



Enhancing Qualitative Social Science Research with GIS

19 April 2024 | 10:40-12:00 | 323A, 3rd Floor, Hawai'i
Convention Center

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Why Give this Workshop?

- To thread Geographic Information Science (GISc) and critical geographical and social theory.
- To expand ideas about what constitutes geospatial data.
- To promote the inclusive, critical, and open nature of research and applications with GIS.
- Enhance the engagement of social geographers with GIS.

Example: The Powers of Qualitative Research: *Nature* - article:
<https://www.nature.com/articles/s41558-021-01153-z>

The thesis for this workshop:

Modern GIS has much to offer to social scientists including geographers who seek to use qualitative and mixed-method perspectives in their instruction and research.

What will we cover:

Innovative practices in teaching and instruction; Survey design, data capture, visualization, analysis, collaboration, and dissemination.

What we will demonstrate:

Approaches for working with diverse data types such as perceptions, concepts, behaviors, and values to investigate complex social and environmental issues.



#EsriSocSci

“Enhancing social science with *GIS strengthens how qualitative and quantitative data and methods work together*. It supports this interplay by providing an *organizing context* that makes the information *more accessible and usable—insights for hard problems* like racial equity, climate-driven migration and other impacts, global health challenges and more.”

--Esri Social Science Collaborative



Types of Data

Spatial Data

**Definition:**

Shape, size and location information of features. (A feature is any object that has a spatial representation such as a point, line, polygon, raster value in a pixel, shape, area, distance, direction, or annotation.)

Examples:

Locations of invasive species, neighborhood planning units

Methods for Collection & Analysis:

Location tracking sensors, hot spot analysis, cluster analysis, choropleth maps, heat maps, etc.

Quantitative Data

**Definition:**

Statistical—typically structured (discrete or continuous).

Examples:

Counts, distributions, weights, etc.

Methods for Collection & Analysis:

Surveys, log data, other automated measures/tools

Qualitative Data

**Definition:**

Tends to be non-numerical and descriptive, typically unstructured or semi-structured.

Examples:

Concepts, descriptions, meanings, language, media, perceptions, and sentiments

Methods for Collection & Analysis:

Interviews, focus groups, observation, ethnography, case study, phenomenology, surveys, and grounded theory



Spatial Data

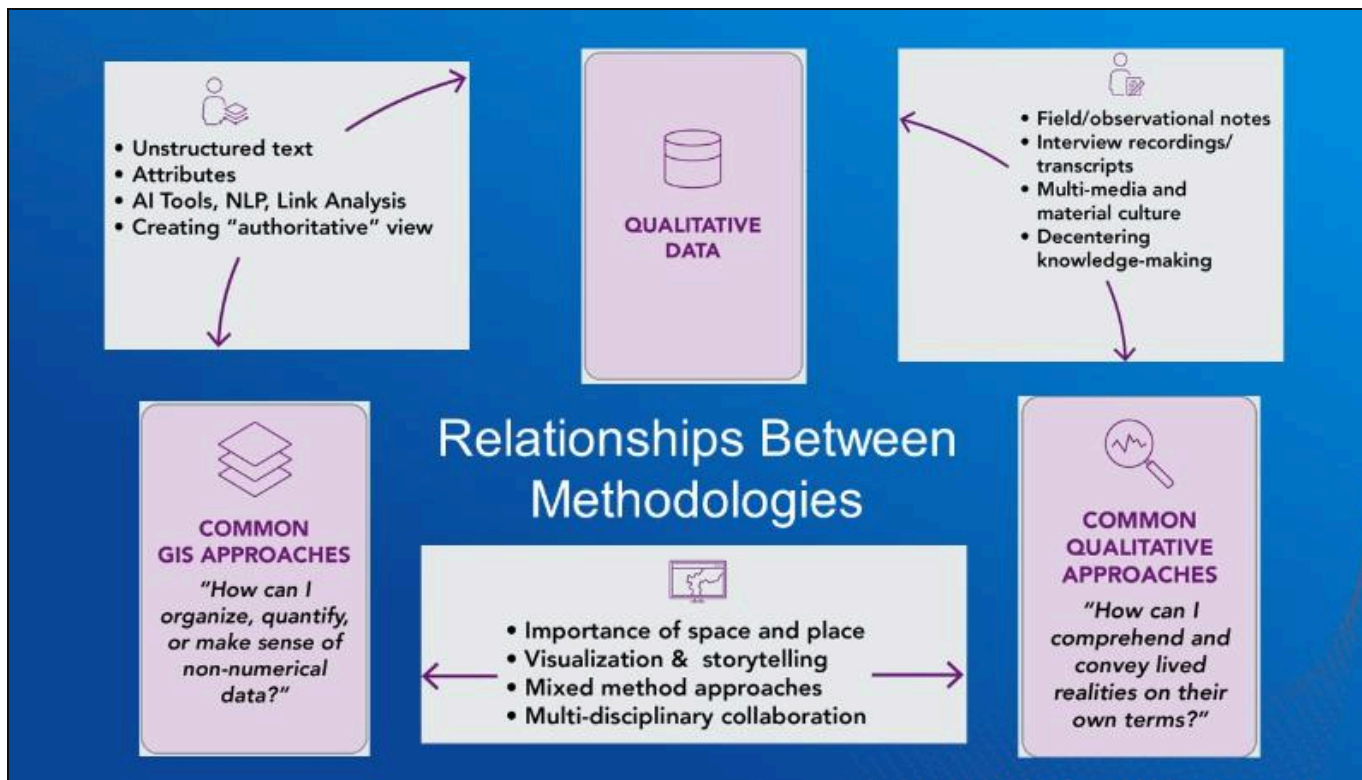
- Location, location, location
- Geospatial data refers to the shape, size, and location of the feature.
- Examples: Locations of invasive species, neighborhood planning units.
- Methods and Approaches: Location tracking sensors, hot spot analysis, cluster analysis, choropleth maps, heat maps, etc.

