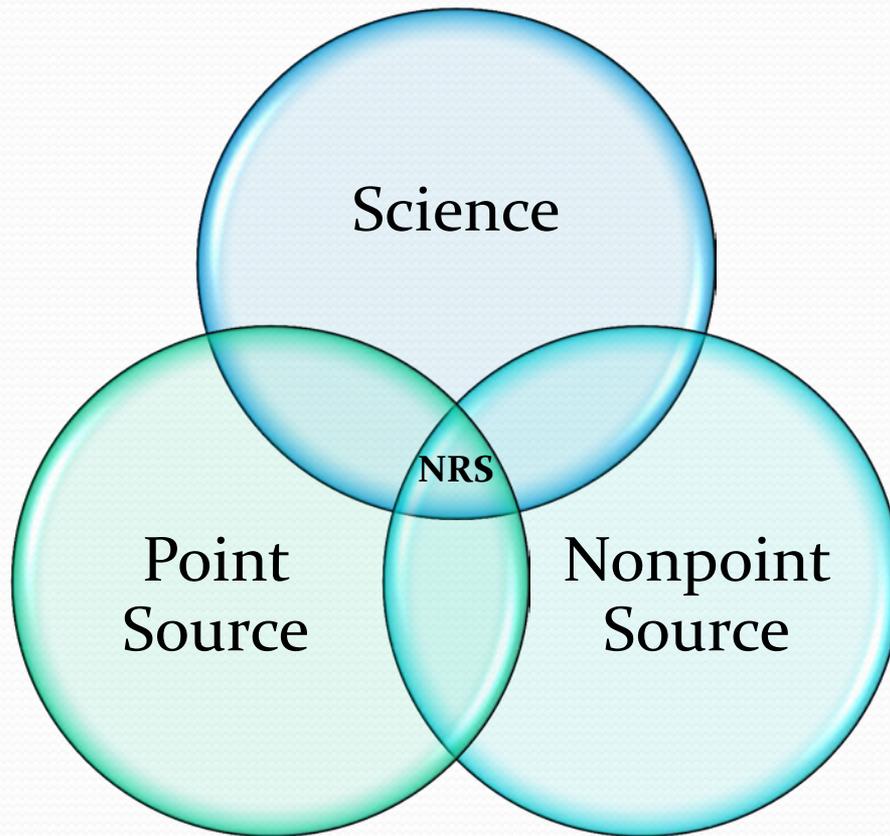


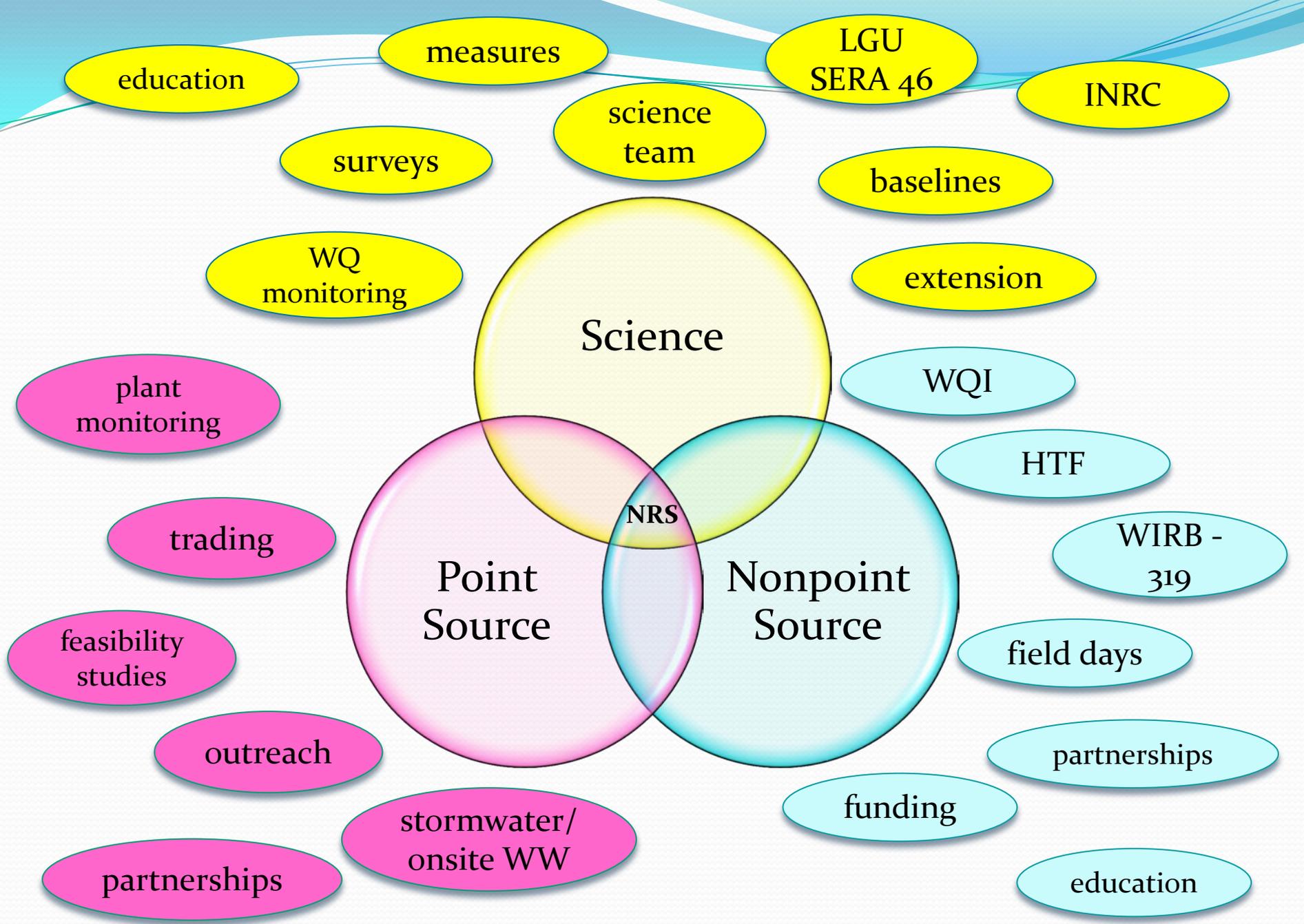


Iowa Nutrient Reduction Strategy: Structural BMP Mapping Project

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education

measures

LGU
SERA 46

INRC

surveys

science
team

baselines

WQ
monitoring

Science

extension

plant
monitoring

WQI

trading

HTF

Point
Source

NRS

Nonpoint
Source

WIRB -
319

feasibility
studies

field days

outreach

stormwater/
onsite WW

partnerships

partnerships

funding

education

How do you know when the Nutrient Reduction Strategy is successful?

MEASURABLE INDICATORS OF DESIRABLE CHANGE



INPUTS

- People
- Funding
- Agency resources
- Private sector resources



HUMAN

- Partner organizations
- Partner agribusinesses
- Farmer knowledge and attitude
- Point source communities and management knowledge and attitude



LAND

- Land use changes
- Practice adoption
- Point source implementation



WATER

- Calculated load reduction
- Measured loads in priority watersheds
- Organized watersheds reported load changes
- Measured loads at existing monitoring stations

What BMPs can be mapped?

