TARGETING CRITICAL AREAS AND SCHEDULING IMPLEMENTATION

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Thomas E Davenport

tedavenport@comcast.net

TREAT THE RIGHT PROBLEMS WITH THE RIGHT SOLUTIONS IN THE RIGHT PLACES

How do we get there?

WHAT CHARACTERISTICS CAUSE WATERSHED EFFORTS TO HAVE THE GREATEST IMPACT ON WATER QUALITY?

- A source of pollution is causing a real problem
- We can identify the location it comes from
- A possible solution exists
- Land owner is willing to make a change

- This location or source is the **biggest** problem

IDENTIFYING CRITICAL AREAS IN YOUR WATERSHED

Definition of a Critical Area: Where watershed efforts need to be targeted to remediate impacts on or prevent degradation of water quality.

GETTING IT RIGHT

- Critical Area Identification
- Delivery System (who, what, how)

SOLVING WATER PROBLEMS

Use biophysical measures to identify vulnerable locations within problem area.

Assess salient behaviors in these locations to determine where disproportionality may be occurring.

Gain understanding why inappropriate behaviors are occurring in these locations.

Design intervention effort based on this understanding.

OBJECTIVE

To remediate a significant amount of water quality degradation from nonpoint sources using existing policy, knowledge, and methods through the incorporation of the "human dimension" in a rigorous and scientifically valid fashion.

SO WHAT ARE SOME OPTIONS FOR IDENTIFYING CRITICAL AREAS?

CRITICAL AREA TYPES

- Restoration:
- Protection:

CRITICAL AREAS IDENTIFICATION

"Within a WMP and following the EPA guidelines, critical areas should be identified as one or a combination of the following descriptions:

1. 12 digit HUCs or smaller geographic areas where a particular pollutant needs to be addressed to meet the water quality goals of the WMP.
2. Specific region within a 12 digit HUC or smaller geographic area where a particular source(s) is contributing a pollutant of concern and needs to be addressed to meet the water quality goals of the WMP.
3. Specific source(s), anywhere in the project area, that are contributing a pollutant of concern."

CRITICAL AREAS IDENTIFICATION OPTIONS

1

Defined by geographic area (usually HUCs or subwatersheds)

Example: Mudbug Watershed

2

Combination

Example: Livestock access to streams in Mudbug Watershed

3

Defined by Source

Example:

Locations where livestock have access to streams

CRITICAL AREAS IDENTIFICATION OPTIONS

1

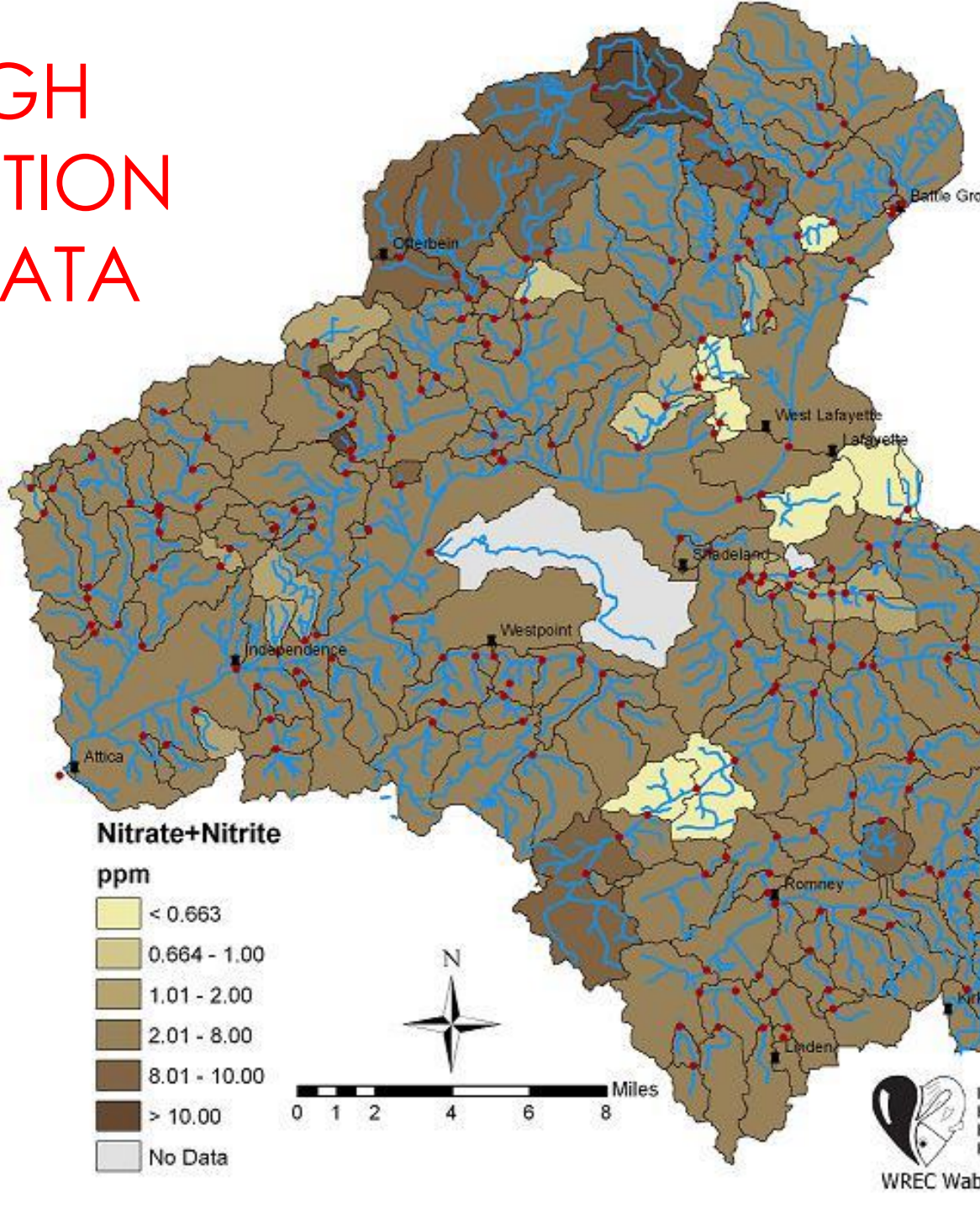
Defined by geographic area (usually HUC or subwatershed)

Makes sense if you

- Have monitoring data that differentiates locations
  - high spatial resolution
  - shows one watershed with higher yields (concentration or load/area)
- Have a very homogenous land use

EXAMPLE OF HIGH SPATIAL RESOLUTION MONITORING DATA

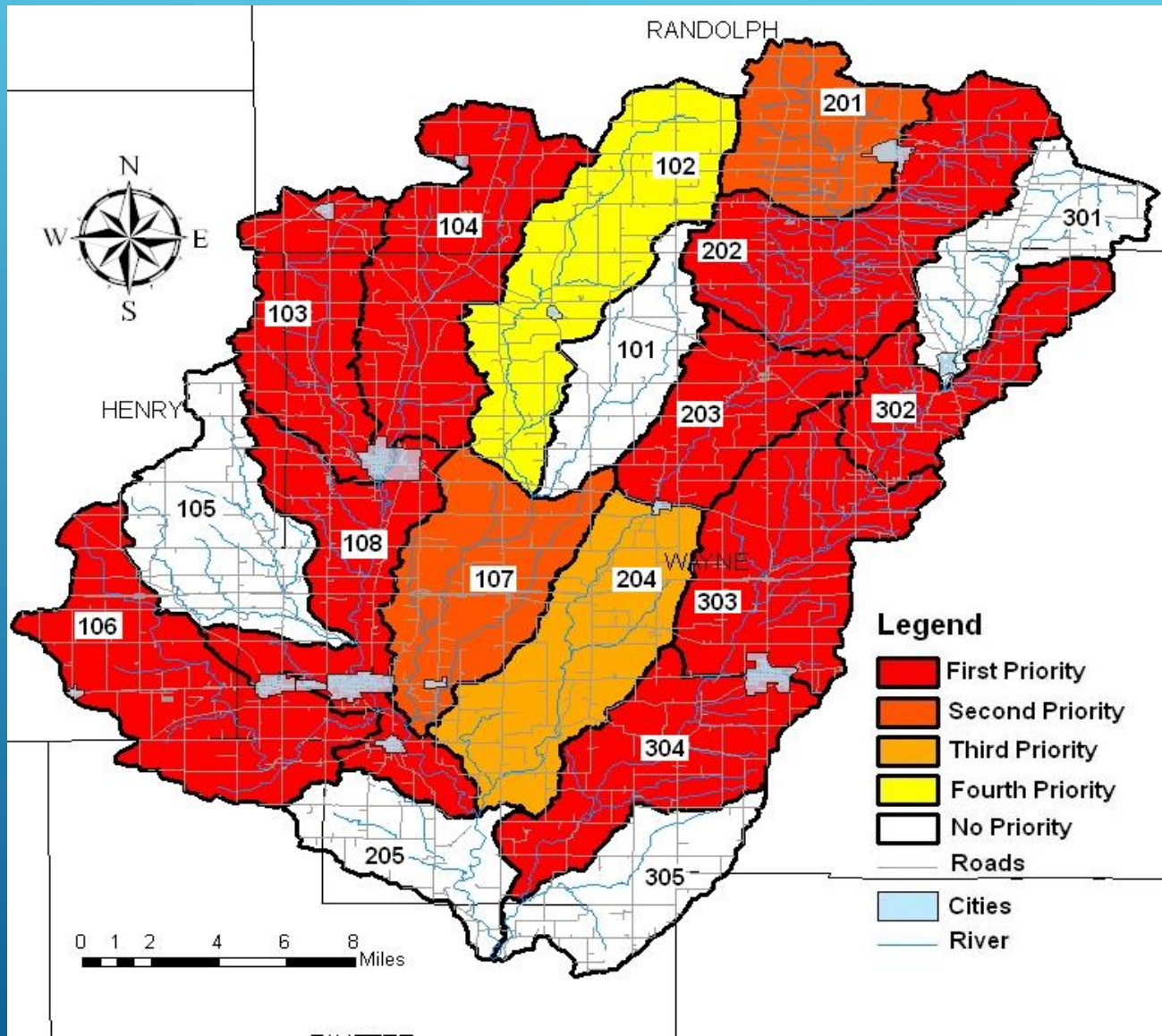
- Define geographic areas if you have monitoring data that can differentiate locations



