

Influence of Watershed Alteration on Oyster Health and Oyster Reef Habitat: Management Implications for the Faka Union and Estero Bays

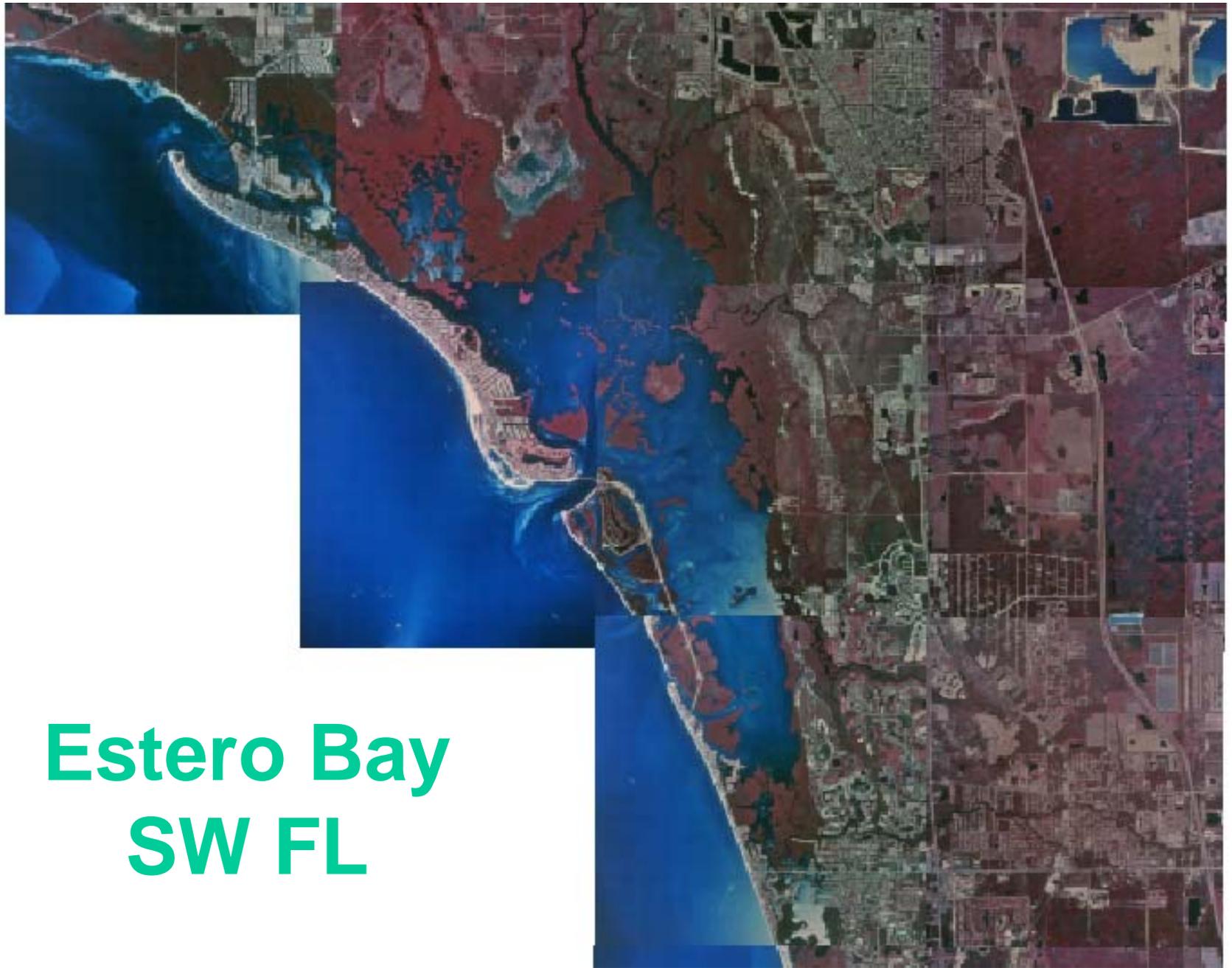
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Management & Restoration of Southwest Florida's Estuaries

- Importance of estuaries.
- Effects of water management.
- Need to prevent future damage to pristine estuaries.
- Need to restore those that are highly altered.