Quantitative Data

- Statistical, typically structured in nature (more rigid and defined). Mathematical or computational analysis.
- Asks the question “how much” or “how many”
- Examples: Discrete data, continuous data.
- Methods/Approaches: Correlational, experimental, causal-comparative, survey research

Qualitative Data

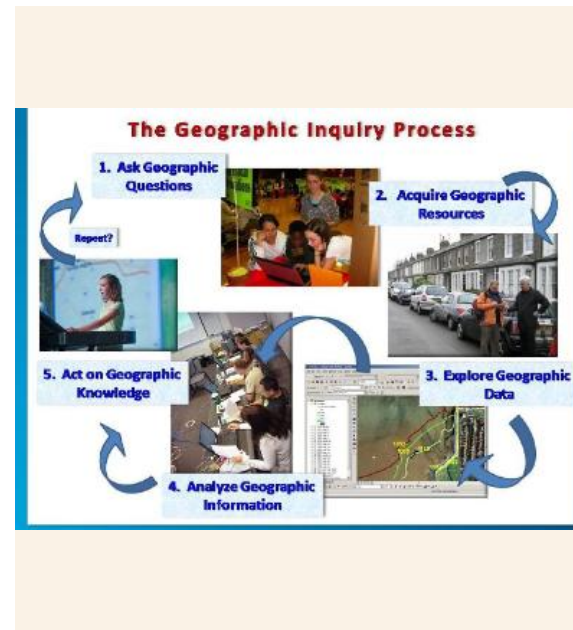
- Descriptive, typically unstructured or semi-structured
- Categorized thematically or based on properties, attributes, labels, and other identifiers
- Asks the question “why”
- Examples: Open-ended and non-numerical data, concepts, descriptions, meanings, language, media, perceptions, sentiments
- Methods/Approaches: Interviews, focus groups, observation, ethnography, case study, phenomenology, surveys, grounded theory

