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Reviewed: 7/27/2021

National Aquatic Resources Surveys: Applications for Wetland Condition Monitoring and Assessment in Texas

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Society of Wetland Scientists
Corpus Christi, TX
June 3, 2016

Environmental Institute of Houston

University of Houston Clear Lake

Acknowledgements

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  - Environmental Protection Agency (EPA)
  - Texas Commission on Environmental Quality (TCEQ)

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  - John Ward (Botanist)
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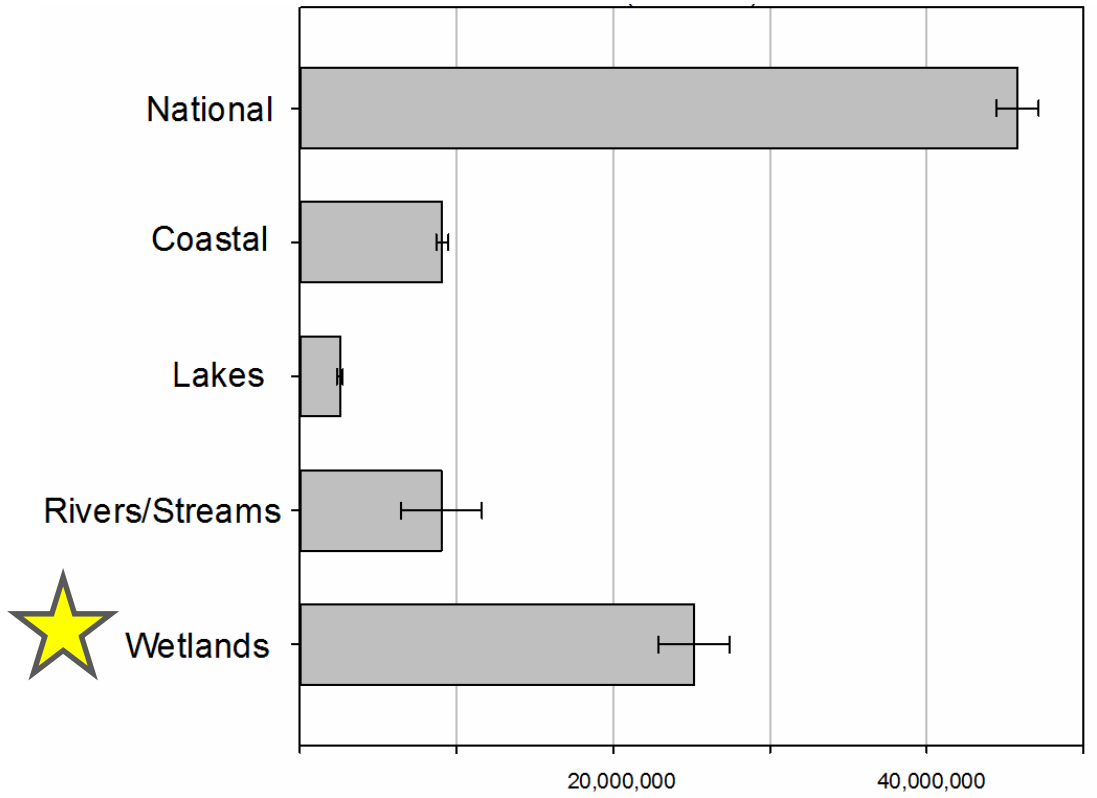
  - Kristen Vale
  - Colby Lawrence
  - Jeff Borksi
  - Khem Paudel
  - Alex Miller

National Aquatic Resource Surveys

- Status and change in the Nation's water quality
  - Coastal Condition Assessment
  - Lakes Assessment
  - Rivers and Streams Assessment
  - Wetland Condition Assessment
    - Sampled 2011
    - Report released 2016

    EPA-843-R-15-005



Steve Paulsen, EPA Personal Communication

NWCA Design Background

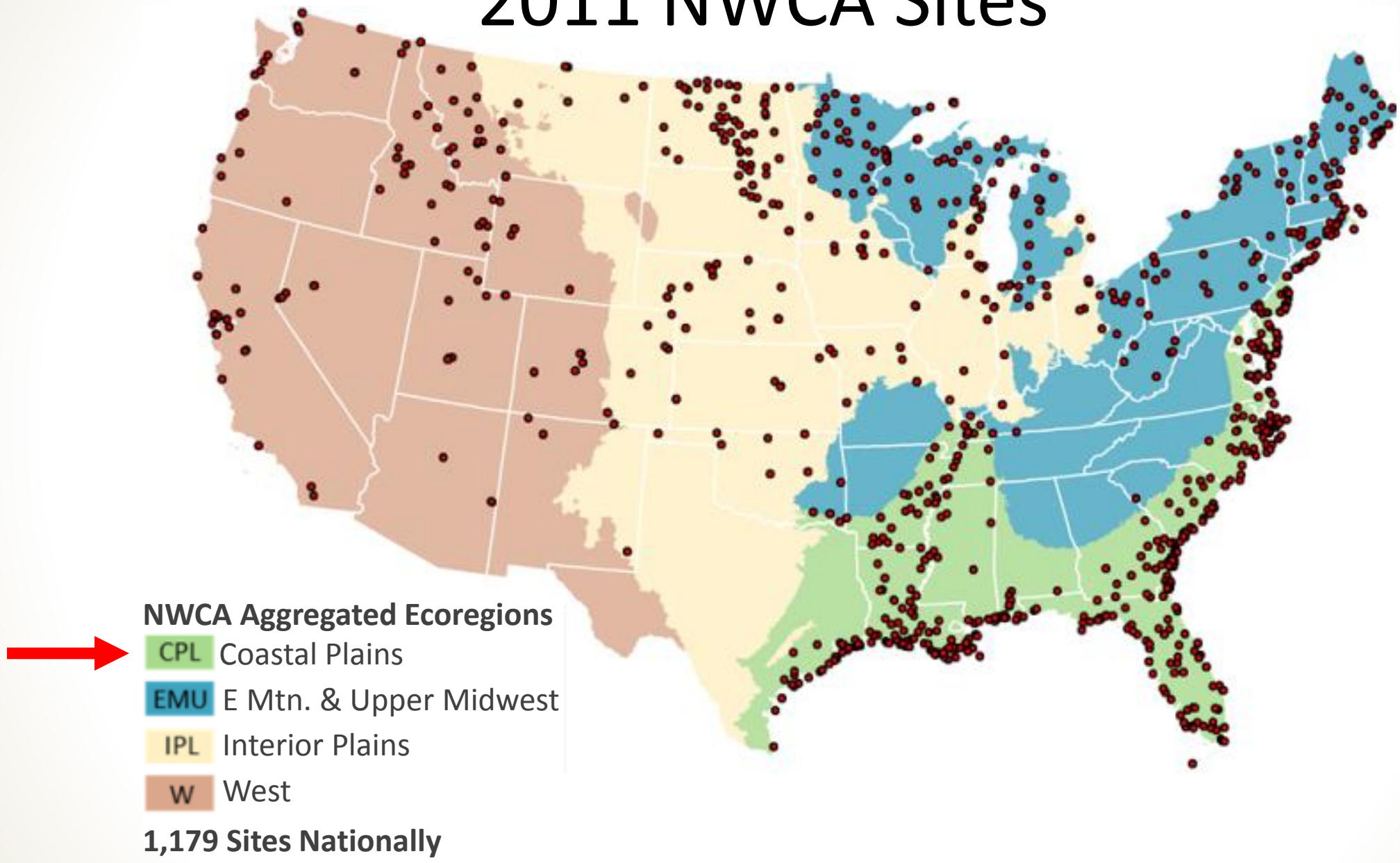
- How does NWCA define wetlands?
  - Cowardin Definition
  - Not considered jurisdictional for purposes of CWA
- Which wetlands are included?
  - USFWS Wetland Status and Trends Program
  - Both Tidal and Non-tidal
  - < 10% of 1+ m deep open water
  - Not in crop production

