

# Results from the National Wetland Condition Assessment 2011 and Future Directions

NWQMC 2016

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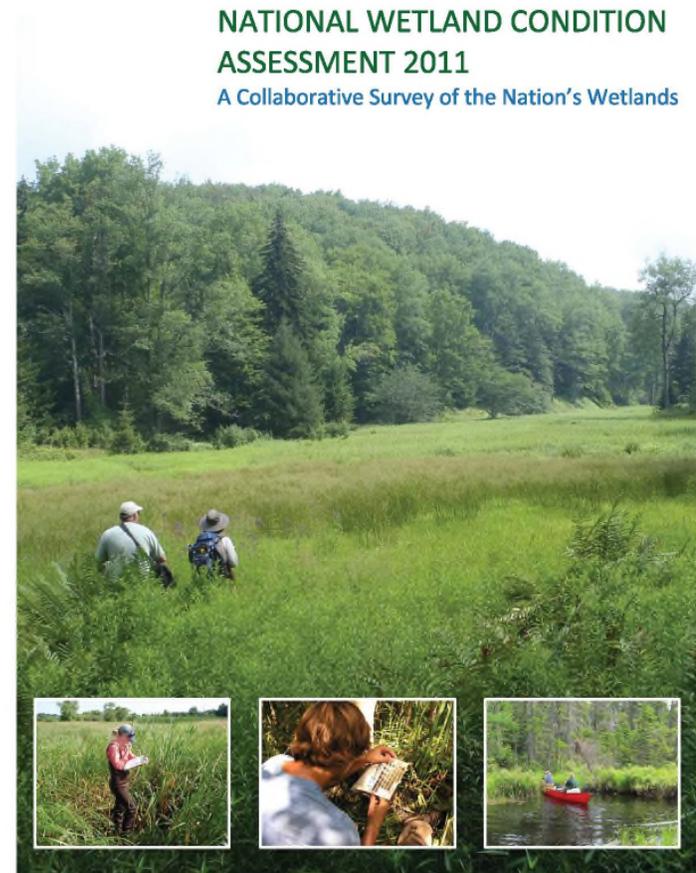
US EPA Wetlands Division



NWCA11-R013  
Lick Creek-Cache River Watershed, Illinois

# Presentation Outline

- NWCA background
- 2011 results
- Future directions
  - Implications, collaboration, and data uses
  - NWCA 2016



# NWCA Background

- Part of EPA's National Aquatic Resource Survey (NARS) program
  - Partnership between EPA, States, Tribes, and others to assess and report on the ecologic condition of the nation's waters
  - 4 surveys (lakes, rivers/streams, coastal waters and wetlands) on five year cycles
- Origins in large-scale assessments of aquatic ecosystems by EPA researchers
  - EMAP
- Desire to understand health of aquatic systems at national scales
  - Limitations of data collected in CWA 305(b) assessments
  - Critical assessments by GAO, National Academies...
- Significant collaboration with Regions/States in planning and implementation
  - Coordination between EPA Wetland and WQ Monitoring programs



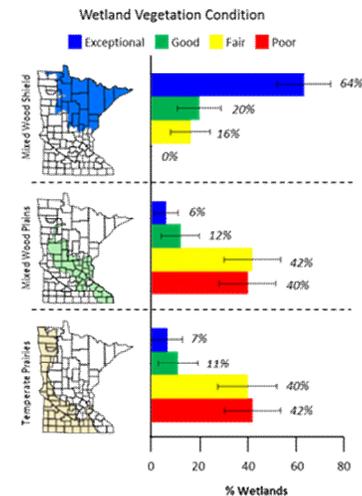
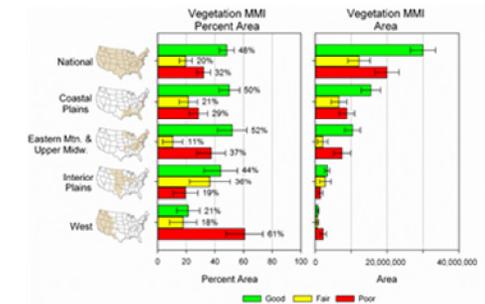
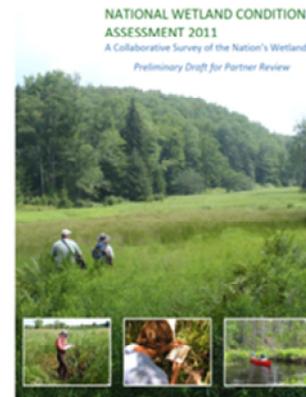
## 2002 WQ Report to Congress

