



What is Coastal Armoring and How Can it Affect Nesting Sea Turtles?

Andrea Mosier
Florida Fish & Wildlife Conservation
Commission
Florida Marine Research Institute

More than 90% of loggerhead turtle nesting in the U.S. takes place on Florida's beaches

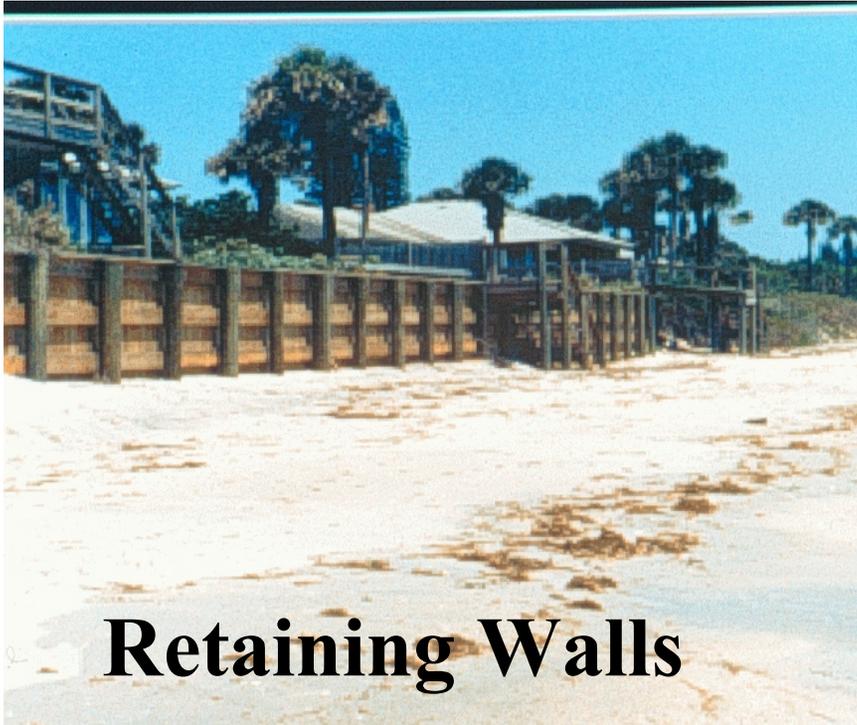


Florida's beaches are as important to humans as they are to sea turtles.



