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

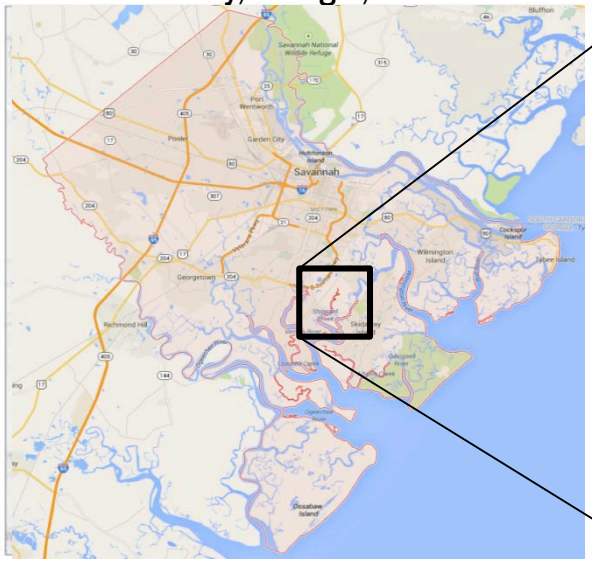
University of Georgia Geodesign Workshop

January 26 – 28, 2015

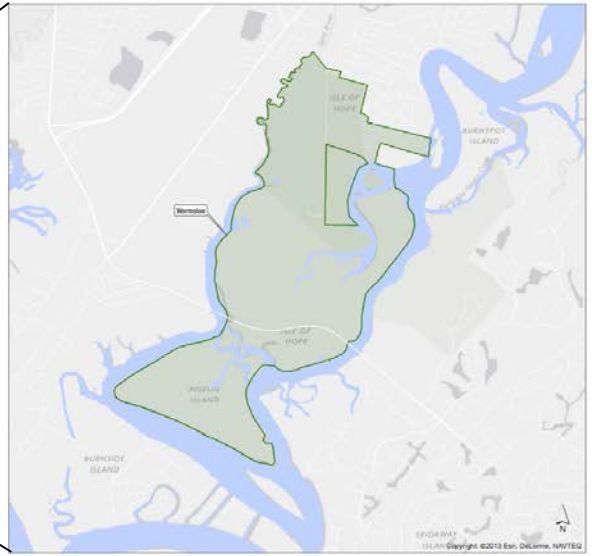
A 3-day workshop was initiated by Professor Carl Steinitz and Dan Nadenicek, Dean of the College of Environment and Design (CED), at the University of Georgia (UGA).

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

Chatham County, Georgia, USA



Wormsloe State Park & Historic Site



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 Challenge: Can we come to one agreed design?

