

# **A rural character planning tool: modeling components of settlement pattern**

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## **ABSTRACT**

The loss of rural character from the American landscape is occurring at an alarming rate due to increased development pressure and changes to historical development patterns. The definition of rural character is unique to each community and typically refers to the physical and social patterns created by the activities and settlement patterns of small communities within the context of a unique region, or biophysical landscape. This study will focus on the contribution of settlement pattern as an important factor to the rural character of a place. Patterns of historical rural development were established by the settlement activities of early American European migrants, typically comprised of small, compact towns surrounded by large areas of open space (Campoli et al., 2002). Most new development is now occurring in the form of suburban sprawl, consuming and fragmenting valued natural, historical, and sociocultural features of the rural landscape (Ryan, 2002). Rural character can be linked to the multifaceted and interdisciplinary construct of sense of place, which explains how and why people become attached to certain aspects of the physical and social environment. This study will seek to distill consistent components of landscape settlement pattern which contribute to rural character specific to Utah as a framework for the development of an online tool. This analysis develops criteria by which these distinct patterns can be mapped using existing GIS datasets and tools. Quantification of these pattern types and their relationship to each other will help provide important indicators for assessment of the overall quality of rural character of a community. With this simple tool, rural character may be given a more

tangible presence in planning and will not be discarded as being too complex, too subjective, and too qualitative.

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## **CHAPTER I**

### **INTRODUCTION**

#### *1.1 The Issue*

“Rural Character” is an important and timely topic of study due to the rapid disappearance of this quality from the American landscape. Rural areas are experiencing significant growth and development pressure, and are increasingly faced with the loss of valued cultural, historical, and natural assets (Arendt et al., 1994; Copps 1995). Studies have confirmed that the preservation of rural character is extremely important to residents of both rural and urban areas (Arendt et al., 1994; Ryan, 2002). Until the middle of the 20<sup>th</sup> century, new growth was relatively compact and incremental, reflecting established town layout and structure (Arendt et al., 1994). Unfortunately, most new development does not respect the historical patterns of land use and usually occurs in the form of poorly planned, haphazard low density developments scattered across the rural landscape, otherwise known as suburban sprawl (Barnes et al., 2001). Subsequently, the rural landscape becomes fragmented, resulting in the loss of aesthetic qualities, diminished sense of community (Tilt et al., 2007), and economically and ecologically inefficient land utilization (Ryan, 2002; 2006).

The western United States is a beautiful and unique place characterized by large open spaces composed of agrarian landscapes and pristine natural areas. These amenities are attractive to those seeking to escape the congested, urban areas on both the west and east coasts. The character of small communities is heavily impacted by sprawl development, mostly due to inadequate land use zoning or regulations. Also, the tradition

of strong private property land rights in America has generally been very resistant to adding additional restrictions on land owners. As a result, the rural character of the western landscape has been dramatically altered in a relatively short time.

In Utah, the problem is exacerbated by several factors. The growth rate is 2.7% (U.S. Census Bureau, 2008), which is one of the highest rates in the country. Also, the majority of the Utah landscape is characterized by wide open vistas through red rock and sagebrush steppe, with very little forested areas. These vast expanses are arguably the most striking aspect of the landscape. Even small changes, such as a new road cut or the addition of a two-story house can have major visual impacts. Additionally, the loss of prime agricultural land is raising concern. A recent poll in Cache County, Utah found 71% of residents favor increasing property taxes \$20 million annually to assist critical lands preservation efforts (Loomis, 2008). In a time of economic uncertainty, residents are becoming aware that it will become increasingly important to protect local land based resources.

### *1.2 Background*

Comprehensive planning is essential for successful long-term protection of rural character (Daniels & Bowers, 1997). The Governor's Office of Planning and Budget in Utah, partially funding this study, has recognized the need to provide an effective method or tool to assist planners in better identifying, quantifying, and protecting rural character for their respective communities. Many small communities do not have adequate or comprehensive general plans in place, nor the financial means to develop one. Some plans that do address rural character are vague and lack specific definitions or goals.

Where they exist, zoning and subdivision codes do not always represent planning goals. Many are insensitive to existing town structure and design, and ignore natural and cultural features of the landscape. In some cases, conventional zoning has translated to the loss of valued rural features and simply translates into “planned sprawl” (Arendt et al., 1994). Rural character is eroded gradually, under the assumption that new development will improve the quality of life and economic opportunities for residents. Often the opposite is achieved when the unique features of the place are lost. Although residents may not be supportive of certain changes within the community, they lack the tools to guide development in an appropriate and desired fashion. Involvement by the public is central in developing a plan to protect the qualities of rural character perceived to be important by the community (Hester, 1985; Arendt et al., 1994; Ryan, 2006). The critical planning challenge is the need “...to grow gracefully, in a manner consistent with the traditional character of the community, so that new development fits harmoniously in the town fabric and helps to reinforce the local sense of place” (Arendt et al., 1994: 8).

Because rural character is inherently based on human values, inquiry into rural character necessarily involves several disciplines and the analysis of the multifaceted theoretical construct of “sense of place.” Architecture and planning have provided valuable tools to analyze form and pattern in the landscape. Sociology has studied the importance of human interactions and social structure in relation to place. Psychology has addressed the deeper innate and cognitive aspects of human preference for certain types of environments. Geography gave the scientific study of sense of place its theoretical basis by linking space with human activities (Tuan, 1974; Relph, 1976), and

provides valuable new tools for spatial analysis and modeling through Geographic Information Systems (GIS) technology. This study will attempt to address the “what” of sense of place as related to rural character by combining theory and scientific method with visualization and design techniques, fusing aspects of these different perspectives of sense of place into a format that can be applied in planning.

### *1.3 Research Questions and Methods*

This study provides a framework to detect large-scale patterns within the landscape that indicate rural character quality. The goal is for this information to be developed into a planning tool, for use on a statewide basis. If components of land settlement patterns contributing to rural character can be assessed using spatial criteria, this information can be mapped throughout the state and made available to the public as a tool to guide future planning efforts. One small community in Utah will serve as the study site for this project. The central research questions for this study are: 1) What are the spatial patterns of land use that are associated with rural character in Utah? 2) What are the physical criteria which define the patterns of rural character, and how can they be developed into a framework for a rural character planning tool?

The methods utilized for this project identify large-scale landscape patterns conducive to rural character qualities and their respective criteria. Individual components are delineated by their physical criteria and isolated for study. The components selected for analysis are limited by the use of existing datasets, straightforward GIS mapping techniques, and by landscape patterns generalizable to the majority of rural communities in Utah. Using GIS datasets and mapping techniques, these components are mapped

individually as rural character indicators and then compiled to represent a gradient of rural character values within the study site. To verify and evaluate results, the composite map is compared to a visual assessment map of the same area. This map is based on an evaluation of pattern type observed from aerial photos.

This study explores and acknowledges the complexity of this subject area, with the goal of creating clarity and legibility of this important topic within the planning process. Because rural character is often perceived as too complex and subjective to define, this important subject is often under-represented by methods that favor quantitative analyses. While this model employs deductive, quantitative methods to define the variables, it also allows individual community values and preferences to influence the final results. This model provides a simple framework for a new planning tool to help visualize and prioritize important aspects of rural character from which communities may begin to develop strategies to accommodate inevitable growth.

## **CHAPTER II**

### **LITERATURE REVIEW**

#### *2.1 Rural Character Defined*

The term “rural” is derived from the latin word *ruralis*, meaning “open land.” Rural is “of or relating to the country, country people or life, or agriculture” (Merriam-Webster Online, 2007). It is comprised of elements that differentiate small communities from large, urban centers. The U.S. Census Bureau (2008) states rural areas comprise open country and settlements with fewer than 2,500 residents, but most would argue that rural encompasses more than indicators of population. The term rural often implies a particular relationship between people and the land, a way of life more than a geographical entity. The rural countryside exists in the “middle landscape,” the “ideal middle world of man poised between the polarities of city and wilderness” (Tuan, 1974: 109). A certain bucolic harmony of people with the land is evoked, where values are rooted in the vocational ties to the land and include the ecological and natural systems that sustain them, the history of its settlement, and the unique charm and elegance of the semi-natural setting (Dubos, 1970).

The differentiation between rural and urban is a continuum. Most people will agree on both ends of the spectrum, but it is difficult to pinpoint when rural becomes urban. It is more useful to accept that most communities are likely to have some aspects that are rural, some that are urban, and some that represent the in-between landscapes of suburban and exurban sprawl. The threshold at which rural becomes urban will vary, and each community will need to determine this threshold if they wish to stay rural.

The term “rural,” combined with “character,” implies values placed on certain aspects of the rural environment. One definition of rural character is “the singular sense of place that one feels when presented with a landscape of unique beauty, a town of particular historical or cultural heritage, or an area containing elements epitomizing the character of a particular, relatively undeveloped place” (Moeller, 2007). These elements may be related to population density and sociocultural history but also reflect landscape characteristics that contribute to the natural scenic beauty, features with specific social or cultural value, or more elusive qualities, such as the sounds, smells, and weather patterns of a region (Hiss, 1990).

In classical Greco-Roman mythology, the *genius loci*, or spirit of place, was believed to be embodied within a particular deity. Although modern society no longer believes in these gods, we still use these concepts to acknowledge the life given to a place through its unique essence (Dubos, 1970). The spirit of place is embodied by the unique features of the topography and landscape which give special character to a place (Norberg-Schulz, 1980). It consists of aspects of the place that persist despite change (Relph, 1976). It includes the appearance, economic and social structure, and cultural meaning of a region but is not the simple summation of these factors. Form, function, and pattern observed in the landscape are important elements of the *genius loci*. The “vocation of place” is the appropriate human response to the constraints and natural resources of a place (Norberg-Schulz, 1980), and rural character is the expression of how people have established this type of harmony with their surroundings.

The folk tradition...is the direct and unselfconscious translation in to physical form of a culture, its needs and values – as well as the needs,

dreams, and passions of a people...The folk tradition is more closely related to the culture of the majority and life as it is really lived than is the grand design tradition which represents the culture of the elite. (Rapoport, 1969: 2)

These authentic expressions of the human response to living in dependence to the land provide important clues about the nature of its rural character and the context for which future activities should be considered.

## *2.2 Sense of Place and Rural Character*

Study of rural character can be encompassed within a larger body of study to address importance of “sense of place,” where the meaning attached to the unique features of the physical environment contributes to the overall sensory experience of a region. Sense of place is broadly defined as a spatial place that has been given meaning (Tuan, 1977). Research has shown that sense of place is deeply important to the human psyche (Sullivan, 1994; Ryan, 2006; Tilt et al., 2007). The “patterns of these sensations make up the quality of places, and ...that quality affects our immediate well-being, our actions, our feelings, and our understandings” (Lynch, 1976:8). The importance and meaning of these features varies, as each person’s perception is unique and his/her experiences are different. They combine to form an experience that is fully unique and not reproducible.

Often, the terms “rural character” and “sense of place” are used together in planning. Rural character is associated with qualities which contribute to sense of place. The link between rural character and sense of place is important, because research in the field of sense of place is extensive and multidisciplinary and addresses in-depth both “how” and

“why” places have meaning to people. It is rich in theory, providing great depth of understanding about the nature and importance of human connection to the physical and sociocultural aspects of the landscape. One major criticism of sense of place research is that it has had difficulty moving past the philosophical and theoretical realm (Stedman et al., 2004). It is perceived as being too subjective and complex to quantify, yet it remains a central focus in research because people inherently sense and understand its value. While extensive, the nature of this research is still somewhat exploratory and descriptive due to its complex nature, and the varied disciplines have yet to converge to create a strong and holistic construct.

Sense of place attributes are difficult to define and represent objectively and empirically. Sense of place is value laden, qualitative, and contextual (Williams and Stewart, 1998). It is a multi-dimensional, highly complex phenomenon, integrating aspects of the physical environment, human behaviors, and social/psychological processes (Stedman et al., 2004). People, by nature, are more naturally drawn to multifaceted, stimulating environments, environments that are neither too boring nor too dangerous (Hiss, 1990). Ironically, it is these experiences that are difficult to break down and analyze for greater understanding (Relph, 1976).

Sense of place is multidisciplinary, and attachment to place can rarely be attributed to a single predominant factor (Beckley et al., 2004). Some attempts to reduce this collection of meanings and values to a single attribute have diminished the “holistic, emotive, social, and contextual quality of the idea, robbing it of the very richness that is its appeal” (Williams and Stewart, 1998:19). But this specific challenge is one that needs

to be resolved in order for these qualities to be given status, understood, and related to other, more quantifiable, biophysical attributes if important places are to be preserved.

### *2.3 Sense of Place Construct*

Sense of place research spans many disciplines, including the professional fields of landscape architecture, planning, architecture, and the scientific disciplines of sociology, geography, psychology, and ecology. The professional design disciplines of architecture and planning have addressed this concept for thousands of years in the development of the human-built environment. The sciences of social geography and psychology have been exploring sense of place for almost 40 years and, more recently, sociology has contributed research to the topic (Beckley et al., 2007). Each of these diverse disciplines has contributed to the understanding of sense of place.

The design disciplines generally employ a phenomenological approach to theory of space and place, drawing heavily from cumulative, qualitative, experiential knowledge embodied by design principles developed over time. The methods used are visual; drawings, images, and maps are powerful tools to express complex relationships empirically observed in the world. In recent years, important theoretical studies have been conducted on sense of place within the design disciplines, seeking to understand the role of form and pattern in meanings attached to the built environment. In a landmark study of urban design, the concept of legibility of image was introduced by Kevin Lynch (1960). Various elements in three cities were mapped and evaluated for strength of image and context, then compared to residents' perceptions of the clarity of the visual environment. This study provided a new method for evaluation of form, classified into

five types of elements: paths, edges, districts, nodes, and landmarks (Lynch, 1960). In another vein, architect and scientist Christopher Alexander spent seven years of field study using ethnographic methods to observe the preferred elements of the built environment, to compose his seminal work *A Pattern Language* (1977). Component parts of the environment are broken down in a detailed and pragmatic way to serve as guidelines and rules to help designers create or preserve high quality places. In his most recent work, *The Nature of Order* (2002), Alexander seeks to address the patterns more holistically, exploring the nature of pattern and the sequences of successful place-making.

Advantages of the professional approach are that design experts are trained “connoisseurs” of landscape quality (Arler, 2000). These experts have developed sensitivity towards understanding relationships between environmental components that contribute to good design. Most people are not cognizant of why they like a particular building or landscape. The connoisseur provides insightful expertise that comes from experience analyzing spatial relationships (Arler, 2000). Simple surveys of the public on landscape preference may not be adequate, because they “bring forward unreflective prejudices of people, most of whom are not well equipped to make decisions about these matters, because they have never taken part in any relevant public inquiry and deliberation” (Arler, 2000:293). However, design professionals must be sensitive to input from others and not be arrogant or elitist (Arler, 2000). Some critics have deemed expert landscape quality analysis methods imprecise, unreliable, and lacking in validity because they rely on classical/historical models of landscape perception and individual interpretation and judgment of landscape components (Daniels, 2001). These concerns

may potentially be alleviated by the development of a multidisciplinary approach, integrating objective techniques and design.

Geographers were among the front-runners introducing the formal theory of sense of place. In the 1970's, human geographers Yi Fu Tuan and E. Relph first formally introduced the construct of sense of place into the sciences. Space and human activity become spatially entwined:

Geographical space is a reflection of man's basic awareness of the world, his experiences and intentional links with his environment. It is the significant space of a particular culture that is humanized by the naming of places, by its qualities for men, and by remaking it to serve better the needs of mankind. (Relph, 1976:16).

*Topophilia: A Study of Environmental Perception, Attitudes, and Values* by Yi Fu Tuan (1974) was a pioneering work exploring the nature of human attitudes and values towards the environment. Topophilia is the bond between people and place, and the book explores the extensive roles of both culture and environment in building these bonds. *Space and Place: The Perspective of Experience* by Tuan (1977) expanded his original theories through a more specific discussion of the process of the transformation of space into place through culture and experience. Relph's work, titled *Place and Placelessness* (1976), is at once a pragmatic and poetic insight into the experiential nature of place. Rooted in a phenomenological structure, knowledge is obtained from the immediate experience of living in the world (Relph, 1976). Places are dynamic entities, infused with physical locations and objects, activities, and meanings. They are less defined by landscape and community than by the human intentions and experiences (Relph, 1976).

Psychology has played a major role in understanding the nature of human-environmental perception. Preference for place from an evolutionary perspective hinges on the theory that humans select environments that are most suited to human functioning (Sullivan, 1994). Landscape preference studies have proliferated across many disciplines predominantly based on the methodological framework provided by Kaplan and Kaplan (1989). The Kaplan model postulates that preference for environment hinges on the psychological needs for mystery, complexity, legibility, and coherence. These methods have been very useful in quantifying and disseminating the physical attributes of the landscape, using photo-assisted survey methods to determine visual preference. Most of these studies have shown that humans have an overriding preference for scenes of nature (Sullivan, 1994; Ryan, 2002, 2006; Tilt et al., 2007).

From a social perspective, sense of place is dominated by the activities and social connections of people and less on the specifics of the physical environment (Beckley, 2003; Stedman, 2003). Sociocultural elements of the environment have been successfully disseminated within this research focus, but environmental variables have not often been built into these models (Beckley, 2003). Much of this work provides descriptive and qualitative data, which is valuable and insightful, but challenging in terms of policy and planning implementation. Recent work is merging the physical, ecological aspects of sense of place into social research to create an index of sense of place measuring the degree of attachment and the proportions of that attachment which can be attributed to sociocultural vs. ecological factors (Beckley, 2003; Beckley et al., 2007).

Once the abstract dimensions that distinguish places are determined, mapping has the potential to spatially represent many types of qualitative and quantitative features in the landscape and illustrate their relationships. Geographic Information Systems (GIS) are increasingly being used as a scientific tool for measurement, mapping, and analysis of the real world (Longley et al., 2001). In planning, GIS provides an advanced tool for overlaying human and environmental processes. Established patterns and relationships are illustrated and new ones observed. New techniques allow mapping to tie into multimedia data, virtual reality, and to provide three-dimensional images (Parsons, 1995). This medium holds promise for expressing the multiple dimensions of sense of place in a comprehensible and powerful format.

#### *2.4 Planning for Rural Character and Applied Research*

From a practical, applied standpoint, the design disciplines have generated many useful and comprehensive guides on planning that address rural character and sense of place. Guides for rural character planning at the community-level are readily available and include the following resources.

1. Utah's Rural Character: Definition, Inventory, and Analysis, found online at <http://www.planning.utah.gov/ruralcharacter.htm>.
2. The Small Town Planning Handbook (Daniels et al., 1988).
3. Rural by Design: Maintaining Small Town Character (Arendt et al., 1994).
4. Preserving Rural Character (Heyer, 1990).
5. Crossroads, Hamlet, Village, Town: Design Characteristics of Traditional Neighborhoods, Old and New. (Arendt, 1999).

6. Dealing with Change in the Connecticut River Valley: A Design Manual for Conservation and Development (Yaro et al., 1988).
7. Views from the Road: A Community Guide for Assessing Rural Historic Landscapes (Copp, 1995).
8. Design for Small Communities (Fulton, 1975).

The predominant method utilizes the design manual approach, which “outlines, in graphic and narrative form, the differences between conventional and creative development alternatives,” compares different examples of potential development patterns resulting from different zoning ordinances, and “puts the specific master plan goals into ordinance form” (Heyer, 1990:7). These tools have been implemented with some measure of success in certain communities, most notably in the case study of the Connecticut River Valley which relies heavily on the concept of cluster development (Yaro et al., 1988). These processes can be time intensive, requiring extensive information gathering, community involvement, and financial resources (Daniels et al., 1988). Although the comprehensive plan offers recommendations for action to achieve community goals, implementation of changes in land-use policies may or may not follow the adoption of a plan depending on the political climate.

Documentation of rural character using mapping techniques provides additional strength to planning documents: a spatial representation of this typically ethereal subject matter has the potential to guide and influence future land development patterns. Maps are powerful ways to communicate and document important information. The availability of a rural character map allows these important features to be evaluated alongside other, more quantitative measures that go into community planning.

Maps, however informative, are no guarantee that conservation of valued rural character assets will take place. New zoning legislation and land use ordinances are often required to enforce the goals resulting from planning efforts. Creative growth tools should be explored, such as conservation easements, transfer of development rights, urban growth boundaries, and others. A list of growth tools and their definitions can be found in Appendix B of the Cache Valley 2030 Report (Toth et al., 2006), found online at <http://www.cachevalley2030.info/>.

