



COST-EFFECTIVE CONSERVATION: USING A BMP AUCTION FOR TARGETING IN KANSAS

Herschel George

*Kansas State University
Watershed Specialist*

Craig Smith

*Kansas State University
Watershed Economist*

Outline

- ◆ Background of water quality problem/issue
- ◆ Results of a Kansas producer survey
- ◆ Implications of survey results
- ◆ Alternative approach used in Kansas
- ◆ Conclusion/Discussion

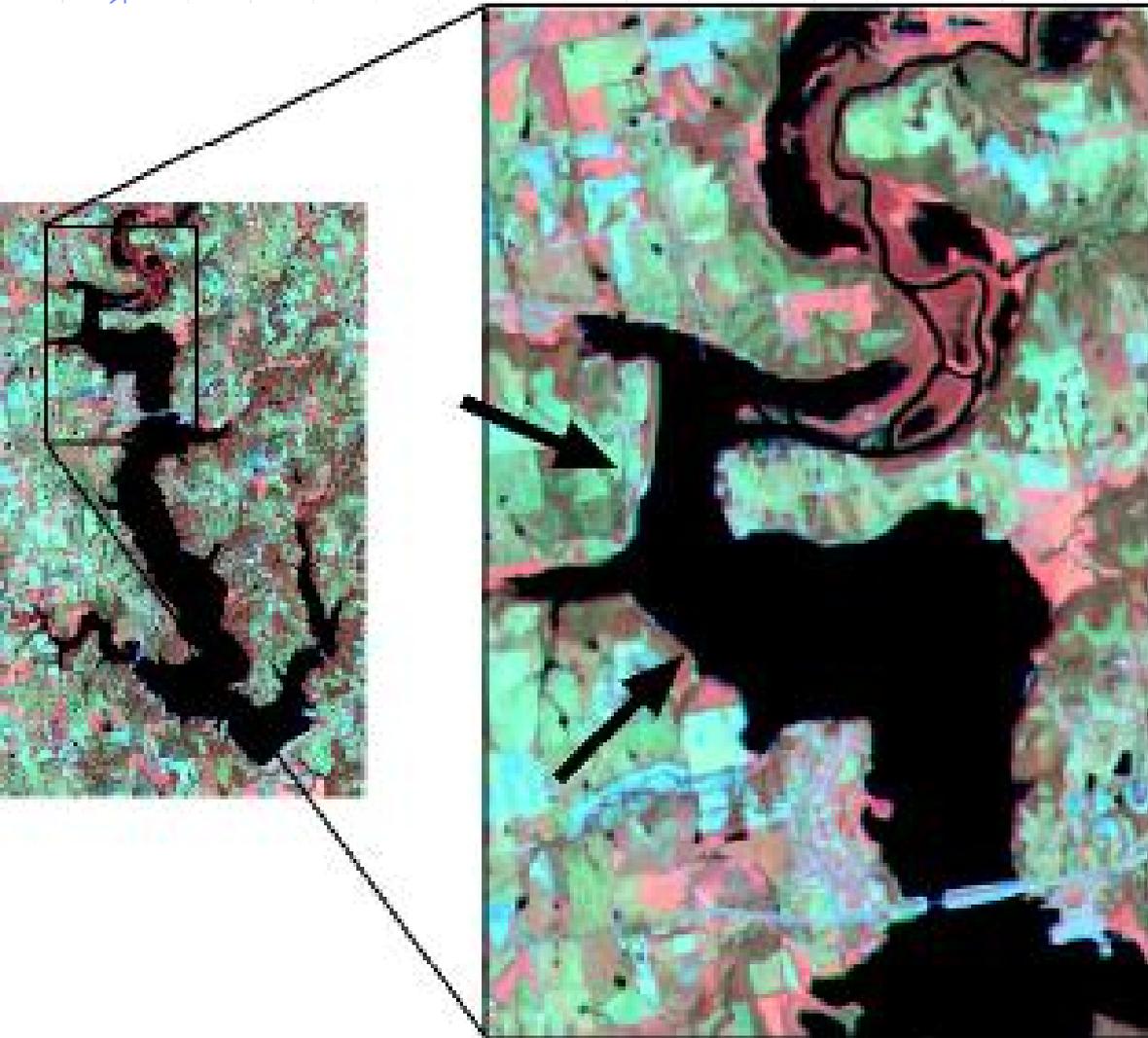
Excess phosphorous → Excess algae growth → Bad looking/tasting water



**Photograph of Tuttle Creek Lake
showing sediment accumulation.**



Reservoir Sedimentation Recreation Impacts – Perry Lake



September 28, 1982

Issue

- ◆ Since 1972 Clean Water Act – increased attention to nonpoint source pollution (sediment, nutrients, pesticides)
- ◆ Many years of effort and \$\$ spent on BMPs aimed at reducing NPS pollution
 - Osage County Conservation District formed in 1939
- ◆ Challenges remain
 - In Kansas (KDHE 2002), 76% of stream miles and 77% of lake acres were impaired for one or more uses
 - Traditional technical assistance/incentive-based programs unlikely to meet TMDL goals

Issue

- ◆ Adoption of BMPs is critical for restoring/protecting water quality
- ◆ Many cost-share & incentive programs in place but.....
- ◆ Many producers still choose not to participate
- ◆ Why is this the case?
- ◆ What are producer's thoughts & perceptions about BMP impacts on water quality and profitability?

K-State Study

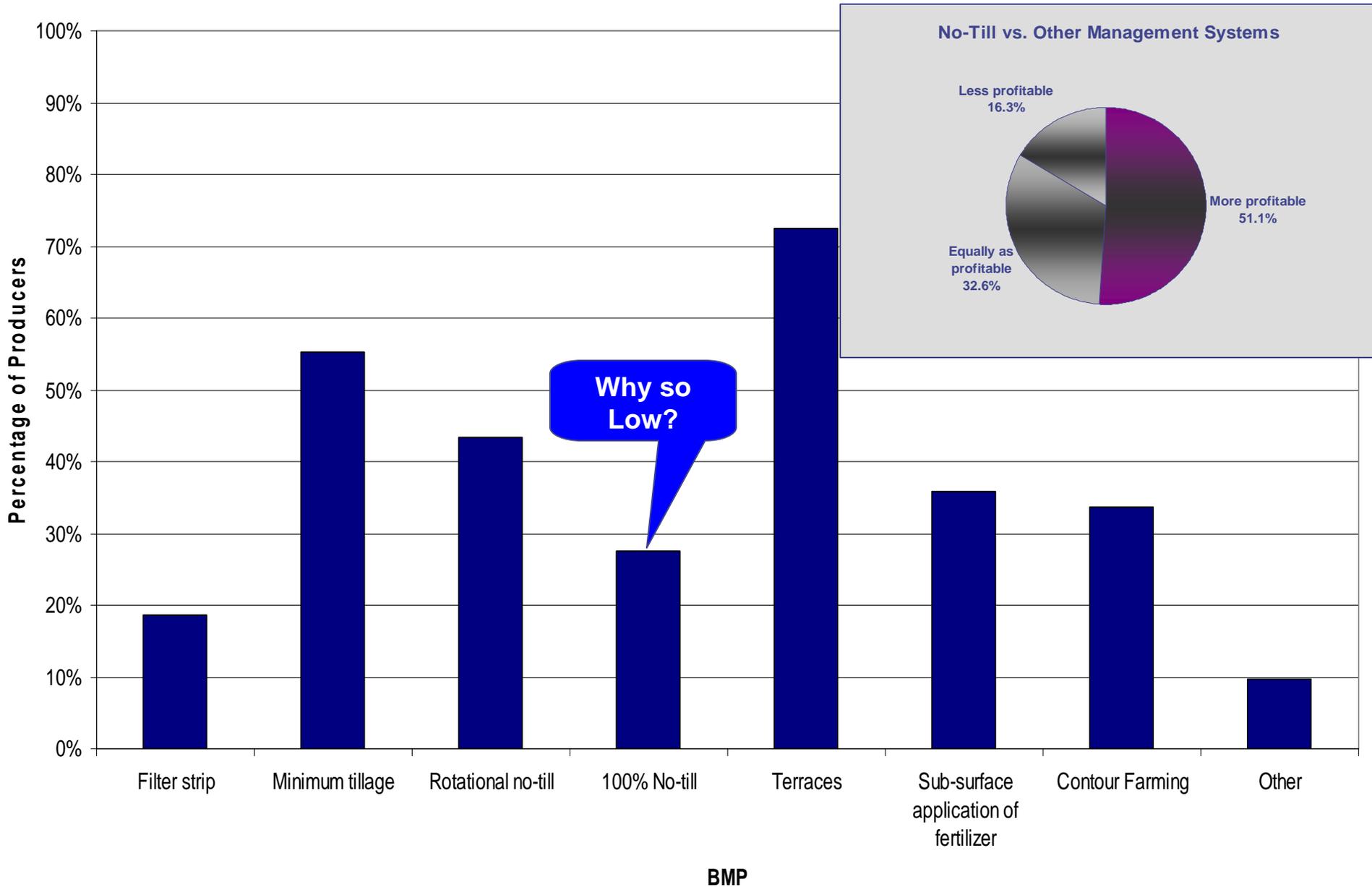
◆ Data from 136 producers from:

- 2006 Risk & Profit Conference
 - ◆ Ag. Profitability meetings:
 - Colby
 - Smith Center
- 2007 KS Farm Bureau YF&R Conference
(Young Farmers and Rancher)

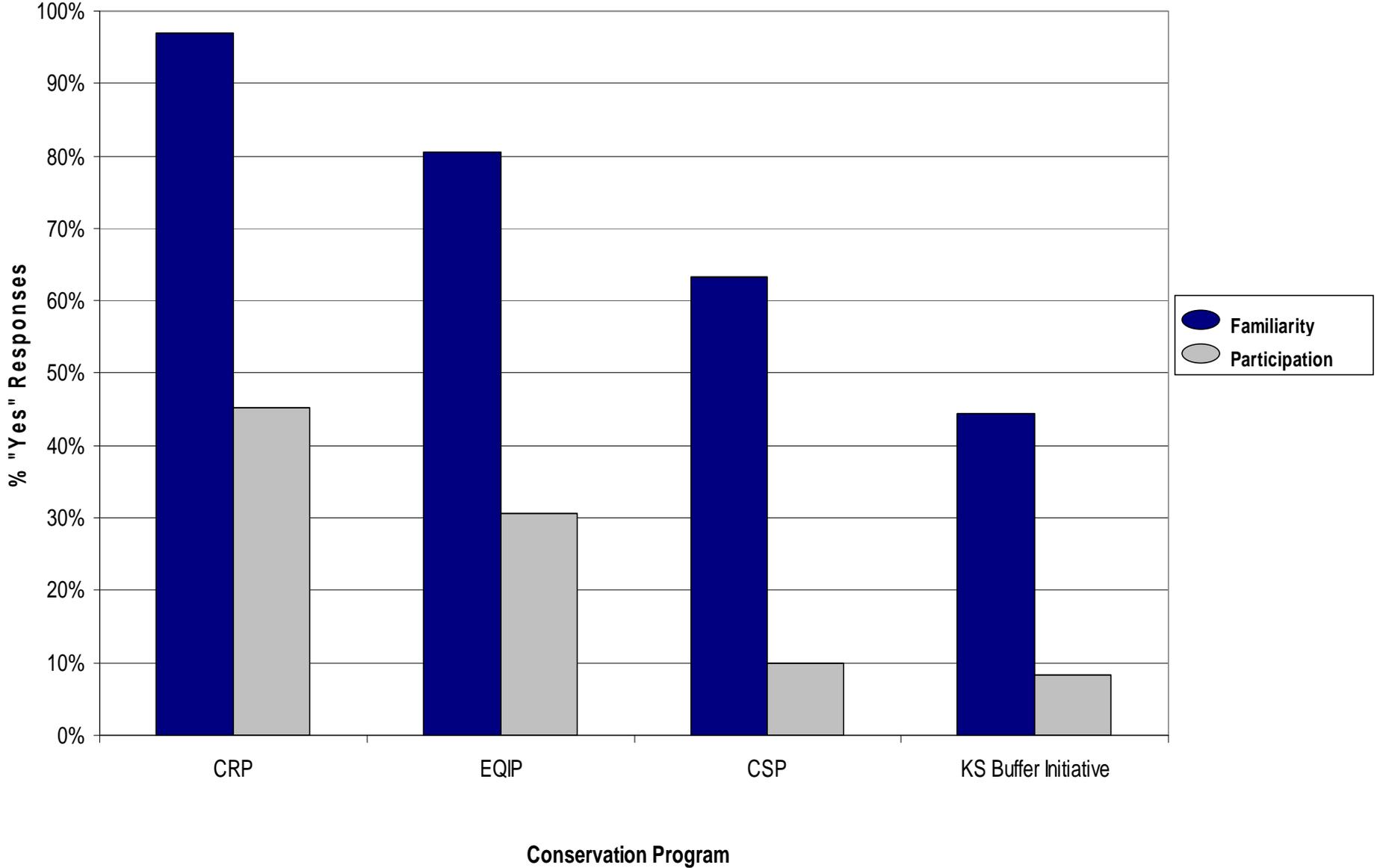
Surveyed producers

- ◆ Attitudes & behaviors about BMPs, conservation programs, and WQ
- ◆ Choice experiments with hypothetical WQT scenarios

BMPs currently in use in farming operation



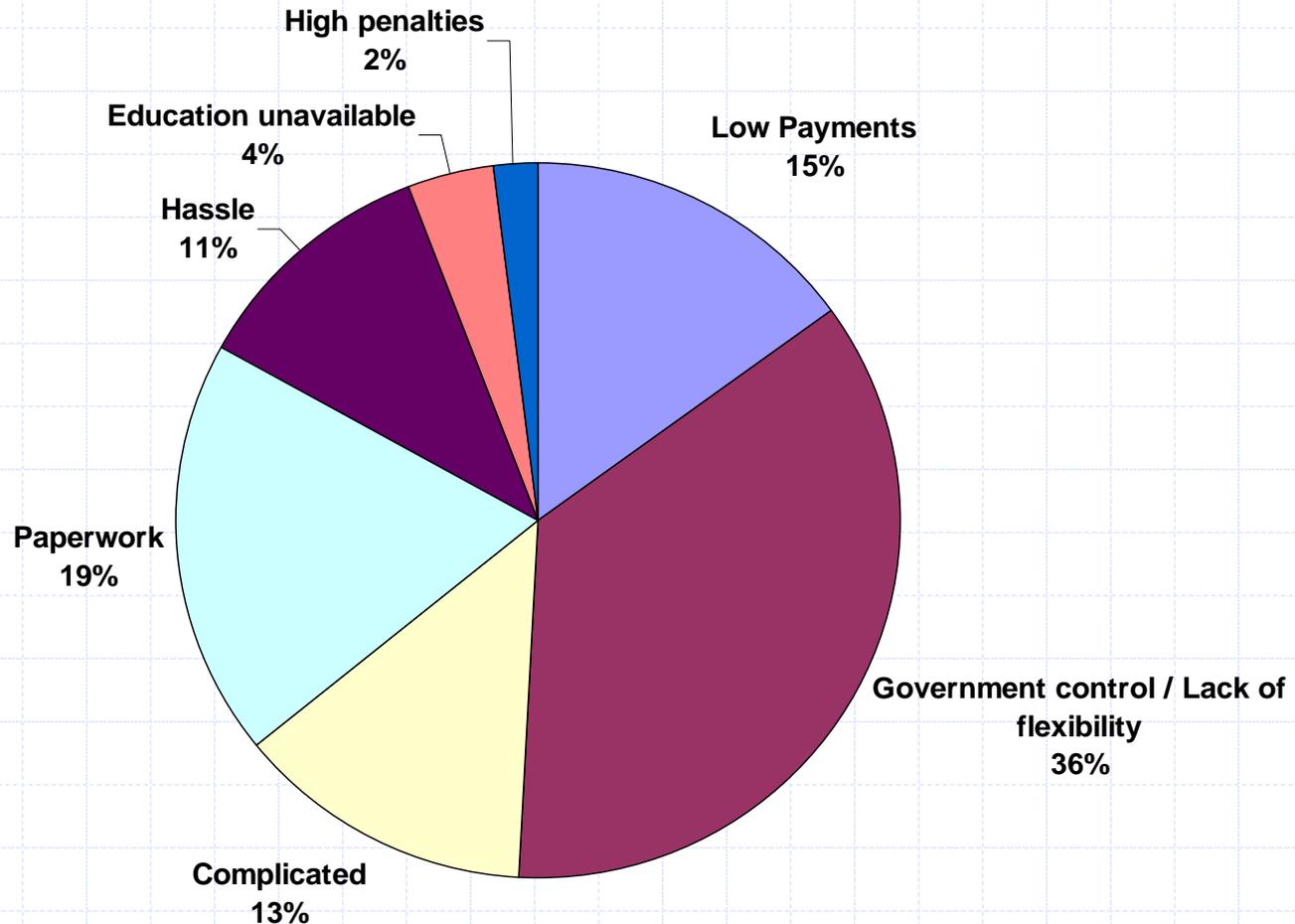
Familiarity and participation in Conservation Programs