The Changes by 2050

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

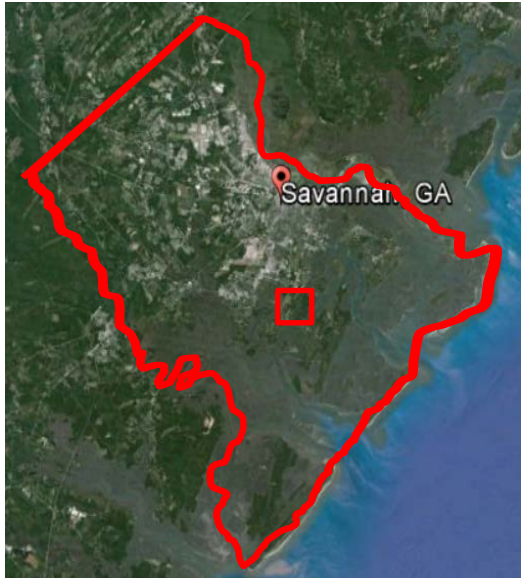
Working Assumptions

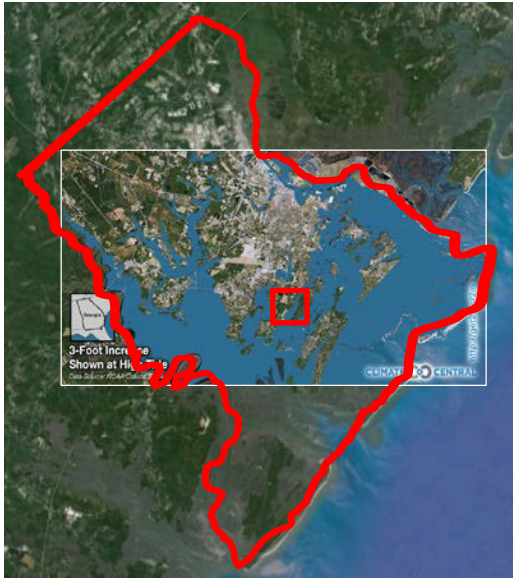
Expanding the port doubles industry

The resident population doubles

Tourism-related commerce quadruples

Climate change:
sea level rise + repeat of record hurricane





Workshop Participants

Sarah Ross, Director Center for Research & Education Wormsloe

Paul Pressly, Director of Ossabaw Foundation

Lupita McClenning Director of Planning, Coastal Regional Commission of GA

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

Jesse Wuest, Assistant Manager, Wormsloe

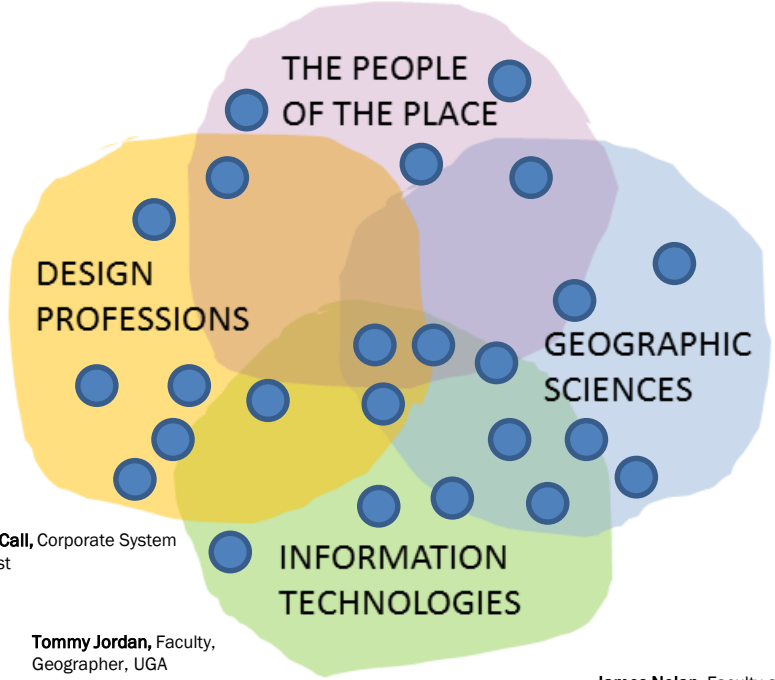
Matt Hauer, Faculty, Demographer, Carl Vinson Institute of Government, UGA

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

Jamie Mitchem, Faculty, Climate University of North Georgia)

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

Doug Pardue, Professor, Landscape Architect, UGA



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

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

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

J.P Smith, Faculty, Ecologist, UGA

Lana Call, Corporate System Analyst

Brian Meyer, Faculty, Geologist, Georgia State University

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

Tommy Jordan, Faculty, Geographer, UGA

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

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

Hunter Key, GIS Manager, Coastal Regional Commission of GA

Eduardo Rendon, student, College of Environment and Design, UGA

Jon Calabria, Faculty, Landscape Architect, 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.

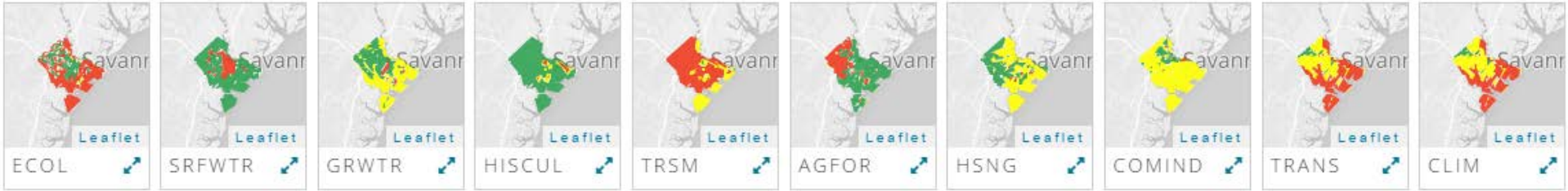
2. Local team from UGA (Team leaders: Rosanna Rivero & Alison Smith)
   - Role: workshop planning and coordination, identify participants and teams, define study area and issues, GIS data preparation and creation of all Evaluation Maps

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

Users include: UGA workshop planning team and workshop participants

Users: UGA Workshop Planning Team

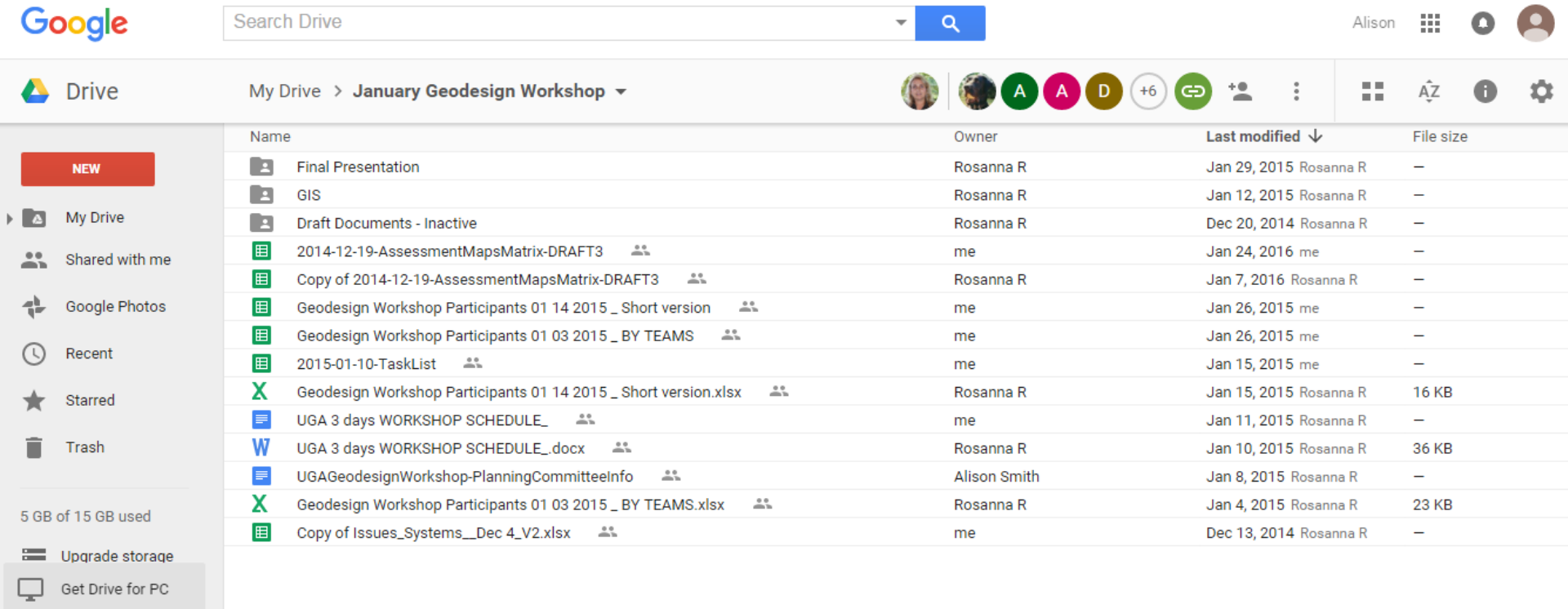
Process for creating the 10 Evaluation Maps



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 the10 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.

