DIEOFF DÉJÀ VU

THE LATE 1980'S SEAGRASS DIEOFF IN FLORIDA BAY LOOKED EERILY SIMILAR TO CURRENT EVENTS

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Penny Hall, Paul Carlson, Mike Durako, Marguerite Koch, Brad Furman and Jay Zieman

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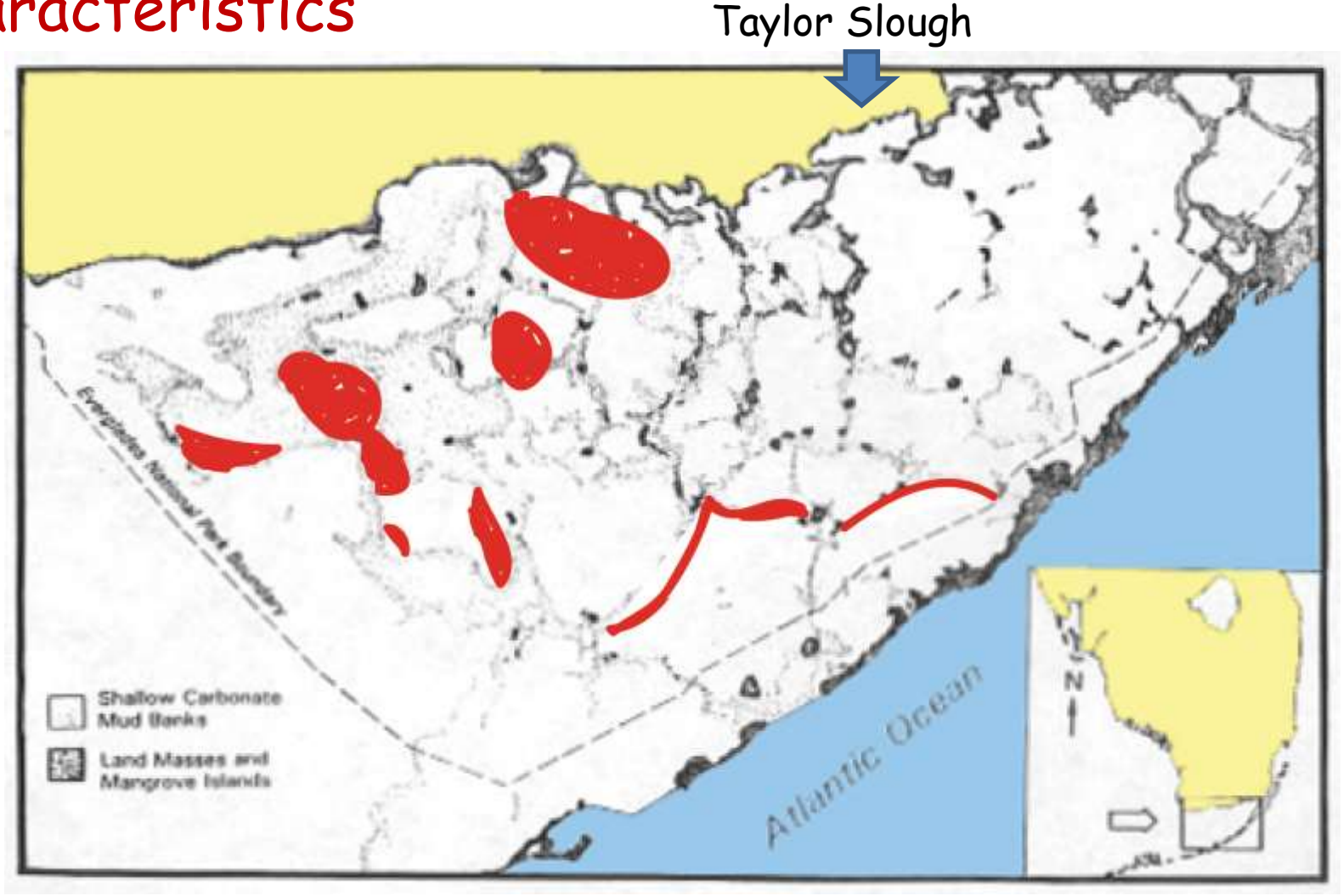
Mass mortality of the tropical seagrass *Thalassia testudinum* in Florida Bay (USA)

M. B. Robblee[1], T. R. Barber[2], P. R. Carlson, Jr[2], M. J. Durako[2], J. W. Fourqurean[3], L. K. Muehlstein[4], D. Porter[5], L. A. Yarbro[2], R. T. Zieman[3], J. C. Zieman[3]

In summer 1987 large seagrass dieoff patches were observed in areas of dense seagrass coverage

