MAPPING FIRING RANGES AS SOCIAL CAPITAL GENERATORS IN HOUSTON, TEXAS

by

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A Thesis Presented to the
FACULTY OF THE USC GRADUATE SCHOOL
UNIVERSITY OF SOUTHERN CALIFORNIA
In Partial Fulfillment of the
Requirements for the Degree
MASTER OF SCIENCE
(GEOGRAPHIC INFORMATION SCIENCE AND TECHNOLOGY)

December 2014

DEDICATION

I dedicate this document to my family for their support and encouragement throughout this process.

ACKNOWLEDGEMENTS

I would like to express my sincere appreciation and thanks to my thesis committee, Dr. John Wilson for his patience, direction, and encouragement throughout my research and Drs. Daniel Warshawsky and Robert Vos, whose guidance throughout this process was invaluable. I would like to thank my student services advisor, Kate Kelsey, whose advice helped me navigate my academic career in the University of Southern California's Geographic Information Science and Technology Graduate Program.

To my family and friends, thank you for your encouragement and patience; your constant motivation and kind words helped me throughout this process.

I would also like to thank the participating firing ranges, without whose assistance I would not have been able to complete my thesis.

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LIST OF ABBREVIATIONS

CSV	Comma Separated Value
GHA	Greater Houston, TX area
GPS	Global Positioning System
NRA	National Rifle Association
OECD	Organization for Economic Co-operation and Development
PTA	Parent-Teacher Association
SCCBS	Social Capital Community Benchmark Survey
SOCAT	Social Capital Assessment Tool
SOCAP IQ	Social Capital Integrated Questionnaire
ZIP	U.S. Postal Service Zone Improvement Plan areas

ABSTRACT

This study illustrates how GIS technology can help to show how social capital is generated and why firing ranges, specifically, can help to generate social capital. The term social capital was defined by Hanifan (1916) as the tangible assets most significant in daily life, such as goodwill, fellowship, and sympathy. This study builds upon previous social capital research by the Organization for Economic Co-operation and Development (OECD), the World Bank, Bettertogether.org, and Robert Putnam. It uses GIS mapping and analysis tools to chart the spatial relationships between firing ranges and traditional social capital generating sources in the Greater Houston, Texas area. A survey modeled after the World Bank's Social Capital Assessment Tool (SOCAT) and Harvard's Social Capital Community Benchmark Survey (SCCBS) was distributed to five firing ranges in Houston, Texas and the results of the survey were used to map the locations of firing ranges and patrons and to show firing ranges help to create social capital in the same manner sporting venues, religious, and community institutions do. This study illustrates why firing ranges are analogous to known social capital generators in their ability to create social capital, assesses the need to employ GIS technology in continued research on the social capital landscape created by non-traditional sources such as firing ranges in America, and marks an opportunity to revisit previous research on social capital from traditional sources and organizations.

CHAPTER ONE: INTRODUCTION

Technological advancements and cultural changes transform how social capital is researched, analyzed, and understood. Galimberti (2009, 3) claims that, "Ethics, social relationships, and psychological wellbeing" bring people of the same interests together, forming social networks. These networks, otherwise known as social capital have been defined in many ways, and while there is much debate on the theory. The Organization for Economic Co-operation and Development (OECD nd) defines social capital as follows: "Networks together with shared norms, values and understandings that facilitate co-operation within or among groups" (OECD nd, 103). The Saguaro Seminar (Putnam 2006) explains the value of social capital, as a social network's feeling to do things for one another. Bettertogether.org (2013) suggests these networks of relationships we build with others who share common interests and goals, are formed within the norms of society during informal neighborhood watches, cancer support groups, and in barn raising on the frontier. Social capital can occur virtually anywhere, at any time, and with anyone sharing common interests and goals with others such as sporting venues, religious institutions, and social clubs, and is integral to economic prosperity and development.

Social capital, here, is applied to the public's involvement in gun ownership as well as weapons use, specifically, membership and attendance of firing ranges in Houston, Texas. Social capital reaches further by defining community type. This includes not just the physical communities surrounding firing ranges, but also the community membership of those who attend them. Patrons range from hunters to government employees who must carry firearms, to those who use firearms for sport (other than hunting) and those who maintain gun ownership for self-defense. Social capital, in this context, brings many types of people together, forming the basis of community values and possibly one or more social networks.

The study area selected for this research was chosen on the basis of three factors: population, the number of firing ranges per state and city, and previous social capital research in the U.S. The Population dataset was derived from the U.S. Census, which showed Texas as the second most populous state with an estimated 26,059,203 legal residents and Houston, with 2,160,821 residents, as the largest city in Texas (txdirectory.com).

The National Shooting Sports Foundation reports 471 permitted firing ranges in the state of Texas, of which 35 are located in Houston, TX. Previous social capital research conducted in Dallas and Houston, TX studied community involvement and identified traditional social capital venues discussed throughout this study, serving as a basis for this research. To further define the study area, a circle was drawn with a 50 mile radius from Downtown Houston, TX using ArcMap's geoprocessing tools.

As discussed in Chapter 2, previous research on social capital in Texas is limited to Putnam's Social Capital Community Benchmark Survey, SOCAT and the San Angelo Social Capital Index which measured social capital in Harris County (Houston), Dallas, Wichita Falls, and San Angelo. None of this research, however, identified firing ranges as social capital generators.

Firing ranges, in the greater Houston, TX area (GHA), like bowling alleys, provide an outlet for community by acting as meeting places in which people practice and learn a new skill not only as individuals, but also as a group, forming the foundation of a club. Analogous to religious institutions, patrons attend firing ranges as individuals as well as small groups and often become members of these range clubs, where membership is encouraged. Membership rests on participation in sporting events and competitions of skill and expertise. The encouragement of

patriotism and the exercising of the right to bear arms help to distinguish firing ranges from other types of clubs and social capital generators.

The number of residents and firing ranges are not the only unique qualities of the GHA. Founded in 1837, Houston was the temporary capital of what was then known as the Republic of Texas and from the outset has favored municipal codes over zoning laws to regulate land use and manage growth (Houstontx.gov 2014). Hence, municipal codes related to the planning, development, inspection, and use of guns and firing ranges enforce how a firing range operates in the GHA, specifically in relation to the hours of operation, types of weapons used, and where a gun can be discharged.

This study used mapping along with published data and the results of an author-administered survey to answer the following questions:

1. Where are firing ranges located in the GHA?
2. Where do firing ranges draw their patrons from in the GHA and what are the personal traits and motivations of GHA firing range patrons?

The remainder of the thesis is organized as follows. Chapter 2 defines social capital, how it is created and the various ways in which it has been measured to date. Chapter 3 discusses the methods and data sources used for data collection, analysis, and visualization in this study. Chapter 4 presents the results of the research performed in the study and Chapter 5 discusses the broader significance of the findings, research limitations, and the conclusions reached.

CHAPTER TWO: RELATED WORK

Social capital theory has been studied since the late 1800s, with the term officially "coined" by Hanifan in 1916 (Routledge and Von Amsberg 2002). Although social capital definitions and measurements are still debated, the OECD (nd) derives their interpretation from Hanifan (1916), who defined social capital as tangible assets most significant in the daily lives of individuals and families.

At its origin, social capital as defined by Hanifan (1916) studied the relationships people have with one another and their shared actions and beliefs. Hanifan's (1916) research on social capital stems from analyzing social trends and common bonds. This early research gave birth to modern day studies from Putnam (2001, 2009), The OECD (nd), Bettertogether.org (2013), and Theworldbank.org (2013). It forms the basis of social capital studies from organizations such as the OECD (nd) and Theworldbank.org (2013).

2.1 Social Capital Concepts and Measurements

The studies by Hanifan (1916) and Putnam (2001, 2009) as well as their applications by the OECD (nd), Bettertogether.org (2013), and Theworldbank.org (2013), assess social capital by introducing measurement tools and assigning values to different elements of social capital.

The concept of social capital, like its definition and measurement, does not hold to one ideal but rather a collection based on values and applications. The initial research on social capital by Hanifan (1916) focused on the concept of tangible assets, speaking to the creation of a social unit. Hanifan (1916) suggested individuals were helpless without group membership, that living conditions or quality of life is greatly improved when individual social needs are met by group membership. Membership in Hanifan's (1916) concept speaks to being neighborly and leads to Putnam's (2001, 2009) theory of membership impacting an individual's quality of life.

Social capital as defined by Putnam (2001, 2009), centers on a three-part theory of societal norms, values, and networks. Putnam's concept focuses on the manner in which people choose to come together in working towards a common goal. Putnam's (2009) *Bowling Alone: America's Declining Social Capital* discusses societal roles in social organization, namely civic engagement, group or organization membership, and volunteering, and how the roles individuals play contribute to the overall societal quality of life. Quality of life, according to Putnam (2009), is then measured by individual participation and shared trust in government, completing the social capital circle of life. Putnam's (2009) discussion of social networking in *Bowling Alone* addresses the value networking can have on both individuals and groups. Examples can be seen in neighborhood get-togethers where crime declines even for those who do not attend these group functions. Putnam (2009) notes networking is also beneficial in career advancement. Putman suggests social capital is multi-dimensional, ranging from Parent-Teacher Association (PTA) involvement, to participation in larger organizations such as worker's unions and religious groups. Putnam's (2001) *Social Capital: Measurement and Consequences* addresses informal social capital, suggesting that simply nodding to an acquaintance while passing each other in the hall can be just as beneficial as direct group membership found in PTAs, unions, and churches.

