Collaborative Geodesign in Practice

Len Kne

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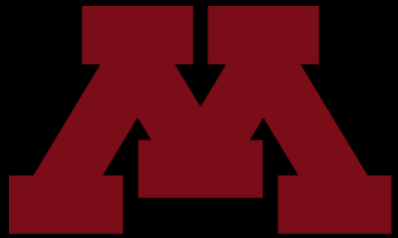


Transdisciplinary Team

• David Pitt	Landscape Architecture
• Bryan Runck	Geography
• Carissa Slotterback	Policy
• Nick Jordan	Agro Ecology
• David Mulla	Soil Science
• Mike Reichenbach	Adult Education
• Len Kne	GISci and Technology
• Many more…	

I’m the geek

points
lines
polygons

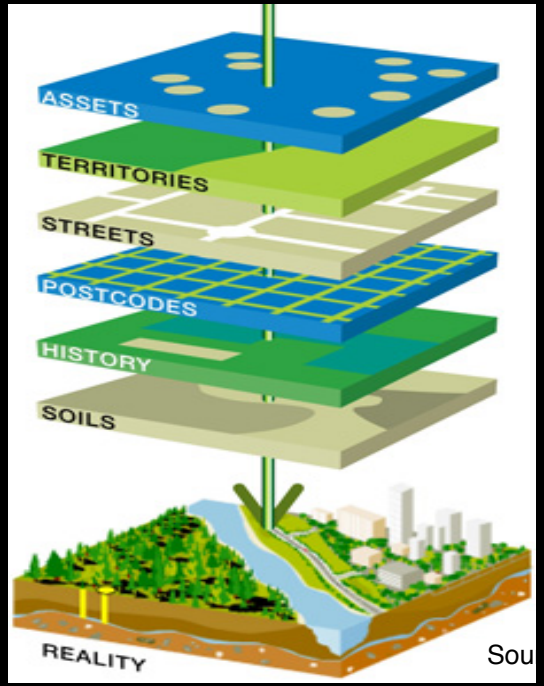
bits and bytes


U-SPATIAL
Support for Spatial Research

What is GIS?

A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information.

A GIS helps you answer questions and solve problems by looking at your data in a way that is **quickly understood and easily shared**.

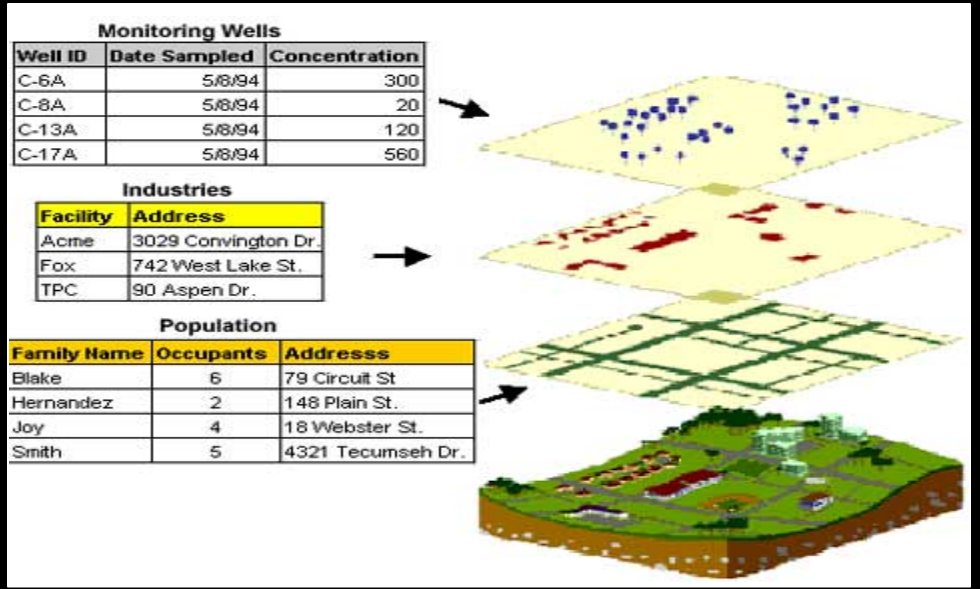


Layers

Main concept of GIS and representing reality

Pull apart themes

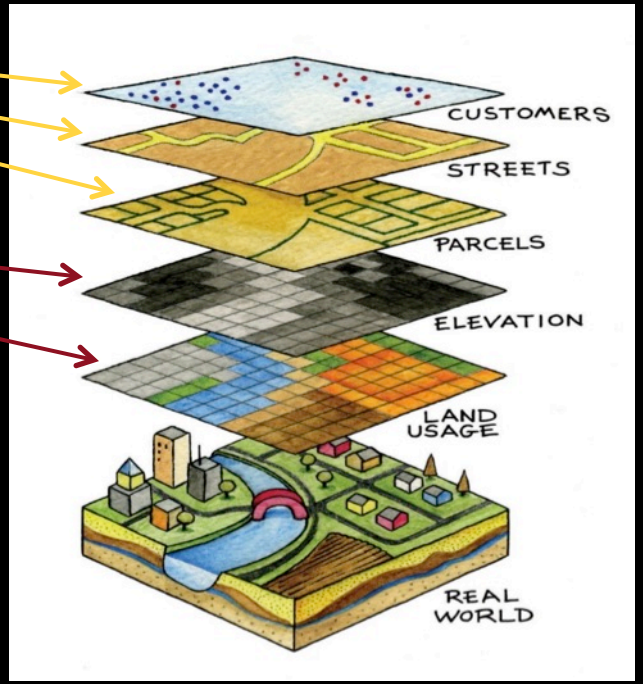
Each layer sits on top of another and has a unique relationship



Types of Spatial Data

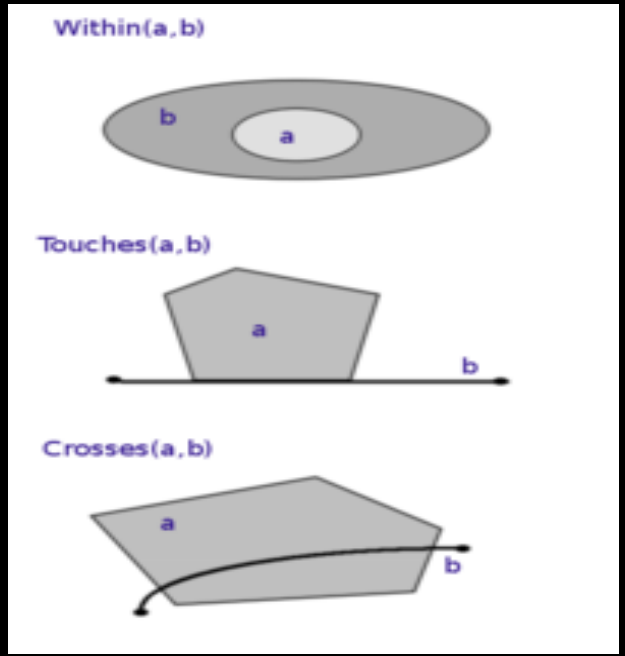
Vector Data

Raster Data



Spatial Relationships

Spatial relationships
define how these layers
interact with one another
“The Power of GIS”



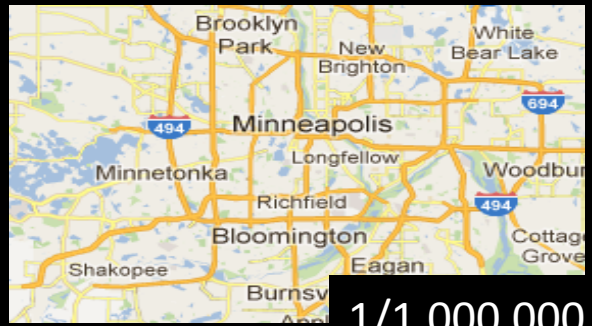
Scale

Real world to map representation

Spatial relationships are NOT affected by scale

Details are affected by scale and how entities are represented

1/10,000



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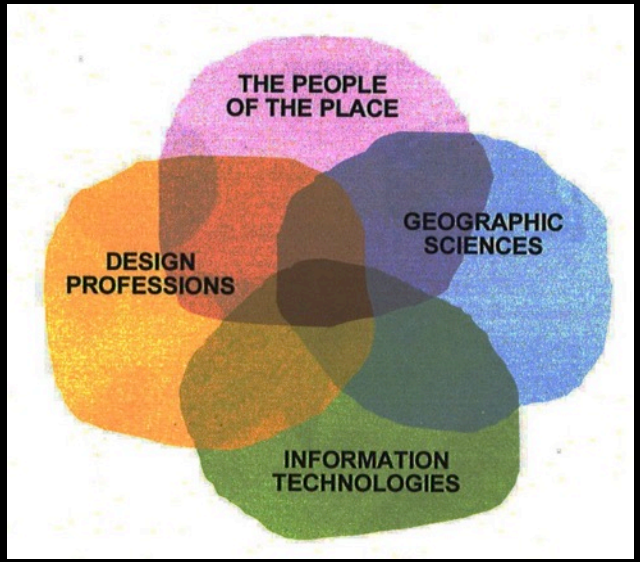
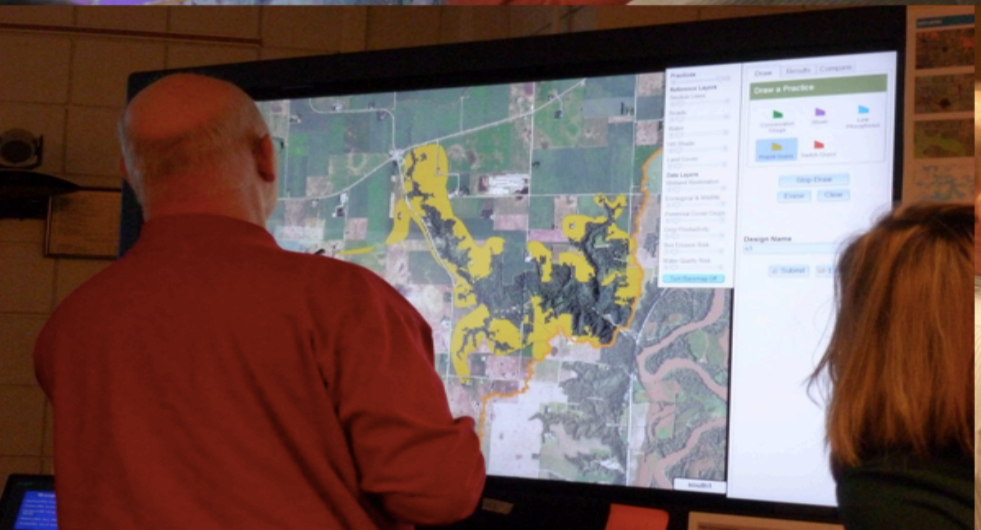
Definition of Geodesign



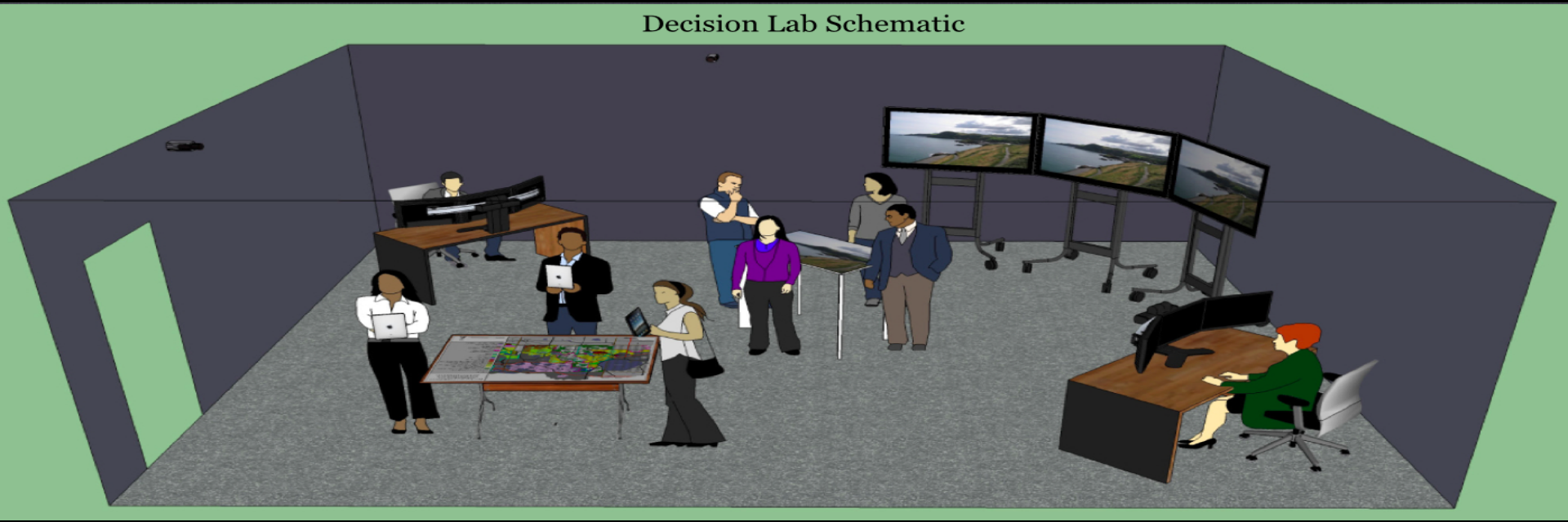
Geodesign requires collaboration among the design professionals, geographical sciences, information technologies, and the people of the place.

