Honoring the Science and Legacy of Joan Browder Part 1

JOAN BROWDER ON SHRIMP, WATER AND MARSH-ESTUARINE MANAGEMENT, SOUTHERN LOUISIANA COASTAL MARSHES

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Browder, J.A. and Moore, D., 1981. A new approach to determining the quantitative relationship between fishery production and the flow of fresh water to estuaries. In *Proceedings of the national symposium on freshwater inflow to estuaries* (Vol. 1, pp. 403-430). US Fish and Wildlife Service Washington, DC.

- GULF OF MEXICO (SOUTH TEXAS TO SOUTH FLORIDA)
- SUGGESTED AN APPROACH TO STUDYING THE ROLE OF FRESHWATER IN ESTUARIES
- PRODUCED A MODEL ON THE EFFECTS OF RIVER INFLOW ON THE PRODUCTION OF FISHERIES STOCK
- THE LOWER THE SALINITY THE SMALLER THE SHRIMP

Browder, J.A., 1983. A simulation model of a near-shore marine ecosystem of the north-central Gulf of Mexico. In *Marine Ecosystem Modeling: Proceedings from a Workshop Held April 6-8, 1982, Frederick, Md* (Vol. 55, p. 179). National Oceanic and Atmospheric Administration, National Environmental Satellite, Data, and Information Service

Purpose is trying to find the best method to increase harvest and eliminate bycatch

Studies needed on shrimp and bottom fish populations

Found shrimp predation by bottom fish was not as important as shrimp lost by sorting bycatch.

Browder, J.A., Bartley, H.A. and Davis, K.S., 1985. A probabilistic model of the relationship between marshland-water interface and marsh disintegration. *Ecological Modelling*, *29*(1-4), pp.245-260.