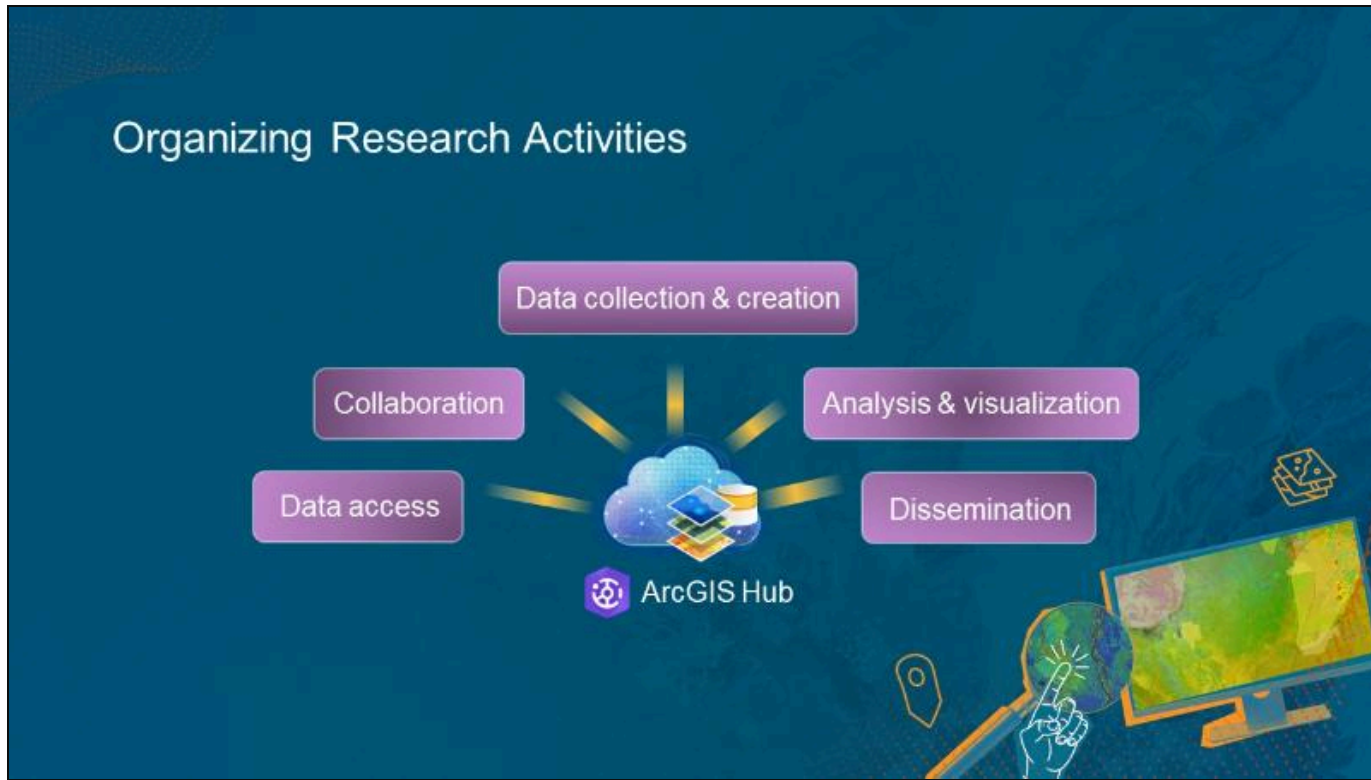


The Research Cycle

Ask meaningful questions > determine methodology > acquire data, tools, and other resources > explore data > analyze data > communicate results > act on knowledge > ask additional questions >

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How ArcGIS Supports Social Science Research

Data access

Contextual data such as satellite imagery or population statistics

-  ArcGIS Online
-  ArcGIS Living Atlas of the World
-  ArcGIS Earth
-  ArcGIS Community Analyst

Collaboration

Leverage web GIS to work on shared projects; build a hub to engage participants

-  ArcGIS Online
-  ArcGIS Enterprise
-  ArcGIS Hub

Data collection & creation

Surveys; locational, contextual, photo/video, participant-generated data

-  ArcGIS StoryMaps
-  ArcGIS Online
-  Site Scan for ArcGIS
-  ArcGIS Pro
-  ArcGIS Survey123
-  ArcGIS Field Maps
-  ArcGIS QuickCapture

How ArcGIS Supports Social Science Research

Analysis & visualization

*Identify spatial patterns and relationships;
triangulate or validate qualitative and
geospatial data*



ArcGIS Online



ArcGIS Pro



ArcGIS Knowledge



ArcGIS Maps for Adobe
Creative Cloud

Dissemination

*Create engaging stories and
interactive digital media;
speak to public audiences*