Characteristics

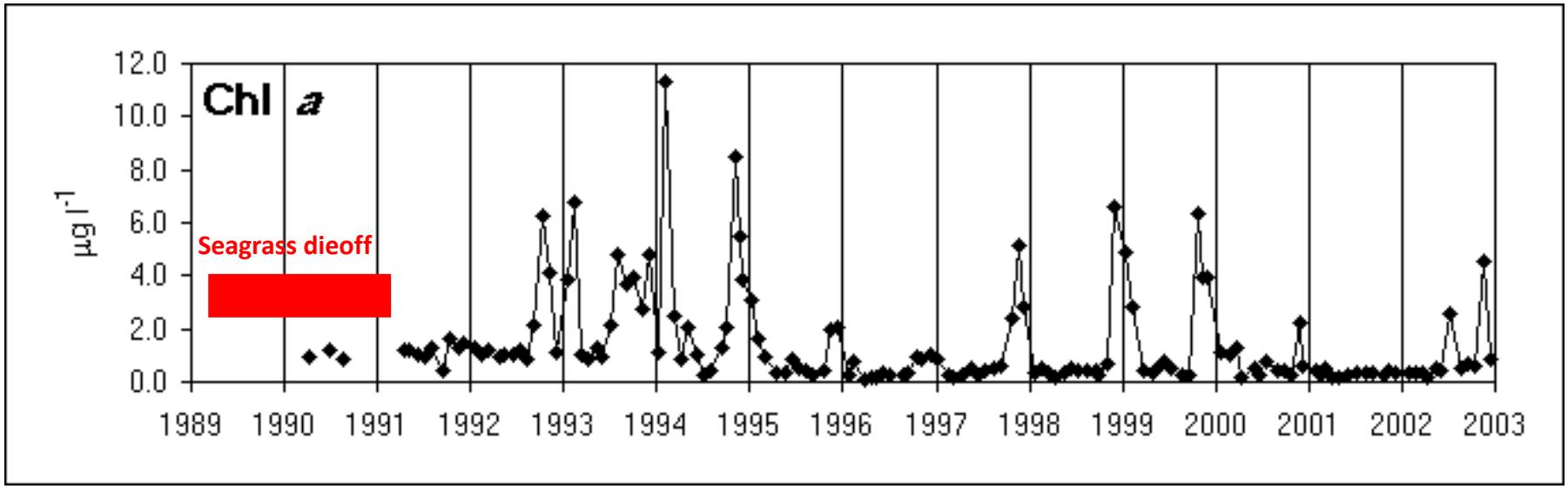


Modified from Robblee et al. 1991

Seagrass dieoff occurred mostly in western Florida Bay, distant from land-based sources of nutrients

Consequences

Twin Key Basin



Seagrass decomposition, sediment resuspension, and decreased seagrass nutrient uptake

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Increased water column nutrient availability

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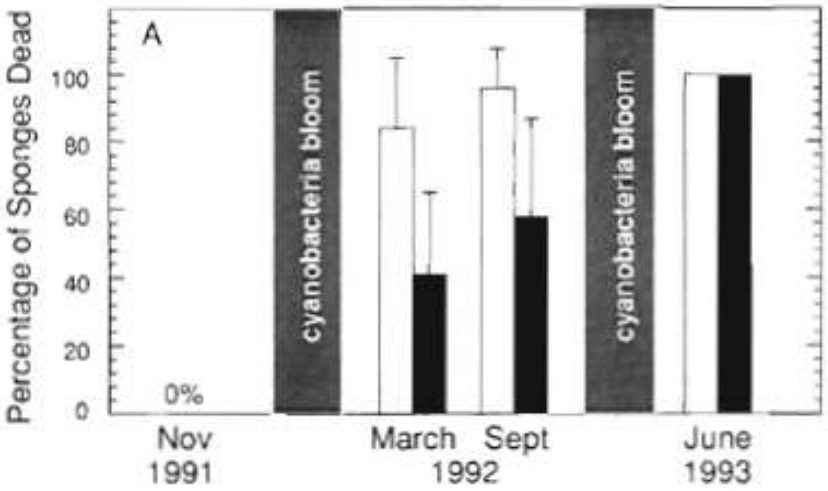
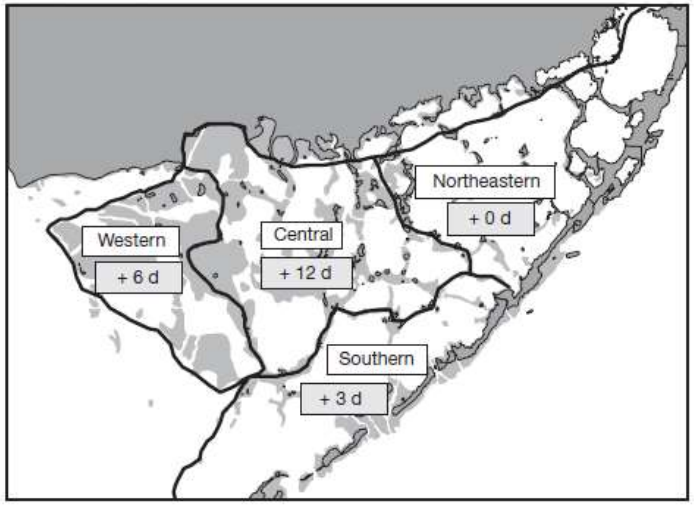
phytoplankton blooms