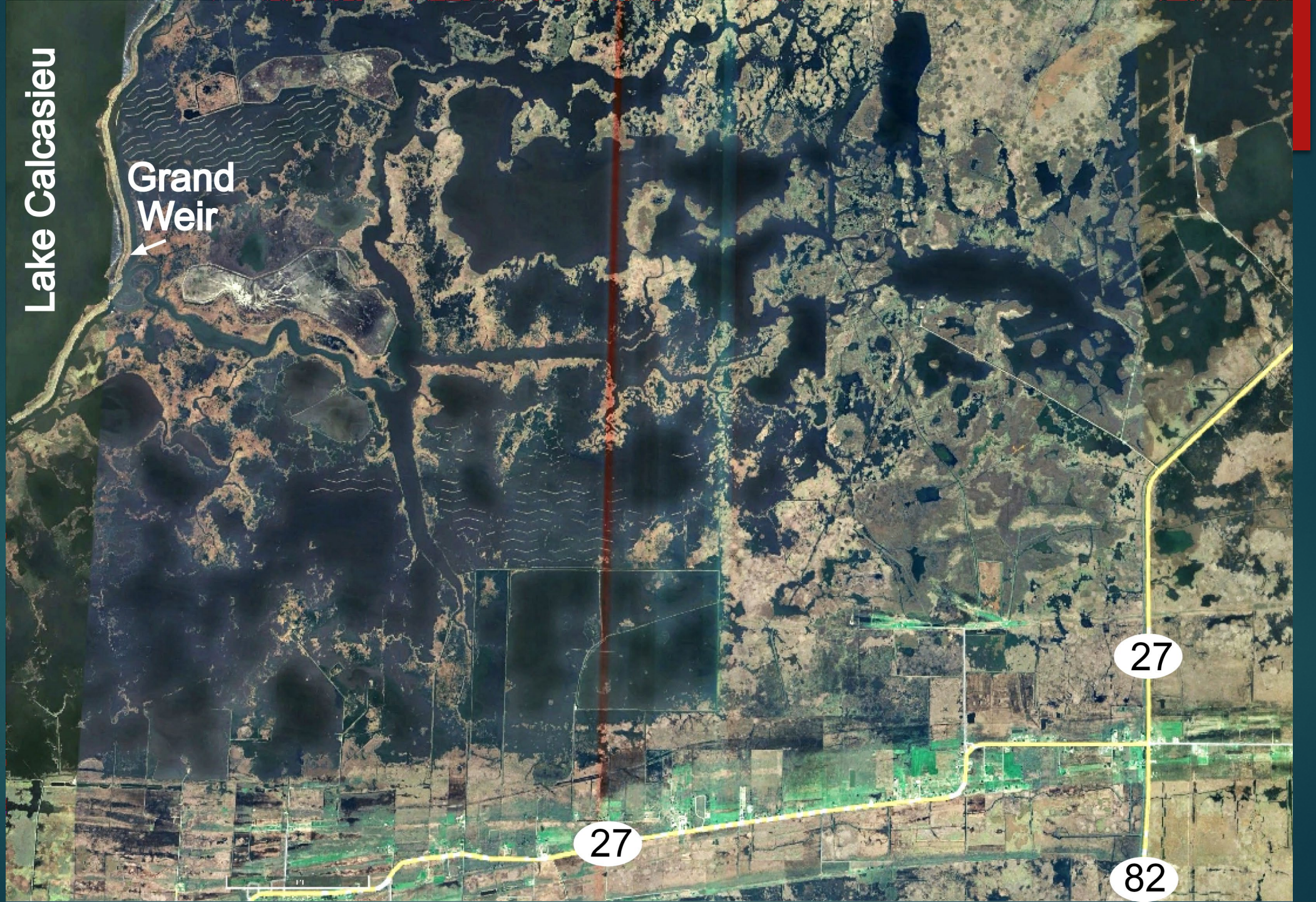
Calcasieu Lake, SW Louisiana

Fishery production may be stimulated by the early stages of marsh disintegration but negatively impacted by later stages.

Shrimp production increases with marsh deterioration and increased edge

Once > 50 % of the marsh is converted to open water the trend reverses

Intracoastal


Lake Calcasieu
Grand
Weir
27
27
82

Browder, J.A., May Jr, L.N., Rosenthal, A., Gosselink, J.G. and Baumann, R.H., 