



# **Psychoecolonomics: Motivating Farmers Toward Cost-effective Actions Through Performance-based Incentives**

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# What's Needed?

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Conservation programs that:

- have clear and appropriate pollution reduction goals
- get local producers interested and develop their ownership of local water quality issues
- are focused on environmental outcomes
- provide flexibility and incentive to maximize “bang for the buck”

# Background

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- Agriculture continues to be the primary source of water quality impairments in the U.S.
- Current conservation programs:
  - Spend close to \$5 billion per year;
  - Are not focused on environmental outcomes;
  - Have not reduced impairments in some regions;
  - Do not motivate producers nor incentivize them to take most cost-effective actions.

# What is Psychoecolonomics?

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- Psychology – motivating producers
- Ecology – focusing on environmental outcomes
- Economics – using financial incentives to induce cost-effective behavior

# The Approach and the Tools

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Approach -

Pay-for-performance Conservation

Tools –

Performance-based Incentives

Farmer-led Watershed Councils

# Pay-for-Performance Conservation:

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- Rewards farmers for achieving specific environmental performance targets;
- Farmers choose how to achieve targets;
- Incentivizes farmers to choose the most cost-effective actions;
- Provides opportunities for additional farm income.

# The Economic Justification

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- There is no “market” for agricultural pollution control
- Current incentives are tied to specific practices
- A well-designed incentive from policy can serve as a “price” for pollution control
- Environmental performance becomes incorporated into farm business planning

# Potential Benefits

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- Improved environmental quality
- Flexibility
- Induced innovation
- Lower-cost solutions
- Enhanced farm income