Model zoning ordinances are offered as resources within several of the listed publications. Randall Arendt (1999) offers a model zoning ordinance for village development. It is summarized by the following principles:

1. Maintain a concise edge
2. Determine the appropriate size and density of new developments
3. Preserve existing natural and built amenities
4. Respect the traditional street pattern
5. Introduce purposeful irregularity
6. Include greens and squares at terminal vistas
7. Employ greater creativity and diversity of housing layouts
8. Use appropriate street scale
9. Include street trees and sidewalks
10. Establish maximum setbacks and mixed-use development within commercial centers.

It is interesting to note that Arendt does not advocate a slavish repetition of the grid pattern but rather suggests the importance of maintaining reference to the grid while allowing streets to incorporate curves in response to natural contours and to add interest to neighborhood design.

Research on rural character form and pattern provides important information to the planning process. The prevailing landscape pattern for rural America is predominated by the settlement activities of early American European migrants, typically comprised of small, compact towns surrounded by large areas of agricultural and natural lands (Campoli et al., 2002). These patterns traditionally were given shape based on the context of the landscape and climate, typically involved the use of local materials and techniques, and were influenced by local governments and economics (usually based on agriculture) (Copps, 1995). It is this vernacular form that has given the landscape its authenticity and character, rooting human activity with natural landscape attributes.

Analysis of aerial photos through time has been employed to understand changes and risks to rural landscapes (Swetnam, 2007), and computer simulation methods can project future scenarios based on perceived trends to project future models of change (Hiss, 1990; Campoli et al., 2002; Toth et al., 2006). Visualization techniques provide powerful tools in communicating how changes in pattern can change the visual character of an area.

It is also important to understand and document how sociocultural patterns affect character of a place. Mapping the intangible aspects of human activity with respect to place is possible as exemplified through the planning for Manteo, North Carolina, which

successfully merged sociological and psychological techniques to develop the “sacred structure” of the town (Hester, 1985). The sacred structures, in this context, were defined as

“...those places - buildings, outdoor spaces, and landscapes – that exemplify, typify, reinforce, and perhaps even extol the everyday life patterns and special rituals of community life, places that have become so essential to the lives of the residents through use or symbolism that the community collectively identifies with the places” (Hester, 1985:15).

Interesting new work in the field of social/natural sciences includes creating a tool for disaggregating and quantifying sense of place attributes into ecological and sociocultural components within the landscape, with implications for practical application in land-use planning (Beckley et al., 2007). A significant contribution of this work is the use of both qualitative and quantitative methods to determine which aspects of sense of place can be identified as sociocultural, ecological, or a mix of the two. The project uses resident-employed photography, where survey participants take pictures to represent their particular perspective on sense of place. In contrast with the Kaplan and Kaplan (1989) framework where respondents are asked to rate predetermined pictures in terms of preference, this method allows participants to expand the preconceived notions that may be present with presenting fixed material. Understanding the origins of sense of place attachment and the strength of attachment to particular places will inform prioritization of places as well as give insight to appropriate planning strategies.

## **CHAPTER III**

### **LANDSCAPE FORM AND PATTERN**

#### *3.1 The Nature of Landscape Pattern*

Larg- scale landscape patterns are the “the tangible evidence of the activities and habits of the people who occupied, developed, used, and shaped the land to serve human needs; they may reflect the beliefs, attitudes, traditions, and values of these peoples” (McClelland et al., 1990). It is these components, their relationship to each other, and their context which will be analyzed in this study. Analysis of rural character in terms of this physical evidence within landscape settlement pattern will potentially free the concept from its elusive, more value-laden definitions.

Landscape ecology, a relatively new discipline, was developed as a way to analyze the relationship of landscape pattern to ecological processes. Landscape ecology focuses primarily on the interrelations of the “function and structure” of processes within the landscape (Griffith, 2004). Landscape pattern analysis has become a central tenet within the discipline of landscape ecology, as the descriptive texture of the underlying structure of the landscape. Landscape metrics are methods for describing and quantifying these spatial patterns, based on specific criteria such as size, shape, and spatial arrangement. Recently, concepts derived from landscape ecology are increasingly being applied to the study of human settlement.

Within the disciplines of architecture and landscape architecture, the concepts of “structure and function” are interchangeable with those of “form and function.” In landscape ecology, these terms are used typically to describe the natural world, and in

architecture they describe the constructed environment. It is increasingly understood that these disciplines are interrelated and interdependent in meaningful ways. “Form follows function” is a phrase coined by architect Louis Sullivan and implies that all form, natural or artificial, is an expression of its function. Pattern is the descriptive texture of the form or structure.

Analysis of pattern requires a visual abstraction, or generalization, of the landscape features of interest in order to isolate those components for study (Toth, 1988). Landscape pattern should be delineated by its descriptive elements as well as its structural elements (Toth, 1988). The structural elements are:

1. Point
2. Line
3. Area
4. Nodes
5. Edges
6. Matrix

Descriptive elements such as size, shape, and scale add information to these structural elements. Texture, relief, value, and color are also important descriptors. Pattern can be discerned by analyzing the relationships of the structural elements to each other. They may exhibit regular, random, clustered, intedigital, repetitive, progressive, or alternating distributions (Toth, 1988). These patterns begin to define the interrelationships of the components to each other and within their greater context.

### *3.2 Components of Rural Character*

There are three essential components of place: physical features, meanings, and activities (Relph, 1976). The components of “physical features” and “activities” are

similar in concept to structure and function, respectively, and can be perceived as elements of landscape pattern. This study will seek to define the physical aspects of rural character which are measurable and generally applicable across small communities within the state of Utah. Several studies utilizing photo surveys to identify aspects of rural character have successfully measured both the physical features and activities components of rural character. Although this study did not have the resources to conduct a survey, a cross-sectional comparison of previous studies reveals components of recurring importance: 1) natural areas, 2) open space, 3) agricultural land, 4) forested land, and 5) historical, traditional architectural forms and townscapes (Sullivan, 1994; Pynnonen et al., 2005; Ryan, 2006; Tilt et al., 2007) as represented in Figs. 1 and 2 of Appendix A.

Components to describe “meaning” are much more difficult to quantify, since they are based on individual experience (Relph, 1976). The “meanings” components of place are arguably the most important but cannot be identified in this study because the definition of these values requires planning at the community level, and individual results will vary. Although this study focuses on the first two as measurable indicators of rural character, it emphasizes the need for additional planning exercises with individual communities to establish an understanding of local cultural meanings and attachments. There are numerous books and guides available for conducting this process, as outlined in this study.

The study of rural historic landscapes can provide clues into important natural and settlement patterns associated with rural character. Large-scale landscape patterns within

rural historic landscapes are defined by the combination of the major physical features of the environment and the human response to the natural context (Copps, 1995).

Predominant natural features influencing location and organization of communities may include mountains, prairies, rivers, lakes, forests, grasslands, and climate. Cultural traditions, such as social and religious customs, are important drivers of the style and orientation of structures as well as the type of land-based vocation employed. Circulation networks are strong linear elements extending through the landscape, representing systems of transporting people and goods. They take the form of roads, trails, canals, highways, or airstrips. Boundary demarcations are evidence of land ownership and land use separations. Vegetation related to the land use is also an evident form giver and may take the form of crops, trees, or shrubs. Vegetation may also reinforce other aspects of form where growth of a certain type is propagated by the presence of existing roads, waterways, or in response to the aspect or elevation of landforms. The style and character of the buildings or other built structures, and how they are clustered, can reflect the historic activities of the original settlements. Archaeological sites are a palimpsest of the site, providing a rich layering of pattern that is evident in the evolution of human settlements through the ages. Small-scale, repetitive elements such as bridges or signs can add a particular flavor to a community. All of these patterns document the response to and context of historic settlements (Copps, 1995).

The ways in which the elements of landscape pattern interact creates the distinctiveness of the experience. Cullen (1964) discusses the “art of the relationships,” a weaving together of all of the elements that shape the environment: the assembly of

buildings, trees, nature, water, traffic, etcetera which create a unique “drama.” Humans experience the traditional town through a sense of serial vision: a series of revelations as one walks through a town. The existing and emerging views are captured and built upon. As a person moves from outside the space and progresses inside the space, a sense of “hereness” and “thereness” reinforces the experience. The content of the spaces, such as the colors, textures, scale, and detailed elements, provide additional richness to the experience (Cullen, 1964).

Early traditional towns were deliberately designed according to a set of central organizing principles (Arendt et al., 1994). The typical spatial and social characteristics of these early settlements are exhibited by:

1. Compactness and tighter form
2. Medium density development
3. Downtown centers with street-edge buildings, mixed uses, gathering places, public buildings, parks, and other open spaces
4. Commercial premises meeting everyday needs
5. Residential neighborhoods close to the town center
6. Civic open spaces within, and rural open spaces at edges
7. Pedestrian friendly, but also auto accessible
8. Streets scaled for typical uses (rather than being oversized for future growth)
9. Incremental growth outward from core (Arendt et al., 1994)

Arendt et al. (1994) also emphasize the importance of a concise town edge. A fragmented edge is not conducive to rural character, reducing the integrity of the pastoral quality of the landscape and the ability to distinguish the form of the town from afar as

contained within its natural and agrarian setting. The size of the town in proportion to the surrounding open space is also an important and delicate distinction. Rural historic landscapes “all contain substantial areas of vegetation; open space; or natural features that embody, through past use or physical character, significant historical values” (McClelland et al., 1990: 3). The presence of rural character is heavily dependent upon the sense of the dominance of large open spaces, natural or cultivated, over the size of the human settlements within them.

### *3.3 The Mormon Village Settlement Pattern*

The Mormon village is a unique and distinctive settlement type in Utah, established by the dominance of Mormon settlement in Utah and other states in the Intermountain West in the mid-19<sup>th</sup> century. The Mormon village provides important, consistent, recognizable landscape patterns reflective of the regional identity of most Utah rural communities (Ellis, 1996). The landscape attributes common to the majority of Mormon villages will be used in this study as criteria for establishing rural character land classifications.

The origins of the Mormon village pattern began with Joseph Smith, founder and president of the Church of Jesus Christ of Latter-day Saints. Smith developed a planning model, titled The Plat of the City of Zion (Figure 1). This plan idealized the religious, utopian ideals set forth by the church and was intended for Jackson County, Missouri (Reps, 1965). The plan was based on a strict gridiron pattern, oriented to the cardinal directions. It specified unusually large block sizes, lot sizes, and street widths. It also specified distinctive lot configurations with specified setbacks for buildings. Although

the idealized plan was never built according to exact specification, the plat formed the basis for a unique type of city plan (Jackson and Layton, 1976).

With increasing persecution by non-Mormons, the Mormons eventually abandoned their attempts to settle in the Midwestern states of Ohio, Illinois, and Missouri. Although they had relative success in establishing a sizeable community in Nauvoo, Illinois, the Mormons continued to be driven westward following the murder of Joseph Smith. Led by Brigham Young, the Mormons established their main headquarters in Salt Lake City, a place far removed from the conflicts induced by their revolutionary dogma in the east. This environment allowed this highly organized group to establish a society, culture, and economy based around their religious ideals. Here, the ideals outlined in the Plat of the City of Zion (though modified and revised to some extent) became the basis for town planning in the Intermountain Western region (Jackson, 1977; Ellis, 1996). The design and placement of most new settlements originated with the Church and were followed faithfully to achieve the collective goal. From Salt Lake City, throughout most of Utah, parts of Arizona, Idaho, and Nevada, the Mormon ideal flourished and became the predominant settlement pattern.

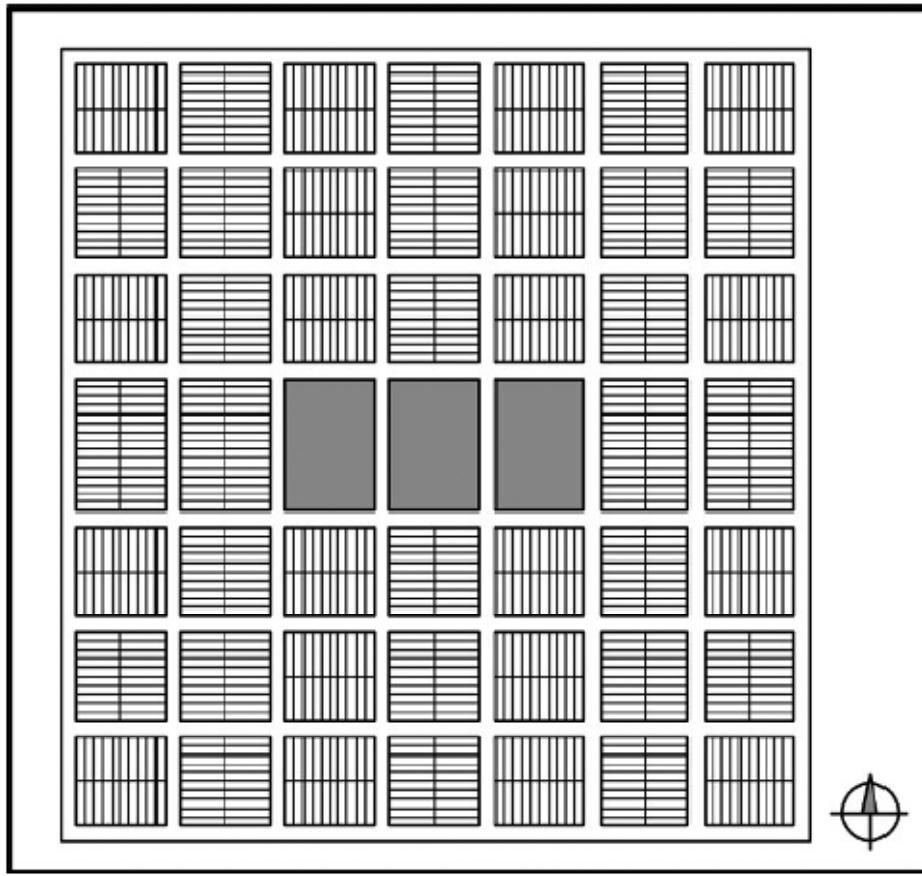


Figure 1: Plat of the City of Zion, by Joseph Smith, 1833

Source: Drawing by the author, based on original in the Archive of the Church of Jesus Christ of Latter-day Saints, Historical Department, Salt Lake City, Utah.

Figure 1. The Plat of the City of Zion. Excerpted from Parera (2005).

The following are characteristics of the Mormon villages, compiled from Ellis (1996), Jackson & Layton (1976) and Nelson (1952):

1. Rectangular street grid, oriented to the cardinal compass directions. Recalls ancient biblical city designs, and ties to the U.S. government's land survey system. Although this rigid pattern type was employed, the layout of villages generally respected and avoided natural boundaries and restrictions, such as steep slopes, floodplains, wetlands, and poor soils.
2. Large blocks and lots. Blocks are typically 4 to 10 acres. Lots are typically .25 to 1.25 acres. See Table 3. Eighty percent are one-acre or larger (Jackson, 1977)

3. Blocks allocated for important public and religious buildings. These were usually at the center of the town, but sometimes also located on prominent hills or bluffs to maximize landmark status.
4. A farming village, centered on agriculture. Lots were designed to allow households to raise a portion of their own food on site. Farm buildings were commonly seen in the town center.
5. Wide Streets, typically ranging from 66 to 132 feet. Excessive widths resulted in “verges,” a strip along the roadside covered by grass, weeds, or other vegetation.
6. Open irrigation ditches. Water was diverted from canals in ditches along the edges of streets, used for irrigation and culinary needs.
7. Distinctive public buildings. Includes Mormon meetinghouses, relief society buildings, tithing offices, tabernacles, and temples.
8. Presence of trees and gardens reflecting a strong tradition of horticulture. Trees to provide shade and fruit, not necessarily as street trees. Gardens were ornamental as well as vegetable.
9. A “Green Village” consisting of agrarian and rural quality. The village is perceived as an oasis, in distinct contrast to both the harsh desert environment as well as the sterility of paved cities.
10. Towns of limited size and population. The original Plat of Zion was intended to be limited to one square mile, and to 15,000 to 20,000 people. Although the plan evolved, the traditional Mormon village roughly adhered to these standards. Observation of historical aerial photos from 1966 of Cache Valley confirms this pattern.

A study conducted by Jackson (1977) of 313 Mormon and non-Mormon towns revealed that street width, lot size, and block size are significantly different between the two settlement types. These three variables alone set apart the Mormon village as a unique settlement pattern in the West. See Tables 1, 2, and 3, excerpted from the study.

**COMPARISON OF STREET WIDTHS IN MORMON AND NON-MORMON TOWNS IN THE WESTERN UNITED STATES**

Width in Feet	Side Streets		Main Streets	
	Non-Mormon	Mormon	Non-Mormon	Mormon
Under 40	5%	0	0	0
40-49	8%	0	2%	0
50-59	10%	2%	5%	1%
60-69	53%	30%	16%	13%
70-79	6%	1%	11%	1%
80-89	16%	17%	38%	13%
90-99	2%	51%	2%	52%
100-109	1%	0	23%	0
110-119	0	0	1%	0
120-129	0	0	1%	1%
130 and over	0	0	0	19%

Table 1. Comparison of Street Widths in Mormon and non-Mormon Towns. Excerpted from Jackson (1977).

**DISTRIBUTION OF TOWNS BY BLOCK SIZE IN MORMON AND NON-MORMON TOWNS**

Type of Town	Less Than 1 acre	1-1.9 acres	2-2.9 acres	3-3.9 acres	4-4.9 acres	5-5.9 acres	6-7.9 acres	8-9.9 acres	10 acres
Non- Mormon	1%	17%	64%	12%	0	4%	1%	0	0
Mormon	0	0	0	0	30%	11%	27%	12%	21%

Table 2. Comparison of Block Size of Mormon and non-Mormon towns. Excerpted from Jackson (1977).

**PERCENT OF TOWNS WITH INDICATED LOT SIZE IN MORMON AND NON-MORMON TOWNS**

Type of Town	Lots of Less Than $\frac{1}{4}$ Acre Size							Lots of $\frac{1}{4}$ Acre or Larger						
	Under 2500	2501- 4000	4001- 5500	5501- 7000	7001- 8500	8501- 10000	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1	$1\frac{1}{4}$	$1\frac{1}{2}$	$1\frac{3}{4}$	2
Non- Mormon	5%	34%	14%	31%	10%	2%	2%	1%	.3%	0	0	0	0	0
Mormon	0	0	0	0	0	0	2%	9%	9%	38%	19%	19%	0	3%

Table 3. Comparison of Lot Size of Mormon and non-Mormon towns. Excerpted from Jackson (1977).

Communities had economic, recreational, and aesthetic ties to both cultivated and natural lands surrounding their villages. The character of the village is inseparable with that of its immediate surrounding regional landscape. The open landscape surrounding the town is as important as the villages themselves (Francaviglia, 1978). The views and vistas were important from the village center. From outside views, the stark contrast between the villages and the stark, semi-arid nature of the natural landscape was equally dramatic and profound. The characteristics of the landscape surrounding the Mormon village, as compiled from Ellis (1996) and Francaviglia (1978) are typically:

1. Fields, rectangular pattern. Irrigated farmland, dry farmland, and pasture.
2. Hills: semi-arid, sagebrush steppe.
3. Mountains and plateaus: the backdrop, relatively untouched.
4. Rivers, streams, and canals. Includes associated vegetation and topography.
5. Fence lines. Defined sometimes with lines of trees and hedges.
6. Lack of farmsteads. Members were encouraged to live in town, and most barns and houses were located in the village by necessity. A few structures were present, such as haystacks or corrals.

The location of early Mormon settlements was also influenced by climate and geology of the region. Town locations were near a water source and typically not more than ten miles apart (Ellis, 1996). In the mountainous valleys in northern Utah, settlements were located in the zone slightly above the valley floor, nestled below the mountains. This location was ideal, above the lowlands prone to flooding and the prime agricultural land needed for farming (Toth et al., 2006), yet still flat enough as a good building and gardening site. This slightly elevated

position also kept the village above the cold air pockets occurring at the bottom of the valley, a common phenomenon during the long, harsh winters. The shoreline of the ancient Lake Bonneville, which covered most of northwest Utah from approximately 14,000 to 30,000 years ago, defines a natural elevation break between the lower and upper bench areas within these mountainous valleys (Toth et al., 2006). The upper limit of most historic settlements is observed at this elevation, about 4,750 feet above sea level. The lower elevation for settlement is estimated at approximately 4,400 feet, based on observations of historic aerial photos of Cache Valley, Utah. A few historic settlements can be found in the middle of the valley floor or on the upper bench, but these are the exception. Figure 2 illustrates the location of the towns in Cache Valley in relation to the elevation of the historic Lake Bonneville shoreline.

