USDA CSREES
Grantsmanship Workshop
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Project Description

- Overarching questions

  Did adoption of agricultural BMPs in a Northern Utah watershed have a measurable impact on phosphorus loadings into the Little Bear River?

  Can the use of fine-grained data from throughout this watershed enable us to determine whether these changes are related to the implementation of management practices?

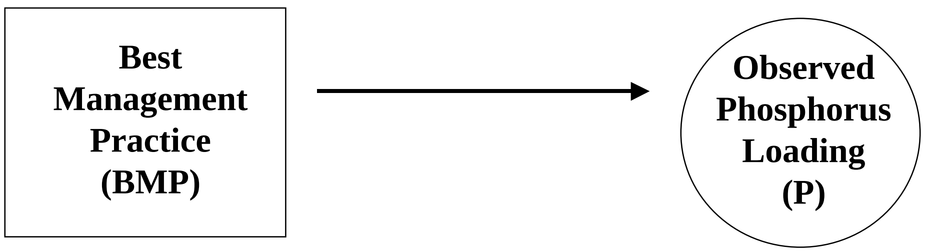
Objectives

- Did publicly-funded programs to promote the adoption of agricultural conservation best management practices reduce phosphorus loadings into surface waters in the Little Bear watershed;
- What are the strengths and weaknesses of different water quality monitoring techniques; and
- How can we ensure that future management efforts are targeted towards the most effective and socioeconomically viable agricultural best management practices.

Conceptual models – A/B

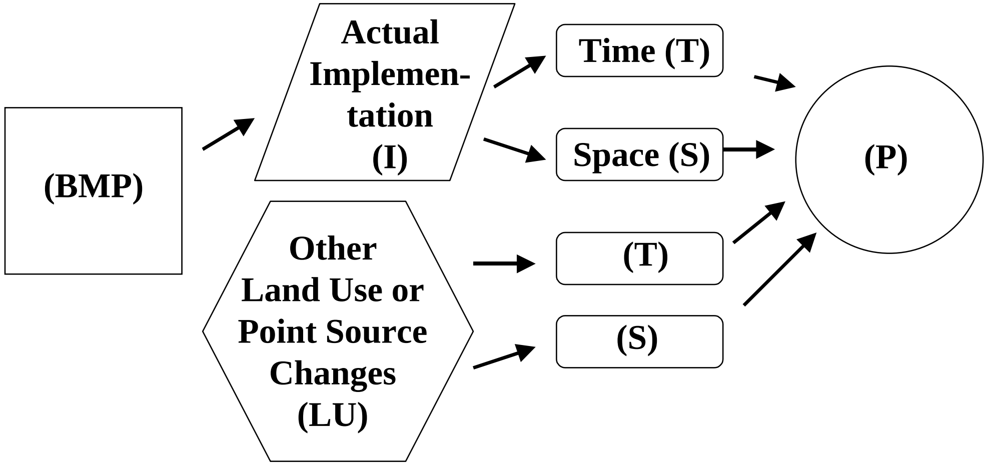
Naive

(A)



4-fold complexity

(B)



Objective 1

- Can we demonstrate a statistically significant association between the use of various types of BMPs and changes in surface water quality within the watershed?
- Does an understanding of variability in the implementation and maintenance of BMPs (and associated behaviors) help improve our ability to explain changes in phosphorus loadings?
- What is the time lag associated with observing a response from land management changes?
- How does spatial location within the watershed affect the timing and intensity of water quality responses to changes in producer behaviors?

Objective 2

- Are existing monitoring techniques adequate to separate the individual effects of multiple management practices at the watershed scale? If not, then how can the most information be derived from the available data, and are there innovative approaches that can be used in the event that data are scarce?
- How well do load reductions predicted by the original models used to design conservation programs in the Little Bear watershed correlate with the actual observed load reductions identified from our monitoring data?
- How well do alternative water quality indicators (such as biomonitoring of macroinvertebrates) correlate with traditional grab sample approaches?

Objective 3

- What social and economic factors within the study watershed facilitate or impede implementation of the conservation practices that are considered most effective at reducing water quality impairment?

- How can future water quality protection efforts be most efficiently designed to maximize the benefits from improved water quality while minimizing economic impacts on the agricultural industry?

