

POTENTIAL FOR UTILIZATION OF REMOTE SENSING TECHNIQUES IN QUANTIFYING AND CHARACTERIZING INTERTIDAL OYSTER HABITAT IN SOUTHWEST FLORIDA

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Southwest Florida's Estuarine Problems

- Part of Greater Everglades system & Comprehensive Everglades Restoration Plan (CERP).
- Water quality, quantity, & timing due to water management.
- Water management for potability, storm water, & agriculture.
- Altered salinity: too much, too little, disrupted seasonality.



Southwest Florida

Caloosahatchee

Estero Bay

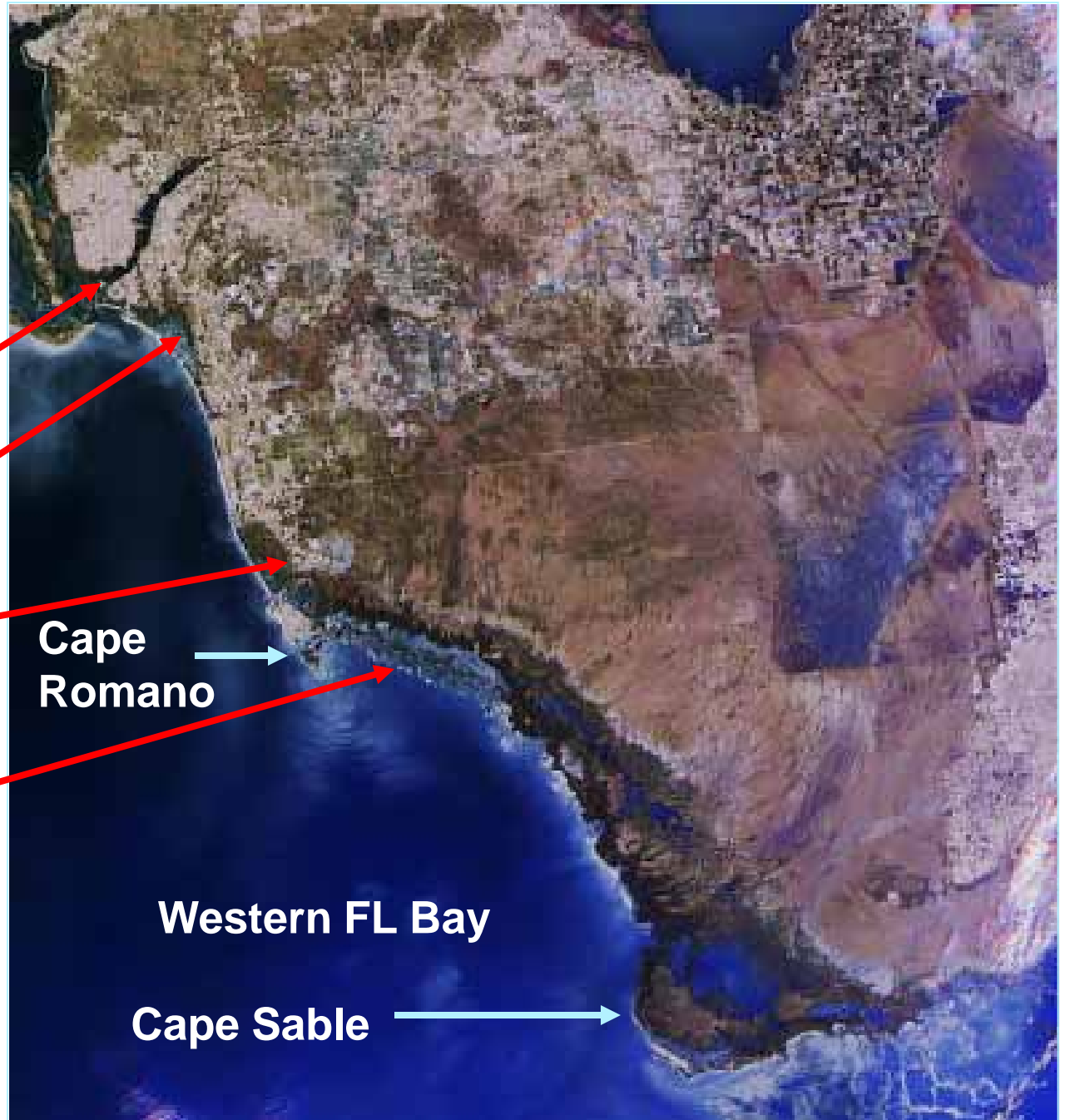
Rookery Bay

**Ten Thousand
Islands**

**Cape
Romano**

Western FL Bay

Cape Sable



Research Questions

- How to gauge the environmental health of SWFL estuaries?
- How to establish estuarine restoration targets?
- How to monitor restoration effectiveness & adaptively manage restoration?

Oysters as Metrics of Estuarine Health

