A Green Infrastructure Plan for the Black Earth Creek Watershed

BECWA Fall Informational Meeting

November 1, 2022

Mike Rupiper and Steve Gaffield

EOR water ecology community

CAPITAL AREA rpc

Beginnings of an idea…

Flooding Impacts on the Watershed

Black Earth Creek Watershed Association Fall Event

Tuesday October 22 | 7 – 9 PM

Cross Plains Fire Station, Bourbon Road, Cross Plains, WI

What Can We Do to Create A Healthy Watershed Amid Climate Change?

A year after epic flooding and catastrophic damage in the Black Earth Creek valley dramatically highlighted the interconnectedness of our watershed communities, join us as we explore what we can do together to mitigate the impacts of climate change on living, working, and recreating here.

Panel A: Flooding Impacts on Farming Viability & Trout Populations

- Bob Duhr, Watershed Farmer & Business Owner
- Dan Oele, Wisconsin DNR Fisheries Biologist

Panel B: Flooding Impact on Communities & What Can Be Done?

- Bill Chang, Village of Cross Plains Administrator
- Michael Rupiper, Environmental Resources Planning, Capital Area Regional Planning Commission

Co-sponsored by BECWA, Gateway to The Driftless, Groundswell Conservancy, and Southern Wisconsin Trout Unlimited

Light refreshments will be served

Black Earth Creek Green Infrastructure Plan

Motivation for the Plan

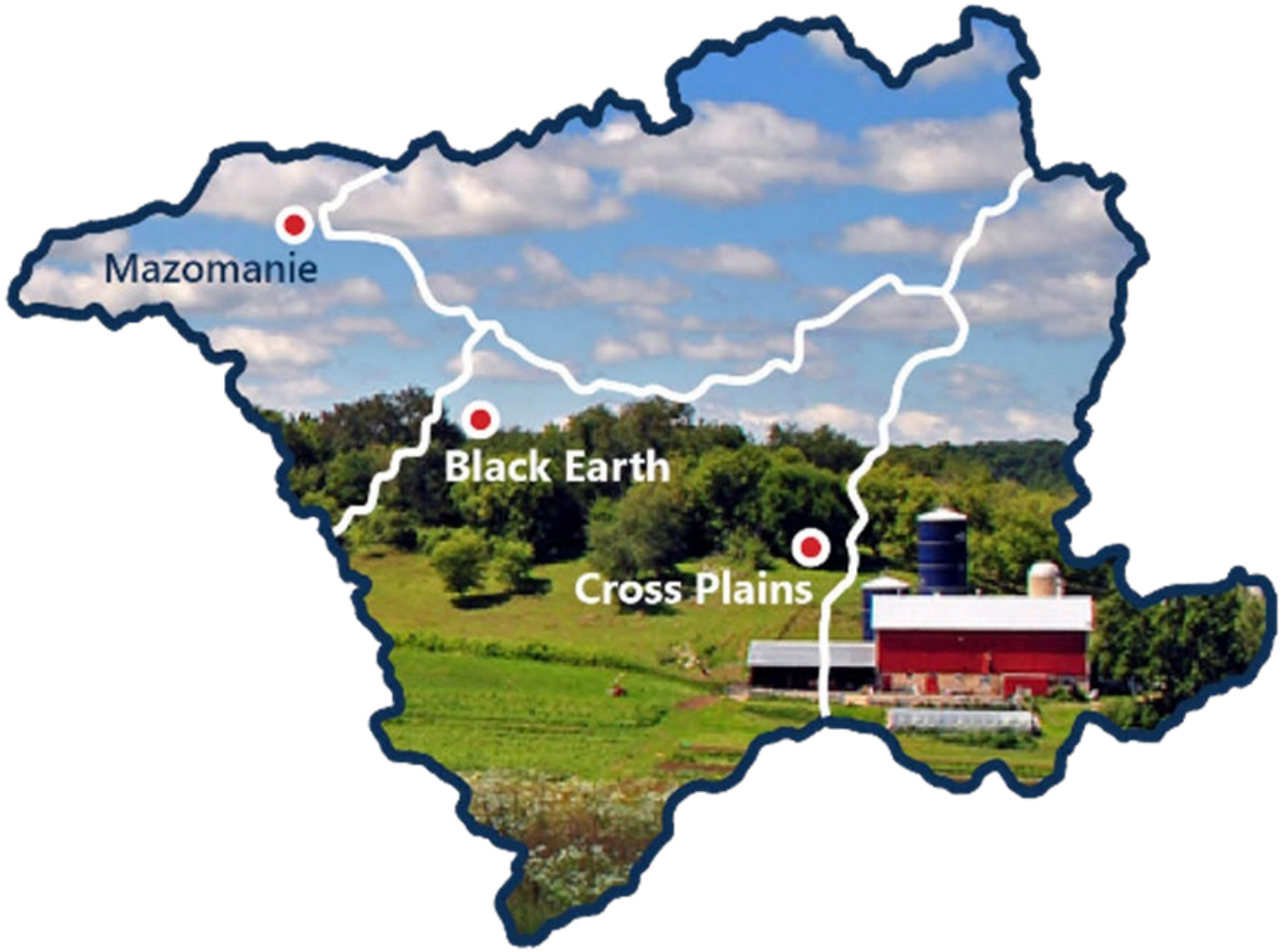
Class 1 trout stream

Flood hazard to communities

Black Earth Creek Green Infrastructure Plan

Funding

- $150,000 - WEM / FEMA Natural Hazard Mitigation Planning Grant
- 12.5% Local match provided by CARPC staff costs
- U.S. Army Corps of Engineers–Silver Jackets watershed modeling



Black Earth Creek Green Infrastructure Plan

Steering Committee

PROJECT PARTNERS:

Village of Cross Plains

DANE COUNTY

MAZOMANIE
LIVE OUTSIDE

GATEWAY TO THE DRIFTLESS

Town of Cross Plains
Established 1846

GROUNDSWELL CONSERVANCY

The Nature Conservancy

CAPITAL AREA rpc

TROUT UNLIMITED SOUTHERN WISCONSIN

US Army Corps of Engineers

Consulting Team

EOR water ecology community

SAND COUNTY FOUNDATION

SILVERNAIL STUDIO FOR GEODESIGN

Goal

To identify specific *projects* and *practices* that provide a quantifiable level of **flood protection** to communities, **water quality benefits** to Black Earth Creek and its tributaries, and **recreational, economic, and ecological benefits** to the watershed as a whole.