NWCA Design Background

- How are sites picked?
  - Probability-based sampling design (GRTS)
  - Number of sites relative to the total area of each wetland type

- What does the NWCA tell us?
  - Condition of wetlands
    - Condition classes: **poor**, **fair**, **good**
    - Stressor levels: **high**, **moderate**, **low**
    - Nationally *OR* by 4 major ecoregions

2011 NWCA Sites

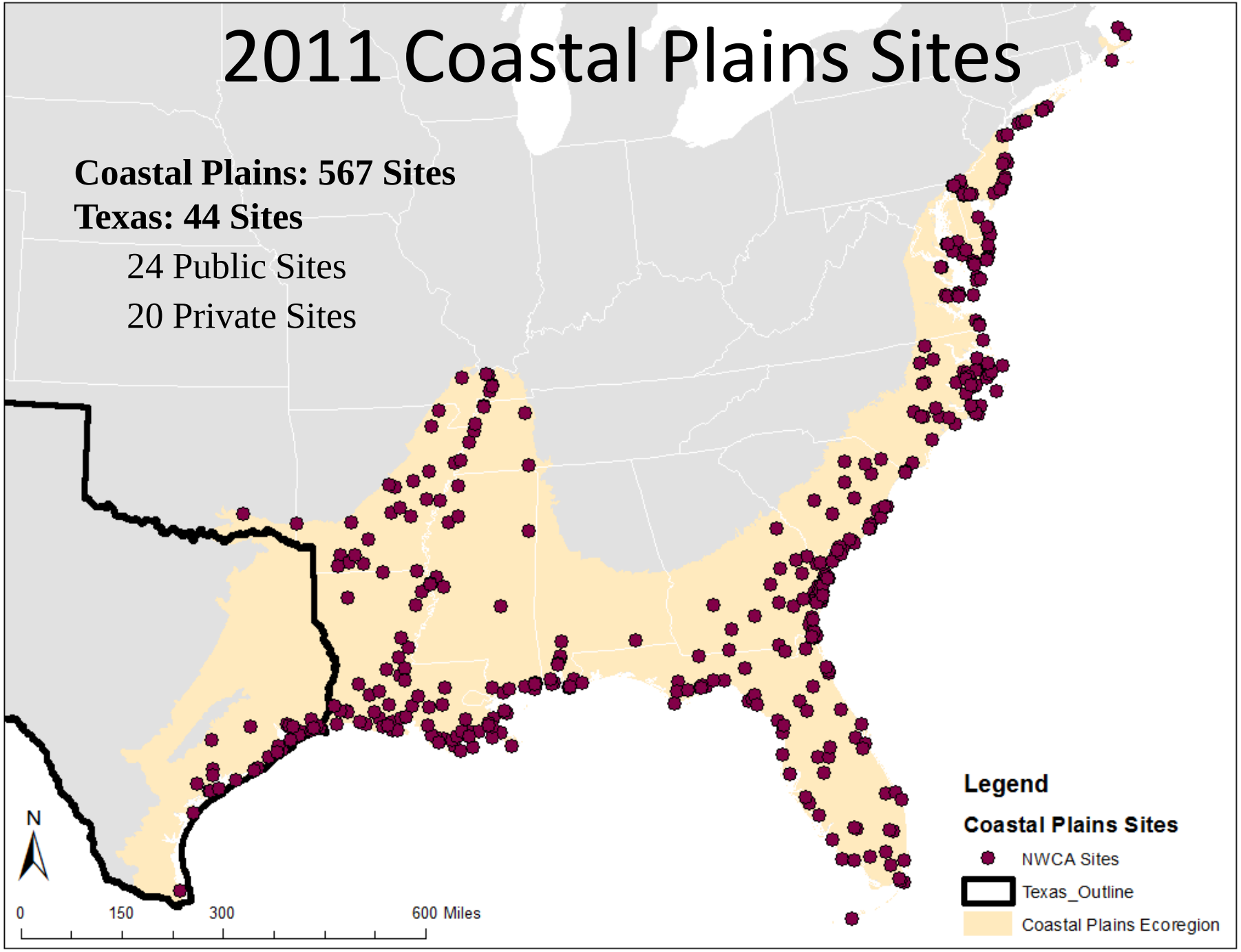


2011 Coastal Plains Sites

Coastal Plains: 567 Sites
Texas: 44 Sites

24 Public Sites

20 Private Sites

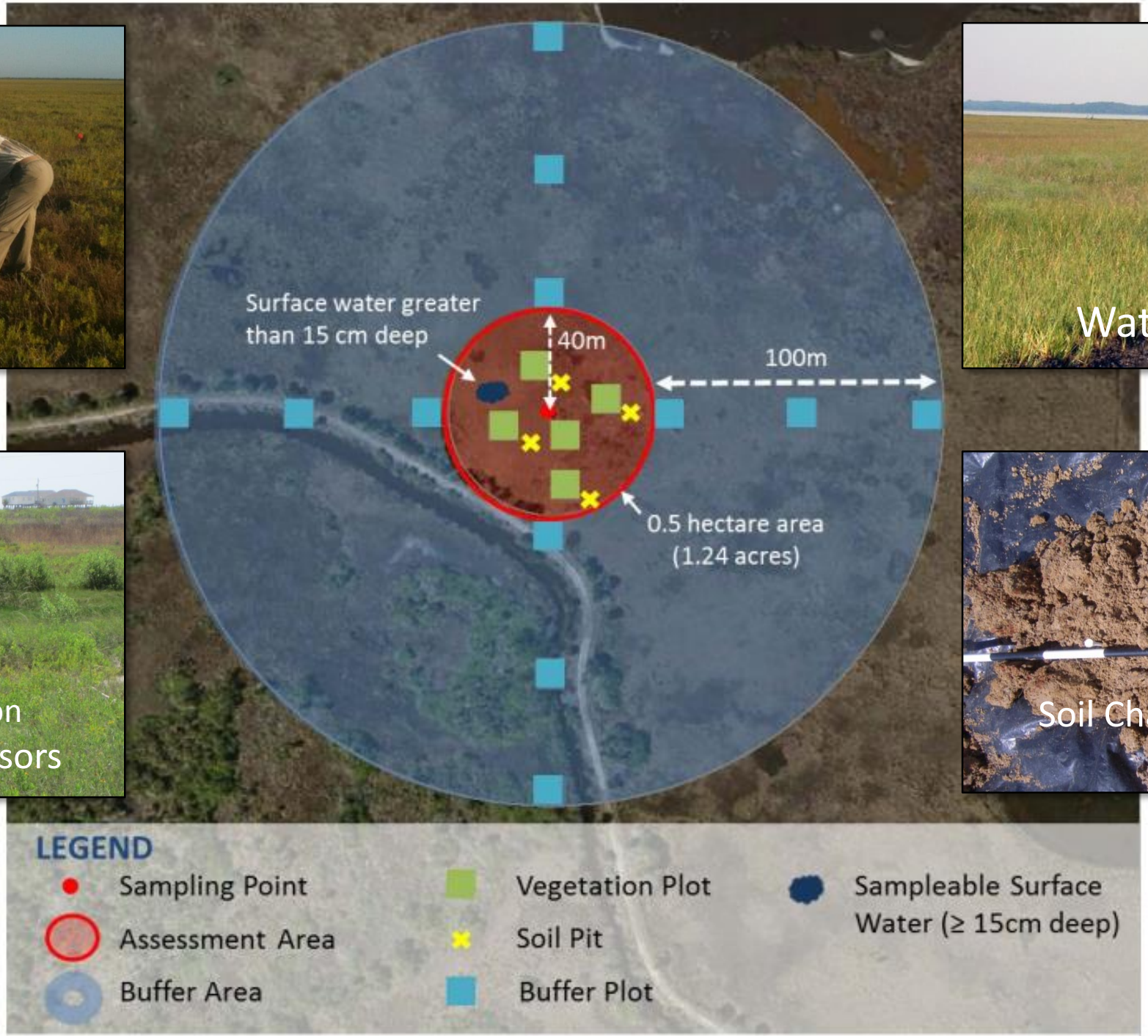


Vegetation

Water Samples

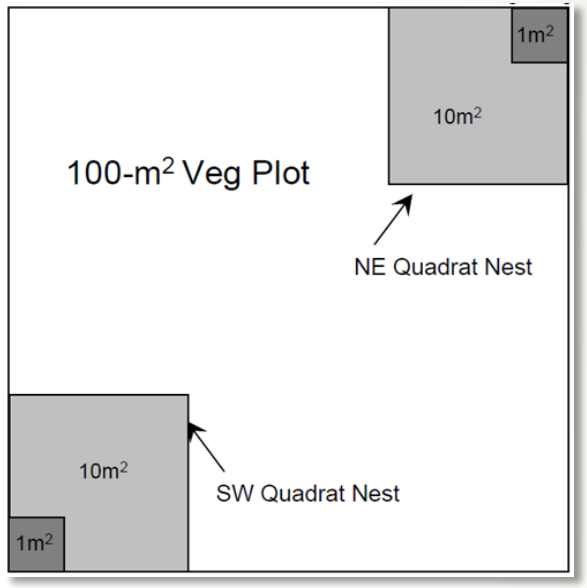
Site Characterization
& Presence of Stressors

Soil Characterization &