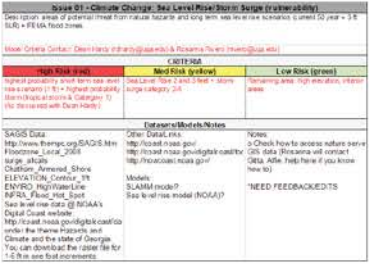


Create a matrix for the 10 Systems/Evaluation Maps

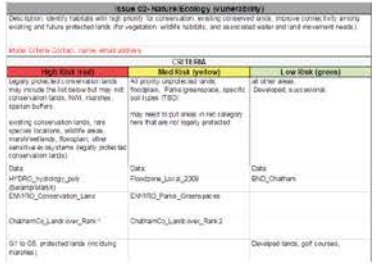
A matrix was created as a Google doc for the evaluation maps to identify the criteria to be considered, person responsible for identifying the criteria, data needs, sources, etc.

Each evaluation map was defined as either a “vulnerability map” or an “attractiveness map” and the criteria consists of three levels/colors.

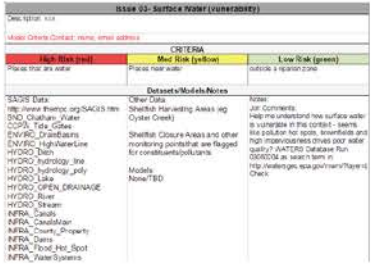
Climate Change



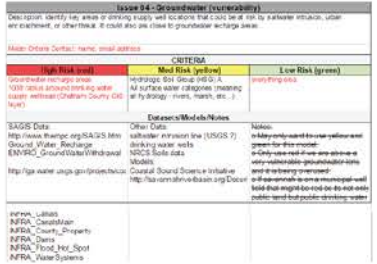
Nature/Ecology



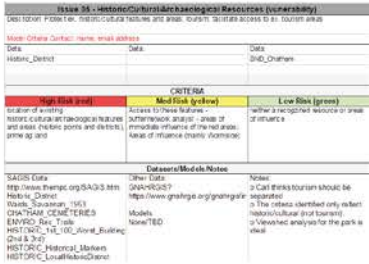
Surface Water



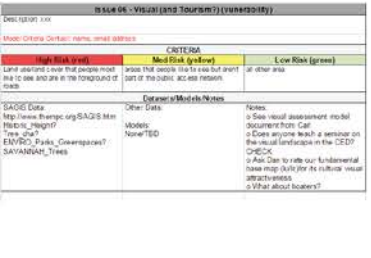
Groundwater



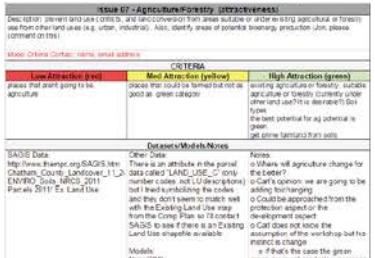
Historic/Cultural/Arch



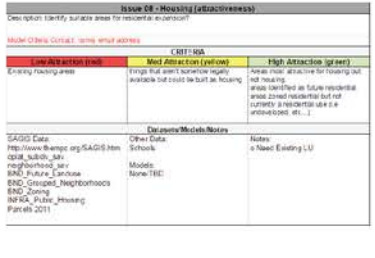
Visual



Agriculture/Forestry



Housing



Commercial/Industrial

Trans/Evacuation

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/

SAGIS
Savannah Area Geographic Information System

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.

Data Layer	type	shp	csv	xml
Historic Preservation				
Historic_District	poly	16.8 KB	1.34 KB	12.9 KB
Historic_Height	poly	12.8 KB	2.01 KB	8.33 KB
Board of Assessors Tax Parcels				
Parcel_1998	poly	72.7 KB	38.4 KB	98.2 KB
Parcel_1999	poly	26.8 MB	10.3 MB	34.5 MB
Parcel_2000	poly	28.9 MB	11.0 MB	37.0 MB
Parcel_2001	poly	29.4 MB	12.3 MB	38.4 MB

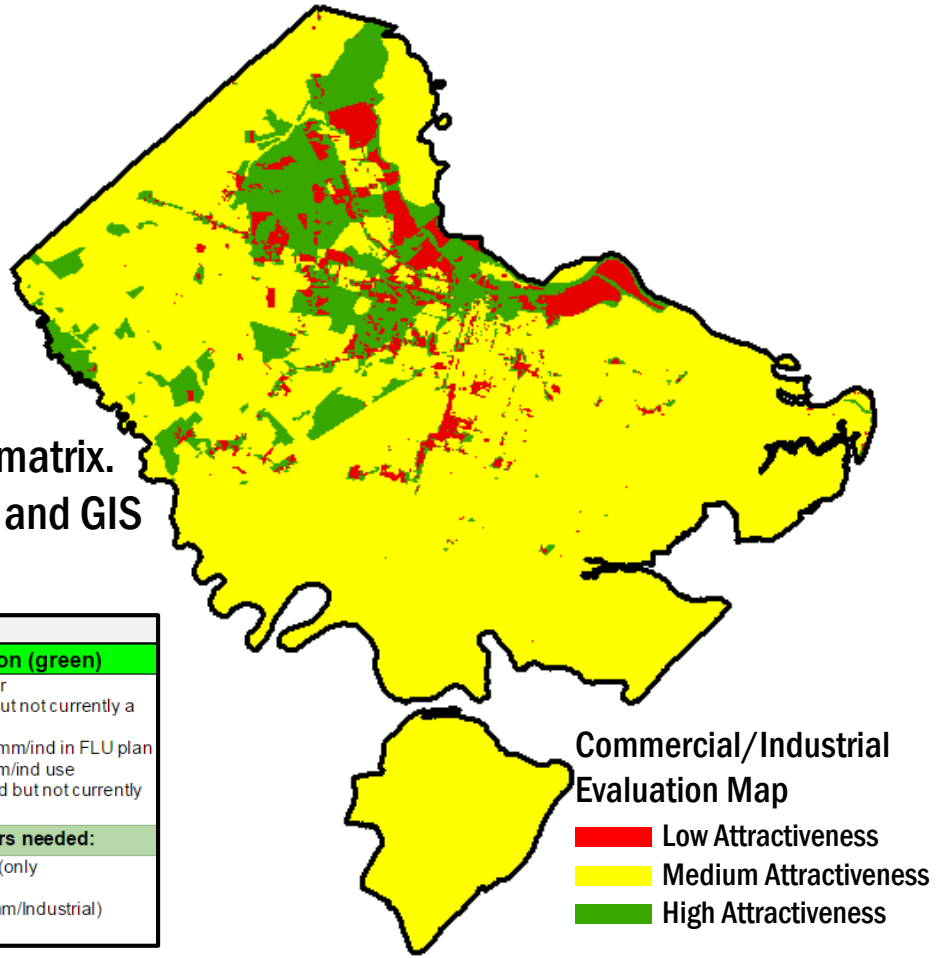
Create Evaluation Maps for each system in GIS