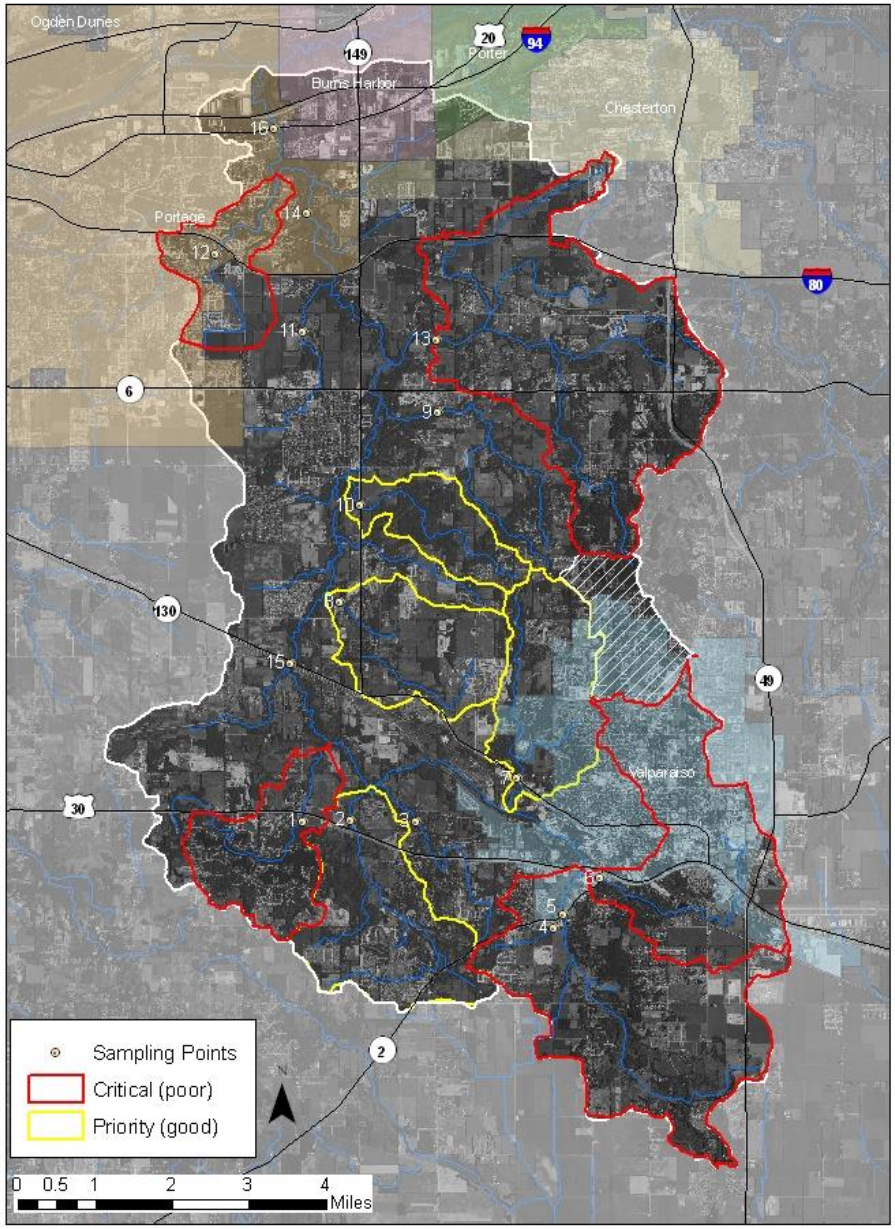
1. DEFINED BY GEOGRAPHIC AREA (USUALLY HUCS OR SUBWATERSHEDS)

Example:

Five priority levels of HUCs defined in a large watershed



The Salt Creek Watershed



Critical and Priority Areas

Critical Areas (Red)

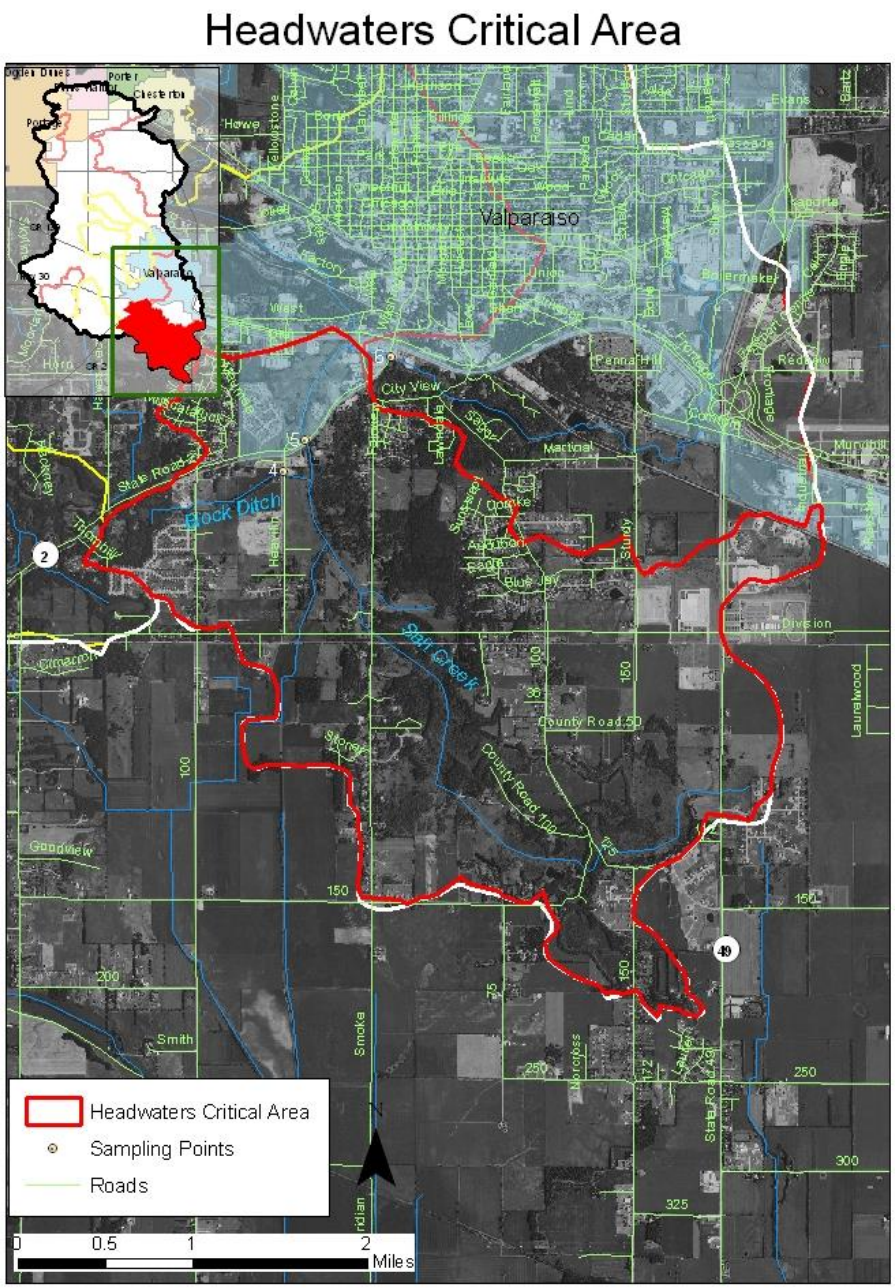
- Need treatment to improve existing poor water quality

Priority Areas (Yellow)

