Explorations of American Churchscape Diversity

by

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Dedication

I dedicate this work to my parents who instilled in me a yearning for knowledge and the bravery to seek answers no matter how difficult the question. And to my husband for his tireless patience, love, and support throughout this long process. I would not be who I am today, were it not for you.

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Abstract

Changing technologies and cultures make possible new ways of analyzing, understanding, and mapping religious geography. This study illustrates how GIS technology can provide a view of the details in the structures and adherents of the churchscape of America. GIS allows more detailed exploration of diversity in the American religious landscape than previous research has uncovered in spite of very limited data availability. This study has illustrated that the religious landscape of America is very complicated and multi-faceted. The physical locations tell us that our nation is a Baptist nation, whereas the adherent population tells us that our nation is a Catholic nation. The diversity of religious beliefs and practices that is part of the fabric of the country's foundation is also reflected in the current landscape. Cluster analysis of physical church locations shows us that churches cluster together regardless of denomination. This study raises questions regarding the exceptional nature of the American religious landscape. The findings call for other disciplines such as sociology, planning, and theology to examine in more detail the diversity found in the religious landscape of America.

Chapter 1 Introduction

Within America, religion has played a significant role in shaping the nation's cultural development. U.S. currency illustrates this with the ever-present "In God We Trust" motto as does the First Amendment to the U.S. Constitution, which acknowledges the inherent right of human beings to the freedom to exercise the religion of their choosing. Societies are organized around morally structured restrictions that we place between ourselves and others to provide a sense of cohesion amongst our group and a boundary line to separate us from those whose actions we disapprove. The presence of religion has acted as a presupposed guarantee of public and private morality that is a necessary criterion for receiving the categorization of "good citizen" of America. Religious beliefs act as an assurance of a minimum set of moral values that leads to a virtuous citizenry (Barb 2011). This belief in religion as a barometer for what constitutes a good person has a strong foundation in the American cultural awareness.

The concept of social capital can be understood in part as the set of norms and relationships that ties people together, bonding people with standards such as honesty, integrity, reliability, and reciprocity (Fukuyama 2001). Religion is recognized as being an important contributor to the networks that facilitate social capital with religious affiliation recognized as one of the most common membership associations in America (Putnam 2001). Religion is a deeply personal, experiential realm that exists as part of the lived world and is

inextricably tied to our understanding of life and provides social cohesion (Levine 1986). Religious affiliation allows individuals to practice the skills that generate social capital (Warf and Winsberg 2010). Given its important role in the ties that bind civil society together, having a more thorough understanding of the religious landscape of America can provide new avenues for facilitating the increase of social capital.

The countryside of the U.S. is dotted by communities that contain at least one church structure. Much of our cultural history is tied to this. The stereotype exhibited by a rural church is part of America's cultural nostalgia. The image of a country church stands for many as a representation of the two parent family with children, living near to grandparents; all working the family farm (Neitz 2009). Linking that cultural nostalgia with physical structures is simple as churches are places that can be seen to exhibit permanence. This permanence places a foothold in the cultural psyche of an area. It stands as a reflection of a given time and its values, providing memory and cultural identity (Blake and Smith 2000). Even in times of urban economic hardship where stores are boarding up windows and going out of business, churches stand in both rural areas and urban neighborhoods as a reminder of hope and stability (Botchwey 2007).

As Zelinsky (2001) points out, we should be concerned about the religious landscape because it plays a critical role in the political, social and economic facets of American culture, as well as being a major source of visible cultural data on the landscape. In order to understand our culture from a holistic geographic

perspective, a study of the landscape of religion is critical, as the way we position critical reservoirs of social capital, like churches, on our landscape shows who we think we are, or what we think we as a culture are becoming (Lewis 1979).

Places of worship have been integral parts of the urban landscape throughout history. They serve as more than just houses of worship, they serve as civic centers and social gathering places (Ayhan and Cubukcu 2010). Church structures are a symbolic manifestation of the interaction between the human and the divine, without which the ideologies of religion would have no foothold in reality, no link to ensure they endure (Knott 2005). They represent the visible imprint of religion on the physical and cultural landscape (Park 2004).

According to the Pew Forum's 2008 U.S. Religious Landscape Survey, approximately 83% of adults identify with some form of faith with 78% belonging to Christian denominations. Their researchers noted the diversity in the Christian American religious landscape, citing such groups as Baptists, Methodists, Pentecostals, Orthodox adherents and Catholics. The diversity of the religious landscape was further noted with the inclusion of such groups as Mormons, Jehovah Witnesses, Jewish, Buddhists, Muslims, Hindus, Baha'is, Zoroastrians, and various New Age groups. Melton noted that the U.S., at its foundation, started out with 20 different religious groups, grew to more than 300 by 1900, and at the end of the twentieth century there were more than 2,000 (Melton 2010).

Although the literature claims great diversity in religions in the U.S., there is little understanding of whether and how that diversity is realized at the landscape level. For example, no standardized measures of diversity have been calculated for comparison within or between regions of the U.S. An important objective of this study is to promote a better understanding of religious diversity in the American landscape.

This study focuses on depicting the church structures in the American cultural landscape, i.e., the "Churchscape," to promote a better understanding of these forms of social capital in all their diversity. For the purposes of this study the Churchscape can be thought of as the assemblage of traditional and non-traditional church locations including recognized church structures, storefront church locations, portable church facilities, and structures on the landscape that hold some form of worship practice. The collection of these structures represents the visible manifestation of the diversity of the American religious landscape.

1.1 Conventional Approaches to Religious Geography

In modern geographic thinking there are two main approaches to the intersection of geography and religion. The "geography of religion" focuses on the artifacts of religious expression on the landscape, while "religious geography" is more concerned with how theology shapes people's conceptions of the universe. Specifically, research in the area of "geography of religion" explores

and explains the various ways religion is expressed in social, cultural, and environmental milieus. Religious geography instead is concerned with the manner in which religion shapes people's perceptions and beliefs about spaces and places in the world around them (Park 2004). In short, the geography of religion is concerned with how internal beliefs are expressed outwardly, while religious geography is concerned with how space and place shape our internal religious conceptions. These two approaches complement one another in thinking about the Churchscape. This study, however, finds itself positioned in the geography of religion, concerned with the location of physical artifacts on the landscape.

Human geography's coverage of religion traditionally has been relegated to the distribution of religions globally and regionally, the origin and diffusion of religious beliefs and practices, and the impact of religion on regional culture, politics, and demographics (Proctor 2006). Mapping spatial patterns and the distribution of religion is a central thematic area in the geography of religion. There are two main methodologies within this area: looking at the distribution of religious groups across space, either as individuals or groups, and the delineation of regions based upon this distribution (Bauer 2006). Maps showing religious distributions must be looked at skeptically, bearing in mind that the religion shown for an area may be the dominant religion but is likely not the only religion. The size of the area attributed to a specific religion or group does not necessarily reflect the actual population distribution within that region. Also, the maps are

not likely to express the vitality or adherence to the religion in the area (Park 2004).

The scholarship revolving around the patterns of religion in the U.S. is well documented. Scholars such as Shortridge (1977), Zelinsky (2001), Jordan (2006), Bauer (2006), and Silk (2005; 2007) have undertaken a variety of descriptions of the religious landscape of America; each coming to their own version of religious regionalization, all very similar. The Northeast is highlighted for its tendency toward Catholicism, the South is correlated with Evangelical Protestant denominations such as Baptists, the upper Midwest is associated with Mainline Protestant denominations such as Lutherans, Utah is shown as the heart of Mormonism, and the West is exposed as an area of non-affiliation. The methods of each vary including the multivariate statistical clustering of Shortridge and the Local Indicators of Spatial Analysis (LISA) statistics of Jordan (Bauer 2012).

Limited scholarship has been undertaken to demonstrate religious diversity at a regional scale. Warf and Winsberg (2008) explore data from circa 2000 using choropleth maps and Dorling cartograms. Silk (2007) defines regions of diversity in his attempt to understand and define the impact of religious pluralism on the American landscape. His work broadly categorizes the U.S. into four regions of diversity including the 'Melting Pot' of the Middle Atlantic region, the 'Secularist' Northeast, the fluidity of the Pacific region, and the 'Culture Warriors' in the Southeast (Silk 2007).

1.2 Using Geographic Information Systems (GIS)

Given the importance and complexity of religion on the landscape and the power of Geographic Information Systems, it is advantageous to use this combination to explore these research fields in new ways. To study something from a geographic perspective allows for more than just a neighborhood or regional approach. It opens the door for study from a "locationally-specific" perspective (Jordan 2006). Using geocoded locations for church buildings it is possible to see if there are patterns between physical presence on the landscape and overall numbers of religious adherents or patterns of diversity in religious practice. How do the numbers of adherents and denominational structures relate to artifacts on the landscape? Finding these kinds of links may suggest hypotheses for further exploration.

Geographic Information Systems possess abilities that far exceed mere tabular data, especially for visualization. Being able to translate the tabular data into a format that people can readily comprehend at one glance, such as a map, provides more analysis power for any topic. If topics are to be explored in new and different ways it is imperative to use the newer more robust technology that makes sense out of non-traditional approaches to data. A map has the ability to speak to more people than a tabular set of words and numbers. Using this technology allows for nationwide examination of very fine scale data on religion in a way that has previously been near impossible.

Using GIS tools, this study aims to explore the "Churchscape" of America. The notion of a "Churchscape" can be loosely thought of as the collective presence of physical church locations on the landscape. This is an initial investigation of church locations, revolving around the regional and spatial variations of religious diversity, spatial clustering of churches, and congregation size. The objective of this study is to explore hypotheses about the impact of religious diversity on the spatial clustering of churches, regional variations in diversity, and congregation size.

This study will explore the possible hypotheses through the following questions. How does the physical churchscape vary across regions? What impact, if any, does religious diversity have on spatial clustering of churches? Does denomination play a role in the degree of clustering? What does the landscape of churchgoers or adherent fabric look like? How does the physical churchscape compare with the adherent fabric? What is the relationship between average congregation size and religious diversity?

Chapter 2 Background

The literature centered on religious geography or the geography of religion is quite varied and extensive. Many scholars have looked at this topic; however, until recently, not much GIS work has been undertaken. This literature review covers some of the main points and ideas that have been considered both in the field as a whole and in regards to the use of GIS. From this framework it is possible to illustrate how GIS can be further expanded into the geography of religion to add additional value to the field.

Religious thinking and geography have been intimately tied throughout the ages. In ancient Greece, the geographers of the time explained the patterns around them as results of larger cosmological and spiritual forces. The Middle-Ages and Renaissance gave rise to ecclesiastical geography which set about describing the spread of Christianity around the world and contained overt theological overtones (Park 2004).

Ecclesiastical geography was replaced by the study of scriptural geography, the mapping of scriptural elements from the bible, which was then supplanted by Enlightenment thinking that held scientific laws superior to God. Modern geography of religion replaced, for the most part, religious geography because the changing scholastic paradigms no longer supported the ideas of religious geography (Bauer 2006).

The geography of religion moved through a series of stages in the twentieth century, beginning with the idea that religious beliefs and landscapes were determined by environmental factors. Some argued that the cradle of the religion determined its imagery and symbolism. For Example, Eskimos believe that hell was a dark place full of storms and intense cold, much like the extremes of their environment (Kong 1990). This was followed by the study in the 1920s of how religious thinking caused adherents to alter the physical landscape to fit into the theological framework of their beliefs. The landscape itself became the focus of study and an attempt was made to determine what artifacts on the landscape, such as settlement patterns, transportation, and population, were direct results of religious influence (Kong 1990). Both the environmental determinist views and the ideas of human agency were eventually synthesized in contemporary theories of religious landscapes (Bauer 2006). However, there is no single overriding theory of religious landscapes; the field is an amalgamation of many disparate yet related ideas.

Rather than seeking to understand how the environment shapes a religion or how Christianity has spread over a region, this thesis seeks to understand the current landscape and how religious diversity is represented at a regional scale. Additionally, by studying the physical artifacts of churches at a micro-scale an attempt is made to understand at a finer level of detail how individual religions are represented on the landscape by the placement of churches. This two-fold process sets out to use more modern technology, GIS, to explore the interaction

between religion and the physical and social landscape, with the physical landscape merely being the starting point rather than the end.

2.1 Precursory Work

Many geographers have studied the concept and reality of sacred space. Places are not sacred because they exist. Instead, they are sacred because they exist as a combination of the history, aspirations, experiences and meanings of a people and are perceived as holy to the people to which they belong (Tuan 1979; Kong 2001; Park 2004). In this vein, many geographers have studied religious architecture at a scale finer than the level of analysis suggested in this thesis. Religious architecture such as churches, mosques, temples, and cathedrals possess value because they are the places where learning and the expression of sacred beliefs are focused on the Earth (Mazumdar and Mazumdar 1993).

Zelinsky (2001) focuses on the uniqueness of the American religious landscape, which possesses a wealth of physical manifestations of religious diversity. These include mega-churches, storefront churches, church signs and reader boards from all denominations. He found that relative to other cultures the American landscape generally lacks sacred space artifacts such as roadside shrines, sacred effigies, and hilltop crosses. Instead, the American landscape is characterized by religiously significant buildings (Zelinsky 2001).

In a review of research surrounding the geography of religion from the 1990s, Kong (2001) points out that most of the work concerning the geography of religion concentrates on the distribution, diffusion, and dynamics of religion. However it does not take into consideration issues of spirituality, personal experience, cultural politics or religious symbolism. She argues that 'new' geographies of religion must examine such things as different sensual experiences of geography that go beyond the 'officially sacred' to include things such as aural/audio experiences, and space-place interactions in cases of religious diversity in urban areas, particularly how churches have been incorporated into other meaning systems through their conversion to alternate spaces. New geographies of religion should also include various scales of analysis stretching from the body to regional to national to global, diverse populations such as women and children, and divergent views of morality (Kong 2001). While this study does not explore the areas suggested by Kong it does look to a new geography of religion by examining the clustering of church locations and their relationship with the underlying diversity of the region.

2.2 GIS in New Geographies of Religion

To explore ideas of new geographies, some have undertaken the use of GIS in their studies. GIS has the capability to examine and represent data in a whole new format. Using GIS technology has enabled scholars to look at things as diverse as radio networks, historical development of cities based on religious

architecture, religious communities in cyberspace, neighborhood stability and religion, and Jewish Enclaves in urban environments. GIS has also furthered the understanding of broad religious regions across the U.S. A brief review of these studies demonstrates the possibilities inherent in GIS analysis by highlighting the arenas that research has already explored and providing examples that serve as a basis for this study.

2.2.1 Radio Networks

Religious programming has existed on the radio airwaves since the early days of AM radio. Over time the presence of the programming has continued, however the form on the landscape has changed. Wikle and Comer (2010) investigate the modern radio translator as a feature of religious landscapes. Translators are low power radio stations that extend reach into areas where signals are blocked by terrain by rebroadcasting the radio signal on an FM frequency. Their article looks at the changing spatial patterns of religious radio landscapes after the advent of these types of networks, highlighting two main types: those aimed at attracting young listeners through music and entertainment, and those aimed at reaching isolated communities with programs with a stronger religious emphasis (Wikle and Comer 2010). The objective of their research was to discover the patterns of the translators over space and time and to understand the socioeconomic characteristics of the various groups found in proximity to the five largest networks.

Wikle and Comer (2010) produced a series of maps showing the point locations of the different translators over space and time, creating a visual means of understanding the pattern and diffusion of the expanded radio translator networks. This point level methodology is beneficial for examining a more specific and detailed level of data and could be expanded to include a different set of landscape features such as religious schools, churches, or bookstores.

2.2.2 Historical Development of Cities

Places of worship have been integral parts of the urban landscape throughout history. They serve as more than just houses of worship, they serve as civic centers and social gathering places (Ayhan and Cubukcu 2010). Because of their importance in the urban environment, understanding their distribution and expansion can help understand the overall development of the cities in which they reside. Ayhan and Cubukcu explore the idea that the spatial pattern of a city can be explained by the location of the places of worship. Their research uses GIS and spatial analysis, particularly mean center, weighted mean center, and standard deviational ellipse, to see if the spatial development pattern of Izmir, Turkey can be approximated by the location of 525 mosques constructed between the years of 1550-2008. The research indicates that the development pattern of Izmir closely imitates the development of mosques throughout the city landscape (Ayhan and Cubukcu 2010). This research was limited to mosques leaving an opening for studying different religious group artifacts in different locations.

2.2.3 Cyberspace and Religion

As cyberspace has matured, the amount of religiously based content has flourished. There are now classes on theology, web discussion boards, religious articles, recorded sermons, and music. According to the Pew Research Center, in 2001, 25 percent of people used the Internet for religious purposes; this figure was higher than that for banking, stock-trading, or even gambling. The Internet breaks down the walls of traditional religious interactions. People of diverse faiths can interact in spaces removed from the physical churchscape. Traditional powers and roles are being replaced by diverse movements originating with the people (Berner 2005).

Some have argued that the spread of more sophisticated technology and communication tools would eradicate distance and render geography irrelevant. However both sacred and secular spaces are still important. With the advent of the Internet, it is merely changing from historical patterns. Worship that was once predominately a corporate practice has become more individualized.

