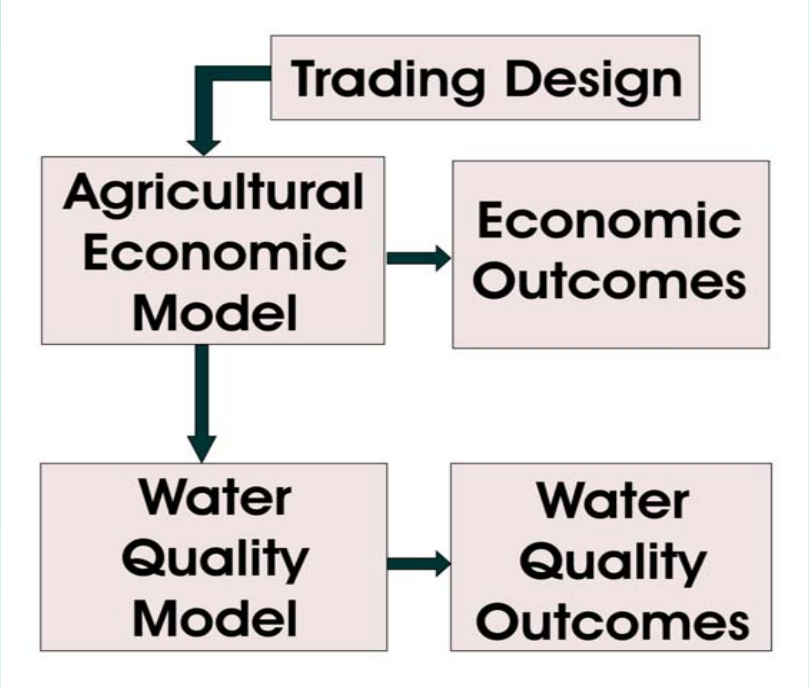
MIA: The Science of Water Quality Trading



Can trading work for water quality?

- Water quality trading originally proposed in the late 1960s as an alternative to inflexible design and performance standards
- Experiments to date (beginning in the 1980s) have not been promising
  - No or few trades = no gains from trading
- Failures to date:
  - Badly designed markets?
  - Necessary conditions for trading not met?
  - Trading does not work for water quality?

Prerequisites of “text book” trading

- Discharges must be “tradable”
  - Substantially controllable by dischargers
  - Measurable
- There must be gains from trade
  - Discharges limited (capped)
  - Heterogeneous control costs
  - “Many” willing buyers and sellers
  - Low transactions costs
    - Search, contracting, monitoring and enforcement

Prerequisites of “text book” trading

- Environmentally valid trading rules E.g…..
  - “commodity” definition
  - market definition (geographic scope)
  - environmental equivalence (delivery ratios, trade ratios etc.)
- No significant externalities resulting from trades
  - Environmental
  - Policy interactions

The Water Quality Trading Challenge: Nonpoint Sources

- Nonpoint pollution….
  - The leading cause of remaining water quality problems in the US
  - Major target of emerging trading initiatives
- Yet, nonpoint pollution does not fit the “text book” model of a tradable pollutant!

NPS Discharges

- There is no tangible nonpoint “commodity”
  - Cannot be measured routinely and accurately at reasonable cost
  - Cannot be forecast easily and reliably at the scale of typical nonpoint source agents
  - Modeled NPS discharges are a very imperfect substitute for measured loads
- NPS discharges are only partially under control of “suppliers” of NPS pollution reduction
  - NPS discharges are stochastic

NPS Discharges

- Scientific knowledge needed to develop rules for environmental equivalence is highly limited
- Externalities are pervasive
  - Ammonia
  - Disamenites
  - Greenhouse gases
  - Policy interactions

What to do?

- Make the “text book” shoe fit?
  - This is the approach so far
- Develop a science of water quality trading?
  - Water quality modeling for trading
  - Market design
    - Commodity definition
    - Market definition
    - Trading rules
    - Coordination mechanisms

Key Elements of Emerging Programs

- Credit trading (versus cap-and-trade)
- NPS credits based on “predicted” temporally averaged NPS emissions reductions
  - Prediction replaces measurement
  - Averaging addresses temporal variability – by ignoring it
- “trading ratios” between point and nonpoint sources to address the relative reliability of point and nonpoint reductions

Research and Policy Issues

- Water quality modeling for trading (validity/reliability of credit computation)
- Treatment of NPS risk
- Design of coordination mechanisms
- Environmental externalities
- Policy coordination

Water Quality Modeling
(Validity/reliability of credit computation methods)

- Both economic and ecological implications
  - Ecological goal achievement
  - Cost minimization
- The perfect should not be the enemy of the good, but “easy numbers” aren’t necessarily good
- Research issues
  - How good is good enough?
  - Development of low cost – credible methods protocols (analogous to the phosphorous index)

Treatment of NPS Risk

- Trade ratios are
  - “crude” at best: **do not** provide incentives to reduce risk
  - typically perversely specified
- Alternative: develop market structures that directly address risk
  - Reliability-graded credit trading
  - Nonpoint performance contracts

Design of coordination mechanisms

- Little experience with mechanisms for trading environmental risks
  - Should “banks” be public or private?
  - Rules governing operation of the bank (e.g., who has liability for “failures”?)
  - Pricing (auctions, posted prices, bilateral negotiations)
- Managing collateral agricultural externalities

Environmental Externalities

- Agri-environmental policies, farm-land preservation, etc.
  - Conflicting incentives
  - Double dipping
- Multi-media pollution
  - Ammonia emissions
  - Methane emissions
  - Carbon sequestration

Conclusions

- Many of the “accepted rules” for designing water quality trading are barriers to success
- Research to develop a science of water quality trading is needed
- Real world experience is needed (even though it proceeds with limited theory)