- Need protection to protect relatively good water quality

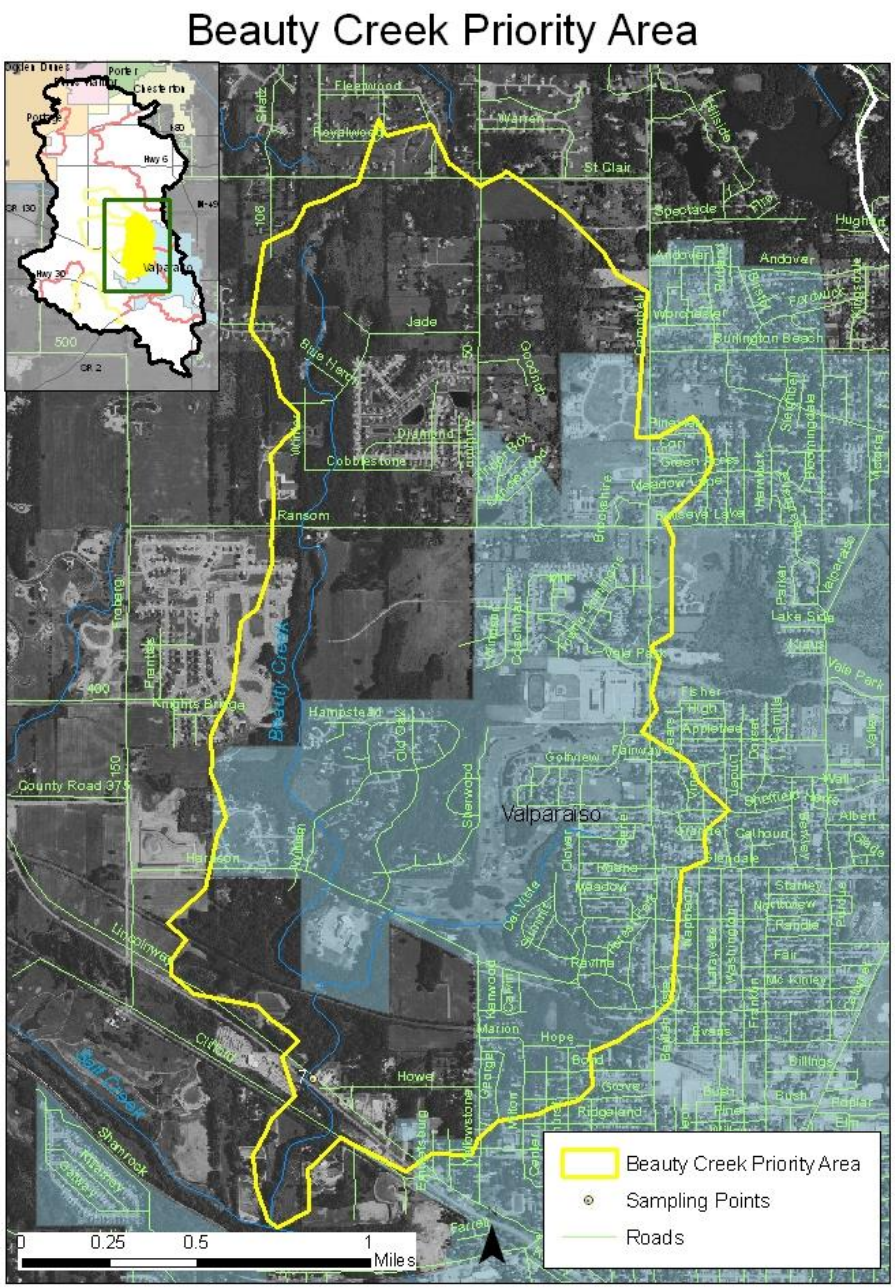
Based upon:

- historic water quality data,
- current water quality data,
- confirmed sources,
- projected future development,
- and causes of impairment.



Salt Creek Headwaters

- Highest average *E. coli* concentration
- Highest average TSS concentration and loading rate
- High nutrient loading rates
- Low DO
- Poor habitat rating



Beauty Creek

- Lowest average *E. coli* concentration
- Lowest average TSS concentration and areal loading rate
- Relatively low nutrient concentrations
- Highest habitat rating

CRITICAL AREAS IDENTIFICATION OPTIONS

Makes sense if

- you know that there are particular behaviors that people are willing to change
- "the time is right" for grants to fund a particular solution to a source
- your monitoring data is sparse or concentrations in all areas are similar

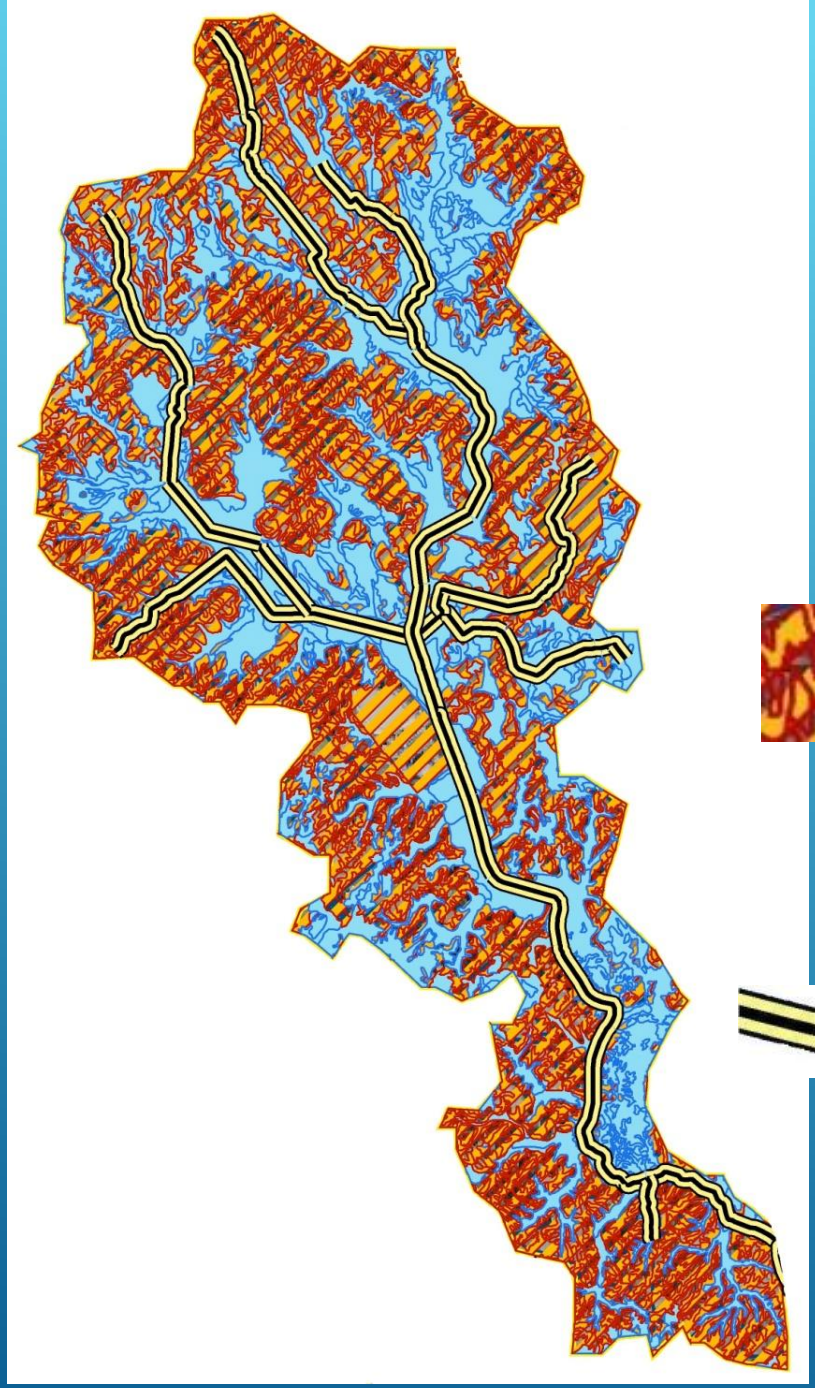
3

Defined by source of pollution to address

Examples:

Cropped fields without cover crops

Lawns that receive P fertilizer



3. DEFINED BY SOURCE OF POLLUTION TO ADDRESS

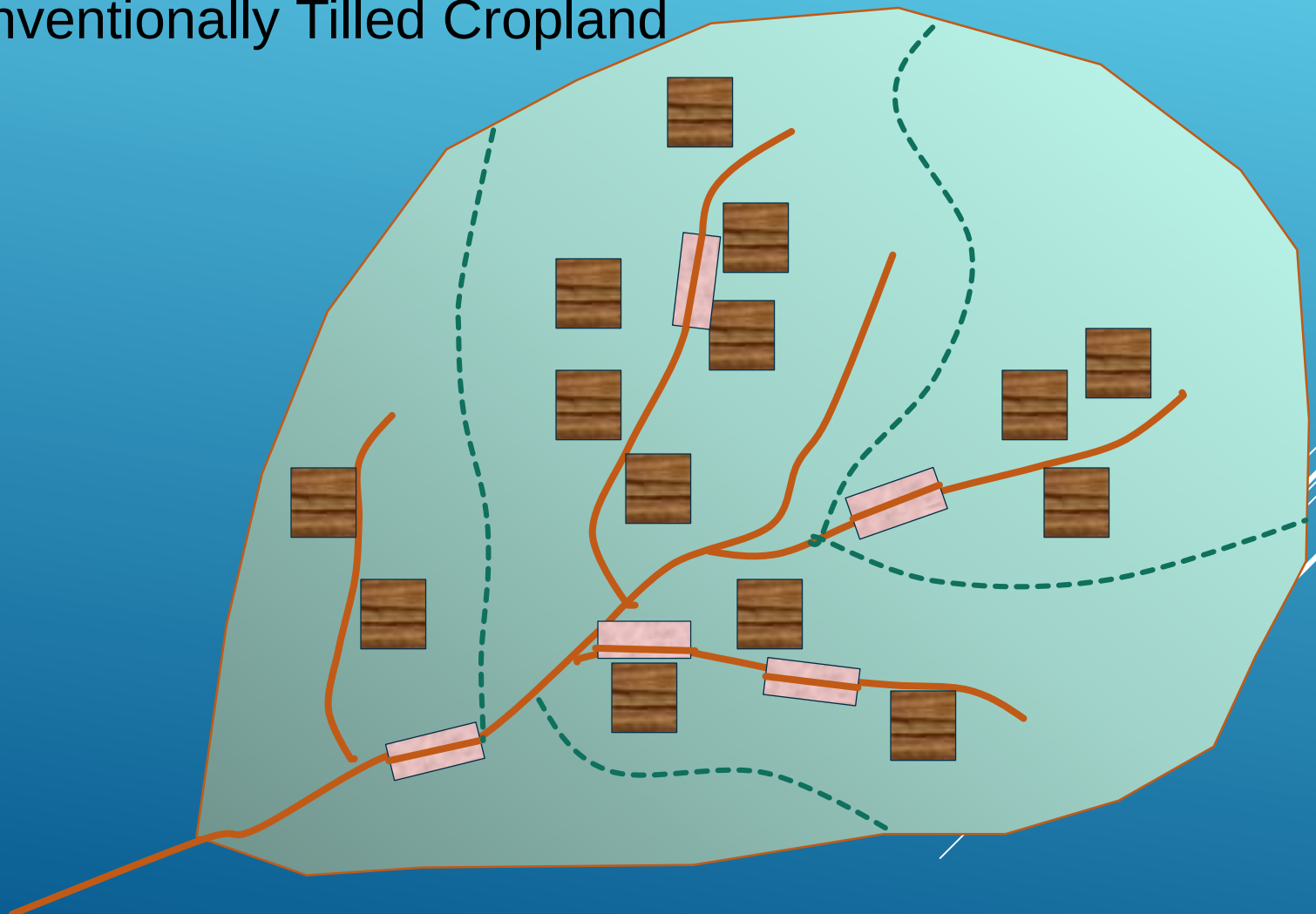
Highly erodible areas contributing to the high levels of suspended sediment and nitrate found throughout the watershed.