Shelton et al. (2001), set out to study religious cyberscapes. The authors used a search program that counted the number of religious references that are geotagged to a specific place and are indexed on Google maps. In the Chicago, Illinois, area there were 7,519 geotagged references that pertained to the word Catholic. This same search was performed across the globe analyzing words and search terms that incorporated key religious names, denominations, buildings, and important religious figures. The study investigated geotagged religious web

content to analyze how and where people are using the Internet for religious engagement. Geotagged information is important for identifying different religious practices on line as well as the distribution of the associated offline practices. The net effect of this research was to create a new ecclesiastical geography based on cyberscapes. (Shelton, Zook and Graham 2011).

Shelton, Zook, and Graham (2011) also mapped the virtual references to specific denominations in the U.S. and produced a map depicting this version of regionalization. The cyberspace references to Baptist, Catholic, Lutheran, Methodist, and Mormon resulted in maps containing points coded by the dominant denominational reference for the area. Their results indicated that there are several clearly defined belts of denominational affiliation in the U.S. (Shelton, Zook and Graham 2011). This differing form of regionalism illustrates the possibility of exploring additional bases for regionalization such as diversity.

Others such as Cheong et al. (2009) assert that the entrance of churches and religious organizations into the Internet realm opens up new avenues for GIS visualization and analysis. Virtual geography is opening new avenues that include multi-scale and spatiotemporal GIS environments to model how people interact over different time and space combinations. Through their spatial analysis of hyperlinks embedded in websites they highlight a new form of mapping to show connections in cyberspace across the globe (Cheong, et al. 2009).

This broadens the meaning of place beyond the local and visible. Many pastors have a sense that their web presence should brand unique elements of a given church. This sense of branding can be extended to people who cannot physically be at that particular church but can feel like a member merely by visiting the website (Cheong, et al. 2009).

The use of this new technology in churches illustrates the idea that the role that GIS can play is far more than just a processing engine; it can be used as a communication device whereby people are connected across vast amounts of space and time into one religious community (Cheong, et al. 2009). Given the relative newness of the Internet this is an area of study that could be greatly expanded. Using Internet networks, research could map the interconnected religious life of diverse groups across the world. While this study does not attempt to address the multi-faceted world of cyberspace it is important to highlight the wide array of ways that religion is expressed on the landscape, both physically and culturally.

2.2.4 Neighborhoods and Religion

Neighborhoods are an important feature of the American landscape, and as all things they can fall victim to decay. The concept of neighborhood stability is important and can be thought of as the permanence of the people and structures over time. To explore the relationship between the stability of a high-poverty neighborhood and the presence of churches, Kinney and Winter (2006)

approached the concept using GIS and one-way analysis of variance (ANOVA). They looked at three different types of churches: free standing, store front, and home-based. The research examined such measures as the permanence of structures, the length of time of residence, and property values as a means to gauge neighborhood stability. Areas around each church within a 250 foot diameter circle were identified using GIS. The choice of 250 feet mitigates the potential problems from overlapping buffers and approximates the standard block length in the area of their case study.

The research performed by Kinney and Winter (2006) found no significant association between free-standing churches and neighborhood stability in low income areas. Store front churches were positively linked to neighborhood stability, although this could be an artifact of the commercially zoned neighborhoods that the store front churches were located in (Kinney and Winter 2006). This research was limited to an urban area in a time of decay. Neighborhood stability will suffer during times of outmigration and financial hardship leading to the presence of church structures that occupy little more than space in the local communities. While beyond the scope of this study, it would be of interest to study how stability of neighborhoods is impacted in suburban or rural communities by church structures.

Another approach to religion and neighborhoods is to investigate the residential proximity of those attending the church. Historically congregations were composed of people who lived nearby the church, even within walking

distance. Now that society is more mobile, proximity is not as much of a determinant of congregation makeup. Sinha et al. (2007) used GIS to analyze the neighborhood composition for churches where the congregation lived nearby and compared it to churches where congregants lived further away. They found the two scenarios provided very different racial makeup, socio-economic status, and neighborhood stability results. Their regression models showed that the contributing factors for congregants living in close proximity to their church were denomination, racial makeup of the congregation, pastor's place of residence, and neighborhood stability. In Catholic and Jewish congregations the regression model showed that adherents were more likely to reside in the same neighborhood as the church. A racial makeup of predominately whites showed a positive correlation with residential proximity while predominately black congregations showed a negative relationship with residential proximity. Their research also showed that if the location of the pastor's place of residence was close to the church the proportion of adherents living in close proximity would be higher. It was also noted that in stable neighborhoods, the residences of adherents would more likely in close proximity to the church. Their analysis of further research suggests using GIS to map actual locations of members to provide the detail of an accurate spatial distribution pattern which can then be compared with neighborhood characteristics to see how distribution may have changed with changes in neighborhoods (Sinha et al. 2007).

The concept of neighborhood scale analysis will be further explored in this study. Point level locations of churches will be examined at a various scales including Metropolitan Statistical Area to compare the denominational diversity and clustering with the underlying congregational fabric of the area. This approach is missing in the current literature of church locations and their interaction with the surrounding neighborhoods.

2.2.5 Jewish Enclaves

Minority or Ethnic religious groups have a tendency to cluster in and define the neighborhoods in which they reside. The Jewish presence in America represents itself very much as an ethnic religion. Patrick Gallagher (2009) studied their presence in Brooklyn using GIS. He completed a GIS-based analysis that attempted to locate Orthodox Jewish Enclave settlements in Brooklyn. His research used a geocoded list of all synagogues, yeshivas (religious schools), and kosher food establishments in the Brooklyn area. Performing density mapping, he looked for areas with high organizational density that were characterized by an increased concentration of religious sites. He also looked at the racial composition of the surrounding neighborhoods. His work illustrated that an abrupt change in density indicated that there was a Jewish Enclave (Gallagher 2009). While this research was specific to just one ethnic/religious enclave the possibilities for this methodology far supersede this one topic. Any subculture group with identifiable map-able elements could be analyzed and

understood using this process. This method could be used to identify if other religious groups present themselves as enclaves such as the Amish or Latter-Day Saints, while not approached in the scope of this study is an area that could add further understanding of the religious landscape of America at a neighborhood scale.

2.2.6 Religious Regions

Spatial patterns and the distribution of religions are main thematic areas in the geography of religion. There are two main approaches to this: looking at the distribution of religious groups across space either as individuals or groups and the delineation of regions based upon this distribution. Bauer (2006) points out that regionalization studies have a long history, most of which focused on grouping regions based on dominant group counts; however, current research is taking novel approaches, including Crawford's (2005) examination of the centroid, and weighted mean of 10 major religious groups showing their shift or stability over time.

Bauer uses GIS cluster analysis to define more current religious regions in the U.S. – grouping counties together based on their religious statistics. He then classified the religious groups based upon Melton's classification scheme that holds groups together that share common theology, history, and lifestyle. From there he created maps that illustrated the religious groupings for the entire population of the U.S. for three successive decades (Bauer 2006). Similarly, this

study examines religious regionalization. However regions are defined based on the diversity rather than the dominant denominational family.

Wu and Tong (2012) examined Buddhist temples in China using GIS to look at the distribution of religious sites compared with different levels of regional religious systems. Buddhist temples are local institutions that are not dependent on the political framework. Because they are dependent on socio-economic and geographical factors for their development they can serve as an accurate index to socio-cultural development. Their work showed that the actual density of Buddhist temples did not necessarily follow the traditionally understood and documented regions. Performing density mapping on the location of Buddhist temples shows the boundaries that can create sub-regions within the larger framework or cause existing boundaries to be adjusted (Wu and Tong 2012). This study will build upon this examination of individual church locations and look at the clustering of individual church locations in hopes of uncovering a theory of denominational clustering.

2.3 Data Limitations

Limits in spatial datasets are an inherent challenge in studying religion within a geographic framework. There are limited spatial data for this topic both in scholarly literature and readily usable datasets. In the U.S., there is no governmental source of data on religious demography; the only acquirable data

comes from private organizations (Zelinsky 2001). The data to map out different dimensions of religion at various scales is near to impossible due to a lack of information. Data on church structures have not been gathered with any global reliability at any useful spatial resolution. Some countries, such as western European countries and the U.S., have more and better data than others but it is often still insufficient for a thorough analysis. However, Christianity has more followers and better statistical documentation than other religions making it much more approachable for study. The U.S., more than any other country, has also been the focus of much study, due largely to the availability of private datasets (Park 2004).

Given the lack of consistent data sources, geography of religion is constrained. One of the subsidiary benefits of this study is the creation of a new data set for the U.S. This data set encapsulates the physical location of a church structure as well as its denominational affiliation. While imperfect, it adds benefit to the study of the geography of religion at the individual church level.

The wide range of topics covered in the literature of the geography of religion sets the tone for new ways of looking at the religious landscape. As Kong (2001) implies, there is room for a 'new' religious geography that explores diversity in a different manner than has been previously undertaken (Kong 2001). The GIS techniques used by Gallagher (2009) and Wu and Tong (2012) highlight an avenue for extrapolating regional scale data from point level data. The combination of these ideas underpins the attempt in this study to use GIS as

a tool for understanding the regional variations in the diversity and composition of the churchscape and for exploring ideas of the spatial relationship churches have with one another.

Chapter 3 Methodology

Using GIS tools, this study aims to explore the churchscape of America. This is an initial investigation of church locations, revolving around the regional and spatial variations of religious diversity, spatial clustering, and congregation size. The objective of this study is to explore hypotheses about the impact of religious diversity on the spatial clustering of churches, regional variations in diversity and congregation size.

This study will explore the possible hypotheses through the following questions:

1. How does the physical churchscape vary across regions?
2. What impact, if any, does religious diversity have on spatial clustering of churches?
3. Does denomination play a role in the degree of clustering?
4. What does the landscape of churchgoers or adherent fabric look like?
5. How does the physical churchscape compare with the adherent fabric?
6. What is the relationship between average congregation size and religious diversity?

The county was chosen as the unit of analysis for several different reasons. Counties have long standing unchanging boundaries with a wealth of data collected at their scale. Their presence in all areas of the U.S. assures that areas will not be overlooked and all regions will be considered in the analysis. There are

3,141 county or county equivalents in the U.S. This study also includes the District of Columbia and the City of Baltimore, bringing the total number of geographic entities to 3,143. Other units of analysis such as census tracts or metropolitan statistical areas do not have the same scope of data collected on them, making them less viable candidates for this study.

3.1 Data Sources

This study takes advantage of two distinct data sets: a polygon data set with data aggregated at the county level and a point data set that represents each individual church on the landscape. Given the complexity of the religious landscape using the two data sets affords an opportunity to look at churches and church-goers from micro or point level scale, and a macro or county level scale. This allows for an exploration of the landscape from different angles adding richness to the study.

The polygon data set comes from The Association of Religion Data Archives (ARDA). The data from ARDA have been collected by scholars and research institutes through surveys, polls, and other data collections since 1997. It is housed under the Department of Sociology at Pennsylvania State University (ARDA 2010). The 2010 Congregational Data that is a main component of the ARDA data was gathered by the Association of Statisticians of American

Religious Bodies, originally appearing in the 2010 U.S. Religion Census: Religious Congregations & Membership Study.

The ARDA data set includes congregational counts for each county, covering both physical meeting places, represented as congregations as well as counts of adherents within each congregation. Adherents are understood by ARDA to be any current member, unaffiliated attender, baptized believer, or child of an attender (ARDA 2010). The data for adherent numbers and congregation counts was gathered by researchers who contacted the administrative body for each denominational family requesting specific congregation counts and adherent numbers. This approach makes the data more reliable than individual survey data, which is noted to be erroneously over reported by some congregations and underreported by others (Hout and Greeley 1998).

Collecting religious data is challenging with some congregations being undercounted, some being over reported and others missed entirely (Grammich et al. 2012). ARDA recognizes the potential shortfalls in their congregation data and addresses one such issue with the following explanatory disclaimer: ". . . The 2010 reports contain incomplete counts of congregations and adherents belonging to the eight largest historically African-American denominations. These denominations are not included in the 2000 reports and are largely missing from the 1990 and 1980 reports" (ARDA 2010). In spite of acknowledged short-comings, this data set is very robust and covers all counties

in the U.S., making it one of the most thorough sources of religious data currently available.

The point level data set comes from a Church database purchased from Oddity Software. It is comprised of individual churches coded with church name, address, denominational affiliation, pre-identified latitude and longitude, and website address. According to the Oddity website, the data are updated every 120 days and should cover over 68,000 worship location across 18 denominations (Oddity Software 2012). No methodology for data collection was provided in their literature. Thus, it is impossible to know how the purportedly full population of churches was established. As will be discussed later, it is likely that this dataset also undercounts churches in the U.S.

The Oddity data contain 93,345 records of church locations in the U.S. For this project, the data were imported into Excel from the purchased CSV file. The data were then sorted by state and county, in preparation for data clean up. From this set 3,133 entries were removed as they represented locations that were not churches. Entries in error included facilities easily mistaken as churches such as religious day care centers and wedding chapels, as well plainly erroneous facilities such as car washes, roofing companies, and restaurants. Of the remaining entries, nearly 60,000 of them required manual denomination classification.

The manual classification process took many weeks and included such steps as identifying denomination through obvious naming conventions, such as Baptist or Methodist. Denomination was also determined by visiting church websites and searching for affiliation either through direct reference or indirectly through doctrinal statements. Additionally, names were run through the search function on the ARDA website to determine which denominational family they belonged to. In the interest of continuity, the congregations were classified into families using the same grouping as the ARDA data. A note of importance is that this data set neglected to provide a church location for 619 counties out of 3,143, an omission of 19.6%. While incomplete, this collection represents the best available point dataset on church structures in the U.S.

3.2 Denominational Groupings

Each of the data sets went through a process of denominational grouping. The individual denominations were grouped into religious families. A religious family can be thought of as a group of denominations that has a shared historical origin (The Pew Forum on Religion & Public Life 2008). Melton's classification takes into account 10 characteristics grouped into 3 categories: history, thought life, and behavior patterns (Melton 2004). History represents the group's own understanding of its history as well as the outsider view. Thought life includes the overall belief system and any specific beliefs that may differ from other groups. Behavior patterns include ethics, worship format, organization structure,

and any distinct spiritual practices. This method is particularly useful for understanding the wide variety of different forms of Christianity found in America. It is a well-known classification schema used in religious research and the backbone of the Encyclopedia of American Religions making it the appropriate choice for this study (Melton 2004).

Other existing methods for denominational classification include Bryan Wilson's classification scheme, which is organized by the path to salvation, and Elmer Clark's approach that classifies groups based on their organizational thrust (Melton 2004). Yet another approach is the typological system used by Bauer in his revisiting of the religious regions of the U.S. However, it is limited to 9 classes not seeming to embrace the full diversity of the landscape (Bauer 2012). These alternative schemes were considered but found to be less comprehensive than Melton's classification system. Tables 1 and 2 illustrate the results of the classification system on each of the data sets. As a point of clarification, Non-Denominational Christian counts represent churches that identify with the New Testament church structure and theology and are not a catch-all classification. The category of "Other" represents churches that do not appear to fit into any of Melton's family groups. While the denominational classification attempts to account for as much variety as possible, the finer groupings in non-Christian religions are not included in this grouping, for example all Muslim groups are categorized as Muslim rather than differentiated as Shiite or Sunni.

Table 1: ARDA data denomination counts

Denominational Family	Number of Churches
Adventist	5,885
Amish	1,869
Anglican	913
Baha'i	1,130
Baptist	1,710,725
Brethren	2,371
Buddhist	2,854
Catholic	20,718
Christian Scientist	1,153
Communal	1
Friends	1,329
Hindu	1,625
Holiness	12,945
Independent Fundamentalist	120
Jain	71
Jehovah's Witnesses	5,769
Jewish	3,529
Latter-Day Saints	14,393
Liberal	1,022
Lutheran	18,848
Mennonite	1,342
Methodist	51,536
Muslim	2,106
Non-Denominational Christian	35,496
Orthodox	2,551
Other/Unknown	34,999
Pentecostal	35,168
Presbyterian	17,404
Shinto	5
Sikh	246
Spiritualist	34
Tao	43
Zororastrian	33
Total Number of Congregations	1,988,199

Table 2: Oddity point data denomination counts

Denominational Family	Number of Churches
Adventist	812
Anglican	3,014
Bahai'i	119
Baptist	20,298
Brethren	349
Buddhist	53
Catholic	10,590
Christian Science	205
Communal	2
Friends	78
Hindu	22
Holiness	2,476
Independent Fundamentalist	412
Jehovah's Witnesses	252
Jewish	1,244
Latter-Day Saints	2,460
Liberal	88
Lutheran	7,750
Mennonite	180
Methodist	9,188
Muslim	163
Non-Denominational Christian	7,479
Orthodox	654
Other	187
Pentecostal	11,276
Presbyterian	7,359
Quaker	3
Sikh	14
Spiritualist	298
Unknown	3,315
Total Number of Congregations	90,340

3.3 Data Quality

Prior to exploring the results in detail, it is important to compare the potential errors between the data sets. The diversity index for each county was examined between the ARDA and Oddity data. Figures 1 and 2 illustrate counties where the diversity index was 0 or 1. An index of 0 indicates that there is either no diversity or that there was missing data for the county. An index of 1 indicates perfect diversity. This score was found in counties where there was either only one church or one each of a combination of congregational families. These two scores expose the possible points within the data sets that the results could be considered less reliable.

