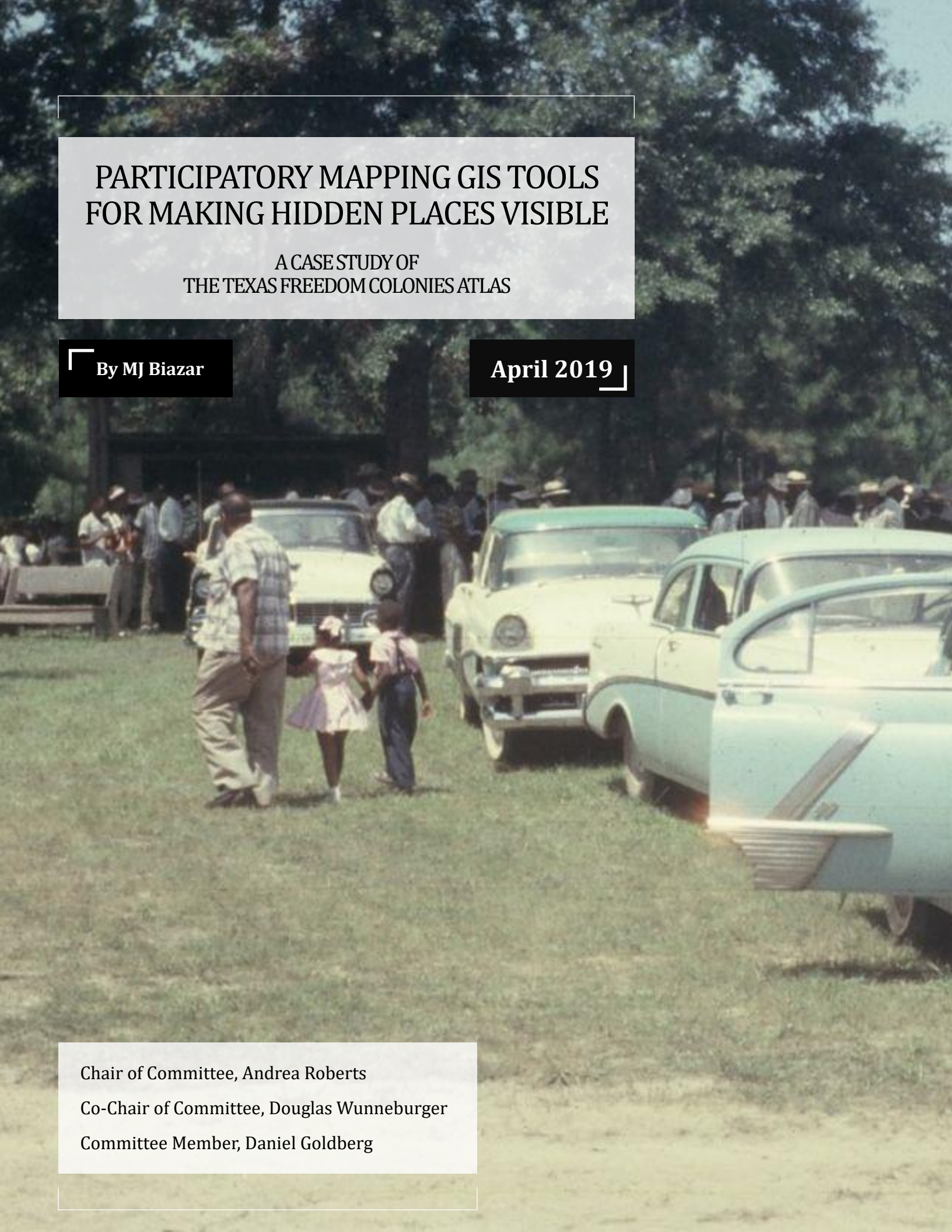
PARTICIPATORY MAPPING GIS TOOLS FOR MAKING HIDDEN PLACES VISIBLE

A CASE STUDY OF THE TEXAS FREEDOM COLONIES ATLAS

By MJ Biazar

April 2019



Chair of Committee, Andrea Roberts

Co-Chair of Committee, Douglas Wunneburger

Committee Member, Daniel Goldberg

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A CASE STUDY OF THE TEXAS FREEDOM COLONIES ATLAS

A Master's Professional Paper

by

MOHAMMAD JAVAD BIAZAR

Submitted to the Office of Graduate and Professional Studies of

Texas A&M University

in partial fulfillment of the requirements for the degree of

MASTER OF URBAN PLANNING

Chair of Committee,	Andrea Roberts
Co-Chair of Committee,	Douglas Wunneburger
Committee Member,	Daniel Goldberg
Head of Department,	Shannon Van Zandt

May 2019

Major Subject: Urban and Regional Planning

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ABSTRACT

This is dedicated to:

My father, who taught me to work as hard as I can to make my dreams come true;

My mother and my wonderful family for all their support and love;

and My lovely wife Lida who has always been my best friend for her inspiration, encouragements, and sacrifices.

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The successful completion of this paper was not possible without support, encouragement, and assistance of my wonderful committee chair and members.

I would like to express my profound appreciation to my advisor Dr. Andrea Roberts for giving me the opportunity to be a part of this amazing project. I owe all my success in this project to her support and inspiration.

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I am grateful for being lucky enough to get to know Dr. Daniel Goldberg at TAMU GIS Day 2017. He introduced me to the amazing world of ArcGIS online which was the essence of this paper.

I would like to extend my gratefulness to the College of Architecture staff and administration and all my professors.

Special thanks to my friends whom I learned a lot from and I cherish their friendship forever.

Finally, I want to thank my family, especially my wife Lida who has always been by my side through thick and thin.

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Chapter 1

INTRODUCTION

INTRODUCTION

This report explains the process and literature informing the development of a web-based crowdsourced mapping tool accompanied by map-based survey forms for data collection, aiming to 1) visualize the findings of the project's mapping process, and 2) map and document freedom colonies in Texas. This platform is called the Texas Freedom Colonies Atlas and is a part of the Texas Freedom Colonies Project—a five-year research study conducted by Dr. Andrea Roberts. By utilizing Dr. Roberts preexisting survey instruments and map layers as well as the capabilities of ArcGIS Online and Survey123 -from Esri, the author created a publically shareable Atlas (or map of freedom colonies) accessible anytime from anywhere.

This platform enables users to see the settlement on the map and explore the information that was gathered –by the research team or from the public through crowdsourcing- and presented by the mapping tool. They can also add their settlement to the map –if it is not already there – and share their information about that place. This information might include origin stories, history, nearest major city, church, school, cemetery, or any special features such as state historical markers or The National Register of Historic Places.

Current and former residents of these settlements and their descendants are the primary target audience of the project. Users can also submit additional documents they might have along with the survey form. These documents can contain different forms including images, documents, or videos and will be attached to the points on the map. These crowdsourced data then will be published on the mapping tool so other users who are not willing to share information can see the points and data added by other users.

Chapter 2, Literature Review, will discuss main concepts of public participation, crowdsourcing, participatory GIS, and participatory mapping through studying many books, articles, papers, and projects related to these subjects. The findings of this study informed Atlas design.

Chapter 3, Cases and Applications, discusses a wide range of crowdsourcing implications and introduces two of the most commonly used crowdsourcing applications. Then, case studies from the literature review are analyzed to 1) show examples of how the concepts of public participation discussed in the literature review can be into various planning processes, and 2) to identify tools and methods which could be (and were) incorporated into the Atlas.

Chapter 4, Methodology, describes the approach and data preparation process. The product of this process was a map of known freedom colonies located through a combination of database research and spatial geocoding utilizing ArcMap software. The final map incorporated the points adopted from the findings of Dr. Andrea Roberts in Newton and Jasper counties in which curated materials were geotagged, making mapping of otherwise invisible places possible. Even though the larger database cones from publically available data, this on-the-ground approach to collecting data is at the heart of the overall Atlas project methodology. The combined database was imported into the ArcGIS Online server to develop the Atlas web-mapping tool.

Chapter 5, Case Study, explains the process of converting the database of freedom colonies into an online interactive map and development of the Atlas as a web-based platform incorporating the map and web-based data collection forms. The Atlas had been released in three different versions: 1) Beta 1.0, 2) Critical Places class application, and 3) Version 2.0. The development process, testing phase, findings, and changes made to the Atlas in each version are described in this chapter.

Chapter 6 presents the finding and results of the project comparing different versions of the atlas in terms of design elements, components, functionality, and collected crowdsourced data.

Finally, chapter 7 how the principles of participatory crowdsourced mapping and data collection application –discussed in the literature review and cases sections- has been implemented in the Texas Freedom Colonies Atlas. This chapter also suggests ways to improve the functionality of the Atlas.

1.1. RESEARCH QUESTION

This report's aim is to determine, **how planners should design web-based, participatory GIS tools to map discrete communities, to collect crowdsourced information, and to support inclusive public planning processes**. This question concerned with design and process emerges from a concern with marginalized, discrete communities called freedom colonies and a review of the literature on crowdsourcing and participatory planning processes. The Texas Freedom Colonies Atlas was developed to make discrete places visible and public planning processes inclusive of freedom colony issues and concerns.

1.2. TEXAS FREEDOM COLONIES

Freedom colonies -also known as Freedmen's Towns- are historic black settlements established by freed black men and women -who did not move to cities or become sharecroppers- after emancipation mostly in rural areas on the edge of former plantations and near the outskirts of cities (Roberts 2017, Hoskins 1993). These settlements initially were ''individually unified only by church and school and residents' collective belief that a community existed" (Sitton and Conrad 2005). They exist all over the United States with a high concentration in Texas.

The term "Freedom Colony" was invented by Texas historians to refer to these historic black communities specifically in Texas, however, they might be called with different terms in other parts of the United States.

Black Texans founded more than 557 independent rural communities between 1865 and 1930 (Roberts [b] 2017). By 1910, freedom colony founders and their descendants owned 31% of all farmland in Texas (Schweninger 1990), but settlements experienced a considerable loss in population, buildings, and visibility after World War II due to annexation, gentrification, the Great Migration, and land loss (Roberts [b] 2017, Sitton and Conrad 2005).

Today, many FCs are unmapped and many disappeared from public records, maps, and memories. Furthermore, while a comprehensive database or an interactive map of FCs' location and information is not available the location data for known FCs is scattered across various archives and agencies (Roberts [b] 2017).

What makes researching these settlements even more difficult is that the place names and the exact location of some settlements are known only by residents or descendants of their founders and the only way to learn about them is researching their oral traditions, rituals, and private collections and archives (Roberts 2018, Connerton 1989).

FCs are vulnerable –especially to natural disasters- since they are undocumented and absent from public planning records due to their geographic location and lack of access to funds and technical assistance (Roberts and Biazar 2018). They are not even recognized as a Census Designated Place because they do not reach the defined population threshold (Roberts 2017, U.S. Census Bureau 2000).

Despite the importance of FCs in the history of African Americans they are often excluded from the National Register because they do not meet the criteria for evaluation defined by U.S. Department of the Interior, National Park Service (National Park Service 2019).

Furthermore, most formerly enslaved Texans founded their settlements in the only areas available to them, bottomland in low-lying areas often in the path of hurricanes (Sitton and Conrad 2005), which makes them even more vulnerable.

1.3. TEXAS FREEDOM COLONIES PROJECT

The Texas Freedom Colonies Project began as dissertation research by Dr. Andrea Roberts seeking to document the African American settlements history by collecting their names and locations, and collect their related information and overcome their invisibility by making them recognized (Roberts 2017). It is an evolving social justice initiative aiming to document historic black settlements names and locations as well as gathering information about community origin stories, cultural practices, and providing support to grassroots preservation groups and their planning activities (Roberts 2018).

The Project also collaborates with freedom colony descendants, holds workshops, and utilizes an online digital humanities platform to enable communities to share their stories, information, and historical and contemporary materials –such as recordings, photos, and oral histories- about their settlements (Roberts 2018).

The Texas Freedom Colonies Project Atlas and Study is a digital humanities platform based on a research and crowdsourced data about freedom colony place, heritage, and social geographic data in Texas serving as an interactive map and online archive in order to make them visible to policymakers, researchers, and descendants of settlement founders (Roberts and Biazar 2018, Roberts [b] 2017).

The project's founder, Dr. Andrea Roberts, conducted an archival and ethnographic research pilot testing for freedom colonies in Newton and Jasper counties. One of the reasons that these two counties were selected as the pilot study area is that a majority of known Texas freedom colonies are concentrated in northeastern and southeastern counties (Roberts [b] 2018).

The pilot research initiated by a list of 22 place names in Newton and Jasper counties and the results helped geocoding and mapping 34 freedom colonies and also revealed that local knowledge of freedom colony place locations is at risk (Roberts [c] 2018). Figure 1 shows the post-study freedom colonies map demonstrating the results of the pilot research in Newton and Jasper counties.

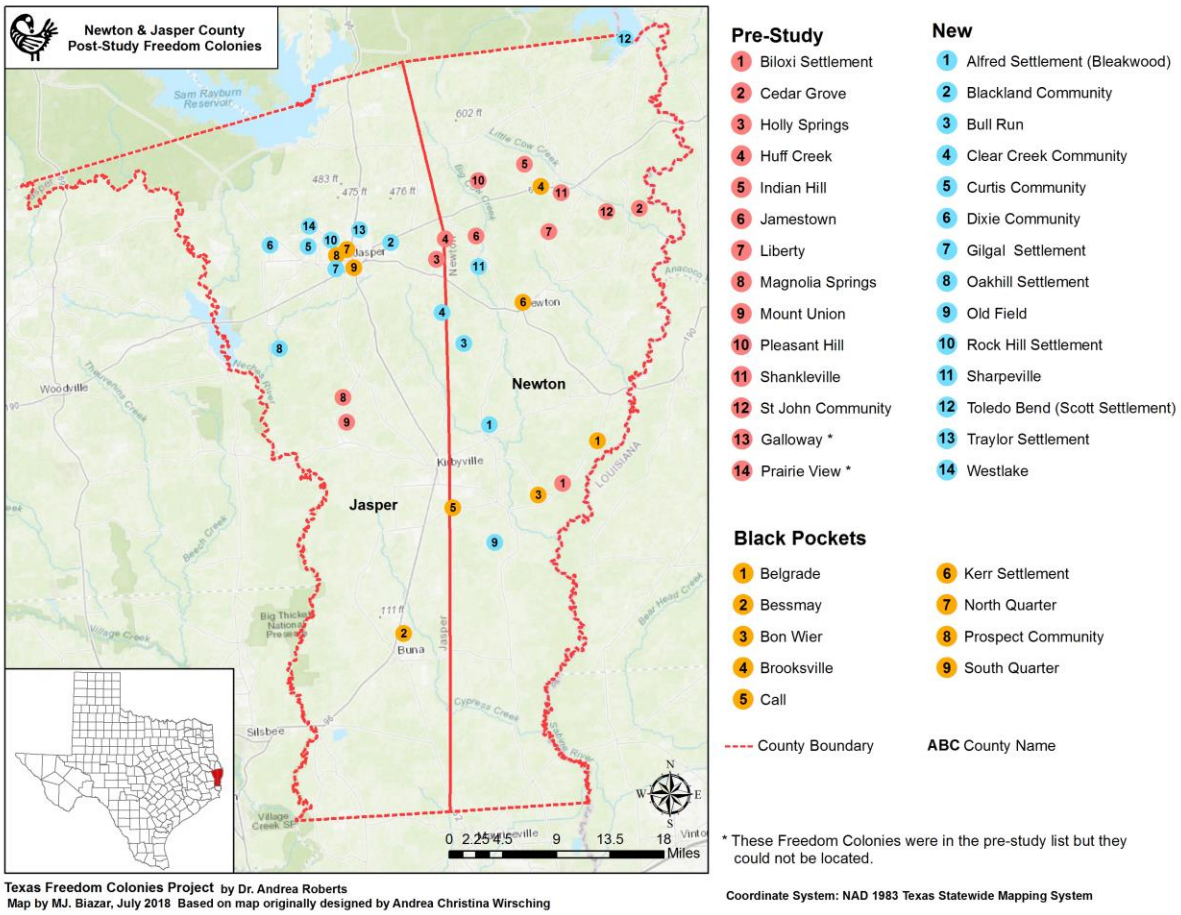


Figure 1. Newton and Jasper Counties Post-study Freedom Colonies

The Texas Freedom Colonies Atlas will undertake a similar approach using an online mapping tool and web-based survey forms to map Texas FCs, crowdsource their information, and incorporate them into a database accessible by the public.

1.4. DEFINITION OF KEY TERMS

The following is the list and definition of key technical terms and concepts used in this paper:

Geographic Information System (GIS) is a set of computer tools designed to collect, integrate, manage, analyze, model, and display data for specific geography (Mennecke, et al. 1995).

ArcGIS is a platform from ESRI that provides a collection of software and tools to create, manage, share, and analyze spatial data.

ArcMap is part of ArcGIS Desktop and is the primary application used in ArcGIS to perform a wide range of common GIS tasks.

Feature is the digital representation of an object from the real word in the GIS environment. Features can have different forms and may represent buildings, parcels, cities, roads, etc.

Feature Layer is a collection of geographic features with a similar class (points, lines, or polygons)

Hosted Feature Layer is a feature layer that is published to ArcGIS Online. Here the layer's data is hosted by, or stored on ArcGIS Online.

Attribute Table is a table showing non-spatial information about a geographic feature in GIS, usually stored in a table and linked to the feature by a unique identifier. This table is a set of data elements arranges in rows (records) and columns (fields) intersect to form cells which contain a specific value for one field in a record.

GeoDatabase is a collection of geographic datasets of various types stored in a single file system folder making representing and managing geographic information possible. Geodatabases can hold feature classes, raster datasets, and attributes.

ArcGIS Online is a cloud-based platform that creates an environment to create, share, and collaborate GIS data. It enables people with no particular GIS expertise to access and use GIS data.

Web Map is an interactive display of geographic information from data layers hosted by ArcGIS Online. ArcGIS Web Maps contain interactive elements such as a basemap, layers, legend, and navigation tools and may include interactive elements such as a basemap gallery, measuring tools, pop-ups that display attributes of map features.

Web Application:

Web AppBuilder for ArcGIS is an online application that allows creating 2D and 3D web apps without using coding. It offers powerful pre-designed tools that are configurable to fit the needs of a project.

Widgets are preconfigured tools and functions featured by different web AppBuilder themes and can be implemented and configured to increase the functionality of the app.

Survey123 is a form-based data collection application of ArcGIS that provides an easy tool to create, share, and analyze surveys.

Organizer is an entity who is in charge of a project and develops and manages tools used in the project. An organizer could be an individual researcher, activist, and organization, or a government.

User is a member of the public, an individual citizen, or a member of an organization who uses and interact with the services provided by an organizer.

Crowdsourcing is the act of collecting information from a group of people usually through an internet-based platform.

Crowdsourced Data is a data that collected from via crowdsourcing from users.

Chapter 2

LITERATURE REVIEW

2.1. OVERVIEW

This chapter introduces the major concepts of public participation and how to incorporate it into the planning process using crowdsourced tools with the focus on GIS and participatory mapping approaches by studying a collection of books, articles, and papers. The findings of this review will be the conceptual design and logical basis of the Texas Freedom Colonies Atlas.

2.2. PUBLIC PARTICIPATION

The first appearance of public participation practices in the United States goes back to 1969 when Arnstein suggested the "Ladder of Participation." The National Environment Policy Act in the same year, and the Federal Advisory Committee Act in 1972 obligated government and planners to include public participation in local, regional, and state planning (Mahmoudi and Seltzer 2013).

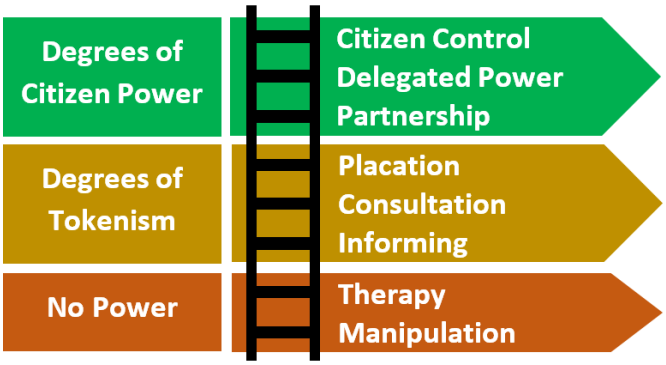


Figure 2. Arnstein (1969) Ladder of Citizen Participation

The concept of ladder implies that the level of citizen involvement should be appropriate to the tasks, competencies, and relations between actors in the process (McCall and Dunn 2012). McCall and Dunn (2012) presents four categories for citizen participation intensity from the least to the most; information sharing, consultation, involvement in decision making, and initiating actions.

The Texas Freedom Colonies Atlas provide a platform to participate in almost all four categories. First, the web mapping tool visualizes the findings of the research combined with the crowdsourced data collected from public users in the form of an online map. The interactive tools of the map also enable them to add new settlements directly to the map.

Second, the Atlas utilizes map-based survey forms in which participants are asked not only to locate their settlements but also to give a background of their communities and define their priorities by identifying the issues that their settlements are dealing with. In both ways, the Atlas enables the public to be part of the mapping and data collection process

Finally, although the Texas Freedom Colonies Atlas does not officially manage or control the local initiatives it can inspire or trigger some local activities by shedding light on their problems by putting them on the map. We had examples of residents or decedents of former residents who reached out to inform us about the activities they already started or express their desire to volunteer to lead projects in their settlements.

Public Participation in Scientific Research (PPSR) is defined as a concept that includes various participatory approaches such as citizen science, crowdsourcing, community-based research, participatory action research, and Volunteered Geographic Information (VGI) (Shirk, et al. 2012). These approaches vary depending on the participation degree and the stage of the process where public get engaged (Shirk, et al. 2012). However, due to the complex definition of PPSR, 'Community and Citizen Science' is more commonly used in public participation literature (Collins, Trettevick and Ballard 2012)

Public participation can be defined as a process that enables citizens and stakeholders to participate in the decision-making process and take part in controlling development and decisions that have an impact on them and their communities (van Asselt Marjolein and Rijkens-Klomp 2002).

Public participation will help to make better decisions that will not only benefit the individuals involved directly in the process, but also the rest of society. Therefore, both government (also planners, elected officials, etc.) and citizens will benefit from the public participation process (Irvin and Stansbury 2004).

2.2.1. BENEFITS OF PUBLIC PARTICIPATION IN PLANNING

The benefits that public participation brings into the planning process are undeniable. Brabham (2009) refers to public participation as a more local, direct, and deliberative extension of the democratic process and considers this as its most important benefit to the planning process. He also claims that citizens' involvement in the planning process will make the implementation part easier due to the easier acceptance by the public who feel themselves as part of the plan (Brabham 2009).

Public participation brings non-expert knowledge into the creative problem-solving process of planning (Brabham 2009). Corburn (2003) cautions planners who want to improve the communities that are prone to risks not to ignore the local knowledge.

Public participation and its tools - such as Participatory GIS – are aiming to empower the communities by giving more voice to local people and increase collaboration between them and planners (McCall and Dunn 2012). In the Texas Freedom Colonies Atlas literature, Local people can be defined as residents –or former residents- of the settlements and their descendants as the main benefiters of the project. However, it doesn't imply that they are the only individuals that can involve with the project. The Atlas is accessible by the public regardless of their relation to freedom colonies.

2.2.2. PARTICIPATORY PLANNING

Urban planning is an interdisciplinary field that deals with the built, natural, and social environment and is thriving to address their issues by keeping a balance amongst various involved features (Rittel and Webber 1973). Citizens as the key players in urban planning can contribute by providing an updated source of information which can help planners to improve their plans.

Planning efforts can achieve their goals when they integrate expert and local knowledge in the decision making process. Public participation can provide planners with insights that help them to create successful plans (Kasemir, et al. 2003). However, traditional planning was mostly data driven and solely dependent on technical and scientific approaches. It was not until 1993 when Friedmann suggested a “non-Euclidian planning mode” that planners accepted knowledge generated by the public as valid data (Zolkafli, Liu and Brown 2017).

The communication gap between planners – as experts – and the public – as stakeholders – was the major reason for this mistrust and will lead to plans that might not be accepted by certain groups. While this gap exists, plans and policies in which some communities or groups are neglected or underrepresented and exclude the local knowledge that could be helpful for experts to address the local problems better (Zolkafli, Liu and Brown 2017). Therefore, it is essential to overcome this gap by applying more public participatory methods (Marzuki 2015). The participatory GIS and participatory mapping are examples of efforts to eliminate the communication gap between public and experts.

By moving away from traditional top-down planning towards more participatory approaches, participatory planning engages the public in the decision making process in order to achieve better-informed and more creative solutions. Consequently, the outcome plan is more likely to be accepted by the public who were involved in the planning process and thus easier to implement.

2.2.3. E-PARTICIPATION

Traditionally, governments, planners, statisticians, or researchers were in charge of collecting and analyzing information about urban and natural environments. In recent years, changes in planning structures and methods, as well as the technological advancements, have introduced new ways of data collection including sensors, satellites, online services, smart-phones, and many other digital and online resources.