Riparian areas in need of buffers and filter strips to provide wildlife habitat and water quality improvements.

WHERE ARE THE CRITICAL AREAS?

Unbuffered Streambank

Conventionally Tilled Cropland



At 3.5 fps it is approximately 46 hours transport time to the lake….

Maumee WS

X

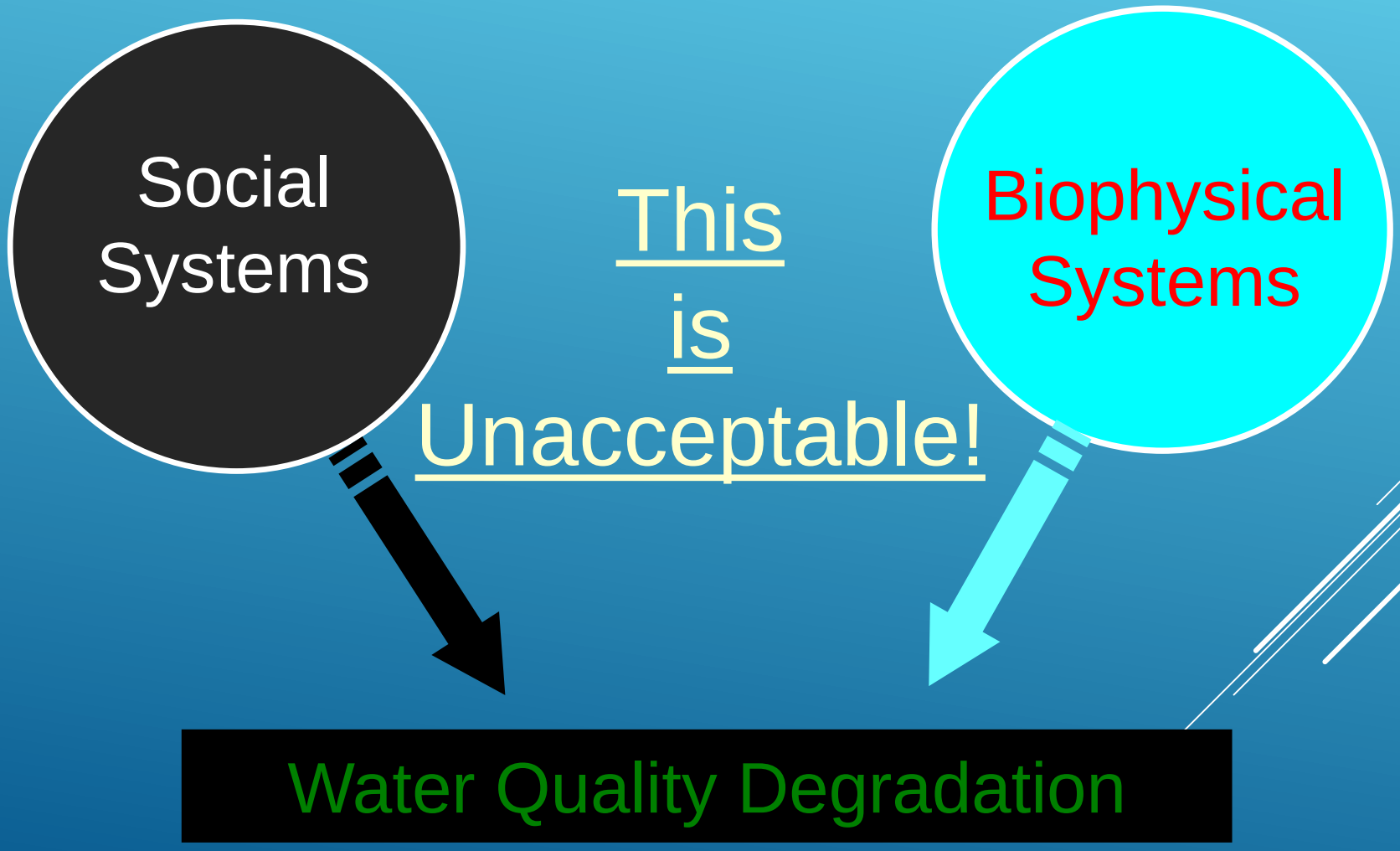
BIOPHYSICAL APPROACHES TO NPS POLLUTION

1. Heterogeneity between agricultural systems is recognized along biophysical dimensions. Variation is examined on the dimensions of climate, hydrology, soils, biology, and prevailing agronomic techniques. The human element is assumed to be a constant relative to profit maximizing behavior. Aquatic system impacts are determined by the interaction between the biophysical characteristics and system-wide production techniques.

SOCIAL APPROACHES TO NPS POLLUTION

2. A social science perspective where the emphasis is on markets, institutions, economic behavior, culture, and technology adoption processes all of which are examined largely independent of the biophysical setting. Variation in attitudes, beliefs, institutional structures, and market processes are viewed as the primary determinant of agriculture's impact on aquatic systems while largely ignoring specific biophysical settings.

APPROACHES TO NPS POLLUTION



HOW TO ADDRESS THIS DILEMMA

1. Base planning efforts on the fact that land user behaviors vary significantly, even when engaging in the same type of land use.
2. Use biophysical models and science to determine what land user behaviors need to be assessed.
3. Focus on disproportionality in your initial efforts.

DISPROPORTIONALITY

Any assessment in a water quality or quantity program needs to try and account for disproportionality as it should become the focus of any intervention effort that is intended to solve problems.

WHY ASSESS BEHAVIORS?

Behavior relative to the environment varies significantly – from saint to sinner.

* If we want to advance science, then we need to assess the full spectrum.
* If we want to manage programs, then we need to assess receptive audiences within the program area.
* If we want to solve water problems, then we begin with those making disproportionate contributions.

INAPPROPRIATE BEHAVIORS

What is the explanation for inappropriate behavior in vulnerable or susceptible biophysical settings?

1. Technological “leakage”
2. Tradition/Community norms
3. Market Rationality
4. Ignorance
5. Scale Incongruence
6. Others?

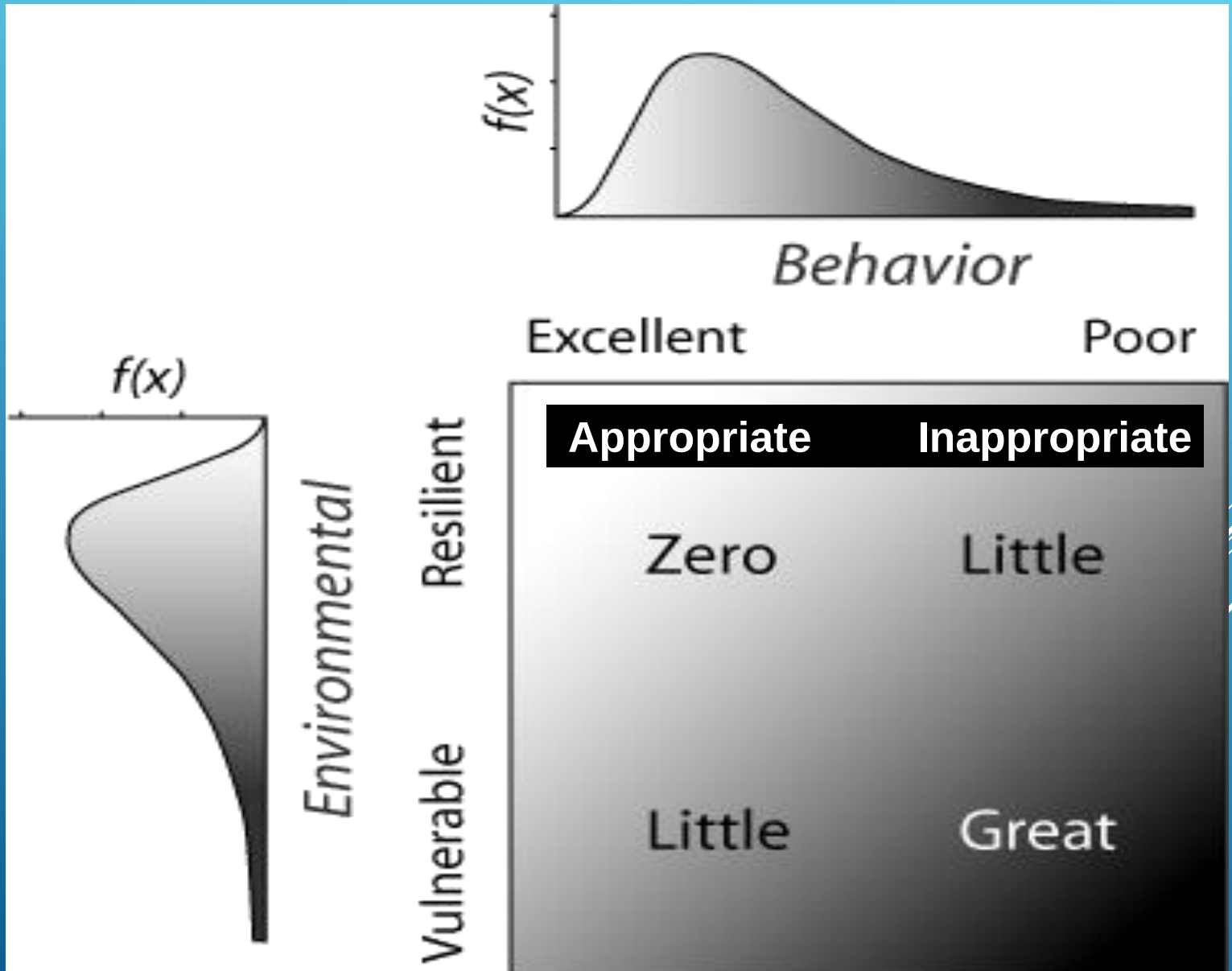
DISPROPORTIONALITY

Egregious behaviors in a well-buffered setting may have an insignificant impact on degradation processes.