Results

Perceptions	Strongly Disagree (-2)	Disagree (-1)	Neutral (0)	Agree (1)	Strongly Agree (2)	Mean Response
BMPs reduce nutrient and sediment runoff	2.2	1.5	5.9	58.5	31.9	1.2
Kansas surface water quality needs to be protected	1.5	1.5	3.0	60.0	34.1	1.2
Kansas ground water quality needs to be protected	0.7	0.7	3.7	55.6	39.3	1.3
Mandating BMP installation is unfair to producers	3.0	17.8	34.8	33.3	11.1	0.3
Environmental legislation is often unfair to producers	0.7	14.1	33.3	40.7	11.1	0.5
Kansas surface waters are polluted	0.7	21.5	34.8	38.5	4.4	0.2
Kansas groundwater supplies are polluted	1.5	30.6	39.6	27.6	0.8	0.0

Why do some producers choose not to participate in conservation programs?



Summary of Findings

- ◆ No simple answer to ↑ BMP adoption & participation in conservation programs
- ◆ Perception gap over severity of WQ problems between producers and govt. agencies
 - Producers agree that BMPs do improve WQ and that WQ needs to be protected
 - Many producers don't see what all the fuss is about
- ◆ Many producers say that participation is limited because of:
 - Excessive paperwork, program complexity, "hassle" of living up to program obligations

Summary of Findings

- ◆ Many producers uncomfortable with govt. control over their land-use decisions
 - Conservation Programs should limit the amount of restrictions placed upon enrollees
 - More flexibility
- ◆ Increasing payment levels could increase participation, but was not a major factor

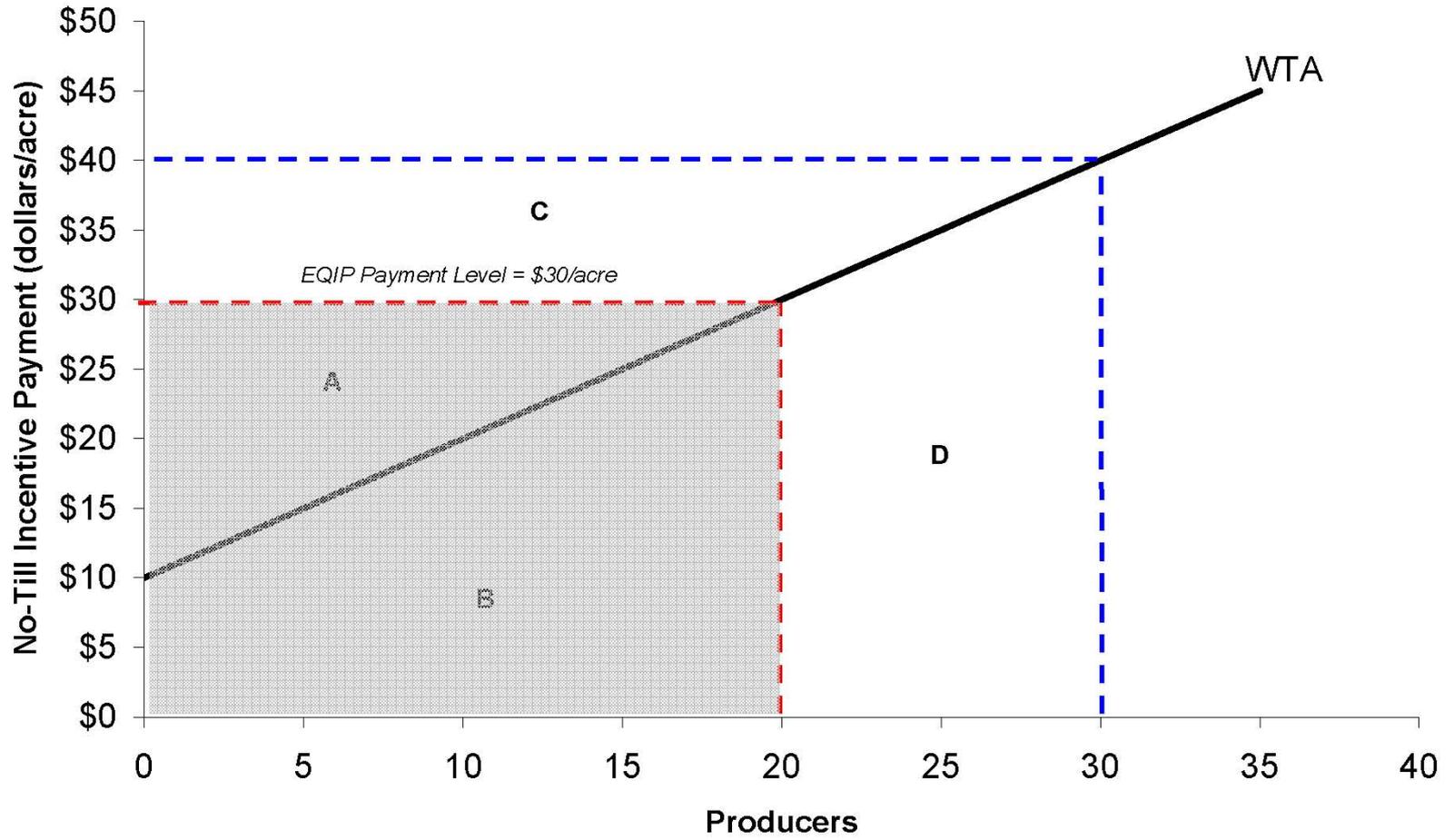
Market-based Approaches

- ◆ Much interest in market-based approaches
- ◆ NRCS Strategic Plan (2005-2010) lists “Market-Based Approaches” as one of three overarching strategies
- ◆ Success in Air Quality Trading
- ◆ Concepts now being applied to Water Quality Trading
- ◆ One hybrid-type approach to be used in Kansas:
BMP Auction

