Shared Beaches, Contrasting Spatial Dynamics: Interannual Nesting Distribution of Shorebirds and Seabirds on an Urban Barrier Peninsula



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Acknowledgments



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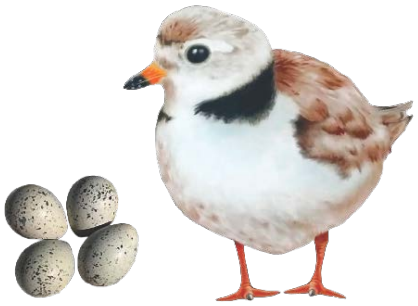
Why spatial distribution matters?



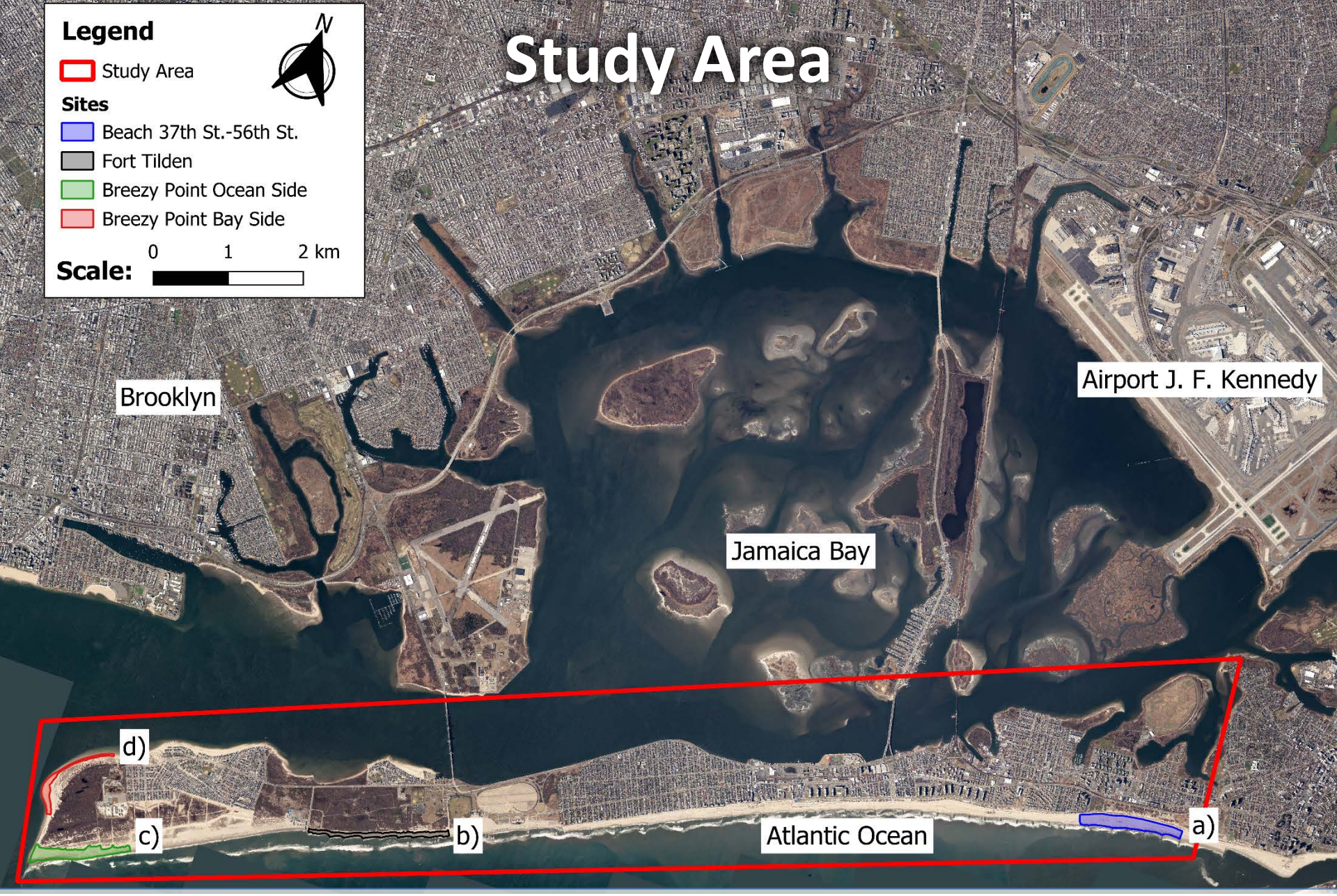
Dynamic Coastal Environments[1]: Storms, erosion, and human management shift habitat rapidly.

Shared Habitat, Contrasting Strategies[2-3]: Territorial nesting vs. colonial nesting.

The Monitoring Problem[4]: Nest number ≠ spatial distribution.

[1] 10.1002/ece3.4564
[2] 10.1093/czoolo/60.4.500
[3] 10.1016/j.biocon.2021.109178
[4] 10.1007/s13253-015-0243-0

Where birds nest may change independently from how many nests are recorded.



