

Sea Turtle Nesting Trends in Florida (2024)

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Introduction

There are five sea turtle species that are represented on Florida's beaches, all of which are listed as either threatened or endangered under the Endangered Species Act. This report visualizes successful sea turtle nesting behavior of the loggerhead (*Caretta caretta*), the green turtle (*Chelonia mydas*), and the leatherback (*Dermochelys coriacea*) along the Florida coastline using data on longitude, latitude, and coastal region. This report aims to highlight spatial trends in successful sea turtle nesting (turtle emergence and egg laying) by analyzing nesting distributions between the state's east and west coasts.

Methods

The data used in this report—**2024 Statewide Nesting Totals**—was compiled by the **Florida Fish and Wildlife Conservation Commission (FWC)** through the **Statewide Nesting Beach Survey (SNBS)** and **Index Nesting Beach Survey (INBS)** programs. These datasets are the result of coordinated efforts by **FWC staff**, who oversee data collection from various individuals and organizations, ensuring consistency in methodology and accuracy for future analysis.

Survey data is collected through **direct observation of sea turtle tracks and nesting signs** left on beaches. The species responsible for each nest is identified based on **track and nest characteristics**, including track width, track configuration, and body pit size/depth. These identification criteria follow established methodologies outlined by **Schroeder and Murphy (2002)** in *Research and Management Techniques for the Conservation of Sea Turtles* and the **FWC Marine Turtle Conservation Handbook (2024)**.

The 2024 Statewide Nesting Totals dataset includes three key variables for each Florida coast:

- **County**
- **Survey Length (km)**
- **Species**

For each species, data is provided for:

1. **Successful nesting** – when a turtle emerges and lays eggs.
2. **Non-nesting emergence (NNE)** – when a turtle leaves tracks but does not nest.

For this analysis:

- **Nest Density** (Total Nest Count per km) was calculated using Survey Length (km) to provide a more accurate representation of nesting activity.
- The **County** variable was replaced with **latitude and longitude** coordinates for spatial visualization.
- **Non-Nesting Emergence (NNE) was omitted** to focus solely on successful nesting.

Data Processing & Visualization

All data analysis and visualization were conducted using **R (version 4.4.2)**. The data was imported, cleaned, and transformed utilizing the **tidyverse** package suite, and visualizations were created using **ggplot2**.

- **Data Cleaning:**
 - Removed non-nesting emergences.
 - Converted county names into latitude/longitude coordinates for mapping.
 - Computed **Nest Density** (Total Nests / Survey Length).
 - Merged east and west data into a unified dataset.

- Reshaped data using **pivot_longer()** to allow species-level comparisons
- **Bar Chart:**
 - Compared total successful nesting counts across Florida's east and west coasts by species and by coast.
- **Scatter Plots & Geospatial Analysis:**
 - Visualized **nest density by latitude** to assess the north-to-south nesting trends by species.
 - Visualized **nest density by longitude** to identify east-to-west spatial patterns.
 - Mapped the **total nest counts** by location to assess regional nesting hotspots.
 - Utilized the **sf** package to map county locations and evaluate the geographic distribution of nesting activity.
- **Total Nest Counts:**
 - Maps displaying total nest counts by location were not adjusted for beach length. These counts confirmed that east coast counties, and in the southeast, had the highest overall nesting activity.

A sample R script used for visualization:

```
# Nest Densities by Latitude or Longitude

ggplot(X7_FFW_ST_EastCoast_CountyCoordinates,
       aes(x = `Latitude (Degrees N)`, y = Nest_Density, color = Species)) +
geom_point() +
labs(title = "Sea Turtle Nest Density by Latitude (2024)",
     x = "Latitude (Degrees N)",
     y = "Nest Density (Nests per km)") +
scale_color_manual(values = c("C_caretta_Nest_Density" = "blue",
                              "D_coriacea_Nest_Density" = "red",
                              "C_mydas_Nest_Density" = "green")) +
theme_minimal()
```

Visualizations & Results

To determine regional nesting trends both nest counts, and nest densities were plotted by latitude and longitude utilizing scatter plots, with data points color-coded by species type. Latitude highlights **north-south trends**, while longitude provided insight into **east-west distribution** between Florida's two coasts.