Estero Bay

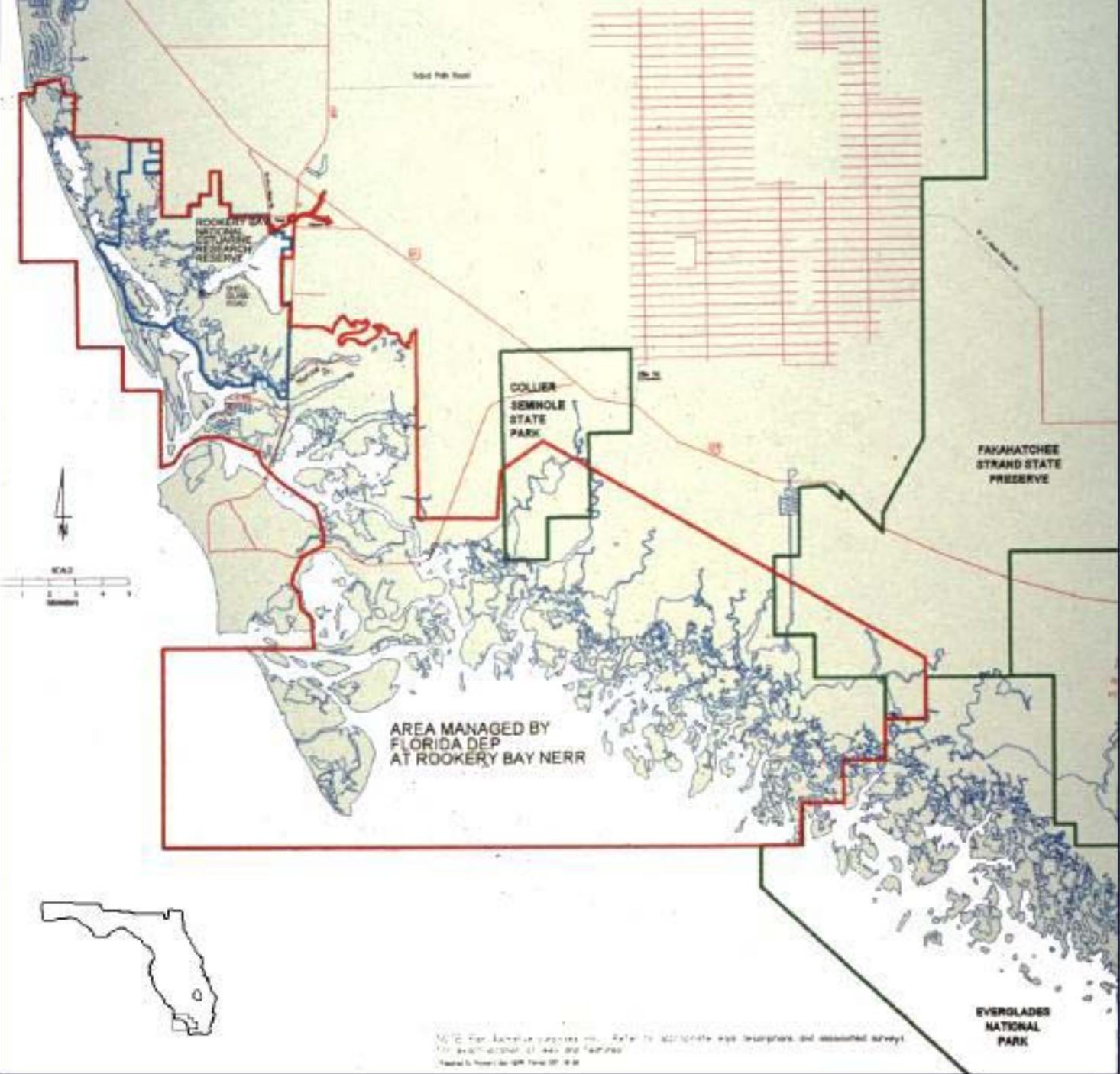
- Estuary relatively pristine.
- High demand for suburban and industrial development.
- Document the bay's state of health.
- Develop a management plan for freshwater delivery.
- Our first attempt to investigate estuarine health.



**Estero Bay
SW FL**

Faka-Union Bay

- 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.
- Critical Greater Everglades project for restoration.
- Previous BCB-funded project studied estuarine health; in need of 2nd year of data.

