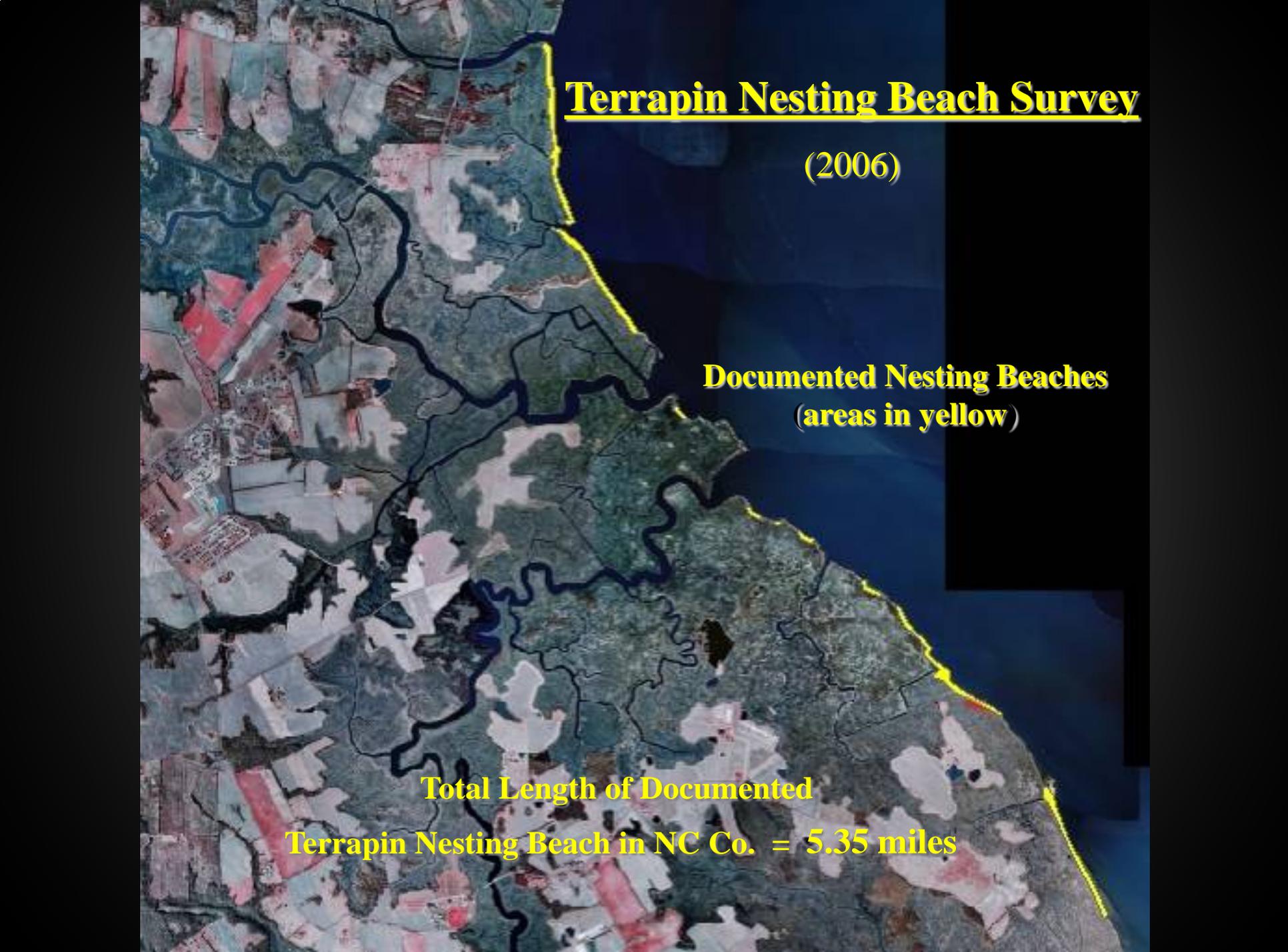


Terrapin Nesting Beach Restoration Project



An aerial photograph of a coastal region in North Carolina, showing a winding river and various land parcels. A yellow line highlights the coastline, indicating the locations of documented nesting beaches. The text is overlaid on the right side of the image.

Terrapin Nesting Beach Survey

(2006)

Documented Nesting Beaches
(areas in yellow)