Consequences

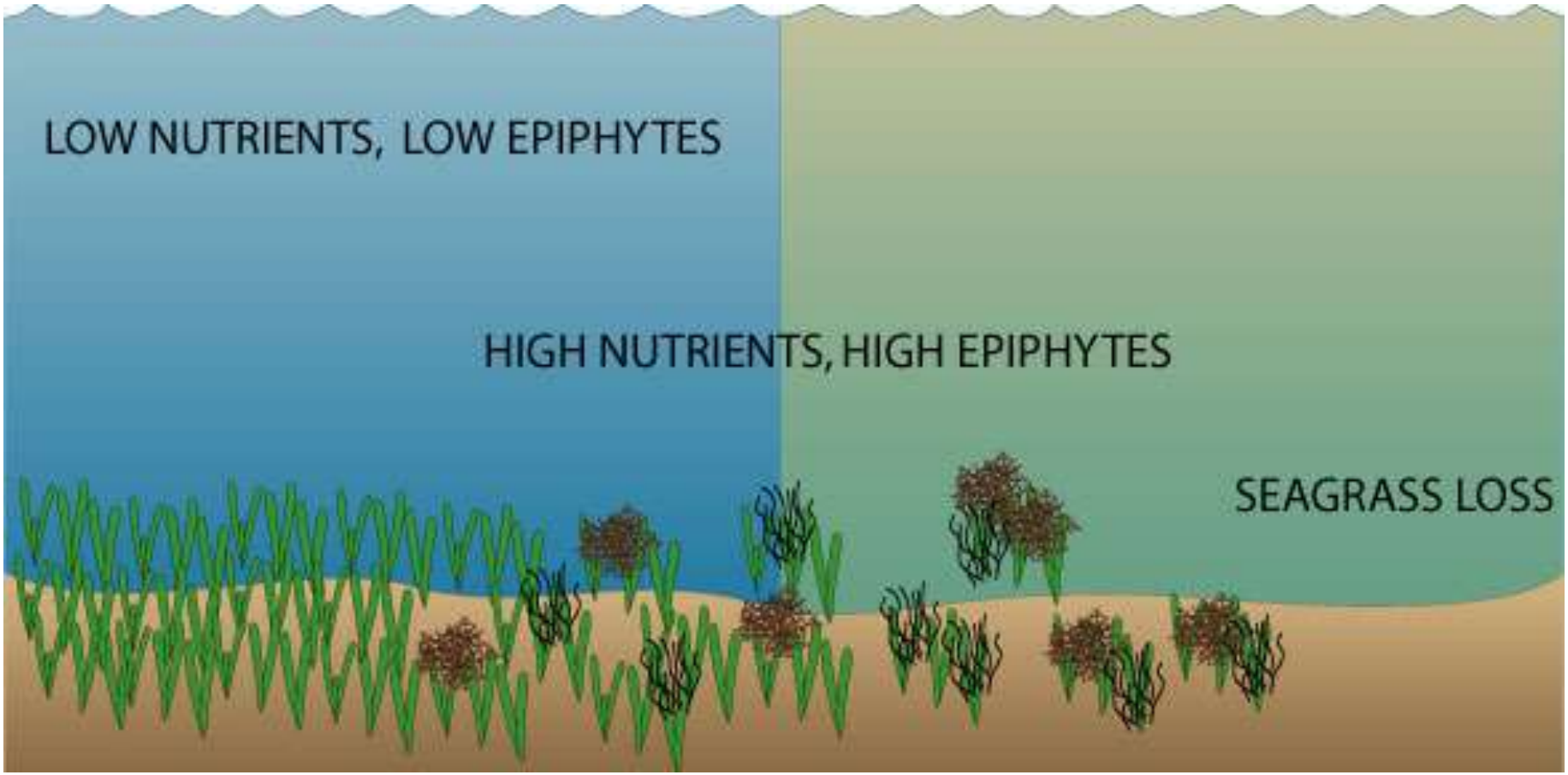
Butler et al 1995 MEPS



Peterson et al 2006 MEPS



Sponges were killed during algal blooms, Florida Bay trophic ecology was altered for decades



Coastal eutrophication is a common cause of seagrass loss

Florida Bay seagrass dieoff

Dieoff occurred in patches under clear water column

Seagrass "stubble"
Note surviving shoal grass (arrow)

