Wetland Assessment in North Dakota using Three Tiered Assessment Methods

Christina Hargiss[a], Shawn DeKeyser[a], Mike Ell[b]

[a]School of Natural Resource Sciences, NDSU

[b]North Dakota Department of Health

Why monitor wetlands?

- Part of the Clean Water Act
- Priority of the EPA
- Started with index of biotic integrity
- Moved into other condition and function assessments

Heavily Disturbed

Moderately Impacted

Little Negative Impact - Native

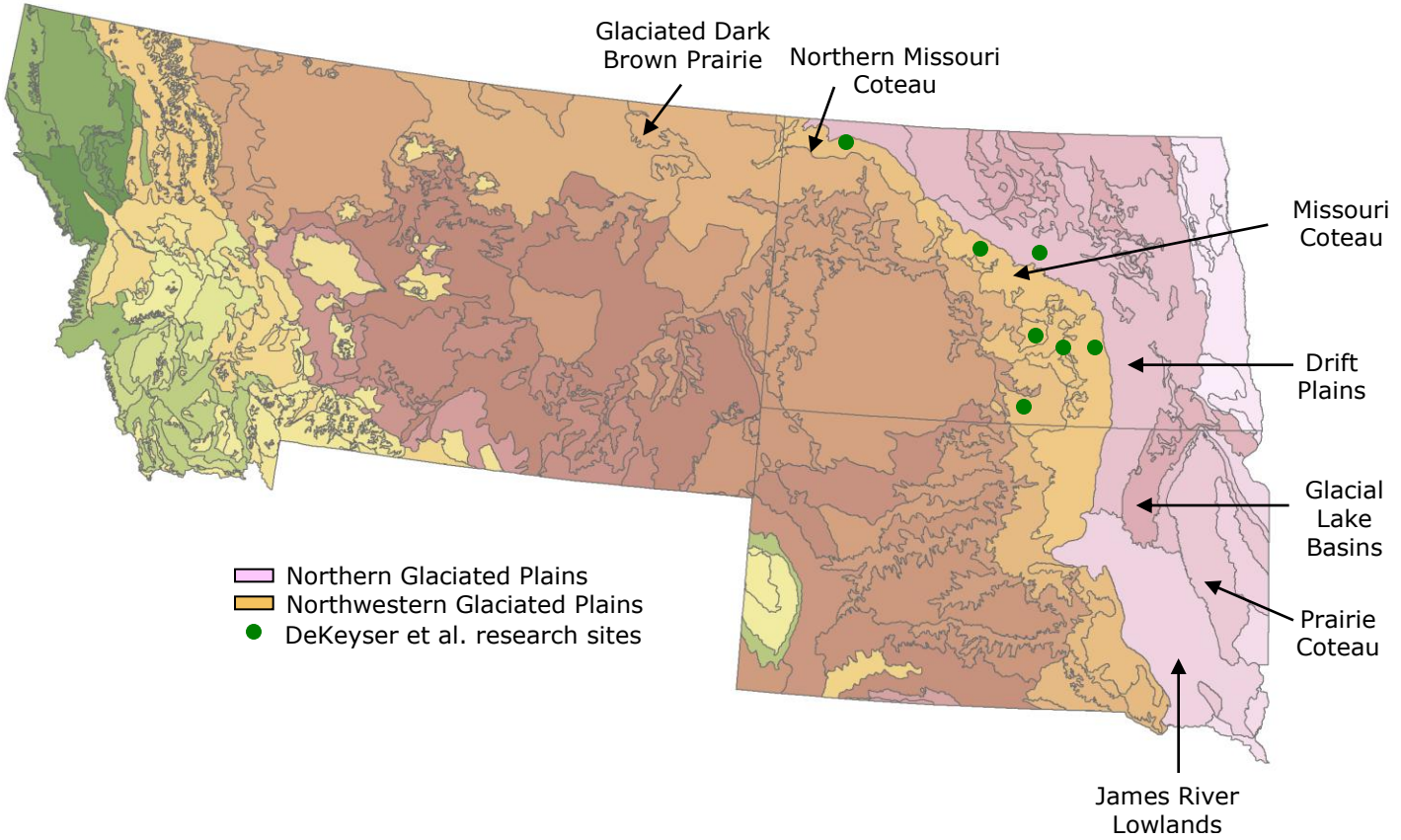
Three Tiered Assessment

- Recommended by EPA
- Level 1 – Remote Assessment
