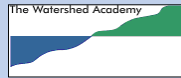


EPA Releases First Ever National Wetland Condition Assessment

Webcast sponsored by EPA's Watershed Academy



Thursday, June 16, 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
- **Gregg Serenbetz**, Environmental Protection Specialist, Wetlands Division, 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.

2

Overview of Today's Webcast

- Overview of the National Aquatic Resource Survey (NARS).
- Results of the National Wetland Condition Assessment (NWCA).
 - National Wetland Condition Assessment Overview and Key Findings
 - Implications and Future Directions



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Presentation Outline

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

5

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.

8

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

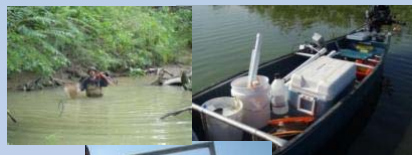
- Fish tissue
- Pathogens (e.g., enterococci)
- Microcystins and other algal toxins

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:

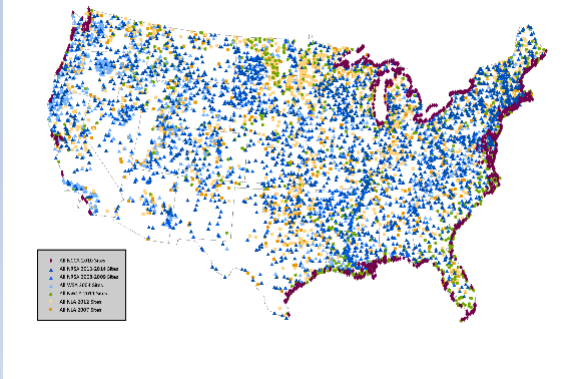
- Sediment enzymes
- Contaminants of emerging concern



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Accomplishments

Sites Sampled as part of the National Aquatic Resource Surveys



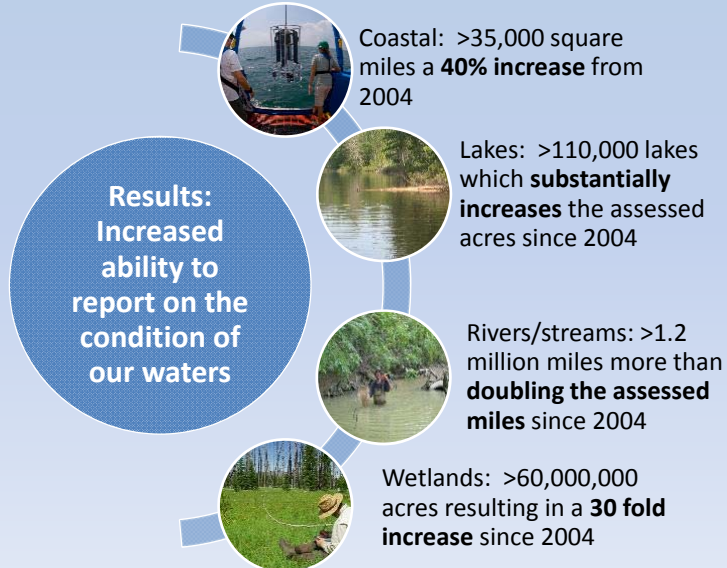
2015: More than 12,000 sites sampled

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

2015: Comprehensive, consistent, and statistically-valid assessments



Current and Upcoming Milestones



Reporting

- NRSA 2008/09 – Final released March 2016
- NCCA 2010 – Final report released January 2016
- NWCA 2011 – Final released May 2016
- NLA 2012 – Release in 2016



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 – Crews are in the field collecting data
- NLA 2017 – Planning and preparations have already begun. Design completed and indicators selected

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A collage of five images related to water bodies. The top-left image shows a wide expanse of water with a low sun, labeled "Coastal Waters". The top-right image shows two people in a canoe on a lake, labeled "Lakes". The middle-left image shows a wetland area with tall grasses, labeled "Wetlands". The bottom-left image shows a person standing by a stream, labeled "Streams". The bottom-right image shows a river flowing under a bridge, labeled "Rivers". In the center of the collage is a dark grey box with the text "Questions?" in white.

14

National Wetland Condition Assessment 2011

Watershed Academy Webcast

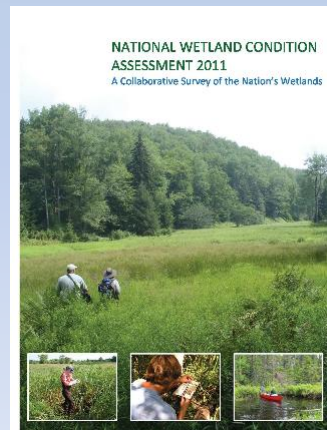
Gregg Serenbetz
US EPA Wetlands Division



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Presentation Outline

- Overview of NWCA
 - Background and objectives
 - Planning and implementation
- Findings from NWCA 2011
 - National
 - Regional
- Implications and future directions
 - Application of 2011 data
 - NWCA 2016



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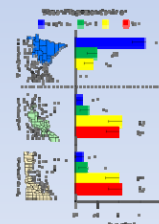
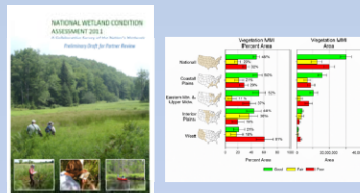
Acknowledgements

- State and Tribal partners
- Federal partners
 - Fish and Wildlife Service
 - NRCS Soil Survey
 - U.S. Geological Survey
 - USDA PLANTS team
 - National Park Service
 - U.S. Forest Service, Army Corps of Engineers, NOAA
- Academic Institutions
- EPA Office of Research and Development and Regions