Extension and Outreach

- Watershed, agency, deciders, extension
  - Prioritize spending on BMPs
  - Monitor their effectiveness
  - Fact sheets
    - Findings
    - Implications
    - Expectations
    - TMDL targets
  - Training – workshops, manuals, monitoring plans, statistical questions

Extension and Outreach

- Producers
  - Lessons learned about BMP effectiveness
  - Operations and maintenance
  - Methods
    - Direct contact
    - Farm tours/presentations
    - Demonstrations coordinated with conservation districts
  - Media coverage
  - Water quality awards w/state
  - Teaching training/youth programs

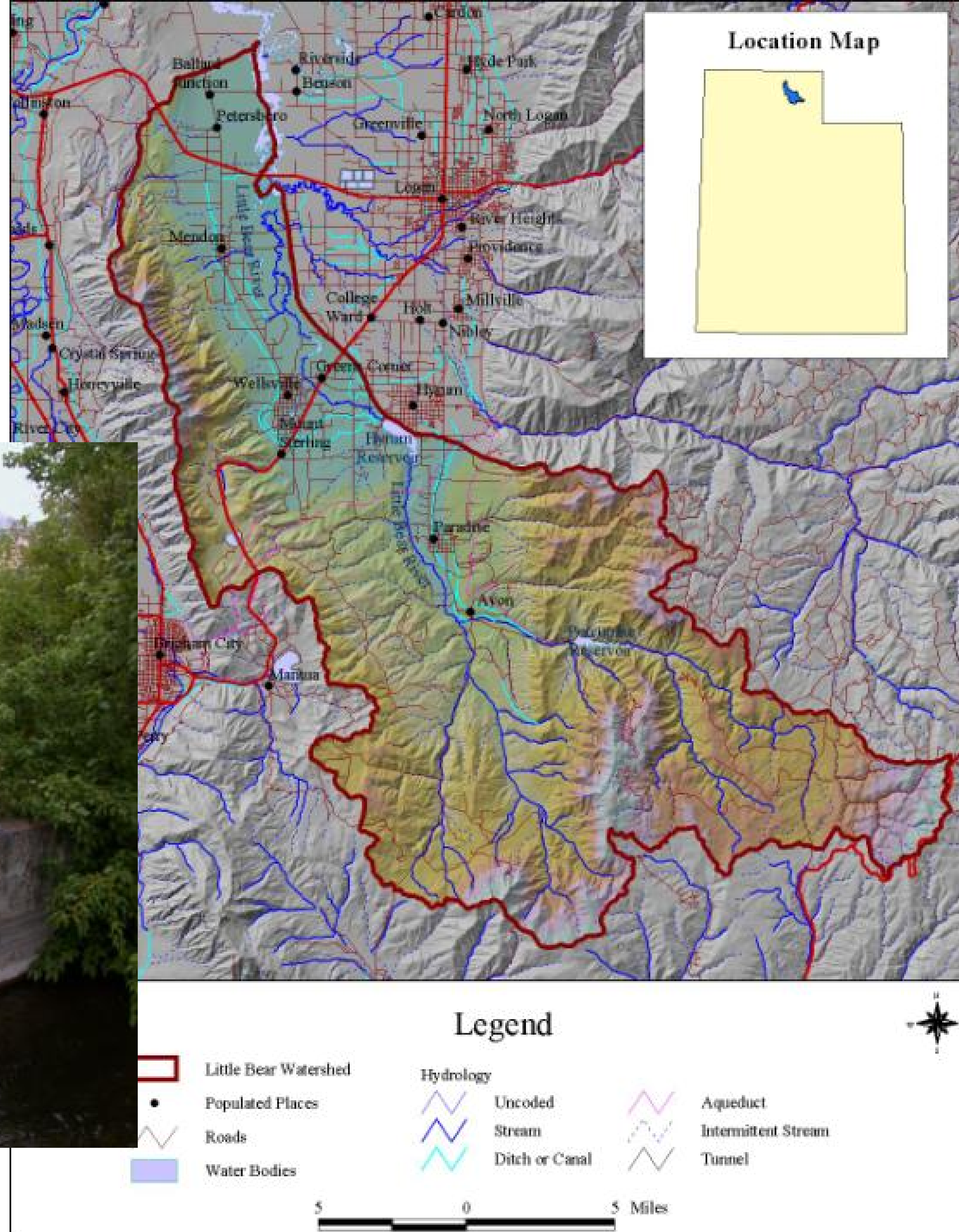
Organization
(5 different departments at USU)