**Total Length of Documented
Terrapin Nesting Beach in NC Co. = 5.35 miles**

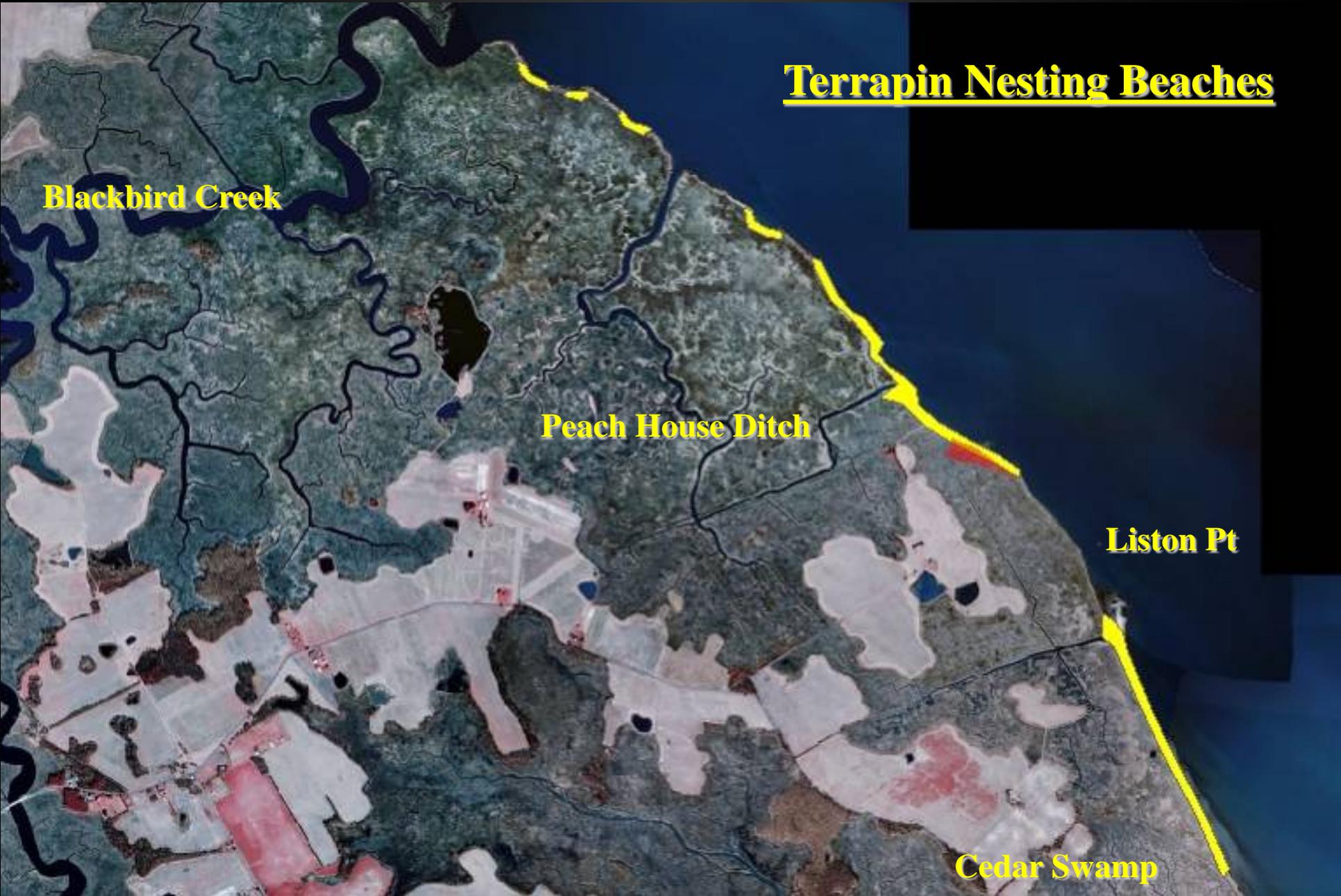
Terrapin Nesting Beaches

Blackbird Creek

Peach House Ditch

Liston Pt

Cedar Swamp



An aerial photograph showing a coastal wetland area. A large, light-brown sand beach is visible in the lower-left and lower-right portions of the image. A winding, dark-colored ditch or canal, labeled "Peach House Ditch", runs through the center of the wetland. The surrounding land is a mix of green grass and brown, bare earth. In the background, there are green agricultural fields and some trees. Three black arrows point from the text "Nesting Beaches" at the bottom towards the sand beach area.

