
What gets restored without a watershed plan?
What should get restored with a watershed plan?
What could happen with no plan under the proposed regulations?

What gets restored without a watershed plan?

Air photos by Aaron Boers; wetland photos from Dahl 2006.

FWS says wetland area increased by ~32,000 ac annually in the conterminous US between 1998 and 2004.

Losses:

Estuarine emergent wetlands declined ~33,240 ac in 6 yrs.

Freshwater emergent wetlands declined by ~142,570 ac in 6 yr.

Gains:

Ponds increased by a total of ~700,000 ac in 6 yr (a 12.6% increase in this type).

T. E. Dahl
U.S. Fish and Wildlife Service
Fisheries and Habitat Conservation
Washington, D.C.

Status and Trends of Wetlands in the Conterminous United States 1998 to 2004

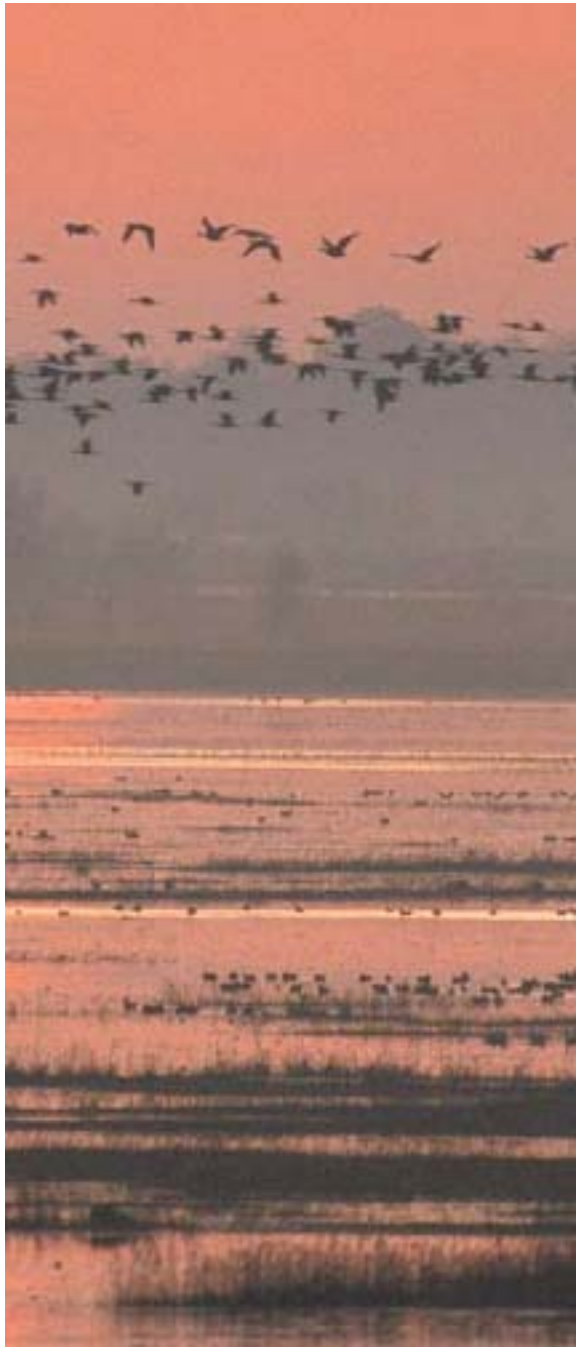


Figure 47. Development in rapidly growing area of south Florida. Insets A–C enlarged from figure above. These photographs have been used as examples of wetland and land use trends. There is no evidence or implication that this represents future change.

A) Largely undeveloped area where vegetated wetland predominates.

Often, losses are from large wetlands and gains are small spots on the landscape.

C) Dense residential development. Surface waters are contained in artificial ponds and lakes.

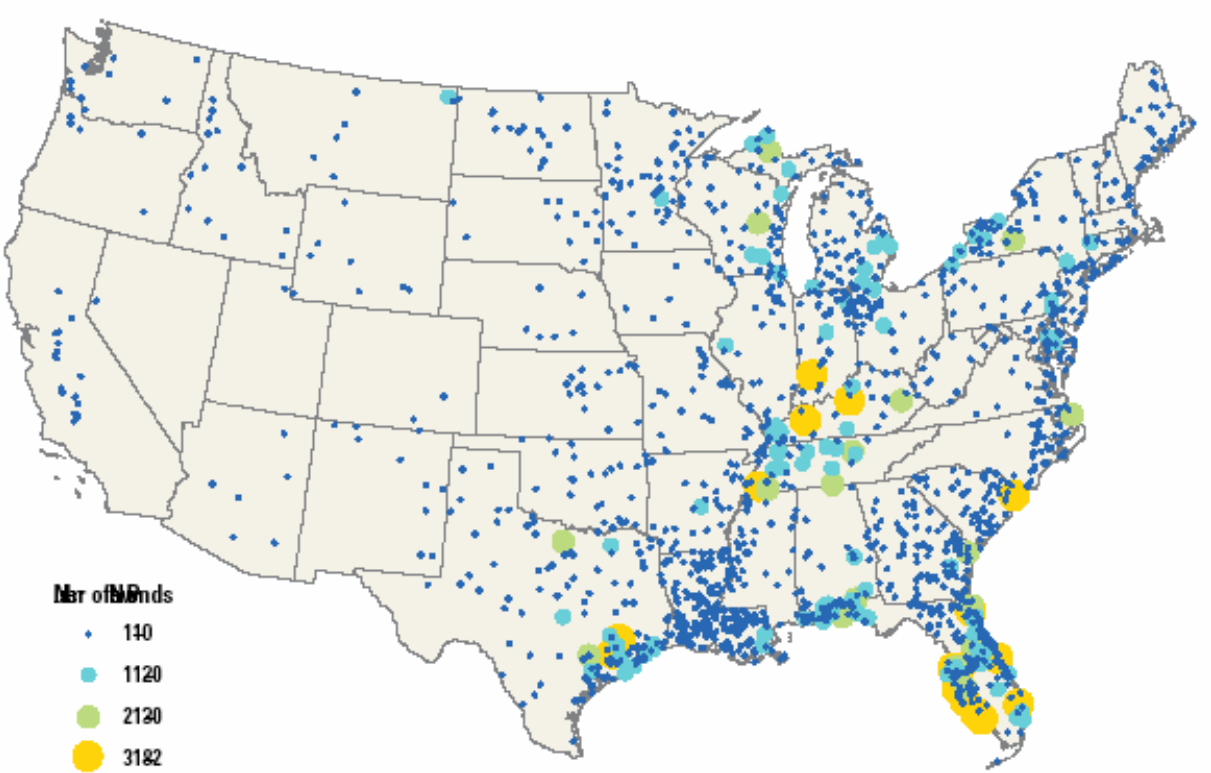


Figure 58. Number and approximate location of new freshwater ponds created between 1998 and 2004.

The pondification of America happened in the absence of watershed plans

Net gain in acres but

Loss of former wetland types

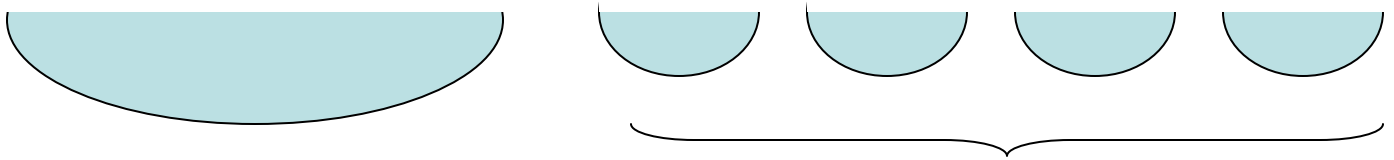
Thus, lost functions

Do lots of ponds provide the same functions as a few larger wetlands?

No. Ponds do not replace other wetland types.

Many little ponds don't even replace one big *pond*….

A large pond of area x compared to 4 ponds of total area x (with same diameter:depth) would hold only **half** the water, and they would have half the flood abatement function (TotVol=SQRT(N)).



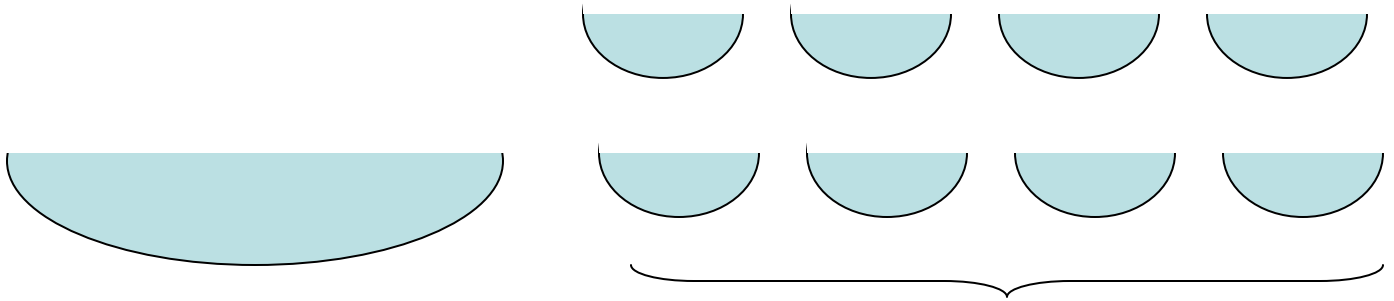
Area X,
volume V

Area X, volume 1/2 V

To replace the **volume** of that one large pond, you would need 8 of the small ponds, or **twice the area** (and more $).

But even twice the area of ponds wouldn't necessarily replace lost functions.

E.g, for ponds to abate flooding, they need to be in the right place.



Area X,
volume V

Area X, volume V

Ponds are

- Cheap,
- Easy to build,
- In compliance with jurisdictional wetlands, and
- Appreciated by people.

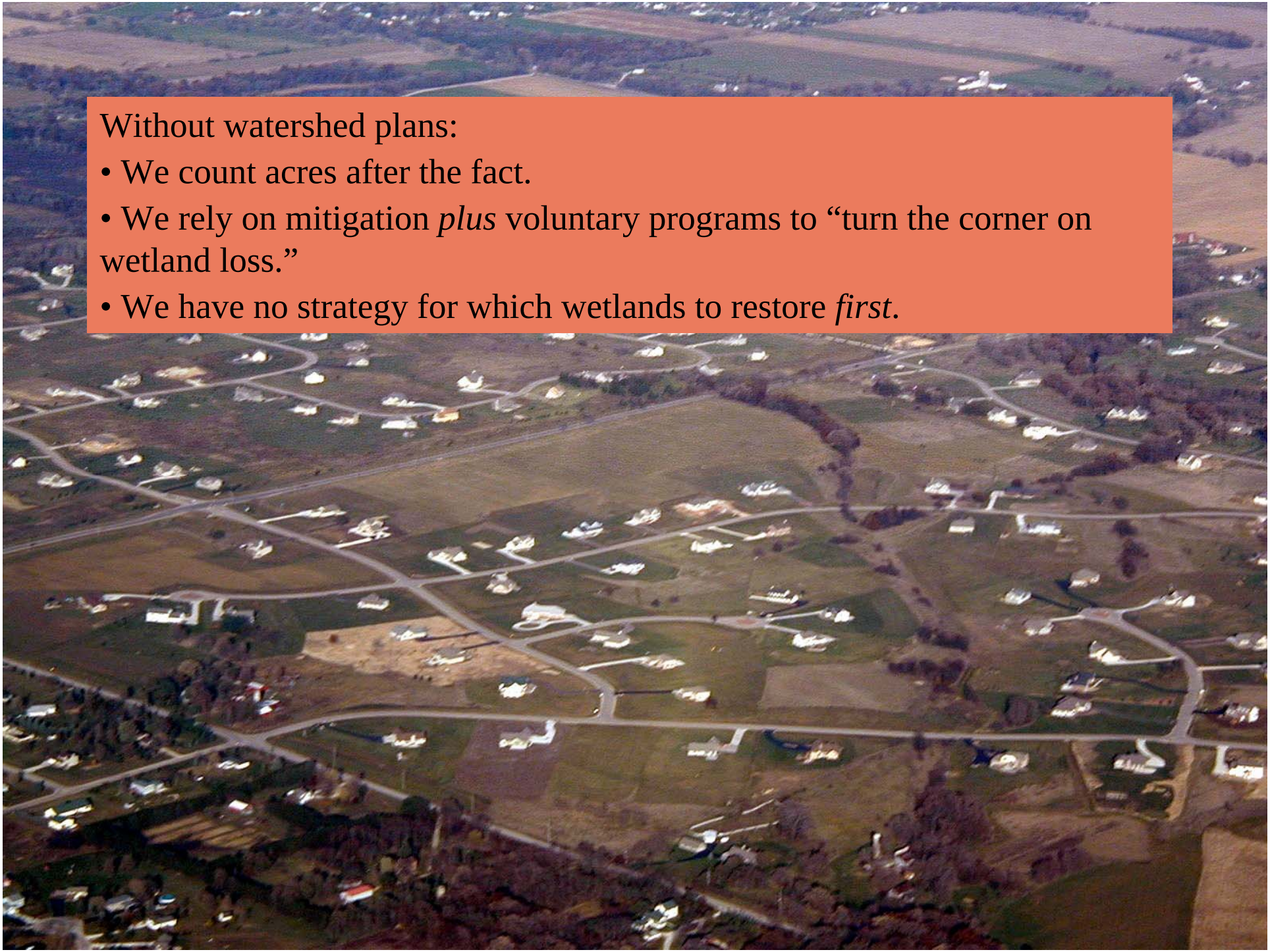
Figure 57. A freshwater pond in central Kansas is starting to support emergent vegetation, 2005.

Ponds are

- Cheap,
- Easy to build,
- In compliance with jurisdictional wetlands, and
- Appreciated by people.