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 and example to illustrate the process used for the 10 evaluation maps.

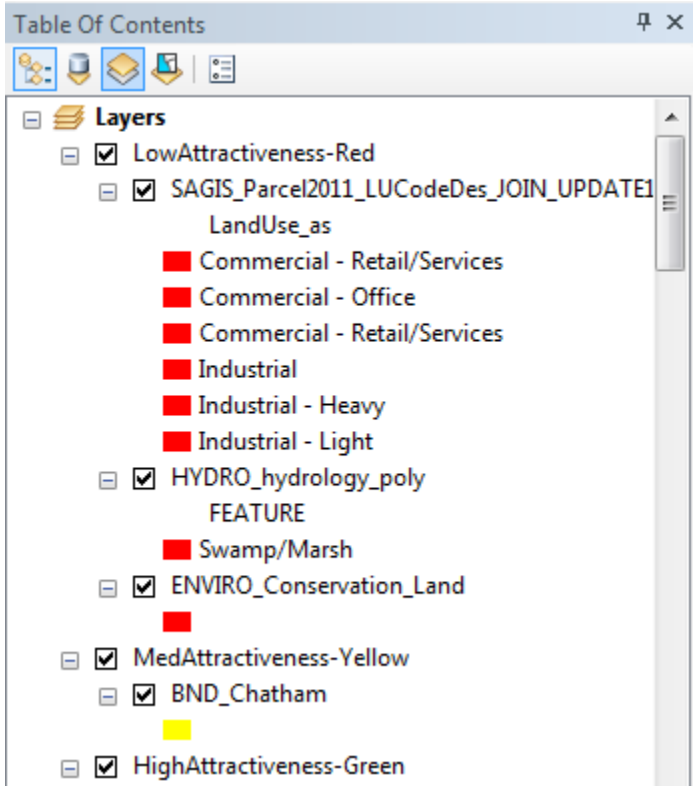
1. Reference criteria & GIS data layer needs from the matrix. The Commercial/Industrial evaluation map criteria and GIS data layer needs include:

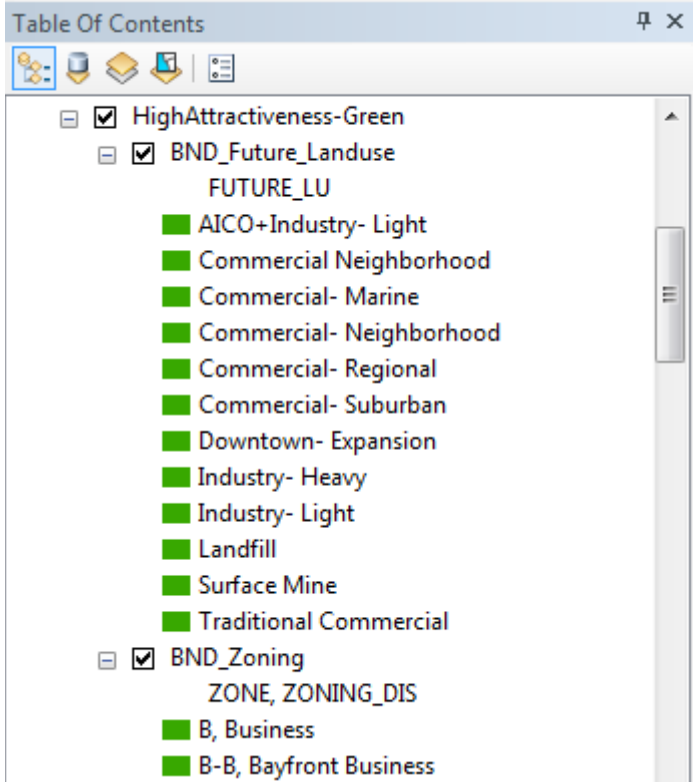
CRITERIA		
Low Attraction (red)	**Med Attraction (yellow)**	**High Attraction (green)**
Existing commercial/industrial areas Swamp/marsh areas Conservation Lands	All other areas/ areas that aren't somehow legally available but could be built as comm/ind	Areas most attractive for commercial/industrial but not currently a com/ind use. - areas identified as comm/ind in FLU plan but not currently a comm/ind use - areas zoned comm/ind but not currently a comm/ind use
GIS Data layers needed:	**GIS Data layers needed:**	**GIS Data layers needed:**
SAGIS_Parcel2011_LUCodeDes_JOIN_UF (Only Comm/Industrial) HYDRO_hydrology_poly (swamp/marsh) ENVIRO_Conservation_Land	BND_Chatham	BND_Future_Landuse (only Comm/Industrial) BND_Zoning (only Comm/Industrial)



