

TECHNICAL REPORT

BROWARD COUNTY SEA TURTLE CONSERVATION PROGRAM 2018 REPORT

**For the
BROWARD COUNTY BOARD OF COUNTY COMMISSIONERS**



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EXECUTIVE SUMMARY

The BCSTCP is funded and administered by the Broward County Board of County Commissioners through the Environmental Planning and Community Resilience Division (EPCRD) and carried out by Nova Southeastern University (NSU) to conduct sea turtle nesting surveys daily from March 1–October 31, 2018 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.

A total of 2,890 (2,733 loggerhead, 136 green, 18 leatherback, and 3 unknown species) nests were deposited in Broward County from March 8 to October 24, 2018. This is 697 less nests for all species combined than 2017 which was the record high nesting season since the BCSTCP's inception in 1981. Loggerhead turtles led the nesting again this year with 2,733 nests, which is 165 less than last year. Loggerheads fell a little short of the five-year average of 2,929 nests per season. Green turtles laid 136 nests which was 529 below the record green turtle nest season in 2017. 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 2017 season was a record high nesting year for green turtles, and so low green turtle nesting was expected in 2018. This season was much lower than the five-year average of 307 green turtle nests. Leatherback turtles are the least common nesters in Broward County, laying 18 nests in 2018. This season, leatherback nesting fell below the five-year average of 26 nests.

Nesting success (nests/(nests + false crawls)) averaged 44.43% for all species combined, 0.8% lower than the 2017 season and about 1% lower than the five-year average of 45.31%. Loggerhead nesting success was 43.87%, very similar to 2017 (43.20%), and about 1% lower than the five-year average of 44.42%. Green turtle nesting success was 53.54%, about 2% lower than 2017 (55.74%) and slightly higher than the five-year average of 50.82%. Leatherbacks showed an increased nesting success of 100%, compared to the 2017 season at 92.31% and fell about 10% above the five-year average of 90.70%.

Reproductive success was investigated for 2,064 nests after hatch-out (1,932 *in situ*, 78 relocated, and 54 restraining cage nests). Emergence success for *in situ* loggerhead nests in 2018 (77.72%) was higher compared to 2017 (69.00%). Emergence success for *in situ* green nests in 2018 was 75.79% which was slight lower than 2017 that had an emergence success of 77.42%. Emergence success for *in situ* leatherback nests rose from 51.61% in 2017 to 57.00% in 2018.

The Hillsboro Beach survey zone had the most nesting in Broward County with an average of 236.98 nests/mile (145.57 nests/km; all species combined). The Hollywood Beach survey zone had the lowest nesting density with an average of 22.59 nests/mile (13.94 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 hatch-out. 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 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), sand placement concluded on December 24, 2016.
- City of Hollywood Beach Nourishment (R107-R109 +300ft, 380ft north of R119-280ft north of R124, 265 north of R100.5-R102), approximately 91,000 cubic yards of sand was placed in this area. Sand placement concluded in March 2018.
- 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 EPCRD and Broward County Board of County 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 (including 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 NSU 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 EPCRD 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 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.
- City of Hollywood Beach Nourishment (R107-R109 +300ft, 380ft north of R119-280ft north of R124, 265 north of R100.5-R102), approximately 91,000 cubic yards of sand was placed in this area. Sand placement concluded in March 2018.
- 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).

Program Goals

The BCSTCP goals in 2018 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, 2018). The FWC Marine Turtle Permit, FWC Marine Turtle Conservation Handbook, and the contract with Broward County were used to set procedures for all monitoring, stranding, and survey protocols for this program.

2018 BCSTCP Staff:

Stephanie Kedzuf – Broward County Contract Administrator
Derek Burkholder – Principle Investigator / Director
Curtis Slagle – Project Manager / Permit Holder
Glenn Goodwin – Assistant Project Manager / Outreach Coordinator
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Alexis Peterson	Morning Staff	Carmen Rodriguez	Lighting Staff
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Sea Turtle Nesting Surveys

Daily sea turtle nesting surveys were conducted by BCSTCP staff from March 1–October 31, 2018 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 are 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 and Deerfield Beaches (Hillsboro), Pompano Beach including Lauderdale-By-The-Sea (Pompano), Fort Lauderdale,

Mizell-Eula State Park, and Hollywood and Hallandale Beaches 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 were 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 were 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 were verified by at least one additional senior staff member after being 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 ArcGIS 10.6.1 (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 were 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 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 flagging tape. If during the season the nest markers were lost, washed away, vandalized, etc. the nest was reestablished using the Trimble sub-meter GPS units. Upon reestablishment, nests were marked with a circle of Red-Glo flagging tape with at least a five feet 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 mortality of the embryos during transportation. A new “nest chamber” was dug by hand to the same depth/width/shape as the original nest chamber, eggs were placed in the chamber and reburied following the FWC Marine Turtle Conservation 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 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, as per the FWC permit. 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.

Cages were constructed of a thick plastic mesh (¾ inch x ¾ inch) 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) Hatched eggs
- 2) Live hatchlings in nest (LIN)
- 3) Dead hatchlings in nest (DIN)
- 4) Live pipped hatchlings (LPIP)
- 5) Dead pipped hatchlings (DPIP)
- 6) Whole, unhatched eggs
 - Unhatched egg with visual development (VD)
 - Unhatched egg with no visual development (NVD)

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

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

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

Lighting Surveys

Surveys for artificial lighting on Broward County beaches were conducted once each month from March–September 2018 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 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 et al., 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 Broward County Sea Turtle Conservation Program Lighting Survey 2018 Summary Report (Broward County, 2018).

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 necessary equipment (tag reader, measuring tape, data sheets, knife, 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 (though this form was phased out partway through the 2018 season and will not be used in the future) (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 2018 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 hatch outs 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 travels 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 most 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 hatchling disorientation event, the nest was marked with the date of hatch out on colored flagging tape to avoid report duplication among groups. In addition, a Marine Turtle Disorientation Report Form (Appendix 10) was filed for each disorientation event. Analyses were conducted using BCSTCP data only as well as all disorientation reports logged by all groups in Broward County. Adult disorientations were observed and reported only by the BCSTCP; Disorientation Forms were filed for these instances, but no analysis was performed on these data.

When a nesting female encountered an obstruction (escarpment, beach furniture, sea wall, rocks, etc.) that impacted her nesting attempt, a Marine Turtle Obstructed Nesting Report (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 2018, a total of 114 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 49,048 individuals (Appendix 12).

RESULTS

Sea Turtle Nesting Surveys

The 2018 sea turtle nesting surveys in Broward County started on March 1, 2017, and the first crawl of the season was a leatherback nest discovered on March 8, 2018. A total of 6,505 emergences were documented for all of Broward County resulting in 2,890 nests and 3,615 false crawls (Figure 4) or a 44.43% nesting success for all species (Figure 5). This is slightly below last year's nesting success at 45.25% and is still below the five-year average nesting success for all species of 45.31%.

Following the general trend, leatherback turtles were the first species to nest in Broward County in 2018, 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 2018 season. A total of 18 crawls were recorded in all of Broward County resulting in 18 nests and no false crawls for a County-wide nesting success for leatherback turtles of 100% (Table 3). This represents a 7.69% increase in nesting success compared to 2017 and is 9.30% higher than the five-year average leatherback nesting success of 90.70% (Figure 7). Leatherback nesting has experienced a significant increase over the life of the program with an average increase of 0.63 nests per year from 1981-2018. Regression shows a highly significant positive trend ($F(1,36) = 13.07$, $P = 0.001$; Figure 8).

Temporal Patterns

The first leatherback nest was deposited on March 8, 2018 and there were no leatherback false crawls documented in the 2018 season. May 4, 9, 11 and 13 each saw 2 leatherback nests each day. The last leatherback nest was deposited on June 12, 2018 (Figure 6).

Spatial Patterns

Leatherback crawls were recorded in all survey zones except Hollywood Beach and Mizell-Eula State Park. County-wide, leatherback turtles laid an average of 0.75 nests/mile (0.47 nests/km). The highest leatherback nesting density was seen in Hillsboro with 2.79 nests/mile (1.71 nests/km) and was lowest in Hollywood Beach and Mizell-Eula State Park where no leatherback nests were documented (Table 4).

Incubation Periods

Incubation periods were determined for 17 leatherback nests left *in situ* on Broward County beaches (excluding Mizell-Eula State Park) in 2018. The overall 2018 season incubation periods for leatherbacks ranged from 59-88 days with a mean incubation period of 68.29 days.

Reproductive Success

Reproductive success was assessed for 17 leatherback nests left *in situ* in Broward County. The 17 nests resulted in 1279 eggs and 729 hatchlings released for an emergence success of 57.00% (Table 5). This represents a nearly 5.5% higher emergence success than was observed in 2017 (51.61%). Pompano Beach had the lowest hatchling emerged percentages at 44.33% and Hillsboro Beach had the highest percentage at 64.12%; however, the small sample sizes make it difficult to compare among beaches (Table 6).

Loggerhead Sea Turtles (*Caretta caretta*)

Overall Nesting Activity

Loggerhead nesting made up the majority of the nesting activity in Broward County in 2018. A total of 6,230 crawls were recorded for loggerhead turtles in all of Broward County: 2,733 nests and 3,497 false crawls, which resulted in a nesting success of 43.87% (Table 3). This is very similar to the loggerhead nesting success from last year (43.20%) but is ~0.5% lower than the five-year average of 44.42% (Figure 7). Loggerhead nesting has experienced a significant increase over the life of the program with an average increase of 35.86 nests per year from 1981-2018. Regression shows a highly significant positive trend ($F(1,36) = 32.28, P < 0.001$; Figure 8).

Temporal Patterns

The first loggerhead nest was deposited on April 19, 2018 and the first loggerhead false crawl was documented on April 28, 2018. Highest daily nesting was recorded on July 6, 2018 when 61 loggerhead nests were discovered in Broward County. The last loggerhead nest was deposited on September 8, 2018, and the last false crawl was recorded on September 1, 2018 (Figure 6).

Spatial Patterns

Loggerhead nests and false crawls were recorded in all survey zones with an average of 114.35 nests/mile (70.80 nests/km) across the entire survey area. Hillsboro experienced the highest loggerhead nesting with 224.65 nests/mile (138.00 nests/km) and Hollywood

showed the lowest loggerhead nesting density with 22.07 nests/mile (13.62 nests/km; Table 4).

Incubation Periods

Incubation periods were determined for 1,825 loggerhead nests left *in situ* on Broward County Beaches (excluding Mizell-Eula State Park) in 2018. Incubation periods ranged from 39-67 days with a mean incubation period of 51.09 days.

Reproductive Success

Reproductive success was investigated in 1,859 *in situ* loggerhead nests across Broward County (excluding Mizell-Eula State Park) in 2018. In these evaluated nests 190,081 eggs were laid resulting in 147,734 hatchlings released for an emergence success of 77.72% (Table 5). This represents nearly a 9% higher emergence success than the 2017 season (69.0%).

Table 7 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 83.37%; the lowest emergence success of *in situ* nests was in Hillsboro Beach at 69.54%.

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 2018 nesting season. A total of 254 crawls were recorded for green turtles in all of Broward County. A total of 136 nests and 118 false crawls resulted in a County-wide green turtle nesting success of 53.54% (Table 3). This represents a 2% decrease in nesting success compared to 2017 and is 2.72% lower than the five-year average green turtle nesting success of 50.82% (Figure 7). Like the other species, green nesting has experienced a significant increase over the life of the program with an average increase of 8.9 nests per year from 1981-2018. Regression shows a highly significant positive trend ($F(1,36) = 31.56, P < 0.001$; Figure 8).

Temporal Patterns

The first green turtle nest was deposited on June 9, 2018 and the first green turtle false crawl was documented on June 4, 2018. Highest daily nesting was recorded on July 15, 2018 when 10 green nests were discovered that morning in Broward County. The last green turtle nest and the last green false crawl were both deposited on October 24, 2018 (Figure 6).

Spatial Patterns

Green turtle nests and false crawls were recorded in all survey zones with a County-wide green turtle average nesting density of 5.69 nests/mile (3.52 nests/km). The highest green nesting density was in Mizell-Eula State Park with 18.75 nests/mile (11.54 nests/km), and the lowest was in Pompano with 0.21 nests/mile (0.13 nests/km; Table 4).

Incubation Periods

Incubation periods were determined for 57 green turtle nests left *in situ* on Broward County Beaches (excluding Mizell-Eula State Park) in 2018. Incubation periods ranged from 47-56 days with a mean incubation period of 50.21 days.

Reproductive Success

Reproductive success was evaluated for 55 green turtle nests that were left *in situ* in 2018. There were 6,655 eggs deposited in the evaluated nests resulting in 5,044 hatchlings released for an emergence success of 75.79% (Table 5). The 2018 season had fewer nests evaluated than 2017, but the emergence success was about 2% lower than that recorded in 2017.

Table 8 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 found on Fort Lauderdale Beach at 85.36% (29 nests evaluated). The lowest emergence success of *in situ* nests was 65.00% (25 nests evaluated), observed in Hillsboro Beach.

Beach Renourishment Projects

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 permitted the placement of 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 188 loggerhead nests and 60 false crawls for a nesting success of 76.0%. Green turtles laid 1 nest and made no false crawls in the project area and leatherbacks had 5 nests and made no false crawls in the project area (Table 9).

Reproductive Success

The Hillsboro/Deerfield Beach Nourishment Project had 139 loggerhead nests that were evaluated for reproductive success. The 139 nests resulted in 18,656 eggs with 15,416 hatchlings released for an emergence success of 81.53%. There were no green or leatherback turtle nests evaluated for reproductive success in the project area (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 saw 6 loggerhead nests and 14 false crawls in the project area, resulting in a loggerhead nesting success in this project area of 30%. There were no leatherback or green turtle crawls in the area this season (Table 9).

Reproductive Success

The Hillsboro Inlet Maintenance and Sand Bypass Project had 6 loggerhead nests evaluated for reproductive success. These nests resulted in 640 eggs and 331 hatchlings released for an emergence success of 51.72% (Table 10).

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 560 loggerhead nests and 651 false crawls documented for a nesting success rate of 46.0%. Green turtles laid 17 nests in the fill area and 10 false crawls for a nesting success of 63%. There was 1 leatherback nest and 0 false crawls for a nesting success of 100% in the project area (Table 9).

Reproductive Success

The Broward County Segment II Project had 479 loggerhead nests that were evaluated for reproductive success. These nests resulted in 49,341 eggs laid and 42,448 hatchlings released for an emergence success of 86.03%. There were 11 green turtle nests evaluated resulting in 1,232 eggs and 1,033 hatchlings released for an emergence success of 83.85%. There was 1 leatherback nest evaluated resulting in 103 eggs and 50 hatchlings released for an emergence success of 48.54% (Table 10).

City of Hollywood Beach Nourishment Project

This is the first year of project monitoring for the City of Hollywood Beach Nourishment (R107-R109 +300ft, 380ft north of R119-280ft north of R124, 265 north of R100.5 - R102), approximately 91,000 cubic yards of sand was placed in this area. Sand placement concluded in March 2018.

Nesting Success

The fill area had 52 loggerhead nests and 60 false crawls for a loggerhead nesting success in the fill zone of 46.00%. Green turtles laid 1 nest and 2 false crawls for a nesting success of 33.00%. Leatherbacks had no crawls in the project area (Table 9).

Reproductive Success

The City of Hollywood Beach Nourishment Project had 45 loggerhead nests that were evaluated for reproductive success. These nests resulted in 4,624 eggs and 3,751 hatchlings released for an emergence success of 81.12%. There were no green or loggerhead nests evaluated for reproductive success in the 2018 season (Table 10).

Relocation

A total of 82 nests (77 loggerhead, 5 green) were relocated throughout the 2018 nesting season. This accounted for 3.13% of all nests laid in Broward County (Figure 9). Of these 82 nests, 40 were relocated mid-incubation due to nest chamber washout or egg exposure, 18 were relocated because they were laid below the high tide line, and the remaining 24 nests were relocated because they were laid in a “donor” zone as specified by FWC.

Incubation Period

Incubation periods were determined for 67 relocated loggerhead nests. Relocated loggerhead nests had an incubation range of 42-67 days with a mean incubation period of 51.88 days. Incubation periods were calculated for 5 relocated green nests. Incubation periods for greens ranged from 45-61 days with an average of 51.4 days.

Reproductive Success

Reproductive success was calculated for 77 relocated nests (72 loggerhead, 5 green). The 72 loggerhead nests resulted in 6,597 eggs with 3,952 hatchlings released for an emergence success of 59.91% (Table 5). The 5 green turtle nests resulted in 615 eggs with 469 hatchlings released for an emergence success of 76.26%.

Disorientation Events

The BCSTCP surveyors reported 149 (22 adult, 127 hatchling) disorientation events across Broward County on morning surveys (Figure 10). Forty-three of these disoriented nests were in the Fort Lauderdale municipality and an additional 32 disoriented nests were in Lauderdale by the Sea municipality. Together these two municipalities accounted for 50.33% of the disorientation events reported by BCSTCP staff this season. The 2018 season saw 69 fewer disorientation events than the 2017 season and was lower than the five-year Broward County average of 170.6 events (Figure 10).

To gain a more comprehensive understanding of the number of hatchling disorientation events in the entire County, all disorientation reports submitted to FWC by all sea turtle monitoring/volunteer groups (BCSTCP, STOP, SFAS, STARS) in Broward County (except Mizell-Eula State Park) were examined. A total of 889 nests experienced hatchling disorientation events out of 2049 nests where a hatch out was observed, yielding a 43.39% disorientation rate (Table 11); however, variation existed among beaches within the County. Fort Lauderdale experienced the highest hatchling disorientation rate at 71.35% (538 nests disoriented out of 754 observed hatch outs). Additionally, Lauderdale-By-The-Sea/Sea Ranch Lakes, and Pompano experienced at least 50% disorientation rates or higher. Dania and Hillsboro had the lowest hatchling disorientation rates with 0.00% (0 nests disoriented out of 4 observed hatchouts) and 2.25% (15 nests disoriented out of 666 observed hatchouts respectively (Table 11, Figure 11).

Predation and Poaching

In 2018, 7 nests (or 0.26% of all nests) in Broward County (excluding Mizell-Eula State Park) experienced predation. This is drastically lower than the 2017 season that had an overall predation rate of 4.59% and is 7.26% lower than the five-year predation average percentage of 7.52% (Figure 12). Broward County has shown little change in predation rates from 2005-2018 until this year. A slight rise in predation in the 2013 and 2014 seasons was not continued during the 2015, 2016, or 2017 season, but fluctuating numbers suggest that continued monitoring of predation rates in this area would be beneficial. Foxes traditionally are the primary predators of

turtle nests in Broward County, but raccoons and several unknown bird species were also documented predated nests. The Hollywood and Pompano survey zones experienced the lowest predation impact with no predation events. The Hillsboro survey zone experienced the highest predation rate with 0.59% of nests experiencing predation (Figure 13). This is greatly reduced from the 2017 season, which saw a 10.76% predation rate and is still considerably lower than the 25% predation rate documented in Hillsboro in 2014. Since Hillsboro hosts the highest nesting density in Broward County and typically sees the highest nest predation rates in the County, the drastic decrease in nest predation in the 2018 season is a very positive sign. Continued monitoring is needed to ensure predation stays low in this area, otherwise this area may warrant some degree of nest protection in future years.

In addition to predation impacts, 5 (4 poaching attempts, 1 nest vandalism) nests in Broward County were impacted by human disturbance/poaching/vandalism (0.17% of all nests laid). This is up from the 2017 season, which saw 0.06% of nests impacted. Luckily, the observed nest poaching events did not appear to result in any egg loss.

Restraining Cages

In the designated “restraining cage” zones, a total of 57 restraining cages were constructed on loggerhead turtle nests: 32 in Fort Lauderdale, 25 in Hollywood.

Incubation Period

Fifty-four of the 57 nests that received hatchling-restraining cages were excavated. Incubation period for caged nests ranged from 45 days to 60 days with a mean incubation period of 50.68 days. This is very similar to the wider dataset of *in situ* loggerhead nests, which had incubation periods ranging from 39-67 days with a mean incubation period of 51.09 days in 2018.

Reproductive Success

Fifty-four caged nests were excavated and analyzed for reproductive success. Three of the 57 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 5,644 eggs were deposited with 4,317 hatchlings released for an emergence success rate of 76.49% across all inventoried caged nests (Tables 5 and 6).

Washover and Washout Events

A total of 803 nests were impacted by washover (excluding Mizell-Eula State Park). Of these 803 nests, 473 were washed out completely (clutch completely or partially lost). A total of 30.23% of all nests throughout Broward County (excluding Mizell-Eula State Park) experienced washover at some point over the 2018 season. This is about 9% lower rate of washover than was experienced in the 2017 season, which had 1,350 (39.71% of nests) nests impacted; this year was slightly lower than the five-year average of 32.74% of nests impacted (Figure 14). Tropical Storms Alberto and Gordon and the King Tides were responsible for 9.59% (n=77) of the washover and 11.63% (n=55) of the washout events in 2018.

Strandings

The BCSTCP responded to 27 marine turtle stranding events from January 1–December 31, 2018. Of these, 9 were live strandings (1 turtle was called in alive but died on arrival) and 18 were dead stranded turtles (Appendix 9). Stranding numbers decreased by 24 in 2018 compared to the 2017 season (Appendix 13).

Of the 27 strandings, one was affected by fishing hooks (it was live and able to be transported to a rehabilitation facility to remove the hooks and fishing line).

Obstructed Nesting Attempts

Morning surveys documented 448 ONAs: 417 were loggerhead crawls, 25 green turtle crawls, and 6 leatherback crawls. Of the 448 ONAs, 261 resulted in false crawls and 187 resulted in nests. Turtles encountered various obstructions (sometimes multiple obstructions) including escarpments (273), beach furniture (93), seawalls (48), rock revetments (9), dune crossovers (6), rock outcroppings (6), boats (1), and special events equipment (1). Turtles also encountered fences, garbage cans, lifeguard stands, posts, stairs, signs, trees, benches, storage bins, roads, pipes, kayak racks, etc. (combined total of 33 interactions).

DISCUSSION

Yearly Nesting Trends

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. Historical Broward County nesting data have demonstrated patterns of high and low nesting seasons that alternated annually. However green turtles are the only species that followed this trend in recent years. Loggerheads are on an increasing trend of +35.86 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. The 2018 season experienced a slight decrease of loggerhead nesting numbers relative to the 2017 nesting season. We saw a large jump in 2016, with a decrease in 2017 and a slight decrease in 2018, suggesting that the 2019 season might be a high loggerhead nesting season. Green turtles have seen a steady positive historic trend in nesting in Broward County. Green sea turtles demonstrate a far more extreme oscillation than other local nesting sea turtles between high and low nesting seasons. The 2017 season experienced a record high nesting season for greens, followed by a large decrease in green nests in the 2018 season, suggesting that 2019 will be a large green nesting season. Leatherback nesting is also following an increasing historical trend (Figure 8). Leatherbacks have traditionally demonstrated an oscillating nesting pattern between seasons however it has been the least consistent in recent years. Broward County has experienced a steady decrease in leatherback nest numbers from 2014-2017, however we did see a slight increase in leatherback nesting in 2018. Although it contradicts predictions, this result is not surprising as similar patterns have been documented in Broward County between seasons 2002 to 2005 and 2010 to 2012.

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. 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 2018 was considerably lower than in 2017 (a record high season) and started later but also ended later than the 2017 season. The first green nest was deposited on June 9 this year compared to May 30 in 2017. The last nest was deposited on October 24 this year compared to September 20 in 2017.

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 the Hillsboro survey zone, followed by Fort Lauderdale Beach, Pompano Beach, Mizell-Eula State Park and the lowest nesting activity in the Hollywood survey zone. 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 least 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 and Lohmann, 2015; Lohmann et al., 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. Female sea turtles return to their natal beaches when they are ready to deposit nests of their own (Lohmann et al., 1997), which may explain the underutilization of Hollywood beaches for sea turtle nesting in recent years. Broward County may be experiencing some impact of this long-term movement of nests into the Hillsboro Beach area; this may be a question that warrants further investigation in the future.