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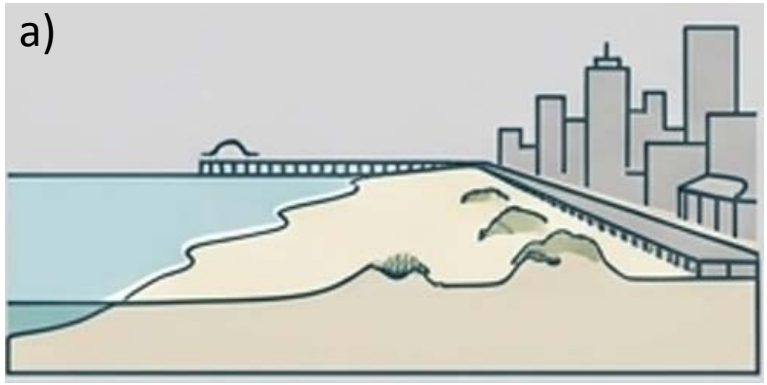
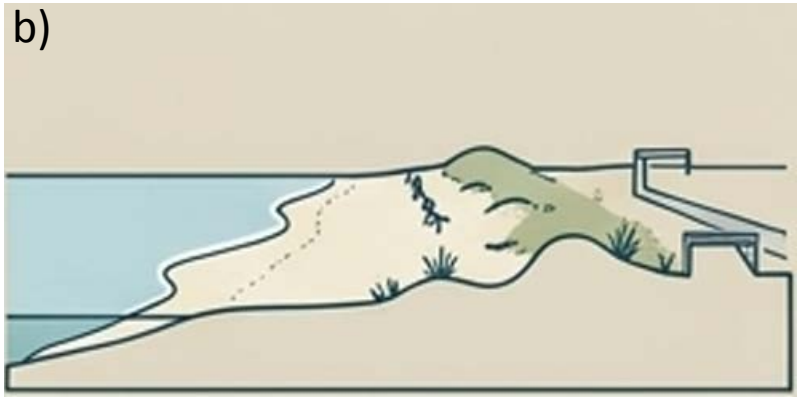
Study Area



Beach 37th–56th St.: Managed urban beach with wide sand, low dunes, high recreation, and nearby infrastructure.



Fort Tilden: Semi-natural beach with developed dunes, mari time vegetation, wetlands, and relatively low human disturbance.



Breezy Point Ocean Side: Exposed, largely undeveloped oceanfront with wide beaches, extensive dunes, and strong Atlantic influence.



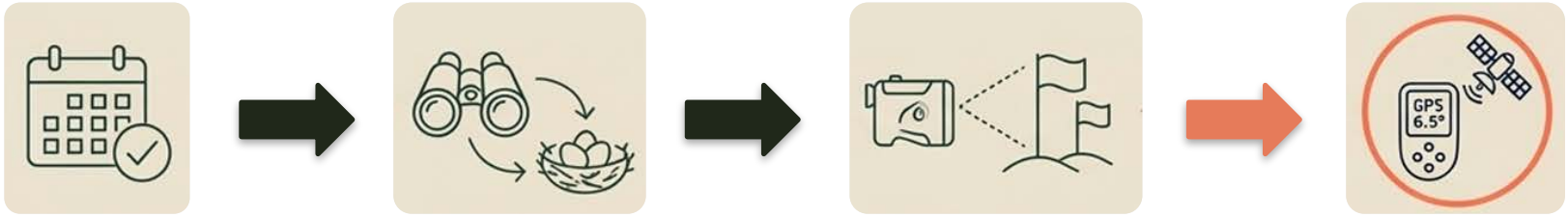
Breezy Point Bay Side: Sheltered Jamaica Bay habitat with tidal flats, salt marshes, and spatially constrained sandy nesting areas.

The Research Gap



Do shorebirds and seabirds differ in the spatial extent and year-to-year consistency of their nesting distributions within the same urban barrier landscape?

Methodology



Weekly Surveys
(15 weeks per season, 2 seasons)

Nest Detection

Rangefinder + Seasonal Markers

Final GPS Coordinates
(collected after breeding season)

