269	41.65%	1	2	33.33%
OVERALL	27	5	84.38%	3400	4437	43.38%	137	161	45.97%

Table 4: A summary of the total nests laid and nesting densities by species and beach.

Beach	Leatherback			Loggerhead			Green		
	<i>Total Nests</i>	<i>Beach Length (mi)</i>	<i>Density (nests per mile)</i>	<i>Total Nests</i>	<i>Beach Length (mi)</i>	<i>Density (nests per mile)</i>	<i>Total Nests</i>	<i>Beach Length (mi)</i>	<i>Density (nests per mile)</i>
Hillsboro	9	4.3	2.09	1040	4.3	241.86	72	4.3	16.74
Pompano	12	4.8	2.5	721	4.8	150.21	6	4.8	1.25
Ft Lauderdale	3	6.6	0.45	1180	6.6	178.79	47	6.6	7.12
Mizell-Eula	1	2.4	0.42	267	2.4	111.25	11	2.4	4.58
Hollywood	2	5.8	0.34	192	5.8	33.1	1	5.8	0.17
OVERALL	27	23.9	1.13	3400	23.9	142.26	137	23.9	5.73

Table 5: Emergence success for all species by nest treatment.

	Evaluated Nests	Unevaluated Nests	# Eggs	Hatchlings Released	Emergence Success (%)
<i>In situ</i>					
Leatherback	16	10	1283	786	60.84
Loggerhead	2109	932	214386	125849	57.29
Green	66	58	7416	5744	75.83
Total	2191	1000	223085	132379	57.90
Relocated					
Loggerhead	81	11	8606	4174	44.36
Green	2	0	189	63	6.31
Total	83	11	8795	4237	43.45
Restraining Cage					
Loggerhead	75	7	7802	2554	48.11
Total	75	7	7802	2554	48.11

Table 6: Excavation information for all evaluated loggerhead nests. See text for details.

	Evaluated Nests	Total Eggs	Emerged (%)	LIN (%)	DIN (%)	LPIP (%)	DPIP (%)	VD (%)	NVD (%)
<i>In situ</i>									
Hillsboro Beach	545	52759	48.73	2.48	1.70	0.36	7.61	31.04	10.87
Pompano Beach	508	51460	58.40	2.33	1.92	0.32	6.36	22.71	8.95
Ft Lauderdale Beach	905	94800	62.94	1.91	1.59	0.21	4.67	18.56	10.72
Hollywood Beach	151	15367	50.61	2.51	1.60	0.77	6.61	25.22	13.89
Total	2109	214386	57.29	2.19	1.70	0.31	5.94	23.10	10.56
Relocated									
Hillsboro Beach	15	2126	30.55	6.40	1.98	2.49	6.87	18.86	7.38
Pompano Beach	28	2804	36.79	8.10	3.14	1.21	14.98	20.76	14.91
Ft Lauderdale Beach	37	1668	54.74	12.35	3.42	8.87	11.21	25.12	32.07
Hollywood Beach	1	151	79.59	0.00	0.00	0.00	0.00	2.65	3.97
Total	81	6749	44.36	8.43	2.77	3.48	11.16	20.83	16.54
Caged									
Ft Lauderdale Beach	39	4247	44.90	4.87	2.12	1.11	8.83	25.85	13.42
Hollywood Beach	36	3555	51.60	4.33	1.43	1.74	8.58	18.93	14.21
Total	75	7802	54.47	4.63	1.81	1.40	8.72	22.70	13.78

Table 7: Excavation information for all evaluated green turtle nests. See text for details.

	Evaluated Nests	Total Eggs	Emerged (%)	LIN (%)	DIN (%)	Live Pip (%)	Dead Pip (%)	VD (%)	NVD (%)
<i>In situ</i>									
Hillsboro Beach	25	2580	70.49	1.09	0.85	0.16	1.67	16.01	9.73
Pompano Beach	5	649	65.45	0.77	0.92	0.00	6.32	20.18	6.16
Ft Lauderdale Beach	35	4099	80.82	1.24	0.85	0.44	1.61	7.76	7.17
Hollywood Beach	1	88	86.36	0.00	0.00	0.00	0.00	4.55	9.09
Total	66	7416	75.83	1.13	0.85	0.30	2.02	11.68	8.00
<i>Relocated</i>									
Hillsboro Beach	2	189	6.31	5.29	3.17	5.82	10.58	39.15	13.76
Total	2	189	6.31	5.29	3.17	5.82	10.58	39.15	13.76

Table 8: Excavation information for all evaluated leatherback nests. See text for details.

	Evaluated Nests	Total Eggs	Emerged (%)	LIN (%)	DIN (%)	Live Pip (%)	Dead Pip (%)	VD (%)	NVD (%)
<i>In situ</i>									
Hillsboro Beach	5	364	49.23	0.82	5.22	0.00	4.40	15.93	28.02
Pompano Beach	8	690	62.56	2.61	8.12	0.00	2.75	9.13	16.38
Ft Lauderdale Beach	2	143	68.61	0.70	0.00	0.00	0.70	10.49	18.18
Hollywood Beach	1	86	89.53	0.00	0.00	0.00	0.00	1.16	9.30
Total	16	1283	60.84	1.71	5.85	0.00	2.81	10.68	19.41

Table 9: A summary of the total crawls and nesting success by species in relation to County-sponsored beach renourishment projects.

	Leatherback			Loggerhead			Green		
	<i>Nests</i>	<i>FC</i>	<i>NS</i>	<i>Nests</i>	<i>FC</i>	<i>NS</i>	<i>Nests</i>	<i>FC</i>	<i>NS</i>
Deerfield	1	0	100%	34	49	59.50%	0	0	NA
Hillsboro Inlet Bypass	0	0	NA	13	19	67.80%	0	1	0%
FCCE	12	0	100%	687	787	46.61%	4	14	22.22%
Segment II	2	1	66.67%	773	967	48.48%	23	15	11.76%
OVERALL	15	1	93.75%	1673	1822	47.87%	14	30	31.82%

Table 10: Reproductive success of loggerhead, green and leatherback turtles in relation to beach renourishment projects.

	Evaluated Nests	Unevaluated Nests	# Eggs	Hatchlings Released	Emerged (%)
Deerfield					
Leatherback	1	0	81	4	3.70
Loggerhead	30	4	2428	1321	55.97
Hillsboro Inlet					
Loggerhead	12	1	1318	677	41.58
FCCE					
Leatherback	8	4	690	439	62.56
Loggerhead	508	179	51478	30623	57.67
Green	3	1	404	199	46.44
Segment II					
Leatherback	1	1	104	96	91.35
Loggerhead	608	165	63265	48356	74.91
Green	16	7	1790	1457	81.21

Table 11: A summary of the hatchling disorientation (DIS) reports by municipality as reported by BCSTCP, STOP, SFAS, and STARS.

	Hatch DIS	Hatch Total	% Hatch DIS
Hallandale	3	19	15.79%
Hollywood	45	117	38.46%
Dania	0	13	0.00%
Fort Lauderdale	598	945	63.28%
Lauderdale-By-The-Sea	169	296	57.09%
Sea Ranch Lakes	7	13	53.85%
Pompano	160	277	57.76%
Hillsboro	31	520	5.96%
Deerfield	10	47	21.28%
County Total (excluding Mizell-Eula State Park)	1023	2247	45.53%

