A Comparison of Alternative Route Alignments for the North Country Trail Through Calhoun County, MI

Whitney K. Lambert

Western Michigan University, lambertwk07@gmail.com

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A COMPARISON OF ALTERNATIVE ROUTE ALIGNMENTS FOR THE NORTH COUNTRY TRAIL THROUGH CALHOUN COUNTY, MI

by

Whitney K. Lambert

A thesis submitted to the Graduate College
in partial fulfillment of the requirements
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Thesis Committee:

David Lemberg, Ph.D., Chair
Charles Emerson, Ph.D.
James Lewis, Ph.D.
A COMPARISON OF ALTERNATIVE ROUTE ALIGNMENTS FOR THE NORTH COUNTRY TRAIL THROUGH CALHOUN COUNTY, MI

Whitney K. Lambert, M.S.
Western Michigan University, 2018

Recreational hiking trails are a popular destination for local residents and tourists, offering health, educational, and social benefits. The North Country Trail (NCT) provides a unique hiking experience because of the many landscapes through which it travels. Because it spans across seven states in the Midwest, a hiker can travel through the mountains of New York, the hardwood forests of upper Michigan, and the plains of South Dakota along one route. When completed, the NCT will be about 4,600 miles; however, there are currently 1,900 miles of undeveloped connector routes during which the route is often located along the road. In Calhoun County, Michigan, the NCT is highly fragmented with sections of trail on the road. Thus, this research analyzed whether there are better alternative routes through the county that would decrease the amount of trail along the road. Focus groups and interviews were conducted to identify different interest group perspectives. These groups were experts, trail users, and businesses/organizations. An overlay analysis was performed on GIS to identify areas of suitability. Then, weighted scoring was used to analyze three different routes based on interview and focus group data. The Loop Route received the highest weighted score. However, it is recommended that the current NCT route be kept as the main route through the Calhoun County. Some minor adjustments would have a great impact on its overall weighted score, which would make it the best route for all interest groups.
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CHAPTER I

INTRODUCTION

The influence of recreational trails

Recreational trails are popular outdoor destinations for both tourists and local populations, offering health, educational, and social benefits. Trail systems are the most common form of infrastructure created for visitors to view natural areas. In the United States, there are over 120,000 km of trails available for hikers (Ballantyne and Pickering 2015b). Trails allow people access to natural areas and provide opportunities for sustainable recreation (Wimpey and Marion 2010). They also provide access to areas that would otherwise not be seen (Tomczyk 2011). Therefore, the influence of recreational trails is widespread, affecting both humans and the natural systems through which they traverse.

Hiking trails have the ability to impact both the human and natural environments through which they pass. Planned trails often provide many benefits such as increased vegetation, connectivity within a community, transportation, recreational opportunities, and environmental protection in urban areas (Ballantyne, Gudes, and Pickering 2014). However, trails can also have negative environmental impacts, as increased popularity makes it difficult to maintain the natural ecosystem. The number of visitors can impact ecological resources such as flora, fauna, soil, and water. However, the amount of negative impact can be minimized through a well-informed trail design, rehabilitation of vulnerable sections that currently exist, and designating appropriate trail use based on specific environmental conditions (Tomczyk and Ewertowski 2013). Also, by concentrating the majority of visitor traffic onto a durable ground surface, surrounding ecosystems can be better preserved (Wimpey and Marion 2010). There is a balance to maintain
between protecting the environment and offering enjoyable benefits for the public. The goal of trail management is to provide the most enjoyment for users with the least amount of environmental and economic cost (Xiang 1996). Once a trail is built, “you will have created not merely a pathway but an experience – a place of enjoyment, a place of solace, a place of discovery to be enjoyed by thousands for generations to come. A well-designed trail can be a work of art, a legacy” (Flink, Olka, and Searns 2001). Therefore, in order to construct a well-designed trail, the planning process must be informed and strategic when making route decisions.

The North Country Trail

The North Country Trail (NCT) provides a unique hiking experience not offered anywhere else in the United States. Similar long distance scenic hiking trails such as the Appalachian, Pacific Crest, and the Continental Divide National Scenic Trail, follow mountain ranges throughout the duration of their routes. However, the NCT takes hikers through a variety of environments, beginning in the mountains of New York and ending on the plains of North Dakota. The route between these points highlights hardwood forests, the Midwest countryside, the shores of the Great Lakes, and many rivers and lakes that were carved by glaciers. It has been noticed that “the diversity of landscapes and scenic and historic features along the North Country NST is perhaps its most appealing quality (“A Handbook for Trail Design, Construction, and Maintenance” 1996). Thus, a hiker following the NCT’s iconic “blue blazes” will experience a variety of environments across the trail (Fig. 1).
Due to its large network and spatial distribution across seven states, the NCT accommodates many different types of trail users. By the time the trail is completed, its distance will be close to 4,600 miles (“Optimal Location Review Handbook” 2014). The NCT is a transportation corridor for both short and long-distance hikers. Due to the large expanse of land that the trail covers, its connectivity as an off-road hiking trail is important. The goal of the route is to provide the most optimal trail setting, with natural scenery, safe public access, suitable water sources, and reasonable distance from commercial, residential, and industrially developed areas (“Optimal Location Review Handbook” 2014). Therefore, appropriate trail alignment planning is essential when considering future trail development.
The current NCT planning process

Currently, the North Country National Scenic Trail Office modifies or designs new hiking routes through a process called the Optimal Location Review (OLR). This method is documented in a handbook explaining how they fix gaps in trail development or relocate the trail. Because The National Park Service was delegated to be the administering federal agency of the NCT by the National Trails System Act of 1968, the NCT route must work with private landowners, state, and local governments to develop their routes. Conducting an OLR can ensure that the trail route highlights scenic, natural, cultural, and historic features according to the intent of Congress (“Optimal Location Review Handbook” 2014).

The process involves several steps that primarily involve team planning, with some GIS for analysis. These steps include identification of a project leader and stakeholders, objectives for the optimal route, inventory of current trail, analysis of route possibilities, identification of the optimal route, and a final prepared document and signatures. This also involves defining the most suitable recreational setting, including scenery, safe public access, suitable water sources, and reasonable separation from residential, commercial, and industrial developments. The OLR team will often visit the site use a GPS to record alternative routes and analyze them. The maps with the alternative routes are then displayed through the use of GIS with positive/negative control points, parcel boundaries, and alternative paths (“Optimal Location Review Handbook” 2014).

Trail routes are often built to minimize road-walk; however, some alignments may not be the most suitable for a permanent protected trail. Thus, an important factor in determining suitable trail alignment is the cooperation of property owners. This usually involves analyzing parcel data on GIS and personal communication with landowners (“Optimal Location Review
Overall, this trail alignment process involves the cooperation of several different parties to determine the optimal trail location. GIS is used for analysis, but is not the main proponent of the location review. This process focuses more on personal relationships between the NCTA, the National Park Service, the government, and public landowners.

**Background of problem**

Throughout the North Country Trail, there is a problem with off-road trail connectivity. Currently, there are about 2,700 miles of developed trail; however, there are about 1,900 miles of undeveloped temporary connector routes as well (“Optimal Location Review Handbook” 2014). These gaps in the trail often force the hiker to walk on the road (Fig. 2). In Calhoun County, MI, the trail consists largely of road-walk, causing fragmentation between on and off road alignments. Because the NCT is a National Scenic Trail, sections of the trail that are on the road often do not provide the appropriate environment for a scenic hiking experience. Due to its designation as a National Scenic Trail, it is important for the trail to highlight the scenic and natural areas, including cultural or historic features when possible, have safe public access, suitable water sources, and reasonable separation from residential, commercial, and industrial developments (“Optimal Location Review Handbook” 2014). Trail that is currently on the road does not meet most, if any, of these requirements. A trail route along the road also jeopardizes the trail user’s safety by putting them in close proximity to traffic and having them travel along a non-sustainable surface (Fig. 2). Because there is not a built sustainable trail environment along most road sections, erosion and gullies are likely to occur along the road. This would create navigational difficulties for a trail user trying to pass through that area. Thus, maximizing the separation between trail users and traffic would provide a safer and more scenic experience.
When considering the best route for the NCT through Calhoun County, there is an increased need for off-road trail connectivity. Currently, the NCT through Calhoun County does not provide sufficient connectivity for a safe hiking experience. By increasing the off-road connectivity at the county level, the route will become a more desirable path to hike. This will optimize path use and improve hiker safety. Increasing this connectivity through appropriate trail planning will be beneficial to the hiking experience and better align the NCT to scenic trail standards. Overall, this research will explore alternative routes that will increase off-road trail connectivity in Calhoun County, MI, and examine trail alignment through landscape-level planning.
H₀: Comparing alternate hiking routes through landscape-level planning and GIS will not identify the best hiking path through Calhoun County, MI.

Hₐ: Comparing alternate hiking routes through landscape-level planning and GIS can identify the best hiking path through Calhoun County, MI.

Purpose of study and research objectives

The purpose of this study is to aid the North Country Trail Association (NCTA) in long distance trail planning decisions by examining the route fragmentation in Calhoun County, MI as a case study. Because the NCT traverses a fragmented landscape and many sections of the trail are road-walk, there is a need for better trail design in several areas. There is little research done on how to best evaluate trail alignment over long distances (county level). In order to better understand decisions for trail alignment, this research will explore how alternative paths may provide better trail connectivity throughout Calhoun County, MI. This will be done through landscape level planning and the incorporation of GIS analysis. Therefore, the objectives of this research are to:

1. Understand the natural trail planning process and gather relevant data to define important factors for optimal trail connectivity.

2. Conduct focus groups and interviews to weight the most important trail attributes as perceived by different interest groups in Calhoun County, Michigan.

3. Provide an overlay analysis on GIS to determine feasible areas for trail alignment in Calhoun County.

4. Compare alternative trail alignments through Calhoun County by using overlay analysis and weighted scoring.
5. Propose a more suitable trail alignment through Calhoun County that can assist future route planning decisions.

**Scope of work and expected outcome**

The scope of this work is to aid in the planning process of trail alignment through Calhoun County, MI. The entire process of trail alignment involves many different factors, including planning, land acquisition, construction, and maintenance. Although the actual implementation of a new trail requires many different areas of expertise, the scope of this research is to identify alternate trail alignments through Calhoun County that could be used as a basis for future community planning. This is a single aspect among many that is part of developing a new trail route. Because the planning process sets the foundation for successful trail development, this research aims to provide insight on which trail alignment will propose the most suitable route during the planning process.

It is expected that the combination of GIS and landscape-level planning can identify the best route for the NCT through Calhoun County. This will be done by identifying which trail attributes are important to the Calhoun County community, using GIS to analyze possible corridors, evaluating different trail alignments through a weighted scoring model, and identifying the route that is most suitable for NCT in Calhoun County. By analyzing the advantages and disadvantages of each model, the most suitable route can be discerned. This will also provide insight on the extent to which GIS can be used in planning an optimal trail alignment across a fragmented landscape. In addition, it is expected that this research will contribute to current literature regarding long distance trail alignment planning.
GIS in trail planning

As the diverse functions of GIS are becoming better understood and further developed, researchers have started to use it to analyze trail alignments. This has included the development of new trail alignment models. Xiang (1996) made significant headway in the use of computer technology to model trail alignments. He noted that hiking trails are popular in natural parks because they provide enjoyable transportation, making them “one of the most appreciated and heavily used visitor facilities in the parks” (1996, p. 11). However, trial design must consider location, layout configuration, and the length of a future trail when planning a new route. He defines trail alignment planning as “a data-intensive, model-driven, and hiker-oriented process” (Xiang 1996, p. 11). The goal is to have the highest user enjoyment with the lowest costs to the environment and economy. Therefore, Xiang developed a model that described the alignment of a future trail based on trail potentials in land parcel cells. He conducted a case study using this model on Crowders Mountain State Park in North Carolina and found that a trail’s best alignment can be easily selected by the GIS “costpath” function. If optimum path information was obtained, this function selected all the cells along the best path between destination and origin cells. Through this method, Xiang used GIS to define an effective model for trail alignment planning.

Although the application of GIS modeling is relatively new to the field of recreational trail planning, it is commonly used to plan routes in other types of fields of study. Using least cost path analysis in GIS has become a popular choice when planning different routes. When
considering the best route through an area, the least cost path has been considered “the most useful tool available for determining the optimal path from one or more origin points to one or more destination points” (Lee and Stucky 1998) This has been commonly used to compare alternate paths for highways (Effat and Hassan 2013), the routing of powerlines (Bagli, Geneletti, and Orsi 2011), roads through sensitive habitat (Atkinson et al. 2005), and irrigation canals (Collischonn and Pilar 2000). Although this method has the potential to ignore some beneficial alternatives, it has been widely recognized for engineering purposes because of its ability to consider cost and environmental impacts. The principles in this method are only recently being applied to recreational trail planning.

**McHargian (overlay) analysis**

GIS can be used to help better understand a feasible trail alignment through McHargian (overlay) analysis. This type of analysis became popular through Ian McHarg, who wrote a book about the concept in 1969 called *Design With Nature*. He encouraged planners to superimpose translucent maps, allowing suitable areas for human activities to be better recognized (Thompson 1991). By using ecological data, McHarg could define a masterplan. He used the limits of the existing landscape as absolute guidelines for future planning. Through this methodology, a planner could use process of elimination to determine where they should build on a large scale (Weller 2008). Although the analysis was originally used with translucent maps, the development of GIS technology has made this analysis possible on the computer (Sui 1997).

GIS is commonly used to apply McHargian analysis to land allocation problems and site suitability analysis (Sui 1997; Lober 1995; Bishop 1994). Lober (1995) used McHarigan analysis to better understand social criteria when choosing a building site. He applied the analysis to
better understand social problems that occurred when building on a site, focusing specifically on public opposition to a project. When looking at the social component of choosing a site, public opposition could often be labeled as NIMBY (Not In My Backyard). This involved how the community perceived conditions as unfavorable and forced when a new building site was established. Lober studied public opposition in regards to locating a recycling center. GIS was used to improve the siting decisions, allowing for better data management and analysis. In order to find the most suitable site, both social and environmental siting criteria were identified to find the optimal sites for land use. Following McHarg’s approach, the exclusionary rule was used to combine layers. This identified which areas were not appropriate for construction by adding layers that should not have land use on them. The final map showed all remaining potential sites. Through this study, Lober used GIS as a tool to create environmental and social siting models that provided insight on the underlying social and ecological systems in the study area. GIS was seen as “an opportunity to enhance ‘the creative fit of man-environment, realizing man’s design with nature’” (Lober 1995).

As GIS technology has increased the efficiency of McHargian analysis, this method has been developed with increased complexity. One outcome of this was the application of weighted overlay analysis. This has been used for projects such as determining suitable locations for groundwater recharge, soil suitability for growing cotton, and determining landfill sites (Walke et al. 2012; Riad et al. 2011; Nas et al. 2010). When a specific objective must be met, there are often several criteria that need to be evaluated (Riad et al. 2011). Weighted overlay analysis assigns more importance to some criteria and less importance to others. It uses thematic layers and the principle of multi-criteria evaluation to identify which locations would be most desirable (Riad et al. 2011; Walke et al. 2012). Different alternatives are ranked on their degree
of attractiveness. Because GIS is able to develop thematic databases, display topographic characteristics, climatic conditions, and different landscape qualities, suitable land areas can be compared (Walke et al. 2012). This provides an integrated analysis for determining site suitability (Walke et al. 2012; Riad et al. 2011).

**Wicked planning problem**

Rittel and Webber (1973) helped develop the idea of the wicked planning problem. They noticed that working with efficiency was the goal during the industrial age. However, in the 20th century, planners became more interested in doing the right thing. This involved looking more at the outcomes of actions. As the process of planning has been further developed, Rittel and Webber noted that “one of the most intractable problems is that of defining problems (of knowing what distinguishes an observed condition from a desired condition and of locating problems (finding where in the complex causal networks and trouble really lies)” (Rittel and Webber 1973). Thus, it is noticed that although an idealized planning process can be recognized, there are many barriers that exist from implementing that perfect system. The societal problems that professional planners deal with are much different than that of scientists. Planners deal with traits that are not easily defined and involve public policy. Thus, Rittel and Webber call the problems “wicked” not because they are ethically corrupt, but to relate them with being aggressive, vicious, or tricky (Rittel and Webber 1973).

Buchanan (1992) defines the wicked planning problem as a “class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values, and where the ramifications in the whole system are thoroughly confusing” (Buchanan 1992). He notes that the previous model used by
designers was linear with two phases. These were a definition of the problem and a solution to the problem. In this linear model, problems are determinate with fixed conditions. However, the definition of wicked problems is based on indeterminacy. Because of this, design problems are seen to have no limits and no definitive conditions. This is due to the fact that design problems are not limited to a specific subject matter; they can be addressed in any area of study. It is the designer who defines the subject (Buchanan 1992).

The concept of “wicked problems” has become largely applicable to landscape planning situations. Buchanan (1992) explains wicked problems in design thinking. He notes that there is a great diversity of ideas and methods used under the label of “design.” As education has become more specialized, the interdisciplinary scope of knowledge held by a person has narrowed. Thus, disciplines have lost connectivity from each other and with the common problems between them. It is noticed that all areas of life involve design, whether it is to create a plan, design a project, generate a hypothesis, or encourage scientific curiosity. Due to the universal applicability of design, diverse professions can experience unity. However, lack of communication between those who are professional designers and those in the scientific community creates an obstacle for clear understanding and acceptance of design thinking. Often, this is due to the fact that problems addressed by professional designers do not fit completely within the boundaries of a single academic discipline (Buchanan 1992). Therefore, due to these issues, Buchanan explores the idea of the wicked planning problem.

Since the wicked planning problem has become more popular since Rittel and Webber’s definition, Xiang (2013) further expands on the development of the idea. He notices that a common strategy for overcoming a wicked planning problem is to “divide and conquer.” This involves taking a small piece of the problem and finding a rational solution to only that piece. By
breaking the problem into pieces, it becomes more defined and solvable. Although this also has the ability to deceive people into thinking the entire problem is solved when they only solve a piece, the recognition of the wicked problem has continued to rise among scholars. This has brought along the idea that these problems should be address in a holistic process. Because they are primarily social problems, the approach should be adaptive, participatory, and transdisciplinary. This process is much more exploratory and aims to build trust among stakeholders. Despite this idea, little research has been able to define how these ideas and approaches should actually be implemented. Rather, more research has reported on the social aspect of the wickedness. Thus, there is a continued need to better understand the best way to address these problems. Xiang notes the importance of having an “active and mindful engagement” of those in a community solving a wicked problem. As a collective community of learners, a better understanding can be gained through learning and exploration together (Xiang 2013).

**Public participation in planning**

Because most planning designs impact human communities, public participation in planning projects has been widely discussed (Reynolds 1969; Kovacs et al. 2017; Booth and Halseth 2011; Parkins and Mitchell 2005) Public participation is essential in planning and compares both the idea situation and the actual reality of including it in the planning process. Ideally, each member in a community would be interested in the project and able to contribute an opinion (Reynolds 1969; Kovacs et al. 2017). This process would be ongoing and continually revised to achieve the best plan (Reynolds 1969). Thus, participation could involve both stakeholders and citizens in the process, providing room for discussion and educating citizens on
democratic principles (Kovacs et al. 2017). However, this is not the case in actual planning circumstances. Thus, terms “public” and “participation” should be defined. Public could mean all members of a society or those involved in a pressure group. Also, participation could involve the identification of goals or an objection out of self-interest. The place where participation is considered within a planning process will have an impact on the outcome of the project. Based on the place of their involvement, the public could help provide direction for establishing a new plan or give input on a plan that is already drawn up. Thus the extent to which the public is involved and the type of participation they contribute can vary (Reynolds 1969).

The amount of public education has been linked to the quality of public participation processes. Successful processes require education and a sense of equity among the public (Booth and Halseth 2011). Reynolds (1969) discussed how public participation in practice is often very different than the ideal for public involvement. Participation often consists only of people who were representative of groups. Thus, the opinions of the public as a whole are not completely represented. The ability of the public to understand planning problems is also limited. The various aspects of a problem that planners must consider are usually not grasped by the public. Because of this, it is common for them to voice objections that may only provide short-term relief instead of a long-term solution. Therefore, good communication and education are important when considering how to involve the public. The level of education has been shown to reflect a person’s capacity to be interested and the number of sources available for them to understand (Reynolds 1969).

Trust is also an important aspect of public participation that has been correlated to successful planning processes. Trust can be created through transparency and honesty in the planning process. This is especially important when there are participants holding different levels
of power. Research has shown that participants are often skeptical of data. They are often uncertain as to the amount of bias and whether information is being selectively portrayed (Booth and Halseth 2011). In order to create a more trusting environment, Parkins and Mitchell (2005) recognize the importance of interpersonal relationships. When individuals have a face-to-face relationship or personal association with a planner, their trust level increases. Thus, the role of relationships is important in the participation process. This relationship of trust also includes a perception of fairness, as authorities are trusted to make decisions that will be the most beneficial for the community (Parkins and Mitchell 2005).

**Weighted scoring method**

When making a planning decision, different options are often compared through the concept of multi-criteria decision analysis (MCDA). This concept was formulated to help decision makers figure out the importance of different sets of activities. Saaty (1977) promoted the importance of this concept by developing a method regarding how to scale and weight different values of importance. He noted that in decision theory, a fundamental problem is deriving weights based on importance for a set of activities. This is a complicated process because a value of importance is usually judged according to several criteria and some or all of the activities being evaluated may share these criteria. This greatly increases inaccuracy if the precise weight of an activity is not understood. Thus, finding the relative strength of each activity with respect to the objective and composing a final result is a problem to be solved in decision-making. In order to better inform the decision-making process, Saaty developed a method of pairwise comparison that has been used by many researchers. His method involved a mathematical process for scaling the weights based on a hierarchical structure (Saaty 1977).
The concept of MCDA has become a management strategy often used by decision makers when there is more than one goal and trade offs must be considered between these goals (Kangas 1994; Beria and Mariotti 2012). It is useful when handling large amounts of complex information because the decision problems can be divided into smaller parts, analyzed separately, and then integrated back together in a logical manner (Nas et al. 2010). Because of this, MCDA is commonly used to compare a wide variety of project impacts that are hard to quantify, such as sustainability, climate change, or public health (Nadafianshahamabadi, Tayarani, and Rowangould 2017). With an origin in operation research, MCDA allows alternative projects to be evaluated from both quantitative and qualitative criteria (Macharis and Bernardini 2015). The alternatives can be evaluated and ranked through a system of scoring, weighting, and aggregating the criteria. This leads to a final decision based on how criteria are scored (Nadafianshahamabadi, Tayarani, and Rowangould 2017). This concept also allows alternatives to be compared through several different methods, which include Weighted Scoring, Analytic Hierarchy Process, and Analytic Network Process (Jadhav and Sonar 2009; Nadafianshahamabadi, Tayarani, and Rowangould 2017; Beria and Mariotti 2012). This allows MCDA to be customizable, making it applicable to a wide variety of project analyses.

