MANAGING AGRICULTURAL CATCHMENTS FOR WATER QUALITY: ADDRESSING SCALES, UNCERTAINTY, COSTS, AND DEMONSTRATING SUCCESSES

Andrew Sharpley
Blue Waters, Green Pastures, and the Elephant
• **Scale**
  - Field
  - Farm
  - Catchment

• **Uncertainty**
  - Climate - non-manageable
  - Politics - external forces, manageable??
  - Landscape - inherent variability

• **Costs**
  - Who pays to tame the elephant?

• **Case studies**
  - Defining extent and magnitude of problem
  - Document water quality response to mgt. change
Conservation Effects Assessment Project (CEAP)

- Catchment scale
- 18 competitively funded
- 13 Government funds

Synthesis of progress
CEAP Synthesis Team
Led by Deanna Osmond, 2011

Assess each project
175 stakeholders interviewed
Conservation in action

• What works, doesn’t work, and why
• Where do farmers get information?
  ▪ Agency personnel
  ▪ Farmers
• Lessons learnt
  ▪ Researchers

CEAP Synthesis, 2011
What worked

- Conservation tillage
  - Saved farmers time and money
  - Trusted equipment available - John Deere
- Off-stream watering
  - Farmers saw improved cow health
What didn’t work

- Stream buffers
  - They take valuable land out of production
- Nutrient management
  - Too complicated, with little farmer benefit
  - Farmers like to brag about yields not profits
  - Family considerations
- Compliance standards too rigid
  - Successful practices vary by region
  - Impracticalities

CEAP Synthesis, 2011
Where farmers get advice

- According to agency personnel -
  - Agency personnel
  - Field days, workshops, meetings & flyers

- According to farmers -
  - Other farmers
  - Self research
  - Too busy to attend fields days, etc...
  - Agency personnel - locally variable

CEAP Synthesis, 2011
Lesson from Lake Erie Basin

Maumee River catchment

Sandusky River catchment

OHIO

MICHIGAN

Lake Erie
Adaptive management may have reduced nutrient loss

- Incorporation of fertilizer and manure
- Winter cover crops
- Spring fertilization
But the reality is .......

- For farmers
  - Spring workload is huge
  - Fertilizer usually costs more in spring
  - Less soil compaction on frozen ground
  - More time-sensitive tasks in spring
• Researchers need to step back and look at the big picture
Discovery Farms Program

- Core farms that reflect “real-world” systems
- On-farm research and demonstration
- Address local and regional water issues
- Demonstrate success stories
One of the most important aspects is farmer involvement.
...... and farmer interaction
The Discovery Farm Program

Wisconsin - 2001: Dennis Frame
drframe@wisc.edu

North Dakota - 2007 - Ron Wiederholt
ron.Wiederholt@ndsu.edu

Arkansas - 2008 - Andrew Sharpley
sharpley@uark.edu

Minnesota - 2009 - George Rehm
rehmx001@umn.edu
What have we learnt from the Chesapeake Bay?
Living with uncertainty

- Large uncertainty in catchment modeling
  - Input & calibration data availability
  - Variable source hydrology poorly modelled
  - Fate & transport of P sources need updating
  - Confidentiality of information on BMPs installed
  - In-stream processing and legacy effects
  - BMPs effects not process-based

- Inherent landscape and BMP variability
Difference in land area (1.39 million acres) is greater than the State of Delaware (1.25 million acres)!!
Blue waters

Green pastures
The elephants

Public expects blue waters and green pastures

With predicted population growth, 50-100% increase in crops yields on same acreage

- Will create pressures to intensify
- Pressures to maximize yields
- Likely on less suitable lands
- Economics will remain a major driver
System response
System response drivers

- **Nutrients**
  - N - groundwater flow pathways 1 day to several decades
  - P - release from high P soils & fluvial sediments

- **Sediment**
  - Response more immediate - effect on light penetration

- Source complexity and lag times increase with scale
The bottom line

- Complex site hydrology turns everything on it’s head
- Robust monitoring to document change
- Accounting for the legacy of past mgt.
- Explaining legacy effects
  - Reduce public disillusionment and impatience
Herding elephants

- Policy requires black & white guidelines
- Science tries to account for all variables and situations
- Realistic goal setting
- Targeted management in an equitable manner
How do we get people living in catchments to own projects & provide solutions

How can we link fields to farms to landscapes to catchments

What is the nutrient attenuation between farm & impaired waters
Conference questions

• How do we adjust our value system to factor in well-being & cultural value equally

• With limited resources how do we consider on-farm “human variability”

• What tradeoffs are we prepared to make to meet social, cultural, economic, & environmental well-being
Thank you ......