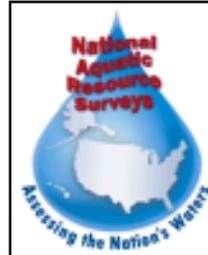


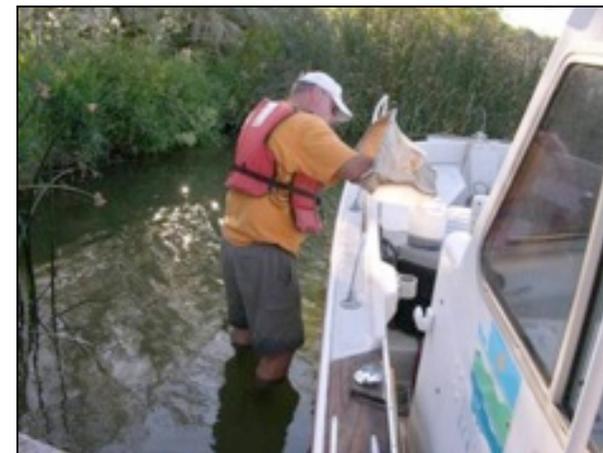
Enhancing and Improving Monitoring and Assessment in the United States



Sarah Lehmann
Ellen Tarquinio



NARS Team
U.S. EPA





Overview



- Water Quality Monitoring Background
- National Aquatic Resource Surveys (NARS)
- Climate Change Monitoring Research:
Leveraging the NARS
 - Indicators and Climate Change
 - Building Monitoring and Reference Networks
- EPA efforts to Manage Climate Change

Clean Water Act

- CWA is the cornerstone of surface water quality protection in the United States
- Goal: Restore and maintain the chemical, physical and biological integrity of the Nation's waters
 - Interim goal: Wherever attainable, water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water
- Employs regulatory and nonregulatory tools to address discharges and polluted runoff



U.S. Water Quality

- Size estimates*
 - Rivers and Streams - 5,632,704 km
 - Lakes/Reservoirs - 16,794,454 hectares
 - Bays/Estuaries –227,918 square km
 - Coastal Shoreline –101,388 km
 - Wetlands - 43,584,643 hectares
- Major stressors to U.S. waters include, among others:
 - Nutrients
 - Sediments
 - Mercury (fish advisories)
 - Pathogens

*Size estimates are state reported

Water Quality Monitoring

- Variety of organizations from local to national conduct monitoring
- EPA initiated the National Aquatic Resource Surveys to address inconsistencies



National Aquatic Resource Surveys – A Partnership between EPA, States and Tribes: Objectives



Coastal

Streams and Rivers

Wetlands

Lakes

1. Assess biological and recreational condition and changes over time of the nation's waters using indicators of condition and stress
2. Rank stressors based on the relative associations between indicators of condition and indicators of stress
3. Build/enhance state and tribal monitoring and assessment capacity

Importance of NARS

- Provide consistent, statistically-valid answers to important national water quality questions
 - What is the condition of all our waters?
 - What are some of the key problems?
 - How wide-spread are the problems?
 - How are conditions changing over time?
- Supports better data for management decisions
- Addresses inconsistencies in State/Tribal reporting





Technical and Scientific Underpinnings of NARS

- Built on the EPA Environmental Monitoring and Assessment Program (EMAP) pilots
 - Randomized design to report on condition of each resource nationally and on a regional basis with documented confidence
 - Standard field and lab protocols
 - National quality assurance and data management
 - Nationally consistent and regionally relevant data



Survey Indicators and Measures

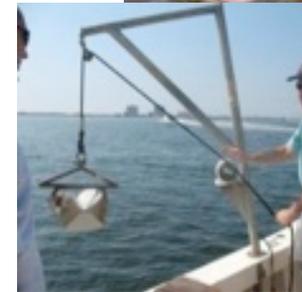
Surveys assess **biological indicators** such as:

- Benthic macroinvertebrates
- Plants
- Fish community



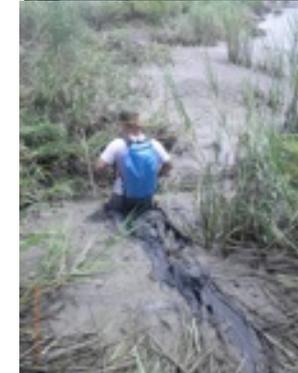
Surveys assess **public health indicators** such as