ArcGIS Hub



ArcGIS StoryMaps



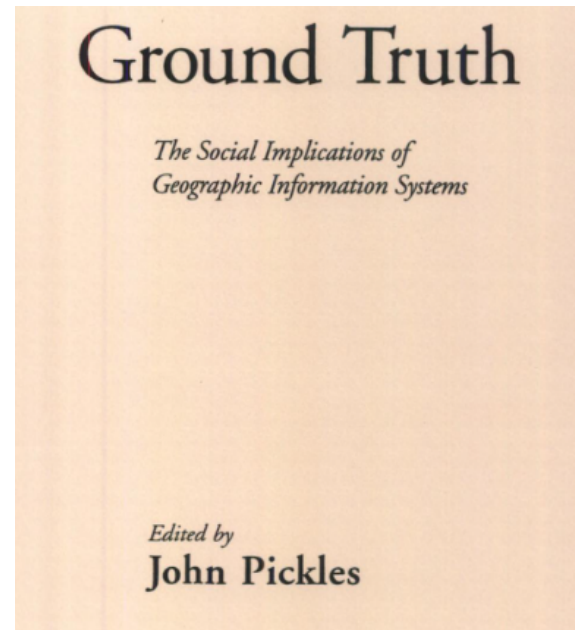
ArcGIS Experience Builder



ArcGIS Dashboards

Concern about the Social Implications of GIS

Is not new: *Ground Truth*, John Pickles, 1995



2 social science examples

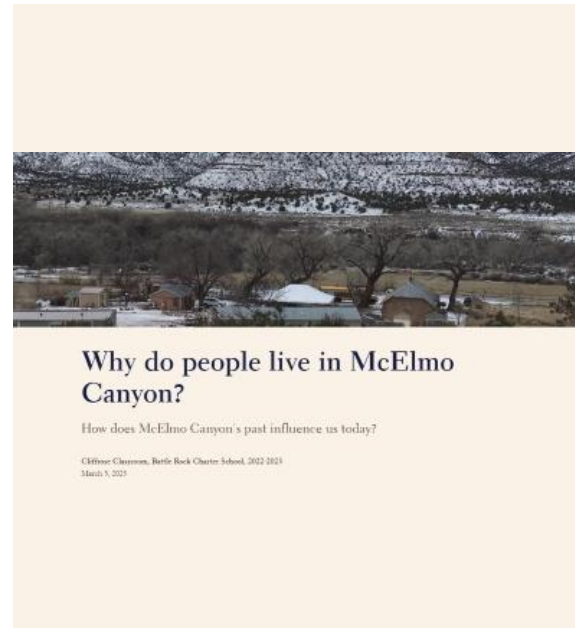
Voices of the Grand Canyon
and
Attitudes and experiences with Electric Vehicles





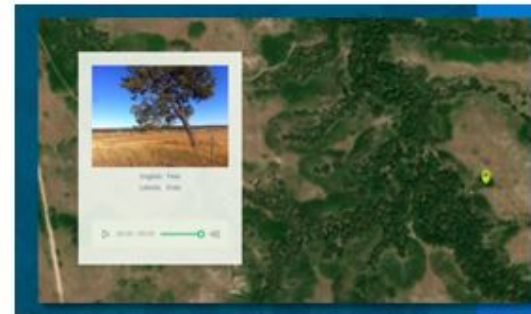
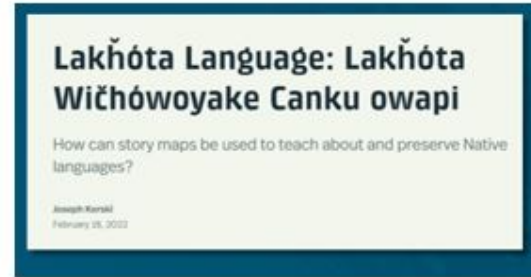
Four Corners

Science, sketching, history, culture, and
much more.



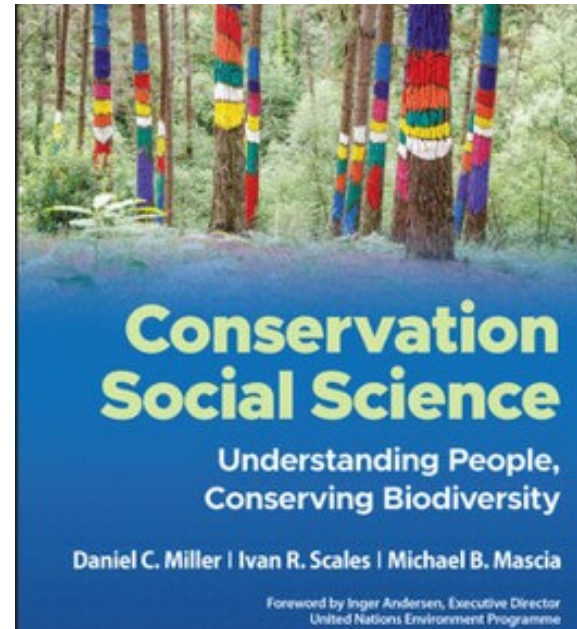
There is usually a higher goal in teaching and research with GIS

The Lakota Language Story Map



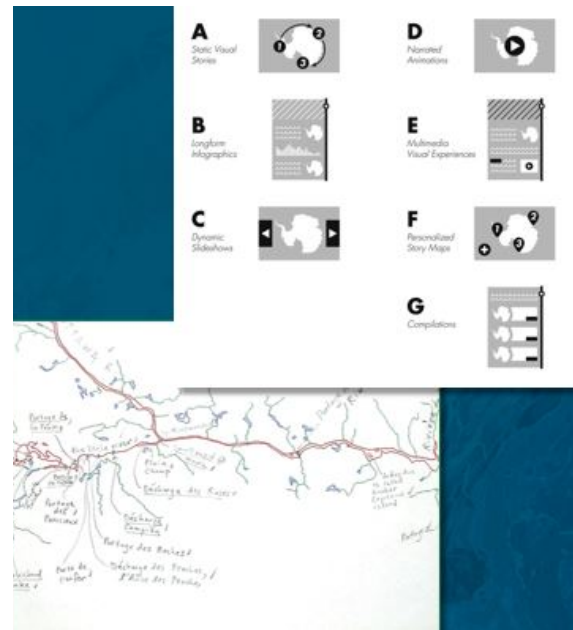
Social Science perspectives are increasingly integral to "standard texts"

