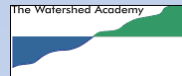# EPA Releases Scientific Report Showing U.S. Coastal Waters a Mix of Good and Fair Health

Webcast sponsored by EPA's Watershed Academy

Thursday, February 25, 2016

1:00pm – 3:00pm Eastern

Instructors:

- **Sarah Lehmann**, Team Leader for National Aquatic Resource Surveys, Monitoring Branch, U.S. Environmental Protection Agency, Office of Water

- **Hugh Sullivan,** Environmental Protection Specialist, Acting National Coastal Condition Assessment Project Lead, on Detail to the Monitoring Branch, U.S. Environmental Protection Agency, Office of Water

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Webcast Logistics

- **To Ask a Question** – Type your question in the "Questions" tool box on the right side of your screen and click "Send."

- **To report any technical issues** (such as audio problems) – Type your issue in the "Questions" tool box on the right side of your screen and click "Send" and we will respond by posting an answer in the "Questions" box.
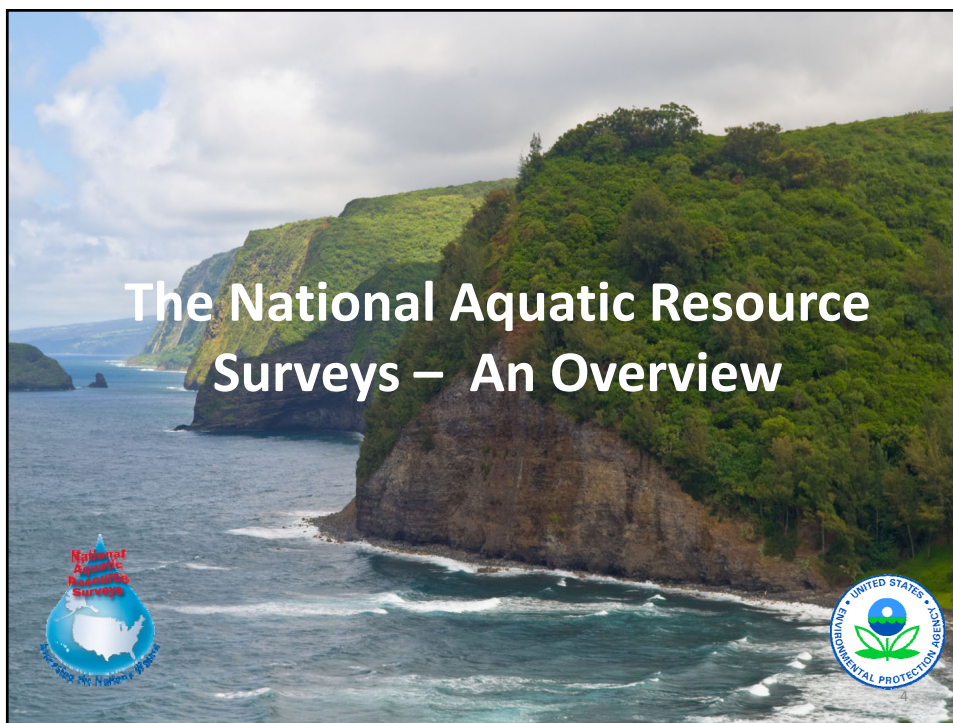
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Overview of Today's Webcast

- Overview of the National Aquatic Resource Survey (NARS).

- Results of the National Coastal Condition Assessment (NCCA).
  - National Coastal Condition Assessment Overview and Key Findings
  - Survey Design and Indicators
  - National Results and Change in Condition
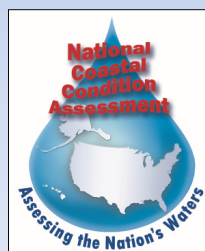
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The National Aquatic Resource Surveys – An Overview

Presentation Outline

- **Background**
- **NARS Approach**
- **Accomplishments**
- **Current and Upcoming Milestones**

What is NARS?

Coastal   *Streams and Rivers*   *Wetlands*   *Lakes*

- Series of surveys implemented by EPA and our state and tribal partners addressing 4 waterbody types
- Assess all surface waters within the 48 conterminous states
- Cost effective, nationally consistent, regionally relevant means of tracking status and trends
- Builds from almost 20 years of research and pilots

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Purpose of the National Aquatic Resource Surveys

- Assess biological and recreational condition and change over time

- Document associations between indicators of condition and indicators of stress

- Build/enhance state monitoring and assessment capacity

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Why is NARS important?

Provides national assessments	• Address gaps in information about the condition of the nation's waters with statistical confidence. • Reports used as water quality outcome measures of progress tracking protection and restoration nationally.
Supports national priorities	• Results support continued nutrient pollution reduction and habitat protection for lakes, rivers and streams, estuaries and wetlands. • Critical data set for identifying and responding to concerns about HABs, defining baseline conditions for Gulf of Mexico.
Complements state and local monitoring	• Reports extent of degradation and risk key stressors pose to water quality at national and regional scales. • State and local monitoring are key to informing local priorities for site specific restoration actions and watershed protection.