- Fish tissue
- Pathogens (e.g., enterococci)
- Microcystin



Surveys measure the occurrence and extent of key **stressors** such as:

- Nutrient enrichment
- Excess sediment
- Physical habitat characteristics (e.g. riparian cover)



Surveys may include pertinent **research indicators** such as:

- Sediment enzymes
- Contaminants of emerging concern

National Aquatic Resource Survey Schedule

	2011	2012	2013	2014	2015
Rivers/ Streams	Lab/Data Analysis; Research	Report; Design	Field	Field	Lab/Data Analysis
Coastal	Lab/Data Analysis	Report	Research	Design	Field
Wetlands	Field	Lab/Data Analysis	Report	Research	Design
Lakes	Design	Field	Lab/Data Analysis	Report	Research

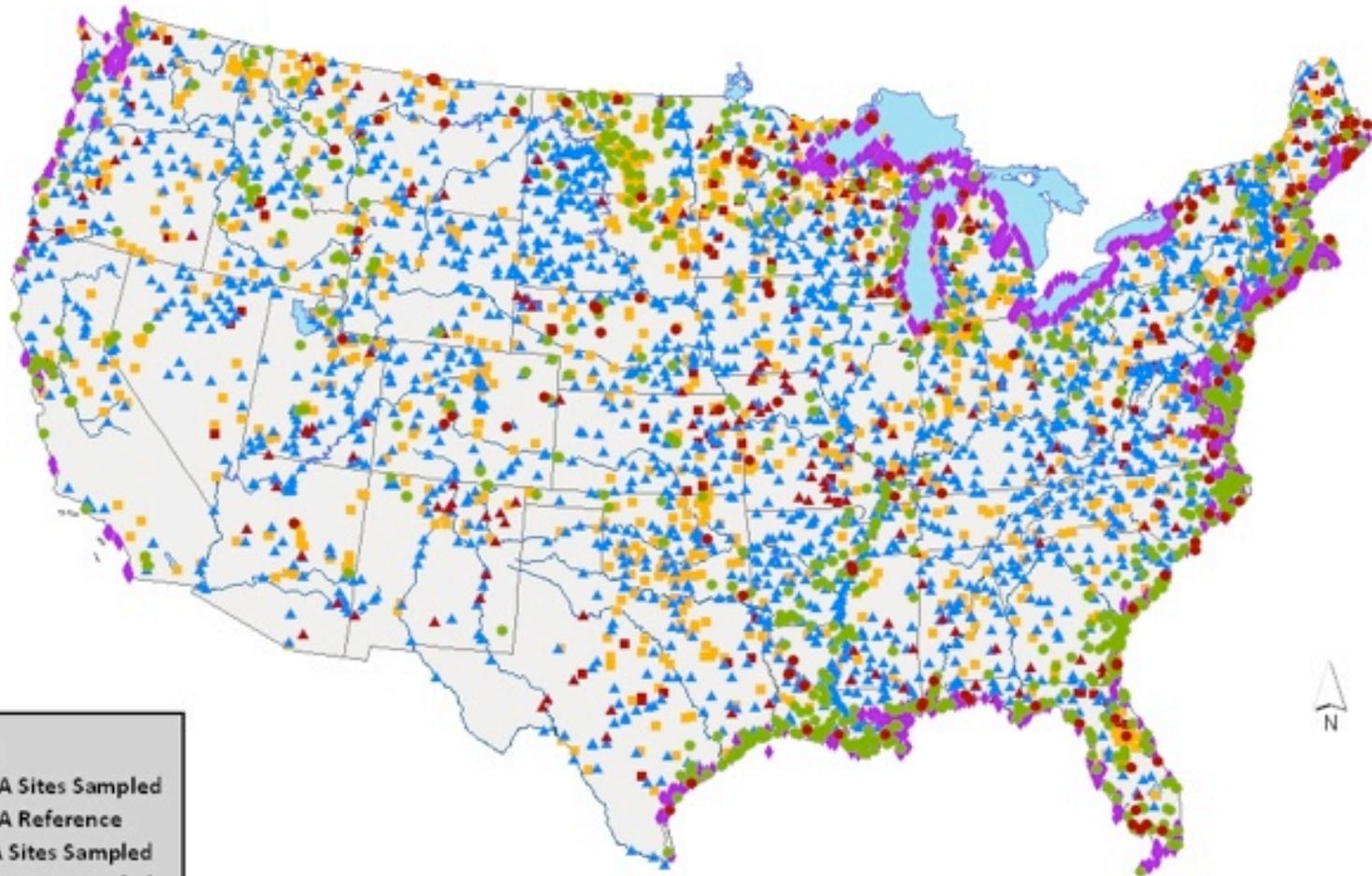
By 2013:

- First round of assessments completed for all waters

By 2014

- Streams, lakes and coastal waters will have been assessed at least twice

Sites Sampled for the National Aquatic Resource Surveys



- Legend**
- NWCA Sites Sampled
 - NWCA Reference
 - ◆ NCCA Sites Sampled
 - ▲ NRSA Sites Sampled
 - ▲ NRSA Reference
 - NLA Sites Sampled
 - NLA Reference



Major NARS Accomplishments

- Nationally consistent and scientifically defensible reports on condition of:

- Lakes (2010)
- Wadeable streams (2006)
- Coastal waters (2001, 2005, 2008)



- Linking results to policy issues

- Wadeable Streams Assessment
River Basin
- National Coastal Condition Assessment
- National Lake Assessment



Nutrients in the Mississippi



Gulf of Mexico Oil Spill

Physical Habitat

Findings

Key Biological Findings To Date

- **Streams:** 42% of streams have poor biological communities. The most important assessed stressors are nutrients and excess sedimentation. Streams with these problems are 2 times more likely to have poor biology.
- **Lakes:** 22% of lakes have poor biological communities. The most important assessed stressors are poor lakeshore habitat and nutrients. Lakes with these problems are 2 to 3 times more likely to have poor biology.
- **Coastal waters:** 27% of coastal waters have poor biological communities. Overall, the condition of the nation's coastal waters is fair and has improved slightly since the 1990s.



Climate Change Monitoring Research: Leveraging the NARS

- Inconsistencies in monitoring programs limit utility of data for evaluating the impacts of climate change nationally.
- EPA researching and evaluating improved indicators and network designs to address climate issues.
- NARS can be leveraged to support climate change needs although modifications (and resources) would be needed.