Carl Steinitz. 2012. A Framework for Geodesign: Changing Geography by Design. Redlands, CA: ESRI

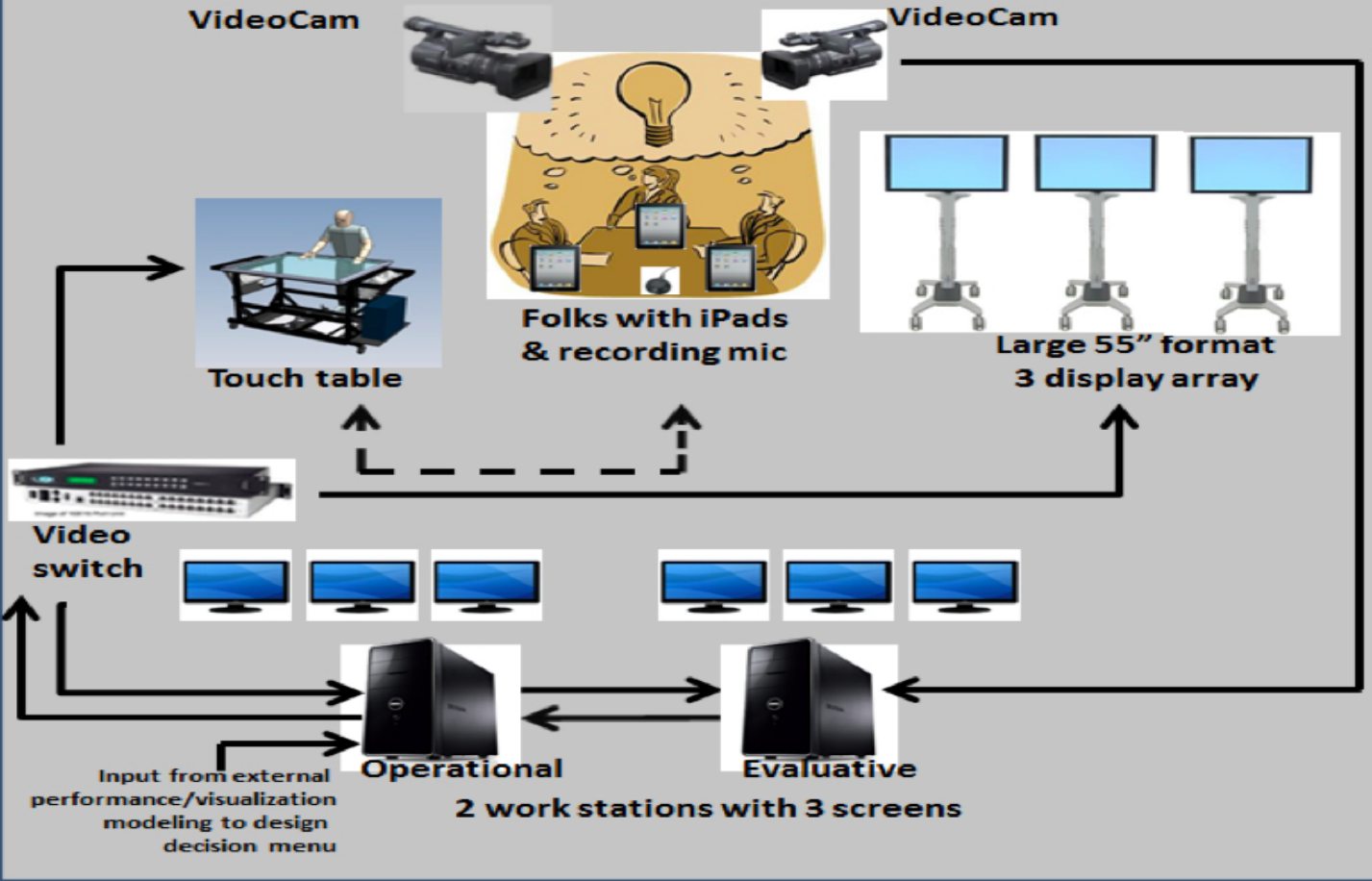
Stakeholder Engagement with Geodesign Technology