  - Landscape Wetland Condition Assessment Model (LWCAM)
- Level 2 – Rapid Assessment
  - North Dakota Rapid Assessment Method (NDRAM)
- Level 3 – Intense Assessment
  - Index of Plant Community Integrity (IPCI)
  - Hydrogeomorphic (HGM) Model

Index of Plant Community Integrity (IPCI)

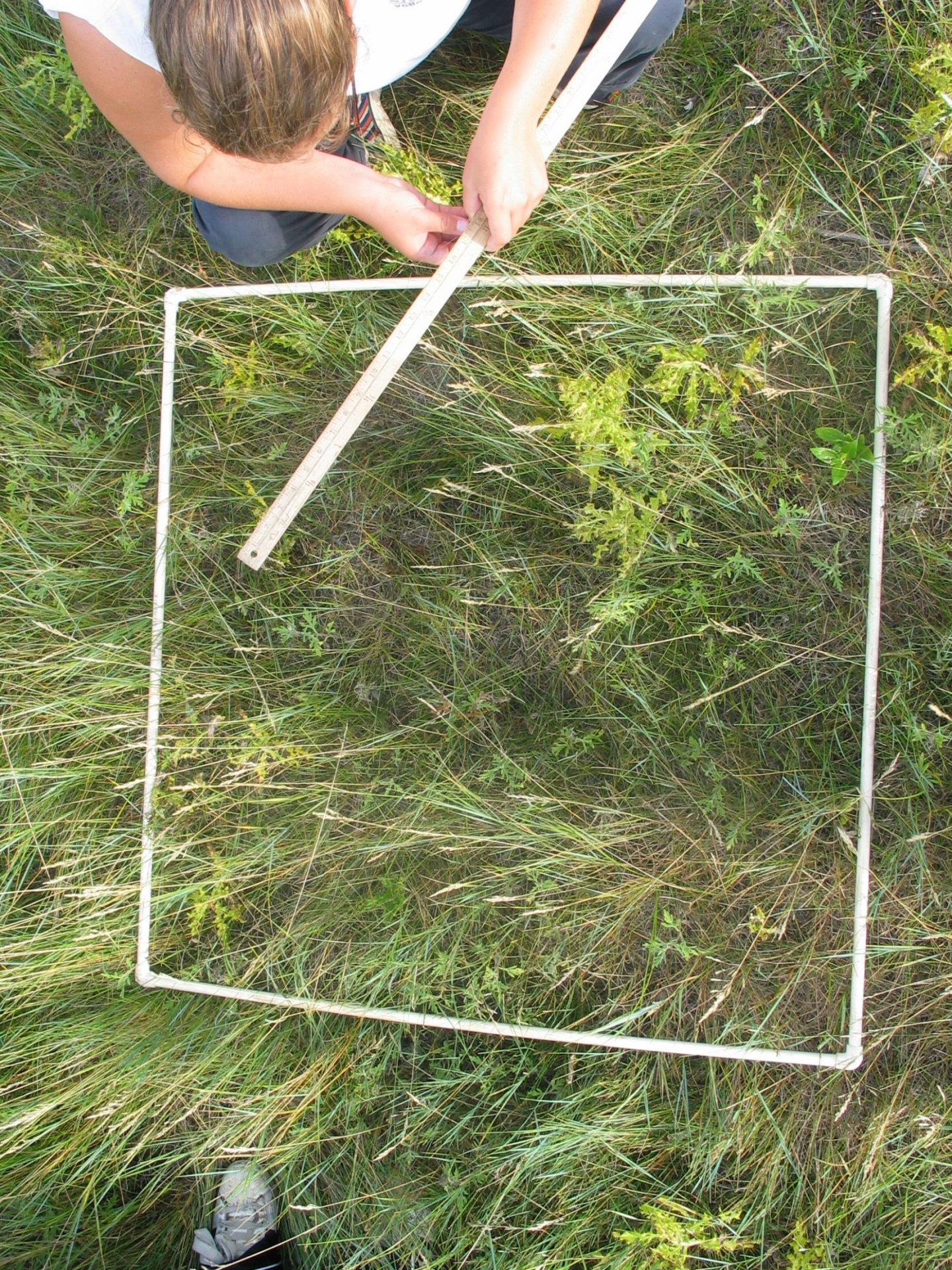
- A plant based Index of Biotic Integrity (IBI)
- Developed by DeKeyser (2000), DeKeyser et al. (2003), and Kirby and DeKeyser (2003)
- Evaluated health of Prairie Pothole Region wetlands based on the plant community
- Developed on temporary, seasonal, and semi-permanent wetlands in North Dakota