Figure 1: Location of Broward County, FL USA

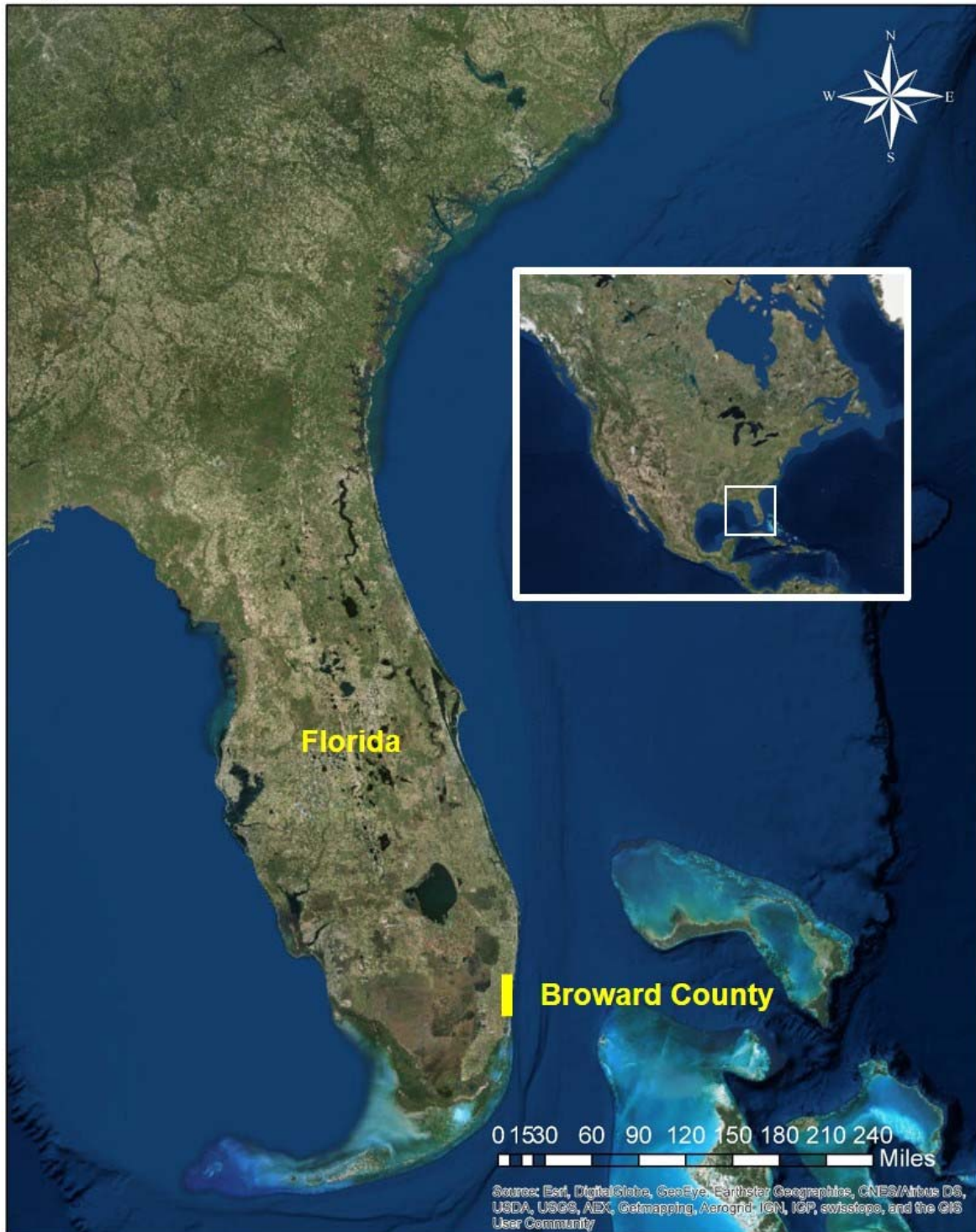


Figure 2: Boundaries of 2016 Sea Turtle Survey Zones

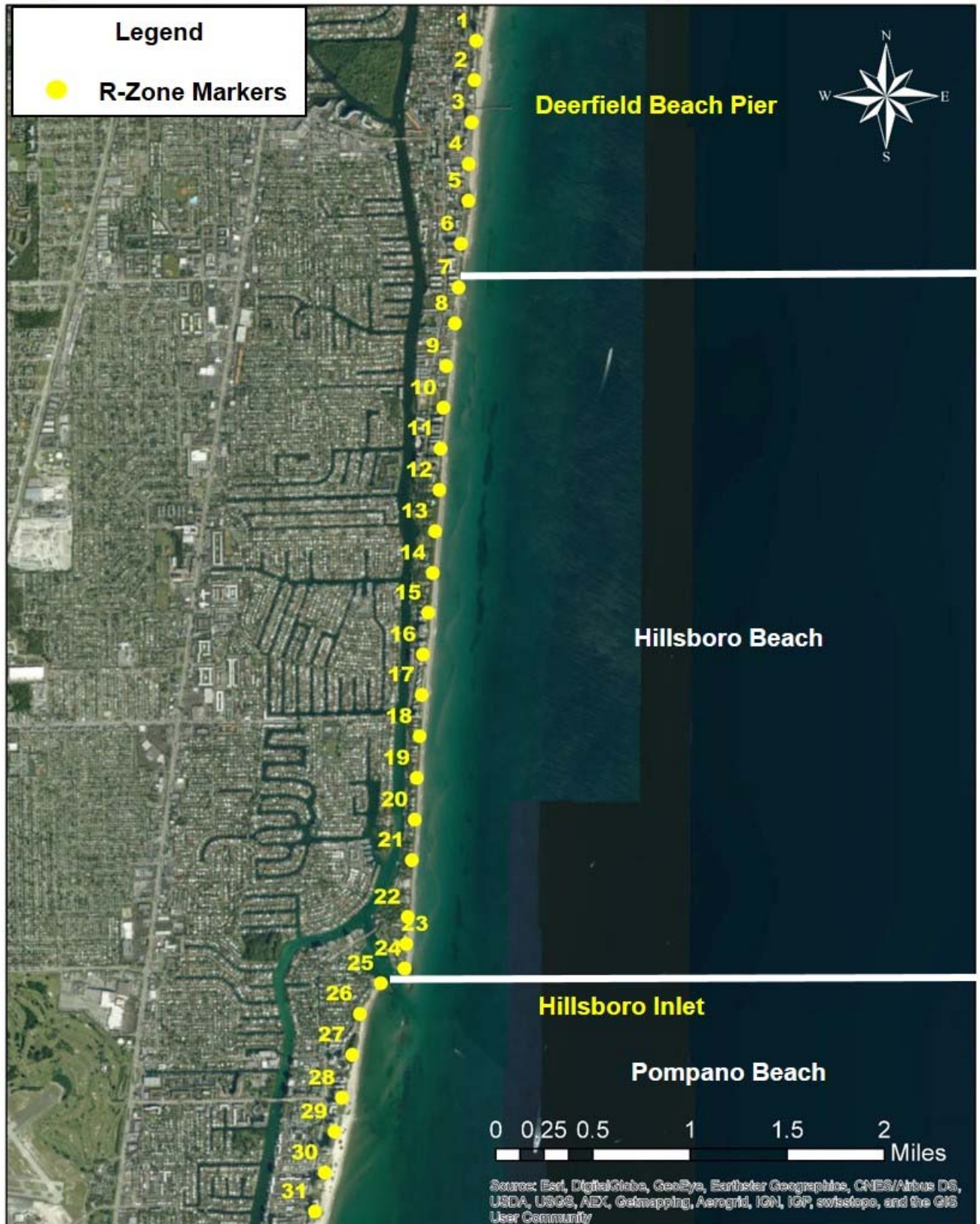


Figure 2: Boundaries of 2016 Sea Turtle Survey Zones

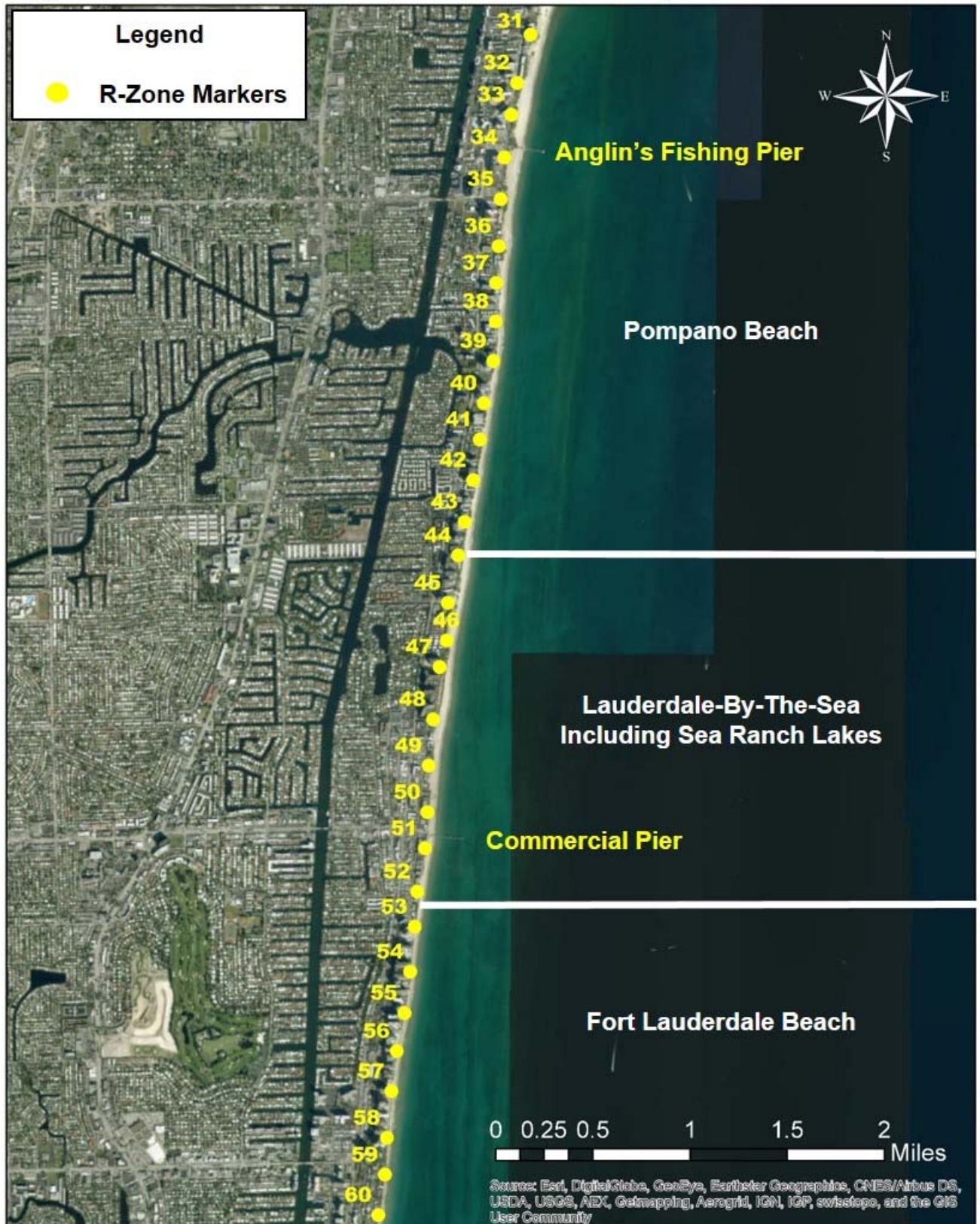


Figure 2: Boundaries of 2016 Sea Turtle Survey Zones

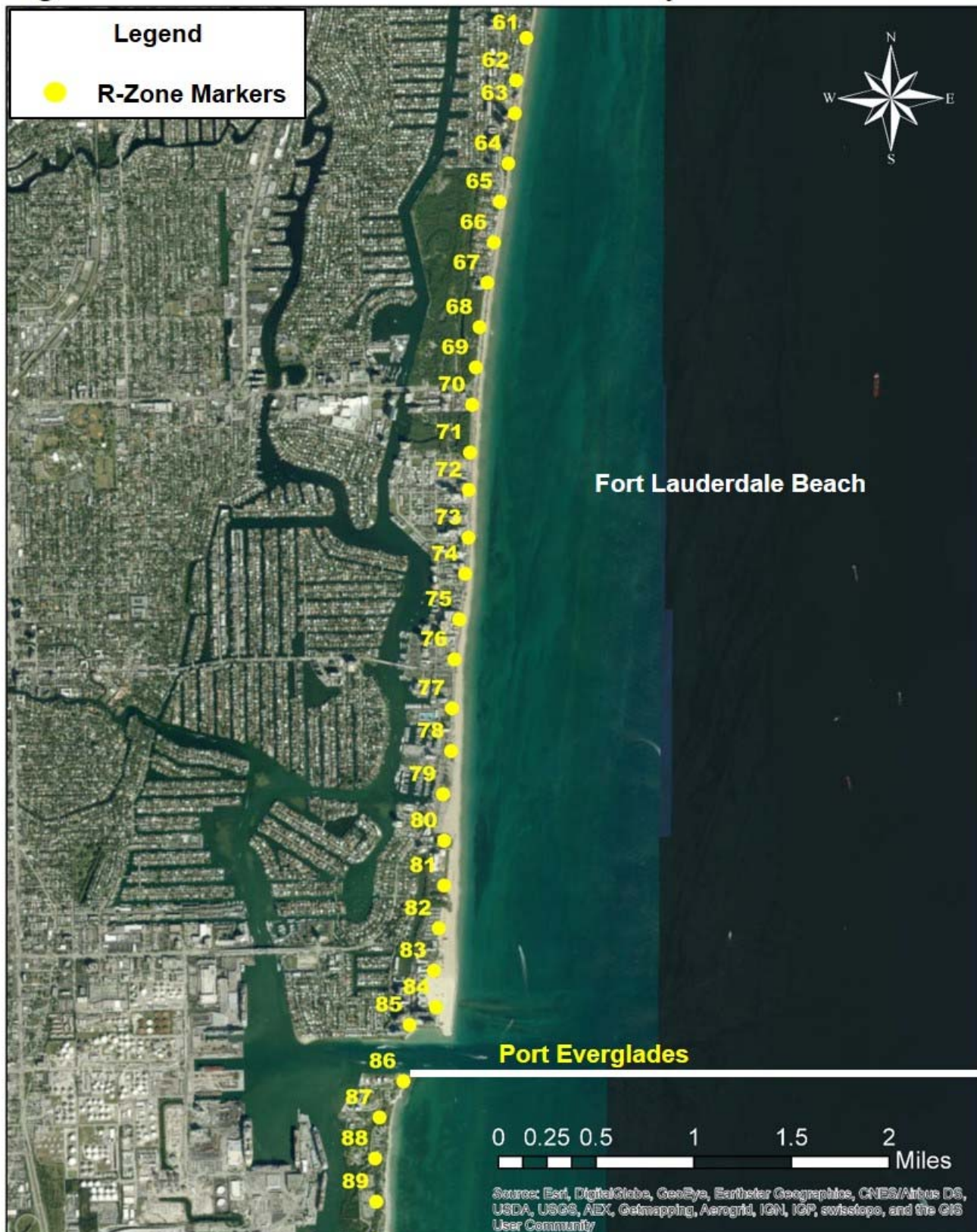


Figure 2: Boundaries of 2016 Sea Turtle Survey Zones

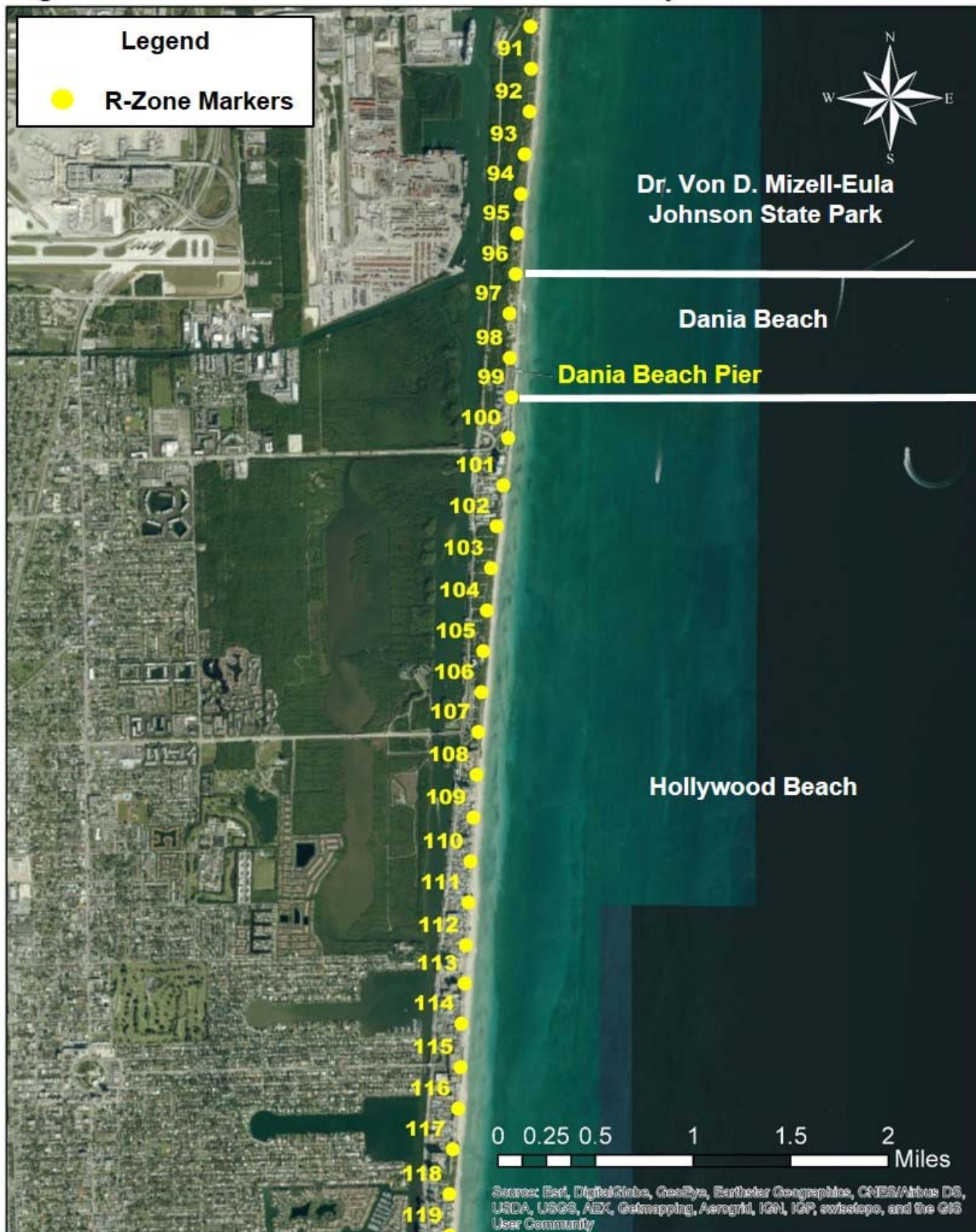


Figure 2: Boundaries of 2016 Sea Turtle Survey Zones

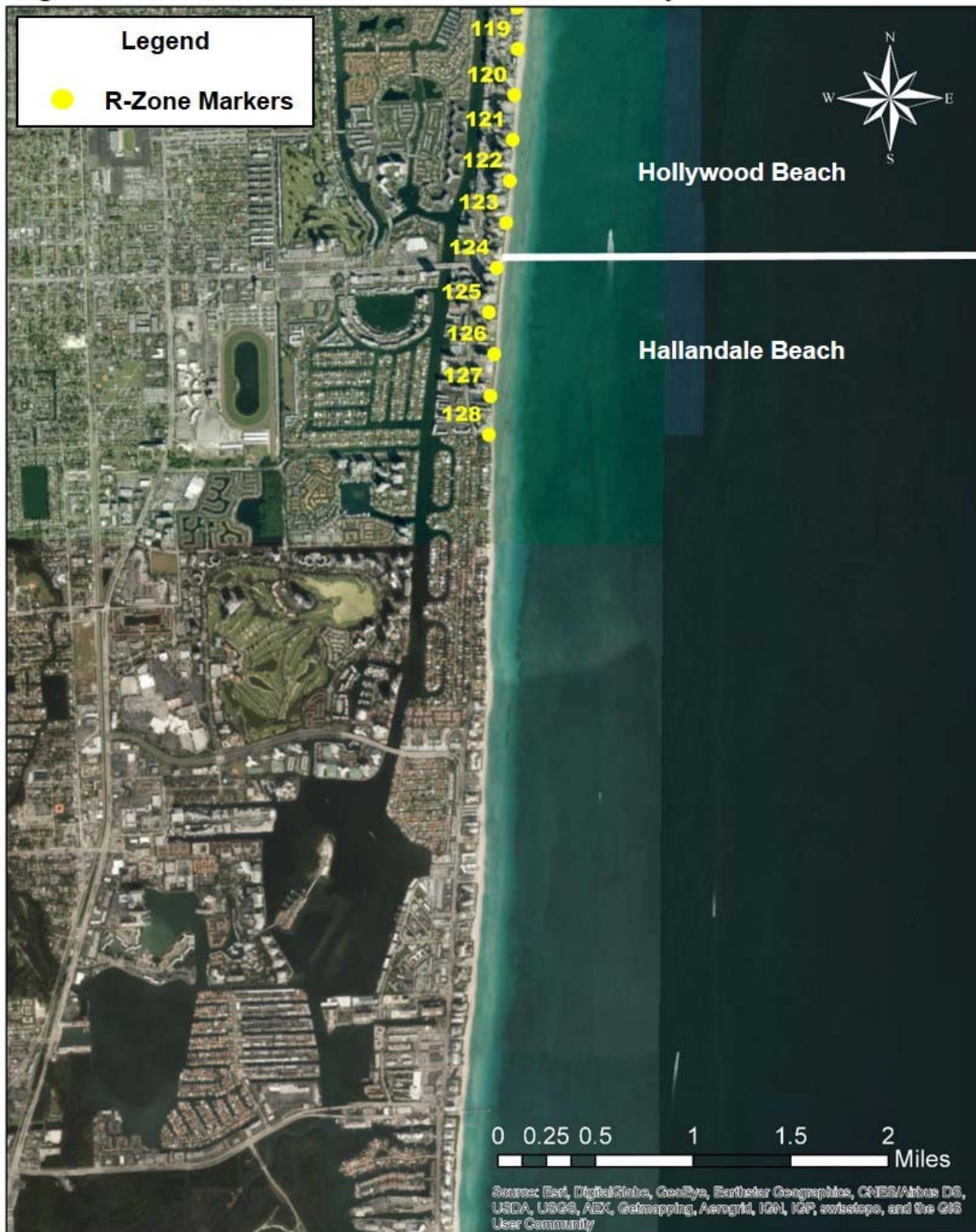


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

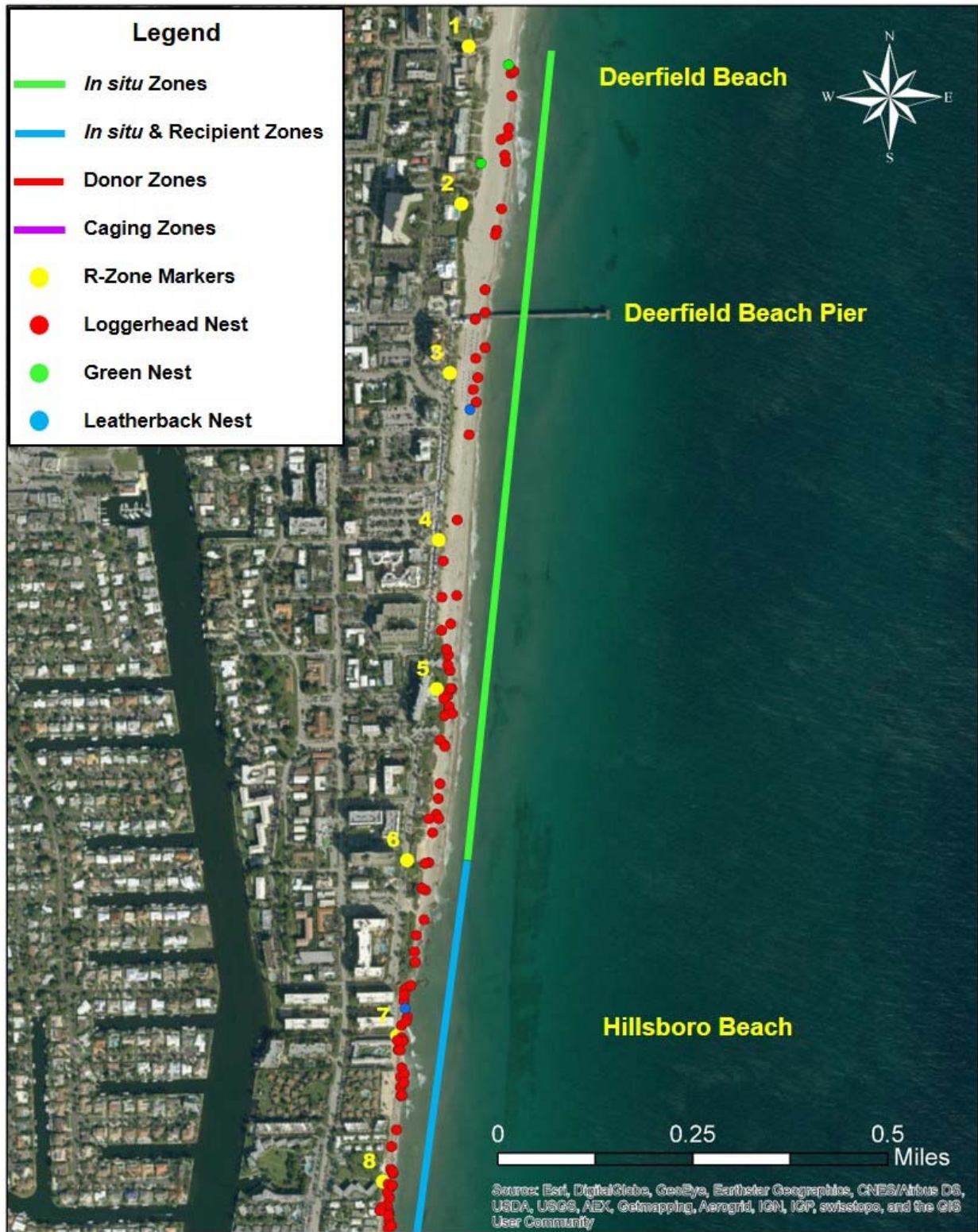


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

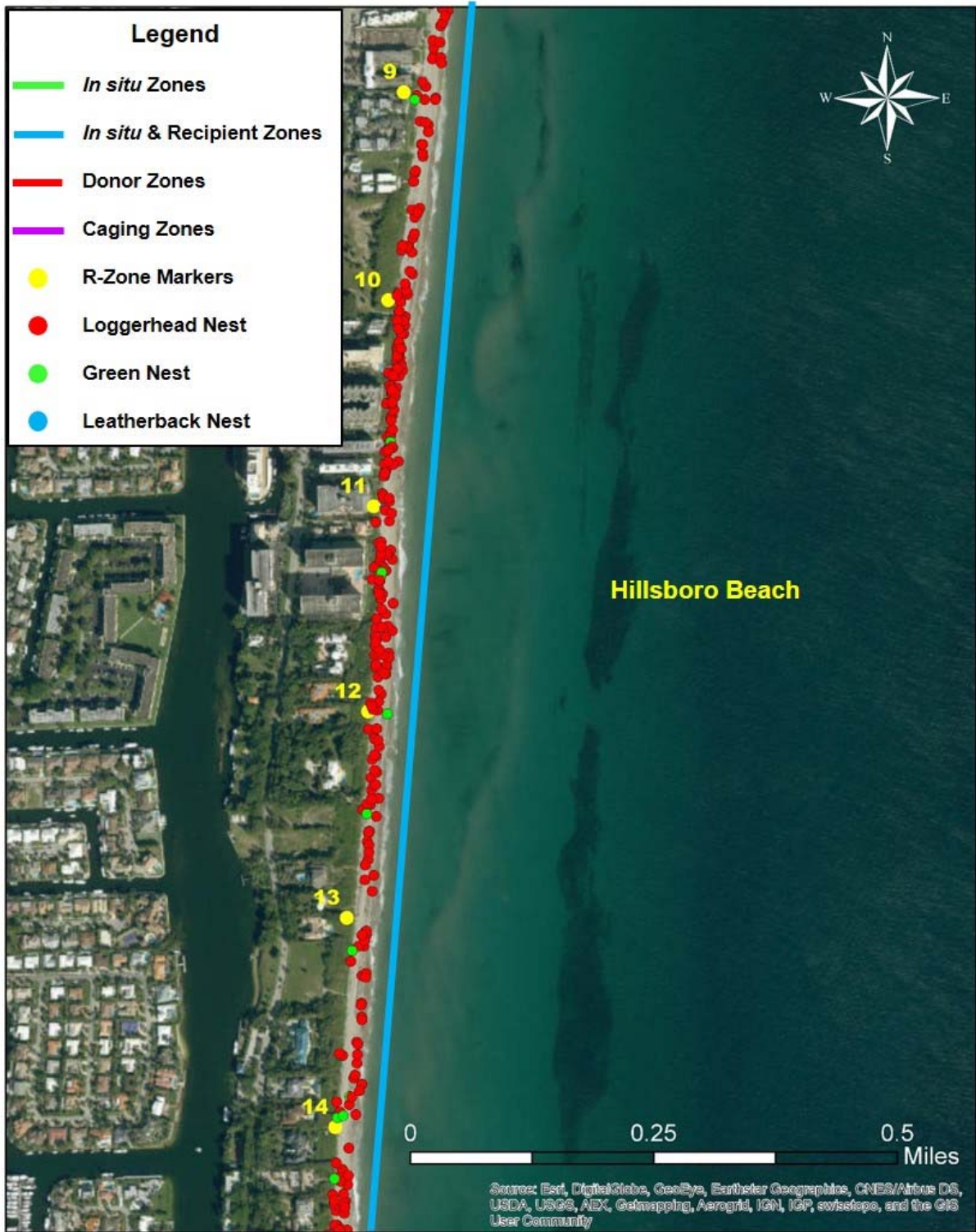


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones



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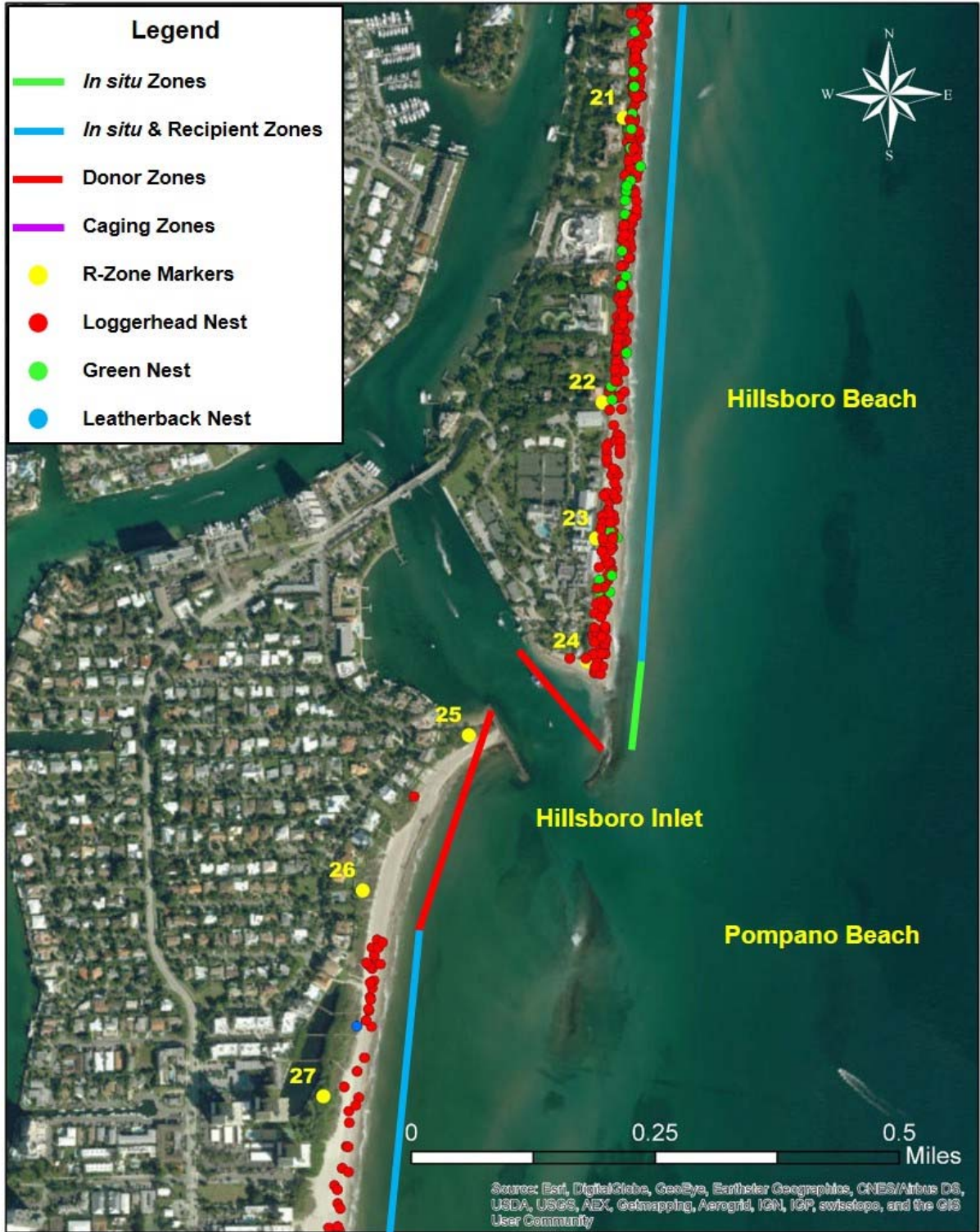


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

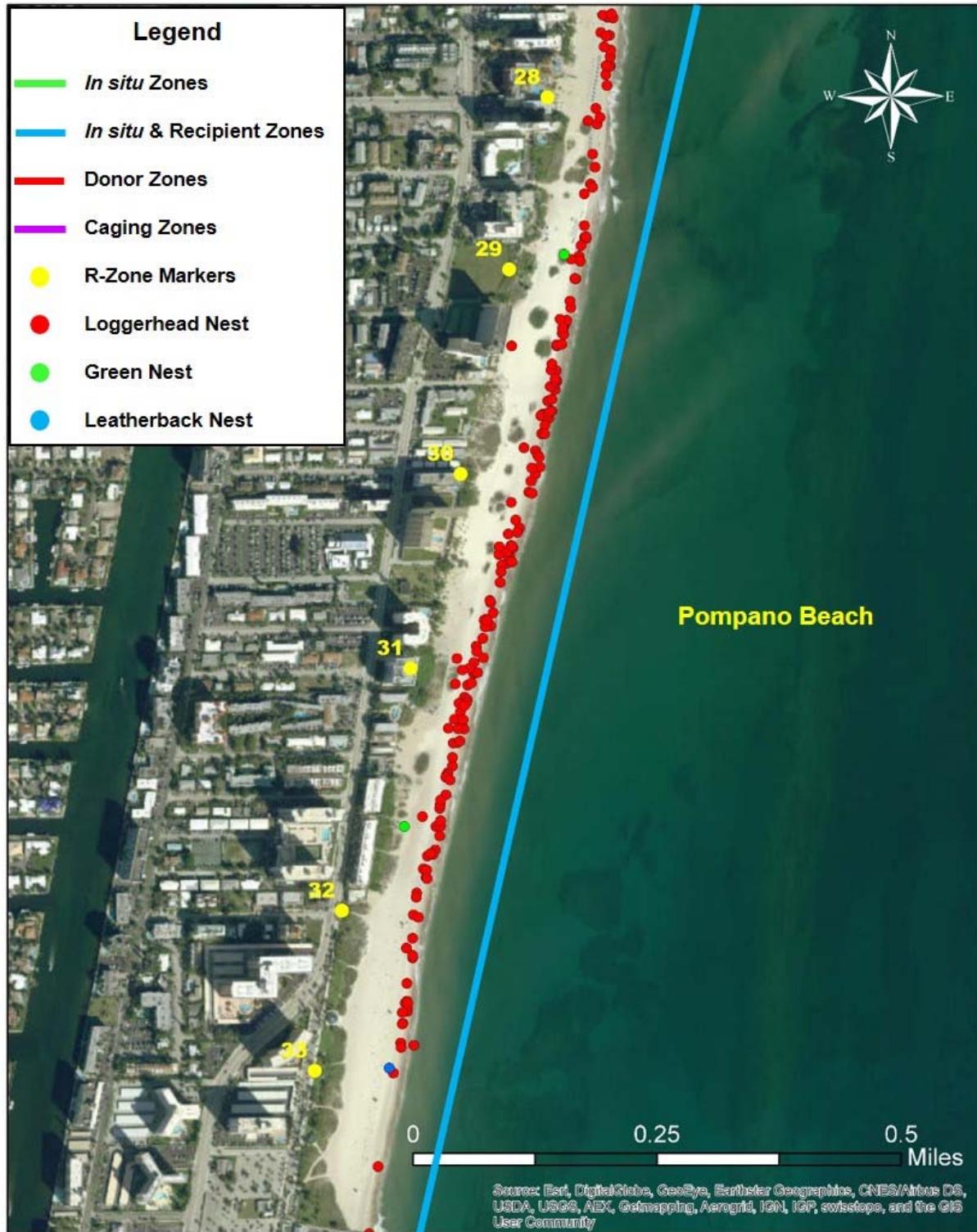


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

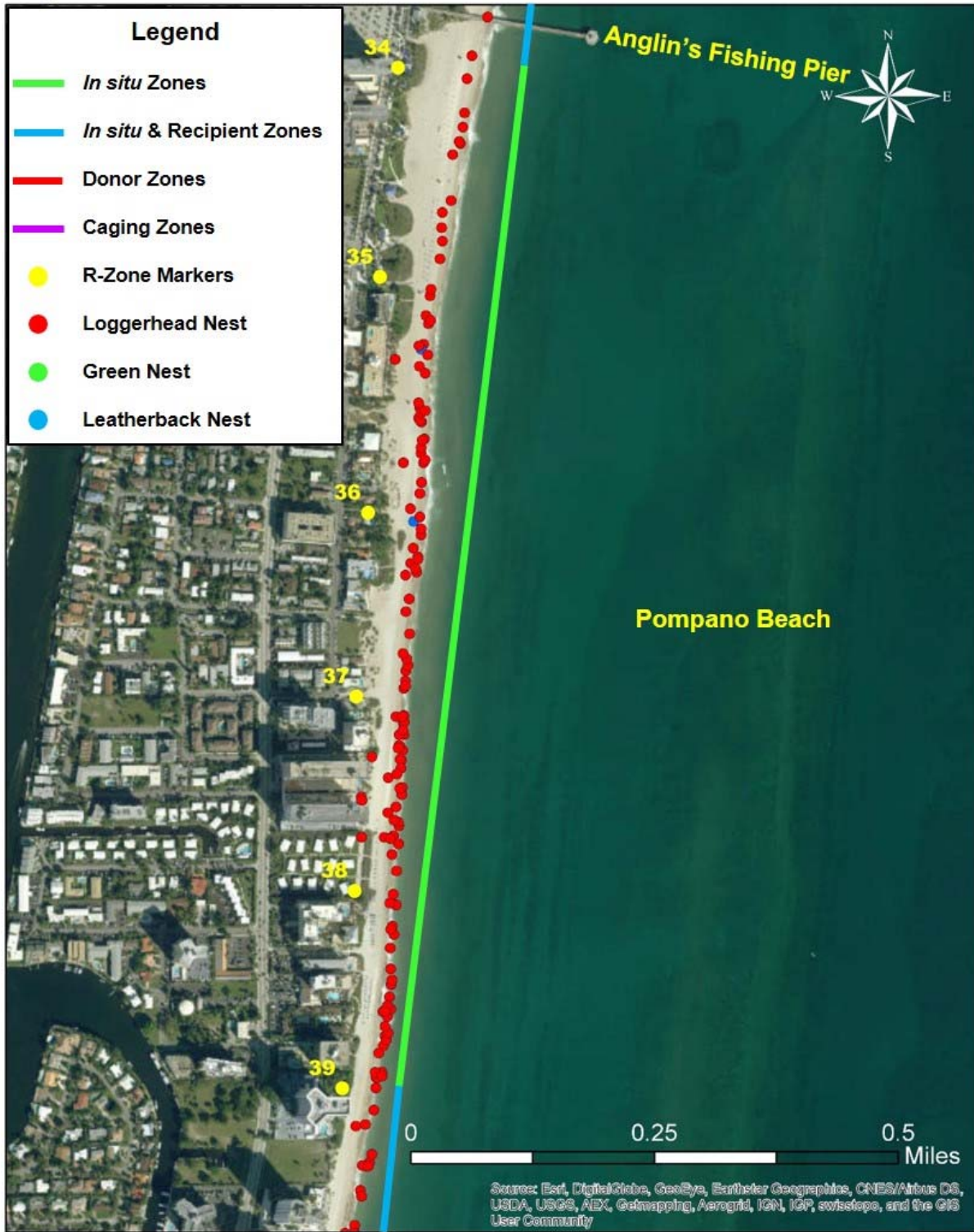


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones



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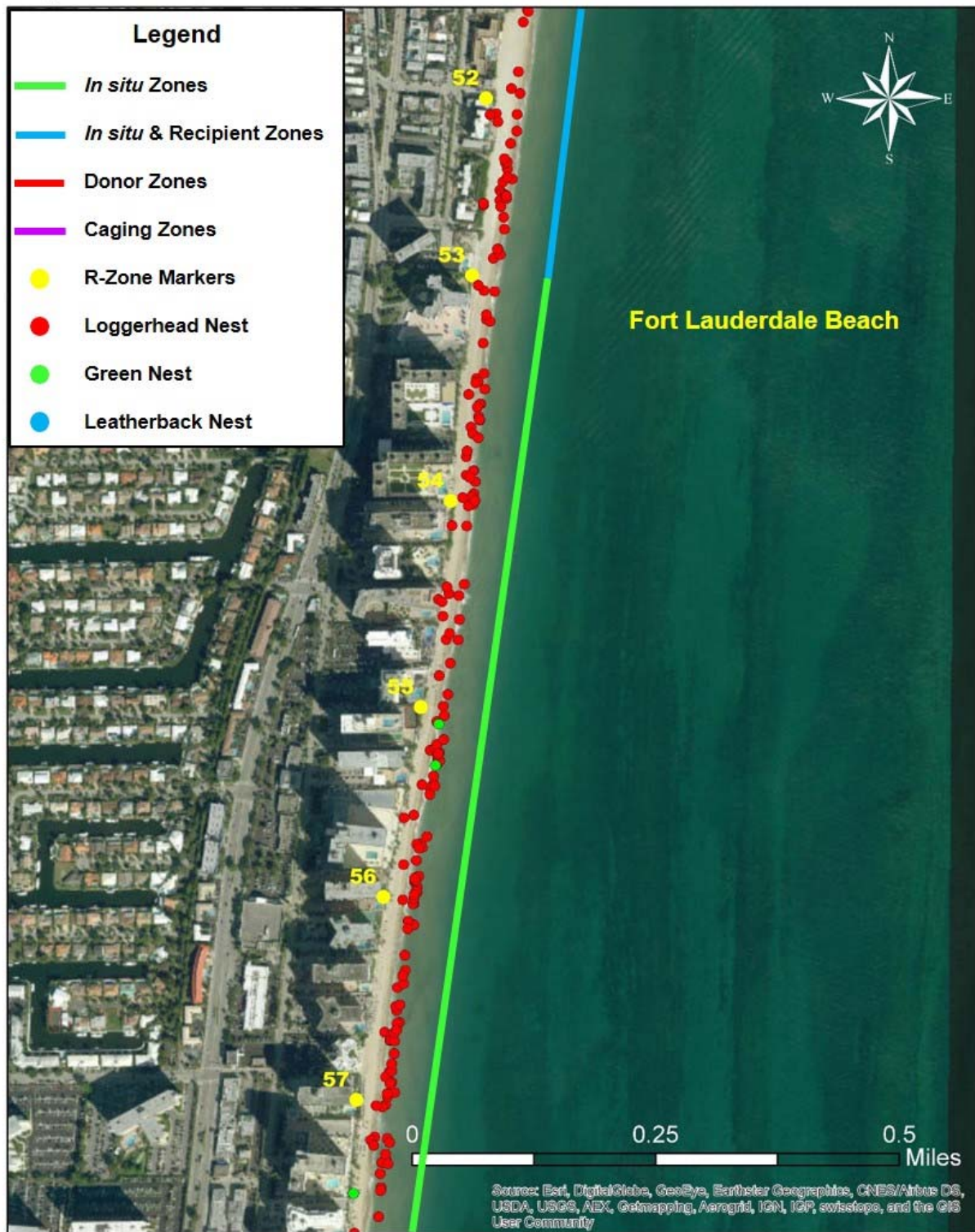