Putnam (2001) also noted the consequences social capital can have on society as well. Social capital helps to grow and sustain positive attributes of society, such as trust and reciprocity, which if absent may cause harm. Putnam's (2001) research on Timothy McVeigh's Oklahoma City bombing, in which several hundred people were killed, provides an example of the adverse consequences social capital can have on others. This example provided evidence to Putnam's (2001, 2009) theory of social capital relying on trust and reciprocity, both of which were absent in the Oklahoma City bombings.

2.2 New Concepts and Links to Other Forms of Capital

The works of Bourdieu (1986), the OECD (nd), and Moody and Paxton (2009) show how social capital is linked to other forms of capital such as human, cultural and economic capital.

Bourdieu (1986) wrote about the links between social capital and other forms of capital, suggesting that one form of capital can be converted to another form and that capital often flows both ways. Bourdieu (1986) suggested that capital represents itself in three guises, economic, cultural and social. His research gives the example of economic capital in the form of money that is converted to cultural capital in the form of property, and then converted back to economic capital. Bourdieu (1986) further suggested how economic and social capital could be transformed from one to the other by way of education and title or class. Similarly, the work on social capital by the OECD (nd) discusses the links between human, economic and social capital, noting that one does not exist without the other, and suggests that social capital actually promotes the development of other forms of capital.

Although social networks are not considered a form of capital, Moody and Paxton (2009) describe how the two are linked and how social networks can be used to explicate the dynamic behind the social capital connections of friendship, trust, and support. These connections are necessary for both forming and maintaining the group memberships found in social networks and for creating and sustaining social capital.

2.2.1 Measuring Social Capital

Theworldbank.org (2013) and Putnam (2009) show there are many ways social capital can be measured. There is no single measurement of social capital and the Theworldbank.org (2014) itself uses a series of quantitative, comparative, and qualitative studies (i.e. approaches) to measure social capital.

Theworldbank.org's (2013) quantitative studies have used surveys such as the World Values Survey that uses Knack and Keefer's (1997) signs of trust and norms to measure civic associations. The most recent World Values Survey, conducted from 2010 to 2014 used quota sampling to identify small clusters with a minimum sample of 30 individuals (Wordsurvey.org 2013). Random dialed phone surveys were conducted in 55 countries, each with a unique identifying code, and post-stratification weights were employed to reduce error.

The use of surveys to uncover relationships and learn more about social capital is relatively common, as illustrated by the three examples below. Putnam (1995), for example, used this approach to examine economic well-being of communities in the U.S. Using his previous research in Italy as a guide he surveyed American communities. The results showed a steadfast decline in America's social capital. Putnam validated his claims by comparing trends in non-profit and for-profit organizations and support groups with survey findings.

In a later study, Massey and Espinosa (1997) examined Mexican immigration to the U.S. using survey and interview data to predict Mexican immigration trends. These authors created a migration model and studied 25 Mexican immigrant communities via a random sample of 200 households in each community. The interviews were used to gather demographic and socio-economic data that included wages and dates of travel. Results showed using social capital theory to predict immigration trends was better than using neo-classical or human capital theories.

In the third study, the Tanzania Social Capital and Poverty Survey, Narayan and Pritchett (1997), surveyed individual's institutional and individual trust. The survey involved 87 attributes in randomly chosen households that were combined into a numerical, normalized index and

compared with the original hypothesis that social capital is linked to income and is both social and economic in nature.

Qualitative studies have taken a variety of forms and include the work of Portes and Sensenbrenner (1993) who examined the effects of immigrant communities when economically successful members left their communities. Interviews were conducted among immigrants from the Dominican Republic, Cuba, Vietnam, China and Haiti, among others, showing strong cultural community ties and the pressures associated with economic success.

The aforementioned surveys and other measurement tools, such as the Social Capital Assessment Tool (SOCAT) and the Social Capital Integrated Questionnaire (SOCAP IQ), assess individual trust, civic engagement, and club membership as well as demographics. These large and sophisticated institutionally directed and supported surveys are employed to gather this information within specific study areas. The SOCAT, for example, consists of surveys, questionnaires, and interviews from households, communities, and organizations. (Theworldbank.org, 2013) which are compared and analyzed based on respondent responses. As part of a pilot test, the SOCAP, which shares numerous similarities with the SOCAT, was applied in Albania and Nigeria using large household surveys to gather the data (Theworldbank.org, 2013).

2.3 Social Capital Research in Texas

Previous social capital research in Texas used Putnam's (2006) Social Capital Community Benchmark Survey, SOCAT (Theworldbank.org 2013), and the San Angelo Social Capital Index (Stewart and Jones 2009) to measure social capital in Harris County (Houston), Dallas, Wichita Falls, and San Angelo, respectively.

The SCCBS was used in 2006 to measure social capital in 22 communities across the U.S. A total of 12,100 households was sampled for this study (Roper Center 2014). Houston, TX as one of the top ranked social capital cities in the U.S., (Roper Center 2014). The random-dialing interview method was used to administer the survey and among the factors researched were trust, connectedness with others, political participation, and connections between the classes. The results suggested that Houston's diversity helped to explain its social capital strength (Roper Center 2014).

Smith-Morris (2007) employed the SOCAT in researching the relationship between social capital and other facets of resident's lives in a Mexican-American community in the city of Dallas, TX. Once community and organizational profiles were established; the SOCAT was deployed via community focus groups and household surveys. Transect walks of the community were also conducted to record public and visible aspects of the community over time. Twenty-two organizations were interviewed as well. The data was compiled and education levels and ethnicity were assigned as dependent variables to measure social capital disparities (Smith-Morris 2007). The major findings included identifying the community's available social resources, such as family and friends, and an overall feeling of being excluded from housing, job/employment, and financial services.

Bowles, Gibson, and Jansen (2007) employed parts of the SCCBS and collected data from state and federal agencies such as the Centers for Disease Control and Prevention, the City of Wichita Falls, North Texas Area United Way, U.S. Department of Health and Human Services, the U.S. Census Bureau, and Texas State Health Services to measure social capital in Wichita Falls, TX. A total of 2,741 residents were surveyed as well and the results of the surveys and accompanying interviews identified community strengths and weaknesses contributing to

Wichita Fall's social capital. The indicators included: education, faith based participation, civic responsibility, healthcare, cultural diversity, trust in government and law enforcement and social services (Bowles, Gibson, and Jansen 2007, 3).

The San Angelo Social Health and Social Capital Index was developed by Stewart and Jones (2009) and used to evaluate social capital in San Angelo, TX. Eighteen indicators and 10 factors affecting social networks were combined in a a 100-point scoring system and used to characterize San Angelo's social health. This scoring system compared both the local community with itself over multiple years and with the state as a whole. Data derived from this study included divorce rates, food stamp use, education costs, suicide rates, elder and disabled abuse and community indicators such as health care and related costs, unemployment, and crime rates.

2.4 Gun Ownership, Group Membership, and Social Capital

On the surface, the gun culture in the U.S. is unique in that Americans who possess guns do so as both a means of self-protection and also in exercising the right to bear arms. In fact, these two drivers often go hand in hand with gun ownership. Research from Kell (1991), Bugg and Yang (2004), Taylor (2008), Hauser and Kleck (2013) and Pew Research (2013), speak to the underlying issues associated with gun ownership in the U.S.

In contrast to public opinion favoring gun control, Kell (1991) suggests there are positive externalities of civilian gun ownership. He explains, "Externalities are unpaid-for effects that accrue to third parties from the use of property by its owners" (Kell 1991, 374) and suggests that in the case of gun ownership positive externalities often go unnoticed or unreported. Examples of these positive externalities are seen in peaceful interactions such as the absence of crime. Kell (1991) wrote that there are many reasons why these events are not occurring, one of which is civilian gun ownership and that gun control laws, "cancel more positive than negative

externalities, because law-abiding citizens are much more likely to obey the rules than are criminals" (Kell 1991, 376). Although not explicitly stated, Kell's (1991) research speaks to the role firing ranges have in generating social capital, in his reference to the National Rifle Association (NRA) and the role of for-profit shooting ranges in providing training or educational opportunities, because both help to reduce crime.

While there has been extensive research on firearms in relation to crime, trends and public opinion, there has been little research conducted on firearms and social capital. One exception is Hemenway et al. (2011), who documented the negative impacts of firearms and demise of social capital in the U.S. but ignored the positive impacts of firearms, such as the social capital created by firing ranges. One possible connection with the earlier writings by Kell (1991) would be how positive externalities of proper firearm education at shooting ranges can help to offset the negative impacts of firearms. Although Kell's (1991) research did not connect firing ranges with social capital explicitly, his research does suggest a connection given the ways firing ranges might increase the aforementioned positive externalities.

Bugg and Yang (2004) studied trends of women gun ownership in the U.S. over time. They discussed America's cultural captivation with firearms and the increase in the rate at which women are buying guns. Further, Bugg and Yang (2004) suggested that the increase in women carrying firearms in public has led to declines in crime rates. This study suggests the need to look at different subsets of society separately and that the "local" effects might vary from one place to another.