Advancements in information technology and its increasing role in the urban planning realm have created new opportunities for implementing e-participation tools to increase public engagement. This new approach increased the involvement of citizens in the decision-making process and enabled them to take part in the planning process as co-producers.

Planners –like other professions- took advantage of internet technologies and online tools to involve a larger group of individuals and stakeholders (Evans-Cowley and Hollander 2010). They use web-based participatory tools along with the traditional methods of public participation not as a replacement (Mahmoudi and Seltzer 2013). In this context, citizens are not just the consumers of planner's products; they engage in the planning process as co-producers.

To exploit the optimum capacity of web-based technologies, planners should develop an interactive user-friendly portal, which provides easy public access to the data, accompanied by collaborative applications for collecting and incorporating expert and public knowledge, and to invite other groups and organizations to use the available data as well as contributing to it by adding new information (Nash 2009).

Social media has great potential for increasing public participation. However, considering the increasing variety of activities and content on social media, attracting more people –especially young generation- requires producing content that conveys the message and serves the purpose of the project and is visually attractive for potential users at the same time.

It is also essential to pick the right communication channel. The public trend towards various social media platform may change over time. A social media network might be commonly used at a particular time but lose its popularity after a while due to the appearance of a new one or change in peoples preferences, or influence of the advertisements.

Heikki (2019) in a report titled "Digitalisation and Youth Work" lists four benefits of social media in the urban planning process (Heikki 2019):

1. Interaction
2. Source of Information
3. Crowdsourcing
4. Self-organization and Urban Activism

Although currently most planning organizations currently use social media as a tool to disseminate information (Sauri 2015), social media platforms have the potential to be a place to discuss planning initiatives. Urban planning authorities can use social media as a valuable source of information. Urban planning organizations have already begun to include analyzing data from social media in their projects (Nummi 2016) but there is still more to do in this field.

Another advantage of using social media data is that they often allow collecting geographic location along with the transmitted information. The concept of crowdsourcing is inherent in social media nature. Social media provides a perfect platform to crowdsource solutions for urban planning problems.

Self-organized channels provided by social media enables the public to influence the planning process Therefore, urban planning organizations must keep themselves up to date and interact with other activists to maximize their use of social media potentials.

2.3. LOCAL KNOWLEDGE & CITIZEN SCIENCE

Local knowledge is a knowledge that does not necessarily rely on professional techniques but rather has its roots in common sense. Local knowledge can be delineated as meaningful information of specific characteristics, circumstances, events, and relationships (Corburn 2003).

Corburn (2003) also brings up the difference between local and professional knowledge in terms of knowledge ownership. While professional knowledge is often held by members of a profession or government organization, local knowledge is owned by individuals and groups of people who are members of the community and might be geographically located or contextually related to a specific place (Corburn 2003). Local knowledge is acquired through life experience and can be collected from pieces of evidence in a variety of forms including cultural traditions, images, oral storytelling or narratives (Corburn 2003). This local knowledge is the exact concept of the information that the Texas Freedom Colonies Atlas intents to collect through its crowdsourced online web mapping tool.

Citizen science – or community science - is the science that is developed by citizens as researchers (Kruger and Shannon 2000). People can be involved in the data collection process at different stages, as a result, citizen-generated data might play different roles in the planning process. Their role might vary from contribution to co-creation. Figure 3 shows the citizens' level of engagement with a project.

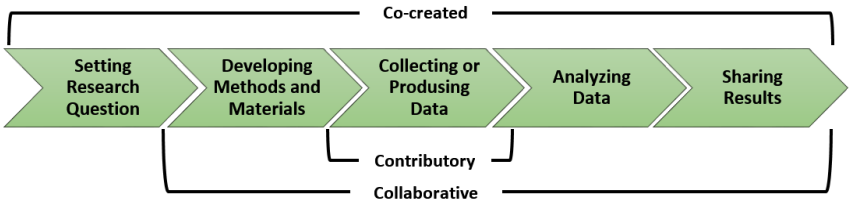


Figure 3. Citizens' level of engagement with a project (Lämmerhirt, et al. 2018)

2.3.1. BENEFITS OF CITIZEN SCIENCE

Using data generated by citizens can benefit the planning process in many different ways (Lämmerhirt, et al. 2018):

- Enables citizens and organizations to express, describe, and help with solving the problems that couldn't be identified through conventional data collection methods
- Provide less expensive ways for data collection comparing to traditional methods
- Bringing in the local knowledge and expertise that might not be achieved by professionals who are not related to that geography
- Engaging communities in the planning process and encourage civic participation

2.4. CROWDSOURCING

Crowdsourcing as a concept came into prominence in 2006 by a series of articles written by Jeffrey Howe. In these articles, although he describes crowdsourcing as a web-based business model, he presents definitions of crowdsourcing that can be applied in other fields including urban planning:

- Finding what you need not internally or from traditional vendors, but from people who are loosely affiliated through the Internet (Howe, The Rise of Crowdsourcing 2006).
- "Crowdsourcing represents the act of a company or institution taking a function once performed by employees and outsourcing it to an undefined network of people in the form of an open call".

Some scholars argued that crowdsourcing cannot be considered as outsourcing action due to the lack of control over the crowd and defined it as a "collective intelligent system" with three major components: 1) The organization that uses crowdsourcing for its benefit, 2) the individuals and groups acting as the crowd, 3) and a platform that connects the organization and the crowd (Zhao and Zhu 2014).

Nonetheless, almost all scholars agree upon the importance of presenting a comprehensive definition of the problem to the crowd and monitoring their input and providing feedback to let them know how they can help better in moving towards the solution (Mahmoudi and Seltzer 2013).

Another challenge of crowdsourcing is the motivation of the public for participation. Motivations for participation must be considered in designing a crowdsourcing action. It might also be noted that each individual or group might have different expectations or motivations to be part of a crowdsourcing action. Motivations can be divided into two major categories: "extrinsic" – such as making money or getting public recognition- and "intrinsic" –such as a sense of duty and love of community- (Brabham 2010, Zhao and Zhu 2014).

In this project, our crowdsourcing approach mainly involves the crowd that has a connection to freedom colonies and are willing to participate in order to improve their communities.

In conclusion, the fundamental principle of crowdsourcing that "every individual possesses some knowledge or talent that some other individual will find valuable. In the broadest terms, crowdsourcing involves making a connection between the two." (Howe 2009)

2.4.1. CROWDSOURCING AND PLANNING

Since the major role of planners is to identify problems and look for the solutions, city and regional planning is a perfect field to apply crowdsourcing as a tool for surveying the public usually through a web-based platform (Evans-Cowley 2011).

Urban planning projects are often based on a problem which plan is trying to solve. That problem can be crowdsourced if 1) There is a clear definition of the problem and 2) Enough data about that problem can be made available (Brabham 2009). Brabham suggests that due to the limitations of traditional participation means such as public meetings, workshops, and charrettes in attracting the maximum involvement, these crowdsource process must go online. He suggests the Web as the ideal medium for a participation platform because it increases the communication speed, is accessible almost globally, data can be shared and access in different points in time, users are able to keep their anonymity, and provides an interactive collaboration space that can hold various forms of media (Brabham 2009).

In order to be useful and valid, a crowdsourcing action must pick the right model –that fits the purpose-, create a diverse heterogeneous crowd, manage and support the crowd's effort, offer the right incentives, and define the problem right while keeping the tasks simple and easily understandable (Howe 2009)

Visualization of the results is one of the most important features of a crowdsourcing application in urban planning that seeks a collaborative decision-making process because the general public and even city officials usually prefer to see a clear visualization of the result rather than raw data that might be hard to comprehend (Pánek 2016). The Texas Freedom Colonies Atlas utilizes a real-time editable mapping tool that enables users to see the point they just created on the map. To ensure the participation of other groups of users that might not be comfortable with the mapping tool, map-based survey forms are used in which the user input will be visualized on the map once they submitted the form. Then they can simply switch to the map tab to view their input information as a new point on the map.

2.4.2. BENEFITS OF CROWDSOURCING

Crowdsourcing empowers all citizens to participate in the planning process. The problem with traditional face to face methods like the public meetings is that some people might not be able or not willing to attend a meeting at a certain time or location. Besides, some of these public meetings are just being held to meet the legislative requirements of the plan and follow a top-down approach where citizens are heard, but the main goal of the meeting is just to inform the public about the decisions made by the experts. An online crowdsourced platform will provide access for any citizen –having a device connected to the internet- enabling them to get their opinion heard at any time and place. This process includes individuals or groups that are typically excluded from the participation process (Brabham 2009).

Another benefit of a crowdsourcing is that citizens can choose their level of involvement. Citizens might have different preferences when it comes to public participation (Maier 2001). While the more involved citizens can participate by adding information, less involved citizens might prefer to explore the existing data and see the information that other citizens have added (Brabham 2009). The Texas Freedom Colonies Atlas will serve both groups regardless of their level of participation. Public users can access the map and see the information for the

points that are already on the map –whether located by research team or users- and they also have the tools to add a new point and upload their information if they wanted to participate in the mapping process.

Burbham (2009) also points out the emergence of new, creative ideas as another accomplishment of crowdsourcing the citizen involvement process due to benefits of using local knowledge which brings insight to the process that experts –especially those who are not from the region- might not be able to bring to the problem-solving process. In the case of the Texas Freedom Colonies Atlas, this could be translated to finding a settlement that does not exist anymore by a former resident that not only shows the location, but also provides history, stories, and other information about that place that otherwise could not be found by the research team.

2.4.3. CHALLENGES OF CROWDSOURCING

There are a number of critical issues that planners should consider when implementing the crowdsourcing (Brabham 2009, Evans-Cowley 2011):

- **Digital divide:** People have unequal access to the internet as well as different level of computer devices and skills.
- **High-speed connection is a must:** High bandwidth is required both to communicate large volumes of data to users and ensure the full participation of users through generating content online.
- **Cost:** Crowdsourcing might be a cheaper and faster method for product development compared to some traditional means of collecting data but is not free for the organization and requires time, money, and commitment to be provided up-front and ongoing through the process.
- **Construction of Web Interface:** a successful crowdsourcing platform urges the need for an interactive, user-friendly, and accessible platform.
- **Representativeness:** Organizers must keep track of users to ensure the maximum inclusivity and provide consistent feedback to users about the project's status and how their shared content is being used.

To overcome the technological challenges, our solution is to encourage users who already have access to the web technologies to interact with the Atlas and for those who don't public workshop will be held in specific locations that are close to these communities where people will be given access to computer devices and internet access to ensure the maximum inclusion of all citizens and stakeholders. This idea is similar to the concept of community technology centers proposed by (Hayden and Ball-Rokeach 2007). Meanwhile, we consider using traditional approaches –such as interviews, face to face meetings- as a supplementary method and integrate the findings into the Atlas.

In terms of usability of the web interface, the designing process was based on simplicity for all citizens with different levels of computer skill. Furthermore, the Atlas Guidebook provides complete instructions on how to access, explore and interact with the online mapping tool. The project also takes advantage of tutorial videos where functions and tools of the Atlas are demonstrated and explained. Finally, the project answers the questions that citizens might have regarding technical issues in working with the mapping tool through the project's social media channels (e.g. Facebook live Q&A).

2.4.4. CITIZEN SCIENCE AND CROWDSOURCING

Some authors argue that "while not all citizen science is crowdsourcing and not all crowdsourcing is citizen science" they should not be considered as synonyms (Eitzel, et al. 2017). Crowdsourcing is the act of collecting content, ideas, or services from a group of participants –usually- using web-based collaborative platforms. This definition is similar to what (Shirk, et al. 2012) categorized as contributory citizen science project.

Furthermore, citizen science projects do not often provide participants with the tools and resources to do the work, while crowdsourcing requires a platform that is designed and is made available to the public for the purpose of the project. In this sense, the Texas Freedom Colonies Atlas approach is closer to crowdsourcing.

2.4.5. CROWDSOURCED GEOGRAPHIC INFORMATION

Albuquerque, et al. (2016) research is focused on the role of Crowdsourced Geographic Information in disaster risk management and suggests three categories based on the information source (Albuquerque, et al. 2016):

1. **Social Media:** Uses the contents generated by usual social media platforms users as an information source.
2. **Crowd Sensing:** Uses application and platforms designed specifically for data collection (Ushahidi is one of the most successful examples).
3. **Collaborative Mapping:** Creates maps of geographic features and collect information about them in collaboration with volunteers through a mapping tool (e.g. OpenStreetMap, Wikimapia).

Although this structure is defined for disaster risk management purposes, it can be used in other fields where crowdsourced geographic information is used.

2.4.6. OPEN-SOURCE CROWDSOURCING

An open-source crowdsourcing process managed and supported by a team of experts, enables individual volunteers to create the product, customize it as fit their needs, and share it for free (Norheim-Hagtun and Meier 2010). Open-source crowdsourcing is based on a collaboration of a group of participants with a shared interest with the goal of developing a specific product

(Olson and Rosacker 2013). The major elements of a successful open-source crowdsourcing are openness, transparency, collaboration, sharing, and a dynamic decision-making structure (Norheim-Hagtun and Meier 2010).

2.5. GIS AND URBAN PLANNING (BOTTOM-UP GIS)

GIS has become a crucial part of the planning process. However, conventional GIS has been criticized for its top-down approach. GIS experts controlled all technical aspect from providing data to presenting the results. Therefore, some argue that the top-down GIS-based decision-making process marginalizes certain communities and their issues while empowering another group (Harris and Weiner 1998).

Researchers suggest the concept of bottom-up GIS (BUGIS) to increase public participation and incorporate the local knowledge in GIS. The Bottom-up GIS enables citizens to express their thoughts about their communities and what they expect from their local government through GIS (Talen 2000). BUGIS not only helps to explore an issue through a collaborative approach but also helps expression of it by visualizing the data.

Conventional methods of consensus building and incorporating public participation in planning might include “interacting groups, silent reflective techniques, surveys, focus groups, and dialectic groups” (Kaiser, Godschalk and Chapin 1995). While we might still find some of the conventional forms useful, BUGIS adds spatial context and interactivity to these existing methods (Talen 2000). We might replace the paper questionnaires with map-based online forms by which users can see their ideas expressed in those forms presented on the map.

Unlike paper maps, interactive GIS maps enable users to simply overlay different map layers to see the relations between multiple factors. Interactivity also provides users with tools by which they can zoom the map to their area of interest, search for a specific place, or turn layers on and off.

2.6. GIS IN GOVERNMENT POLICIES AND PROGRAMS

Being first created by the Canadian government in the 1960s, GIS is government-associated in nature. Even today, governments –in different scales- are the major users of GIS applications and it was not until the 1980s that other organizations started using GIS software packages (Haklay, et al. 2014). In 1986, the introduction of the first desktop GIS application, MIDAS (Mapping Display and Analysis System) later known as MapInfo, was the start of the shift that moved GIS from government to public (Pánek 2016).

Of course, at the beginning integrating crowdsourced data in paper map formats into a GIS database was a challenge that GIS users had to deal with. However, with the changes that GIS software and applications went through and evolving into the tools that are available now, it has become easier to incorporate crowdsourced data –especially from online sources- into GIS database.

VGI projects can help governments to use the help of individuals who are familiar with GIS to collect data needed for various projects and plans (Haklay, et al. 2014). Citizen-generated data and maps produced by a participatory mapping process can inform governments and other organizations to improve their performance and services.

Brabham (2013) studied a number of case studies and concluded ten best practices of crowdsourcing (Haklay, et al. 2014):

1. Clearly define the problem and solution parameters
2. Determine the level of commitment to the outcomes, commit to communicating to the online community exactly how much impact user-submitted ideas and labor will have on the organization
3. Know the online community and their motivations. It is important to know whether a given crowdsourcing application will appeal to participants
4. Invest in usable, stimulating, well-designed tools
5. Craft policies that consider the legal needs of the organization and the community
6. Launch a promotional plan and a plan to grow and sustain the community
7. Be honest, transparent and responsive
8. Be involved, but share control
9. Acknowledge users and follow through on obligations
10. Assess the project from many angles

2.7. PUBLIC PARTICIPATION IN GIS

In the 1990s, by entering the internet era new concepts such as social networks, Web GIS, Cloud GIS, Web Map Services, etc. emerged as a result of the digital revolution. The Internet made possible the interconnection of web and GIS which resulted in a new collaborative model of participatory GIS (Haklay, Singleton and Parker 2008). It was around this time that (Goodchild, Just the facts 1991) emphasized on the usefulness of GIS when it used by people with geographical knowledge and experience and argued otherwise “it is actually only a dangerous form of naive empiricism in the hands of technocrats” (Pánek 2016).

After this era, GIS was expanded to socially related issues, and GIS started to be implemented in the areas that had been formerly ignored. Meanwhile, participatory approaches incorporated into GIS in new areas such as landscape planning and revitalization of public spaces (Dunn 2007). Later, in the social media era, the internet and crowdsourcing became more popular and provided GIS practitioners and planners with new tools to enhance the interaction of GIS and society (Pánek 2016). New collaborative methods like Participatory GIS emerged as the result of the changes in this era.

As a result of these evolutions, a new concept was conceived to incorporate public participation approaches into GIS applications. Public participation might be incorporated into GIS in a variety of forms. The term “Public Participation Geographic Information Systems” (PPGIS) emerged from the meetings of National Center for Geographic Information and Analysis

(NCGIA) in the U.S. in 1996 focused around the role of GIS in supporting public participation in different applications (NCGIA 1996).

Similar to PPGIS, the term "Participatory GIS" (PGIS) has also been commonly used in the literature as a contemporary form of participatory mapping that uses GIS technologies.

The term "Volunteered Geographic Information" (VGI) was coined by (Goodchild 2007) and involved developing the tools that enable volunteered individuals to create non-expert spatial information (Brown and Kyttä 2018).

Both PGIS and PPGIS increase the inclusion in the planning process and empower individuals and communities that were left out from the traditional planning methods (Brown and Kyttä 2014). PPGIS expands GIS capacities for spatial visualization and analysis and uses it as a tool to enhance citizen engagement in the planning process (Schlossberg and Shuford 2005).

The difference between PPGIS and PGIS is in the methods they use to choose the target audience and the tools they apply. While PGIS has been developed as a tool to empower communities –especially in rural areas- to promote social justice and equity using mostly non-digital mapping technologies with the resulting map being the second important component after the engagement process itself, PPGIS aims to enhance the participation process for urban-centered population in order to improve the quality of planning and decisions using digital internet-based mapping techniques, in which the generated map is part of the initial motivation of the process (Brown and Kyttä 2014).

In terms of choosing the target audience, PGIS chooses its participants through sampling in the form of surveys or interviews to ensure inclusion and make silent voices heard. PPGIS, on the other hand, ensures that all key stakeholders are included in the mapping process (Brown and Kyttä 2014). Meanwhile, VGI takes advantage of citizen-initiated sampling methods to involve individual contributors. Schlossberg and Shuford (2005) emphasize on the importance of defining the concept of "public" in PPGIS and warn practitioners –and planners- to be aware of different biases, opportunities, and limitations of selecting and incorporating public into a PPGIS project (Schlossberg and Shuford 2005).

Nonetheless, they all enable planners to incorporate the local knowledge in the mapping and decision-making process. However, it is crucial that planners encourage communities to be involved and ensure maximum public participation.

In a review of PPGIS, PGIS, and VGI, Brown and Kyttä (2014) concluded that although these terms cannot be considered as synonyms, due to the ambiguity in methods, design, and implementation in different practices with different mapping subjects, technologies, and locations, there is not a distinct line separating these concepts (Brown and Kyttä 2014). Table 1 shows the characteristics of PPGIS, PGIS, and VGI based on this review.

	PPGIS	*PGIS*	*VGI*
Process emphasis	Enhance public involvement to inform land use planning and management	Community empowerment Foster social identity Build social capital	Expand spatial information using citizens as sensors
Sponsors	Government planning agencies	NGOs	NGOs, ad hoc groups, individuals
Global context	Developed countries	Developing countries	Variable
Place context	Urban and regional	Rural	Variable
Importance of mapped data quality	Primary	Secondary	Primary
Sampling approach	Active: probability	Active: purposive	Passive: voluntary
Data collection	Individual (e.g., household sampling)	Collective (e.g., community workshops)	Individual
Data ownership	Sponsors of the process	People and communities that created data	Shared (e.g., data commons license)
Dominant mapping technology	Digital	Non-digital	Digital

Table 1. Characteristics of PPGIS, PGIS, and VGI
Source: (Brown and Kyttä 2014)

2.8. PARTICIPATORY MAPPING

Participatory mapping is defined as different ways that individuals and local communities can interact with a supporting organization (i.e. governments, non-governmental organization, university) to communicate their knowledge and experience in form of creating a map (Corbett 2009). Participatory mapping enables planners to exploit local participation and engage stakeholders in data collection and develop spatial information using mapping technologies (Craig, Harris and Weiner 2002). These maps could be used in different applications including urban and regional planning. Participatory mapping always thrived to engage and empower marginalized groups by using spatial technologies (Brown and Kyttä 2018), so it is one of the best approaches in planning for hidden or underrepresented communities.

Spatial issues call for spatial approaches in which maps and GIS are the major components. Maps are the best visualization form for illustrating spatial issues and can facilitate the mutual understanding of an issue between professional practitioners and the public. Many scholars noted that maps are the key component in grassroots change efforts (Talen 2000) and can help to visualize the equity issues and community condition to identify the problem and take action to solve it (Harris and Weiner 1998). Historically, maps were influenced by power sources. For instance, in colonial times, maps were a tool in the hand of elites to justify their demand for land, without considering local communities (Harris and Weiner 1998). Participatory mapping, in contrast, reflects the social and cultural background of communities (Corbett and Rambaldi 2009).

Due to the advances in GIS technologies, increasing demand from under-represented groups for more involvement in decisions made for their communities, and recognition of the benefits of using local knowledge to solve complex issues – especially in planning which deals directly

with people -, participatory mapping has evolved (Brown and Kyttä 2018) and became more common in planning practices.

Although maps are usually considered as the final product of GIS, it is important to note the process of map creation as a concept of collaborative planning (Schlossberg and Shuford 2005). Participatory mapping – which covers PGIS, PPGIS, and VGI - is a process in which citizens and groups are involved in the map making process and contribute to this process in various ways. Engaging local stakeholders in the early stages of participatory mapping improves the community trust (Dunn 2007) which is crucial for the acceptance of a participatory process and the plans and decisions made.

Depending on the purpose of the map and the target users a variety of tools can be implemented. From more traditional methods like the hands-on map to more contemporary methods including GIS and online mapping tools (Corbett 2009). GIS applications and online tools have made creating maps by non-cartographers –including citizens- possible. The general public is now being involved in the process of creating community maps. This process empowers community members to participate in an activity that puts them on the map using their local spatial knowledge, therefore, creates the sense of belonging and ownership of the empowering process (Vlok and Pánek 2012).

Despite the use of public participation approaches in any participatory mapping project, it is important to notice the different level of emphasis put on public participation component and GIS technology component which has a significant effect on the whole mapping process (Brown and Kyttä 2018).

Chapter 3

CASES & APPLICATIONS

3.1. OVERVIEW

This chapter reports the result of studying the cases that implemented participatory approaches in the planning process in various ways. The goal is to show how crowdsourcing, crowdsensing, and participatory tools can contribute to the planning process in different fields. Looking at their methodologies, approaches, tools, and results, the best practices will be considered in designing the Texas Freedom Colonies Atlas.

3.2. PARTICIPATORY MAPPING APPLICATIONS

Crowdsourcing is used in a variety of applications for mapping purposes. Here we study some most important applications.

Creating a base map

At its basic level, crowdsourcing can help to create a basic map for a defined area using public participation and VGI. This could be a quite useful application especially in developing countries that lack sophisticated spatial databases and infrastructures.

Updating an existing database

In the case that a spatial database is available, crowdsourcing tools can help to update the existing maps and data. This could be done with the help of citizens, groups, and organizations although might be managed by government authorities in most cases.

Improve policies, plans, and services

Both previous applications can inform government entities to improve the quality of their plans and services by including all stakeholders that might been missing from the process. The local knowledge brought by local stakeholders can help to create more effective and more inclusive policies.

Natural disaster management

Another important implication of crowdsourcing tools is in disaster management. This may implement two approaches: 1) proactive (preparedness by creating the necessary infrastructure to minimize the consequences of future disasters) and 2) reactive (crisis management after a natural disaster)

City Maintenance

Cities spend a lot of their money in maintenance activities such as installation and maintenance of public infrastructures, maintenance of roads, and maintenance of public green spaces. All of these activities involve a lot of human work, most of which do not require specialized skills or tools (Zambonelli 2011).

By using public participation and crowdsourcing applications can help cities to identify any possible need for maintenance in a dynamic way by enabling citizens to contribute to monitoring capabilities by reporting problems. Having a web-based crowdsourcing tool also helps cities to establish a system to organize citizen activities. Using this system, city managers can assign tasks to volunteer citizens and organizations and keep track of their activities (Zambonelli 2011).

By exploiting these opportunities, cities can reduce their stable employees and hence their expenses, improve their services, and make citizens feel as part of community.

