

Wetlands Supplement: Incorporating Wetlands into Watershed Planning

Webcast sponsored by EPA's Watershed Academy



Tuesday, September 17, 2013
1:00pm – 3:00pm Eastern

Instructors:

Kerryann Weaver, Environmental Scientist, U.S. EPA Region 5

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Siobhan Fennessy, Jordan Professor of Biology and Environmental Science, Kenyon College



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Webcast Logistics

- **To Ask a Question** – Type your question in the “Questions” tool box on the right side of your screen and click “Send.”
- **To Report any Technical Issues** (such as audio problems) – Type your issue in the “Questions” tool box on the right side of your screen and click “Send” and we will respond by posting an answer in the “Questions” box.



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Overview of Today's Webcast

- Introduction to the Wetlands Supplement
- Case Study
 - Michigan Department of Environmental Resources – Landscape level wetlands functional assessment
- Case Study
 - Kenyon College, Ohio – Predicting suitability for wetlands restoration



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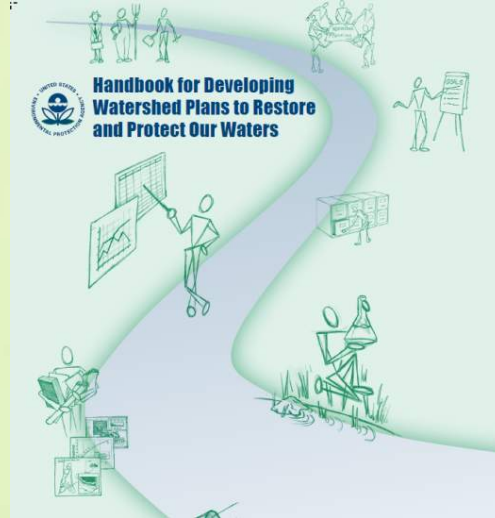
INCORPORATING WETLANDS INTO WATERSHED PLANNING

WETLANDS SUPPLEMENT to the WATERSHED HANDBOOK

Kerryann Weaver, Environmental Scientist,
US EPA Region 5, Watersheds and Wetlands Branch

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Watershed Handbook - 2008



http://water.epa.gov/polwaste/nps/handbook_index.cfm

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Purpose

Encourage inclusion of proactive wetland management into watershed plans

Wetlands and watershed health

Landscape level approach

Achieving water management goals

Watershed organizations & local/state agencies



Photo: Staff, Michigan Dept of Natural Resources



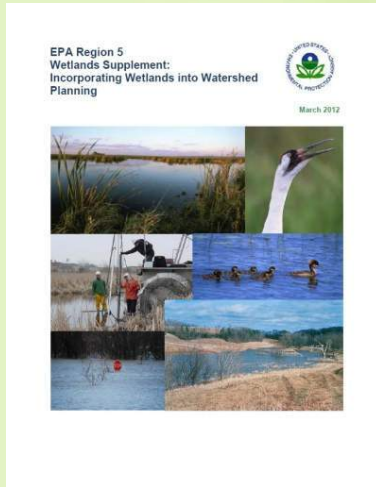
Photo: PG Environmental, LLC



Photo: PG Environmental, LLC

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Region 5 Supplement



Wetland Functions versus Wetland Values

Wetland Functions

Wetland functions relate to a process or series of processes (the physical, biological, chemical, and geologic interactions) that take place within a wetland. Major wetland functions include those that change the water regime in a watershed (hydrologic function), improve water quality (biochemical function), and provide habitat for plants and animals (food web and habitat functions).

Wetland Values

Values are generally associated with goods and services that society recognizes. Wetlands can have ecological, economic, and social values. It is important to note that not all environmental processes are recognized or valued.

Sources: Novitzki et al. 1997; Sheldon et al. 2005.

www.epa.gov/region5/agriculture/pdfs/wetlands-in-watershed-planning-supplement-region-5-201302.pdf

Wetland Basics

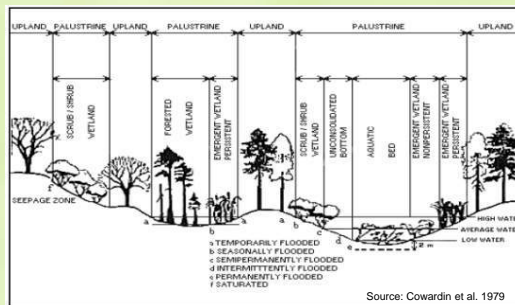
Wetland definition

Wetland types

- Forested
- Emergent
- Scrub/shrub

Wetland classification systems

- National Wetland Inventory (NWI)
- Hydrogeomorphic (HGM)
- NWIPlus



What is the NWI?

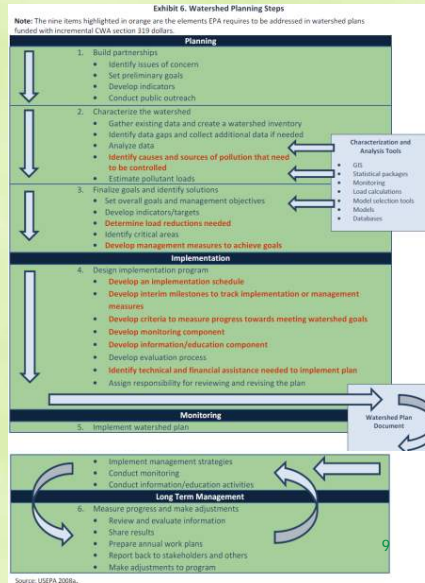
The National Wetlands Inventory is a database of information used to identify the status of wetlands across the United States. The system contains wetland data in map and digital formats (i.e., geographic information systems, or GIS). Wetlands are classified in the system according to the Cowardin system.

Source: USFWS 2010.

When to Include Wetlands in Watershed Plans

Steps

- Planning
 - Setting goals
 - Characterizing watershed
- Implementation
 - Design strategies
 - R/C/E Techniques
- Monitoring
 - Progress
- Long term management
 - Perpetuity



Case Studies

Michigan

Ohio

Virginia

Utah

Exhibit 18. Paw Paw River Watershed Management Plan Implementation Tasks Associated with Wetlands

Wetland-Related Tasks	Implementation Dates	Milestones	Evaluation Method(s)
Protect Wetlands	2009/2013	By 2015: 20 acres By 2018: 80 acres By 2023: 180 acres	<ul style="list-style-type: none"> Number of acres protected Number of landowners protecting wetlands Estimate pollutant loading reduction
Protect Sensitive Lands	2014/2018	By 2020: 200 acres By 2023: 600 acres By 2028: 1,400 acres	<ul style="list-style-type: none"> Number of acres protected Estimate pollutant load reduction
Restore Wetlands	2009/2013	By 2015: 80 acres By 2018: 180 acres By 2023: 240 acres	<ul style="list-style-type: none"> Number of acres restored Number of landowners restoring wetlands
Protect Wetland Streambanks	2009/2013	By 2015: 120 acres By 2018: 320 acres By 2023: 720 acres	<ul style="list-style-type: none"> Estimate loading reduction Number of acres protected Number of landowners protecting wetlands Estimate pollutant load reduction

Source: Fizzell and Zbiciak n.d.

