INVESTIGATING THE UTILITY OF GEOGRAPHIC INFORMATION TECHNOLOGY FOR A COMMUNITY-BASED FARM: A CASE STUDY IN LONG BEACH, CA

Shannon Julius

Master of Science in Geographic Information Science (MSGISci)

Department of Geography, California State University, Long Beach

Introduction

This project investigates how community-based agriculture organizations can use geographic information systems (GIS) software and GPS capabilities to achieve goals of community outreach and resource management. The study area for this project was The Growing Experience (TGE), a community center, farm, and community garden within the Carmelitos public housing development in North Long Beach.

TGE's primary role is a community resource center that works to address regional problems such as food access, green space access, and health inequality. Disseminating geospatial information may be a positive way to raise awareness of such issues. TGE is also a farm that provides locally grown produce to the community (figure 1). Geographic Information Systems (GIS) are known to be beneficial for agricultural production, but their utility is largely under-researched on small farms.

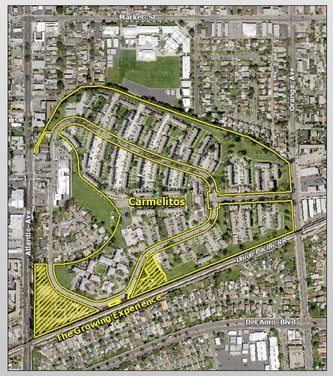

Figure 1. *Study Area.*

Data and Data Sources

Public domain imagery and parcel data were the starting points for the visualizations. GPS points were collected as part of this project to ensure the map was within a level of accuracy. Data regarding regional parks, public housing, and farmers markets were used along with photos and infographics to provide context in the final Story Map.

Table 1. *List of data and data sources used in the project*

Dataset	Source
Orthoimagery (1ft)	LARIAC (2011)
Basemap Control Points	Personally Collected
Parcel Data	LA County Assessor (2014)
OpenStreetMap	OpenStreetMap Contributors via ArcGIS Online
California Protected Areas Database	GreenInfo Network (2015)
Public Housing Sites	HACOLA
Census-Designated Places	TIGER (2010)
Farmer's Market and Farm Locations	Harbor Area Farmer's Markets (2014)
Infographics	Leaf & Fin Aquaponics (2013)
Photos & Infographics	The Growing Experience

Methodology

The site basemap was built in QGIS, a free and open source desktop GIS software. One-foot resolution orthoimagery was used in the preliminary digitizing process. To confirm locations of farm elements, a GPS survey was undertaken using a Trimble GeoXH handheld device. The resulting map was used for a low-tech survey where paper versions of the map provided the structure for participatory data collection. The results from these surveys were then synthesized into a series of static visualizations.

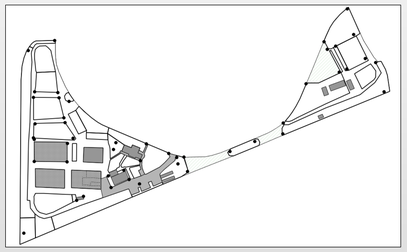

Figure 2. *GPS Survey Methodology. Forty-three GPS points, denoted as black dots, were used to spatially correct the basemap.*

The final visualization method was a Story Map using ArcGIS Online. Additional data were acquired to provide contextual information about regional green space, public housing, and local agriculture. The project layers were customized to display information that related to the theme of each Story Map page. Layers were uploaded and styled in an ArcGIS Online web map. The Map Journal template was used and incorporated web map layers, textual information, photographs, and external links. Finally, the map was shared publicly online.

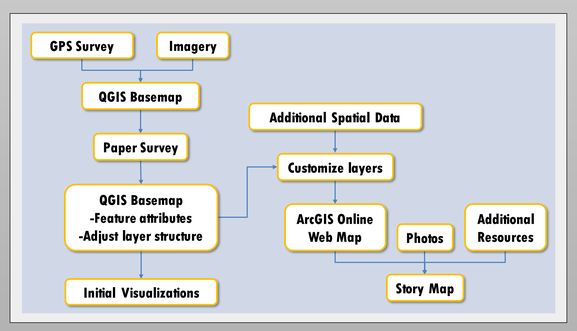

Figure 3. *Visual Model of Project Workflow*

Timeline

June 8-29: Project Planning
Research Question, Timeline, Lit Review, Proposal

July 1-26: Product Development
Data Collection, Map Design, Write Methods & Results

July 17-August 15: Writing
Write Discussion, Introduction, Conclusion
Finalize Paper and All Products

Results

Static Visualization

Field data collection and feature digitization in QGIS resulted in a series of static visualizations. The layers included information about plot use, buildings, sustainable highlights, points of interest, community garden records, and underutilized areas.