The Decision Lab



Decision Lab Module

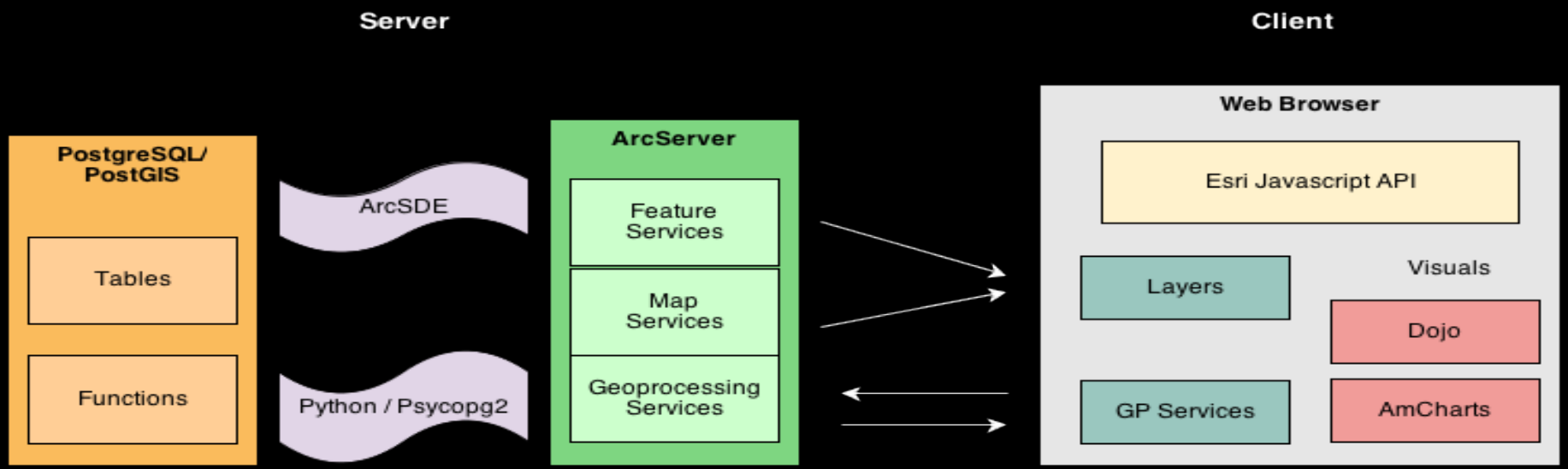


Th ab

Mobile Geodesign

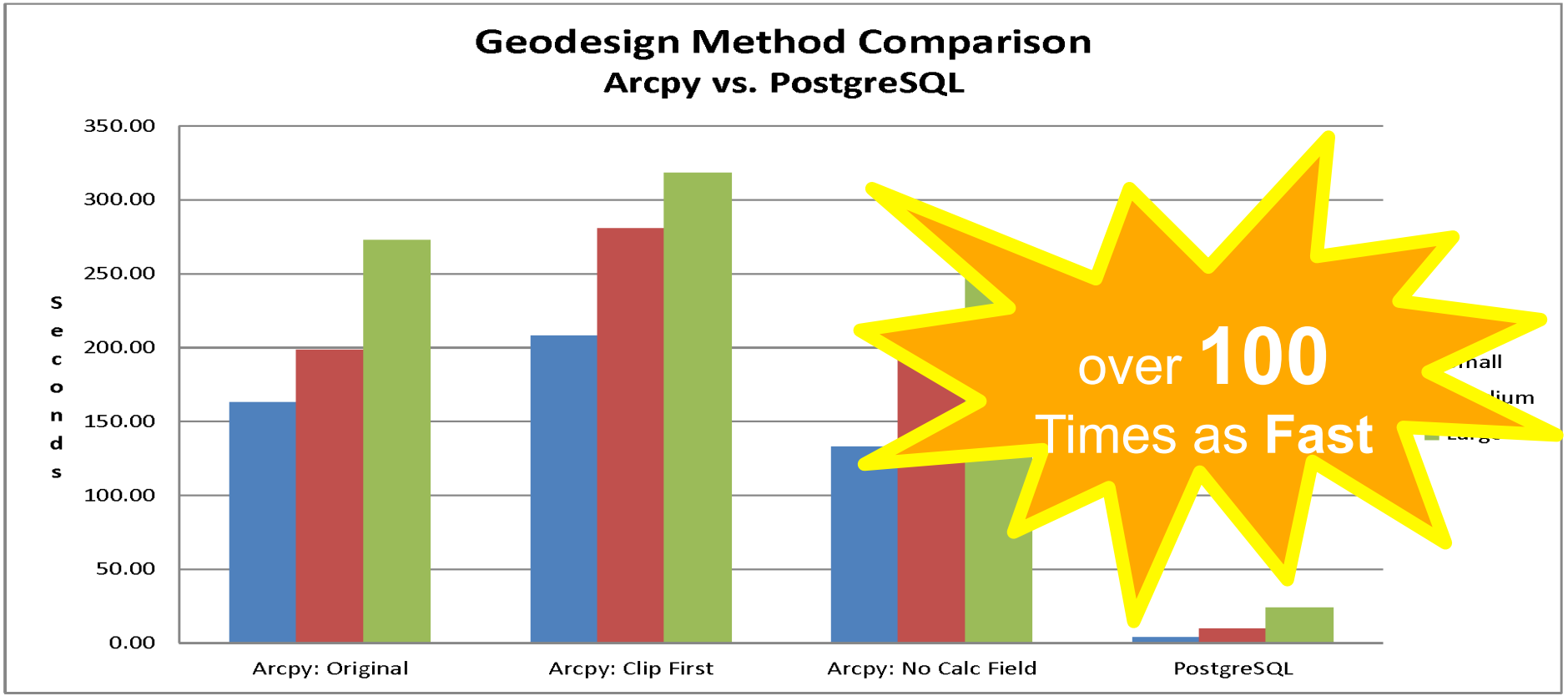
Mobile Geodesign

System Architecture



Courtesy: Kris Johnson

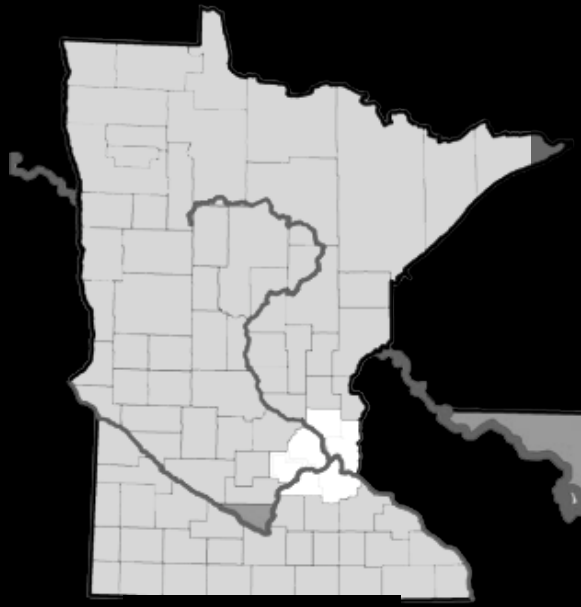
Model Method Time Test Results



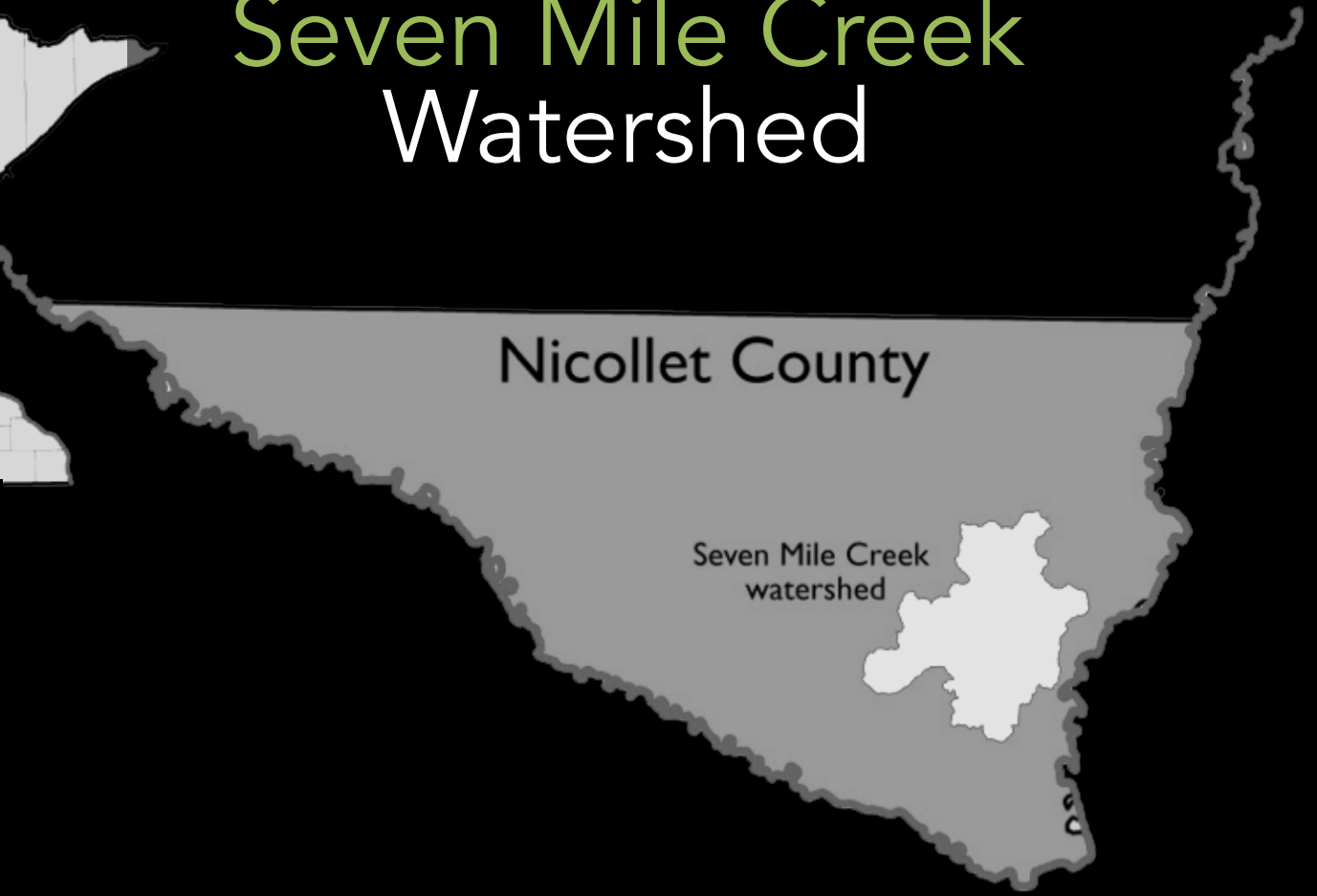
Courtesy: Kris Johnson

Case Study 1

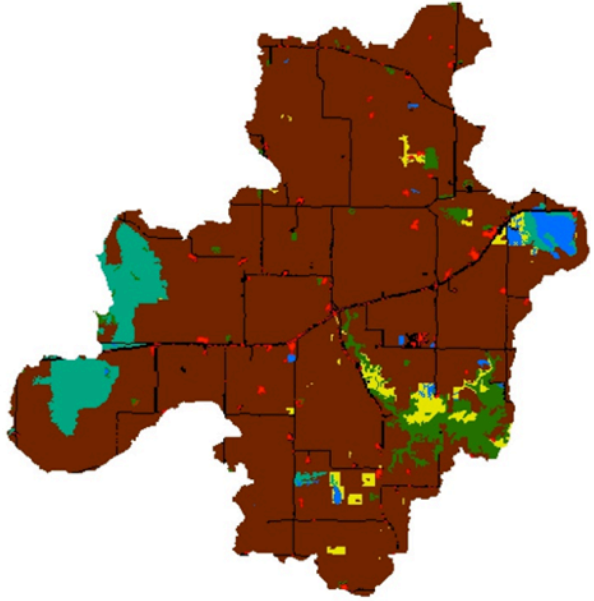
Seven Mile Creek Watershed



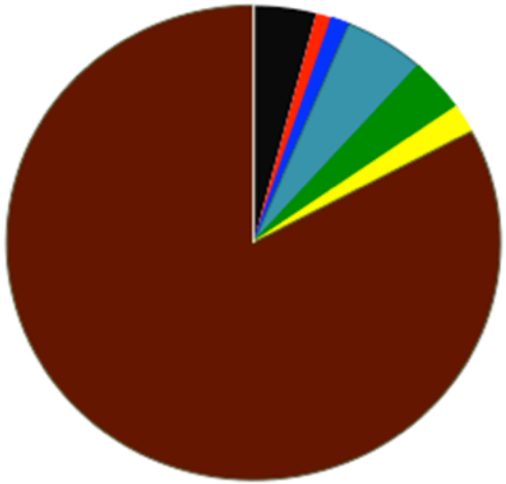
Minnesota



Current Land Use



Area 95 km^2



> 80% corn/soybean

- Roads
- Residential
- Water
- Wetland
- Forest
- Grassland
- Switchgrass
- Conventional tillage
- Conservation tillage
- Low P fertilizer

Land Cover >>> Water Quality

Solution? Strategic Biomass Production to Create Multifunctional Landscapes

Provide ecosystem services

- Water quality
- Biodiversity
- Food, fiber, fuel

Stakeholders' Goal: find win-win-win-wins

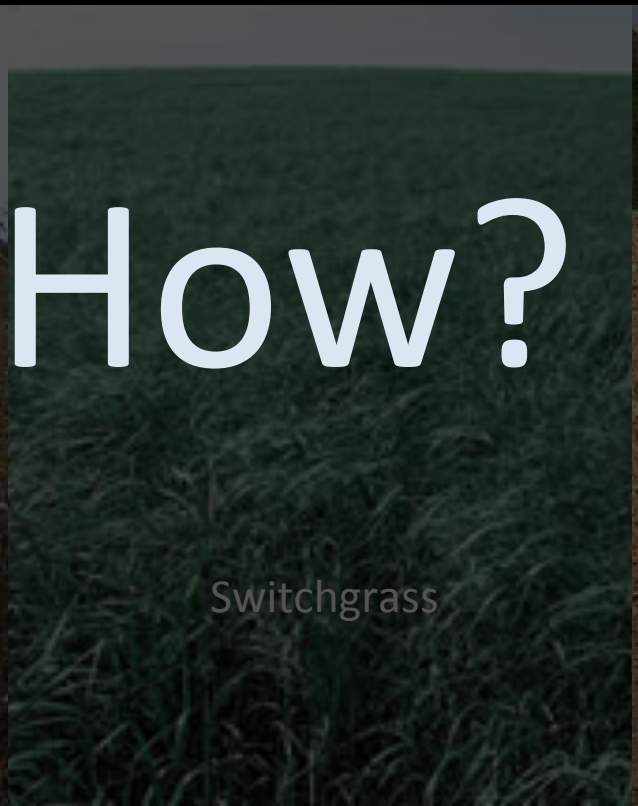
- ↓ TSS (SWAT modeling)
- ↓ Total P (SWAT modeling)
- ↓ Runoff (SWAT modeling)

- ↑ Habitat value (DNR modeling)
- ↑ Market return (UMN modeling)
- ↑ Landscape appearance of practices included in design
- ↑ Carbon sequestration (InVest modeling)

Solution? Land cover

Solution? Land cover

How?