Nest Relocation

As stated previously, hatcheries were historically 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 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 et al., 2008, Van et al., 2006). When all or most 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 et al., 1987). In 2004, Hurricanes Frances and Jeanne had significant negative impacts on the hatchery nest facilities in Broward County (Burney and Ouellette, 2004).

Relocated sea turtle nests generally experience lower emergence success than *in situ* nests because the eggs are moved and placed into an artificial chamber and some eggs/embryos may be damaged in transport/handling (Moody, 1996). This was demonstrated in 2018 as the *in-situ* loggerhead emergence success (77.72%) was significantly higher than the relocated loggerhead emergence success of 59.91%. In a hatchery system, some nests may travel a long distance in buckets before they are placed in their new man-made nests, increasing the likelihood of damage to the embryos. The final year of the hatchery facilities in Broward County resulted in loggerhead nests with an emergence success of 41.6% for relocated nests (N = 1151; Burney and Ouellette, 2005). 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 3.13% in 2018 (Figure 9). The five-year average for nest relocation is currently 2.41%. 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 allowed 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 is being implemented 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.

The trends in disorientation reports are similar this season to previous years. Ft Lauderdale beach has some of the highest rates of disorientation annually and Hillsboro and Deerfield show some of the lowest rates of disorientation. County wide, disorientation rates were 10% higher in 2018 (45.39%) than the 2017 season (35.03%). 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 Storm Alberto and Tropical Storm Gordon as well as King Tide events. Broward County beaches sustained some flooding/sand erosion with these events resulting in the loss of 55 nests (with an additional 22 nests that experienced wash over).

A small degree of vandalism was observed throughout the season that resulted in damage to nest stakes as well as restraining cages and 4 nests experienced poaching events with extensive digging in the nest perimeter.

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 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.

While local nesting numbers did not reach the previous record setting years, this was expected due to seasonal fluctuations in nesting activity. Nesting numbers in Broward County this year still indicate an overall positive trend, leaving local scientists cautiously optimistic about the status of the local nesting sea 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 were not used.	All nests left in place; nests from "donor" zones may not be relocated in these zones.	All nests left in place; a restraining cage was installed on every other nest.
R-Monuments	R24 - Hillsboro Inlet R25 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 R78-R80 R84-R84.7 R97.5-R102	R74-R78 R107-R124

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	12	0	100.00%	966	1143	45.80%	41	28	59.42%
Pompano	5	0	100.00%	561	634	46.95%	1	12	7.69%
Ft Lauderdale	1	0	100.00%	889	1113	44.41%	46	28	62.16%
Mizell-Eula	0	0	N/A	189	457	29.26%	45	45	50.00%
Hollywood	0	0	N/A	128	150	46.04%	3	6	33.33%
OVERALL	18	0	100.00%	2733	3497	43.87%	136	119	53.33%

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</i>	<i>Nests per mile</i>	<i>Total Nests</i>	<i>Beach Length</i>	<i>Nests per mile</i>	<i>Total Nests</i>	<i>Beach Length</i>	<i>Nests per mile</i>
Hillsboro	12	4.3	2.79	966	4.3	224.65	41	4.3	9.53
Pompano	5	4.8	1.04	561	4.8	116.88	1	4.8	0.21
Ft Lauderdale	1	6.6	0.15	889	6.6	134.70	46	6.6	6.97
Mizell-Eula	0	2.4	0.00	189	2.4	78.75	45	2.4	18.75
Hollywood	0	5.8	0.00	128	5.8	22.07	3	5.8	0.52
OVERALL	18	23.9	0.75	2733	23.9	114.35	136	23.9	5.69

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

Species	Evaluated Nests	Unevaluated Nests	Total Eggs	Hatchlings Released	Emergence Success (%)
<i>In situ</i>					
Leatherback	17	1	1279	729	57.00
Loggerhead	1859	554	190081	147734	77.72
Green	55	22	6655	5044	75.79
Total	1931	577	198015	153507	77.52
Relocated					
Loggerhead	72	2	6597	3952	59.91
Green	5	0	615	469	76.26
Total	77	2	7212	4421	61.30
Restraining Cage					
Loggerhead	54	3	5644	4317	76.49
Total	54	3	5644	4317	76.49
Overall					
Leatherback	17	1	1279	729	57.00
Loggerhead	1985	559	202322	156003	77.11
Green	60	22	7270	5513	75.83
Total	2062	582	210871	162245	76.94

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

Location	Evaluated Nests	Total Eggs	Emerged (%)	LIN (%)	DIN (%)	Live PIP (%)	Dead PIP (%)	VD (%)	NVD (%)
<i>In situ Nests</i>									
Hillsboro Beach	11	797	64.12	3.51	2.01	0.00	3.51	9.66	20.70
Pompano Beach	5	379	44.33	4.49	3.96	0.00	1.32	12.14	38.26
Ft Lauderdale Beach	1	103	48.54	3.88	4.85	0.00	0.97	15.53	30.10
Overall <i>In situ</i>	17	1279	57.00	3.83	2.81	0.00	2.66	10.87	26.66

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

Location	Evaluated Nests	Total Eggs	Emerged (%)	LIN (%)	DIN (%)	Live PIP (%)	Dead PIP (%)	VD (%)	NVD (%)
<i>In situ Nests</i>									
Hillsboro Beach	663	67643	69.54	2.78	3.09	0.26	3.36	13.61	5.55
Pompano Beach	432	43393	80.57	2.29	2.31	0.24	2.33	7.36	5.51
Ft Lauderdale Beach	686	70926	83.37	1.11	1.34	0.10	1.75	6.21	5.41
Hollywood Beach	78	8119	81.29	1.60	1.51	0.14	2.11	5.81	6.17
Overall <i>In situ</i>	1859	190081	77.72	1.99	2.19	0.19	2.47	9.09	5.52
Relocated Nests									
Hillsboro Beach	15	1417	44.74	7.34	2.33	1.55	4.52	23.78	19.76
Pompano Beach	17	1607	56.00	9.83	2.05	3.48	5.60	11.01	13.63
Ft Lauderdale Beach	39	3509	67.20	6.78	0.91	1.71	9.01	8.83	7.55
Hollywood Beach	1	64	93.75	0.00	0.00	0.00	0.00	0.00	6.25
Overall Relocated	72	6597	59.91	7.58	1.49	2.09	7.12	12.49	11.64
Caged Nests									
Ft Lauderdale Beach	31	3220	79.44	2.39	1.18	0.43	2.39	8.66	5.40
Hollywood Beach	23	2424	72.57	1.40	3.92	0.17	3.51	7.92	11.76
Overall Caged	54	5644	76.49	1.97	2.36	0.32	2.87	8.35	8.13

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

Location	Evaluated Nests	Total Eggs	Emerged (%)	LIN (%)	DIN (%)	Live PIP (%)	Dead PIP (%)	VD (%)	NVD (%)
<i>In situ Nests</i>									
Hillsboro Beach	25	3100	65.00	2.84	2.00	0.06	3.77	6.61	5.77
Pompano Beach	1	119	80.67	0.84	1.68	0.00	0.84	0.00	0.00
Ft Lauderdale Beach	29	3436	85.36	1.89	0.87	0.17	1.37	0.67	1.11
Overall <i>In situ</i>	55	6655	75.79	2.31	1.41	0.12	2.48	3.43	3.26
<i>Relocated Nests</i>									
Hillsboro Beach	1	120	42.50	17.50	4.17	2.50	1.67	0.00	0.00
Ft Lauderdale Beach	4	495	84.44	7.27	1.41	2.83	2.02	2.02	0.20
Overall Relocated	5	615	76.26	9.27	1.95	2.76	1.95	1.63	0.16

Table 9: A summary of the total nests, false crawls (FC), and nesting success (NS) by species in relation to beach renourishment projects: the Hillsboro/Deerfield Beach Nourishment Project (“Deerfield”), the Hillsboro Inlet Maintenance and Sand Bypass Project (“Hillsboro Inlet”), the City of Hollywood Beach Nourishment Project (“Hollywood”), and the Broward County Segment II Project (“Segment II”).

	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	5	0	100%	188	60	76%	1	0	100%
Hillsboro Inlet	0	0	N/A	6	14	30%	0	0	N/A
Hollywood	0	0	N/A	52	60	46%	1	2	33%
Segment II	1	0	100%	560	651	46%	17	10	63%
OVERALL	6	0	100%	806	785	51%	19	12	61%

Table 10: Reproductive success of loggerhead, green and leatherback turtles in relation to beach renourishment projects: the Hillsboro/Deerfield Beach Nourishment Project (“Deerfield”), the Hillsboro Inlet Maintenance and Sand Bypass Project (“Hillsboro Inlet”), the City of Hollywood Beach Nourishment Project (“Hollywood”), and the Broward County Segment II Project (“Segment II”).

Project	Evaluated Nests	Unevaluated Nests	# Eggs	Hatchlings Released	Emerged (%)
Deerfield					
Loggerhead	139	49	18656	15210	81.53
Green	0	1	0	0	N/A
Hillsboro Inlet					
Loggerhead	6	0	640	331	51.72
Hollywood					
Loggerhead	45	7	4624	3751	81.12
Segment II					
Leatherback	1	0	103	50	48.54
Loggerhead	479	81	49341	42448	86.03
Green	11	2	1232	1033	83.85

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

Municipality	Hatch DIS	Hatch Total	% Hatch DIS
Deerfield	21	44	47.73%
Hillsboro	15	666	2.25%
Pompano	141	270	52.22%
Lauderdale-By-The-Sea/Sea Ranch Lakes	139	214	64.95%
Fort Lauderdale	538	754	71.35%
Dania	0	4	0.00%
Hollywood	29	79	36.71%
Hallandale	6	18	33.33%
Total (excludes State Park)	889	2049	43.39%

