

South Carolina's Approach for Assessing Estuarine Ecosystem Health Using Integrated Indices of Condition

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Defining the Ecosystem

Classical Definition

“A biological community and the related nonliving environment interacting together as a whole”

SAFMC Issues:

- The SAFMC regional definition really consists of multiple ecosystems that are functionally very different
- Many of the managed fauna inhabit several different ecosystems
- Some ecosystems more threatened than others
- Ecosystem health measures not applicable to all life stages

Estuarine Ecosystem

- Most threatened ecosystem due to coastal development
- Critical nursery habitat for many offshore species
- Most applicable at watershed scales

Management Issues

➤ ***Fisheries Management***

- *20th Century: Regulate the fisheries*
- *21st Century: Environmental based effects likely*

➤ ***Better incorporation of environmental data into habitat condition or fisheries stock evaluations***

- *Collected by state or program but not regionally integrated*

The South Carolina Estuarine and Coastal Assessment Program

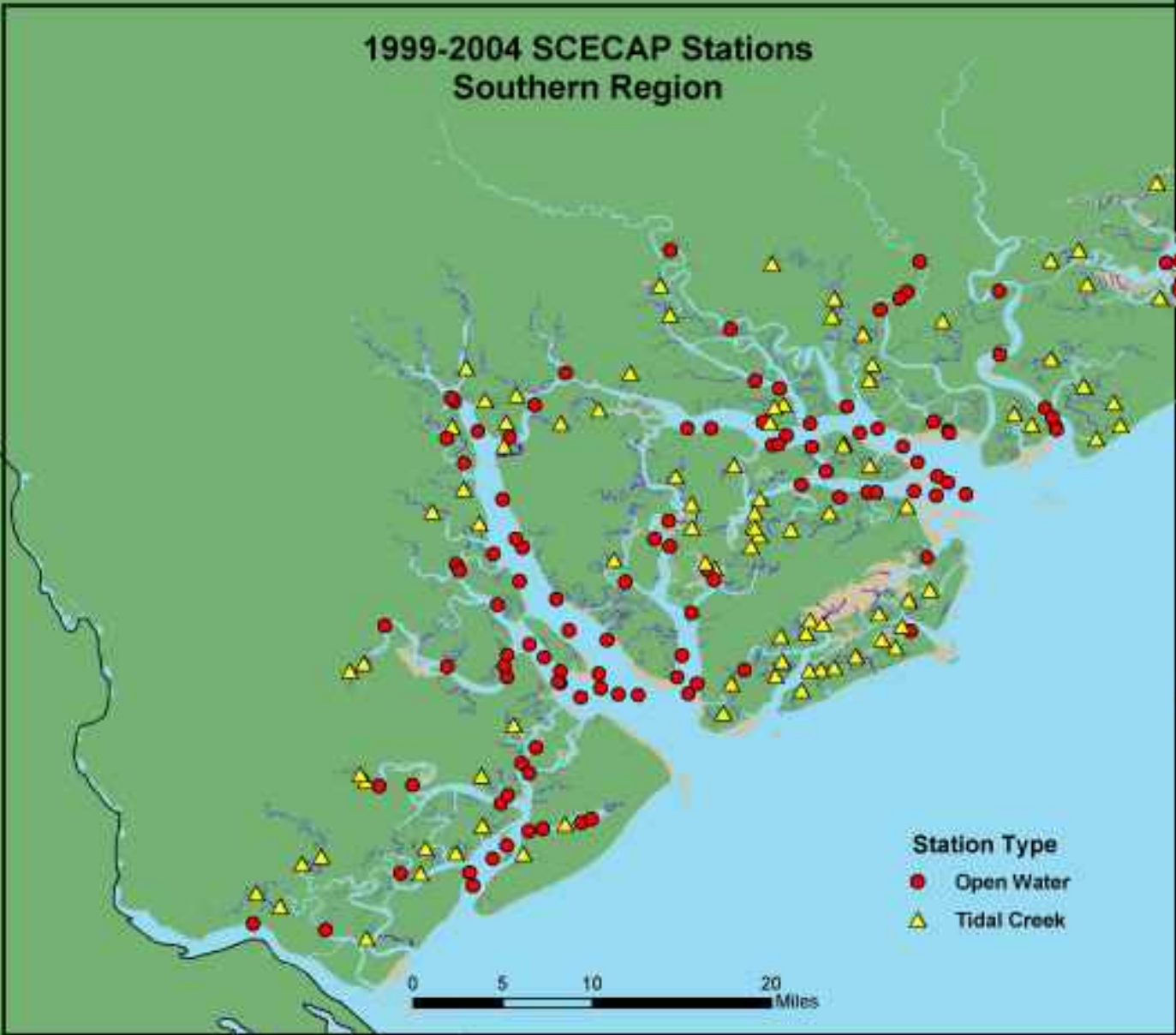


Objectives:

- *Monitor the quality of all South Carolina estuaries*
 - Water and Sediment Quality
 - Biological Condition
- *Develop integrated measures of habitat condition*
- *Report findings to the public in understandable formats*
- *Use the data for management / regulatory decisions*



1999-2004 SCECAP Stations Southern Region



Sampling Components

Water Quality

- Continuous monitoring for salinity, DO, pH, temp
- Nutrients (total & dissolved nitrogen, phosphorus)
- BOD, fecal coliform bacteria, metals
- Phytoplankton (Chl-a)

Sediment Quality

- Contaminants (85 analytes)
- Toxicity (3 assays)