260 Total Nests Analyzed | 2025-2026

Shorebirds

American Oystercatcher, Piping Plover



Seabirds

Common Tern, Least Tern, Black Skimmer



Total Variation Distance

$$D = \frac{1}{2} \sum_{i} \left| p_{i,2025} - p_{i,2026} \right|$$

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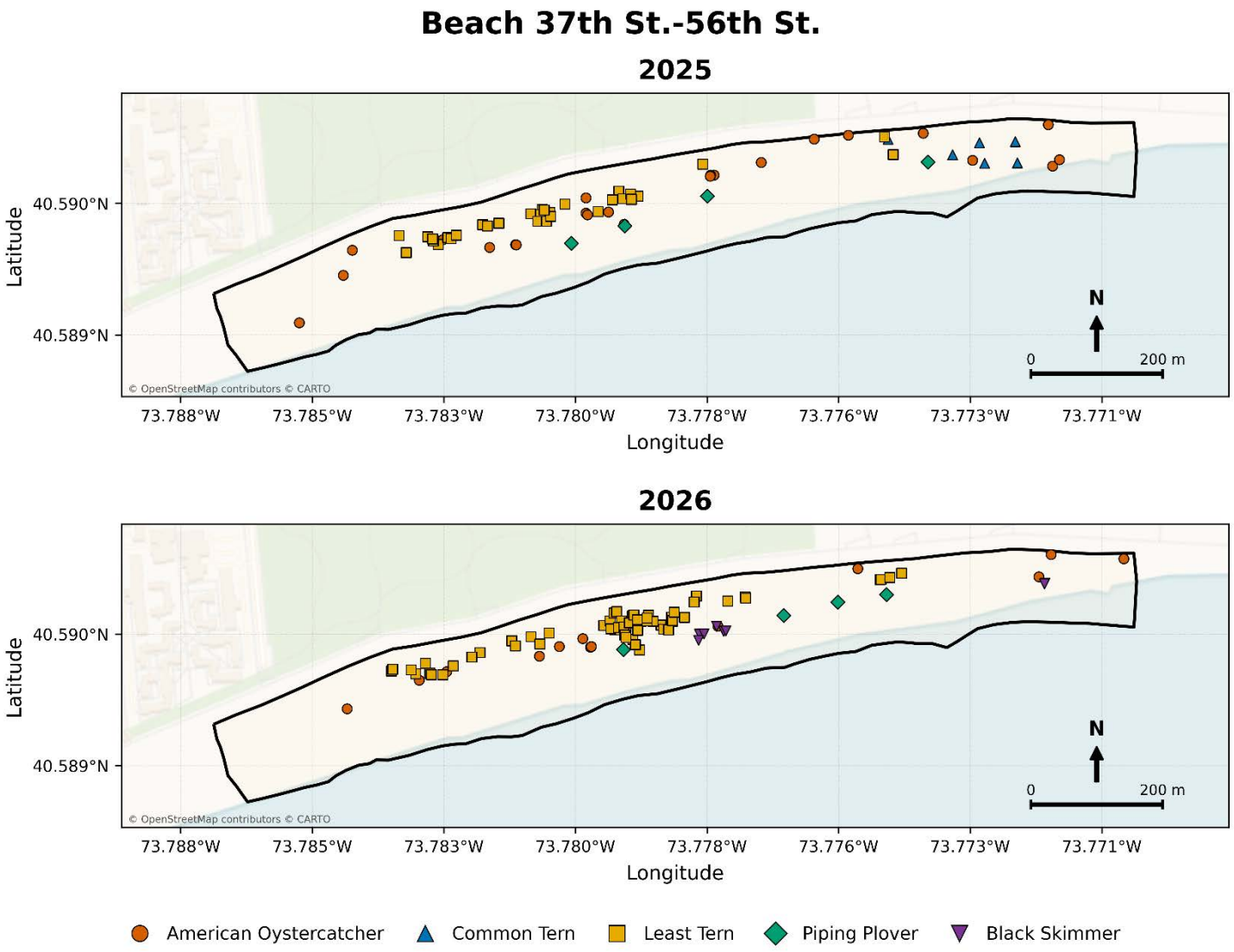
Results: Study Area



