Designing the Future of Coastal Georgia with Geodesign Technologies

2016 Geodesign Summit, January 28, 2016
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College of Environment & Design, University of Georgia
University of Georgia Geodesign Workshop

A 3-day workshop was initiated by Professor Carl Steinitz and Dan Nadenicek, Dean of the College of Environment and Design (CED), at the University of Georgia (UGA).

The issue at hand was to produce a single negotiated design, based on a series of constraints for long-term future scenarios (2030 and 2050) for Chatham County, GA and the Wormsloe Historic Site.

The Challenge: Can we come to one agreed design?

Chatham County, Georgia, USA

Wormsloe State Park & Historic Site

January 26 – 28, 2015

Subsystems which drive change
Industry and Tourism
Demographic/social change
Climate change, hurricanes

Vulnerable to change
Climate
Ecology/Nature
Surface Water
Groundwater
Historic/Cultural
Visual/Tourism

Attractive for change
Agriculture/Forestry
Housing Development
Commercial/Industrial development
Transportation development

10 Systems
The Changes by 2050

- Expanding the port doubles industry
- The resident population doubles
- Tourism-related commerce quadruples
- Climate change: sea level rise + repeat of record hurricane

Photo Credit: Jeff Sents, Flickr Creative Commons. https://www.flickr.com/photos/jeffsents/5906841828/
Workshop Participants

Sarah Ross, Director Center for Research & Education Wormsloe

Brian Orland, Professor, Landscape Architecture, Penn State University, Institute of Energy and Environment

Mariana Alfonso, Student, Integrative Conservation Ph.D. Program, UGA

Sudanshu Panda, Faculty, Environmental Science and GIS, University of North Georgia

Alfie Vick, Faculty, Landscape Architect, College of Environment and Design, UGA

Dean Hardy, Faculty, Ecologist, Center for Integrative Conservation Research, UGA

Hunter Key, GIS Manager, Coastal Regional Commission of GA

Lupita McClennig, Director of Planning, Coastal Regional Commission of GA

Paul Pressly, Director of Ossabaw Foundation

Jim Nolan, Faculty and Local Government Project Manager, Information Technology Outreach Services, Carl Vinson Institute of Government, UGA

Mariana Alfonso, Student, Integrative Conservation Ph.D. Program, UGA

Sudanshu Panda, Faculty, Environmental Science and GIS, University of North Georgia

Jesse Wuest, Assistant Manager, Wormsloe

Matt Hauer, Faculty, Demographer, Carl Vinson Institute of Government, UGA

Marguerite Madden, Professor, Director of the Center for Geospatial Research, Geography, UGA

Katie Laughon, Director Center for Research & Education Wormsloe

Matt Hauer, Faculty, Demographer, Carl Vinson Institute of Government, UGA

Jamie Mitchell, Faculty, Climate University of North Georgia

Doug Pardue, Professor, Landscape Architect, UGA

Marguerite Madden, Professor, Director of the Center for Geospatial Research, Geography, UGA

J.P. Smith, Faculty, Ecologist, UGA

Emily Hunt, student, College of Environment and Design, UGA

Greg Muse, student, College of Environment and Design, UGA

Andrew Bailey, student, College of Environment and Design, UGA

Jesse Wuest, Assistant Manager, Wormsloe

Emily Hunt, student, College of Environment and Design, UGA

Andrew Bailey, student, College of Environment and Design, UGA

J.P. Smith, Faculty, Ecologist, UGA

Emily Hunt, student, College of Environment and Design, UGA

Greg Muse, student, College of Environment and Design, UGA
Workshop Planning

Planning efforts started in November 2014, with a steering committee composed of two teams:

1. Leading team, from the Centre for Advanced Spatial Analysis (CASA), University College London, UK (Carl Steinitz & Hrishi Ballal)
   • Role: lead and conduct geodesign workshop, geodesign software design, implementation, and support.

2. Local team from UGA (Team leaders: Rosanna Rivero & Alison Smith)
   • Role: workshop planning and coordination, identify participants and teams, define study area and issues, GIS data preparation and creation of all Evaluation Maps

This presentation will focus on the use of the geodesign software used in this workshop (geodesignstudy.com) from a users perspective.

