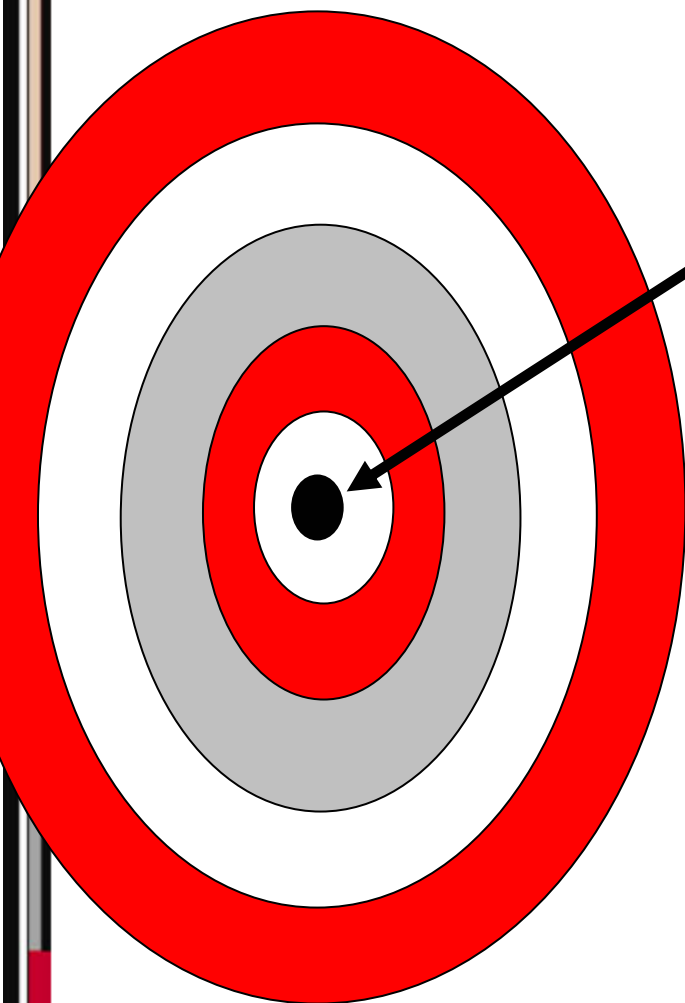


OUR'S IS A SMALL AND MOVING TARGET

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**OUR'S IS A
SMALL AND
MOVING TARGET :**

**managing agricultural
landscapes to improve
water quality**

What is targeting?

- the focusing of practices on specific places in the landscape where they will have the greatest benefits (small target)

“Certain portions of the landscape are either especially sensitive to human activities or strategically located to mitigate environmentally detrimental impacts of human activities.” (Walters et al. 2006)

- the focusing of practices at specific times when they will have the greatest benefits (moving or changing target)

Targeting is not a new concept, e.g.erosion



Perspectives

- Landscape position matters
- Land parcels are inter-connected
- Landscapes are multi-purpose
 - landscape services are diverse
- Environmental protection has several objectives at once; multiple processes are important
- Appropriate “scale” depends on the objectives, management precision, and controlling processes

New Perspectives and New Tools

- Moving beyond
 - The field-level to landscapes and/or watersheds
 - Individual farmers to communities or groups of stakeholders
 - Local water bodies to distant water bodies
- Remote sensing, GIS, models, integration with local knowledge

The nature of pollutants differ

- Leaching of nitrate-N is very sensitive to N application practices but spatially extensive
- Runoff P losses are more sensitive to transport potential (erosion and runoff) and less sensitive to P application practices; spatially confined
 - 80% of the P loss may come from 10% of the watershed area

