



Social Justice in Water Supply

2016 Water Resource Conference Panel Discussion

Moderator: Wanda Kirkpatrick, Metropolitan Council Director of Equal Opportunity

- + What is Social Justice?
 - + Environmental Justice
 - + Social Justice
 - + Water Equity

Panel Members

- + John Linc Stine, Commissioner Minnesota Pollution Control Agency
- + Danette McCulley, Business Services Manager Minneapolis Division of Water Treatment and Distribution Services
- + Ruth Hubbard, Executive Director Minnesota Rural Water Association
- + Chris Kolb, President of the Michigan Environmental Council and member of the Flint Water Advisory Task Force

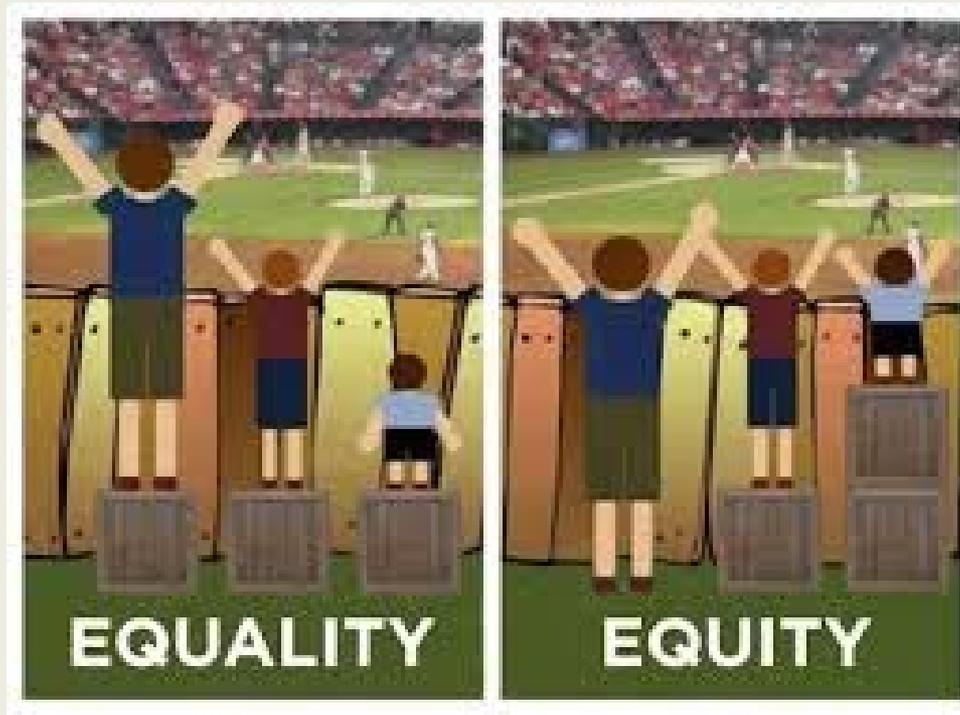
Environmental Justice Minnesota's Approach



John Linc Stine



Equity is about creating opportunities for everyone to be healthy



MPCA EJ Policy

Updated October
2012

The MPCA will, within its authority, strive for the “**fair treatment** and **meaningful involvement** of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations and policies.”



Environmental Justice at MPCA

- All people benefit from equal levels of environmental protection and service
 - Pollution does not harm one group of people more than another
 - Protecting Minnesotans most at risk



Environmental Justice & Water

- ❑ Safe drinking water – lead, nitrates, et al
- ❑ Lakes & streams – fishable, swimmable
- ❑ Wastewater treatment – housing, income
 - Individual Sewage Treatment Systems
 - Community Wastewater (Rates, Affordability)



CITY OF MINNEAPOLIS

Social and Environmental Justice

Danette McCulley

Business Services Manager

Public Works Water Treatment and Distribution Services Division

jus·tice

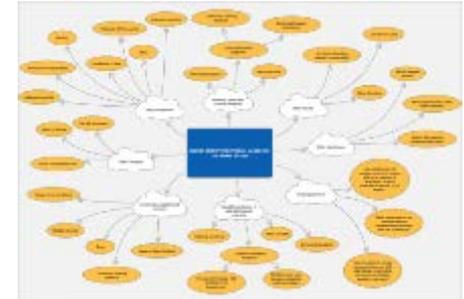
/ˈjʌstəs/

noun

1. just behavior or treatment.

"a concern for justice, peace, and genuine respect for people"

synonyms: fairness, justness, **fair play**, fair-mindedness, **equity**, evenhandedness, impartiality, **objectivity**, **neutrality**, disinterestedness, **honesty**, **righteousness**, morals, **morality**
"I appealed to his sense of justice"



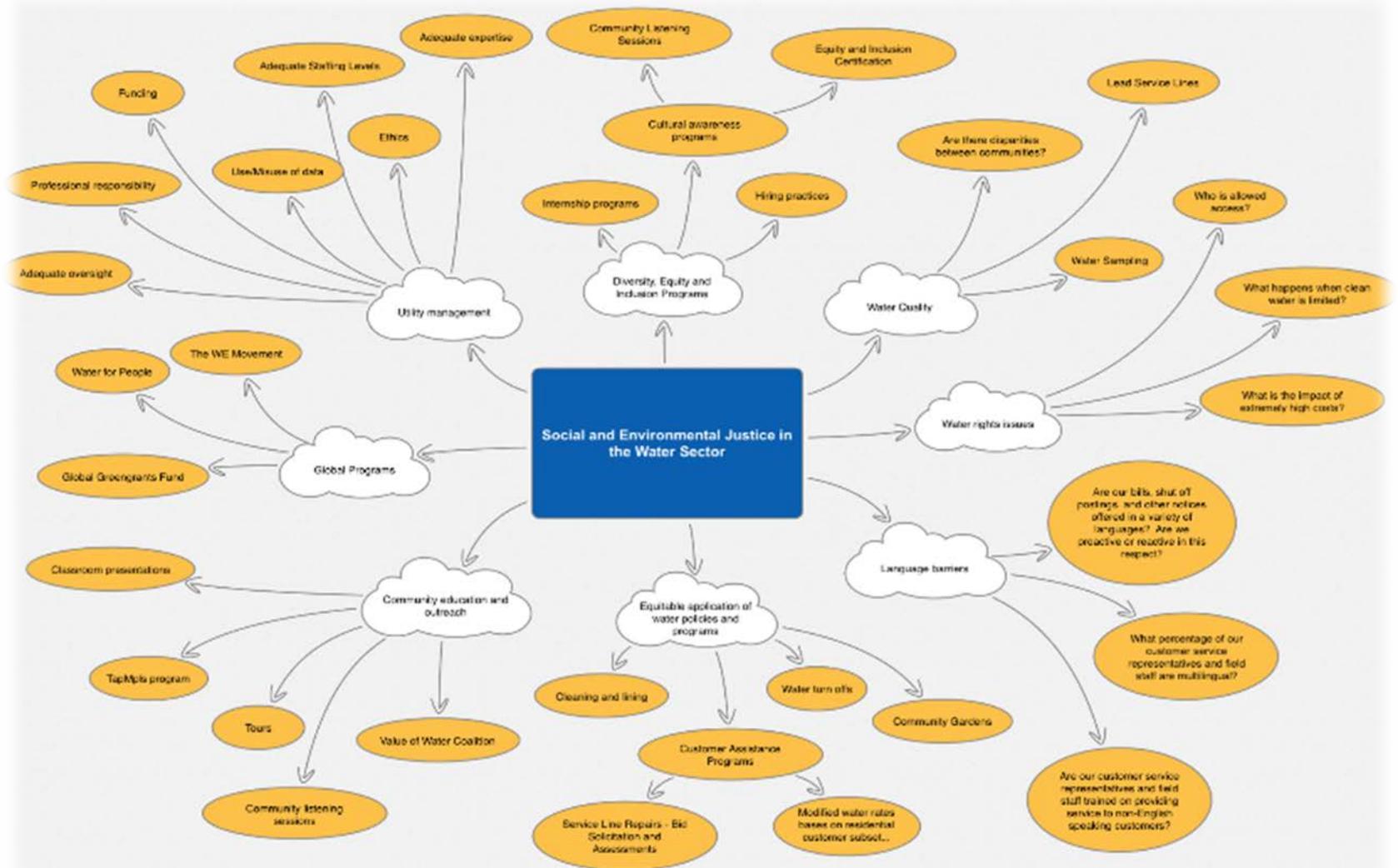
- Water Quality
 - Water sampling sites in all communities
- Community Education and Outreach
 - TapMpls Water Fountains and Bottle Fillers
 - Community listening sessions
 - Plant tours
 - Classroom presentations
- Diversity, Equity and Inclusion Programs
 - Hiring practices
 - Cultural awareness programs



- Water Quality
 - Lead Service Lines
- Language and Cultural Barriers
 - Are our bills, shut off postings, and other notices offered in a variety of languages? Are we proactive or reactive in this respect?
 - What percentage of our customer service representatives and field staff are multilingual?
 - Do our customer service representatives and field staff receive cultural awareness training?
- Equitable application of water policies and programs
 - Train staff to evaluate our services, programs and printed materials through the social and environmental equity lens



Endless Possibilities





Water quality



Water rights issues



Language barriers



Equitable application of water policies and programs



Community education and outreach



Global programs



Utility management



Diversity, equity and inclusion programs



What's already in place?

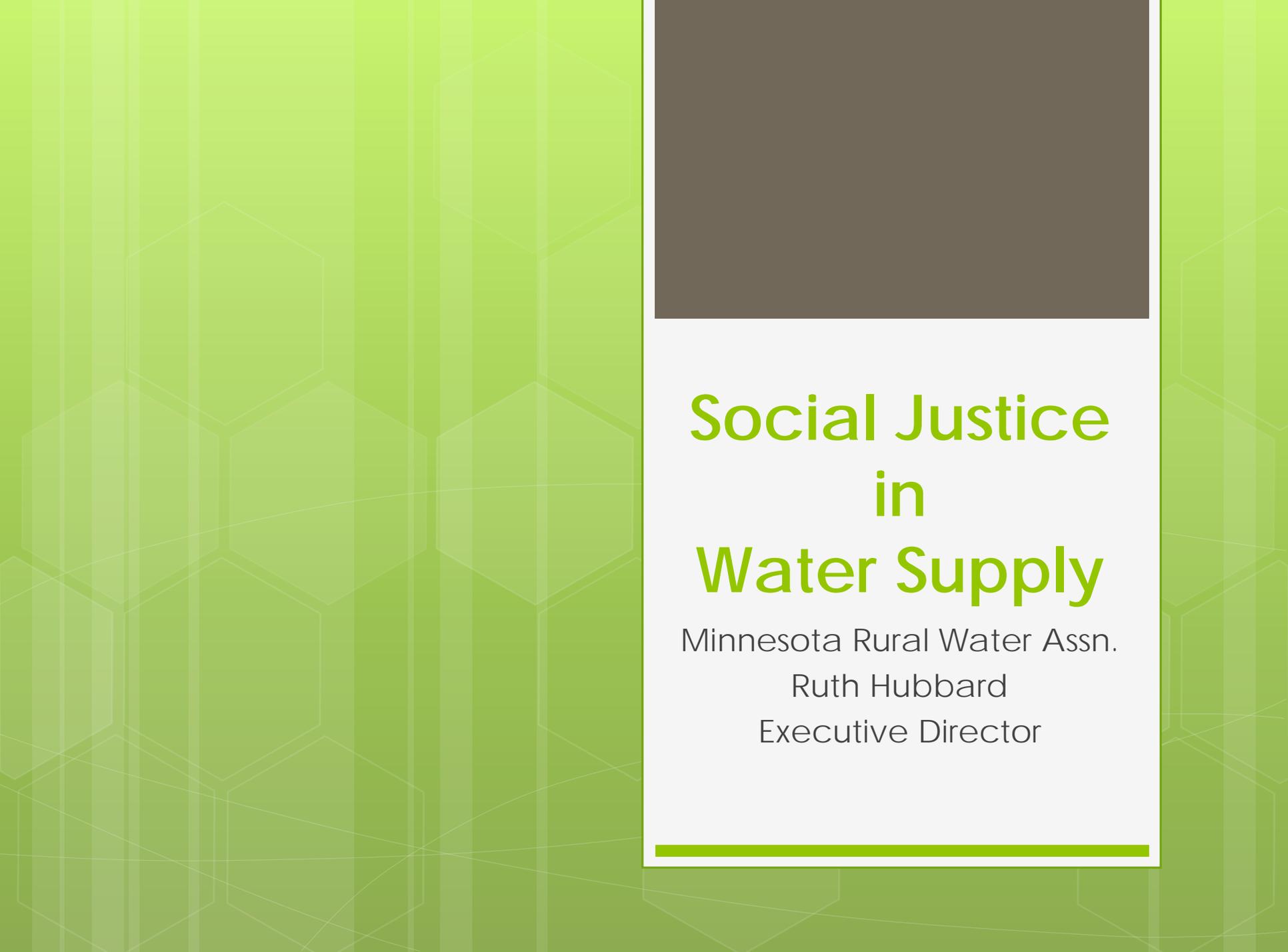
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What's next?



- **Water Quality**
 - Lead Service Lines
- **Language and Cultural Barriers**
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**Social Justice
in
Water Supply**

Minnesota Rural Water Assn.

Ruth Hubbard
Executive Director

Minnesota Rural Water Assn.

- Private non-profit 501c3 organization that provides training and on-site technical assistance to small and rural water and wastewater systems in Minnesota. MRWA has a staff of 17.
- Train over 3,300 licensed professionals annually
- Provide over 3,800 on site visits annually.
- Compliance with SDWA and CWA, financial stability, operation and maintenance, source water protection, etc.

Minnesota Facts

- 27% of Minnesotans live in rural areas compared to 19% nationwide
- Have lower incomes (20-30% lower than urban counterparts) and higher unemployment
- 20% of Minnesota residents rely on private wells which are not monitored or regulated under the Safe Drinking Water Act.
- Domestic wells may have increased exposure to groundwater contaminants.

Minnesota Facts

- Groundwater contaminants are likely to fall into two categories.
 - Naturally occurring
 - 10% of wells exceed 10ug/l arsenic standard. Some counties exceeded standard by 45%
 - In a statewide sample of 2,339 private wells, 49% exceeded the 100 ug/L MDH Health Risk Limit for manganese.

Minnesota Facts

- Contaminants from anthropogenic sources such as pesticides and other agricultural chemicals from surface activities.
- MDA nitrate testing clinic in 2012, 8% of wells tested above the 10 mg/L nitrate standard
- MDH 10% of noncommunity systems (600 of 6,000)
 - 105 exceed limit
 - 230 above 5 mg/L
 - 260 above 3 mg/L
- Nitrate levels in Minnesota groundwater continue to rise.

Minnesota Facts

- Who is paying for safe drinking water???
- Private systems are paid by private individuals (generally)
- 730 Municipal community public water systems are paid by it's customers (and tax payers)
- 5,926 Non-municipal systems (transient/non-transient) paid by the owners (renters, cost of products, taxpayers (rest stops, schools))
- Rural Water systems are paid by it's customers (and tax payers)

Minnesota Facts

- System affordability 1.4% per utility
 - Oslo – Population 310
 - \$4,283,000 needs \$2,966,000 grant
 - \$52.84 per month per utility
 - Need exceeds federal programs
- Rural Water Systems 2.3% plus assessment above \$18,000

Health Inequity and Water

- For those who drink from private wells
- For those who drink from smaller public water supplies with few customers to share costs
- For those small communities that lack capacity to support a community water supply
- For those who have to pay to remove contaminants introduced by others

Rate Food for Thought...

- Average monthly charge
 - 0-2,500 = \$44.45
 - 10,001 – 25,000 = \$26.04
 - AE2S 2016 Survey



Chris Kolb

- + President of the Michigan Environmental Council and member of the Flint Water Advisory Task Force



Panel Question and Answer Session

Audience can ask questions in Pigeonhole or via index cards

Session Wrap Up

- + Audience:
 - + How do you see social justice and equity impacting what you do?
 - + What can you do to improve social justice?
- + Moderator synthesis of Minnesota related issues and possible next steps
- + Panelist closing remarks

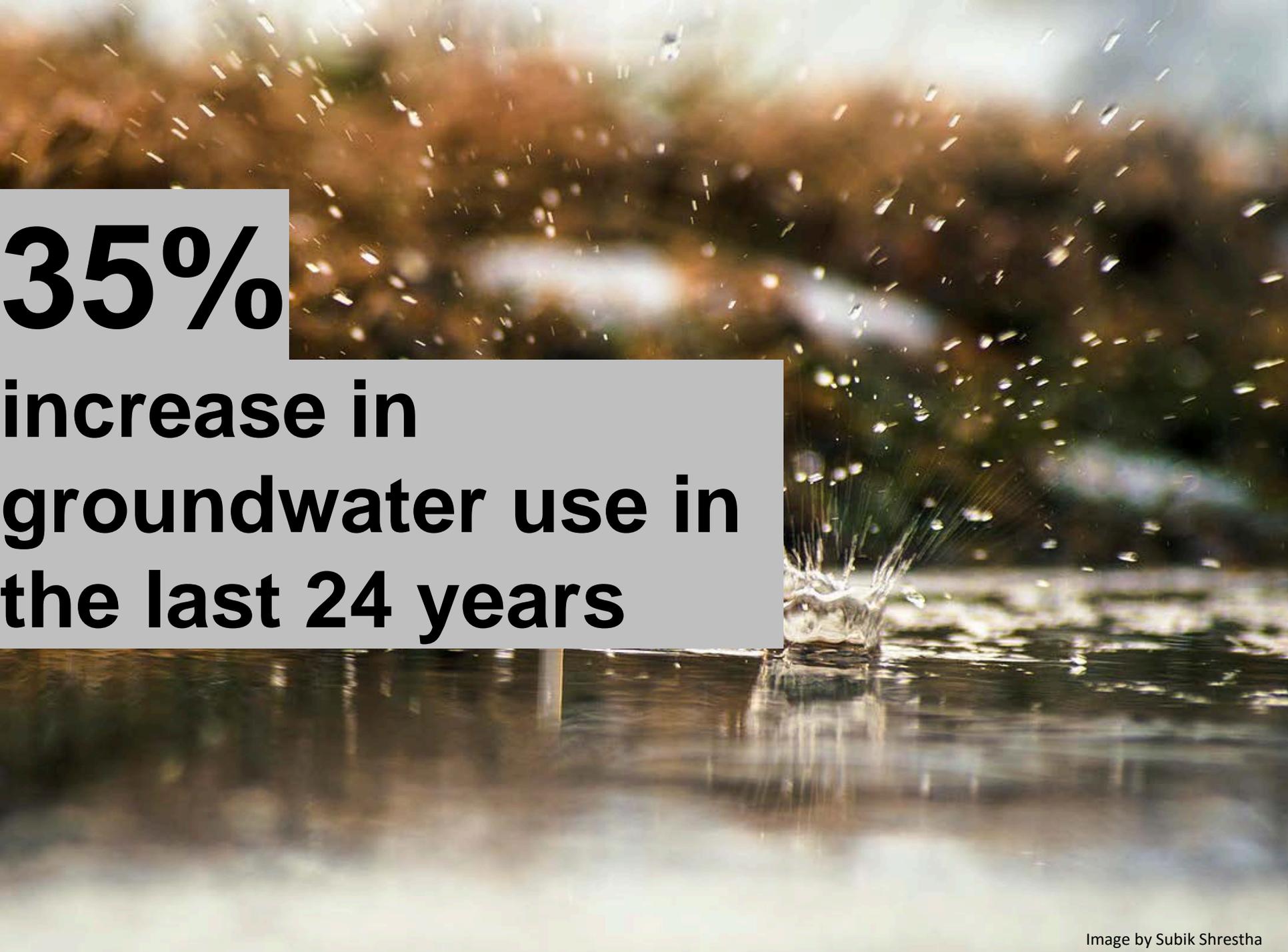
Building Soil and Water Conservation District Staff Capacity for Groundwater Protection

Amit Pradhananga

Sharon Pfeifer

Mae A. Davenport





35%

**increase in
groundwater use in
the last 24 years**

What is the **capacity** of SWCD staff to engage in groundwater protection?

What is
Community Capacity?

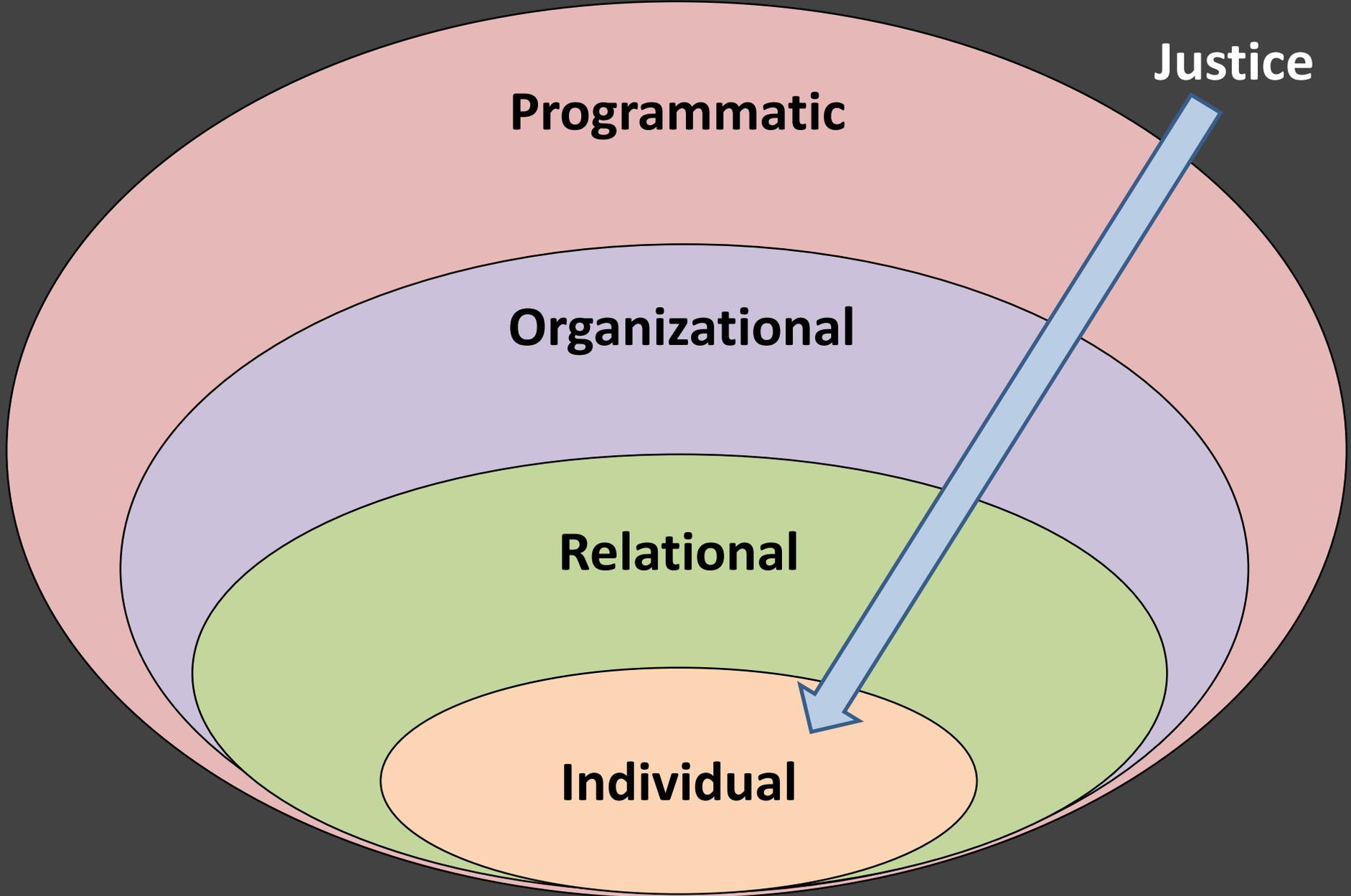
“The
interaction

of human capital, organizational
resources, and social capital
existing within a given community

that can be
leveraged

to solve collective
problems and improve or
maintain the well-being of
that community”

-Chaskin et al. (2001, pg. 7)



Multi-level Community Capacity Model

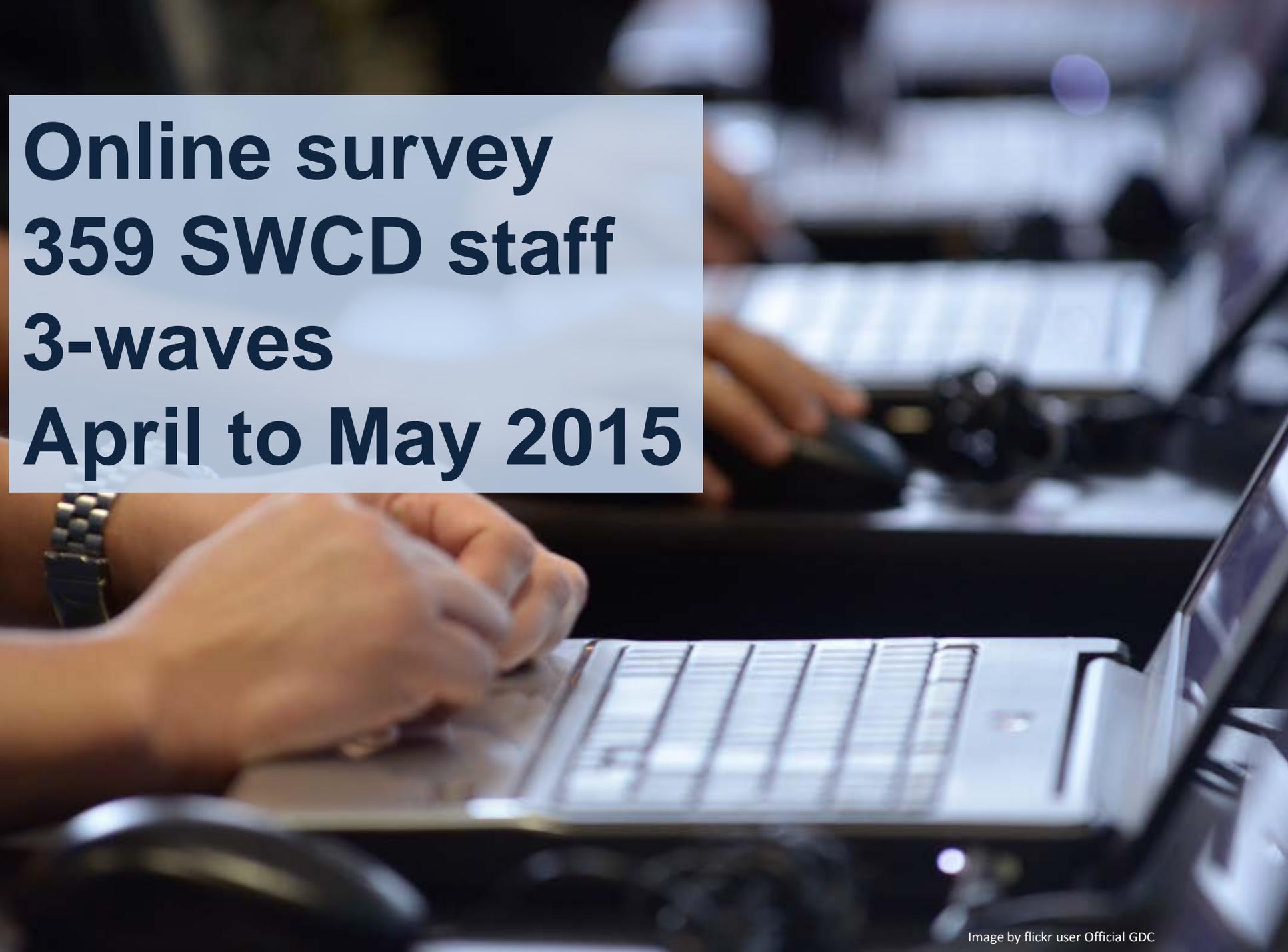
STUDY DESIGN

Baseline
Survey

Tailored
Workshops

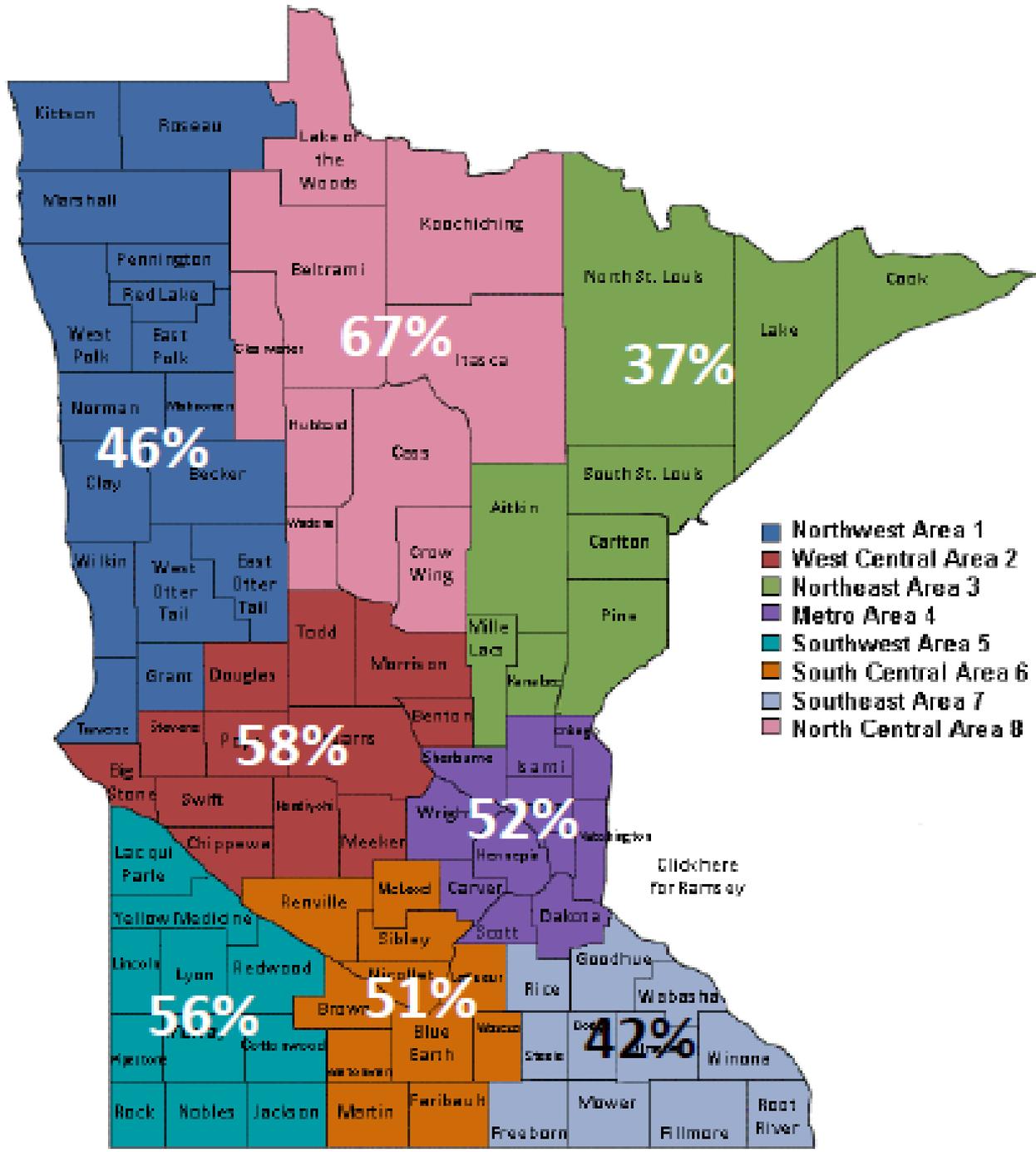
Pre/post
evaluation

BASELINE SURVEY

A close-up photograph of a person's hands typing on a silver laptop keyboard. The person is wearing a metal watch on their left wrist. The background is blurred, showing other people working at desks in an office environment. A semi-transparent white box with dark blue text is overlaid on the left side of the image.

**Online survey
359 SWCD staff
3-waves
April to May 2015**

52%
of SWCD
staff
completed
the survey



WHO

are the respondents?