Users include: UGA workshop planning team and workshop participants
1. Define study area and issues
2. Identify 10 Systems
3. Identify “experts” to define Evaluation Map criteria for each system
4. Create a matrix for the 10 systems to document model criteria, data needs, etc.
5. Collect GIS data needed for each system
6. Create Evaluation Maps for each system in GIS
7. Email Evaluation Maps (shapefiles) to Hrishi to upload into Geodesign Software
Get Organized and Collaborate!

After defining the study area, identifying the 10 systems and “experts” to define the evaluation map criteria for each system, we created a Google Drive folder for the workshop as a way for the UGA team, the CASA team and the “system experts” to collaborate and work together.
Create a matrix for the 10 Systems/Evaluation Maps

A matrix was created as a Google doc for the evaluation maps to identify the criteria to be considered, person responsible for identifying the criteria, data needs, sources, etc.

Each evaluation map was defined as either a “vulnerability map” or an “attractiveness map” and the criteria consists of three levels/colors.
Collect GIS data needed to map the criteria for each system

Based on the criteria identified in the matrix, GIS data layers needed to map that criteria were added to the matrix.

The primary data source for this workshop was SAGIS (Savannah Area Geographic Information Systems) although other data sources were used as well.

http://www.sagis.org/

Welcome to the Savannah Area GIS (SAGIS) data download page. We have made the majority of our data catalog available for download. Data will be updated the first week of the every quarter (Jan., April, July, Oct.).

If you would like custom maps or data please contact SAGIS directly at (912) 651-1440

Note: All data is in the Georgia State Plane East coordinate system.
Note: CSV files do not contain geometry, only attributes.

<table>
<thead>
<tr>
<th>Data Layer</th>
<th>type</th>
<th>shp</th>
<th>csv</th>
<th>xml</th>
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Create Evaluation Maps for each system in GIS

All 10 Evaluation Maps were created using ArcGIS software. The process was streamlined to facilitate easy integration into the geodesignstudy.com software.

The Commercial/Industrial evaluation map will be used as an example to illustrate the process used for the 10 evaluation maps.

1. Reference criteria & GIS data layer needs from the matrix.
   The Commercial/Industrial evaluation map criteria and GIS data layer needs include:

<table>
<thead>
<tr>
<th>CRITERIA</th>
<th>GIS Data layers needed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Attraction (red)</td>
<td>GIS Data layers needed</td>
</tr>
<tr>
<td>Existing commercial/industrial areas</td>
<td>BND_Chatham</td>
</tr>
<tr>
<td>Swamp/marsh areas</td>
<td></td>
</tr>
<tr>
<td>Conservation Lands</td>
<td></td>
</tr>
<tr>
<td>Med Attraction (yellow)</td>
<td>GIS Data layers needed</td>
</tr>
<tr>
<td>All other areas/areas that aren't somehow legally available but could be built as commind</td>
<td>BND_Future_Landuse (only Comm/Industrial)</td>
</tr>
<tr>
<td>High Attraction (green)</td>
<td>GIS Data layers needed</td>
</tr>
<tr>
<td>Areas most attractive for commercial/industrial but not currently a commind use</td>
<td>BND_Zoning (only Comm/Industrial)</td>
</tr>
<tr>
<td>- areas identified as commind in FLU plan but not currently a commind use</td>
<td></td>
</tr>
<tr>
<td>- areas zoned commind but not currently a commind use</td>
<td></td>
</tr>
</tbody>
</table>
Create Evaluation Maps for each system in GIS

2. Gather all the data layers into group layers in ArcMap by color/level
Create Evaluation Maps for each system in GIS

3. **Complete the following steps for each color/level:**
   (Commercial/Industrial color/level example: Red – Low Attractiveness)
   
   a. **Select by Attributes and export only features needed to a new data layer**
      For Commercial/Industrial, this included selecting all commercial and industrial uses from the existing land use data layer, selecting swamp/marsh from the hydrology data layer and exporting each out to a new data layer
   
   b. **Dissolve any features if needed**
      Use the dissolve tool for the following 3 data layers:
      Commercial/Industrial Land Uses, Swamp/Marsh, Conservation Lands
   
   c. **Create new shapefile for each level/color with attributes for “Type” and “Color”**
   
   d. **Copy dissolved features from each layer needed into this new shapefile**
      Start an edit session and copy/paste all features from the 3 data layers listed above
   
   e. **Use the “SimplifyPolygon” and “Aggregate Polygon” tools to generalize features**
Create Evaluation Maps for each system in GIS

4. Combine the three colors/levels into one shapefile:
   a. Use the county boundary polygon layer and multiple iterations of the “Erase” and “Union” tools to combine the three colors/levels and ensure there are no overlaps.
   The order of this process is very important. For example, the existing commercial/industrial areas (Red – Low Attractiveness), will most likely be identified in the Future Land Use plan data layer (Green – High Attractiveness), as areas for commercial/industrial. You must ensure that the existing commercial/industrial areas are removed from the Future Land Use plan data layer.
   b. Use the “SimplifyPolygon” tool further generalize the combined features and to resolve any topological errors.