Conservation Social Science:
Understanding People, Conserving
Biodiversity



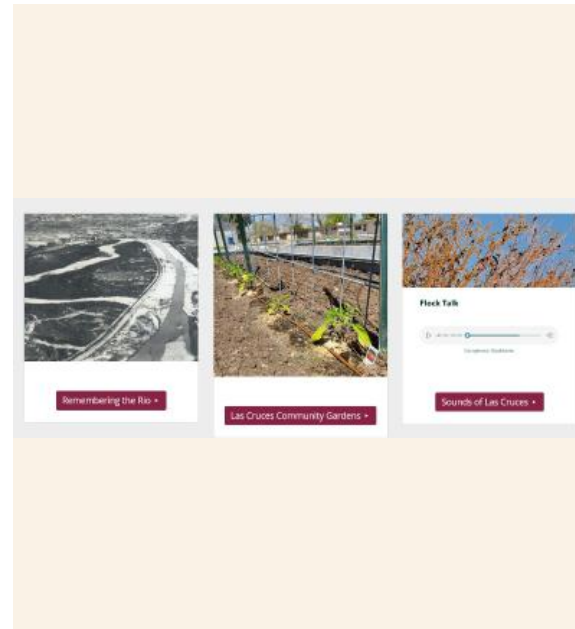
Visual Storytelling research and methods

*Cartographic Design as Visual Storytelling:
Synthesis and Review of Map-Based
Narratives, Genres, and Tropes*
and
*Framing the Days: Place and Narrative in
Geography – Margaret Wickens Pearce,
Cartography and GIScience and Sensory
Maps*



GIS use outside of GIScience and geography is expanding

Innovative Critical Approaches to Place:
Teaching Narrative Mapping in Southern
New Mexico Brings GIS to an Expanded
Array of Disciplines



GIS in Music Styles and History

<https://musicalgeography.org/about/>
What can maps tell us about music?



Through Narrative, Qualitative Data is Supported and Told

Understanding the Night Sky





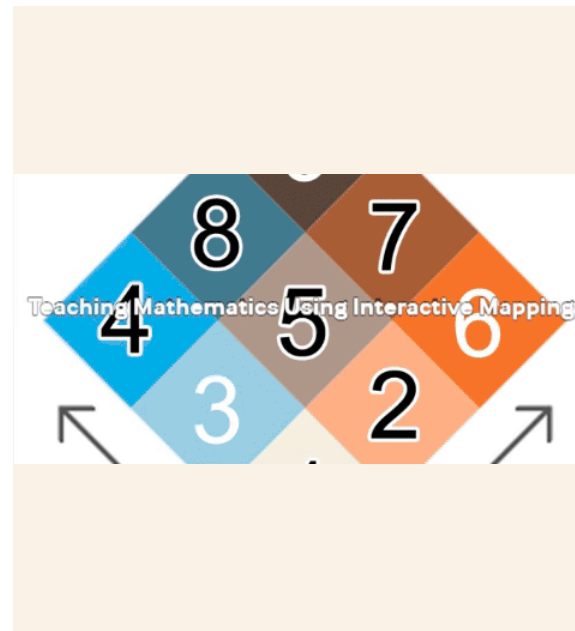
The impact of freeways on urban neighborhoods

Examining the social, environmental, and economic impact: [Article here, Kerski, J.](#)



Teaching Mathematics using Interactive Maps

Book from Taylor & Francis, Arlinghaus,
Kerski, Arlinghaus



Connection to Ethics

Instruction and Research considerations:
Choice of symbology, projection,
classification. Location Privacy.
Copyright. Data Quality. Metadata (and
lack of it).



