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

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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

NWCA Aggregated Ecoregions

- CPL Coastal Plains
- EMU E Mtn. & Upper Midwest
- IPL Interior Plains
- W West

1,179 Sites Nationally
2011 Coastal Plains Sites

Coastal Plains: 567 Sites
Texas: 44 Sites
  24 Public Sites
  20 Private Sites
Water Samples
Soil Characterization & Samples
Vegetation
Site Characterization & Presence of Stressors
Water Samples
Soil Characterization & Samples

Surface water greater than 15 cm deep
0.5 hectare area (1.24 acres)

LEGEND
- Sampling Point
- Assessment Area
- Buffer Area
- Vegetation Plot
- Soil Pit
- Buffer Plot
- Sampleable Surface Water (≥ 15cm deep)
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
• Study design was not intended to evaluate at state level
• Snapshot of wetland condition
Biological Condition

Vegetation MMI

- **Coastal Plains**
  - (n = 567)
- **Texas Only**
  - (n = 44)

Percent of Sites Sampled

- **Good**
- **Fair**
- **Poor**
Biological Condition

Vegetation MMI

- All Coastal Plains:
  - Poor: 31%
  - Fair: 50%
  - Good: 19%

- Texas Only:
  - Poor: 41%
  - Fair: 29%
  - Good: 30%
Biological Indicator of Stress

Non-native Plant Stressor Indicator

Percent of Sites Sampled

- Low
- Moderate
- High
- Very High

Coastal Plains (n = 567)

Texas Only (n = 44)
Biological Indicator of Stress
Non-native Plant Stressor Indicator

Legend
Coastal Plains Sites
Non-native Veg Stress
- Very High
- High
- Moderate
- Low
- Coastal Plains Ecoregion
Physical Indicators of Stress

Vegetation Alteration

Vegetation Removal

Vegetation Replacement

Coastal Plains (n = 567)

- Low
- Moderate
- High

Texas Only (n = 44)

- Low
- Moderate
- High

Percent of Sites Sampled

Low  Moderate  High
**Physical Indicators of Stress**

**Hydrologic Alteration**

<table>
<thead>
<tr>
<th>Coastal Plains (n = 567)</th>
<th>Texas Only (n = 44)</th>
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- **Damming**
  - Low
  - Moderate
  - High

- **Ditching**
  - Low
  - Moderate
  - High

- **Hardening**
  - Low
  - Moderate
  - High

- **Filling/Erosion**
  - Low
  - Moderate
  - High

**Percent of Sites Sampled**

- Low
- Moderate
- High
Chemical Indicators of Stress

Soil Chemistry

Chemical Indicators of Stress

Heavy Metals

Total Phosphorus

Percent of Sites Sampled

Low  Moderate  High  Missing

Coastal Plains (n = 567)

Texas Only (n = 44)
Future Work

NWCA 2016 Sites
NWCA surveys, making an impact...