Targeting Critical Areas and Scheduling Implementation

Thomas E Davenport

Davenport.thomas@epa.gov

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

How do we get there?

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.

A Definition

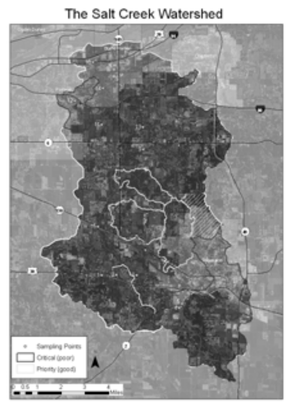
The human dimension of water resource management can be defined as the effort to classify, explain, predict and influence salient behaviors proportionate to their impact on water quality and quantity.

Getting it right

- Critical areas
- Delivery System (who, what)

Critical Area Types

- Restoration:
- Protection:



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

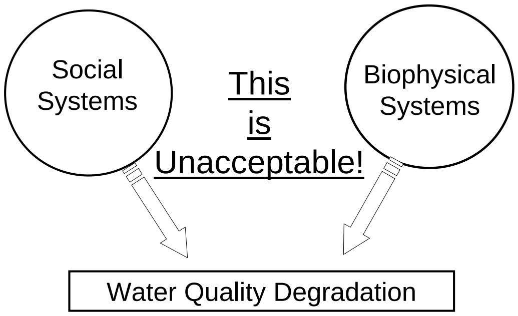
Approaches to NPS Pollution

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.

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.

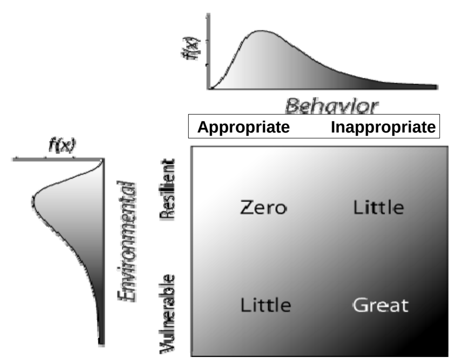
Disproportionality

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

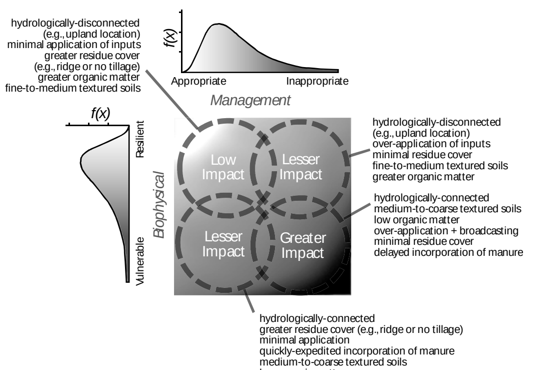
"Normal" behaviors in a vulnerable setting may have a significant impact on degradation processes.

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

Disproportionality



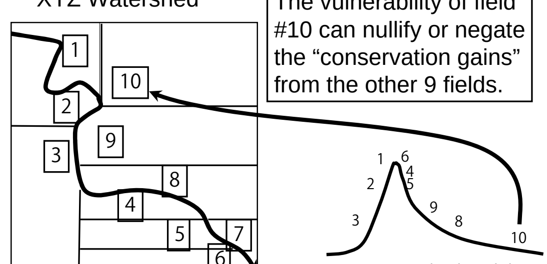
Disproportionality



Example of Diverse Biophysical Resources

Loading in the XYZ Watershed

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



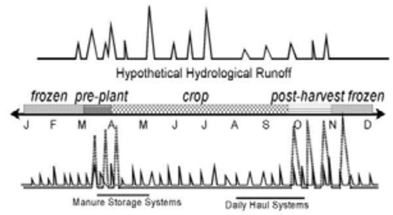
Assume "behavior" measure is constant

Why Assess Behaviors?

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

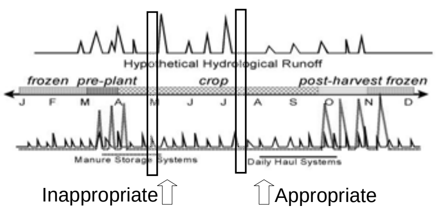
* If we want to advance science, then we need to assess the full spectrum.
* If we want to manage programs, then we need to assess receptive audiences within the program area.
* If we want to solve water problems, then we begin with those making disproportionate contributions.