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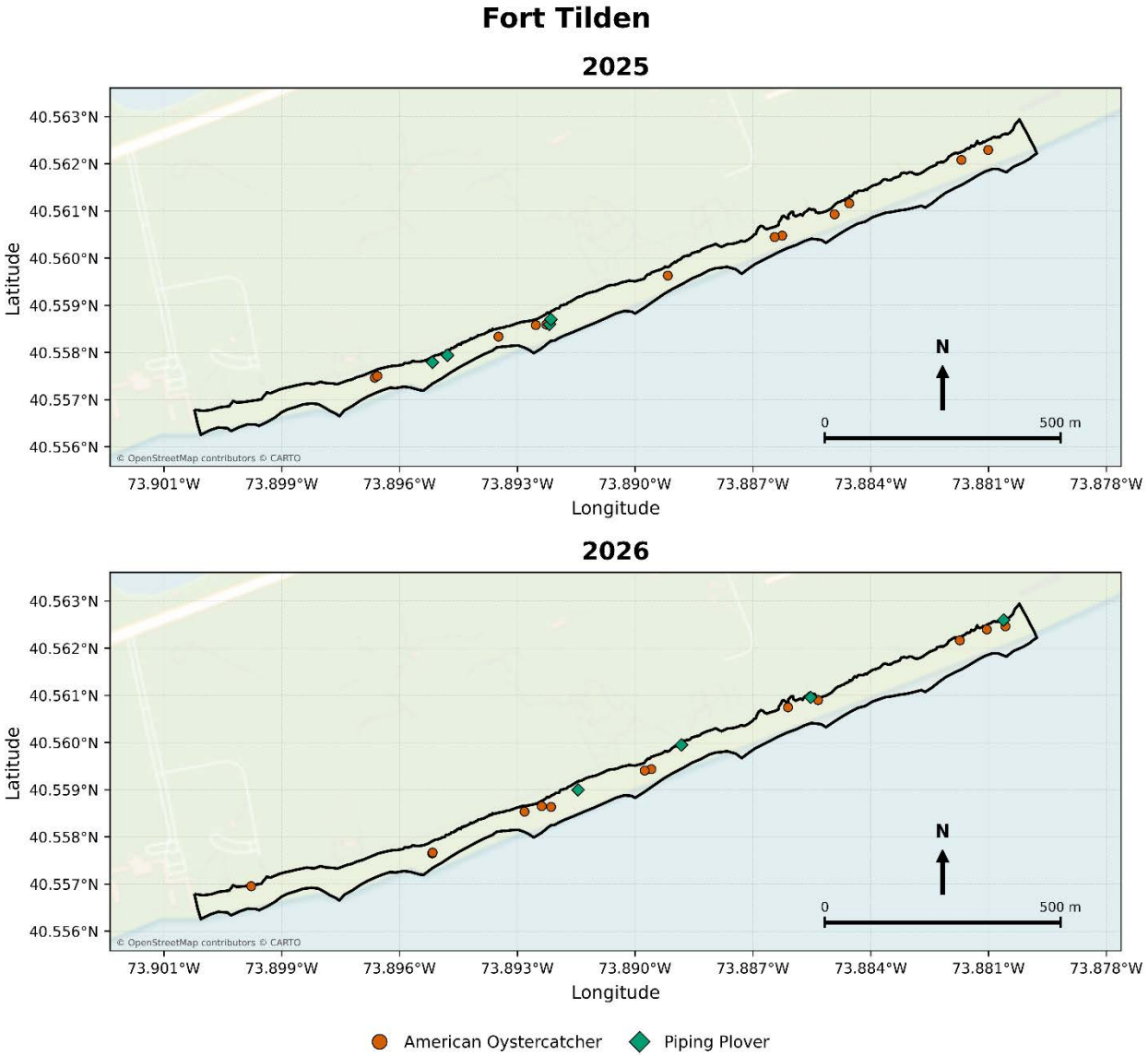

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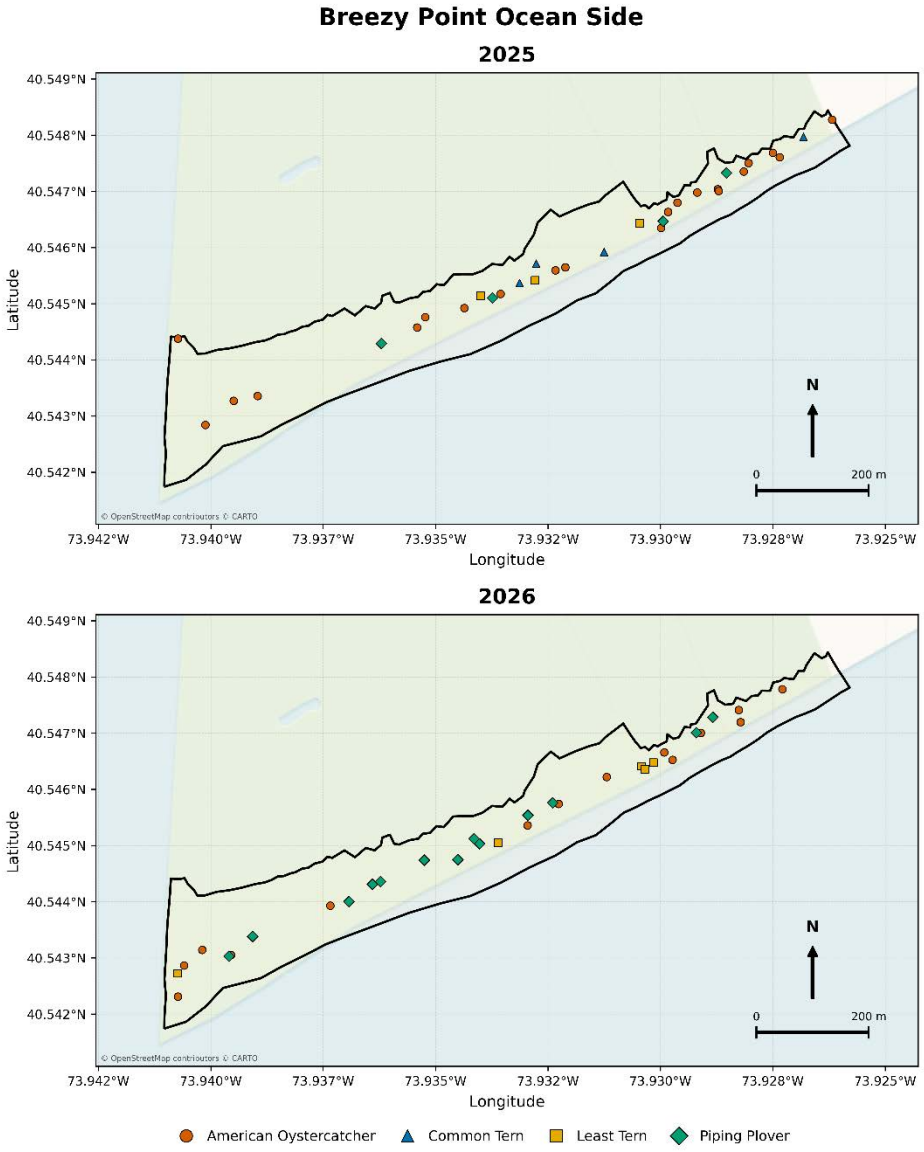