Florida Bay seagrass dieoff is unique

Images from Zieman et al. 2004 and Brad Furman

Florida Bay Seagrass Dieoff Characteristics "Clues"

Occurred predominantly in central and western Florida Bay
Only in most dense seagrass meadows
Occurred in late summer and fall, bay waters warm
Only Turtle Grass
Clear water column – abundant light
No epiphyte or macroalgal abundance
Occurred during drought, hypersaline
Damage concentrated at seagrass meristem
Disease organism present (*Labyrinthula*)

No historical record of such an event happening on this scale before

Prime suspects

Hypersalinity

Temperature

Sulfide stress (Paul Carlson, Marguerite Koch)

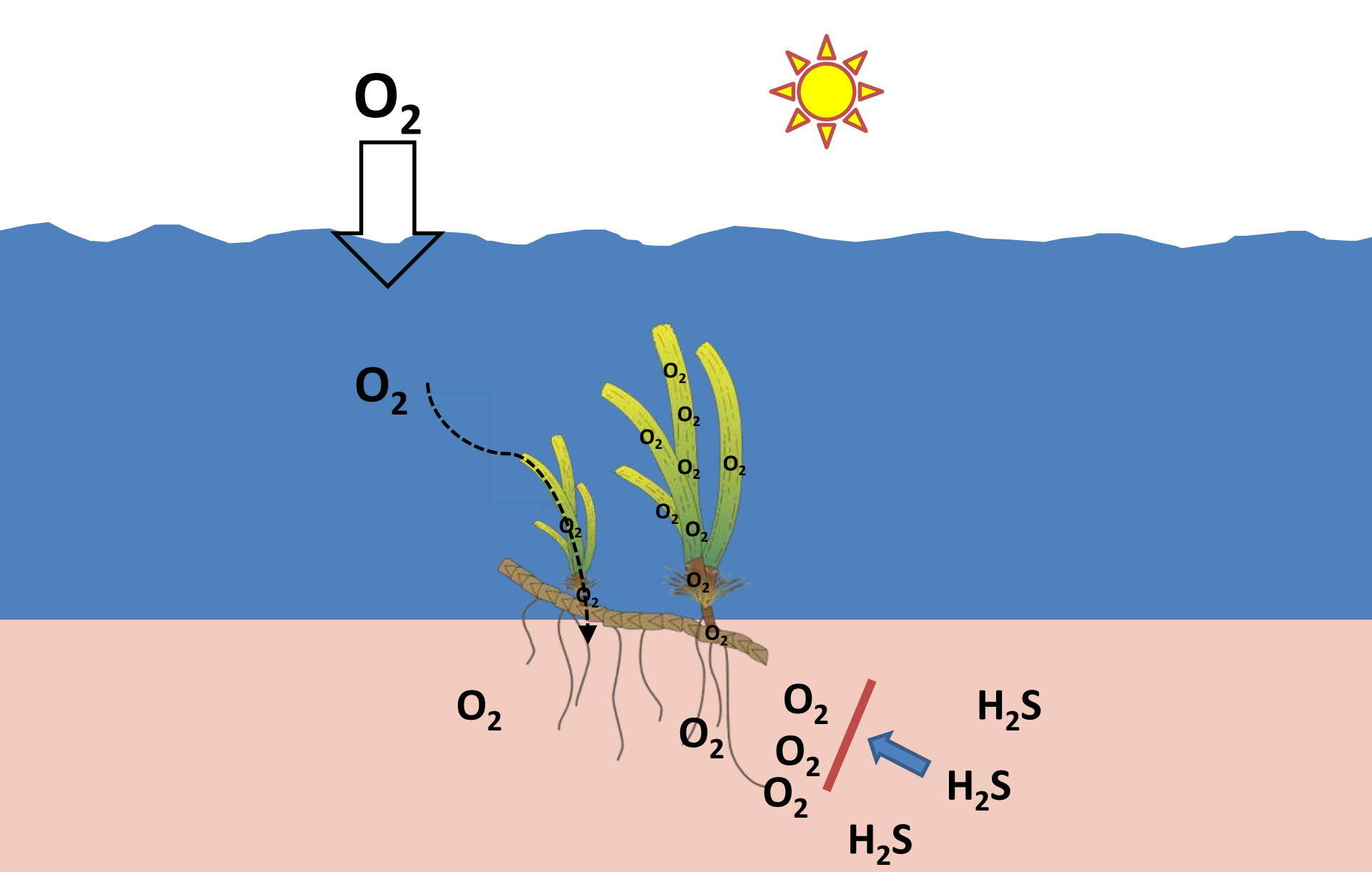
Disease (Mike Durako, Dave Porter, Lisa Muehlstein)