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

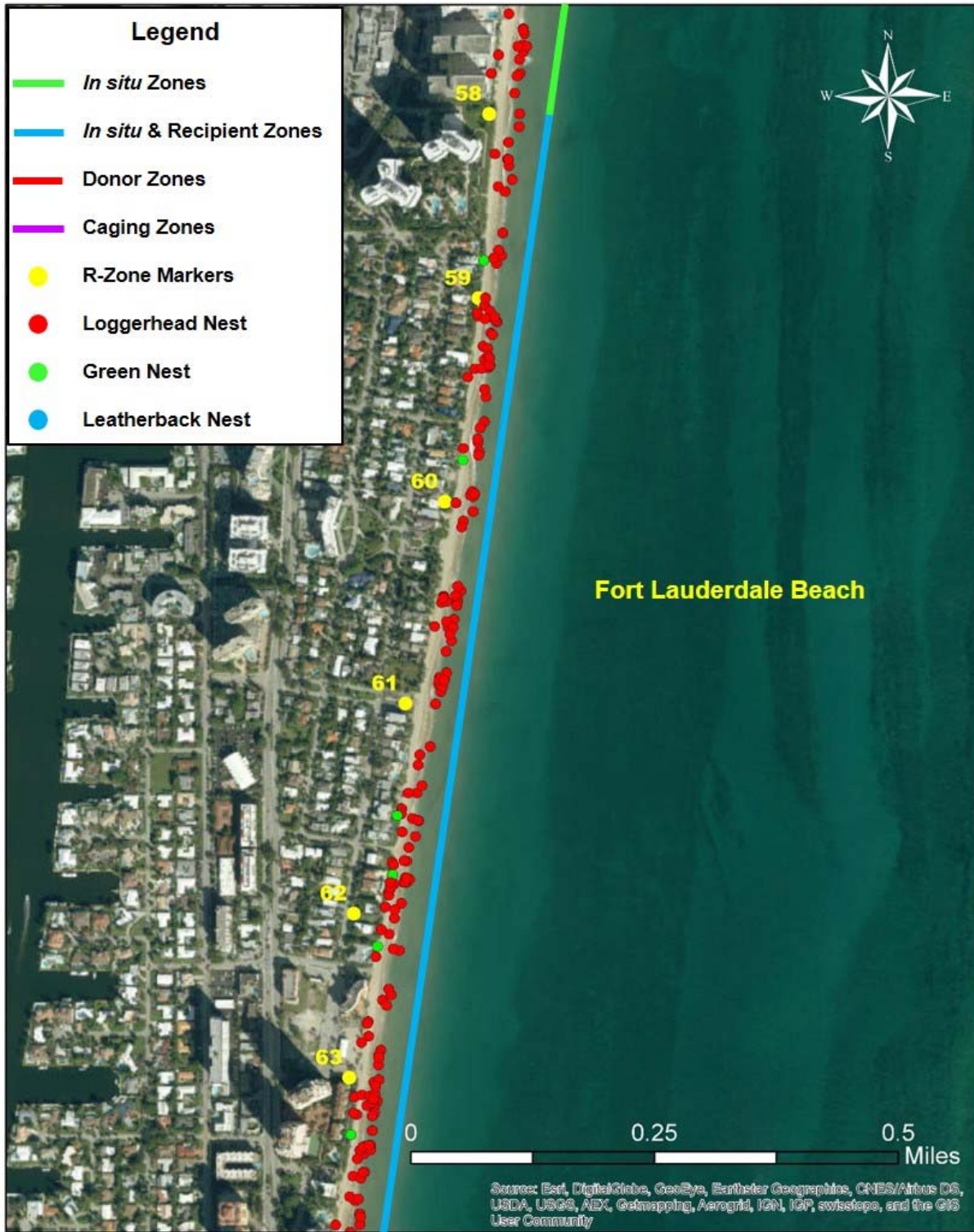


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

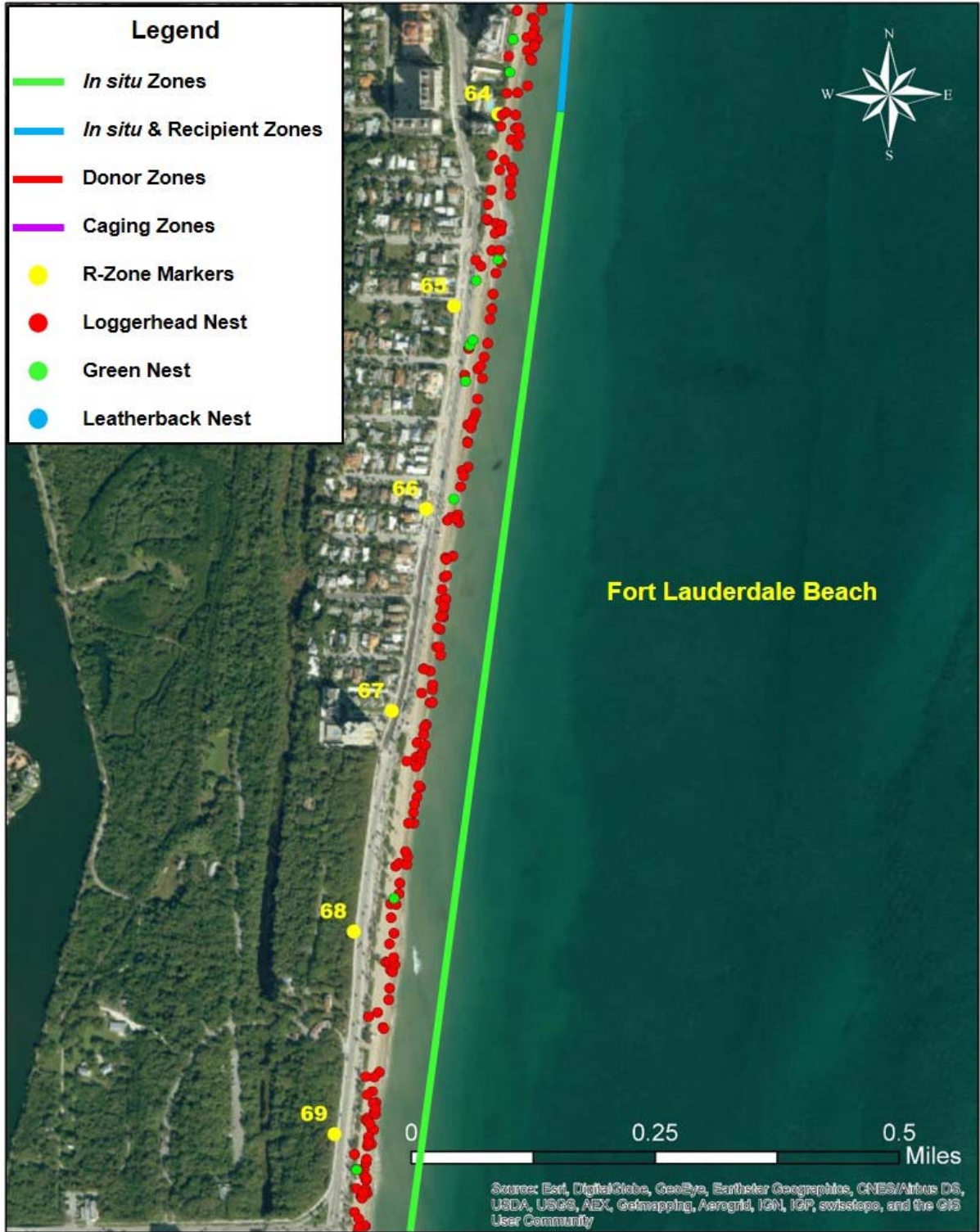


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

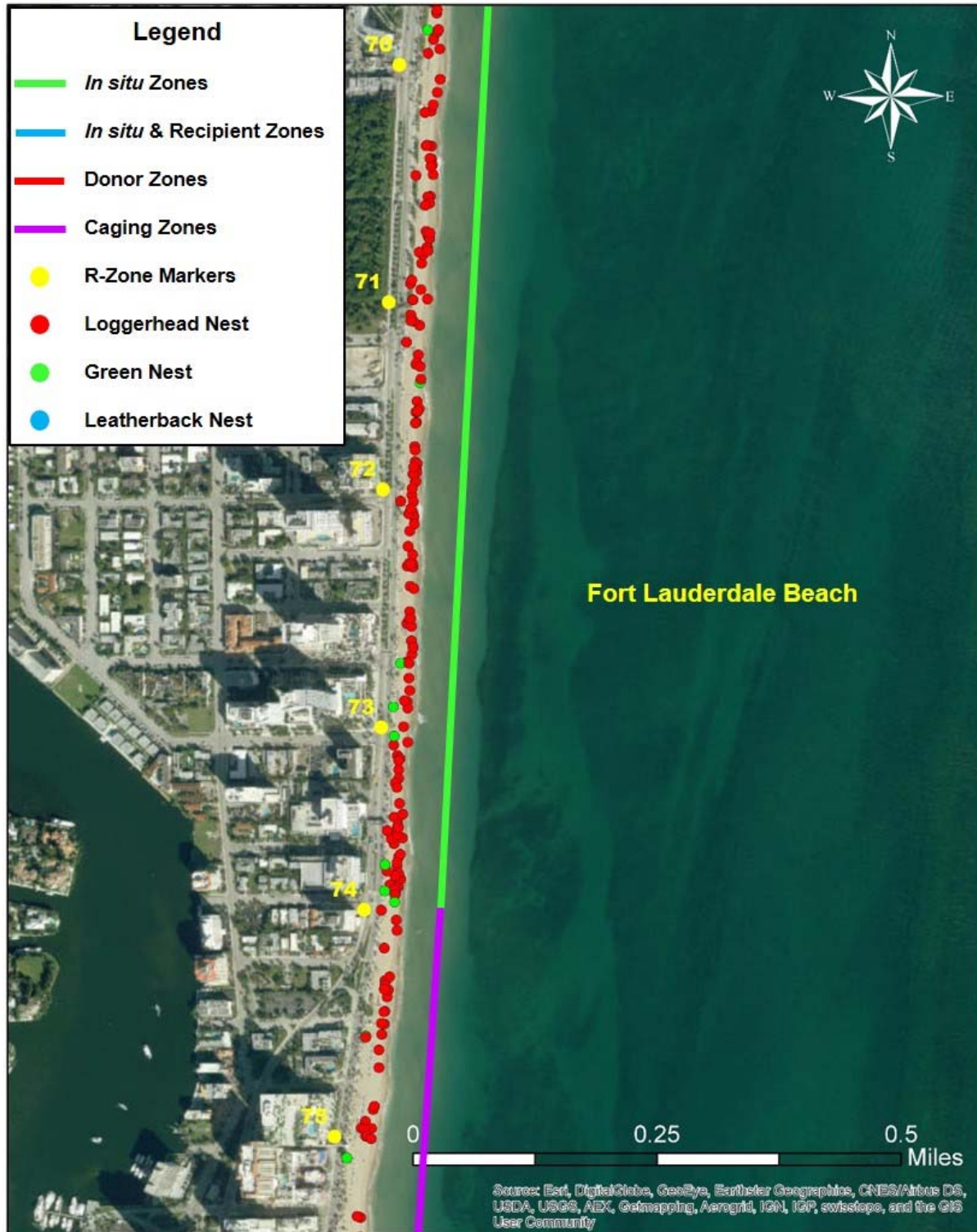


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

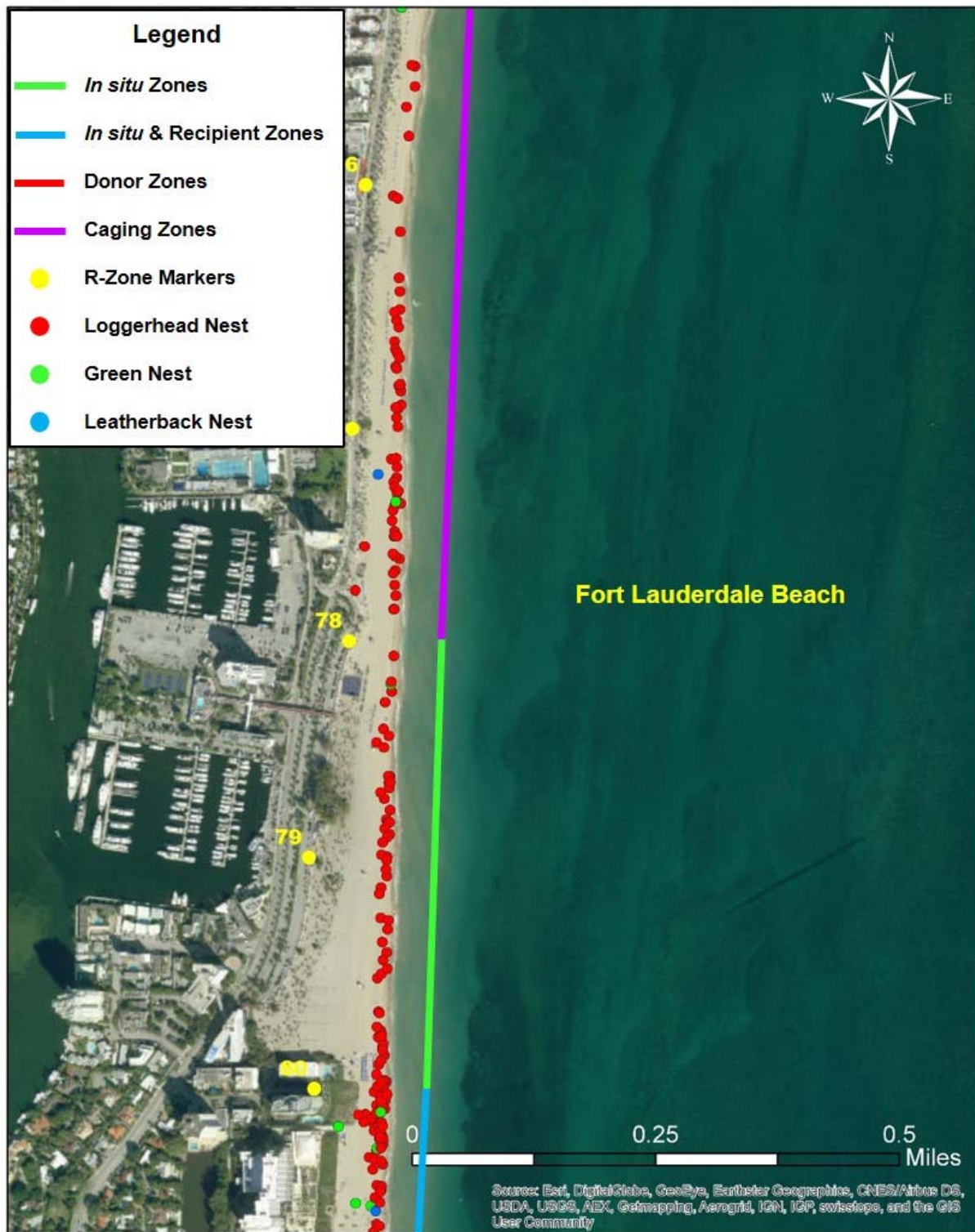


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones



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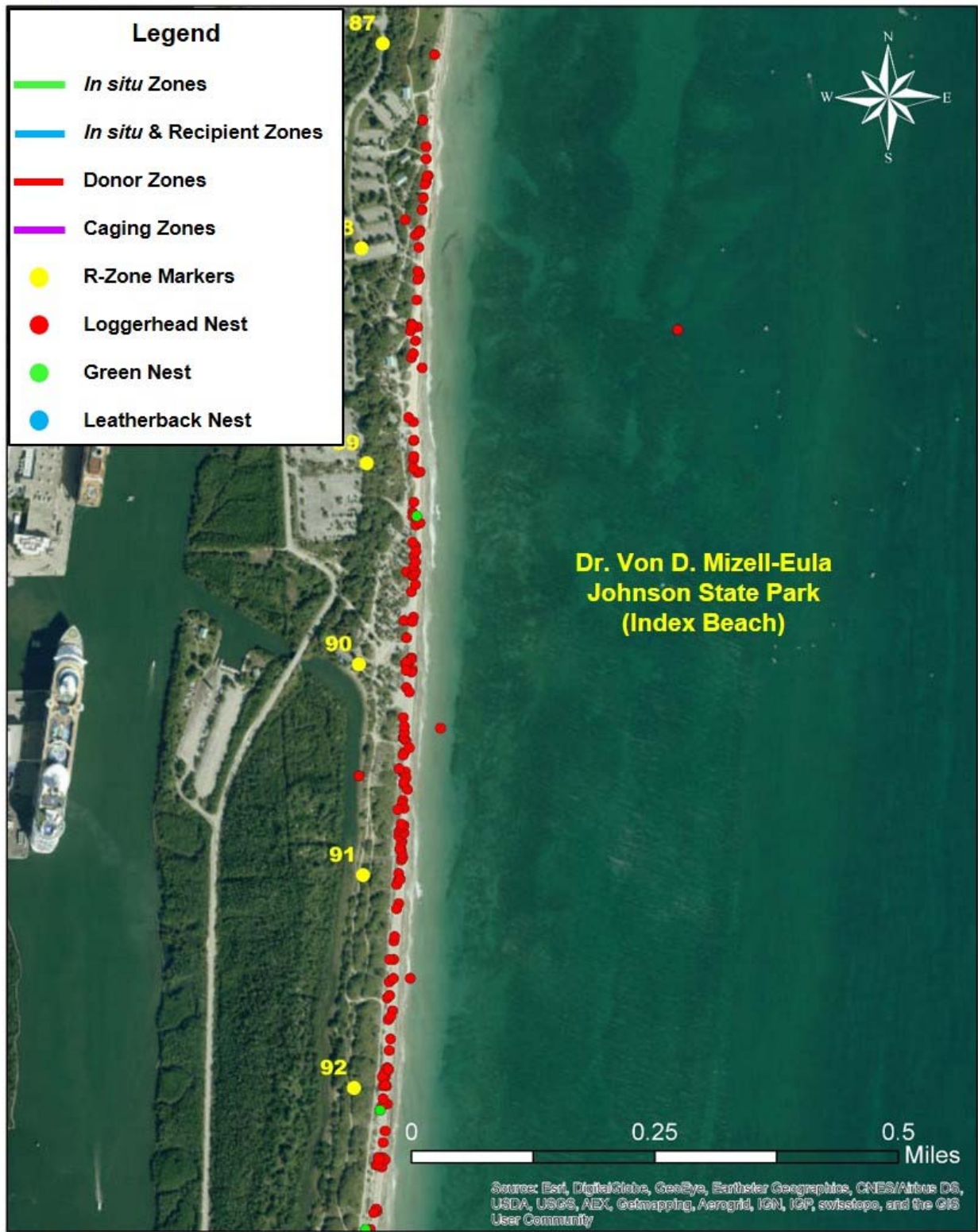