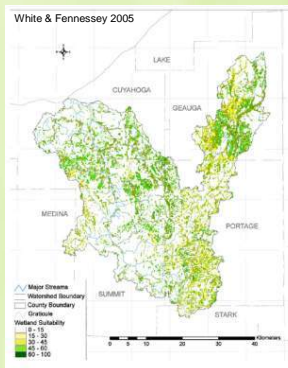
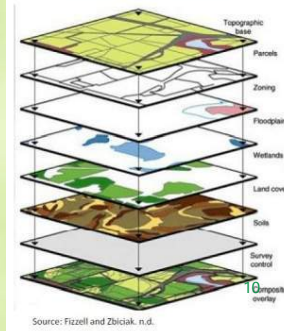



Exhibit 20. Map Layers for Inclusion in Clinton River Watershed Wetland Assessment





Appendices

A: Federal Programs and Acts Affecting Wetlands in the United States

B: Example Assessment Data and Sources

C: Level 1-3 Assessment Methods

D: Restoration, Creation, and Enhancement Techniques

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Finding the Supplement

http://water.epa.gov/polwaste/nps/handbook_index.cfm

www.epa.gov/region5/agriculture/pdfs/wetlands-in-watershed-planning-supplement-region-5-201302.pdf

Contact: Kerryann Weaver
Region 5
Water Division, Watersheds and
Wetlands Branch
weaver.kerryann@epa.gov
312-353-9483

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Questions?

Watershed Handbook (includes a link to the Supplement)

http://water.epa.gov/polwaste/nps/handbook_index.cfm

Wetlands Supplement (direct link to PDF file)

www.epa.gov/region5/agriculture/pdfs/wetlands-in-watershed-planning-supplement-region-5-201302.pdf

Kerryann Weaver

Region 5

Water Division, Watersheds and Wetlands Branch

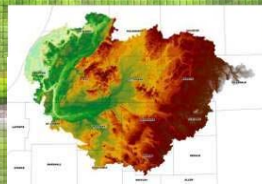
weaver.kerryann@epa.gov

312-353-9483



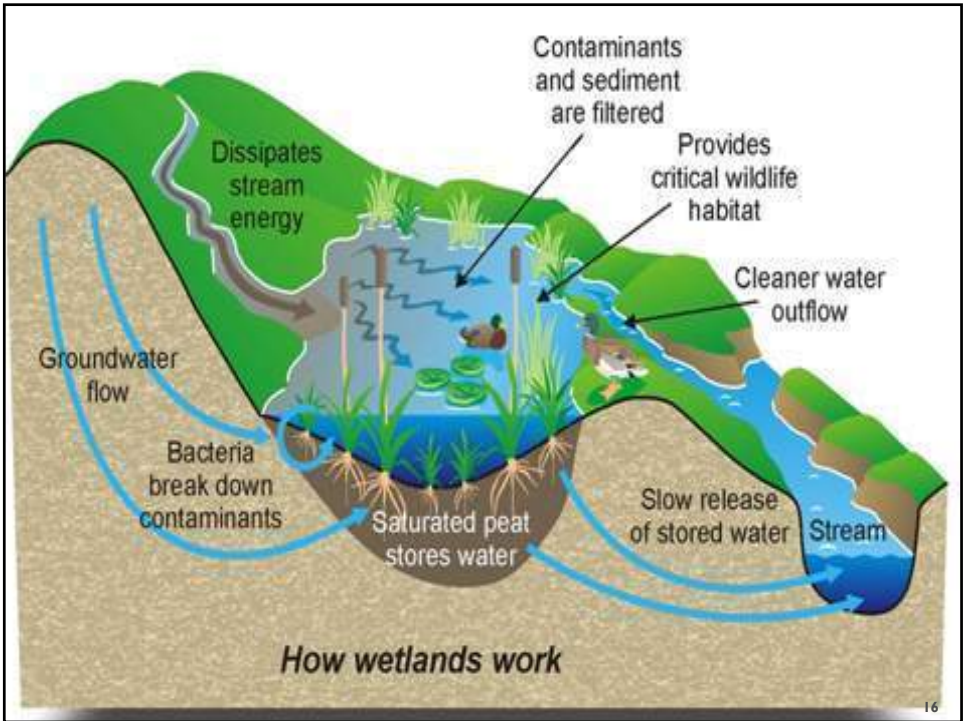
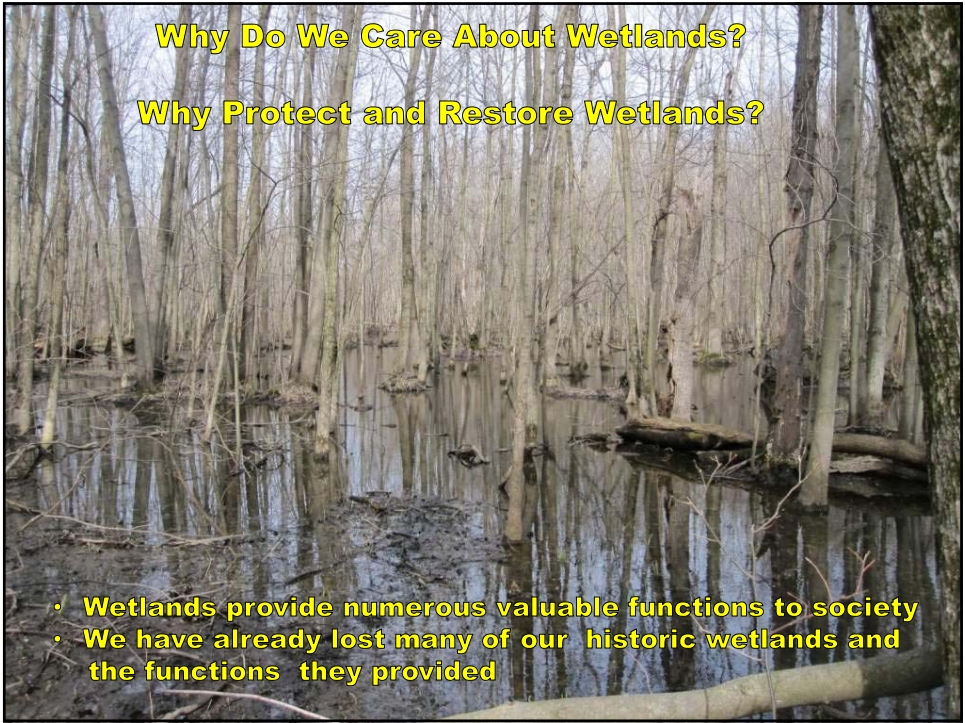
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WETLANDS AND WATERSHED PLANNING IN MICHIGAN: Landscape Level Wetland Functional Assessment