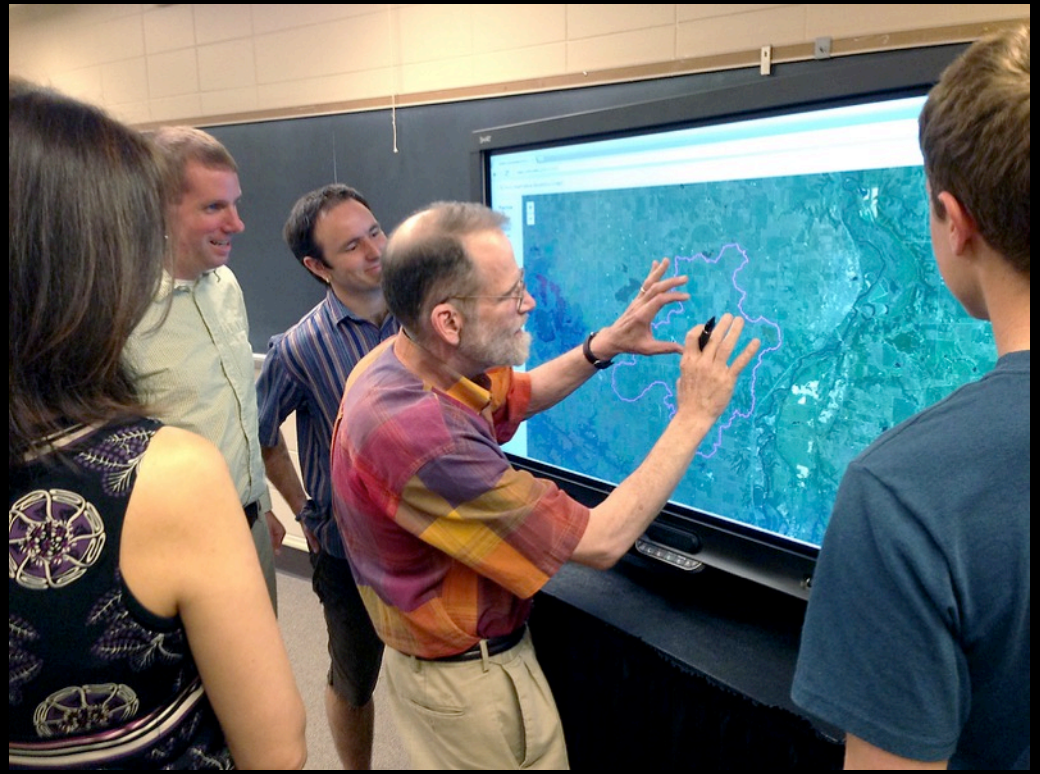


Solution? Land cover

Collaboration + Geodesign

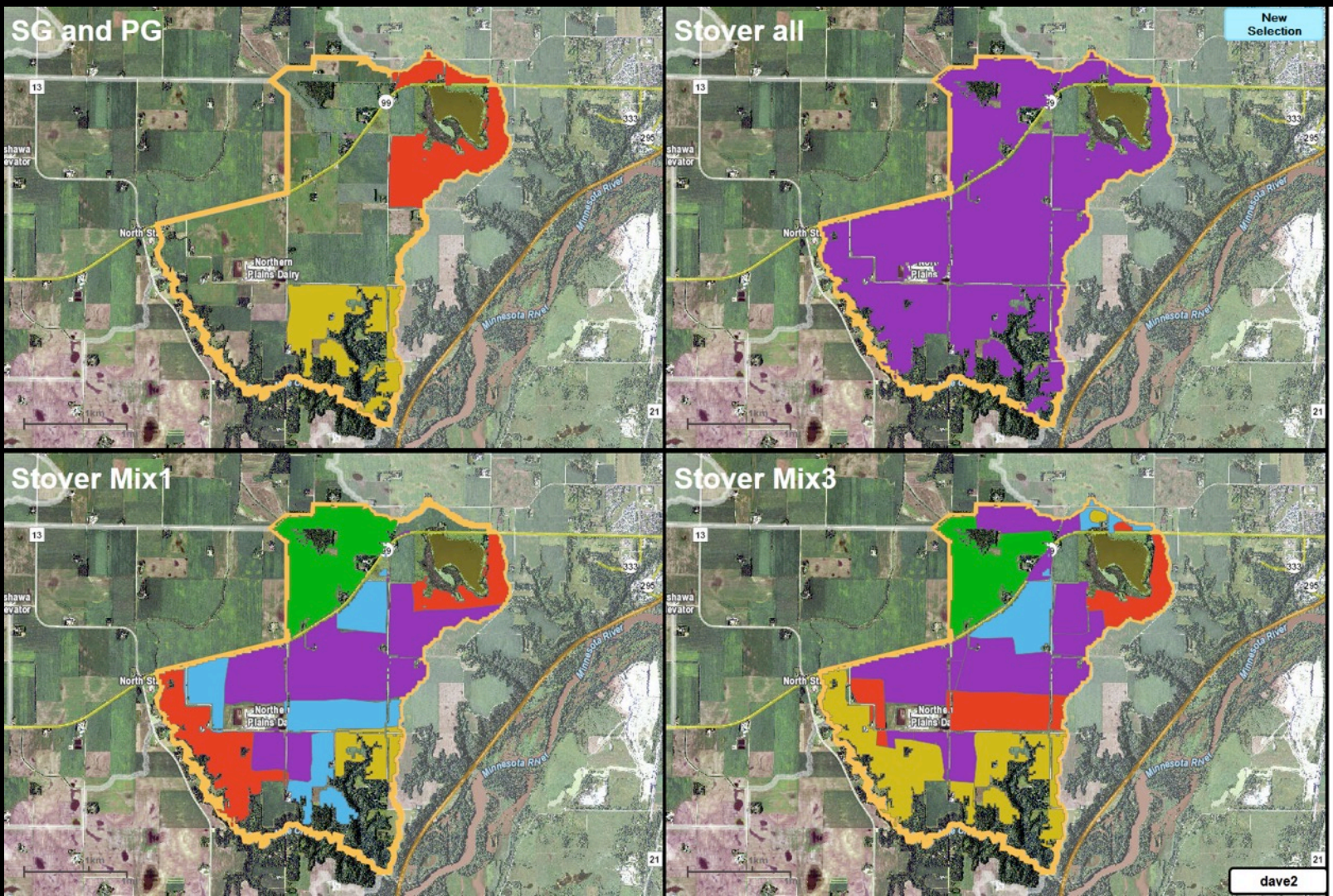
Collaborative Geodesign Workshops

- 8 meetings
  - 4 background
  - 4 with tool



Show video

- https://youtu.be/nXdW81Q7KyI?t=40s

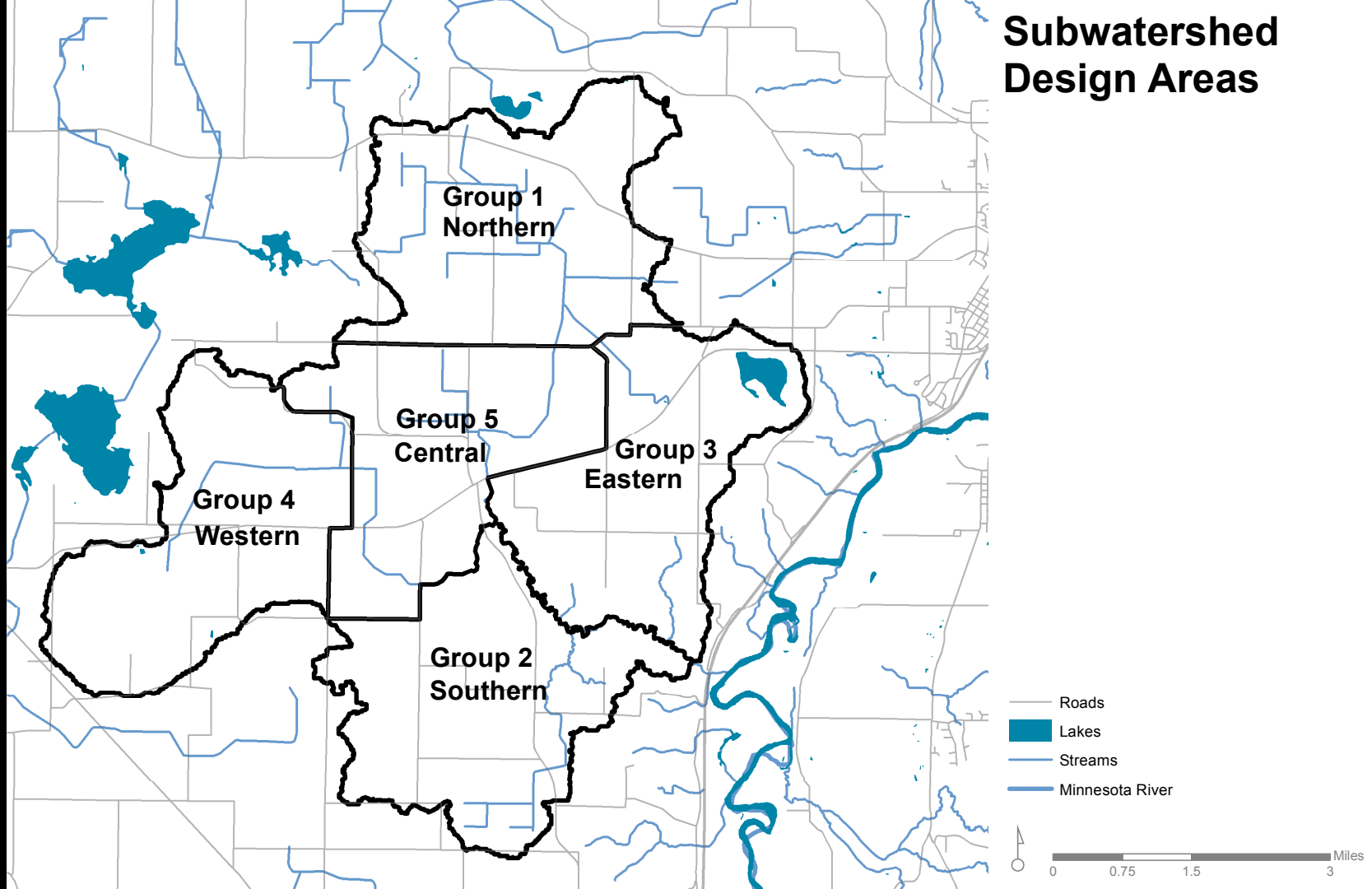

SG and PG
Stover all
New Selection
Stover Mix1
Stover Mix3
dave2
Draw
Results
Compare
Sediment (t/yr)
SG and PG: 277
Stover all: 472
Stover Mix1: 307
Stover Mix3: 219
Phosphorus (lb/yr)
SG and PG: 405
Stover all: 758
Stover Mix1: 434
Stover Mix3: 299
Water Yield (ft/yr)
SG and PG: 107
Stover all: 141
Stover Mix1: 105
Stover Mix3: 90
Habitat
SG and PG: 112,327
Stover all: 106,355
Stover Mix1: 111,851
Stover Mix3: 117,632
Carbon Sequestration (t/yr)
SG and PG: 230
Stover all: 0
Stover Mix1: 102
Stover Mix3: 368
Market Return ($/yr)
-75,173
Stover all: 151,081
Stover Mix1: 15,716
-33,946

Collaborative Geodesign Results

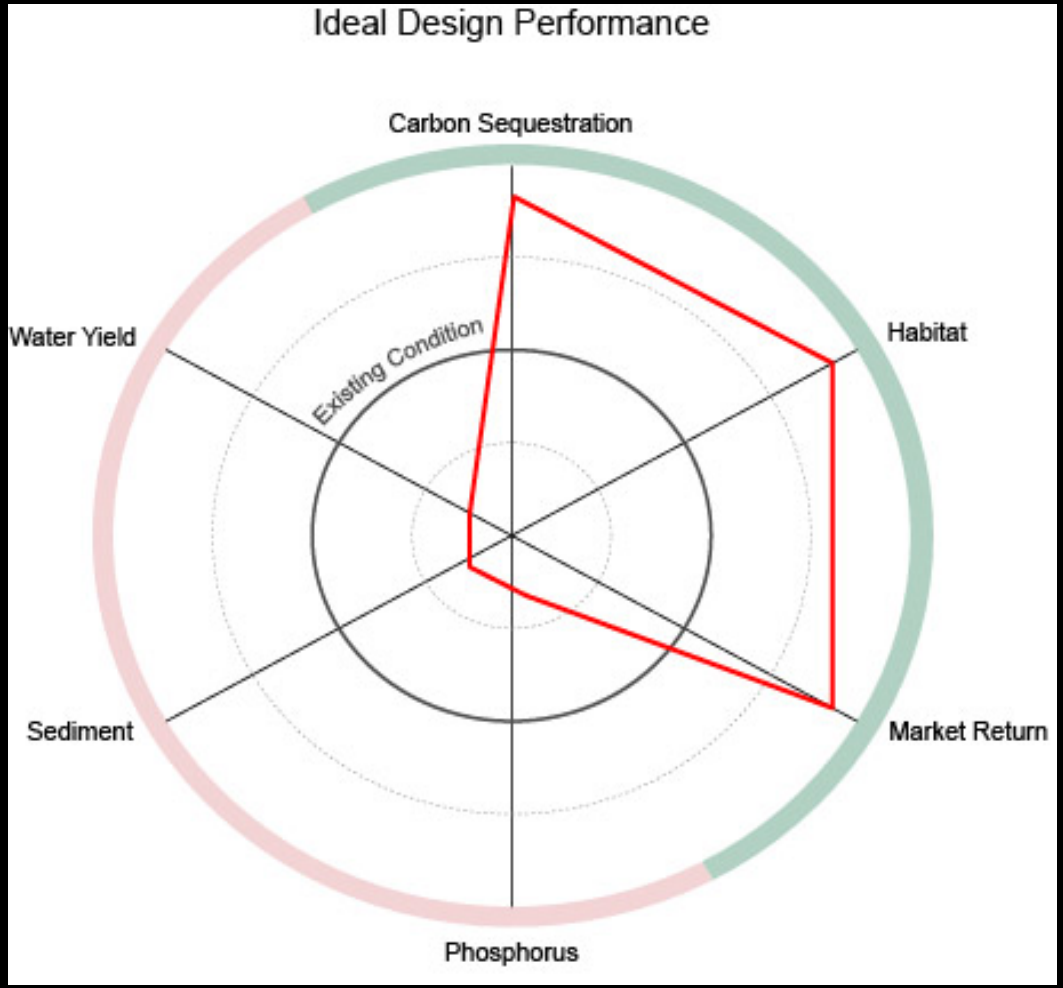
How did participants respond to the quantitative feedback and alter their designs?

Collaborative Geodesign Research

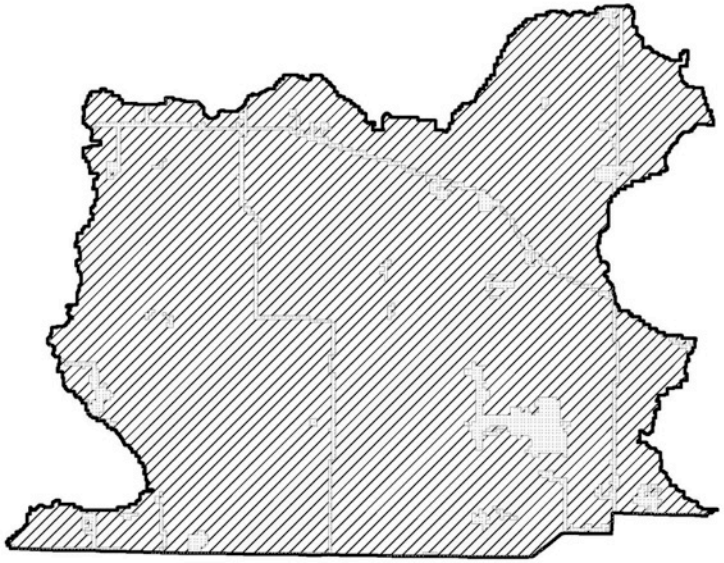
- 8 Surveys
- 2 Sets of interviews
- 1 focus group

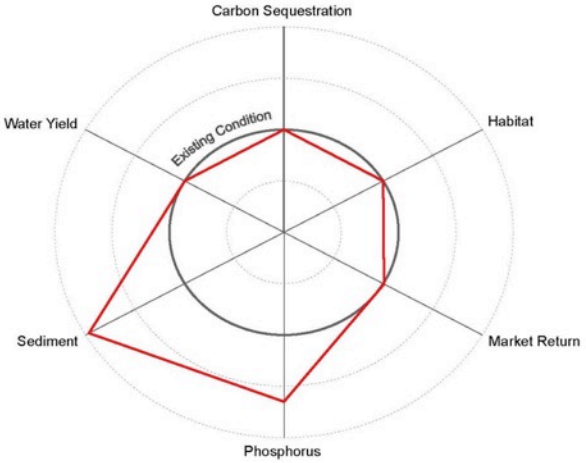

Subwatershed Design Areas
Group 1 Northern
Group 5 Central
Group 3 Eastern
Group 4 Western
Group 2 Southern
Roads
Lakes
Streams
Minnesota River
0
0.75
1.5
3
Miles