1989. Modeling future trends in wetland loss and brown shrimp production in Louisiana using thematic mapper imagery. *Remote sensing of environment*, *28*, pp.45-59.

Barataria, Terrebonne, and Timbalier basins

The land-water interface of coastal marshes may influence the production of estuarine-dependent fisheries more than the area of these marshes.

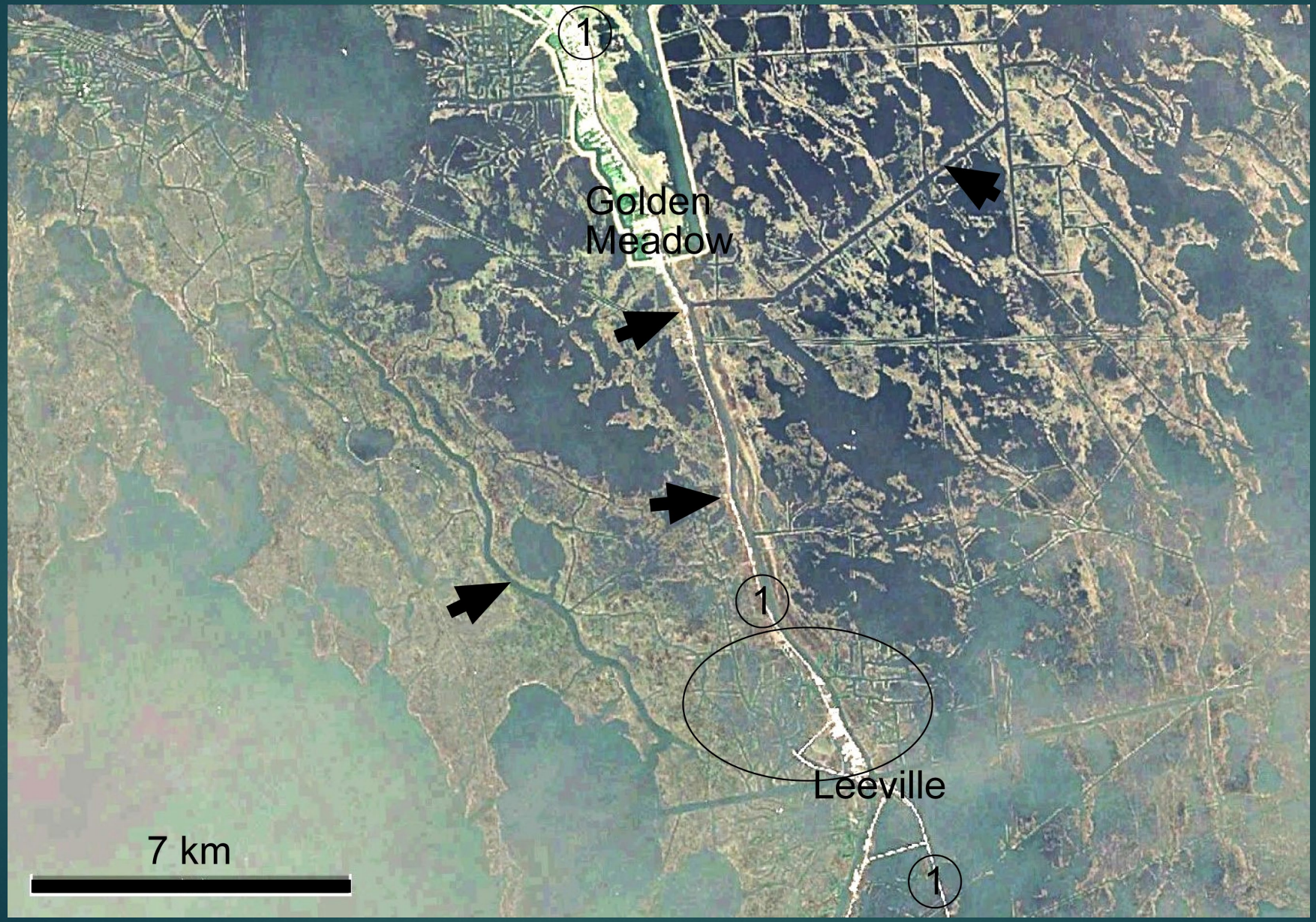
parabolic relationship between land-water interface (edge) and marsh disintegration.

