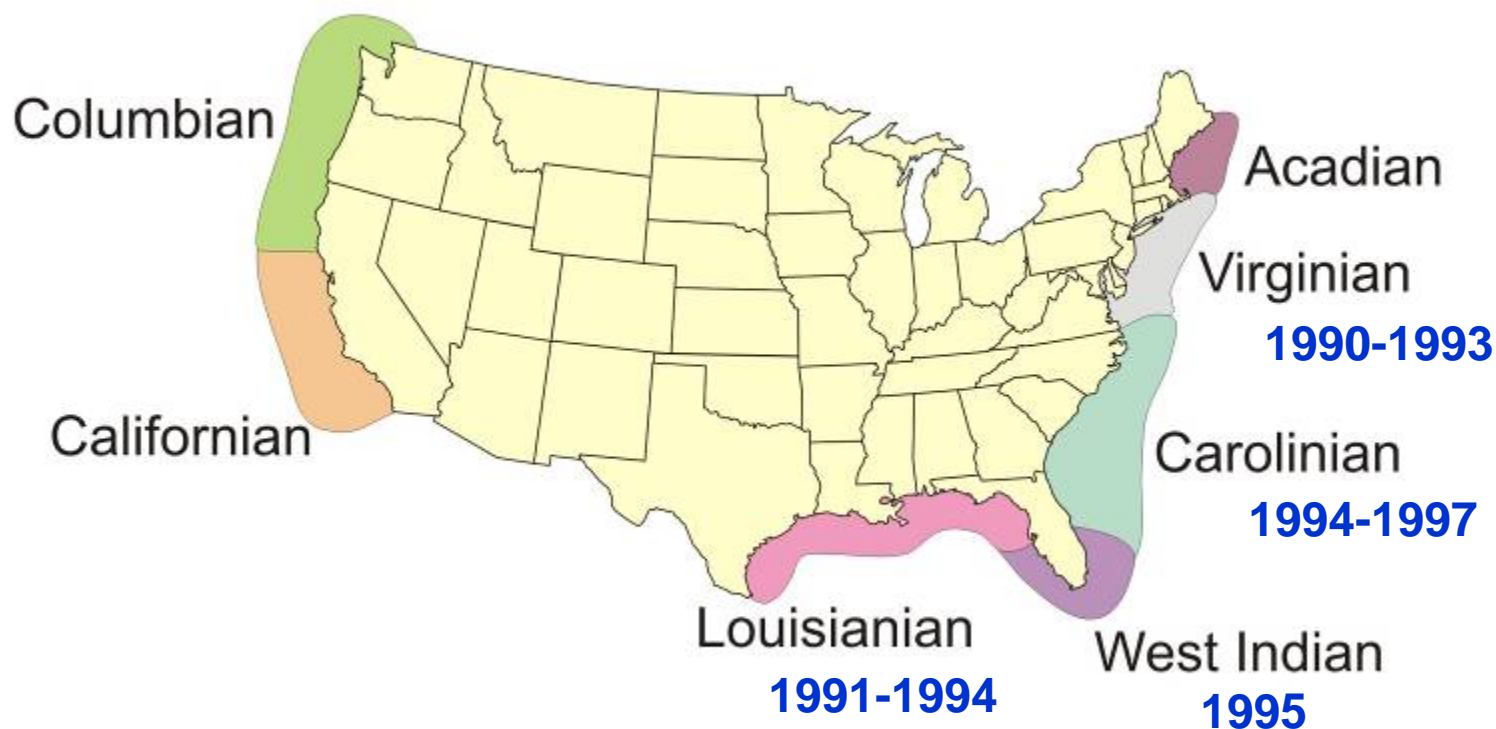


US EPA ARCHIVE DOCUMENT

# ***15 Years of Monitoring Estuaries: What have we learned?***

Virginia Engle  
US EPA  
EMAP 2007 Symposium  
April 10-11, 2007

# EMAP-Estuaries



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## *Back then...*

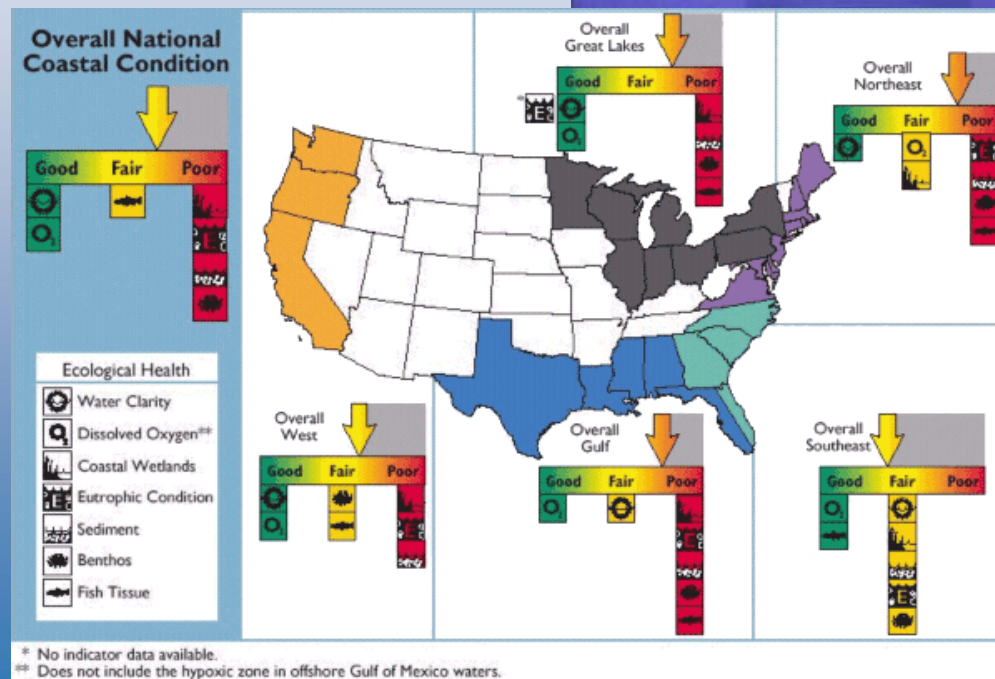
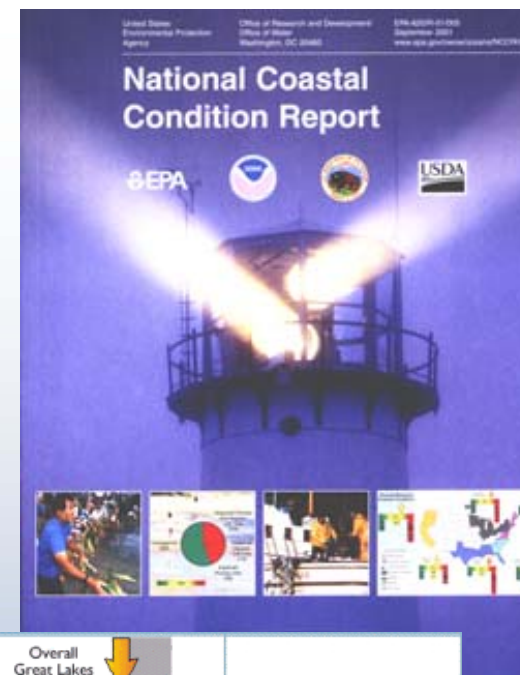
- Survey designs
  - Biogeographic province
  - Stratified – large & small estuaries, tidal rivers
- Indicators
  - Habitat – temperature, salinity, pH, secchi, silt-clay, TOC, AVS
  - Response – benthos, fish, pathology, debris, water clarity, tissue contaminants
  - Exposure – DO, sediment toxicity, sediment contaminants





# 1<sup>st</sup> NCCR

- 70% of conterminous U.S. estuarine area represented
- EMAP-Estuaries data from 1990-1997
