Assessing Ecological Conditions in U.S. Coastal-Ocean Waters: Implications for an Integrated Ecosystem Assessment (IEA) in the Southeast

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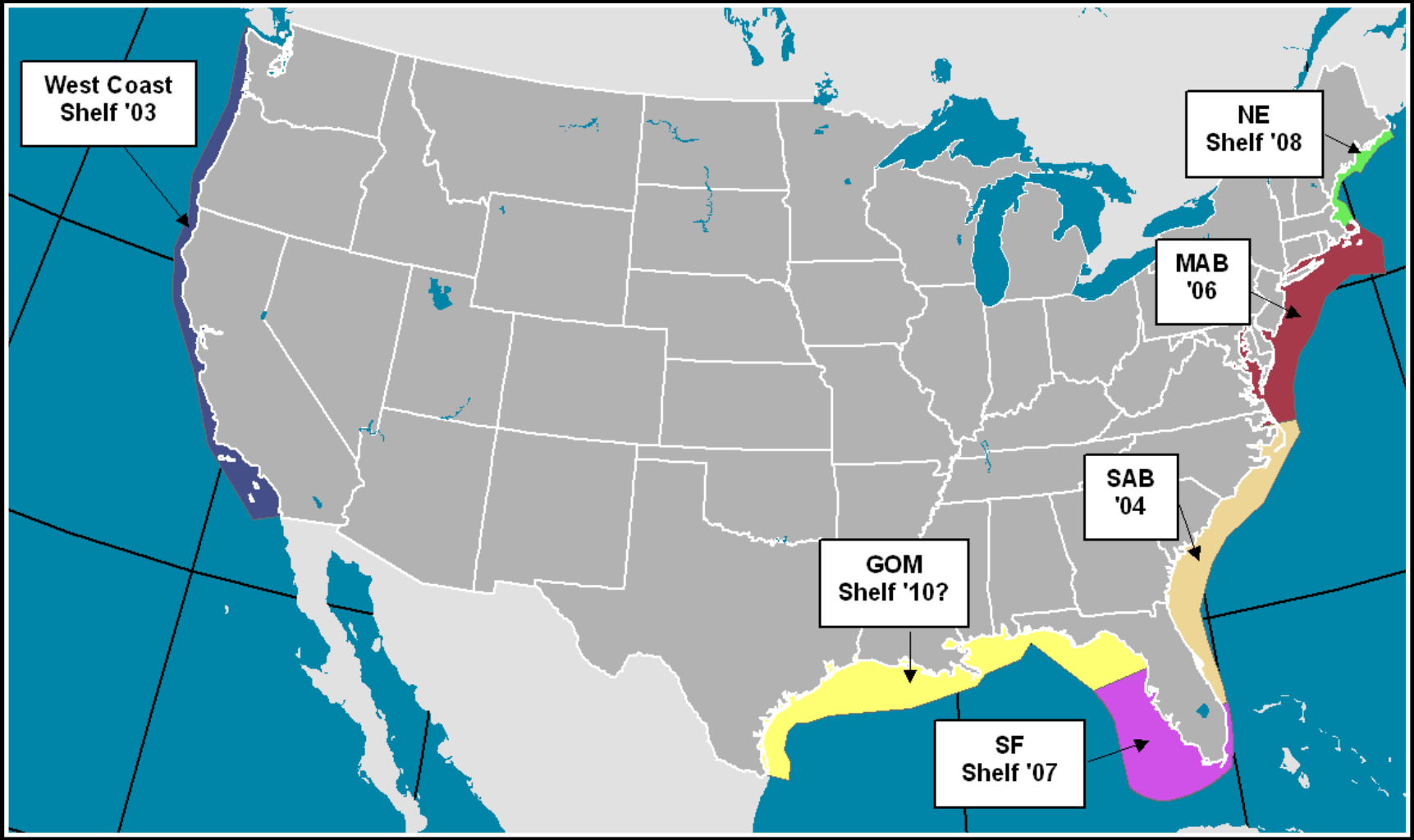
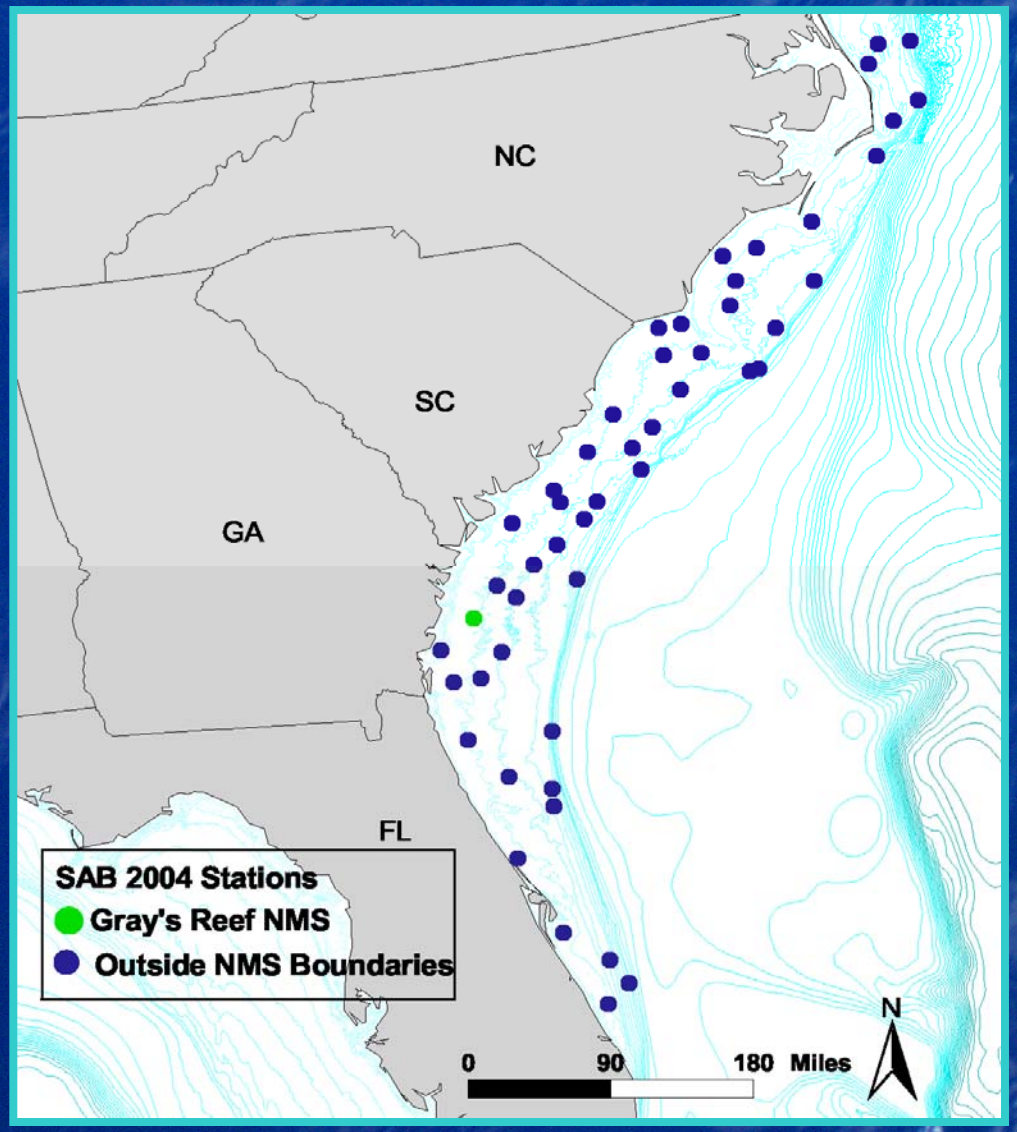
Regional Assessments of Ecological Condition Throughout Coastal-Ocean Waters of the U.S.