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

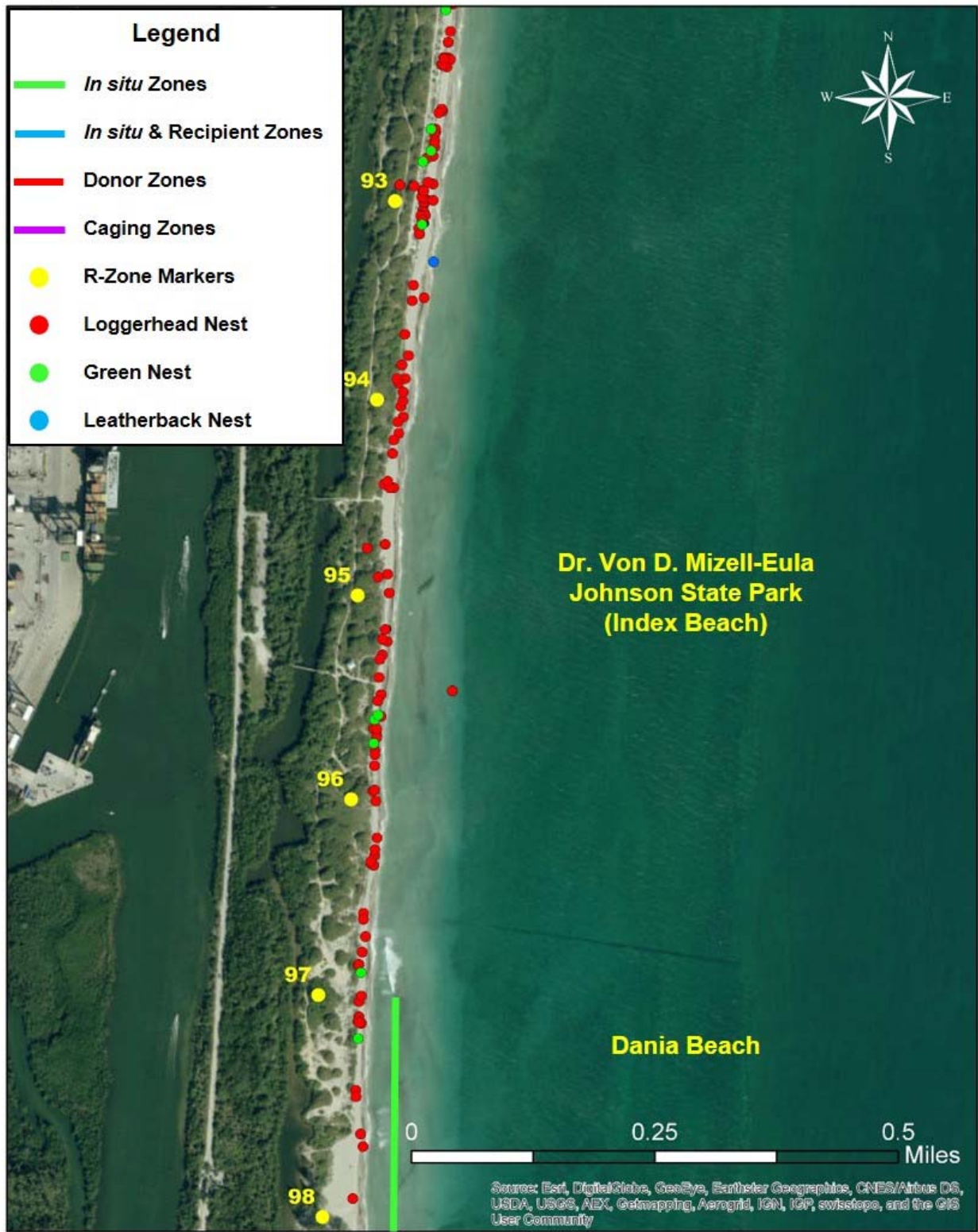


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

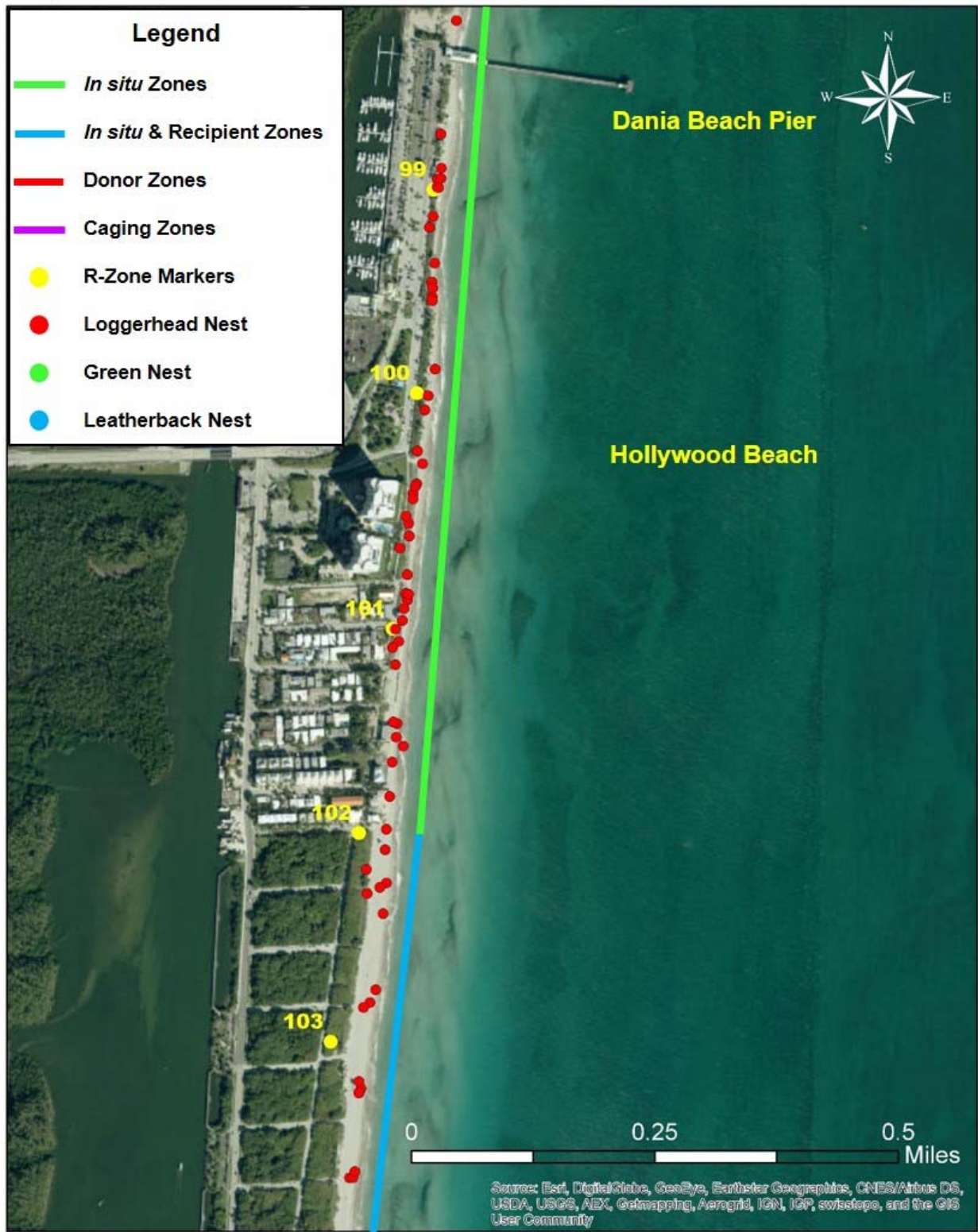


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

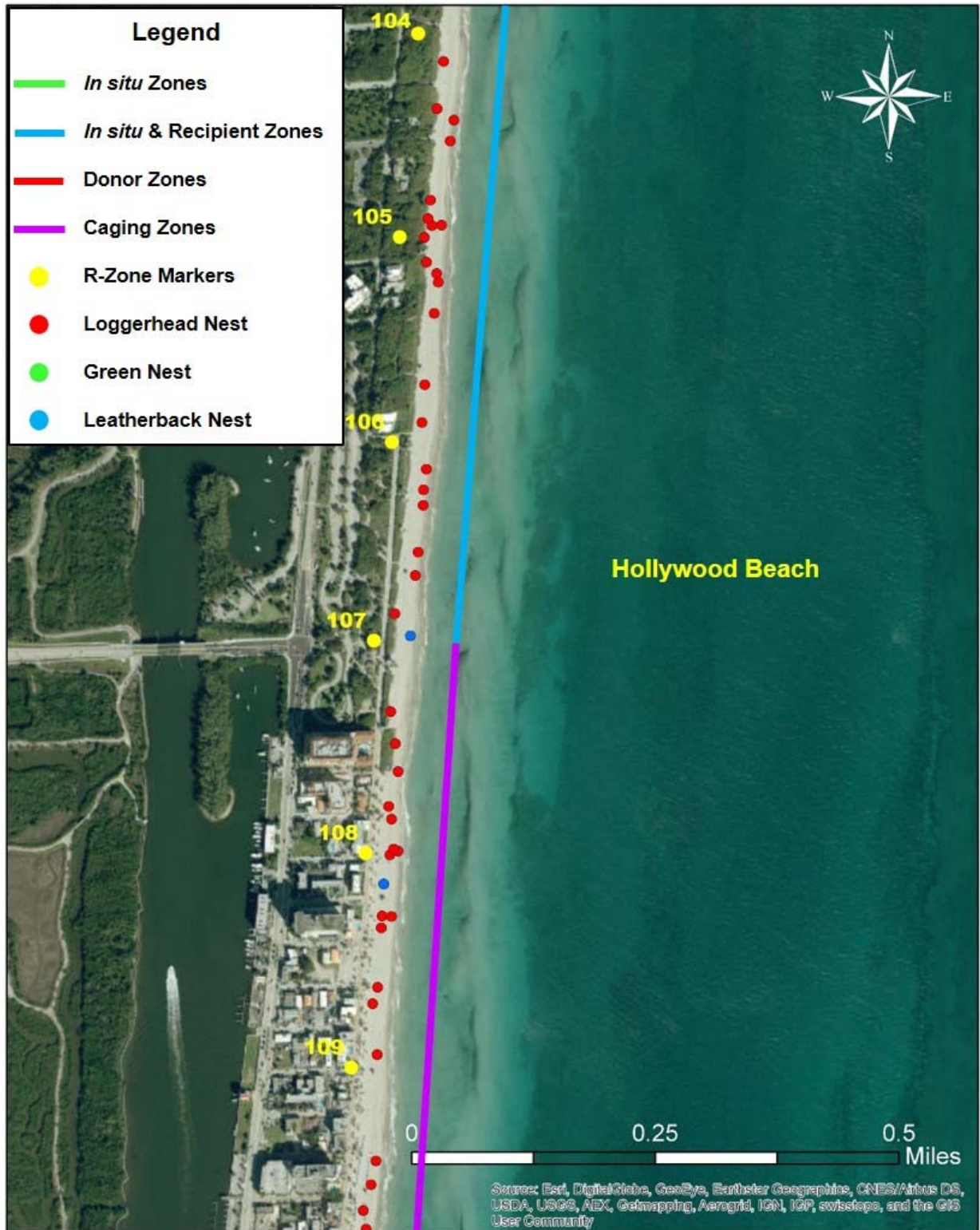


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

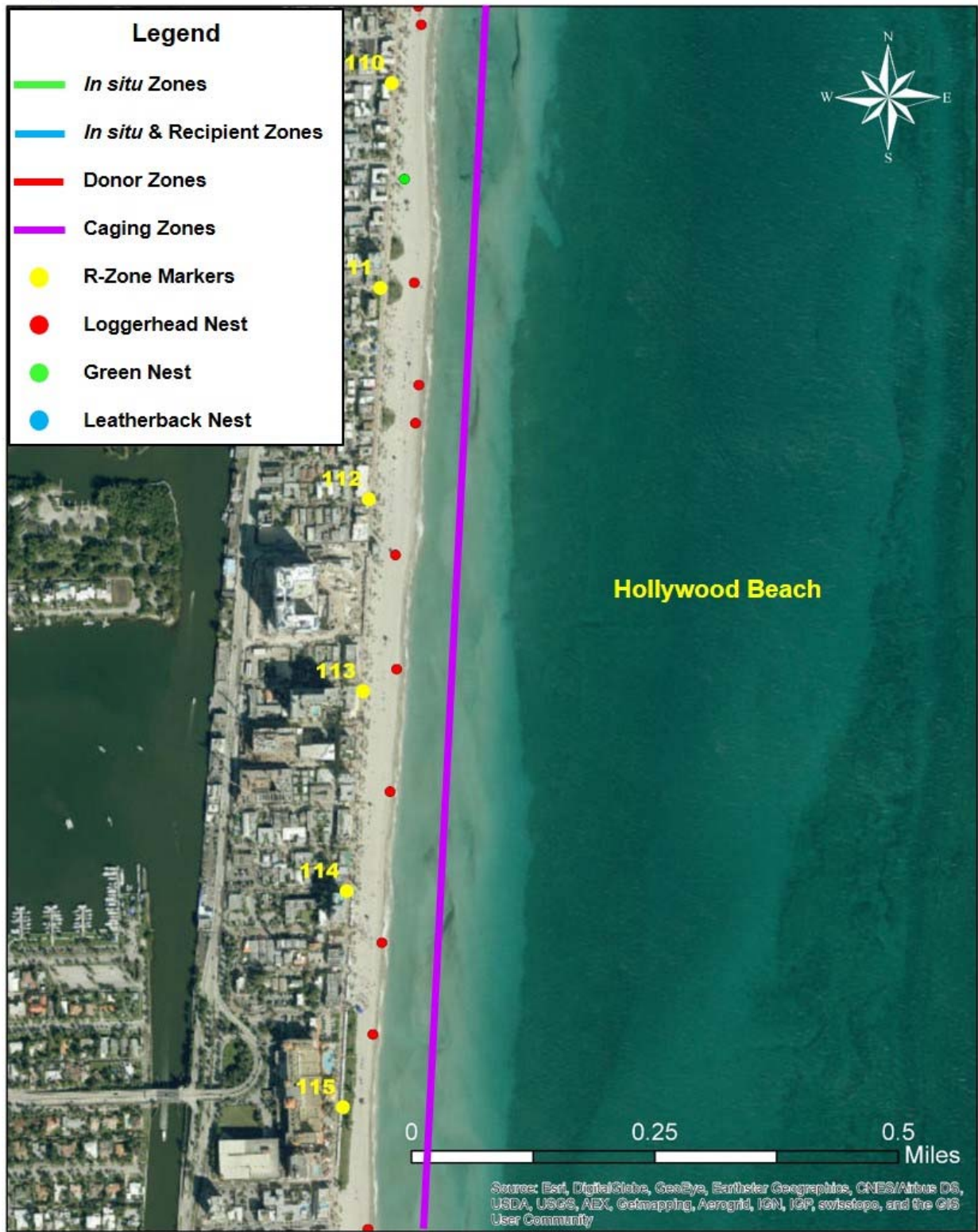


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

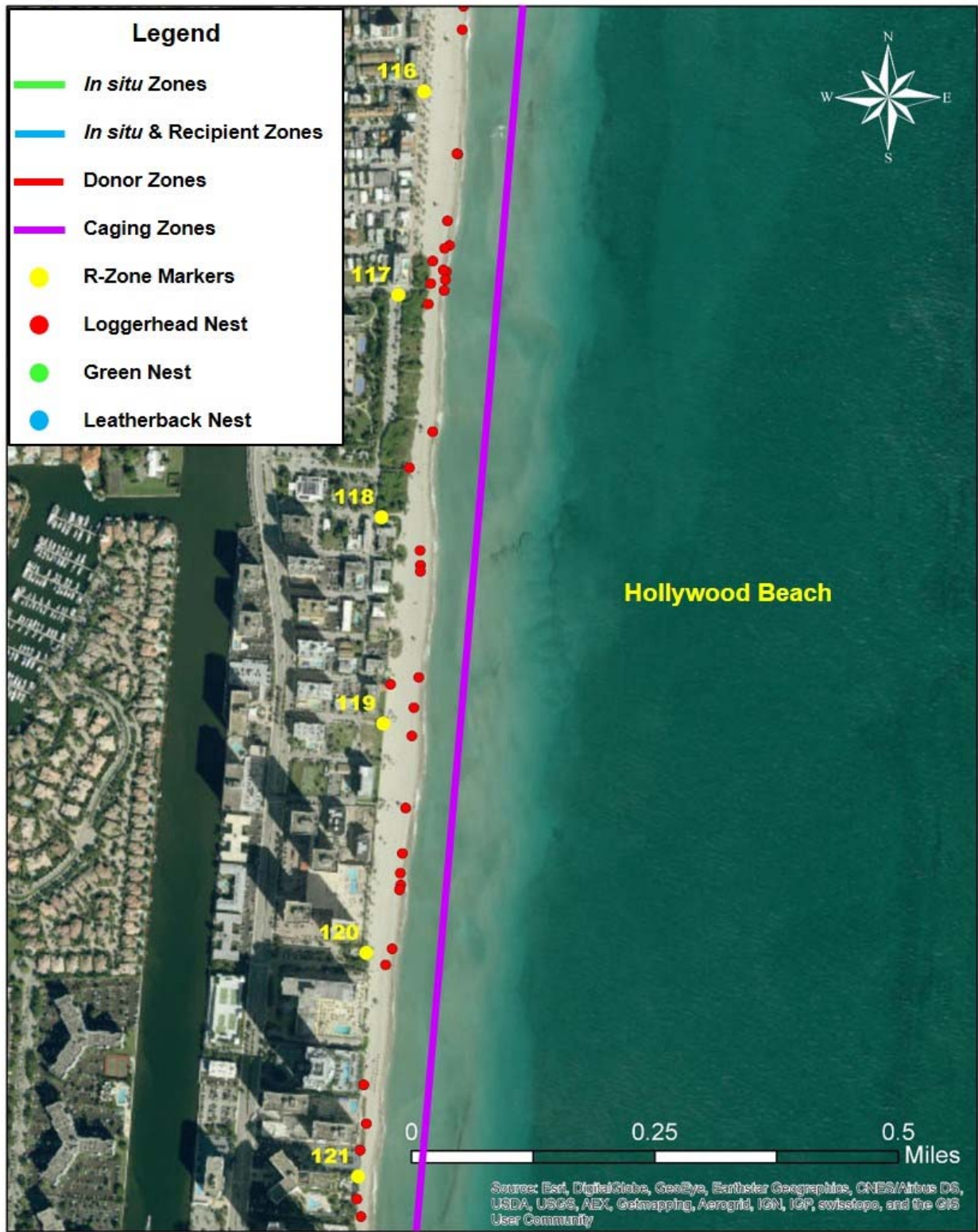


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

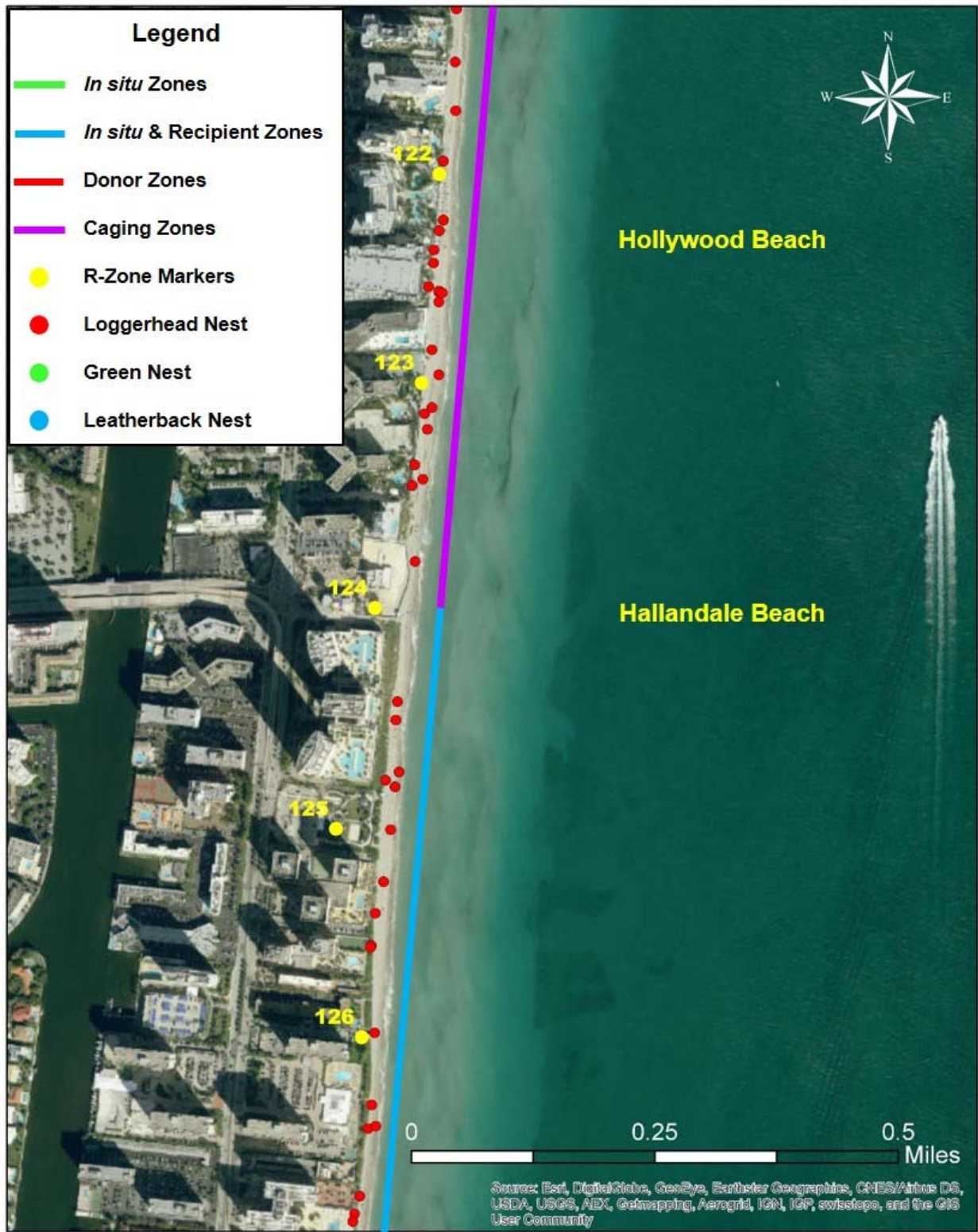


Figure 3: Locations of 2016 Turtle Crawls and Treatment Zones

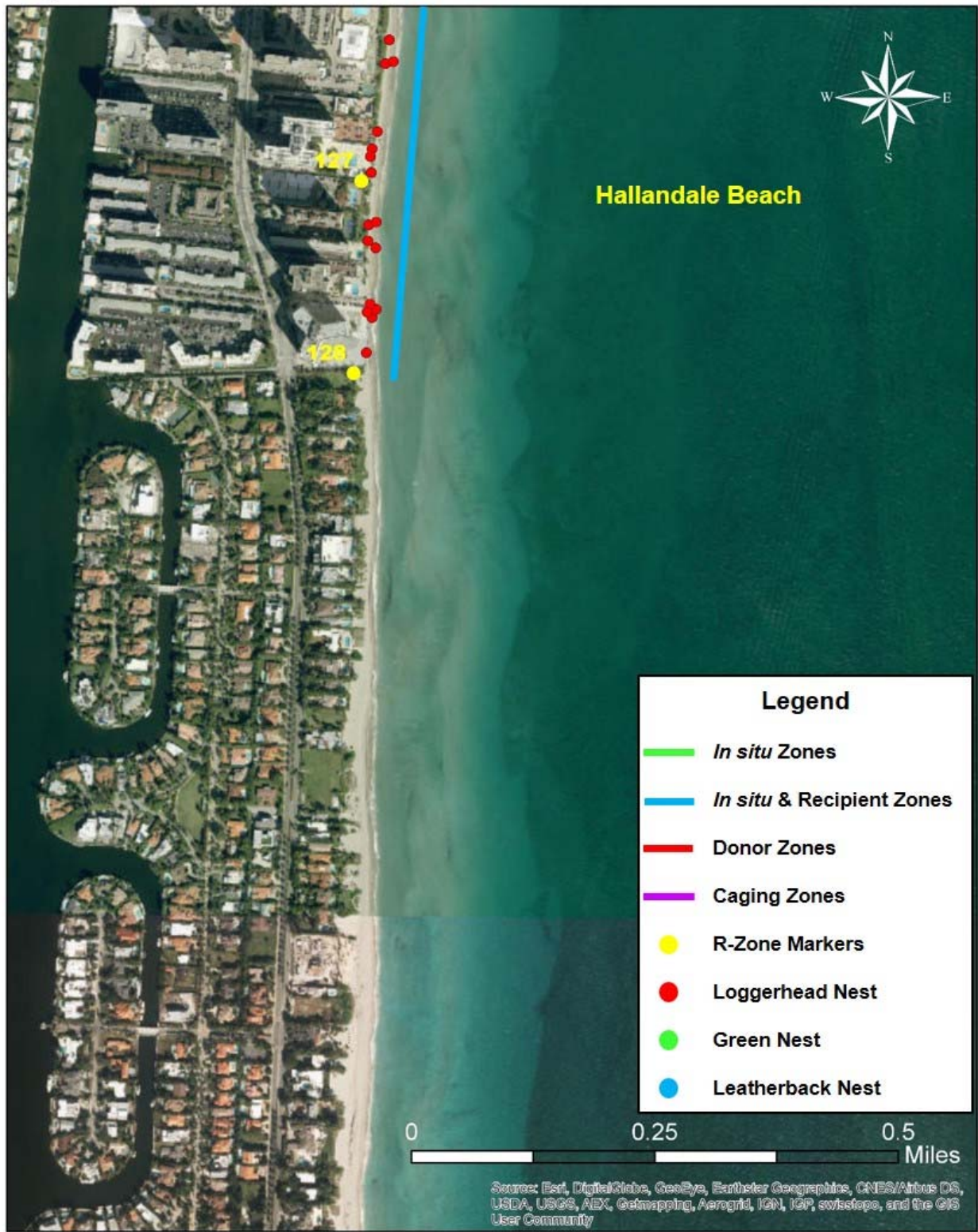


Figure 4: Historical crawl totals for all species combined for Broward County (2000-2016). Nests are designated by blue bars and false crawls are designated by red bars. Solid lines indicate trend lines for nesting (blue) and false crawls (red).