Information provided by states addressed:

- 20% of rivers/streams
- 40% of lakes
- 35% of coastal waters
- **1% of wetlands**

# Objectives of the NWCA

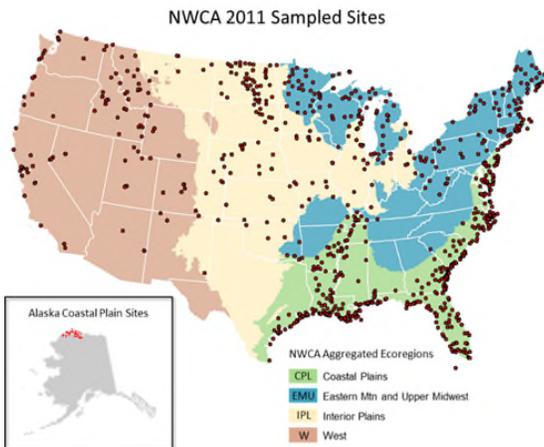
- Produce a national report describing
  - ecologic condition of the nation's wetlands
  - stressors most commonly associated with poor condition
- Collaborate with states and tribes in developing
  - complementary wetland monitoring tools
  - analytical approaches
  - data management technologies
-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

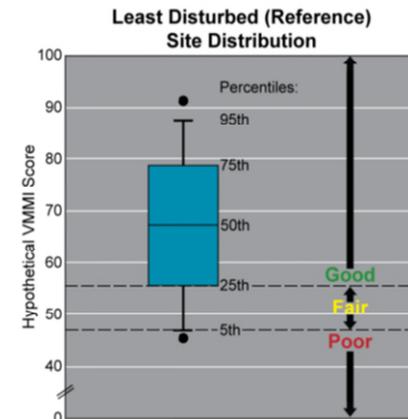
# Summary of NWCA data collection and analysis activities

## A. Select and Sample Sites Representing Population

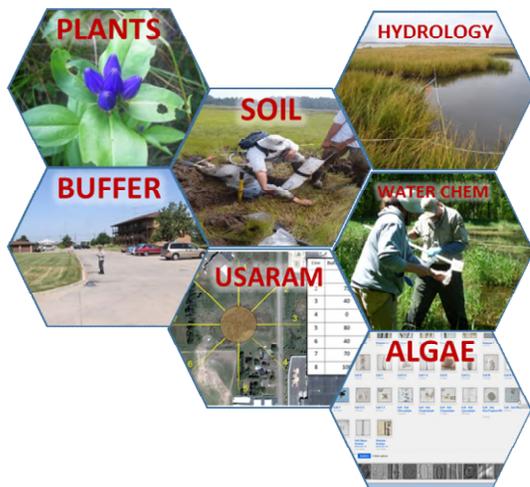


C. Develop Appropriate Metrics/Indicators of Condition and Stress

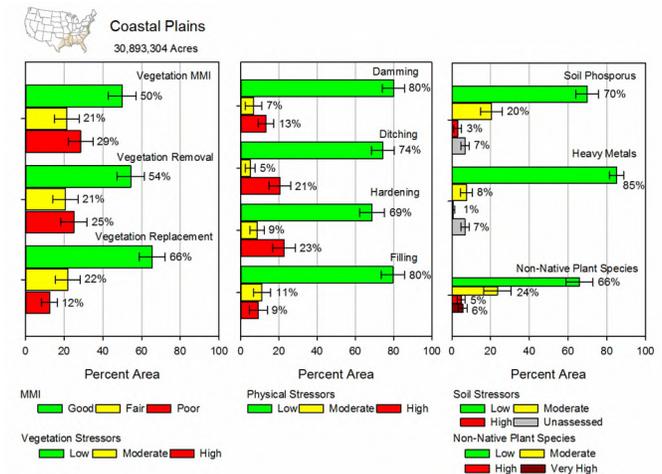
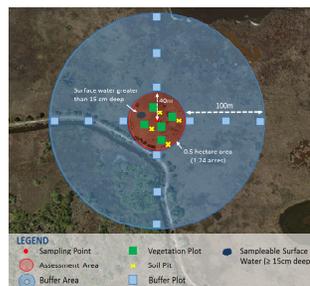
## D. Set thresholds for Condition/Stress categories (i.e., "good", "fair", "poor")