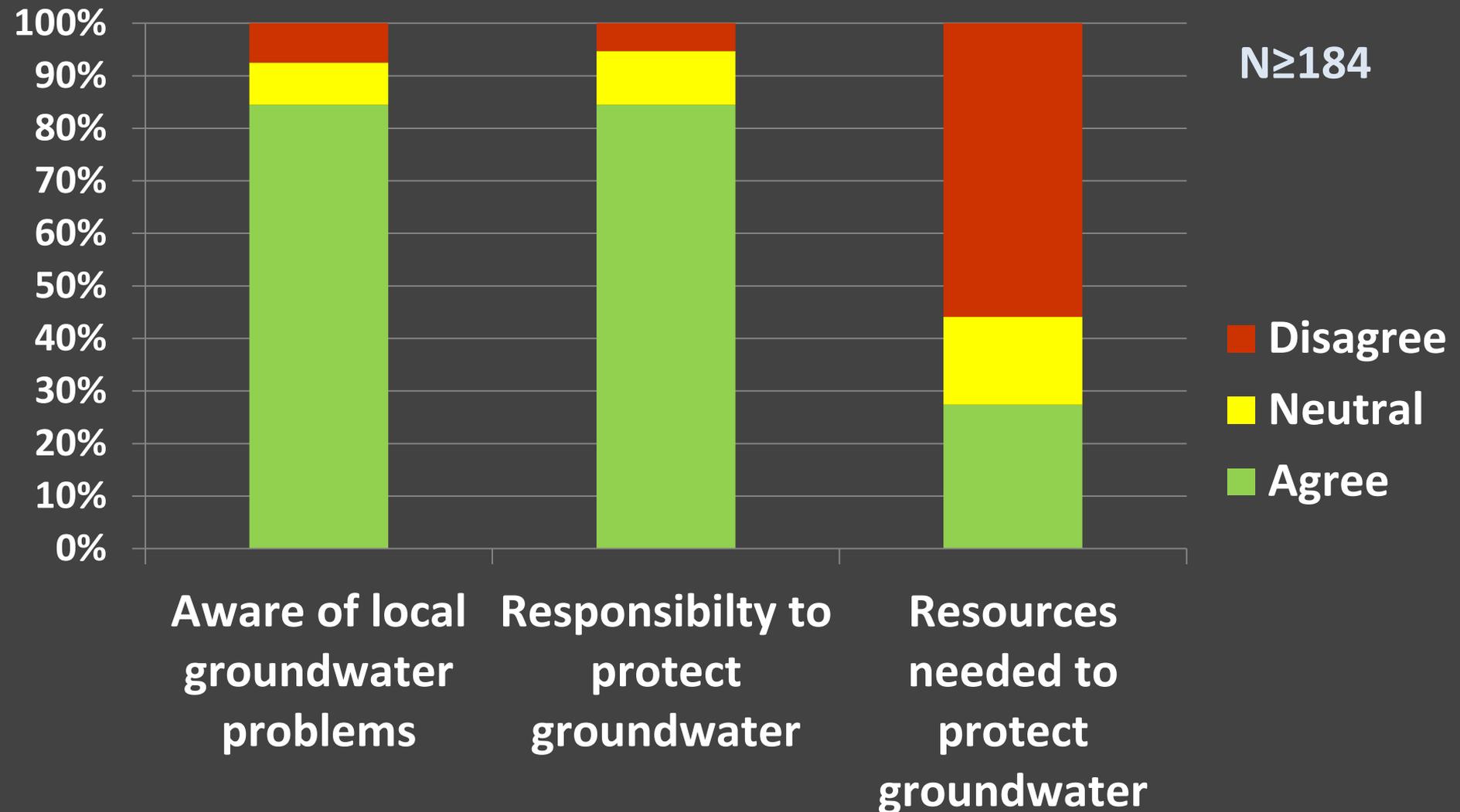
61% Male

72% Have at least a college Bachelor's degree

68% With a role in groundwater education and outreach

Individual Capacity

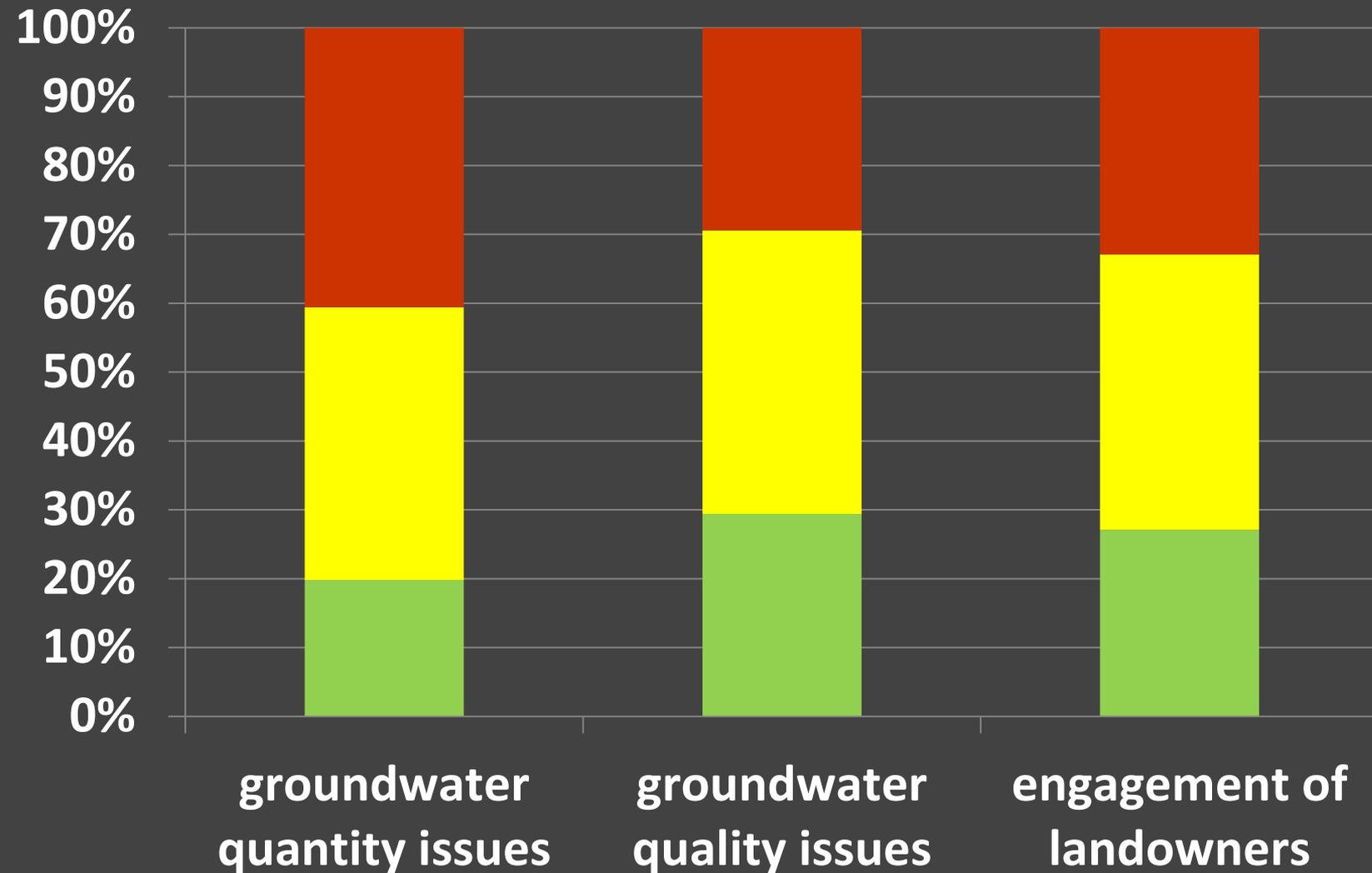
Do respondents believe they have the resources they need to protect groundwater?



Do SWCD staff believe they have the expertise in groundwater issues and in engaging client groups?

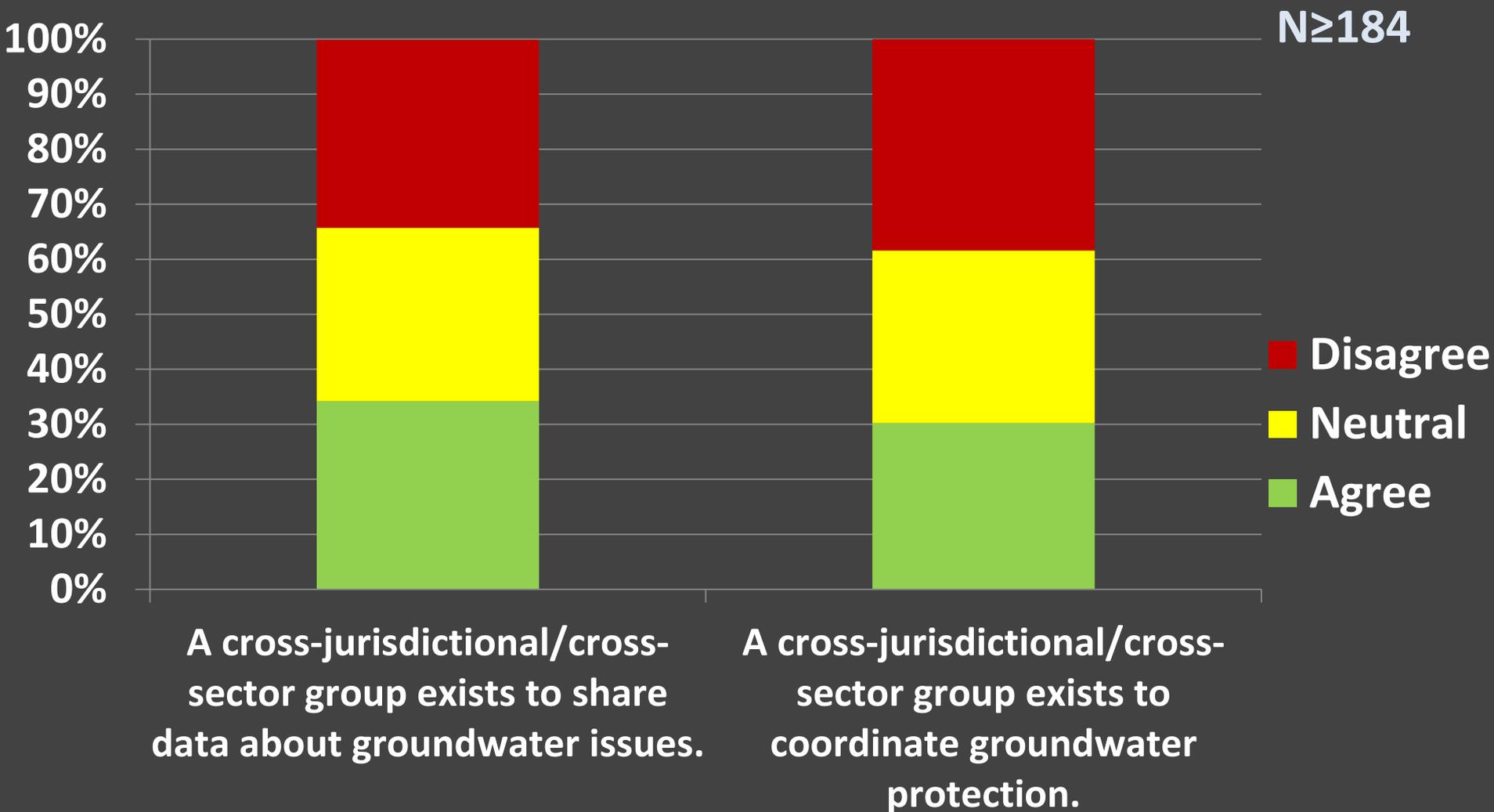
N≥183

■ Poor
■ Fair
■ Good



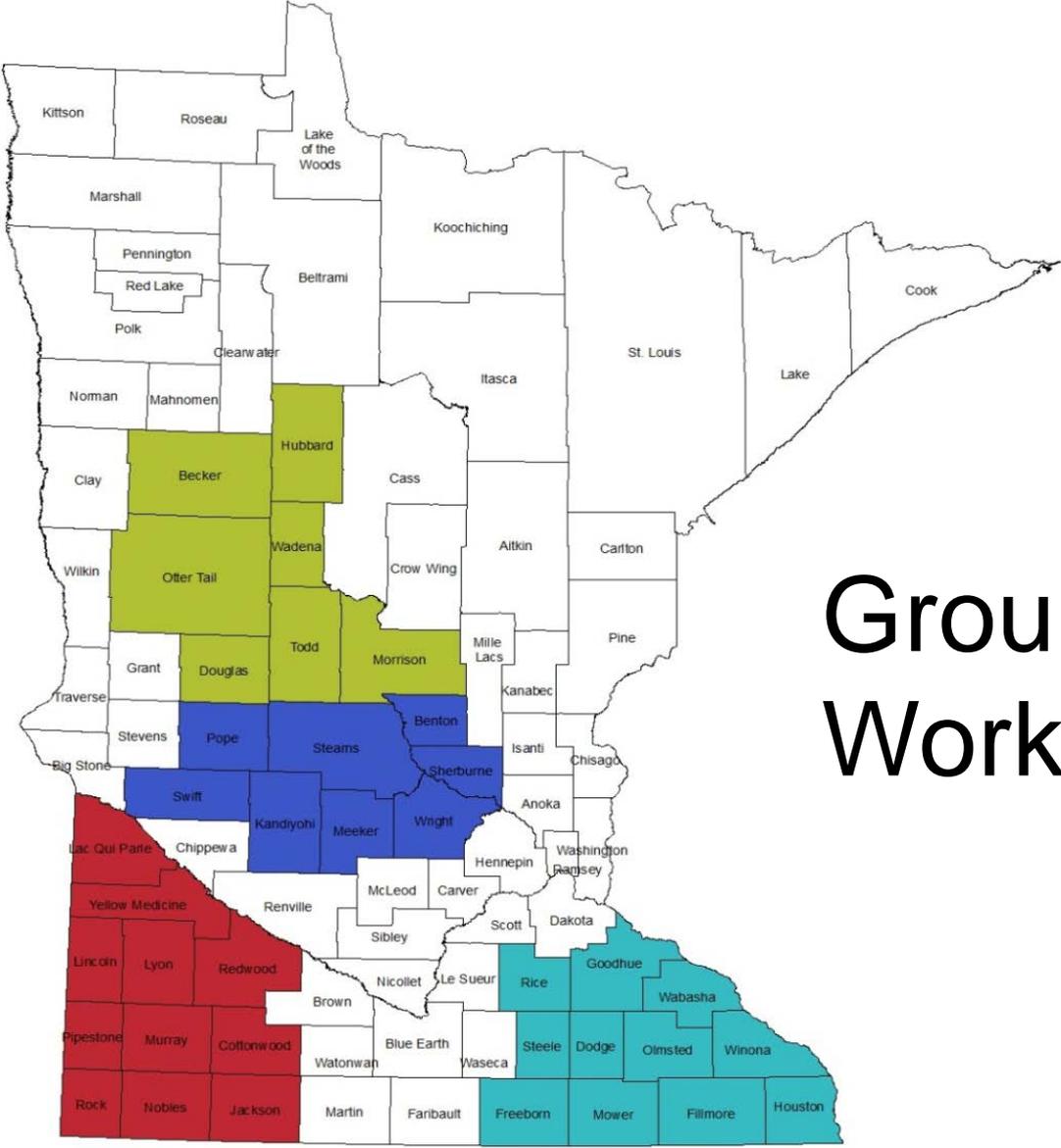
Programmatic Capacity

Do respondents believe cross-jurisdictional/cross-sector groups exist to share data about and coordinate groundwater protection?





WORKSHOP DESIGN AND EVALUATION

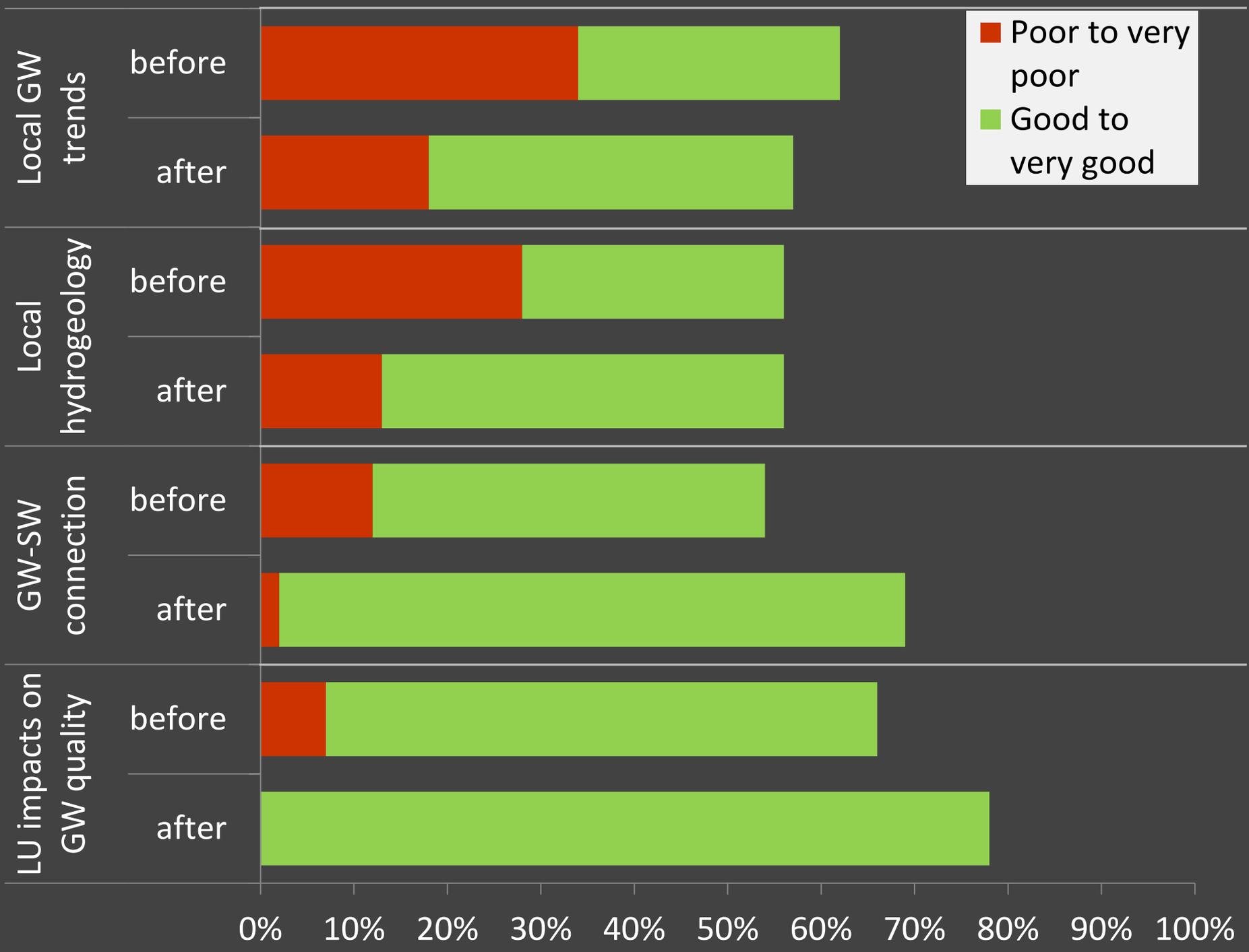


Groundwater (GW) Workshop “Zones”

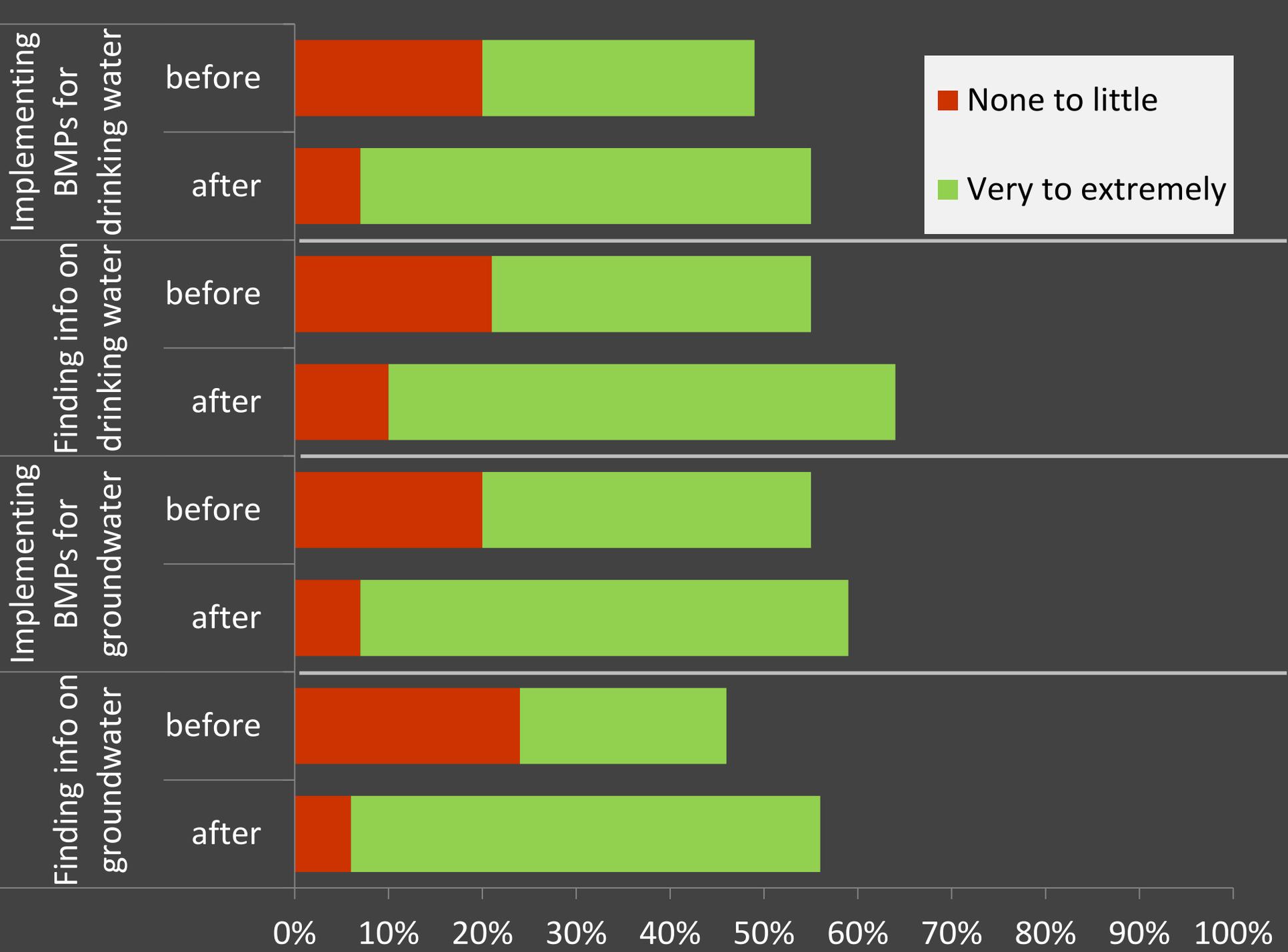
Workshop Objectives

- ✓ To provide current information on local hydrogeology and groundwater quality and quantity issues
- ✓ To develop a better understanding about the connection between groundwater and surface water
- ✓ To illustrate the impacts of land uses on groundwater quality and quantity
- ✓ To clarify roles regarding groundwater and drinking water management

Change in Knowledge



Change in Confidence



CONCLUSIONS AND RECOMMENDATIONS

Programmatic

Lack of cross-jurisdictional/cross-sector groups to share data about and coordinate groundwater protection; lack of programs to build local capacity

Organizational

Lack of strategic, long term plans for groundwater protection

Relational

Lack of capacity to provide meaningful feedback on groundwater protection and develop cultural norms or expected behavior around groundwater protection

Individual

Lack of technical expertise and resources to address groundwater problems

Capacity Constraints



**Provide training and support
in groundwater issues and
capacity building**



Promote information exchange across local and state organizations



Acknowledgements

- Collaborators:
 - LeAnn Buck, MASWCD
 - Carrie Raber, MDH
 - Mark Hauck, MDH
 - Mark Wettlaufer, MDH
 - Margaret Wagner, MDA
- Baseline survey and workshop participants
- UMN students- Vanessa Perry and Alyssa Prokott

Questions?

Using Social Science to Accelerate Conservation



Row crop
agriculture



Water quality





How do we accelerate the adoption of conservation farming practices?



Farmer-led, community-based



It seems so simple...

If you want to solve a problem, ask the people affected by the problem to DEFINE the problem before you try and solve it.

Our Problem

- How do we accelerate the adoption of conservation farming practices?

Their Problem

- Don't know the Soil and Water guy
- Mixed messages from agencies
- Too much paperwork
- Too long a wait for cost-share dollars
- Lack of evidence that what we are being asked to do will work

Why is this important?

BECAUSE YOU CAN'T SOLVE YOUR PROBLEM

UNTIL YOU SOLVE THEIR PROBLEM

Why is this important?

Land use

Culture

Tradition

Politics

Education



Invite



Ask



Listen





Farm to Stream

Recommendations for Accelerating Soil and Water Stewardship



Freshwater
Society every drop
matters

How can we
accelerate
adoption of
conservation
practices?



How we listened

- On-the-ground work in the project area
- Community Capacity study
- Roundtable discussion
- A survey of agricultural and environmental organizations

How will you
prepare your
organization for
this new work?



Advice From the Field

Preparing for county-level buffer work



We asked...

When your organization is two years into this new buffer work, what will success look like?

As you prepare your organization for this new buffer work, what are your greatest concerns?



How we listened

- Hosted conversations with staff of 32 SWCDs
- Asked participants to:
 - Take ALL the notes
 - SORT the notes into themes
 - SUMMARIZE the themes



Protecting groundwater-sourced drinking water:

An assessment of the needs and barriers faced by local water management professionals

Prepared by Freshwater Society
for the
Minnesota Department of Health

March 15, 2016



How can state-level agencies best match resources with local needs in order to accelerate the adoption and implementation of groundwater and drinking water protections?”



How we listened

- Online survey
- Structured group conversations



Invite



Ask



Listen



Use Social Science to...

Recommend action...

- Incorporate participants' ideas into your planning or policies.
- Develop policies based that address barriers your participants identify
- Change policies that have created barriers based on what you learn

... accelerate conservation



Good questions to ask...

- Should we outsource this to professionals?
- How do I build on this and disseminate so participation improves?
- Does my city council really want input or do they want us to go through the motions?
- Do I start with blank paper, or settle for an end of the process review and comment opportunity?
- How do you let the loud voices talk-- but not drive away your other members?



Peggy Knapp

Director of Programs

Freshwater Society

pknapp@freshwater.org

NEMO Workshops on-the-water

–

**Inspiring policy actors and
community leaders to take action**



UNIVERSITY OF MINNESOTA
EXTENSION

Driven to DiscoverSM

NEMO Workshops on-the-water

Inspiring elected and appointed community leaders to take action

Presented by
John Bilotta

Minnesota Water
Resources Conference

October 2016



WOW !

- 1. Innovative in approach** - *for education and for civic engagement*
- 2. Result in significant increases in knowledge and skills**
- 3. Policy actors and community leaders take action**
- 4. Be specific with goals and objectives**
- 5. Continual and repeated engagement**

About WOW !

Workshops-on-the-water



About WOW !

Workshops-on-the-water

St. Croix Workshop on-the-water. NEMO Program. July 2014.
Photo credit to the University of Minnesota Extension, St. Croix River
Association, and the East Metro Water Resource Education Program.



Growing toward a Bright Future



About the target audience



Nonpoint **E**ducation for **M**unicipal **O**fficials

Deliver educational programming, provide resources, and create effective tools to assist and enable communities to make informed decisions regarding land use and natural resources.

Policy actors: Elected and appointed officials and community leaders

2009

2010

2011

2012

2013

2014

2015

2016

2

states

5

counties

10

watersheds

100

presenters

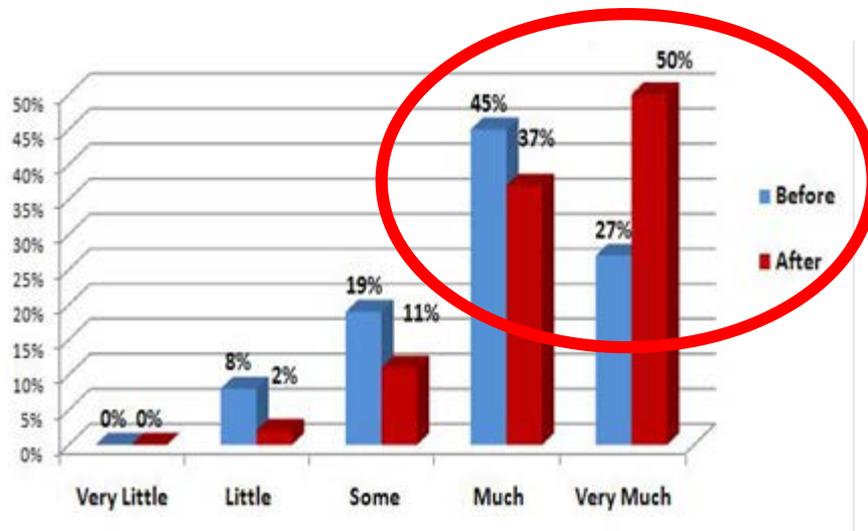
+700

leaders

2009

A View from the River

Leaders increased their knowledge about their role roles in protecting the River.



“I became involved in government because I thought there were too many restrictions on what you could do with your own land. Now I have reversed my opinion.”

The WATERSHED GAME



2010

Putting the Pieces Together

The water science lab



~75% of the participants indicated they increased their level of understanding about monitoring and how data is gathered and used.

2011

Challenges and Solutions – Your Role in Protecting the St. Croix

89%

- ☑ Education value was high
- ☑ Educational approach very effective
- ☑ Strong indications of knowledge and skill gain

43%

- ☑ Were repeat participants
AND
- ☑ as a result of participating,
identified actions they had taken.



**NEMO Workshop "Connections & Solutions on the St. Croix River"
June 2011.**

2013

Making Change Happen for the St. Croix



~ 80% Being on the River enhanced their learning experience; It also drove them to participate in the program.
Its about *PLACED BASED EDUCATION*

2014

Engaging local leaders to preserve and enhance the St. Croix

“It will help inform my votes on projects that effect the river, and give some focus on the river for the new comp plan.”



*“I feel I have a bit deeper knowledge of the 'end' desirably and **can ask better questions** and hopefully come up with a better solution.”*

☒ Actions for local leaders

- ☒ **Erosion control** can be a major problem during rapid development. **Assign** a field staff person to continually monitor areas under active construction.
- ☒ **Develop a plan for the long-term maintenance of stormwater BMPs** (best management practices). Assume the city or county will be responsible and design accordingly.
- ☒ **Review and revise your comprehensive plan and ordinances** to ensure that they adequately support clean water, natural resources and preservation of rural character.
- ☒ **Ask if your policies are up to date, when were they last reviewed?** Should they be reviewed? Do they meet adopted community visions and meet local overarching watershed requirements?

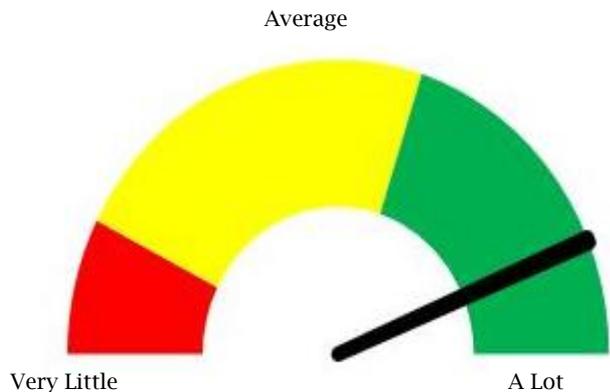


St. Croix Workshop on-the-water. NEMO Program. July 2014.
Photo credit to the University of Minnesota Extension, St. Croix River
Association, and the East Metro Water Resource Education Program.

2015



Introduction to the water quality , land use, and health of the St. Croix River



Back to the science

New local leaders

Knowledge gains in four areas





2016

Our St. Croix – Preserving a Natural, Recreational, and Economic Amenity



- INTEGRATION
- Stormwater ordinances (MIDS) throughout zoning processes

“ I will make sure MIDS (MN Minimal Impact Design Standards for stormwater) are incorporated when redevelopment occurs and try to make sure more BMPs are incorporated into street reconstruction.”

69% WOW would assist them in their roles

77% increased skills to implement stormwater ordinances



9
Cities

“Program will help me to ask better questions to get more complete answers.”

WOW !– the take home

- 1. Innovative in approach** - *for education and for civic engagement*
- 2. Result in significant increases in knowledge and skills**
- 3. Policy actors and community leaders take action**
- 4. Be specific with goals and objectives**
- 5. Continual and repeated engagement**



- Wisconsin DNR
- University of Wisconsin Extension
- Minnesota Board of Water and Soil Resources
- Minnesota Clean Water Legacy Amendment
- Carnelian-Marine St. Croix WSD
- South Washington WSD
- St. Croix Basin Team
- Washington & Chisago Counties

NEMO Workshops on-the-water

Inspiring elected and appointed community leaders to take action

Information on the WOW programs, visit the UMN Extension – NEMO website
www.northlandnemo.org/resources

Presented by

John Bilotta

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Minnesota Water
Resources Conference

October 2016



So what?

Knowledge gains; Behavior changes

Workshop evaluations demonstrate that **participating community leaders have grown steadily more knowledgeable about**

- ✓ water quality issues affecting the St. Croix River,
- ✓ connections between land use and water quality,
- ✓ stormwater BMPs, and
- ✓ the role local communities play in protecting water resources through planning, policies, ordinances and zoning.

St. Croix Workshop on-the-water. NEMO Program. July 2014.
Photo credit to the University of Minnesota Extension, St. Croix River
Association, and the East Metro Water Resource Education Program.



Behavior changes; Impacts to the River

“ I will make sure MIDS (MN Minimal Impact Design Standards for stormwater) are incorporated when redevelopment occurs and try to make sure more BMPs are incorporated into street reconstruction.”

- ✓ Nine communities have adopted (or shortly will) MIDS –
Revised stormwater policies for their cities

- 69% of respondents indicated this years St. Croix WOW would assist them in their roles in making land use and water management decisions.
- 77% of the respondents indicated the St. Croix WOW increased their skills to implement stormwater ordinances within their community.

Prior year workshop information

UMN Extension – NEMO website

www.northlandnemo.org/resources

MN DNR – search for Lower St. Croix River
Workshops

http://www.dnr.state.mn.us/waters/watermgmt_section/wild_scenic/wsrivers/workshops.html

2011

Challenges and Solutions – Your Role in Protecting the St. Croix

89% of the participants

- ☑ found good to great value in this workshop
- ☑ indicated a strong sense of knowledge and skill gain and
- ☑ found the educational approach very effective.

Participants said they would **take action** as a decision maker or leader.

