Targeting Critical Areas and Scheduling Implementation

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Treat the Right Problems with the Right Solutions in the Right Places

How do we get there?

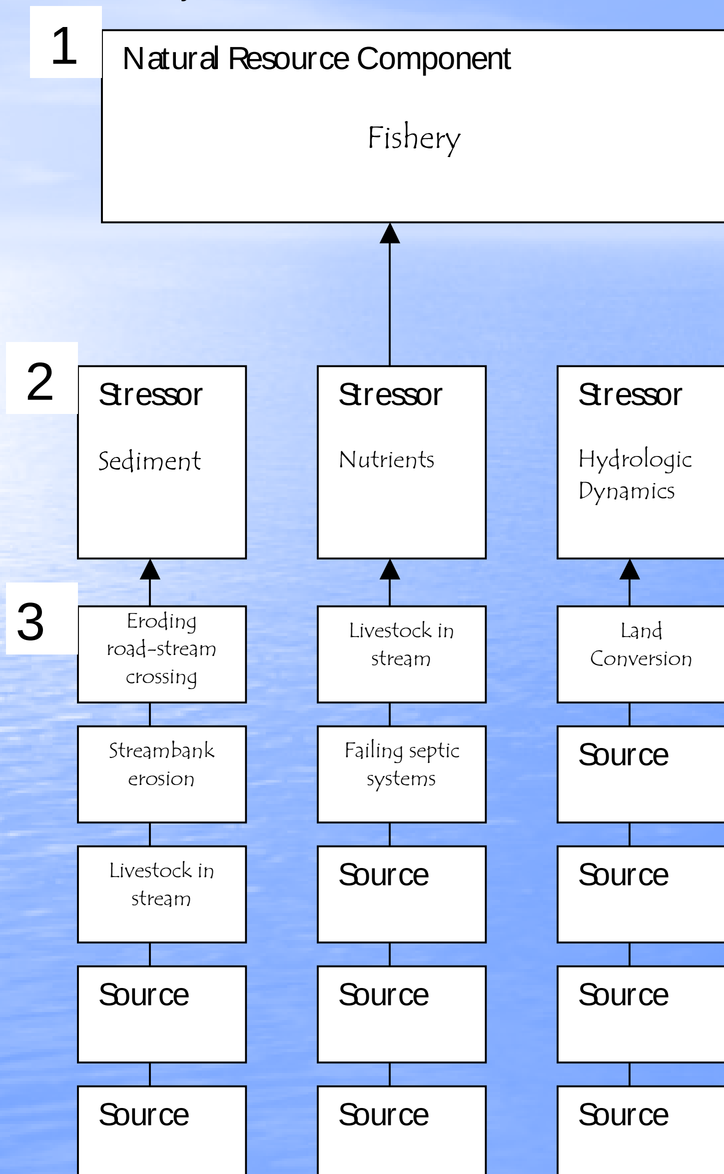
Objective

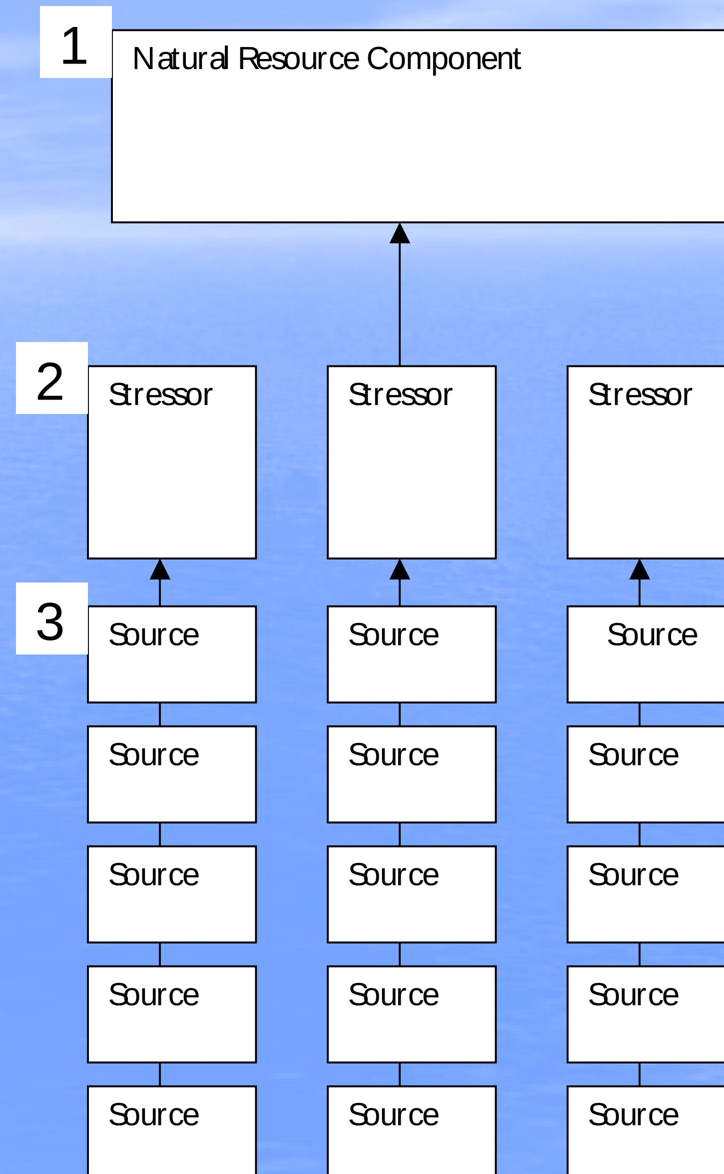
To remediate a significant amount of water quality degradation from nonpoint sources using existing policy, knowledge, and methods through the incorporation of the "human dimension" in a rigorous and scientifically valid fashion.

A Recently Maintained Channel

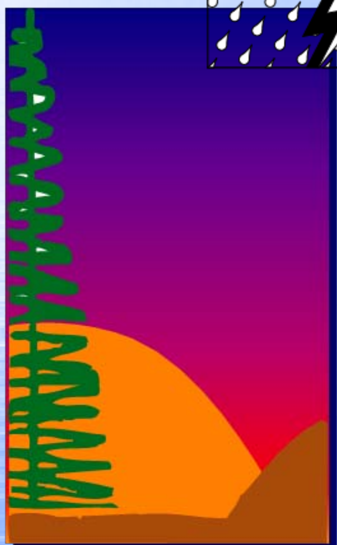
Bank Failure in an Illinois Ditch

For each natural resource component in your watershed, identify the stressors acting to degrade or impair that component. Then, identify the sources that contribute to the stressors.





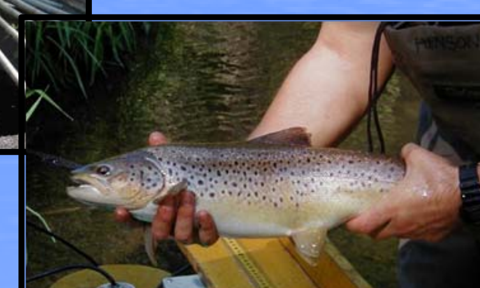
Impacts on Water Quality



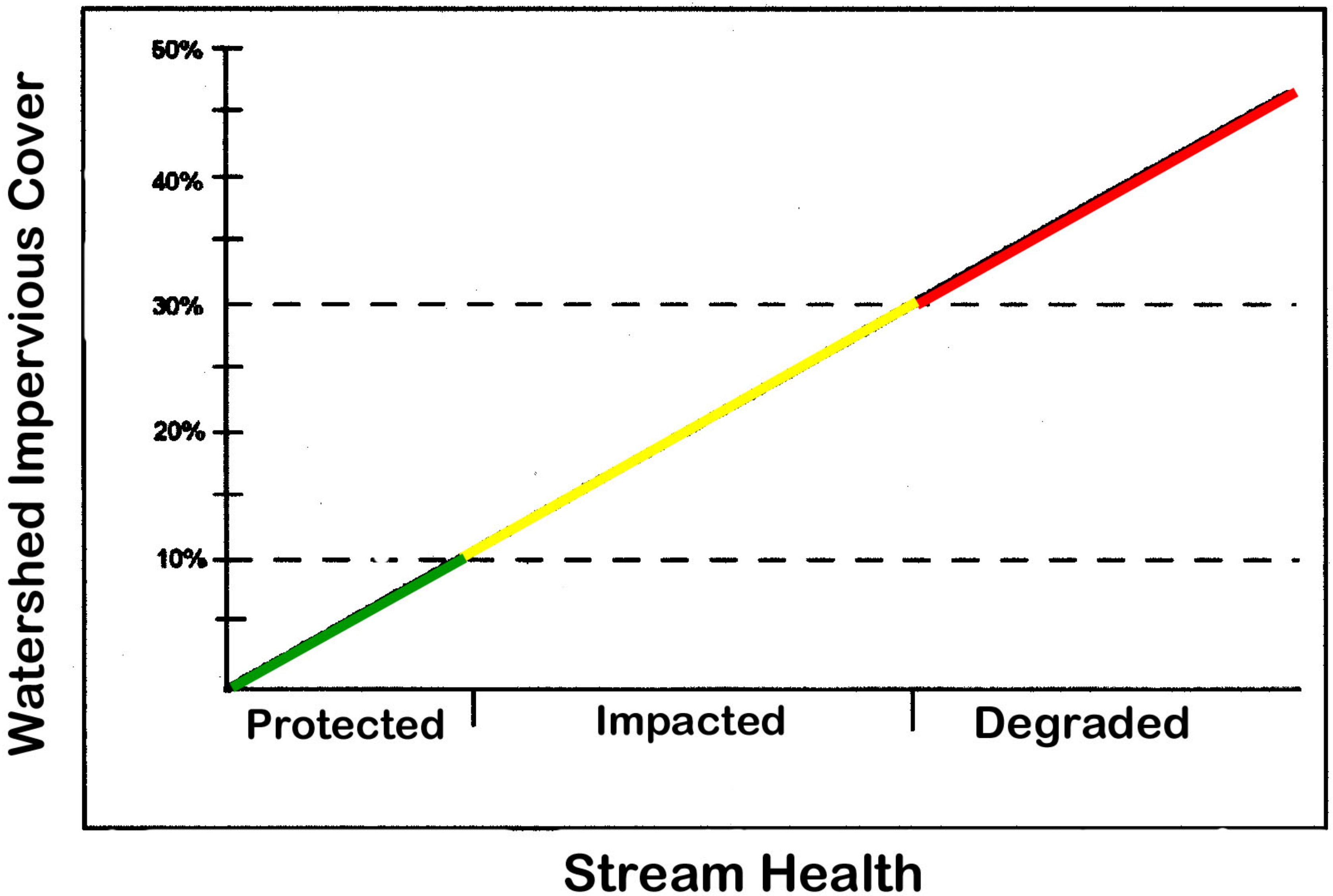
- Nutrients
- Pathogens
- Sediment
- Toxic Contaminants
- Debris
- Thermal Stress