Statistical linear relationship between edge and shrimp catch

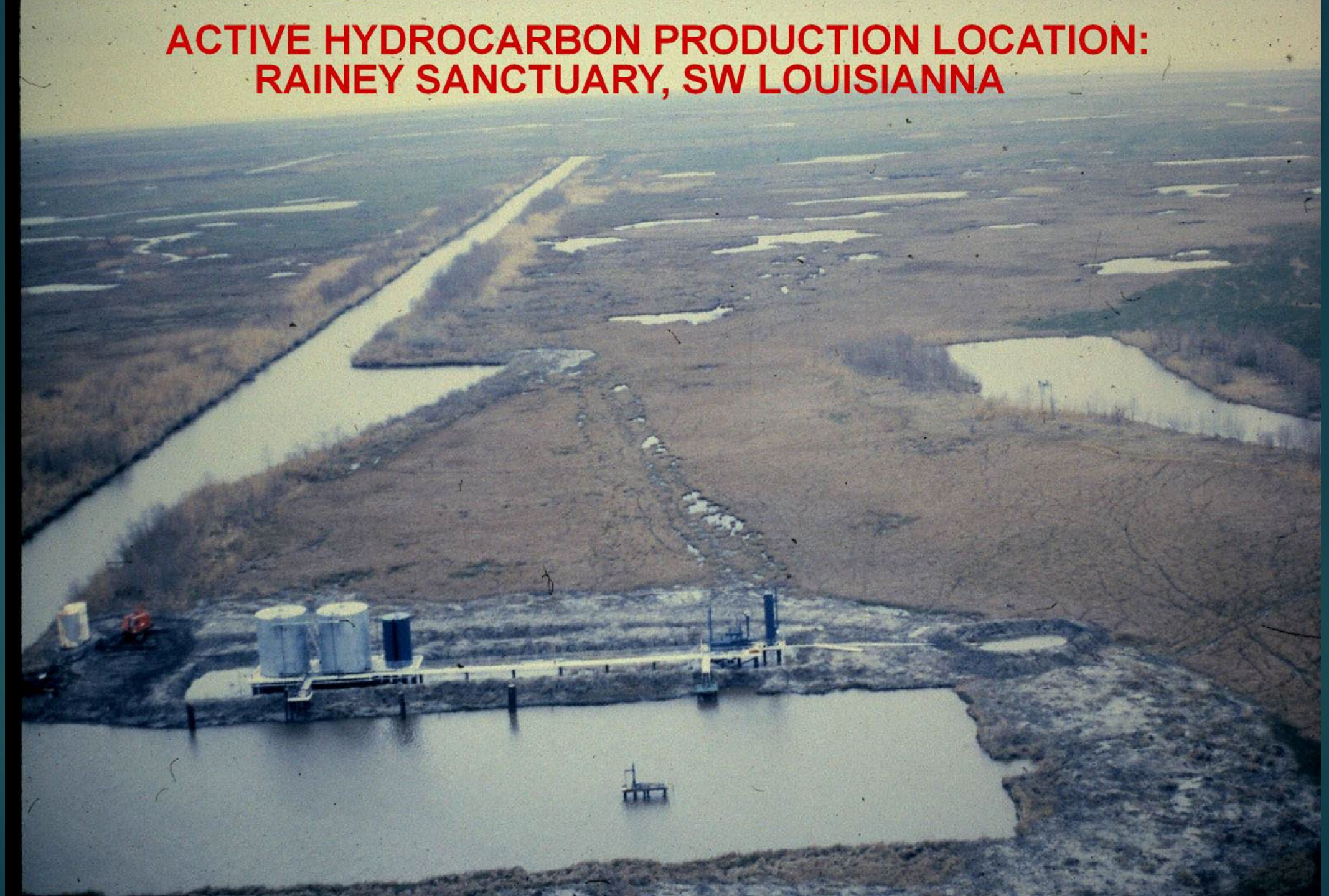
Predict shrimp decline will begin in 1995