Singh and Singh (2017) applied MCDA to find the optimum highway route alignment across a landscape in India. They note that there are often different stakeholder groups with conflicting interests when a route passes through natural and human environments. However, designing alternative routes with MCDA allowed for more informed decisions among the available choices. They analyzed economic and environmental impacts on existing areas of forest and water in Allahabad India. Then they performed three levels of analysis: criteria map, surface cost, and least-cost path analyses. Their model evaluated the different types of analyses
and determined four route alignments. Based on the four alignments, the best route was discerned (Singh and Singh 2017).

The MCDA method has both prominent strengths and weaknesses in its design. Nadafianshahamabadi et al. (2017) note that a weakness of this method is the subjectivity with which the criteria are evaluated. The criteria that are chosen, their scores, and the weighting scheme have a direct influence on the results. These values are often based on expert opinion. Thus, the values and the judgment of an expert or group of experts who helps make these decisions will have a significant influence on the results. However, despite this weakness, the strength of this method is in its potential to be transparent and flexible (Nadafianshahamabadi, Tayarani, and Rowangould 2017). All the different methodologies used under MCDA follow the same general organization (Macharis and Bernardini 2015). This allows a wide variety of projects to be evaluated under this method and a broad range of applicability.

Weighted scoring is a specific form of MCDA commonly used for project management decisions. Gharai (2014) notes that several project management software packages available for organizations to use when planning. However, these organizations do not have much guidance on which software tools would be most appropriate for their business use. Therefore, he used a weighted scoring model to evaluate the different packages and compare them. This provided a quantitative assessment of the software package through weights and scores for different software attributes. The final score measured the overall performance of a software package. Weights for package attributes were based on their degrees of importance. These values were expressed as percentages out of 100. Measuring the performance of a package against an attribute created scores for each software package. The weighted score was then determined by multiplying the score by the weight. This method allowed Gharai to compare different
software packages for project management and better understand which ones were most applicable for businesses to use (Gharaibeh 2014).

**Scenic beauty assessments**

The question has long been asked, “What is beauty?” Lothian (1999) takes a philosophical approach to understand whether landscape quality is inherent in the landscape or if it is in the eye of the beholder. He bases his research on two paradigms of landscape aesthetics: objectivist and subjectivist. The objectivist view assumes that “landscape quality is an intrinsic attribute of the physical landscape” (Lothian 1999). Lothian notes that planners and geographers often hold an objective view of landscape quality; it is something that can be mapped and classified. The subjectivist view understands that individual perceptions of beauty may vary and believes it is a human construct. This involves interpretation based on memories, imagination, and associations. Each paradigm has notable strengths and weaknesses. The objective view can discern beauty based on measurements and evaluations from surveys of a landscape. However, those who classify the landscape must make assumptions that certain features have more intrinsic value than others. The subjective view uses more psychological methods to understand community landscape preferences. This is replicable and can reflect community preferences without research bias. However, this method is more expensive and requires more specialist skills to properly apply (Lothian 1999).

Lothian (1999) traces these two views in philosophical thought throughout history. Philosophers have regarded beauty as one of three ultimate values. In classical philosophy, beauty was considered intrinsic in the landscape. The Greeks, the early Christian era, and the Renaissance considered beauty objectively. In the 17th century, John Locke was the first to
consider beauty as having both objective and subjective qualities. Over the next century, the idea of beauty as being subjective continued to grow. Kant described aesthetics as completely subjective and laid a framework that became influential for later thought. Thus, over time, Lothian notes that there has been a shift from the objective to the subjective paradigm (Lothian 1999).

Daniel (2000) also notices a distinction between the objective and subjective approaches to evaluating a landscape. He names them the expert/design approach and the public perception-based approach. The expert/design approach uses formal design parameters to define landscape quality, which are assumed to have universal acceptance. The public perception-based approach views landscape features as stimuli that create psychological responses. He notices that the expert/design approach has been mostly used in the context of land management, while the public perception-based approach has been commonly used for research in environmental perception and landscape assessments. Despite their differences, Daniel notes that there are also similarities between the two approaches. They both share the view that landscape quality involves an interaction between biophysical features in the environment and human perception of the landscape. Daniel states, “Landscape quality arises from the relationship between properties of the landscape and the effects of those properties on human viewers” (Daniel 2001). Because landscape features and human perception of those features appear to be interdependent, it is expected that the two approaches will merge into one approach that is more effective. With the development of GIS and environmental modeling, this new approach could allow for more comprehensive ecological management (Daniel 2001).

Angileri and Toccolini (1993) expanded on the idea of ecology when considering landscape quality. They note that besides aesthetic value, landscapes often encompass cultural,
economic, and biological aspects. They state, “It is in fact often possible to find a correlation between the beauty of a landscape and its richness in bio-ecological terms” (Angileri and Toccolini 1993). Although land may have aesthetic value based on the lines, colors, and structures found within the landscape, the ecologically productive landscape is also seen as more beautiful than one that is not ecologically productive. This often involves landscapes with rich biodiversity (Angileri and Toccolini 1993).

Arriaza et al. (2004) use both direct and indirect methods to assess the landscape quality of agricultural areas and understand the importance of individual landscape features. The direct methods involved a survey of public preferences while the indirect methods evaluate landscape quality based on intensity or presence of certain features. In the direct method, six researchers evaluated 160 photos and a regression analysis was performed to determine which variables had the strongest correlation with visual quality. It was found that some degree of wilderness and positive man-made elements were important for determining visual quality. Areas of water and contrasting colors were also seen as important. It is noted that planners can influence many of these important features for landscape quality. Because visual quality was greatly influenced by positive man-made features, planning rural areas should consider which features would enhance or detract from the surrounding landscape. Also, planners can alter the amount of vegetation and color contrast, increasing visual quality through species diversity (Arriaza et al. 2004).

**Important trail attributes**

During the trail planning process, there are several variables to be noted that contribute to a positive hiking experience. Two major elements to consider in trail design are safety and convenience. These are considered base-line values for whether a person will use a trail,
regardless of other attributes a trail may possess. When considering trail alignment, safety is the most important attribute to evaluate (Trail Planning, Design, and Development Guidelines 2007). This attribute is important for trail users, public and private landowners, other types of recreational users, and the environment. Some trails allow the use of off road vehicles (ORVs), bicycles, and horseback riders. However, these are considered high impact activities and have a greater influence on natural vegetation, soils, and wildlife (Pickering et al. 2010). This can affect the hiking experience by lessening the quality of scenery and causing trail degradation that could become dangerous for hikers. Also, because these other recreation types are high impact activities, they are larger and more forceful than hiking. This puts the hiker at an increased risk while on the trail, so they have to be more aware of their surroundings on multi-use paths.

Matching the hiker’s skill level with the trail’s level of difficulty is key for providing a safe trail environment. This must then be communicated well to the trail users (Trail Planning, Design, and Development Guidelines 2007). By designating the use of a trail during the trail alignment process and clearly communicating the intended users, hikers can be more prepared for what they will encounter when they begin to traverse the trail.

Along with safety, a trail should also be convenient for users. Convenience is an important trail attribute because it is related to the repeated use of users. People are less likely to use a trail that has an inconvenient location due to the extra effort required to access the trail (Trail Planning, Design, and Development Guidelines 2007). As humans have an increased demand placed on their time, there is a need for convenient recreational opportunities. Multi-use trails often accommodate these needs by providing opportunities for many different types of users friendly (Corning, Mowatt, and Chancellor 2012). This creates a universal appeal to users because its access is easily accessible (Trail Planning, Design, and Development Guidelines 2007).
Trails with a convenient location also provide the opportunity for people to use them for transportation to a primary destination. This increases physical fitness, land use efficiency, and is environmentally friendly (Corning, Mowatt, and Chancellor 2012). Overall, the vast majority of trail users will come from those who live in close proximity to the trail (Trail Planning, Design, and Development Guidelines 2007). Although the recreational value of a trail will still influence its use, it is important to consider the community of users that the trail will predominantly serve when planning a new trail alignment.

Although safety and convenience are two foundational concepts to consider when planning a trail, environmental and economic impacts of trails can greatly influence the user experience and must be considered to effectively plan a trail. Many trail users enjoy the experience because of the scenic environment present along the trail. The degree of wilderness and some positive man-made features (houses, farm buildings, vistas) have been found to increase the visual quality of rural areas. Also, the presence of water and contrasting colors were influential for individual enjoyment (Arriaza et al. 2004). Trails provide a unique opportunity for individuals to experience nature. The hike is enhanced when the scenery is able to elicit a feeling that leads to a positive experience. This provides health benefits that are not only physical, but also emotional. Therefore, experiencing different scenery apart from urban areas is a large attraction for hikers.

The economic impact of trails can be a result of a trail’s connectivity to other destinations. When planning a new trail, connectivity can provide effective transportation for the user. Connectivity is defined as “the degree to which the landscape facilitates or impedes movement among resource patches” (Taylor et al. 1993). This occurs between nodes (vertices) and links (edges) of a landscape. Two nodes are connected by a link, which facilitates movement
between patches. The links between patches become corridors, which connect two previously separate patches (Pascual-Hortal and Saura 2007). Thus, trails are a network of corridors designed for transportation. Because a trail is a transportation corridor, connectivity is an important aspect to consider when planning a new route. A completed trail should have appropriate connectivity to facilitate movement between an origin and a destination. This connection can occur between different points of interest such as counties, cities, parks, or natural areas. The presence of trails has been found to increase the local tax base, the income of businesses, and decrease health care costs in a community (Corning, Mowatt, and Chancellor 2012). Because of this, trail connectivity is an important trail attribute related to economic benefits.

Although many trail attributes must be considered when planning a successful route, using spatial data in a trail alignment plan is also beneficial because recreational areas facilitate relationships between “space and human-related phenomena” (Beeco and Brown 2013). Several spatial processes are involved in a trail network. Spatial diffusion occurs when people begin at a common location and spread throughout the trail network. Spatial segmentation is also important to consider, as it partitions a homogeneous region into sub-regions. On a trail system, this can be obtained through the Recreation Opportunity Spectrum (ROS), which splits a protected area into sub-regions such as “rustic” or “primitive.” Another influence is spatial interaction, which occurs when one area of space affects several different areas. This can occur when one trail is used more heavily than another. Finally, spatial processes also affect resources (Beeco and Brown 2013). Different resources are impacted by the amount of trail use. These different spatial aspects are important to understand when designing a recreational trail route. Therefore, spatial analysis is an integral part of trail alignment.
Eco-tourism

Ecotourism has become a term used for a type of tourism that “fosters environmentally responsible principles” (Boyd and Butler 1996). Promotion of ecotourism originally occurred the most in developing nations. However, it continued to grow to include new destination areas, remote landscapes, polar regions, and even less exotic regions such as Ontario, Canada (Boyd and Butler 1996). Although some definitions of ecotourism emphasize environmental conservation, the introduction of tourists inevitably changes an area. Thus, ecotourism can be viewed as an instigator of change. The introduction of more visitors to an area places new demands on the environment. Because of this, those promoting ecotourism are often looking to bring change to an area, such as an improvement to a current situation (Wall 1997). This change often comes in the form of economic benefits, which have often been promoted as a major benefit and primary motivation of ecotourism (Boyd and Butler 1996). However, difficulty comes when different stakeholders have opposing views of what type of change should take place and how it should be attained.

As the concept of ecotourism has continued to develop, its definition and goals have also been adjusted. Das and Chatterjee (2015) have defined it as “responsible travel to natural areas that conserves the environment and improves the welfare of the local people” (Das and Chatterjee 2015). They view the goal of ecotourism as providing a positive experience for the tourist, promoting the local economy, and facilitating concern for species. It has been publicized to support conservation and provide income for local communities. However, despite its positive objectives, research has also shown several negative implications of ecotourism (Das and Chatterjee 2015). Thus, there are mixed results concerning the impact of ecotourism on the natural landscape. Because hiking trails are a prominent aspect of experiencing a natural area,
their impact is often debated. Therefore, management must consider how to protect local biodiversity while also providing opportunities for enjoyable recreation.

*Hiking trail impacts on the landscape*

The impact of hiking trails on the surrounding landscape is a current research concern. Ballantyne, Gudes, and Pickering (2014) notice that recreation is increasing within natural areas and trails are the most common type of infrastructure created for visitor enjoyment. Hiking provides health, educational, and social benefits by connecting people with the natural environment. Despite their benefits for human connectivity, trails have also been known to cause negative environmental impacts such as reduced height, cover, and composition of vegetation (Ballantyne, Gudes, and Pickering 2014). These impacts can be the result of trampling on the trail surface, which results in soil compaction and erosion. As more ground becomes bare, vegetative cover decreases. These adverse impacts are especially prominent in informal trails, which are created and maintained by trail users often for the purpose of exploration, avoidance, and shortcutting areas. These types of trails are most known to increase erosion and widen the trail. However, formal trails that are developed by managers also have the same ability to present negative impacts. These impacts are most seen in altering the plant composition along the trail edge due to disturbance during construction and maintenance (Ballantyne and Pickering 2015a).

Ballantyne and Pickering (2015a) also look at the negative impacts trails have on keystone species. Previous research has shown that trails often alter plant composition, which influences ecosystem processes. Inter-specific interactions such as competition and facilitation can be altered. However, there is limited research done on how trails as a tourist attraction can affect ecological processes such as facilitation. Thus, Ballantyne and Pickering focus their
research on the community of Windswept Feldmark in Kosciuszko National Park, Australia. The dominant shrub, *Epacris gunnii* (Epacridaceae) is sensitive and recovers slowly from damage. However, it facilitates the growth of other plants by providing habitat for species that are not as tolerant of the wind and cold alpine environment, making it is a keystone species of high conservation value. However, Ballantyne and Pickering found that hiking trails have reduced its abundance and density in the study area. If this specie’s abundance continues to decline, the ranges of other plants will also diminish and competition may increase between species. Although closing trails to protect this species is not possible, it is suggested that trail management take measures to protect the species by promoting alternative trail infrastructure (Ballantyne and Pickering 2015b).

Additionally, the extent of fragmentation caused by trails has not been extensively researched. Ballantyne et. al. (2014) look specifically at a Tall Open Blackbutt Forest in southeast Queensland, Australia. They found that 5.7% of forests in this area had been damaged or completely lost due to the presence of trails in the area, mostly due to fragmentation from informal trail networks. This loss was comparable to the amount of forest fragmented through urban development and the severity of this fragmentation was comparable to that of popular national parks in the United States. Additionally, it was found that trails had the greatest negative impact on the structure, function, and composition of areas that were already fragmented. Therefore, it is concluded that more sustainable planning should be implemented into recreational trail construction (Ballantyne, Gudes, and Pickering 2014).

Trails have been perceived as detrimental to species by causing disturbances and fragmentation, but Wolf and Croft (2014) notice that species abundance does not always decrease in areas with trails. The intensity of usage can also determine the extent to which
species are impacted. The number of visitors, individual behavior of the user, surface type, and activities being conducted on the trail are all influential factors to consider when determining the impact of a trail. When considering plants, other complex processes besides the presence of a trail often determine their abundance. Thus, abundance may be greater or lower than other less disturbed sites. Although impacts such as compaction and erosion can cause significant problems for vegetation, trails may also offer situations that help plants thrive. A greater amount of moisture may be retained in the track shoulder from increased water runoff, which can facilitate vegetative growth. Therefore, several factors such as topography, weather conditions, and vegetation type may influence the amount of impact a trail will have on a landscape (Wolf and Croft 2014).

Ecotourism potential of hiking

Ecotourism provides the opportunity to protect threatened species and biodiversity (Querioz, Ventura, and Silva 2014; Das and Chatterjee 2015; Santarém and Paiva 2015). Land with little disturbance is often habitat for many types of plants and wildlife, including rare species. Thus, outdoor recreational activities such as hiking give tourists the opportunity to observe various species, making biodiversity a primary attraction. Although trails are often regarded as negatively impacting their surrounding environment, Querioz, Ventura, and Silva (2014) noticed that this is not always the case in their research on vegetation change around hiking trails in the Azorean islands. The islands have received increased visitation by tourists, so the goal of their study was to analyze plant communities along hiking trails crossing Natura 2000 areas on two of the islands in the archipelago. They found that hiking had an impact on the plant community richness and diversity, but no major changes in overall landscape composition. The
trails provided a different habitat than that of the core communities and number of species decreased closer to the trail. However, these differences between plant communities were found to be associated with specific trails and their altitude rather than the presence of humans. Thus, Querioz et al. found that there were other factors other than the trail itself contributing to plant biodiversity. They also found that the conservation value of trails varied due to the presence of different types of species that were present. Results did not show any species from the trail replacing core species. Thus, they concluded that other factors had a greater influence on species such as surrounding human activities, the presence of roads or pastures, and different altitudes of trails (Querioz, Ventura, and Silva 2014).

Another important aspect of ecotourism is its potential to save fragile ecosystems. When people appreciate a specific ecosystem, they put more effort into protecting it (Das and Chatterjee 2015). More support is raised for an area when visitors experience and appreciate the natural environment (Nyaupane and Poudel 2011). Santarém and Paiva (2015) notice that some regions, such as the desert, are prone to misconceptions about their environment. The desert is often portrayed as a barren land with no life. This misconception has reduced public interest and support of the desert ecosystem, even though valuable species and important cultural heritage often exist in these environments. Thus, ecotourism can be used to help conserve these aspects that are unique to the desert environment. Also, other activities that may be harmful to habitats and species, such as poaching and logging, may be abandoned when tourism increases in these areas (Santarém and Paiva 2015).

While ecotourism has been shown to protect threatened biodiversity, it has also been shown to promote local economies. This segment of tourism is growing at a rate almost three times faster than regular tourism, contributing 7% of the demand for tourism worldwide and
gaining revenues of about $100 billion each year (Hultman, Kazeminia, and Ghasemi 2015). It is a strategy that has often been promoted to generate interest for specific natural areas. By doing so, it is argued that tourists generate revenues that can be used for sustainable management of the area and local employment. In some areas, it has both helped conserve natural resources while also reducing poverty. It allows local communities to receive economic benefits from increased activity in their area (Das and Chatterjee 2015).

**Deficiencies in current research**

A current deficiency in research is how to classify land as “scenic.” Because the NCT is a National Scenic Trail, it is designed to highlight natural scenic features. However, assessment of beauty can be difficult. This is evident through the objectivist and subjectivist views that have been identified in the literature (Arriaaza et al. 2004; Daniel 2001; Lothian 1999). Each paradigm presents strengths and weakness that make landscape quality difficult to establish. Overall, the classification of beauty is not well developed in current literature regarding trail alignment planning. Because both human perception and landscape features are interdependent when discerning landscape quality, understanding landscape aesthetics is a complex process (Daniel 2001). Although the NCT is a scenic trail, there are various types of scenery that can be interpreted differently by individuals. Because the trail is developed in seven states, perceptions of beauty may also vary across states. Therefore, determining the most scenic route in trail alignment can be difficult and hard to quantify for planning decisions.

When considering the best path for a hiking trail, there is also a need to understand connectivity at the larger landscape level. When constructing a trail, the goal is to provide trail users with the greatest amount of enjoyment at the lowest economic and environmental costs.
A major reason landscape connectivity is not commonly used in planning is “the lack of effective and credible ways to articulate and convey knowledge about landscape connectivity” (Bergsten and Zetterberg 2013). Connectivity is not often considered through a systematic process. Opinions are formed through different human visual assessments. Therefore, there is a need to better understand networks and landscape-level ecology. This requires skill in GIS-database management, so network analysis can be used to interpret the results correctly. This provides better communication of the problem and its meaning (Bergsten and Zetterberg 2013). The increasing popularity of GIS is providing a platform for visual assessments and explanations of landscape-level decisions. Because a trail system forms a network, GIS can be used to perform a network analysis and inform decisions on the best path to build a route. (Sedeghi-Niaraki, Varshosaz, Kim and Jung 2011).

Another deficiency in current research is how to implement connectivity models into applied planning practices. Even though research has been conducted using different GIS models of connectivity, there has not been much empirical analysis of uses, barriers, and potential in practical trail planning. Bergsten and Zetterberg (2013) surveyed Swedish municipal planners and ecologists to better understand their opinions about landscape connectivity. They found that municipal planning does not often consider landscape connectivity. They could not easily communicate the significance of connectivity, especially to decision-makers. Decision-makers often did not understand or did not consider it important. Also, the planners did not feel knowledgeable enough to run and interpret models. Bergsten and Zetterberg also noted a lack of tools and methods for assessment at the landscape level. However, most interviewees agreed that using a network approach could provide more credibility for connectivity assessments by helping them look beyond municipal borders and consider interactions over a larger region of land.
(Bergsten and Zetterberg 2013). Therefore, there is a deficiency in literature to explain how to implement connectivity models on a practical planning scale. Many planners do not feel qualified or know how to represent their findings. Especially in trail alignment planning, there is deficiency in research on how to model trail routes for practical planning use.
CHAPTER III

STUDY AREA

Community description

Geographic planning area

This research compared NCT trail alignments across Calhoun County, Michigan (42.25° N, 85.00° W). Calhoun County encompasses an area of 718.44 square miles and is centrally located in southern Michigan (Fig. 3). Water covers 9.72 square miles and the rest of the county is land. Barry and Eaton Counties border the north side of Calhoun, Jackson County is on the east, Branch and Hillsdale Counties lie to the south, and Kalamazoo County is on the western border. There are four cities, four villages, and nineteen townships within the county. The major cities hold the most influence on the commercial industry of the county. Outside of these cities, the county is predominately a rural community. The residential density becomes low and the land is primarily used for agricultural purposes. Overall, about 75% of the land in the county is used for agriculture (“Calhoun County Parks and Recreation Master Plan 2015-2019” 2015). Therefore, although commercial industry is present in the county, the rural agriculture has an influential role within the community.
Economic influences

There are three major cities in Calhoun County that are the leading economic centers: Battle Creek, Marshall, and Albion. They are urban areas with a priority on commerce and industry. Residential density also increases in these urban areas. Located within these industrial centers are six companies that greatly influence the economy of Calhoun County. The largest of these is the Kellogg Company, then the Denso Manufacturing Michigan, Hart-Dole-Inouye Federal Center, Bronson Battle Creek, the Veteran’s Administration Medical Center, and the Michigan Air National Guard (“Calhoun County Parks and Recreation Master Plan 2015-2019” 2015). These companies provide the most economic influence within the county and help develop the cities as urban commercial centers.
Throughout Calhoun County, transportation also plays a significant role in shaping the economy. The county is located along a major international trade corridor, as two interstates connect it to all the major trades routes in the United States. The Chicago-Detroit transportation corridor, which is Interstate 94, crosses through the county. This is the predominant route for east-west transportation in Michigan. Interstate 69 also intersects Interstate 94 and is a major route for north-south travel. There are also three rail lines that are in operation: Amtrak, Conrail, and Canadian National. These offer passenger transportation between Detroit and Chicago and also freight transportation. Additionally, there are two airports. The major airport is W.K. Kellogg Regional Airport in Battle Creek, and there is also a local airport in Marshall named Brooks Airfield. Therefore, there is potential for great economic and urban growth through the presence of these transportation corridors (“Calhoun County Parks and Recreation Master Plan 2015-2019” 2015).

