

First meeting, Ames  
September 21

# WATERSHED ADVISORY COUNCIL

# Agenda

- Introduction to “Reverse Auctions” and “Watershed Trading”
  - What are they?
  - How might they be implemented in Iowa?
- Describe our three research proposals
  - Our choice of watersheds
  - Goals of the research
  - Our approach to the research
- Role of Advisory Council
- Discussion

# **EPA TARGETED WATERSHEDS GRANTS PROGRAM**

## ***2008 RFP* : WATER QUALITY TRADING AND OTHER MARKET-BASED PROJECTS TO REDUCE THE HYPOXIC ZONE IN THE NORTHERN GULF OF MEXICO**

- Assess feasibility of water quality trading or other market-based projects
- projects must address reducing nitrogen, phosphorus, sediment, or other pollutant loadings that cause low oxygen levels in local waters
- Must be located within one of the three Mississippi River sub-basins with the highest nutrient contributions to hypoxia in the Northern Gulf of Mexico: the Ohio River sub-basin, the Upper Mississippi River sub-basin, and/or the Lower Mississippi River sub-basin.

# Three Proposals Funded

- Research Team: Cathy Kling, Philip Gassman, Manoj Jha, Keith Schilling, Calvin Wolter, Sergey Rabotyagov, Adriana Valcu
- Support of Iowa DNR
- Three watersheds: Boone, Walnut, and Raccoon
- Feasibility assessments of reverse auctions and watershed trading
- N, P, and sediment

# Reverse Auction

- Evaluate “feasibility” for all three watersheds
- Basic idea:
  1. Auction agency (gov’t or NGO) solicits bids from producers to provide conservation services
  2. Producers/landowners decide what conservation practices they would be willing to adopt on their land and their minimum acceptable price which they submit as a bid
  3. All bids are evaluated and the agency selects those that are most competitive to achieve their goals
  4. Selection criteria can depend on the goals of the agency
    - simple (lowest cost providers)
    - or complex (use fancy models and genetic algorithm to optimize), or
    - Medium, something like CRP’s Environmental Benefit Index
  5. Agency contracts with winning bidders and water quality improves

# Reverse Auction

- Market-like properties
  - Induces competition between suppliers (farmers) so that agency can get most environmental bang for its buck
- But, does not make conservation free!
  - Reverse auctions should help keep costs down, but don't eliminate costs

# Watershed/Water Quality Trading

- Theory
  - Cap-and-trade type system
  - Each producer faces a “cap” on emissions from field
  - Can meet the cap either by installing practices to achieve the cap OR by buying credits from other producers who have more than met their cap by their conservation programs
- Existing examples are sparse: almost all cases of successful trading are driven by point sources