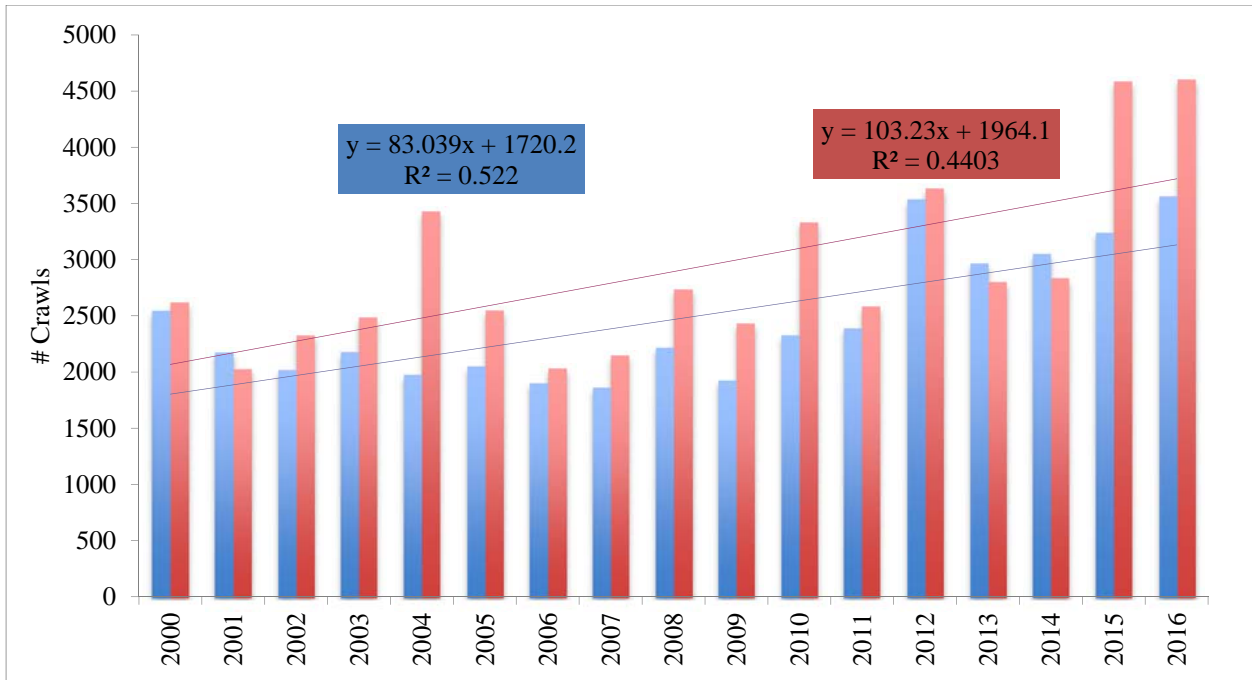


Figure 5: Historical nesting success, all species combined for Broward County (2000-2016). Five year average is indicated by the solid black line.

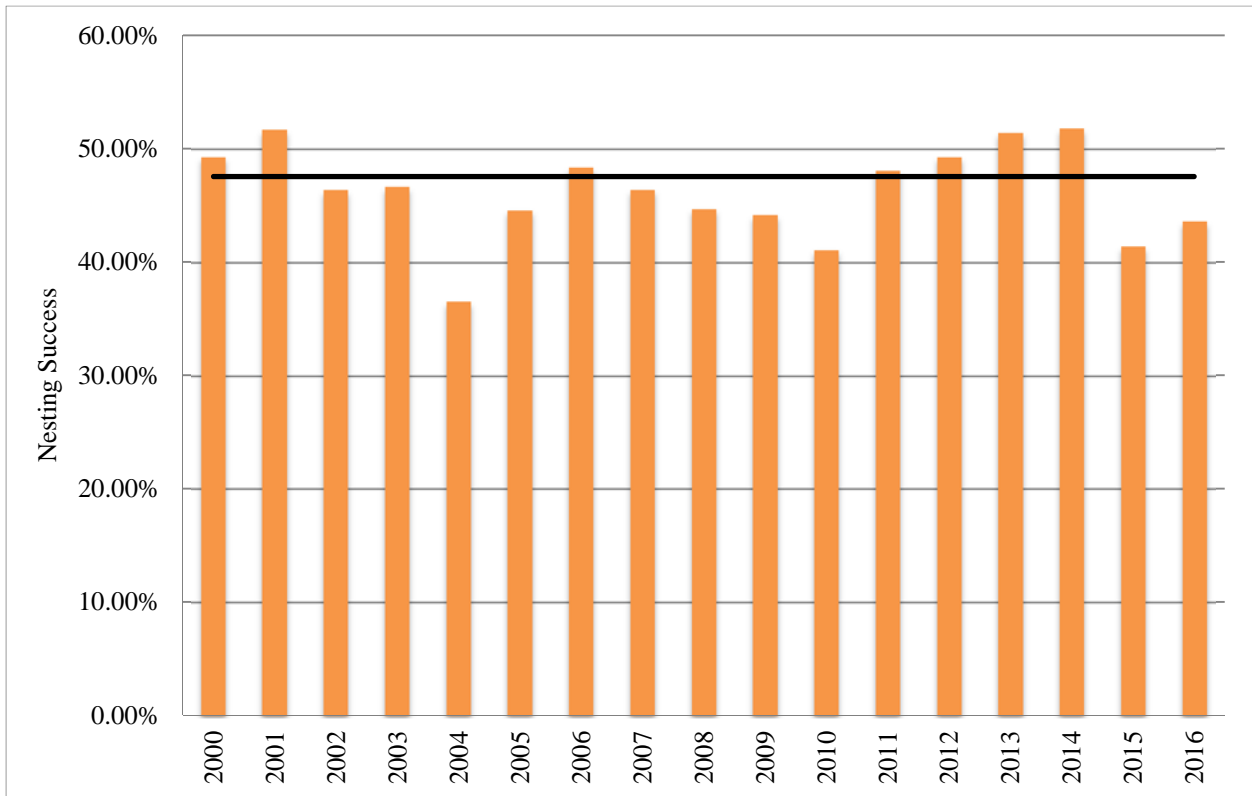


Figure 6: Number of nests laid per day in Broward County, by species.

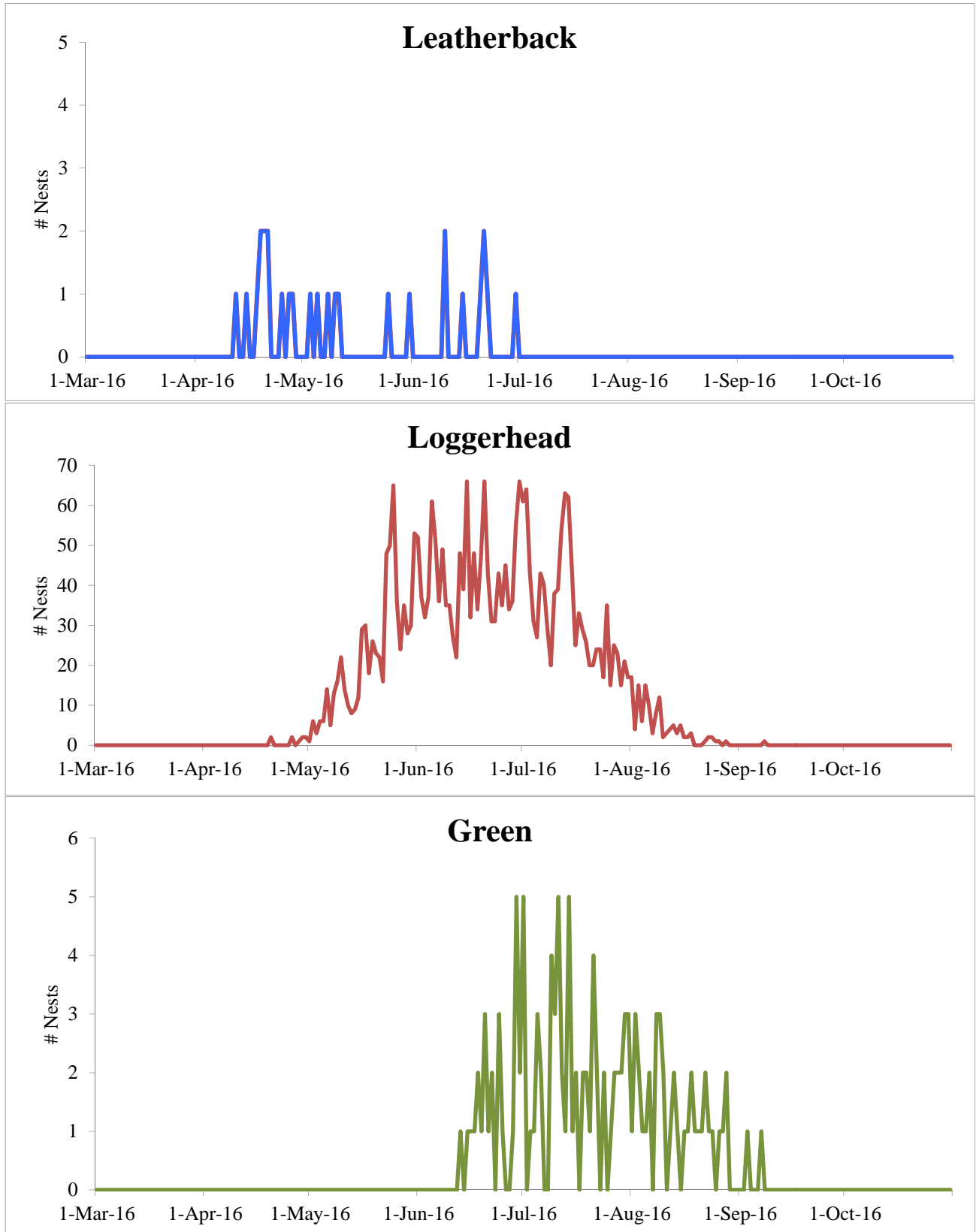


Figure 7: Historical nesting success in Broward County by species from 2000-2016. Five year average is indicated by the solid black line.

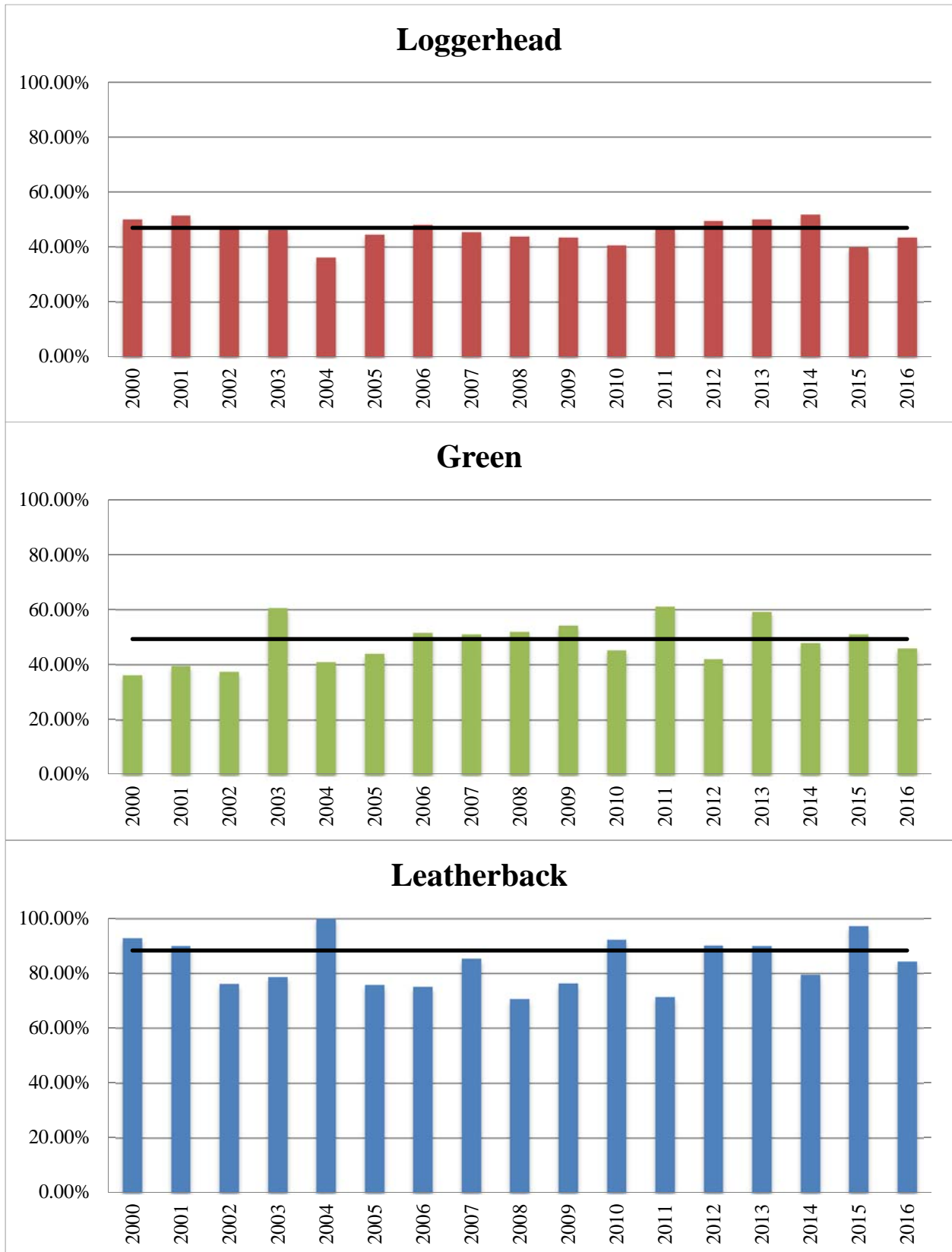


Figure 8: Historical nest activity in Broward County by species from 1981-2016.

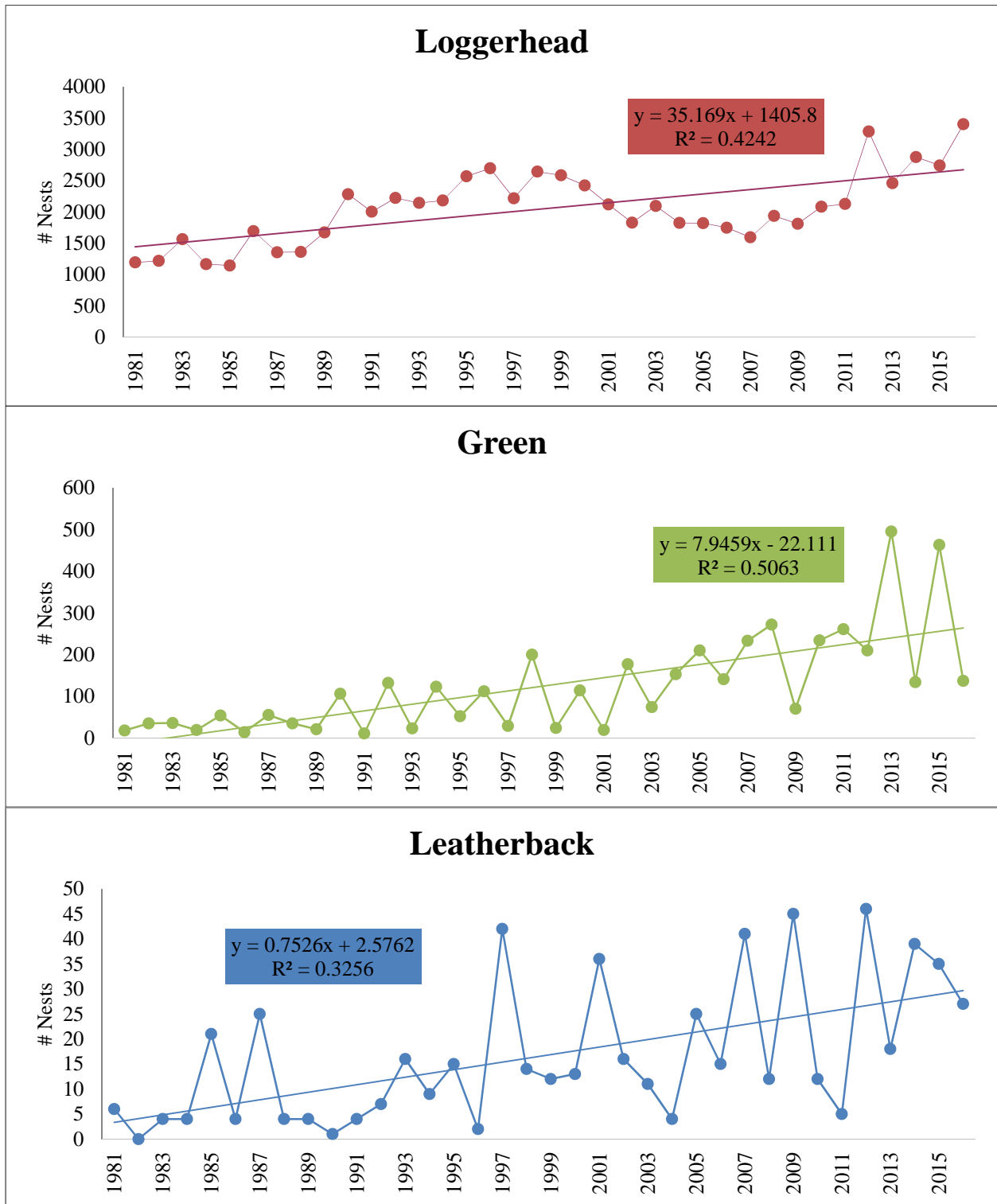


Figure 9: Historical nest relocation activity in Broward County (excluding Mizell-Eula State Park) 2005-2016.

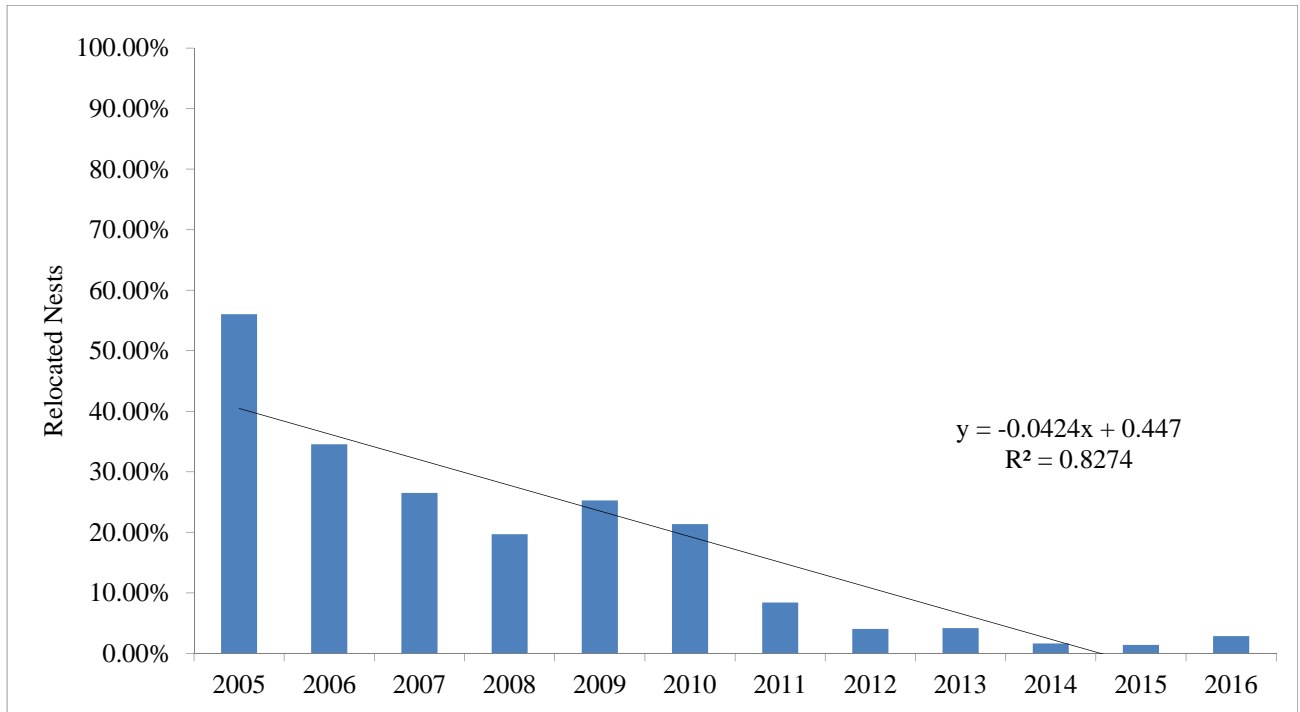


Figure 10: Historical disorientation reporting (adult and hatchling disorientations) by the BCSTCP in Broward County (excluding Mizell-Eula State Park) 2009-2016 reported by the solid purple line. The solid black line indicates the 5 year average.

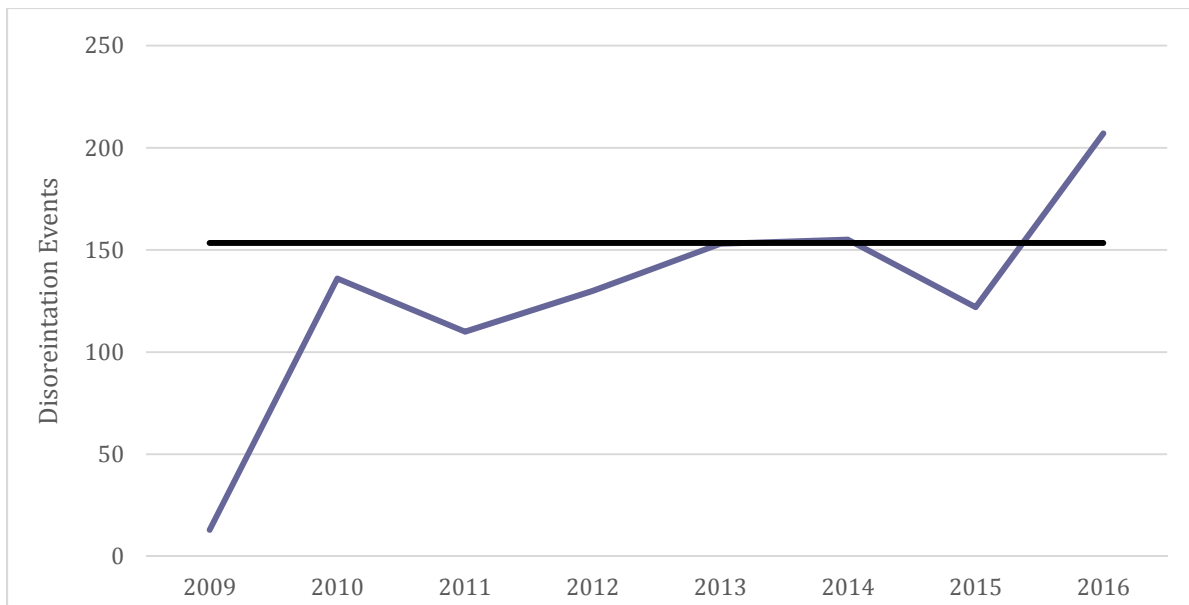


Figure 11: All hatchling disorientation reports by municipality recorded in 2016; as reported by BCSTCP, STOP, SFAS, and STARS.

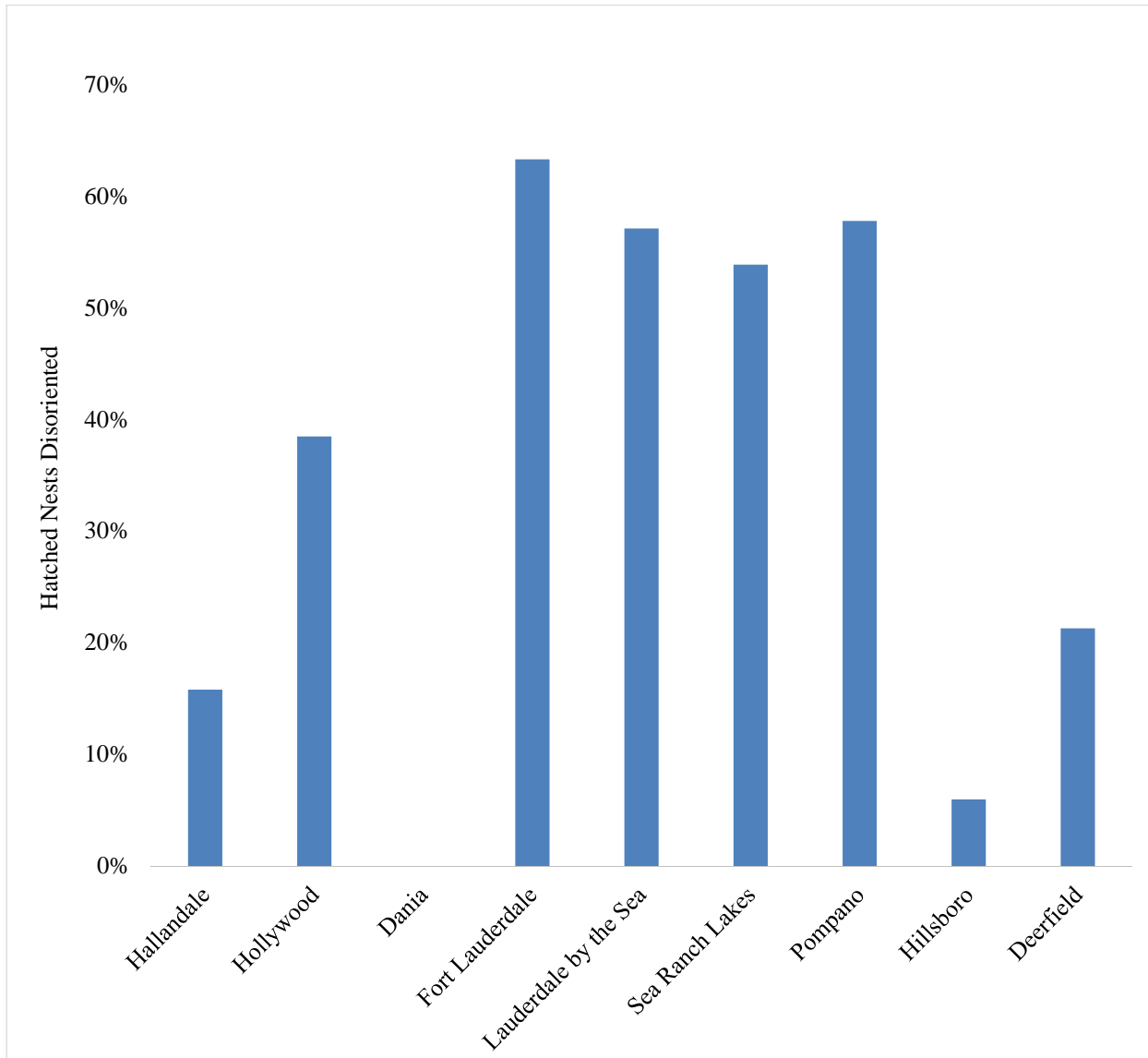


Figure 12: Percentage of nests that experienced predation in Broward County, all species and survey zones combined, 2005-2016.