Social characteristics

The population of Calhoun County is predominately a rural community that relies on agriculture and three major cities for the majority of its livelihood. Based on population, it is the 17th largest county in Michigan. In 2015, the median household income was $42,520, which was a -1.57% growth rate from the previous year. With a population size of 134,790, there were 56,687 residents that had jobs in 2015 and a poverty rate of 17.5%. The number of working residents had a -0.09% growth rate from the previous year. The most common sectors for work were in manufacturing, healthcare, and retail trade (“Data USA: Calhoun County, MI” 2015). Overall, the population has been experiencing a loss in population and seeing a shift to an older demographic (“Calhoun County Parks and Recreation Master Plan 2015-2019” 2015).
Calhoun County does not have positive rankings for community wellness compared to the state of Michigan. A report from The Coordinating Council for 2016 gave Calhoun an overall Health Outcomes ranking of 71 out of 83 counties in Michigan and an overall Health Factors ranking of 60 out of 83 counties in Michigan. A subsection of health behaviors ranked 78 compared to other counties in Michigan. This is influenced by higher percentages of adult obesity and physical inactivity (“Calhoun County Health Ranking” 2017). Along with this, the most common condition for Medicare patients in 2014 was Congestive Heart Failure, followed by Pneumonia and Acute Myocardial Infarction (“Data USA: Calhoun County, MI” 2015). Therefore, the presence of heart problems could be associated with an overall lack of physical activity.

County parks

There are four major parks in Calhoun County that offer many recreational opportunities, all located in Battle Creek. Historic Bridge Park is located along the Kalamazoo River is part of the Calhoun County Trailway. It offers a unique recreational and cultural experience to visitors through the placement of restored bridges on the property. The park provides a place for the rehabilitation of historic bridges that are not able to transport vehicles anymore and turns them into structures for pedestrian or non-motorized use. They create both a path for people to use and also a “‘hands on’ exhibit of Michigan’s transportation history and the technology of cast iron and steel fabrication” (“Calhoun County Parks and Recreation Master Plan 2015-2019” 2015). There are a total of five bridges in the park. It also offers a playground, pavilion area, indoor restrooms, a handicap accessible boat launch, picnic tables, and educational signage (“Calhoun County Parks and Recreation Master Plan 2015-2019” 2015).
Another park within the Calhoun County park system is Riverside Park. This park is also located along the Kalamazoo River, to the west of Historic Bridge Park. The only way to enter this park is through the Historic Bridge Park. Although it consists of about 74 acres, the land is largely undeveloped. It is mostly wetland areas and rustic trails that are not well maintained (“Calhoun County Parks and Recreation Master Plan 2015-2019” 2015). Therefore, this is not a popular area for recreation activities, even though it is managed by the county park system.

Kimball Pines is another county park that offers several recreational activities. This 100-acre park is located in Emmett Township off Michigan Avenue. The primary uses are hiking, biking, disc golf, and picnicking. It became part of the Calhoun County park system in the 1960s, but was previously used as a pine plantation. The name Kimball Pines comes from its history as a pine plantation in the 1930s and 1940s. In May 2011, strong winds toppled many of the trees, which were subsequently logged and removed (“Calhoun County Parks and Recreation” 2015). However, the park still contains one of the oldest stands of urban pines in Michigan (“Kimball Pines County Park” 2017).

Another significant recreation area in Calhoun County is the Ott Biological Preserve. Although considered within the Calhoun County park system, it is actually a preserve that protects many natural habitats. It encompasses 298 acres in Emmett Township, just east of Battle Creek, with primary uses being hiking, wildlife observation, and exploration of fauna. Evidence of glaciers can be seen through two spring fed kettle lakes and two prominent eskers. There are several microhabitats present within this property, offering unique habitats for different species. These include well-developed upland and lowland hardwood forests, less developed forest areas that used to be fields and orchards, prairie fen habitat around the lake edges, and marshes. Found
among these habitats are species such as frogs, toads, turtles, birds, squirrels, raccoons, and white-tailed deer (“Calhoun County Parks and Recreation” 2015).

Although not identified specifically as a county park, there are a few smaller parks that exist in Calhoun County as well. Although these are often small parks, they provide areas that can serve as resting places or points of scenery for trail users. In Albion, city parks include Victory Park, Rieger Park, Holland Park, McAuliffe Park, McIntosh Park, and McClure Park. Victory Park and Rieger park join each other to create a space with a waterfall, woods, a natural spring, and a garden. There are restrooms and a pavilion available. Holland Park also has a picnic shelter and restrooms available. McAuliffe Park and McIntosh Park both offer picnic areas and restrooms. McClure Park includes 30 acres of riverfront with trails, a picnic area, and an old train trestle that is being repaired (“Parks Division” n.d.).

Also, in the city of Marshall, there is Ketchum Park, Brooks Memorial Fountain Park, Stuart’s Landing, and Carver Park. Ketchum Park has shelters with picnic tables and a large playground. Brooks Memorial Fountain Park displays a fountain that was modeled after the Temple of Love in Versailles, France. This park is located in the center of town an known for its scenery. Stuart’s Landing has picnic tables and a gazebo overlooking the Kalamazoo River. It is also where trail users can start the Marshall Riverwalk. Carver Park is a small park that has a fountain and benches available (“Marshall Area Parks, Trails, Historic Locations & More” n.d.).

County trailways

There are four major trail systems that are built in Calhoun County. The Battle Creek Linear Park offers 28 miles of paved non-motorized trail (Fig. 4). It was one of the first non-motorized and multi-use trails developed in Michigan. It has an asphalt surface that incorporates
several sections of boardwalk. The route includes sections that follow the Battle Creek and Kalamazoo rivers and also historic downtown Battle Creek. Points of interest along the route include an Underground Railroad Sculpture, W.K. Kellogg House, and a historic train depot ("Battle Creak Linear Park" 2017).

Figure 4. The Battle Creek Linear Parkway. Photo taken July 21, 2017.

The Calhoun County Trailway is a prominent trail system managed by the county. It offers several different access points for recreational opportunities. It is a crushed gravel multi-use path that is 5.28 miles long and 10 feet wide. The route connects the Battle Creek Linear Park and the Historic Bridge Park. In doing this, it also crosses through the Ott Biological
Preserve and Kimball Pines ("Calhoun County Parks and Recreation" 2015). It also intersects the NCT, offering opportunities for more recreational hiking. Although it’s current length is only 5.28 miles, it is expected that the trail will be 40 miles when completed. The final route will connect Historic Bridge Park to the Falling Waters Trail in Concord. The goal of this is to provide a link within the Great Lake-to-Lake Trail, which will connect South Haven and Port Huron in a continuous bike path ("Battle Creak Linear Park" 2017).

Two other notable trail routes are the Albion River Trail and the Marshall Riverwalk. Although smaller in size then the Battle Creek Linear Park and the Calhoun County Trailway, these trails provide recreational opportunities for the eastern townships in Calhoun County. Both trails are 1.6 miles of non-motorized paved trail. The Albion River Trail follows the Kalamazoo River, connecting several city parks and also taking trail users through the historic downtown of Albion (Fig. 5). The Marshall Riverwalk offers sections of boardwalk, a few bridges, and views of two dams near the city of Marshall ("Albion River Trail" 2017) (Fig. 6). Despite their smaller size, these trails offer recreational opportunities with scenic views near the city.
Figure 5. Map of the Albion River Trail. Photo taken July 21, 2017.

Figure 6. A bridge along the Marshall Riverwalk that includes part of the NCT. Photo taken July 21, 2017.
Identification of lodging

Lodging is an important attribute to consider when planning a trail route for the NCT, as hikers must have a place to spend the night after a long day of hiking. The greatest number of lodging options is within cities and villages. Since Calhoun County is predominantly rural farmland, there are not many campgrounds and the hiker will have the best chance of finding lodging within the more populated areas. Because it is the largest city, Battle Creek has the most chain hotels. These include hotels such as the Fairfield Inn by Marriott, Best Western, Holiday Inn, Hampton Inn, Baymont Inn & Suites, and Quality Inn. There are also smaller and cheaper options such as the Kimball Pines Motel, Park Motel, and Travelodge. Thus, there are numerous lodging options available throughout the city.

Marshall also has several lodging options, with an emphasis on historic places. These include the National House Inn, Way Inn B&B, Townhouse B&B, and the Avenue B&B. There are also more generic lodging options such as the Comfort Inn, Hampton Inn, and Quality Inn. However, Marshall is known for it’s historic homes and many have been turned into inns or bed and breakfasts. The National House Inn is the oldest operating inn in Michigan (“National House Inn” n.d.) (Fig. 7). Most of the bed and breakfasts are decorated to represent the historic period from which they were built. They are often old restored homes or part of the Historic District in Marshall.
Figure 7. The National House Inn in Marshall, MI. Photo taken February 16, 2018.

Additionally, Albion has various lodging selections throughout the city. It has two old historic houses that were turned into bed and breakfasts, which are the Palmer House Inn B&B and Albion Heritage B&B. Additionally, the city has regular hotels such as Days Inn, Super 9, and Courtyard by Marriott. Although the city does not have as many historic lodging options as Marshall, it still has unique options that offer positive control points and nice accommodations for hikers in the area. By having both historic and normal hotel lodging options, hikers can choose what type of lodging experience they would like to have.

There are limited lodging options in the villages of Calhoun County. Union City is a village with a few lodging opportunities. The most unique is the Victorian Villa Inn, which is one of the oldest operating inns in Michigan (Fig. 8). They have Victorian style rooms, offer afternoon tea, and have a gourmet restaurant with 7 course dinners (“The Victorian Villa Inn” n.d.).
Another lodging option is the Welcome Inn Motel. These are the only two lodging options in the village. Just outside the village is a Potawatomi Recreation Area. This area has 176 wooded campsites, giving the campground a northern Michigan atmosphere. There are showers, a camp store, nature trails, playground, swimming, laundry, and a playground in this area (“Potawatomi Recreation Area” 2016). The village of Athens only has lodging at Camper Village, which is an RV park (Fig. 9). There are both seasonal and long-term options and they specifically focus on the park for seniors who travel in RVs (“Camper Village Campground” n.d.).
Outside of the cities and villages, there are several campgrounds throughout the county. In the northern part of the county, there is Rockey’s Campground and Hide Away Hills. Rockey’s is situated between five lakes and has a beach and grocery store (“Rockey’s Campground” n.d.). Hide Away Hills has 200 sites, a pool, and rustic campground (“Hide Away Hills” n.d.). In the middle of the county there are the Tri-Lakes Trails Campground, Westwinds Campground, and Camp Turkeyville RV Resort. Tri-Lakes Trails Campground has three lakes for fishing, swimming, miniature golf, trails, a café, and wagon rides (Fig. 10). There are a total 272 campsites (“Tri-Lake Trails” n.d.). The Westwinds Campground is part of Quality Camping Inc., which has several campsites on Nottawa Lake (Fig. 11). There is a pool, mini-golf, and hiking available (“Quality Camping, INC” n.d.). Camp Turkeyville is within Cornwell’s Turkeyville near the city of Marshall. This campground has a pool, showers, laundry, a pond, and playground (“Camp Turkeyville RV Resort” n.d.). Lighthouse Village RV Resort is the only campground located near the village of Homer. This campground has mini-golf, tennis courts, a pool, and beaches (“Lighthouse Village RV Resort” n.d.).
Figure 10. Entrance to Tri-Lake Trails campground in Marshall, MI. Photo taken February 16, 2018.

Figure 11. Entrance to Quality Camping Inc. campground in Marshall, MI. Photo taken February 16, 2018.
Positive control points

Positive control points are attractions or features along a route that will enhance the hiking experience. Positive control points identified throughout the county include both cultural and natural features. In Albion, positive control points include the Bohm Theater, Kids ‘N’ Stuff Children’s Museum, and the Gardner House Museum. These are all historical or cultural points of interest that are within the city of Albion. Additionally, Albion College is located in the city and has its own nature center that is open to the public called Whitehouse Nature Center. This nature center is comprised of 140 acres and has 5 acres of trails. The land is used to facilitate outdoor education and has a visitor’s center, classroom, wildlife observation room, and live reptile and amphibian exhibits ("Whitehouse Nature Center" n.d.).

Several positive control points exist in Marshall, including the Brooks Memorial Fountain, Honolulu House, American Museum of Magic, the US Postal Museum, Governor’s Mansion Museum, Dark Horse Brewing, Schuler’s Restaurant & Pub, and the Brooks Nature Area. The city has been credited the nation’s largest National Historic Landmark District for a small urban area. A total of 144 buildings and 50 markers can be walked to throughout the city. Included in this designation are many old houses that have now been turned into museums. Besides the museums, other attractions contribute to the unique environment of the city. The Brooks Fountain is located in front of the National House Inn and offers a nighttime light show of 96 color variations with the center spray of water rising to 30 feet ("Marshall Michigan Things to Do" n.d.) (Fig. 12). Dark Horse Brewing features a microbrewery, general store, and coffee shop with an eclectic style. Schuler’s offers a unique dining experience, showcasing murals of the city during the 19th century. There are also short excerpts from writers such as Shakespeare and Mark Twain in Old English script ("Schuler’s Restaurant" n.d.). The Brooks Nature Area
has over 180 acres of protected land. There are two miles of trail within the park and opportunities for wildlife viewing, lake overlooks, and over 300-year-old trees. The land includes wetlands, hardwood forest, restored native prairie, and lakeshore areas (“City of Marshall: Parks” n.d.). All of these positive control points make Marshall a significant historic and cultural place within Calhoun County.

Figure 12. Brooks Memorial Fountain in Marshall, MI. Photo taken February 16, 2018.

In the city of Battle Creek, positive control points include the Kingman Museum, Leila Arboretum, Kimball House Museum, Sojourner Truth Monument, Historic Adventist Village, Clara’s on the River Restaurant, Underground Railroad Sculpture, Binder Park Zoo, and Kellogg House Park. The Kingman Museum is located within the Leila Arboretum and is the only natural history museum in southwest Michigan. It also has a Digistar Planetarium and offers hands-on experiences and several paved trails for guests to enjoy (“Kingman Museum” n.d.) (Fig. 13).
The Kingman Museum is a Queen Anne style Victorian house that was turned into a museum. There are several different displays, including one that focuses on Sojourner Truth (“Kimball House Museum” n.d.). The Historic Adventist Village shares how the Seventh Day Adventist faith began. The village is around three blocks and has restored or replicated buildings from the church. Within this property is the John Harvey Kellogg Discovery Center, which is an interactive attraction that allows visitors to learn about health treatments from over a hundred years ago (“Historic Adventist Village” n.d.). Clara’s on the River offers a unique dining experience in the Historic Michigan Central Railroad Depot (Fig. 14). This provides a historical perspective of the railway within a restaurant setting. They also have a 17-page menu, adding to the unique atmosphere of the restaurant (“Clara’s on the River” n.d.). Binder Park Zoo is also situated in the southern portion of Battle Creek. It encompasses 433 acres and has a 50 acre African national park and one of the largest giraffe herds in the country (“Binder Park Zoo”
Additionally, the Kellogg House Park offers a relaxing garden environment for visitors to appreciate. The Underground Railroad Sculpture is located here surrounded by trees, flowers, and a groomed lawn (“Kellogg House Park” n.d.).

In Athens, a positive control point is the Critchlow’s Alligator Sanctuary (Fig. 15). This place rescues reptiles and amphibians and allows visitors to have a hands-on or up-close experience with them. Critchlow’s Sanctuary is home to over 35 alligators and allows people to experience them in a semi-natural environment (“Critchlow’s Alligator Sanctuary” n.d.). Additionally, the Nottawaseppi Huron Band of the Potawatomi Native Americans own land in Athens. They have a store named Bkedé O Mshiké, from which visitors can buy native gifts (Fig. 16).
Figure 15. Critchlow’s Alligator Sanctuary in Athens, MI. Photo taken February 16, 2018.

Figure 16. Native American Store on the Pine Creek Indian Reservation in Athens, MI. Photo taken February 16, 2018.

In Union City, positive control points include Meteor Ridge Farm, the Victorian Villa Inn, Union Lake, the Civil War Monument, and Hammond House Museum. The Meteor Ridge
Farm is the home of Patricia Polacco, a children’s author and illustrator. The home is one of the heritage trust homes in Michigan and was named after a meteor that fell not far from the home. The meteorite is now used as the family headstone in the village cemetery. The Victorian Villa Inn is surrounded with Victorian landscaping and provides a place for afternoon tea or wine. They have a gazebo, goldfish pond, fountain, and 19th century antique lighting shop. Union Lake is a shallow lake created when a dam was constructed on the St. Joseph River to meet electrical demands of the city (Fig. 17). The Civil War Monument was established in 1884 in the churchyard of First Congregational Church to remember fallen heroes. The Hammond House Museum is a Greek revival structure built by Chester Hammond. Hammond was influential in developing Union City, as the city’s first town clerk and an original stockholder in the Union City Iron Company. Now the museum also preserves local artifacts and written history pertaining to the city (“Union City Michigan” n.d.).

Figure 11. Dam located on Union Lake in Union City, MI. Photo taken February 16, 2018.
**Current NCT route**

Currently, the NCT route through Calhoun County exhibits fragmentation between on and off-road segments of trail. The route follows the Kalamazoo River when possible (Fig. 2). Because water is a scenic feature and also a natural resource, the route has tried to utilize paths along the river. The NCT also passes through three major cities, Battle Creek, Marshall, and Albion, which are also built along the Kalamazoo River. Although some portions of the route are on established trail, a large section of trail is on the road throughout the county. This is especially apparent in the rural sections between the cities (Fig. 18). Therefore, this section of trail is largely fragmented and does not provide conditions for a safe and scenic hike throughout the entire county.

![Map showing on and off-road sections of the NCT through Calhoun County.](image)
Despite having sections of trail on the road, the NCT has made efforts to share paths with local trails already established within the county. In Battle Creek, it joins with the Calhoun County Trailway, which takes it from Historic Bridge Park to the Battle Creek Linear Park. Once reaching the Battle Creek Linear Park, it follows the trail in this park along the Kalamazoo River. In Albion, it shares the Albion River Trail route (Fig. 19). By connecting to these established trail systems, the route can be better maintained through county management. It also provides an opportunity to see scenic areas that are already established. Therefore, integrating the NCT with local trail networks has allowed the NCT to pass through some scenic, historic, and well-managed areas.

Figure 19. The NCT along the Albion River Trail. Photo taken on July 21, 2017.
CHAPTER IV

METHODOLOGY

Data collection

Data was collected for this research from June 20 through September 14, 2017. This involved the collection of data through both interviews and surveys. Although human subjects were being interviewed, no personal information was being collected from them. Thus, HSIRB confirmed that this project did not need HSIRB approval (Appendix A). The Lucia Harrison Endowment provided funds to travel to Calhoun County and surrounding areas throughout the summer and also covered funding for small gift packages to give to focus group participants.

Focus groups and interviews

Focus groups and interviews were conducted to help determine which trail attributes were important to people in Calhoun County, MI. Three categories of groups were examined: experts, trail users, and businesses/organizations. A total of five trips were made to Calhoun County or the surrounding area in order to speak with local people, businesses, organizations, and experts in the field of trail planning. Additionally, two phone interviews were conducted with those who could not meet in person. Participants were asked 9 questions regarding trail design preferences (Appendix B). Questions 1-5 and 7-9 were based on relevant literature regarding the safety, scenery, and economic development of trail routes and (Arriaza et al. 2004; Corning, Mowatt, and Chancellor 2012; Trail Planning, Design, and Development Guidelines 2007; Daniel 2001; Lothian 1999; Xiang 1996). Additionally, question 6 was based on the Calhoun County Recreation Master Plan to create a demographic health related question. The interviews and
focus groups were recorded using Sony Stereo IC Recorder. To identify emerging themes, interviews and focus groups were then transcribed and coded using Dedoose (Corning, Mowatt, and Chancellor 2012). This is a web-based application that allows researchers to organize and analyze research data. It supports both qualitative and mixed methods approaches and provides a secure and collaborative environment for data analysis (“Meet Dedoose Userguide” n.d.). Interviews can be transcribed, coded, and analyzed through various methods in this software. Thus, it was used to code interviews and focus group data and help identify trail attributes that were valued by different types of users and how the trail is currently perceived.

**Trail attribute evaluations**

Trail attribute evaluation sheets were handed out to participants to help determine which trail attributes they considered most important (Appendix C). Design of the trail attribute evaluation sheet was based on important trail attributes in literature, attributes considered important for the NCT as a National Scenic Trail, and attributes considered important by the experts at the NCTA. These were passed out after focus groups and interviews were conducted. For those who could not fill out an evaluation in person, an online evaluation was created on Survey Monkey and a link was sent to these participants so they could fill out the evaluation online. Design of the trail attribute evaluation sheet was based on important trail attributes in literature and attributes considered important by the NCTA. Each participant evaluated a total of 12 attributes. These attributes were natural scenery, facilities, health/fitness, safety, maintenance, shared use path, connection to commercial areas, connection to other natural areas, cultural points of interest, path type, accessibility, and construction cost. These attributes were chosen based on their importance to the trail planning process and their significance to the NCT as a
National Scenic Trail (“Optimal Location Review Handbook” 2014, *Trail Planning, Design, and Development Guidelines* 2007; Corning, Mowatt, and Chancellor 2012). In total, 10 different organizations were considered and 25 trail attribute evaluation sheets were collected.