43% of the local leaders in attendance also indicated they **had participated in a previous workshop** on-the-water for the St. Croix and as a result of participating, identified **actions they had taken.**

Conservation Leverage Points in Rural Minnesota: Learning from Citizens in the Watonwan River Watershed

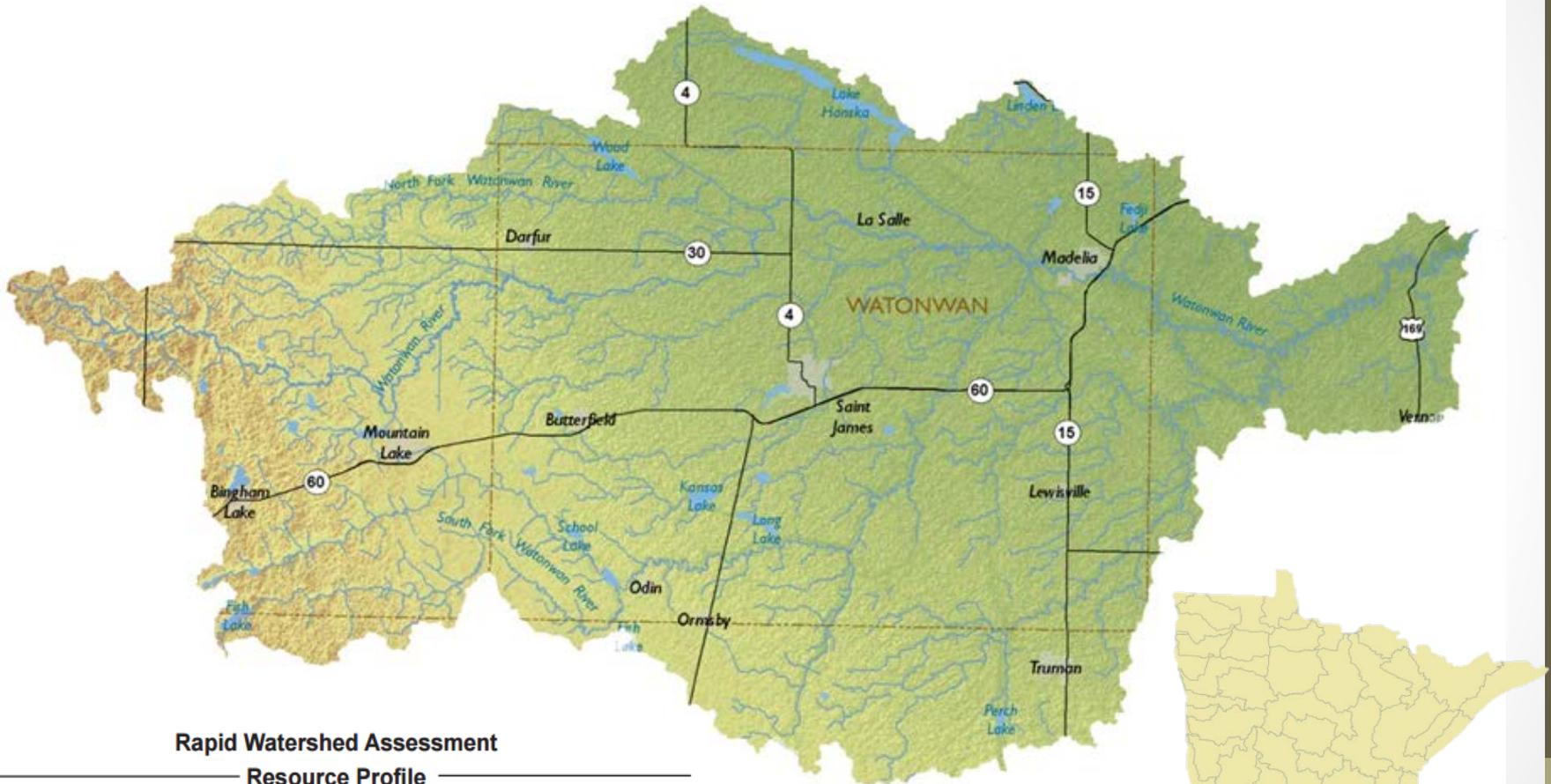
Dustin Anderson, GBERBA
Kim Musser, WRC, MSU-Mankato
Paul Davis, MPCA



Minnesota Pollution
Control Agency



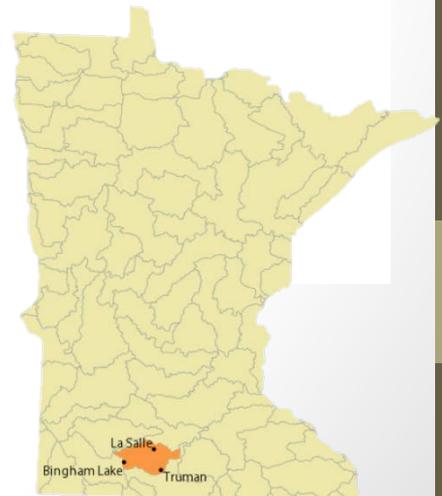
Watowwan River Watershed



Rapid Watershed Assessment Resource Profile

Watowwan (MN) HUC: 7020010

- 878 square miles
- 86% agriculture
- Pop. 27, 387
- 97% privately owned
- 1,206 Farms



Intensive Watershed Monitoring - 2013

10-year cycle:

- **Monitoring & Assessment**

- collecting data on water chemistry and biology.

- **Stressor ID**

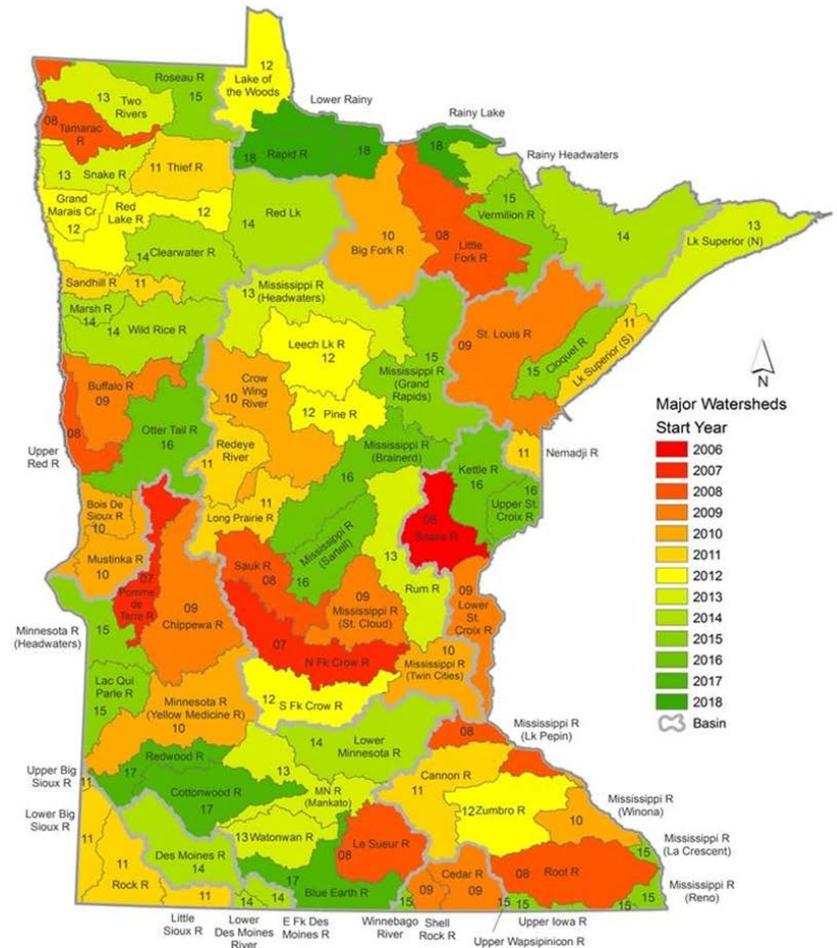
- ID conditions stressing water quality and which factors are fostering healthy waters.

- **Watershed Restoration & Protection Strategies (WRAPS)**

- develop strategies with local partners and citizens

- **Implementation**

- local partners implement projects to restore and protect waters

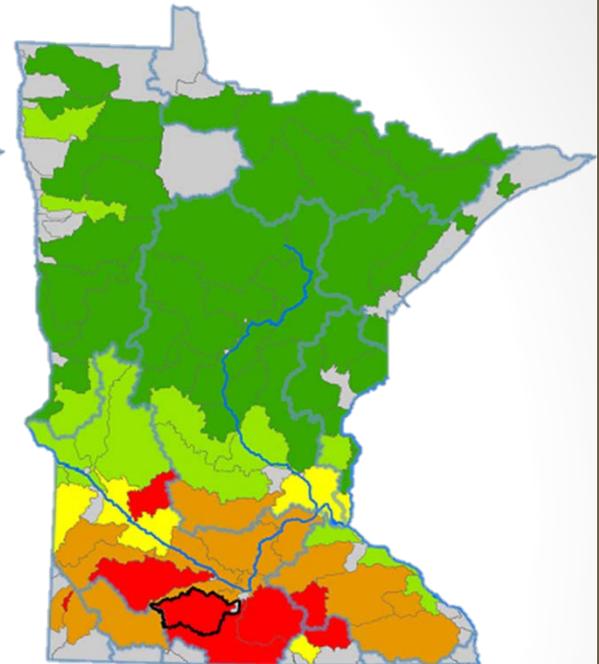
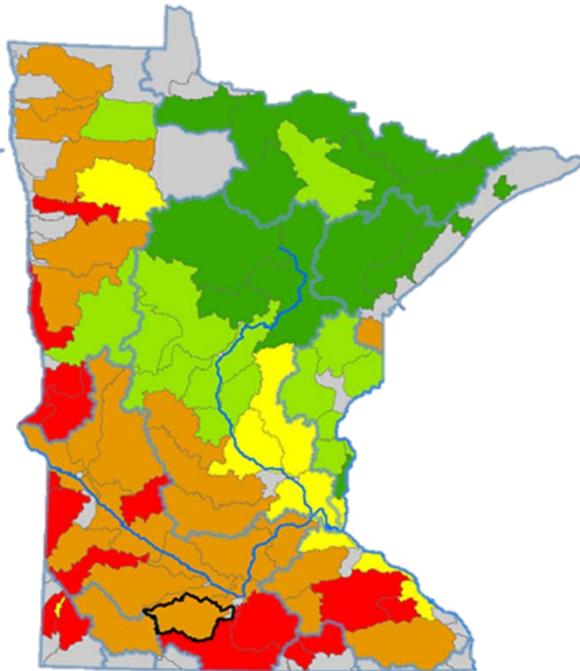
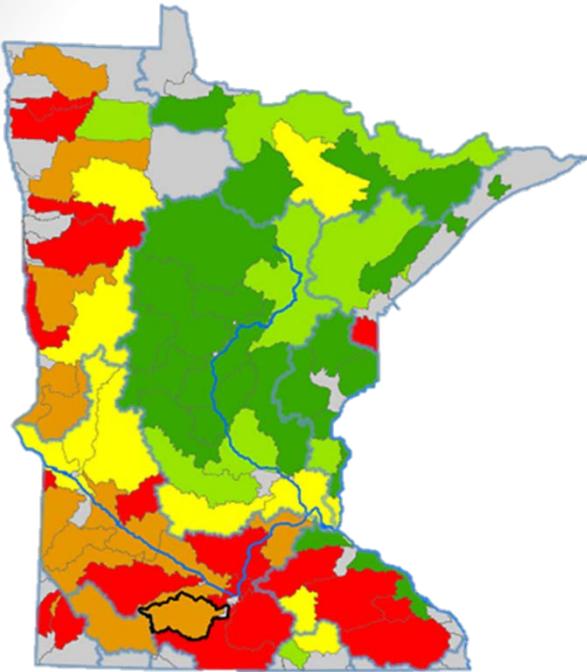


IWM Schedule

Sediment

Phosphorus

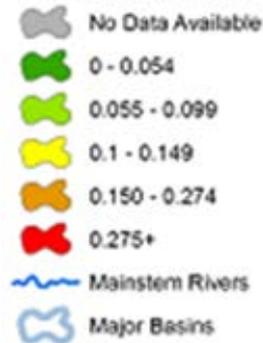
Nitrogen



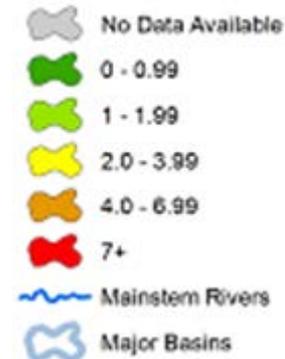
TSS FWMC (mg/L)



TP FWMC (mg/L)

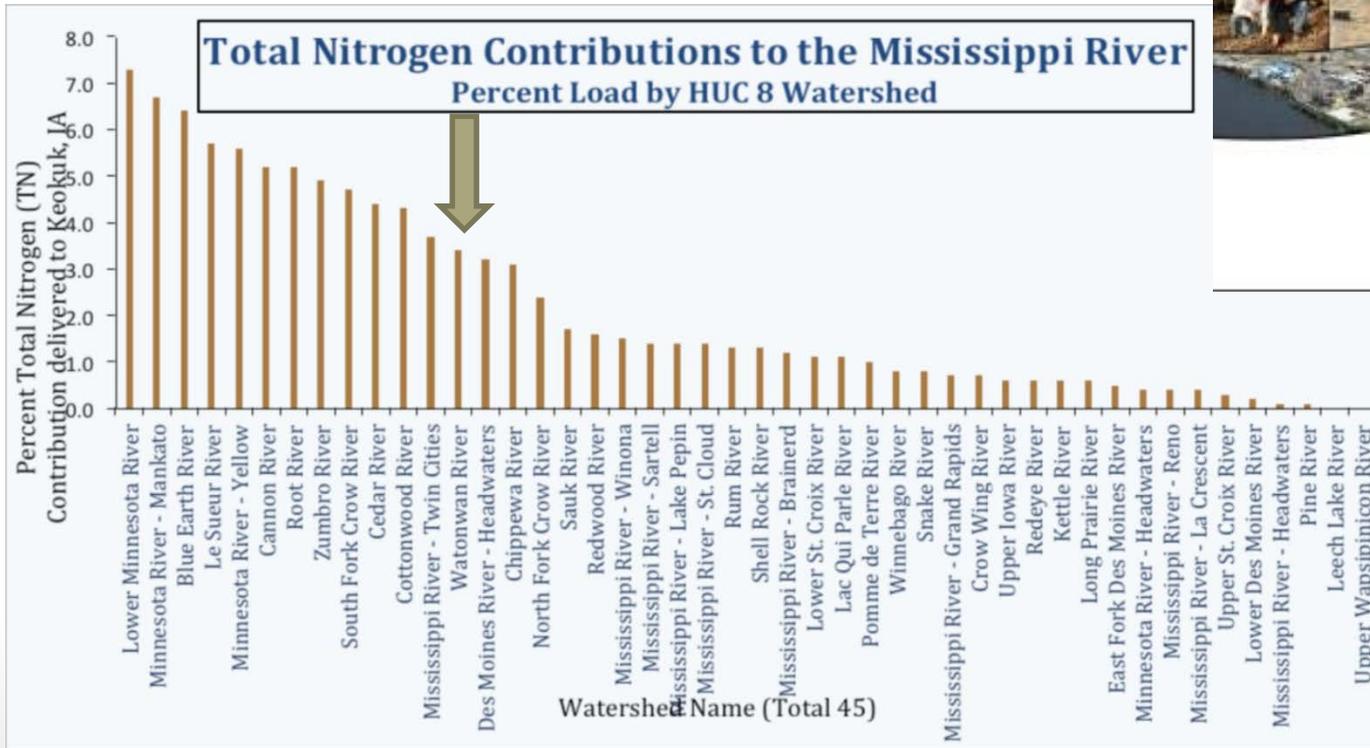
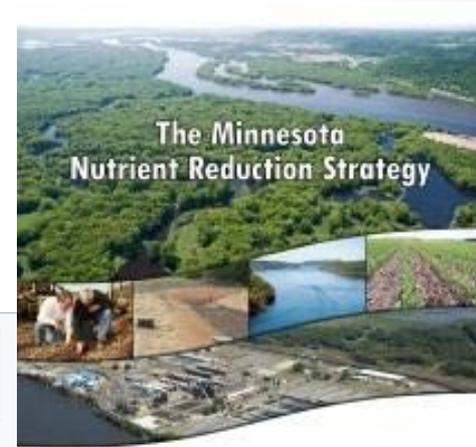


NO3+NO2 - N FWMC (mg/L)

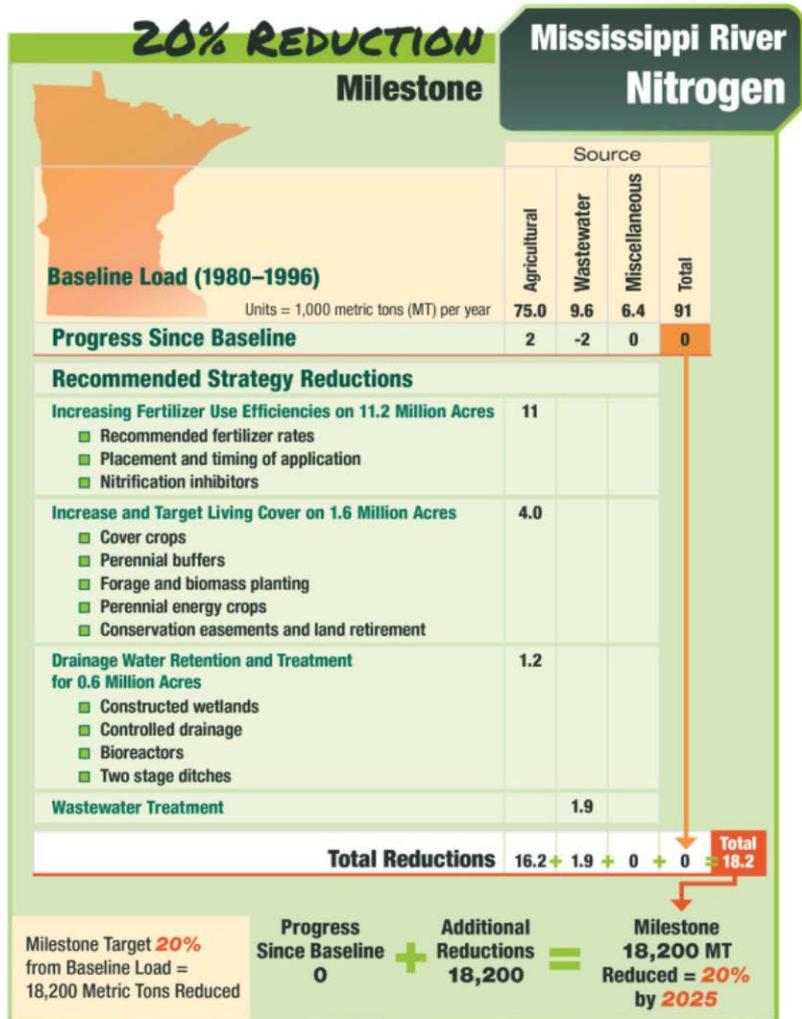


MN Nutrient Reduction Strategy

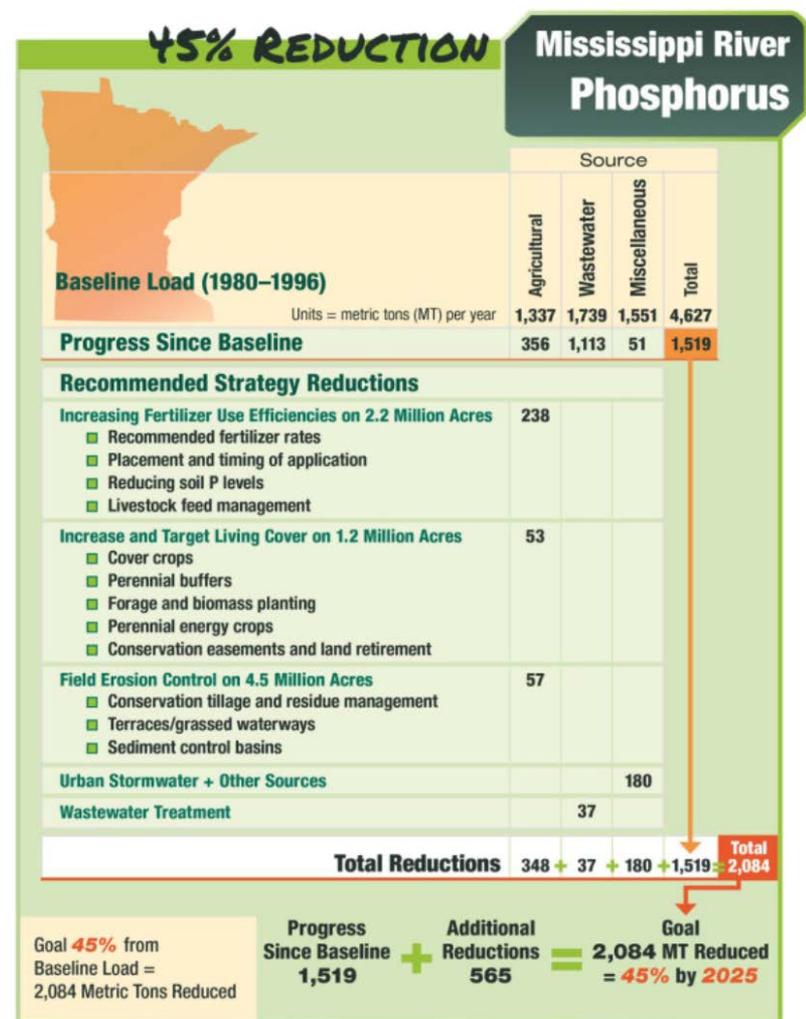
Watonwan River Watershed is a **high** priority for Phosphorus and Nitrogen



Nutrient Reduction Strategies



1,000 kg = 1 MT



1,000 kg = 1 MT

Methods

INTERVIEWS

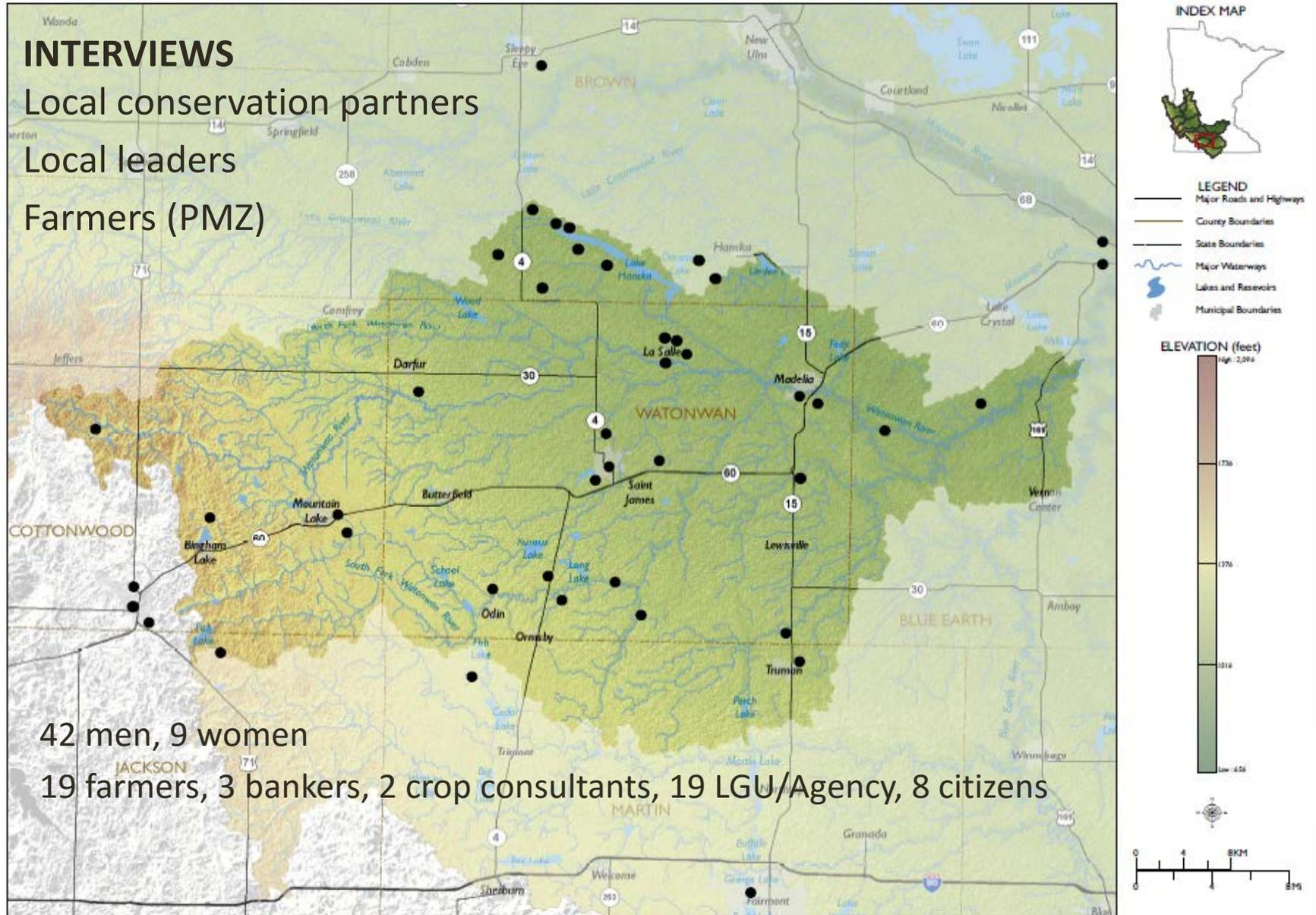
Local conservation partners

Local leaders

Farmers (PMZ)

42 men, 9 women

19 farmers, 3 bankers, 2 crop consultants, 19 LGU/Agency, 8 citizens



Water Resources



Concerns

- Streambank erosion – trees, rip rap, straightening
- Groundwater
- Surface runoff – after a hard rain

“I’m probably more concerned about [groundwater] than anything; more than even the lakes because what are we going to do if we can’t drink that?” (4885)

Importance

- Drainage
- Recreation

“We have to make a living. I think that’s more important than some of these other things.” (8124)



Shallow lake near Butterfield, MN

Crop Consultant Rent Machinery Labor Insurance Fertilizer Seed Chemical Technology



Yield

Making a living

2nd job
Taxes
Health care

Cash flow

Operating Loan

Profitability



"Many years the bank decided whether you were gonna go again or not."(8617)

Fewer, larger farms

Increased competition

Absentee farmers

Churches
Aging

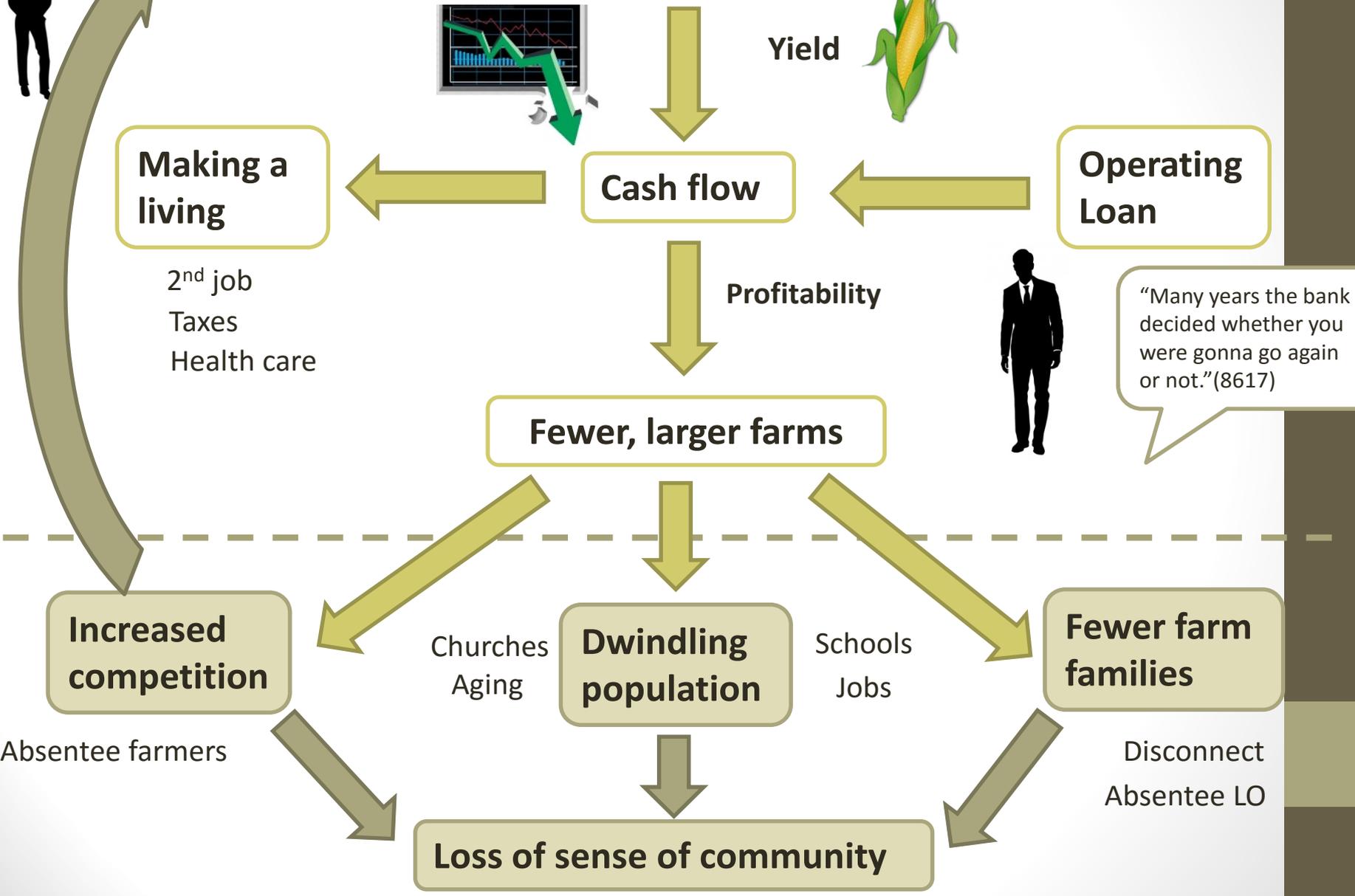
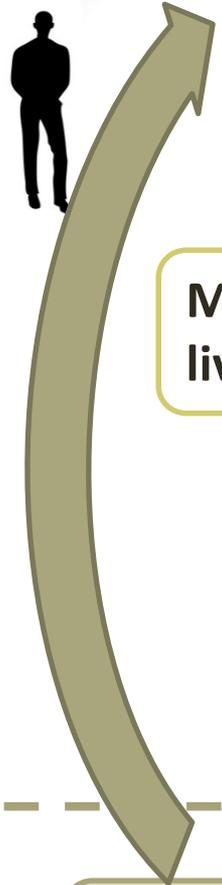
Dwindling population

Schools
Jobs

Fewer farm families

Disconnect
Absentee LO

Loss of sense of community



Conservation Practices

Yard stick

- ✓ Practical
- ✓ Cost-effective
- ✓ Long Lasting
- ✓ Guaranteed
- ✓ Flexible
- ✓ Convenient
- ✓ Maintain Yield

General Barriers

- Risk
- Time
- Age
- Priorities
- Cost
- Red-tape
- Climate
- Temperament

56.6 = Average age
of Minnesota Farmer

Mn.gov

“The conservation practices have to **not** be a yield drag or it can’t cost you a lot of money because the margins are such that you need to be making money and you need to be paying back your operating loans.” (2862)

“I like to try new things, but they have to make me money.” (3844)

“You never can expect most farmers to take a lot less to conserve the land.” (1557)

Conservation Tillage

- Leave residue, don't till the hills, don't get too smooth.
- Watonwan Watershed – 2007 Tillage Transect Survey
 - 38% Conservation Tillage
 - 32% Reduced Tillage
 - 24% Conventional Tillage

“I think they've really gone to almost no till or conservation till. I don't see a big problem with farming itself anymore very often.” (1557)



Photo Source: John Deere

No-Tillage

- Expensive
- Need to incorporate fertilizer
- Too far north
- Partner isn't interested
- Age
- Crop rotation – Corn on Corn
 - Easier to grow
 - < Income potential
 - Advanced genetics
 - More fun
 - Easier to control weeds
 - Builds OM
 - More time with family



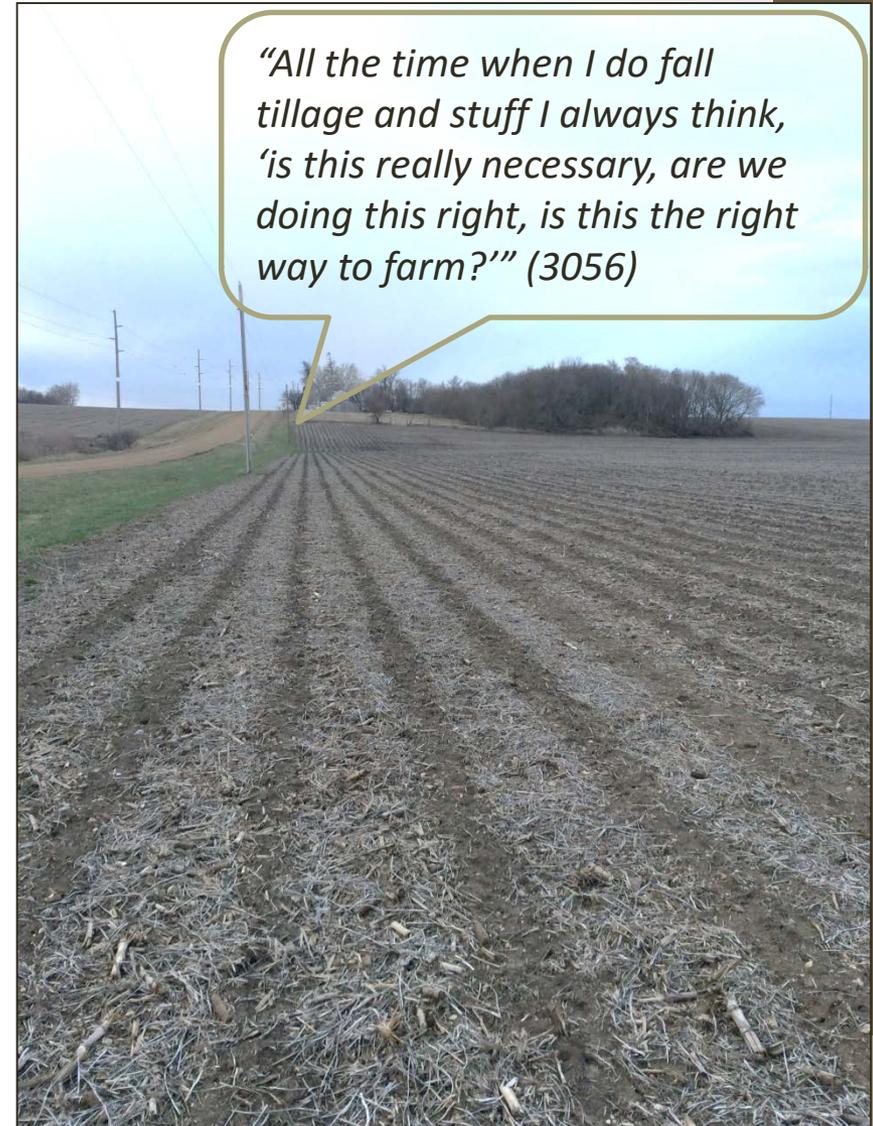
Seeding soybeans into corn stalks in the headwaters of the Watonwan

"We have to do fall tillage otherwise you wouldn't get in there in the spring; the ground is that sticky. It's just one of those things that you have to do." (2767)

"The younger people are doing more of that than the old timers. They just couldn't get the moldboard out of their head, it has to be turned over." (4885).