Exploring the symbolism in guns and gun ownership in American gun culture, Taylor (2008) studied the meaning behind gun ownership and how individual gun ownership influences social interaction characteristics. Taylor's (2008) research found guns hold symbolic value, gun

ownership has emotional rather than monetary value, and this value influences owner's interaction with their guns and who they socialize with. Taylor's (2008) research also noted the stigma associated with gun ownership and how the U.S. gun culture revolved around demeanor-filled rituals, by which gun owners and users view them as objects of near-worship. While Taylor's (2008) research did not speak of social capital in relation to firing ranges, it does shed light on the background behind gun ownership and draws a connection with ownership, group membership, and social trends, all of which are related to creating and maintaining social capital.

Hauser and Kleck (2013) suggested there is a deeper meaning behind why those who own guns for self-protection do so, that there is an asymmetrical relationship between guns and fear and that it is fear of crime that often triggers the purchase of a weapon, but that owning one does not reduce the original fear. Further, the right to bear arms only exacerbates this relationship. While Hauser and Kleck's (2013) study advocated an interesting relation between guns and fear, they also noted there were several limitations in their research admitting their data did not allow separate identification of gun owners who owned guns for recreational hunting and target shooting.

Hauser and Kleck's (2013) research on guns and fear may have may motivated by an anonymous article published in the Economist, entitled *Guns in America: Home on the Range* (Anon. 1994). Although dated, it speaks to the sheer number of guns in the U.S., suggesting there is a clear relationship between crime and gun ownership in the U.S. but that our constitutional right to bear arms serves as a connection between perceived freedom and guns. This suggested connection between guns and freedom in the U.S. creates quite a predicament. Pew Research (2013) has argued that Americans are evenly divided on gun control vs. gun rights. A survey conducted in May 2013 shows 50 percent of Americans favor controlling gun ownership, while

48 percent find protecting gun ownership rights more important. Pew Research (2013) noted this gap is marked by differing partisan views on the efficacy of laws relating to gun ownership.

2.5 Spatial Aspects

Displaying social capital is equally as important as measuring it. Using GIS, this study displays social capital in the GHA by creating maps or visual representations of firing ranges, bowling alleys, clubs, and churches. A prime example of how GIS has been used to display firing ranges can be seen in the Missouri Department of Conservation's (2014) online and paper maps of firing ranges and outdoor recreational opportunities such as hiking, biking, and camping (Figure 1). Further examples of how GIS has been applied to social capital research are the *Town of Candia Open Space Task Force's Open Space Plan* (Anon. 2011), Oulton's (2012) *Community Gardens for Social Capital: A Site Suitability Analysis in Akron, Ohio,* and Alamo's (2013) *Explorations of American Churchscape Diversity.*

The Missouri Department of Conservation's (2014) shooting range maps draw both individual and group participants to these facilities and thereby encourage participation and promote growth in social capital. These kinds of interactive maps as well as traditional paper maps show the important role maps and related location services such as vehicle navigation and routing services can play in promoting the growth of social interaction in addition to performing other roles related to site suitability, maintenance, and management. In creating and displaying firing range maps, the Missouri Department of Conversation (2014) serves as a leading example in displaying recreational firing ranges as one kind of social capital generator.

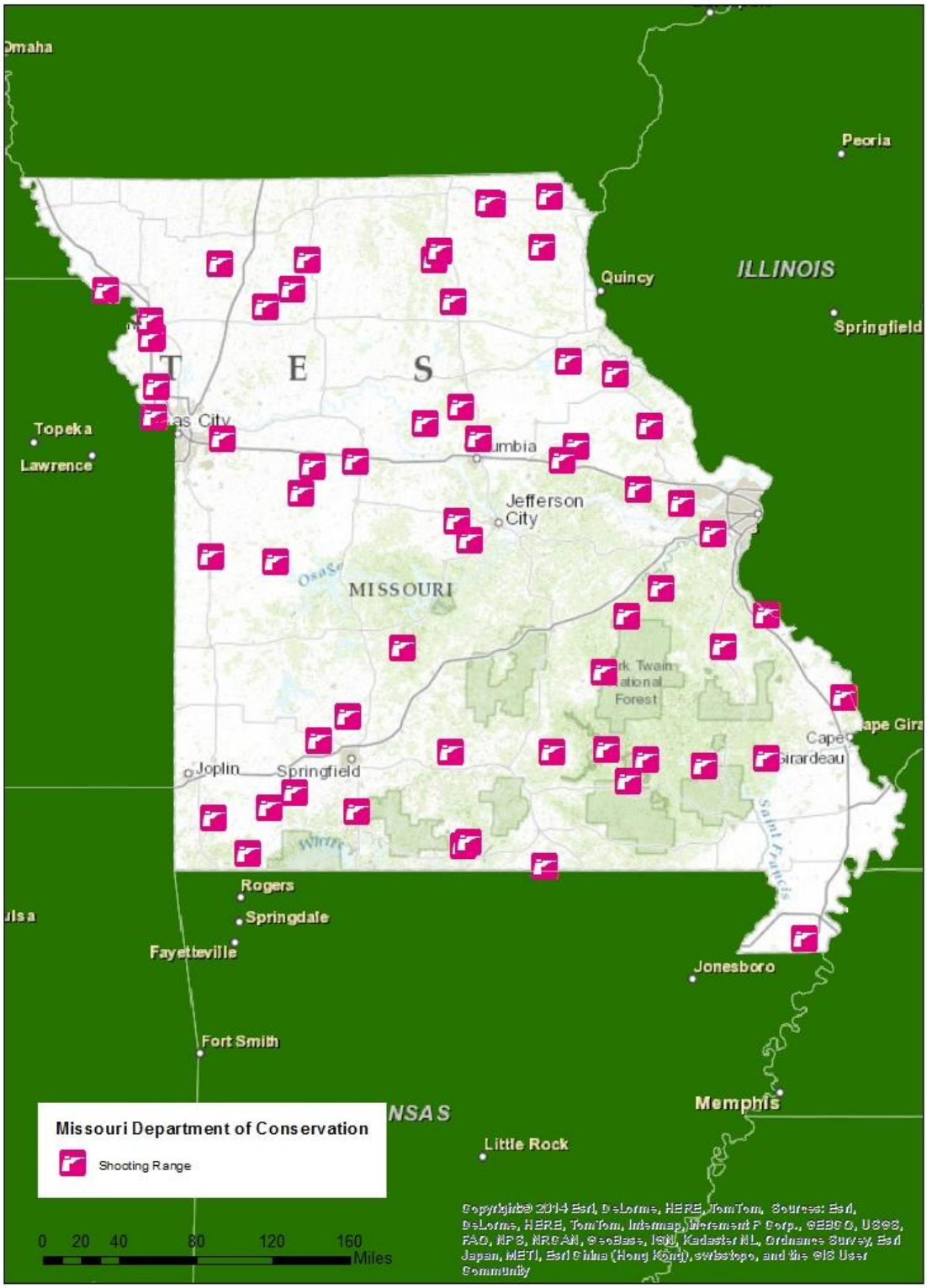

Figure 1 Map showing shooting ranges in Missouri (adapted from Missouri Department of Conservation (2014) Firing Range Online Interactive Map)

In another application, the Town of Candia's Open Space Task Force used GIS to map community survey responses in Candia, NH. Survey responses were geocoded to demonstrate the need for open space in Candia, NH to foster social capital growth and provided an important input in the development of the town's master plan that will be used to guide future growth (Anon. 2011).

Oulton's (2012) research identifying suitable locations for community gardens to promote social capital growth also used GIS to conduct a site suitability analysis of Akron, OH. She used a model adapted from previous community garden research to identify and map locations in Akron, OH that could benefit from establishing community gardens. Her research used GIS to identify and analyze parcels, soils data, and known social capital geographic reference points as identified by Putnam's (2001, 2009) social capital definition.

Alamo's (2013) work focused on America's church landscapes, or churchscapes. She used GIS to identify known religious institutions throughout the U.S. and through cluster analysis, showed how religious institutions tended to locate near one another, despite differences in denomination. While her research did not specifically focus on studying social capital, it provided an example of how GIS could be used to identify, analyze, and map social capital generators such as churches.

CHAPTER THREE: METHODS AND DATA SOURCES

GIS tools were used to define the spatial distribution of firing ranges in the GHA. A survey was then constructed and used to document the similarities firing ranges have with other social capital generators. The overall goal in defining the spatial distribution of firing ranges and deploying the survey was to document the positive impacts firing ranges can have on communities using the Greater Houston Metropolitan region as an example.

3.1 GIS Analysis

The National Shooting Sports Foundation (2014) reports 471 permitted firing ranges in the state of Texas alone, with most located in large cities and some in smaller towns like Wichita Falls and Pasadena. Of the 471 ranges in Texas, the GHA accounts for the largest number with a total of 35. The GHA was defined as cities and towns located within a circular area within a 50 mile radius of Downtown Houston, TX.

The 35 firing range locations in the GHA were gathered from materials prepared by the National Shooting Sports Foundation (2014), the National Rifle Association (2012), and yellowpages.com. Addresses obtained from these sources were geocoded by converting addresses to latitude/longitude coordinates and then mapping these locations in ArcMap (Esri, Redlands, California).