Figure 1: Location of Broward County, FL, USA



Figure 2: Boundaries of 2018 Sea Turtle Survey Zones

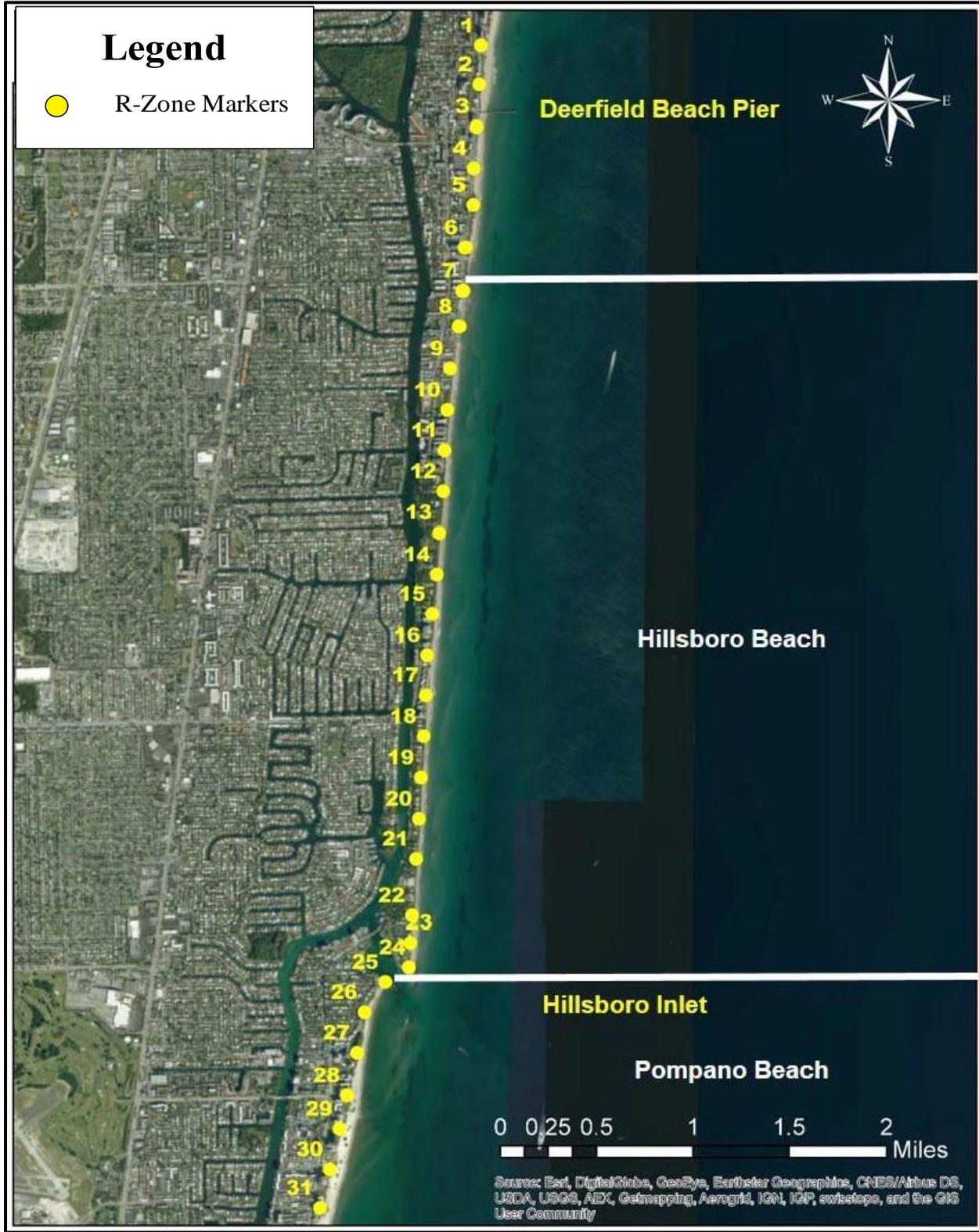


Figure 2: Boundaries of 2018 Sea Turtle Survey Zones

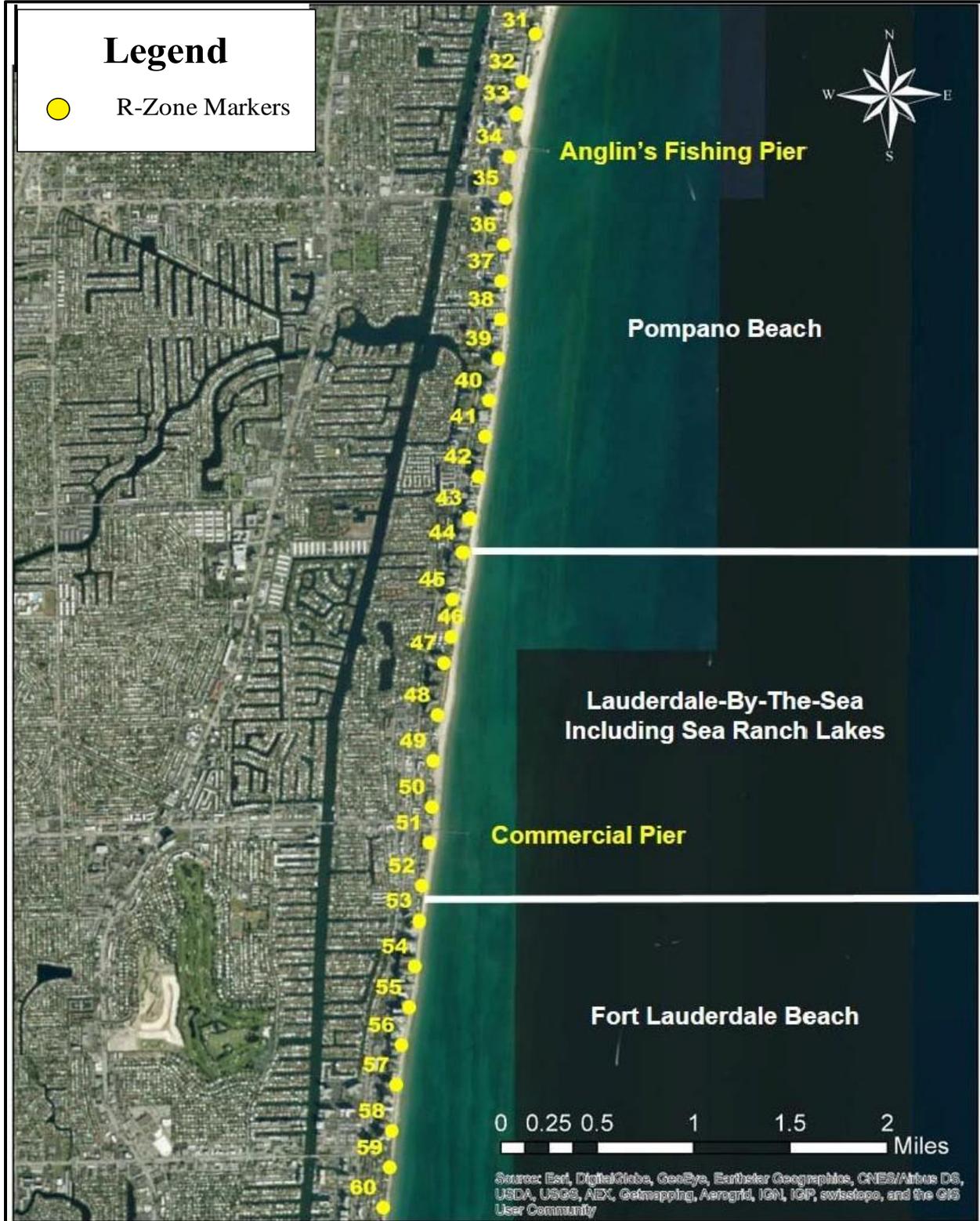


Figure 2: Boundaries of 2018 Sea Turtle Survey Zones



Figure 2: Boundaries of 2018 Sea Turtle Survey Zones



Figure 2: Boundaries of 2018 Sea Turtle Survey Zones



Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

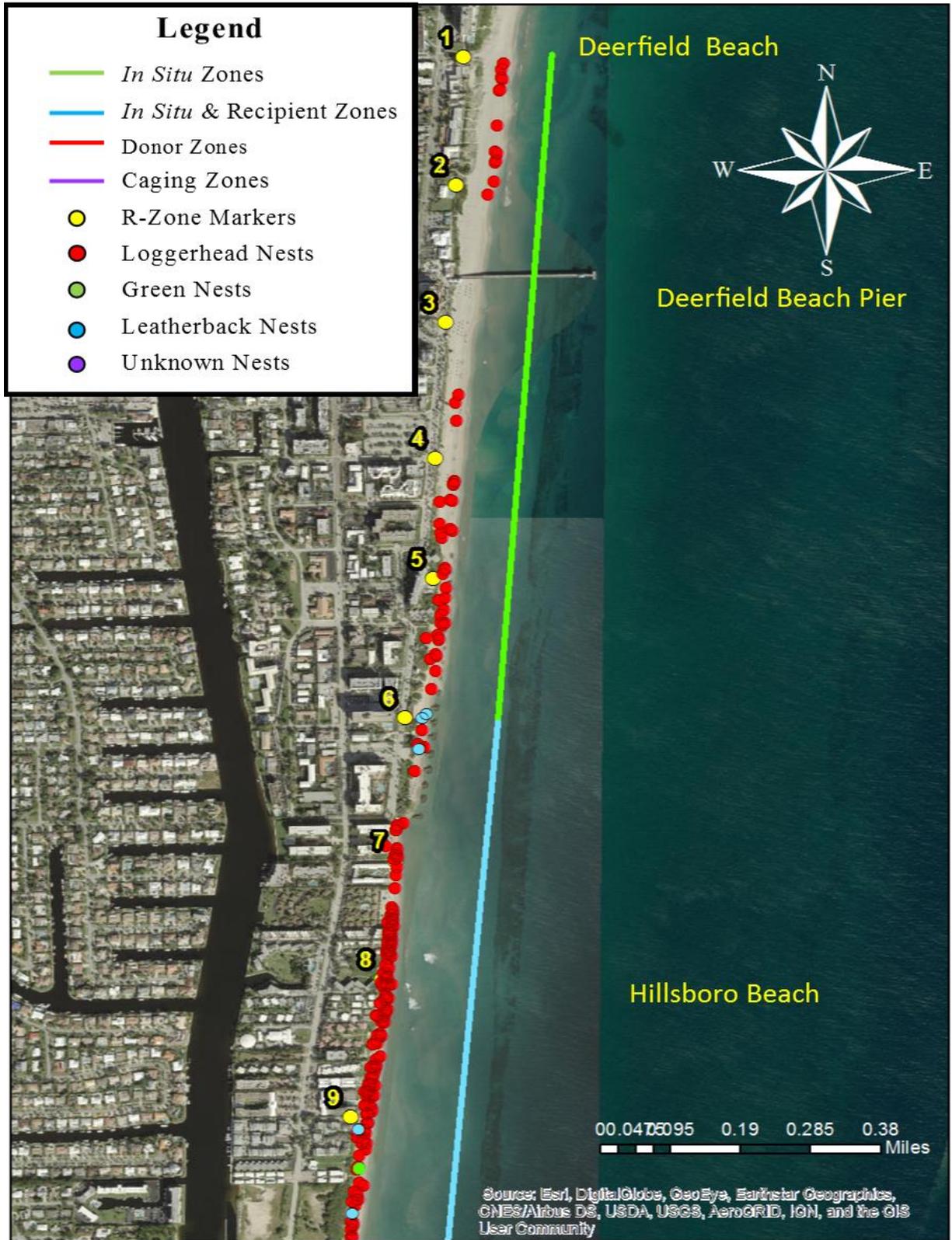


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

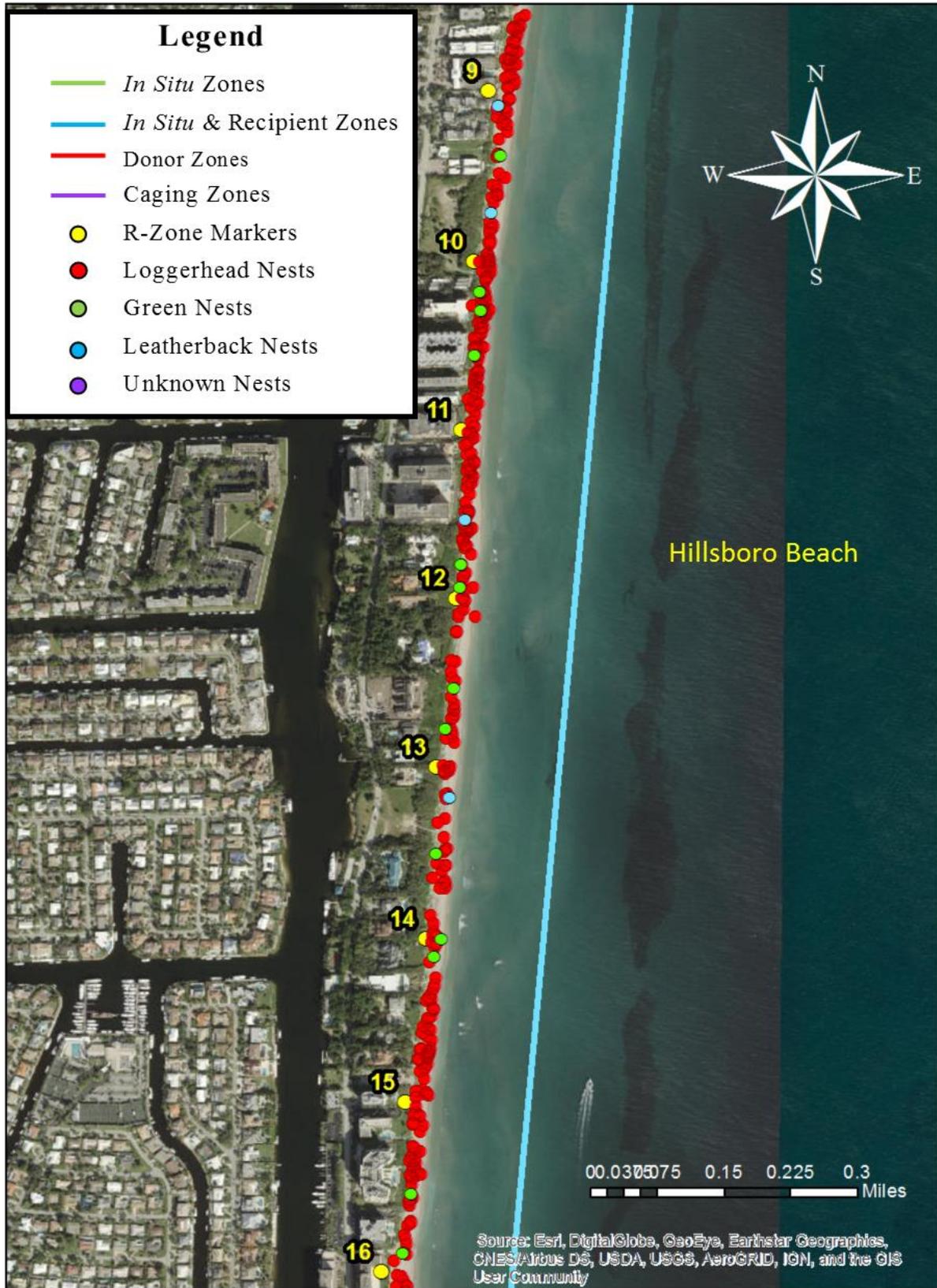


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

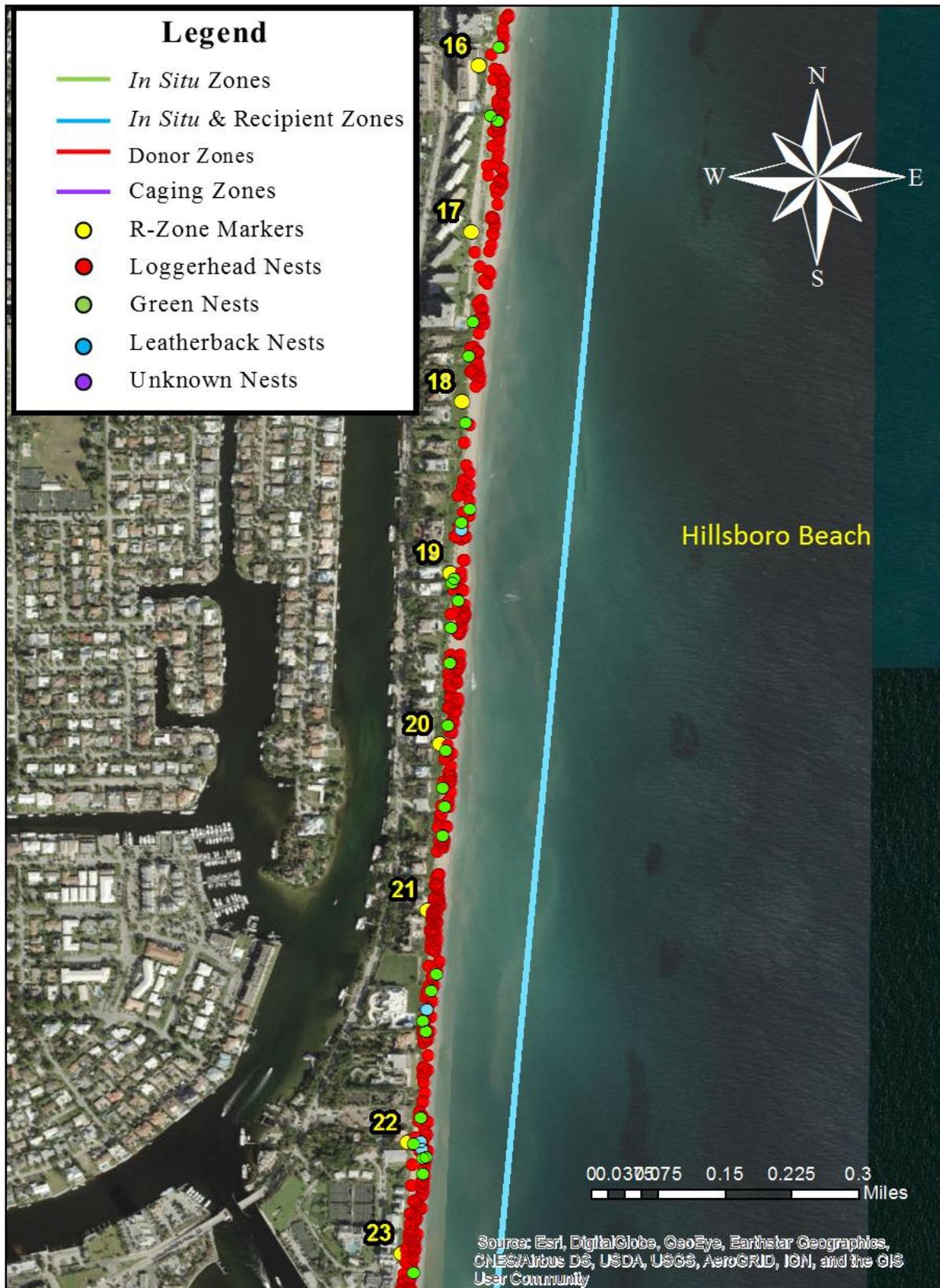


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

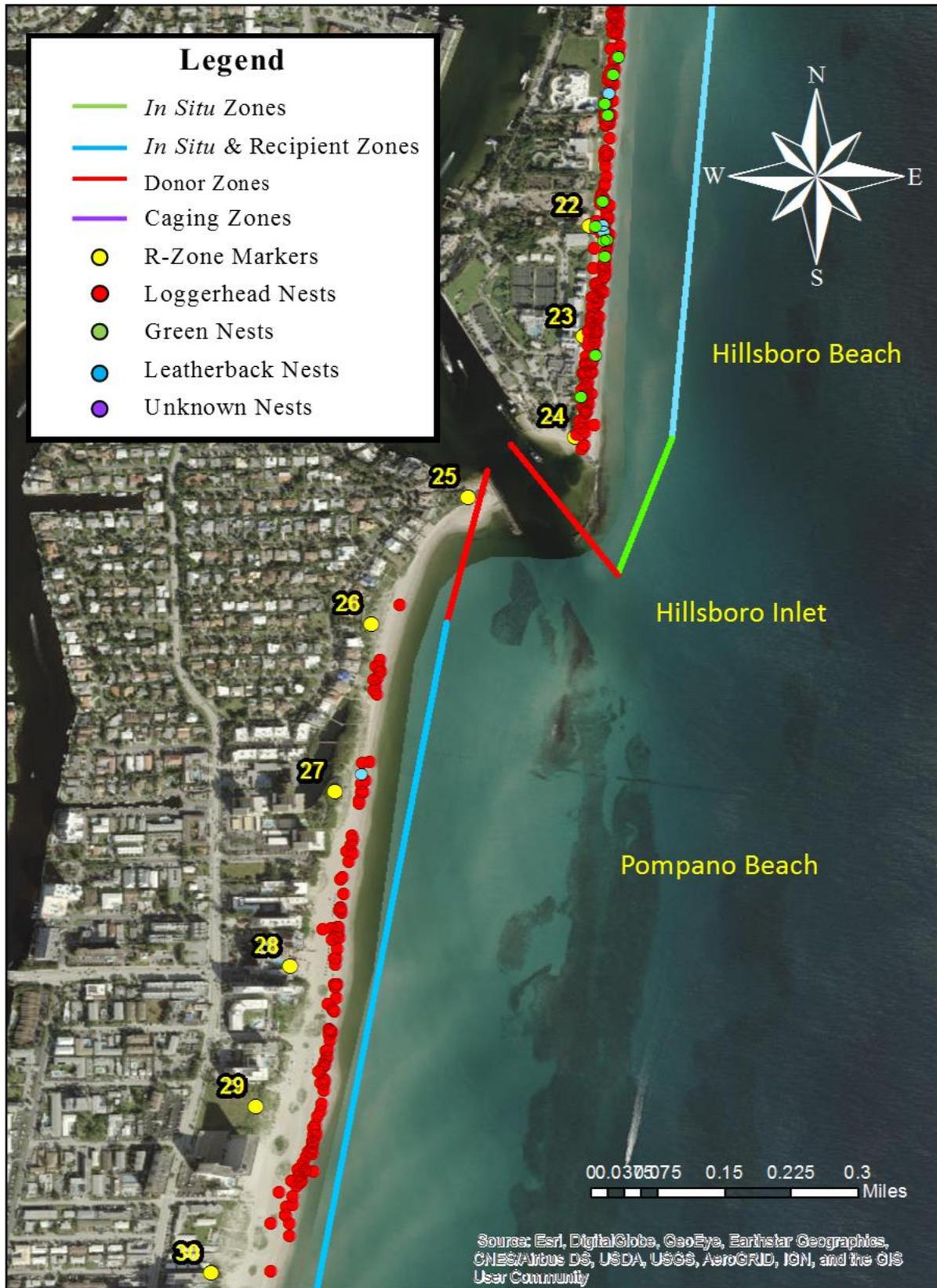