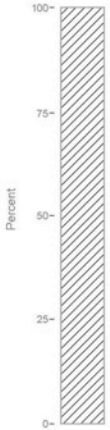
Win-Win
Win-Win
Win-Win



Group: 1 | **Design name:** North cons tillage all | **ID:** 1







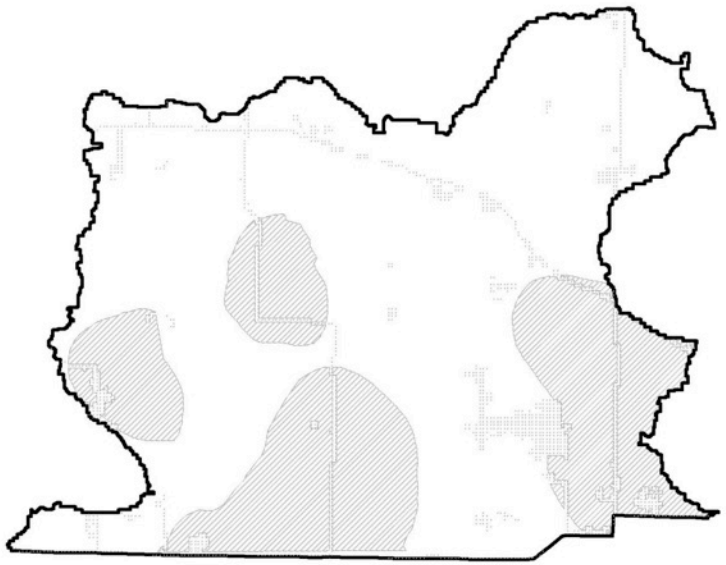
Land use practice

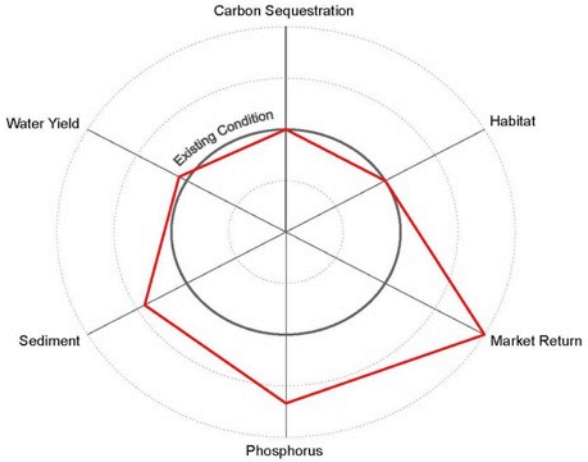
0 Corn
1 Conservation tillage
2 Stover
3 Low phosphorus
4 Prairie grass
5 Switchgrass
9 Non designable areas

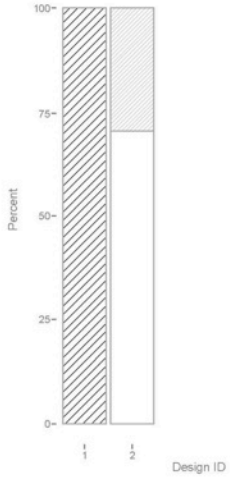
Miles
0 0.25 0.5 1

Bryan Runck

Group: 1 | **Design name:** north selective stover | **ID:** 2







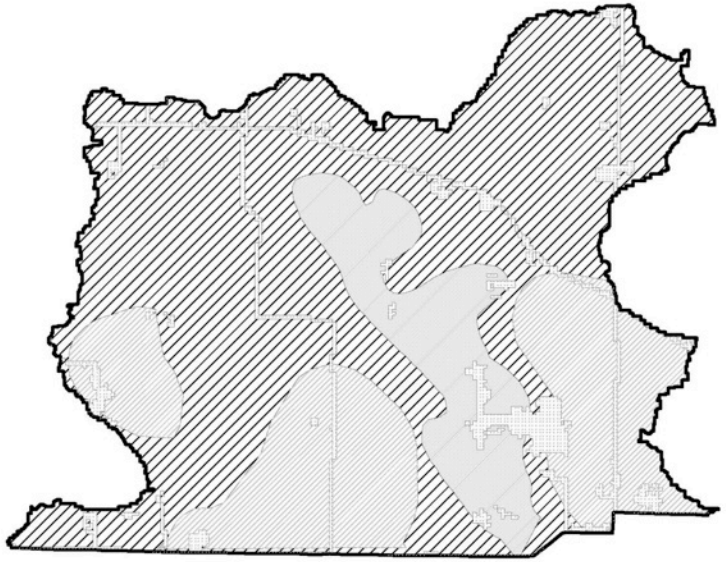
Land use practice

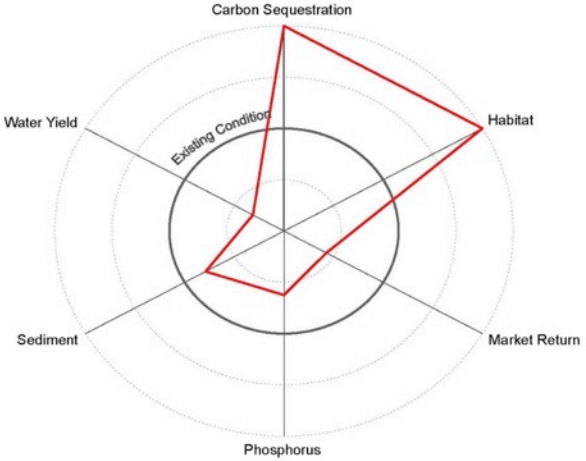
0 Corn
1 Conservation tillage
2 Stover
3 Low phosphorus
4 Prairie grass
5 Switchgrass
9 Non designable areas

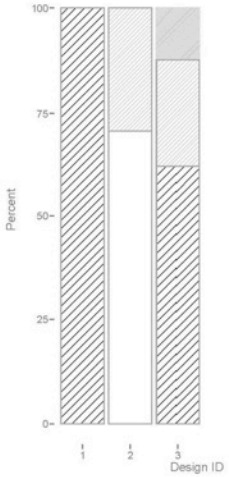
Miles
0 0.25 0.5 1

Bryan Runck

Group: 1	Design name: North cons tillage minus stover and prairie	ID: 3







Land use practice

0 Corn
1 Conservation tillage
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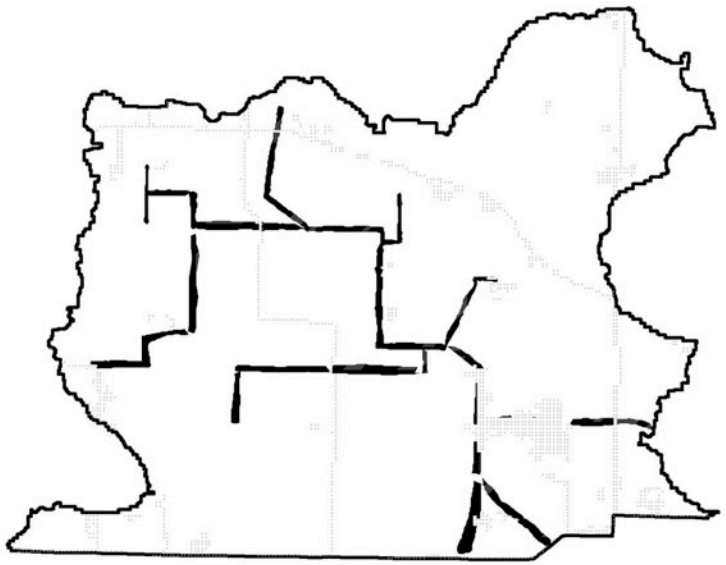
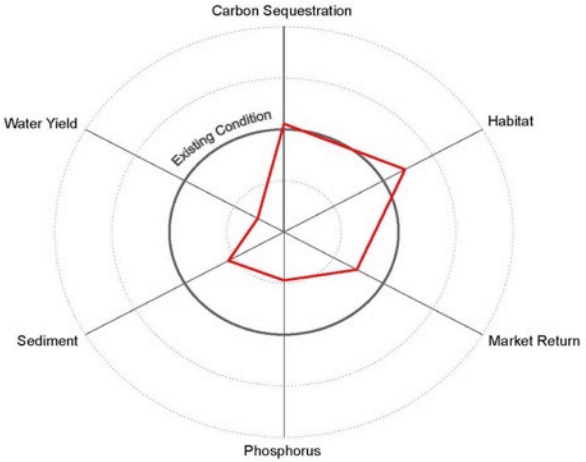
4 Prairie grass
5 Switchgrass
9 Non designable areas

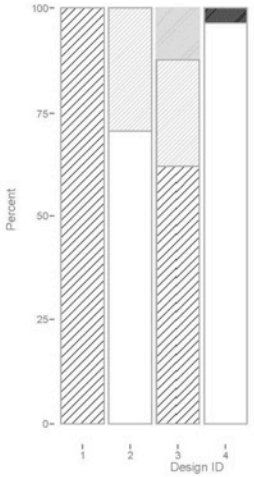
Miles
0 0.25 0.5 1

Bryan Runck

Group: 1	Design name: nbuffers	ID: 4







Land use practice

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1 Conservation tillage
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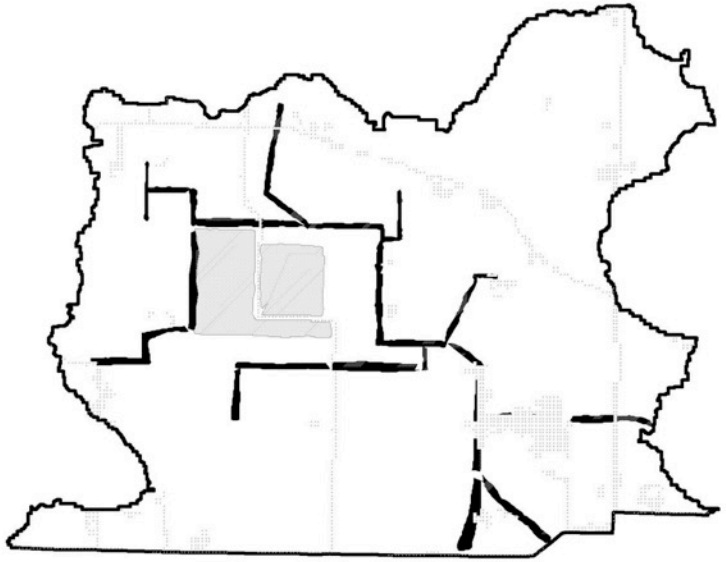
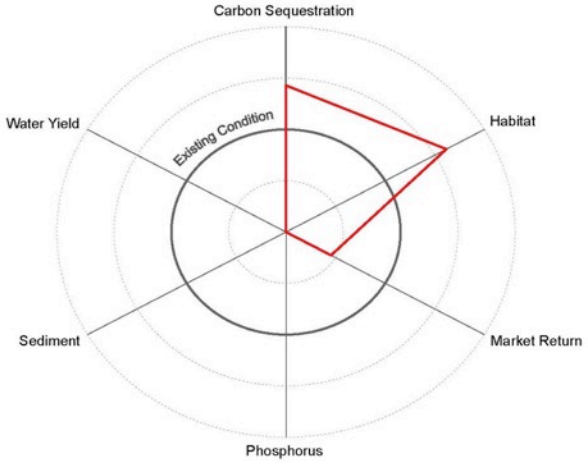
3 Low phosphorus
4 Prairie grass
5 Switchgrass
9 Non designable areas

