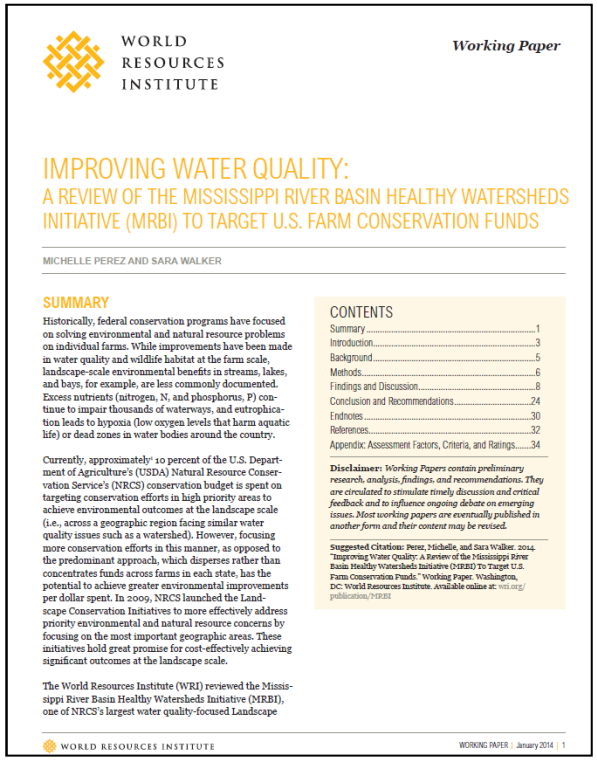
IMPROVING WATER QUALITY THROUGH BETTER TARGETING

July 16, 2014 TOWG Presentation



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Working Paper

IMPROVING WATER QUALITY:
A REVIEW OF THE MISSISSIPPI RIVER BASIN HEALTHY WATERSHEDS INITIATIVE (MRBI) TO TARGET U.S. FARM CONSERVATION FUNDS

MICHELLE PEREZ AND SARA WALKER

SUMMARY

Historically, federal conservation programs have focused on solving environmental and natural resource problems on individual farms. While improvements have been made in water quality and wildlife habitat at the farm scale, landscape-scale environmental benefits in streams, lakes, and bays, for example, are less commonly documented. Excess nutrients (nitrogen, N, and phosphorus, P) continue to impair thousands of waterways, and eutrophication leads to hypoxia (low oxygen levels that harm aquatic life) or dead zones in water bodies around the country.

Currently, approximately[1] 10 percent of the U.S. Department of Agriculture's (USDA) Natural Resource Conservation Service's (NRCS) conservation budget is spent on targeting conservation efforts in high priority areas to achieve environmental outcomes at the landscape scale (i.e., across a geographic region facing similar water quality issues such as a watershed). However, focusing more conservation efforts in this manner, as opposed to the predominant approach, which disperses rather than concentrates funds across farms in each state, has the potential to achieve greater environmental improvements per dollar spent. In 2009, NRCS launched the Landscape Conservation Initiatives to more effectively address priority environmental and natural resource concerns by focusing on the most important geographic areas. These initiatives hold great promise for cost-effectively achieving significant outcomes at the landscape scale.

The World Resources Institute (WRI) reviewed the Mississippi River Basin Healthy Watersheds Initiative (MRBI), one of NRCS's largest water quality-focused Landscape

CONTENTS

Disclaimer: *Working Papers contain preliminary research, analysis, findings, and recommendations. They are circulated to stimulate timely discussion and critical feedback and to influence ongoing debate on emerging issues. Most working papers are eventually published in another form and their content may be revised.*

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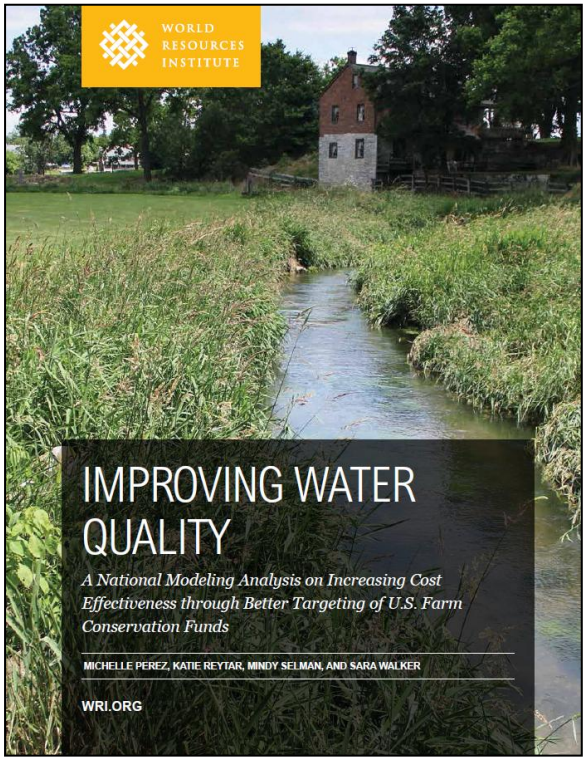

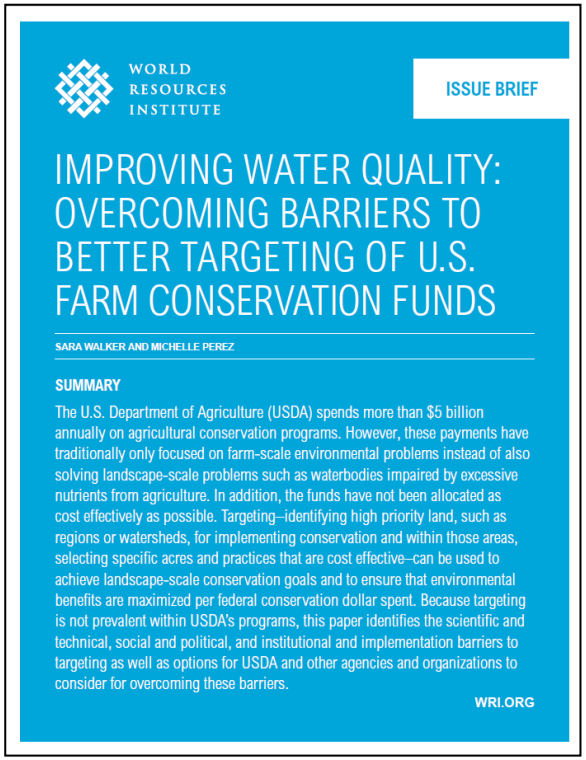

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ISSUE BRIEF

IMPROVING WATER QUALITY: OVERCOMING BARRIERS TO BETTER TARGETING OF U.S. FARM CONSERVATION FUNDS

SARA WALKER AND MICHELLE PEREZ

SUMMARY

The U.S. Department of Agriculture (USDA) spends more than $5 billion annually on agricultural conservation programs. However, these payments have traditionally only focused on farm-scale environmental problems instead of also solving landscape-scale problems such as waterbodies impaired by excessive nutrients from agriculture. In addition, the funds have not been allocated as cost effectively as possible. Targeting–identifying high priority land, such as regions or watersheds, for implementing conservation and within those areas, selecting specific acres and practices that are cost effective–can be used to achieve landscape-scale conservation goals and to ensure that environmental benefits are maximized per federal conservation dollar spent. Because targeting is not prevalent within USDA's programs, this paper identifies the scientific and technical, social and political, and institutional and implementation barriers to targeting as well as options for USDA and other agencies and organizations to consider for overcoming these barriers.

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TARGETING DISCUSSION

1. Improving Water Quality: A National Modeling Analysis on Increasing Cost Effectiveness through Better Targeting of U.S. Farm Conservation Funds

2. Improving Water Quality: Overcoming Barriers to Better Targeting of U.S. Farm Conservation Funds

3. Preliminary Review of the Chesapeake Bay Watershed Initiative

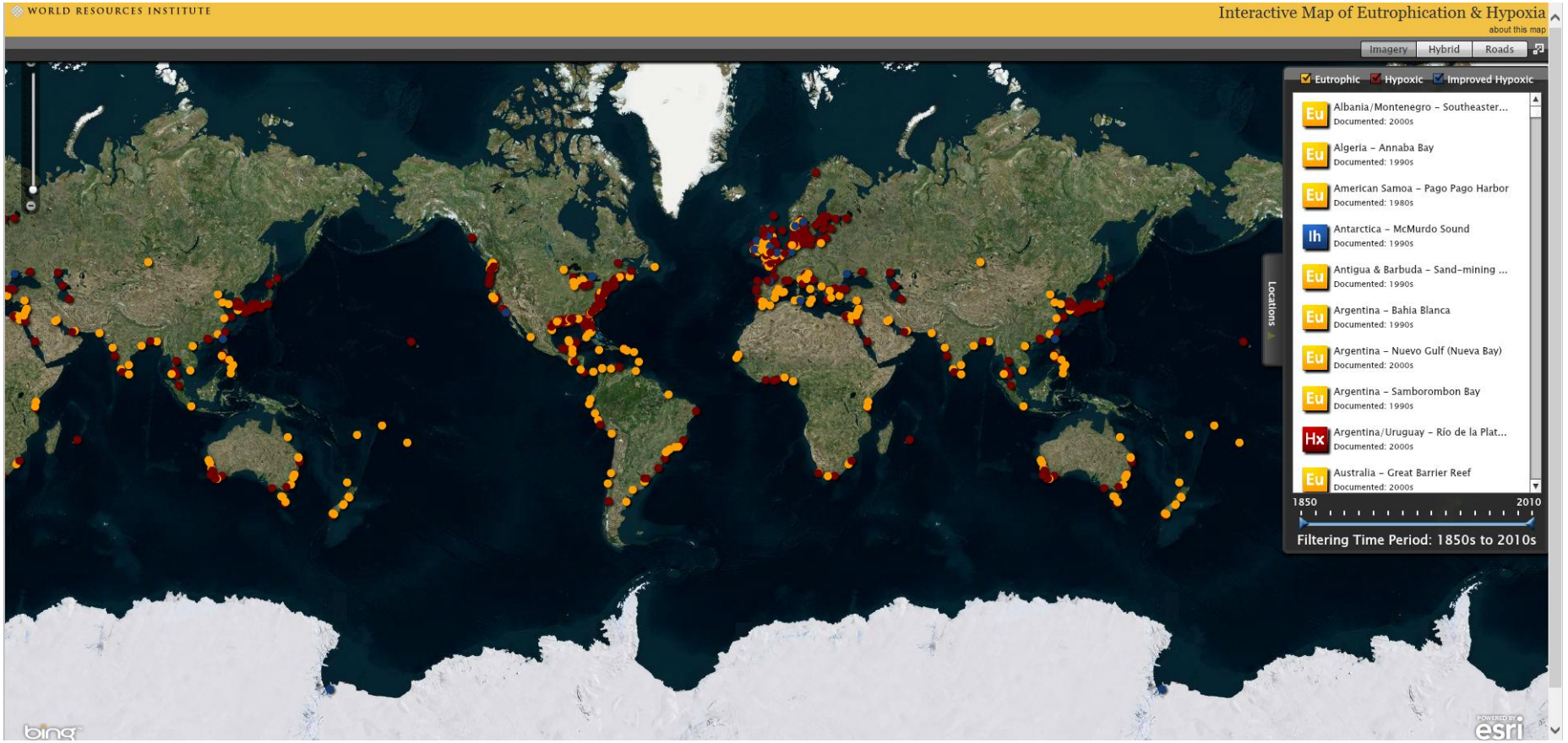
Michelle Perez and Sara Walker

ENVIRONMENTAL PROBLEM: EXCESS ALGAE BLOOMS

ENVIRONMENTAL PROBLEM: FISH KILLS

MAJOR SOURCE:
FARM NUTRIENT & SEDIMENT RUNOFF

ENVIRONMENTAL PROBLEM:
COASTAL EUTROPHICATION & HYPOXIA WORLDWIDE



DEFINING TARGETING

- Geographic targeting – Prioritizing areas:
  a. Greatest environmental impairments
  b. Pristine conditions
  c. Greatest *change* in environmental conditions possible

- Benefit-cost targeting – Identifying acres and practices that can produce the most environmental benefits per dollar spent (e.g., most pounds of N reductions/$)