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National Consistency: NARS Approach

- Randomized design to report on condition of each resource nationally and regionally
  - 1,000 sites in lower 48

- Standard field and lab protocols

- National QA and data management

- Nationally consistent and regionally relevant data interpretation and peer-reviewed reports

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Types of Survey Indicators and Measures

Biological indicators such as:
- Benthic macroinvertebrates
- Plants
- Fish community

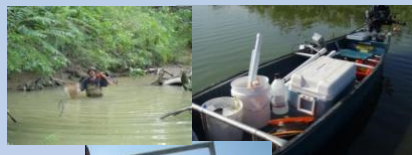**Public health indicators** such as
- Fish tissue
- Pathogens (e.g., enterococci)
- Microcystin and other algal toxins

Occurrence and extent of key **stressors** such as:
- High levels of Nutrients
- Excess sediment
- Physical habitat characteristics (e.g. riparian cover)

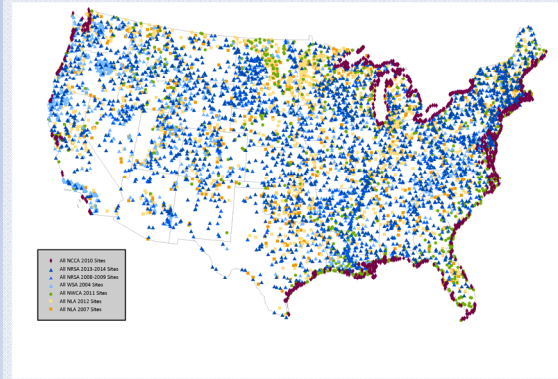May include pertinent **research indicators** such as:
- Sediment enzymes
- Contaminants of emerging concern

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Accomplishments

Sites Sampled as part of the National Aquatic Resource Surveys

2015: More than 12,000 sites sampled

First ever, nationally consistent assessments of coastal waters, lakes and reservoirs, rivers and streams, and wetlands.

Assessments address ecological and human-health indicators; stressors; and changes over time

Expanded/strengthened state, tribal and interagency partnerships

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2015: Comprehensive, consistent, and statistically-valid assessments

Results: Increased ability to report on the condition of our waters

Coastal: >35,000 square miles a **40% increase** from 2004

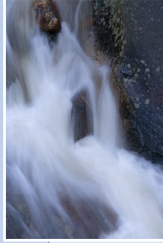Lakes: >110,000 lakes which **substantially increases** the assessed acres since 2004

Rivers/streams: >1.2 million miles more than **doubling the assessed miles** since 2004

Wetlands: >60,000,000 acres resulting in a **30 fold increase** since 2004

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Current and Upcoming Milestones

Reporting

- N R S A 2008/09 – F i n a l released expected March/April 2016
- NCCA 2010 – Final report released January 2016
- NWCA 2011 – Released for public comment; final report expected April 2016
- NLA 2012 – Release in 2016 for public comment

New Data Collection

- NRSA 2013/14 – Data are in final stages of QC; analysis beginning
- NCCA 2015 – Finished field season; samples being processed by labs
- NWCA 2016 – Making final preparations for the 2016 field season
- NLA 2017 – Planning and preparations have already begun. Design completed and indicators selected

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Estuaries

Lakes

Wetlands

Questions?

Streams

Rivers

National Coastal Condition Assessment 2010


Presentation Outline

- National Coastal Condition Assessment Overview and Key Findings
- Survey Design and Indicators
- Detailed National Results and Change in Condition

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NCCA Overview and Key Findings

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Previous National Coastal Condition Reports

1990 -1996

1997 -2000

1997 -2003

2001 - 2002

2003 - 2006

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The NCCA 2010 is the Fifth Coastal Condition Reports

- The 2010 survey transitioned the NCCA from research to monitoring.
- 1st statistically valid randomized survey of the Great Lakes nearshore and embayment waters.
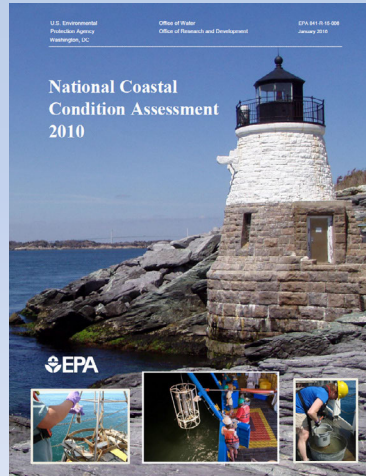
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Why Monitor Coastal Waters?

Coastal Waters are Important

- Valuable and productive ecosystems.
  - Support wildlife and fisheries
  - Commercial fishing industry supports 1 million jobs and over $51 Billion in income.
  - Provide recreation and tourism, and enhance the quality of life

Why be Concerned?

- Land-based environmental pressure
  - Solid waste and non-point source pollution
  - Loss of greenspace and habitat
- Offshore stressors
  - Overexploitation of fisheries
  - Contamination from ocean dumping and energy development
- New pressures from climate change
  - Sea level rise
  - Ocean acidification

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What is the Purpose of the NCCA 2010?