Documenting and Preserving Cultural Heritage

Recording and preserving hidden or undocumented heritage assets requires appropriate data collection techniques that goes beyond the individual efforts (Dhonju, et al. 2018). Community engagement and citizen participation can significantly contribute to this process (Tiwari 2015).

Participatory mapping and participatory GIS approaches can incorporate place-based local knowledge –that is a result of long and close interaction with the place- into the cultural heritage preservation actions (Larrain and McCall 2018). Most existing crowdsourced heritage conservation projects use a variety of tools including online crowdsourcing, 3D reconstruction, and mobile applications, enabling public to engage in data collection, mapping, and sharing heritage assets (Dhonju, et al. 2018).

Mapping underrepresented communities

Participatory approaches -such as community mapping- are in some cases implemented to engage disadvantaged communities and helped them document their communities and communicate their values and priorities (Lung-Amam and Dawkin 2019). The key point here is recognizing that the stories told by experts and organizations about low-income, communities of color, and other marginalized communities might be substantially different from their residents' priorities and experiences (McKnight and Kretzmann 1993).

Maps created by community members provide planners and policy makers with unique insight of the community's status and its member's values and assets and can contribute to preservation efforts and development plans (Lung-Amam and Dawkin 2019).

3.3. CASES

Studying crowdsourcing cases started by introducing Ushahidi and OpenStreetMap as two pioneer –and most commonly used- applications that had greatly influenced crowdsourcing and participatory mapping technologies and applications. A number of cases in different countries that implemented crowdsourcing approaches were studied and presented in this section.

OpenStreetMap

OpenStreetMap (OSM) is a collaborative web mapping project established in 2004 in reaction to the restrictions imposed on the use of map data collected by government. The OSM team began to map different parts in London using GPS devices to create a database and a web application that was easily accessible for various users for free (Soden and Palen 2014). Today OSM provides an open editable map of the world featuring basic geographic data and has about 5.3 million users around the globe (OpenStreetMap 2019).

OSM web interface enables users to interact with the database by adding to the map or downloading the map and the data as they need (Soden and Palen 2014). OSM as an application of volunteered geographic information could be useful in the data collection process. Data collection is often an expensive process; however, OSM offers a cheap way of data collection by creating a partnership between the organization and citizens (Haklay, et al. 2014). Figure 4 shows screenshot of OSM interactive mapping tool interface.

OSM has contributed to different projects all over the world by editing the existing data or producing new information (Curran, Crumlish and Fisher 2013). US Census Bureau is currently working on opportunities to incorporate the OSM into the census data collection.

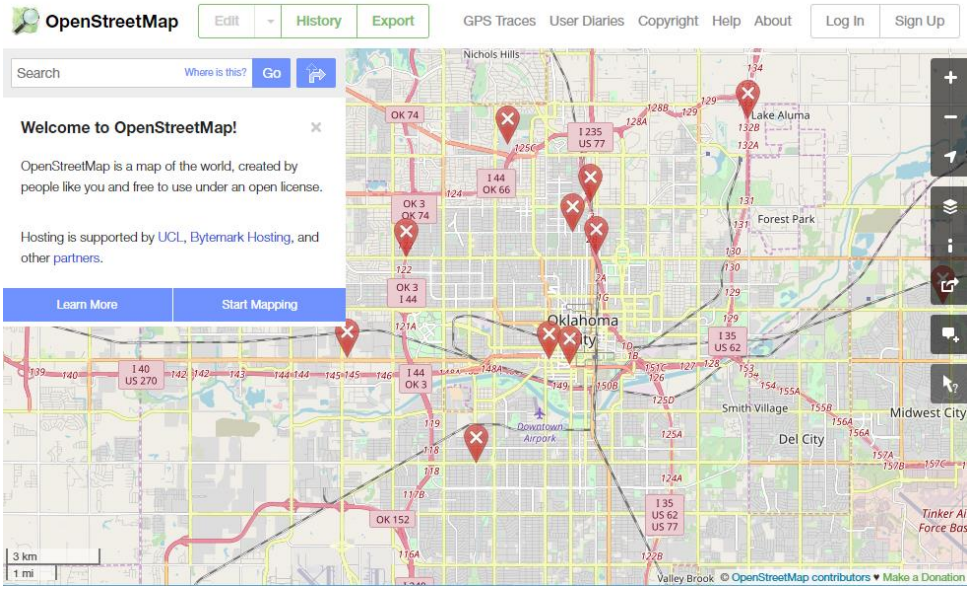


Figure 4. OpenStreetMap Interactive Mapping Tool Interface

Ushahidi

Ushahidi is one of the most prominent open-source mapping tools and one of the pioneers of implementing crowdsourcing in the world (Rotich 2017). Ushahidi platform combines citizen observations with visualization tools to create live interactive maps (Norheim-Hagtun and Meier 2010). This platform was first established in 2008 as a reaction to the post-election violence in Kenya for monitoring purposes (Greengard 2011) and later evolved to one of the most commonly used platforms for application in humanitarian crisis situations (Okolloh 2009).

The application of Ushahidi in Kenya revealed the power of geographically mapping crowedsourced information and developed it as a tool that can be deployed in different situations to collect and visualize data (Okolloh 2009) from citizens or on-site volunteers through a variety of sources including SMS, web, email, mobile applications, and social media (Albuquerque, et al. 2016, Zook, et al. 2010).

Ushahidi is thriving to help marginalized people raise their voice (Ushahidi 2019) and has been deployed in many countries all over the globe in a range of applications including natural disaster reporting, election monitoring, violence monitoring, crisis management, and disaster response (Scholl, Glassey and Janssen 2016). Many organizations including military, United Nations, human right groups, governments, and NGOs are using Ushahidi maps in their needs assessment projects (Norheim-Hagtun and Meier 2010). Figure 5 shows a screenshot of Ushahidi platform developed for post-election violence monitoring in Kenya.

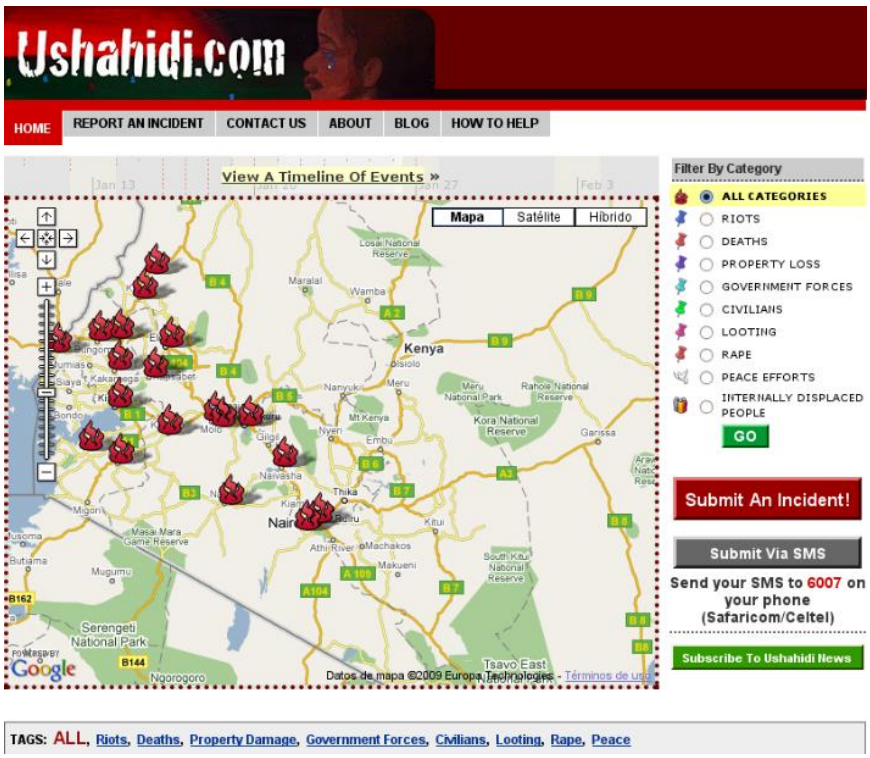


Figure 5. Ushahidi platform for the 2008 post-election violence monitoring in Kenya

3.3.1. CROWDSOURCING IN DISASTER MANAGEMENT

Haiti Disaster Response Mapping Project - Haiti

Ushahidi and OSM played a significant role in Haiti Disaster Response Mapping Project. A few hours after the 2010 earthquake in Haiti that took the lives of 100,000 to 200,000 people, Ushahidi started developing a crisis-mapping tool specifically for post-earthquake response. With the help of a group of student volunteers, reports from social media (i.e. Twitter and Facebook) were being mapped at haiti.ushahidi.com. This was the first time that Ushahidi was used as a humanitarian needs assessment tool (Norheim-Hagtun and Meier 2010). Due to the large amount of incoming information and the lack of a reliable basemap, finding the exact GPS location of the reports through a manual process became a challenge. Therefore, City needed an updated map to distribute aid and supplies more effectively and identify damaged buildings, infrastructures, and medical centers (Haklay, et al. 2014).

The mapping process started by creating a basemap using historic maps and satellite imagery. Meanwhile, open-source mapping tools such as Open Street Maps, started to improve their maps and provide recent high-resolution satellite imagery for Haiti (Norheim-Hagtun and Meier 2010). OSM has already been used for humanitarian purposes in disaster response after Tropical Storm Ondoy in the Philippines in 2009 (Soden and Palen 2014). In the next phase, over a three month period, 600 volunteers contributed to the mapping process using GPS devices and paper maps helping to create a basemap for responding organizations and the government (Haklay, et al. 2014).

The mapping project was a collaboration between government, international organizations, volunteers, and mapping platform engineers including Ushahidi and OSM. For instance, Ushahidi used OSM both as a basemap and as a reference to geotag reports coming from volunteers (Soden and Palen 2014). Figure 6 compares available data in OSM at the Day of earthquake with the changes made to the map two days after the earthquake, and on Feb 5th.

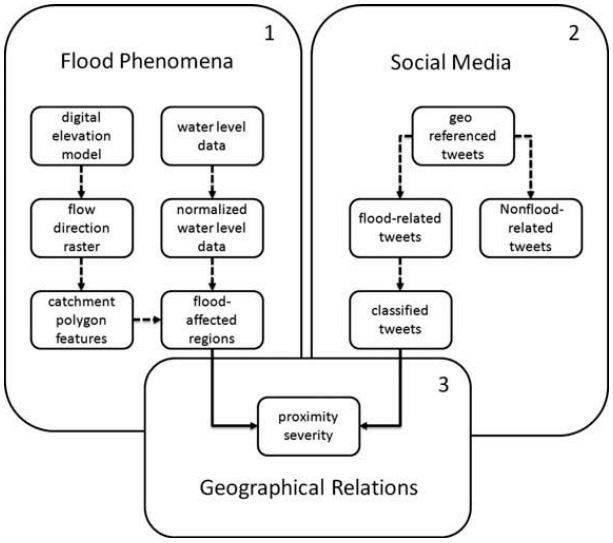
Figure 6. Progression of the OpenStreetMap for Port-au-Prince in Haiti on Jan 10, Jan 12, and Feb 5, 2010 (Waters 2010)

The Haiti disaster response is one of the successful examples of combining the conventional geographic information system with the public participation of volunteers which provide government with a valuable data that can inform their actions in reacting to disasters (Haklay, et al. 2014). The success of the Haiti disaster response mapping project is mostly due to the collaborative effort of high participation of volunteers supported by the government.

Social Media and Authoritative Data for Disaster Management - River Elbe Flood, Germany

Albuquerque et al. (2015) study the usefulness of combining georeferenced data collected from social media messages -as VGI- with geoinformation gathered from other official sources including sensor data, hydrological data and digital elevation models in disaster management.

Their approach included three main components: 1) collecting flood information and identifying flood-affected areas, 2) collecting information from social media (Twitter messages), and 3) analyzing the geographical relation between information from these two sources. Figure 7 shows the research approach flowchart.



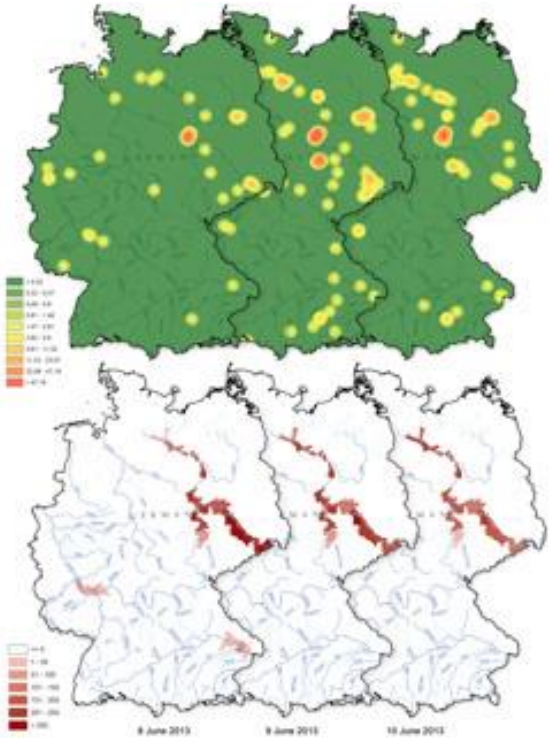


Figure 7. (Left) Albuquerque et al. (2015) Research Approach
Figure 8. (Right) Distribution of Twitter messages (Top) and Flooded Catchments (Bottom)

They implemented this method for the River Elbe Flood of June 2013 in Germany and compared the distribution of flood-related twitter messages with the map of flooded catchment produced by the information gathered from river gauges for a three day period of during the flood. They found similarity in patterns that was then proven by quantitative analysis and concluded that this approach can be a useful way to improve collecting information from social media messages for managing disasters (Albuquerque, et al. 2015).

3.3.2. CROWDSOURCING IN CITY MANAGEMENT

FixMyStreet - UK

FixMyStreet is an open source web-based application, launched in February 2007 in United Kingdom, which enables the public to report local physical problems (e.g. broken lams, abandoned vehicles, potholes) in their neighborhood and keep track of their resolution by local government (Haklay, et al. 2014, Baykurt 2011). Thanks to its open source code, many other applications in other countries around the world used its civic engagement model to design web-based public participation platforms (Baykurt 2011).

FixMyStreet is one of the most popular web applications that involved public in problem-solving process by giving them voice to that enable the public to voice their concerns regarding local issues. Through a simple process, the share their concerns about their local issues (Haklay, et al. 2014).

The most significant advantage of FixMyStreet over previous applications is that reports are not just being recorded in an administrative database, rather are shared publically and all residents –not only the ones who reported- can see the issues and the learn about the local authorities' actions to solve them which contribute to creation of public value both for those neighborhoods and the entire community (Haklay, et al. 2014).

An interactive map-based interface makes it easy for users to mark the exact location of the problem being reported (King and Brown 2007) and provides local authorities with a spatial database of reported issues. This map later can be used in the planning and prioritizing the solution process. An area on the map with a high concentration of reported points suggest a serious issue in that area that might be addressed by authorities. Figure 9 shows screenshot of FixMyStreet map application.

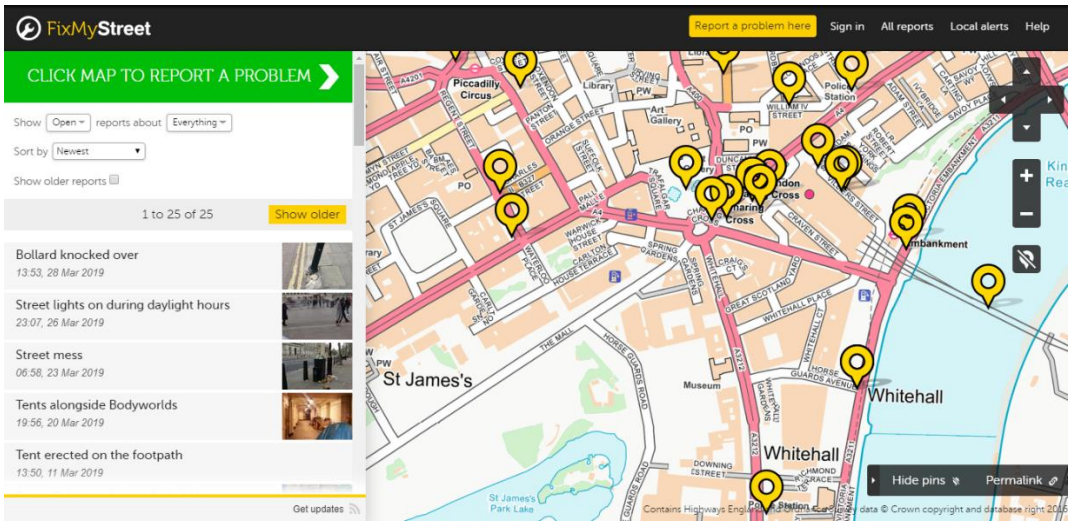


Figure 9. FixMyStreet Map Application (FixMyStreet 2019)

3.3.3. WEB-BASED PARTICIPATORY DESIGNING PROCESS

Virtual 3D Visualization for Public Participation - Shenzhen, China

Some scholars argue that although Web GIS technologies were initially designed to present 2D maps or an image of planning sketches via the internet, 3D technologies were later developed to feature more intuitive visualization to the public (Wu, He and Gong 2010). Their paper reports the development of a 3D virtual globe-based urban planning information visualization system for the city of Shenzhen in China aiming to publicize urban planning information through web services. Being shared in a system connected to the internet, citizens could easily access, interact, and participate in the planning process.

The 3D model for about 20,000 buildings was created using geographic coordinates and textures collected by a field survey. This model then incorporated into a web application that allowed end users to browse anywhere in the city and interact with the model using the tools provided by the application. Users can query the attribute information of a selected building, measure distances, compare available urban planning solutions and design alternatives, and upload remarks and information about buildings or places within the city. More advanced spatial analysis tools were also available to perform professional tasks including sunlight and shadow analysis.

Figure 10. Comparing the Design Scenarios

They concluded that using a virtual globe-based 3D model can facilitate the public participation by visualizing urban planning projects at any scale and any viewpoint (Wu, He and Gong 2010).

3.3.4. CROWDSOURCING IN HISTORIC PRESERVATION

Austin Historical Survey Wiki - Austin, United States

Historic resources surveys provide lists of buildings, structures, districts, cultural landscapes, and objects that can inform a variety of planning actions and decision-making processes including designating historic landmarks, revitalization efforts, place-making initiatives, and preserving historic resources (Minner, et al. 2016).

Austin Historical Survey Wiki -developed and implemented by a university-based research team[1] at the University of Texas at Austin in collaboration with the City of Austin, the local preservation society, a non-governmental organization, and community members- is an open source web-based tool aiming to create and maintain a database of historic resources by combining existing data from previous surveys with a crowdsourcing tool that enables citizens to add and edit historic places (Minner, et al. 2016).

Austin Wiki acts as a planning support system to help governments to make more defensible, representative, and more equitable decisions. To ensure the validity of the crowdsourced data, Austin Wiki does not allow anonymous contributions, keeps track of changes made to the records, and get all contributions reviewed by moderators before publishing (Minner, et al. 2016). At the time of writing this paper, Austin Wiki had 324 users with 23 survey efforts and maintained a database of 10,336 places, 4,355 images, and 1,249 documents (Austin Historical Survey Wiki 2019). Figure 11 shows the homepage of Austin Historical Survey Wiki.

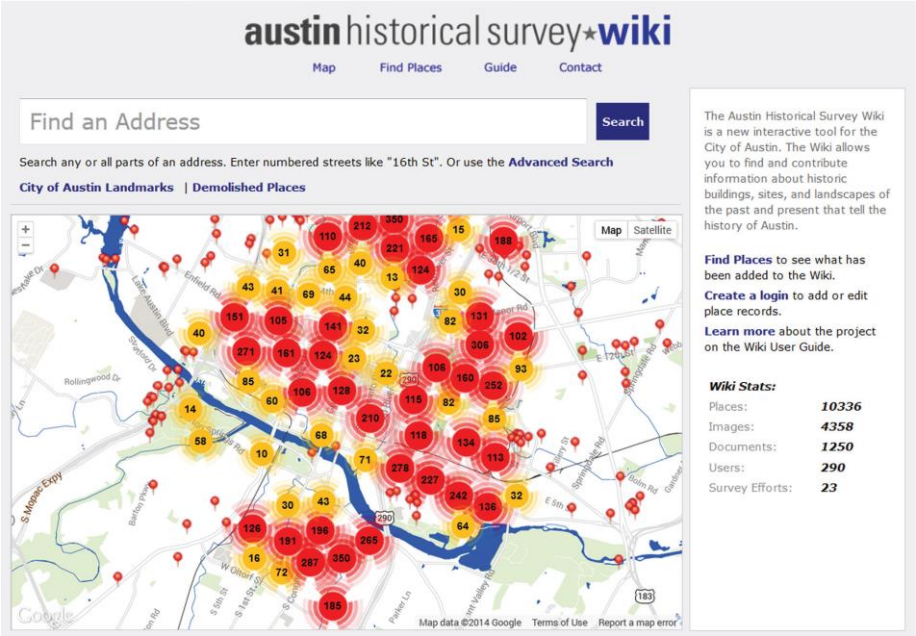


Figure 11. Screenshot of the Austin Historical Survey Wiki Mapping Tool (Minner, et al. 2016)

[1] The TXFC Project director, Dr. Andrea Roberts was on this research team and her work was informed by her experience on the Austin Wiki research team.

Survey LA, Los Angeles - United States

SurveyLA known as “the largest and most comprehensive survey initiative ever completed in an American city” (SurveyLA 2019) is a citywide survey of historic resources, developed by the City of Los Angeles in 2005 and recorded more than 30,000 resources throughout the city (Barton, et al. 2017). Data was collected using a custom-designed GIS-based mobile survey application installed on tablet PCs. Citywide historic context statement including nine major contexts and more than 200 themes and sub-themes was created by studying the city’s evolution and development to define the criteria for a site or building to be considered historically and architecturally significant (Bernstein and Hansen 2016).

To improve the public knowledge and support for the project, SurveyLA implements a comprehensive public participation and outreach program with a multilingual approach to reach out to underrepresented communities and over the years, organized more than 200 volunteers and 30 project ambassadors to help with the project (Bernstein and Hansen 2016).

In order to manage the large amounts of data being collected and create an inventory of surveyed resources and also to share this information with the public through an interactive platform, HistoricPlacesLA was established and now is serving multiple purposes and users (Barton, et al. 2017).

SurveyLA data is now being used by planners to inform and guide new planning tools, zoning overlays, designated historic districts, and community and neighborhood plans in Los Angeles to minimize negative impacts on historic resources and protect neighborhood character (Bernstein and Hansen 2016). Figure 12 shows a screenshot of Historic Places LA website homepage.

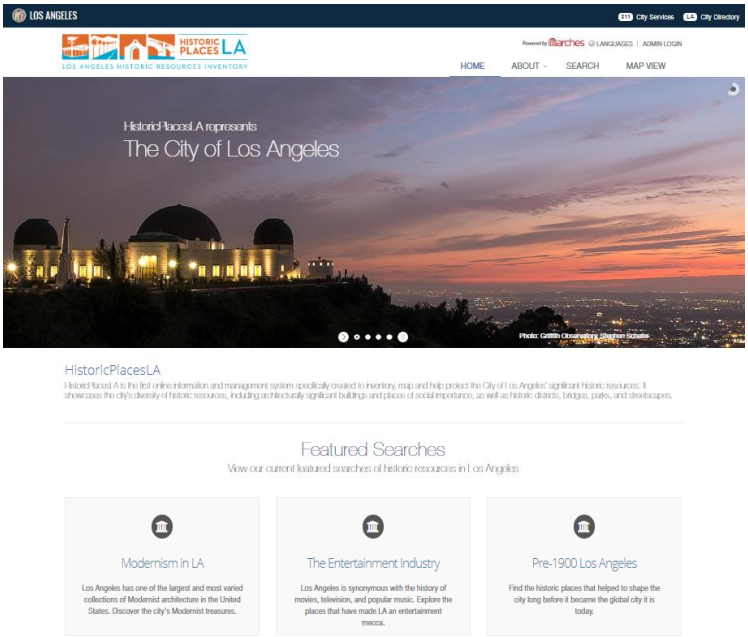


Figure 12. HistoricPlacesLA Website (HistoricPlacesLA 2019)

3.3.5. CROWDSOURCED COMMUNITY MAPPING

Informal settlement mapping, Map Kibera - Nairobi, Kenya

Kibera is one of the world's most populated informal settlements and the most densely populated part in Nairobi, Kenya (Hagen 2011). Kibera "was a blank spot on the map until November 2009, when young Kiberans created the first free and open digital map of their own community" (Map Kibera 2019). Figure 13 shows an aerial view of Kibera as of January 2008.