## E. Derive Estimates of Condition/Stress for Population

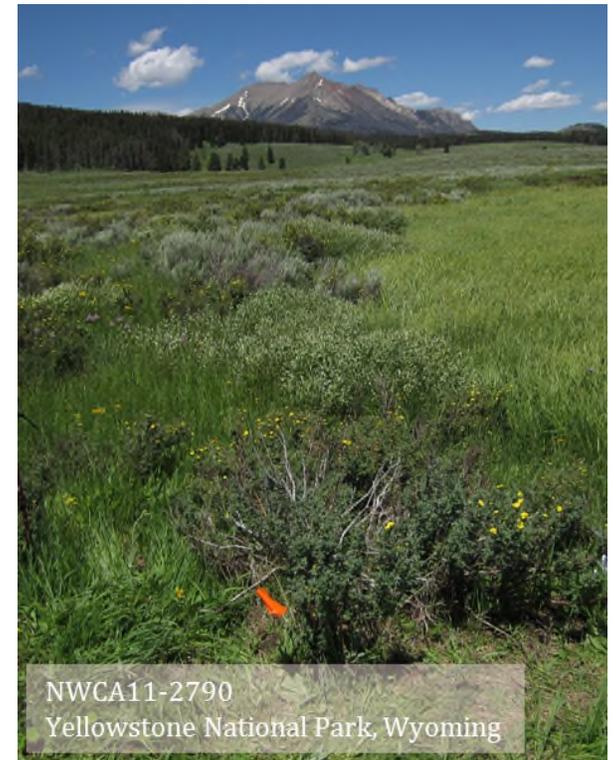


## B. Collect Standard Field and Lab Data



# Key Report 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



# 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**

# 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**

# 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)**

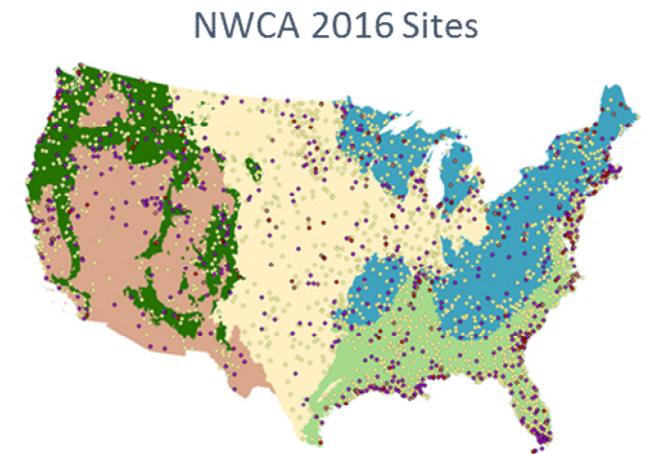
# Regional Findings: West



- 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%**

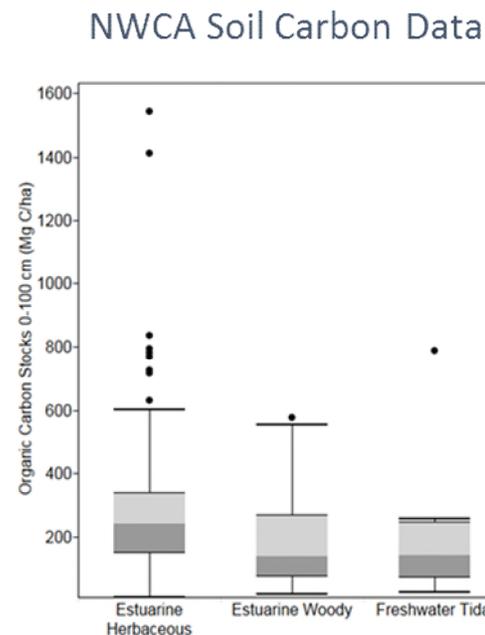
# NWCA Implications & Follow-Up Actions

- Working with ORD, R10, and western states 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
  - R10 RARE proposal
- Engagement with stakeholders on implications, applications, and use of NWCA data
  - ASWM communications templates
  - Special Issue on NWCA in scientific journal
  - NWCA Campus Challenge
  - External/Internal program outreach



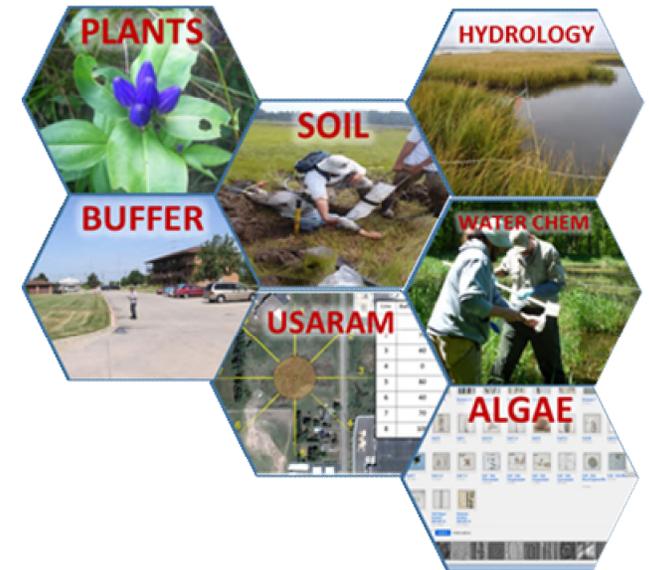
# Applications/Uses of NWCA Data

- Program management
  - Compensatory mitigation & voluntary restoration
    - Performance monitoring and evaluation
    - Data on reference condition
  - Wetlands role in mitigating climate change