Best choice of BMP varies

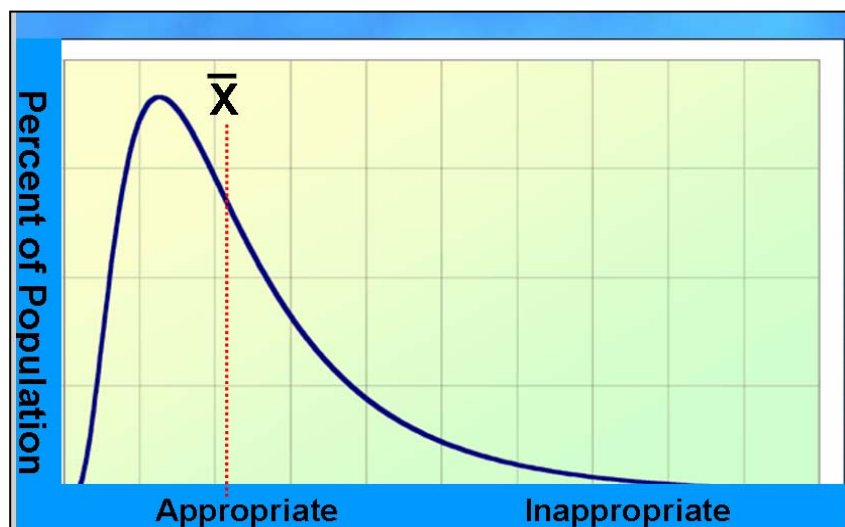
- Land type and use
 - Topography and geology
 - Land use
 - ✓ row crop vs. pasture
 - ✓ multi-purpose landscapes
 - Environmental concerns: nature of the pollutant; Local vs distant water body
- Socio-economics: cost:benefit ratios and cost share opportunities; tradition; markets; technology; peer pressure
- Unintended consequences
 - No-till sorghum may result in more atrazine in runoff
 - Tillage choice affects transport pathways
 - Feeding of ethanol co-products increases manure P

How good is farmer behavior in land and water resource management? Perceptions

- Lake Wobegon farmers: all are above average?
- Family farms do well; corporate farms do poorly?
- Most do poorly?

Adapted from Peter Nowak, U of Wisconsin

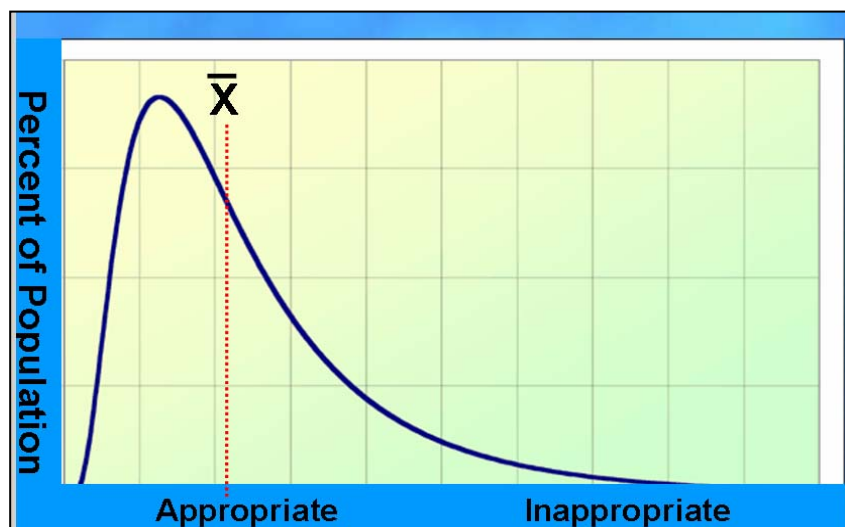
Most farmers have good land management practices



Inappropriate behavior may not be bad behavior

- Appropriate behavior in one place or time may be inappropriate in another
- Appropriate behavior for one pollutant may be inappropriate for another