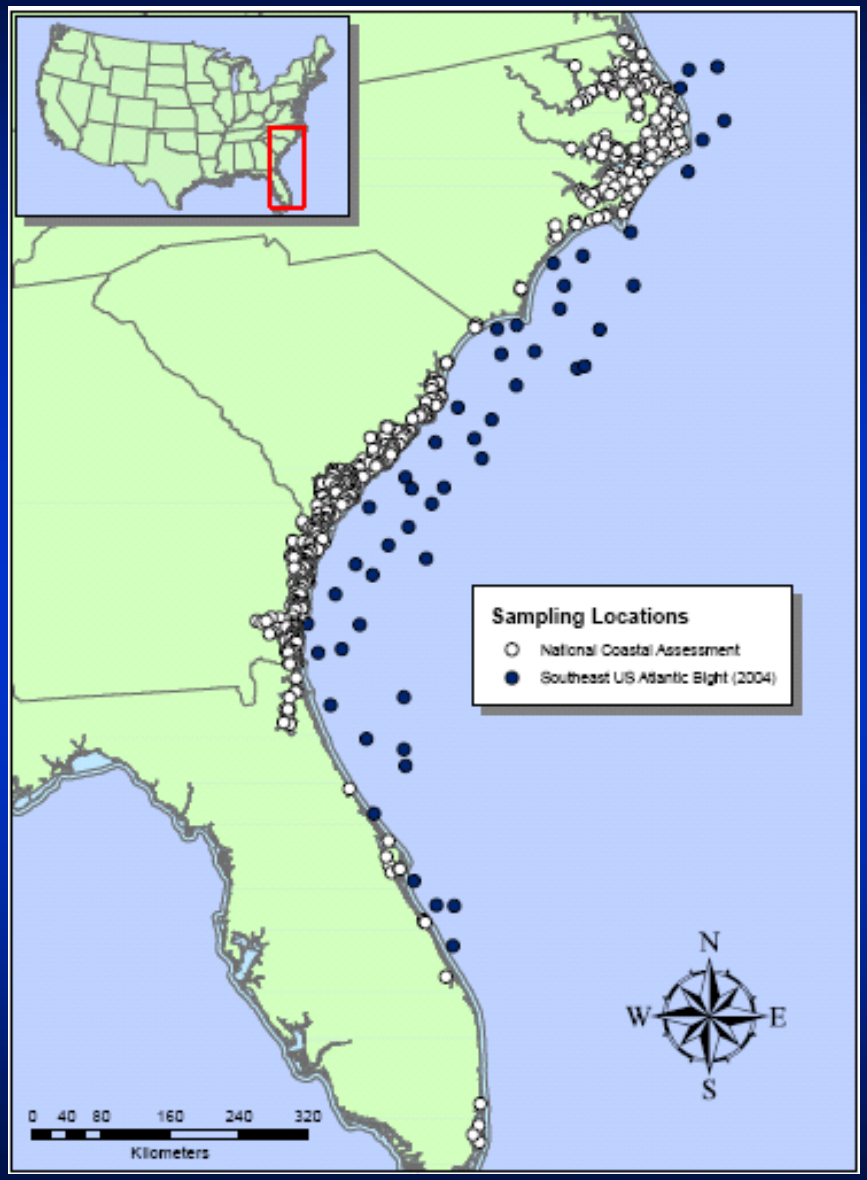


SAB Shelf (~10-100 m): April 04



Partners:
NOAA (NCCOS, NMSP)
EPA/ORD/NHEERL
States of FL, GA, SC, NC

Sampling Parameters:
Habitat Characteristics
(T, S, DO, nutrients, grain-size, TOC)
Stressors (Chemical contaminants in sediments & biota, hypoxia, organic enrichment)
Biological Condition
(Benthic infauna, chlorophyll a, fish pathology)



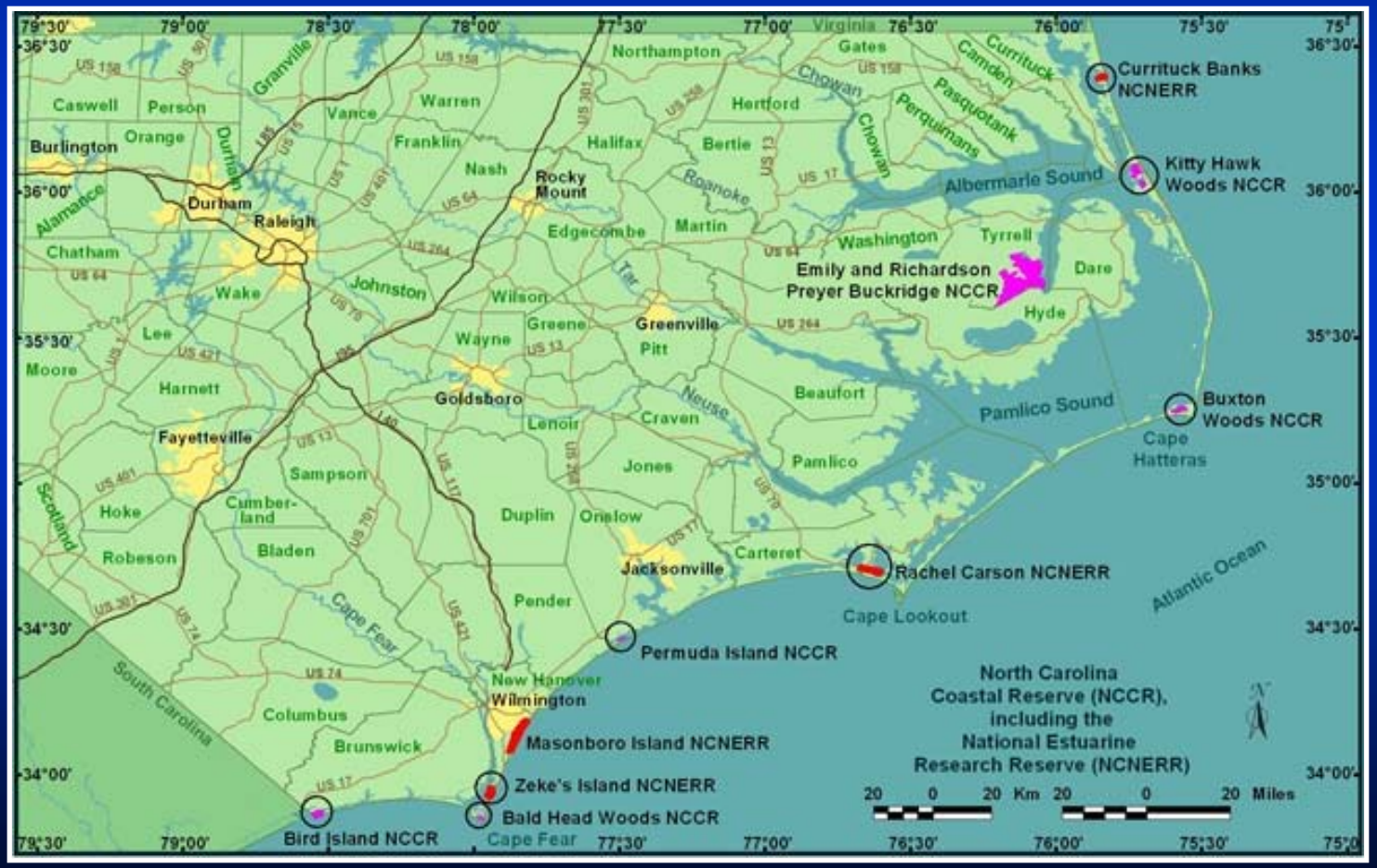
Sampling Sites from Estuarine and Coastal Ocean Habitats of the SAB