    - “Blue” Carbon project
    - NWCA soil data being used to inform development of baseline estimates of carbon storage in coastal wetlands
  - National and site-specific data to inform
    - CWA 404 permit, NEPA reviews
    - Development of wetland water quality standards
- Data for national databases
  - Species occurrence data for USDA PLANTS
  - Accuracy of National Wetlands Inventory maps
  - NRCS hydric soils
  - Reference site networks
- Verification and assessment of wetland field indicators
  - Plant, hydrology, and hydric soil indicators



# NWCA Innovations for Wetland Science

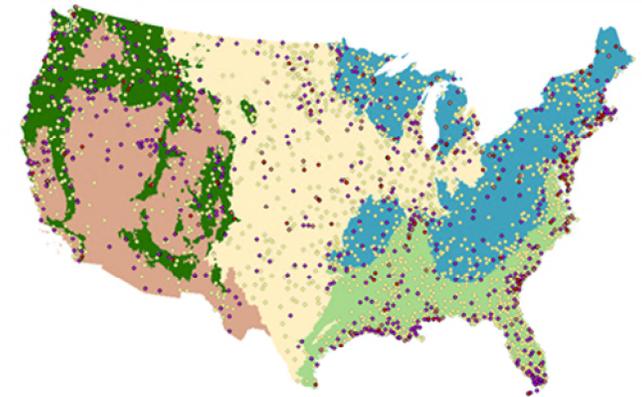
- Development of national indicators of biological condition and stress
  - Robust multimetric index of biological condition (VMMI) to evaluate condition across varying wetland types and ecoregions
  - Physical, chemical and biological indicators of stress based on readily collected field and lab data
- 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



# NWCA 2016 Survey

- Field sampling for NWCA 2016 survey began April 17<sup>th</sup> in Georgia
- Completing regional trainings for state and contract field crews
- 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

