Introduction and Rationale

What to tackle:

• what's known, what's unknown, what's answerable (& unanswerable?) ...

Why?

• to encourage fruitful collaborations, shared language, identify voids, guide future work & engage education

• evidence of success of geodesign methods will promote rapid uptake, evidence of problems will help us fix them
Lessons and Questions from Practice

Original questions: @GSD circa 1998: Why don’t designers use GIS? -> What could GIS learn from designers?

Today: (Flaxman / GeodesignTech) research-oriented practice

3 case studies, each with different concerns and starting points
Example Regional Studies

- Florida Beaches HCP – Endangered Species Act
- NSF Ecohydrology – Ecosystem Services Science
- BLM Great Basin – Modernizing ‘resource assessment' methods to include design/policy alternatives
Florida Beaches HCP
Starting Context

• Traditional impact assessment framework

• But with minimization and mitigation accounting (ESA Section 10 not 8)

• Huge scope
  400 miles of beach
  16 species
  50 permit types
  10k permits/year
  6 Years of meetings…
Project 1:  
Florida Beaches HCP

- Project underway for 2 years before I was hired. Why?
  - Had ignored impact of sea level rise on beaches
  - Didn’t have a technical framework capable of simulating biological impacts at scale
  - Didn’t have conceptual framework to target minimization and mitigation, or account for it quantitatively
Florida Beaches HCP
What’s Been Done

- Created contextual scenarios which look specifically at SLR & beach development
- Created an interactive online impact assessment system supporting ~100 participants
- Developing mitigation plan scenarios
NSF Hydroecology Study
Context

• Large science research study.

• Responsible for “scenario planning” within an ecosystem services quantification project

• Goal: generate scenarios and tools for managing water & green infrastructure better
NSF Hydroecology Study
Work Done to Date

• Created online scenario platform integrating diverse land use, climate & hydro data

• Developing geovisualizations to explain what “getting the water right” might look like
Great Basin Alternative Futures: Context

• BLM-sponsored effort, in advance of large new federal & state commitments for Sage-Grouse restoration (millions of acres of land use change).

• Prior “REA” planning effort done standard way, considering single future
Great Basin Alternative Futures: Goals & Methods

• Leverage prior planning & impact assessment work

• Extend to consider human choice (covering millions of acres), climate change & working lands

Engage stakeholders in very remote areas, including many who strongly disagree with current land tenure and management
Questions from Practice

1) Which social and technical methods need to be developed to support routine geodesign use and updating of "best available science"?

2) How can ecosystem services be fully accounted for within a geodesign framework (positive impacts minimizing and mitigating negative ones)?

3) How can "robust decision-making" (plans evaluated against multiple contextual scenarios) be integrated into conventional planning?
Precedent: GIS&T BoK

- UCGIS Body of Knowledge -
- Comprehensive Chart

- Over 100 + topics! Perhaps too many categories…
Precedent: NCGIA

- Consider the NCGIA 3-point triangle
- 'People, Society, Computers' -
- robust, but simple (& geography implicit),

- And … no design! Perhaps too few categories…
Precedent: Ervin’s 15-part System

- perhaps look at Ervin's 15 part 'system / toolbox'

- ... Design topics included (e.g. constraints, diagrams, simulation...)

- ... But perhaps 15 is still too many categories...
Precedent: Miller’s 9-point List

- Good List but somewhat ‘instrumental’ focus...

- Operational frameworks
- Data models
- Creation and modification tools
- Inference engines
- Geo processing tools
- Feedback displays and dashboards
- Scenario management tools
- Collaboration tools
- Interoperability tools

Miller, 2012.
Introducing Geodesign: The Concept.
White paper. ESRI Press.
Precedent: Steinitz’s 6-part Framework

• Structuring a research agenda on the framework

• What if each step generates research questions?

• Advantage: well known and procedurally strong

• Challenge: tacit on ‘who’, scale, issues
Precedent: Steinitz’s 4-pole Venn Diagram

• Useful - Broad, Spatial

Introduces Design Explicitly…

• Connects to Disciplines
Steinitz’s Venn Diagram @ NAU

- Maps Curriculum into 4 poles...