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)

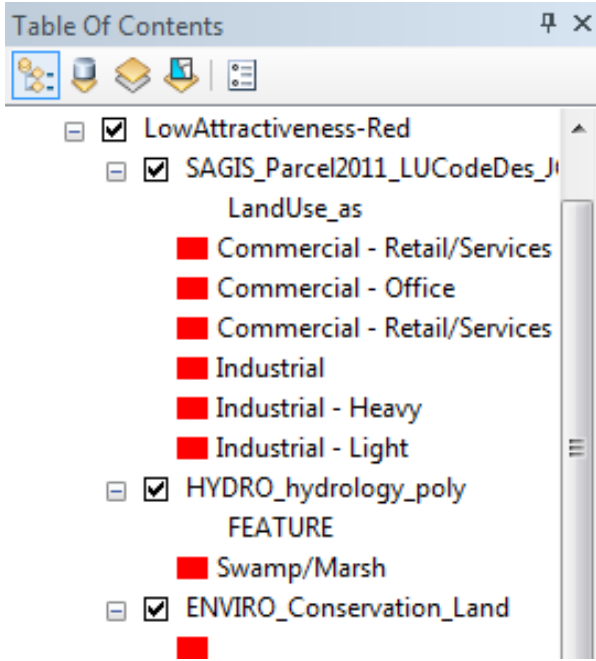
   a. **Select by Attributes and export only features needed to a new data layer**
   For Commercial/Industrial, this included selecting all commercial and industrial uses from the existing land use data layer, selecting swamp/marsh from the hydrology data layer and exporting each out to a new data layer

   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

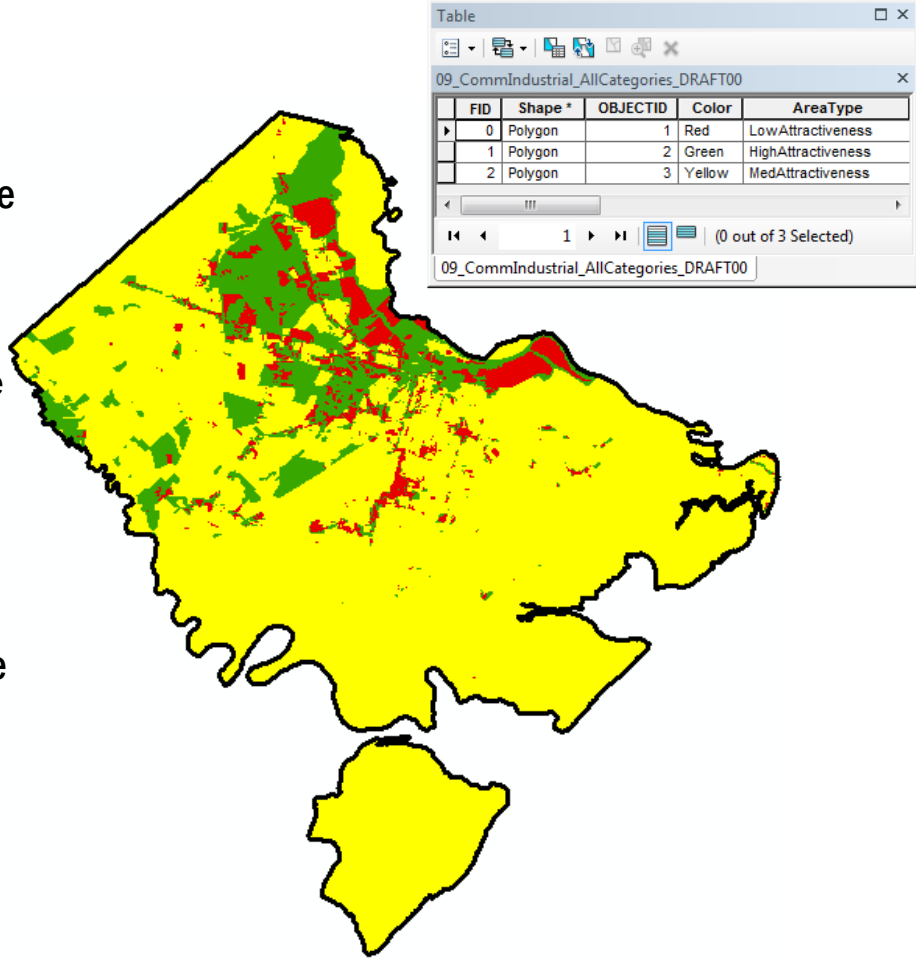
   e. **Use the "SimplifyPolygon" and "Aggregate Polygon" tools to generalize features**



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.

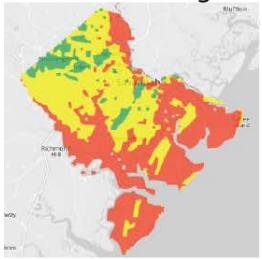
5. Email each Evaluation Map shapefile to Hrishi to upload into the Geodesign Software

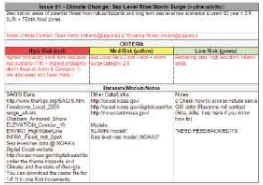


FID	Shape *	OBJECTID	Color	AreaType
0	Polygon	1	Red	LowAttractiveness
1	Polygon	2	Green	HighAttractiveness
2	Polygon	3	Yellow	MedAttractiveness