NWCA 2016 Sites



# Acknowledgements

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



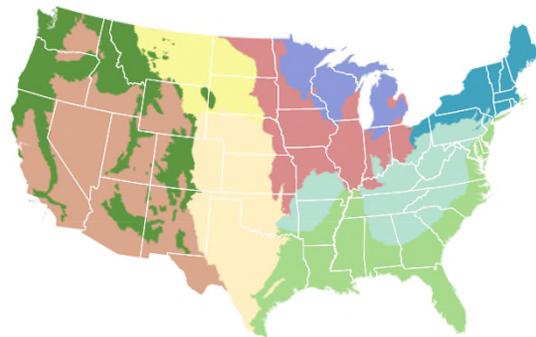
# Appendix: Additional Slides for reference

# NWCA Indicators and Threshold Approach

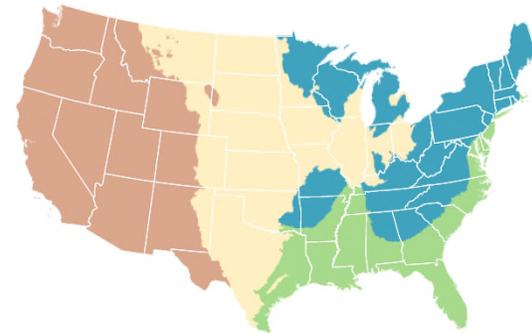
Category	Indicator	Description	Threshold Approach	General Assessment Notes
Biological Condition	Vegetation MMI	Index comprised of 4 metrics related to plant abundance, native status, and tolerance to disturbance	Regionally specific distribution based threshold	Data on specific plants and abundance collected from five plots systematically distributed in assessment area. Index developed based on species composition (presence/abundance) and traits.
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, pasture/hay, rangeland)	Nationally consistent fixed threshold	Observational data on the presence of stressors collected from plots systematically distributed in assessment area and 100 meter buffer area. Information was compared to fixed thresholds set nationally.
	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, fallow field)		
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)	Nationally consistent fixed threshold	Observational data on the presence of hydrologic stressors collected in the assessment area and from plots systematically distributed in the 100 meter buffer area. Information was compared to fixed thresholds set nationally.
	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 measured in soil sample and closely associated with anthropogenic activities	Nationally consistent fixed threshold	Samples collected from upper 10 centimeter of soil in the assessment area. Measured concentrations compared to thresholds based on background concentrations of heavy metals.
	Soil Phosphorus	Concentration of phosphorus in soil sample	Regionally specific distribution based threshold	Samples collected from upper 10 centimeter of soil in the assessment area. Measured concentrations compared to thresholds based on reference sites.
	Microcystin	Concentration of the algal toxin microcystin in composite water, sediment, and surface vegetation sample	Nationally consistent fixed threshold	Samples collected from surface water, sediment, and vegetation surfaces. Measured concentrations compared to WHO algal toxin threshold for recreation.
Biological Stress	Nonnative Plant Stressor Index	Index comprised of 3 metrics related to presence and abundance of nonnative plants	Nationally consistent fixed threshold	Data on specific plants and abundance collected from five plots systematically distributed in assessment area. Index developed based on species composition (presence/abundance) and traits. 17

# NWCA 2011 Reporting Groups

- General rule followed by EPA in NARS is to have  $\geq 50$  sites per reporting group to ensure valid population estimates
- NWCA grouped ecoregions



9 NARS Ecoregions



4 NWCA Ecoregions

- NWCA grouped wetland types

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



herbaceous

scrub-shrub (SS) forested (FO)