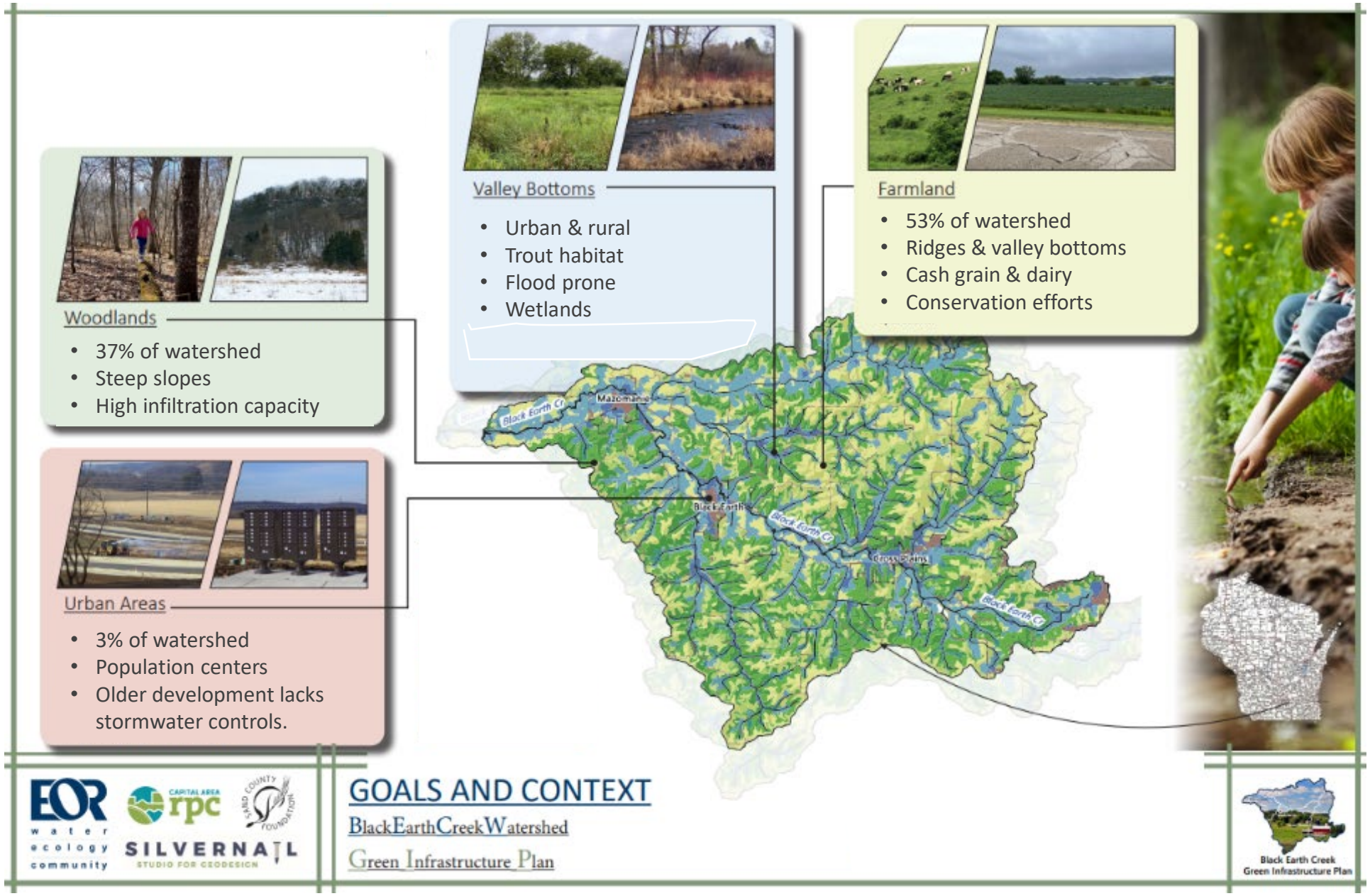
Black Earth Creek Green Infrastructure Plan

Green Infrastructure Approach

1. **Greenways:**
   Vegetated drainageways can slow down runoff and provide water quality and ecological benefits.
2. **Raingardens/Bioretention:**
   These shallow, vegetated basins collect and infiltrate runoff from rooftops, sidewalks, streets, etc. to reduce storm runoff.
3. **Tree Trenches/Urban Forest Enhancements:**
   Urban trees can intercept water in their canopies and infiltrate water in their root zones, reducing storm runoff.
4. **Greenroofs:**
   Vegetated roofing systems with live plants and a growing medium over a waterproof barrier reduce runoff, keeps buildings cooler in summer, and provides aesthetic and ecological benefits.
5. **Bioswales:**
   These vegetated channels are designed to safely slow down stormwater runoff to reduce peak runoff rates, reduce pollutants and runoff volume through infiltration, and provide aesthetic and ecological benefits.
6. **Porous Payment:**
   Paved surfaces designed to allow water to infiltrate through them to an underlying storage layer can reduce runoff and remove pollutants.
7. **Native Landscaping:**
   The deep roots of native plant species can enhance water infiltration into the soil, reducing stormwater runoff while providing habitat and aesthetic value.
8. **Rain Barrels/Cisterns:**
   Stormwater can be collected for reuse for irrigation, toilet flushing and industrial processes, reducing storm-water runoff and conserving potable water supplies.
9. **Green Alleys/Streets/Parking Lots:**
   Integrated stormwater management systems incorporating vegetation, soil, and engineered elements (e.g., permeable pavement) slow, filter, and cleanse stormwater runoff.
10. **Urban Floodplain/Stream Restoration**
    A connected, functional floodplain attenuates floods, dissipates energy, enhances water quality and stream and wetland habitat, and retains water during periods of high flow and releases it back into the stream when flows are lower. Urban green space also provides recreational and aesthetic benefits.