Increased quantity

Decreased quality



Relationship of Impervious Cover to Stream Health



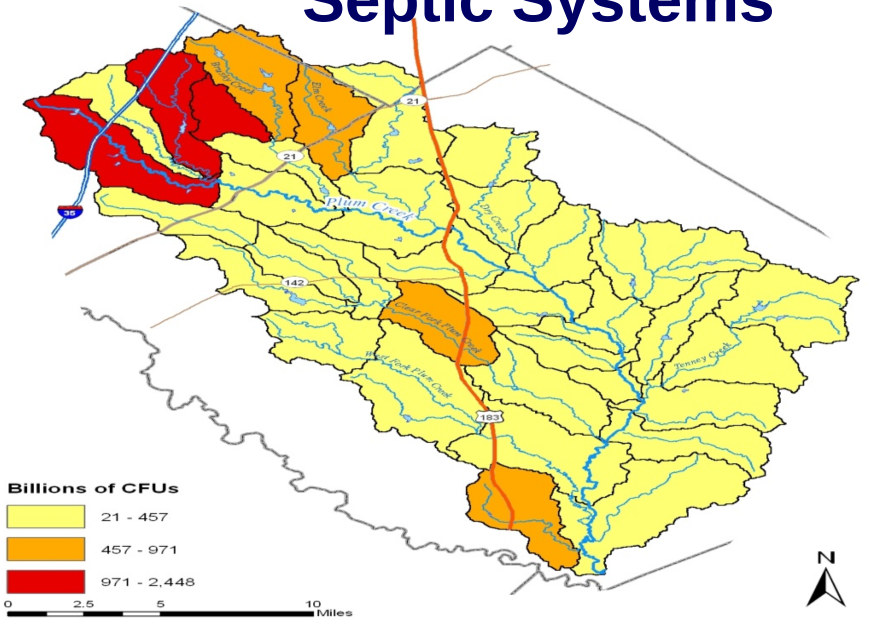
Center for Watershed Protection

Potential Sources

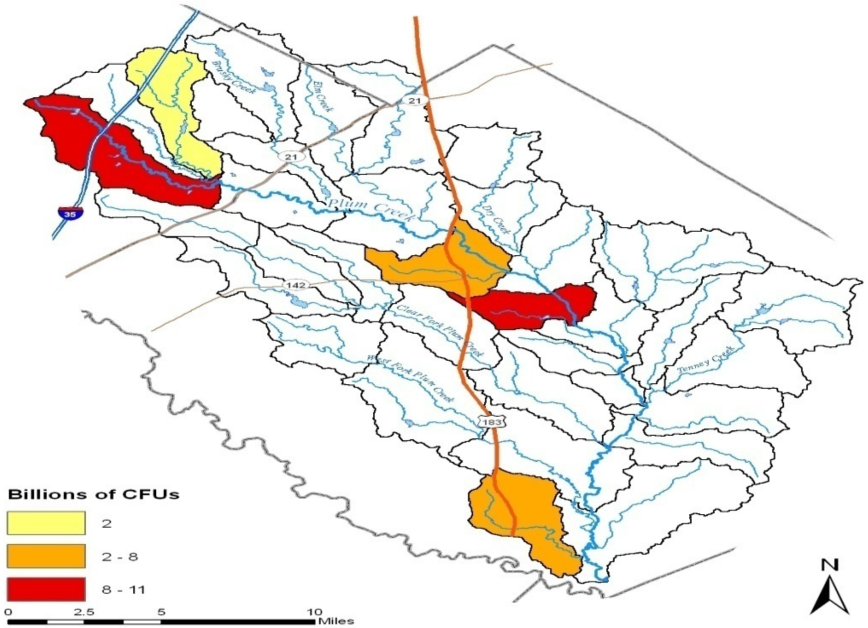
Potential Sources	Bacteria	Nutrients	Other
Septic Systems	X	X	X
<u>Wildlife</u>			
Deer	X	X	
Feral Hogs	X	X	
Cropland		X	
<u>Livestock</u>			
Sheep and Goats	X	X	
Horses	X	X	
Cattle	X	X	
Oil and Gas Production			X
Urban Runoff	X	X	X
Wastewater Treatment Facilities	X	X	

Average Daily Potential *E. coli* Load from SELECT

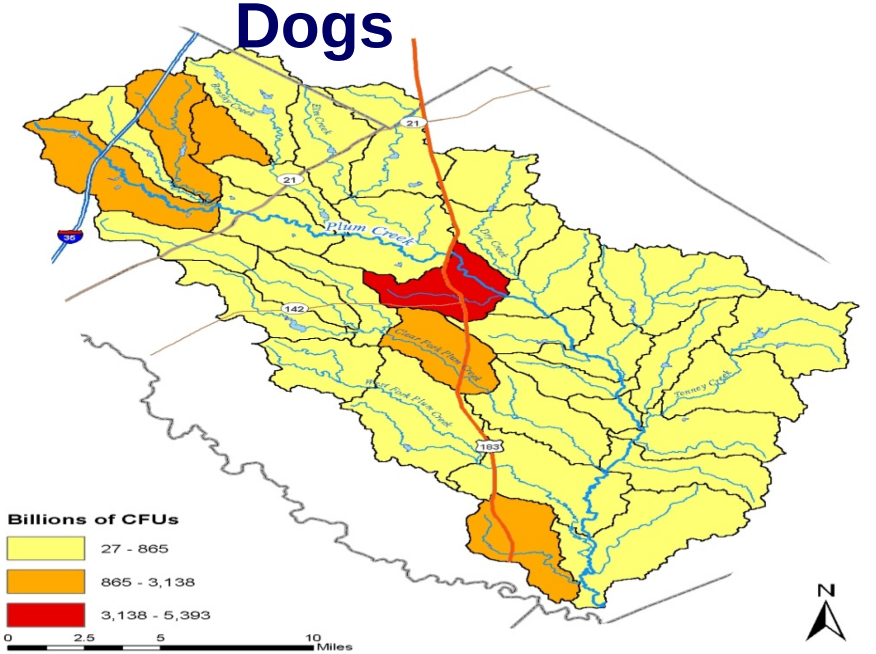
Septic Systems



WWTPs



Dogs



Preliminary Report by P.M. Glibert, *et. al.*
Univ. of Maryland Center for Environmental Science
Horn Point Laboratory

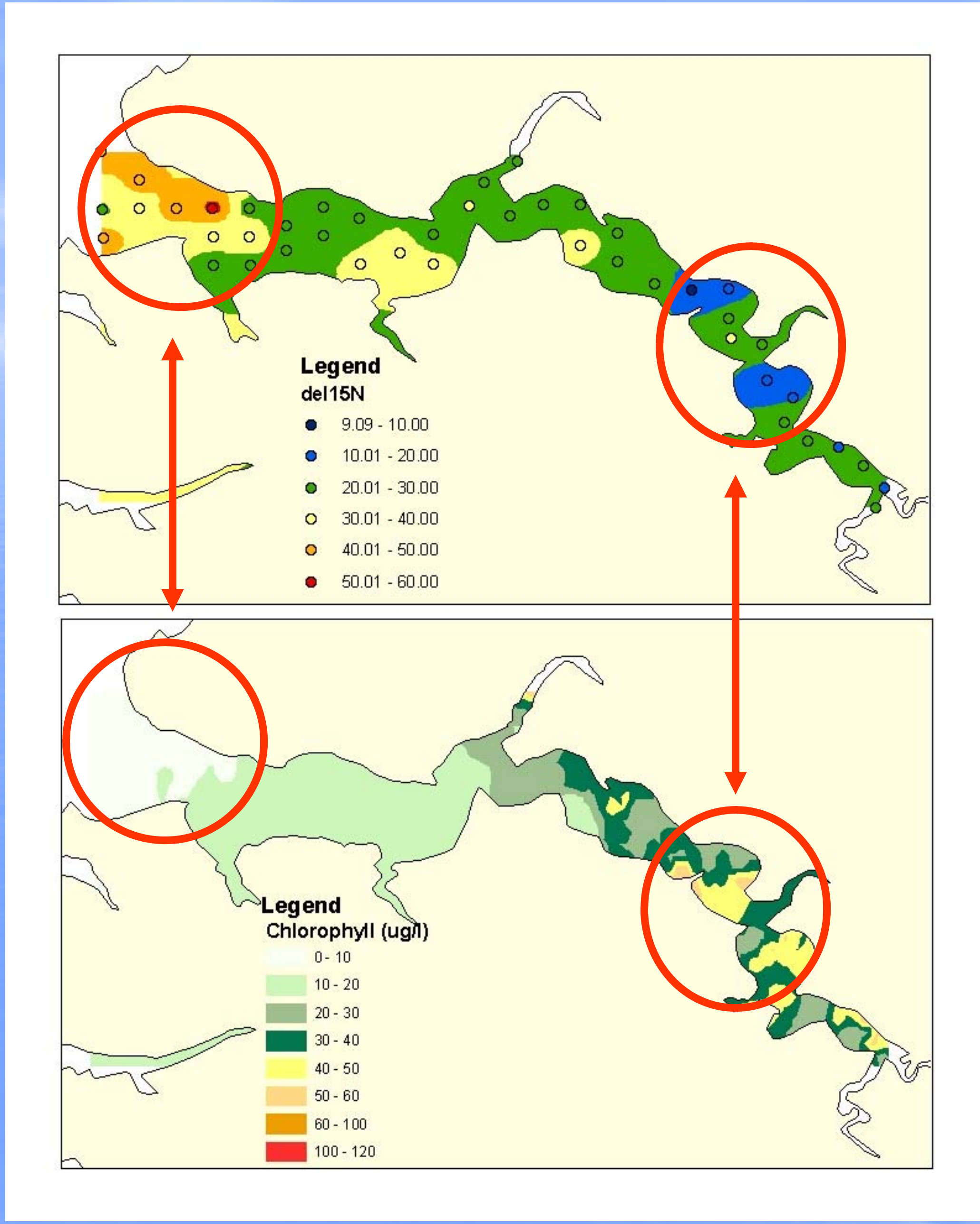
47 samples were collected for chlorophyll and δ^{15}N on October 11, 2006

Highest levels of δ^{15}N corresponded with lowest levels of chlorophyll and vice versa

"These results are suggestive of different nitrogen sources upriver and down."