- David Stevens – PI/modeling, statistics
- Nancy Mesner – Co/PI Extension, monitoring, analysis
- Douglas Jackson-Smith –– Co/PI Landowner/producer relations, collection and analysis of socioeconomic aspects of data
- Darwin Sorensen – – Co/PI Biomonitoring, WQ data analysis
- Jeffery Horsburgh – Data coordinator, modeling, web site
- Ron Ryel – Statistical analysis of large watershed data

USU Water Initiative

- 2002 – Administrative initiative
- Campus-wide effort to coordinate water-related research, extension, etc across the campus
  - Research
  - Annual ‘Spring Runoff’ conference in April
  - Graduate student support
  - Seed money for larger proposal efforts

Lay of the land

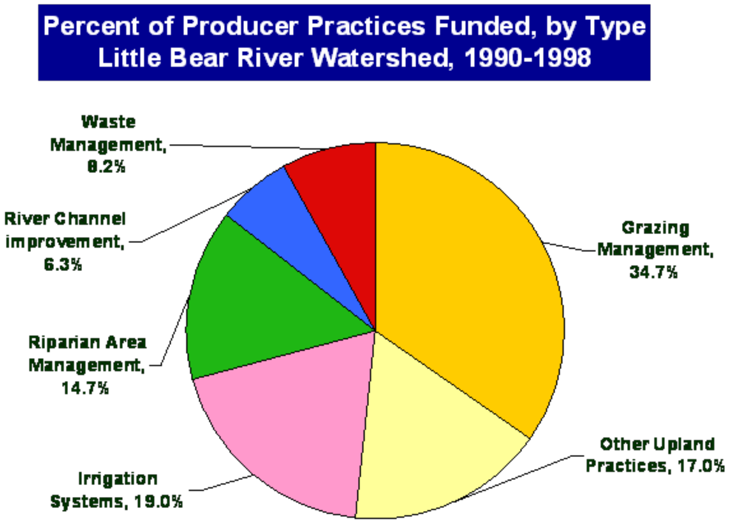


Document actual BMP implementation

- **Detailed information about two kinds of behavior:**
  - **Behaviors hat were directly related to the project**.
    - type, location, and timing for all Best Management Practices (BMPs) that were part of producer contracts in the watershed,
  - **Behaviors that were indirectly related to the project**.
    - Changes in associated behaviors that maximize the benefits of contracted
    - information about whether producers were able to continue using recommended practices after the expiration of their original contracts.
    - Concerns about protecting the confidentiality led to development of a rigorous protocol that governs how information from NRCS files can be handled and analyzed

Important Conservation BMPs

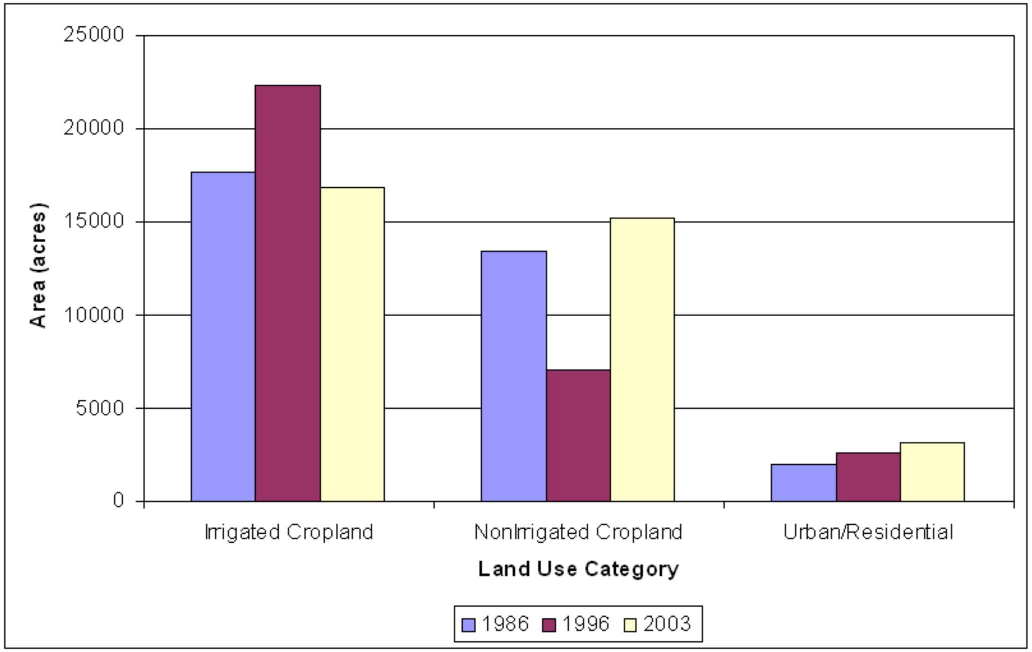
- Project files
  - most important categories of conservation practices are grazing and other upland management practices, irrigation system improvements, streambank and stream-channel restoration, and livestock waste management (see the figure at right).