Chad Fizzell, Wetlands GIS Specialist, Michigan
Department of Environmental Quality, Water
Resources Division, Wetlands, Lakes, and
Streams Unit





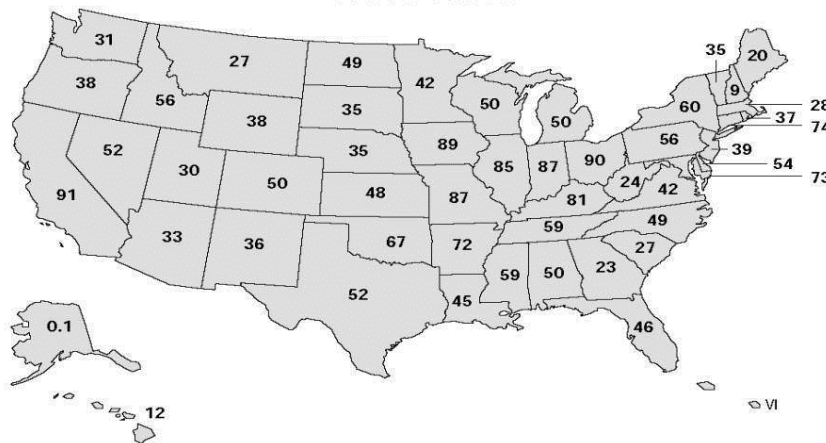
FLOOD WATER STORAGE NATURE'S SPONGES

- ▶ Reduced Flooding and Associated Damage During High Water Events
- ▶ Reduces Flashiness of Streams
 - a) Reduces Bank Erosion
- ▶ Releases Water Slowly Over Time Which Provides Stable Stream Flows
 - a) streams don't dry up in summer
 - b) improves biological health of stream



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Percentage of Wetland Acreage Lost, 1780s-1980s



Twenty-two States have lost at least 50% of their original wetlands. Seven of these 22 (California, Indiana, Illinois, Iowa, Missouri, Kentucky, and Ohio) have lost more than 80% of their original wetlands.

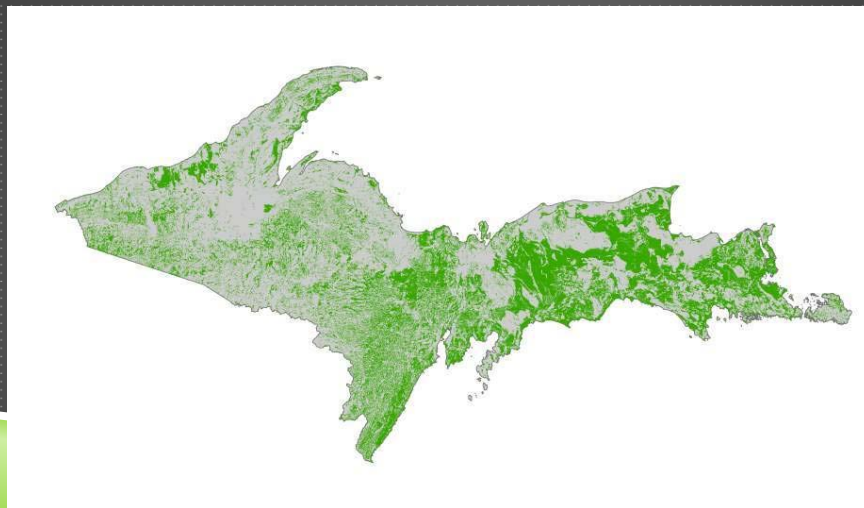
Source: Dahl, T.E., 1990, *Wetlands Losses in the United States 1780's to 1980's*, U.S. Department of the Interior, Fish and Wildlife Service.

MICHIGAN'S WETLAND LOSES NOT UNIFORM

- ▶ UPPER PENINSULA – 17% LOSS (638,000 ACRES)
- ▶ NORTHERN LOWER PENINSULA – 20% LOSS (387,000 ACRES)
- ▶ SOUTHERN LOWER PENINSULA – 66% LOSS (3,320,000 ACRES)
- ▶ GREAT LAKES COASTAL WETLANDS – 71% LOSS

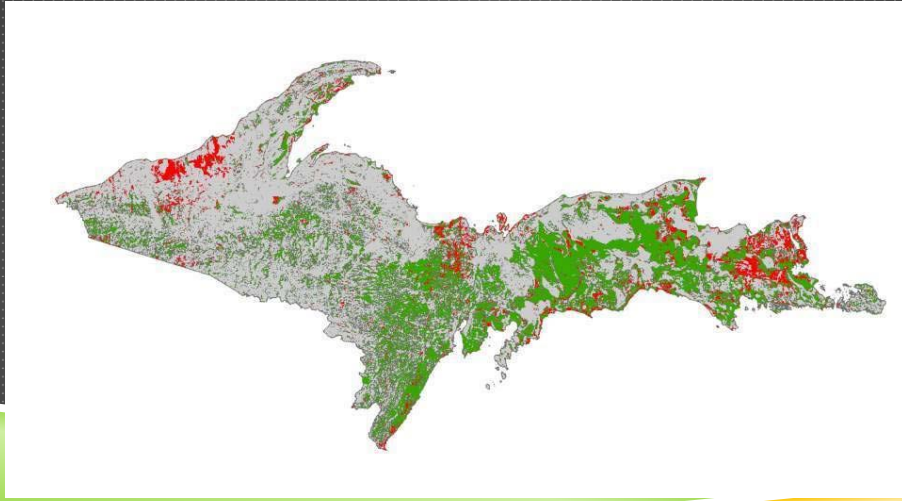
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UPPER PENINSULA: PRE-SETTLEMENT WETLANDS