# Water quality trading

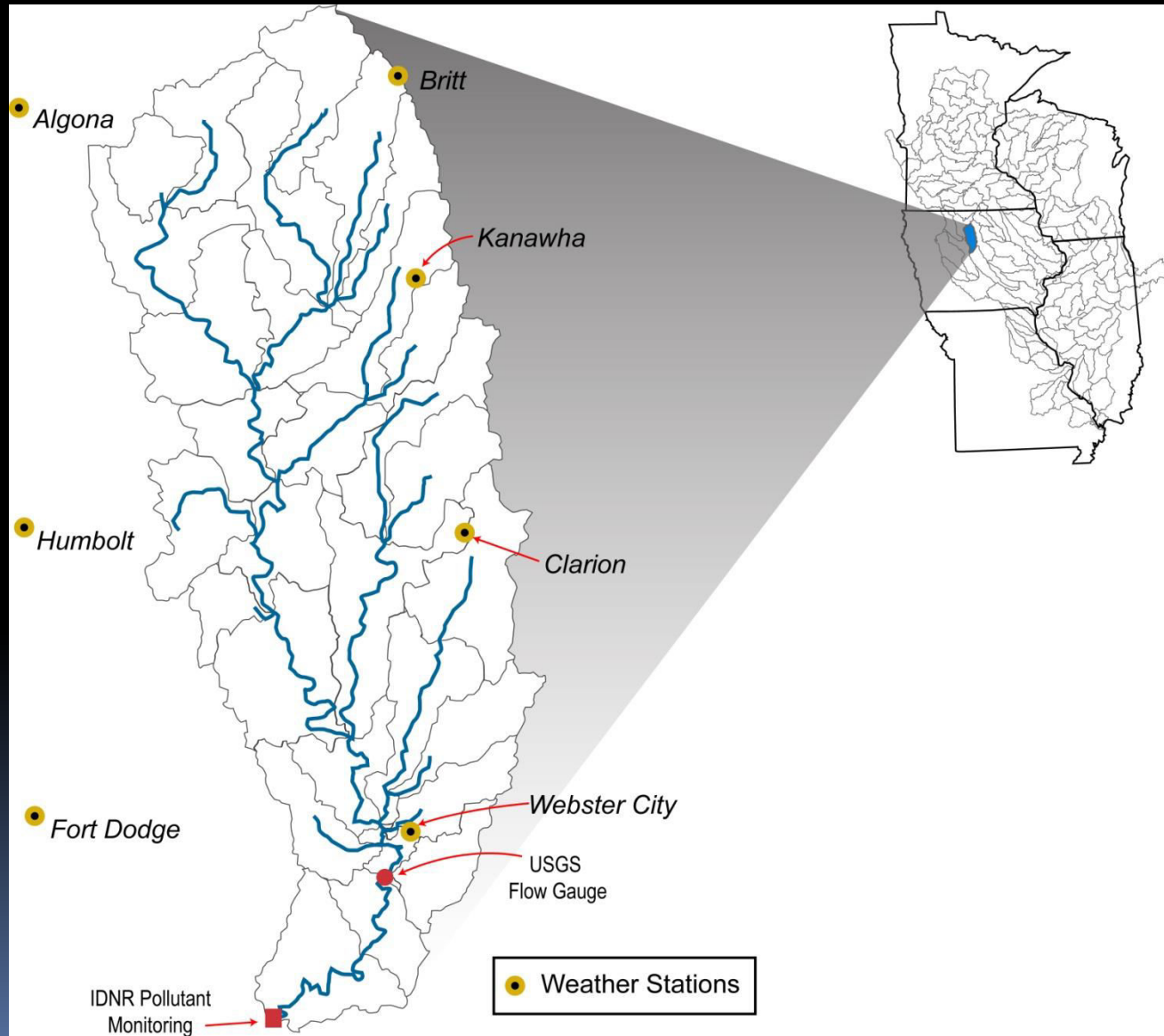
- What would be needed to really do this?
- A cap!!
  - Water quality trading can achieve a cap at a lower cost than alternative approaches, BUT IT CANNOT BE EXPECTED TO IMPROVE WATER QUALITY BEYOND A CAP (a legally enforceable requirement)
  - Only “point” sources currently face emission caps and there are relatively few of them in the watersheds of interest
- A measurable “emission” which can be traded, ideally N, P, sediment that leave a field would be easily measured and verified



# Differences between Reverse Auctions and Trading

- Who pays?
  - Reverse Auctions: NGO, government bears initial financial burden
  - Trading: landowners/farmers bear initial financial burden
  - This is only initial incidence, expect market prices to adjust, tax payers to revolt, etc.
- Because of legal nature of regulatory requirements, Reverse Auctions likely to be easier to implement sooner than trading programs