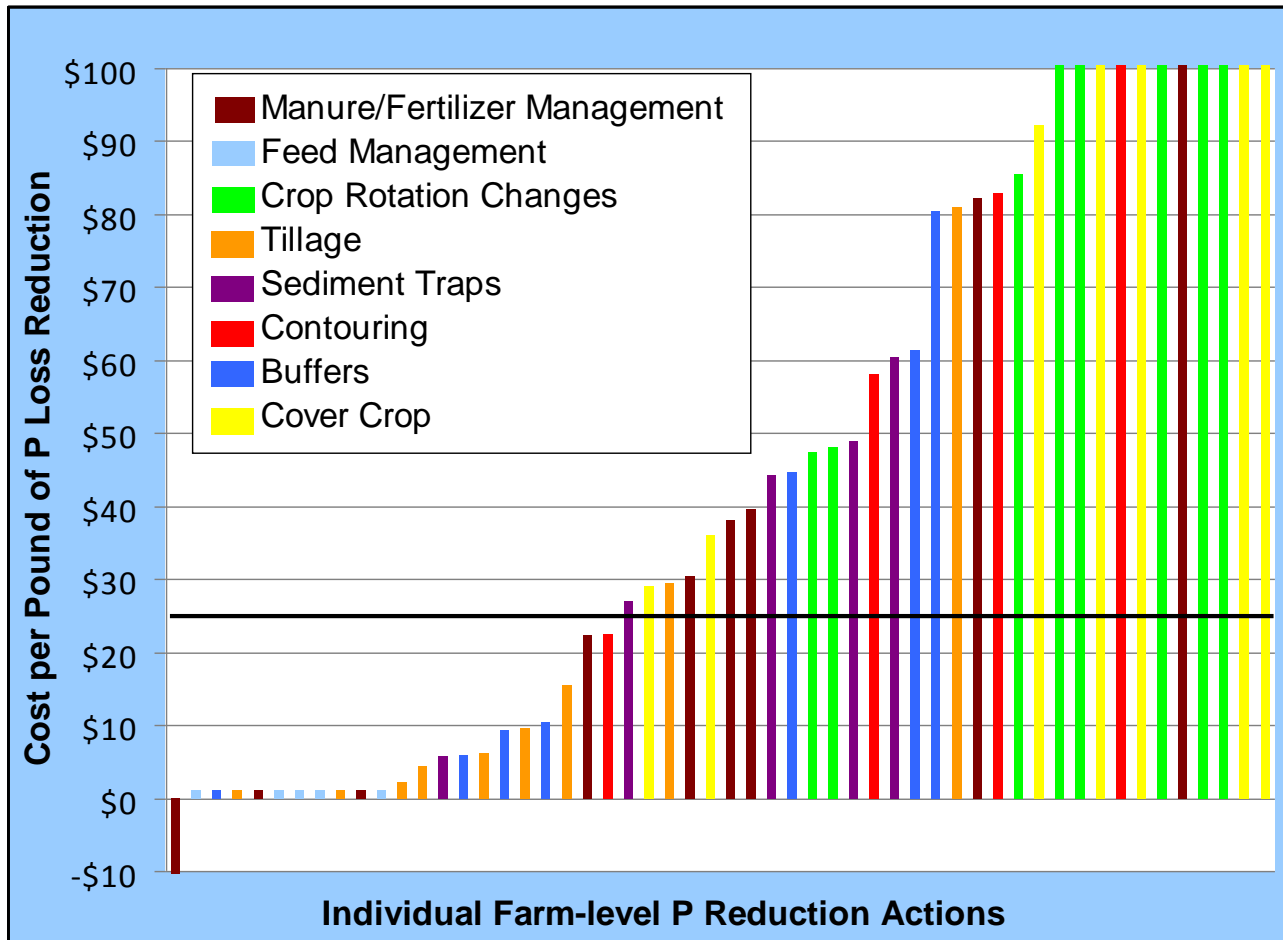


# Challenges and Constraints

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- Measuring performance
- Information-intensive
- Appropriately designed incentives
- Shifting gears

# Why Pay-for-Performance Conservation?



# Psychology.....

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## Key Question:

- How do we motivate producers to participate in conservation programs?

# The Details of Motivation

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- Definition: The activation of goal-setting behavior
- People have a drive to reach a clearly defined end-state
- Important aspects for an efficient goal:
  - Proximity
    - Goal can be reached within a reasonable time period
  - Difficulty
    - Not too hard to achieve, but not too easy either

# The Details of Motivation (cont'd)

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- Intrinsic and extrinsic motivation
- Intrinsic motivation
  - Attribute the outcome to factors they can control
  - Believe that they can be effective agents of change
  - Interested to see how good their performance can get
- Extrinsic motivation
  - Seeking the reward
  - Competition
  - Coercion

# Current Conservation Programs

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- What are the goals?
- USDA Field Staff:
  - “We have a list of BMPs that can help solve our local water quality problems, would you consider implementing some of them?”
- Farmer response:
  - “OK, if ***you’re*** going to pay for most it”
  - “You really think ***that’s*** gonna help?”
  - “Solutions to ***what*** water quality problem?”

# Ecology.....

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## Key Questions:

- Where do we quantify environmental performance?
- How do we quantify environmental performance?