Estuarine sites: 2000-2004, n = 697 (from EPA's EMAP/NCA program);

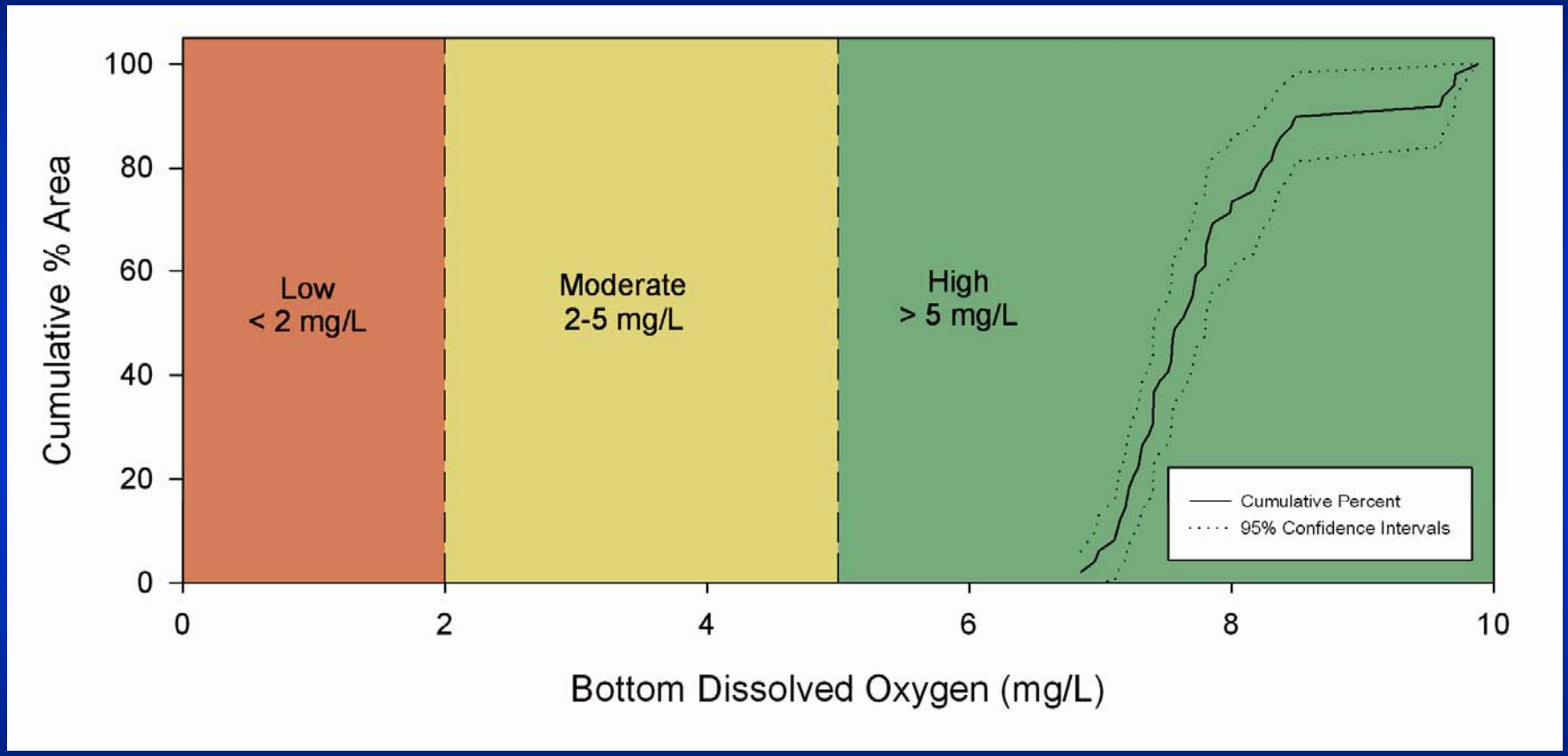
Offshore sites: 2004, n = 50 (from NOAA's SAB-04 survey)