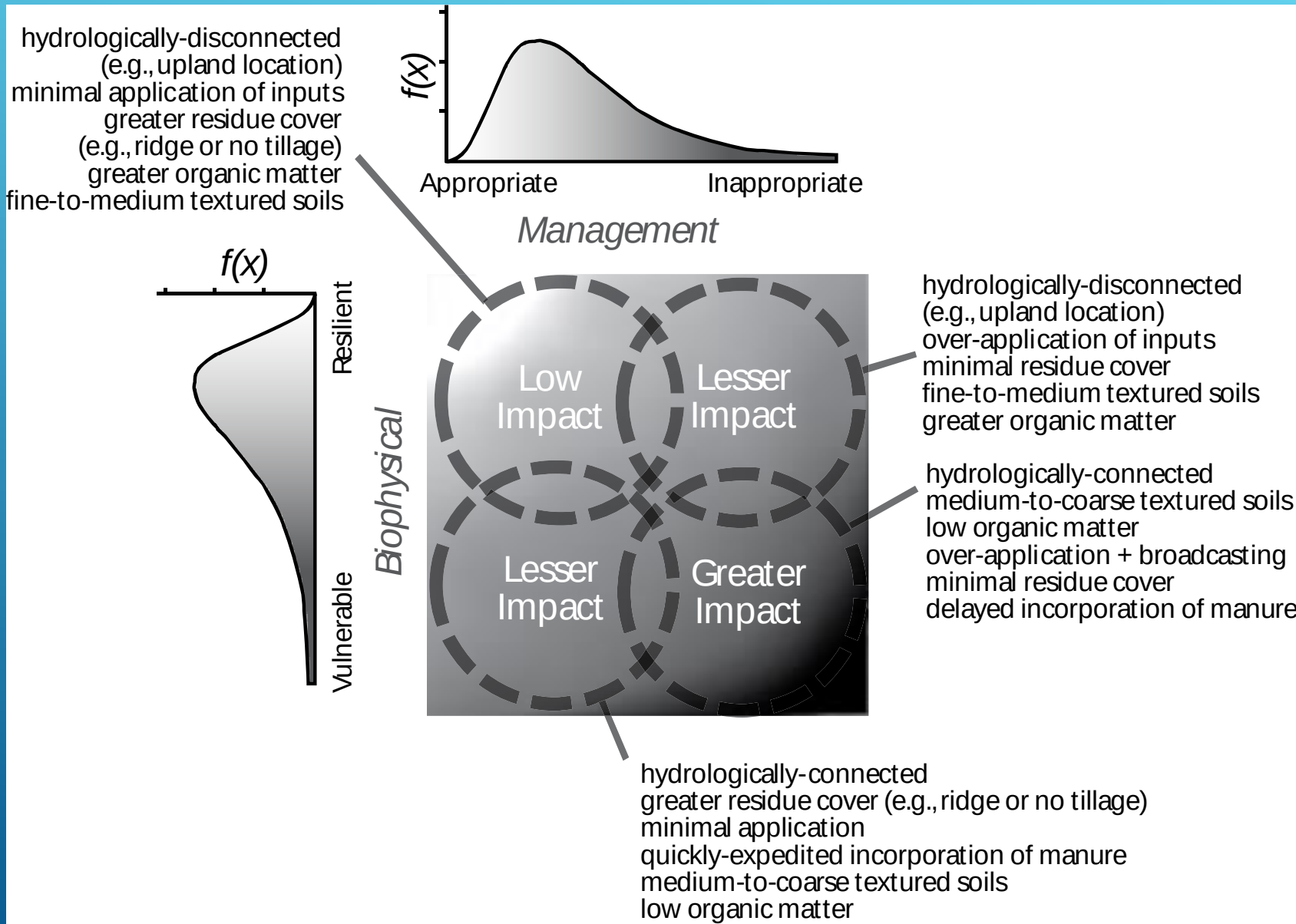
"Normal" behaviors in a vulnerable setting may have a significant impact on degradation processes.

Disproportionality emerges out of scale-specific interactions between human and biophysical attributes.