"The low δ^{15}N values are consistent with a sewage derived signal."

"However… [it] may also be consistent with significant processing of nitrogen [by algae]."



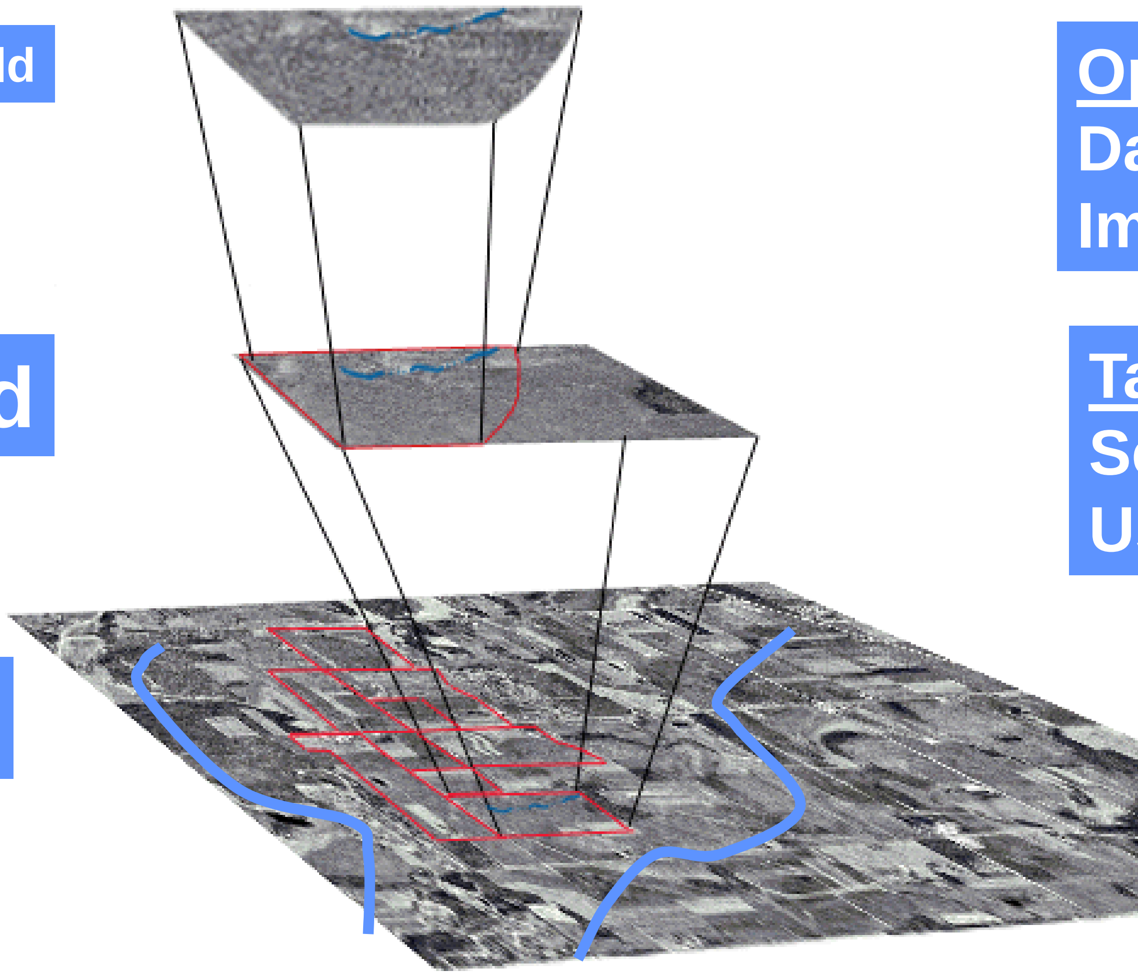
Courtesy MD Dept. of Natural Resources

October 11, 2006

Scales of Management

Scale

Decisions



Sub-Field

Operational
Day-to-Day Implementation

Field

Tactical
Seasonal Use/Non-Use

Farm

Strategic
Multi-Year Planning

Watershed

Not Considered

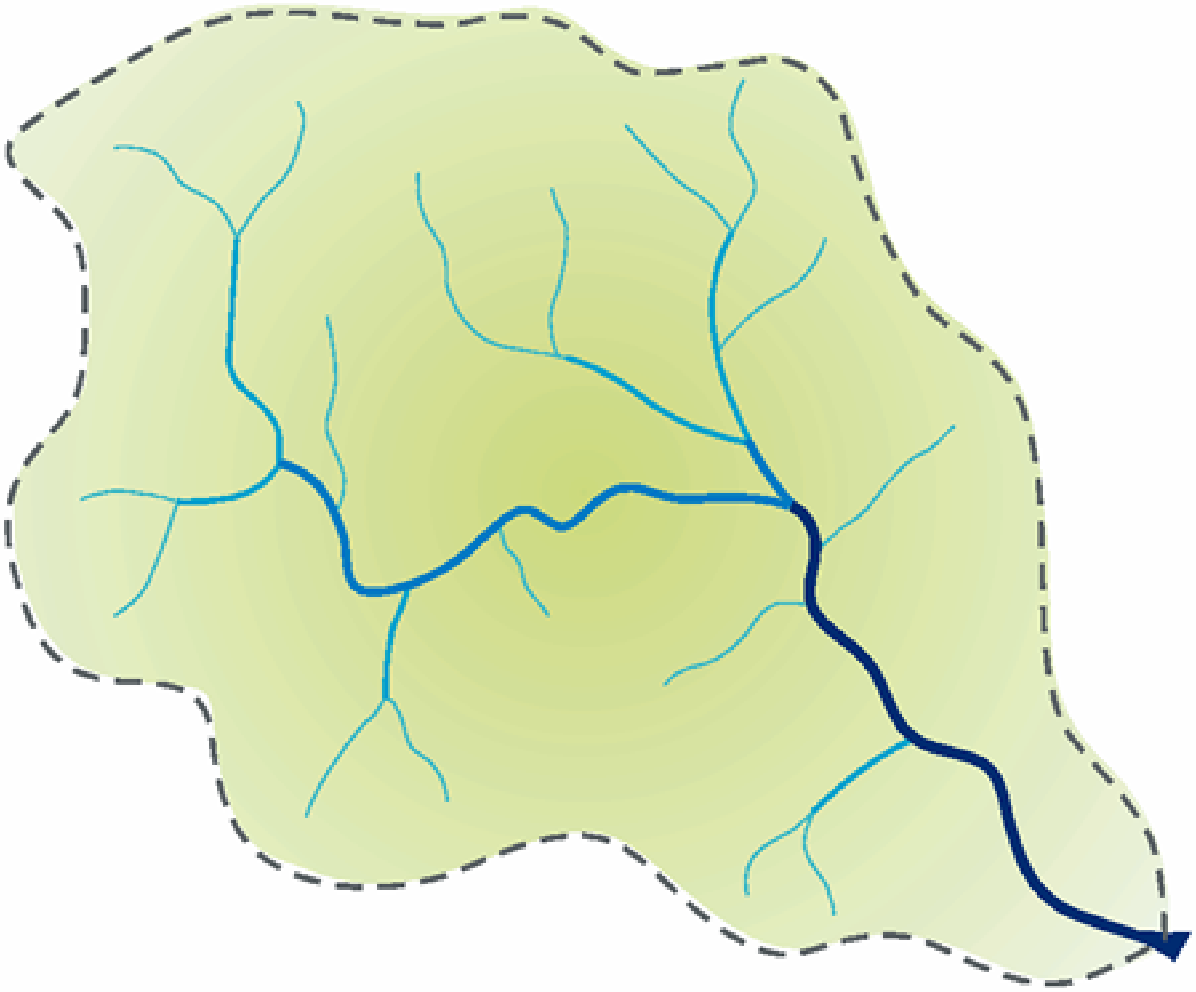
Getting it right

- Critical areas
- Delivery System (who, what)

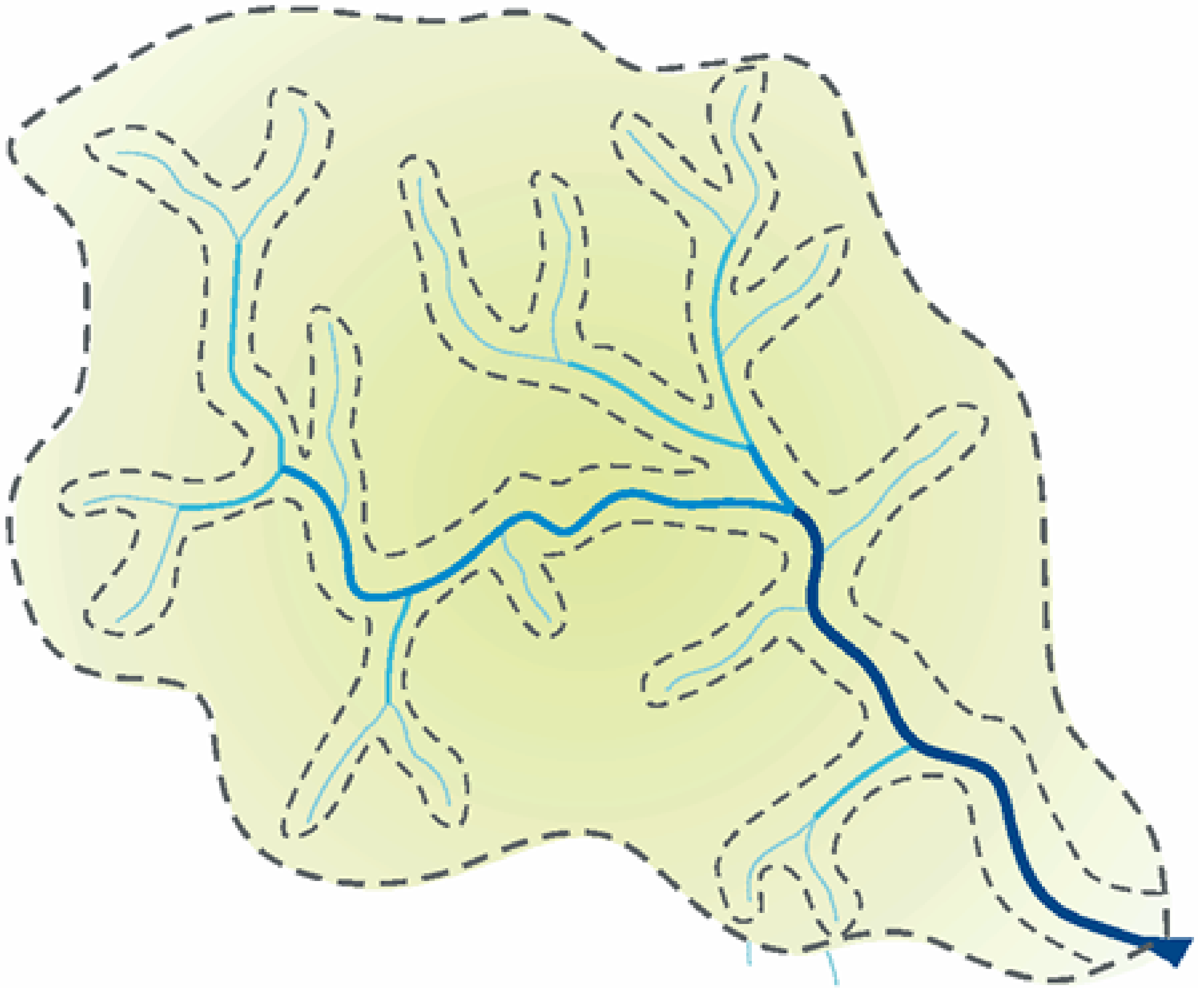
Critical Area Types

- Restoration:
- Protection:

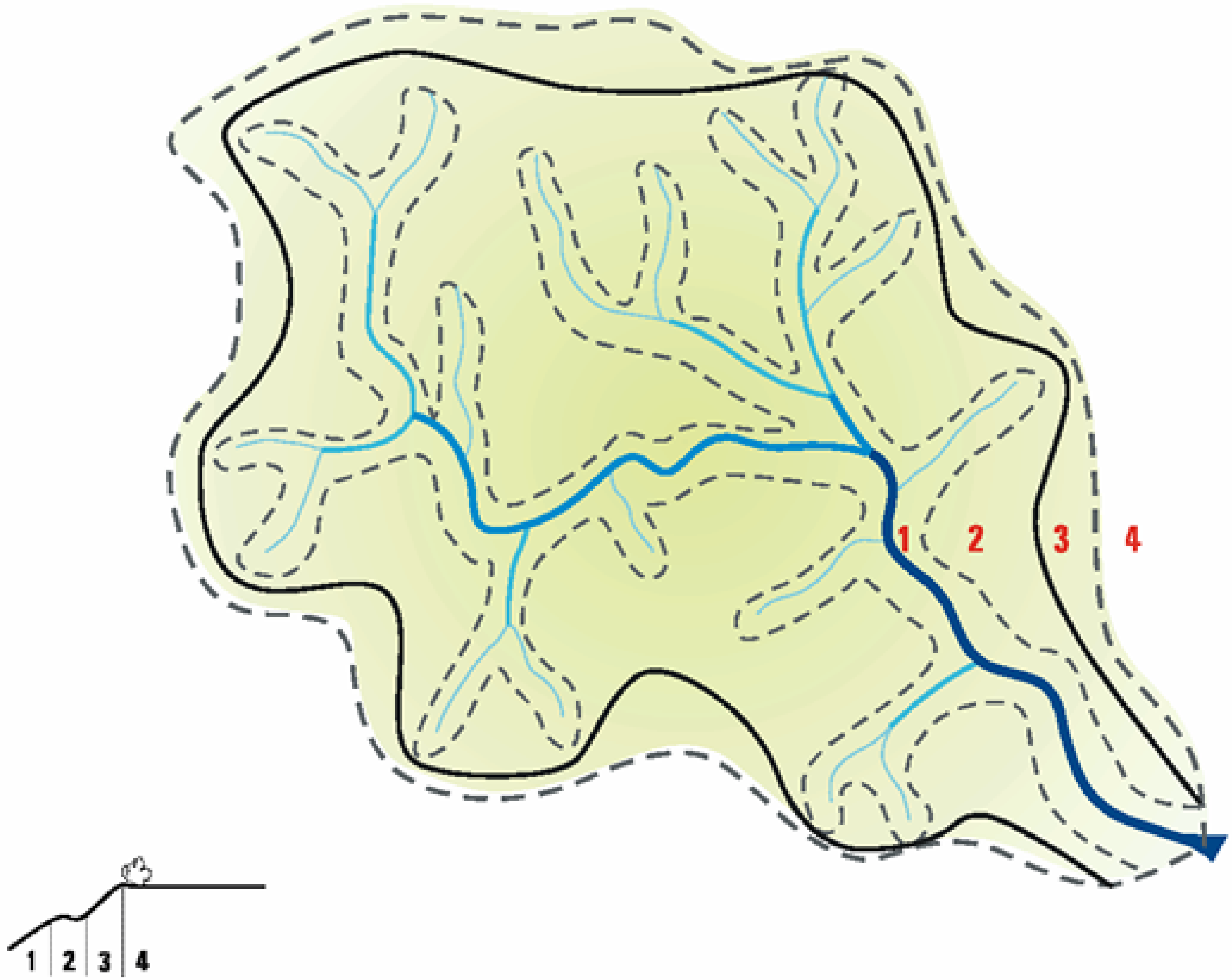
Management Zones Based on Watershed Boundary

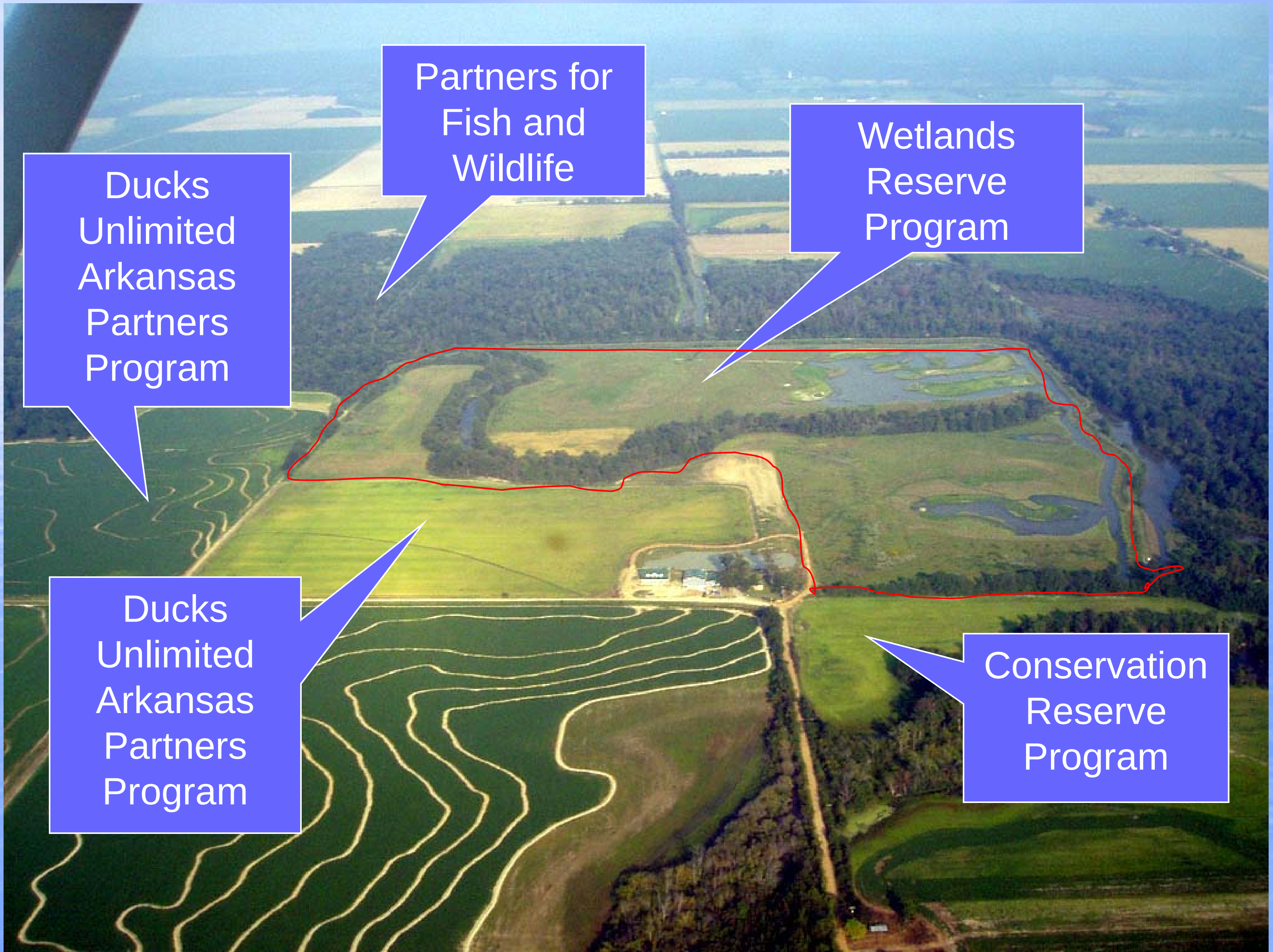


Management Zones Based on Proximity to Water Body



Management Zones Based on an Integrated Pollutant Source and Transport Approach




Partners for Fish and Wildlife
Wetlands Reserve Program
Ducks Unlimited Arkansas Partners Program
Ducks Unlimited Arkansas Partners Program
Conservation Reserve Program

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.

Why Assess Behaviors?