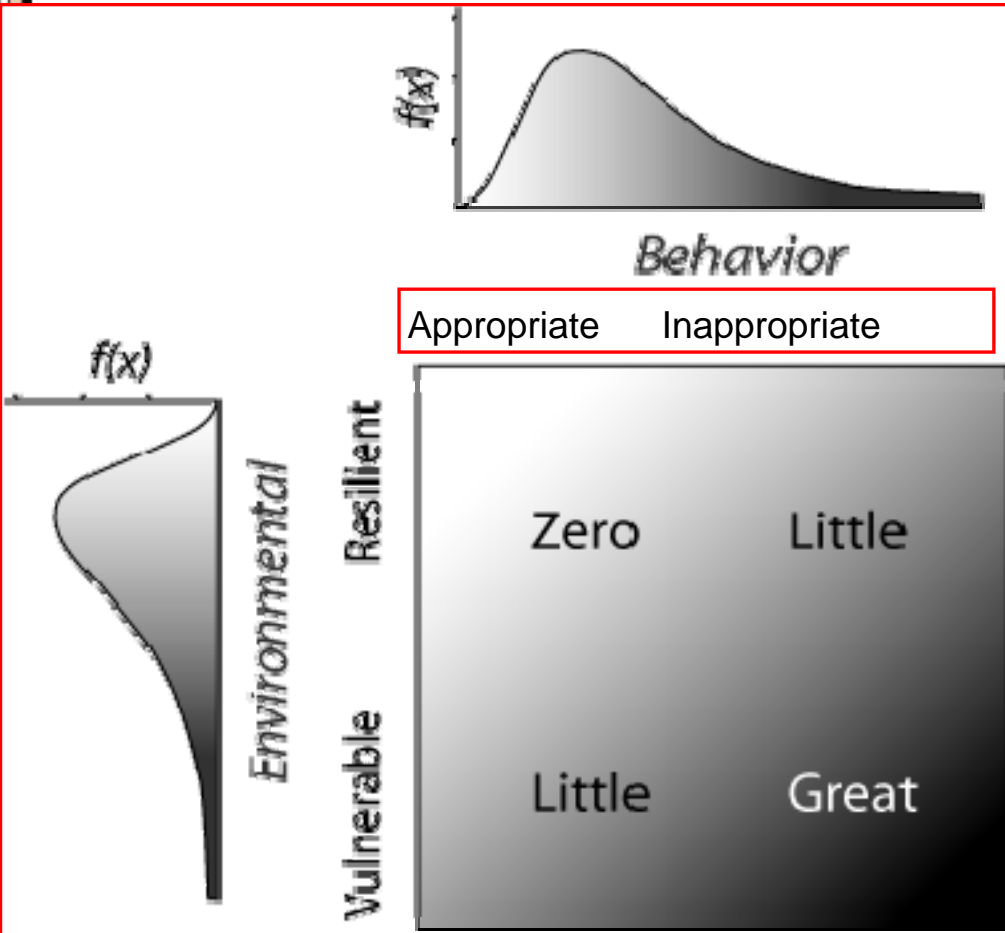
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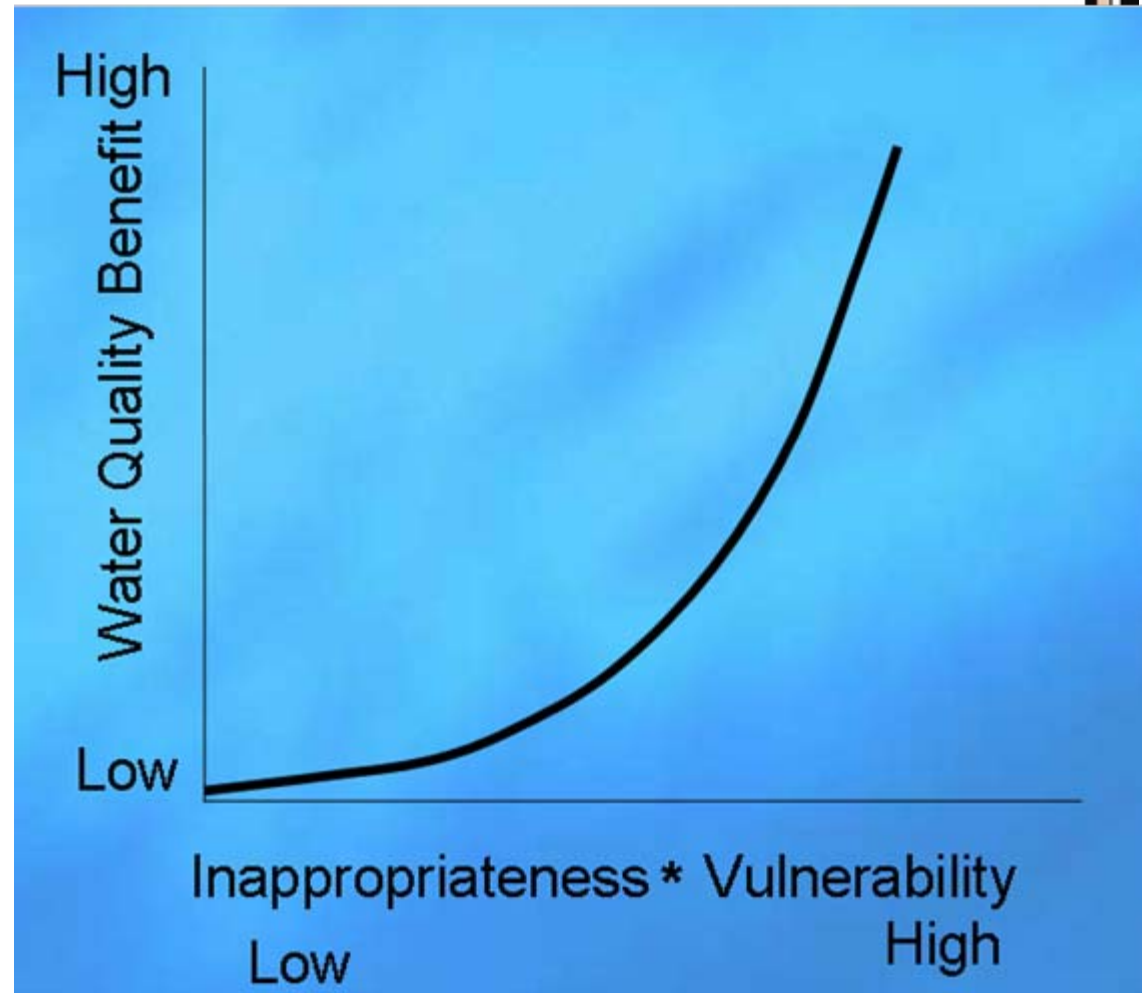
Landscape buffering capacity or resilience versus vulnerability or sensitivity may also have a log normal distribution with most having above average resilience.