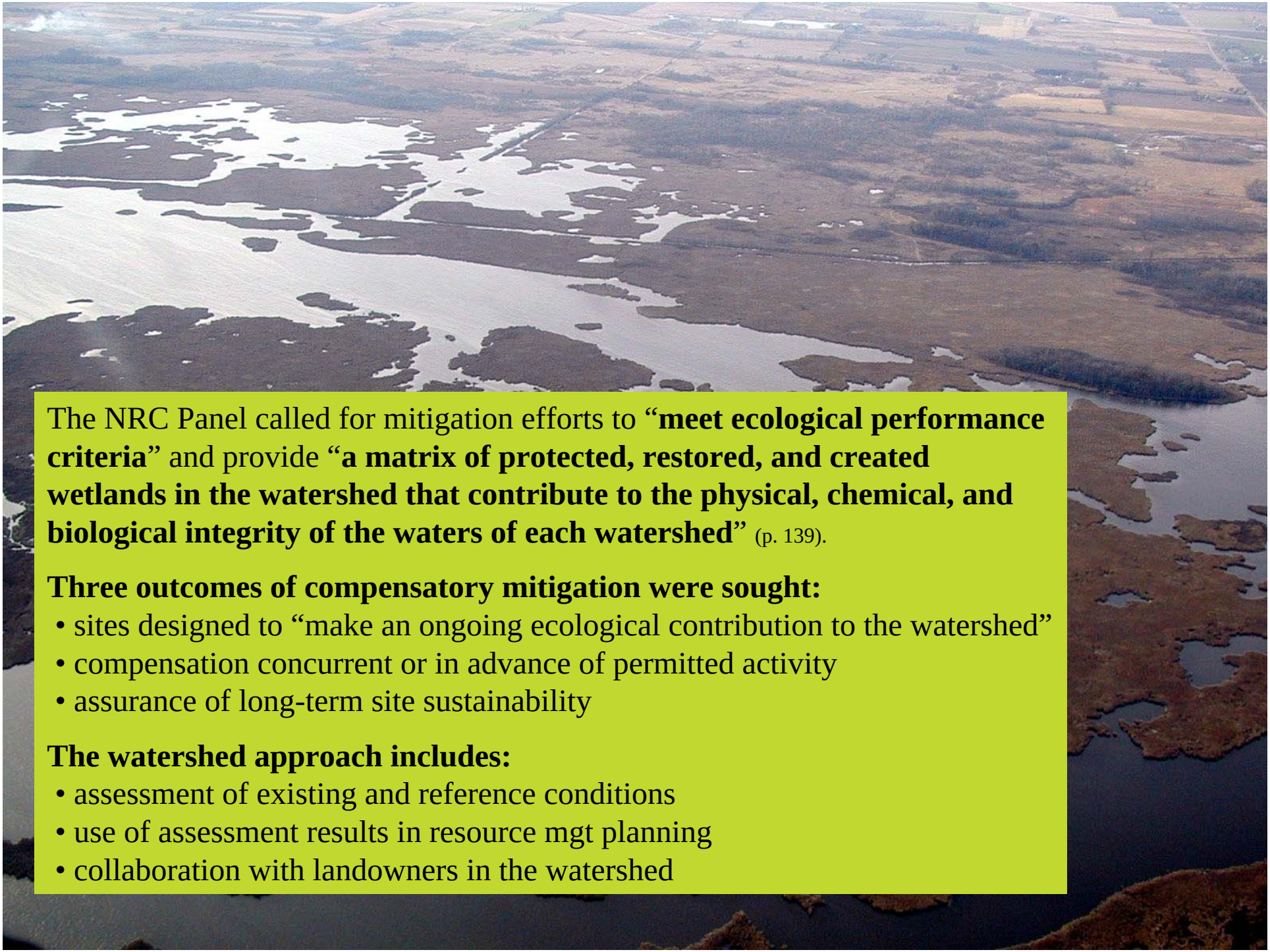
Figure 57. A freshwater pond in central Kansas is starting to support emergent vegetation, 2005.

But they do not compensate for losses of other wetlands.



Without watershed plans:

- We count acres after the fact.
- We rely on mitigation *plus* voluntary programs to “turn the corner on wetland loss.”
- We have no strategy for which wetlands to restore *first*.



The NRC Panel called for mitigation efforts to "**meet ecological performance criteria**" and provide "**a matrix of protected, restored, and created wetlands in the watershed that contribute to the physical, chemical, and biological integrity of the waters of each watershed**" (p. 139).

Three outcomes of compensatory mitigation were sought:

- sites designed to "make an ongoing ecological contribution to the watershed"
- compensation concurrent or in advance of permitted activity
- assurance of long-term site sustainability

The watershed approach includes:

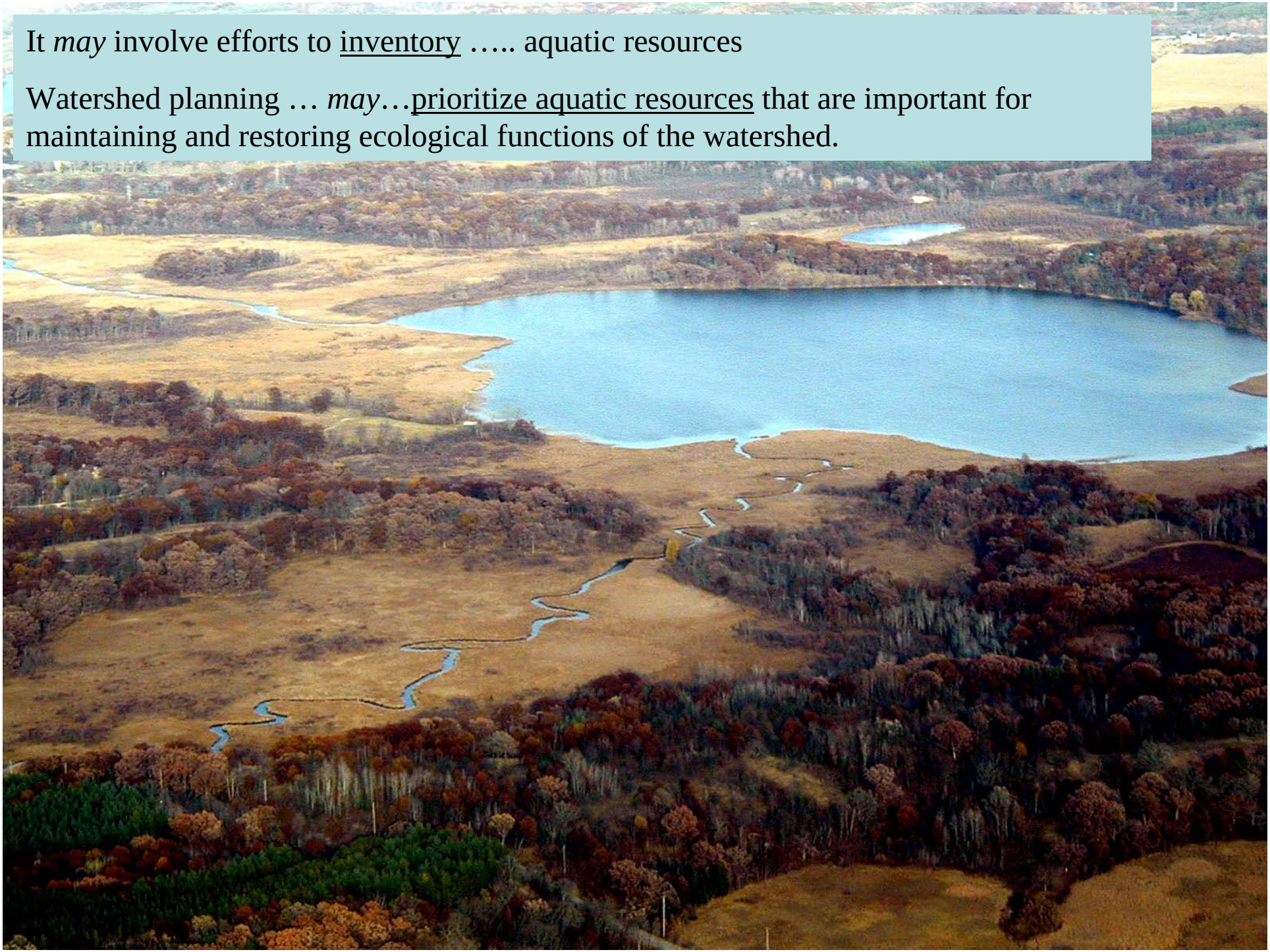
- assessment of existing and reference conditions
- use of assessment results in resource mgt planning
- collaboration with landowners in the watershed

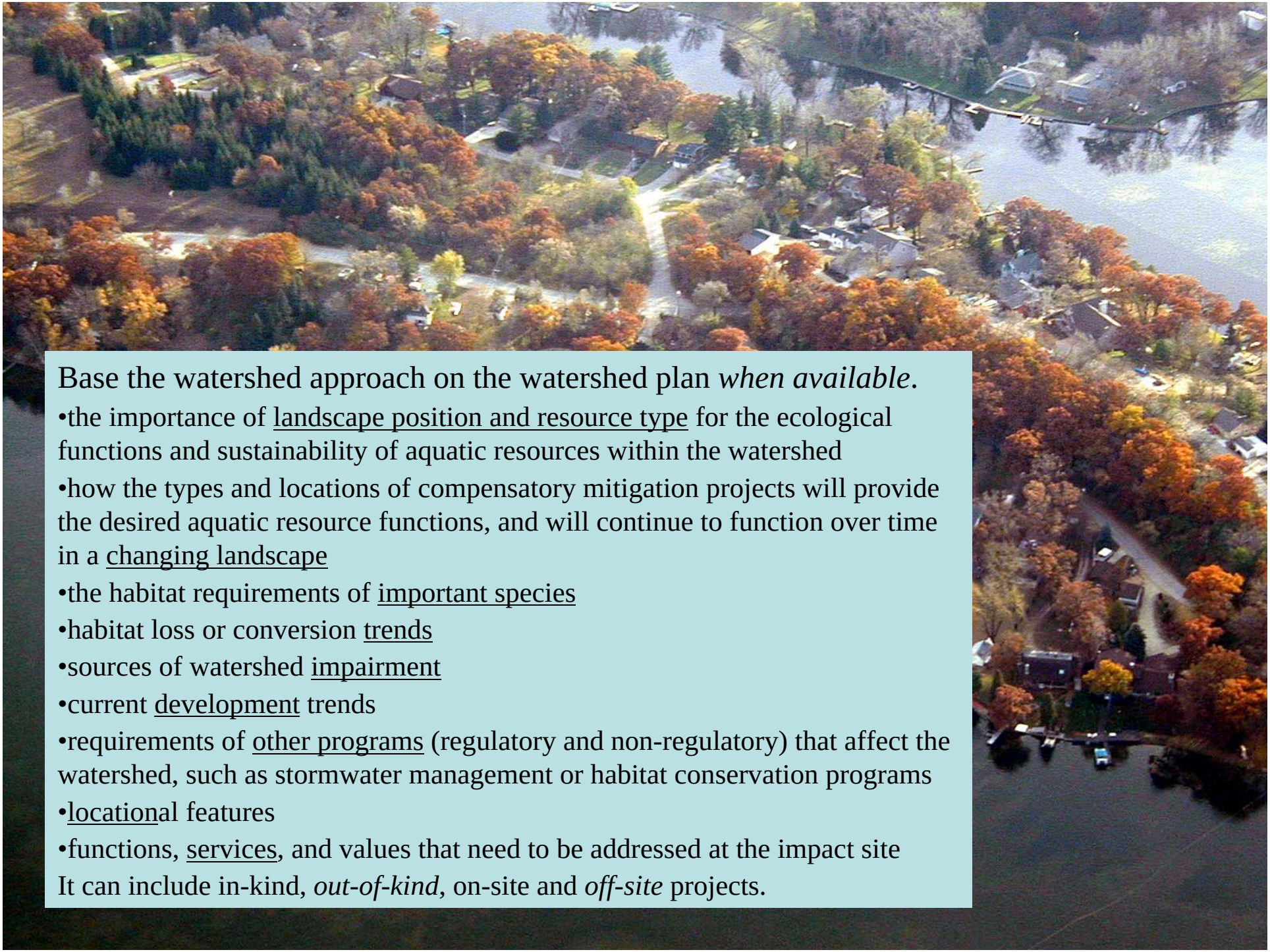
What should get restored with a watershed plan?

From the Proposed Regulations…."The ultimate goal of a watershed approach is to maintain and improve the quality and quantity of aquatic resources within watersheds through strategic selection of compensatory mitigation sites."

It *may* involve efforts to inventory ….. aquatic resources

Watershed planning … *may*…prioritize aquatic resources that are important for maintaining and restoring ecological functions of the watershed.

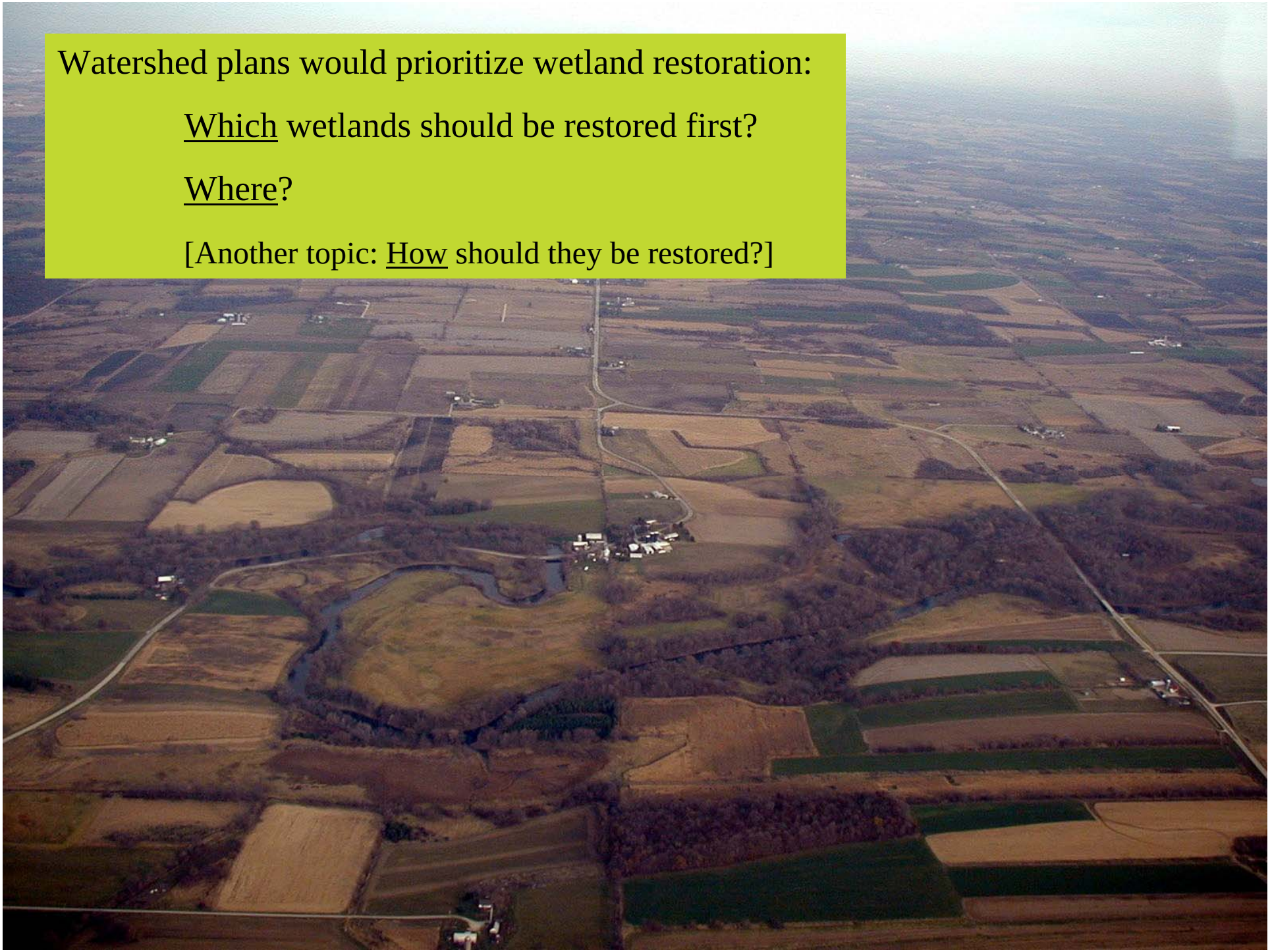




Base the watershed approach on the watershed plan *when available*.