Samples

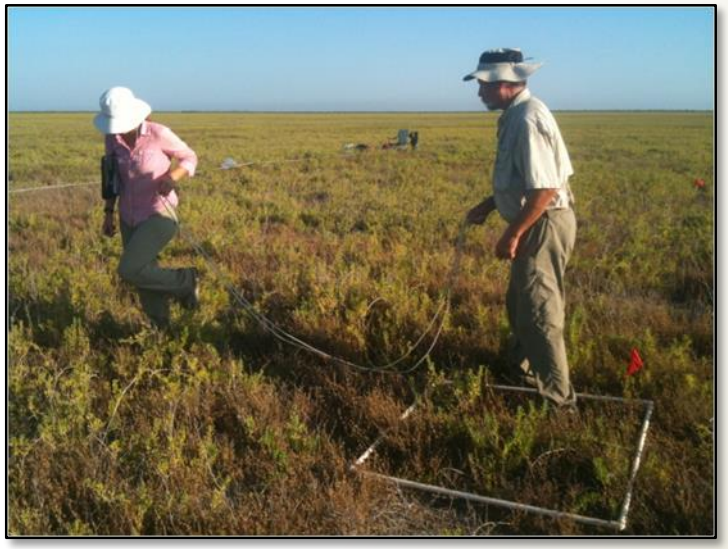


Biological Condition

- Identified all species of vegetation
  - Composition
  - Abundance
  - Trait Information

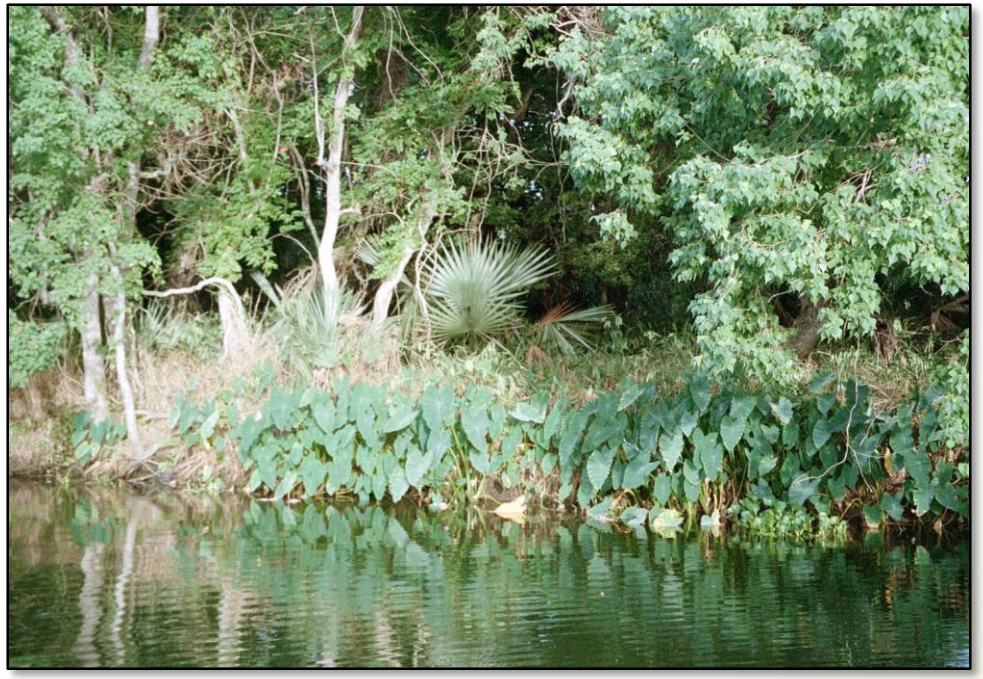


- **Vegetation Multimetric Index** (VMMI)
  - Floristic Quality Assessment Index
  - Relative Importance of Native Plant Species
  - Number of Plant Species Tolerant to Disturbance
  - Relative Cover of Native Monocot Species



Biological Indicator of Stress

- **Non-native Plant Stressor Indicator** (NPSI)
  - Relative Cover of Non-native Species
  - Non-native Species Richness
  - Relative Frequency of Occurrence of Non-native Species



* Photos: Galveston Bay Estuary Program's "The Quite Invasion"