1. **Farm Ponds:**
   Ponds formed by excavation or embankments are commonly used as water sources for livestock or irrigation and can also detain runoff and remove some pollutants.
2. **Water and Sediment Control Basins:**
   Basins formed by an embankment across a drainageway detain runoff and trap sediment from farmland, reducing downstream flooding and improving water quality.
3. **Wetland Restoration:**
   Restoring drained wetlands can detain and infiltrate runoff, storing floodwaters, improving water quality and providing valuable habitat.
4. **Floodplain and Oxbow Restoration:**
   A connected, functional floodplain attenuates floods, dissipates energy, enhances water quality and stream and wetland habitat, and retains water during periods of high flow and releases it back into the stream when flows are lower. Oxbow lakes provide valuable habitat and water quality benefits.
5. **Saturated Buffers:**
   Areas of perennial vegetation between agricultural fields and waterways are designed to capture tile outlet drainage and distribute water along the buffer, which absorbs water and removes nitrate.
6. **Terraces:**
   Earthen structures transform long slopes into a series of shorter slopes, intercepting runoff, slowing runoff, reducing erosion, and improving downstream water quality. They can also provide cover for wildlife.
7. **Prairie Strips:**
   Strategically placed strips of native perennial vegetation (grasses and forbs) within farm fields retain rainfall while capturing soil and nutrient runoff & enhancing biodiversity.
8. **Cover Crops:**
   Rotating cover crops with annual crops can reduce soil disturbance and maintain living plant cover, reducing runoff and nutrient losses while enhancing agricultural resilience.
9. **Native Plant Vegetation:**
   Deep-rooted native plants build deep, permeable soils that enhance infiltration and reduce runoff while enhancing biodiversity.
10. **Soil Health Improvements**
    Managing for soil health reduces erosion and Improves water quality, maximizes water infiltration to reduce flooding, improves nutrient cycling, saves money on inputs, and improves resiliency of farmland.