- Use various aspects of oyster physiology and ecological distribution.
- Reefs primarily intertidal, upper meso- to polyhaline (15-30 ppt).
- Reefs occur in inner-middle regions of the “inner bays”.
- Importance for development of coastal geomorphology through late Holocene.





Blackwater River & Bay



Germane to Greater Everglades Restoration

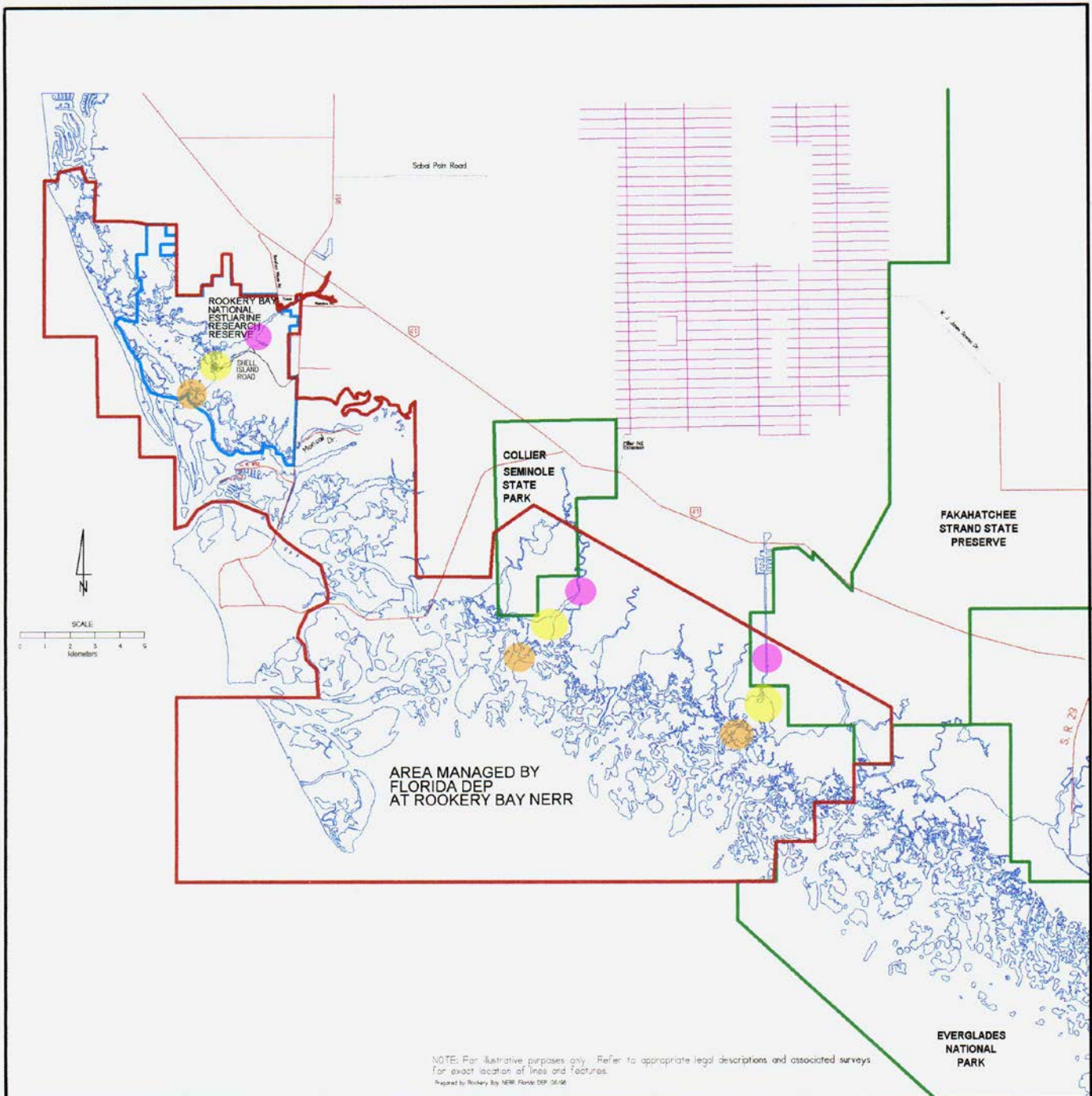
- Results used to plan and monitor restoration in 3 CERP projects.
- Results used to define formal “performance measures”.