**Coastal Development + Beach Erosion =
Diminished Habitat**

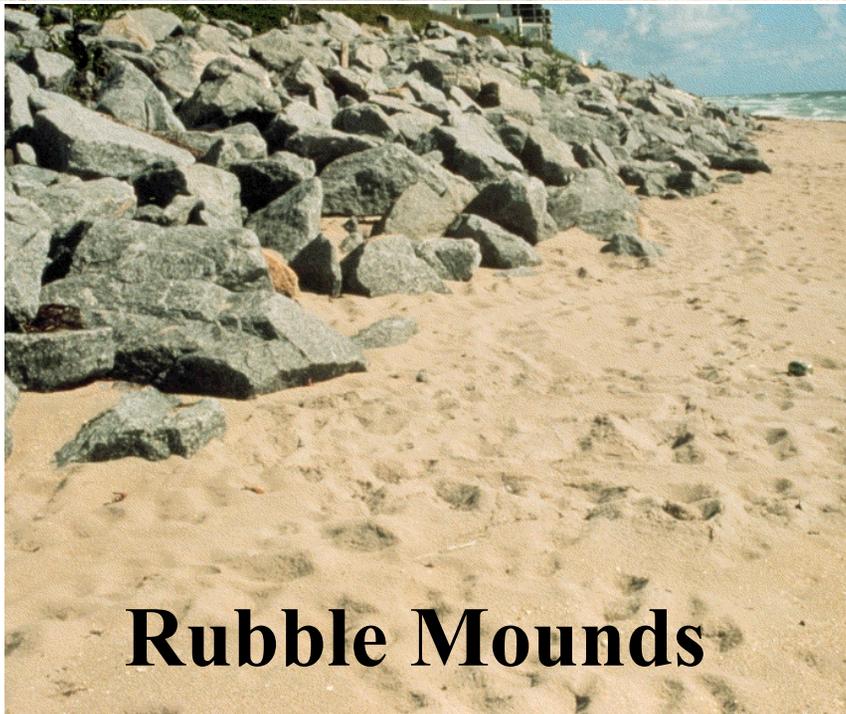




Retaining Walls



Groin Fields



Rubble Mounds



SandBags

Seawall



EFFECTS OF SEAWALLS ON THE BEACH

Toe scour

Beach-face erosion

End scour

Sand accretion

Rip- current troughs

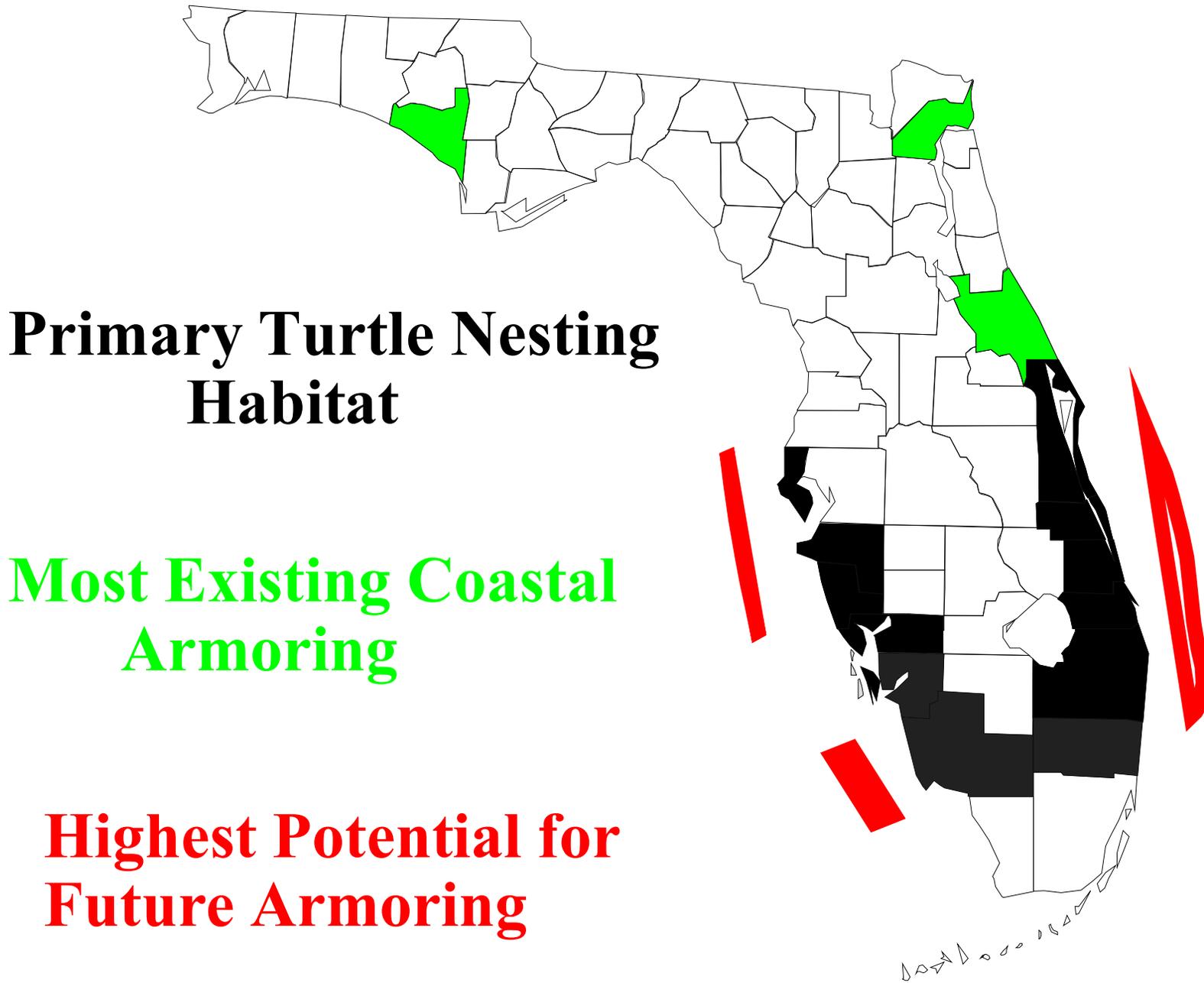
Semi-circular cusps



EFFECTS OF SEAWALLS ON SEA TURTLE NESTING



- **Prevention of access to nesting sites**
- **Abandonment of nesting attempts**
- **Interaction with structures**
- **Interference with nest digging**
- **Nest erosion**



**Primary Turtle Nesting
Habitat**

**Most Existing Coastal
Armoring**

**Highest Potential for
Future Armoring**

Objectives:

1. Determine what nesting sea turtles did when they encountered a seawall.
2. Examine the spatial relationship between turtle nests and seawalls.
3. Describe changes in beach elevation in front of the seawalls.