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UPPER PENINSULA: APPROXIMATE AREAS OF WETLAND LOSS



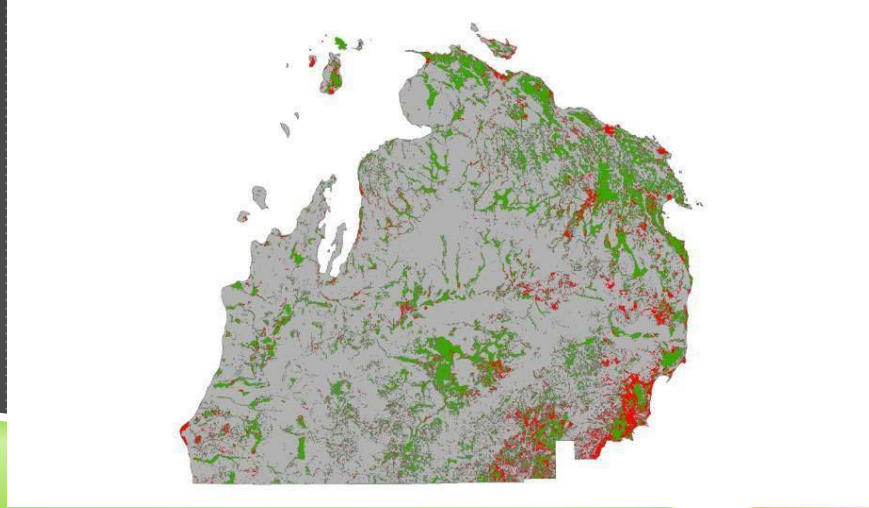
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NORTHERN LOWER PENINSULA: PRE-SETTLEMENT WETLANDS



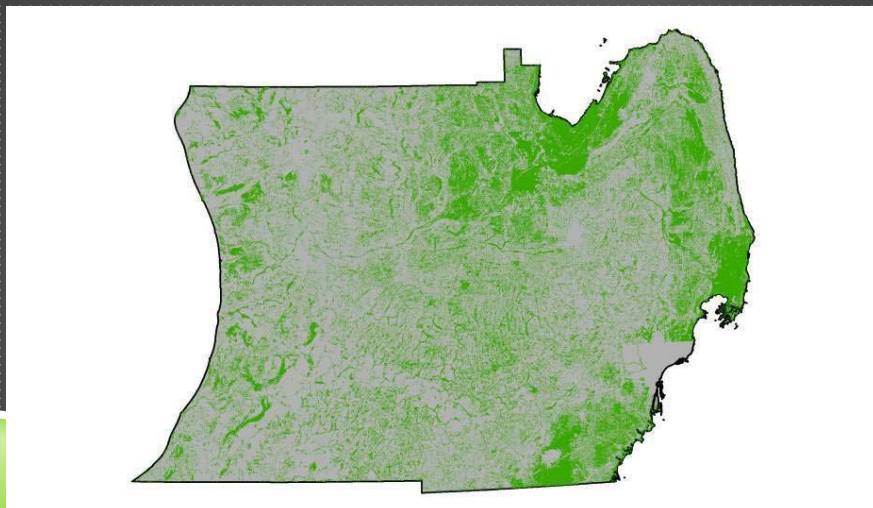
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NORTHERN LOWER PENINSULA:
APPROXIMATE AREAS OF WETLAND LOSS



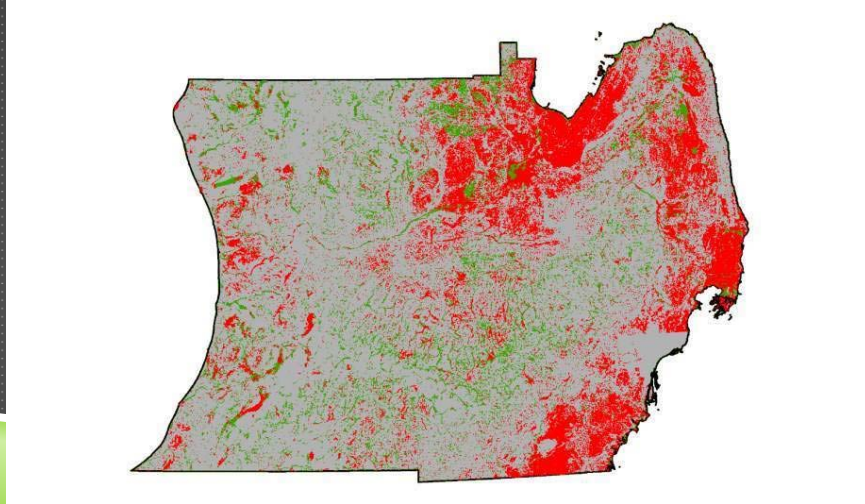
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SOUTHERN LOWER PENINSULA:
PRE-SETTLEMENT WETLANDS



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SOUTHERN LOWER PENINSULA: APPROXIMATE AREAS OF WETLAND LOSS



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WETLAND LOSS = FUNCTIONS LOST

- ▶ Wetland loss has always been expressed as acreage loss.
- ▶ What does the loss 35,170 acres of wetlands really mean in the Thornapple River Watershed Less the Coldwater River Watershed?
- ▶ What does the loss 11,530 acres of wetlands really mean in the Coldwater River Watershed?
- ▶ LLWFA allows wetland loss to be expressed in terms of functions lost.

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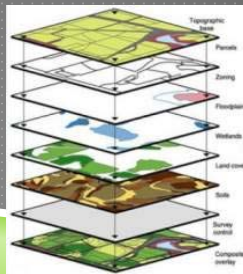
3 STEP PROCESS FOR WATERSHED PLANNING

1. **ENHANCE** existing and historic wetland data.
2. **PRIORITIZE** by geography to identify areas of priority.
3. **UTILIZE** results to assist in the planning effort.