Using these perspectives in a GIS activity

Locating an Art-o-Mat in a neighborhood

<https://www.esri.com/en-us/industries/higher-education/roles/business-education>

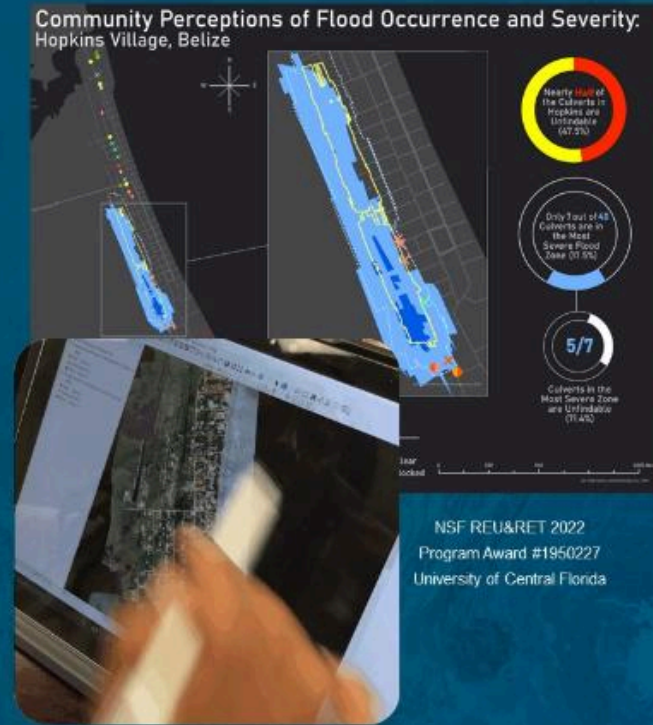
Criteria: In the past 12 months:

1. Ordered from Etsy website.
2. Went to museum.
3. Went to art gallery.
4. Did any painting or drawing.



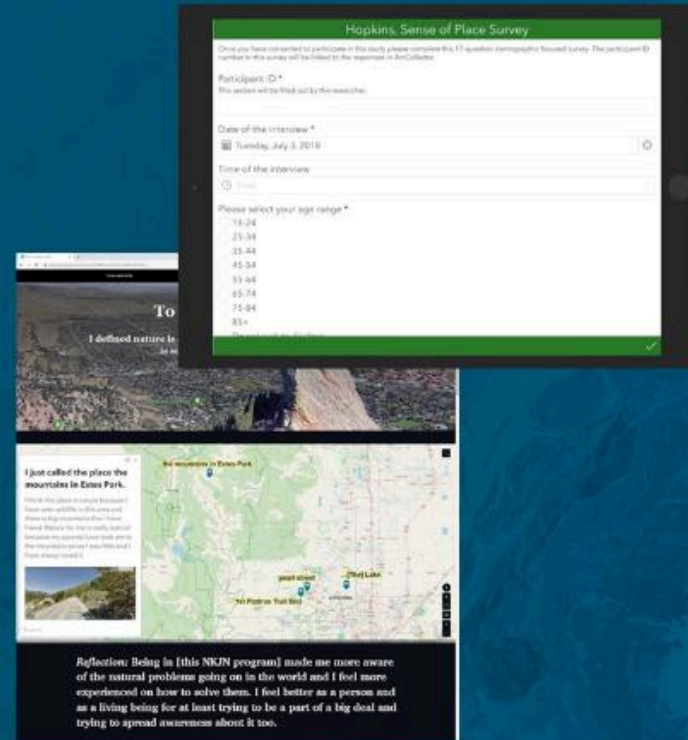
Data collection & creation I

- Using **ArcGIS Field Maps** mobile app to record spatial data, fieldnote jottings, and photos during **participant-observation** and **go-along interviews** (Singer, 2020; see also Kamstra et al, 2019)
- Engaging participants to use **ArcGIS Field Maps** to record everyday experiences of place in cities (Wee et al, forthcoming)
- Longitudinal participatory study combining **drone imagery and manual mapping/digitization** (e.g., *Site Scan for ArcGIS*) with **digital sketch mapping** and **interviewing** with **ArcGIS Pro** (formerly ArcMap) (Brandt et al, 2019)



Data collection & creation II

- Creating a public **questionnaire** with **ArcGIS Survey123** to collect locational and qualitative data (Chivite, 2016)
- **Map elicitation** – using digital maps (e.g., **ArcGIS Online**) or other GIS outputs as an interviewing tool to prompt discussion and reflection (Moore-Cherry et al, 2014, Coleman (Tate), 2018)
- Engaging participants to use **ArcGIS Survey123** and **ArcGIS StoryMaps** to document **narratives** and support **interviews** about relationships with place (Martz et al, 2020) and nature (Martz et al, 2022)



Hopkins, Sense of Place Survey

Once you have completed to participate in this study, please complete this 11 question demographic based survey. The participant ID number in this survey will be linked to the responses in ArcCollector.

Participant ID *

This section will be filed out by the researcher.

Date of the Interview *

Tuesday, July 3, 2018

Time of the Interview

Please select your age range *

18-24
25-34
35-44
45-54
55-64
65-74
75-84
85+

I just called the place the mountains in Estes Park.

Reflection: Being in [this NKN program] made me more aware of the natural problems going on in the world and I feel more experienced on how to solve them. I feel better as a person and as a living being for at least trying to be a part of a big deal and trying to spread awareness about it too.

