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Restraurant regions : an ecological community based model of restaurant chain distribution in the United States

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RESTAURANT REGIONS: AN ECOLOGICAL COMMUNITY BASED MODEL OF RESTAURANT CHAIN DISTRIBUTION IN THE UNITED STATES

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DEDICATION

I would like to thank my family. Countless thanks go out to Mom, without your support this second chance at success would have never been possible. Erma, Glenda, and Stacey thank you for believing in me. Apologies go out to “My Piggy” and “Mi Jitito”. I live with the hope that the future that we enjoy makes up for the countless hours which I have spent the past two years consumed by my studies. I love you both with all of my heart.

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RESTAURANT REGIONS: AN ECOLOGICAL COMMUNITY BASED MODEL OF RESTAURANT CHAIN DISTRIBUTION IN THE UNITED STATES

By

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ABSTRACT

The scope of this paper is an exercise in regional identification within the geography of the United States. This paper applied a hierarchical clustering methodology to analyze the distribution of restaurants in the landscape. The clustering model utilized in this study is commonly used in analysis of ecological communities. Each restaurant chain was treated as an individual biological species, and the clustering software analyzed it as such. The individual restaurant chain locations were treated as individual samples in the environment. Ward's (1963) algorithm was used to group the individual restaurant chain locations into related clusters using simple correlation as the distance measurement.

The scale of the research was limited to Restaurant and Institutions Top 400 restaurant chains ranked by gross sales. InfoUSA provided the location information for individual restaurant locations in the form of latitude/longitude coordinates. The clustering methodology requires sample areas to define the geographical boundaries of the hierarchical clusters. Combined Statistical Areas (CSA) defined by the United States Census Bureau were used for this purpose. Various methods of data reduction were employed towards development of a statistically significant model, and eventually a six-cluster restaurant region model was

identified.

These six restaurant regions were scrutinized by comparing them to existing perceived regions in the United States. The cluster methodology produced Indicator Species (IS) that provides a simple, intuitive solution to the problem of evaluating species associated with groups of sample units. The resulting (IS) were presented in the form of restaurant chain names rather than individual restaurant locations. It [Indicator Species Analysis] combines information on the concentration of species [restaurant chain locations] abundance in a particular group and the faithfulness of occurrence of a species [restaurant chain] in a particular group. It produces indicator values (IV) for each species [restaurant chain] in each group. These are tested for statistical significance using a Monte Carlo technique (McCune and Medford, 1999). The top three indicator species were identified and used to further explore the six restaurant regions. The characteristics of the restaurant chains identified as (IS) were compared to the cultural, cuisine, and ethnic characteristics of the geographies with which they corresponded. The restaurant regions were found to statistically significant, visually familiar, and culturally representative of the perceived regions with which they corresponded.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER ONE

Introduction

1.1 Background

Regions have been an integral part of the American identity since the founding of the United States. The original thirteen colonies, despite having been united in their rebellion, were from the very beginning divided into three distinct regions: New England, Middle, and Southern. This legacy of regionality was further reinforced by the polarizing effects of the Civil War (Dal Lago, 2013). As America grew, the nature of ethnic migration created clear regions that persist to this day (*Figure 3)*. Cuisine is an identity marker (Bessière, 1998). The study of ethnic cuisine has long been used by geographers to define ethnic boundaries and perceived regions in the United States (Lockwood and Lockwood, 1998; Kelly, 1998; Lloyd, 1981; Lewis, 1989; de Witt, 1982). There are foods commonly associated to geographies that are well established in popular culture. Maine lobster, Rocky Mountain oysters, and Cincinnati chili all come to mind (Lloyd, 1981; Lewis, 1989; Hoy, 1998).

It is from within this legacy of regionality that the concept of this research is grounded. The primary focus of this paper will be to address the following question. Can the study of restaurant distribution be used to identify food regions in the United States? Which begs the question, why is this important? In 2004, 40% of American's meals [were] eaten outside of the home. Total [restaurant] industry sales [were] expected to grow well over $577 billion by 2010, with consumers spending 53 cents out of every dollar on food away from home, compared to 45 cents in 1999 (Kim and Gu, 2003; National Restaurant Association Research Department, 2007), making it [United States] one of the highest food away from home percentages in the

world (Hua and Templeton, 2008). Moreover, the restaurant industry [entered] its 16th consecutive year of real growth [net sales] in 2007 and will have a total economic impact that will exceed $1.3 trillion (Steven C. Anderson, President, National Restaurant Association cited in Strong, 2007, p. 96). These facts further support existing scholarship which utilizes the study of restaurant distribution to measure food consumption, which in turn offers insights into the foodscape (Milbauer, 1998; Roarke, 1998). This is important because food has been conceived of as much more than a source of nutrition (Darby and Mason, 1978; Levy, 1981) for it represents cultural taste or [cultural] symbol (as cited by Roark, 1998).

This research draws further inspiration from the term foodscape itself. Foodscape has been defined as structures in society forming the food environment (Burgoine et al., 2009). This linkage between business landscape and the natural environment lends itself to the application of business ecology theory to delineate the parallels between the business and natural environments. Moreover, these parallels allow for the application of methodology, traditionally associated with biological ecologies, towards the measurement the regionality of restaurant distribution in the foodscape. In fact, this project will apply a community based modeling (Duvall, 2011) approach towards the identification of restaurant regions in the United States.

The community based model will classify each restaurant chain as a distinct species. The various locations will be treated as individual samples within the ecosystem. Similarities within groupings of individual samples will be identified, and a group of clustered restaurant locations will result.

1.2 Project Description

Current popular research within the discipline food geography and food studies in general is primarily focused on three areas. First, researchers are concerned with the study of food access as it relates to socioeconomic and demographic categories (Pearson, Russell, Campbell, and Barker, 2005; Hendrickson and Eikenberry, 2006). The next popular area of interest concerns the various relationships between fast food restaurants and obesity (Jeffery, Baxter, McGuire, and Linde, 2006; Maddock, 2004; Davis and Carpenter, 2009). Finally, food studies scholarship has focused on the consumers increased interest in local foods as a reaction to globalized food system (Lacy, 2000; Phillips, 2006; Allen, 2010). Within the established framework, my research would fall into the category of food access, but I am not necessarily concerned with the measuring access across the demographic spectrum. Rather, this research hopes to contribute to a contemporary regional definition relating to food. This will be done by measuring food consumption patterns through the geospatial analysis of restaurant distribution within the United States (Roarke, 1998). This analysis is based on hierarchical clustering methodology, a method widely used in vegetation ecology. Application of this methodology enables description of restaurant regions with concepts analogous with those used in vegetation ecology, as well as those used in business ecology theory. I will use biological terminology to explain restaurant regionality. My use of ecological concepts clarifies the cultural and social processes that have produced variation in the distributions of restaurant chains and assemblages of chains.

1.3 Research Goals

I initially sought to answer the simple query: Do assemblages of chain restaurants present across the U.S. show significant variation? The primary question implies the following three secondary questions.

Question One: How will the largest restaurant chains affect the ecological model's ability to identify regionality in the overall restaurant chain distribution?

> *Hypothesis:* Dominant restaurant chains will function much like their biological equivalents, known as generalist species. Their overwhelming abundance in the foodscape mimics the behavior of generalists in the ecological model. Their presence in the environment will prevent the ecological model from revealing any statistically significant regionality.

Question Two: Do the resulting restaurant regions correspond with existing perceived regions within American culture?

> *Hypothesis:* When the appropriate clustering level is reached, the resulting restaurant regions will correspond with existing perceived cultural regions within the contiguous United States.

Question Three: How do characteristic chains for each restaurant region relate to the corresponding perceived cultural region?

> *Hypothesis:* Once the influence of the generalist species is accounted for and dealt with methodologically, the resulting restaurant regions will contain statistically significant indicator species (IS) that are representative of the cultural regions with which they intersect.

CHAPTER TWO

Literature Review

2.1 General Context

This research is grounded in a diverse range of academic scholarship, which includes regional geography, geographic information science, business ecology, and community based ecological modeling. This wide spectrum of literature is relevant due to the inherently interdisciplinary nature of the project.

2.2 Regional Geography

Regional geography has an ominous history to say the least. Regional geography due to its association with environmental determinism has experienced a decrease in influence over time as discipline of Geography has evolved. It is however experiencing resurgence with the popularity of Jared Diamond's (1997) book *Guns, Germs, and Steel: The Fate of Human Societies*. Its extended run on the New York Times Best Seller list, along with the popularity of the corresponding PBS video series, has reintroduced the theories of regional geography to the American public. It is in the spirit of regional geography rather than that of geographic determinism that this paper is grounded. In fact, this paper builds on the premise set forth by Ayers (1996) in his foundation work, *All Over the Map, Rethinking American Regionalism* that regions are "complex and unstable constructions, generated by constantly evolving systems of government, economy, events, migration, and culture" (p. 5).

As early as the 18th century, Immanuel Kant identified geography as the study of regions (Elden, 2009). Kant's concept of region was expanded, seized by central place theorists, and reintroduced to Geography. Within the framework of central place theory, Christaller (1933) described regions as hierarchical in nature and as being comprised of

cities organized into systems based on orders of magnitude based on resources and produced goods. Losch (1954) both reinforced these central place theory concepts and expanded on them towards a more economic geography focused definition of regionality.

More contemporary conceptualizations of regions and regionality can be found in the works of Fox and Kumar (1994) and Richardson (1979). Fox and Kumar's (1994) work is the foundation for the way in which the United States Census Bureau defines regions. The United States Census Bureau relies on estimates of commuting patterns to delineate metropolitan statistical areas (MSA) that are similar to Fox and Kumar's (1994) functional economic areas but correspond to administrative boundaries (counties) rather than actual commuting areas (Dawkins, 2003). This research employs the CSA which is a derivation of the MSA to glean the restaurant location data into a manageable and quantifiable data set. Essentially, this research will build upon well-known and scientifically accepted regional classifications to help delineate regions within the restaurant industry. I propose that this will lend to the validity of the resulting restaurant regions.

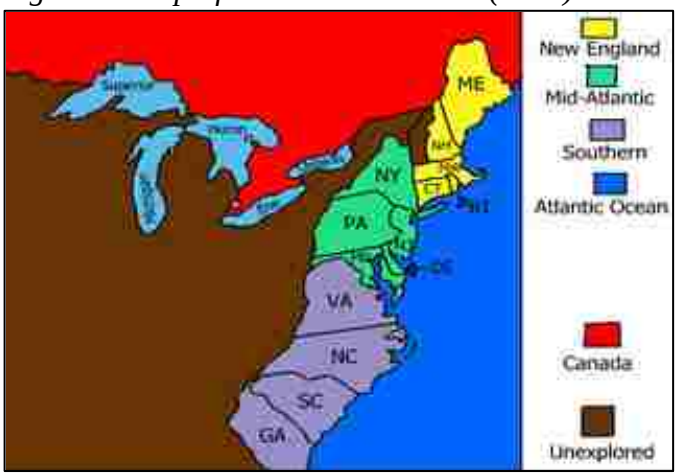
The idea of regions, as a collection of parts characterized by some degree of homogeneity, is not new. In his foundational work, *Regional Economics*, Harry W. Richardson (1979) defined regions as having some degree of homogeneity based on a measurable assigned trait of some kind. Regional classification transcends disciplines and many scientific methodologies employ homogeneity to define regions. One product of this research will be cartographic representations of the resulting hierarchical clustering. Homogeneity is the characteristic of a region and non-homogeneity or discontinuity is the characteristic of the boundary of a region (Hojjatoleslami, 1998).

Lastly, regions may also be defined in terms of natural resource, ecosystem, or other geographic boundaries (Dawkins, 2003). The history of both natural resource and geographic based regions will be discussed later in this literature review, as they provide a basis upon which to gauge the validity of the resulting restaurant regions. However, it is the ecosystem model of regionality on which this research will depend on most directly. The restaurant foodscape will be treated as a biological community system. Then, through the application of business ecology theory, the appropriate methodology will be employed to develop a regional model. However, the legacy of regionality in the United States will be addressed before the introduction of Business Ecology theory.

2.3 Regional Heritage: Food, Ethnicity, and the American Identity

This journey towards a regional representation of the restaurant industry in the United States is furthered with a discussion of regional geography as it relates to food studies in the United States. The change in the regional perception within the United States parallels the evolution of regionality within Geography itself. Since the inception of the United States as a nation in 1776, despite having only thirteen states, the geography of the United States was inherently regional. There were three distinctive regions: Southern, Mid-Atlantic, and New England (Figure1), and there were cuisines associated with these geographies (Bennion, 1976; Smith, 2009).

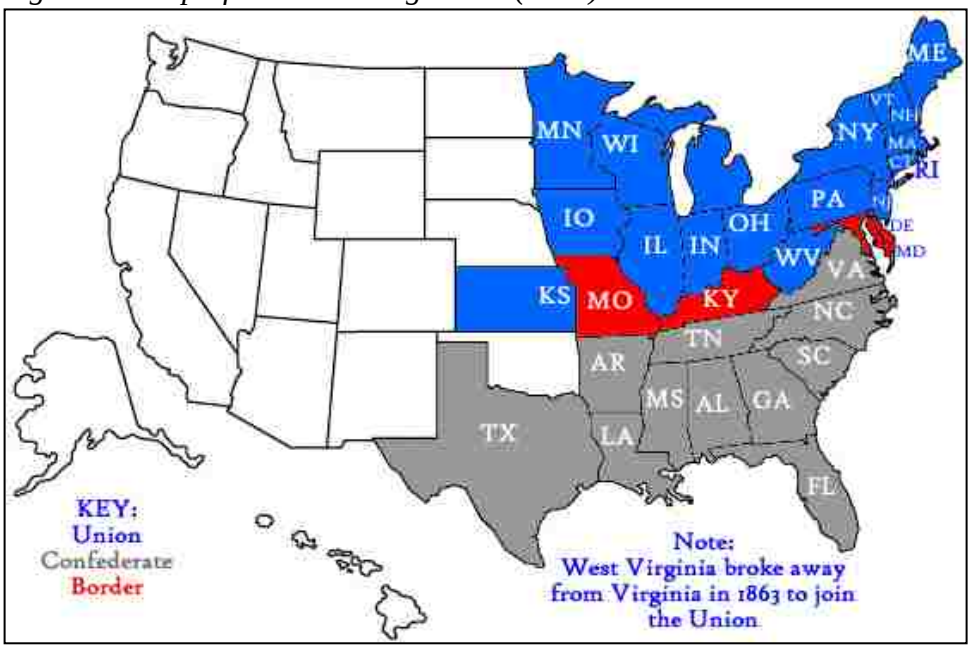
Figure 1: Map of new world colonies (1776)



Source: http://mrnussbaum.com/images/makeyourown.jpg accessed 06/20/2013

This heritage of regionalism was confirmed and reinforced over 100 years later by the regional divisions defined by the conflict between the Union and the Confederacy during the American Civil War (David and Blight, 2001; Faust and Livermore, 2011).

Figure 2: Map of civil war allegiances (1860)



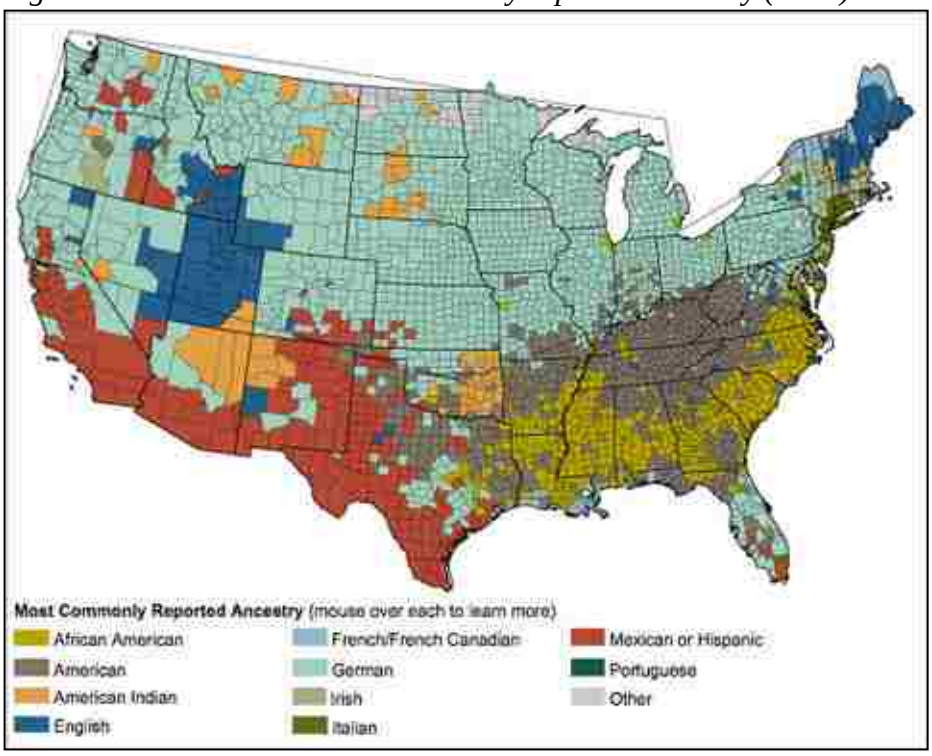
Source http://www.civilwarinfoguide.com/american_civil_war.html cited 11/24/2012

There is a clear regional division to the American landscape (*Figure 2*) circa 1860. The "New England" region from Colonial times has expanded, and is now "The North". It seems destined that "The South" will always be known simply as "The South", and the colonial "Mid-Atlantic" Region became known as the "Border Region" during the Civil War. The important trend to acknowledge is that the regional divisions in America persisted despite changes in the ways that these geographies were labeled. As the United States has grown in area, complexity and diversity this regional perception of the United States has grown along with it. There are clear and commonly accepted geographic regions of the United States (Ayers, 2013). During reconstruction, America grew more complex as massive waves of immigrants began to dominate the American landscape; a strong idea of regional identity was renewed in America. Regions were less defined by the geography of the area and the foods that grew there and began to be defined by the ethnicity of the people who migrated to and lived in them (Lockwood and Lockwood, 1998; Kelly, 1998; Lloyd, 1981; Lewis, 1989; de Witt, 1982). The migration of European empires in the sixteenth and seventeenth centuries gave rise to regional differences in eating habits (Gabaccia, 1998). This shift had definitely possessed an urban slant with clustered ethnic neighborhoods thriving in cities across the nation (Lieske, 1993).

Spanish colonization also played a significant role in America's ethnic identity. As a result, America's Hispanic population continued to grow. The Southwest developed and continues to possess a Hispanic regional identity (Bean, Dawson, and Tiend, 1987; Durand, Massey, and Zenteno, 2001). A distinctly Scandinavian Great Lakes region, German Atlantic Region, and Irish New England were and are accepted perceived regional

classifications (*Figure 3*). These regions reflected the ethnic makeup of the population as well as the ethnic cuisines that the population consumed (Shortridge and Shortridge, 1998).

Figure 3: US Census Bureau commonly reported ancestry (2000)



Source: [http://wettercrashers.weebly.com/uploads/1/3/9/6/13961933/416134170.jpg cited 1/20/2013](http://wettercrashers.weebly.com/uploads/1/3/9/6/13961933/416134170.jpg)

Cuisine regions are an excellent example of the collective regionalism inherent to the American landscape (Timothy and Ron, 2013). They are also an example of the wide range of characteristics with which regions are defined and represented. Regionalism in colonial times was inherently tied to a sense of place and the foods that grew there as a representation of identity (Bennion, 1976; Smith, 2009). As ethnicity began to replace geography (*Figure 3*) as a deciding factor, ethnic food regions began to dominate the discussion of cuisine regions in the United States (Gabaccia and Gabaccia, 2000; Brown and Mussell, 1984; Gutierrez, 1998; Kraut, 1979).

2.4 The McDonaldization of the Restaurant Industry

World War II introduced a generation of American soldiers to European culture and cuisine. Post World War II American food culture was influenced by the advent of suburbia and the caricaturization of ethnic cuisines (Addison, Bryan, Carter, Del Tufo, Diallo, and Kinzey, 2013; Hirschman, 2011; Camillo, Kim, Moreo, and Ryan, 2010; Weldon, 2011). Americans were introduced to Chef Boyardee, the Frito Bandito, and Aunt Jemima as genuine representatives of the ethnic cuisines that they were marketing. These pop culture representations of caricaturized ethnicity were products of the burgeoning industrialized food system, the advent and exponential growth of fast food chain restaurants were another (Productions and Weber, 2009). Moss (2004) highlights these changes on a regional scale. Just as the rise of industrial food production and the Domestic Science movement helped make New England home cooking very much the same as cooking everywhere else in the United States, so did chain restaurants help make dining out in New England more similar to dining out everywhere else (Moss, 2004).

In his 1993 book McDonaldization of Society, sociologist George Ritzer introduced a contemporary interpretation of Max Weber's "rationalization" theory as it applied to the "new consumerism" that Ritzer felt was a product of Globalization. This new consumerism was synonymous homogeneity. More emphatically put, the book introduced the term McDonaldization into learned discourse to describe mind-numbing sameness (Gilbert 2002). As the world has grown increasingly more globalized, there has been a surge in the number of chain restaurants in the United States (Ritzer and Malone, 2000). This process has come to be stereotyped as McDonaldization (Ritzer and Malone, 2000). This is the process by which the principles of the highly successful and revolutionary fast food restaurant are

coming to dominate more and more sectors of American society and an increasing number of other societies throughout the world. However, the McDonald's franchise system and the principles upon which it has so successfully spread throughout the world represent the exemplar (as was the bureaucracy in Weber's model) of the contemporary development of rationalization States (Ritzer and Malone, 2000). The most notable and more directly visible cultural impact is the way McDonald's is altering the manner in which much of the rest of the world eats (Ritzer and Malone, 2000). In 2012, the top nine fast food restaurant chains in the United States maintained a 45% market share (*Table 1*) of overall fast food revenues. This would seem to imply a homogenous distribution of fast food restaurants across the United States. It is this assumption that this paper chooses to explore.

Table 1: Top nine restaurant chains market share (2012)

Market Share of Top Nine Fast Food Restaurant Chains (2012)	
Restaurant Chain	**Market Share (Total Revenue)**
McDonalds Corporation	**19%**
Doctor's Associates	**10%**
Subway	
Yum Brands	**9%**
Kentucky Fried Chicken	
Taco Bell	
Pizza Hut	
Jack in the Box	**2%**
Wendy's Corporation	**2%**
Burger King, Inc.	**1%**
Domino's Pizza	**1%**
Total Top Nine	**45%**

Source: adapted and compiled from data collected at http://www.wikinvest.com/stock/McDonald's_Corporation_(NYSE:MCD) cited 04/12/2013

2.5 Foodsheds, Foodscapes, and Foodways

The homogenizing for of McDonaldization has led to an increase in the desire to understand the foods that are available to us, and subsequently the venues that provide that food (Productions and Weber, 2009; Schlosser, 2004). Inherent to this trend towards a better understanding of food availability is the concept of "local" (Lenzer, 2011; Guptill, and Wilkins, 2002). The desire to understand our food system is not new; however its resurgence in the literature is evident (Allen, 2010; Martinez, 2010; Stuckler and Nestle, 2012). This lineage can be sourced to introduction of the term Foodshed into the American lexicon. W.P. Hedden introduced the term in his 1929 book, How *Great Cities Are Fed*. Hedden described a 'foodshed' in 1929 as the 'dikes and dams' guiding the flow of food from the producer to consumer (Peters, 2008). Although the boundaries of a foodshed are not meant to be rigidly defined, the foodshed is seen as socially, economically, ethically and physically infused in a particular place (Kloppenburg et al., 1996). This notion of community and moral economy within the foodshed may serve as a way of gaining a sense of place amidst a globalized food provisioning system (Lenzer, 2011). Lenzer provides excellent insight into the dynamics of foodsheds. Most importantly she identifies the importance of embeddedness. The field of sustainability studies has embraced this and recent research synthesizing cartography, sustainability and food access reflects this (Goldsberry, Duvall, Howard, and Stevens, 2010; Opfer, 2010). Opfer (2010) employed GIS spatial analysis tools to measure the density of food access points across demographics; whereas, other scholars (Goldsberry et. al, 2010) are interested in conceptualizing new ways in which to visualize food access.

2.6 Food and Regional Identity

Shortridge's (1998) article provides inspiration for this research; and in doing so, clearly validates the need for this type of regional exploration, when she states:

> Food is a sensitive indicator of identity and change in American culture. Everyone eats, of course, and the overall wealth and diversity of peoples in the United States have generated an unprecedented variety of food-stuffs from which to select. Each time we reach for even a snack, we are making conscious decision that serves to define us. Is that choice determined by where we live within the United States? Yes, in part. Is it based on our ethnic background and that of others in our community? Yes, to some degree. As much as the advertisements for franchise (chain) restaurants and processed foods would like us to believe that we have a homogenous national cuisine, we do not. Our diet is richly varied and constantly in flux. (p. 507)

This statement stands in clear opposition to the concept of McDonaldization and its homogenizing forces. Clearly, it is optimistic in nature, and sets the tone for this research. Thankfully, Shortridge (1998) does not stand alone in this recognition of a persistent contemporary regionality. Zelinsky (2011) reports, it [Unites States] has also retained the identity of many of its multitudinous places and, in fact, increased their number and variety while also preserving the integrity of some regionally defined cultural items. I wished to address Shortridge's (1998) position that there is no "homogenous national cuisine" in America. Also, the integrity of Zelinsky's "regional defined cultural items [food]" is in need of further validation. In order to so, the distribution of restaurants in the American Foodscape is proposed. If Shortridge (1998) is indeed correct about the state of the American Foodway, and we are indeed privy to a diet that is richly varied and constantly in flux; it follows that restaurant distribution would reflect the culture and cuisine of the local population.