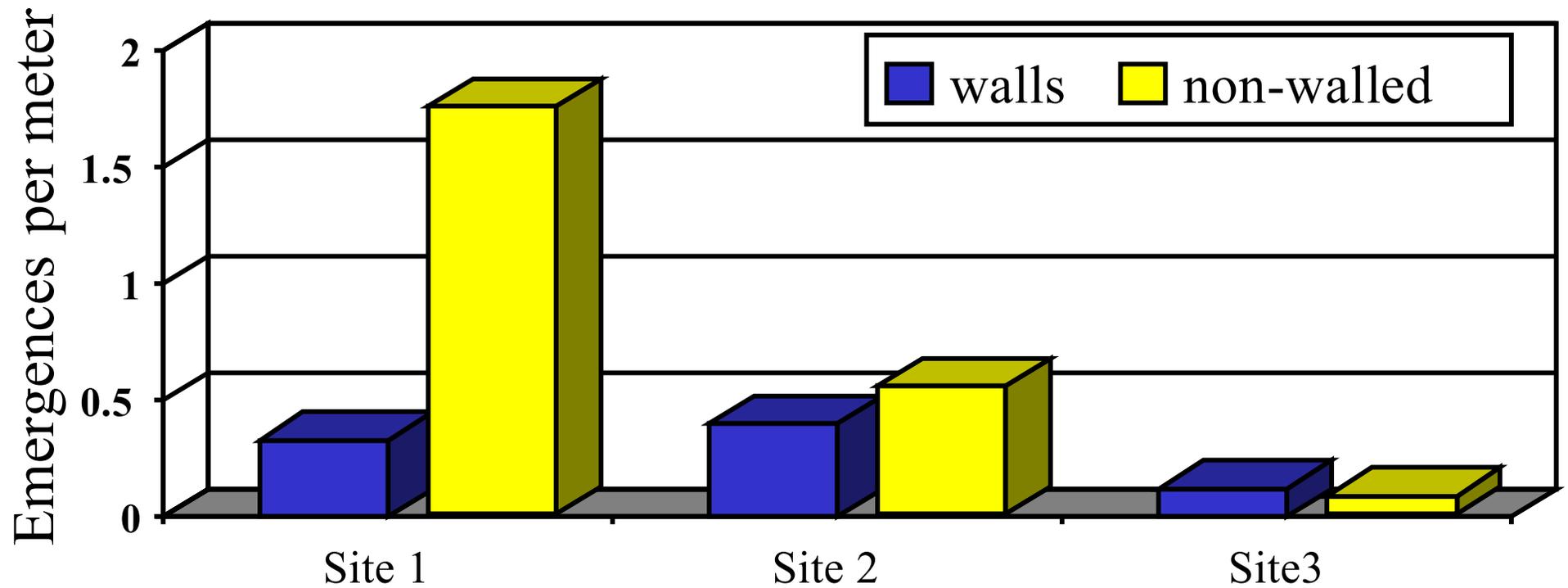
Nesting Beach with Walls



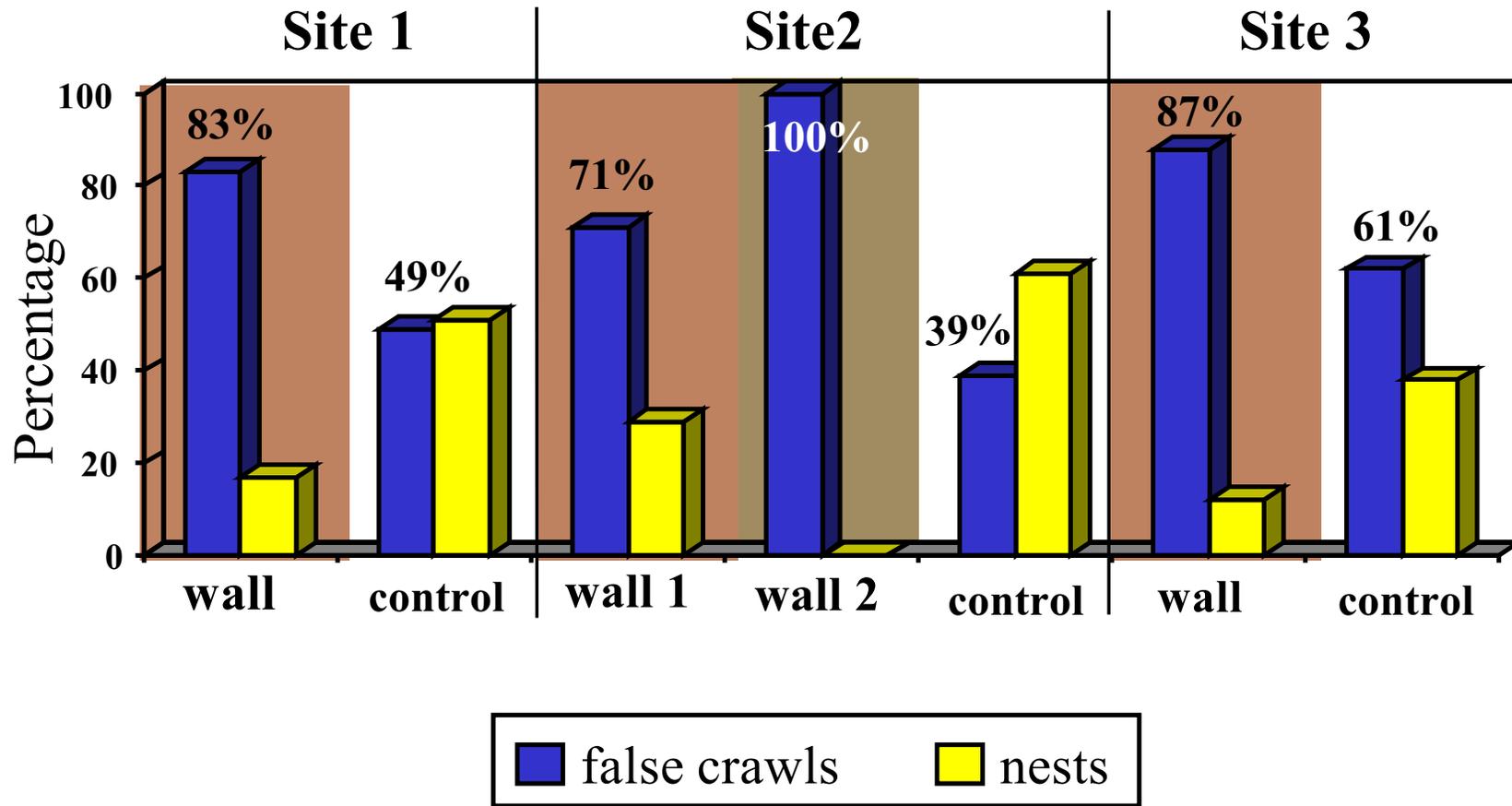
Nesting Beach Without Walls



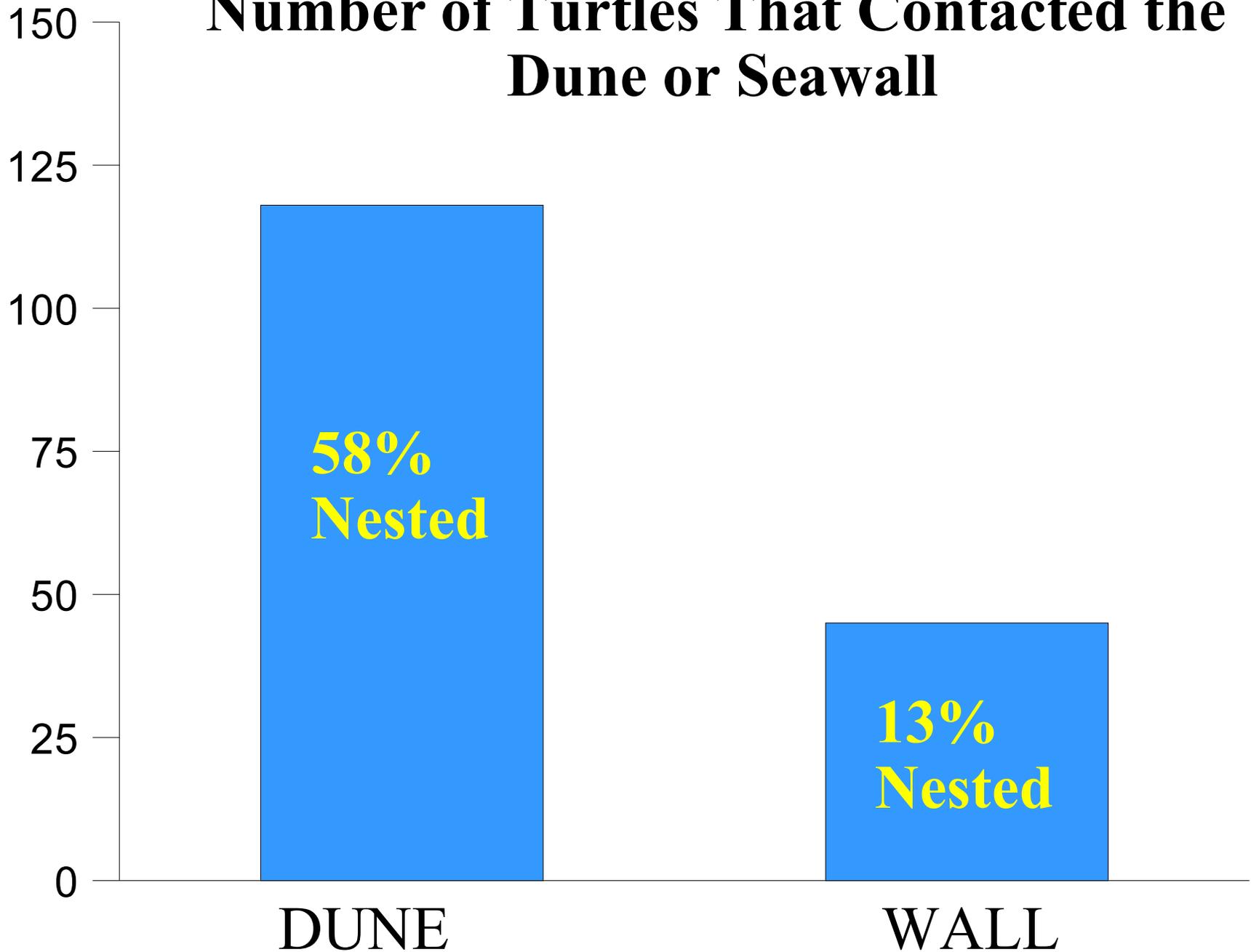
Density of Turtle Emergences



PERCENTAGE OF FALSE CRAWLS VS NESTS

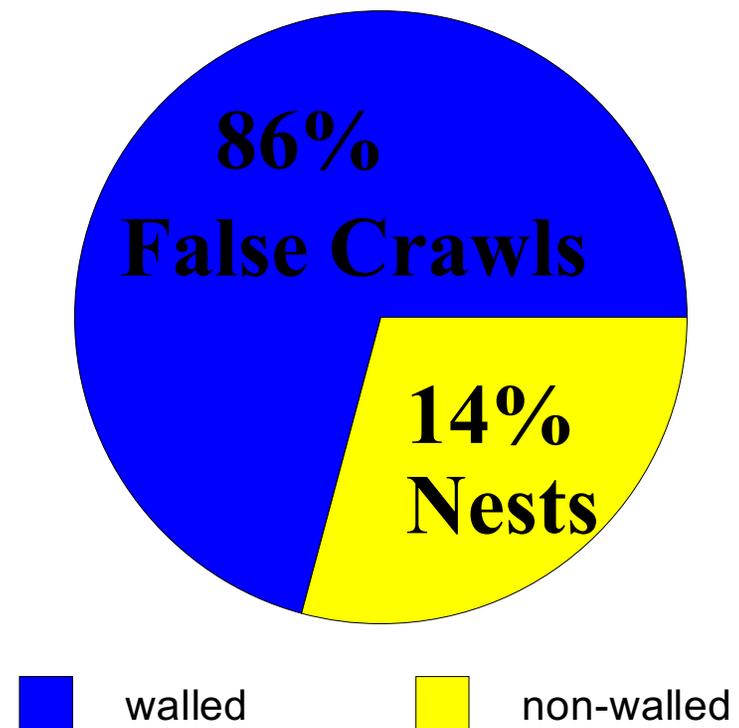