Using ArcMap, the WGS 1984 Web Mercator Auxiliary Sphere projection was applied to a blank map. The GHA was defined in the map using the City of Houston city limits feature class dataset that was designed by the City of Houston, TX and downloaded from ArcGIS Online using ArcMap's Add Data tool. To further delineate the GHA, Esri's World Street Map found on ArcGIS Online was also imported into the map via ArcMap's Add Data tool, and a 50 mile

radius buffer from Houston's city center was applied using ArcMap's geoprocessing buffer tool, as depicted in Figure 3.

The range addresses were geocoded to longitude and latitude using GPS Visualizer's online geocoding tool (GPS Visualizer 2013). This produced a Comma Separated Value (CSV) file containing range names and locations in latitude and longitude units. The CSV file was then uploaded into ArcMap and the longitude and latitude (x and y coordinates) were converted to a shapefile representing firing range points, using ArcMap's create feature class tool. Firing range points were then assigned a color value, red, orange, yellow, green, and blue to represent the five participating firing ranges, and grey to represent all other firing ranges in the GHA.

CSV files were also created for a number of other social capital generators such as bowling alleys, clubs, and churches and these were geocoded using the same method as with firing ranges. Each type of social capital was assigned a color, blue, green, and pink for bowling alleys, clubs, and churches. Data on the type and name of facility (bowling alleys, clubs, and churches) were derived from the National Center for Charitable Statistics (2013).

Turning next to analysis, the ArcMap geoprocessing buffer and join tools were first used to calculate the number of traditional social capital venues located within five miles of each firing range. The survey respondent's residential ZIP codes were next used as spatial references to calculate the number of ZIP codes respondent's travelled across to attend firing ranges. The numbers of ZIP codes separating respondent's residences and the firing range(s) they attended were calculated to approximate the distances traveled because respondent addresses were not acquired in the survey (see Section 3.2 for additional details). The ZIP codes of each of the five participating firing ranges and their patrons were mapped using ArcGis.com's ZIP code boundaries dataset which is based on the U.S. Census Bureau's TIGER Line 2010 dataset for the

State of Texas. The 28 respondent residential and five firing range ZIP codes were color-coded into five categories to match the five participating firing ranges of red, orange, yellow, green, and blue (see Figure 3 for additional details).

To mark the urbanized areas of the GHA, Esri's Greater Houston, TX area 2010 urbanized dataset was uploaded into ArcMap as seen in Figure 4. The urbanized dataset was used to show which firing ranges were located inside and near urbanized areas.

3.2 The Survey

The survey was loosely modeled after the SOCAT and Social Capital Community Benchmark Surveys (SCCBS) and used to gather the opinions of firing range patrons on the connections between firing ranges and social capital in the GHA.

3.2.1 Survey Design

The 30-question survey was made available in paper and online at http://freeonlinesurveys.com/s.asp?sid=wyiora1p7izewfe405500. The link to the online version was listed on each paper survey as well as on the ballot box included in the distributed survey kits, and could be accessed via a Quick Response (QR) code printed on each survey and ballot box.

As seen in Appendix A, the first question identified the firing range location the respondent completed the survey for. The following eight questions addressed the respondent's frequency of firing range visits, the types of activities they participate in, and with whom. Question 9 addressed the purpose of range attendance listing practice for sport, self-defense, hunting, professional (member of law enforcement or military), all of the above, and other (reasons) as potential answers. Questions 10 through 12 addressed whether or not respondents brought their own weapons and targets with them or rented them and if they shared with others.

Questions 13 and 14 addressed range membership and whether or not respondent's felt their opinion on range activities were important to firing range owners.

Questions 15 through 17 addressed membership of other groups that might promote and/or sustain social capital (clubs, churches, additional firing ranges, sporting venues, charitable organizations, political and community involvement, etc.) and the frequency of the respondent's participation in social activities and community events.

Questions 18 through 21 addressed whether or not respondents were considered decision makers or took part in voting at groups and organizations, the importance of firing range community involvement, and if range community involvement was a contributing factor in range participation.

Questions 22 through 24 addressed the perceived impact the range has had on quality of life in the surrounding communities and indicators of trust/adherence to norms. Question 25 addressed the factors in range choice with regards to proximity to the respondent's home or work, the atmosphere created by patrons and range employees, range amenities, facility cleanliness, cost, and membership opportunities.

Questions 26 through 29 sought information about the respondent's occupation, residence, age and gender and Question 30 addressed the respondent's political affiliation(s), if any.

3.2.2 Survey Distribution

Attempts were made to contact all 35 firing ranges in the GHA via mailed request letters, email (where applicable), and telephone. Of the 35 firing ranges, six request letters came back as undeliverable. Attempts were then made to find alternative mailing addresses for these six ranges – the Austin County Rifle and Pistol Club, Bay Area Practical Shooters, Bayou Rifles, Champion

Lake Gun Club, Clear Creek Gun Range, and the Lake Houston Gun Club – but these were unsuccessful.

Attempts to contact some of the ranges via telephone resulted in nine unreturned messages and 15 unanswered or out-of-service numbers. Two ranges, the Pasadena Gun Center and Top Gun of Texas, declined to participate and two responses were received from both the Athena Gun Club and High Noon Indoor Gun Range. Of 35 firing ranges in the GHA, 11 agreed to participate.

Survey kits were created that included 20 paper surveys, a survey ballot box, and a postage paid return-envelope. Survey kits were distributed in early March to 11 firing ranges via the U.S. Postal Service allowing four to six weeks for completion. Each range received a reminder one week before the survey began, and two weeks before survey results were due to be collected.

3.2.3 Collecting and Analyzing the Data

Completed surveys were returned in April via two methods: the regular mail and Internet. Completed surveys were sorted using pre-assigned codes for each range. Survey results were provided to participating ranges to promote social capital and for making improvements to their range via U.S. mail.

3.2.3.1 Collecting the Data

Completed surveys were returned from participating firing ranges in pre-paid return envelopes from the survey kits each firing range received. Before survey codes could be assigned, each firing range envelope was filed alphabetically according to its name. Once all of the surveys were received, a numerical code was assigned to each firing range survey return envelope according to its alphabetical order.

3.2.3.2 Organizing and Coding the Responses

Results from each range received an alphanumeric code; ranges were coded from 1 to 5 and each survey was coded alphabetically, i.e., The Arms Room was assigned a code of 1 and each survey from this range was assigned a letter. Coded surveys for the Arms Room read 1A, 1B, 1C, etc. Survey questions were coded as Q1-30. Participant occupations were coded separately into seven groups based on similarity and participant ZIP codes were not assigned a code. Participant occupation groups included sales, engineering, business owner, retired, law-enforcement, unemployed, and other or not listed by participant.

3.2.3.3 Analyzing the Responses

After each survey received a code the data was compiled by creating an Excel file to account for each survey and survey question for the five firing ranges. Survey answers, beginning with The Arms Room (Survey 1A), were added to the Excel file to account for all 30 questions. Survey question answers received a numerical value for each possible answer with the exception of Questions 1, 26, and 27 which reported the name of the firing range, respondent's occupation, and residential ZIP codes, respectively. The values for each question were calculated to account for answered and unanswered questions. Percentages for each question were calculated by dividing the total number of surveys by the total number of responses for each variable on each question and multiplying by 100.

3.2.3.4 Accounting for Missing Data

Several questions throughout the surveys were left unanswered and received a numerical code of 0. Five of the respondents did not answer the questions on the second half of survey and one in five of the respondents left Question 26 which asked about their occupation unanswered; this particular answer required a hand written response. Similarly, all but one of the respondents

who left Question 26 unanswered also left Question 27 that asked about their residential ZIP code blank. Neither of these questions received a numerical code as each required a hand-written response. As noted in the survey formatting changes below, these questions received a NA (no answer) code.

3.3 Survey Formatting Changes

Several questions required formatting changes to accurately code the data. Questions in which respondents circled more than one answer were assigned an additional response of two or more. Additionally, questions that were not answered received a code to account for missing data. Each survey question requiring this formatting change was marked in red pencil to avoid data corruption. Questions requiring this change include Questions 8-10, 15- 16, and 25. Each question was assigned a code of 0 to account for unanswered questions.

3.4 Survey Response Rate

There was no way to know or discover the numbers of patrons for each of the participating firing ranges, and as a consequence, there is no way to determine the survey response rate. Statistical rigor is based solely on the 49 individual surveys that were received from the patrons of the five participating firing ranges.

CHAPTER FOUR: RESULTS

The firing ranges and some traditional social capital generators are mapped and the survey results are summarized in this chapter.