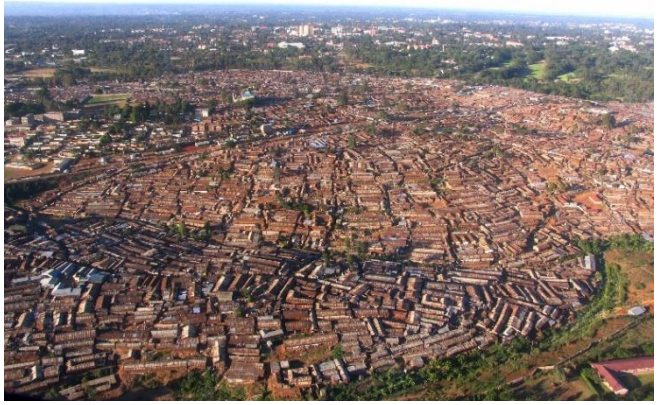


Figure 13. An aerial view of the Kibera slums, Nairobi, Kenya. January 2008 (The New Humanitarian 2008)

In the absence of map data and other public information, Map Kibera was launched in 2009 to map Kibera and put marginalized communities on the map (Hagen 2011, Haklay, et al. 2014). The project started by involving 13 trained volunteers to collect and edit GPS data using OSM online platform; the data which were used for analysis and map creation purposes using other software including QGIS and ArcGIS (Haklay, et al. 2014).

Figure 14. A Volunteer Collecting Waypoins Data using a GPD device in Kibera (Hagen 2017)

In the second phase, mappers started adding the basic points of interest such as water, public toilets, schools, police stations and clinics to the map. Meanwhile, two other types of participatory visual media was introduced. 1)The Voice of Kibera enabled users to submit reports, articles, and breaking news through WordPress blogging and Ushahidi software (Haklay, et al. 2014); 2)Kibera News Network was a YouTube-based video journalism initiative that gave local residents the opportunity to participate (Hagen 2017). Collectively, these two methods supported the mapping process by engaging more citizens. Figure 15 shows an screenshot of Voice of Kibera homepage featuring the embedded OSM.

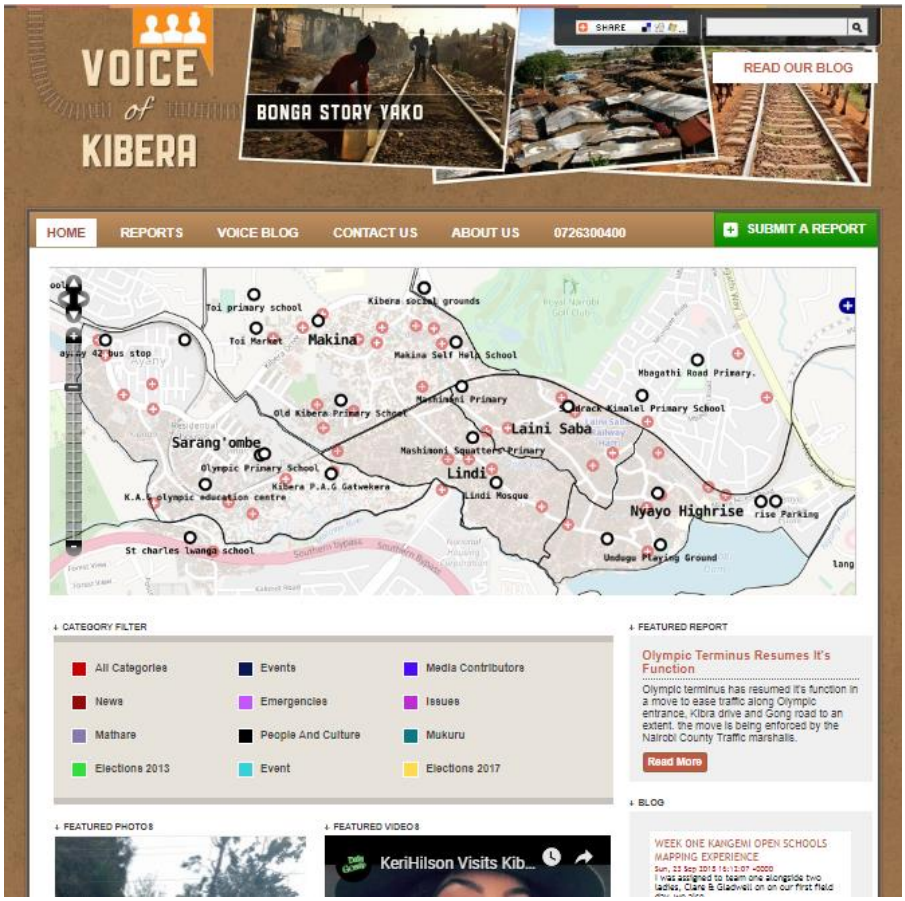


Figure 15. Voice of Kibera website (Voice of Kiberia 2019)

The collaboration between the local government and the project's representatives was one of the key factors in success of Map Kibera; a process that not only improved the project but also gave residents the opportunity to gain new technological knowledge (Haklay, et al. 2014).

The most challenging issues were to educate residents to work with new technologies and to explain the benefits of their participation, lack of funds to appropriately compensate volunteers, difficulties in sharing information (Haklay, et al. 2014).

Most cases studied here suggest methods and approaches that can be implemented for multiple applications described at the beginning of this chapter. Furthermore, it is important to note that to establish a successful public participation project, a variety of tools and methods must be implemented. These must be carefully chosen regarding the purpose of the project, available funds and equipment, the existing condition of the study area, and characteristics of the public.

Haiti Disaster Response Mapping Project shows the power of public participation in participatory mapping projects. With the help of local volunteers and collaboration between government and different organizations, this project exhibits an excellent example of participatory mapping. In a short period of time the contributors updated the map for Haiti which helped disaster response authorities and saved lives.

As it shown in the case of Haiti, government support and collaboration of volunteers and other active organizations is essential in success and effectiveness of public participatory actions. The TXFC Project will partner with local organizations and individual volunteers to map FCs and develop a database of their information which will be a useful database for government to inform their plans.

River Elbe flood case in Germany demonstrates the benefits of combining data from official – and more traditional – data with the crowdsourced data and the significant role of social media. Users' usual activities in social media platform can be used as an important source of data. This can be improved by using data from platforms exclusively designed to collect data for specific purposes.

FixMyStreet application has was studied to show the role of citizens' reports to find problems and issues in cities. These reports will help local governments to identify the problems, prioritize them, and take actions to solve them. Citizens are present throughout the process and can track the status of the issue they reported.

The Texas Freedom Colonies Atlas is using a similar method to help residents and their descendants to identify their problems in a wider range –not only physical issues- and in a larger scale.

Virtual 3D Visualization in Shenzhen, China is an example of citizen participation in form of consultants. Consultation with citizens will improve the plan and makes it easier to implement. It also provides a platform to incorporate local knowledge and come up with innovative ideas that was not originally part of proposed alternatives.

The Texas Freedom Colonies Atlas is not currently using 3D technologies, however this method might be useful in future to build a 3D model of buildings and structures in these settlements with the help of volunteer residents.

Austin Historical Survey Wiki and Survey LA both demonstrate the application of web-based crowdsourcing tool in mapping and developing a database of historic resources. Austin Wiki combined the existing data from previous surveys with a crowdsourcing tool.

Freedom colonies are places with a significant historic value. The approach implemented by Wiki Austin and SurveyLA is also applicable in the Texas Freedom Colonies Atlas in terms of informing government to support future plans to ensure inclusivity and preserve historic resources. Furthormore, HistoricPlacesLA is the inventory of SurveyLA to share surveyed resources with public. This is similar to the function of the Texas Freedom Colonies Atlas.

Map Kibera in Nairobi, Kenya, is focused on mapping one of the largest informal settlement in the world. This project is a good example of participatory mapping application for mapping underrepresented communities. Map Kibera introduced two other types of participatory visual media: Voice of Kibera and Kibera News Network. Their experience proved the usefulness of combining different techniques and participatory platforms that might be a model for future expansion of the Texas Freedom Colonies Project.

Chapter 4

METHODOLOGY

4.1. OVERVIEW

The Texas Freedom Colonies Atlas is part of a research-based project by Dr. Andrea Roberts. The Atlas represents the mapping side of the project which is consisted of two phases:

1) Offline Mapping: The process of converting the pre-study list of freedom colony place names into a geodatabase and map located freedom colonies. MS Excel, MS Access, and ArcMap were used for this phase. Figure 16 shows the workflow of this phase which will be presented in "methodology" chapter.

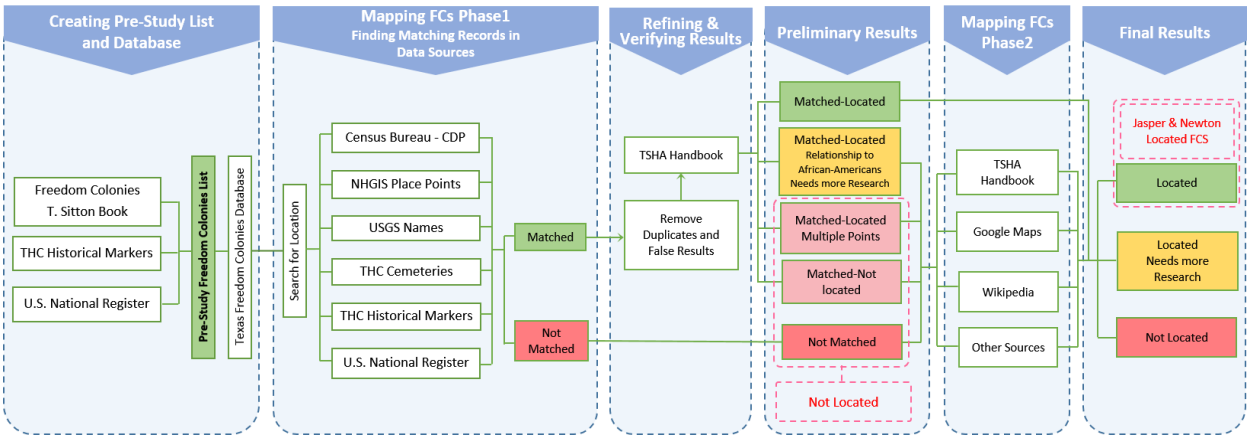


Figure 16: Workflow of the offline mapping process

2) Online Mapping and Crowdsourcing Tool: The GIS geodatabase created in the first phase was the base for the second and more important section of the Atlas. Using the ArcGIS Online platform, a web map application was designed to show the mapped freedom colonies through an interactive interface accessible to public users. The Atlas also utilized the ArcGIS Survey123 to design map-based survey forms for crowdsourced data collection. This phase will be discussed in more details in the "case study" chapter.

4.2. PRE-STUDY LIST

The Texas Freedom Colonies Atlas aims to map freedom colonies in Texas. The mapping process initiated from a list of 557 freedom colony place names in Texas that we call the "pre-study list". The pre-study list came from previous research by Dr. Andrea Roberts with inspiration from the index of the book "Freedom Colonies: Independent Black Texans in the Time of Jim Crow" by (Sitton and Conrad 2005). She added more freedom colony names to the list by studying the US National Register and the historical markers from Texas Historic Site Atlas. The result was an excel spreadsheet listing the counties in Texas and the number of freedom colonies in each county. Figure 17 shows a snapshot of the pre-study list.

The goal of the mapping process was to map as many as possible of these freedom colonies using available data sources. In order to do that, the first step was converting the excel

spreadsheet of the pre-study list to an MS Access database which demonstrates the data for freedom colonies rather than counties. Figure 17Figure 17. Pre-study list

shows a few records of the new database. In the new database, each freedom colony is assigned a GeoID which helps identify it by a unique code.

COUNTY	UNINCORPORATED	INCORPORATED	MUNICIPAL STATUS UNKNOWN/ANNEXED	Total FCs	SC List
Freestone	Coutchamn		Beulah, Bethlehem, Board Bottom, Brown's Creek (Titus Farm), carter's Place (Grove Island),coutchman, Davis Chapel, Frazier, Gibson Chapel, Grove Island, Hopewell, Jerusalem, Jones Academy, Keechi, Lake Creek, Landsville,Lee, Lepan, Lone Star,	44	44
Smith	New Hope, Starrville		Bethlehem, Blackjack, Clear Springs, Cold Hill, Douglas, Dunbar, Fairview, Galilee, Jackson, Jamestown (Berrien, Jimtown), Jones Valley, Lanes Chapel*,Liberty*, Mount Olive, New Bethel*, New Mountain, Old Hopewell, Omen, Pleasant Grove, Shady Grove, Spring Hill, St. Louis, Siolam, St. Violet, Thompson Hills (Thompson), Union*, Universe*, Wallace Grove*, Waters Bluff	31	31
Cherokee	Weeping Mary	Cuney ,	Blounts Chapel, Bulah, Church Hill(Church Hill), Delmert, Elm Grove, Holly Springs*, Lost Ball*, Macedonia, Mount Comfort, Mount Haven, Mount Olive, New Hope, Old Larissa, Pine grove, Pine Hill, Pleasant Plains, Pleasant View*, Shady Grove, St. Thomas Chapel, Rock Hill, Sweet Union (Hog Jaw), Woodville (Black Ankle)	24	24
Panola			Corinth (Longbranch)*, Eleven Hundred*, Evergreen, Four Mile, Harmony (Deberry)*, Holland's Quarters, Paradise*, Pleasant Hill*, Walnut Grove, Mims Chapel, New Boggy*, Old Bethel*, Pope Quarters*, Saint Rest, Shady Grove, Shiloh*, Smith Chapel, Social Point*, Walnut Grove, Zion (New Zion)*, Macedonia (THSA)	22	20

Figure 17. Pre-study list

GeoID	Name	Alias	State	COUNTY
48055001	St. John Colony	Wynn's Colony	Texas	Caldwell
48293002	Bethlehem	Woodland	Texas	Limestone
48035003	Wash Lock Hill	West Point	Texas	Bosque
48419003	Africa	Webb, St. John	Texas	Shelby
48241002	Mount Union	Walnut Hill	Texas	Jasper
48347002	County Line	Upshaw	Texas	Nacogdoches
48119001	Cross Roads	Union, Clem, Hog Wallow	Texas	Delta
48161005	Brown's Creek	Titus Farm	Texas	Freestone
48423027	Thompson Hills	Thompson	Texas	Smith
48405002	Greertown	The Preemption	Texas	San Augustine
48175001	Cologne	The Colony, Perdido, Centerville, Ira	Texas	Goliad
48221001	Mount Zion	The Colony	Texas	Hood
48035002	Rock Spring	The Colony	Texas	Bosque
48177010	Terrysville	Terryville	Texas	Gonzales
48161038	Tea Color	Tehuacana Grove	Texas	Freestone
48321002	Cedar Lane	Sugar Land	Texas	Matagorda
48041001	Mudville	Steele's Store	Texas	Brazos

Figure 18. Database of freedom colonies created based on the pre-study list
** This figure is not showing all attribute fields in the database.*

4.3. MAPPING PROCESS

4.3.1. FINDING MATCHING NAMES

The next step was approving the existence of settlements on the list, as freedom colonies and map known settlements. In order to do that, datasets from six different sources were studied to

find matching records with the same name or alias as settlements on the pre-study list. Following is the list of data sources that had been used:

- US Census Bureau Designated Places (Point Features)
- Integrated Public Use Microdata Series (IPUMS) National Historical Geographic Information System (NHGIS) Places (Point Features)
- United States Geological Survey (USGS) Place Names (Converted to point features using latitude and longitude fields)
- Texas Historical Commission Historical Markers (Point Features)
- Texas Historical Commission Cemeteries (Point Features)
- US National Register (Point Features)

Figure 19 shows the workflow for the process of finding matching names.

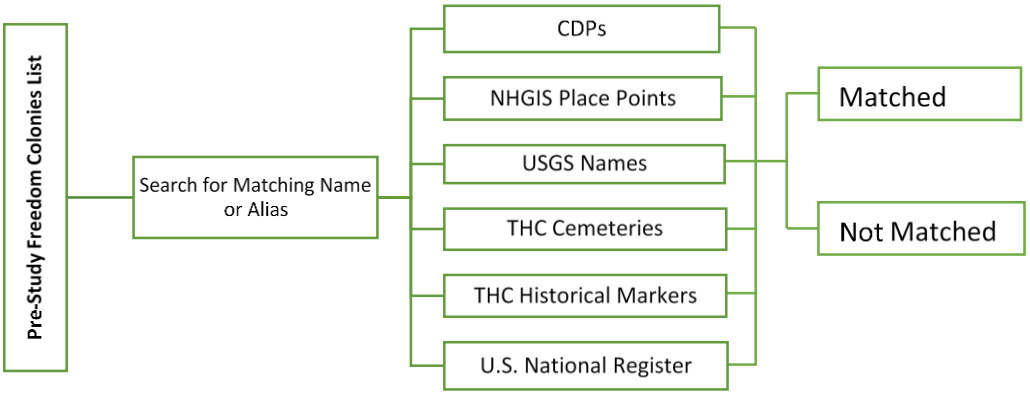


Figure 19: Finding Matching Names in Datasets

Layers and databases from each source were downloaded and prepared for the analysis. Preparation included cleaning the data, finding common fields, deleting unnecessary fields, and matching the format of the names in attribute tables. For analysis in this step, an SQL query in MS Access was used to compare the name of each point from all sources to the names and aliases of freedom colonies on the pre-study list to find similar and partially matching records. Table 2 and

Table 3 show the query expressions by source for both names and aliases comparison. Each query results in a table that contains the name of freedom colony, the name of a correspondent feature point in the data source, and the name of the county in which it is located.

Table 2. Query expressions for name field by data source

Source	*SQL Expression*
Census Bureau – CDP	SELECT FCs_Database.GeoID, FCs_Database.Name, FCs_Database.COUNTY, Census_Bureau_CDP.GEOID, Census_Bureau_CDP.NAME FROM FCs_Database, Census_Bureau_CDP WHERE (((Census_Bureau_CDP.NAME) Like "*" & [FCs_Database].[Name] & "*") AND ((FCs_Database.COUNTY)=[Census_Bureau_CDP].[County])) or (((FCs_Database.Name) Like "*" & [Census_Bureau_CDP].[NAME] & "*") AND ((FCs_Database.COUNTY)=[Census_Bureau_CDP].[County]));
NHGIS Place Points	SELECT FCs_Database.GeoID, FCs_Database.Name, FCs_Database.COUNTY, IPUMS_NHGIS_Texas_Place_Points_2015.GISJOIN, IPUMS_NHGIS_Texas_Place_Points_2015.NAME FROM FCs_Database, IPUMS_NHGIS_Texas_Place_Points_2015 WHERE (((FCs_Database.Name) Like "*" & [IPUMS_NHGIS_Texas_Place_Points_2015].[NAME] & "*") AND ((FCs_Database.COUNTY)=[IPUMS_NHGIS_Texas_Place_Points_2015].[County])) or (((IPUMS_NHGIS_Texas_Place_Points_2015.NAME) Like "*" & [FCs_Database].[Name] & "*") AND ((FCs_Database.COUNTY)=[IPUMS_NHGIS_Texas_Place_Points_2015].[County]));
USGS Names	SELECT FCs_Database.GeoID, FCs_Database.Name, FCs_Database.COUNTY, USGS_Texas_Names_Points.FEATURE_ID, USGS_Texas_Names_Points.FEATURE_NAME, USGS_Texas_Names_Points.FEATURE_CLASS FROM FCs_Database, USGS_Texas_Names_Points WHERE (((FCs_Database.Name) Like "*" & [USGS_Texas_Names_Points].[FEATURE_NAME] & "*") AND ((FCs_Database.COUNTY)=[USGS_Texas_Names_Points].[COUNTY_NAME])) or (((USGS_Texas_Names_Points.FEATURE_NAME) Like "*" & [FCs_Database].[Name] & "*") AND ((FCs_Database.COUNTY)=[USGS_Texas_Names_Points].[COUNTY_NAME]));
THSA Cemeteries	SELECT FCs_Database.GeoID, FCs_Database.Name, FCs_Database.COUNTY, THSA_Cemeteries.ATLAS_NUM, THSA_Cemeteries.CEMNAME FROM FCs_Database, THSA_Cemeteries WHERE (((FCs_Database.Name) Like "*" & [THSA_Cemeteries].[CEMNAME] & "*") AND ((FCs_Database.COUNTY)=[THSA_Cemeteries].[COUNTY])) or (((THSA_Cemeteries.CEMNAME) Like "*" & [FCs_Database].[Name] & "*") AND ((FCs_Database.COUNTY)=[THSA_Cemeteries].[COUNTY]));
THSA Historical Markers	SELECT FCs_Database.GeoID, FCs_Database.Name, FCs_Database.COUNTY, THSA_Historical_Marker.ATLAS_NUM, THSA_Historical_Marker.NAME FROM FCs_Database, THSA_Historical_Marker WHERE (((FCs_Database.Name) Like "*" & [THSA_Historical_Marker].[NAME] & "*") AND ((FCs_Database.COUNTY)=[THSA_Historical_Marker].[County])) or (((THSA_Historical_Marker.NAME) Like "*" & [FCs_Database].[Name] & "*") AND ((FCs_Database.COUNTY)=[THSA_Historical_Marker].[County]));

Table 3. Query expressions for alias field by data source

Source	*SQL Expression*

Census Bureau – CDP	SELECT FCs_Database.GeoID, FCs_Database.Name, FCs_Database.Alias, FCs_Database.COUNTY, Census_Bureau_CDP.GEOID, Census_Bureau_CDP.NAME
	FROM FCs_Database, Census_Bureau_CDP
	WHERE (((FCs_Database.Alias) Is Not Null) AND ((FCs_Database.COUNTY)=[Census_Bureau_CDP].[County]) AND ((Census_Bureau_CDP.NAME) Like "*" & [FCs_Database].[Alias] & "*")) OR (((FCs_Database.Alias) Like "*" & [Census_Bureau_CDP].[NAME] & "*" And (FCs_Database.Alias) Is Not Null) AND ((FCs_Database.COUNTY)=[Census_Bureau_CDP].[County]));
	
	SELECT FCs_Database.GeoID, FCs_Database.Name, FCs_Database.Alias, FCs_Database.COUNTY, IPUMS_NHGIS_Texas_Place_Points_2015.GISJOIN, IPUMS_NHGIS_Texas_Place_Points_2015.NAME
	FROM FCs_Database, IPUMS_NHGIS_Texas_Place_Points_2015
	WHERE (FCs_Database.Alias) Is Not Null AND ((((FCs_Database.Alias) Like "*" & [IPUMS_NHGIS_Texas_Place_Points_2015].[NAME] & "*") AND ((FCs_Database.COUNTY)=[IPUMS_NHGIS_Texas_Place_Points_2015].[County]))
	or (((IPUMS_NHGIS_Texas_Place_Points_2015.NAME) Like "*" & [FCs_Database].[Alias] & "*") AND ((FCs_Database.COUNTY)=[IPUMS_NHGIS_Texas_Place_Points_2015].[County])));
	
	SELECT FCs_Database.GeoID, FCs_Database.Name, FCs_Database.Alias, FCs_Database.COUNTY, USGS_Texas_Names_Points.FEATURE_ID, USGS_Texas_Names_Points.FEATURE_NAME, USGS_Texas_Names_Points.FEATURE_CLASS
	FROM FCs_Database, USGS_Texas_Names_Points
	WHERE (FCs_Database.Alias) Is Not NULL And ((((FCs_Database.Alias) Like "*" & [USGS_Texas_Names_Points].[FEATURE_NAME] & "*") AND ((FCs_Database.COUNTY)=[USGS_Texas_Names_Points].[COUNTY_NAME]))
	or (((USGS_Texas_Names_Points.FEATURE_NAME) Like "*" & [FCs_Database].[Alias] & "*") AND ((FCs_Database.COUNTY)=[USGS_Texas_Names_Points].[COUNTY_NAME])));
	
	SELECT FCs_Database.GeoID, FCs_Database.Name, FCs_Database.Alias, FCs_Database.COUNTY, THSA_Cemeteries.ATLAS_NUM, THSA_Cemeteries.CEMNAME
	FROM FCs_Database, THSA_Cemeteries
	WHERE (FCs_Database.Alias) Is Not NULL AND ((((FCs_Database.Alias) Like "*" & [THSA_Cemeteries].[CEMNAME] & "*") AND ((FCs_Database.COUNTY)=[THSA_Cemeteries].[COUNTY]))
	or (((THSA_Cemeteries.CEMNAME) Like "*" & [FCs_Database].[Alias] & "*") AND ((FCs_Database.COUNTY)=[THSA_Cemeteries].[COUNTY])));
	
	SELECT FCs_Database.GeoID, FCs_Database.Name, FCs_Database.Alias, FCs_Database.COUNTY, THSA_Historical_Marker.ATLAS_NUM, THSA_Historical_Marker.NAME
	FROM FCs_Database, THSA_Historical_Marker
	WHERE (FCs_Database.Alias) Is Not NULL AND ((((FCs_Database.Alias) Like "*" & [THSA_Historical_Marker].[NAME] & "*") AND ((FCs_Database.COUNTY)=[THSA_Historical_Marker].[County]))
	or (((THSA_Historical_Marker.NAME) Like "*" & [FCs_Database].[Alias] & "*") AND ((FCs_Database.COUNTY)=[THSA_Historical_Marker].[County])));
	
	SELECT FCs_Database.GeoID, FCs_Database.Name, FCs_Database.Alias, FCs_Database.COUNTY, THSA_Historical_Marker.ATLAS_NUM, THSA_Historical_Marker.NAME
	FROM FCs_Database, THSA_Historical_Marker
	WHERE (FCs_Database.Alias) Is Not NULL AND ((((FCs_Database.Alias) Like "*" & [THSA_Historical_Marker].[NAME] & "*") AND ((FCs_Database.COUNTY)=[THSA_Historical_Marker].[County]))
	or (((THSA_Historical_Marker.NAME) Like "*" & [FCs_Database].[Alias] & "*") AND ((FCs_Database.COUNTY)=[THSA_Historical_Marker].[County]));

4.3.2. ADDRESSING DUPLICATE RECORDS

Six tables resulted from comparison analysis on our six data sources were joined to the freedom colonies database table by the common field of "Name" using Attribute Join tool in ArcMap. Having the joined tables, using latitude and longitude coordinates of each point (available in their attribute table) the points of matching records were mapped. In the next step, these resulted points were analyzed to verify their location and accuracy.