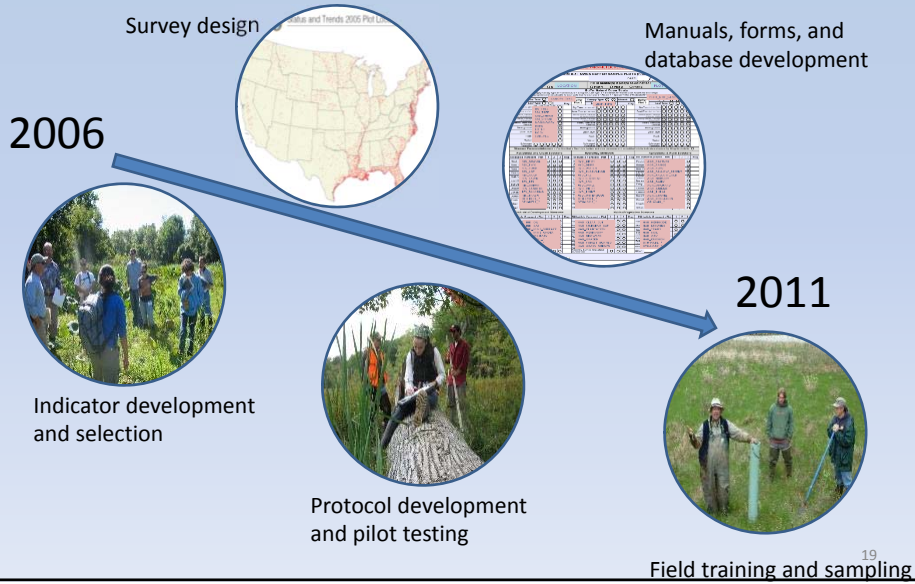
Objectives of the NWCA

- Produce a national report describing
 - ecologic condition of the nation's wetlands
 - stressors most commonly associated with poor condition
- Collaborate with states and tribes in developing
 - complementary wetland monitoring tools
 - analytical approaches
 - data management technologies
- Advance the science of wetland monitoring and assessment to support wetland management and policy needs



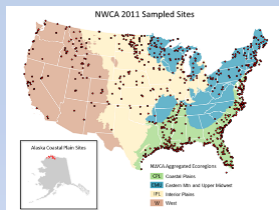
Goal: Information on wetland quality that leads to more effective protection and restoration of wetlands

Planning and Implementation

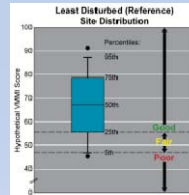


Summary of NWCA field data collection and analysis activities

A. Select and Sample Sites Representing Population



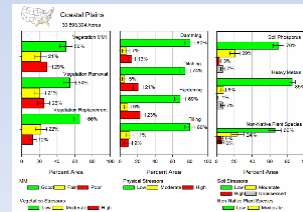
D. Set thresholds for Condition/Stress categories (i.e., "good", "fair", "poor")



C. Develop Appropriate Metrics/Indicators of Condition and Stress

E. Derive Estimates of Condition/Stress for Population

B. Collect Standard Field and Lab Data



Selection of Sites

- Site selection made using a probability-based survey design (GRTS)
 - Every element in population has known probability of selection
 - Ensures results reflect full range of wetlands in target population
- FWS Status and Trends sample frame used as a base map to select wetland sites meeting NWCA target population
- All sites were screened to ensure they met established criteria for inclusion in survey

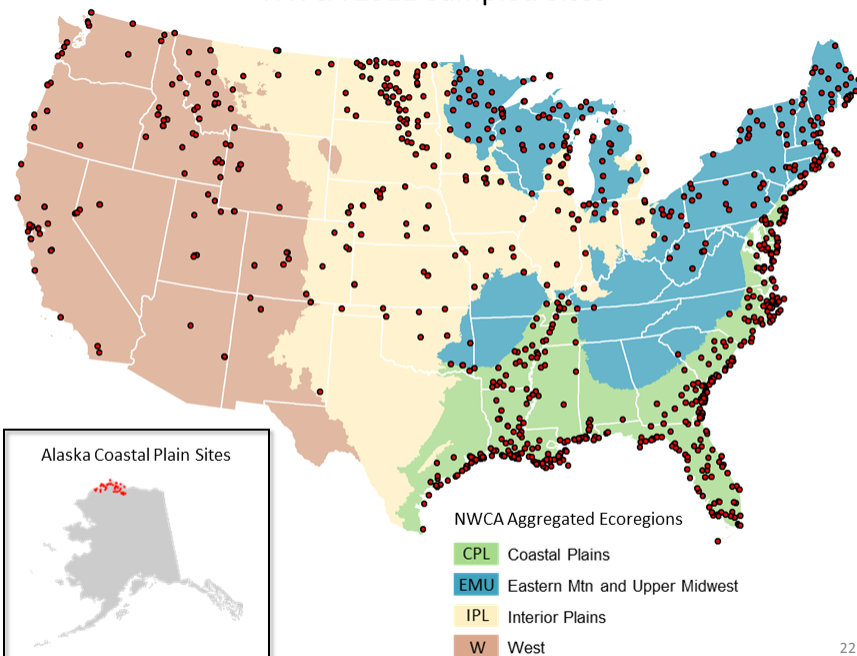


NWCA Target Population

- Tidal and non-tidal wetlands of the conterminous U.S., including certain farmed wetlands not currently in crop production.
- The wetlands have rooted vegetation and, when present, open water <1 m deep.
- NWCA uses a definition for wetlands described by Cowardin that is broader than the definition used in the Clean Water Act.
- A wetland's jurisdictional status under state or federal regulatory programs did not factor into the NWCA definition of target.