Peach House Ditch

Nesting Beaches

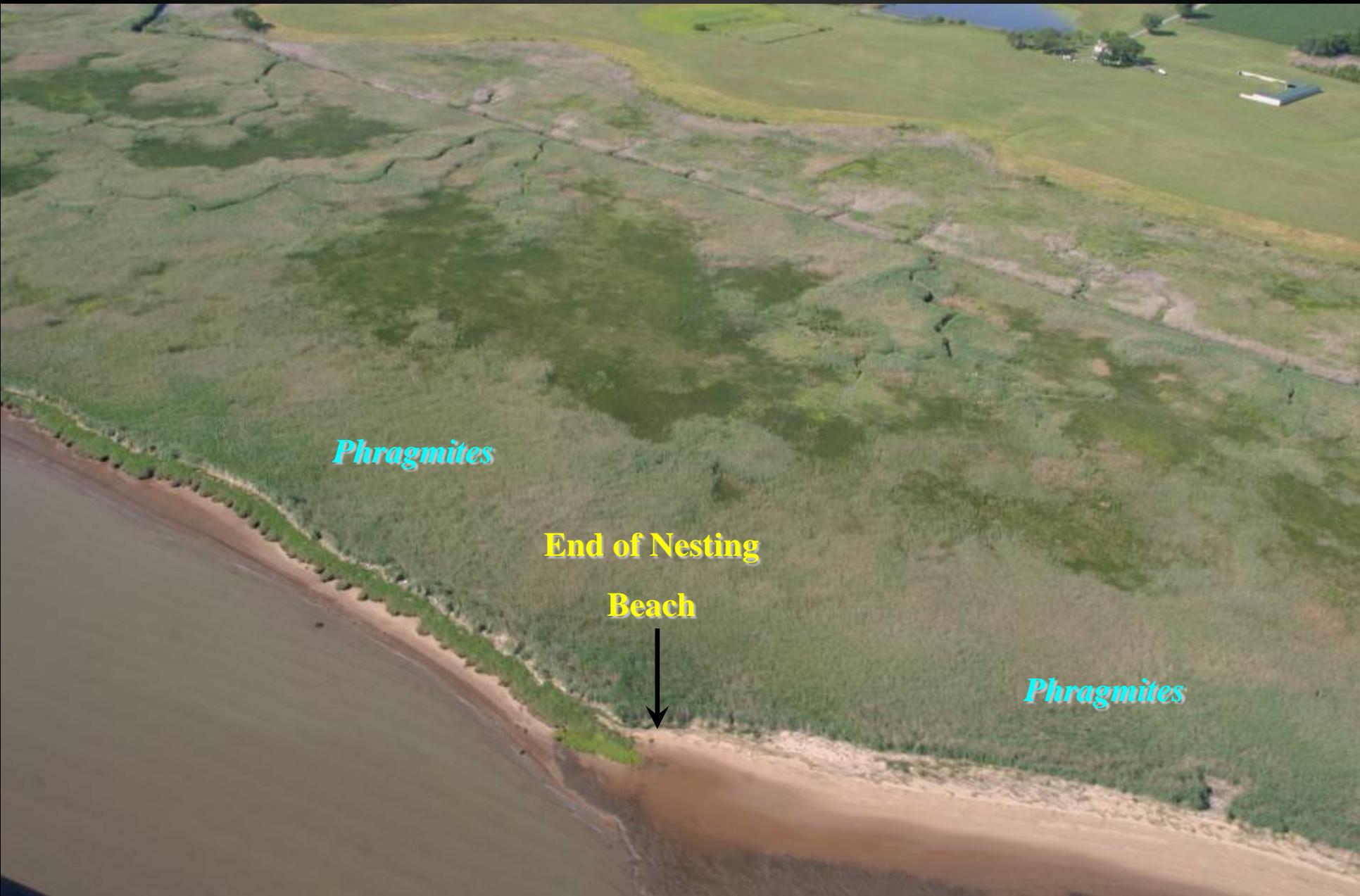


An aerial photograph showing a large wetland area. In the foreground, a wide, muddy river flows from the bottom left towards the right. A sandy bank separates the river from the land. The land is a mix of green grassy areas and brown, bare soil. A golf course is visible in the middle ground, with several green fairways and a small blue pond. In the background, there are more green fields and some trees. The word "Phragmites" is written in yellow, italicized text with a black outline, pointing to a specific area of the wetland.

Phragmites

Phragmites

An aerial photograph showing a large area of wetland vegetation, identified as Phragmites, situated along a riverbank. The vegetation is a mix of green and brownish-green, with visible cracks and channels in the ground. In the upper right, a golf course is visible, featuring a green fairway, a blue pond, and a white building. The river in the foreground is a muddy brown color, and a sandy bank separates it from the wetland.