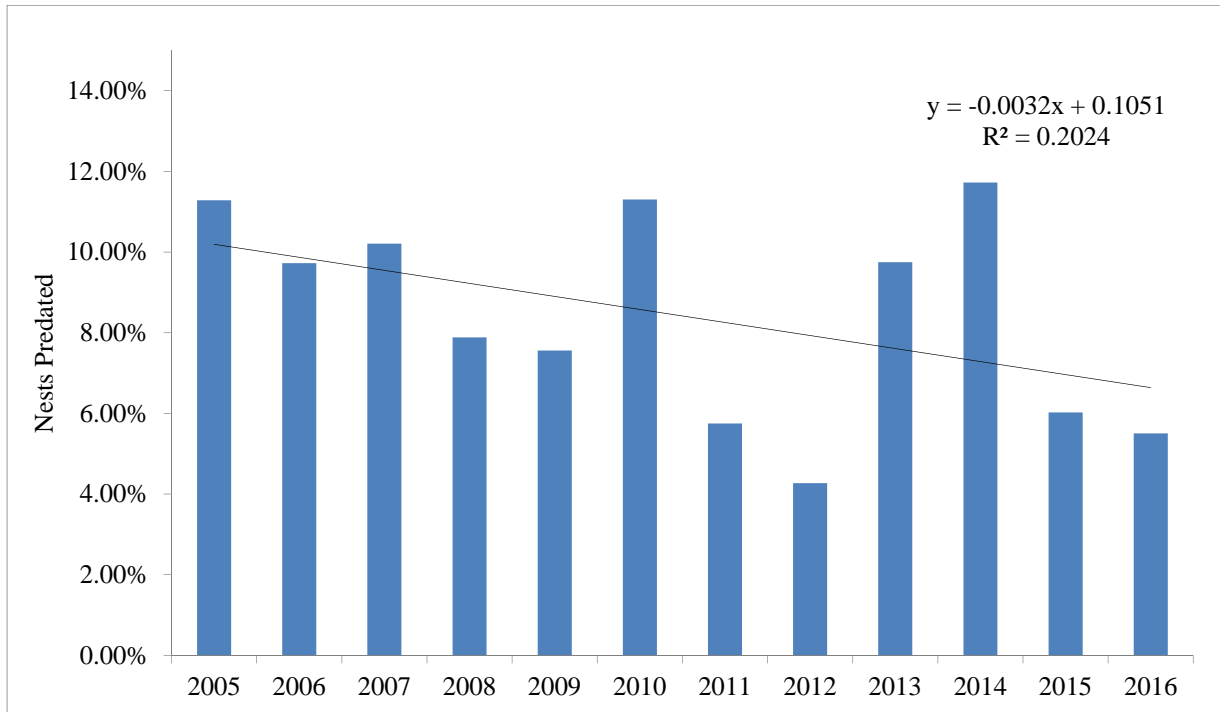


Figure 13: Percentage of nests that experienced predation in the Hillsboro survey zone, all species combined, 2005-2016.

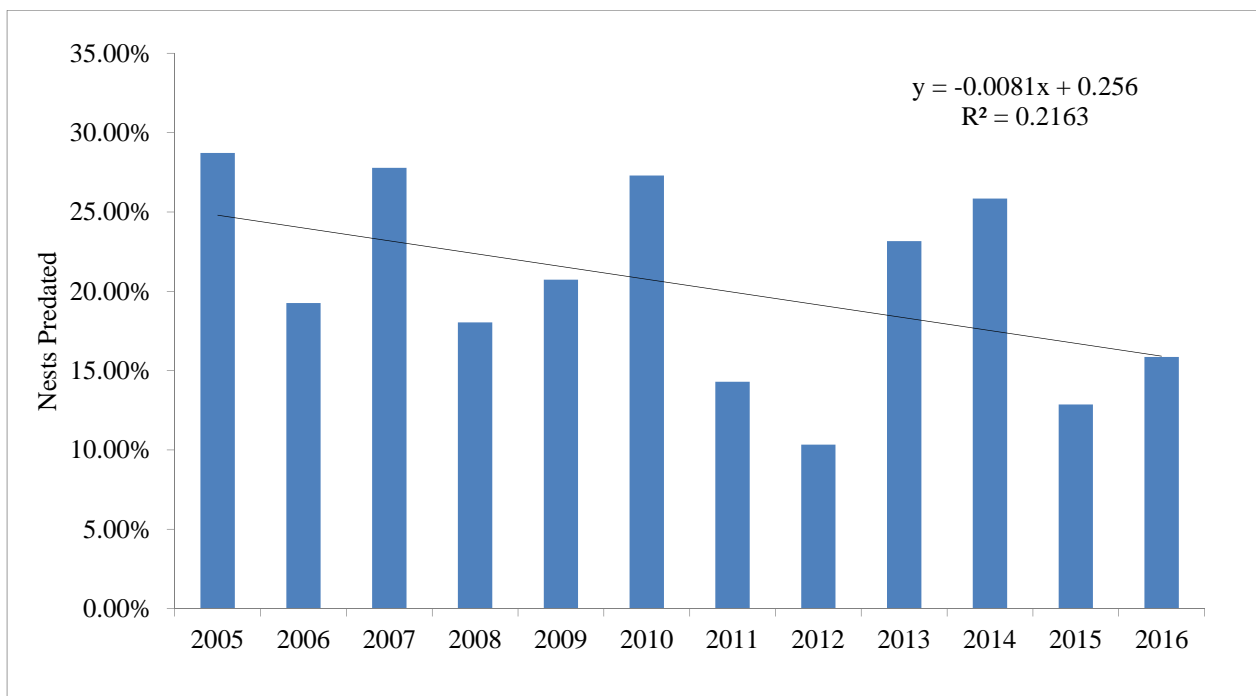
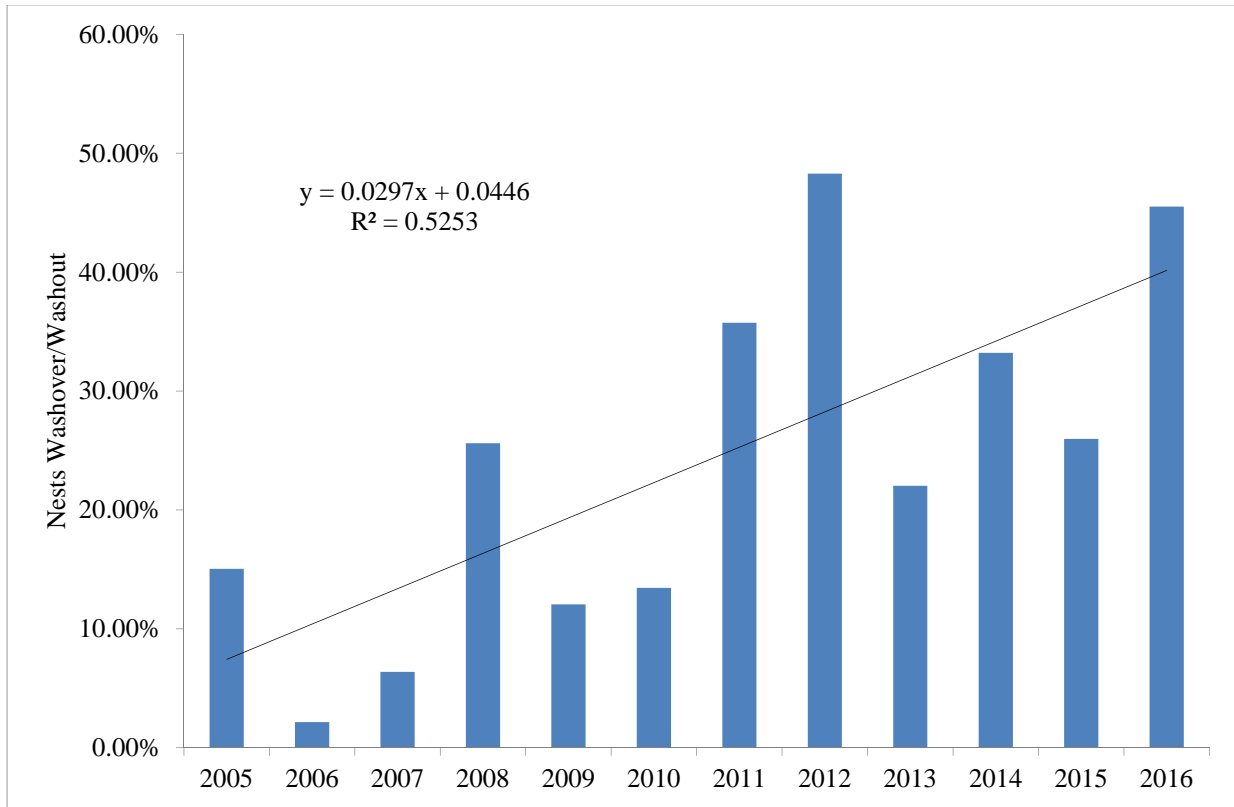



Figure 14: Historical nest washover/inundation in Broward County (excluding Mizell-Eula State Park), all species combined, 2005-2016.



**Appendix 1: FWC sea turtle nesting reports for 2016 season.
Hillsboro/Deerfield:**

		FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION FISH AND WILDLIFE RESEARCH INSTITUTE ANNUAL REPORT FOR THE STATEWIDE NESTING BEACH SURVEY, 2016	
1. PRINCIPAL PERMIT HOLDER INFORMATION			
Principal Permit Holder:	Curtis Slagle	Permit No:	214
Organization:	Broward County Sea Turtle Conservation Program - Nova Southeastern University		
Address:	1161 S Park Rd. Apt. 301 Hollywood, FL 33021		
County:	Broward	Email Address:	cs1858@nova.edu
Day Telephone:	(954) 383-2072	Night Telephone:	(954) 383-2072
Beach Name:	Deerfield/Hillsboro Beaches		
Point of Contact & Phone #	N/A	Email Address for Point of Contact: (if different from above)	N/A
2. GENERAL SURVEY INFORMATION			
Survey Boundary Information: Please describe survey boundaries geographically. If boundaries have changed, please enter the new boundaries in the space below. <u>Be specific</u> and use known landmarks that can be found on a map (or include a marked map).			
Beginning Survey Boundary:	Palm Bch/Broward Co Line (26.32100, -80.07447)		
Ending Survey Boundary:	Hillsboro Inlet (26.25817, -80.08043)		
Beach Length: KM (miles):	7 km (4.4 miles)	Was this the same survey area as last year? (Y or N)	Y
IF NO, please explain the specific differences, new survey length, AND why the survey area changed:			
N/A			
Start Date of Survey (mm/dd/yy):	03/01/16	End Date of Survey (mm/dd/yy):	10/31/16
Time of Day Surveyed: Start (AM or PM)	~6:00 AM (30 Minutes Bef	Finish (AM or PM)	~9:00 AM
Number of Days Per Week Surveyed:	7		
Total # of Days Surveyed in 2016 (this is the total # of days between start and end dates MINUS any missed days):	245		
If you did not survey 7 days per week throughout the nesting season, please describe your survey schedule (how many days per week, what days of the week). It is recommended to adhere to a fixed schedule if 7 days/week is not possible (e.g., 5 days/week every week), and these days would preferably be consecutive.			
N/A			
If you did not survey 7 days per week, how were tracks counted on the day that surveys resumed after a missed day?			
N/A			
Were all non-nesting crawls (false crawls) counted during your survey?	Y/N	Y	
How many people were involved in surveying your nesting beach this season?	25		

3. NESTING BEACH MANAGEMENT INFORMATION						
Do you collect GPS data for your nests? (Y/N)		Y		Do you save (electronic or paper files) these data? (Y/N)		Y
How many nests were RELOCATED this season?		24		Of these, how many were for construction projects, e.g., beach renourishment?		3
List other reasons:		Below previous night's high tide line, donor zone, or exposed egg chamber with active egg loss				
Do you mark nests for inventory to determine hatching success?				Y/N		Y
If yes, how many nests were inventoried in 2016? (Note: data for all inventoried nests must be submitted on the NPA spreadsheet)				594		
4. FATE OF NEST INFORMATION (for marked and unmarked nests)						
Do you actively look for and record predation events?				Y/N		Y
Regarding mammalian predation events, what proportion of the events do you likely record? All, Most, Some, or Few				All		
If you record predation events, how many nests were negatively affected by each predator species during the course of the season? Note: 1) no nest should occur in more than 1 box (there are spaces for multiple predators); 2) For "other", please enter in the space provided the specific predator(s), e.g., "bobcat" or "bobcat & ghost crab"; 3) Predation events include both partially & completely predated nests.						
Only Raccoon	2	Only Feral Hog	0	Raccoon & Ghost Crab	0	
Only Fox	168	Only Armadillo	0	Coyote & Ghost Crab	0	
Only Coyote	0	Mammal-Unk	0	Other:	Fox and Raccoon/Fox and Crab (be specific)	9/1
Only Dog	0	Only Ghost Crab	0	Other:	Unknown (be specific)	1
Canine (unsure if Coyote or Dog)	0	Only Ants	0	Other:	Fox and Bird/Fox and Bird and (be specific)	6/1
If predator control methods other than screening/caging were employed, please describe below:						
N/A						
How many nests were negatively affected by another nesting sea turtle?						1
How many nests were negatively affected by roots (i.e., damaged eggs, impeded hatchling emergence)?						0
How many nests were negatively affected PRIOR to hatching by each of the following storm-related events? Note: this does not include stake loss.						395
Complete Wash Outs	55	Partial Wash Outs	8	Accretion		9
Inundation (flooded)	0	Washed over	395	Other:	N/A (be specific)	0
Please give name(s) of storms if possible			Tropical Depression 8 and Hurricane Matthew			
How many nests were taken or disturbed by humans (Example: nest dug into, eggs removed, etc.)? Note: this does not include stake removal.						0
Please give details:		N/A				
If human disturbances occurred, were they reported to law enforcement?				Y/N		Y
How many disorientation events occurred on this survey area in 2016?						21
Have all disorientation reports been submitted to FWC?						Y/N
I certify the above information to be true and accurate to the best of my knowledge. (type in name & date)						
Curtis Slagle			Date:		11/29/2016	



FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
FISH AND WILDLIFE RESEARCH INSTITUTE
ANNUAL REPORT FOR THE STATEWIDE NESTING BEACH SURVEY, 2016

1. PRINCIPAL PERMIT HOLDER INFORMATION

Principal Permit Holder:	Curtis Slagle	Permit Number:	214
Beach Name:	Deerfield/Hillsboro Beaches		

2. GENERAL NESTING DATA for All nests on this survey area (Marked, Unmarked, & Misidentified Nests)

	<i>C. caretta</i> (Loggerhead)	<i>C. mydas</i> (Green Turtle)	<i>D. coriacea</i> (Leatherback)	<i>E. imbricata</i> (Hawksbill)	<i>L. kempii</i> (Kemp's Ridley)
Total # of Nests	1040	72	9	0	0
Total # of Non-Nesting Emergences (False Crawls)	1131	60	3	0	0
Date (mm/dd/yy) of First Documented Nest	04/20/16	06/13/16	04/15/16		
Date (mm/dd/yy) of Last Documented Nest	08/22/16	09/07/16	06/21/16		

Total # of Nests Prior to 15 May:	56	0	6	0	0
Total # of Nests After 31 Aug:	0	2	0	0	0

Comments: N/A

In the spaces below, please provide information on the initial nest treatment (e.g., in situ, screened, relocated, etc.). For example, if the initial treatment was in situ with no protection, it should be included in "(a) # of Nests left in place without additional protection" even if you later relocate the nest due to erosion.

Nest Data for nests left in place (where the turtle deposited the clutch): These nests may be left without additional protection, screened with a self-releasing flat screen, or covered with self-releasing or restraining above-ground cages.

Record the number of nests by category and species. For each species, rows a+b+c+d should equal the total number of nests left in place. Please check to make sure this is the case.	<i>C. caretta</i> (Loggerhead)	<i>C. mydas</i> (Green Turtle)	<i>D. coriacea</i> (Leatherback)	<i>E. imbricata</i> (Hawksbill)	<i>L. kempii</i> (Kemp's Ridley)
TOTAL # OF NESTS LEFT IN PLACE (a + b + c + d)	1026	70	9	0	0
(a) # of Nests left in Place without Additional Protection	1026	70	9	0	0
(b) # of Nests left in Place with Self-Releasing Flat Screen	0	0	0	0	0
(c) # of Nests left in Place with Self-Releasing Cage	0	0	0	0	0
(d) # of Nests left in Place with Restraining Cage	0	0	0	0	0

Relocated Nest Data: Relocated nests are those where the clutch is removed from its original site of deposition and reburied at another site. As with nests left in place, relocated nests may be left without additional protection, covered with self-releasing flat screen, or covered with a self-releasing for restraining above-ground cages. **Include ALL Relocated nests**, e.g., beach renourishment, nests moved because of possible inundation, etc.

Record the number of nests by category and species. For each species, rows a+b+c+d+e+f should equal the total number of relocated nests. Please check to make sure this is the case.	<i>C. caretta</i> (Loggerhead)	<i>C. mydas</i> (Green Turtle)	<i>D. coriacea</i> (Leatherback)	<i>E. imbricata</i> (Hawksbill)	<i>L. kempii</i> (Kemp's Ridley)
TOTAL # OF NESTS RELOCATED (a + b + c + d + e + f)	14	2	0	0	0
(a) # of Relocated Nests without Additional Protection	14	2	0	0	0
(b) # of Relocated Nests with Self-Releasing Flat Screen	0	0	0	0	0
(c) # of Relocated Nests with Self-Releasing Cage	0	0	0	0	0
(d) # of Relocated Nests with Restraining Cage	0	0	0	0	0


Additional Comments for the 2016 Season

Beach Name:

Deerfield/Hillsboro Beaches

<p>Nesting Beach Management Information (e.g., predation, storms, poaching, etc.)</p>	<p>Hurricane Matthew- 39 nests were impacted by Hurricane Matthew: 39 washed over, ten of which were washed out, and 3 reestablished. Tropical Storm 8 - 198 nests were impacted by Tropical Storm 8: 198 washed over, 23 of which were washed out, four reestablished, and two relocated due to exposed eggs.</p>
<p>General Nesting Data (e.g., nests, false crawls)</p>	<p align="center">1122 total nests and 1194 total false crawls 72 ONA Reports and 21 DIS Reports 23 missed nests, 15 associated with a false crawl</p>
<p>Nest Success Data</p>	<p align="center">594 nests inventoried and 528 nests not inventoried</p>
<p>Miscellaneous Comments Regarding Data</p>	

Pompano/Lauderdale-By-The-Sea:

		FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION FISH AND WILDLIFE RESEARCH INSTITUTE ANNUAL REPORT FOR THE STATEWIDE NESTING BEACH SURVEY, 2016	
1. PRINCIPAL PERMIT HOLDER INFORMATION			
Principal Permit Holder:	Curtis Slagle		Permit No: 214
Organization:	Broward County Sea Turtle Conservation Program - Nova Southeastern University		
Address:	1161 S Park Rd. Apt. 301 Hollywood, FL 33021		
County:	Broward	Email Address:	cs1858@nova.edu
Day Telephone:	(954) 383-2072	Night Telephone:	(954) 383-2072
Beach Name:	Pompano/Lauderdale-by-the-Sea		
Point of Contact & Phone #	N/A	Email Address for Point of Contact: (if different from above)	N/A
2. GENERAL SURVEY INFORMATION			
<p>Survey Boundary Information: Please describe survey boundaries geographically. If boundaries have changed, please enter the new boundaries in the space below. <u>Be specific</u> and use known landmarks that can be found on a map (or include a marked map).</p>			
Beginning Survey Boundary:	Hillsboro Inlet (26.25801, -80.08185)		
Ending Survey Boundary:	Commerical Blvd. Pier (26.18948, -80.09466)		
Beach Length: KM (miles):	7.7 km (4.8 miles)	Was this the same survey area as last year? (Y or N)	Y
<p>IF NO, please explain the specific differences, new survey length, AND why the survey area changed:</p>			
N/A			
Start Date of Survey (mm/dd/yy):	03/01/16	End Date of Survey (mm/dd/yy):	10/31/16
Time of Day Surveyed: Start (AM or PM)	~6:00 AM (30 Minutes Bef	Finish (AM or PM)	~9:00 AM
Number of Days Per Week Surveyed:	7		
Total # of Days Surveyed in 2016 (this is the total # of days between start and end dates MINUS any missed days):	245		
<p>If you did not survey 7 days per week throughout the nesting season, please describe your survey schedule (how many days per week, what days of the week). It is recommended to adhere to a fixed schedule if 7 days/week is not possible (e.g., 5 days/week every week), and these days would preferably be consecutive.</p>			
N/A			
<p>If you did not survey 7 days per week, how were tracks counted on the day that surveys resumed after a missed day?</p>			
N/A			
Were all non-nesting crawls (false crawls) counted during your survey?	Y/N		Y
How many people were involved in surveying your nesting beach this season?	25		

3. NESTING BEACH MANAGEMENT INFORMATION					
Do you collect GPS data for your nests? (Y/N)	Y	Do you save (electronic or paper files) these data? (Y/N)	Y		
How many nests were RELOCATED this season?	28	Of these, how many were for construction projects, e.g., beach renourishment?	12		
List other reasons:	Below previous night's high tide line, donor zone, or exposed egg chamber with active egg loss				
Do you mark nests for inventory to determine hatching success?	Y/N	Y			
If yes, how many nests were inventoried in 2016? (Note: data for all inventoried nests must be submitted on the NPA spreadsheet)	549				
4. FATE OF NEST INFORMATION (for marked and unmarked nests)					
Do you actively look for and record predation events?	Y/N	Y			
Regarding mammalian predation events, what proportion of the events do you likely record? All, Most, Some, or Few	All				
If you record predation events, how many nests were negatively affected by each predator species during the course of the season? Note: 1) no nest should occur in more than 1 box (there are spaces for multiple predators); 2) For "other", please enter in the space provided the specific predator(s), e.g., "bobcat" or "bobcat & ghost crab"; 3) Predation events include both partially & completely predated nests.					
Only Raccoon	0	Only Feral Hog	0	Raccoon & Ghost Crab	0
Only Fox	0	Only Armadillo	0	Coyote & Ghost Crab	0
Only Coyote	0	Mammal-Unk	0	Other:	N/A (be specific) 0
Only Dog	0	Only Ghost Crab	0	Other:	N/A (be specific) 0
Canine (unsure if Coyote or Dog)	0	Only Ants	0	Other:	N/A (be specific) 0
If predator control methods other than screening/caging were employed, please describe below:					
N/A					
How many nests were negatively affected by another nesting sea turtle?					0
How many nests were negatively affected by roots (i.e., damaged eggs, impeded hatchling emergence)?					1
How many nests were negatively affected PRIOR to hatching by each of the following storm-related events? Note: this does not include stake loss.					341
Complete Wash Outs	20	Partial Wash Outs	4	Accretion	8
Inundation (flooded)	0	Washed over	341	Other:	N/A (be specific) 0
Please give name(s) of storms if possible		Tropical Depression 8 and Hurricane Matthew			
How many nests were taken or disturbed by humans (Example: nest dug into, eggs removed, etc.)? Note: this does not include stake removal.					1
Please give details:		Eggs were removed from a freshly deposited nest			
If human disturbances occurred, were they reported to law enforcement? Y/N					Y
How many disorientation events occurred on this survey area in 2016?					63
Have all disorientation reports been submitted to FWC? Y/N					Y
I certify the above information to be true and accurate to the best of my knowledge. (type in name & date)					
Curtis Slagle			Date:	11/29/2016	



FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
FISH AND WILDLIFE RESEARCH INSTITUTE
ANNUAL REPORT FOR THE STATEWIDE NESTING BEACH SURVEY, 2016

1. PRINCIPAL PERMIT HOLDER INFORMATION

Principal Permit Holder: **Curtis Slagle** Permit Number: **214**
Beach Name: **Pompano/Lauderdale-by-the-Sea**

2. GENERAL NESTING DATA for All nests on this survey area (Marked, Unmarked, & Misidentified Nests)

	<i>C. caretta</i> (Loggerhead)	<i>C. mydas</i> (Green Turtle)	<i>D. coriacea</i> (Leatherback)	<i>E. imbricata</i> (Hawksbill)	<i>L. kempii</i> (Kemp's Ridley)
Total # of Nests	721	6	12	0	0
Total # of Non-Nesting Emergences (False Crawls)	823	16	1	0	0
Date (mm/dd/yy) of First Documented Nest	05/05/16	06/18/16	04/12/16		
Date (mm/dd/yy) of Last Documented Nest	08/23/16	08/28/16	06/22/16		

Total # of Nests Prior to 15 May:	26	0	7	0	0
Total # of Nests After 31 Aug:	0	0	0	0	0

Comments: N/A

In the spaces below, please provide information on the initial nest treatment (e.g., in situ, screened, relocated, etc.). For example, if the initial treatment was in situ with no protection, it should be included in "(a) # of Nests left in place without additional protection" even if you later relocate the nest due to erosion.