Research Design I:

- Distribution of oyster reefs & reef living density as two of many measures.
- Other aspects:
 - Oyster reproduction.
 - Oyster growth.
 - Disease susceptibility.

Research Design II: Spatial Homologue Approach

- What is a spatial homologue: similar geomorphology & hydrology.
- Assume spatial homologues among the 3 estuaries have same water quality, oyster health & ecology, & faunal assemblages in absence of human alteration.
- Compare: water quality; oyster distribution, growth, & health.



Methodology I: Oyster Reef Mapping

- Photograph reefs from helicopter during extreme low tide.
- Two sets of photographs: large scale for perspective; small scale for size.
- Transfer by hand to a GIS layer.

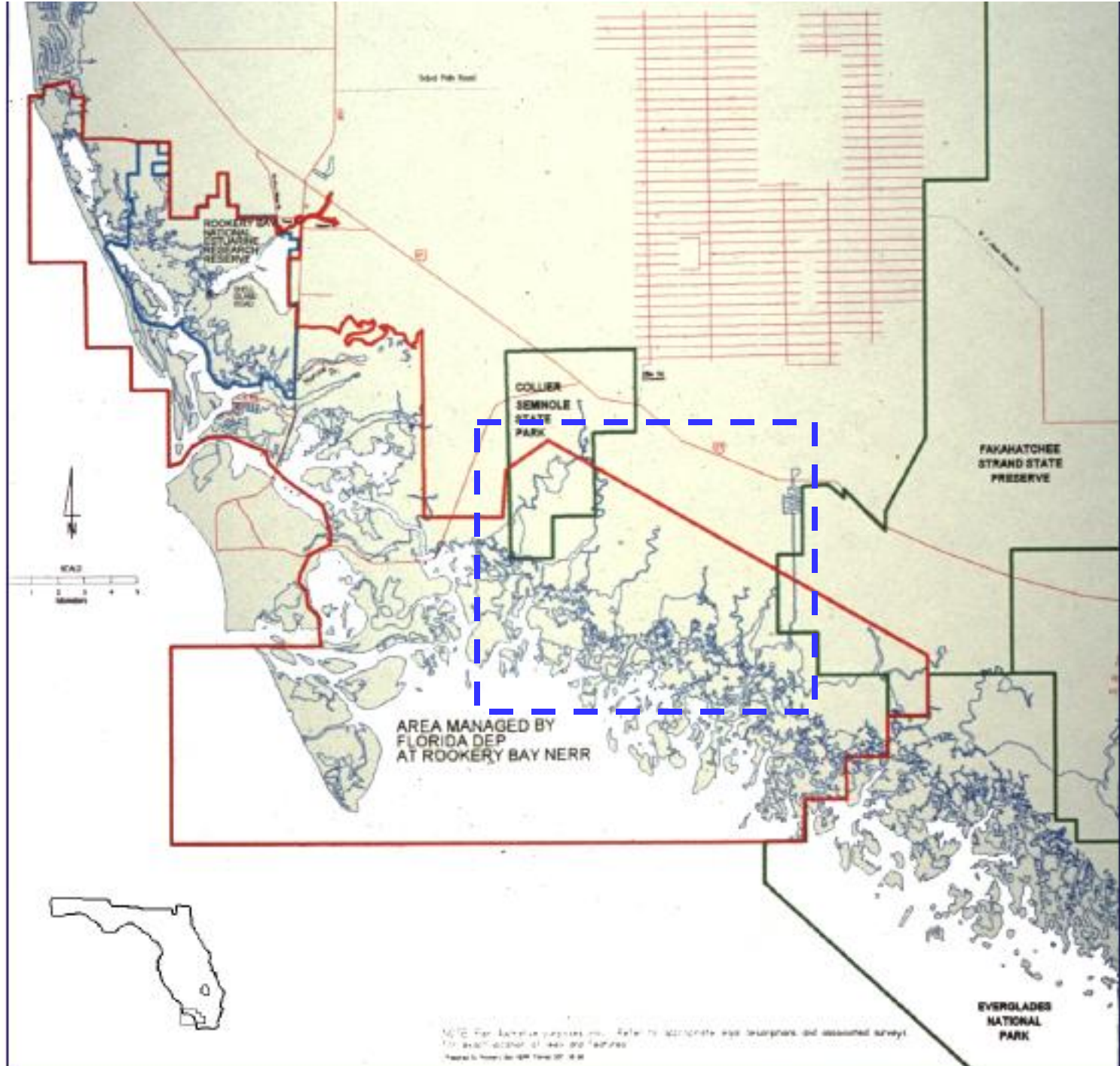




Methodology II: Living Density

- Count living oysters within quadrats.
- Survey middle intertidal contour; height of highest living density.
- Randomly sample a number of quadrats along this contour.







Faka-Union: “Want to buy some swamp land in Florida?”

- Land development planned by Gulf American Corporation -- creation of Southern Golden Gate Estates.
- Problem: Excessive freshwater; 115,000 extra acres of wetland drained into estuary.
- No flow control structures.
- CERP project for restoration.