- Answer key questions about coastal and Great Lakes nearshore waters
  - What is the condition of the nation's coastal waters?
  - Is the condition of coastal waters getting better or worse?
  - What is the extent of stressors affecting coastal waters?
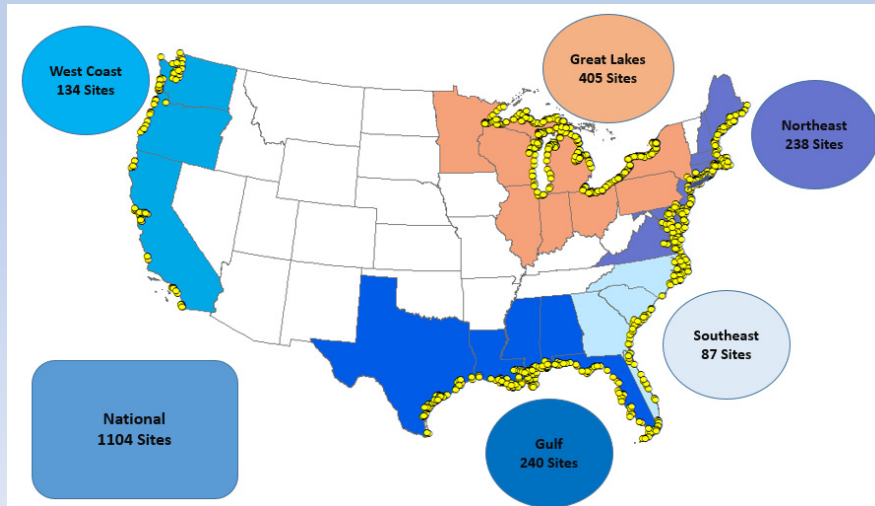
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NCCA 2010 Project Scope

- 47 crews sampled 1,104 sites around the country
- 10 sample types collected and tracked through labs for each site
  - 3 additional sample types collected at Great Lakes sites
- More than 15 *in situ* measurements and observations at each site.
- Extensive QA/QC throughout field, lab and data analysis

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Locations of NCCA 2010 Sampling Sites

- 1,104 sites represent 35,400 square miles of coastal waters.

West Coast
134 Sites

Great Lakes
405 Sites

Northeast
238 Sites

Southeast
87 Sites

National
1104 Sites

Gulf
240 Sites

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National Coastal Condition 2010 Report contains

- **National and Regional Assessments of**
  - **Biological Quality**
    - Benthic Macroinvertebrates
  - **Water Quality**
    - Nutrients
      - Phosphorus
      - Nitrogen
    - Chlorophyll *a*
    - Dissolved Oxygen
    - Water Clarity
  - **Sediment Quality**
    - Sediment Chemistry
    - Sediment Toxicity
  - **Ecological Fish Tissue Quality**
    - Ecological Fish Tissue Contaminants
  - **Change in Condition***
    - Biological Quality
    - Sediment Quality
    - Water Quality

- **Highlights include:**
  - Watershed influence on Great Lakes Waters
  - Potential Utility of Video Sampling
  - Great Lakes Human Health Fish Tissue Study
  - NOAA Gulf of Mexico Offshore Surveys
  - The Gulf of Mexico Oil Spill: *Sediment Findings from NCCA 2010*
  - Monitoring in Alaska's Northeastern Chukchi Sea

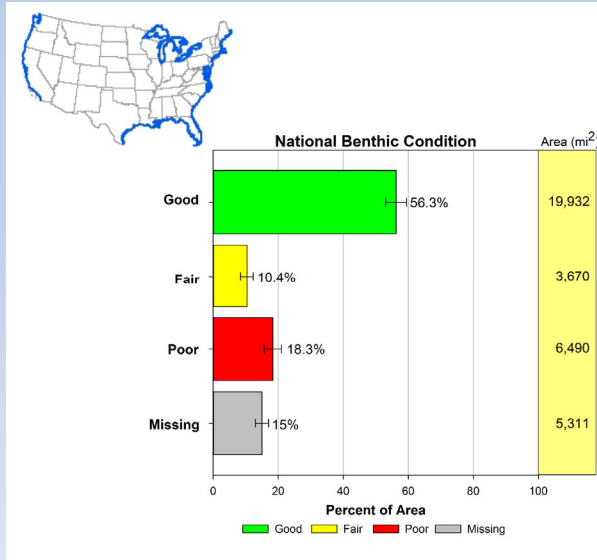* No change assessment available for Great Lakes waters

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Findings – Biological Quality

56% of U.S. coastal and Great Lakes nearshore waters are in good biological condition, supporting healthy communities of benthic macroinvertebrates.

Compared to a 2005-06 coastal assessment, *17% more* square miles of coastal waters are in good biological condition.*

*Great Lakes waters were first assessed in 2010 and are not included in change statistics.

National Benthic Condition — Area (mi²)

| Condition	Percent of Area	Area (mi²)
Good	56.3%	19,932
Fair	10.4%	3,670
Poor	18.3%	6,490
Missing	15%	5,311

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Findings – Water Quality

36% of U.S. coastal and Great Lakes nearshore waters have good water quality.

Phosphorus is the leading indicator contributing to poor condition in coastal waters.

This is not a significant change in percent area rated good for overall water quality since the 2005-06 survey.
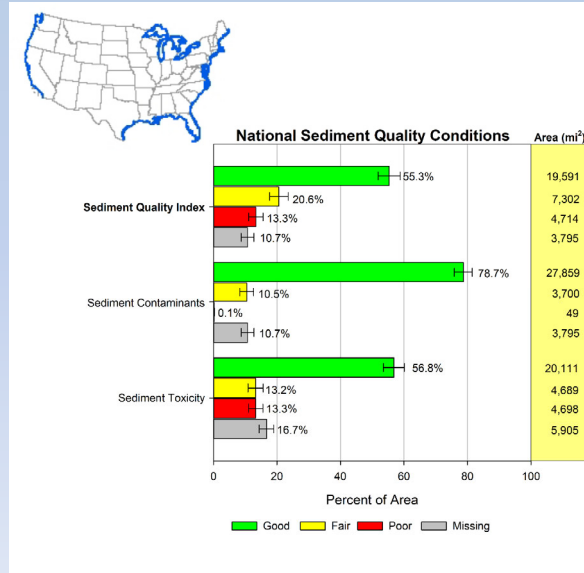