49% Acreage Lost in the Coldwater River Watershed

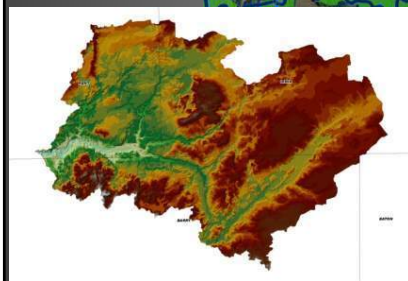


36% Flood Storage Capacity Lost

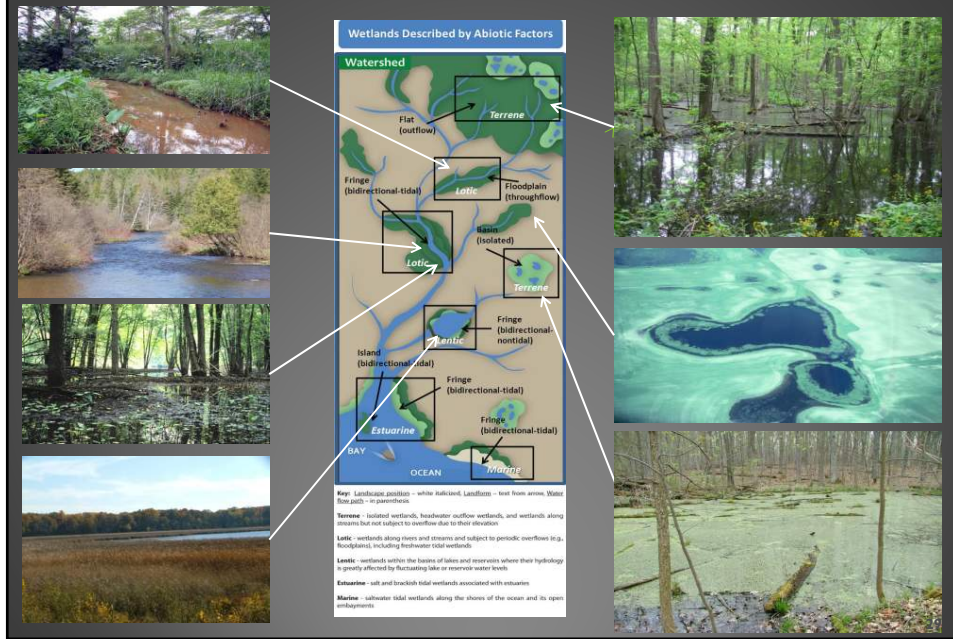


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STEP I. ENHANCING NWI FOR LANDSCAPE-LEVEL WETLAND FUNCTIONAL ASSESSMENT

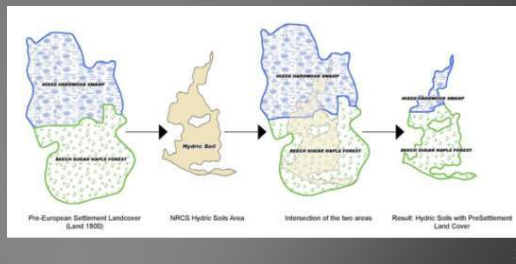
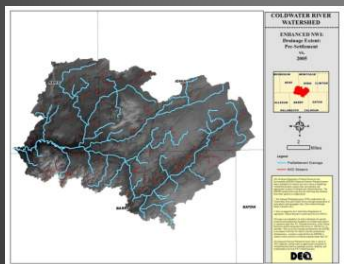
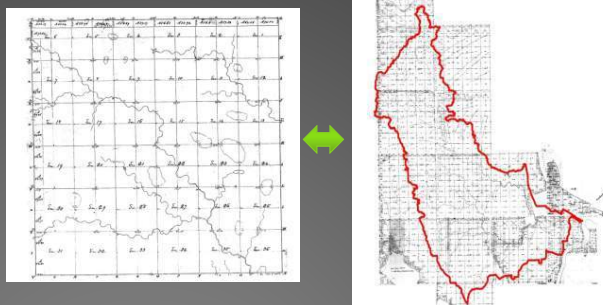


STEP I. ENHANCE



STEP I. ENHANCE

- Create Pre-Settlement wetland data
- Based on the presence of hydric soils
 - Utilize historic land cover data
 - Determine historic drainage extent
 - Add HGM attributes



EVALUATED WETLAND FUNCTIONS

- ▶ Water Quality Functions
 - ▶ Flood Water Storage
 - ▶ Streamflow Maintenance
 - ▶ Nutrient Transformation
 - ▶ Sediment and Other Particulate Retention
 - ▶ Shoreline Stabilization
 - ▶ Stream Shading
 - ▶ Ground Water Influence
 - ▶ Carbon Sequestration
 - ▶ Pathogen Retention

- ▶ Habitat Functions
 - ▶ Fish Habitat
 - ▶ Waterfowl/Waterbird Habitat
 - ▶ Shorebird Habitat
 - ▶ Interior Forest Bird Habitat
 - ▶ Amphibian Habitat
 - ▶ Conservation of Rare and Imperiled Wetlands & Species



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STEP 2. PRIORITIZE

UNDERSTAND ACREAGE VS. FUNCTION LOSS

Area	Acreage Loss	Floodwater Storage Loss	Sediment Retention Loss	Nutrient Transformation	Combined Water Quality Loss	Habitat Loss
Thornapple River <small>(Less Coldwater)</small>	44%	40%	33%	44%	40%	32%
Chester Township	58%	61%	54%	65%	61%	66%
Coldwater River	49%	44%	32%	48%	45%	38%
Bear Creek Sub-basin	54%	52%	45%	54%	54%	46%

•**Water Quality**- Floodwater Storage, Sediment Retention, Nutrient Transformation, Shoreline Stabilization, Streamflow Maintenance, Carbon Sequestration, and Pathogen Retention

•**Wildlife Habitat**- Fish, Waterfowl, Interior Forest Bird, Shorebird, and Amphibian Habitat.

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STEP 2. PRIORITIZE

RANK BY GEOGRAPHY & OR FUNCTION



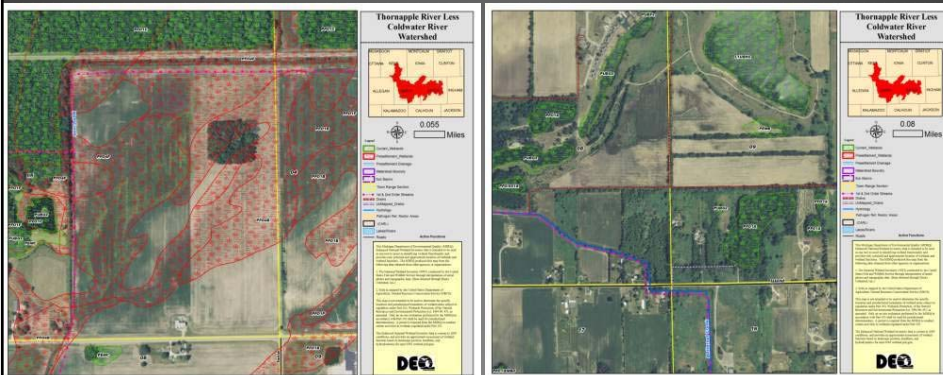
Rank	HU_12_NAME	Wetland Acreage	Sediment Retention Loss PCT
1	Duck Creek	923	57.8
2	Bear Creek	1,357	45.1
3	Messer Brook-Coldwater River	1,020	44.8
4	Jordan Lake-Little Thornapple River	1,025	42.2
5	Woodland Creek-Little Thornapple River	825	41.8
6	Pratt Lake Creek	1,401	8.4
7	Coldwater River	3,270	0.0