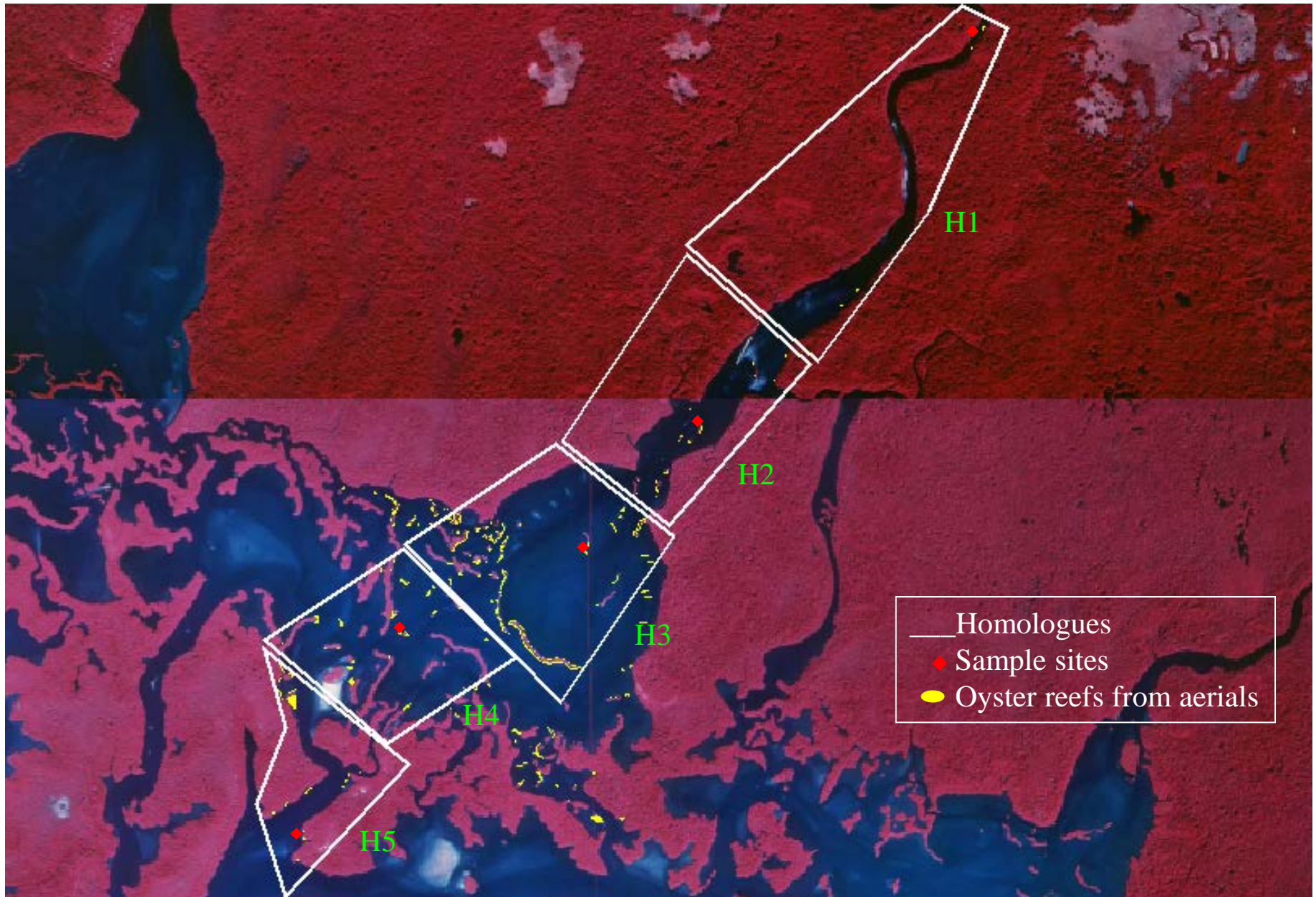
Southern Golden Gate Estates

- 813 miles of roads
- 138 miles of canals