- Terraces
- Water and sediment control basin
- Grassed waterways
- Contour strip cropping
- Contour buffer strips
- Pond dams

Iowa Conservation Progress

Iowa Conservation Progress (excerpt from INRS)

State and federal cost share programs have contributed significantly in helping Iowa farmers make progress in protecting Iowa's soil and water resources. Here are some examples:

- From 1982-2007, soil erosion in the United States has been reduced by 43 percent, according to the USDA's [National Resources Inventory report](#). Iowa's erosion rate was estimated at 5 tons per acre per year in 2007, down 33 percent from 7.4 tons per acre in 1982.
- A [survey of rural well water](#) in Iowa by the University of Iowa showed a decline in the number of wells with detections of nitrates and herbicides, including atrazine. The survey of 473 rural wells in 2006-2008 showed a decline in numbers of wells with pesticides and nitrates detected, and very low concentrations present when detections occurred. It was a follow-up to a similar survey of rural wells in 1988 and 1989. Results include:
 - No well had a pesticide exceeding or even close to drinking water standards.
 - Nitrate detections were down 11 percent from 20 years ago.
 - Seven major conservation practices used on Iowa farms are estimated to remove as much as 28 percent of the nitrate, 38 percent of the total nitrogen, and up to 58 percent of the phosphorus that otherwise would be present, according to the Center for Agricultural and Rural Development's [Conservation Practices in Iowa: Historical Investments, Water Quality and Gaps](#).
- Between 1980 and 2010, U.S. farmers nearly doubled corn production using slightly fewer fertilizer nutrients than in 1980. According to data from the USDA National Agricultural Statistics Service, farmers grew 6.64 billion bushels of corn using 3.9 pounds of nutrients (nitrogen, phosphorus and potassium) for each bushel in 1980. In 2010 they grew 12.45 billion bushels using 1.6 pounds of nutrients per bushel produced. In total, this represents an 87.5 percent increase in production with 4 percent fewer nutrients ([The Fertilizer Institute](#)).
- The Iowa [Conservation Reserve Enhancement Program](#) (CREP) restores strategically located and designed wetlands to intercept tile drainage water, with 72 wetlands currently restored or under development. These 72 wetlands will remove 76,700 tons of nitrogen over their lifetimes and protect 91,500 watershed acres. CREP wetlands also restore high quality wetland and prairie habitat. A new initiative that builds on the N-removal technology of CREP wetlands continues development – the Iowa Wetland Landscape Systems Initiative. It seeks to optimize drainage systems by redesigning them to reduce surface runoff, erosion, and delivery of agricultural chemicals to surface waters while also increasing agricultural productivity. These systems are integrated with N-removal wetlands at their outlets to complete the package of environmental benefits.
- Iowa farmers used conservation tillage on almost 15.2 million acres in 2007, up about 9 percent from 13.9 million in 2006 ([Conservation Technology Information Center](#)).
- Iowa farmers have more than 614,000 acres enrolled in the continuous, targeted Conservation Reserve Program, more than any other state ([September 2012, Farm Service Agency](#)). This number increases every month. It's also almost 12 percent of the U.S. continuous CRP signup total.
- Iowa farmers have restored more than 250,000 acres of wetlands, putting Iowa farmers 8th in the nation in terms of voluntarily restoring cropland to wetlands ([Iowa NRCS, 2008](#)).
- Since 2004, practices installed through voluntary watershed projects now collectively reduce sediment reaching Iowa's waters by 130,947 tons per year and phosphorus loading by 202,312 pounds per year. (February 2010, Iowa DNR).
- The Mississippi River Basin Healthy Watersheds Initiative (MRBI), sponsored by NRCS and its partners, will help producers in selected watersheds in the Mississippi River Basin voluntarily implement conservation practices that avoid, control, and trap nutrient runoff; improve wildlife habitat; and maintain agricultural productivity. These improvements will be accomplished through a conservation systems approach to manage and optimize nitrogen and phosphorus within fields to minimize runoff and reduce downstream nutrient loading. The Initiative will build on the past efforts of producers, NRCS, partners, and other state and federal agencies in the 12-State Initiative area to address nutrient loading in the Mississippi River Basin. More details [here](#).
- More than \$41 million in financial assistance in fiscal year 2010 to Iowa farmers through two of USDA's most popular 2008 Farm Bill financial assistance programs – the [Environmental Quality Incentives Program \(EQIP\)](#) and the [Conservation Stewardship Program \(CSP\)](#).
- EQIP is a voluntary conservation program that promotes agricultural production and environmental quality. Iowa NRCS obligated more than \$20.8 million through 1,267 contracts covering 79,374 acres to farmers in all 99 counties through EQIP. This program offers financial and technical assistance to install or implement targeted structural, vegetative and management practices, including terraces, residue management (no-till), grassed waterways, waste storage facilities, prescribed grazing, and nutrient and pest management.
- CSP is a voluntary conservation program that encourages producers to address resource concerns in a comprehensive manner by undertaking additional conservation activities and improving, maintaining, and managing existing conservation activities. CSP pays participants for conservation performance – the higher the performance, the higher the payment. Iowa NRCS obligated more than \$20.2 million through 1,480 contracts covering 797,605 acres through CSP in fiscal year 2010.

Benefits to mapping structural BMPs

- Establish a baseline to compare future progress to
- Estimate nutrient load reduction
- Estimate conservation investment
- Show historical progress over time and in future
- Evaluate saturation level of BMPs in watershed
- Improved modeling estimates
- Verify ACPF Tool results and streamline BMP implementation

Benefits continued...

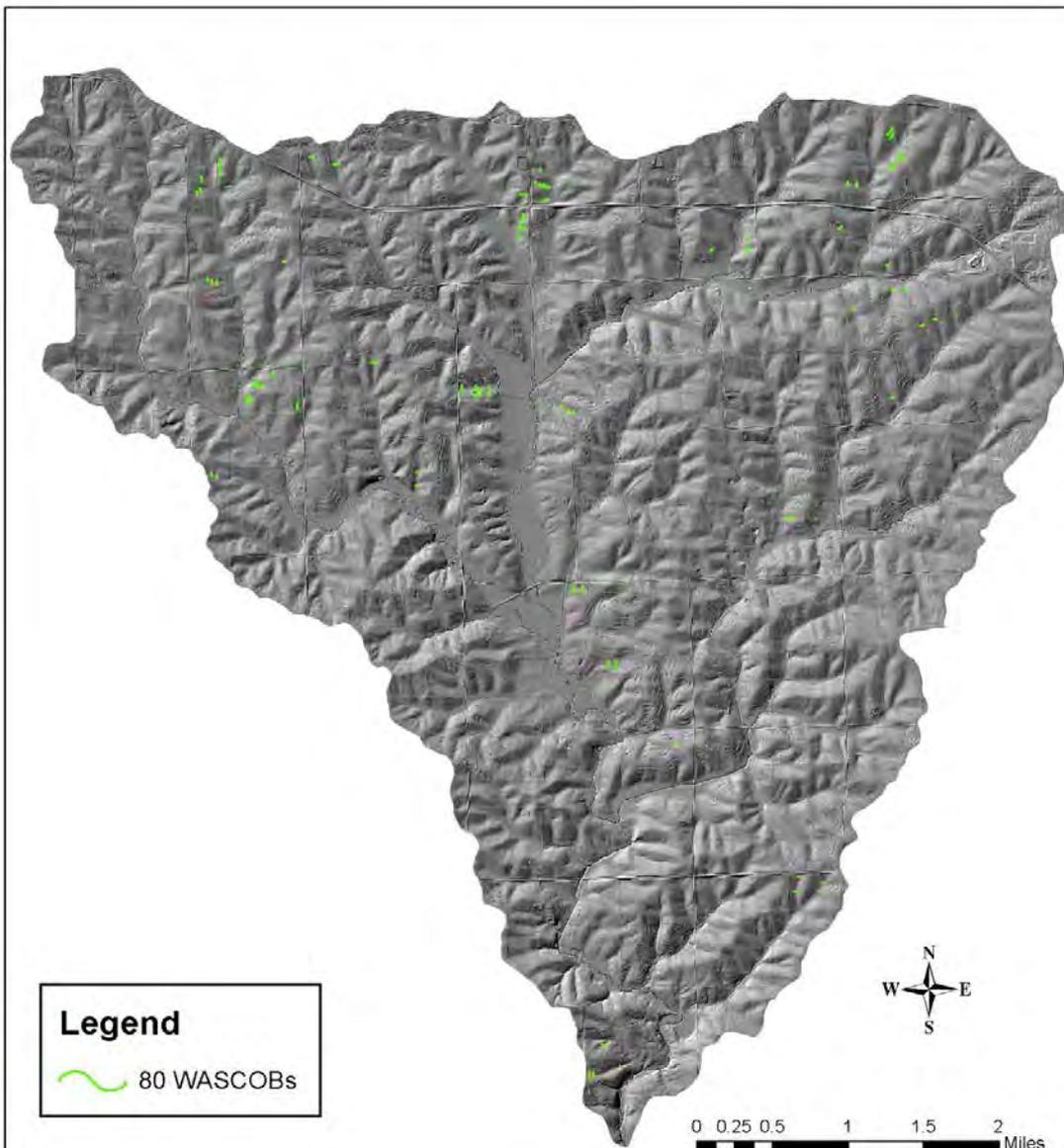
- Provides a uniform, consistent database to work from for the whole state
- Serve as an educational tool (right practice in the right place)
- Statewide picture – not just one program like CRP
- Not just cost-share, but overall progress over time
- Blind to private or public investment
- State vetted