Lake Pontchartrain
10
10
New Orleans
90
23
90
Houma
1
1
1
x
x
x
Barataria Bay
Venus
Timbalier Bay
Terrabonne Bay
Gulf of Mexico

Deteriorating marsh

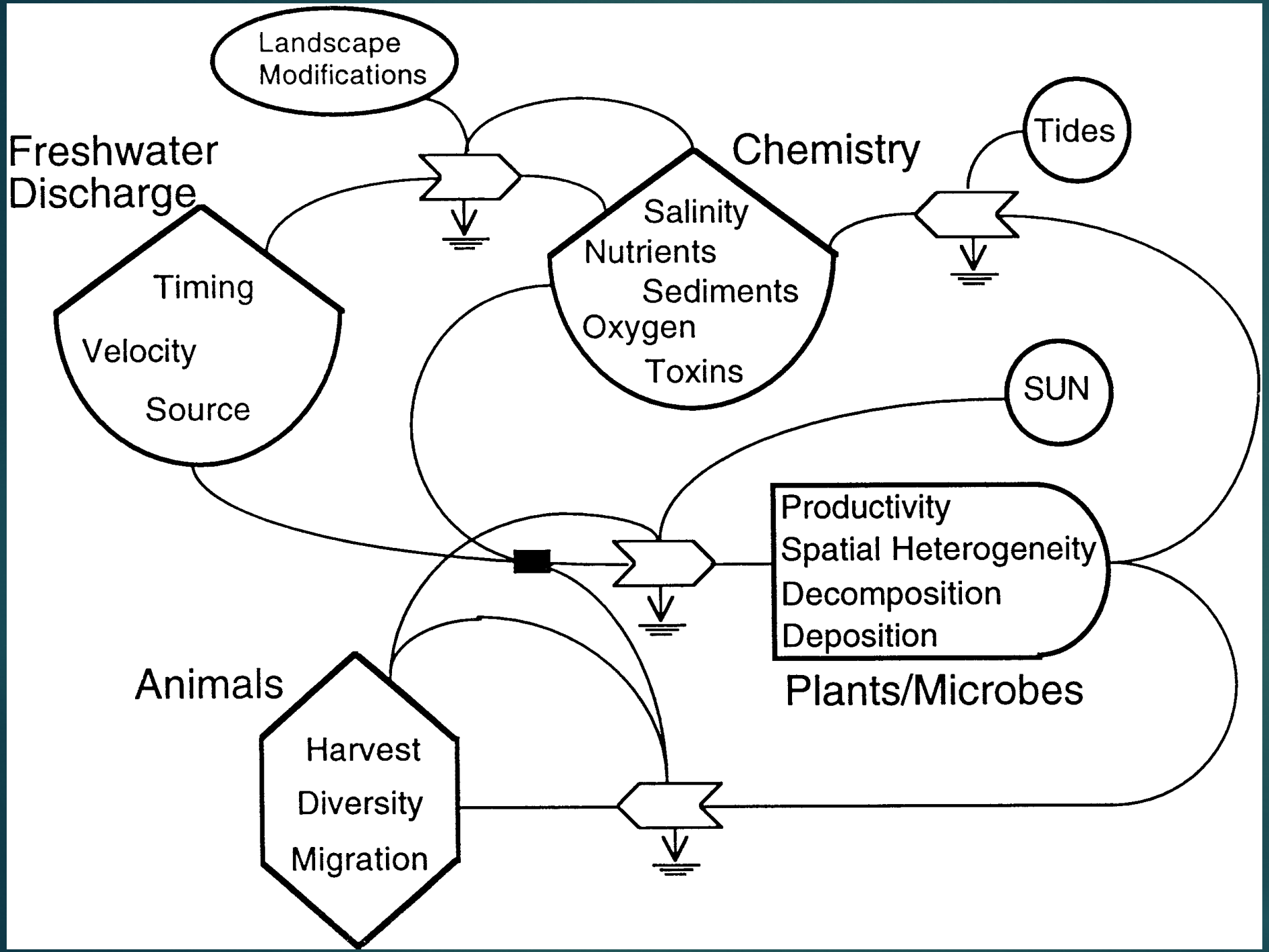


ACTIVE HYDROCARBON PRODUCTION LOCATION: RAINEY SANCTUARY, SW LOUISIANNA



Sklar, F.H. and Browder, J.A., 1998. Coastal environmental impacts brought about by alterations to freshwater flow in the Gulf of Mexico. *Environmental management*, *22*, pp.547-562.

