United States Department of Agriculture
Natural Resources Conservation Service

NRCS Edge-of-Field Water Quality Monitoring

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Washington, D.C.

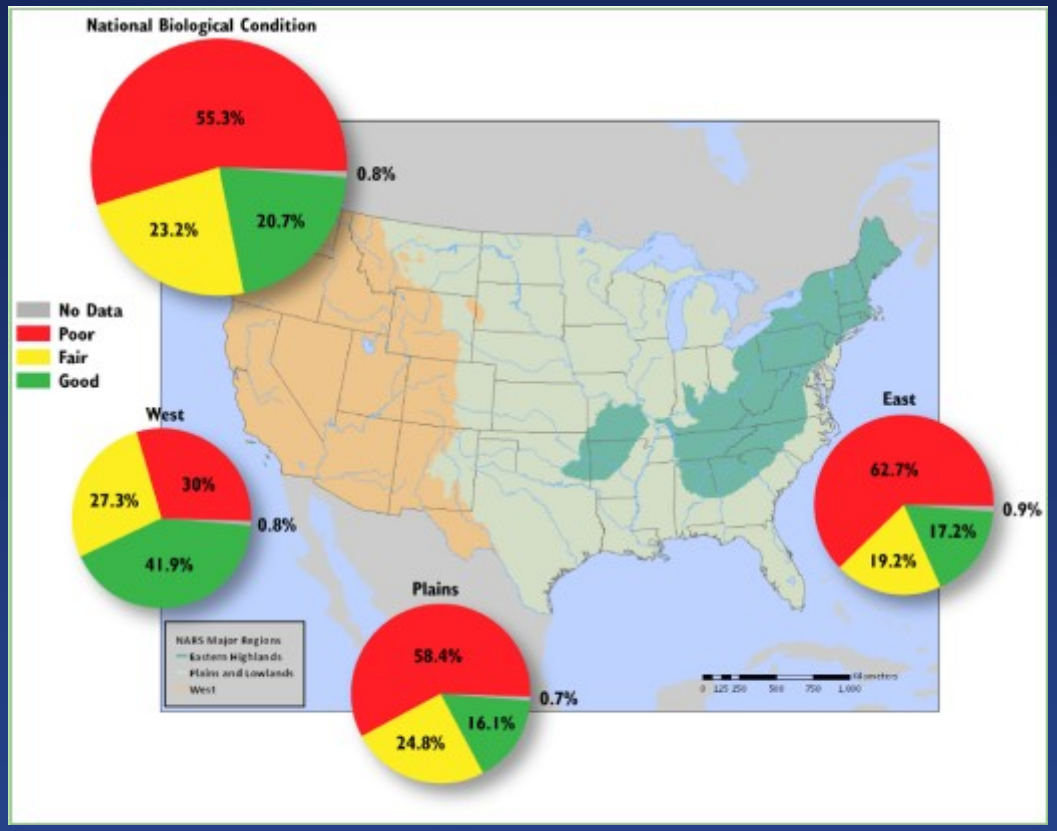
North Dakota
Water Quality Monitoring Conference
March 4-6, 2014
Bismarck State College
National Energy Center of Excellence

Roadmap

- Background: Why the NRCS is doing edge-of-field monitoring
- The what and how of edge-of-field monitoring
- NRCS edge-of-field monitoring initiative

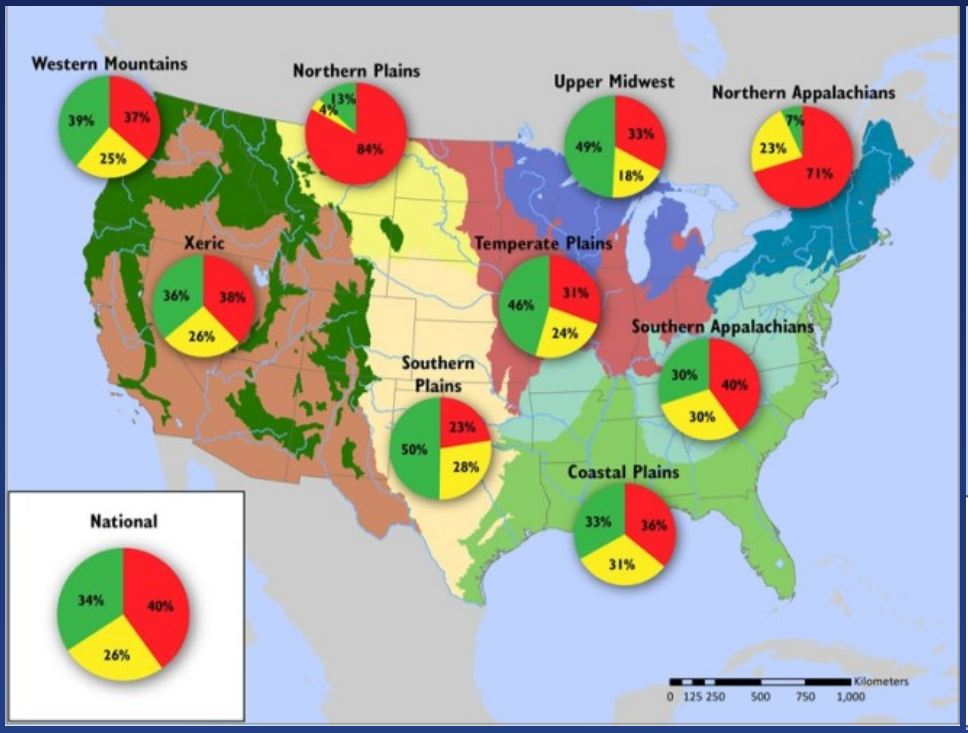
National Water Quality Challenges

- Biological conditions of nation's rivers and streams
  - Poor - 55.3%
  - Fair – 23.3%
  - Poor – 20.7%
  - Unknown – 0.8%
- Greatest stressors:
  - Phosphorous
  - Nitrogen
  - Riparian cover and disturbance
  - Streambed sediment

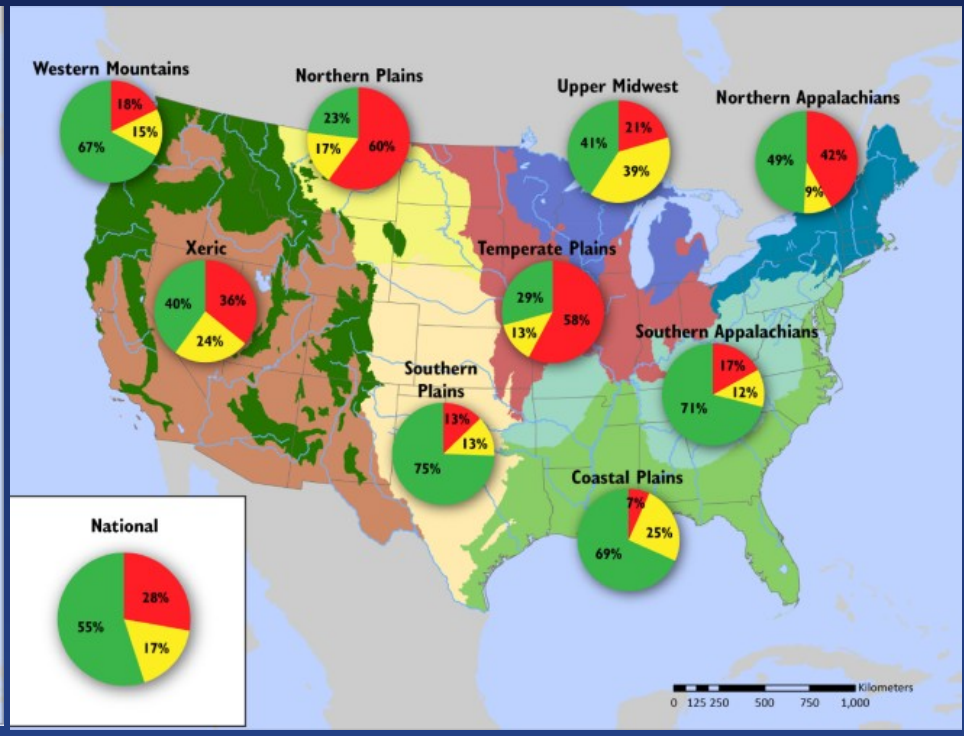


Biological condition of the nation's rivers and streams, based on the Macroinvertebrate Multimetric Index. From National Rivers and Streams Assessment (2008–2009) - DRAFT. (EPA, 2013.)