Physical Indicators of Stress

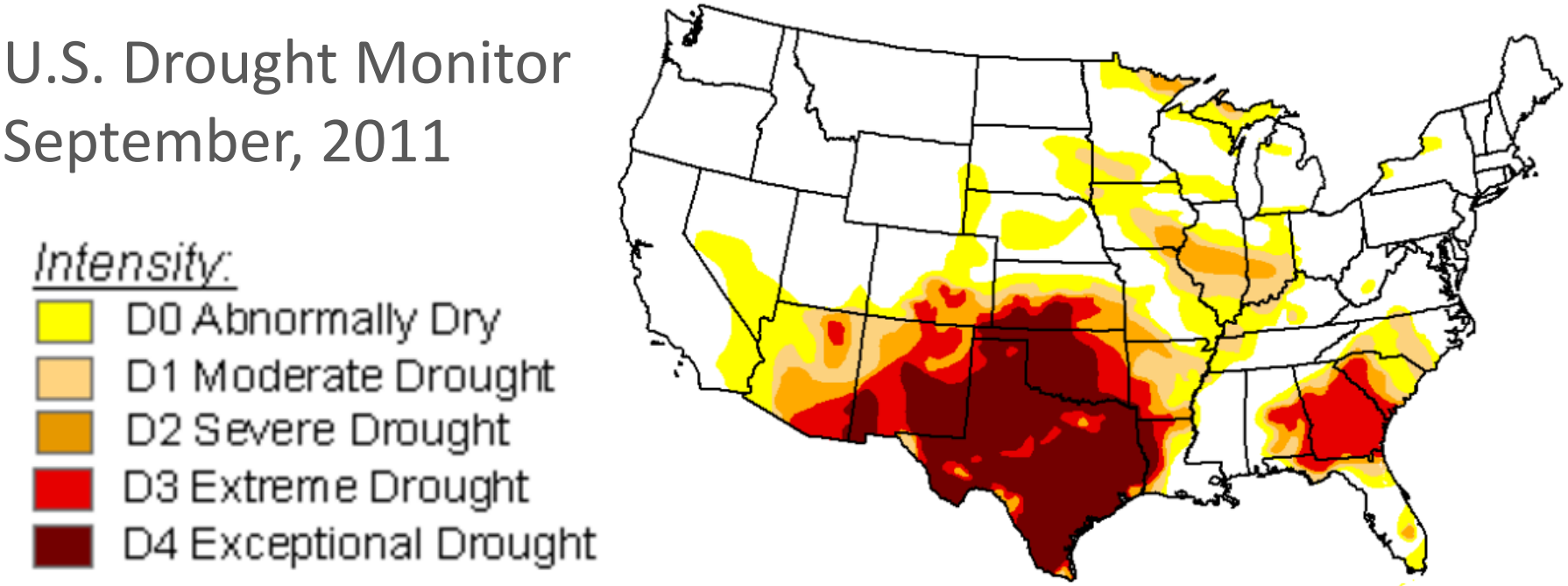
- **Vegetation Alteration**
  - Vegetation Removal
  - Vegetation Replacement
- **Hydrologic Alteration**
  - Damming
  - Ditching
  - Hardening
  - Filling/Erosion

Chemical Indicators of Stress (Soil)

- **Heavy Metal Index**
  - 12 metals associated with anthropogenic activities
  - Stress-level thresholds, based on natural background concentrations (not toxicity)
  - ≥3 thresholds exceeded = high stress
  - 0 thresholds exceeded = low stress
- **Soil Phosphorus Concentrations**
  - Natural variation
    - Soil type
    - Wetland type
    - Climate
  - Localized reference site approach