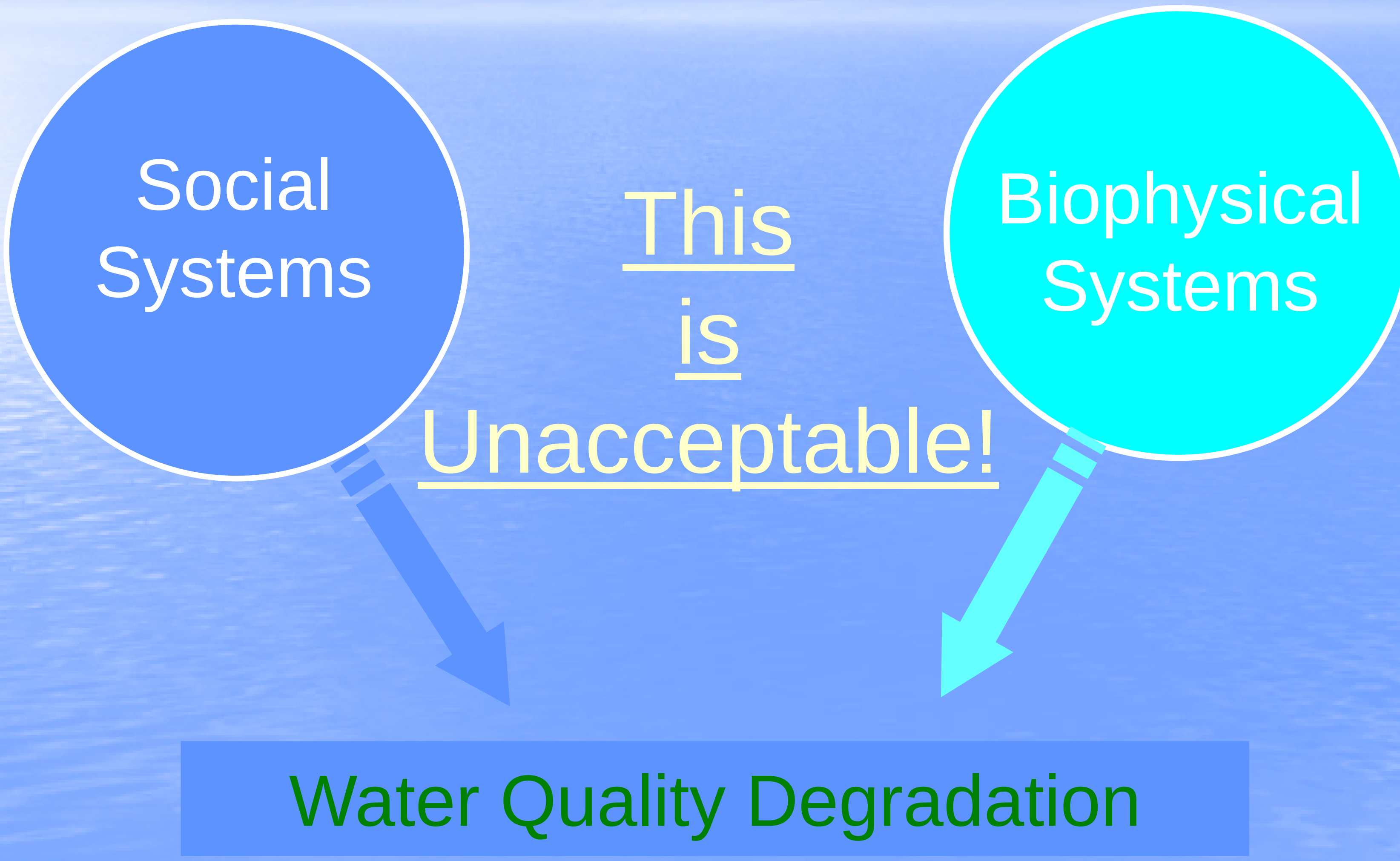
Behavior relative to the environment varies significantly – from saint to sinner.

* 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.

A Definition

The human dimension of water resource management can be defined as the effort to classify, explain, predict and influence salient behaviors proportionate to their impact on water quality and quantity.

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

The degree of asymmetry emerging between a specific behavior, or a set of behaviors, and the resiliency or buffering capacity of the biophysical setting (i.e., space and time) where these actions occur.

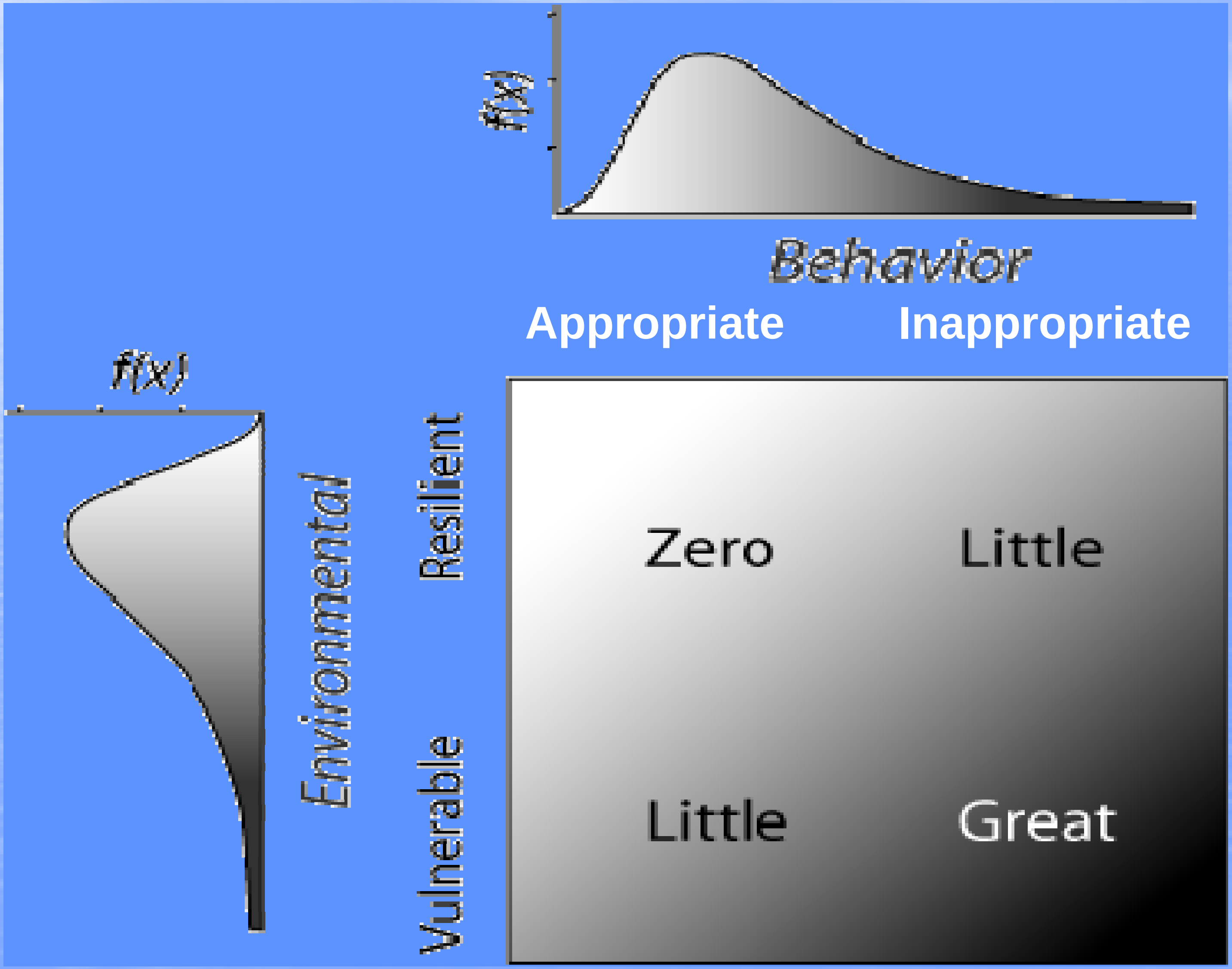
Disproportionality

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

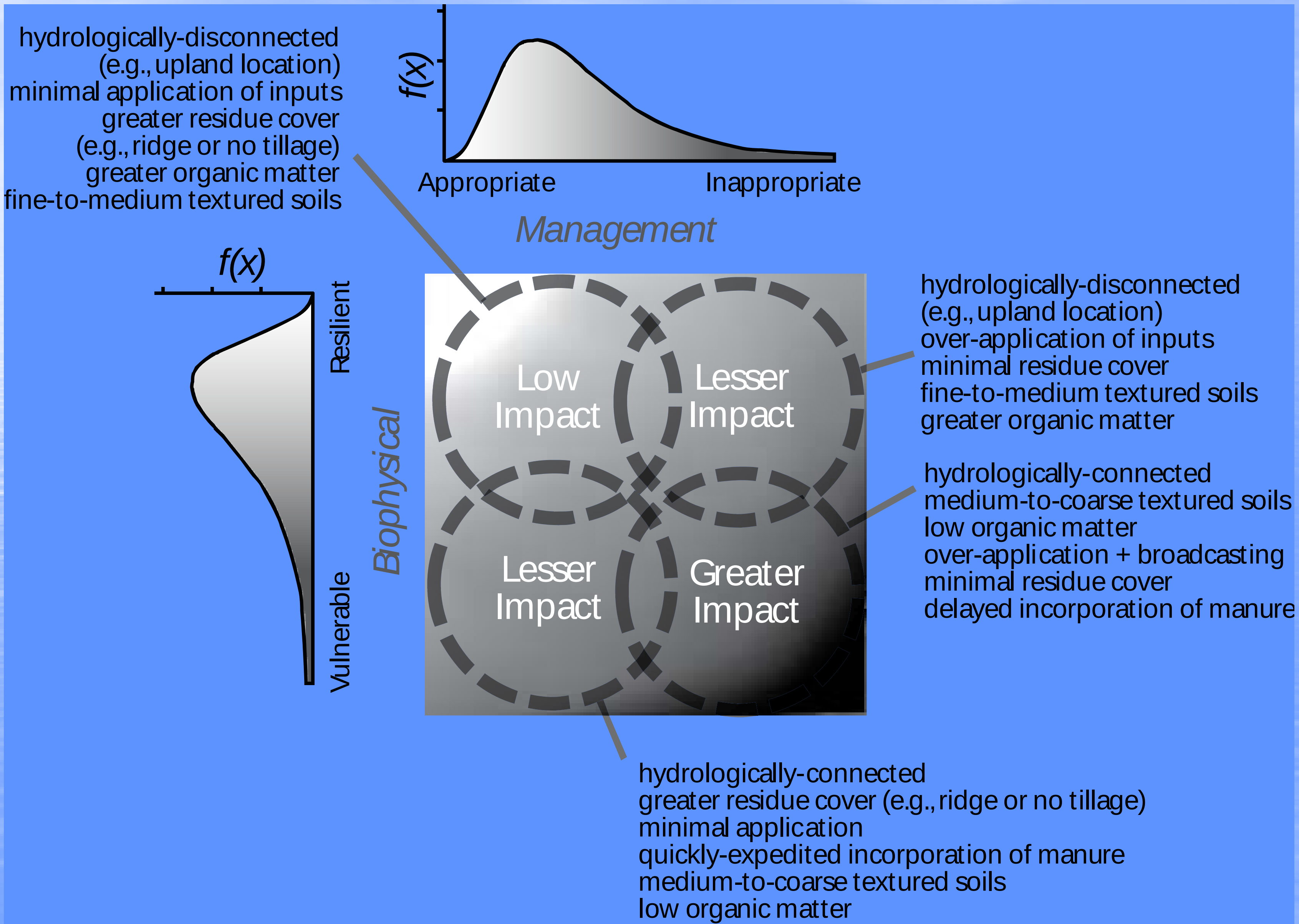
"Normal" behaviors in a vulnerable setting may have a significant impact on degradation processes.