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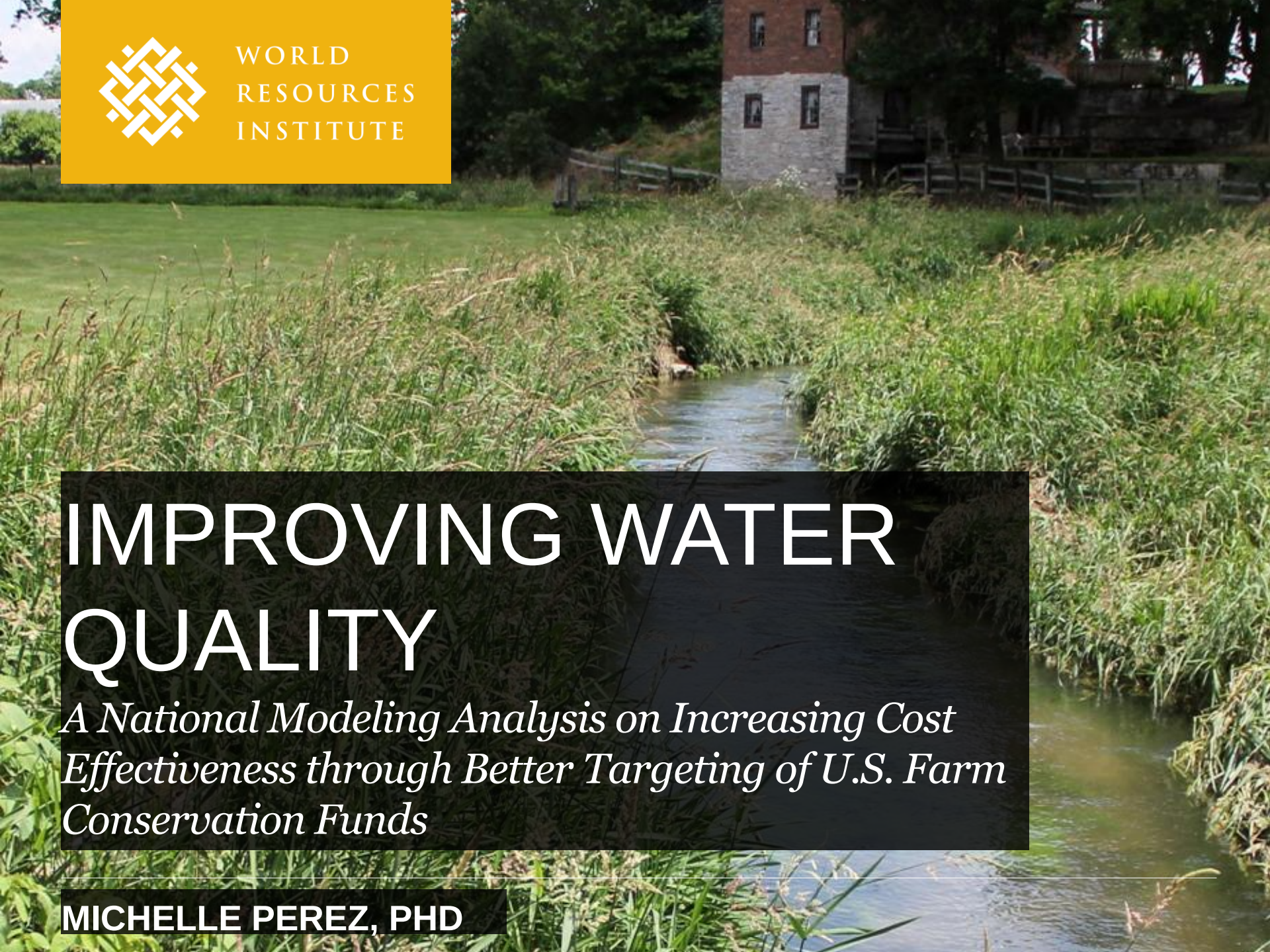

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IMPROVING WATER QUALITY

A National Modeling Analysis on Increasing Cost Effectiveness through Better Targeting of U.S. Farm Conservation Funds

MICHELLE PEREZ, PHD

RESEARCH QUESTIONS

1. How cost effective is the current (BAU) approach?
   - BAU=spending on nutrient & erosion control practices: ’06-’11
2. How much more effective could it be with targeting?
   - 3 targeting approaches
3. How do results change depending on what environmental benefit is being optimized?
   - N, P, & sediment reduction & soil C sequestration
4. If programs were designed to achieve the most cost-effective benefits, where would the funds be spent?

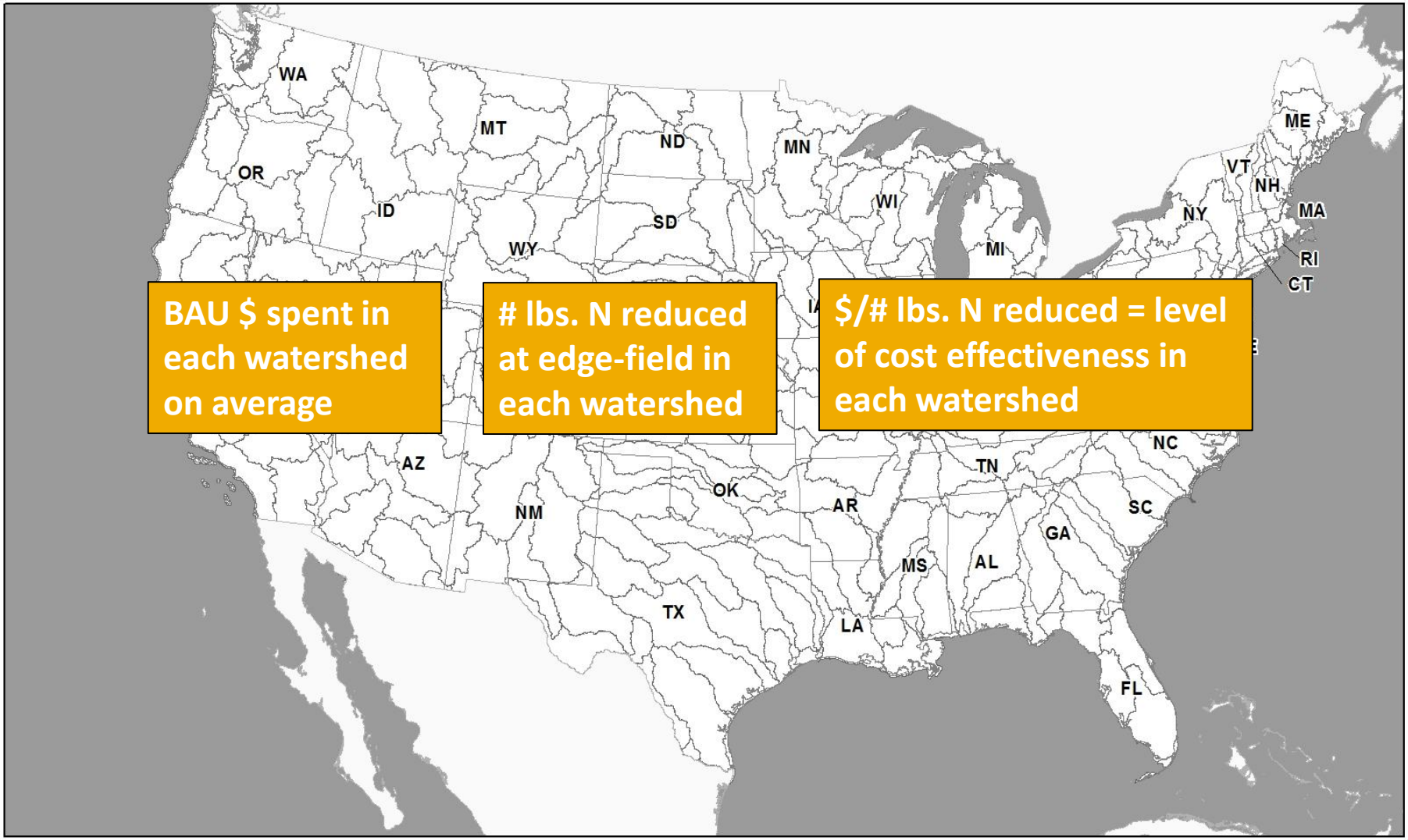
DATA & MODELS

- Farmer survey data from Natural Resources Inventory-Conservation Effects Assessment Project (NRI-CEAP)
- Agricultural Policy Extender (APEX) model
- Economic optimization model

MODELING LIMITATIONS

- Geographic targeting - Prioritizing areas with greatest change possible
- Model analysis is at edge-of-field
- Doesn’t account for where acres are vis a vis impaired water bodies
- Prioritizes acres that offer the biggest edge-of-field pollution reduction opportunities

201 4-DIGIT WATERSHEDS
& ESTIMATING BAU COST EFFECTIVENESS



3 TARGETING APPROACHES IN MODEL

TARGETING APPROACHES	MODELED VARIABLES	
	CONSERVATION BUDGETS PER WATERSHED	COST-EFFECTIVENESS LEVEL PER WATERSHED
Geographic + Benefit-Cost Targeting (a.k.a. Dual Targeting)	Optimized	Optimized
Geographic Targeting Only	Optimized	BAU
Benefit-Cost Targeting Only	BAU	Optimized

DUAL TARGETING MORE EFFECTIVE THAN BAU

TARGETING APPROACH	OPTIMIZATION SCENARIOS	$/LB. NITROGEN REDUCED (1,000 LBS. N REDUCED)	$/LB. PHOSPHORUS REDUCED (1,000 LBS. P REDUCED)	$/TON SEDIMENT REDUCED (1,000 TONS SEDIMENT REDUCED)	$/LB. SOIL CARBON SEQUESTERED (1,000 LBS. C SEQUESTERED)
BAU	N/A	**$3.65** (91,843)	**$19.82** (16,891)	**$28.27** (11,845)	**$1.05** (317,565)
Geographic + Benefit-Cost	N Reduction	**$0.30** (1,124,304)	**12 x**	**$11.82** (28,353)	**$1.71** (196,350)
	P Reduction	**$0.68** (492,979)	**$2.46** (136,395)	**8 x**	**$0.39** (855,065)
	Sediment Reduction	**$1.32** (254,597)	**$4.87** (68,759)	**$3.63** (92,354)	**8 x**
	Soil C Sequestration	**$0.98** (343,226)	**$5.47** (61,210)	**$9.84** (34,034)	**$0.14** (2,377,003)
	Multiple Benefits (100P+10N+1C)	**$0.36** (934,517)	**$2.82** (118,993)	**$7.02** (47,709)	**7.5 x**

DUAL TARGETING IS MOST COST EFFECTIVE

- Geographic + benefit-cost targeting could result in 7 to 12 times more environmental benefits per dollar spent than BAU
- Benefit-cost targeting alone could achieve 4 to 9 times the benefits as BAU
- Geographic targeting alone could be better or worse than BAU