- Overall condition was fair (score=2.4)
- 56% in good condition
- 44% impaired for human or aquatic life use
- SE rated best overall;
- Gulf rated worst.



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## *What did we learn?*

- Need to build partnerships with coastal states
- Need to add nutrients & chlorophyll measures to assess water quality
- Need flexible survey designs to meet multiple objectives



# Coastal 2000 → NCA

## Sampling Stations - National (1997-2000)



- Survey designs
  - Stratified by State
  - USGS Frame – US estuaries
  - Included some existing state monitoring stations
  - Added NE and West Coasts and Puerto Rico



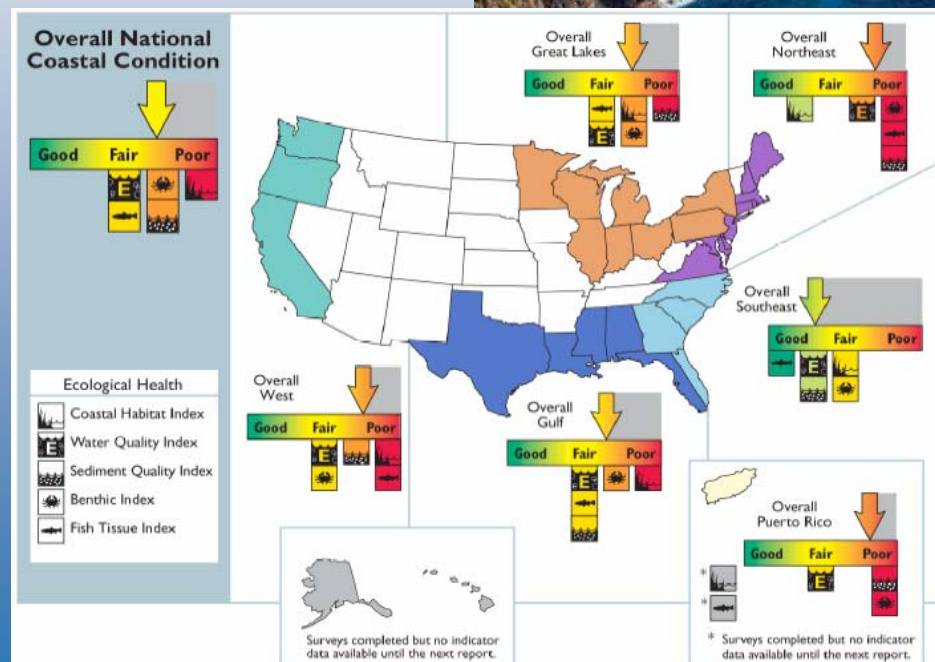
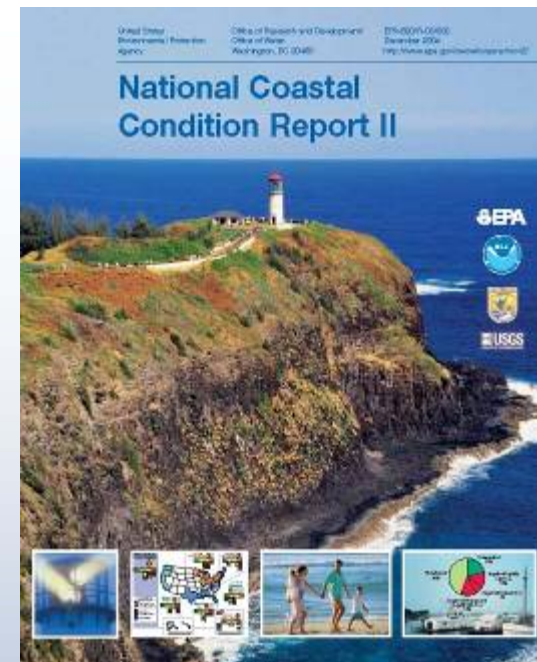
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# NCCRII

