Using GIS to facilitate interdisciplinary educational objectives: Lessons learned from the Coastal Community Resilience Studio

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Four years ago, designer and technologist Bran Ferren issued a challenge during the first Geodesign Summit: become better storytellers using geodesign.

Ferren, the chief creative officer of Applied Minds LLC, returned to Esri in January to keynote the fourth Geodesign Summit, reiterate his first call to action, and deliver another: develop a 250-year plan for the planet enabled by geodesign to create a vision of the future.

"Geodesign combines geography and data with modeling, simulation, and visualization to tell stories and [show] the consequences of your actions," Ferren told the more than 260 architects, urban and transportation planners, GIS and design professionals, educators, and others, in attendance. He sees great potential for geodesign to ultimately help find solutions to complex problems. "It is still in the shiny object stage, but it will be very important," he said.

Geodesign technology will mature naturally, much like other technologies, such as GPS, did. But meanwhile, said Ferren, in this era of short attention spans, people need to start thinking far, far into the future to create a problem-solving template that can be built on over time.

"If we are going to address these big global issues facing us—whether that’s disease, education, freshwater, war, or global warming—you actually have to take a long view," Ferren said. "For this planet, we need—pick a number—a 250-year plan."

continued on page 2
Resilience Studio

- Institute for Coastal Ecology & Engineering
- School of Architecture and Design
- School of Geosciences
- Dept. of Sociology and Anthropology
- UL Lafayette/NASA Regional Application Center
GIS, CAD, AI (and integration) at work
PECAN ISLAND

Within the context of the Pecan Island, the goal is to develop and create opportunities for community-based food production. The project focuses on utilizing vertical farming and hydroponics to maximize space and productivity. The design incorporates a system of vertical farming structures and community gardens that are integrated into the existing landscape. This approach not only enhances the aesthetic appeal but also promotes sustainable living.

The project aims to encourage community engagement and education about sustainable practices. Through a combination of workshops, community meetings, and interactive exhibits, the project seeks to empower the community to take ownership of their local food systems. By fostering a sense of ownership and pride, the project hopes to create a resilient and self-sufficient community that is better equipped to face future challenges.

Key components of the project include:

1. **Vertical Farming Structures**: These structures are designed to maximize space and productivity, using hydroponics to sustain plant growth without the need for soil.
2. **Community Gardens**: These gardens provide a space for community members to grow their own produce and learn about sustainable agriculture.
3. **Educational Workshops**: Regular workshops and community meetings are planned to educate residents about sustainable practices and provide opportunities for hands-on learning.
4. **Public Engagement**: The project aims to engage the public through interactive exhibits and community events, fostering a sense of ownership and pride in the local food systems.

The project is designed to be adaptable and scalable, allowing for easy expansion and modification based on community feedback and changing needs.
Resiliencies in the structures along Pecan Island become a huge factor in determining the form the local architecture. The main threat of destruction is the storm surge created by hurricanes and storms. In 2005, the flood surge reached 12 feet above sea level. The main buildable area of Pecan Island is roughly 3 feet. Camps that were raised below 9 feet off the ground were potentially lost in the storm. Because of these storms, newer structures could be built. Each major typology has developed ways of responding to flooding conditions. Some strategies involved permanent solutions, while some range on temperate solutions.
Because of the finances in lifting a structure to the proper elevation to resist flooding, an alternate solution has been developed that uses a breakaway structure. These campers during operation are attached the main unit, and during flooding conditions these campers have the ability to detach from the structure. These structures have used a combination of permanent and temporary structures that creates a unique typology of building.

Type 1

Type 2

Type 3

Type 4

Type 5
Analysis of Resource Use in Pecan Plant Use: Cultivated & Wild → Resource Use

Resource Use Identification

Questions
- Native vs. non-native?
- Overlap between wild & cultivated?
- Stacking, edible, medicinal, material?
- Tools created from resources available

Cultivated
- Citrus trees
- Edible
- Med. regulate blood sugar
- Plant trees
- Various vegetables
- Pecan trees
- Pigeon trees
- Longleafs
- Sea island or Black seeded
- Cotton
- Yellow hanks
- Sugar cane
- Rice
- Peas
- Oats

Wild
- Castor bean
- Cotton
- Tobacco
- Oil
- Sugar cane
- Quercus Virginiana
- Muskrat
- Nutria
- Alligator
- Types of fish?
- Oysters
- Crabs
- Crawfish
- Types of fish?
- Other use of wild resources
- Spiderwebs
- Med. use to control clothing

Plants
- Bark dye? Used to tan shoes & saddles
- Timber resource
- Sugar cane molasses
- Quercus Virginiana
- Bignonia capreolata
- Material for building
- Sabal minor
- Willow
- G alta nigra?

Animals
- Hogs
- Ducks
- Deer
- Deer
- Otter
- Nutria
- Alligators
- Types of birds?
- Redfish
- Oysters
- Crabs
- Crawfish
- Types of fish?
Organization and Analysis of Field Data from Social and Design Sciences

09-22-12 Pecan Island Resident interviews conducted by Dr. Joanne Derouen & students

09-22-12 Pecan Island photographs taken by Lilli Voorhies

09-28-12 Donald Broussard interview conducted by Phillip Breaux & Lilli Voorhies

09-28-12 Pecan Island photographs taken by Lilli Voorhies

09-28-12 Pecan Island photographs taken by Phillip Breaux

10-11-12 Neil & Susan Bourque interview conducted by Dr. Joanne Derouen & students
Land Loss in Pecan Island

The chart shows the process of subsidence in impounded agricultural fields from 1998 to 2010. The land itself begins to shrink from drying out.

Marsh Restoration

A moderate scenario of marsh loss in the Mississippi Delta in the year 2010. Without more action to restore natural marshes, thousands of acres will be lost due to predicted hydrology changes. The most important factors are: higher sea levels from melting sea ice, increased storm intensity and frequency, increased run off and salt production, increased production of black carbon, and saltwater intrusion. These processes contribute to the progressive loss of wetlands and coastal marshes. The chart above shows the process of marsh loss from 1998 to 2010. The marshes are shrinking as a result of rising sea levels and increased saltwater intrusion.

Hwy 82

The chart shows the process of subsidence in impounded agricultural fields from 1998 to 2010. The land itself begins to shrink from drying out.
### Analyses of water from Bull Run River near Bull Run, Oreg.

[Parts per million, except as otherwise designated.]

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* Sodium and potassium, determined on combined alkali residues.  
  * Total annual denudation.
\[ \mu \text{NO}_3 = 0.60 \text{ mg N L}^{-1} \]

\[ \mu \text{NO}_3 = 1.79 \text{ mg N L}^{-1} \]

Census Reports Volume VI

Twelfth Census of the United States, Taken in the Year 1900

William R. Merriam, Director

Agriculture

Part II

Crops and Irrigation

Prepared under the Supervision of Le Grand Powers, Chief Statistician for Agriculture

Washington, United States Census Office 1902

Bureau of the Census Library

Take Home Message: Role of GIS

- Ability to coalesce seemingly disparate datasets:
  - Architectural Photographic Surveys, Social Science interviews, Property Records, Salinity, Vegetation, land loss, Recreational & Commercial Fisheries, Agricultural, …

- Ability to spatially correlate meaningful conclusions and model capable predictions

- A tool for ‘bridging the gap’ between disciplines and training modern professionals for today’s complex problem solving scenarios
For more information

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