# Performance Measures

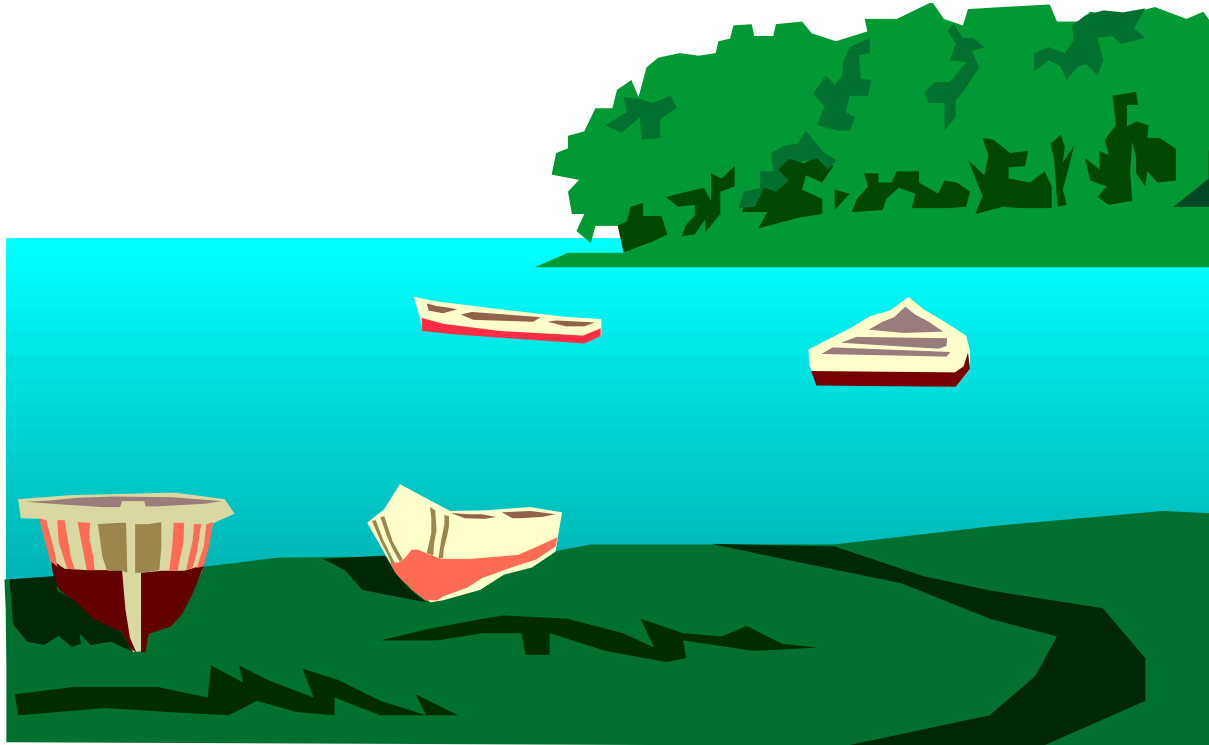
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- Where, how, and when environmental performance is quantified.
- Need performance measures that are closely related to ultimate water quality concern AND directly influenced by farm management decisions.



# Performance Measures – In the Lake, Bay, or Ocean

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# Performance Measures – In the River

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# Performance Measures – On the Farm

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# Measured vs. Modeled Performance

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- Measured performance
  - Real data from actual conditions
  - Is measurement practical at the farm-level?
  - Use of proxy variables?
- Modeled performance
  - Is it accurate enough - in a given year or over the long-term?
  - Is it simple enough to use?
  - Allows for scenario analysis – before actions are taken.
- Modeled farm-level performance and measured watershed-level performance

# Model at the Farm – Measure at the Watershed

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- Modeling farm performance
  - Allow scenario analysis
  - Only the farmer's actions affect performance
  - Triggers primary incentive payment
  - Incorporate environmental management into farm business decision-making (profit maximization)
- Measuring watershed performance
  - Not prohibitively expensive
  - Provides a real report card
  - Provides a focal point for stakeholders
  - Triggers a secondary incentive payment to participating farmers
  - Farmer-to-farmer peer pressure for participation

# Economics.....

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## Key Questions:

- What do we pay for?
- How much do we pay?
- Where will the funding come from?

# Reduced Losses vs. Specified Losses

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- Paying for reduced losses
  - Greatest cost-effectiveness
  - Can pay per pound of reduction
  - Unfair to better land stewards?
  - Fully compliant to qualify
- Paying for specified losses
  - Reduced cost-effectiveness - Not all payments will result in environmental improvement
  - Payments per acre
  - More fair?
- Both?