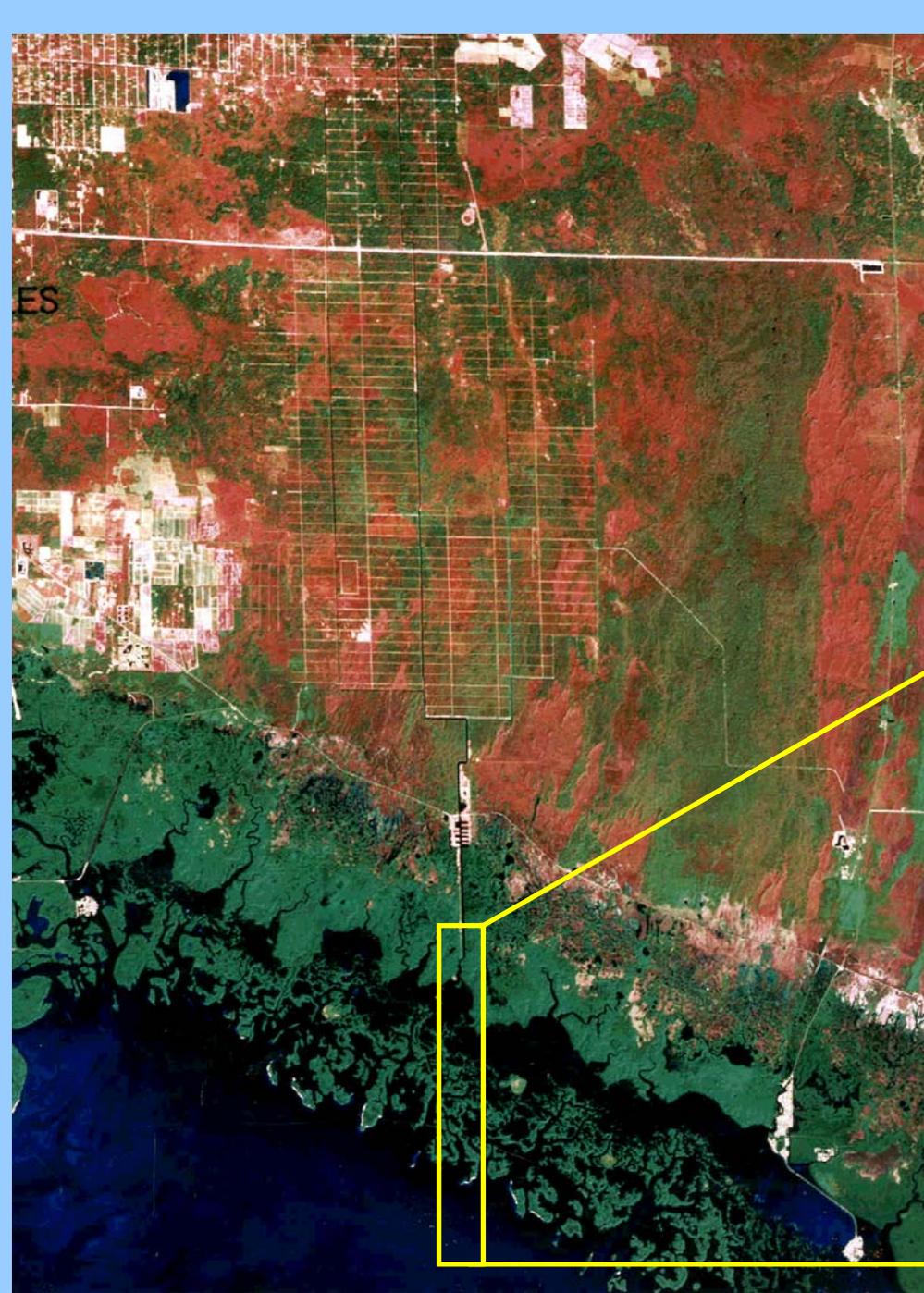


NOTE: For accurate purposes only. Refer to appropriate map descriptions and associated surveys for exact location of lines and features.
Revised by Florida DEP 04/04 10:00 AM '04

Southern Golden Gate Estates

- 813 miles of roads
- 138 miles of canals

All water flows out of one canal into Faka Union Bay



Oyster Physiology & Reef Ecology

- **Propose using oysters for monitoring conditions of estuarine health.**
- **Impacts of watershed management.**
- **Establish restoration target conditions.**
- **Monitor restoration effectiveness – performance measure.**

Why Oysters?

- **Oysters prolific within estuaries.**
- **Tolerate wide range of environmental conditions, yet physiology & distribution are maximal under limited conditions.**
- **Biologic & ecologic condition indicative of water quality, particularly salinity.**
- **Reefs support great deal of life – a “valued ecosystem component”.**