**Weighted scoring**

A weighted scoring model was used to evaluate alternative routes through Calhoun County, MI based on preferences of the different interest groups. This model was chosen to provide a quantitative assessment of interest group opinions. It provides a simple decision analysis table that uses weights and scores assigned to each trail attribute, which is calculated according to the following formula.

\[
\text{Weighted Score} = \text{Score} \times \text{Weight}
\]

By summing the weighted scores for each alternative trail route, a score can be determined for each route and for each interest group (Gharaibeh 2014). Two alternative routes were identified through Calhoun County and the current NCT route was also evaluated. A total of three different routes were analyzed for each of the interest groups. Weights for this model were determined by summing and normalizing the data from the trail attribute evaluation sheets. First, the values for each attribute were summed. Then dividing by the lowest value normalized the summed values. This gave the least important attribute a value of one. This process was repeated for each interest group, so each group had a least important value with a value of one. Because the least important was the same for each group, values were comparable between groups. Then, after weights were normalized, they were used as the input weights in the weighted scoring model. Thus, the route decision-making process was guided by this determination of importance, or weights, that were emphasized by the different types of groups (Atkinson, Deadman, Dudycha, and Traynor 2005).
Scores were also determined for each alternative route according to each user group and trail attribute studied. The interview and focus group data obtained during data collection was used to help inform each score. The scores were determined using the following terminology to describe each attribute (Gharaibeh 2014):

- **Poor**: If the attribute (see Table 1) does not fulfill the objectives of the interest group at all.
- **Bad**: If the attribute does not really fulfill the objectives of the interest group.
- **Neutral**: If the attribute neither detracts nor enhances the objectives of the interest group.
- **Good**: If the attribute fulfills the interest group’s objectives fairly well or partially fulfills it.
- **Excellent**: If the attribute fulfills the interest group’s objectives extremely well.

<table>
<thead>
<tr>
<th>Score</th>
<th>Performance</th>
<th>Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Poor</td>
<td>If the attribute does not fulfill the objectives of the interest group at all.</td>
</tr>
<tr>
<td>2</td>
<td>Bad</td>
<td>If the attribute does not really fulfill the objectives of the interest group.</td>
</tr>
<tr>
<td>3</td>
<td>Neutral</td>
<td>If the attribute neither detracts nor enhances the objectives of the interest group.</td>
</tr>
<tr>
<td>4</td>
<td>Good</td>
<td>If the attribute fulfills the interest group’s objectives fairly well or partially fulfills it.</td>
</tr>
<tr>
<td>5</td>
<td>Excellent</td>
<td>If the attribute fulfills the interest group’s objectives extremely well.</td>
</tr>
</tbody>
</table>
Overlay analysis

A weighted overlay analysis was performed to identify potential areas in Calhoun County suitable for hiking trail construction. Three different factors were considered in this analysis: slope, soil, and land availability. These will all have high impacts on whether a trail will be able to be constructed through an area. DEMs used to calculate slope were downloaded from the USGS National Elevation Dataset. The 2017 Calhoun County parcel data was obtained from Calhoun County GIS Department. The Soil data was obtained from the Michigan Geographic Framework.

Because Calhoun County is located between two USGS elevation scenes, two scenes were downloaded and the Mosaic tool was used in ArcGIS Pro to combine both scenes. The Slope spatial analyst tool was then used to calculate slope. Then, this slope layer was transformed using the Transform by Function tool to scale the data between 1 and 5. This was done using the MS Small function, since smaller slopes are preferred to limit erosion.

For the Calhoun County parcel data and the soil data, new fields were created in the attribute tables to identify new categories of data. In the parcel data, categories were added for Residential, Commercial, Industrial, Agricultural, Exempt, Vacant, and Other. In the soil data, categories were added for Very Limited, Somewhat Limited, Not Limited, Urban, Not Rated, and Water. Then, the Polygon to Raster tool was used on both of these vector datasets in order to create raster versions of the data. Once these datasets were converted to rasters, the Reclassify tool was used to transform the data and create a common scale (Table 2). This tool was used on both slope and parcel rasters and their categories were transformed according to a scale of 1 to 5 (Tables 3 & 4).
Table 2. Scale values used to transform data.

<table>
<thead>
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<th>Suitability Level</th>
<th>Scale Value</th>
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<td>High</td>
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</tr>
<tr>
<td>Moderately High</td>
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</tr>
<tr>
<td>Medium</td>
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<tr>
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</tr>
<tr>
<td>Low</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 3. Classification of parcel data categories based on scale values.

<table>
<thead>
<tr>
<th>Category</th>
<th>Scale Value</th>
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</thead>
<tbody>
<tr>
<td>Vacant</td>
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</tr>
<tr>
<td>Exempt</td>
<td>5</td>
</tr>
<tr>
<td>Agricultural</td>
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</tr>
<tr>
<td>Residential</td>
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</tr>
<tr>
<td>Industrial</td>
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</tr>
<tr>
<td>Other</td>
<td>NODATA</td>
</tr>
</tbody>
</table>

Table 4. Classification of soil data categories based on scale values.

<table>
<thead>
<tr>
<th>Category</th>
<th>Scale Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Limited</td>
<td>5</td>
</tr>
<tr>
<td>Somewhat Limited</td>
<td>4</td>
</tr>
<tr>
<td>Urban</td>
<td>3</td>
</tr>
<tr>
<td>Very Limited</td>
<td>2</td>
</tr>
<tr>
<td>Water</td>
<td>1</td>
</tr>
<tr>
<td>Not Rated</td>
<td>NODATA</td>
</tr>
</tbody>
</table>

Once each dataset was transformed to the same scale, a weighted overlay was performed to combine the layers. The parcel layer was given a weight of 3, the soil layer was given a weight of 2, and the slope layer was given a weight of 1. The parcel layer is the most important because accessibility is often the most difficult issue when planning a new trail route. Although slope and soil are important, they are irrelevant if the land is inaccessible. Parcel data shows which areas of land could potentially allow for a trail route. Thus, the parcel layer is three times more important than slope and two times more important than soil. Soil is the second most important because it will impact the type of tread that can be built and how much maintenance a trail will need. It is still twice as important as slope because even if an area has good slope, a trail route would be
impassable if it were built in a wetland or muck area. The type of soil has a great impact on route maintenance. Finally, slope was considered least important. Calhoun County is known to be relatively flat so the terrain slope is not a major concern. Although it should still be considered, it is not as important as accessibility and soil because the county is predominately flat farmland.
CHAPTER V

DATA ANALYSIS AND RESULTS

**Identification of suitable route areas**

The overlay analysis map reflects the weighted overlay of the transformed values for parcel, soil, and slope data. Thus, the green areas are more suitable and the red areas are less suitable based on the combined criteria (Fig. 20). The overlay analysis showed that the eastern portion of Calhoun County is relatively unobstructed and would be the best place to have a trail route, as this section does not have many limitations. There would not be much concern for erosion and the parcels are primarily residential or agricultural in this area. Viewing only the parcel map shows that most of the residential land is located towards the western side of the county and near Battle Creek while most of the vacant or agricultural land is located near the middle and eastern portions of the county (Fig. 21). Because there are more vacant or agricultural parcels on the east side of the county, the eastern side would be a better candidate to built a trail route through. However, there are still some options for a route through the western side of the county if it travels to the western side of Battle Creek.
Figure 20. Overlay analysis showing suitable route areas based on land accessibility, slope, and soil.
Identification of alternative trail routes

Three different trail routes for the NCT are proposed for Calhoun County, MI. Route A follows the St. Joseph River corridor to the west, passes through the village of Tekonsha, traverses along the old route of the Air Line Division Michigan Central Railroad, and heads north until it reaches Ceresco. Beginning in Litchfield in Hillsdale County and traveling to the far side of Calhoun County, the length of Route A is 57.8 mi. It then follows the Michigan Central Railroad until it joins with current NCT off-road trail and the Battle Creek Linear Park on the east side of Battle Creek (Fig. 16). This can be joined with the current NCT route to create a large loop. This route has the least amount of walking on the road out of all the routes (<1 mi
before it joins with the current NCT route). It largely follows hedgerows and tree lines along farm fields. This will provide the trail user with good scenery of the rural country. By following the old route of the Air Line Division Michigan Central Railroad, there is also some cultural and historic significance to this route. This railroad was built on an old Native American trail (Hinsdale 1931). It has fewer commercial connections, as it only passes through the village of Tekonsha and later the city of Battle Creek. The emphasis of this route is a rural scenic off-road experience, with a few cultural features and a few city features present. It also creates a loop if connected to the current NCT route. Thus, it could be a more rural option to the regular route that passes through more cities.

Route B begins in the same direction as Route A, passing through Tekonsha, but continues along the Air Line Division Michigan Central Railroad corridor west to Union City in Branch County. It then follows hedgerows and tree lines along farmland north to Athens. From Athens, it is directed northward toward Battle Creek and joins the Battle Creek Linear Park on the west side of Battle Creek (Figure 22). Beginning in Litchfield in Hillsdale and traveling to the far side of Calhoun County, Route B is a total of 46.6 mi. This route emphasizes the rural farmland of Calhoun County along with a significant presence of historic and cultural features. It passes through Tekonsha, Union City, Athens, and trail users can go into Battle Creek if they desire. Thus, it has more options for urban encounters than Alternate Route A. It also follows the old corridor of the Air Line Division Michigan Central Railroad for an extended period of time and passes through the Huron Potawatomi Native American reservation in Athens. These provide cultural opportunities for trail users to learn about historic features and events that happened in Calhoun County. Additionally, it passes alongside Squirrel Hollow Golf Course and
a Morse Nursery. This could provide the NCTA with further opportunities for relationships with other types of businesses.

Route C is the current NCT route through the county. It passes through the village of Homer, heads north to the city of Albion, and then is directed west through the city of Marshall and then the city of Battle Creek. It follows the Kalamazoo River corridor from Albion to Battle Creek. Along the route, it connects with the Albion River Trail and the Battle Creek Linear Parkway. It also provides some opportunities for the trail user to experience historic features by following the Michigan Central Railroad and passing through the Historic Bridge Park.

Figure 22. Map of alternate trail routes through Calhoun County, MI.
Determination of weights

Weights from data sheets showed that scenery was the most important attribute to all categories of users (Fig. 23). Safety (N=2.8), accessibility (N=2.4), natural connections (N=2.3), and maintenance (N=2.2) were given high scores by trail users. Safety (N=2.8), maintenance (N=2.5), accessibility (N=2.3), and facilities (N=2.3) were given high scores by businesses/organizations. For the experts, natural connections (N=2.3), safety (N=2.2), path type (N=2.0) and maintenance (N=2.0) were important attributes to consider after scenery. The data values are also listed in Table 5 for a more specific comparison of values.

Figure 23. Normalized importance values of trail attributes.
Table 5. Normalized trail attribute weights for each interest group.

<table>
<thead>
<tr>
<th></th>
<th>NS 1</th>
<th>F 2</th>
<th>H 3</th>
<th>S 4</th>
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1 Natural Scenery 2 Facilities 3 Health 4 Safety 5 Maintenance 6 Shared Use Path 7 Commercial Connections 8 Natural Connections 9 Cultural Point of Interest 10 Path Type 11 Accessibility 12 Construction Cost

Justification of weights

Natural Scenery

Experts: This group viewed natural scenery as the most important attribute and valued it higher than any other interest group. This corresponds with this group being predominately made up of trail planners. They view scenery as a necessary aspect of a trail and the primary attribute that is sought by most trail users. Thus, their planning considers this attribute very highly.

Trail Users: This group often seeks natural scenery as a primary reason for being on a trail, so they gave this attribute the highest score within their group. If there is a lack of natural scenery, the path is not as interesting or enjoyable. Scenery enhances the trail experience and is a primary reason for being on a trail.

Business/Organizations: Because natural scenery is a primary reason trail users will travel along a path, a route with good scenery will become more popular. With more people on the trail, businesses have a greater opportunity of serving the trail user community. Thus, this attribute is valued the highest within this interest group as well.
Facilities

Experts: This group is not as concerned with facilities, which is reflected in how they gave this attribute a low weight. They view facilities primarily as the trail user’s responsibility. Although they consider lodging and water sources when planning routes, the trail user still carries the majority of the responsibility to fulfill this attribute.

Trail Users: This group thought facilities were important. Short distance hikers enjoy having destinations while hiking, which can often be a type of facility. Long distance hikers require places to lodge and re-stock on supplies. Thus, this group desires to have some facilities along a route.

Business/Organizations: This group gave the highest value to the attribute of facilities. This is because they are able to offer facilities to trail users. The incorporation of more facilities in a route means more business for them. Thus, they want routes to promote their business by including and promoting facilities along the route.

Heath

Experts: This group determined the attribute of health to be fairly important. Although it is not the primary goal of a trail, it can be a positive side affect of being outside in nature. The trail can promote positive behaviors and offer alternatives for other forms of recreation. The construction of a trail can provide benefits for communities socially, physically, and emotionally. Thus, experts value this attribute as fairly important.
**Trail Users:** The group gave health the lowest value. Most trail users have other motivations for going out on a trail besides health. Although this is a good side affect, there are often other reasons to choose a trail. This could be its accessibility, scenery, or convenient location.

**Business/Organizations:** The attribute was given the highest value by this interest group. They are interested in promoting the trail through different benefits that are positive for the community, one of which includes health benefits. Community health can impact revenue for different types of businesses as people support the recreation industry more.

**Safety**

**Experts:** This is considered an important attribute by this interest group. If a trail is not safe or gains a poor reputation, there will be a limited number of people who will use the path. Thus, it is essential to have a safe trail in order to provide a recreational opportunity for the greatest number of people. This is an important attribute to consider when planning a trail.

**Trail Users:** This attribute is really important to trail users. A trail with good scenery but a bad reputation will not be popular. The reputation and feeling of safety largely impacts whether or not people will travel on a route.

**Business/Organizations:** This attribute is really important to this interest group. Having safe trails reflects on the overall perception of a community. A positive community atmosphere can bring in more visitors to generate business. A safe trail also has an increased number of people on it, so this increases the potential for people to encounter businesses along a route as well.
**Maintenance**

**Experts:** This attribute is considered important to the expert group. Those in this group are often involved in overseeing trail maintenance. Thus, it is important for them to consider how much maintenance will be involved to construct and maintain a trail. Volunteers are often a key part of this process and the experts often manage volunteer groups to keep the trail maintained. Thus, this attribute is important to this group.

**Trail Users:** Maintenance is somewhat related to safety and therefore still an important attribute for this group. A trail that is maintained often gives the impression of being safe. It often reflects good management and the presence of an overseeing organization, which increases the feeling of safety. Also, good route signage and parking is important to keep a route feeling safe.

**Business/Organizations:** This attribute is important for this interest group. Because the maintenance of a trail will reflect the community, this interest group desires to have a good community impression for trail users passing through town. More people are likely to use a trail that is well maintained, which can promote business in urban areas.

**Shared Use Path**

**Experts:** This group is least concerned about shared use paths. Although the NCT is primarily concerned with foot traffic, this group as a whole does not have a huge preference on shared use paths. They may be more concerned with high impact recreation types, but overall this is not as
important as other attributes when designing a trail. When a route is built, it is good for different
types of users to enjoy it.

**Trail Users:** This attribute was not extremely important to trail users. Although they sometime
have a conflict of interest with other types of users, sharing a path is generally still not a huge
concern. If they know beforehand what to expect on a route, trail users can prepare ahead of time
for the types of encounters they may have on a path.

**Business/Organizations:** This group was the most interested in shared use paths out of all the
interest groups. This is because they desired to have as many people on the trail as possible.
More shared use paths will bring more types of recreation users and therefore the potential for
their business to impact more people.

**Commercial Connections**

**Experts:** Out of the three interest groups, experts are least concerned about this attribute. They
are mainly focused on building trails in natural areas to highlight scenery. Commercial areas
have limited scenic opportunities, so this group is not as interested in routing a path through
these areas. Also, accessibility is often more limited in commercial areas, which makes route
construction difficult.

**Trail Users:** This attribute is not really important to trail users. Although some commercial
connections are nice, they are primarily concerned with natural connections. It is more enjoyable
for them to be in the natural environment than a built one. However, they still want the trail to be convenient, so the trail should not be too far from commercial areas.

**Business/Organizations:** This group wanted routes through commercial connections. This would allow more trail users to come into contact with their businesses. They could offer more goods and services to the trail user community along routes that make commercial connections.

**Natural Connections**

**Experts:** This was the second most important attribute to this group after natural scenery. These attributes are related, since natural connections will increase natural scenery. The goal is to have a trail in as many scenic areas as possible.

**Trail Users:** This was an important attribute for trail users. When traveling along a route, they expect there to be some scenic points of interest. They would rather have natural connections than commercial ones, as this increases the amount of natural scenery they will encounter.

**Business/Organizations:** This attribute is somewhat important to this group. Although they care about commercial connections to generate more business, trail users are likely to desire trails that have natural scenery. Making natural connections along a route can increase the amount of people on a trail, as they desire to see different natural areas. As long as the trail still passes commercial areas, businesses can receive benefits from increased trail users.
Cultural Point of Interest

Experts: This attribute is fairly important to this group. They will try to include cultural points of interest if possible, but will not build a route completely out of the way in order to include them either. Thus, this attribute is important, but not important enough to make the trail route hit every point of interest available in an area.

Trail Users: This is not a very important attribute for this interest group. Although cultural points of interest add to the hiking experience, they are not often a primary reason to choose a trail. Their focus is more on the natural scenery than the cultural points of interest.

Business/Organizations: This attribute was given the highest value by this interest group. Businesses and organizations often manage cultural points of interest to preserve and protect them. Thus, they see them as valuable and something a trail user should encounter along a route.

Path Type

Experts: This attribute is important to the experts. The type of path will encourage or discourage different types of users. The NCTA prefers dirt footpath so that hikers are the predominate users of the route. Other organizations will build a path type with specific tread and width to accommodate their target interest group. Thus, this attribute is important to those designing trails.
**Trail Users:** This attribute was most important to trail users. Different types of paths generate different experiences along a trail. It also allows for different user types. Therefore, having a path type that aligns with user expectations will provide a positive hiking experience.

**Business/Organizations:** This is the least important attribute for this group. They do not care what type of path is created, as long as it brings the most users into contact with them. The specific tread or width does not directly impact them.

*Accessibility*

**Experts:** This attribute is not extremely important to this group. They care about accessibility of land to put a route through, but once they have the land the other aspects of accessibility are not as important. Parking lots and access points should be sufficient, but the trail itself is of greater concern.

**Trail Users:** This was an important attribute for this interest group. They were primarily concerned with how parking was set up and how signage was constructed. Large parking lots and clear signs along a route made for easy navigation along a trail. An easily accessible trail would be more popular and also feel safer to users.

**Business/Organizations:** This is an important attribute to this interest group. Accessibility impacts how many people will travel along a route. Limited accessibility means a decrease in trail users. Thus, in order to maximize use, this group considers good accessibility to be important.
**Construction Cost**

**Experts:** This attribute was given the highest value from the expert group. This is because they are often the ones paying or trying to fundraise for the route. The number of volunteers they have also impacts the cost. Thus, when implementing a new route, this group is primarily responsible for the cost.

**Trail Users:** This attribute was given the lowest value within this interest group. Because they are not directly responsible for the construction of a trail, they are not very concerned with how much it costs. They are more concerned with the outcome of trail design, but most trail users are not informed and not interest in the specifics of trail construction cost.

**Business/Organizations:** This is not a very important attribute for this interest group. They are not primarily concerned with the cost of building a trail. Because it does not have a great impact on them, they are not as interested in the specifics of construction cost.

**Objectives of interest groups**

Scores for the weighted scoring model were guided by objectives determined for each interest group. The expert interest group is involved in the details of planning trail routes. They understand the process that goes into planning and designing a route and have had experience with doing so. Their primary objectives include:

1. *Obtaining accessibility from different landowners so that the best route can be implemented.*
Accessibility to different land parcels is important to this group because if landowners grant them access to a site, they can construct the best route. The best route is not often implemented due to issues with accessibility. Although the best route can often be identified on a map, building the route is limited by the number of people willing to give access to the land along that route. Thus, in order to build the best route, this is an important objective for experts to consider.

2. *Providing a safe and enjoyable hiking experience that cultivates a land stewardship ethic.*

Trails have the unique ability to take people to areas that would not otherwise be seen. This creates a deeper appreciation for the land since more of it can be highlighted along the trail. As people develop connections to the land around them, they cultivate a stewardship ethic that makes them care for the land and the community around them. Additionally, as cultural and historic events are recognized along a trail, people can gain a greater appreciation for history and the land they live in.

3. *Highlighting natural scenic areas as positive control points along the route.*

Natural scenic areas provide destination points for trail users to visit. When there is a destination point, a hike is given a specific purpose. Thus, having points dotted along the trail provides a reason to hike and motivates people to see new things. This helps cultivate a healthy community lifestyle and increases hiker appreciation of an area. These positive control points are often places with water or an overlook viewpoint. By having variety in scenery along a trail, a trail user will stay interested in the route for a longer period of time. Thus, this group looks at trail design in relation to how scenic features can be incorporated.
The trail user interest group includes those who travel on the trail. Their experiences along the trail determine which areas are desirable and worth returning to. Their primary objectives include:

1. *Experiencing natural areas that offer scenic features and destination points.*

   Trail users desire to see scenery that is unique and accessible only through the trail. Viewing natural scenery was very important to this interest group. They do not want to see the same views as those that can be obtained in a vehicle. The trail should have destination points that give them a purpose to travel on the route. The combination of scenery and variation throughout the trail makes it more interesting and enjoyable for the trail user. These scenic features can be anything from a vista to a cultural point of interest. They are anything that positively contributes to the hiking experience.

2. *Having facilities available along the route as is appropriate for the length of the trail.*

   Depending on the length of the hike, people desire different types of facilities. If it is a short couple hour hike, facilities are not necessary. However, for the long distance hiker, more facilities are necessary. Ideally, hikers should have a campground or lodging option every 10 miles. Places to re-stock food and supplies are also nice to have for the long distance hiker. Because the NCT was designed with the long distance hiker in mind, facilities pertaining to lodging/camping and re-stocking supplies are more important when designing a route.

3. *Traveling in areas that promote the safety of all trail users.*

   The safety of a trail was very important to all types of trail users. If a trail gained a
negative reputation, they were not likely to use it. Contributing to the safety of the trail was how accessible it was, whether there were road crossings, and how it was maintained. A trail considered to have good accessibility had a parking lot near the trailhead that was well lit. The placement of a parking lot far from the trailhead was viewed as more dangerous. Depending on the type of road, crossing a street could put the hiker in danger. Additionally, the maintenance of the trail reflected on its overall desirability and safety. If a trail was not maintained, it was not viewed as safe. Having more people present on a trail contributed to hikers feeling safer on it.

The business/organization interest group includes those who offer goods and services to the trail users along the route. They are often located near or within cities and can develop relationships with the hiking community. Their primary objectives include:

1. *Having the greatest number of visitors that can be recipients of their goods and services.*

   Incorporating the hiking community into the group of people that receive goods and services from local businesses increases revenue and popularity. By expanding their sphere of influence, more revenue can be obtained. Relationships between businesses and trail users can be established when a route goes through a town, as they both meet the needs of the other.

2. *Having good connections between commercial areas so that cities and villages can become destination points for trail users.*

   When a trail route connects different cities, the trail user can frequently have options for re-stocking supplies, obtaining more food, or finding suitable lodging. Also, towns often offer cultural and historical features that can be a point of interest for the trail user. By having
greater varieties of options for the trail user, towns can become destination points. This contributes to the revenue of businesses and supports the local economy.