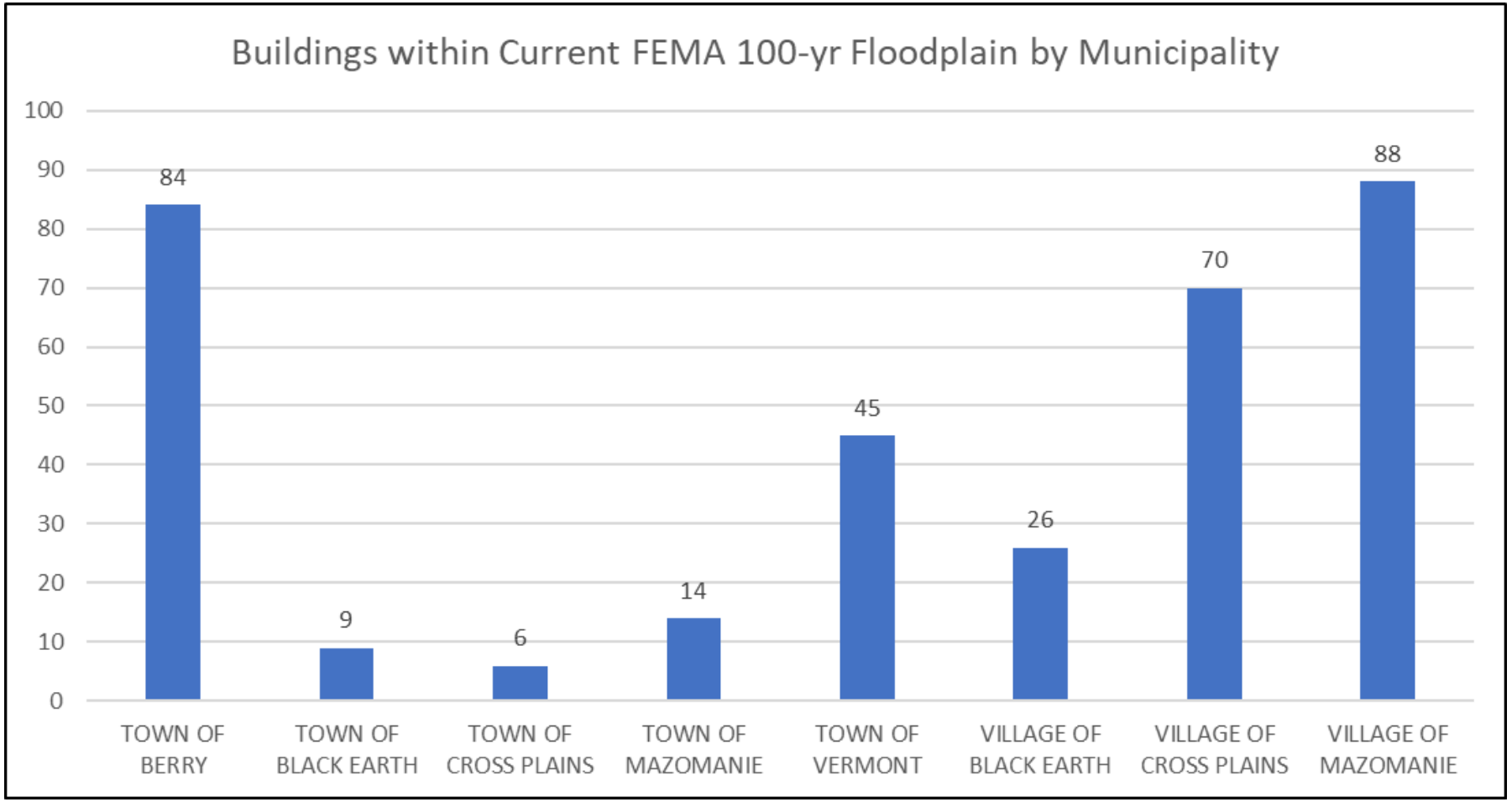
Watershed Context



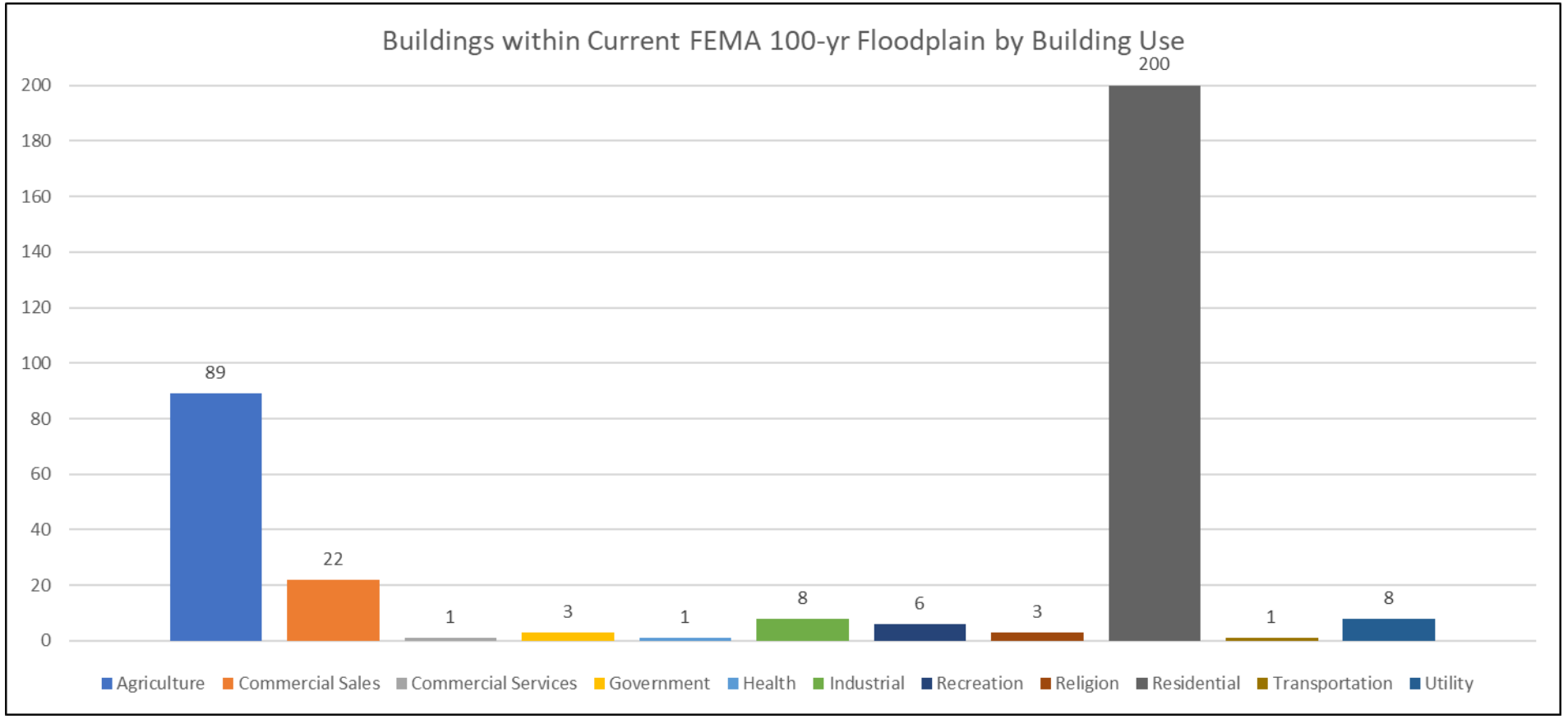
Public Engagement

- Steering committee
- Open house in Black Earth
- Black Earth Community Field Day table
- Three public webinars
- Pizza night with farmers
- Cover crop seminar & coffee
- Calls, emails & mailings
- ArcGIS Hub site