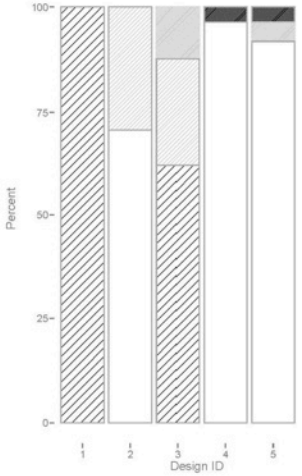
0 0.25 0.5 1 Miles

Bryan Runck

Group: 1	Design name: nbuffers.PG	ID: 5







Land use practice

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3 Low phosphorus
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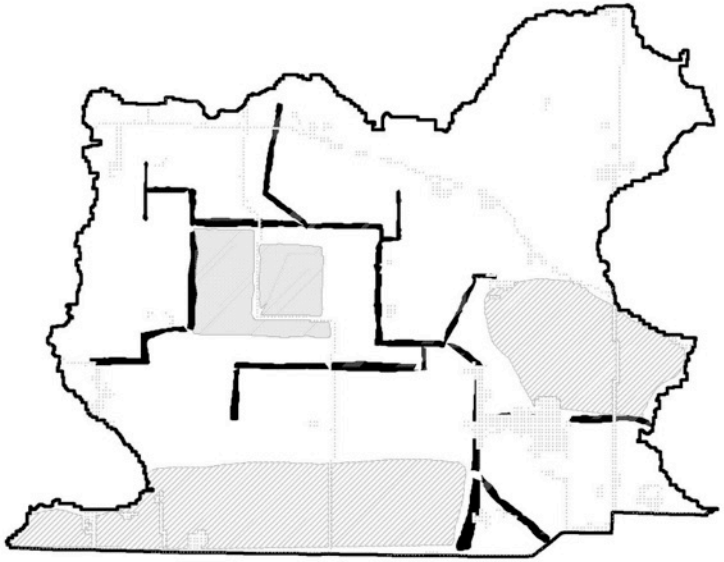
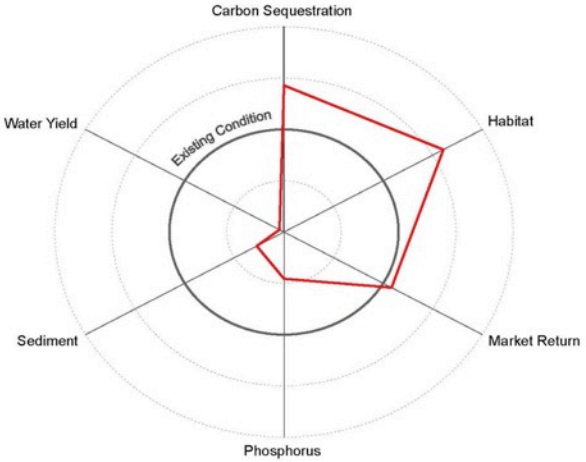
5 Switchgrass
9 Non designable areas

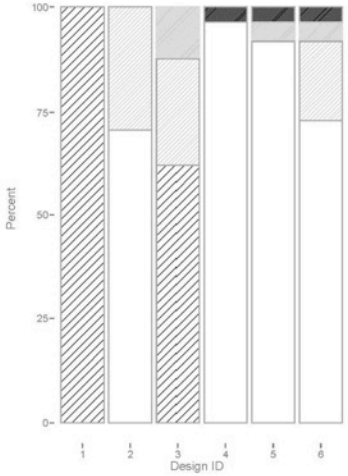
0 0.25 0.5 1 Miles

Bryan Runck

Group: 1	Design name: nbuffers.PG.stover	ID: 6







Land use practice

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9 Non designable areas

Miles
0 0.25 0.5 1

Bryan Runck

Phases?

tinkering
integration
strategic
regression

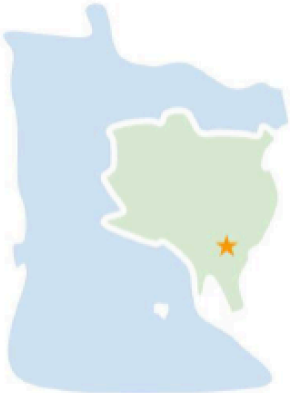
The geodesign “technology is wonderful but has its [technical] problems”

… What was unique was the use of [geodesign] in the context of the conversation we were having about the [landscape]… it allowed people to perhaps unintentionally lower those proposed barriers that they might normally have.

Case Study 2

LA Studio

Multifunctional Landscape Plan for
Laketown Township and Eagleton, MN



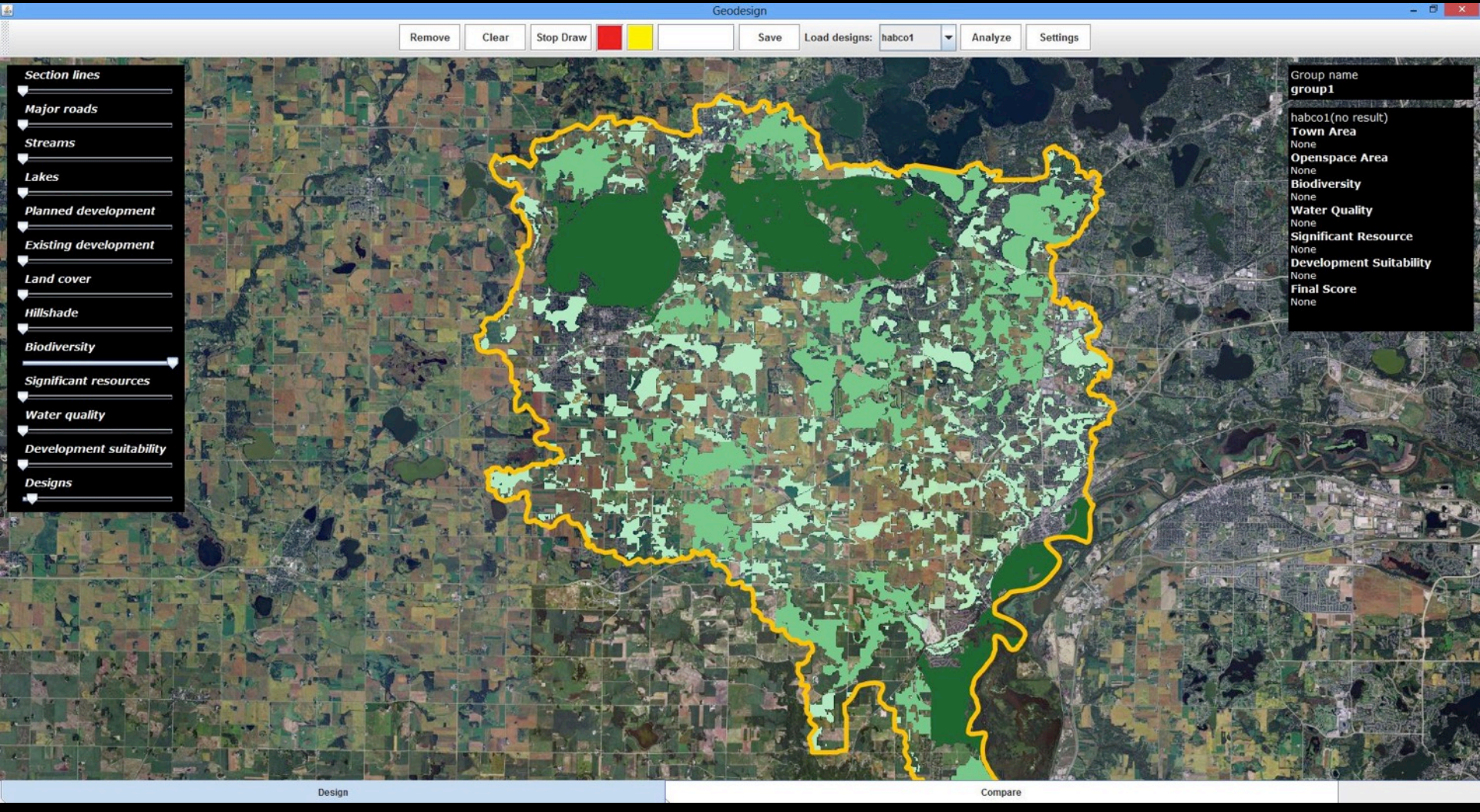
*Laketown Township Study Region within MN

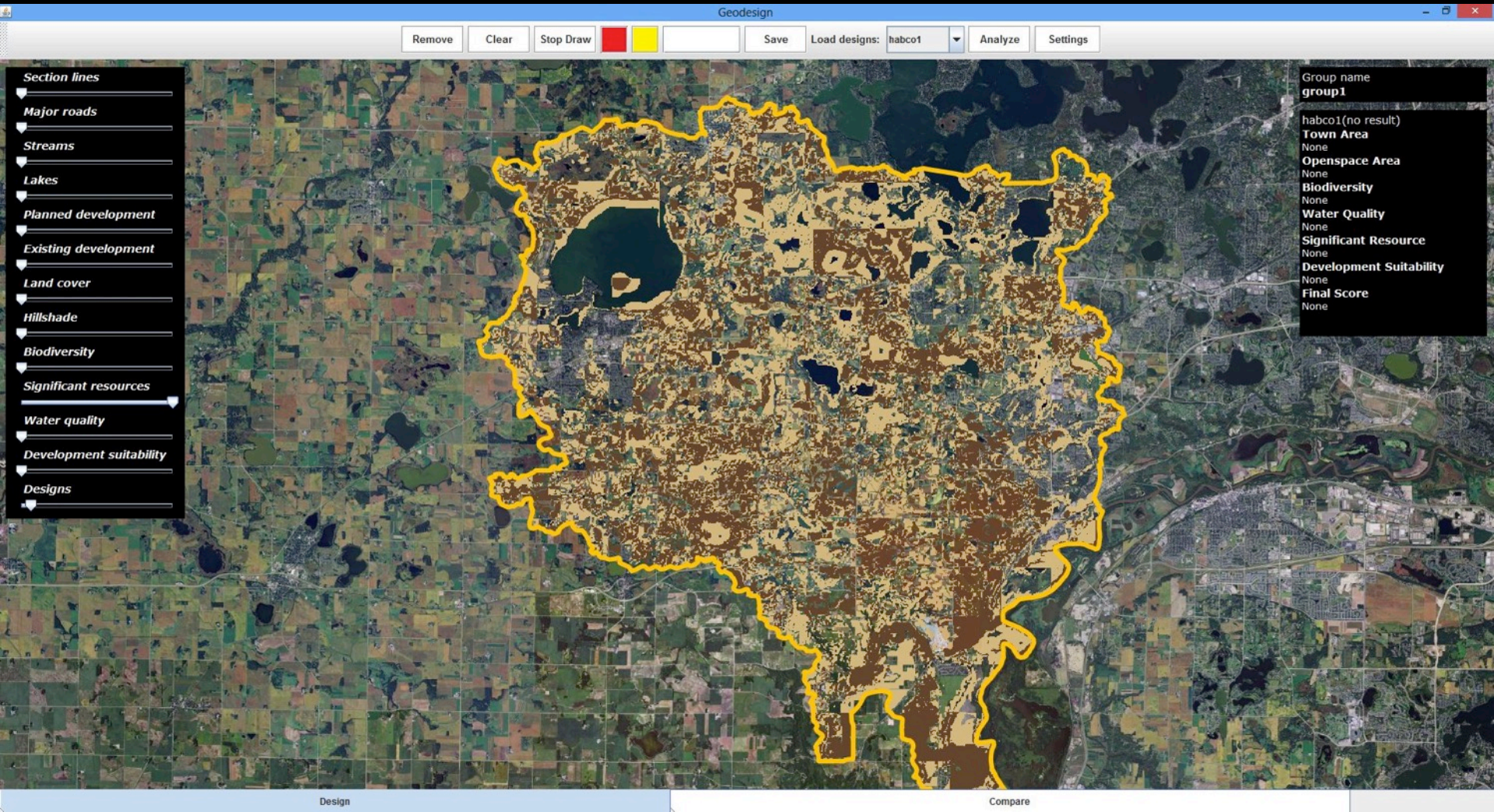
*View of Carver Creek from proposed location of Eagleton

Prepared May 14th, 2015
S I N Planners + Design, LLC
Drew Ingvalson, Katrina Nygaard & Zachary Sippel