3. *Promoting community development through the incorporation of trails in a town.*

Trails have the ability to promote community development through offering health/fitness options and community engagement. If a section of trail becomes popular, people will be more comfortable using it and as a result also spend more time and money in the surrounding area. As more people use the trail, their fitness increases. Additionally, when businesses are able to meet the needs of the trail user, economic revenue is generated for the local economy and the trail is promoted. Thus, community development can take place for both businesses and the local people when a town is incorporated along a trail route.

**Scores for the current NCT route**

Table 6. Scores determined for the current NCT route.

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1 Natural Scenery 2 Facilities 3 Health 4 Safety 5 Maintenance 6 Shared Use Path 7 Commercial Connections 8 Natural Connections 9 Cultural Point of Interest 10 Path Type 11 Accessibility 12 Construction Cost

**Natural Scenery**

**Experts:** The overall score given for this attribute is 3 because Route C neither fulfills nor detracts from the objectives of this interest group. In the interview data, the expert group emphasized the importance of scenery in a natural trail route, especially when considering the
planning process (Appendix B). This is due to the designation of the NCT as a National Scenic Trail. Although the current NCT route takes hikers through some beautiful rural areas (Fig. 24), the amount of road walk detracts from the overall score of this route (Fig. 25). When planning a route, it is important to highlight features that will allow hikers to see areas that cannot be seen (i.e. a vehicles). An expert from the Trails and Greenways Alliance said, “I definitely think that they [trail designers] like to place trails in more scenic areas to get people out in areas where they wouldn’t otherwise go that are really beautiful and just show off the town in a beautiful way that cars can’t.” Because this route has an extensive amount of road walk, a unique hiking experience is not established throughout the entire county. Since experts consider scenery as an important attribute to consider in a route, this score is fairly low for the experts. Additionally, the off-road sections of this route are often in the city, which does not provide the opportunity to experience natural scenery. However, despite these factors, some natural scenery is still present, especially around Battle Creek where the route follows the Kalamazoo River and passes through the Ott Biological Preserve, Leila Arboretum, and Historic Bridge Park. Therefore, although some scenic areas are highlighted with this route, the overall score is lower due to the presence of road walk between the cities.
Figure 24. Scenic route in the Ott Biological Preserve. Photo taken on July 21, 2017.

Figure 25. Road walk along the current NCT route. Photo taken July 21, 2017.
Trail Users: The overall score given for this attribute is 3 because Route C neither fulfills nor detracts from the objectives of this interest group. Although there is not much emphasized in the interview data about natural scenery specifically, trail users emphasized the importance of wildlife along the trail. One hiker said, “I like to see wildlife; I think it adds. If you have an area completely devoid of animals it’s a little worrisome almost.” This plays into the importance of natural scenery as wildlife/vegetation and different terrain types are not as diverse in non-natural settings. Because the trail user will be the one experiencing the full extent of the trail, variation in scenery will make the hike much more enjoyable. Thus, this is an important attribute for trail users to consider when choosing a route. Popular routes will often have more variation in terrain and wildlife/vegetation. Because the current NCT route has both some scenic areas and some non-scenic road-walk areas, the score given for trail users is a 3.

Businesses/Organizations: The overall score given for this attribute is 3 because Route C neither fulfills nor detracts from the objectives of this interest group. Although businesses themselves do not necessarily care about a trail’s scenery, better scenery often brings along more trial users who are more likely to stop in a town and generate economic revenue. Because businesses want more trail users and the users want good scenery, businesses will want to support routes with good scenery. Additionally, some organizations interviewed were non-profits that were concerned with the environment. Thus, to them the natural scenery was very important. The current NCT trail has a combination of beautiful rural scenery and also boring road-walk areas, so the score is assigned a middle number to reflect both good and bad areas.
Facilities

Experts: The overall score for this attribute is 5. Route C provides some good opportunities for facilities; however, this is not a primary objective of this user group. Although facilities such as lodging are important to this group, other facilities such as bathrooms, water, and food are seen to be responsibilities of the trail user. This route provides the most lodging accommodations out of all the routes because it travels through the three major cities in Calhoun County and one township. It is about 9 miles from Litchfield to Homer, about 10 mi from Homer to Albion, about 12 mi from Albion to Marshall, and about 10 mi from Marshall to the outskirts of Battle Creek. There are few options for facilities outside of these cities along this route and traveling to Marshall and Battle Creek will be long hiking days. However, this interest group is not as concerned with providing lots of facilities for trail users. Since the NCT is designed to be a long-distance trail, it is expected that hikers will be fairly self-sufficient. Thus, because this attribute is not as important for this interest group, it fulfills their objectives in this route.

Trail Users: The overall score for this attribute is a 4. Because the route passes through the three cities and one township in Calhoun County, it provides several lodging opportunities for hikers passing through the county. It also provides areas for the hikers to stock up on supplies and use facilities in the city. However, there is a considerable distance to travel between Albion and Marshall and also from Marshall to Battle Creek. These will make for long days and there are no opportunities to stop along the way because most of these sections are on the road. Therefore, there are not many options for facilities between cities. If the hiker cannot make it to the next city in one day, then they will not have many, if any, options for lodging and food. Therefore,
although the cities provide ample facilities, this route is only somewhat satisfactory for this interest group due to the extensive road walk between cities.

**Businesses/Organizations:** The overall score for this attribute is a 5. Businesses are the ones providing the facilities for the trail users, so this route provides the best route for businesses and organizations to offer facilities to trail users. Because the businesses are almost all located within the cities, this is the only route that passes through the three major cities in Calhoun County. Thus, taking the trail users on this route will generate the most business and provide trail users with the most opportunities for facilities. Several businesses noted that hikers would stop in for drinks, food, or to use the bathrooms while on the trail near their businesses. This route fulfills the objectives of the businesses/organizations very well to provide for trail users.

**Health**

**Experts:** The overall score for this attribute is a 4. Promoting the trail as a way to get healthy was not an overly important objective of the expert group. The expert from the Trails and Greenways Alliance notices that most of the time people seem to not go on trails because they do not have time or do not have a way to get out to the trail. She commented that there are probably more effective ways to promote community health, however, hiking is acknowledged as a good way to stay healthy. If using a trail to promote health, incentive programs may be very beneficial. Because outside exercise develops good health, it is still an aspect to consider when developing a trail. In the planning process, this group is more concerned about creating a good experience for the trail user so they want to return to the trail, and promoting the trail as a way to get healthy is a side affect from being outside and enjoying the hike. However, because there are still some
sections of the trail, such as those on the road, that will not be used for purely recreational and health purposes, the whole route only somewhat fulfills the objectives of this interest group.

**Trail Users:** The overall score for this attribute is a 3 because there are both positive and negative aspects of this route for trail user health. For a long distance hiker, there are opportunities to go to health centers in the cities. The trails in the cities also provide the opportunity for local trail users to get outside on a trail that is nearby and convenient. However, the sections of trail between cities in this route are not likely to be used for health purposes because they are on the road. People will not use these sections of trail to get healthy or for pure recreation. So overall, this route can provide an avenue for people to get outside and be healthy in some areas, but not the entire route is useful for keeping people healthy.

**Businesses/Organizations:** The overall score for this attribute is a 4. This group is fairly concerned with the overall community health. A trail could be a way to get people healthy so they’re somewhat interested in having trails as a way to promote good health. There is skepticism about whether a trail would actually work or not, but still consider it better than nothing. The manager of Dark Horse Brewing commented on how nature is a peaceful place and can help develop the community by promoting a healthy lifestyle. Thus, by connecting different cities through this route, the trail could promote healthy recreation habits in more communities than other alternative routes.

**Safety**

**Experts:** The overall score for this attribute is 2. Although there are some good off-road trail
sections within the cities, there are large sections of road walk connecting the cities in the current NCT trail. These large sections of road walk are along some roads that have a higher speed limit (55mph) and a small shoulder along the road. There are also several blind spots along curves in the road and the trail user must cross a bridge that does not have a pedestrian walkway (Fig. 26). These sections of road walk dramatically decrease the safety level of the trail in Calhoun County. Therefore, although there are some good safe off-road trail sections in the county, the on-road sections present significant danger for trail users.

Figure 26. A blind curve with minimal shoulder along the current NCT route. Photo taken July 21, 2017.

Trail Users: The overall score for this attribute is 2. Because of the extensive road-walk in this current route, the overall route is not very safe for the hiker. There are several blind curves along the road and a bridge that the hiker must pass over that does not have a shoulder (Fig. 27). Within the cities, there are still roads that must be crossed. Although there are sections of trail
that do not pose a safety threat, especially near the cities, there are significant areas of danger throughout the county. The current route is designed to only provide a path for a long-distance hiker to get through the county. Thus, a hiker looking for a shorter distance hike is not likely to use the current route due to safety concerns.

Figure 27. A bridge crossing along the current NCT route. Photo taken on July 21, 2017.

**Businesses/Organizations:** The overall score for this attribute is 3. Although businesses and organizations care about the safety of people in general, it is also not a primary point for them to consider in a trail route. They want trail users to come through their area, so a safer trail will bring along more people. In that respect, safety is important to consider. However, because they will not personally encounter the trail route, they will not have as strong of an opinion on the safety of a trail compared to the trail users and experts. The current NCT route has areas that are not safe for the hiker, but it also brings the hikers through the cities, which is important for
revenue. Therefore, there is interplay between safety for the hiker and the best revenue for the businesses in the county. Thus, businesses are fairly neutral overall on the safety of this route.

**Maintenance**

*Experts:* The overall score for this attribute is a 5. Currently, the area where the NCT route does not follow the road is when it is connected to other county trails (Fig. 28 & 29). It connects with the Albion River Trail, Marshall Riverwalk, the Battle Creek Linear Parkway, and the Calhoun County Trailway. The trail also travels through the Leila Arboretum, Historic Bridge Park, and the Ott Biological Preserve. The maintenance of these is also overseen by other organizations. Because of these connections to local trails, these trails are managed by other organizations and the NCT does not need to worry much about maintenance. Additionally, the county road commission manages the areas that are road-walk. Therefore, there is not much trail maintenance that needs to be done by the NCT throughout the county.
Figure 28. The NCT along the Marshall Riverwalk. Photo taken on July 21, 2017.

Figure 29. The NCT along the Battle Creek Linear Parkway. Photo taken on July 21, 2017.
Trail Users: The overall score for this attribute is 4. Overall, the trail maintenance is overseen by other organizations or is along the road. This keeps the path fairly well kept up. However, there were a few sections of trail that, although there was a distinct path, the area looked run down with abandoned buildings (Fig. 30). Although the route is not impassable, it would questions about safety of the area for a local trail user. The reputation of the area and the overall feel of maintenance were given as big determinants of whether a trail user would go on a trail. It would be fine for a long-distance hiker to pass through, but not an area where a short-distance hiker would choose to spend time. This deters the trail from getting use from local people in these types of areas. However, overall, other organizations and the NCT Chapters do a good job of keeping up segments of the NCT. Thus, this is still not a major concern of trail users along this route.

Figure 30. An abandoned building along the NCT route near Battle Creek. Photo taken on July 21, 2017.
Businesses/Organizations: The overall score for this attribute is 5. Because the businesses are primarily concerned about providing goods and services and receiving revenue from the trail users, the maintenance of the trail is not a primary concern unless it is directly linked to their business. If the business is located directly on the trail, like Dark Horse Brewing or Clara’s on the River, the maintenance of the trail will impact the look of the business. In this respect, the maintenance of the trail is important because it will affect the overall appeal of the business. However, if the business is located slightly away from the trail, they will not care as much how the trail is maintained as long as it still brings trail users into their area. However, the areas where there are businesses along the current route are well maintained. Especially near Clara’s on the River, the route was decorated with lights and they have seating overlooking the trail since it follows the Kalamazoo River. Thus, the trail is well maintained and reflects well on the local businesses in the current route.

Shared Use Path

Experts: The overall score for this attribute is a 2. Most sections of the trail share the path with another type of trail user. Because, ideally, the NCT is purely a footpath, this attribute is not really fulfilled by the current route through Calhoun County. The current route shares the route with cars, bicyclists, tourists, and joggers most of the time. There are only a few sections of the route that only allow foot traffic, such as the Ott Biological Preserve, in Battle Creek. Therefore, this route does not really fulfill the objectives of the NCT to have the trail be only foot traffic.

Trail Users: The overall score for this attribute is 4. Out of all the types of use along trails, trail users objected most to dogs being on the trail. They did not appreciate the mess that dogs make
along the trail and how owners were irresponsible in keeping their dogs on a leash. The mess from dogs and their ability to run off the trail and trample vegetation was a primary concern. Even though Michigan has a law that all dogs must be kept on a leash, this is often broken and not adhered to by other trail users. Because this route is often in a city or along the road, though, dogs are not a large concern along this route. However, there are other types of use such as bicyclists and joggers allowed on trails in the cities. It was found that hikers have different reactions to these other types of use. Some do not mind other users and others prefer only other hikers. In scenic natural areas, only foot traffic was preferred overall. Because most of the multi-use paths are in the cities along this route, this attribute somewhat fulfills the interest group’s objective concerning multi-use paths.

**Businesses/Organizations:** The overall score for this attribute is 5. Businesses tended to be in favor of multi-use paths because they bring more people down the trail. The owner of Palmer B&B commented, “Anything that positively promotes the town is good for business. That is just the way it is. I think the trail is only going to be as good as it is promoted. I look at anything like that as great for me because it’s going to bring people in.” If there are more options for use, then more people have the opportunity to go on the trail and are more likely to stop at the businesses. This promotes business revenue, as more people need their services and facilities. Overall, they are not specific about what type of use is on the surrounding trail. In general, they tend to see more options as better. The owner from Palmer B&B also said in relation to shared use paths, “I think we should open it up to everything. Heck, if we could run a jeep trail I’d be there. Yeah the more the merrier. Bikes, horses, people, skate boards, yeah you name it…You can bring in anybody.” The current NCT route allows several different types of use along the route. This is
positive for the businesses so they can generate the most revenue and have the most interaction with trail users.

Commercial Connections

Experts: The overall score for this attribute is a 5. The experts are not as concerned with commercial connections along the NCT. They are more concerned with having periodic places for the hiker to re-stock on supplies. The current route allows hikers to pass through several cities that will provide opportunities for the hiker to re-stock on supplies. Connecting commercial areas are also important for promoting the trail. Larger numbers of people can learn about that trail in more popular commercial areas. Thus, the main draw for experts to travel through commercial/business areas are for publicity and support. This support from economic areas has been seen through the Trail Town program that the NCTA currently employs. Thus, because the current trail travels through the three cities in Calhoun County, it provides the most commercial connections for publicity.

Trail Users: The overall score for this attribute is 5. Trail users in general liked some connection to commercial areas. If they had young kids or were hiking in groups, they preferred to have a destination point. This often involved an area of commerce such as stopping for ice cream afterward. One hiker with young kids commented how her son would like to stop during the middle of a walk. If she had a destination point at the end of the trail such as ice cream, it was easier to encourage him to keep going. For a long-distance hiker it is helpful to have a destination to rest and use facilities or re-stock on supplies. Therefore, because the current route
goes through several urban areas and connects these commercial areas, there are good opportunities for hikers to encounter an urban area after a hike.

**Businesses/Organizations:** The overall score for this attribute is 5. The current NCT route provides the most commercial connections throughout Calhoun County, as it connects three cities and one township. This is the best option for businesses and organizations because it allows the most trail users to interact with their businesses. There are currently several businesses that are located alongside the trail. Because businesses and organizations are concerned with revenue, the connection between cities is a primary objective for them. Thus, the current route provides the best option for them to fulfill this objective.

**Natural Connections**

**Experts:** The overall score for this attribute is a 3. Because the NCT is a National Scenic Trail, it is intended to pass through natural scenic areas and connect them. However, there are limited natural areas that are connected throughout the county. There are a few natural connections within Battle Creek, but not many beyond that. This trail route is dominated by more commercial connections than natural ones. Although both are important, there is a deficiency in the amount of natural connections. Any areas that are not in the city are road-walk. Because there are limited scenic connections and this is an important attribute for the NCT to consider when planning, this score is low for the attribute of natural connections.

**Trail Users:** The overall score for this attribute is 2. There are not many natural connections between sections of trail. If someone wanted to do a short-distance hike, there are certain
destination points that they could drive to and hike. However, the natural areas are not well connected, so a trail user could not easily hike from one natural area to another. In general, trail users preferred natural scenery to urban scenery, so their general objectives involved seeing as many natural features as possible. Therefore, connecting more natural features would make for a more interesting hike. Currently, there are pockets of natural scenery, but the lack of connection makes it difficult for a trail user to plan even a short couple-day trip around the county to see scenery.

**Businesses/Organizations:** The overall score for this attribute is 4. This attribute is not as important for businesses and organizations to consider. Although natural scenery is nice to have along a trail, this interest group is more concerned with trail users coming to their businesses than they are with connecting natural areas along the way. Thus, connections between natural areas are not a primary objective for this interest group to consider. Oftentimes, connections between natural areas can bypass a commercial area, so this would detract from business. The current NCT route does not highlight connection between natural areas, but this is not very important to businesses and organizations so the route still somewhat fulfills their objectives.

**Cultural Points of Interest**

**Experts:** The overall score for this attribute is 5. There are some cultural points of interest throughout the current NCT route that contribute to the cultural objective promoted by the NCTA. These are predominantly located in Battle Creek, but there are also a few points of interest in Albion and Marshall as well. In Albion, there is the Albion College and the historic Bohm Theater. The owner of Palmer’s B&B noted how she would get people stay overnight
because they were visiting the Bohm. She thought the trail would bring people in for an overnight visit as well. Any activity in the county was viewed as positive for her business. In Marshall, there is the Marshall Hall Gar Museum, the National House Inn, and the Oakridge Cemetery. In Battle Creek, cultural points of interest include the Leila Arboretum Society, the Kingman Museum, Historic Bridge Park, the Sojourner Truth Monument, and the Kimball House Museum (Fig. 31 & 32). Overall, this fulfills the objective of the experts to include cultural points of interest.

Figure 31. A bridge in the Historic Bridge Park. Photo taken on July 21, 2017.
Trail Users: The overall score for this attribute is 5. Trail users were not overly interested in hiking to seek out cultural points of interest. However, if a cultural point of interest was along the trail it made the trail more interesting. Because the presence or absence of a cultural point of interest did not greatly determine whether a hiker would go on a trail, this is not as important of an objective to consider for the hiking group. However, the current NCT route encounters several points of interest along the route. Albion, Marshall, and Battle Creek all offer lodging and activities related to history and culture. Also, because Marshall is considered the Nation’s largest National Historic Landmark District for a small urban, there are many cultural features for trail users to experience. This includes a total of 144 buildings and 50 markers can be walked to throughout the city and many old houses that have now been turned into museums. Because the current NCT trail encounters several cultural points of interest, it fulfills the objective for this group very well.
Businesses/Organizations: The overall score for this attribute is 5. Businesses and organizations often promote cultural points of interest. They can offer opportunities for trail users to experience the local culture. This is evident by the number of museums and local restaurants that provide opportunities for trail users to stop, use facilities, and explore the area. Thus, businesses and organizations see cultural points of interest as an important objective to fulfill in a trail route. This also contributes to the experience of a hike, which this interest group is able to control through cultural points of interest. The overall experience can become an attraction to bring people into an area. People will enjoy the trail more when there is a rich experience connected to an attraction or destination (Trail Planning, Design, and Development Guidelines 2007). The current NCT route provides opportunities for the hiker to experience different cultural points of interest throughout the different cities. These can become distinct attractions that create an experience for the hiker. There are different types of opportunities, ranging from historic bridges in Historic Bridge Park, to a unique garage culture promoted by Dark Horse Brewing, to museums such as the Kimball House Museum. Thus, the current route provides ample opportunities for historic and cultural points of interest to be encountered by the trail user.

Path Type

Experts: The overall score for this attribute is 1. The path type changes throughout the route in Calhoun County and most of it is a paved trail. The NCT would ideally have a path that is entirely foot traffic. This is usually a small dirt path or a sidewalk if in the city. An expert wilderness guide in the Upper Peninsula comments, “The NCT is supposed to be a hiking only trail. And wherever possible that’s what we should do…it’s supposed to be a premier hiking-only experience.” However, he also notes that having multi-use trails is unavoidable in urban
areas because landowners and managers have different ideas. It is motorized traffic that makes him more concerned. The current route often has multiple user types on a wide paved path based on AASHTO standards in the city or is along the road, which allows vehicular traffic nearby. Bikes, dogs, vehicles, and trail runners are allowed on most of the paths in the current route. Therefore, this does not fulfill the objective of the NCTA to have a singular footpath for the hiker.

**Trail Users**: The overall score for this attribute is 3. Path type was more of a personal preference between different types of hikers. Depending on the goal of the hike and personality of the person, different path types were preferred. If a more rural hike is desired, hikers tend to desire a dirt path. However, if an urban hike is desired it is more common to enjoy a paved pathway. Some people desire the wilderness atmosphere while others are intimidated by the wilderness and feel safer on pavement. This also depends on the age and fitness of the trail user. There are several factors to consider when determining what surface people would like to hike on and different groups of trail users can be targeted with different path types. Therefore, it seems most effective to have different options. Because there is so much variation within this group, a neutral score is given for this attribute.

**Businesses/Organizations**: The overall score for this attribute is 5. Path type is not a primary concern of businesses. Whatever type of path will bring the most customers will be preferred by the businesses and organizations. Because multi-use paths allow the most people, these paved paths are usually preferred. The current NCT route has mostly paved paths and routes along the
road with only a few segments of dirt path. Because path type is not very important to this interest group overall, though, the current route fulfills their objectives regarding this attribute.

**Accessibility**

**Experts:** The overall score for this attribute is a 4. This attribute is not a major concern of the experts. They are more concerned with which features the trail passes through and how it will be managed. Accessibly from the standpoint of how a hiker will access the trail is not as important since it is a long distance trail and being designed from that standpoint. A hiker that is going through the county will most likely already be on the trail. If they are not, this current route allows other trail users to access the trail at almost any point. Most of the route can be access from each of the cities or through a park. However, accessibility from the standpoint of obtaining access from landowners is a much more important issue for experts to consider. Obtaining land access is one of the most important attributes to think about when designing a route. Thus, not only does the current route provide accessibility through the cities at almost any point, it also does not require much communication with private landowners because most of it is on public lands.

**Trail Users:** The overall score for this attribute is 3. Trail users that were interviewed had a strong desire for good accessibility. Access to a trail determines the extent to which they will use the trail, especially for short-distance hikers. This involves the level of convenience that the trail offers. Convenience is considered a base-line value that determines whether a person will even use a trail. Even if it offers personal values such as recreation, fitness, and transportation, a person is not likely to use the trail if it is not convenient (Trail Planning, Design, and
There are some places that it is convenient to access the NCT in this route, such as in the cities, in one of the parks, or on one of the other county trailways. However, there are other sections that do not offer good accessibility. For someone who is not already on the NCT, it can be hard to find a good access site to start the trail if it is not already at an established organizational space. Thus, because this route has both some good and some bad spots for accessibility, it is given a neutral score for this interest group.