National Water Quality Condition
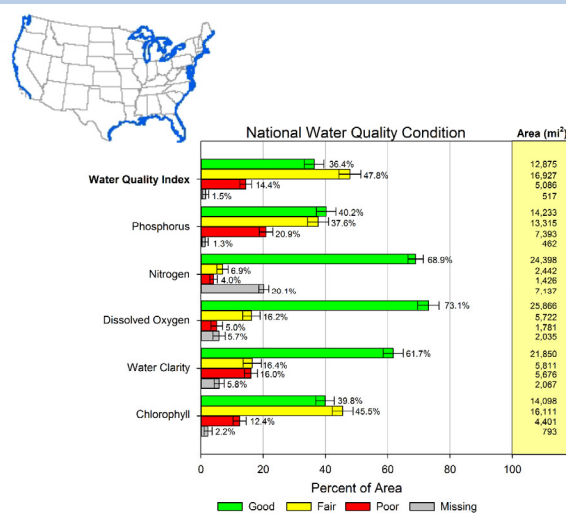
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Findings – Sediment Quality

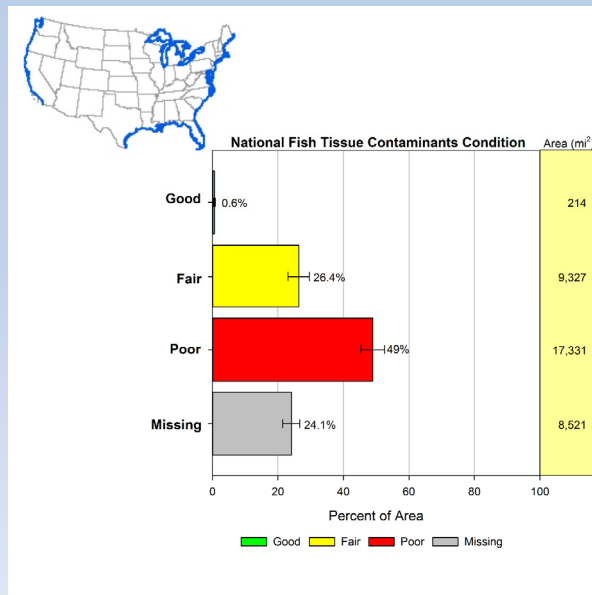**55% of U.S. coastal and Great Lakes nearshore waters have good sediment quality.**

Areas rated good decreased by 22% between 2005-06 and 2010.

National Sediment Quality Conditions

Sediment Quality Index		Area (mi²)
Good	55.3%	19,591
Fair	20.6%	7,302
Poor	13.3%	4,714
Missing	10.7%	3,795

Sediment Contaminants
	78.7%	27,859
	10.5%	3,700
	0.1%	49
	10.7%	3,795

Sediment Toxicity
	56.8%	20,111
	13.2%	4,689
	13.3%	4,698
	16.7%	5,905

Good Fair Poor Missing

Findings – Ecological Fish Tissue Quality

Nationally, less than 1% of coastal and nearshore Great Lakes waters are rated good for fish tissue contaminants that pose potential for harm to the most sensitive wildlife.

This index is used to assess potential harm to wildlife, not people.

National Fish Tissue Contaminants Condition

		Area (mi²)
Good	0.6%	214
Fair	26.4%	9,327
Poor	49%	17,331
Missing	24.1%	8,521

Good Fair Poor Missing

Questions?

NCCA 2010
Design and
Indicators

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What is the Target Population?

- Estuarine
  - All coastal waters of the contiguous United States from the head of salt to the confluence with the ocean.
    - Includes inland waterways and major embayments.
    - Head of salt is defined as 0.5 parts per thousand.
- Great Lakes
  - Near shore and embayment waters of the Great Lakes of the United States.
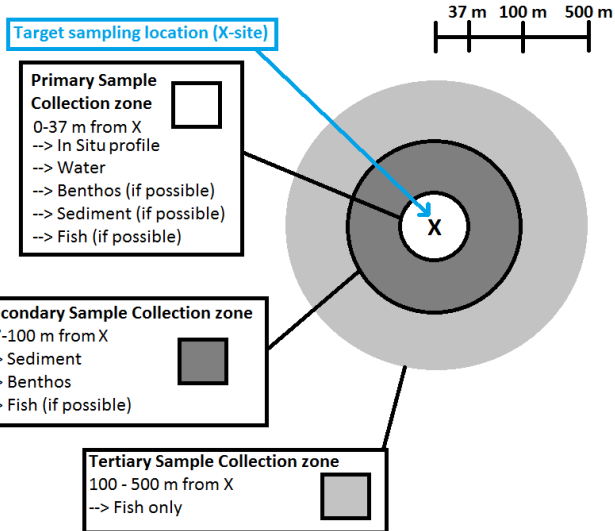   - Defined as up to 30 m in depth and less than 5 km from the shoreline.

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How Were Sampling Locations Selected?

- Randomized* survey design
  - Spatially balanced
  - Unbiased
- Results represent coastal condition of the target population at national and regional scales.

* As a probability-based survey, the NCCA does not target known problem areas.