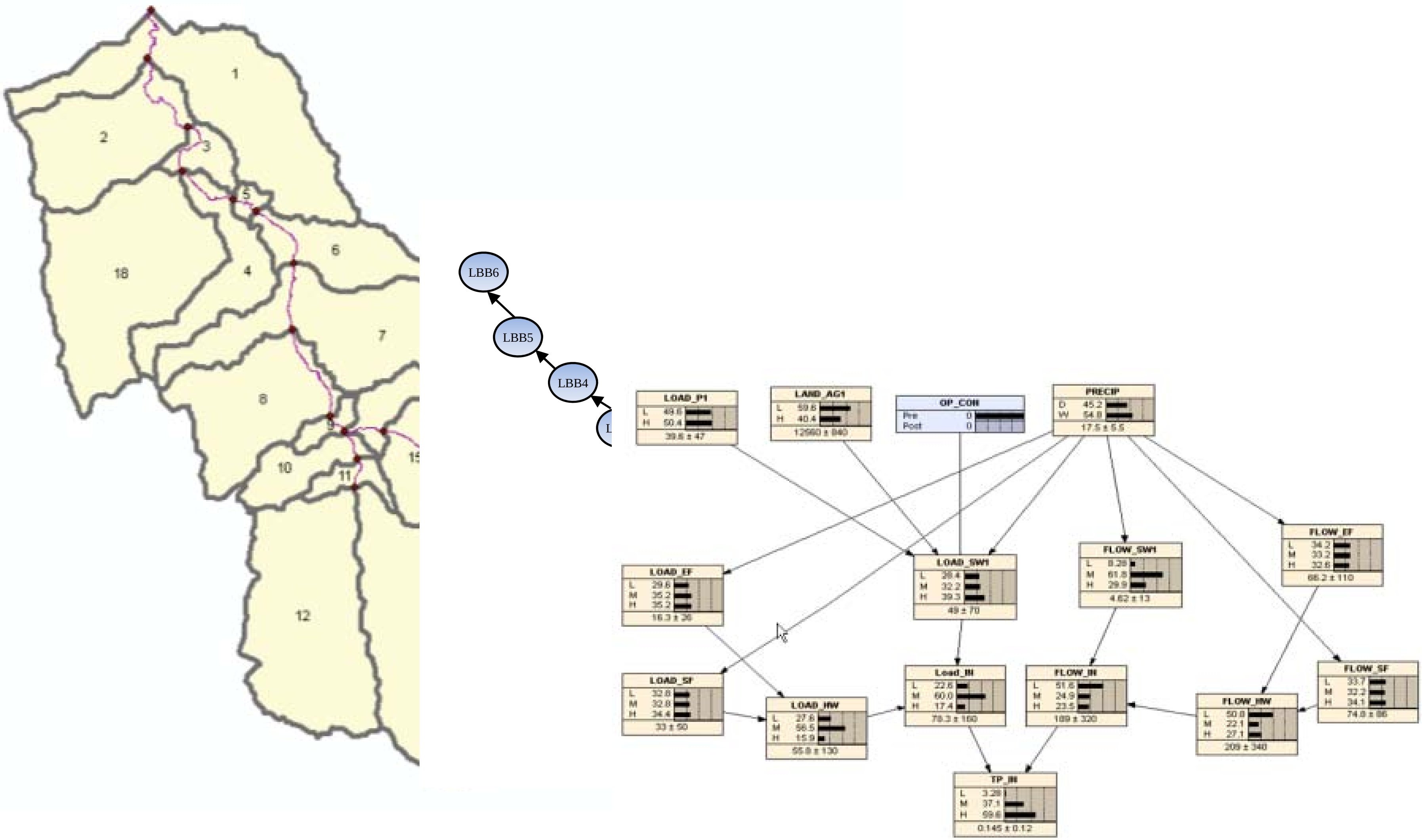
- Field interviews
  - most of the project participants,
  - help us understand how implementation of BMPs was experienced by producers,
  - whether or not they were able to maintain these practices beyond the life of their original NRCS contract.