**Businesses/Organizations:** The overall score for this attribute is 4. Accessibility is not a major concern for this interest group unless it will impact how people will get to their businesses. In the current NCT route, the best accessibility is within the cities, which is where most of the businesses are located. People can park in the city and join up with the current NCT route to walk on it for a while. There are still some areas are still hard to find accessibility because there are not designated trail parking areas. However, the areas of the most limited accessibility are often in rural areas where businesses and organizations will be less impacted. Thus, the current route somewhat fulfills the objectives of this interest group by providing accessibility within the cities.

**Construction Cost**

**Experts:** The overall score for this attribute is a 5. This is an important attribute for the experts to consider since they are involved in the planning and maintenance of a trail route. The current route needs minimal maintenance since it is almost entirely on public land. The maintenance is already overseen by other organizations. Additionally, there is no new trail that needs to be constructed. When it is not along the road, the current route joins with already established
trailways so no new trail needed to be built. It traverses through parks as well, which are managed by the city or township. Thus, this is a great benefit to the current route through the county.

Trail Users: The overall score for this attribute is 5. The objectives of trail users do not highly consider the construction cost to create and maintain a trail. Because they do not consider this attribute very heavily, the current route is sufficient for fulfilling their desires for this attribute. It does not cost the NCTA much to upkeep this route in the first place and trail users do not have to contribute any money for the upkeep of the trail. Thus, this current route is given a high score because the trail users are not very concerned about this attribute and the current route does not cost them anything.

Businesses/Organizations: The overall score for this attribute is 5. The construction cost of the trail is not a primary objective of this interest group to consider because they will not be contributing directly to the construction of the trail. Usually the trail will bring them more revenue, but they do not have to pay for the construction costs themselves. Their business will often increase in value, but they will not have to pay for the cost of the trail. Additionally, because the current NCT route joins with local county trails, the construction cost is minimal overall. Therefore, this attribute is given a high score because it fulfills the objectives of this interest group.
Scores for Alternative Route A – Loop Route

Table 7. Scores determined for Alternative Route A.

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1Natural Scenery 2Facilities 3Health 4Safety 5Maintenance 6Shared Use Path 7Commercial Connections 8Natural Connections 9Cultural Point of Interest 10Path Type 11Accessibility 12Construction Cost

Natural Scenery

Experts: The overall score for this attribute is 5. This route provides a more scenic alternative to the current NCT route. Most of the route is located along hedgerows and does not follow the road. This provides the trail user with a better opportunity to see natural scenery, since they will be experiencing areas that cannot be viewed by a vehicle. They will also be closer to natural areas, since they are often following a tree line or traversing through a forest patch. Not only do these areas provide shade relief on a hot day, they also provide a more natural hiking environment, consistent with standards of a national scenic trail. However, the wilderness guide commented how just having scenery was not enough to bring people to a trail. He said, “I think it’s more loops in scenic areas than just scenic areas.” Because this alternative route forms a loop with the current NCT trail, a loop could be hiked within the county. This provides more options and trail users do not have to see repeated scenery. Thus, this alternative route fulfills the objectives of this user group.

Trail Users: The overall score for this attribute is 5. There is a significant amount of scenery encountered along this route. Because hikers were highly desirous of scenic routes, this
alternative route will better fulfill their objectives for a scenic route. Hikers commented in interviews that they wanted a wilderness experience in the country. A lot of trail users prefer natural settings such as routes through the woods. They noted that they would drive for that kind of experience. With this alternative route, the rural landscape of the county will be highlighted as the route follows farmland. Trail users can experience both the forest in Calhoun County and also the farmland that dominates the landscape. Because the county’s landscape is highly fragmented, trail users will be able to experience variation between forest patches and farm fields. Overall, this route allows them to see more of the rural landscape throughout the county and thus fulfills this interest group’s objective for a scenic route very well.

**Businesses/Organizations:** The overall score for this attribute is 4. Natural scenery will attract more trail users to a route, which will increase the number of people passing by businesses and organizations. This will generate more business by the number of people being exposed to the businesses. This will also increase revenue and increase the value of their property. Thus, because natural scenery is important to the number of people attracted to a trail, it is also important to businesses for attracting more people to an area.

**Facilities**

**Experts:** The overall score for this attribute is 4. Although this route does not traverse through populated areas most of the time, there are specific areas along the way that still have facilities available. It is primarily the hiker’s responsibility to provide their own supplies, as experts from the NCTA have noted in interviews. However, when designing a route, camping areas should be considered because a hiker cannot make it through the entire county in a day. NCTA experts also
commented, “We’re in a unique position of not being fully able to control the situation, but we
do try to locate campsites with nearby natural water sources.” The wilderness expert also
commented, “Yeah the burden is on the hiker; however, if they want this to be a long distance
backpacking trial, it would behoove them to find camping opportunities about every 10 miles,
whether it’s a bivouac, somebody’s property, to a three sided shelter, or a campground, or
something.” Although there are not an abundance of facilities outside Battle Creek on this route,
it does pass through three different camping sites that are spaced throughout the route. The first
is Lighthouse Village RV Resort near Homer. Then, both the Tri-Lakes Trails Campground and
the Westwinds Campground are located between Tekonsha and Marshall. These campsites have
trails, showers, laundry, and lakes located nearby. Thus, they provide good stopping points for
hikers along the route.

Trail Users: The overall score for this attribute is 3. The trail users that were interviewed had a
strong desire for facilities. Although hikers on the NCT are expected to be fairly self-sufficient,
the majority of people who want to go out for a short-distance hike would benefit from having
more facilities available. Having periodic options for facilities such as bathrooms would increase
popularity of the trail for short-distance hikers. Although the trail is built with long-distance
hikers in mind, the majority of use comes from short-distance hikers. Thus, having some periodic
facilities available for these types of hikers could promote the popularity of the trail. This is very
limited along this alternative route since it avoids cities and is largely along private land.
Although there are more options in Battle Creek, there are very limited options throughout the
rest of the county. Thus, this route is given a neutral score overall since it has some positives and
negatives for both long and short-distance hikers.
Businesses/Organizations: The overall score for this attribute is 3. This route does not provide very good access to facilities for most of the route. Because it only passes through the city of Battle Creek at the end of the route, it avoids most of the commercial areas where facilities are offered. A restaurant interviewee answering a question about whether facilities are important says, “Yes definitely, for bathroom use and for people that are on their bikes. They’ve been biking all through town, from the other end of town, so they need to use the bathroom or they want beverages or they’re hungry. And then we also have nice patio seating so they get to enjoy it a little bit to hang out and take it all in.” Even though this route avoids some of the cities, it does still have a few good sites for camping, particularly between Tekonsha and Marshall. There are also several facilities made available in Battle Creek. However, because there is a lot of private land that would be traveled across, it limits the number of facilities that can be available towards the beginning of the route. Therefore, because one of the objectives of businesses and organization is to provide facilities and contribute to the overall hiking experience, this route is given a neutral score.

Health

Experts: The overall score for this attribute is 4. Although designing a trail for the purpose of promoting health is not a primary objective of this group, it is a byproduct of an active lifestyle. One of the most important aspects to consider for promoting this is an interlinking trail system that provides different route options (Trail Planning, Design, and Development Guidelines 2007). Because this alternative route joins with the current NCT route before Battle Creek, it provides a loop option for local people. This increases the number of users who would be
interested in hiking since they do not have to look at repeated scenery. The most popular sections of trail in Michigan are located in loops. Additionally, the wilderness guide notices how places that have tons of trails, such as Boulder, CO, have people with good physical health. His philosophy was “build it and they will come.” Thus, this allows routes to be more interlinked and provides options for fitness. Although fitness is not the goal of the NCT, it can still somewhat be promoted through the county by providing another trailway option.

**Trail Users:** The overall value for this attribute is 5. Health is becoming a more important goal for people and is generally achieved on a trail if the trail is safe and convenient (*Trail Planning, Design, and Development Guidelines 2007*). This route would often have good sight lines because it follows hedgerows along farm fields much of the time. This provides trail users with the feeling of safety because they can see farther around them. Additionally, because this route creates a loop with the current NCT, there is the opportunity for local trail users to do a couple day hike within their county. Giving people more options creates more healthy opportunities. Outside of Battle Creek most trail systems are isolated, so this alternative route provides a more convenient way for both local people and long-distance hikers to enjoy the trail and experience health benefits from it.

**Businesses/Organizations:** The overall score for this attribute is 3. There were mixed opinions from this interest group about whether a trail would actually promote health. One business manager noted that when there is different scenery and more places to go, she is more apt to push herself and go a little further each time. She notes that any type of movement is getting a person healthier and a bigger place to do that will promote more health. However, another business
owner noted that she thinks it’s an attempt, which is better than nothing. However, it may not be as effective as originally thought. Thus, because this route offers a more opportunities, it can promote positive health as identified by businesses. However, because this route does not pass through many cities, it may not have as great of an impact on community health as a trail that is more convenient.

**Safety**

**Experts:** The overall score for this attribute is 4. This route is almost entirely off the road and most of the sections that do follow a road are in the city. Before arriving in Battle Creek, there is less than 1 mile of trail on the road. This offers a safer experience for the trail user by providing a route that is off the road. A land stewardship manager commented on safety saying, “Two things come to mind. One is sort of the sense of immediate safety by good sightlines, so that [hikers] can see what’s coming and where they’re going. It’s not enclosed by dense brush. They don’t like enclosed places. The other is good so they don’t feel lost.” Because this alternative route follows hedgerows most of the time, the trail user is still in the open and not always isolated, which provides good sightlines to also create a safer environment. Also having places for good signage provides information so trail users know what to expect. Overall, by keeping the trail user away from the road and along hedgerows, this attribute fulfills the expert group’s objectives for safety fairly well.

**Trail Users:** The overall score for this attribute is 5. This group talked about safety more than any other interest group during interviews and it was one of the most important attributes to them. Most often they talked about feeling safe in parking lots and on the trail, which corresponded to
good sight lines and lighting. One hiker commented about how a certain park had beautiful trails but nobody would use them because of a bad reputation. She said, “The parking lot is not welcoming and it’s also not clearly marked so you don’t know if you park in a parking lot how far you are from the trails, which would also be a safety concern for me…. I want to be able to clearly know where I’m going.” Trail users also emphasized the importance of signs. Having good information beforehand about what would be encountered along the trail was important to them. One hiker commented, “I think posting what the trail conditions are would help. Kind of like a ‘what you may encounter on this hike.’” This alternative route would allow trail users to keep good sightlines and also have parking spots in the city where there is good lighting. It also provides a route that is off the road, which would greatly increase the safety of the route. Additionally, there would be fewer conflicts between recreation types, as this path would not allow as many high impact users. This path accompanied by informative signs with maps and information would help trail users feel safe on the trail.

**Businesses/Organizations:** The overall score for this attribute is 4. Trails can easily gain a reputation of being safe or unsafe. Once a trail has a reputation of being unsafe, it is hard to reverse this reputation. The reputation of local trails also reflects on the community in that area. This route provides good sightlines for trail users because of its alignment along forest hedges and farm fields. This would give it the feeling of being safe for the trail user and contribute to a positive reputation. Overall, the promotion of a safe trail will bring more trail users to the route and also into commercial areas. Again, the only drawback is that this trail does not traverse into commercial areas as much as other routes in consideration. However, the feeling of safety can bring a greater number of trail users into the area and still impact business.
**Maintenance**

**Experts:** The overall score for this attribute is 3. This alternative route would be much harder to maintain because it follows many hedgerows and goes through forest patches. Although it provides benefits by keeping the route away from the road, it bypasses some connections with other trails in Albion and Marshall. There would be more upkeep on this alternative path and the local NCTA chapter would have to organize groups to periodically fix and clean the route. However, some positives for maintenance include the facts that the route follows two railroad corridors and a power line corridor. These are often kept up by other organizations and would decrease the amount of maintenance. Therefore, this attribute is fairly neutral overall for this interest group.

**Trail Users:** The overall score for this attribute is 4. This attribute was also considered important by trail users in interviews, as it was closely correlated to feeling safe. A well-maintained trail was often perceived as a safe trail. Because this route follows farm fields, maintaining good sight lines would be fairly easy. This route also utilizes a corridor kept by the power line company, which will be periodically mowed. Additionally, by traveling through Battle Creek and joining with the Battle Creek Linear Parkway, this route provides the good maintenance through a local trail. Additionally, having the NCTA oversee much of the maintenance of this trail would provide good maintenance through the chapter system. One hiker commented, “Sometimes I feel like more people will participate if they were aware of other people going out and doing a volunteer day too. So having that blanket organization that oversees it is important.” Because the NCTA would oversee a large portion of the trail, the local chapter could ensure that the route
was well maintained instead of relying on other organizations that may not pay as much attention to the route.

**Businesses/Organizations:** The overall score for this attribute is 3. Businesses note the maintenance of a trail will be determined by whether there is an organization or volunteers willing to take care of it. The manager of an organization noted that their organization struggles with dog walkers and dog waste. Without organizational intervention, it ends up all over the trails. However, if they provide bags for dog waste, then people leave the bags all over the trail. He commented that there are cascading consequences if a business or organization starts offering stuff for trail users, because then they have to maintain it. This alternative route does not provide many opportunities for businesses and organizations to offer options to trail users because the route does not pass through many urban areas. Thus, this diminishes the amount they would have to maintain locally and the responsibility would primarily fall on the NCTA. However, because some maintenance is still required by local areas around the trail and the maintenance of the trail directly reflects the appearance of a business, this attribute is neutral overall for this route.

**Shared Use Path**

**Experts:** The overall score for this attribute is 4. Most of this alternate path would provide a good route for foot traffic. Because a lot of it would have to be created by the NCTA, they could determine what type of users they would like to have on the trail. This fulfills the objective of the NCT to have only foot traffic most of the time. However, other types of use such as horseback riders would also be desirous of a path such as this, especially since Albion College is known for their equestrian team. Depending on the types of use allowed and who is funding, this path could
be designed for only foot traffic or could allow multiple uses. Because the NCTA desires to minimize conflicts of interest and have a footpath only, this trail could align well with their objectives. However, the desires for other local recreation users to use this alternative may be strong because of the type of its placement in the county.

**Trail Users:** The overall score for this attribute is 5. This alternative route provides the greatest amount of trail off the road. Because the dominant use would most likely be foot traffic, this would align well with the hikers’ desires to have fewer types of uses along a trail. By having fewer types of uses, they would not have to watch out for other higher impact recreation types and could enjoy the scenery more. Additionally, any trail users that have kids would have more freedom to let them explore instead of watching out for other types of recreation that could be dangerous. One hiker commented, “When you know that your kids are safe and not going to get run over by bikes, you can give them a little more space and they can explore a little more on their own where we don’t have to be helicoptering.” Paved pathways allow for faster types of recreation such as biking and jogging and can become dangerous for large groups or those with younger children. Because this route would be predominately dirt, slower recreation would be more common and there would be fewer conflicts of interest. Additionally, it would provide a non-paved option, which is not common in Calhoun County. This would attract more people because the type of recreation use is different from everything else in the county.

**Businesses/Organizations:** The overall score for this attribute is 1. Businesses and organizations desire shared use paths because they provide the opportunity for more people to come into contact with their services. A manager from Dark Horse Brewing notes when talking about
different types of trail users, “It’s a very eclectic mix of people that we get that come to our compound anyway, so it doesn’t matter to us. Its kind of what the Dark Horse is; we bring different personalities together.” Because this alternative route does not provide many options for different types of users, it does not fulfill the objectives of this group very well. It limits the type of use to those who would prefer to be on a dirt trail most of the time. Thus, the score is low for this attribute on this alternative route because of the limited use of users impacting the businesses.

**Commercial Connections**

**Experts:** The overall score for this attribute is 3. Although the NCTA is promoted as a scenic trail, it is also unique in its ability to take hikers through towns as well. The interplay between natural scenic areas and local cities makes the trail unique in the Midwest. This alternative route offers minimal interaction with local cities. However, it does pass through the largest city in the county, Battle Creek. Thus, the overall connection to commercial areas is minimal. However, this is not a strong deterrent for this interest group, so the overall score is fairly neutral regarding this attribute.

**Trail Users:** The overall score for this attribute is 3. Although some trail users enjoy having the opportunity to connect to commercial areas, others would rather not have any commercial connections. Determining the extent to which a route should connect commercial areas is largely based on the goal of the hike. Overall, fewer trail users were concerned with commercial connections. Because most of the use will come from local people, they do not need to connect to commercial areas. This was reflected in their lack of concern about commercial connections in
interviews. However, commercial connections are beneficial for long-distance hikers who need to replenish supplies and must still be considered since the NCT is designed with long-distance hikers in mind. Because this route doesn’t have good stopping points for long-distance hikers, they may not be able to find appropriate lodging and supplies. However, these connections may not be as important to short-distance hikers. Therefore, the overall score for this attribute is neutral because it provides benefits to some while drawbacks for others.

**Businesses/Organizations:** The overall score for this attribute is 2. There are not many commercial connections in this alternative route. In order for businesses and organizations to provide goods and services to trail users, the users have to come into contact with the urban community. However, there would still be some revenue generated around the villages and in campgrounds along the way. However, because the only major urban connection along this route is Battle Creek, this alternative does not fulfill the desire of this interest group to impact the hiking community.

**Natural Connections**

*Experts:* The overall score for this attribute is 4. This alternative route passes through many more natural areas than the current route. It connects different forest patches and also follows the Air Line Division Michigan Central Railroad and the Michigan Central Railroad corridors (Fig. 33). These corridors connect the route to different natural areas and also follow the St Joseph River. Water has been posed as a universally loved aspect of scenery. One expert from the NCTA commented about the NCT, “It’s an experience, I think, the variety, it’s a longer, almost ideally backcountry experience and stuff like that. And that’s just not what the paved pathways offer.
And then most of your, like the Ott Biological Preserve, or any of the piece of land with a trail on them, even though it’s a foot trail, it’s still a limited short distance experience. So we’re striving for a little bit longer experience, like a backpacking trail.” This alternative route would fulfill this vision well for a longer distance footpath through the county. It provides variation and reduces the amount of pavement the trail user would be on. Although the route does not connect to major natural areas that are already established by other organizations, the connections between different forest patches would provide a natural scenic experience for the trail user.

![Figure 33. Old corridor of the Air Line Division MI Central Railroad. Photo taken February 16, 2018.](image)

**Trail Users:** The overall score for this attribute is 4. Most of the trail is a natural, rural hiking experience. By passing through Tekonsha and Battle Creek there are a few urban connections, but the majority of the route passes between different forest patches. This provides a good
amount of rural scenery for the trail user with a little bit of variation in the urban areas. Because trail users tend to like variation and options for hiking, this route allows them to have a more wilderness experience without being completely devoid of urban areas through the whole county. This provides another unique hiking option in the county.

**Businesses/Organizations:** The overall score for this attribute is 3. The connection of natural areas is not a predominant objective of this interest group. They are more concerned with commercial connections that generate business than they are with natural connections, because most often connecting natural areas involves a bypass of commercial areas. This is the case of this alternative route, as the path traverses through rural areas and bypasses the cities. However, this route still goes through Battle Creek and connects natural areas near the city, such as the Historic Bridge Park and the Ott Biological Preserve. Because this attribute is not a primary objective of this interest group, it is given a neutral score overall.

**Cultural Points of Interest**

**Experts:** The overall score for this attribute is 5. This route provides many cultural opportunities for the trail user along the way. As the user follows the old Air Line Division Central Michigan Railroad corridor, they are also following an even older Native American trail (Fig. 34 & 35). This brings historical significance to that section of the route. Then in the village of Tekonsha, there are Native American mounds, a village, and a burying ground that have been identified (Fig. 35). Additionally, by still connecting to the NCT before Battle Creek, the trail user is able to experience historic features within the city of Battle Creek. They can still travel through the
Historic Bridge Park and experience the museums and monuments in the city. Therefore, this route fulfills the objective of the experts to highlight cultural points of interest along the route.

Figure 34. Map of Calhoun County showing the Air Line Division MI Central RR. (Walling 1873).
Figure 35. Archeological map based on Native American trails and artifacts. (Hinsdale 1931).

Trail Users: The overall score for this attribute is 4. By providing different points of interest along the route, the trail user can learn about the history of the area and significant events that took place. This creates an experience for the trail user. They can be educated in a natural setting and create memories about the places they encounter. The experience had while hiking is what keeps hikers coming back to a trail. If an area has a significant memory or is a historical point of interest, it captures the attention of those passing by. A boring route can become a place of intrigue based on how it is packaged and presented to the hiker. Knowing historical significant can make a route much more interesting. Because this route follows the Air Line Division Central Michigan Railroad corridor, an old Native American trail, and passes by historical markers near Battle Creek, it provides opportunities for trail users to appreciate the area. These
points of interest are spread throughout the county as well, so there are points of interest to look forward to throughout the route.

**Businesses/Organizations:** The overall score for this attribute is 3. Businesses and organizations have the opportunity to promote the history of an area and tell trail users about it. The manager of Clara’s on the River notes, “People see our long building and our big huge building with the clock towers and they want to check it out and it’s different. You know, we have a 17 page long menu, so that also helps us a lot too. So we have the cool building, the cool menu, all different things, all different cultures come in for our menu, so definitely I would say that it helps.” People often take interest in a place that looks interesting or different. Trail users are much more likely to stop by a place if the route takes them by it and it looks unique. Because a lot of the unique places in the county are around Battle Creek, this route still allows trail users to experience some fascinating cultural points of interest. However, because it bypasses some cultural areas in exchange for rural scenery, it does not provide opportunities to experience historical and cultural features the entire time. Thus, the overall score for this route is neutral.

**Path Type**

**Experts:** The overall score for this attribute is 5. This interest group would ideally have a small footpath constructed for the NCT. It is easier to manage and minimizes different types of use. This alternative route would be largely a dirt footpath. There is already a lot of paved pathway in Calhoun County, so this alternative provides people with the opportunity to get on a dirt path. The wilderness guide noticed, “You get people who don’t want to hike paved trails. They want tread, and vice versa. So having different options, loops, surfaces, will attract a wider audience.
If you just had a paved, 6-foot-wide trail, that’s probably going to eliminate a lot of your trail hikers, because they don’t want to hike on pavement.” Thus, this alternative route creates a more wilderness experience compared to the city feeling created by paved paths. It also minimizes the amount of shared use traffic on the trail and provides variation for trail users. Therefore, the objectives of this group are fulfilled by this attribute along this route.