Due to the technical issues in the process of finding matched names and joining known records to freedom colonies database in ArcMap, several types of duplicate records occurred that needed to be addressed. Following are the examples of each type of duplicate and our strategy to solve them:

- Freedom colonies with multiple matching records in different counties. Since we used the "Name" field to join attribute tables the first place point will be joined to both freedom colonies with the same name regardless to their county name, so we should remove these duplicates and fill in the county field manually based on the data from the right matching record point. Table 4 shows an example of this type of duplicate records.

Table 4. Example of Duplicate Records in Different Counties

Freedom Colony Name	*County*	*THSA Cemetery Name*
Cedar Grove	Bowie	Cedar Grove
Cedar Grove	Newton	Cedar Grove

- Despite being in the same county, partially matched name or aliases may produce false results. These duplicate records had been checked one by one to make sure the false results are removed and the actual matching records which represent the correspondent freedom colony have remained in the database. Table 5 shows an example of this type of duplicate records.

Table 5. Example of Partially Matched Records

Freedom Colony Name	*County*	*THSA Cemetery Name*
Center Point	Camp	Center
Smith Grove	Houston	Smith
Thompson Hills	Smith	Thompson

- Freedom colonies with multiple matching records in the same county. These duplicates should be checked one by one and through other available sources to find the point with the right location of freedom colony. Table 6 and Figure 20 show an example of this type of duplicate records.

Table 6. Example of Duplicate Records in same County with the same Feature Classes

Freedom Colony Name	*County*	*USGS Place Name*
Boykin	Angelina	Boykin Cemetery
Boykin	Angelina	Boykin Cemetery

Figure 20. Example of Duplicate Records in same County with the same Feature Classes

- Same FC name with same source point name of different feature type in the same county. These duplicates should be investigated to find out which feature really represents the correct location of FC. Table 7 and Figure 21 show an example of this type of duplicate records.

Table 7. Example of Duplicate Records in same County with Different Feature Classes

Freedom Colony Name	*County*	*USGS Place Name*	*USGS Feature Class*
Bethel	Anderson	New Bethel Church (historical)	Church
Bethel	Anderson	Bethel Church	Church
Bethel	Anderson	Bethel	Populated Place
Bethel	Anderson	Bethel School Number 2	School
Bethel	Anderson	New Bethel Church	Church

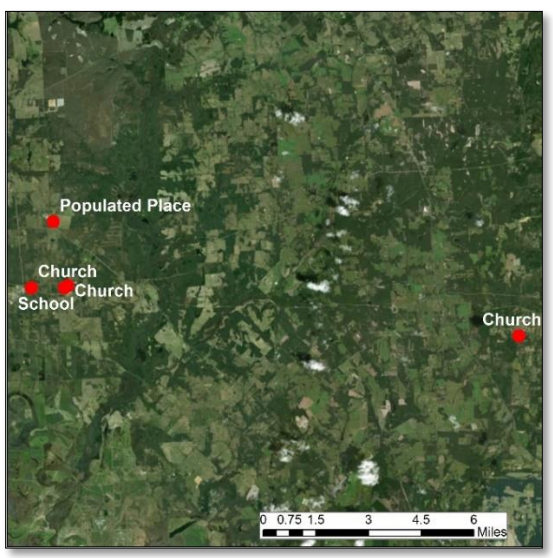


Figure 21. Example of Duplicate Records in same County with Different Feature Classes

4.3.3. RESULTS VERIFICATION

At this point, we have the locations of 347 of 557 place names on the pre-study list but not all of them necessarily represent the true location of the settlements. Moreover, even if there is a settlement, we need to verify that it is – or was at some point - a freedom colony. In order to verify the results, the located points were verified using information from the Texas State Historical Association (TSHA) Online Handbook. TSHA Online Handbook of Texas is a digital encyclopedia that provides a rich dataset consists of an overview, general, and biographical information focused on the history of Texas the indigenous Native Americans Era to the Modern Age (TSHA Website).

The results divided the points into four categories:

- **Located:** Location of the settlement and its history as a freedom colony was approved,
- **Located – Relationship to African-Americans Needs More Research:** Location of the settlement was approved but not enough evidence of the presence of African-Americans found at this point.
- **Located in Multiple Locations:** TSHA Handbook describes these settlements in a different location than what was found in other data sources. These points also need more research.
- **Not Located:** Although these records were in the results of matching names we lack enough evidence to conclude that they represent a location of a freedom colony. Their corresponding features with matching name in data sources were mostly unpopulated places such as lakes, streams, or springs. Therefore, these points were considered as "not located".

Table 8 shows the number of freedom colonies in each category by the data source.

Table 8. Number of freedom colonies by locating status and data source

Data Source	*Matched Names**	*Located*	*Located – Need more Research*	*Not Located*
USGS Place Names	324	216	86	22
THSA Cemeteries	170	114	52	4
TSHA Handbook	90	78	12	0
THSA Historical Markers	72	56	8	8
Newton & Jasper Pilot Study	35	35	0	0
Census Designated Places	19	19	0	0
IPUMS NHGIS Places	19	19	0	0
US National Register	7	5	0	2

** These numbers include duplicates and might overlap as a freedom colony might be among the results from more than one data source. Therefore, they don't add up to the total number of freedom colonies.*

4.3.4. SEARCHING FOR UNLOCATED PLACES

The second process of mapping was focused on the three latter categories mentioned in the previous step along with the place names that did not have a matching record in six data sources. The goal was finding information and evidence that help to locate those settlements in other data sources including TSHA Handbook, Google Maps, and Wikipedia. In this step, 80 freedom colonies were located by information from the TSHA Handbook.

4.3.5. COMBINING RESULTS AND CREATING THE FINAL MAP

By aggregating the results of previous steps explained in this chapter, and adding 35 freedom colonies located through a pilot study by Dr. Andrea Roberts in Newton and Jasper counties to the final database, 557 place names from the pre-study list were divided into three categories. Figure 22 shows freedom colonies by their locating status. Freedom colonies that were located and the ones located but need more research are shown in Figure 23.

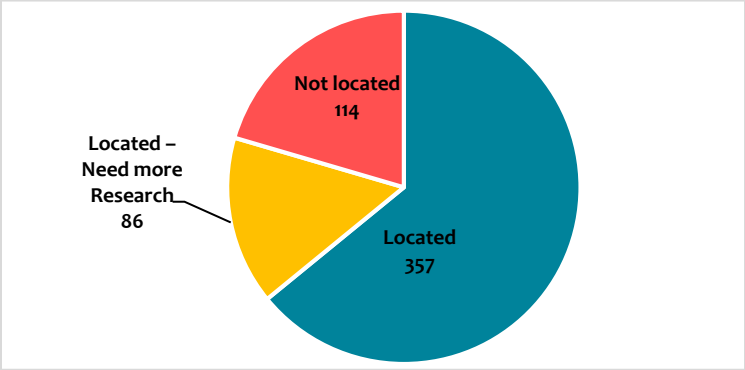


Figure 22. Freedom Colonies by Locating Status

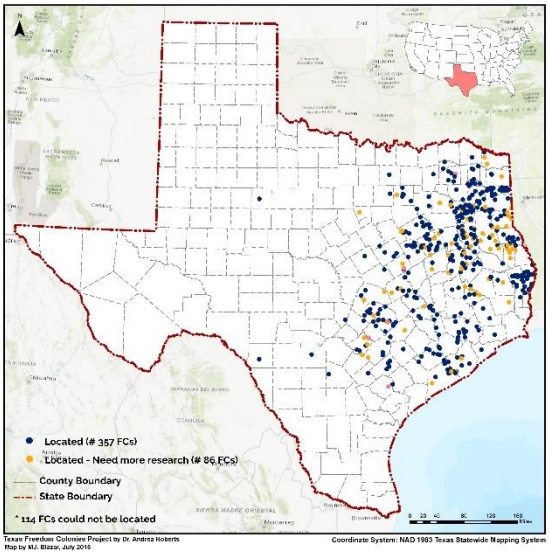


Figure 23. Freedom Colonies by Location Status

Chapter 5

CASE STUDY

5.1. OVERVIEW

This section introduces the Texas Freedom Colonies Atlas is a crowdsourced mapping tool and data collection platform and part of the Texas Freedom Colonies Project. Components of the Atlas including 1) online web mapping tool and 2) map-based data collection survey forms and the process of creating them is described in this section.

Having the database of located and mapped freedom colonies, explained in the previous chapter, the next phase was creating an online web mapping application using ArcGIS Online (AGOL). This online platform serves two purposes: 1) visualizing the map of located freedom colonies and 2) collecting data from public users through crowdsourced interactive mapping tool and data collection forms. This application is accessible via various devices (i.e. computers, tablets, and smartphones). In order to do that, the freedom colonies database and other layers required for the map were published to AGOL to begin the process of creating the map and the mapping tool application in AGOL.

The mapping tool presents the map visualizing the Texas freedom colonies in three scales from the state, to counties, to settlements. Figure 24 demonstrates a snapshot of different scales of the Atlas mapping tool.

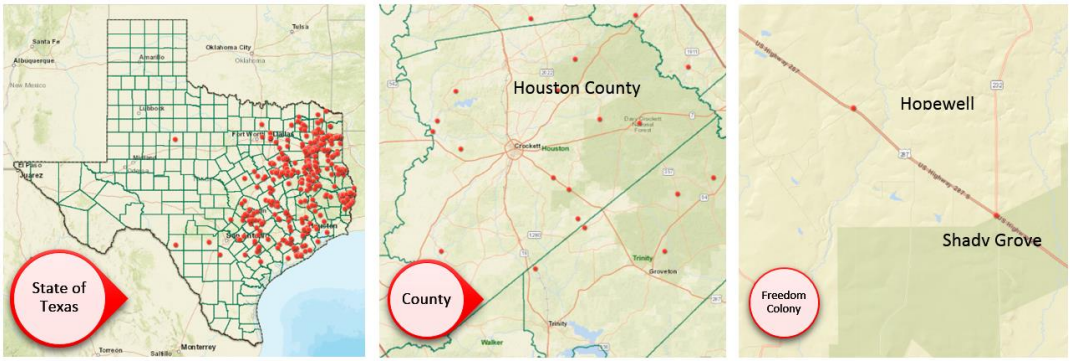


Figure 24. Scales of the Atlas Mapping Tool

Another component of the Atlas is the data collection forms. In order to provide multiple ways of engagement for users with different level of computer skills or preferences, the Atlas incorporates the mapping tool with online survey forms. Survey forms were generated in ArcGIS Survey123 application and then shared via the Atlas.

The Texas Freedom Colonies Atlas features two survey forms:

1. The short survey form, known as “Freedom Colony Storyteller Portal”
2. The long survey form, known as “Black Settlements Study Survey”

Each form here represents a crowdsourced point layer on the map which visualizes the information shared by survey responders. Next two sections explain the process of creating survey forms and the mapping tool application.

The crowdsourced data collected from users will inform the database – originally created by the project's research team – that can inform governments to recognize these settlements and ensure inclusion of freedom colonies in plans. Figure 25 shows the schematic diagram of the Atlas architecture from database development to user interface.

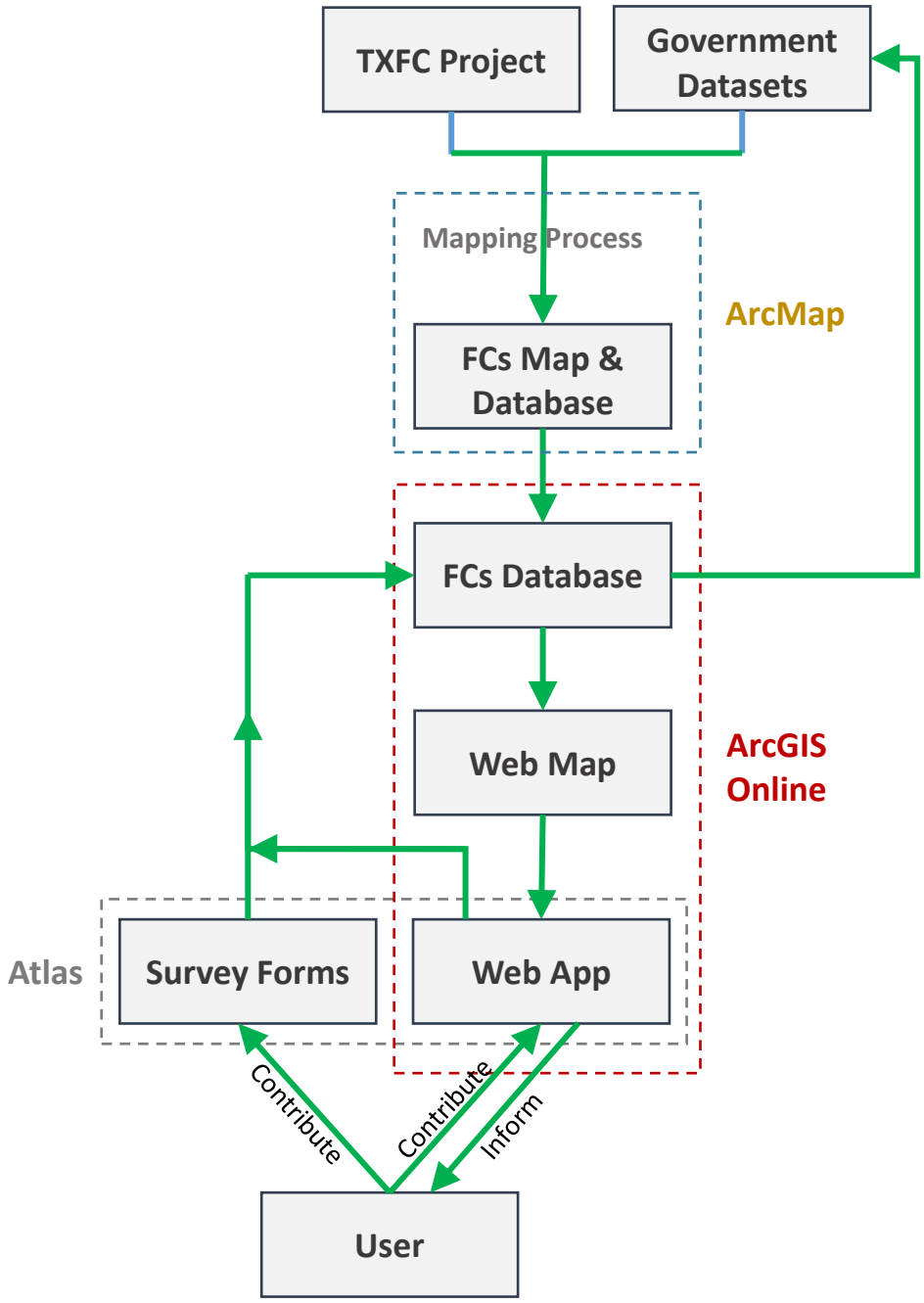


Figure 25.The Atlas Architecture Diagram

5.2. SURVEY FORMS

There are different services and applications providing platforms for creating web-based survey/data collection forms. To find the optimum option that fulfills the requirements of the project, Google Forms and Survey123 as two common platforms for creating online survey forms were studied to evaluate their function for the purposes of the project.

Google Forms is a survey app that allows collecting information through personalized survey forms. Google Forms provides a collection of pre-defined questions in a variety of forms which makes creating a survey form easy. Survey123 is a similar application from ArcGIS and "is a complete, form-centric solution for creating, sharing and analyzing surveys" (Esri 2019) that makes data collection via the web or mobile devices possible.

These two applications were compared based on their variety of question types, design elements and customization capabilities, storing responses, limitations. Both applications share a number of items but overall Survey 123 gives more options in the form components and questions. Table 9 compares Google Forms tools and form components with their corresponding items in Syrvey123 application.

Table 9. Question Types and Components Comparison between Google Forms and Survey123 Applications

Google Forms	*Survey123*
Short answer	Singleline Text
Paragraph	Multiline Text
Multiple Choice	Single Choice
Multiple choice grid	Single Choice Grid
Checkboxes	Multiple Choice
Dropdown	Dropdown
Linear scale	Likert
×	Rating
Checkbox grid	×
Date	Date
Time	Time
×	Date/Time
×	Number
×	Email
×	Website
×	Image (Upload)
File Upload	File Upload
×	Signature
×	GeoPoint
Image (include an image in form)	×
Video (include a video in form)	×
Title and Description	Note
×	Group (grouping the questions)
Section	Page

The most significant advantage of Survey123 over Google Forms –especially in the application in the Texas Freedom Colonies Atlas- is the "GeoPoint" function. This type of question shows the user a map on which they can specify the location for the settlement that they are submitting the form. Using these points make mapping the results easier. Figure 26 shows the GeoPoint function of Survey123 as it appears in the short survey form.

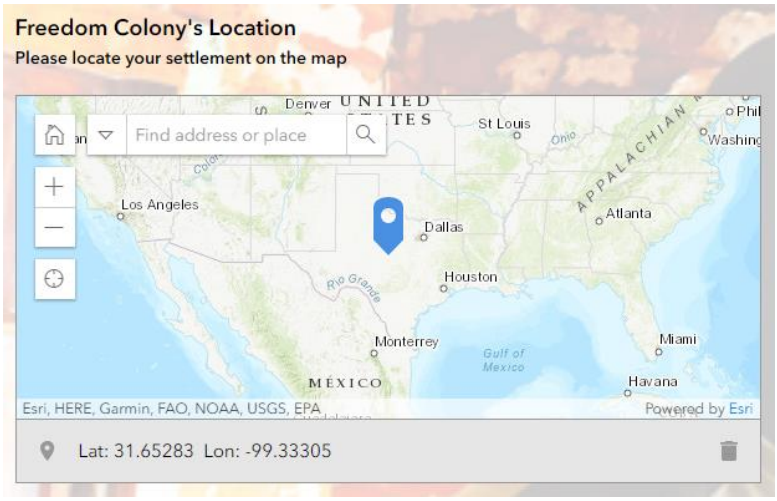


Figure 26. Survey123 GeoPoint Function, from the Freedom Colony Storyteller Portal

Different question types in both platforms have limitations that might be problematic depending on the purpose of the data collection process and the type of information they collect from the users. For example, the "multiline text" question in Survey123 limits the user's response to 1000 characters while "paragraph" question as its equivalent type in Google Forms does not have a character limit for this type of question.

Another limitation involves the "file upload" function. Both platforms allow the organizer to choose the acceptable file types for upload, however, while Survey123 limits the file size to 10 MB, in Google Forms, the organizer can change the maximum file size. Another difference is that "file upload" in Google Forms allows uploading multiple files (the number of files can be set by the designer to 1, 5, or 10), but "file upload" in Survey123 allows uploading only 1 file at a time. Therefore, if more files are needed to be uploaded, a separate file upload section must be added for every additional file.

Google Forms stores the survey inputs -as a spreadsheet- and uploaded files on Google Drive. This might be a good form of storing and managing responses and collected data for non-spatial information, however, when we are dealing with geographic information, which is the case in the Texas Freedom Colonies Project, a map-based survey form like what Survey123 offers is a better option since it exports the user responses into a shapefile stored on AGOL server from where it can directly be added to a map to spatially visualize the crowdsourced information. Besides, uploaded files will be attached to the feature points on AGOL.

Comparing the appearances customization capabilities, both platforms share a selection of themes and colors, Survey123 gives the organizer more options to customize the details of the design elements. For example, while in Google form you can only define a theme color and background color, Survey123 allows you to pick different colors for the background, input boxes, header, and text in different sections of the form including header, content (questions), and components (buttons).

Similarly, Google Forms allows selecting an image for the form header, while in Survey123 you can select an image as the background for your form and for the content frame separately if you choose not to use a simple color background. Organizers can take advantage of this option to present their brand while making their forms more visually appealing. Overall, Survey123 gives the organizer more control over the design elements and customizing the appearances of the form. This might not seem an important issue but changing these design details can significantly increase the readability of the form, hence attract more users to participate.

Considering the capabilities and limitations of both applications Survey123 was used for designing data collection forms. In the Beta 1.0 and CPC version, only the long form was used. The long form included 30 questions and aimed to collect information from users who want to share the information about their settlements and participate in Black Settlements Study by answering additional questions that provide more information including events and traditions, preservation activities, settlement challenges and issues, and important buildings and structures (i.e. schools, churches, cemetery, and historical house). However, while this form provides valuable information about the settlements, it might be too long for users who don't want to spend a relatively long time filling out the form. Therefore, in Version 2.0, to ensure engagement of all groups of users, besides simplification of the existing form, another form with only 10 questions was designed and incorporated to the Atlas.

Both forms collect users' contact information to make possible future contacts if they are willing to involve more. The GeoPoint feature was utilized to connect the form to the map and visualize the results. The layers for the short survey (Freedom Colony Storyteller Portal) and the long survey form (Black Settlements Study Survey, IRB2018-0147) were kept separate to keep track of records submitted by each form. Figure 27 shows a snapshot of Freedom Colony Story Teller Portal.

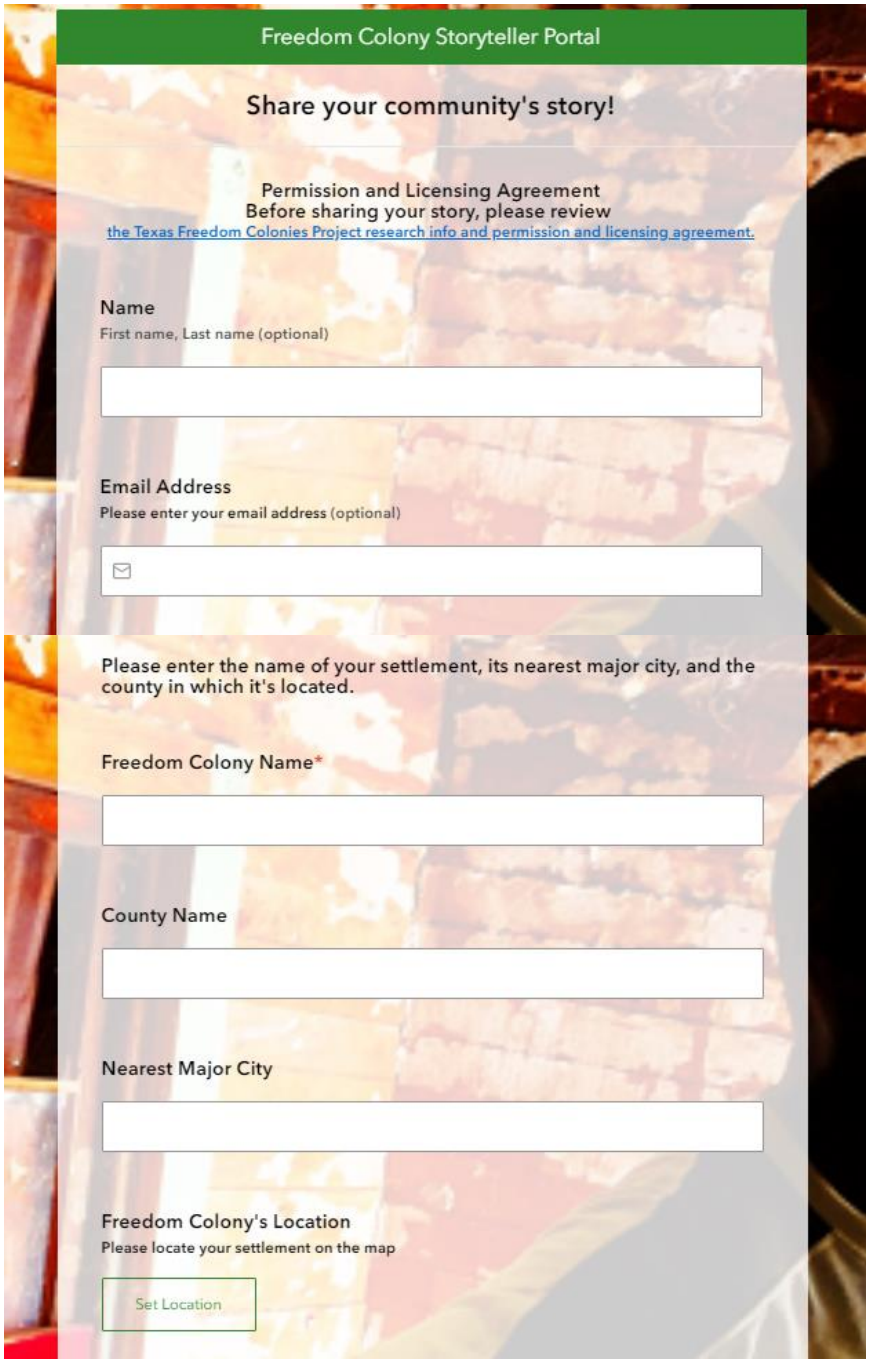


Figure 27. Freedom Colony Story Teller Portal

5.3. THE ATLAS

The Atlas refers to a part of the Texas Freedom Colonies Project that includes the web map application and crowdsourcing tools. ArcGIS Online (AGOL) platform, ArcGIS Online Web App Builder, and Survey123 were utilized to create online maps, web map applications, and data collection survey forms. By the time of writing this paper, three versions of the mapping tool have been released: 1) Beta 1.0, 2) Critical Places Class (CPC) version, and 3) Version 2.0. These versions share the basic components but have utilized different layouts, tools, and characteristics which will be explained in this section.