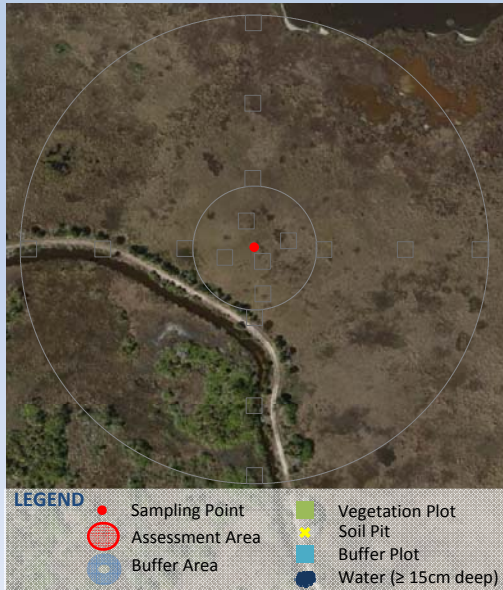
21

NWCA 2011 Sampled Sites



22

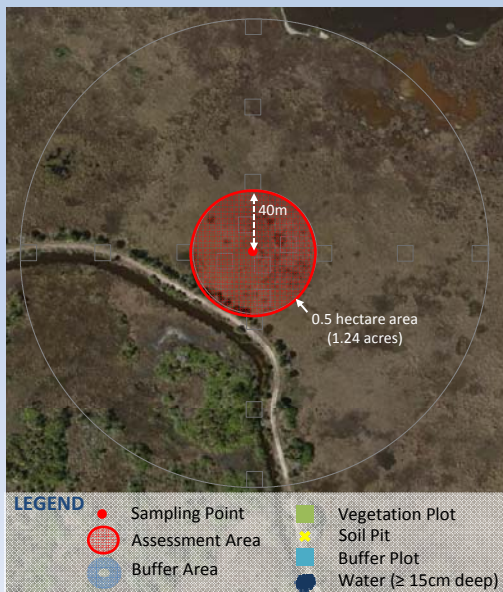
Field Sampling: Standard Site Layout



At each site crews collected data within

23

Field Sampling: Standard Site Layout



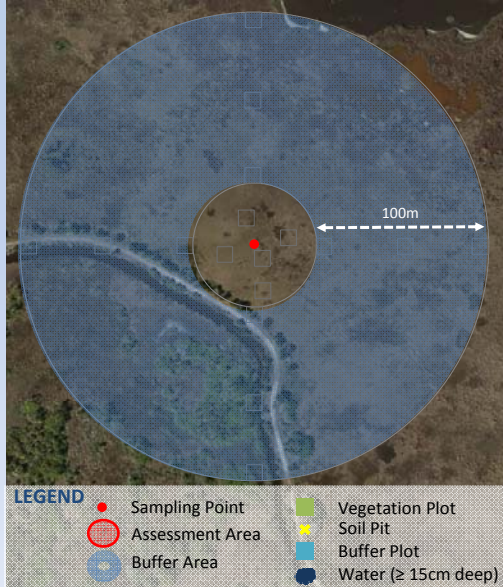
At each site crews collected data within

A Core Assessment Area (AA)

- Represented by 40 meter radius circle around the sampling point (0.5 hectares)

24

Field Sampling: Typical Site Layout



At each site crews collected data within

A Core Assessment Area (AA)

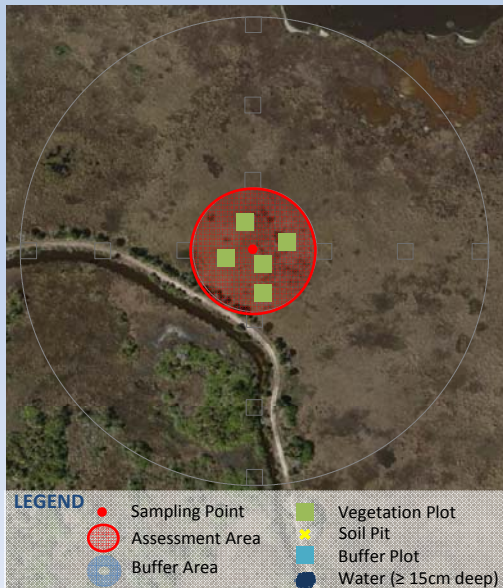
- Represented by 40 meter radius circle around the sampling point (0.5 hectares)

The Surrounding "Buffer"