Number of Turtles That Contacted the Dune or Seawall



TURTLE INTERACTIONS WITH THE WALLS

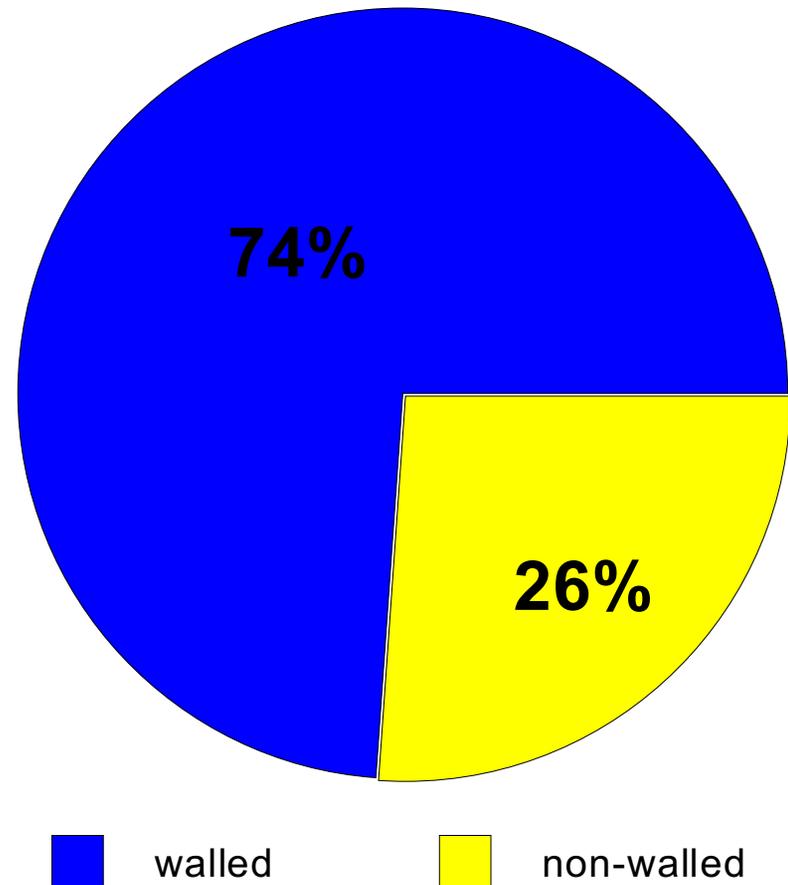
- Of the 52 crawls documented in front of the seawalls, 37 (71%) came into contact with the walls.
- 86% of these turtles that “bumped” into the wall eventually abandoned their nesting effort (false crawls).