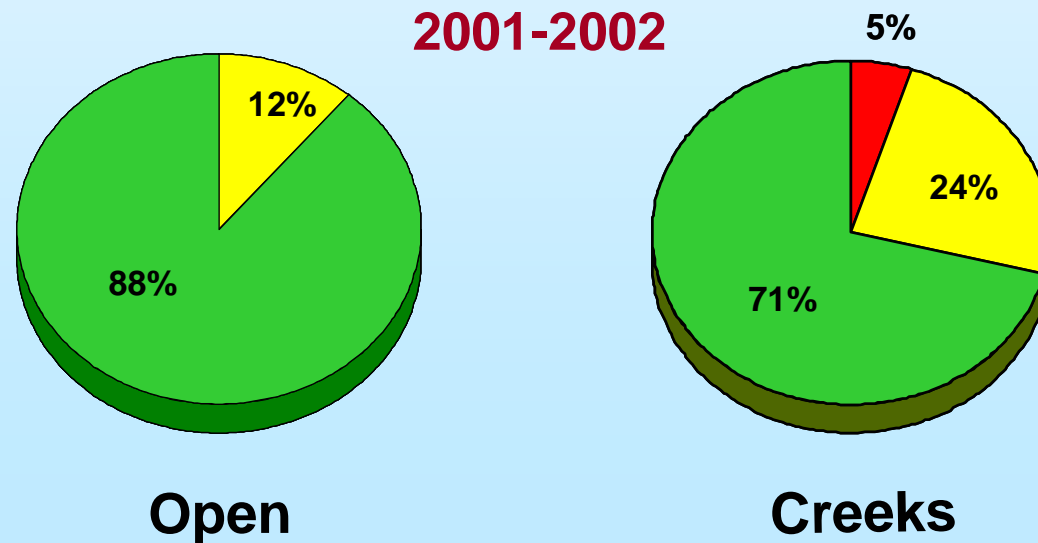
Biological Condition

- Benthos
- Phytoplankton composition
- Finfish and crustaceans

Developed Integrated Measures

Water Quality

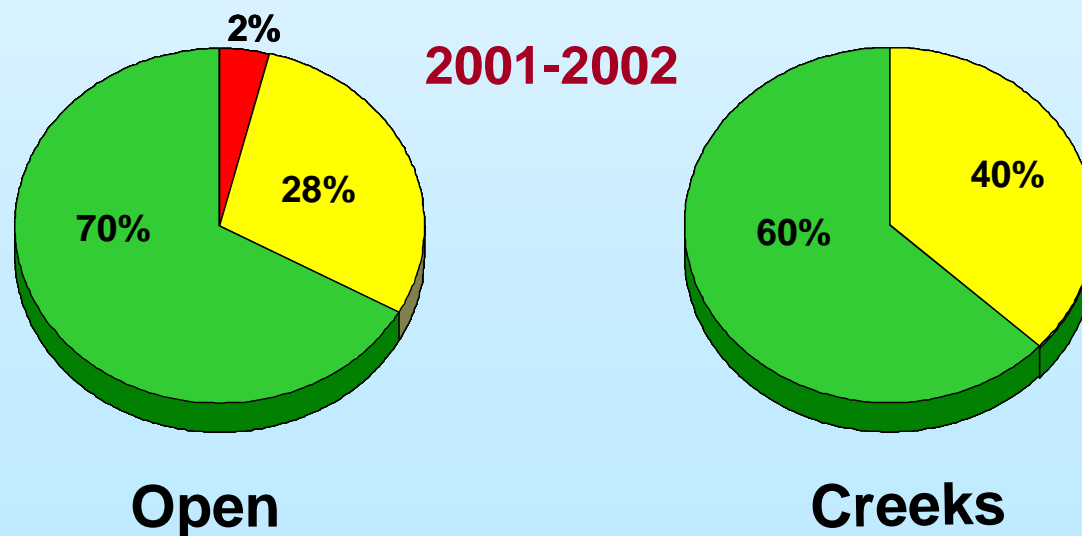
- Six primary measures (DO, pH, TN,TP, Chla, fecal coliform bacteria)
- Each measure is scored based on water quality criteria or historical data
- Scores averaged for integrated water quality measure



Integrated Measures

Sediment Quality

- Selected 24 priority pollutants with known bioeffects data