Estero River

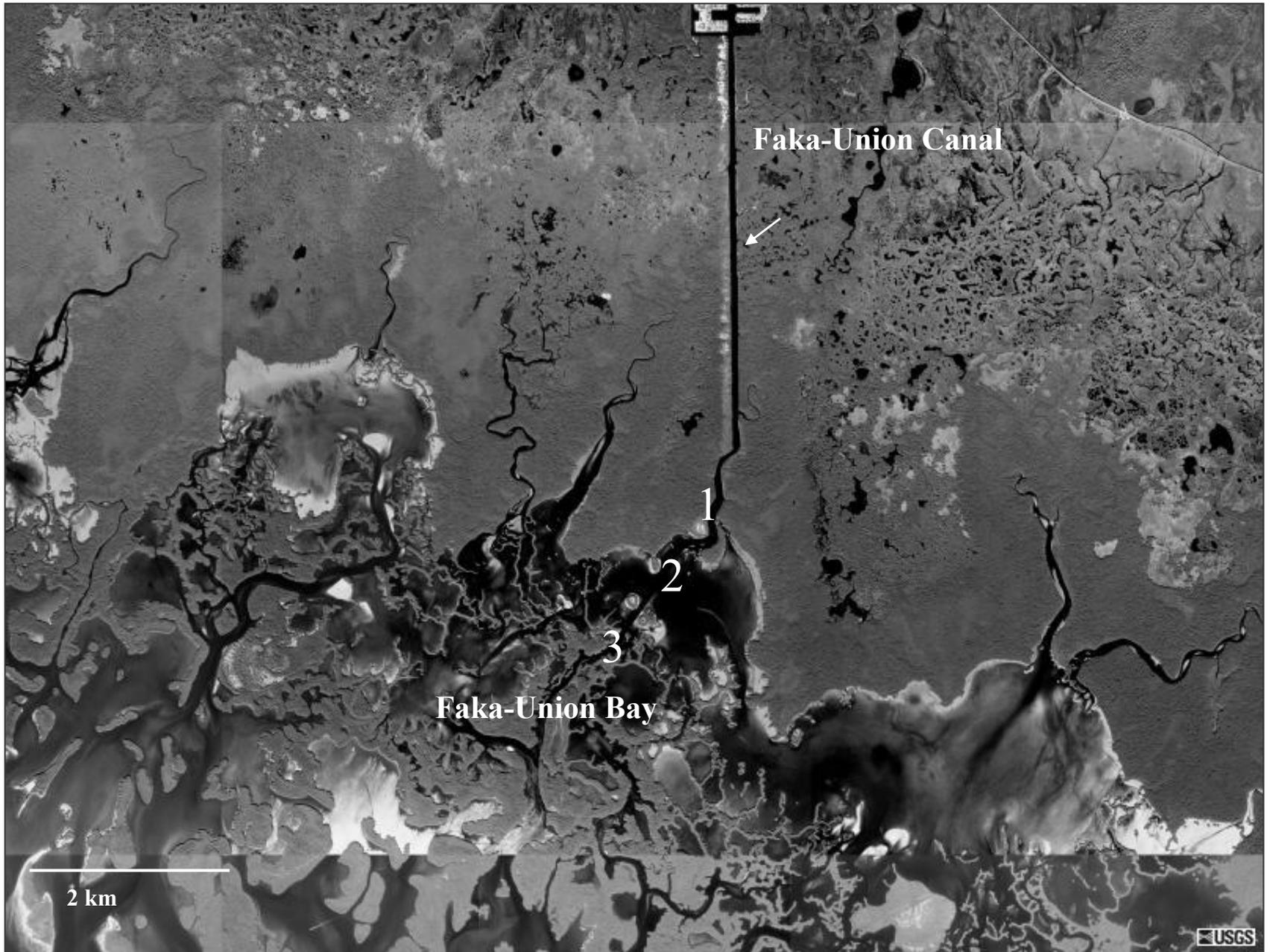
3
2
1

Estero Bay

Gulf of Mexico

2 km





Faka-Union Canal