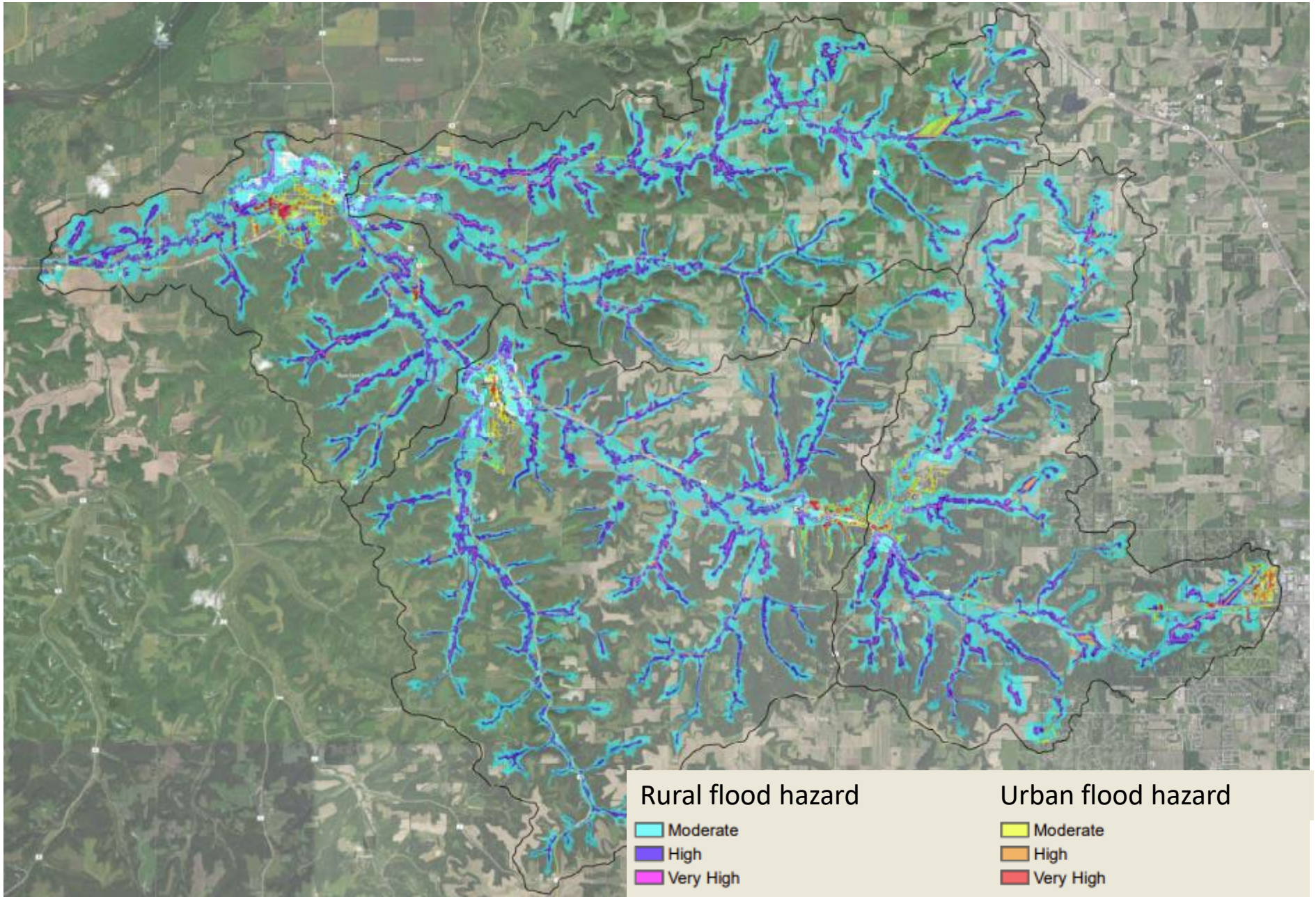
Flood Vulnerability



Flood Vulnerability



Flood Vulnerability



Recommendations

URBAN AREAS

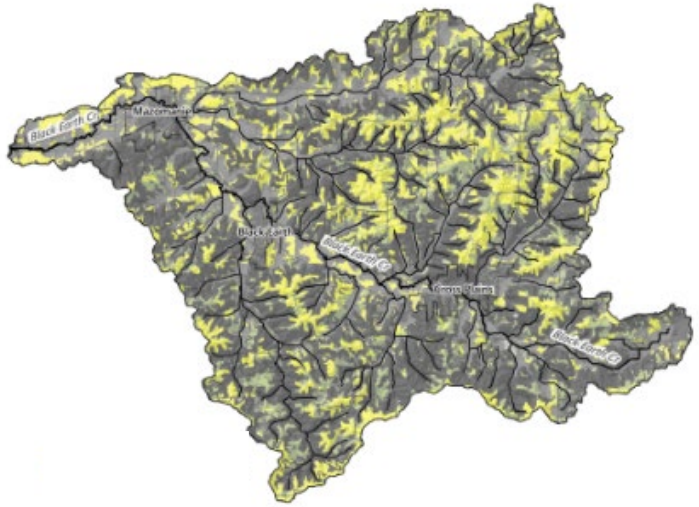
1. Permeable pavement: large footprint
2. Stormwater infiltration: variety of practices & benefits
3. Downspout disconnection: simple & effective
4. Rainwater harvesting & reuse: irrigation, toilet flushing, industrial processes.

- Ambitious scenario: treat 35-50% of impervious surfaces
- Peak flood flow reduction 0-4% on main stem of creek
- Local benefits greater
- Water quality benefits

Recommendations

FARMLAND

1. Cover crops: maintain root networks & reduce runoff
2. No till or reduced till: reduce soil disturbance & runoff
3. Prairie strips: infiltrate & filter water, enhance biodiversity
4. Native vegetation: transition marginal farmland

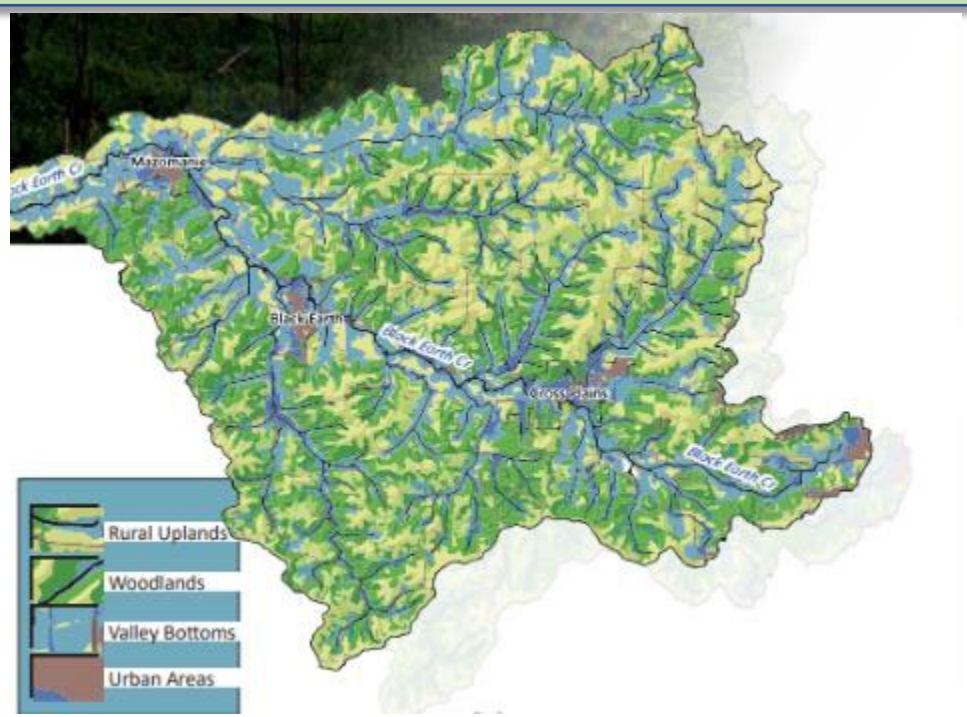


GI Practice	Peak Flow Reduction
Cover crops	4 – 16%
Cover crops + no-till	6 – 21%
Prairie strips	2 – 9%