Phragmites

End of Nesting

Beach



Phragmites



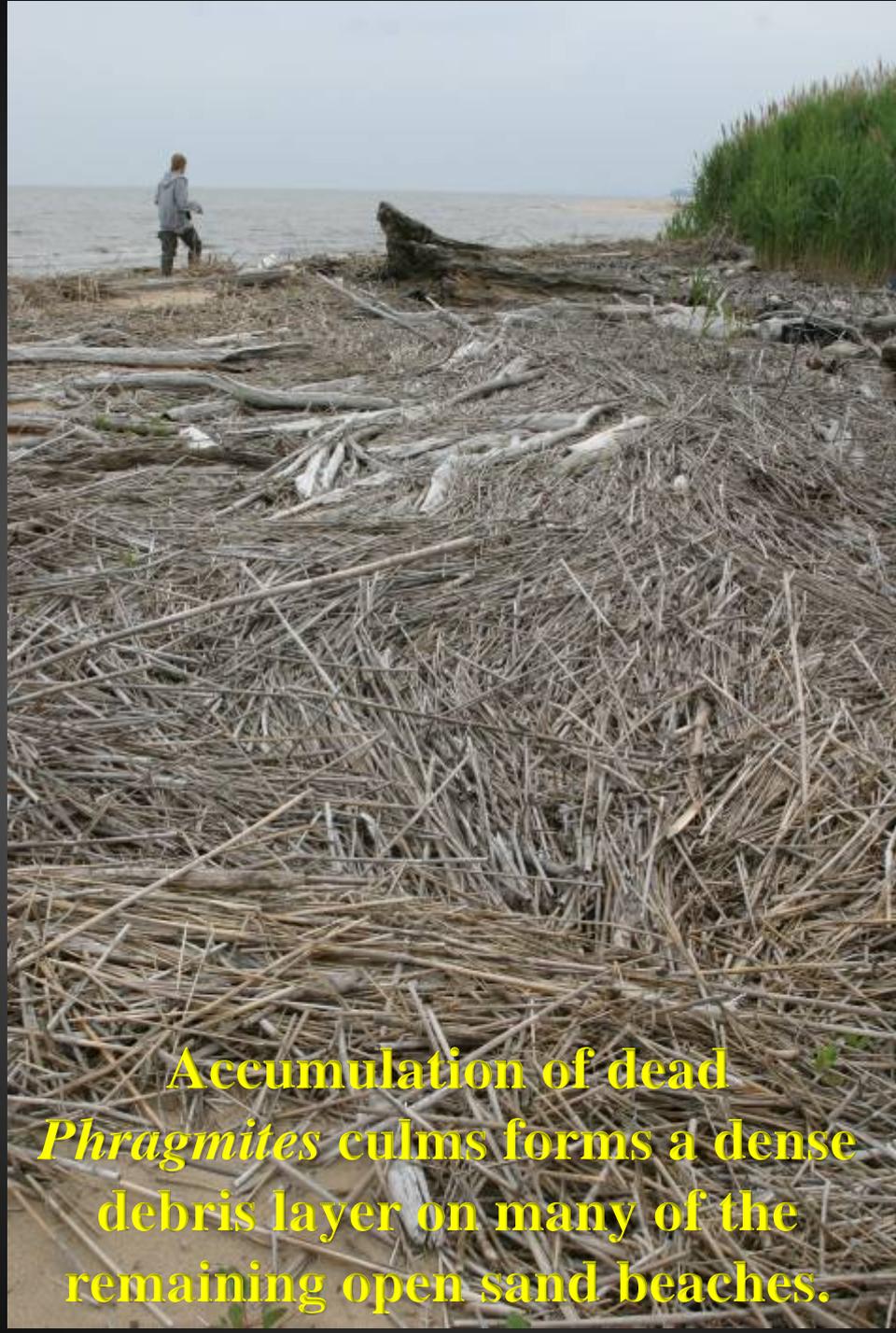
Above Ground Barrier



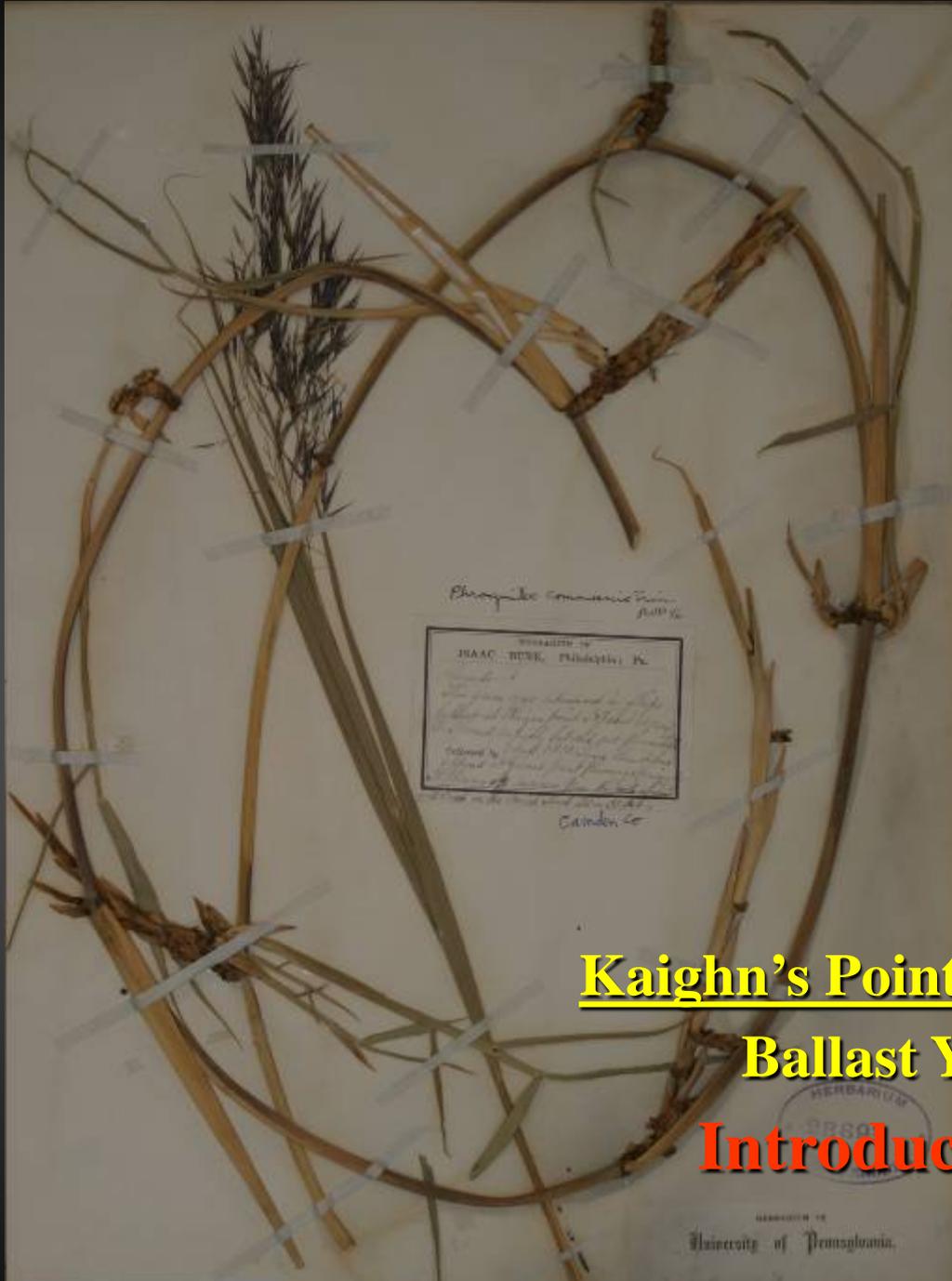
**3 ft High Wall of Accumulated Wrack
(Dead Culms), July 2006.**