Strip-Tillage

- Good compromise to no-till
 - Prevent erosion
 - Could work for cont. corn rotation
 - Warm up the soil
 - Incorporate N-P-K
- Barriers
 - Equipment, \$\$\$
 - Don't have the right land
 - Still need some tillage to alleviate compaction



Prepared strips in Cottonwood County

Cover Crops

- Lack of information
 - **When to plant?**
 - What to plan?
 - How much does it cost?
 - Growing season is too short?
 - What are the benefits?
- Risk
 - What if it prevents me from harvesting my cash crop?
 - What if it doesn't grow?



Cereal Rye in standing corn in headwaters of the Watonwan

“Every story you see or read about seems to be beneficial but you need to make it work to your particular farm, the way you’re farming the dates you can get it planted to make it work. . . I always thought there was a plus side to it as far as yields go.” (3844)

Nutrient Management

- Great strides!
 - Soil testing, precision application, N-stabilizers

"I think it's something that we need to look at to justify our farming, that we're trying to be more efficient and trying to use our natural resources in a way that we should be." (2862)

"With most growers it gets brought up and they think that [the BMP rate] is awful low." (4762)

- Risk
- Split Application
 - Equipment
 - Availability of Coop in Spring
 - Added labor

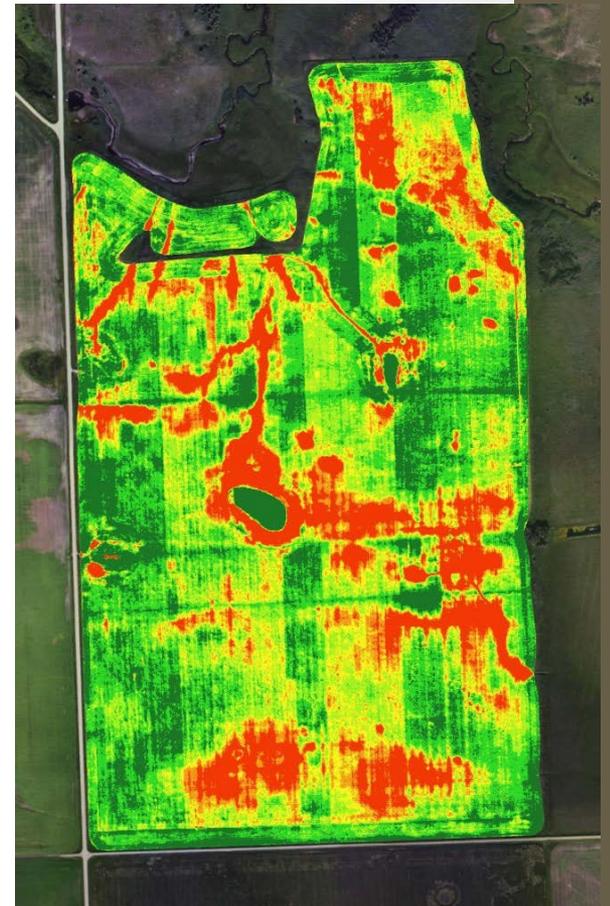


Photo Source: Argen Tech Solutions

Easement Barriers

- Inflexibility
- Management difficulties
- Make more money
 - Renting/farming it
 - Putting an irrigator on it
 - Tiling it



Photo source: Scott Seigfreid



Prairie burn near Comfrey, MN

“Some guys have a thing about taking land out of production, even if it’s marginal or don’t want to deal with a government payment.” (4762)

Tile

- Yield advantage
- Water Storage – Sponge effect
- Filters water through the soil

“The creeks and ditches that go in, that’s our livelihood, you’ve got to do the tiling and you’ve got to have a good farm in order to make it work.” (1557)

“People say you don’t need all these tile lines and stuff, well it’s a proven fact, we have yield maps saying drainage is a big issue and I think people say that you can’t be draining all this stuff. And yeah, that’s probably true from their standpoint, but from our standpoint, if it’s helping your bottom line you have to look at it.” (2862)

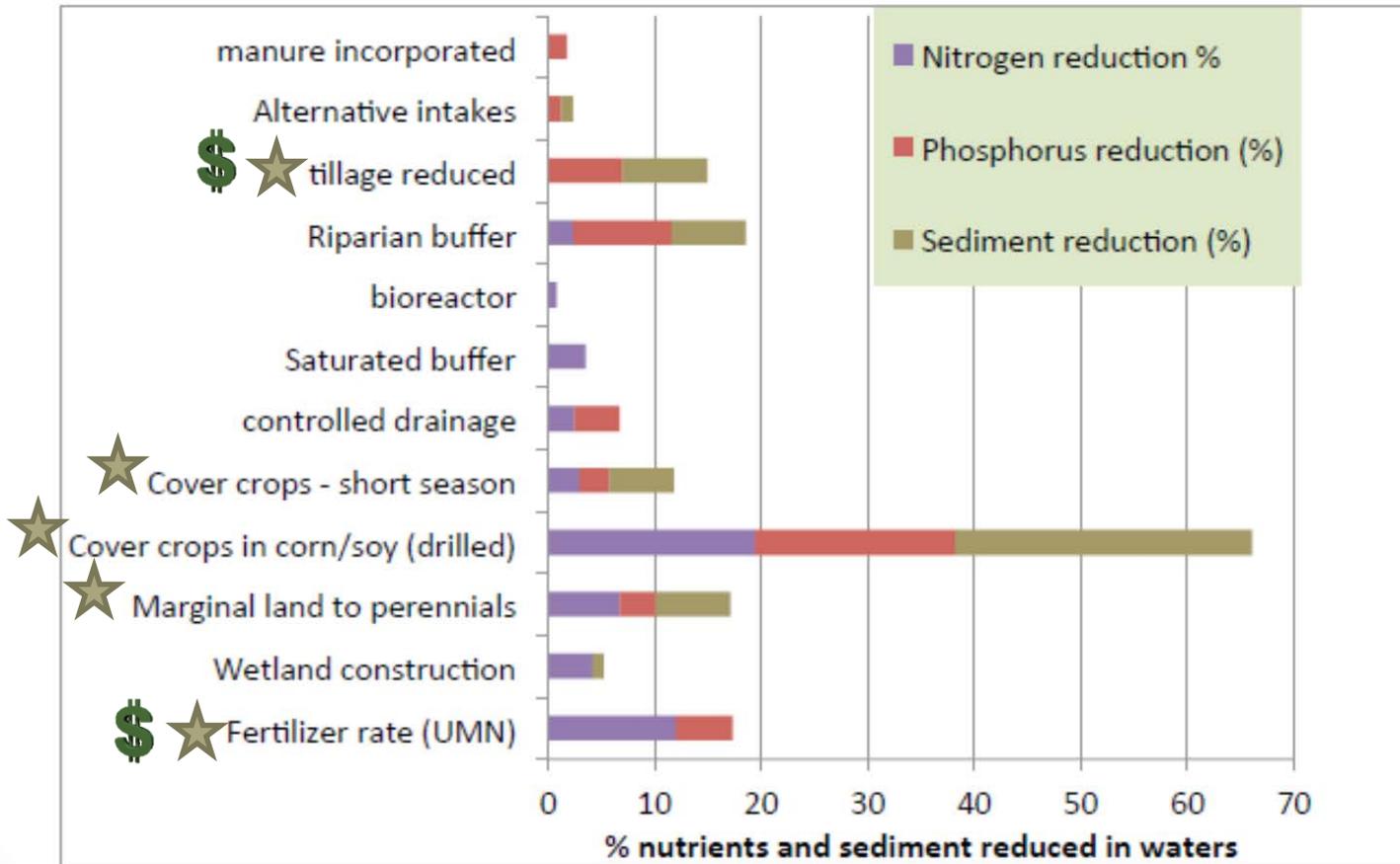


Harvest in Blue Earth County

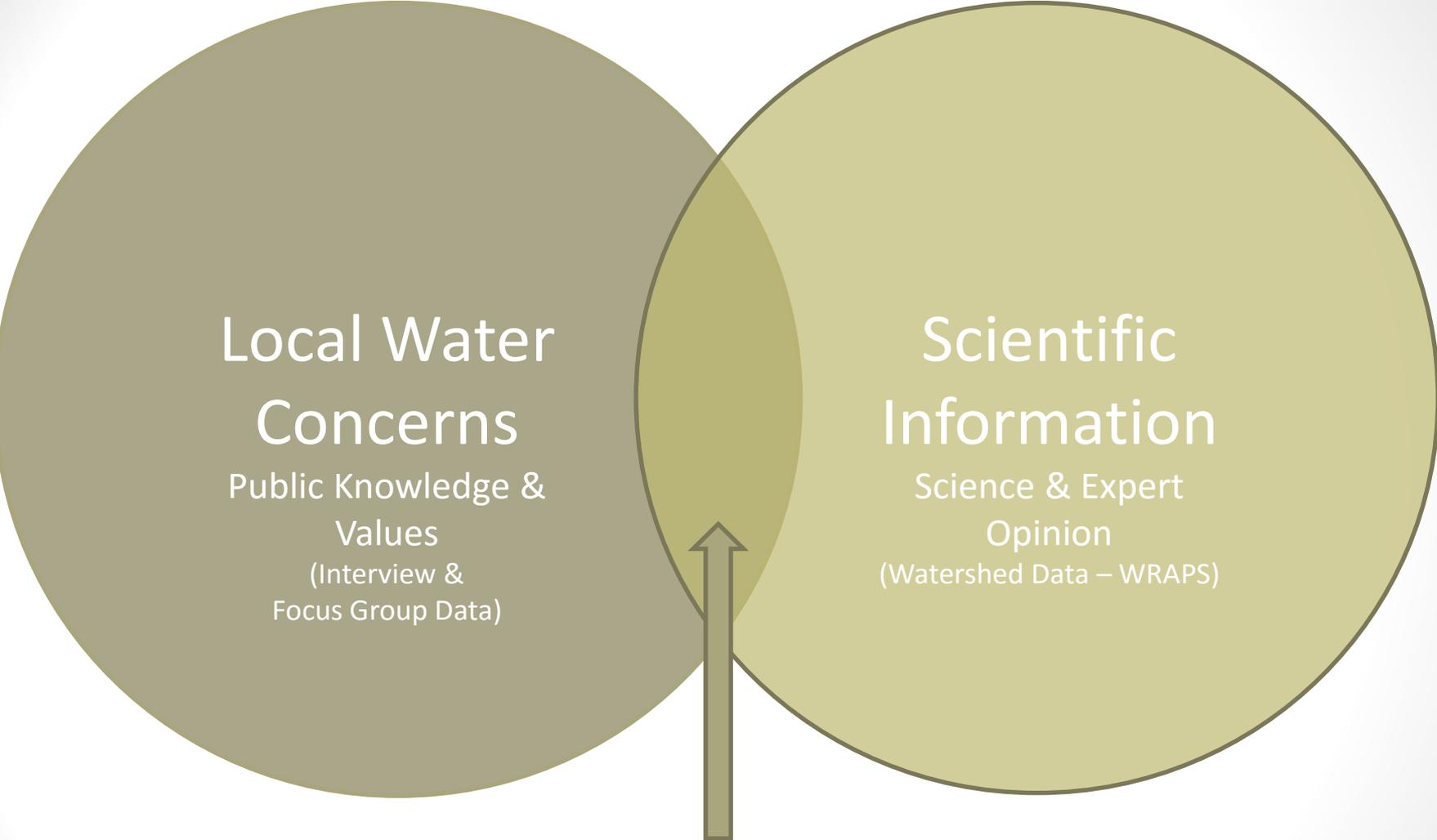


Cost : Pollution Prevention

Combined benefits Nitrogen + Phosphorus + Sediment



Source: Mn Nutrient Reduction Strategy Pilot Project: Le Sueur River Watershed & Freeborn Lake Subwatershed



The diagram consists of two overlapping circles. The left circle is a dark olive green and contains the text 'Local Water Concerns' and 'Public Knowledge & Values (Interview & Focus Group Data)'. The right circle is a lighter olive green and contains the text 'Scientific Information' and 'Science & Expert Opinion (Watershed Data – WRAPS)'. The overlapping area is a darker shade of green. An arrow points from the text 'Leverage Points for change' below to the intersection of the two circles.

Local Water Concerns

Public Knowledge &
Values
(Interview &
Focus Group Data)

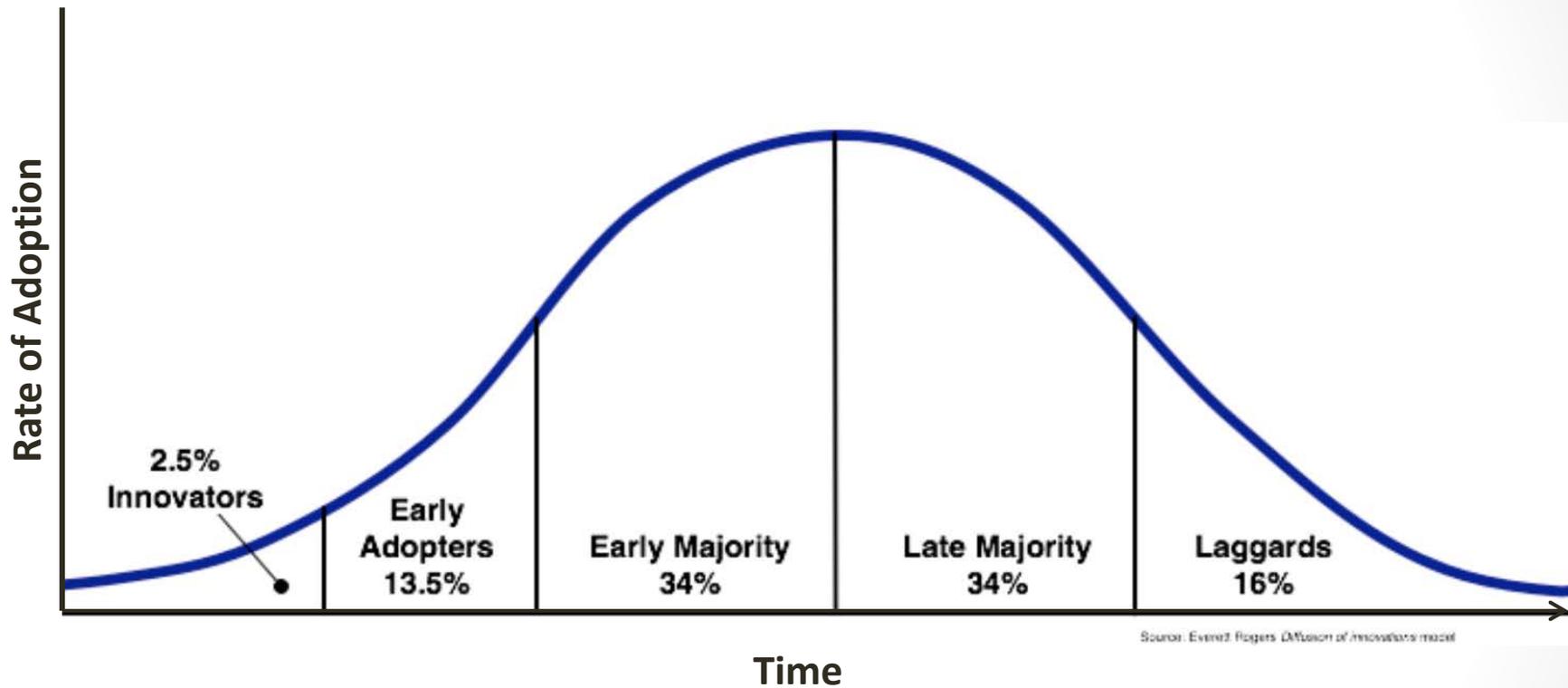
Scientific Information

Science & Expert
Opinion
(Watershed Data – WRAPS)

Leverage Points for change

3-6 key interacting system components often explain the key sticking points or opportunities for change in a system

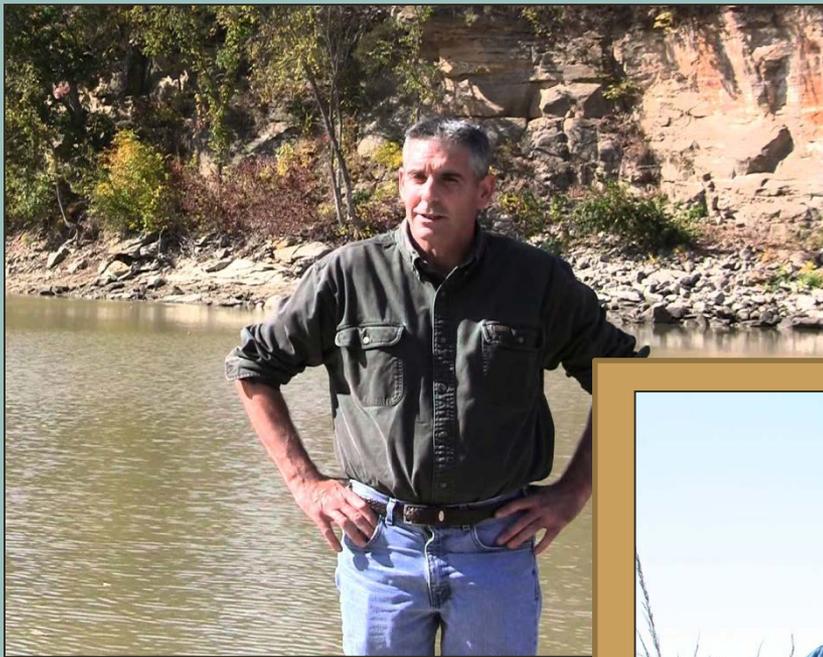
Diffusion of Innovations by Everett Rogers



Key finding: adoption is based primarily on subjective values and social norms diffused through interpersonal networks

Community Capacity Strategic Planning





People

Citizens – Advice for Engagement

- Consider how water connects to our lives
- Show us local examples of change, what is happening in our rivers and lakes
- Tell us what the problems are in simple language, we are busy, distil it down
- Help us try and solve a problem we have on our land, in our communities
- Help us try to navigate through all the water-related groups – who does what??
- Tell us what to do to make a difference, what does the research show?

Building Community Capacity

- Engage the public in new ways
- Support active citizenship
- When people begin to see their part in creating policy, they no longer see themselves as powerless
- Civic engagement seeks to build community capacity to self-govern that is sustainable



Photo source (2): Scott Seigfreid



STATE OF THE RIVER REPORT 2016

Water quality and river health
in the metro Mississippi River





Report goals

- Clear and easy to understand
- Increase public awareness
- Build public support around priorities for action
- Audience: Minnesotans who want to know more about the Mississippi River



Acknowledgements

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- Paul Hoff - MPCA
- Kent Johnson - MCES
- Byron Karns - NPS
- Rebecca Key - NPS
- Sue Magdalene - SCWRS
- Patricia McCann - MDH
- Bruce Monson – MPCA
- Phil Monson – MPCA
- Rachel Olmanson - MPCA
- Barb Peichel - MPCA
- Bill Route - NPS
- Shawn Schottler – SCWRS
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- Bill VanRyswyk - MDA
- David Wall – MPCA
- Hong Wang - MCES
- Dennis Wasley – MPCA
- Steven Weiss - MPCA





Report indicators

RIVER FLOW

Flow & hydrology

SWIMMING & RECREATION

Bacteria

Phosphorus

RIVER LIFE

Fish consumption

Fish survey

Invasive Asian carp

Bald eagles

Mussels

ECOLOGICAL HEALTH

Sediment

Nitrate

Chloride

Pesticides

Microplastics

OTHER RIVER CONTAMINANTS

Additional contaminants of concern



River flow has changed, affecting overall river health.

- Flows have increased by 24% over the last 70 years.
- Changes in flow are linked to land use, drainage and climate.

12 FLOW

Flow and hydrology

River flow has changed, affecting overall river health.

Metro river flows have increased by 24% over the last 70 years.

Recent changes in flow are linked to land use, drainage and climate.

Description and impacts. The timing, amount and intensity of rain and snow can impact river flow, which naturally varies seasonally and from year to year. High and low flows can have positive and negative effects on river health.

- High flows can cause increased erosion, degrade habitat and carry more pollutants into the river system. However, higher flows can also restore natural floodplains and dilute concentrations of some key pollutants.
- Low flows tend to deliver less pollution to the river and can stimulate growth of healthy aquatic vegetation. However, low flows also amplify the effect of sources like wastewater treatment plants. For example, during the lowest flow periods, up to 15% of metro Mississippi River flow consists of treated wastewater released from the Metro Wastewater Treatment Plant.^{1,2}

Sources. Under natural conditions, the "water cycle" is dominated by evapotranspiration (Figure 1, panel 1).^{3,4} Human activities and changes in land cover can alter the natural water cycle by changing how water leaves the landscape. In cities and towns, hard surfaces such as roads, rooftops and driveways contribute runoff that can increase flows in nearby water bodies (Figure 1, panel 2).⁵ In agricultural areas, row crops and artificially drained fields result in increased runoff, which typically leads to higher flows downstream (Figure 1, panel 3).⁶ These seemingly small changes in runoff, spread over a large landscape, have significant impacts on river flow and hydrology.

Figure 1. Water and the landscape

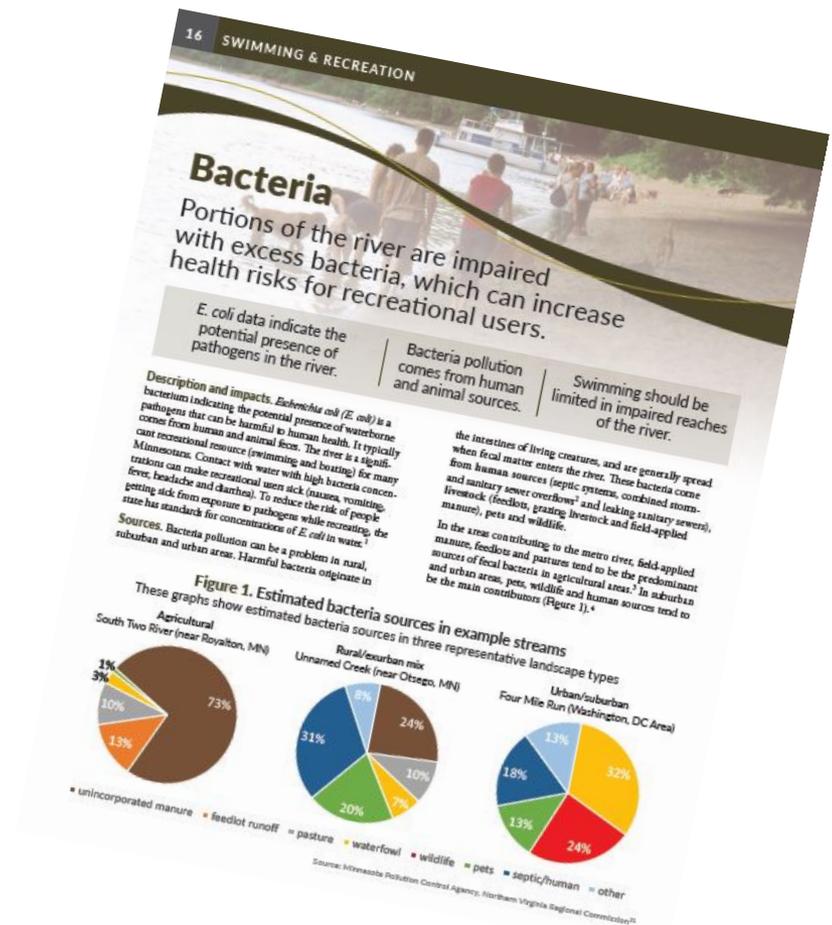
Panel 1: natural landscape
100% runoff and flow reduction

Panel 2: urban/suburban development (35-50% impervious)
10% runoff and flow reduction

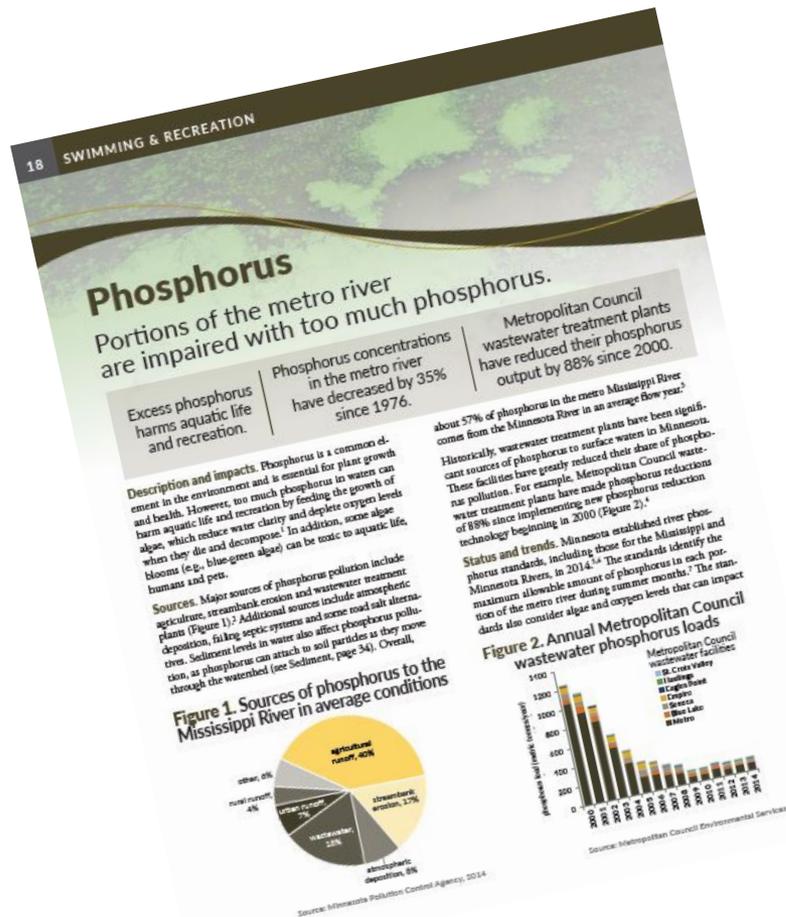
Panel 3: farm with artificial drainage
10% runoff and flow reduction

Portions of the metro river are impaired with excess bacteria.

- *E. coli* indicates potential presence of pathogens.
- Human and animal sources.
- Limit swimming in impaired reaches.



Portions of the metro river are impaired with too much phosphorus.



- Harms aquatic life and recreation.
- Concentrations have decreased by 35% since 1976.
- Wastewater treatment plants have reduced their output by 88% since 2000.

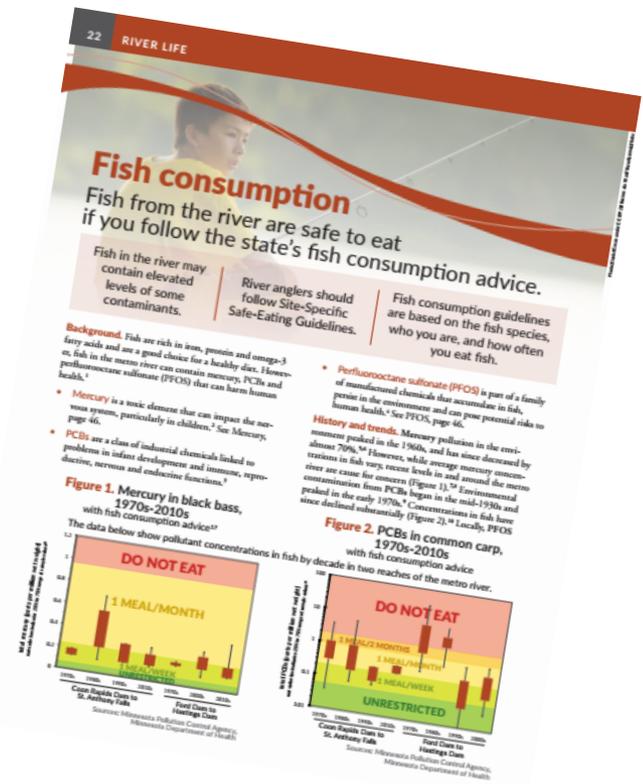
The metro river is a world-class fishery.



- Vastly improved fishery
 - Trophy walleye
 - World class smallmouth
- Catch-and-release regulations in place
- Need more data on species mix and trends

Fish from the river are safe to eat if you follow state fish consumption advice.

- River fish may contain elevated levels of some contaminants.
- Follow site-specific consumption advice.
- Consumption guidelines based on:
 - Location + species + who you are
 - Exclude catch-and-release species



Invasive Asian carp continue moving into the metro river.

- Asian carp are an invasive fish.
- At least 19 have been caught in Lake Pepin and the metro river since 2011.
- Changes in lock management have been made.



The metro river is home to a resilient population of bald eagles.

28 RIVER LIFE



Bald eagles

The metro river is home to a resilient population of bald eagles.

Eagles along the river have made a dramatic comeback from near-extinction.

Lead levels in nestlings are higher in the metro river corridor than elsewhere in the region.

Levels of several contaminants are declining, but remain cause for concern.

Background. In 1963, only 417 bald eagle pairs nested in the lower 48 states. Today, nearly 10,000 pairs live in the lower 48 states, including over 1,300 in Minnesota.¹ This extraordinary recovery is linked to protections offered by the Bald Eagle Protection Act (1940),² the Clean Water Act (1972),³ a national ban on DDT (1972),⁴ and the Endangered Species Act (1973).⁵

Eagles feed primarily on aquatic prey and are susceptible to contaminants present in fish and other wildlife. Young bald eagles ("nestlings") are particularly vulnerable to these contaminants, and can help us understand overall ecosystem health.

Population status. Currently, the metro river is home to approximately 55 active nesting sites. This is approximately a 35% increase since 2011, indicating a strong and stable bald eagle population. Research is tracking this productive eagle population, which averages about one and a half nestlings per nest, well over the threshold for a healthy population (Figure 1).⁶ Though the reproductive rate has varied over the years, it remains high relative to other areas mentioned by the National Park Service.

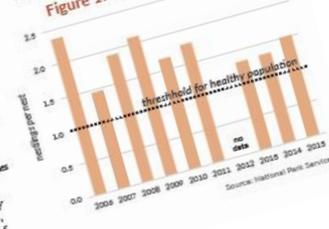
Nesting health status. From 2006 through 2015, the National Park Service visited nests annually to take samples to measure levels of targeted contaminants, including:

- **PFCS:** Perfluorinated chemicals (PFCS) are a family of man-made chemicals widely used in stain-, grease-, and water-resistant products. High levels of PFCS in humans are associated with obesity, diabetes

and early menopause in women. PFCS, including PFOS (see PFOS, page 46), also contribute to fish consumption advisories in the metro river (see Fish Consumption, page 22). Overall concentrations of PFCS declined in nestlings between 2006 and 2014. However, compared to upriver nestlings, PFCS levels were nearly twice as high in the lower portion of the metro river, including record levels in a nestling near Hastings (Figure 2).⁷

- **Lead.** Lead is a neurotoxin with potentially harmful impacts to eagle nestlings and other wildlife. It is introduced into the environment via industrial uses, fishing tackle,

Figure 1. Nestlings per nest



Year	Nestlings per nest
2006	2.4
2007	1.7
2008	2.4
2009	2.2
2010	2.3
2011	2.1
2012	2.2
2013	2.2
2014	2.3
2015	2.3

Source: National Park Service

- Eagles have made a dramatic comeback.
- Higher nestling lead levels.
- Levels of other contaminants are declining, yet cause for concern.

Some native mussel populations are gradually being re-established.

RIVER LIFE 31

Mussels

Some native mussels are gradually being reestablished in the metro river.

The presence of mussels is a good biological indicator of river health.

River pollution eliminated mussels from much of the metro river in the early 1900s.

Mussel habitat is degraded below the confluence with the Minnesota River.

About mussels. Native mussels perform important functions in water bodies, and their presence is a good biological indicator of overall river health. Minnesota's native mussels filter solid material like plant debris, bacteria and runoff from the water, and excrete nutrients used by plants and other animals.¹

Health and lifecycle. Mussels spend their lives partially or fully buried in mud, sand or gravel in lakes, rivers and streams. They require a stable surface, dissolved oxygen, and a food supply of organic matter to filter from the water passing over them. Mussels reproduce by releasing larvae that attach to a host animal, usually fish (Figure 1). Once attached to their host, the larvae metamorphose into adults, leave the host, and take up life in the river bottom.²

Status. Because they can't swim away, mussels are directly impacted by river contaminants. The discharge of untreated waste to the river through the early 1900s eliminated the mussel population downstream of St. Anthony Falls. Since then, mussels have responded favorably to improved sewage treatment, the separation of storm sewers from sanitary sewers, and other water quality improvements.³ Mussel habitat downstream of the confluence with the Minnesota River is degraded, most likely due to high loads of sediment and other pollutants. However, some mussel species have returned and this lower reach of the river now supports 28 of the original 43 native mussel species.⁴ Upstream of

Figure 1. The lifecycle of a mussel

The diagram illustrates the lifecycle of a mussel. It starts with a fish host, which releases glochete larvae. These larvae attach to the gills of the fish host. The glochete larvae then develop into an adult mussel. The adult mussel releases juvenile mussels, which then settle on the river bottom.