- A conceptual model of the direct and feedback influences associated with the source, timing, renewal rate, and velocity of freshwater discharge to coastal lagoons, wetlands, and bays, based upon Gulf of Mexico. Landscape alteration, impacting the timing and volume of freshwater inflow, was found to be the most common stress on estuarine systems.
- Common biogeochemical impacts include excessive stratification, eutrophication, sediment deprivation, hypoxia, and contamination. Common biological impacts include reduction in livable habitats, promotion of "exotic" species, and decreased diversity.
- assume that optimum estuarine productivity and diversity is found somewhere between the stress associated with altered freshwater flow and the subsidy associated with natural flow.
- landscape simulation model demonstrates how cumulative impacts and ecosystem processes can be predicted as a function of changes in freshwater, sediment, and nutrient inflows.



Model of freshwater delivery to estuaries

JOAN'S LOUISIANA CONTRIBUTIONS

1.Documented relationship between marsh deterioration and changing shrimp production

2.Documented relationship between shrimp and freshwater delivery

3.Produced useable models relating shrimp production with marsh condition and freshwater delivery

4. Influenced two generations of research (ers)

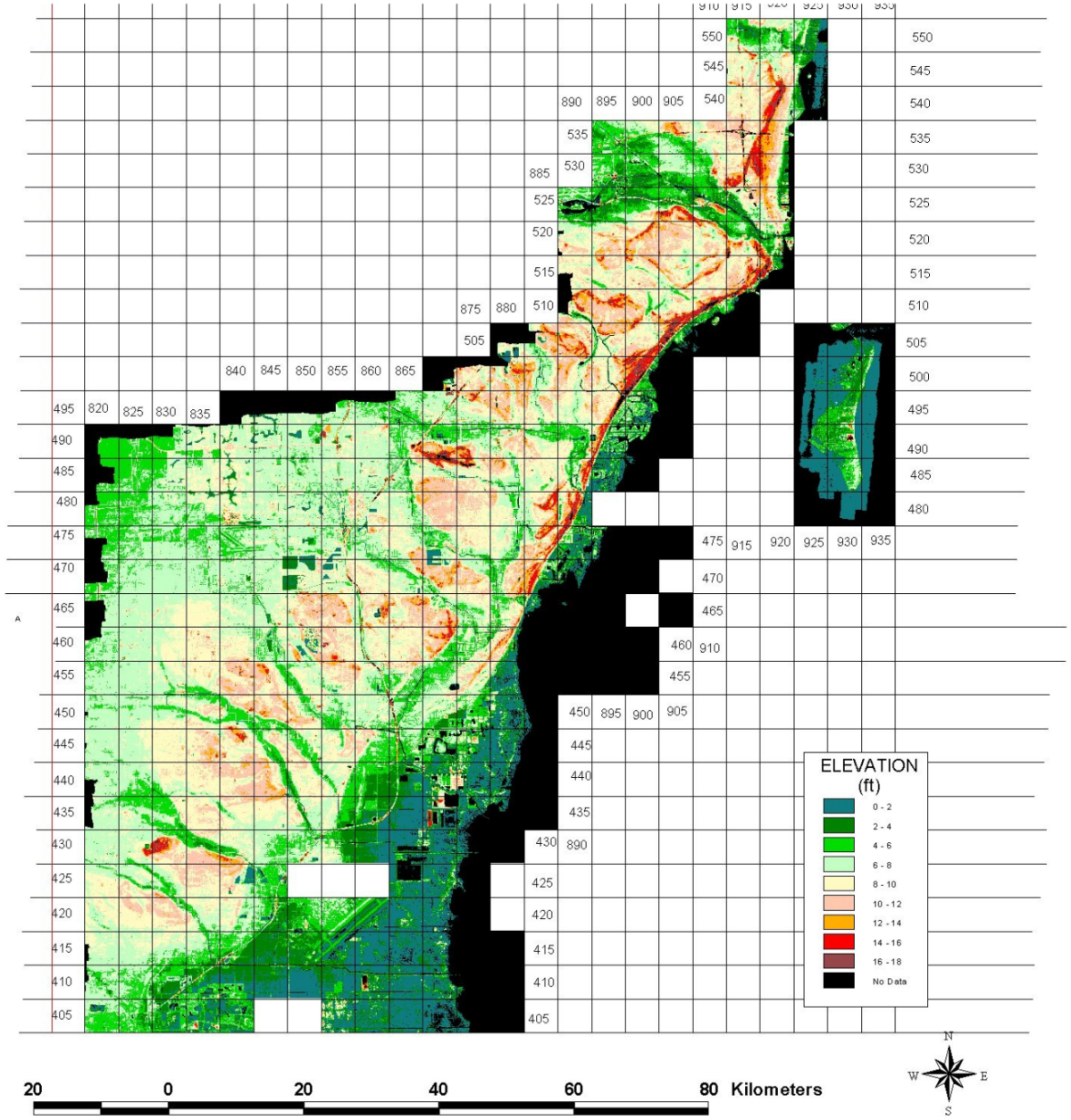
JOAN BROWDER LESSONS LEARNED IN LA ON RELATIONSHIP BETWEEN FRESHWATER DELIVERY AND SHRIMP DETERIORATING HABITAT AND SHRIMP