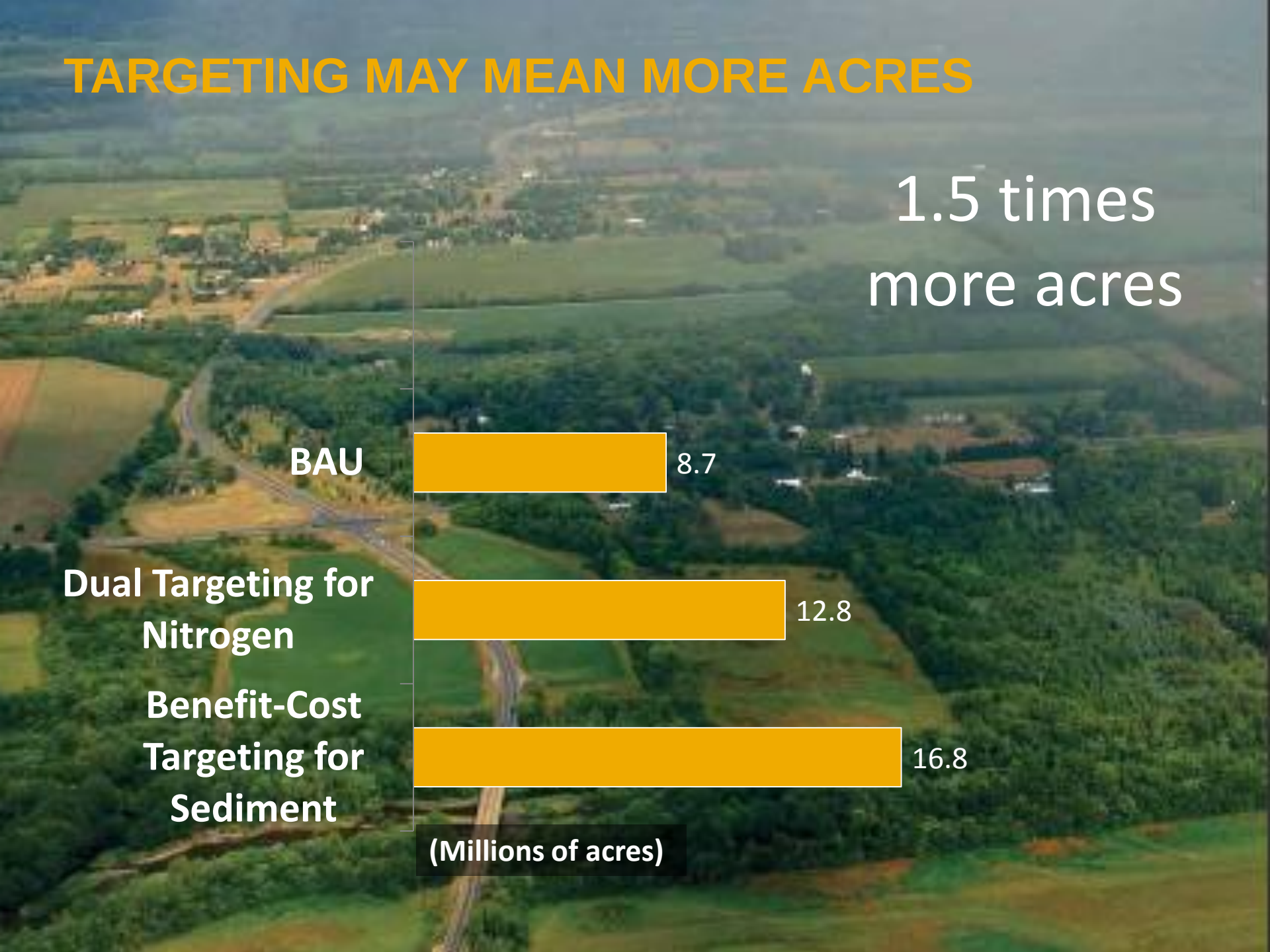
CHOOSING WHAT TO TARGET

- Optimizing for multiple benefits (N, P, & soil C) yields more co-benefits & fewer trade-offs than optimizing for individual benefits

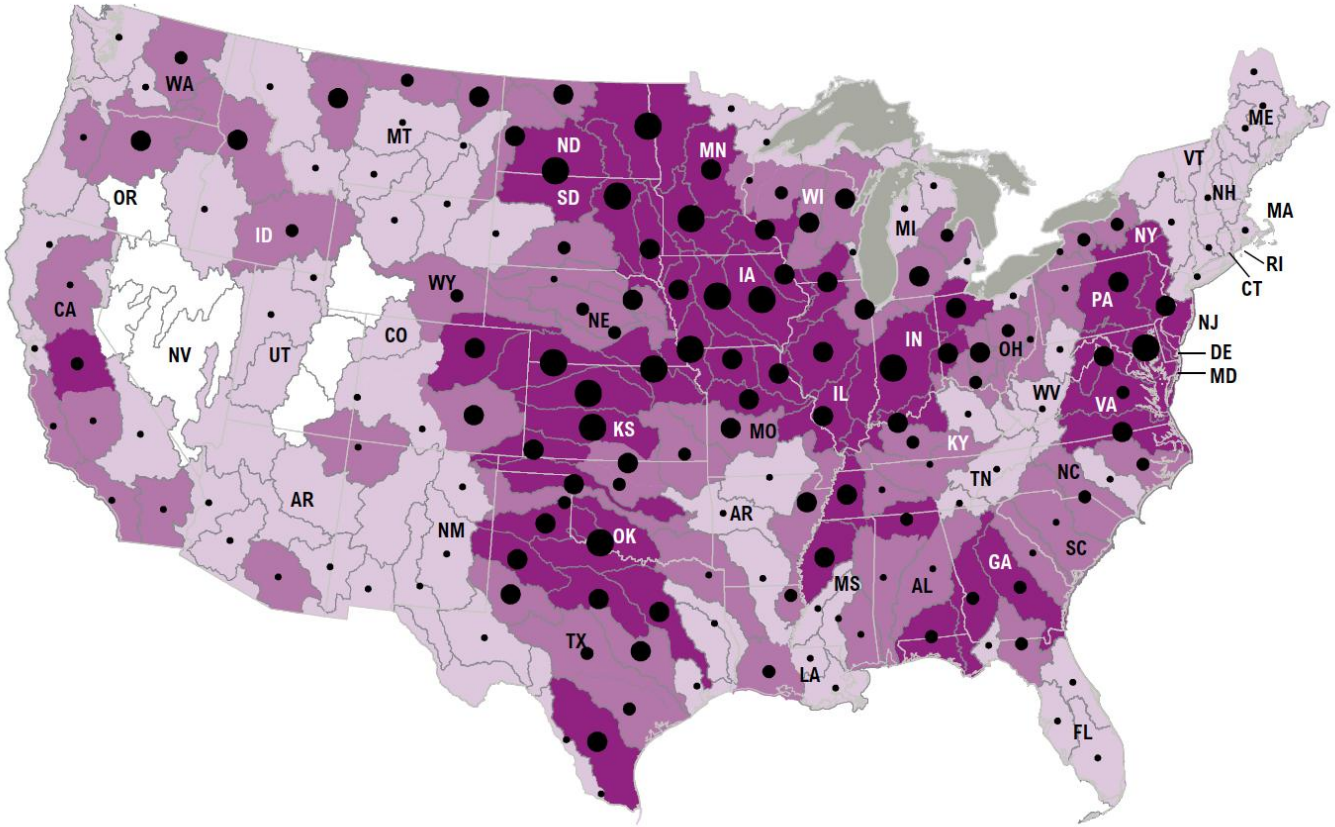
- If only 1 benefit can be targeted, optimizing for phosphorus reductions is best

TARGETING MAY MEAN MORE ACRES

1.5 times more acres



BUSINESS-AS-USUAL ALLOCATION OF FUNDS



High Priority Watershed ($2.9M–$15.8M), n = 48

Medium Priority Watershed ($578K–$2.8M), n = 63

Low Priority Watershed ($1K–$577K), n = 83

Non-priority Watershed ($0), n = 7

Acres Treated

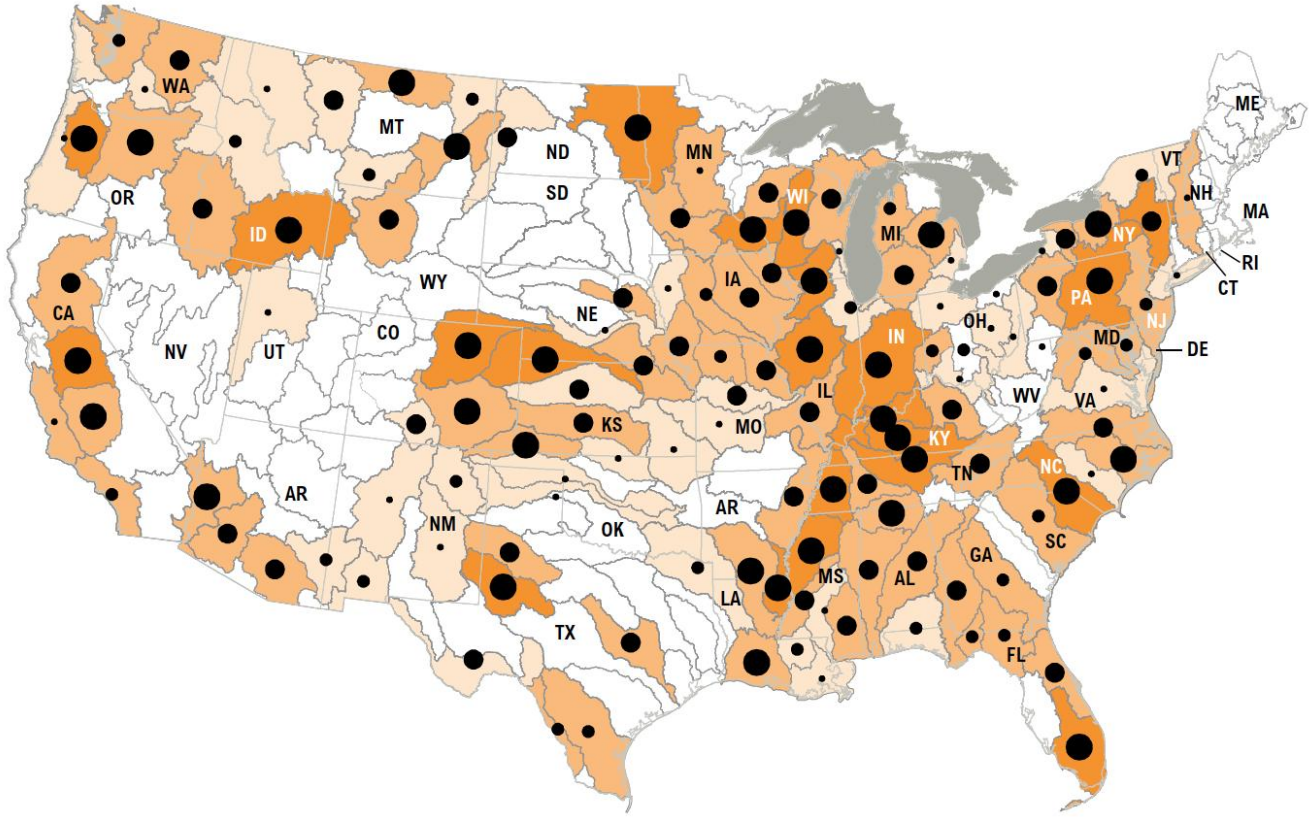
126,000–514,000

51,000–125,000

26,000–50,000

1,000–25,000

FUNDING ALLOCATIONS FOR MULTIPLE BENEFITS OPTIMIZATION (N, P, C)

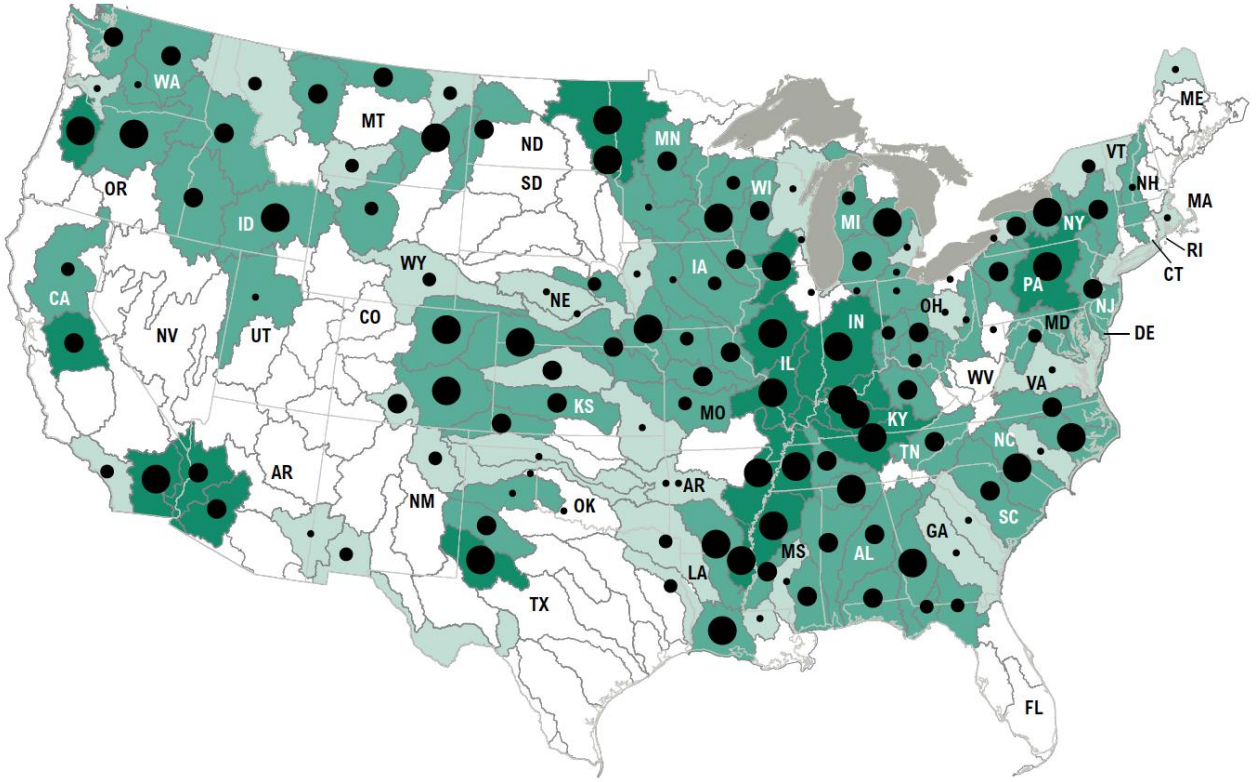


- High Priority Watershed ($4.5M–$23.2M), n = 22
- Medium Priority Watershed ($839K–$4.4M), n = 64
- Low Priority Watershed ($21K–$838K), n = 42
- Non-priority Watershed ($0), n = 73