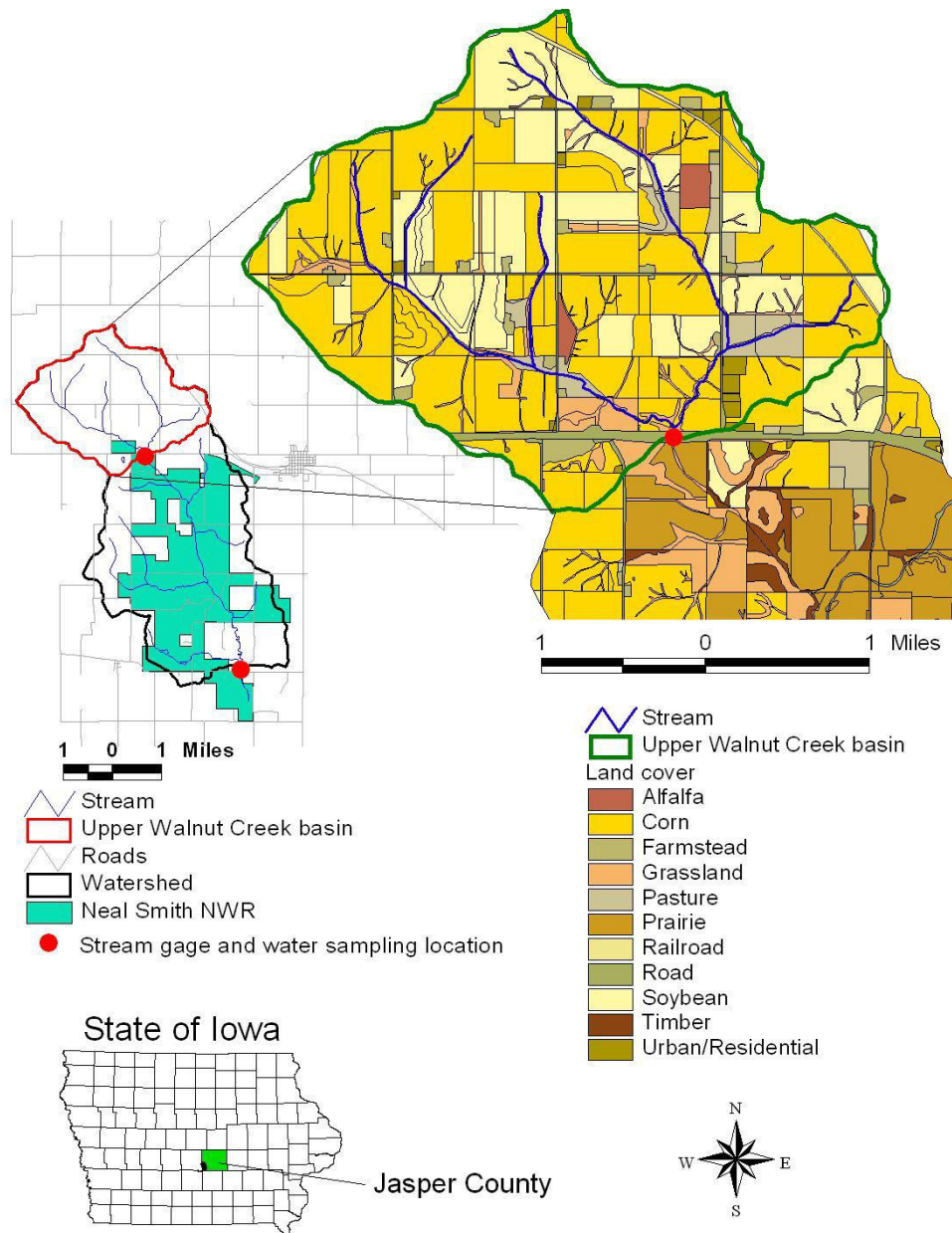
# Boone



# Boone – reasons for choice

- A number of highly engaged groups are undertaking projects in the watershed:
  - Iowa Soybean Association
  - TNC (identified the Boone as a priority watershed within the UMRB )
  - Prairie Rivers RC&D
  - Active farmers and others
- Our team is already working with these key stakeholders via the Boone River Watershed Project and we have done extensive data collection
- DNR has expressed in using various funding resources (Division of Soil Conservation funds, Iowa Watershed Improvement Review Board , USEPA 319 , etc.) to implement a reverse auction, and is interested in the Boone because...
- there is a TMDL in one of the subwatersheds and the Boone River has been identified as a protected waterway.

