



Updating Southern MN NWI and Wetland Functional Assessment

SE Minnesota GIS User Group
November 06, 2014
Winona, MN

Introduction

Watershed:

- A watershed is the area of land that contributes runoff to or drains to a lake, river, stream or other water body

Wetland:

- transition zones where the flow of water, the cycling of nutrients, and the energy of the sun meet to produce a unique ecosystem characterized by specific hydrology, soils, and vegetation

Watershed Approach:

- an analytical process that considers the abundance, locations, and conditions of aquatic resources in a watershed. It further considers how those attributes support landscape functions and attainment of watershed goals (EPA, 2013)

Introduction

Wetland Functions

- The physical, biological, chemical and geologic processes or interactions that occur within wetlands
- In a watershed these functions manage:
 - water regimes (e.g. water interception and release);
 - influence water quality (e.g. sediment retention or nutrient cycling)
 - Provide habitat for plants and animals

Wetland Services:

- Values of wetlands that are generally associated with societal goods and services (e.g. flood control, recreation, food production etc.)

Introduction

Wetland Functional Assessment

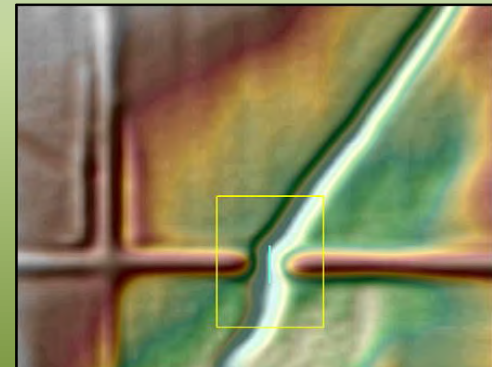
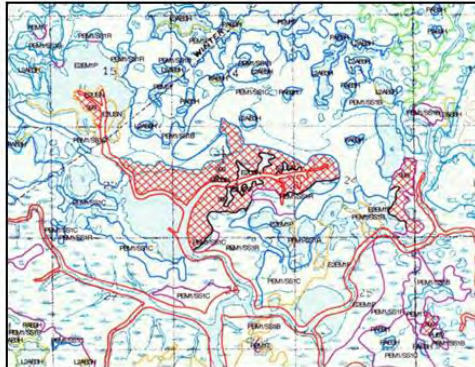
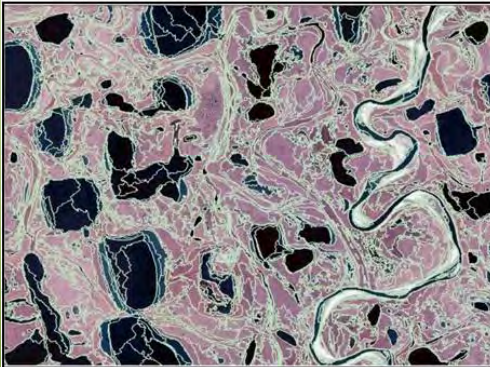
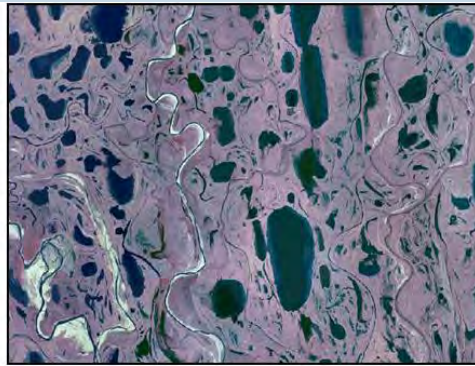
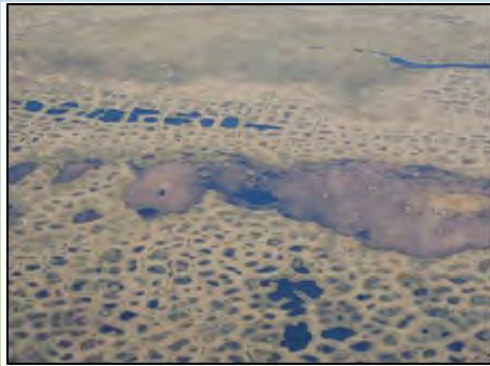
- An applied science approach to the inventory and characterization of wetlands on a watershed basis that evaluates indicators of wetland abundance, condition and provision of goods and services

GeoSpatial Services and WFA

- Over a decade of partnership with USFWS NWI
- Original mapping in over 20 states including Alaska
- Watershed level WFA work grew out of initial NWI tools and enhancements by Ralph Tiner
- GSS adapted inventory methods and techniques and extended to application to federal, state, tribal and local governments plus stakeholders
- Current WFA projects in:
 - Alaska (Kodiak Island)
 - New Mexico
 - Wisconsin (4 projects)
- WFA projects currently under discussion:
 - Missouri
 - Kentucky
 - Alabama

Wetland Inventory to Wetland Functional Assessment

Traditional wetland inventory:



Wetland Inventory to Wetland Functional Assessment

Challenges:

- i. Natural systems (wetlands and watersheds) are complex
- ii. Data collection is expensive
- iii. Funding is limited
- iv. Logical land areas for assessment are large (sub-watersheds, watersheds, eco-regions)
- v. Issues and planning challenges are larger: water management, infrastructure impacts, climate change, watershed resiliency

Wetland Inventory to Wetland Functional Assessment

PARTNERSHIPS ARE ESSENTIAL!

Recent projects have included DNR, USACE, EPA, Tribes, Counties, local stakeholders,

- work with existing landscape level wetland inventory techniques
- extend mapping to include additional descriptive metrics (e.g. soils, elevation surfaces, hydrogeomorphic, adjacent landcover/landuse, water quality, and others)
- incorporate applied science, best professional judgment, local input, stakeholder concerns

Wetland Inventory to Wetland Functional Assessment

Prioritize wetland preservation, enhancement restoration sites based on:

- functional assessment data
- ecological and social needs
- available opportunities
- mitigation requirements
- local input etc.

Main Steps in the WFA Process

WFA is an “adaptive environmental management process”:

1. Inventory Present-Day Wetlands
2. Convert and refine to NWI FGDC standard
3. Interpret additional hydrogeomorphic metrics
4. Correlate wetland functions to wetland data
5. Identify Historic and Potential Restorable Wetlands (PRWs)
6. Prioritize wetland preservation, enhancement and restoration

“Adaptive management is a decision process that promotes flexible decision making that can be adjusted in the face of uncertainties as outcomes from management actions and other events become better understood”
Williams, et al. 2009

A Little Bit About Classification

Classification of Wetlands and Deepwater Habitats of the United States



By

Lewis M. Cowardin¹, Virginia Carter², Francis C. Golet³, and Edward T. LaRoe⁴

U.S. Department of the Interior

Fish and Wildlife Service

Office of Biological Services

Washington, D.C. 20240

Classification of Wetlands and Deepwater Habitats of the United States

1

- NWI classification based on Cowardin et. al. 1979
- Classify wetlands based on dominant life forms
- Hierarchical