- Developed Effects Range Median Quotient (ERM-Q)
- Scored ERM-Q by published benthic effects ranges
- Scored toxicity assays by number of assays with “hits”
- Averaged contaminants and toxicity score



Integrated Measures

Biological Condition

- Benthic Index of Biotic Integrity (B-IBI) for biological response
 - *Described by Van Dolah et al. (1999) for use in Southeast region*



Other Indices of Interest

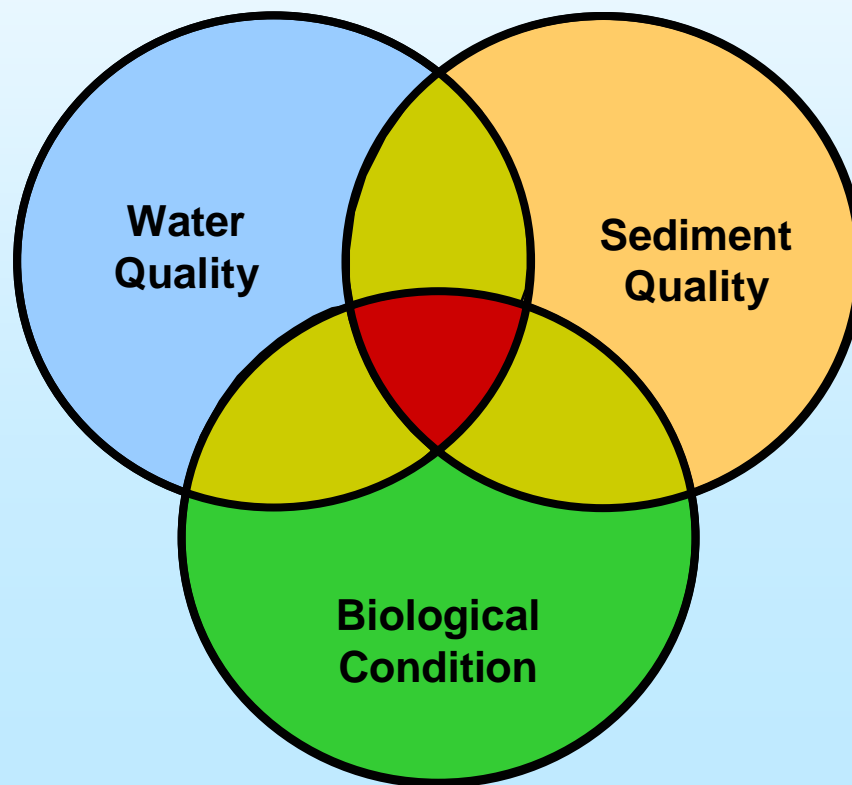
- Demersal Finfish / Crustacean IBI
- Phytoplankton Composition Index (HABs)