2.7 Business Ecology Modeling

The idea that business structure and distribution can be described using ecological metaphors is a relatively new concept. Its origins can be traced to the 1990's (Montague, 1993; Moore, 1993; Abe, 1998). Moore's (1996; 1993) foundational works, *The Death of Competition: Leadership & Strategy in the Age of Business Ecosystems* and *Predators and prey: A new ecology of competition,* support the application of community based methodology to restaurant chain distribution data set. However where Moore focuses on the interaction of business partners for his ecological community, the research focuses on the way in which competitors are distributed in the business landscape. This portion of the literature review purports to detail the key concepts of Moore's analogy, as well as the ways in which it will be adapted to the restaurant foodscape.

Moore begins by defining a business ecosystem as an economic community supported by a foundation of interacting organizations and individuals – the organisms of the business world (Moore, 1993). It follows then that each restaurant location can be classified as an organism within the business ecosystem. Moreover, the next conceptual leap that can be made is in terms of classification; individual company locations were treated as individual organisms within the business ecosystem. Additionally, when these individual organisms belong to the same restaurant chain, they could be categorically grouped together and treated as species. One of the strengths of the population ecology model is that it emphasizes populations within a species as an important unit of analysis. Identifying an analogue to the biological notion of specie, it is argued, should resolve the problem of treating organizations as either unique or all the same (Betton, 1985). It is apparent that Moore's business ecosystem is closer to the concepts of cluster and value

network (Peltoniemi 2004). It is through this established lineage of scholarship that this research is compelled. The application of ecological clustering methodology towards the construction of a community based model of the restaurant industry is a natural addition to the existing related scholarship.

The ecological community model allows for this research to address the fact that, as a result of McDonaldization, a select few restaurant species dominate the foodscape. The key to a business ecosystem are leadership companies, "the keystone species", who have a strong influence over the co-evolutionary processes (Peltoniemi, 2004). Lansiti and Levien expand on Moore's idea of keystone species further by more clearly defining the roles of individual species within the business ecosystem. The biological counterparts of the two other primary roles that we have identified in business ecosystems – the dominator and the niche player- are more obvious. Many "weeds", which supplant other species in their ecosystems, are classic dominators. And most species in nature, like companies in the business world are niche players, with specialized function that contributes to the functioning of their ecosystems (Iansiti and Levien, 2004). These dominant species are seen as generalists by this study. I will use Iansiti and Levin's concept of a business weed to address hypothesis one of this paper. Additionally, it will be used to justify the data reduction phase of the methodology. Restaurants that dominate the foodscape will simply be treated as generalist species and classified as "weeds". This procedure will be detailed in the methodology section of this paper.

CHAPTER THREE

Research Design and Methodology

3.1 Research Design

The premise for this research is that the restaurant chain distribution in the foodscape can be studied by using tools designed to study the biological community. Ecological community analysis was applied to the restaurant chain foodscape. The results were analyzed and described using ecology based terminology. Finally, the resulting restaurant chain clusters were organized and mapped towards the development of a regional foodscape model.

An ecological community based hierarchical clustering methodology was used to investigate the regional distribution of restaurant chain locations in the Contiguous United States in 2007. The year 2007 was chosen because of the availability of the data set. More current years were inaccessible due to financial barriers. Cluster is a term introduced by Porter (1990). Clustering is a phenomenon linked to geographic concentrations of national industries which originate from vertical or horizontal relationships between companies. According to Porter (1990) the power of clusters lies in fierce competition within them, which obliges the companies to elevate their standards of performance (Peltoniemi, 2004). This is relevant because it alludes to natural selection which is another connection to the ecological community. Each similarity between the business world and ecology supports the application of ecological modeling to restaurant distribution. ESRI's ArcMap 10.0 software was used to organize and glean the immense, comprehensive restaurant location data set into a more manageable one. PcORD was used to incrementally construct more complex clusters using Ward's algorithm. MRPP and ISA tools were used to gauge the

statistical relevance of the resulting clusters, and a dendrogram was produced for the most statistically relevant cluster. One again, ArcMap 10.0 was utilized to create maps that effectively communicate the statistical results represented in the dendrogram in a visual format. It is through the construction of these maps, that the regionality of restaurant chain distribution in the United States becomes most apparent. I utilized two well established and broadly accepted spatial analysis software suites in order to explore this inherent regionality.

3.2 Study Area

The US Census provides statistics concerning the of population distribution in the United States (*Table 2*). These statistics provide the starting point for the selection of the appropriate areal scale for this project. Seventy nine percent of the US population lives in urban areas. Close scrutiny of 2000 Census data reveals that, more than two out of three Americans live in urbanized areas. These areas collectively cover two percent of the nation's land area. Counting urbanized areas and urban clusters together, nearly four out of five Americans live in an urban setting. Thus, this research focused on urban areas.

Table 2: Census 2000 population statistics

Census 2000 Population Statistics			
U.S. Population Living in Urban vs. Rural Areas			
Geographic Division	Number of Areas	Total Population	Percent of U.S. Total
Total U.S. Population		285,230,516	100
Population in Urban Areas	3,629	225,956,060	79.219
Population in Rural Areas		59,274,456	20.781
Urban Area Categories			
> 200,000 population	153	166,215,889	58,274
50k to 199k population	310	29,584,626	10,372
5k to 49k population	1838	25,438,275	8,918
2.5k to 4.9k population	1328	4,717,270	1,654

Source: http://www.fhwa.dot.gov/planning/census_issues/archives/metropolitan_planning/cps2k.cfm cited 04/04/2013

The data in *Table 2* refers to the United States as a whole, and the first effort to achieve an appropriate scale will be to limit the study area to the contiguous United States. The inherently spatial nature of the clustering methodology and remoteness of both Alaska and Hawaii lend to their exclusion from the proposed regional restaurant model. This now leaves the issues posed by defining the study area as the contiguous United States. As previously stated, the intent was to study restaurants only in areas with high population densities. Fortunately, there is a long established methodology for researching urban areas in the United States. For the past 50 years, the US Census Bureau has maintained the Core Based Statistical Area (CBSA) program designed to provide a nationally consistent set of standards for collecting, tabulating, and publishing federal statistics for geographic areas in the United States and Puerto Rico. (MSA, 2004)

> A CBSA is a term used by the US census bureau to refer to any micropolitan and metropolitan statistical areas. A metropolitan statistical area (MSA) comprises a central county or counties with a Census bureau-defined urbanized area of at least 50,000 people, plus adjacent outlying counties having a high degree of economic and social integration with the central county as measured through commuting, whereas a micropolitan statistical area comprises a central county or counties with a Census, Bureau-defined urban cluster of 10,000 to 49,999 populations […]. A combined statistical area (CSA) is considered to be the combination of two or more adjacent CBSAs. […]. CSA'S provide data users with a broader perspective of how adjacent metropolitan and micropolitan areas are related. (MSA, 2004)

3.2.1 Gleaning the location data set

The Info USA data set contains vendor provided latitude/longitude data for 540,829 restaurant locations in the United States. Initially, the data set was reduced to include only those restaurants in R & I Magazines Top 400 Restaurant Chain List. This list uses annual gross sales data to determine the top 400 ranking. A shapefile was created for all restaurant

locations in the InfoUSA data set. This shapefile contained 155,065 restaurant locations. From this list of 400, two businesses were categorically excluded: Circle K and Seven Eleven. Despite serving food, these businesses specialize in retail packaged food sales. This study chose to focus only on businesses that primarily sell prepared foods in a restaurant setting.

Using ArcMap spatial analysis, this list was further reduced to include only the top 200 chains ranked by individual location count within the study area. United States Census Bureau Tiger Shape Files containing geocoded information for Combined Statistical Areas (2007) were imported into the ArcMap geodatabase. By using the intersect tool to isolate only those top 200 restaurant chain locations that were located within the study area, the ArcMap was able to glean the primary location data base to a more manageable, meaningful, and easily quantifiable data set of 98,040 individual restaurant chain locations. A separate data layer containing the top 200 chains within the CSA boundaries was created.

After preliminary data reduction, I noticed some anomalies in the 200 chain data set. These anomalies included restaurant chain location counts with obviously low total location counts or restaurant chains with location counts equal to zero. An example of this was Krispy Kreme Donut. ArcMap count analysis reported that there were only fourteen Krispy Kreme locations within the study area. That result was obviously incorrect. A quick search of the company website verified that the company had 773 locations in 2012. There were a number of these anomalies, within the 151 to 200 rank range of the 200 chain data set. I made the decision to remove chains with obvious data discrepancies. Towards that end, I simply removed the bottom 50 chains from the data set. This is an acknowledged weakness in the methodology as it does not completely address the data discrepancy, as chains with

higher location counts within the study area could have errors that are much more difficult to identify and isolate.

From this list of 200 restaurant chains, the top 150 chains by location count rank were chosen for inclusion in the hierarchical clustering model. I exported the 150 chain data set into Microsoft Excel so that it could be formatted for analysis with PcORD software. The resulting matrix contained restaurant count and absence/presence information for each top 150 chains within each of the 123 CSA'S in the study area. The Excel workbook was then used as input for the PcORD software. The 150 chain data set was submitted to the PcORD clustering software, and no statically significant clusters were revealed. After consulting the appropriate literature, I deemed it necessary to submit the 150 chain data set to data reduction protocol in order to remove the influence of the generalist species on the clustering model. By using the relative frequency results generated by PcORD for the simplest two-cluster model, the 150 chain data set was reduced. The relative frequency result for each of the two clusters was averaged. The 150 chain data set was then ranked according to the average cluster frequency for each chain. Restaurant chains with a 66.0% relative frequency or greater were tagged as generalist species, as a result of their overwhelming presence in both clusters identified in the preliminary two-cluster mode. These generalist species were removed from the 150 data set and excluded from further analysis. This process resulted in a new 119 chain data set. Ultimately, the final PcORD clustering analysis was performed and completed on this 119 restaurant chain data set.

3.3 Data source description

In order to complete the geospatial analysis necessary for the construction of a regional model, a standardized set of geographic shapefiles was necessary. These shapefiles were accessed through the online data access tool, American Fact Finder 2. A brief summary of these shapefiles and their technical aspects are detailed in the technical documentation for these files. The Census Bureau (2007) technical documentation states:

> The 2007 TIGER/Line Shapefiles are extracts of selected geographic and cartographic information from the U.S. Census Bureau's Master Address File/Topologically Integrated Geographic Encoding and Referencing (MAF/TIGER) database. The MAF/TIGER database was developed at the Census Bureau to support the mapping and related geographic activities required by the decennial and economic censuses and sample survey programs. Geographic base linear, area, and point features such as roads, railroads, rivers, lakes, and geographic area boundaries are represented in the files, as well as the polygons that make up the legal and statistical geographic areas for which the Census Bureau tabulates data. (p. 3-1)

The metadata for the two census shape files used in this study are presented in *Table 3* and *Table 4*.

Table 3: CSA shapefile metadata

Current Combined Statistical Area (CSA) Shapefile			
The shapefile name is: fe_2007_us_csa.shp			
The shapefile is nation-based.			
The following is the shapefile's attribute table layout:			
Field	**Length**	**Type**	**Description**
CSAFP	3	String	Current Combined Statistical Area FIPS code
NAME	100	String	Current Combined Statistical Area name
NAMELSAD	100	String	Current name and the translated legal/statistical area description code for Combined Statistical Area
LSAD	2	String	Current legal/statistical area description code for Combined Statistical Area
MTFCC	5	String	MAF/TIGER feature class code
FUNCSTAT	1	String	Current functional status

Source: http://www.fhwa.dot.gov/planning/census_issues/archives/metropolitan_planning/cps2k.cfm (2000 census table source) cited 03/25/13

Table 4: Contiguous US state shapefile metadata

Current State and Equivalent Shapefile

The shapefile name is: fe_2007_us_state.shp
The shapefile is nation-based.
The following is the shapefile's attribute table layout:

Field	Length	Type	Description
STATEFP	2	String	Current state FIPS code
STATENS	8	String	Current state ANSI code
STUSPS	2	String	Current United States Postal Service state abbreviation
NAME	100	String	Current state name
LSAD	2	String	Current legal/statistical area description code for state
MTFCC	5	String	MAF/TIGER feature class code
UR	1	String	Current urban/rural indicator
FUNCSTAT	1	String	Current functional status

Source: http://www.fhwa.dot.gov/planning/census_issues/archives/metropolitan_planning/cps2k.cfm (2000 census table source) cited 03/25/13

The primary restaurant location Data Base contains restaurant locations from InfoUSA Business Listing File for the year 2007. This location database is collected by consolidating business locations from multiple public sources including phone directories, trade publications, and online listings. InfoUSA validates each of the business locations via the ESRI geocoder process. The primary locator utilizes the Tele Atlas Address Points database. The secondary locator utilizes the Tele Atlas Street Address Range database. Records that did not match fall back to the geocode provided by InfoUSA.

This primary data base containing "all" restaurant locations in the United States in 2007 was gleaned using Restaurant and Institutions annual top 400 restaurant chain list. This list uses annual gross sales data to determine the top 400 ranking. Initially, two businesses were excluded from the list: Circle K and Seven Eleven. Despite serving food, their primary business is convenience sales. This study chose to exclude them and focus on listings whose primary business focused on restaurateuring.

Table 5: Info USA restaurant location metadata

Description: InfoUSA collects information on approximately 12 million private and public US companies.
Individual businesses are located by address geocoding—not all will have an exact location. The ESRI geocoder integrates an address-based approach with more than forty million residential and commercial
U.S. address records from the Tele Atlas Address Points database. This database maps street addresses to a physical location so each address is a fixed point and not an interpolation from an address range.
The geocoder uses address locators in a cascading fallback approach to ensure a match for as many records as possible. The primary locator utilizes the Tele Atlas Address Points database. The secondary locator utilizes the Tele Atlas Street Address Range database. Records that did not match fall back to the geocode provided by infoUSA.

Businesses can be retrieved by their Standard Industrial Classification Code (SIC) as well as by North American Industry Classification System (NAICS) Code and Location. The infoUSA Business File can be used for locating both competitors and marketing opportunities. This data is current as of January 2007.
Overall, 84 percent of the businesses are geocoded to the address level using the ESRI geocoder.

Variable Name	Description	Type	Width	
CONAME	Company Name	Char	30	
CITY16	City	Char	16	
STATE	State Abbreviation	Char	2	
STATE_NAME	State Name	Char	30	
ZIP	5-Digit ZIP Code	Char	5	
SIC	Primary SIC	Char	6	
NAICS_EXT	8-Digit NAICS Code	Char	8	
SALES_VOL	Estimated Sales Volume	Num	8	*in Thousands
HDBRCH	Business Status code	Char	1	
NUMBER_EMP	Number of Employees (Actual)	Num	8	
EMPSIZ	Employee Size Code	Char	1	
FRNCOD	Franchise Code	Char	6	
SQFT	Square Footage Code	Char	1	
MATCH_CODE	ESRI Geocoder Match Code	Char	5	
LOCNUM	Location Number (Unique Number)	Char	9	
LONGITUDE	Longitude	Num	11	
LATITUDE	Latitude	Num	10	

Source: Infousa.com. (2007). Restaurant Location CSV File (2007). Retrieved June 25, 2006, from Business Locations Database.

3.4 Methodology

In order to begin the geospatial analysis, I constructed a geodatabase using ArcMap 10.0. The ArcGIS database modeling process follows database abstractions developed in the 1980s (Nyerges, 2006). These abstractions are classification, generalization, association, and aggregation. ArcGIS modifies the terminology as follows: classification, subtypes,

relationships, and topology, respectively (Addison, 2006). This simple four stage process is expanded in the literature into a decisive ten step analysis process used specifically for geodatabase construction. Development of the……geodatabase data model follows the outline described by Arctur and Zeiler (2004) and recommended by ESRI (Addison, 2006).

I derived an adaptation of Arctur and Zeiler's process as it pertains to the construction of the restaurant location geodatabase. This adaptation is inspired by my completion of the exercises in *ArcGIS Tutorial1* (ESRI, 2012) and is detailed in the following eight stage explanation.

1. **Identify intended geodatabase output.**

   The research design phase of the research project provided information for this phase of the geodatabase construction. The desired output was a shapefile containing the top 200 restaurant chains by location count within the study area.

2. **Research, identify and select appropriate base layers for desired output.**

   Again the research design phase of the project provided the information for this section. Having established the validity of using CSA's as boundaries for the study area, the US Census Bureau website was accessed to download TIGER shapefiles with the appropriate CSA boundaries for the contiguous United States. The Info USA list of restaurant locations in latitude/longitude coordinates would comprise the next shapefile necessary for the geodatabase construction. Finally, the TIGER shapefile for the contiguous United States was also downloaded from the Census Bureau website to provide the background and reference for both the CSA and restaurant location shapefiles.

3. Identify and specify the appropriate cartographic scale

The scale for the geodatabase needed only to address the three shapefiles listed above. After some consideration the scale for the geodatabase was chosen and set to 1:24,000,000. This allowed for appropriate representation of the CSA's and restaurant locations and insured the consistent production of output maps.

4. Define datasets.

The country boundary and CSA shapefiles were organized into a single dataset for the purpose of clearly establishing the study area boundaries. The restaurant shapefile was organized into its own dataset containing only the restaurant locations. This set concluded the conceptual design portion of the GIS analysis process.

5. Define the tabular database structure and any behavior for attributes.

Due to extremely simple nature of the data used in the initial data gleaning process, this step was not initially employed. However, once the PcORD methodology detailed later in this section was completed, the resulting clusters were used to define a tabular database structure comprised of regions with the contiguous United States. This process was used to help create the regional maps used to present the results of the clustering methodology.

6. Assign spatial properties to geodatabase.

Figure 4 details the coordinate system and projection applied to the datasets within the geodatabase. These settings are applied so that the data will be located precisely within the geodatabase, and so that the resulting output will be valid.

Figure 4: Spatial properties of restaurant geodatabase

USA Contiguous Lambert Conformal Conic WKID: 102004 Authority: ESRI
Projection: Lambert Conformal Conic
False Easting: 0.0
False Northing: 0.0
Central Meridian: -96.0
Standard Parallel 1: 33.0
Standard Parallel 2: 45.0
Latitude of Origin: 39.0
Linear Unit: Meter (1.0)
Geographic Coordinate System: GCS North American 1983
Angular Unit: Degree (0.174532925199433)
Prime Meridian: Greenwich (0.0)
Datum: D North American 1983
Spheroid: GRS 1980
Semimajor Axis: 6378137.0
Semiminor Axis: 6356752.314140356
Inverse Flattening: 298.257222101

Source: ArcMap 10.0 properties for Restaurant Geodatabase referenced 05/25/2013

7. Design prototype geodatabase.

This study has produced a prototype geodatabase design. The prototype is based on the information products collected in step one, the data types and structure outlined in steps two through five, and the spatial properties defined in step six. The prototype geodatabase was created with ArcCatalog. Background information for the data model was collected during the literature review process to better understand how other data models have been designed and implemented in other fields of study. (Addison, 2006)

8. Apply ArcMap geospatial analysis tools to geodatabase.

The goal of identifying and extracting only those restaurants that are located within the CSA shapefile study area is a relatively simple exercise in ArcMap. In fact the power of ESRI's ArcMap software allows for this task to be accomplished using one simple tool. A spatial join involves matching rows from the Join Features to the Target Features based on their relative spatial locations. The target features and the joined attributes from the join features are written to the output feature class. By default, all attributes of the join features are appended to attributes of the target features and copied over to the output feature class. Two new fields, Join_Count and TARGET_FID, are always added to the output feature class. Join_Count indicates how many join features match each target feature (ESRI online help). ArcMap allows for the ranking of the Join_Count field, and in doing so the top 200 restaurant chains are identified for inclusion in the hierarchical clustering phase of the study. The output feature class stores the results of the spatial analysis in an attribute table. The resulting attribute table was exported in spreadsheet format so that it could be formatted for analysis with the PcORD software. *Figure 5* reports the membership, count, and distribution of the 200 chain data set.

Figure 5: Top 200 restaurant chain locations (see appendix A for restaurant abbreviations)

Top 200 (Gross Sales) Restaurant Chain Locations (2007)

Restaurant	Count	Restaurant	Count	Restaurant	Count	Restaurant	Count	Restaurant	Count	Restaurant	Count
SUBWAY	18429	OUTBCK	827	SCHLOT	384	ORANGE	237	TACMAR	158	PETERP	109
MCDONA	13574	PANEXP	759	TACMKR	382	TACTIM	233	ONBRDR	156	VOCEL	106
BURKNG	6809	WHATAB	703	WHTCAS	381	ROMANO	232	PENSTA	156	POTBLY	105
PIZHUT	6587	REDLOB	660	BOJANG	361	FUDDRU	230	COUSIN	154	TONYRO	96
STARBU	5866	BOSMKT	643	HONEYB	350	FIREHO	228	JOHNNY	153	FIVEGY	89
WENDYS	5854	OLIVEG	590	ELPOLL	349	TOGOEA	227	TACCAB	152	L&LBBQ	88
DOMINO	5253	BOBEVN	585	FAZOLI	339	CARRAB	223	ATLBRD	151	COFLTD	49
TACBEL	5241	CAPTND	583	WIENER	337	SIZZLR	223	LEECHK	151	WAWAFD	45
KFCCHK	5211	CICPIZ	577	ZAXBYS	333	CHARLEY	222	BAKSQR	150	CHESTR	36
DQUEEN	4417	CRKBRL	569	CULVER	330	UNOGRL	207	AUBOPA	148	WETZEL	34
QUIZNO	4199	SBARRO	559	RITASW	317	DANGEL	201	FAMOUS	148	JAMBAJ	33
ARBY'S	3223	TGIFRI	556	MARBLE	316	MCALIS	200	LUBYSC	146	TIMHOR	32
SONICD	3104	FRIEND	539	MOESGR	316	BEEFOB	194	TACJHN	140	SMOKNG	31
PAPJHN	2649	HUNGRY	532	REDROB	315	HAAGEN	191	PFCHAN	139	EINSTN	28
LITTLE	2006	CHIPOT	526	JERSEY	313	DONATO	189	PIZPRO	138	TACOBU	28
JACKIN	1998	CHUCKE	520	VLAPIZ	308	INNOUT	189	SONNYS	136	TULLYS	26
APPLEB	1798	GODFAT	517	PONDER	303	OLDCNT	185	WESTRN	136	CINNAB	24
HARDEE	1793	RNDTBL	486	SHONEY	302	TROPCL	185	MARIEC	134	GATTIS	21
WAFHSE	1498	PERKIN	483	BEN&JE	292	MAZZIO	183	NOODLE	133	BIGAPL	14
DENNYS	1497	GOLDEN	482	BAJAFR	290	BACKYD	178	PZRNCH	129	HONEYD	14
POPEYE	1456	STKSHK	482	PIZINN	289	GRTSTK	177	JETSPZ	128	KRISPY	14
BASKRO	1435	DELTAC	468	BRAUMS	285	ROLPOL	176	STKESC	128	SURFCI	9
BLIMPI	1345	TCBYOG	447	QDBMEX	284	COFBEA	175	ROSATI	127	BRUEGG	8
IHOPRE	1254	CHCKRS	430	BENNIG	276	PZFACT	175	CHECAK	126	PICADI	8
COLDST	1218	A&WALL	427	FOXPIZ	275	CALPIZ	173	PICKUP	126	FRESHN	7
CHILIS	1074	JIMMYJ	423	WNGSTP	273	PAPAGI	171	SKYLIN	125	LOGANS	7
CHKFLA	1072	DUNKIN	416	LNGHRN	267	JASONS	170	SMOKEY	125	CARINO	6
CHURCH	1071	BUFFWW	412	RYANSG	265	SIMPLE	169	PEETSC	124	MRSFLD	5
LNGJHN	1068	CARVEL	408	BIGBOY	252	HOMETW	168	PORTOF	124	PRETZL	5
PAPMPH	942	HUDDLE	398	LONSTR	251	MAGMOO	166	AUNTAN	121	SHEETZ	3
CARLJR	922	CARIBO	395	TEXRHS	246	RUBIOS	166	NATHAN	120	GRTHAR	2
PANERA	917	KRYSTL	390	OCHARL	244	VILLAG	165	CASEYS	119	SANDEL	2
RUBYTU	854	HOOTER	389	BRUSTR	238	MARCOS	158	NOBLER	119	CINNAM	1

Source: Researcher compiled data from results of ArcMap 10.0 geospatial analysis of 200 restaurant chain data set

3.5 Data Reduction

These top 200 chains, ranked by the total number of locations within the CSA boundaries, were then exported into Microsoft Excel software. The data base was scrutinized for anomalies and obvious data errors. These included obviously underrepresented restaurant location counts and an abundance of no value entries in the data matrix. These apparent abnormalities all occurred in the 150 to 200 range. It is acknowledged that these abnormalities may have just been more noticeable in the lower count chains. The data set was simply trimmed to include only the top 150 restaurant chains by location count within the CSA study area. These top 150 restaurant chains were then used to perform another spatial analysis in Arc Map 10.0. Again, using the intersect tool, a data table was constructed containing information on each of the 123 CSA'S in the Contiguous United States. This provided for detailed count information for each restaurant chain to be compiled for each CSA. Again, this data was exported into Microsoft Excel format for further analysis.