GEER: Biscayne Bay restoration:
Rehydrate coastal wetlands
Create estuarine conditions
Increase water quality

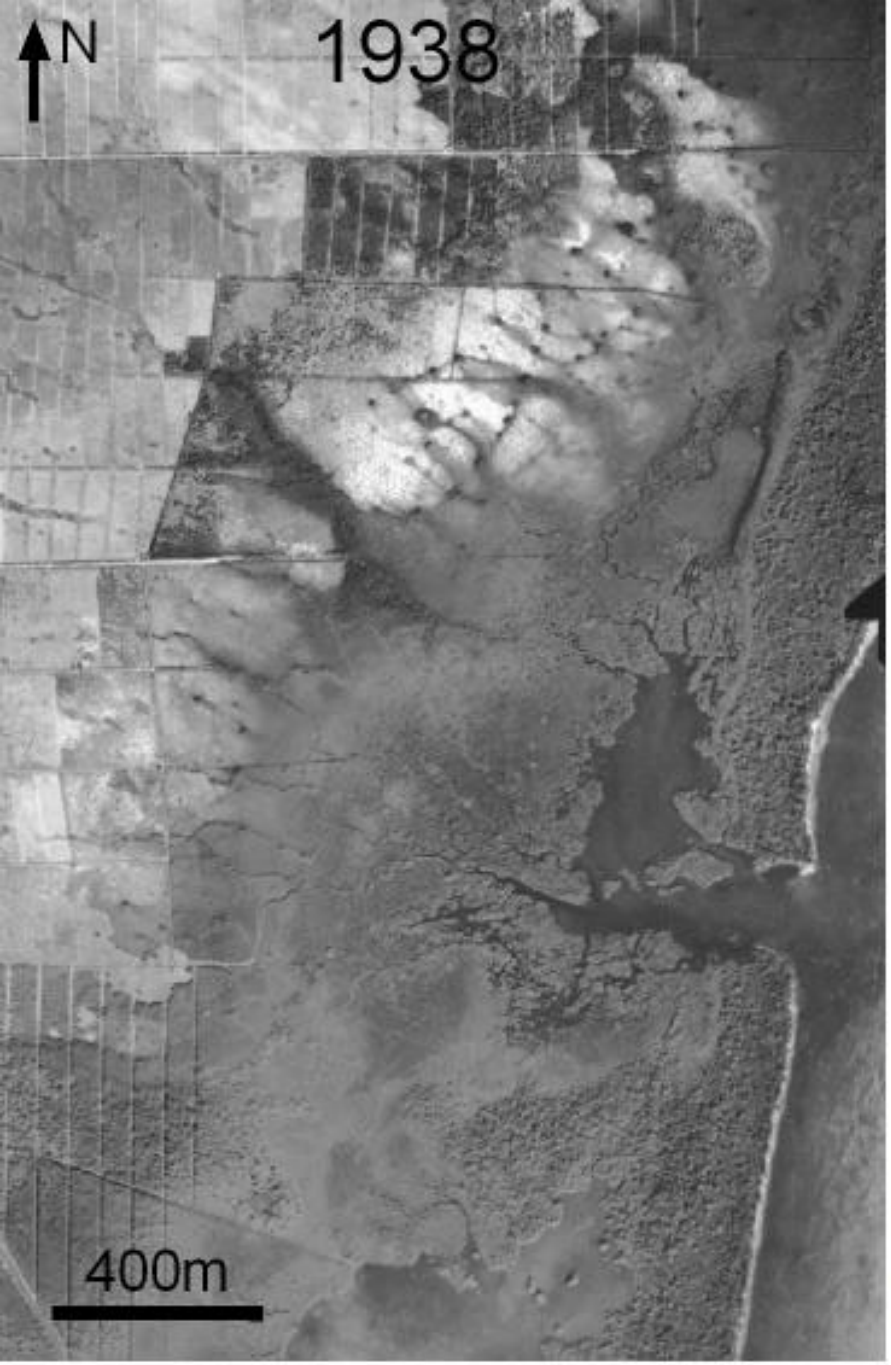
BBCRT

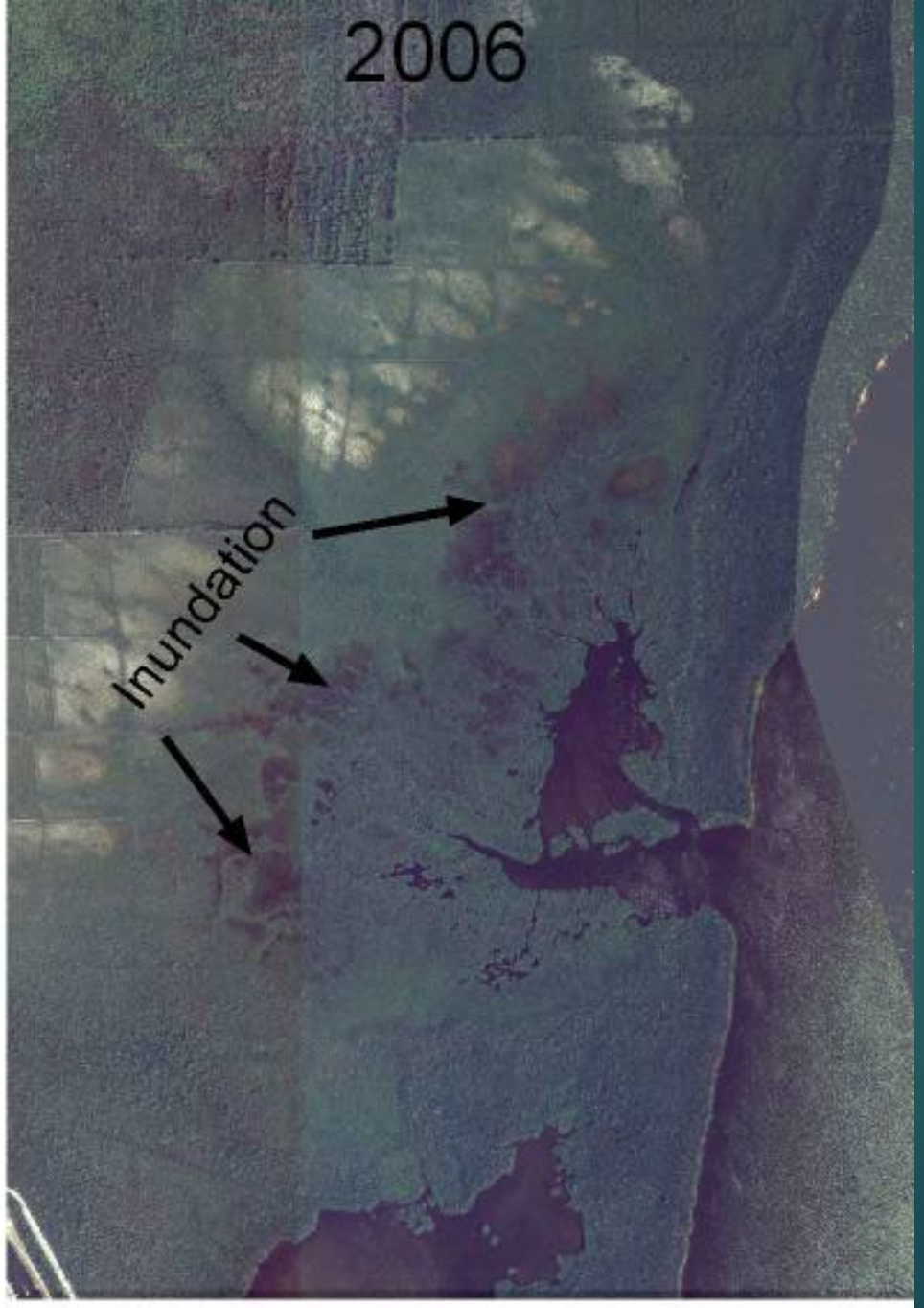
- From 1992 to 2024, and beyond
- Established performance measures and targets
  - Shrimp salinities
  - Oyster salinities

Miami Oolite Elevation



Freshwater sources to Biscayne Bay





North of Back Point

TOO LATE! TO SAVE FRESHWATER WETLANDS

BETWEEN 1992 AND 2025, 33 YEARS,

SEA LEVEL RISE PRODUCED SALTWATER ENCROACHMENT AND TOTAL PROPAGULE INGRESS

WILL PRODUCE THE LARGEST ESTUARINE ZONE IN THE RESTORATION PLAN.

