Collaborative Geodesign in Practice

Len Kne
University of Minnesota
lenkne@umn.edu
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
Definition of Geodesign

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

The Decision Lab
Mobile Geodesign
Mobile Geodesign
System Architecture

Server

- PostgreSQL/PostGIS
  - Tables
  - Functions
- ArcSDE
- Python/PsycoPG2

ArcServer

- Feature Services
- Map Services
- Geoprocessing Services

Client

Web Browser

- Esri Javascript API
- Layers
- Visuals
- Dojo
- GP Services
- AmCharts

Courtesy: Kris Johnson
Model Method Time Test Results

Geodesign Method Comparison
Arcpy vs. PostgreSQL

Over 100 Times as Fast

Courtesy: Kris Johnson
Case Study 1
Current Land Use

Area 95 km²

> 80% corn/soybean
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

Native Grass Mixture

Switchgrass

Corn Stover
Solution? Land cover

How?

Native Grass Mixture  Switchgrass  Corn Stover
Solution? Land cover

Collaboration + Geodesign

- Native Grass Mixture
- Switchgrass
- Corn Stover
Collaborative Geodesign Workshops

- 8 meetings
- 4 background
- 4 with tool
Show video

• https://youtu.be/nXdW81Q7Kyl?t=40s
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
Win-Win
Win-Win
Win-Win
Group: 1  Design name: North cons tillage minus stover and prairie  ID: 3

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

Prepared May 14th, 2015
S I N Planners + Design, LLC
Drew Ingvalson, Katrine Nygaard & Zachary Sippel
<table>
<thead>
<tr>
<th>Development Alternative</th>
<th>Town Area (acres)</th>
<th>Open Space Area (acres)</th>
<th>Biodiversity</th>
<th>Water Quality</th>
<th>Significant Resources</th>
<th>Development Suitability</th>
<th>Overall Score (dev/harm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eagleton</td>
<td>5125</td>
<td>1001</td>
<td>3.41</td>
<td>26.11</td>
<td>40.28</td>
<td>-42.10</td>
<td>1.75</td>
</tr>
<tr>
<td>A</td>
<td>5145</td>
<td>992</td>
<td>3.63</td>
<td>25.27</td>
<td>36.20</td>
<td>-37.37</td>
<td>1.64</td>
</tr>
<tr>
<td>B</td>
<td>5122</td>
<td>1000</td>
<td>5.85</td>
<td>28.27</td>
<td>33.75</td>
<td>-34.69</td>
<td>1.48</td>
</tr>
</tbody>
</table>

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
Funding

- USDA-NRCS Conservation Innovation Grant Program
- U-Spatial, University of Minnesota
- Office of the VP for Research, University of Minnesota
- Institute for Renewable Energy and Environment, UMN
- MnDRIVE
Thank you

Len Kne
University of Minnesota
lenkne@umn.edu