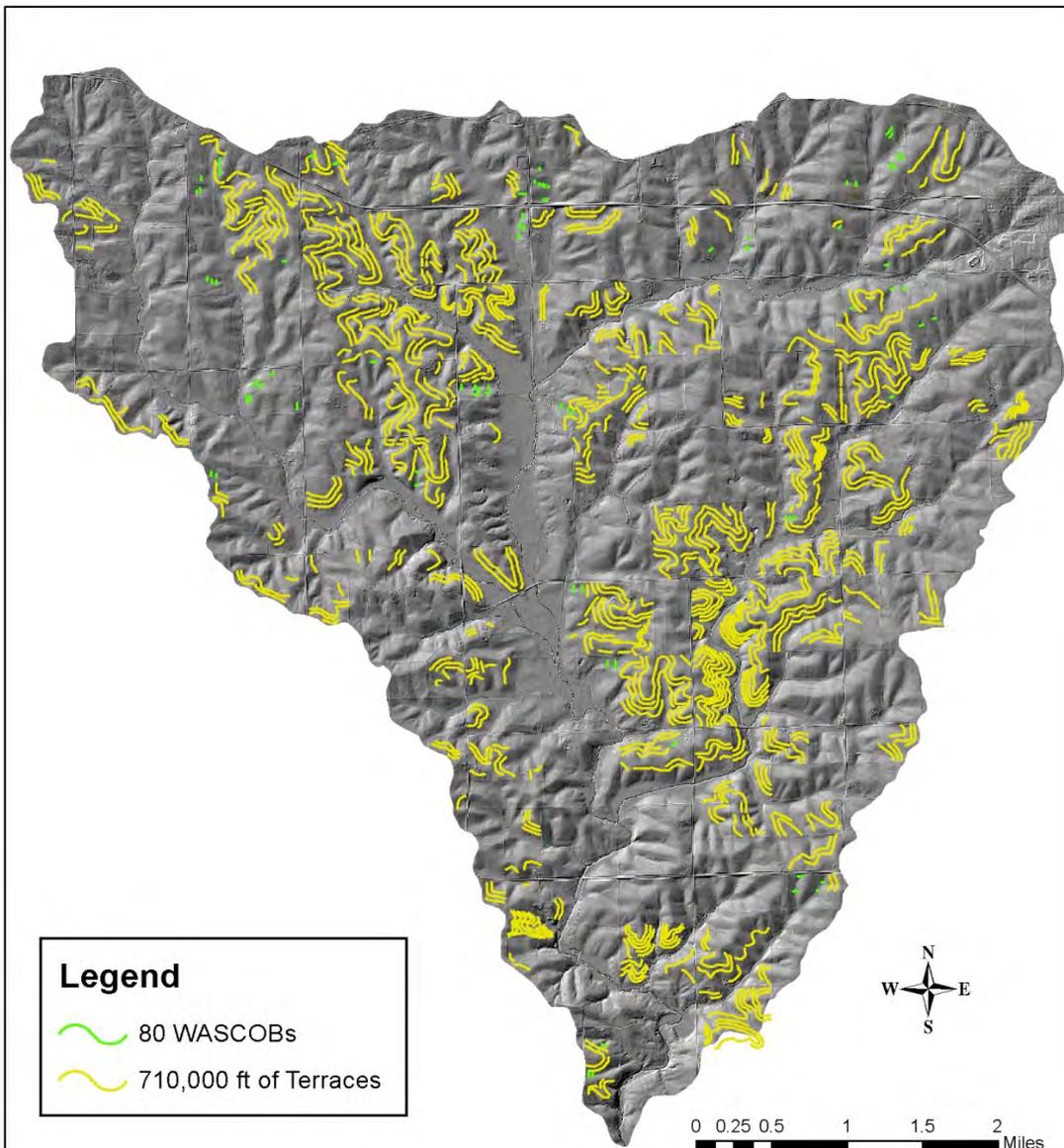
2014 Image of Silver Creek Watershed



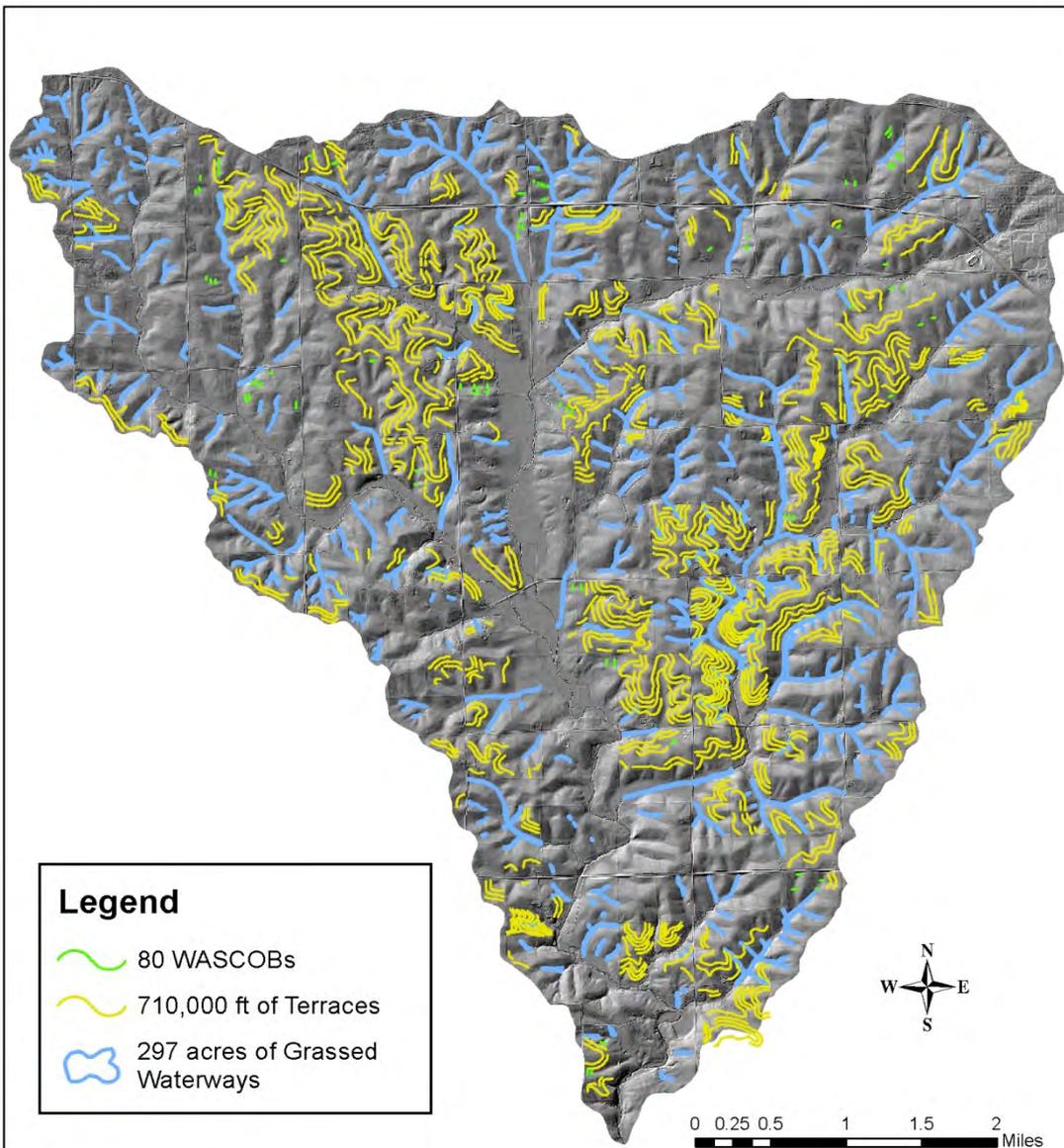
Topography of Silver Creek Watershed



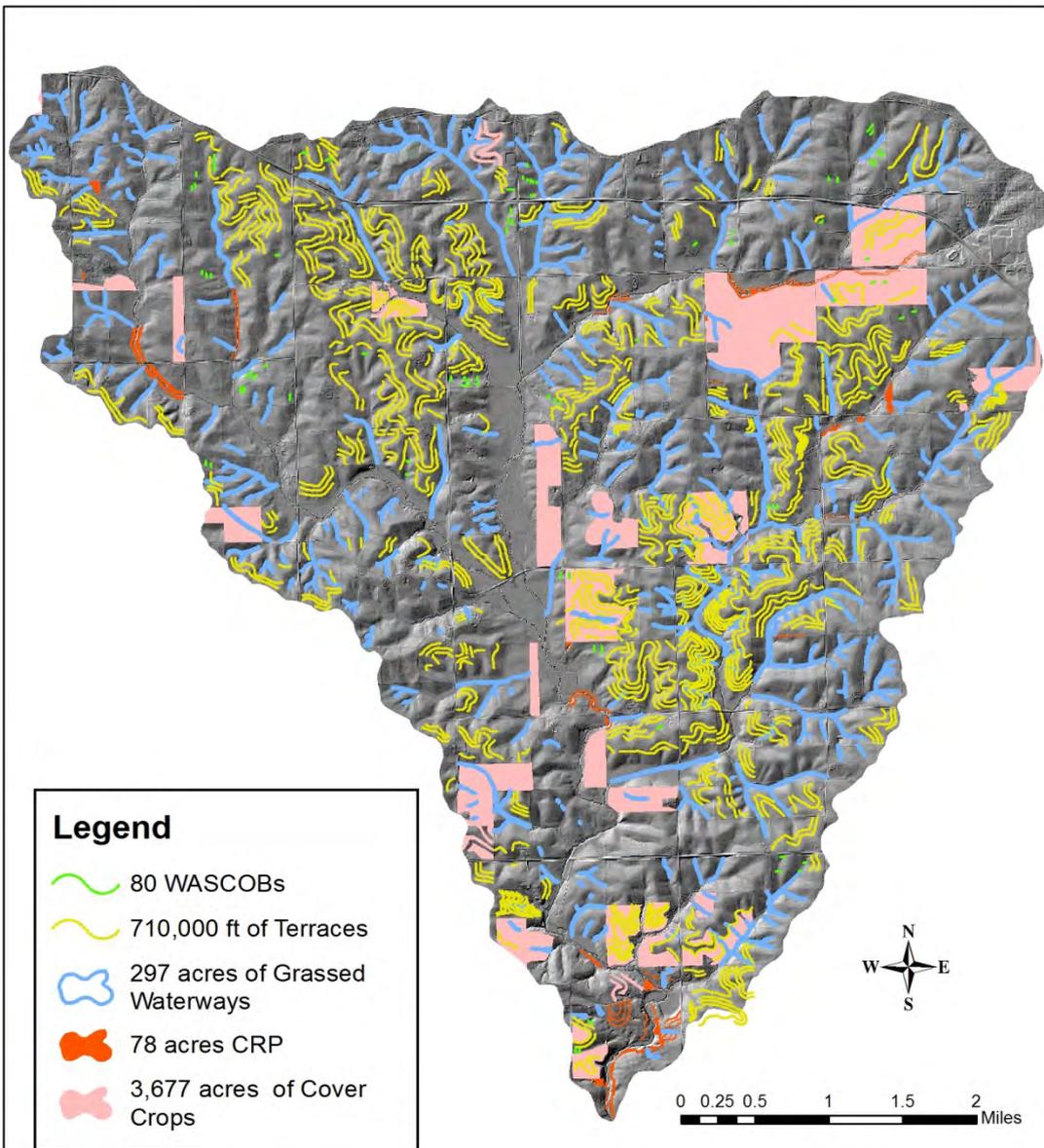
BMPs mapped in Silver Creek Watershed



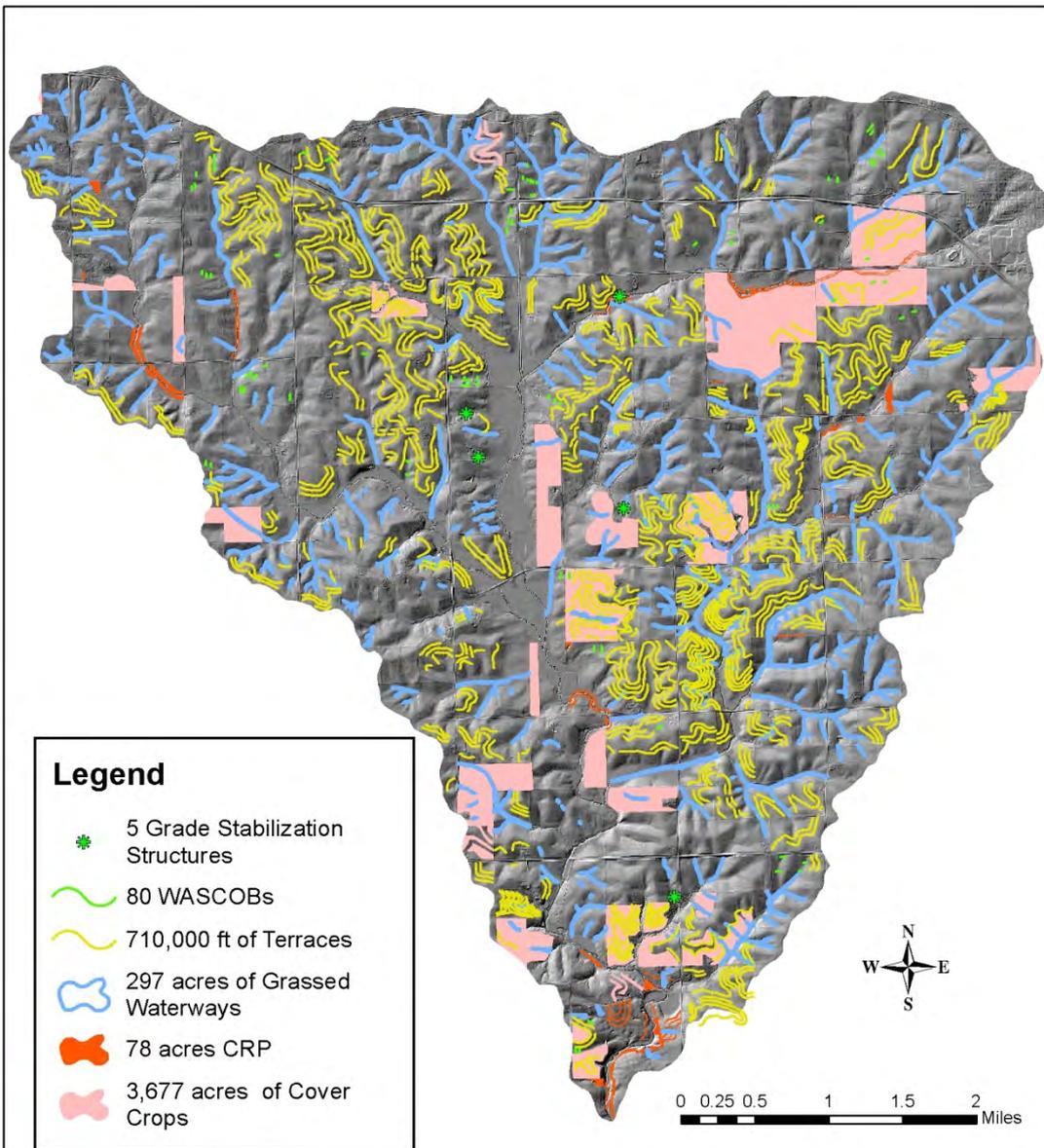
BMPs mapped in Silver Creek Watershed



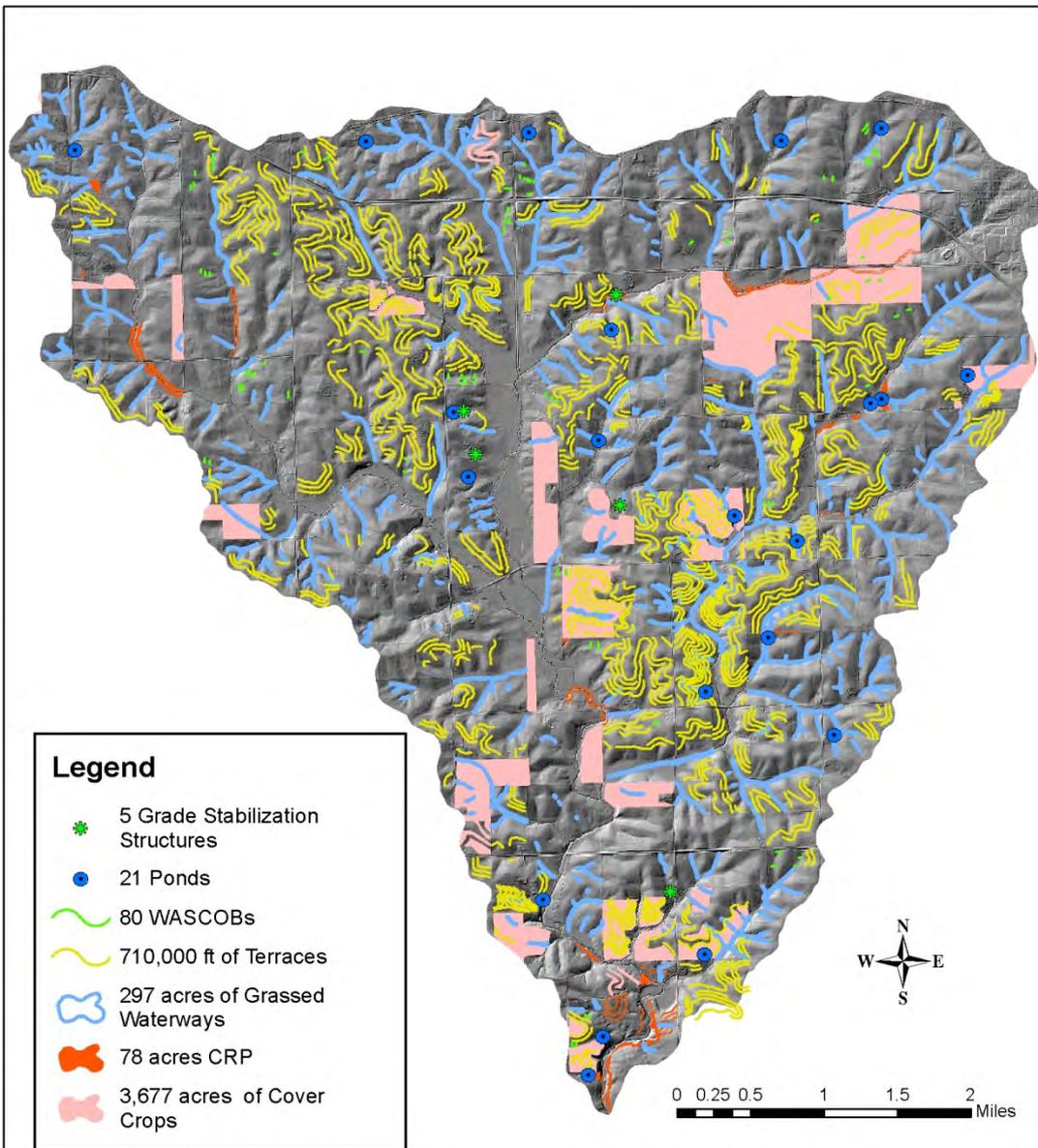
BMPs mapped in Silver Creek Watershed



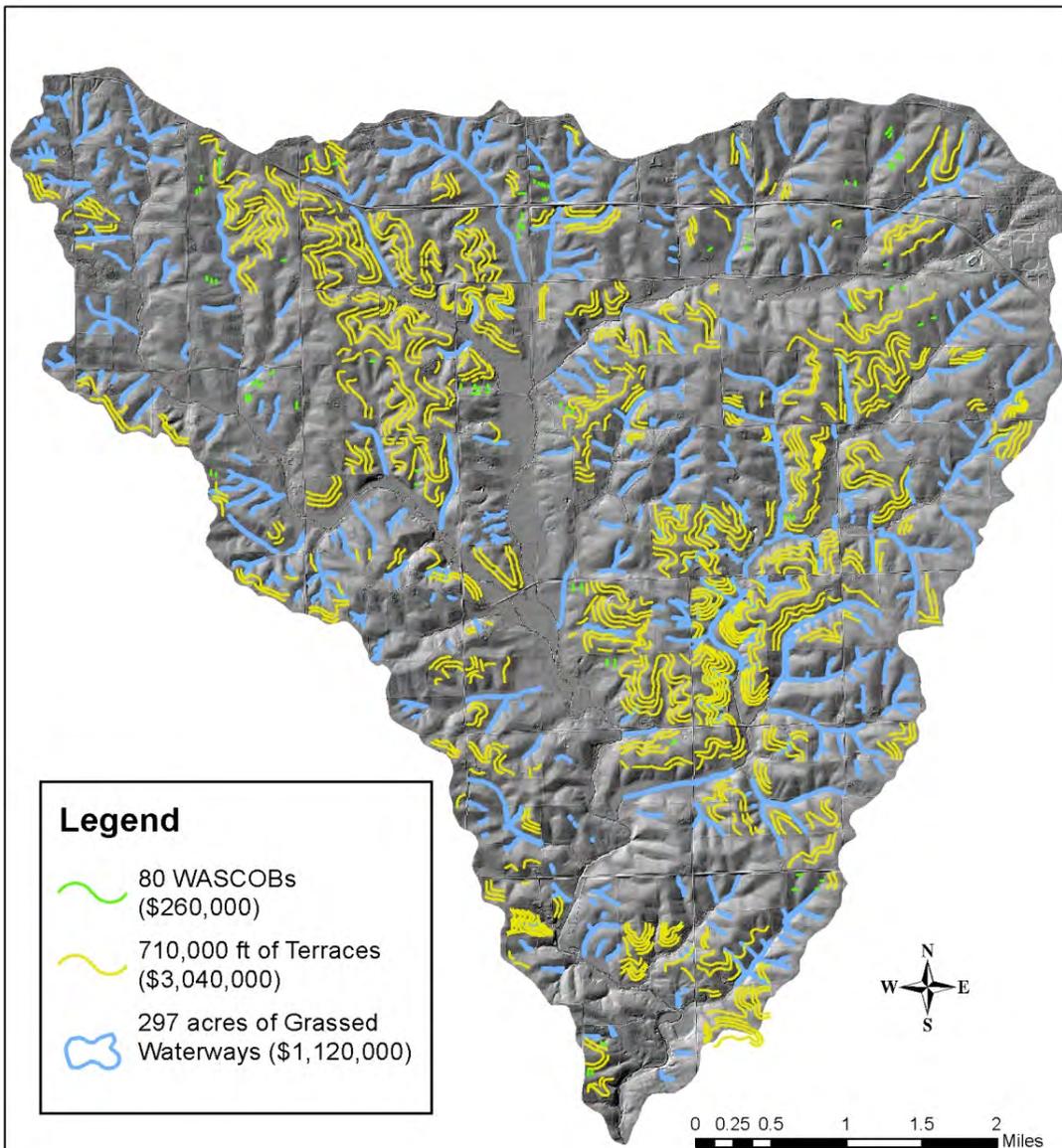