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

Disproportionality



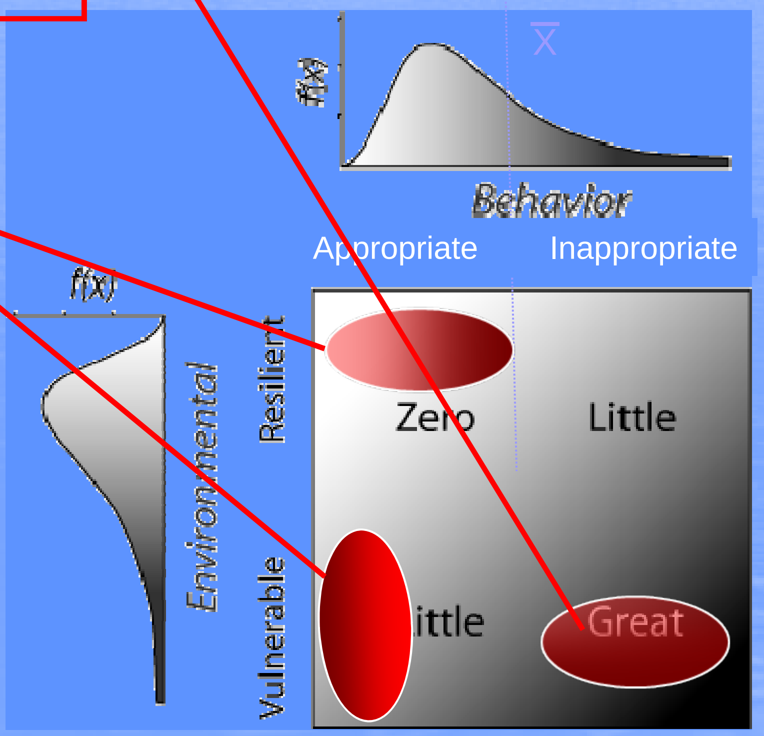
Disproportionality



What Should be the Focus of NPS Management?

Focus on Solving Problems

Focus on Managing Programs



Three Dimensions

The following three dimensions need to be treated as an integrated package. That is, one cannot focus on one or two to the exclusion of the others.

3 Dimensions

1. Assessment
2. Disproportionality
3. Inappropriate Behavior

Assessment

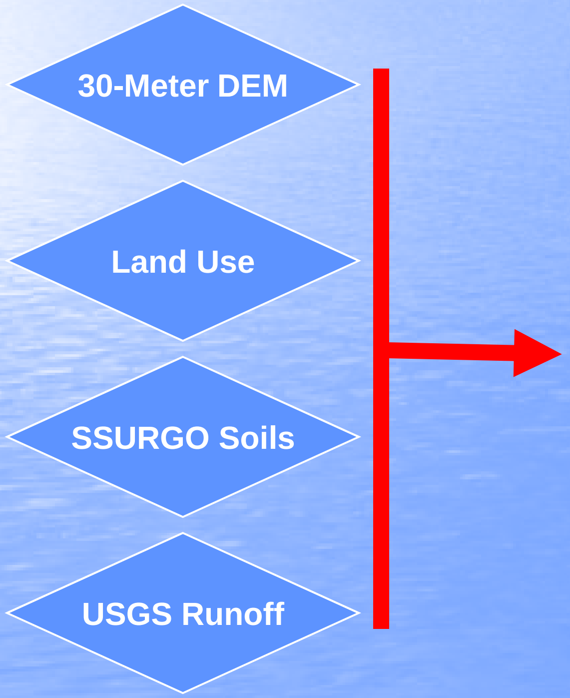
Assessment is the process of classifying behaviors into categories that are meaningful to underlying theories or models.

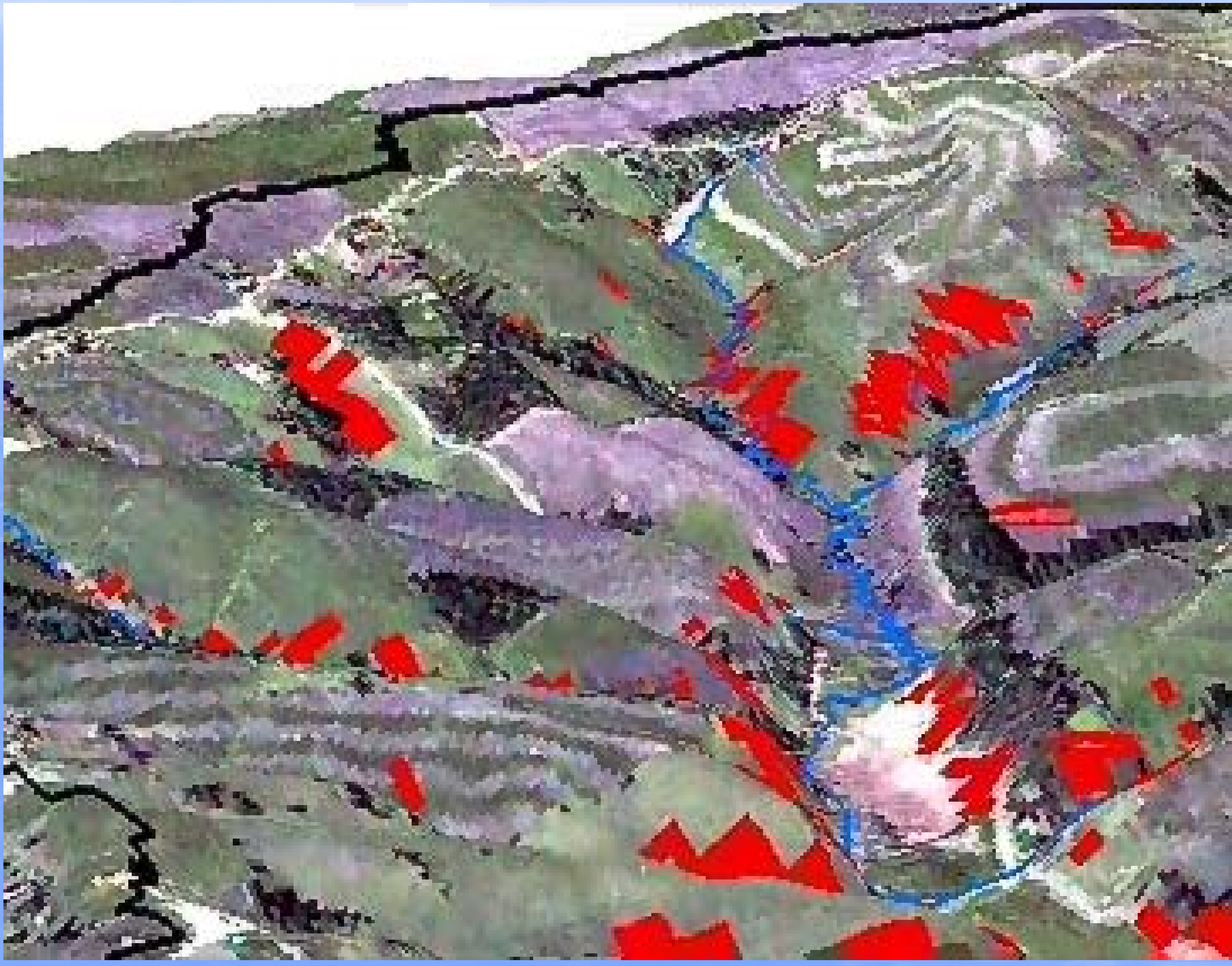
•Meaningful assessment is underutilized in our current water program efforts.

* Too much of the current “human dimensions” is based on political expediency/social marketing or, from a scientific perspective, is “fluff” at best.

Assessment

Land use behaviors in vulnerable areas are critical in assessment





Relief Exaggerated

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.

Inappropriate Behaviors

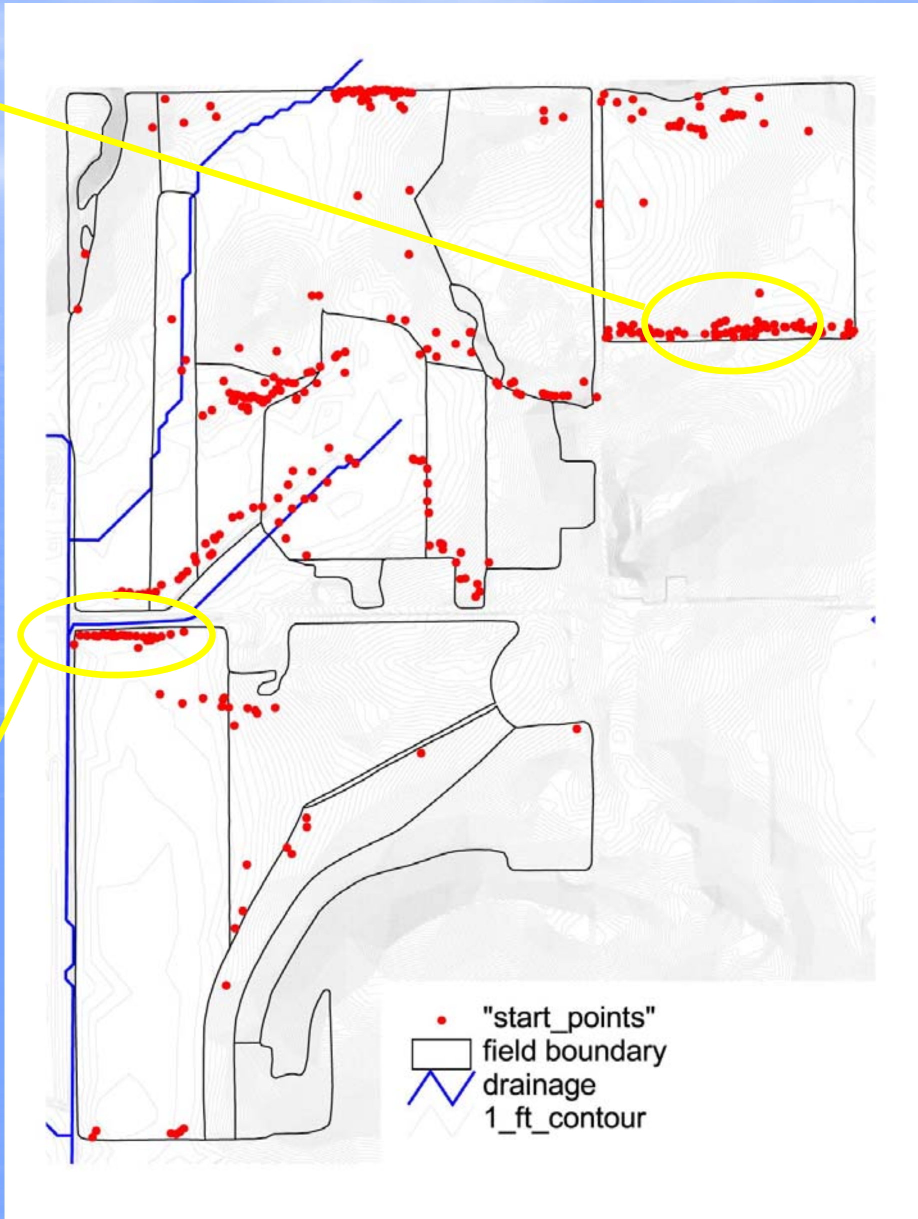
What is the explanation for inappropriate behavior in vulnerable or susceptible biophysical settings?