***Phragmites* has invaded former sand beach habitats, well below the high tide mark.**



**Accumulation of dead
Phragmites culms forms a dense
debris layer on many of the
remaining open sand beaches.**



Phragmites communis Trin.
1880
PROPERTY OF
ISAAC BURE, Philadelphia, Pa.
Collected by
Isaac Bure, Philadelphia, Pa.
Camden, N.J.

Kaighn's Point, NJ: 1880

**Ballast Yard
Introduction!**

Specimens and/or leaf tissue retained for
morphological examination
Dr. M.A. Becka, 1991 - Ohio University

HERBARIUM
1880
UNIVERSITY OF PENNSYLVANIA

HERBARIUM OF
ISAAC BURK, Philadelphia; Pa.

Arundo?

This grass was introduced in ship's ballast at Kaighn's Point NJ about 1876 or/

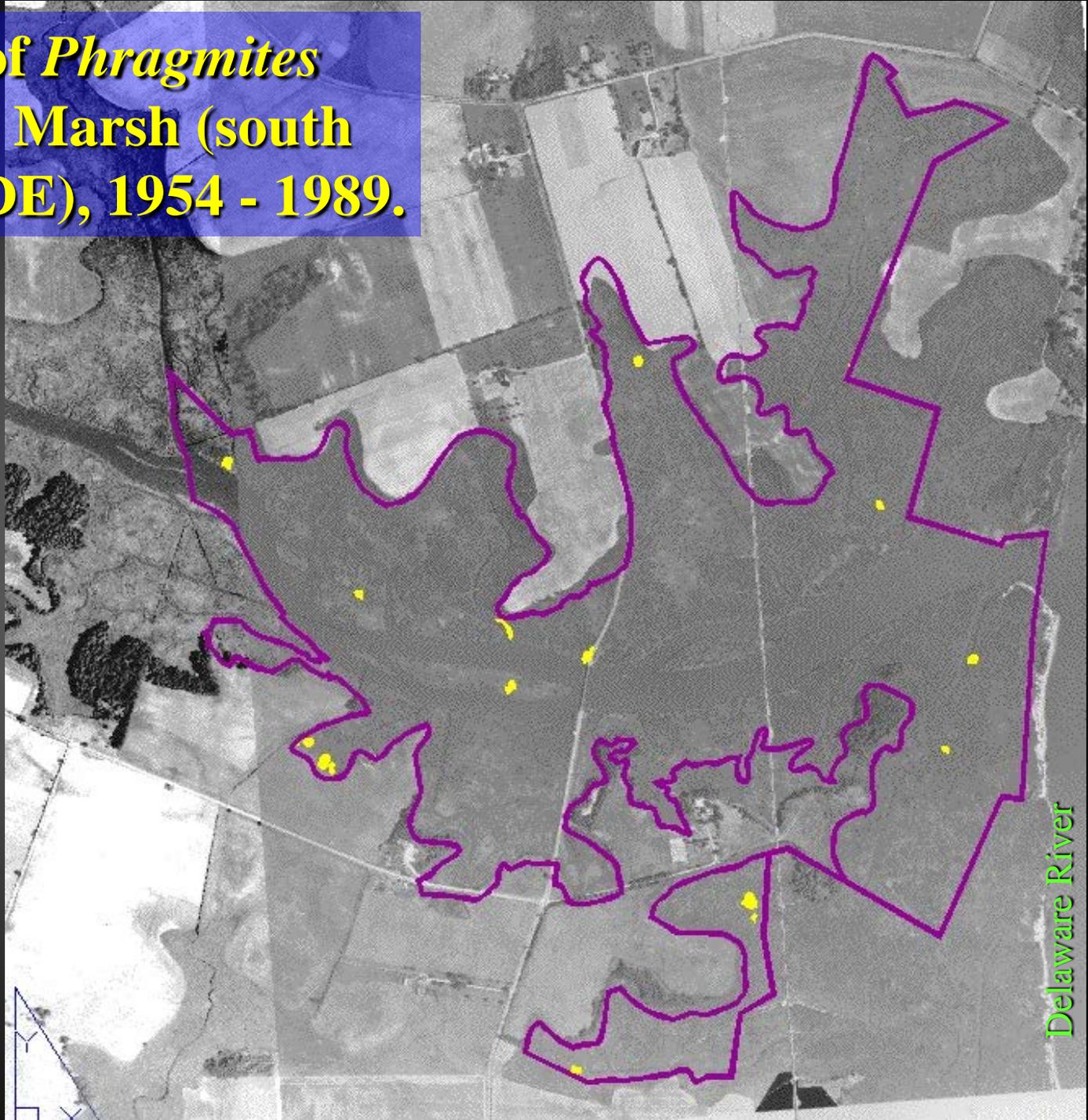
It spread rapidly but did not flower until about 1880. Since then it has appeared at Girard Point flowering sparingly.