The Mormons created a highly organized, structured, theocratic system, and the Mormon village was implemented to “facilitate the establishment of vital, coherent social communities and an active religious life among the populace” (Ellis, 1996: 32). New settlements, established under the direction of the LDS church, were organized around socialist principals requiring subordination of individual interests for the common good (Ellis, 1996). Strict adherence to the ordained design principles has resulted in a very unique, consistent, and recognizable pattern of rural character for many communities in the Great Basin.

The contribution of the planning principles established by Joseph Smith and Brigham Young has influenced the settlement of over 500 communities in the West, including

most towns and cities in Utah. In 1996, the American Institute of Planners recognized the significance of this effort with their national Planning Landmark Award, presented to the Church of Jesus Christ of Latter-day Saints (Bear River Heritage, 2009).

# Cache Valley, Utah

## Elevation of Historic Lake Bonneville

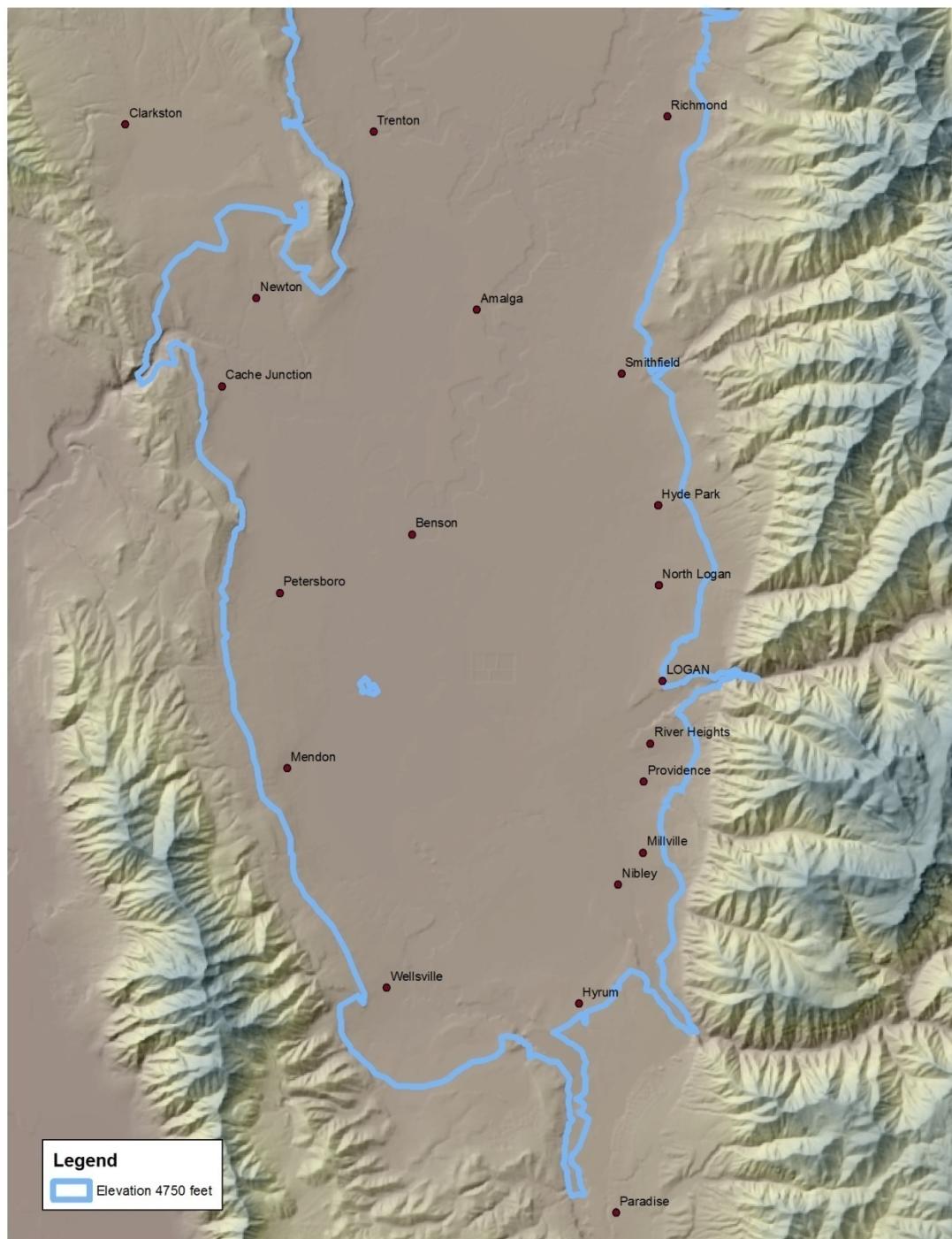


Figure 2. Elevation Range of Historic Settlements in Cache Valley, Utah.

### *3.4 The Patterns of Sprawl*

The post-World War II era brought significant change to growth patterns for both rural and urban America, on a massive scale. These patterns are commonly referred to as sprawl. Sprawl is a complex phenomenon characterized by the exodus and decentralization of urban areas, resulting in new patterns of development within the urban fringe and outlying rural areas (Barnes et al., 2001). Sprawl is characterized by a lower density than urban centers, but higher density than rural villages. These are the new “middle landscapes,” a reality somewhere between city and countryside (Rowe, 1991). The origins of sprawl date back to the 1800s, but the majority of this activity has taken place since World War II. This shift has “dramatically altered how Americans live, work, recreate, use energy, and impact the environment” (Barnes et al., 2001: 1). The character of rural landscapes has been significantly altered by these new patterns.

The need for new, inexpensive housing became acute after the war during the baby boomer population explosion. In addition, the rise of America’s reliance on the automobile pushed new development further from the town core where land was less expensive. Highway and freeway expansions facilitated the movement from the city into the outlying countryside. Incomplete, simplistic new zoning laws were enacted in an effort to control growth and prevent incompatible development. These laws served to separate different land uses, dividing communities and creating homogenous, standardized, sprawling developments (Arendt et al., 1994). Mixed-use development, characteristic of traditional towns, was discouraged and even outlawed in many cases. Cheap building methods, with the invention of balloon frame construction, made single-

family homes affordable to the masses (Ames, 1995). Ironically, this growth model has placed great financial burden on communities, due to expensive implementation and maintenance of infrastructure required to support these outlying communities.

The origin of the modern suburb goes back to the early 1800's, with the advent of the electrified street car mass transit system. Residents of the city now had the opportunity to live outside the city and commute to work in an efficient manner (Ames, 1995). This provided an opportunity for a new type of residential subdivision, one that broke from the rigidity and sterility of the grid pattern characteristic of most American city and town designs. The emerging model was based on rural, romantic ideals typified by curvilinear street patterns which responded to the natural contours of the land and the incorporation of open space and vistas (Arendt, 1999). Many of these early suburbs were elegant and picturesque, designed carefully and conscientiously in harmony with the landscape. Frederick Law Olmstead, America's most famous landscape architect, and other talented designers were responsible for implementing careful planning to achieve these successful subdivisions (Arendt, 1999).

After World War II, the suburb became synonymous with the American dream, but the implementation changed dramatically from its origins. The planning principles that were so central to the early suburbs were virtually lost, as mainstream development sought to homogenize and mass produce these concepts into a recipe for any town. The curvilinear street pattern was applied in a nonsensical, heavy handed manner. The original suburb development pattern that emerged from nostalgia for rural landscapes generally served to diminish those qualities.

Strip commercial and industrial sprawl is a by-product of residential sprawl and followed as demand for goods and jobs shifted outside the urban core. These patterns have been shaped by the “drive-in culture,” characterized by development along major roads in a linear but disjointed fashion (Barnes et al., 2001). These typically are large lots, dominated by parking lots and massive box-like buildings with little architectural aesthetic value.

The primary reason for such bleak and inconsequential exterior realms is the reduced terms of reference for their design. They are nothing more than expedient, barely functional, minimal solutions to car movement, temporary parking, and subsequent pedestrian access to buildings. Furthermore, the public presentation of buildings is often reduced to the sheer bulk of the structure itself, looming at the edge of the parking lot with a sign tacked on the side announcing the firm that resides inside. (Rowe, 1991: 259).

This building style has been aptly named the “decorated shed” (Venturi et al., 1989). Strip development is pervasive and destructive, fragmenting agricultural land and the visual clarity of the rural landscape.

The resulting landscapes are surreal and disorienting: they have little connection to place due to the homogenization of form and lack of integration with the existing community and natural environment. These patterns break down the concise edge of the village, deemed critical but fragile by Arendt (1999). They force residents to use automobiles to obtain goods and services. New neighborhoods segregate and divide people by social status and race, as homes further from the town center are typically the largest and most expensive (Rowe, 1991). Small communities, once livable and walkable, are forever altered socially, economically, and aesthetically by these activities.

Patterns of sprawl may be characterized by four types of spatial forms: 1) low-density continuous sprawl, 2) ribbon sprawl, 3) leapfrog development sprawl and 4) exurban development (Barnes et al., 2001). Low density continuous sprawl is concentrated along the edges of existing metropolitan areas, where existing utilities are utilized and expanded. While this type of growth is characterized by high land consumption, it is probably the least costly form of sprawl in terms of infrastructure. Ribbon sprawl is development which occurs along major roads, and occurs in a linear fashion. This type of sprawl is one of the most intrusive on the rural character, since it can be visually pervasive for great distances even if it does not consume large amounts of land. Leapfrog sprawl is characterized by a discontinuous, fragmented pattern of development in a patchy manner across the countryside. Even though these developments may be less consumptive of land (i.e., clustered developments), they are very costly in terms of infrastructure, requiring great capital expenditures for roads, utilities, and other services. These may also be costly to the visual quality of the landscape and to the social integration with existing settlements. The final form of sprawl is categorized as exurban development, defined as very low density, scattered, non-farm residential lots. These are also referred to as “hobby farms.” These large lots are typically intermixed with the rural farmland but differ significantly in land use. Visually, these large homes with manicured lawns can contrast significantly in scale and texture with the surrounding working landscape. They take the suburban ideal out of its own context, and amplify its scale. Also, these developments create tension between the

rural economic land activities, which may create undesirable sights, sounds, and smells to the exurbanite (Barnes et al., 2001).

## **CHAPTER IV**

### **THE RESEARCH PROJECT**

#### *4.1 Study Site*

Providence, Utah has been selected as the study site for this project (Figure 3) because it is a good reflection of an early Mormon village that has experienced significant and varied changes over the past 50 years. The changes illustrate a variety of new settlement pattern types as well as a continuation of the original settlement pattern, providing a representation of pattern types that should translate well to other small communities across Utah. Figure 4 contrasts the study site at two points in time, illustrating the magnitude of change over the past 30 years.

The scale of the project will be the community level, which includes the town and a portion of the surrounding countryside. Data scaled at 1:24,000 or less is appropriate for this size study area. This meso-scale is appropriate to capture subtleties in settlement pattern, but not fine enough to analyze specific elements such as individual structures.

The perimeter dimension is determined by the adjacency of other towns, and natural boundaries. The inclusion of the countryside is extremely important, because studies and surveys have found that rural character is heavily dependent on open space and the presence of natural and agrarian landscapes. The study site is 2 miles in the east/west direction by 1-1/2 miles in the north/south direction, and three square miles in area. The rectangular site is roughly centered on the traditional village, including a portion of the surrounding landscape. The boundary is limited in the north/south direction by the presence of adjacent towns.

## Study Site Providence, Cache County, UT

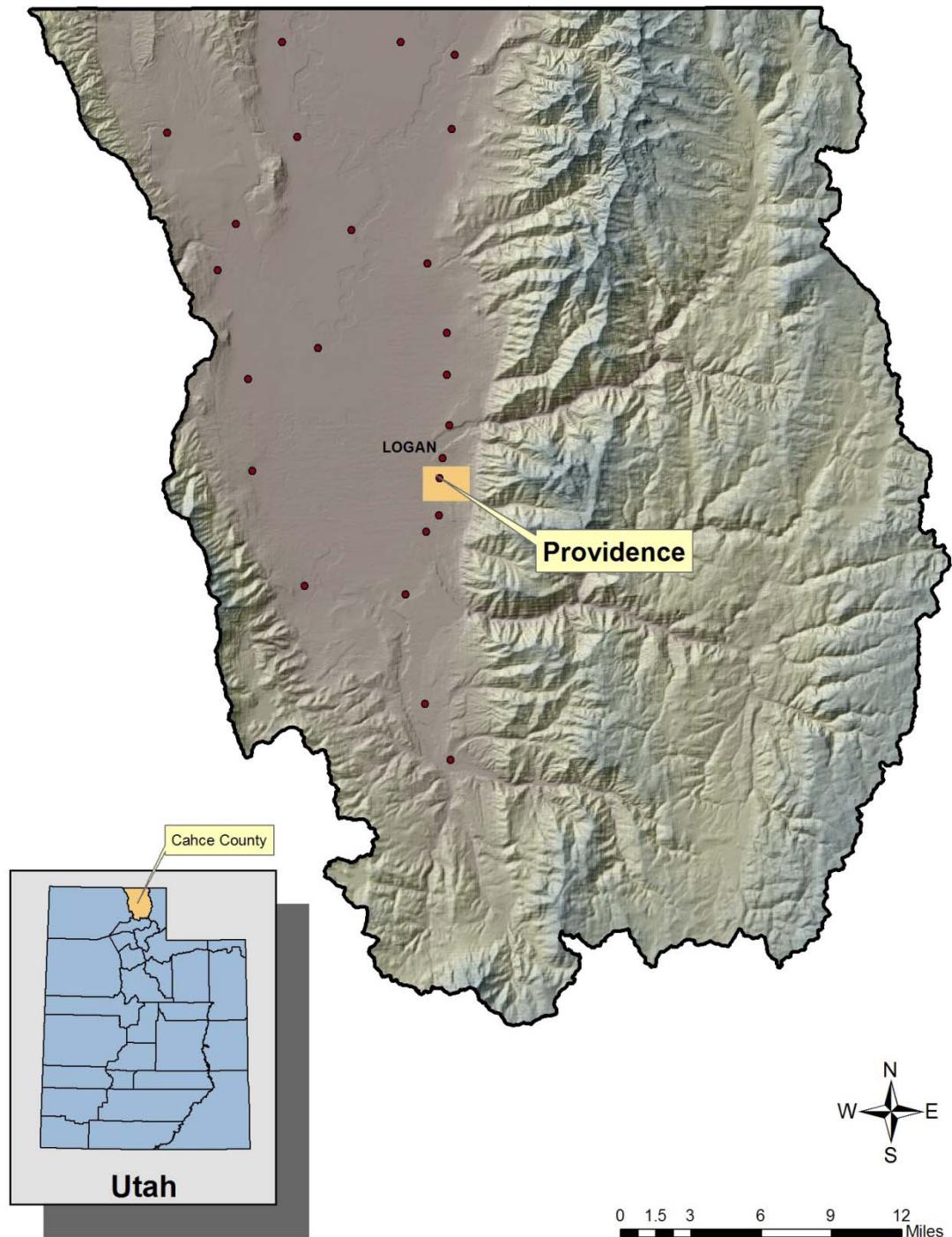


Figure 3. Study Site: Providence, Utah.

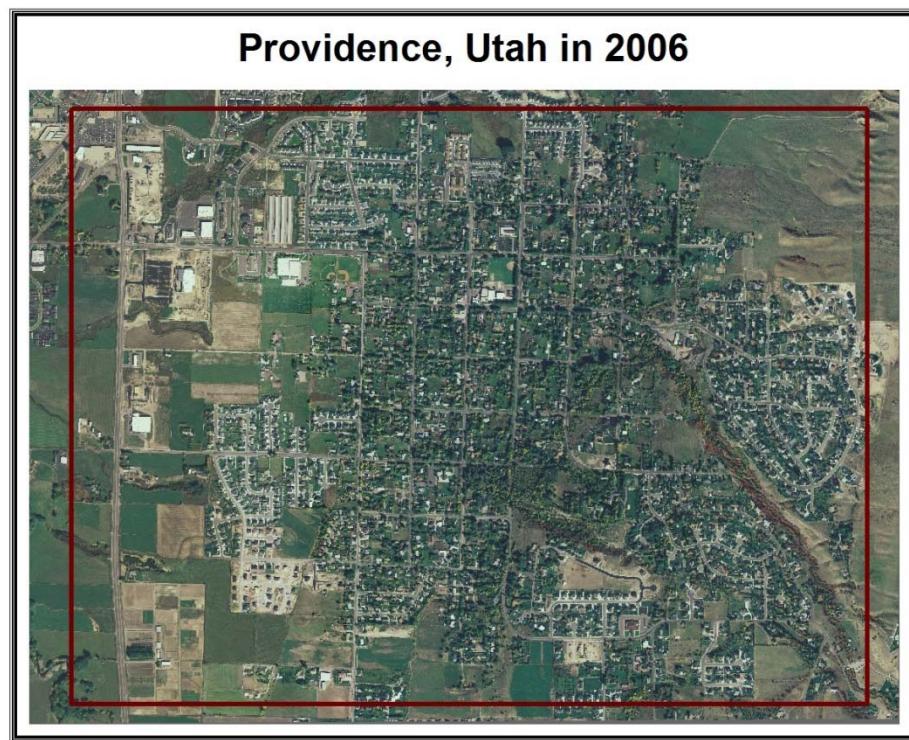
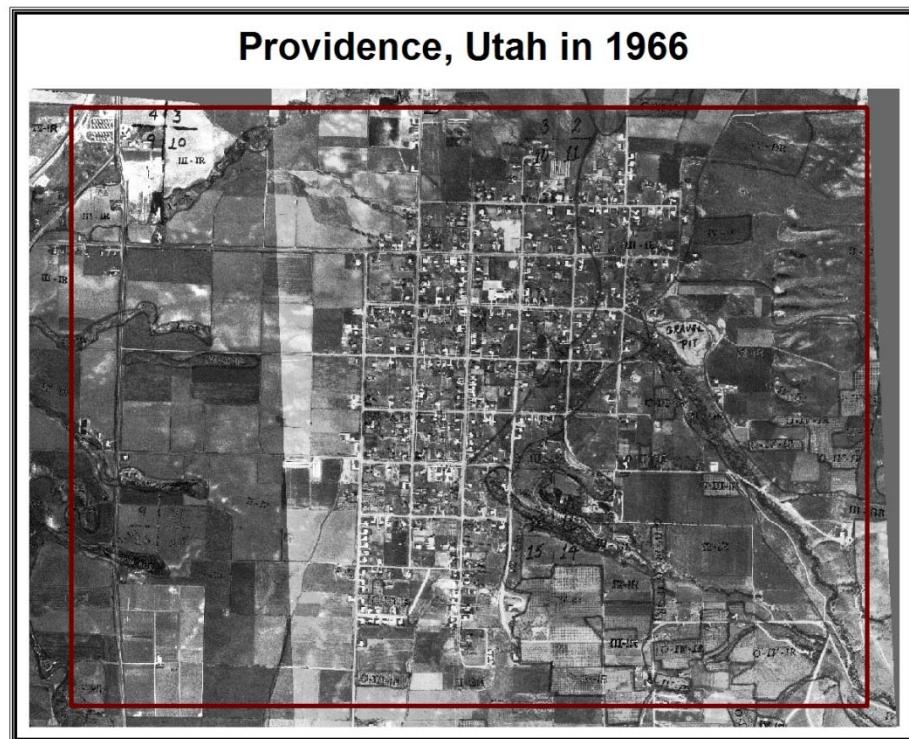


Figure 4. Study Site in 1966 and 2006.

#### *4.2 Objectives*

The objective of the study is to spatially quantify selected components identified as conducive to rural character through an analysis of large-scale landscape pattern for use as a planning tool. This analysis will also include identification of patterns that are not conducive to rural character as these will equally inform the planning process through their contrast. These components, outlined in previous chapters, will specifically incorporate those unique to the historic Mormon village. A series of indicators for rural character will be established based on spatial criteria identified, available existing statewide GIS data, and replicable mapping techniques. The parameters for the successful implementation of the tool statewide will include:

1. Use of existing GIS datasets for the state of Utah.
2. Straightforward, replicable mapping techniques utilizing GIS software.
3. Identification of spatial criteria based on landscape patterns that are generalizable and applicable for rural communities across Utah.

#### *4.3 Methods*

Physical characteristics of settlement pattern are analyzed to understand and document the relationships between component parts that give rural character qualities to a community. GIS mapping tools as well as manual visual assessment methods are employed to isolate landscape pattern components related to rural character. Two models are created and compared to each other.

For the GIS model, each spatial component identified is used as a “rural character indicator.” A simple Boolean grid is utilized to spatially assign numerical values that

correspond to presence or lack of rural character attributes. The final product is a compilation of all of the indicator maps, where map addition is employed within the GIS software to combine the values of the individual indicator maps together in one composite map (Price, 2008). Based on this compilation, the composite map will exhibit a gradient of rural character, with low values indicating a lack of rural character, and high values indicating the presence of rural character. A visual assessment model, conducted through a visual interpretation of the same study site, is subsequently developed. Its purpose is to further distinguish landscape pattern related to rural character and help evaluate the effectiveness of the defined GIS Model.