Acres Treated

- 126,000–1,026,000
- 51,000–125,000
- 26,000–50,000
- 1,000–25,000

FUNDING ALLOCATIONS FOR PHOSPHORUS OPTIMIZATION



High Priority Watershed ($5.1M–$30.1M), n = 15

Medium Priority Watershed ($525K–$5.0M), n = 72

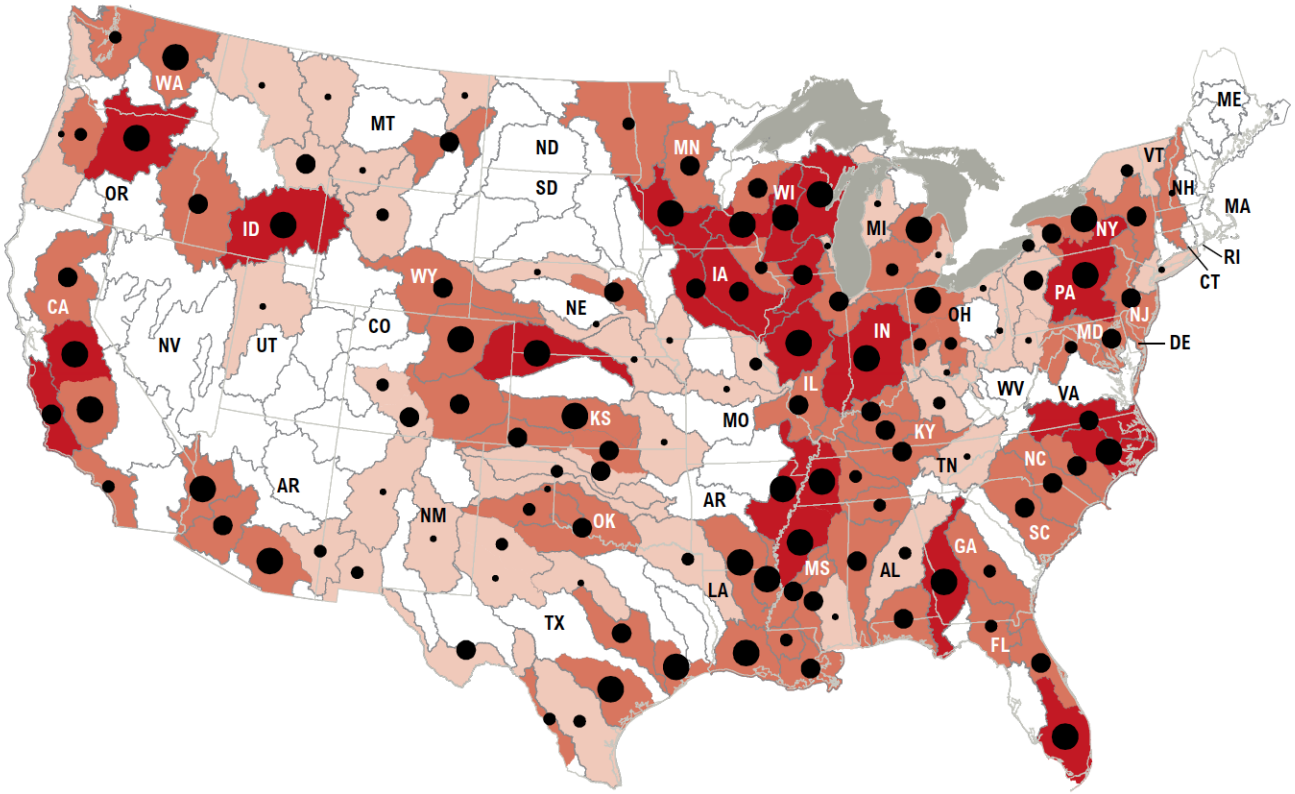
Low Priority Watershed ($21K–$524K), n = 39

Non-priority Watershed ($0), n = 75

Acres Treated

- 126,000–1,131,000
- 51,000–125,000
- 26,000–50,000
- 1,000–25,000

FUNDING ALLOCATIONS FOR NITROGEN OPTIMIZATION



High Priority Watershed ($4.4M–$24.2M), n = 22

Medium Priority Watershed ($838K–$4.3M), n = 62

Low Priority Watershed ($21K–$837K), n = 45

Non-priority Watershed ($0), n = 72

Acres Treated

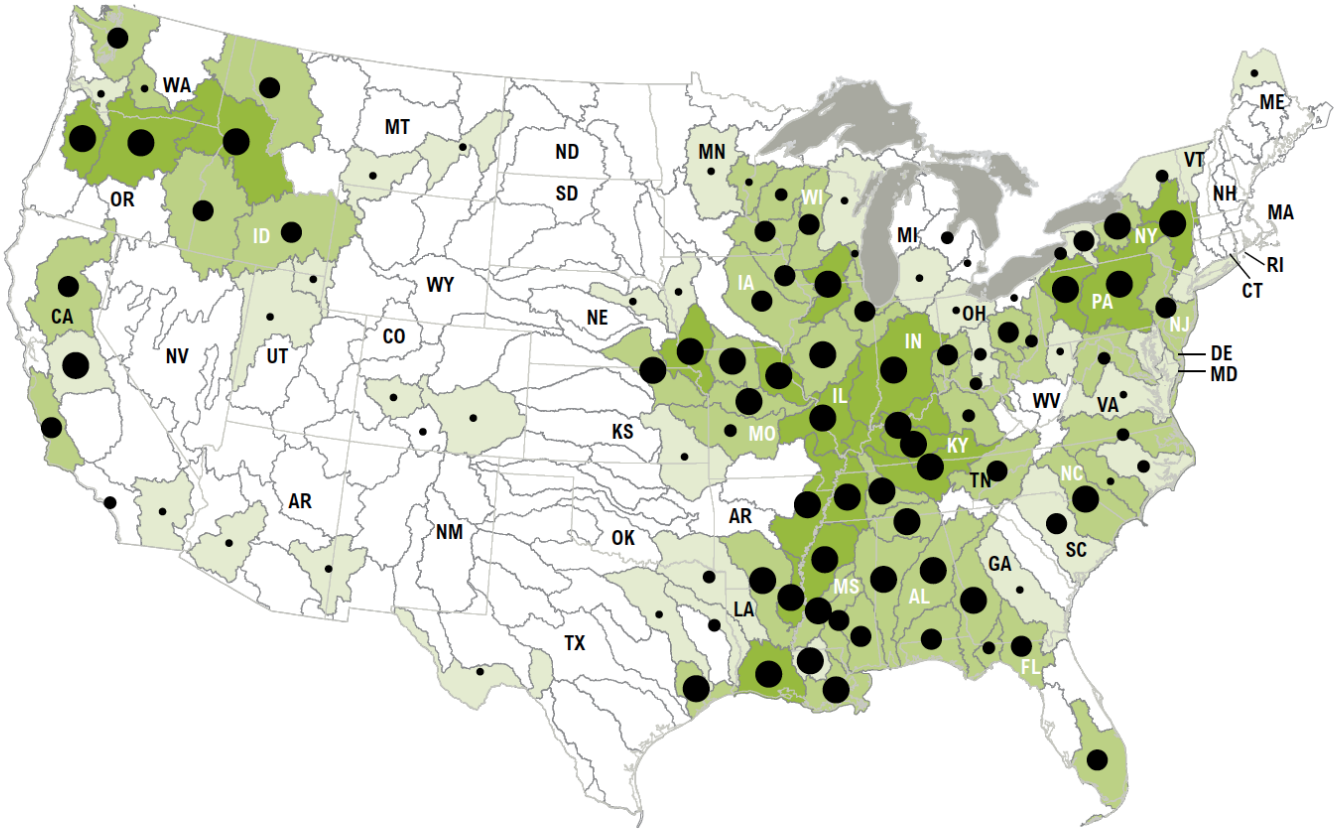
126,000–691,000

51,000–125,000

26,000–50,000

1,000–25,000

FUNDING ALLOCATIONS FOR SEDIMENT OPTIMIZATION

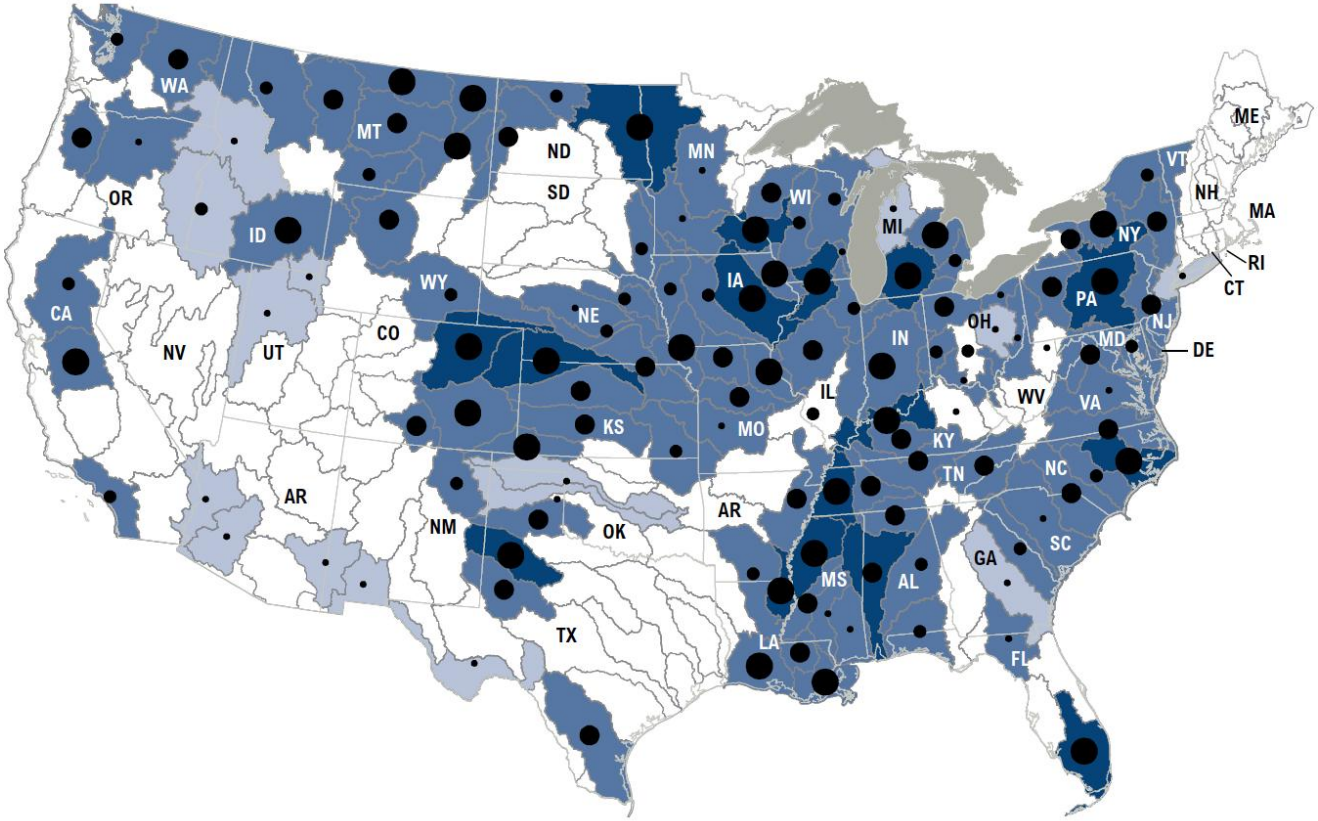


- High Priority Watershed ($5.9M–$35.7M), n = 19
- Medium Priority Watershed ($628K–$5.0M), n = 72
- Low Priority Watershed ($15K–$627K), n = 35
- Non-priority Watershed ($0), n = 100

Acres Treated

- 126,000–1,660,000
- 51,000–125,000
- 26,000–50,000
- 1,000–25,000

FUNDING ALLOCATIONS FOR SOIL CARBON OPTIMIZATION



- High Priority Watershed ($4.9M–$38.4M), n = 16
- Medium Priority Watershed ($258K–$4.8M), n = 88
- Low Priority Watershed ($43K–$257K), n = 15
- Non-priority Watershed ($0), n = 82

Acres Treated

- 126,000–1,482,000
- 51,000–125,000
- 26,000–50,000
- 1,000–25,000

WHAT THIS STUDY IS & IS NOT

- Not an analysis of what NRCS could have done in past due to
  - Scientific & technical barriers
  - Institutional & implementation barriers
  - Social & political barriers
- Is an analysis of what NRCS could be doing in the future

RECOMMENDATIONS

1. Track environmental benefits
2. Rank applications according to benefit-cost ratios
3. Conduct pilot projects
4. Improve state funding allocation formulas

Thank You!