Examples of other data…

- Land use - 1990s show a significantly different distribution than 1980s and now
- These data required conversations with producers and iron-clad privacy agreements



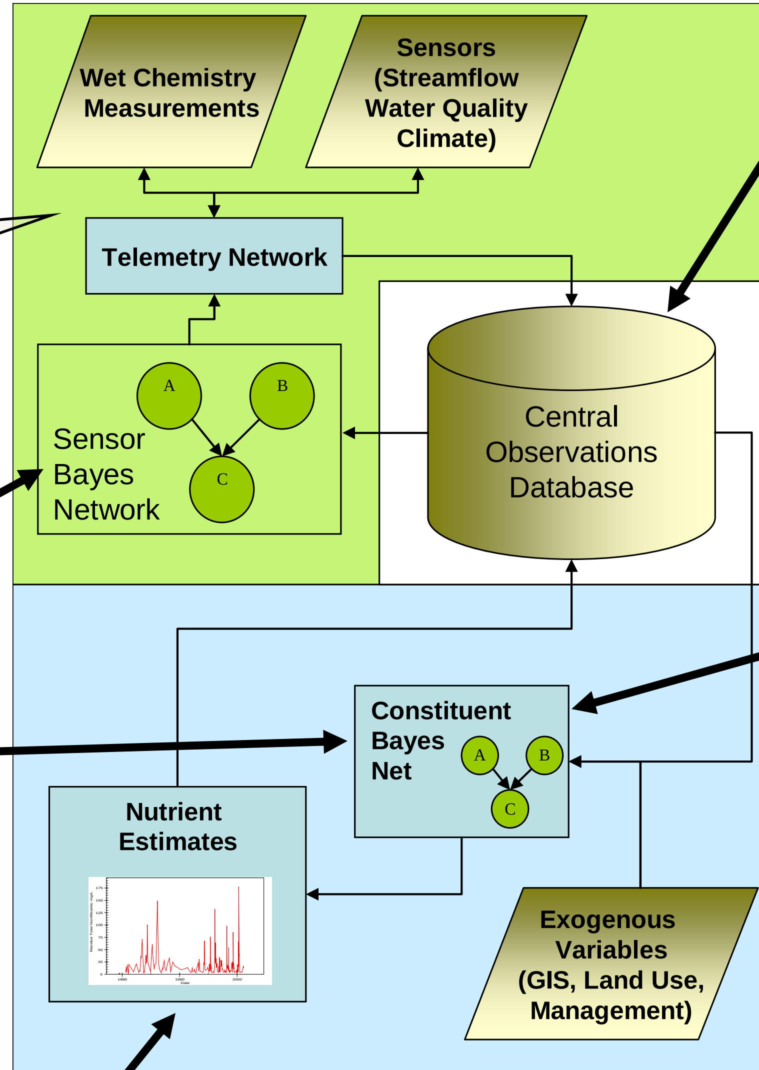
Modeling



LBB6
LBB5
LBB4
LOAD_P1
LAND_AG1
OP_CON
PRECIP
LOAD_EF
LOAD_SW1
FLOW_SW1
FLOW_EF
LOAD_SF
LOAD_HW
Load_BI
FLOW_BI
FLOW_HW
FLOW_SF
TP_BI

Monitoring network

Data collection



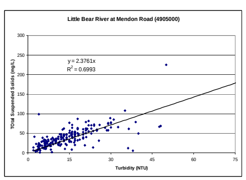
Integrated monitoring system

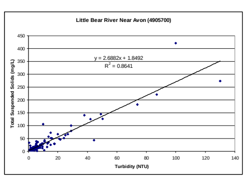
CUAHSI HIS ODM – central storage and management of observations data

Bayesian Networks to control monitoring for storm events and base flow

Bayesian Networks to construct water quality measures from surrogate sensor signals to provide high frequency estimates of water quality and loading the Little Bear river.

Correlations for TSS/TP vs. turbidity





End result: high frequency estimates of nutrient concentrations and loadings

Problem Focused

- What is the problem addressed by your project?
  - Whether BMPs funded by cost sharing programs reduced phosphorus loading into the Little Bear River
- What process(s) did you use to identify it?
  - Social – interviews, file review, on-farm visits
  - Technical – monitoring, data analysis, modeling, Bayesian networks
  - Outreach – dissemination of results through publications, workshops, tours

Stakeholder Driven

- Who are the people that will benefit from the solution you create?
  - Conservation managers, regulators
  - Producers
  - Other researchers
- How did you gather and use their input for this project?
  - Direct cooperation with managers (NRCS, DEQ)
  - Interviews and information sharing with producers
  - Monthly meetings to review findings
  - Presentations/posters at local, regional, national mtgs

What are the outcomes you expect to achieve through this work?