Clues from Denmark

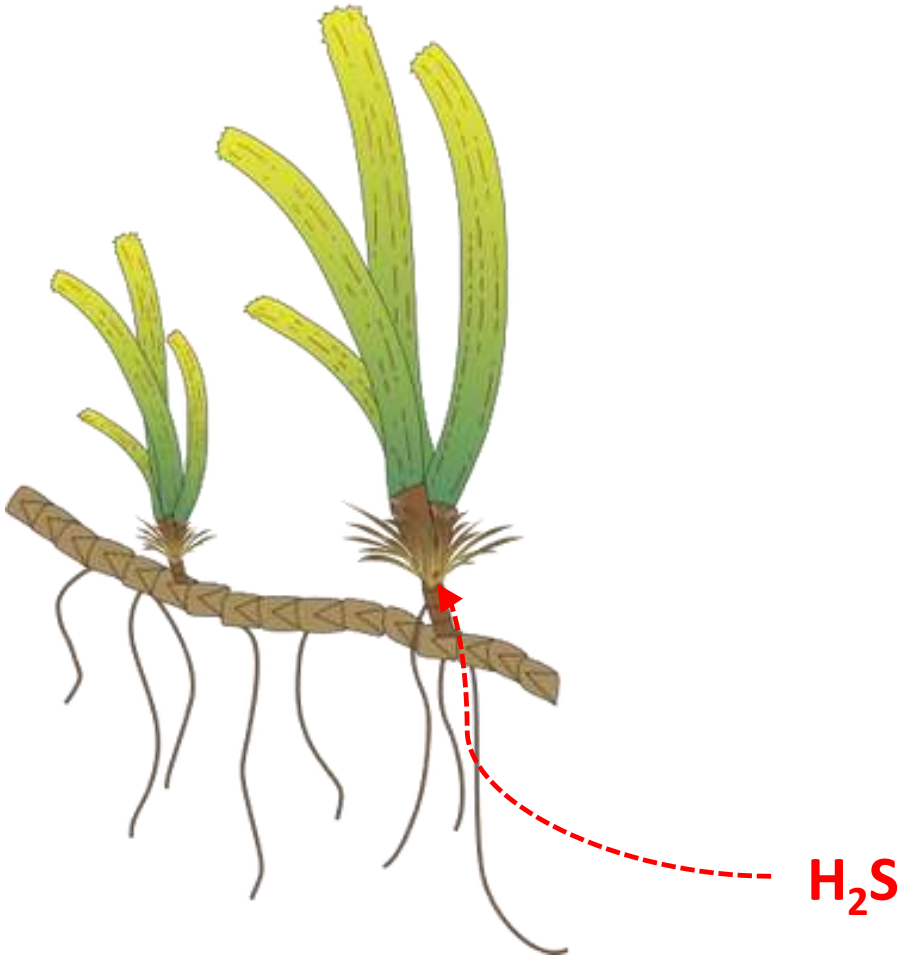
Oxygen and sulfide measurement *inside* plants

Similar dieoff of eelgrass in the Baltic Sea

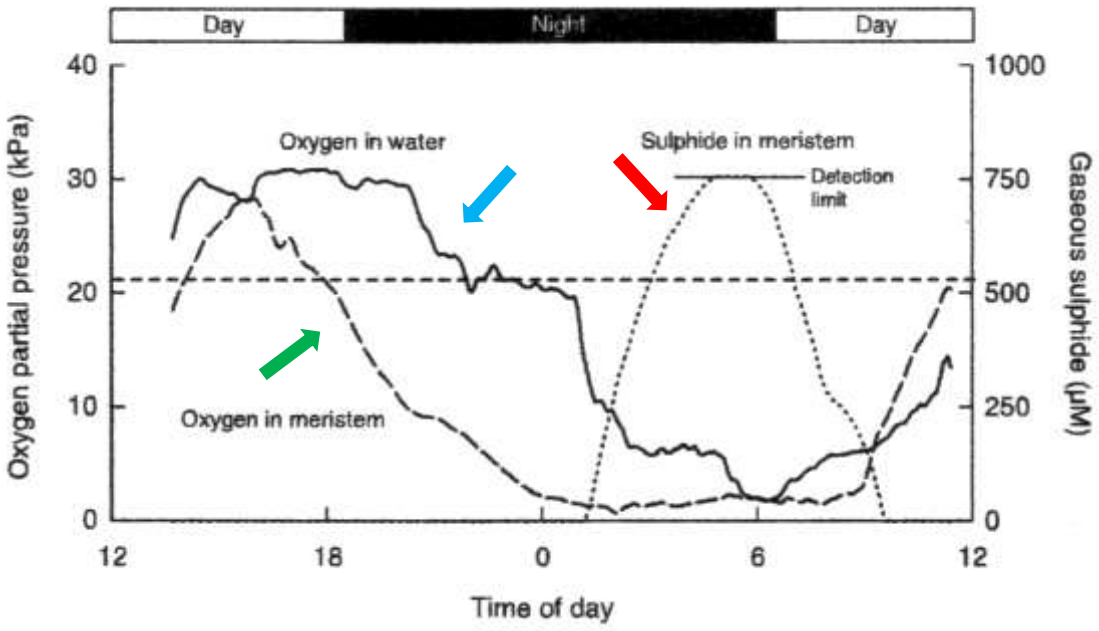
New technologies revealed sulfide poisoning