Total Phosphorus



Total Nitrogen



Good
Fair
Poor

(EPA/NRSA, 2013)

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NRCS
Helping People Help the Land

Private Lands and Conservation

- 70 percent of the land in the lower 48 states is owned by private landowners.
- 88 percent of all surface water falls on private land before reaching lakes, streams, and groundwater aquifers.
- The quality of our environment depends on the millions of individual decisions private landowners make every day.

- Since 2009, USDA has worked with more than 500,000 private landowners to implement conservation practices.

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Conservation Technical Assistance & Financial Assistance

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Conservation Practices

Systems Approach to Nutrients: Avoiding, Controlling, Trapping (ACT)

Avoiding

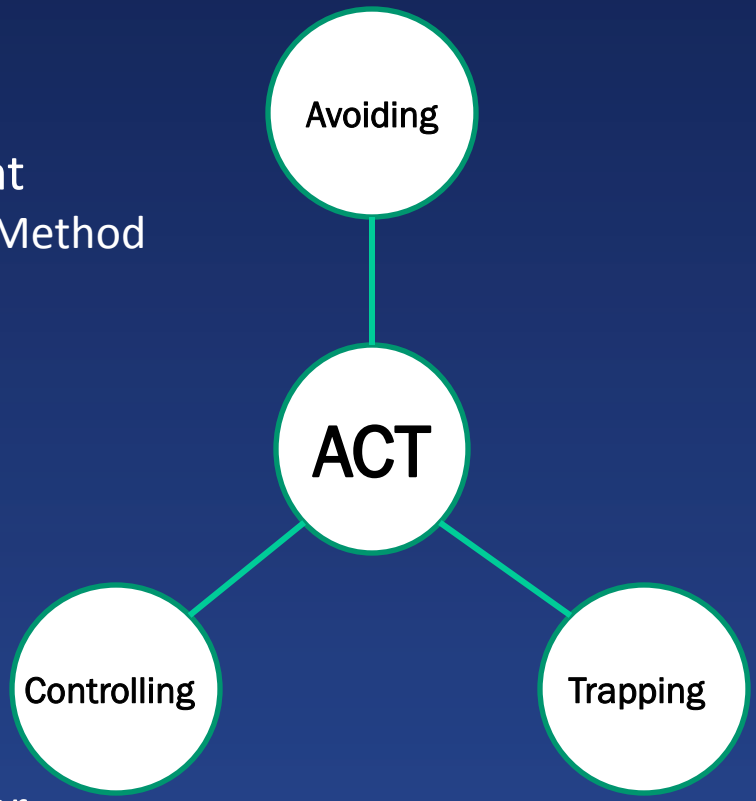
- Nutrient management
  - Rate, Timing, Form, Method

Controlling

- Residue and tillage management
- Drainage water management

Trapping

- Buffers
- Wetlands designed for nutrient removal



Why is NRCS investing in edge-of-field monitoring?

Accountability –

NRCS must show that investments in voluntary conservation are working ... and are worth continuing.

Accountability in quantifiable terms –

NRCS must be able to show quantitative benefits gained for the dollars expended

Purposes of Edge-of-Field Monitoring

- Evaluate conservation practice effectiveness
- Use data to calibrate field-scale models
- Inform adaptive management

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The What and How of Edge-of-Field Monitoring

Lynn Betts, NRCS

United States Department of Agriculture
Natural Resources Conservation Service

Tim McCabe, NRCS

United States Department of Agriculture
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Lynn Betts, NRCS

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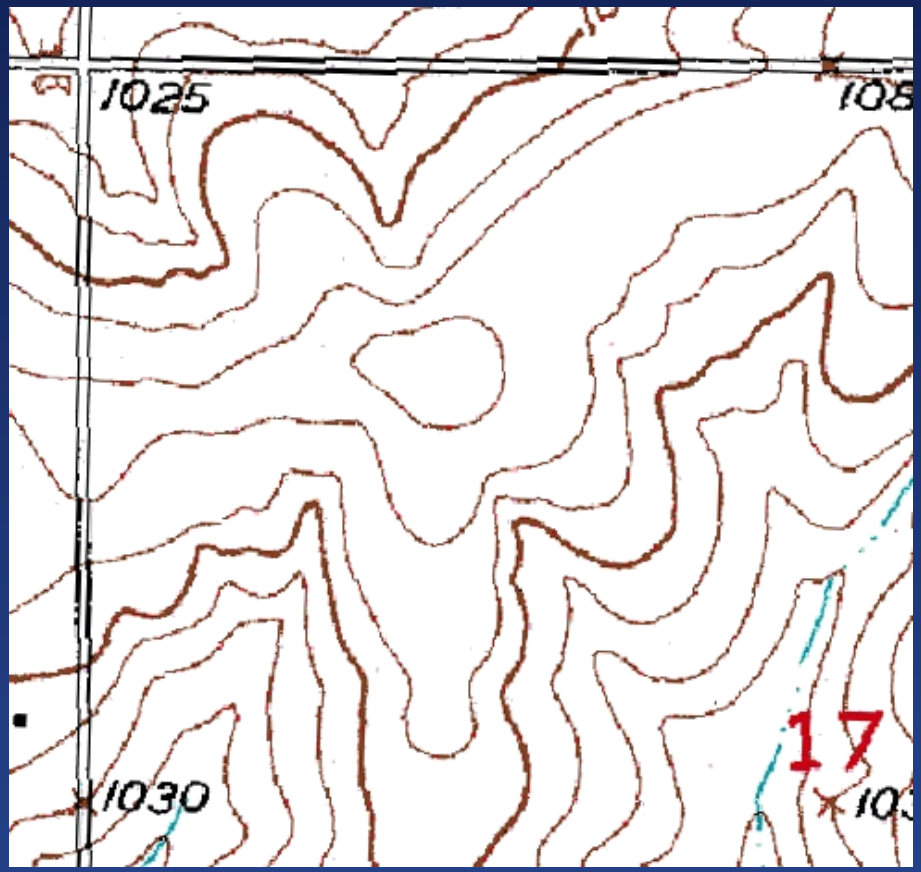

Linkage to Downstream Monitoring

Doing Edge-of-Field Monitoring

Don Meals, Stone Environmental, Inc.

