

University of Montana

ScholarWorks at University of Montana

Graduate Student Theses, Dissertations, &
Professional Papers

Graduate School

2016

Bicycle Mobility in Glacier National Park: Assessing Going-to-the-Sun Road Travelers' Attitudes, Knowledge, and Perceptions of Bicycling

Brian G. Battaglia
The University Of Montana

Follow this and additional works at: <https://scholarworks.umt.edu/etd>

 Part of the [Geography Commons](#)

Let us know how access to this document benefits you.

Recommended Citation

Battaglia, Brian G., "Bicycle Mobility in Glacier National Park: Assessing Going-to-the-Sun Road Travelers' Attitudes, Knowledge, and Perceptions of Bicycling" (2016). *Graduate Student Theses, Dissertations, & Professional Papers*. 10682.

<https://scholarworks.umt.edu/etd/10682>

This Thesis is brought to you for free and open access by the Graduate School at ScholarWorks at University of Montana. It has been accepted for inclusion in Graduate Student Theses, Dissertations, & Professional Papers by an authorized administrator of ScholarWorks at University of Montana. For more information, please contact scholarworks@mso.umt.edu.

**BICYCLE MOBILITY IN GLACIER NATIONAL PARK: ASSESSING
GOING-TO-THE-SUN ROAD TRAVELERS' ATTITUDES,
KNOWLEDGE, AND PERCEPTIONS OF BICYCLING**

By

Brian George Battaglia

B.A. in Geography, St. Cloud State University, St. Cloud, MN, 2008

Thesis

Presented in partial fulfillment of the requirements for the degree of

Master of Science
in Recreation Management

The University of Montana
Missoula, MT

May 2016

Approved by:

Scott Whittenburg, Dean
The Graduate School

Dr. Norma Nickerson, Chair
Department of Society and Conservation

Dr. Keith Bosak
Department of Society and Conservation

Dr. Thomas Sullivan
Department of Geography

Abstract

Chair: Dr. Norma Nickerson

The central aim of this thesis assessed whether Going-to-the-Sun Road (GTSR) travelers have a positive or negative association with roadway bicycling and the degree of public support for GTSR bicycling in Glacier National Park (GNP). Secondly, this thesis tested a control and treatment group's knowledge of roadway cycling laws to determine the effectiveness of a "Bicycles May Use Full Lane" sign and brochure, which both reflected Montana's cycling laws. Finally, an analysis of the necessity of GNP's partial bicycle restriction on the GTSR was conducted by comparing the characteristics of two road segments using GIS, and by assessing the attitudes, perceptions, and interactions occurring between travelers.

Two approaches were used to assess bicycling mobility in GNP: (1) a quantitative analysis of travelers' frequency of bicycling, attitudes, knowledge, and perceptions (2) and a geographical and mobilities framework to critically discuss the hierarchy of GTSR mobility. An onsite survey was conducted at Logan Pass in August to collect data from travelers based on their frequency with cycling, whether they cycled the GTSR or drove a motor vehicle, and whether or not they viewed an experimental treatment sign. A GIS was used to analyze two sections of the GTSR.

This thesis challenges the assumption that a partial bicycling restriction is warranted based on the key findings reported. Despite travelers' frequency of bicycling, they were primarily positive in the way they legitimize cyclists on the roadway, and the majority were neutral to positive in their support for unrestricted GTSR cycling. Respondents with knowledge of cycling laws showed more positive attitudes, and the sign/brochure treatments

were effective at improving knowledge of the cycling laws. Interactions between GTSR cyclists and motorists were overwhelmingly positive. Finally, the comparison of road segments suggests the restriction was implemented arbitrarily without empirical evidence. Automobility is prioritized over bicycling mobility to support steady tourism flows. By confronting power relations that prioritize auto-tourism, a re-produced tourism space can begin to occur along the Going-to-the-Sun Road. Glacier National Park is in a position to evaluate the data and critical discussion from this thesis to begin working towards greater mobility evenness.

Acknowledgements

Wow, what a challenging and rewarding experience this has been. When I first began pursuing this degree it had been six years since my undergraduate education and I did not realize how challenging it would be to complete a thesis. In the first months I had cold feet about it all, but the stars aligned so to speak as the Glacier National Park bicycling project landed in my lap.

I owe much of my success to Dr. Norma Nickerson for waving the bike study in front of my eyes as the end of semester one neared. At that point in time I don't know if she fully understood my level of passion for bike commuting as one of my deep environmental values. Perhaps she would have refrained from proposing the project to me had she known about my bike ideologies! Norma did an excellent job at helping me strike a balance in this project and I owe her a major thank you for that, and for encouraging me along the way. Norma was readily available as an advisor and taught me a great deal about the ins and outs of social research. Thank you Norma and we probably ought to go on a bike ride together one of these days.