- 100 meter area outside the core Assessment Area

25

Field Sampling: Standard Site Layout



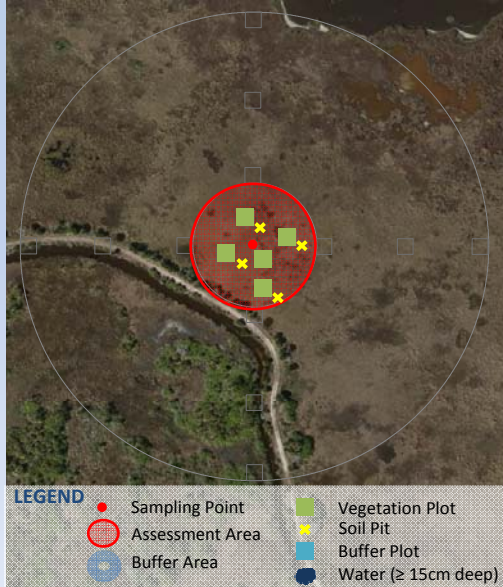
Within AA crews collected data on

VEGETATION

- Species identity, presence, and abundance
- Within five 100m² plots

26

Field Sampling: Standard Site Layout



Within AA crews collected data on

VEGETATION

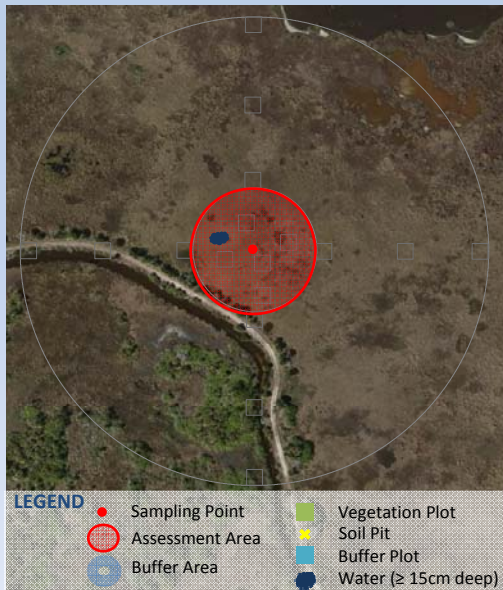
- Species identity, presence, and abundance
- Within five 100m² plots

SOILS

- Soil morphology (color, texture, saturation)
- Samples for analysis of physical and chemical properties
- Four soil pits described (samples collected at representative pit)

27

Field Sampling: Typical Site Layout



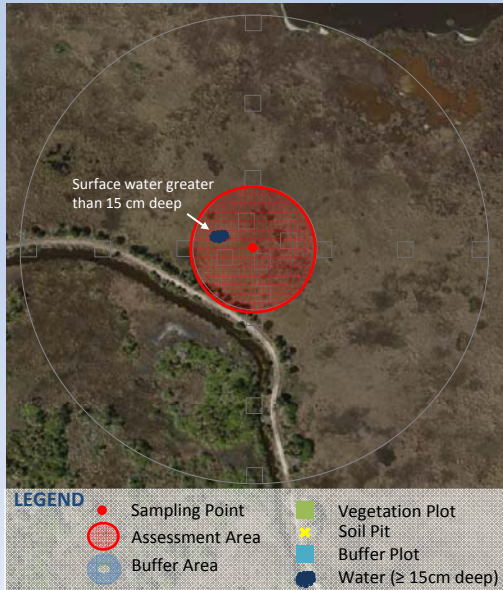
Within AA crews collected data on

HYDROLOGY

- Presence of water sources, evidence of hydrologic alterations, indicators of hydrology

28

Field Sampling: Typical Site Layout



Within AA crews collected data on

HYDROLOGY

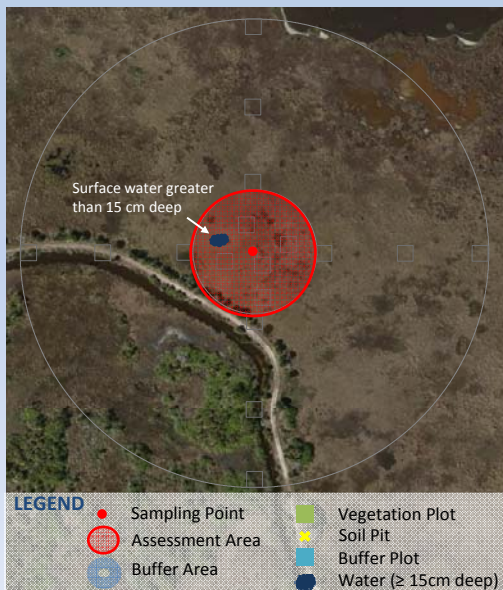
- Presence of water sources, evidence of hydrologic alterations, indicators of hydrology

WATER CHEMISTRY

- Sample collected at sites with surface water $\geq 15\text{cm}$ deep and analyzed for WQ parameters

29

Field Sampling: Typical Site Layout



Within AA crews collected data on

HYDROLOGY

- Presence of water sources, evidence of hydrologic alterations, indicators of hydrology

WATER CHEMISTRY

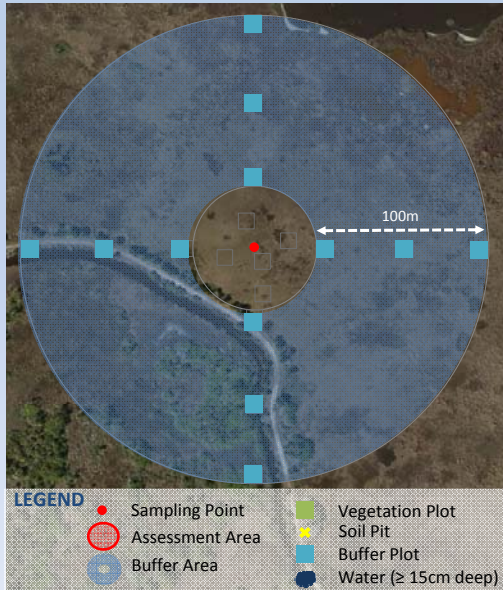
- Sample collected at sites with surface water $\geq 15\text{cm}$ deep and analyzed for WQ parameters

ALGAE

- Sample collected for algae species ID
- Samples collected for chlorophyll-a and microcystin analysis at sites with surface water $\geq 15\text{cm}$ deep