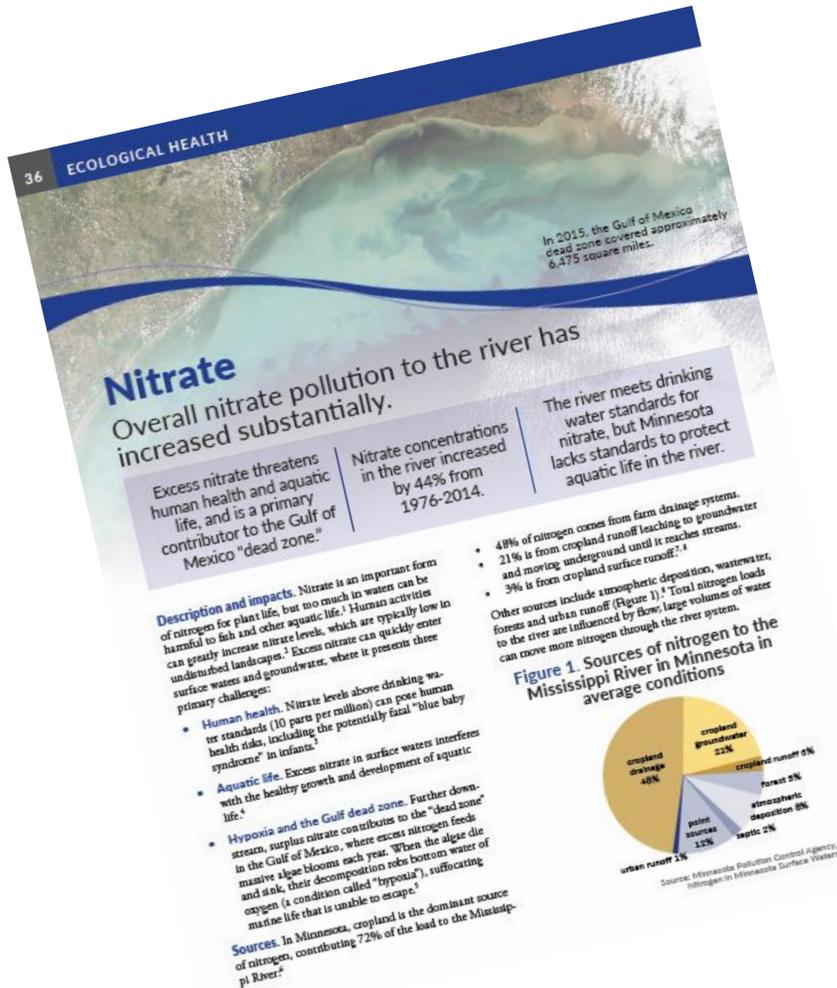
Source: Water Resources Center at Minnesota State University, Mankato

St. Anthony Falls, where lock construction added host fish passage and mussel migration, there are 18 native mussel species.⁷ Upstream of the Coon Rapids Dam, seven of nine historical native species are present.²

Management solutions. Reducing pollution is critical to improving mussel abundance in the river. Efforts to remove fish migration barriers like dams would also benefit mussel populations, but would need to be coordinated with efforts to control the spread of invasive Asian carp. In addition, ongoing efforts to reintroduce native mussels into the metro river will be important to their continued recovery.

- Indicator of river health.
- Mussel habitat degraded below Minnesota River confluence.
- Species diversity + abundance have not fully recovered to historic levels.

Overall nitrate pollution to the river has increased substantially.



- Human health, aquatic life “dead zone” impacts.
- 1976-2014: Concentrations increased by 44%.
- Minnesota lacks standards to protect aquatic life.

The lower portion of the metro river is impaired due to excess sediment.

- Excess sediment can harm aquatic wildlife + habitat.
- 76% comes from the Minnesota River basin.
- Lake Pepin filling in at 9 times its natural rate.



The river meets standards for chloride, but levels are increasing in the metro area.

- Primarily from road deicing salt, water softeners.
- 1 teaspoon of salt permanently pollutes 5 gallons of water.
- 39 local water bodies impaired.



The metro river meets standards for pesticides.

40 ECOLOGICAL HEALTH



Pesticides

The metro river meets standards for pesticides.

Pesticides are used to control unwanted insects, weeds and other pests. At elevated levels, pesticides can harm aquatic life and beneficial pollinators. Herbicides 2,4-D, acetochlor, atrazine and metolachlor are frequently detected at levels well below state standards.

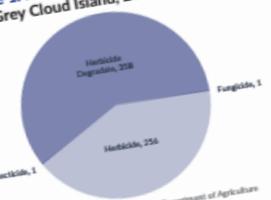
Description and Impacts. Pesticides are used to control unwanted insects, plants, rodents, fungi, mold or bacteria. Pesticides are applied in both agricultural and urban areas. Pesticides can move into waterbodies through runoff, groundwater discharge and wind. Pesticide detections in waterbodies are dependent on pesticide use, river flow and season.¹

The Minnesota Department of Agriculture (MDA) monitors for pesticides in surface waters. Statewide the MDA has identified these compounds as surface water pesticides: atrazine, acetochlor and atrazine (both herbicides) and chlorpyrifos (insecticide).²

Metolachlor is a widely used agricultural herbicide, and 2,4-D is a broadly used herbicide in both agricultural and developed areas. The MDA also monitors for six insecticide compounds. Neonicotinoids are a group of insecticides that are used widely on farms and in urban and suburban landscapes. Insects including bees and butterflies, as well as earthworms, can be harmed by neonicotinoids.³ Pollinators may become sick or die if they visit plants treated with neonicotinoids.⁴

- **Atrazine** was introduced in 1954 for weed control in corn production, and has possible links to prostate and other cancers in humans and to reproductive deformities in frogs.⁵ It has been found in groundwater and surface waters across Minnesota.⁶ Farm operators may not apply atrazine within 66 feet of waterbodies.⁷
- **Acetochlor** used primarily in corn and soybean production, was introduced in 1994, and is classified as a "probable human carcinogen."⁸ Farm operators are encouraged to not apply acetochlor within 66 feet of waterbodies.⁹
- **Chlorpyrifos** has been used since 1965 to control pests.¹⁰ It can be toxic to birds, fish and insects, including bees.¹¹ Farm operators may not apply chlorpyrifos within 25 feet (ground application) or 150 feet (aerial application) of water bodies.¹²

Figure 1. Pesticide detections by type at Grey Cloud Island, 2010-2015¹³



Pesticide Type	Number of Detections
Herbicides	228
Fungicides	1
Insecticides	1

Source: Minnesota Department of Agriculture

- Used to control unwanted insects, weeds, other pests.
- Can harm aquatic life and beneficial pollinators.
- Several herbicides frequently detected (at levels well below state standards).

Fibers are the most common microplastic in the metro river.

- Tiny pieces of plastic, abundant in the environment.
- Potential risks to wildlife and human health.
- Research is underway to better understand their presence.



Additional contaminants of concern may negatively impact the health of the metro river.

- **Pharmaceuticals** repeatedly detected in rivers and streams.
- **Mercury** and **PFOS** contribute to fish consumption advisories.
- **Triclosan-derived dioxins** up 200-300% in Lake Pepin sediment.



Summary and conclusions



Summary and conclusions

THE GOOD NEWS

Mussels



Bald eagles



Fish



Summary and conclusions

THE GOOD NEWS (FOR NOW)

Pesticides



Chloride



Summary and conclusions

CAUSE FOR CONCERN

- **Sediment**
- **Bacteria**
- **Phosphorus**
- **Fish consumption**



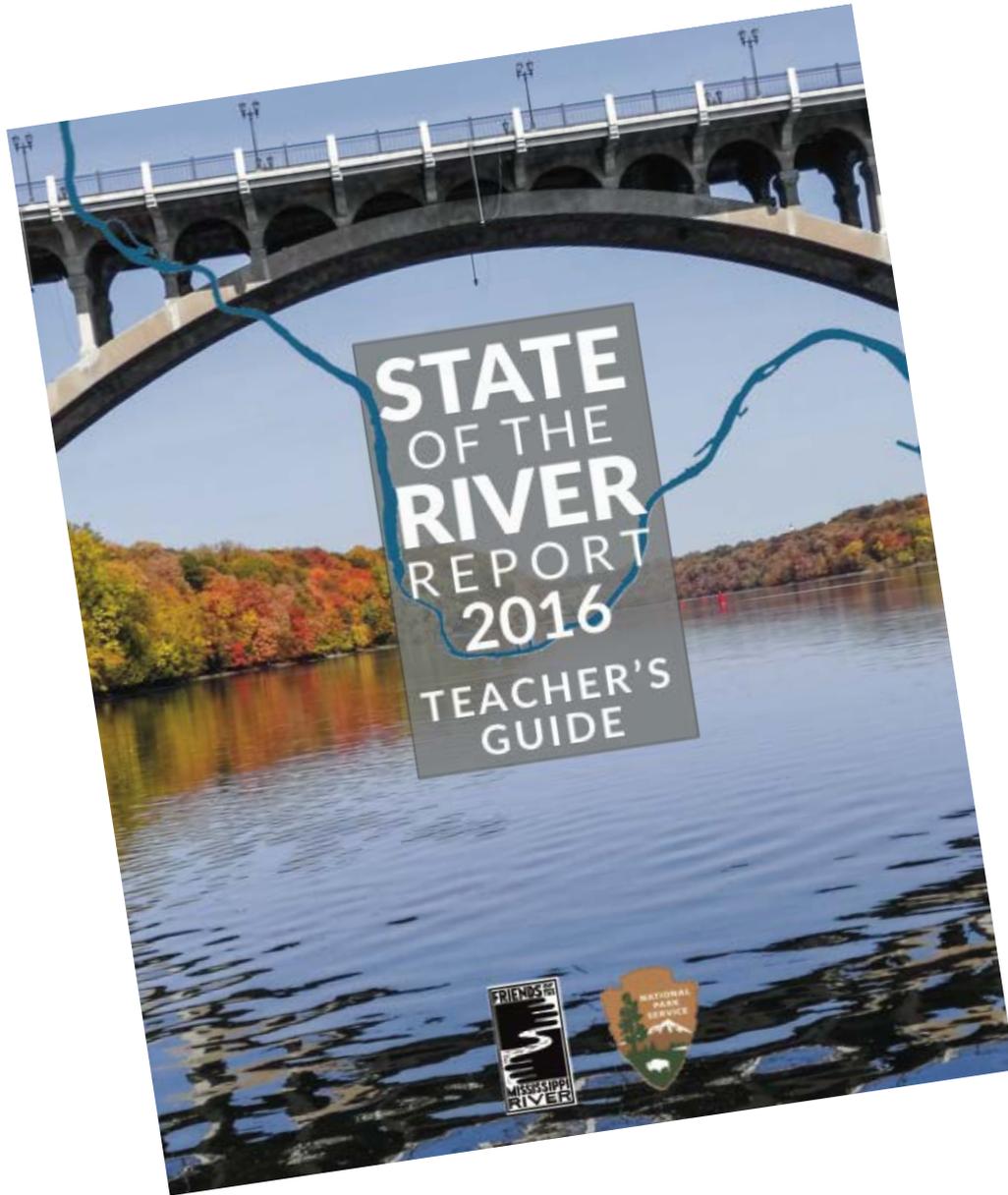
Summary and conclusions

CAUSE FOR ALARM



- River flow (up 24%)
- Nitrate (up 44%)
- Invasive Asian carp
- Emerging contaminants

Stewardship Guide & Teacher's Guide



FMR's Policy Guide

FMR's Policy Guide

Top 10 actions that federal, state,
and local leaders can take
for the river





STATE OF THE RIVER REPORT 2016

Water quality and river health
in the metro Mississippi River



The Easement Experience

Mike Lynn
Dakota County

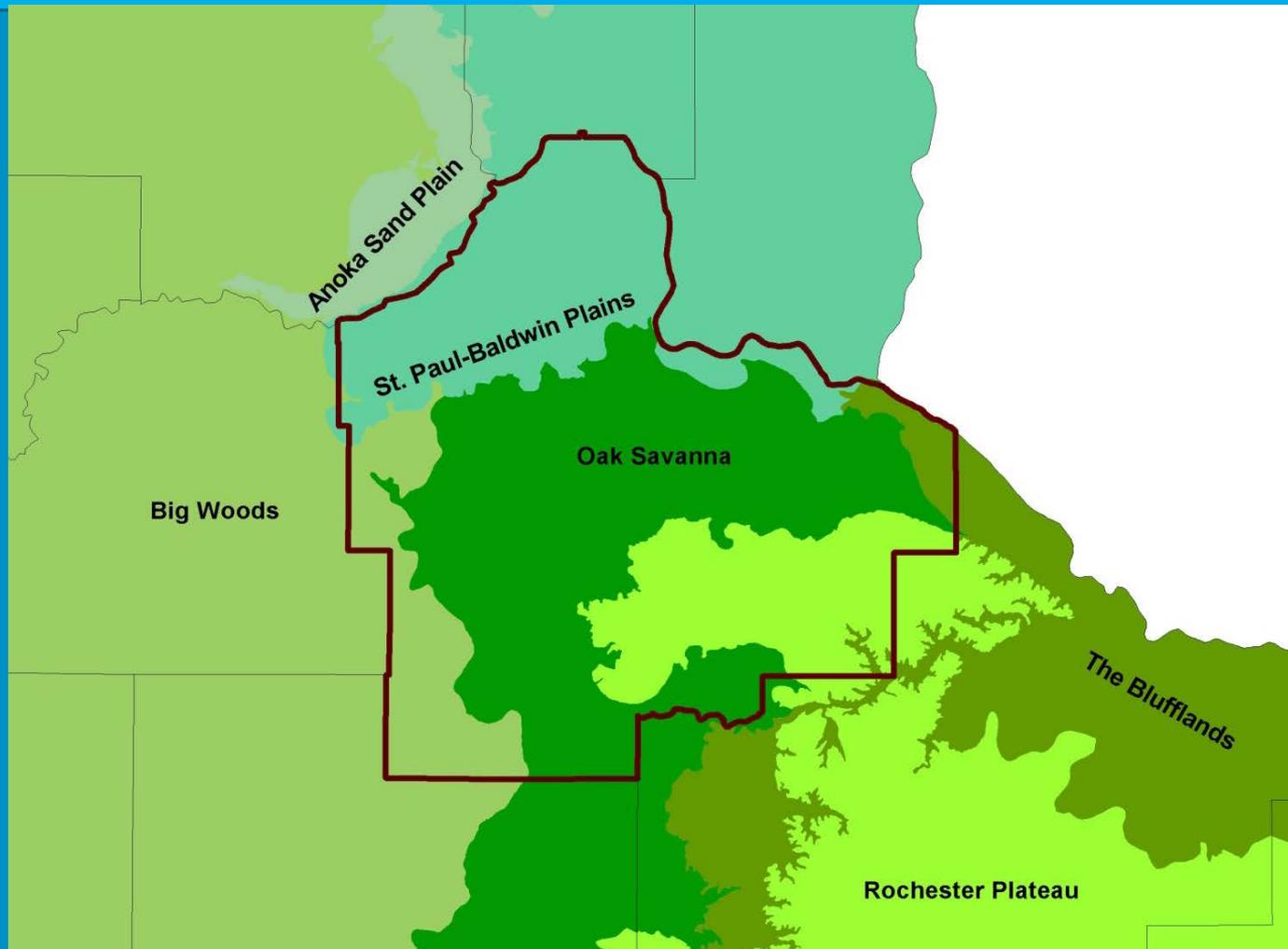
Topics

- Background
- Agricultural Easements
- Natural Area Easements
- Case Studies And Water Quality Applications
- Future Applications and Issues

Dakota County Context

- 386 square miles
- 412,000 residents
- 21 Cities - Eagan (67,000)
- 16,000 residents in 13 Townships
- No Rural Land Use Authority
except shoreland/floodplain

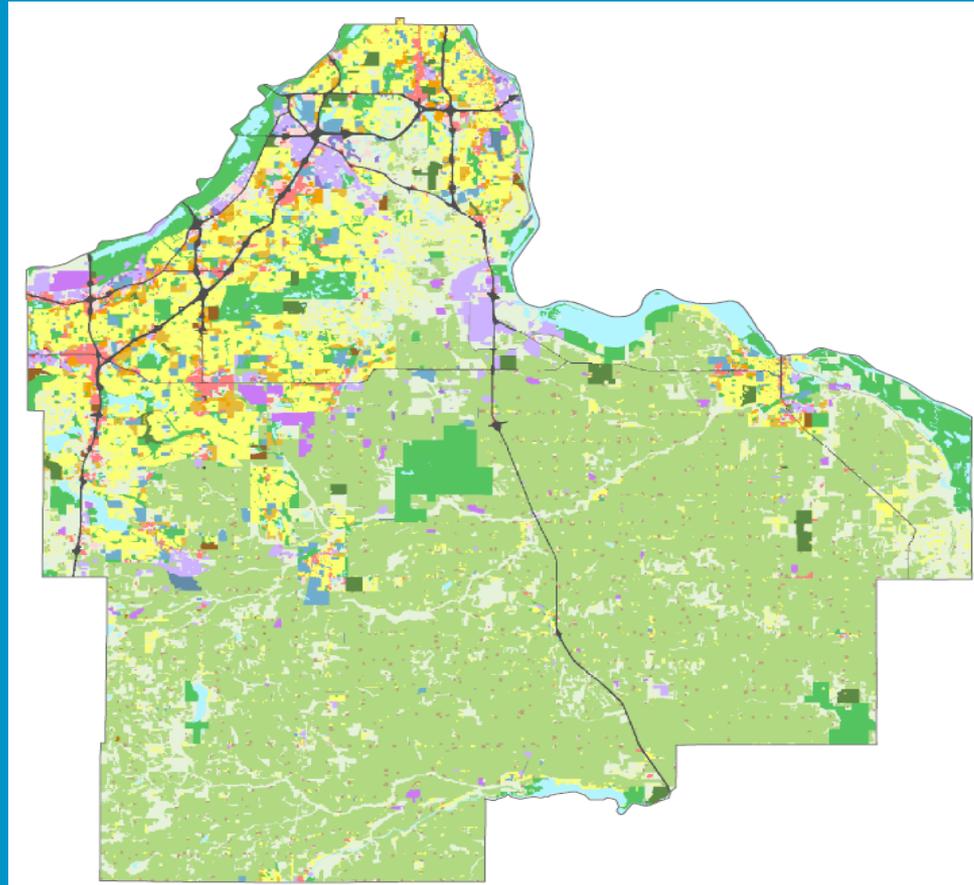
Landscape/Ecological Diversity



Rivers and Streams



Generalized Land Use



Farmland and Natural Area Program

State funded planning grant in 1998

Approved Farmland and Protection Plan in 2002

\$20M bond referendum in 2003

- ◆ Agricultural areas

- ✓ 68 easements totaling 7,600 acres

- ◆ Natural areas

- ✓ 21 fee title projects totaling 1,918 acres

- ✓ 42 easements totaling 1,522 acres

Acquisition Process

- ◆ Application
- ◆ Scoring
- ◆ Independent Appraisal
- ◆ Offer
- ◆ Title Work
- ◆ Environmental Assessment
- ◆ Property Report
- ◆ Natural Resource Management Plan
- ◆ Closing

Principal Documents

- Easement Deed
- Property Report
- Natural Resource Management Plan

Property Report

◆ Ecological Documentation

- Quality of landcover
- Invasive species

◆ Water Quality

- Location of buffer
- Streambank stability
- Stormwater flow

NRMP

- ◆ Land Use
- ◆ Geology and Aquifer Sensitivity
- ◆ Soil Types
- ◆ Hydrology
- ◆ Vegetation
- ◆ Wildlife
- ◆ Recommendations and Priorities
- ◆ Work Plan

Agricultural Easements

Eligible areas within ½ mile of river or stream or adjacent to protected land

- ◆ Prohibits development
- ◆ Agricultural use using BMPs
- ◆ Protects existing natural areas
- ◆ Maintain and expand vegetative buffers along rivers, streams and wetlands

Natural Area Easements

- Focus on high quality, privately owned natural areas determined by criteria
- Prohibits
 - ◆ Agricultural use
 - ◆ Mining/Alterations to topography
 - ◆ Commercial and industrial uses
 - ◆ Residential development

Natural Area Easements

■ Valuation

◆ Less than \$20,000:

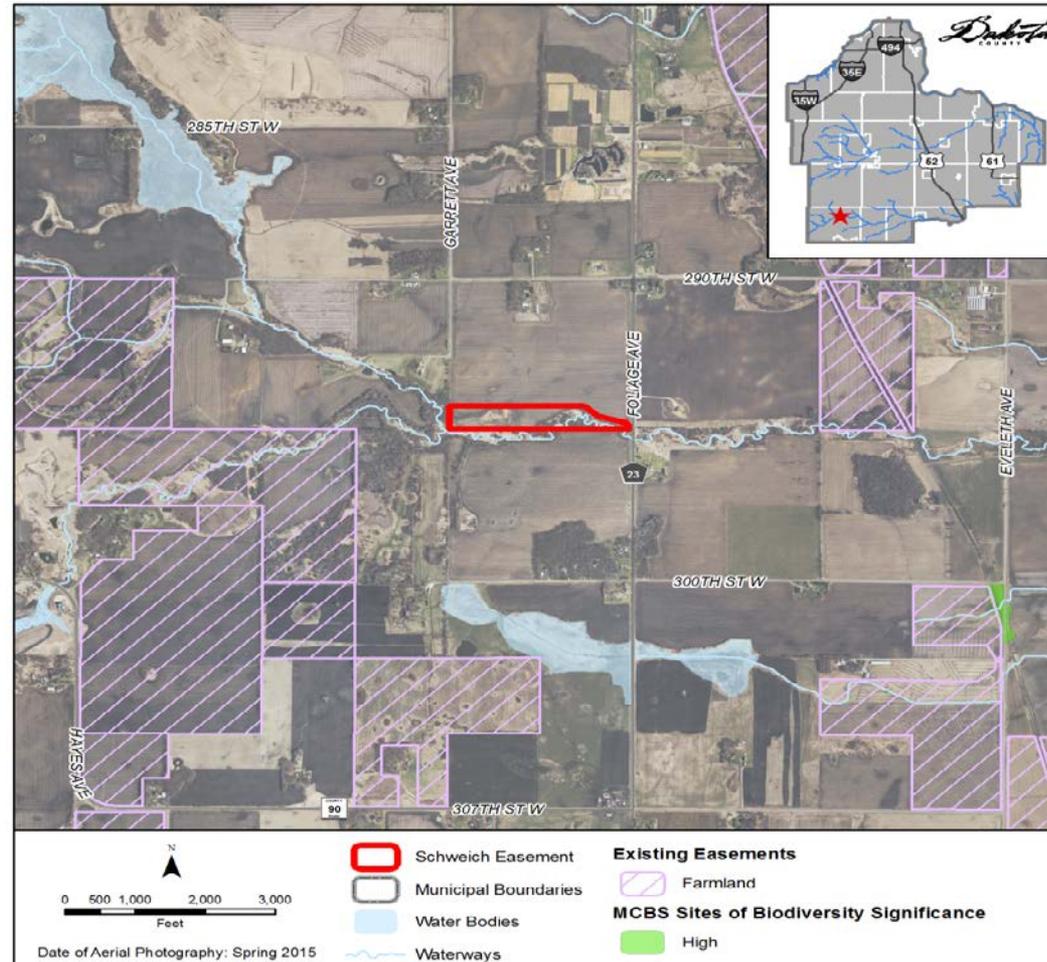
- ✓ Formula based on different percentages of tax-assessed value

◆ More than \$20,000

- ✓ Independent appraisal of Before and After Values. Easement value may range from 30 to 90 percent of fee value

Case Study: Schweich Property on Chub Creek

Figure 1. Location of Natural Area Easement

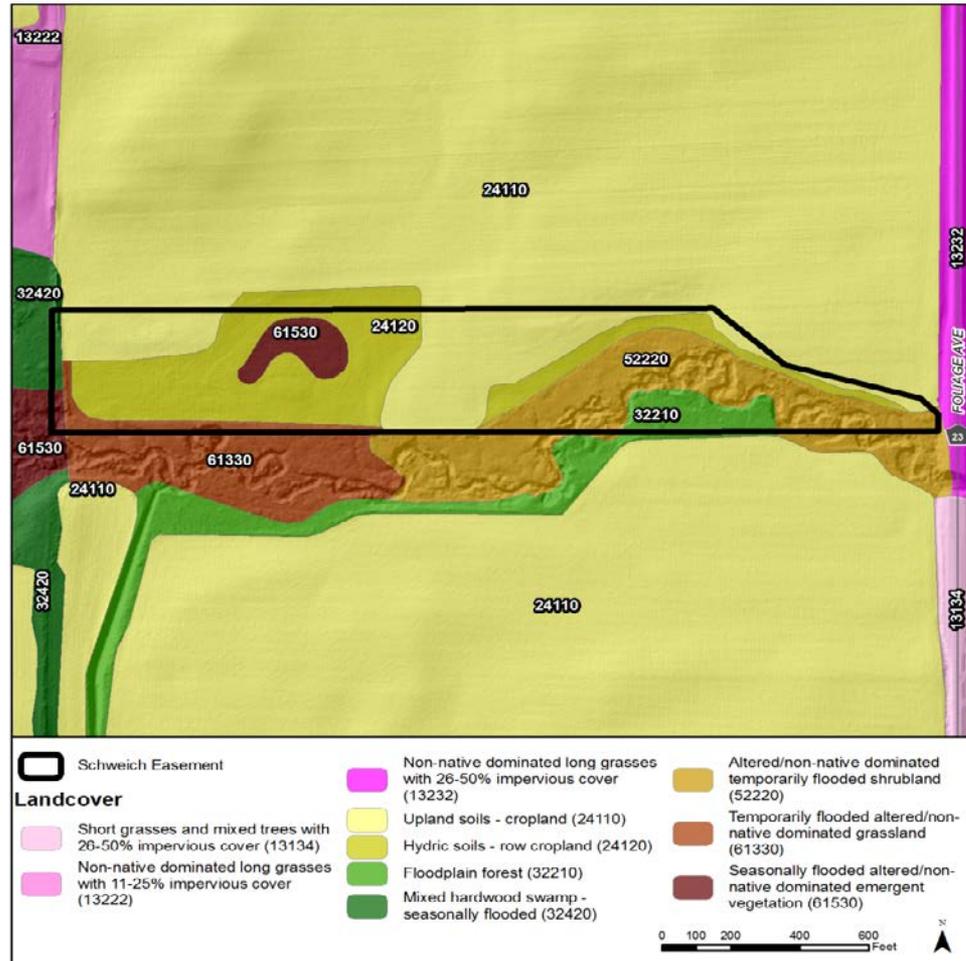


Schweich Property on Chub Creek

- Water Quality Issues on Chub Creek
 - ◆ Impaired for fecal coliform
 - ◆ Proposed Impaired Water List by the MPCA in 2014 for aquatic macroinvertebrates and fish bio-assessment impairments
 - ◆ De-stabilized Streambanks
 - ◆ Cultivation within fifty feet

Schweich Property on Chub Creek

Figure 15. Existing Landcover



Schweich Property on Chub Creek

Cultivation Within 50 feet from the top of
bank



Schweich Property on Chub Creek

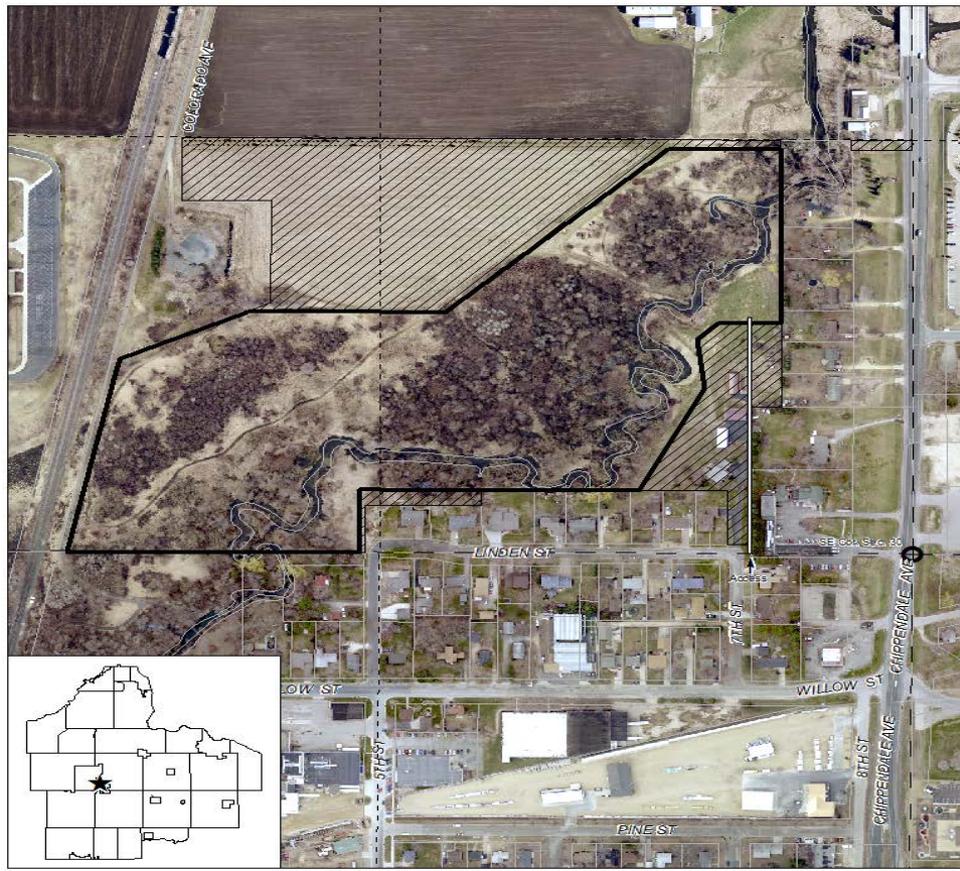
Eroding Streambank



Schweich Property on Chub Creek

- Natural Resource Management Work Plan
 - ◆ Convert fifteen acres of cropland to native prairie in the buffer area - June 2016
 - ◆ Stabilize streambank sections
 - ◆ Remove woody species from floodplain
 - ◆ Possible tile outlet wetland/retention basin(s)

Case Study: Finden Property on the Vermillion River



Map Date: 6/3/2015
1 inch = 300 feet

Finden Property on the Vermillion River

- Water Quality Impacts
 - ◆ Non-Attainment for fecal coliform
 - ◆ Horse pasture within fifty feet of river
- Geomorphic Assessment prepared for the Vermillion River Watershed Joint Powers Organization
 - ◆ Ruined footbridge blocking flow
 - ◆ Stormwater culvert causing localized stream-bank erosion
 - ◆ De-stabilized streambanks

Finden Property on the Vermillion River

Fallen bridge



Finden Property on the Vermillion River

Stormwater Outfall



Finden Property on the Vermillion River

- Natural Resource Management Plan
 - ◆ Conversion of horse pasture to wet meadow
 - ◆ Remove bridge obstructing flow
 - ◆ Remove woody species to improve condition of floodplain
 - ◆ Investigate feasibility of water retention structure upstream of outfall

Easement Advantages

- Voluntary approach to habitat and water quality protection and improvements on private land
- Acquiring property rights for less than fee simple value
- Property still generates property taxes
- Increased and shared management costs

Easement Challenges

- Market Competition
 - ◆ Residential Use and Speculation
- Agricultural Commodities
 - ◆ Price Supports
- No economic valuation for water quality, habitat, or “public good”.
- Availability of qualified appraisers
- Lack of appraisal “comparables”

Other Practical Issues

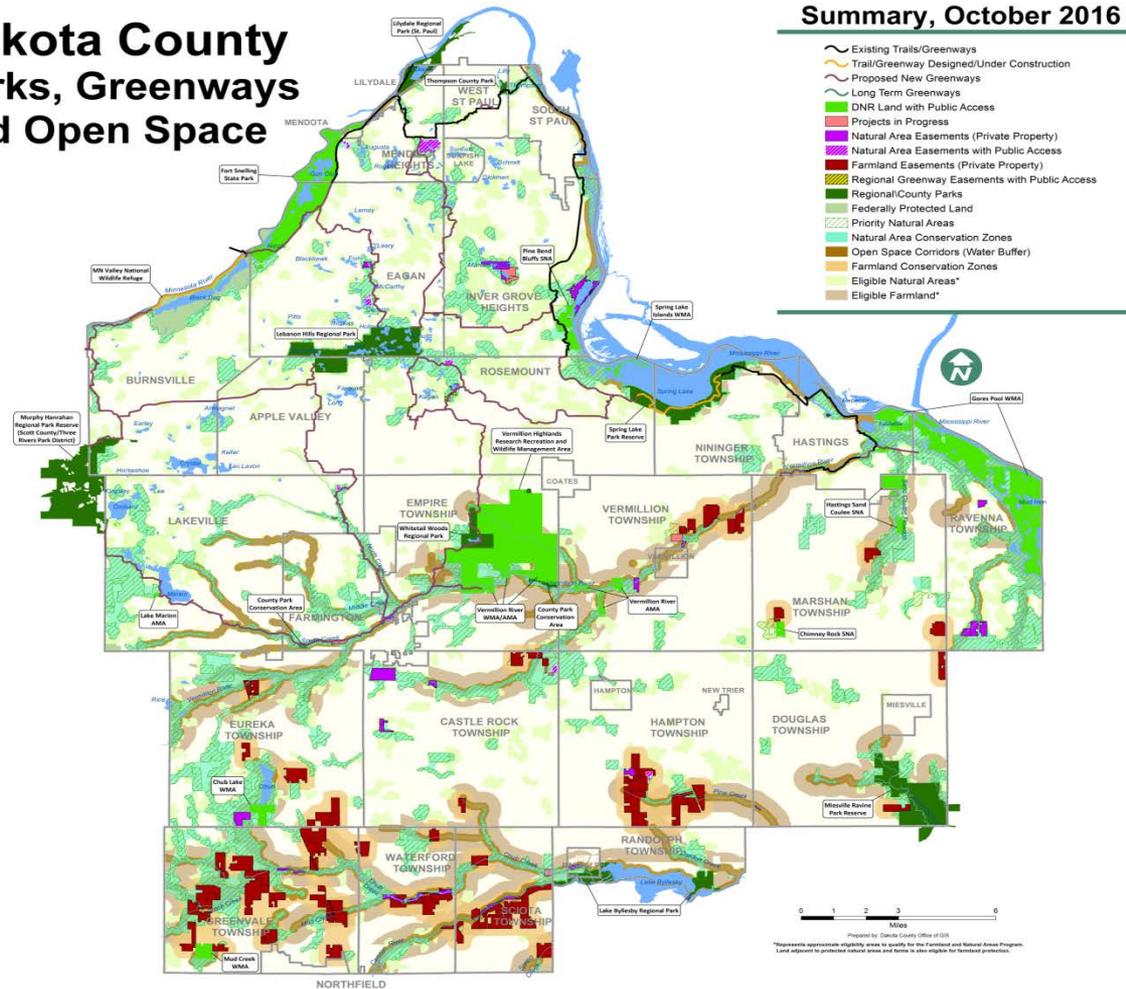
- Mortgage Subordination
 - ◆ Amount owed vs. remaining value and working with national mortgage lenders
- Environmental Assessment
 - ◆ Removal of waste and escrow
- Restoration and Management
 - ◆ Landowner participation

Summary

- Conservation area is a tool for habitat preservation and improving water quality
 - ◆ Increasingly acquisition is not an ends to itself. Management need is a function of purpose.
 - To document success over time, work to establish through NRMPS:
 - ◆ Purpose-Protect endangered species, water storage, etc.
 - ◆ Baseline-Animal Populations
 - ◆ Metrics-% Restored land
 - ◆ Landowner Participation Rate

Land Conservation Summary

Dakota County Parks, Greenways and Open Space





We Think We Can?