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NCCA Sampling Diagram

Target sampling location (X-site)

Primary Sample Collection zone
0-37 m from X
--> In Situ profile
--> Water
--> Benthos (if possible)
--> Sediment (if possible)
--> Fish (if possible)

Secondary Sample Collection zone
37-100 m from X
--> Sediment
--> Benthos
--> Fish (if possible)

Tertiary Sample Collection zone
100 - 500 m from X
--> Fish only

37 m   100 m   500 m

X

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NCCA 2010 Core Indicators
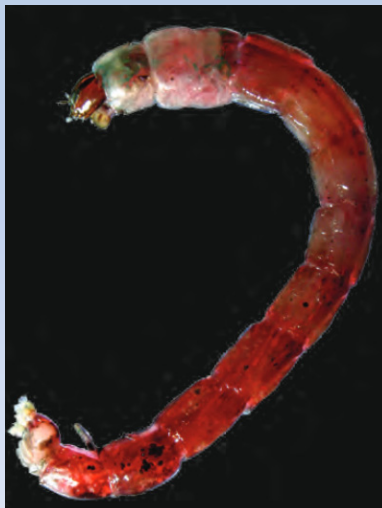
Water Quality

Sediment Quality

Ecological Fish Tissue Quality

Biological Quality

Biological Quality

- Comparable regional benthic indices used to rate quality on several metrics
  - Benthic community diversity
  - Abundance of pollution tolerant and sensitive macroinvertebrates
  - Species richness

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Water Quality

- Index created from five water quality indicators
  - Nutrient enrichment indicators
    - Surface Phosphorus
    - Surface Nitrogen
  - Indicator of amount of algae (biomass)
    - Surface Chlorophyll *a*
  - Indicators of adverse effects of eutrophication
    - Bottom Dissolved Oxygen
    - Water Clarity

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Sediment Quality

- The sediment quality index evaluates the potential that sediment contaminants will adversely affect benthic organisms.
  - Sediment Chemistry
    - Metals
    - PCBs
    - PAHs
    - Insecticides
  - Sediment Toxicity

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Ecological Fish Tissue Contaminants

- Index evaluates whether contaminant levels in whole-body fish tissue pose a potential harm to the most sensitive fish-eating predators (receptors).
  - Receptors
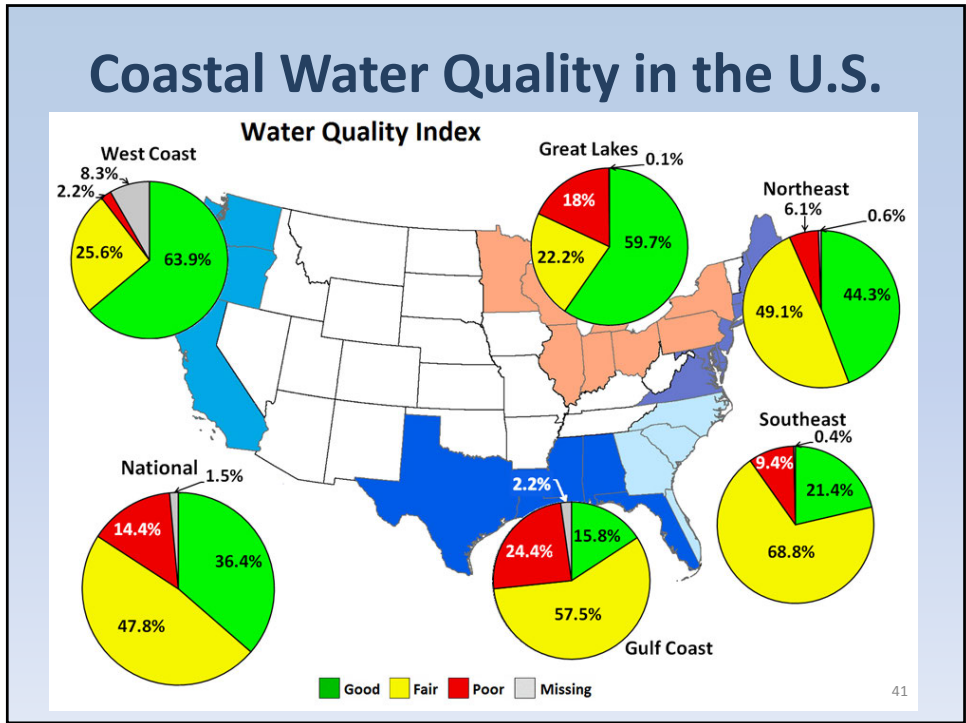   - Fish
    - Birds
    - Mammals

This index is used to assess potential harm to wildlife, not people.

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Questions?

NCCA 2010
Detailed National
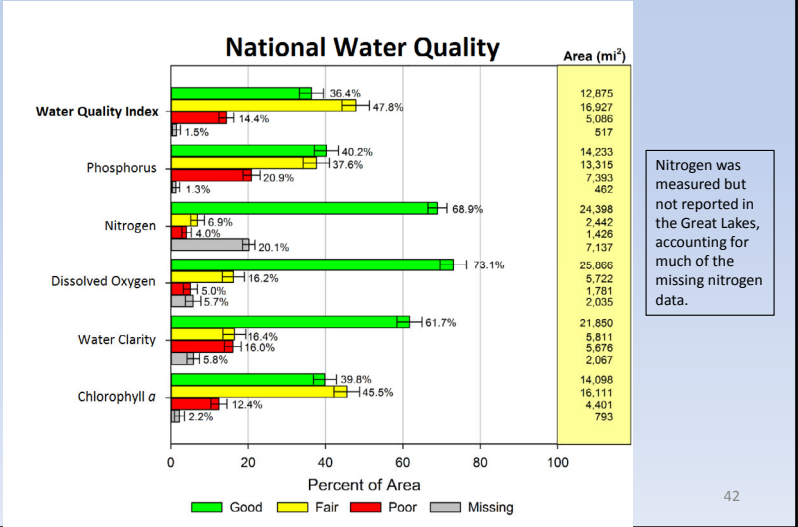Results and Change
in Condition

Coastal Water Quality in the U.S.