Integrated Measures

Overall habitat quality

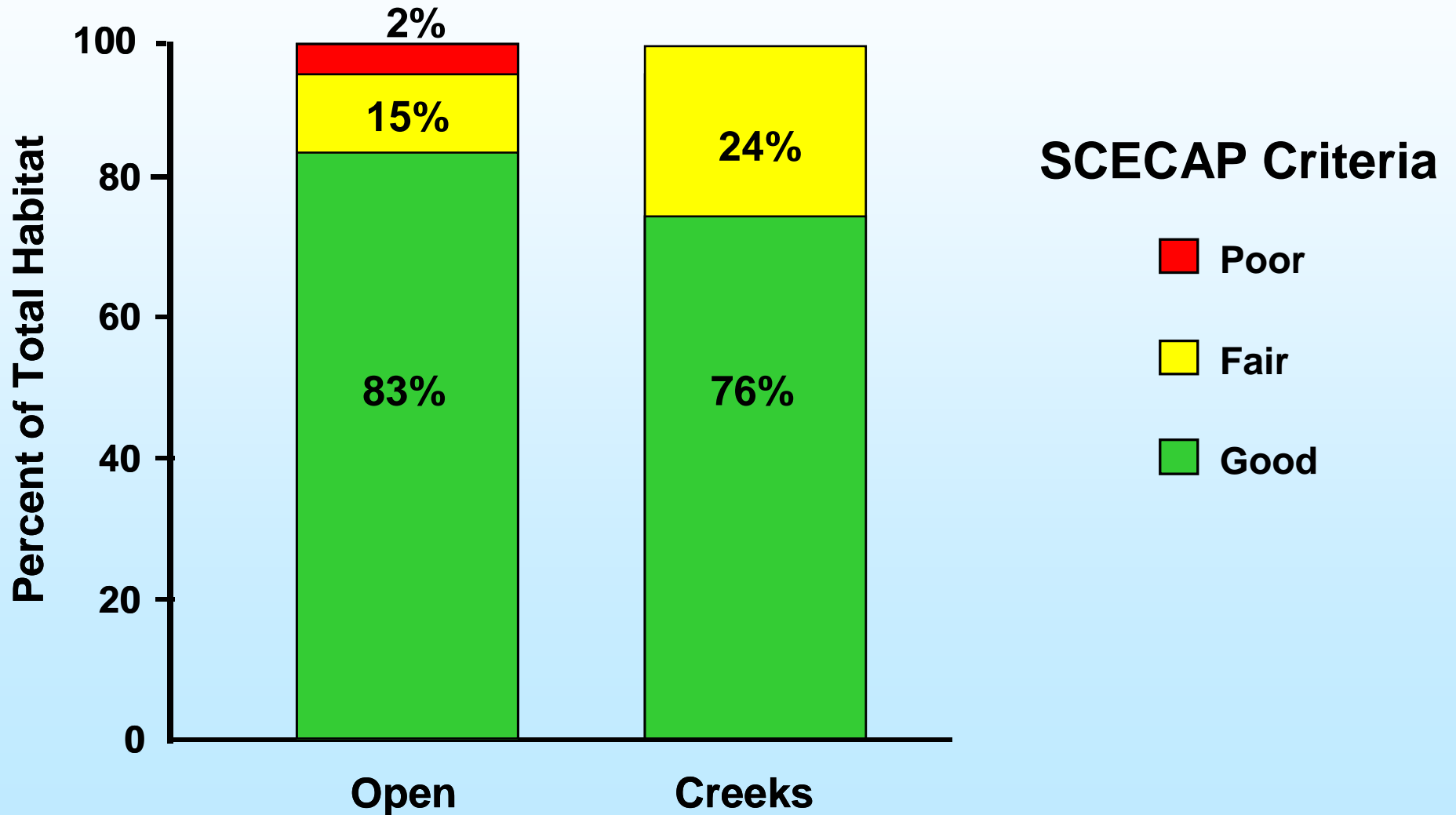
- Averaged scores of each subcomponent into an integrated score for overall habitat quality
- Each component weighted equally