BMPs mapped in Silver Creek Watershed



BMPs mapped in Silver Creek Watershed



BMPs mapped in Silver Creek Watershed

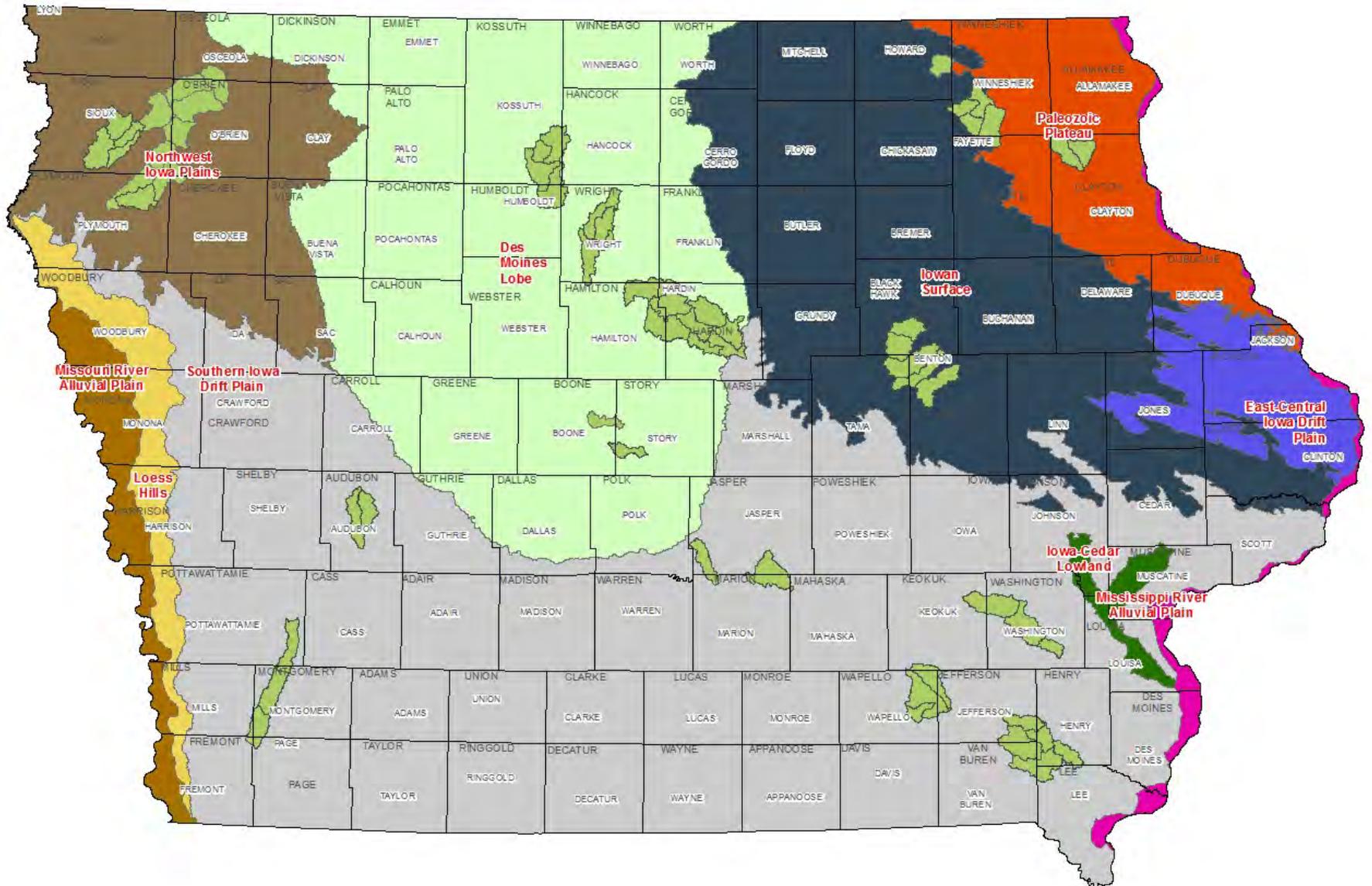


BMPs mapped in Silver Creek Watershed

Estimated total investment to install BMPs
in current dollars = \$4,420,000

Benefits calculated from mapped BMPs

- Annual load reduction from terraces and WASCOBs
 - 20,600 tons of soil
 - 22,700 pounds of phosphorus
- Annual load reduction from grassed waterways
 - 2,500 tons of soil
 - 2,700 pounds of phosphorus
- Annual load reduction from contour strip cropping and contour buffer strips (1,300 acres)
 - 4,500 tons of soil
 - 5,000 pounds of phosphorus



Differences in Land Forms

- Southern Iowa Drift Plains – Average Slope = 5.7%
- Des Moines Lobe – Average Slope = 1.8%
- Iowan Erosion Surface – Average Slope = 2.5%
- Northwest Iowa Plains – Average Slope = 2.9%
- Paleozoic Plateau – Average Slope = 10.5%

- The worst sloping ground is not likely cropped
- The average gives a relative difference between the regions.
- **Won't see** Terraces, WASCOBs, contour strip cropping and contour buffer strips on the Des Moines Lobe
- **Will see** terraces, dams, contour buffer strips and contour strip cropping in the Southern Iowa Drift Plains, Northwest Iowa Plains and the Paleozoic Plateau