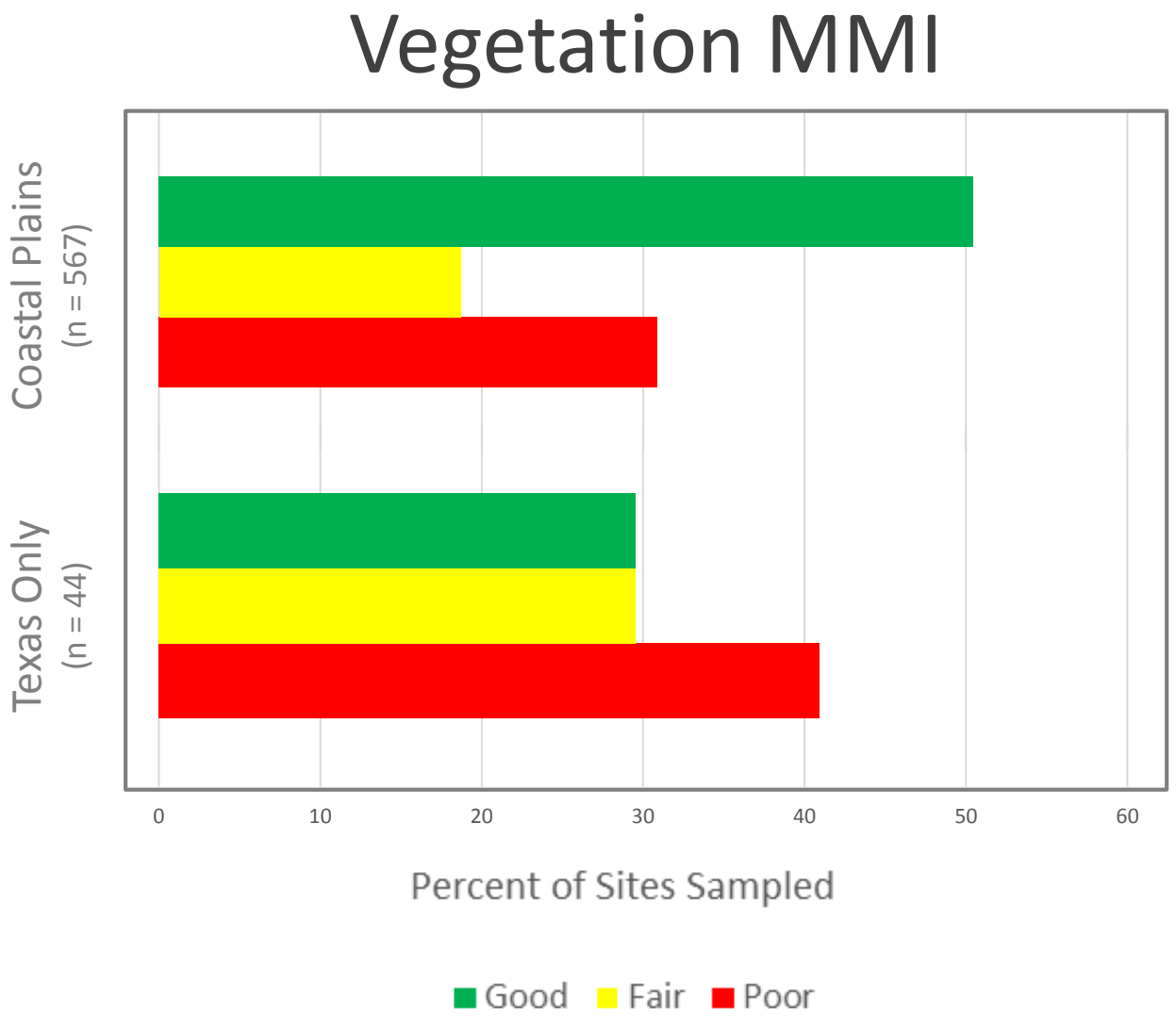
Qualifiers

U.S. Drought Monitor
September, 2011



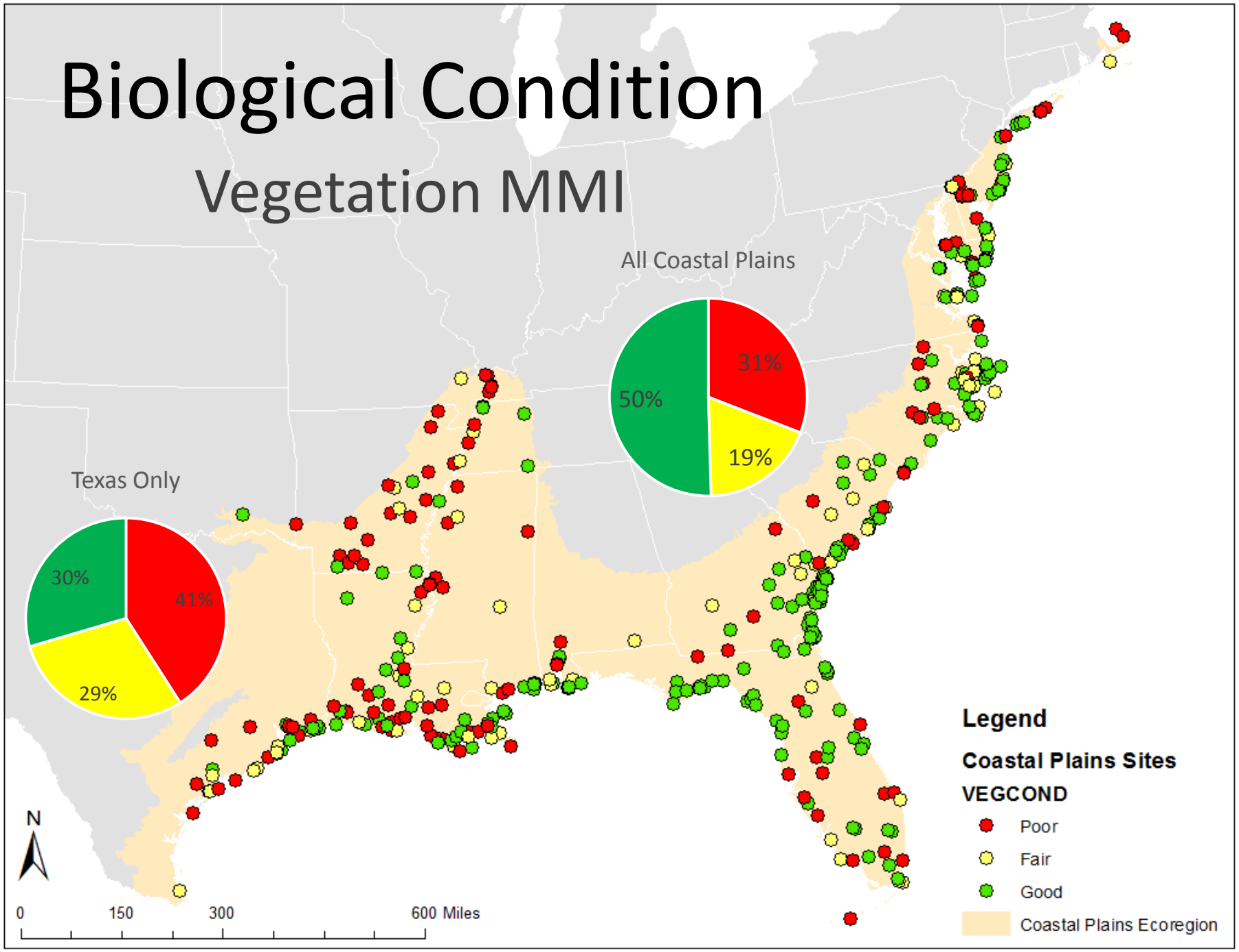
- Study design was *not* intended to evaluate at state level
- *Snapshot* of wetland condition