# Setting the Appropriate Payment Level

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- Getting the price right
- Societal value
  - Set price based on public value of reductions
  - Efficient allocation of resources
  - Difficult to quantify – adds additional complexity
- Cost of production
  - Set price based on known average cost of reductions
  - Aim to induce changes but not break the bank
- Reverse auction



# Lessons from the Field.....

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# Four watersheds in Northeast Iowa

- Intensive row-crop and livestock operations
- Watershed Councils created to guide work
- Field trials and education are important components



## Iowa Pilot-testing

### Approach I

North Fork Headwaters

### Approach II

Hewitt Creek

Lime Creek

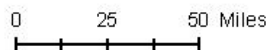
Coldwater - Palmer

### Larger Watersheds

Maquoketa

Middle Cedar

Shell Rock



# Vermont's Missisquoi River Watershed



- 70,526 total acres
- 17,412 acres of cropland
- Largely dairy farming
- TMDL for P in Lake Champlain
- Missisquoi Bay has highest P loads and acute algae blooms

## Vermont Pilot-testing

- Approach I      Larger Watershed
- Hungerford Brook   ■ Missisquoi
  - Rock River

0 5 10 20 Miles



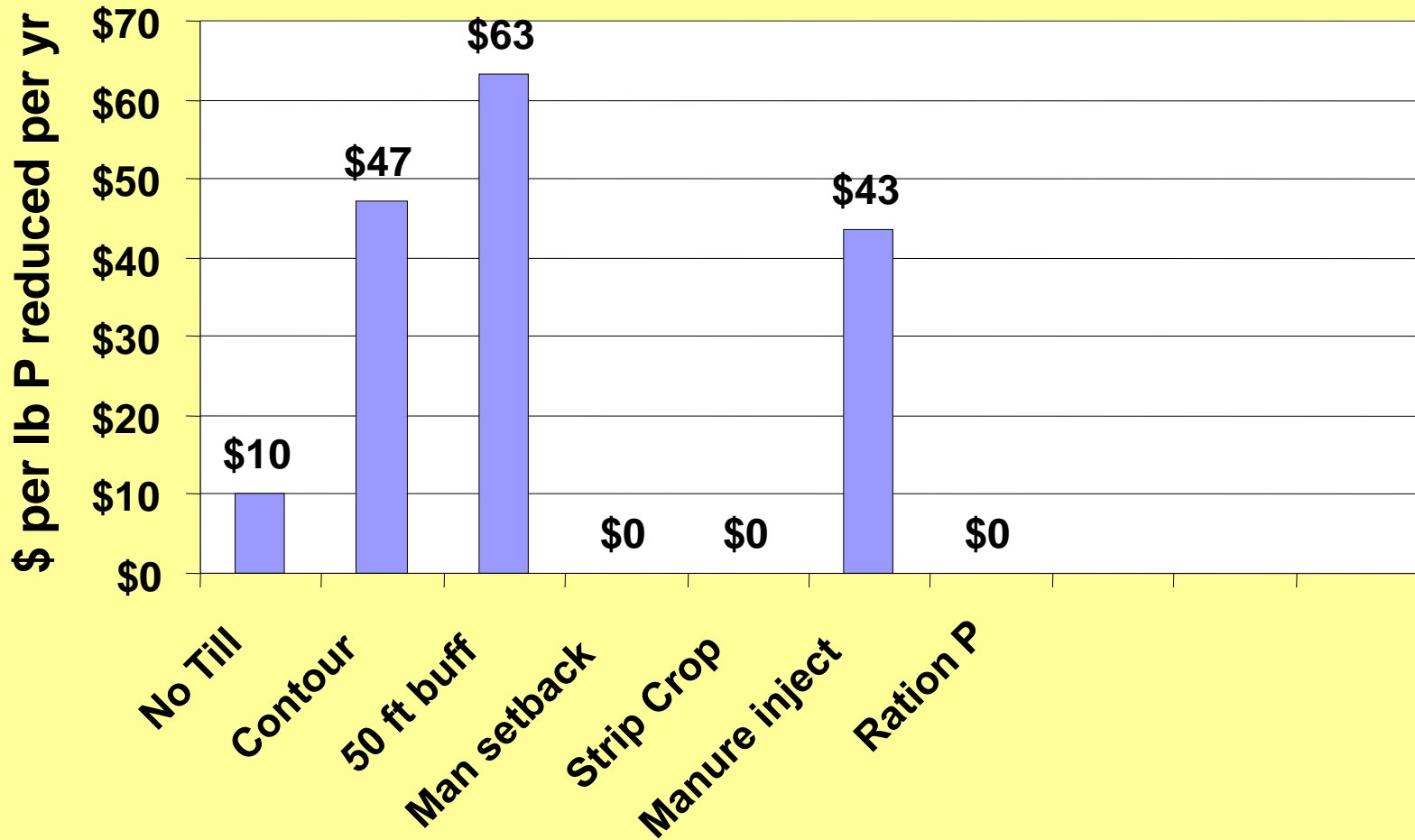
# Pilot-testing Performance-based Incentives in Vermont