System

Subsystem

Class

Subclass

Water Regime

Special Modifiers

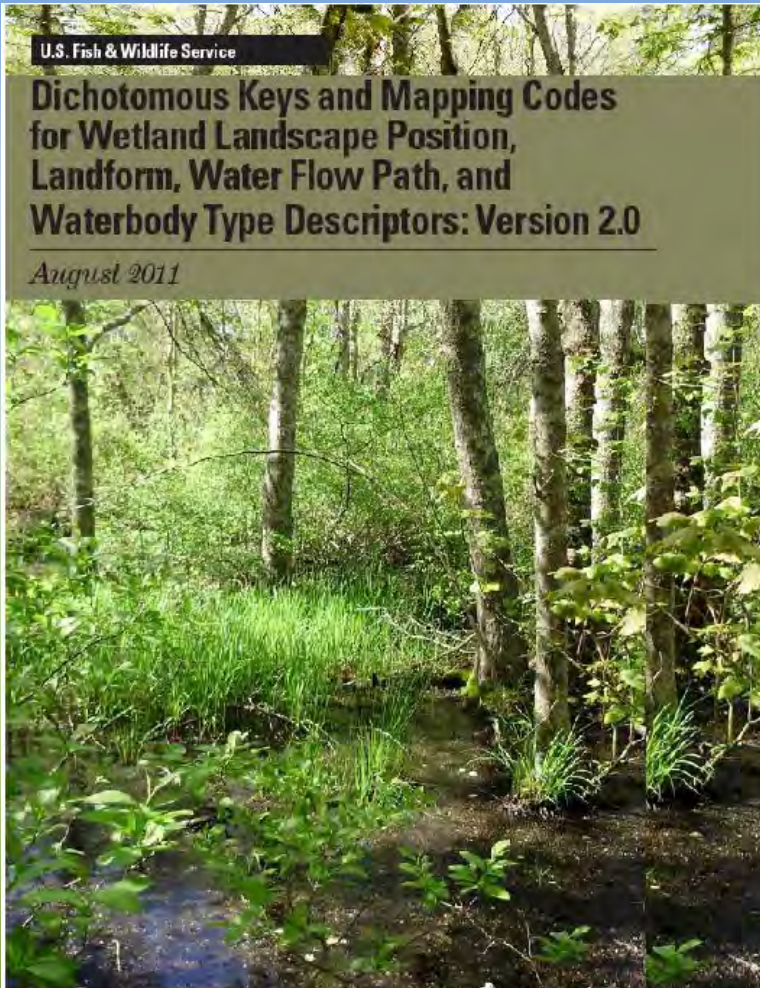
A Little Bit About Classification



PSS3Bag

Palustrine, scrub shrub,
broad leaf evergreen,
saturated, acidic, organic

A Little Bit About Classification



- LLWW classification based on USFWS Tiner, 2011
- Hydrogeomorphic metrics that further describe wetland character

Landscape Position - relationship between a wetland and an adjacent waterbody or not

Landform - shape or physical form (island, basin, floodplain, terrene etc.)

Water Flow Path - directional flow of water (outflow, inflow, isolated, etc.)

Water Body Type – lake, pond, river, stream

A Little Bit About Classification



TESLOUhw

Terrene, sloped, outflow,
headwater.

A Little Bit About Classification

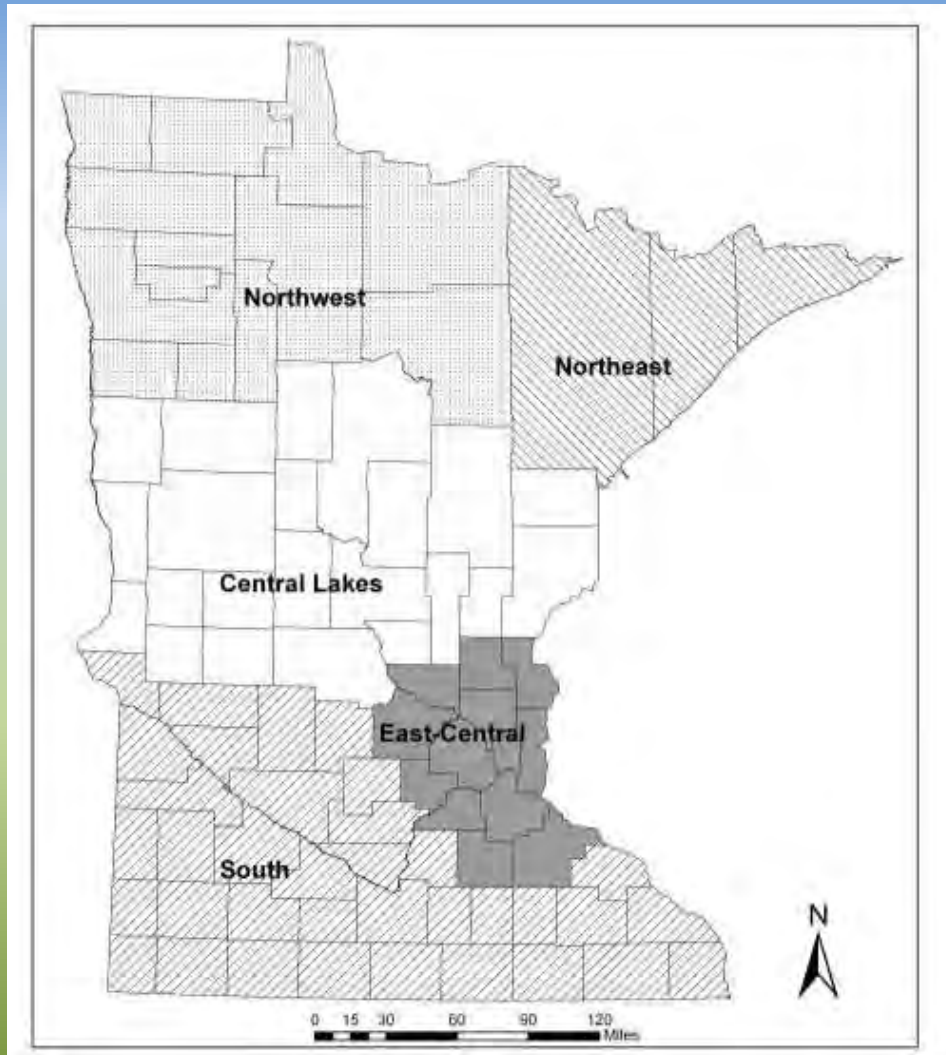


NWI: R2EM2H
LLWW: LR1FRTH

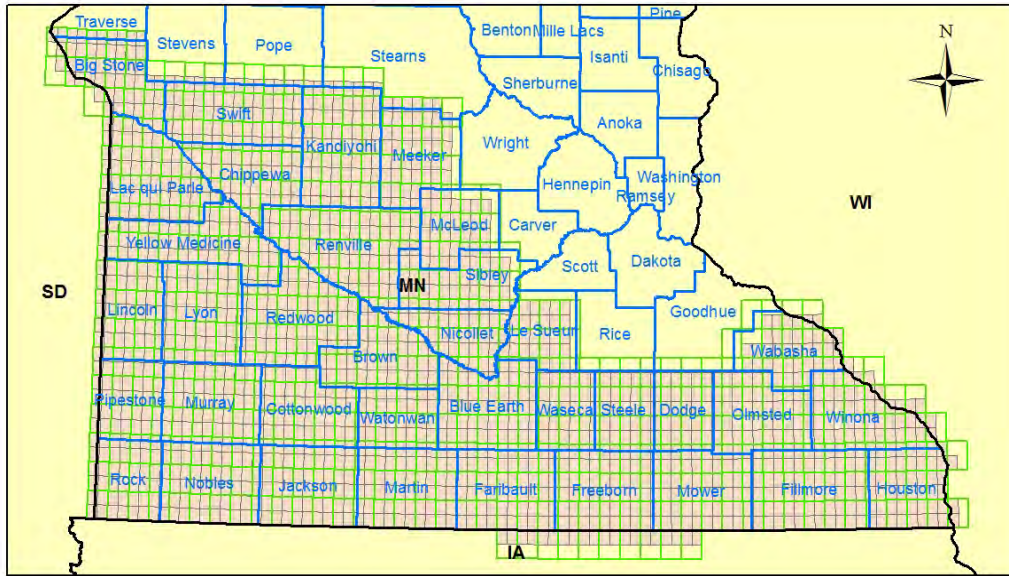
MN NWI Update

Started: 2008
Anticipated Completion: 2020

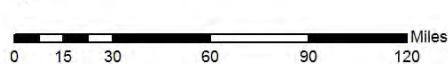
- Land use planning and zoning
- Environmental impact assessment
- Wetland regulation
- Fish, wildlife and native plant management
- Baseline data for assessing wetland policies and management actions



MN NWI Update – GSS Activity



Southern Project Area
Update of Minnesota National Wetlands Inventory



- Southern MN Project Area (rev. 8/31/12) - 1/4 Quadrangles
- USGS 7.5 Minute Quadrangle Boundaries
- Minnesota Counties

Update for Southern Minnesota

Started:	Fall 2012
Completion:	Spring 2015
Counties:	36
Area:	23,800 sq. miles
1:24K Quads:	446
Original NWI:	174, 995 approx.
Revised NWI:	?? Over 225,000