- 100% of conterminous US estuarine area represented
- NCA (+ MAIA) data from 1997-2000
- Overall condition was fair (score=2.3)
- 21% in good condition
- 44% in fair condition
- 35% impaired for human or aquatic life use
- SE rated best overall; Puerto Rico rated worst.



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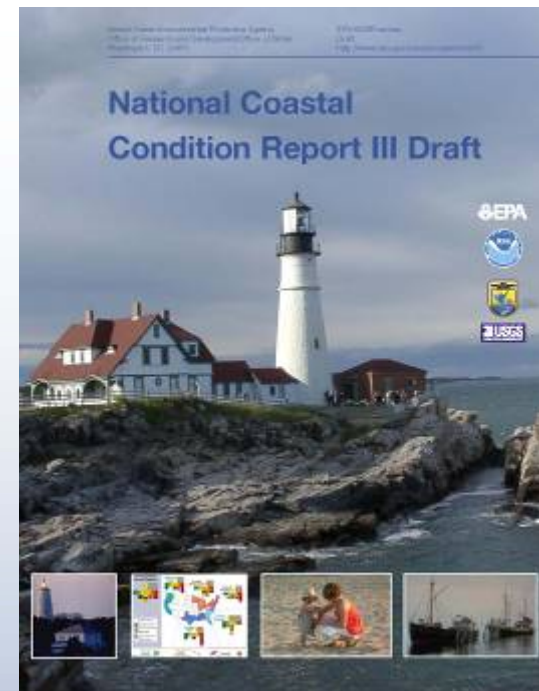
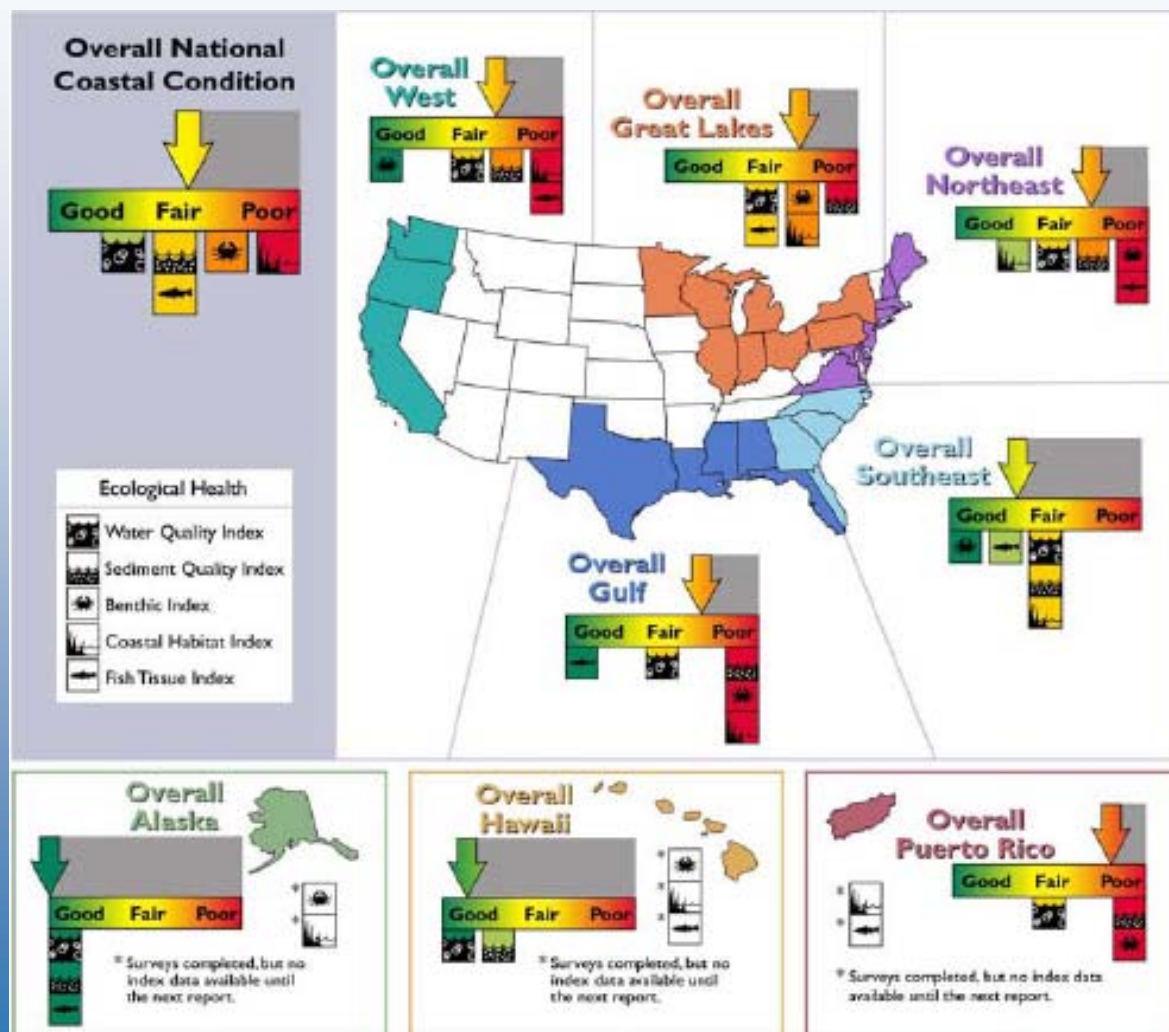
## NCCR vs NCCR2