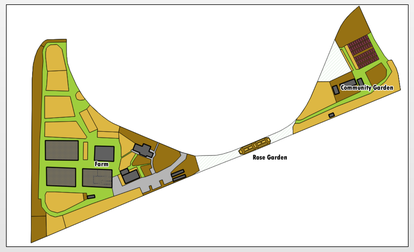

Figure 4. *TGE Static Visualization Example. Tan polygons are agricultural plots; dark gray polygons are buildings; maroon rectangles are community garden boxes; brown polygons are non-agricultural spaces.*

Story Map

The final result is a Story Map web application, which acts as a "digital brochure" where maps, images, and text lead the viewer through the multifaceted story of TGE's mission and programs (figure 5). The app covers themes of public housing, green space, and local agriculture. Viewers learn when to visit the site for events and how to support TGE's programs.

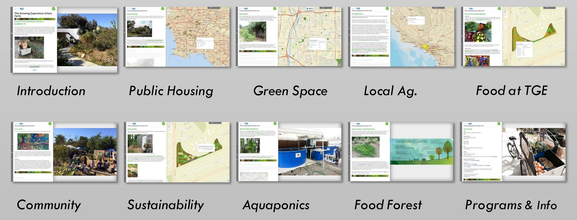

Figure 5. *The Story Map Storyboard. Ten pages cover ten essential themes to tell TGE's story.*

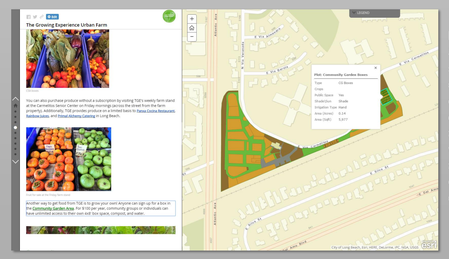

Figure 6. *Story Map Screenshot #1. The left side of the screen describes the community garden and other food programs; the right side shows the web map and denotes the location of the community garden with a popup.*

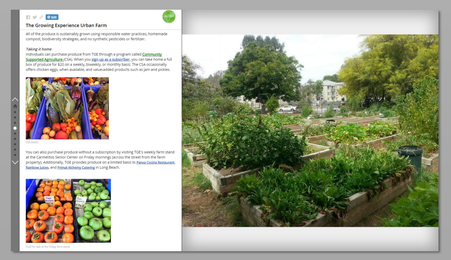

Figure 7. *Story Map Screenshot #2. Clicking on linked text on the left side of the screen causes a photo of the community garden to replace the map in the previous figure.*

Discussion

Significance

The static visualizations were useful for an initial understanding of the farm's spaces. The layers generated for the basemap provided digital storage for fundamental farm information. These datasets were beneficial as a means to synthesize information from disparate sources, but were not useful to manage resources for which recordkeeping was not already part of staff workflow. The Story Map's dynamic format was well-suited for goals of outreach, education, community building. Its narrative and visual elements effectively provided context to explain TGE's complex mission. The Story Map was shared publicly online, thus was accessible to many potential constituents.

Limitations

The GPS points collected in the field were not differentially corrected, thus the points were not as accurate as possible. Feature shapes were digitized with minimal detail due to my limited experience editing in QGIS. The web service further simplified feature shapes. Story Map access is contingent upon internet connection, which is limited at the farm itself and may not be immediately available to many Carmelitos residents. This project based data collection on TGE's current needs and did not account for potential future needs. Finally, the datasets were not prepared for use by TGE as part of this project.

Conclusion

This project found that GIS efforts can fuel and feed off of organizational efforts. It is important to determine the motivational forces of the organization in order to see how GIS can best be applied. In the UGE case, the motivation lies heavily with providing community services and much less with selling produce. Thus the story map was an appropriate solution for their needs, but a comprehensive database was not. The results of this project are a significant improvement to TGE's online presence.

Future Work and Recommendations

Future work will include completion of a plant list to include in the story map, preparation of data for TGE use, GIS training sessions with TGE staff, and outreach with the Story Map. Alternate workflows could have included UAV imaging of the site, diverse perspectives from community members and volunteers as well as staff, or a GPS survey with common devices such as smart phones.

I would like to acknowledge Holly Carpenter and Jimmy Ng from The Growing Experience for their enthusiastic collaboration on this project. I would also like to acknowledge Michael Shensky, Cohort 2, MSGISci professors, and friends and family for their support throughout the program.

Submitted in partial fulfillment of the requirements of the Masters of Science in Geographic Information Science(MSGISci), August 15, 2015.

For additional information please contact:
Shannon Julius | Shannon.m.Julius@gmail.com

Story Map:
http://www.arcgis.com/apps/MapJournal/index.html?appid=24be1ca83ed848a28e7ceffda05bcbad