MN NWI Update – Murray County Example

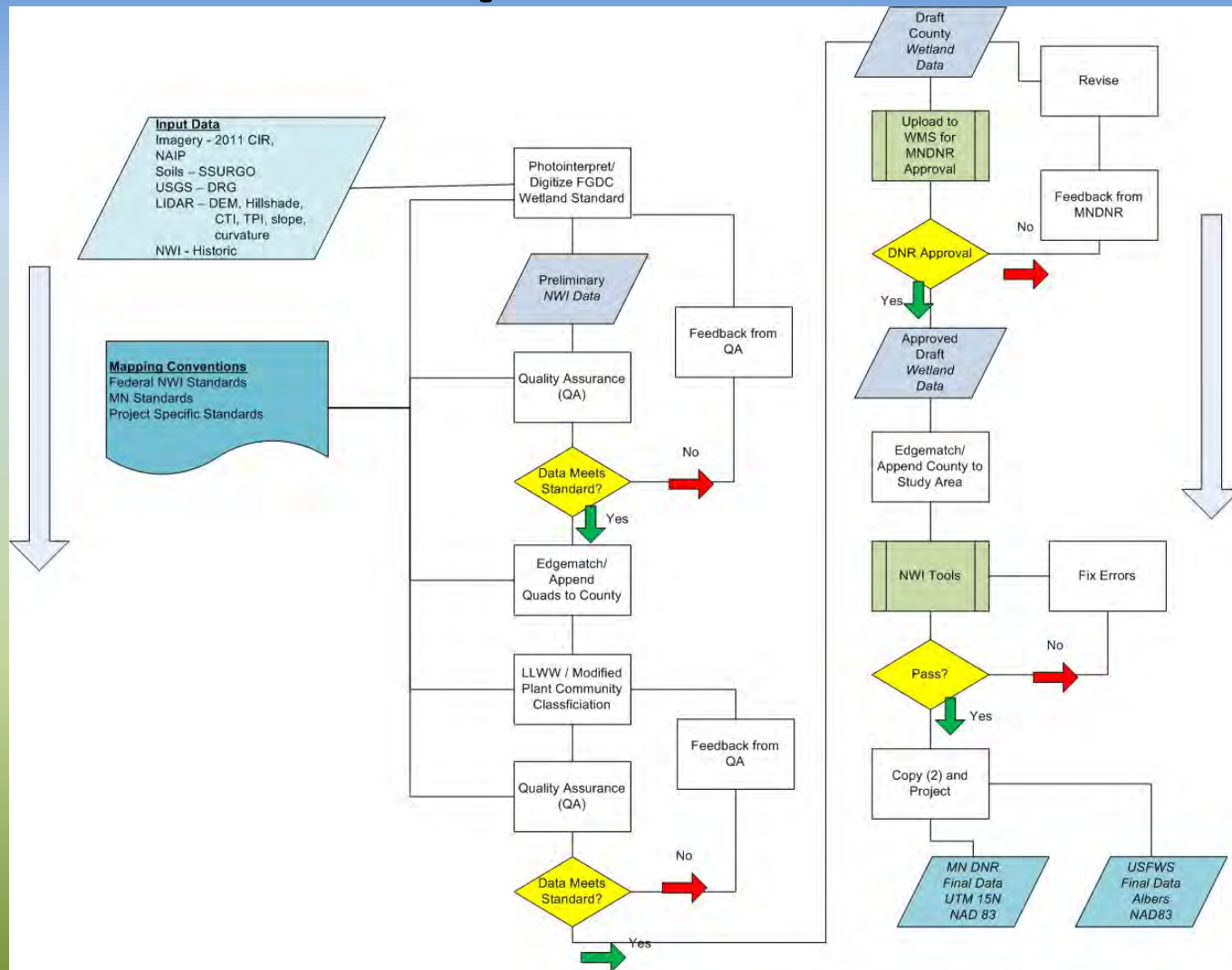


6200 Wetlands



8100 Wetlands

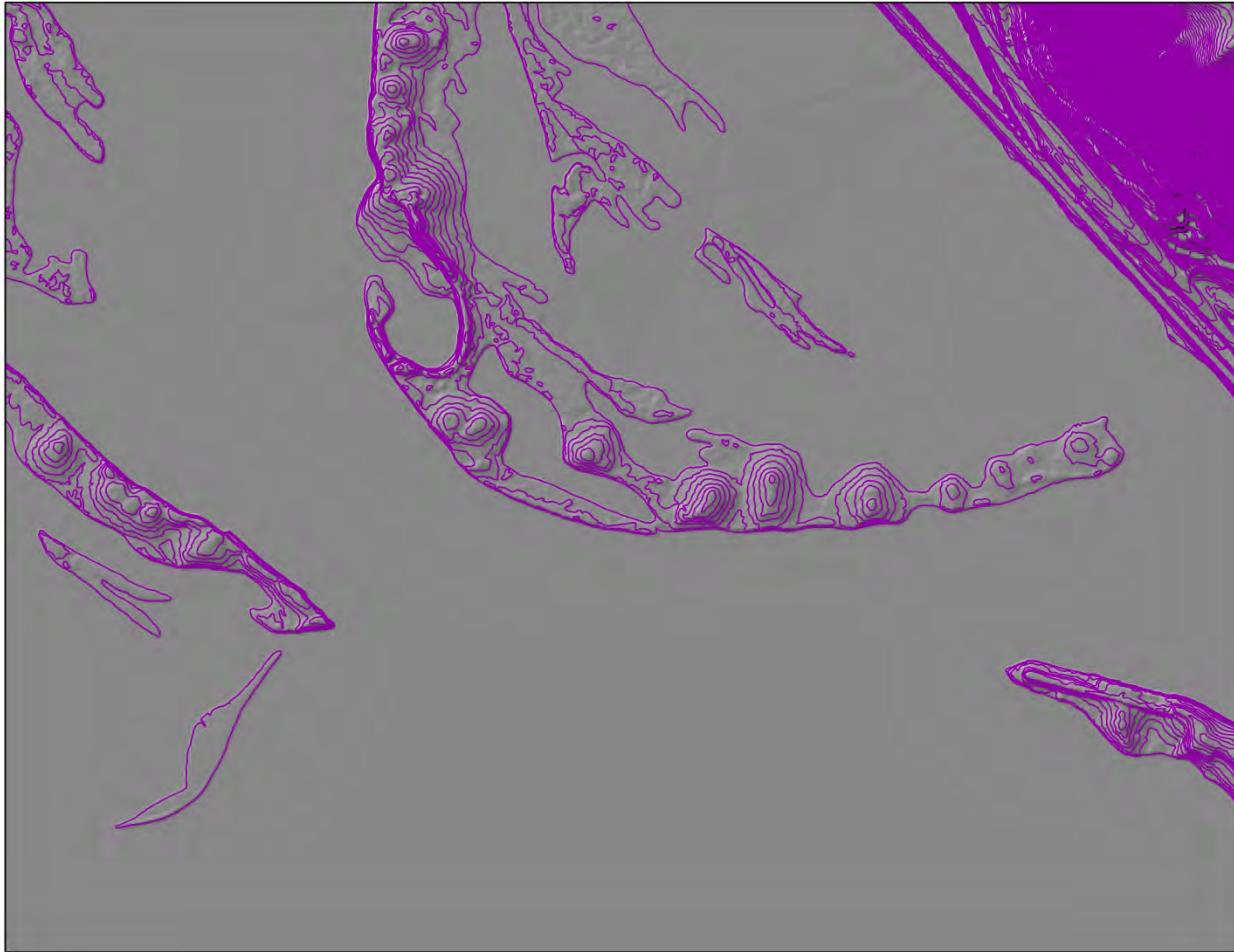
MN NWI Update – Work Flow



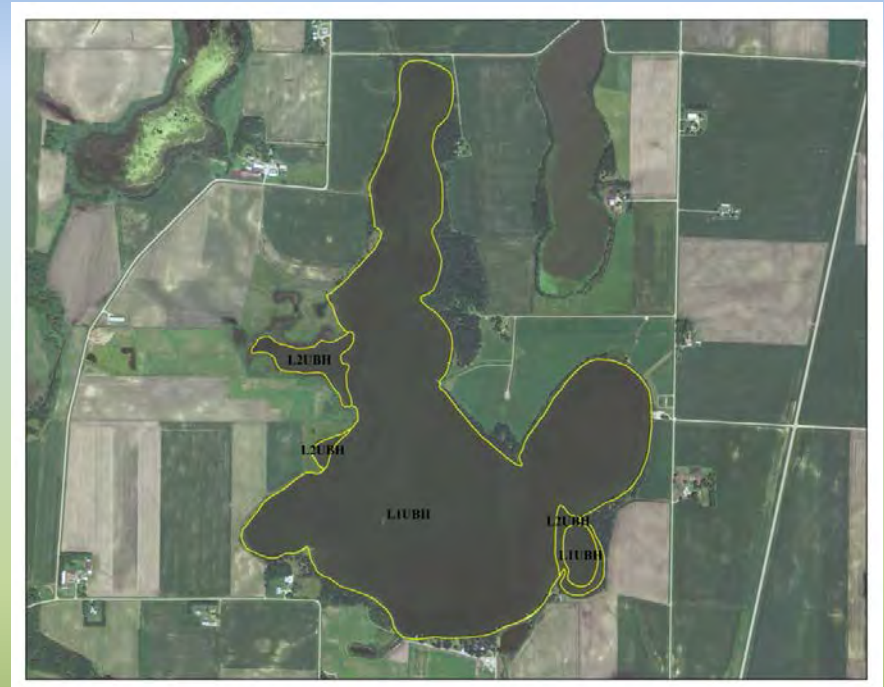
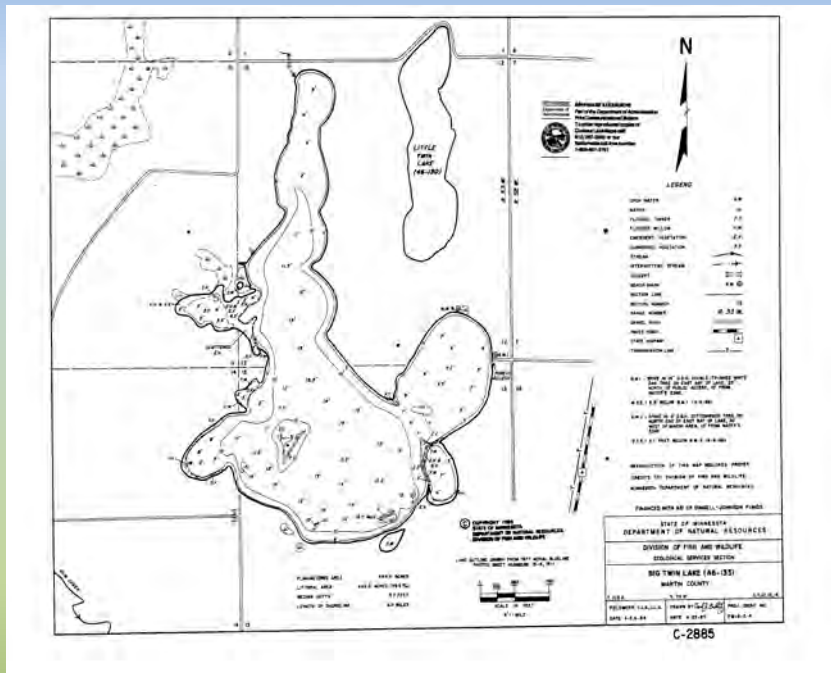