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OVERCOMING BARRIERS TO TARGETING

SARA WALKER AND MICHELLE PEREZ

POLICY PROBLEM
BUSINESS-AS-USUAL CONSERVATION

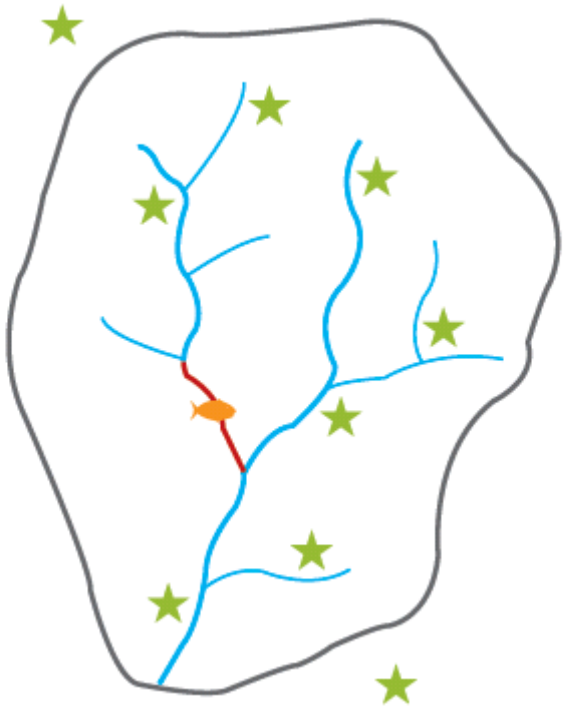
Solves individual water quality problems on individual farms

Before

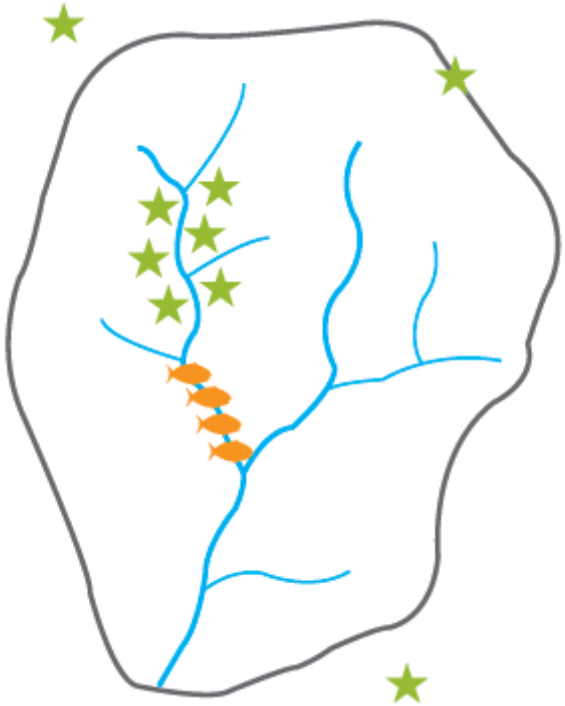
After

POLICY SOLUTION: TARGETING

Business As Usual:
Solves individual farm water quality problems



Targeting Critical Sub-Areas:
Solves landscape-scale water quality problems



3 MAJOR TYPES OF BARRIERS

1. Scientific and Technical
2. Social and Political
3. Institutional and Implementation

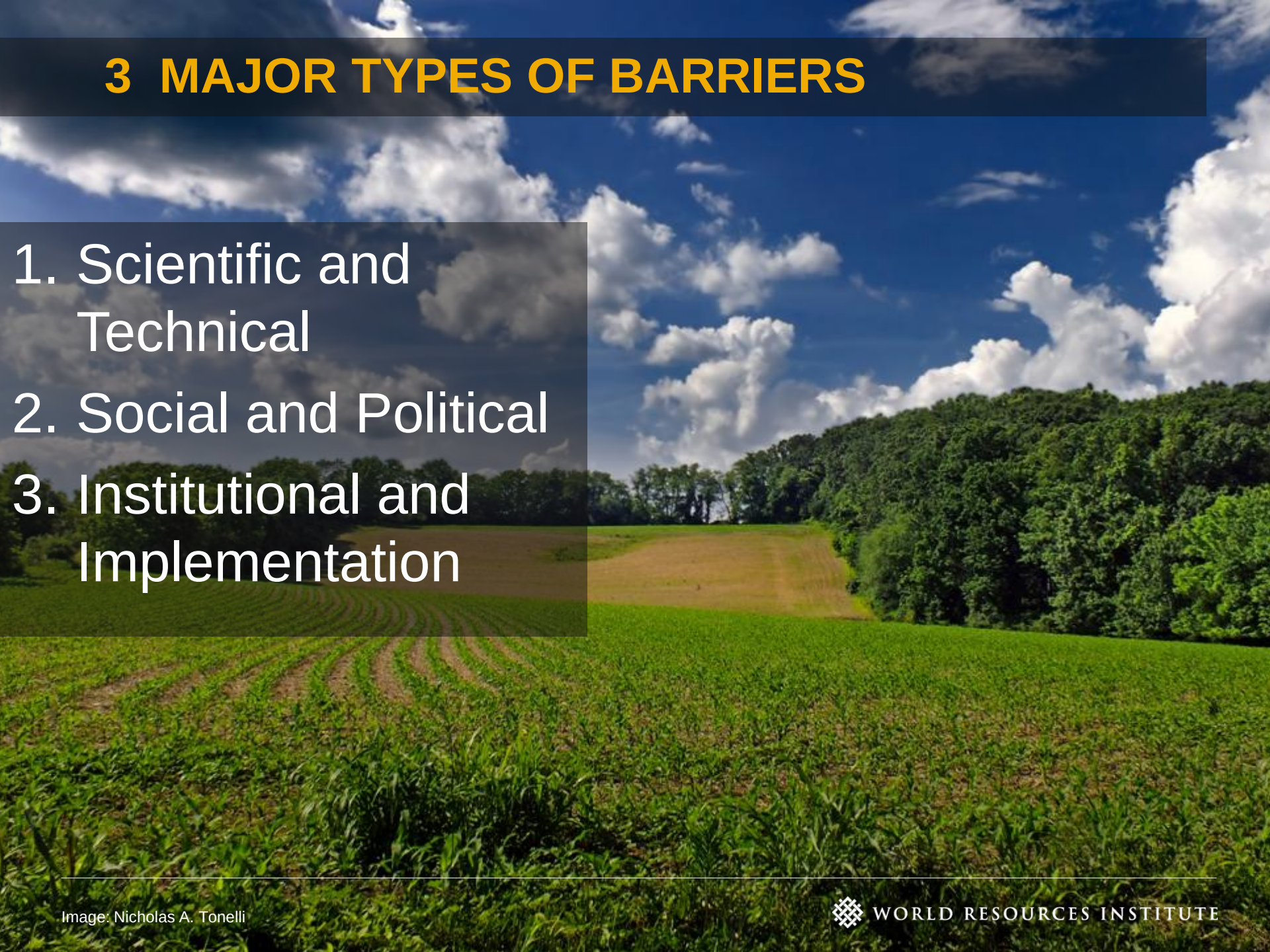
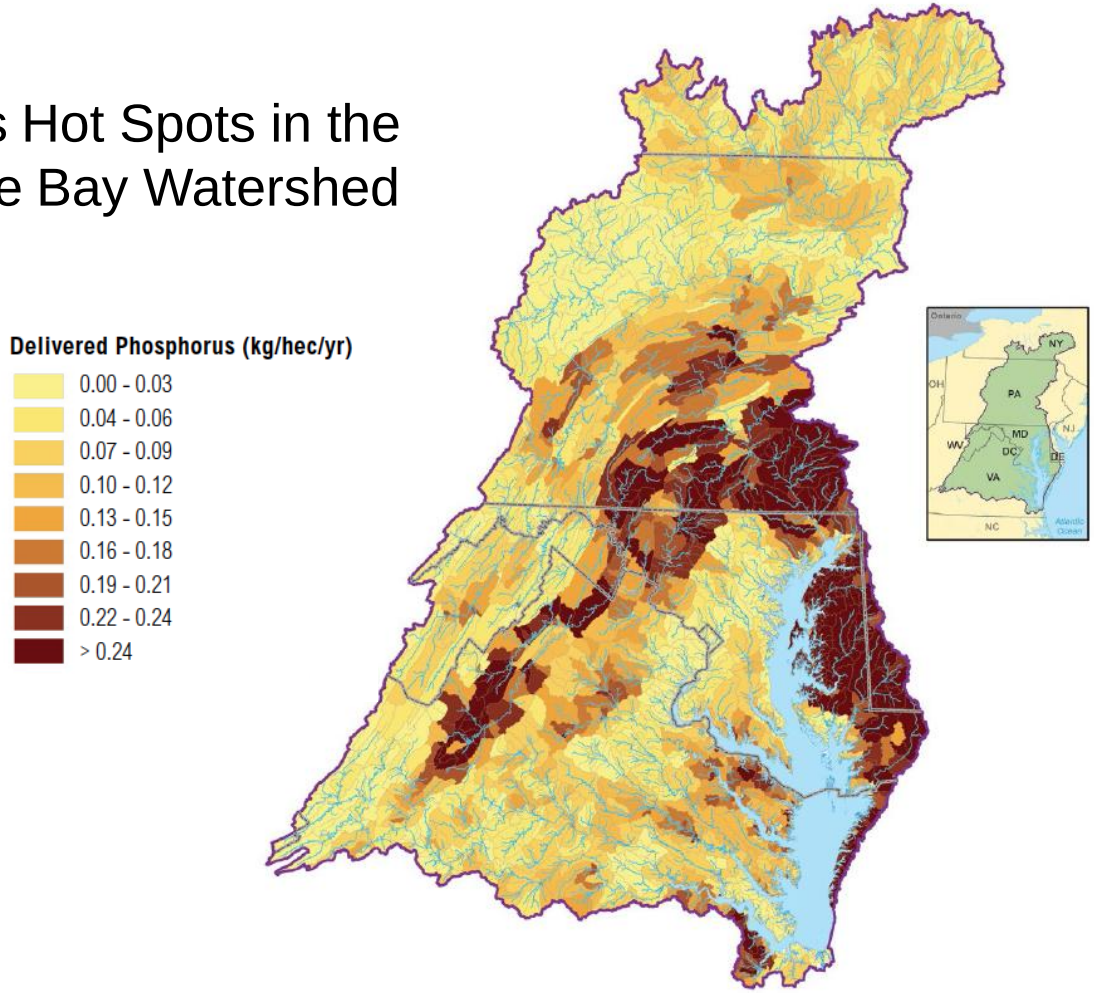


Image: Nicholas A. Tonelli

CHALLENGE: LIMITED DATA AND TOOLS

Phosphorus Hot Spots in the Chesapeake Bay Watershed



Source: U.S. Geological Survey SPARROW Model, courtesy of the Chesapeake Bay Program