WANDERING BEHAVIOR

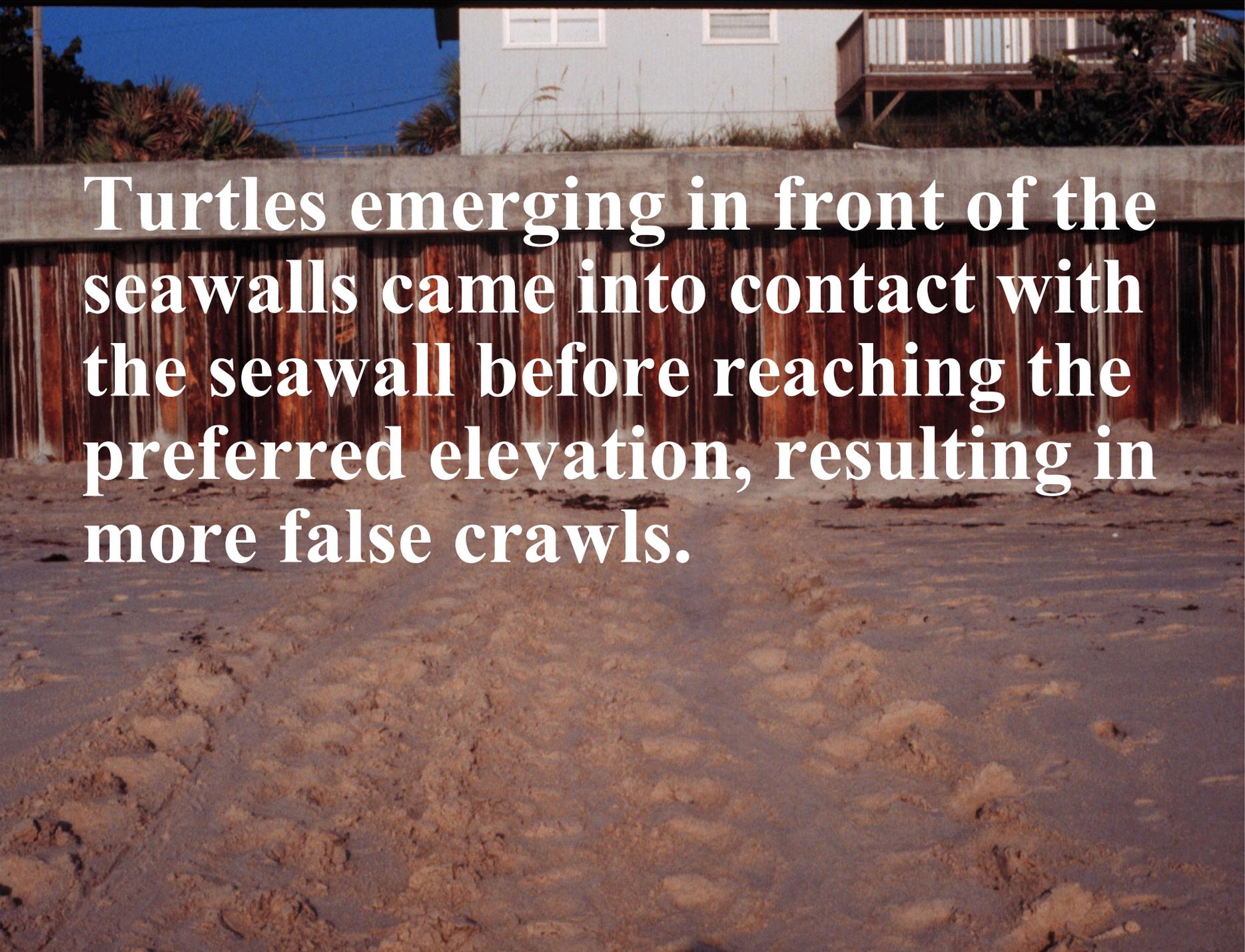
- Only 10% of all emergencies exhibited wandering behavior
- 74% of those that wandered were located in front of the seawalls
- 100% of these turtles had contact with the wall
- 100% resulted in false crawls



Summary

Emerging turtles traveled up the beach until reaching a preferred elevation for nesting.



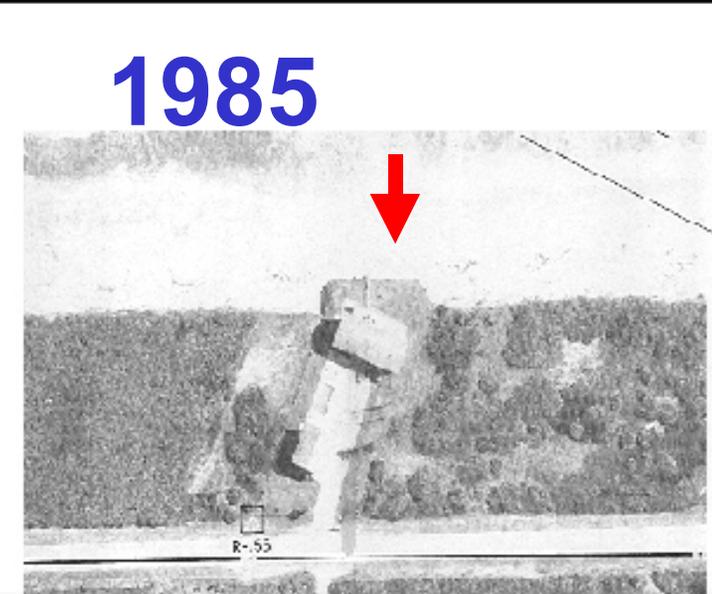
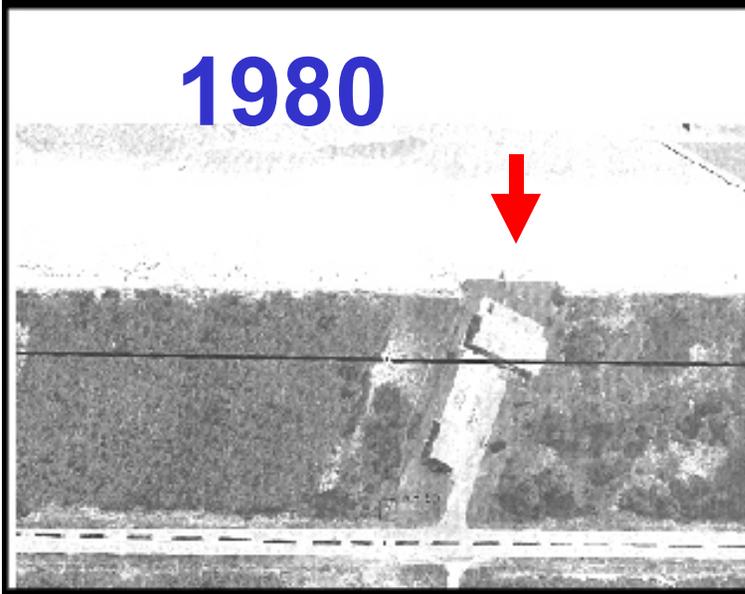
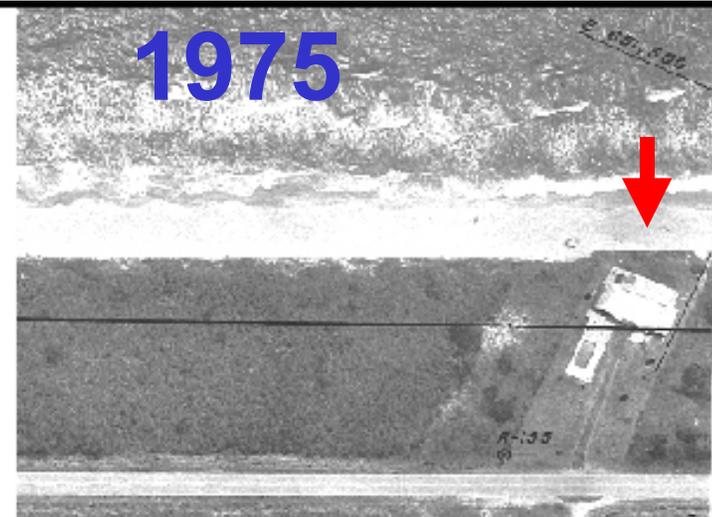
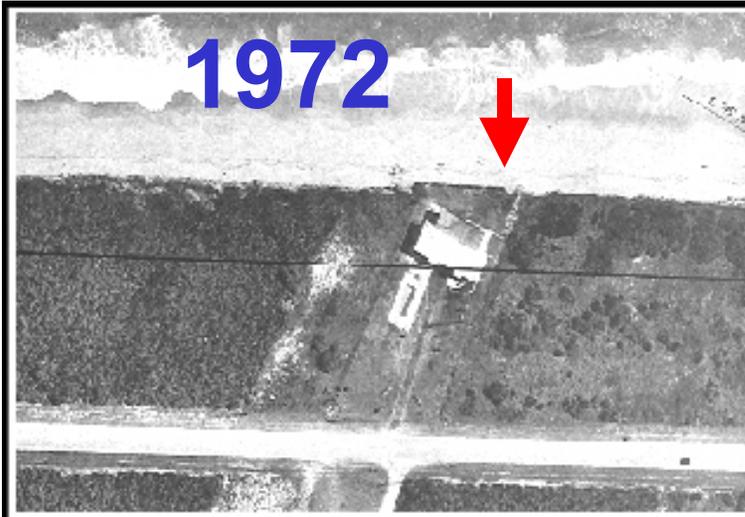
A photograph of a beach scene. In the foreground, there is a sandy beach with numerous tracks and impressions, likely from turtles. A concrete seawall runs across the middle ground. Behind the seawall, there is a light blue building with two windows and a wooden deck. The sky is clear and blue. The text is overlaid on the image in a white, serif font.