- NCCR Indicators
  - Water Clarity
  - Dissolved Oxygen
  - Coastal Wetlands
  - Eutrophic Condition
  - Sediment
  - Benthos
  - Fish Tissue
- NCCR2 Indicators
  - Water Quality Index
  - Sediment Quality Index
  - Benthic Index
  - Coastal Habitat Index
  - Fish Tissue Index

	NE	SE	Gulf	West	GL	PR	US
NCCR	1.8	3.6	1.8	2.0	1.4	--	2.0
NCCR2	1.8	3.8	2.4	2.0	2.2	1.7	2.3



# Draft NCCRIII



- NCA 2001-2002
- Added AK & HI
- Assessed trends
- Overall condition was fair (2.8)
- AK rated best; PR rated worst.



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# Assessing Trends

- Challenges
  - Estuarine resource surveyed has changed over time
  - Indicators and scoring methods have changed over time
- But if we...
  - assume that the condition of all estuaries has a similar distribution to the condition of those surveyed and,
  - adjust the indicators and scores to ensure comparability over time then...
- We can assess temporal change in the condition of estuaries by region and for the US.



# *Regional Trends*

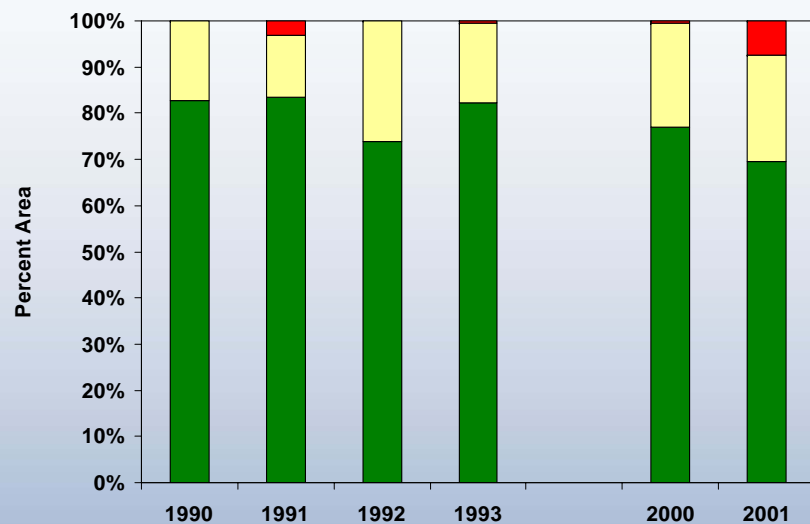
- EMAP-Estuaries province data compared to NCA data
  - boundaries adjusted to match
- Indicators in common
  - DO, water clarity
  - Benthic Index
  - Sediment TOC, toxicity, contaminants
- Analysis
  - CDFs by year
  - Comparison of 2 time periods (e.g., 1990-1993 vs 2000-2001 for NE)
- Comparison of Scores from NCCR, NCCRII, NCCRIII