5. Email each Evaluation Map shapefile to Hrishi to upload into the Geodesign Software
Final Evaluation Maps & Matrices

Climate Change  Nature/Ecology  Surface Water  Groundwater  Historic/Cultural/Arch

Visual  Agriculture/Forestry  Housing  Commercial/Industrial  Trans/Evacuation
Users: UGA Workshop Participants

Software Tutorial

INPUTS:
Shapefile, Feature Service, CartoDB, KML, GeoJSON, WKT, Drawing

THROUGHPUTS:
Shape file diagrams in system color code
Shape file versions
Summary graphs and maps

OUTPUTS:
Shapefile, GeoJSON

Hrishi Ballal
Software tutorial
Software: Digital Workflow for Dynamic Geodesign Synthesis

- a digital web based workflow to support the rapid creation of conceptual designs to address large and complex geodesign problems

- designed to foster collaboration between professionals and their clients, and among teams of professionals, during the early stages of design

- simple user interface which easily incorporates existing and diverse data structures for both its inputs and outputs

- enables users to collaborate in person and/or over the internet in real time to produce designs and assess them.

- the tool is publically available and free to use for all. It has extensive self-help documentation, with video and text tutorials. These are available by signing up for an account at geodesignhub.com.
Software Functionality

COMPARE: Decision Models, Designs, Component Diagrams, Frequency of Diagrams, Overlapping Designs, Impacts, Costs
Workshop Conclusions

• Chatham County can accommodate residential growth through increasing density in and near existing residential areas. However, since much of the warehousing and industrial development associated with the port will be single story, it will be impossible to accommodate the required area within the boundaries of Chatham County.

• As well as protecting its environment and consolidating increased development in its northwestern area, it will be necessary to expand development outside Chatham County. This will mean growth in adjoining Georgia counties and the need for increasing cooperation and collaboration in planning with South Carolina, areas which will also benefit from the growth of the Savannah region.

Brian Orland, University of Georgia
- The sketching interface treats all users equally
- It enables quick mid-flow representations
- its ability to let you change diagrams, decision models, and comparative scenarios is one of the software’s greatest strengths, as is its ability to show impacts in real-time.
- The possibilities for collaborative and rapid generation of design ideas is clear and compelling.
- As a platform for bringing together experts and encouraging discussions about values and decisions, it already is excellent.
- the tool powerfully and effectively produces well-informed plans and policies for a county with numerous complex design issues.
- the software offered a slick way to collaborate and potentially share information across different locations to design in real time.
- The ability to access and assess data, then trace how the design and others iterations evolved was useful. It improved design alternatives that culminated in a single viable, vetted product.
- a useful tool to engage multiple participants in the design process, and was actually a lot of fun... I will definitely use this again.

As a regional planner it is just great being able to work with experts and being able to ground truth planning with science, there is no other way to do it. This kind of tools for decision making is absolutely necessary as we move into the future.

- Lupita McClenning, Director of Planning and Government Services at the Coastal Regional Commission of Georgia.
Replication: Professor Rivero's Fall 2015 Regional Planning Studio

- Climate
- Ecology
- Surface Water
- Groundwater
- Historic/Cultural
- Tourism
- Forestry/Agriculture
- Housing
- Commercial/Industrial
- Transportation

Evaluation teams

Change teams

Negotiation teams
Future Planning Efforts: 2016 Coastal Georgia Geodesign Workshop

The Coastal Regional Commission of Georgia and the College of Environment and Design (CED) at the University of Georgia will host a workshop April 20-21, 2016 at the Coastal Regional Commission office in Darien, GA.

- Simultaneous linked design at more than one size/scale/area
- CRC plans to use this software as planning tool for their region with subsequent workshops to follow each year.
Special thanks to the following:

Carl Steinitz, Hrish Ballal, Rosanna Rivero and all who participated in the UGA Geodesign Workshop