Biological Condition

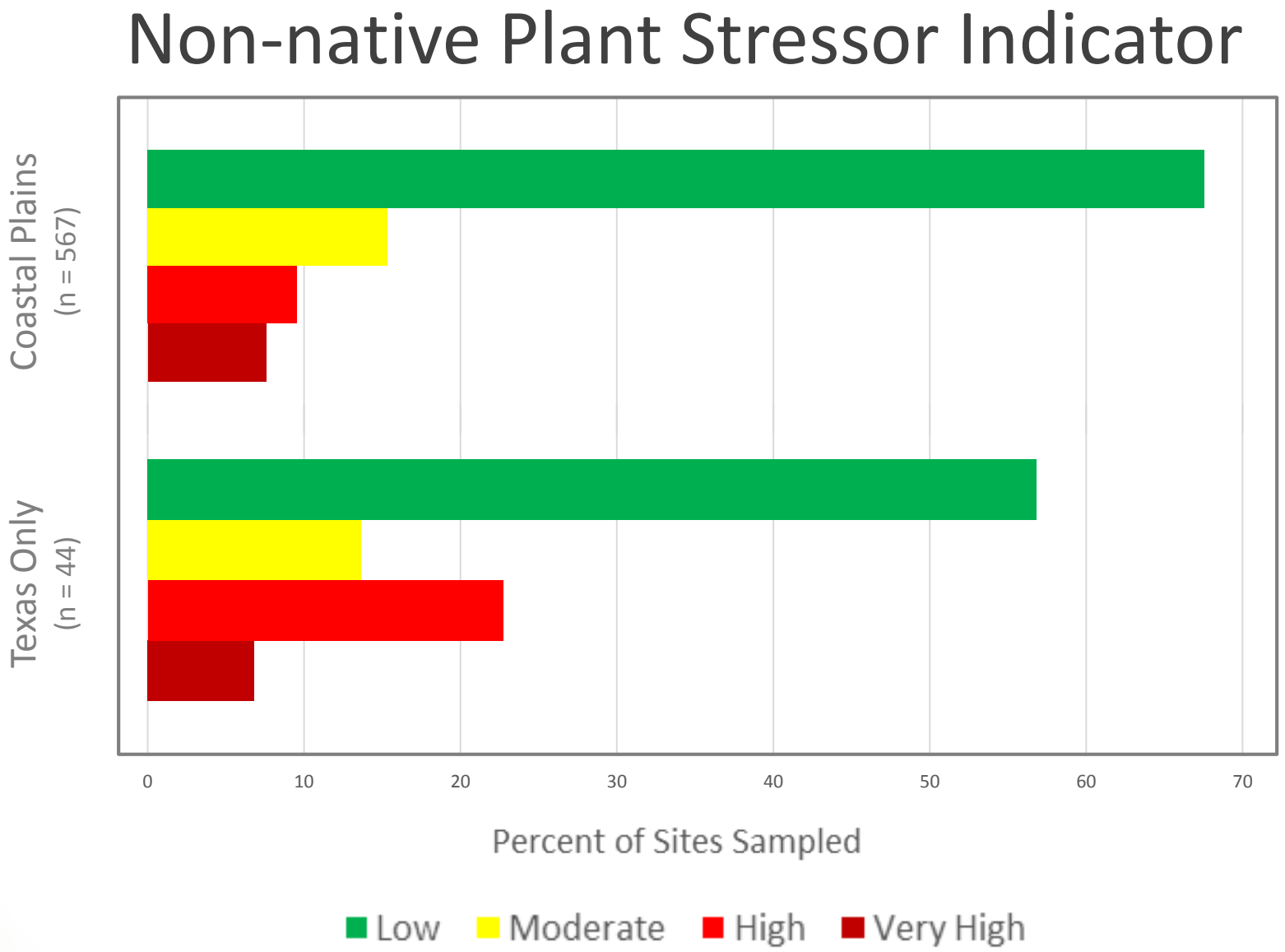


Biological Condition

Vegetation MMI

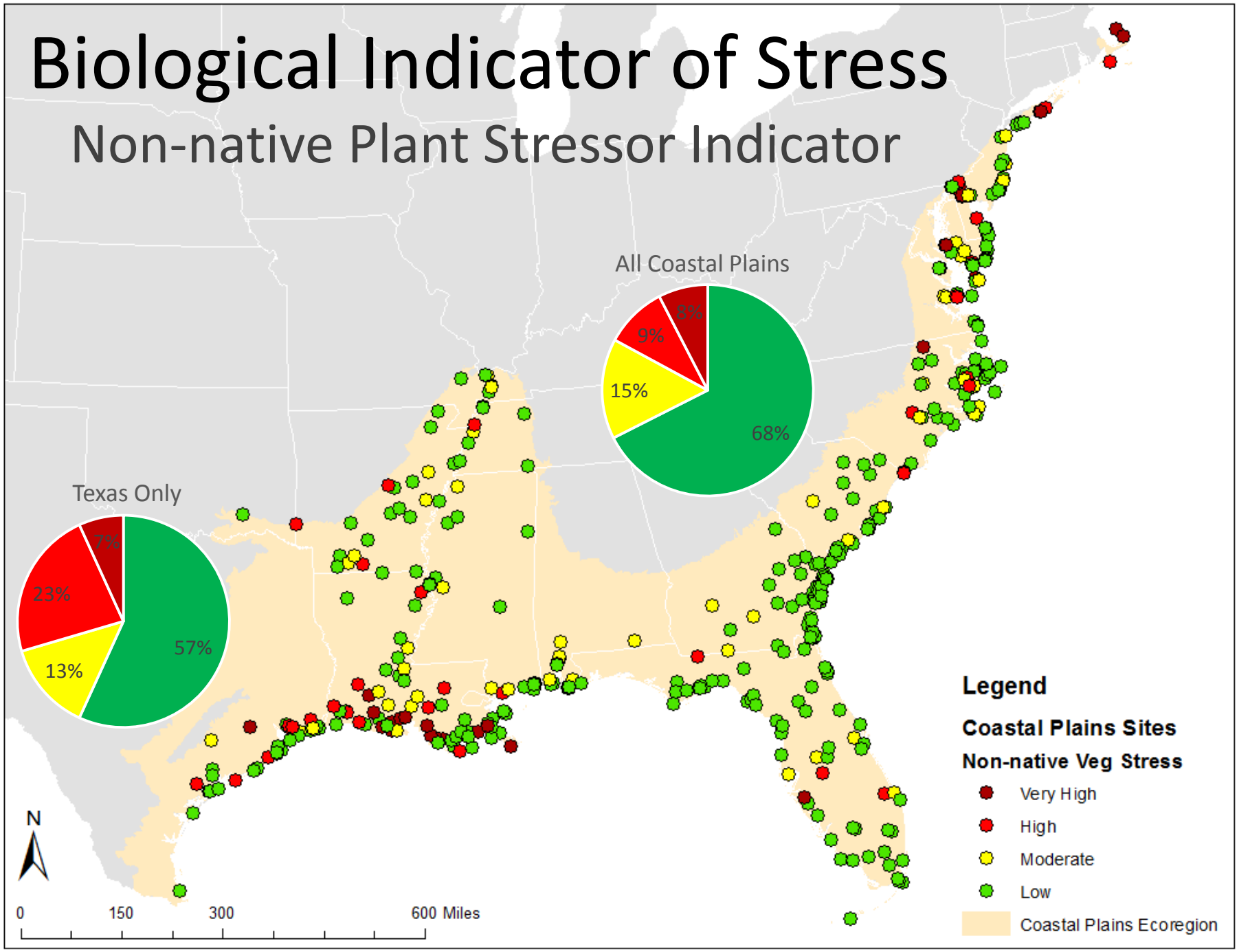


Biological Indicator of Stress



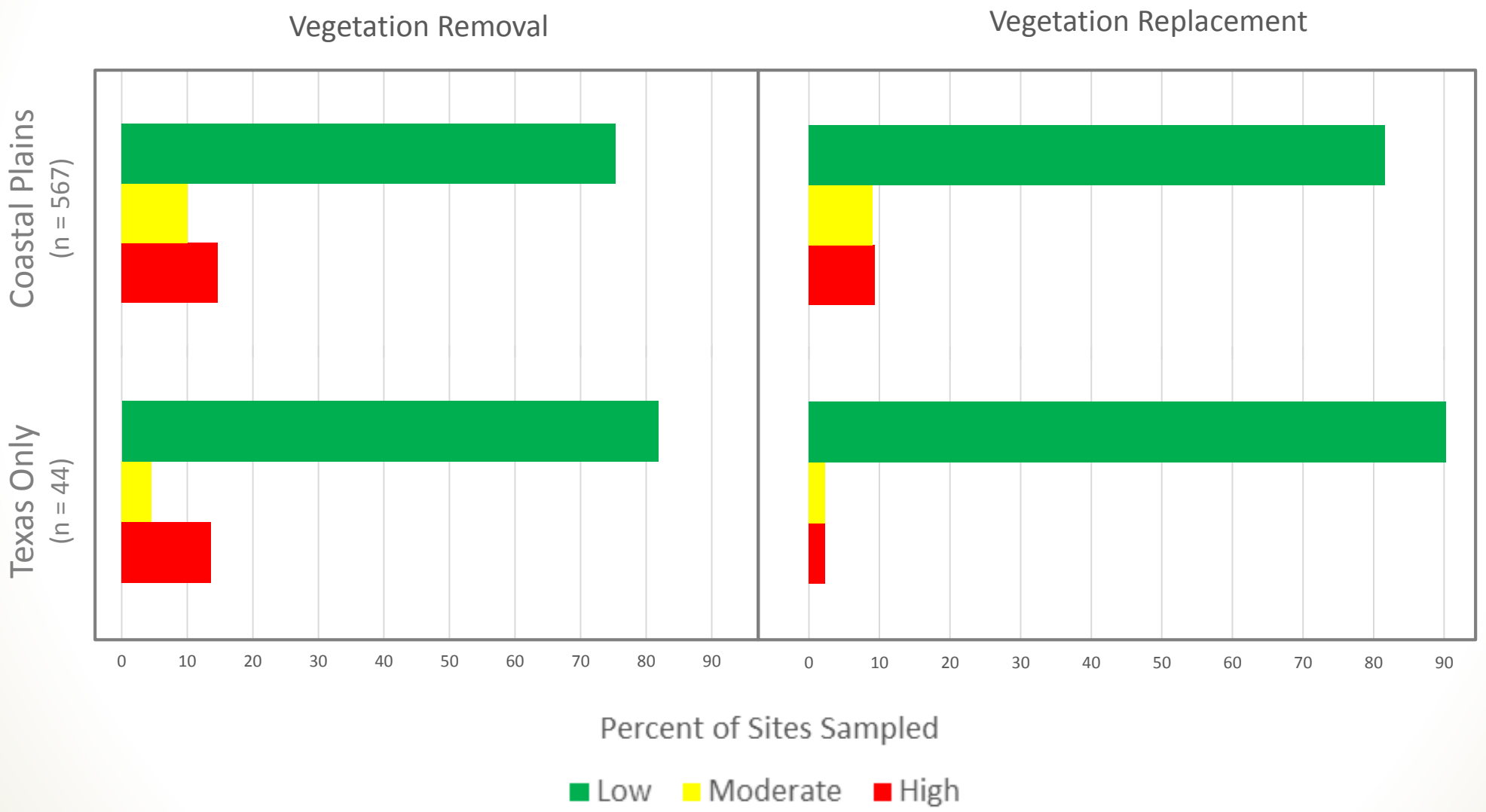
Biological Indicator of Stress