30

Field Sampling: Typical Site Layout



Within Buffer crews collected data on

NATURAL COVER

- Vegetation and ground cover in twelve 100m² plots arrayed along cardinal directions from point

DISTURBANCE

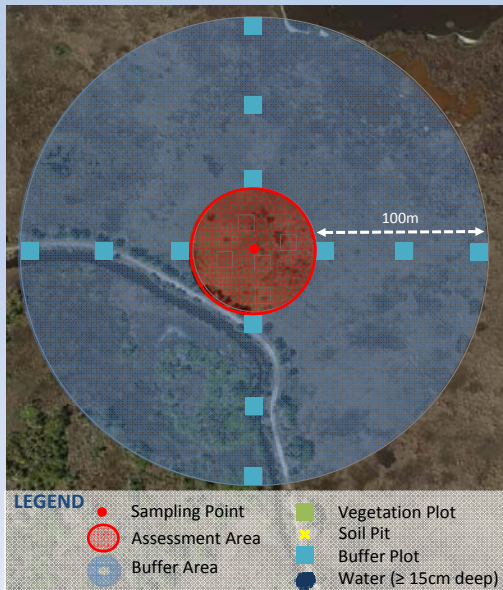
- Presence of stressors in twelve 100m² plots arrayed along cardinal directions from point

TARGETED INVASIVE SPECIES

- Presence of 22 targeted invasive plant species in twelve 100m² plots arrayed along cardinal directions from point

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Field Sampling: Typical Site Layout



Crews also collected data in both the AA and buffer for pilot rapid assessment method

USARAM

- Physical and Biological structure within AA
- Presence of stressors within AA
- Presence of stressors within Buffer

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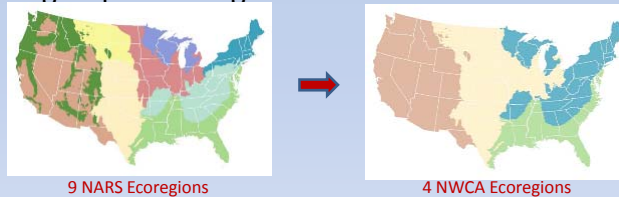
Development of Metrics/Indicators

- Process and QA field and lab data (lots of it!)
- Determine reporting groups
- Characterize reference condition
 - Categorize sites along a disturbance gradient
- Detailed information provided in NWCA 2011 Technical Report

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NWCA 2011 Reporting Groups

- General rule followed by EPA in NARS is to have ≥ 50 sites per reporting group to achieve statistically valid estimates
- NWCA grouped ecoregions



- NWCA grouped wetland types (based on Cowardin)

emergent (EM)
pond (PUB) → herbaceous
farmed (Pf)

scrub-shrub (SS)
forested (FO) → woody

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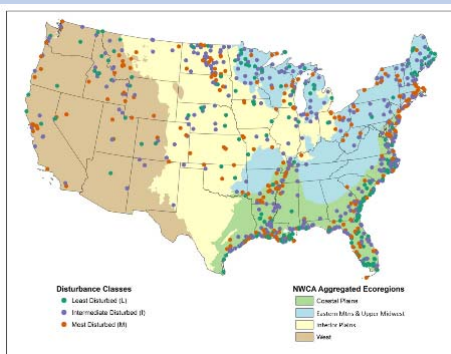
Ten NWCA reporting groups

NWCA Aggregated Ecoregions NWCA Aggregated Wetland Types	Palustrine, Riverine, and Lacustrine Herbaceous (PRLH) <i>Aggregates PEM, PF, PUBPAB</i>	Palustrine, Riverine, and Lacustrine Woody (PRLW) <i>Aggregates PFG, PSS</i>	Estuarine Herbaceous (EH) <i>Includes EZEM</i>	Estuarine Woody (EW) <i>Includes EZSS</i>
	Coastal Plains (CPL) <i>Same as Coastal Plains (CPL) in Nine Aggregated Ecoregions; Includes Eastern and Gulf Coastal Plains</i>	1. Coastal Plains Herbaceous (CPL-PRLH) <i>72 Sites Sampled</i>	2. Coastal Plains Woody (CPL-PRLW) <i>189 Sites Sampled</i>	9. Estuarine Herbaceous (ALL-EH) <i>272 Sites Sampled</i>
Eastern Mountains & Upper Midwest (EMU) <i>Aggregates Northern Appalachians (NAP), Southern Appalachians and Piedmont (SAP), and Upper Midwest (UMV)</i>	3. Eastern Mountains & Upper Midwest Herbaceous (EMU-PRLH) <i>73 Sites Sampled</i>	4. Eastern Mountains & Upper Midwest Woody (EMU-PRLW) <i>127 Sites Sampled</i>		
Interior Plains (IPL) <i>Aggregates Temperate Plains (TPL), Northern Plains (NPL), and Southern Plains (SPL)</i>	5. Interior Plains Herbaceous (IPL-PRLH) <i>138 Sites Sampled</i>	6. Interior Plains Woody (IPL-PRLW) <i>52 Sites Sampled</i>		
West (W) <i>Aggregates Western Mountains (WMT), and Xeric (XER)</i>	7. West Herbaceous (W-PRLH) <i>67 Sites Sampled</i>	8. West Woody (W-PRLW) <i>75 Sites Sampled</i>		

Note: The Estuarine reporting group encompasses estuarine wetlands in all ecoregions (hence, the prefix "ALL"). However, estuarine wetlands only occur in CPL, EMU, and W ecoregions. There are no estuarine wetlands in IPL.