4.1 Locations of Firing Ranges and Other Social Capital Generators

Figure 2 shows the locations of the 35 firing ranges derived from the National Shooting Sports Foundation, the NRA, and yellowpages.com and traditional social capital generators derived from the National Center for Charitable Statistics. The pink dots show the locations of the 4,378 churches in the GHA, the green dots show the locations of the 857 clubs and organizations, including PTAs, youth groups, recreation and sports clubs and associations, fraternities, sororities, civic associations, charities, men's and women's clubs, and miscellaneous organizations such as mentoring and outreach groups, and the blue dotes show the locations of the 17 GHA bowling alleys in the GHA. Table 1 lists the 35 GHA firing ranges and shows the year each was established, the type (indoor vs. outdoor) and the numbers of churches, bowling alleys, and other forms of social capital located within five miles of each firing range. ArcMap's count tool was used to count the number of social capital generators occurring within that five mile radius. The results listed in second and third columns of Table 1 show the year each firing range was established and the type. The results listed in the final four columns show there were a total of 2,355 churches, 8 bowling alleys and 637 other social capital generators located within in 5 miles of firing ranges in the GHA. There were a total of 3,3036 social capital generators located within 5 miles of firing ranges, the most at 573, were located within 5 miles of 59 Gun Range.

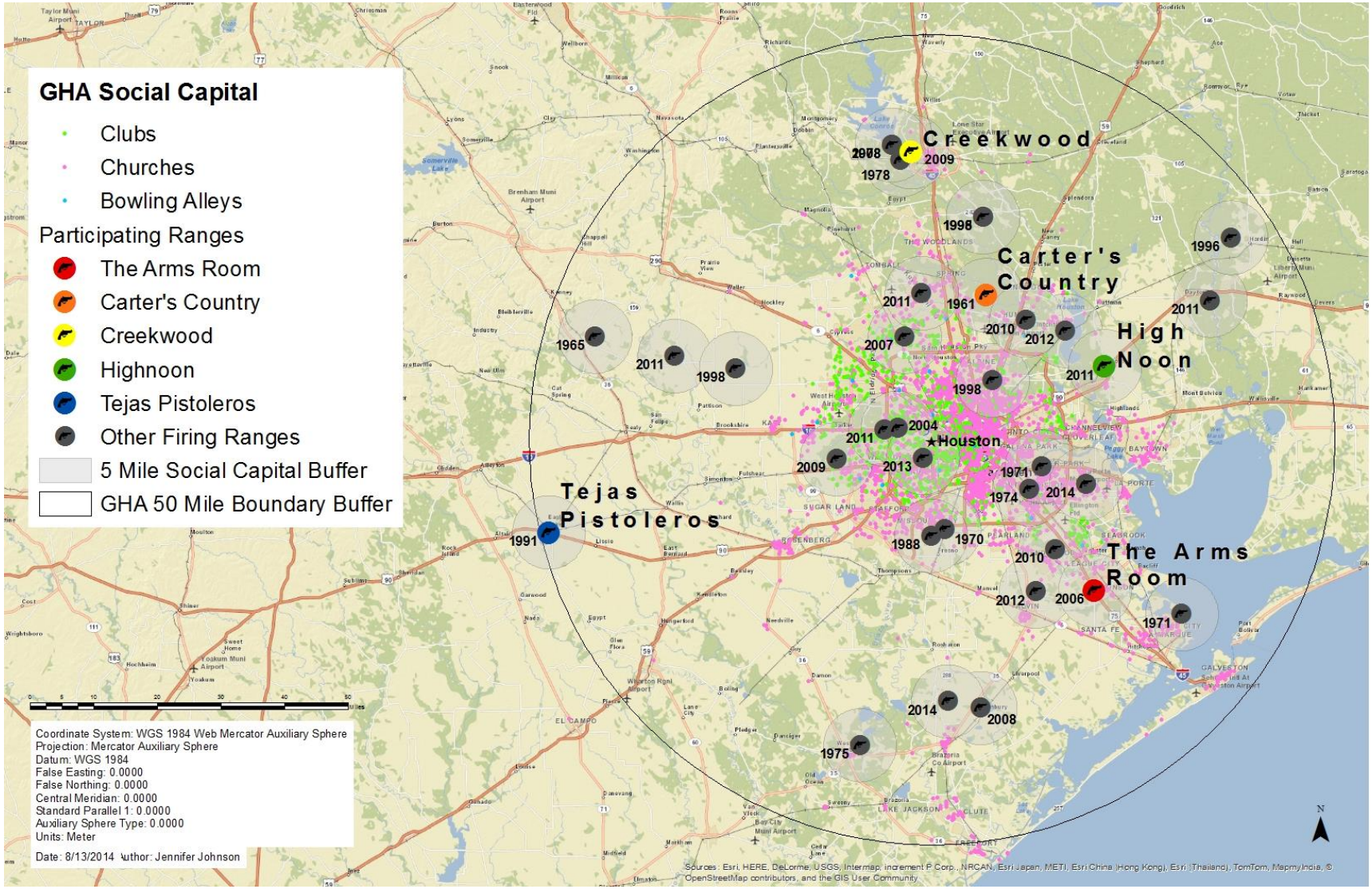

Figure 2 Map showing social capital generators in the Greater Houston, TX area

Table 1 Numbers of traditional social capital generators within a five mile radius of each of the 35 firing ranges

Firing ranges by name	Year est.	Type	Churches	Bowling alleys	Other social capital generators	No. of social capital generators within 5 miles of firing range
1. Participating Firing Ranges						
Carter's Country Outdoor Stores	2004	Outdoor	31	0	4	35
Creekwood Shooting Sports	2008	Outdoor	31	0	0	31
High Noon Indoor Gun Range	2011	Indoor	13	0	0	13
Tejas Pistoleros Shooting Club	1991	Outdoor	0	0	0	0
The Arms Room	2006	Indoor	27	0	1	28
2. Non -participating Firing Ranges						
25 to 100 yard	2012	Outdoor	18	0	6	24
59 Gun Range	1998	Indoor	550	0	23	573
American Shooting Centers	2009	Indoor	83	1	41	125
Athena Gun Club	2011	Indoor	194	1	118	313
Austin County Rifle & Pistol Club	1965	Outdoor	0	0	0	0
Baileys Rifle & Pistol Range	1970	Outdoor	107	0	0	107
Best Shot Range	2010	Indoor	99	1	30	130
Clay Mound Sporting Center	2011	Outdoor	0	0	0	0
Conroe Shooting Center	1978	Outdoor	26	0	0	26
Greater Houston Gun Club	1988	Indoor	119	0	7	126
Greenwood Practical Pistols	1975	Indoor	8	0	0	8
Gun Emporium	1978	Indoor	8	0	0	8

Lost Maples Gamebirds	2008	Outdoor	3	0	0	3
Marksman Indoor Range	1974	Indoor	35	0	13	48
Memorial Shooting Center	2004	Indoor	260	1	134	395
Metro Gun Club	2014	Outdoor	5	0	0	5
Pasadena Gun Center	1971	Indoor	34	0	12	46
PSC Shooting Club	2010	Indoor	44	0	0	44
Rives Rifle Range	1996	Outdoor	0	0	0	0
Saltgrass Archery Club	2014	Outdoor	108	0	4	112
Shiloh Shooting Range	2002	Indoor	94	1	76	171
Shooter's Station	1998	Indoor	1	0	0	1
Sportsman’s Outlet Shooting Center	2010	Indoor	48	1	1	50
Spring Guns and Ammo	2011	Indoor	71	0	19	90
T.R.S. Indoor Gun Range	2008	Indoor	8	0	0	8
Texas City Municipal Shooting Range	1971	Indoor	27	0	0	27
Thunder Gun Range	1995	Outdoor	1	0	1	2
Top Gun of Texas	1998	Indoor	302	2	183	487
West Side Sporting Grounds	1998	Outdoor	0	0	0	0
West Houston Shooter’s Club	2011	Outdoor	0	0	0	0
Totals			**2,355**	**8**	**673**	**3,036**

Firing ranges with no social capital generators located within 5 miles were Austin County Rifle and Pistol, Clay Mound Sporting Center, Rives Rifle Range, Tejas Pistoleros, Westside Sporting Grounds and West Houston Shooter's Club, all of which were located outside of an urbanized area.

4.1.1 Identifying Firing Range Type

Land development in the GHA is governed by codes enforced by the Department of Planning and Development. Development codes in the GHA do affect the type of firing ranges established within city limits however, by enforcing safety codes, hours of operations, and laws that pertain to discharging weapons. While not prohibited, outdoor firing ranges within city limits do not exist and are reserved for areas with enough land to avoid violating these codes.

Firing range type is important because indoor ranges are typically reserved for discharging handguns in shooting galleries and for archery, while outdoor ranges can support handguns, shotguns, including skeet shooting and rifles, and archery. None of the 15 outdoor ranges identified in Table 1 was located within city limits because the codes that govern land use within the GHA (referred to in Chapter 1) favor locating this type of range in areas with sufficient land to support them and on sites that avoid conflicts with other land uses.

Taken as a whole, there are 20 indoor and 15 outdoor firing ranges in the GHA and roughly half of these ranges have been established (or perhaps simply changed ownership) since 2000.

4.2 Survey Results

Of the 11 firing ranges who agreed to participate, completed surveys were received from five ranges and there was a total of 49 returned surveys. Results were derived from 47 paper surveys and 2 online surveys. Data from both survey methods were coded and combined in an Excel table.

Survey results showed participants' social capital contributions at firing ranges and other forms of social capital as well as their opinions on how firing ranges contribute to the social capital created in the GHA. The results from Question 2 show 24% of the respondents attend a firing range once a week, 12% attend once a month, another 12% attend twice a month, 29% attend 3-4 times per month, 14% attend 5-10 times per month, 6% offered "other" as the answer to this question and 2% did not answer the question at all. One survey received no response on all but one question (Question 15), accounting for the consistent 2% who did not answer most of the questions that follow.