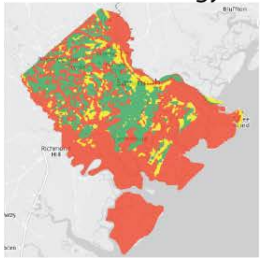
Final Evaluation Maps & Matrices

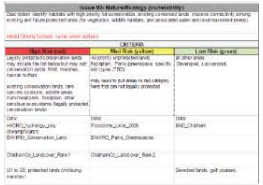
Climate Change



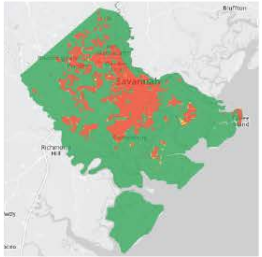


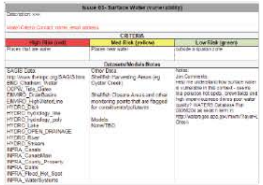
Nature/Ecology



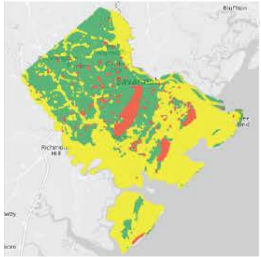


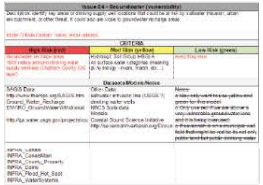
Surface Water



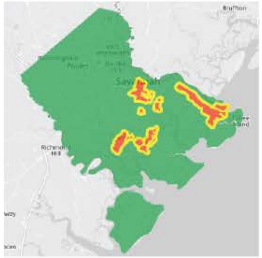


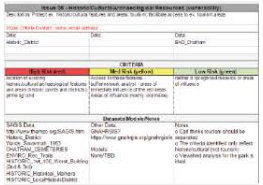
Groundwater



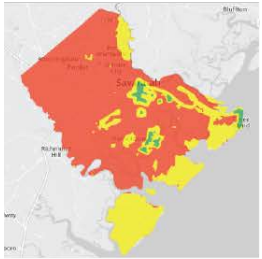


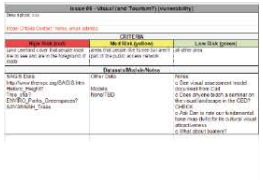
Historic/Cultural/Arch



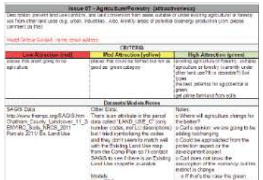


Visual

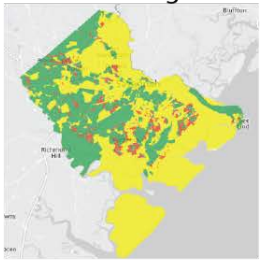


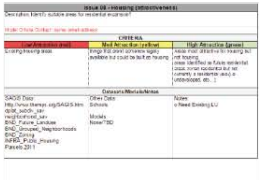


Agriculture/Forestry

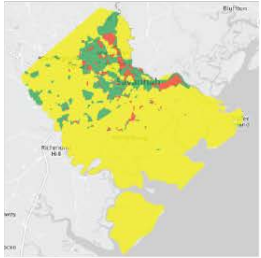


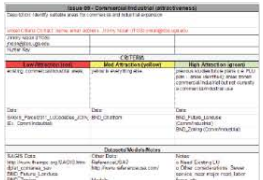
Housing



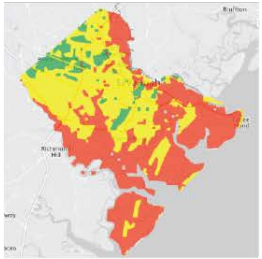


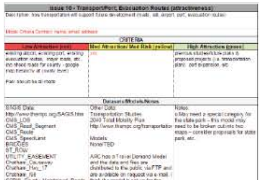
Commercial/Industrial





Trans/Evacuation





Users: UGA Workshop Participants

Software Tutorial

Hrishi Ballal

Software tutorial

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

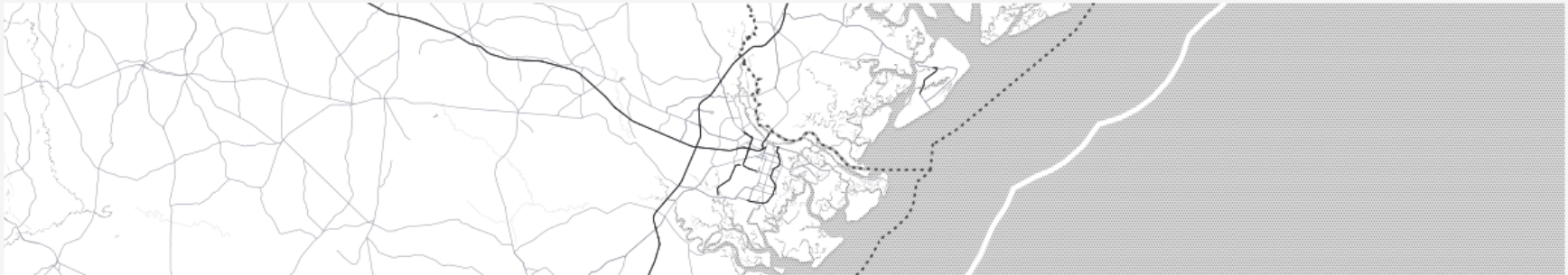
THROUGHPUTS:
Shape file diagrams in system color code