The ARDA Data had very few areas that were missing data or had an index of 0. There were 29 counties or county equivalents out of 3,143 that had potential outlier data. Five counties possessed a diversity score of 0, in each case this was attributed to single denominational dominance. The additional 24 counties had scores indicating perfect diversity. The Oddity Data did not fare so well. There were 1,637 records that were potential areas of less reliable results in this data set. For the purposes of diversity calculations the ARDA data were considered the more reliable source. Figures 1 and 2 illustrate the location of the counties with the potentially problematic data.

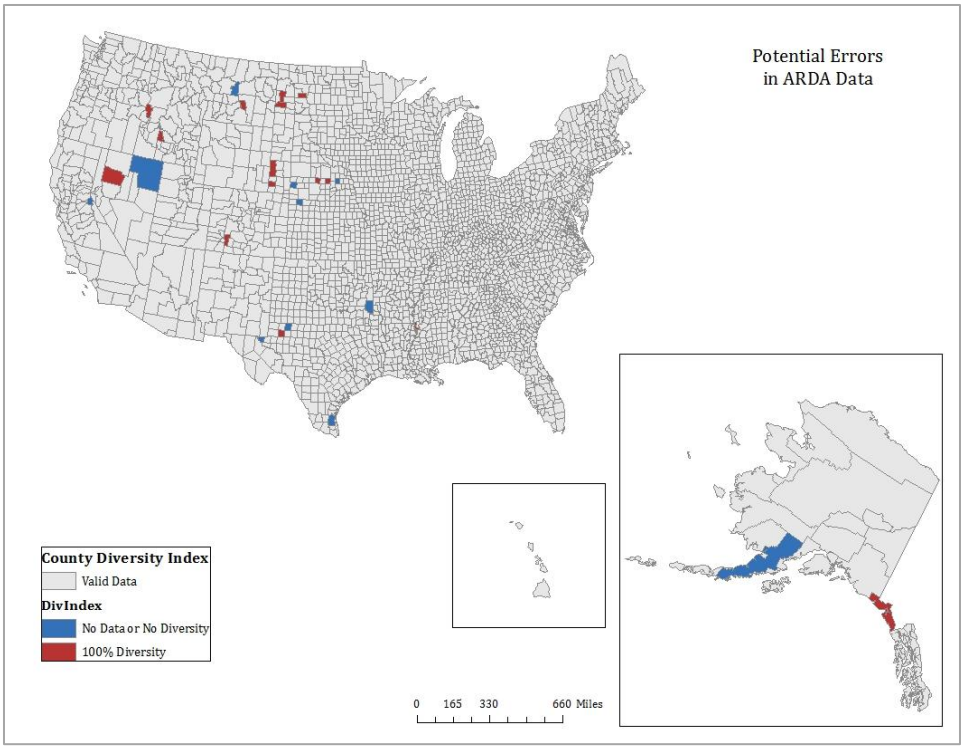

Figure 1: Counties in the ARDA data with a diversity index score of 0 or 1.

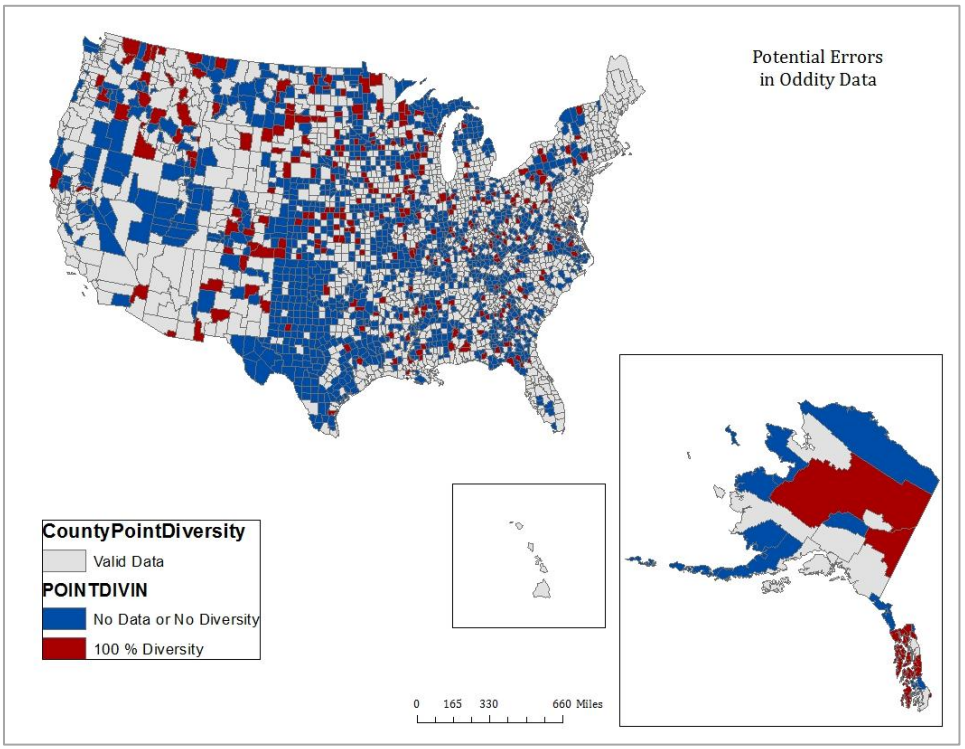

Figure 2: Counties in the Oddity data with a diversity index score of 0 or 1.

3.4 Diversity Index Calculations – Simpson Index of Diversity

In order to map and analyze the religious diversity of the American Churchscape, a diversity index had to be calculated for each county. There are a multitude of methods for calculating diversity, many of which come from the field of biodiversity and ecology (Lu, Wagner and Chen 2007). For the purposes of this study the Simpson Index of Diversity was used, which calculates the probability that two randomly chosen samples will be of different species (Khan 2013). It takes into account the number of species present and the relative abundance of each species. The formula for the Simpson Index of Diversity (SID) is:

$$SID = 1 - D \quad (1)$$

where $D = (\sum n (n-1))/ (N (N-1))$; n= the total # of organisms of a particular species; and N = the total number of organisms of all species. The results fall within a range of 0 to 1. Scores closer to 0 indicate lower level of diversity. Scores closer to 1 indicates higher levels of diversity. As the value of D increases the diversity decreases.

This method takes into account both richness and evenness. It is important to note that this index is "heavily weighted to the most abundant species in the sample while being less sensitive to species richness" (Khan 2013, 2). Species richness focuses on the sheer number of different species and does not take into account the relative abundance of the species. In practical terms this

index does not address diversity in terms of small non-Christian denominations, the species richness, instead focuses on relative abundance, which is exhibited predominantly by Christian denominations. Counties with an overabundance of one specific denomination and a scattering of many other denominations will appear less diverse than a county that has a more equitable count of each denomination. This limitation in the formula is offset by the lack of susceptibility to sample size found in other diversity index formulas, enabling counties with differing sample sizes to be more readily comparable.

County religious diversity was then calculated and mapped for each county in both the ARDA and the Oddity datasets. The data were originally symbolized using the Geometric Interval classification method, Quintiles, as well as the Natural Breaks (Jenks) method. The Geometric Interval is well suited for data that are not normally distributed and have a high count of duplicate values, as these data sets do. It produces an easy to interpret visual display. Quintile classification is useful for grouping data into easy to understand categories such as low, medium low, medium, etc. This produces easier to interpret visual output while still maintaining data reliability. The Natural Breaks (Jenks) classification groups classes together to make them as similar as possible while maximizing the differences between classes. This produces data that is partitioned into natural groups found within the data. The Geometric Interval classification methodology was chosen because the data sets are not normally distributed and have high counts of duplicate values.

The Oddity data were found to be of such poor quality that they were not utilized for the diversity calculations. The overwhelmingly high rate of missing data made it an unacceptable candidate when compared against the more complete ARDA data set. While incomplete, the Oddity data represents the type of data that are available at the individual point level, making it the only viable candidate to use for spatial clustering analysis.

3.5 Nearest Neighbor Calculations

As a means to examine the spatial clustering of the location of churches on the landscape in relation to diversity, the Oddity Data were run through a series of Nearest Neighbor calculations. This method's main purpose is to determine the distance between a feature and its nearest neighbor and then calculate an average that is used in an index, useful for comparing the clustering of features (Esri 2013). The purpose in this study was to see to what degree churches of specific religious families are clustered together in the American Churchscape. Is it the case that like denominations stick together spatially?

The Nearest Neighbor measure first calculates the distance between the points and their nearest neighbor and then calculates the average from the data set. If the ratio is less than the expected average for a random distribution, then the finding is considered clustered. If it is greater than the expected average,

then it is considered dispersed. The Nearest Neighbor calculations are performed by first calculating the Average Nearest Neighbor Ratio;

$$ANN=Do/De \quad (2)$$

where Do is the observed mean distance between each feature and their nearest neighbor,

$$Do = \frac{\sum_{i=1}^{n} d_i}{n}, \quad (3)$$

and De is the expected mean distance for the features given a random pattern,

$$De= \frac{0.5}{\sqrt{n/A}} \text{ (Esri 2013).} \quad (4)$$

The closer to 0 the results the more clustered the points, while a reading of 1 indicates randomness, and a reading above 1 tends toward dispersion. This method is effective for comparing features within the same study area and best used on point data. However, it is sensitive to size changes. The results can be greatly skewed by the geographic size of the county. A county with a larger geographic size will likely show more clustered results than a county of a smaller geographic size using the same point locations.

The density of churches on the landscape varies regionally across the U.S. In order to calculate the clustering of each denomination across regions with similar density, the data points were broken into three regions. West of the Mississippi the settlement patterns tend to be more dispersed with larger empty

spaces between areas of development. East of the Mississippi the settlement patterns tend to be more densely packed and more homogenously distributed. Alaska and Hawaii were best kept as individual cases due to their isolated nature and differing settlement patterns.

To further explore scalar effects this process was run at three additional scales across low, medium, and high diversity areas. Each of the additional sites shares similar geographic sizes to mitigate the calculations sensitivity to size differences. State level calculations were performed on a subset of three states, New Mexico, Mississippi, and New York. County level calculations were performed on Jefferson County, Alabama; Maricopa County, Arizona, and Providence County, Rhode Island. Lastly, the process was also performed at the Metropolitan Statistical Level. The areas chosen were Dallas-Ft. Worth-Arlington, Seattle, and Washington D.C.

Within each of the scales and regions the nearest neighbor ratio was calculated for each of the major denominations and then compared against the ratio for all churches within the same region. This method was used in an attempt to see if there were any noticeable clustering patterns driven by denominational family. This was then compared with the religious diversity index calculations to see if diversity had any impacts on the spatial clustering of churches.

3.6 3D analysis using ArcScene

The use of GIS enabled a novel method for creating a representational fabric of both Churchscape and the landscape of adherents or "Adherentscape". ArcScene, a tool in Esri's suite of visualization tools, allows users to analyze and interact with two-dimensional data in a three-dimensional viewer. This helps to make subtleties in the data more apparent. Standard choropleth maps may be useful in understanding some facets of the data sets, but lack the compositional rendering that ArcScene allows. Used in conjunction with the ARDA data, ArcScene provides an additional resource for understanding the religious landscape of an area.

3.6.1 Visualizing the Churchscape

To create the Churchscape Fabric (CF), each of the largest congregational families was symbolized with a different color at the county level. Then the extrusion or three dimensional setting was set using the following formula:

$$CF = (FC/C) * 10{,}000 \quad (5)$$

where FC = the total count of congregations within a denominational family; C= the total number of congregations within the county; and 10,000 is the factor the result is multiplied by to obtain the extrusion height. With each of the congregational families using the same formula, the one with the largest value becomes the dominant color for the county.

3.6.2 Visualizing the Adherentscape

The religious landscape is composed of more than just the churches. It is also composed of the adherents or churchgoers. To capture what the adherentscape fabric (AF) looks like, each congregational family adherent count was symbolized as a different color at the county level. Then the extrusion setting was set for the ARDA data using the following formula:

$$AF = (AC/A) * 10{,}000 \quad (6)$$

where AC = the total count of adherents per denominational family; A= the total # of adherents within the county; and 10,000 is the factor the result is multiplied by to obtain the extrusion height.

Population variations could have significant impacts on either over- or under-representation of adherent counts. There will also be areas where adherents may live in one county, yet attend church in a different county. In order to minimize the potential problems that could be introduced, these data were also normalized by total population. The following formula was used:

$$AF = ((AC/A) * 10000)/\text{2010 Census Population} \quad (7)$$

The adherent population that has the highest proportion of the population is the dominant color for the county.

3.6.3 Visualizing the Mega-Church Phenomenon

ArcScene was also used to visualize more clearly those regions that had the highest average denomination size. Mega-churches, establishments with attendance counts higher than 2,000, are considered one of the more rapidly growing elements of the religious landscape in America (Warf and Winsberg 2010). The visualization of this phenomenon was performed in hopes of seeing if there was any pattern in the location of these counties in terms of diversity, as well as a dominant denomination. To estimate church sizes, the ARDA data were used to calculate the average denomination size using the formula Total Adherents/Total Congregations. The calculation is an average of total adherents at the county level and does not represent specific counts for individual congregations. This is an alternative way of looking at Mega-Churches, instead of looking at individual churches it looks at the overall abundance of adherents limited to a given number of congregations.

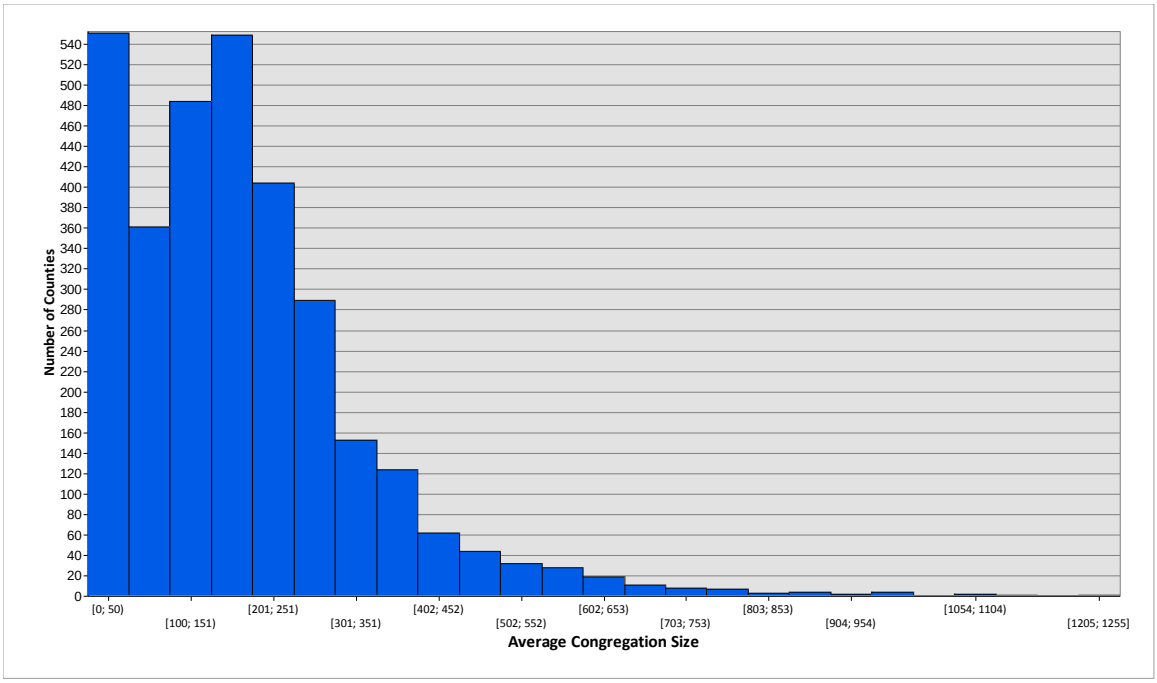

Figure 3: Average congregation size distribution

Figure 3 shows the distribution of average congregation sizes by county. The mean for this data set is 188 while the median is 166. This result was then extruded producing a three-dimensional view of the regions with the highest average congregation size.

3.7 Summary

Understanding the churchscape and adherentscape of America is a complex task. In an attempt to explore the landscape in novel ways, diversity indexes were calculated for each county using a well-known diversity index from ecology using two different data sets. Then the religious diversity was mapped at

the county level in order to visualize the patterns on the landscape. The degree of clustering of churches was calculated to see if there were any patterns amongst denomination. Using ArcScene, a fabric of churches and adherents was created providing a new way of visualizing the religious landscape of America. Lastly, the mega-church phenomenon was mapped using 3D tools providing a new way of conceptualizing the location of mega-churches. The techniques and methods presented here can be used to produce new visualizations of the religious landscape of America. The choices made reflect an effort to explore this topic from many different angles in an attempt to further a thorough understanding of the American Churchscape.

Chapter 4 Results: The American Churchscape

The religious landscape of the U.S. can be viewed and explained in many different ways depending upon the metrics employed. Looked at as a whole, the different regionalization patterns show a complex and diverse landscape of American religion. The introduction of GIS allows for the existing landscape to be explored from new angles. By examining the differences between what the physical locations say about the religious landscape with what the adherents say about the religious landscape a different form of regionalization becomes apparent. Looking at counties using diversity as an indicator illustrates yet another type of regionalization.