Oxygenated water column keeps sulfide away



Low oxygen allows sulfide intrusion

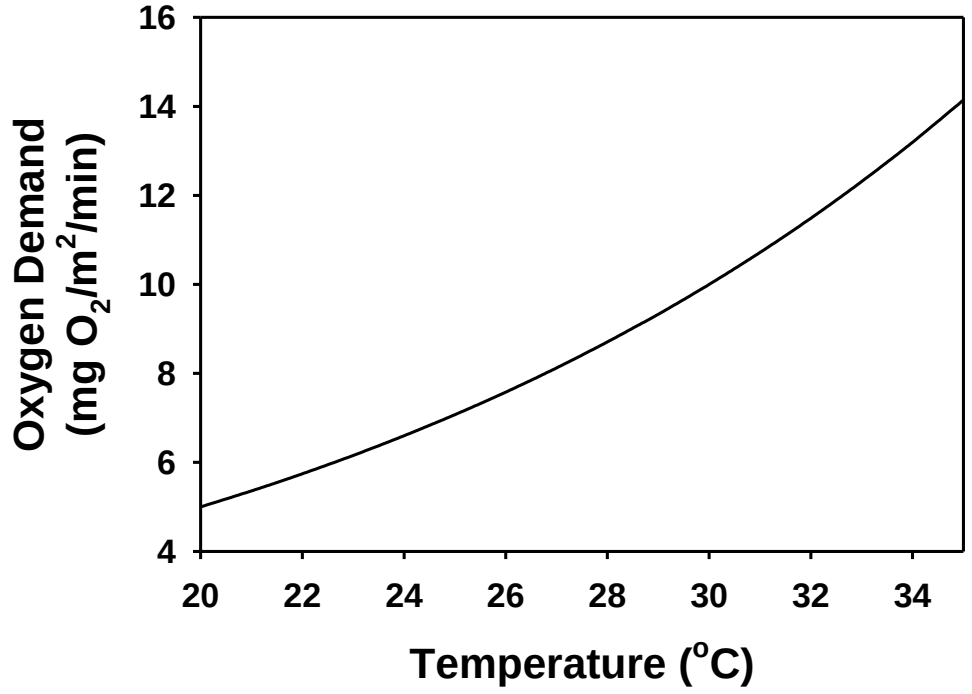


Borum et al. (2005) Journal of Ecology

Dying turtle grass experienced hypoxia and sulfide intrusion