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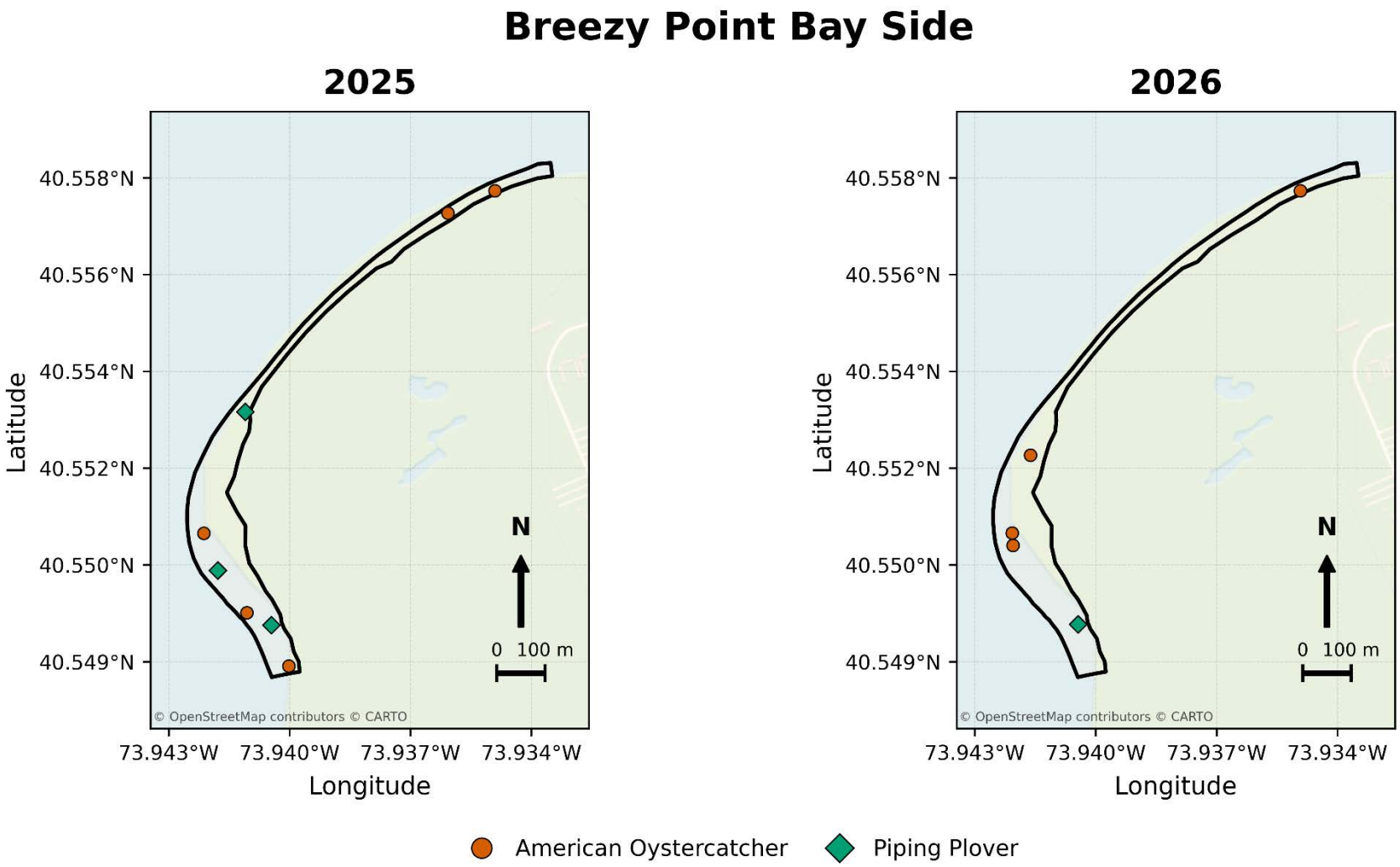
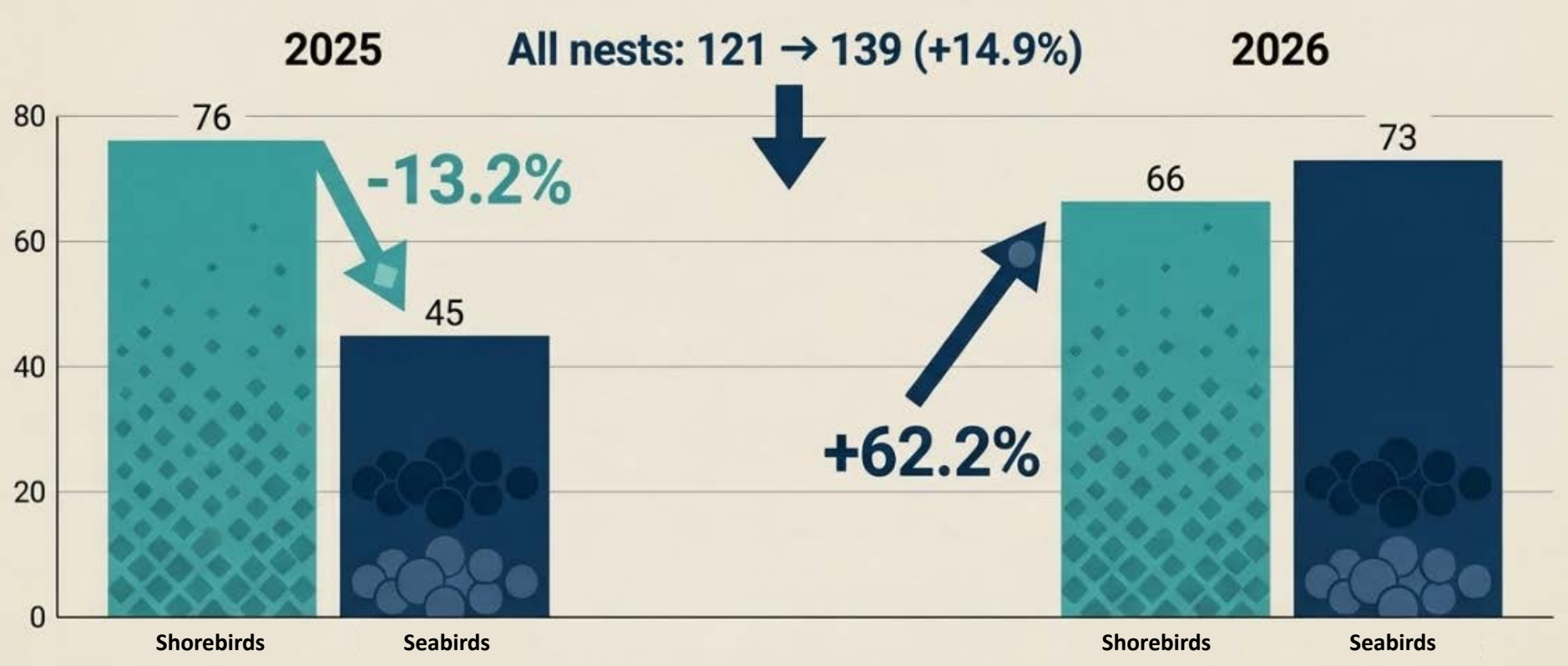
Results: Study Area