- the importance of landscape position and resource type for the ecological functions and sustainability of aquatic resources within the watershed
- how the types and locations of compensatory mitigation projects will provide the desired aquatic resource functions, and will continue to function over time in a changing landscape
- the habitat requirements of important species
- habitat loss or conversion trends
- sources of watershed impairment
- current development trends
- requirements of other programs (regulatory and non-regulatory) that affect the watershed, such as stormwater management or habitat conservation programs
- locational features
- functions, services, and values that need to be addressed at the impact site

It can include in-kind, *out-of-kind*, on-site and *off-site* projects.



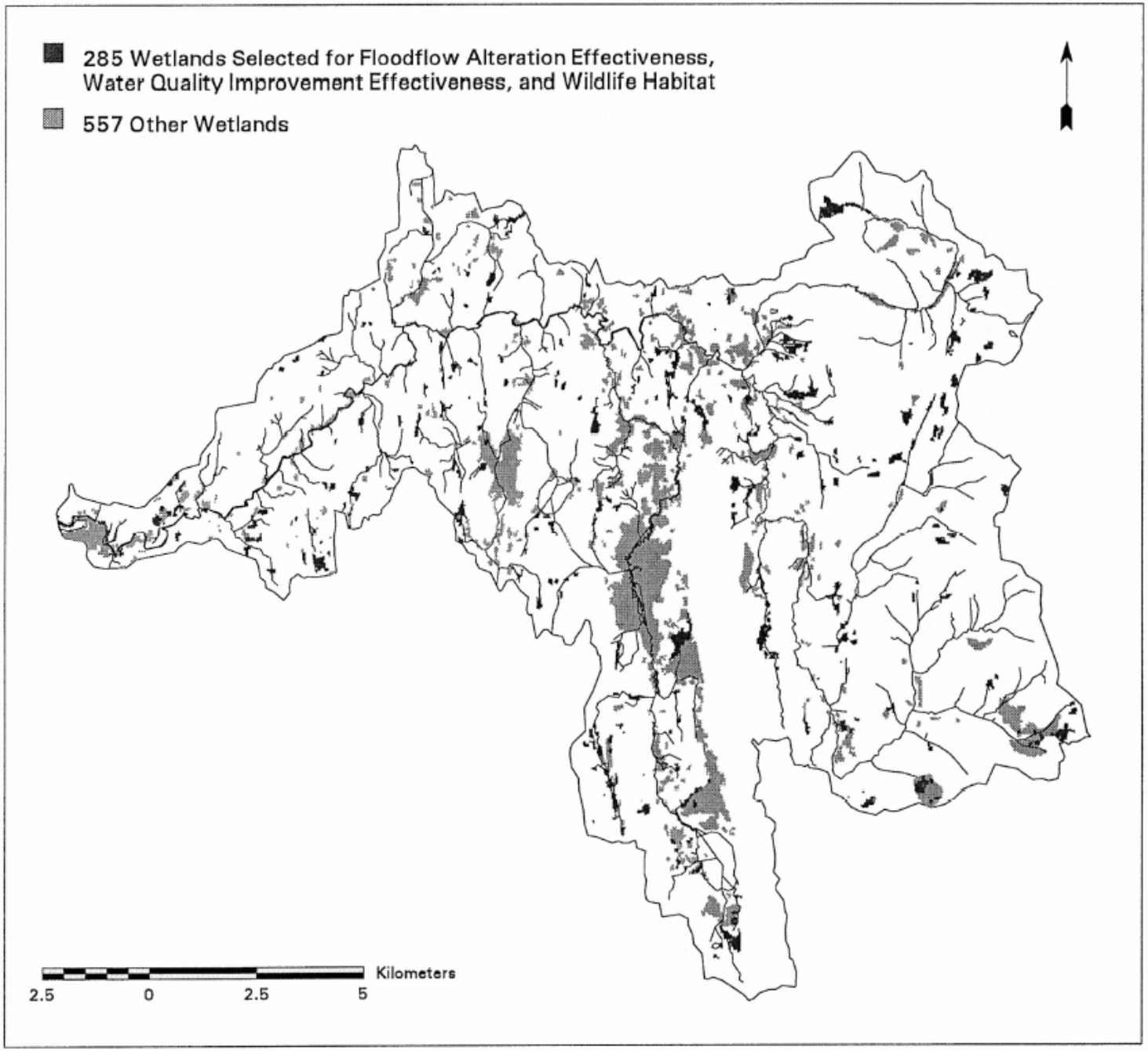
Watershed plans would prioritize wetland restoration:

Which wetlands should be restored first?

Where?

[Another topic: How should they be restored?]

Prioritized wetlands to protect in Vermont's Lewis Watershed



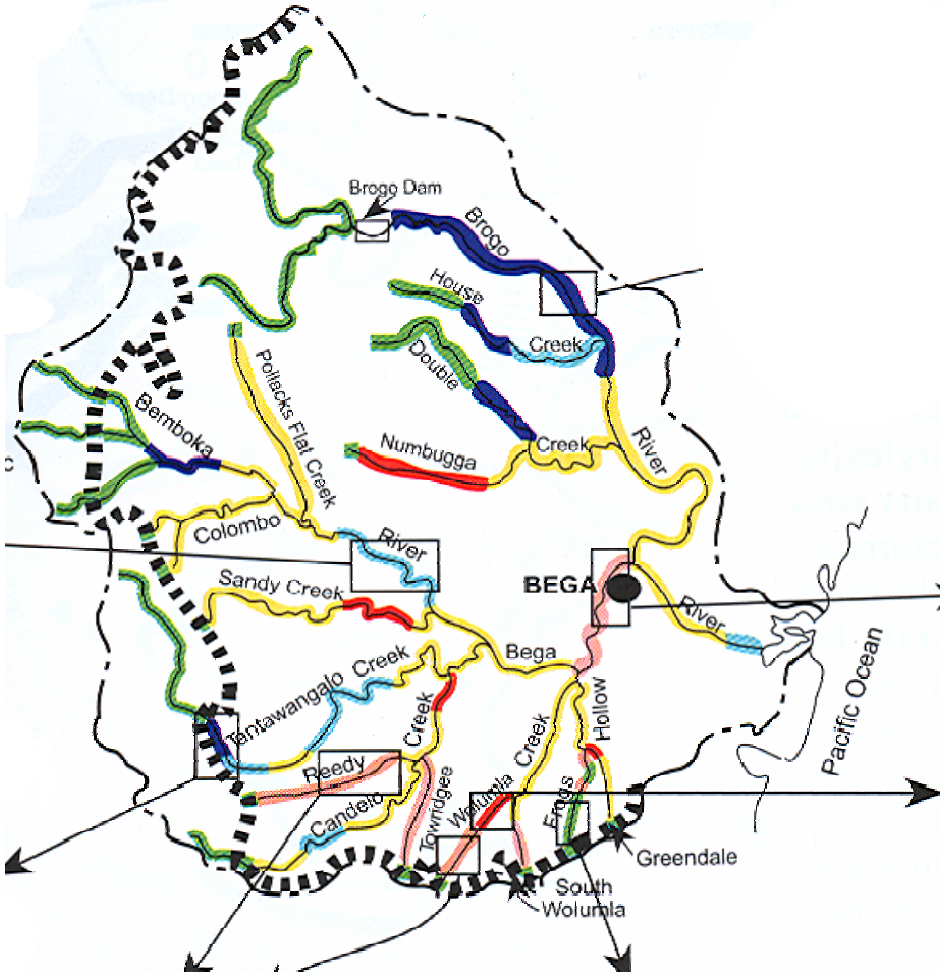
(Cedfeldt, Watzin & Richardson 2000 *Environmental Management* 26)

Table 1. AMNEW predictors of wetland function

Flood flow alteration function	
FAOPP1	Upslope wetlands comprise less than 5% of the wetland's watershed.
FAOPP2	Wetland area is less than 20% of watershed area.
FAOPP3	The majority (>50%) of the wetland watershed is made up of impervious surfaces.
FAOPP4	Most of the soil (>80%) of the wetland's watershed have a very slow infiltration rate (<1.5 mm/hour).
FAEFF1	Wetland is located near an intermittent or first-order stream.
FAEFF2	Wetland area is larger than 81 ha.
FAEFF3	Wetland has no connection to the surface water network.
Surface water quality improvement function	
SWQOPP1	Wetland's watershed contains potential sources of pollutants.
SWQOPP2	All of the following are true: a. a majority of the watershed is not forested or scrub shrub. b. wetland is less than 5% of watershed acreage. c. Upslope wetlands comprise less than 5% of the watershed.
SWQOPP3	Average slope of the wetland's watershed is greater than 10%.
SWQOPP4	Wetland type is riparian.
SWQEFF1	The soil type underlying a wetland is either histosol or frequently flooded mineral soil with both high clay and high organic matter content.
SWQEFF2	Wetland is located near an intermittent or first-order stream.
Wildlife habitat function	
WL1	Wetland size is larger than 100 ha.
WL2	There is at least one wetland of a different type bordering the wetland being considered.
WL3	Wetland type is the least common in relation to all other wetlands in the watershed.
WL4	Wetland is connected to the surface water network.
WL5	Wetland is completely surrounded by a minimum of 100 m of natural vegetation.
WL6	Wetland is hydrologically connected to another wetland within 400 m.
WL7	Presence of a natural vegetation corridor to another wetland within 400 m.

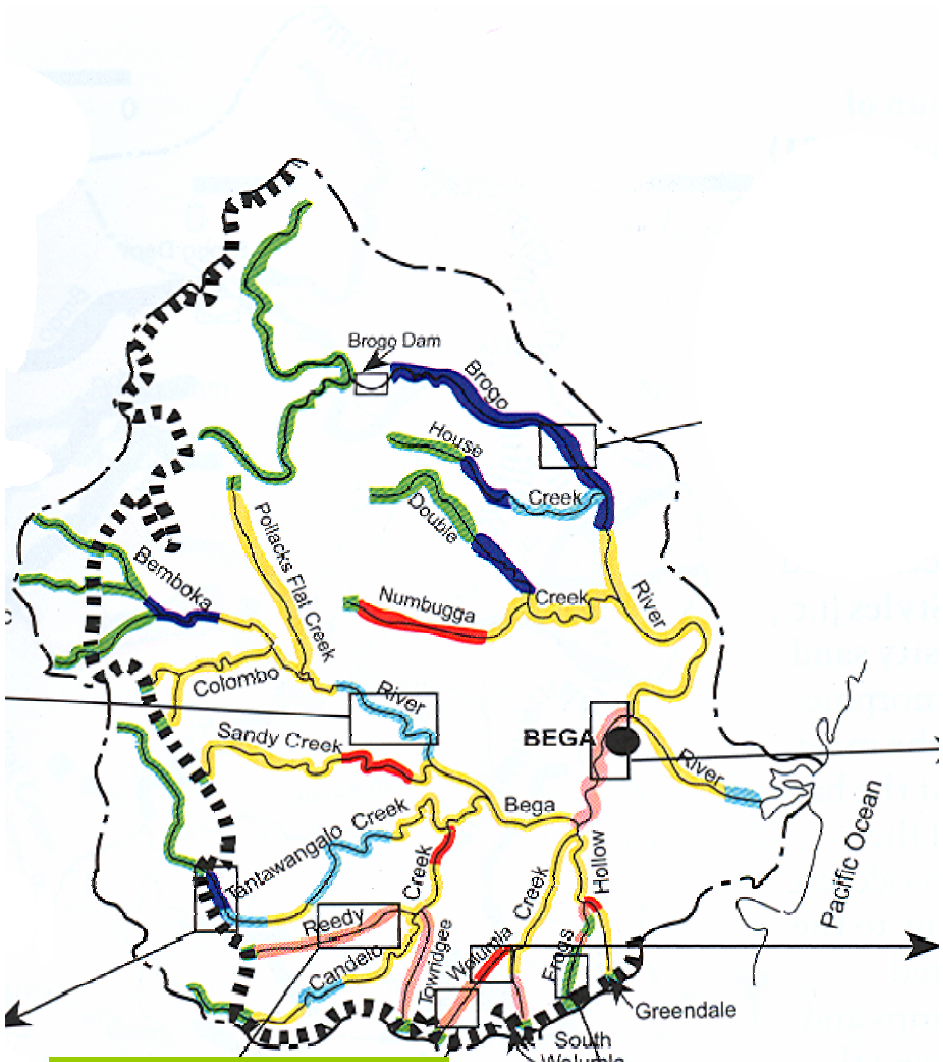
Watershed Plan for restoring river reaches in Bega catchment, south of Sydney

(Brierley & Fryirs 2005)