3.5 PcORD Clustering Analysis

This research applied two analysis methods to the 119 chain data set using the Pc ORD software (McCune and Mefford 1999): (1) hierarchical cluster analysis using Ward's algorithm interpreted via indicator species analysis (ISA); (2) multiresponse permutation procedures (MRPP) of clusters and sites grouped by environmental factor. Ward's Method starts out by finding two points with the minimum within-groups sum of squares. Points continue to be joined to the first cluster or to other points depending on which combination minimizes the error sum of squares from the group centroid (www.qualtrex.com). In all analyses, between-site distances were formulated using the principle of between point

correlation. The standard Peterson's product-moment correlation coefficient (*r*) can be used as distance measure by reversing its directionality and rescaling it from zero to one (maximum distance, no correlation): correlation distance = (1-*r*)/2 where r is the correlation coefficient. With community data it has maximum sensitivity to the zero-truncation problem (Beals 1984) and performs adequately only with data sets with very low beta diversity (McCune, 1999). The zero-truncation problem limits species abundance as a measure of favorability of a habitat. When a species is absent we have no information on how unfavorable the environment is for that species (McCune and Grace, 2002). Correlation is held forth as a valid measure of distance, because this study is not concerned with measuring the favorability foodscape. Moreover beta, or the differentiation among habitats, is presumed to be low due to the supposed homogeneity of the restaurant landscape in the United States.

First, Pc ORD performed a cluster analysis to identify groups of sites with restaurant chain distribution. This classification method has a long history of use; this study draws heavily upon established methodology within the field of community ecology (Duvall, 2011). In fact the analysis process is so well described in Duvall's (2011) work, that the following excerpt was used as the model for the methodology applied to the restaurant data set. Duval (2011) outlines the PcORD process accordingly:

> A brief description of the PC-ORD cluster analysis (1) between-site dissimilarity matrix calculated from species abundance values per site; (2) the sites with the lowest dissimilarity linked using [Ward's algorithm]; (3) the information lost by creating this new group (i.e., dendrogram scaling) calculated using Wishart's objective function; (4) a new dissimilarity matrix calculated; and (5) these steps repeated until all sites grouped together. Linkages and associated objective function values were represented as a dendrogram. Dendrogram pruning was based on ISA and interpretation of the ecological meaning of clusters. ISA

> assesses the fidelity of species to predefined groups of sample sites (e.g., clusters identified through cluster analysis; Dufrˆene and Legendre 1997). The indicator value (IV) for each species per cluster ranges from 0 percent (no indication) to 100 percent (perfect indication). Interpreting IVs is done in comparison with statistics on within-cluster homogeneity (Devineau 2005). Species with high IVs for clusters with low within-cluster homogeneity are generalists and IVs for these species decrease as within-cluster homogeneity increases. IVs for specialist species increase as within-cluster homogeneity increases. However, if there are too few sites per cluster, IVs are less meaningful because cluster characteristics do not relate to widely occurring conditions (Devineau 2005). Thus, IVs are useful in identifying the smallest ecologically meaningful clusters identified through cluster analysis (McCune and Grace 2002).
>
> The steps performed by PC-ORD in ISA were (1) the proportional abundance (proportion of all individuals belonging to a species) and (2) the proportional frequency (proportion of sample sites in which a species occurs) of each species in each cluster calculated; and (3) these two proportions multiplied and then expressed as a percentage, providing the IV for each species in each cluster. Statistical significance was assessed by randomly reassigning species to groups 1,000 times and then calculating IVs for these reassignments (McCune and Grace 2002). (pp. 503-504)

Indicator Species Analysis (ISA) was performed on models ranging from incrementally from two clusters to ten clusters. IS are indicative of environmental conditions. The ideal IS occurs only one cluster and occurs in every sampling of that cluster (Dufrˆene and Legendre 1997). The method [ISA] produces Indicator Values (IV) by combining species abundance in a particular group and the faithfulness of occurrence of a species in a particular group (McCune and Grace, 2002). (IS) are those with a high (IV). After subjecting the eight cluster models to ISA scrutiny, the six-cluster model was proved to be the most statistically significant. This determination was arrived by averaging the Indicator Values (IV) for each of the highest IS for each cluster. The cluster model with the highest average (IV) value was determined to be the most statistically significant.

Next, the six-cluster model was subjected to multiresponse permutation procedures

(MRPP) analysis. These results are presented in *Figure 8*. The study again turns to Duvall (2011) for a concise description of the MRPP analysis procedure:

> MRPP is a multivariate, nonparametric method of testing the hypothesis of no difference in species composition between predefined groups of sample units (Mielke and Berry 2001; McCune and Grace 2002).MRPP has been used regularly in ecology, especially to assess the influence of disturbance and environmental factors on vegetation composition. MRPP essentially assesses the likelihood that observed within-cluster homogeneity and between-cluster heterogeneity for predefined clusters are due to chance, based on randomization of group membership. McCune and Mefford (1999) described specific procedures used by PC-ORD in MRPP analysis. I then rank-transformed the distance measures, which increased sensitivity and makes MRPP results more analogous to those provided by NMS (McCune and Grace 2002). The distance matrix used abundance per species per site; the weighted mean within-group distance (δ) used the standard group-weighting equation, Ci = ni /ni (McCune and Grace 2002). (p.503)

CHAPTER 4

Results

4.1 Geocoding Results

Relevant geospatial information for the 200 chains chosen for the preliminary PcORD analysis is listed in *Figure 5*. From this list of 200 restaurant chains, the top 150 chains by location count rank were chosen for inclusion in the hierarchical clustering model. A map of the resulting 150 chains and the resulting location count information are presented below in *Figure 6*. The results of the geospatial count analysis in *Figure 6* shows clear relationship between the population of a CSA and the number of restaurant locations within it. By using the relative frequency results generated by PcORD for the simplest two-cluster model, the 150 chain data set was reduced to a new 119 chain data set. The results of the relative frequency analysis which lead to the identification of the generalist species are presented in *Table 7*. The 119 chain data set was input into the PcORD software to perform a hierarchical clustering using Ward's (1963) clustering algorithm. The six-cluster model was shown to have the highest average (IV) value and judged to be the most statistically significant, and the results are presented below in *Table 6*.

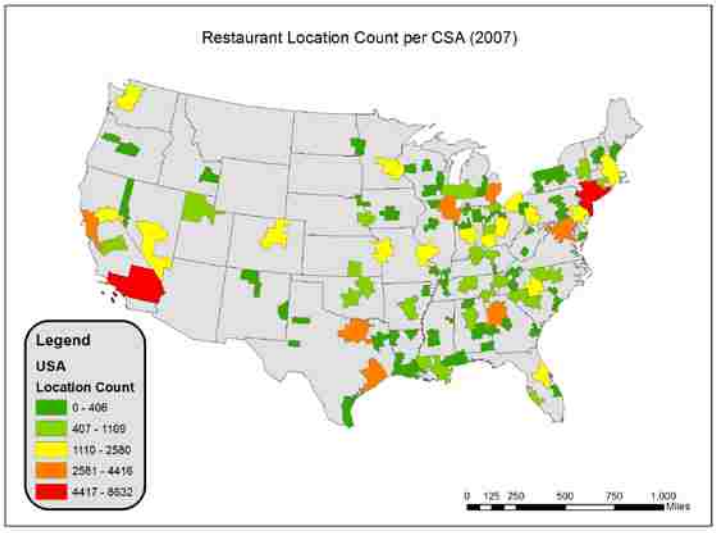
Table 6: Average IV analysis results for six-cluster regional model

Results of average IV analysis													
Six Cluster Model	WEST		UPPER MIDWEST		NORTHEAST		OHIO VALLEY		SOUTH		SOUTHWEST		Avg.
	Restaurant	IV	Restaurant	IV	Restaurant	IV	Restaurant	IV	Restaurant	IV	Restaurant	IV	IV
	TACMAR	87	TACMKR	83	FRIEND	78	BOBEVN	63	HUDDLE	67	SONICD	63	73.5

Source: Researcher compiled results from results of PcORD analysis

Figure 6: Top 150 restaurant count per CSA

Top 150 (Relative Frequency) Restaurant Chain Count per CSA



CSA Name	Location Count	Population Rank	CSA Name	Location Count	Population Rank	CSA Name	Location Count	Population Rank	CSA Name	Location Count	Population Rank
LosaCA	8632	2	GreeNC	859	30	MacoGA	320	80	JackTN	129	106
NewyNY	5921	1	GreeSC	826	35	MyrtSC	318	83	EaucWI	123	94
ChicIL	4416	3	KnoxTN	794	43	ColuGA	315	73	SaliMD	123	103
DallTX	4070	7	DaytOH	764	41	HarrPA	310	55	LimaOH	121	99
WashDC	3951	4	BirmAL	714	37	SoutIN	308	62	MansOH	113	102
AtlaGA	3661	10	GranMI	709	32	CorpTX	306	72	SiouIA	108	109
SanjCA	3247	6	TulsaOK	664	44	AsheNC	293	74	PaduKY	104	115
HousTX	3078	9	LittAR	555	46	MontAL	293	76	CapeMO	99	114
DetrMI	2901	11	OmahNE	552	45	SyraNY	290	50	JoneAR	99	108
BostMA	2580	5	NewoLA	542	40	SavaGA	288	79	BeckWV	93	117
PhilPA	2184	8	HartCT	529	33	LafaLA	279	64	KokoIN	90	113
SeatWA	2131	12	LexiKY	523	54	RenoNV	277	70	AlbaOR	87	96
MinnMN	2112	13	ChatTN	521	53	PortFL	272	57	BendOR	87	100
DenvCO	1818	14	FresCA	499	42	ShreLA	262	75	FairWV	86	112
OrlaFL	1765	17	ToleOH	480	51	PeorIL	260	78	LumbNC	83	104
StloMO	1763	16	ColuSC	465	49	PortME	245	66	WausWI	78	107
ClevOH	1669	15	SaraFL	461	47	GulfMS	234	81	FindOH	77	116
IndiIN	1546	23	BatoLA	457	48	RockIL	233	71	SantNM	77	98
CincOH	1435	21	WichKS	444	56	SagiMI	218	84	CorbKY	74	119
CharNC	1392	20	AlbaNY	432	38	ApplWI	216	82	FondWI	73	97
ColuOH	1388	24	BuffNY	406	36	YorkPA	214	68	IdahID	71	105
SacrCA	1307	19	MobiAL	402	60	BrowTX	207	77	AmesIA	65	118
PittPA	1262	18	RochNY	395	39	LubbTX	186	85	WillPA	58	110
KansMO	1256	22	JackMS	390	63	LongTX	170	86	SunbPA	54	101
LasvNV	1249	25	MadiWI	381	59	DothAL	158	89	IthiNY	50	111
NashTN	1109	29	DesmIA	373	58	FargND	152	93	ClarNH	49	92
RaleNC	949	28	YounOH	372	52	TylwerTX	151	88	ColuMS	45	121
LouiKY	929	31	HuntAL	360	65	MidlTX	146	87	ClovNM	38	123
MilwWI	896	26	JohnTN	356	69	LakeLA	141	91	UnioTN	38	122
SaltUT	891	27	FortIN	346	61	LafaIN	135	90	FortLA	34	120
OklaOK	884	34	LansMI	323	67	MonrLA	131	95			

Source: Research produced map from results of ArcMap analysis

Table 7: Identification of keystone species (highlighted in yellow) through relative frequency data reduction

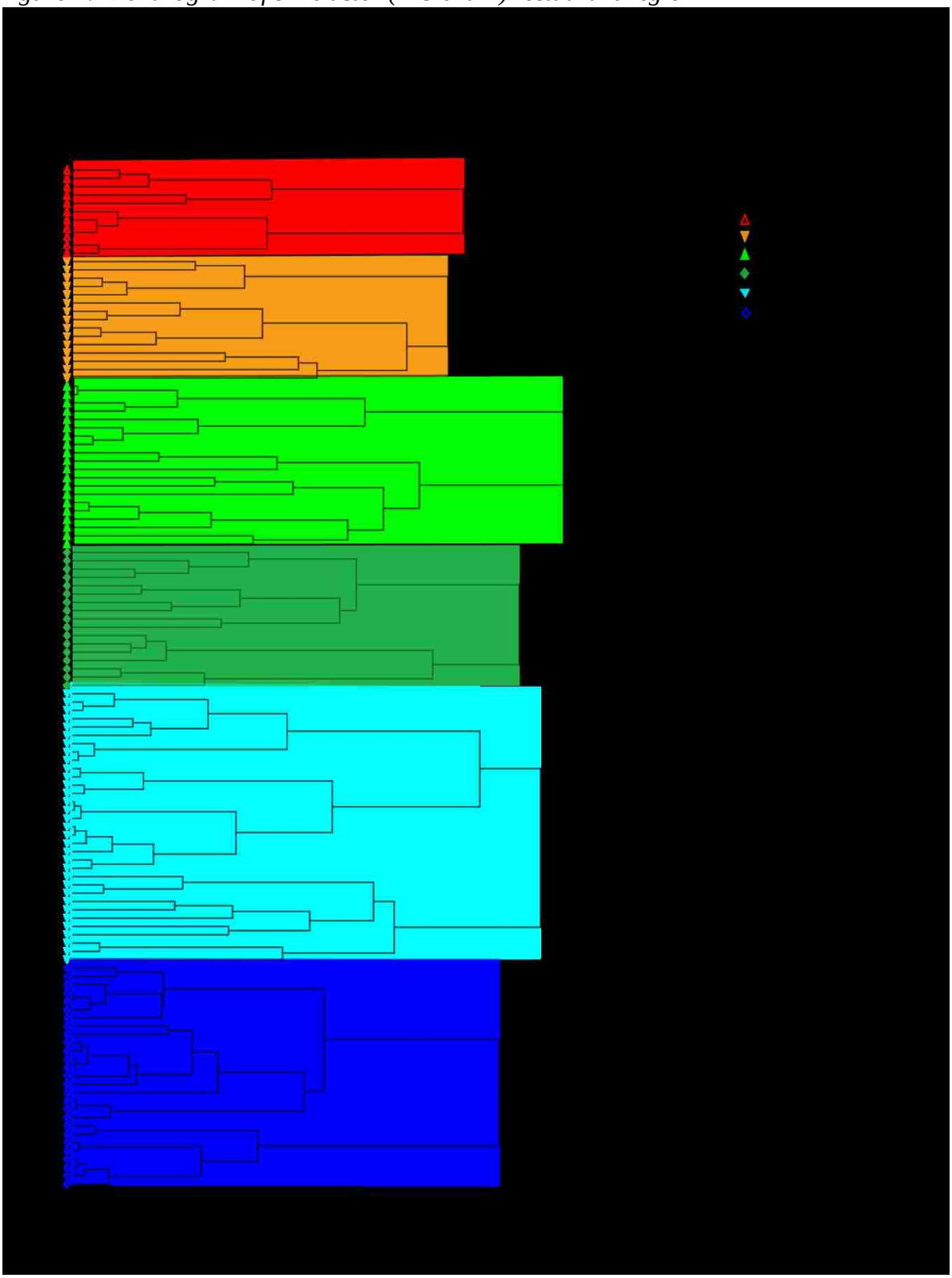
Restaurant Chain Relative Frequency per Two Cluster Modeling																
Sequence:				1	2			Sequence:				3	4		
Identifier:				1	5			Identifier:				9	13		
Number of items:				71	52			Number of items:				33	14		
Restaurant	Max	MaxGrp	Group	Freq. 1	Freq. 5	Average	Rank	Restaurant	Max	MaxGrp	Group	Freq. 1	Freq. 5	Average	Rank
SUBWAY	100	100	1	100	100	100	1	PANEXP	35	52	5	52	17	34.5	76
MCDONA	100	100	1	100	100	101	2	JERSEY	34	35	1	34	35	34.5	77
BURKNG	100	100	1	100	100	100	3	HUDDLE	34	60	1	8	60	34	78
WENDYS	100	100	1	100	100	101	4	BEN&JE	34	42	1	42	25	33.5	79
PIZHUT	100	100	1	100	100	100	5	FOXPIZ	33	38	5	38	29	33.5	80
DOMINO	100	100	5	100	100	100	6	BOSMKT	33	49	1	49	17	33	81
KFCCHK	100	100	1	100	100	100	7	WNGSTP	33	48	5	18	48	33	82
TACBEL	98	100	1	96	100	98	8	BENNIG	33	37	5	37	29	33	83
QUIZNO	98	100	1	100	96	98	9	ONBRDR	32	35	1	30	35	32.5	84
ARBY'S	97	99	1	99	96	97.5	10	ATLBRD	33	33	5	32	33	32.5	85
DQUEEN	94	94	1	94	94	94	11	PONDER	32	52	1	52	12	32	86
PAPJHN	94	94	5	94	94	94	12	JASONS	32	54	5	10	54	32	87
APPLEB	93	99	1	99	87	93	13	AUNTAN	32	37	5	37	27	32	88
OUTBCK	86	88	5	85	88	86.5	14	SHONEY	31	52	1	10	52	31	89
STARBU	84	89	1	89	79	84	15	PIZINN	29	50	1	8	50	29	90
CHILIS	83	85	1	82	85	83.5	16	GRTSTK	29	37	1	37	21	29	91
LITTLE	83	85	1	85	81	83	17	UNOGRL	29	42	1	42	15	28.5	92
OLIVEG	83	83	5	83	83	83	18	FAMOUS	29	44	5	44	13	28.5	93
REDLOB	82	83	5	83	81	82	19	CHECAK	27	37	1	37	17	27	94
CHUCKE	79	81	1	77	81	79	20	KRYSTL	27	46	5	7	46	26.5	95
IHOPRE	78	87	5	70	87	78.5	21	CHIPOT	26	38	1	38	13	25.5	96
DENNYS	76	87	1	87	65	76	22	BRUSTR	26	33	5	18	33	25.5	97
CRKBRL	76	83	1	69	83	76	23	HUNGRY	25	25	1	25	25	25	98
COLDST	72	82	1	82	62	72	24	ZAXBYS	25	46	1	4	46	25	99
RUBYTU	71	76	5	76	65	70.5	25	JOHNNY	25	39	1	39	10	24.5	100
BLIMPI	70	77	5	77	62	69.5	26	OLDCNT	24	44	5	44	4	24	101
HOOTER	69	71	1	66	71	68.5	27	DUNKIN	24	34	1	34	13	23.5	102
POPEYE	68	73	5	62	73	67.5	28	CHCKRS	23	27	1	20	27	23.5	103
TGIFRI	68	77	5	77	58	67.5	29	CULVER	23	41	1	41	6	23.5	104
CHKFLA	66	85	1	48	85	66.5	30	CALPIZ	24	34	5	34	13	23.5	105
LNGJHN	67	67	5	66	67	66.5	31	CARVEL	22	31	5	31	13	22	106
SBARRO	65	69	5	69	62	65.5	32	FIREHO	21	38	5	4	38	21	107
BASKRO	64	71	5	58	71	64.5	33	JACKIN	21	23	1	18	23	20.5	108
GOLDEN	63	73	5	54	73	63.5	34	BOJANG	20	35	1	6	35	20.5	109
SONICD	63	100	5	25	100	62.5	35	HAAGEN	21	28	1	28	13	20.5	110
CICPIZ	62	87	5	38	87	62.5	36	HOMETW	20	31	1	31	10	20.5	111
TEXRHS	62	67	1	56	67	61.5	37	LEECHK	21	24	1	24	17	20.5	112
HARDEE	61	67	1	55	67	61	38	FRIEND	20	34	5	34	6	20	113
PANERA	59	75	5	75	44	59.5	39	BAJAFR	20	30	1	30	10	20	114
BUFFWW	59	61	5	61	58	59.5	40	WHATAB	20	38	1	1	38	19.5	115
TCBYOG	57	63	1	51	63	57	41	TACMKR	19	27	1	27	12	19.5	116
WAFHSE	55	79	5	31	79	55	42	CARIBO	19	28	1	28	10	19	117
FAZOLI	54	55	1	55	54	54.5	43	BIGBOY	17	31	1	31	4	17.5	118
CHURCH	54	81	5	27	81	54	44	MARCOS	16	27	1	27	6	16.5	119
HONEYB	54	56	5	56	52	54	45	NATHAN	17	20	1	20	13	16.5	120
RYANSG	53	75	5	31	75	53	46	WIENER	14	15	1	15	13	14	121
MARBLE	51	67	1	35	67	51	47	WHTCAS	14	25	1	25	2	13.5	122
MOESGR	50	56	5	44	56	50	48	BAKSQR	13	23	1	23	4	13.5	123
LONSTR	49	56	5	56	42	49	49	CARLJR	13	15	1	15	10	12.5	124
CARRAB	49	54	5	44	54	49	50	PENSTA	12	17	5	17	8	12.5	125
SCHLOT	48	62	1	35	62	48.5	51	NOODLE	12	23	1	23	2	12.5	126
ROMANO	48	50	1	46	50	48	52	MAZZIO	12	23	1	1	23	12	127
A&WALL	47	61	5	61	33	47	53	AUBOPA	12	21	1	21	2	11.5	128
GODFAT	45	58	5	58	33	45.5	54	POTBLY	11	17	1	17	6	11.5	129
CAPTND	45	69	5	21	69	45	55	SIZZLR	11	20	1	20	2	11	130
ROLPOL	43	50	1	37	50	43.5	56	COUSIN	11	20	1	20	2	11	131
LOGANS	43	60	1	27	60	43.5	57	TACMAR	11	18	1	18	4	11	132
JIMMYJ	41	54	5	54	29	41.5	58	DELTAC	10	17	1	17	4	10.5	133
CHARLEY	42	46	5	46	37	41.5	59	RITASW	10	20	1	20	0	10	134
MCALIS	41	73	1	10	73	41.5	60	DONATO	10	14	1	14	6	10	135
STKSHK	41	44	1	38	44	41	61	ELPOLL	9	11	5	11	8	9.5	136
VILLAG	38	44	5	44	33	38.5	62	MARIEC	9	13	1	13	6	9.5	137
PAPMPH	38	55	1	55	21	38	63	TACCAB	8	13	1	3	13	8	138
OCHARL	38	56	1	20	56	38	64	SKYLIN	7	14	1	14	0	7	139
ORANGE	38	51	1	51	25	38	65	TACTIM	7	14	1	14	0	7	140
BOBEVN	37	54	1	54	21	37.5	66	INNOUT	6	10	1	10	2	6	141
REDROB	38	56	1	56	19	37.5	67	JETSPZ	6	8	1	8	4	6	142
PFCHAN	37	42	5	42	33	37.5	68	ROSATI	6	8	5	8	4	6	143
MAGMOO	37	42	1	42	31	36.5	69	RNDTBL	6	11	1	11	0	5.5	144
FUDDRU	36	38	1	34	38	36	70	BRAUMS	6	10	1	1	10	5.5	145
PERKIN	36	56	5	56	15	35.5	71	TOGOEA	5	8	1	8	2	5	146
QDBMEX	35	48	1	48	23	35.5	72	PEETSC	5	10	1	10	0	5	147
LNGHRN	36	40	5	31	40	35.5	73	DANGEL	4	7	1	7	0	3.5	148
VLAPIZ	35	49	1	49	21	35	74	PAPAGI	3	6		6	0	3	149
BACKYD	35	62	5	8	62	35	75	COFBEA	2	4		4	0	2	150

Source: Research produced from results of PcORD analysis of 150 chain data set

4.2 Clustering analysis results

The properties of the six-cluster model are summarized by PcORD using a dendrogram chart. The six-cluster dendrogram is presented in *Figure 7*. The dendrogram contains information concerning the statistical validity of each cluster via the results of the ISA. The top three (IS) for each cluster are reported here. The results of the clustering methodology are more clearly apparent when they are presented cartographically. The clusters identified by the dendrogram in *Figure 7*, are mapped in *Figure 8*. The map clearly shows the regional aspects of the six-cluster model derived from the 119 chain data set. For the purposes of this study, the resulting six regions will be named: West, Upper Midwest, Ohio Valley – Florida, Northeast, South, and Southwest. Finally, *Figure 8* also contains the results of the MRPP analysis performed on the six-cluster model.