4.1 Diversity Index Calculations

The diversity index was calculated for each county and then classified using the Geometric Interval classification. This method is best used on data that is not normally distributed and contains a high count of duplicate values. As shown in Figure 4, the diversity index values for U.S. counties are non-normally distributed. The Geometric Interval classification method provides an easy-to-interpret visual representation of the data that minimizes the issues that can arise in data that are not normally distributed. The pattern shows a bimodal distribution with more counties weighted toward higher levels of diversity.

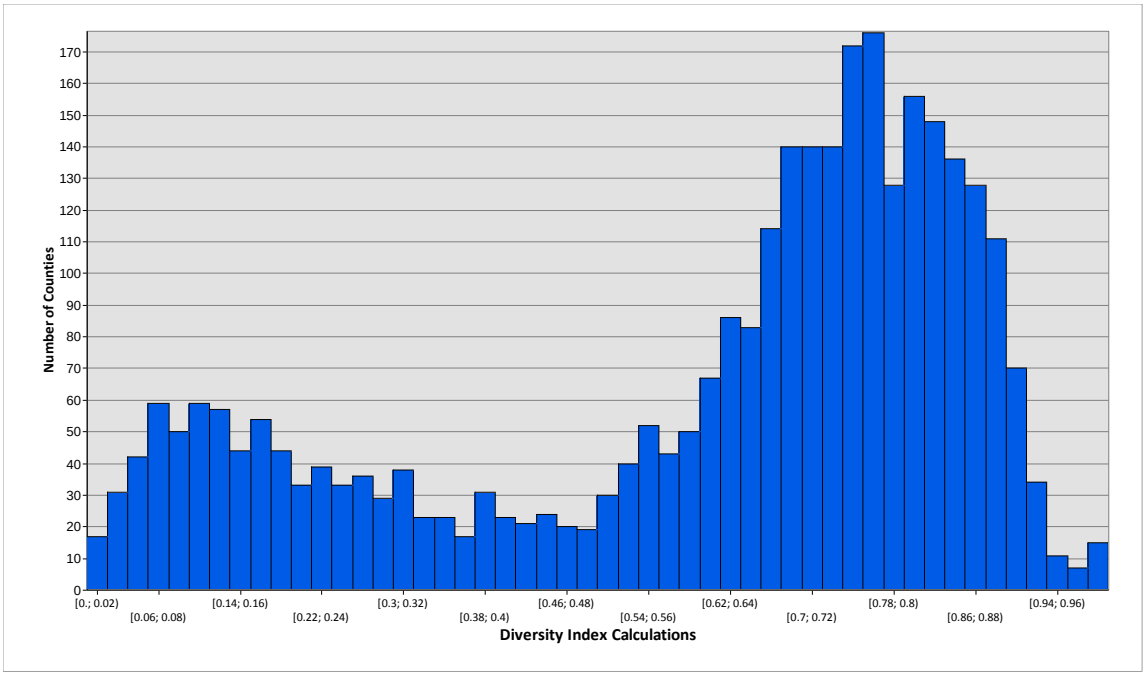

Figure 4: Distribution of diversity index calculations

When mapped, the overall the religious diversity of the U.S. exhibits three main regions. Figure 5 illustrates the collective diversity landscape at the county level. The Northeast region exhibits a broad tendency toward less diversity. The South exhibits predominately moderate levels of diversity. By contrast, the West has many counties with higher levels of diversity interspersed with counties of lower levels of diversity. In the West, the overall trend is toward more diversity, and counties with lower diversity sometimes form distinct sub-regions (e.g., Coastal and Central California, Coastal Washington State).

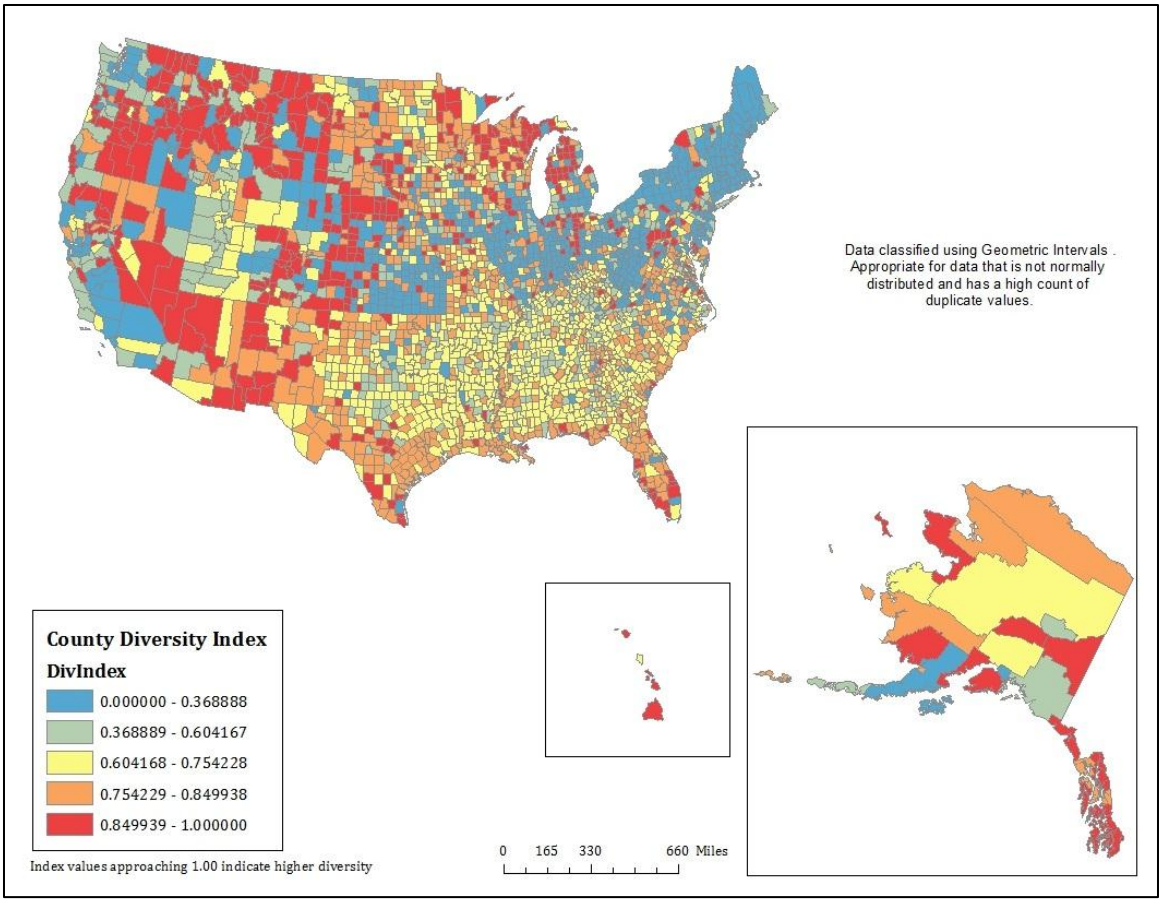

Figure 5: Map depicting religious diversity at the county level

4.2 Regional Religious Landscape Investigations

To look at the religious landscape in further detail, smaller geographic regions were defined. These regions encompass many states and were loosely determined by the overall pattern of diversity. The regionalization following diversity levels is an approach to religious grouping not typically seen. Traditionally, religious regions are defined by the dominant denomination of the area rather than the diversity of the area.

Denominational profiles are also useful for understanding the religious landscape of a region. The religious composition of a region viewed in the frame of diversity shows that the composition and numerical distribution of denominations plays a role in the diversity of the area. For the following regions, the only denominations highlighted graphically were the groups with a larger share of the adherent population. The landscape contains many smaller denominations and many non-Christian groups such as Hindu, Muslim, and Buddhist, but their limited numbers are not as likely to appear as diverse in the landscape even though they represent species richness. This approach looks at the overall fabric of the region rather than the specific details.

4.2.1 Northeastern Low Diversity Region

The states of Maine, Vermont, New Hampshire, Massachusetts, New York, Rhode Island, Connecticut, New Jersey, Pennsylvania, Ohio, Indiana, West Virginia, and Illinois were chosen for this grouping because of the overwhelming presence of counties of low diversity upon visual inspection. The mean religious diversity for the 552 counties in this region is 0.338, the lowest of any region.

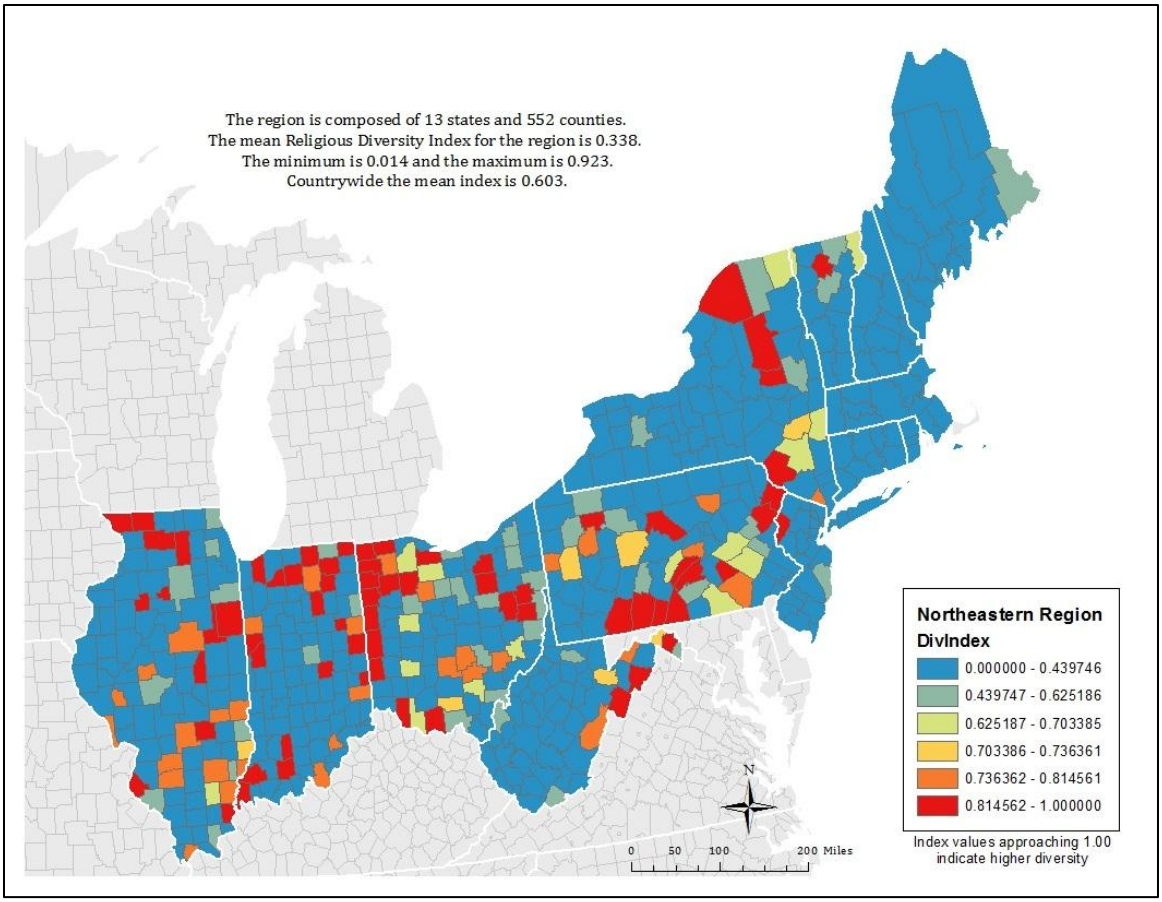

Figure 6: Map depicting the low diversity Northeast Region

This area is defined by two main cultural regions, the New England Region and a portion of the Midwest. The New England culture has been shaped by early European immigration that was largely rooted in a Puritan heritage. A great deal of the culture focused on maritime affairs such as fishing and whaling. Despite the early religious beginnings of the area, it is now according to the American Religious Identification Survey, one of the least religious areas of the nation (Kosmin and Keysar 2009). The other culture region present is a portion of the Midwest. This area is known for its combination of heavy industry and

agriculture. Many Midwesterners share common values that have come to be identified with the Heartland including family, hard work, honesty, and integrity (Zelinsky 1973, Gillin 1955, Kosmin and Keysar 2009).

The religious landscape of the Northeast Region is characterized by numerous small churches. This selection of counties has an average number of 1,772 congregations per county with an average of 86 adherents per church. Many of the congregations appear to be hold-overs from the mainline protestant denominational history of the area. The low number of adherents per congregation is likely a product of the high number of churches in an area noted for its low overall religiosity.

Figure 7 shows the denominational composition of the area highlighting the dominance of Catholic, Baptist, and Methodist congregations. The higher count of churches might be associated with higher levels of diversity, but in this case it is not. Instead, the increased number of churches are confined to a few denominations and coupled with low overall religiosity.

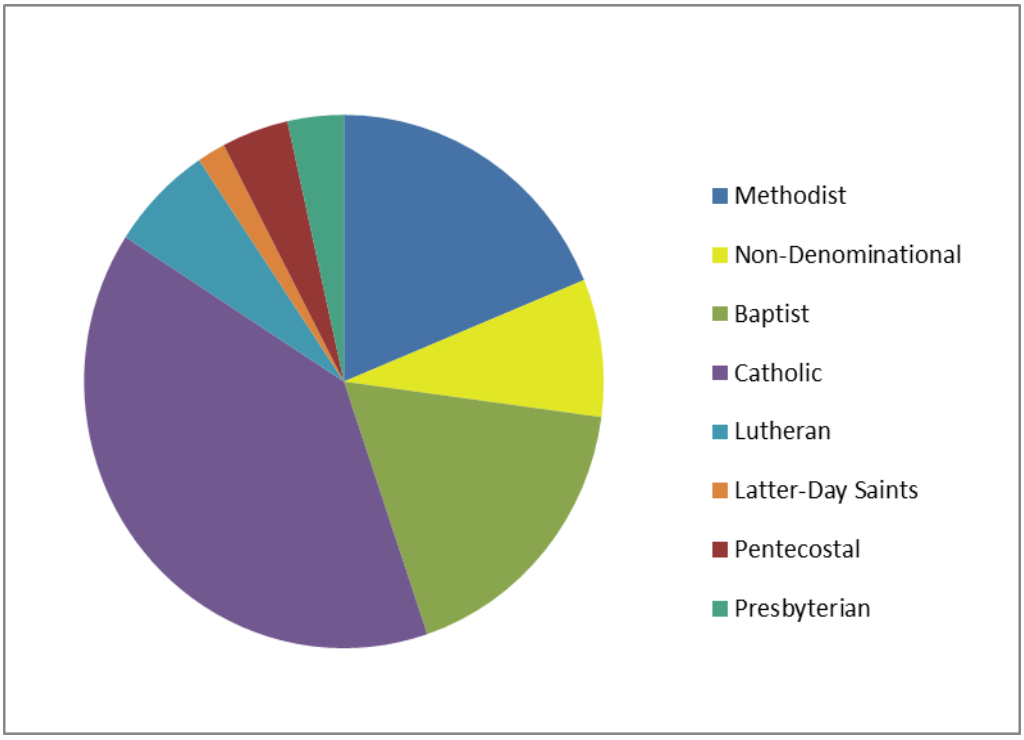

Figure 7: Religious composition of Northeastern Region

4.2.2 North Central Region

This region's 657 counties cover the states of Michigan, Wisconsin, Minnesota, North Dakota, South Dakota, Nebraska, Kansas, and Missouri. Counties in this region have a mean diversity index score of 0.604 closest to the mean for all states, at 0 .603. Kansas is an outlier for this region and seems to fit more closely with the Northeastern Region than any of its surrounding areas.