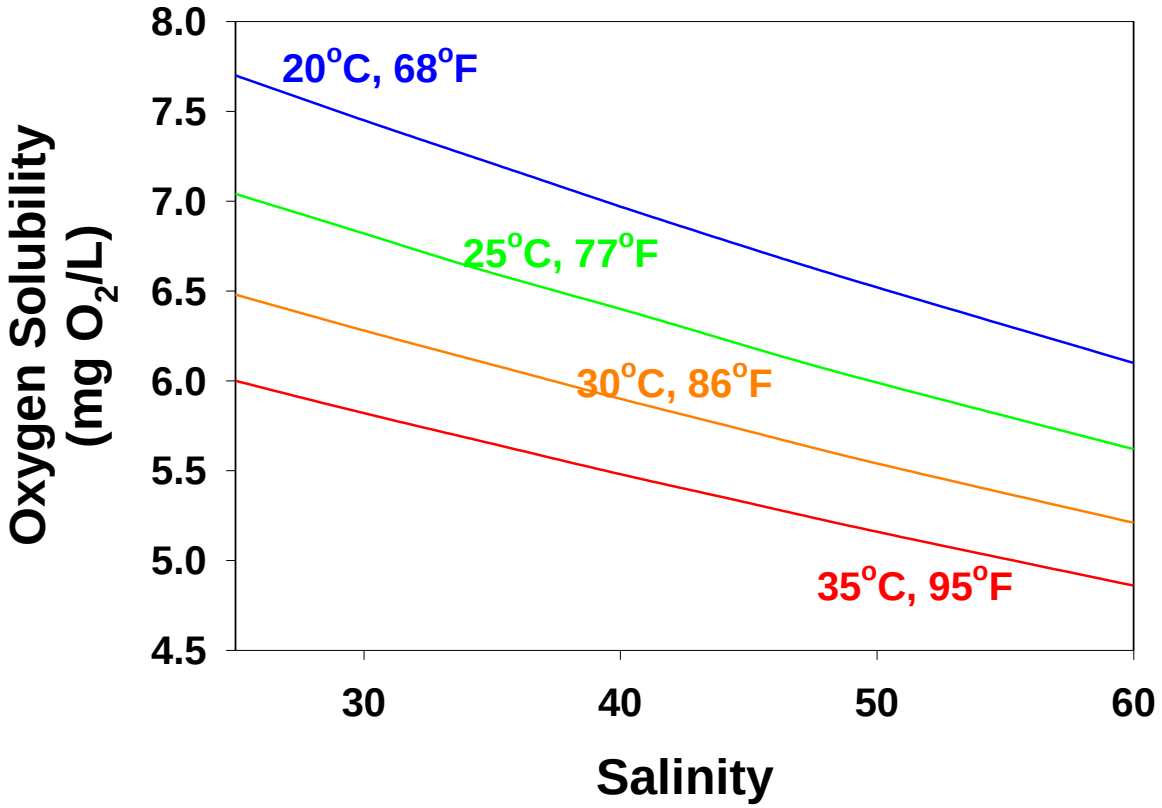
Oxygen demand

Oxygen use increases dramatically with temperature

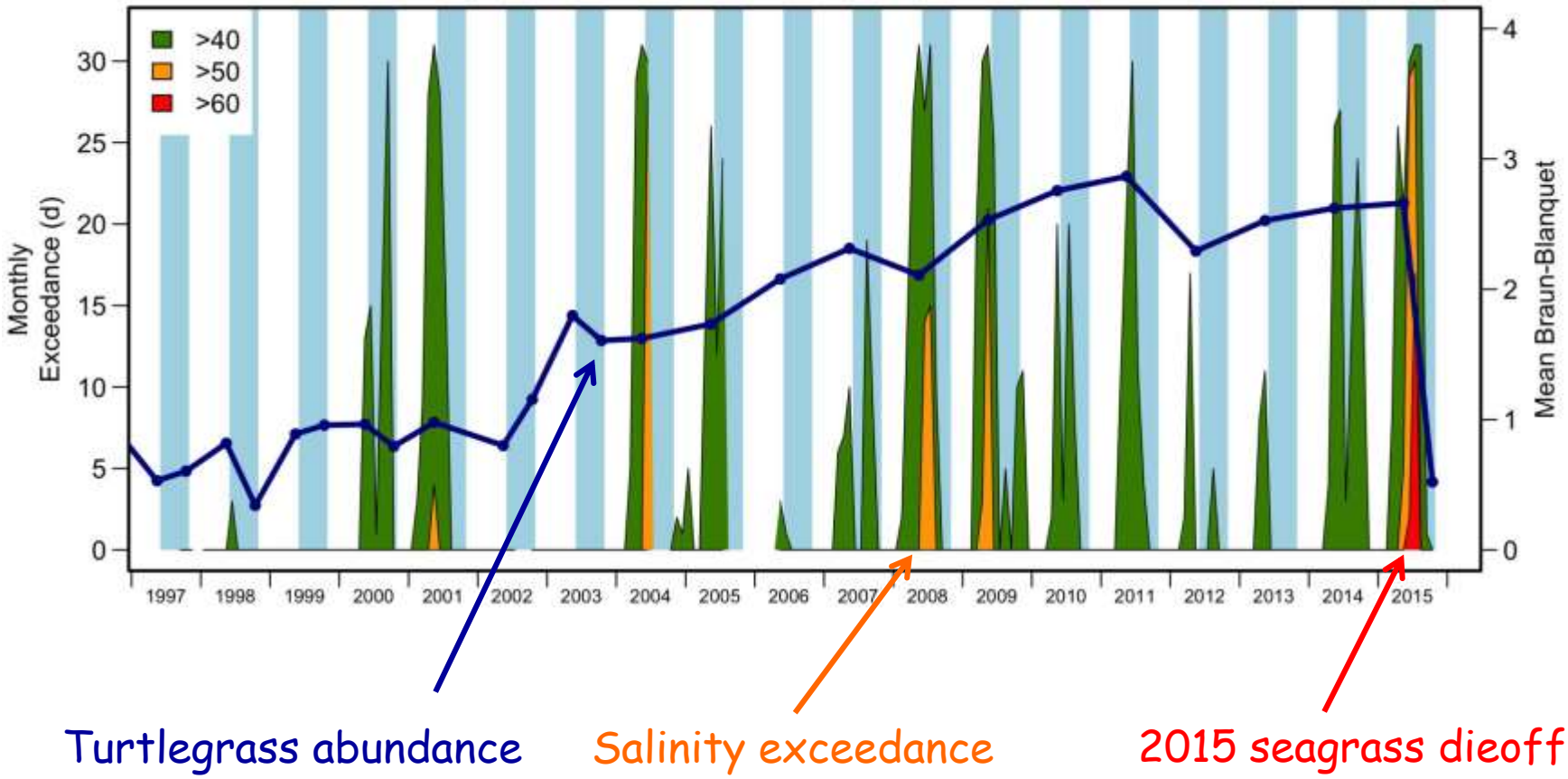


Also, dense seagrass uses more oxygen than sparse!