Recommendations

WOODLANDS

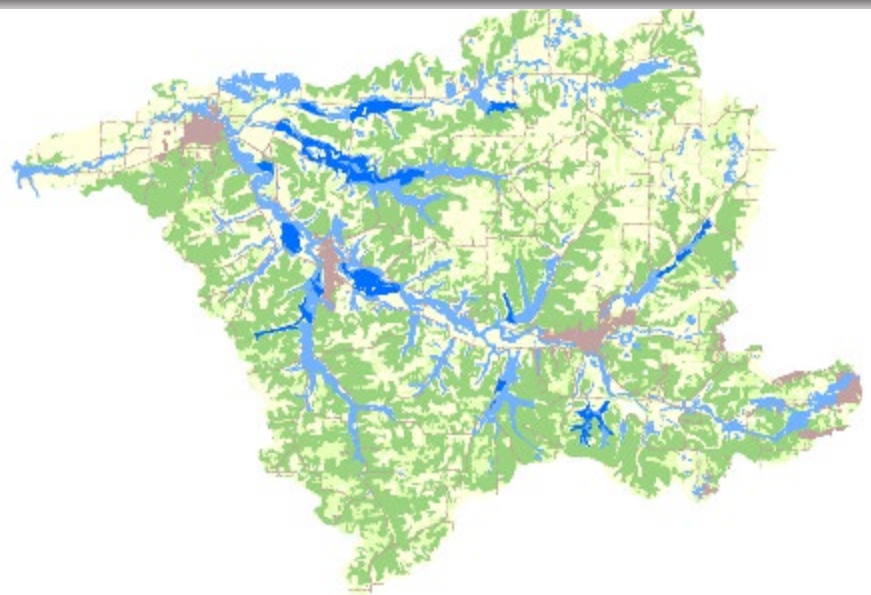
1. Manage to maintain hydrologic & ecological functions
2. Consider in floodplain & wetland restoration plans



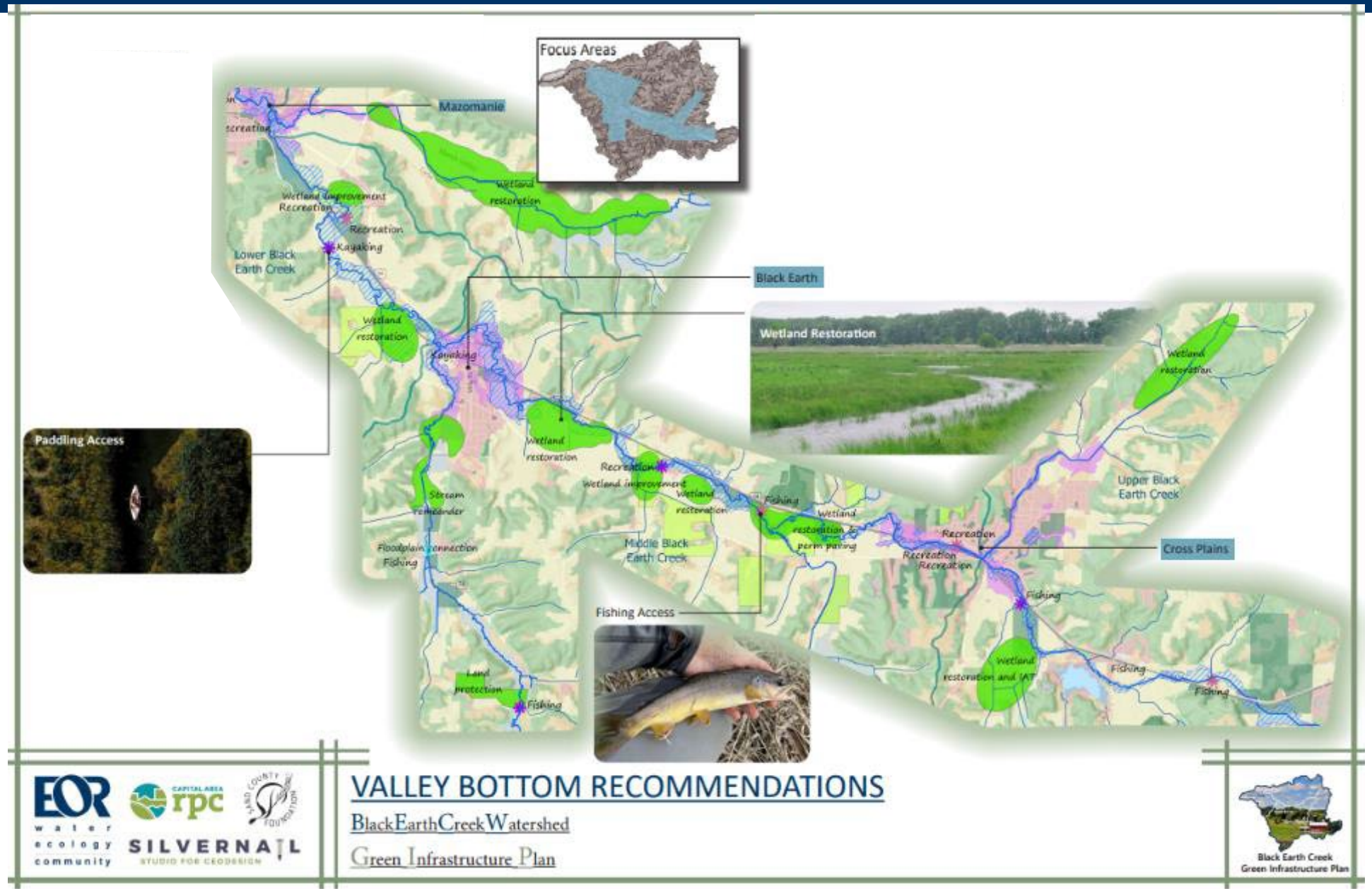
Recommendations

VALLEY BOTTOMS

1. Wetland restoration: store & infiltrate floodwater, improve water quality & habitat
2. Floodplain restoration: attenuate flood peaks, dissipate energy, improve water quality & habitat