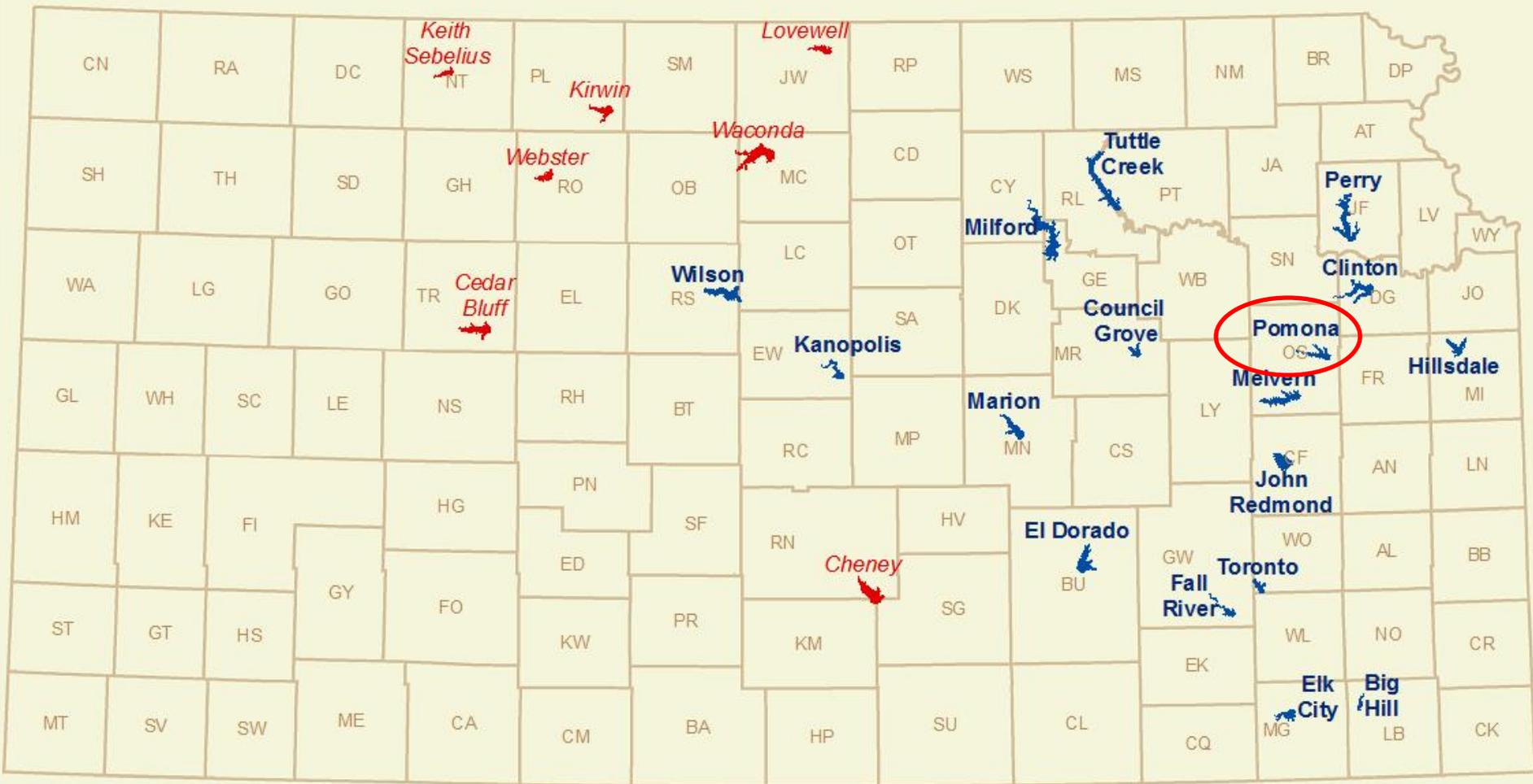
Possible Alternative – BMP Auctions

- ◆ Producers submit bids to supply the watershed with WQ improvements (to install a BMP)
- ◆ Bids are ranked by amount of WQ improvements generated per dollar (\$/ tons of soil saved)
- ◆ Producer who offers WQ improvements at lowest price is contracted with first
- ◆ Process repeated until a predetermined point is reached (maximum of dollars spent, a given cost/unit or ...)
- ◆ BMP auctions identify and purchase the most cost-effective WQ improvements for a specified budget