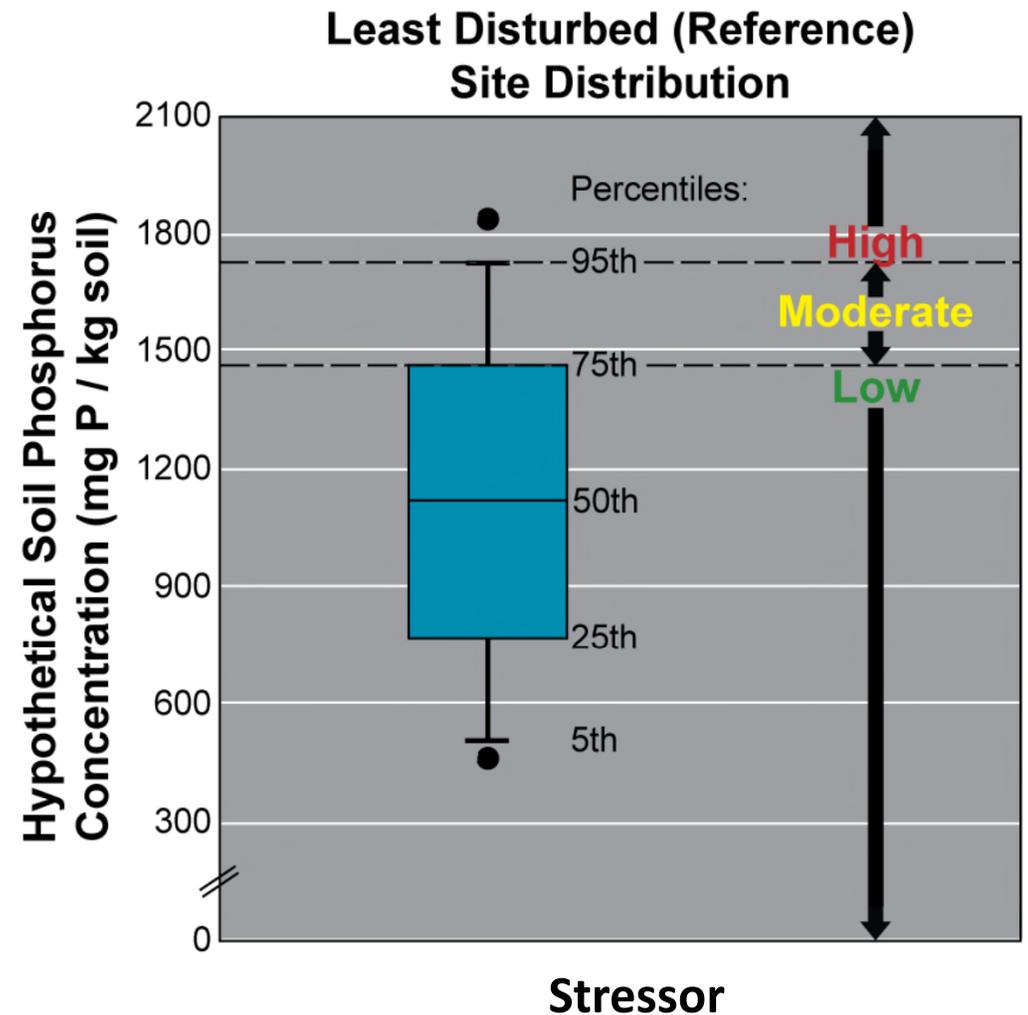
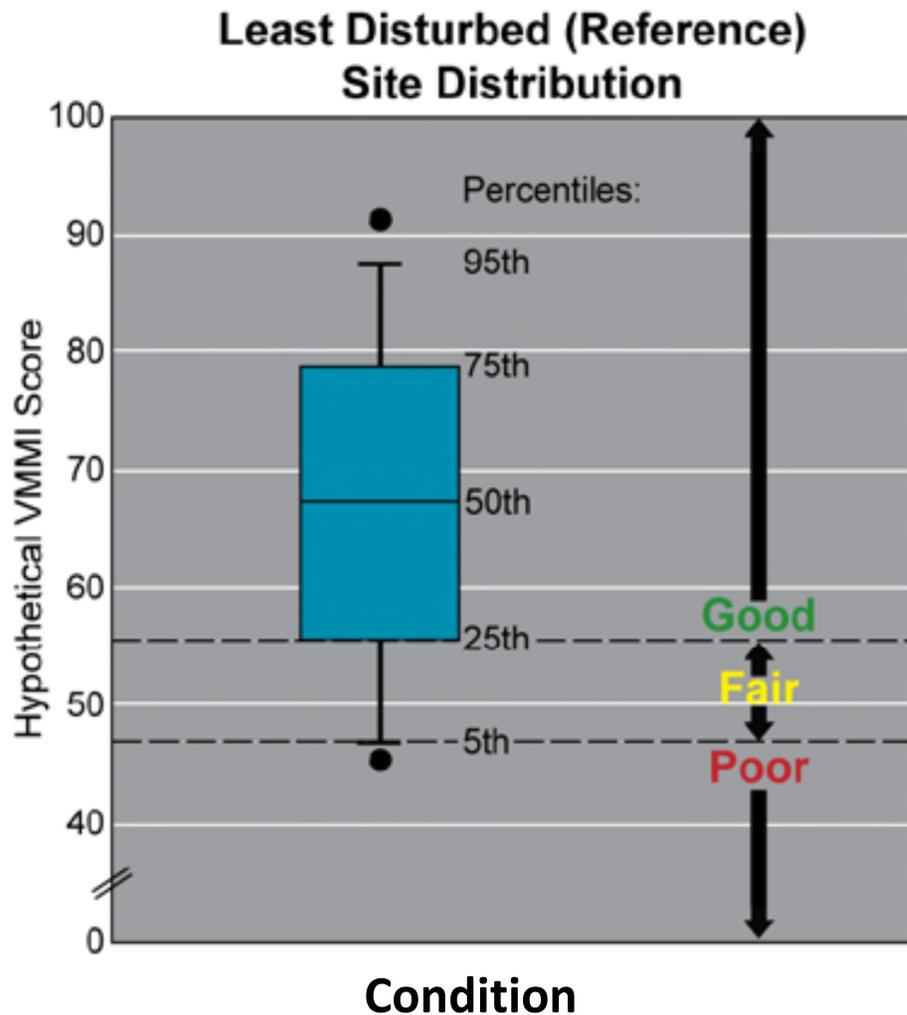