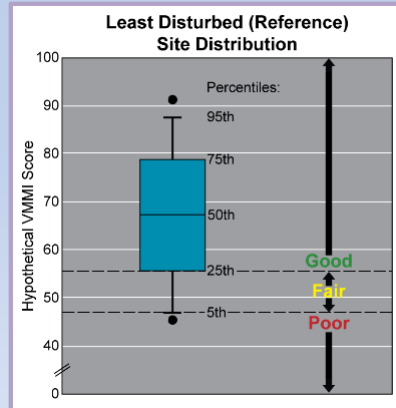
Characterizing Reference Condition

- Similar to well-established approach used in other NARS studies
- Four categories of stressor data used from field/lab data
 - Buffer
 - Hydrology
 - Soil chemistry
 - Nonnative plant cover
- Each site screened to see if exceeded threshold or not
- Thresholds could be
 - Observed presence
 - Chemical concentration (based on literature & lab data)
 - BPJ (nonnative plant cover)
- Identified least/most disturbed for each reporting group
 - 20-30% of sites per class target



Setting Condition/Stressor Thresholds

- Distribution-based threshold approach
 - NARS conventions used to set
 - vegetation MMI thresholds for each reporting group
 - Soil phosphorus stressor indicator
- Fixed threshold approach
 - Used to set thresholds for other stressors
 - Accepted values from peer-reviewed, published literature that are well established or widely used by agencies
 - E.g. microcystin thresholds based on WHO values
 - Best professional judgement
 - E.g. nonnative plant stressor



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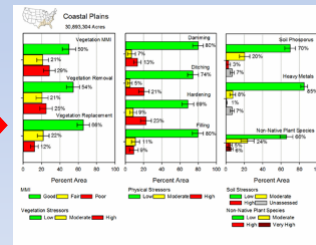
NWCA 2011 Indicators

Category	Indicator	Description
Biological Condition	Vegetation MMI	Index comprised of 4 metrics related to plant abundance, native status, and tolerance to disturbance
Physical Stress – Vegetation Alteration	Vegetation Removal	Field observations related to loss, removal, or damage of vegetation (e.g., mowing / shrub cutting, herbicide use, highly grazed grasses, recently burned forest)
	Vegetation Replacement	Field observations of a change in the plant species present due to anthropogenic activities (e.g., tree plantation, golf course, lawn/park, row crops, pasture/hay, rangeland)
Physical Stress – Hydrological Alteration	Damming	Field observations related to impounding or impeding water flow from or within the site (e.g., dikes, dams, berms, railroad beds)
	Ditching	Field observations related to draining water within the site (e.g., ditches, corrugated pipe, excavation-dredging)
	Hardening	Field observations related to soil compaction, including activities and infrastructure that primarily result in soil hardening (e.g., roads, suburban residential development, pavement)
	Filling/Erosion	Field observations related to soil erosion or deposition (e.g., soil loss/root exposure, fill/spoil banks, freshly deposited sediment)
Chemical Stress	Heavy Metal Index	Index comprised of 12 different heavy metals closely associated with anthropogenic activities measured in soil sample
	Soil Phosphorus	Concentration of phosphorus in soil sample
	Microcystin	Concentration of the algal toxin microcystin in composite water, sediment, and surface vegetation sample
Biological Stress	Nonnative Plant Stressor Index	Index comprised of 3 metrics related to presence and abundance of nonnative plants

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Deriving Estimates of Condition/Stress for Population

- Each NWCA probability site is assigned to a condition or stress-level category based on the indicator value (e.g. VMMI, Heavy Metal Index, etc) for the site and the threshold appropriate to the site (e.g., reporting group)
 - Biologic condition (good, fair, poor)
 - Levels of stress (high, moderate, low)
- Site weights from the probability design, reflecting the number of acres each site represents across the total population of specific NWCA target wetland types, are summed for each class to estimate total area in that class (i.e. good, fair, poor)



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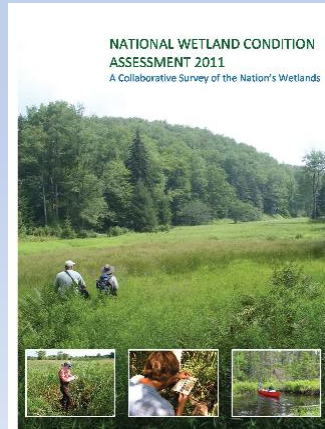
Questions?