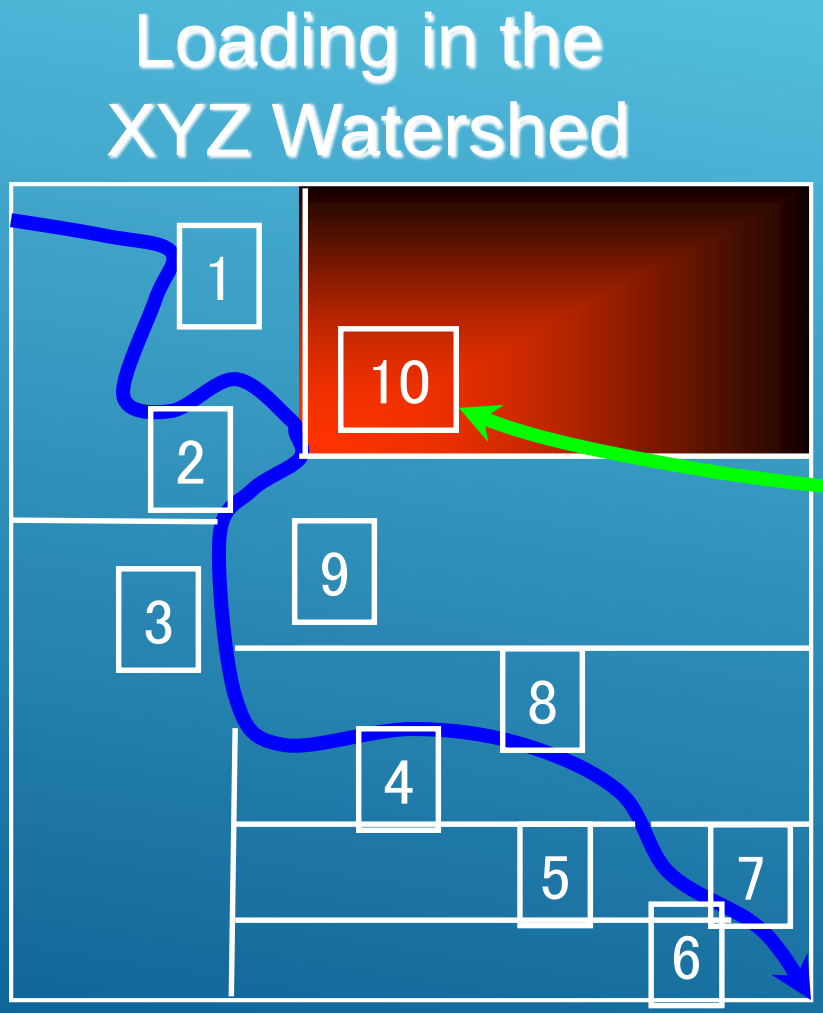
DISPROPORTIONALITY



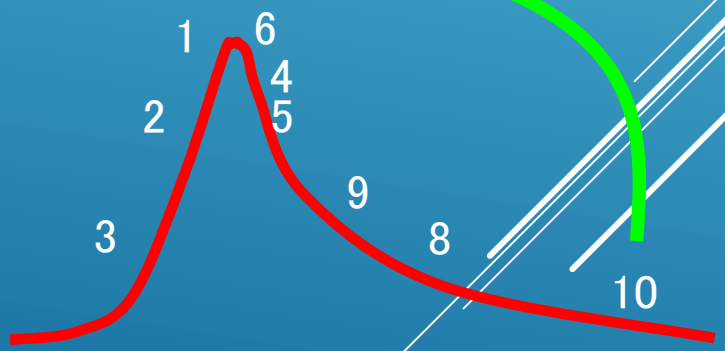
DISPROPORTIONALITY



EXAMPLE OF DIVERSE BIOPHYSICAL RESOURCES

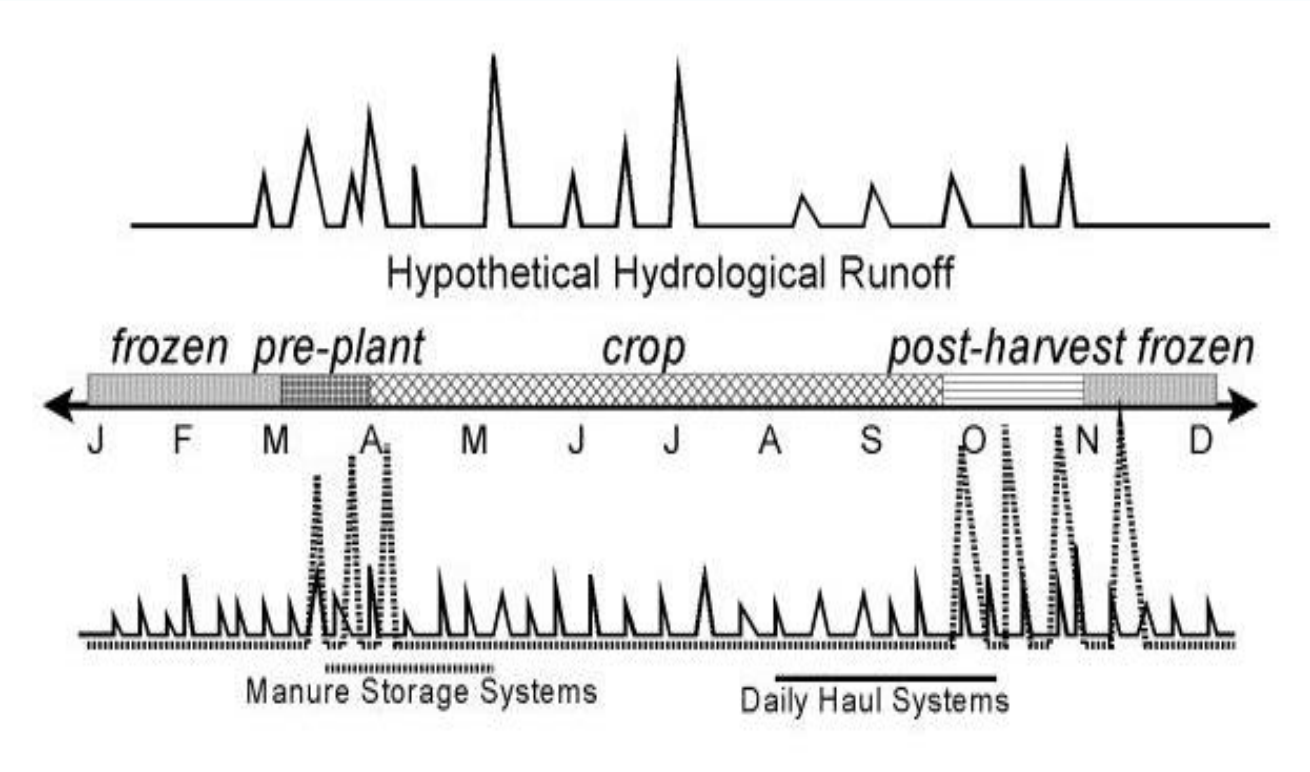


The vulnerability of field #10 can nullify or negate the “conservation gains” from the other 9 fields.



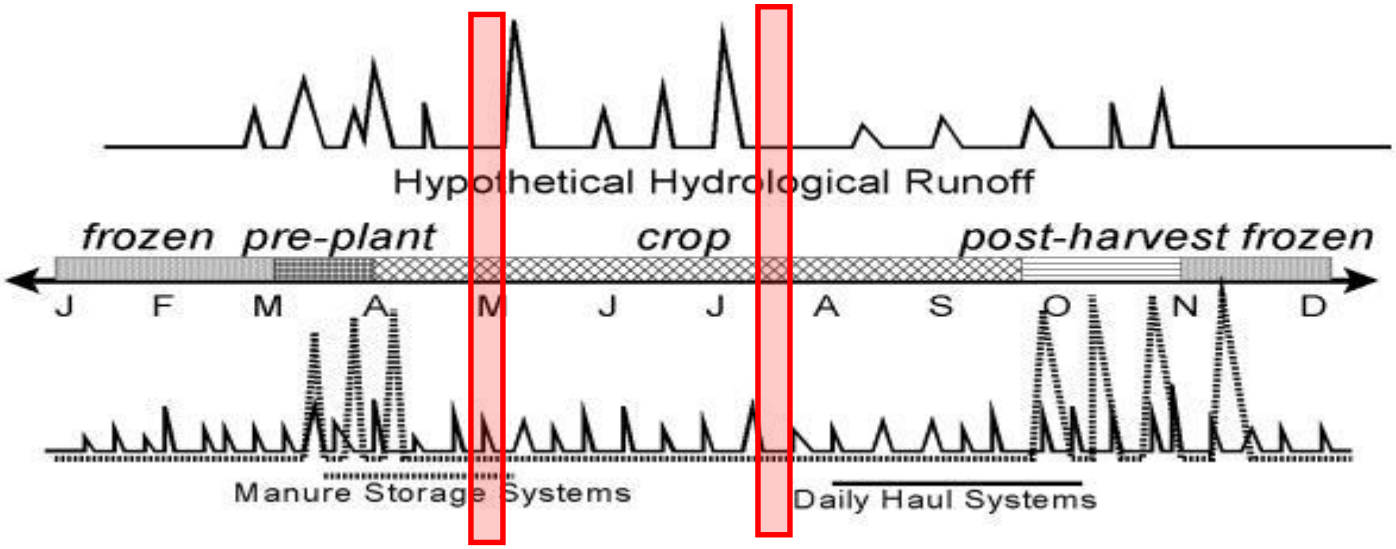
Assume “behavior” measure is constant

TEMPORAL SCALES OF MANAGEMENT

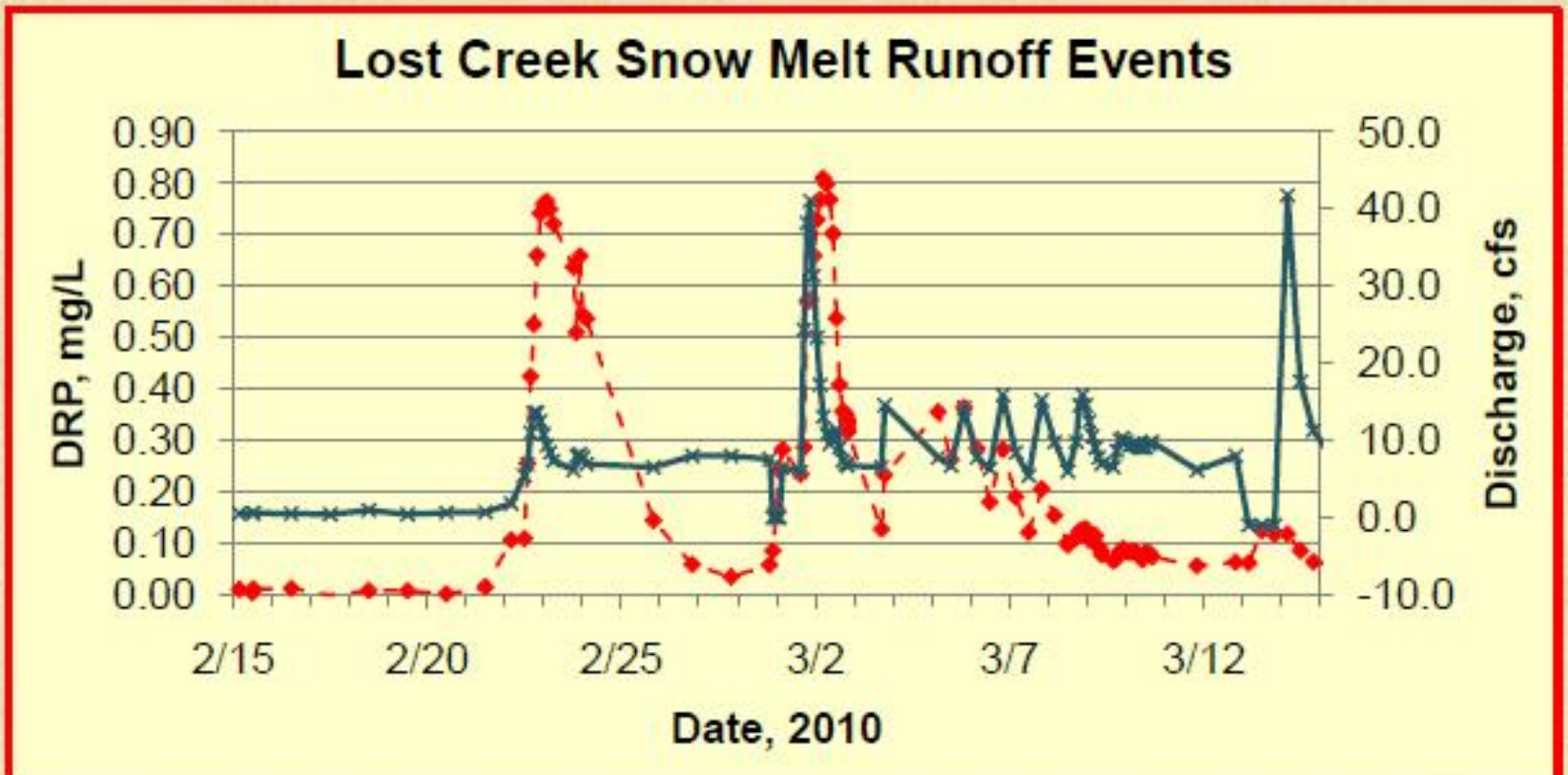


Variation in climate and hydrologic patterns induce changes in the spatial and temporal attributes of manure distribution decisions.