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

An Example

Appropriate

Starting points where spreader gate opened and PTO engaged across 24 month period



Inappropriate

Science Challenges

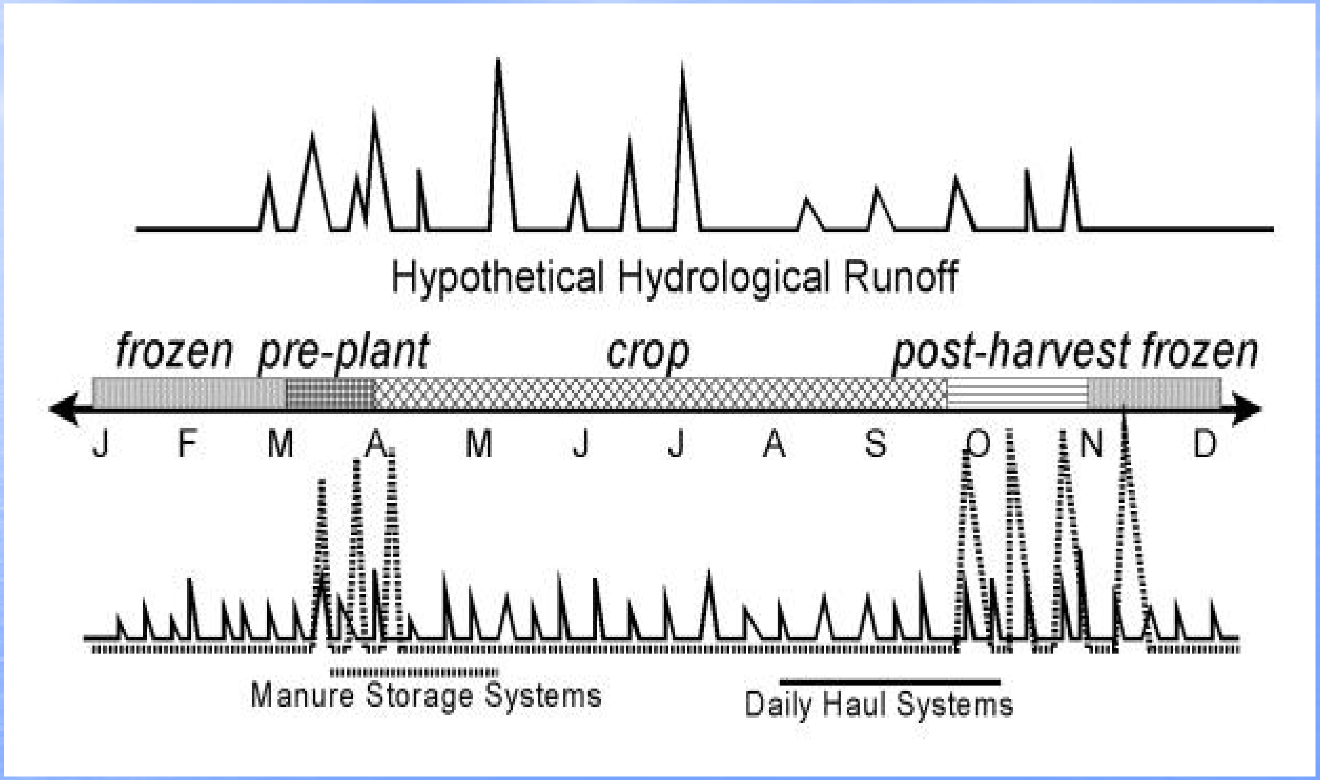
Non-linearity
Relationship between action and effect varies

Indirect effects
Impact of action depends on many factors

Uncertainty
Future changes and actions difficult to predict or measure

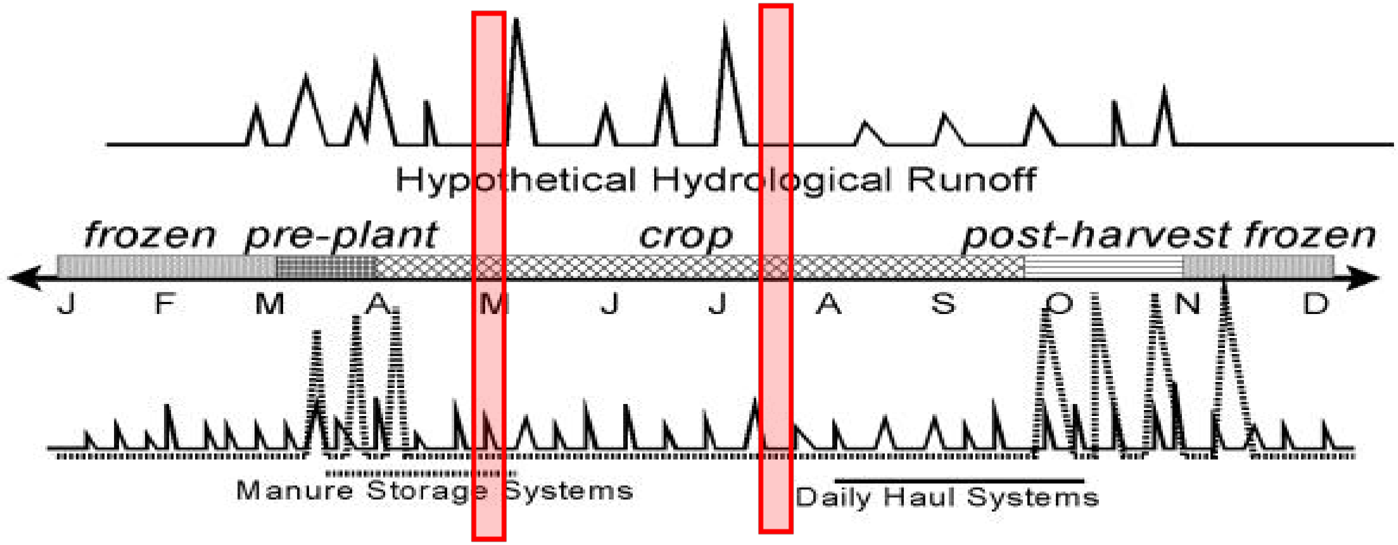
Incorporating the human dimension into natural resource management will not be easy, but "good science" never is.

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



Next Steps

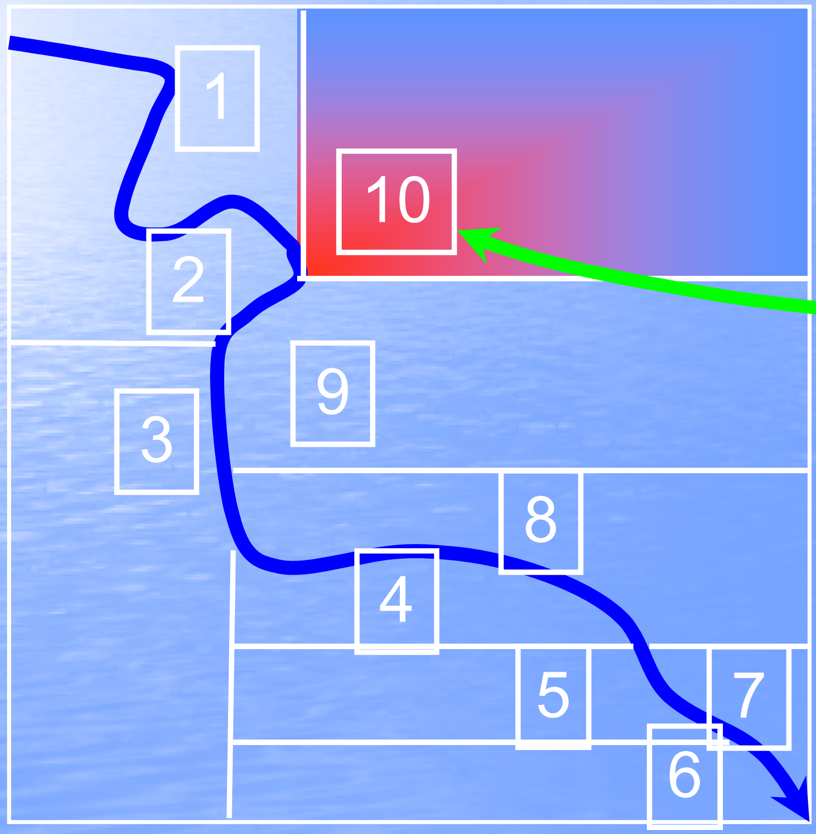
- Develop delivery system

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

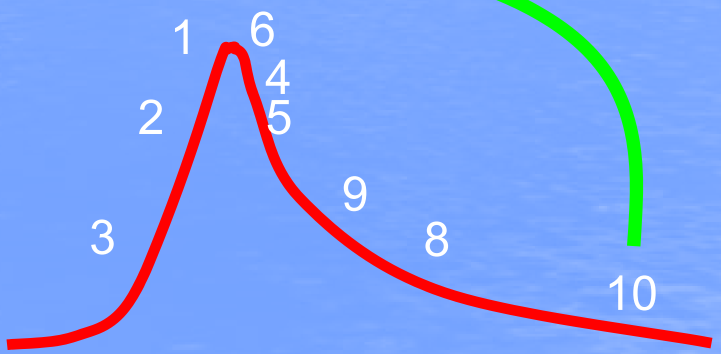
Example of Diverse Biophysical Resources

Loading in the
XYZ Watershed



Assume "behavior" measure is constant

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



Environmental Vulnerability

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

INTEREST	PERCENT RESPONDING 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 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