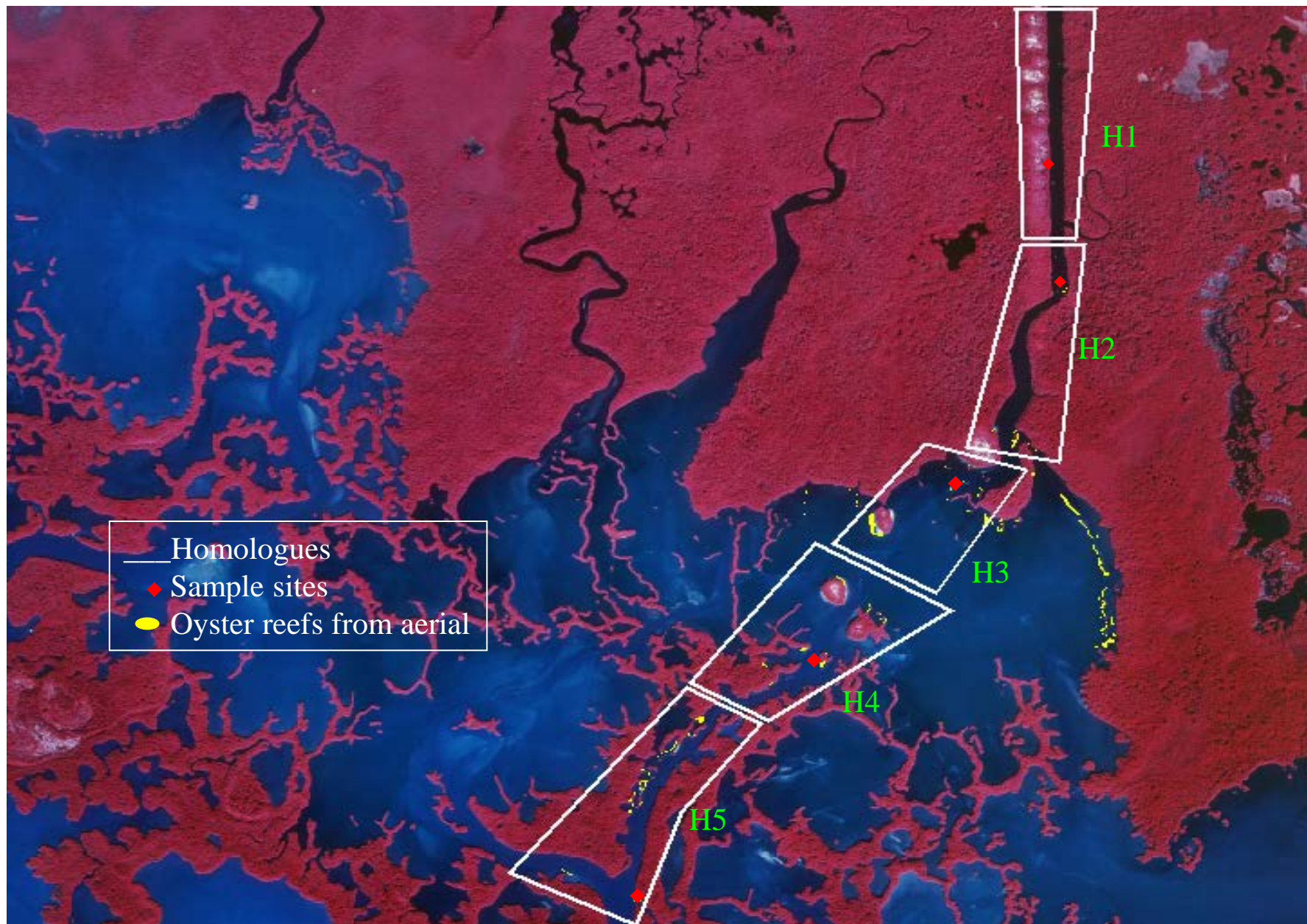
All water flows out of one canal into Faka Union Bay