Great impact can be achieved in cases of inappropriate behavior on vulnerable parts of the landscape.

Too much emphasis (e.g. cost share investment) on well-managed, resilient parts of the landscape has led to the perception of “random acts of conservation”.

The more inappropriate the behavior, and the more vulnerable the setting, the greater the potential water quality benefit.

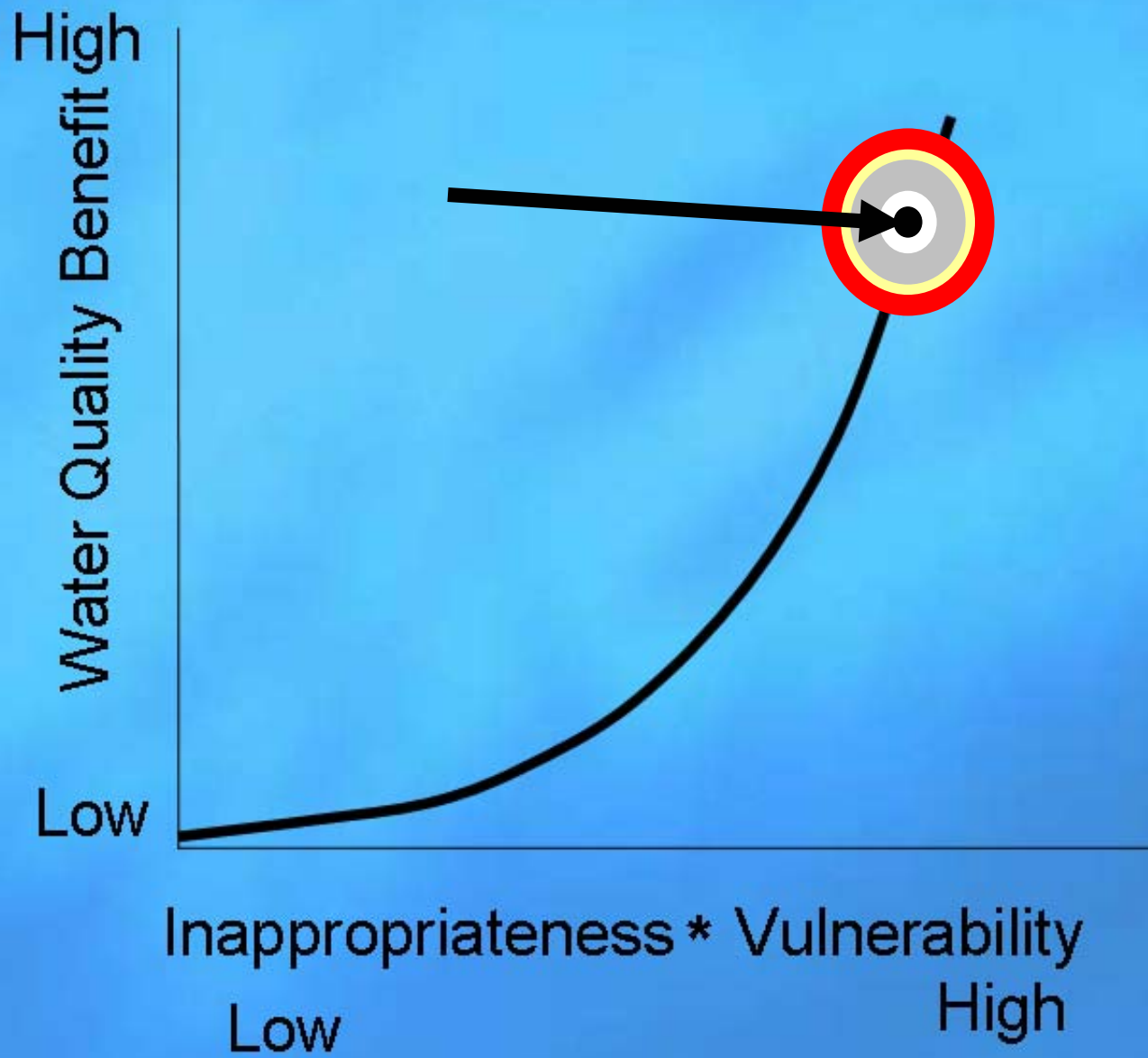


High
Water Quality Benefit

Low