Question 3 addressed whether or not respondents attended more than one firing range; results showed 78% did attend more than one range while 20% did not; 2% did not answer this question.

Question 4 addressed whether or not respondents attended ranges with others: 33% always attended with others, 55% attended with others about half of the time, 10% attended ranges alone, and 2% did not answer this question.

Question 5 addressed the number of people respondents met at firing ranges: 27% met 1-5 people, 16% met 6-10, 53% have met 11 or more people, and 4% did not answer this question.

Question 6 addressed whether or not respondents returned to ranges to meet new people: 35% returned to meet new people, 49% did not, 14% were not sure and 2% did not answer this question.

Question 7 addressed the activities respondents engaged in at firing ranges: 27% participated in shooting, 2% socialized on the firing line, 4% socialized at a range eatery or bar, 43% attended ranges to shoot and socialize on the firing line, 2% attended to shoot and socialize at an eatery and/or bar, 20% attended firing ranges to shoot and socialize both on the firing line and at an eatery or bar and 2% did not answer this question.

Question 8 addressed what types of weapons respondents used while at firing ranges: 16% used a handgun, 82% used two or more types of weapons, and 2% did not answer this question.

Question 9 addressed why respondents visited the firing ranges: 16% attended for sport, 8% for self-defense, 2% for law enforcement, 14% for sport, self-defense, hunting and as members of law enforcement, 8% visited for other reasons, 49% visited for two or more of the aforementioned reasons, and 2% did not answer this question.

Question 10 recorded whether respondent's brought or rented their weapons and if they shared with others: 84% brought their own weapon, 4% brought and rented a weapon, 2% rented only, 2% shared with others, 6% visited the range for other reasons, and 2% did not answer this question.

Questions 11 and 12 addressed whether or not respondents brought their own targets, bought them at the range and if they shared with others: 61% bought targets at the range, 8% brought targets with them, 22% bought targets at the range and brought them as well, and 8% did

not answer this particular question, Forty-one percent of the respondents shared their targets, 51% did not, and 8% did not answer this question.

Question 13 addressed range membership: 59% were members of one or more ranges, 39% were not members of any range(s), and 2% did not answer this question.

Question 14 addressed whether or not they felt their opinion on range activities was important: 71% felt their opinions were important, 4% did not, 22% were not sure, and 2% did not answer this question.

Question 15 addressed other types of social activities respondents participated in: 4% bowl, 12% attend religious institutions, 2% attend bars or night clubs, 6% attend movies, theatre and comedies, 22% went to coffee, lunch or dinner with friends, 37% participated in two or more of the aforementioned activities, and 14% did not answer this particular question.

Question 16 addressed types of groups and organizations respondents were members of: 4% were members of religious institutions, 2% were members of charitable organizations, 2% were members of recreational clubs, 6% were members of gun clubs alone, 12% were members of gun related organizations such as the National Rifle Association (NRA), 57% were members of two or more of the aforementioned organizations, and 16% did not answer this particular question.

Question 17 addressed attendance in social activities outside of work: 43% engaged in social activity one or two times per week, 12% engaged in social activities five or more times per week, 10% only did so on the weekends, 8% varied, 14% did not engage in social activity at all, and 12% did not answer this question.

Question 18 addressed whether or not respondents were decision makers or took part in voting at groups, organizations and associations: 55% were decisions makers, 24% were not,

10% were not members of these types of groups, and 10% did not answer this particular question.

Question 19 addressed how important it was for organizations they were members of to take part in community events: 61% felt it was important, 12% felt it was not important, 14% were unsure, and 12% did not answer this question.

Question 20 addressed whether firing ranges they were members of were involved in the community: 59% thought they were involved in the community, 2% said they were not, 29% were not sure, and 10% did not answer this question.

Question 21 addressed whether or not respondents were members of firing ranges because of their community involvement: 14% were members because of their involvement, 41% were not, 35% did not feel it mattered, and 10% did not answer this question.

Questions 22, 23 and 24 addressed housing, quality of life and firing range impact on surrounding communities within the past three years: 51% felt housing had improved, 6% felt it had worsened, 31% felt it remained the same, and 12% did not answer this particular question. For Question 23, 65% felt the overall quality of life had improved, 2% felt it had worsened, 22% felt it had remained the same, and 10% did not answer this question. Two of every three respondents (65%) felt firing ranges had a positive impact on surrounding communities, 8% felt firing ranges made neither a positive nor a negative impact, 16% were unsure of the impact (if any), and 10% did not answer this particular question.

Question 25 addressed why the respondents attended the specific firing range they were surveyed at as opposed to others: 16% chose to attend a specific range because of its proximity to home or work, 18% preferred the atmosphere created by patrons and employees, 8% were concerned with range cleanliness, 2% were concerned with membership opportunities alone,

43% made their decision based on two or more of the aforementioned reasons, and 10% did not answer this question.

Question 26 addressed the respondent's occupations. Occupations were grouped into seven categories such that 10% reported they worked in sales, 9% in engineering, 29% were retired, 4% were unemployed, 6% were business owners or self-employed, 4% worked in law enforcement or the military, and 14% worked in various fields that included education, the trades, real estate, the oil industry, as a veterinarian, and as plant operators and inspectors.

Question 27 asked respondents for the residential ZIP codes and these are displayed in Figure 3, which shows that respondents travelled from 28 different residential ZIP codes to attend the five firing ranges that participated in this survey. Each respondent ZIP code was color-coded to its respective firing range ZIP code. Figure 3 also shows four respondents, two from the Carter's Country and two from the Creekwood firing ranges resided within the same ZIP code. To mark the shared ZIP codes, these two ZIP codes were assigned light orange.

Table 2 lists the number of ZIP codes separating respondent's homes and the firing range they attended. Although exact distance was not measured, clearly, proximity was not a major concern since five of every eight respondents who answered this question traveled across three or more ZIP codes to get from their home to the preferred firing range. The two ranges that generated the majority of the patron surveys – High Noon and Texas Pistoleros – suggest that indoor and outdoor ranges may draw patrons differently. High Noon, an indoor range, draws 60% of its patrons from within two ZIP codes (which may, in turn, simply reflect its suburban location and higher population densities in the surrounding neighborhoods), whereas Texas Pistoleros, an outdoor range located nearly 50 miles from Downtown Houston, draws patrons from many parts of the Greater Houston, TX area.

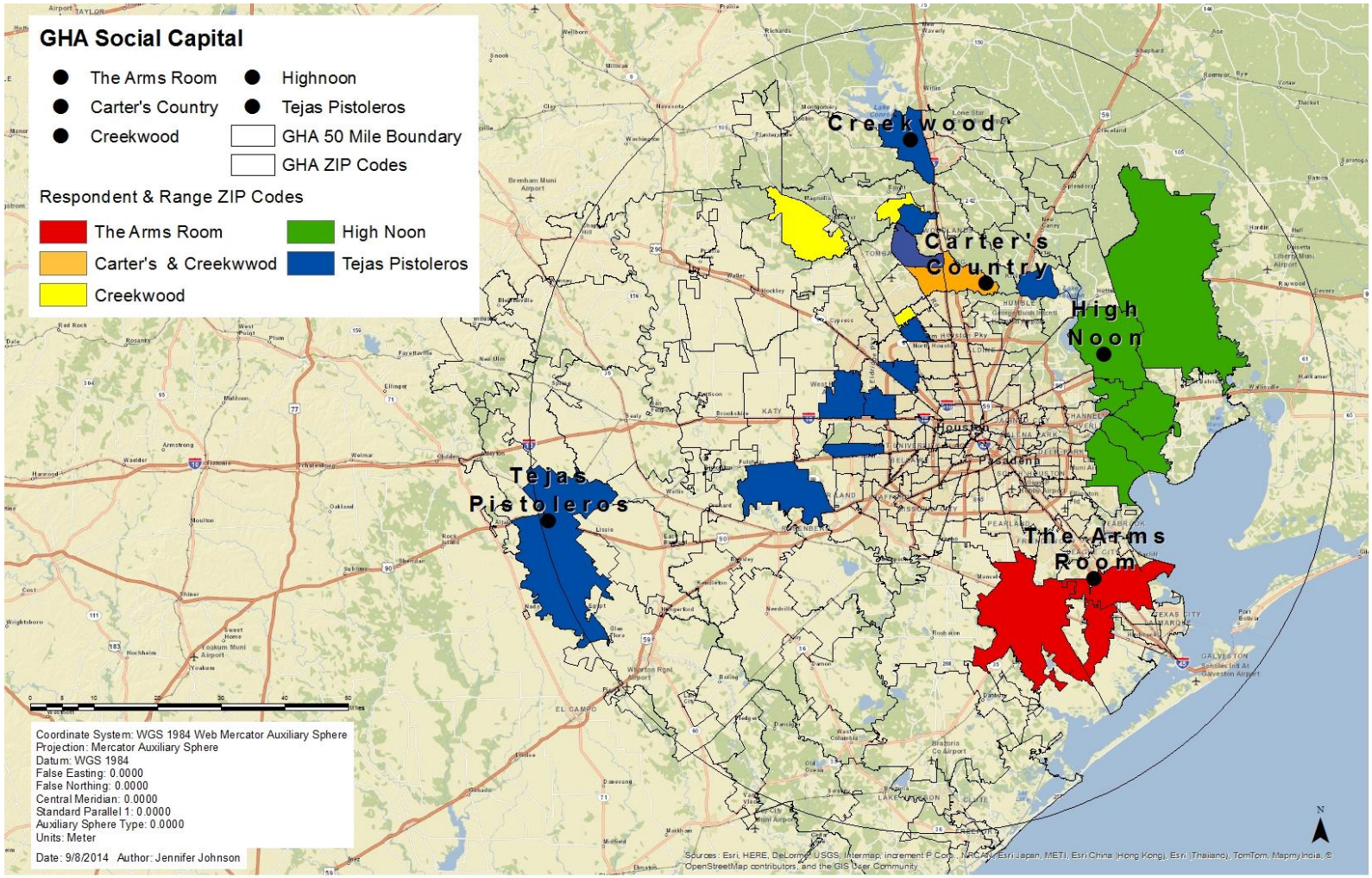

Figure 3 Map showing residential locations of patrons attending five Greater Houston, TX are firing ranges.