5.3.1. BETA 1.0

The Beta 1.0 version of the mapping tool was created using AGOL Web App Builder. The main component of a mapping tool is a map which was created using AGOL and included the layers that were uploaded to AGOL server. Table 10 shows list the layers of the Texas Freedom Colonies Atlas map and their feature types.

Table 10. Texas Freedom Colonies Atlas Layers by Feature Type

Layer Name	*Feature Type*
Texas Freedom Colonies	Point
Texas Counties Boundary	Polygon
Texas State Boundary	Polygon
Texas Counties by African American Population 2010	Polygon
Texas Harvey Affected Counties	Polygon

The “Texas Freedom Colonies” point feature layer contains all 557 freedom colony names from the pre-study list and visualizes the points for 357 located FCs and 80 FCs located-need more research.

“Texas Counties Boundary” shows Texas counties with the number of total freedom colonies listed in the pre-study list and number of FCs by locating status.

Texas State Boundary is a polygon layer that will be used to show the state boundary.

“Texas Counties by African American Population 2010” includes the same polygon features as counties layer and shows the concentration of African American population as a percentage of the total population according to census 2010 data.

“Texas Harvey Affected Counties” layer contains 58 counties of Texas that were affected by hurricane Harvey in 2018. This layer was created using FEMA disaster declaration maps for hurricane Harvey and takes into account the governor’s disaster declarations as well.

Besides the layers mentioned above, one feature layer was created for new freedom colonies that will be located by users via the mapping tool. This layer is a point feature type and has the same attribute fields as the freedom colonies layer. Then another layer which was automatically created by Survey123 to visualize the inputs of the data collection form was also added to the map.

The symbologies were modified to ensure the readability of the map and make different layers distinguishable for users, especially elders and users with sight difficulties. For example, we have three layers on the map that show the points for freedom colonies based on their data source: 1) FCs located by the research team through the mapping process, 2) FCs located by users via the mapping tool, and 3) FCs located by survey form users. Therefore, it was important to choose colors that create a clear distinction between the points from different layers and avoid confusion for users.

The Beta 1.0 mapping tool offers tools and functions that enables users to interact with the map in different ways. Basic tools include zoom bar, home extent, and current location finder. Another set of tools enables users to change the background basemap, turn map layers on and off, and see the legend for layers shown on the map.

The Texas Freedom Colonies Project - and Atlas – is transparent about the data sources used to map the freedom colonies. A list of these data sources is shared with users via a link on the mapping tool. Links to the mapping tool guidebook, the projects website, and the Atlas and Study Portal are also available in the mapping tool.

Besides the general tools mentioned above, there are four other tools available on the mapping tool, enabling users to explore the map and add their information about the settlements. Figure 28 shows a snapshot of the mapping tool Beta 1.0 and introduces its tools and widgets.

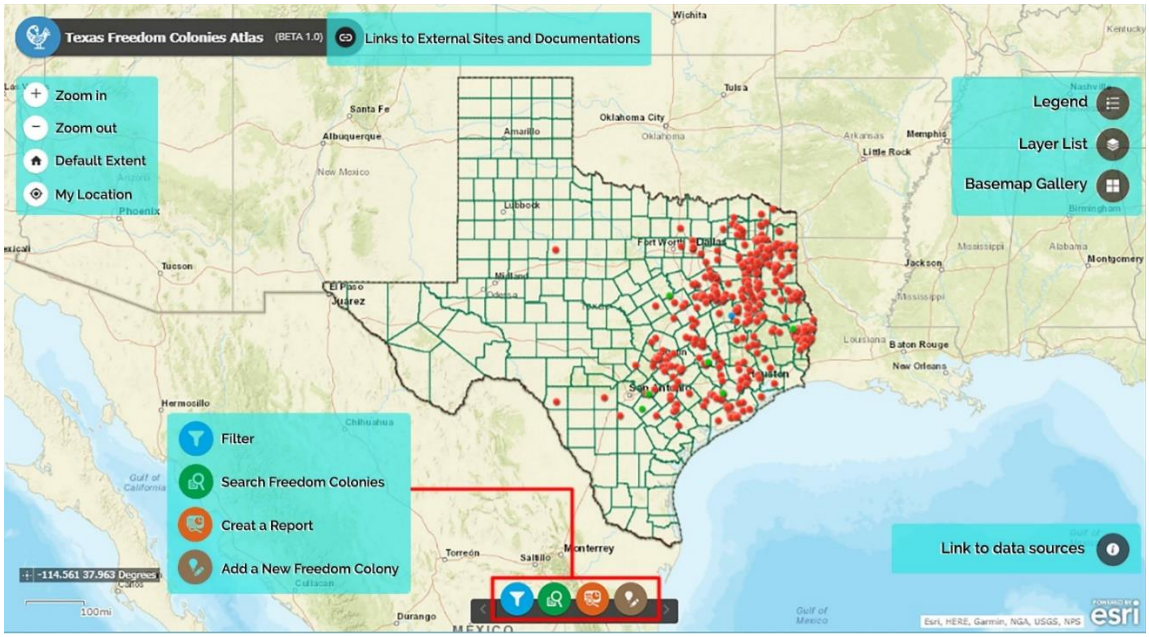


Figure 28. Atlas Beta 1.0 Mapping Tools and Widgets

The Beta 1.0 version was launched on 12 July 2018 and shared publicly with the goal to solicit feedback. That feedback was then taken into consideration in designing future versions of the Atlas.

AGOL web maps present the data and information for map features in pop-up windows. Pop-up windows are boxes that appear by clicking on a feature on the map. The data in these informative windows comes from the layer's attribute table and organizer can customize the window to include selected attribute fields, add contents (text, images, links, etc.), and change the graphics and appearances.

In the Beta 1.0, pop-up windows were customized for the three layers for FC points and counties layer. All FC point layers presented the same information but had their source in their title to also reflect their locating source. Figure 29 shows a snapshot of a pop-up window for FC point layers.

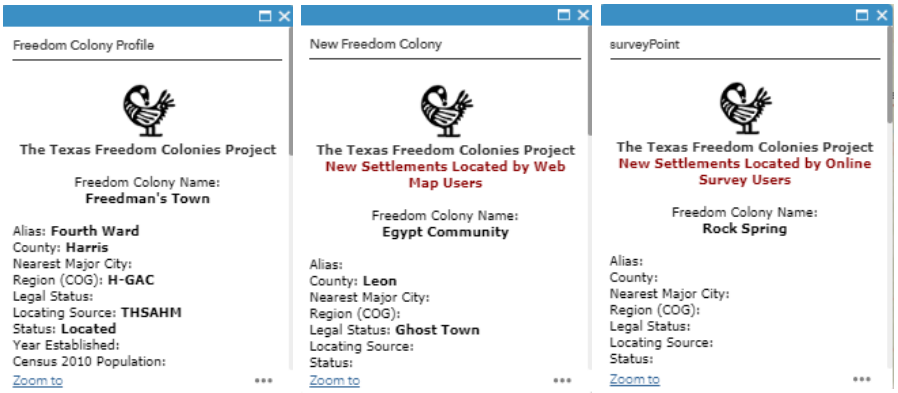


Figure 29. Pop-up Window for FC Points in Beta 1.0

The layer list allows map users to turn layers on and off to select the map layers as they desire. For instance, by turning on the African American Population layer and overlaying with the FCs layers, users can study the concentration of FCs in relation to the African American population in Texas counties. Figure 30 and Figure 31 show the snapshot of Beta 1.0 mapping tool demonstrating overlay of different map layers.

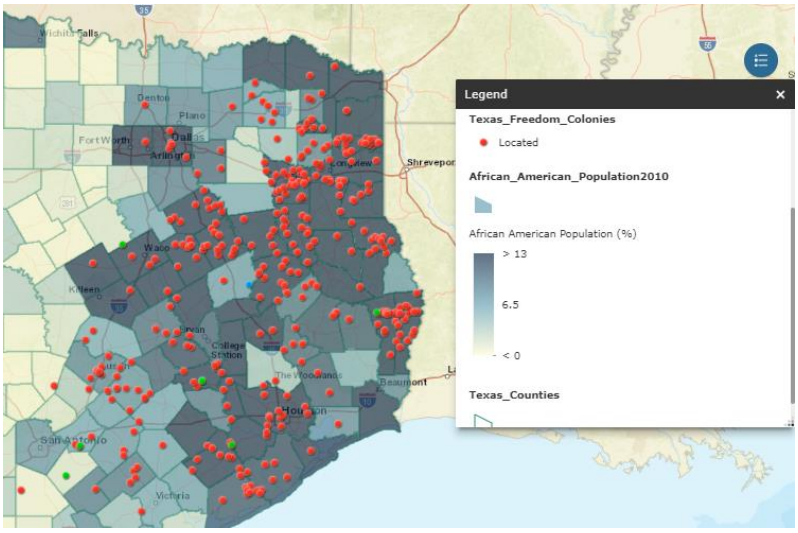


Figure 30. Overlaying African American Population Layer with FC Points

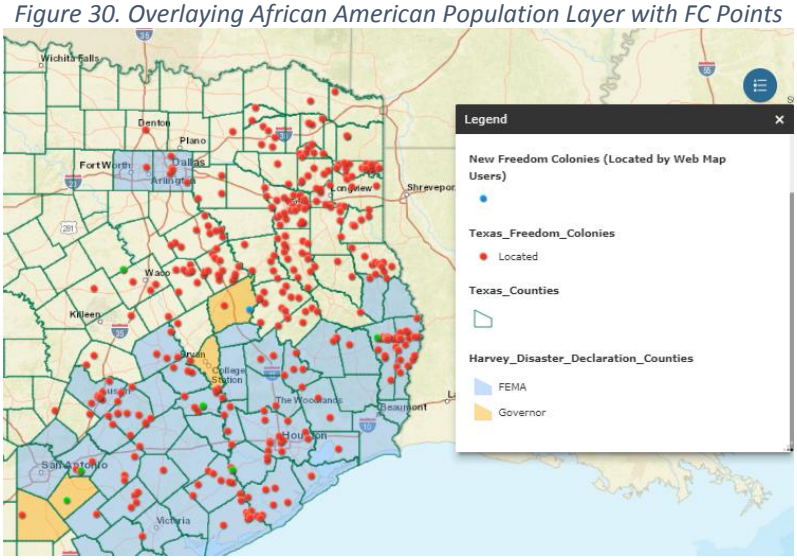


Figure 31. Overlaying Harvey Affected Counties Layer with FC Points

The basemap gallery makes a collection of different maps available for users to set as the background of the map. Figure 32 shows the available maps in basemap gallery.

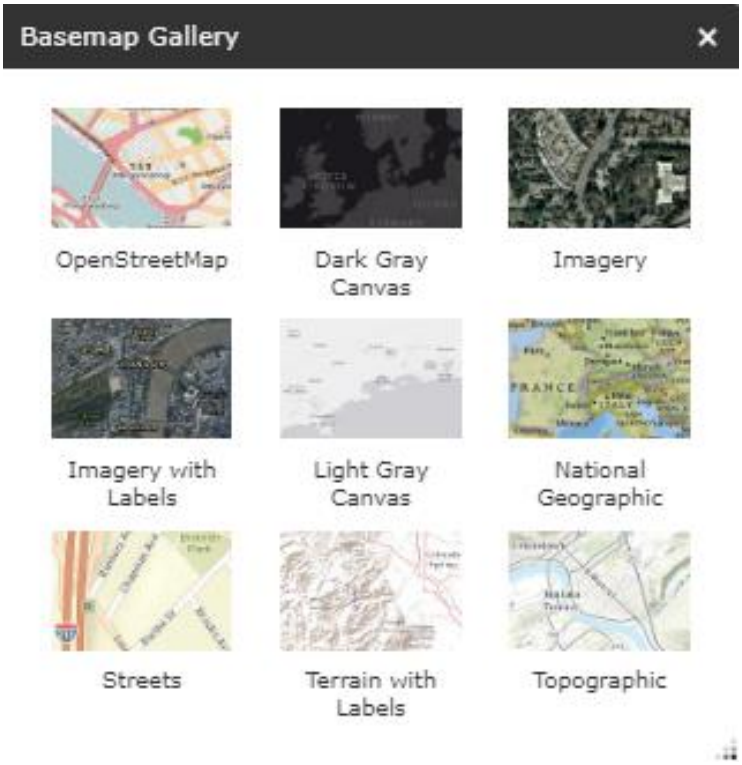


Figure 32. Basemap Gallery

Using the filter tool, users can filter the FC points to show only the selected FC or FCs in a selected county. Figure 33 shows an example of the filter tool function in Beta 1.0.

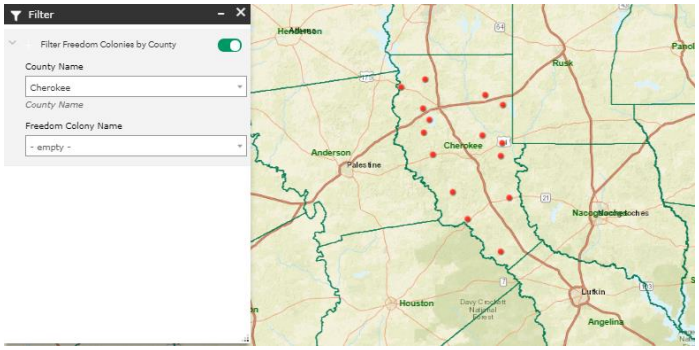


Figure 33. Showing FCs in Cherokee County Using Filter Tool

Search tool provides users with the ability to search for an FC or FCs in a county. Figure 34 shows an example of the search tool results in Beta 1.0.

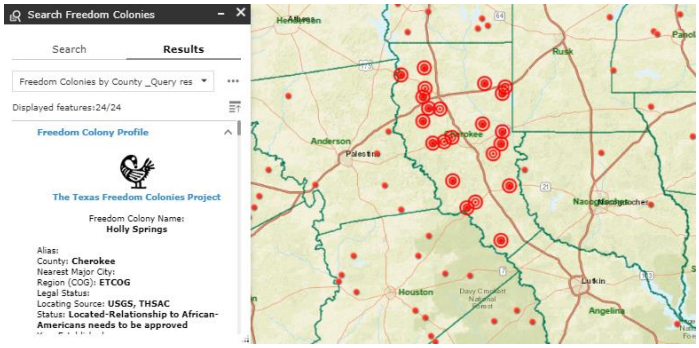


Figure 34. Search Results of FCs in Cherokee County Using Search Tool

Users can add to the crowdsourced layer of new FCs using the “Add a Freedom Colony” tool. This tool requires users to put a point on the map and add the information to the attribute table. Figure 35 shows an example of adding a point to the map using the “Add a Freedom Colony” tool.

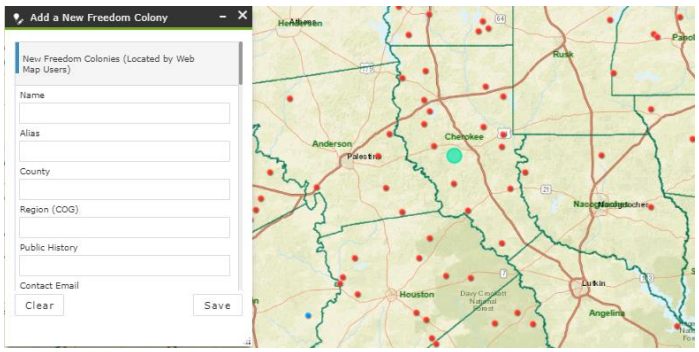


Figure 35. Adding a FC to the Map Using Add a Freedom Colony Tool

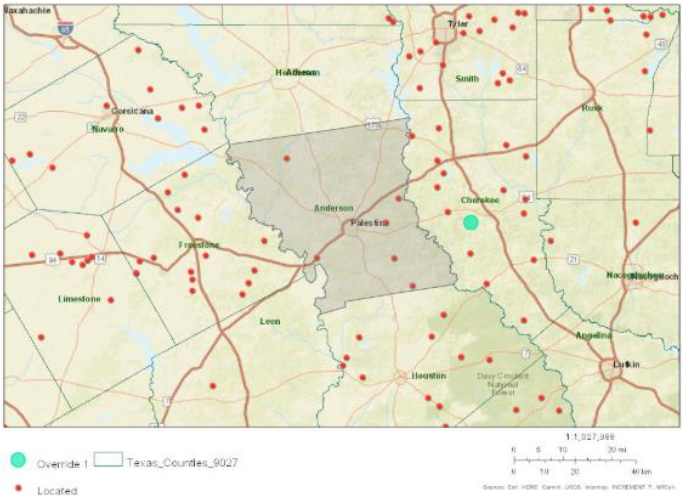
Finally, the report tool enables users to export a report for selected FC or FCs in a selected county to a pdf or download it in CSV format. Figure 36 shows a snapshot of the exported report from Atlas Beta 1.0.

Texas Freedom Colonies Project (Profile Report)

Area of Interest (AOI) Information

Area : 30,052,957,514.9 ft²

Mar 25 2019 20:13:31 Central Daylight Time



Summary

Name	Count	Area(ft²)	Length(ft)
Freedom Colonies	8	N/A	N/A

Freedom Colonies

#	Name	Alias	County	COG	Locating Source	Latitude	Longitude	More Info	Count
1	Bethel	*No Data*	Anderson	ETCOG	USGS, THSAHM, THSAC	31.92	-95.92	https://tshaonline.org/handbook/online/articles/hnb33	1
2	Tucker	Green Bay	Anderson	ETCOG	USGS, THSAHM, THSAC	31.67	-95.75	https://tshaonline.org/handbook/online/articles/hlt34	1
3	Bosman	Bozman	Anderson	ETCOG	USGS	31.97	-95.85	https://tshaonline.org/handbook/online/articles/hrbab	1
4	Davenport	*No Data*	Anderson	ETCOG	TSHA	31.78	-95.51	https://tshaonline.org/handbook/online/articles/hvd09	1
5	Beulah	*No Data*	Anderson	ETCOG	USGS	31.69	-95.61	*No Data*	1

Figure 36. Snapshot of a Report Generated by Report Tool

5.3.2. CRITICAL PLACES CLASS APP (CPC VERSION)

This version of the application was designed exclusively for the Critical Places Studies class taught by Dr. Roberts in fall 2018 semester at Texas A&M University. The goal was to test the Atlas by students as users and also evaluate its functionality as a participatory teaching tool in such classes focused on related subjects.

This application was based on the Beta 1.0 version and used the same layout but it was different in terms of component, design elements, and sharing settings. The Beta 1.0 was shared publically while the CPC version was shared only with the students in the class. Students could access the map through their organizational AGOL account which made tracking of their activities, edits, and the data they added to the map possible.

Both maps shared the same layer except for the "Existing Features and Structures" layer that was added to the CPC version map. It was a polygon feature layer, editable by students to let them draw features on the map including church, school, park/open space, structure, or an object. Choosing the "Add a Feature" tool gives students the option to choose which layer they want to edit. They can select to add a point to the "New Freedom Colonies" layer or a new polygon to the "Existing Features and Structures" layer.

Although both maps included the point layer for freedom colonies, they were different in terms of the visualized data on the map. While Beta 1.0 showed only 357 located FCs, CPC version showed points for both located FCs and 80 FCs that were located but needed more research.

The CPC version also provided more tools for students to interact with the map. Besides the tools inherited from the Beta1.0, in this version four new tools were made available to students. The goal was to see the usefulness of these tools to decide whether to keep them in future versions or not. Following is the list of CPC version additional tools:

- **Add Data:** Gives user the option to upload data layers from their own computer or an online source to the map mostly for analysis purposes.
- **Measurement:** Users can measure distance and area on the map.
- **Attribute Table:** Shows the attribute table for selected layers on the map and gives user the option to export the information in the form of a table.
- **Edit:** Enables users to edit the existing features on the map and change their attribute data.

The fundamental difference between Beta 1.0 and CPC version was the edit tool. Editing the existing points was disabled for public users to prevent potential human errors. For example, users might accidentally delete a point. Moreover, the tracking of edited data was impossible since public users are not required to log in to AGOL. Students, on the other hand, had AGOL student account which enabled us to monitor and verify their edits. Figure 37 shows a snapshot of the mapping tool CPC version and introduces its tools and widgets.

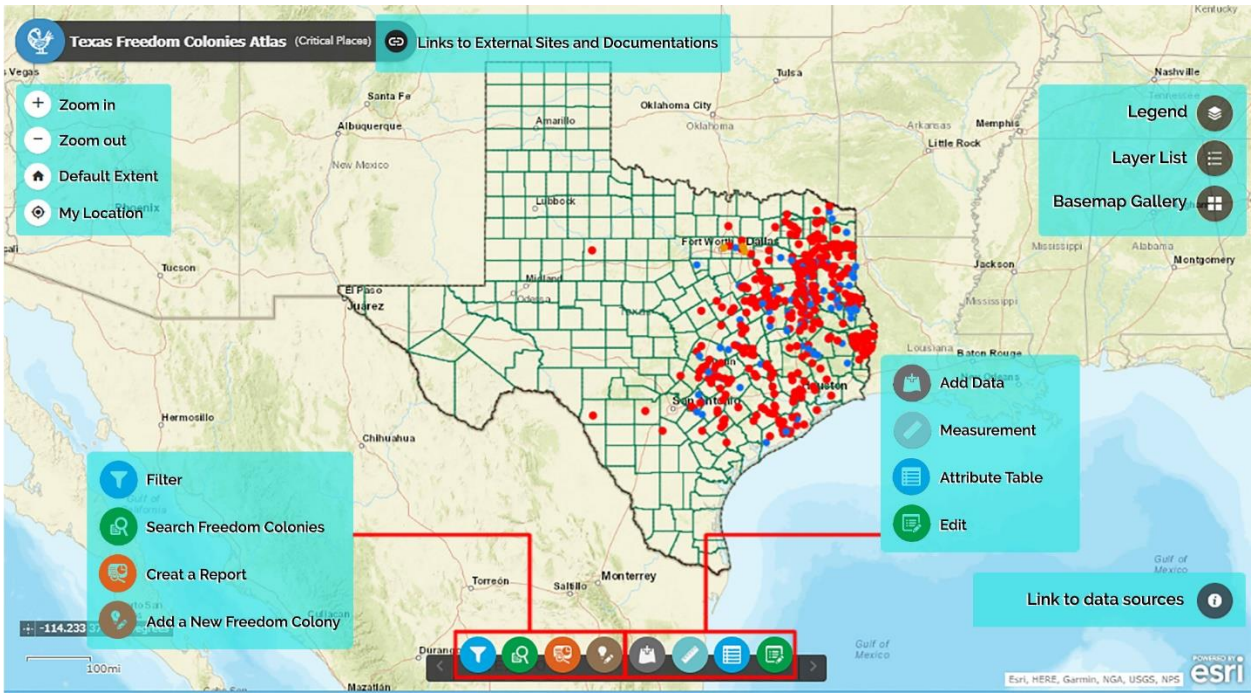


Figure 37. Atlas CPC Version Mapping Tools and Widgets

Add data tool gives students the option to add additional data layers to the map. They can browse the contents shared via ArcGIS Online or another web address, or upload their own layers using the file option. This tool helps with performing analysis for a variety of projects focusing on freedom colonies in Texas. Figure 38 shows a snapshot of the Add Data tool window.

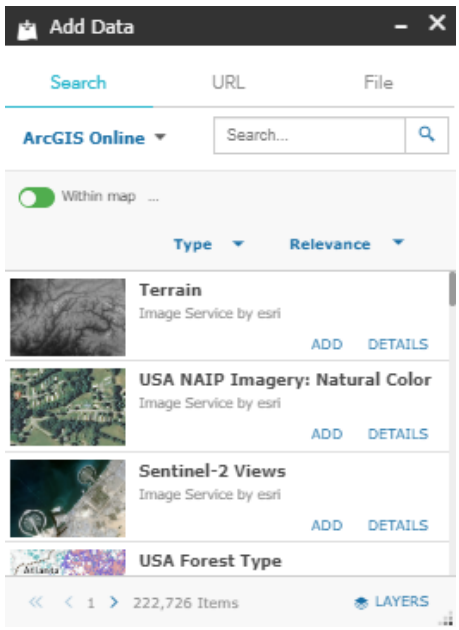


Figure 38. Add Data Tool Window in Atlas CPC Version Mapping Tool

Measurement tool provides a simple tool to measure distance and area on the map in desired units. Figure 39 shows an example of the Measurement Tool function in Atlas CPC Version mapping tool.