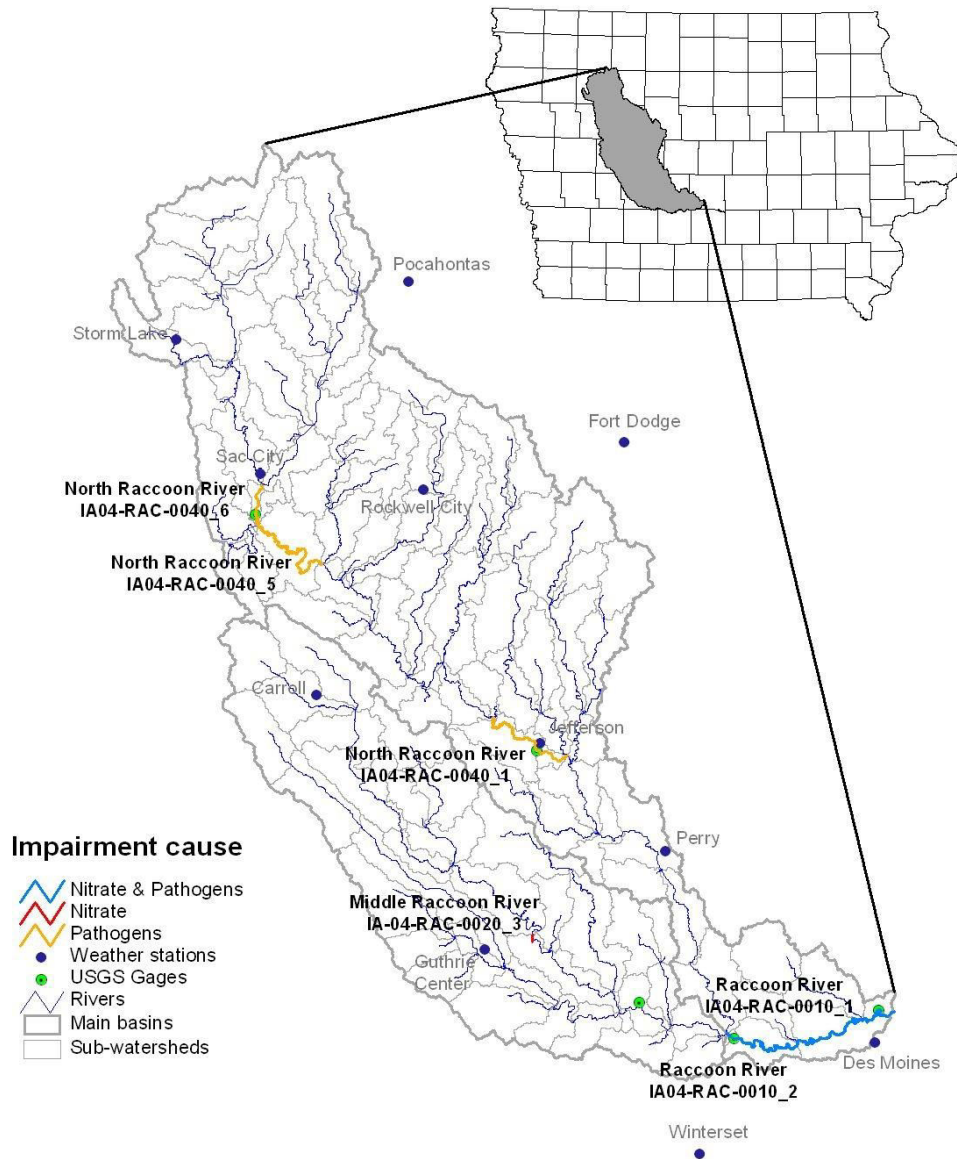
# Upper Walnut



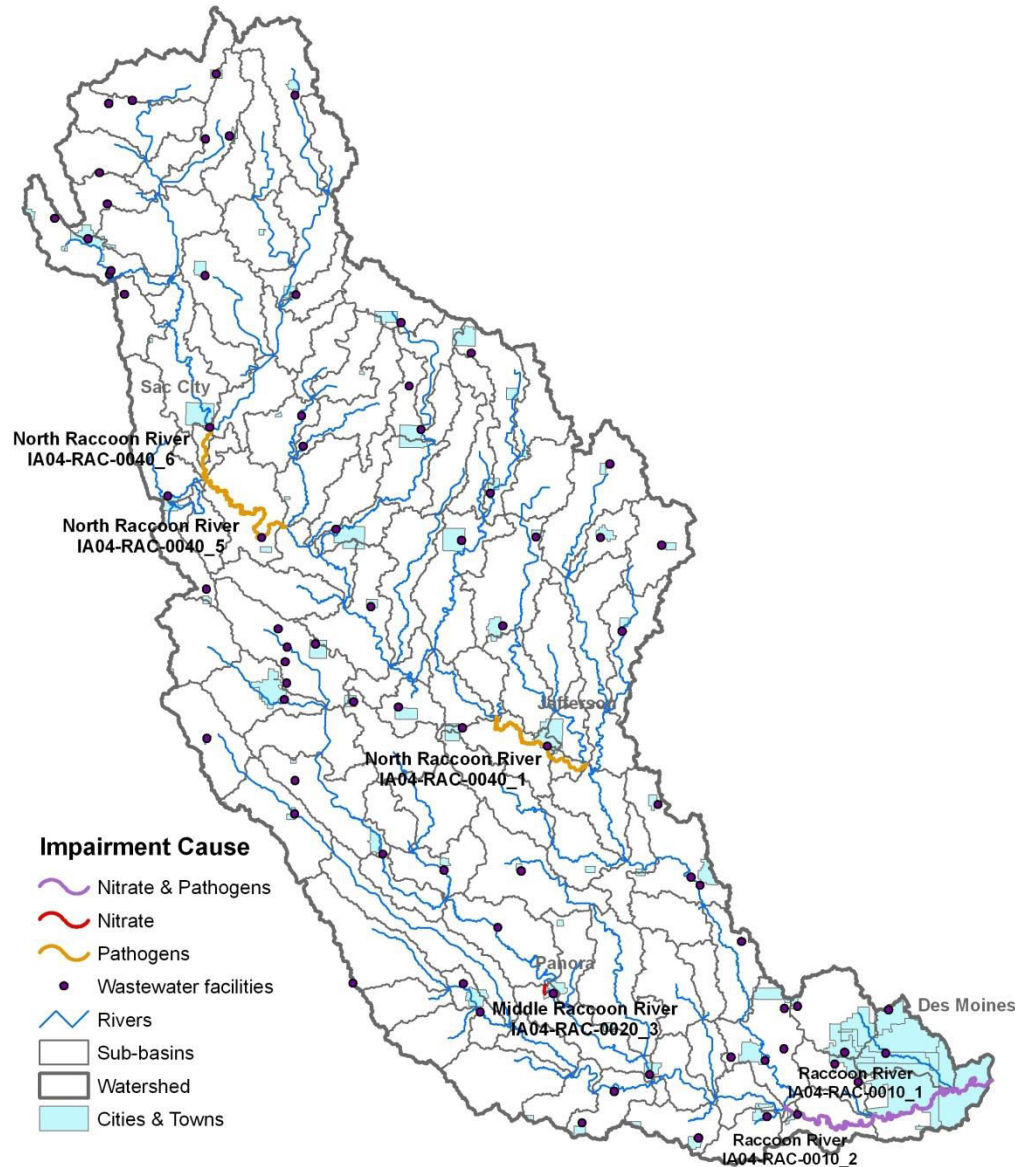
# Upper Walnut—reasons for choice

- Neal Smith National Wildlife Refuge was established in the Walnut Creek watershed,
  - large portions of the watershed are being converted from row crop to native prairie and savanna
  - this flagship project provides a perfect backdrop for an innovative implementation approach to water quality improvement
- Significant monitoring of water quality and analysis of the hydrology and water quality of the watershed is ongoing.
  - if a reverse auction were to be implemented, it would be possible to accurately assess the degree to which conservation practices implemented as part of that auction were responsible for water quality improvement.
  - Small size of watershed is ideal: small enough to detect changes in water quality affect the level of changes needed to be measured.
- Our team is already working with these key stakeholders via various projects and we have done extensive data collection
- Finally, there are long-established existing partnerships in the basin that would support the reverse auction concept, ranging from local landowners, county conservation officials and state and federal government agencies, including IDNR, IDALS, EPA and USFWS.