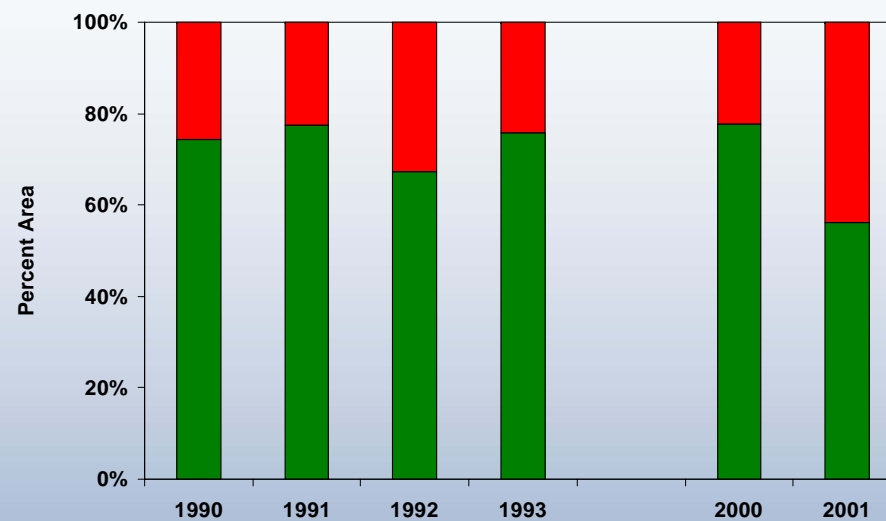


# NE Trends

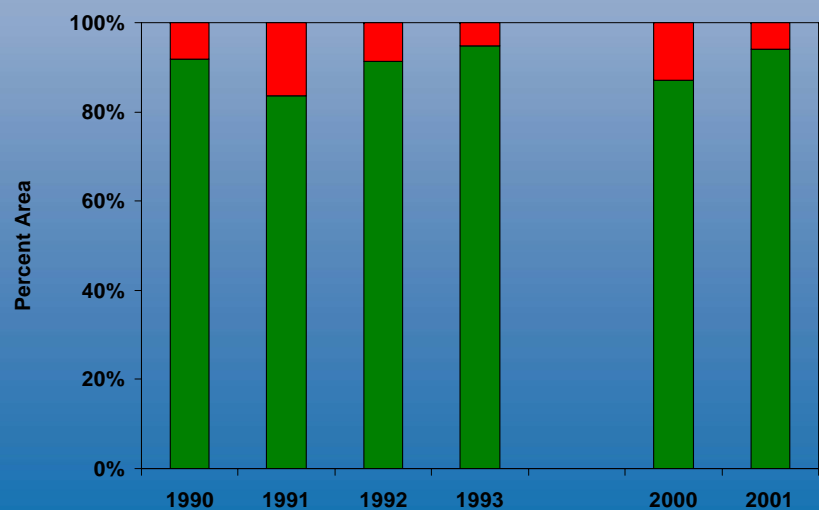
Dissolved Oxygen



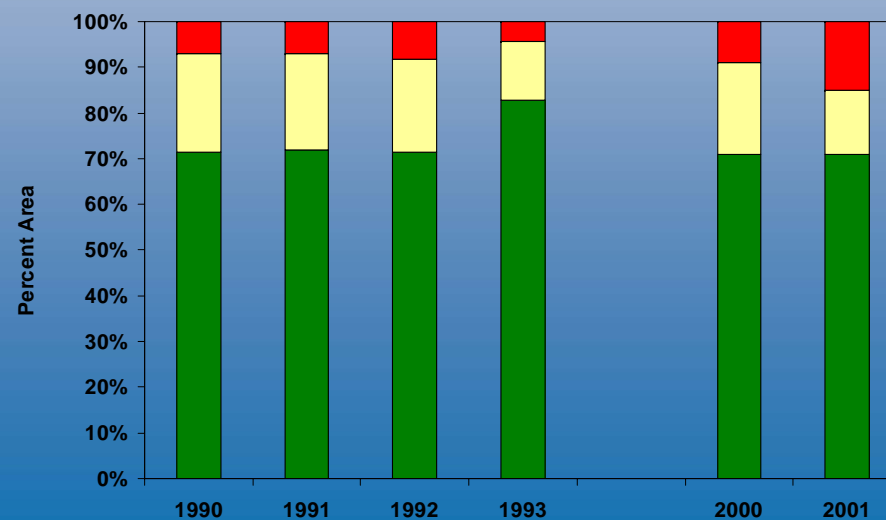
Benthic Index



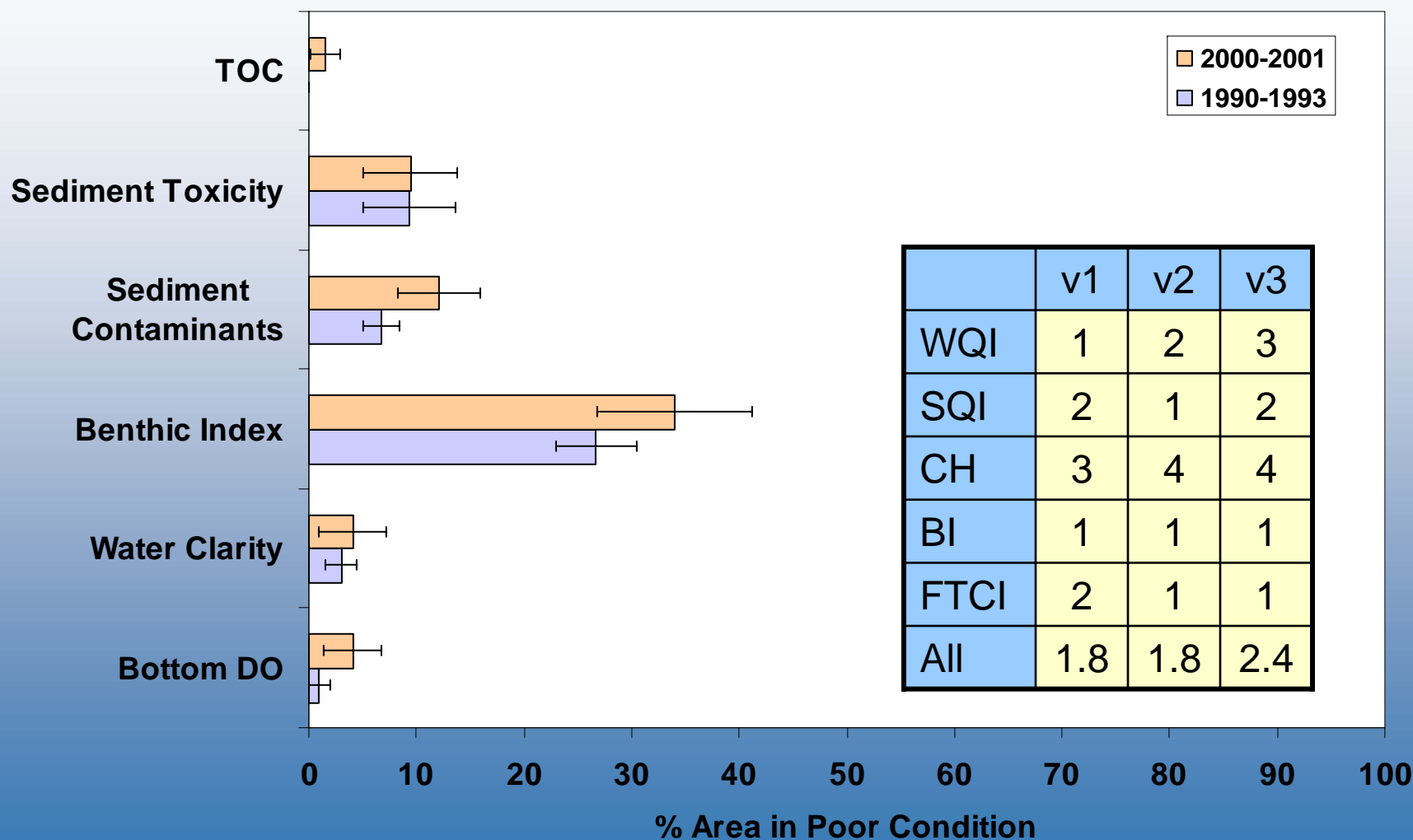