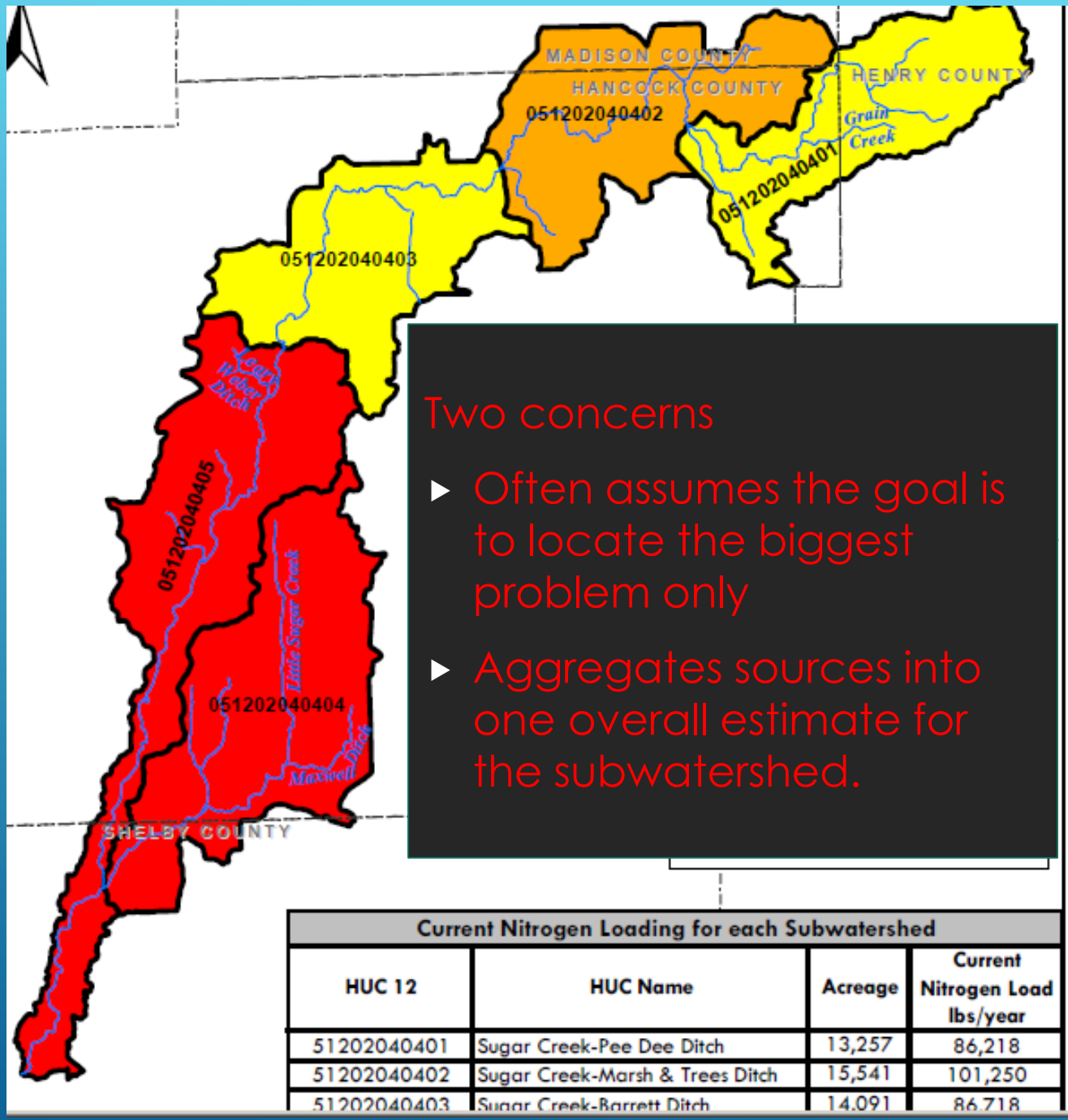
SAME BEHAVIOR, DIFFERENT TIME



Winter Broadcasting of fertilizer in the Lost Creek Watershed, 2010



DOES MODELING HELP DEFINE CRITICAL AREAS?



Two concerns

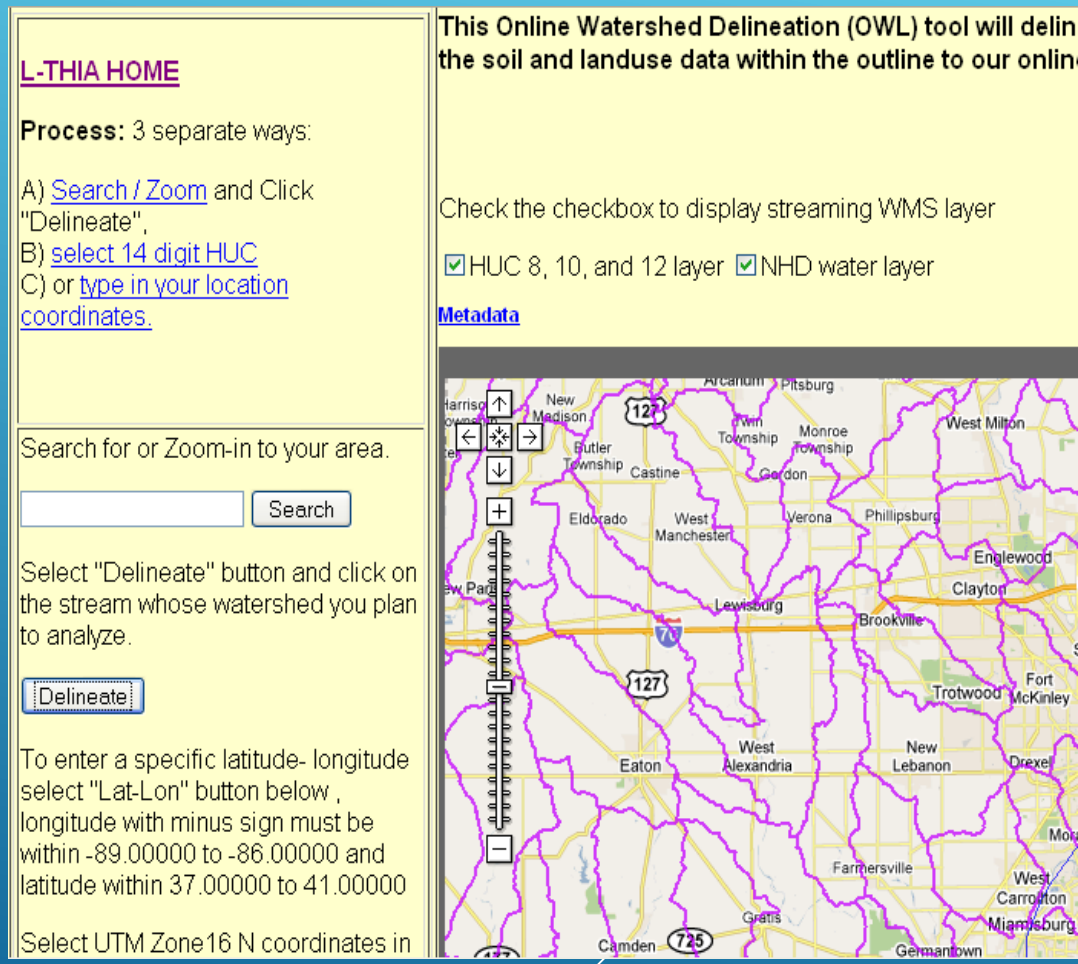
- Often assumes the goal is to locate the biggest problem only
- Aggregates sources into one overall estimate for the subwatershed.

Current Nitrogen Loading for each Subwatershed			
HUC 12	HUC Name	Acreage	Current Nitrogen Load lbs/year
51202040401	Sugar Creek-Pee Dee Ditch	13,257	86,218
51202040402	Sugar Creek-Marsh & Trees Ditch	15,541	101,250
51202040403	Sugar Creek-Barrett Ditch	14,091	86,718

MODELS ARE USEFUL, BUT PERHAPS NOT FOR CRITICAL AREA DEFINITION

Useful for

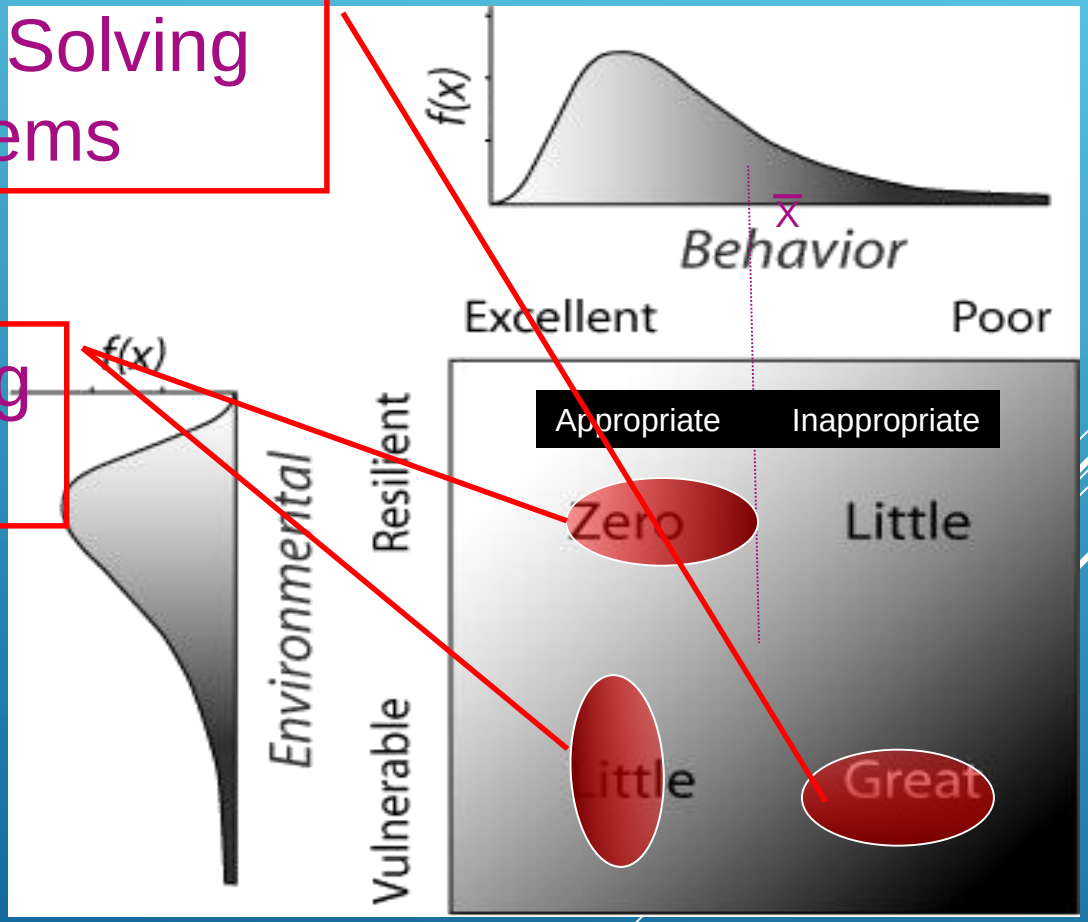
- Load estimation
- Load reduction estimation
- If we are confident in load reduction, can use models to see where load **reduction** is greatest