Turtles emerging in front of the seawalls came into contact with the seawall before reaching the preferred elevation, resulting in more false crawls.

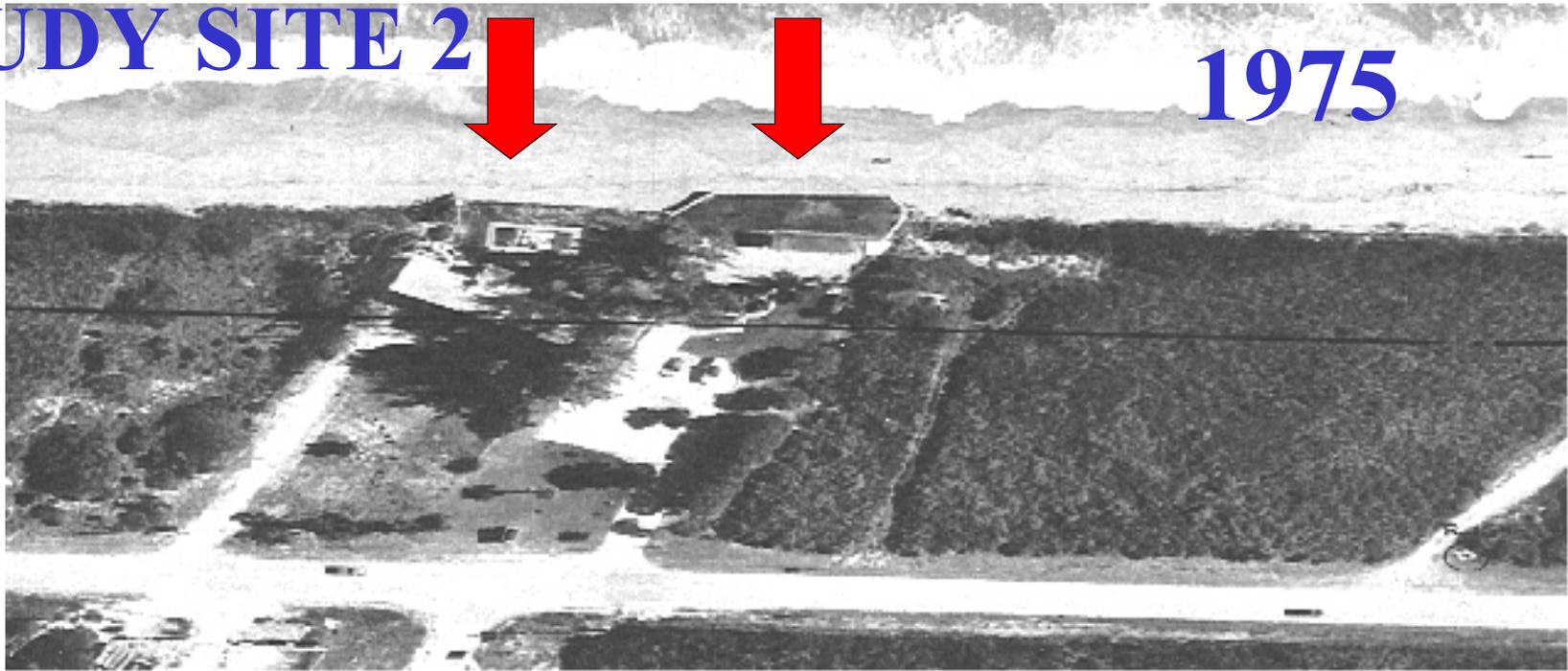
Consequences...

- **Loss of nesting habitat**
- **Additional strain on nesting turtles**
- **Implications of future armoring**

STUDY SITE 1: A THIRTEEN YEAR COMPARISON



STUDY SITE 2



Consequences...