Sediment Toxicity



Sediment Contaminants



# NE Trends



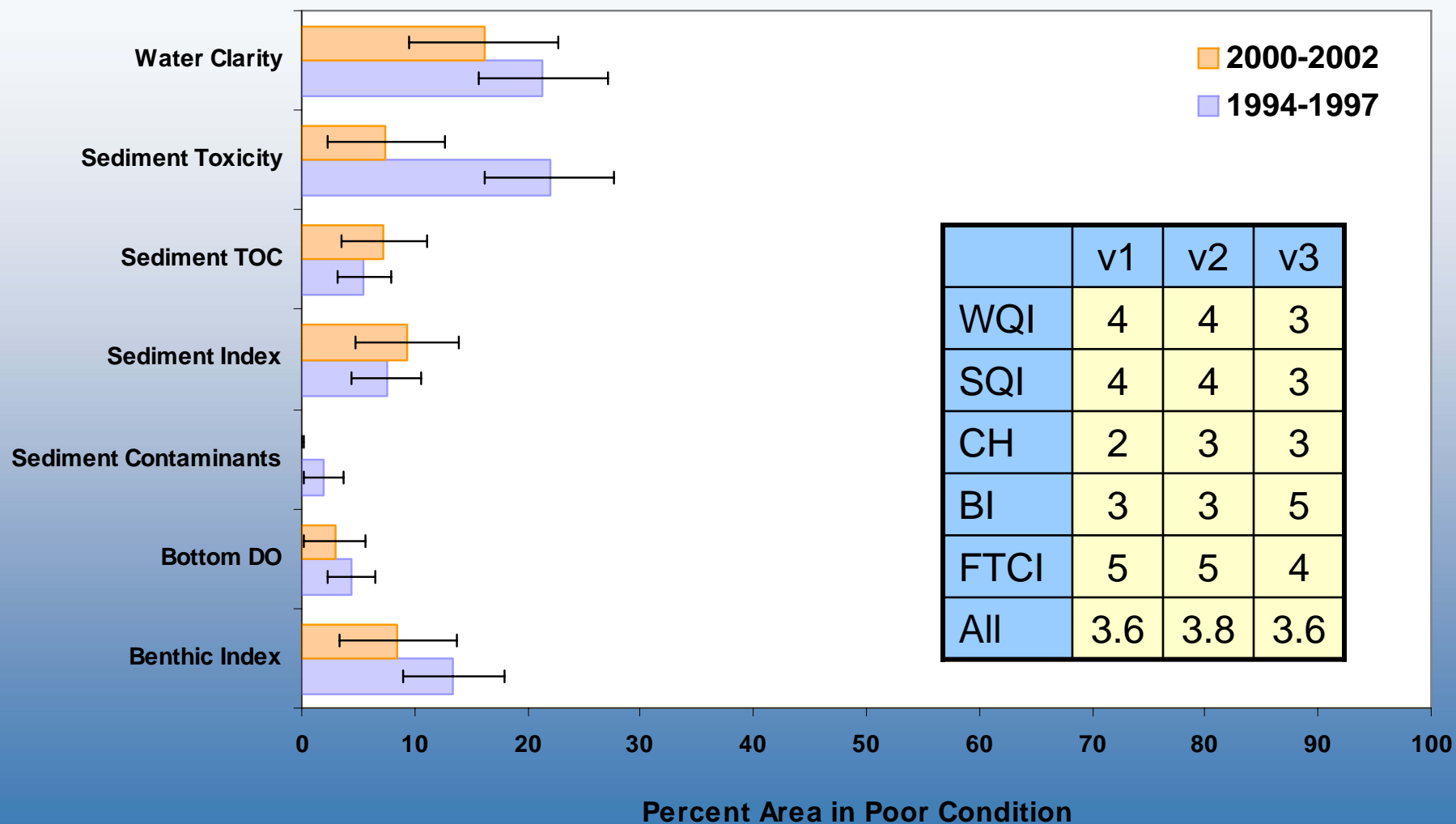
	v1	v2	v3
WQI	1	2	3
SQI	2	1	2
CH	3	4	4
BI	1	1	1
FTCI	2	1	1
All	1.8	1.8	2.4