1

2

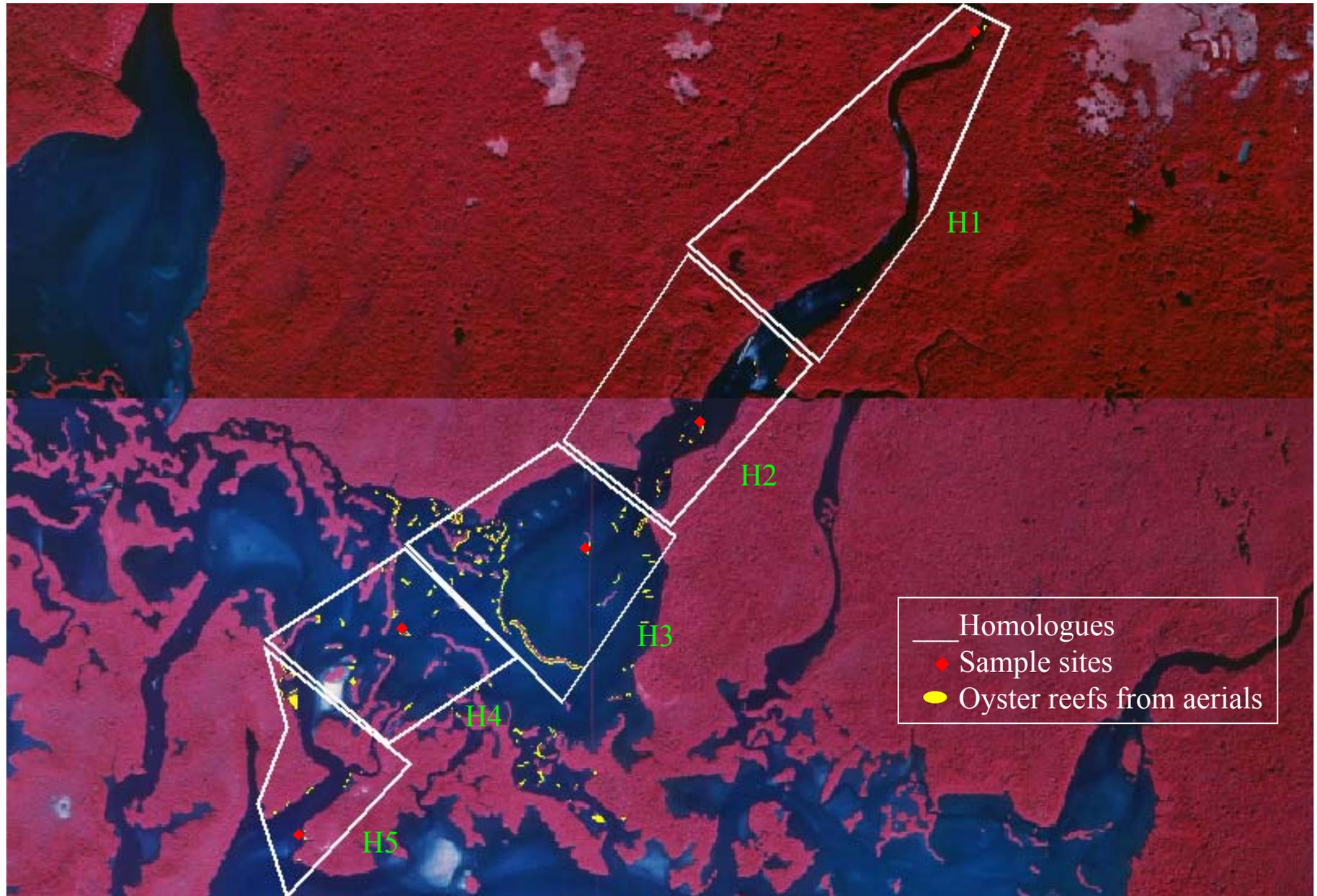
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Faka-Union Bay