Ecological Assessment of NERRS

30 stations sampled (Sep 06), using a probabilistic sampling design, throughout the 4 NC NERRS locations: Currituck Banks, Rachael Carson, Masonboro Island, and Zeke's Island

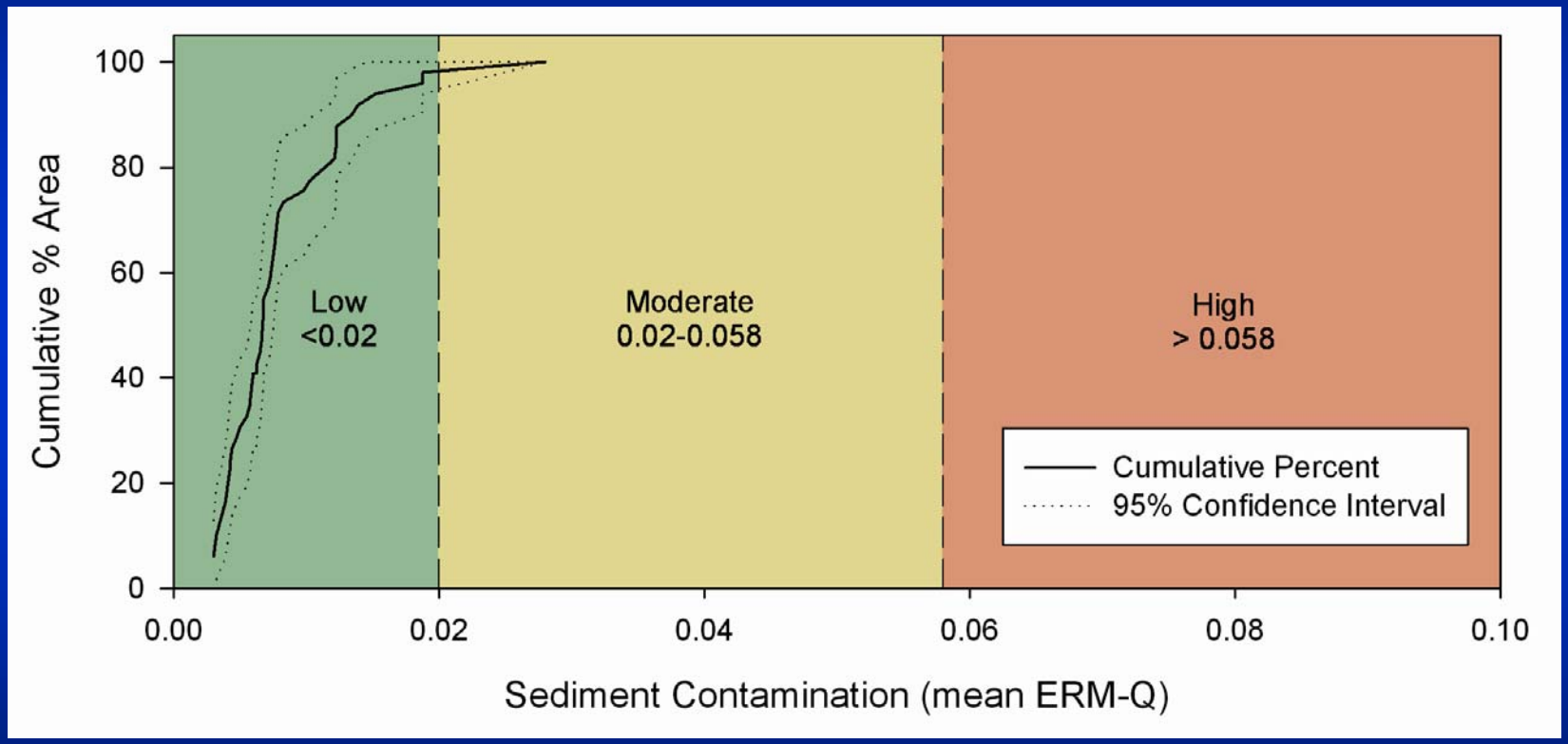


SAB Offshore Waters: Water Quality (DO)