Rank	NAME	Wetland Acres	Wetland Loss Percentage
1	Beaver Twp	251	0.0
2	Wainville Twp	0	0.0
3	Johnstown Twp	1,611	2.6
4	Levell Twp	368	3.7
5	Hope Twp	4,001	8.5
6	Castleton Twp	3,118	14.6
7	Leighton Twp	172	15.8
8	Orangeville Twp	334	17.0
9	Walden Twp	1,298	18.7
10	Henry Twp	342	22.7
11	Thornapple Twp	1,090	23.8
12	Ballentine Twp	3,551	23.9
13	Banked Springs Twp	1,060	24.6
14	Woodland Twp	1,090	25.6
15	Leaning	234	26.6
16	Patting Twp	1,430	27.1
17	Carleton Twp	1,465	30.0
18	Leighton Twp	1,881	30.4
19	Carlton Twp	660	34.7
20	Bellevue Twp	671	35.2
21	Armonville Twp	2,811	36.4
22	Eds Twp	163	42.6
23	Gracie Grove Twp	1,377	45.8
24	Cascade Twp	947	47.1
25	Armad Twp	1,149	47.8
26	Galena Twp	2,247	49.1
27	Palms Twp	350	52.3
28	Leighton Twp	2,084	53.6
29	Woodbury Twp	250	63.0
30	Benton Twp	1,629	66.3
31	Walden Twp	1,169	67.8
32	Leban Rapids Twp	457	71.2
33	Leaning	79	71.8
34	Leaning	771	75.6
35	Leaning Twp	1	79.6
36	Patla Twp	169	81.8
37	Bellevue Twp	172	81.9
38	Howard Twp	463	82.3
39	Walden Twp	21	83.6
40	Leaning Twp	142	86.4
41	Charlotte	81	88.6

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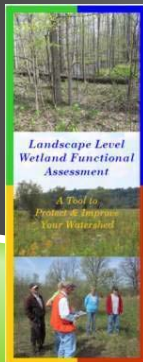
STEP 3. UTILIZE



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STEP 3. UTILIZE

- ▶ Targeting Outreach
- ▶ Strategic Planning
- ▶ Decision Making



Wetlands at Work
Protecting & Restoring Wetlands for Clean Water

WETLANDS WORK FOR US: they filter pollutants, absorb & store excess rainfall, and perform a number of other functions that keep our lakes and rivers clean.

YOU ARE INVITED to learn about programs, tools and financial incentives that allow property owners to protect existing wetlands and restore degraded or drained wetlands.

Join staff from these organizations:
 - National Resource Conservation Service (NRCS)
 - Michigan Department of Environmental Quality
 - U.S. Fish & Wildlife Service
 - Southern Michigan Land Conservancy
 - Conservation Districts
 - Van Buren County Drain Commission
 - Two River Coalition
 - And more!

This event will be offered at two times and locations:
 Thursday, January 31, 2013
 3-5 p.m. at Savitt Nature Center, Benton Harbor
 7-9 p.m. at Lake Michigan College, South Haven

Sponsored by the Van Buren Conservation District
www.vanburencd.org • 269-657-4030 x3

VAN BURLEN CONSERVATION DISTRICT

January 7, 2013

Dear Landowner:

Over the last century, Michigan has lost more than 50% of its wetlands. As a result, we have seen increased flooding, degraded water quality and threats to public health and safety. The Van Buren Conservation District is leading a local effort to safeguard our area by targeting wetland restoration and protection.

Why You Received This Letter: As part of our project, a study was completed which found extraordinary wetland resources on land that appears to be owned by you or the organization you represent. We invite you to join us for a short program on Thursday, January 31st to discuss protection and restoration options.

Why You Should Attend: There can be financial advantages to protecting or restoring wetlands on your property. Programs exist that cover restoration costs and pay you for each acre of wetland restored. There can be significant tax benefits to protecting wetlands with a permanent conservation easement. Learn more about these opportunities and bring this letter to be eligible to win a local food gift basket!

What is the Study? A Landscape Level Wetland Functional Assessment (information enclosed) was completed to rank current and historic wetlands based on the significance of the functions they provide (for example, soil retention, floodwater storage, fish habitat, etc.). These functions protect our agricultural resources, our water quality and, ultimately, our livelihoods.

Please join us at one of the following times on Thursday, January 31st to learn more:

- 3:00-5:00 pm at Savitt Nature Center (2100 North Beacon Center Road, Benton Harbor)
- 7:00-9:00 pm at Lake Michigan College (125 Veterans Boulevard, South Haven)

Representatives from key organizations/agencies will be present to answer questions. There is no admission fee and light refreshments will be provided. If you're not able to make it but would still like information about wetland restoration or protection, please don't hesitate to contact us.

Thank you for your time. We hope to see you there!

Sincerely,

 Marc Meerman and Erin Fuller
 Wetland Coordinators
 Van Buren Conservation District

1030 E. Michigan Avenue, P.O. Box 49079
 Phone: 269-657-4030 ext. 3 • Fax: 269-657-4818
WWW.VANBURENCDD.ORG

STEP 3. UTILIZE

Decision Making

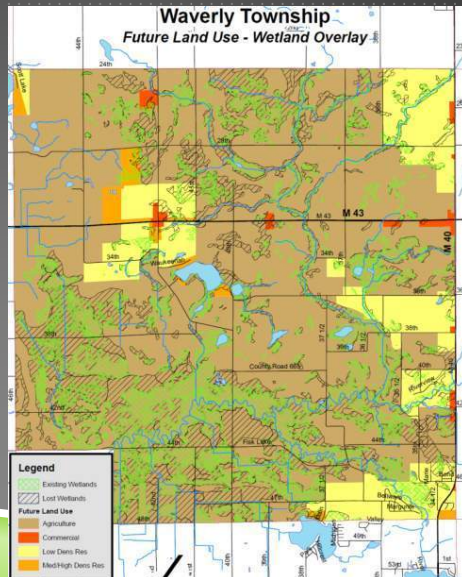
- ▶ Support more restrictive zoning and better land use planning

Legend

- Existing Wetlands
- Lost Wetlands

Future Land Use

- Agriculture
- Commercial
- Low Dens Res
- Med/High Dens Res

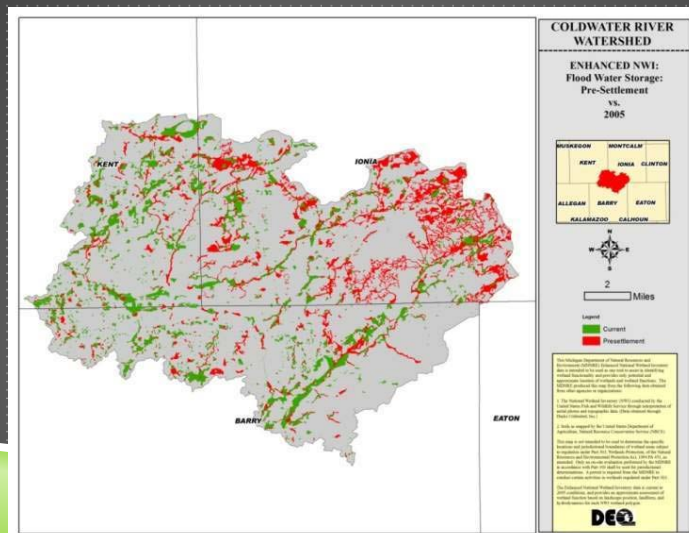


Keeping Opportunities for Protection and Restoration

FLOOD WATER STORAGE

- ▶ This function is important for reducing the downstream flooding and lowering flood heights, both of which aid in minimizing property damage and personal injury from such events.
- ▶ The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