Sites researched during the formation of the IPCI



Ecoregions of North Dakota, South Dakota, and Montana. Modified from Bryce et al. 1998 and Omernik 1987.

Sampling Method

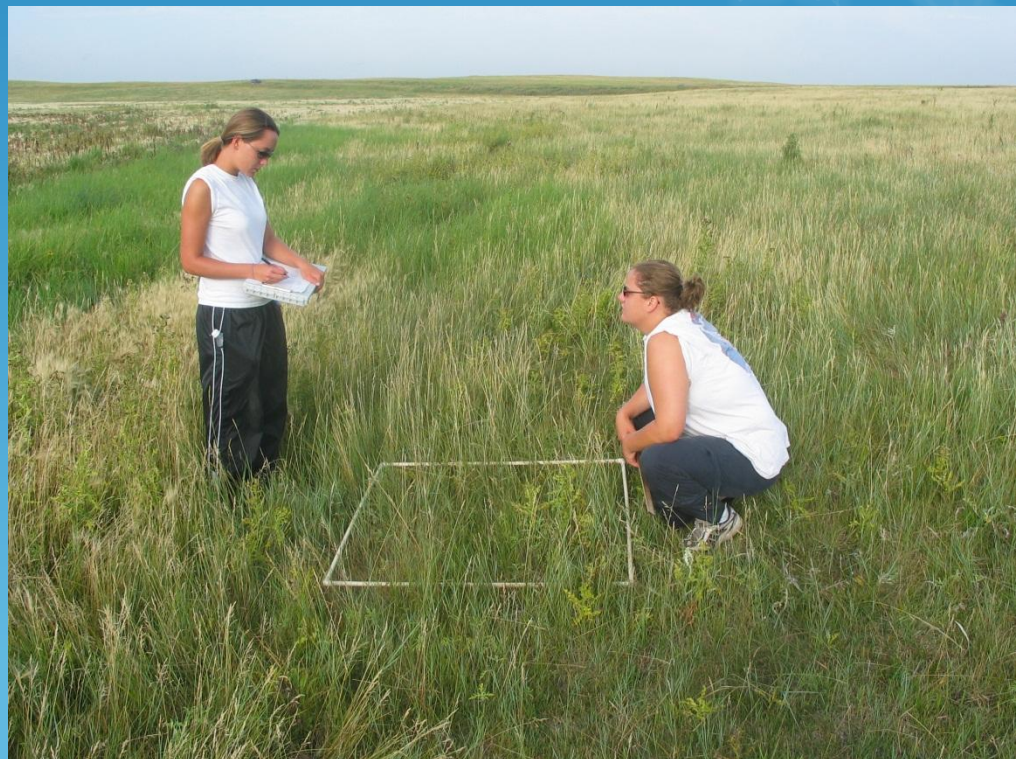


Formation of a Multimetric Index for Vascular Plants

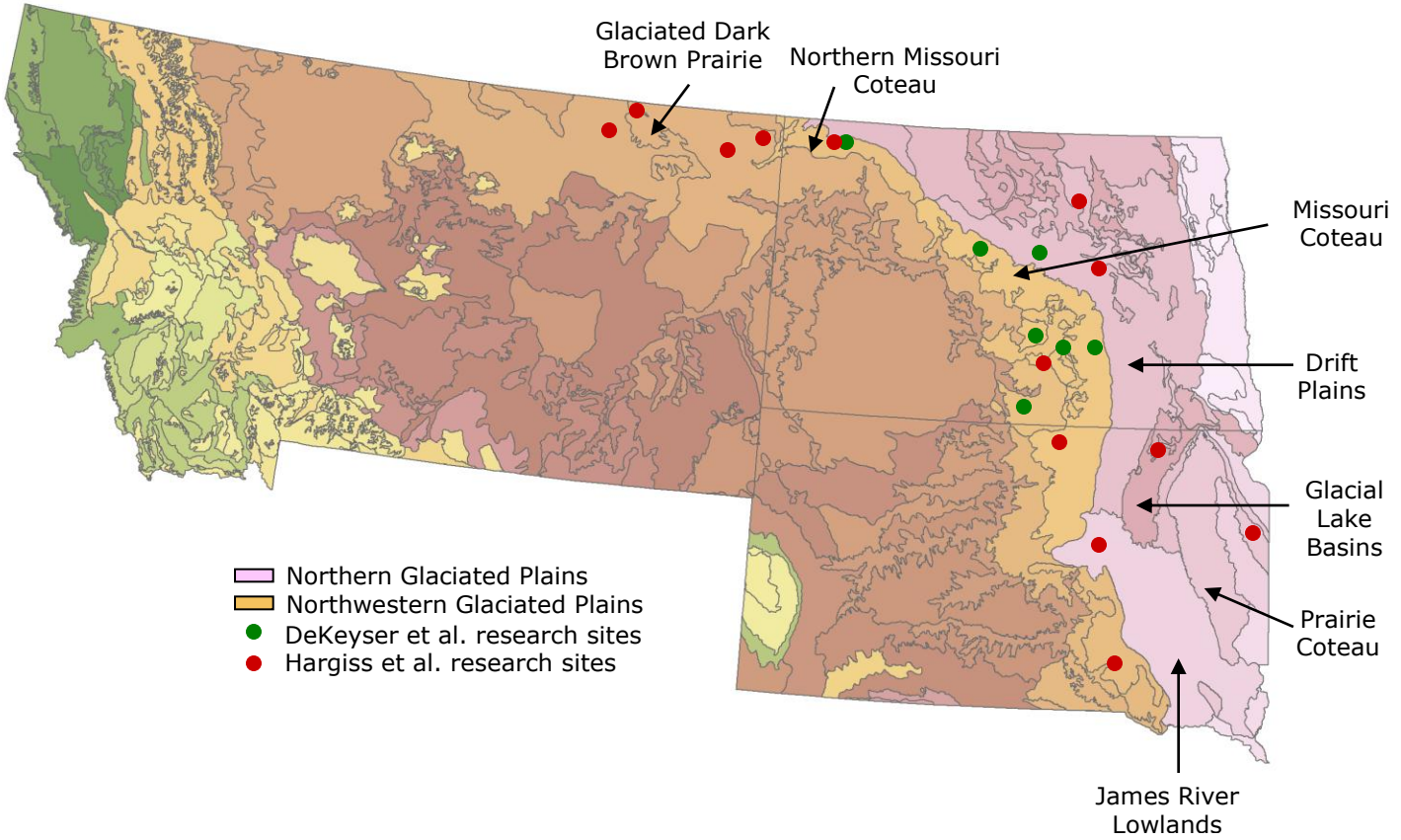
- Species Richness of Native Perennials
- Number of Genera of Native Perennials
- Assemblages: Native Grass and Grass-Like Species
- Percentage of Annual, Biennial and Introduced Species of Entire Species List
- Wet Meadow Zone – Number of Native Perennial Species
- Number of Species with a C-Value $\geq$ 5
- Wet Meadow Zone – Number of Species with a C-Value $\geq$4
- Average C-Value
- Floristic Quality Index = the average C-Value multiplied by the square root of the total number of native plant species