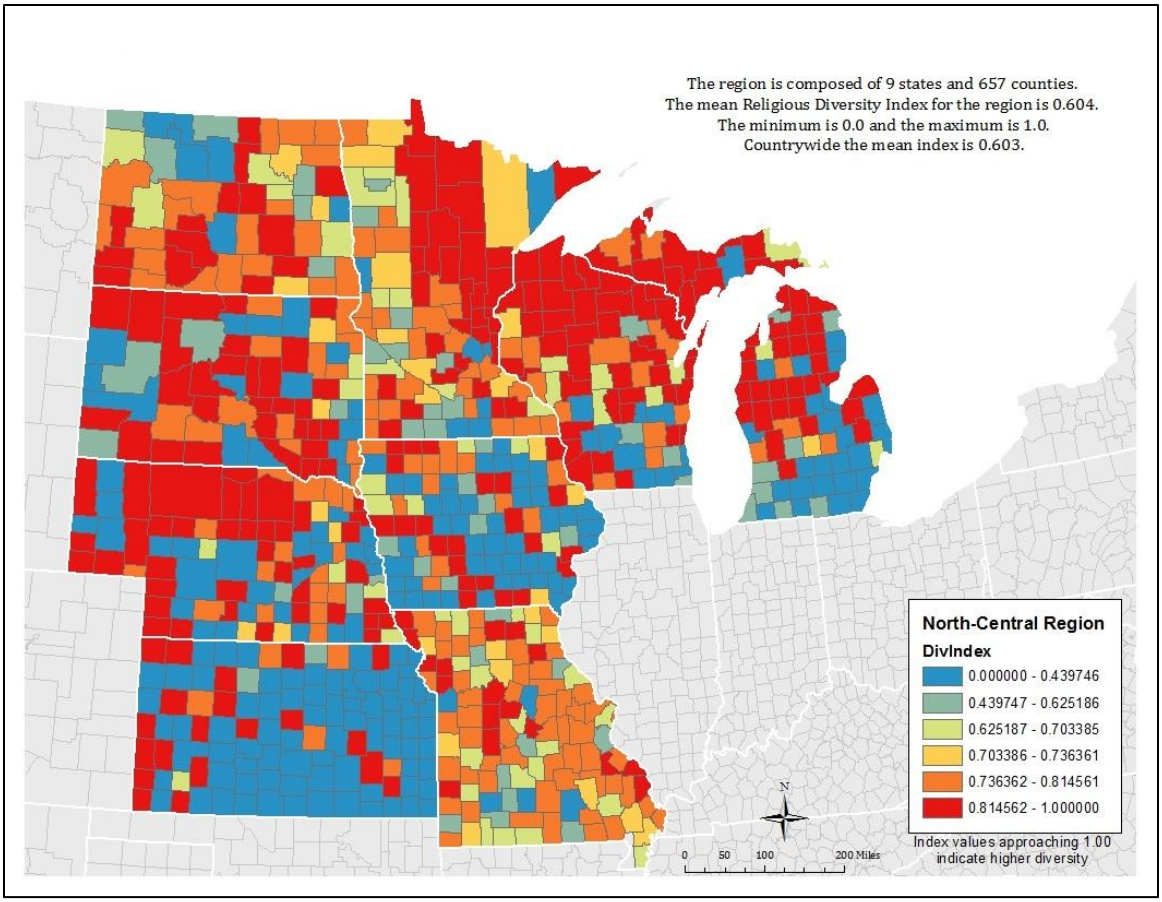

Figure 8: Map depicting the North-Central Region

The culture of this area, particularly the Upper Midwest, is greatly influenced by large numbers of Scandinavians, Irish, German, and Polish. Religion is an important part of the regional lifestyle. The economy is a balance between heavy industry and agriculture, with nearly 65% of the population participating in the workforce according to the U.S. Census. The average median family income is slightly above the U.S. average at $57,998.

The religious landscape of the area is closer to the national mean than other regions. The average congregation count for the selection of counties is 307 with an average adherent count of 177 people per congregation. The denominational profile is a fairly even split between Catholic, Lutheran, and Methodists. This area has the highest percentage of Lutheran adherents in the entire U.S.

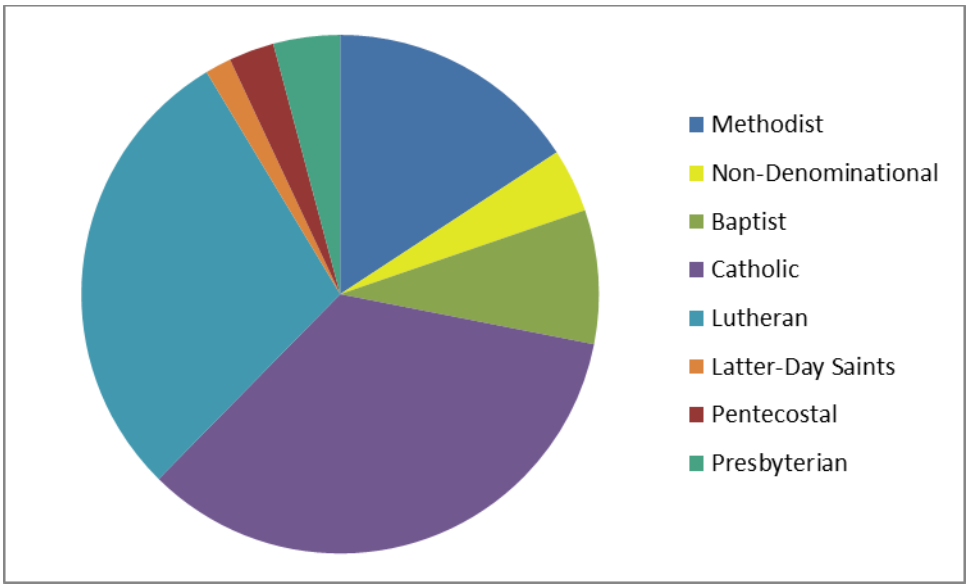

Figure 9: Religious composition of the North-Central Region

Kansas is an outlier in this grouping. The religious diversity for Kansas is significantly lower overall than any of the surrounding states. It more closely follows the pattern found in the Northeast region. What is it about Kansas that makes it an outlier for the region? This is an area that would benefit from a more in-depth analysis than performed here.

Kansas has 105 Counties with a mean religious diversity index of 0.342 and a median diversity index of 0.209. The mean congregation size is 58 with a median of 26. The mean congregation count per county is 507 with a median of 107. The variance between the mean and the median indicates that there are a few counties that have much higher averages than the others and cause the mean to be higher. The relative abundance of farmland supported by small farming communities and the presence of only a few major urban areas likely drive this landscape. Overall the denominational profile is heavily weighted toward Catholics and Methodists as Figure 10 indicates.

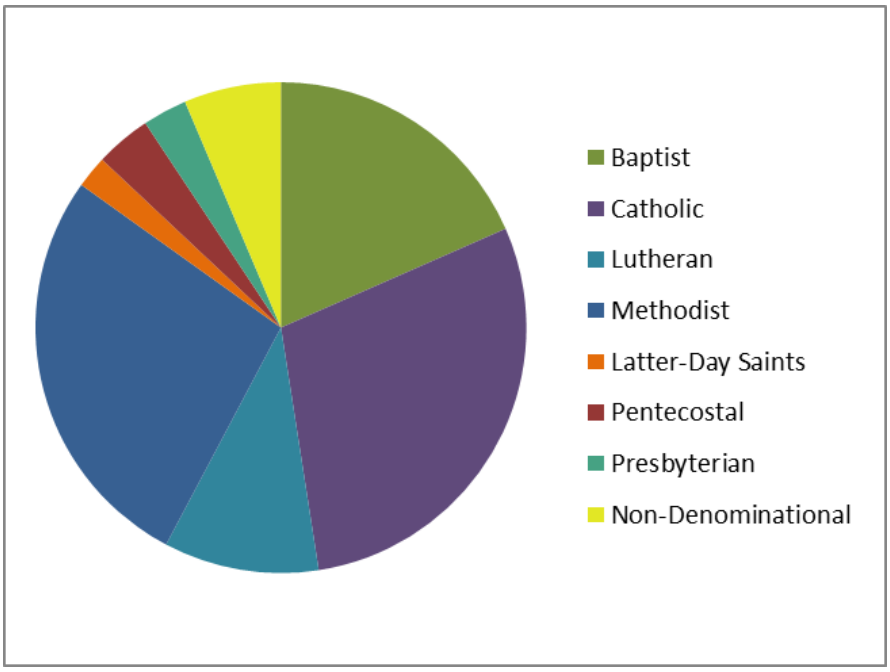

Figure 10: Religious composition of Kansas

4.2.3 Southeastern Bible Belt Region

The eastern seaboard and southern states of Maryland, Delaware, District of Columbia, Virginia, Kentucky, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Tennessee, Arkansas, Oklahoma, Texas, and Louisiana make up the third region. The 1,365 counties in this grouping have a mean diversity of 0.678, the second highest in the regions identified here.

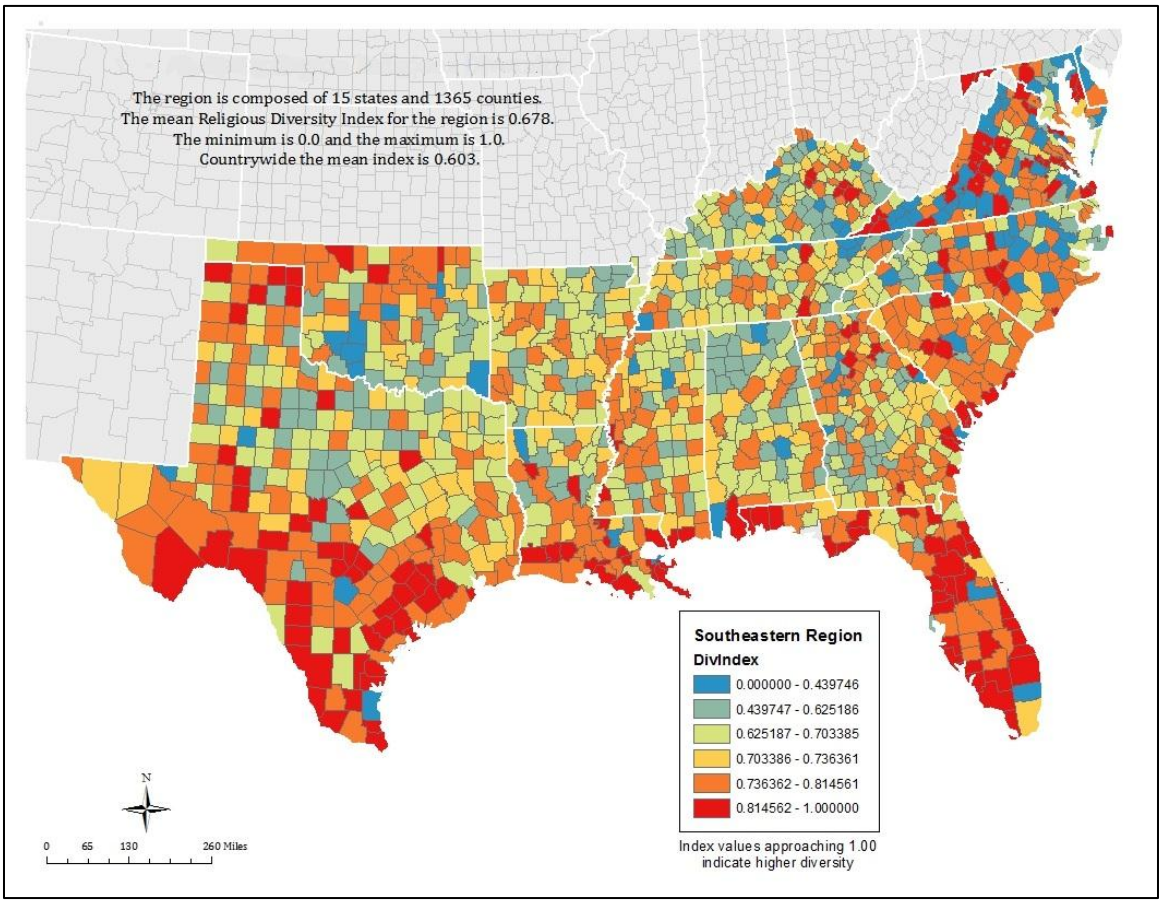

Figure 11: Map depicting the moderate diversity Southeastern Region

Traditionally known as The South, this region was historically dependent on agriculture, and society was stratified along property ownership lines and by a history of slavery, reconstruction, and segregation. The original settlers were primarily of English origin with a large influx of African Americans due to slavery. Religion has always been an important facet of the culture, and is something that is simply part of how life is lived here, giving the region the commonly known nickname "The Bible Belt". This is a distinct subculture region and significantly more politically conservative than the remainder of the U.S (Gillin 1955, Zelinsky 1980).

The religious landscape of the area is overwhelmingly dominated by Baptist congregations as seen in Figure 12. The selection of counties has an average number of 306 congregations with an average adherent count of 235. It has the highest average congregation size of all the regions. The average median income of the region is the lowest of all regions at $51,664. It would seem that the overwhelming dominance of one denomination would create an environment where religious diversity is lower than areas with a more balanced denominational composition. Yet, even in this region, almost half of the church structures host other denominations. Of particular note is the nearly even balance between the Methodist and Catholic churches, the other two principal denominations. While traditional thinking believed that this region was heavily dominated by Baptists and lacking diversity, this study highlights that "The Bible Belt" is much more diverse than commonly believed to be.

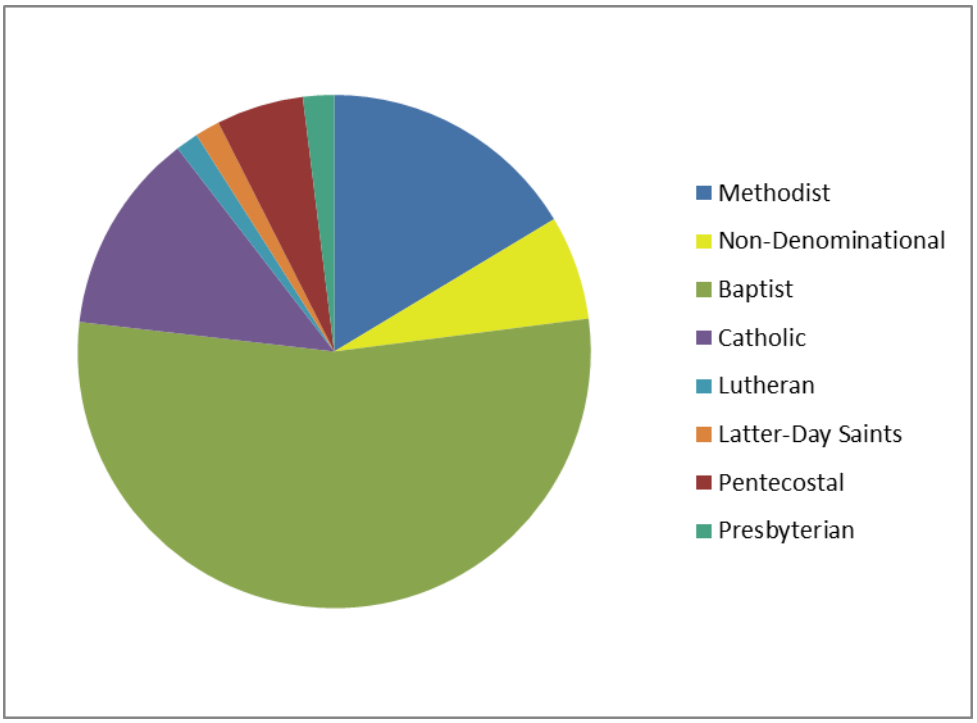

Figure 12: Religious composition of the Southeastern Region

4.2.4 Mountain Region

The region made up of Montana, Idaho, Wyoming, Colorado, Utah, Nevada, New Mexico, and Arizona has a mean diversity index at 0.695. This region of 281 counties exhibits the highest overall religious diversity index of any region.

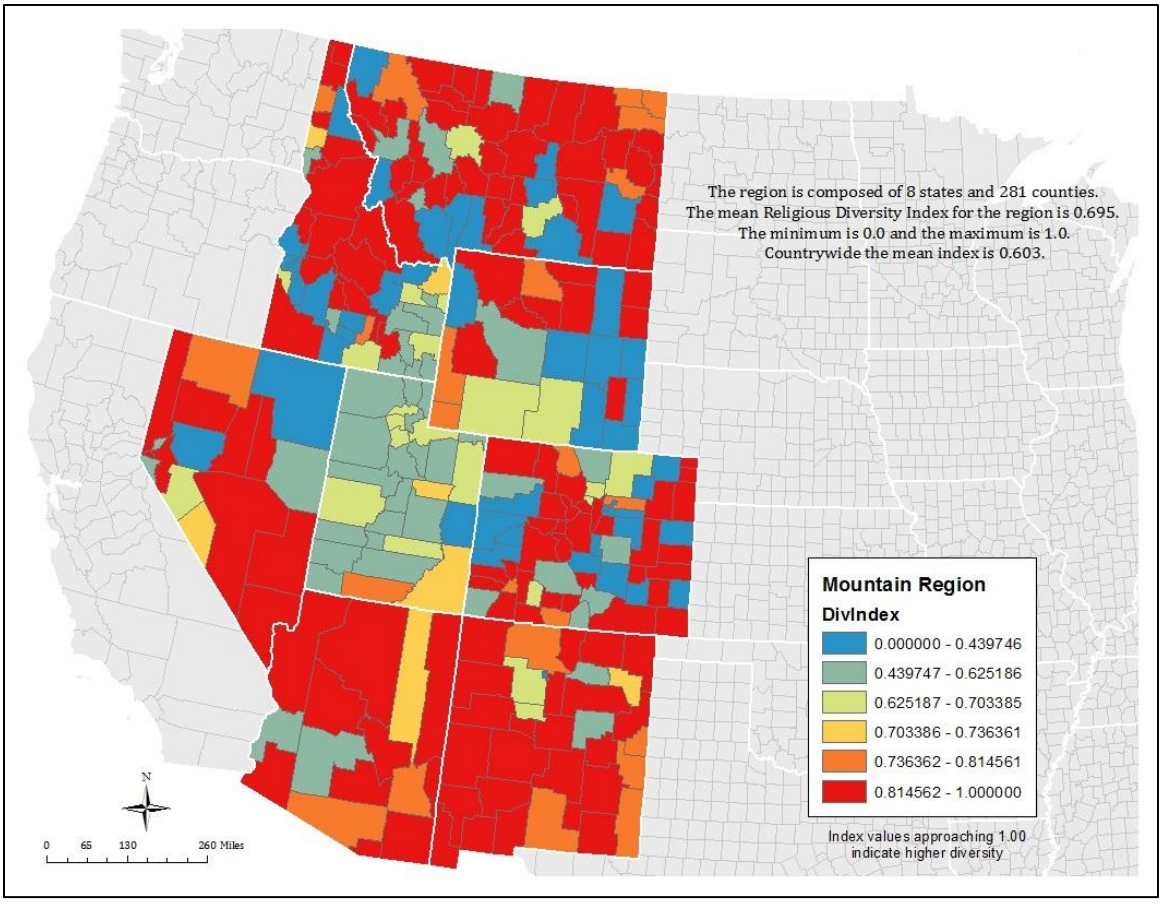

Figure 13: Map depicting the high diversity Mountain Region

The Mountain Region is an area known as a frontier and a haven for independent and free-spirited people. The abundance of wilderness and outdoor activities are a major attraction. Much of the culture is built on the cowboy ethos of hard work and self-reliance (Gillin 1955).