Table 2 Number of ZIP Codes Separating Respondent's Homes from the Firing Range(s) They Attended

Firing range	Traveled within the same ZIP code	Traveled across 1 ZIP code	Traveled across 2 ZIP codes	Traveled across 3 or more ZIP codes	No information provided for residential ZIP code
The Arms Room	0	1	1	0	2
Carter's Country	1	1	0	0	0
Creekwood	0	1	0	5	3
High Noon	4	4	2	3	4
Texas Pistoleros	0	0	0	17	0
Totals	**5**	**7**	**3**	**25**	**9**

Question 28 addressed respondent age ranges: 4% were 18-25 years old, 8% were 26-34 years old, 6% were 35-49 years old, 71% were 50 years or older, and 10% did not answer this particular question.

Question 29 asked about the gender of the respondents: 80% were male, 8% were female, 2% declined to answer this question, and 10% did not answer this question (i.e. they left all of the possible choices blank).

Although not a focus of this study, question 30 addressed the respondent's political affiliation(s): 45% were Republican, 6% were Democrat, 20% selected "other" as their affiliation, 14% were not politically affiliated, and 14% did not answer this question.

4.3 Broader Survey Findings

The broader survey results shows there are similarities between firing ranges and traditional social capital venues in terms of frequency and group attendance.

Question 2 showed that although a large percentage of respondents attended firing ranges weekly, the majority of respondents attend firing ranges 3-4 times per month but not necessarily

every week. These answers indicate that range attendance could be a matter of personal schedules rather than adherence to a weekly routine.

Questions 3, 6, and 13 showed most respondents attended more than one firing range and that many are members of more than one firing range. While most attended firing ranges with others at least half of the time, nearly as many respondents always attended firing ranges with others. Perhaps the most significant findings are the results gleaned from Question 5, showing that although there is no direct comparison to the number of people respondents have met at firing ranges to people met at traditional social capital generators, the majority have met 11 or more people while attending firing ranges; this shows how firing ranges are capable of producing and sustaining social activity, as happens at traditional social capital generators like churches and bowling alleys.

The proximity of firing ranges to respondent's work or homes was addressed by survey Questions 25 and 27. The results from Question 25 addressing why respondents attended a specific range over others, rendered ZIP code data inconclusive as most respondents selected two or more reasons for firing range location choice with only 16% specifically stating proximity to home or work was a consideration. The results from Question 27, displayed in Figure 3, show how proximity may matter more for indoor vs. outdoor ranges – however, a large and more representative sample (i.e. coverage) of both firing ranges and patrons is needed to confirm the preliminary results evident in Figure 3 and Table 2.

CHAPTER FIVE: DISCUSSION AND CONCLUSIONS

Researching the role firing ranges play in generating social capital in the GHA proved challenging; however, by employing a survey at firing ranges, this study was able to show firing ranges do play a role in generating social capital in the GHA.

5.1 Research Questions Answered

Research question 1 addressing where the firing ranges were located within the GHA compared to traditional social capital generators was answered in two parts, first in Figures 2 and 4, and second, by survey questions 15, 16, and 17.

Figure 2 shows spatially how firing ranges are no different than traditional social capital generators because they occur in similar locations, notably in clusters much like traditional social capital generators. Additionally, Figure 4 shows how 23 of the 35 firing ranges are located within urbanized areas.

Four of the 12 firing ranges located outside of the urbanized areas are classified as outdoor ranges and rely on larger parcels not typically found within urbanized regions. The survey responses from the Texas Pistoleros firing range patrons suggest firing range patrons are prepared to travel long distances to use the kinds of facilities associated with outdoor ranges. Question 15 on other types of places and social activities respondents participated in showed that one in five respondents (22%) participated in coffee, lunch, or dinner with friends or loved ones. Additionally, 37% participated in at least two or more activities including church, bars and night clubs, movies, theater and comedy, and bowling alleys. Question 16 addressed the types of groups, organizations, and associations' respondents were members of. Individually, membership was low; however, respondents who selected two or more membership types totaled 57%, showing respondents are active within their communities.

Activity frequency was answered with Question 17 regarding social activity engagement outside of work: 43% engaged in other types of social activity outside of work one or two times per week, 12% did so five or more times per week, 10% only did so on weekends and 8% in varying amounts. However, 14% who did not engage in activity outside of work and 12% who did not answer the question, showing there is a significant number of respondents who only engage in social activity at firing ranges outside of work. However, further research is required to identify where the respondents engaged in other activities linked to traditional social capital and how their locations were related to their residences and work locations.

The second research question addressed whether or not proximity or some other aspect of location mattered to those who attend firing ranges in the GHA. Figure 3 shows how respondents traveled from 28 different ZIP codes to attend firing ranges and the responses to Question 25 indicated that the atmosphere of the firing ranges was more important than proximity to their work or homes to choosing a firing range. ZIP codes were color coded to match the respective firing range and respondent's ZIP codes. Notably, of the 43% who indicated there were two or more factors in range selection, the majority again were more concerned with the atmosphere created by patrons and range employees than its location, amenities, facility cleanliness, and cost or membership opportunities.

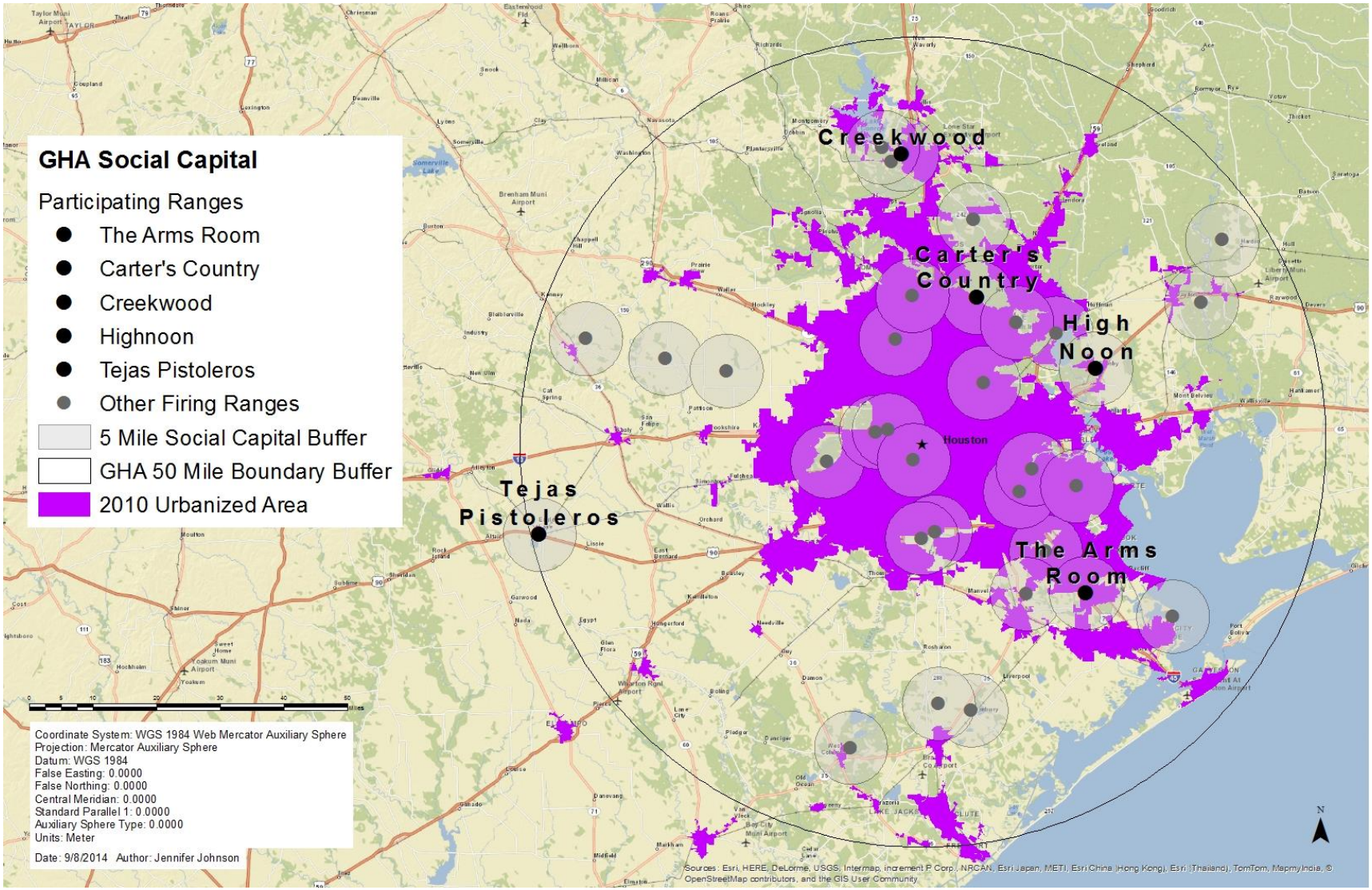

Figure 4 Map showing 35 firing ranges with 5-mile buffers and 2010 urbanized areas within Greater Houston, TX area.