- Short-term or Learning Outcomes
  - Awareness by producers that small changes can yield big dividends
  - Knowledge that brings improvement in attitude about environmental change
  - Skills development in students
  - Try to affect opinions to reduce the them vs. us attitude that inhibits communication and progress

Medium-term or Action Outcomes

- Working principle: Producers are good stewards of the environment
  - Follow- through on program implementation will demonstrate that agencies aren't just throwing $$ at NPS problems – outcomes matter
  - Success is temporal – many changes will require years before environmental improvements can be measured
  - 'Stay the course' is a hard sell when $$ involved so there is a need to develop shorter term measures of success

Long-term or Condition Outcomes

- Project is timely
  - Community is facing an expensive major changes in wastewater and storm water management to control P to improve water quality in a reservoir
  - NPS are about 75% of the total and are being held 'harmless' by regulators
  - Worry about a backlash where 'incentive' based programs are seen as nonviable and regulations are put in place
  - Efforts underway to move toward regional nutrient control that includes urban and non-urban sources that may involve trading

Project Outcomes

- How will you measure and assess your progress toward achieving these outcomes?
  - The usual –
    - Papers published
    - Conferences attended
    - Students graduated
  - The unusual
    - Producers attending conferences and workshops
    - Reduction of tension between producers and others
    - Participation in public process
  - The hopeful – more funding

Team Building

- Who are the members of your team and what are their roles?
  - David Stevens – engineering – lead on modeling
  - Nancy Mesner – watershed science, extension – monitoring, outreach
  - Douglas Jackson-Smith – sociology – interviews, socio/economic data analysis
  - Darwin Sorensen – microbiology, water quality data analysis
  - Jeffery Horsburgh – data manager, communications, modeling, monitoring
  - Ron Ryel – watershed data analysis
  - Eight graduate students
- Was this a pre-existing team? No
- Or one put together for this project? Yes

Developing the Project and Writing the Proposal

- How long did this take?
  - About 2 months
- What role did each team member play?
  - David Stevens – inter-element coordination, modeling conceptual design
  - Nancy Mesner – technical conceptual design
  - Douglas Jackson-Smith – socioeconomic project design
  - Jeffery Horsburgh – data system design, end game

Developing the Project and Writing the Proposal

- How did you allocate time and resources for each project function (i.e., research, education, extension)?
- Goal: each major portion was equally important to the outcomes
  - Each co P/I developed their portion independently
  - Several coordination meetings
  - Independent review and rebalancing
  - Budget requests based on actual time estimates
  - Iteration

Managing the Project

- How was this done?
  - The PI was really PM
  - Each co PI worked more or less independently
  - Frequent communication/integration meetings
- What forms of communication did you use?
  - Monthly PI meetings
  - Frequent technical communication within each group
  - email, phone, the usual
- How was reporting of progress handled?
  - Each co PI would deliver progress summaries to go into the reports. One would integrate the summaries for meeting reporting requirements

Project Challenges and Opportunities

- What challenges did you encounter and how did you overcome them?
  - temporal and spatial gaps in the data series that constrained our analysis – collected continuous monitoring data
  - Small number of monitoring sites and years of observation – improved statistical methods
  - potential for possible measurement error in (a) the official records of program participation; (b) landowner self-reports of BMP implementation experiences; and (c) remote sensing of land use changes in the area – worked closely with NRCS staff, created/capitalized on good relationships with producers , worked with producers, others to 'ground truth' remote sensing data

Project Challenges and Opportunities

- Did you experience any unexpected benefits or barriers associated with integrating research, education, and/or extension?
  - Mostly benefits but we expected that – integration was our goal from the outset
  - A major benefit for the technical group was to understand first hand how much farther one can get with stakeholders by having project partners skilled in social sciences

Conclusions

- Proposal
  - Measure of success is obviously approval of the project, but also ongoing support and cooperation for extensions, etc.
  - Another measure is local – bringing together disparate disciplines for proposal writing helps identify opportunities to build long term relationships
- Project
  - Winding down – ends this September (this time we mean it!)
  - Technically challenging as are any worth doing, but also challenging from perspective of several headstrong PIs working together

Acknowlegements

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