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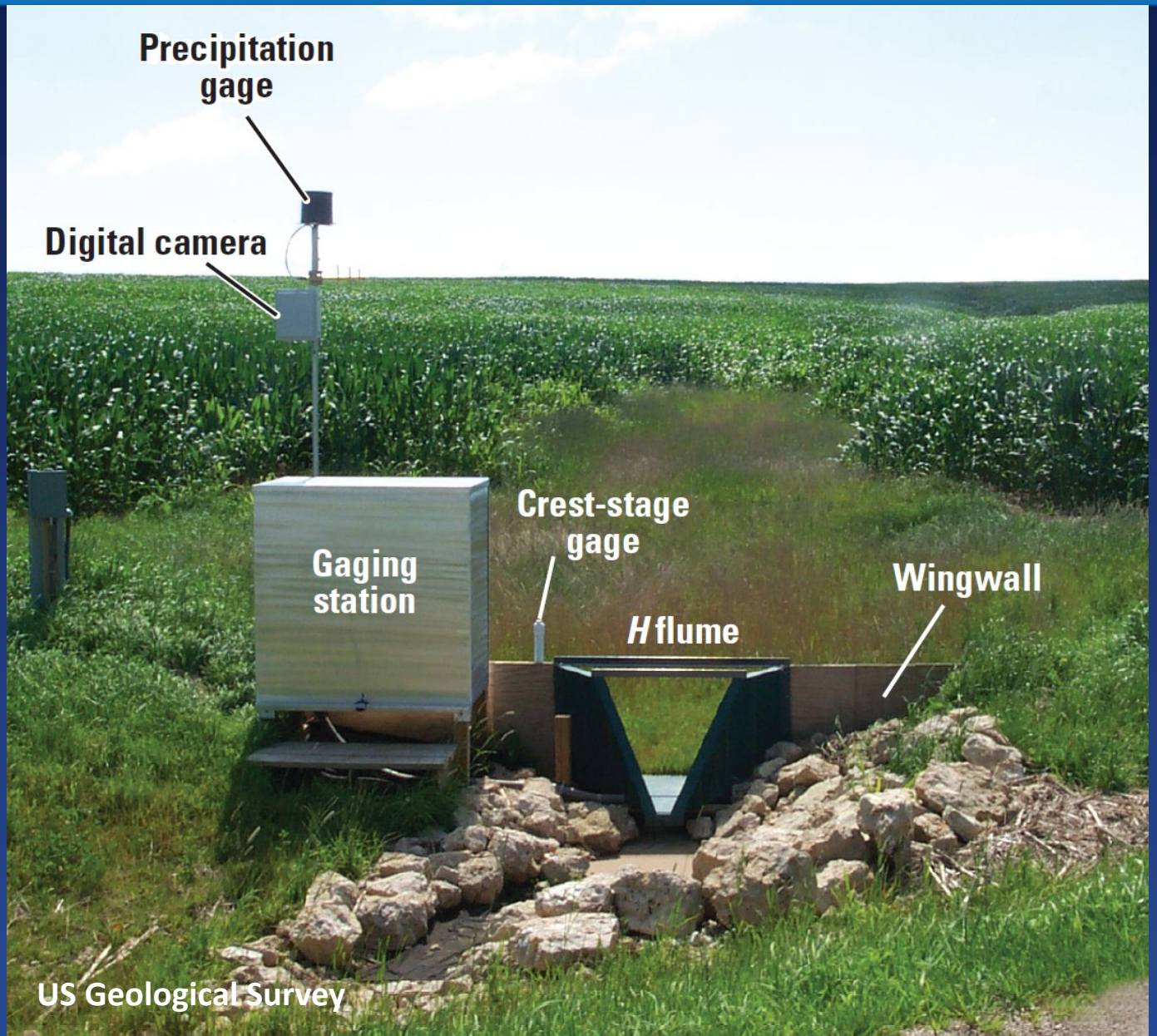
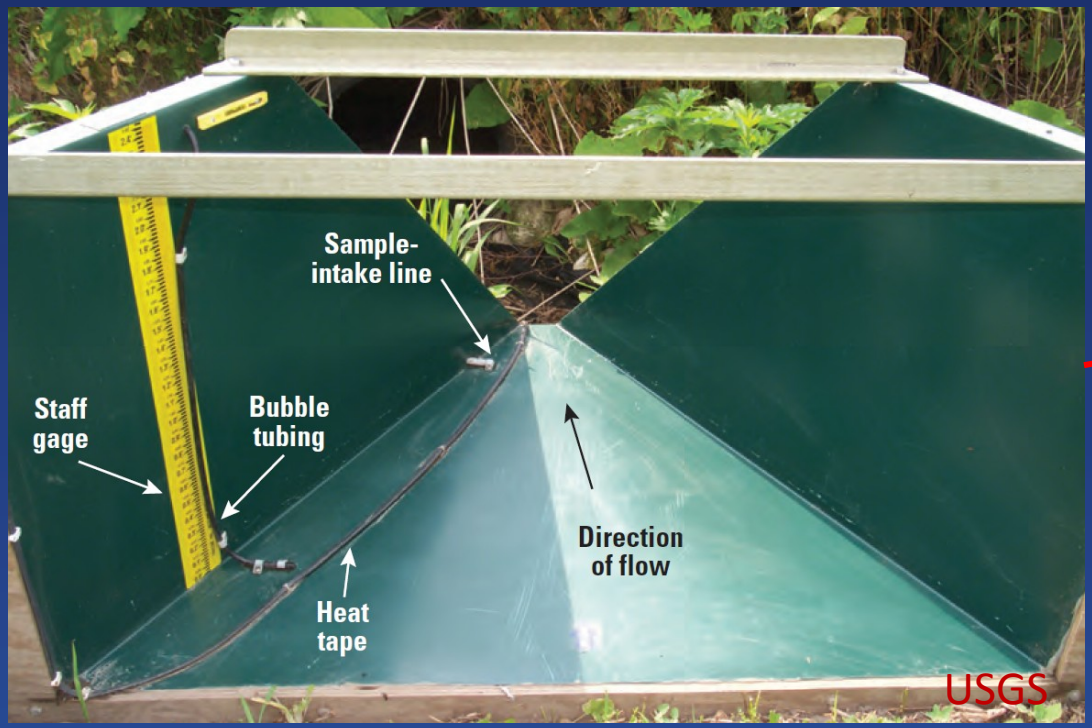
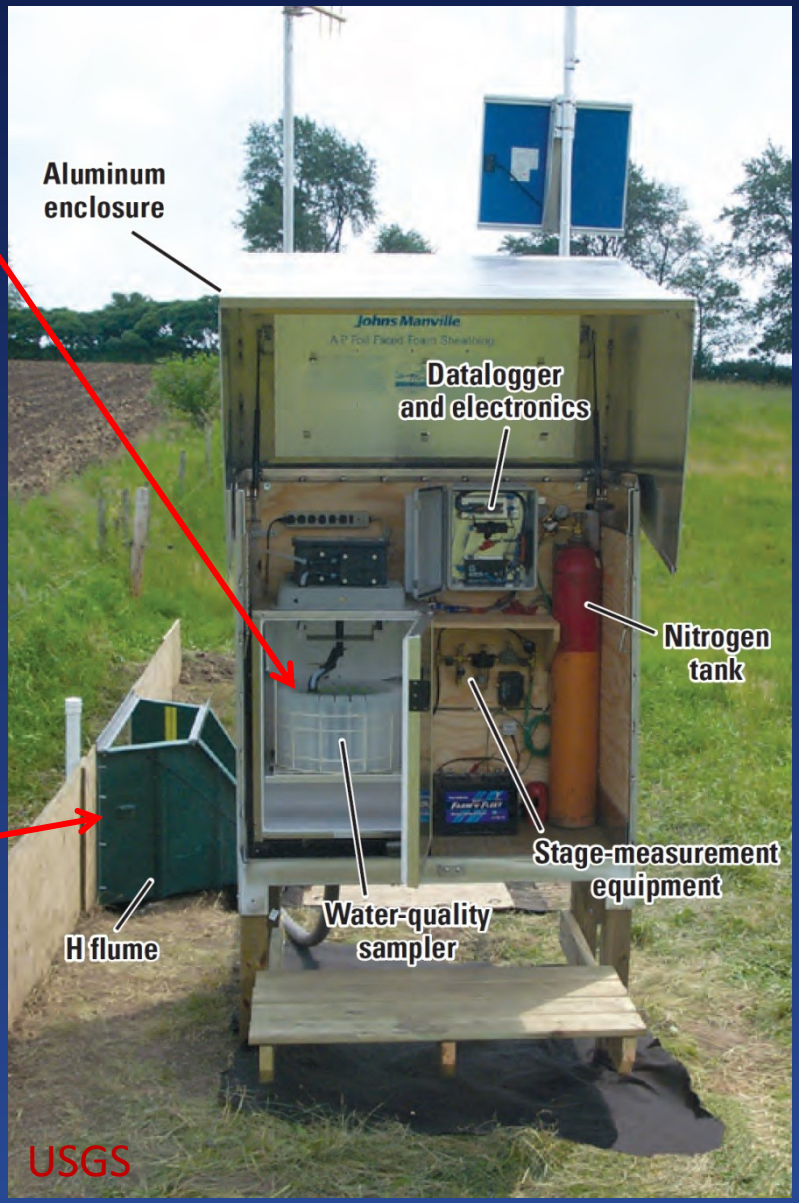