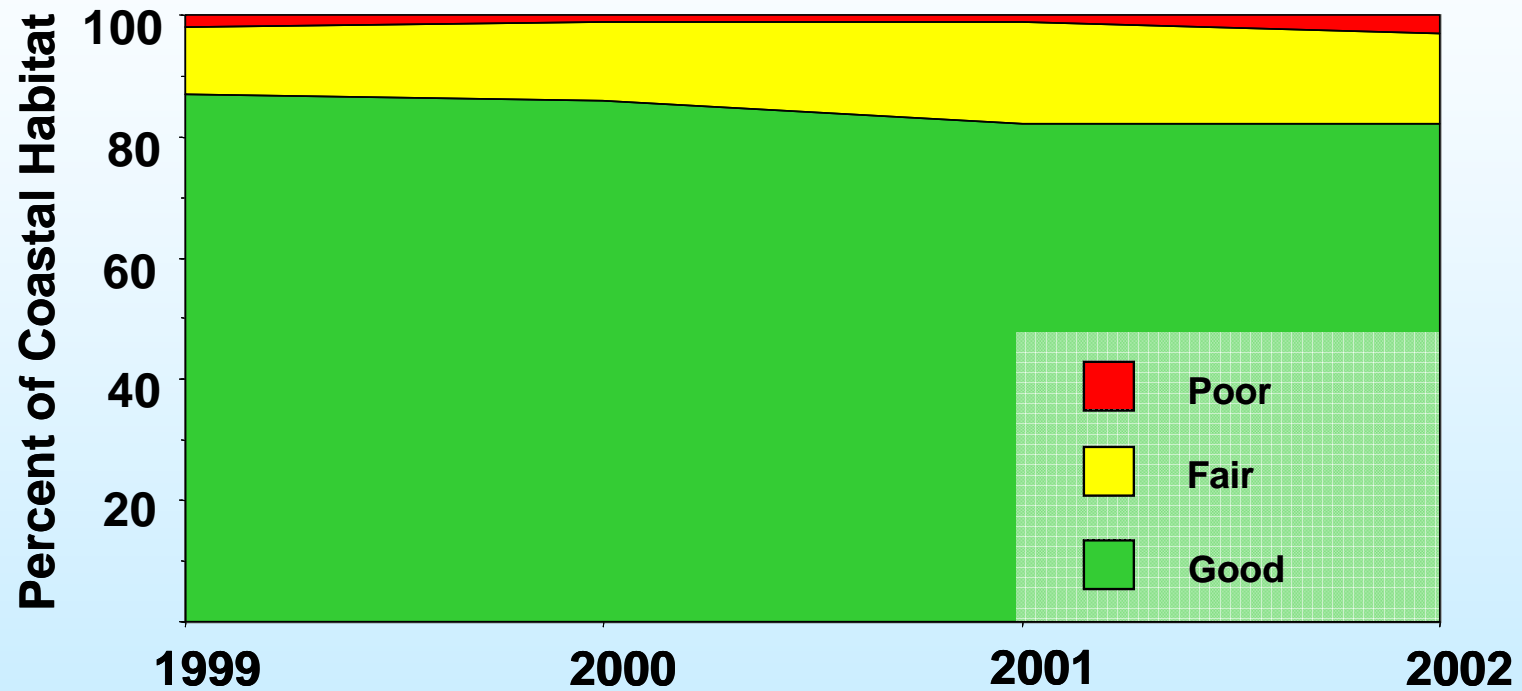
*For more information:
Google SCECAP*

Integrated Habitat Quality Score