The methodology for the study involves the following steps:

1. Conduct a visual assessment of landscape pattern for the study site, based on an interpretation of historic and current aerial photos.
2. Select components identifying landscape settlement pattern appropriate for large-scale landscape analysis that are universal to the majority of rural communities in Utah.
3. Identify the criteria for the components, based on structural and descriptive elements and the GIS data available for the state of Utah.
4. Map each component, or rural character indicator utilizing GIS tools.
5. Overlay the rural character indicators to create a composite map.
6. Compare the results of the GIS composite map with the visual assessment map. Evaluate the effectiveness of the tool.

A diagram of the methodology used for this project is shown in Figure 5, to illustrate the relationship of the two models used.

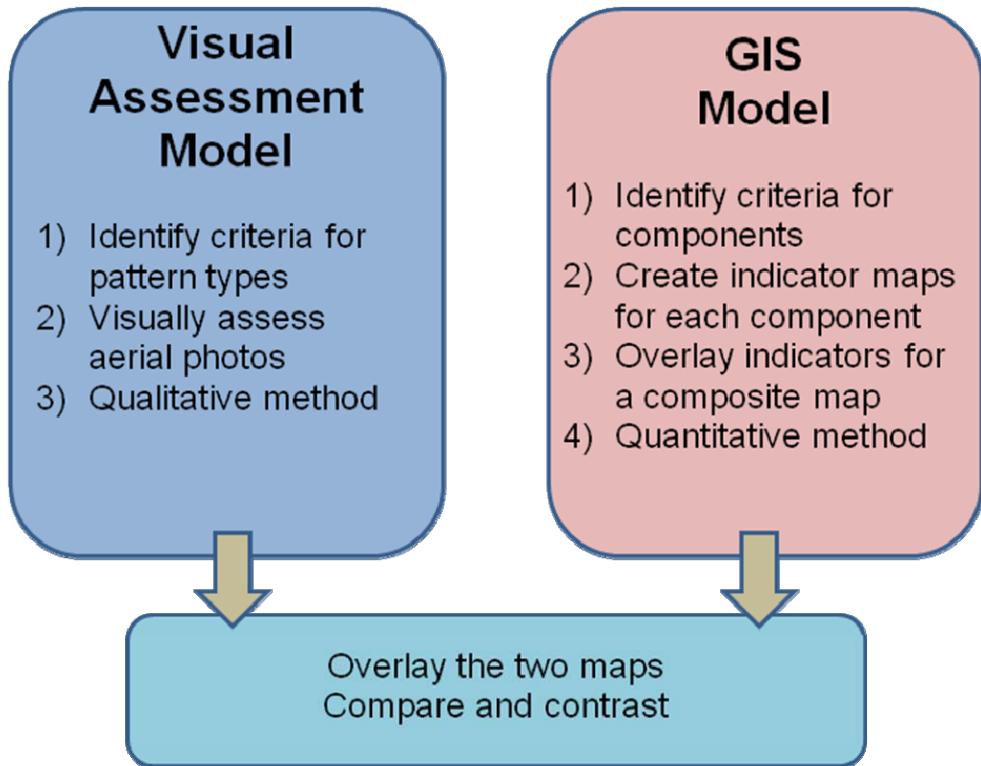


Figure 5. Diagram of Methodology.

#### *4.4 The Visual Assessment Model*

The visual assessment model was conducted prior to developing the GIS indicators and overlays and was not influenced by the results of the GIS model. It is included as an alternate form of analysis and as a comparison for the maps generated with GIS tools. The mapping of land pattern types is based on visual assessment of the aerial photos from 1966 and 2006, with some information provided by the parcel data. The mapping was done according to the following pattern types and corresponding criteria:

1. Traditional Town – based on the original settlement pattern of the town. Typically, streets are oriented on a N/S/E/W grid, with blocks about 700 ft. by 700 ft. The pattern is compact, incremental, with rectangular lots ranging from .5 to 1.5 acres in size.

2. Farm Land – Tilled fields, orchards, or range land larger than 5 contiguous acres.
3. Natural Land – Open space with natural vegetation, such as forest, sagebrush, or marsh.
4. Commercial/Industrial Sprawl – Large commercial strip developments that do not conform to the traditional town pattern. They usually have large parking lots on the street frontage. Lots are typically larger than 1 acre.
5. Residential Sprawl – Small residential lots, not conforming to the traditional town grid. Typically these include winding streets and cul-de-sacs. They are somewhat dispersed from the town center, and do not build incrementally on the existing town perimeter. Lots range in size and shape, with many wedge shaped. Lot size is typically .15 to 1 acre.
6. Exurban development – large homes on 1 to 5 acre lots that do not conform to the established traditional town pattern. Typically, they are dispersed from the town center.

These criteria are very similar to those utilized for developing the GIS model. It is worth noting that the area assigned “traditional town” includes both historic and recent development, discriminating based on pattern, not age, of the development. The results of the visual assessment model are shown in Figure 6.

This visual method of mapping is typical of how planners assessed landscape features and patterns prior to the availability of GIS tools. It uses a quasi-qualitative method for categorizing the landscape rather than quantitative methods offered by GIS. Comparing the visual results to the output from the GIS model will be of value for two reasons: First, a comparison will reveal if the GIS tool and the visual assessment maps are in agreement, particularly in the designation of areas of high and low rural character value. Second, each method will have advantages and disadvantages, and these will reveal the value of each approach.

## Visual Assessment Map

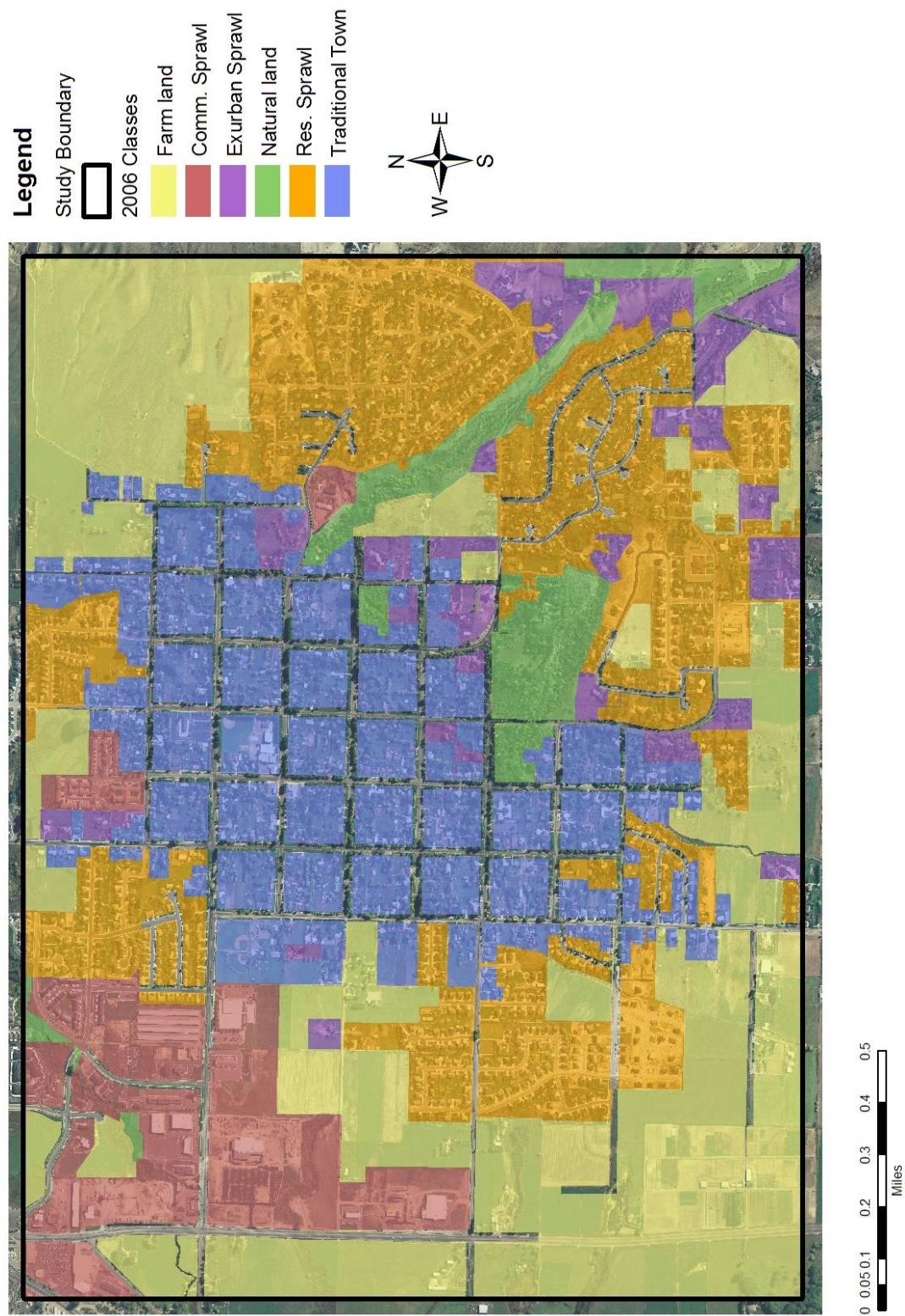


Figure 6. The Visual Assessment Map.

#### *4.5 The GIS Model*

Landscape settlement patterns identified as appropriate for this analysis are distilled from the research on components of rural character, the traditional Mormon village patterns, and the summary of suburban and commercial sprawl pattern characteristics. These are discussed in detail in previous chapters and several have been selected as potential indicators for the model. These components were also selected based on the limitations of the data available. Additional indicators can be identified and included as the process is developed and refined. Qualitative mapping of place meanings should also be mapped within each community as local planning activities ensue. Spatial criteria defining the selected indicators are outlined and the structural and descriptive elements identified. Landscape form and pattern are delineated using structural and descriptive elements, following Toth (1988) and Lynch (1960), and mapped using GIS software tools. Data sources and GIS mapping techniques are documented to provide the future framework for the online tool (see Appendix B). Each component is identified by three broad categories of land use: developed land, open space, or both. These categories clarify the area within the study site analyzed for each particular indicator and are important in determining the appropriate weighting of components in the analysis.

Existing GIS datasets provide the basis for the mapping. The data used in this study are free and available through the Utah Automated Geographic Reference Center (AGRC) and other state or local governmental entities. A detailed listing of the data used for this study is provided in Appendix C.

## Matrix of Rural Character Indicators

Rural Character Indicator	Structure/Description	Criteria	Developed Land (D) or Open Space (O)	Data Source	GIS Tools
Lot Size	Area, size	Large Lots 1/2 to 1.5 acres, 80% larger than 1 ac.	D,O	Parcel Data	Select by attribute for lot size
Lot Orientation	Line, shape	Rectangular grid in the N/S/E/W directions	D	Parcel Data Street Data	COGO
Distance	Node, proximity	Distance rings ½ mile increments from town center	D	Digitized	Euclidean Distance
Elevation	Matrix, continuous	Elevation 4400 to 4750 ft.	D	Slope Data	Select by attribute for elevation range
Farmland	Area, proportion	Irrigated, Non-Irrigated Agricultural designation	O	Parcel Data, WRLU	Select by attribute
Natural Land	Area, Line, Matrix, Edges	Slopes > 20%, Irrigation Canals, Rivers, Lakes, marsh, greenbelt	O	Parcel Data, Water Data, WRLU, DEM	Select by attribute
Age	Matrix, continuous	Developed before 1950	D	Parcel Data	Select by attribute

Table 4. Rural Character Indicators.

A matrix summarizes the selected indicators and each indicator's criteria, structural and descriptive characteristics, potential data sources, and mapping techniques are enumerated (Table 4).

The seven individual indicator maps are included in the following Figures 7 through 13. Appendix B includes a cartographic modeling process flowchart for each of the indicator maps.

## Lot Size Indicator

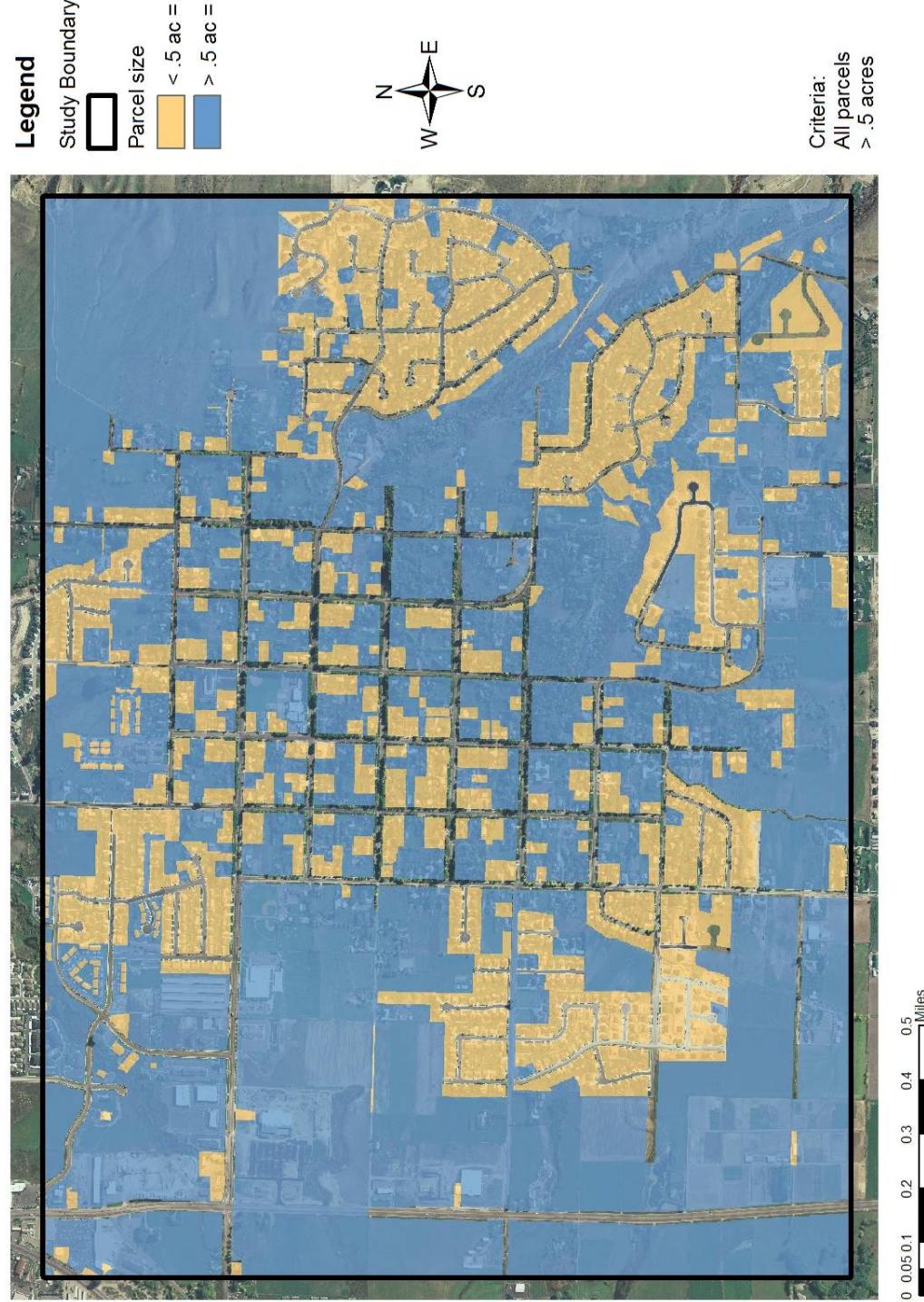


Figure 7. The Lot Size Indicator Map. Parcels less than  $\frac{1}{2}$  acre are given a value of 0, and parcels  $\frac{1}{2}$  acre and up are given a value of 1. See Figure 1 of Appendix B for the process flowchart.

## Lot Orientation Indicator

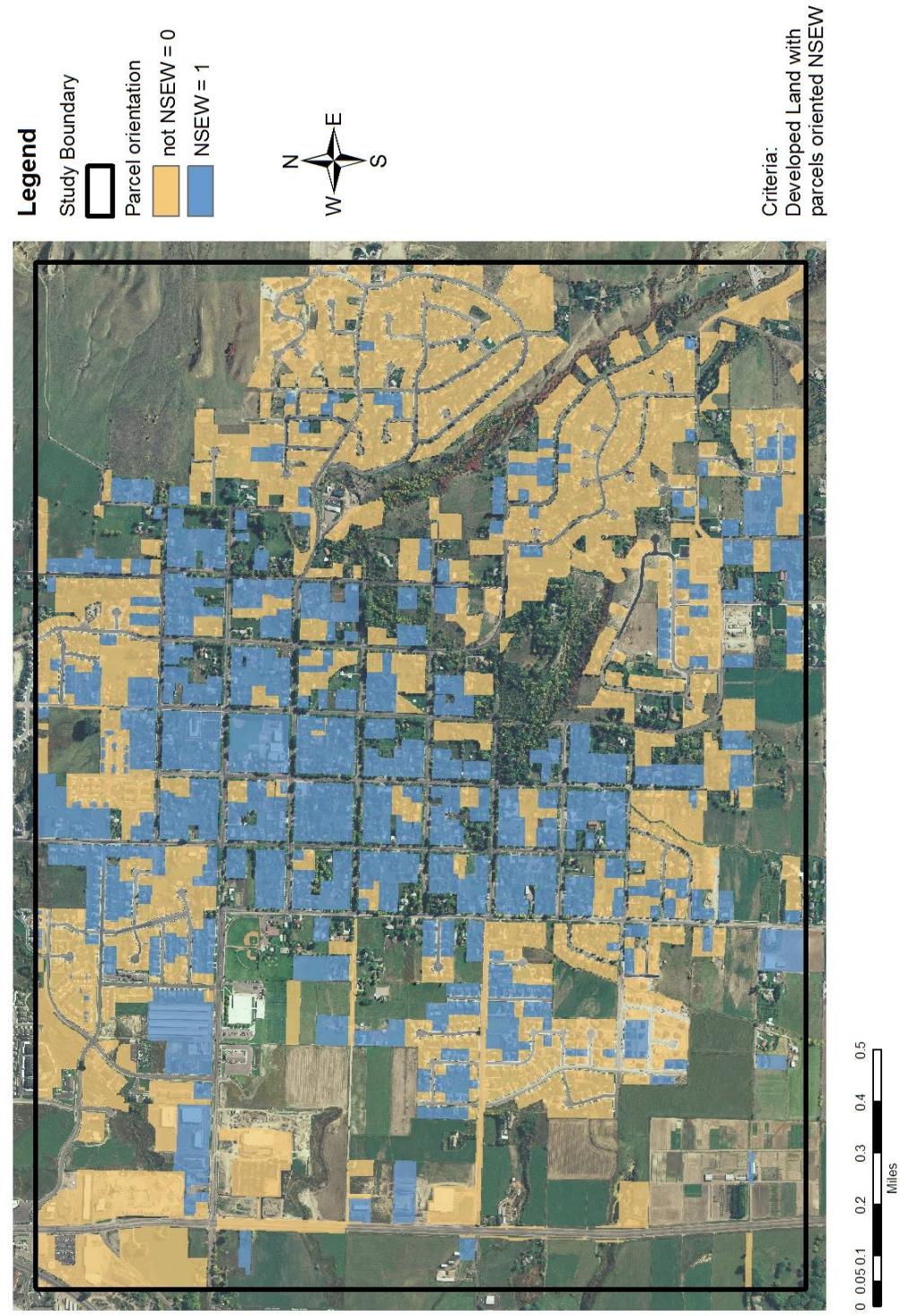


Figure 8. The Lot Orientation Indicator Map. Developed parcels with lot lines in the north, south, east, and west were given a value of 1. Those that did not meet this criterion were assigned a value of 0. Undeveloped land is assigned a value of 1. See Figure 2 of Appendix B for the process flowchart.