MN NWI Update – Primary Data



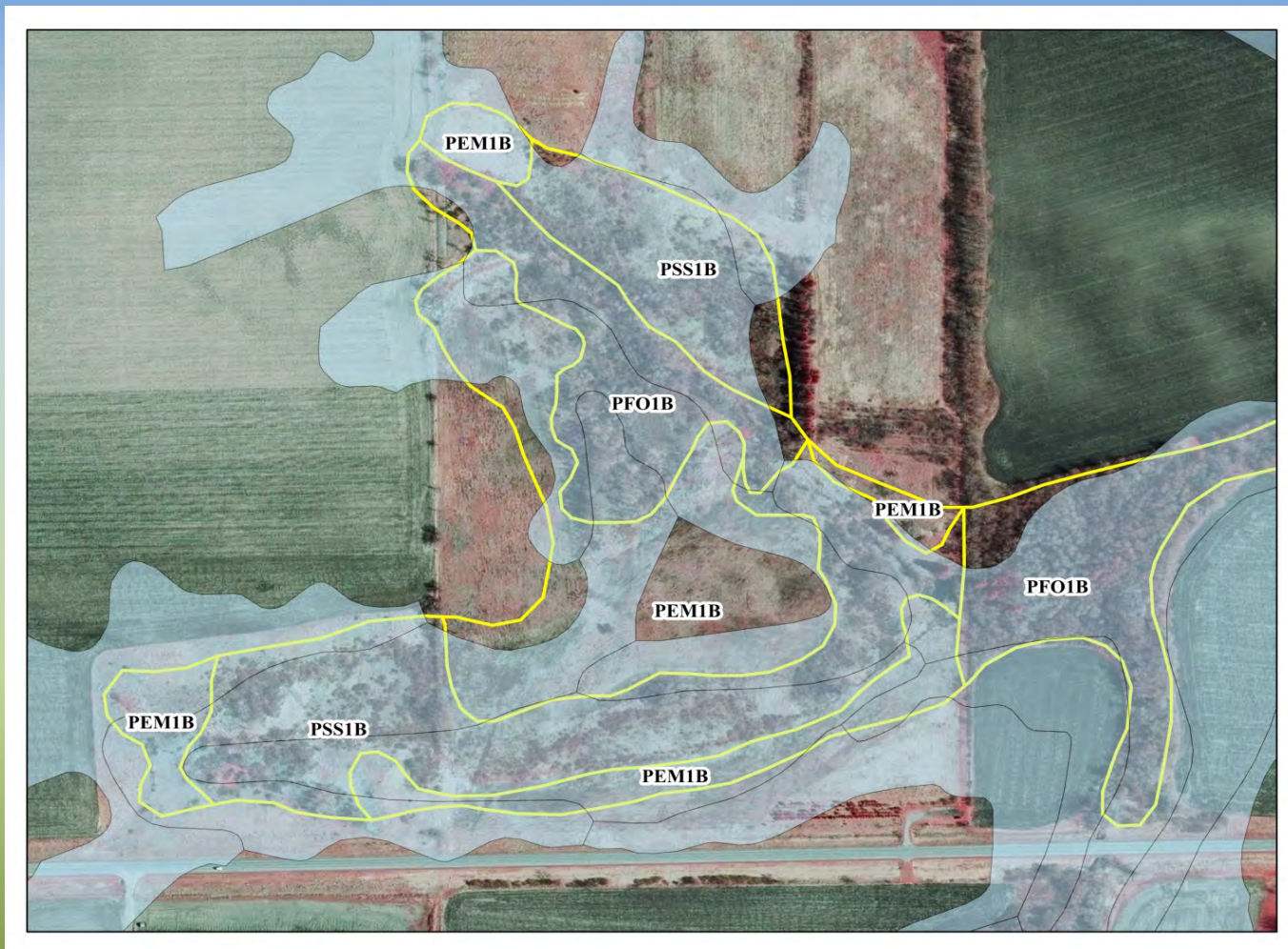
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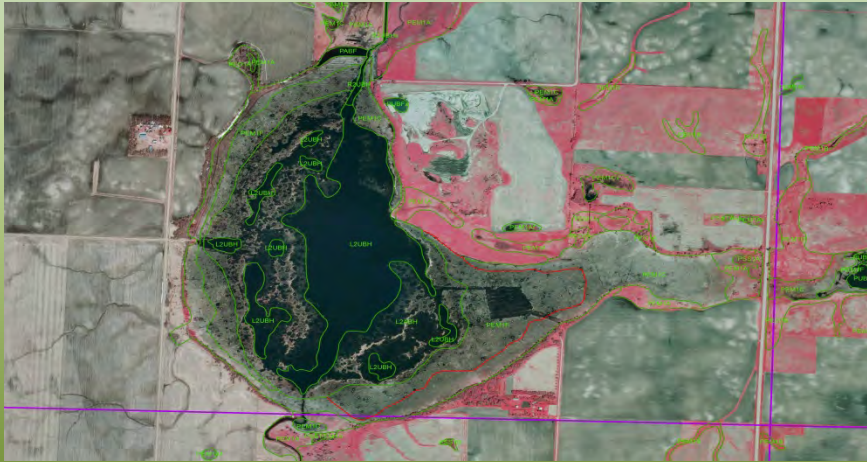
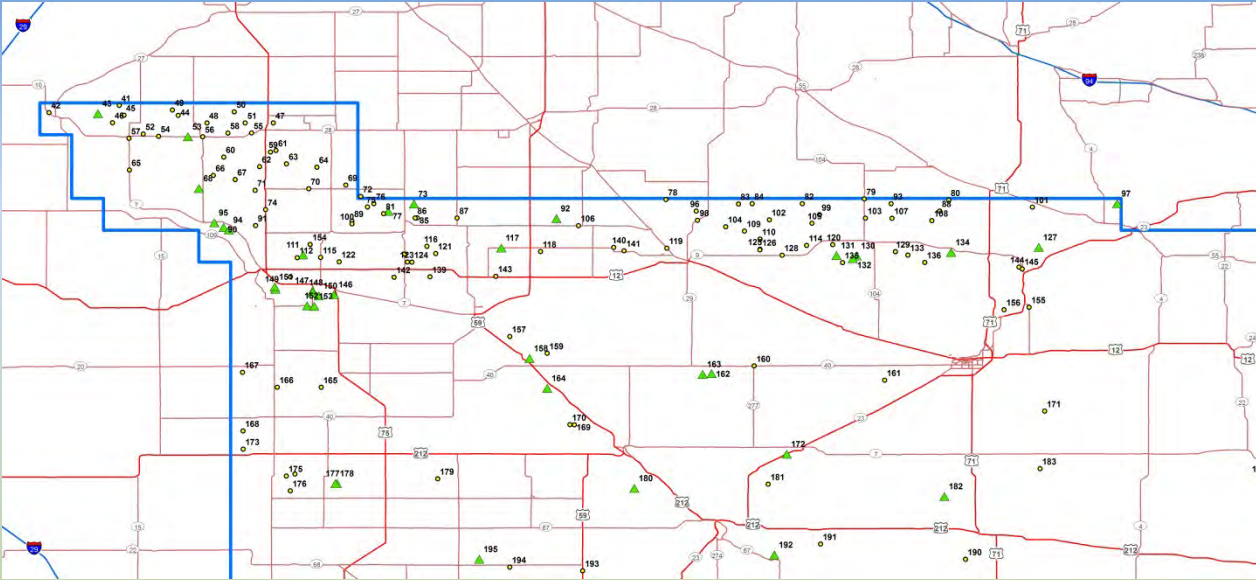
MN NWI Update – Primary Data