- **Loss of nesting habitat**
- **Additional strain on nesting turtles**
- **Implications of future armoring**

- **Energetic costs of “false crawls”**
- **Nesting beach fidelity**
- **Risk of death from predators**



Consequences...

- **Loss of nesting habitat**
- **Additional strain on nesting turtles**
- **Implications of future armoring**

Simulation Model of the Cumulative Effects of Coastline Armoring on Turtle Nesting Behavior

Formula:

$$\frac{[Cu \times Nu + Ca \times Na]}{Nu} \times 100\% = \text{Percent of Nests Expected}$$

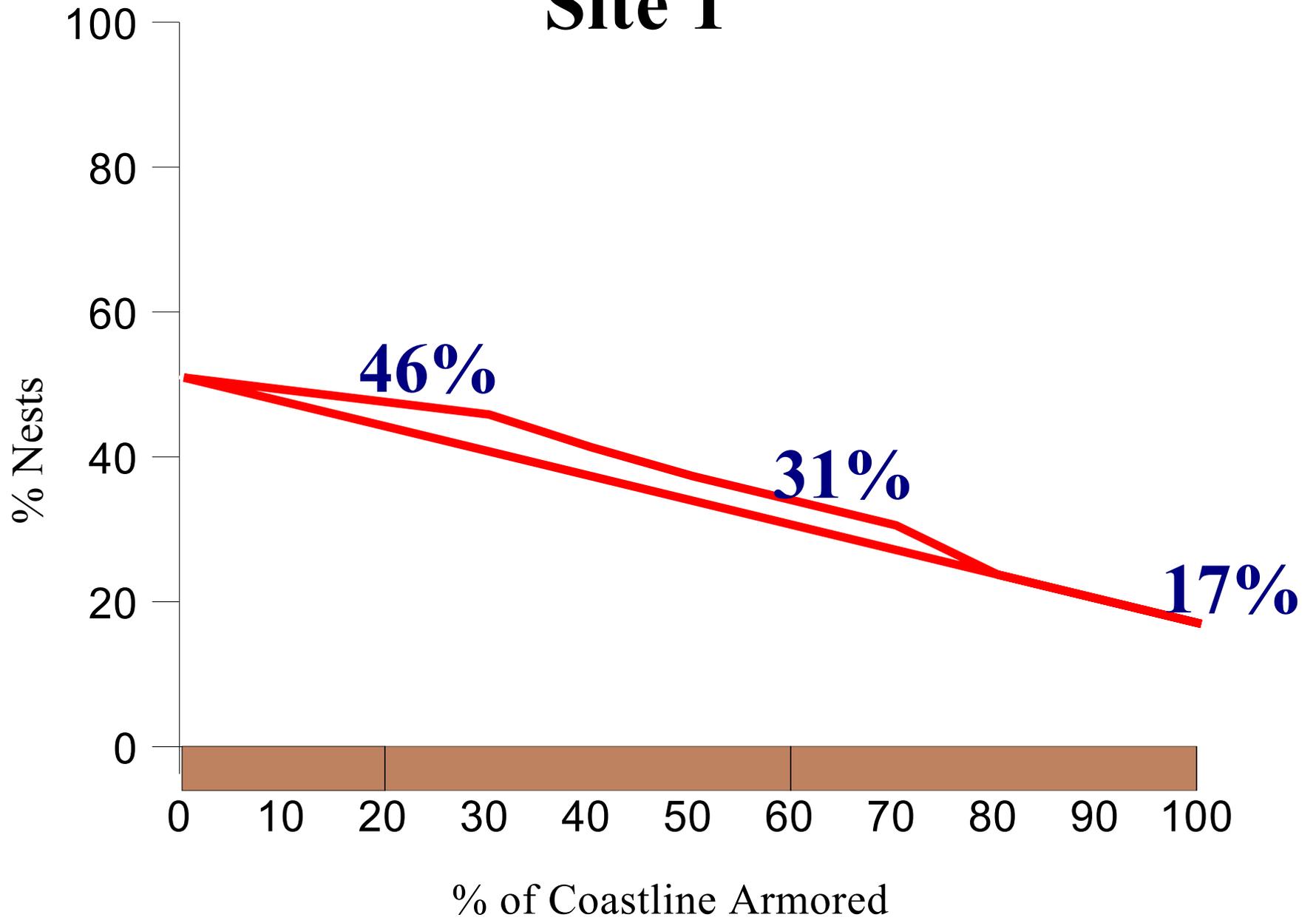
Cu = Proportion of coastline unarmored