1. Assessed reach conditions: Conserve; remove threats

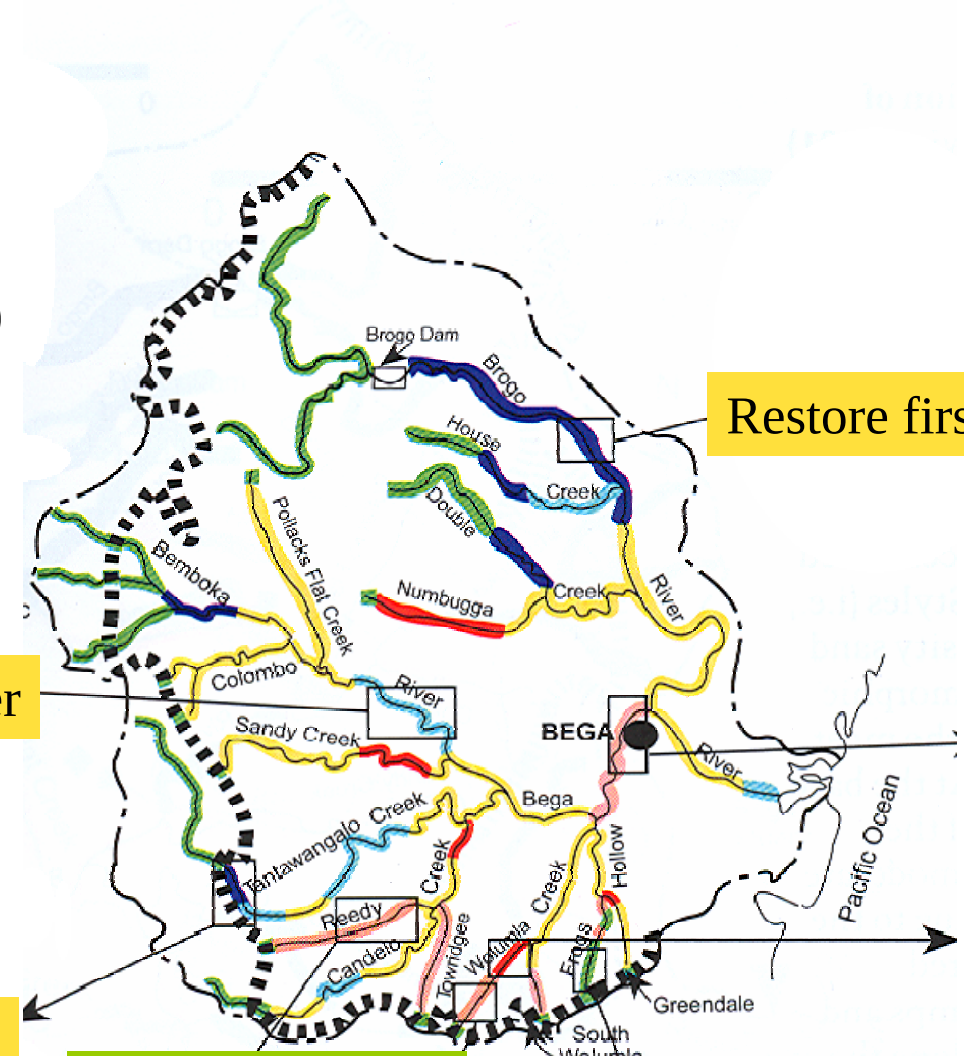
(Brierley & Fryirs 2005)



1. Assessed reach conditions: Conserve; remove threats

2. Ranked recovery potential

(Brierley & Fryirs 2005)



DNR approach for Milwaukee River Basin:

1. Identify potentially restorable wetlands

2. Map those that, when restored, create large habitat blocks

Courtesy of Tom Bernthal, Kate Barrett, Joanne Kline, et al., WDNR

UW WRM approach for prioritizing wetlands for restoration

Students of the UW-Madison **Water Resources Management** (WRM) Program, 2005.

Sponsored by **Enironmental Defense's Center for Conservation Incentives**

Watershed-based approaches have been applied in many studies attempting to prioritize wetland-restoration sites for a single objective; most commonly, that objective is water quality, biodiversity enhancement, or flood attenuation (Schweiger et al., 2002; Smith et al., 1995; Brooks et al., 2002; Boyd and Wainger, 2002; Richardson and Gatti, 1999; Llewellyn et al., 1996). Questions still remain regarding the generalizations made, the scales used, and the practical applicability of each method. The following are some of the concerns we have identified in relation to these published studies:

- Because many of these researchers relied solely on GIS and digital data, they have conducted analysis at a scale too large to evaluate effectively the potential function of a restoration site or the functionality of an existing wetland.
- Many of the approaches did not integrate local knowledge of a watershed or its wetland systems.
- Complex, costly, and time-consuming methods have been used in many of the studies to evaluate the criteria used to prioritize restoration sites; many of these methods have not been adopted as a common practice.

The WRM objective was to develop a watershed approach that

- uses appropriate spatial scale
- integrates local knowledge of ecosystem services
- is cost effective
- uses GIS

Process:

Interviewed resource agents

Learned about existing restorations and their goals

Identified community interests, desires

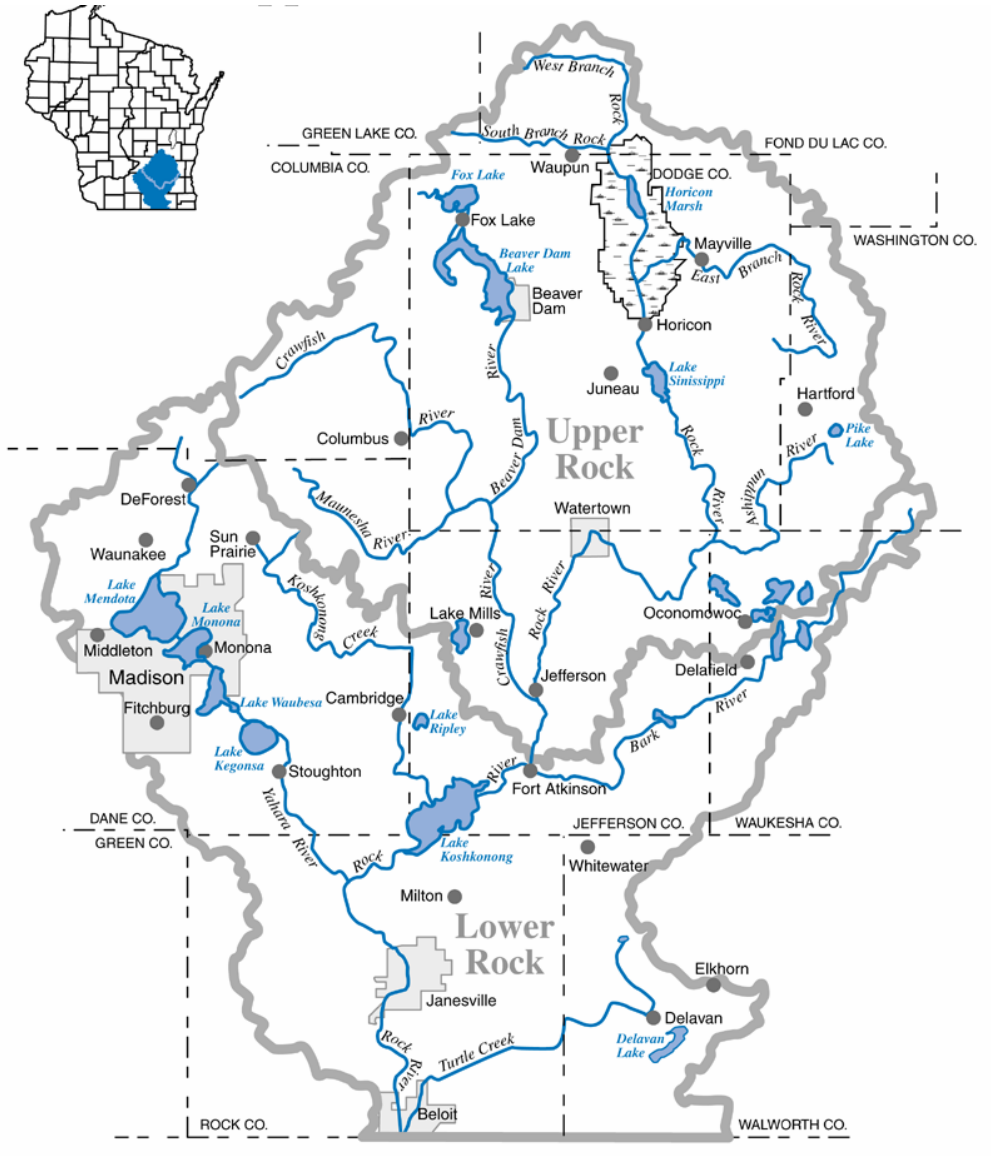
Visited sites, viewed existing restorations

Synthesized knowledge to determine key physical needs of the basin

What spatial scale?

Wisconsin's Rock River Basin:

3,777 square miles,
high [NO_3^-] contribution to Miss. R.



NO_3^- to Miss. R.

Upper Rock River Basin:
1,890 square miles

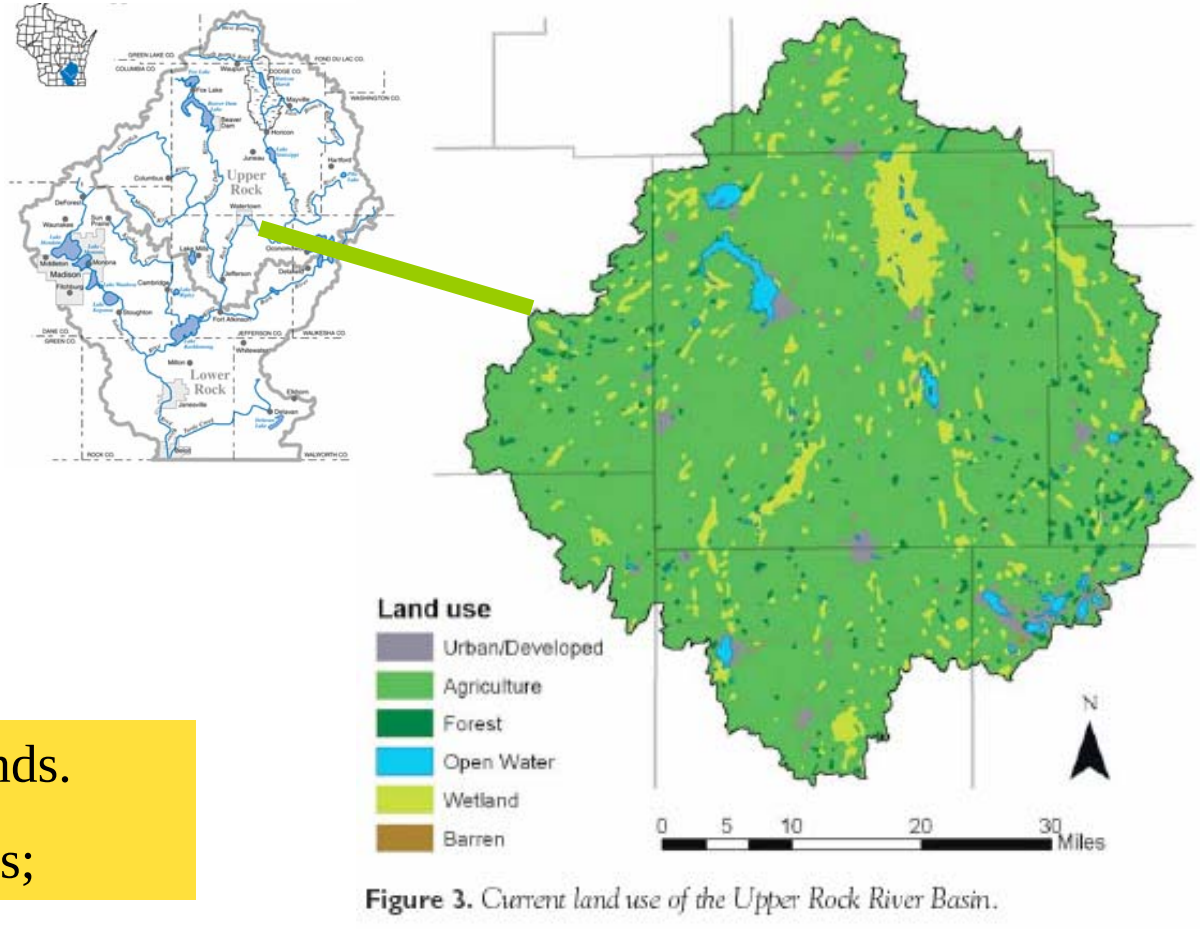


Figure 3. *Current land use of the Upper Rock River Basin.*

Many remnant wetlands.

Agriculture dominates;

Data assembled:

GIS data on watershed boundaries, soils, roads, orthophotos, digital elevation model, impaired water bodies, hydrography, and the WI wetland inventory

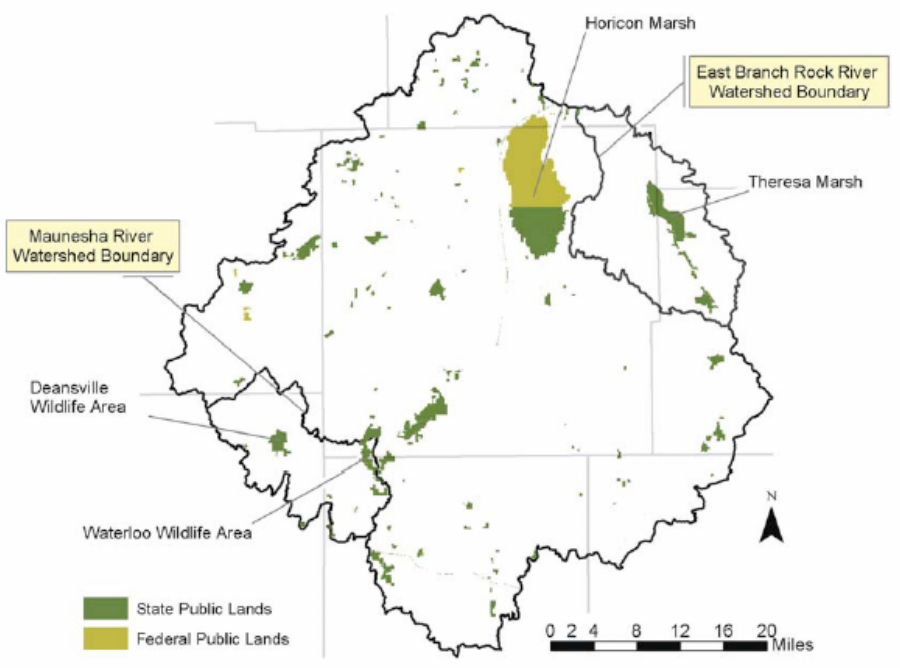
Overlays identified potential wetland restoration sites

Other data on sediment and nutrient loss indicated threats

The overall restoration goal we identified for the Upper Rock River Basin includes the protection and enhancement of important watershed resources. Within the basin, several large wetland remnants support (or have the potential to support) a diversity of plants and animals, but these areas are experiencing diversity loss due to eutrophication and/or contaminants. To restore basin areas properly, the quality of water entering the systems must be improved to limit phosphorus and sediment accumulation in the marsh areas.

