Applications of National Wetland Condition Assessment Data to Wetland Protection and Management

Mary E. Kentula
USEPA, ORD, NHEERL-WED, Corvallis, OR

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The views expressed in this presentation are those of the author and do not necessarily represent the views or policies of the U.S. Environmental Protection Agency
The 2011 NWCA Collaborators

- The USEPA Wetland Division Team and counterparts in the Regions
- State and Tribal Environmental Agencies – site evaluation and sampling
- The USEPA ORD Analysis Team
- Great Lakes Environmental Center - sampling logistics
- U.S. Army Corps of Engineers
- U.S. Department of Agriculture, Natural Resource Conservation Service
- U.S. Department of Agriculture, Forest Service
- U.S. Department of Interior, Fish and Wildlife Service
- U.S. Department of Interior, National Park Service
- U.S. Geological Survey
- Cooperating Colleges and Universities
- Participating Contractors
NWCA Objectives:

- Produce a national report describing the ecological condition of the Nation’s wetlands and stressors commonly associated with poor condition;

- Collaborate with states and tribes in developing complementary monitoring tools, analytical approaches, and data management technology to aid wetland protection and restoration; and

- Advance the science of wetland monitoring and assessment to support management needs.
The NWCA sampled:

Tidal and nontidal wetlands of the conterminous U.S., including farmed wetlands not currently in crop production.

The wetlands had rooted vegetation and, when present, open water less than 1 meter deep.
NWCA 2011 Sites Sampled

Total of 1138 sites

NWCA Aggregated Ecoregions
- Coastal Plains (CPL)
- Eastern Mountains and Upper Midwest (EMU)
- Interior Plains (IPL)
- West (W)
NWCA Standard AA and Buffer

- Assessment Area
- Vegetation Plot
- Soil Pit
- Buffer Area
- Buffer Plot
Categories of Data Collected:

- Vegetation
- Soils
- Hydrology
- Water Chemistry
- Algae
- Stressors in AA and Buffer
- Buffer Characterization
- USA-RAM
Results and Potential Applications

- Definition of reference
- Status of ecological condition
- Relationship between stressors and ecological condition
Following Stoddard et al. (2006) definitions of reference:

- **Minimally Disturbed** sites have no evidence of significant human disturbance

- **Least Disturbed** sites represent the best available conditions given the current state of the landscape
The Screening Approach

Screen with "mesh size" determined by a Threshold

For example,
Screen = Vehicle Ruts in the Buffer
Threshold = Observed presence
Quantitatively defining reference

Definition of reference customized by NWCA aggregated ecoregion

- The initial thresholds for identifying reference sites were strict
- Relaxed thresholds, as needed, based on least disturbed condition in a region

Thresholds were determined by:

- Observed presence of indicator in buffer and hydrology data
- Combination of published background concentrations and natural breaks in the data for soil chemistry
- BPJ for Relative Cover of Alien Plant Species

Criteria for screening

- If a site did not exceed the threshold for an index, it remained in consideration for reference
- Reference sites must pass all thresholds
- Exceeding any one threshold disqualified a site as reference

Definition of reference is not intended to change with time; number of least disturbed sites increases with each assessment
Distribution of Classified Sites

Disturbance Classes
- Least Disturbed (L) \( n = 272 \)
- Intermediate Disturbed (I) \( n = 530 \)
- Most Disturbed (M) \( n = 331 \)

NWCA Aggregated Ecoregions
- Coastal Plains
- Eastern Mtns & Upper Midwest
- Interior Plains
- West

[Map showing distribution of classified sites across the United States]
Cape Cod, Massachusetts

High Density Residential Development

Golf Course

Most Disturbed

SITE_ID = NWCA11-1748
STATE = MA
ECO_X_ST = EMU-PH
REF_NWCA = M

B1H_ALL = 1.4
H_DIS = 3
HEAVYmetal_INDEX = 3
%ALIEN = 65
Least Disturbed

SITE_ID = NWCA11-1743
STATE = MA
ECO_X_ST = EMU-PH
REF_NWCA = L
B1H_ALL = 0.12
B1H_RESURB = 0.23
%ALIEN = 1.3

Residential Development
Minimally Disturbed

Northern Lakes & Forests Ecoregion

SITE_ID = NWCA11-R110
STATE = MN
ECO_X_ST = EMU-PH
REF_NWCA = L
Applications of Least Disturbed Sites

- National and ecoregional benchmark for tracking changes in the resource over time

- Provides a quantitative description of the target for restoration and other management actions in terms of characteristics of least disturbed wetlands
BIOLOGICAL CONDITION OF RESOURCE

Vegetation MMI Percent Area

- National (n = 967)
  - Good: 48% (20%)
  - Fair: 32% (32%)
  - Poor: 20% (29%)