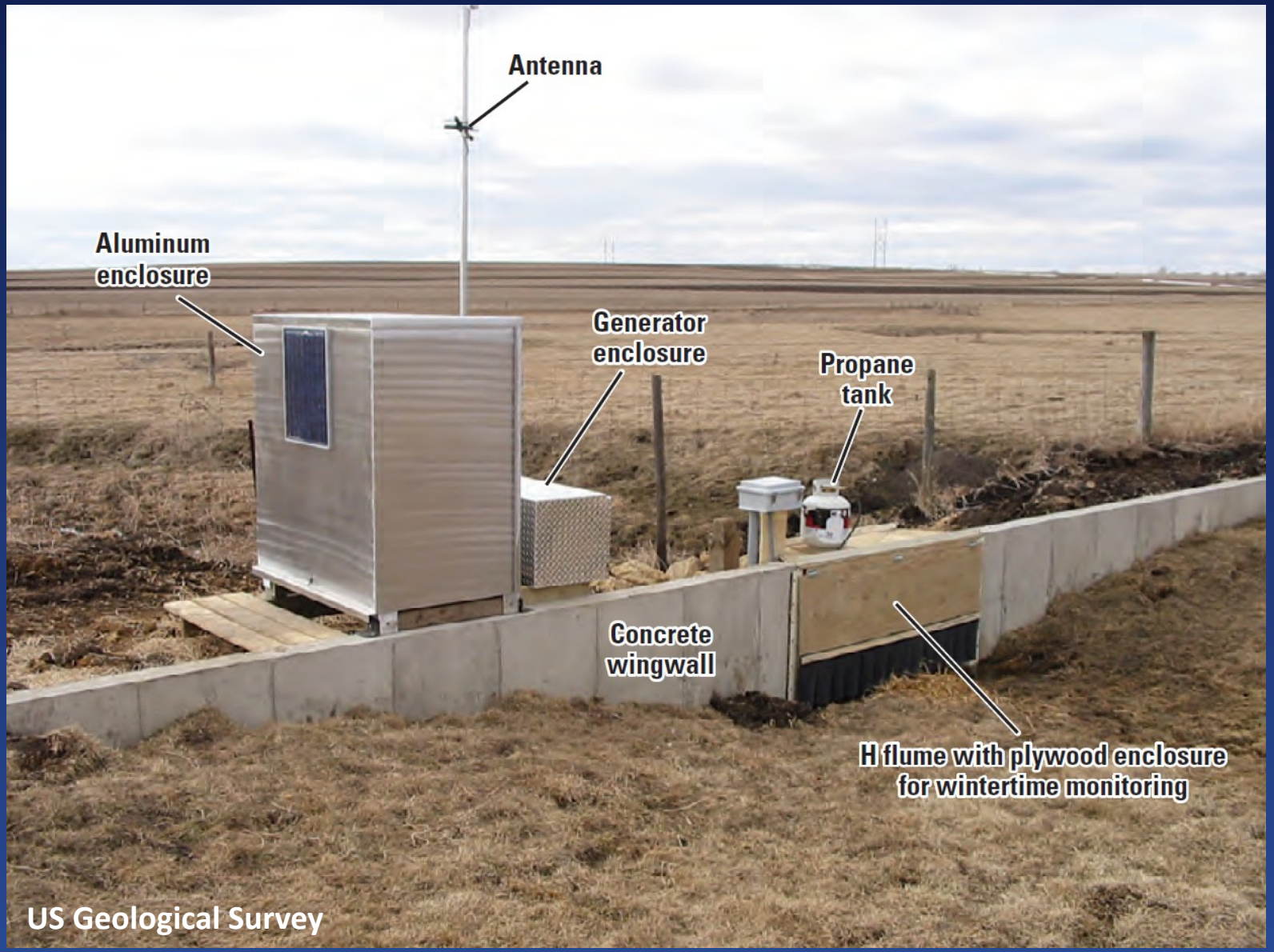
Automated Sampler

H Flume



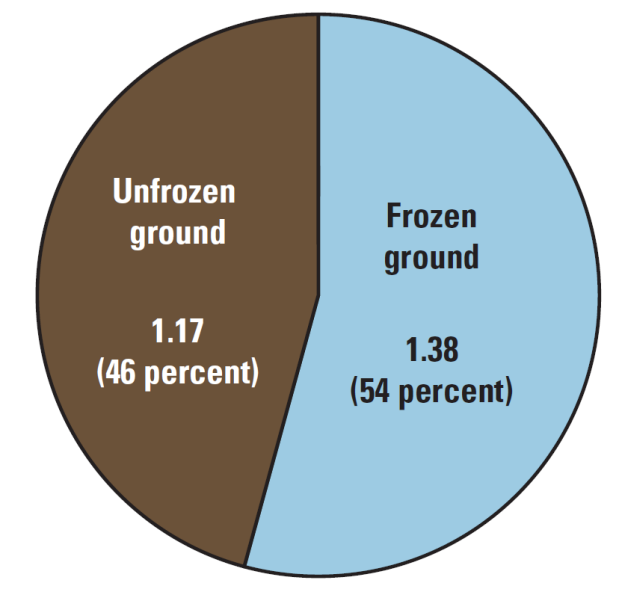



US Geological Survey



US Geological Survey

Do we need to do wintertime monitoring?



Mean annual runoff (inches per acre) and percent of total, by ground condition, Discovery Farms and Pioneer Farm, water years 2003–8 (USGS, 2011).

