REFERENCE WETLANDS

Karen Newlon and Cat McIntyre
Montana Natural Heritage Program
Helena, MT
REFERENCE CONCEPT

- Indicators are evaluated against some expectation of condition
- Expectations act as a *reference* for comparison
- Reference represents a range of wetland conditions can be correlated with a known set of stressors
- Highest values within this range – *Reference Standard*
- Provides standard of comparison for describing the highest level of potential or expected wetland condition
REFERENCE STANDARD CONCEPT

- Minimally disturbed – condition in the absence of significant human disturbance
- Least disturbed condition – condition given the best available condition of the landscape
- Best attainable condition – equivalent to least disturbed condition if best management practices are implemented
Minimally disturbed – condition in the absence of significant human disturbance

Least disturbed condition – condition given the best available condition of the landscape

Best attainable condition – equivalent to least disturbed condition if best management practices are implemented
Defining reference standard provides context for interpreting wetland condition

Expectations for reference standard are represented by a range of indicator scores

This range of values represents the natural variability within a wetland system

Once described, different indicators within that range can be used to classify wetland condition
WETLAND CONDITION

Gradient of Ecological Condition

Reference standard

Severely impacted

Minimal disturbance

Gradient of human disturbance

Severe disturbance
Reference Standard Wetland
-an example from the Prairie Pothole Region
Impacted Wetland
-an example from the Prairie Pothole Region
REFERENCE WETLAND NETWORKS

- Establish a baseline for defining characteristic levels of condition
- Represent a range of condition for monitoring and assessing trends
- Establish range and variability of wetland attributes
- Develop indices of ecological integrity
MONTANA’S REFERENCE WETLAND NETWORK

- Provide a collection of sites that represent a gradient of condition
- Provides examples of reference standard for multiple wetland systems
- Identifies the variability in wetland attributes
- Identifies human-induced disturbances impacting wetland condition
Northwestern Glaciated Plains Ecoregion

- Great Plains Prairie Pothole
- Western Great Plains Saline Depression
- Western Great Plains Closed Depression
- Western Great Plains Open Freshwater Depression
Northwestern Great Plains Ecoregion

- Western North American Emergent Marsh
- Western Great Plains Closed Depression
- Western Great Plains Open Freshwater Depression
Middle Rockies, Northern Rockies, & Canadian Rockies Ecoregions

- Western North American Emergent Marsh
- Rocky Mountain Subalpine-Montane Fen
- Rocky Mountain Alpine-Montane Wet Meadow
METHODS

- Selected sites based on wetlands described in the literature and input from other ecologists

- Classified each wetland by:
  - ecological system
  - Cowardin system, class, and water regime
  - hydrogeomorphic features
METHODS

Level 2 - Rapid assessment

- Landscape connectivity, Buffer width
- Hydroperiod, Water source
- Native plant species cover, Invasive plant species cover
- Soil surface integrity, Water quality

Landscape Context, Hydrology, Biotic Structure, Physicochemical

Disturbances
RESULTS

Wetland Condition Score Categories

- at or near expected reference standard (scores = 90-100)
- least impacted (scores = 80-89)
- moderately impacted (scores = 70-79)
- severely impacted (scores < 70)
Results – Great Plains Wetlands

- **Overall Condition Score**
  - # of Wetlands
  - Freshwater Depression
  - Prairie Pothole
  - Saline Depression

**Results:**

- **<70:**
  - Freshwater Depression: 0
  - Prairie Pothole: 0
  - Saline Depression: 1

- **70-79:**
  - Freshwater Depression: 2
  - Prairie Pothole: 6
  - Saline Depression: 0

- **80-89:**
  - Freshwater Depression: 14
  - Prairie Pothole: 8
  - Saline Depression: 7

- **90-100:**
  - Freshwater Depression: 0
  - Prairie Pothole: 18
  - Saline Depression: 20
Results – Montane Wetlands

Overall Condition Score

- Subalpine-Montane Fen
- Emergent Marsh
- Alpine-Montane Wet Meadow

# of Wetlands
RESULTS

Northwestern Glaciated Plains and Northwestern Great Plains Wetlands

Most Common Stressors

- livestock grazing
- roads
- buffer condition
- landscape connectivity
- altered hydrology
RESULTS

Middle Rockies, Canadian Rockies, and Northern Rockies Wetlands

Most Common Stressors

- livestock grazing
- altered hydrology
- roads
WETLAND REFERENCE NETWORK
Uses and Applications

- Allow for rapid comparison of wetland condition both within and across wetland systems
- Can diagnose potential causes of wetland degradation
- Provide examples of multiple wetland systems in varying levels of condition across Montana
- Highlights areas to focus and prioritize conservation, acquisition, and restoration efforts
- Characterize examples of reference standard
- Validate and calibrate our wetland assessment methods
WETLAND REFERENCE NETWORK
Future Work

- Continue adding to network
- Refine disturbance gradient
- Collect more Level 3 data
- Develop regional networks
Rocky Mountain Regional Monitoring and Assessment Project (REMAP)

Project Partners:
- Montana
- Colorado
- Wyoming
- Funded through EPA ORD

Project Objectives:
1. Develop a regional set of reference standard wetlands:
   - wet meadows
   - marshes
   - fens
   - riparian shrublands
2. Quantify the range of natural variability within reference standard wetlands
3. Develop a regionally standardized Level 1, 2, 3 protocol
SITE SELECTION

- Selected 50 2x2 mile grid cells within each Level 3 Ecoregion

- Used a landscape integrity model to guide us towards high integrity areas

- Low integrity landscape excluded from the sample frame
Site Selection

- Within the high integrity landscape of each 2x2 m cell, laid down a grid of points 100 meters apart.
- Points ordered by GRTS in a spatially balanced random sequence.
- Identified all potential wetlands through photo-interpretation and NWI.
- Selected the first ordered point from each wetland ecological system.
**Field Criteria for Minimally Disturbed Sites**

**Distance from Roads:**
- >200 m 4x4, dirt road
- >300 m local, city road
- >500 m highways

**Hydrologic modifications:**
- >200 m canals, ditches
- >200 m wells, impoundments
- >1,000 m upstream reservoirs

**Land Cover:**
- >300 m low density residential
- >500 m crop agriculture/ hay pastures
- >2,000 m high density residential/ timber harvest

**Land Use:**
- >200 m evidence of livestock grazing
- >500 m abandoned mines/ tailing piles
- >1,000 m active gravel pit, open pit, strip mining
AA ESTABLISHMENT CRITERIA

- Assess 1 Ecological System
- Ecological system has to be at least 0.1 ha
- Wetlands had to be at least 20 m wide
- AA has to have less than 10% standing water and upland inclusions
Lessons So Far......

With so many rules a preliminary field season is a must!
Rocky Mountain Subalpine-Montane Fens
**Wet Meadow vs. Marsh**

- Have similar vegetation
- Can have similar soils
- Main difference is water duration
Questions?

knewlon@mt.gov or cmcintyre@mt.gov