Priority resources (e.g., biodiversity reserves, public needs)

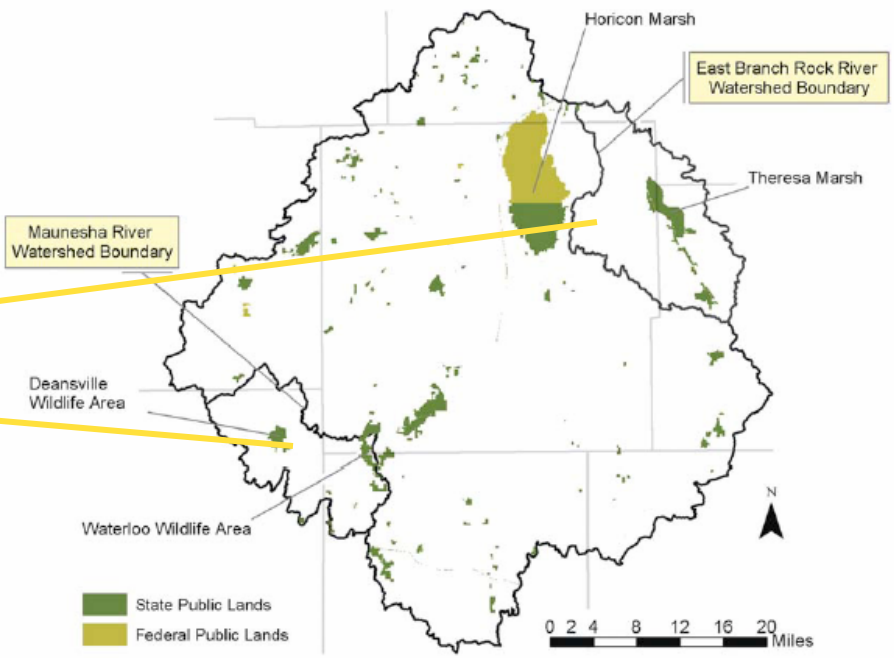
Horicon Marsh, a Wetland of International Importance, and other significant wetlands and wildlife areas:

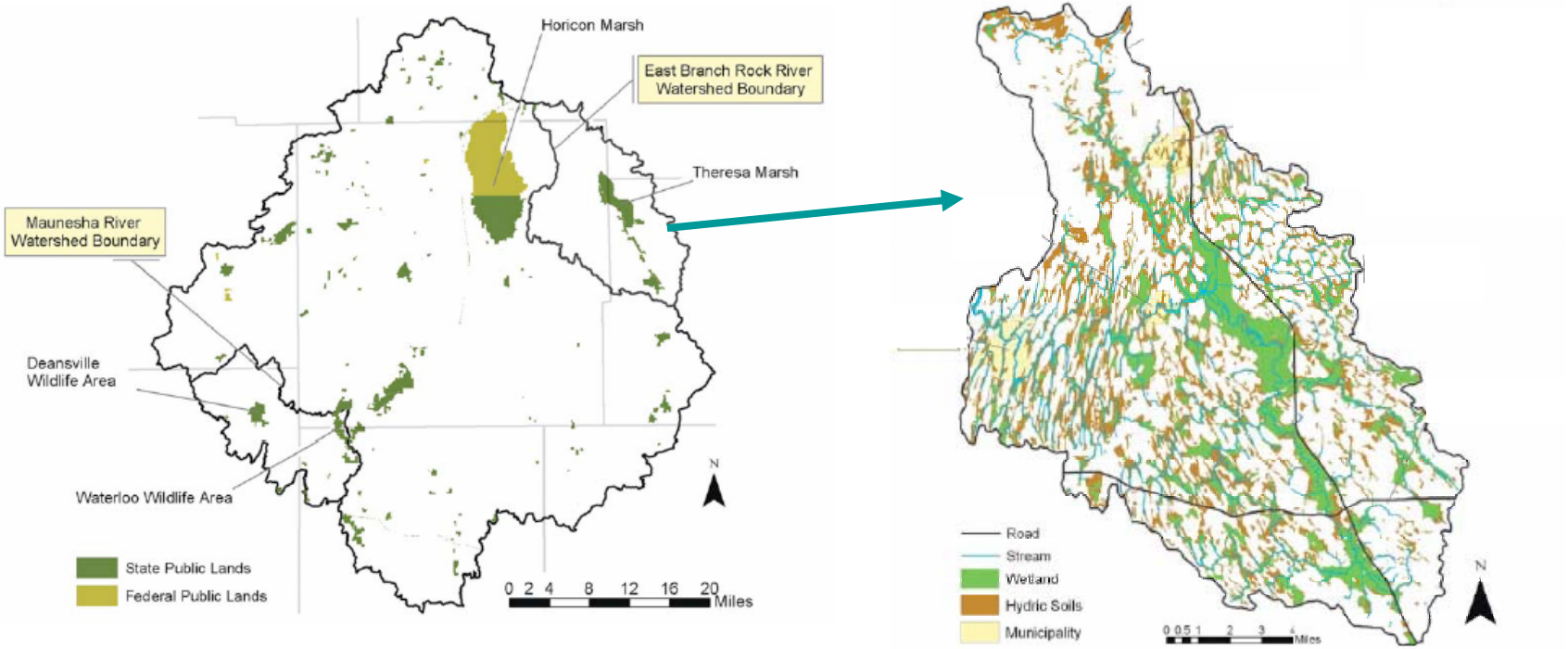


(WRM 2005)

After consulting with various federal, state, and local entities as well as community members, we selected the following wetland complexes as important watershed resources for the East Branch Rock River and Maunesha River watersheds: Horicon Marsh, Theresa Marsh, Deansville Marsh, and Waterloo Wildlife Area (refer to fig. 9 for the locations of these wetland complexes).

Two watershed examples
(80,608 and 114,820 acres)



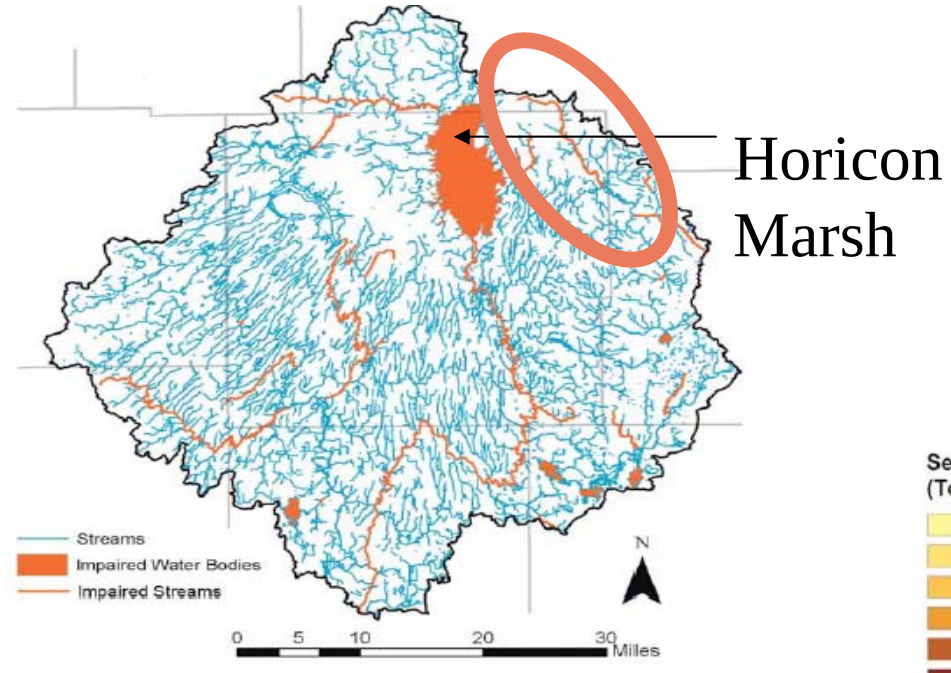


To attain our restoration goal, we developed three restoration objectives with the needs of the East Branch Rock River and Maunesha River watersheds in mind. These objectives provide the framework of our restoration strategy:

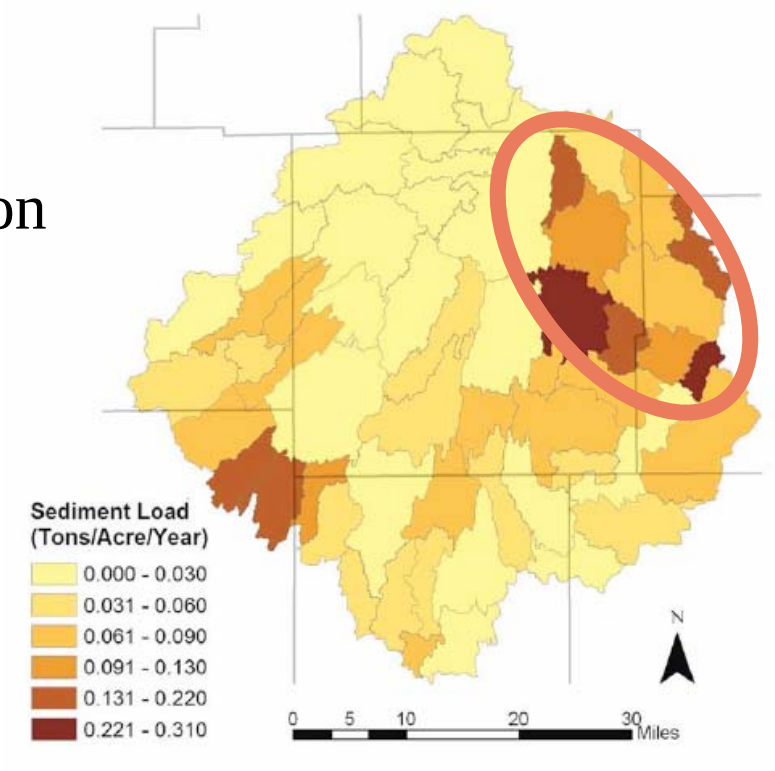
- Improve water quality upstream of important watershed resources
- Restore hydrologic connectivity within existing wetland complexes
- Expand the area of existing wetland complexes to their historical limits

Identify threats, e.g. loadings

of nutrients

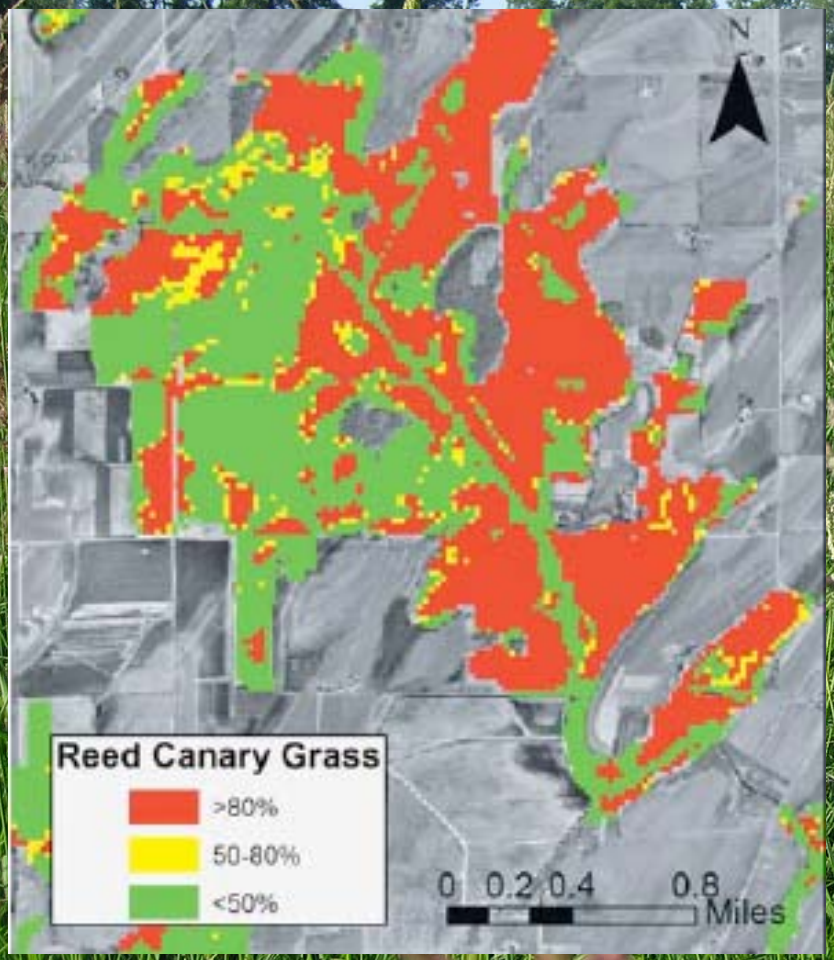


and sediments



(WRM 2005)

Other threats: Invasive reed canary grass, *Phalaris arundinacea*



Bernthal & Willis 2004

Table 1. *Summary of physcial characteristics of the Upper Rock River Basin, the Maunesha River watershed, and the East Branch Rock River watershed*