Valley Bottoms



Flood Abatement Benefits

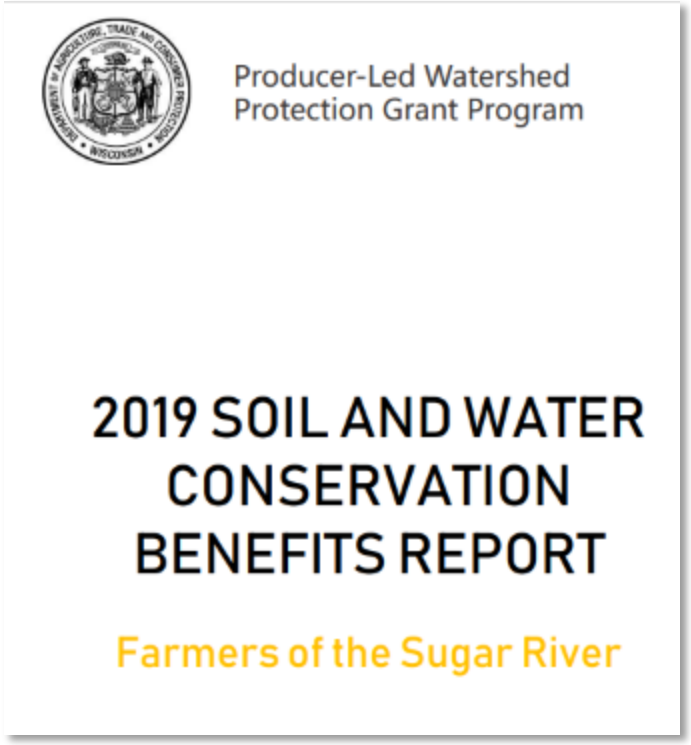
Modeled mid-range flood reduction estimates

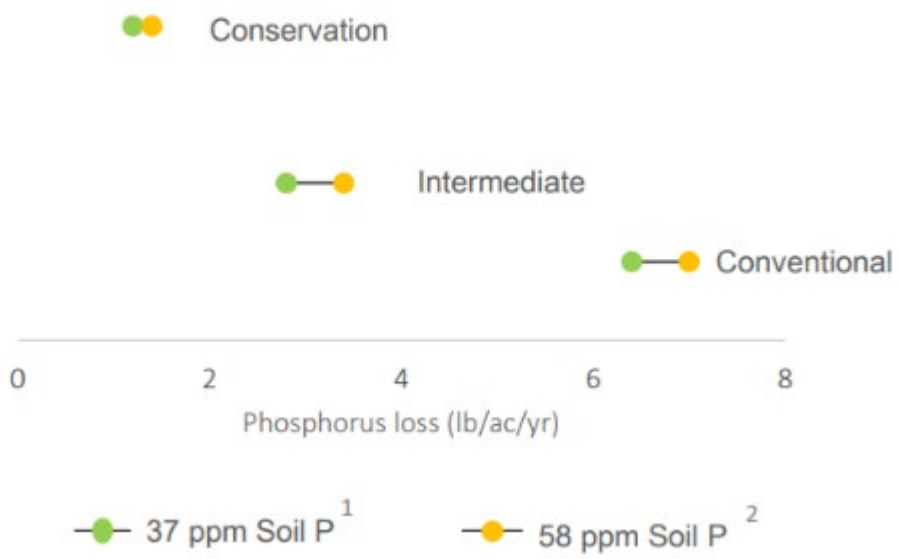
GI Scenario	Peak Flow	Flooded Area
100% cover crop + no-till	9%	5%
100% prairie strips	5%	3%
Wetland restoration (top 9)	2%	2%
Urban stormwater controls	2%	1%
Theoretical Potential Combine all 4 above	19%	10%
Ambitious but more realistic implementation	5-10%	3 – 5%

A 10% reduction in 100-yr discharge on the main stem would remove 22 structures from the floodplain (17.5% decrease).

Water Quality Benefits

- Nonpoint sources create 98% of phosphorus load (*Adaptive Mgmt. Plan*)
- Converting 800 – 1600 ac to conservation rotations could achieve state phosphorus criterion
- Urban & valley bottom GI would also reduce nutrient load





Social & Economic Benefits

- Reduced flooding of structures
  - $7 – 19M based on FEMA cost-benefit values
- FEMA ecosystem services values
  - Millions $ / year for new valley bottom green infrastructure and existing forests
- Fishery value ~ $4M / year (*based on Trout Unlimited data*)
  - Restoration efforts make anglers more likely to fish in Driftless Area
- Recreational trails have generated several million $ / year & raised adjacent property values
- Urban
  - Not enough information to quantify
  - GI can be less expensive than gray infrastructure