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

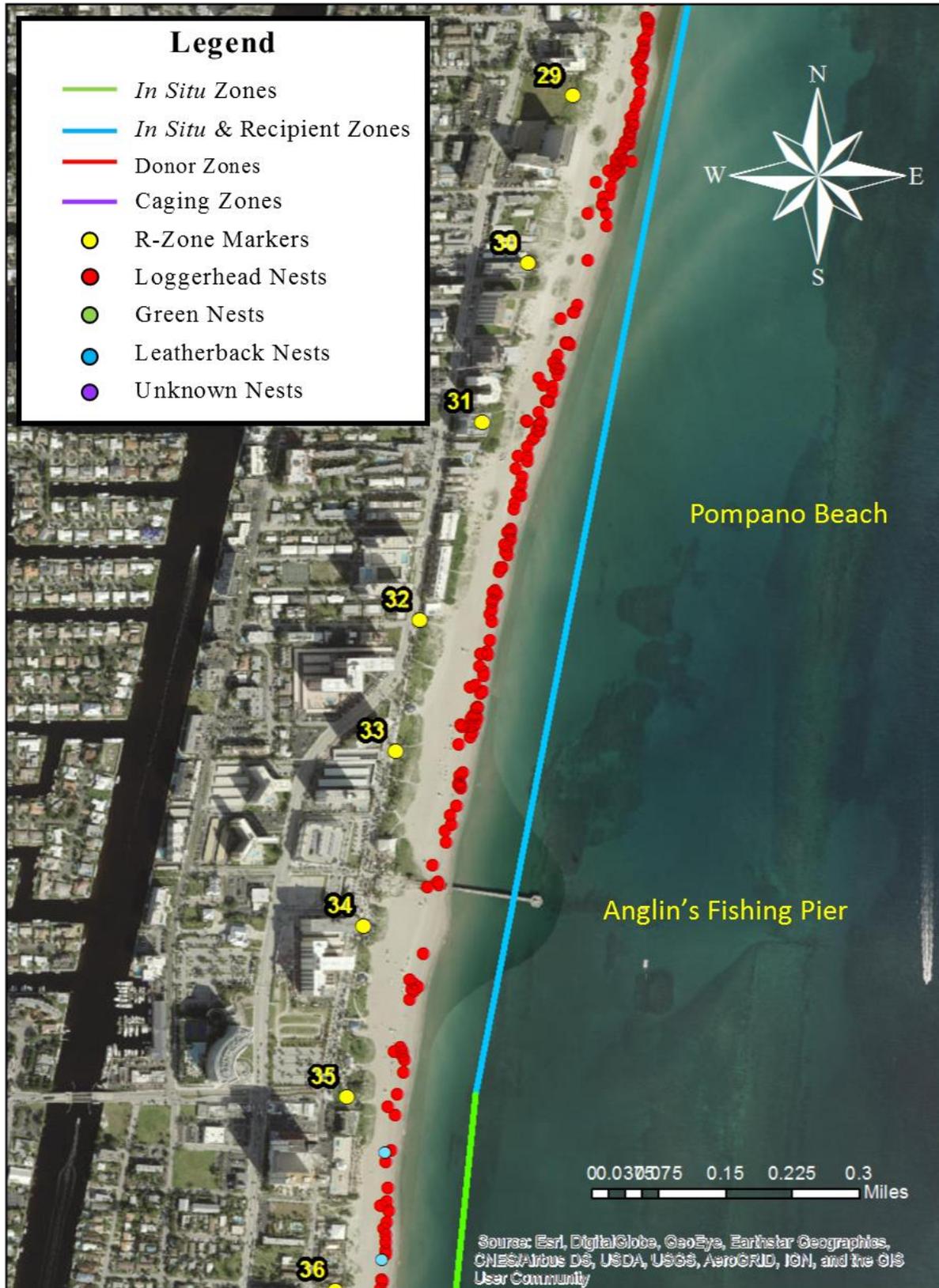


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

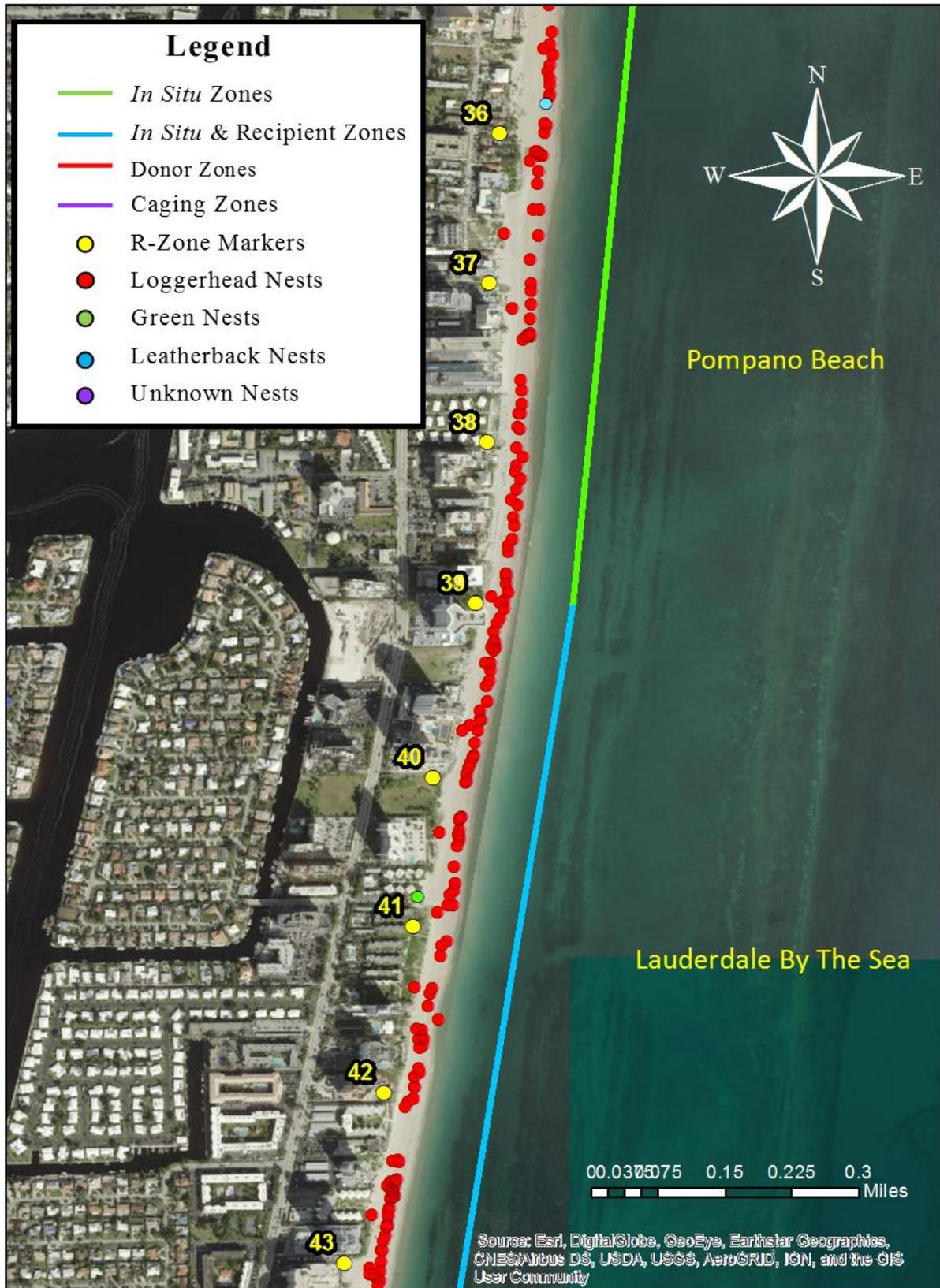


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

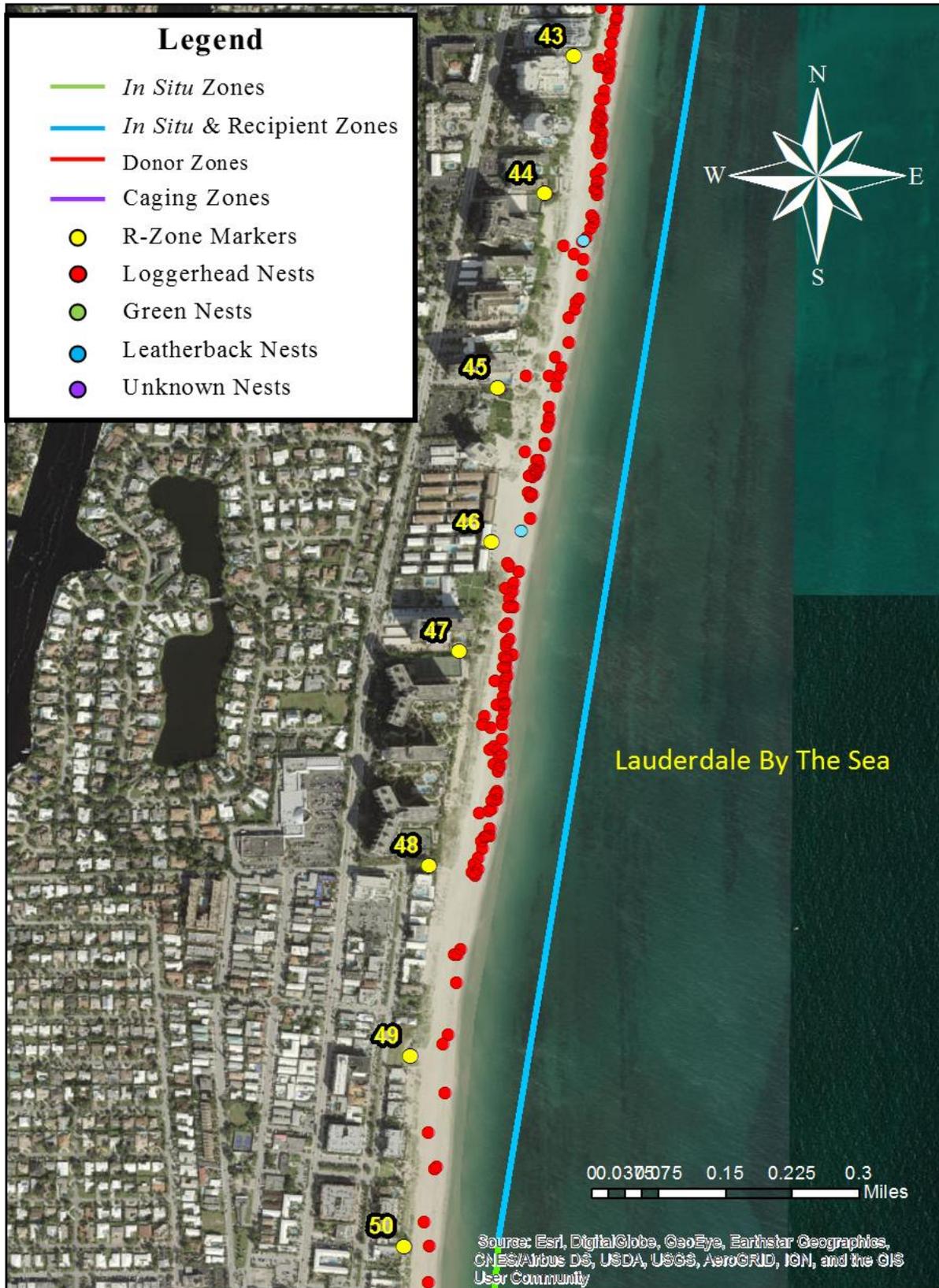


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

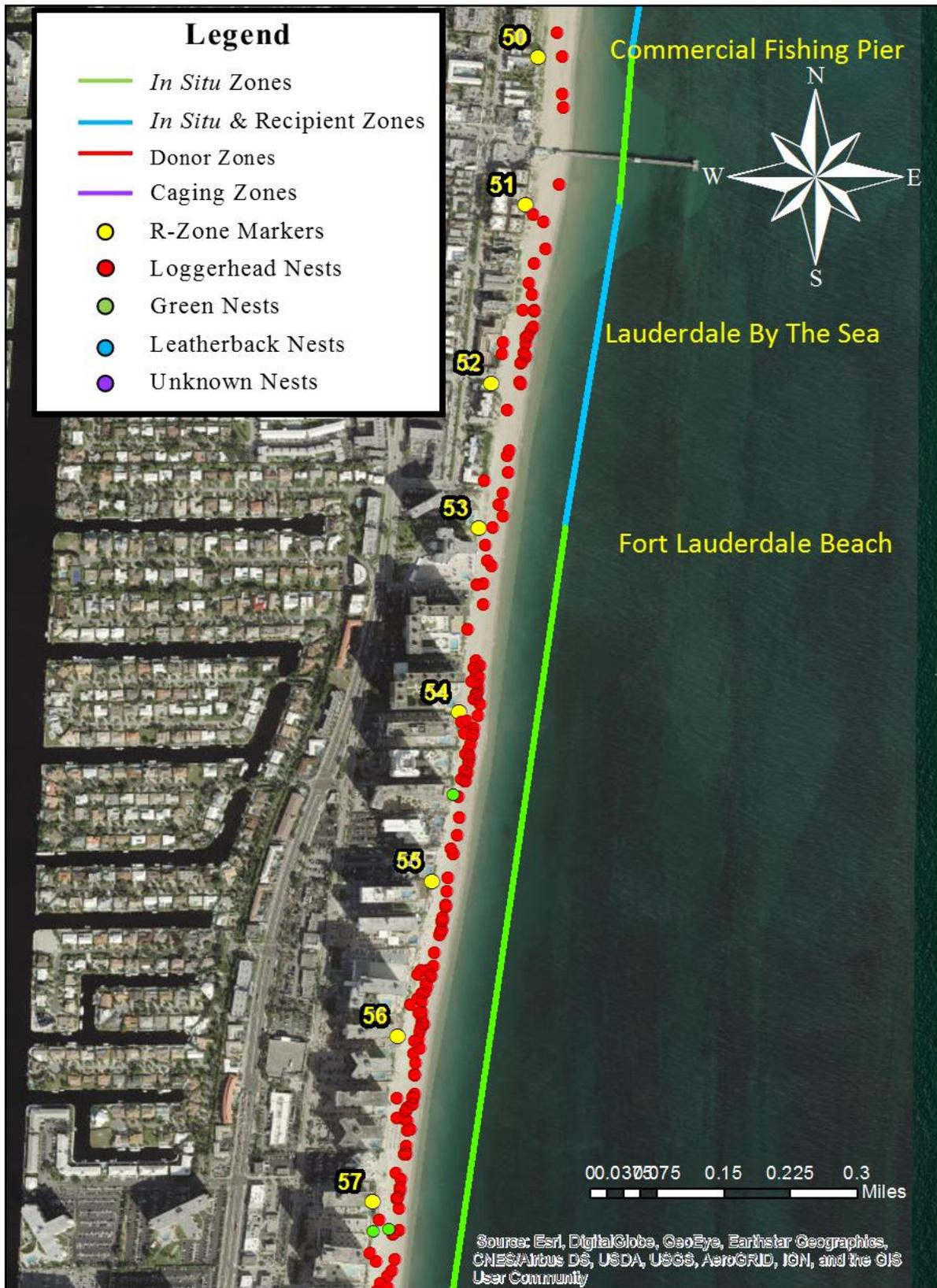


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

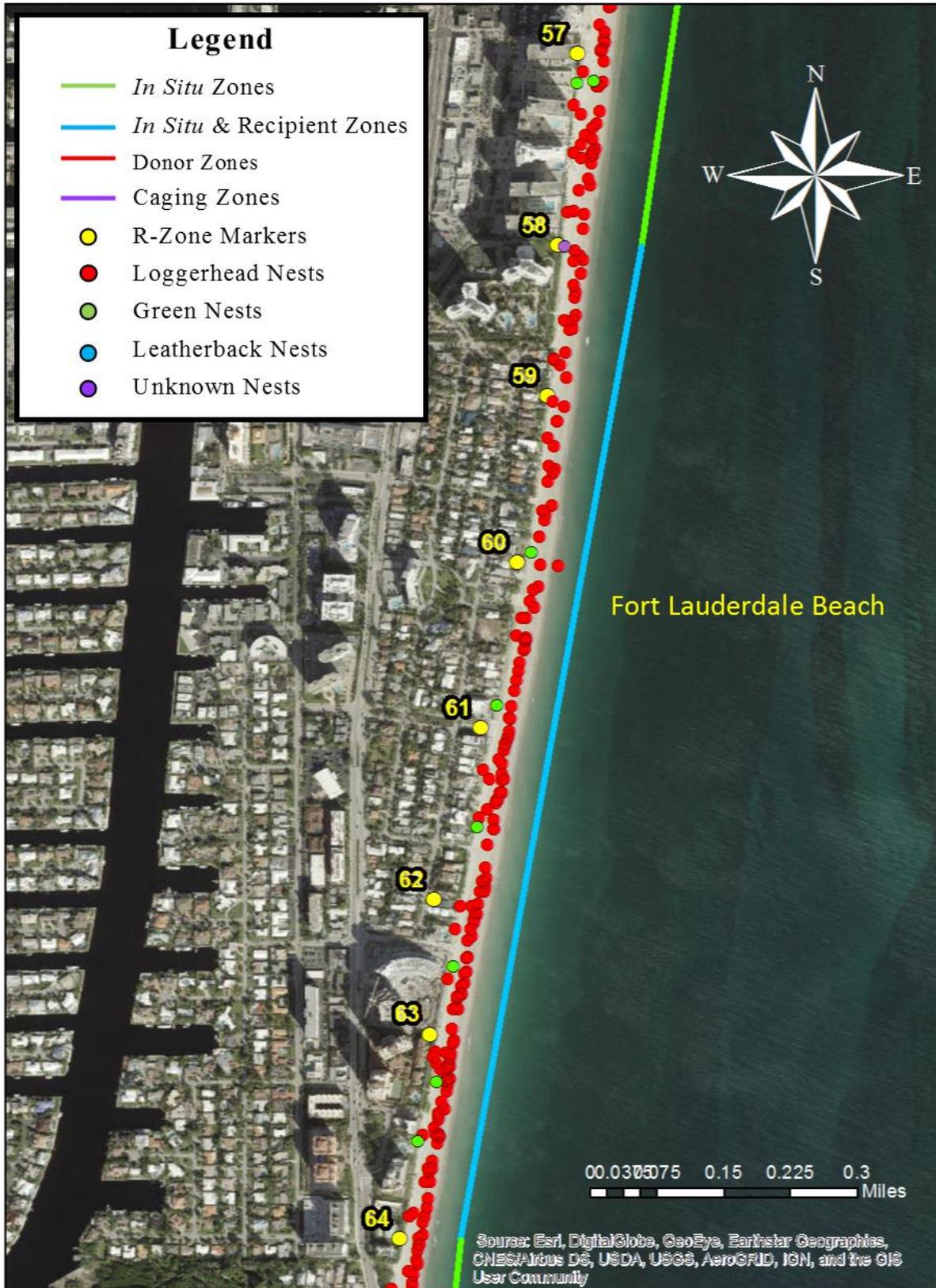


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

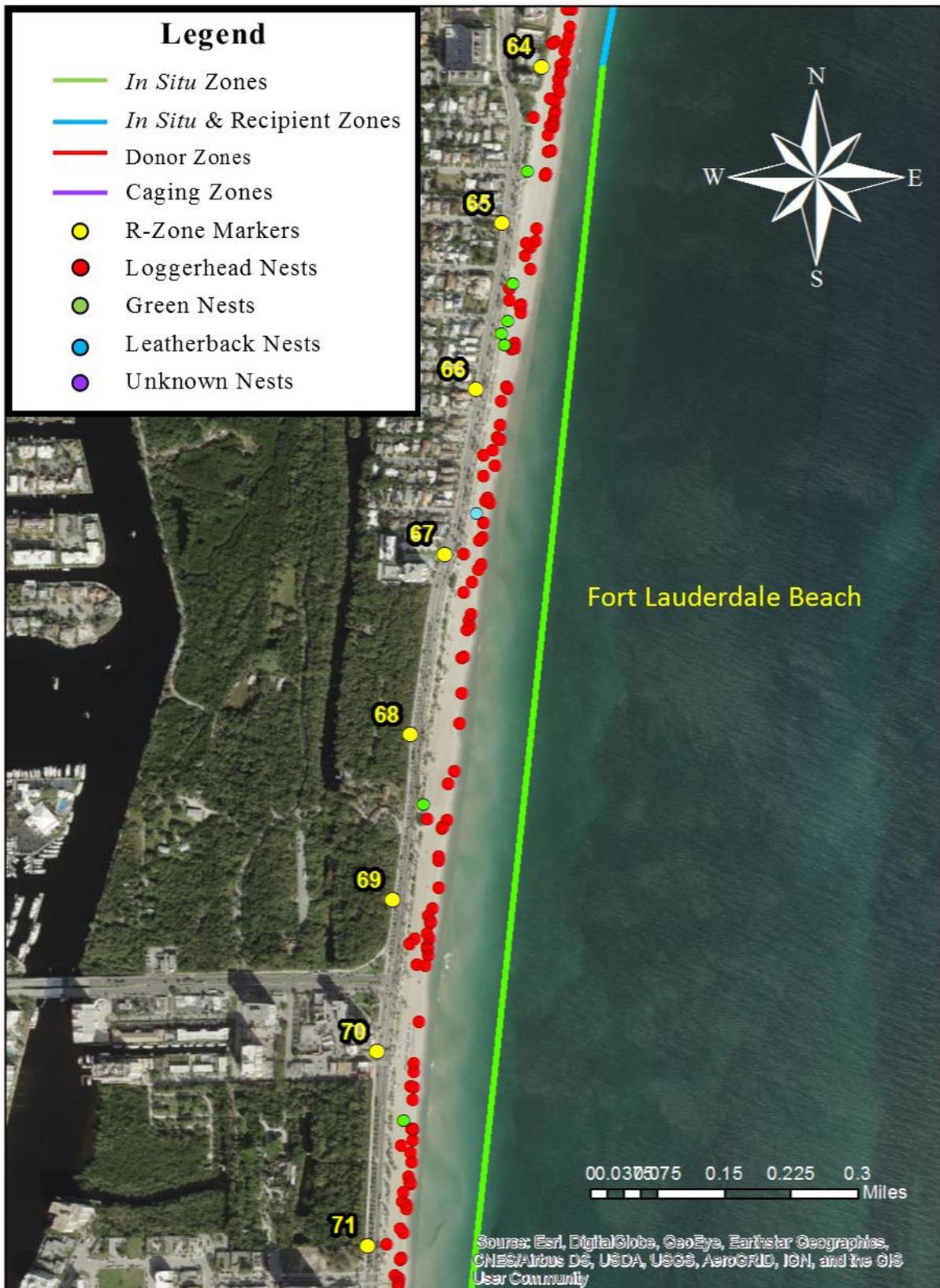


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

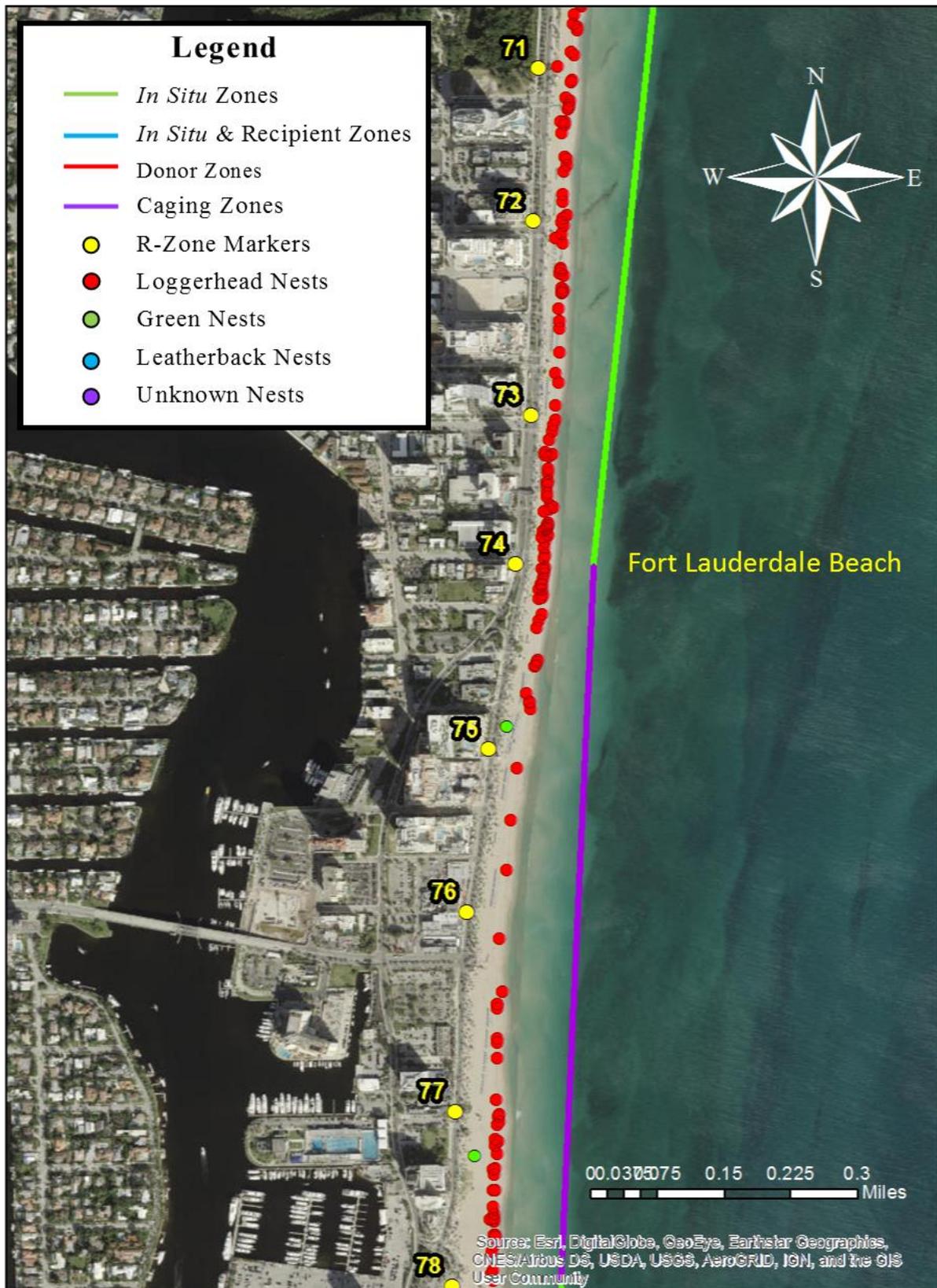


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

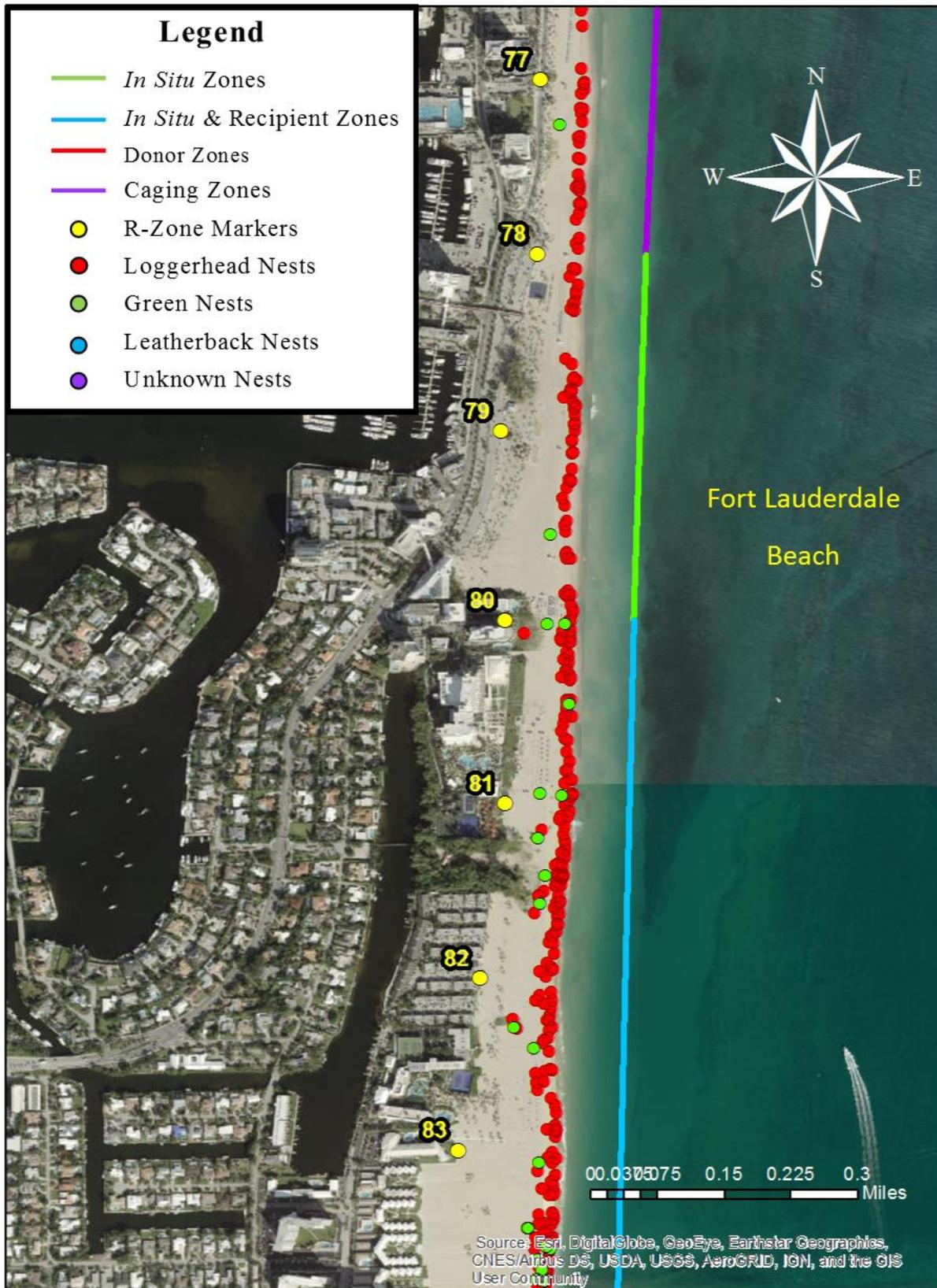