Collective Efficacy and Community Perspectives On Climate, Extreme Weather, and Water Management in Minnesota's Lake Superior Basin

Vanessa Perry, Mae Davenport, George Host
Minnesota Water Resources Conference, St. Paul, MN October 18, 2016



Funder

Project participants

Project Personnel

William Herb

George Host

Lucinda Johnson

Paul Meysembourg

Mae Davenport

Holly Meier

Jenn Shepard

STUDY AIMS

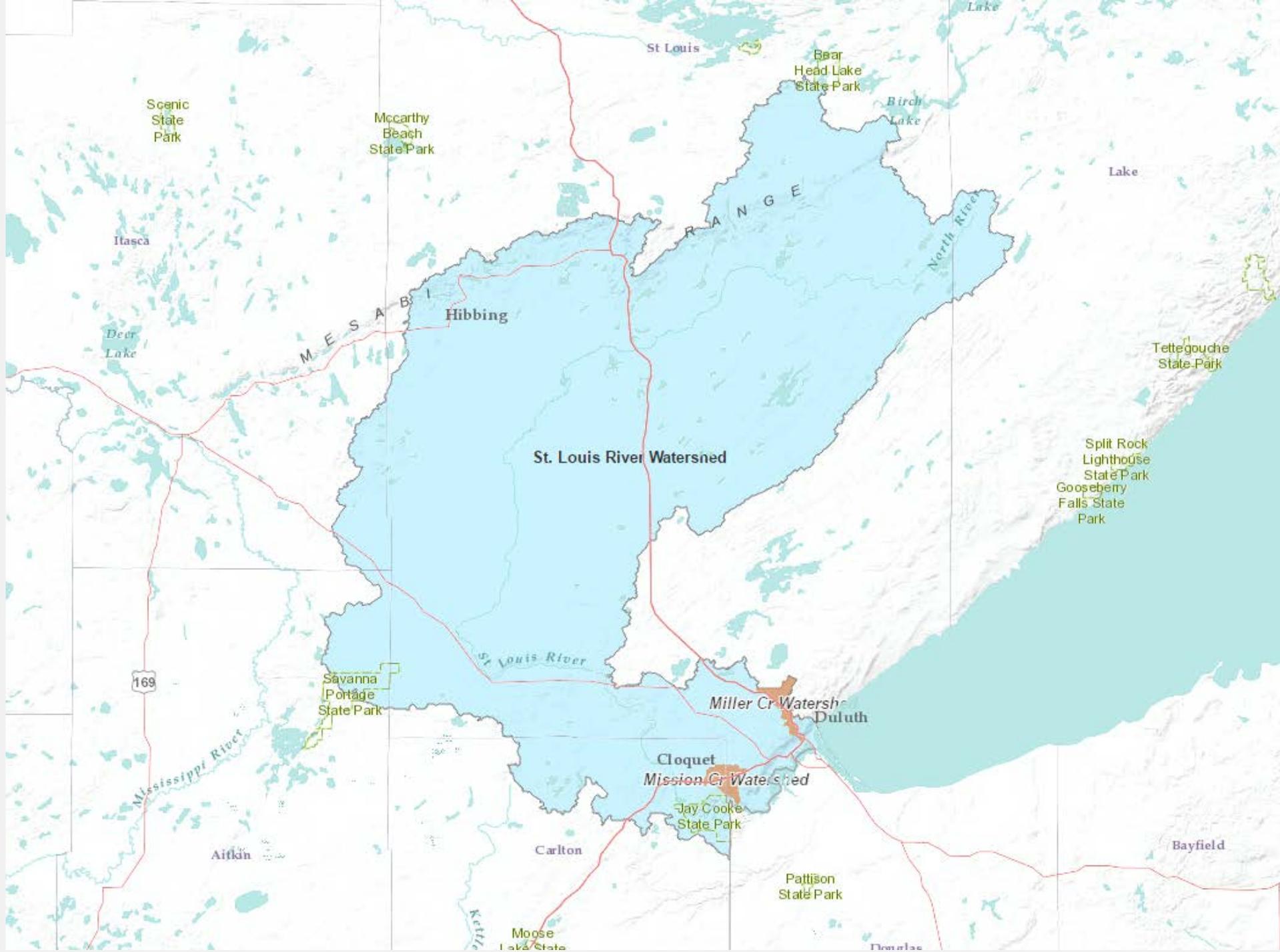
**to better understand
community responses
to water resource
impacts and to build
climate readiness in
coastal communities**



STUDY AIMS

to better understand community responses to water resource impacts and to build climate readiness in coastal communities

1. Local perspectives on community assets, community needs, environmental planning, and water conservation programming
2. The adaptive capacity of communities, community leaders, and land use/water resource professionals—their ability to anticipate and respond to climate-related impacts

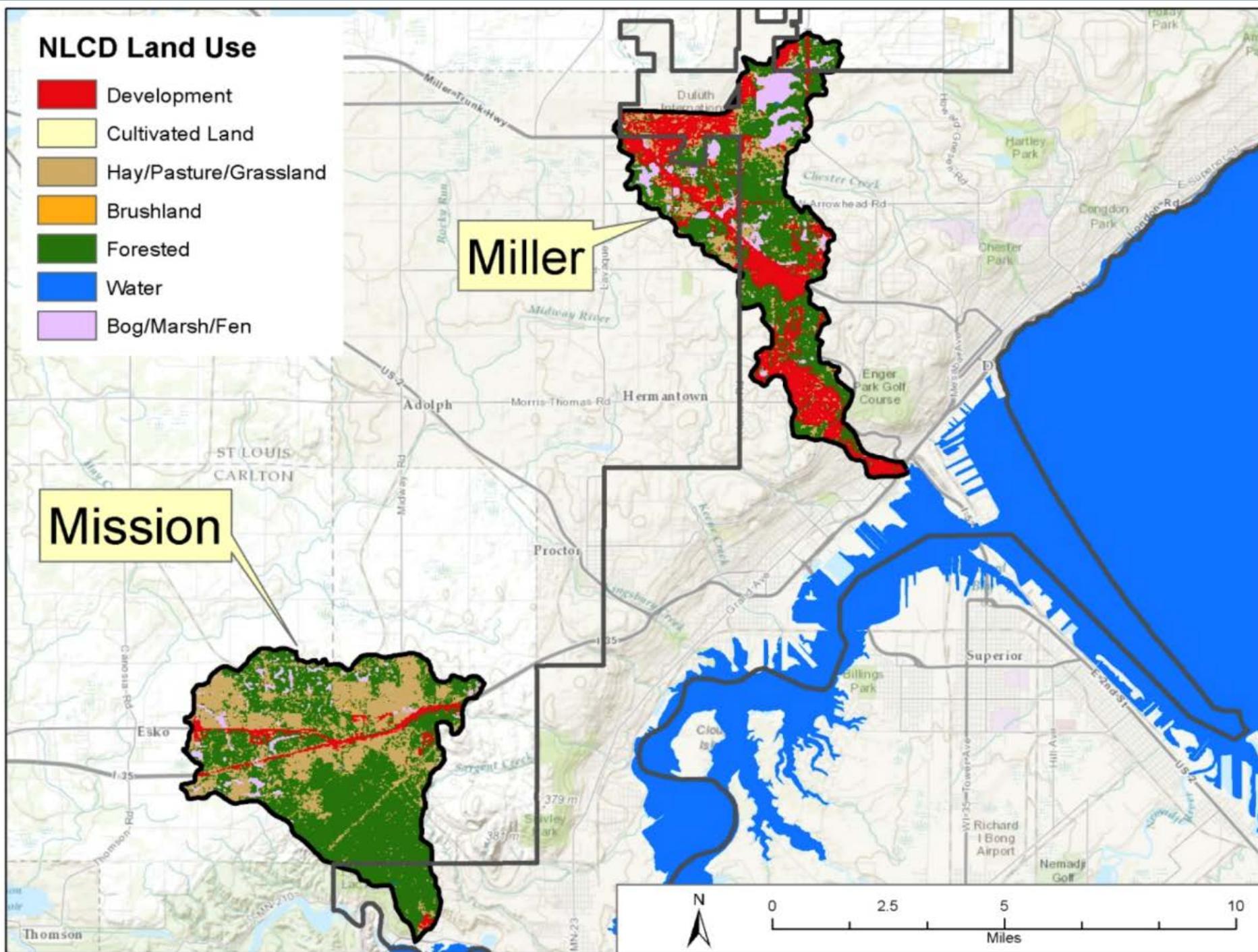


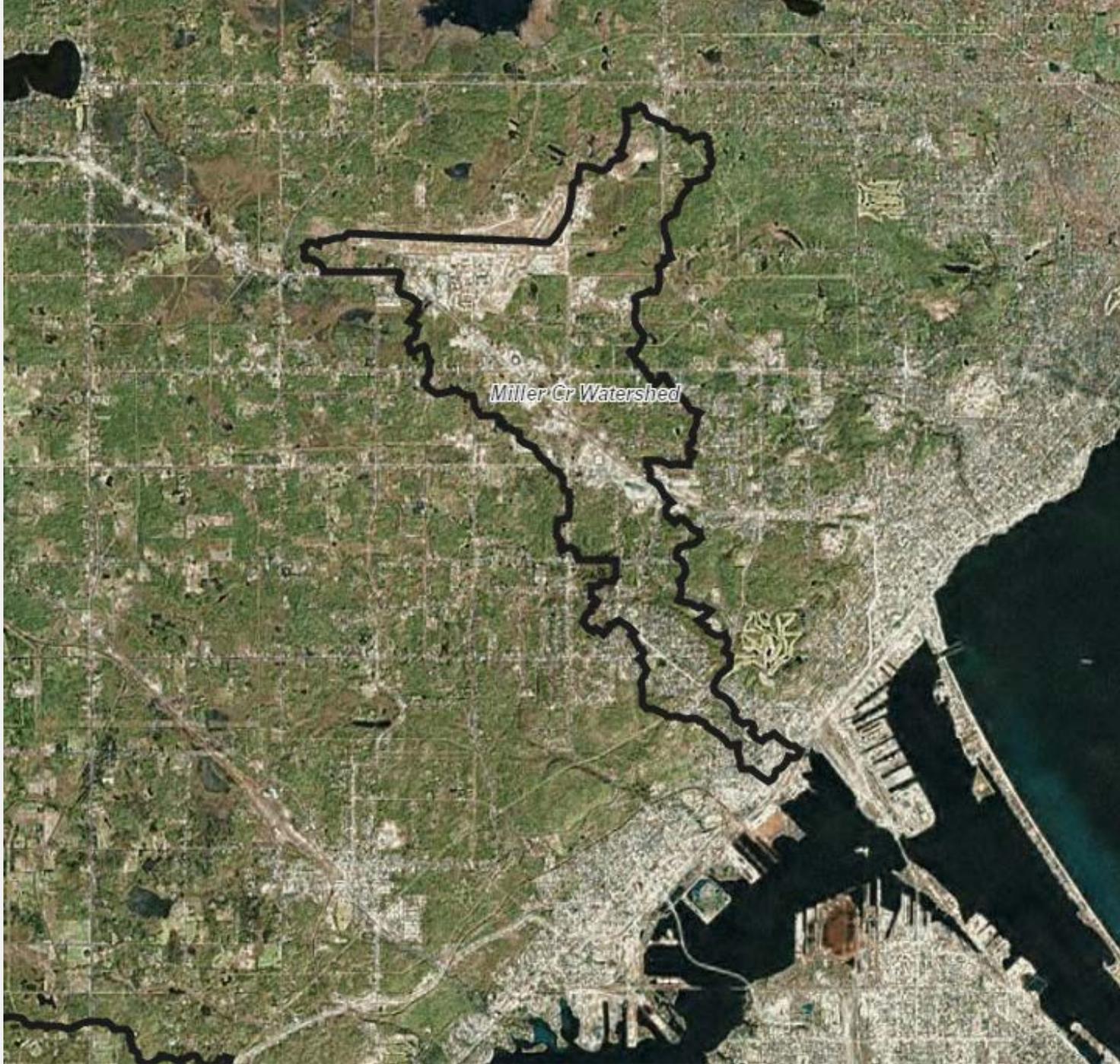


Vermilion Rd in Duluth during June 2012 flood (photo courtesy John Goodge)

NLCD Land Use

- Development
- Cultivated Land
- Hay/Pasture/Grassland
- Brushland
- Forested
- Water
- Bog/Marsh/Fen





Miller Cr Watershed

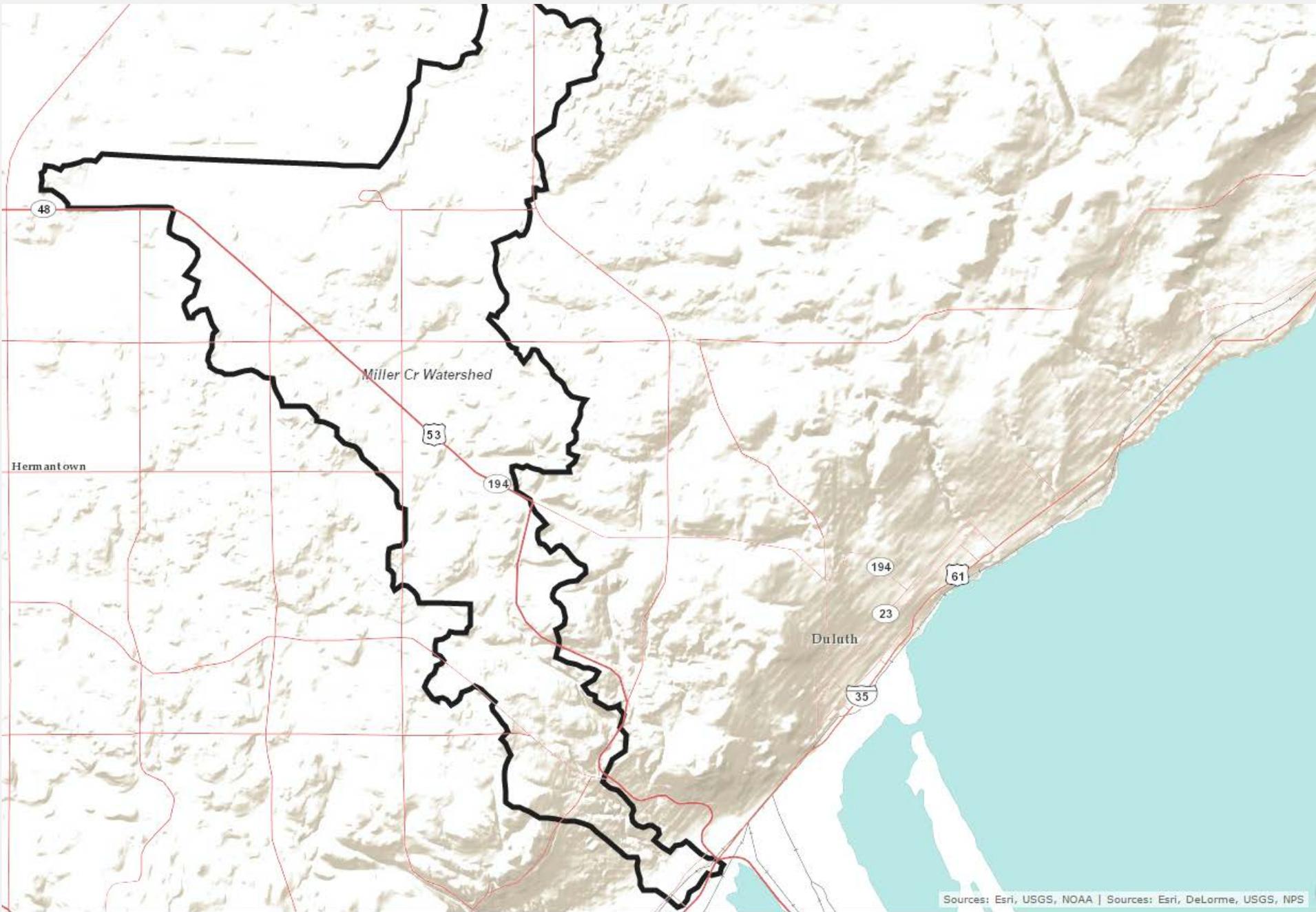
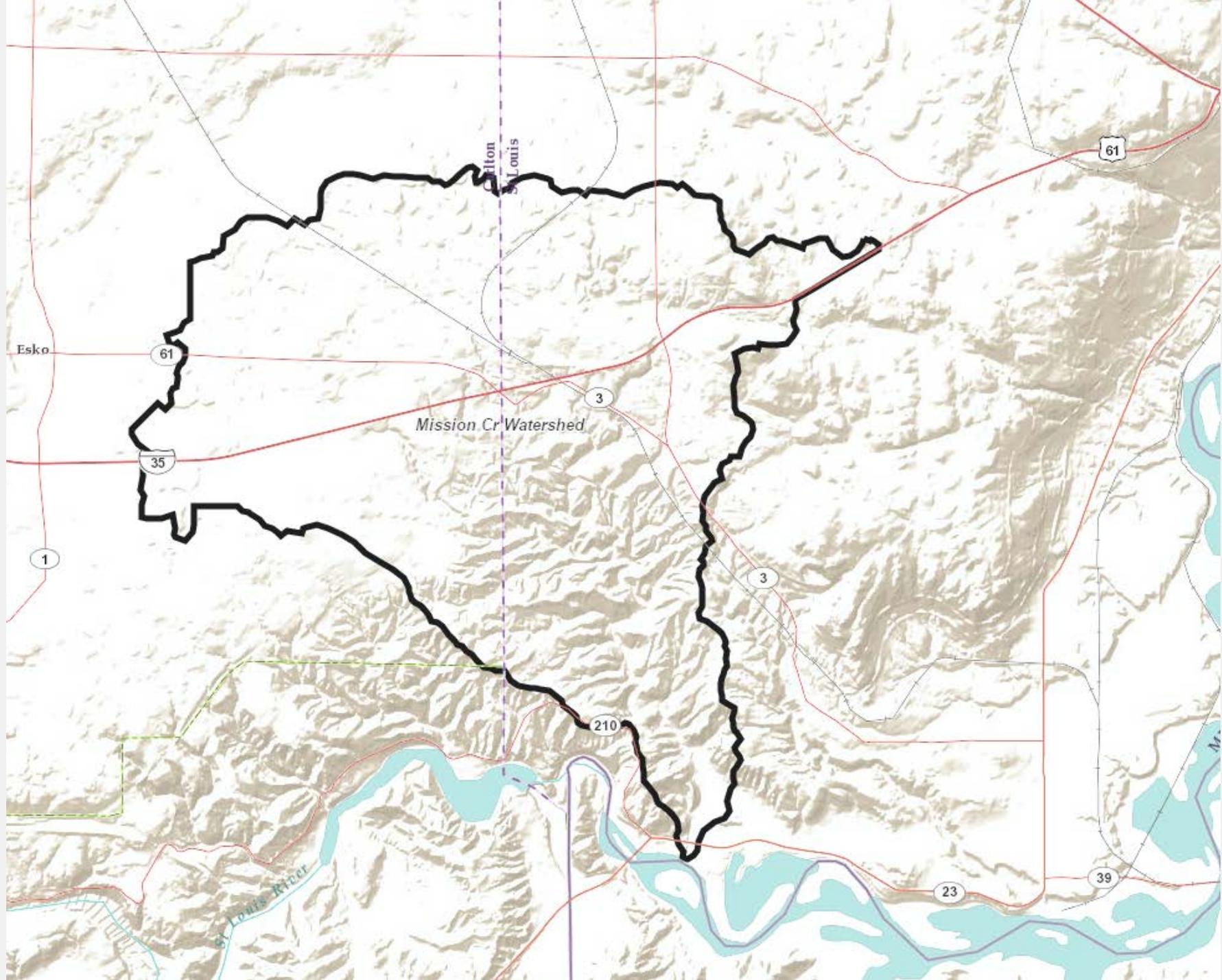




Photo: Bob King/AP



Mission Cr Watershed





SUPERIOR HIKING TRAIL

➡ Spur Trail to SHT Main Trail (via old Mission Creek Parkway and then up Mission Creek Trail 500 feet) 0.6 mi

Munger Trail Trailhead at 123rd Ave W 2.7

Grand Portage Trail Trailhead at Jay Cooke State Park 4.2 mi



Blue Blazes are SHT Main Trail,
White Blazes are Spur or Overlook Trails

NO CAMPING, NO FIRES, FOOT TRAVEL ONLY
(Unless other use specifically authorized)

SUPERIOR HIKING TRAIL ASSOCIATION | 218-834-2700 | www.shta.org

**SPUR TRAIL
PERMANENTLY
CLOSED.
WASHOUTS
AND NO
MAINTENANCE**

Posted by the Superior Hiking Trail Association
218-834-2700 * hike@shta.org



Interviews

Biophysical
Modeling

Focus
Groups

Workshop

Interviews

Biophysical
Modeling

Focus
Groups

Workshop

Interviewees	27
Age (min/max)	33-66
Median age	48
Years in community (min/max)	2-41
Median years in community	17
Gender	15 female 11 male 1 not reported

Nodes

- Nodes
- Relationships
- Node Matrices

Sources

Nodes

Classifications

Collections

Queries

Reports

Models

Folders

- Look for: Search In: Nodes Find Now Clear Advanced Find
- Nodes**
- social norms
 - soil conservation
 - stewardship ethic
 - suitability
 - talk with others
 - technology impro
 - urban population
 - way of life
 - weather
 - wildlife
 - yield
 - farm bill
 - intro question
 - percieved control
 - age
 - chemical use
 - community chan
 - corporate farmin
 - crop insurance
 - better for larg
 - dependent o
 - to manage ri
 - economics
 - family ties
 - farm bill
 - farm size
 - independence
 - outside influence
 - risk management
 - rotation
 - soil conservation
 - technology
 - values
 - environmental st
 - fairness
 - independence

12171201 [Click to edit](#)

mean, it wouldn't have been a problem and they wouldn't have had to let it go as soon as they did. The Red River, just like Ditch 52, wasn't meant to handle what's being drained into it today, from '49 to '85. Those two reservoirs wasn't meant to handle as fast as the water comes. Weren't the dams put in here after the war? If I started farming in '76, there were a lot more little sloughs and that water wouldn't be down there. Now it is. You take every little cut out here and start heading it that way, well, there's a lot more water going there than was going there when those dams were built. We're behind. And what a time to need that, the government is broke.

I: Are you concerned about water resource problem in the Mustinka?

P: We have the Bois de Sioux watershed here. What can I say about the Bois de Sioux watershed. There's a board, but it still doesn't seem like... It seems like some areas get attention and some areas don't. We have to permit through them, that's where we start our process. When this all started years ago, we had boards for individual public ditches, and I'm still not sure if that isn't the way to go. Inseatd of having it all in pone big entity. For instance, we have Ditch 52 over here that dumps straight into Traverse and it's caused erosion like you couldn't imagine. I should take you on a pickup drive. The cut in the land is 60 feet deep. It's unbelievable. That ditch was dug in 48 or 49, I believe. The ditch was sufficient at the time. Well, then from '49 to 1985 you could ditch anything you wanted to ditch. You didn't need a permit or nothing. Whatever your capabilities were, you could do. I mean, whatever you had, a horse, a drag scraper, a 4-wheel tractor, you could ditch. So they ditched into this ditch. Well, you would pay to drain into that ditch, but that was always behind. You might pay to drain your quarter into that ditch, but nobody really knew it until it was researched to see what water was coming. Well, that ditch grew in size. I mean, there's so much more water coming into that ditch than when it was built and where it drops down into the lake it's cutting something terrible. In fact, there's a spot where there's a weir now. They've tried to control it, but to fix it and fix it right would take millions of dollars and it's just not here. It was created by people that no longer farm or no longer live. For us to fix that problem would be almost impossible, dollar-wise. And that's where the government comes in because we would need to subsidize that. And it needs to be fixed because it's going to cut, in time, it's hundreds of feet above where it drops down to the lake, and it's going to cut all the way down to the bottom, I would think. Like I said, to realize what's going on in that ditch, you would have to drive up and see it. That is something that I think that the watershed, when they were formed, they should have done something about it a long time ago. As a township officer, I tried to get them to fix it a long time ago. They said, at the time, it would take a million dollars. Well, just think if we'd have done it. Now it would take \$12 million or whatever it is. Well, it would be more than that. Number one because it takes more money to do anything now and number two because it's worse than it was 20 years ago or whenever it was. Stuff like that is just overlooked. You can't fix it so don't fix it. You talk about erosion

Coding Density

driver

constraint

values

long term management

lifestyle

soil conservation

environmental stewardship

limited risk

economy

chemical use

percieved control

government

economics

financing

CONVERGENCE

DIVERGENCE

CONVERGENCE

water



Value

Identity

with local water resources and restoration
efforts



“People really have embraced the water overall as sort of a defining factor”



Interest in
protection



Restoration



Connection



“I think as people spend more time in the streams, and enjoy them, and see the fish, and the flows and the trees, and have good experiences on the streams, they will value them more and protect them more or want to pay more to maintain them.”

DIVERGENCE



DIVERGENCE

Restoration Perspectives

Natural Resource Preparedness

Climate Perspectives

Climate Preparedness



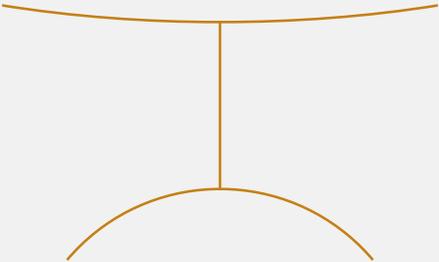
DIVERGENCE

Restoration Perspectives





What concerns do you have about future natural resource impacts / water impacts?



Restoration Perspectives



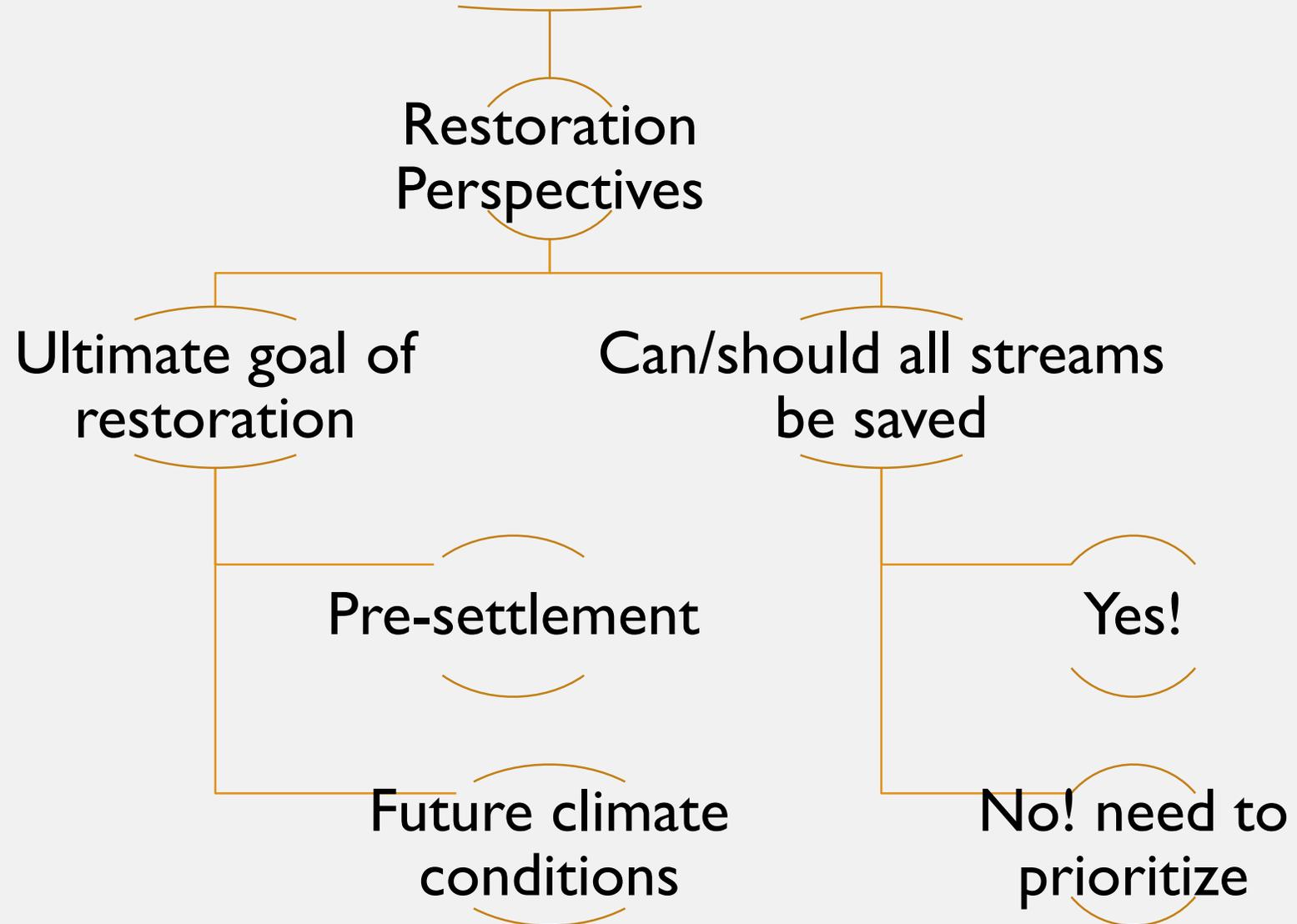
What concerns do you have about future natural resource impacts / water impacts?

Restoration Perspectives

Ultimate goal of restoration

Can/should all streams be saved

What concerns do you have about future natural resource impacts / water impacts?



“How do we keep [these resources] the way that we want to have it for our communities and for future generations? . . . How do we manage resources like this and how do we protect them and how do we restore them and **how do we prepare them for changes like climate change?**”

DIVERGENCE

Natural Resource Preparedness



*Is the community doing what it needs to prepare for
future natural resource impacts?*

could do more

don't know

no, not
prepared

somewhat
prepared

yes, prepared

Is the community doing what it needs to prepare for future natural resource impacts?

could do more

don't know

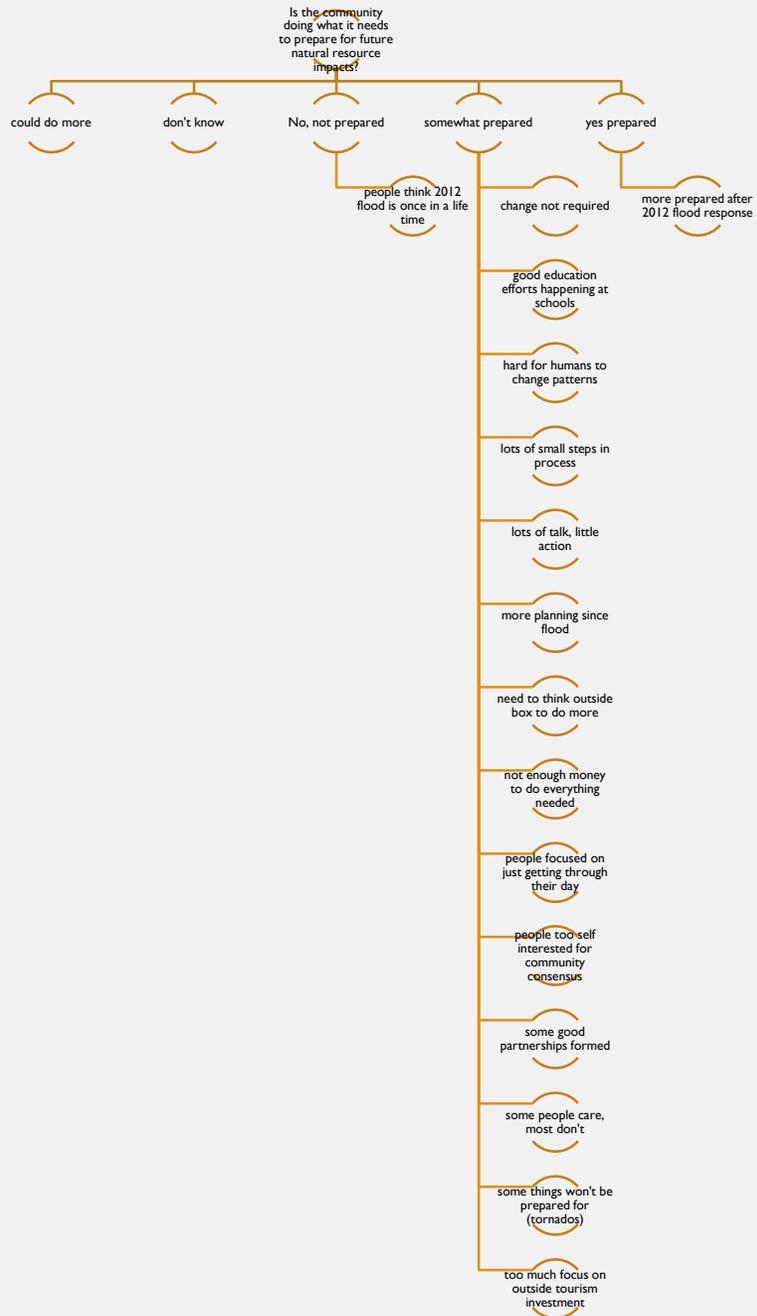
no, not prepared

somewhat prepared

yes, prepared

people think
2012 flood is
once in a life
time

more prepared
after 2012 flood
response



“I think a lot of people are saying “Oh, 100 year flood”. Well if people have that mindset, that it’s going to be every 100 years, **they don’t understand the urgency.**”

DIVERGENCE

Climate Perspectives



*Please share with me your
perspectives on climate change.*

a concern

a reality

not sure

*Please share with me your perspectives
on climate change.*

a concern

a reality

not sure

need to prepare
for

need to prioritize
actions

need to right-
size
infrastructure

vegetation
changing

can't connect
weather and
climate

need more
information

part of
natural cycle

rely on experts



“My perspective on climate change is that we have no idea what is coming. We don't know if we are going to have more intense storms or less intense storms, or more rain or less rain, or whatever's going to happen, and so we don't know.”