Scientific and Technical

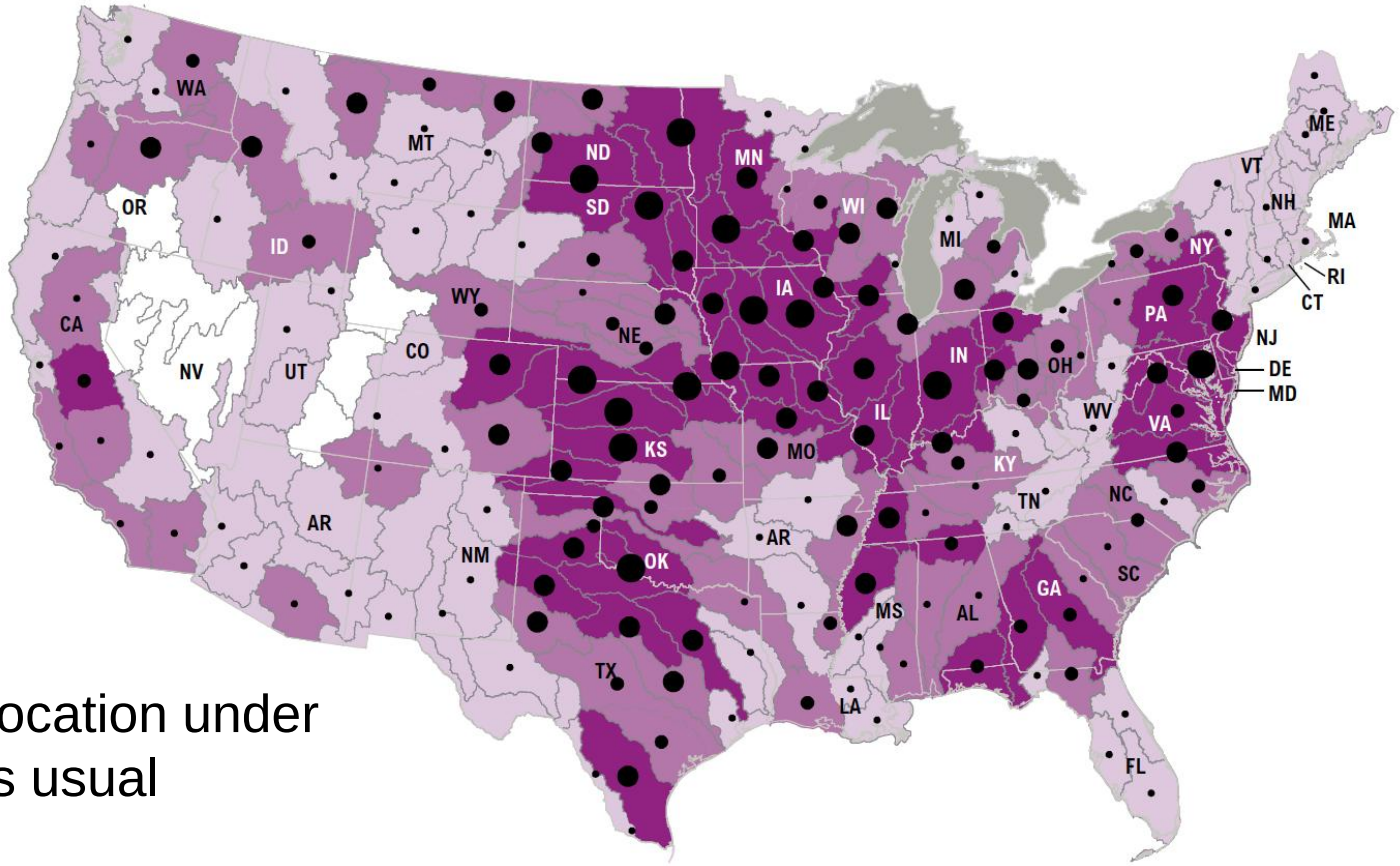
1 2 3

OPTIONS

- Better employ existing tools and metrics
- Transfer tools
- Advance modeling capabilities

Image: NRCS/Lynn Betts

CHALLENGE: COMPETING POLITICAL AND STAKEHOLDER INTERESTS



Funding allocation under business as usual

High Priority Watershed
Medium Priority Watershed
Low Priority Watershed
Non-priority Watershed

Acres Treated

126,000–514,000
51,000–125,000
26,000–50,000
1,000–25,000

Source: WRI

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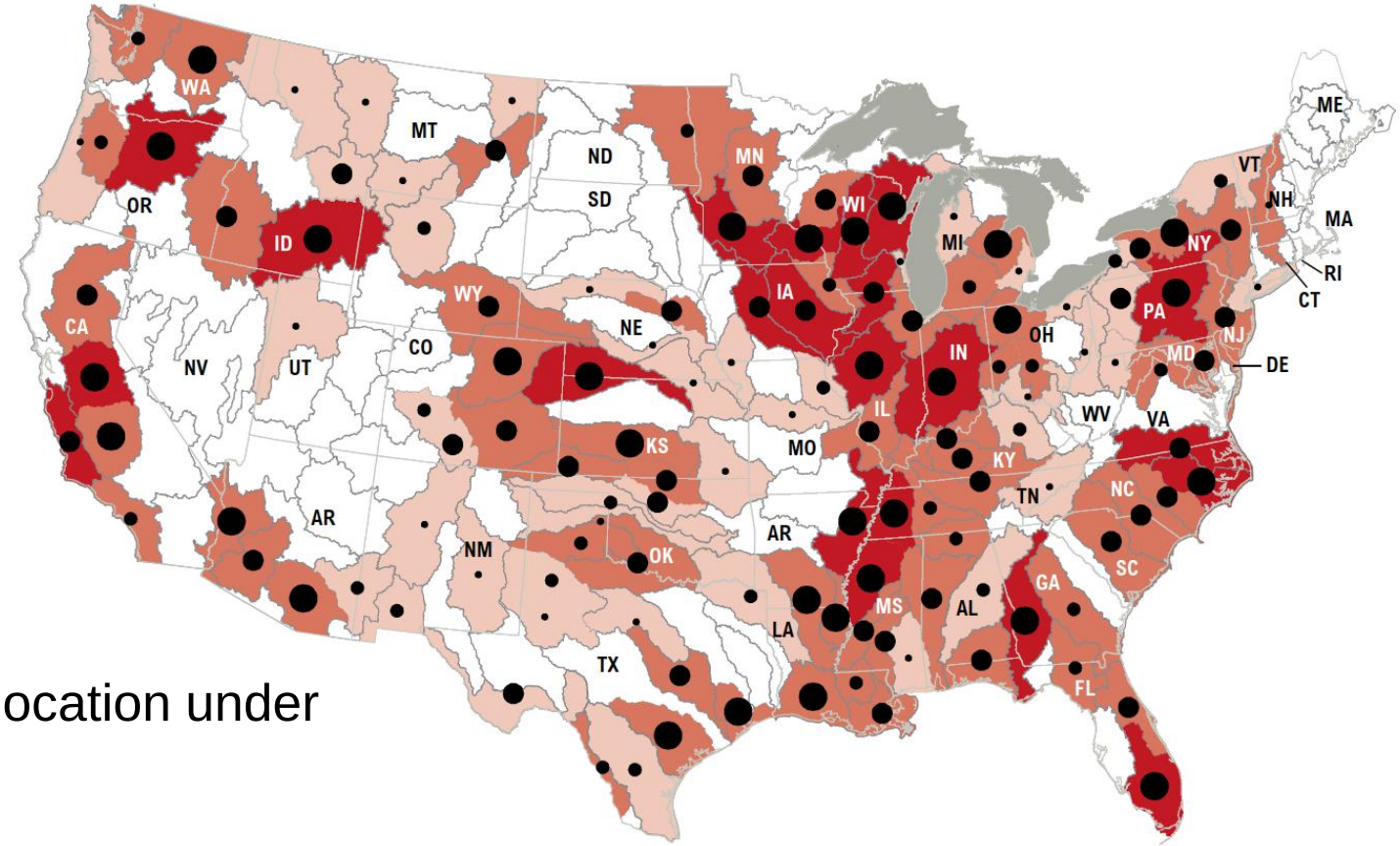
CHALLENGE: COMPETING POLITICAL AND STAKEHOLDER INTERESTS



Funding allocation under targeting

High Priority Watershed | Medium Priority Watershed | Low Priority Watershed | Non-priority Watershed

Acres Treated

126,000–691,000 | 51,000–125,000 | 26,000–50,000 | 1,000–25,000

Source: WRI

Scientific and Technical 1 | Social and Political 2 | 3

OPTIONS

- Set aside portion of funds for geographic targeting
- Focus on costs and benefits

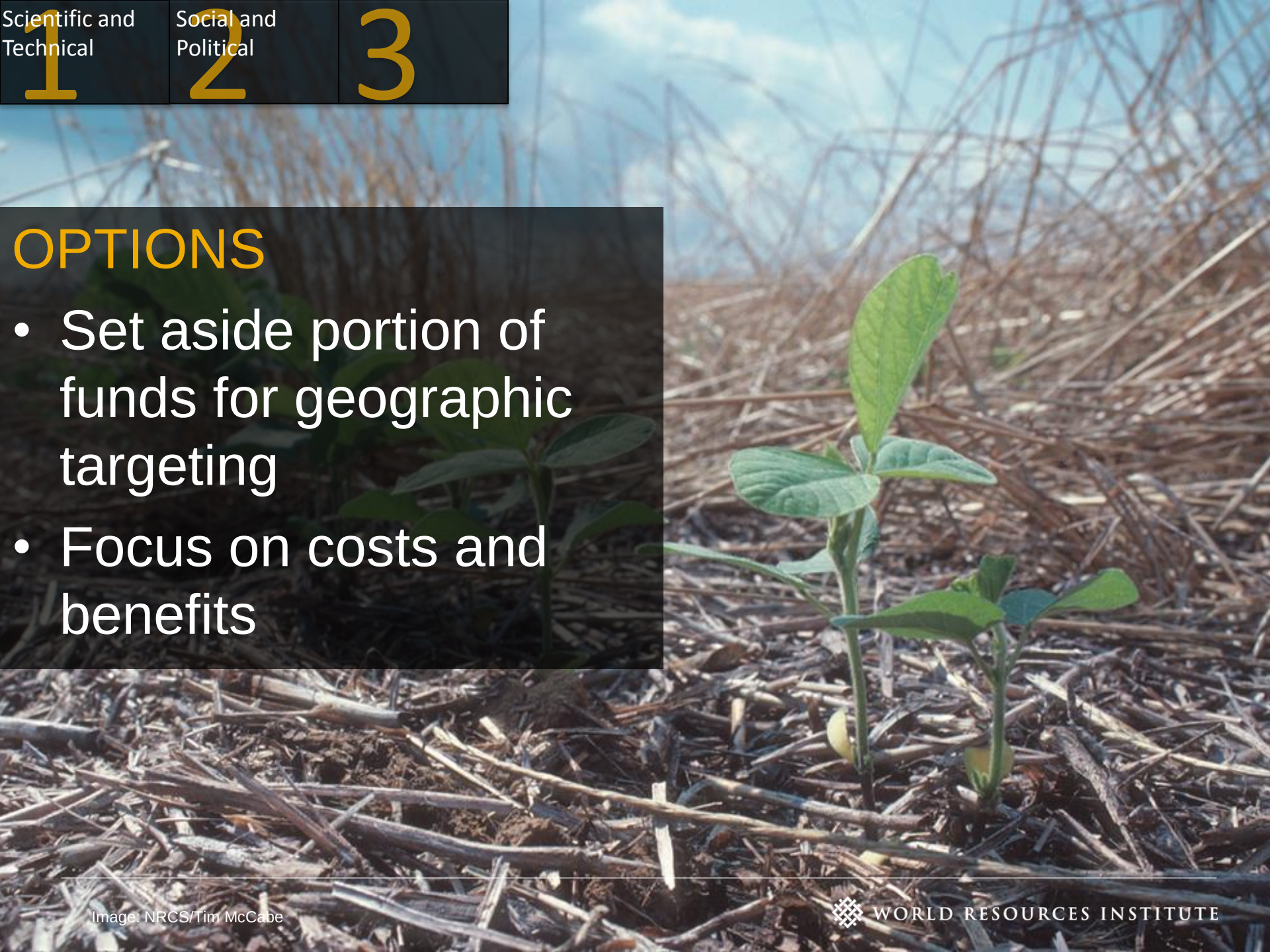


Image: NRCS/Tim McCabe

CHALLENGE: LIMITED AGENCY CAPACITY AND TARGETING EXPERIENCE

Image: NRCS/Bob Nichols

OPTIONS

- Strengthen leadership and oversight
- Involve producers and local community
- Use effective mechanisms to educate producers

Image: NRCS South Dakota

THANK YOU!