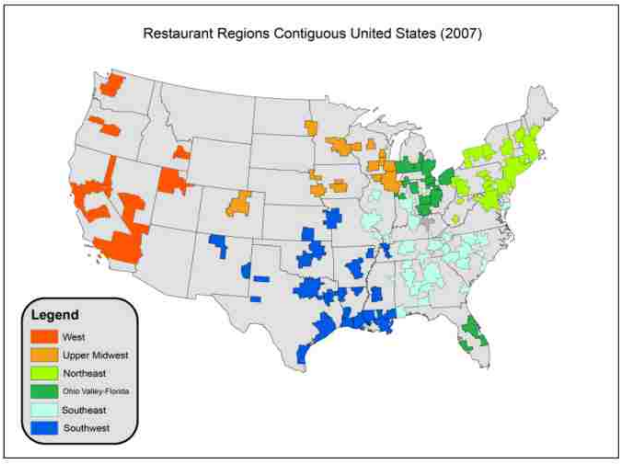
Figure 7: Dendrogram of six-cluster (119 chain) restaurant region



Source: Researcher derived graphic from results of PcORD clustering analysis

Figure 8: Map of six-cluster regional model including results of MRPP

Six Cluster (119 Member) Regional Model Statistics (2007)



Region Name: West	Size: 11	Average distance = 0.12482417								
AlbaOR	BendOR	FresCA	IdahID	LasvNV	LosaCA	RenoNV	SacrCA	SaltUT	SanjCA	SeatWA

Region Name: Northeast	Size: 20	Average distance = 0.26814119								
AlbaNY	BeckWV	BostMA	BuffNY	ClarNH	FairWV	HarrPA	HartCT	IthiNY	NewyNY	PhilPA
PittPA	PortME	RochNY	SunbPA	SyraNY	WashDC	WillPA	YorkPA	YounOH		

Region Name: Upper Midwest	Size: 15	Average distance = 0.20698987								
AmesIA	ApplWI	ChicIL	DenvCO	DesmIA	EaucWI	FargND	FondWI	MadiWI	MilwWI	MinnMN
OmahNE	RockIL	SiouIA	WausWI							

Region Name: South	Size: 33	Average distance = 0.14596533								
AsheNC	AtlaGA	BirmAL	CapeMO	CharNC	ChatTN	ColuSC	ColuGA	ColuMS	CorbKY	DothAL
GreeNC	GreeSC	HuntAL	IndiIN	JohnTN	KnoxTN	KokoIN	LexiKY	LimaOH	LouiKY	LumbNC
MacoGA	MobiAL	MontAL	MyrtSC	NashTN	PaduKY	PeorIL	RaleNC	SaliMD	SavaGA	StloMO

Region Name: Southwest	Size: 27	Average distance = 0.00795908								
BatoLA	BrowTX	ClovNM	CorpTX	DallTX	FortLA	GulfMS	HousTX	JackTN	JackMS	JoneAR
KansMO	LafaLA	LakeLA	LittAR	LongTX	LubbTX	MidlTX	MonrLA	NewoLA	OklaOK	SantNM
ShreLA	TulsaOK	TylwerTX	UnioTN	WichKS						

Region Name: Ohio Valley	Size: 17	Average distance = 0.23501161								
CincOH	ClevOH	ColuOH	DaytOH	DetrMI	FindOH	FortIN	GranMI	LafaIN	LansMI	MansOH
OrlaFL	PortFL	SagiMI	SaraFL	SoutIN	ToleOH					

Test statistic: T = -50.752930
Observed delta = 0.16911988
Expected delta = 0.50000000
Variance of delta = 0.42502955E-04
Skewness of delta = -0.60612841

Chance-corrected within-group agreement, **A = 0.66176024**
A = 1 - (observed delta/expected delta)
Amax = 1 when all items are identical within groups (delta=0)
A = 0 when heterogeneity within groups equals expectation by chance
A < 0 with more heterogeneity within groups than expected by chance
Probability of a smaller or equal delta, p = 0.00000000

Source: Researcher produced from results of PcORD analysis of the six-cluster (119 chain) data set using Ward's clustering algorithm

CHAPTER 5

Analysis

5.1 Restaurant weeds in the foodscape

The analysis begins by addressing secondary question number one and hypothesis number one. How will the largest restaurant chains affect the ecological model's ability to identify regionality in the overall restaurant chain distribution? *Hypothesis:* Dominant restaurant chains will function much like their biological equivalents, known as generalist species. Their overwhelming abundance in the foodscape mimics the behavior of weeds in the ecological model. The fact that they dominate the environment will prevent the ecological model from revealing and statistically significant regionality.

Initially, 150 restaurants were chosen for PcORD analysis. Again, these restaurants were chosen using the following criteria. They were present in R&I magazines *2007 Top 400 Restaurant Chain (by Gross Sales)* ranked list of restaurants. Additionally, they were ranked in researched generated list of the top 200 restaurant chains by location count within the CSA study area. Close scrutiny of this list of 150, revealed that the top 74 restaurants on the *R&I* list survived the restaurant count rank screening.

As the PcORD analysis was systematically run on the 150 chain data set, the effects of the generalist species on the ecological clustering methodology became increasing apparent. The 150 chain data set was subjected to hierarchical clustering using Ward's clustering algorithm. Attempts were made to construct a simple two-cluster model and progressed incrementally until the methodology was applied towards a ten cluster model. Beginning with the simple two-cluster model, the resulting clusters had no regional characteristics. This trend continued until the four cluster model. In the simple two-cluster model, CSA's with the highest total restaurant count populated the most statistically

significant cluster. As the number of clusters increased, the CSA's with the highest total restaurant count continued to group together, while the other clusters failed to show any geographical regionality. In addition, the cluster with the high total restaurant count CSA's was the only cluster with statistically significant (IS). Collectively, all of these factors began to reveal the influence of generalist species on the restaurant landscape. In the end, PcORD failed to construct a statistically significant cluster from the 150 chain data set. The most interesting trend was the tendency for the highest total restaurant count CSA's to cluster together. Interestingly, the highest total restaurant count CSA's also tended to have the highest populations.

If the generalist species are to be treated as weeds, (Iansiti and Levien, 2004) then their dominance of the foodscape can be more easily understood. The ecological clustering model was simply unable to "see" beneath the overwhelming number of generalist species to reveal any significant regional patterns. *Figure 9* illustrates the thorough geographical distribution of McDonald's restaurants in the United States in 2011. As the number two restaurant by restaurant location count and number one in total gross sales, McDonald's is an excellent example of a generalist species.

Figure 9: Example of weeds in the foodscape

Source: http://www.datapointed.net/2009/09/distance-to-nearest-mcdonalds/

The impact of generalist species on the methodology can be attributed to the selection of (*r*) correlation was chosen as the distance measurement. As a reminder, the distance referred to is not a geographical distance, but rather a measurement of dissimilarity amongst groups. With such a large number of chains with restaurant locations in most or all CSA's, the dissimilarity between clusters was very low. Therefore, the decision was made to classify some portion of the 150 chain list as generalist species.

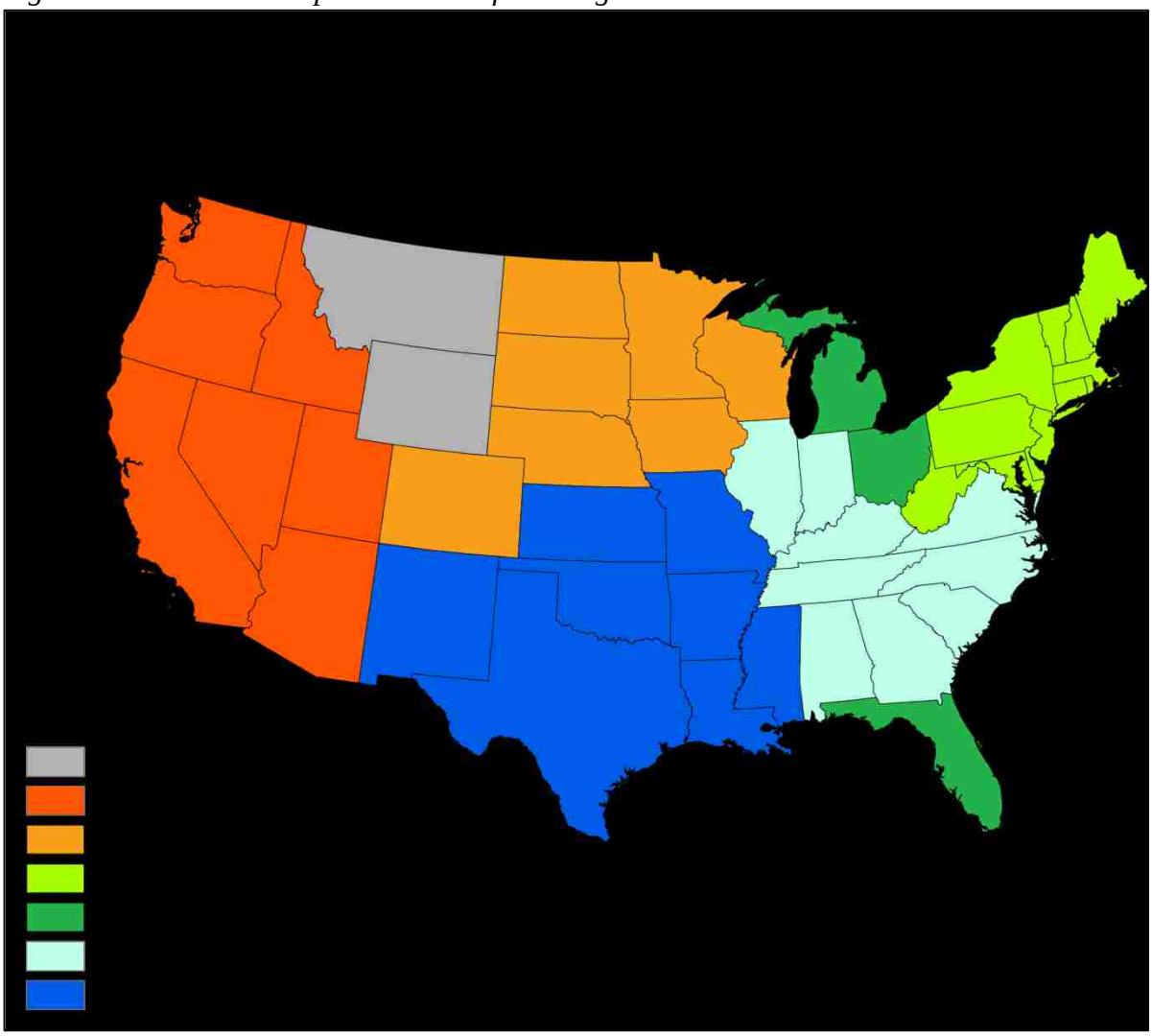
The results of the relative frequency data reduction measures were productive. Using the 119 chain data set, the PcORD software was able to develop a statistically significant regional model with six clusters. The resulting clusters have a familiar regional geography. Moreover, they substantiated by the presence of multiple statistically significant (IS) within each region.

5.2 Recognizable regionality

Many regional maps of the United States (see *Figure 11* and *Figure 12* below) use state scale mapping to visualize regions. In order to more easily draw comparisons to existing regional models, the CSA scale region map in *Figure 8* was rescaled so that the six regions could be represented in state scale(*Figure 10*). The symbology for each individual state was altered from the base grey color to correspond with the color of the CSA's contained within it. In the few cases where there where states contained CSA's with different regional memberships, the state was assigned regional membership by ranking the number of CSA's within each region. The region with the highest representation within each state was assigned to that state. As a result of this, Missouri was placed into the Midwest region, and Tennessee was grouped with the other states in the South region. States with no CSA's were labeled No Data and excluded from regional membership.

Once the state scale regional map was constructed, the regional distribution of the restaurant clusters becomes drastically more familiar. There is a clear region marking in red that is recognizable as a west coast or a pacific region. Next, the region represented in orange is also easily equitable with the labels Midwest or Great Plains. The region marked in dark green is also familiar. We recognize this as the great lakes or the Ohio valley region.

Figure 10: State scale representation of CSA regions



Source: Researcher produced map with ArcMap 10.0 from data derived from PcORD six-cluster (119 chain) CSA model

The lime, turquoise, and dark blue regions are identifiable as The Northeast or New England, The South or Dixie, and The Southwest or The Gulf Coast respectively. Collectively these regions are recognizable as well. The map of restaurant regions (*Figure 10*) is similar to other contemporary regional classifications (*Figure 11*). The regions in *Figure 11* were all derived using criteria dissimilar to this project, yet they all contain similar regional characteristics. More importantly, the six restaurant regions correspond to other existing food studies regions (*Figure 12*).

Table 8: Perceived Regions with Similar Geography

Restaurant Region	Perceived Regions with Similar Geography
West	Western, Pacific, Pacific Northwest, Far West
Upper Midwest	Great Lakes, Great Plains, Midwest, High Plains
Northeast	New England, Atlantic Seaboard, East Coast, The East, Up North, Rust Belt
Ohio Valley - Florida	Snowbird
South	Dixie, The South, Bible Belt, Cotton Belt
Southwest	Gulf Coast, Sun Belt

Source: researcher compiled table (Ayers, 1996; Shortridge and Shortridge, 1998)

5.3 Unrelated regional models

There are noticeable and obvious similarities between the unrelated regional models and the restaurant regions (*Table 8*). It is important to note that these maps were chosen because of their similarity to map produced by this research. This is an acknowledged weakness in the study and will be addressed in detail in Section Six. That being said, it provides a means with which to interpret the validity of the restaurant region model, and it opens an avenue for discussion. Most importantly the research can begin to ask: Why are these regional maps so similar? And, why is this important?

Regions divide the world into quantifiable units so that these units may be studied geographically. Again, regions have some sort of unifying characteristic or trait: they have an inherent commonality. But perhaps most importantly for the analysis of the resulting restaurant regions, they can be formal, functional, or vernacular. It is this cross comparison of regional types that will provide the means for a deeper understanding of regionality in the United States.

Figure 11 contains examples of formal, functional, and vernacular regional maps of the United States. With the exception of, *Perceived Cultural Regions in the United States*, the maps are all examples of formal or functional regions (*Table 9*). Although a simple

visual comparison is highly non-scientific, it does lend credence to the concept of vernacular or perceived regionality. The "imagined" region is one perceived as distinctive by those who live within it, by those who live outside it, or both (Friesen, 2007). Vernacular regions are perceived regions, such as "The South," "The Midwest," or the "Middle East;" they have no formal boundaries but are understood in our mental maps of the world (Schultz, 2009). Mental maps, like real maps, are a means to structure and store knowledge (Tuan, 1975). The inherent familiarity of the restaurant regions displays the power of mental mapping and in turn legitimizes the results of the ecological clustering methodology.

Table 9: Properties from maps in Figure 11

Map Name	Region Type	Number of Regions
US Biathalon Assn. Membership Regions	Functional	6
Percieved Cultural Regions United States	Vernacualar	14
American society of Safety Engineers	Functional	8
Census Regions United States	Formal	4
Top Freight Shipping Co. National Service Regions	Functional	7
National Drug Intervention Council	Formal	6

Source: Researcher compiled data from maps in Figure 11

Formal regions are those that are designated by official boundaries, such as cities, states, counties, and countries. For the most part, they are clearly indicated and publicly known (Schultz, 2009). The *US Census Map (Figure 11*, is an example of official boundaries that are also commonly recognized. The Functional regions are defined by their connections (Schultz, 2009). For example, the *Top Freight Shipping Map (Figure 11)* shows the ways in which service channels for a fleet maintenance company are connected. More importantly, despite the varied methodologies that led to each regional map, the maps are all comparable to the restaurant map. Not only is there a familiarity between each map in *Figure 11*, but there is a familiarity between the regions portrayed in *Figure 12* and the

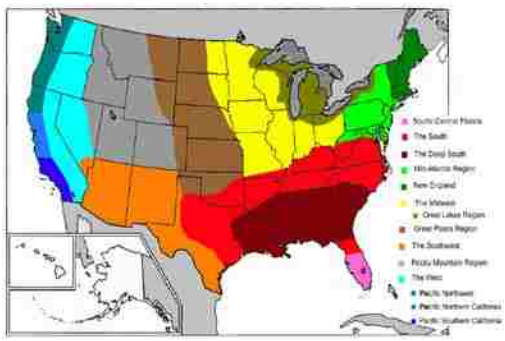
restaurant region map *Figure 10*. The similarity between the restaurant region map and these formal and functional maps is further endorsement of the accuracy of the restaurant region map.

Figure 11: Examples of Region Maps for the United States

UNITED STATES BIATHLON ASSOCIATION MEMBERSHIP REGIONS

Source: http://www.usbiathlon.org/foundation/regional-distribution-map.html accessed 9/12/2012

PERCIEVED CULTURAL REGIONS UNITED STATES



Source:http://sperglord.files.wordpress.com/2011/06/cultural-usa-map.jpg accessed 9/12/2012

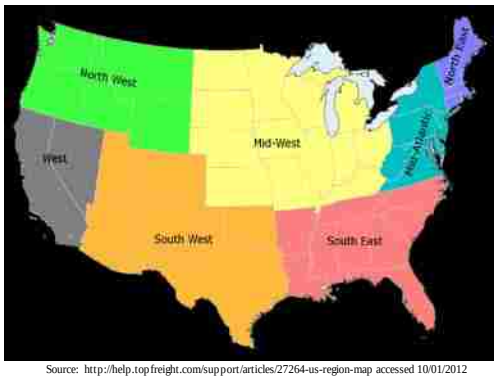
AMERICAN SOCIETY OF SAFETY ENGINEERS CHAPTERS

http://www.asse.org/membership/findachapter/usa.php accessed 3/02/2012

CENSUS REGIONS UNITED STATES

www.agcensus.usda.gov/Help/Report_Form_and_Instructions/2012_Report_Form/ accessed 11/23/2012

TOP FREIGHT SHIPPING CO. NATIONAL SERVICE ASSISTANCE REGIONS



Source: http://help.topfreight.com/support/articles/27264-us-region-map accessed 10/01/2012

NATIONAL DRUG INTERVENTION COUNCIL

Source: http://www.justice.gov/archive/ndic/pubs8/8731/images/figure1.gif accessed 9/12/2012

Source: Researcher compiled graphic from sources listed below each map

5.4 Food studies regional maps

The characteristics of the food studies maps are detailed in *Table 10*. Notice that the nature of these maps has shifted to include a greater percentage of vernacular maps, as would be expected due to the nature of food as a cultural indicator. Culture is complex, and it visualization lends itself to ideals of perceived regionality. The same arguments that were made in support of the restaurant model through comparison to the unrelated regional maps can be made using the food studies map: familiarity, similarity, and significance. The purpose of introducing these maps is not to reestablish the validity of the restaurant model, but rather the goal is to simply shift the discussion towards food, culture, and identity as they relate to regionality.

Table 10: Properties from maps in Figure 12

Map Name	Region Type	Number of Regions
USDA Food Assistance Regions	Formal	7
University of Caimbridge Food Dialect Regions	Vernacualar	4
Cuisine Regions United States	Vernacualar	8
National BBQ Association Regions	Functional	5
Gourmet Regions United States	Vernacualar	6
Organic Food Regions United States	Functional	7

Source: Researcher compiled data from maps in Figure 12

As outlined in the literature, the regional legacy in the United States has taken on a distinct cultural aspect that revolves around ethnic identity. Scholarship supports the idea that everything having to do with food—its capture, cultivation, preparation, and consumption-represents a cultural act (Montanari, 2006). As this study shifts focus towards more food related regional representations, it is important to remember that the regional restaurant model represents more than just the geographical distribution of chain restaurants. The similarity of the restaurant regions to other food studies regions implies some sort of causal relationship between food, culture, identity, and regionality. An examination of the

(IS) for each restaurant region was conducted towards that end, and the results are presented in Section 5.4.

Figure 12: Food Studies Regional Maps of United States

Source: Researcher compiled graphic from sources listed below each map

5.5 Restaurant regions of the United States

So that a more in depth exploration of each of the six regions can begin, I will now reduce the scale of the regional analysis. Each of the six regions identified by the clustering analysis are analyzed individually below. Towards that end, the top three (IS) for each region were isolated and mapped using ArcMap 10.0. The website for each restaurant chain was visited, and basic information concerning each company including the company logo was recorded. This information is presented in *Table 11*. I believe that a better understanding of each region can be gained by looking at a collection of the top (IS). This broader spectrum of species will provide a richer glimpse into the regions which they represent. In doing so, this section will address secondary questions two and three. Question 2: Do the resulting restaurant regions correspond with existing perceived regions within American culture? Question 3: Are the (IS) for each restaurant region representative of the perceived cultural regions with which they correspond?

Table 11: Characteristics of top three indicator species

Top Three ISA Details - Six Cluster (129 Member) Model								
Region	Identifier CSA	Top 3 Indicator Species	Indicator Value	Cuisine Type	Service Type	Headquarters Location	Founding Location	Year Founded
WEST	1	TACMAR	87	Mexican	Fast Food	Seattle, Wa.	Seatlle, Wa.	1992
		SIZZLR	83	American / Steakhouse	Buffet	Mission Viejo, Ca.	Culver City, Ca.	1958
		CARLJR	79	Hamburger	Fast Food	Carpinteria, Ca.	Los Angeles, Ca.	1941
		DELTAC	79	Mexican	Fast Food	Lake Forest, Ca.	Yermo, Ca.	1964
NORTHEAST	2	FRIEND	78	Ice Cream	Fast Food	Wilbraham, Ma.	Springfield, Ma.	1935
		RITASW	49	Ice Cream	Fast Food	Trevose, Pa.	Philadelphia, Pa.	1984
		DUNKIN	48	Coffee / Donut	Fast Food	Canton, Ma.	Quincy, Ma.	1950
UPPER MIDWEST	3	TACMKR	83	Mexican	Fast Food	Ogden, Ut.	Ogden, Ut.	1978
		CULVER	78	Hamburger	Casual	Prairie du Sac, Wi.	Sauk City, Wi.	1984
		COUSIN	64	Deli	Fast Food	Menomonee Falls, Wi.	Milwaukee, Wi.	1972
SOUTH	5	HUDDLE	67	American	Diner	Atlanta, Ga.	Decatur, Ga	1964
		HARDEE	65	Hamburger	Fast Food	St. Louis, Mo.	Greenville, Nc.	1960
		ZAXBYS	64	Fried Chicken	Casual	Athens, Ga.	Statesboro, Ga.	1990
SOUTHWEST	7	SONICD	63	Hamburger	Drive In	Oklahoma City, Ok.	Shawnee, Ok.	1953
		WHATAB	53	Hamburger	Fast Food	Corpus Christi, Tx.	Corpus Christi, Tx.	1950
		CICPIZ	37	Pizza	Buffet	Coppell, Tx.	Plano, Tx.	1985
		JASONS	37	Deli	Buffet	Beaumont, Tx.	Beaumont, Tx.	1976
OHIO VALLEY	18	BOBENV	63	American	Diner	Columbus, Oh.	Rio Grande, Oh.	1946
		BIGBOY	60	Hamburger	Diner	Warren, Mi.	Glendale, Ca.	1936
		MARCOS	58	Pizza	Fast Food	Toledo, Oh.	Toledo, Oh.	1978

Source: Researcher compiled data from PcORD analysis results of 119 chain six-cluster model

5.5.1 West Region

Figure 13: AKA: Pacific, Pacific Northwest, Far West

Source: Researcher produced map with ArcMap 10.0 from data derived from PcORD six-cluster (119 chain) CSA model

The West Region of the restaurant model has areal similarity to other common perceived regional classifications. The West Region is recognizable as the Pacific, the Pacific Northwest, and the Far West. Another popular region that shares this geography is the PAC-10 NCAA sports conference. The West Region is comprised entirely of the States that are west of the Rock Mountain range, which is a substantial geographic barrier. The ethnic makeup of the West regions is very diverse (*Figure 3*). The Southern third of the region is predominantly Hispanic or Mexican with a large secondary concentration of Native

Americans. The middle third of the region is dominated by the Mormon influence. Thus, the English ancestry is prevalent here. The top third has a strong French/Canadian ancestral population. The result of this sub regional dominance by various races is that the West Region is an extremely ethnically diverse geography. However, there is a clear regional identity which is inherently geographical. The Rocky Mountains define the Eastern border of the West Region, and they are a unifying aspect. The region is in fact isolated geographically. The Pacific Ocean forms a permanent border to the West, and the region is framed by formal National borders to the north and the south. Because of all of these factors, I believe that the West Region does support hypothesis two, and that it does correspond with other existing perceived cultural regions.

The (IS) for this region are Taco Del Mar, Sizzler, Carl's Jr., and Del Taco. We must explore these (IS) in order to address hypothesis three, and determine if they are reflective of the perceived cultural regions with which they intersect. The diversity of foods both produced and consumed in the Pacific Region is in large part due to its multicultural populace (Nettles, Salazar, and McLean, 2004). Despite the ethnic diversity of the region, Nettles, et al., (2004) reveal a key unifying force in the region […] perhaps more than any other activities, food production, distribution, and consumption serve to define this region and to ground it.

The varied demographic of the region, which is home to the majority of the U.S. Asian and Hispanic ethnic populations, is a reflection of the region's long history as a landing ground for explorers, traders, and immigrants, many led by their desire for a new life of prosperity (Nettles, et al., 2004). Both Del Taco and Taco del Mar are excellent cultural indicators of this high concentration of Hispanics. And a simple reflection of the

demographics of the region, it is an excellent (IS). An exploration of the restaurant industry in the region reveals that California has the most taco shops of any state, and Los Angeles has one of the largest numbers of barbeque restaurants outside the South, due to its relatively high African American population (Nettles, et al., 2004). This high concentration of barbeque restaurants leads to the discussion of Carl's Jr.