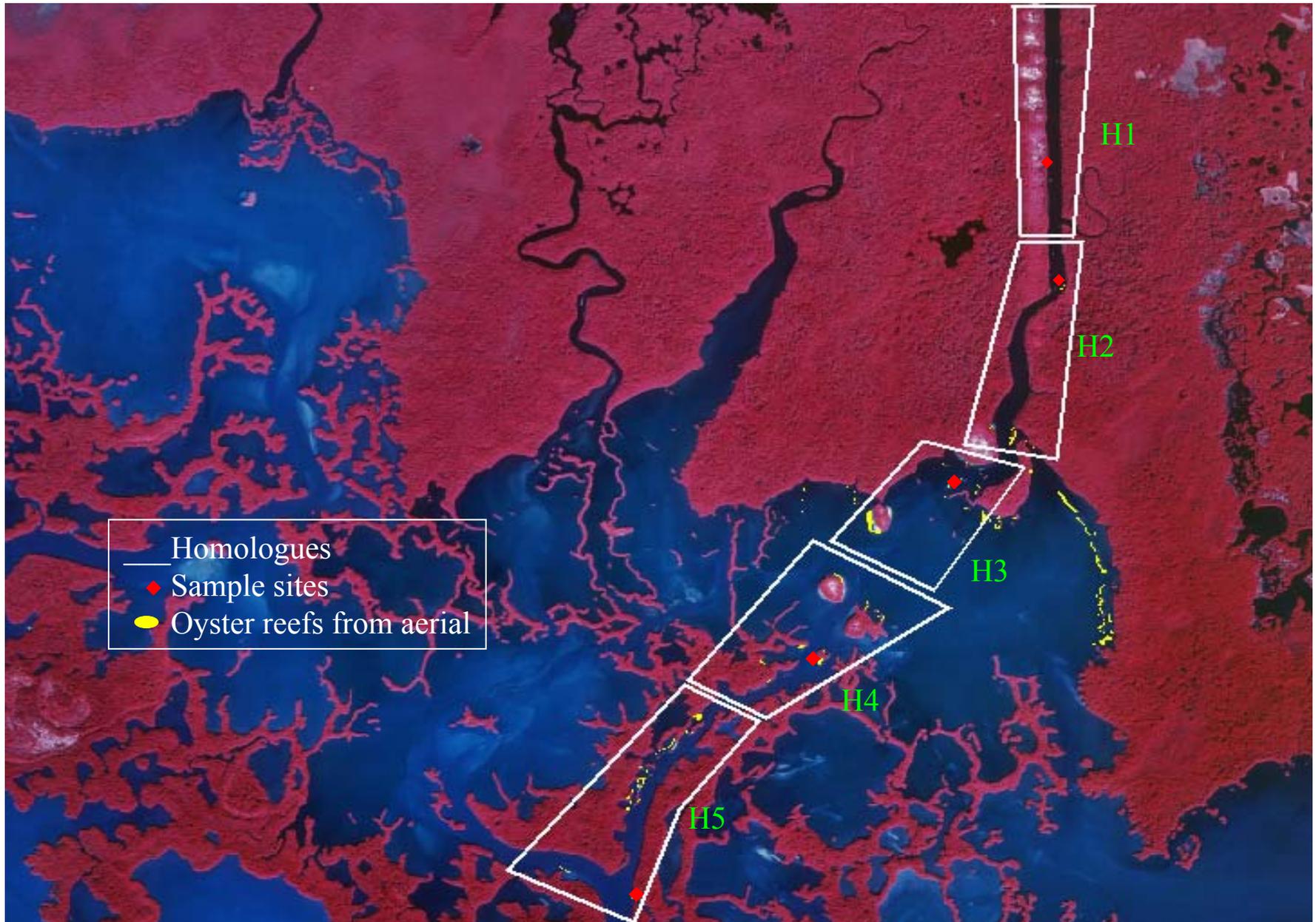
2 km



Reef Distribution in Blackwater

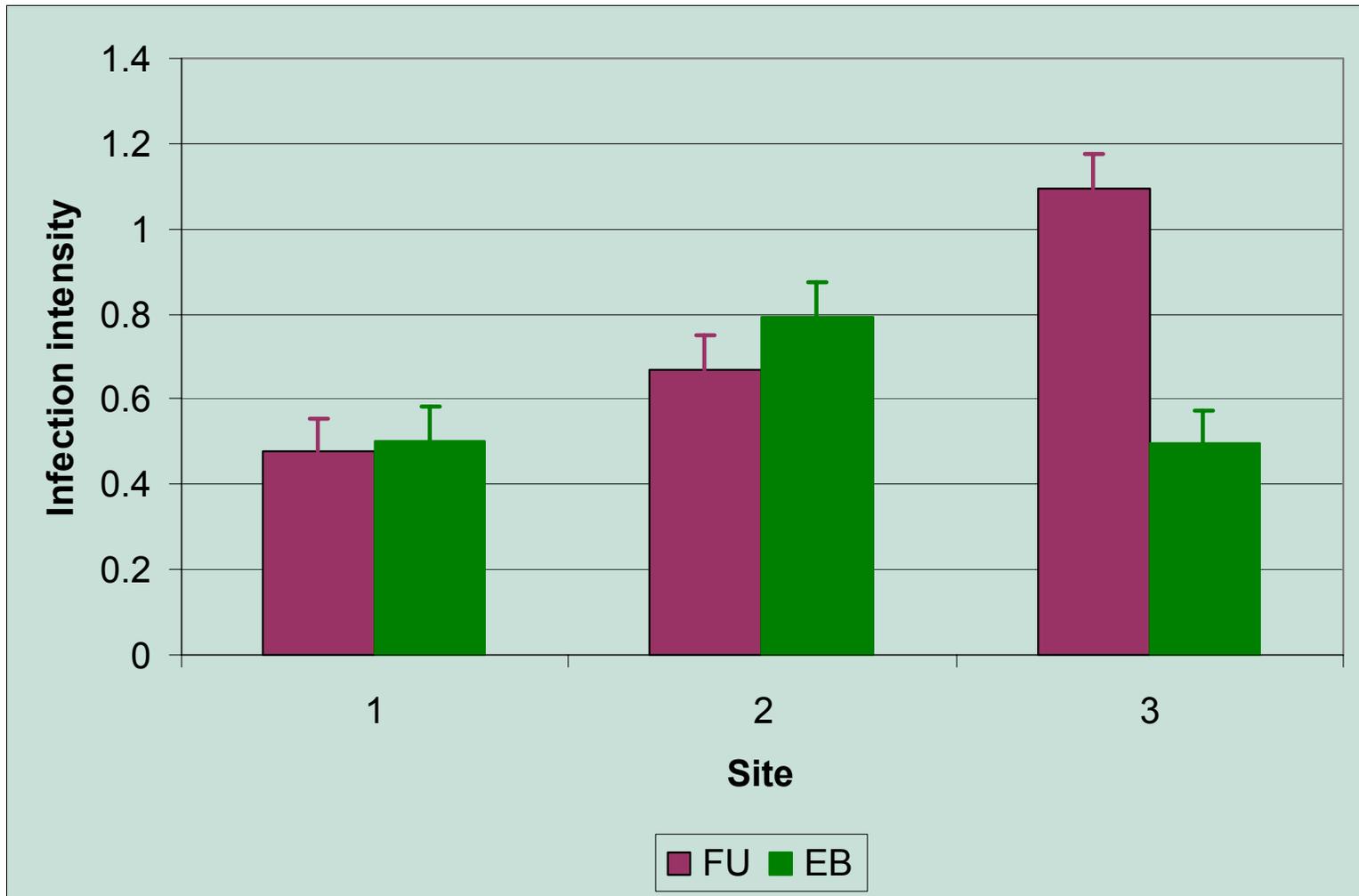


Reef Distribution in Faka-Union

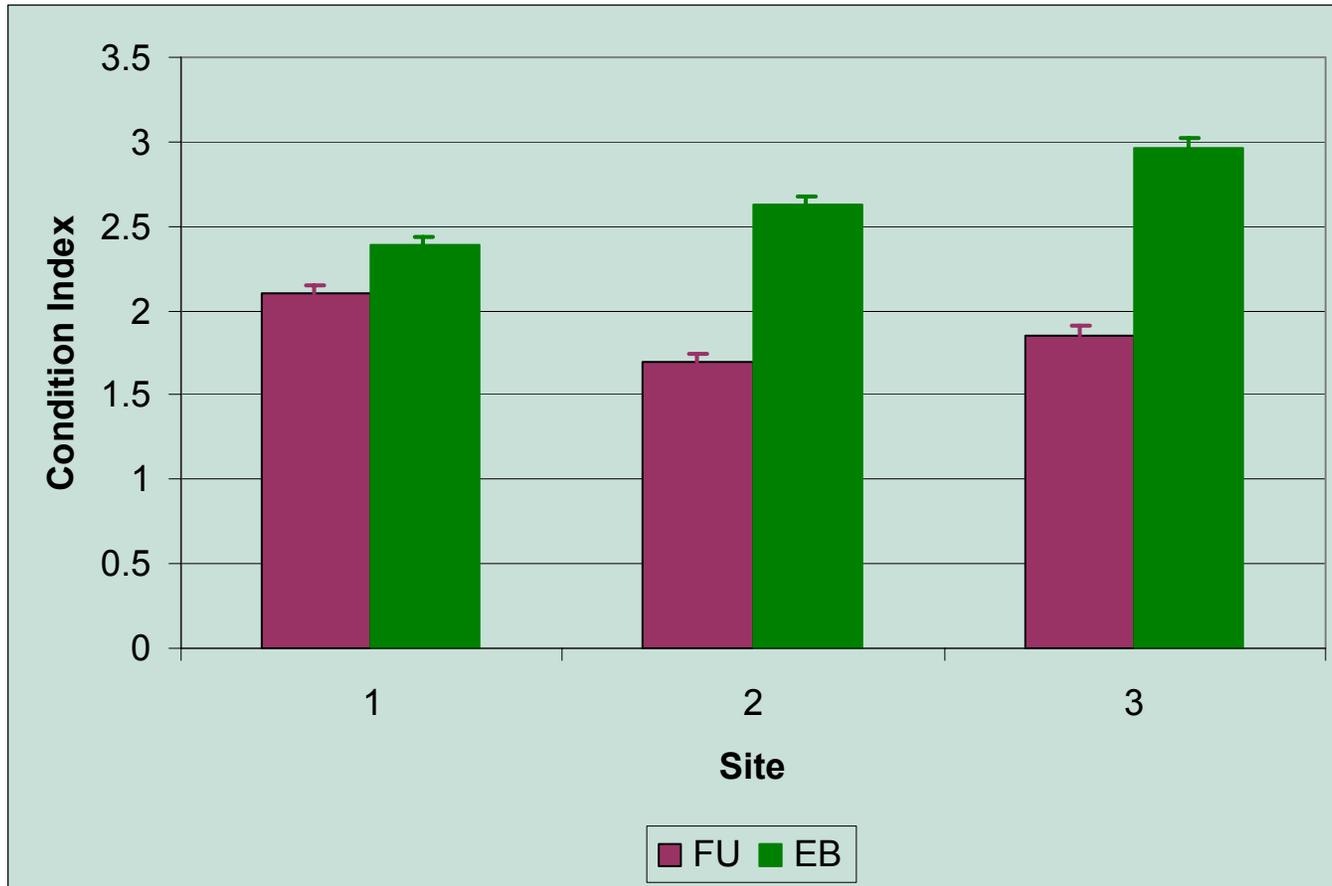


Aspects of Oyster Physiology & Reef Ecology

- Used many measures for other studies.
- Focused here upon:
 - Oyster condition index.
 - Oyster disease susceptibility (*Perkinsus*).
 - Oyster living density.
 - Crustacean and fish use of reefs.