It throws out runners from the roots which will creep on the moist sand 20 or 30 feet.

will creep on the moist sand 20 or 30 feet

**Expansion of *Phragmites*
in Silver Run Marsh (south
of Port Penn, DE), 1954 - 1989.**

1954



Delaware River

Images courtesy of PSEG.

1962



Delaware River

Images courtesy of PSEG.

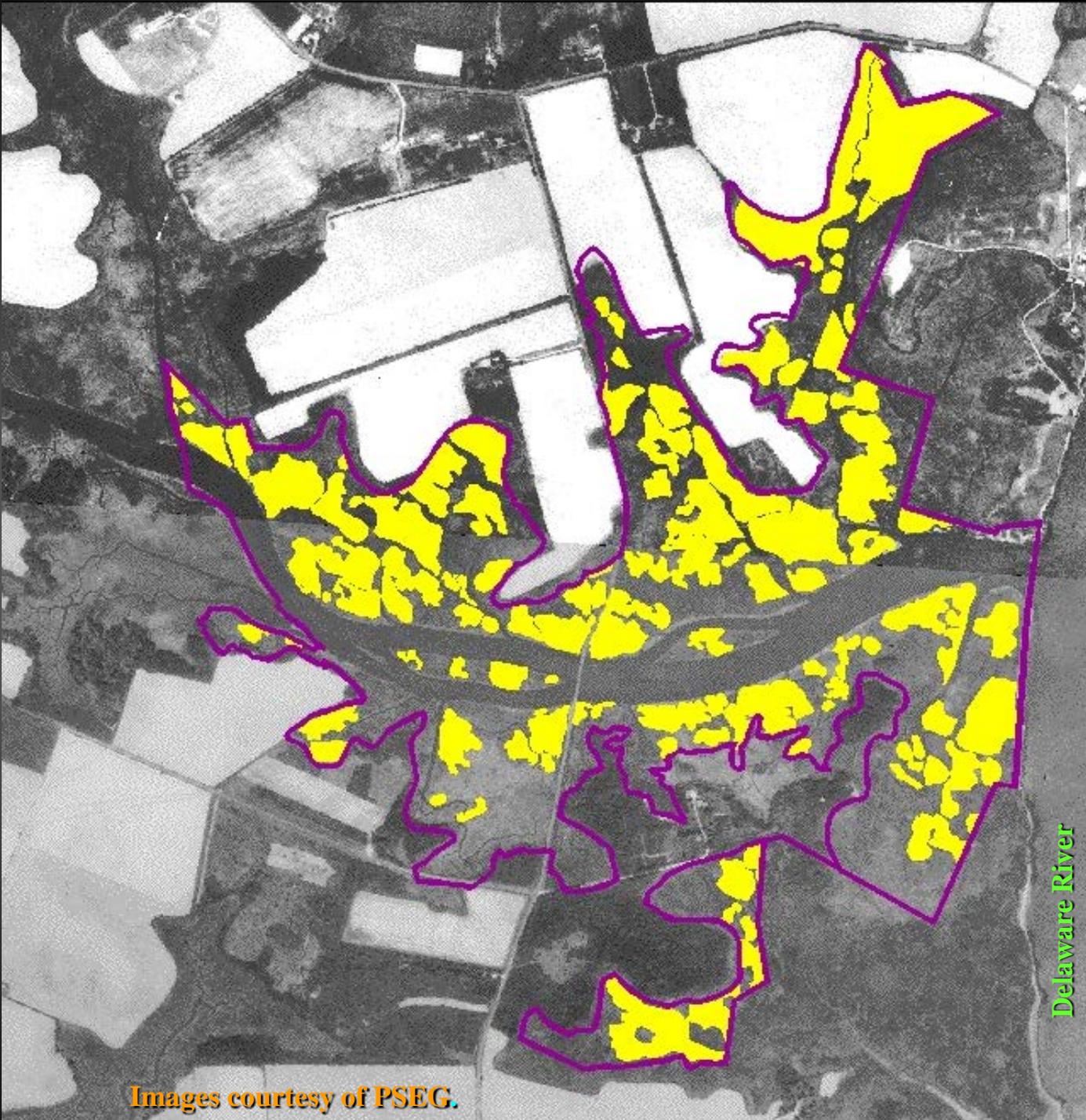
1968



Delaware River

Images courtesy of PSEG.

1977



Delaware River

Images courtesy of PSEG.