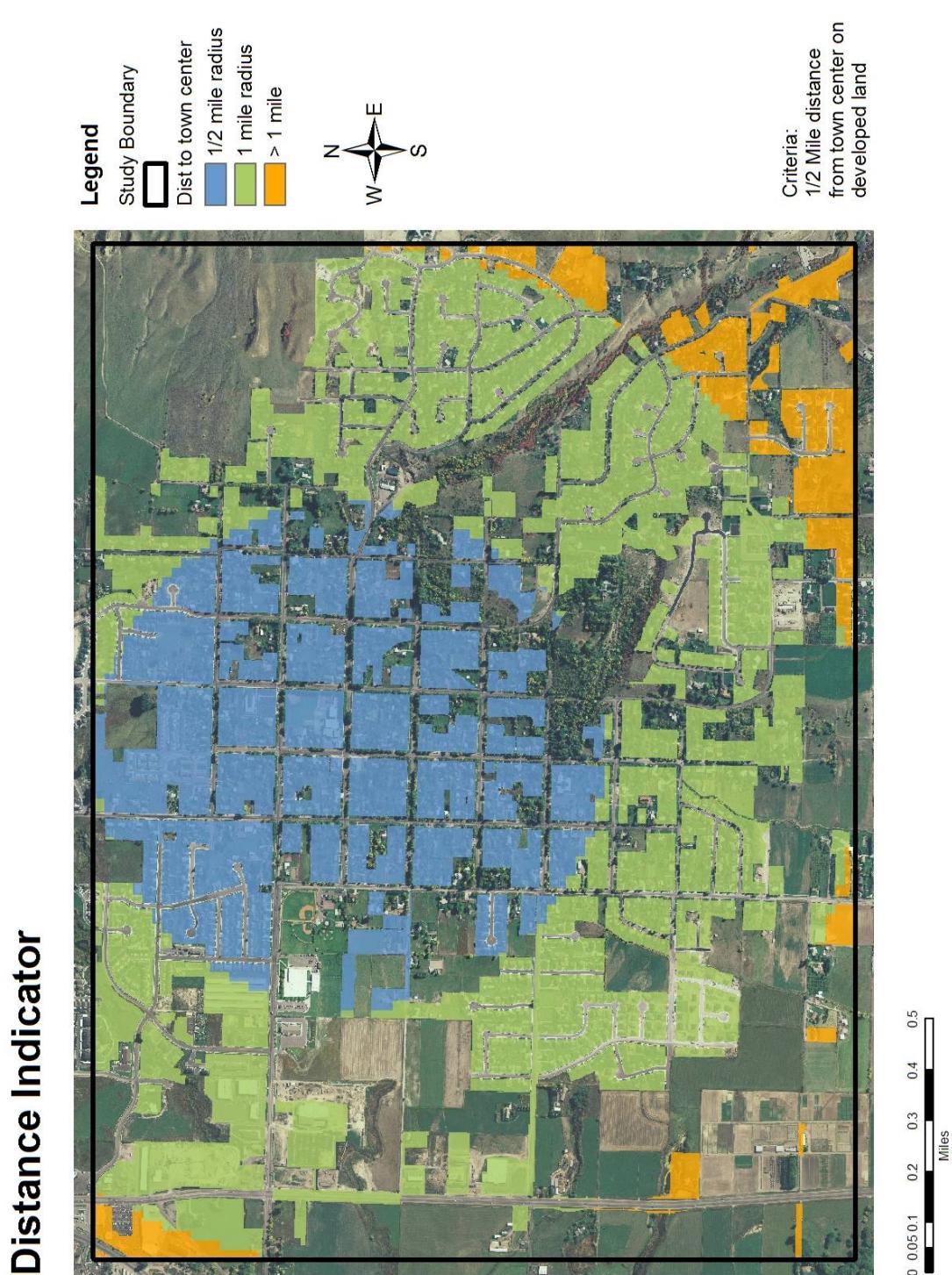


Figure 9. The Distance Indicator Map. Distance increments are assigned on a  $\frac{1}{2}$  mile radius from the center of the town to the peripheral areas and are given values of 2, 1 and 0. Undeveloped land is assigned a value of 1. See Figure 3 of Appendix B for the process flowchart.

## Elevation Indicator

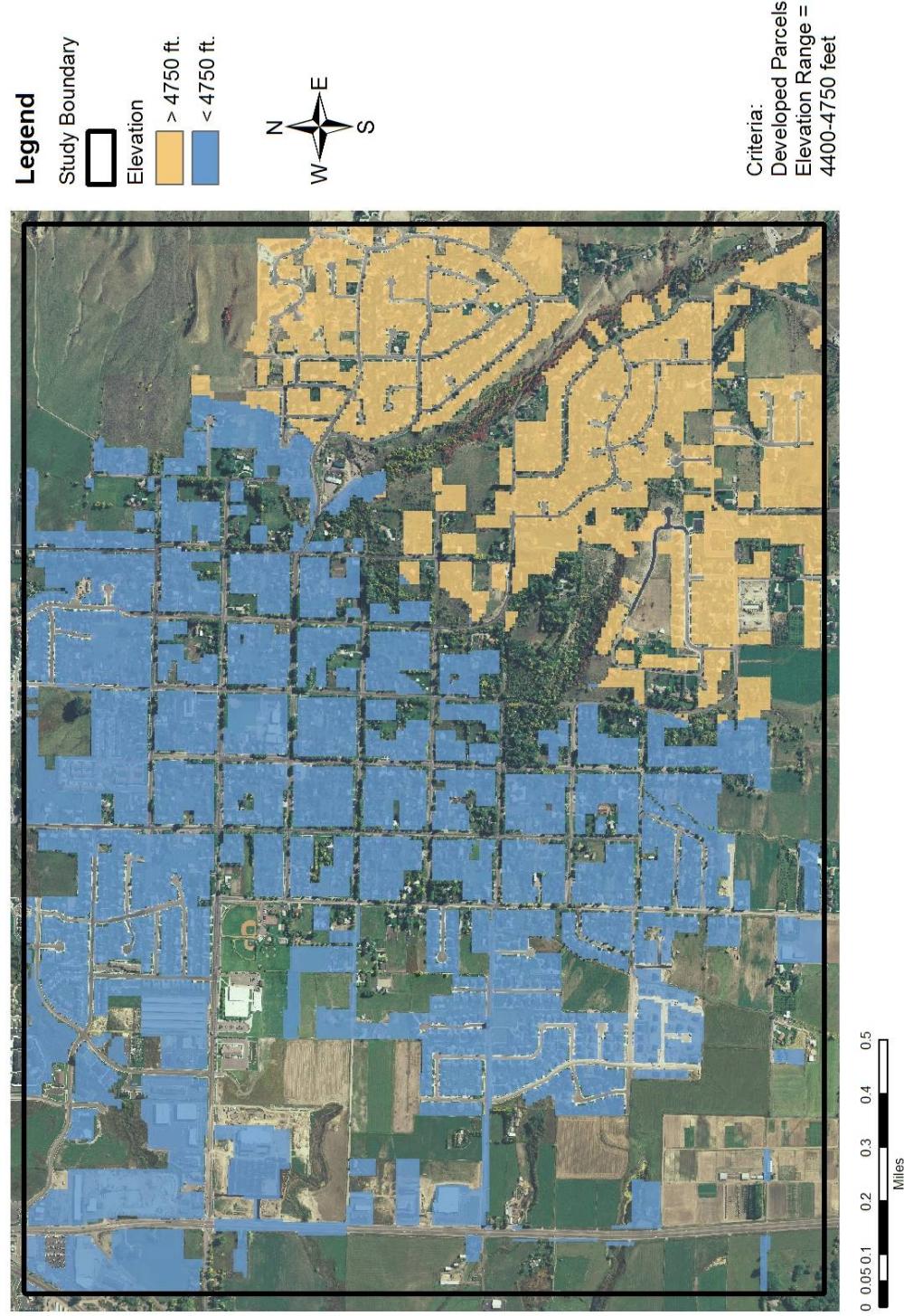


Figure 10. The Elevation Indicator Map. Developed areas within the elevation range of 4440-4750 feet are given a value of 1, and those outside of the range are given a value of 0. See Figure 4 of Appendix B for the process flowchart.

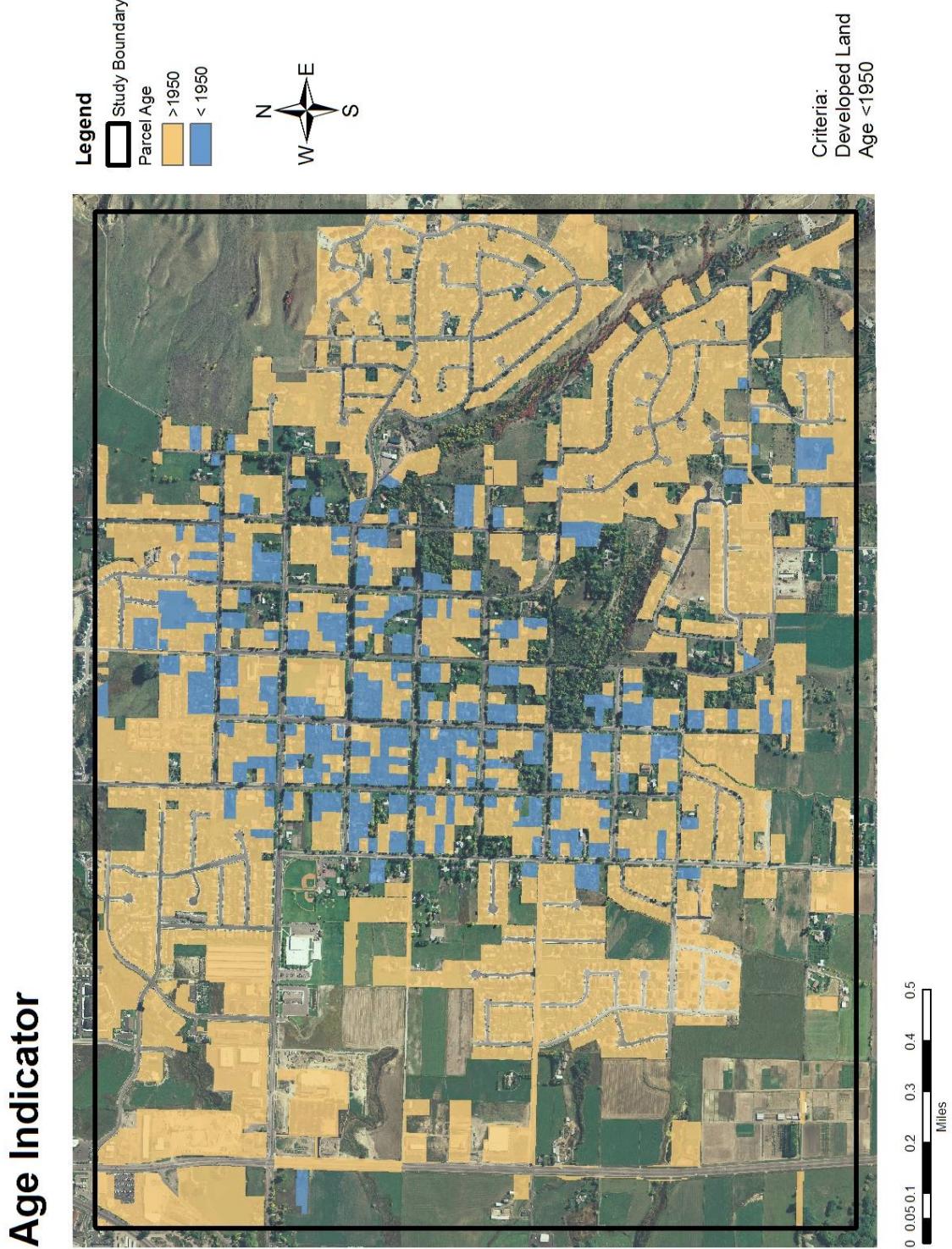


Figure 11. The Age Indicator Map. Parcels developed after 1950 are assigned a value of 0, and parcels developed prior to 1950 are given a value of 1. See Figure 5 of Appendix B for the process flowchart.

## Farm Land Indicator



Figure 12. The Farmland Indicator Map. The value assigned for farmland is 1, and the remaining land is assigned a value of 0. See Figure 6 of Appendix B for the process flowchart.

## Natural Land Indicator



Figure 13. The Natural Land Indicator Map. Natural land includes non-agricultural open space, rivers, wetlands, canals, riparian zones, and steep slopes. Areas meeting these criteria are given a value of 1, and areas not meeting the criteria are 0. See Figure 7 of Appendix B for the process flowchart.

To ensure that all areas on each of the indicator maps have an equal chance of receiving a value, areas of no data are also assigned a value. For the indicator maps that deal only with developed land, the remainder of the area (representing undeveloped land) is assigned a value of 1. This assumption is made based on the research, which unanimously agrees that open space in the form of agriculture and natural lands are critical elements of rural character. This is necessary also because the developed areas have the opportunity to achieve a higher value due to the repetitive use of the developed areas across the indicator maps. Without this convention, developed areas may achieve a maximum value of 5, while farmland and natural areas can only achieve a value of 2. For the farmland and natural space datasets, areas of no data are assigned a value of 0 since no assumption can be made about the values of those spaces.

#### *4.6 Composite Overlays*

The first composite map is generated by merging all of the values designated within each component map. First, each rural character component is mapped utilizing the tools outlined in Table 4, then converted to raster data for analysis. The raster data represents the area as a grid with a cell size of 10 X 10 feet. Grid cells within each component map that meet the criteria are assigned a value, as designated in the previous section. Areas that do not meet the criteria are assigned a value of 0. The raster overlay tool is used to add up all of the overlapping values from the component maps (see Figure 14). The resulting Rural Character Composite Map (see Figure 15) is a gradient of values, where high values in dark blue represent areas of rural character, and low values in dark orange

represent areas which lack rural character. Mid-values represent areas which have a varying degree of rural character.

The methodology used in this study for creating composite maps is flexible. It allows for the numerical values assigned to each indicator to be determined by individual communities, based on the priorities they define for themselves. It also is designed to allow each community to select only the indicators they decide are relevant. Composite maps 2 and 3, (Figures 16 and 17), are examples of how prioritization of certain indicators will alter the composite map. Ultimately, the tool will allow each community to choose the indicators they decide are relevant and weight them according to their own community values.

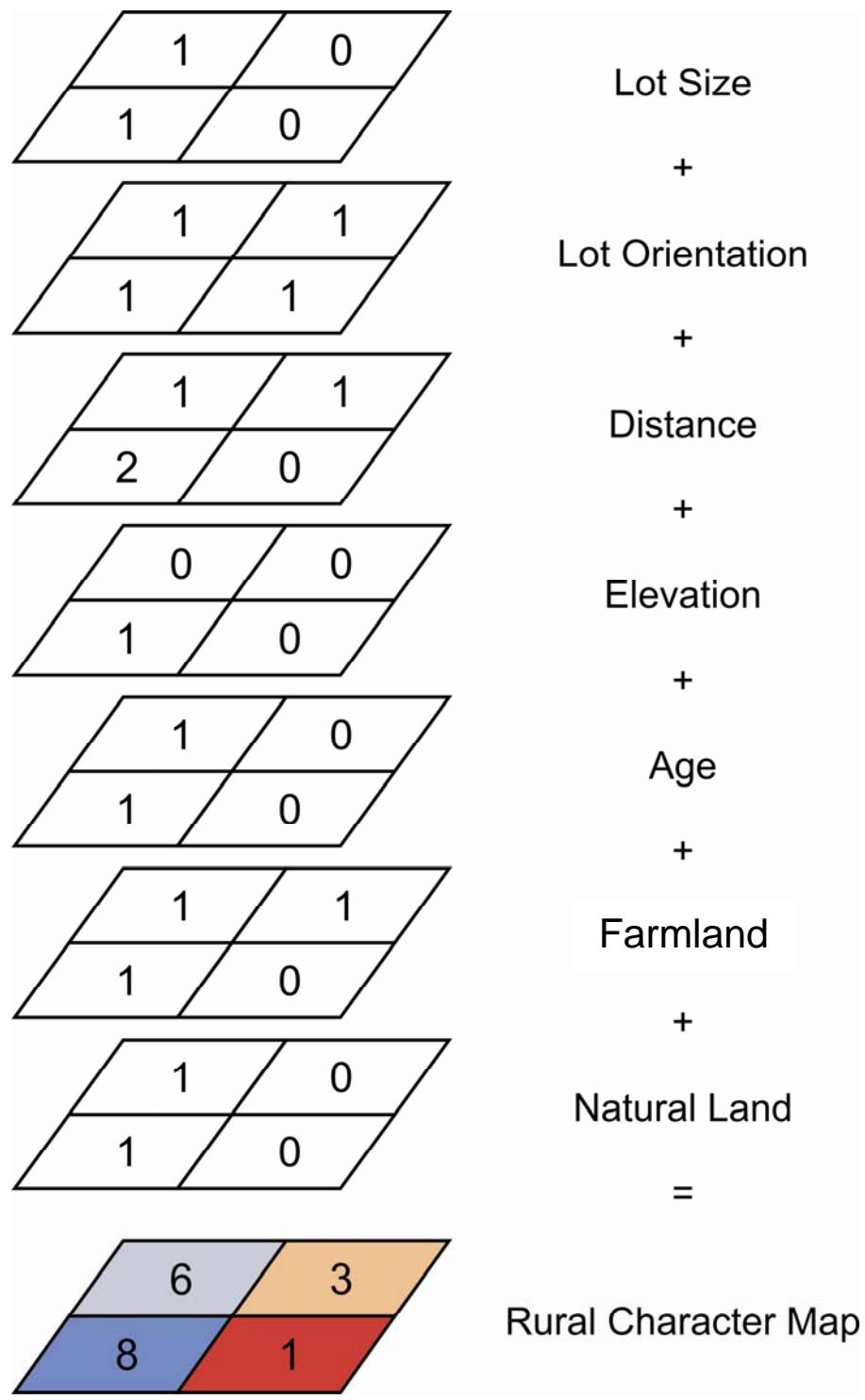


Figure 14. Overlay Diagram.

## Rural Character Composite

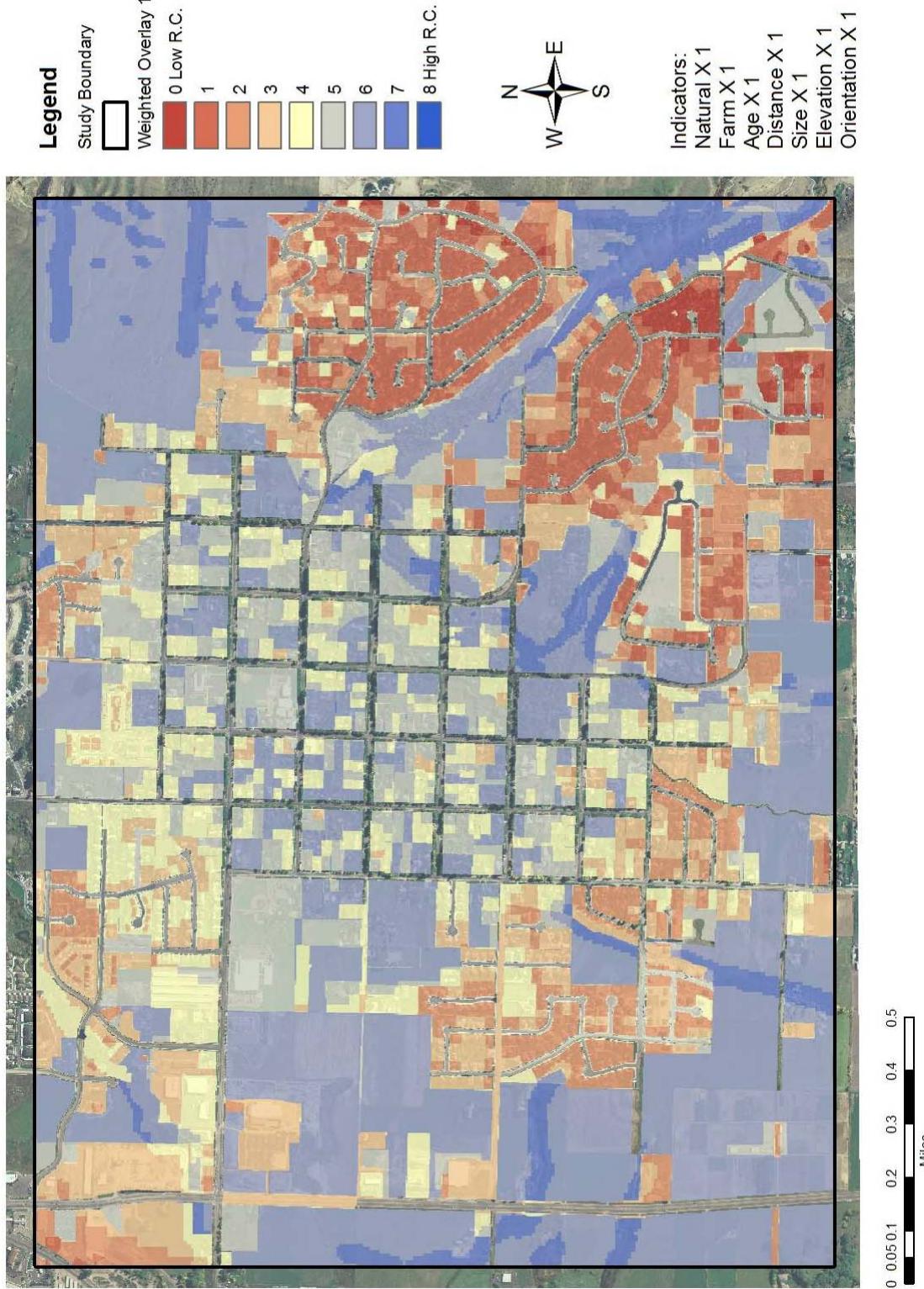


Figure 15. Rural Character Composite Map.