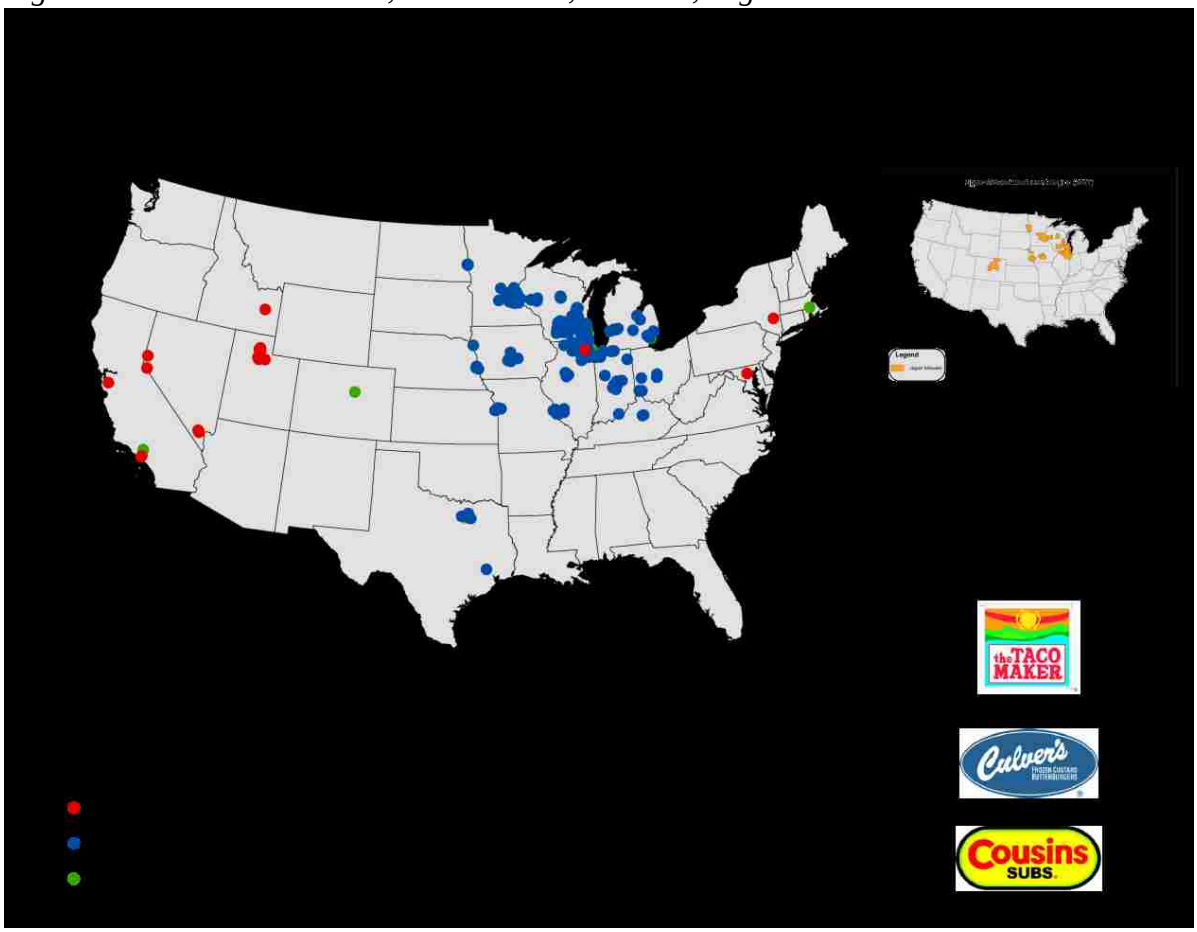
Carl's Drive-In Barbeque was founded in Carpentaria, CA in 1941, and it still maintains its national headquarters in Los Angeles, CA (*Table 11*). According to the company website, Carl's Jr. is a product of the Drive-In craze of the 1940's in California, and the long standing popularity of barbeque in Los Angeles (www.carljr.com). Carl's Jr. Restaurants predate McDonaldization by about 15 years, but they are both products of the West Region. Many of the concepts adapted by McDonald's were innovations from Carl's Jr. (www.about.com). The success of McDonald's and Carl's Jr. inspired many other fast-food restaurants that had their beginnings in Southern California, especially Taco Bell and Jack in the Box, which are still around today. Interestingly, although California is arguably the birthplace of fast food, it is now one of the lowest fast-food-eating states (Nettles, et al., 2004).

According to the Sizzler website, the chain was founded in 1958 as Del's Sizzler Family Steak House in Culver City, CA. Its company headquarters is in Mission Viejo, CA, and today most Sizzlers are in the West Region of the Restaurant model. Sizzler's original business model was a take on the exploding fast food industry in California. They employed McDonaldization to the steak, rather than to the hamburger. According to the website, in 1958 Sizzler offer a $1.19 steak dinner, with an additional steak for .01¢ (www.sizzler.com).

The best gauge of the (IS) species for the West Region of the restaurant model can be derived from consideration of the group as a whole. Taco Del Mar and Del Taco are both reflective of the widespread Hispanic cuisine prevalent in the area. They were both founded in the region, and they are still headquartered there. Carl's Jr. has a lineage in the fast food industry that predates McDonald's, and its California origins are indisputable. Carl's Jr. restaurant locations saturate the foodscape of the West Region, and there presence in the Eastern half of the United States is limited. This limited growth in the East will be discussed when analyzing Hardees restaurant. Hardee's is a business partner of Carl's Jr., and happens to be an (IS) for the Southeast Region of the restaurant model. Sizzler reinforces the West Region's historical link to the fast food industry. Collectively, these (IS) reflect the cuisine, ethnicity, and the restaurant history of the West Region. Therefore, I assert that they confirm hypothesis three, in that they accurately reflect the culture of the West Region.

5.5.2 Upper Midwest Region

Figure 14: AKA: Great Lakes, Great Plains, Midwest, High Plains



Source: Researcher produced map with ArcMap 10.0 from data derived from PcORD six-cluster (119 chain) CSA model

The Upper Midwest Region shares geography with regions known as the Great Lakes, the Great Plains, the Midwest, and the High Plains. This collection of States shares a perceived regionality that is acknowledged by its residents and celebrated regionally. *Figure4* reveals that the Upper Midwest region possesses an inherently European ethnicity. The Upper Midwest Region is predominantly German and French with concentrated pockets of Scandinavian ancestry concentrated around the Great Lakes (*Figure 3*). There is also a very prevalent region wide Native American ethnic presence. There are many Native

American Indian Reservations dispersed across the Upper Midwest Region, and their influence on regional identity is widespread. One of the major issues facing Upper Midwest regional classification is lack of clearly defined Southern border. The Rocky Mountains form a western barrier, and the Mississippi River is a formidable barrier to the east. Canada is a clearly defined political border to the north. Research supports that Southern regional border is not well defined nor is it commonly accepted. That may account for the wide variation in regional classifications for the area. The regions corresponding to the Upper Midwest in *Figure 11* and *Figure 12* vary tremendously in there range and size. Despite this, the Upper Midwest is clearly recognizable and familiar. Perhaps this wide range of regional classifications lends to the familiarity. There is a perceived regionality to the geography of the middle section of the United States, and I believe that the Midwest Region modeled in this project helps lend to its identification.

"Beef, it's what's for dinner" is a slogan taken seriously in the Great Plains. In a recent survey, 70 percent of residents said that this meat would be the core of any representative meal from their region (Shortridge, 1994). Shortridge surveyed Minnesota county extension agents, food editors at daily newspapers, geographers at community colleges and universities, and home cooks, asking them "to create a menu for hypothetical out-of-state guests who wanted to eat food representative of the region."(Shortridge, 2003) She found that the meal of choice was roast beef (with grilled steak second and hamburgers third […] Midwesterners like desserts with every meal, according to Shortridge's survey (Shortridge, 2004). On the surface, these observations supports the validity of all three (IS) that were identified for this area. Culver's restaurant specializes in butter hamburgers and custard. These two products are directly supplied by the industrialized beef production

system. Cousin's is a submarine sandwich shop. This business model relies heavily on processed meat products. This is another direct tie to the beef industry. Taco Maker is simply an ethnic derivative of the Upper Midwest's association with the beef industry. Beef production also is the highest-value agricultural enterprise in the Plains and is therefore important to local economies. Residents are accustomed to seeing cattle at pasture and in feedlots, and these images also dominate on calendars, postcards, and promotional tourist materials (Shortridge, 2004).

Culver's "Signature Combination" is their Butter burger and fresh frozen custard (www.culvers.com). The company website portrays regional ties and ethics attributed the perceived Midwestern region of the United States. The [Midwestern] foodways or traditions, Shortridge (2004) argues, "reveal a high caloric intake to supply the needs of hardworking farmers, and this heritage still pervades food traditions today […]". Culver's participation in these foodways are conveyed in the following statement regarding the chains origins. The son of a cheese maker and grandson of a Wisconsin farmer, George Culver spent the early part of his career inspecting and grading dairy farms for the Wisconsin Dairies Cooperative. While George was out calling on area dairy farms, Ruth Culver was home joyfully raising their three children, instilling in them the small-town, Midwest values she herself had come to know growing up in Sauk City (www.culvers.com). The ties to the dairy local dairy industry and the implied Midwestern value structure both support hypothesis three's assertion that the (IS) species for each region will reflect the regions culture.

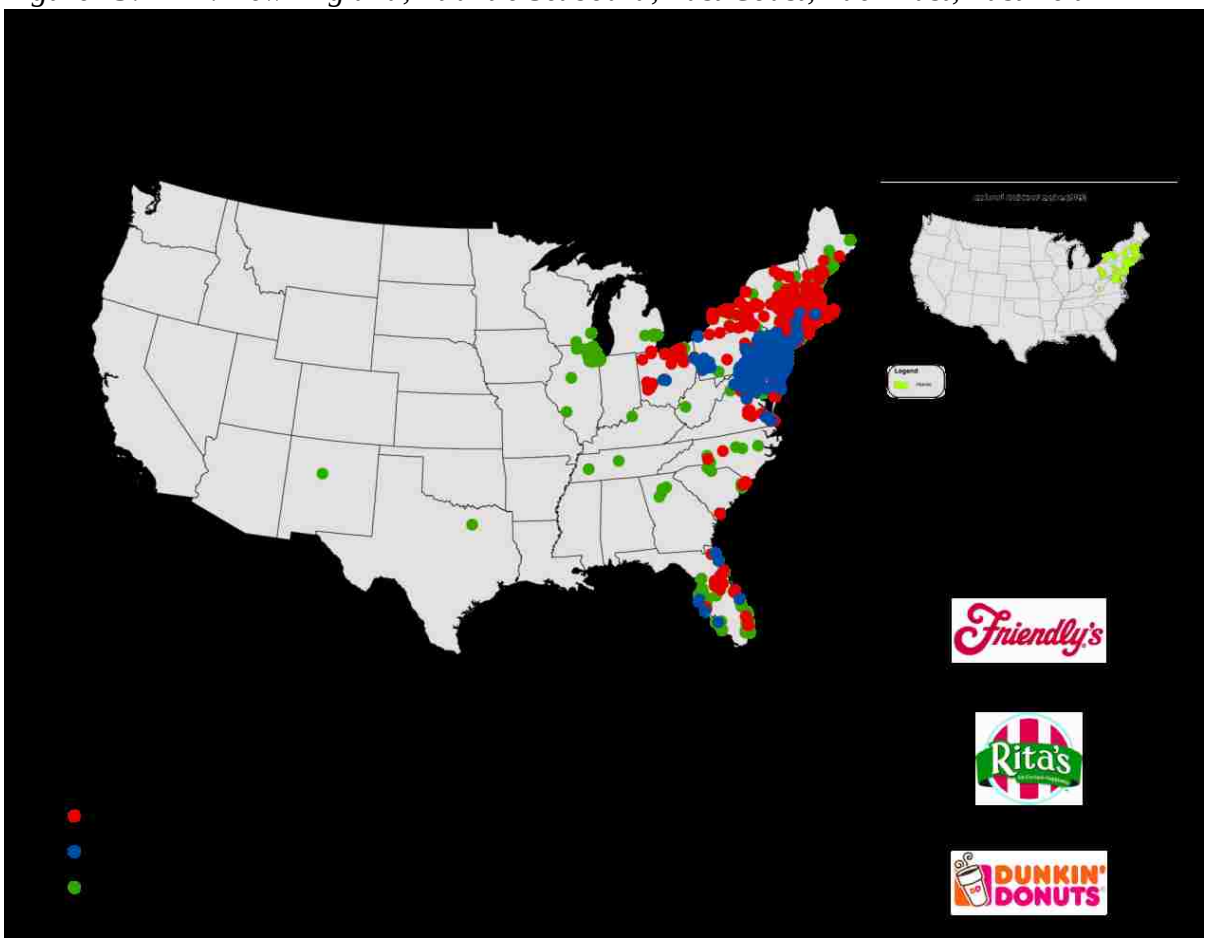
Cousin's Sub Sandwich Shop is a Milwaukee, WI based chain whose business is centered on the processed meat industry. The company website attribute the chains founding to the owner's longing for the foods he ate "Back East" as a child, so the regional culture

projected by the company corresponds to the Northeast Region defined in this study, rather than to the Upper Midwest region to which it belongs. This restaurant chain seems to disprove hypothesis three.

Taco Maker is the (IS) for the Upper Midwest region that produced the highest indicator value. The chain was founded in Ogden, UT and until 2010 its corporate headquarters was located there (www.tacomaker.com). So there is a regional identity per se to the origins of the chain. It was founded in 1968 and the company's domestic expansion is predominantly within the Upper Midwest region of the restaurant model. Taco Maker is a relatively small restaurant chain compared to the other (IS) in the study. As a result of this, there was relatively little information available on the franchise. Hispanic migration to the Upper Midwest region is a relatively new phenomenon, so this restaurant does not reflect he ethnic culture of the region. Despite having ties to the industrialized beef system which Shortridge (2004) identifies as central to the regions identity, Taco Maker does not reflect the region's cuisine. Therefore, this (IS) also disproves hypothesis three, because it does not accurately reflect the regional identity of the Upper Midwest Region.

5.5.3 Northeast Region

Figure 15: AKA: New England, Atlantic Seaboard, East Coast, Back East, Rust Belt



Source: Researcher produced map with ArcMap 10.0 from data derived from PcORD six-cluster (119 member) CSA model

The Northeast Region of the restaurant model has a distinct regional recognition, also. The States that comprise the Northeast Region are easily recognizable as New England, the Atlantic Seaboard, the East Coast, Back East, or the Rust Belt. There is a strong perceived regionality which residents of this area that its residents embrace and celebrate (Conforti, 2001). The ethnic makeup of this region is diverse, but its landscape is marked my concentrated populations of Irish or Italians amidst a landscape dominated by people of English or French ancestry (*Figure 3*). This regional identity is centuries old, and represents one of the oldest cultural and ethnic regional heritages in the United States. I

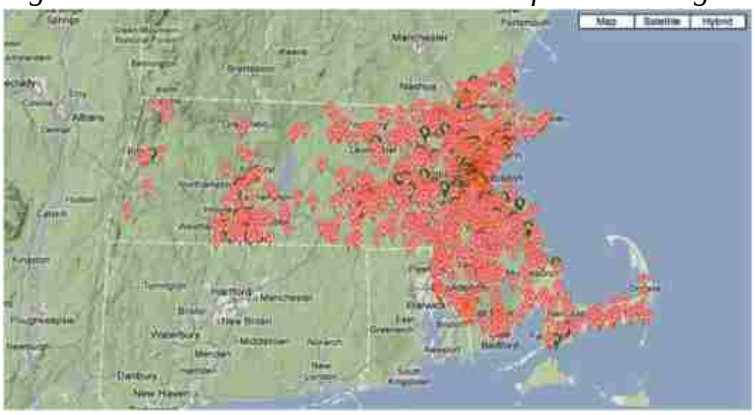
believe that the fact that the Northeast's regional ancestry is distinctly European, binds the inhabitants despite their varied nationalities. There regional heritage was formed along with that of the United States. As long as there has been a United States, there has been a New England. Again, I assert that all of these factors are in support of hypothesis two, and that the New England region does correspond with other existing regional classifications.

The (IS) species for the Northeast regions not only reflect the ethnic diversity of the region, but they also represent the large metropolitan areas in which they were founded. They all have an extremely strong association with singular metropolitan area. The first Friendly's opened in Springfield, Massachusetts, in 1938 and soon developed into a chain of highway soda fountains notable for their Georgian Revival– styled buildings (Moss, 2004). Dunkin Donuts, founded in Quincy, Massachusetts, in 1950, now has over three thousand shops worldwide (Moss, 2004). Rita's Water Ice was originally known as Rita's Italian Ice. Rita's was founded in Philadelphia which has a large population of Italian ancestry. Rita's till maintains its corporate headquarters is in Trevose, PA.

Bostonian's identify with Duncan' Donuts and hold it up as a true representation of Bostonian culture and ethics. According to (Contois, 2013), throughout decades of expansion, franchising, marketing, and repositioning, Dunkin' Donuts emerged and remains a regional power brand, operating one store for every 5,000 to 6,000 people across New England (Rosenwald & Kirkham 2006) and outnumbering Starbucks ten to one (Carroll 2010) (Figure 16). Recently, the ties between Duncan Donuts and Bostonian identity were highlighted as a result of the Boston Marathon bombing. Pop culture reactions to the tragedy in the form of internet articles and blogs have appeared on the internet (Contois, 2013). Long before the Boston Marathon tragedy, Bostonians used the internet to ponder the link

between Duncan' Donuts and Bostonian Identity. "So what is it? You and I both know what Dunkin' Donuts means to Boston and New England. It's a lynchpin of our identity. It's a religion. It's a cult. People in these parts freaking love Dunkin' Donuts. Why? This has become much more than mere caffeine addiction. And it can't simply be ascribed to its hometown roots" (Millard, 2007). Contois (2013) offers a response when she details exactly what Duncan Donuts means to Bostonian regional identity. "It embodies the Bostonian character, physically, linguistically, and socially. It represents 'the local,' both literally and symbolically. Dunkin' Donuts endorses and practices values that Bostonians hold dear, including loyalty, which is related to regional sports fandom, and honor, which is linked to a proud, working class identity that is independent of actual social status or income."

Figure 16: Duncan Donuts dominance of the New England Foodscape



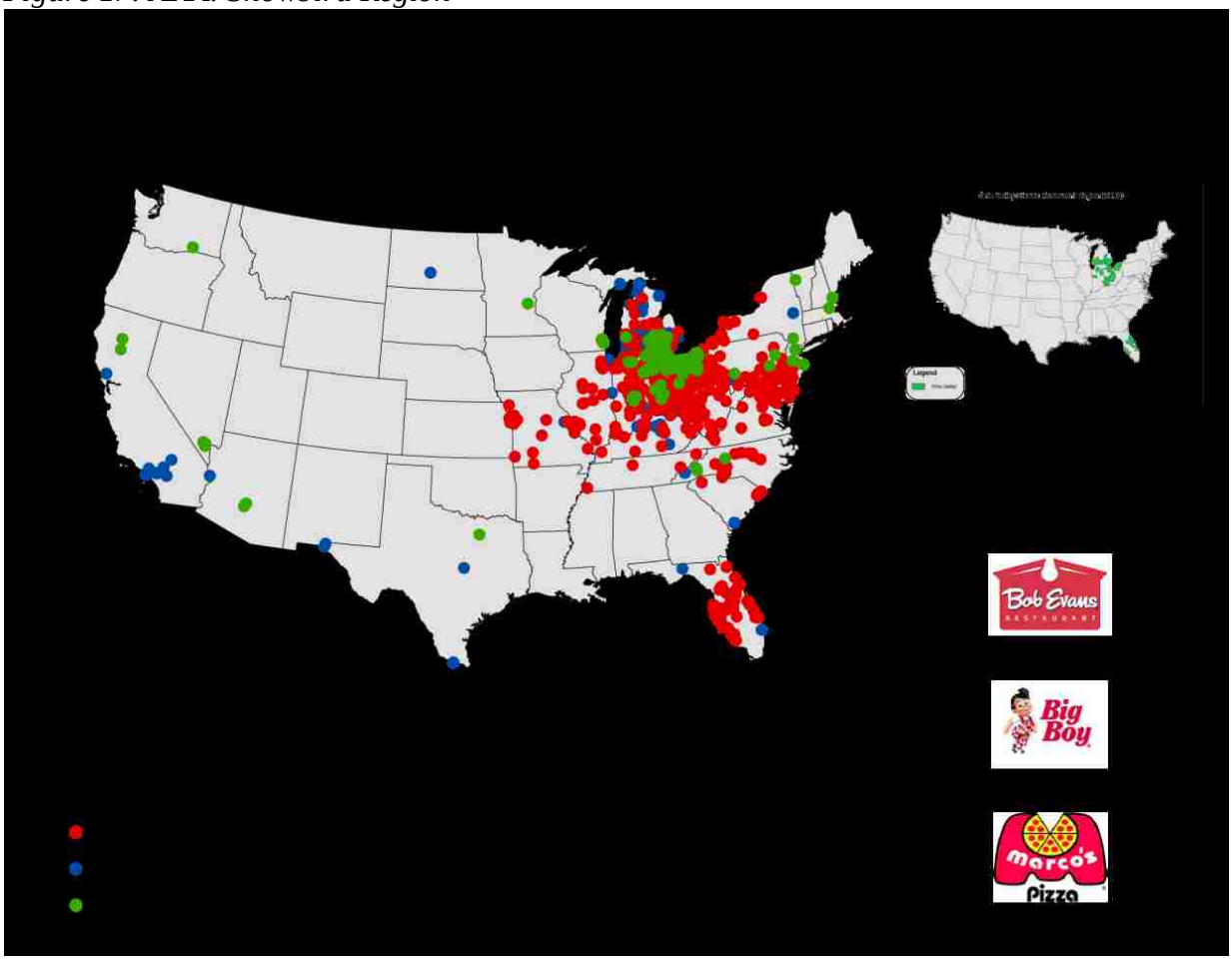
Source: Matt Harold of the Boston Globe (Map of Massachusetts plotting Duncan' Donuts locations in pink and Starbucks locations in green) accessed 03/12/2013 from [*http://www.boston.com/yourtown/massfacts/snapshot_dunkin_donuts_vs_starbucks_massachusetts/*](http://www.boston.com/yourtown/massfacts/snapshot_dunkin_donuts_vs_starbucks_massachusetts/)

Although not as well known nationally, Friendly's Ice Cream shops are a staple on the New England foodscape. They represent a regional identity every bit as strong as the Bostonian Identity associated with Duncan Donuts. Friendly's popularity can best be attributed to New England's strong rural puritan tradition. There is a history of dairy

farming in the region. Vermont's status as both a regional and national dairy producer may attribute to the fact that New England leads the U.S. in ice cream consumption per capita (Nelson, 2007). Friendly's is joined on the New England foodscape by other popular brands like Ben and Jerry's, Brigham's, Four Seas, Cows, and New England Ice Cream Co.

5.5.4 Ohio Valley-Florida Region

Figure 17: AKA: Snowbird Region



Source: Researcher produced map with ArcMap 10.0 from data derived from PcORD six-cluster (119 chain) CSA model

The Ohio Valley – Florida region has the lowest level of recognizable relationship to other established perceived cultural regions. The Ohio Valley is an established regional classification with a long history, but its relationship to Florida needed exploration. Initially

it was the most difficult region to classify, due to fact that it was the only region with a state that was disconnected from the other cluster of States. Because Florida is so geographically isolated from the rest of the Ohio Valley – Florida Region, it does not correspond with other established perceived regions. This is the first restaurant region that does not correspond to other geographical regions. This seems to disprove hypothesis one on the premise that there is no corresponding geographical regions with which to compare the Ohio Valley – Florida region. I will attempt to explain the similarities between geographies in terms of annual migration patterns.

After some consideration, I assert that residents from Northern states who annually migrate to Florida during the cold winter months influence the number and types of restaurants that are located in Florida. Over the past three decades hundreds of motels, restaurants, and housing units across the state bought up by Canadians (Jarvis, 2002). I believe that this is relevant due to the strong French Canadian population in Ohio and Michigan (*Figure 3*). These migrants, known as snowbirds, become an influential factor. Moreover, Florida is a retirement state. A great number of people move to Florida after retirement to enjoy the climate and low taxes. Not only do the snowbirds purchase businesses in Florida, I believe that restaurants from their home States cater to these snowbirds. Local restaurants may change their chain affiliation in order to cater to the snowbird population. In addition, I believe that restaurant chains from Ohio and Michigan follow their customer's migration to this new Florida geography.