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

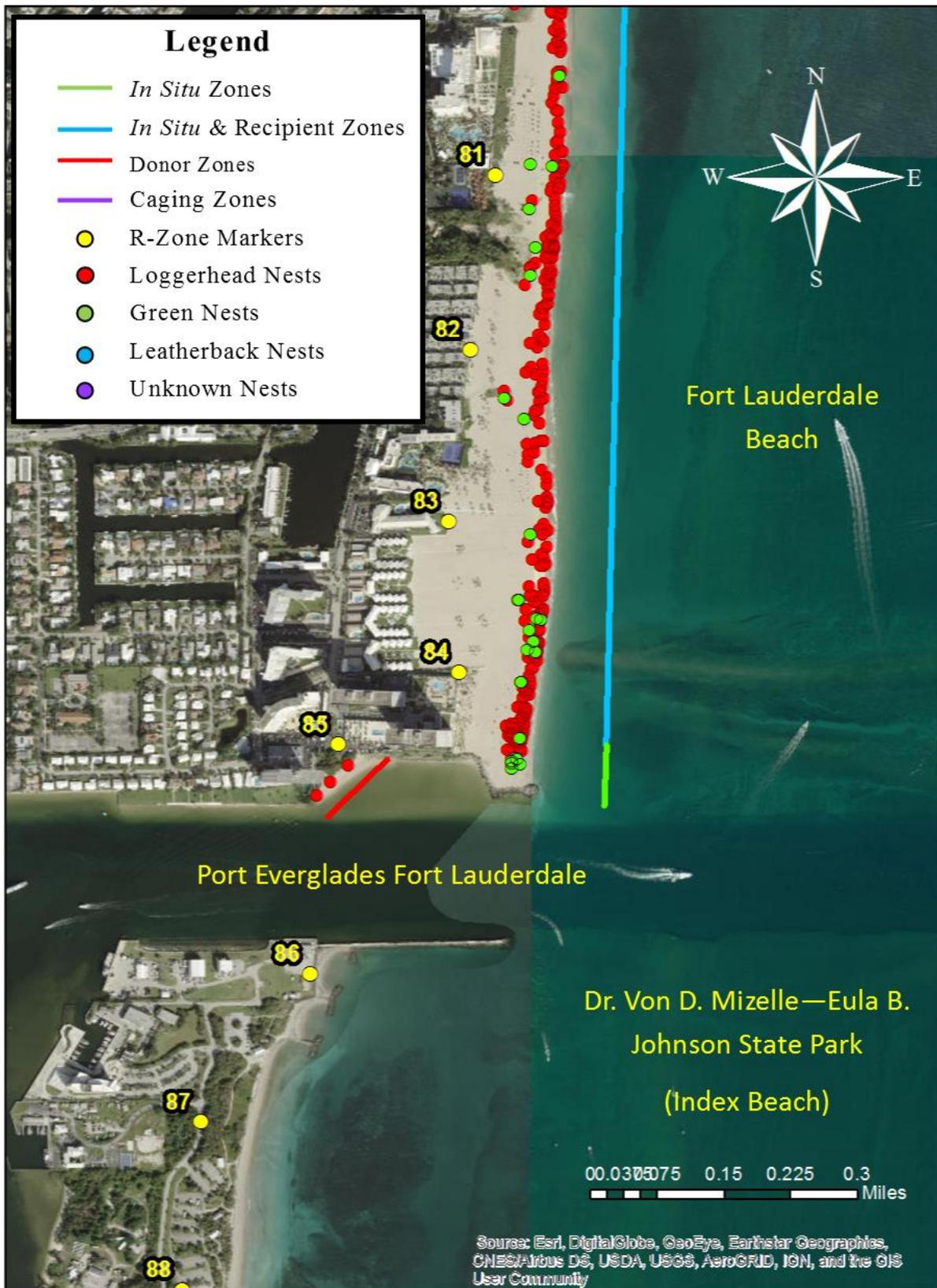


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

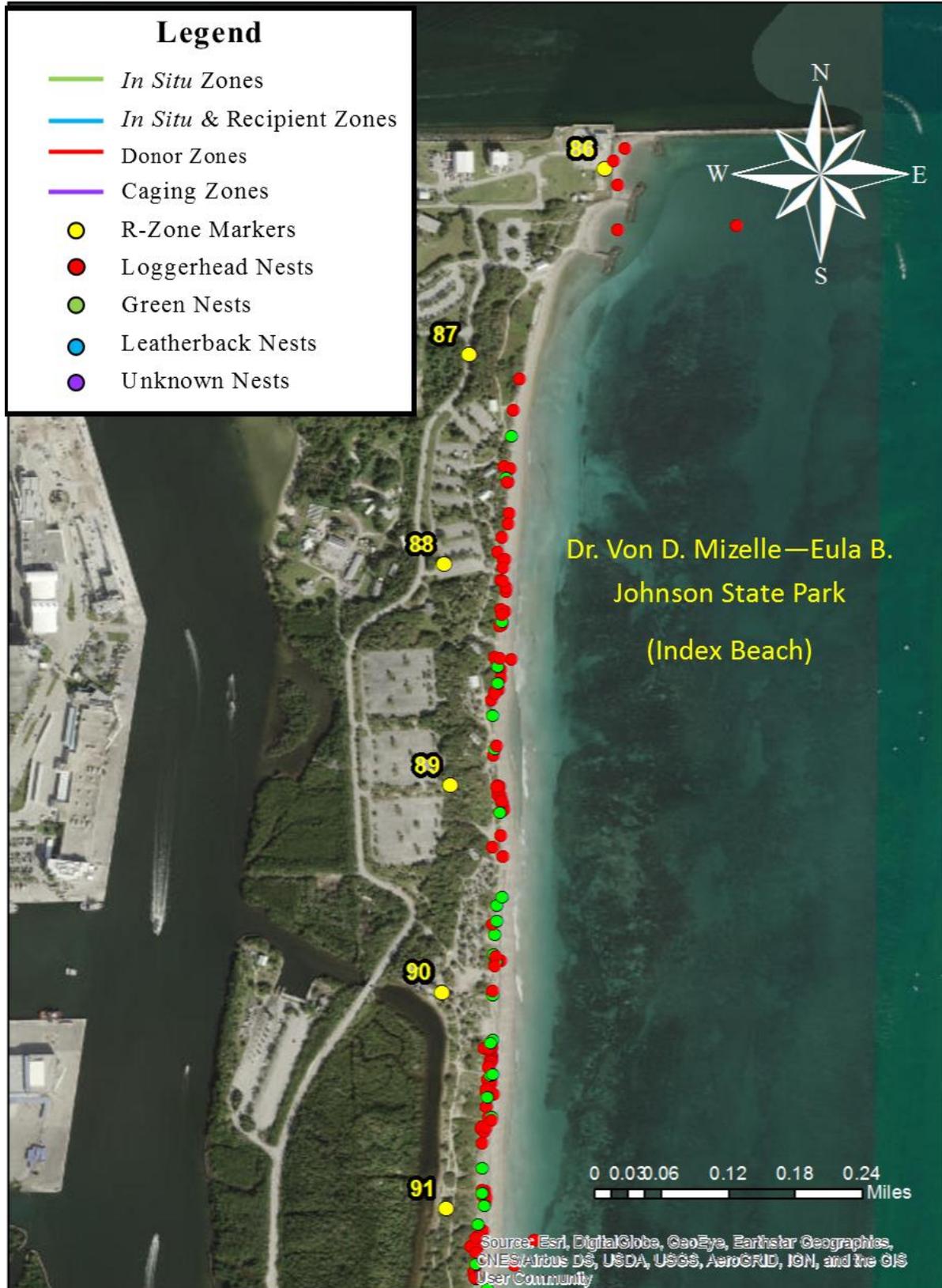


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

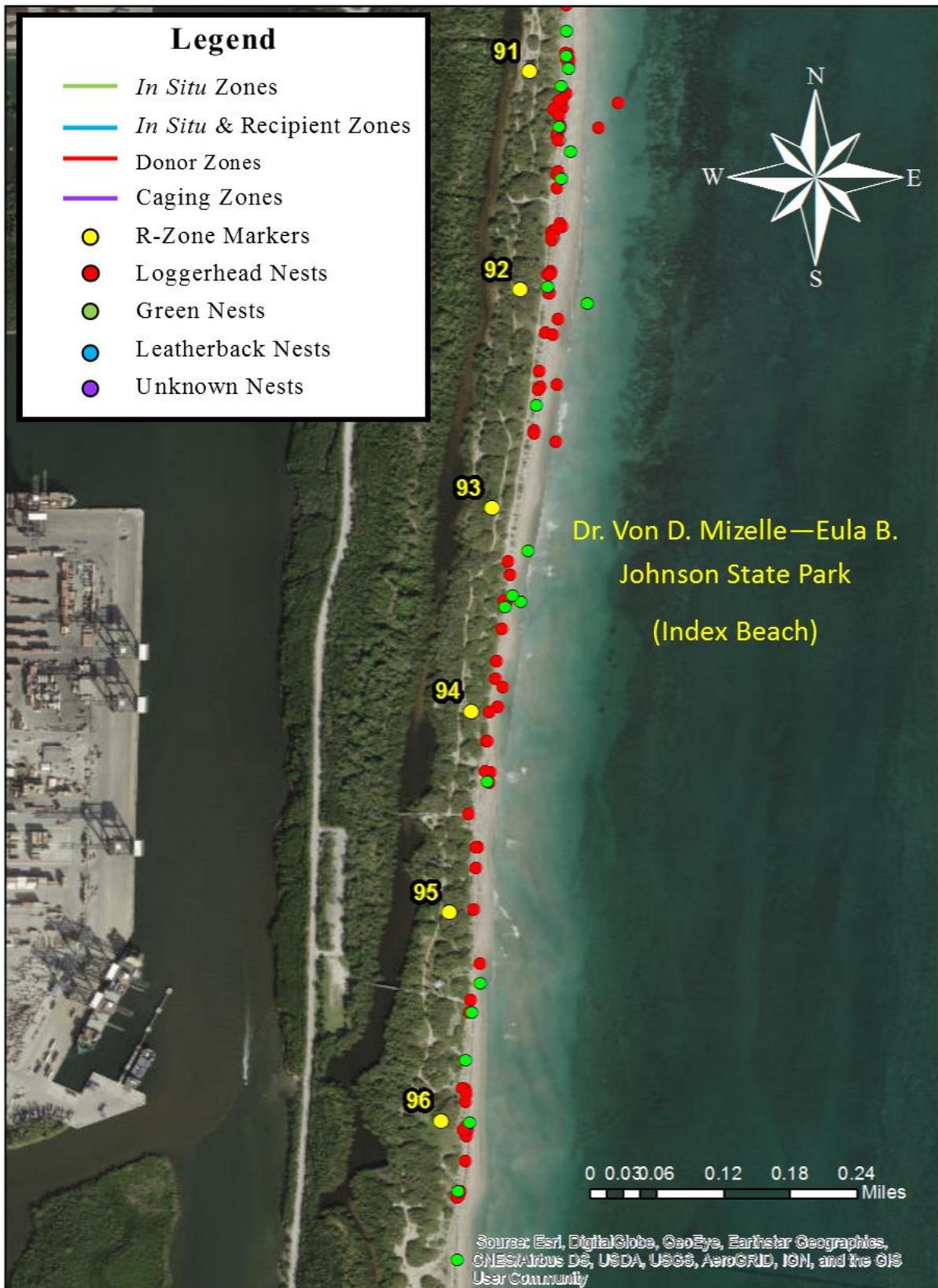


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

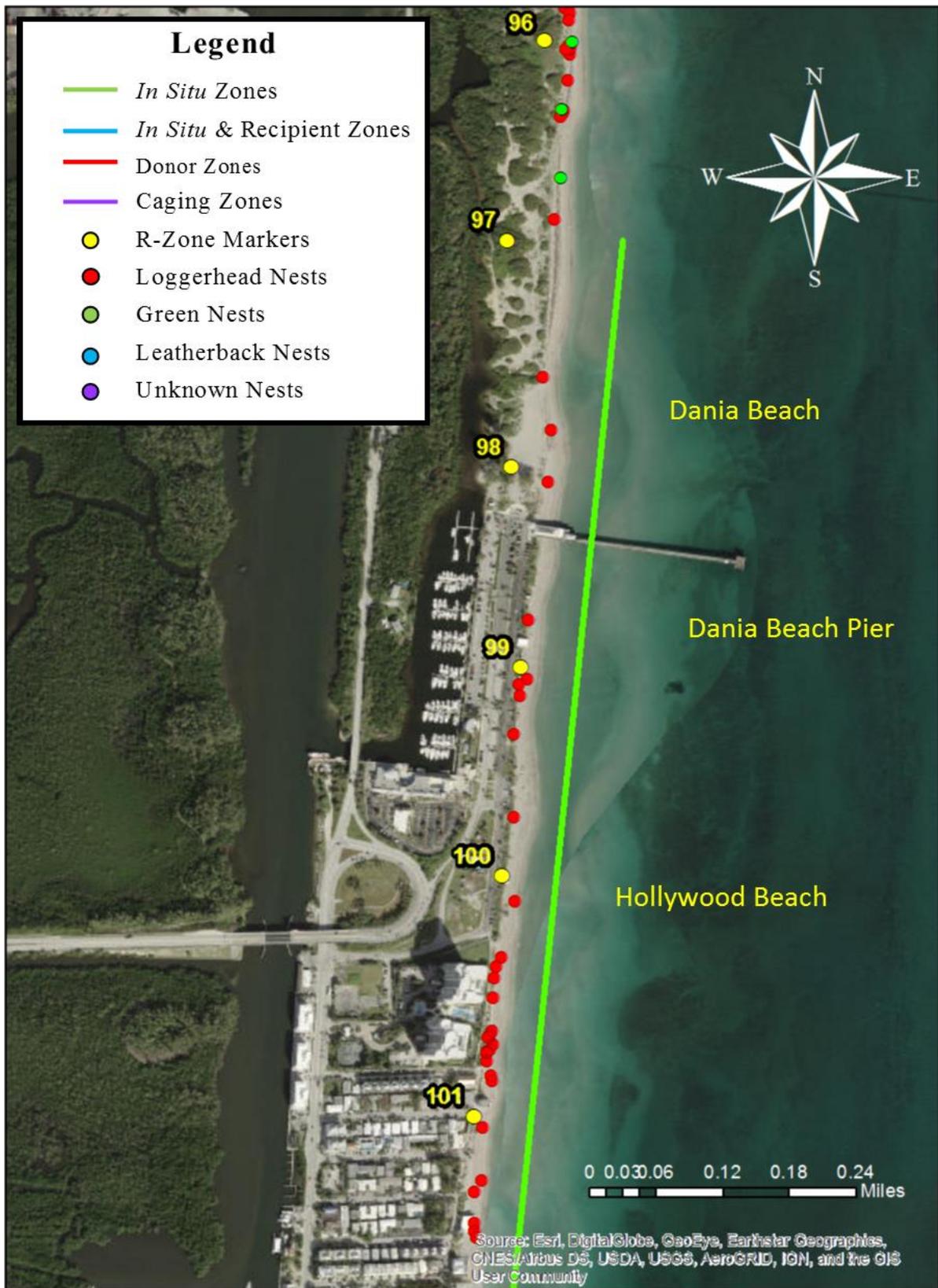


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

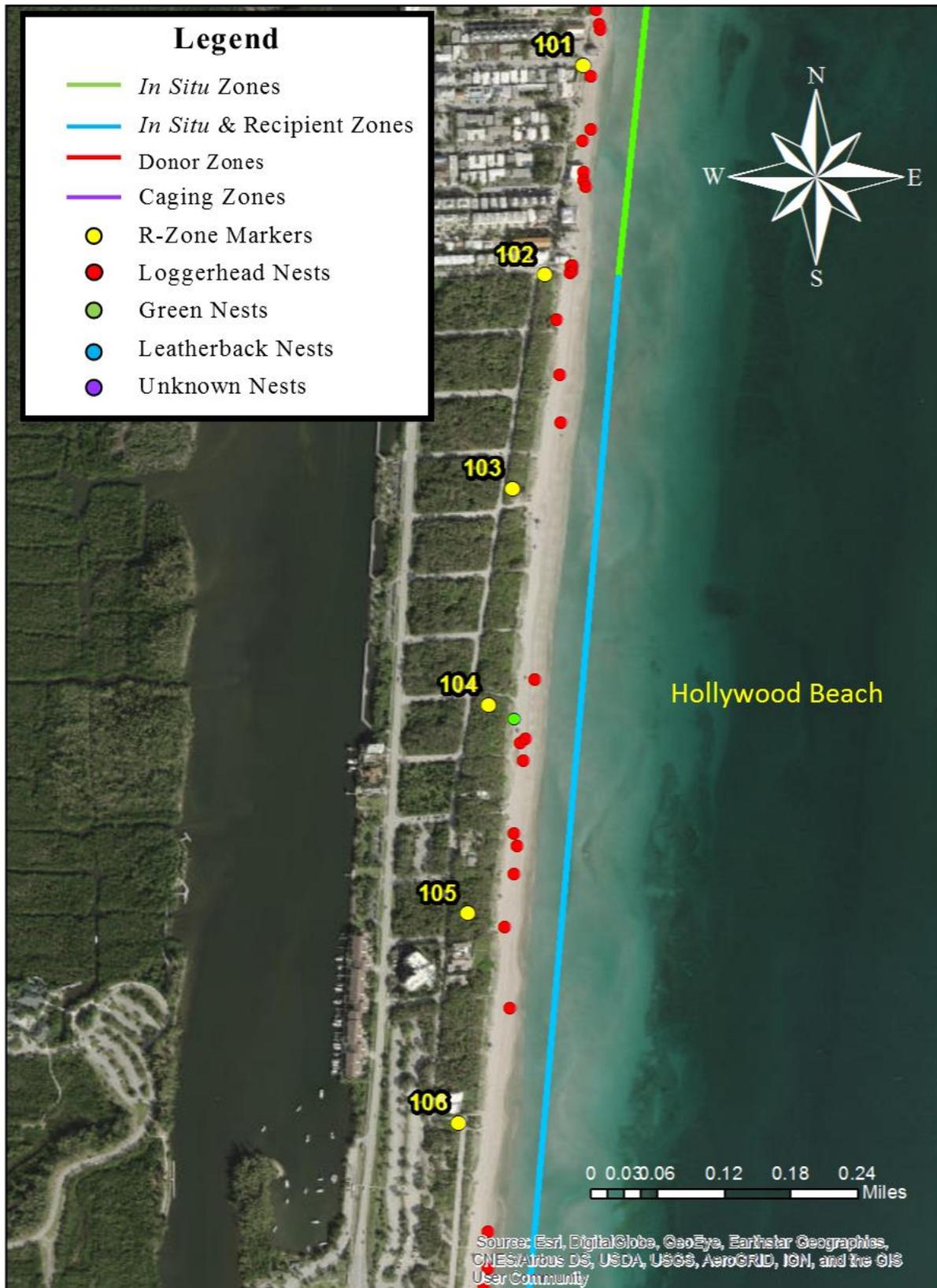


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

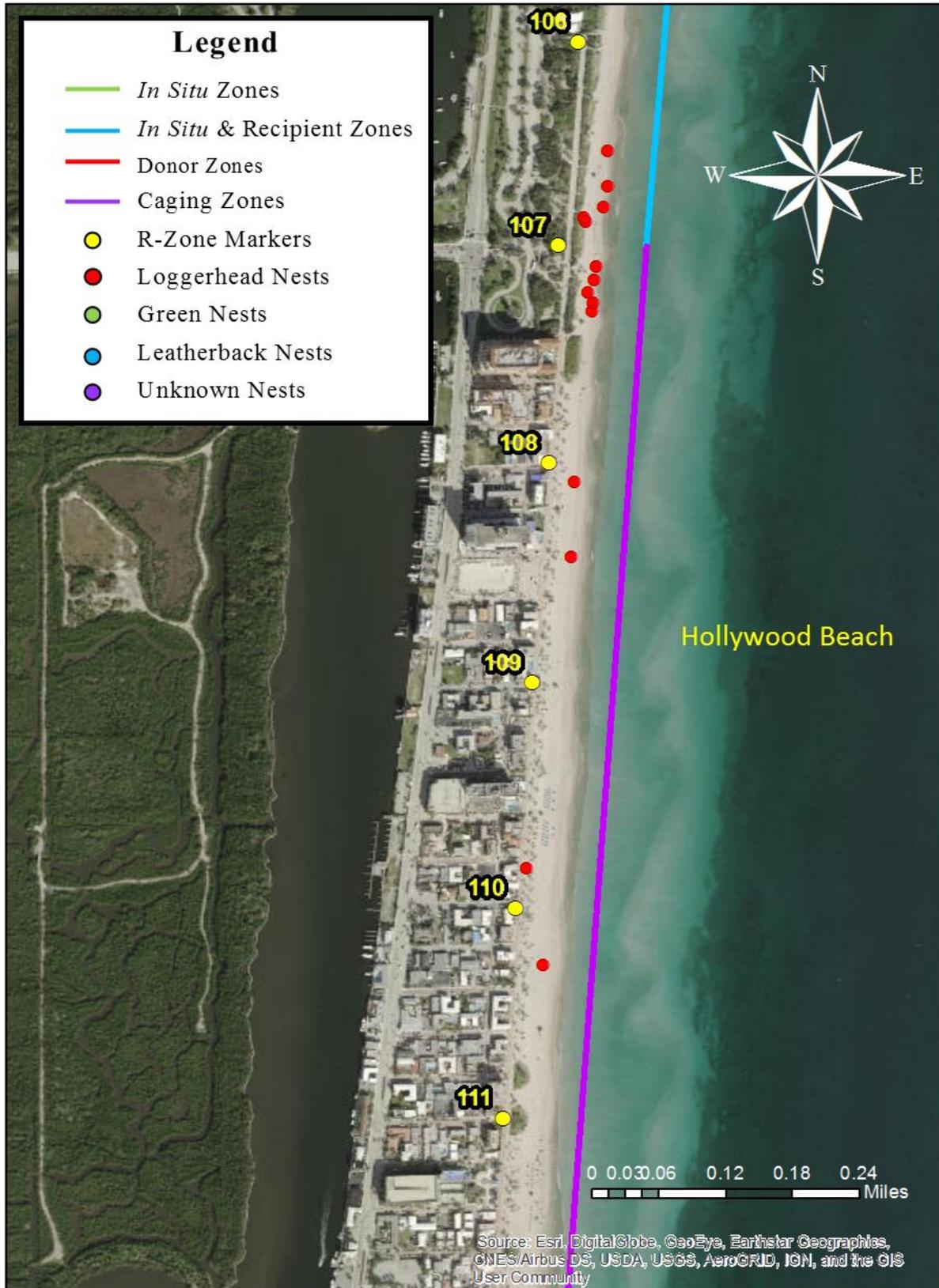


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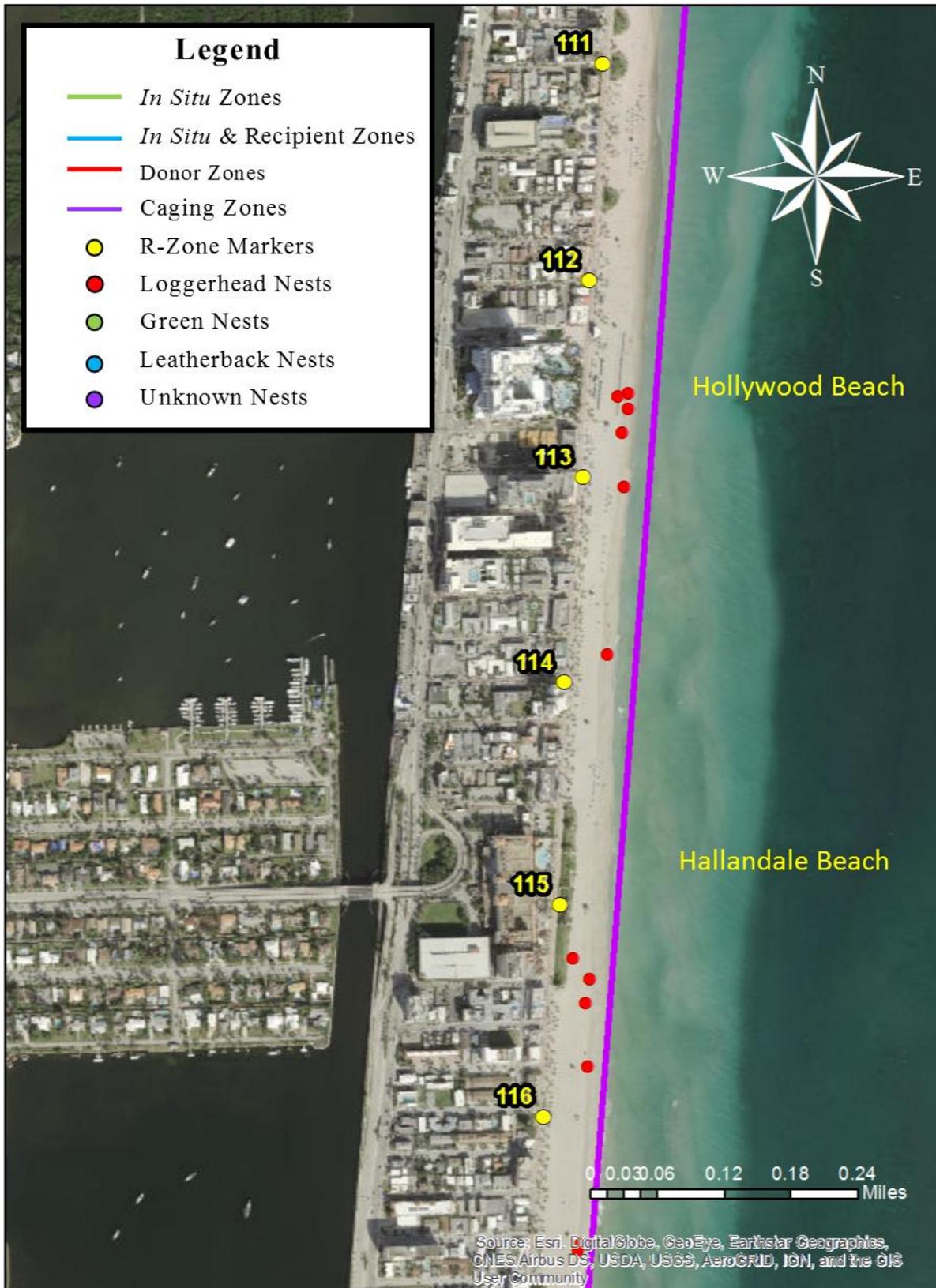


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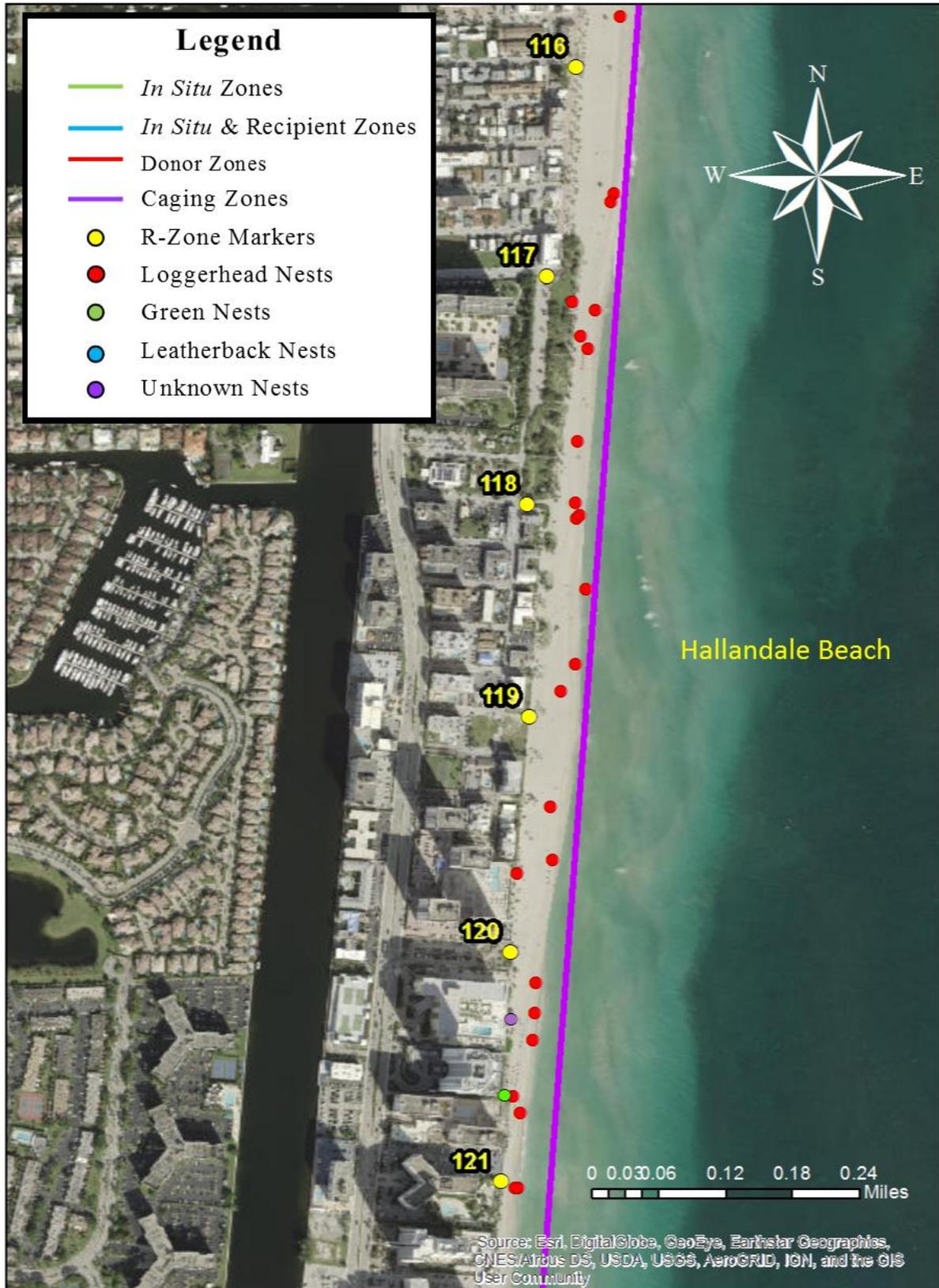