Comparison of Traditional Conservation Programs to BMP Auctions

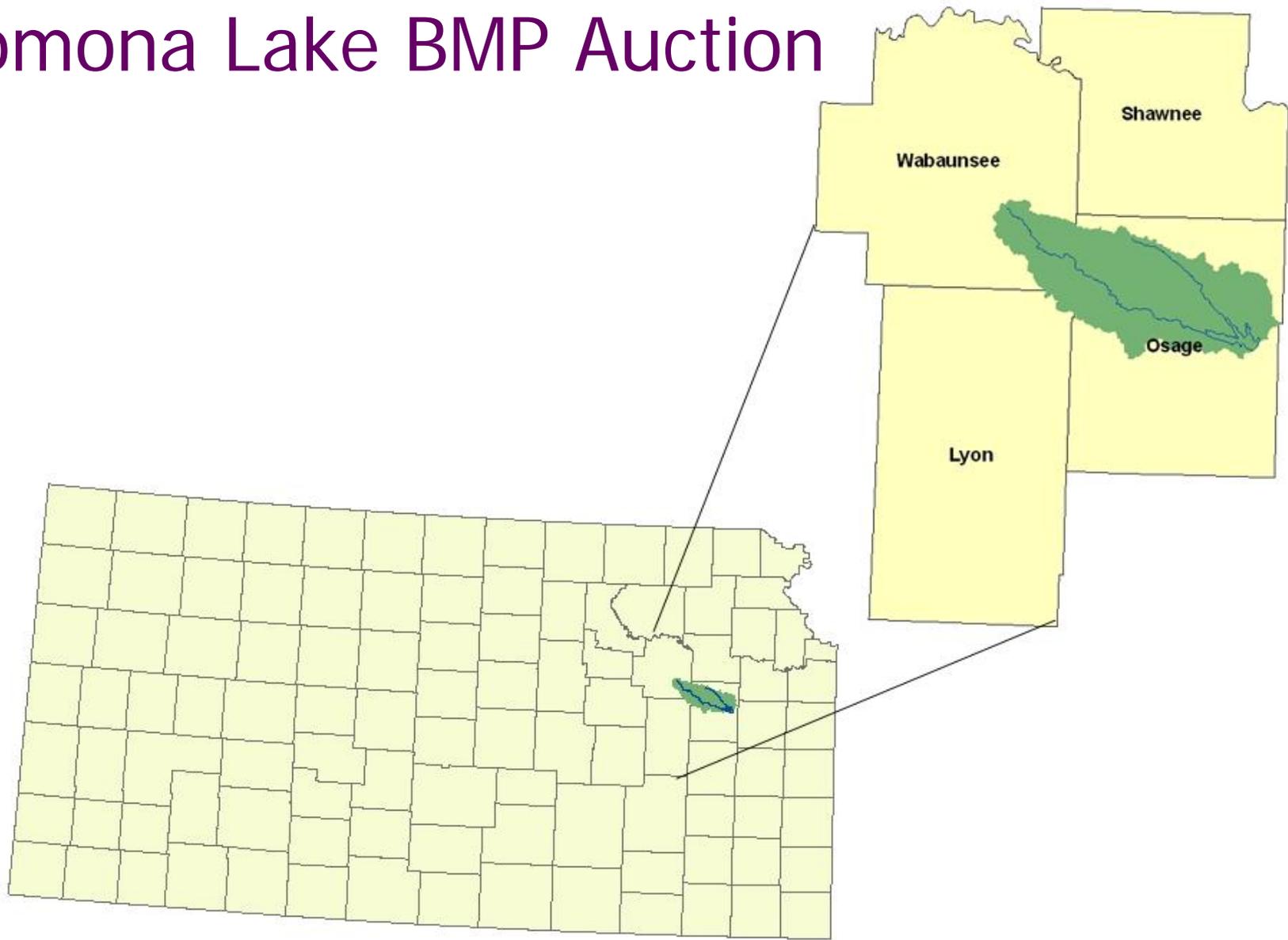


Federal Reservoirs in Kansas

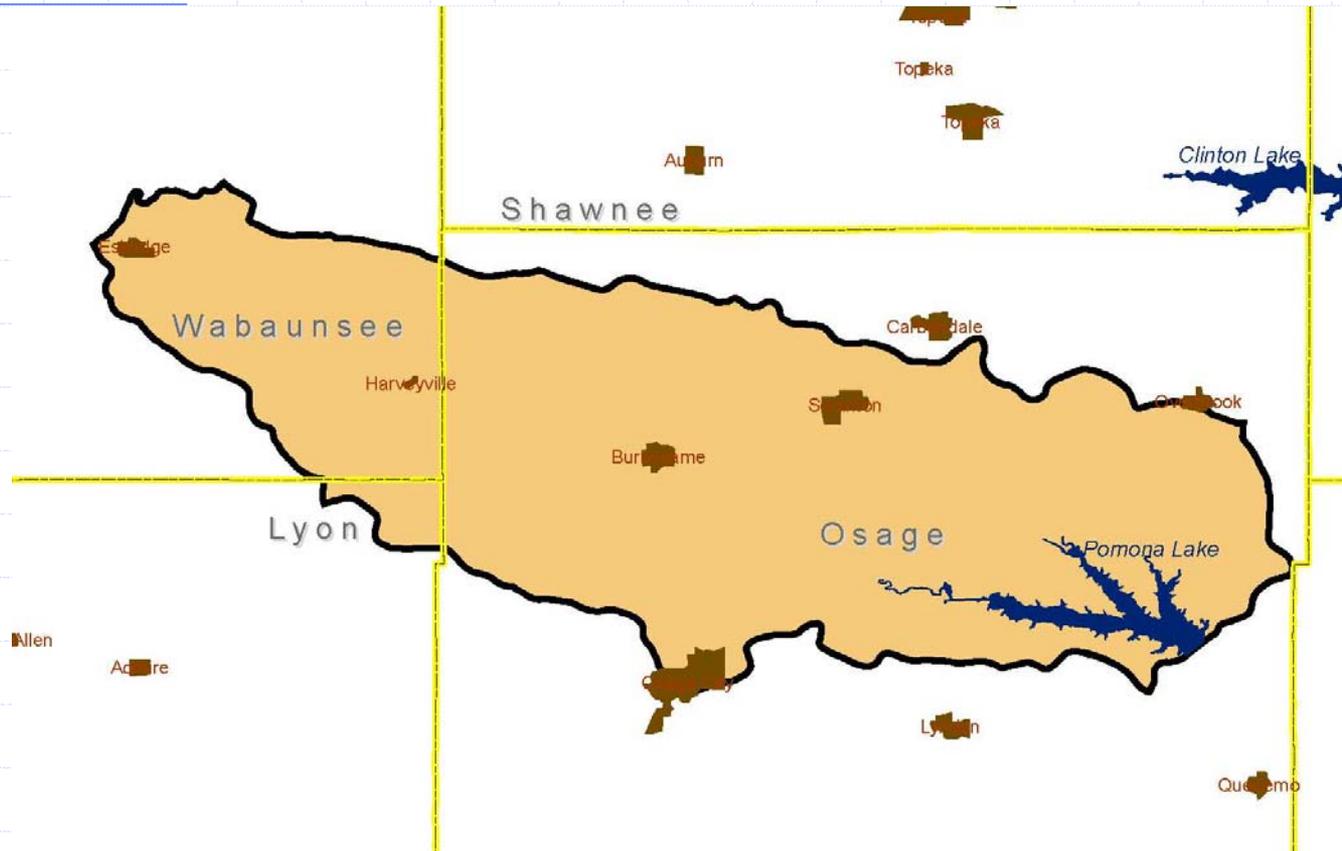


United States Army Corps of Engineers Lake
United States Bureau of Reclamation Lake

Pomona Lake BMP Auction



Pomona Lake Impairments



TMDLs for: Eutrophication, Silt, Low Dissolved Oxygen

Pomona Lake Reservoir Fact Sheet

Location On 110 Mile Creek, 8.3 miles above confluence with Marais des Cygnes river; 8.5 miles west and 3 miles north of Pomona in Osage County. Watershed includes portions of Franklin, Lyon, Osage and Wabaunsee counties.

River Basin Marais Des Cygnes

Top of Dam Elevation** 1031 ft.

Construction History**

Construction Began June, 1959

Gates Closed July 19, 1962

Multipurpose Pool Filled June 4, 1965

**Current
Federally
Authorized
Purposes****

Flood control, low flow supplementation, water quality, recreation, and fish and wildlife enhancement.

**State
Designated
Uses*****

General purposes, expected aquatic life use, primary contact recreation, domestic supply, food procurement, industrial water supply.

Watershed

Watershed Drainage Area** 322 mi² **Hydrologic Unit Code** 10290101030

Percent of Watershed in Organized Watershed District* 10% **Elevation of Top of Watershed**** 1400 ft.

Major Streams 110 Mile, Dagoon, and Valley Brook Creeks

*Original Sediment Survey Year** 1964

*Most Recent Survey Year** 1989

Multipurpose Pool

Top of Multipurpose Pool 974 ft.

*Multipurpose Pool Surface Area** 3,865 acres

*Original Storage Capacity** 70,603 acre-ft.

*Capacity at Most Recent Survey** 64,208 acre-ft.

*Estimated Current Capacity** 59,642 acre-ft.

*Design Sedimentation Rate*** 294 acre-ft./yr

*Actual Sedimentation Rate** 254 acre-ft./yr

*Loss of Capacity to Date** 15.52%

*Hydraulic Residence Time****

*Average Water Depth**** 20 ft.

*Multipurpose Pool Shoreline Perimeter Length*** 52

Multipurpose and Flood Pool

Top of Flood Pool 1003 ft.

*Flood Pool Surface Area** 8,522 acres

*Original Storage Capacity** 247,276 acre-ft.

*Capacity at Most Recent Survey** 240,331 acre-ft.

*Estimated Current Capacity** 235,372 acre-ft.

*Design Sedimentation Rate*** 294 acre-ft./yr

*Actual Sedimentation Rate** 276 acre-ft./yr

*Loss of Capacity to Date** 4.81%

Impact of Sediment Summary

*Watershed Sediment Yield** 0.86 acre-ft./mi²/yr

*Design Life for Sediment Storage*** 100 Years

*Years to Fill Sediment Storage Multipurpose Pool From Time of Gate Closure** 116 Years

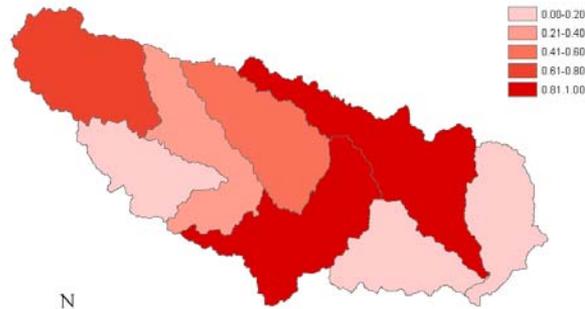
*Year Sediment Storage is Filled** 2078

Goals of Pomona Lake

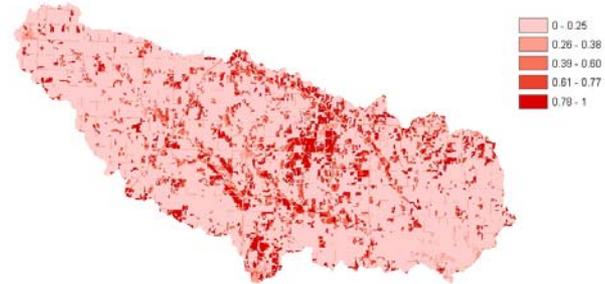
WRAPS BMP Auction

- ◆ With the limited funds available for protection our land and water resources,
- ◆ Make the best use of funds.
- ◆ Provide the greatest water quality improvement per dollar spent.
- ◆ Producers and landowners will benefit by keeping more soil on their farms and having the flexibility to choose which BMP(s) will work best for their operation.
- ◆ Producers will be allowed to indicate the amount of money needed before they adopt certain BMPs.