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



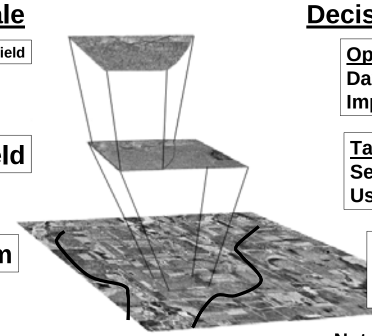
Scales of Management

Scale | **Decisions**

Sub-Field | **Operational** Day-to-Day Implementation

Field | **Tactical** Seasonal Use/Non-Use

Farm | **Strategic** Multi-Year Planning

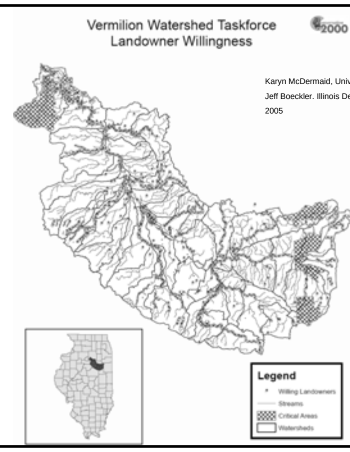


Watershed | **Not Considered**

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?



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

Karyn McDermaid, University of Illinois 2005

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

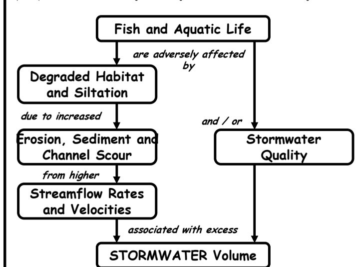
Table 26. Landowner survey: Self-reported obstacles to implementing conservation practices (N = 317).

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

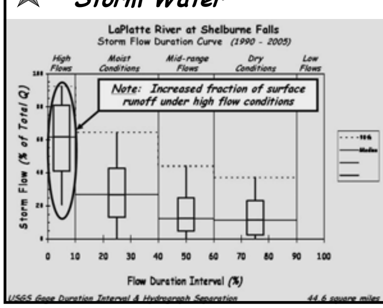
The Remaining Problem: Stormwater

- **Identify key relationships**



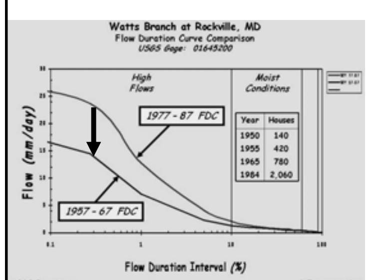
Issues

- ***Volume, Peak Flow and Timing on Delivery of "Storm Water"***



Basis of Management Approach

- **Hydrology-based Target**



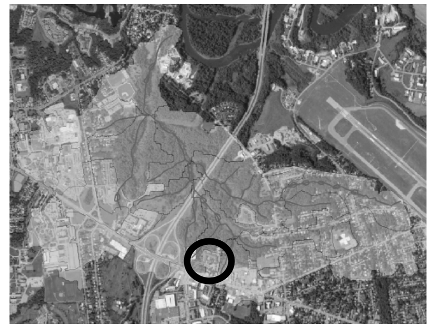
Identifying Implementation Sites in Critical and Priority Areas

Challenges

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

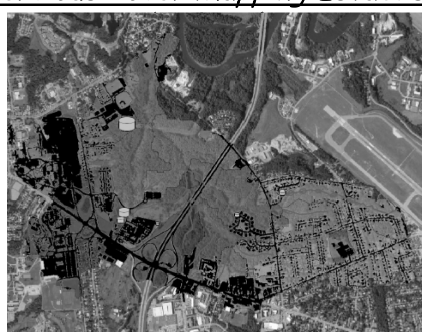
Targeting

Subwatershed Focus Based on Goals



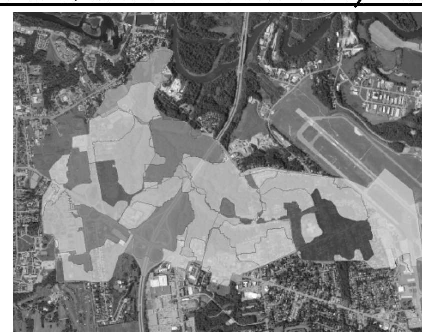
Targeting

Impervious Cover Mapping Establishing



Targeting

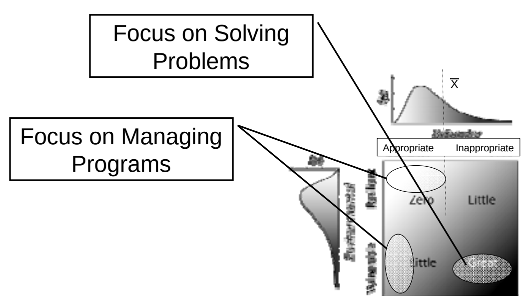
Spatial Watershed Sensitivity Analysis



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.

What Should be the Focus of NPS Control Efforts?



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

Conclusion

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