# Raccoon



# Raccoon point sources





# Raccoon – reasons for choice

- The Raccoon provides drinking water for two municipalities within the watershed: the Cities of Des Moines and Panora.
- Three segments of the Raccoon River within the watershed have been identified as impaired by nitrate (and five that are impaired for *Escherichia coli* (*E. coli*))
- Nitrate is introduced into the river via both point and nonpoint sources.
  - 77 holders of National Pollution Discharge Elimination System (NPDES) permits in the watershed, but they are not major contributors.
  - Nonpoint sources include agricultural, urban/residential, and background sources. The largest of these is agriculture which accounts for 48-60% of the total N loading in the watershed.
- A TMDL target of 9.5 mg/l was adopted for nonpoint sources which represents a margin of safety of 0.5 mg/l relative to the drinking water standard



# Reverse Auction Research Tasks



Task 1. Establish and Convene an Advisory Council

Task 2. Collect historical and current land use and water quality data for each watershed and use this data to calibrate the SWAT model.

Task 3. Collect cost data to represent willingness-to-accept of farmers for conservation practices

Task 4. Postulate a budget amounts for a reverse auction and simulate the outcome of a reverse auction.

Task 5. Repeat the feasibility assessment for multiple budget levels and evaluate the robustness of the findings with respect to the cost estimates.

# Role of Advisory Council

The role of this council will be to provide feedback to the feasibility assessment team before and during the assessment with respect to all aspects of the analysis.

Examples include the

- choice of the set of conservation practices
- Improved estimates of costs, especially how those costs might differ in different watersheds and
- Appropriate levels for auction budgets
- ways in which the auction might be most effectively implemented.

# Conservation Practices

- Terraces
- Grassed Waterways
- Reduced/no till
- Contour farming
- Land retirement
- N fertilizer reduction
- Cover crops
- Replacement of conventional crops with perennial grasses (biofuel feed stocks)
- Elimination of fall fertilizer application

**Table 2. Conservation Practices and Direct Cost Data**

<b>Practice</b>	<b>Mean, \$/acre</b>	<b>Standard Deviation, \$/acre</b>
Land Retirement <sup>a</sup>	148.1	21.7
Terraces <sup>a</sup>	36.6	15.8
Grassed Waterways <sup>a</sup>	5.5	1.3
No-till <sup>a</sup>	16.8	8.1
Contour farming <sup>b</sup>	6.6	-
N fertilizer reduction <sup>c,d</sup>	3.9	1.7

a. Kling et al. (2007)

b. Kling et al. (2005)

c. Sawyer et al. (2006)

d. Libra, Wolter, and Langel (2004)

# Role of Advisory Council

Bigger Goal?

“We anticipate significant insight and contribution of the Advisory Council with respect to .... the ultimate execution of the auction”

# Water quality trading: our study

## Perfect Fiction:

1. Assume a cap faced by everyone in equal share
  - Meet the TMDL designated used
  - Meet an overall 40% reduction in N and P from the watershed
  - Meet the eco-regional nutrient criteria??
2. Assume perfect measurement (as if our models and data are true and everyone agrees to them)
3. Identify the optimal set of conservation practices, their location, and what it would cost to achieve the various caps

Given that it is perfect fiction, why is this interesting?  
It's a best case scenario

# Water quality trading: our study

A more realistic alternative? A Point System:

- Each conservation practices assigned a point value
  - E.g., no till might be assigned a value of “50”
  - land retirement with perennial plantings might be assigned a “150,” etc
  - Points could be made to vary by soil type, climate, etc.
- Each nonpoint source would be required to adopt conservation practices whose value achieves a given total point value (say 100 for purposes of example) per acre of land. This represents a cap on each nonpoint source.
- Cap could be satisfied by adopting practices to achieve the required points.
- Alternatively, a landowner could adopt practices that more than meet the requirements; in this case, the extra points could be sold to landowners who chose not to meet their requirements.