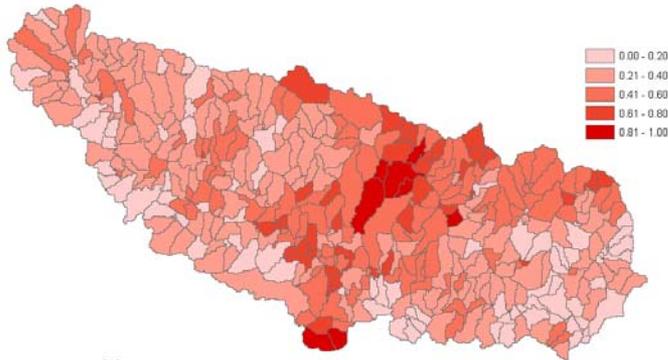
Pomona Watershed Modeling



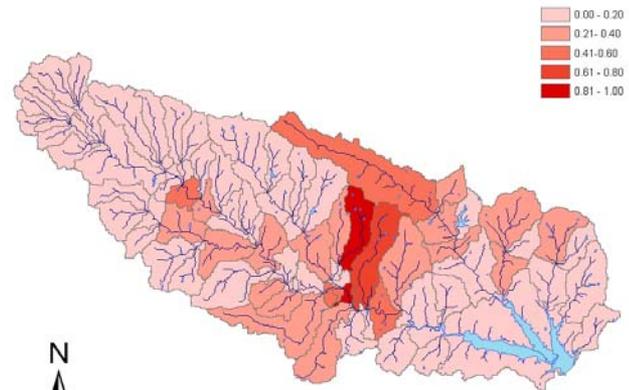
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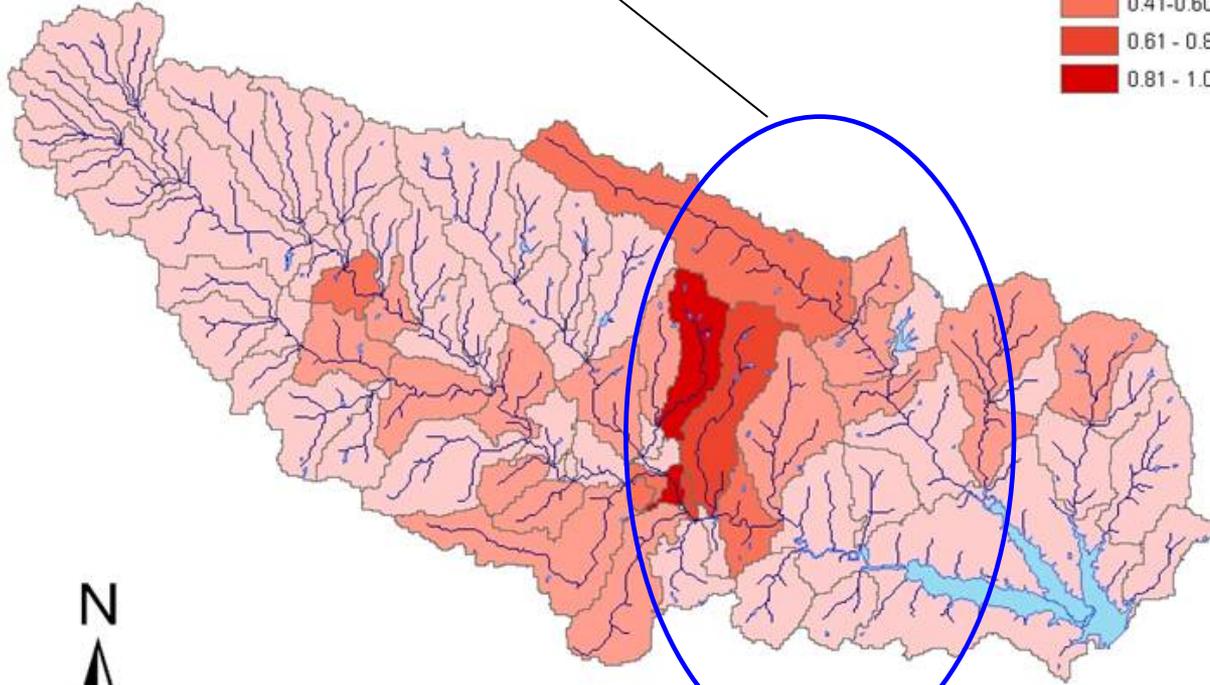
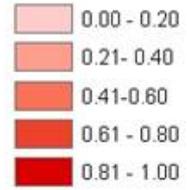


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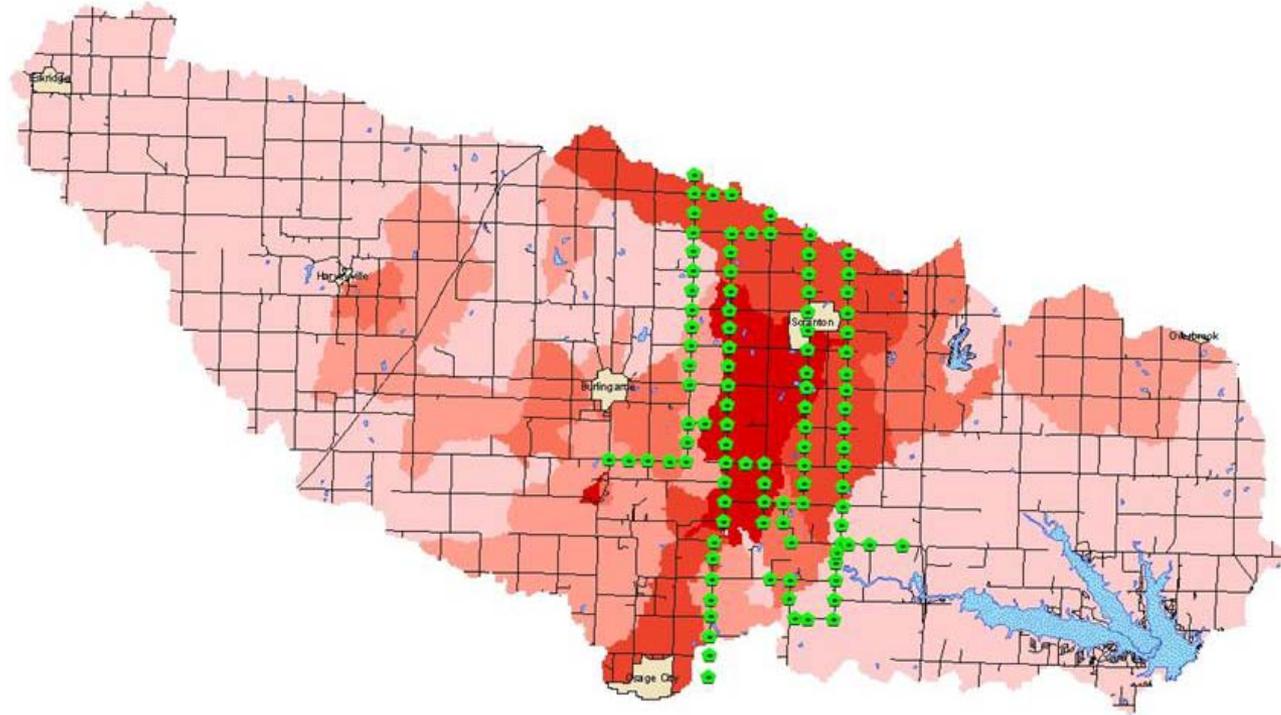


AVSWAT-X

Critical Area



Driving Assessment of BMP's





























BMP Auction - Application

Pomona Lake Watershed BMP Auction

Field Sign-Up Sheet (fill out one sheet per field)

This Best Management Practice (BMP) Auction project is sponsored by the Pomona Lake Watershed WRAPS Leadership Team and is being offered in cooperation with K-State Research and Extension and the Osage County NRCS/Conservation District. Funding for this project has been provided by the Kansas Department of Health and Environment through a US EPA Section 319 grant.

Name _____ Date _____ Telephone _____

Email _____ Address _____

Field Name & Legal Description _____ Field Size _____

Current crop rotation (circle current crop) _____

Current tillage system (circle): conventional (0-15% residue) reduced (15-30% residue) no-till (>30% residue)

Is the field currently terraced? Yes No Is the field currently contour farmed? Yes No

- Which of the following soil erosion reduction BMPs (in addition to the ones currently being used) would you be willing to use on this field? —See reverse side for BMP definitions
- How many field acres will the selected BMP(s) treat? —e.g., if a 2 acre buffer treats runoff from 50 acres of the field, then you would enter 50 treated field acres
- What is the amount of single payment you would need to implement the selected BMP(s)? - these funds can be piggy-backed on top of other funds you may be receiving (through other conservation programs)

<input checked="" type="checkbox"/> Best Management Practices—see back for definitions	Erosion Reduction Efficiency	Treated Field Acres	Total Bid Price (dollars)
Establish riparian vegetative buffer (check width): ___ less than 30' wide ___ 30' to 60' wide ___ greater than 60' wide	25% 50% 75%	_____	_____
No-tillage (check option): ___ Option #1 ___ Option #2	40% 75%	_____	_____
___ Farm on the contour	35%	_____	_____
___ Establish contour grass strips	50%	_____	_____
___ Re-shape existing terraces	25%	_____	_____
___ Establish terraces	30%	_____	_____
___ Establish permanent vegetation on entire field	95%	_____	_____
___ Establish grassed waterways	50%	_____	_____
___ Alter crop rotation away from continuous soybeans	25%	_____	_____
___ Other (explain):	TBD	_____	_____