BBCRT

Browder, J.A. and Robblee, M.B., 2009. Pink shrimp as an indicator for restoration of everglades ecosystems. *ecological indicators*, *9*(6), pp.S17-S28.

Joan will not be forgotten

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Map of Delta and Vermilion Parish

National Audubon Society's
J Paul Rainey Sanctuary

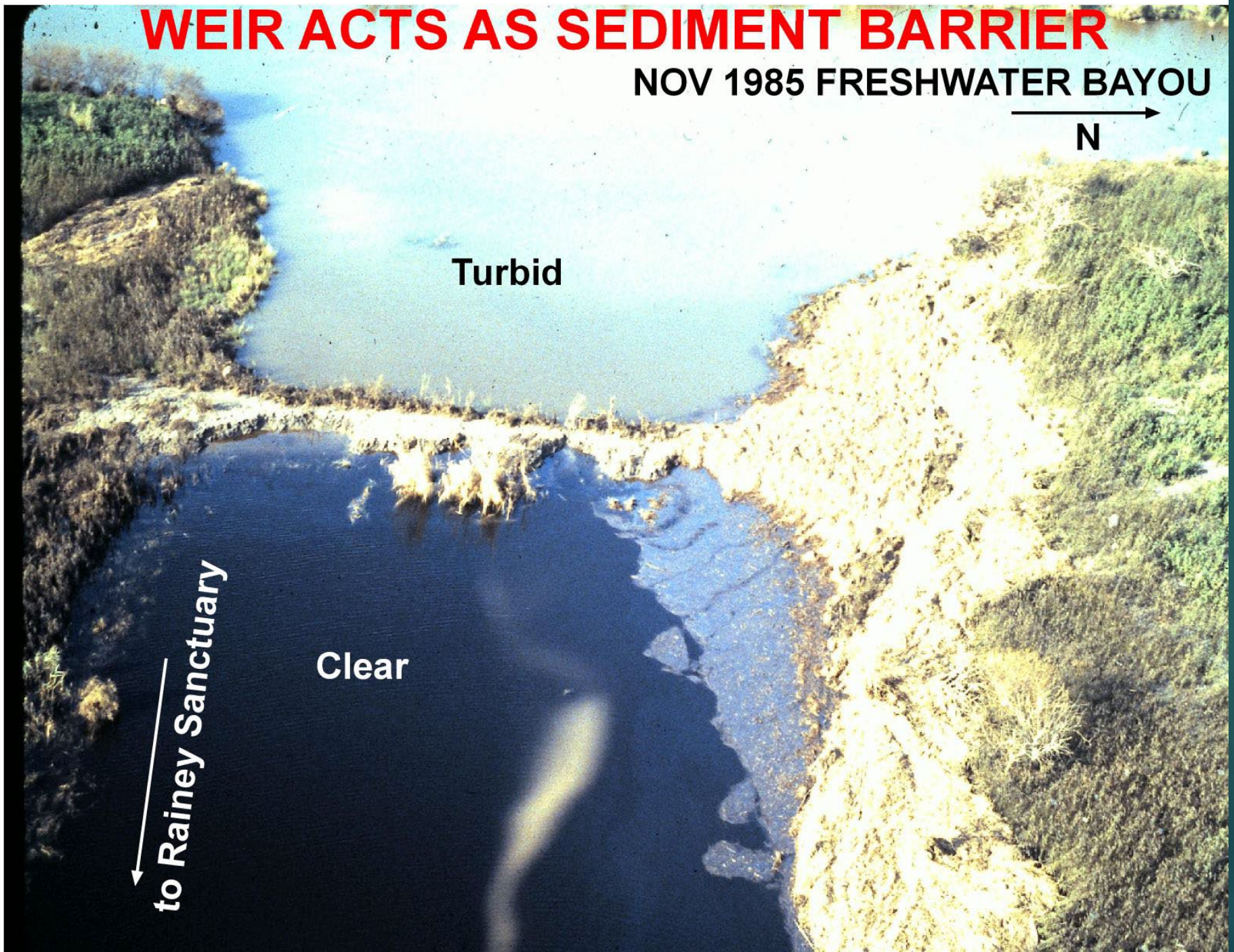
Water Management

Conserve freshwater

Hydrocarbon service canals cause over drainage and saltwater encroachment

70% reduction in shrimp and menhaden

WEIR ACTS AS SEDIMENT BARRIER




Freshwater Bayou
Vermillion Bay
McIlhenny Canal
Fixed Crest Weir
1,300m