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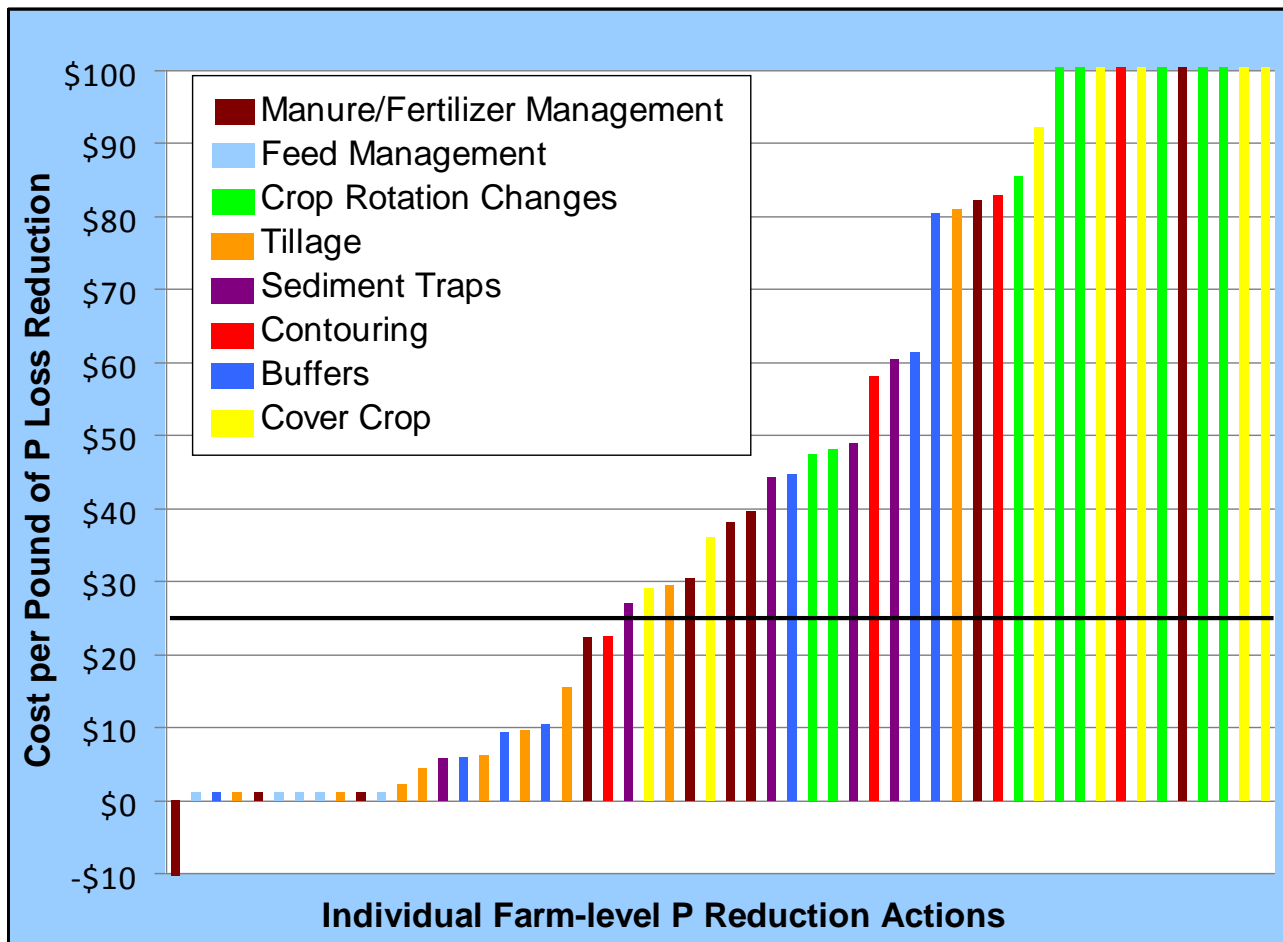
- Goal: Reduce estimated P loss (using VT P Index)
- Incentive: \$25/lb P loss reduced
- Steps:
  - Calculated or updated farm's P Index
  - Brainstormed actions to reduce P loss
  - Calculated P loss reduction, costs, and cost-effectiveness for each action
- If resulting payment is greater than cost, action is a good business decision for farm