The religious landscape of the area is the most diverse of all the regions. The denominational composition is heavily weighted toward the Latter-Day Saints and Catholics as seen in Figure 14. The Latter-Day Saints have their

headquarters in Utah, which is the area with the lowest diversity of the region, perhaps indicating that the predominant presence of Latter-Day Saints reduces the diversity in that state. However, it is important to note that even Utah has a higher level of diversity than many other states in the U.S. The large numbers of Catholics is likely due in part to the growing of Hispanic populations in Arizona and New Mexico.

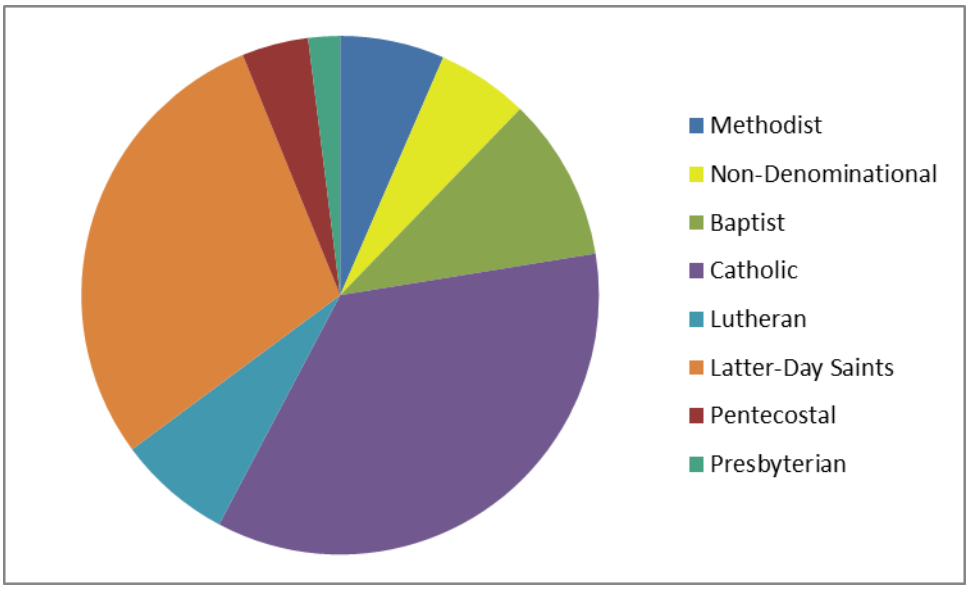

Figure 14: Religious composition of the Mountain Region

4.2.5 Pacific Region

The Pacific states of Washington, Oregon, California, Hawaii, Alaska and their 167 counties make up the final grouping. This region has the second lowest overall diversity with a mean diversity index of 0.632.

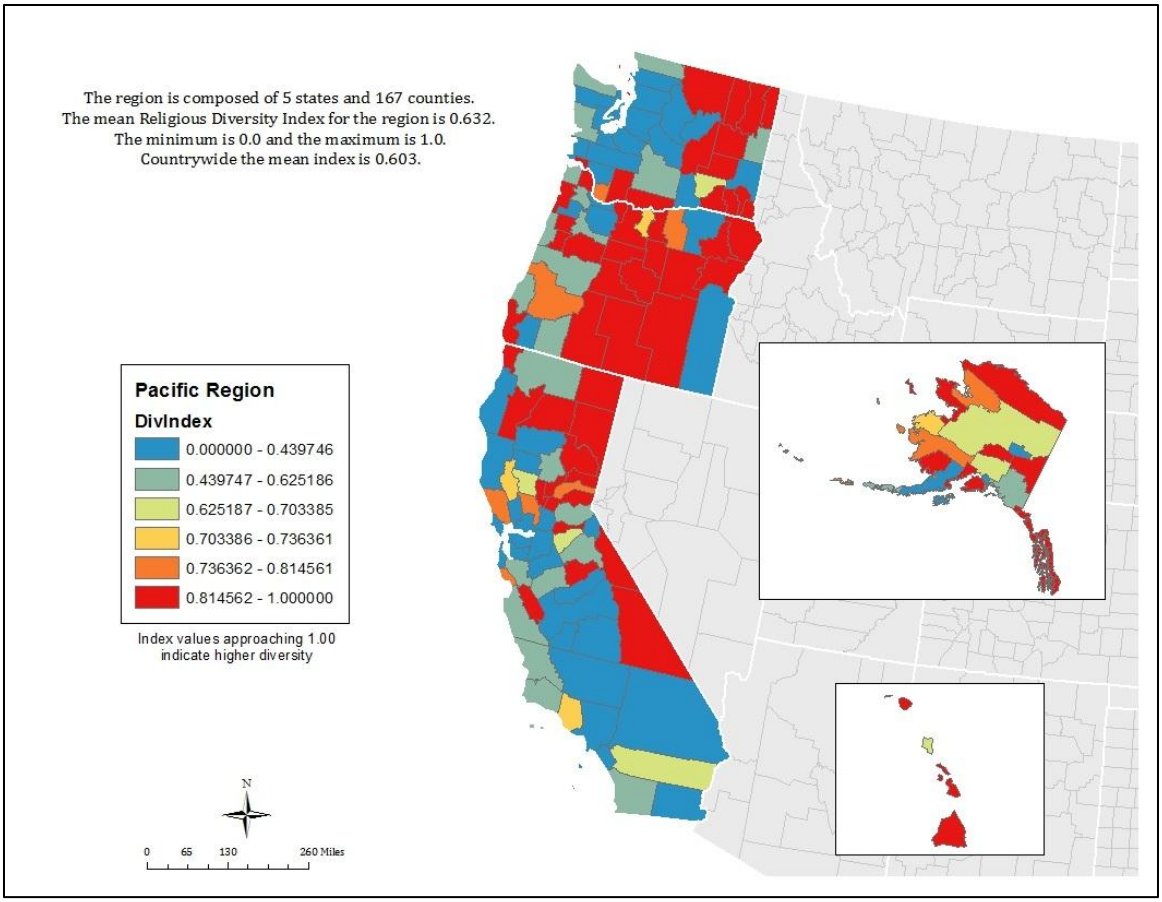

Figure 15: Map depicting the Pacific Region

The Pacific Northwest is a bastion for those wanting a lifestyle that is laid back and revolves around the natural beauty and favorable climate. The landscape is made up of liberal cities thriving on new money from technology ventures, juxtaposed by very conservative agricultural or ranching rural areas. Overall there is a very low population density. California is unique in terms of culture, an immigration destination, and its role in show business, technology,

finances, and agriculture. This region is known for its loose family ties and high value placed on mobility (Gillin 1955).

The religious composition of the Pacific Region, as seen in Figure 16, is surprising considering its long time association with a lack of strong religious ties. This area is largely Catholic with secondary dominance split between Baptists and Methodists. Non-Denominational Christians have a greater presence in this area than any other area. Perhaps the relative newness of settlement and the influx of different cultures make a denomination that is different than the traditional mainline denominations appealing.

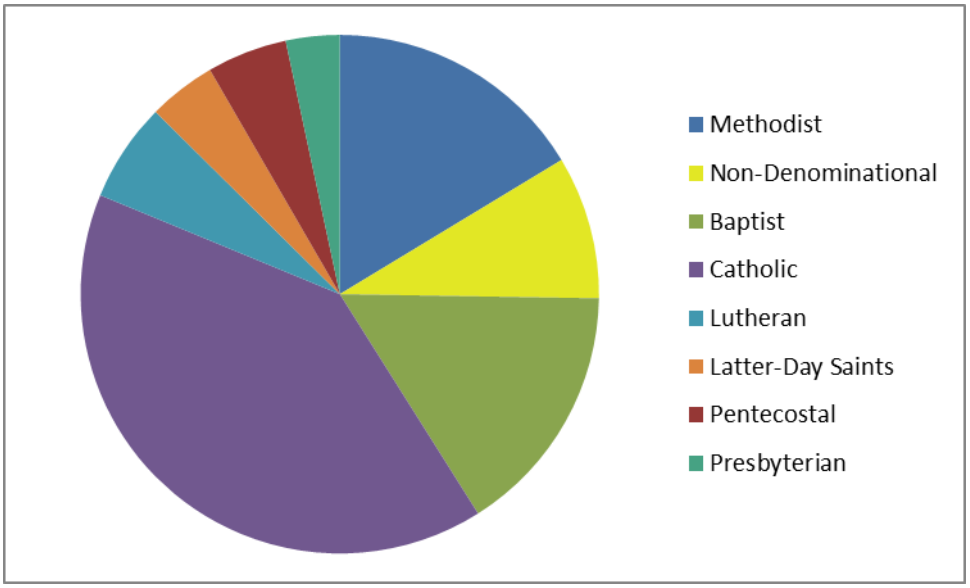

Figure 16: Religious composition of the Pacific Region

4.3 Multi-Scale Nearest Neighbor Calculations

This study also set out to look at the spatial clustering of churches on the landscape at various scales ranging from broad regions to selected states, counties, and metropolitan statistical areas across differing scopes of religious diversity. The process entailed performing Nearest Neighbor Calculations for all churches and then each of the major church denominational families, by region, state, county, and then metropolitan statistical area. The goal was to determine if the physical churches for particular denominations are spatially clustered in the U.S. Do particular denominations isolate their church structures in areas with like-minded denominations? The closer to 0 the resulting statistic the more clustered the locations, whereas a statistic closer to 1 indicates randomness, and statistic greater than 1 indicates dispersion.

The broad regions included counties east of the Mississippi, counties west of the Mississippi, Alaska, and Hawaii. This method for grouping counties was chosen for the differences in development pattern and density. This study is not interested in comparing between the regions, to do so would require a method for normalizing data based on development patterns.

Tables 3 through 6 illustrate the differences between each of the broad regions and each denominational family. Overall the calculations for All Churches showed the highest degree of clustering. Thus, although churches of all denominations tend to be clustered in the landscape, particular denominations are not isolated from others.

Table 3: Nearest neighbor calculations for Eastern Region

	Nearest Neighbor Index	Number of Churches
All Churches	0.196893	55,518
Adventist	0.352769	393
Anglican	0.32488	2,011
Baptist	0.256257	12,965
Catholic	0.303351	6,837
Holiness	0.40367	1,447
Latter Day Saints	0.470106	374
Lutheran	0.287287	4,655
Methodist	0.315932	6,525
Non-Denominational Christian	0.309229	4,033
Pentecostal	0.378639	6,393
Presbyterian	0.281524	5,295

Table 4: Nearest neighbor calculations for Western Region

	Nearest Neighbor Index	Number of Churches
All Churches	0.201364	32,903
Adventist	0.330107	398
Anglican	0.305625	883
Baptist	0.209628	7,121
Catholic	0.292004	3,501
Holiness	0.395654	955
Latter Day Saints	0.341544	1,887
Lutheran	0.225542	2,991
Methodist	0.263263	2,527
Non-Denominational Christian	0.236298	3,311
Pentecostal	0.315243	4,623
Presbyterian	0.28609	1,936

Table 5: Nearest neighbor calculations for Hawaii

	Nearest Neighbor Index	Number of Churches
All Churches	0.103136	608
Adventist	2.757913	7
Anglican	1.113632	17
Baptist	0.172192	44
Catholic	0.51014	49
Holiness	0.810967	24
Latter Day Saints	0.172192	159
Lutheran	2.831444	12
Methodist	0.315605	18
Non-Denominational Christian	0.715294	30
Pentecostal	0.173564	105
Presbyterian	0.816797	34

Table 6: Nearest neighbor calculations for Alaska

	Nearest Neighbor Index	Number of Churches
All Churches	0.166722	530
Adventist	1.000772	11
Anglican	0.775257	15
Baptist	0.374415	50
Catholic	0.464449	43
Holiness	0.206651	40
Latter Day Saints	0.661897	32
Lutheran	0.189746	38
Methodist	0.297655	24
Non-Denominational Christian	0.130482	64
Pentecostal	0.347446	97
Presbyterian	0.418347	14

In examining the clustering data for each denominational family it is important to look at the number of churches for each denomination that factor

into the nearest neighbor statistic. It could be a safe assumption that the law of large numbers could be at play; denominations with more congregations will have more clustered results and denominations with fewer congregations will show more random or dispersed statistics. This does not appear to carry through within this data set. In the Eastern Region, Table 3, Anglican and Adventist denominations have markedly different counts and quite similar statistics. There are a total of 2,011 Anglican churches with a nearest neighbor statistic of 0.32488; yet there are only 393 Adventist denominations that produce a statistic of 0.352769. Given that there are five times more Anglican churches than Adventist churches, it might be safe to assume that Adventist denominations would show significantly less clustering, perhaps five times less, than Anglican churches. The statistics do not show this.

Non-Denominational Christian congregations in Alaska were the only family that exhibited a higher degree of clustering than the calculation for All Churches within the same region. This was true across all of the four broad regions. With the exception of Jews and Presbyterians, all Western Region churches exhibited higher degrees of clustering than the Eastern Region churches, in spite of the smaller denominational counts. This was an expected result given that the observed development pattern in the Western U.S. follows a much more clustered pattern than the diffuse homogeneous pattern seen in the Eastern U.S. The density calculations for Hawaii were quite varied, some

congregations like the Baptists exhibiting tightly clustered results while others such as the Adventist and Lutheran congregations were quite dispersed.

The results indicate that development patterns dictate to a large degree the clustering of churches on the landscape. In areas where development is diffuse, the churches can be expected to exhibit less clustering than in areas where development is clustered. Denomination did not appear to play an appreciable difference in the clustering of churches overall. The two denominational families with the largest ranges of clustering were the Adventists and the Lutherans, each because of their dispersed results from Hawaii.

The states chosen for the analysis included states of similar geographic size but different religious diversity results. In part, this was done in an effort to explore whether the spatial scale of the analysis influences the basic conclusions. The states chosen were the high diversity state of New Mexico, the moderately diverse state of Mississippi, and the low diversity state of New York. The results are included in Table 7. A score closer to 0 represents a greater degree of clustering while a score closer to 1 indicates randomness and a score above 1 indicates a greater degree of dispersion. The results for the clustering of All Churches illustrates that the number of churches does not play an appreciable role in the clustering statistic. New Mexico had the fewest number of churches and the most clustered result. Methodist denominations exhibit similar disregard for the law of large numbers. New Mexico has 30 congregations and a statistic of 0.522495, Mississippi has 70 congregations with a statistic of

0.327665, while New York has 462 congregations and a statistic of 0.477637. The statistic from New York, if it were following the law of large numbers would show a result significantly more clustered than either of the other states.

Table 7: Nearest neighbor calculations by state

	New Mexico	Number of Churches	Mississippi	Number of Churches	New York	Number of Churches
All Churches	0.17752	593	0.380425	908	0.228347	3627
Adventist	0.716379	8	0	1	0.558727	24
Anglican	0.880838	14	1.269823	17	0.398906	227
Baptist	0.336409	62	0.296646	335	0.319985	343
Catholic	0.599113	79	0.56146	44	0.372842	912
Holiness	0.929161	18	1.129171	20	0.408271	63
Latter-Day Saints	0.598812	75	1.149568	12	1.643511	7
Lutheran	0.234839	27	0.926785	12	0.387794	340
Methodist	0.522495	30	0.327665	70	0.477637	462
Non-Denominational Christian	0.438409	46	0.539929	39	0.410765	149
Pentecostal	0.338944	109	0.598118	240	0.345197	302
Presbyterian	0.341857	29	0.414963	26	0.440834	412

The nearest neighbor calculation was also conducted at the county level, once again to check for scalar effects on the measure. The counties chosen include three counties of roughly the same geographic size and represent low, moderate, and high diversity. Jefferson County, Alabama is the most populated county in the state, encompassing Birmingham and its suburbs. Maricopa County, Arizona is the home to Phoenix and is one of the most populated counties in Arizona. Providence County, Rhode Island is the center of population for the state. These three counties are all population centers in different diversity

regions. Their nearest neighbor ratio calculations are included in Table 8. In all three counties the ratio for All Churches showed a higher degree of clustering than any one denominational family. Non-Denominational Christian statistics show that in Jefferson County there are 29 congregations with a clustering statistic of 0.952718, while Maricopa County has 114 congregations with a statistic of 0.741038, and Providence County has 14 congregations with a statistic of 1.344221. These statistics show that congregation count does not seem to matter at the county scale either.