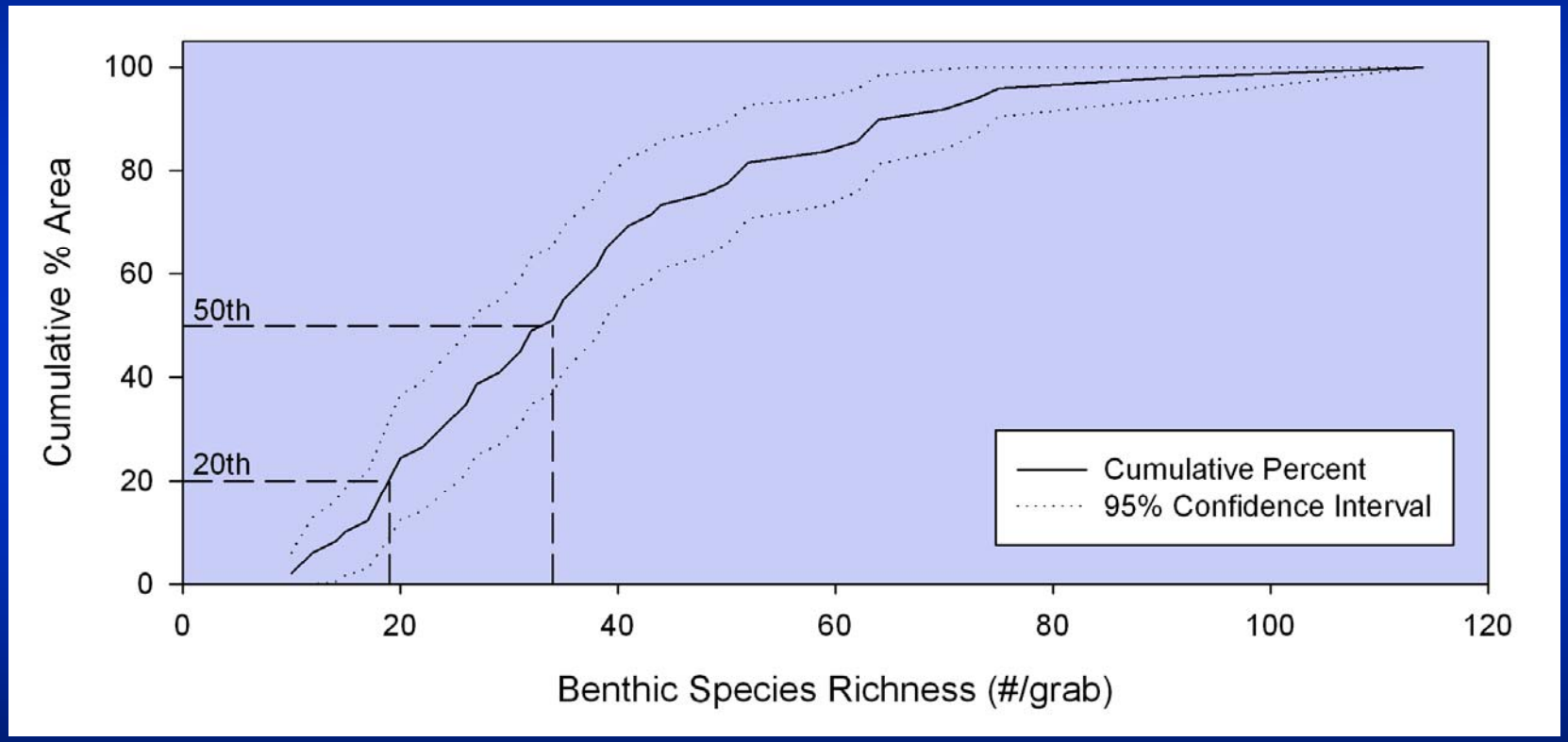
(Vertical-line thresholds are based on EPA 2000, Diaz & Rosenberg 1995)

SAB Offshore Waters: Sediment Quality (sediment contamination expressed as mean ERM-Q)



(Vertical-line thresholds are based on Hyland et al. 1999)

SAB Offshore Waters: Benthic Biodiversity (Infaunal Species Richness)



*What is an IEA?

Definition: "A synthesis & quantitative analysis of information on relevant physical, chemical, ecological & human processes in relation to specified ecosystem management objectives."

Characteristics:

- Incorporates multiple indicators of the environment & ecosystem including human factors
- Is geographically specified
- Establishes target levels & thresholds for key ecosystem components
- Evaluates the impacts of management options & risks of not attaining target ecosystem states
- Long-term process with adaptive management