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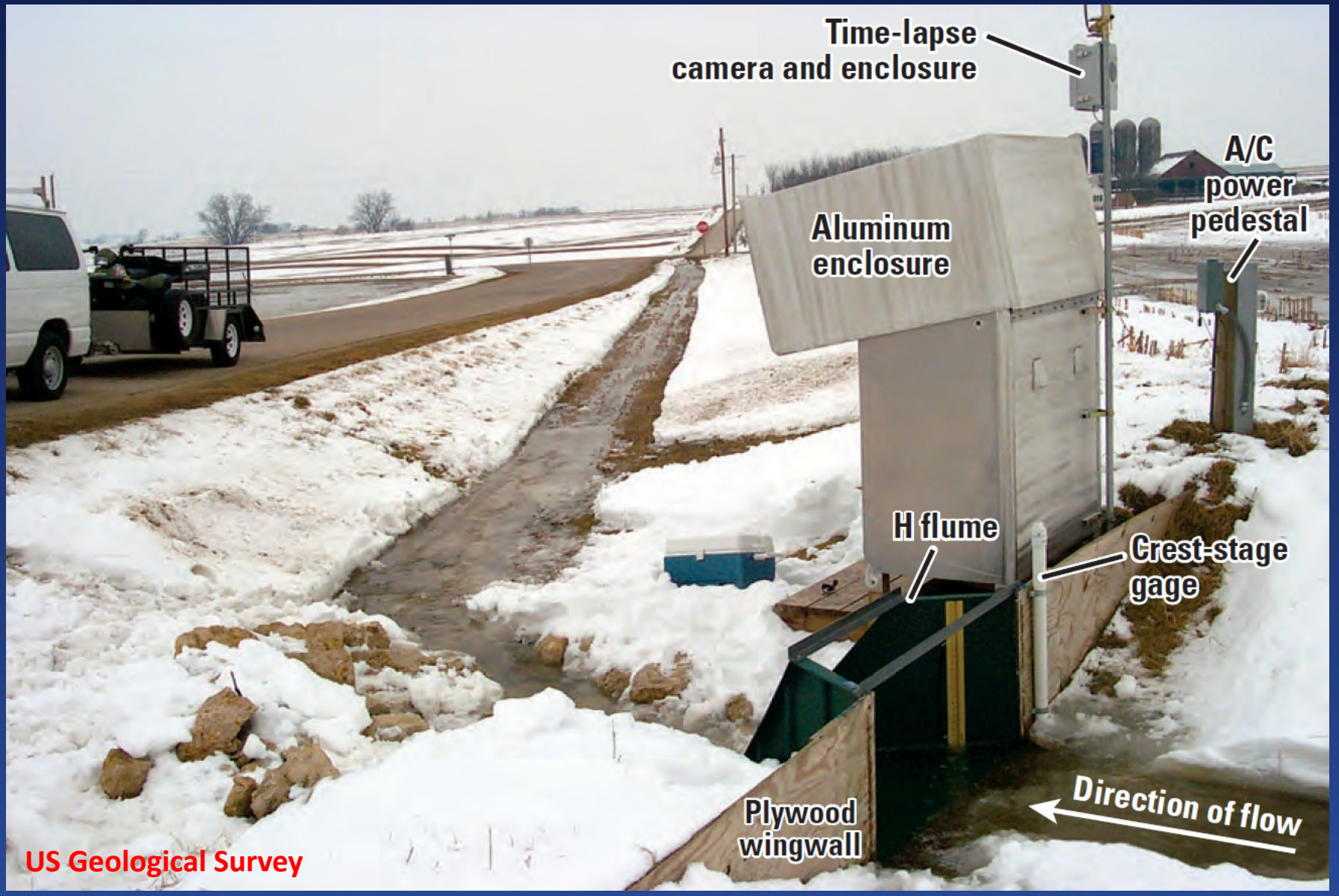
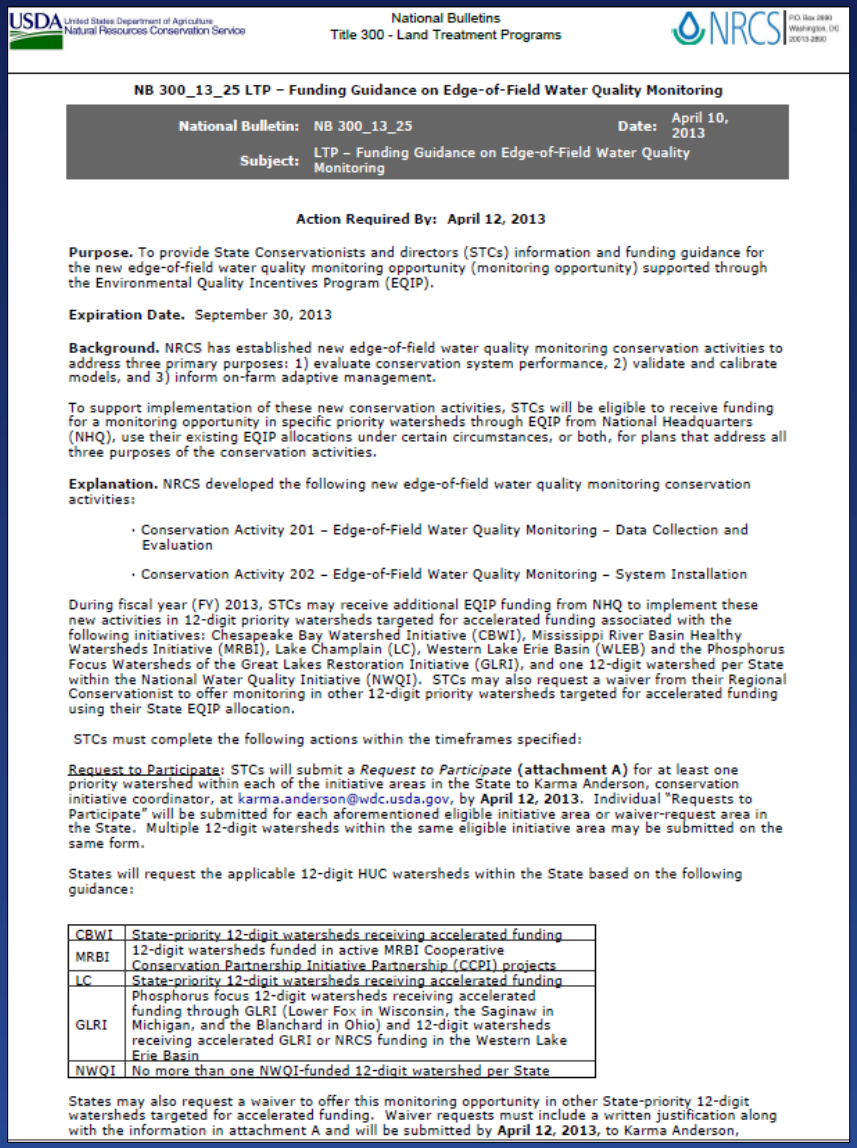


US Geological Survey

NRCS Edge-of-Field Monitoring Initiative



USDA United States Department of Agriculture Natural Resources Conservation Service

National Bulletins
Title 300 - Land Treatment Programs

NRCS

NB 300_13_25 LTP – Funding Guidance on Edge-of-Field Water Quality Monitoring

National Bulletin: NB 300_13_25 **Date:** April 10, 2013

Subject: LTP – Funding Guidance on Edge-of-Field Water Quality Monitoring

Action Required By: April 12, 2013

Purpose. To provide State Conservationists and directors (STCs) information and funding guidance for the new edge-of-field water quality monitoring opportunity (monitoring opportunity) supported through the Environmental Quality Incentives Program (EQIP).

Expiration Date. September 30, 2013

Background. NRCS has established new edge-of-field water quality monitoring conservation activities to address three primary purposes: 1) evaluate conservation system performance, 2) validate and calibrate models, and 3) inform on-farm adaptive management.

To support implementation of these new conservation activities, STCs will be eligible to receive funding for a monitoring opportunity in specific priority watersheds through EQIP from National Headquarters (NHQ), use their existing EQIP allocations under certain circumstances, or both, for plans that address all three purposes of the conservation activities.

Explanation. NRCS developed the following new edge-of-field water quality monitoring conservation activities:

- Conservation Activity 201 – Edge-of-Field Water Quality Monitoring – Data Collection and Evaluation
- Conservation Activity 202 – Edge-of-Field Water Quality Monitoring – System Installation

During fiscal year (FY) 2013, STCs may receive additional EQIP funding from NHQ to implement these new activities in 12-digit priority watersheds targeted for accelerated funding associated with the following initiatives: Chesapeake Bay Watershed Initiative (CBWI), Mississippi River Basin Healthy Watersheds Initiative (MRBI), Lake Champlain (LC), Western Lake Erie Basin (WLEB) and the Phosphorus Focus Watersheds of the Great Lakes Restoration Initiative (GLRI), and one 12-digit watershed per State within the National Water Quality Initiative (NWQI). STCs may also request a waiver from their Regional Conservationist to offer monitoring in other 12-digit priority watersheds targeted for accelerated funding using their State EQIP allocation.

STCs must complete the following actions within the timeframes specified:

Request to Participate: STCs will submit a *Request to Participate* **(attachment A)** for at least one priority watershed within each of the initiative areas in the State to Karma Anderson, conservation initiative coordinator, at karma.anderson@wdc.usda.gov, by **April 12, 2013.** Individual "Requests to Participate" will be submitted for each aforementioned eligible initiative area or waiver-request area in the State. Multiple 12-digit watersheds within the same eligible initiative area may be submitted on the same form.