Shape file versions

Summary graphs and maps

OUTPUTS:
Shapefile, GeoJSON

GEODESIGN HUB

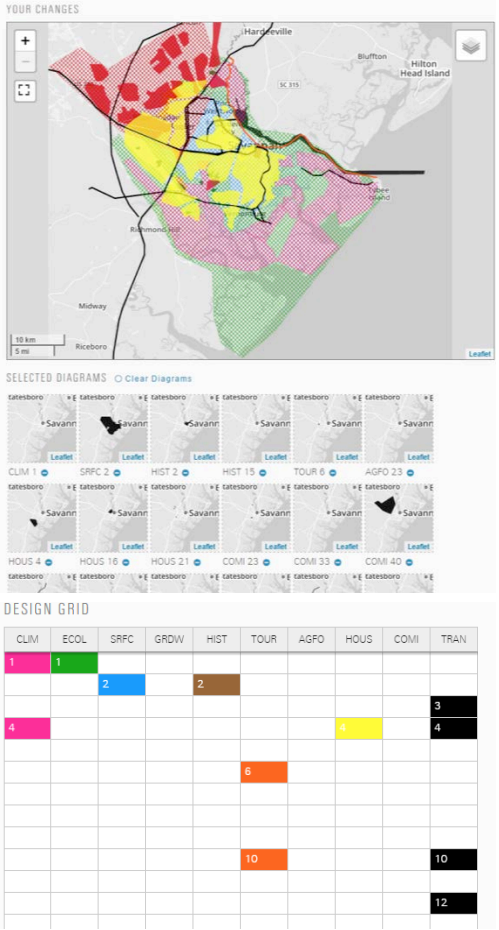


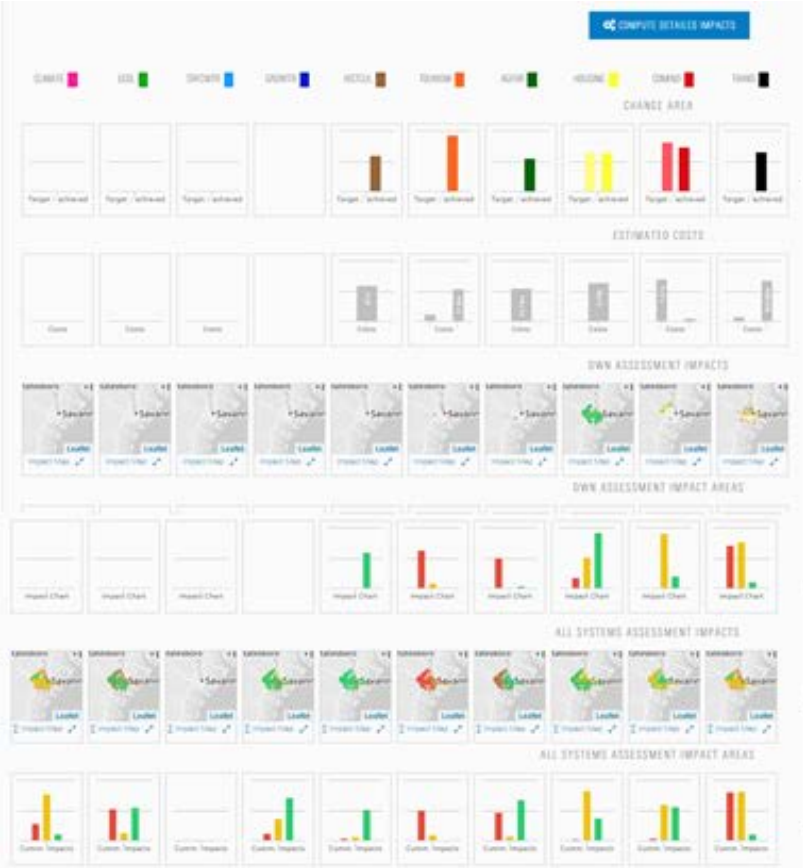
Software: Digital Workflow for Dynamic Geodesign Synthesis

Hrishi Ballal

- 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





Area of Change

Estimated Cost of implementation

Impacts on its' own Evaluation model

Impacts areas
on its' own Evaluation model

Impacts on all other
Systems' Evaluations

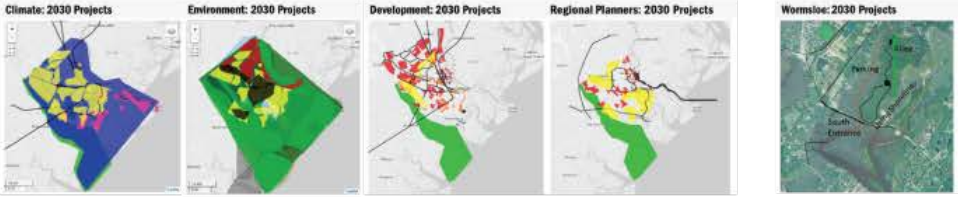
Impacts areas on all other
Systems' Evaluations

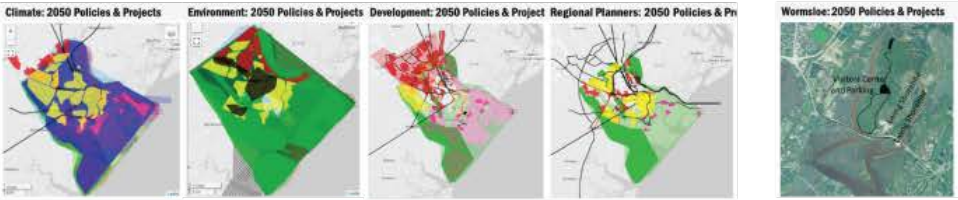
COMPARE: Decision Models, Designs, Component Diagrams, Frequency of Diagrams, Overlapping Designs, Impacts, Costs