WHAT SHOULD BE THE FOCUS OF NPS CONTROL EFFORTS?

Focus on Solving Problems

Focus on Managing Programs



DELIVERY SYSTEM ADMINISTRATIVE GOALS DRIVING ENVIRONMENTAL PROTECTION

- Critical areas not being addressed – not going out to the critical area
- Partial treatment of problems –scope and BMPS
- Not all problems being addressed
- Landowner capacity not developed

IDENTIFYING IMPLEMENTATION SITES IN CRITICAL AND PRIORITY AREAS

Challenges

- ***Logistically difficult – ownership, physical rquirements***
- ***Potentially expensive – cheaper to prevent***


The Dead
Presidents

Vermilion Watershed Taskforce
Landowner Willingness

Karyn McDermaid, University of Illinois

Jeff Boeckler. Illinois Department of Natural Resources

2005

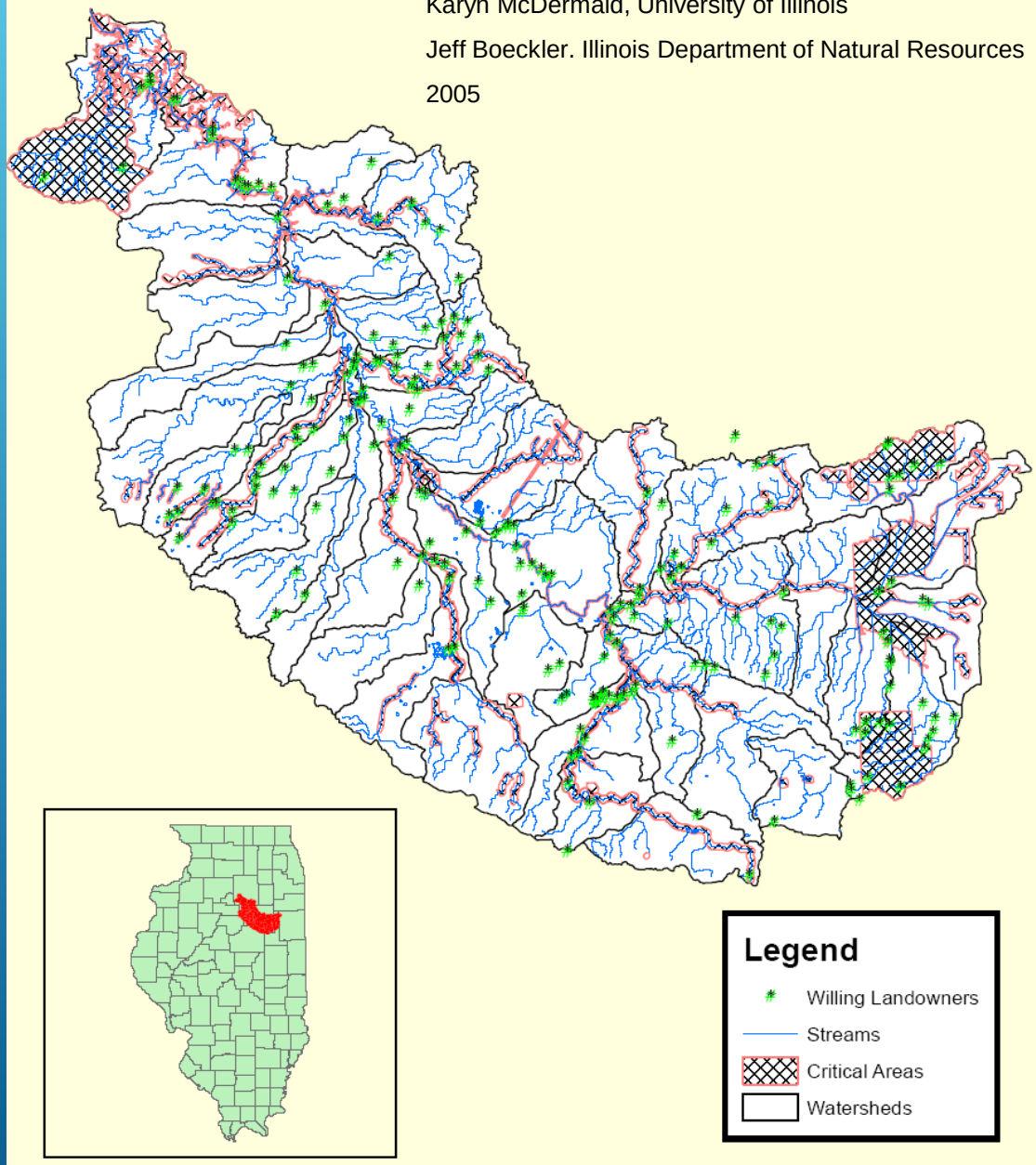


Table 21. Landowner survey: Willingness to install best management practices (N = 606).

BEST MANAGEMENT PRACTICES	PERCENT RESPONDING **Willing to install, with both technical and financial assistance**
Cropland	
Habitat improvement	23
Nutrient management	15
Conservation easements	13
Wetland installation	12
Reduced-tillage program	10
Grassland	
Habitat improvement	17
Pest management	14
Native grass planting	12
Nutrient management	13
Conservation easements	10
Burning grassland	6
Woodland	
Habitat improvement	15
Timber stand improvement	13
Tree planting	13
Pest management	11
Conservation easements	8
Timber harvest	4
Burning	4
Streamside	
Plant a buffer with trees and/or shrubs	19
Route field tile drainage to a treatment wetland	18

Table 23. Landowner survey: Interest in letting volunteer groups install practices (N = 606).

	PERCENT RESPONDING			
INTEREST	Yes	Maybe	No	No response/ don't know
Let a volunteer group install a grassland/prairie	8	19	52	22
Let a volunteer group install a wetland	5	14	58	23
Let a volunteer group install a riparian buffer	8	19	50	23
Let land be used for research demonstrations	9	28	45	17

Karyn McDermaid, University of Illinois

2005

Table 26. Landowner survey: Self-reported obstacles to implementing conservation practices (N = 317).

OBSTACLE	Number of comments
Lack of money/costs	124
Maintaining productivity	37
Lack of government funding/incentives	30
Lack of time	17
Problems with cost-share	14
Lack of knowledge	12
Government regulations/interference	12
Lack of technical assistance	12
Lack of equipment	9
Drainage	9
Absentee landowner won't approve	8
Uncooperative neighbors	6
Erosion	6
Lack of labor	4
Flooding	4
Taxes	4
Red tape with government assistance	3
Wildlife damage	2
Tillage	2
Weeds	1
Tenant won't do	1

Karyn McDermaid, University of Illinois

2005

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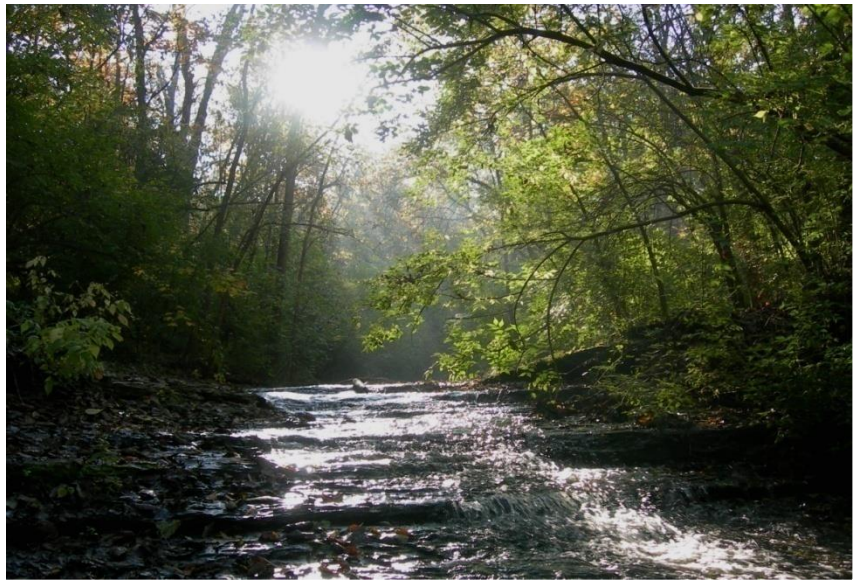

"In our attempt to make conservation easy, we have made it trivial."

-Aldo Leopold (1948)