40

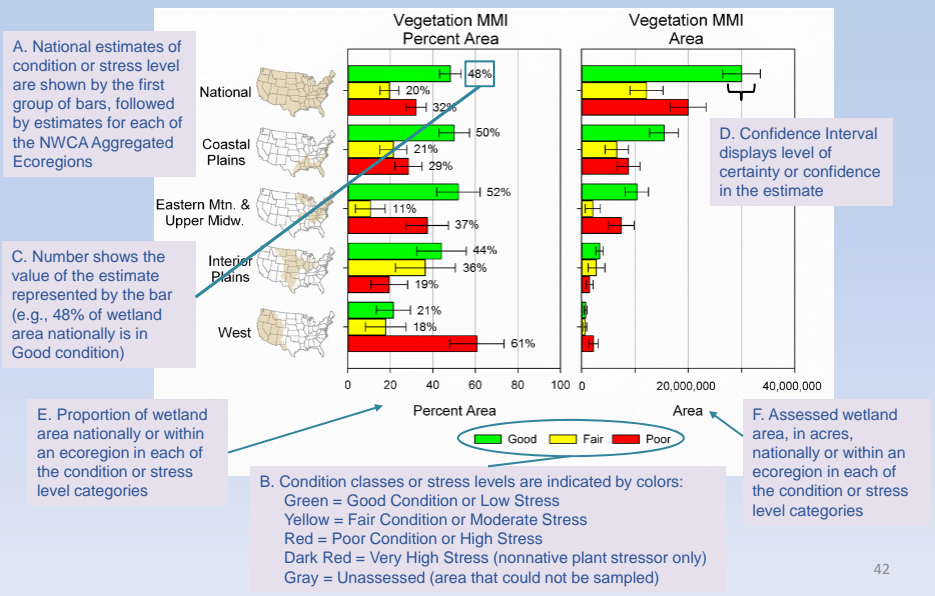
NWCA 2011 Findings

- Results from data analysis presented in NWCA 2011 report
 - Nationally
 - Regionally by major ecoregion and broad wetland type
- Estimates for different reporting groups by condition/stress category
 - Example on next slide



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Reporting of NWCA 2011 Results



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Key NWCA 2011 Findings

- Less than half of wetland area – 48% - is in good condition based on plant community characteristics
- Physical disturbances to wetlands and surrounding habitat such as soil compaction, ditching, and plant removal are most widespread stressors
 - Wetlands with high levels of stress from soil compaction are twice as likely to have plant communities in poor condition
- Nonnative plants are a problem, particularly in the interior plains and west
- West is in poorer condition and has higher levels of stressors than other regions



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National Findings: Biological Indicators



Plants integrate different wetland processes and respond to physical, chemical, and biological disturbances.

Indicator of condition

- NWCA developed vegetation multi-metric index (VMMI)
 - Field-based observations of plant species presence and abundance
 - Species trait information (e.g., C-value reflecting sensitivity to human disturbance)
- Reference-based approach used to set regionally specific thresholds
- **48% of wetland area in good condition, 20% in fair, and 32% in poor**

Indicator of stress

- Nonnative Plant Stressor Index based on species composition and traits
- Fixed threshold used nationally
- **19% of wetland area has high or very high levels of stress from nonnative plants**

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National Findings: Physical Indicators of Stress



Physical changes to the plant community and hydrology in wetlands and their surrounding habitat alter natural wetland processes, impacting plant productivity, nutrient and carbon cycling.

- Based on field-observed disturbances to wetlands and surrounding habitat
- Disturbances classified by whether they resulted primarily in alterations to
 - vegetation (removal, replacement)
 - hydrology (damming, ditching, hardening, filling/erosion)
- Fixed thresholds used nationally
- **Hardening (soil compaction) and plant removal (grazing, cutting, mowing, herbicides) at high stress levels for 27% of wetland area**
- **Ditching at high stress levels for 23% of wetland area**

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National Findings: Chemical Indicators of Stress

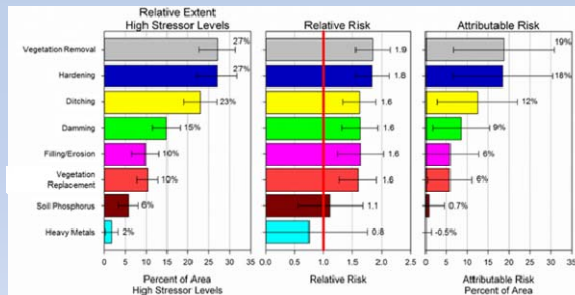


Chemical stressors to wetlands can disrupt nutrient cycles, affect plant and animal growth, and be detrimental to human health.

- Based on laboratory analysis of soil and water samples collected at field site
- Soil indicators
 - Heavy Metal Index
 - Concentrations of 12 metals compared to literature values for background and natural breaks in NWCA data
 - **2% of wetland area at high stress levels**
 - Soil phosphorus
 - Concentrations compared to reference- based thresholds
 - **6% of wetland area at high stress levels**
- Microcystin
 - Toxin produced by cyanobacteria
 - **Detected in 12% of wetland area; less than 1% at moderate or high levels of risk for recreational exposure (WHO thresholds)**

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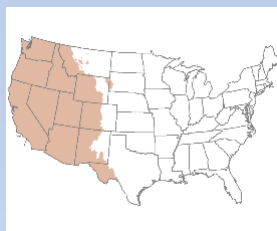
National Findings: Relationships between Stressor/Condition Data



- Quantitative approach to explore relationship between high stressor levels and poor condition
- Relative Risk ratio of 1.9 indicates that sites in high stress category are nearly twice as likely to be in poor condition

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Regional Findings: West



- Findings for West worse than other ecoregions
- **61% of wetland area in poor condition (21% good condition)**
- Greater percentage of wetland area at high levels of stress
 - **Ditching 76%**
 - **Nonnative plants 72% (high or very high)**
 - **Hardening 70%**
 - **Vegetation removal 61%**
- **Heavy metals** at moderate stressor levels for **47%** of wetland area

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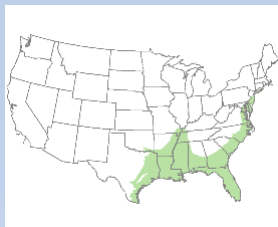
Regional Findings: Interior Plains



- **44% of wetland area in good condition (19% in poor condition)**
- **Vegetation removal (44%), hardening (35%), and ditching (28%)** are predominant stressors at high levels
 - All physical stressors except filling/erosion above 20%
- **Nonnative plants** at high or very high stressor levels for **46%** of wetland area
 - **Only 4% inland herbaceous** wetland area at low stressor levels