5.2 The Role of Firing Ranges in Generating Social Capital

The survey showed that while most respondents did not attend firing ranges specifically to meet new people, the answers did show how many respondents attended often, frequently attending more than one range and that at least half of that time, they attended firing ranges with others, and socialized while there. The survey answers also showed while range membership was not the driving factor in attendance, many of the respondents were members of more than one range, suggesting respondents socialized at multiple firing ranges.

Although community involvement was not a factor in firing range selection, respondents believed that these ranges were involved in their surrounding communities, that overall housing and quality of life in the surrounding communities had improved, and that individual ranges had a positive impact on the surrounding communities overall.

The survey answers also showed that the opinions captured in this research project were gleaned mostly from retired males 50 or older who considered themselves Republicans.

Given these findings, this study results clearly show that firing ranges do contribute to the social capital generated in the GHA and possess many similarities to traditional social capital generators by fostering relationships and socialization with others. It shows many feel their opinions are considered and matter and that community involvement and impact is an important facet of firing ranges, a feature shared by traditional social capital generators as reported by Baum and Ziersch (2003), Smith-Morris (2007) and Hauberer (2010), among others.

This study also showed how GIS is useful in mapping and analyzing traditional social capital, studying spatial distributions of social capital, and in discovering new social capital generators like firing ranges. The use of GIS in conjunction with the survey showed not only how firing ranges create social capital but also where it was being created, and by and for whom,

given the spatial distributions of the firing ranges themselves across the GHA and the ZIP codes of the respondents (i.e. the people who travel throughout the GHA to more than one firing range at least 3-4 times per week to engage in this specific form of social activity).

5.3 Data Challenges and Limitations

Although this study showed how firing ranges are social capital generators and should be considered as such in future social capital studies, there were challenges and limitations.

The most difficult challenge was contacting the 35 firing ranges in the GHA. Attempts were made via mail, email, and phone; however, many survey participation letters were returned unanswered, resulting in follow-up contact measures that included repeated phone calls and emails. Few emails were answered and repeat phone calls were time consuming and did not generate new or additional responses. Many firing ranges were reluctant to participate and some refused, while others agreed to participate initially but failed to follow through; so that completed surveys were only obtained from respondents affiliated with 5 of the 11 ranges who agreed to participate. The low numbers of firing ranges (5 of 35 total) and patrons (49) participating in this study meant that the study did not generate a scientific (i.e. stratified random or random) survey and that as a consequence, the results should be interpreted with caution.

The ability to map and analyze the spatial distribution of social capital using GIS nonetheless played an integral role in this research, however, the limited data due to low survey response meant that some of these capabilities were not fully exploited. GIS was effective in showing the spatial distribution of firing ranges relative to traditional social capital generators. Although GIS was able to show that firing ranges exhibited spatial clustering patterns similar to traditional social capital generators, it failed in explaining why firing range locations were clustered and located close to other social capital generators, nor why respondents' make specific

range choice(s). Further research is needed to explain why firing ranges choose their locations and why respondents chose to attend specific ranges over others.

The lack of individual survey question responses proved a challenge in other ways as well as many questions were consistently left unanswered skewing the results. Survey instructions were also not clear on selecting only one answer for each question, and the coding of the survey answers had to be altered to accommodate these questions with more than one answer selected.

The survey was useful in gleaning the opinions of a small sample of respondents from the participating firing ranges; however, a revised survey and a personal approach might be used in future work to gather better data by providing more detailed instructions and conducting in-person interviews as well as or in place of mail surveys.

5.4 Future Research

While this study was able to show firing ranges are social capital generators and show the spatial distribution of firing ranges relative to traditional social capital generators, further research is necessary if we are to understand the spatial significance of firing range locations relative to one another and to traditional social capital generators as well as why respondents select one firing range over another.

By incorporating GIS with social capital research methods, this study shows further research on social capital in the GHA is not only needed but would benefit from the use of GIS to map and provide further in-depth analysis on social capital spatial distribution patterns. The use of GIS in this study also shows the possibilities for continuing social capital research spatially throughout the U.S. similar to *the Town of Candia Open Space Plan* (Anon. 2011),

Oulton's (2012) *Community Gardens for Social Capital: A Site Suitability Analysis in Akron, Ohio,* and Alamo's (2013) *Explorations of American Churchscape Diversity.*

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APPENDIX A: QUESTIONNAIRE

1. Which firing range are you completing this survey for?
    a. _____
2. How often do you go to firing ranges?
    a. Once a week
    b. Once a month
    c. Twice a month
    d. 3-4 times per month
    e. 5-10 times per month
    f. Other _____
3. Do you go to more than one firing range?
    a. Yes
    b. No
4. Do you go to firing ranges with others?
    a. Always
    b. Half of the time
    c. Never (Always go alone)
5. How many people have you met at firing ranges?
    a. 1-5
    b. 6-10
    c. 11 or more
6. Do you return to ranges to meet new people?
    a. Yes
    b. No
    c. Not sure
7. What types of activities do you engage in at firing ranges?
    a. Shooting
    b. Socializing on the line
    c. Socializing at a range eatery or bar
    d. A and B
    e. A and C
    f. All of the above
8. What type of weapons do you use at ranges?
    a. Handgun
    b. Rifle
    c. Shotgun
    d. Archery
    e. Skeet
    f. Clay
    g. Other _____
9. What is your purpose at firing ranges?
    a. Practice for sport
    b. Self Defense
    c. Hunting

d. Professional (member of law enforcement, military)
e. All of the above
f. Other _____

10. While at firing ranges you usually:
    a. Bring and use your own weapon
    b. Bring your weapon and rent another weapon(s)
    c. Rent a weapon(s)
    d. Share with your friends or others at the range
    e. Just there to spectate

11. Your targets are usually
    a. Bought at the range
    b. Brought with you
    c. Both

12. Do you share your targets with others?
    a. Yes
    b. No

13. Are you a member of one or more ranges?
    a. Yes
    b. No

14. Do you feel your opinion on range activities is important?
    a. Yes
    b. No
    c. Not sure

15. What other types of places or social activities do you participate in?
    a. Bowling Alley
    b. Religious Institution
    c. Bar or night club
    d. Movies, Theatre, Comedy
    e. Coffee, lunch, or dinner with friends/loved ones
    f. Other _____

16. What types of groups, organizations, or associations are you a member of?
    a. Religious Institution
    b. Charitable organization
    c. Political organization
    d. Recreational/health (cycling, running, or walking)
    e. Agricultural
    f. Gun related club
    g. Gun related organization such as the NRA

17. In addition to firing ranges how often do you engage is social activity outside of work?
    a. One or two times per week
    b. 5 or more times per week
    c. Weekends only
    d. After work, varies
    e. Don't engage in other forms of social activity

18. Are you a decision maker or take part in voting at groups, organizations, or associations you are a member of?
    a. Yes
    b. No
    c. NA

19. Is it important for the organizations you belong to engage in community events?
    a. Yes
    b. No
    c. Unsure

20. Do the ranges you attend take part in community involvement?
    a. Yes
    b. No
    c. Unsure

21. Are you a member of this range or others because of their community involvement?
    a. Yes
    b. No
    c. Doesn't matter

22. In the past three years housing in this range's community has:
    a. Improved
    b. Worsened
    c. Remained the same

23. In the past three years the overall quality of life in this range's community has:
    a. Improved
    b. Worsened
    c. Remained the same

24. What impact do you think this range has made on its community?
    a. Positive
    b. Negative
    c. Neither positive or negative
    d. Unsure

25. Why do you attend this range as opposed to others?
    a. Location is closer to my home or work
    b. Atmosphere created by patrons and or range employees
    c. Amenities offered such as multiple range types
    d. Facility is clean and up-to-date
    e. Cost
    f. Membership opportunity
    g. Other_____

26. What is your occupation? _____

27. What is your residence zip code?
    a. _____

28. What is your age?
    a. 18-25

b. 26-34
c. 35-49
d. 50 +

29. What is your gender?
    a. Male
    b. Female
    c. Declined to answer

30. What is your political affiliation
    a. Republican
    b. Democrat
    c. Other_____
    d. None