Evaluation of the IPCI

- Same vegetation sampling technique
- More intense quantification of disturbance
- Expanded to include more of the Prairie Pothole Region within EPA Region 8 (Hargiss et al. 2008)
  - Included 110 sites in:
    - Montana
    - South Dakota
    - North Dakota



Sites researched during the formation and evaluation of the IPCI



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Seasonal Metric Value Ranges

Metric	Value Range for 0	Value Range for 4	Value Range for 7	Value Range for 11
Sp. Rich.[1]	0-19	20-31	32-41	42+
# Genera[2]	0-14	15-24	25-32	33+
Grass-like[3]	0-6	7-10	11-17	18+
% of intro.[4]	41.1+	30.8-41.0	21.1-30.7	0-21.0
# Nat. in WMZ[5]	0-8	9-16	17-24	25+
# C $\geq$ 5[6]	0-7	8-17	18-26	27+
# C $\geq$ 4 in WMZ[7]	0-4	5-9	10-16	17+
Avg. C[8]	0.00-2.60	2.61-3.12	3.13-3.52	3.53+
FQI[9]	0.00-10.00	10.01-16.10	16.11-22.99	23.00+

[1] Species richness of native perennial plant species.
[2] Number of genera of native perennial plant species.
[3] Number of grass and grasslike species (Poaceae, Juncaceae, Cyperaceae).
[4] Percentage of the total species list that are annual, biennial, and introduced.
[5] Number of native perennial plant species found in the wet meadow zone.
[6] Number of plant species with a C-Value $\geq$ 5.
[7] Number of plant species with a C-Value $\geq$ 4 found in the wet meadow zone.
[8] Average C-Value of all species present.
[9] Floristic Quality Index = Average C-Value multiplied by the square root of the total number of species.

IPCI

- Scores for each metric are added together
- Total score between 0-99
- Condition categories based on final score

Seasonal	Temporary and Semi-permanent
Very Good (80-99)	Good (66-99)
Good (60-79)	Fair (35-65)
Fair (40-59)	Poor (0-32)
Poor (20-39)	
Very Poor (0-19)	

Low Impact

High Impact

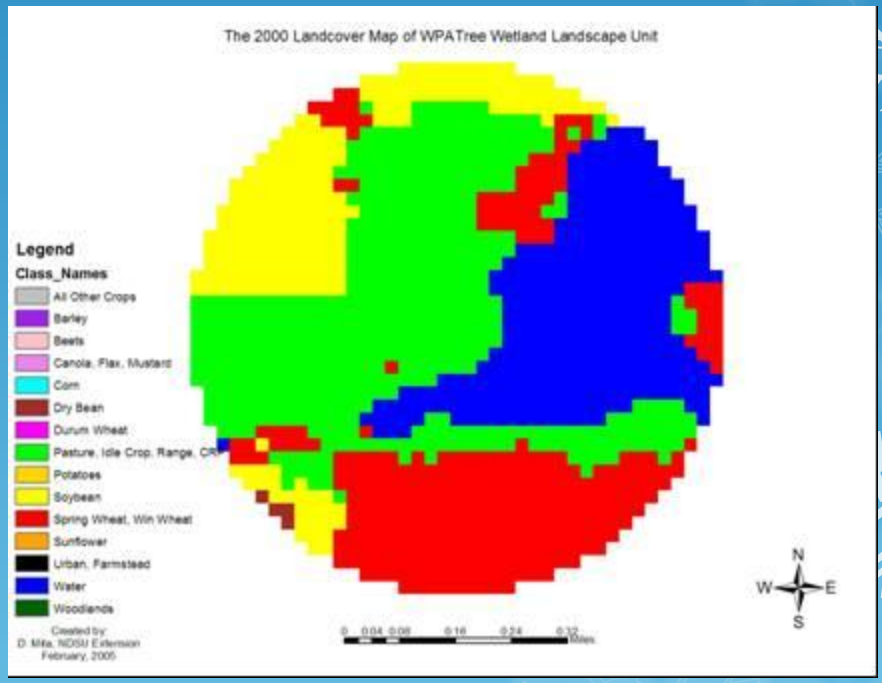
Landscape Wetland Condition Assessment Model (LWCAM)