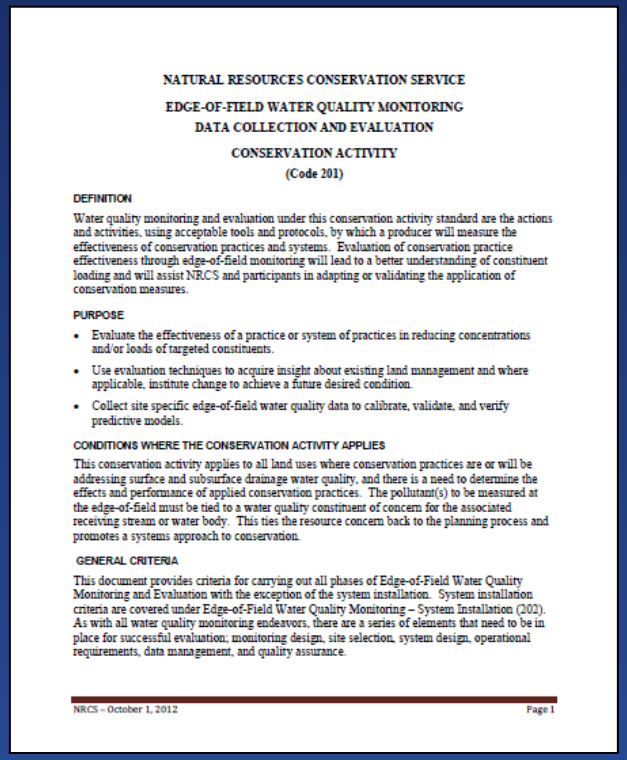
States will request the applicable 12-digit HUC watersheds within the State based on the following guidance:

CBWI	State-priority 12-digit watersheds receiving accelerated funding
MRBI	12-digit watersheds funded in active MRBI Cooperative Conservation Partnership Initiative Partnership (CCPI) projects
LC	State-priority 12-digit watersheds receiving accelerated funding
GLRI	Phosphorus focus 12-digit watersheds receiving accelerated funding through GLRI (Lower Fox in Wisconsin, the Saginaw in Michigan, and the Blanchard in Ohio) and 12-digit watersheds receiving accelerated GLRI or NRCS funding in the Western Lake Erie Basin
NWQI	No more than one NWQI-funded 12-digit watershed per State

States may also request a waiver to offer this monitoring opportunity in other State-priority 12-digit watersheds targeted for accelerated funding. Waiver requests must include a written justification along with the information in attachment A and will be submitted by **April 12, 2013**, to Karma Anderson,

Monitoring Conservation Activities

- Data Collection and Evaluation (CA 201)
  - Monitoring Design and Site Selection
  - Operational Requirements
  - Data Management & Reporting
- System Installation (CA 202)
  - System Design
  - Reporting Requirements



NATURAL RESOURCES CONSERVATION SERVICE

EDGE-OF-FIELD WATER QUALITY MONITORING
DATA COLLECTION AND EVALUATION

CONSERVATION ACTIVITY
(Code 201)

DEFINITION

Water quality monitoring and evaluation under this conservation activity standard are the actions and activities, using acceptable tools and protocols, by which a producer will measure the effectiveness of conservation practices and systems. Evaluation of conservation practice effectiveness through edge-of-field monitoring will lead to a better understanding of constituent loading and will assist NRCS and participants in adapting or validating the application of conservation measures.

PURPOSE

- Evaluate the effectiveness of a practice or system of practices in reducing concentrations and/or loads of targeted constituents.
- Use evaluation techniques to acquire insight about existing land management and where applicable, institute change to achieve a future desired condition.
- Collect site specific edge-of-field water quality data to calibrate, validate, and verify predictive models.

CONDITIONS WHERE THE CONSERVATION ACTIVITY APPLIES

This conservation activity applies to all land uses where conservation practices are or will be addressing surface and subsurface drainage water quality, and there is a need to determine the effects and performance of applied conservation practices. The pollutant(s) to be measured at the edge-of-field must be tied to a water quality constituent of concern for the associated receiving stream or water body. This ties the resource concern back to the planning process and promotes a systems approach to conservation.

GENERAL CRITERIA

This document provides criteria for carrying out all phases of Edge-of-Field Water Quality Monitoring and Evaluation with the exception of the system installation. System installation criteria are covered under Edge-of-Field Water Quality Monitoring – System Installation (202). As with all water quality monitoring endeavors, there are a series of elements that need to be in place for successful evaluation; monitoring design, site selection, system design, operational requirements, data management, and quality assurance.