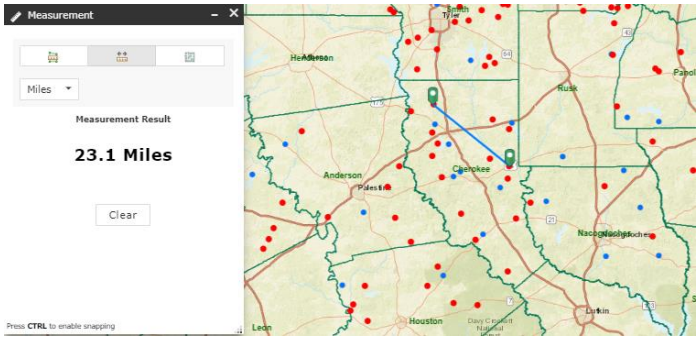


Figure 39. Example of Measurement Tool Function in Atlas CPC Version Mapping Tool

Finally, using the edit tool, students can edit the attribute data for each point by clicking on it and opening the pop-up window. Figure 40 shows an example of an editable pop-up window for an FC in CPC version map. Students input will be monitored and verified and then edits will be made if needed.

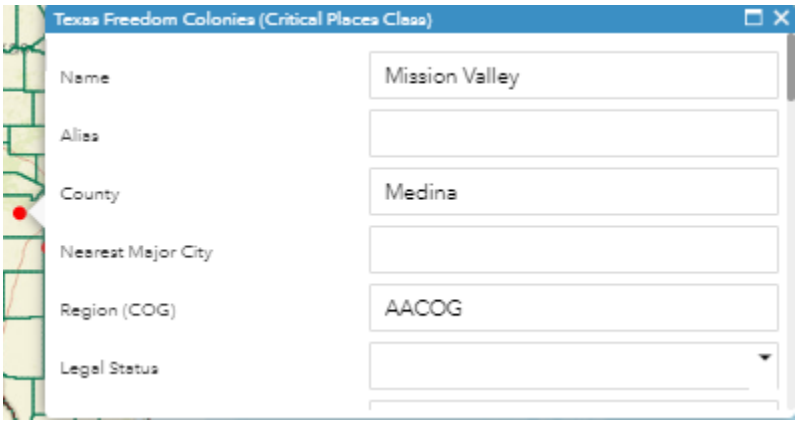


Figure 40. Editable Pop-up Window in Atlas CPC Version Mapping Tool Edit Tool

These additional tools were tested by the students and based on the findings of their usefulness, functionality and ease of use, two of these four tools were made available in Version 2.0 of the Atlas; Measurement Tool and Attribute Table.

5.3.3. VERSION 2.0

After studying the results and feedback from previous versions users, version 2.0 of the Atlas was designed to solve the issues found and provide an interface with optimum functionality. In Beta 1.0 and CPC version, users could access the map and survey forms separately through the project's website or via the links available in the mapping tool. In order to provide easier access, all components of the Atlas including the mapping tool, short survey form, and long survey form were integrated into a single interface using the AGOL Map Series (Tabs) template. This template provides a layout in which you can have various forms of content in a single interface within different tabs. Users can switch between the pages simply by clicking on each tab.

Besides the main component, Atlas 2.0 had three additional tabs that were also accessible through the website in previous versions:

1. "Welcome" page which introduces the different tabs' components in Atlas 2.0 and tools of the mapping tool,
2. "Atlas Guidebook" page is a tutorial document which provides users with a detailed explanation of how to interact with the map using the tools, and
3. "About the Project" page includes a spark portal introducing the Texas Freedom Colonies Project & Atlas.

Presenting all the components of the Atlas in a single interface makes interaction easier for users. Basically, you can give users access to everything they need to learn about the project and use the Atlas and the mapping tool by sharing a link to this page. Figure 41 shows a snapshot of the Atlas 2.0 welcome page.

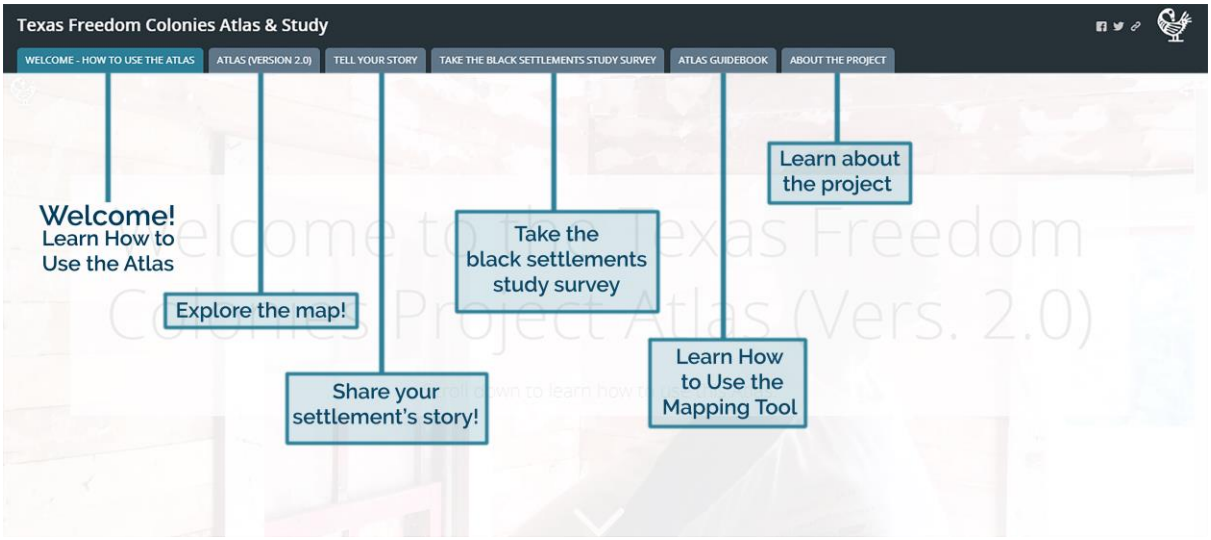


Figure 41. Atlas 2.0 Welcome Page

The mapping tool in the Atlas version 2.0 is a combination of two previous versions. After being tested by public users (in Beta 1.0) and students (in CPC version), tools available on the map for version 2.0 has been selected based on the findings of the tests. A print tool and a button to make the map full screen were then added to the previously tested tools.

The tools in this version of the mapping tool include:

- Legend
- Layer List
- Basemap Gallery
- Print*
- Zoom In/Out
- Default Extent
- My Location
- Full Screen*
- Search Freedom Colonies
- Create a Report
- Add a New Freedom Colony
- Filter
- Measurement
- Attribute Table

* We did not have these two widgets in previous versions of the Atlas and they were used in Version 2.0 for the first time.

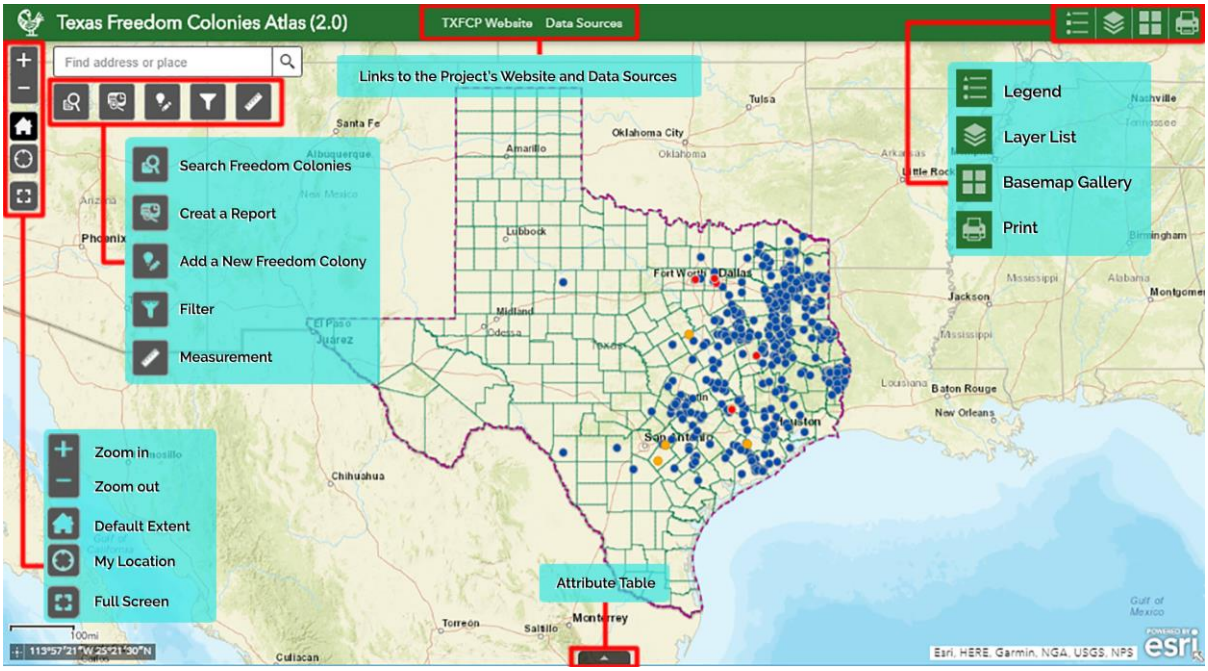


Figure 42. Atlas Version 2.0 Mapping Tools and Widgets

During the testing process, we found that some users might want to involve through the survey form but due to its length and number of questions, they were less likely to fill out the form. Therefore, another survey form with less number of questions was designed to those group of users who prefer to spend less time to share their information. Therefore, we now have three separate crowdsourced layers for freedom colonies on the map that are presented with different color points along with the points located by the research team. Table 11 shows the list of layers for freedom colonies on the map by their source and their respective symbols.

Table 11. Atlas 2.0 Map Freedom Colony Layers by Source

Symbol	*Layers*	
●	FCs Located by the Research Team	
●	Crowdsourced Layers	Located by Map Users
●		Located by Storyteller Portal Users (Long Form)
●		Located by Study Survey Users (Short Form)

The pop-up windows for all FC point layers have been modified and their information was summarized to make them simpler. Also, the attachments (files uploaded by users or the research team) were added to be shown in the pop-up window. Due to the importance of settlement origin stories and sharing them in the Texas Freedom Colonies Project, the origin story field was moved to the top in the list of attribute data in the FCs' pop-up window. Figure 43 shows a pop-up window for a freedom colony located by a map user. The origin story shared by this user is as an example of information that was almost impossible to acquire without the contribution of settlement residents and their descendants.

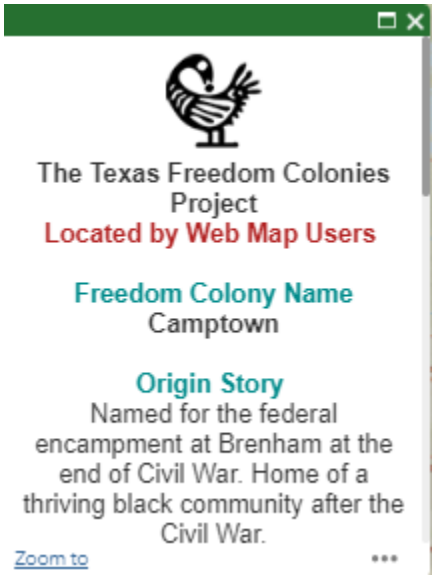


Figure 43. Snapshot of a Pop-up Window for a FC in Atlas Version 2.0 Mapping Tool

Another change in map layers was combining “Texas Counties,” “Harvey Affected Counties,” and “African American Population” layers. The attribute data from the other two layers were joined to “Texas Counties” layer using ArcMap Join Attribute Tables. Now we have a single layer in our database which is the source for all three layers mentioned above. Figure 44 shows Cherokee County’s pop-up window including the county’s information demonstrated in map layers as an example.

Figure 44. Snapshot of a Pop-up Window for a County in Atlas Version 2.0 Mapping Tool

The Atlas Version 2.0 was launched on 1 April 2019 and was replaced the Beta 1.0.

Chapter 6

FINDINGS & RESULTS

6.1. OVERVIEW

This section describes the findings from the mapping process, designing the application, and users and students feedback, and also reports the crowdsourced result from all three versions of the Atlas. The changes and updates made through this process and the rationale behind them are also explained.

6.2. ATLAS VERSIONS COMPARISON

6.2.1. LAYERS

Data layers are the fundamental components of a map. Depending on the purpose of the map and what needs to be conveyed, different layers might be illustrated on the map. Feature layers could either be made in AGOL or prepared in ArcMap and then published on AGOL server. Each version of the Atlas includes a different set of feature layers. Table 12 compares the map layers in Beta 1.0, CPC Version, and Atlas Version 2.0.

Table 12. Comparing Map Layers in Beta 1.0, CPC Version, and Atlas Version 2.0

Map Layers	*Beta 1.0*	*CPC Version*	*Version 2.0*
Texas Freedom Colonies	✓	✓	✓
Crowdsourced FC Points (Mapping Tool)	✓	✓	✓
Crowdsourced FC Points (Long Survey Form)	✓	✓	✓
Crowdsourced FC Points (Short Survey Form)	×	×	✓
Crowed Sourced New Structures & Buildings	×	✓	✓
Texas Counties Boundary	✓	✓	
Texas Counties by African American Population 2010	✓	✓	✓ *
Texas Harvey Affected Counties	✓	✓	
Texas State Boundary	✓	✓	✓

** The three layer of Texas Counties, African American Population, and Harvey Affected Counties were integrated into a single layer in Version 2.0 map.*

The sharing setting of map layers is another critical factor that organizers must take into consideration. AGOL allows the organizer to share the contents with the public, or with certain groups of users. In order to be accessed by the public, all components (including feature layers, maps, and web applications) must be shared publically.

Sharing the layers allows public users to see them on a shared map through a shared application, however, it does not necessarily enable them to edit or add to a feature layer. Organizers can provide them with this ability by making certain layers editable. They can also manage how these layers can be edited. Users might have permission to add new features to a layer, while they can only edit the existing features in another layer.

We utilized this capability of AGOL in the Atlas by letting public users add new features to “New Freedom Colonies” and “Existing Features and Structures” while only students were able to edit the existing records in “Texas Freedom Colonies” point layer in CPC version mapping tool.

6.2.2. WEB APPLICATION LAYOUT

AGOL provides three different ways to create a web application including 1) using a template, 2) using the Web App Builder, and 3) using Operations Dashboards. Each of these options offers different capabilities and must be chosen according to the needs and requirements of the project.

AGOL template collection offers a wide variety of templates for creating a web app. These templates provide predesigned layouts that range from simple story map to a 3D scene display. Figure 45 shows the template categories available in AGOL.

Although using templates offers advantages like saving time to design every single element or creating tools and widgets, they have some limitations in terms of controlling some details of widgets. In order to have full control over all elements of the application, the organizer must establish their own server and use programming to develop their own application. This is a costly process comparing to the free services available through AGOL.

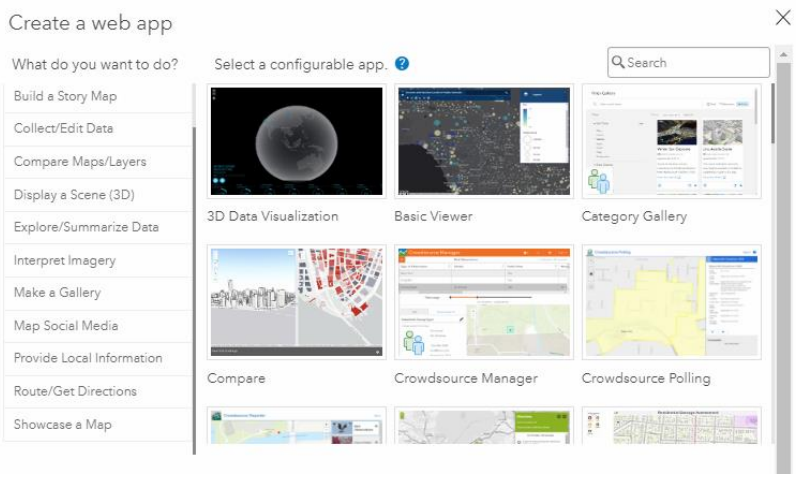


Figure 45. Snapshot of AGOL Web App Templates Window

ArcGIS Web AppBuilder enables organizers to present their web map via an interactive interface designed with preset themes. It also features a large toolbox of different widgets and offers more freedom for modifying and customizing widgets to fit the purpose of the application in each project. Figure 46 shows a list of widgets available in ArcGIS Web AppBuilder.

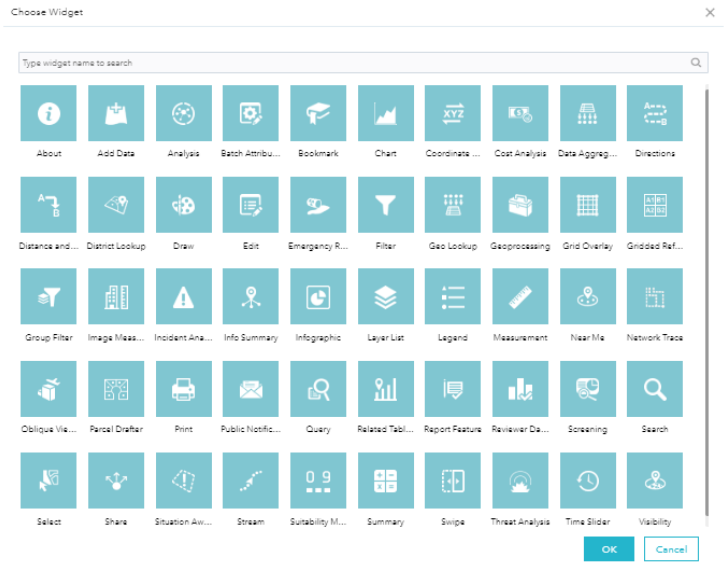


Figure 46. Choose Widget Window in ArcGIS Web AppBuilder

Beta 1.0 and CPC version were designed using ArcGIS Web AppBuilder. Other contents including data collection forms and guidebook were linked to this application from external sources. To integrate all components into a single interface, the Texas Freedom Colonies Atlas Version 2.0 utilizes a combination of Story Map Series (for the Atlas main interface), Story Map Cascade (for the Welcome Page), and the Web AppBuilder (for the mapping tool).

6.2.3. TOOLS AND WIDGETS

ArcGIS Online Web AppBuilder makes available a large collection of different tools and widgets that organizers can choose to include in their designed applications. It is important to choose these tools in a way that survey the purpose of the application. On the other hand, it is crucial to pick tools that are easy to use for public users, considering the different levels of skills among users. Although some tools might be quite useful, using them might not be appropriate due to their complexity.

Tools and their functions must be explained to users. This could be done as a part of the application, or as a separate guidebook document. Application designers and organizers must be aware that a tool that seems easy to them might be hard to understand by some users. Therefore, tools and widgets must be designed in a way that users with a minimum level of skills and figure out how to use them with the help of the guidebook.

It would be helpful if application designers could evaluate the functionality of the available tools by putting them in a test by a random sample of users. In the Texas Freedom Colonies Atlas design process, the usability and functionality of different tools and widgets were tested by public users and student in previous versions and the appropriate ones were chosen and included in Version 2.0.

Table 13 compares the map application tools and widgets in Beta 1.0, CPC Version, and Atlas Version 2.0

Table 13. Comparing Map Tools in Beta 1.0, CPC Version, and Atlas Version 2.0

Map Tools	*Beta 1.0*	*CPC Version*	*Version 2.0*
Filter	✓	✓	✓
Search	✓	✓	✓
Report	✓	✓	✓
Add Feature	✓	✓	✓
Add Data Layer	×	✓	×
Measurement	×	✓	✓
Attribute Table	×	✓	✓
Edit	×	✓	×
Print	×	×	✓

One of the advantages of using ArcGIS Online Web AppBuilder is that the tools and components of the map -as well as the map itself- can be modified and updated at any point depending on the circumstances including new goals, having certain users or any other factor that might require a change in the application.

6.2.4. CROWDSOURCING RESULTS

Collecting data from public users was one of the main goals of the Texas Freedom Colonies Atlas. Information about the Texas freedom colonies has been collected via the web mapping tool application, Freedom Colony Storyteller Portal, and the Black Settlements Study Survey.

Collectively, data collection forms and mapping too in different versions of the atlas helped mapping 13 new FCs, 1 church, and 1 cemetery, and updating the information of 16 existing FCs. Table 14 compares the users' interaction and crowdsourced data collected through different sources in Beta 1.0, CPC version, and Version 2.0.

Table 14. Crowdsources Data from Beta 1.0, CPC Version, and Atlas Version 2.0

User Contribution	*Beta 1.0*	*CPC Version*	*Version 2.0*
Crowdsourced FC Points (Mapping Tool)	2	3	1
Crowdsourced FC Points (Long Survey Form)	7	0	0
Crowdsourced FC Points (Short Survey Form)	0	0	0
Crowdsourced Features & Buildings	-	1	1
Edited Existing FC Points	-	16	-

Figure 47 shows the crowdsourced layers on the Atlas map.

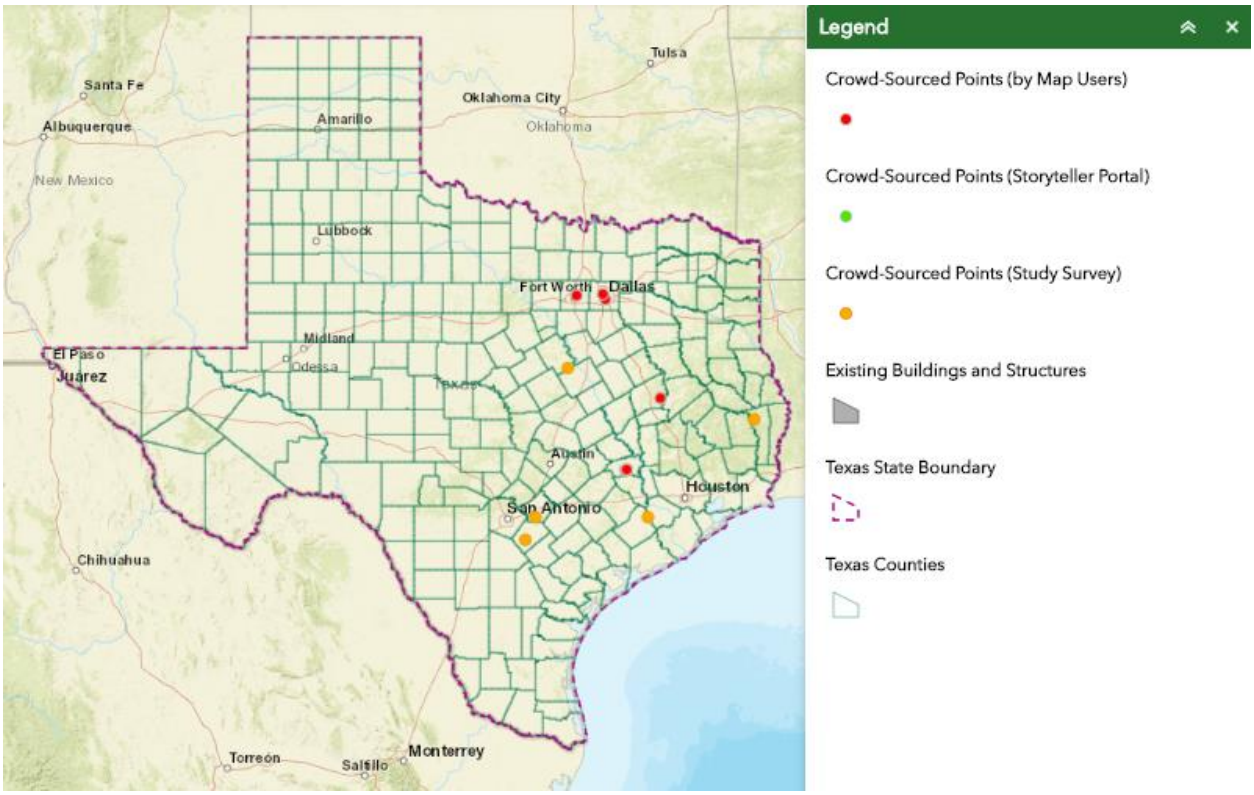


Figure 47. Crowdsourced Layers Shown on the Atlas Map

The information shared by the public users are the true example of local knowledge and citizen science. The Atlas as a public participation GIS platform enabled us to collect the information that is only owned by descendants of residents and could not be acquired through traditional data collection forms. Following are examples of information shared by the Atlas users.