Nest Data for nests left in place (where the turtle deposited the clutch): These nests may be left without additional protection, screened with a self-releasing flat screen, or covered with self-releasing or restraining above-ground cages.

Record the number of nests by category and species. For each species, rows a+b+c+d should equal the total number of nests left in place. Please check to make sure this is the case.	<i>C. caretta</i> (Loggerhead)	<i>C. mydas</i> (Green Turtle)	<i>D. coriacea</i> (Leatherback)	<i>E. imbricata</i> (Hawksbill)	<i>L. kempii</i> (Kemp's Ridley)
TOTAL # OF NESTS LEFT IN PLACE (a + b + c + d)	697	6	12	0	0
(a) # of Nests left in Place without Additional Protection	697	6	12	0	0
(b) # of Nests left in Place with Self-Releasing Flat Screen	0	0	0	0	0
(c) # of Nests left in Place with Self-Releasing Cage	0	0	0	0	0
(d) # of Nests left in Place with Restraining Cage	0	0	0	0	0

Relocated Nest Data: Relocated nests are those where the clutch is removed from its original site of deposition and reburied at another site. As with nests left in place, relocated nests may be left without additional protection, covered with self-releasing flat screen, or covered with a self-releasing for restraining above-ground cages. Include ALL Relocated nests, e.g., beach renourishment, nests moved because of possible inundation, etc.

Record the number of nests by category and species. For each species, rows a+b+c+d+e+f should equal the total number of relocated nests. Please check to make sure this is the case.	<i>C. caretta</i> (Loggerhead)	<i>C. mydas</i> (Green Turtle)	<i>D. coriacea</i> (Leatherback)	<i>E. imbricata</i> (Hawksbill)	<i>L. kempii</i> (Kemp's Ridley)
TOTAL # OF NESTS RELOCATED (a + b + c + d + e + f)	24	0	0	0	0
(a) # of Relocated Nests without Additional Protection	24	0	0	0	0
(b) # of Relocated Nests with Self-Releasing Flat Screen	0	0	0	0	0
(c) # of Relocated Nests with Self-Releasing Cage	0	0	0	0	0
(d) # of Relocated Nests with Restraining Cage	0	0	0	0	0


Additional Comments for the 2016 Season

Beach Name:

Pompano/Lauderdale-by-the-Sea

Nesting Beach Management Information (e.g., predation, storms, poaching, etc.)	<p>Hurricane Matthew- Seven nests were impacted by Hurricane Matthew: Seven washed over, five of which were washed out, and 1 reestablished.</p> <p>Tropical Storm 8 - 146 nests were impacted by Tropical Storm 8: 146 washed over, 15 of which were washed out, five reestablished, and two relocated due to exposed eggs.</p> <p style="text-align: center;">Poaching - One successful poaching attempts documented.</p>
General Nesting Data (e.g., nests, false crawls)	<p>739 total nests and 840 total false crawls</p> <p>40 ONA Reports and 63 DIS Reports</p> <p>5 missed nests, 3 associated with a false crawl</p>
Nest Success Data	<p>549 nests inventoried and 190 nests not inventoried</p>
Miscellaneous Comments Regarding Data	

Ft Lauderdale:

		FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION FISH AND WILDLIFE RESEARCH INSTITUTE ANNUAL REPORT FOR THE STATEWIDE NESTING BEACH SURVEY, 2016	
1. PRINCIPAL PERMIT HOLDER INFORMATION			
Principal Permit Holder:	Curtis Slagle		Permit No: 214
Organization:	Broward County Sea Turtle Conservation Program - Nova Southeastern University		
Address:	1161 S Park Rd. Apt. 301 Hollywood, FL 33021		
County:	Broward	Email Address:	cs1858@nova.edu
Day Telephone:	(954) 383-2072	Night Telephone:	(954) 383-2072
Beach Name:	Ft Lauderdale Beach		
Point of Contact & Phone #	N/A	Email Address for Point of Contact: (if different from above)	N/A
2. GENERAL SURVEY INFORMATION			
<p>Survey Boundary Information: Please describe survey boundaries geographically. If boundaries have changed, please enter the new boundaries in the space below. <u>Be specific</u> and use known landmarks that can be found on a map (or include a marked map).</p>			
Beginning Survey Boundary:	Commerical Blvd. Pier (26.18948, -80.09466)		
Ending Survey Boundary:	Port Everglades Inlet (26.09508, -80.10500)		
Beach Length: KM (miles):	10.6 km (6.6 miles)	Was this the same survey area as last year? (Y or N)	Y
<p>IF NO, please explain the specific differences, new survey length, AND why the survey area changed:</p>			
N/A			
Start Date of Survey (mm/dd/yy):	03/01/16	End Date of Survey (mm/dd/yy):	10/31/16
Time of Day Surveyed: Start (AM or PM)	~6:00 AM (30 Minutes Bef	Finish (AM or PM)	~9:00 AM
Number of Days Per Week Surveyed:	7		
Total # of Days Surveyed in 2016 (this is the total # of days between start and end dates MINUS any missed days):			245
<p>If you did not survey 7 days per week throughout the nesting season, please describe your survey schedule (how many days per week, what days of the week). It is recommended to adhere to a fixed schedule if 7 days/week is not possible (e.g., 5 days/week every week), and these days would preferably be consecutive.</p>			
N/A			
<p>If you did not survey 7 days per week, how were tracks counted on the day that surveys resumed after a missed day?</p>			
N/A			
Were all non-nesting crawls (false crawls) counted during your survey?	Y/N	Y	
How many people were involved in surveying your nesting beach this season?	25		

3. NESTING BEACH MANAGEMENT INFORMATION					
Do you collect GPS data for your nests? (Y/N)	Y	Do you save (electronic or paper files) these data? (Y/N)	Y		
How many nests were RELOCATED this season?	39	Of these, how many were for construction projects, e.g., beach renourishment?	0		
List other reasons:	Below previous night's high tide line, donor zone, or exposed egg chamber with active egg loss				
Do you mark nests for inventory to determine hatching success?	Y/N	Y			
If yes, how many nests were inventoried in 2016? (Note: data for all inventoried nests must be submitted on the NPA spreadsheet)					981
4. FATE OF NEST INFORMATION (for marked and unmarked nests)					
Do you actively look for and record predation events?	Y/N	Y			
Regarding mammalian predation events, what proportion of the events do you likely record? All, Most, Some, or Few					All
If you record predation events, how many nests were negatively affected by each predator species during the course of the season? Note: 1) no nest should occur in more than 1 box (there are spaces for multiple predators); 2) For "other", please enter in the space provided the specific predator(s), e.g., "bobcat" or "bobcat & ghost crab"; 3) Predation events include both partially & completely predated nests.					
Only Raccoon	1	Only Feral Hog	0	Raccoon & Ghost Crab	0
Only Fox	0	Only Armadillo	0	Coyote & Ghost Crab	0
Only Coyote	0	Mammal-Unk	0	Other:	Unknown (be specific) 1
Only Dog	0	Only Ghost Crab	0	Other:	N/A (be specific) 0
Canine (unsure if Coyote or Dog)	0	Only Ants	0	Other:	N/A (be specific) 0
If predator control methods other than screening/caging were employed, please describe below:					
N/A					
How many nests were negatively affected by another nesting sea turtle?					2
How many nests were negatively affected by roots (i.e., damaged eggs, impeded hatchling emergence) ?					2
How many nests were negatively affected PRIOR to hatching by each of the following storm-related events? Note: this does not include stake loss.					490
Complete Wash Outs	33	Partial Wash Outs	15	Accretion	0
Inundation (flooded)	0	Washed over	490	Other:	N/A (be specific) 0
Please give name(s) of storms if possible		Tropical Depression 8 and Hurricane Matthew			
How many nests were taken or disturbed by humans (Example: nest dug into, eggs removed, etc.)? Note: this does not include stake removal.					3
Please give details:		Nests were dug into but eggs/hatchlings were not successfully removed			
If human disturbances occurred, were they reported to law enforcement? Y/N					Y
How many disorientation events occurred on this survey area in 2016?					78
Have all disorientation reports been submitted to FWC? Y/N					Y
I certify the above information to be true and accurate to the best of my knowledge. (type in name & date)					
Curtis Slagle			Date:	11/29/2016	



**FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
FISH AND WILDLIFE RESEARCH INSTITUTE
ANNUAL REPORT FOR THE STATEWIDE NESTING BEACH SURVEY, 2016**

1. PRINCIPAL PERMIT HOLDER INFORMATION

Principal Permit Holder: **Curtis Slagle** Permit Number: **214**

Beach Name: **Ft Lauderdale Beach**

2. GENERAL NESTING DATA for All nests on this survey area (Marked, Unmarked, & Misidentified Nests)

	<i>C. caretta</i> (Loggerhead)	<i>C. mydas</i> (Green Turtle)	<i>D. coriacea</i> (Leatherback)	<i>E. imbricata</i> (Hawksbill)	<i>L. kempii</i> (Kemp's Ridley)
Total # of Nests	1180	47	3	0	0
Total # of Non-Nesting Emergences (False Crawls)	1537	61	0	0	0
Date (mm/dd/yy) of First Documented Nest	04/26/16	06/15/16	04/19/16		
Date (mm/dd/yy) of Last Documented Nest	09/08/16	08/24/16	06/30/16		

Total # of Nests *Prior* to 15 May: 55 0 2 0 0

Total # of Nests *After* 31 Aug: 1 0 0 0 0

Comments: N/A

In the spaces below, please provide information on the initial nest treatment (e.g., in situ, screened, relocated, etc.). For example, if the initial treatment was in situ with no protection, it should be included in "(a) # of Nests left in place without additional protection" even if you later relocate the nest due to erosion.

Nest Data for nests left in place (where the turtle deposited the clutch): These nests may be left without additional protection, screened with a self-releasing flat screen, or covered with self-releasing or restraining above-ground cages.

Record the number of nests by category and species. For each species, rows a+b+c+d should equal the total number of nests left in place. Please check to make sure this is the case.	<i>C. caretta</i> (Loggerhead)	<i>C. mydas</i> (Green Turtle)	<i>D. coriacea</i> (Leatherback)	<i>E. imbricata</i> (Hawksbill)	<i>L. kempii</i> (Kemp's Ridley)
TOTAL # OF NESTS LEFT IN PLACE (a + b + c + d)	1156	0	0	0	0
(a) # of Nests left in Place without Additional Protection	1156	47	3	0	0
(b) # of Nests left in Place with Self-Releasing Flat Screen	0	0	0	0	0
(c) # of Nests left in Place with Self-Releasing Cage	0	0	0	0	0
(d) # of Nests left in Place with Restraining Cage	0	0	0	0	0

Relocated Nest Data: Relocated nests are those where the clutch is removed from its original site of deposition and reburied at another site. As with nests left in place, relocated nests may be left without additional protection, covered with self-releasing flat screen, or covered with a self-releasing for restraining above-ground cages. **Include ALL Relocated nests**, e.g., beach renourishment, nests moved because of possible inundation, etc.

Record the number of nests by category and species. For each species, rows a+b+c+d+e+f should equal the total number of relocated nests. Please check to make sure this is the case.	<i>C. caretta</i> (Loggerhead)	<i>C. mydas</i> (Green Turtle)	<i>D. coriacea</i> (Leatherback)	<i>E. imbricata</i> (Hawksbill)	<i>L. kempii</i> (Kemp's Ridley)
TOTAL # OF NESTS RELOCATED (a + b + c + d + e + f)	24	0	0	0	0
(a) # of Relocated Nests without Additional Protection	24	0	0	0	0
(b) # of Relocated Nests with Self-Releasing Flat Screen	0	0	0	0	0
(c) # of Relocated Nests with Self-Releasing Cage	0	0	0	0	0
(d) # of Relocated Nests with Restraining Cage	0	0	0	0	0


Additional Comments for the 2016 Season

Beach Name:

Ft Lauderdale Beach

Nesting Beach Management Information (e.g., predation, storms, poaching, etc.)	<p>Hurricane Matthew- 29 nests were impacted by Hurricane Matthew: 29 washed over, five of which were washed out, and eight reestablished.</p> <p>Tropical Storm 8 - 210 nests were impacted by Tropical Storm 8: 210 washed over, 11 of which were washed out, one reestablished, and eight relocated due to exposed eggs.</p> <p>Restraining Caging - Storm and hide tide events resulted in multiple cages having to be removed sporadically throughout the season. Most cages were able to be replaced within three days of removal. 39 of 43 restraining cages were inventoried. The restraining cages not inventoried were either washed out or the egg chamber location was lost during the season.</p> <p>Poaching - Three poaching attempts documented, four nests were vandalized by the removal of stakes.</p>
General Nesting Data (e.g., nests, false crawls)	<p>1232 total nests and 1598 total false crawls</p> <p>52 ONA Reports and 78 DIS Reports</p> <p>13 missed nests, 1 associated with a false crawl</p>
Nest Success Data	<p>981 nests inventoried and 251 nests not inventoried</p>
Miscellaneous Comments Regarding Data	<p>Restraining cages were utilized as a conservation effort for local lighting issues.</p>

Hollywood/Hallandale:

		FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION FISH AND WILDLIFE RESEARCH INSTITUTE ANNUAL REPORT FOR THE STATEWIDE NESTING BEACH SURVEY, 2016	
1. PRINCIPAL PERMIT HOLDER INFORMATION			
Principal Permit Holder:	Curtis Slagle	Permit No:	214
Organization:	Broward County Sea Turtle Conservation Program - Nova Southeastern University		
Address:	1161 S Park Rd. Apt. 301 Hollywood, FL 33021		
County:	Broward	Email Address:	cs1858@nova.edu
Day Telephone:	(954) 383-2072	Night Telephone:	(954) 383-2072
Beach Name:	Hollywood/Hallandale Beaches		
Point of Contact & Phone #	N/A	Email Address for Point of Contact: (if different from above)	N/A
2. GENERAL SURVEY INFORMATION			
<p>Survey Boundary Information: Please describe survey boundaries geographically. If boundaries have changed, please enter the new boundaries in the space below. <u>Be specific</u> and use known landmarks that can be found on a map (or include a marked map).</p>			
Beginning Survey Boundary:	3.9 km S of Port Everglades Inlet (26.06043, -80.11138)		
Ending Survey Boundary:	Broward/Miami-Dade Co Line (25.97518, -80.11828)		
Beach Length: KM (miles):	9.4 km (5.8 miles)	Was this the same survey area as last year? (Y or N)	Y
<p>IF NO, please explain the specific differences, new survey length, AND why the survey area changed:</p>			
N/A			
Start Date of Survey (mm/dd/yy):	03/01/16	End Date of Survey (mm/dd/yy):	10/31/16
Time of Day Surveyed: Start (AM or PM)	~6:00 AM (30 Minutes Bef	Finish (AM or PM)	~9:00 AM
Number of Days Per Week Surveyed:	7		
Total # of Days Surveyed in 2016 (this is the total # of days between start and end dates MINUS any missed days):	245		
<p>If you did not survey 7 days per week throughout the nesting season, please describe your survey schedule (how many days per week, what days of the week). It is recommended to adhere to a fixed schedule if 7 days/week is not possible (e.g., 5 days/week every week), and these days would preferably be consecutive.</p>			
N/A			
<p>If you did not survey 7 days per week, how were tracks counted on the day that surveys resumed after a missed day?</p>			
N/A			
Were all non-nesting crawls (false crawls) counted during your survey?	Y/N	Y	
How many people were involved in surveying your nesting beach this season?	25		

3. NESTING BEACH MANAGEMENT INFORMATION						
Do you collect GPS data for your nests? (Y/N)	Y	Do you save (electronic or paper files) these data? (Y/N)	Y			
How many nests were RELOCATED this season?	3	Of these, how many were for construction projects, e.g., beach renourishment?	0			
List other reasons:	Exposed egg chamber with active egg loss					
Do you mark nests for inventory to determine hatching success?	Y/N	Y				
If yes, how many nests were inventoried in 2016? (Note: data for all inventoried nests must be submitted on the NPA spreadsheet)	154					
4. FATE OF NEST INFORMATION (for marked and unmarked nests)						
Do you actively look for and record predation events?	Y/N	Y				
Regarding mammalian predation events, what proportion of the events do you likely record? All, Most, Some, or Few	All					
If you record predation events, how many nests were negatively affected by each predator species during the course of the season? Note: 1) no nest should occur in more than 1 box (there are spaces for multiple predators); 2) For "other", please enter in the space provided the specific predator(s), e.g., "bobcat" or "bobcat & ghost crab"; 3) Predation events include both partially & completely predated nests.						
Only Raccoon	0	Only Feral Hog	0	Raccoon & Ghost Crab	0	
Only Fox	1	Only Armadillo	0	Coyote & Ghost Crab	0	
Only Coyote	0	Mammal-Unk	0	Other:	N/A (be specific)	0
Only Dog	0	Only Ghost Crab	0	Other:	N/A (be specific)	0
Canine (unsure if Coyote or Dog)	0	Only Ants	0	Other:	N/A (be specific)	0
If predator control methods other than screening/caging were employed, please describe below:						
N/A						
How many nests were negatively affected by another nesting sea turtle?						0
How many nests were negatively affected by roots (i.e., damaged eggs, impeded hatchling emergence)?						0
How many nests were negatively affected PRIOR to hatching by each of the following storm-related events? Note: this does not include stake loss.						68
Complete Wash Outs	4	Partial Wash Outs	3	Accretion		4
Inundation (flooded)	0	Washed over	68	Other:	N/A (be specific)	0
Please give name(s) of storms if possible		Tropical Depression 8 and Hurricane Matthew				
How many nests were taken or disturbed by humans (Example: nest dug into, eggs removed, etc.)? Note: this does not include stake removal.						0
Please give details:		N/A				
If human disturbances occurred, were they reported to law enforcement? Y/N						Y
How many disorientation events occurred on this survey area in 2016?						25
Have all disorientation reports been submitted to FWC? Y/N						Y
I certify the above information to be true and accurate to the best of my knowledge. (type in name & date)						
Curtis Slagle			Date:	11/22/2016		



**FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
FISH AND WILDLIFE RESEARCH INSTITUTE
ANNUAL REPORT FOR THE STATEWIDE NESTING BEACH SURVEY, 2016**

1. PRINCIPAL PERMIT HOLDER INFORMATION

Principal Permit Holder:	Curtis Slagle	Permit Number:	214
Beach Name:	Hollywood/Hallandale Beaches		

2. GENERAL NESTING DATA for All nests on this survey area (Marked, Unmarked, & Misidentified Nests)

	<i>C. caretta</i> (Loggerhead)	<i>C. mydas</i> (Green Turtle)	<i>D. coriacea</i> (Leatherback)	<i>E. imbricata</i> (Hawksbill)	<i>L. kempii</i> (Kemp's Ridley)
Total # of Nests	192	1	2	0	0
Total # of Non-Nesting Emergences (False Crawls)	269	2	0	0	0
Date (mm/dd/yy) of First Documented Nest	04/30/16	08/28/16	04/20/16		
Date (mm/dd/yy) of Last Documented Nest	08/24/16	08/28/16	05/25/16		

Total # of Nests <i>Prior</i> to 15 May:	9	0	1	0	0
Total # of Nests <i>After</i> 31 Aug:	0	0	0	0	0

Comments: N/A

In the spaces below, please provide information on the initial nest treatment (e.g., in situ, screened, relocated, etc.). For example, if the initial treatment was in situ with no protection, it should be included in "(a) # of Nests left in place without additional protection" even if you later relocate the nest due to erosion.

Nest Data for nests left in place (where the turtle deposited the clutch): These nests may be left without additional protection, screened with a self-releasing flat screen, or covered with self-releasing or restraining above-ground cages.

Record the number of nests by category and species. For each species, rows a+b+c+d should equal the total number of nests left in place. Please check to make sure this is the case.	<i>C. caretta</i> (Loggerhead)	<i>C. mydas</i> (Green Turtle)	<i>D. coriacea</i> (Leatherback)	<i>E. imbricata</i> (Hawksbill)	<i>L. kempii</i> (Kemp's Ridley)
TOTAL # OF NESTS LEFT IN PLACE (a + b + c + d)	192	1	2	0	0
(a) # of Nests left in Place without Additional Protection	192	1	2	0	0
(b) # of Nests left in Place with Self-Releasing Flat Screen	0	0	0	0	0
(c) # of Nests left in Place with Self-Releasing Cage	0	0	0	0	0
(d) # of Nests left in Place with Restraining Cage	0	0	0	0	0

Relocated Nest Data: Relocated nests are those where the clutch is removed from its original site of deposition and reburied at another site. As with nests left in place, relocated nests may be left without additional protection, covered with self-releasing flat screen, or covered with a self-releasing or restraining above-ground cages. **Include ALL Relocated nests**, e.g., beach renourishment, nests moved because of possible inundation, etc.

Record the number of nests by category and species. For each species, rows a+b+c+d+e+f should equal the total number of relocated nests. Please check to make sure this is the case.	<i>C. caretta</i> (Loggerhead)	<i>C. mydas</i> (Green Turtle)	<i>D. coriacea</i> (Leatherback)	<i>E. imbricata</i> (Hawksbill)	<i>L. kempii</i> (Kemp's Ridley)
TOTAL # OF NESTS RELOCATED (a + b + c + d + e + f)	0	0	0	0	0
(a) # of Relocated Nests without Additional Protection	0	0	0	0	0
(b) # of Relocated Nests with Self-Releasing Flat Screen	0	0	0	0	0
(c) # of Relocated Nests with Self-Releasing Cage	0	0	0	0	0
(d) # of Relocated Nests with Restraining Cage	0	0	0	0	0

Additional Comments for the 2016 Season

Beach Name:

Hollywood/Hallandale Beaches

<p>Nesting Beach Management Information (e.g., predation, storms, poaching, etc.)</p>	<p>Hurricane Matthew- Five nests were impacted by Hurricane Matthew: Five washed over and two of which were washed out.</p> <p>Tropical Storm 8 - 17 nests were impacted by Tropical Storm 8: 17 washed over, 1 relocated due to exposed eggs and one of which was washed out.</p> <p>Restraining Caging - Storm and high tide events resulted in multiple cages having to be removed sporadically throughout the season. Most cages were able to be replaced within three days of removal. 36 of 39 restraining cages were inventoried. The restraining cages not inventoried were either washed out or the egg chamber location was lost during the season.</p> <p>Poaching - No poaching attempts documented, one nest was vandalized by the removal of stakes.</p>
<p>General Nesting Data (e.g., nests, false crawls)</p>	<p align="center">195 total nests and 271 total false crawls</p> <p align="center">18 ONA Reports and 25 DIS Reports</p> <p align="center">3 missed nests, 2 associated with a false crawl</p>
<p>Nest Success Data</p>	<p align="center">154 nests inventoried and 41 nests not inventoried</p>
<p>Miscellaneous Comments Regarding Data</p>	<p align="center">Restraining cages were utilized as a conservation effort for local lighting issues.</p>

Appendix 2: Sea turtle nest sign. Size: 5.5"x8.5".

**DO NOT DISTURB
SEA TURTLE
NEST**



**VIOLATORS SUBJECT
TO FINES AND
IMPRISONMENT**

**FLORIDA LAW
CHAPTER 379.2431(1)**

No person may take, possess, disturb, mutilate, destroy, cause to be destroyed, sell, offer for sale, transfer, molest, or harass any marine turtle or its nest or eggs at any time.