DESIGN GROUP, LLC

SIPPEL
INGVALSON
NYGAARD


Geodesign
Remove
Clear
Stop Draw
Save
Load designs:
habco1
Analyze
Settings
Section lines
Major roads
Streams
Lakes
Planned development
Existing development
Land cover
Hillshade
Biodiversity
Significant resources
Water quality
Development suitability
Designs
Group name
group1
habco1(no result)
Town Area
None
Openspace Area
None
Biodiversity
None
Water Quality
None
Significant Resource
None
Development Suitability
None
Final Score
None
Design
Compare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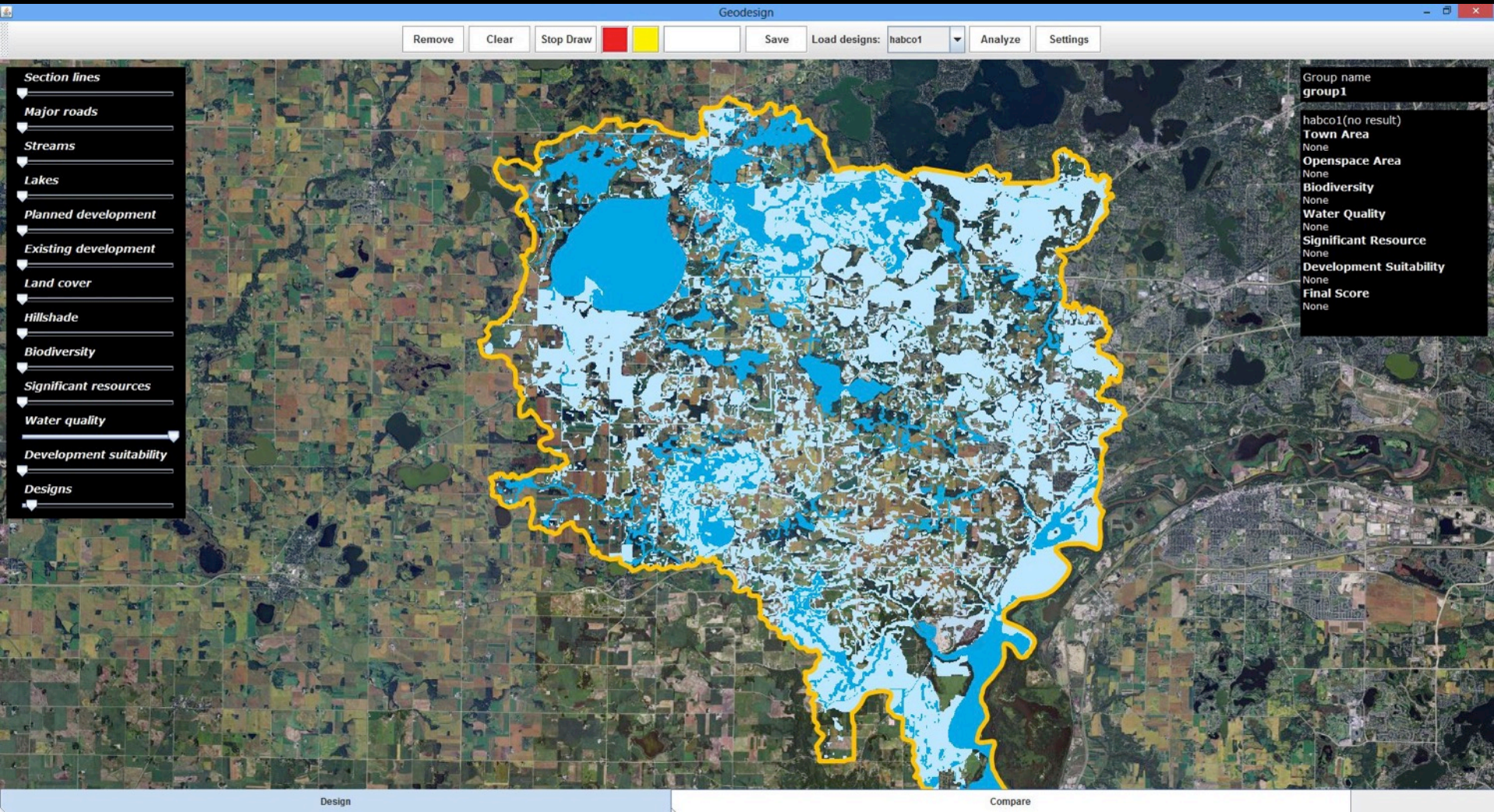
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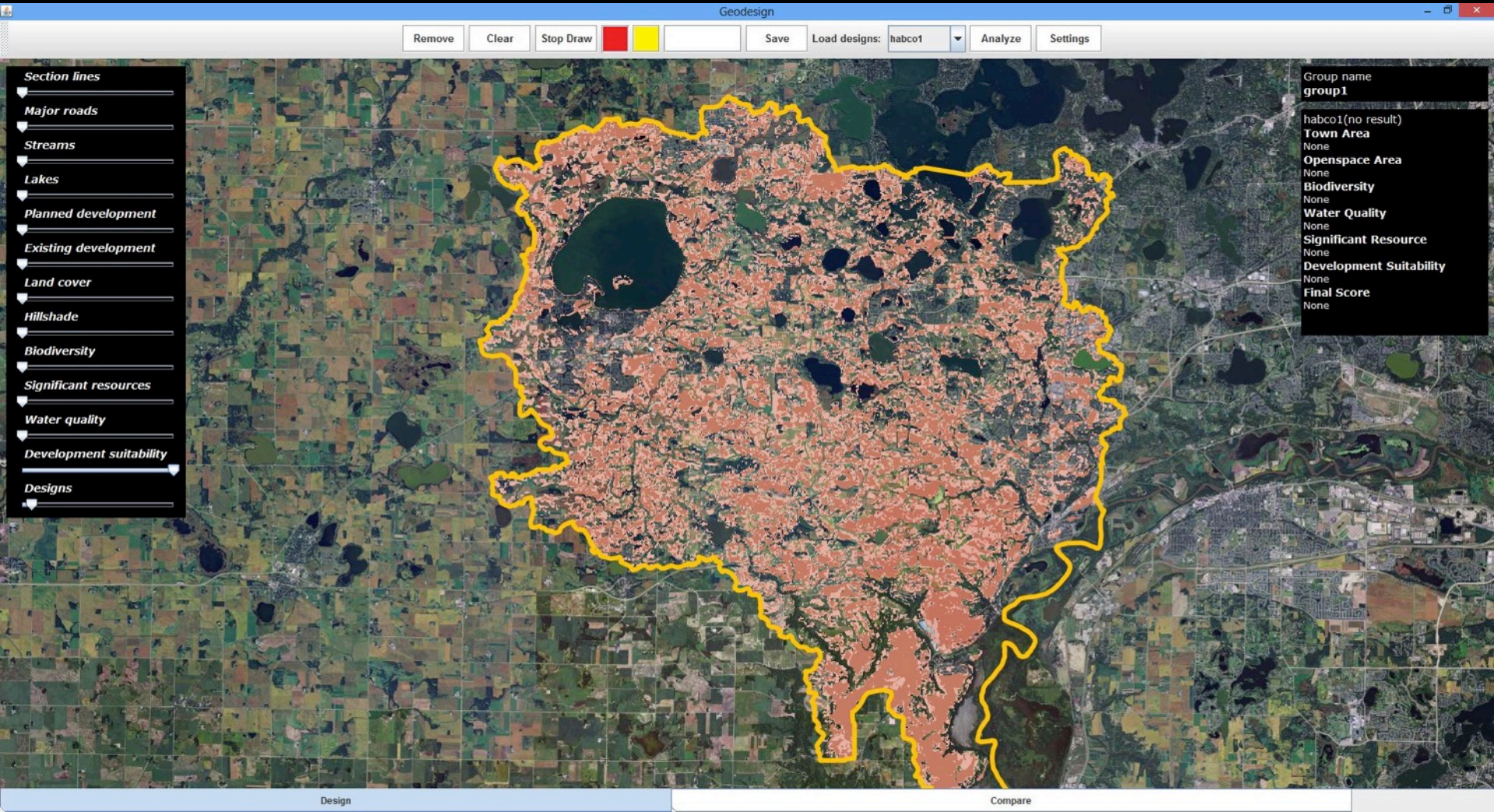
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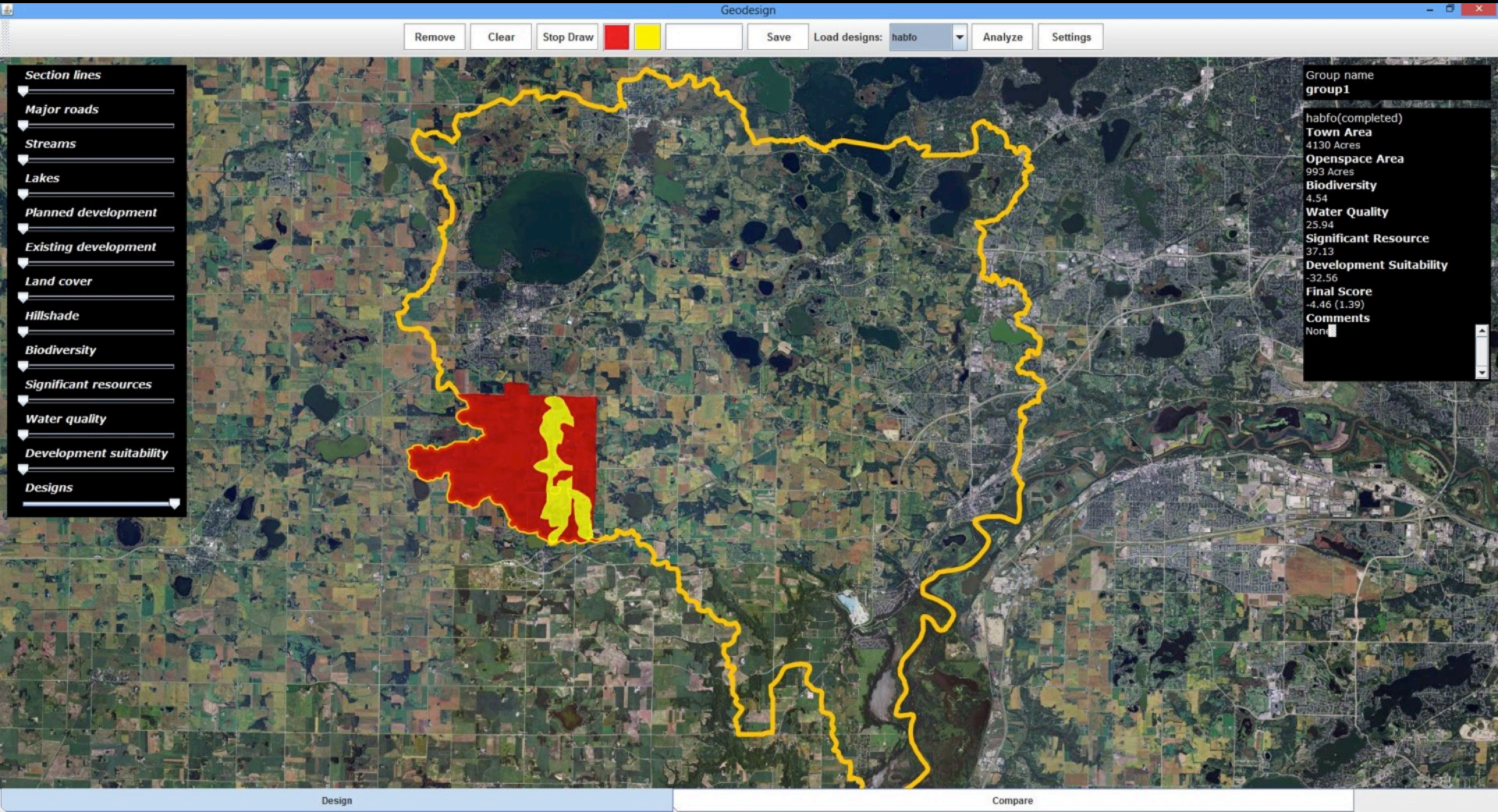
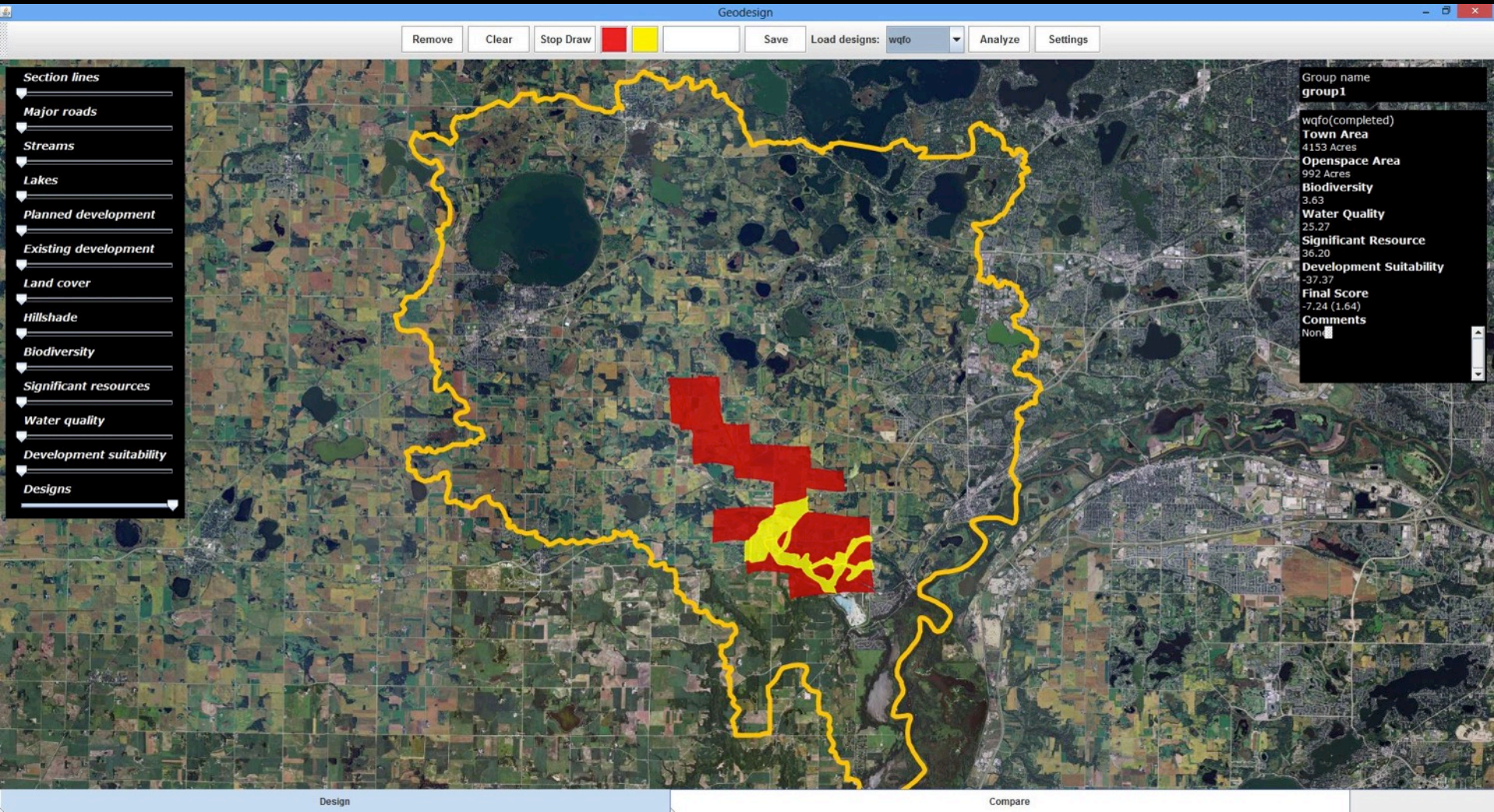
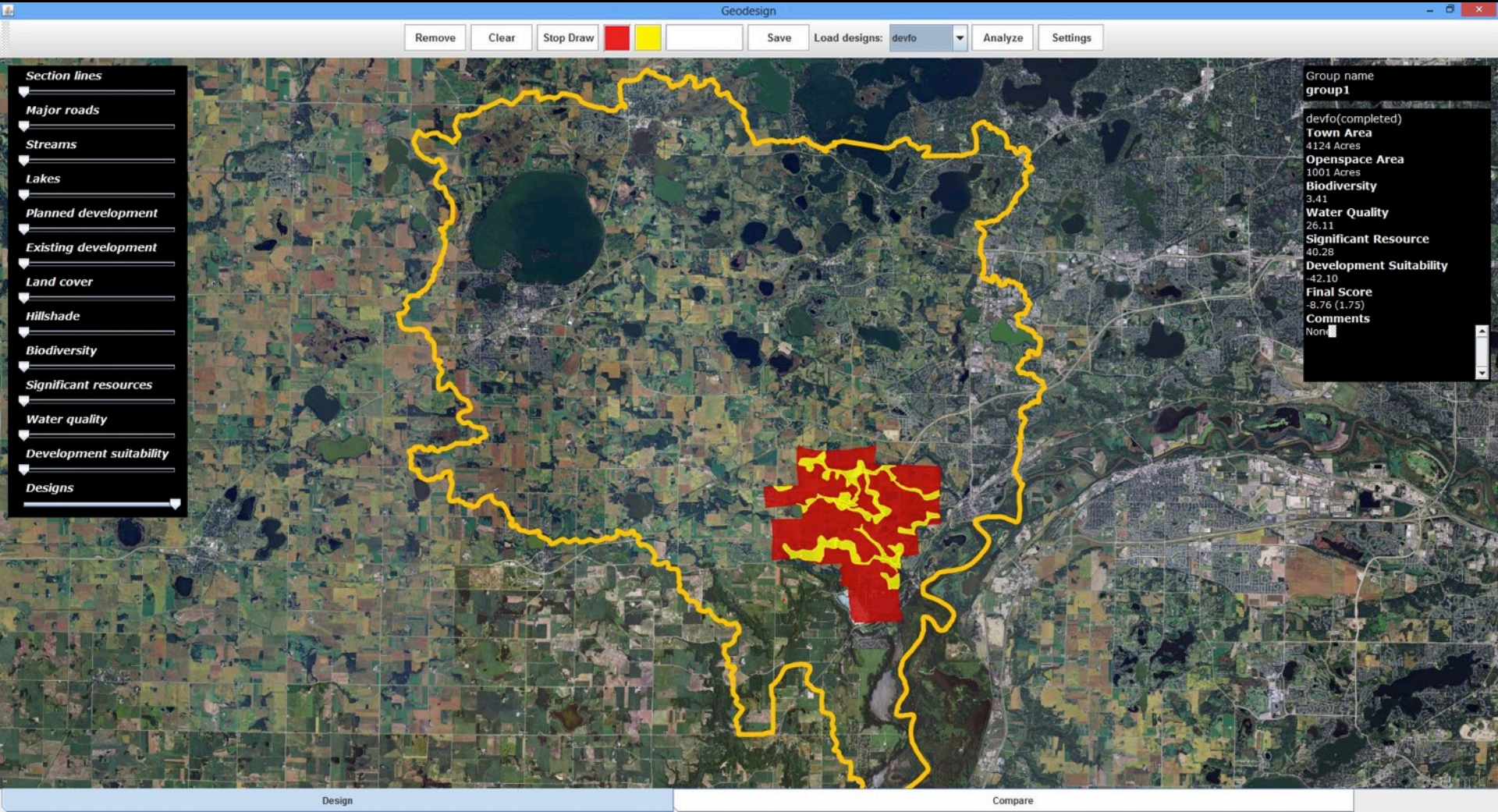
habco1(no result)
Town Area
None
Openspace Area
None
Biodiversity
None
Water Quality
None
Significant Resource
None
Development Suitability
None
Final Score
None
Design
Compare