<b><u>Scenario #</u></b>	<b><u>Short Name</u></b>	<b><u>Description of changes</u></b>
<b>Action 1</b>	<b>No-till</b>	<b>Spring chisel to no tillage on fields G01, G06C, H02A, H02B, H02C, and G06.</b>
<b>Action 2</b>	<b>Contour</b>	<b>Plow and plant on the contour when fields H02, H02B, H02C are in corn.</b>
<b>Action 3</b>	<b>Buffers</b>	<b>Added 50' not harvested buffer on fields G01 (500' length buffer on southern edge of field), G06C (750' buffer on portion along G06B), H02A (550' length buffer along southwest edge of field), H02B (430' length buffer along southwest edge of field), H02C (440' length buffer along southwest edge of field).</b>
<b>Action 4</b>	<b>Manure Set-back</b>	<b>Manure setback 50' nearest waterways on fields G01, G06C, H02A, H02B, and H02C</b>
<b>Action 5</b>	<b>Strip Cropping</b>	<b>Strip cropping (hay and corn) on fields H02A, H02B, H02C</b>
<b>Action 6</b>	<b>Manure Injection</b>	<b>Manure injection on all fields except G02B &amp; H01 (from not incorporated on hay fields and chisel plow on corn fields)</b>
<b>Action 7</b>	<b>Ration P</b>	<b>Decrease P in feed ration for milkers from 0.45% to 0.39%.</b>

# Cost to Reduce P Loss by 1 Pound



# Cost of P Loss Reduction (\$/lb)



# Results of Good Business Decisions

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<b>Watershed</b>	<b>P Loss Reduced (lbs/acre/yr)</b>	<b>Farm Cost (\$/lb P)</b>	<b>Farm Profit (\$/lb P)</b>	<b>Sediment Loss Reduced (tons/acre/yr)</b>
<b>Iowa</b>	<b>0.88</b>	<b>-\$0.61</b>	<b>\$10.61</b>	<b>1.58</b>
<b>Vermont</b>	<b>0.26</b>	<b>\$4.86</b>	<b>\$20.14</b>	<b>1.01</b>



# Farmer-led Watershed Councils



# Lessons Learned:

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- Cost-effectiveness varies greatly across BMPs; **AND**
- Cost-effectiveness varies greatly within any given BMP.
- Small incentive payments are appropriate for small changes.

# Lessons Learned (Cont'd):

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- Producers are motivated by:
  - Becoming agents of change
    - Learning about local WQ issues
    - Having clear goals to achieve
  - Having flexibility
  - Solving problems
  - Profits
  - Working together and competing

# For More Information:

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Visit the Project Website:  
[www.flexincentives.com](http://www.flexincentives.com)

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