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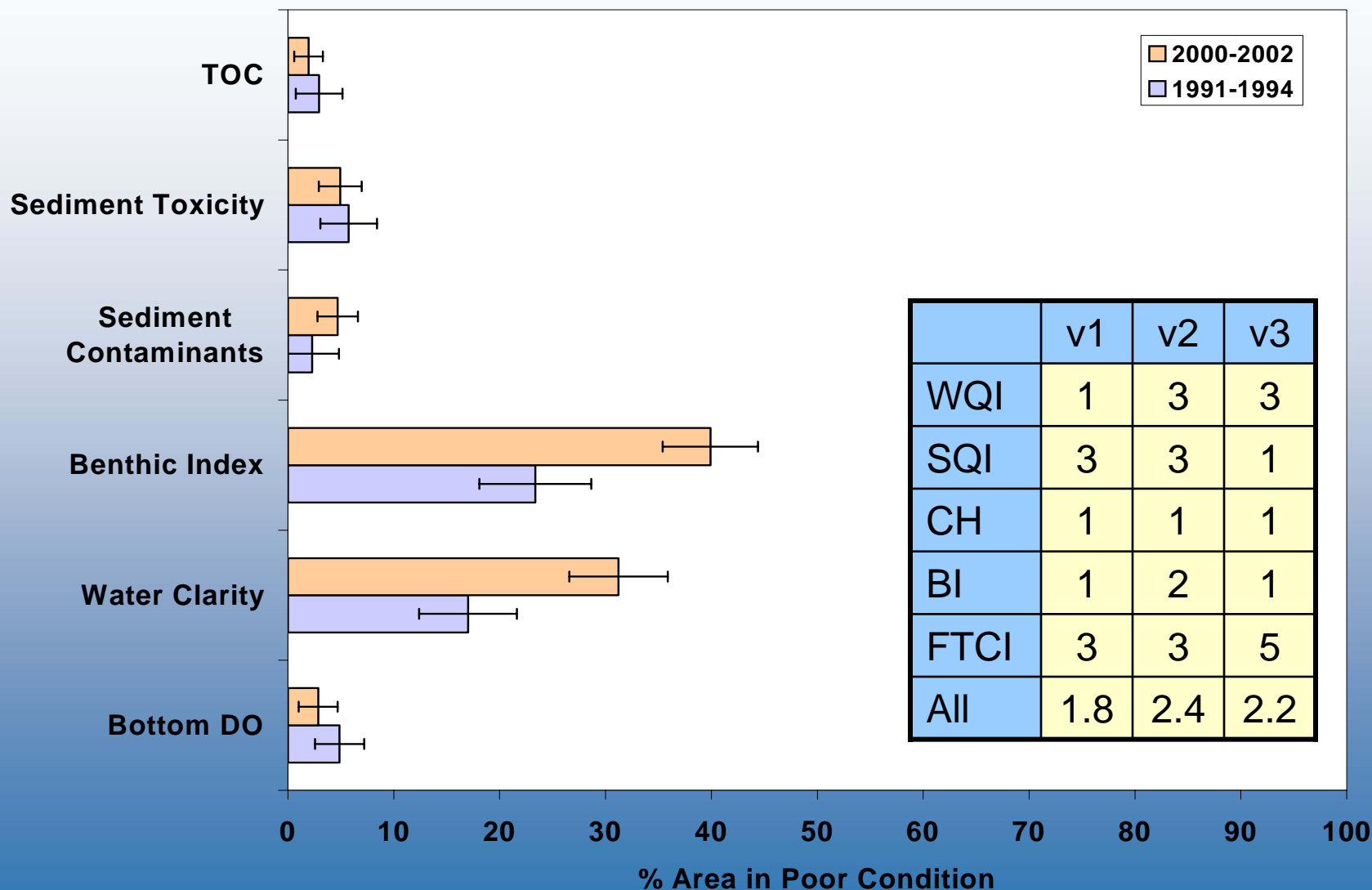
# SE Trends



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# Gulf of Mexico Trends



	v1	v2	v3
WQI	1	3	3
SQI	3	3	1
CH	1	1	1
BI	1	2	1
FTCI	3	3	5
All	1.8	2.4	2.2



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## *Other Regions*

- West Coast
  - Original pilot not designed to assess trends
  - NCCRIII – trends reported for Puget Sound, San Francisco Bay, & Southern California Bight
- AK & HI
  - No historical EMAP data available
- Great Lakes
  - Not NCA – GLP uses different methods but some similar indicators
  - Can't calculate spatial estimates of condition but can compute scores
- Puerto Rico
  - No new data available to assess trends

