The Rock Creek (Ohio) Conservation Effects Assessment Project: Plans and Preliminary Results

R. Peter Richards[1], David Baker[1], James Coss[2], John Crumrine[1], Kevin Czajkowski[2], Jack Kramer[1], Robert McCall[3], and Jim Stafford[4]

1: Heidelberg College, Tiffin, OH 2: University of Toledo, Toledo, OH 3: Ohio State University Extension, Findlay, OH 4: USDA-NRCS, Columbus, OH

The Rock Creek Watershed

22,000 acres
Moderate relief (for Ohio)
82% ag, 16% forest

Project Goals and Approaches

Assess trends in water quality
- 1982 through 2005
- Flow, sediment, nutrients, chloride

Assess trends in land use
- Farm acreage, crop choices
- Tillage practices
- Nutrient application/management

Any connection between the two?!

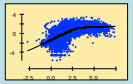
AnnAGNPS model of watershed
- Impacts of ag management on water quality
- Placement of practices in watershed
- Lag times
- Optimization of choice/placement
- Interactions of practices - good or bad?
- Can model be used for risk assessment?

Water Quality Trends: Methods

Sampling Program
- Refrigerated Autosampler
- 3 Samples per day, high flow
- 1 Sample per day, low flow
- Continuous operation since 1982
- 12,500 samples
- Sediment, nutrients, major ions, pesticides

Data Analysis for Trends
- Concentrations, not loads (Why?)
- Trend plots are LOWESS smooths with 20% bin width
- Statistical assessment using ANCOVA two-slope model:

ln(c) adjusted for ln(q) using LOWESS smooth



$$\ln(c) = b_1 t + b_2 \ln(q) + b_3 \sin(2pt) + b_4 \cos(2pt) + b_5(PP) + b_6(PP*t) + b_7$$

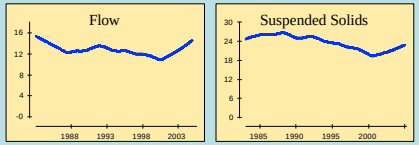
(t=time, q=flow, PP=dummy var: before or after 1995)

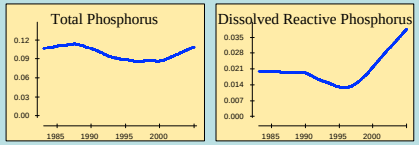
Land Use Trends: Methods

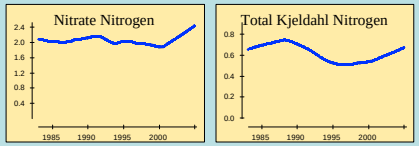
Data
- County-level; Rock Creek entirely in Seneca Co.
- NASS, Ag Census, CTIC, Ohio Dep't Ag
- Some important data not available
- Is Rock Creek characterized by county average?

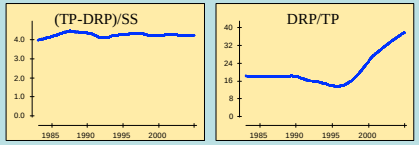
Statistical Analysis
- Usually simple regression analysis is enough

Water Quality Trends: Results







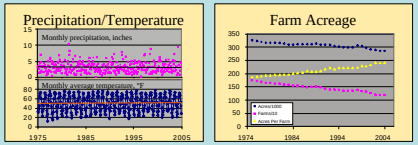


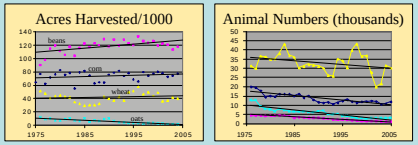
Units: chemical parameters, mg/L; flow, cubic feet per second;(TP-DRP)/SS, ‰ (g/kg); DRP/TP, %

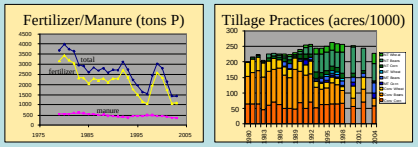
Percent change in values, per decade, before and after 1995

Parameter	Before	After	Parameter	Before	After
Flow	-17	+32	Susp. Solids	-12	-32
Total Phosphorus	-27	+12	Dis. Reactive P	-45	+306
Nitrate N	-12	+17	Tot. Kjeldahl N	-22	+26
(TP-DRP)/SS	-7	+8	DRP/TP	-27	+301

Trends in Possible Causes







Summary and Conclusions

Important trends in water quality
- DRP trends particularly disturbing
- Several trends appear related to flow

Significant changes in agriculture
- Farm acreage, animal numbers down
- Conservation tillage increased mid-'90s
- Nutrient applications fluctuate

Any connection between water quality and ag land use?!
- Possible cause and effect relationships are far from obvious!
- Complex relationships require modeling!

Funded by USDA-CSREES

Partners: Heidelberg College, University of Toledo, Ohio State University, USDA-NRCS (Ohio and National), USDA-FSA, Seneca County SWCD, local stakeholders