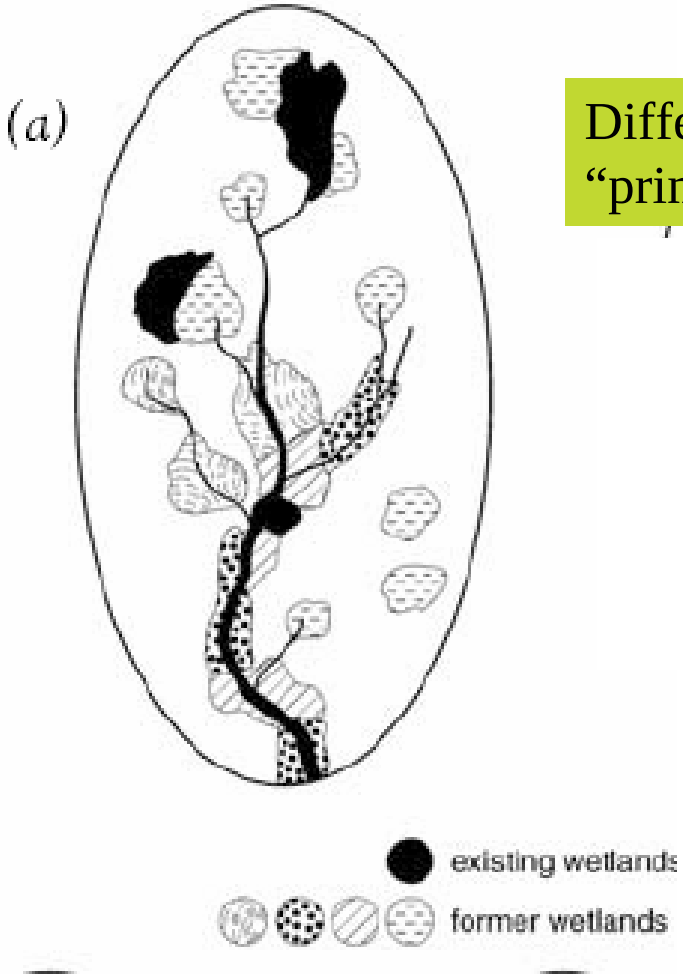
					303(d) Impaired waters list[4]		Public lands[5]	
Watershed	Total area[1] (acres)	Hydric soil area[2] (%)	Wetland area[1] (%)	Number of threatened/ endangered species[3]	Rivers and streams (miles)	Water bodies (acres)	State (acres)	Federal (acres)
Upper Rock River	1,212,723	41	16	131	245	35,048	43,536	21,860
Maunesha River	80,608	37	12	22	32	—	4,271	—
East Branch of the Rock River	114,820	34	14	25	30	—	7,108	—

SOURCES: [1] WDNR Wisconsin Wetlands Inventory, [2] WDNR Digital Soils Data, [3] WDNR Natural Heritage Inventory (n.d.), [4] WDNR Digital Impaired Waters Data, [5] WDNR Digital Public Lands Data (See Appendix 2 for more information about data sources.)

WRM's Basic principles for prioritization:

- Develop an understanding of the watershed resources and values to the community.
- Determine your watershed restoration goal(s).
- Identify obstacles to address (e.g., poor water quality).
- Develop restoration objectives to achieve your goal and overcome obstacles.
- Prioritize sites according to those objectives.

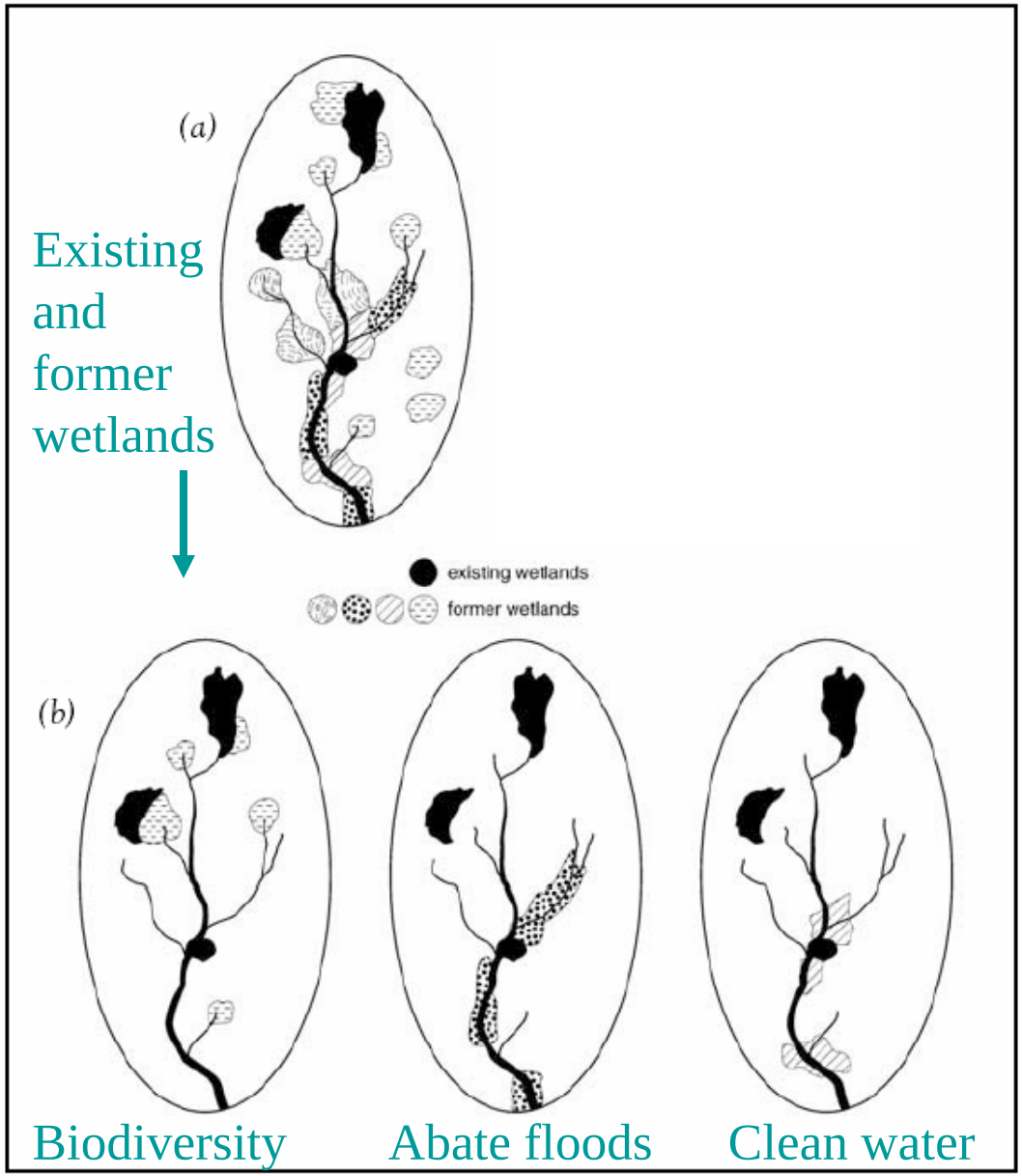
My thoughts: Prioritize services to be restored--which, where:
Biodiversity support near headwaters and on protected land
Water quality treatment in strategic locations
Flood abatement in strategic locations



Different sites for each "primary service"

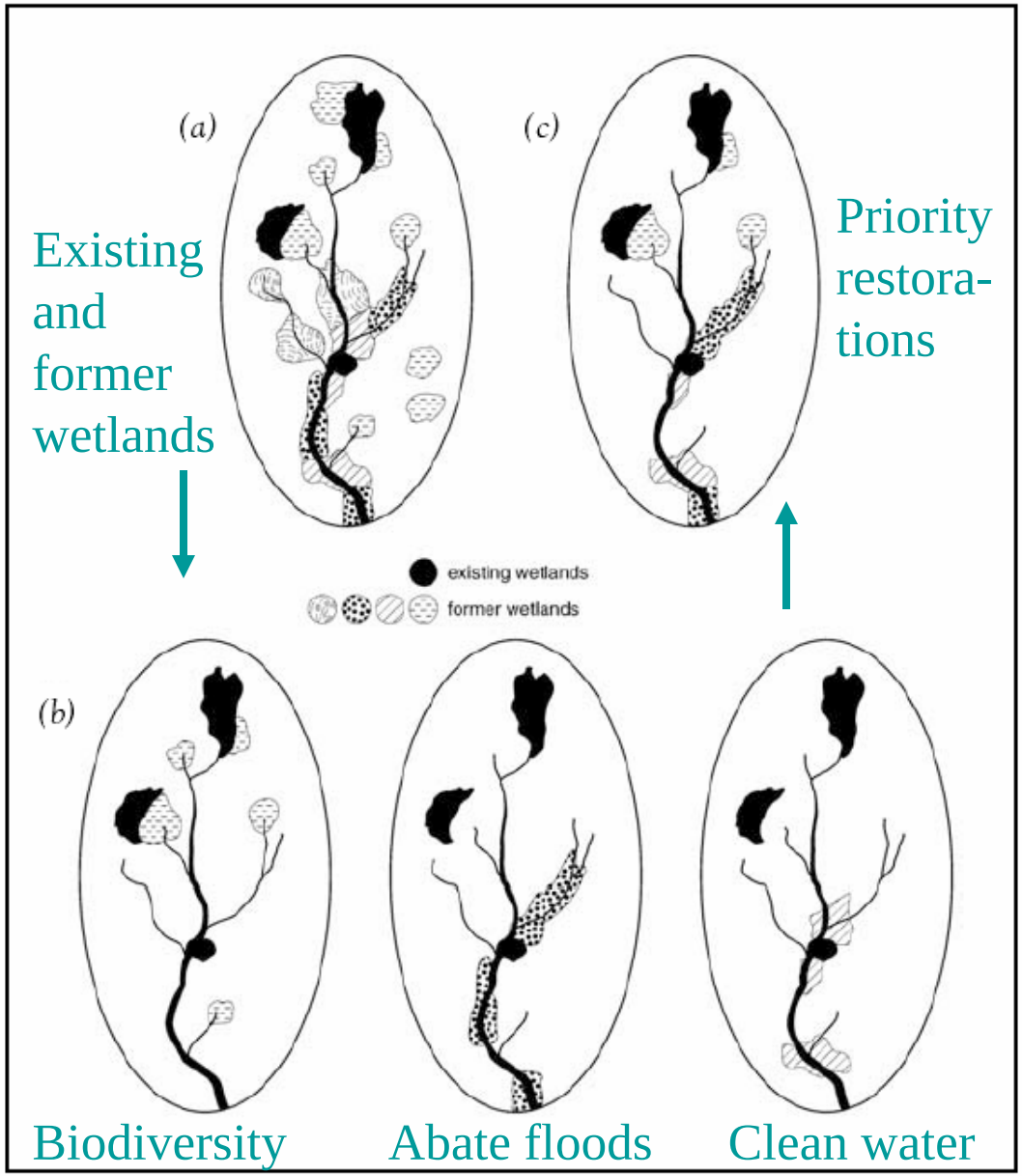
One restored wetland type or location will not perform all functions.

Watersheds need multiple "primary-purpose" wetlands in strategic locations.



Zedler 2003

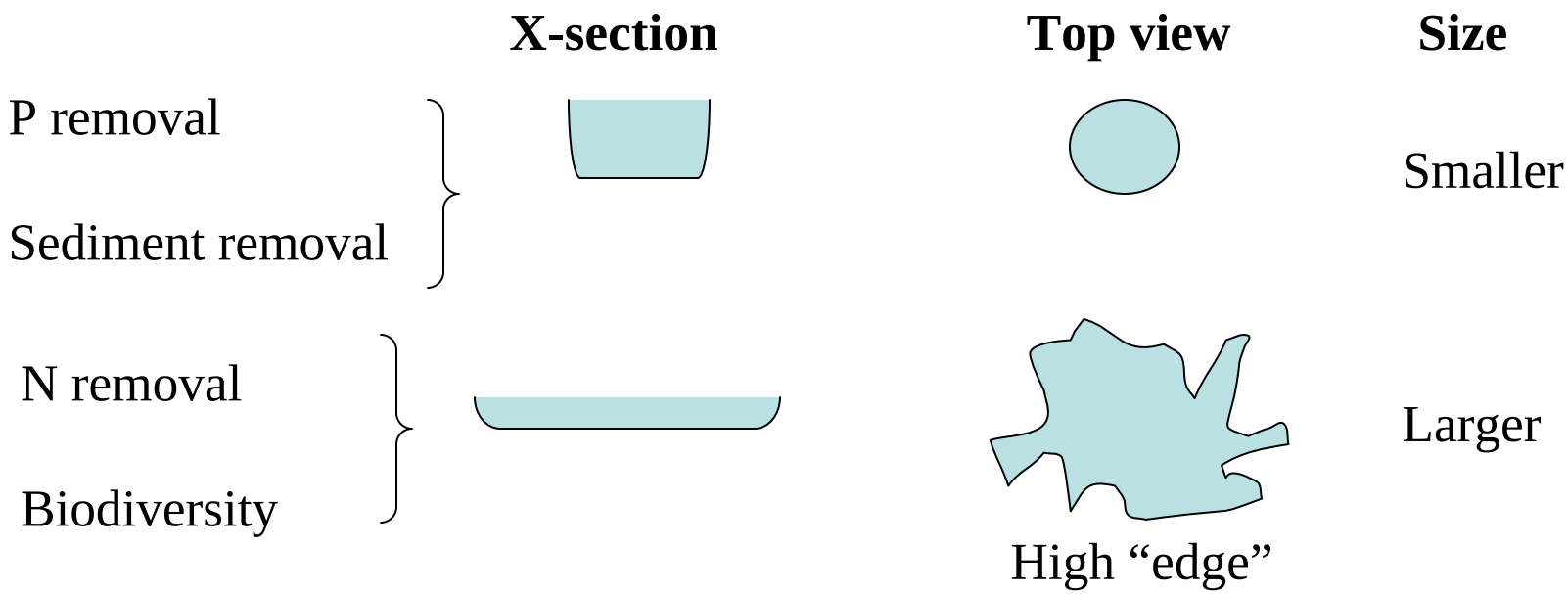
To be strategic, prioritize which to restore first and where



Zedler 2003

Another big topic: How to restore wetlands for primary services.

Different services require different designs



A comparison of 32 constructed wetlands in Sweden suggests that N removal and biodiversity objectives are compatible, as are P removal and sediment removal.

(Hansson et al. 2005. Freshwater Biology 50:705-714)

What could happen with no plan under the proposed regulations.