Table 8: Nearest neighbor calculations by county

	Jefferson County, Alabama	Number of Churches	Maricopa County, Arizona	Number of Churches	Providence County, Rhode Island	Number of Churches
All Churches	0.571203	482	0.464962	877	0.525917	354
Adventist	2.71188	4	1.459972	10	1.996689	5
Anglican	1.430522	12	1.111882	23	0.871157	27
Baptist	0.765308	241	0.771243	123	1.014376	34
Catholic	1.261473	19	0.903831	76	0.597382	106
Holiness	1.877533	6	1.12872	35	1.682295	8
Latter-Day Saints	0	1	0.873903	85	1.121464	9
Lutheran	1.384221	7	0.93771	83	1.911739	5
Methodist	0.957841	62	0.981075	46	1.5213574	11
Non-Denominational Christian	0.952718	29	0.741038	114	1.344221	14
Pentecostal	0.862411	75	0.694132	126	1.02331	46
Presbyterian	1.009876	18	0.912332	49	1.369986	18

As a final check at the smallest relevant scale, three urban areas were chosen including locations from regions of the U.S. that differ both geographically and in their overall diversity levels. Dallas-Fort Worth represents

an urban area that is comprised of 10 different counties with a mean diversity index of 0.689. The Seattle urban area contains three counties with a mean diversity index of 0.263. Washington D.C is comprised of 22 counties with a mean diversity of 0.632. In each of these areas the nearest neighbor ratio shows the most clustering for All Churches. No single denominational family exhibits higher clustering. Catholic denominations across each of the MSA's highlight a similar finding that number of churches is not a determinant of clustering statistic. In Dallas-Ft. Worth there are 87 churches that produce a statistic of 1.270416, Seattle has 75 congregations that produce a nearest neighbor statistic of 0.8903, and Washington DC has 168 locations that produce a statistic of 0.780911. The significant difference between Dallas-Ft. Worth and Seattle illustrates that church numbers do not dictate clustering statistics.

Table 9: Nearest neighbor calculations by Metropolitan Statistical Area

	Dallas-Fort Worth-Arlington, TX	Number of Churches	Seattle	Number of Churches	Washington DC	Number of Churches
All Churches	0.53833	1,719	0.505865	809	0.486971	1,782
Adventist	1.881634	9	1.375442	18	1.322122	23
Anglican	1.076792	55	1.246841	36	1.069051	116
Baptist	0.656644	751	0.791244	105	0.62562	410
Catholic	1.270416	87	0.8903	75	0.780911	168
Holiness	1.160986	19	1.403188	28	0.737241	34
Latter-Day Saints	3.797126	4	0.939972	37	1.446444	14
Lutheran	0.972724	69	0.789633	137	1.017675	111
Methodist	1.011925	202	1.058381	64	0.816564	252
Non-Denominational Christian	0.736618	225	0.156369	94	0.738549	122
Pentecostal	0.891984	159	0.73813	90	0.528602	177
Presbyterian	0.956655	73	0.841225	72	0.825931	122

The findings for the spatial clustering for churches are an important evidence for the null hypothesis. There is no evidence of a relationship between clustering of like denominations in the American Churschape. Also, no particular denominations are more clustered than others. Changes in scale and overall levels of diversity do not influence this result. Irrespective of scale, the findings for All Churches showed a higher degree of clustering than any denominational family. As the geographic regions chosen for analysis got smaller the degree of clustering seemed to trend toward randomness or dispersion. However, the relationship remains in which churches of all denominations are more clustered than for any specific denominations.

The study also finds for the null hypothesis on the relationship between diversity and clustering. This study was unable to identify any linkage between diversity and clustering. Thus, even in areas where a few denominations are in the minority, these church structures for these denominations are not spatially isolated from other churches.

While this study was unable to find any direct correlation between clustering and congregation counts, or diversity there is much still to be explored. The nearest neighbor statistic is susceptible to study area size, making it critical to compare study areas of like size. This paper attempted to find samples of similar geographic size in different diversity regions, there is additional study that should be done to control for geographic size more closely to confirm the findings.

4.4 Dominant Denominations in the American Churchscape

Another way to view the Churchscape is to look for the most dominant church denomination on the landscape in terms of church buildings or meeting places. This analysis is based on the congregation counts found within the ARDA data because of its completeness. The most surprising result is that Baptist churches or places of worship prevail across the vast majority of the U.S. The Lutheran church dominates the far north around Minnesota and North Dakota. The Latter-Day Saints are fairly tightly clustered in the region surrounding Utah.

The Methodist, Catholic, Pentecostal, and Presbyterian congregations are scattered across the remainder of the U.S. as seen in Figure 17.

This result is surprising given that traditional religious geography that relegates Baptists to the Bible Belt in the Southeast region of the U.S. (Clarke 1990). Based on physical places of worship America appears to be a predominantly Baptist country. The Lutheran presence in the far north parallels the migration of Scandinavian peoples into the area. The concentration of Latter-Day Saints in and around the Utah area is reasonable; given Salt Lake City's role as the historical heart of the Latter-Day Saints Church. The remaining counties are a mixture of Methodist, Pentecostal, and Catholic denominations scattered throughout the U.S.

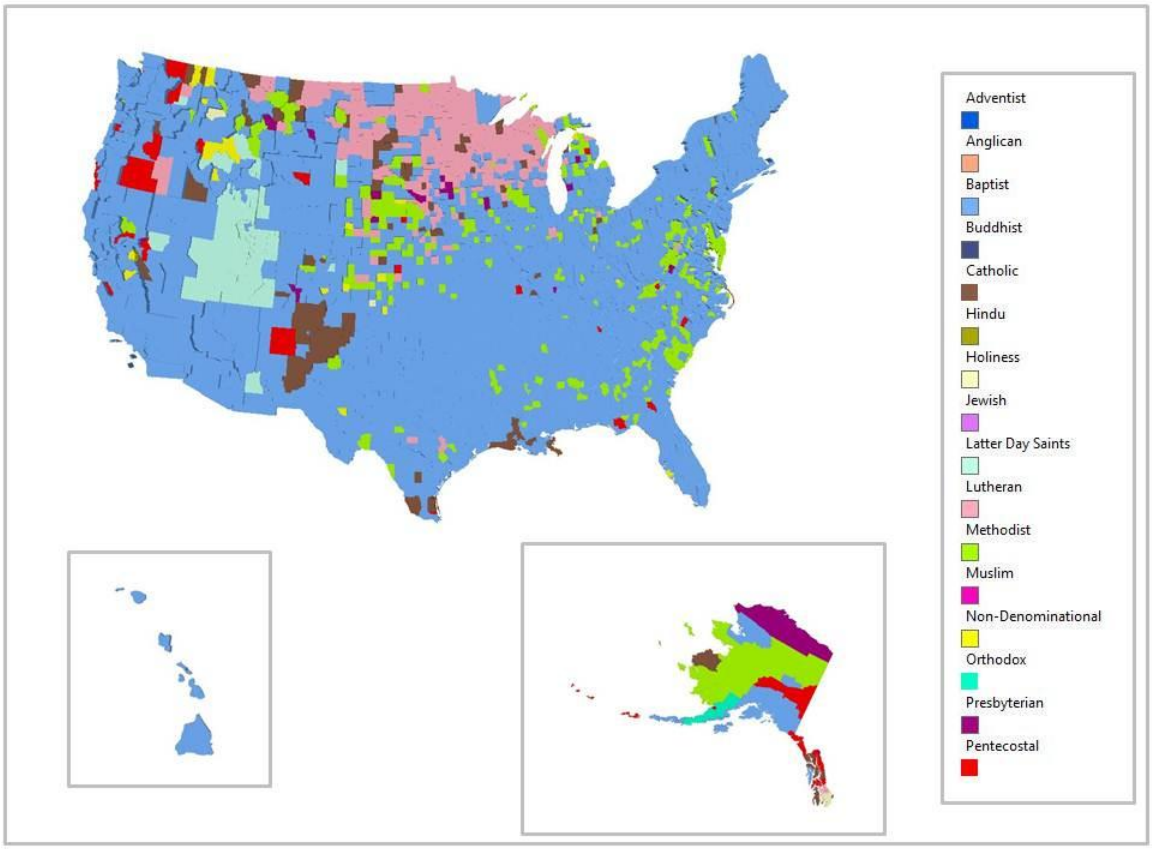

Figure 17: Churchscape of the U.S.: County color reflects denominational family with highest percentage of church buildings on the landscape.

4.5 Adherentscape

The Adherentscape represents the denomination that has the highest percentage of adherents per county, shown in Figure 18. The results show regional clustering of denominations. The Baptists are homogenously spread across the southeastern U.S. The Latter-Day Saints are concentrated in the Salt Lake Basin, covering the majority of Utah and parts of Idaho and Wyoming. The Lutherans are clustered in the north covering parts of North and South Dakota and Minnesota. The Catholics were the most surprising with their distribution seemingly acting as a border around the perimeter of the U.S. The lone clustering

of Methodists in southwestern Pennsylvania and Northeastern Virginia marks the only other grouping of note.

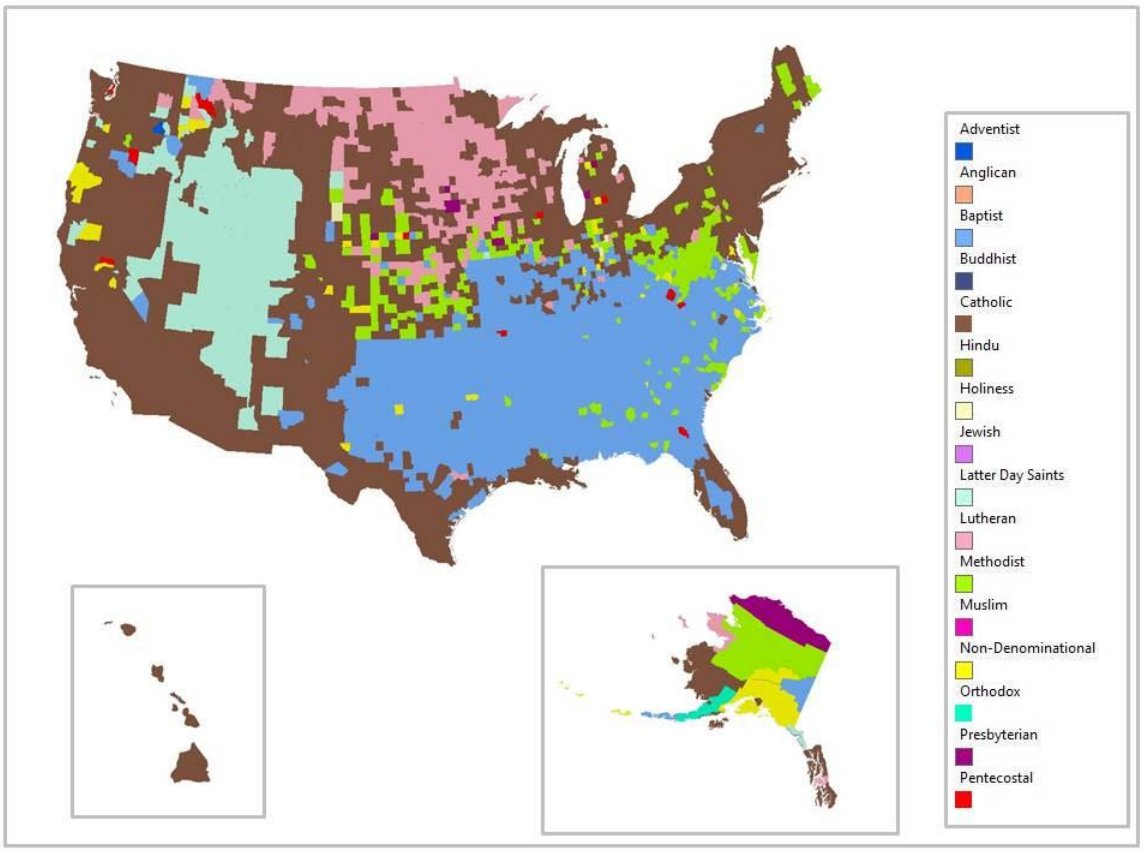

Figure 18: Adherentscape of the U.S.: County color reflects denominational family with highest percentage of adherents.

One of the most striking results from this study is the difference between the Churchscape and the Adherentscape. The physical congregations as seen in Figure 17 show an overwhelming dominance of Baptists. Yet the adherents as seen in Figure 18 limit the Baptist influence to the area commonly understood as the Bible Belt. The Lutheran presence in the church locations is seemingly more localized in the north,

whereas the adherents spread further south into more of the Great Plains region. The Latter Day Saints also exhibit a similar pattern, with their churchscape dominance being less pervasive than their adherentscape presence.

4.6 Highest Average Denomination Size

This study also looked at the average congregation size by county as seen in Figure 19. Within the ARDA Data each denomination was given a total count of adherents. This was divided by the total number of congregations to determine the mean adherent count per church for each county. Based on this county-by-county calculation, the mean church size for the U.S. is 188 with the median value of the mean church size for all counties being 166. The Northeast as well as West Virginia, Indiana and portions of Kansas has the lowest average congregation size. Here nearly all fall below an average adherent count of 126.

The areas that show the highest average denomination size share one thing in common: the dominant congregational family is Catholic. In Mono County California, there are 13,645 adherents spread across 14 different congregations, and 12,852 of those adherents attend just three Catholic churches. Not surprisingly, Webb County, Texas has 147,243 adherents in 138 different congregations with 126,750 of them belonging to 26 different Catholic churches. The complex of parishes with large churches that surround New Orleans, Louisiana also exhibits the Catholic dominance. In counties with high average church sizes that are not Catholic, the results favor rural areas with only a few

church structures where the adherent counts may represent the majority of the believers for the entire county.

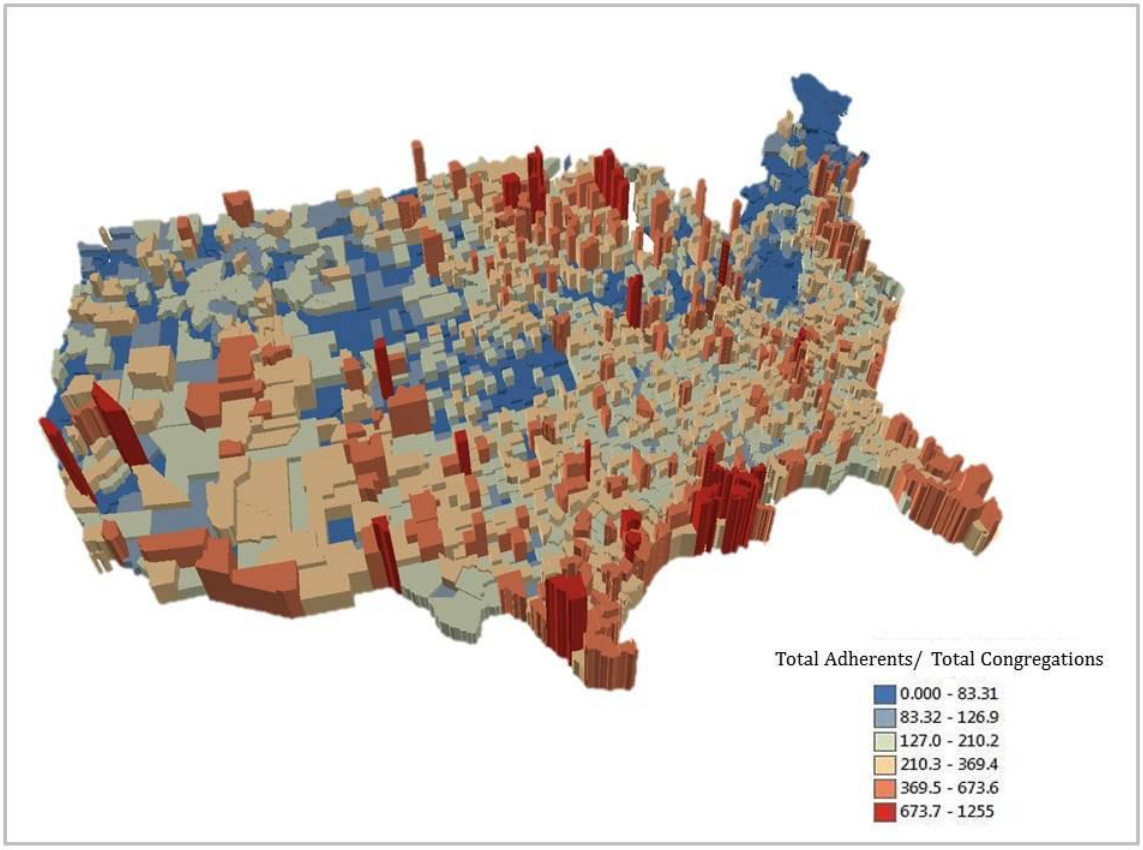

Figure 19: Average congregation sizes by county symbolized by geometric interval

Chapter 5 Discussion and Conclusion

The traditional geographic distribution of religions in the U.S. shows that we have very distinct regions dominated by different denominations. The results from this study also show this; however, the comparison between the landscape of the physical church structures and the landscape of adherents uncovers discord between the two. The American Churchscape is predominantly Baptist and the Adherentscape is predominantly Catholic.