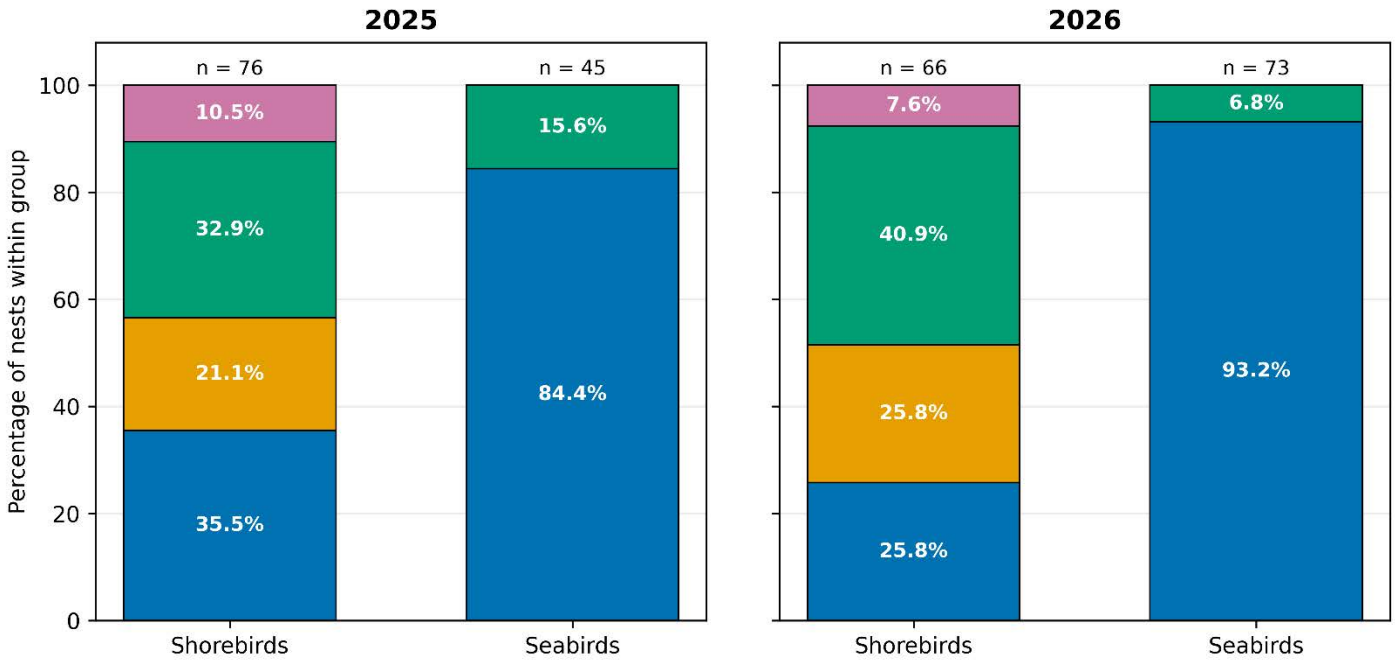


Results: Interannual Spatial Redistribution



The community composition changed substantially, but did they redistribute spatially?

Results: Spatial Allocation Selection







Shorebirds

Broad Coverage: 4/4 Sectors Occupied

Moderate Redistribution D = 0.127

Seabirds

Concentrated Coverage: 2/4 Sectors Occupied

Low Redistribution D = 0.087

84.4%→93.2% concentrated in a single sector

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Results: Species Reveal the Real Dynamics

Ecological Group / Species		Nests 2025 → 2026	Total Variation Distance (D)
Shorebirds	American Oystercatcher	61 → 44	D = 0.108
	Piping Plover	15 → 22	D = 0.324
Seabirds	Common Tern	10 → 0	NC
	Least Tern	35 → 65	D = 0.009
	Black Skimmer	0 → 8	NC

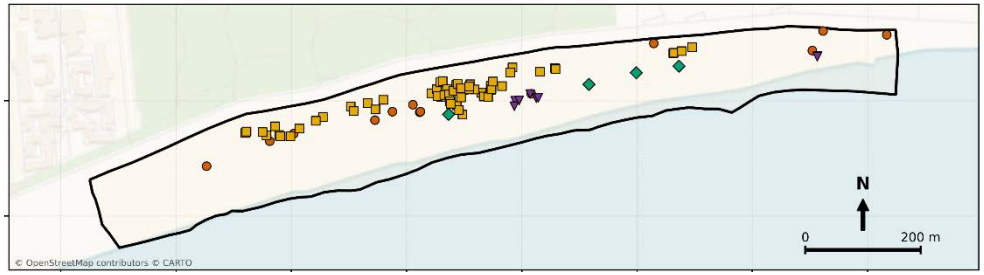
Moderate abundance increase, but **HIGH** redistribution