**Trail Users:** The overall score for this attribute is 4. Trail users like to have different options available for different hiking experiences. This alternative route would provide a more wilderness experience than other routes currently constructed in Calhoun County. Most of the trails in the county are currently paved. Because this route would be mostly dirt trail, it would provide variation for the trail user. Although people feel comfortable on different types of tread and not every trail user would enjoy this path type, this route would fill a void in the current trail types in the county.

**Businesses/Organizations:** The overall score for this attribute is 2. This interest group noted that having different path types is beneficial because people prefer different things. A museum director presumed that paved paths would be safer in the city. More people can be on the path when it is paved and it can be ensured that the terrain is stable. Most often, a paved trail will allow the most traffic to go through an area since it provides tread for a variety of different recreation types. However, this interest group was less concerned about the type of path than the amount of users that would be able to travel on it. More users meant more business for them. Because the path type of this alternative route would be primarily dirt trail, this does not provide
options for a wide variety of users. Thus, it does not fulfill their objective to accommodate for lots of different recreation types very well.

Accessibility

Experts: The overall score for this attribute is 3. In order to establish most of this route, there will need to be a lot of accessibility granted by individual landowners. The communication between landowners/farmers and organizations can sometimes be difficult. The experts at the NCT commented on how the best path for a route may be in a different place than the actual path constructed based on who gives them access. Although the route stays along the edges of fields and property lines, there are numerous people from whom the experts would have to gain permission from in order to create this route. However, despite these difficulties, this route would follow a number of property parcels that are vacant. There are several vacant property parcels due to the amount of farmland in the area. Although permission would still need to be gained from landowners, the landowners may be more willing to support the development of a trail on vacant land.

Trail Users: The overall score for this attribute is 3. Trail users emphasized the desire for good accessibility to a variety of trails. They like options. One hiker noted, “there has to be a good mix of trails that are accessible to new hikers and those who are really hikers.” This alternative route provides another unique option compared to trails that are currently in Calhoun County. This route would be a more scenic and rural experience compared to the parks and paved pathways that currently exist. However, trail users also mentioned accessibility in relation to parking lots. A large part of accessibility for them involved the construction and placement of lit parking lots.
that are maintained. Local people are less likely to seek out a trail that has hidden access points. Having clearly marked and maintained access points were attractive to trail users. This alternate route does not really have good areas to create access points. Most of the access points could be located within the village of Tekonsha or the city of Battle Creek. However, once the trail user is on the route in the rural farmland country, there are not many spots for access points because a large amount of the land is private and landowners would not be open to construction. Therefore, there is a neutral score given overall because of both positive and negative aspects of this route for accessibility.

**Businesses/Organizations:** The overall score for this attribute is 2. This interest group is concerned with the number of people that will be able to experience the trail. If there are not large accessibility points that are convenient for people, they will not attract as many people. Because this alternative route is predominately through private land, there will not be large access points for people to park and hike. This will diminish the number of users based on the convenience of parking and hiking. However, because better accessibility points will be in the city, this is helpful for businesses. Overall, though, there is limited accessibility due to the location of the trail on private land.

**Construction Cost**

**Experts:** The overall score for this attribute is 2. By following the railroad and power line corridors, some cost is minimized. Trees do not need to be cleared and the railroad corridors already have a ground base established from building the rail line. However, in the areas that are not established, there will need to be a significant amount of trail constructed. Because this route
connects several forest patches and it does not join with existing trailway systems until Battle Creek, there is a large amount of new trail that will need to be laid. Therefore, the cost of constructing a large portion of new trail is a significant factor to consider for this alternative route.

**Trail Users:** The overall score for this attribute is 4. This is not a high priority objective of this group. They are more concerned with the results of the built trail than they are with the actual construction cost. Because the construction cost does not impact them directly, they do not consider it as highly as other factors. Once the trail is constructed, they are more concerned with the layout, design, and maintenance of the trail then what it cost to build. Thus, because this interest group does not consider this a very important objective to consider, the score is fairly high because this route mostly fulfills their objectives for this attribute.

**Businesses/Organizations:** The overall score for this attribute is 5. The construction cost of the trail is not a primary objective of this interest group unless the cost impacts them. Because this alternative route is primarily on private land, the cost will not impact the local businesses and organizations. In Battle Creek, this route joins the Battle Creek Linear Parkway, which is an already established trail. This also minimizes cost that could have an impact on this interest group. Thus, although this is not a primary objective of this interest group, this alternative route fulfills their desire to not have additional costs.
Scores for Alternative Route B – Urban Bypass Route

Table 8. Scores determined for Alternative Route B.

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¹Natural Scenery ²Facilities ³Health ⁴Safety ⁵Maintenance ⁶Shared Use Path ⁷Commercial Connections ⁸Natural Connections ⁹Cultural Point of Interest ¹⁰Path Type ¹¹Accessibility ¹²Construction Cost

Natural Scenery

Experts: The overall score for this attribute is 5. Rivers have been noticed as a positive landscape feature that seems to be universally loved by all people. The experts at the NCTA all commented that they tend to design trails to follow rivers. This alternative route follows sections of the St. Joseph River near Tekonsha and also follows Pine Creek near the Huron Potawatomi Reservation in Athens. It also passes Union Lake in Union City. Additionally, this route takes trail users through several forest patches and rural farmland that provide a good view of the scenery in Calhoun County. Thus, considering the landscape that is present throughout the county, this route gives a good mixture of farmland, river, and forest scenery. This fulfills the desire of this interest group to provide a different mixture of scenery throughout the county to represent the different types of scenery present to the long distance hiker.

Trial Users: The overall score for this attribute is 4. This alternative route provides good scenery for trail users by giving a variety of different scenic viewpoints. It provides variation so that trail users can see different land cover types that exist in the county. However, these different scenery sections are spaced throughout the county and a trail user going out for the day will not
experience all the different variations in land cover. Particularly while following the Air Line Division Michigan Central Railroad corridor, the trail user stays on the old railroad corridor for just over 14 miles. This is a long time to walk in one direction. More variation is found as the trail user moves north, which provides a more interesting hiking experience. Overall, there is a good amount of natural scenery. However, the lack of directional change in some areas may make sections of this route less interesting to trail users.

**Businesses/Organizations:** The overall score for this attribute is 4. This is not a major objective to this interest group. However, the surrounding natural scenery may bring in more trail users to the urban areas and generate more business. Because the commercial areas are mostly in villages for this route, trail users traverse through smaller urban centers. There are scenic areas around many of the businesses, so this alternative route has the ability to bring trail users to urban areas after a hike. Because of this, the scenic areas are often closer to the commercial centers than they would be for a city. However, the types of scenery surrounding the villages may not be the most appealing for a day hiker, so it might not impact businesses as much as desired. Overall, though, there is potential for trail users to generate business within the villages.

**Facilities**

**Experts:** The overall score for this attribute is 2. Experts have noted that the burden falls on the hiker for figure out their own needs for facilities. However, there are many different types of skill levels that will travel on a trail. The wilderness guide commented, “You get this huge continuum of hikers. You get people like me who go into a wilderness area and dig a hole in the ground and others that got to have a heated toilet seat.” This makes the planning process difficult
because experts cannot please every skill level. The land stewardship manager commented how his organization does not often provide many facilities because they do not have the capacity to keep them up. Thus, their own resources limit them. Because the NCTA cannot maintain facilities throughout the trail, they are also limited in how many facilities can be made available. However, the presence of lodging opportunities is still important to have available for the hiker along a route. For this route, there are limited opportunities for hikers to use facilities along the route. The villages are very small and do not offer many lodging opportunities. Tekonsha and Athens do not offer any lodging opportunities and the village of Union City only has two options. There is also only one campground in Athens, the Village Campground. Thus, this route is limited by the availability of lodging options.

**Trail Users:** The overall score for this attribute is 2. Although the route goes through three villages, there are a limited number of places to stop along the way. There are few lodging opportunities for the long-distance hiker along the way. Although this would not impact the short-distance hiker as much, there are not many other facility options for the short-distance hiker either (Fig. 36 & 37). However, the route does pass through the west side of Battle Creek so there are still some available facilities near Battle Creek. Overall, though, the major source of facilities exists within Battle Creek, so many facilities are still missed by not traveling directly through the city. A long distance hiker could still take a detour into the city for the day if desired, but it would be out of the way. Thus, this route does not provide many options for facilities throughout the county.
Figure 36. Downtown Tekonsha, MI. Photo taken February 16, 2018.

Figure 37. Downtown Athens, MI. Photo taken on February 16, 2018.
**Businesses/Organizations:** The overall score for this attribute is 3. There are four villages that would be impacted by this route. Also, trail users going through the outskirts of Battle Creek would also encounter some areas around the city. This provides the NCT route to impact a wider span of semi-urban areas. By traveling through smaller villages, trail users could make more of an impact on local businesses. Thus, the hiking community has the opportunity to be built more in these smaller areas and there could be more support for trail users in the form of facilities. By traveling through different villages, facilities can be offered to trail users along the way. Camper Village is also located near Athens and could provide lodging. However, the drawback to going through the villages is that, because they are small, their facilities are more limited than those found in cities. There are fewer businesses for the hiking community to impact because there are not as many facilities available.

**Health**

**Experts:** The overall score for this attribute is 3. Experts have commented on how a person’s health can be improved through walking on a trail. Those at the NCTA promoted a strategy called “Hike 100” to help people get outside and log distance to hike up to 100 total miles. They commented:

> It’s what we saw with the Hike 100, that just because it’s a long distance trail we rarely even promote it as a long distance trail anymore. We promote it as local use. And you saw a lot of people in the Hike 100 doing a mile at a time and people telling us stories like “I was out of breath after walking 10 steps the first hike and then by the end of summer I did my first backpacking trip.”
Therefore, trails have been seen as a way to promote the physical fitness and activity of people. However, the areas where this alternative route travels will not always be appealing to local people. Some sections of the route are flat and straight. However, there are other sections that provide more interesting scenery, especially near the Huron Potawatomi Reservation. Thus, this route is given a neutral score overall.

**Trail Users:** The overall score for this attribute is 4. Trail users often linked health with safety. They were more willing to go out on a trail for health purposes if they knew other people would be out there too. This route has contact with other businesses and organizations along the way, which increases the feeling of safety and therefore would also increase the confidence of people to get outside. Also, because the route only travels through villages, people in the villages are closer to the path that takes them into more wilderness areas. This creates a more convenient environment to go hiking on a trail.

**Businesses/Organizations:** The overall score for this attribute is 3. Because this route goes through more villages than cities, it could have more impact on the people in these villages. The trail would gain more popularity because there is not as much in the village. This would create more awareness and interest in the trail. However, there would also be fewer people around to use the trail because it would be far away from populated areas. Thus, it would not be drawing as many people from the areas that have the most people. Because there are both positive health benefits to the smaller local community while also negatives for the overall number of people being reached, the score for this attribute is neutral.
Safety

Experts: The overall score for this attribute is 4. A wilderness guide commented about safety questions he gets, saying, “downstate here it’s probably cars being broken into and people safety. But you’ll find, the research shows that trails are some of the safest places you’ll use. There are other people on them and things like that.” Especially when there is a decent amount of traffic on a trail, there will be increased safety. This alternative route overall would have good safety measures in effect. The route passes through some areas managed by businesses, such as the Morse Nursery, Squirrel Hollow Golf Course, and the Huron Potawatomi Reservation. These organizations and businesses would keep watch on their property. Also, through the city there are often sidewalks for hikers to walk on. The only safety concerns with this route are a few areas where the hiker has to be on the road and cross over a few busy roads.

Trail Users: The overall score for this attribute is 4. Trail users commented on how they feel safer when more people are on a trail. Having more people around or being with someone who had been on the trail before made them feel safer and want to get out on the trail more. Because this route goes through some areas that are managed by businesses and organizations, these entities will keep the area more maintained and keep a watch on their property. This will make trail users feel safer when going through some of the areas. However, there are a few areas where the user must still walk on the road and cross a few intersections. This decreases the overall safety a little bit. Despite this, the overall safety would be fairly good for this route.

Businesses/Organizations: The overall score for this attribute is 4. Businesses can help provide safety as established organizations along the route. There are some businesses that will be
impacted within the villages and the outskirts of Battle Creek. There are also a few businesses along the route, such as the Morse Nursery and the Squirrel Hollow Golf Course. This provides the opportunity for relationships could be made with businesses both within and outside the villages. When this happens, more people are involved in maintaining and keeping an eye on the trail. As the route gains popularity, more people will also travel on it, making people feel safer. Thus, by having period businesses along the trail and also keeping the trail maintained through good access points, hikers will feel safer on the trail. The only drawback is a few sections on the road that also involve crossing intersections and roads. However, these are fairly limited and often near the city. Thus, this fulfills the desires of this interest group fairly well.

**Maintenance**

**Experts:** The overall score for this attribute is 4. The experts at the NCTA primarily look at maintenance in terms of whether volunteers can easily access the trail to maintain it on a trail workday. This alternative route would be easily accessible for volunteers to maintain through the chapter system. There would also be additional help from other businesses and organizations along the route that may own adjacent property. Thus, the chapter system would be able to upkeep the trail fairly well. The only uncertainty would be how much the volunteers could keep up throughout the entire county and getting access on private property. Because this route would have to built from the ground up and does not share with other county trails for most of the route, there would be a lot of upkeep introduced to the chapter that takes care of this county.

**Trail Users:** The overall score for this attribute is 5. Sections of this trail would have maintenance overseen by other businesses and organizations. Additionally, it would not be hard
for local hikers to volunteer to care for sections of this route. Hikers thought that having an organization oversee maintenance would be the best way to care for a trail. Because the local NCTA chapter would organize workdays, they act as the overseeing organization. This provides some structure for the trail to stay maintained. Because the route does not have areas that are hard to access, it would be relatively easy for trail users to volunteer as well. Thus, this attribute fulfills the objectives of this interest group very well.

**Businesses/Organizations:** The overall score for this attribute is 4. This interest group is not overly concerned with the trail itself; rather, it is how the trail impacts their business and makes them look. Because a well-maintained trail brings in more trail users and promotes community development, businesses are more interested in promoting positive community development. Since the NCTA has the chapter system that organizes volunteers for workdays, the trail stays fairly well maintained. Because this alternative route does not have sections that would be very hard to access, more people can volunteer for short periods of time and still contribute to maintaining the trail. By having a volunteer base, businesses can be more confident that the trail will be maintained around them.

**Shared Use Path**

**Experts:** The overall score for this route is 5. Because a lot of this route would have to be built by the NCTA, they could determine the path type. Thus, they could make a lot of the trail a footpath-only route. Additionally, because the route is adjacent to a golf course and garden nursery, they would most likely desire to have minimal impact on their property. This would make a footpath-only route more desirable to these types of businesses instead of allowing more
high-impact recreation types. Because there are not any other established county trails through the villages, there would not be a excessive amount of other recreations types either. Therefore, this route would fulfill the NCTA’s desire to have a footpath-only route very well.

**Trail Users:** The overall score for this attribute is 4. Trail users did not have a huge preference on types of use, as long as the recreation types were not high impact and threatening to their hiking experience. Leisurely bikers and joggers were not a major concern. Fast bikers and more high impact recreation types were not preferred because then the hiker had to be more aware and on guard of surrounding recreation types instead of enjoying the scenery. However, they also noted that having signs stating the rules of an area or what to expect are always helpful. Then they are not caught off guard. Because this route would be mostly developed off road, high impact recreation types would not be as common. A few sections are along the road, which means this route would not be conducive for horseback riders, and the lack of pavement would eliminate speed bikers. Because this route would provide an alternative to some of the paved routes in the northern part of the county, this route fulfills the trail users’ objectives fairly well to have a route that minimizes high-impact recreation.

**Businesses/Organizations:** The overall score for this attribute is 1. Businesses desired to have more people on the trail so that they could offer goods and services to more people. Because a lot of this trail would have to be developed by the NCTA, a lot of it would be foot traffic only. This would limit the types of use allowed and the overall number of people that would be present on the trail. Because there would not be many different recreation types allowed on this route, it
does not fulfill the desires of this interest group to have many different types of recreation present.

**Commercial Connections**

**Experts:** The overall score for this attribute is 4. The NCT was designed to take hikers into both wilderness areas and downtown areas. This alternate route does a good job of alternating rural areas with urban areas. The hiker is able to experience both of these throughout the county. The only drawback to this route is that the urban downtown areas are villages that do not always offer many facilities and experiences for the hiker. However, there are several villages that are visited and there are still some significant attractions mostly related to cultural activity within the county. Additionally, the villages that are incorporated in the route are known to be fairly positive towards trails and recreation. Therefore, overall this route fulfills this interest group’s objectives related to this attribute fairly well.

**Trail Users:** The overall score for this attribute is 4. This route comes in contact with four villages and the largest city in the county. These are spaced throughout the route so that the trail user can have a good mixture of rural and urban experiences. However, the villages are very small so there are limited advantages to making these connections. Additionally, the route does not travel through Battle Creek, which is a major re-supply area and has interesting cultural features. It passes on the outskirts of the city so some connections are still made, but they are more limited as well. Overall, though, there is good spacing between the urban and rural sections of the route. There are also unique business connections along this route, such as the Critchlow Alligator Sanctuary in Athens. Business connections could also be made as the route passes
alongside the Morse Nursery and Squirrel Hollow Golf Course. Thus, overall this attribute still fulfills this interest group’s objectives fairly well.

**Businesses/Organizations:** The overall score for this attribute is 2. There are some commercial connections along this route as it passes through three villages and the outskirts of Battle Creek. It also has a few businesses located along the route outside of the villages, such as the Morse Nursery and the Squirrel Hollow Golf Course. A museum organizational leader commented how having businesses along the route could promote the trail itself. However, because this route bypasses all the major cities, there are fewer commercial connections than the current NCT route. There are also limited connections that would be made in the villages. Because the villages are so small, they do not offer many services that would be useful to trail users. Because businesses would prefer the trail to go through the most urban areas to generate more business, this route only partially fulfills their objectives. It still goes through the villages, but misses the major urban areas.

**Natural Connections**

**Experts:** The overall score for this attribute is 3. There are not many specific natural connections in this route. However, the major one that exists is the connection to the Huron Potawatomi Reservation, which would provide a more wilderness experience for the trail user. The user would also have the opportunity to connect to the Woodland Park and Nature Preserve shortly after joining the Battle Creek Linear Parkway if they desired. These provide good opportunities for relationships when planning because these types of organizations are usually supportive of trails. However, besides these places, most natural connections would be between forest patches
on private land. Thus, there are not many natural connections along the route that are to established natural areas. Most of the natural areas that the route connects to are on private land. Thus, when planning, this makes it difficult to keep the trail user’s interest because there are not many destination points. The connections become less interesting to the trail user because they will start to see the same types of scenery over and over again of farmland and forest patches. Therefore, this route is given a neutral score because it offers the opportunity for some positive relationships while also being limited in the number of available natural areas.

**Trail Users:** The overall score for this attribute is 4. There are some good natural connections made throughout this route by providing trail users the opportunity to see the rural farmland in the county. The majority of natural connections are between forest patches on private land. The only major connection to an established natural area is the Huron Potawatomi Reservation. Thus, there are not many natural connections along the route that are to established organizations. However, this was not a major concern of this interest group. They commented that they like a mix of natural and urban areas. This gives variety and allows them to have more options when deciding to go for a hike. Because they were not as concerned with connecting different natural areas, this attribute somewhat fulfills this interest group’s objectives for a route.

**Businesses/Organizations:** The overall score for this attribute is 4. This is not a primary objective for this group, because it does not have a direct impact on them. They are more concerned with urban connections than natural connections. However, because people are often more interested in hiking through natural areas, this group will still be interested in having natural areas along the route so that more trail users will be present along the trail. Although there are not many
established natural areas along the route, there are still connections between forest patches.
Additionally, the Woodland Park and Nature Preserve is near this route just outside Battle Creek,
at which trail users could stop off if they desired. Because this route has natural areas along the
route and this mostly fulfills the objectives of this interest group.

*Cultural Points of Interest*

*Experts:* The overall score for this attribute is 4. This route has cultural influences present
throughout the route. An expert at the NCTA commented, “I like the word ‘positive control
points,’ and those include waterfalls and grist hills and archeological sites. It’s just a point of
interest.” These positive control points make the route more interesting. This can also be
accompanied by the idea of storytelling along a route. The land stewardship manager told how,
“you’re telling a story about this landscape – not it’s interesting. It’s like, ‘oh, this isn’t just a flat
field.’ All of a sudden you can see the working landscape and the history.” Once people see that
the land has a story to tell, the route becomes much more interesting. The wilderness guide
commented how people become more interested in a trail based on how it’s packaged and
presented to them. This is also related to storytelling. The idea of storytelling and story making
creates a positive experience on a trail. Because this route encounters different historical
features, it becomes easier to tell trail users about the story of the land and promote the route as a
way to tell and create stories. Specifically, this route promotes the stories of the Native American
people, as trail users can see the location of mounds, burying grounds, and an old village near
Tekonsha. They will also enter land owned by the Huron Potawatomi Native Americans near
Athens, where there is a Native American community. Also, the old Air Line Division Michigan
Central Railroad used to be a Native American trail, so the use of this land would be established
once again. Thus, this aligns with the experts’ desire to incorporate positive control points in the form of cultural points of interest and help tell the story of the land.

**Trail Users:** The overall score for this attribute is 4. This route offers many types of cultural points of interest for the trail user. The cultural emphasis of this route is the Native American culture. The trail user would travel along an old Native American route and could also visit mounds, burying grounds, and an old village near Tekonsha. Additionally, they would travel through land owned by the Huron Potawatomi Native Americans. They could also visit a Native owned store called Bkedé O Mshiké and purchase native gifts. Besides the Native American points of interest, there are also different points of interest that would enhance the trail user’s experience. These would include also following the Air Line Division Michigan Central Railroad and visiting unique places such as the Critchlow Alligator Sanctuary. Thus, this route fulfills the objectives of this interest group well.

**Businesses/Organizations:** This overall score for this attribute is 3. There are a few different cultural points of interest along this route, mostly related to Native American history. Most of these historical points of interest are located near the villages. The Native American burial grounds, village, mounds, and reservation are all situated around the county villages. Additionally, the Bkedé O Mshiké Native American Store could receive increased business. Also, the old Native American trail, which became the Air Line Division Michigan Central Railroad, takes trail users through the village of Tekonsha to the village of Union City. However, the villages do not promote these cultural points of interest very much. Although there are sections with cultural significance, there would need to be a decent amount of signage or
direction given to the trail user in order for them to realize the culturally significant features around them.

Path Type

Experts: The overall score for this attribute is 4. This group desires to predominately have dirt path along the NCT to create a wilderness experience and not be intrusive to the surrounding area. Because the NCTA would have to create most of the trail for this route, they could design it the way they would like. Also, because they are not connecting with other county trailways for most the route, they do not have to accommodate the path desires of other recreation types. Thus, even in the villages, they would not have to create wide paths for different recreation types. Some of the route would be on sidewalks that are already an established width. The only drawback would be a few sections along the road that would not be desirable. Overall, the path type would be determined by the NCTA, though, so they could create the path type they would like most of the time.