- Uses remote sensing and habitat fragmentation to predict wetland condition
- Developed on seasonal wetlands in ND

  (Mita et al. 2007)

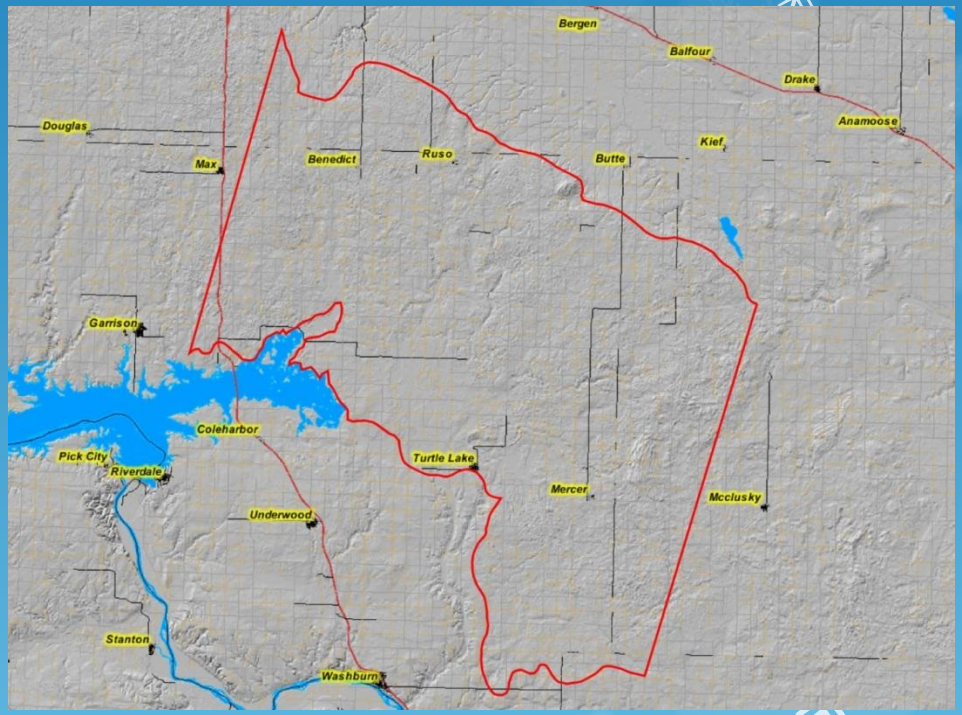
LWCAM Model

- 300 m buffer created around wetlands
- Land use data is overlaid with wetland buffer
- Model assesses
  - Total area of grassland
  - Number of patches
  - Largest patch of grassland



North Dakota Rapid Assessment Method (NDRAM)

- Rapidly assesses wetlands based on plant and landscape characteristics (Hargiss 2009)
- Developed based on
  - Other rapid assessment methods
    - Ohio (Mack 2001)
    - California (Collins et al. 2008)
  - Wetland characteristics specific to Prairie Pothole Region wetlands
- Tested on 976 wetland in designated area of Missouri Coteau Ecoregion
  - 255 tested during study using IPCI, LWCAM, and HGM



North Dakota Rapid Assessment Model (NDRAM)