Detailed Findings – Coastal Water Quality

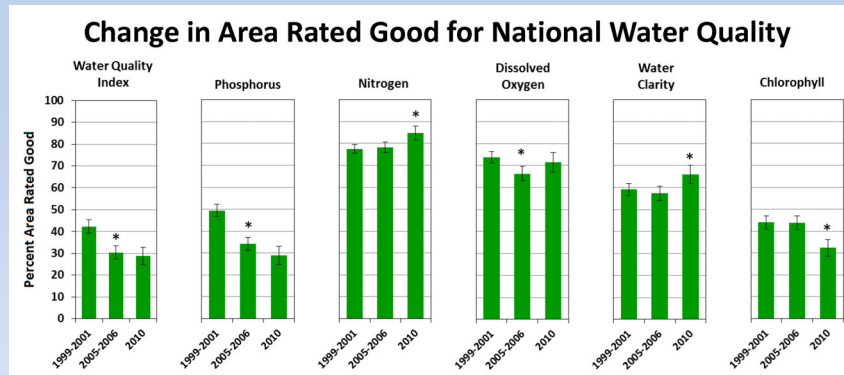**36% of U.S. coastal and Great Lakes nearshore waters have good water quality. 48% have fair water quality, while 14% have poor.**

Change in Coastal Water Quality

The **Takeaway**: While in 2010 there is no significant change in water quality from the previous period, water quality has worsened over the last decade, as indicated by the decrease in area rated good.
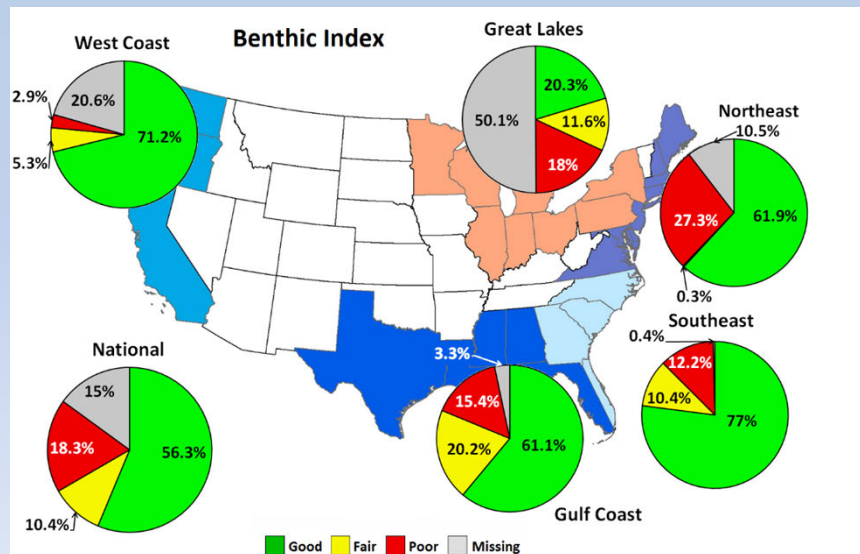

Percent area rated good for the water quality index and its component indicators

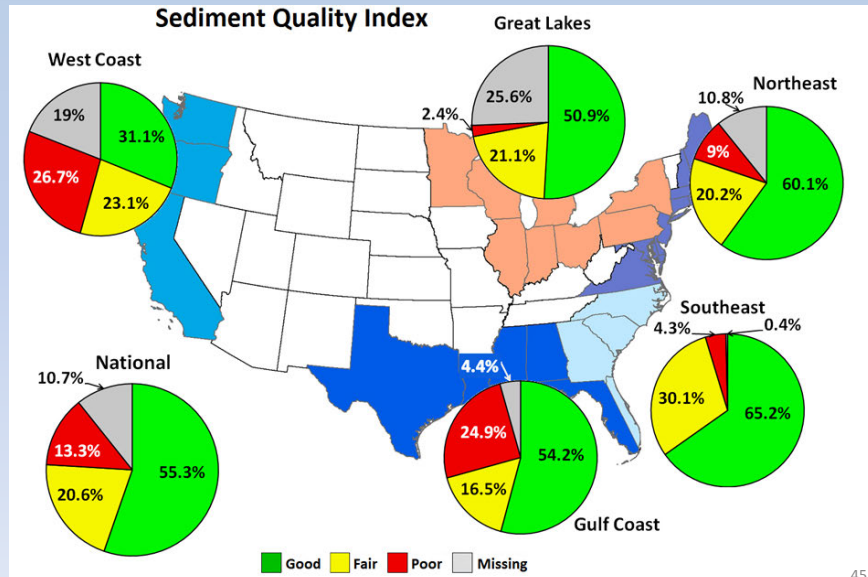* Indicates significant change from previous survey.
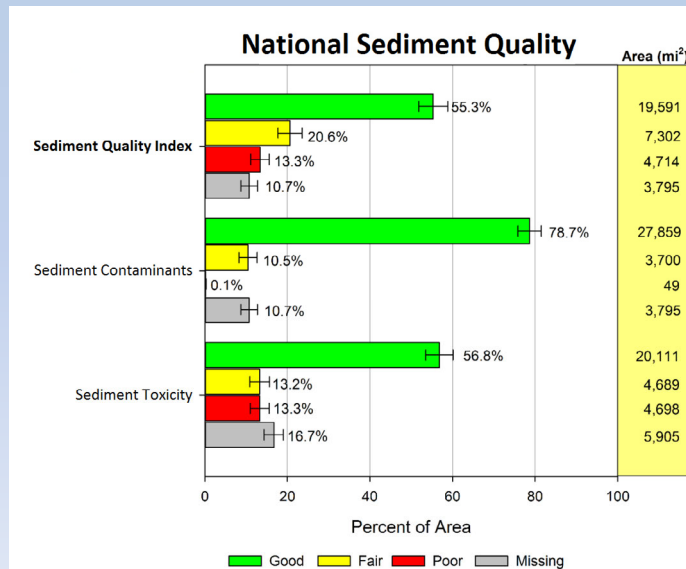
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Biological Condition of U.S. Coastal Waters