# Score Comparisons

## West Coast

	v1	v2	v3
WQI	1	3	3
SQI	2	2	2
CH	1	1	1
BI	3	3	5
FTCI	3	1	1
All	2.0	2.0	2.4

## Great Lakes

	v1	v2	v3
WQI	1	3	3
SQI	1	1	1
CH	1	2	2
BI	1	2	2
FTCI	3	3	3
All	1.4	2.2	2.2

## AK

	v3
WQI	5
SQI	5
CH	-
BI	-
FTCI	5
All	5.0

## HI

	v3
WQI	5
SQI	4
CH	-
BI	-
FTCI	-
All	4.5

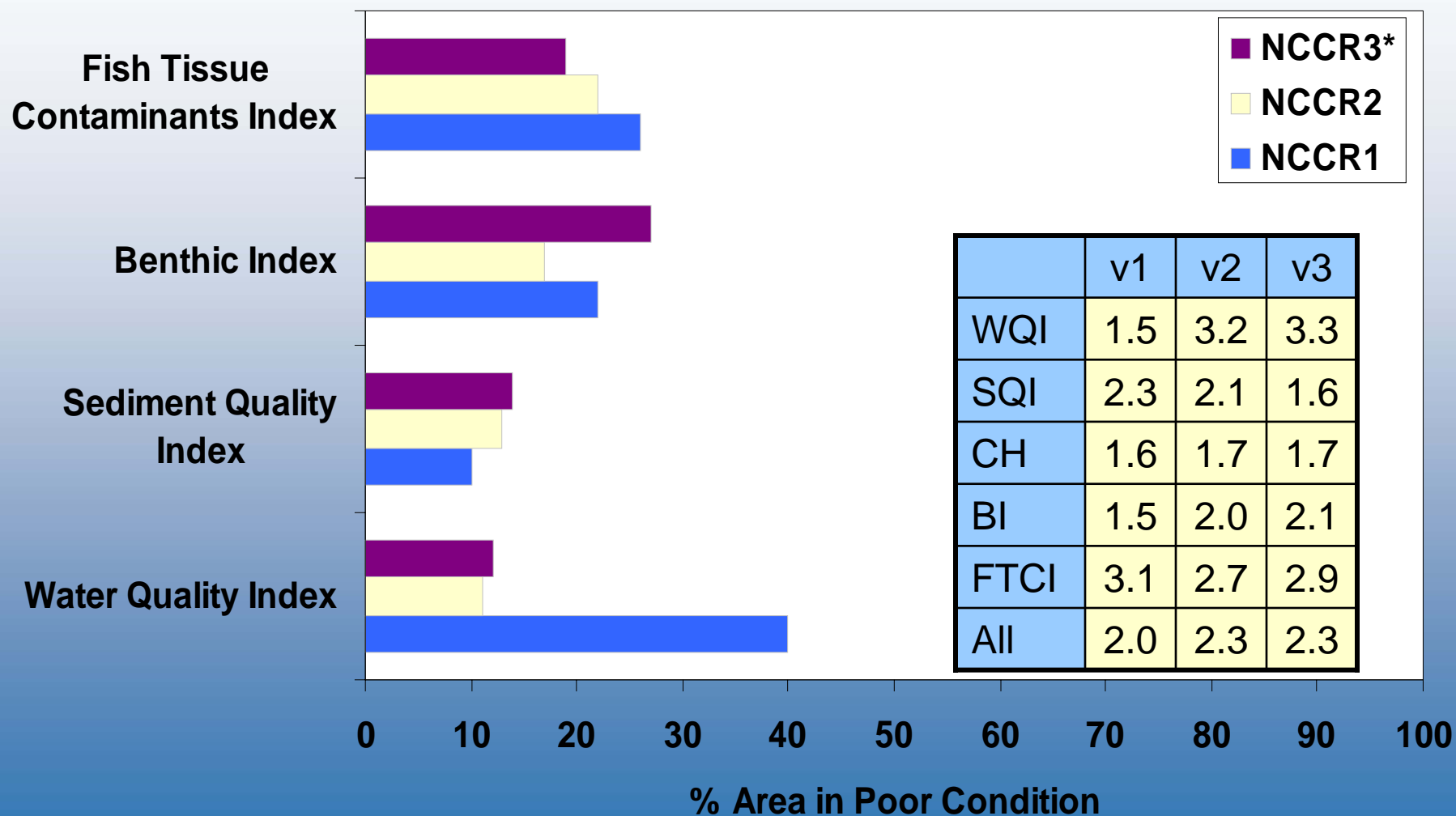
## Puerto Rico

	v2	v3
WQI	3	3
SQI	1	1
CH	-	-
BI	1	1
FTCI	-	-
All	1.7	1.7





# US Trends (excluding AK & HI)



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## *What have we learned?*

	NE	SE	Gulf	West	PR	AK, HI	US
WQI	↑	↓	↑	↑			↑
SQI		↓	↓				
CH	↑	↑					
BI		↑		↑			↑
FTCI	↓	↓	↑	↓			
Overall	↑			↑			↑



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## *What have we really learned?*

- Consistency & comparability is key
- When all else fails, be creative
- Successful partnerships require negotiation & compromise
  - EPA gets what we need
  - States get what they need
- Surveys of condition are great for status & trends but do not answer all questions



## *What's next?*

- NCCRIV
  - Draft completed 2009
  - NCA 2003-2006 + Trends
- EPA Office of Water
  - Surveys of the Nation's Waters
  - Coastal 2010 - 1000 sites in US
  - Comparable to NCA
  - Conducted by States with §106 \$\$
  - Report in 2012