- Approximately 20 minutes to conduct survey
- Uses 3 metric system
- Final scores on a scale of 0-100
- Groups wetlands based on final score
  - Good
  - Fair High
  - Fair Low
  - Poor
- Results intended to be similar to the IPCI

Hydrogeomorphic (HGM) Model

- Developed by Army Corp. of Engineers and NRCS
- Assesses the physical attributes and functional characteristics of each wetland
- Synthesized physical characteristics, land-use information, biological data, soil data, and GPS and GIS information
- Calculated six Functional Capacity Indices (FCI) for each wetland
  - (Gilbert et al. 2006)

Comparison of Models

- 255 wetlands from NDRAM development study
- Kendall Coefficient of Concordance Test
  - Determined if methods ranked wetlands similarly

Model	Similarity	p-value
IPCI vs. LWCAM	75%	.0001*
IPCI vs. NDRAM	87%	.0001*
IPCI vs. HGM	92%	.0001*

*Significant p-value indicates that methods were similar

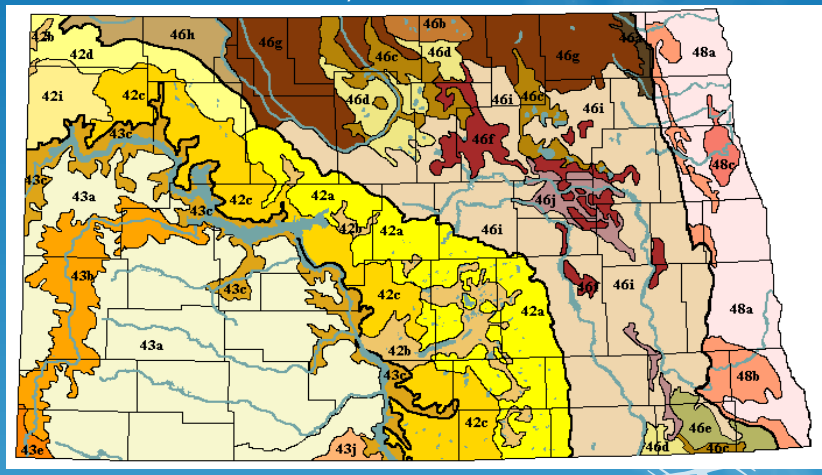
- Techniques rank sites similarly but measure different attributes

Conclusions

- Differences are found between the models; however,
- All models studied are valuable in indicating wetland condition in different capacities
  - LWCAM as first indication of land use in an area
  - NDRAM as overall condition assessment
  - IPCI used for in-depth assessment and for indicating condition trends
  - HGM indicates general function and physical condition
- A combination of all models is best to indicate overall condition at a site

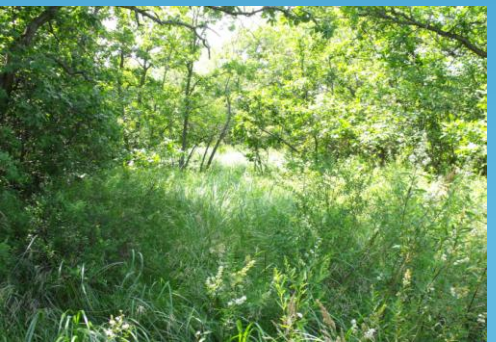
Testing Other Areas

Bryce et al. 1998



- Unique ecoregions tested:
  - Glacial Lake Agassiz Basin (48a)
  - Turtle Mountains (46b)
  - Pembina Escarpment (46a)
  - Missouri Plateau (43a)
- Total of 40 reference wetlands identified and tested
  - 5 temporary and 5 seasonal in each ecoregion

Pembina Escarpment



Missouri Plateau

Glacial Lake Agassiz Basin

Turtle Mountains

Moving Forward

- Modifying methods for statewide assessment
- Test methods in new areas and over expanded periods of time
- National Wetland Condition Assessment (2011)
  - Three tiered assessment used:
    - National Methods
    - Region Specific Methods
      - IPCI
      - NDRAM
      - HGM


Questions?