Geodesign
Remove
Clear
Stop Draw
Save
Load designs:
habfo
Analyze
Settings
Section lines
Major roads
Streams
Lakes
Planned development
Existing development
Land cover
Hillshade
Biodiversity
Significant resources
Water quality
Development suitability
Designs
Group name
group1
habfo(completed)
Town Area
4130 Acres
Openspace Area
993 Acres
Biodiversity
4.54
Water Quality
25.94
Significant Resource
37.13
Development Suitability
-32.56
Final Score
-4.46 (1.39)
Comments
None
Design
Compare


Geodesign
Remove
Clear
Stop Draw
Save
Load designs:
wqfo
Analyze
Settings
Section lines
Major roads
Streams
Lakes
Planned development
Existing development
Land cover
Hillshade
Biodiversity
Significant resources
Water quality
Development suitability
Designs
Group name
group1
wqfo(completed)
Town Area
4153 Acres
Openspace Area
992 Acres
Biodiversity
3.63
Water Quality
25.27
Significant Resource
36.20
Development Suitability
-37.37
Final Score
-7.24 (1.64)
Comments
None
Design
Compare

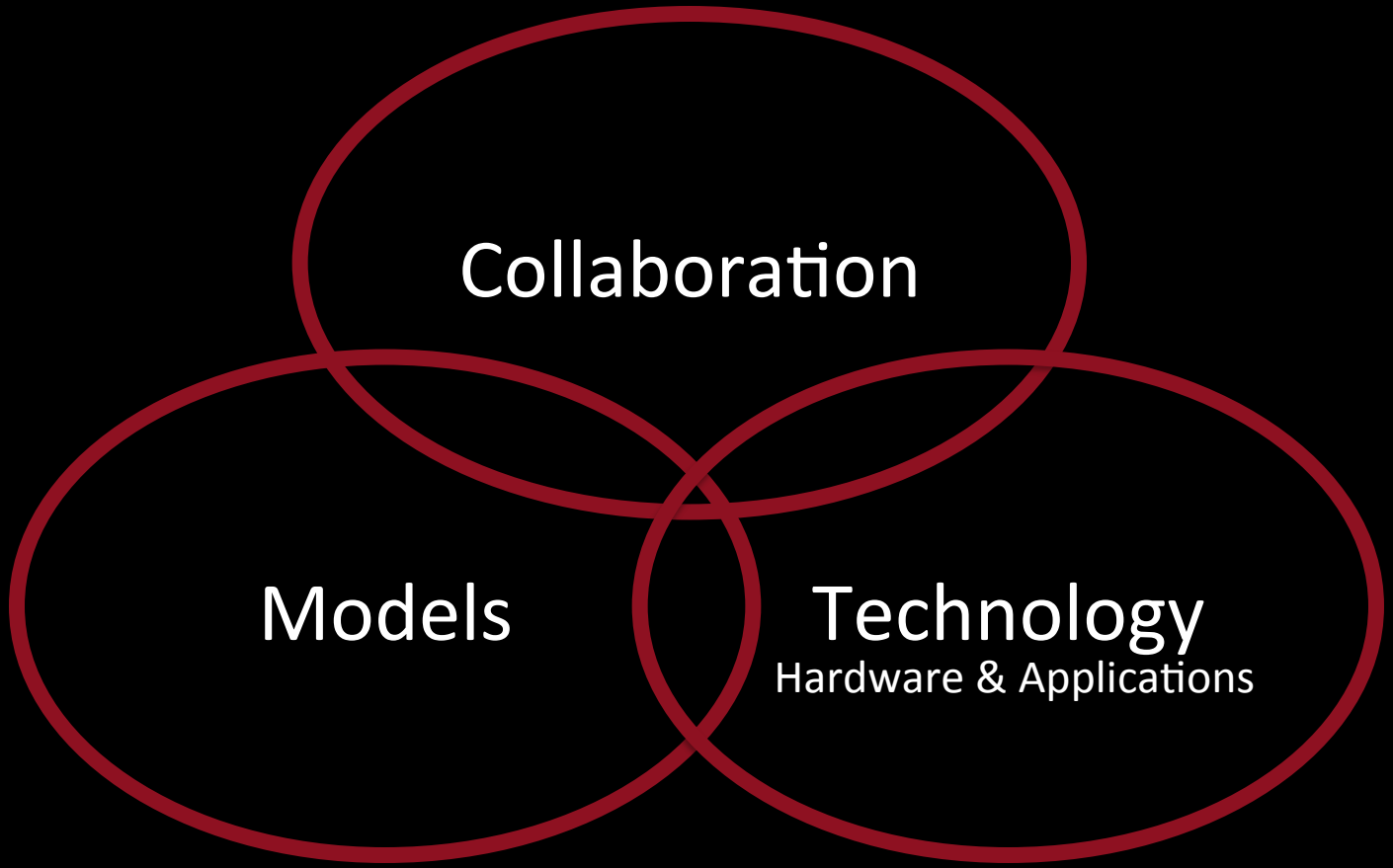

Geodesign
Remove
Clear
Stop Draw
Save
Load designs:
devfo
Analyze
Settings
Section lines
Major roads
Streams
Lakes
Planned development
Existing development
Land cover
Hillshade
Biodiversity
Significant resources
Water quality
Development suitability
Designs
Group name
group1
devfo(completed)
Town Area
4124 Acres
Openspace Area
1001 Acres
Biodiversity
3.41
Water Quality
26.11
Significant Resource
40.28
Development Suitability
-42.10
Final Score
-8.76 (1.75)
Comments
None
Design
Compare

Development Alternative	Town Area (acres)	Open Space Area (acres)	Biodiversity	Water Quality	Significant Resources	Development Suitability	Overall Score (dev/harm)
Eagleton	5125	1001	3.41	26.11	40.28	-42.10	1.75
A	5145	992	3.63	25.27	36.20	-37.37	1.64
B	5122	1000	5.85	28.27	33.75	-34.69	1.48

Table 1: Development Suitability Metrics

Collaborative Geodesign Impact

1. Iterative, exploring design process
2. Potentially added complexity
3. Bounds group expectations
4. Decreases barriers between people


Collaboration
Models
Technology
Hardware & Applications

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- Institute for Renewable Energy and Environment, UMN
- MnDRIVE

Thank you

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