Stevenson Colony, Wilson County

"*My great great great grandfather Charles Stevenson born in 1825 and great great great grandmother Harriet Glasco Stevenson founded Stevenson Colony. I am not sure exactly when it was founded but I understand it had a small grocery store, church, school, lodge hall and a cemetery. I got this info from a write up my cousin did on our family history*."

Camptown, Washington County

"Starting with the cemetery for names and working with digital newspaper archives, a working history of the community is beginning to emerge."

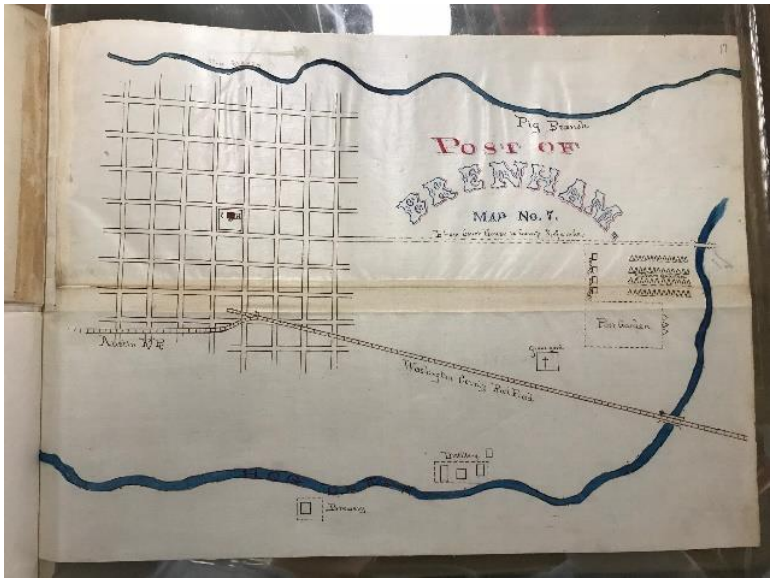


Figure 48. Post of Brenham Map, giving the location of Camptown Cemetery (Uploaded by an Atlas user)

Dixie Community, Jasper County

"Today's descendants remain committed to their inherited values and the Freedom Colony lives on. They have established a cultural center on the former campus of the old George Washington Carver School where they tell the story of their past and offer inspiration for the future."

Figure 49. Dixie Community, Jasper County (Picture uploaded by a user via survey form)

Despite the fact that students used the CPC version of the Atlas just for a portion of a semester, they had the most contribution to the Texas freedom colonies database. This suggests that even a small group of users can have a significant contribution if they are given instructions and support. The same applies to public users. In order to ensure the maximum public participation, the Texas Freedom Colonies Project suggest holding local workshops to introduce the Atlas to the public and walk them through how to interact with the map, share their stories, and add to the map.

In less than 9 months, the Atlas Beta 1.0 got 2,408 visits which is a significant achievement in such a relatively short period of time. Figure 50 shows the usage report for Atlas Beta 1.0 from the launching day (12 July 2018) to 19 March 2019. However, comparing the number of visits to the number of crowdsourced records added to the map shows that most users who have visited the map did not get the chance to add their information to the map.

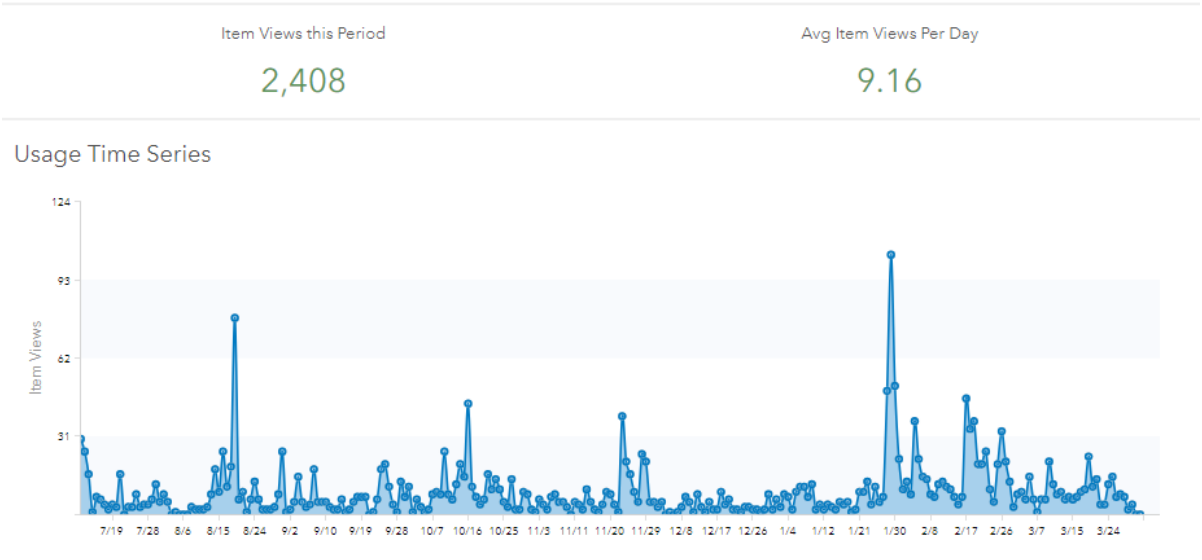


Figure 50. Atlas Beta 1.0 Usage Report (12 Jul 18 – 1 April 19) Generated by AGOL

Within less than a week, Atlas 2.0 had 77 views and users added a new FC point and a cemetery to the map. Figure 51 shows the Atlas 2.0 usage report for the first week of its launce.

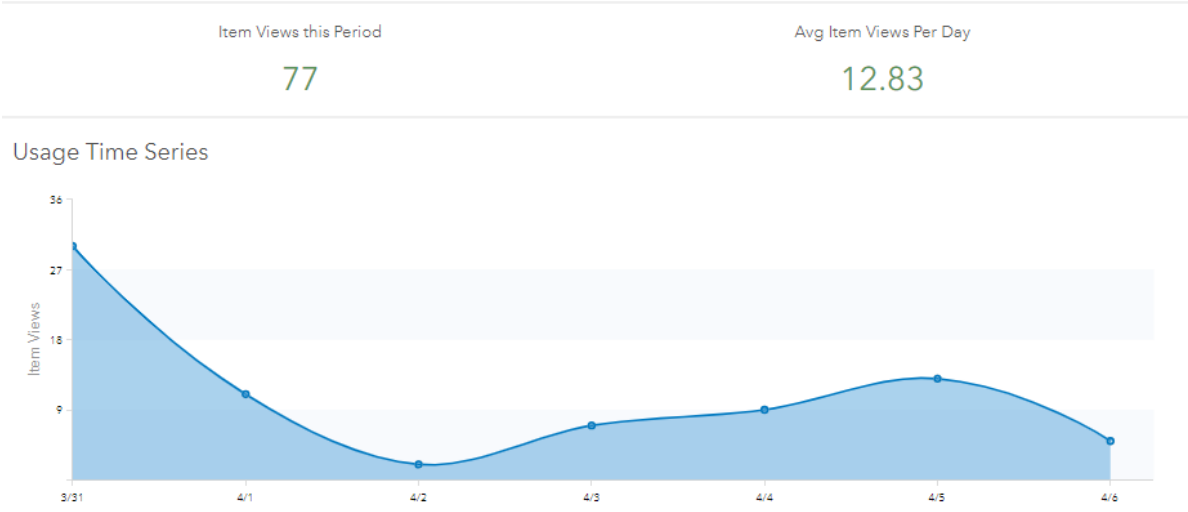


Figure 51. Atlas 2.0 Usage Report (1-7 April 19) Generated by AGOL

Watrousville, Washington County

"This neighborhood was among the first to be settled after Camptown by the newly freed people."

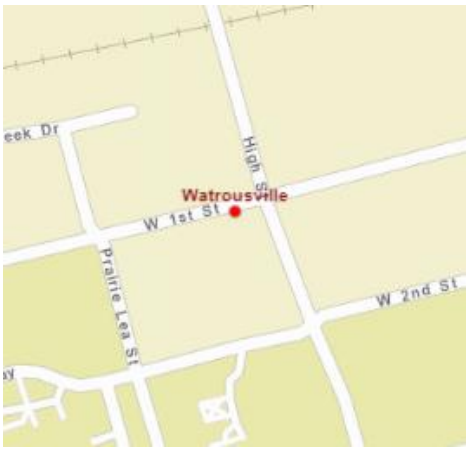


Figure 52. Screenshot of Watrousville Freedom Colony Point Put on the Map by a User

Figure 53. Mount Zion United Methodist Church, Watrousville, Washington County (Picture uploaded by a user via the mapping tool)

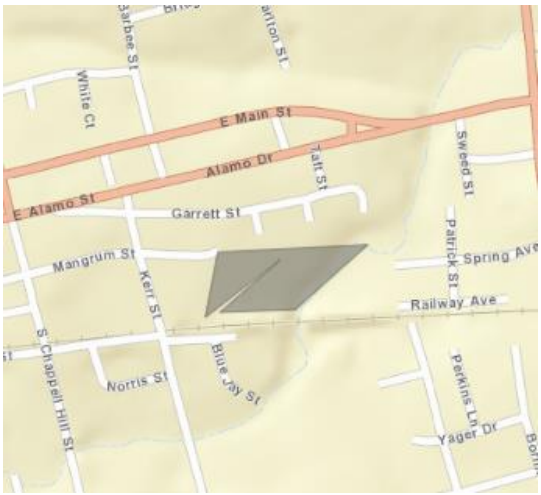


Figure 54. Screenshot of Camptown Cemetery Polygon Put on the Map by a User

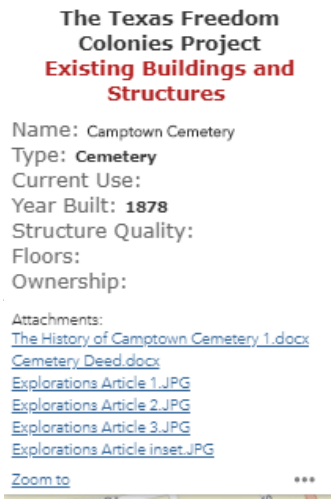


Figure 55. Screenshot of the Pop-up Window for Camptown Cemetery Showing Information, Documents, and Pictures Uploaded by a User

Integrating data collection forms, guidebook, project introduction, and the mapping tool might increase the participation rate by providing easier access to the crowdsourcing tools. Since Version 2.0 has been released only for a short time, a certain conclusion about this issue cannot be made by the time of writing this paper.

Another solution to address this issue was creating tutorial videos to promote the Atlas 2.0 and demonstrate how users can use the mapping tool and survey forms. Although a guidebook document has been presented along with the Atlas from Beta 1.0 and has been updated for other versions, instructional videos might be a better way to reach out to the public and give them information and tutorials especially for users who might not willing to spend more time to go over a several pages of the guidebook.

The increasing use of social media among people provides a great opportunity for public outreach through these platforms. Videos are the best medium to use in digital platforms. Moreover, citizens will learn more about the project through the website, social media platforms, and public events and presentations.

Chapter 7

CONCLUSION

7.1. CONCLUSION

Defining the problem is the essential requirement of a successful crowdsourced planning process (Brabham 2009). Having a clear definition of the problem helps organizers to take the right approach to solve the problem and also gives public a clear idea of what they are participating in and what they can do to help to solve that problem.

Another important factor in a public participation approach is defining the "public" (Schlossberg and Shuford 2005). The Texas Freedom Colonies Project aims to involve local people - Descendants of freedom colony founders who are residents or non-residents- while encourages other citizens to engage with the project as well.

It is also important to define where the citizens stand on Arnstein's Ladder of Participation. The Texas Freedom Colonies Atlas enables citizens to participate in three levels defined by McCall and Dunn (2012):

Table 15. Levels of public participation in the Texas Freedom Colonies Atlas

Level of Participation	*Implication in the Texas Freedom Colonies Atlas*
Information sharing	This is a two-way relationship between the project and citizens. While the project shares the findings and information of mapped FCs with the public through the mapping tool, citizens are able to share their information through the crowdsourcing tools available via the Atlas.
Consultation	Citizens are being asked about their settlements issues and prioritizing their problems. They can also discuss these issues further during the site visits, interviews, and workshops held by the project's public outreach team.
Initiating actions	Recognizing these discrete communities by putting on the map not only makes the visible to planners and decision-makers in government, but also encourage individuals and groups –who already have the potential motive due to their relation to the community- to establish initiatives to improve their settlements.

Having a clear definition of public will also help to choose the right approach, tools, and means of participation. The abilities and needs of different groups of the public with different levels of knowledge, background, skill, and expectations must be taken into consideration in developing a crowdsourcing participatory tool.

ArcGIS Online offers a wide variety of tools to create web-based maps and applications to incorporate public participation into the planning –and mapping- process. However, the application type and design elements must be utilized in a simple way that is understandable and usable by the public users (Howe 2009).

Planners must take advantage of contemporary online tools to ensure inclusivity. The Texas Freedom Colonies Atlas combines the mapping and web app creation capabilities of AGOL with the data collection tools of Survey123 to provide various ways of public participation.

Mahmoudi and Seltzer (2013) emphasize on the importance of monitoring the public input and providing feedback to acknowledge their participation and evaluate their interactions and let them know how they can contribute to the project more and in a better way. The crowdsourced data from the Atlas users is being constantly monitored by the project's research team. The public outreach team manages the promotions about the Atlas updates and also provides support for users by responding to their questions and requests regarding using the Atlas.

Developing a participatory crowdsourcing tool will bring the local knowledge into the planning process and will help to make better decisions that will not only benefit the individuals involved directly in the process, but also the rest of society. The result of this process is not merely a map created by the help of citizens, rather it is a rich data source combining the expert and local knowledge that could inform governments and their policies and plans to improve their inclusivity and solve spatial inequity issues.

The Texas Freedom Colonies Project was initially started with the long-term goal creating the Atlas as a mapping tool to make freedom colonies visible to preservationists, planners, and disaster mitigation specialists and assuring an equitable, inclusive disaster recovery. This is just an example of how governments and planners can use Atlas outcomes to improve their plans.

The final product of the Texas Freedom Colonies Atlas will be a spatial database of freedom colonies in Texas developed through a collaborative process combining the findings of professional research with the crowdsourced local knowledge. This database makes mapping these hidden communities possible. Besides providing an interactive database which can be used by general public, researchers, preservationists, and other activist individuals and organizations, the Atlas can inform governments, policymakers, and planners about these settlements and ensure their inclusion in different plans. The goal here is to empower these communities and their residents by recognizing them, putting them on the map, and make them visible.

Besides the potential of this project to become a nation-wide database, the approach of the Texas Freedom Colonies Atlas, presented in this report, provides a framework for designing a web-based crowdsourcing and participatory mapping tool that can be implemented to map any type of place at any given geography.

In conclusion, and in order to answer the research question; "How web-based public participation GIS tools can help to map discrete communities and collect crowdsourced information to ensure inclusion in the planning process?" this paper concludes that:

- The Texas Freedom Colonies Atlas will help mapping discrete settlements, develop a comprehensive database of FCs, and make them visible to governments, planers, and policy makers.
- The Atlas has the potential to help developing a database for FCs nation-wide, not only in Texas.
- The framework implemented by the Texas Freedom Colonies Atlas can be used to develop online crowdsourcing tools using ArcGIS Online for similar projects.
- Finally, the ultimate goal of a participatory mapping is not producing a map or merely developing a crowdsourced database, rather is to share the map and database with the public, researchers, governments, planners, and policy makers to inform their plans to enhance their quality and support inclusivity and equity. Subsequently, this will lead to improvements in communities and the lives of their residents; the ones who have participated and made their voices heard.
- The project team will hold workshops in communities to overcome the digital divide by providing computer devices with internet connection and teaching citizens how to use the Atlas

7.2. Recommendations

- Planners should use web-based crowdsourcing tools can help planners to ensure inclusivity, engage underrepresented groups, and bring local knowledge into the planning process.
- ArcGIS Online and other related ArcGIS applications offer a wide variety of tools to help improving public participation, crowdsourcing data, and participatory mapping via web-based tools and applications.
- Crowdsourcing tools must have simple design and functions that is easily understandable and usable by general public.
- Public input must be constantly monitored and evaluated to improve the tools and methods and hence users' interaction.
- In order to be successful, a crowdsourcing tool must provide users with sufficient guidelines and instructions -on how to use and interact with the tool- and technical support.
- Online tools can help improving public participation, however, they will not replace the traditional methods (i.e. field surveys, interviews, ethnographic research, etc.), rather the act as their supplement to enhance them.
- The crowdsourcing tool should offer flexibility by utilizing a combination of various crowdsourcing applications and techniques to involve different groups of public.
- New web-based technologies – i.e. ArcGIS Collector – offer new tools such as mobile application will provide easier access for public to participate.
- The issues of digital divide (users with different levels of computer skills) and lack of access to the internet –especially in disadvantaged communities- must be taken into account by organizers.
- Organizers should partner with local organizations, groups, and individuals to give them the opportunity to involve directly in the process and contribute to the project (i.e. VGI).

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APPENDIXES

Appendix A .National Register Criteria for Evaluation

U.S. Department of the Interior, National Park Service

II. NATIONAL REGISTER CRITERIA FOR EVALUATION

Criteria for Evaluation

The quality of significance in American history, architecture, archeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

A. That are associated with events that have made a significant contribution to the broad patterns of our history; or

B. That are associated with the lives of significant persons in our past; or

C. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or

D. That have yielded or may be likely to yield, information important in history or prehistory.

Criteria Considerations

Ordinarily cemeteries, birthplaces, graves of historical figures, properties owned by religious institutions or used for religious purposes, structures that have been moved from their original locations, reconstructed historic buildings, properties primarily commemorative in nature, and properties that have achieved significance within the past 50 years shall not be considered eligible for the National Register. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories:

a. A religious property deriving primary significance from architectural or artistic distinction or historical importance; or

b. A building or structure removed from its original location but which is primarily significant for architectural value, or which is the surviving structure most importantly associated with a historic person or event; or

c. A birthplace or grave of a historical figure of outstanding importance if there is no appropriate site or building associated with his or her productive life; or

d. A cemetery that derives its primary importance from graves of persons of transcendent importance, from age, from distinctive design features, or from association with historic events; or

e. A reconstructed building when accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and when no other building or structure with the same association has survived; or

f. A property primarily commemorative in intent if design, age, tradition, or symbolic value has invested it with its own exceptional significance; or

g. A property achieving significance within the past 50 years if it is of exceptional importance.

Appendix B. USGS Names Feature Classes Definition

USGS place names database uses terms to define the features types. In order to distinguish between duplicate names with different feature classes we need to identify the definition of these terms.

- Church - building used for religious worship (chapel, mosque, syna- gogue, tabernacle, temple).
- Flat - relative level area within a region of greater relief (clearing, glade, playa).
- Gut - relatively small coastal waterway connecting larger bodies of water or other waterways (creek, inlet, slough).
- Lake - natural body of inland water (backwater, lac, lagoon, laguna, pond, pool, resaca, waterhole).
- Locale - place at which there is or was human activity; it does not include populated places, mines, and dams (battlefield, crossroad, camp, farm, ghost town, landing, railroad siding, ranch, ruins, site, station, windmill).
- Populated place - place or area with clustered or scattered buildings and a permanent human population (city, settlement, town, and village).
- Reservoir - artificially impounded body of water (lake, tank).
- Spring - place where underground water flows naturally to the surface of the Earth (seep).
- Stream - linear body of water flowing on the Earth's surface (ana- branch, awawa, bayou, branch, brook, creek, distributary, fork, kill, pup, rio, river, run, slough).
- Summit - prominent elevation rising above the surrounding level of the Earth's surface; does not include pillars, ridges, or ranges (ahu, berg, bald, butte, cerro, colina, cone, cumbre, dome, head, hill, horn, knob, knoll, mauna, mesa, mesita, mound, mount, mountain, peak, puu, rock, Sugarloaf, table, volcano).
- Valley - linear depression in the Earth's surface that generally slopes from one end to the other (barranca, canyon, chasm, cove, draw, glen, gorge, gulch, gulf, hollow, ravine)

Source: Geographic Names Metadata – Stanford Libraries – Retrieved from:

https://earthworks.stanford.edu/catalog/stanford-qh755vk9233/metadata

Appendix C .Black Settlement Study Survey Questions

Black Settlements Study Survey

The Texas Freedom Colonies Project: Mapping Communities and Cultures

1. **Name:** First name, Last name (optional)
2. **Address*:** Where you currently live (City & ZIP Code are acceptable)
3. **Email Address**
4. **Phone Number:** Best number to reach you
5. **How did you hear about the Texas Freedom Colonies Project?**
    - Public Event
    - Social Media
    - TV/Radio
    - Word of Mouth
    - Other

6. **How often do you spend time in the settlement?** Are you a ...?
    - Full-time Resident
    - Non-resident
    - Part-time Resident
    - Occasional Visitor

Please enter the name of your settlement, its nearest major city, and the county in which it's located.

7. **Freedom Colony Name***
8. **County Name**
9. **Nearest Major City**
10. **Can you locate your settlement/freedom colony on the map?**** Put the marker on the location
11. **In the space below, share your settlement's origin story and the approximate founding year. If unaware of how the settlement was founded or when it began, provide any memories of founding families or institutions (Churches, Schools, etc.).**
    It doesn't have to be accurate. Just whatever you remember. Feel free to email us a video response at freedomcoloniesproject@gmail.com.

12. **How many people currently live in the settlement? Estimate the population by selecting one of the ranges below.**
    - 1-1,000
    - 1,001-5,000
    - 5,001-10,000
    - +10,000

13. **If you were to give a tour of the settlement(s), what are the most important buildings or places you would point out to visitors?** Feel free to provide information on multiple places.
    - Church
    - Cemetery
    - School
    - House (Built before 1978)

Settlement Connections and Networks

14. **Are you affiliated to any other settlements/freedom colonies? List the names, counties, and nearest/town cities below.** (e.g. Freedom Colony Name, County Name, City/Town Name)
15. **Recall your most recent visit. What did you like the most about visiting or living full time in the settlement?**

Events and Traditions

16. Do you have any ongoing activities (events, celebrations, etc.) that bring you back to the settlement?
    - Yes
    - No

If yes:

17. **Which events, places, or people bring you back to the settlement?** Select your settlement's current event type. Include the name of event and a short description.
    - Homecoming
    - Chuech Anniversary
    - Reunion
    - Food Festival
    - Other

18. **What are some of the activities, foods, or traditions associated with your events and/or celebrations?**
19. **Please upload any images, videos, or documents associated with the settlement or annual events.** Indicate that you own and have permission to share the files by clicking the upload button below. (By uploading the file you will give the researcher to use this file.)
20. **Please share a link of any images associated with the settlement or annual events.**
21. **Check the box if you would like that information to be public and you would like to be contacted about the event.***
    - Yes, I would like to be contacted.
    - No, I'm not willing to be contacted.

Preservation Activities

22. **How and when do you pass on the story of how your community was founded to young people?** (e.g. Oral History, Traditions)
23. **Do you currently live on commonly owned land, a homestead, or farmstead in the settlement?**
    - Yes
    - No

24. **Have you tried to preserve or conserve buildings, homesteads, and/or cemeteries? How have you maintained them?** Please tell us what has worked.
25. **When, if ever, do you work with government planners or preservationists? Has the experience been positive?**

Settlement Challenges and Issues

26. **What are the biggest challenges to maintaining property or historic sites in your community/freedom colony?** Feel free to write about more than one challenge.
27. **Who do you rely on to help you with problems like taxes, land, and community services?**
28. **Is access to the internet or quality utility services (water) an issue in your freedom colony? If so, please elaborate on the extent of the issues and why you think they have remained unresolved.**
29. **Upload additional documents***:** Please feel free to upload any additional documents about your settlement.

* Required questions

** This GeoPoint question gives user a map to show the location of FC

*** This survey allows only 1 file submission.

Appendix D .Freedom Colony Storyteller Portal Survey Questions

Freedom Colony Storyteller Portal

Share your community's story!

Permission and Licensing Agreement
Before sharing your story, please review
the Texas Freedom Colonies Project research info and permission and licensing agreement.

1. **Name:** First name, Last name (optional)
2. **Email Address:** Please enter your email address (optional)
3. **Zip Code*:** Please enter your residency area Zip Code
4. **How did you hear about the Texas Freedom Colonies Project?**
    - Public Event
    - Social Media
    - TV/Radio
    - Word of Mouth
    - Other

Please enter the name of your settlement, its nearest major city, and the county in which it's located.

5. **Freedom Colony Name***
6. **County Name**
7. **Nearest Major City**
8. **Freedom Colony's Location**:** Please locate your settlement on the mapWhat is the name of the original settlement/Freedom Colony to which you belong? In which counties is it located? What is the nearest town/city?
9. **Tell Your Settlement's Story:** Please share the story of your settlement (origin story, history, population, family names, traditions, events, church, cemetery, and school name, etc.)
10. **Upload File(s):** Please upload file(s) related to your settlement (images, documents, videos)
11. **More Files?*****
    - Yes
    - No

* Required questions

** This GeoPoint question gives user a map to show the location of FC

*** If user choses yes, another upload window shows up. This survey allows up to 6 files submission.