Inappropriateness * Vulnerability
Low High





Issues

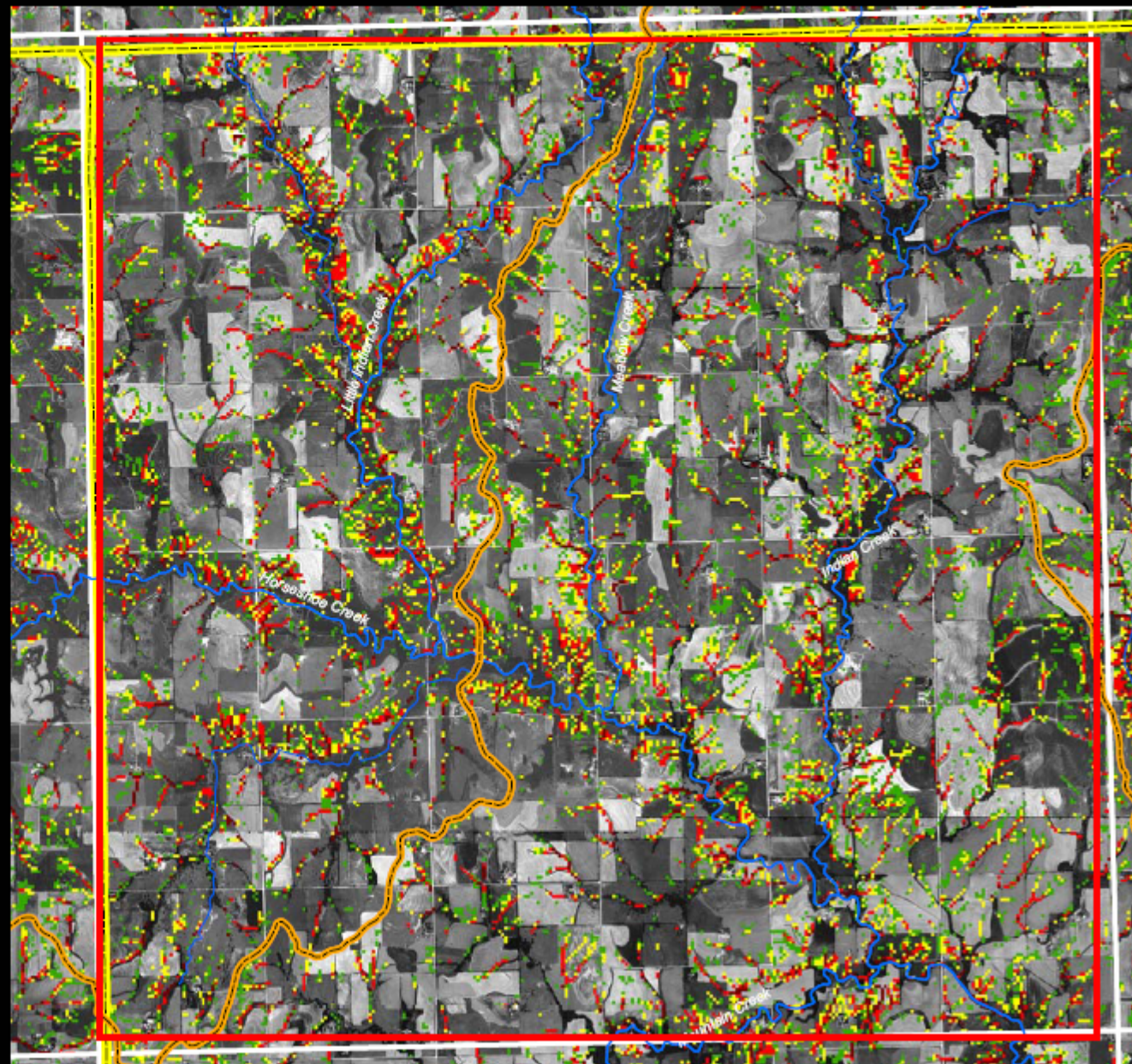
- Are technologies that were designed to over-ride or nullify agro-ecological variation most appropriate?
 - System/landscape heterogeneity and inter- and intra-connections
 - Interconnections between cycles: water, OC, N, P
- How important are the relative contributions of different temporal and spatial scales in choice of BMPs?
 - Hot spots and hot moments