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

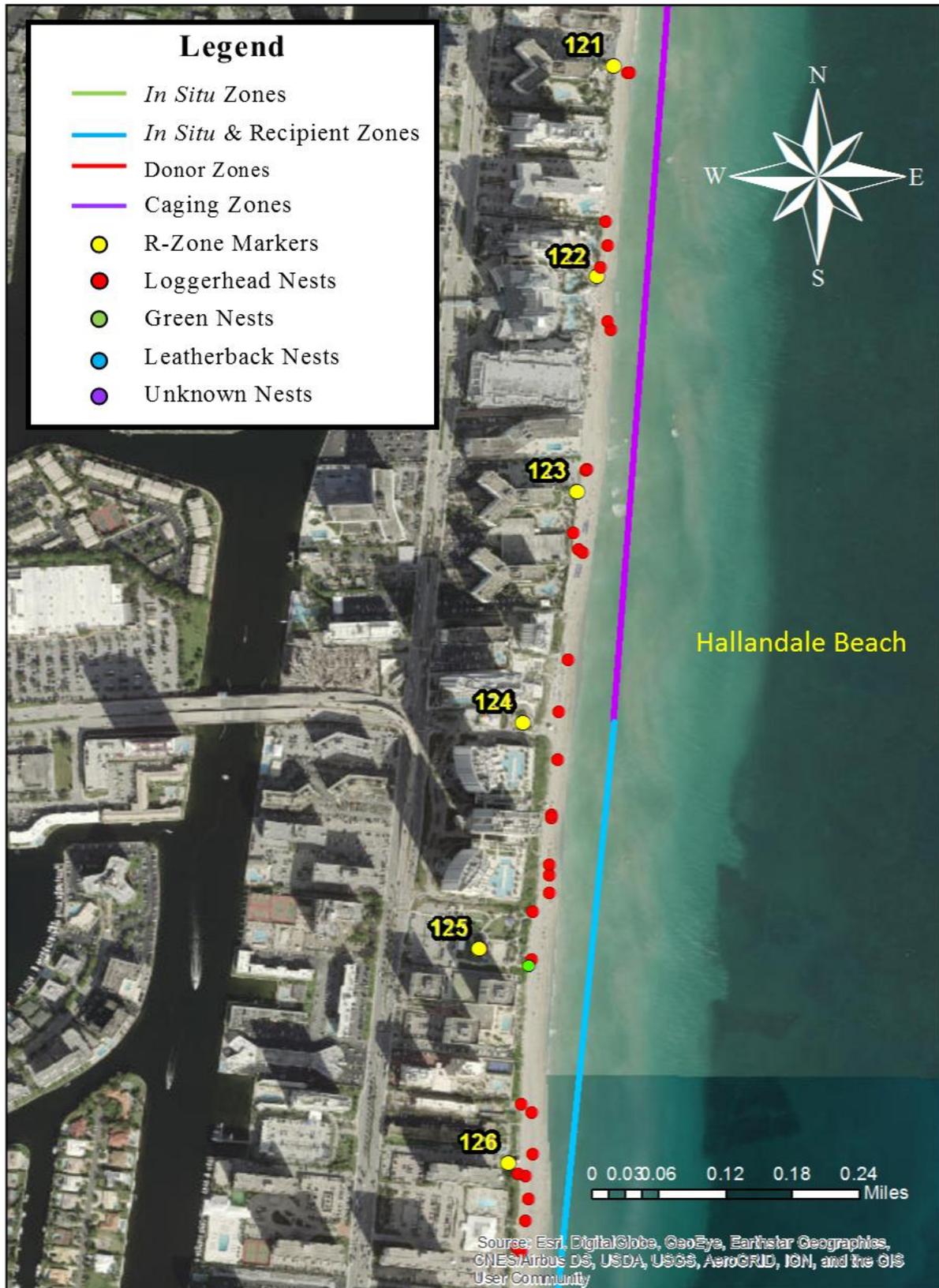


Figure 3: Locations of 2018 Turtle Crawls and Treatment Zones

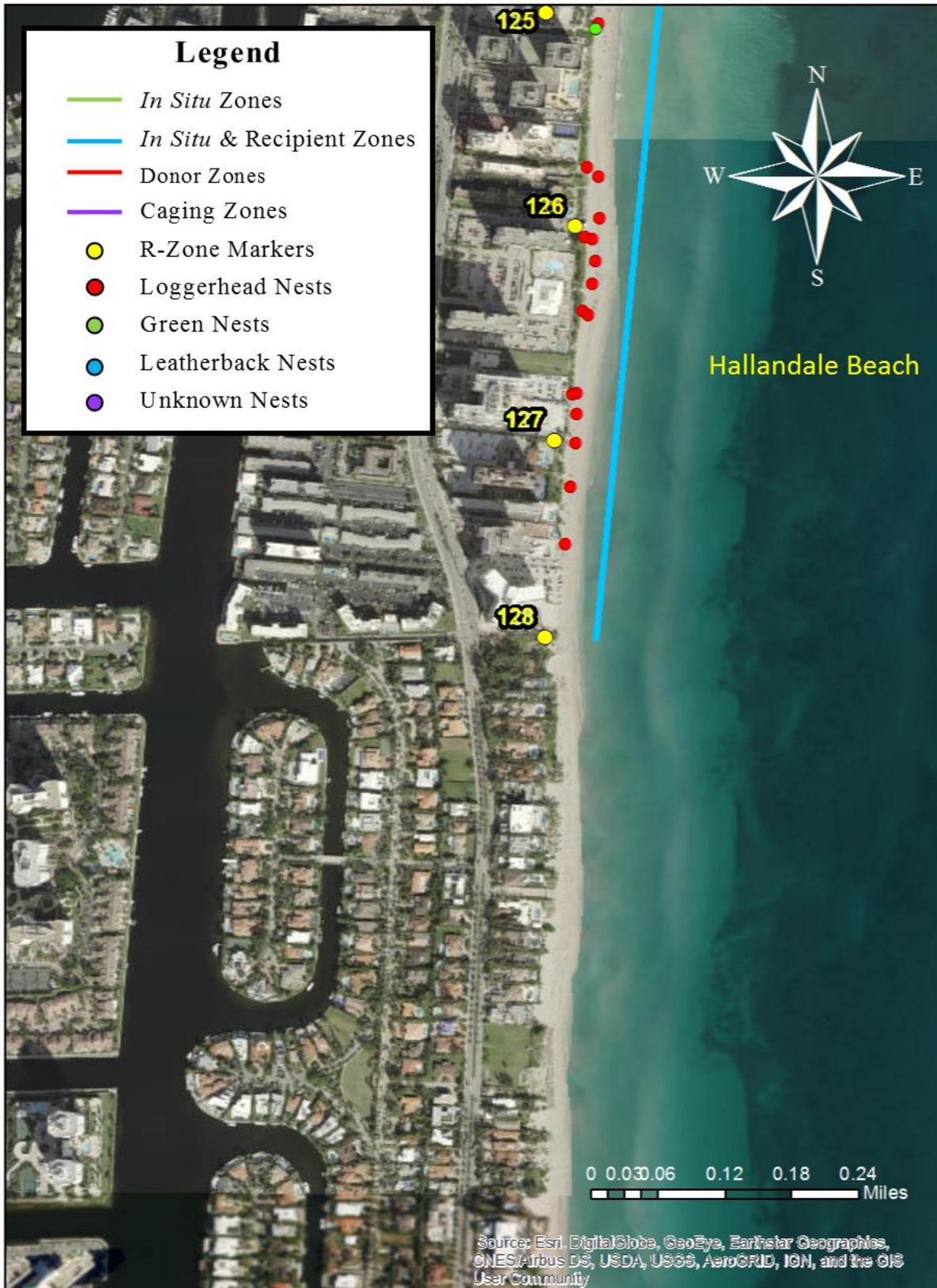


Figure 4: Historical crawl totals for all species combined for Broward County (2000-2018). Nests are designated by blue bars and false crawls are designated by red bars. Solid lines indicate linear trend lines for nesting (blue) and false crawls (red).

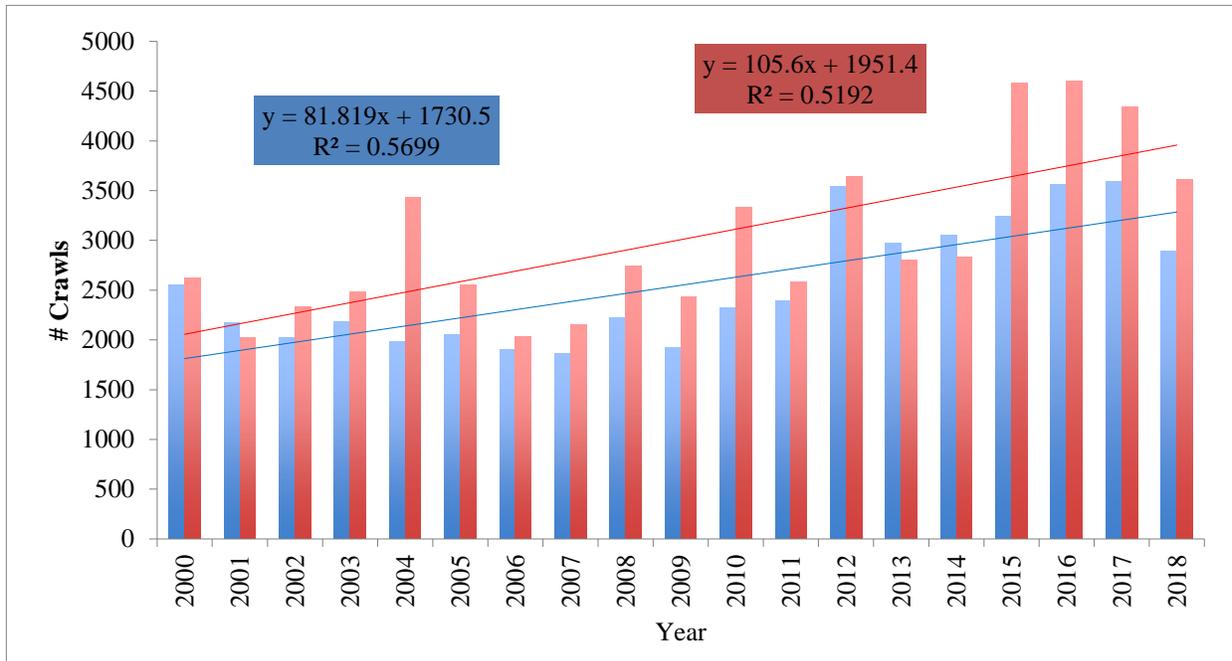


Figure 5: Historical nesting success, all species combined for Broward County (2000-2018). Five-year average is indicated by the solid black line.

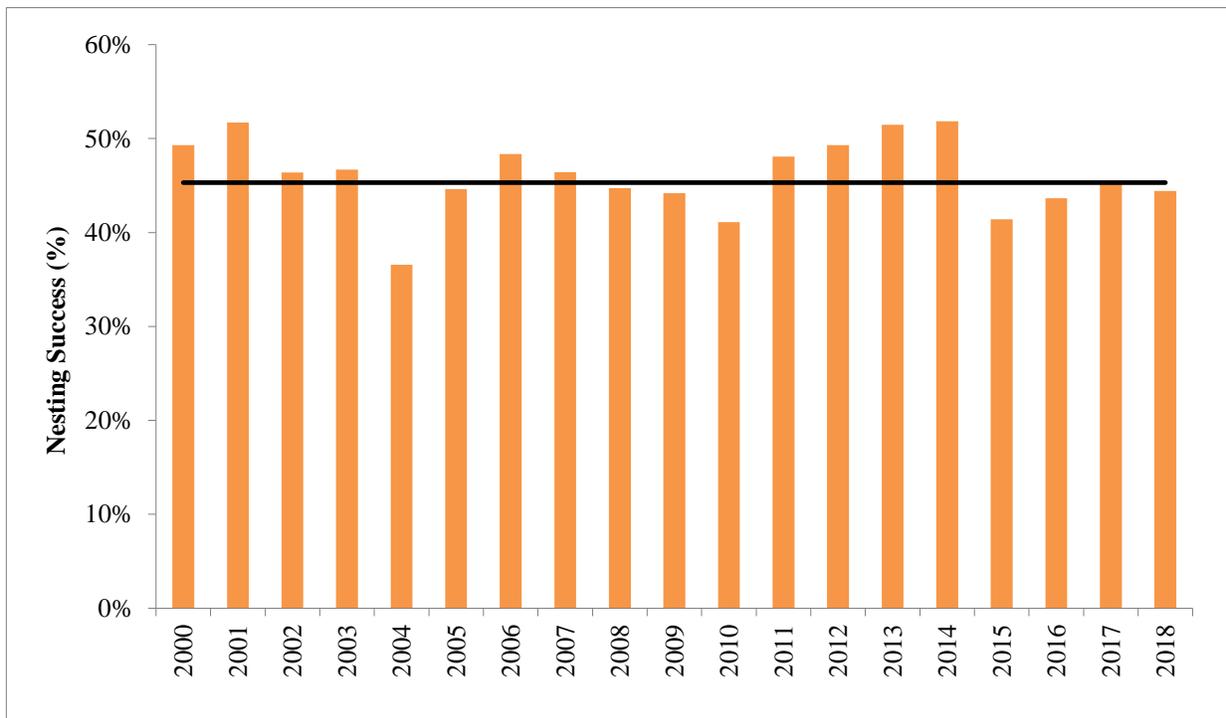


Figure 6: Number of nests laid per day in Broward County, by species.

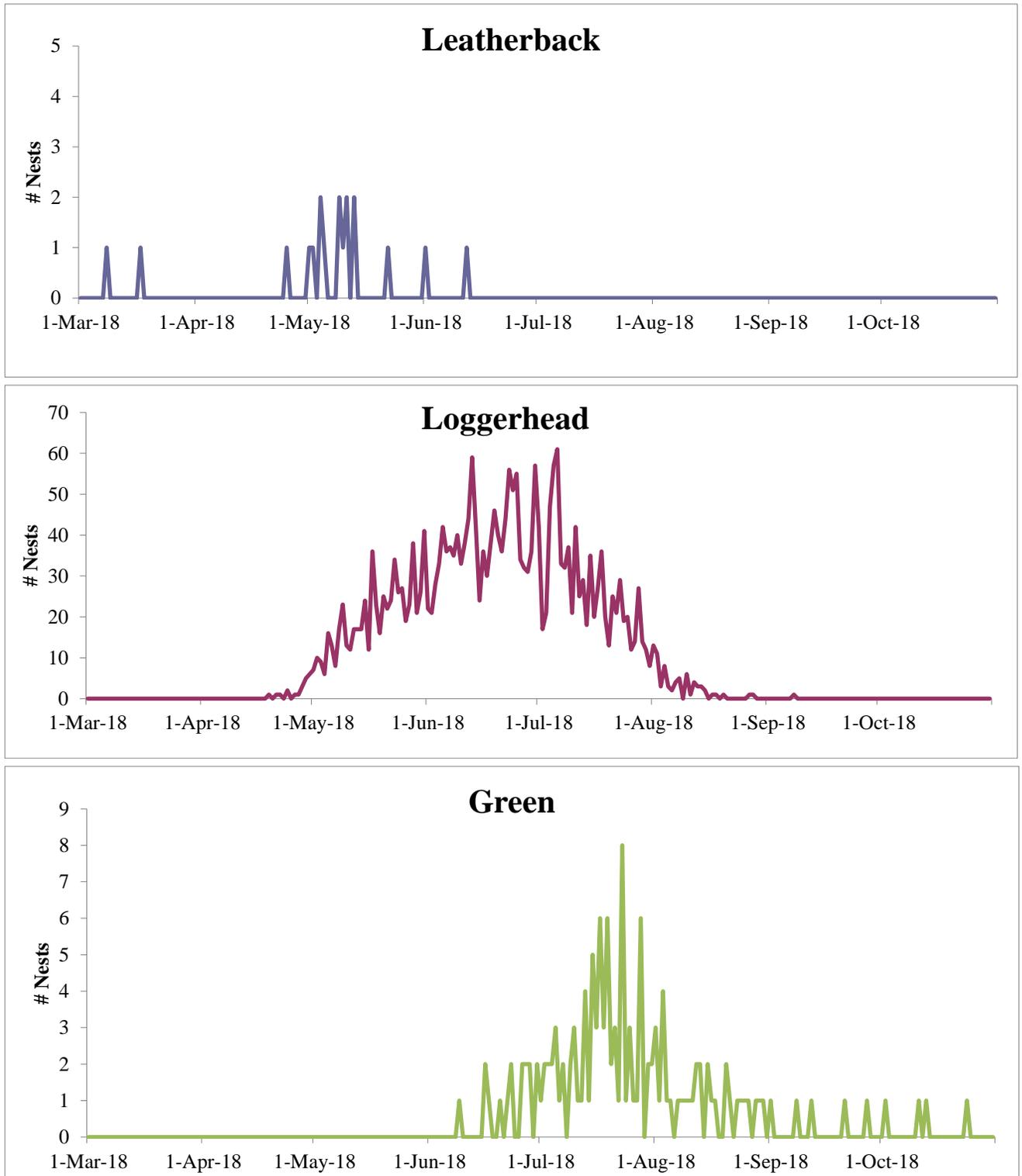


Figure 7: Historical nesting success in Broward County by species from 2000-2018. Five-year average is indicated by the solid black line.

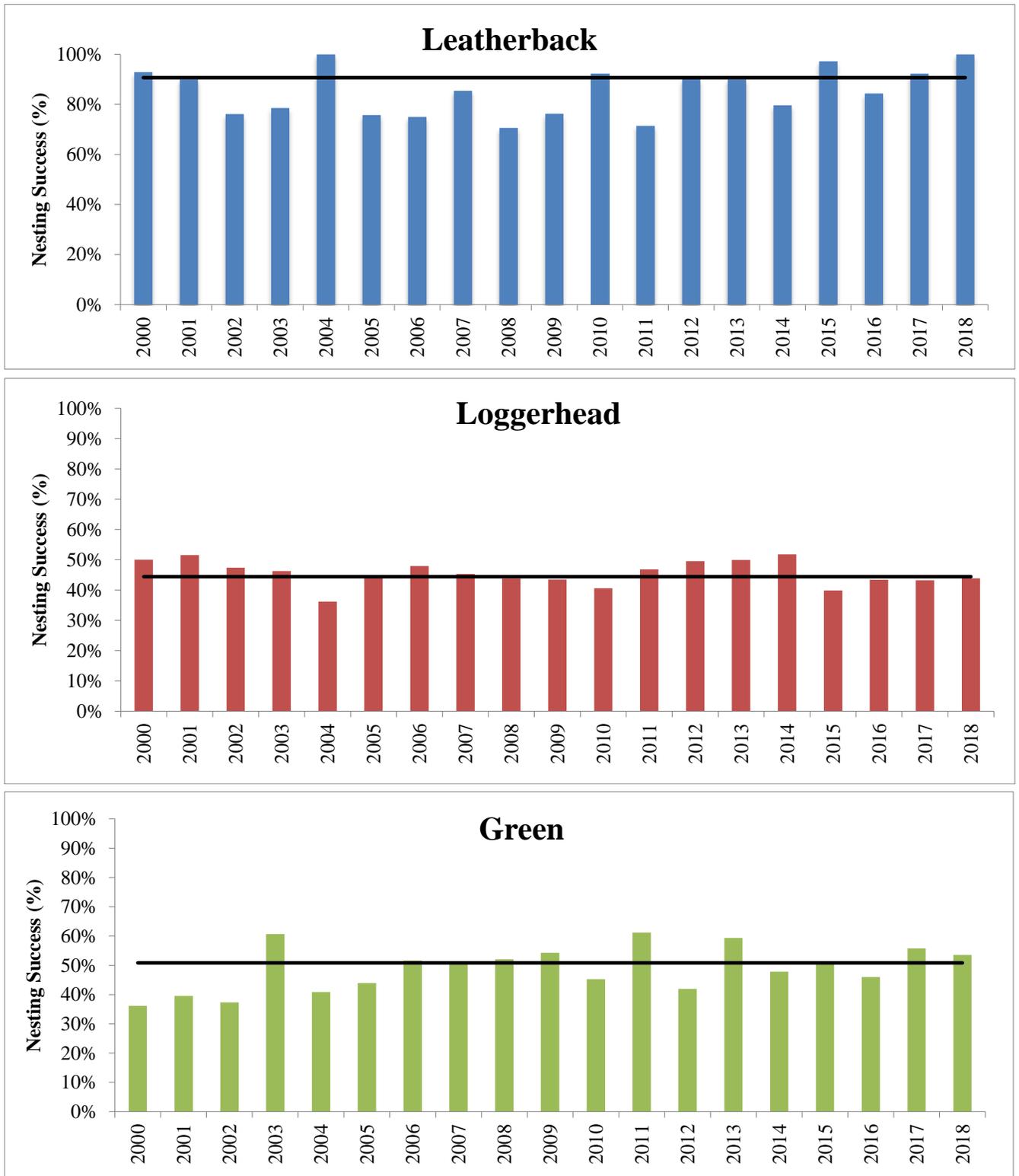


Figure 8: Historical nest activity (number of nests) in Broward County by species from 1981-2018. Dotted lines indicate trend lines of nest activity.

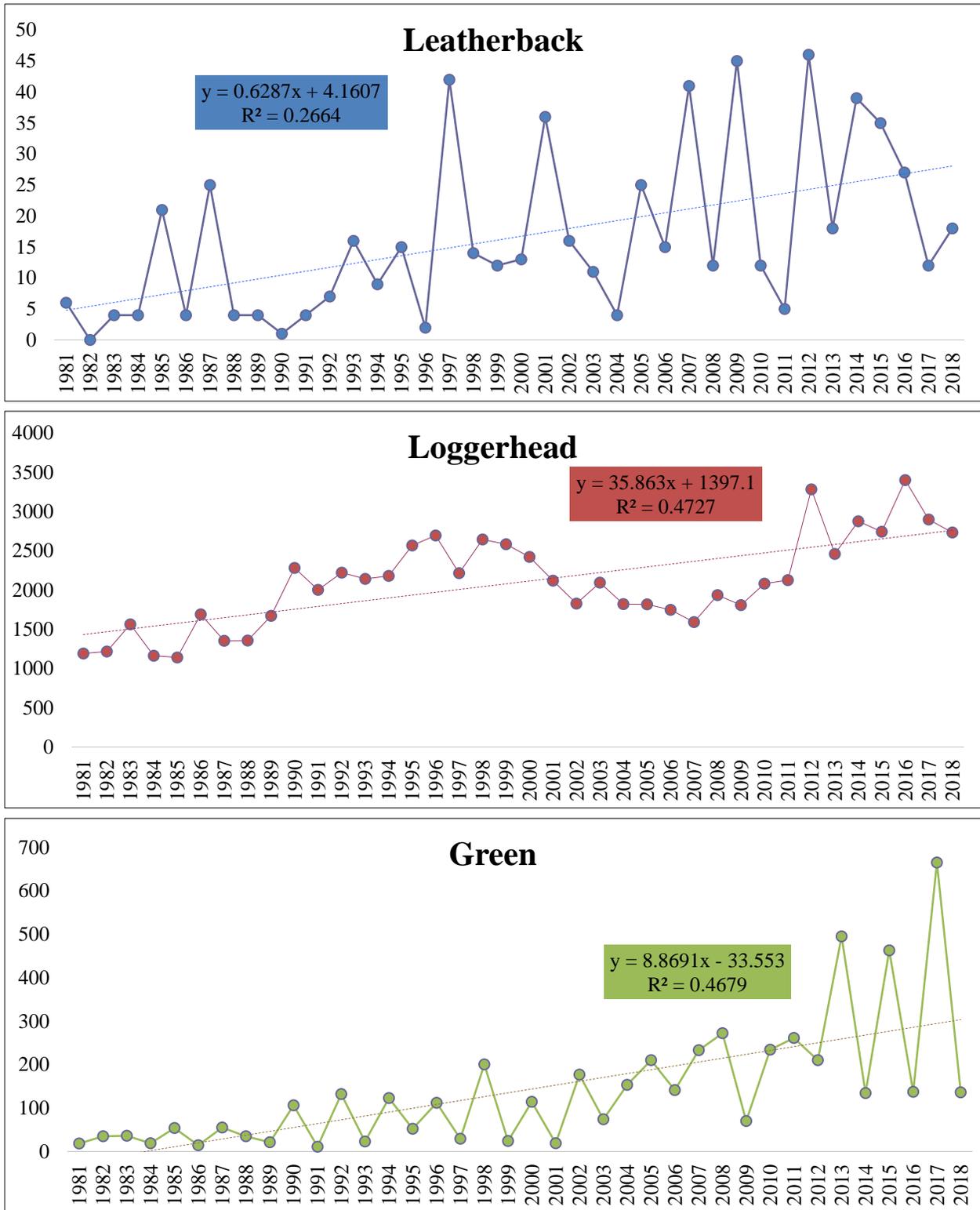


Figure 9: Historical nest relocation activity in Broward County (excluding Mizell-Eula State Park) 2005-2018. Solid line indicates linear trend line of nest relocation activity.

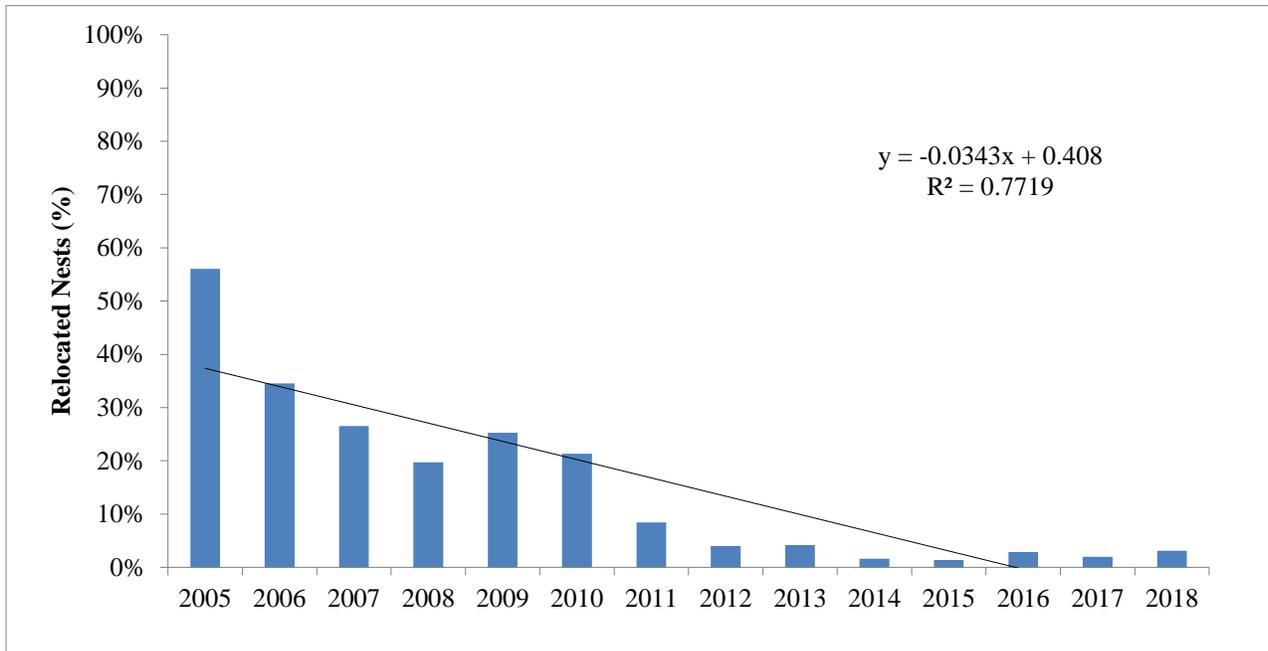


Figure 10: Historical disorientation reporting (adult and hatchling disorientations) by the BCSTCP in Broward County (excluding Mizell-Eula State Park) 2009-2018 reported by the solid purple line. Dotted line indicates linear trend line of disorientations.