2001 - 2002



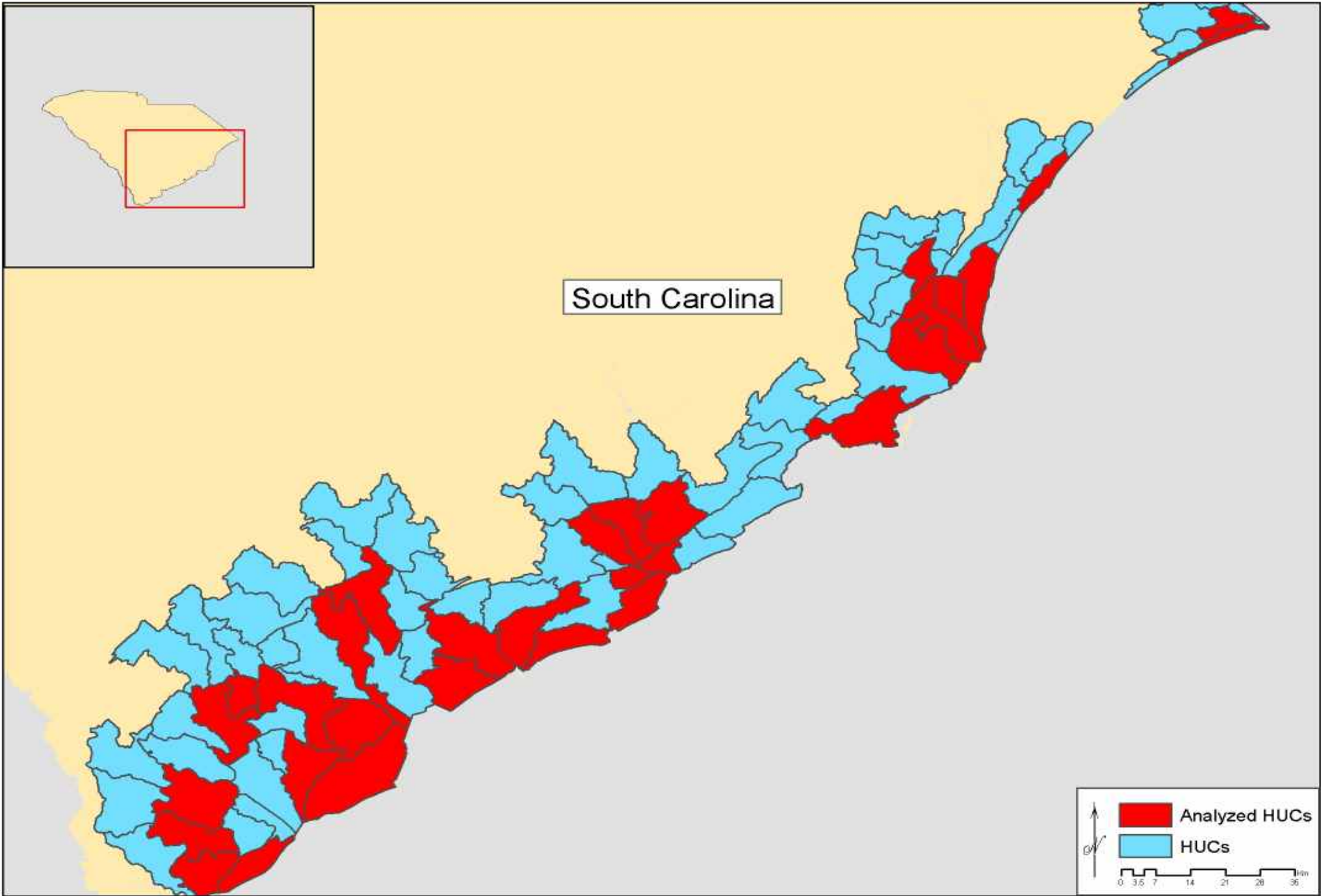
Temporal Change in Overall Habitat Quality Score