Non-native Plant Stressor Indicator



Physical Indicators of Stress

Vegetation Alteration

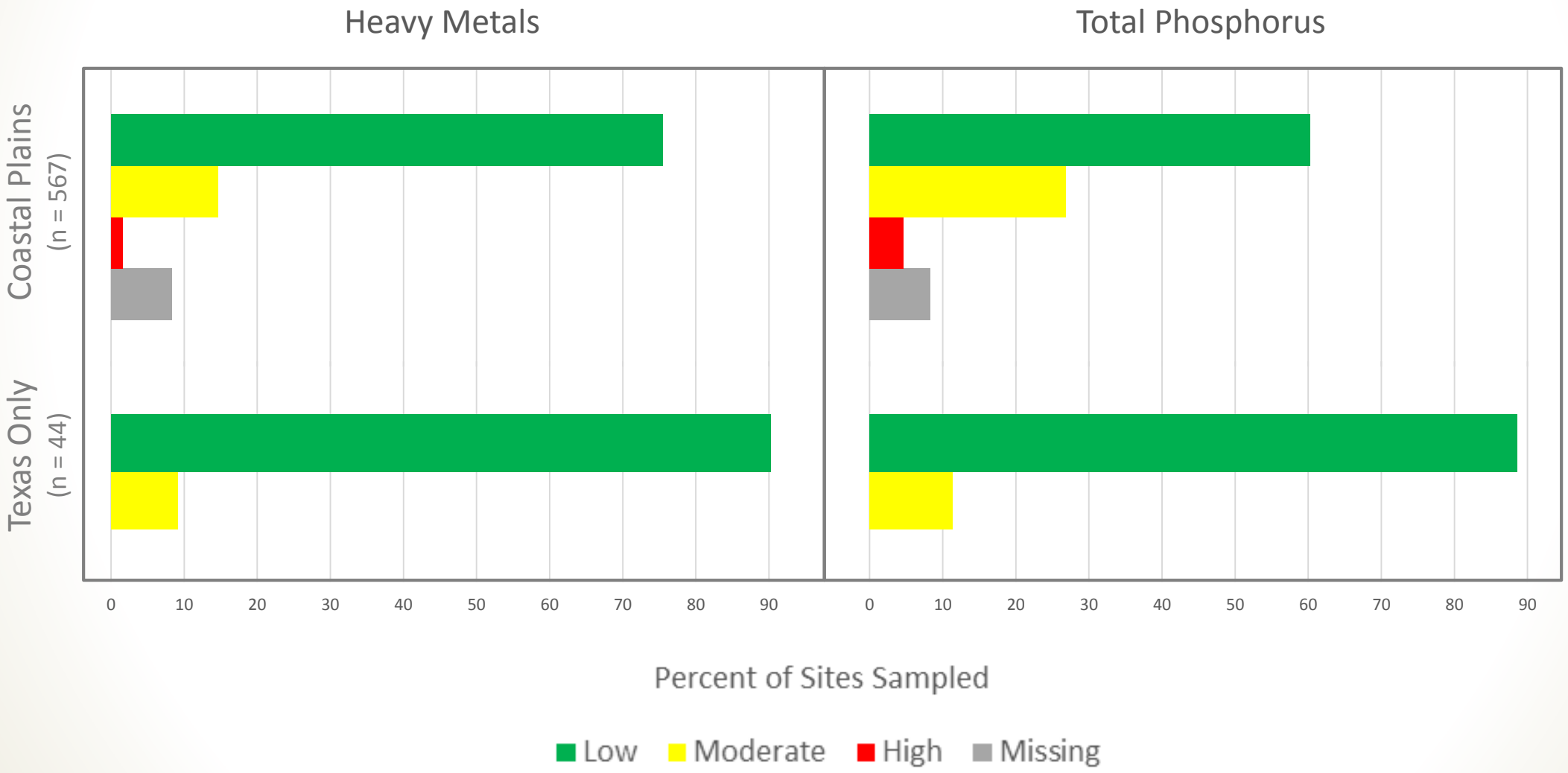


Physical Indicators of Stress

Hydrologic Alteration

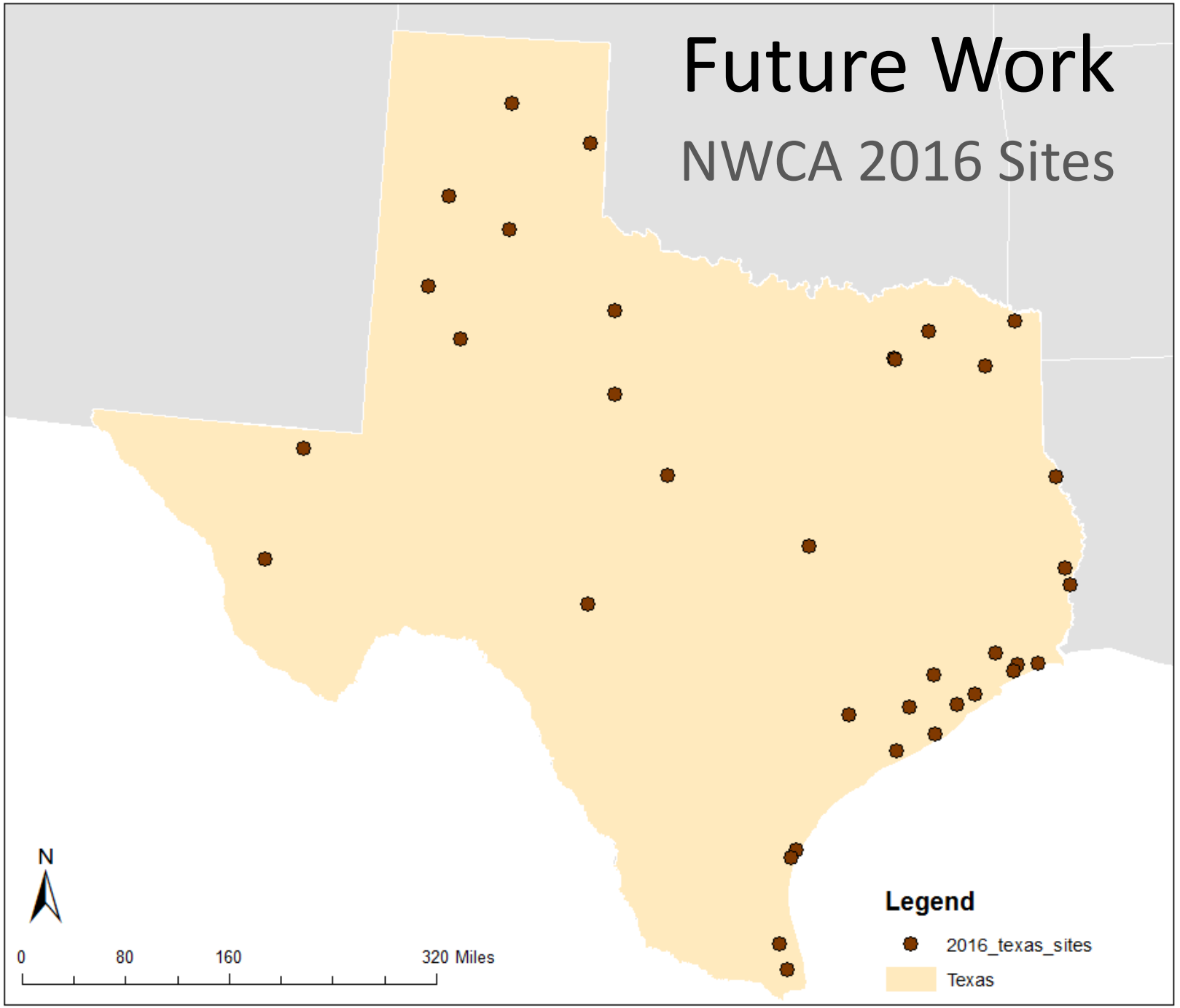
Chemical Indicators of Stress

Soil Chemistry