Reef Distribution in Blackwater



Reef Distribution in Faka-Union

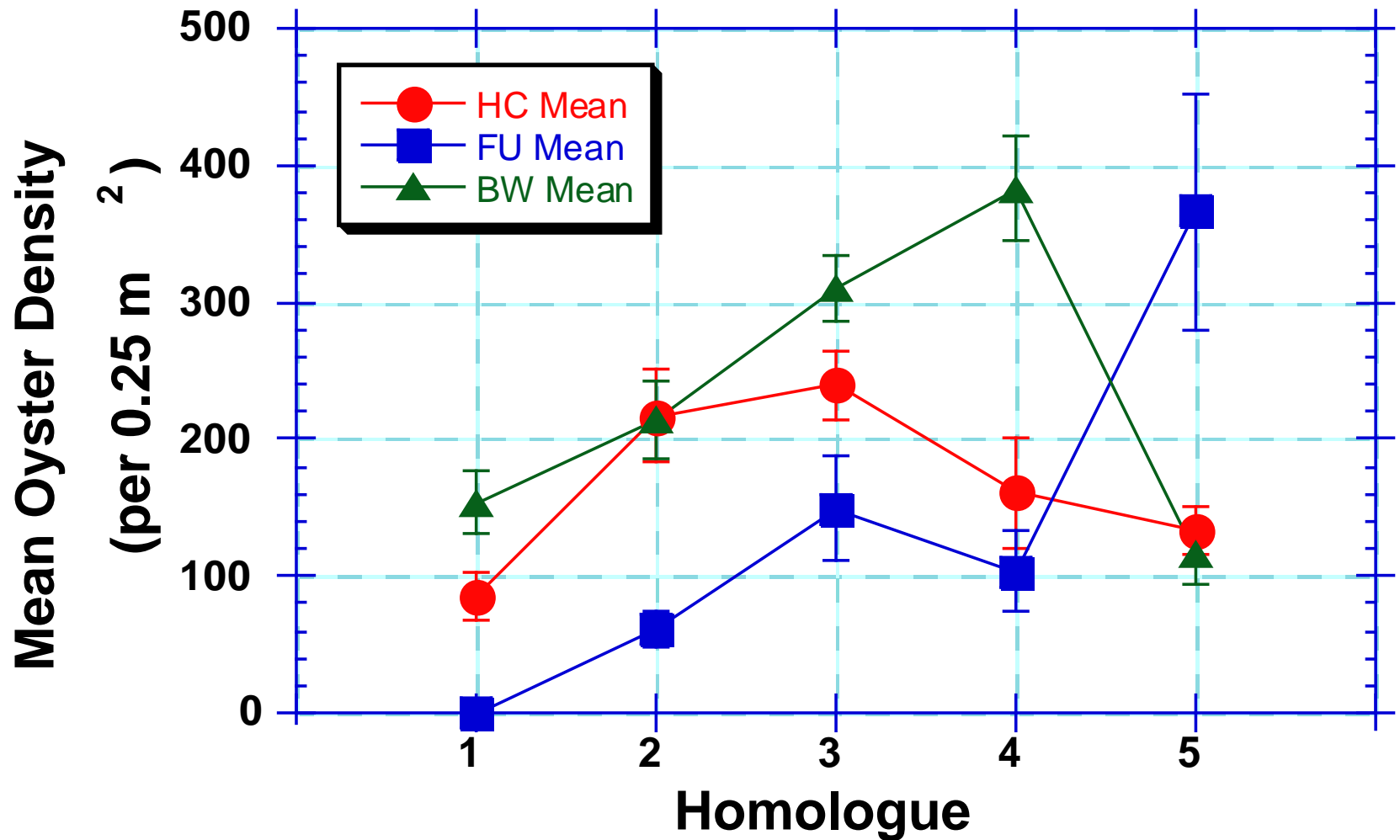


Distribution of Oyster Reefs

Location	Reef Area (m ²)	Accommodation Space (m ²)	Percent Reef Coverage
Faka-Union	24,270	2,334,685	1.04%
Henderson	47,656	2,956,326	1.61%
Blackwater	35,365	2,034,695	1.74%

- Within Blackwater & Henderson reefs dominate at homologues 2, 3, & 4.
- Within Faka-Union reefs dominate at homologues 4 & 5. No living reefs at homologue 1 (relict reefs occur).