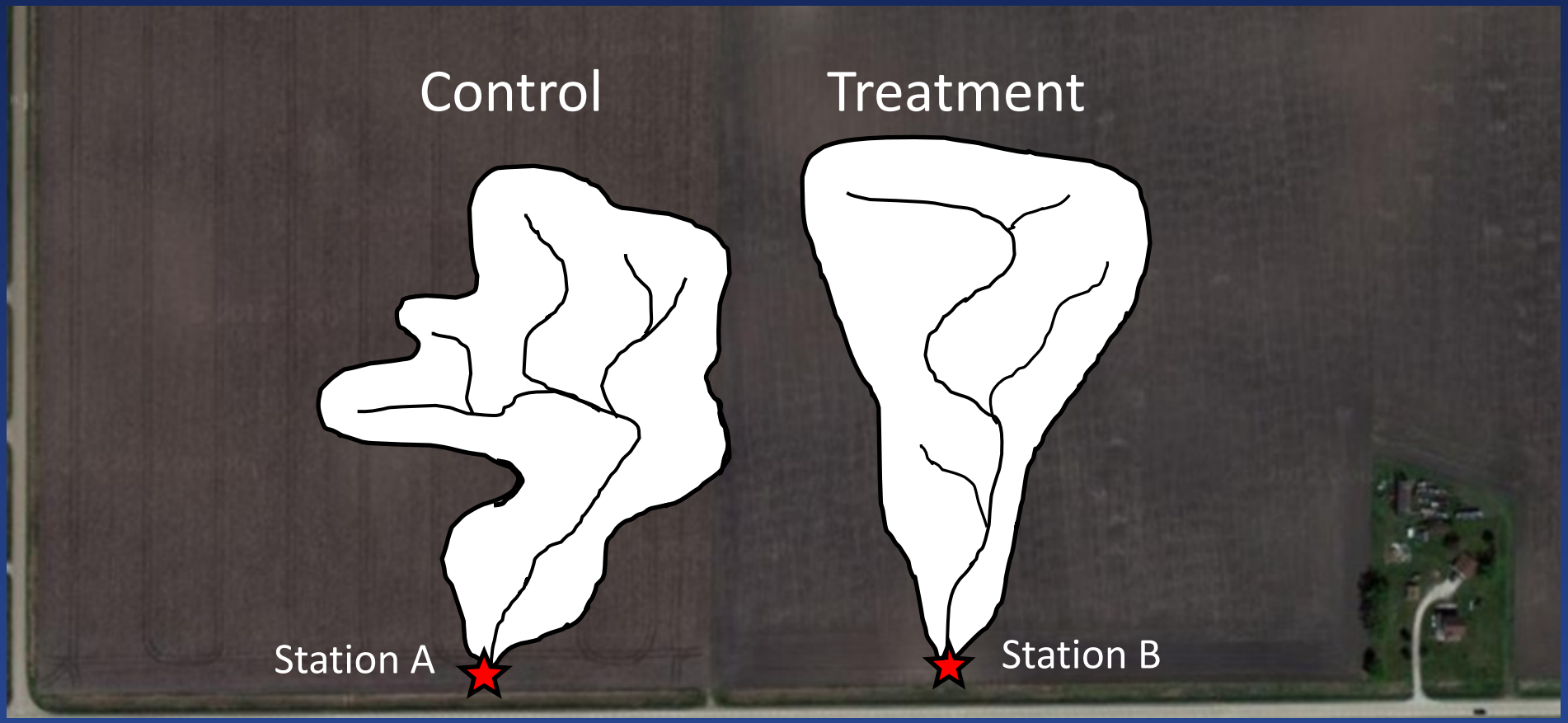
Edge-of-Field Monitoring Site Selection

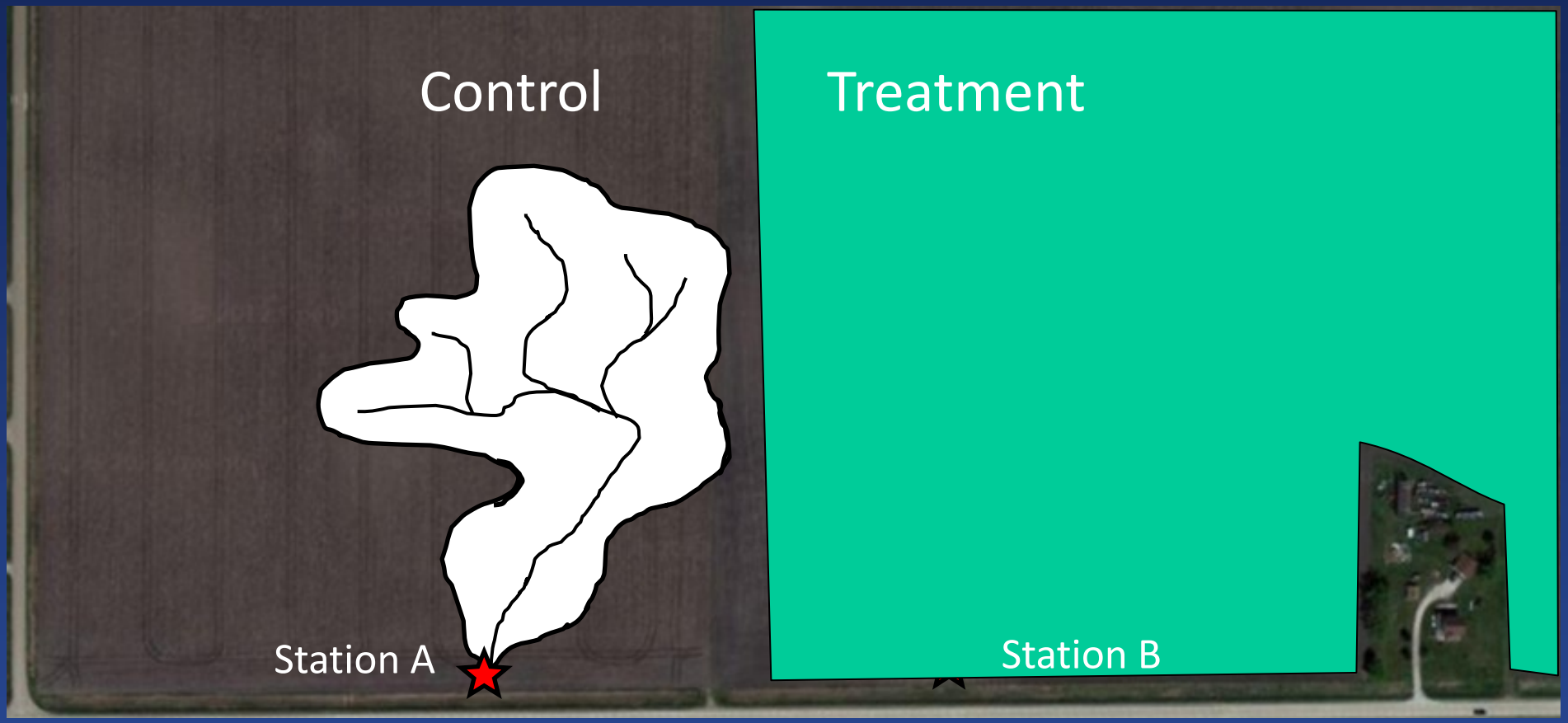
- Pollutant tied to agriculture
- The pollutant is a significant water quality concern of the receiving water body or water course—303(d)/TMDL
- Conservation practices are available to address the concern
- Need to evaluate conservation practice

Monitoring Sites

- Surface runoff
- Irrigation surface runoff
- Drain tile outlets
- Denitrifying bioreactors
- Possibly others

Paired Watershed Design




Control
Treatment
Station A
Station B

Other Site Selection Considerations

- Field watershed size
- Physical setting
- Proximity
- Similarity of watersheds
- Physical feasibility

Length of the Monitoring Period

Number of Years in Crop Rotation	Baseline Period	Post Installation Practice(s) Period
1 year crop rotation	2 years	4 years
2 year crop rotation	2 years	4 years
3 year crop rotation	3 years	6 years

Hydrological Data

- Water quality
  - Nitrogen
  - Phosphorous
  - Sediment
- Runoff
- Precipitation

Water Quality Data

- Nitrogen
  - NH4-N (Where animal waste is land applied)
  - NO2-N + NO3-N
  - TKN (Total Kjeldahl Nitrogen)
- Phosphorus
  - Soluble Reactive P (Orthophosphate Phosphorus)
  - Total Phosphorus (TP)
- Sediment
  - Suspended Sediment Concentration (SSC) – *Preferred*
  - Total Suspended Solids (TSS) – *When SSC is not available through the lab*

Farm Operations Data

- Current year's cropping
- Conservation practices applied
- Fertilizer application
- Manure application
- Irrigation applications

Core Conservation Practices

	Avoiding
328	Conservation Crop Rotation
340	Cover Crop
590	Nutrient Management
633	Waste Recycling
	Controlling
362	Diversion
554	Drainage Water Management
410	Grade Stabilization Structure
412	Grassed Waterway
449	Irrigation Water Management
329	Residue & Tillage Management, No-Till/Strip Till/Direct Seed
345	Residue & Tillage Management, Mulch Till
646	Shallow Water Development and Management for Wildlife
	Trapping
327	Conservation Cover
656	Constructed Wetland
747	Denitrifying Bioreactor
393	Filter Strip
391	Riparian Forest Buffer
390	Riparian Herbaceous Cover
350	Sediment Basin
601	Vegetative Barrier
635	Vegetated Treatment Area
638	Water and Sediment Control Basin systems
658	Wetland Creation
659	Wetland Enhancement
657	Wetland Restoration

- Avoid
- Control
- Trap

NB_300_13_25, Attachment B

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Avoid: Nutrient Management

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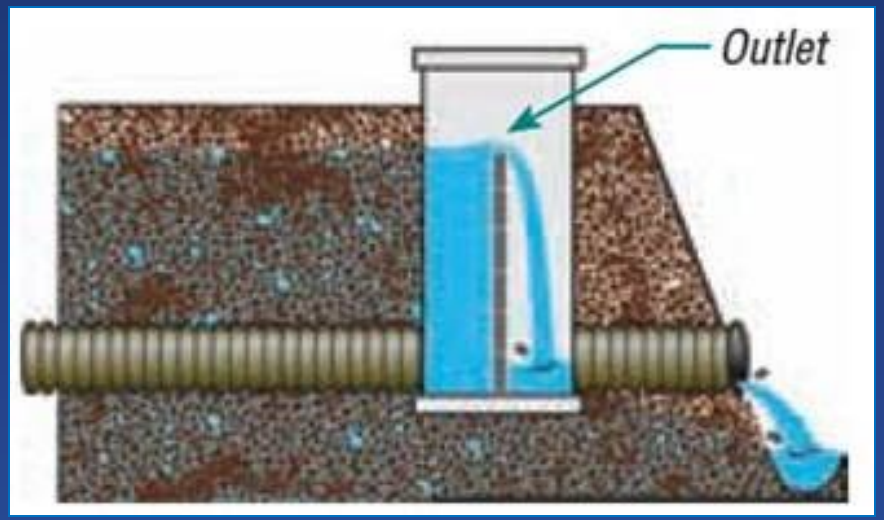
Control: Drainage Water Management