5.1 The Churchscape

The American Churchscape reflects the long historical tradition of religious diversity and pluralism stemming from the Colonial period. Although adherents and church structures for one denomination or another predominate in particular counties and regions, there is no trend toward isolation or sectarianism in either the Churchscape or the Adherentscape, as is sometimes reported in other parts of the world.

When looking at the churches in communities across the country Baptist churches are the most numerous. Why is the landscape this way? Could the proliferation be due to Baptist evangelism efforts at the beginning and middle of the Twentieth century? Stetzer (2005) reported that during the 1920s and the 1950s church growth in the Southern Baptist Convention experienced positive growth and evangelism due to the "75 Million Campaign" and "A Million More in

54" (Stetzer 2005). Examining the establishment date for the churches could pinpoint the era of greatest infiltration of Baptists across the American landscape.

Some regional clusters are well explained by particular religious histories. For example, the cluster of the Latter-Day Saints in the area surrounding Utah is easily comprehended as this area was a remote place of refuge for Mormon adherents when the early church was persecuted in the Midwest. Also, the history of Scandinavian immigration explains the cluster of Lutherans in the far north. The Baptist dominance across the majority of America is not as easy to explain and is worthy of further exploration.

5.2 The Adherentscape

The landscape of adherents or those that attend a specific church tells a different story than the Churchscape. The Adherentscape is largely Catholic, with a heavy concentration of Baptists in the southeastern U.S. and a large cluster of Latter-Day Saints in the Utah area. Why does the Adherentscape tell a different story than the Churchscape? This finding falls more in line with the traditional understanding of the religious regions of America; however, the disparity between physical church establishments and adherents deserves further exploration. A standardized and regularly maintained data set that includes locations, denominational affiliation, and attendance might highlight the

differences found in this study or it could show that the findings of this study do not hold true.

5.3 Religious Regionalization

Traditional religious geographic thinking carves the American landscape into regions based on dominant denomination. Notwithstanding studies by Silk (Silk 2007) and Warf and Winsberg (2008) using different techniques, diversity is a less explored facet of religious regionalism. The detail in this study allows for a more fine-grained view of the diversity of the American Churchscape.

Exploration of the pluralistic nature of the American religious landscape as undertaken by Warf and Winsberg (2008) focuses on mapping the religious diversity at the county level. Using Shannon's Index, a well-known biodiversity index, and a Dorling Cartogram. The visual exploration also included mapping the sheer volume of different denominations at a county level and mapping each county's adherents belonging to the largest denominations (Warf and Winsberg 2008). While each of the results was similar, the visual representations only focused on the largest denominations rather that the entire fabric of diversity. Also at issue is the base congregational data, while from a similar source, is circa 2000. Much can change in a decade.

This study builds upon previous scholarship such as Warf and Winsberg (2008). Rather than limiting diversity to measures reflecting only the major

denominations, all denominational families were included to truly appreciate the diversity of potential religious expression. ARDA data from 2010 includes previously unreported data that originates from the traditionally African-American denominations (ARDA 2010). Utilizing a more complete data set that takes into account the finer details of religious diversity provides a more comprehensive look at the religious diversity of America. However, the denominational families were heavily weighted to the many varieties of Christianity and did not include the full variety of non-Christian groups, creating a limitation in understanding the full diversity of the religious landscape.

The work of Bauer (2012) illustrates the similarities and differences between American religious regions from 1980 and 2000. The results of the regionalization in this work were pulled from a data source similar to the ARDA, providing a similar base for comparison. The classification of religious groups was done at a typological level that groups many denominational families together, rather than at a denominational family level as in this study. By creating a more detailed classification and basing it on diversity, this study shows a greater level of specificity and detail that has not been included in most traditional region level classifications.

This study looked at creating regions based on religious diversity; the result was five broad multistate regions that span multiple denominational dominances. However, the underpinnings of culture in these regions were not explored in great detail. Further study should explore in detail the demographic,

cultural, historical and economic factors in each region to find any discernible explanation for the differences in the degree of diversity across regions. Esri has a data set, the Esri Tapestry Segmentation that uses cluster analysis on census data to group ZIP codes into 65 different social segments (Esri 2013). Usage of the Esri data set could empower researchers to look at the underlying social fabric of each region as people commonly understand it to see what factors may be driving the levels of religious diversity in an area.

5.4 Church Clustering

The spatial clustering of churches, despite religious diversity, is not denominationally specific. Churches as a whole cluster more closely than any given denomination at all scales. This seems contrary to common thought that certain denominations may cluster more tightly than others, such as the Latter-Day Saints to escape persecution. Further study looking at cities that were established at similar times in history and are approximately the same size may be a better comparison.

In regions of the world undergoing political and ethnic turmoil, an examination of the church spatial clustering would be beneficial. Examining locations in areas of turmoil can illustrate the impact of strife on churches. What would the landscape of Northern Ireland show? Perhaps looking at this type of

result and comparing it with the findings of American cities may produce interesting results.

While this thesis looked at different scales, there are scales that could still be explored. Further research could look into the clustering at the city, town, or even neighborhood scale. This level of examination could provide relevant understanding for urban planners and those interested in neighborhood stabilization.

5.5 Highest Average Congregation Sizes

The relatively recent phenomenon of Mega-Churches, those with huge numbers of adherents, is an area where much further scholarship should be done. From this study's approach it appears that churches that have highest average adherent counts tend to be in suburban areas where Catholicism is the dominant denomination. Previous research has indicated that the majority of Mega-Churches have Protestant, suburban, metropolitan, and Sunbelt orientations (Warf and Winsberg 2010). Is this always the case? Many of the most commonly identified Mega-Churches are specifically Non-Denominational Christian, such as the Crystal Cathedral in Garden Grove, California. This study indicates that the counties with the highest average adherent count are predominantly Catholic. The adherent counts reported by the ARDA data utilized the same formula for calculating for each denomination, what could cause this differentiation.

A plausible theory for the Catholic lean toward large congregations could be that Catholic parishes offer more opportunities for worship during the week than other denominations. For example, Saint John Cathedral in Lafayette, Louisiana has 17 different times for Mass during the week, whereas Bayou Baptist church in the same community has only three services during the week. The increased opportunities for worship may contribute to the higher adherent count in Catholic churches in some areas.

This apparent contradiction in what is traditionally understood to be a Mega-Church and what the ARDA data indicates deserves further research. While geographers have looked at the individual churches and their locations as isolated instances, the ARDA data seems to indicate that perhaps the local adherent body is larger in areas where there are Mega-Churches. Chaves (2006) looked at the overall distribution of growing Protestant denominations; the same methodology could be applied to Catholic churches to see if the patterns uncovered in this study are supported by other findings.

5.6 Data Set Needs

Traditionally, GIS has approached analysis from a problem solving perspective. This approach is self-limiting and often establishes a cycle of continually focusing on problems that eventually lead to negativity. Hodza (2013) brings this idea to the forefront in his recent article. He asserts that this

negative cycle causes GIS to miss the point of Appreciative Inquiry, where focus is placed on strengths rather than weaknesses (Hodza 2013). Religious data in and of itself will not likely be a data set used for problem solving. Rather it is a data set that can be used by communities and scholars to explore how to drive community innovation and generate social capital.

This study had to cope with data problems. Spatial data on religion is scarce at best. There are limited numbers of reliable data sources, many of which are themselves rife with data collection problems. There was only one easily attainable point level data set wrought with flaws available for this study. This initial data set contained over 93,000 points that required several weeks' worth of clean up, that included manual classifying the denominations and deleting records that were not actual church locations.

Point level data on each church with self-identified denomination and standardized attendance numbers could provide a more accurate base by which further point level analysis could be accomplished. This study shows the value of GIS as a tool for understanding and answering questions about the religious landscape. Overlaying accurate points on various types of demographic data such as the Esri Tapestry Segments could be used by religious scholars and church planners to see what type of church appeals to various types of people. Church planners could then make more informed decisions when attempting to locate a new church in an area that would have the most impact.

5.7 Other Areas for Exploration

Within this study there were many variables that could have been examined in more detail. One such area is the denominational grouping schema. If data were examined at the tradition level rather than the denominational level, how would the findings compare? Would the results be similar to what is found in Warf and Winsberg (2008)? Data deficiencies created the need for a great deal of manual classification and educated guessing at the denominational level. Using a broader classification could eliminate many of these issues.

Another area that could be explored as a check against these findings is the diversity calculation formula. There are many other formulas in ecology that may produce different results, such as Shannon's Index. Further study could compare the findings across multiple diversity formulas to explore alternate understandings of religious diversity in America, with particular attention to the formulas that are more sensitive to richness with less sensitivity to evenness. This would allow for a more detailed examination of the many permutations of both Christian and non-Christian groups in the landscape without allowing the larger numbers of Christian denominations to skew the diversity calculation.

5.8 Final Thoughts

Taken as a whole, America is a truly diverse and complicated land, physically and culturally. The physical landscape spans ecosystems from deserts

to tundra to boreal forests to mangroves. The cultural landscape welcomes peoples from all areas of the world and brings together a very diverse array of cultures and beliefs. The religious landscape is a mirror to that diversity. The physical church locations indicate America is a strongly Baptist country, whereas the actual adherents indicate we are a predominantly Catholic country. The apparent contradiction further exemplifies the complexity and diversity found in America, and the churchscape is in some ways a manifestation of the constitutional freedom each American has to choose their religion and the freedom to practice as they see fit.

References

ARDA. *About*. 2010. http://www.thearda.com/about/(last accessed 29 August 2013).

Ayhan, Irem, and K. Cubukcu. 2010. Explaining historical urban development using the locations of mosques: A GIS/spatial statistics-based approach. *Applied Geography* 30: 229-238.

Barb, Amandine. 2011. An atheistic American is a contradiction in terms: Religion, Civic Belonging and Collective Identity in the United States. *European Journal of American Studies* 1: 2-18.

Bauer, John T. 2012. US Religious Regions Revisted. *The Professional Geographer* 64 (4): 521-539.

Bauer, John T. 2006. Stability and Change in the United States: Religious Regions, 1980-2000. PhD Thesis, Department of Geography, University of Kansas.

Berner, Sam. 2005. Thou meets online." *South African Journal of Information Management* 7(2): 1-5

Blake, Kevin, and J. Smith. 2000. Pueblo Mission Churches as Symbols of Permanence and Identity. *Geographical Review* 30(9): 359-380.

Botchwey, Nisha. 2007. The Religious Sector's Presence in Local Community Development. *Journal of Planning Education and Research* 27(36): 36-48.

Bureau, US Census. *USA*. September 18, 2012. http://quickfacts.census.gov/qfd/states/00000.html(last accessed 29 August 2013).

Chaves, Mark. 2006 All Creatures Great and Small: MegaChurches in Context. *Review of Religious Research* 474(4): 329-349.

Cheong, Pauline, J. Poon, S. Huang, and I. Casas. 2009. The Internet Highway and Religious Communities: Mapping and Contesting Spaces in Religion-Online. *The Information Society: An International Journal* 25(5): 291-302.

Clarke, Clifford. 1990. The Bible Belt Thesis: An Empirical Test of the Hypothesis of Clergy Overrepresentation. *Journal for the Scientific Study of Religion* 29(2): 210-225.

Esri. *Esri Online Help*. April 2, 2013. http://resources.arcgis.com/en/help/main/10.1/index.html#//005p00000008000000(last accessed 29 August 2013).

--- *Tapestry Segmentation: Reference Guide*. Redlands: Esri, 2011(last accessed 29 August 2013).

Fukuyama, Francis. 2001. Social capital, civil society, and development. *Third World Quarterly* 22(1): 7-20.

Gallagher, Patrick. 2009. Identification and Analysis of Orthodox Jewish Enclaves in Brooklyn, New York: A GIS Based Approach. *Middle States Geographer* 42: 83-89.

Gillin, John. 1955. National and Regional Cultural Values in the United States. *Social Forces* 34(2): 107-113.

Hodza, Paddington. 2013. Appreciative GIS and Strength-Based Community Challenge. *Transactions in GIS*.

Hout, Michael, and A. Greeley. 1998. What church officials reports don't show: Another look at church attendance. *American Sociological Review* 63(1): 113-119.

Jordan, Lisa. 2006. Religion and Demography in the United States: A Geographic Analysis. PhD Thesis, Department of Geography, University of Colorado, 2006.

Khan, S. Ajmal. Methodology for Assessing Biodiversity. *Annamalai University*. April 12, 2013. http://ocw.unu.edu/international-network-on-water-environment-and-health/unu-inweh-course-1-mangroves/Methodology-for-Assessment-Biodiversity.pdf(last accessed 29 August 2013).

Kinney, Nancy, and W. Winter. 2006. Places of Worship and Neighborhood Stability. *Journal of Urban Affairs* 28(4): 335-352.

Knott, Kim. 2005. Spatial theory and method for the study of religion. *Temenos* 41(2): 153-184.

Kong, Lily. 1990. Geography and Religion: Trends and Prospects. *Progress in Human Geography* 14: 355-370.

----. 2001. Mapping 'new' geographies of religion: politics and poetics in modernity. *Progress in Human Geography* 25(2): 211-233.

Kosmin, Barry, and A. Keysar. 2009. *American Religious Identification Survey (ARIS 2008) Summary Report*. Summary Reprot, Hartford: Institue for the Study of Secularism in Society and Culture

Levine, Gregory. 1986. On the Geography of Religion. *Transactions of the Institute of British Geographers* 11(4): 428-440.

Lewis, Peirce. 1979. Axioms for Reading the Landscape. In *The Interpretation of Ordinary Landscapes*, 11-32. New York: Oxford University press.

Lu, Hui-Ping, H. Wagner, and X. Chen. 2007. A contribution diversity approach to evaluate species diversity. *Basic and Applied Ecology* 8: 1-12.

Mazumdar, Shampa, and S. Mazumdar. 1993 Sacred Space and Place Attachment. *Journal of Environmental Psychology* 13(3): 231-242.

Melton, J. Gordon. 2004. An Introduction to New Religions. In *The Oxford Handbook of New Religious Movements*, 16-35.

----. 1978. *Encylopedia of American Religions*. Detroit: Gale Publishing Company.

----. 2010. *American Religion's Mega-Trends: Gleanings from Forty Years of Research*. Pennsylvania State University, State College: The Association of Religion Data Archives.

Neitz, Mary Jo. 2009. Encounters in the Heartland: What Studying Rural Churches Taught Me About Working Across Differences. *Sociology of Religion* 70(4): 343-361.

Oddity Software. *US Churches Database V.1.0.21*. November 14, 2012. http://www.odditysoftware.com/page-datasales38.htm(last accessed 29 August 2013).

Park, Chris. 2004. Religion and Geography. In *Routledge Companion to the Study of Religion*, by J. Hinnells, 1-29. London: Routledge.

Proctor, James. 2006. Introduction: Theorizing and Studying Religion. *Annals of the Association of American Geographers* 96(1): 165-168.

Putnam, Robert. 2001. *Bowling Alone: The collapse and revival of American Community*. Simon and Schuster.

Shelton, Taylor, M. Zook, and M. Graham. 2011. The Technology of Religion: Mapping Religious Cyberscapes. *The Professional Geographer*, 64(4): 1-16.

Shortridge, J. R. 1977. A new regionalization of American Religion. *Journal for the Scientific Study of Religion* 16(2): 143-53.

Silk, Mark. 2007. Defining Religious Pluralism in America: A Regional Analysis. *Annals of the American Academy of Political and Social Science* 612: 64-81.

----. 2005. Religion and Region in American Public Life. *Journal for the Scientific Study of Religion*, 44(3): 265-270.

Sinha, Jill, A. Hillier, R. Cnaan, and C. McGrew. 2007. Proximity Matters: Exploring Relationships Among Neighborhoods, Congregations, and the Residential Patterns of Members. *Journal for the Scientific Study of Religion* 46(2): 245-260.

Stetzer, Ed. 2005. The Missional Nature of the Church and the Future of Southern Baptist Convention Churches. *The Mission of Today's Church: Baptist Leaders Look at Modern Faith Issues*. 73-93.

The Pew Forum on Religion & Public Life. 2008. *U.S. Religious Landscape Survey*. Washington, DC.

Tuan, Yi-Fu. 1979. Space and Place: Humanistic Perspective. *Philosophy in Geography* 66(2): 387-427.

Warf, Barney, and M. Winsberg. 2008. The Geography of Religious Diversity in the United States. *The Professional Geographer* 60(3): 413-424.

----. 2010. Geographies of megachurches in the United States. *Journal of Cultural Geography* 27(1): 33-51.

Wikle, Thomas, and J.Comer. 2010. Translator Networks and the New Geography of Religious Radio. *Journal of Radio & Audio Media* 17(1): 48-62.

Wu, Jiang, and D. Tong. China Data Center - Learning Center. *China Data Center: University of Michigan*. March 17, 2012. http://www.chinadatacenter.org/Files/20120320133611377l.pdf (last accessed April 11, 2012).

Zelinsky, Wilbur. 1980. North America's Vernacular Regions. *Annals of the Association of American Geographers* 70(1): 1-16.

----. 1973. *The cultural geography of the United States*. Englewood Cliffs: Prentice-Hall.

----. 2001. The Uniqueness of the American Religious Landscape. *Geographical Review* 91(3): 565-585.