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Image: NRCS/Lynn Betts

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PRELIMINARY REVIEW OF THE CHESAPEAKE BAY WATERSHED INITIATIVE-COOPERATIVE CONSERVATION PARTNERSHIP INITIATIVE

SARA WALKER AND MICHELLE PEREZ

CBWI-CCPI OVERVIEW

- Authorized in 2008 Farm Bill
- $4.8M over 2010-2011 for targeted watershed projects
- Priority river basins: Susquehanna, Potomac, and Patuxent

REVIEWING CBWI

6 Factors of Good Targeting

1. Stakeholder & producer buy-in
2. Policy-oriented SMART-Q goals
3. Geographic targeting
4. Monitoring & evaluation
5. Cost effectiveness
6. Adaptive management

METHODS

- Reviewed CBWI literature
- Reviewed all CBWI projects from 2010 & 2011
- Interviewed USDA staff and project leaders

1. STAKEHOLDER & PRODUCER BUY-IN

Good

- Diversity of partners
- Designed to leverage funds

Rating: Fair

Bad

- Projects aren't leveraging funds
- Landowners not involved in planning

Image: NRCS/Jeff Vanuga

2. POLICY-ORIENTED SMART-Q GOALS

Good

- Environmental outcome-oriented goals
- Mention of policy drivers

Rating: Fair

Bad

- General CBWI goal
- Lack of SMART-Q components

Image: Chesapeake Bay Program

3. GEOGRAPHIC TARGETING

Good

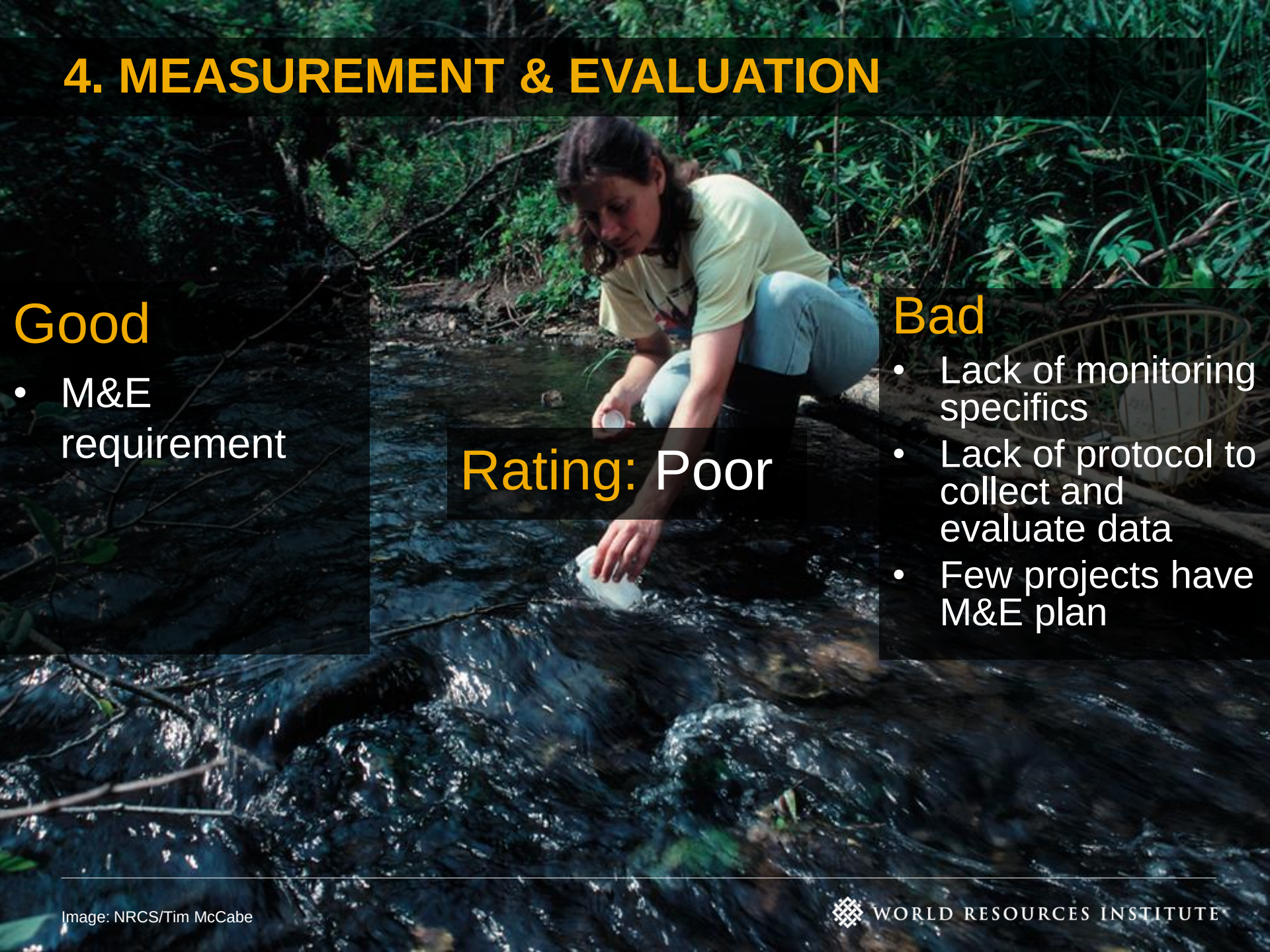
- 10 priority areas
- Rationale behind project watersheds

Rating: Good

Bad

- Lack of geographic focus in 2010

4. MEASUREMENT & EVALUATION



Good

- M&E requirement

Rating: Poor

Bad

- Lack of monitoring specifics
- Lack of protocol to collect and evaluate data
- Few projects have M&E plan

Image: NRCS/Tim McCabe

5. COST EFFECTIVENESS

Good

- Minimum element in ranking system

÷

Environmental Benefits

- Lbs. TN reduced
- Lbs. TP reduced
- Lbs. TSS reduced
- Lbs. Soil C sequestered

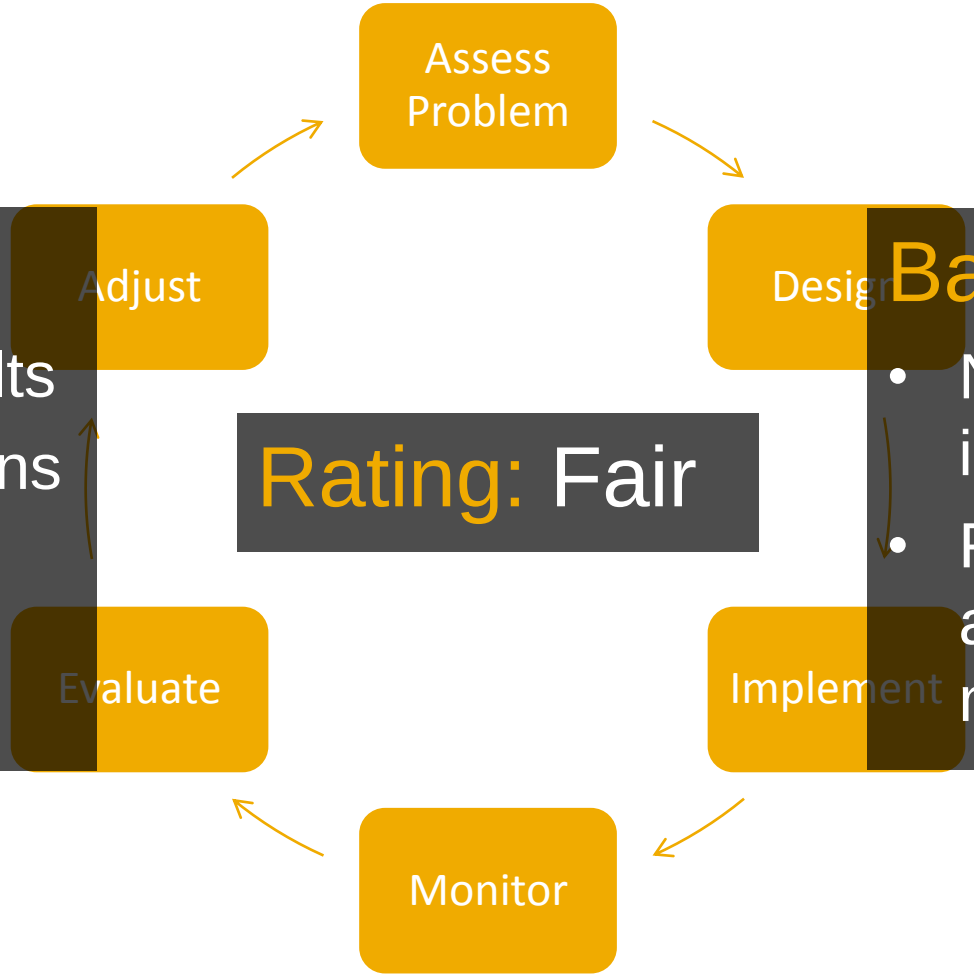
=

Rating: Very Poor

Bad

- Largely unaddressed

6. ADAPTIVE MANAGEMENT



Good

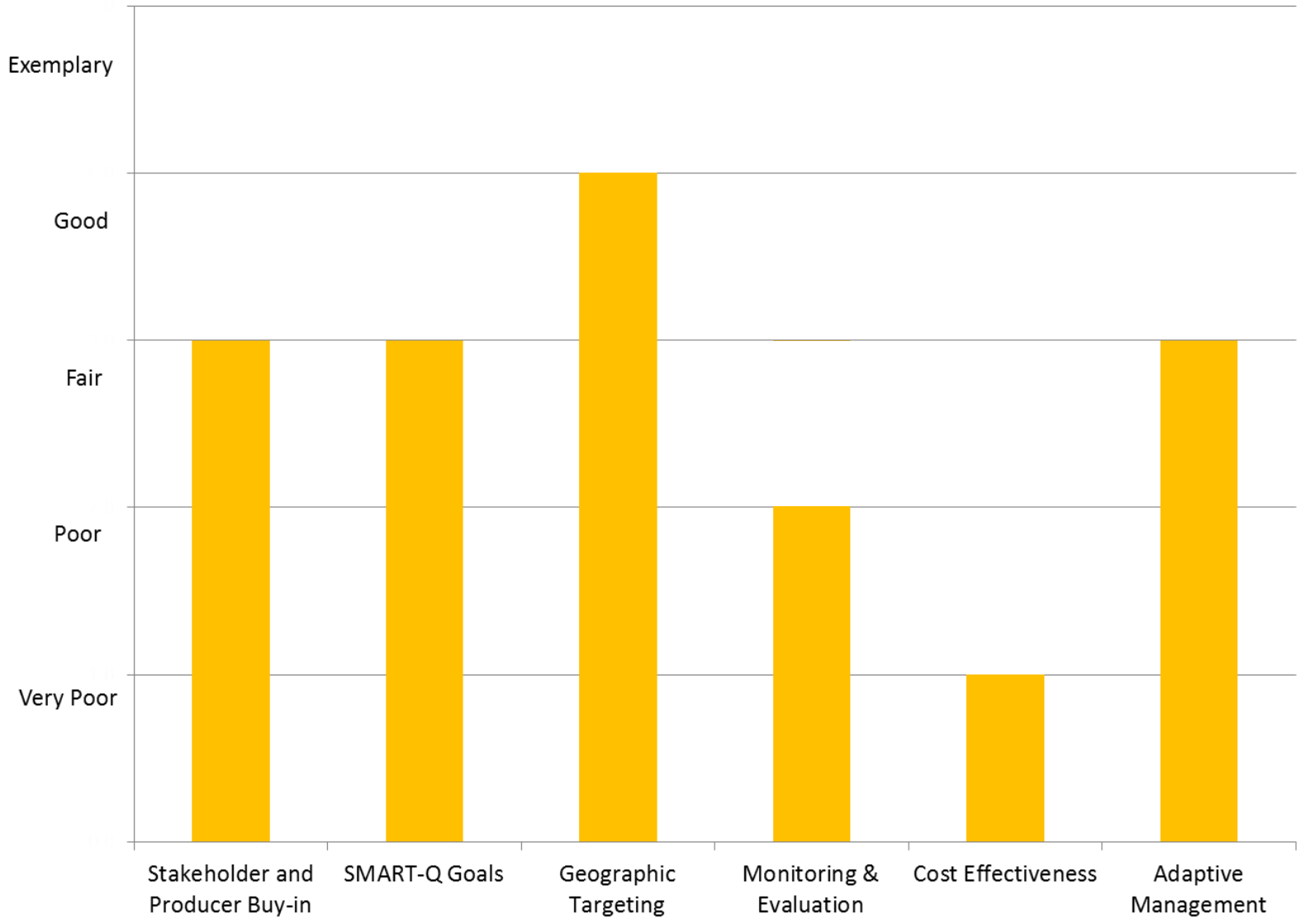
- Sharing results
- Unofficial plans

Rating: Fair

Bad

- No formal plan in place
- Few projects adaptively managing

CBWI RATED "FAIR" OVERALL



RECOMMENDATIONS

- Enable agricultural producers to participate in planning
- Write clear and landscape-scale SMART-Q goal statements
- Improve leadership and accountability for M&E
- Strive for cost effectiveness

Image: Chesapeake Bay Program

QUESTIONS?