woody

# Wetland Area Assessed in NWCA by Region/Type

Region	Sampled Sites in Population	Acres Represented by Sampled Sites, (% of Population)	NWCA Wetland Type	Sampled Sites in Population	Acres Represented by Sampled Sites, (% of Population)
National 	967	62,156,199 (100%)	Estuarine Herbaceous	258	4,987,824 (8%)
			Estuarine Woody	69	497,821 (1%)
			Inland Herbaceous	302	13,599,611 (22%)
			Inland Woody	338	43,070,943 (69%)
Coastal Plain 	513	30,893,305 (50%)	Estuarine Wetlands	288	5,283,489 (9%)
			Inland Herbaceous	62	3,750,551 (6%)
			Inland Woody	163	21,859,265 (35%)
Eastern Mtn & Upper Midwest 	152	19,956,668 (32%)	Estuarine Wetlands	14	29,173 (0.04%)
			Inland Herbaceous	55	3,762,089 (6%)
			Inland Woody	83	16,165,406 (26%)
Interior Plains 	156	7,659,166 (12%)	Estuarine Wetlands	0	0
			Inland Herbaceous	115	4,598,831 (7%)
			Inland Woody	41	3,060,335 (5%)
West 	146	3,647,060 (6%)	Estuarine Wetlands	25	172,985 (0.3%)
			Inland Herbaceous	70	1,488,139 (2%)
			Inland Woody	51	1,985,936 (3%)

# Reference-based approach for setting thresholds



# Reporting of NWCA 2011 Results

A. National estimates of condition or stress level are shown by the first group of bars, followed by estimates for each of the NWCA Aggregated Ecoregions

C. Number shows the value of the estimate represented by the bar (e.g., 48% of wetland area Nationally is in Good condition)

E. Proportion of wetland area nationally or within an ecoregion in each of the condition or stress level categories

B. Condition classes or stress levels are indicated by colors:  
 Green = Good Condition or Low Stress  
 Yellow = Fair Condition or Moderate Stress  
 Red = Poor Condition or High Stress  
 Dark Red = Very High Stress (nonnative plant stressor only)  
 Gray = Unassessed (area that could not be sampled)

D. Confidence Interval displays level of certainty or confidence in the estimate

F. Assessed wetland area, in acres, nationally or within an ecoregion in each of the condition or stress level categories