Thank you to my loving wife Jenna for her support and tolerance in dealing with my chaotic schedules working many evenings and most weekends to complete this project. I appreciate her effort in listening to me while I discussed any number of my intellectual pursuits or problems I was faced with while in graduate school. Even more impressive is that she did this while simultaneously juggling her full time professional career while pursuing a graduate degree of her own.

Many thanks to Ginny Sullivan and Saara Snow at Adventure Cycling Association for the immensely challenging work they do to advocate for bicycle travel and for being at the forefront of envisioning a re-produced tourism space and mobility within our national parks. I am grateful to both of them for initiating Superintendent Jeff Mow of Glacier National Park in pursuing research on bicycling in the park.

Thank you to my committee members Dr. Keith Bosak and Dr. Thomas Sullivan for their relaxed demeanors and for the trust they placed in Norma in overseeing that I would carry out a successful research project. Keith and Tom provided me insights on academic literature covering theories and concepts of space, place, geography, and critical theory which have helped me in positioning the bicycle according to its social significance. I look forward to improving my writing on the more abstract geographical thought components to this thesis following feedback from both Keith and Tom.

I would also like to thank Jeff Mow for his support of bicycling in Glacier and his foresight in recognizing bicycling as an important alternative transport mode in the park. Others I would like to thank are Melinda Barnes at Bike Walk Montana for her work in improving statewide bicycling, Jeff Austin, Tara Carolin, and everyone else from Glacier National Park who helped with logistics and research planning.

Thank you to the entire staff, graduate students, and work study at the Institute for Tourism and Recreation Research. Miranda Felde was a great assistant helping in the data collection and I could not have achieved any of this without her help, so extra thanks to Miranda. Megan Shultz taught me how to effectively issue front end surveys to travelers, was always willing to help me navigate software for developing my survey, and offered thoughtful feedback in questionnaire development. Kara Grau was always super patient and I appreciated her calm demeanor in helping me with troubleshooting software, and just for her willingness to listen as I worked through various thesis issues. Jake Jorgenson got me over the statistical

analysis wall that was looming after finishing data entry, and he offered general guidance on being a graduate student at ITRR. Geoff Havens and I got through statistical methods together and generally had a mutual understanding as to where one another were coming from throughout the process.

Awknowledgement of Values

When first embarking on this project I hadn't yet grasped the intricacies pertaining to the philosophy of science and what constitutes truth of knowledge and understanding of both the natural and social world. I certainly don't have it all figured out and probably never will seeing as philosophers have been squabbling over science for thousands of years. That being said, I do have a better understanding of the complexity and diversity that exists in defining scientific knowledge. When I reflect back on coursework in methods and the arduous hours spent grappling with theories, conceptual frameworks, and methodological approaches to my thesis, it is clear to me now that there is no single correct approach.

One of my greatest struggles in writing this thesis and completing this project was developing an approach to science. Ultimately, I've ended up walking a strange line between positivist or maybe post-positivist quantitative approaches and critical social theory, Marxist geography, and abstract theories of the mobilities paradigm. If I had to fit into a philosophy of science box, perhaps I'd be in the post-positivist or critical theorist box? That I still do not have completely figured out. At any rate, I always felt pressure to remain objective and unbiased throughout the research endeavor but I don't actually believe there is an objective reality. Or if there is, then it is surely malleable, revisable, and influenced by social, political, and economic forces that have conflicting beliefs, values, and worldviews.

All research receives funding from an organization, government, business, or individual and I don't really believe that money coming from these sources is objective without biases. On the contrary, I believe that funders of research have a lot of power and influence. The way I see it for this project is that one either advocates for the status quo of automobility or for greater mobility evenness by encouraging improvements for bicycle mobility. One might argue that it is the job of the researcher to do the research unbiased and objectively. However, to remain objective is to remain passive and power relations in society cannot be confronted if we all remained passive, especially knowing that power is a subjective force that is not passive. I think that objectivity in science is a fallacy and that if we all remained passive objective observers, we'd just see the status quo endure endlessly. I am laying my values on the table here to establish that my personal values are to improve bicycle mobility. I bicycle regularly for reasons of social and environmental justice. I believe that the bicycle has great potential to reduce anthropogenic impacts on the biosphere, and to re-produce meanings of space, place, and mobility.