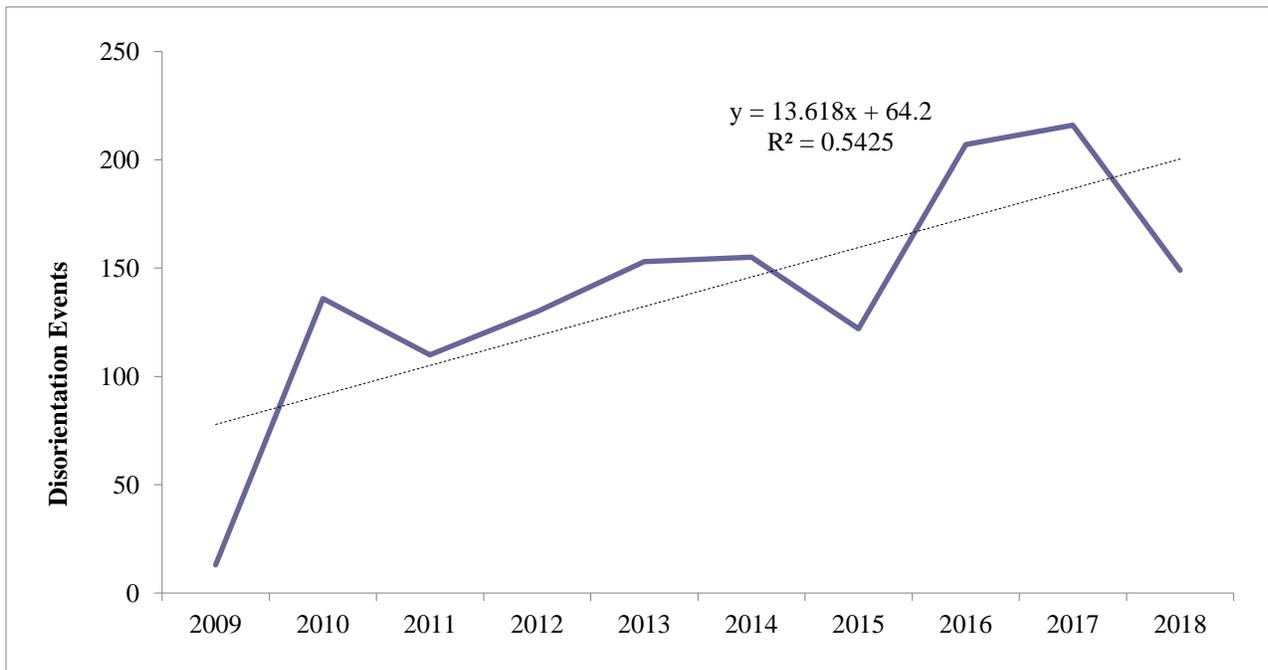


Figure 11: All hatchling disorientation reports by municipality recorded in 2018, as reported by BCSTCP, STOP, SFAS, and STARS.

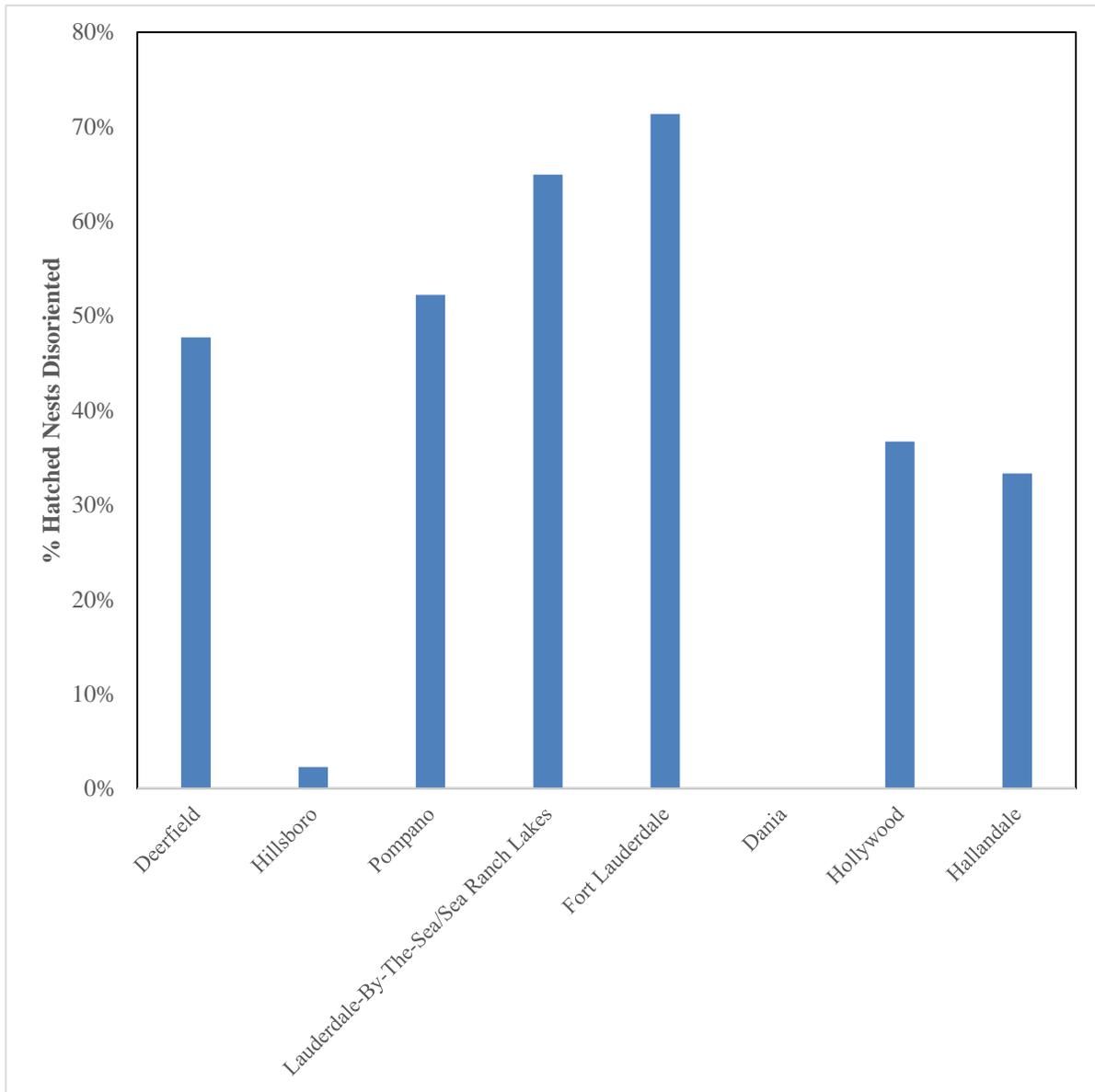


Figure 12: Percentage of nests that experienced predation in Broward County, all species and survey zones combined, 2005-2018. Solid line indicates linear trend line of nest predation.

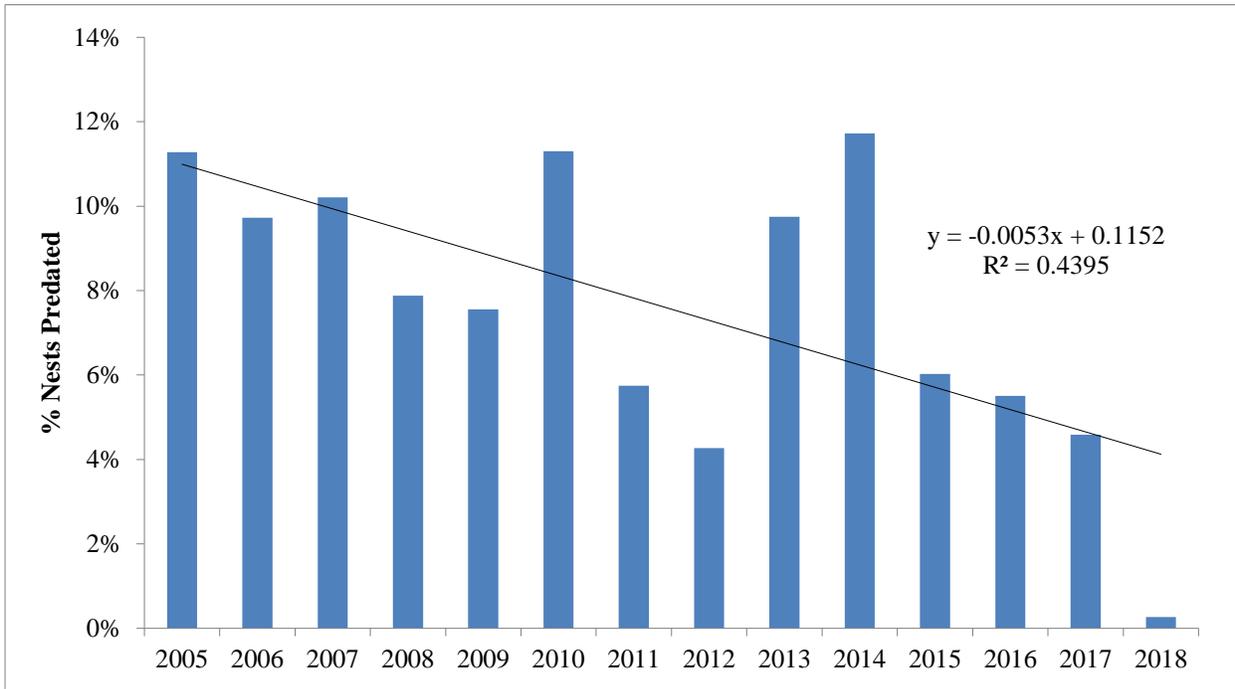


Figure 13: Percentage of nests that experienced predation in the Hillsboro survey zone, all species combined, 2005-2018. Solid line indicates linear trend line of nest predation.

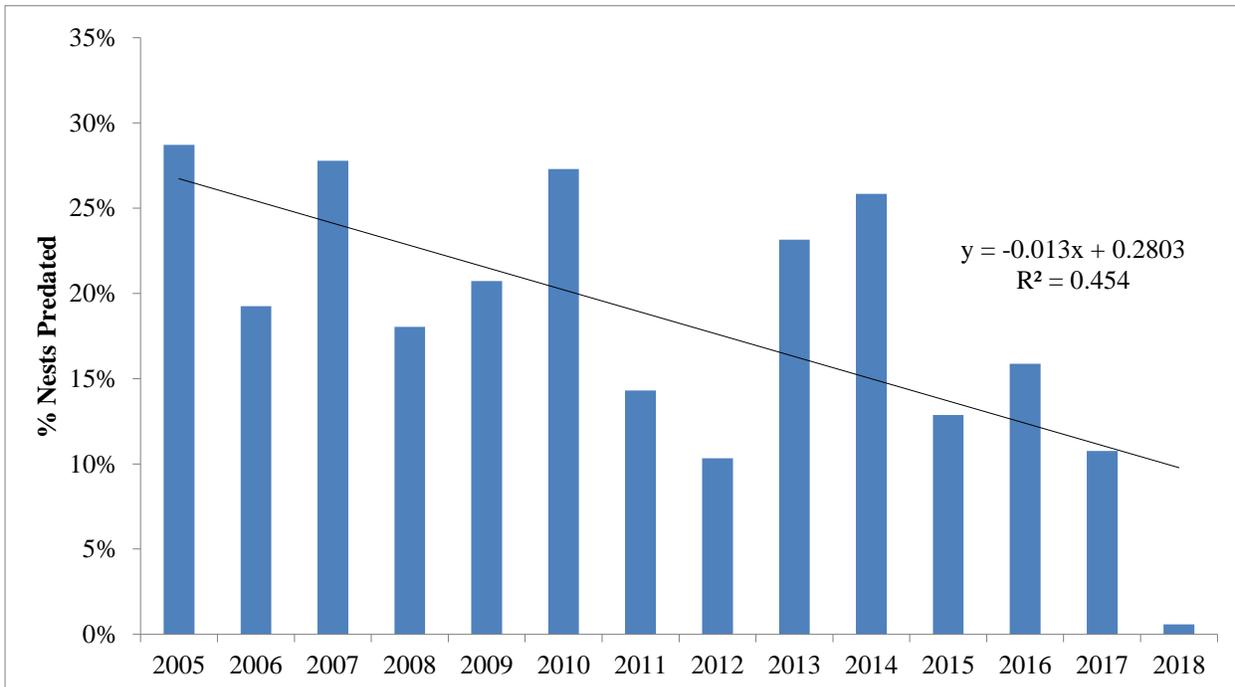
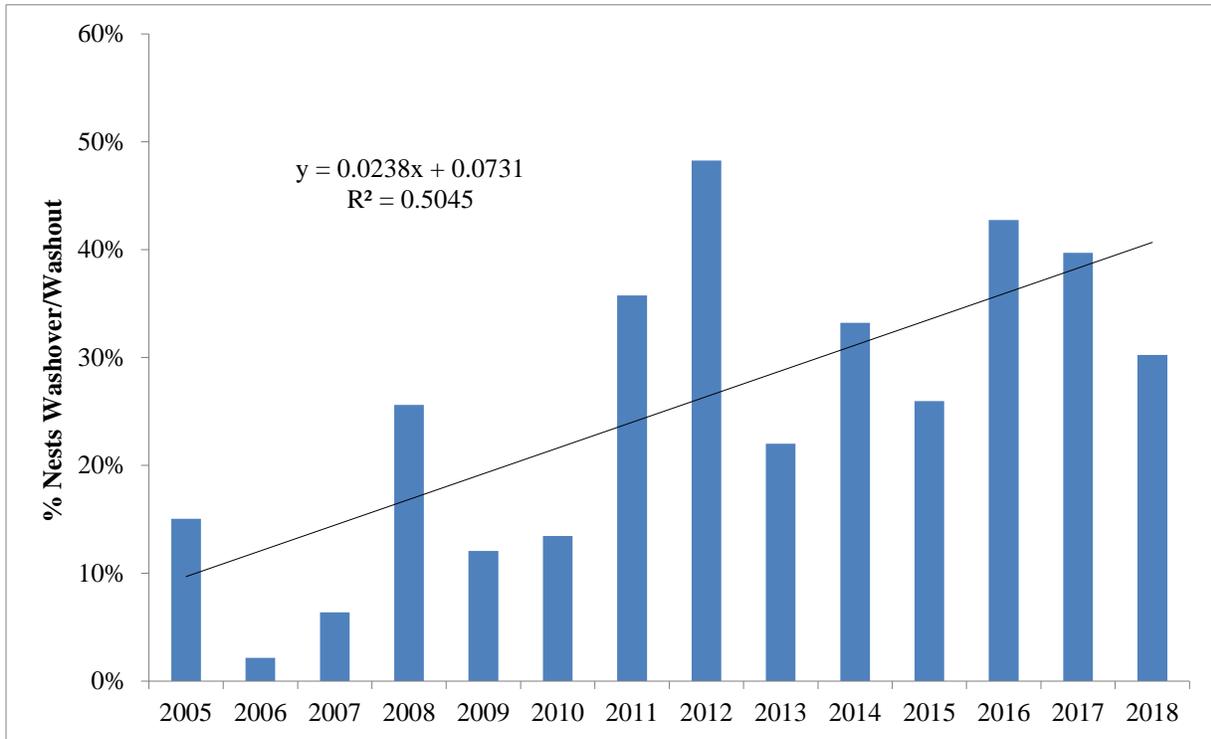


Figure 14: Historical nest washover/inundation in Broward County (excluding Mizell-Eula State Park), all species combined, 2005-2018. Solid line indicates linear trend line of nest washover/inundation.



Appendix 1: FWC sea turtle nesting reports for 2018 season.

Hillsboro/Deerfield:

Permit Number: 214

Beach: Deerfield/Hillsboro Beaches (BROWARD)

Principal Permit Holder

Name: Curtis Slagle

Organization:

Address line 1: 1161 S Park Rd., Apt. 301

Address line 2:

Email address: cs1858@nova.edu

Phone number (day): 954-383-2072

Phone number (evening):

Qualified Individual

Name:

Point of Contact

Name:

Email address:

Phone number:

Previous Survey Boundary Description

Beginning survey boundary: Palm Bch/Broward Co Line

Ending survey boundary: Hillsboro Inlet

Beach length (km): 7.00

Same area surveyed this year: Yes

2018 Survey Details

Total # of days surveyed during entire 2018 nesting season: 245

How many people were involved in surveying your nesting beach this season: 25

Start date: 03/01/2018

End date: 10/31/2018

Number of days per week surveyed: 7

Description of survey schedule: 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

Permit Number: 214

Beach: Deerfield/Hillsboro Beaches (BROWARD)

GPS Data

Did you collect GPS data for your nests: All

Did you also collect GPS data for false crawls: Yes

Did you collect GPS data for your nests: Yes

Relocated Nests

How many nests were relocated this season: 18

Of these, how many were for construction projects, e.g., beach renourishment: 0

List other reasons for nest relocation: Nests located at or below high tide line on date of deposition and exposed nests with active egg loss.

NEST INVENTORY

Did you mark nests for inventory to determine hatching success: Yes

How many nests were inventoried in 2018: 715

Predation

Did you actively look for and record predation events: Yes

Regarding mammalian predation events, what proportion of the events did you likely record: All

How many nests were negatively affected by predators (other than humans) PRIOR to hatching: 6

List all non-human predators that were documented preying nests this season: Fox, birds (secondary), and crabs.

Predator control methods other than screening/caging: N/A

Human Disturbance

How many nests were taken or disturbed by humans: 0

Other Disturbances

How many nests were negatively affected by another nesting sea turtle PRIOR to hatching: 0

How many nests were negatively affected by roots: 8

How many nests were negatively affected by erosion, accretion, inundation, and storm-related events PRIOR to hatching: 41

Details: 33 nests washed out

7 nests accreted (1 of which was a washout)

3 nests inundated (1 of which was a washout)

Storms Alberto and Gordon only washed out 14 nests

Disorientation Events

How many disorientation events occurred on this survey area in 2018: 20

Have all disorientation reports been submitted to FWC: Yes

Permit Number: 214

Beach: Deerfield/Hillsboro Beaches (BROWARD)

Nesting Overview Data					
	<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	966	41	12	0	0
Total # of Non-Nesting Emergences	1143	28	0	0	0
Date of First Documented Nest	04/19/18	06/09/18	03/17/18		
Date of Last Documented Nest	08/27/18	08/23/18	06/01/18		
Total # of Nests Prior to 15 May	62	0	10	0	0
Total # of Nests After 31 Aug	0	0	0	0	0
Comments: N/A					

Initial Nest Treatment: Left In Place					
	<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)
(a) # Left without Additional Protection	961	40	12	0	0
(b) # Left with Self-Releasing Flat	0	0	0	0	0
(c) # Left with Self-Releasing Cage	0	0	0	0	0
(d) # Left with Restraining Cage	0	0	0	0	0
Total # Left In Place (a+b+c+d)	961	40	12	0	0

Initial Nest Treatment: Nests Relocated					
	<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)
(e) # Relocated without Additional	5	1	0	0	0
(f) # Relocated with Self-Releasing	0	0	0	0	0
(g) # Relocated with Self-Releasing	0	0	0	0	0
(g) # Relocated with Restraining Cage	0	0	0	0	0
Total # Relocated (e+f+g+h)	5	1	0	0	0

Permit Number: 214

Beach: Deerfield/Hillsboro Beaches (BROWARD)

Additional comments about nesting beach management (e.g., predation, storms, poaching, etc.)

No major comments to add.

Additional comments regarding general nesting data (e.g., nests, false crawls)

228 ONA reports filed

16 missed nests were discovered, 11 were associated with false crawls

Additional comments regarding nest success data

N/A

Miscellaneous comments regarding the data

N/A

Pompano/Lauderdale-By-The-Sea:

Permit Number: 214

Beach: Pompano/Lauderdale-by-the-Sea (BROWARD)

Principal Permit Holder

Name: Curtis Slagle

Organization:

Address line 1: 1161 S Park Rd., Apt. 301

Address line 2:

Email address: cs1858@nova.edu

Phone number (day): 954-383-2072

Phone number (evening):

Qualified Individual

Name:

Point of Contact

Name:

Email address:

Phone number:

Previous Survey Boundary Description

Beginning survey boundary: Hillsboro Inlet

Ending survey boundary: Commerical Blvd. Pier

Beach length (km): 7.70

Same area surveyed this year: Yes

2018 Survey Details

Total # of days surveyed during entire 2018 nesting season: 245

How many people were involved in surveying your nesting beach this season: 25

Start date: 03/01/2018

End date: 10/31/2018

Number of days per week surveyed: 7

Description of survey schedule: 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

Permit Number: 214

Beach: Pompano/Lauderdale-by-the-Sea (BROWARD)

GPS Data

Did you collect GPS data for your nests: All

Did you also collect GPS data for false crawls: Yes

Did you collect GPS data for your nests: Yes

Relocated Nests

How many nests were relocated this season: 17

Of these, how many were for construction projects, e.g., beach renourishment: 5

List other reasons for nest relocation: Nests located at or below high tide line on date of deposition and exposed nests with active egg loss.

NEST INVENTORY

Did your mark nests for inventory to determine hatching success: Yes

How many nests were inventoried in 2018: 455

Predation

Did you actively look for and record predation events: Yes

Regarding mammalian predation events, what proportion of the events did you likely record: All

How many nests were negatively affected by predators (other than humans) PRIOR to hatching: 0

Predator control methods other than screening/caging:

Human Disturbance

How many nests were taken or disturbed by humans: 4

Details: One evening, four nests were excessively dug into without successful egg removal.

Were the disturbances reported to law enforcement: Yes

Other Disturbances

How many nests were negatively affected by another nesting sea turtle PRIOR to hatching: 0

How many nests were negatively affected by roots: 0

How many nests were negatively affected by erosion, accretion, inundation, and storm-related events PRIOR to hatching: 31

Details: 25 nests washed out.

4 nests accreted.

2 nests inundated.

Storms Alberto and Gordon washed out 24 nests.

Disorientation Events

How many disorientation events occurred on this survey area in 2018: 55

Have all disorientation reports been submitted to FWC: Yes

Permit Number: 214

Beach: Pompano/Lauderdale-by-the-Sea (BROWARD)

Nesting Overview Data

	<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	561	1	5	0	0
Total # of Non-Nesting Emergences	634	12	0	0	0
Date of First Documented Nest	04/24/18	08/28/18	05/05/18		
Date of Last Documented Nest	08/13/18	08/28/18	06/12/18		
Total # of Nests Prior to 15 May	47	0	4	0	0
Total # of Nests After 31 Aug	0	0	0	0	0
Comments: N/A					

Initial Nest Treatment: Left In Place

	<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)
(a) # Left without Additional Protection	551	1	5	0	0
(b) # Left with Self-Releasing Flat	0	0	0	0	0
(c) # Left with Self-Releasing Cage	0	0	0	0	0
(d) # Left with Restraining Cage	0	0	0	0	0
Total # Left In Place (a+b+c+d)	551	1	5	0	0

Initial Nest Treatment: Nests Relocated

	<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)
(e) # Relocated without Additional	10	0	0	0	0
(f) # Relocated with Self-Releasing	0	0	0	0	0
(g) # Relocated with Self-Releasing	0	0	0	0	0
(g) # Relocated with Restraining Cage	0	0	0	0	0
Total # Relocated (e+f+g+h)	10	0	0	0	0

Permit Number: 214

Beach: Pompano/Lauderdale-by-the-Sea (BROWARD)

Additional comments about nesting beach management (e.g., predation, storms, poaching, etc.)

No major comments to add.