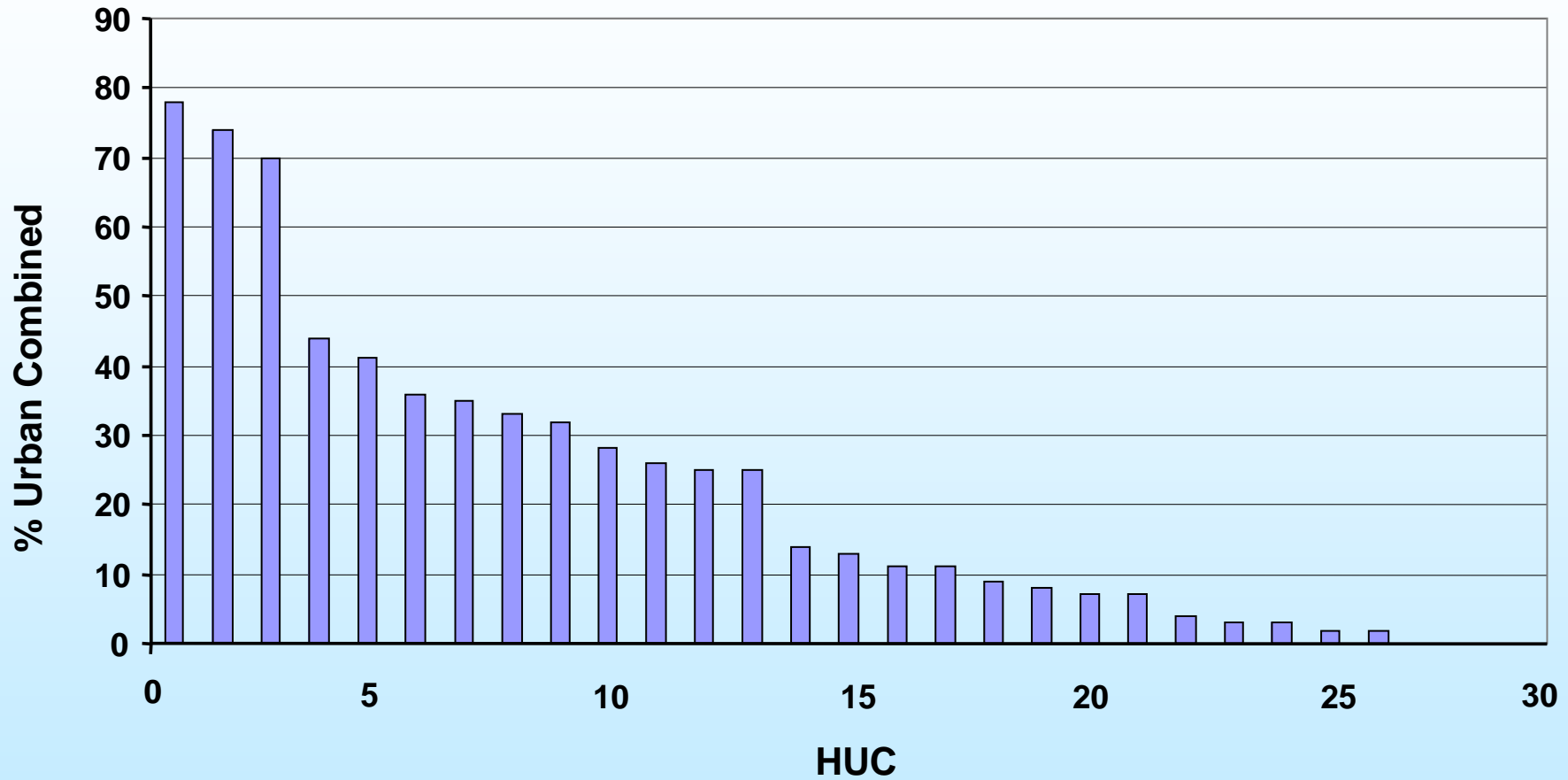
Approach Useful at Several Levels

- **State Wide Assessment**
 - Unbiased random sample
 - Represents entire resource
 - Known confidence of estimates
- **Specific watersheds**





Percent Urban Cover for Analyzed HUCs



600 Stations with Water and/or Sediment Quality Data

Summary

- ***SCECAP approach is useful to SCDNR and SCDHEC***
 - *Provides unbiased assessment of state's estuarine environmental quality and biotic condition*
 - *Integrated measures of ecosystem condition*

- ***Additional Program Values***
 - *Useful for understanding natural (unaltered) conditions*
 - *Useful for understanding change over time*
 - *Aids in understanding relationships between environmental and biotic condition*

Summary

- *Need better integration of both inshore (estuarine) and offshore environmental and climatic data being collected within the region*
 - *At both local and regional scales*
 - *Consistent data types and formats*
 - *Use to evaluate effects on managed fishery resources*