EPA' Global Change Research Program Pilot Studies

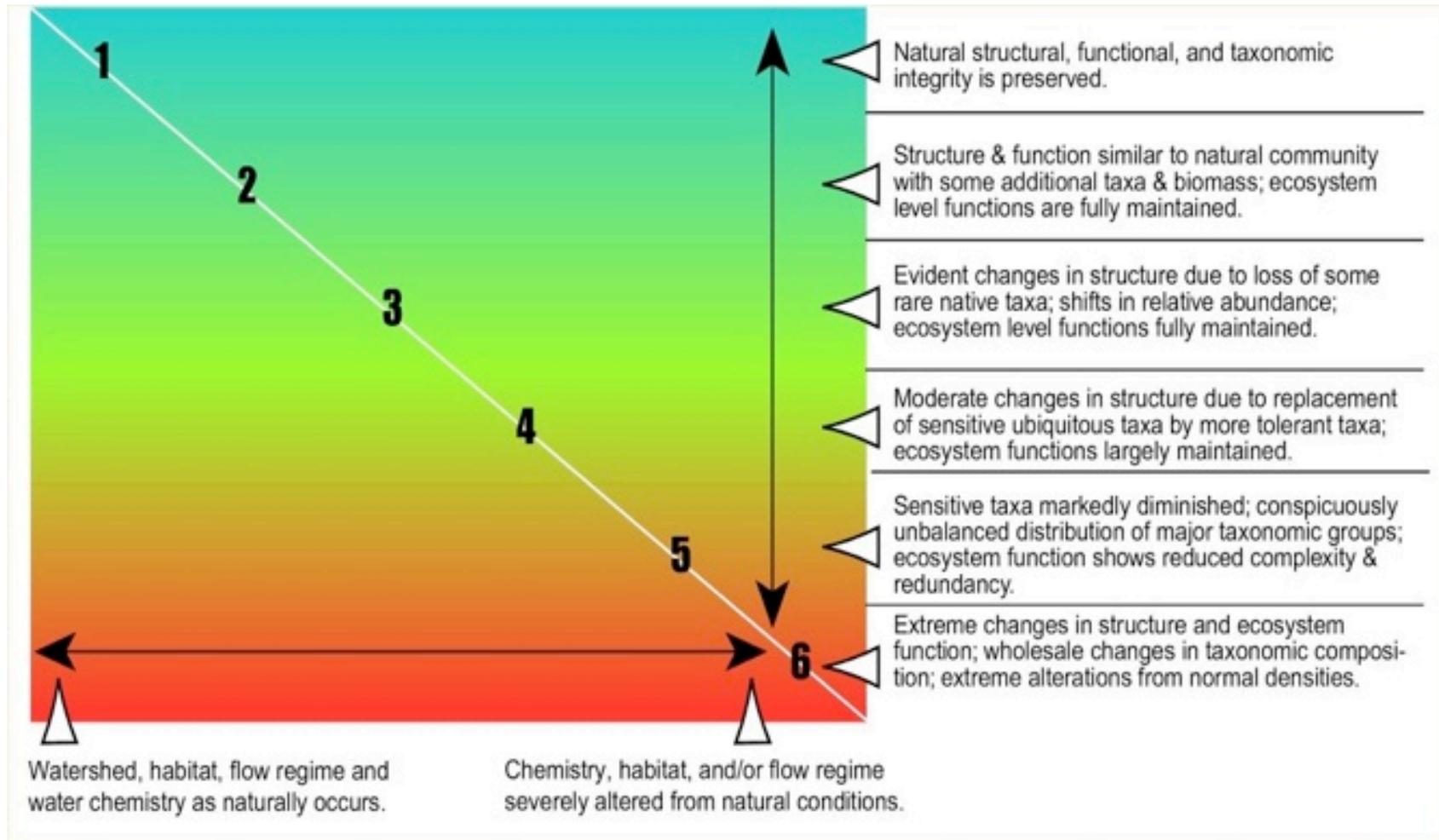
- Objective:
 - Assess existing responses to climate change
 - Identify climate-sensitive indicators
- 4 states partnered with EPA for pilot studies
 - Long-term data
 - Regionally distributed



Utah: Example

- Objective: Analyze long term invertebrate data in Utah to determine if past climate change trends could be detected
- Data: Long-term stream invertebrate data at four reference stations, in two ecoregions
- Results
 - Significant associations between declining richness or abundance of cold-preference taxa and increasing temperature.
 - Fairly predictable losses in a metric considered sensitive to pollution and disturbance – EPT taxa richness
 - **EPA and Utah estimated that a 25 – 40% loss of EPT taxa could occur with current scenarios of temperature increases by 2050.**

Application of the EPA's Biological Condition Gradient



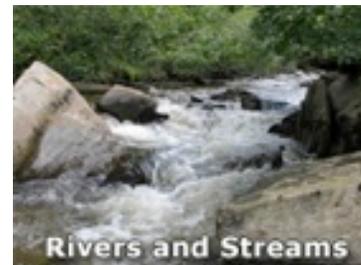
Monitoring and Reference Condition Networks

- Coordinating Monitoring Networks
- Reference Network for climate change:
A need exists for reliable long-term data from waters minimally affected by human activities to help differentiate changes from land/water use from changes associated with climatic cycles
 - Pilot climate change network
 - Potential criteria for climate network



Potential for Leveraging NARS

- Importance of NARS core elements
 - Biological, chemical and physical data
 - Additional indicators across the U.S. and across waterbody types
 - Continuing cycle of implementation
- Reference network
 - Nation-wide
 - Multiple waterbody types



Reference Sites for the National Aquatic Resource Surveys



Legend

- NWCA Reference
- ▲ NRSA Reference
- NLA Reference

0 135 270 540 810 1,080 Miles

EPA efforts to manage climate change

- Mitigation involving water use and energy efficiency
- Adaptation efforts to prevent contaminated drinking water supplies and provide support for such programs as Climate Ready Estuaries
- Research to inform adaptation and mitigation activities
- Education to build awareness both within EPA and among partners
- Program management to integrate climate change considerations into ongoing agency activities

Acknowledgements and References

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 - Chris Faulkner
 - Greg Colianni
 - Hugh Sullivan
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 - Office of Water Climate Change - <http://water.epa.gov/scitech/climatechange/>
- Michael Barbour, Tetra Tech

Thank You!