Additional comments regarding general nesting data (e.g., nests, false crawls)

73 ONA reports filed.

7 missed nests were discovered, 3 were associated with false crawls.

Additional comments regarding nest success data

N/A

Miscellaneous comments regarding the data

N/A

Fort Lauderdale:

Permit Number: 214

Beach: Ft Lauderdale Beach (BROWARD)

Principal Permit Holder

Name: Curtis Slagle

Organization:

Address line 1: 1161 S Park Rd., Apt. 301

Address line 2:

Email address: cs1858@nova.edu

Phone number (day): 954-383-2072

Phone number (evening):

Qualified Individual

Name:

Point of Contact

Name:

Email address:

Phone number:

Previous Survey Boundary Description

Beginning survey boundary: Commerical Blvd. Pier

Ending survey boundary: Port Everglades Inlet

Beach length (km): 10.60

Same area surveyed this year: Yes

2018 Survey Details

Total # of days surveyed during entire 2018 nesting season: 245

How many people were involved in surveying your nesting beach this season: 25

Start date: 03/01/2018

End date: 10/31/2018

Number of days per week surveyed: 7

Description of survey schedule: 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

Permit Number: 214

Beach: Ft Lauderdale Beach (BROWARD)

GPS Data

Did you collect GPS data for your nests: All

Did you also collect GPS data for false crawls: Yes

Did you collect GPS data for your nests: Yes

Relocated Nests

How many nests were relocated this season: 45

Of these, how many were for construction projects, e.g., beach renourishment: 0

List other reasons for nest relocation: Nests located at or below high tide line on date of deposition, nests deposited in donor zones, and exposed nests with active egg loss.

NEST INVENTORY

Did you mark nests for inventory to determine hatching success: Yes

How many nests were inventoried in 2018: 792

Predation

Did you actively look for and record predation events: Yes

Regarding mammalian predation events, what proportion of the events did you likely record: All

How many nests were negatively affected by predators (other than humans) PRIOR to hatching: 1

List all non-human predators that were documented predated nests this season: Ghost crab

Predator control methods other than screening/caging:

Human Disturbance

How many nests were taken or disturbed by humans: 0

Other Disturbances

How many nests were negatively affected by another nesting sea turtle PRIOR to hatching: 0

How many nests were negatively affected by roots: 7

How many nests were negatively affected by erosion, accretion, inundation, and storm-related events PRIOR to hatching: 18

Details: 17 nests washed out

1 nests accreted

0 nests inundated

Storms Alberto and Gordon only washed out 11 nests

Disorientation Events

How many disorientation events occurred on this survey area in 2018: 49

Have all disorientation reports been submitted to FWC: Yes

Permit Number: 214

Beach: Ft Lauderdale Beach (BROWARD)

Nesting Overview Data					
	<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	889	46	1	0	0
Total # of Non-Nesting Emergences	1113	28	0	0	0
Date of First Documented Nest	04/21/18	06/16/18	03/08/18		
Date of Last Documented Nest	09/08/18	10/24/18	03/08/18		
Total # of Nests Prior to 15 May	77	0	1	0	0
Total # of Nests After 31 Aug	1	6	0	0	0
Comments: N/A					

Initial Nest Treatment: Left In Place					
	<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)
(a) # Left without Additional Protection	864	44	1	0	0
(b) # Left with Self-Releasing Flat	0	0	0	0	0
(c) # Left with Self-Releasing Cage	0	0	0	0	0
(d) # Left with Restraining Cage	0	0	0	0	0
Total # Left In Place (a+b+c+d)	864	44	1	0	0

Initial Nest Treatment: Nests Relocated					
	<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)
(e) # Relocated without Additional	25	2	0	0	0
(f) # Relocated with Self-Releasing	0	0	0	0	0
(g) # Relocated with Self-Releasing	0	0	0	0	0
(g) # Relocated with Restraining Cage	0	0	0	0	0
Total # Relocated (e+f+g+h)	25	2	0	0	0

Permit Number: 214

Beach: Ft Lauderdale Beach (BROWARD)

Additional comments about nesting beach management (e.g., predation, storms, poaching, etc.)

N/A

Additional comments regarding general nesting data (e.g., nests, false crawls)

95 ONA reports filed.

20 missed nests were discovered, 7 were associated with false crawls.

Additional comments regarding nest success data

N/A

Miscellaneous comments regarding the data

N/A

Hollywood/Hallandale:

Permit Number: 214

Beach: Hollywood/Hallandale Beaches (BROWARD)

Principal Permit Holder

Name: Curtis Slagle

Organization:

Address line 1: 1161 S Park Rd., Apt. 301

Address line 2:

Email address: cs1858@nova.edu

Phone number (day): 954-383-2072

Phone number (evening):

Qualified Individual

Name:

Point of Contact

Name:

Email address:

Phone number:

Previous Survey Boundary Description

Beginning survey boundary: 3.9 km S of Port Everglades Inlet

Ending survey boundary: Broward/Miami-Dade Co Line

Beach length (km): 9.40

Same area surveyed this year: Yes

2018 Survey Details

Total # of days surveyed during entire 2018 nesting season: 245

How many people were involved in surveying your nesting beach this season: 25

Start date: 03/01/2018

End date: 10/31/2018

Number of days per week surveyed: 7

Description of survey schedule: 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

Permit Number: 214

Beach: Hollywood/Hallandale Beaches (BROWARD)

GPS Data

Did you collect GPS data for your nests: All

Did you also collect GPS data for false crawls: Yes

Did you collect GPS data for your nests: Yes

Relocated Nests

How many nests were relocated this season: 2

Of these, how many were for construction projects, e.g., beach renourishment: 0

List other reasons for nest relocation: Exposed nests with active egg loss.

NEST INVENTORY

Did you mark nests for inventory to determine hatching success: Yes

How many nests were inventoried in 2018: 102

Predation

Did you actively look for and record predation events: Yes

Regarding mammalian predation events, what proportion of the events did you likely record: All

How many nests were negatively affected by predators (other than humans) PRIOR to hatching: 0

Predator control methods other than screening/caging: N/A

Human Disturbance

How many nests were taken or disturbed by humans: 0

Other Disturbances

How many nests were negatively affected by another nesting sea turtle PRIOR to hatching: 0

How many nests were negatively affected by roots: 1

How many nests were negatively affected by erosion, accretion, inundation, and storm-related events PRIOR to hatching: 4

Details: 4 nests washed out.

Storms Alberto and Gordon only washed out 2 nests.

Disorientation Events

How many disorientation events occurred on this survey area in 2018: 21

Have all disorientation reports been submitted to FWC: Yes

Permit Number: 214

Beach: Hollywood/Hallandale Beaches (BROWARD)

Nesting Overview Data					
	<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	128	3	0	0	0
Total # of Non-Nesting Emergences	150	6	0	0	0
Date of First Documented Nest	05/02/18	09/08/18			
Date of Last Documented Nest	08/17/18	10/11/18			
Total # of Nests Prior to 15 May	10	0	0	0	0
Total # of Nests After 31 Aug	0	3	0	0	0
Comments: 1 Nest is an unknown species.					

Initial Nest Treatment: Left In Place					
	<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)
(a) # Left without Additional Protection	128	3	0	0	0
(b) # Left with Self-Releasing Flat	0	0	0	0	0
(c) # Left with Self-Releasing Cage	0	0	0	0	0
(d) # Left with Restraining Cage	0	0	0	0	0
Total # Left In Place (a+b+c+d)	128	3	0	0	0

Initial Nest Treatment: Nests Relocated					
	<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)
(e) # Relocated without Additional	0	0	0	0	0
(f) # Relocated with Self-Releasing	0	0	0	0	0
(g) # Relocated with Self-Releasing	0	0	0	0	0
(g) # Relocated with Restraining Cage	0	0	0	0	0
Total # Relocated (e+f+g+h)	0	0	0	0	0

Permit Number: 214

Beach: Hollywood/Hallandale Beaches (BROWARD)

Additional comments about nesting beach management (e.g., predation, storms, poaching, etc.)

No major comments to add.

Additional comments regarding general nesting data (e.g., nests, false crawls)

49 ONA reports filed

7 missed nests were discovered, 0 were associated with false crawls

Additional comments regarding nest success data

N/A

Miscellaneous comments regarding the data

N/A

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)	U.S. ENDANGERED SPECIES ACT OF 1973
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.	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.
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.	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” height x 24” diameter.



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



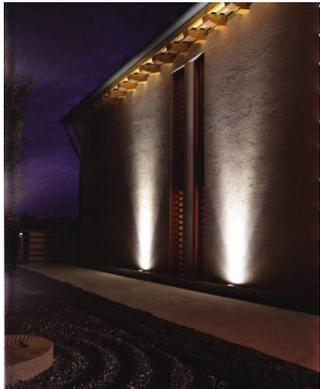
Appendix 4: Example lighting survey data sheet.

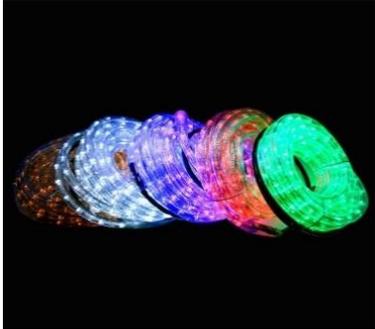
HALLANDALE	BLANK = 0 LIGHTS; 1 = 1 LIGHT; 2 = 2-10 LIGHTS; 3 = 11-25 LIGHTS; 4 = 25+ LIGHTS																						
ADDRESS	Cobra	Acorn	Floodlight	Globe	Bell	Wall Mount	Ceiling Mount	NEMA	Up Lighting	Bollards	Landscape	Spotlights	Interior	Rope	Posted	UFO	Pool Lighting	Neon	Signage	Fluorescent	Walkway	Step Lights	COMMENTS
111 S Surf Rd																							
2801 E Hallandale Beach								1	1									1					Wall mounts on construction west
1800 S Ocean Dr				1								1			2								
1830 S Ocean Dr								1															Fluorescent lights on north side
1850 S Ocean Dr			1																	1			
1870 S Ocean Dr															1					1			
1904-1880 S Ocean Dr								1															Globes from west side of A1A
1920-1912 S Ocean Dr			1	2												2			1				
1928 S Ocean Dr								1															
1936 S Ocean Dr															1			1					
1950 S Ocean Dr		1																					
1980 S Ocean Dr												1				1							
2000 S Ocean Dr																							
2030 S Ocean Dr							1																
2080 S Ocean Dr										1								3				1	
2076 S Ocean Dr																							
3140 S Ocean Dr					1								1				1		1			1	
3180 S Ocean Dr								1															
Miami Dade County																							

Appendix 5: Lighting survey examples of light fixtures.

Light Fixture Type	Description	Example
<p style="text-align: center;">Cobra</p>	<p style="text-align: center;">Streetlights that look like a snake head.</p>	
<p style="text-align: center;">Acorn</p>	<p style="text-align: center;">Streetlights that resemble acorns.</p>	
<p style="text-align: center;">Floodlight</p>	<p style="text-align: center;">Lights that are typically attached to corners of buildings and illuminate a broad area.</p>	

Light Fixture Type	Description	Example
<p style="text-align: center;">Globe</p>	<p>Circular, posted lights. May be “shielded” on one side with black paint, canvas, or inside the fixture.</p>	
<p style="text-align: center;">Bell</p>	<p>Pole-mounted lights with a bell-shaped fixture.</p>	
<p style="text-align: center;">Wall Mount</p>	<p>A light fixture that is mounted to a wall that is not described elsewhere.</p>	
<p style="text-align: center;">Ceiling Mount</p>	<p>A light fixture that is mounted to a ceiling that is not described elsewhere.</p>	

Light Fixture Type	Description	Example
<p style="text-align: center;">NEMA</p>	<p style="text-align: center;">Streetlight with a circular covering and open bottom.</p>	
<p style="text-align: center;">Up Lighting</p>	<p style="text-align: center;">Lights that are directed upward.</p>	
<p style="text-align: center;">Bollards</p>	<p style="text-align: center;">Lighting that is inside posts attached to ground; usually less than 4 feet in height.</p>	
<p style="text-align: center;">Landscape</p>	<p style="text-align: center;">Lighting that illuminates trees or other vegetation.</p>	

Light Fixture Type	Description	Example
<p style="text-align: center;">Spotlights</p>	<p style="text-align: center;">Lighting that is directed toward something specific.</p>	
<p style="text-align: center;">Interior</p>	<p style="text-align: center;">Lights that are located inside a property and turned on.</p>	
<p style="text-align: center;">Rope</p>	<p style="text-align: center;">Multiple small lights attached to a rope.</p>	
<p style="text-align: center;">Posted</p>	<p style="text-align: center;">Any other lights on a pole not previously described.</p>	

Light Fixture Type	Description	Example
<p style="text-align: center;">UFO</p>	<p style="text-align: center;">Streetlights with round, saucer-like fixtures.</p>	
<p style="text-align: center;">Pool Lighting</p>	<p style="text-align: center;">Lights that are found underwater in swimming pools.</p>	
<p style="text-align: center;">Neon</p>	<p style="text-align: center;">True neon lighting of various colors (e.g., blue, green, purple, etc.).</p>	
<p style="text-align: center;">Signage</p>	<p style="text-align: center;">Signs that are illuminated internally.</p>	

Light Fixture Type	Description	Example
<p style="text-align: center;">Fluorescent</p>	<p style="text-align: center;">Long tube lights that are typically seen in parking garages.</p>	
<p style="text-align: center;">Walkway</p>	<p style="text-align: center;">Lights that illuminate a pathway.</p>	
<p style="text-align: center;">Step Lights</p>	<p style="text-align: center;">Lights that illuminate stairs.</p>	

Appendix 6: Summary of 2018 sea turtle emergency line use.

Call Subject	Number of Calls
Live Strandings	14*
Dead Strandings	13
Disorientations	16
Strandings outside Broward	3
Nest/crawl Locations	10
Exposed Eggs	7
Hatchling Pick-up	24
Caging Inquires	8
Lighting concerns	11
Non-emergency Sea Turtle Inquires	48
Other Wildlife Non-emergencies	9
Other Wildlife Emergencies	10
Spam	124
Overall	297

*includes 3 events responded to by Gumbo Limbo Nature Center

Appendix 7: Example FWC sea turtle stranding report.

SEA TURTLE STRANDING AND SALVAGE NETWORK – STRANDING REPORT

<p>OBSERVER'S NAME AND CONTACT INFORMATION: First John M.I. Last Doe E-mail johndoe@aol.com Affiliation Broward County Sea Turtle Conservation Program</p> <hr/> <p>(Area code) Phone number 555-555-5555</p>	<p>STRANDING DATE: Year 2017 Month 02 Day 05 Turtle number by day 01</p> <hr/> <p><small>State coordinator must be notified within 24 hrs; this was done by <input type="checkbox"/> phone (561)575-5407 <input checked="" 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

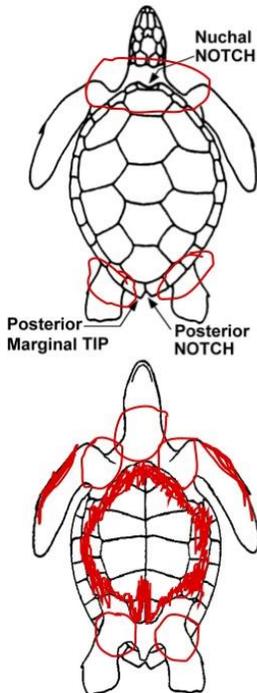
Check unidentified if not positive. Do not guess.

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 _____ cm/in



STRANDING LOCATION: Offshore (Atlantic or Gulf beach) Inshore (bay, river, sound, inlet, etc)
 State Florida County Broward
 Descriptive location (be specific) Found behind Diplomat Resort on beach
 3555 S Ocean Dr, Hollywood 33019

Latitude 25.991670 (approx.) Longitude -80.117021 (approx.)

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? _____

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
 NSF _____

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 _____

TUMOR DOCUMENTATION:

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

CARAPACE MEASUREMENTS: (see drawing)

Using calipers Choose unit

Straight length (NOTCH-TIP) _____ cm/in
 Minimum length (NOTCH-NOTCH) _____ cm/in
 Straight width (Widest Point) _____ cm/in

Using non-metal measuring tape Choose unit

Curved length (NOTCH-TIP) 44.0 cm
 Minimum length (NOTCH-NOTCH) 43.0 cm
 Curved width (Widest Point) 38.5 cm

Weight actual / est. 77 lb

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.

No external wounds found, circles on diagram indicate location of paps.
significant quantity of tumors, filled in areas on diagram indicate location of leech eggs

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: John Doe Stranding Date: 20170205

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.

NSF

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 27 stranding events from January 1–December 31, 2018. Of the 27 stranding events, 18 turtles were dead upon arrival (15 *Chelonia mydas*, 2 *Caretta caretta*, and 1 Unknown). Of the dead stranding responses, 8 turtles suffered from boat strikes, 1 from entanglement, 1 from a predator attack, and 6 unknown cause of death. Nine strandings were in response to live turtles (3 *Caretta caretta*, 5 *Chelonia mydas*, and 1 *Eretmochelys imbricata*). One live turtle was accidentally hooked by fishermen, 1 was struck by a boat, 1 had injuries consistent with entanglement, 2 were washbacks, 2 were removed from an FPL intake canal, 1 was a nesting mother trapped in beach chairs, and 1 died before transport. Seven of the live turtles were transported to Gumbo Limbo Nature Center in Boca Raton, Florida for treatment and rehabilitation. One live turtle that was trapped under beach chairs during nesting sustained no injuries and was released immediately.

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

<div style="border: 1px solid red; padding: 5px; margin-bottom: 5px;"> Port 2200 2100 </div> <p style="text-align: center;">Waterline</p>	Was the incident photographed? <input type="checkbox"/> YES <input type="checkbox"/> NO Was the source nest found? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO Was the nest excavated? <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <i>If "YES" report date of excavation: <u>9/21/16</u></i>
--	---

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? <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> NO <i>If "YES" indicate the number: _____</i>	

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: <u>Port Everglades</u>

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

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*

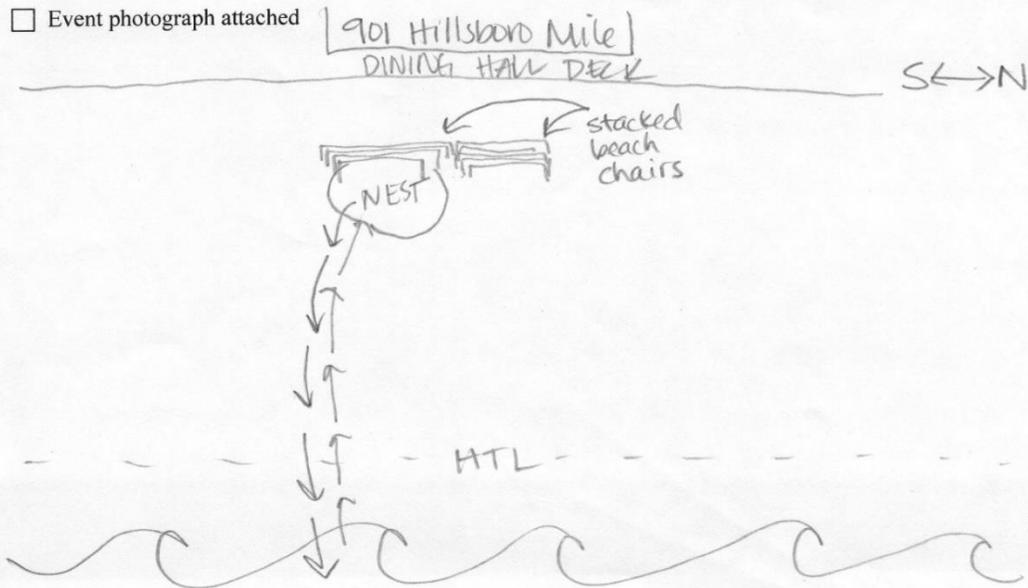
Turtle Permit #: 214 Date of Incident: MAY-1-17
 Observer's Name: Abby Nease
 Telephone (include area code): 954-262-3672 E-mail address: cs1858@nova.edu
 Species: Loggerhead Green Leatherback Other: _____
 Crawl resulted in: Nest False Crawl
 Location of nest or false crawl (address, beach name and/or nearest landmark): 901 Hillsboro Mile
in front of dining hall
 GPS Coordinates of nest or false crawl location:
(in the WGS projection in decimal degrees i.e., Lat 26.845412 Long -80.458796):
 Latitude 26.260174 Longitude -80.480431
 City: Hillsboro County: Broward
 Local nest ID#: 116 Zone nest/false crawl was located in: 23
 Obstruction(s) encountered: (please circle)

- | | | | | |
|---|---|--|---|---|
| <input checked="" type="checkbox"/> Beach furniture | <input type="checkbox"/> Dune Crossover | <input 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: turtle crawled west, hit beach chairs, nested, returned to the ocean.

Signature of Observer: [Signature] Date: MAY-1-17

Event photograph attached



Appendix 12: Summary of education and outreach activities.

One of the goals of the BCSTCP is to provide engaging educational/outreach opportunities to the general public and students. In doing so, the program brings awareness to individuals, businesses, beach users, and coastal residents and nurtures 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 2018, the BCSTCP conducted a total of 114 education/outreach events connecting with over 49,048 individuals.

- Turtle talks (22 presentations, ~1,788 participants)
 - American Heritage Science Adventure Camp
 - Broward County NatureScape by the Sea at Lauderdale-By-The-Sea
 - Broward County Northwest Regional Library
 - Deerfield Beach Percy White Library
 - Driftwood Elementary School Career Day
 - Flamingo Elementary Career Day
 - Glades Christian Academy
 - Griffin Elementary Environmental Club
 - Hillsboro Club Turtle Talk
 - Hollywood Academy of Arts and Science STEM Career Day
 - Indian Trace Elementary
 - Lakeside Elementary
 - Lighthouse Point Garden Club
 - Marriott BeachPlace Turtle Talk
 - McNab Elementary School
 - NSU Computer Science Camp
 - NSU First-Year Experience Class
 - NSU Middle School Camp
 - NSU's Alvin Sherman Library Summer STEM Program
 - Oakridge Elementary School Career Day
 - Pompano Beach Garden Club
 - Sheridan Park Elementary Career Day
 - Small World Montessori Turtle Talk

- Turtle talks followed by public hatchling release (59 presentations; ~2,456 participants)
 - Anne Kolb Nature Center
 - Beaux Arts Group
 - Bill Gallow's Group
 - Charity Guild Group
 - Children Opportunity Group
 - Hillsboro Club

- Hillsboro Police Department
 - LauderAle Hatchling Season
 - NSU Alumni Society
 - NSU Fellows Society
 - NSU Levan Ambassadors Board
 - NSU Nature Club
 - NSU President's Associates
 - Pompano Dive Center
 - Public Release
 - Stoked on Salt
 - Stoneman Douglas Families
 - Ultimate Software
 - Various family groups
 - Women's International Shipping & Trading Association
- Table events (17 events, ~44,750 participants)
 - Broward College Earth Day
 - Broward County OceanFest at Anne Kolb Nature Center
 - Gumbo Limbo Nature Center Sea Turtle Day
 - Heal the Planet Earth Day Event-Esplanade Park
 - Hollywood Funtastic Friday Earth/Arbor Day at Young Circle
 - Hollywood YMCA Halloween Festival
 - Loggerhead Marine Life Center TurtleFest
 - Marine Environmental Education Center (MEEC) Anniversary
 - MEEC- Free Our Seas Art Event
 - MEEC Mermaid Masquerade
 - Museum of Discovery and Science Great Barrier Reef Celebration
 - NSU Earth Day at Alvin Sherman Library
 - Riptide Music Festival
 - Stoked on Salt Ocean Conservation Day
 - Surfrider/Free Our Seas March for the Ocean Event at the MEEC
 - Tortuga Music Festival
 - Tri-Rail Rail Fun Day
- Excavation demonstrations (3 demonstrations, 34 participants)
 - Sea Turtle Oversight Protection Youth Camp
- Ride-along tours (6 tours, 20 participants)

Appendix 13: Historical sea turtle strandings in Broward County, 2004-2018. Red bars indicate dead strandings and green bars indicate live strandings.