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Regional Findings: Coastal Plains



- Half of assessed wetland area nationally occurs in ecoregion
- **50% of wetland area in good condition (29% in poor condition)**
- **Vegetation removal (25%), hardening (23%), and ditching (21%)** are predominant stressors at high levels
- Inland herbaceous wetlands far worse than inland woody wetlands
 - **59% of wetland area in poor condition**
 - **Vegetation removal 61%**
 - **Hardening 57%**
 - **Ditching 52%**

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Regional Findings: Eastern Mountains and Upper Midwest



- **52% of wetland area in good condition (37% in poor condition)**
- **Hardening (22%), vegetation removal (17%), ditching (15%)** are predominant stressors at high levels
- Larger percentage of wetland area with high stress levels for **soil phosphorus (13%)** than other ecoregions
 - **35% for inland herbaceous**
- **Heavy metals** at moderate stressor levels for **31%** of wetland area

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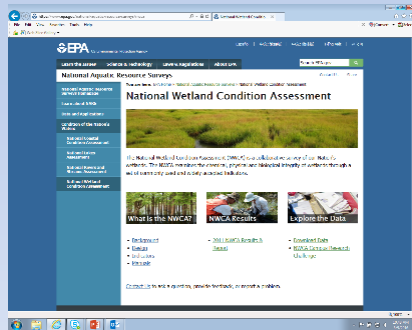
Regional Findings: Estuarine



- Estuarine wetlands are reported nationally by wetland type (herbaceous or woody)
 - Estuarine herbaceous wetland area comprises 90% of total
- Estuarine herbaceous wetlands
 - **58% of wetland area in good condition (26% in poor)**
 - **Ditching (18%), hardening (11%), and damming (10%)** were predominant stressors at high levels
 - **Nonnative plants** at high and very high levels for **24%** of wetland area
- Estuarine woody wetlands
 - **59% of wetland area in good condition (22% in poor)**
 - **Ditching (18%), hardening (13%), and soil phosphorus (9%)** were predominant stressors at high levels

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Accessing NWCA report and data

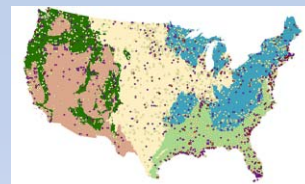


- 2011 reports and data available for download at:
- <https://www.epa.gov/national-aquatic-resource-surveys/nwca>

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Implications & Follow-Up Actions

- Working to further understand data results for West
 - Survey design changes to add more sites and enable reporting of Xeric and Western Mountains independently
 - Target additional candidate reference sites
 - Panel Session at SWS Pacific NW Workshop
- Engagement with stakeholders on implications, applications, and use of NWCA data
 - Special Issue on NWCA in scientific journal
 - NWCA Campus Challenge
 - ASWM communications assistance



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Applications/Uses of NWCA Data

- Wetland program management
 - Compensatory mitigation & voluntary restoration
 - Wetlands role in mitigating climate change
 - National and site-specific data to inform development of water quality standards
- Data for national databases
 - Species occurrence data for USDA PLANTS
 - National Wetland Inventory maps
 - NRCS hydric soils
 - Reference site networks
- Verification and assessment of wetland field indicators
 - Plant, hydrology, and hydric soil indicators

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Innovations for Wetland Science

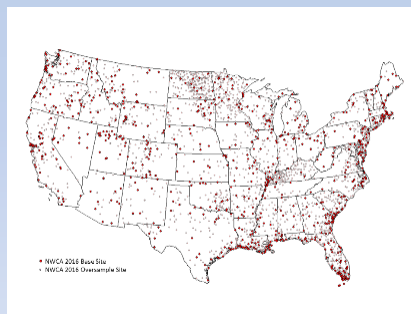
- Development of national indicators of biological condition and stress
 - Robust multimetric index of biological condition (VMMI) to evaluate condition across varying wetland types and ecoregions
 - Physical, chemical and biological indicators of stress based on readily collected field and lab data
- Wealth of data to pursue research into development of other wetland assessment protocols and indicators
 - Soil indicators of stress and health
 - Rapid Assessment Methods (RAMs)
 - Water chemistry
 - Algae species



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NWCA 2016 Survey

- Field sampling for NWCA 2016 survey began April 17th in Georgia
- Same core indicators
 - Vegetation
 - Soil
 - Hydrology
 - Water samples (nutrients, chlorophyll-a, microcystin)
 - Stressors
- Expanded design
 - Greater number of sites in west
 - Separate reporting groups for xeric and western mountains
 - Improved distribution in other areas



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Speaker Contact Information



Sarah Lehmann

Lead, National Aquatic Resource Surveys
U.S. EPA's Office of Wetlands, Oceans, and Watersheds

Lehmann.Sarah@epa.gov



Gregg Serenbetz

Environmental Protection Specialist
U.S. EPA's Office of Wetlands,
Oceans, and Watersheds

Serenbetz.Gregg@epa.gov



<http://www.epa.gov/national-aquatic-resource-surveys/nwca>

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Next Watershed Academy Webcast: Please Visit Our Website

More Details to Come!

www.epa.gov/watershedacademy

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Participation Certificate

If you would like to obtain participation certificates
type the link below into your web browser:

- https://www.epa.gov/sites/production/files/2016-05/documents/watershed_academy_webcast_wetland.pdf

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

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Questions?



NWCA11-R013
Lick Creek-Cache River Watershed, Illinois
Photo by Mick Micacchion, MBI

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