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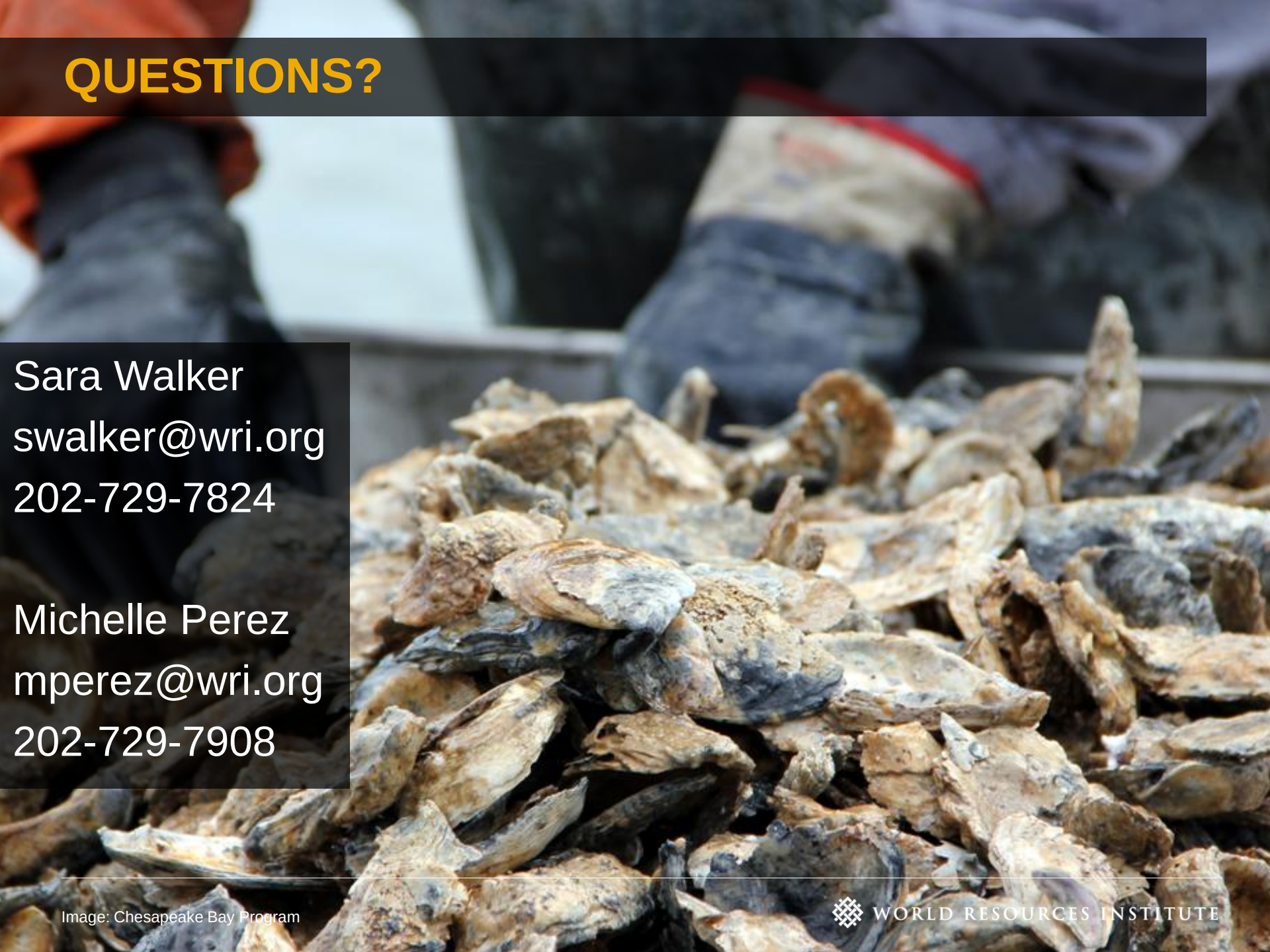
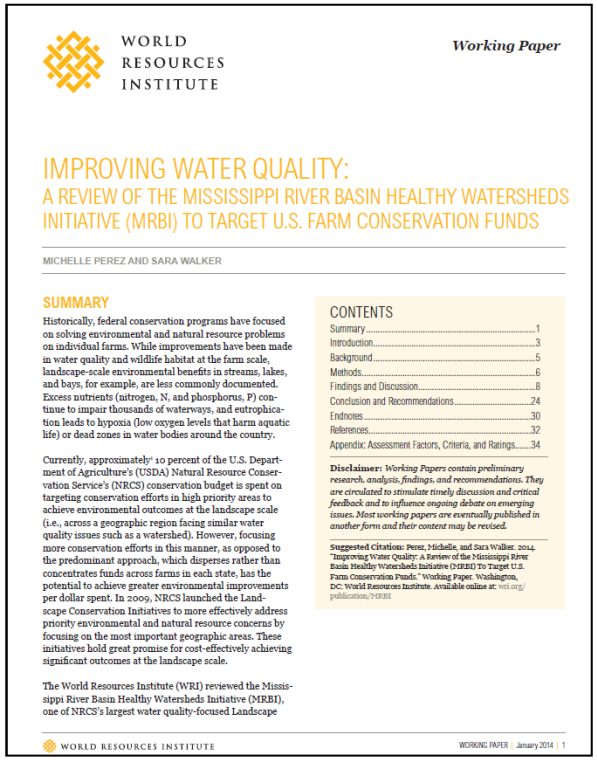


Image: Chesapeake Bay Program

VISIT WATER QUALITY TARGETING PAGE

wri.org/water/water-quality-targeting



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SUMMARY

Historically, federal conservation programs have focused on solving environmental and natural resource problems on individual farms. While improvements have been made in water quality and wildlife habitat at the farm scale, landscape-scale environmental benefits in streams, lakes, and bays, for example, are less commonly documented. Excess nutrients (nitrogen, N, and phosphorus, P) continue to impair thousands of waterways, and eutrophication leads to hypoxia (low oxygen levels that harm aquatic life) or dead zones in water bodies around the country.

Currently, approximately[1] 10 percent of the U.S. Department of Agriculture's (USDA) Natural Resource Conservation Service's (NRCS) conservation budget is spent on targeting conservation efforts in high priority areas to achieve environmental outcomes at the landscape scale (i.e., across a geographic region facing similar water quality issues such as a watershed). However, focusing more conservation efforts in this manner, as opposed to the predominant approach, which disperses rather than concentrates funds across farms in each state, has the potential to achieve greater environmental improvements per dollar spent. In 2009, NRCS launched the Landscape Conservation Initiatives to more effectively address priority environmental and natural resource concerns by focusing on the most important geographic areas. These initiatives hold great promise for cost-effectively achieving significant outcomes at the landscape scale.

The World Resources Institute (WRI) reviewed the Mississippi River Basin Healthy Watersheds Initiative (MRBI), one of NRCS's largest water quality-focused Landscape

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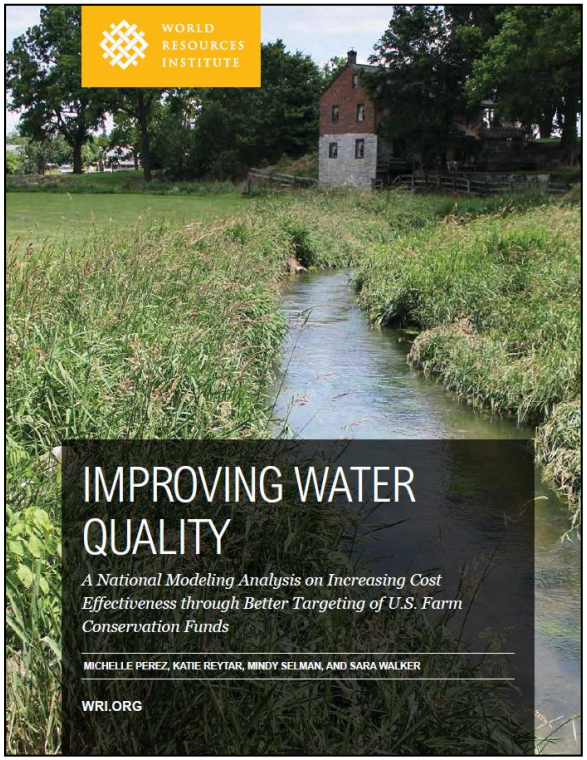

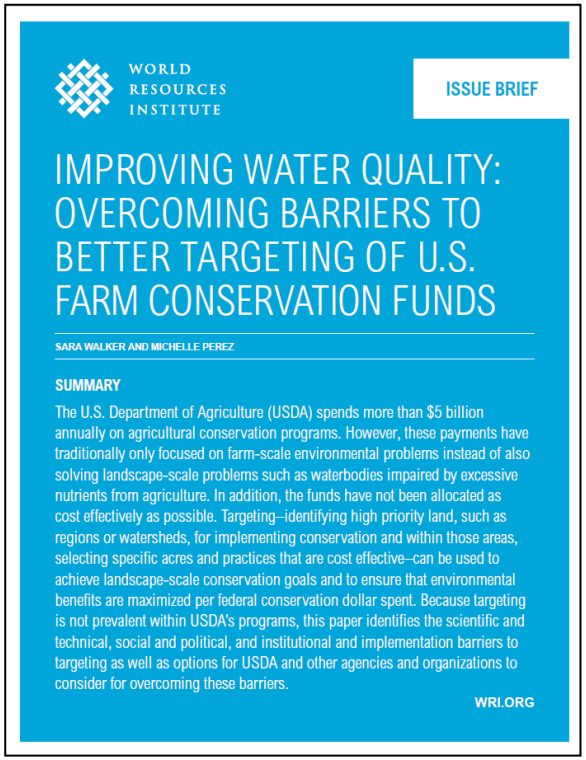

WORLD RESOURCES INSTITUTE

ISSUE BRIEF

IMPROVING WATER QUALITY: OVERCOMING BARRIERS TO BETTER TARGETING OF U.S. FARM CONSERVATION FUNDS

SARA WALKER AND MICHELLE PEREZ

SUMMARY

The U.S. Department of Agriculture (USDA) spends more than $5 billion annually on agricultural conservation programs. However, these payments have traditionally only focused on farm-scale environmental problems instead of also solving landscape-scale problems such as waterbodies impaired by excessive nutrients from agriculture. In addition, the funds have not been allocated as cost effectively as possible. Targeting–identifying high priority land, such as regions or watersheds, for implementing conservation and within those areas, selecting specific acres and practices that are cost effective–can be used to achieve landscape-scale conservation goals and to ensure that environmental benefits are maximized per federal conservation dollar spent. Because targeting is not prevalent within USDA's programs, this paper identifies the scientific and technical, social and political, and institutional and implementation barriers to targeting as well as options for USDA and other agencies and organizations to consider for overcoming these barriers.

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