Oyster Living Density



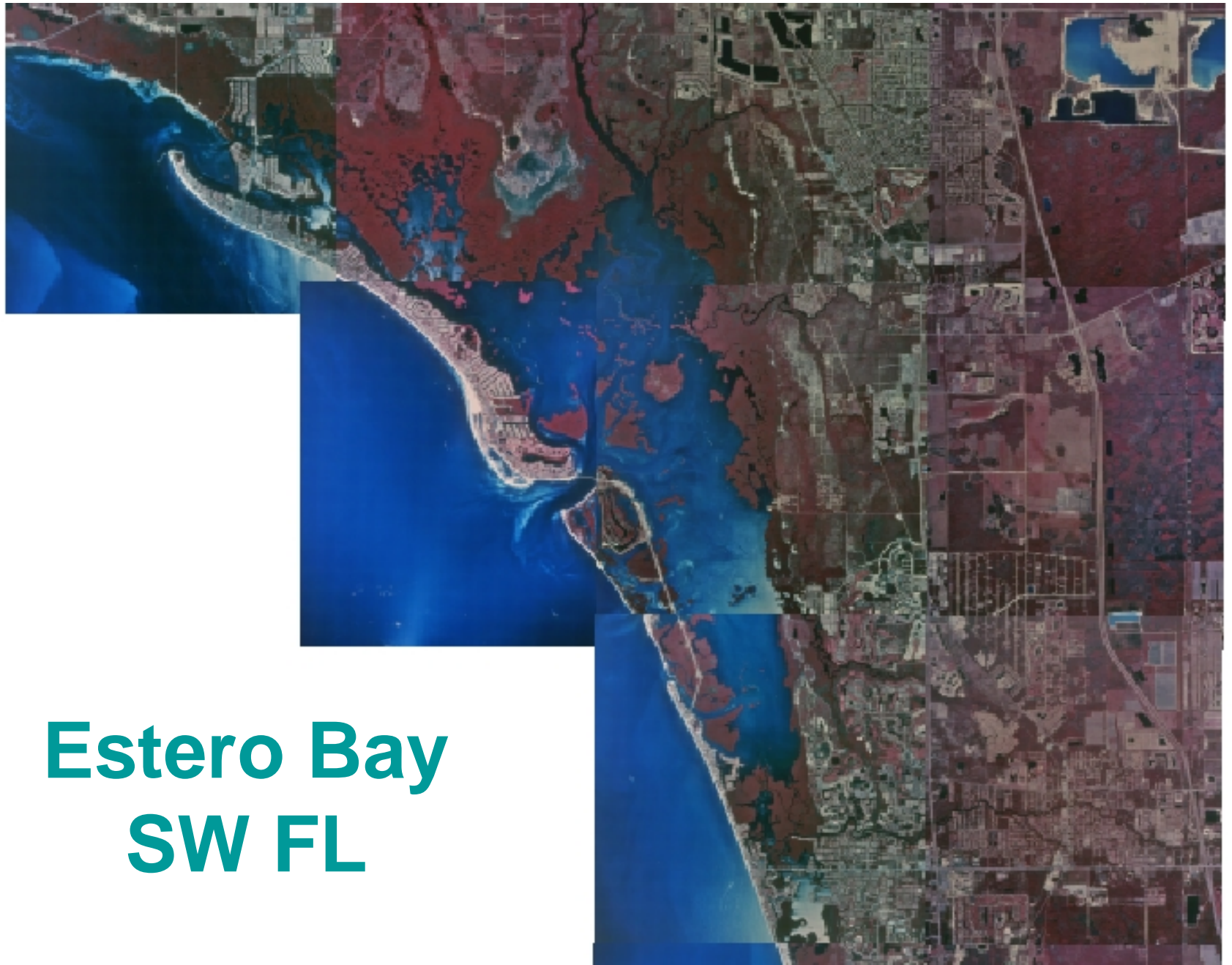
Implications

- Target water flow to establish right conditions for reef development.
- Results used for restoration design and planning.
- Can assess restoration performance & adaptively manage restoration.

Caloosahatchee River & Estuary



- Problem:** System is highly altered and highly managed
- Result:** Altered freshwater input (timing and amount)
- Downstream effects:** Salinity structure, water quality and residence time
- Ecological implications:** Distribution and abundance of estuarine organisms; downstream production
- Project Goals:** Use data from oysters and oyster-reef communities to guide management targets for minimum and maximum flows as well as the timing of freshwater releases



Estero Bay
SW FL

Complications & Limitations

- Helicopter photographic surveys costly & time intensive.
- Reefs extend into shallow subtidal depths:
 - Can't always see subtidal edges.
 - Waters are tanin-rich, opaque.
 - SAV can look like oyster clumps when subtidal.
- Photography accurately positions reefs but not size.
- Living density varies drastically & difficult to visualize from photos.
- Can't distinguish reef substrate or “strata” types.
- Other techniques?