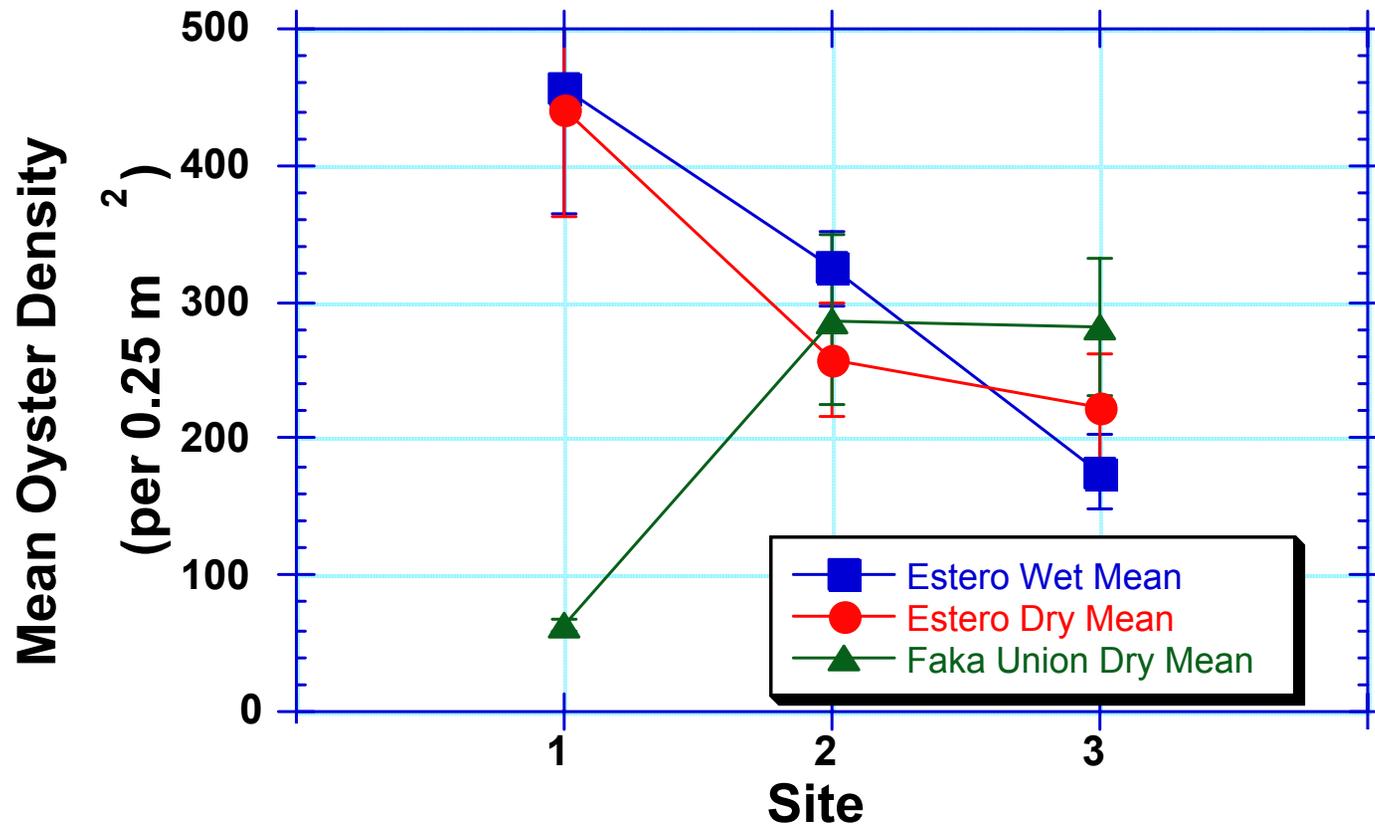


- Infections lessened by freshwater.
- Doesn't offset other ill-effects.



- Oysters in better health in Estero.
- Too much freshwater reduces condition.

Oyster Density



- Density patterns normal for Estero. No wet/dry season differences.
- Upstream site at Faka Union ill-effected by freshwater.





Southwest Resumes

Sterilite

FILE #

Table 9. Decapod crustaceans and fishes collected on oyster reefs using lift nets. Size represents mean carapace width or length (as appropriate) for decapods and standard length for fishes (standard deviations are in parentheses).

Species	Common Name	Number collected	Size (mm)	Percent occurrence	Relative occurrence
ESTERO					
Decapods					
<i>Alpheus heterochaelis</i>	bigclaw snapping shrimp	49	18.5 (4.8)	40.8	common
<i>Eurypanopeus depressus</i>	flatback mud crab	2,525	9.5 (4.2)	100.0	abundant
<i>Menippe mercenaria</i>	Florida stone crab	11	18.3 (9.2)	12.2	uncommon
<i>Palaemonetes</i>	grass shrimp	6	11.1 (0.9)	4.1	rare
<i>Panopeus simpsoni</i>	oystershell mud crab	272	13.6 (9.2)	79.6	abundant
<i>Petrolisthes armatus</i>	green porcelain crab	3,595	5.3 (2.1)	69.4	abundant
Fishes					
<i>Archosargus probatocephalus</i>	sheepshead	4	54.2 (11.4)	4.1	rare
<i>Chasmodes saburrae</i>	Florida blenny	2	34.0 (4.2)	4.1	rare
<i>Cyprinodon variegatus</i>	sheepshead minnow	4	32.2 (2.1)	2.0	rare
<i>Eucinostomus</i>	mojarra	22	14.8 (1.6)	6.1	uncommon
<i>Gobiesox strumosus</i>	skilletfish	14	24.4 (5.5)	26.5	common
<i>Gobiosoma robustum</i>	code goby	7	20.1 (2.5)	10.2	uncommon
<i>Lagodon rhomboides</i>	pinfish	9	51.8 (11.0)	12.2	uncommon
<i>Lophogobius cyprinoides</i>	crested goby	112	35.4 (9.7)	34.7	common
<i>Lupinoblennius nicholsi</i>	highfin blenny	1	45.6 (0)	2.0	rare
<i>Lutjanus griseus</i>	gray snapper	5	59.9 (15.0)	6.1	uncommon
<i>Lutjanus synagris</i>	lane snapper	3	29.8 (16.6)	4.1	rare
<i>Opsanus beta</i>	Gulf toadfish	27	43.3 (20.8)	20.4	common





Table 12. Correlation coefficients for comparisons among oyster community metrics and environmental parameters in the Estero. Numbers accompanied by an asterisk represent significant relationships (n = 49 unless otherwise noted).

	Abundance	Biomass	Dependents (%)	Diversity	Dominance	Petro:Eury	Richness	Salinity
Biomass	0.43*							
Dependents (%)	-0.33*	0.05						
Diversity	-0.30*	0.14	0.62*					
Dominance	-0.03	-0.17	-0.40*	-0.70*				
Petro:Eury	0.76*	0.57*	-0.26	-0.28	0.03			
Richness	0.11	0.35*	0.28	0.63*	-0.29*	0.00		
Salinity*	-0.04	0.36	0.49*	0.38*	-0.52*	0.12	0.30	
Temperature**	0.37	-0.36	-0.30	-0.18	-0.07	0.14	-0.04	-0.27

* n = 18

** n = 16

- Higher salinity leads to greater diversity & greater number of reef-dependent species.
- These patterns most pronounced in Estero. Faka Union has lower diversity and reef-dependent percentages.

Conclusions & Recommendations

- **For Estero Bay:**
 - Best conditions in middle of bay and near river mouth.
 - Locations with greatest accommodation space.
 - Estero in good shape. Presently receiving a good mix of marine and freshwater.
- **For Faka Union Bay:**
 - Best conditions further downstream near coastal margin.
 - Locations with minimal accommodation space.
 - Freshets are detrimental.
 - Restoration alternative 3D is favored.