Issues: DRIP (data rich, information poor)?







- Geospatial data
- Models for spatial characterization, diagnosis, and pre-evaluation of solutions
- Need to integrate science with local knowledge and objectives; a challenge for extension
 - Work with stakeholders in watershed management
 - ✓ Bottom-up solutions
 - ✓ Bridge science and implementation
 - ✓ Evaluate program success, e.g. monitoring water quality
 - What is the role of semi-quantitative models, e.g. P indexes, in this integration?

Identify Erosion Potential

From: Jeff Neel



Sediment Potential

-  Low
-  Moderate
-  High
-  Very High
-  Extreme
-  Streams (NHD)

Nebraska Phosphorus Index

INSTRUCTIONS: Enter data in white cells. Indicate run, field name and option. Then enter all erosion data, runoff data next, and irrigation data.

Erosion Component Value **#N/A**

County **Adams** Note!

Soil Type

Gross Erosion (average tons /acre /year)

Note! Sheet & Rill (e.g. RUSLE2 value)

Estimate	Field Area (acres)	Tons (total)
Ephemeral 0.00	<input type="text"/>	<input type="text"/>
Gully 0.00	<input type="text"/>	<input type="text"/>
Factor 0.00		

Conservation Practices

Note!

Factor **1.00**

Landform Region

Till Plains

Select Landform Region >>>

Note!

Enter the distance in feet from the center of the field or management unit to the closest point where runoff enters a intermittent or perennial stream, river, or lake, or where runoff enters a ditch or channel, outside the field, that leads to one of these water bodies.

Factor **1.00**

Grassed Filter Strip Width

Note! **0-10 ft**

Factor **1.00** [393 Standard](#) [Hot Link](#)

Runoff Component Value **0.00**

Tillage and Cropping System

Enrichment Note!

Tillage System

Crop System Note!

Precipitation Factor	5.8
Runoff Curve Number	<input type="text"/>
RCN Fraction	<input type="text"/>
Factor	0.00
Enrichment Factor	#N/A

Phosphorus Test

Bray-1 P, Mehlich-3

Note!

Enter the P test result (ppm)

Factor (runoff)	0.05
Factor (erosion)	#N/A

Application Rate

Note!

Annual P application from all sources. pounds per acre

P₂O₅ elemental P

Incorporate or Inject Within 24 Hours

Factor **0.00**



Irrigation Component

Type of Irrigation

Manure Component

Note! Manure Application (tons/acre)

Erosion Estimator

Note! Sheet & Rill Erosion Estimate **#N/A**

P - Index Value

0 to 2 = Low risk

2 to 5 = Medium risk

5 to 15 = High risk

15+ = Very high risk

Nebraska Phosphorus Index



Widening the NPS application

- Currently, the P index estimates
 - Volume of runoff
 - Dissolved and sediment bound P
 - Erosion: sheet and rill; ephemeral gully
- Should we add N and maybe some pesticides?
 - Organic N and mineral N
 - Pesticide: solubility; rate of breakdown; application
- Should we add cost:benefit analysis for BMPs?
- Should we link it to ArcGIS for landscape characterization, evaluation of management alternatives, etc.?
- Potential for regional adaptation?

Thank you