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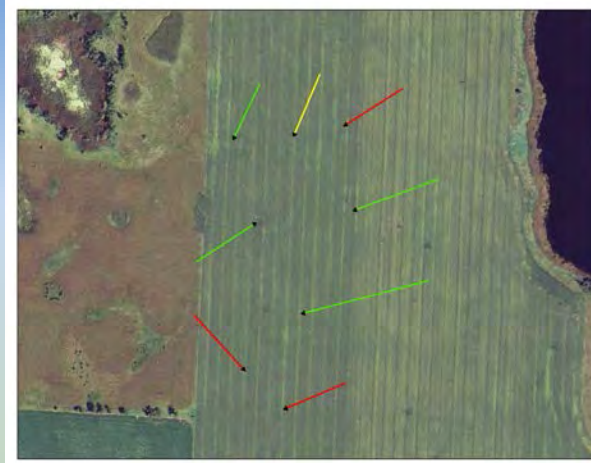


MN NWI Update – Secondary Data

2011 CIR



2010 NAIP



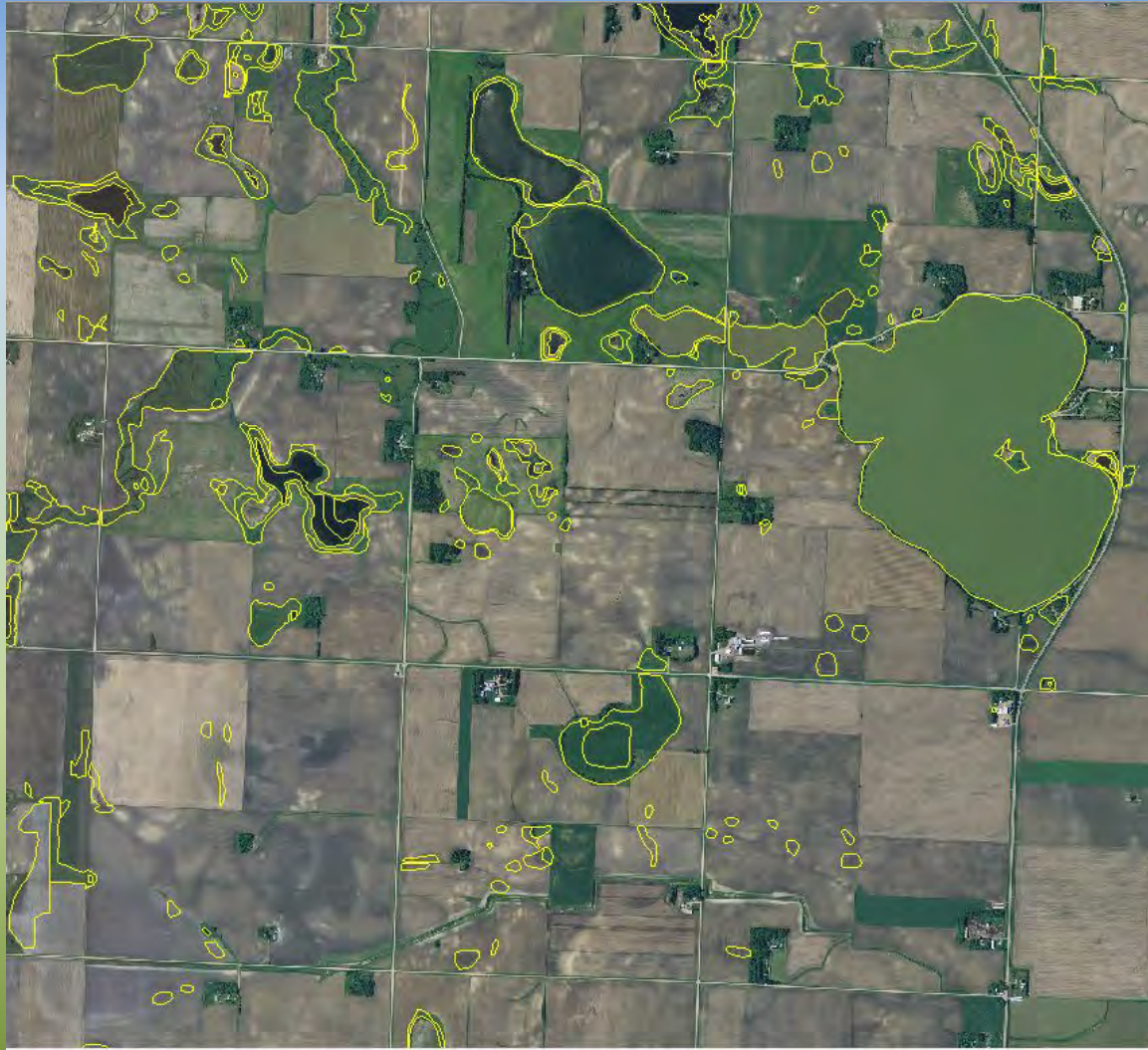
2009 NAIP



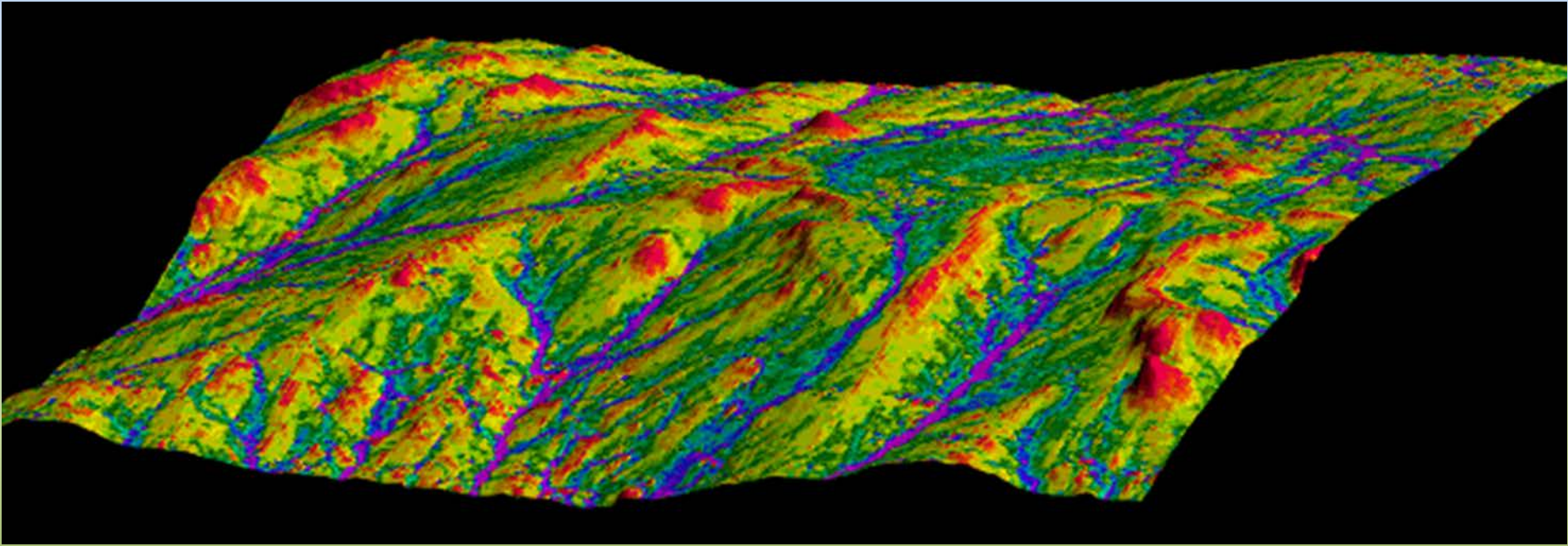
2008 NAIP



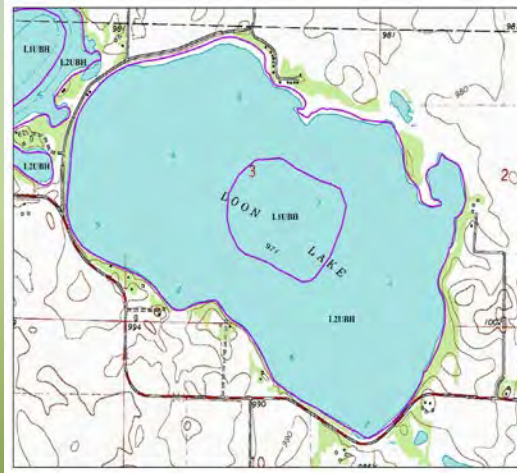
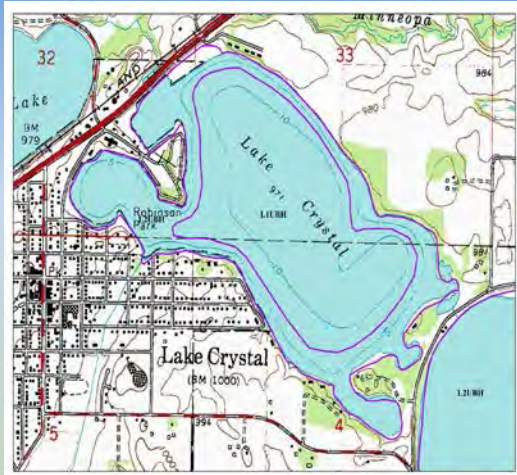
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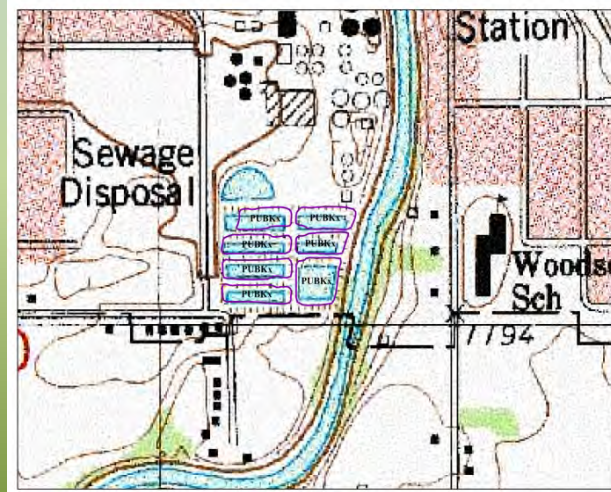
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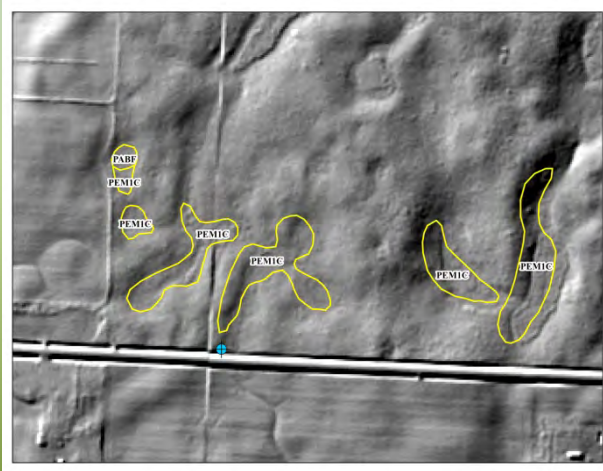
MN NWI Update – Decision Rules



MN NWI Update – Decision Rules



MN NWI Update – Decision Rules



Wetland Functional Correlation

- The process of identifying what functions each wetland provides at a landscape level based on NWI and LLWW characteristics
- An expert driven (local and regional), best professional judgment exercise
- Starting points are correlation tables that have been developed for other projects (regional or national)
- Wetlands are identified as providing specific functions at a high or moderate level with respect to other wetland types on the watershed.

Wetland Functional Correlation

Potential Wetland Functions for Assessment

Water Quality Functions

- Surface Water Detention
- Streamflow Maintenance
- Energy Dissipation
- Groundwater Recharge
- Shoreline Stabilization
- Nutrient Transformation
- Carbon Sequestration
- Sediment or Particulate Retention

Habitat Functions

- Fish Habitat
- Aquatic Invertebrate Habitat
- Waterfowl Habitat
- Waterbird Habitat
- Amphibian Habitat
- Other Wildlife Habitat
- Conservation of Biodiversity

Example Functional Correlations

Surface Water Detention

Highly Functional

- Semi-permanently flooded or wetter vegetated wetlands along streams, rivers, lakes, and islands
- Basin wetlands semi-permanently flooded or wetter with inflow, outflow or through-flow

Moderately Functional

- Seasonally-flooded through-flow or outflow vegetated wetlands
- Wetlands adjacent to streams, rivers and lakes not already included in high (e.g. seasonally flooded)

Example Functional Correlations

Streamflow Maintenance

Highly Functional

- All headwater wetlands on 1st and 2nd order streams
- Include organic soil wetlands on 3rd order streams