The ethnic make-up of the three States that comprise the Ohio Valley – Florida supports this idea of a Snowbird Region. Whereas Northern Florida's ethnic distribution is similar to its Southern neighbors, Central and Southern Florida's ethnic makeup is

noticeably dissimilar to its surrounding neighbor States. The South Region is dominated by Black and American ancestries; whereas, Florida's non-Hispanic ethnic makeup mimics the pattern found in Ohio and Michigan. There are large portions of Central and Southern Florida whose ethnicity parallels the French/Canadian and Germanic populations of the rest of the Ohio valley – Florida Region. The strong concentrations of Hispanic population in Southern Florida can be attributed to its proximity to Cuba and the well documented migration that has taken place to Florida from the island of Cuba.

Bob Evan's restaurant was the most statistically significant (IS) for the Ohio Valley – Florida Region happens to be an Ohio cultural icon. Bob Evan's represents a rural Ohio heritage due to high quality food and its intimate and long standing relationship with the State. An excerpt from the company website helps explain the regional heritage of the Bob Evans restaurant chain:

> Bob Evans Farms got its start when our founder, Bob Evans, began making sausage on his southeastern Ohio farm to serve at a 12-stool diner he owned in nearby Gallipolis in 1948. "We served a lot of breakfasts, but we couldn't get any decent sausage," Bob recalled. "So I decided to start making my own from hogs raised right on our farm, using all the best parts of the hog, including the hams and tenderloins." The restaurant drew many truck drivers who traveled through the region. "You might say the truck drivers did my research for me," Bob said. "They would tell me that this was the best sausage they ever had, and then buy 10-pound tubs to take home."[...] Bob Evans Restaurants are known for its signature favorites like The Rise & Shine breakfast, sausage gravy 'n biscuits, and turkey and dressing. Also, known for its signature seasonal favorites, Bob Evans Restaurants offers up favorites like chicken salad, Bob Evans Bob-B-Q, pumpkin pie, among many others. (www.bobevans.com)

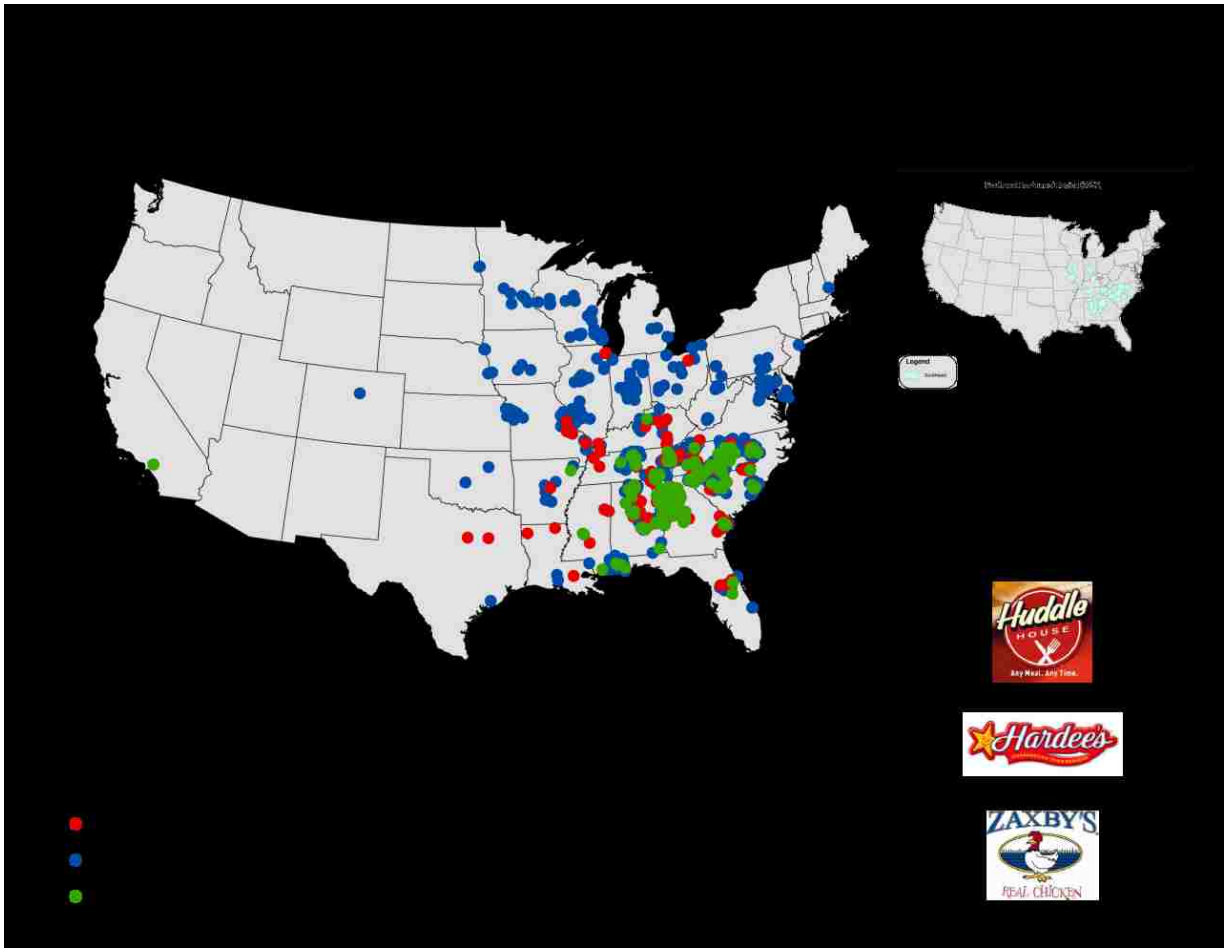
Big Boy's status as a (IS) for the Ohio Valley – Florida Region can be attributed to a single franchise owner. Frisch's Big Boy franchise is the oldest franchise in the Big Boy

corporate empire, and the franchise was begun in the Ohio area. Frisch's original territory consisted of Ohio, Kentucky, and Indiana. Very soon after this acquiring this original Tri-State franchise area, Frisch's added the State of Florida to its territory. I believe that this is attributable to the snowbird effect. As a successful franchisee, I believe that Frisch would have been aware of the migration and adapted to it by acquiring rights to the Florida territory. Regardless of cause, the simple fact that Frisch's franchise territory is split offers a valid geographical cause for the split region. Big Boy is centered in the Cincinnati, Ohio/Tri-State area and then has a remote satellite territory in the State of Florida. The franchise territory corresponds very closely with the restaurant region developed in the study.

I believe that the Ohio Valley-Florida region does indeed represent the culture of the Ohio Valley around which the region is centered. Bob Evans restaurant is a recognized Ohio icon, and can be put forth as representative of Ohio valley culture. Since that is the case, I believe the Ohio Valley-Florida regions also supports hypothesis three. The snowbirds from the Ohio Valley simply transport this culture with them during their seasonal travels.

5.5.5 Southeast Region

Figure 18: AKA: Dixie, The South, Bible Belt, Cotton Belt



Source: Researcher produced map with ArcMap 10.0 from data derived from PcORD six-cluster (119 chain) CSA model

The Southeast Region also has a very strong association with well-established regional classifications. Dixie, the South, the Bible Belt, and the Cotton belt can all be easily associated with the geography of the Southeast Region. This regions also shares geography with an extremely popular and widely recognized NCAA sports conference. The SEC or Southeast conference overlaps the Southeast restaurant region almost entirely. There is deep rooted perceived regional identity to the Southeast region that is as old as the United States itself. The dominant reported ethnicities of the South Region are Black and

American (*Figure 3*). Each of these factors supports hypothesis two as it applies to the Southeast Region. I believe that the Southeast Region of the restaurant model corresponds with many other regional models with which it shares geography. There are regions (*Figures 13 &14*) similar to the Southeast Region that are vernacular (perceived), formal, or functional. This wide range of regional associations further supports the results of the regional restaurant model.

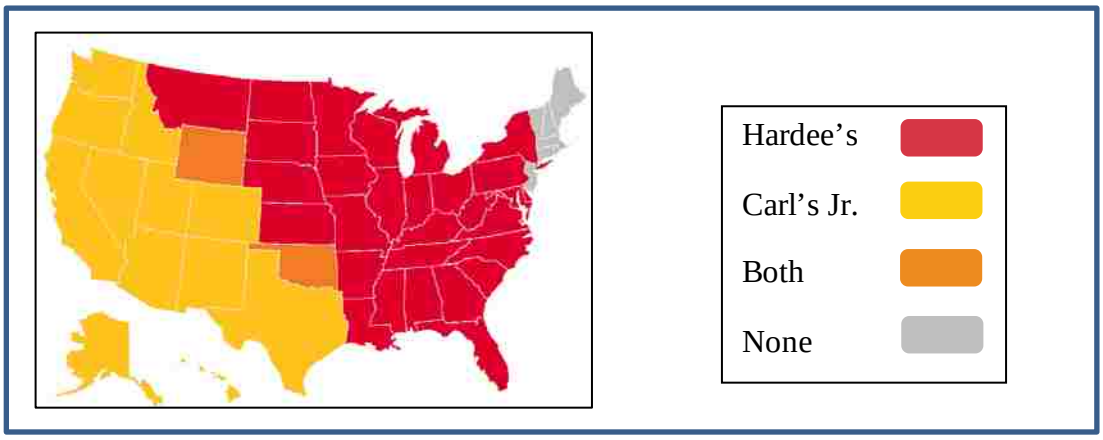
The (IS) species associated with the Southeast Region are all representative of the cultural identity of the region. Huddle House restaurant offers a menu closely tied to the culture of the area. But more importantly it draws on the regions strong links to college football. Football is integrally woven into the culture of the American South (Borucki, 2003). Nothing is more ingrained in the Southern psyche than the love of Southern college football—not as a game or a mere diversion, but as a way of life (Barnhart, 2000). The chain refers to this relationship to football on its website: Huddle House was founded in 1964 by John Sparks. He decided that Huddle House was the perfect name for the restaurant chain and it would be the place where folks would gather, or "huddle up," for great food and good times after Friday night football games (www.huddlehouse.com). Huddle house is an excellent (IS) species for the Southeast Region of the United States, because it reflects the area's passionate connection with college football.

Hardee's was founded in the region, and its menu reflects the grilling and barbeque heritage of the Southern United States. Hardee's status as an IS can be attributed to a more contemporary effect of the globalized food system. Hardee's is partnered with another (IS) species form this study. Hardee's and Carl's Jr. are partnered and together they make up the 5th largest fast food corporation in the United States (R&I, 2007). I believe that they

embrace their regionality, and market accordingly. As discussed earlier. Carl Jr. is an excellent (IS) species because it reflects the culture of the West Region very well. Carl's Jr. has roots in the Los Angeles area and continues to reflect an inherently west coast culture. Hardee's on the other hand, conveys a more Southern culture. Its menu is filled with BBQ and char-grilled items. These menu items are reflective of the Southern BBQ heritage.

After retrieving the map in *Figure 19*, it seems clear to me that Carl's Jr. and Hardee's are aware of their regional identity, and locate their restaurant chains accordingly. Hardee's restaurants are located in the states in red, and Carl's Jr. restaurants are located in Yellow States. The orange States are zones of intersection where both companies have locations. Notice also, that there neither chain has locations in the upper Northeast Region. This supports my assertion that the restaurant distribution of the corporation is sensitive to regional identity. I believe that the cultures of the West Region and the Southeast Region do appeal to New Englanders who have their own strong regional identity. I believe that the Hardee's chain supports hypothesis three; moreover, I assert that the chain is keenly aware of this regionality and distributes or limits the distribution of Hardee's in the foodscape.

Figure 19: Map displaying regional distribution of the Hardee's – Carl's Jr. Partnership



Source: http://commons.wikimedia.org/wiki/File:Carlsjr-vs-hardees-locations-map.png accessed 05/02/2013

Zaxby's Fried Chicken restaurants have a strong geographical presence in the Southeast Region of the restaurant model. Their core business reflects a centuries old regional cuisine centered on the chicken. The quintessential Southern chicken dish is, of course, fried chicken.[…] Southern cooks have been frying chicken the same way for at least 180 years, generally following the 1824 advice of Mary Randolph (Tucker and Nossiter,2004). Chicken's role in Southern cooking can be attributed to its prevalence in the foodway of the region. The South raises more chickens than any other area in the country. Georgia, Arkansas, Alabama, North Carolina, and Mississippi together raised over half of the 8.5 million broilers produced in the United States in 2002 (Tucker and Nossiter, 2004). There is a regional heritage tied to the chicken that transcends time. It is an integral part of the Southern diet, and Southern regional identity. Tucker and Nossiter (2004) describe the intimacy of this relationship by explaining:

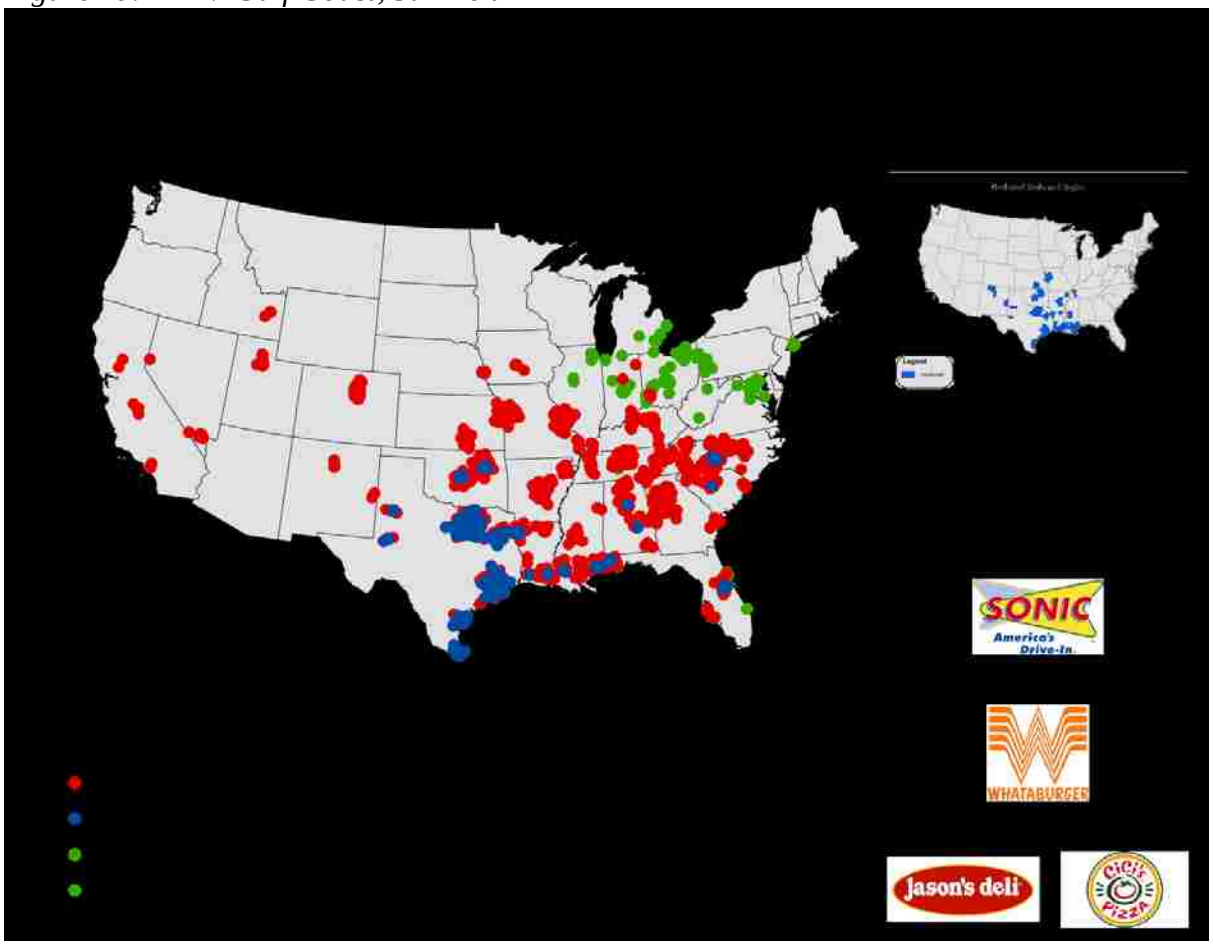
> For special occasions, Southerners have always preferred chicken to a pork roast, and chickens themselves have played an important part in Southern history. In many parts of the nineteenth-century South, chickens were sold by /African Americans, often their one source of cash in times of slavery and sharecropping. Louisiana's

> Huey Long, like many other politicians, used the chicken as a symbol of prosperity, promising "a chicken in every pot" for Sunday dinner. Long knew that too many people depended on their hens to lay eggs to cook one for dinner very often. Farm women and even women in small towns traded eggs for groceries when money was scarce.

Individually, each of the (IS) species for the Southeast Region validate hypothesis three. However, when considered together, Huddle House, Hardee's and Zaxby's offer an authentic snapshot of the cuisine culture of the Southeast Region. They reflect the regions ties to poultry, barbeque, and college football, all of which are quintessentially Southern

5.5.6 Southwest Region

Figure 20: AKA: Gulf Coast, Sun Belt



Source: Researcher produced map with ArcMap 10.0 from data derived from PcORD six-cluster (119 chain) CSA model

The States that comprise the Southwest Region are also commonly referrd to as the Gulf Coast or the Sunbelt. The share geography with the Big 12 NCAA sports conference, and also have an establsihed percieved regional identity that is centuries old. Based on ethnic distribution, the Southwest Region has two distinct ethnic subregions (*Figure 3*). The western half of the region is dominated by Hispanic and Mexican cultural identities. In addition, there is a large concentrated population of Native American ethnicity geographically centered around the large Native American Tribal Reservasations in the region. The eastern of the Southwest region half has an fairly evenly mixed Black and American ethnic makeup. Perhaps as a result of these two distinct subregions, the Southwest Region had the least statistically significant IV values for the restarants identified as (IS). This ethnic diversity does not detract from the strong regional identity of the area. The Rocky Mountains, the Gulf of Mexico, and the Mississippi River frame the region on three sides. These naturally occuring borders are significant and lend to the Southwest Region's similarity to other established regions. It contains The Southwest Region also supports hypothesis two due to its similarity to other long recognized regions with which it is identified.

The most statistically significant (IS) for the Southwest Region is Sonic Drive-In. The other two chains Cici's Pizza and jason's deli were not statistically significant as there (IV) score were well blow 50%. Because of this I will only discuss Sonic Drive-In's significance as it relates to hypothesis three. Sonic Drive-In is in part a product of the McDonaldization process introduced earlier. The spread of suburbia and the rise of the automobile in American culture provided the proper climate for the drive-in restaurant concept to flourish. Sonic Drive-In is the most successful of a string of drive-in concept

restaurants that floursihed as the automobile gained popularity. In 1923, J. G. Kirby and Dr. Reuben Wright Jackson opened the first drive-in eatery, the Pig Stand, in Dallas, Texas. A&Wopened a drive-in diner in 1923, and Maid-Rite had a drive-through window when it opened in 1926. In 1951, Jack in the Box introduced the drive-through system of ordering at a two-way intercom in the parking lot and then driving to a service window to pay for and pick up an order. Sonic opened its first drive-in diner, complete with carhops, in 1952. (Meyers, 2011)

Sonic Drive-In projects an image of the Southwest that reflects the collective nostalgia of the region, rather than the ethnicity. I believe that this nostalgia is related directly to historic Route 66 and the culture of the automobile that is associated with it. Officially established in 1926, Route 66 spanned 2,448 miles, stretching from Chicago to Los Angeles (running through the states of Illinois, Missouri, Kansas, Oklahoma, Texas, New Mexico, Arizona, and California), becoming the first all-weather road from the Midwest to the West Coast, and opening up the Southwest for the first time to migrants, soldiers, and vacationers traveling by automobile (Caton and Santos, 2007). Caton and Santos (2004) hints at Sonic Drive-In's relevance as an (IS) species for the Southwest Region of the restaurant model.

First, the Route 66 passes directly through the heart of the Southwest Region by transecting five of the seven states in the restaurant region. Drive-In restaurants of all types grew to become synonymous with the Route 66 (Jakle and Sculle, 1999). Contemporary Route 66 is steeped in nostalgia, […] the road is commonly positioned as a symbol of a "lost, generally happier era in American history" (Caton and Santos, 2007). I believe Sonic Drive-In is aware of this strong geographic tie and benefits from its customers nostalgic tie

to the geography of the region. The best example can be taken from Sonic Drive-In's drink menu. Their flagship drink is the Route 44, which is allusion and pays homage to the famous highway. Each time customers look at the menu, the ties to highway and to the region are reinforced.

Canton and Santos (2007) provide another insight into Sonic's regional distribution when describing the history of Route 66. They mention that fact that Route 66 was the first "all weather" route from Chicago to Los Angeles. Historically, this fact ensured the popularity of Route 66 (Canton and Santos, 2007). I argue that weather still plays a decisive role in Sonic's restaurant distribution. This is drawn from the nature of its business model. Sonic is a drive-in restaurant. An examination of Sonic's distribution reveals that their locations are centrally located around Route 66, but where there is expansion, the restaurants are overwhelmingly in the Southern half of the United States. I assert that this is due to temperate climate in those States. I believe that people are more inclined to frequent a drive- in when the weather is good.

Sonic Drive-In is another IS that confirms hypothesis three. It is different from the other (IS) species because it relates to a different culture than the other (IS) in the study. Sonic's core business model is tied to the automobile, and to Route 66. This nostalgia for the automobile and for a bygone era is extremely reflective of Americana, and of the Southwest region. Sonic Drive-In is an excellent example of a valid and culturally representative (IS).

CHAPTER 6

Conclusion

6.1 Conclusion

My thesis sought to address this fundamental question. Can the study of restaurant distribution be used to identify food regions in the United States? Simply put, yes it can. The ecological clustering methodology was able to reveal restaurant regions that were statistically significant, visually familiar, and representative of the culture of the perceived regional geographies that they overlay. The factors supporting this conclusion are detailed in *Table 12*. These factors were also used to support the assertion that all three hypotheses posed by my thesis were confirmed.

Table 12: Factors used to evaluate hypotheses

Summary of Factors used in Hypotheses Evaluation					
Hypothesis One					
			200 Chain Data Set	150 Chain Data Set	119 Chain Data Set
Statistically Significant Clusters			No Data	NO	YES
CONFIRMED					
	Hypothesis Two		**Hypotheis Three**		
Region	Corresponding Regions	Geographical Barriers	Ethnic Identifier	Cultural Identifier	Cuisine Identifier
West	YES	4/4	YES	YES	YES
Upper Midwest	YES	3/4	NO	YES	YES
Ohio Valley-Florida	NO	0/4	NO	YES	YES
Northeast	YES	2/3	NO	YES	YES
Southeast	YES	3/4	YES	YES	YES
Southwest	YES	3/4	NO	YES	YES
	CONFIRMED		**CONFIRMED**		

Source: Researcher compiled table from results of clustering methodology

The hierarchical clustering methodology, which is primarily used in vegetation ecology studies, was proven to be a useful tool. By using Ward's (1963) algorithm the PcORD software suite constructed restaurant clusters that were used to delineate the restaurant

regions. In doing so, the cross-disciplinary application of the ecological model was validated.

6.2 Broader significance

I now wish to return to the underlying question introduced on page one of this project. Why was this study important? On the simplest of levels, this was an exercise in regionality. I sought to contribute to the existing scholarship in regional identification by using restaurant chain location clusters to build a regional model. Secondarily, the interdisciplinary application of an ecological model towards the study of business location distribution was proved to be a valid pursuit. Finally, my research was intended to begin a conversation concerning regional identity as it relates to food. Although the relationship between regional identity and food is worthy of a separate paper the magnitude of this study, I will address the major concepts now, as I see them. This is intended to foster further conversation and scholarship in the area.

The key issues related to regional identity discussed in the analysis can be categorized into two groups: "regional identity of inhabitants" and "identity image of a region" (Knapp, 2003). The "regional identity of inhabitants" can also be thought of in terms of a regional consciousness (Paasi, 2003). This regional consciousness is prevalent in the perceived regions that were used to evaluate the restaurant regions identified in this paper. The scholarship on regional identity (Long, 2004; Moss, 2004; Shortridge, 2004) identified regional heritage imbedded in cuisine, ethnicity, and culture and manifested as a tangible regional consciousness. Paasi's (2003) "identity of a region" was also touched upon in my analysis of the restaurant regions. There are images that can be related to a region, and there

are attitudes and ideologies associated with these images of "identity of a region". Images make up one part of the dynamic process of continuity that is the region. Images portray a physical and social reality which is normally mainly beyond one's local day-to-day life, and it is these and the facts, stereotypes and myths in them that constitute the spatial basis for our view of the world (Knapp, 2003). This portrayal of reality was inherent to the ways in which the (IS) represented the perceived cultural identity of their geographies. Restaurants were shown to construct narratives of a caricaturized regional identity that can be described as both mythical and stereotyped.