Latitude-Based Trends:

- Loggerhead (*Caretta caretta*) nesting density was at its peak between **26° and 28° North**, which was pronounced on the **east coast**.
- Green turtle (*Chelonia mydas*) nesting choice displayed a similar preference **for mid-latitude beaches**, with the highest densities also occurring along the southeast coast.
- Leatherback (*Dermochelys coriacea*) nesting occurred with less frequency overall, but did display a significant pattern of favoring **southern latitudes** along the east coast.

Longitude-Based Trends:

- Nesting activity of all species was **strongly clustered along the east coast**, with the highest densities being located between **80.00° and 80.50° W**.
- The **west coast** exhibited more dispersed and lower nest densities for all species, being particularly pronounced for the green turtles and leatherbacks.
- These patterns reinforce the critical importance of **Florida's southeast coast** as a significant nesting region for all three species of turtle.
- **Total Nest Counts:**
 - Maps displaying total nest counts by location where not adjusted for beach length. These counts confirmed that east coast counties, and in the southeast, had the highest overall nesting activity.
 - Loggerheads (*Caretta caretta*) accounted for most total nesting activity statewide.

- Bar Chart Summary:
 - A bar chart comparing **species totals by coast** visually demonstrates the **preference of the east coast** in nesting for all three species.
 - Loggerheads (*Caretta caretta*) nested in substantially greater numbers than the other species on both coasts, but especially in the southeast.