## Rural Character Composite 2

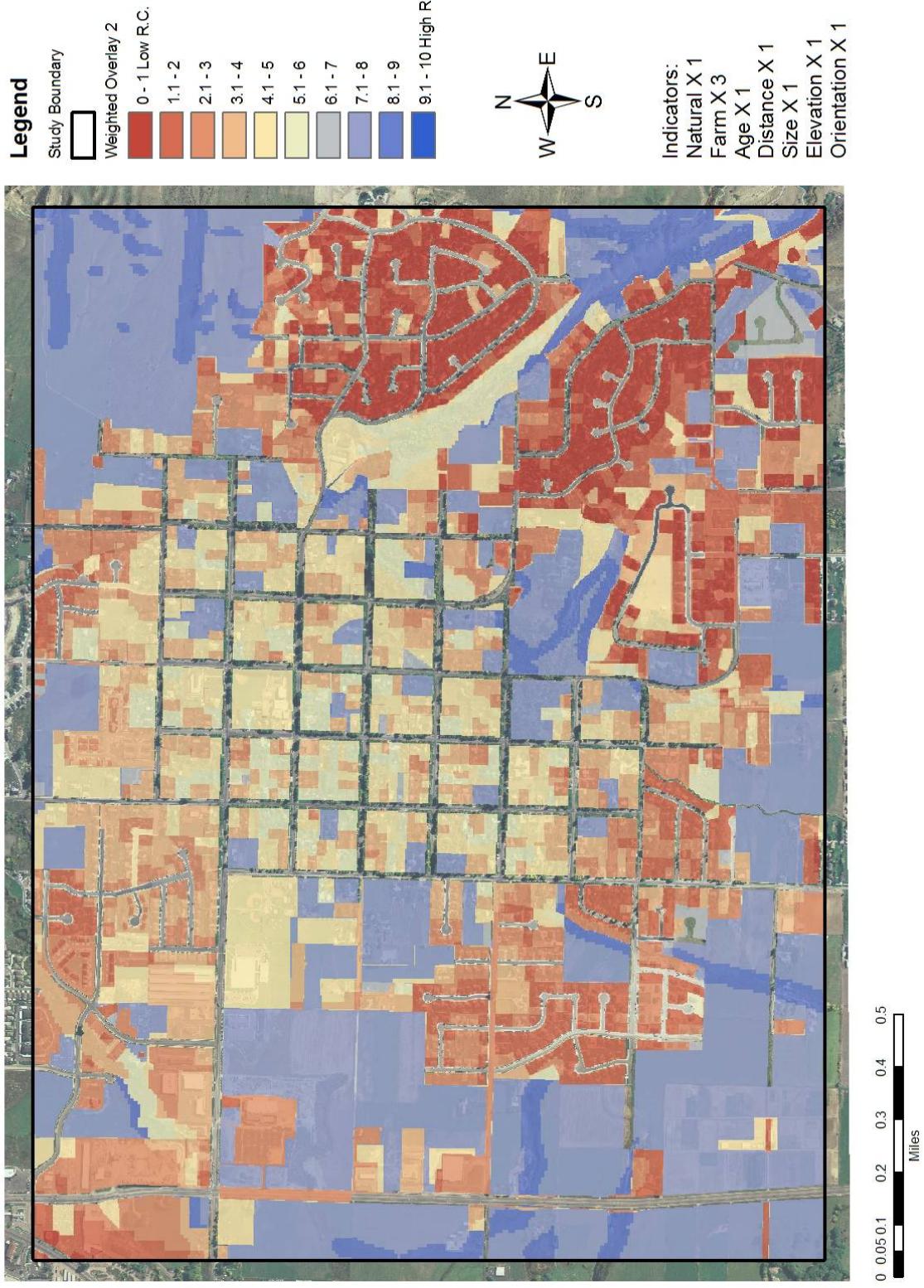


Figure 16. Rural Character Composite Map 2.

### Rural Character Composite 3

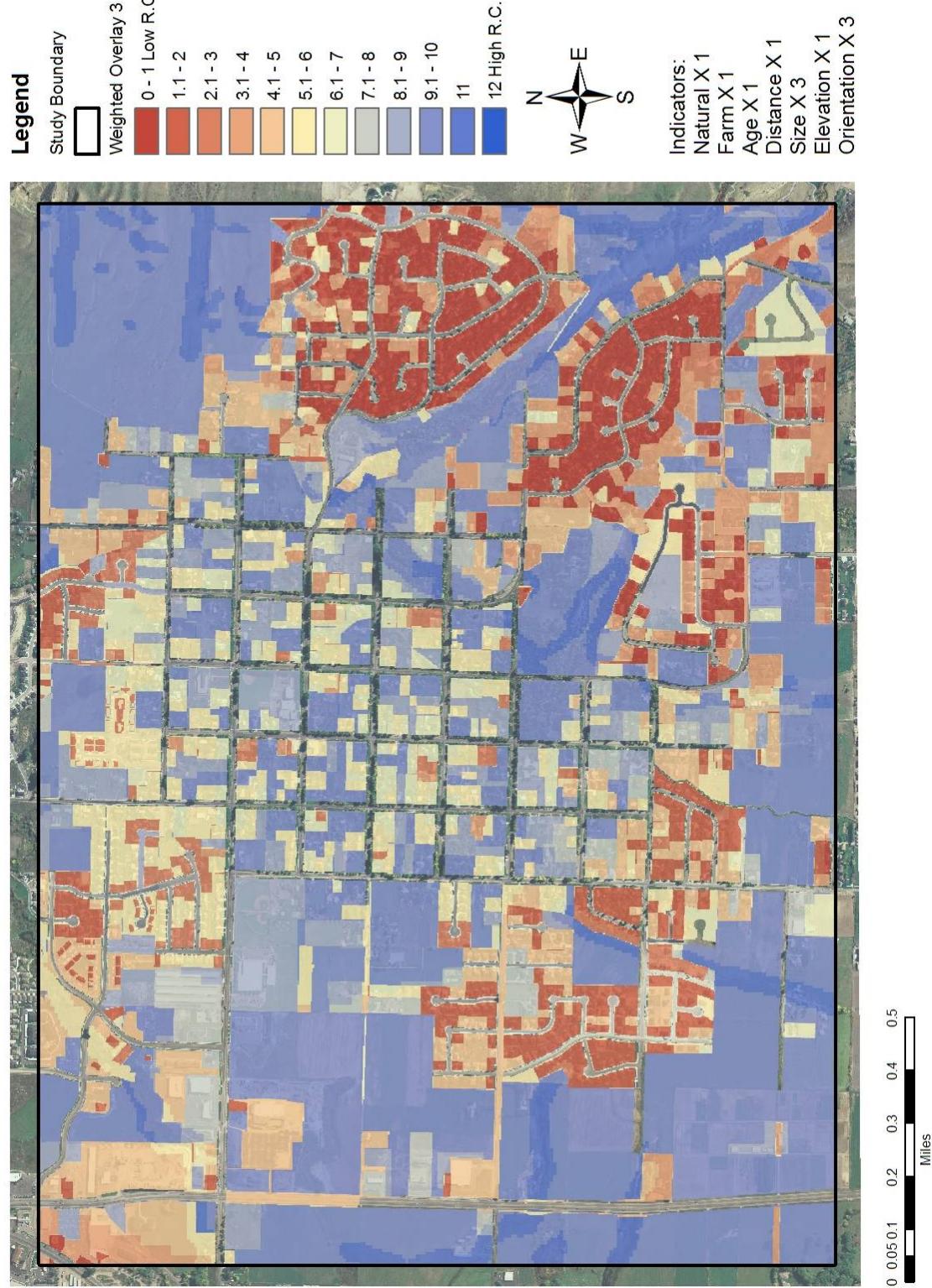


Figure 17. Rural Character Composite Map 3.

#### *4.7 Comparing the Visual Assessment Model with the GIS Model*

The GIS model is compared to the visual assessment model as a measure of the effectiveness of each approach in capturing patterns of rural character. An overlay of the two maps reveals where they agree upon the presence and lack of rural character in the study area.

First, the visual assessment map (Figure 5) is converted into raster data, separating the pattern types corresponding to rural character from those having less value for rural character. The categories of traditional town, farmland, and natural land are patterns associated with rural character and are assigned a value of 1. Commercial sprawl, residential sprawl, and exurban sprawl are not associated with rural character in general and are assigned a value of 0. The resulting map is shown in Figure 18.

Next, the GIS composite map (Figure 15) is simplified. The composite values 0-4 are lumped together as non-representational of rural character and are assigned a value of 0. The composite values 5-8 are areas likely to contain high rural character and are assigned a value of 1. The simplified map is depicted in Figure 19.

An overlay of the two maps reveals where rural character values match (Figure 20). Grid values of 0 indicate both maps agree that rural character value is low, grid values of 2 indicate both maps agree that rural character value is high, and grid values of 1 represent areas where the maps did not agree upon the assigned value.

This simple evaluation reveals that the results for each map are in general agreement, as shown in Figure 19. 77% of the cells agree upon the presence or lack of rural character.

### Visual Assessment Map

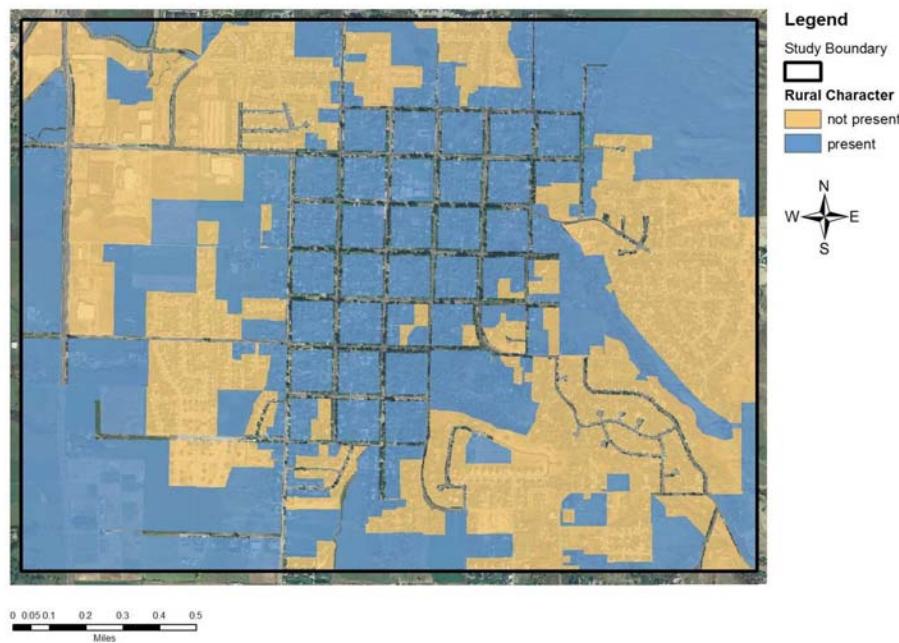


Figure 18. Visual Assessment Map Translated for Positive and Negative Values of Rural Character.

### Rural Character Composite

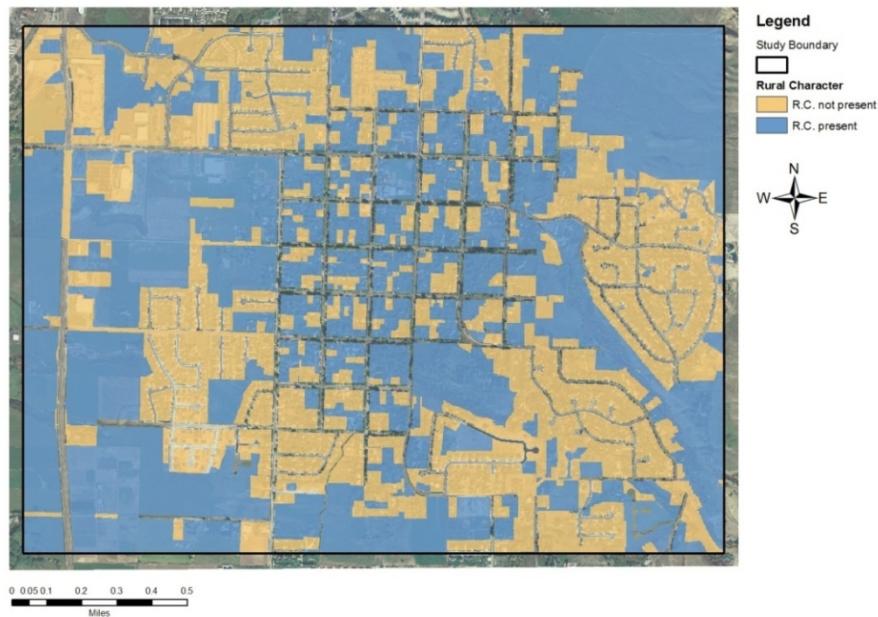


Figure 19. GIS Composite Map Simplified to Identify Positive and Negative Values for Rural Character.

## Visual Assessment / Overlay Comparison

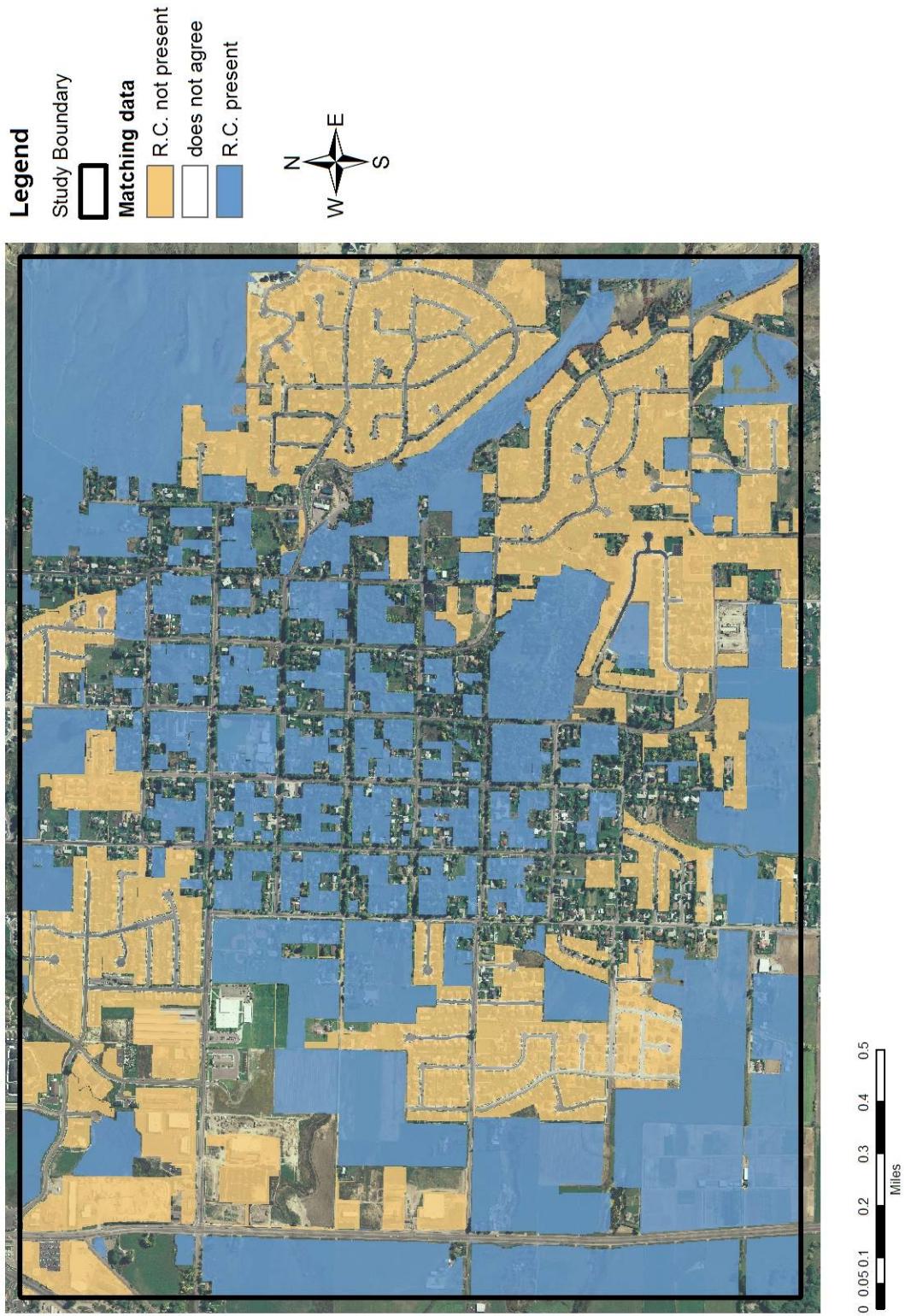


Figure 20. Comparison of Results from the Visual Assessment and GIS Overlay Maps.

#### *4.8 Results*

The comparison of the two models validates each mapping approach, indicating that each is generally successful at identifying landscape pattern associated with rural character based on these defined parameters. While the focus of this project is on the GIS model, both models exhibit strengths and weaknesses that warrant discussion.

The strengths of the GIS model are by design: the model utilizes existing data, establishes replicable techniques, and is set up for mass implementation to provide this information on a statewide basis. This model does not allow classification of the landscape into distinct pattern types or classifications but rather depicts the study site as a matrix of low to high values. Here the landscape is a heterogeneous gradient of rural character, representing rural character as a grey scale. The gradient of values suggests the complexity of this subject matter and may be more representational of reality. The drawback of this model is that it is limited to a deductive, quantitative analysis, limiting the types of components which can be analyzed. It is also limited to the assessment of the landscape at one point in time due to the data available. This model is also heavily reliant on the quality of the data.

Despite the quantitative nature of the GIS model, the design of this tool actually offers a qualitative component. Indicators may be included or omitted as well as weighted according to local values and priorities, allowing some flexibility with the use and interpretation of the data.

By contrast, the visual assessment model is more of a holistic approach, less limited by the quantitative variables needed for the GIS model. The approach gives more

flexibility in interpreting the complexity inherent in this subject matter (Antrop and Van Eetvelde, 2000). Landscape pattern types are intuitively discerned and classified.

According to Gestalt theory, humans are able to “recognize and interpret complex spatial patterns,” and landscape analysis is considered on the whole, as greater than the sum of its parts (Antrop and Van Eetvelde, 2000). The classification of pattern type is probably the greatest strength of this model, which is not possible with the GIS model. However, the blocking out and simplifying of the landscape into large blocks of area may be an over-simplification of the patterns, appearing much more homogeneous than the GIS model. Because it does not allow for a gradient of values, the rural character is depicted as either present or not present. This model is also limited by its dependence on a subjective assessment of the landscape, which could vary dependent upon individual interpretation of the variables. It is much more time-intensive than the GIS model if it is to be applied on a statewide level.

The visual assessment approach lends itself to a study of the landscape through time, because the data is generated from aerial photos. If the goals for the tool are most concerned with assessing rate of temporal change to the landscape, this method is recommended. But, because historical data is not available, these datasets would need to be created through the visual assessment techniques. The evaluation of landscape change over time also requires a categorization of the landscape pattern types, rather than a gradient of values. This study initially explored options for the development of the tool in this vein, utilizing a Markov statistical model to predict landscape change (Gergel and

Turner, 2002), but it was not pursued due to the limitations of existing data and the intensive effort necessary to create new data.

It is interesting to note that the GIS model produces the map quantitatively but relies on a qualitative interpretation. The visual assessment model is generated by qualitative means but lends itself to quantitative analyses.

Areas of suburban sprawl appear strongly in the GIS overlay maps, on the low end of the spectrum of values for rural character. Farm and natural land are represented consistently on the high end. Areas within the traditional town exhibit a mosaic of values, predominantly from mid-to high-levels of rural character. This may be due to several factors. The village center encompasses development spanning the entire history of development on this site, from historic to new. Some lots are generally unchanged, and others have been subdivided for new development. The lot size and age indicators represent the range of these variables. Another reason why the village area may be somewhat less consistent than the other areas is lack or inconsistencies of the datasets. The parcel data in particular had gaps in several fields.