Trail Users: The overall score for this attribute is 4. Trail users commented how they like having variety. More options will bring more people. However, this was not a large concern for them overall. Some felt safer on pavement while others enjoyed the wilderness experience and wanted to have more of that in Southern Michigan. Because most of the other trails are paved in Calhoun County, having a route that is mostly dirt path would be a good variety for people who desire a more wilderness experience. Thus, this route fulfills the desires of this interest group fairly well.
**Businesses/Organizations:** The overall score for this attribute is 2. This interest group desires to have as many recreation types as possible along the route because it provides opportunities for more people and thus generates more business for them. Because this route would be predominately foot traffic, it would not provide as many opportunities for people as the current NCT route. Additionally, the sections of the trail that travel through the villages are often on current sidewalks. Because sidewalks are relatively narrow and not designed for lots of recreation, there would not be a large variety of users on this route. Although there are a few sections that would allow for some bikes, the route overall does not provide opportunities for many types of use. Thus, it does not fulfill the desires of this group very well.

**Accessibility**

**Experts:** The overall score for this attribute is 3. A lot of this trail is located on private property, so access would have to be granted by landowners. This often limits access because landowners are not always cooperative. However, there are also some sections that are not on private land that could increase the probability of the route being established. Some businesses such as the Morse Nursery and the Squirrel Hollow Golf Course could be negotiated with more easily, since they could be promoting community health and do not have residence on their land. Additionally, the Native Americans associated with the Huron Potawatomi Reservation are generally supportive of recreation and a good relationship could be established with them. Additionally, because a decent amount of the trail follows the Air Line Division Michigan Central Railroad, this corridor is a separate parcel that has the potential to be made into a trail. Thus, because there is a mix of businesses/organizations and private land that the route traverses, this attribute is given a neutral score.
Trail Users: The overall score for this attribute is 4. Trail users identified accessibility as trails that have good parking lots at the trailhead. The condition and size of the parking lot were good determinants of how many people were going to enjoy the trail. One hiker commented, “for me, access in more of a place that’s people friendly, or more people around, is better.” Having parking lots in good condition made the trail feel more safe and inviting. Without good spots to park, local hikers are not as likely to use the trail. This alternative route has potential for some good parking spots, especially around the villages. There could be good access sites for hikers to begin hiking the trails in the villages. Also, there could be an access site at the Huron Potawatomi Reservation.

Businesses/Organizations: The overall score for this attribute is 3. Some predominant points of accessibility would be in the villages. However, because the villages are so small, there are not many developed parking lots that could be used to park cars for hiking. These would still have to be developed near the businesses. However, once some accessibility points were established, there would be good access to the trail from areas near the villages. Also, if the Huron Potawatomi Reservation helped develop an access point on their site, this would be near the village of Athens. Although the accessibility sites would have to be constructed and they would not provide access to all types of recreational users, there are still some potential spots that would be near the villages.

Construction Cost

Experts: The overall score for this is 3. A lot of this trail would have to be constructed by the
NCTA. It joins with the Battle Creek Linear Parkway at the end of the route, but besides this the route would have to be built entirely new. A solid base for this route may be found along the old railroad corridor, as the railroad would already have good ground for the construction of a trail. However, outside of the villages, the trail would have to be built everywhere else. Because there are both positives and negatives to building a trail along this route, this attribute is given a neutral score for this interest group.

**Trail Users:** The overall score for this attribute is 5. This was not a primary objective of this interest group, mainly because they were not affected by the cost of the trail. Because they would not be paying for the construction of the trail, this attribute is not as high of a consideration for them. However, they may be able to contribute to lowering the construction cost by volunteering time and effort to help build the trail. Because this route encounters some businesses and organizations along the way, more support could be gained. Additionally, since accessibility is fairly good for this route, more people could help build the trail on a workday. Overall, trail users do not consider this attribute very heavily and this route would fulfill their group’s objectives.

**Businesses/Organizations:** The overall score for this attribute is 4. The construction cost of the trail will not have a large impact on local businesses and organizations. They will receive benefit from having the trail constructed near them, but the actual cost and maintenance of the trail would be provided through other means. However, some organizations such as the Huron Potawatomi Reservation, may wish to contribute to the trail’s construction. If the trail goes through any business or organizational property, they may provide more resources or support. This may take extra effort on their part, but they would also receive rewards from the trail’s
construction. Overall, this interest group will not be largely impacted by the construction cost of the trail, so this fulfills their objectives fairly well.

**Weighted scores**

Table 9. Weighted scores for the expert interest group.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Weight</th>
<th>Route A - Loop</th>
<th>Route B - Urban Bypass</th>
<th>Current NCT Route</th>
</tr>
</thead>
<tbody>
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<td>3</td>
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</tr>
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Table 10. Weighted scores for the trail user interest group.

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<th>Route B - Urban Bypass</th>
<th>Current NCT Route</th>
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<tr>
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<td>Maintenance</td>
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<td>Construction Cost</td>
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<tr>
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<td><strong>93.5</strong></td>
<td><strong>78.6</strong></td>
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Table 11. Weighted scores for the business/organization interest group.

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<th>Criteria</th>
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<th>Route B - Urban Bypass</th>
<th>Current NCT Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Scenery</td>
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<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Facilities</td>
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<tr>
<td>Health</td>
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<tr>
<td>Safety</td>
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<td>Shared-use Path</td>
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<td><strong>Weighted Scores</strong></td>
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<td><strong>73.3</strong></td>
<td><strong>79.0</strong></td>
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The route that best suits the objectives of the business/organization interest group is the current NCT route, with a weighted score of 105.1 (Table 11). The route that best suits the objectives of the trail user interest group is the Loop Route (Alternative Route A), with a weighted score of 97.6 (Table 10). The route that best suits the objectives of the expert interest group is also the Loop Route, with a weighted score of 84.9 (Table 9). The Urban Bypass Route (Alternative Route B) also had a very close weighted score of 83.2.
CHAPTER VI

DISCUSSION AND CONCLUSION

Discussion of results

Based on the weighted scoring method, the Loop Route (Route A) was found to be the best choice for the NCT through Calhoun County, MI. This route had the highest scores for both the expert and trail user interest groups, with scores of 84.9 and 97.6. The current NCT route received the lowest score for both of these groups. This is due to the fact that these interest groups highly valued natural scenery and safety, which are jeopardized in the current route due to the sections of route along the road. Overall, the expert interest group tended to weight attributes lower than the other two groups, but they weighted natural scenery the highest out of the other groups, giving it a value of 3.4. Thus, a change in the score for this attribute had a significant impact on the overall weighted score for that route. If the current route were given the same score for natural scenery as the other two routes, then the overall weighted score would also be around the same value as the other routes (N=83.5). Because natural scenery was such an important attribute to this group, the lack of natural scenery along the road walks had a great impact on the overall lower score of the current NCT route.

When considering the final scores for the expert interest group, the alternative routes have similar scores. The Loop Route score was 84.9 while the Urban Bypass Route score was 83.2. Although the Loop Route was considered the better option, it only won by a small margin. Because of this, changing the score of one attribute has the potential to change the outcome regarding which route is preferred. If a score was to be changed on an attribute with a higher weight, the Urban Bypass Route could receive an overall weighted score higher than the Loop
Route. Because of these close margins, the Urban Bypass Route should not be ruled out as a poor option.

The current NCT route is clearly the best option for the business/organization interest group with a value of 105.1. Because that route travels through three cities in Calhoun County, it provides the most access to businesses and the greatest opportunity for trail users to generate revenue in the local area. Additionally, it provides hikers with ample opportunities for access to facilities such as lodging. There are several inns, bed and breakfasts, and hotels located in the cities. The cities also have the greatest number of cultural points of interest, which are often museums or monuments throughout Calhoun County. Thus, the trail user has more opportunities to learn about the history of the area and these things become positive control points along the route.

The greatest variation between weighted scores occurs in the trail user interest group. The Loop Route is clearly preferred over the other two routes. This is largely due to the fact that the Loop Route would be the most scenic while hiking, has a decent number of facilities required for long distance hiking, and would be the safest route overall. Almost the entire route is off the road, which increases safety. Also, the path would have to be almost completely built by the NCTA, which means that they could determine which types of recreation types they would prefer on the trail. This could minimize high impact recreation and conflicts of interest between hikers and other user groups. This would also increase safety by allowing hikers to have clearly defined use on the path. Additionally, because this route is almost completely off the road, scenery is increased overall. The trail users would be able to see different parts of the land not visible in a vehicle. Finally, there are good places for lodging along this route. There is a campground located just outside Homer, two placed between Tekonsha and Marshall, and then
many options for accommodations in Battle Creek. Thus, the placement of lodging options throughout this route gives a definite advantage over the Urban Bypass Route.

Overall, how participants weighted the different attributes had a significant impact on the overall scores for the routes. The most sensitive attribute was natural scenery, meaning that changes in scores for this attribute affected the overall weighted score the most significantly. This is because participants from all three interest groups rated natural scenery as the most important attribute to consider when planning a trail. Thus, because some weighted scores had similar values, slight changes in the score values could have a big impact on the outcome of the weighted score. Also, participants considered safety as another one of the most important attributes to consider. The reputation of a trail is important in determining the number of people that will hike on it. Many people will feel safe hiking on a trail with a good reputation. However, a good reputation takes time to build and a bad reputation gain be gained in a moment. Therefore, the success of a trail is often influenced by its overall reputation of safety.

**Recommendations**

Despite the higher scores for the Loop Route, I am inclined to say that the current NCT route is still the best route for the trail overall and should remain the main route for the trail through Calhoun County. Calhoun County is predominately rural farmland with a few cities located throughout it. Although the rural farmland is scenic, it can also become monotonous if there is no variation. Having a spatially diverse trail through the continuous farmland landscape is vital to ensuring a mentally and physically engaging hiking experience. This involves the incorporation of detailed and intimate space along with expansive and open space (Trail Planning, Design, and Development Guidelines 2007). By incorporating the trail route through
the cities of Albion, Marshall, and Battle Creek, positive variation in the trail route can be obtained. These urban areas can become destination points for the trail user. Not only can hikers experience the unique features that the cities have to offer, but they can also still enjoy rural scenery around the towns.

The cities that the current NCT route travels through have many unique features that can be positive control points. There are numerous historical points of interest, both urban and natural around the cities. These all provide a good variation in types of scenery along the trail. Marshall has been identified as the nation’s largest National Historical Landmark District for a small urban area. Because of this, there are many old houses that have been turned into museums. Additionally, there are quaint bed and breakfasts throughout both Albion and Marshall. A lot of the character of these small cities comes from their historically significant buildings. Because the NCT aims to include historical and cultural points of interest, these small cities fit within their goals very well. Also, in Battle Creek, there are several historic and cultural features that can serve as positive control points along a trail.

There are also options suited for different types of personalities within the cities, which would be lost if the trail did not continue through these areas. These options range from the eclectic café and brewery at Dark Horse Brewing to the breakfast options at the oldest operating inn in Michigan, the National House Inn. There are historically significant monuments for those interested in history, unique museums serving a specific audience, a well-kept arboretum for those who enjoy gardens, and parks with historical features incorporated for all ages to enjoy. The combination of features offered within the cities makes them areas of historical importance. There is especially an emphasis on history related to railroads, with Clara’s on the River being an old train depot turned into a restaurant, the Historic Bridge Park allowing people to view and
climb on restored railroad bridges, and a monument in memory of the underground railroad. The incorporation of historical railroad features helps trail users learn more about the character of the county and what helped shape its current culture.

A unique feature of the NCT is that it does not avoid towns and in fact often incorporates them so the trail user experiences both urban and rural areas. Part of the beauty of this trail route is that it changes. Because this is an expectation of the hiker when choosing to hike the NCT, it is not essential to avoid all urban areas. Although natural scenery is a trail user’s preference overall, urban areas are not always detrimental. Because the NCT travels through seven states, the scenery changes dramatically along the route. Even within Michigan, a southern county such as Calhoun will look extremely different than part of the route in the Upper Peninsula. This change is part of the overall experience, as the hiker can travel through both the rural farmlands and small cities of the south and also the hardwood forests of the north.

The type and amount of scenery is often the predominant attribute to consider in trail design, and this was reflected in the weights obtained for each interest group. Particularly, for the expert group, the score value for scenery had a large impact on the overall weighted score. The participants in this group weighted natural scenery more important than any other group. The reason the current NCT route was given a lower score for natural scenery than the other two routes was because of the amount of trail on the road between the cities. If there could be established off-road trail between the cities, the overall weighted score for the current route could be significantly improved. Thus, it is not essential that the whole current route be discarded; rather, it would be helpful to work on establishing off-road connections between the cities. This would create a positive hiking experience between rural and urban areas.
Because some sections of the current route are along the road, it is recommended that these areas continue being developed and alternative off-road paths be found between the cities. This current route has the potential to be the best possible route through the county if these road walks are eliminated through either the construction of new off-road paths or a sustainable trail surface alongside the road. The elimination of the road walks would increase both natural scenery and safety. This would allow the route to have a good balance of variation between rural farmland and urban areas. The variation between the cities and rural farmland make for a more positive hiking experience overall due to the spatial diversity that the cities introduce. The open farmlands slowly become less dominant and the buildings in the cities bring a more enclosed feeling. The change between rural and urban areas keeps the route interesting. A successful trail will reflect both the setting and the landscape that it travels through. When people choose to hike a trail, they choose it for a specific experience. In an urban area, the trail should highlight local landmarks and points of interest, while in a natural area it should be shaped by nature. By this design, emotional responses are elicited in the trail user (Trail Planning, Design, and Development Guidelines 2007). Currently, the NCT does a good job highlighting both urban and natural areas near the cities. However, the section of trail between the cities where the route is along the road does not follow the natural landscape. This detracts from the overall experience of the trail. Should these areas be eliminated or reduced, the trail would greatly benefit. A trail that is able to connect many different types of features creates a unified experience for the trail user. Thus, both natural and built forms of trail, along with spatial diversity, can create a pleasing experience to the trail user along the NCT (Trail Planning, Design, and Development Guidelines 2007).
Additionally, the current route already has established connections with other trailways, such as the Calhoun County Trailway, the Battle Creek Linear Park, the Marshall Riverwalk, and the Albion River Trail. Many of these trailways were designed along the Kalamazoo River. By connecting to these routes, maintenance and construction cost are minimized for the NCT. These routes highlight certain points of interest, so by joining them the NCT is able to experience the benefits of some already established trail sections. Creating an alternative NCT trail alignment across the county would eliminate most, if not all, of these current connections. Because the NCT is already established along these routes, it would be detrimental to remove the route altogether in order to avoid the urban areas.

However, the Loop Route could be added in addition to the current route to increase the variation and popularity of the route within the county. Adding the Loop Route would give trail users an option as to which type of experience they would like. The Loop Route would provide a more natural rural farmland experience, while the current route would provide a more urban experience. Loops were found to be a major factor in determining the popularity of a trail. Thus, if part of the county had a NCT loop on it, long distance hikers would have an optional route and local residents could use it for a short backpacking trip. The presence of Albion College nearby also has the potential to draw a lot of college students who would be interested in taking short backpacking trips. Thus, the construction of a loop in the county could be significant for increases the popularity and use of the NCT through Calhoun County. Thus, overall, my recommendation would be to keep the current NCT route and add on the Loop Route as an alternative option.
Study limitations

Limitations of this research included the number of participants that could be interviewed for each focus group. Time limited the number of participants that could be interviewed as representatives of each interest group. Along with this, individuals within each group were not representatives of larger groups, but were often from similar backgrounds. The individuals representing each group were based on those who responded to my phone calls and emails. Due to time, the groups were not as diverse as desired. Increased time could have provided a more expansive and complete representation of each interest group’s perceptions.

Additionally, this study was limited by the inter-connected nature of the trail attributes. In trail planning, a lot of the attributes that are considered important are connected to each other. The situation of one often impacts the outcome of another. For example, natural scenery is often obtained when there are connections between natural areas, and these areas can only be connected if there is good accessibility to land. It is hard to consider one attribute apart from the influence of the others. Although the connectivity between these attributes is unavoidable, it makes it more difficult for participants to weight the most important attributes.

Also, interest group participants may have interpreted the perception of trail attributes differently. Although I tried to clearly explain how to weight the different attributes, there will still be error in how the attributes were perceived by different individuals. For the trail user interest group, accessibility seemed to be associated with how easily they could reach the trailhead. It included the placement of parking lots and how far they had to walk before reaching the trailhead. However, for the expert interest group, accessibility seemed to be interpreted as the ability to gain access to a piece of property for trail construction. They were not as worried about
people finding the trailhead; rather they were more concerned with where the trail could be placed based on who owned the land.

Another limitation is the subjective nature of scenery. Although all interest groups weighted this trail attribute as the most important, the scenic quality of something is hard to quantify because people have different ideas of what this means. Without giving an exact definition of scenery in this context, it could be easy for people to interpret this according to their already preconceived notions about what scenery should be. One expert noted that water features seem to be universally loved. However, the extent to which a person considers scenery is subjective. This makes the concept of quantifying scenery and implementing it into a trail route difficult.

Additionally, the trail attribute of safety is also subject to different interpretations. Participant views of safety included things such as not liking tall grass, being worried about street crossings, trailheads too far from the parking lot, being alone, poisonous plants, other recreation types, and vehicles being broken into. There is a large range of ideas that constitute safety to people. Some people feel safer in the woods, others in open fields. This tends to correlate to what people expect when going on a trail. Many hikers commented that it would be nice to know what to expect on a trail. When hiker expectations align with the experience, they seem to feel safer because there surprises are limited. However, because each person has a different idea of what safety means, it is hard to numerically quantify for analysis.

Considerations for future research

Future research should focus on fewer but more specific attributes related to NCT route planning. This research provided a broad analysis of many trail attributes and alternative routes
throughout the county. It would be helpful to look at a few clearly defined attributes and identify the public perception regarding these attributes. If fewer attributes are studied, they can be analyzed more in depth and provide more specific insight for trail planning decisions. This could result in a more detailed study of small route adjustments rather than analyzing completely alternative routes.

Overall, trail research benefits from the complementary work of both public participation and GIS analyses. Future research that includes both of these types of analyses will be able to identify public preferences while also understanding the feasibility of a route. Continuing to engage the public and understand their desires will help trails be created that best serve the community. However, the feasibility of a route can be better understood through GIS analyses. Increased work in both of these areas will continue to help trail planning be informed and strategic.
APPENDIX A

HSIRB Approval
Date: March 22, 2017

To: Dave Lemberg, Principal Investigator
    Whitney Lambert, Student Investigator for thesis

From: Amy Naugle, Ph.D., Chair

Re: Approval not needed for HSIRB Project Number 17-03-24

This letter will serve as confirmation that your project titled “Identification of Hiking Trail Attributes through Focus Groups” has been reviewed by the Human Subjects Institutional Review Board (HSIRB). Based on that review, the HSIRB has determined that approval is not required for you to conduct this project because you are not collecting personal identifiable (private) information about individual and your scope of work does not meet the Federal definition of human subject.

45 CFR 46.102 (f) Human Subject

(f) Human subject means a living individual about whom an investigator (whether professional or student) conducting research obtains

(1) Data through intervention or interaction with the individual, or
(2) Identifiable private information.

Intervention includes both physical procedures by which data are gathered (for example, venipuncture) and manipulations of the subject or the subject’s environment that are performed for research purposes. Interaction includes communication or interpersonal contact between investigator and subject. Private information includes information about behavior that occurs in a context in which an individual can reasonably expect that no observation or recording is taking place, and information which has been provided for specific purposes by an individual and which the individual can reasonably expect will not be made public (for example, a medical record). Private information must be individually identifiable (i.e., the identity of the subject is or may readily be ascertained by the investigator or associated with the information) in order for obtaining the information to constitute research involving human subjects.

“About whom” – a human subject research project requires the data received from the living individual to be about the person.

Thank you for your concerns about protecting the rights and welfare of human subjects.

A copy of your protocol and a copy of this letter will be maintained in the HSIRB files.

1903 W. Michigan Ave., Kalamazoo, MI 49008-5456
Phone: (269) 387-8293 Fax: (269) 387-8270
Campus Site: 251 W. Walwood Hall
APPENDIX B

Trail Planning Questions
**Trail Planning Questions**

1. How important do you think a trail is for the economic development of a city? Do you think the NCT could help or hinder this?

2. Do you think trails should connect major destination (e.g. cities, shopping centers, other recreational areas)? If so, should they be natural or commercial connections?

3. Should the public be involved in construction and maintenance of trails?

4. Should there be amenities (e.g. food, water) or facilities (e.g. bathrooms, shelters) available along a trail or are these the responsibility of the hiker?

5. Calhoun’s current Parks and Recreation Master Plan states that the county was ranked 78 out of 82 counties studied in Michigan for statewide health, with a high ranking of physical inactivity. Do you think a hiking trail could impact the community health or are other more effective options?

6. What makes you feel safe on a trail?

7. Do you think it is important for trails to provide opportunities for many types of users (e.g. biking, trail running, ORVs)?

8. What type of scenery would you prefer to have (e.g. agriculture, water, residential, commercial)? Does distance from any other these scenery types matter?

9. How important is it to have wildlife and vegetation along the trail?
APPENDIX C

Handout for Identifying Important Trail Attributes
Handout for Identifying Important Trail Attributes

Choose the trail attribute that is least important and give it a weight of 1. Assign weights to the rest of the trail attributes by comparing them to your least important attribute. For example, if safety is twice as important as the least important attribute, give safety a value of 2.

<table>
<thead>
<tr>
<th>Trail Attribute</th>
<th>Weight of Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural scenery</td>
<td></td>
</tr>
<tr>
<td>Facilities (e.g. bathrooms, picnic area)</td>
<td></td>
</tr>
<tr>
<td>Health/fitness</td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td></td>
</tr>
<tr>
<td>Shared use path (e.g. equestrian, biking)</td>
<td></td>
</tr>
<tr>
<td>Connection to commercial areas (e.g. food, lodging)</td>
<td></td>
</tr>
<tr>
<td>Connection to other natural areas (e.g. parks, nature centers)</td>
<td></td>
</tr>
<tr>
<td>Cultural/historic points of interest</td>
<td></td>
</tr>
<tr>
<td>Path type</td>
<td></td>
</tr>
<tr>
<td>Convenience/accessibility</td>
<td></td>
</tr>
<tr>
<td>Land acquisition/construction cost</td>
<td></td>
</tr>
</tbody>
</table>

What is your association with trail usage? (Please circle one)

Non-profit organization  Governmental Agency  Club
Local Business

Other (Please specify) _______________________________________


https://doi.org/http://dx.doi.org/10.1016/j.landurbplan.2014.07.004.


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