Massive abundance surge, but **ZERO** redistribution

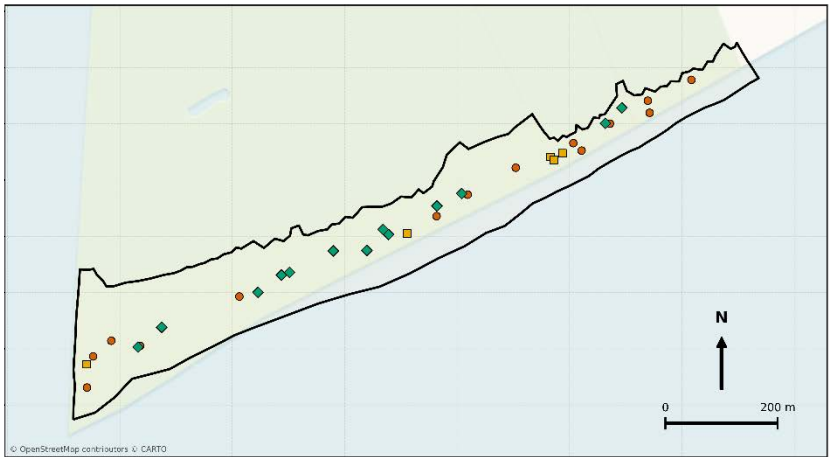
A large change in nest numbers does not necessarily imply a large change in spatial distribution



Results: The Spatial Mosaic

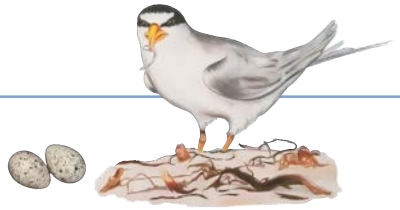


Colonial Seabirds (Concentrated)
Highly localized aggregations: restricted spatial breadth (e.g. Least Tearn ■)



Territorial Shorebirds (Dispersed)
Broad, dispersed distribution across all four sectors; high interannual flexibility (e.g. Oystercatcher ● and Piping Plover ◆)

Abundance ≠ Composition ≠ Redistribution



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Spatially Differentiated Management

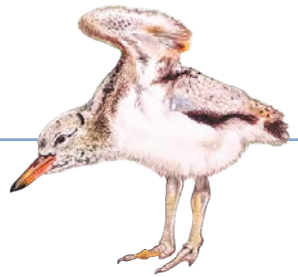
PROTECT THE CORE

- 84–93% of marine-bird nests and 90% of Least Terns rely on Beach 37th–56th St.
- **Action:** Maintain stable, seasonal protection of this core site. Continue monitoring Ocean Side.