**GSP Core Course Key:**
- 130: Mapping the World
- 150: Physical Geography
- 201: Community, Planning & Change
- 206: Public Participation & Comm.
- 240 or 241: World Geography West/Cast
- 303: Community Design & Preservation
- 331: GIS Foundations I: Map Design
- 371: The Urban Realm
- 375W: Community & Global Analysis
- 405C or 480C: Capstone Professional Project

**Source:** Paradis, T. 2011
Adapted from Steinitz, C., 2011 GeoDesign Summit Presentation.

Figure 3. The Steinitz Geodesign Framework with GSP course numbers embedded. Course location is based on a qualitative estimate of their weighting toward one or more geodesign areas. Source: Tom Paradis, Mark Manone.
A Dozen Geodesign Research Questions
(Not quite random)

Design Professionals

Information Technologies

People of the Place

Collaboration / Participation

Critical GIS

Geographic Science

Geodesign Research

Computer Aided Design / Artificial Intelligence

Geographic Information Systems / Technology
What are some examples of projects - real or imagined - that clearly and convincingly serve to define what Geodesign is and, importantly, what it isn’t? — Dana Tomlin

What are the relationships between “problem type/size/scale” and effective “ways of designing”? How complex do models need to be in order to properly inform and influence geodesign decisions? — Carl Steinitz

How can/should 2D planning tools and 3D simulation tools interact? What are desirable attributes of ‘geodesign dashboards’? What tools/techniques are required for productive multi-party web-enabled collaboration in geodesign? — Eric Wittner & Bill Miller

Which social and technical methods need to be developed to support routine geodesign use and updating of “best available science”? — Mike Flaxman

What does the doing of ‘critical geodesign’ mean? — Matt Wilson

To what extent should (or would) geodesign approaches and practices benefit from (as well as shape) innovative smart environments in order to improve or facilitate citizen engagement? — Stephane Roche

How is geodesign different from “traditional design” methods? Does the notion of “primary generator” have relevance to (or meaning in the context of) geodesign? What would be the best use(s) of AI in geodesign? — Allan Shearer

What system architecture(s) can form the basis of an end-to-end and top-to-bottom geodesign environment to address complex sustainable systems (decision) interventions that are theoretically sound and practically useful? — Timothy Nyerges

How can GIS technology be extended to include/cover all of the elements of a geodesign ontology (including e.g. dynamics, interactions, affordances, and especially “purpose” — answers to “why?” questions)? — Mike Goodchild

What role might geodesign play in addressing the "grand challenges" of our time and how might these tools and methods be more widely used in order to deal with those challenges? — Tom Fisher

What distinguishes geodesign from similar processes? — Kelleann Foster

What are the roles of diagrams in geodesign and how might they be digitally represented and computed with? — Stephen Ervin
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Carl Steinitz:

What kinds of **DIGITAL** information-management support are needed for geodesign workflow, and especially for the **CHANGE** models in geodesign collaboration?
• Really, it’s the DESIGN component that’s new in geodesign, and that should drive a big part of the research enterprise

• (as we benefit from all the other ongoing research in GIS&T, AI, ITC, social computing, etc....)

• but ‘design research’ is nebulous, and hard!
Observation 2: Spatial Scenarios

- Both sciences and design are taking place in a changing world
- Spatial scenario simulations represent the start of a “lingua franca”, understood (differently) by all parties
- However, participatory generation, management and sharing of large number of separately-conceived scenarios is still challenging
Observation 3:

Impact Assessment

- Rapid design-time geospatial impact assessment is a stated goal of geodesign
- However, we need empirical research to validate this assumption, and Steinitz’ work suggest this varies by scale and method
Observation 4: Biomimicry & Ecosystem Services

• Janine Benyus’ ‘14 keynote challenged us to start design with a very high standard (nature)

• ‘Ecosystem services’ provide a framework for quantifying triple-bottom-line impacts

• Design tools which credit positive ES contributions of good design fit geodesign well, but are very underdeveloped
A key component of geodesign is the intersection -> interaction -> INTEROPERABILITY between four domains; so a key research topic is interoperability — between people, systems, disciplines, models, etc — This requires shared language, data models, …
Conclusions

• Community of researchers/practitioners needed to push research along…Various precedents to guide - new modes/forms of research indicated?
Opportunities to Engage

• **Spatial Decision Support Consortium (~40+ member group)** actively discussing collaborative opportunities and upcoming proposals (see Tim Nyerges or Naicong)

• Geodesign Research Network Google Plus Group:

http://snipurl.com/geodesignresearch

• Or tweet using #geodesignresearch