Moderately Functional

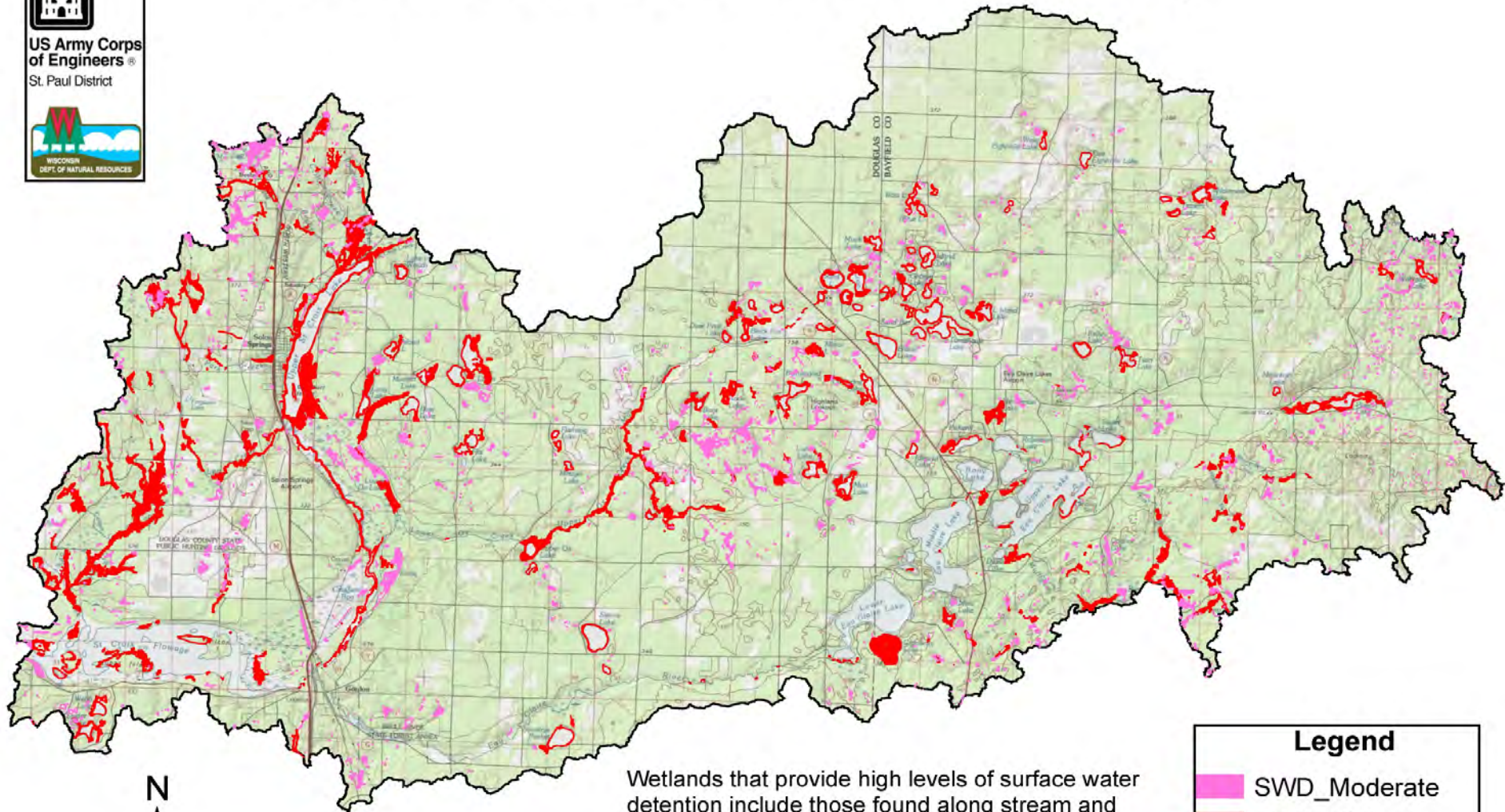
- Riverine floodplain wetlands
- Ponds
- Isolated basins with outflow
- Wetlands adjacent to other open waters (e.g. lakes, ponds)

CORRELATION BETWEEN FUNCTIONS AND WETLAND TYPES
(Upper St. Croix Watershed, Wisconsin – Final Draft – October 3, 2011)

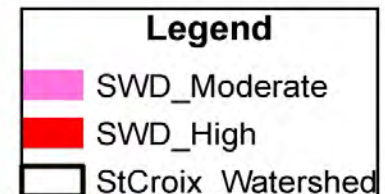
<u>Function (code)</u>	<u>Level of Function</u>	<u>Wetland Types</u>
Surface Water Detention (SWD)	High	LEBA, LEFR, LEFL (in reservoir and dammed areas only: LE2FL and LE3FL), LEIL, LSBA, LRFPba, LSFR (excluding nonvegetated gravel bars/banks), LRFR, LRIL, PDTH, TEFRpdTH?, TEBApdTH, TEBATH, (Note: Retained floating mat bogs such as LEFR because their area will store surface water when lake levels rise.)
	Moderate	LRFPfl, LSFL, LE1FL, TEBA (other than above), PD (other except PD2f), TE__pd (other, excluding slope wetlands TESLpd__), TEBATI (Note: Exclude industrial wastewater ponds and any saturated wetlands “B” water regime from Moderate, e.g., PFO1B that is LSFL)
Streamflow Maintenance (SM)	High	hw (all headwater wetlands)
	Moderate	LR1FP, LS BA, PDTH, TE__pdTH, PDOU, TE__pdOU, TEOU (not hw but associated with streams not rivers), LE wetlands associated with throughflow lakes (LK__TH)

Question: Should organic soil wetlands along 3rd order perennial streams be added to the High potential?

St. Croix Headwaters Watershed Surface Water Detention (SWD)



Wetlands that provide high levels of surface water detention include those found along stream and river floodplains, in lakebasins and fringes and islands. Terrene wetlands with throughflow are also included. Moderate SWD is found in vegetated wetlands and ponds with isolated or outflow water path.



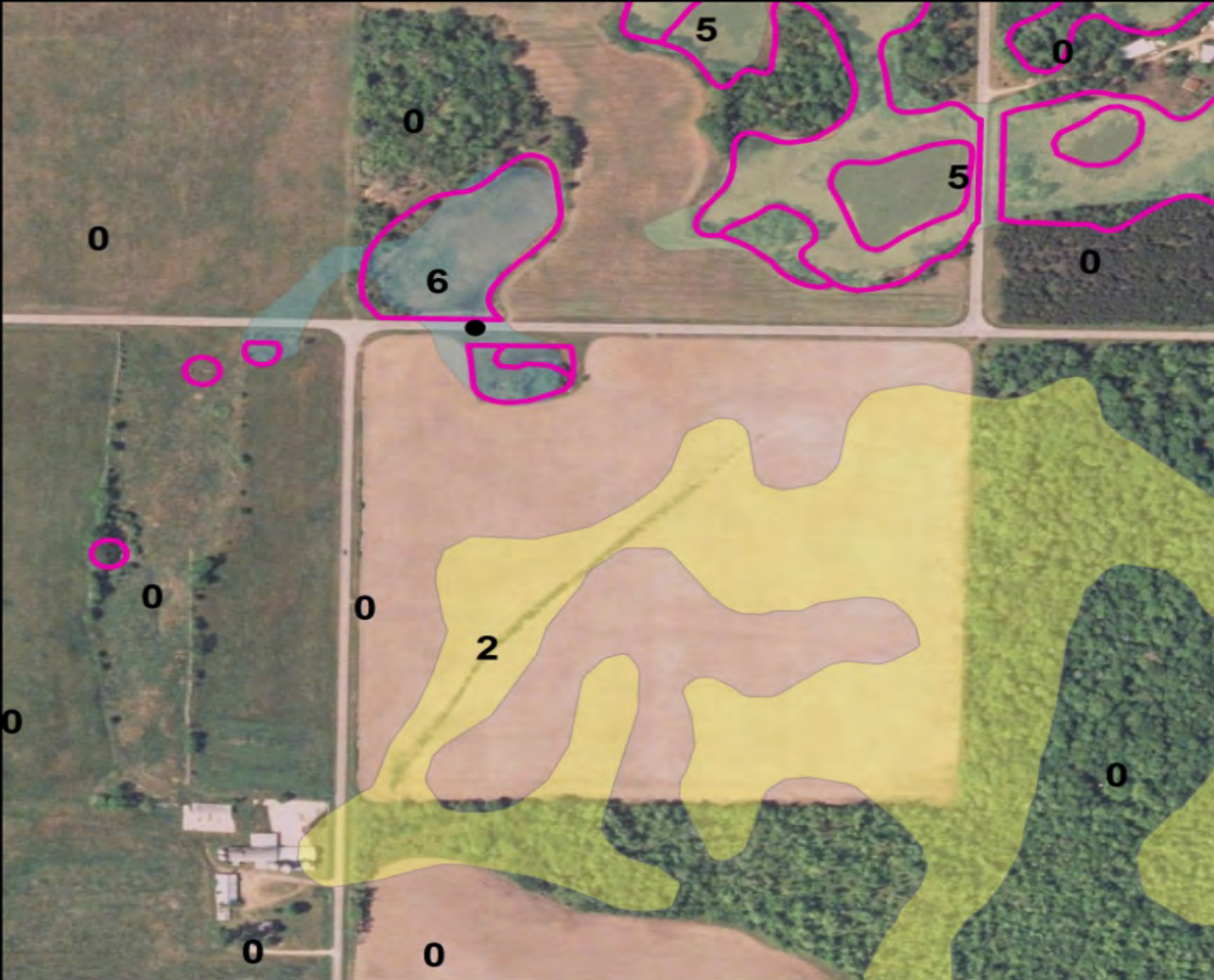
Potentially Restorable Wetlands

- Model potentially historic wetlands based on extended SSURGO soil queries and image interpretation
- Add derived flow networks, basins and additional derivative elevation datasets (e.g. CTI, curvature)
- Review with existing hydrology and imagery to identify sites with high potential for preservation, enhancement or restoration based on *preponderance of evidence* approach
- To quantify historic loss, utilize various techniques including:
 - Historic inventories (e.g. Bordner Survey in WI)
 - Historic aerial imagery
 - Land surveyor notes/maps