Can track new BMPs using Annual Photography

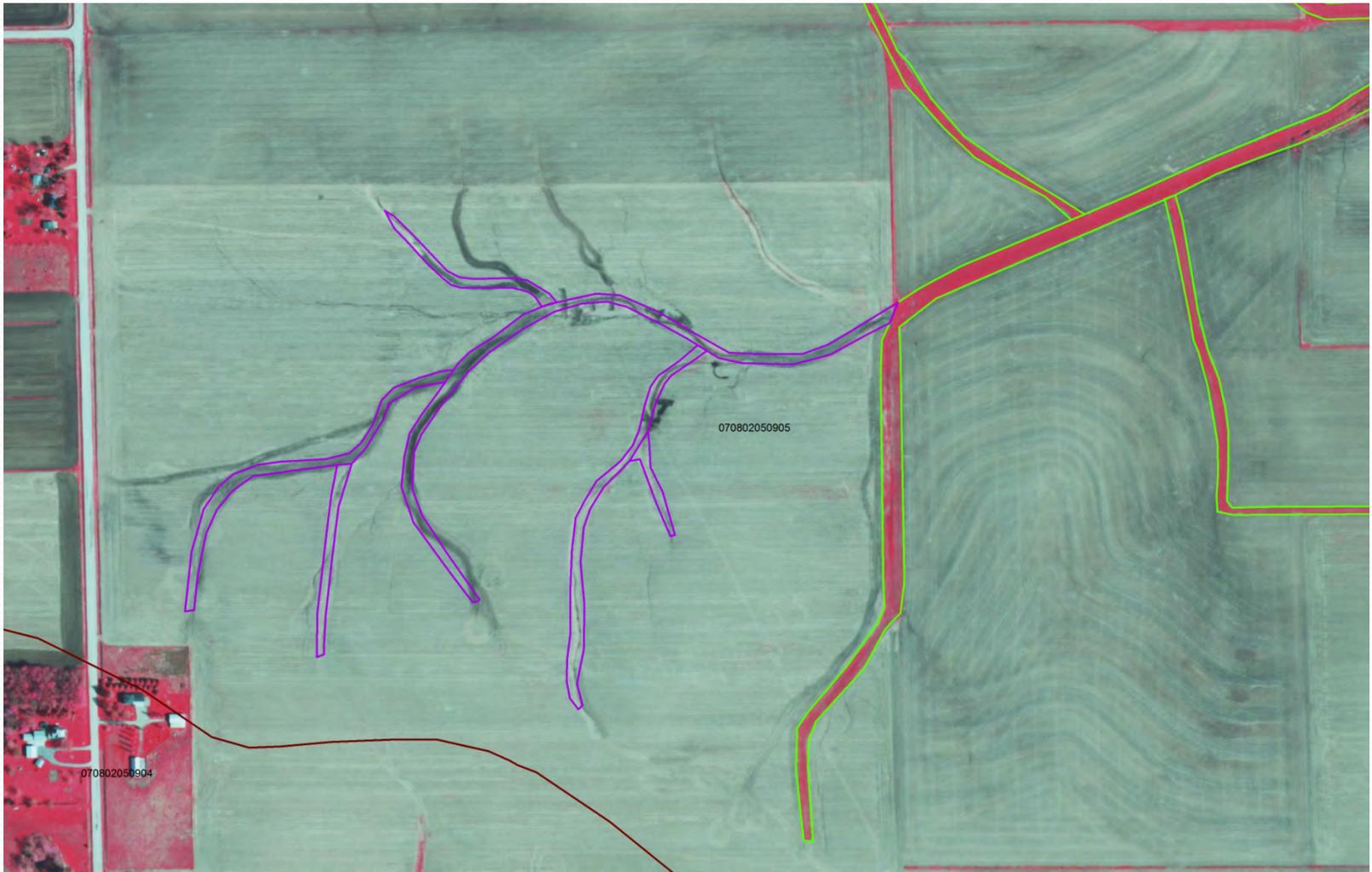


BMPs mapped from LiDAR



New terraces visible on 2011
NAIP photography

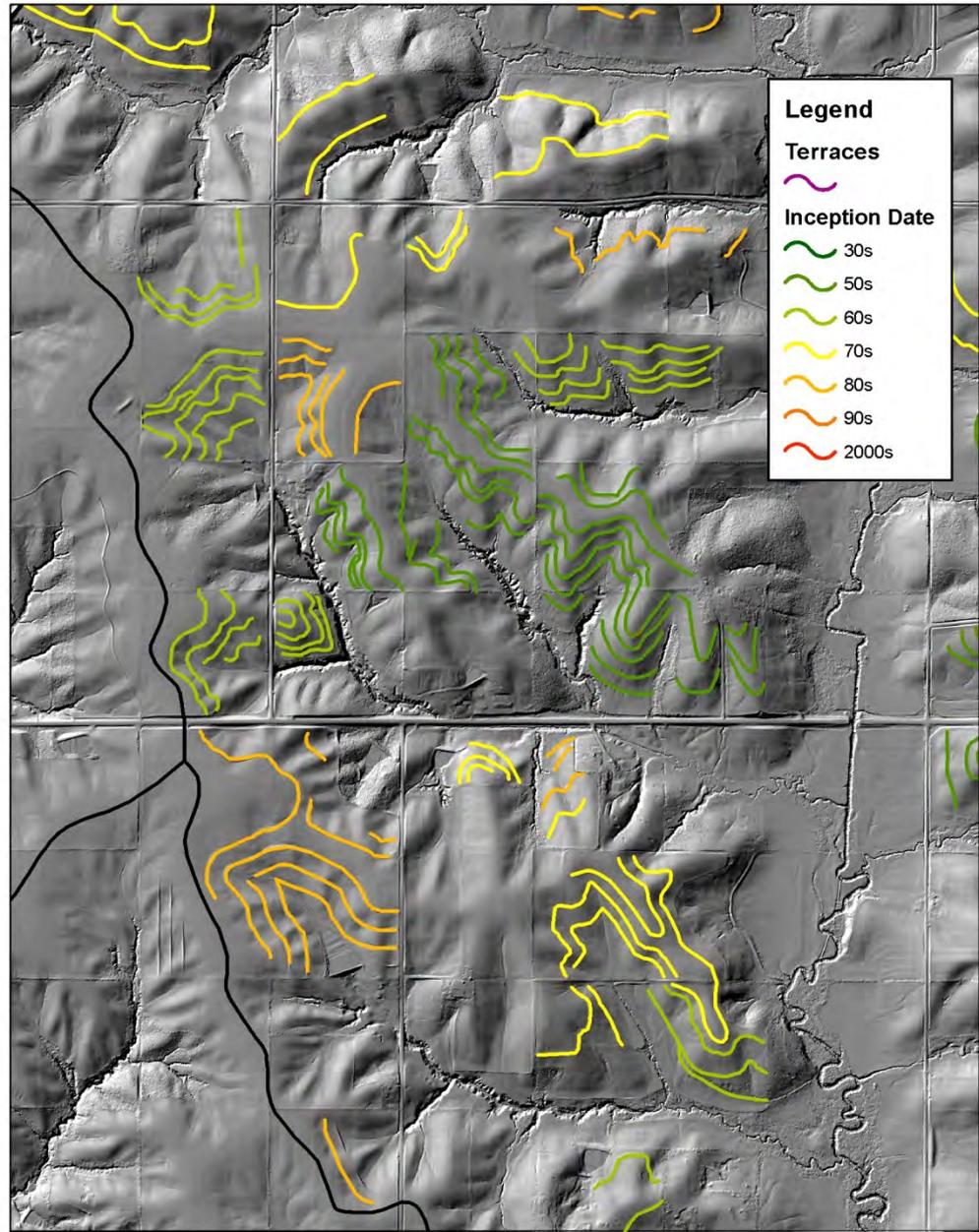
Can track new BMPs using Annual Photography