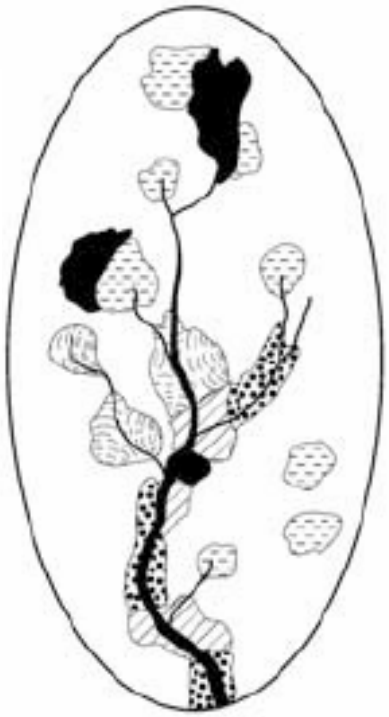
The proposed regulation says: The level of information and analysis needed to support a watershed approach must be *commensurate with the scope and scale* of the proposed project requiring a permit, as well as the functions lost as a result of that project.

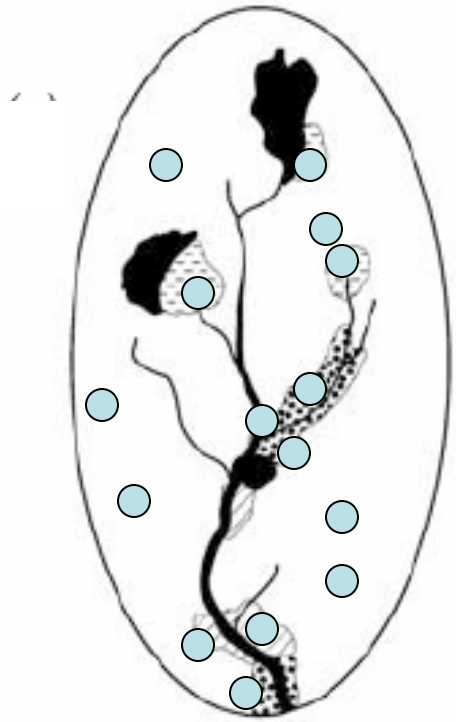
Potential problems:

Piecemeal approach:		Cumulative result:
• Many small projects	→	Large loss of function
• A few large projects with minimal function	→	Large loss of area

Many options for restoration……

Existing and former wetlands





Without a plan: Ponds everywhere?

A test case: St. Johns Bayou/New Madrid Floodway Project

Environmental Defense is suing the Army Corps of Engineers for inadequate mitigation:

Impact: 50-80 thousand acres (mostly farmed) to be removed from backwater flooding by a levee

Compensation:

A gate for water and fish “mid-season”

Plant trees, wildlife corridor

Shorebird moist soil

“construct 387 acres of borrow pits that would benefit floodplain fish.”

Net loss: ~30,000 acres

Functions associated with area and species not considered by HEP

“To offset the loss of 80,000 acres of wetlands and floodplains, the government would not restore a single wetland but promises to plant 8,000 acres of trees on farmland. No farmers have yet been found to purchase this land from, nor has it been explained how fish will climb over the levee to use these new forests to spawn. Put simply, the project would be an ecological disaster for southeast Missouri.” www.moenviron.org/waterqualitystjohn.asp

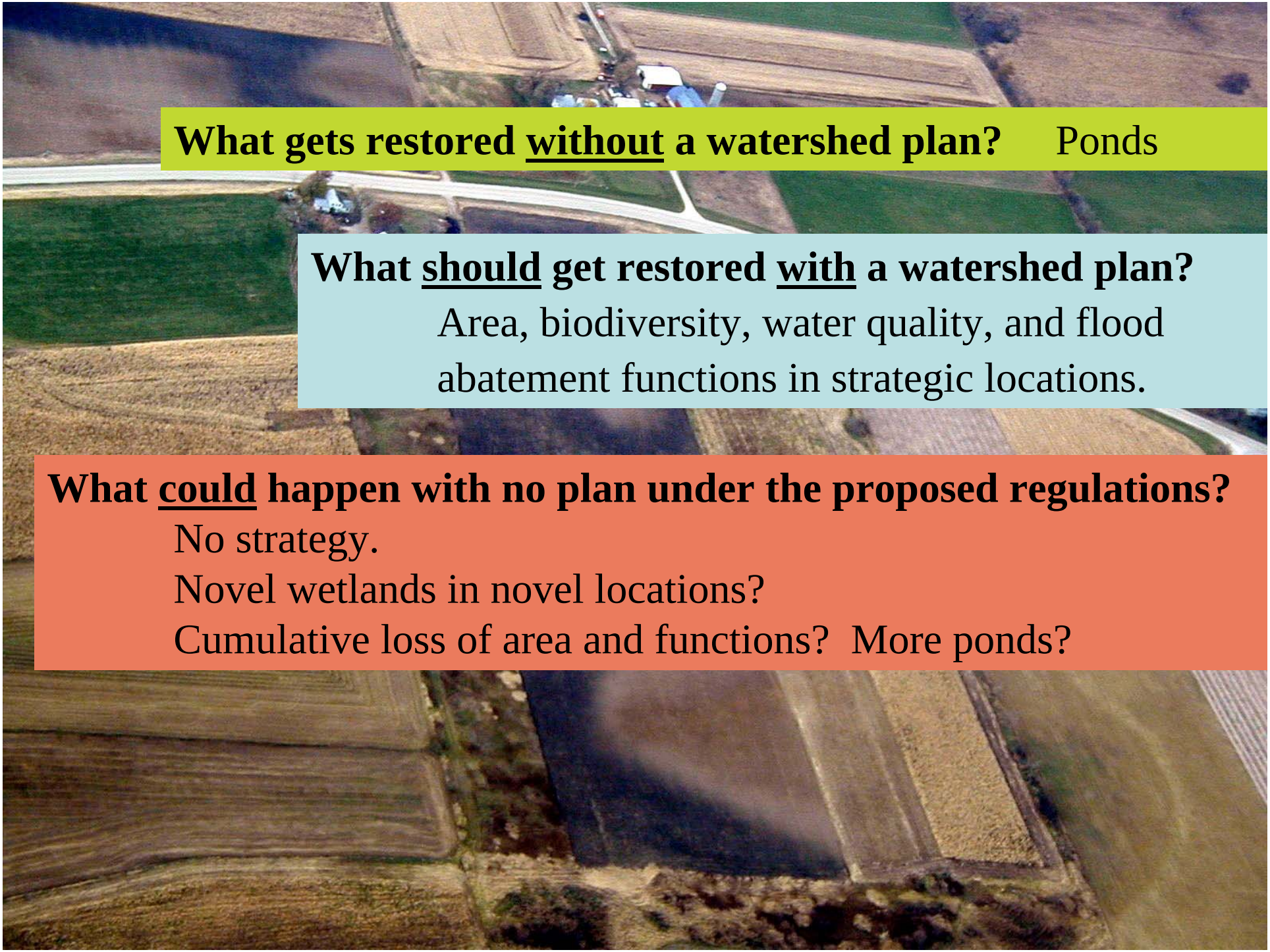
A test case: St. Johns Bayou/New Madrid Floodway Project

Corps says:

- "The Corps' proposed wetland mitigation will do exactly what the NRC report recommends." p. 285
- "Mitigation is based on compensating for lost habitat, not a certain quantity of acreage." p. 290 of responses to my comments.

"To offset the loss of 80,000 acres of wetlands and floodplains, the government would not restore a single wetland but promises to plant 8,000 acres of trees on farmland. No farmers have yet been found to purchase this land from, nor has it been explained how fish will climb over the levee to use these new forests to spawn. Put simply, the project would be an ecological disaster for southeast Missouri." www.moenviron.org/waterqualitystjohn.asp

Would the new regulations prevent a mitigator from selecting just a few functions (mid-season fish support) and a few of the 100+ fish species that would lose habitat? Would the new regulations allow mitigators to ignore area loss and everything else?



What gets restored <u>without</u> a watershed plan? Ponds

What <u>should</u> get restored <u>with</u> a watershed plan?

Area, biodiversity, water quality, and flood abatement functions in strategic locations.

What <u>could</u> happen with no plan under the proposed regulations?

No strategy.

Novel wetlands in novel locations?

Cumulative loss of area and functions? More ponds?

Be strategic; prioritize wetland restoration at the watershed scale.
Find ways to fund and organize and coordinate the planning process.

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UW-MadisonArboretum Restoration Research Program

EPA STAR award R-82801001-0 to K. Potter, R. Lathrop, J. Zedler

EPA STAR Agreement R-8286750 with G. Niemi, C. Johnston, B. Bedford, J. Zedler: EPA Great Lakes Environmental Indicators (GLEI) Project

Wisconsin Sea Grant Institute (NA16RG22557, Proj. R/LR-96)

WISCONSIN COASTAL MANAGEMENT PROGRAM

National Oceanic and Atmospheric Administration pursuant to Grant #NA03NOS4190106 to J. Zedler

http://www.ctic.purdue.edu/KYW/Brochures/PutTogether.html

Putting Together a Watershed Management Plan
A Guide for Watershed Partnerships

So you're ready to put together a plan.

Overview.
The goal of watershed management is to plan and work toward an environmentally and economically healthy watershed that benefits all who have a stake in it. By now you and your partners have taken this into consideration in the development of the purpose statement for your group's watershed efforts. (See *Building Local Partnerships* guide for more information on developing a purpose statement.)

Your watershed partnership probably has a good feel for the watershed including maps and other information.

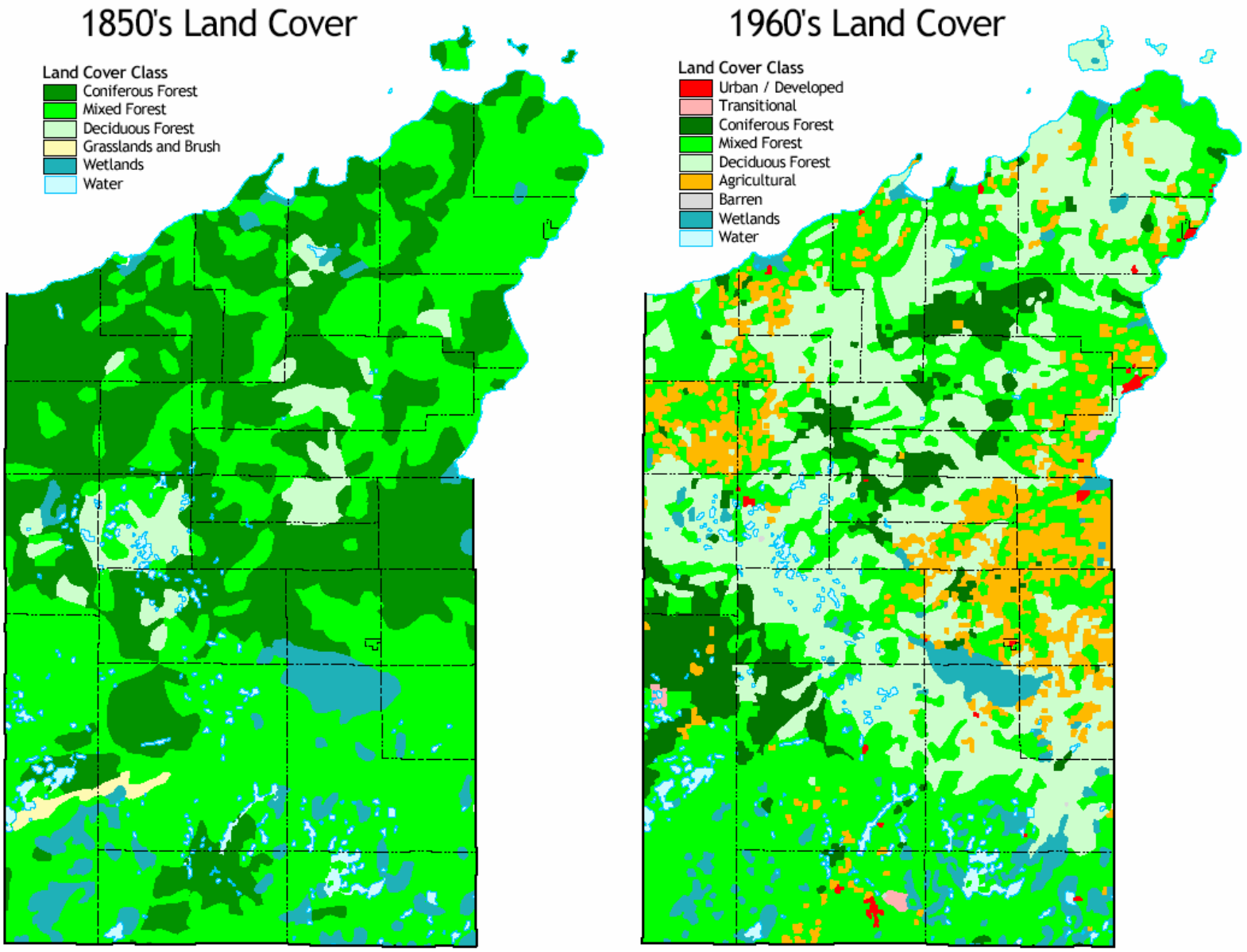
Stage-by-stage.
Once you and your partners have pulled together as much information as possible about your watershed, you're ready to start putting together a plan. This process can be broken into three stages:

The first stage includes uncovering concerns, gathering and analyzing information and data, defining challenges/opportunities, developing objectives, and documenting data and decisions.