Upon conviction, a person may be imprisoned for a period of up to 60 days or fined up to \$500, or both, plus an additional penalty of \$100 for each sea turtle egg destroyed or taken.

**U.S. ENDANGERED
SPECIES ACT OF 1973**

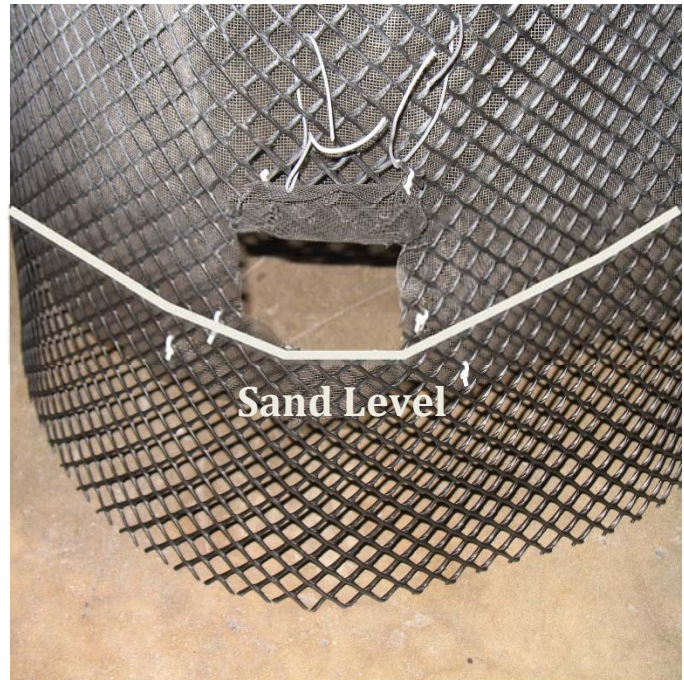
No person may take, harass, harm, pursue, hunt, shoot, wound, kill, trap, or capture any marine turtle, turtle nest, and/or eggs, or attempt to engage in any such conduct.

Any person who knowingly violates any provision of this act may be assessed a civil penalty up to \$25,000 or a criminal penalty up to \$100,000 and up to one year imprisonment.

**SHOULD YOU WITNESS A VIOLATION, OBSERVE AN INJURED
OR STRANDED TURTLE, OR MISORIENTED HATCHLINGS,
PLEASE CONTACT FWC AT**

1-888-404-FWCC OR *FWC (MOBILE PHONE)
FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION
MARINE TURTLE PROTECTION PROGRAM

Appendix 3A: Sea turtle hatchling restraining cage design with escape door. Size ~24 inch high x 24 inch diameter.



Appendix 3B: Restraining cage informational sign. Size: 8.5"x11".



Appendix 5: Lighting survey examples of light fixtures.

Cobra: Bright streetlights, look like a cobra head.



Acorn: Streetlights that resemble acorns, sometimes turtle-friendly with amber bulb.



Floodlight: Very bright, usually attached to corners of buildings.



Carriage: Typically used as streetlights, light looks like would be on horse drawn carriage.



Globe: Circular, typically used as streetlights, sometimes half globes are seen.



NEMA: Extremely bright streetlight.



Bell: Typically streetlights that look like a bell.



Wall mount: Anything that is mounted to a wall of a building that is not described elsewhere.



Ceiling mounted: Anything that is mounted to a ceiling that is not described elsewhere.



Up-lighting: Lights that are directed upward.



Bollards: A lot are turtle friendly if fitted properly; most are pathway lights attached to ground.



Landscape: Directed towards trees or vegetation.



Spotlights: Very bright, direct light towards something specific.



Interior: Any lights that are inside and on.



Rope lighting: Multiple small lights attached to a rope.



Posted: Any other lights on a pole not specifically known.



UFO: Streetlights that resemble UFOs.



Canister: Light housed in a canister; considered turtle-friendly if it is pointing directly down.



Pool lights: Lights that are underwater.



Neon: Lights that show are neon colors.



Signage: Signs that are lit up.



Fluorescent: Extremely bright lights, usually seen in car garages.



Step lights: Small lights that illuminate steps of a stairway.



Walkway lights: Lights that illuminate a walkway.



Appendix 6: Summary of sea turtle emergency line use.

Call Subject	Number of Calls
Live Strandings	31
Dead Strandings	38
Strandings Outside of Broward County	4
Nest Locations	32
Exposed Eggs	14
Hatchling Pick-Up	71
Caging Inquires	14
Lighting Concerns	15
Non-Emergency Sea Turtle Inquires	196
Other Wildlife Emergencies	20
Spam	183
Overall	618

Appendix 7: Example FWC sea turtle stranding report.

SEA TURTLE STRANDING AND SALVAGE NETWORK – STRANDING REPORT

<p>OBSERVER'S NAME AND CONTACT INFORMATION: First <i>Jessica</i> M.I. L Last <i>Boyd</i> E-mail <i>cs1858nova.edu</i> Affiliation <i>Broward County Sea Turtle Conservation Program</i> (Area code) Phone number <i>954-262-3672</i></p>	<p>STRANDING DATE: Year 20 ¹ <i>6</i> Month ¹ <i>1</i> Day ² <i>2</i> Turtle number by day ⁰ <i>1</i></p> <p><small>State coordinator must be notified within 24 hrs; this was done by <input type="checkbox"/> phone (561)575-5407 <input type="checkbox"/> email <input type="checkbox"/> fax (561)743-6228 <input type="checkbox"/> FWC Wildlife Alert Hotline 1-888-404-3922</small></p>
---	---

SPECIES: (check one)

- CC = Loggerhead
- CM = Green turtle
- DC = Leatherback
- EI = Hawksbill
- LK = Kemp's ridley
- LO = Olive ridley
- UN = Unidentified

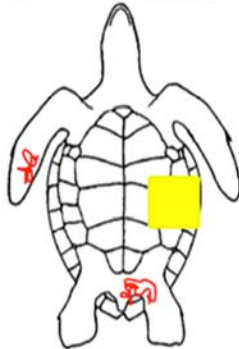
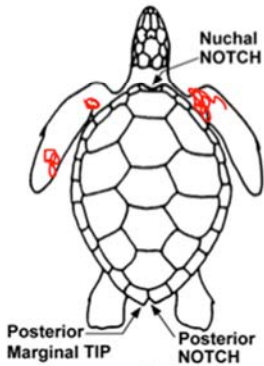
Check unidentified if not positive. Do not guess.

Photos taken? Yes No
 Species verified by state coordinator? Yes No

SEX: (check one)

- Immature, undetermined
- Female Male

How was sex determined?
 Necropsy
 Tail length (adult only)
 Length of tail beyond carapace _____



STRANDING LOCATION: Offshore (Atlantic or Gulf beach) Inshore (bay, river, sound, inlet, etc)

State *Florida* County *Broward*
 Descriptive location (be specific)
1136 Holiday Dr - B Ocean, Fort Lauderdale 33316

Latitude *26.06538* Longitude *-80.06271*

CONDITION: (check one)

- 0 = Alive
- 1 = Fresh dead
- 2 = Moderately decomposed
- 3 = Severely decomposed
- 4 = Dried carcass
- 5 = Skeleton, bones only

FINAL DISPOSITION: (check one)

- 1 = Left on beach where found; painted? Yes* No(5)
- 2 = Buried: on beach / off beach; carcass painted before buried? Yes* No
- 3 = Salvaged: all / part(s), what/why?
For FWC Necropsy, & potential specimen in BCSTCP Freezer at Nova
- 4 = Pulled up on beach/dune; painted? Yes* No
- 6 = Alive, released
- 7 = Alive, taken to rehab. facility, where?
- 8 = Left floating, not recovered; painted? Yes* No
- 9 = Other, explain

**If painted, what color?*

TAGS: Contact state coordinator before disposing of any tagged animal!!

Flipper tags present at stranding? Yes No
 If so, has CMTTP been notified? Yes No
Check all 4 flippers. If found at stranding, record tag number(s)/tag location/return address

PIT tag scan? Yes No
Check all 4 flippers. If PIT tag found at stranding record id/tag location
 NSF

Checked for living tag? Yes No
 If found, record location (scute number & side)
 NSF

CARAPACE MEASUREMENTS: (see drawing)

Using calipers Choose unit

Straight length (NOTCH-TIP) _____ C

Minimum length (NOTCH-NOTCH) _____ C

Straight width (Widest Point) _____ C

Using non-metal measuring tape Choose unit

Curved length (NOTCH-TIP) *38.4* C

Minimum length (NOTCH-NOTCH) *38* C

Curved width (Widest Point) *33* C

Weight actual / est. *20* I.

TUMOR DOCUMENTATION:

Fibropapilloma-like tumors present? Yes No
 FP documentation form attached? Yes No

Mark wounds or abnormalities on diagrams at left and describe below (note tar or oil, gear or debris entanglement, propeller damage, epibiota, papillomas, emaciation, etc.). **Please note if no wounds or abnormalities were found.** If released, note if new tags were applied.

Growth in left eye, growths in inguinal areas and around tail

Appendix 8: Example FWC fibropapilloma documentation form.

FIBROPAPILLOMA DOCUMENTATION FORM

Please complete for every turtle exhibiting fibropapillomas and submit with the STSSN report form.

Observer: Jessica Boyd Stranding Date: Nov. 22, 2016

Stranding Number by Day: 01 Species: CM

1. Please select sites where tumors are present:

- Left Eye Right Eye Inside Mouth Neck
 Base Front Flippers Base Rear Flippers Along Front Flippers Along Rear Flippers
 Around Tail On Carapace On Plastron Other _____

2. How many fibropapillomas are less than 1 cm in diameter? (select one)

- 0 1 - 5 greater than 5

3. How many fibropapillomas are between 1 cm and 4 cm in diameter? (select one)

- 0 1 - 5 greater than 5

4. How many fibropapillomas are between 4 cm and 10 cm in diameter? (select one)

- 0 1 - 3 greater than 3

5. How many fibropapillomas are greater than 10 cm? (select one)

- 0 1 - 3 greater than 3

6. Do you believe that vision was blocked by fibropapillomas? (select all that apply)

- No Yes, in Left Eye Yes, in Right Eye Yes, in Both Eyes

7. Please describe the size and exact location of any fibropapillomas inside the mouth.

Unable to examine interior of mouth

Please be sure to take photographs showing all ventral and dorsal surfaces. Please also take one "head-on" photograph of the turtle. If there is a fibropapilloma inside the mouth, please take a photograph of it. *If the turtle is not a green turtle, or if it has a fibropapilloma inside the mouth, please salvage the turtle and contact the FWC turtle staff through a text message to SeaTurtleStaff@myfwc.com or by calling the FWC Wildlife Alert Hotline at 1-888-404-3922.*

Appendix 9: Summary of sea turtle strandings.

The BCSTCP responded to 47 stranding events from January 1–December 31, 2016. Of the 47 stranding events, 28 turtles were dead upon arrival (20 *Chelonia mydas*, 7 *Caretta caretta*, 1 *Eretmochelys imbricata*). Of the dead stranding responses, 10 turtles suffered from boat strikes, 1 from entanglement, 1 from consumption of plastics/line, 8 predator attacks, and 8 unknown cause of death. Nineteen strandings were in response to live turtles (1 *Lepidochelys kempii*, 1 *Eretmochelys imbricata*, 4 *Caretta caretta*, and 13 *Chelonia mydas*). The live turtles inflicted injury from numerous sources as well. Two were struck by a boat, 9 were accidentally hooked by fishermen, and 1 was emaciated. Eight live turtles were transported to Miami Seaquarium in Miami, Florida and 11 were taken to Gumbo Limbo Nature Center in Boca Raton, Florida for treatment and rehabilitation. One live stranded turtle died in transport to a rehabilitation facility.

Appendix 10: Example FWC marine turtle disorientation report.

CJS 16 09 18 01 BRO

Permit Holder Initials Year Month Day Dis. # by Day County Code

FWC MARINE TURTLE DISORIENTATION REPORT

If you have any questions, please contact FWC at the Tequesta Field Laboratory (561) 882-5975

Fax reports to: (561) 743-6228 or Email reports to: SeaTurtleLighting@MyFWC.com

Send reports to: Disorientation Reports, FWC, 19100 SE Federal Highway, Tequesta, FL 33469

Marine Turtle Permit #: 215 Date of Incident: 9/18/16

Observer's Name: Curtis Slagle

Telephone (include area code): 954-262-3672 E-mail address: cs1858@nova.edu

Location of Disorientation Event: (address, beach name and/or nearest landmark): 2100 S Ocean Lane

City: Fort Lauderdale County: Broward

Local nest ID#: 1130 Zone nest was located in: 84

Nest GPS Coordinates (use decimal degrees: i.e., Lat 26.845412 Long -80.458796):

Latitude: 26.096155 Longitude: -80.104932

SPECIES: (check one) <input checked="" type="checkbox"/> Cc = Loggerhead <input type="checkbox"/> Cm = Green Turtle <input type="checkbox"/> Dc = Leatherback <input type="checkbox"/> Un = Unidentified <input type="checkbox"/> O = Other _____	TYPE OF EVENT: (check one) <input type="checkbox"/> Adult – Nesting Emergence <input type="checkbox"/> Adult – False Crawl <input checked="" type="checkbox"/> Hatchling	NEST TREATMENT: (check all used) <input type="checkbox"/> Restraining Cage <input type="checkbox"/> Self-releasing Screen/Cage <input type="checkbox"/> Light Barrier (i.e., silt screen) <input checked="" type="checkbox"/> Relocated
---	--	--

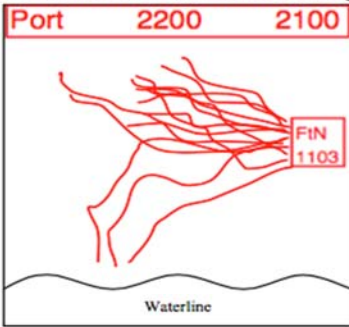
Incident was documented during: (check one) Morning Survey Night Survey Daytime

Was the incident photographed? YES NO

Was the source nest found? YES NO

Was the nest excavated? YES NO

If "YES" report date of excavation: 9/21/16



Number of turtles disoriented: <input type="checkbox"/> 1 <input type="checkbox"/> 2-10 <input type="checkbox"/> 11-50 <input checked="" type="checkbox"/> >50	Disoriented turtles reaching the water: <input type="checkbox"/> All <input checked="" type="checkbox"/> Some <input type="checkbox"/> None <input type="checkbox"/> Not investigated
---	--

Were any disoriented turtles found dead? YES NO

If "YES" indicate the number: _____

Addresses/landmarks turtle(s) disoriented towards: Port Everglades & 2200 S Ocean Lane, Fort Lauderdale

Were probable/possible light source(s) identified? YES NO

If "NO" indicate why: (check one) No lights present Too many lights Other: _____

Indicate categories of light(s) identified as probable/possible lighting sources: (check all that apply)

- | | | |
|---|--|--|
| <input type="checkbox"/> parking lot | <input checked="" type="checkbox"/> street light | <input checked="" type="checkbox"/> condominium (interior) |
| <input type="checkbox"/> dune crossover | <input type="checkbox"/> single family home (interior) | <input checked="" type="checkbox"/> condominium (exterior) |
| <input type="checkbox"/> restaurant/bar | <input type="checkbox"/> single family home (exterior) | <input checked="" type="checkbox"/> sky glow/urban glow |
| <input type="checkbox"/> pier | <input type="checkbox"/> sign | <input checked="" type="checkbox"/> other: Port Everglades |

Additional comments (use back if necessary): _____

Local authority provided a copy of this report: City County FWC Other: _____

Signature of Observer _____ Date 9/18/16

FWC Revised 6/92, 11/96, 9/97, 1/99, 3/01, 1/02, 1/08, 5/12

Appendix 11: Example FWC obstructed nesting attempt form.

FWC MARINE TURTLE OBSTRUCTED NESTING ATTEMPT (ONA) REPORT FORM

If you have any questions please contact FWC at the Tequesta Field Laboratory (561) 575-5407
Fax reports to: (561) 743-6228 or Email reports to: SeaTurtleLighting@MyFWC.com
Send reports to: ONA Reports, FWC, 19100 SE Federal Highway, Tequesta, FL 33455

Turtle Permit #: 214 Date of Incident: 9/3/16

Observer's Name: Curtis Slagle

Telephone (include area code): 954-262-3672 E-mail address: cs1858@nova.edu

Species: Loggerhead Green Leatherback Other: _____

Crawl resulted in: Nest False Crawl

Location of nest or false crawl (address, beach name and/or nearest landmark): 1107 Hillsboro Mile

GPS Coordinates of nest or false crawl location:
(in the WGS projection in decimal degrees i.e., Lat 26.845412 Long -80.458796):

Latitude 26.287808 Longitude -80.078268

City: Hillsboro Beach County: Broward

Local nest ID#: HN 1098 Zone nest/false crawl was located in: 13

Obstruction(s) encountered: (please circle)

- | | | | | |
|--|---|--|---|---|
| <input type="checkbox"/> Beach furniture | <input type="checkbox"/> Dune Crossover | <input checked="" type="checkbox"/> Escarpment | <input type="checkbox"/> Rock Outcropping | <input type="checkbox"/> Special Events Equipment |
| <input type="checkbox"/> Boat | <input type="checkbox"/> Groins | <input type="checkbox"/> Marine Debris | <input type="checkbox"/> Rock Revetment | <input type="checkbox"/> Tent |
| <input type="checkbox"/> Cabana | <input type="checkbox"/> Geotube/Sandbags | <input type="checkbox"/> Nourishment Equipment | <input type="checkbox"/> Seawall | <input type="checkbox"/> Umbrella |

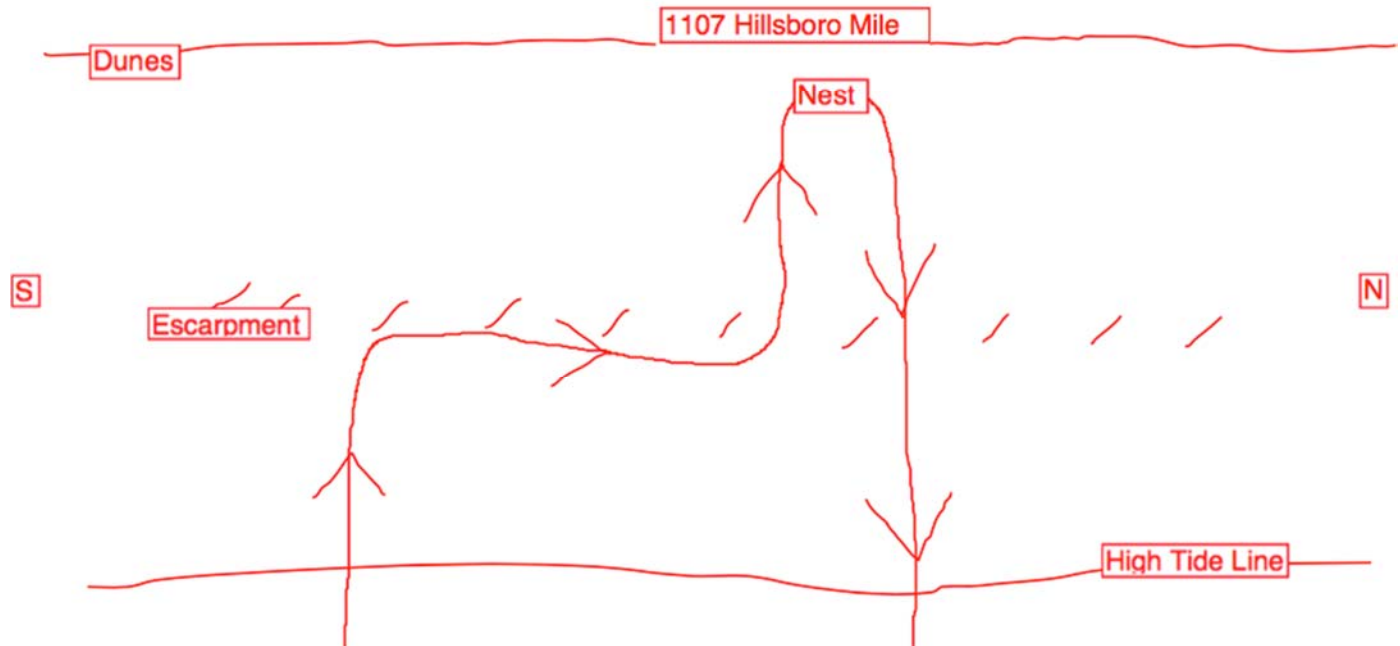
Other Obstruction (please describe): _____

Describe Event: Sea turtle emerged crawled west until hit escarpment, turned north and crawled along escarpment. She managed to start crawling west and navigate up escarpment, she nested and then crawled east back to the ocean.

Curtis Slagle 9/3/16

Signature of Observer Date

Event photograph attached



Appendix 12: Summary of education and outreach activities

Marine turtles have a strong presence on the beaches of Broward County, Florida and within the coastal community. One of the goals of the BCSTCP is to provide engaging educational/outreach opportunities to the general public and students to bring awareness to individuals, businesses, beach users, and coastal residents to try to nurture stewardship towards a more suitable environment for these important animals. Educational flyers were distributed throughout the season to interested parties on the beach, at turtle talks, classroom/school visits, and hatchling releases.

In 2016, the BCSTCP conducted a total of 142 education/outreach events connecting with over 50,700 individuals.

- Turtle talks (49 presentations, ~2,700 participants)
 - Marriott's Beach Place Towers
 - Sheridan Hills Christian School
 - Broward County Master Naturalist
 - Cardinal Gibbons High School Nautical Club
 - Save Ocean Life
 - Green Children's House
 - Our Circle of Friends
 - Hola Mundo Beach Camp
 - Driftwood Middle School (Career Day)
 - Somerset Pines STEM
 - Miami Country Day School
 - Forest Hills Elementary School (Career Day)
 - Royal Palm Elementary School (Career Day)
 - Broward Charter School
 - Nova Blanche Forman Elementary (Career Day)
 - Miami Children's Museum
 - American Heritage Science Camp
 - Sea Turtle Oversight Protection Youth Camp
 - City of Hollywood Sea Camp
 - City of Deerfield Beach
 - Mailman Segal Center for Human Development
 - Bayview Elementary School
 - Camp Live Oak
 - Marblue Montessori Academy
 - Stocked on Salt
 - NSU Sherman Library
 - Girl Scouts of Broward County
 - Jewish Cooperative School
 - Anne Kolb Nature Center
 - Virginia Shuman Young Elementary School
 - Broward College Science Club
 - NSU Early Emersion Program
 - Flamingo Elementary School (Career Day)
 - Yeshiva High School Humane Club
 - Somerset Academy Charter

- Wynmoor Club
- Turtle talks followed by public hatchling release (58 presentations; ~2,400 participants)
 - Anne Kolb Nature Center
 - Boy Scouts of America
 - Girl Scouts of America
 - Pompano Dive Center
 - Buzzy Kids, Inc.
 - 4-H Broward County Hooked on Nature
 - Hillsboro Club
 - International Game Fishing Association Summer Camp
 - Wild Over Wildlife Club
 - Memorial Milers
 - Stocked on Salt
 - Beaux Arts
 - MOSS Construction
 - Pawnee Tribe of the Y Princess Niccosukee Nation
 - Lauderdale Yacht Club
 - Virginia Shuman Young Elementary
 - Save Ocean Life
 - NSU Fellows
 - NSU Ambassadors Board
 - Various family groups
- Table events (24 events, ~45,500 participants)
 - Tri-Rail's Rail Fun Day
 - Hollywood Car Show
 - Gumbo Limbo Nature Center Sea Turtle Day
 - Loggerhead Marine Life Center TurtleFest
 - Dania Beach Arts and Seafood Celebration
 - Marine Industries Association of South Florida Plywood Regatta
 - Tortuga Music Festival Conservation Village
 - Broward College Earth Day
 - NSU Earth Day Celebration
 - Florida Earth Festival
 - Deerfield Spring Fest
 - Mcnicol Middle School Green Expo
 - Flamingo Gardens KidzFest
 - Museum of Discovery and Science Event
 - Marine Industry Day
 - Veteran Earth and Pompano Dive Center Event
 - International Coastal Cleanup at Dr. Von D. Mizell-Eula Johnson State Park
 - Challenger Elementary School Science Event
 - NSU Open House
 - Fort Lauderdale International Boat Show
 - Broward County Green Expo

- Excavation demonstrations (4 demonstrations, ~100 participants)
 - Sea Turtle Oversight Protection Youth Camp
 - 4-H Broward County Hooked on Nature
 - Boy Scouts Troop 441 & Cub Scouts Pack 441

- Ride-along tours (7 tours)

Appendix 13: Historical sea turtle strandings in Broward County, 2004-2016.