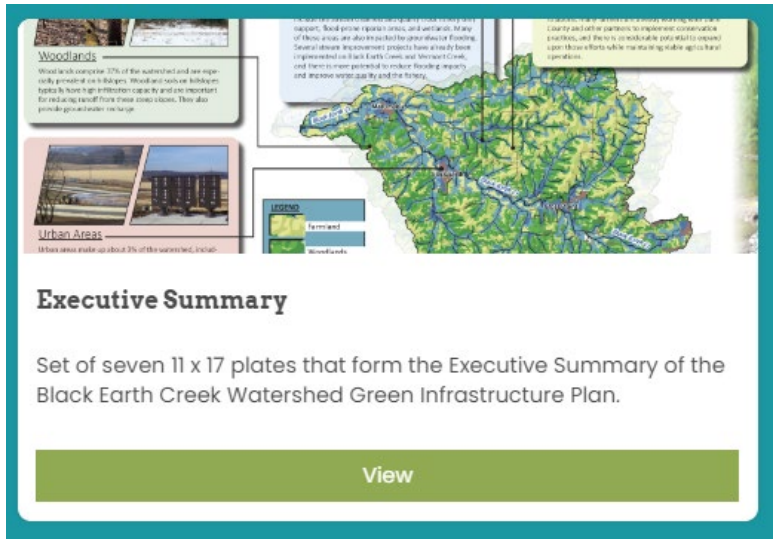
Implementation

Setting	5-Year Goals
Urban Areas	Treat 2% of impervious cover each year, to mitigate 10% of currently untreated impervious surfaces in 5 years, focusing on high-impact stormwater outfalls to the creek.
Farmland	Increase acres of cropland with soil health improvement practices by 25% per year, with a total of approximately 3000 acres in 5 years.
Valley Bottoms	Implement 3 new stream/floodplain/wetland restoration projects along Black Earth Creek, including 1 of the priority wetland restoration sites. Stream reaches with high potential for near-term implementation include (1) from Cross Plains to Salmo Pond and (2) from Wisconsin Heights school to the Village of Black Earth. These also present opportunities to incorporate extensions of existing multi-use trails. Develop a plan with WisDOT to alleviate impacts of STH 14 on floodplain routing during future highway reconstruction projects.

Black Earth Creek Green Infrastructure Plan

Plan website and WEM approved plan

https://becw -gi-carpc.hub.arcgis.com/



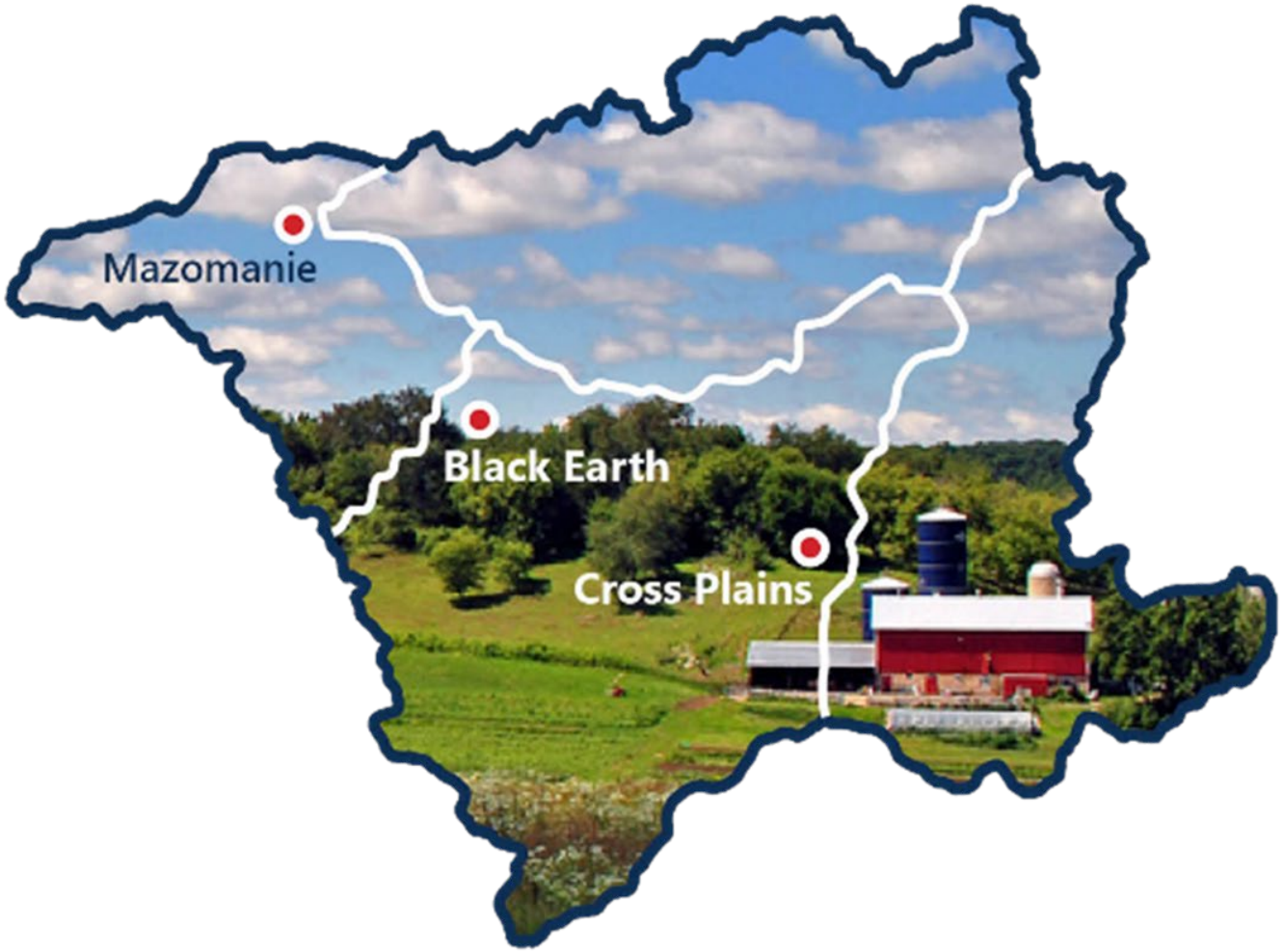
Executive Summary

Full Plan

Black Earth Creek Green Infrastructure Plan

Next Steps

- Landowner outreach & partnership building
- Green infrastructure project identification
- Funding applications
- Design & construction
- Monitoring & maintenance



Thank you