Nu = Proportion of emerging turtles expected to nest on unarmored beach

Ca = Proportion of coastline armored

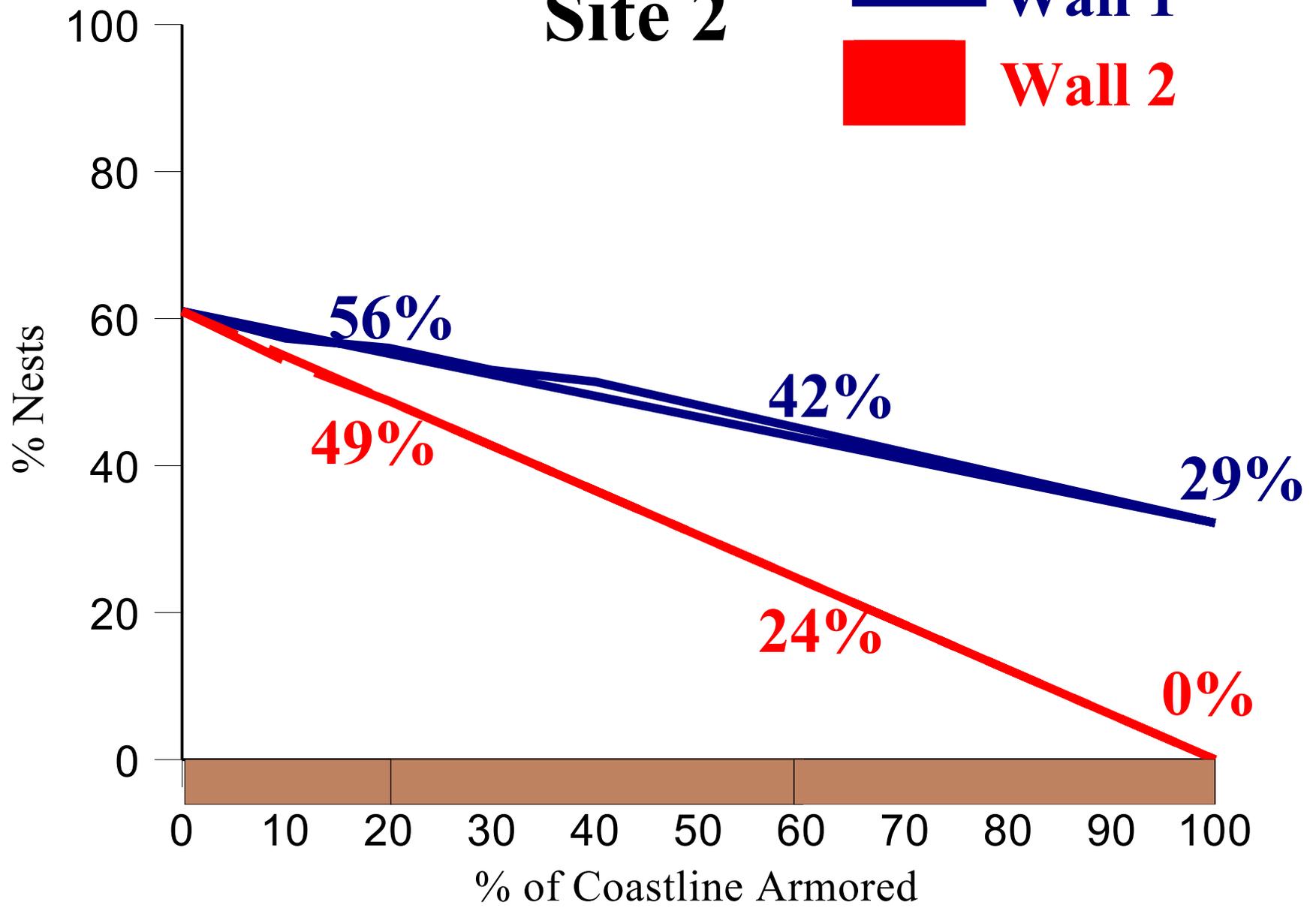
Na = Proportion of emerging turtles expected to nest on unarmored beach

Site 1



Site 2

— Wall 1
■ Wall 2



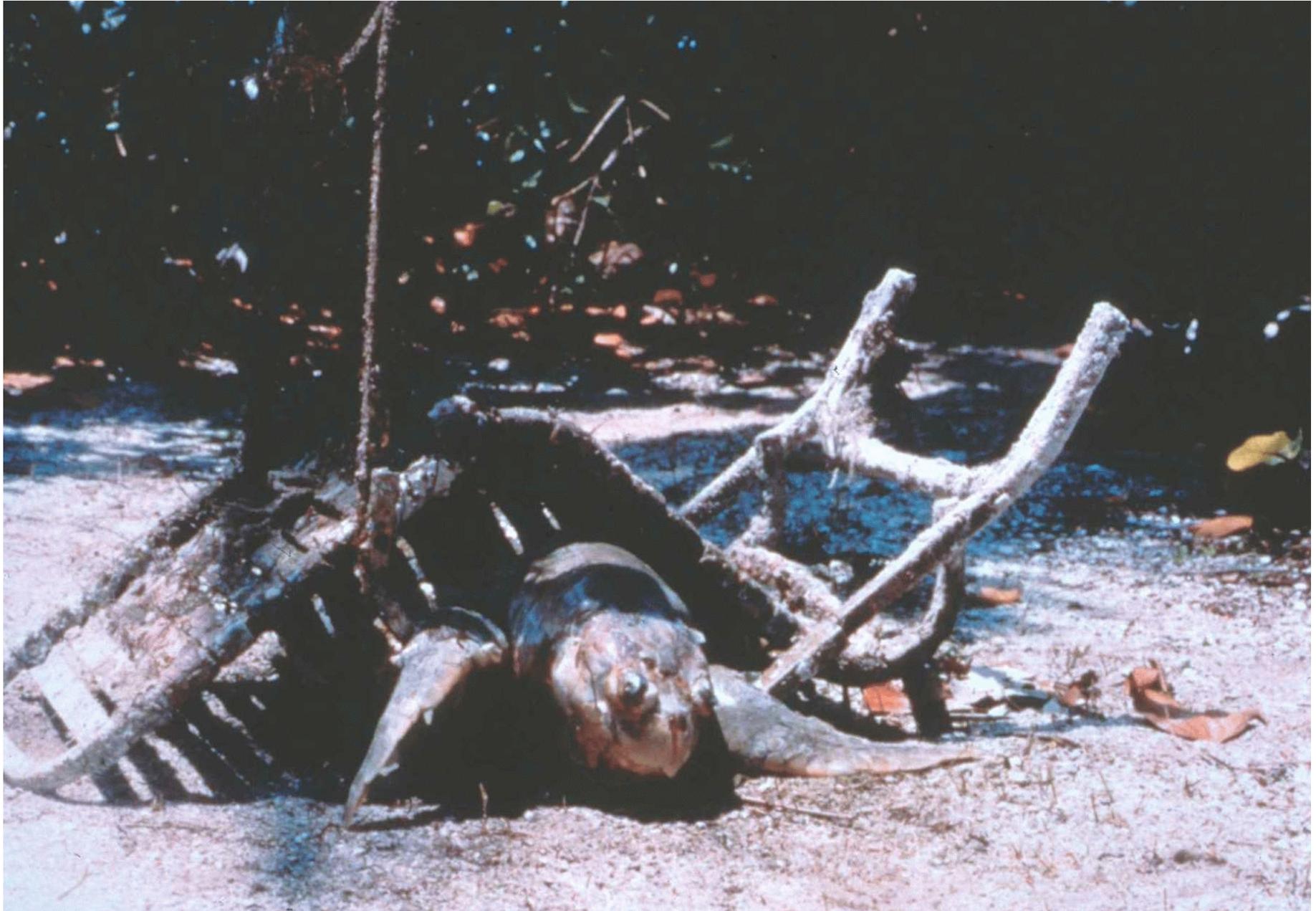


Lounge furniture on the beach blocks turtles' access to suitable nesting sites

Equipment, boats and sheds stored on the beach can interfere with nesting behavior...



Resulting in injuries or death to adult turtles...



... and hatchlings.



**“Erosion Problem” or
“Development Problem” ?**



Turtle Problem.