As they relate to food, [these] contexts of narratives of identity thus vary from the regimes of power and ideologies that come 'from above' to local actions of citizens and forms of resistance (Paasi, 2003). The idea of identity as constructed from above has direct ties to the McDonaldization process described earlier. The generalist species in the study were so dominant in the landscape that they created a homogenous landscape in which a regional identity could not be revealed. These regimes of power project McDonaldization in its essence. At a personal level regional identity/consciousness provides an answer to the question 'where do I belong' (Paasi, 2003)? This need to "identify" relates directly to Paasi's (2003) narratives of resistance, which are manifest in the resurgence of the concept of local foods and foodways (Allen, 2010; Lenzer, 2010; Productions & Weber, 2009). These forms of resistance are essential in the maintenance of the "regional identity of inhabitants" that are obstructed by the McDonaldization of the foodscape.

6.3 Weakness of study

Due to the unique cross-disciplinary approach to my research there were clear weaknesses inherent to the project. First of which was the conceptual leap in the application

of the biological model to a data set comprised of business locations. From my review of existing literature, this approach is unproven and unconventional. Despite adding to the weakness of the study, these two characteristics provided the inspiration to impart on this journey as well as the passion to complete it.

Additionally, the ambiguous choice of the study size at the onset of the study and during the data reduction stages can be identified as weaknesses. Perhaps a more scientific means of data selection like quintile or standard deviation classification would lend to the validity of the results. Another weakness related to the data set relates to the obvious anomalies that were identified during the geospatial analysis. Some restaurants were clearly underrepresented in the final data set. This fact detracts from the validity of the data set as a whole. Despite this, ESRI and InfoUSA are reputable data sources, and ESRI is the official software supplier of the UNM Geography Department. This implies that their data would be valid for use in my research. I would assert that it was the best data set available to me as a graduate student.

The last set of weaknesses relate to the identified regions themselves. Simply put, regions were used to define regions. The CSA shapefiles are inherently regional. The ecological model used these regions as the study area, and there is a chance that the regional nature of the study area skewed the results of the PcORD analysis. The regions may be so visually familiar because they are so closely related to the distribution of the CSA areas in the landscape. Lastly, the final model is based on a scenario where there are not generalist species in the foodscape. This is not representative of the true foodscape in which we live! However, as discussed previously the underlying regional identity identified in my research that is so very important in understanding the landscape in which we live. This regional

restaurant geography, and its associated regional identity, is present and identifiable. Restaurant regions exist despite the fact that generalist restaurant chains dominate the foodscape.

6.4 Implications for further research

This research expands current scholarship in regional geography. Towards continuing that goal, geography would benefit from expanding the application of the ecology based methodology to restaurant data sets of various sizes to compare the statistical significance of the resulting regions. Additionally, different non-Census based study areas could be utilized to develop the regional model. This could be used to address some of the issues concerning the validity of the census derived restaurant regions. Lastly, a temporal aspect could be added to the study methodology. The simple act of comparing restaurant regions over time could be used to gauge the changes in the foodscape.

REFERENCES

Abe, J. M.; Dempsey, P.E., & Bassett, D.A. (1998). *Business Ecology: Giving Your Organization the Natural Edge*. Boston: Butterworth-Heinemann.

Adobe Systems Incorporated. (2013). Adobe Illustrator CS6. San Jose, CA.

Addison, A., (2006). *ArcGIS geodatabase data model for cave science* (Thesis). Northwest Missouri State, Missouri.

Addison, S., Bryan, K., Carter, T., Del Tufo, J. T., Diallo, A., & Kinzey, A. (2013). African Americans and Southern Food.

Allen, P. (2010). Realizing justice in local food systems. *Cambridge Journal of Regions, Economy and Society, 3*(2), 295-308.

Ayers, E.L., Limerick, P.N., Nissenbaum S., & Onuf, P.S. (1996). *All Over the Map: Rethinking American Regions*. Baltimore, MD: Johns Hopkins University.

Ayers, E.L. (2005). *American Regionalism*. Manuscript. Retrieved from http://xroads.virginia.edu/~DRBR/ayers_in.html

Barnhart, T. (2000). *Southern Fried Football: The History, Passion, and Glory of the Great Southern Game*. Chicago, Triumph Books (1).

Bean, F. D., & Tienda, M. (1987). *The Hispanic population of the United States*. Russell Sage Foundation.

Bennion, M. (1976). Food preparation in colonial America. A Bicentennial study. *Journal of the American Dietetic Association, 69*(1), 16.

Bessière, J. (1998). Local development and heritage: traditional food and cuisine as tourist attractions in rural areas. *Sociologia ruralis*, *38*(1), 21-34.

Betton, J. & Dess G. (1985). *The Application of Population Ecology Models to the Study of Organizations*. Oxford University Press: New York.

Borucki, W. (2003). " You're Dixie's Football Pride": American College Football and the Resurgence of Southern Identity. *Identities: Global Studies in Culture and Power, 10*(4), 477-494.

Brown, L. K., & Mussell, K. (1984). Ethnic and regional foodways in the United States: the performance of group identity. Minnesota Historical Society Press: St. Paul.

Burgoine, T. et al. (2009). Changing foodscapes 1980 – 2000, using the ASH30 study. *Appetite*, 53, 157-165.

Camillo, A., Kim, W. G., Moreo, P. J., & Ryan, B. (2010). A model of historical development and future trends of Italian cuisine in America. *International Journal of Hospitality Management*, *29*(4), 549-558.

Carroll, Matt. 2010. "Snapshot: Dunkin' Donuts vs Starbucks: Where Do You Stand?" Boston Globe. June 17. Accessed October 23, 2011.

Caton, K., & Santos, C. A. (2007). Heritage tourism on Route 66: Deconstructing nostalgia. *Journal of Travel Research*, *45*(4), 371-386.

Christaller, W. ([1933] 1966). *Central places in Southern Germany*. Trans. Baskin, C. London: Prentice Hall.

Clarke, K. R. (1993). Non-parametric multivariate analyses of changes in community structure. *Australian Journal of Ecology*. 18, 117-143.

Conforti, J. A. (2001). *Imagining New England: explorations of regional identity from the pilgrims to the mid-twentieth century*. University of North Carolina Press.

Contois, E. (2007). Dunkin' Donuts Coffee: A Site and Source of Bostonian Identity. *Posted by emilycontois in Coffee Culture*. http://emilycontois.com/2013/01/07/dunkin-donuts-coffee-a-site-and-source-of-bostonian-identity/ accessed 05/25/13

Contois, E., (2013). Dunkin' Donuts Coffee: A Site and Source of Bostonian Identity Even During a Lockdown. http://inquisitiveeater.com/2013/04/22/dunkin-donuts-coffee-a-site-and-source-of-bostonian-identity-even-during-a-lockdown/ April 22, 2013 accessed 05/25/13

Contois, E., (2013). The Dunkin' Donuts Origin Story: A Meaningful Beginning. *Posted by emilycontois in Coffee Culture*. http://emilycontois.com/2013/01/14/the-dunkin-donuts-origin-story-a-meaningful-beginning/ accessed 06/01/13

Darwin, C.R., (1860) *The Origin of Species.* Vol. XI. The Harvard Classics. New York: P.F. Collier & Son, 1909–14; Bartleby.com, 2001.

Dal Lago, E. (2013). At the Precipice: Americans North and South during the Secession Crisis. *American Nineteenth Century History*, *14*(1), 127-128.

Dawkins C. (2003). Regional development theory: conceptual foundations, classic works, and recent developments. *Journal of Planning Literature*. 18, 131-173.

David, W., & Blight, D. W. (2001). *Race and reunion: The civil war in American memory*. Harvard University Press.

Davis, B., & Carpenter, C. (2009). Proximity of fast-food restaurants to schools and adolescent obesity. *Journal Information, 99*(3).

Devineau, J.L. (2001). Les esp`eces ligneuses indicatrices des sols dans des savanes et jach`eres de l'Ouest du Burkina Faso [Woody species indicative of soils in savannas and fallows in western Burkina Faso]. *Phytocoenologia*. 31 (3), 325-351.

Devineau, J.L. (2005). Generalist versus specialist: A contrasted sociology of woody an herbaceous species in fallow-land rotation system in the West African savanna (Bondukuy, western Burkina Faso). *Phytocoenologia*. 35 (1), 53–77.

Diamond, J. M. (1997) *Guns Germs and Steel: The Fate of Human Societies*. New York NY: W.W. Norton & Company.

Dufrˆene, M., & Legendre, P. (1997). Species assemblages and indicator species: The need for a flexible asymmetrical approach. *Ecological Monographs*. 61, 53-73.

Durand, J., Massey, D. S., & Zenteno, R. M. (2001). Mexican immigration to the United States: Continuities and changes. *Latin American Research Review,* 107-127.

Edge, J.T. (Ed.). (2007). *The New Encyclopedia of Southern Culture, Volume 7: Foodways*. Chapel Hill: University of North Carolina Press.

Elden, S. (2009). Reassessing Kant's geography. *Journal of Historical Geography*. 35(1), 3-25.

ESRI. (2010). ArcGIS Desktop Release 10.0. Redlands, CA.

Faust, D. G., & Livermore, T. L. (2011). Causes of the Civil War. *The Oxford Encyclopedia of the Civil War*, 61.

Friesen, G. (2005). 2005 Presidential Address of the CHA: Space and Region in Canadian History. *Journal of the Canadian Historical Association/Revue de la Société historique du Canada*, *16*(1), 1-22.

Goldsberry, K., Duvall, C. S., Howard, P. H., & Stevens, J. E. (2010). Visualizing nutritional terrain: a geospatial analysis of pedestrian produce accessibility in Lansing, Michigan, USA. *Geocarto International*, *25*(6), 485-499.

Gorr, W.L. & Kurland K. S. (2011), *GIS Tutorial 1: Basic Workbook, Fourth Edition*, California: ESRI Press.

Gutierrez, C. P. (1998). Cajuns and crawfish. *The Taste of American Place*, 139-44.

Hayward, J.C. (2004). FOOD. In *The Greenwood Encyclopedia of American Regional Cultures: The Southwest*. Retrieved from http://libproxy.unm.edu/login?url= http://www.credoreference.com.libproxy.unm.edu/entry/abcarcsw/food

Hedden, W.P., (1929). How great cities are fed. Boston: D.C. Heath and Company.

Hendrickson, D., Smith, C., & Eikenberry, N. (2006). Fruit and vegetable access in four low-income food deserts communities in Minnesota. *Agriculture and Human Values*, *23*(3), 371-383.

Hirshman, E. C. (2011). Motherhood in Black and Brown: Advertising to US Minority Women. *Advertising & Society Review*, *12*(2).

Hess, John L. and Karen Hess. 2000. The Taste of America. New York: Grossman.

Hoy, J. F. (1998). Rocky Mountain Oysters. *The Taste of American Place: A Reader on Regional and Ethnic Foods*, 37.

Hijjatoleslami, S. A. & Kittler, J. (1988) Region growing: A new approach. *IEEE Trans. Image Processing*. 7, 1079–1084.

Iansiti, M. & Levien, R. (2004b). Strategy as ecology. *Harvard Business Review*, 82/3, 68-78.

Jakle, J. A., & Sculle, K. A. (1999). *Fast food: Roadside restaurants in the automobile age*. JHU Press.

James, P.E., (1966). The Geography of Man. Waltham, Mass: Blaisdell. 3rd. Ed.

Jarvis, E. (2002). Florida's Forgotten Ethnic Culture: Patterns of Canadian Immigration, Tourism, and Investment since 1920. *The Florida Historical Quarterly*, *81*(2), 186-197.

Jeffery, R. W., Baxter, J., McGuire, M., & Linde, J. (2006). Are fast food restaurants an environmental risk factor for obesity?. *International Journal of Behavioral Nutrition and Physical Activity*, *3*(1), 2.

Kelly, J. (1999). Loco Moco: a folk dish in the making. *The Taste of American Place: A Reader on Regional and Ethnic Foods*, 39-43.

Kloppenburg Jr, J., Hendrickson, J., & Stevenson, G. W. (1996). Coming in to the foodshed. *Agriculture and human values*, *13*(3), 33-42.

Knapp, W. (2003). Regional identity–a conceptual framework, in "A Sense of Place". *ILS–Research Institute for Regional and Urban Development*.

Kraut, A. M. (1979). Ethnic foodways: the significance of food in the designation of cultural boundaries between immigrant groups in the US, 1840–1921. *Journal of American Culture*, *2*(3), 409-420.

Lacy, W. B. (2000). Empowering Communities Through Public Work, Science, and Local Food Systems: Revisiting Democracy and Globalization*. *Rural sociology*, *65*(1), 3-26.

Lenzer, K. (2011). Characterizing the Local Food Environment in Albuquerque, New Mexico: A Dual Perspective of Retailer and Consumer.

Lewis, G. H. (1989). The Maine lobster as regional icon: competing images over time and social class. *Food and Foodways*, *3*(4), 303-316.

Lieske, J. (1993). Regional subcultures of the United States. *Journal of Politics*,*55*(4), 888-913.

Lloyd, T. C. (1981). The Cincinnati chili culinary complex. *Western Folklore*,*40*(1), 28-40.

Lockwood, Y. R., & Lockwood, W. G. (1998). Pasties in Michigan's Upper Peninsula. *The Taste of American Place: A Reader on Regional and Ethnic Foods*, 21.

Long, L. (2004). FOOD. In *The Greenwood Encyclopedia of American Regional Cultures: The Midwest*. Retrieved from http://libproxy.unm.edu/login?url=http://www.credoreference.com.libproxy.unm.edu/entry/abcarcmw/food

Losch, A. (1954). *The economics of location*. New Haven, CT: Yale University Press.

Lubowski, R., Vesterby, M., Bucholtz , S., Baez, A. and Roberts M., (2006*).* Major Uses of Land in the United States (2002). *Economic Information Bulletin No.* (EIB-14).

Maddock, J. (2004). The relationship between obesity and the prevalence of fast food restaurants: state-level analysis. *American journal of health promotion*,*19*(2), 137-143.

Martinez, S. (2010). *Local Food Systems; Concepts, Impacts, and Issues* (No. 97). DIANE Publishing.

McCune, B., & Grace, J.B., (2002). *Analysis of ecological communities*. Gleneden Beach, OR: MJM Software Design.

McCune, B., & Mefford, M.J., (1999). *PC-ORD: Multivariate analysis of ecological data, version 4*. Gleneden Beach, OR: MJM Software Design.

Metropolitan Statistical Areas: New Standards and Their Impact on Selected Federal Programs. (2004). GAO-04-758. Accessed at http://www.fhwa.dot.gov/ planning/ census_issues/archives/metropolitan_planning/cps2k.cfm

Mielke, P. W., Jr., & Berry, K.J., (2001). *Permutation methods*. New York: Springer Press.

Milbauer, J. A. (1998). The Geography of Food in Eastern Oklahoma: A Small Restaurant Study. *The Taste of American Place: A Reader on Regional and Ethnic Foods*, 201.

Millard, M., (2007). Choosing our religion: How one little post-war doughnut shop became synonymous with Boston's identity?, http://thephoenix.com/boston/life/34630-choosing-our-religion/#ixzz2XA9W5SAp accessed 06/14/13

Montague, (1993). *Ecology of competition*. Montague Institute. Retrieved November 1, 2003.

Montanari, M. (2006). *Food is culture*. Chicago: Columbia University Press.

Moore, J.F., (1996). *The Death of Competition: Leadership & Strategy in the Age of Business Ecosystems*. New York: Harper Business.

Moss, R.F., (2004). FOOD. In *The Greenwood Encyclopedia of American Regional Cultures: New England*. Retrieved from http://libproxy.unm.edu/login?url=http://www.credoreference.com.libproxy.unm.edu/entry/abcarcne/food

Myers, A. (2011). Drive-through Businesses. *American Business History and Civil Liberties*.

Nan, H. & Templeton, A., (2010). Forces driving the growth of the restaurant industry in the USA. *International Journal of Contemporary Hospitality Management*, 22(1), 56-68.

Nelson, J.,(2007). New England's best ice cream. *The Boston Globe*. Retrieved 06-01-13.

Nettles, K.D., Salazar, M., and McLean, A. (2004). FOOD. In *The Greenwood Encyclopedia of American Regional Cultures: The Pacific Region*. Retrieved from http://libproxy.unm.edu/login?url=http://www.credoreference.com.libproxy.unm.edu/entry/abcarcpr/food

Nyerges, T., (2006). Developing a Geodatabase. *University of Washington Department of Geography*. Retrieved from http://courses.washington.edu /geog461/final_project_06/geodatabase_development.doc

Opfer, P. R. (2010). Using GIS Technology to Identify and Analyze 'Food Deserts' on the Southern Oregon Coast.

Paasi, A. (2003). Region and place: regional identity in question. *Progress in human geography*, *27*(4), 475-485.

Pearson, T., Russell, J., Campbell, M. J., & Barker, M. E. (2005). Do 'food deserts' influence fruit and vegetable consumption?—A cross-sectional study.*Appetite*, *45*(2), 195-197.

Peters, C., Bills, N. & Fick, G., (2008). Foodshed analysis and its relevance to sustainability. *Renewable Agriculture and Food Systems*, 24, 1-7.

Peltoniemi, M., (2004). *Cluster, Value Network and Business Ecosystem: Knowledge and Innovation Approach*. Finland: Institute of Business Information Management, Tampere University of Technology.

Phillips, L. (2006). Food and globalization. *Annu. Rev. Anthropol., 35*, 37-57.

Porter, M. E. (1990). New global strategies for competitive advantage. *Planning Review, 18*(3), 4-14.

Productions, P., & Weber, K. (2009). *Food Inc.: A Participant Guide: How Industrial Food Is Making Us Sicker, Fatter, and Poorer-And What You Can Do about It*. PublicAffairs.

Qualtrics. (2012). *Cluster analysis*. Retrieved from www.qualtrics.com/university/researchsuite/docs/ClusterAnalysis.pdf

Restaurant Location CSV File (2007). InfoUSA. Retrieved June 25, 2006, from Business Locations Database, www.infousa.com.

Richardson, H.W., (1978). *Regional economics*. Urbana: University of Illinois Press.

Roark, M. O. (1998). Fast Foods: American Food Regions. *The Taste of American Place*, 227-41.

Rosenberg, William, with Jessica Brilliant Keener. 2001. *Time to Make the Donuts*. New York: Lebhar-Friedman Books.

Schlosser, E. (2004). *Fast food nation: The dark side of the all-American meal.* Harper Perennial.

Schultz, R.B. & Bock, J.K., (2009). *GEO 102: Earth's Landforms Lab Manual Fifth Printing*. Department of Geography and Geosciences. Illinois: Elmhurst College Press.

Shortridge, B. (2004). FOOD. In *The Greenwood Encyclopedia of American Regional Cultures: The Great Plains Region*. Retrieved from http://libproxy.unm.edu/login?url=http://www.credoreference.com.libproxy.unm.edu/entry/abcarcgpr/food

Shortridge, B.G., (2003). A Food Geography of the Great Plains. *Geographical Review*. 93(4), 507-529.

Shortridge, B. G. (2003). Not just jello and hot dishes: Representative foods of Minnesota. *Journal of Cultural Geography, 21*(1), 71-94.

Shortridge, B. G., & Shortridge, J. R. (1998). *The taste of American place: a reader on regional and ethnic foods*. Rowman & Littlefield Pub Incorporated.

Slade, Joseph W., and Judith Yaross Lee. *The Midwest*. Greenwood Publishing Group, 2004.

Smith, A. F. (2009). *Eating History: 30 Turning Points in the Making of American Cuisine*. Columbia University Press.

Strong, M., (2007). Spending spurs industry growth. *Nation's Restaurant News*. 41 (5), 96.

Technical Documentation: 2007 Tiger/Line® Shapefiles Technical Documentation. (2008). Prepared by the U.S. Census Bureau. Retrieved from https://www.census.gov/geo/maps-data/data/tiger-line.html.

Timothy, D. J., & Ron, A. S. (2013). 15 Heritage cuisines, regional identity and sustainable tourism. *Sustainable Culinary Systems: Local Foods, Innovation, Tourism and Hospitality*, 275.

Tuan, Y. (1975). Images and Mental Maps. *Annals Of The Association Of American Geographers*, *65*(2), 205-213.

Tucker, S. and Nossiter, S.S. (2004) FOOD. In *The Greenwood Encyclopedia of American Regional Cultures: The South*. Retrieved from http://libproxy.unm.edu/login?url=http://www.credoreference.com.libproxy.unm.edu/entry/abcarcsouth/food

Unknown, (2008) Surviving the New England Winter: You Scream, I Scream, Ice Cream!. *The Harvard Harbus*. Retrieved 2008-01-14.

Warnes, A., (2008). *Savage Barbecue: Race, Culture, and the Invention of America's First Food*. Athens: University of Georgia Press.

Weldon, M. (2011). *Tito the Frito Bandito*. AuthorHouse.

Winter, M., (2003). Geographies of food: agro-food geographies—making reconnections. *Progress in Human Geography*. 27: 505-513.

Zandbergen, P.A., Duvall, C.S., Lenzer, K.E., & Santos, R., (2011). *Validation of food store environment characteristics and implication for spatial accessibility analysis*. Albuquerque, New Mexico: University of New Mexico.

Zelinsky, W. (2011). *Not yet a placeless land: tracking an evolving American geography*. Univ of Massachusetts Press.

2007 R&I Top 400 Chain Restaurants. (2008). *Restaurants and Institutions Magazine*. Retrieved from http://qdoba.com/WebFiles/MarketingFiles/Documents/R&I_Top_40_2007.pdf

APPENDIX

Appendix A: Metadata - R&I Top 200 restaurant chains by location count within study area

Top 200 (by location count per CSA) Restaurant Data

Restaurant Chain Name	Restaurant Code	Top 200 by location count	Included in Clustering	Generalist Species	Excluded from Clustering	Indicator Species Rank	Rank (locations per CSA)	Headquarters Location	Founding Location	Year Founded	R & I Rank (Gross Sales)	Location Count all CSA's	Average Locations per CSA
SUBWAY	SUBWAY	X		X	X		**1**	Milford, Ct.	Bridgeport, Ct.	1965	5	11213	91.16
MC DONALD'S	MCDONA	X		X	X		**2**	Oak Brook, Il.	San Bernardino, Ca.	1940	1	8443	68.64
STARBUCKS	STARBU	X		X	X		**3**	Seattle	Seatlle, Wa.	1971	4	4391	35.70
BURGER KING	BURKNG	X		X	X		**4**	Miami, Fl.	Miami, Fl.	1954	3	4163	33.85
WENDY'S	WENDYS	X		X	X		**5**	Dublin, Oh.	Columbus, Oh.	1969	7	3685	29.96
PIZZA HUT	PIZHUT	X					**6**	Dallas, Tx.	Wichita, Ka.	1958	6	3536	28.75
DOMINO'S	DOMINO	X		X	X		**7**	Ann Arbor, Mi.	Ypsilanti, Mi.	1960	9	3311	26.92
TACO BELL	TACBEL	X		X	X		**8**	Irvine, Ca.	San Bernardino, Ca.	1962	8	3257	26.48
KFC	KFCCHK	X		X	X		**9**	Louisville, Ky.	North Corbin, Ky.	1930	2	3158	25.67
QUIZNOS SUB	QUIZNO	X		X	X		**10**	Denver, Co.	Denver, Co.	1981	27	2918	23.72
DAIRY QUEEN	DQUEEN	X		X	X		**11**	Minneapolis, Mn.	Joliet, Il.	1940	23	2171	17.65
ARBY'S	ARBY'S	X		X	X		**12**	Atlanta, Ga.	Youngstown, Oh.	1964	15	2007	16.32
PAPA JOHN'S	PAPJHN	X		X	X		**13**	Louisville, Ky.	Jeffersonville, In.	1984	26	1716	13.95
SONIC DRIVE-IN	SONICD	X	X			1	**14**	Oklahoma City, Ok.	Shawnee, Ok.	1953	13	1536	12.49
JACK IN THE BOX	JACKIN	X	X				**15**	San Diego, Ca.	San Diego, Ca.	1951	18	1338	10.88
LITTLE CAESARS	LITTLE	X		X	X		**16**	Detroit, Mi.	Garden City, Mi.	1959	37	1173	9.54
APPLEBEE'S	APPLEB	X		X	X		**17**	Overland Park, Ka.	Decatur, Ga	1980	11	1136	9.24
POPEYE'S	POPEYE	X					**18**	Atlanta, Ga.	Arabi, La.	1972	32	1047	8.51
BASKIN-ROBBINS	BASKRO	X	X				**19**	Canton, Ma.	Glendale, Ca.	1945	36	1037	8.43
WAFFLE HOUSE	WAFHSE	X	X				**20**	Norcross, Ga.	Avondale Estates, Ga.	1955	48	1006	8.18
COLD STONE	COLDST	X	X				**n/a**	Cheyenne, Wy.	Cheyenne, Wy.	1969	76	925	7.52
DENNY'S	DENNYS	X		X	X		**21**	Spartanburg, Sc.	Lakewood, Ca.	1953	22	842	6.85
BLIMPIE SUBS	BLIMPI	X		X	X		**22**	Scottsdale, Az.	Hoboken, Nj.	1964	109	837	6.80
IHOP	IHOPRE	X		X	X		**23**	Glendale, Ca.	Toluca Lake, Ca.	1958	25	815	6.63
HARDEE'S	HARDEE	X	X			2	**25**	St. Louis, Mo.	Greenville, Nc.	1960	29	744	6.05
PANERA BREAD	PANERA	X	X				**26**	Richmond Heights, Mo.	Kirkwood, Mo.	1993	28	740	6.02
CHILI'S GRILL	CHILIS	X		X	X		**27**	Dallas, Tx.	Dallas, Tx.	1975	12	716	5.82
CHICK-FIL-A	CHKFLA	X		X	X		**28**	Atlanta, Ga.	Atlanta, Ga.	1967	24	706	5.74
CHURCH'S CHICKEN	CHURCH	X	X				**29**	Atlanta, Ga.	San Antonio, Tx.	1952	39	632	5.14
CARL'S JR	CARLJR	X	X			3	**30**	Carpinteria, Ca.	Los Angeles, Ca.	1941	34	619	5.03
LONG JOHN SILVER'S	LNGJHN	X		X	X		**31**	Louisville, Ky.	Lexington, Ky.	1959	51	565	4.59
OUTBACK	OUTBCK	X		X	X		**32**	Tampa, Fl.	Tampa, Fl.	1988	17	558	4.54
RUBY TUESDAY	RUBYTU	X		X	X		**33**	Marysville, Tn.	Knoxville, Tn.	1972	30	549	4.46
PANDA EXPRESS	PANEXP	X	X				**34**	Rosemead, Ca.	Pasadena, Ca	1973	45	528	4.29
BOSTON MARKET	BOSMKT	X	X				**35**	Golden, Co.	Newton, Ma.	1985	58	519	4.22
PAPA MURPHY'S	PAPMPH	X	X				**36**	Vancouver, Wa.	Petaluma, Ca.	1984	80	498	4.05
CHIPOTLE	CHIPOT	X	X				**37**	Denver, Co.	maker	1983	49	433	3.52
TGI FRIDAY'S	TGIFRI	X		X	X		**38**	Carrollton, Tx.	NYC, Ny.	1965	16	422	3.43
FRIENDLY'S ICECREAM	FRIEND	X	X			1	**39**	Wilbraham, Ma.	Springfield, Ma.	1935	59	419	3.41
BOB EVANS	BOBEVN	X	X			1	**40**	Columbus, Oh.	Rio Grande, Oh.	1946	38	415	3.37
RED LOBSTER	REDLOB	X		X	X		**41**	Orlando, Fl.	Lakeland, Fl.	1958	20	410	3.33
SBARRO	SBARRO	X		X	X		**42**	Melville, Ny.	Brooklyn, Ny.	1956	61	410	3.33
OLIVE GARDEN	OLIVEG	X		X	X		**43**	Orlando, Fl.	Orlando, Fl.	1982	19	396	3.22