Dissemination with ArcGIS Hub

1. Provide 1-stop—shop for research participants to access everything they need to participate in a study.
2. Include community accounts for researchers to provide research participants with access to ArcGIS tools to generate data.
3. Organize participants and configure Hub in ways that protects the privacy of participants and the data they share.

University of Denver campus-city partnership.

and Connect Ocean.

How walkable is your community?

Links 4 components of the ArcGIS

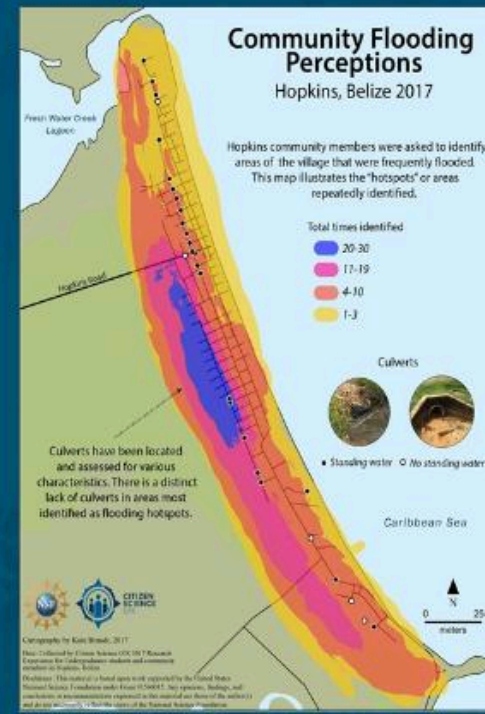
Platform: Survey, map, dashboard, story map.



Analysis & visualization

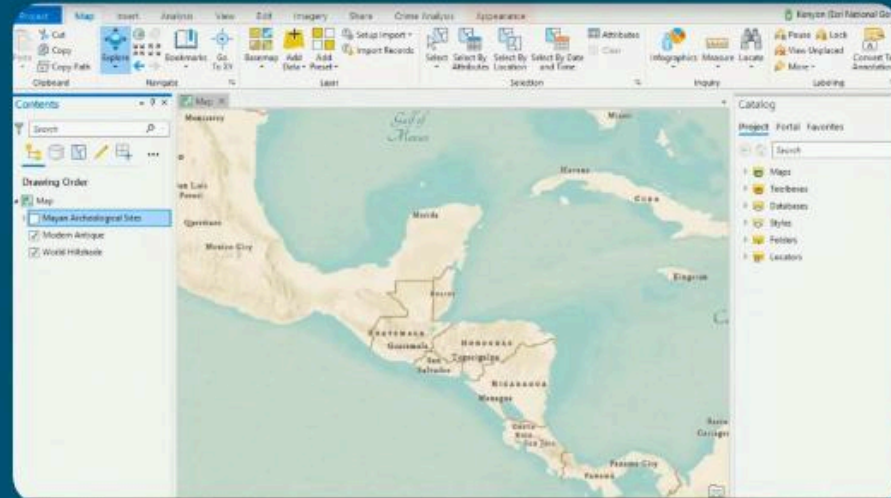
3 main approaches to integrating geospatial and qualitative analysis identified by Jung and Elwood (2010):

- Attaching or hyperlinking qualitative data within a GIS, such as including a quote, photo, or video within a point or area on a map (e.g., Szukalski, 2019)
- Geovisualizing qualitative data through classification, symbolization, or other manual cartographic processes, such as extracting placenames and movement patterns from interview transcripts (Orford and Webb, 2017) or delimiting areas of concern from sketch maps (Curtis et al, 2014)



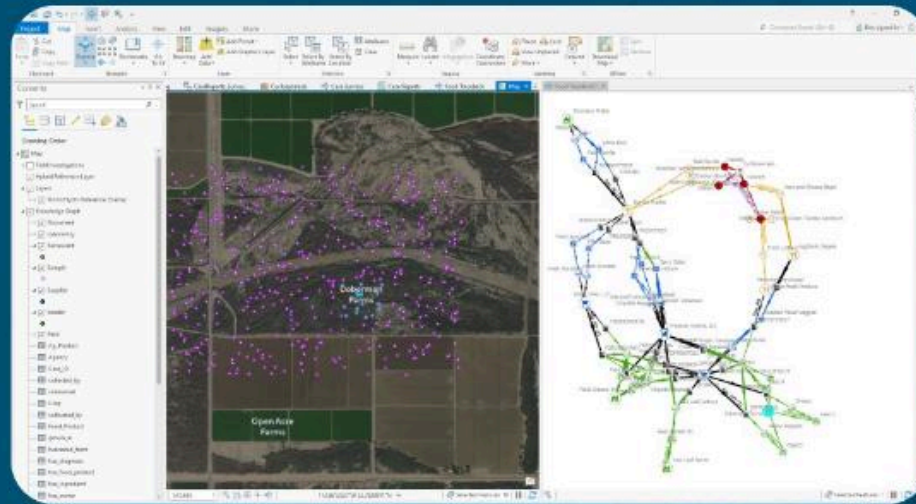
Analysis & visualization of 'big' qualitative datasets I