- Coastal Plains (n = 513)
  - Good: 50% (21%)
  - Fair: 29% (29%)
  - Poor: 21% (29%)

- Eastern Mtn. & Upper Midw. (n = 152)
  - Good: 52% (11%)
  - Fair: 37% (37%)
  - Poor: 11% (37%)

- Interior Plains (n = 156)
  - Good: 44% (19%)
  - Fair: 36% (19%)
  - Poor: 11% (18%)

- West (n = 146)
  - Good: 61% (21%)
  - Fair: 36% (18%)
  - Poor: 18% (18%)

Percent Area

Area (acres)
CONDITION BY NWCA AGGREGATED WETLAND TYPE

Vegetation Index Percentages

<table>
<thead>
<tr>
<th>Type</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
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</thead>
<tbody>
<tr>
<td>National</td>
<td></td>
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<tr>
<td>(n = 967)</td>
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<tr>
<td>Estuarine Herbaceous</td>
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<td>(n = 258)</td>
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<tr>
<td>Estuarine Woody</td>
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<td>(n = 69)</td>
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<tr>
<td>PRL Herbaceous</td>
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<td>(n = 302)</td>
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<td>PRL Woody</td>
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<td>(n = 338)</td>
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Vegetation Index Area

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Stressor Extent: Nonnative Plants (NPSI)

- National: 21% Low, 9% Moderate, 10% High, 61% Very High
- Coastal Plains: 24% Low, 6% Moderate, 5% High, 66% Very High
- Eastern Mtn. & Upper Midw.: 15% Low, 7% Moderate, 4% High, 74% Very High
- Interior Plains: 27% Low, 12% Moderate, 26% High, 25% Very High
- West: 14% Low, 15% Moderate, 15% High, 42% Very High

Legend:
- Green: Low
- Yellow: Moderate
- Red: High
- Brown: Very High
Relationship Between Stressors and Condition

- Relative Extent of Stressors
- Relative Risk
- Attributable Risk
Relationship Between Stressors and Condition

Relative Extent
High Stressor Levels

- Vegetation Removal: 27%
- Hardening: 27%
- Ditching: 23%
- Damming: 15%
- Filling/Erosion: 10%
- Vegetation Replacement: 10%
- Soil Phosphorus: 6%
- Heavy Metals: 2%

Percent of Area
High Stressor Levels
Relationship Between Stressors and Condition

Relative Extent
High Stressor Levels

- Vegetation Removal: 27%
- Hardening: 27%
- Ditching: 23%
- Damming: 15%
- Filling/Erosion: 10%
- Vegetation Replacement: 10%
- Soil Phosphorus: 6%
- Heavy Metals: 2%

Percent of Area
High Stressor Levels

Relative Risk

- 1.9
- 1.6

Relative Risk

- 1.6
- 1.6
- 1.6
- 1.6
- 1.1
- 0.8
Relationship Between Stressors and Condition

Relative Extent
High Stressor Levels

- Vegetation Removal: 27%
- Hardening: 27%
- Ditching: 23%
- Damming: 15%
- Filling/Erosion: 10%
- Vegetation Replacement: 10%
- Soil Phosphorus: 6%
- Heavy Metals: 2%

(n = 967)

Relative Risk

- Vegetation Removal: 1.9
- Hardening: 1.8
- Ditching: 1.6
- Damming: 1.6
- Filling/Erosion: 1.6
- Vegetation Replacement: 1.6
- Soil Phosphorus: 1.1
- Heavy Metals: 0.8

Attributable Risk

- Vegetation Removal: 19%
- Hardening: 18%
- Ditching: 12%
- Damming: 9%
- Filling/Erosion: 6%
- Vegetation Replacement: 6%
- Soil Phosphorus: 0.7%
- Heavy Metals: -0.5%

EPA
2011 NWCA results can be used in management and restoration:

- As a quantitative definition and benchmark of least disturbed condition
- As a context for results of smaller scale assessments, e.g., state or watershed level
- To develop management approaches and restoration designs to address common stressors closely tied to poor condition
- To prioritize effort based on relative and attributable risk

NWCA info at http://water.epa.gov/type/wetlands/assessment/survey.index.cfm
2011 NWCA sets a benchmark for tracking future trends in wetland quality and, ultimately, for tracking progress toward the goals of the No Net Loss Policy

The NWCA results raise the question: “Is the current status of wetland quality what we want as a target?”

- only ~50% of wetland area nationally is in good biological condition, while
- ~30% of wetland area nationally is in poor biological condition

Identification of critical stressors to wetlands can shape a targeted approach to improving wetland quality

Monitoring and assessment of both gains and losses in wetland quality is essential from local to national scales

NWCA info at http://water.epa.gov/type/wetlands/assessment/survey.index.cfm