“I don't think anybody is arguing that the climate isn't changing,
and that rainfall patterns aren't changing.”

“I’m still formulating my opinions from the people who are studying it. I think there’s more popular opinion that’s communicated by those who feel that what we do [causes climate change]. But I don’t know that that’s the majority opinion. I think that’s the vocal opinion.”

DIVERGENCE

Climate Preparedness



*Do you think the community is doing what it needs to do to
prepare for future climate impacts?*

can't prepare

could do
more

don't know

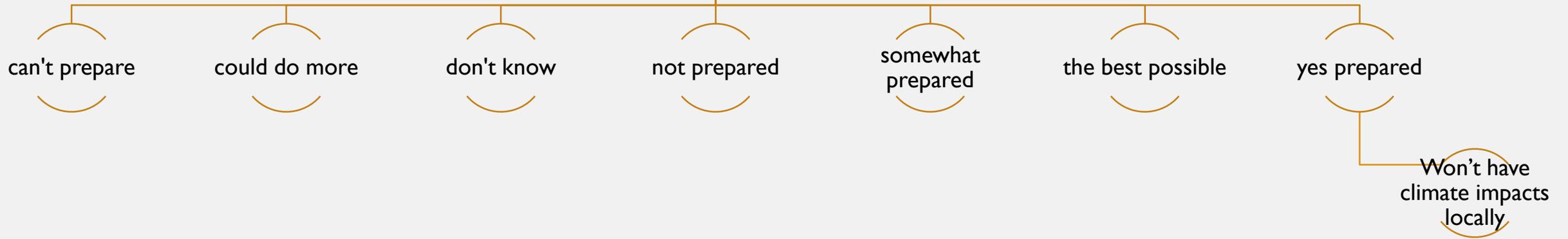
not prepared

somewhat
prepared

the best
possible

yes prepared

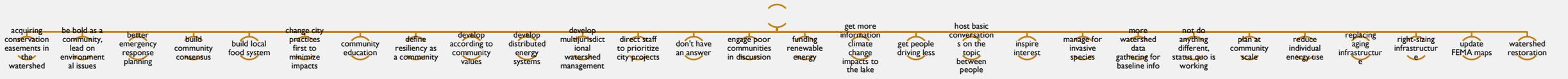
*Do you think the community is doing what it needs to do
to prepare for future climate impacts?*



Do you think the community is doing what it needs to do to prepare for future climate impacts?



If you were in charge, what actions would you prioritize to better prepare the community for future climate impacts?



build community consensus	3
reduce individual energy use	2
replacing aging infrastructure	2
acquiring conservation easements in the watershed	1
be bold as a community, lead on environmental issues	1
better emergency response planning	1
watershed restoration	1
build local food system	1
change city practices first to minimize impacts	1
community education	1
define resiliency as a community	1
develop according to community values	1
develop distributed energy systems	1
develop multijurisdictional watershed management	1
direct staff to prioritize city projects	1
update FEMA maps	1
engage poor communities in discussion	1
funding renewable energy	1
get more information climate change impacts to the lake	1
get people driving less	1
host basic conversations on the topic between people	1
inspire interest	1
manage for invasive species	1
more watershed data gathering for baseline info	1
not do anything different, status quo is working	1
plan at community scale	1
right-sizing infrastructure	1
don't have an answer	1

Interviews

Biophysical
modeling

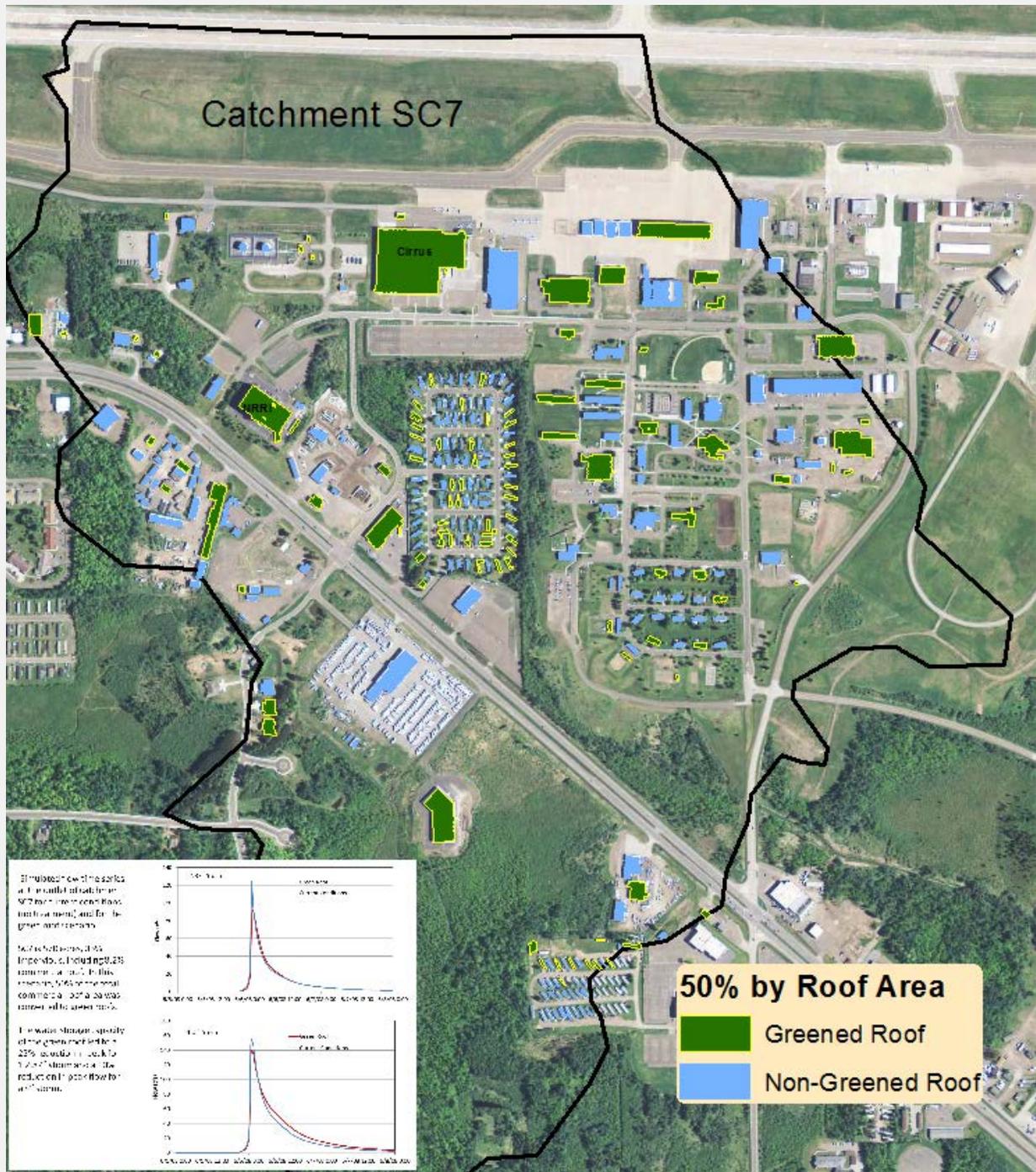
Focus
Groups

Workshop

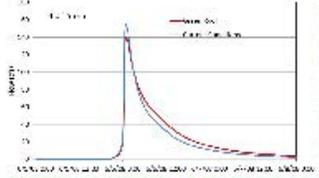
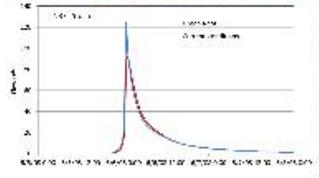
WHAT IF WE PLACED GREEN ROOFS ON **HALF** OF THE COMMERCIAL BUILDINGS?



Catchment SC7



The reduction of the surface area of impervious surfaces (Roof Area) in catchment SC7 (see map) will reduce runoff volume and peak flow rate, and therefore reduce the risk of flooding and erosion. The reduction of the surface area of impervious surfaces (Roof Area) in catchment SC7 (see map) will reduce runoff volume and peak flow rate, and therefore reduce the risk of flooding and erosion.



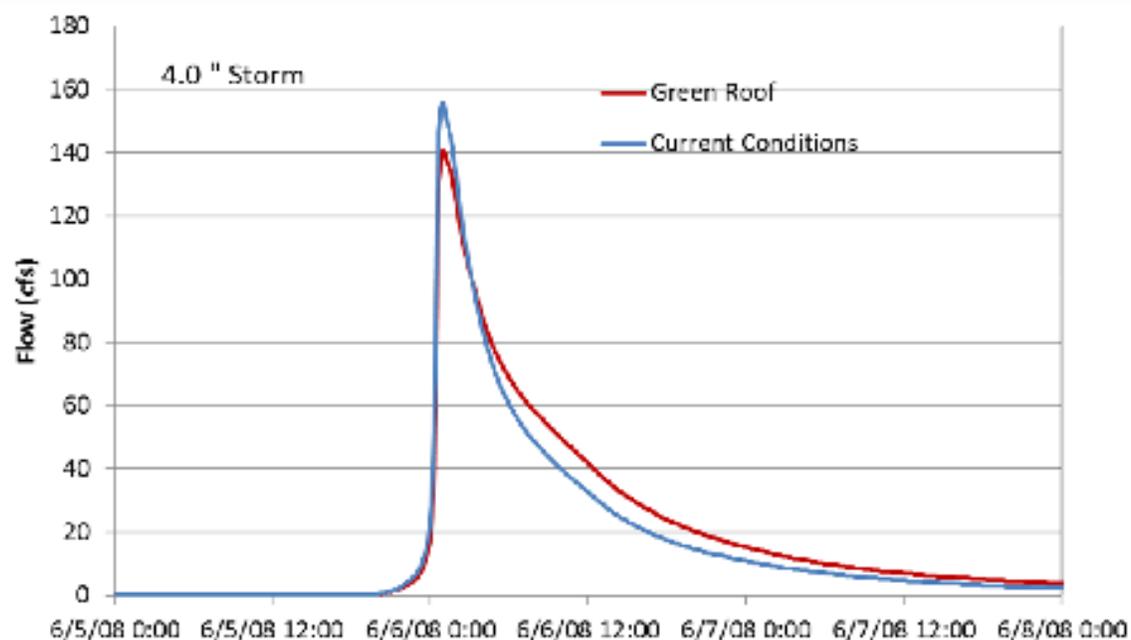
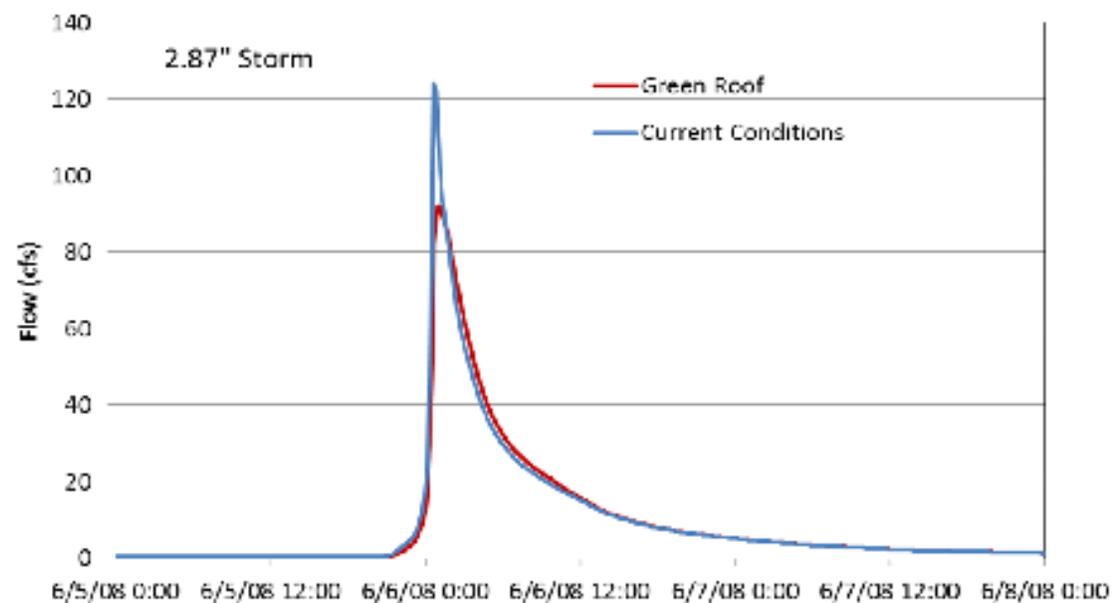
50% by Roof Area

- Greened Roof
- Non-Greened Roof

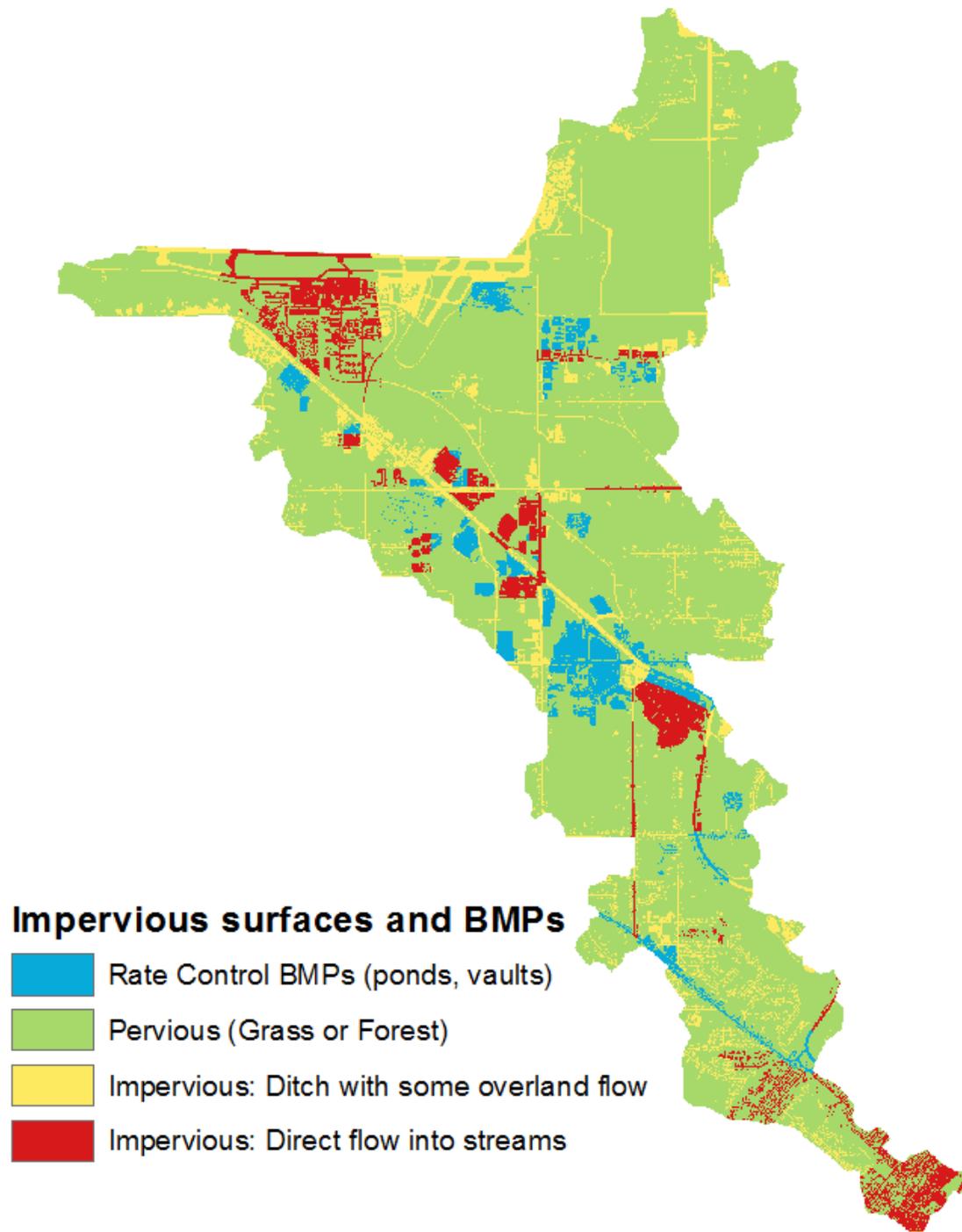
Simulated flow time series at the outlet of catchment SC7 for current conditions (no treatment) and for the green roof scenario.

SC7 is 570 acres, 33% impervious, including 8.2% commercial roof. In this scenario, 50% of the total commercial roof area was converted to green roofs.

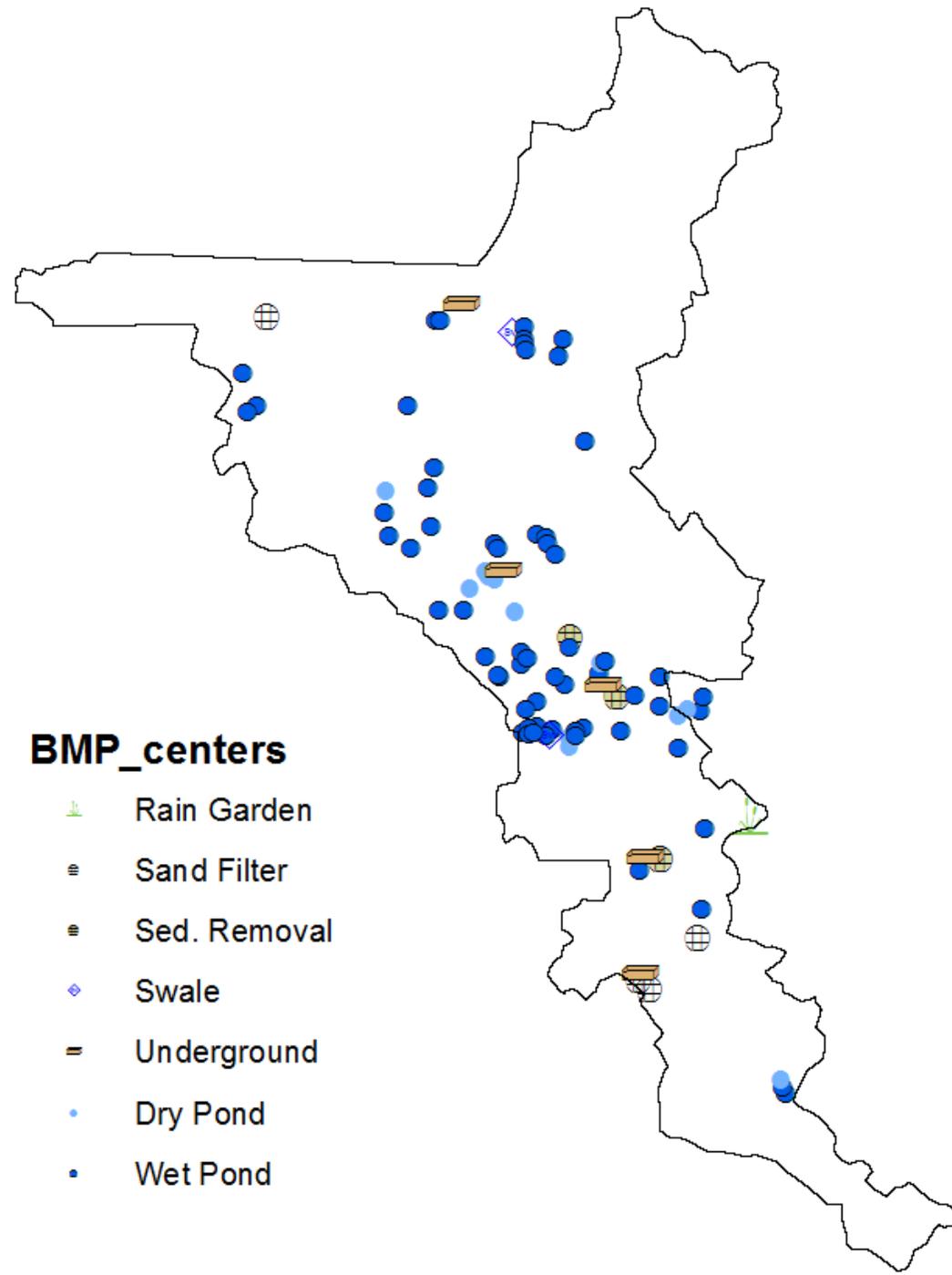
The water storage capacity of the green roof led to a 25% reduction in peak for 1 2.87" storm and a 10% reduction in peak flow for a 4" storm.

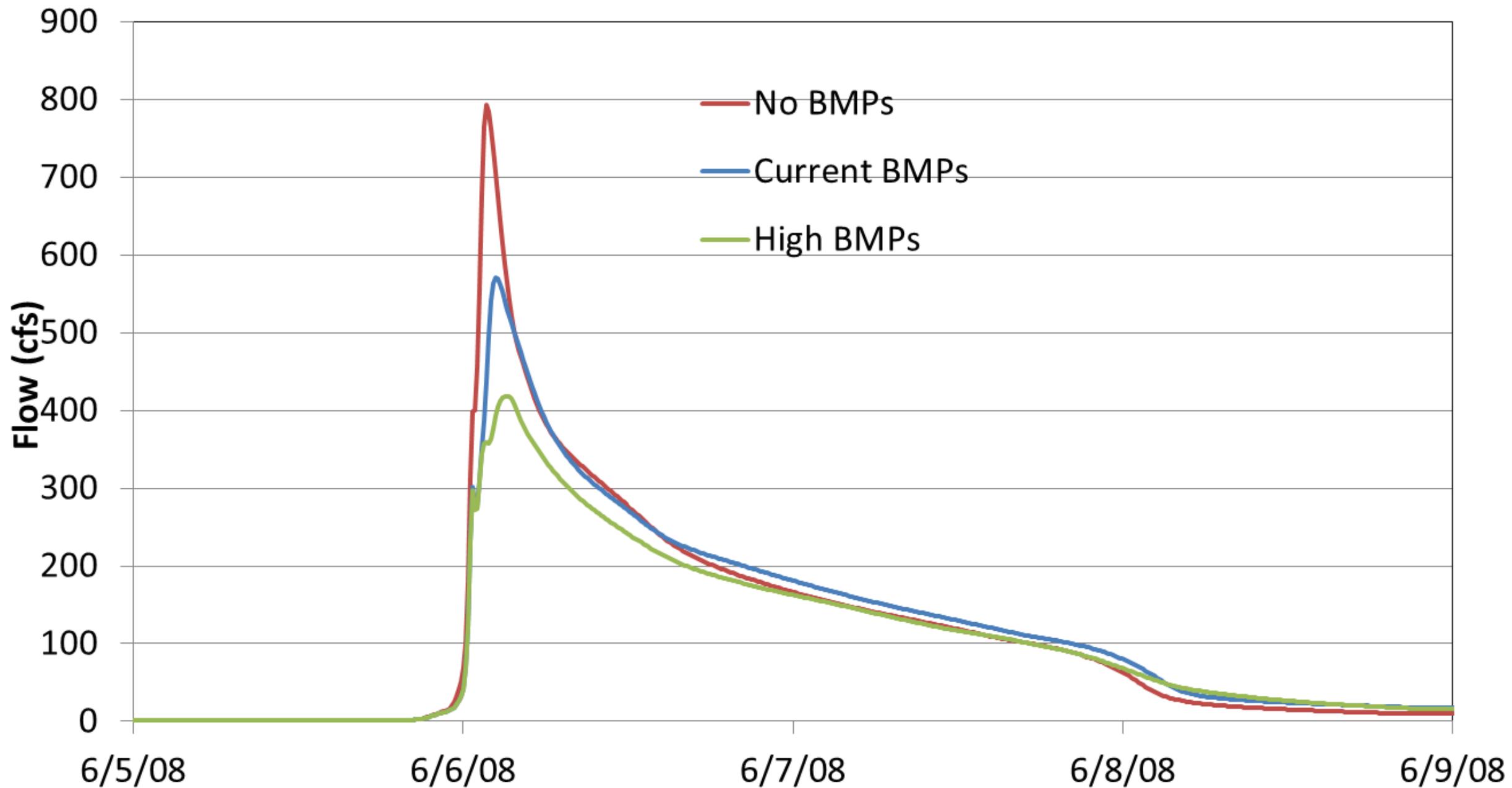


Rate Control Study

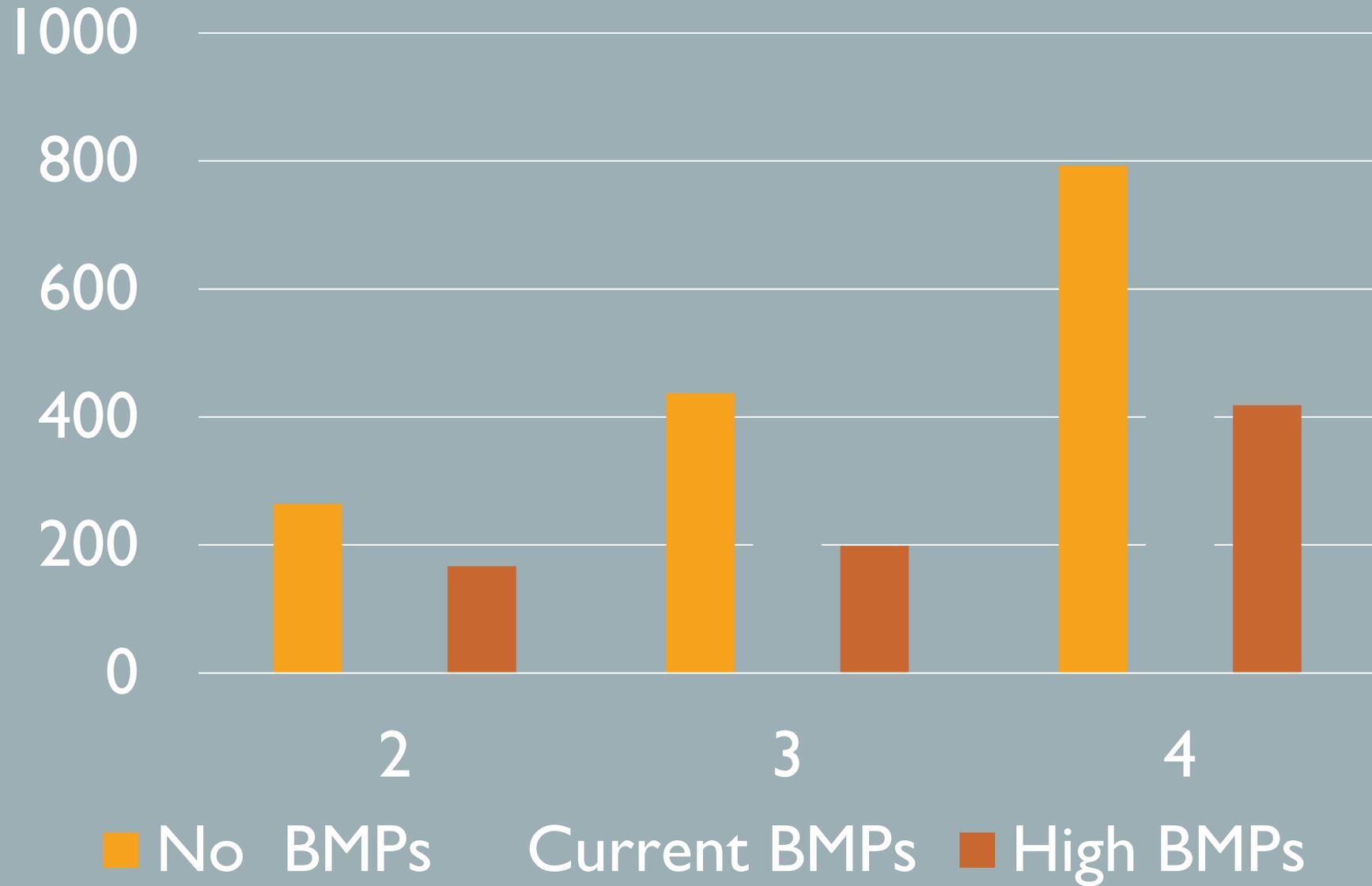


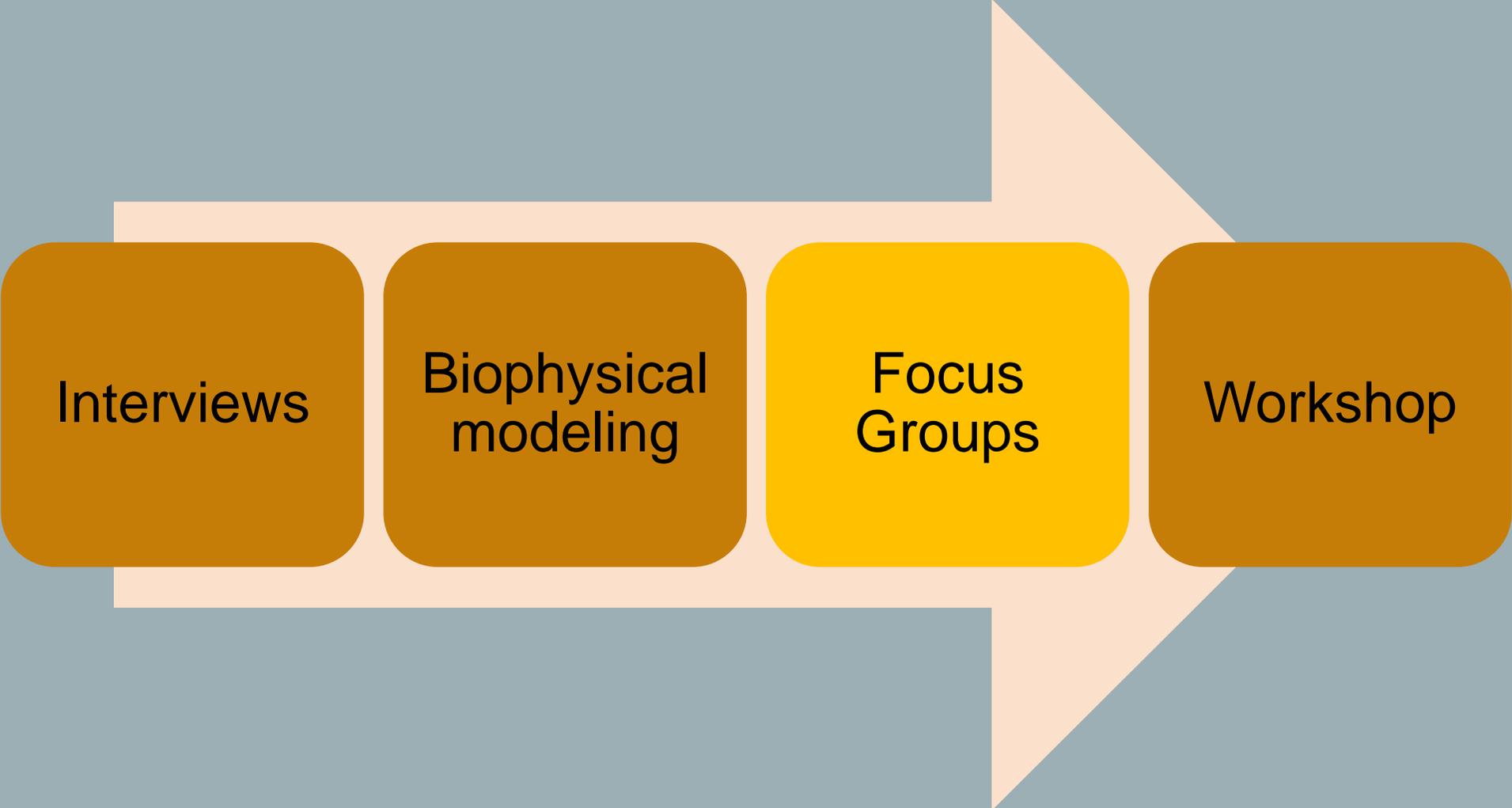
Existing BMPs in the Miller Creek Watershed