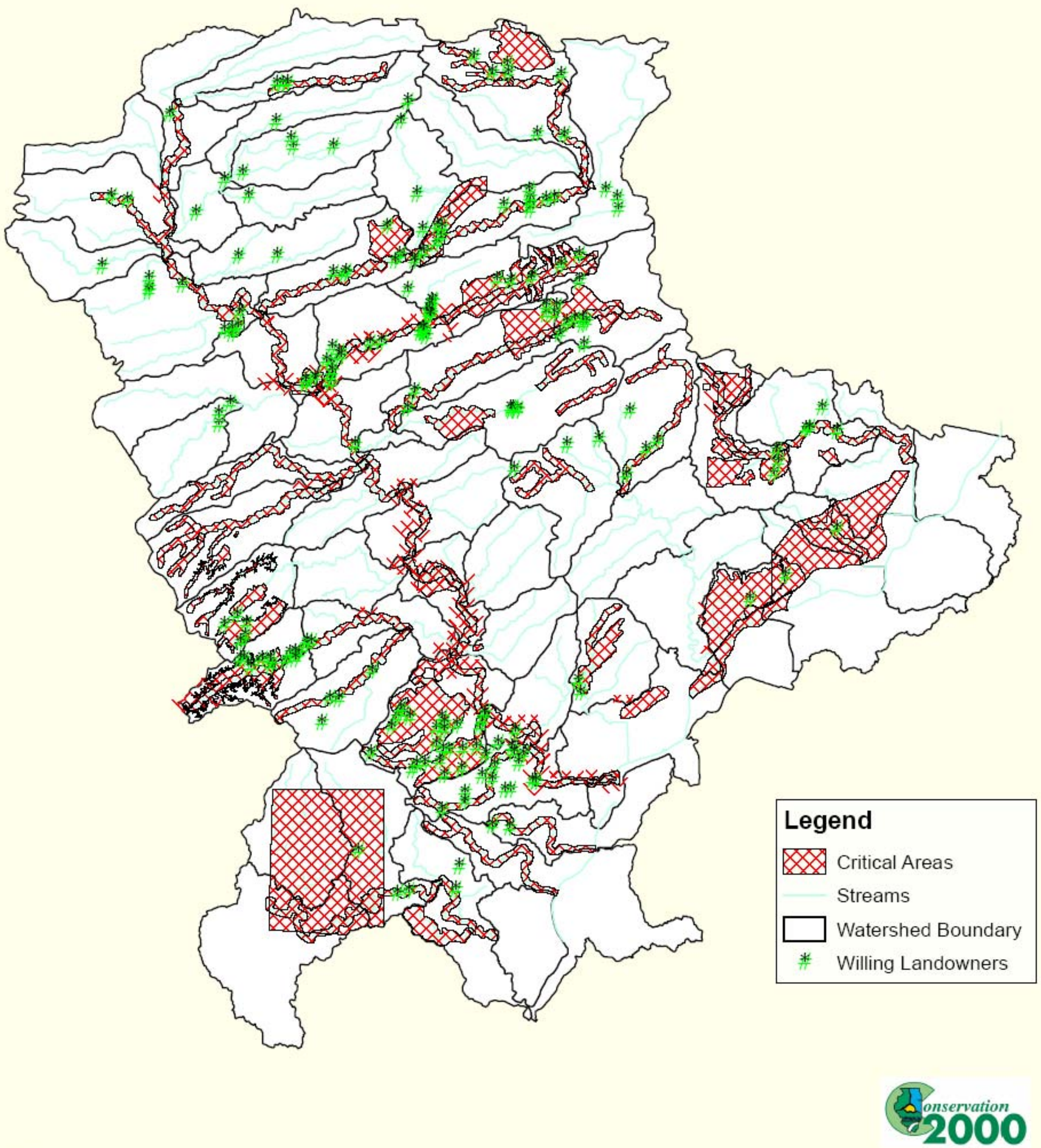
Table 26. Landowner survey: Self-reported obstacles to implementing conservation practices (N = 317).

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

La Moine River Ecosystem Partnership Willing Landowners and Critical Areas



2005

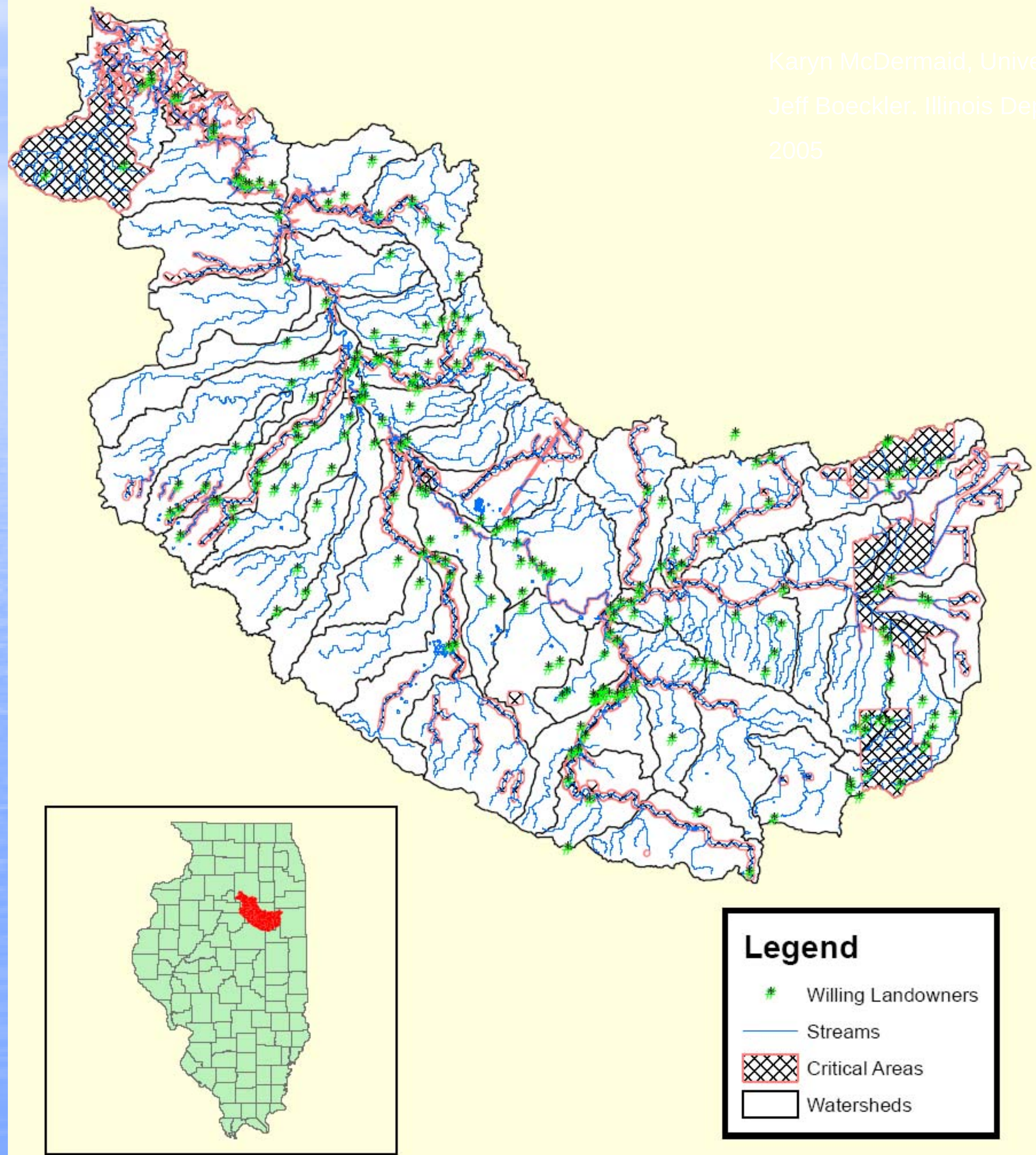
Karyn McDermaid, University of Illinois
Jeff Boeckler. Illinois Department of Natural Resources
2005

Vermilion Watershed Taskforce
Landowner Willingness

Karyn McDermaid, University of Illinois

Jeff Boeckler, Illinois Department of Natural Resources

2005



Defining the Problem

- Identify Challenges and Opportunities
  - Obstacles that prevent positive change
  - Condition that can make positive effect

Natural Resource Component

Fishery

Goal

Restore the cold water fishery

Objective

Reduce the amount of sediment by _*amount*_ by _*date*_

Objective

Reduce the amount of nutrients by _*amount*_ by _*date*_

Objective

Reduce hydrologic impacts by _*amount*_ by _*date*_

Objective

Natural Resource Component

Goal

Objective

Objective

Objective

Objective

Natural Resource Component

Goal

Objective

Objective

Objective

Objective

Lake Sarah Watershed Management Plan Turbidity Objective

Objective	Activity	Action	Responsibility	Time Frame	Cost Estimate
Reduce turbidity in lake by 15 % by June 2004	Install riparian buffers	Involve local land-owners	Partner group	July 2001 – July 2002	XXXX

How Do We Begin To Solve Water Problems?

We need to admit that we do not have all the answers, but need to design our programs so to give us the opportunity to learn.

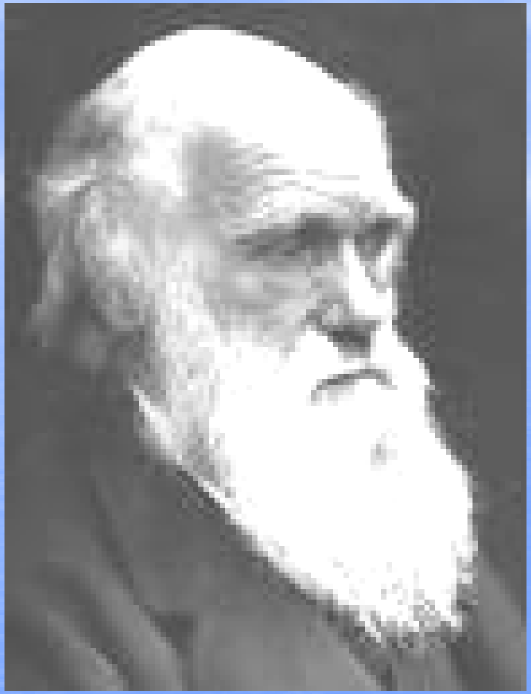
Understanding why traditional local implementation effort failed could be the key to success for future programs.

Adaptive Management

Conclusion

We have the capacity and knowledge to address the "human dimension" of water problems in a robust and valid fashion.

Who Is This?



Charles Darwin; “Origin of Species”

Who survives? --- not the strongest, not the most intelligent, but <u>those who adapt to change the best</u>.