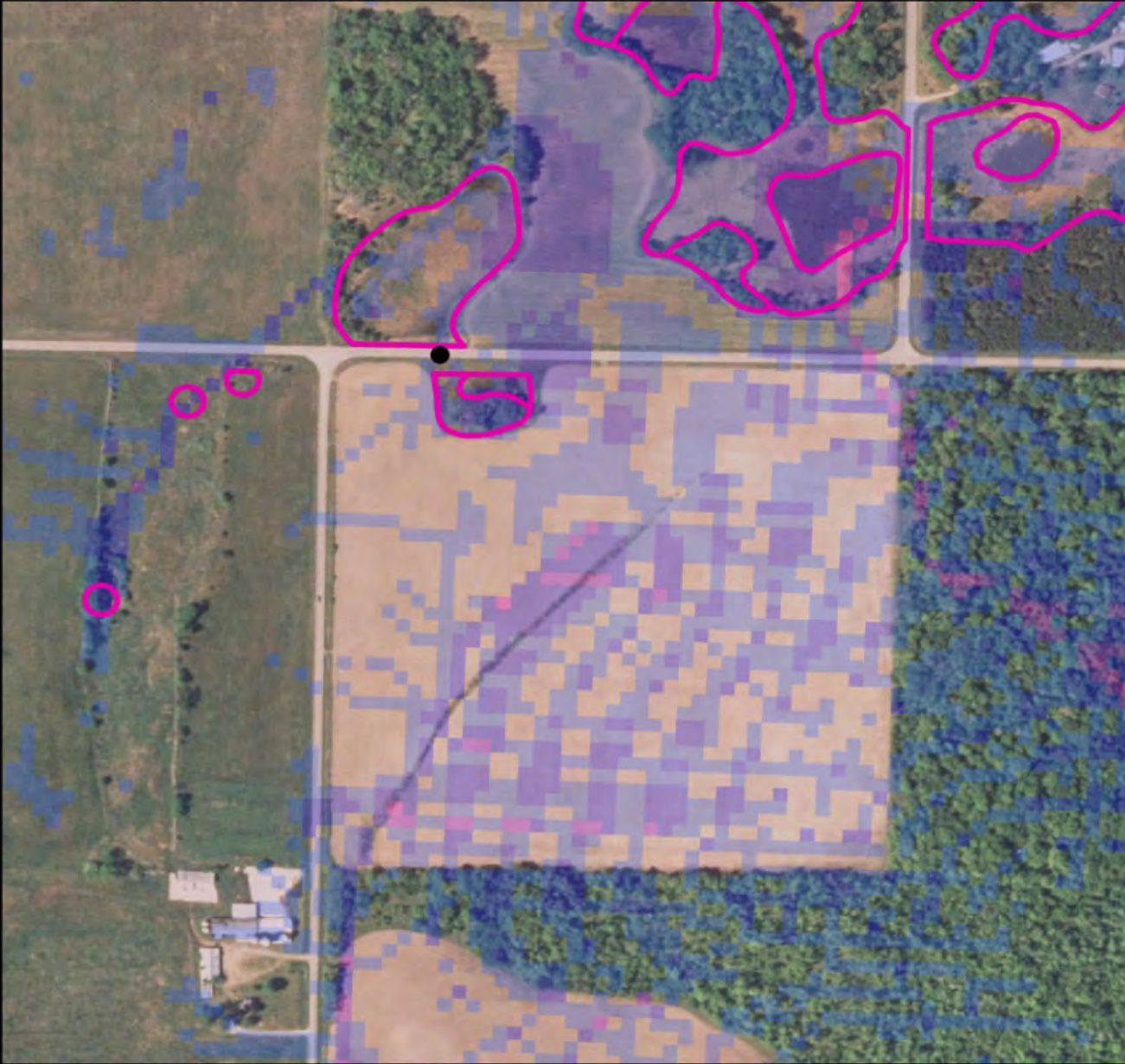


**Derived flow lines
shown with existing
NWI wetlands**

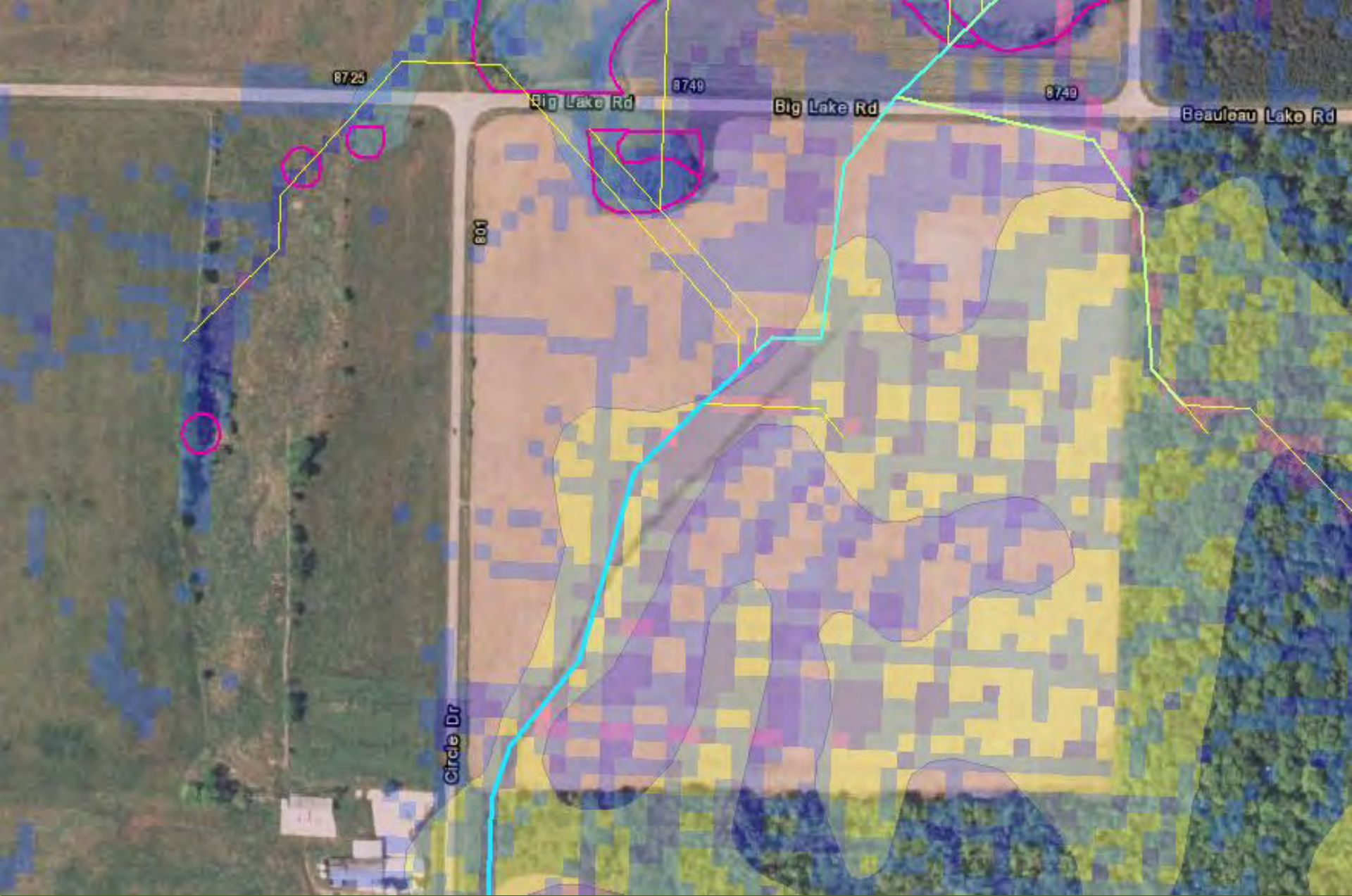


Enhanced Soils Data Queries

6 = very poorly drained, no April ponding, frequent April flooding, no August ponding.
5 = very poorly drained, no April ponding, occasional April flooding, no August ponding.
2 = somewhat poorly drained, no April flooding or ponding, no August ponding.
0 = no drainage class info or excessively drained, moderately well drained, somewhat excessively drained, well drained, and no April flooding, no April or August ponding.



Compound
Topographic Index
Showing Areas With
High Potential To
Hold Surface Water



**Combined data layers + local knowledge of site
conditions = high potential for wetland**



Questions?

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