Design Process

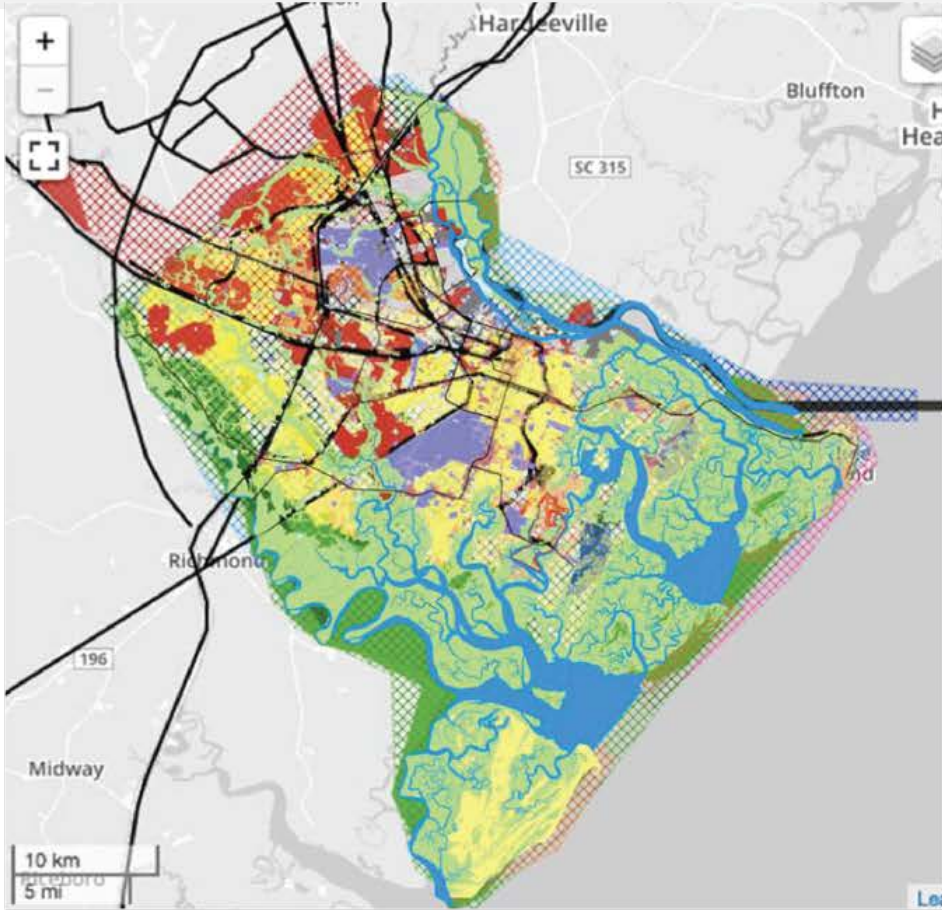
Assessment Maps

Interest Groups





Recommended Plan 2050



CLIMATE ECOL SRFCWTR GRDWTR HISTCUL TOURISM AGFOR HOUSING COMIND TRANS

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

UGA Workshop Participants Feedback

- *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 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.

- *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.*

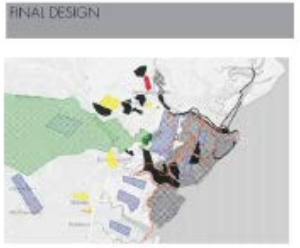
Replication: Professor Rivero's Fall 2015 Regional Planning Studio

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

Evaluation teams

Change teams

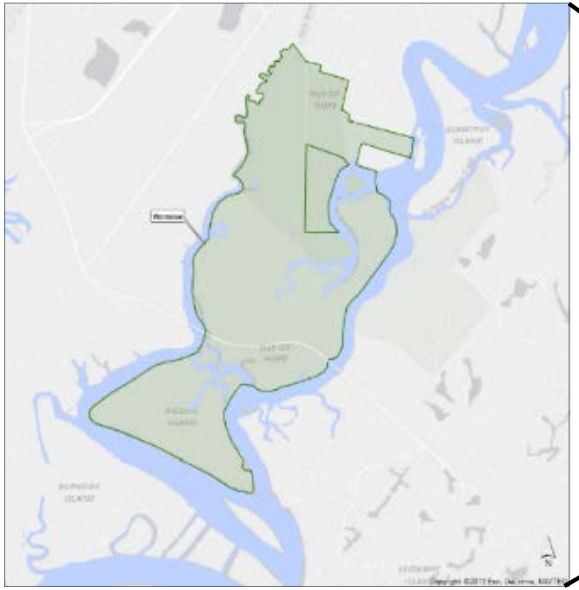
Negotiation teams



Future Planning Efforts: 2016 Coastal Georgia Geodesign Workshop

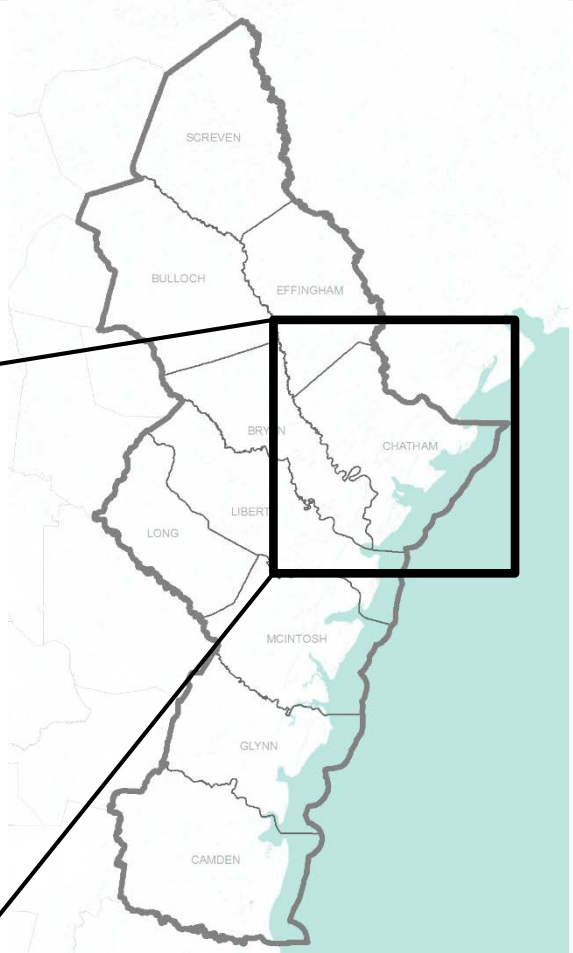
The Coastal Regional Commission of Georgia and the College of Environment and Design (CED) at the University of Georgia will host a workshop April 20-21, 2016 at the Coastal Regional Commission office in Darien, GA.

- 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.



Wormsloe

Chatham County



10 Coastal Counties

Special thanks to the following:

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

2016 Geodesign Summit, January 28, 2016
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