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Sediment Quality in U.S. Coastal Waters

Sediment Quality Index

West Coast: 19% Missing, 31.1% Good, 26.7% Poor, 23.1% Fair

Great Lakes: 25.6% Missing, 50.9% Good, 2.4% Poor, 21.1% Fair

Northeast: 10.8% Missing, 9% Poor, 20.2% Fair, 60.1% Good

National: 10.7% Missing, 13.3% Poor, 20.6% Fair, 55.3% Good

Gulf Coast: 4.4% Missing, 24.9% Poor, 16.5% Fair, 54.2% Good

Southeast: 4.3% Poor, 0.4% Missing, 30.1% Fair, 65.2% Good

Legend: Good, Fair, Poor, Missing

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Detailed Findings – Coastal Sediment Quality

National Sediment Quality

	Percent of Area	Area (mi²)
Sediment Quality Index	55.3%	19,591
	20.6%	7,302
	13.3%	4,714
	10.7%	3,795
Sediment Contaminants	78.7%	27,859
	10.5%	3,700
	0.1%	49
	10.7%	3,795
Sediment Toxicity	56.8%	20,111
	13.2%	4,689
	13.3%	4,698
	16.7%	5,905

Percent of Area

Legend: Good, Fair, Poor, Missing

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Change in Sediment and Biological Quality

The **Takeaway**: Sediment quality has worsened over time. Area rated good for both of the sediment indicators declined significantly in 2010. In contrast, the benthic index improved significantly across the country.
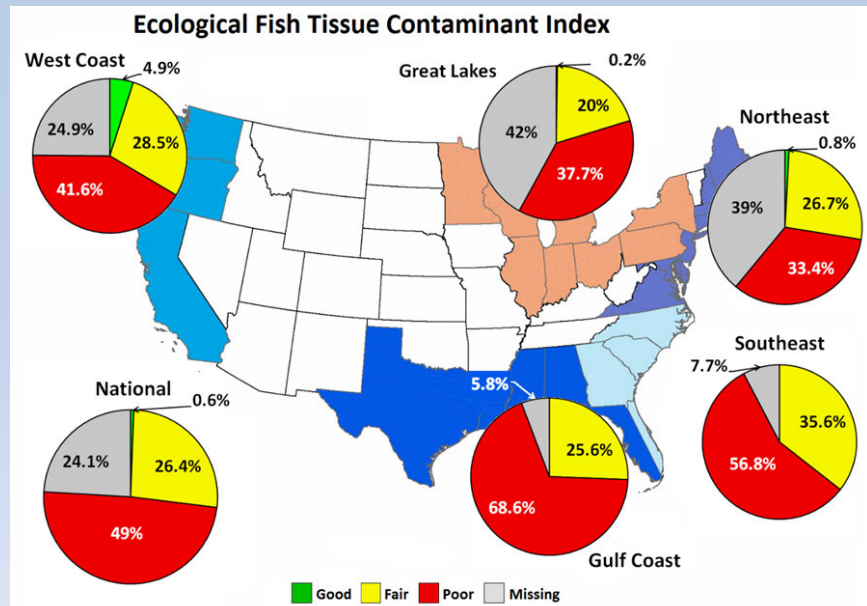
Change in Area Rated Good for National Sediment and Biological Quality
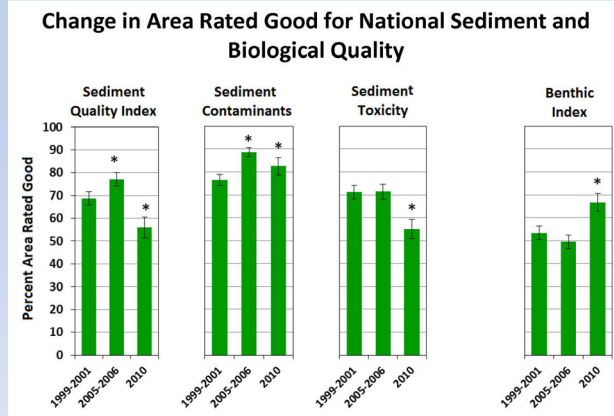
* Indicates significant change from previous survey.