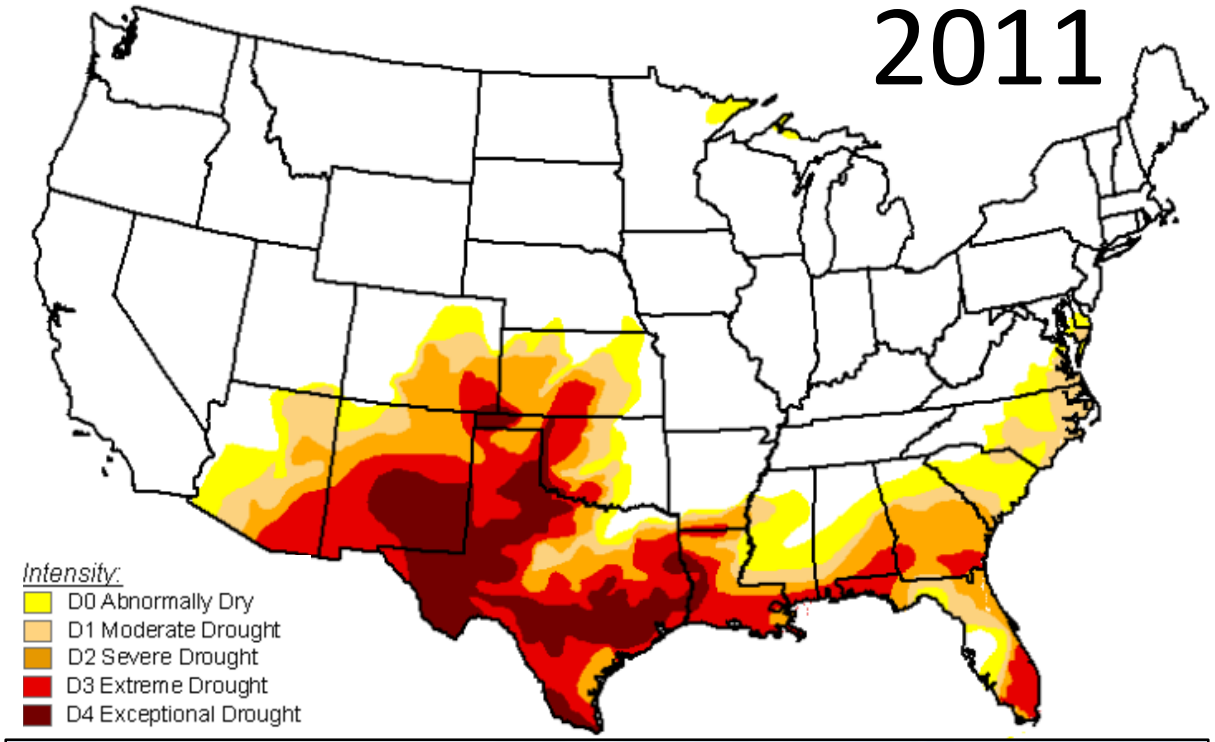


Future Work

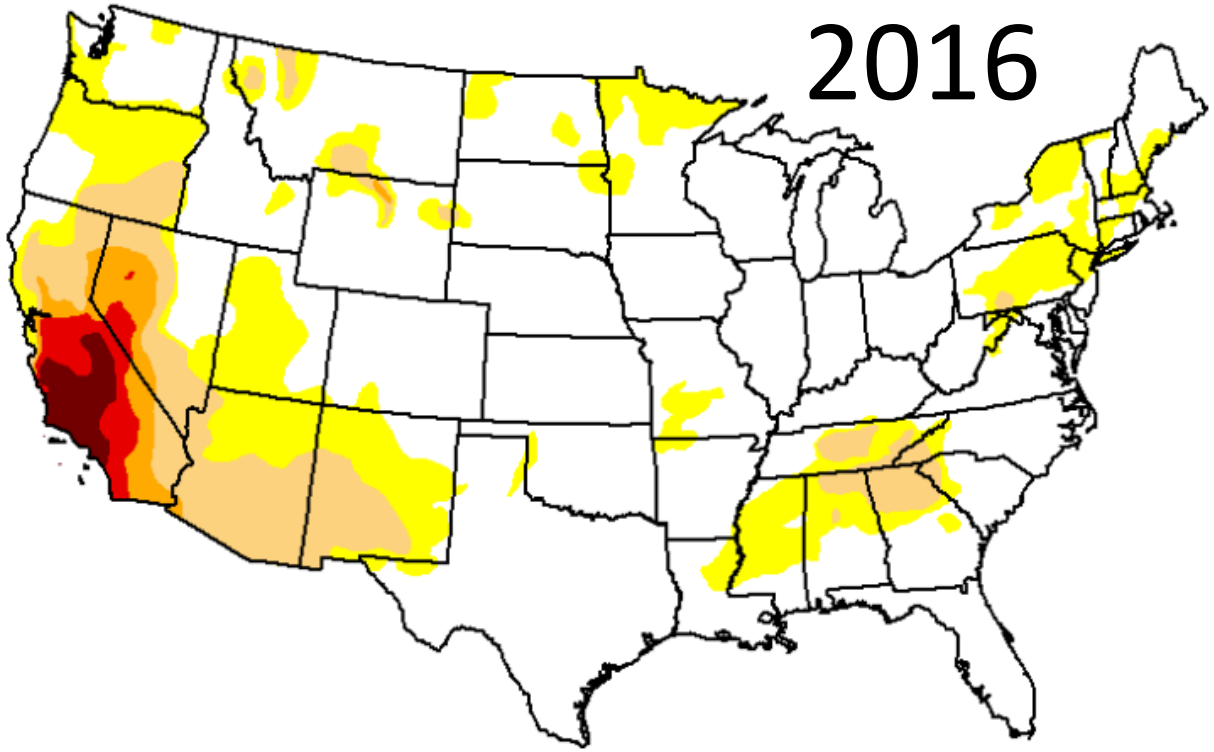
NWCA 2016 Sites



2011


Intensity:
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought

2016



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NWCA surveys, making an impact…