Progress Tracking/Funding Example

- INRC Project – use of photography to determine changes
- Middle Cedar Watershed HUC₁₂
- 40 acres of grassed waterways added from 2010 to 2016
- NRCS cost share data showed only 4 acres added
- This info can be used to help to determine the difference in private vs public investment
- 9 in 10 grassed waterway acres privately funded

Can show
history of BMP
implementation



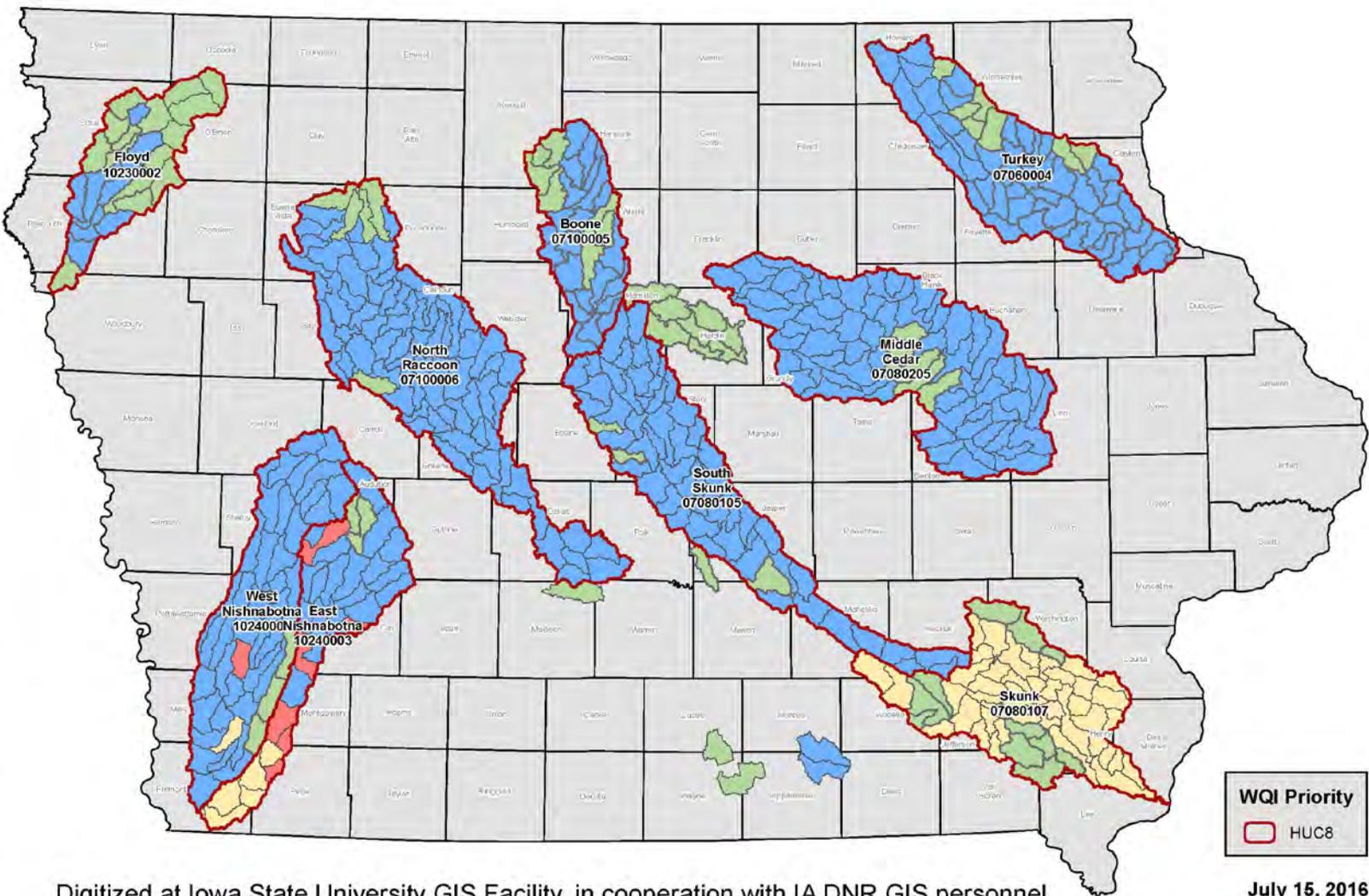
Improved Modeling

- West Branch of the Floyd River example:
 - Compare the two sediment delivery result summaries with and without mapped BMPs
 - Illustrates how one can generate an average sheet and rill erosion rate for each field (from RUSLE), omit areas already treated by BMPs, and generate a prioritization map for future conservation efforts
 - Without having the BMP locations and the areas they treat, it is easy to focus on areas that are already being treated and miss the opportunity to focus on the areas that really need BMPs

Conservation Practices Inventory HUC 12 Watershed Status

Summer 2016 Focus HUC 8: Middle Cedar, North Raccoon, South Skunk, E and W Nishnabotna

Status	
■	Ready 41
■	Processing 0
■	Completed 0
■	Metadata 0
2016 Middle Cedar	
■	Ready 0
■	Processing 0
■	Completed 52
■	Metadata 0
2016 N. Raccoon	
■	Ready 0
■	Processing 0
■	Completed 70
■	Metadata 0
2016 S. Skunk	
■	Ready 0
■	Processing 0
■	Completed 45
■	Metadata 0
2016 Nishnas	
■	Ready 6
■	Processing 7
■	Completed 54
■	Metadata 0
Overall Status	
■	Ready 6
■	Processing 7
■	Completed 321
■	Metadata 71



WQI Priority
 HUC8

Digitized at Iowa State University GIS Facility, in cooperation with IA DNR GIS personnel

July 15, 2016

BMP Mapping for WQI Watersheds (as of June 9, 2016)

HUC 8 Name	HUC Acres	HUC 12 Mapped	Pond Dams (#)	Grassed waterways (ac)	Terraces (number)	Terraces (mi)	WASCOBs (number)	WASCOBs (mi)	Contour Buffer Strips (ac)	Strip cropping (ac)
Boone	581,186	29	63	1,248	127	28	309	26	314	0.0
Floyd	586,570	23	168	2,840	13558	2,609	851	37	1,368	761
Middle Cedar	1,545,363	68	671	21,109	5041	843	2444	224	8,914	1,529
N Raccoon	1,579,997	75	593	5,400	2110	404	2998	290	1,237	653
Skunk	1,044,443	11	1165	3,740	2942	418	7366	324	1,168	217
S Skunk	1,179,099	15	141	2,057	565	85	808	63	1,065	79
Turkey	1,083,426	53	1131	11,176	9973	1,622	2793	149	40,538	7,164
E Nishnatbotna	734,993	2	109	894	1381	259	53	2	1,526	0
W Nishnatbotna	1,057,490	8	50	342	2713	554	163	8	880	7
Total	9,392,567	284	4,091	48,806	38,410	6,822	17,785	1,123	57,009	10,409

Conservation Investment To Date

- 284 watersheds finalized (~6,000,000 acres)
- The totals for the 284 watersheds are:
 - grassed waterways worth \$183,600,000
 - terraces worth \$154,500,000
 - WASCOBs worth \$57,600,000
- **Total Investment of \$395,700,000 or
~\$1,400,000 per watershed**

Current Status – Next Steps

- 321 HUC12s mapped to date
- WQI watersheds nearing completion
- ISU, IDALS, IDNR and NREC have committed \$100k for this next fiscal year
- More baseline mapping to occur
- Piloting the uses of the data will continue (e.g., modeling, progress tracking, hindcasting, etc)

What questions do you have?



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West Branch of the Floyd River WQI Average Sheet & Rill Erosion Rate of Non-BMP Treated Fields