Peak Flow





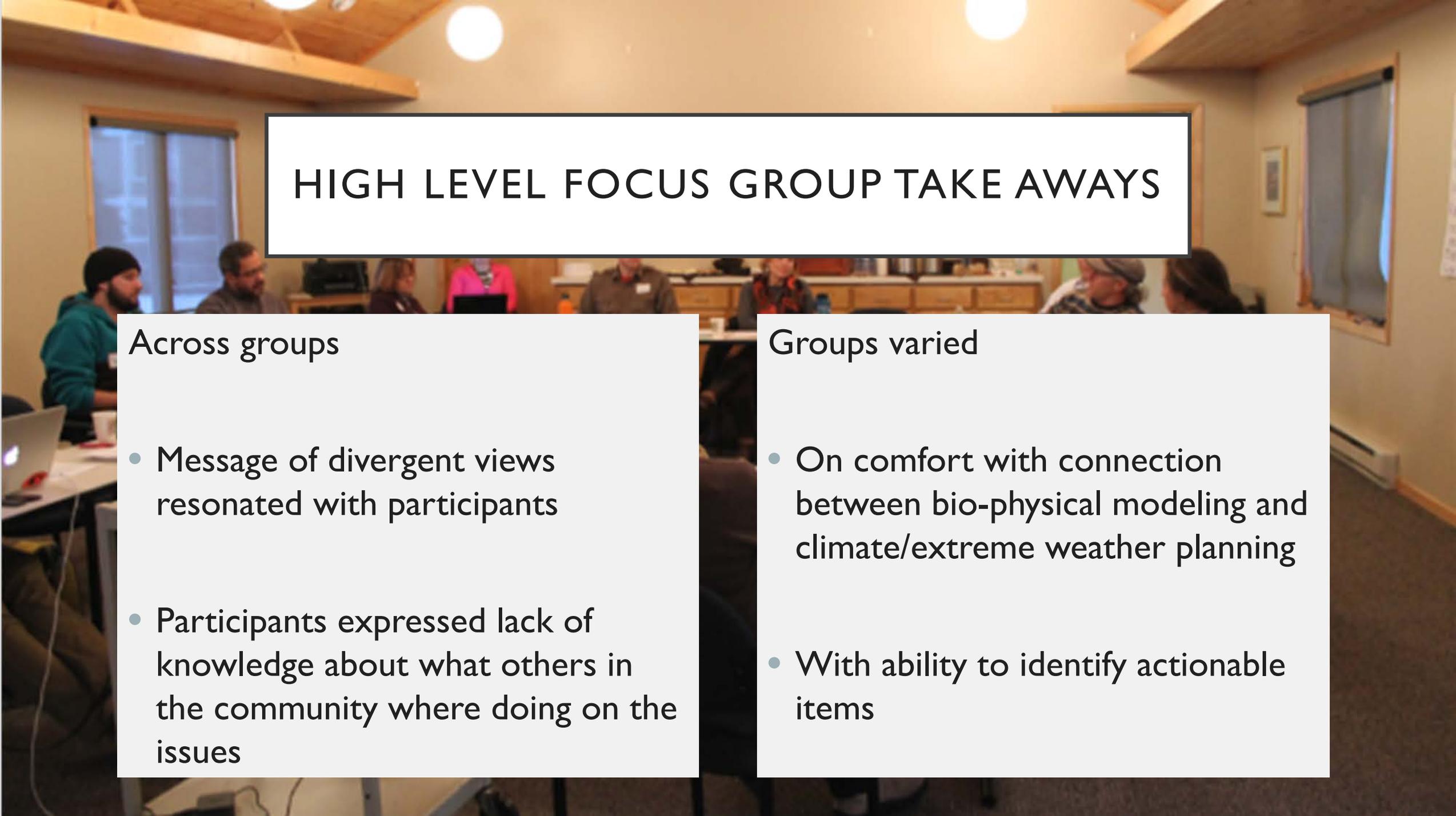
Interviews

Biophysical
modeling

Focus
Groups

Workshop





HIGH LEVEL FOCUS GROUP TAKE AWAYS

Across groups

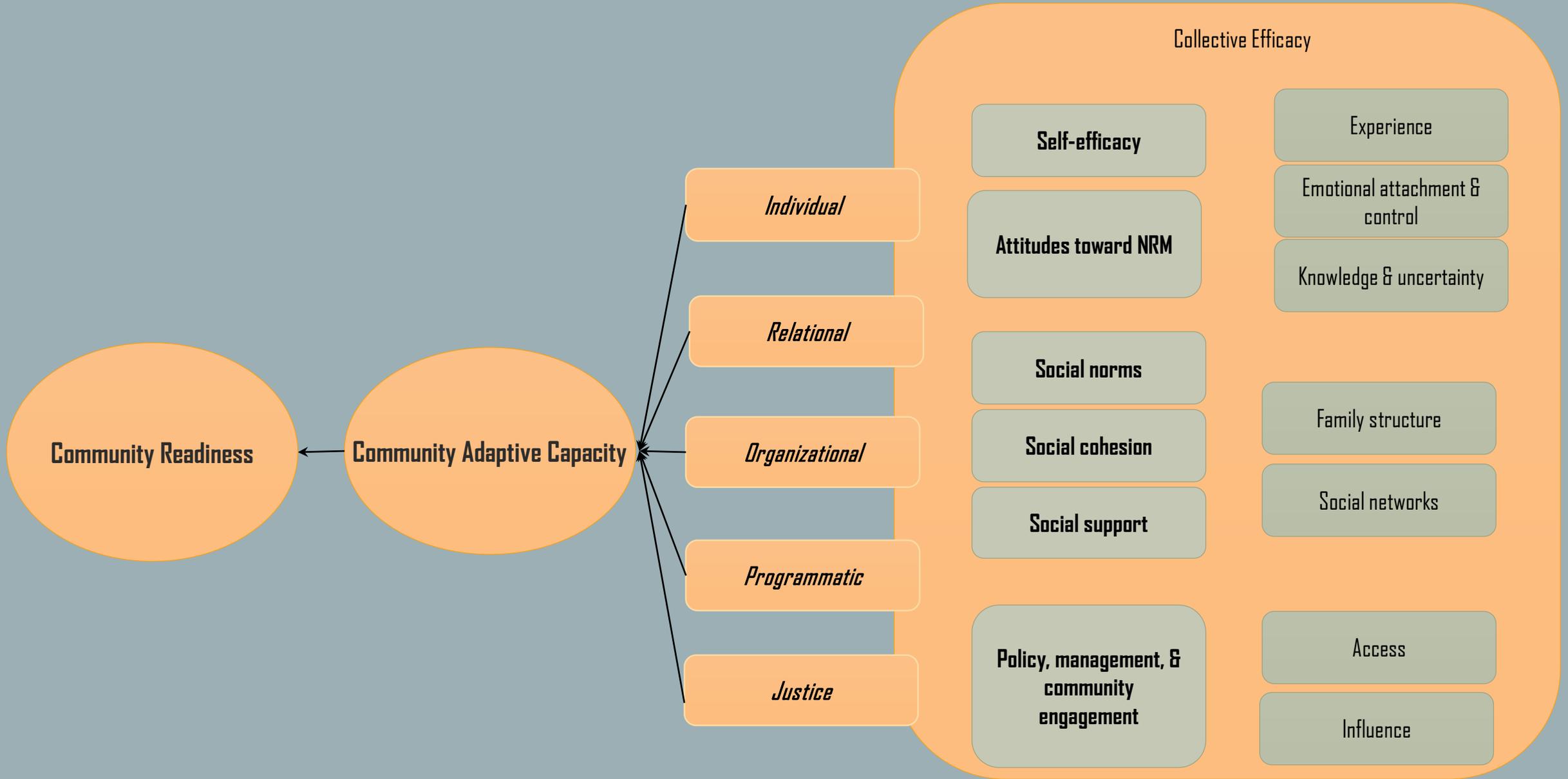
- Message of divergent views resonated with participants
- Participants expressed lack of knowledge about what others in the community were doing on the issues

Groups varied

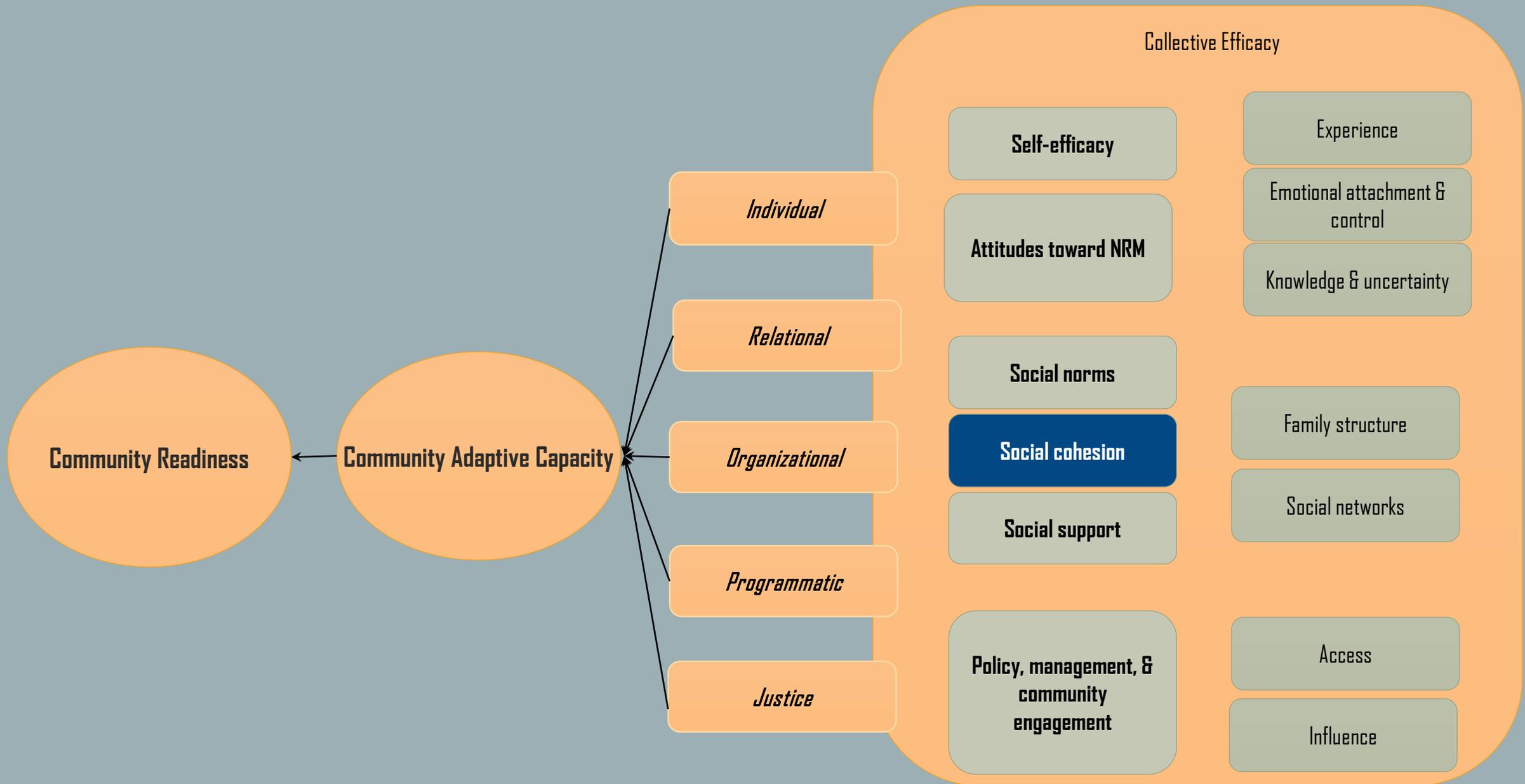
- On comfort with connection between bio-physical modeling and climate/extreme weather planning
- With ability to identify actionable items

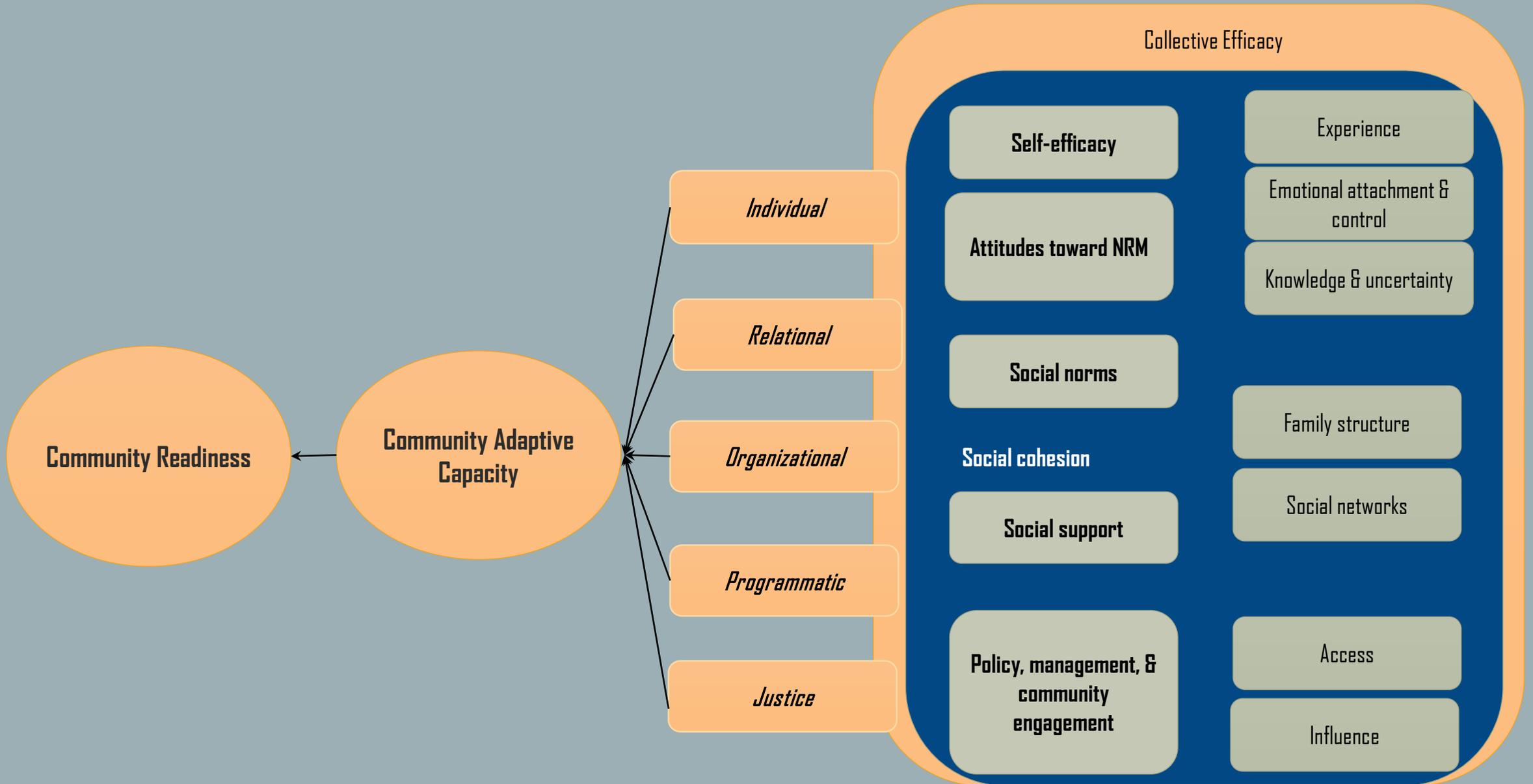
“Among the mechanisms of agency, none is more central or pervasive than people’s beliefs about their capabilities to exercise control over events that affect their lives. Self-beliefs of efficacy influence how people feel, think, and act.”

Albert Bandura, 1990, p.128



Community capacity model modified from Brinkman, E., Seekamp, E., Davenport, M., & Brehm, J. (2012).





Interviews

Biophysical
Modeling

Focus
Groups

Workshop



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Water Resources Center

Advancing science-based solutions for freshwater management

Using the Agricultural Conservation Planning Framework to Analyze Minnesota Watersheds

Ann Lewandowski and Les Everett
University of Minnesota Water Resources Center

Water Resources Conference, October 18, 2016



Planning Tools

HUC-8

Plan broad priorities and strategies

- WRAPS
- 1W1P
- Comp Plans
- TMDLs

Model the impacts

- SPARROW
- HSPF, HSPF-SAM
- GSSHA
- SWAT
- WHAF
- P8
- WinSLAMM
- PTMApp

Prioritize zones

- Zonation
- EBI
- PTMApp

Select and site practices

- ACPF
- PTMApp?

Pre-design and cost

- Cost-benefit analyses
- NRCS GIS toolbox
- Agren design tool

Terrain analysis

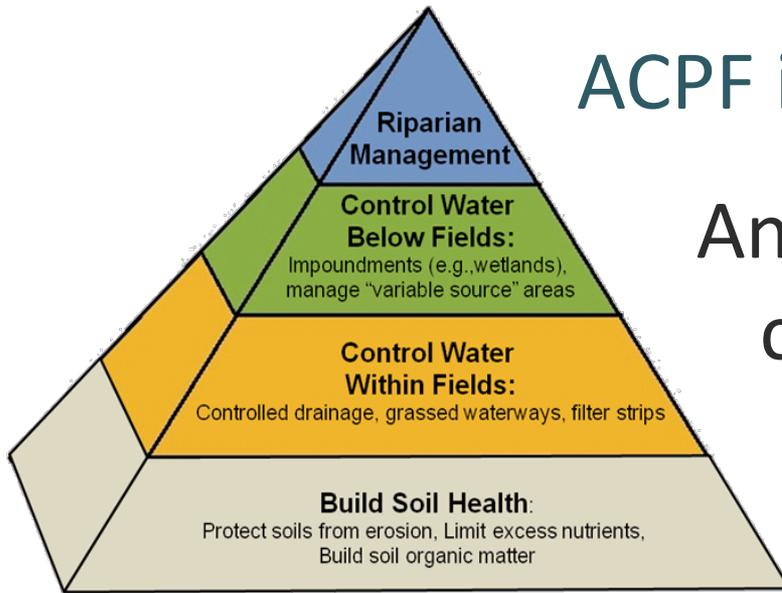


HUC-12

Site

ACPF is a watershed approach

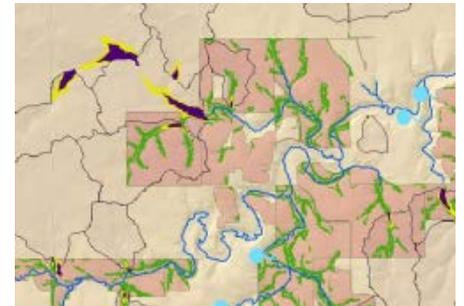
An integrated view of conservation practices



ACPF is a set of
ArcGIS tools
and input databases



Output
maps



Semi-automated ArcGIS Tools

Terrain Processing

- Hydro-modification of DEM
- Define stream reaches

In Field

- Controlled drainage
- Depressions (for surface intakes or restored wetlands)
- Steep slopes (for contours, terraces, or conservation cover)
- SPI and TWI
- Grassed waterways
- Runoff Risk

Below Field

- Bioreactors
- Water detention

Riparian Zone

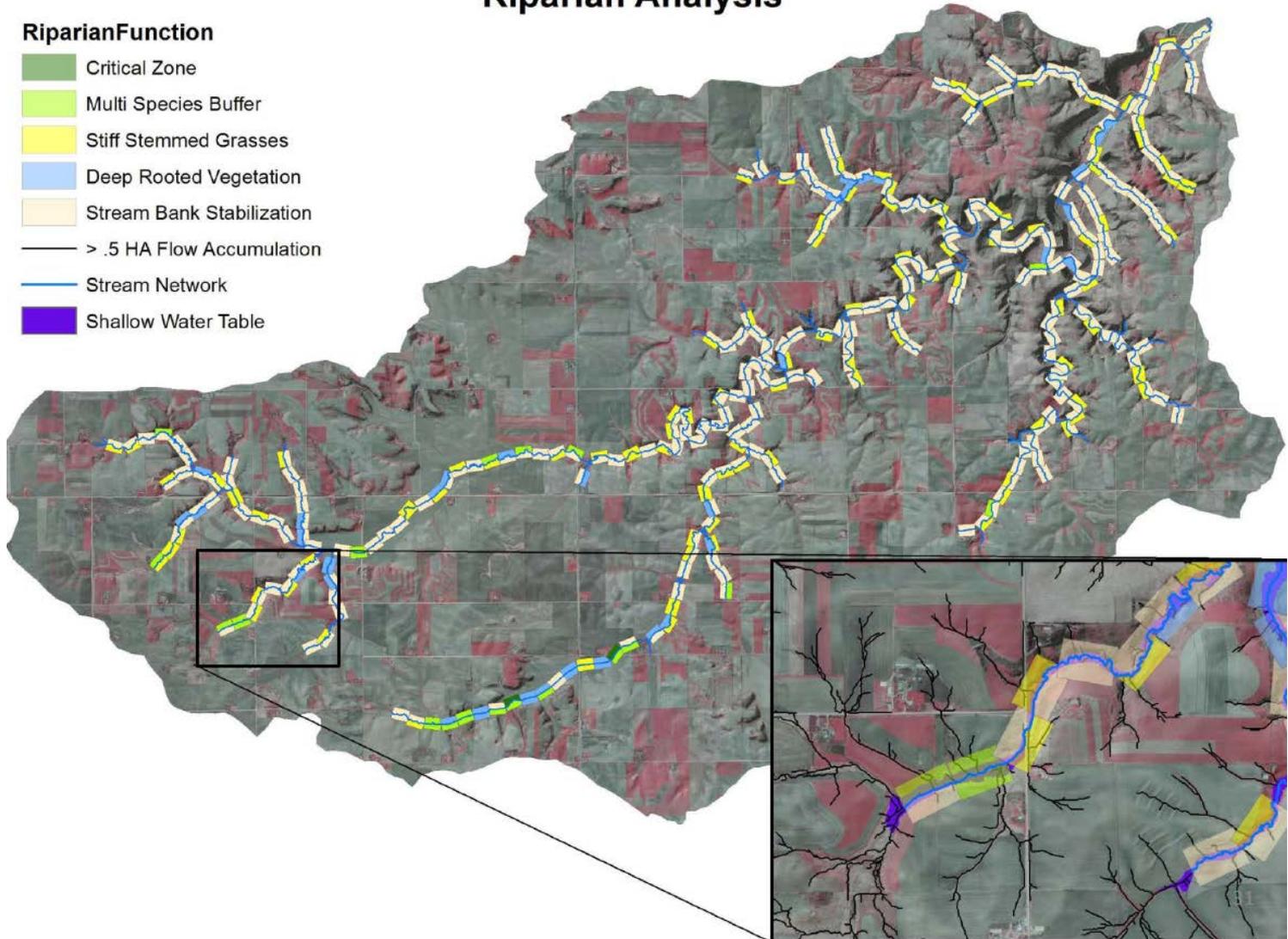
- Saturated buffers
- Riparian buffer designs

Example Output

Riparian Analysis

RiparianFunction

-  Critical Zone
-  Multi Species Buffer
-  Stiff Stemmed Grasses
-  Deep Rooted Vegetation
-  Stream Bank Stabilization
-  > .5 HA Flow Accumulation
-  Stream Network
-  Shallow Water Table



Example Output

Impoundments

Sediment Control Basin

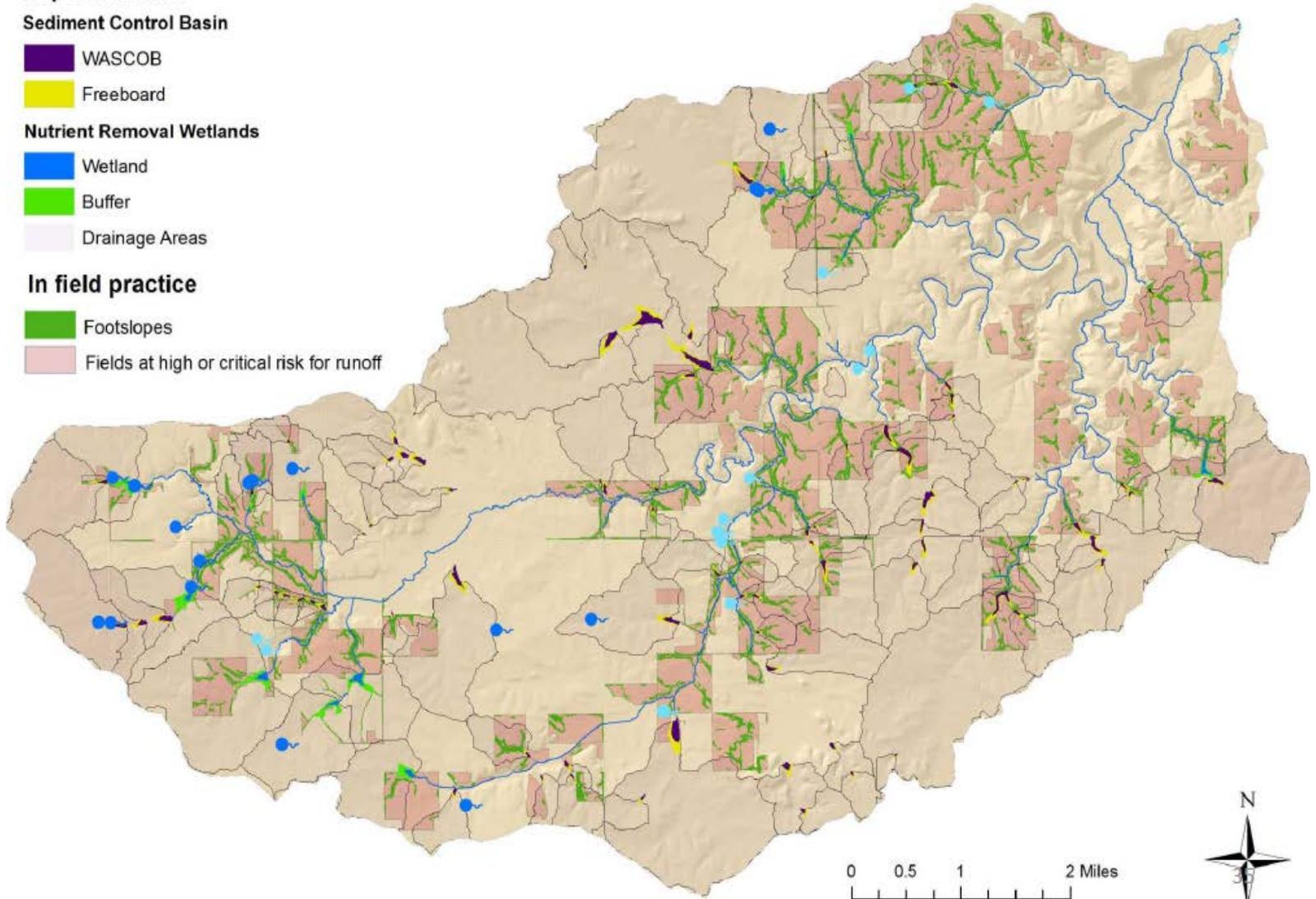
- WASCOB
- Freeboard

Nutrient Removal Wetlands

- Wetland
- Buffer
- Drainage Areas

In field practice

- Footslopes
- Fields at high or critical risk for runoff



Project Goal

Test the usefulness of the ACPF in Minnesota
and
help local conservation staff decide
whether and how to use the ACPF

Project Funded by

THE MCKNIGHT FOUNDATION

Project Activities

May and August 2015

- Trained 39 GIS-capable staff from around MN

September to January 2016

- Trainees applied the ACPF to their watersheds

February 2016

- Interviewed ACPF users

Results: Requirements

Software:

- Advanced version of ArcGIS

Time:

- 2-10 days for hydroconditioning
- <1 day to run the siting tools

Expertise

- Moderate GIS skills
- Local field knowledge

Results: What users liked

- User-friendly
- Flexible, easy to match local needs
- Tools for hydro-conditioning and defining watershed boundaries
- Ready-to-use databases
 - Soils
 - Field boundaries
 - Land use (6 year cropping history)
- Farm-field basis
- Slope and runoff risk maps

Results: Uses of the ACPF

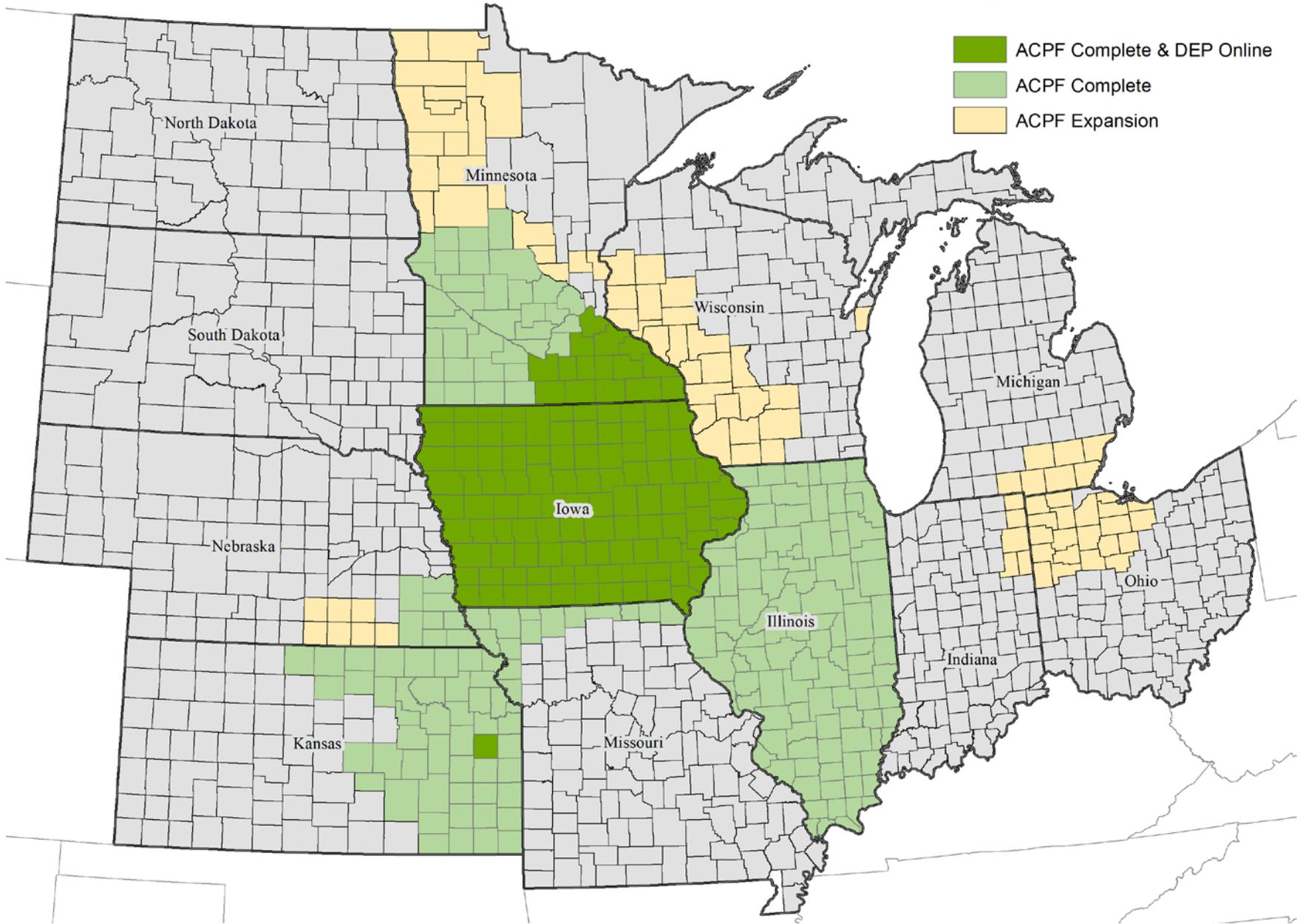
- Encourage conservationists to do outreach to high-impact sites
 - Use the runoff risk map to identifying high-priority areas
- Support work with individual landowners
 - Prepare for conversations
 - Illustration during conversations
- Target CREP money with the water storage tool
- Plan and justify funding proposals.
 - Quantify the potential for implementation.
- Use the buffer tool to refine buffer needs

Current Projects

EPA and NRCS/ARS funded training projects

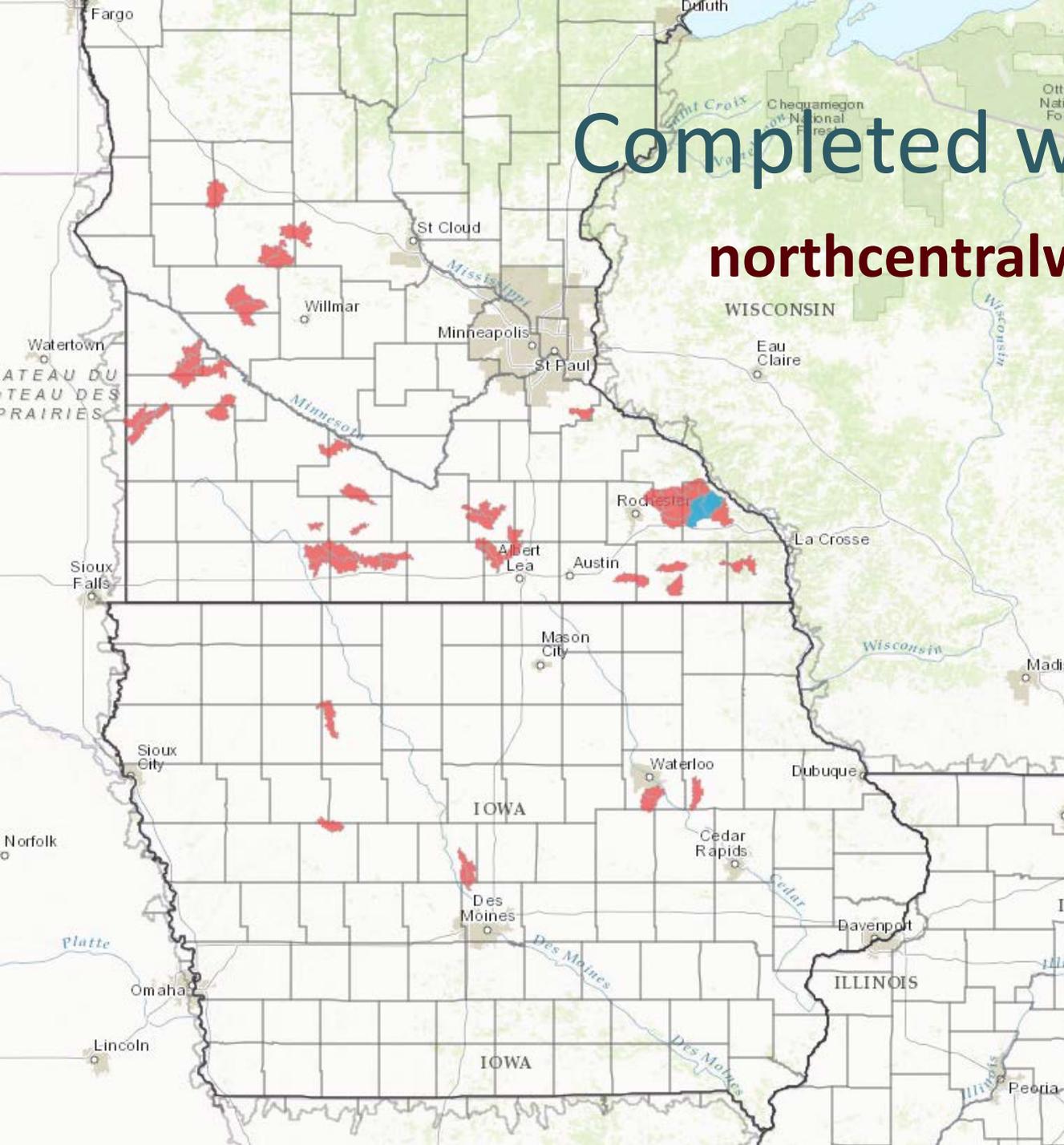
- Collaboration of UM WRC, UW Extension, Purdue, ARS-Ames
- Interviews with ACPF users across Midwest
- Training on using the ACPF as part of a watershed approach to conservation
- Technical training

ACPF Database Coverage



Completed watersheds

northcentralwater.org/acpf



Summary

ACPF identifies specific opportunities for conservation practices → informed decisions

Relatively easy to use

Barriers:

- Advanced version ArcGIS
- Time needed to prepare DEM

Local expertise is important

Acknowledgements and Contacts

Project funding from the McKnight Foundation

Thanks to Jessica Nelson, Joel Nelson, Les Everett,
and local cooperators

Project reports: z.umn.edu/acpf

Download the ACPF: northcentralwater.org/acpf

Ann Lewandowski, alewand@umn.edu



Water Resources Center