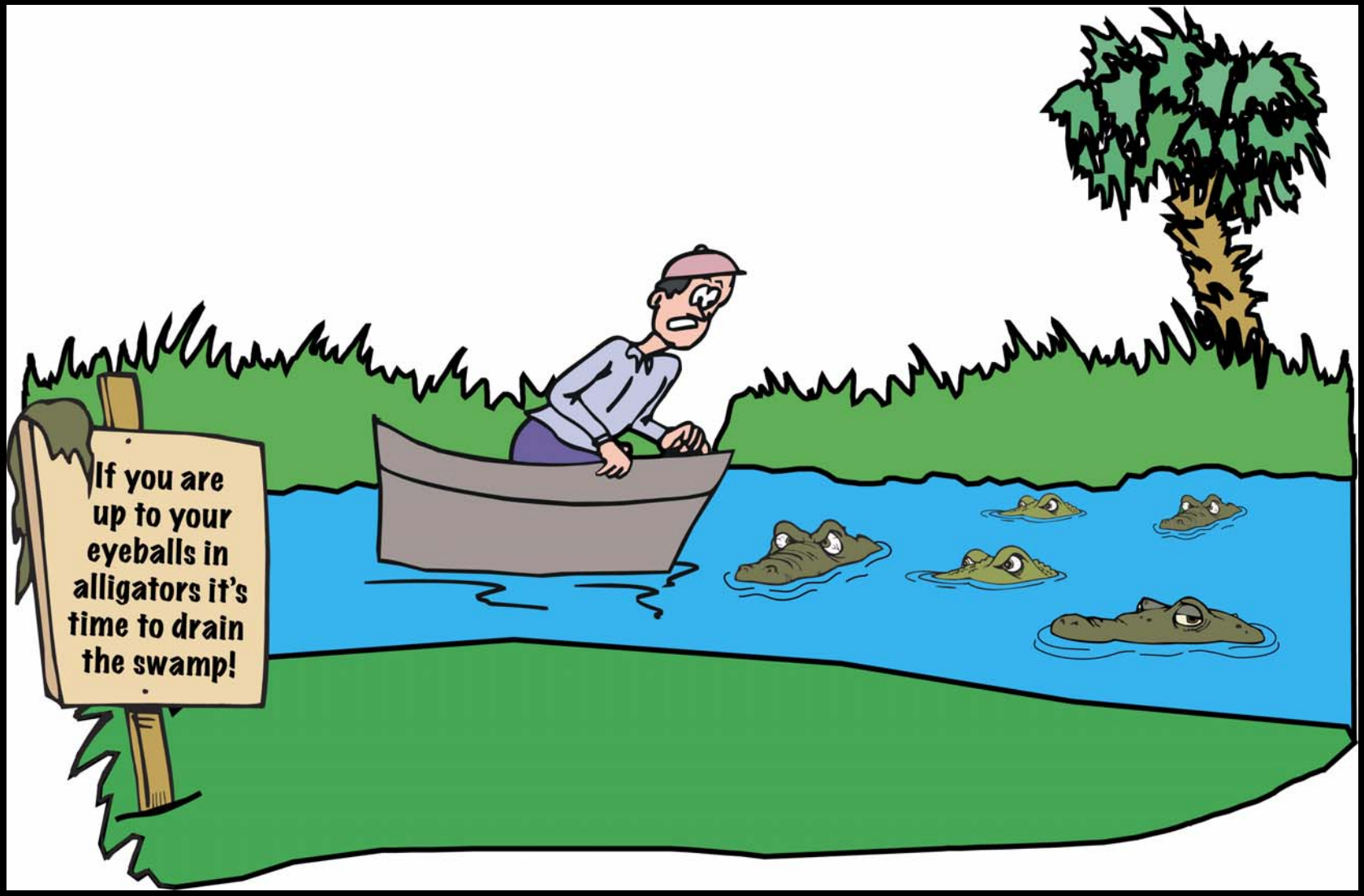
(* From NCCOS FY05-09 Strategic Plan, Murawski 2007 presentation)

Components of an IEA*

1. Assessment of baseline conditions (status) of the ecosystem relative to attributes of concern & corresponding management targets (indicator thresholds)
2. Assessment of stressors (drivers & pressures) on the ecosystem that compromise the ability to achieve stated targets
3. Forecasts of ecosystem status with no management action (status quo response)
4. Forecasts of ecosystem status under different management strategies (optional responses)
5. Evaluation of success of management actions (updates of ecosystem status relative to targets after actions taken)

*(From NCCOS FY05-09 Strategic Plan, Murawski 2007 presentation)