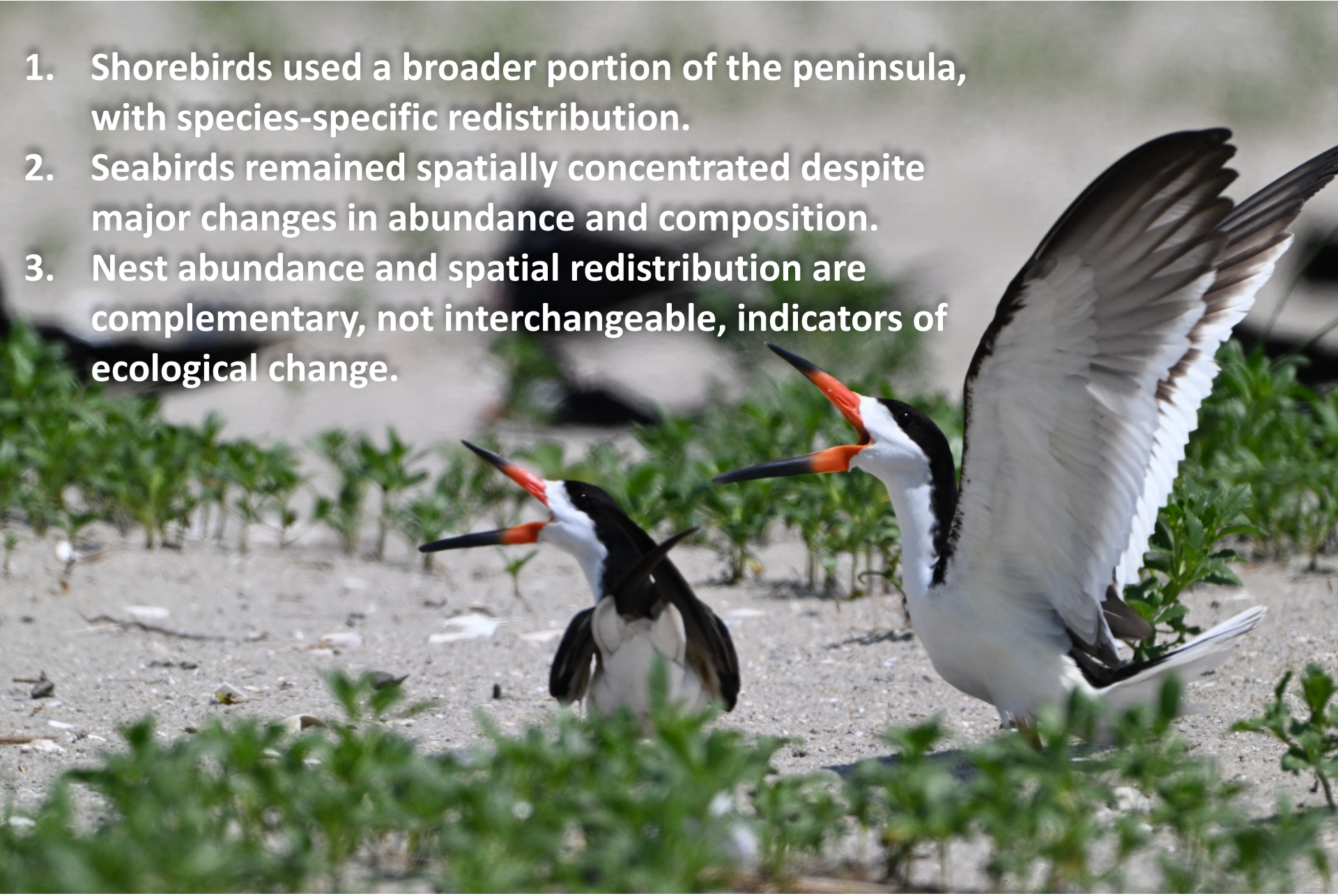
Stable Core Protection + Flexible Peninsula-wide Monitoring

MONITOR THE WHOLE

- All four sectors are occupied; Piping Plovers redistribute substantially between years.
- **Action:** Implement flexible, peninsula-wide monitoring based on current-season use, not just past locations.



1. Shorebirds used a broader portion of the peninsula, with species-specific redistribution.
2. Seabirds remained spatially concentrated despite major changes in abundance and composition.
3. Nest abundance and spatial redistribution are complementary, not interchangeable, indicators of ecological change.



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Questions?



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