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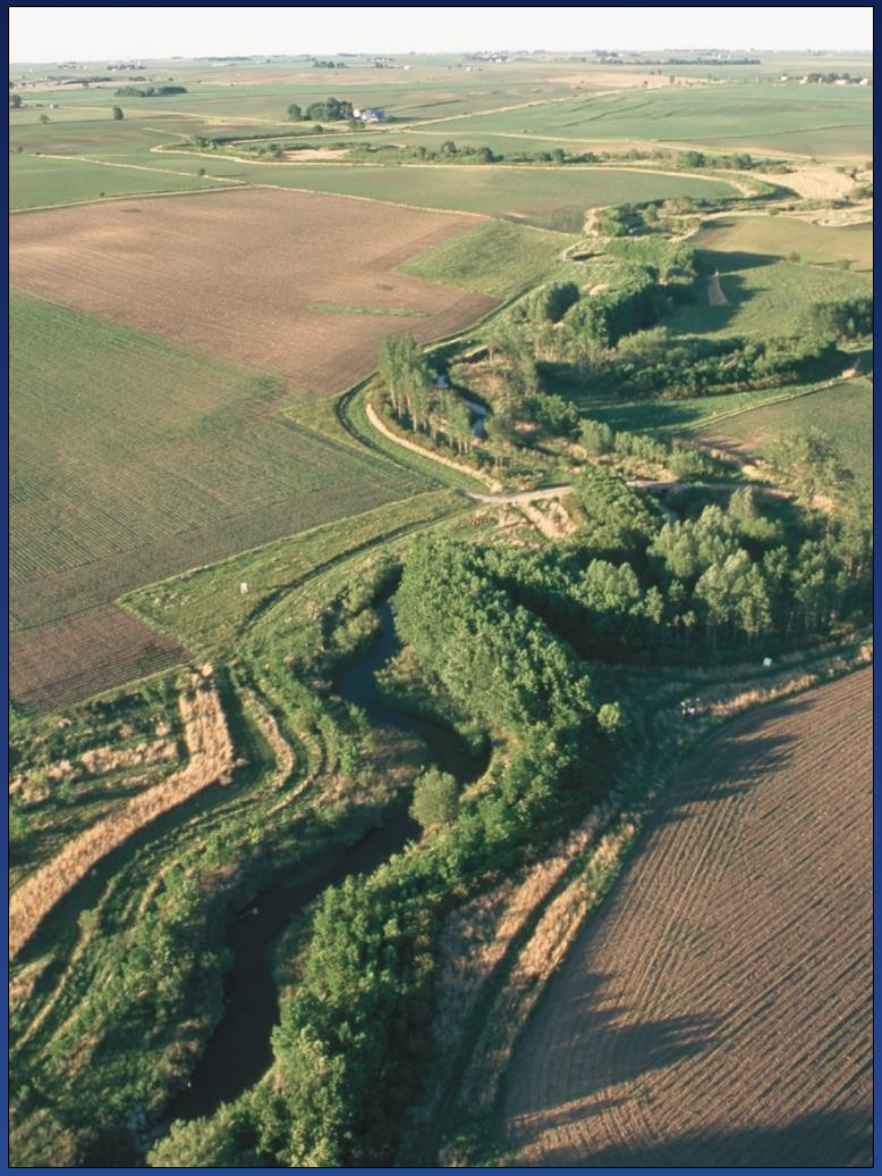

Trap: Vegetative Buffers and Filter Strips

Edge-of-Field Monitoring Implementation

- 2014 NRCS National Bulletin
- Dedicated EQIP funding
  - EQIP contract with producer
  - 75% funded; 25% match
- Specific priority watersheds
  - NWQI, MRBI, others
    - 4 NWQI watersheds in ND
  - State priority monitoring

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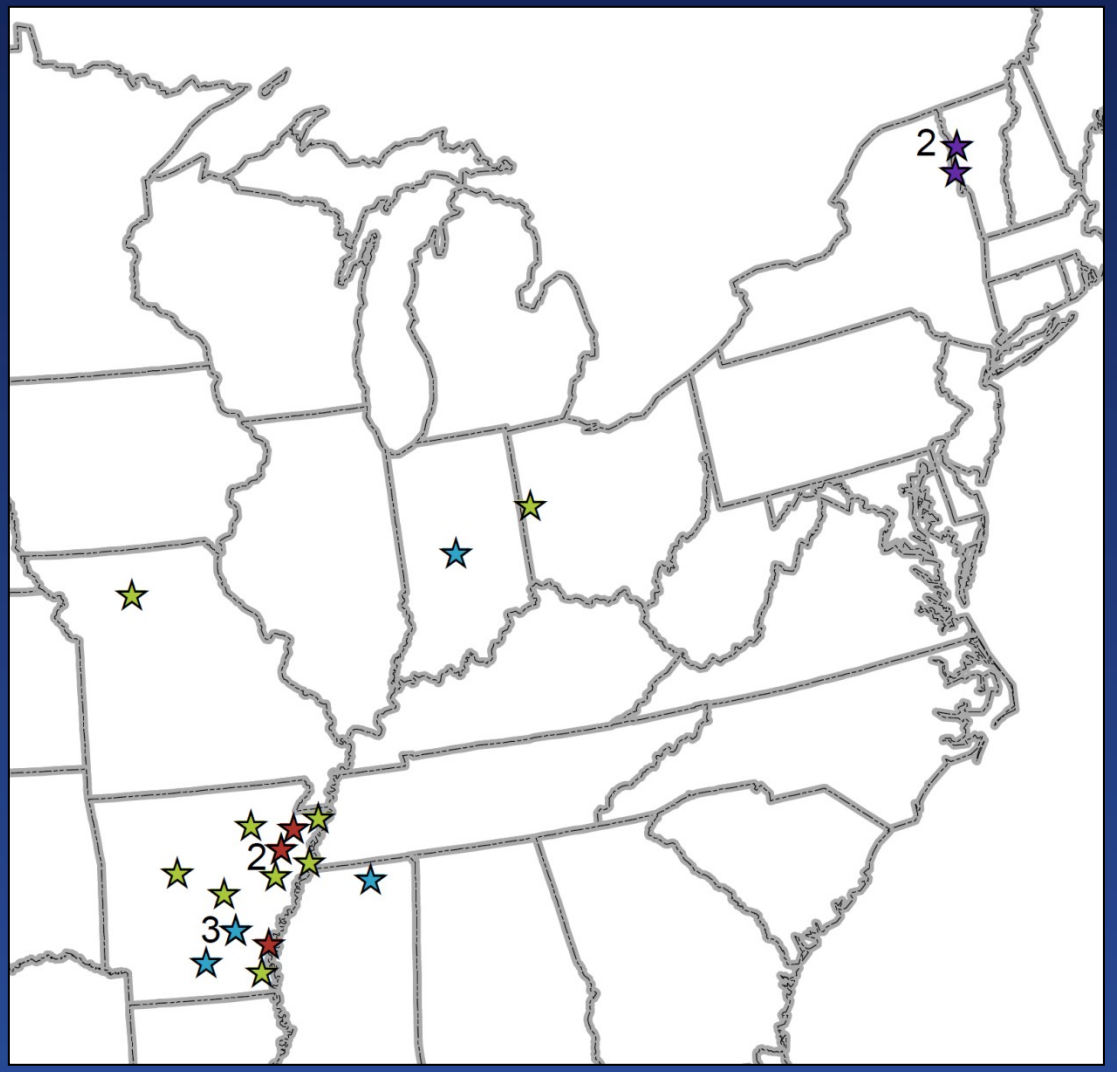
2013 Edge-of-Field Monitoring Sites

FY 2013 EOF Sites

Initiative

- Lake Champlain [3]
- MRBI (New) [9]
- MRBI (Existing) [4]
- NWQI [6]



Questions?