- **Exploratory text analysis** of large-scale survey data using **ArcGIS API for Python** (Majumdar, 2020)
- Perform **unstructured data analysis** using **ArcGIS LocateXT** to automatically identify, extract, and map locational data from large amounts of unstructured text data (Fotheringham, 2020)



Analysis & visualization of 'big' qualitative datasets II

- **Place-based word clouds** with SQL and Python (Garnett, 2015; Jung, 2014)
- Perform **graph analytics** in **ArcGIS Knowledge** to explore relationships that connect people, organizations, places, events, and other entities (Bush and Martin, 2022).



Don't stop at mapping: Spatial Analysis

This hazards analysis includes an enrichment activity that considers population (total, age, and those living in group quarters).



Participatory Field Sketching

Smart sketching in Survey123: <https://community.esri.com/t5/arcgis-survey123-blog/smart-sketching-in-survey123-stroke-by-stroke/ba-p/891732>

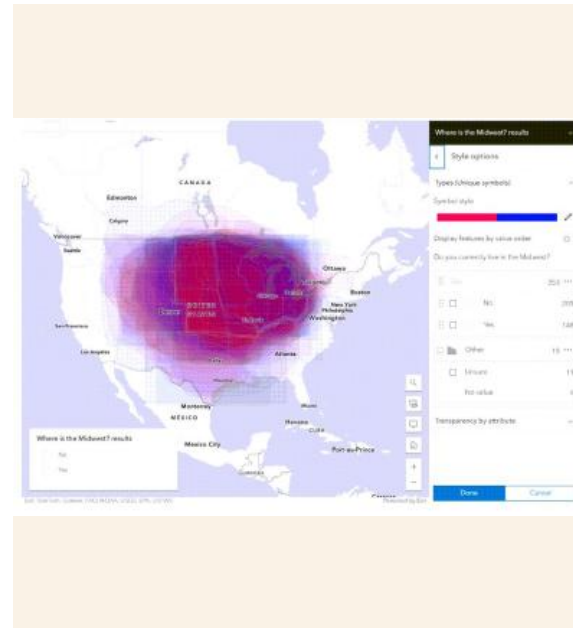
Sample survey: <https://arcg.is/1mylPy>

Sample survey result in map:

<https://www.arcgis.com/apps/mapviewer/index.html?webmap=b8fd08391cdc4dcfa47eb65fed92fabf>

Visualize, Combine, and Analyze Responses from Participatory Mapping

Where is the Midwest? This uses ArcGIS Survey123, ArcGIS Online (Merge), ArcGIS Pro (count Overlapping Polygons). Extensions: Where is the "rust belt/Steppe regions of the world/where you feel safe on your campus?"



Recommendations & considerations:

- For qualitative researchers, GIS can be another tool in your kit.
- For GIS practitioners, qualitative data and methodologies can provide context and grounding.
- Different GIS tools can be used throughout project lifecycle.
- How might you need to adapt your informed consent and data use policies?

Challenges still exist:

- Many kinds of qualitative data are still not well supported in GIS tools.
- Easy to get stuck in tools or lost in the terminology.
- Sometimes a time-consuming manual process.
- Lack of integration: GIS & CAQDAS (computer-aided qualitative data analysis) tools:
<https://lumivero.com/products/nvivo/> NVIVO qualitative data analysis.

How can you continue moving forward in this area?

Map meaningful places in your community.

Crowdsource student hangouts.

How to integrate ArcGIS Survey123 and StoryMaps.

Manage data: Use hosted feature layers to provide relevant data to city employees managing interactions between citizens and wildlife.

Solve a spatial problem: Human-Environmental interaction, invasive weeds in campgrounds in New Zealand.

> > Keep in touch with the Esri Social Sciences Initiative.

Tell your social science story

- Tell your social science story:

- <https://arcg.is/a9yTS0>

Social Science Survey URL: <https://arcg.is/a9yTS0>

Social Science Dashboard URL:

<https://commsolutions.maps.arcgis.com/apps/dashboards/ec6646c781734bf79a1d9c93269e7ae1>



Enhancing Qualitative Social Science Research with GIS

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