Need for Reliable indicators



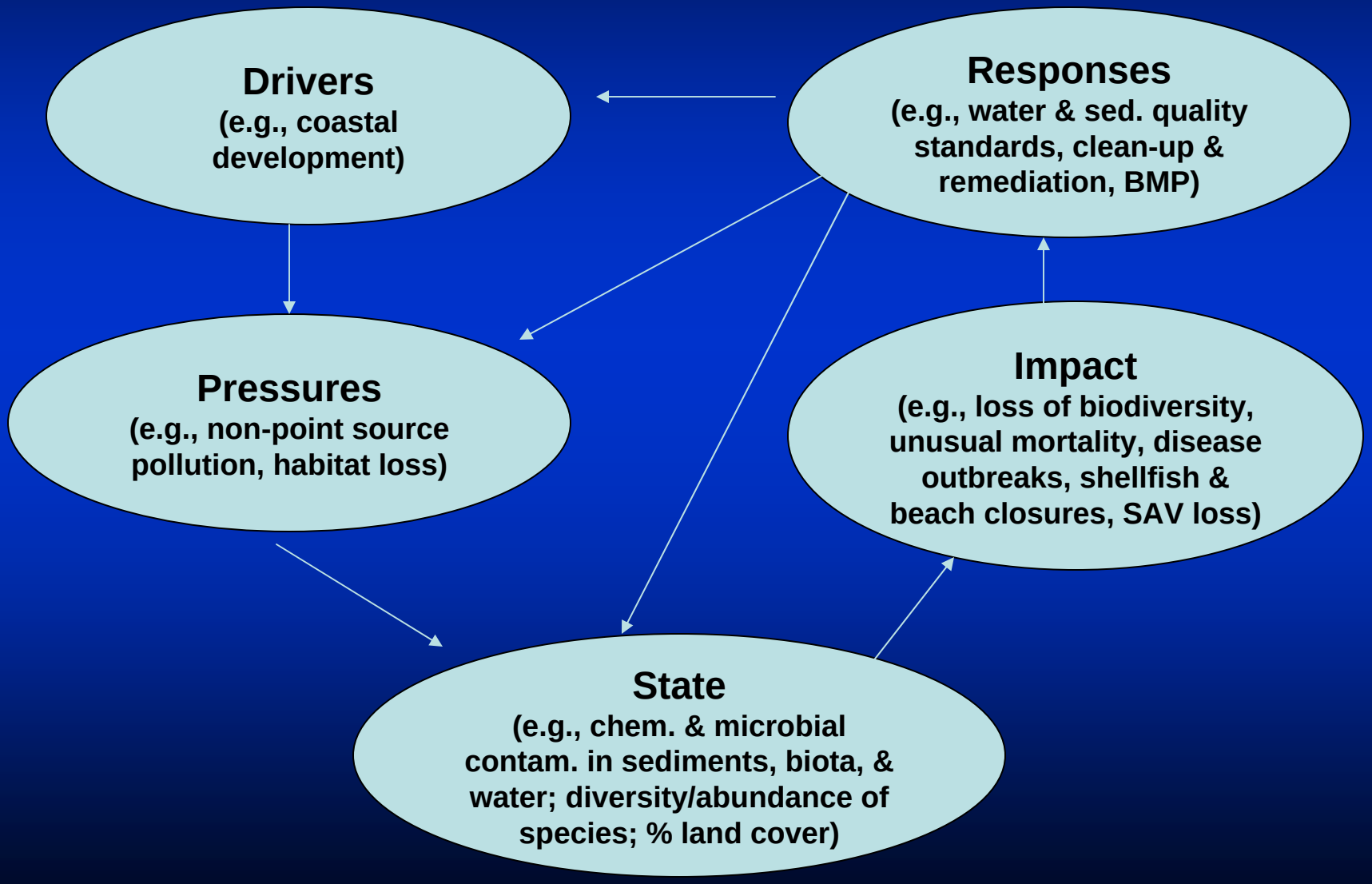
Indicators & Indicator Frameworks

"Basically everything is an indicator of something but nothing is an indicator of everything" **(Cairns et al. 1993)**

Thus there is a need for appropriate frameworks, or paradigms, for organizing & applying the right combination of multiple indicators – ecological & socioeconomic – which, in addition to being cost-effective, best match the specific management questions, accurately represent the state of the ecosystem relative to desired ecosystem quality targets, & track the effectiveness of necessary management actions.

Indicator Frameworks: The DPSIR Model

(Rapport & Friend 1979; OECD 1991, 1993; EEA 2001, 2005)



Support for S.E. Region EIA Process

Likely EIA Steps	What can CCEHBR Contribute?
Scoping (consensus based): • Continue to build regional collaborations of stakeholders • Define management questions • Identify appropriate indicators (ecological & socio-economic) • Define ecosystem-quality targets (indicator thresholds) for man. action	• Participate in various workshops & scoping activities • Knowledge of some existing indicators & corresponding thresholds that might be suitable
Assessment: • Baseline status conditions (EIA C1) • Stressor impacts & links to drivers & pressures (EIA C2)	• Can provide existing probability-based data (supporting spatial estimates of condition) for inshore & offshore waters region-wide, including NMSs & NERRS sites, for multiple ecological indicators & limited socioeconomic indicators (e.g., fish contaminants, water clarity, marine debris)

Support for S.E. Region EIA Process - continued

Likely EIA Steps	What can CCEHBR Contribute?
Forecasts: • Predict ecosystem health with no management action (EIA C3) • Predict ecosystem health under different management actions (EIA C4)	• Possible future work
Evaluate Success of Management Actions (EIA C5): • Updates of ecosystem status relative to targets • Revise management actions accordingly (adaptive feedback)	• Possible future work

The End