CICI'S PIZZA	CICPIZ	X	X			3	**44**	Coppell, Tx.	Plano, Tx.	1985	65	377	3.07
CHUCK E CHEESE'S	CHUCKE	X		X	X		**45**	Irving, Tx.	San Joce, Ca.	1977	67	374	3.04
WHATABURGER	WHATAB	X	X			2	**46**	Corpus Christi, Tx.	Corpus Christi, Tx.	1950	41	373	3.03
WHITE CASTLE	WHTCAS	X	X				**47**	Columbus Oh.	Wichita, Ka.	1921	66	372	3.02
CARIBOU COFFEE	CARIBO	X	X				48	Minneapolis, Mn.	Minneapolis, Mn.	1992	151	371	3.02
DEL TACO	DELTAC	X	X			3	**49**	Lake Forest, Ca.	Yermo, Ca.	1964	68	361	2.93
ROUND TABLE PIZZA	RNDTBL	X	X				**50**	Concord, Ca.	Menlo Park, Ca.	1959	87	353	2.87
STEAK N SHAKE	STKSHK	X	X				**51**	Indianapolis, In.	Normal, Il.	1934	57	351	2.85
CRACKER BARREL	CRKBRL	X		X	X		**52**	Lebanon, Tn.	Lebanon, Tn.	1969	31	349	2.84
CARVEL ICE CREAM	CARVEL	X	X				**53**	Atlanta, Ga.	Hartsdale, Ny.	1929	204	345	2.80
DUNKIN' DONUTS	DUNKIN	X	X			3	**54**	Canton, Ma.	Quincy, Ma.	1950	10	334	2.72
CAPTAIN D'S SEAFOOD	CAPTND	X	X				**55**	Nashville, Tn.	Donelson, Tn.	1969	71	327	2.66
JIMMY JOHN'S	JIMMYJ	X	X				**56**	Champaign, Il.	Charleston, Il.	1983	129	319	2.59
BUFFALO WILD WINGS	BUFFWW	X	X				**57**	Minneapolis, Mn.	Columbus, Oh.	1982	46	305	2.48
EL POLLO LOCO	ELPOLL	X	X				**58**	Irvine, Ca.	Sinaloa, Mexico	1975	70	292	2.37
HUNGRY HOWIE'S	HUNGRY	X	X				**59**	Madison Heights, Mi.	Taylor, Mi.	1973	128	286	2.33
TCBY	TCBYOG	X	X				**60**	Salt Lake City, Ut.	Little Rock, Ar.	1981	122	283	2.30
GOLDEN CORRAL	GOLDEN	X	X				**61**	Raleigh, Nc.	Fayetteville, Nc.	1973	33	264	2.15
PERKINS RESTAURANT	PERKIN	X	X				**62**	Memphis, Tn.	Cincinnati, Oh.	1958	47	264	2.15
RITA'S WATER ICE	RITASW	X	X			2	**63**	Trevose, Pa.	Philadelphia, Pa.	1984	288	261	2.12
HONEY BAKED HAM	HONEYB	X	X				**64**	Loveland, Oh.	Detroit, Mi.	1957	130	260	2.11
HOOTERS	HOOTER	X		X	X		**65**	Atlanta, ga.	Clearwater, Fl.	1983	43	255	2.07
KRYSTAL	KRYSTL	X	X				**66**	Chattanooga, Tn.	Chattanooga, Tn.	1932	82	252	2.05
CHECKERS DRIVE-IN	CHCKRS	X	X				**67**	Tampa, Fl.	Mobile, Al.	1986	63	243	1.98
WIENERSCHNITZEL	WIENER	X	X				**68**	Newport Beach, Ca.	Wilmington, Ca.	1961	137	243	1.98
JERSEY MIKE SUBS	JERSEY	X	X				**69**	Manasquan, Nj.	Point Pleasant, Nj.	1956	202	239	1.94
BOJANGLES'	BOJANG	X	X				**70**	Charlotte, Nc.	Charlotte, Nc.	1977	72	233	1.89
BAJA FRESH	BAJAFR	X	X				**71**	Thousand Oaks, Ca.	Newbury Park, Ca.	1990	102	231	1.88
GODFATHER'S	GODFAT	X	X				**72**	Omaha, Ne.	Omaha, Ne.	1973	110	228	1.85
QDOBA	QDBMEX	X	X				**73**	Wheat Ridge, Co.	Denver, Co.	1995	135	226	1.84
MARBLE SLAB	MARBLE	X	X				**74**	Houston, Tx.	Houston, Tx.	1983	266	223	1.81
MOE'S SOUTHWEST	MOESGR	X	X				**75**	Atlanta, Ga.	Atlanta, Ga.	2000	124	220	1.79
RED ROBIN	REDROB	X	X				**76**	Greenwood Village, Co.	Seatlle, Wa.	1969	42	220	1.79
SCHLOTZSKY'S DELI	SCHLOT	X	X				**77**	Austin, Tx.	Austin, Tx.	1971	144	218	1.77
CULVER'S	CULVER	X	X			2	**78**	Prairie du Sac, Wi.	Sauk City, Wi.	1984	69	216	1.76
FAZOLI'S	FAZOLI	X	X				**79**	Lexington, Ky.	Lexington, Ky.	1988	105	208	1.69
ZAXBY'S	ZAXBYS	X	X			3	**80**	Athens, Ga.	Statesboro, Ga.	1990	85	207	1.68
A & W ALL-AMERICAN	A&WALL	X	X				**81**	Louisville, Ky.	Lodi, Ca.	1919	114	202	1.64
BEN & JERRY'S	BEN&JE	X	X				**82**	South Burlington, Vt.	South Burlington, Vt.	1978	201	201	1.63
BIG BOY	BIGBOY	X	X			2	**83**	Warren, Mi.	Glendale, Ca.	1936	161	201	1.63
TOGO EATERIES	TOGOEA	X	X				**84**	San Joce, Ca.	San Joce, Ca.	1967	185	199	1.62
WINGSTOP	WNGSTP	X	X				**85**	Richardson, Tx.	Garland, Tx.	1994	190	195	1.59
LONGHORN STEAK	LNGHRN	X	X				**86**	Atlanta, Ga.	Atlanta, Ga.	1991	54	185	1.50
O'CHARLEY'S	OCHARL	X	X				**87**	Nashville, Tn.	Nashville, Tn.	1969	64	184	1.50
BENNIGAN'S GRILL	BENNIG	X	X				**88**	Plano, Tx.	Atlanta, Ga.	1976	56	183	1.49
PONDEROSA	PONDER	X	X				**89**	Kokamo, In.	Westport, Ct.	1965	93	182	1.48
DONATOS PIZZA	DONATO	X	X				**90**	Columbus, Oh.	Columbus, Oh.	1963	173	181	1.47
D'ANGELO	DANGEL	X	X				**91**	Dedham, Ma.	Dedham, Ma.	1967	228	180	1.46
BRAUM'S ICE CREAM	BRAUMS	X	X				**92**	Oklahoma City, Ok.	Emporia, Ka.	1968	127	178	1.45
BRUSTER'S ICE CREAM	BRUSTR	X	X				**93**	Bridgewater, Pa.	Bridgewater, Pa.	1989	261	178	1.45
LONE STAR	LONSTR	X	X				**94**	Wichita, Ka.	Winston-Salem, Nc.	1992	78	175	1.42
ROMANO'S MACARONI	ROMANO	X	X				**95**	Dallas, Tx.	San Antonio, Tx.	1988	53	174	1.41
UNO CHICAGO GRILL	UNOGRL	X	X				96	West Roxbury, Ma.	Chicago, Il.	1943	77	172	1.40

SIZZLER	SIZZLR	X	X	2	**97**	Culver City, Ca.	Culver City, Ca.	1958	97	165	1.34
TEXAS ROADHOUSE	TEXRHS	X	X		**98**	Louisville, Ky.	Clarksville, In.	1993	44	164	1.33
FUDDRUCKERS	FUDDRU	X	X		**99**	Austin, Tx.	San Antonio, Tx.	1979	103	157	1.28
PAPA GINO'S	PAPAGI	X	X		**100**	Dedham, Ma.	Boston, Ma.	1959	193	155	1.26
IN-N-OUT BURGER	INNOUT	X	X		**101**	Irvine, Ca.	Baldwin Park, Ca.	1948	89	152	1.24
CHARLEY'S SUBS	CHARLEY	X	X		**102**	Columbus, Oh.	Columbus, Oh.	1986	187	151	1.23
PIZZA INN	PIZINN	X	X		**103**	The Colony, Tx.	Higland Park, Tx.	1958	200	151	1.23
RYAN'S GRILL BUFFET	RYANSG	X	X		**104**	Greer, Sc.	Greer, Sc.	1977	50	150	1.22
CARRABBA'S ITALIAN	CARRAB	X	X		**105**	Tampa, Fl.	Houston, Tx.	1986	62	146	1.19
FOX'S PIZZA DEN	FOXPIZ	X	X		**106**	Murraysville, Pa.	Pitcairn, Pa.	1971	217	146	1.19
ORANGE JULIUS	ORANGE	X	X		**107**	Minneapolis, Mn.	Los Angeles, Ca.	1926	175	146	1.19
OLD COUNTRY BUFFET	OLDCNT	X	X		**108**	Ogden, Ut.	Eagan, Mn.	1983	40	145	1.18
CALIFORNIA PIZZA	CALPIZ	X	X		**109**	Los Angeles, Ca.	Beverly Hills, Ca.	1985	60	144	1.17
COFFEE BEAN & TEA	COFBEA	X	X		**110**	Los Angeles, Ca.	Los Angeles, Ca.	1963	188	144	1.17
GREAT STEAK & POTATO	GRTSTK	X	X		**111**	Scottsdale, Az.	Dayton, Oh.	1982	232	140	1.14
SHONEY'S	SHONEY	X	X		**112**	Nashville, Tn.	Charleston, Wv.	1947	83	140	1.14
PENN STATION	PENSTA	X	X		**113**	Cincinnati, Oh.	Dayton, Oh.	1983	257	139	1.13
HAAGEN-DAZS SHOP	HAAGEN	X	X		**114**	Minneapolis, Mn.	Bronx, Ny.	1961	268	136	1.11
ROLY POLY SANDWICHES	ROLPOL	X	X		**115**	Jacksonville, Fl.	Atlanta, Ga.	1996	259	135	1.10
VILLA PIZZA	VLAPIZ	X	X		**116**	Morristown, Nj.	NYC, Ny.	1964	312	133	1.08
BAKERS SQUARE	BAKSQR	X	X		**117**	Denver, Co.	Des Moines, Ia.	1969	154	132	1.07
HUDDLE HOUSE	HUDDLE	X	X	1	**118**	Atlanta, Ga.	Decatur, Ga	1964	145	132	1.07
MC ALISTER'S DELI	MCALIS	X	X		**119**	Ridgeland, Ms.	Oxford, Ms.	1989	132	132	1.07
TACO CABANA	TACCAB	X	X		**120**	San Antonio, Tx.	San Antonio, Tx.	1978	140	132	1.07
MARCO'S PIZZA	MARCOS	X	X	3	**121**	Toledo, Oh.	Toledo, Oh.	1978	269	131	1.07
AU BON PAIN	AUBOPA	X	X		**122**	Boston, Ma.	Boston, Ma.	1978	119	129	1.05
MAGGIE MOO'S	MAGMOO	X	X		**123**	Columbia, Md.	Kansas City, Ka.	1989	304	124	1.01
JOHNNY ROCKETS	JOHNNY	X	X		**124**	Lake Forest, Ca.	Los Angeles, Ca.	1986	156	121	0.98
FIREHOUSE SUBS	FIREHO	X	X		**125**	Jacksonville, Fl.	Jacksonville, Fl.	1994	198	119	0.97
JASON'S DELI	JASONS	X	X	3	**126**	Beaumont, Tx.	Beaumont, Tx.	1976	95	119	0.97
ON THE BORDER	ONBRDR	X	X		**127**	Dallas, Tx.	Dallas, Tx.	1982	79	119	0.97
VILLAGE INN	VILLAG	X	X		**128**	Denver, Co.	Denver, Co.	1958	96	119	0.97
HOME TOWN BUFFET	HOMETW	X	X		**129**	Eagan, Mn.	Eagan, Mn.	1983	40	118	0.96
ATLANTA BREAD CO	ATLBRD	X	X		**130**	Smyrna, Ga.	Atlanta, Ga.	1993	177	115	0.93
JET'S PIZZA	JETSPZ	X	X		**131**	Stirling Heights, Mi.	Stirling Heights, Mi.	1978	258	115	0.93
NOODLES & CO	NOODLE	X	X		**132**	Broomfield, Co.	Cherry Creek, Co.	1995	224	115	0.93
SKYLINE CHILI	SKYLIN	X	X		**133**	Cincinnati, Oh.	Cincinnati, Oh.	1949	246	115	0.93
PEET'S COFFEE & TEA	PEETSC	X	X		**134**	Emeryville, Ca.	Berkley, Ca.	1966	254	113	0.92
TACO MAKER	TACOMKR	X	X	1	**135**	Ogden, Ut.	Ogden, Ut.	1978	280	111	0.90
TACO TIME	TACTIM	X	X		**136**	Scottsdale, Az.	Eugene, Or.	1959	172	111	0.90
LOGAN'S ROADHOUSE	LOGANS	X	X		**137**	Nashville, Tn.	Lexington, Ky.	1991	74	110	0.89
MAZZIO'S PIZZA	MAZZIO	X	X		**138**	Dallas, Tx.	Tulsa, Ok.	1961	192	110	0.89
COUSINS SUBS	COUSIN	X	X	3	**139**	Menomonee Falls, Wi.	Milwaukee, Wi.	1972	308	109	0.89
FAMOUS DAVE'S	FAMOUS	X	X		**140**	Minnetonka, Mn.	Hayward, Wi.	1994	94	108	0.88
P F CHANG'S	PFCHAN	X	X		**141**	Scottsdale, Az.	Scottsdale, Az.	1993	55	104	0.85
NATHAN'S FAMOUS	NATHAN	X	X		**142**	Westbury, Ny.	Coney Island, Ny.	1916	256	103	0.84
ROSATI'S PIZZA	ROSATI	X	X		**143**	Niles, Il.	Chicago, Il.	1964	239	102	0.83
BACK YARD BURGERS	BACKYD	X	X		144	Memphis, Tn.	Cleveland, Ms.	1987	182	101	0.82
LEE'S FAMOUS RECIPE	LEECHK	X	X		**145**	Santa Rosa Beach, Fl.	Lima, Oh.	1966	225	101	0.82
CHEESECAKE FACTOR	CHECAK	X	X		**146**	Calabasas Hills, Ca.	Woodland Hills, Ca.	1978	35	99	0.80
POTBELLY SANDWICH	POTBLY	X	X		**147**	Chicago, Il.	Chicago, Il.	1977	197	99	0.80
MARIE CALLENDER'S	MARIEC	X	X		**148**	Aliso Viejo, Ca.	Orange County, Ca.	1948	108	97	0.79
TACO DEL MAR	TACMAR	X	X	1	**149**	Seattle, Wa.	Seattle, Wa.	1992	324	95	0.77

AUNTIE ANNE'S	AUNTAN	X	X		**150**	Gap, Pa.	Downington, Pa.	1988	117	94	0.76
BEEF O'BRADYS	BEEFOB	X		X	**n/a**	Winston-Salem, Nc.	Winston-Salem, Nc.	1937	167	n/a	n/a
BIG APPLE BAGELS	BIGAPL	X		X	**n/a**	Wawa, Pa.	Wawa, Pa.	1964	380	n/a	n/a
BRUEGGER'S BAGEL	BRUEGG	X		X	**n/a**	Scottsdale, Az.	Tempe, Az.	1988	181	n/a	n/a
CARINOS	CARINO	X		X	**n/a**	San Francisco, Ca.	San Luis Obispo, Ca.	1990	86	n/a	n/a
CASEY'S GENERAL ST.	CASEYS	X		X	**n/a**	Orlando, Fl.	Orlando, Fl.	1999	146	n/a	n/a
CHESTER FRIED CHKN.	CHESTR	X		X	**n/a**	Ontario, Ca.	Ontario, Ca.	1964	88	n/a	n/a
CINNABON	CINNAB	X		X	**n/a**	Houston, Tx.	San Antonio, Tx.	1947	150	n/a	n/a
CINNAMON	CINNAM	X		X	**n/a**	Golden, Co.	Golden, Co.	1995	n/a	n/a	n/a
CIRCLE K	CIRCLEK	X		X	**n/a**	Tempte, Az.	El Paso, Tx.	1951	84	n/a	n/a
COFFEE BEANERY LTD	COFLTD	X		X	**n/a**	Dallas, Tx.	Miami, Fl.	1972	n/a	n/a	n/a
EINSTEIN BROS	EINSTN	X		X	**n/a**	Birmingham, Al.	Birmingham, Al.	1965	92	n/a	n/a
FIVE GUY BURGER	FIVEGY	X		X	**n/a**	Baton Rouge, La.	n/a	n/a	245	n/a	n/a
FRESHENS	FRESHN	X		X	**n/a**	Austin, Tx.	Austin, Tx.	1968	180	n/a	n/a
GATTI'S GREAT PIZZA	GATTIS	X		X	**n/a**	Altoona, Pa.	Altoona, Pa.	1952	199	n/a	n/a
GREAT HARVEST	GRTHAR	X		X	**n/a**	Tampa, Fl.	Brandon, Fl.	1958	260	n/a	n/a
HONEY DEW DONUTS	HONEYD	X		X	**n/a**	Deerfield, Il.	n/a	1993	289	n/a	n/a
JAMBA JUICE	JAMBAJ	X		X	**n/a**	Burlington, Vt.	Troy, Ny.	1983	90	n/a	n/a
KRISPY KREME	KRISPY	X		X	**n/a**	Ankeny, Ia.	Boone, Ia.	1968	52	n/a	n/a
L & L HAWAIIAN BBQ	L&LBBQ	X		X	**n/a**	Atlanta, Ga.	Federal Way, Wa.	1985	275	n/a	n/a
LUBY'S CAFETERIA	LUBYSC	X		X	**n/a**	Kansas City, Ka.	Kansas City, Ka.	1985	106	n/a	n/a
MRS FIELD'S COOKIES	MRSFLD	X		X	**n/a**	Flushing, Mi.	Dearbom, Mi.	1976	194	n/a	n/a
NOBLE ROMAN'S	NOBLER	X		X	**n/a**	Lorton, Va.	Arlington, Va.	1986	230	n/a	n/a
PETER PIPER PIZZA	PETERP	X		X	**n/a**	Atlanta, Ga.	Atlanta, Ga.	1985	164	n/a	n/a
PICADILLY	PICADI	X		X	**n/a**	Baton Rouge, La.	Stehensville, Tx.	1964	134	n/a	n/a
PICK UP STIX	PICKUP	X		X	**n/a**	Dillon, Mt.	Great Falls, Mt.	1976	248	n/a	n/a
PIZZA FACTORY	PZFACT	X		X	**n/a**	Plainville, Ma.	Mansfield, Ma.	1973	352	n/a	n/a
PIZZA PRO	PIZPRO	X		X	**n/a**	Honolulu, Hi.	Honolulu, Hi.	1976	237	n/a	n/a
PIZZA RANCH	PZRNCH	X		X	**n/a**	Salt Lake City, Ut.	Palo Alto, Ca.	1977	271	n/a	n/a
PORT OF SUBS	PORTOF	X		X	**n/a**	Indianapolis, In.	Indianapolis, In.	1972	387	n/a	n/a
PRETZEL TIME	PRETZL	X		X	**n/a**	Scottsdale, Az.	Phoenix, Az.	1973	205	n/a	n/a
RUBIO'S FRESH MEX.	RUBIOS	X		X	**n/a**	San Clemente, Ca.	Santa Margarita, Ca.	1989	196	n/a	n/a
SANDELLAS CAFE	SANDEL	X		X	**n/a**	Oakhurst, Ca.	Oakhurst, Ca.	1985	301	n/a	n/a
SEVEN ELEVEN CORP	SEVENE	X		X	**n/a**	Tokyo, Jp.	Dallas, Tx.	1927	21	n/a	n/a
SHEETZ INC	SHEETZ	X		X	**n/a**	Cabot, Ar.	Jacksonville, Ar.	1985	121	n/a	n/a
SIMPLE SIMON'S PIZZA	SIMPLE	X		X	**n/a**	Hull, Ia.	Hull, Ia.	1981	388	n/a	n/a
SMOKEY BONES BBQ	SMOKEY	X		X	**n/a**	Reno, Nv.	Sparks, Nv.	1972	100	n/a	n/a
SMOOTHIE KING	SMOKNG	X		X	**n/a**	Salt Lake City, Ut.	Trumbll, Ct.	1991	231	n/a	n/a
SONNY'S REAL PIT BBQ	SONNYS	X		X	**n/a**	Carlsbad, Ca.	San Diego, Ca.	1983	116	n/a	n/a
STEAK ESCAPE	STKESC	X		X	**n/a**	Redding, Cn.	Redding, Cn.	1994	326	n/a	n/a
SURF CITY SQUEEZE	SURFCI	X		X	**n/a**	n/a	n/a	1983	379	n/a	n/a
TACO BUENO	TACCAB	X		X	**n/a**	Covington, La.	Kenner, La.	1973	174	n/a	n/a
TACO JOHN'S	TACJHN	X		X	n/a	Maitland, Fl.	Gainsville, Fl.	1968	125	n/a	n/a
TIM HORTONS	TIMHOR	X		X	n/a	Columbus, Oh.	n/a	1982	14	n/a	n/a
TONY ROMAS	TONYRO	X		X	n/a	Scottsdale, Az.	Phoenix, Az.	1981	101	n/a	n/a
TROPICAL SMOOTHIE	TROPCL	X		X	n/a	Abeline, Tx.	Abeline, Tx.	1967	283	n/a	n/a
TULLY'S COFFEE	TULLYS	X		X	n/a	Destin, Fl.	Destin, Fl.	1993	389	n/a	n/a
VOCELLI PIZZA	VOCEL	X		X	n/a	Seattle, Wa.	Seattle, Wa.	1992	337	n/a	n/a
WAWA FOOD MARKET	WAWAFD	X		X	n/a	Pittsburgh, Pa	Pittsburgh, Pa	1988	81	n/a	n/a
WESTERN SIZZLIN	WESTRN	X		X	n/a	Roanoke, Va.	Augusta, Ga.	1962	160	n/a	n/a
WETZEL'S PRETZELS	WETZEL	X		X	n/a	Pasadena, Ca.	Redondo, Ca	1974	317	n/a	n/a

Source: User compiled data from individual company websites accessed 4/25/13 to 4/30/13