The results of the GIS model illustrate that a few distinct indicators can be used to illustrate strong differences in pattern type within the landscape. Additional indicators and landscape metrics should be explored in future studies and as new data becomes available. Additional datasets would be very useful, such as a classification of land cover at a finer scale. There are many datasets available for land cover, but these are at a very large scale and do not translate well to the finer scale of this study. Amount and type of vegetation and quantification of impervious surfaces could contribute to additional rural

character components for exploring such variables as building area to lot size ratios, building and parking lot configurations, or measuring road widths. Vegetation age and type may be associated with type of development and land use. Development of other GIS datasets on a statewide scale would add useful information to this model, such as ortho-rectifying historic aerial photos and mapping culturally significant landmarks, historic register sites, scenic routes, viewsheds, and recreational areas. Equally important is the refinement of existing datasets, which contain inconsistencies and errors. The analysis is only as good as the data utilized.

The visual assessment model is presented here to contrast with the GIS model and to verify its results. To provide further verification of the tool, a photo survey could be conducted among residents of the study area. At its simplest form, this survey could consist of a series of photographs within the study site representing areas with both high and low degrees of rural character, to be ranked by survey participants following Kaplan and Kaplan methodology (1989).

#### *4.9 Questions of Ethics and Validity*

Some threats to validity for this project may include potential confounding variables or spurious factors due to the complex nature of the subject. External validity may be at risk since this project seeks to quantify an inherently qualitative subject. Also, the rural character components defined by the survey of the current literature may not necessarily represent rural character on a more local scale, especially since rural character is heavily dependent on the uniqueness of place.

The construct validity should be strong, since this study attempts to consolidate sense of place theories through a holistic, interdisciplinary approach. Construct validity is achieved if multiple indicators operate in the same manner for the specified problem (Neuman, 2006). Here, two methods are compared and achieve similar results. From a theoretical basis, multiple disciplines and approaches are studied and incorporated into the project design.

## **CHAPTER V**

### **APPLICATIONS**

#### *5.1 Using the GIS Model as a Planning Tool*

How will planners use this model as a tool? What other processes should be incorporated into planning for rural character? What strategies may be used to assess proposals for future growth and to improve the conditions in existing neighborhoods? This project was developed with these questions in mind, with the intent that the GIS model may easily be developed into a statewide tool for small community planning.

The model is developed with the concept of using map overlays. It is set up to be flexible, so choice and weighting of the indicators can be done by individual communities according to their unique values. It is also set up for the future development and inclusion of additional variables. It is simple and easy to understand by design, so planner and layperson alike may benefit from its application. The intention is that the model will be developed on a statewide scale and offered as an online tool to maximize the availability of this information as a service of the state to its residents. Many small jurisdictions lack the funding for professional planning staff, and while this tool is not meant to be a surrogate for the need to pursue more comprehensive planning, it will provide information and data which can contribute to long-term planning objectives.

The maps generated with this model may be used by planners utilizing both GIS and manual mapping overlays. The maps may be overlaid with additional maps representing other social and environmental conditions in the landscape. The idea of overlays was popularized by landscape architect Ian McHarg, who “suggested that information about

social constructs and environmental processes could be mapped and overlaid to determine opportunities and constraints for potential land uses” (Toth et al., 2006: 28). For example, the state has a similar tool to identify critical lands. Critical lands are defined as those essential for the health, safety, and welfare of residents and include such elements as floodplains, steep slopes, and earthquake fault zones (Bohn, 2005). Overlay of the rural character map with the critical lands map may highlight areas that should receive a high priority in supporting quality of life concerns. For planners without GIS resources or training, the traditional method utilizing transparent map overlays on a light table is still valid. However, the use of GIS mapping technology facilitates this process by providing greater flexibility and more options for analysis. Because overlays are such an important tool in evaluating the suitability of future development, the availability of spatial data for assessment of subject areas like rural character that are typically difficult to quantify is extremely important. The evaluation of these items needs to be placed on equal footing with those variables more easily quantified.

### *5.2 Weighting the Overlays*

The GIS model allows easy manipulation of each indicator, allowing the individual or community to change their assigned values. For some, open space and agricultural lands may carry the most significance; others may prioritize natural lands or historic buildings. This flexibility produces variability of potential results which is necessary when attempting to approximate differing community values by utilizing landscape metrics. The use of this tool is intended for communities which seek to identify and preserve their rural character amenities and will generate maps which show areas with

positive rural character indicators as a higher value than other areas. This is not meant to label different types of development as good or bad, only to show the differences in development types and to help planners spatially identify areas containing rural character.

### *5.3 Landscape Metrics*

The information from these maps can provide insights about the relative proportion and configuration of the pattern types observed. It may be useful to know what percentage of the landscape has rural character. A few simple landscape metrics may be used to assess the composition of the landscape. Proportion is the most fundamental of landscape metrics and summarizes the total number of cells within each landscape category. Proportion ( $p_i$ ) is:

$P_i = \text{Total number of cells of category } i / \text{total number of cells in the landscape}$   
(Gergel and Turner, 2002)

### **Rural Character Table of Proportional Metrics**

VALUE	COUNT	Proportion	Percentage
0	6524	0.008982143	0.90
1	51868	0.071411067	7.14
2	67727	0.093245494	9.32
3	86320	0.118844052	11.88
4	91645	0.126175430	12.61
5	100147	0.137880853	13.79
6	281195	0.387144962	38.71
7	40900	0.056310492	5.63
8	4	5.50714E-06	0.00

Table 5. Proportional Metrics of Rural Character.

Table 5 tallies the number of cells for the Composite Map, according to their summarized value, and represent each value as a percentage of the whole area. Summarizing values 0-4 as low rural character, and 5-8 as high rural character, proportionally there is around 41% of the study area with low rural character value and 59% of the area with high rural character value. The same type of analysis may be used to determine the proportion of each of the other distinct pattern types, such as farmland, natural land, or open space in general. Data from the indicator maps may be arranged in multiple configurations to illustrate different aspects of the landscape. If mapped for several points in time, these data may be used to analyze the change in proportion of land cover over time utilizing simple statistical modeling.

The spatial configuration of landscape elements may also be observed. The nature of the edge of the village is a measure of its rural character, with a more compact edge representing a higher level of rural character, and a fragmented, less compact edge representing a breakdown in the integrity of the village and its surrounding landscape. This compactness is reflected by the degree of sprawl for the developed portion of the landscape and can be measured with the perimeter/area ratio metric (Irwin, 2003). The conciseness, or integrity, of the village edge can be calculated with landscape metrics such as fractal dimensions, which measures the relationship between size and length (Lowry, 2008).

To increase conciseness of the town perimeter, one planning strategy may be to prioritize the pockets between developments for future build-out (Dramstad et al., 1996). Arendt (1999) outlines examples of “filling in and rounding out,” where the “expanded

village continues to nestle and intrusions into the surrounding farmland have been minimized” (p. 44).

#### *5.4 Community Level Data*

These maps can serve as a basis for rural character planning, allowing the addition of other important elements of rural character, defined at the community level. These may be sociocultural elements, historic sites, distinctive architecture, scenic byways, viewscapes, natural resource areas, or ecologically important zones. These elements should be inventoried locally and added to the rural character map. If GIS tools are utilized, they may be developed into additional indicator maps to be included in the weighted overlay. For example, local documentation of historic and significant sites, routes, and experiences for this study area has already been assembled and mapped by the Bear River Association of Governments (BRAG) as a part of an effort by the Bear River Heritage Council to establish the region as a Heritage Area (Bear River Heritage, 2009). The data includes locations of historical barns and farmsteads, sites on the historic register, historic building locations, location of trails, and location of food and lodging sites with roots in local heritage. Data sets obtained from BRAG were transformed into an additional indicator map (see Figure 21). An additional composite map, now including the cultural indicator, illustrates how this data can influence and change the rural character map. (see Figure 22). The availability of this data varies by region and, in many cases, will need to be created.

## Cultural Features Indicator

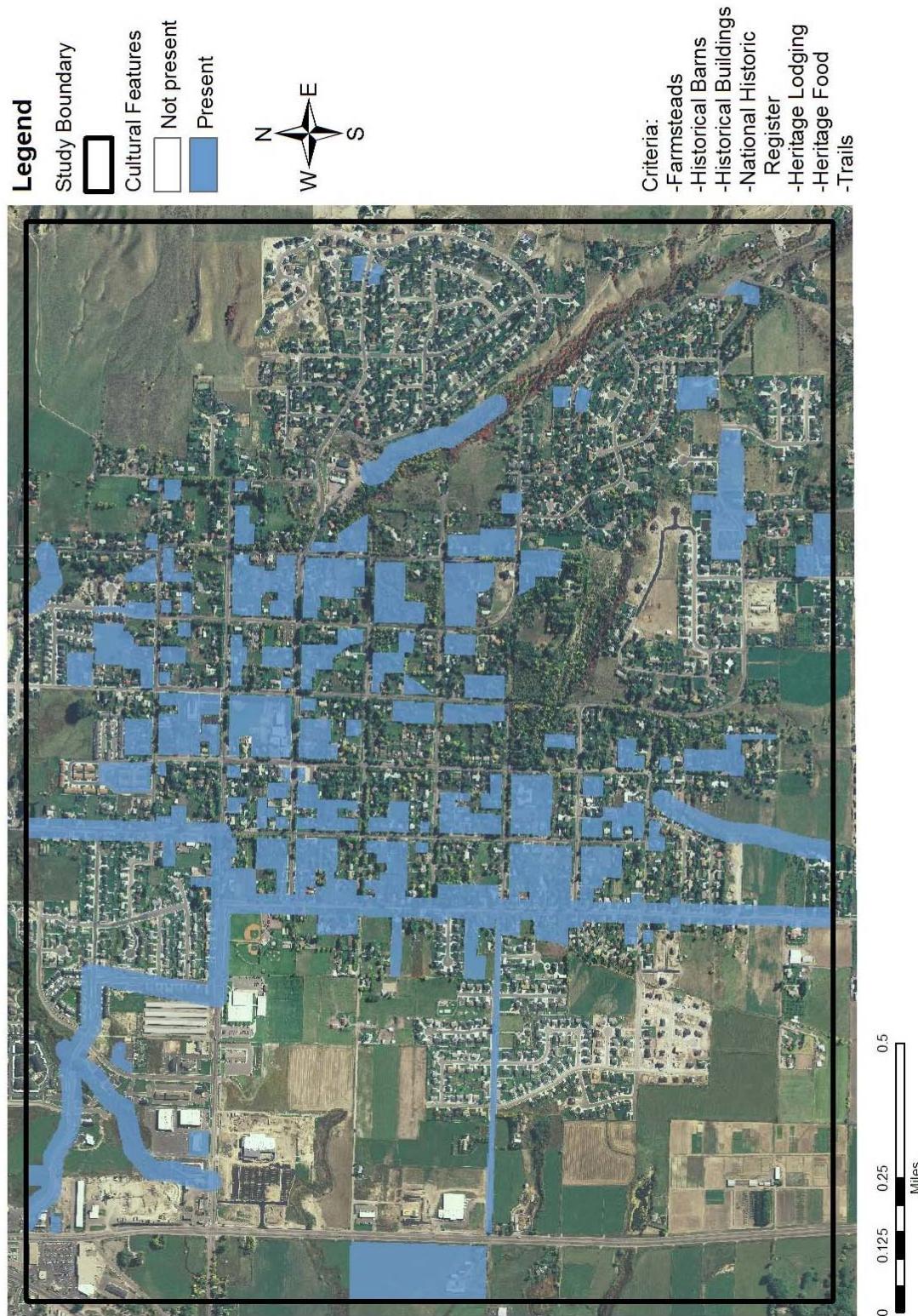


Figure 21. Cultural Features Indicator Map.

## Rural Character Composite with Cultural Features

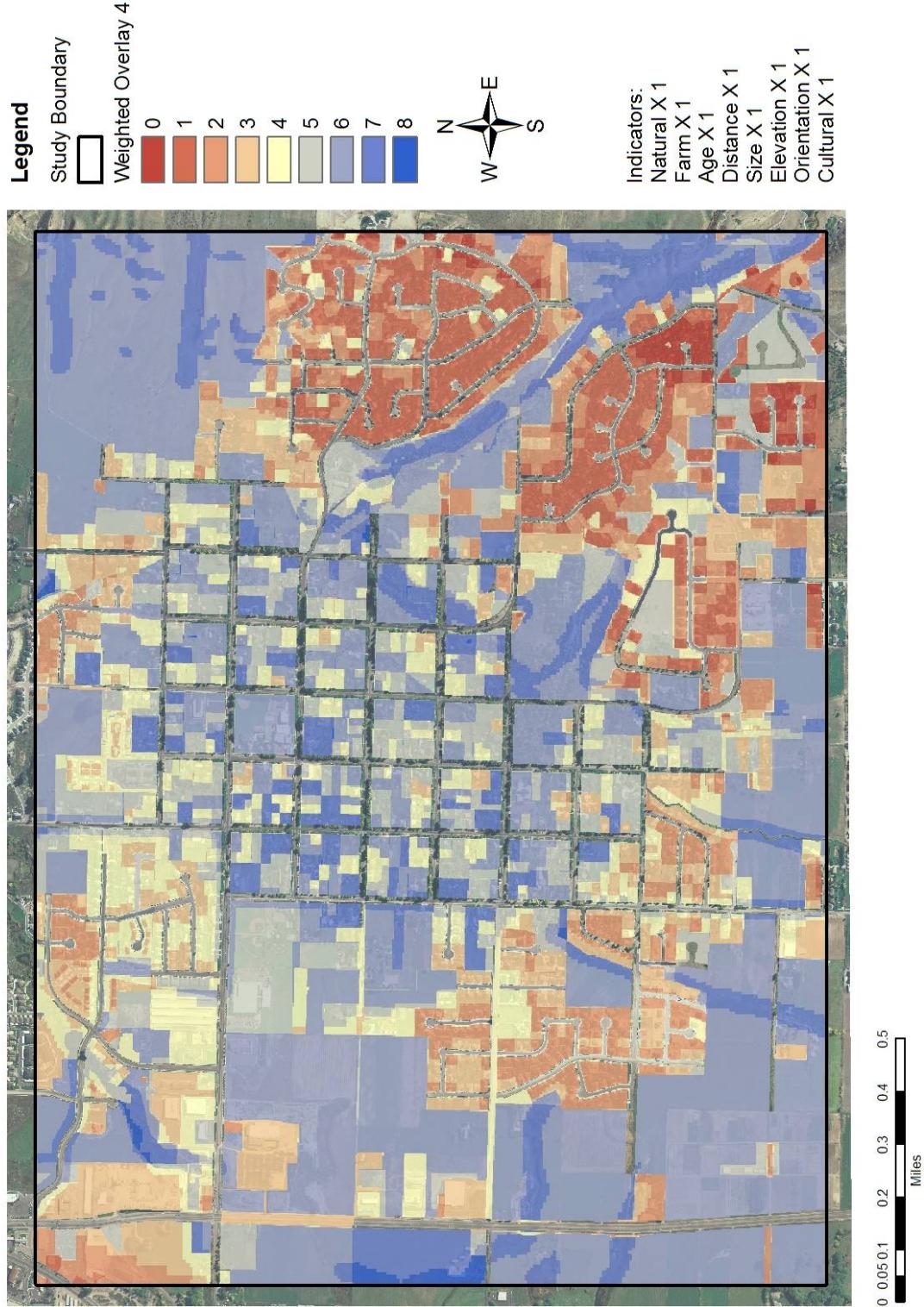


Figure 22. Rural Character Composite Including Cultural Features.

## **CHAPTER VI**

### **DISCUSSION AND CONCLUSION**

#### *6.1 Discussion*

Models are, by definition, abstractions of reality. This simplification of the complex and dynamic processes which contribute to landscape pattern can provide valuable insights but should not be utilized without an understanding of its limitations. While this tool provides only partial information as a starting point for planning, it can start to raise important questions regarding the nature of our physical and social structures. The patterns appearing on the landscape reflect the priorities of our society and sometimes the duality of our values.

Most people value rural character and at the same time wish to live in a large suburban home with all of the amenities and luxuries afforded by the modern lifestyle. The sense of place and community associated with rural character are fundamental in the human need to identify and find meaning within the environment, but many aspects of the traditional lifestyle are outdated. Housing is typically much smaller in traditional neighborhoods, and floor plans are much more divided and formal than the current living model. These buildings are often in various states of disrepair. At the same time, the heavy handed, commodity-based approach of suburban developers has created a new reality that is not sensitive to the amenities of place, creating divided, disjointed communities (Rowe, 1991). Oftentimes, there is little choice available to those who might choose different alternatives to living. There is an obvious need to reconcile the lifestyle desired of modern society with the wish to preserve and protect rural character.

Planning strategies should explore opportunities to achieve both, and communities should be active participants in determining their own futures.

Suburban sprawl has been a predominant pattern within rural landscapes across this country over the last century for a variety of complex reasons. Existing zoning laws have placed control over how communities grow into the hands of speculative developers who often subdivide land in the most efficient way and at the greatest profit. These large companies may not have a stake in the long-term quality of life of a community. Current conventional zoning laws facilitate the imposition of standardized sprawl development, and the non-critical acceptance of this planning model by planners, engineers, realtors, and residents propagates the needless erosion of the qualities of rural character within small rural communities (Arendt et al., 1994). Regardless of the prevailing sentiment in this country to protect private property rights, it is the community and not the individual who will bear the burden of land-use decisions far into the future.

How can design for new developments reconcile the lifestyle of modern society with traditional small town values and the desire to live close to nature? The embracing of this duality of values within the American culture, termed “modern pastoralism” (Rowe, 1991) may provide important clues into developing the context for future development. Rowe (1991) suggests that the current suburban model of development must change significantly. The residential landscape must “be devised that creates a greater sense of civic identity, recognizes the rapidly changing needs of households, and provides a higher level of social service” (p. 290). Commercial landscapes must be elevated beyond their one-dimensional functional response to “higher levels of mixed use, greater expressive

latitude, and a heightened sense of common property resource” (p. 290). Expressiveness of form should be inclusive of traditional and environmental references and not simply a mechanistic, modern response. These, however, must be authentic and allow for the inevitable changes to cultural tradition.

Elements of commercial sprawl are often the greatest offenders. These developments appear along highways, often decentralizing the commercial core of the traditional village. As a result, ribbon sprawl breaks down the concise village edge, creates economic strife for existing villages, and becomes the new gateway to the town. The biggest offenders are typically the massive, inhospitable parking lots between the roads and the buildings. Arendt’s (1999) solution implements setback ordinances, prohibiting parking between the street and the buildings. This solution reinforces the path and creates an inviting presence. Rowe (1991) suggests a different tact, one which celebrates the experience from the automobile. He imagines parking lots as fully landscaped park-like settings which may also accommodate other community functions. A combination of these ideas is also fully feasible. Also, a nodal pattern should be encouraged at highway connection points, instead of a haphazard, strip pattern, to preserve the integrity of the rural landscape and reduce traffic hazards along major roadways (Arendt et al., 1994). The distinction between the “townless highway” and the “highwayless town” should be made (Arendt et al., 1994).

One casualty of the suburban age is the loss of the vitality of the town center. Decentralization of the core areas has caused the devaluation and vacancy of property in the town center. Additionally, traditional town centers have disappeared due to post-

World War II redesign activities, completely removing significant portions of the historical fabric of towns to make room for new buildings. In recent decades, this activity has been curbed as community values have come full circle. Urban revitalization movements are successfully occurring across the country, as communities look to improve the conditions of the town center. Redevelopment of the commercial town center must include equal focus on both civic and retail functions (Arendt et al., 1994). Success of the town center is dependent upon developing a mix of spaces, at a pleasing human scale, to serve a variety of desired social functions. It should encourage appropriate infill development to strengthen and enhance existing patterns (Arendt et al., 1994). Creative zoning ordinances may be necessary to encourage mixed-use development or shared parking scenarios. The development of amenities will also encourage revitalization of nearby historical residential areas. Residential revitalization can also be encouraged through local tax incentives or programs such as the National Historic Register.

Farmland is one of the most important elements of rural character, yet the decline in farming is a precipitous trend. How can planning activities encourage the continuation of farming activities as an integral and valued part of the community? Exurban development, or hobby farm development, continues to fragment agricultural lands into expanses of low density suburban residences. Conflicts between new residents and established farmers are on the rise due to the sights, sounds, and smells associated with farming activities. Additionally, farmers are cash poor and land rich and often wish to subdivide their land to afford a retirement. In areas where low density subdivision is a

precedent, it is difficult to enact new zoning laws to curb future trends in this vein. Private land development rights are a topic of heated debate, and limitations proposed to limit them typically receive much opposition in rural, conservative towns. Care must be taken to determine how land-use ordinances may be used to limit development rights, although pursuit of these is not outside of the law (Arendt et al., 1994).