1989



Delaware River

Images courtesy of PSEG.



Rhizome Mat – Below Ground Barrier

Northern Diamondback Terrapins



**Carapace averaged (1976):
Length 7.3 in.
Width 5.5 in**

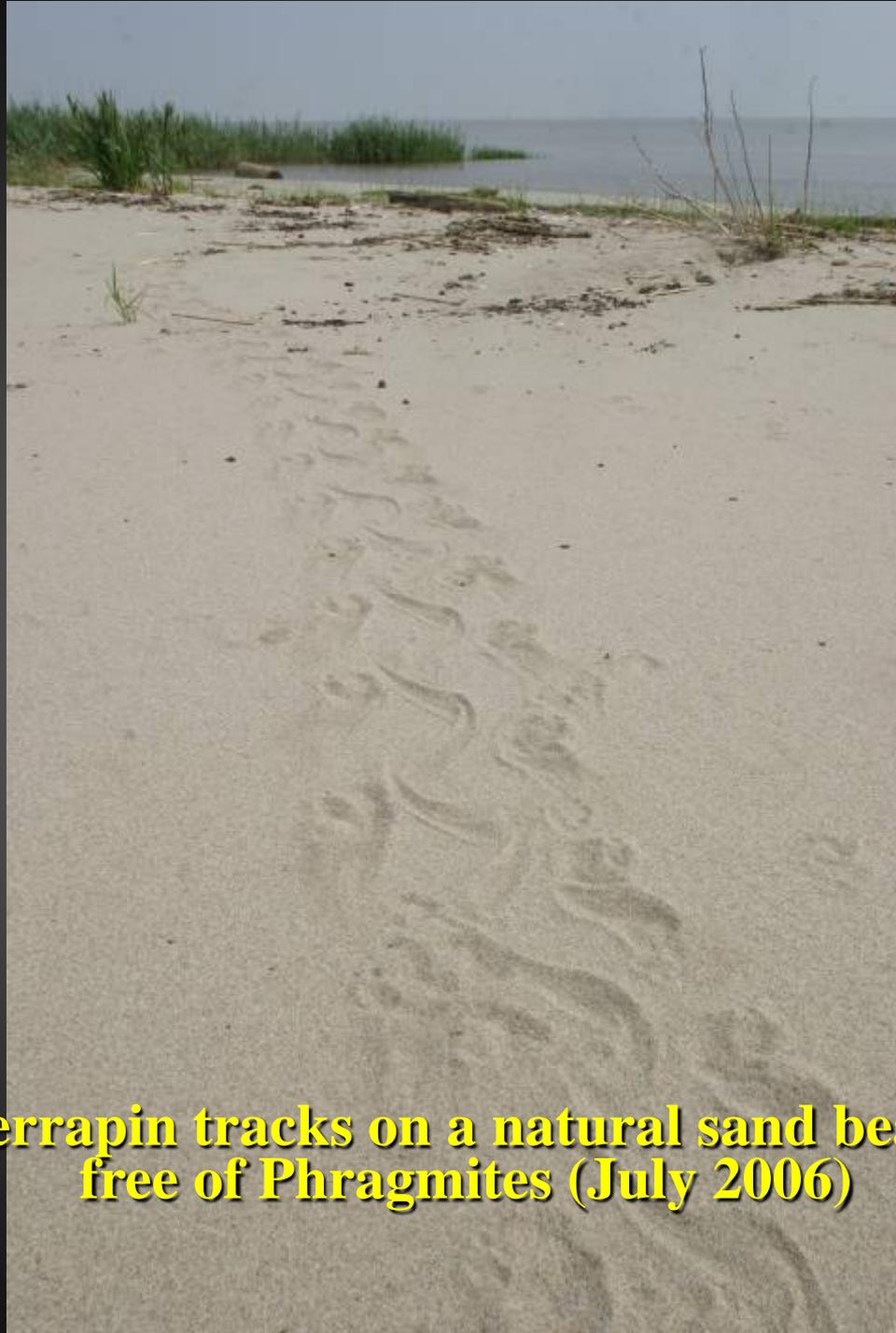




**Averaged Age (1976):
10.1 years**







**Terrapin tracks on a natural sand beach
free of Phragmites (July 2006)**



Terrapin successfully nesting in sparse Phragmites stand.

Terrapin nesting just above the prevailing high tide line (1980).







**Successful terrapin nest on sand beach
with limited *Phragmites*, (near Peach
House Ditch, July 2006).**





Typical moderate density vegetated habitat used by Terrapin's for nesting.

Typical depredated Terrapin nesting



Ovary Dissection











Surprise!



Black Racer



Commercial Harvest ?





Shoreline Erosion!



How do you restore nesting habitat at a Terrapin Beach?





Controlled burn of previously sprayed stand of *Phragmites* along the beach front at Peach House Ditch, April 2007.

Beach cleared of Phragmites by controlled burn at Peach House Ditch, April 2007.



Similar beach area in 2006.



Wash Over Area







Nesting Beach Survey Post Restoration June 29, 2013



An aerial photograph showing a long, narrow beach area outlined in yellow. The beach is situated between a body of water on the right and a dark, textured land area on the left. The text "Peach House Ditch Beach" is overlaid in yellow on the image.