You may sign up multiple fields, but the Grand Total for bids per Producer/Landowner cannot exceed \$5,000.00

Continue—>

BMP Definitions:

- **Establish riparian vegetative buffer:** area of land at the edge of the field and/or bordering a waterbody that is converted to permanent vegetation - varying widths result in different erosion reduction efficiencies
- **No-Tillage:** planting and drilling are the only operations which break the surface of the ground
 - Option 1: No-till must be used for 3 years with no more than one crop being soybeans
 - Option 2: No-till must be used for 3 years with no crop being soybeans
- **Farm on the contour:** tilling and planting across the slope following the contours for 3 years
- **Establish contour grass strips:** planting strips of grass on the contours to control and filter runoff
- **Re-shape existing terraces:** rebuilding and increasing the effectiveness of existing terraces
- **Establish terraces:** establishing embankments which run perpendicular to the slope of the field
- **Establish permanent vegetation on entire field:** converting grain cropland to hay, pasture, or rangeland
- **Establish grassed waterways:** area of land within the field that is converted to permanent vegetation
- **Alter crop rotation away from continuous soybeans:** changing to a crop rotation that does not include soybeans for at least 3 years
- **Other:** enter and explain a practice that reduces soil erosion. The practice will be evaluated by the WRAPS Leadership Team and an estimated erosion reduction efficiency will be estimated.

Next Steps: A current baseline sediment loading rate (tons/acre/year) will be estimated for your field. The BMP(s) you have selected will be evaluated to determine beneficial effects on reducing sedimentation and improving water quality in Pomona Lake. All of the bids received throughout the Pomona Lake Watershed will be ranked by the amount of sediment reduction generated per dollar. Whomever can reduce sedimentation at the lowest price will be contracted with first. Then, the next "best" bid will be identified and that bidder will be offered a contract. This process will be repeated until the funds are exhausted.

Goals of Pomona Lake WRAPS BMP Auction: With limited funds available for protecting our land and water resources, we are attempting to make the best use of funds. Our approach is intended to provide the greatest water quality improvements in the Pomona Lake watershed per dollar spent. Producers and landowners also will benefit by keeping more soil on their fields and having the flexibility to choose which BMP(s) will work best for their operation. They also will be allowed to indicate the exact amount of money needed before they adopt certain BMPs—something that isn't allowed in current conservation programs.

Important Dates:

Submitted bids must be received by 5pm on August 31, 2007.
You will be notified if your bid was accepted by October 1, 2007.

Please return this sheet in a sealed envelope by August 31, 2007 to:
Osage County Conservation District
c/o BMP Auction bid
115 West 17th Street
Lyndon, KS 66451

For more information or questions:

- Contact your KSU Watershed Specialist, Herschel George at 913-294-6021 or hgeorge@oznet.ksu.edu
- Contact your NRCS District Conservationist, Tim Gogolski at 785-828-3831 or Timothy.Gogolski@ks.usda.gov
- Contact your Osage County Conservation District Manager, Lori Griffith at 785-828-3458 or lori.griffith@ks.nacodnet.net

By signing this, you agree to participate in the 2007 Pomona BMP Auction. You will not be able to revise or change this bid. If you fail to comply with the terms of this contract, any funds that were distributed to you must be returned. The check will be made out to the name listed on the first page.

Signatures (need both producer's and landowner's signature for rented or share-cropped land):

Producer _____ Date _____

Landowner _____ Date _____

BMP Auction - Application

BMP Auction

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BMP Auction - Application

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BMP Auction - *mechanics*

Auction managers:

- Receive the bids
- Rank the bids in order based on \$/ton of sediment reduction
- Contract with producer who will reduce sediment loads for the lowest price
- Repeat process until the funds are exhausted

Evaluation Process

Baseline sediment load (*BSL*): Revised Universal Soil Loss Equation (RUSLE)

BMP Erosion Reduction %: from MF-2572

Cumulative Erosion % (from STEPL)

$$BMPe = 1 - \frac{\sum_{i=1}^n T_i * (1 - e_i) * (1 - e_{i+1}) * \dots * (1 - e_n)}{\sum_{i=1}^n T_i}$$

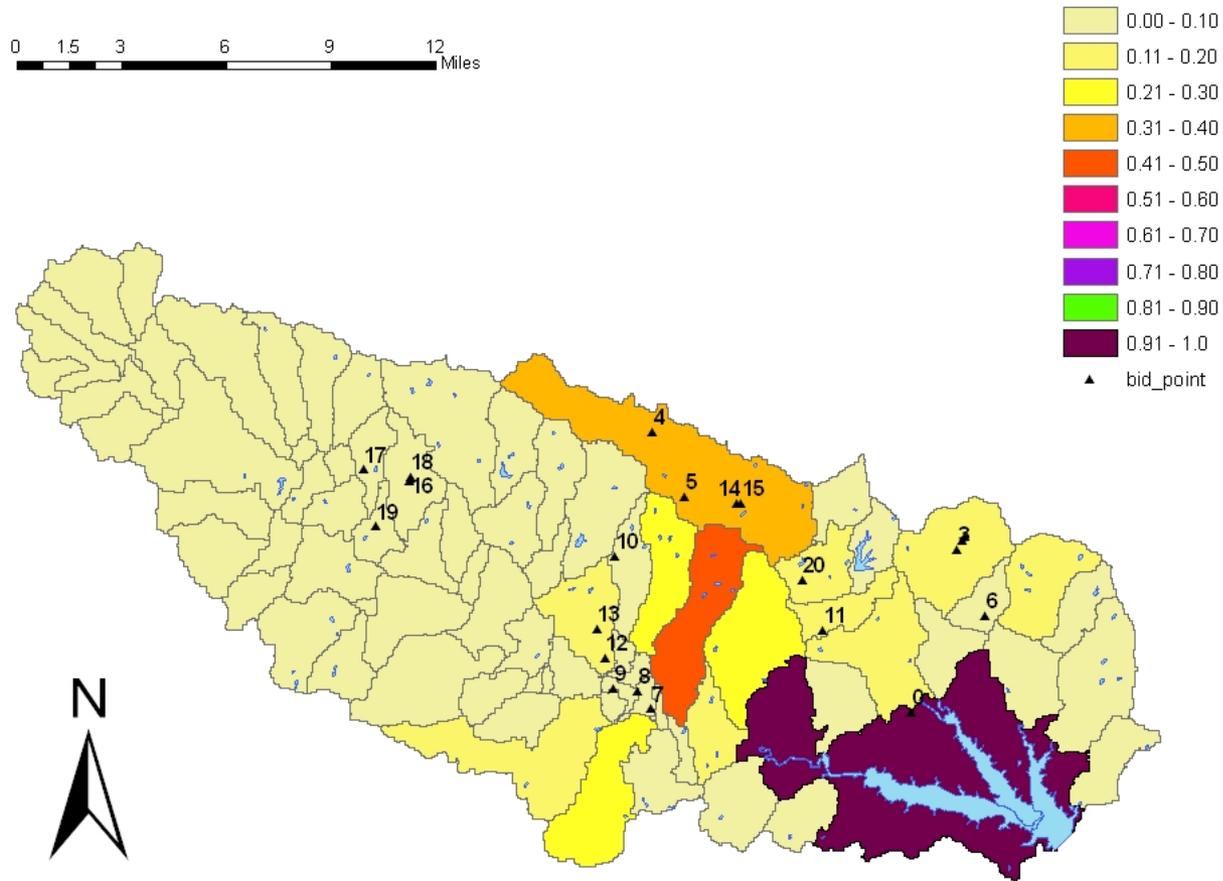
Apply Sediment Delivery Ratio (from AVSWAT-X):

$$Sedred = BMPe * W_{BMP} * (W_{BMP} + DR - W_{BMP} * DR)$$

Determine Cost:

$$Cost = \frac{Bid}{BSL * Sedred}$$

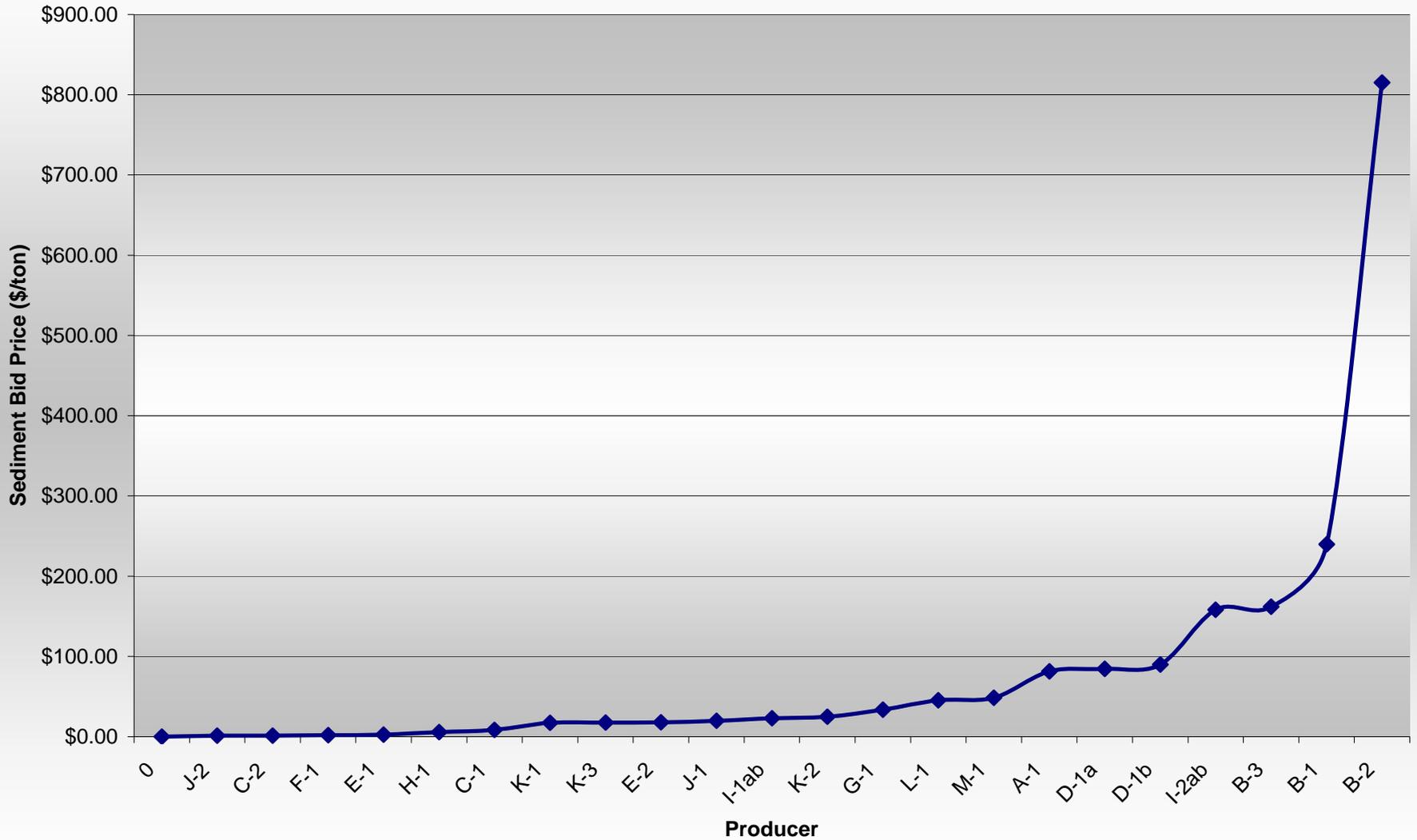
Sediment Delivery Ratios



Bid Evaluation

Producer	Baseline Sediment delivery (tons/acre)	BMP(s)	BMP reduction efficiency	Bid Price (\$/treated acre)	\$/ton sediment reduction
J-2	4.5	--, Other: establish quail habitat, --, Sediment Delivery Factor = 0.35	80%	\$4.17	\$1.16
C-2	5.8	--, Other: grass strip is needed to stop erosion between different ownerships - seed 1 acre, --, Sediment Delivery Factor = 0.35	80%	\$6.08	\$1.31
F-1	3.5	Veg Buffer greater than 60' wide, --, --, Sediment Delivery Factor = 0.05	61%	\$4.14	\$1.94
E-1	3.5	Veg Buffer greater than 60' wide, --, --, Sediment Delivery Factor = 0.05	61%	\$5.45	\$2.55
H-1	40	--, Other: Fill ditches and repair and reseed diversion channel, --, Sediment Delivery Factor = 0.15	62%	\$142.86	\$5.78
C-1	5.8	--, Other: need to seed washed off bank in the field that's eroding and running into a small creek - seed 0.3 acres, --, Sediment Delivery Factor = 0.35	80%	\$40.00	\$8.63
K-1	11	Establish permanent vegetation, --, --, Sediment Delivery Factor = 0.05	77%	\$147.06	\$17.28
K-3	11	Establish permanent vegetation, --, --, Sediment Delivery Factor = 0.05	77%	\$150.00	\$17.62
E-2	3.5	Veg Buffer greater than 60' wide, --, --, Sediment Delivery Factor = 0.05	61%	\$38.24	\$17.88
J-1	6.2	Establish grassed waterways, --, --, Sediment Delivery Factor = 0.35	42%	\$52.17	\$20.00
I-1ab	4	Veg Buffer 30' to 60' wide, Other: reshape washed area next to creek, --, Sediment Delivery Factor = 0.15	47%	\$43.62	\$23.03
K-2	8.4	Establish permanent vegetation, --, --, Sediment Delivery Factor = 0.05	77%	\$162.16	\$24.95
G-1	5.5	Establish permanent vegetation, --, --, Sediment Delivery Factor = 0.05	77%	\$144.23	\$33.89
L-1	1	Re-shape existing terraces, --, --, Sediment Delivery Factor = 0.05	20%	\$9.26	\$45.47
M-1	13.2	--, Other: plant scouring area to permanent native grass, --, Sediment Delivery Factor = 0.15	78%	\$502.50	\$48.66
A-1	14.7	Establish grassed waterways, --, --, Sediment Delivery Factor = 0.95	45%	\$535.71	\$81.39

Variation in Producer Bid Price



Pomona Summary

- ◆ 24 bids for BMPs requesting \$19,062
- ◆ 1,244 tons of baseline soil loss at edge of field
- ◆ 938 tons of soil loss reduced for erosion reduction efficiency of 75%
- ◆ \$20.32 per ton of soil loss reduction

BMP Auction - *benefits*

- ◆ Several benefits to coupling a BMP Auction with flexible implementation funding:
 - Funds can be targeted to highest impact investments and exceed limits of existing programs
 - Producers offered flexibility of choosing alternative BMPs that work best for their operation and name their price
 - Apply stakeholder input & science to guide change in the watershed
 - Provides valuable insights into the incentive levels required to adopt BMPs
 - ◆ Guide future policies and investments

Pomona BMP Auction - Challenges

- ◆ Keeping it simple enough to be easily understood, but complex enough to be effective
 - Many meetings with stakeholder group, NRCS, CD, Watershed Specialist, Extension Agent discussing details
- ◆ Targeted Marketing
 - Multiple producer meetings, mailings, farm visits, phone calls to spread the word

Kansas BMP Auctions

- ◆ Pomona Lake bidding closed August 31, 2007
 - 24 bids received for \$19,062 in total
 - All projects were funded
 - Distributed money October 1
- ◆ Marais des Cygnes Targeted Watershed Grant approved
 - Kansas and Missouri project
 - BMP Auction language included in proposal
- ◆ Upper Arkansas, Toronto, Pomona round #2

Questions?

Special thanks to: Osage County Conservation District, Lori Griffith, Tim Gogolski, Pouyan Nejadhashemi, Rod Schaub, John Leatherman, Bill Hargrove, Craig Smith, Herschel George and the KDHE Watershed Management Section