FLOOD WATER STORAGE

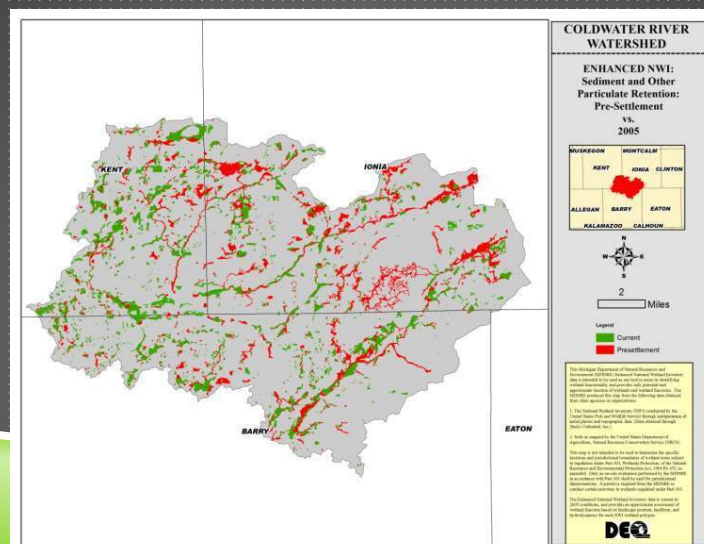


SEDIMENT AND OTHER PARTICULATE RETENTION

- ▶ This function supports water quality maintenance by capturing sediments with bonded nutrients or heavy metals. Vegetated wetlands will perform this function at higher levels than those of non-vegetated wetlands.
- ▶ The following map illustrates wetlands that perform the above ecological service at a level of significance above that of wetlands not designated. Wetlands deemed to be performing this function are mapped in two distinct time periods; Pre-European settlement (red), and wetlands circa 2005 (green).

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SEDIMENT AND OTHER PARTICULATE RETENTION



STEP 3. UTILIZE

Decision Making

- ▶ Strengthen grant funding requests
- ▶ Assist agencies in evaluating projects
- ▶ Identifying restoration and preservation sites



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SUCCESSFUL WATERSHED APPLICATIONS

- ▶ Galien River Watershed
 - ▶ Functional data used to identify areas where restoration can benefit the reduction of nonpoint source pollutants.
- ▶ Black River and Paw Paw River Watersheds
 - ▶ Inventory of natural features includes wetlands and ecological services.
 - ▶ Selection of priority protection and restoration areas based in part on wetland function for watershed improvement.
- ▶ North Branch Clinton River
 - ▶ Functional data used to identify areas where restoration can benefit the reduction of nonpoint source pollutants. Location has been found for restoration and a 319 grant awarded for the project.

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APPLICATIONS CONTINUED...

- ▶ Status and Trends of a particular watershed.
- ▶ Cumulative impact analysis of wetland functions.
- ▶ Illustration of the effective role that wetlands play within the larger landscape and the role that wetland destruction and degradation has played in reduced surface-water quality, habitat, and flood control over time.

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▶ If you would like more information on using NWI for Wetland Functional Assessment please contact MDEQ for a copy of our Methodology Report

▶ JonesJ28@michigan.gov
▶ 517-284-5536


▶ Fizzellc@michigan.gov
▶ 517-284-5533

LANDSCAPE LEVEL WETLAND FUNCTIONAL ASSESSMENT
(LLWFA)
Version 1.0
Methodology Report



July 12, 2011

Michigan Department of Environmental Quality




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Questions?

If you would like more information on using NWI for Wetland Functional Assessment please contact MDEQ for a copy of our Methodology Report

- Email: JonesJ28@michigan.gov
 - Phone: (517) 284-5536
- Email: Fizzellc@michigan.gov
 - Phone: (517) 284-5533



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Planning Wetland Restoration at a Hierarchy of Scales

Siobhan Fennessy
Kenyon College

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Wetland values accrue at the watershed scale

- The problem:
 - nearly half of nations waterways do not meet basic water quality standards
 - Nonpoint sources account for ~50% of water quality impairment
- Watershed based planning can restore ecosystem-level processes that maintain water resource integrity
- Spatial distribution of wetlands important

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Issues in wetland mitigation

- Recent study by National Academy of Science: improvement is needed!
 - No preference for on-site, in-kind mitigation
 - Long-term sustainability critical
 - Consider hydrologic equivalence
 - Landscape degradation limits project success
 - Select sites on a watershed scale to mimic natural distribution of wetlands



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The Cuyahoga River Basin



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The Cuyahoga River Basin

- 813 square miles
- 3% of state land area, houses 16% of population
- Wetlands mapped by OWI
- Designated a Great Lakes *Area of Concern* due to industrial pollution



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The Cuyahoga River fires: catalyst for water protection



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Development of a site-suitability model for restoration

- Goals
 - Avoid site-specific decisions
 - Investigate how the spatial configuration of wetlands influences their contribution to watershed water quality
- Considerations in model development
 - Hydrogeologic setting (watershed characteristics that control flow of surface and groundwater)
 - Geomorphology
 - Land use

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Restoration Site-Suitability Model: Two-phase approach

1. Identify total population of sites suitable for restoration
 - Those with high likelihood of success
 - Sustainable over the long-term
2. Of those, identify priority restoration areas
 - Which contribute most to water resource integrity
 - Downstream systems
 - Adjacent wetlands

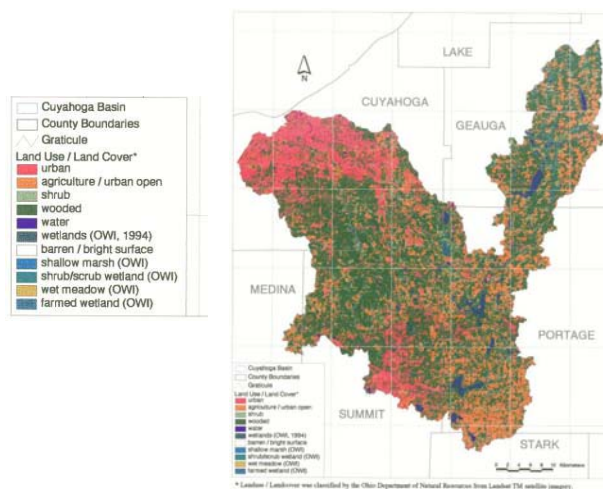
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What we Did - Suitability Modeling: a multi-criteria evaluation using GIS