## 6.2 Conclusion

This research seeks to clarify the relationships between spatial patterns in the landscape that contribute to rural character in Utah communities. Consistent elements of pattern and form which enhance rural character are articulated spatially in this study for application as a tool in community planning. The hope for this work is that some of the complexity of this topic will be reduced through spatial representation of strong elements of landscape form and pattern, allowing comprehensive planning efforts to address rural character in a more transparent, intelligible way. In this manner, rural character may be given a more tangible presence in planning and will not be discarded as being too complex, too subjective, and too qualitative.

The framework developed here will potentially support a statewide planning tool by providing generalizable insights into the nature of rural character. The tool developed will be an online, interactive map utilizing GIS layers. Layers representing pattern elements within the landscape will be utilized as indicators for rural character. Users will be able to select which indicators they view as relevant and weight their values interactively. A rural character composite map is the final product, where rural character will be suggested as a gradient of values.

The intent of this project is to provide a simple visualization tool for understanding and assessing settlement pattern associated with rural character for communities throughout the state of Utah. The tool is a basic starting point for communities seeking to preserve their rural character. In addition, it will be necessary to conduct community-scale planning efforts to develop a finer, more detailed understanding of local values, amenities, and artifacts. Most studies recognize that planning at the community-scale is essential to success, because community involvement not only helps identify issues but also instigates a dialog, awareness, and empowerment of citizens to be greater advocates within their communities (Daniels et al., 1988; Arendt et al., 1994). It will be this support that will be crucial when difficult policy decisions need to be made concerning land use. Elected officials who may be subject to political and market-based pressures will find it conspicuous to go against the will of a united public.

The simplicity of this project is intentional, with the hope that planning for rural character will begin to be implemented at a fundamental level. Future projects should be explored to add other tools and guidelines to evaluate and summarize effective planning strategies to preserve rural character. With the intense pressures on rural areas from development, it is important to continue to find ways to move this topic out of the theoretical realm, giving these important, elusive, and intangible concepts some ‘teeth’ in the final planning document.

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## **APPENDICES**

## RURAL CHARACTER COMPONENTS MATRICES

### APPENDIX A

Rural Character Components – Physical Features		Research Project	Ryan, 2006	Tilt, 2007	Sullivan, 1994	Pynnonen et al., 2005
Natural areas						
Water (marshes, wetlands, swamps, ponds)	Agricultural land (pastures, cropland)	Agricultural equip.				
Wetlands, swamps, ponds,	Agricultural buildings (barns, silos)	Farms				
	Barns					
	Old / farm houses	Traditional town fabric				
	Town commons					
	Churches					
	Schoolhouses	Cemeterys				
	Stone walls	Open space				
	Undeveloped/isolated	Wild vegetation				
	Trees/Forests	Animals (livestock & wildlife)				
	Low density settlement	Country roads				
	Mountains / Hills	Defined space & pattern				

Figure 1. Rural Character Components – Physical Features.

Rural Character Components – Activities	
	Research Project
Working landscape	Ryan, 2006
Activities in nature (recreation)	Tilt, 2007
Good Neighborhood (including safety)	
Animals (hearing, seeing)	
Quietness	
Nature sounds	
See the stars	
Vivid colors	
Views	
Low traffic / pedestrian friendly	
Living off the land	
Local schools	
Local businesses	

Figure 2. Rural Character Components – Activities.

**APPENDIX B**  
**CARTOGRAPHIC MODELING OF RURAL CHARACTER COMPONENTS**

**Rural Character Lot Size Indicator**

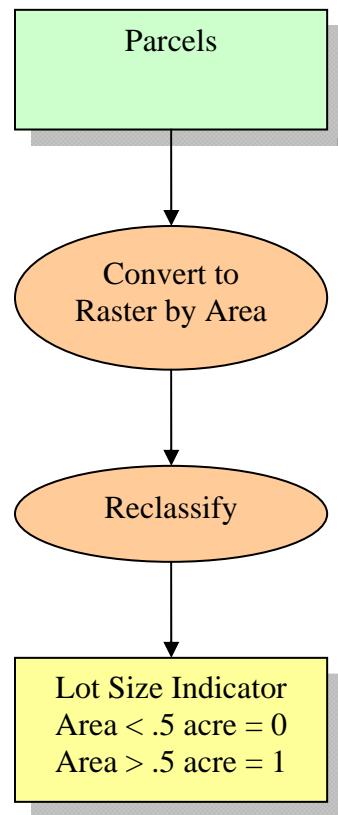


Figure 1. Cartographic modeling illustrating data processing in the ESRI mapping program Arc Map to generate the Lot Size Indicator for the rural character tool. Method per Lowry (2008).

## Rural Character Lot Orientation Indicator

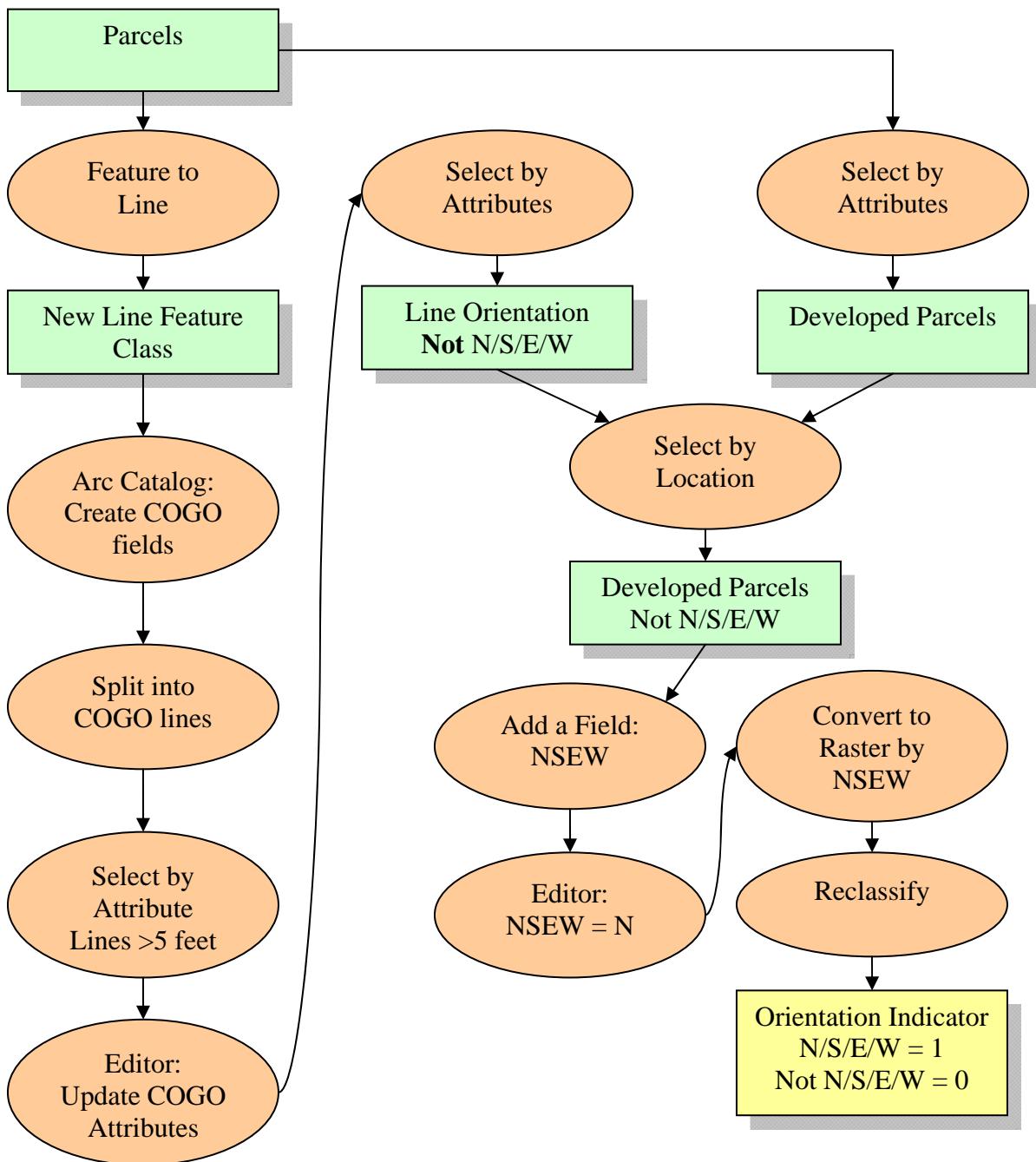


Figure 2. Cartographic modeling illustrating data processing in the ESRI mapping program Arc Map to generate the Lot Orientation Indicator for the rural character tool. Method per Lowry (2008).

## Rural Character Distance Indicator

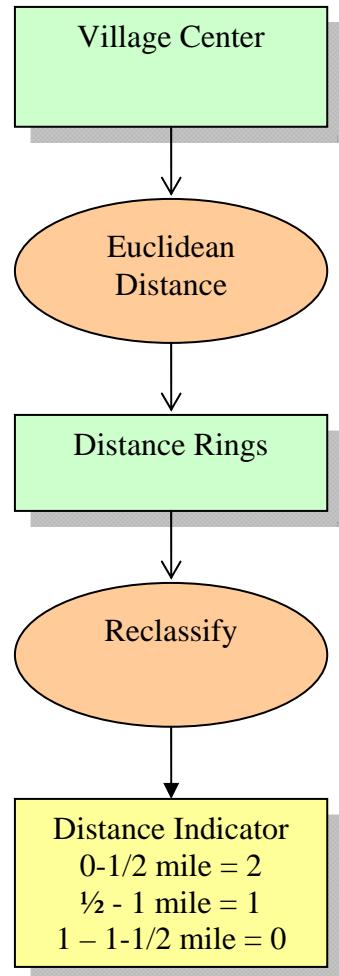


Figure 3. Cartographic modeling illustrating data processing in the ESRI mapping program Arc Map to generate the Distance Indicator for the rural character tool. Method per Lowry (2008).

## Rural Character Elevation Indicator

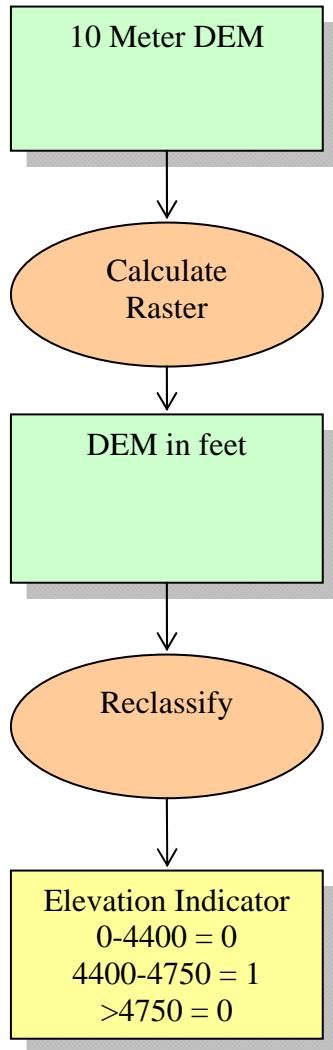


Figure 4. Cartographic modeling illustrating data processing in the ESRI mapping program Arc Map to generate the Elevation Indicator for the rural character tool. Method per Lowry (2008).

## Rural Character Age Indicator

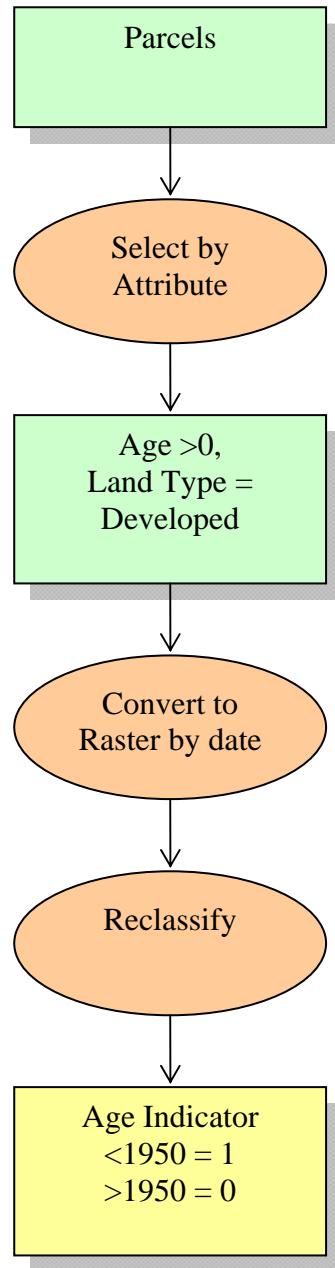


Figure 5. Cartographic modeling illustrating data processing in the ESRI mapping program Arc Map to generate the Age Indicator for the rural character tool. Method per Lowry (2008).

## Rural Character Farmland Indicator

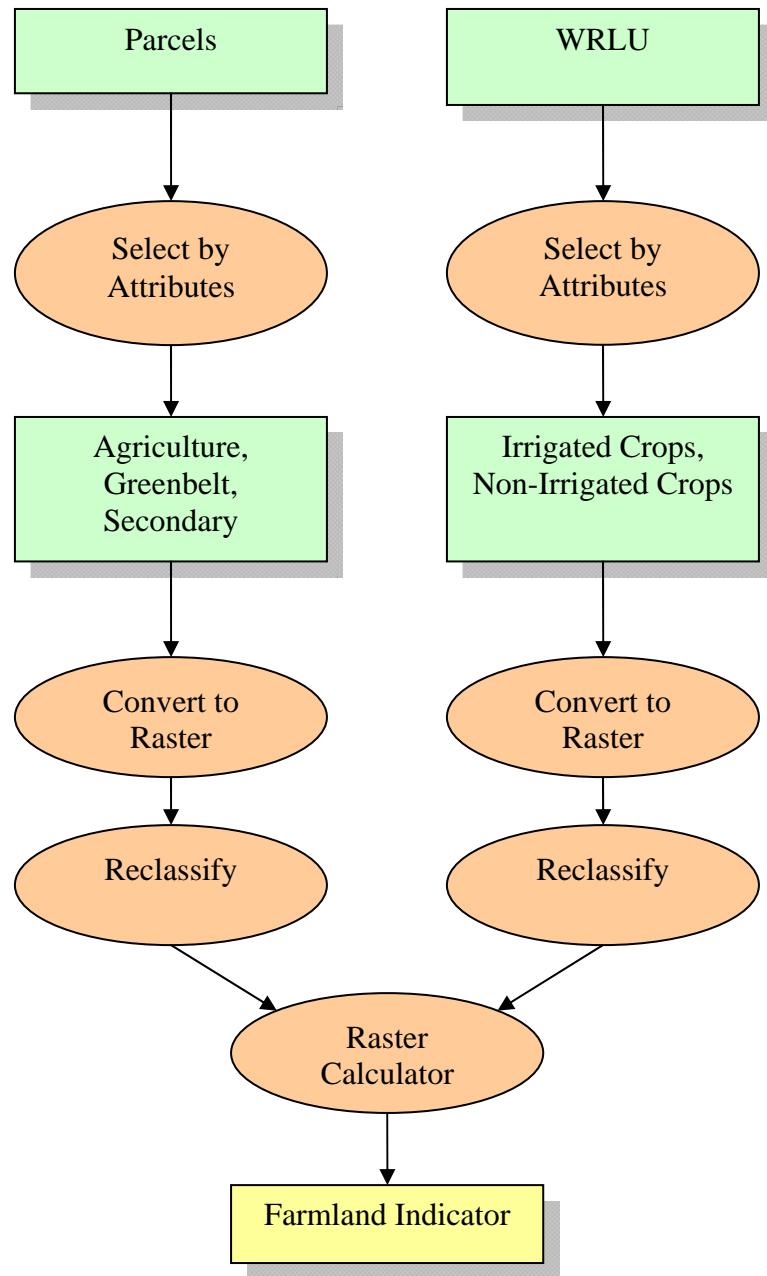


Figure 6. Cartographic modeling illustrating data processing in the ESRI mapping program Arc Map to generate the Farmland Indicator for the rural character tool. Method per Lowry (2008).

## Rural Character Natural Land Indicator

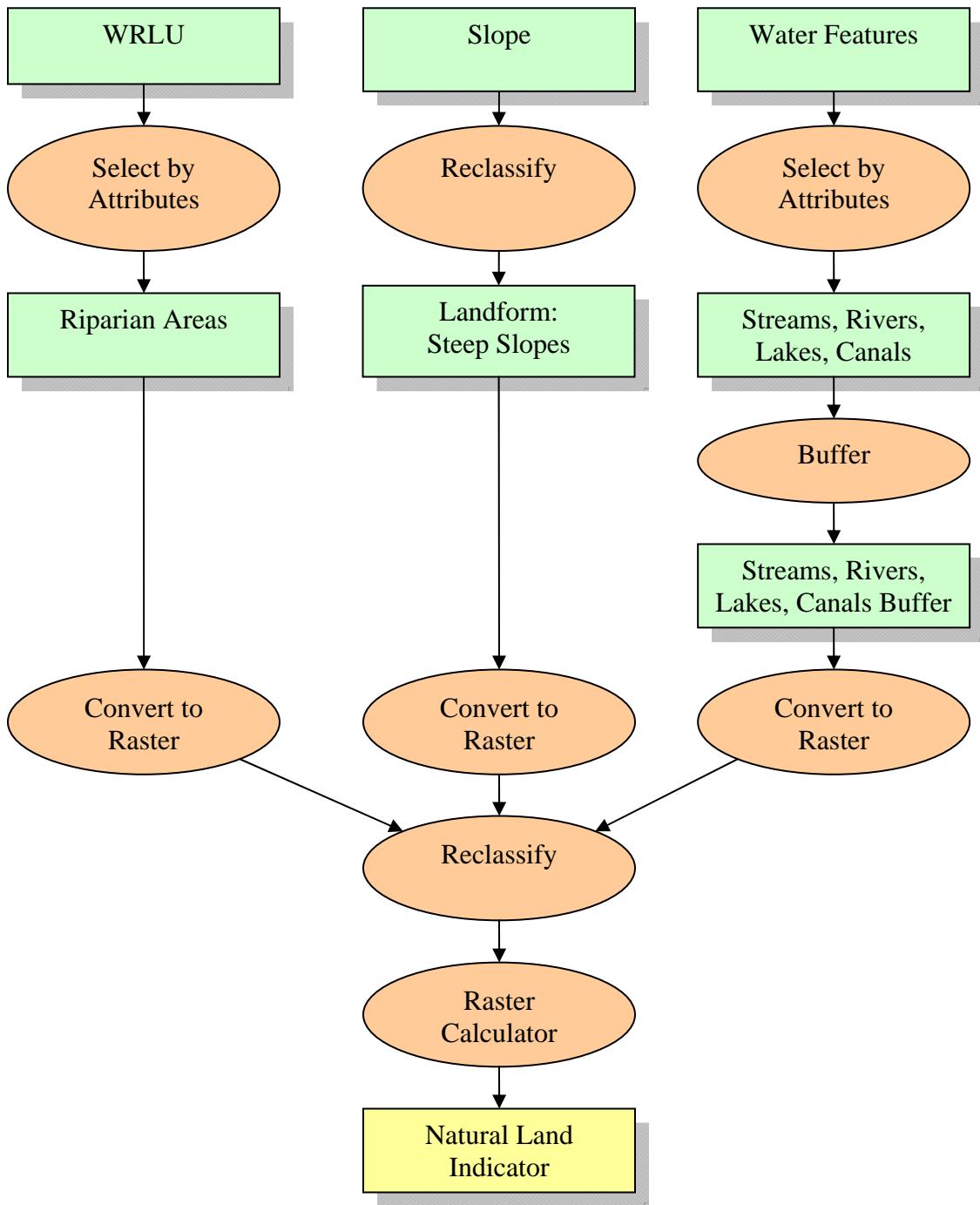


Figure 7. Cartographic modeling illustrating data processing in the ESRI mapping program Arc Map to generate the Natural Land Indicator for the rural character tool. Method per Lowry (2008).

## **APPENDIX C**

### **GIS DATA REFERENCES**

#### Computer Software

Data analyses were performed utilizing Environmental Systems Research Institute (ESRI) Arc GIS 9.2

#### Map Projection Data

Projection: State Plane Utah North FIPS 4301 Feet Intl  
Datum: North American Datum 1983

Primary Scale: 1:24,000

Grid Data Resolution: 10 feet

#### Primary Data Sources

Bear River Association of Governments (BRAG)

Cache County, Utah

Utah Automated Geographic Reference Center (AGRC)

<http://agrc.its.state.ut.us/>