Peach House Ditch Beach



800 m of Beachfront

**Beach Width varied from
17 – 26 m**

January 9, 2014



431 m of Beach Front

**Remained naturally
vegetated sand**

**369 m of Beach Front
Dominated by Phragmites**

Sandy Beach

**Beach
Front**

**No.
Nests** **Distance
(m)** **No.
Nests/m**

61 352 0.17

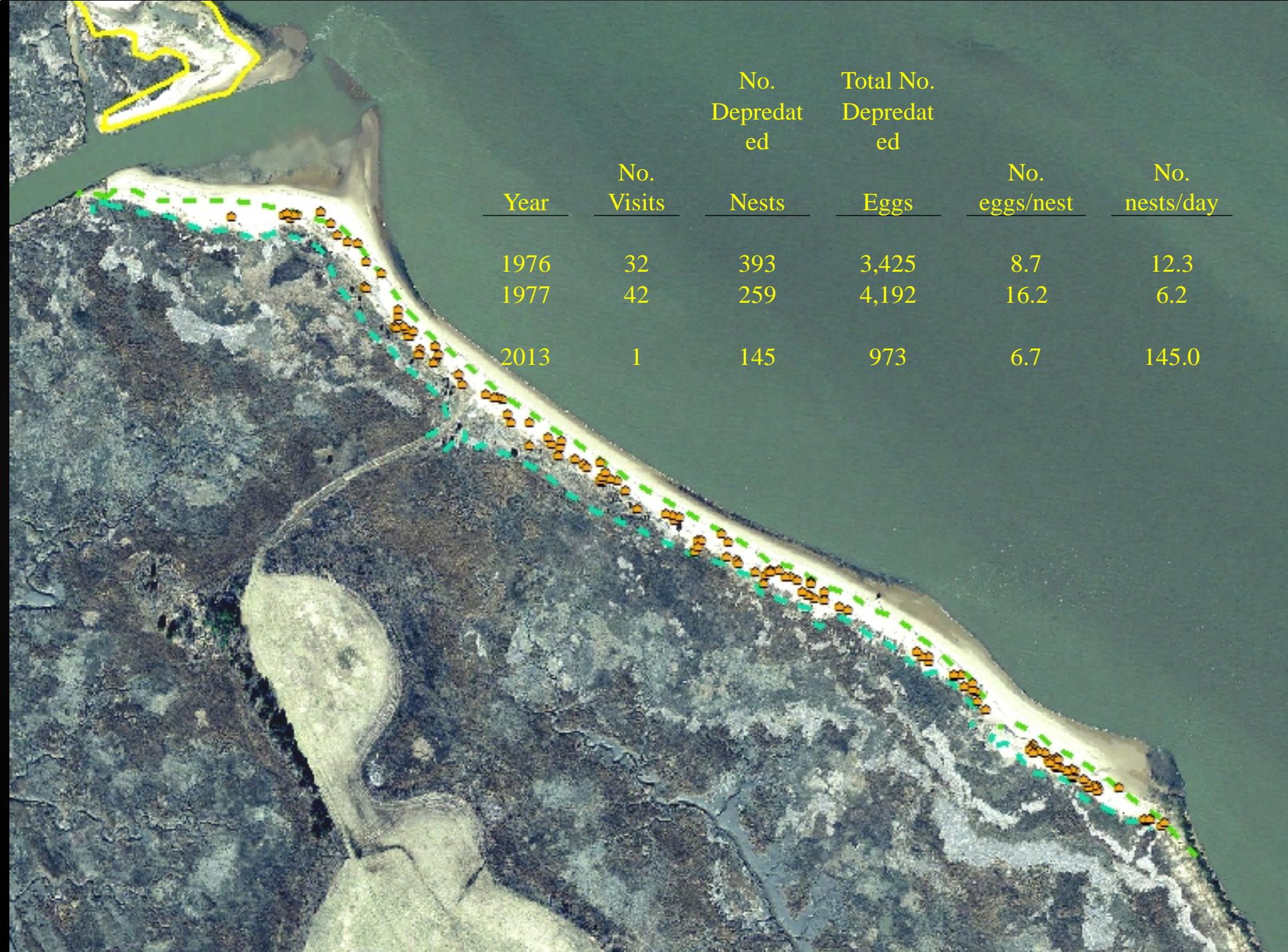
**Former Phragmites Dominated
Beach**

**Beach
Front**

**No.
Nests** **Distance
(m)** **No.
Nests/m**

83 331 0.25





<u>Year</u>	<u>No. Visits</u>	<u>No. Depredated Nests</u>	<u>Total No. Depredated Eggs</u>	<u>No. eggs/nest</u>	<u>No. nests/day</u>
1976	32	393	3,425	8.7	12.3
1977	42	259	4,192	16.2	6.2
2013	1	145	973	6.7	145.0

Nesting Gaps

Beach area too remote from Bayfront

Wash over/breach area





Shoreline in 1926

126m of Loss



**Over 200 m
of Loss**

Project Partner: Delaware Wildlands