- Landscape criteria
 - Physical parameters that characterize wetland form (local character)
 - Land use/land cover, existing wetlands, saturation index vegetation type, soils, topography
 - Parameters that characterize wetland function (neighborhood character)
 - Overland flow distance to perennial stream channel, stream order, in-stream water quality

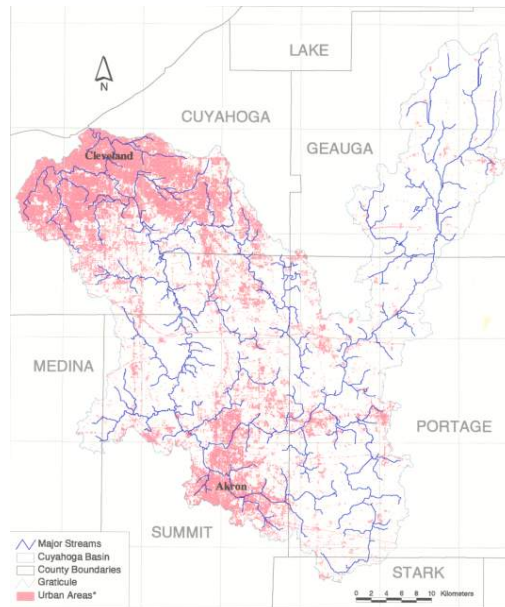
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Cuyahoga Watershed: land use as a constraint



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Cuyahoga Watershed: Urban land use



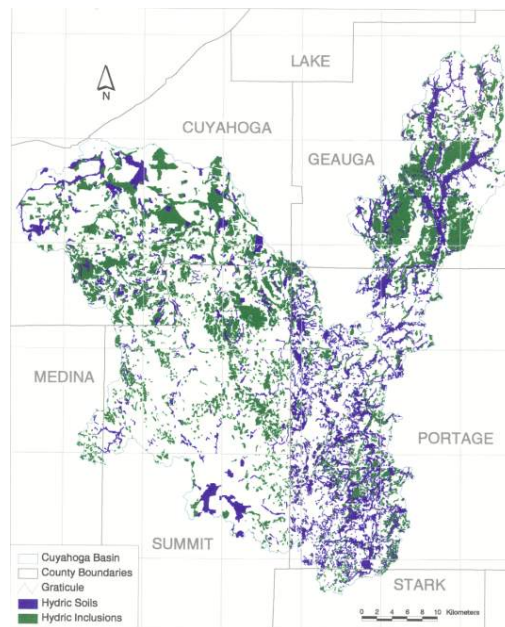
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How to Identify Suitable Sites: multi-criteria evaluation using GIS

- Effectiveness matrix extracts all suitable sites
- Based on:
 - Land use type (urban, open water, transportation excluded)
 - Hydric soils and soils with hydric inclusions
 - Saturation index
 - Digital elevation model

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Cuyahoga Watershed: Hydric soils as the basis for restoration



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How to Identify Priority Sites: multi-criteria evaluation using GIS

- A priority matrix summarizes importance to downstream areas
 - Stream order
 - Overland flow length
 - Saturation index
 - Stream condition in subwatershed (aquatic life use attainment)

Matrix algebra used to combine the pieces:

$$\text{Restoration Potential} = \text{effectiveness matrix} * \text{priority matrix}$$

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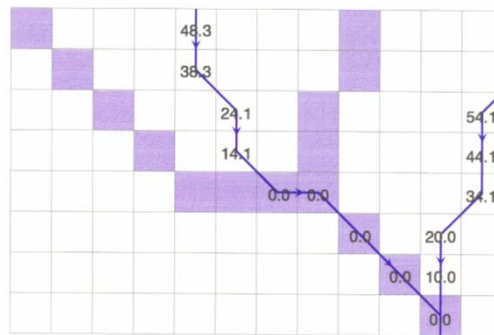
Will the hydrology work? A topographic saturation index

- Measures potential soil saturation for all grid cells in model
- Based on digital elevation model (DEM)
 - Slope
 - Flow accumulation (hydrologic length)
- Delineate subwatersheds to calculate drainage to any given point in study area

$$SI = \ln (a / \tan\beta)$$

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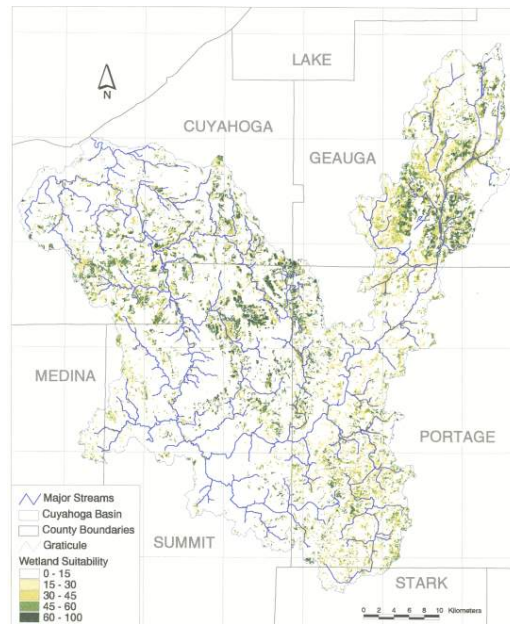
Flow path analysis: hydrologic distance



- selected flow paths
- grid cells (distance weight = 1)
- stream channels (distance weight = 0)
- 14.1 flow distance in meters for selected flow paths

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Cuyahoga Watershed: Wetland Restoration Model



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Restoration Site-Suitability Model: Two-phase approach

1. Resource Phase

- Identify population of sites available for restoration
- Have high likelihood of success
- Sustainable over the long-term

2. Application Phase

- “Filter” the population of available sites based on watershed goals and regional priorities

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Thanks! And questions?

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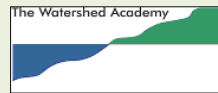
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Next Watershed Academy Webcasts



- **Linking Nutrient Pollution and HABs:
State of the Science and EPA Actions**
September 25, 2013, 1:00 – 3:00 p.m. ET
- **National Stormwater Calculator**
October 2, 2013, 1:00 – 2:30 p.m. ET

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