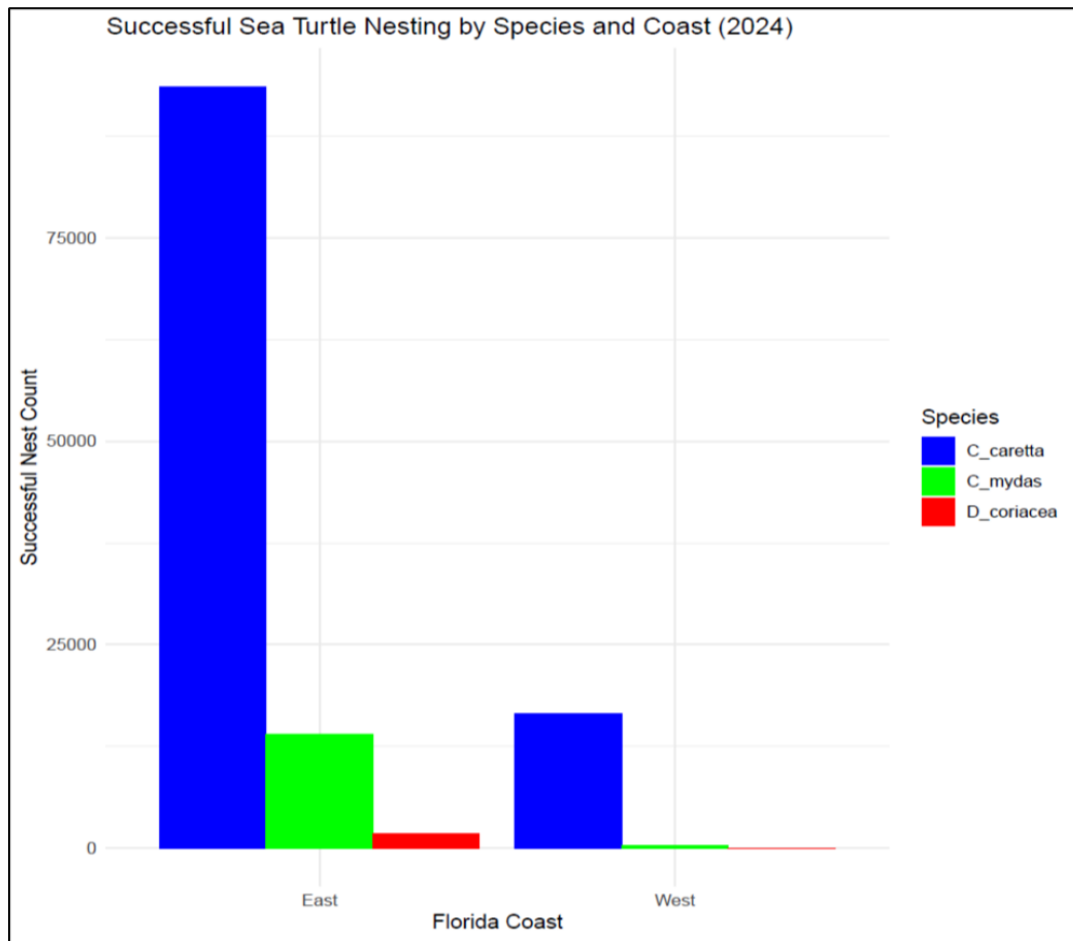


Figure 1

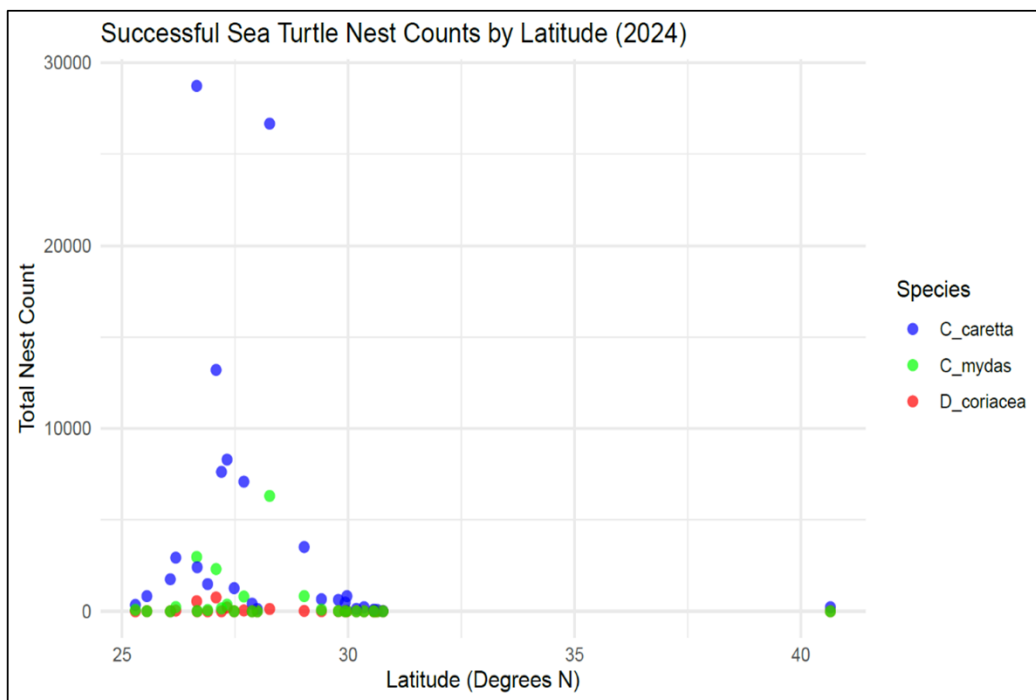


Figure 2

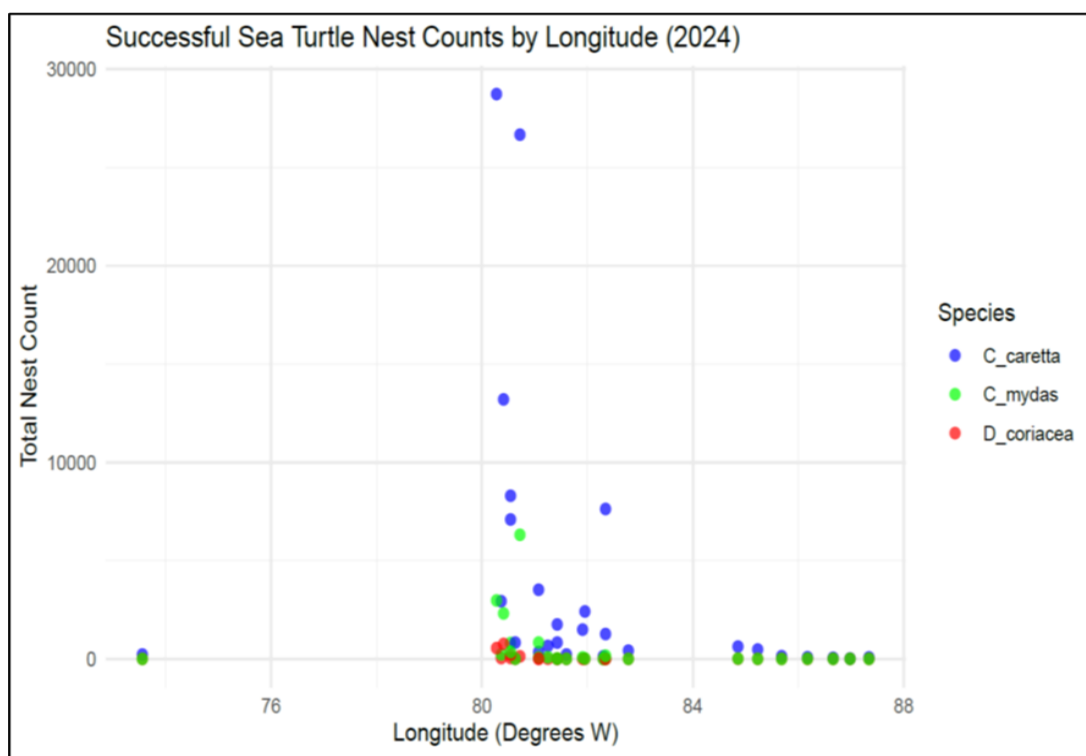


Figure 3

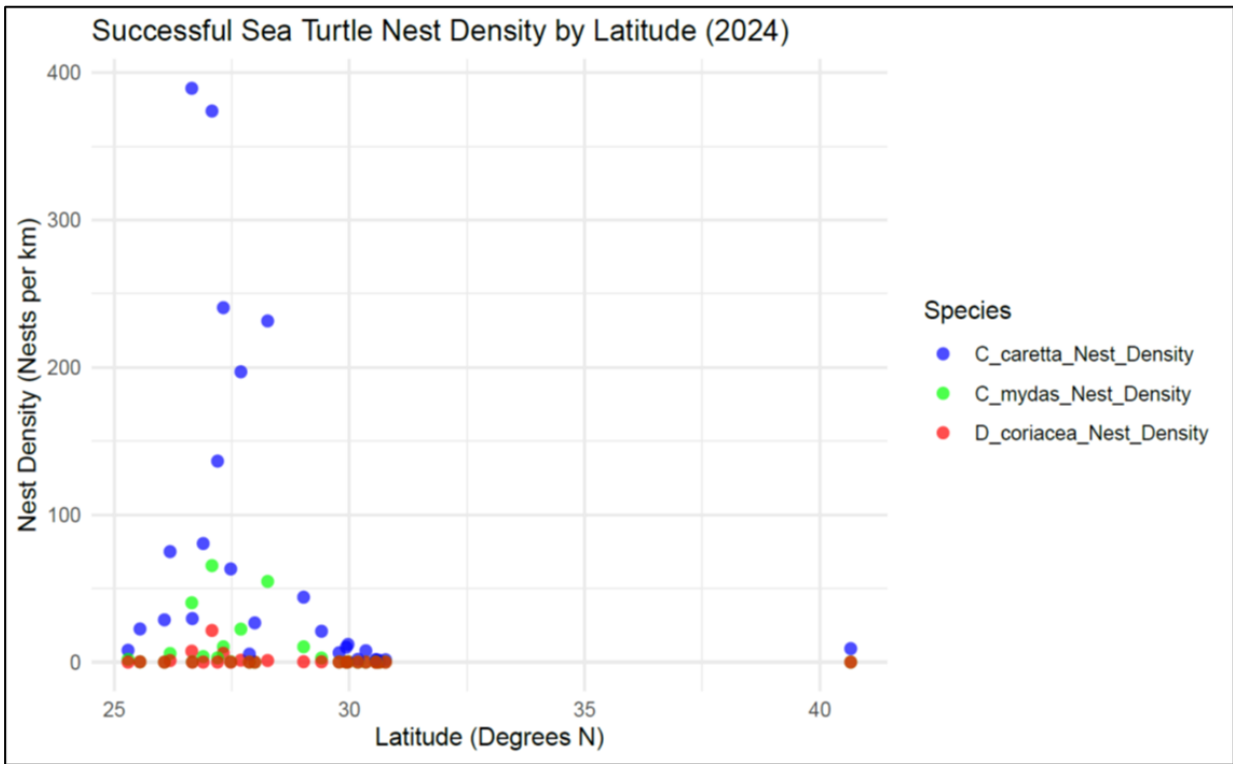


Figure 4

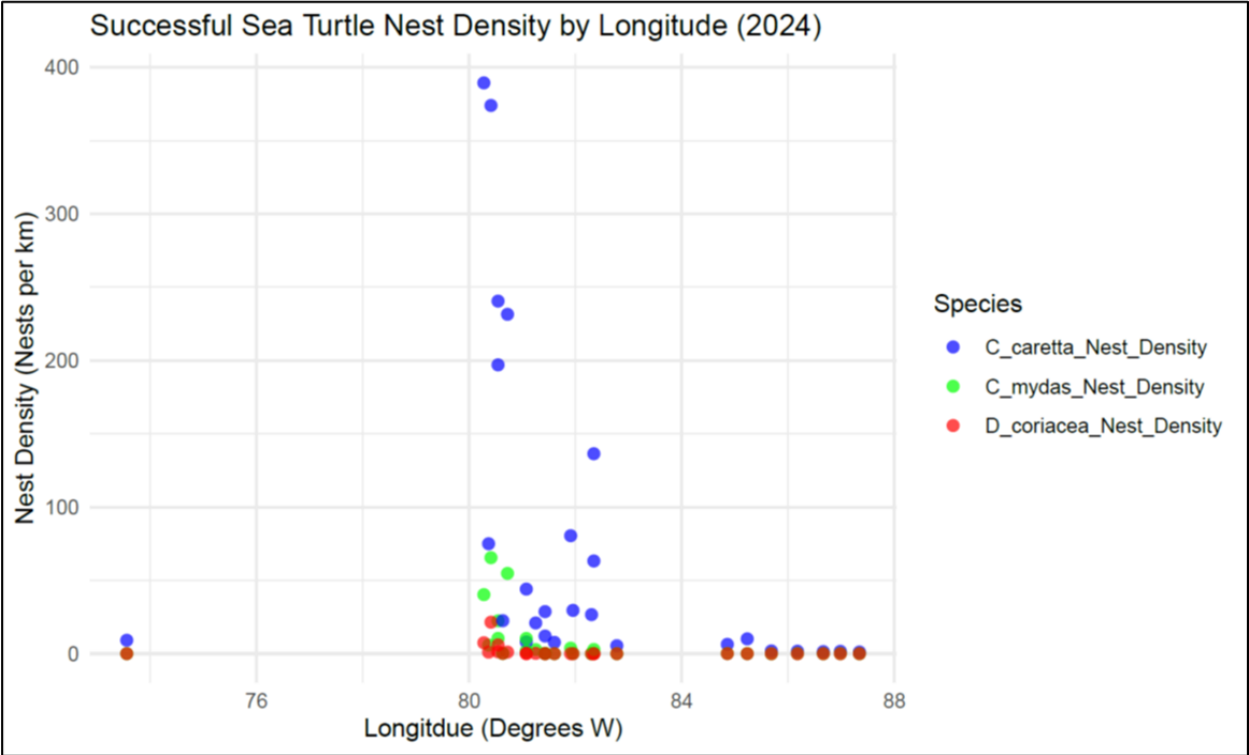


Figure 5

Discussion & Conclusion

This analysis of the Florida 2024 Statewide Nesting Totals highlights the strong spatial nesting preferences among the state's three primary sea turtle species. This nesting activity was highly concentrated on the east coast, specifically in **southeastern counties**, with both nest counts and densities peaking in this region.