Percent area rated good for sediment quality, its components, and biological quality

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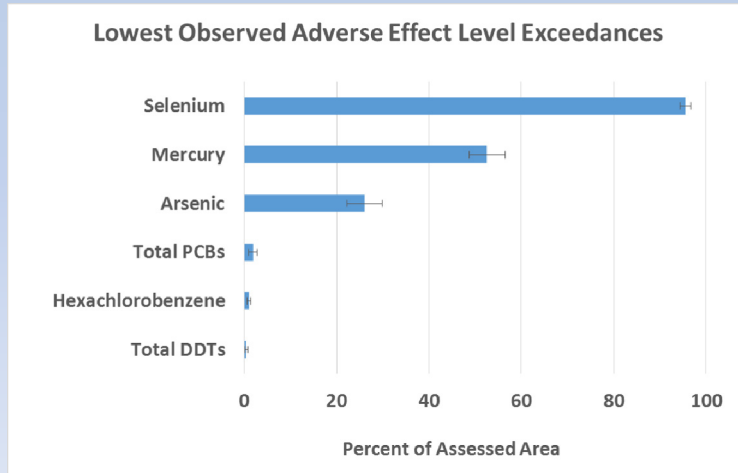## Ecological Fish Tissue Quality in U.S. Coastal Waters

Ecological Fish Tissue Contaminant Index

This index is used to assess potential harm to wildlife, not people.

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Key Findings – Ecological Fish Tissue Quality

The **Takeaway**: These contaminants have potential to accumulate in the food chain, leading to negative effects for predators of contaminated fish.

Lowest Observed Adverse Effect Level Exceedances

(Bar chart: Percent of Assessed Area, x-axis 0 to 100)

- Selenium — ~95
- Mercury — ~52
- Arsenic — ~26
- Total PCBs — ~2
- Hexachlorobenzene — ~1
- Total DDTs — ~0

This index is used to assess potential harm to wildlife, not people.

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What's Next for the NCCA?

- 2015 field sampling completed
  - In addition to indicators used in previous years, new indicators include:
    - Algal toxins
    - Mercury in fish fillets
    - Types and extent of land-based trash
  - Samples undergoing lab analysis
- NCCA 2015 Report planned for Late 2017 release

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Thanks to our many partners!

- Alabama Department of Environmental Management
- Alaska Department of Environmental Conservation
- Connecticut Department of Environmental Protection
- Delaware Department of Natural Resources
- Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute
- Georgia Department of Natural Resources
- Hawaii Department of Health
- Illinois Environmental Protection Agency
- Louisiana Department of Wildlife and Fisheries
- Maine Department of Environmental Protection
- Maryland Department of Natural Resources
- Massachusetts Department of Environmental Protection
- Michigan Department of Environmental Quality
- Minnesota Pollution Control Agency
- Mississippi Department of Environmental Quality
- New Jersey Department of Environmental Protection
- New York Department of Environmental Conservation
- North Carolina Department of Environment and Natural Resources
- Ohio Environmental Protection Agency
- Oregon Department of Environmental Quality
- Pennsylvania Department of Environmental Protection
- Rhode Island Department of Environmental Management
- San Francisco Estuary Institute
- South Carolina Department of Health and Environmental Control
- South Carolina Department of Natural Resources
- Southern California Coastal Water Research Project
- Texas Parks and Wildlife Department
- Virginia Department of Environmental Quality
- Washington Department of Ecology
- Wisconsin Department of Natural Resources

- Steve Bay, David Gillett, and Steve Weisberg, Southern California Coastal Water Research Project;
- Joseph Bohr, MI Department of Environmental Quality;
- Angel Borja, AZTI Tecnalia, Spain;
- Paul Carlson and Laura Yarbro, FL Fish and Wildlife Conservation Commission;
- Judy Crane, MN Pollution Control Agency;
- Christine Olsen, CT Department of Environmental Protection;
- Bob Van Dolah, SC Department of Natural Resources;
- Len Balthis, Cindy Cooksey, Jay Field, Jeff Hyland, and Ed Long, NOAA, National Ocean Service;
- Eva DiDonato and Brenda Moraska LaFrancois, NPS;
- Dan Dauer, Old Dominion University; and
- Paul Montagna, Texas A & M University, Corpus Christi.
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- Darvene Adams, Region 2;
- John Dorkin, Elizabeth Murphy, Brian Thompson, and Santina Wortman, Region 5;
- Laura Hunt, Region 6;
- Terry Fleming, Region 9;
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- Stephen Hale, Virginia Hansen, Linda Harwell, Jack Kelly, John Kiddon, Tom Kincaid, John Macauley, Walt Nelson, Teresa Norberg-King, Tony Olsen, Jack Paar, Steve Paulsen, Dave Peck, Peg Pelletier, Jill Scharold, and Peder Yurista, Office of Research and Development;
- Kendra Forde, Susan Holdsworth, Alice Mayio, Richard Mitchell, Amina Pollard, Bernice Smith, Marla Smith, Leanne Stahl, Ellen Tarquinio, and John Wathen, Office of Water.
- Julie Lietz, David Cox, and Vince Bacalan, ORISE Research Participants assigned to U.S. EPA.

This report is dedicated to the memory of Gregory Colianni of EPA, a colleague and friend who worked tirelessly to protect our nation's coasts. As the lead for the NCCA program, Greg's expertise, guidance, and support set the stage for coastal surveys for years to come. He is deeply missed.

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Speaker Contact Information

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http://www.epa.gov/national-aquatic-resource-surveys/ncca

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More Details to Come!

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https://www.epa.gov/sites/production/files/2016-02/documents/watershed_academy_webcast_coastal_waters.pdf

You can type each of the attendees names into the PDF and print the certificates.

Questions?