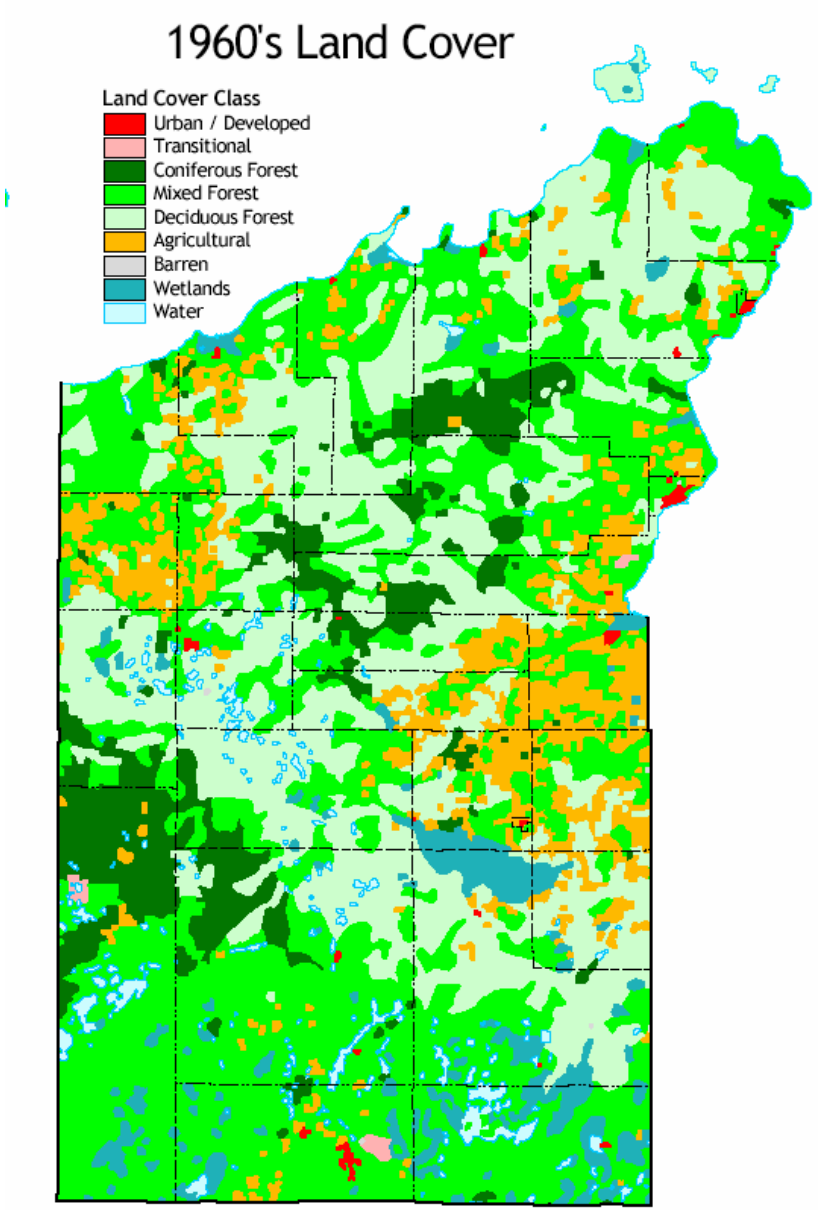
The second stage includes developing a game plan for addressing the objectives, selecting the best watershed management alternative(s), listing ways (strategies) for implementing the selected alternative(s), and determining how to measure progress.

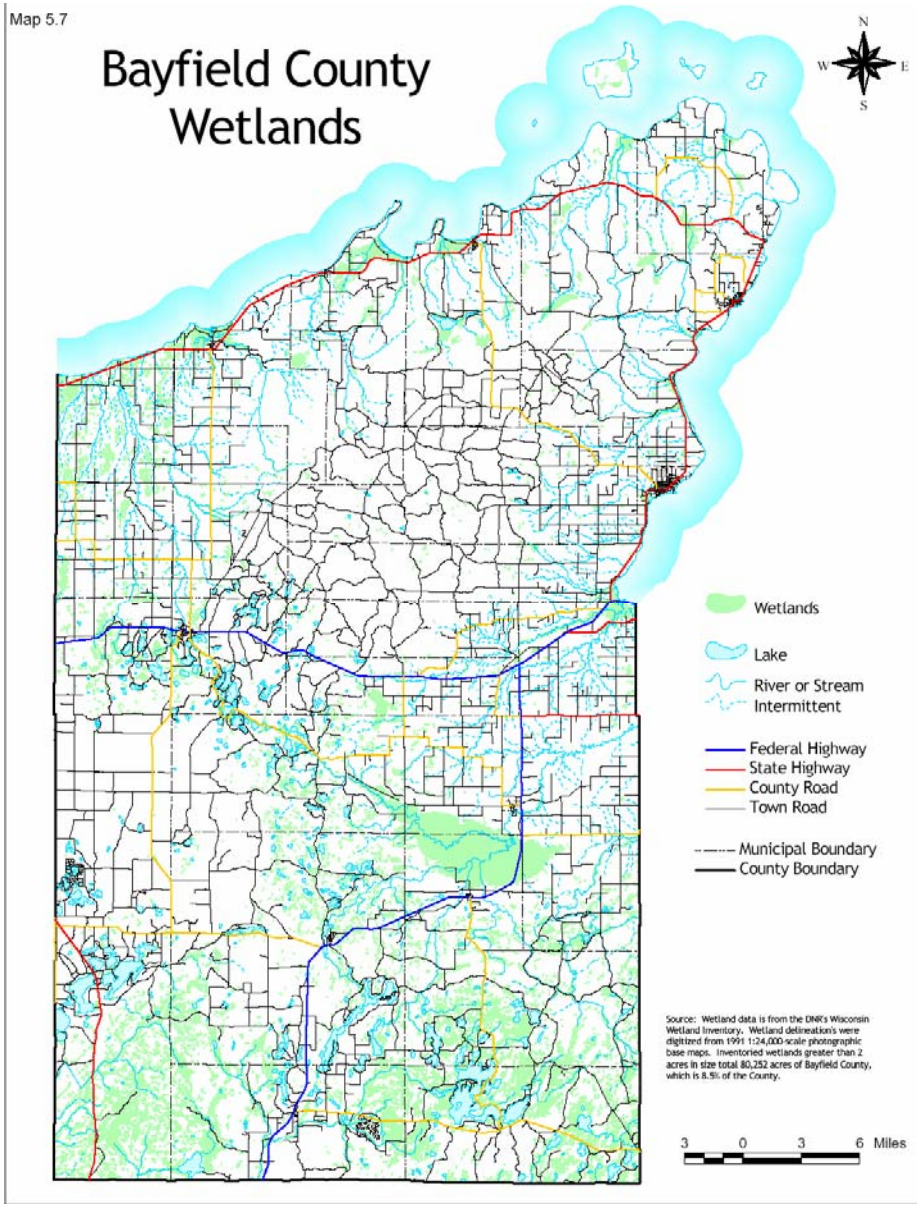
The third stage includes implementing and evaluating efforts.

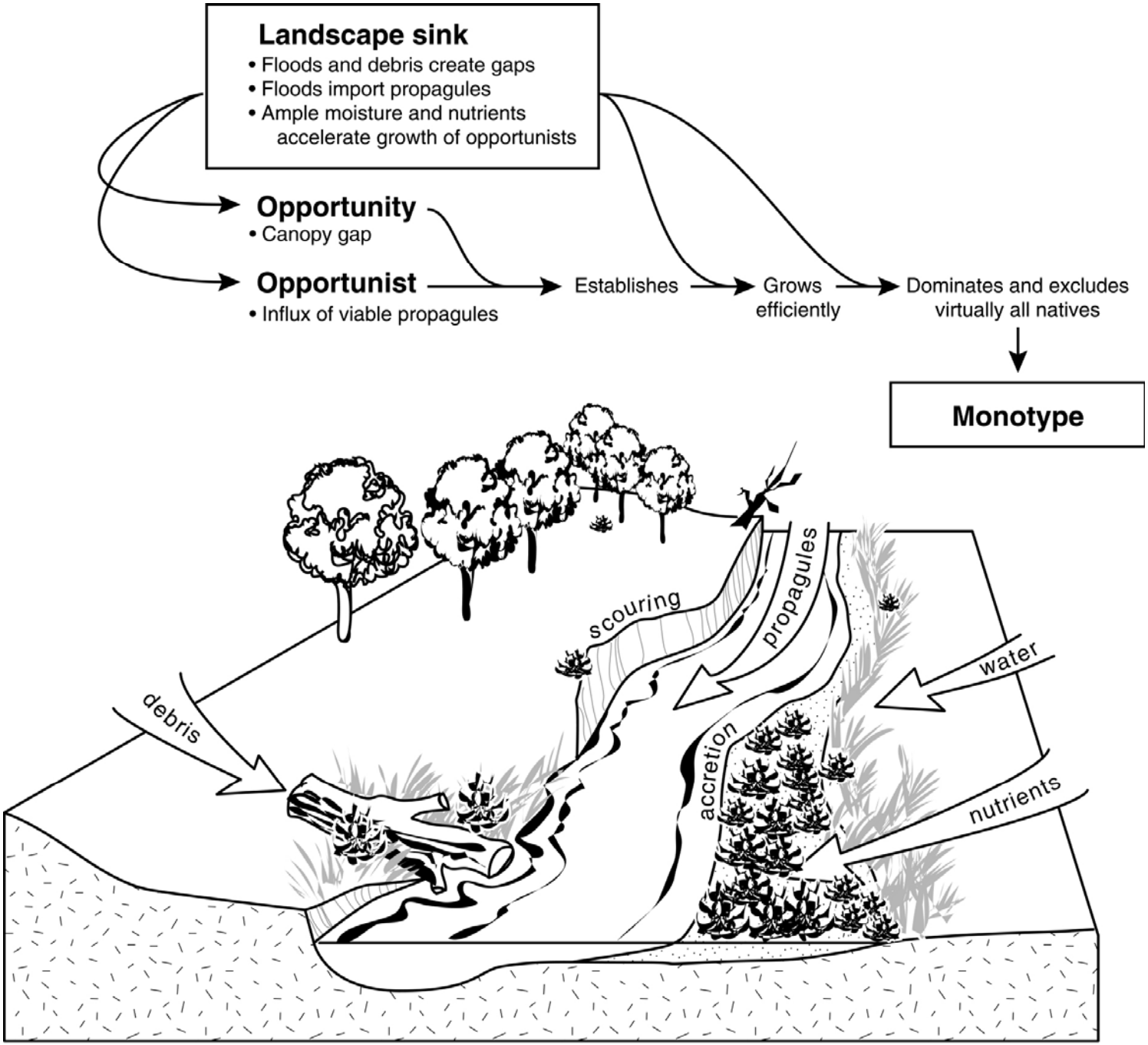
Map 5.3



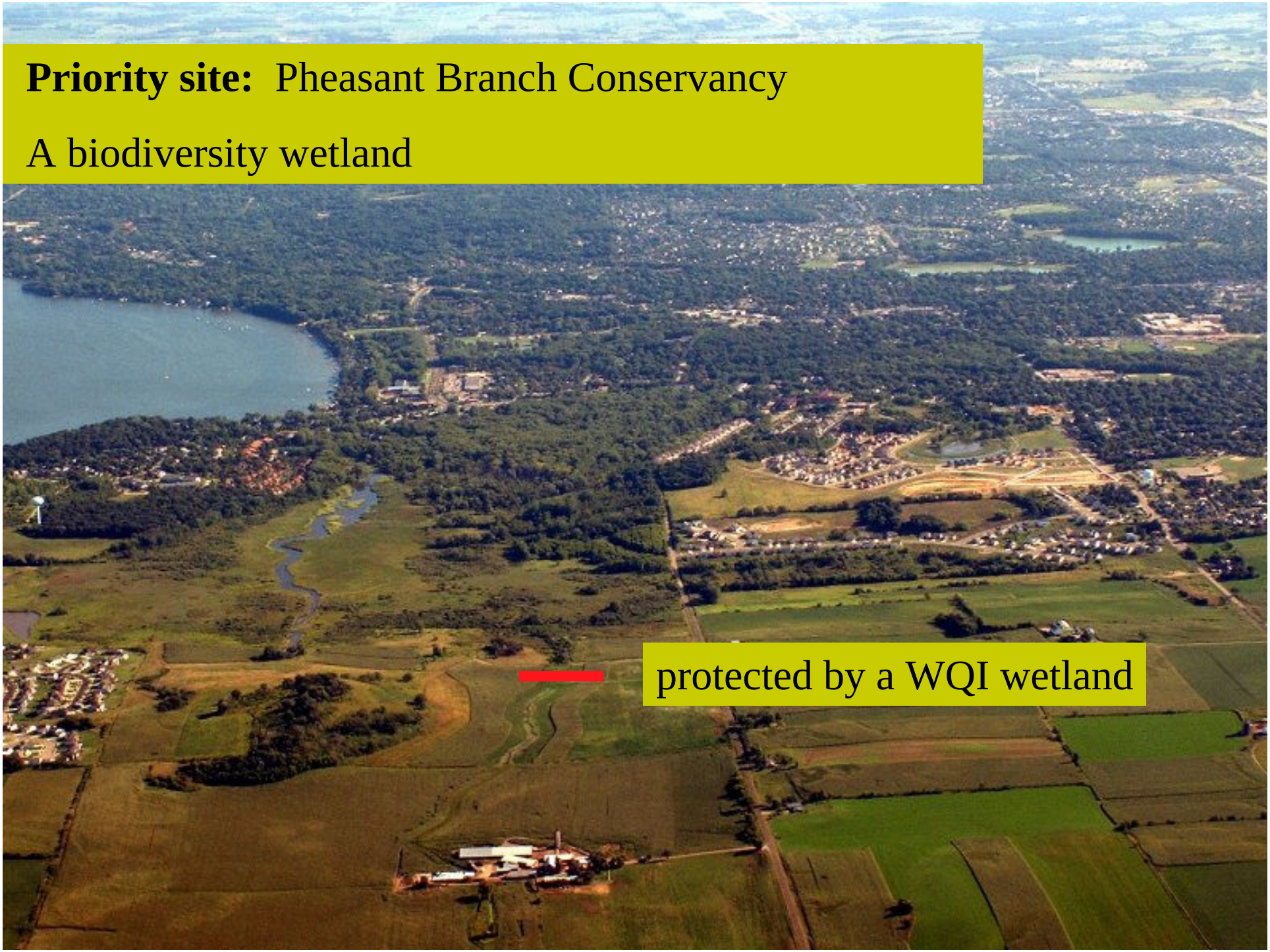
Bayfield County land use changehttp://www.uwex.edu/ces/cty/bayfield/cnred/planning/coverpage.html


1960's Land Cover
Land Cover Class
Urban / Developed
Transitional
Coniferous Forest
Mixed Forest
Deciduous Forest
Agricultural
Barren
Wetlands
Water


Map 5.7
Bayfield County
Wetlands
N
W
E
S
Wetlands
Lake
River or Stream
Intermittent
Federal Highway
State Highway
County Road
Town Road
Municipal Boundary
County Boundary
Source: Wetland data is from the DNR's Wisconsin Wetland Inventory. Wetland delineation's were digitized from 1991 1:24,000-scale photographic base maps. Inventoried wetlands greater than 2 acres in size total 80,252 acres of Bayfield County, which is 8.5% of the County.
3 0 3 6 Miles



(Zedler & Kercher 2004)


Priority site: Pheasant Branch Conservancy
A biodiversity wetland
protected by a WQI wetland