Among the species analyzed, **loggerheads** (*Caretta caretta*) represented the most prolific nesters across the state, followed by **green turtles** (*Chelonia mydas*). Despite being less common, **leatherbacks** (*Dermochelys coriacea*) showed clear spatial trends and were also primarily concentrated along the southeastern coast.

References

Florida Fish and Wildlife Conservation Commission. (2024). *Marine Turtle Conservation Handbook*. Tallahassee, FL: Florida Fish and Wildlife Conservation Commission.

Florida Fish and Wildlife Conservation Commission. (2024). *2024 Statewide Nesting Totals*. Retrieved from <https://myfwc.com>

Schroeder, B. A., & Murphy, S. (2002). *Research and Management Techniques for the Conservation of Sea Turtles*. IUCN/SSC Marine Turtle Specialist Group Publication No. 4.

R Core Team. (2024). *R: A language and environment for statistical computing* (Version 4.4.2). R Foundation for Statistical Computing. Retrieved from <https://www.r-project.org/>

Wickham, H., et al. (2023). *Tidyverse: Easily install and load the Tidyverse*. R package version 2.0.0. Retrieved from <https://tidyverse.tidyverse.org>

Pebesma, E. (2018). *Simple Features for R: Standardized Support for Spatial Vector Data*. *The R Journal*, 10(1), 439–446.