Oxygen supply

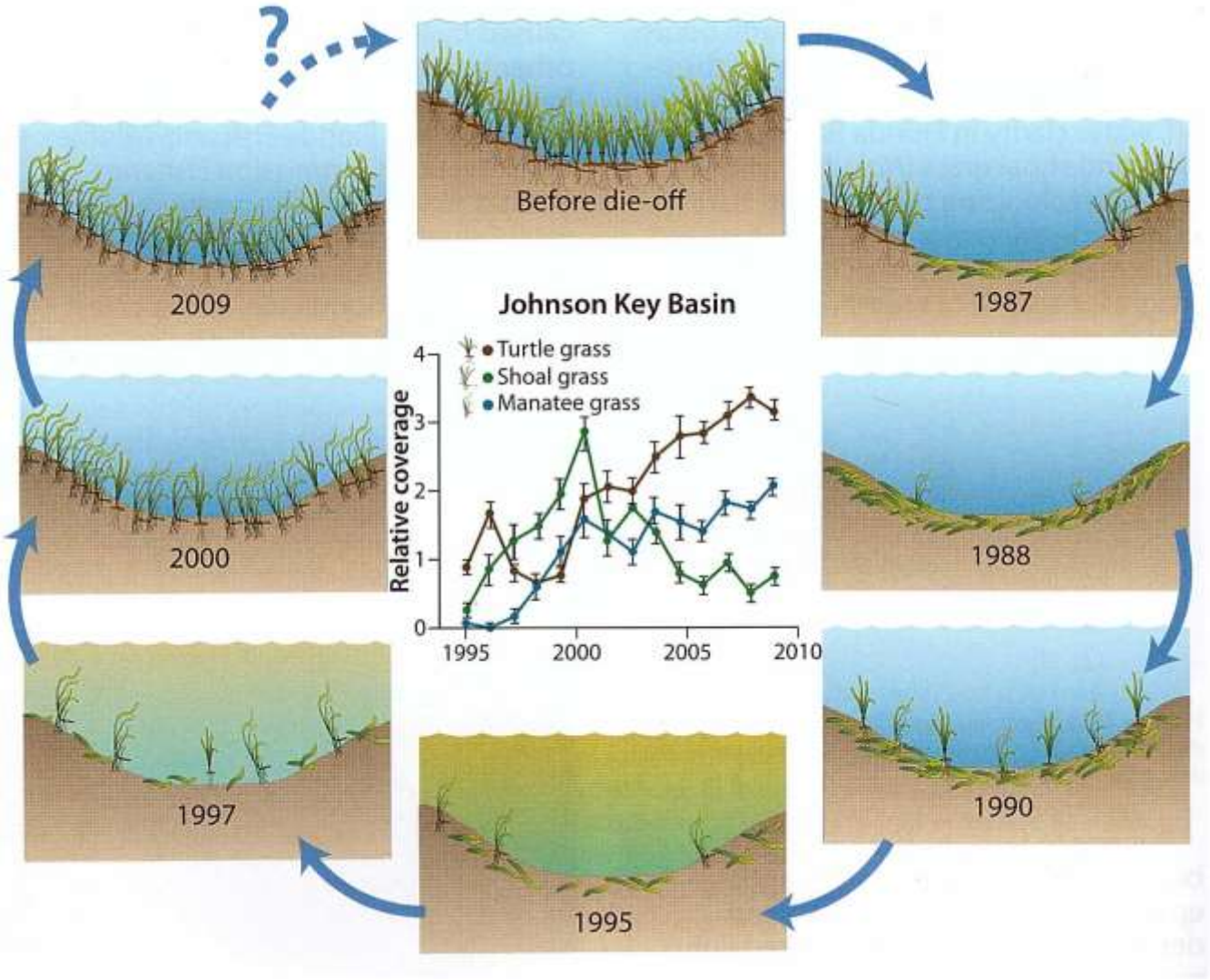


Hot, salty water holds less oxygen than cooler less-salty water



Very high salinity and high seagrass abundance at time of 2015 seagrass dieoff

From Penny Hall and Brad Furman, FWC



Florida Bay seagrass dieoff – A recurring cycle?

From Penny Hall and Brad Furman, FWC

THANK YOU!

To all the Florida Bay researchers and cooperating agencies:

Everglades National Park
FIU – Southeast Environmental Research Center
Florida Fish and Wildlife Commission
Tavernier Audubon Science Center
Scientists at the South Florida Water Management District
And scores of others!

Jay Zieman 1943-2015

Photo - Jud Kenworthy