Table of Contents

Abstract.....	ii
Acknowledgements.....	iv
Acknowledge of Values.....	v
Tables.....	x
Figures.....	x
Chapter One: Introduction.....	1
Purpose.....	4
Thesis Organization.....	4
Chapter Two: Literature Review.....	6
Introduction.....	6
Geography and Tourism.....	6
Space and Place.....	7
Endured Space.....	8
Rhythms of Capitalism.....	9
The Mobility Framework.....	10
Tourism Mobilities.....	11
A Politics of Mobility.....	13
Automobility.....	14
Bicycle Mobility.....	15
The Significance of Bicycle Tourism.....	18
Re-emergence of Bicycling in Society.....	20
Bicycle Tourism.....	20
Defining Bicycle Tourists.....	21
Transportation and National Parks.....	22
Automobility in Glacier National Park.....	23
Bicycling Attitudes.....	25
Bicycling Frequency.....	27
Knowledge of Roadway Bicycling Laws.....	28
Informational Messaging and Cycling Signage.....	29
Motorist Behavior and Cyclist Behavior.....	30
Perceived Fear of Bicycling.....	31
Perceived Interaction and Recreation Conflict.....	32

Bicycle-Automobile Perceived Interactions	33
Summary of Literature	34
Research Questions	36
Chapter Three: Methodology	37
Operational Definition of Variables	39
Bicycling Attitudes	39
Bicycling Frequency	40
Knowledge of Roadway Bicycling Laws	41
Motorist Behavior and Cyclist Behavior	43
Perception of Fear	44
Perceived Interactions on the GTSR	44
Support for Cycling on the GTSR	46
Demographics	47
Dependent Variable Index	47
Experimental Design	48
Treatments	49
Manipulation Checks	50
Sampling	51
Sampling Frame	51
Sampling Procedure	51
Survey Instrument	53
Statistical Analysis	54
Limitations	55
Extraneous Variables	56
Internal Validity	57
External Validity	58
Unknown Factors, Contingencies, and Alternatives	58
Chapter Four: Results	59
Response Rate	59
Demographics	59
Miscellaneous Characteristics	61
Reasons for Cycling: Recreation vs. Commuting	61
Previous Experience Cycling the GTSR	62

Mobility Experience.....	62
Transportation Mode.....	63
Cyclist vs. Non-Cyclist	64
Bicycling Frequency	65
Factor Analysis of Attitude Statements	65
Bicycling Attitude and Bicycling Frequency.....	68
Motorist Behavior and Bicycling Frequency	69
Cyclist Behavior and Bicycling Frequency	71
Bicycling Knowledge and Bicycling Frequency.....	73
Legal on Road, Considered a Vehicle with Same Rights/Responsibilities.....	73
May Use Full Lane.....	74
Bicycle Attitude and Bicycling Knowledge.....	75
Legally Entitled on Roads.....	75
Considered Vehicle with Same Rights/Responsibilities	76
May Use Full Lane.....	76
Perceived Fear and Bicycling Frequency.....	77
Perceived Fear and Bicycling Attitude	78
Perceived Interactions on the GTSR.....	79
Support for GTSR Cycling and Bicycle Attitude	80
Support for GTSR Cycling and Bicycling Frequency	81
Experimental Results	82
Manipulation Checks	82
Knowledge Differences – Control vs. Treatment	83
Bicycling Restrictions on the Going-to-the-Sun Road.....	85
Chapter Five: Summary, Discussion, and Implications.....	87
Significance and Discussion of Data Analysis	89
Bicycle Mobility on the Going-to-the-Sun Road	97
Social Constructions of GTSR Space and Place.....	97
Tourism Mobilities of the GTSR.....	98
A Politics of GTSR Mobility	100
Bicycle Mobility on the GTSR	101
Chapter Six: Conclusion	103
Future Recommendations	103

Concluding Remarks.....	106
References.....	109
Appendix A.....	118

Tables

Table 1. Bicycle attitude scale.....	39
Table 2. Motorist behavior scale and cyclist behavior scale.....	43
Table 3. Exploratory factor analysis for attitude statements using KMO and Bartlett's Test	67
Table 4. Mean bicycle attitude vs. bicycling frequency.....	69
Table 5. Mean motorist behavior vs. bicycling frequency	71
Table 6. Mean cyclist behavior vs. bicycling frequency	73
Table 7. Percentage knowledgeable vs. bicycling frequency	74
Table 8. Percentage knowledgeable (full lane) vs. bicycling frequency.....	75
Table 9. Mean bicycle attitude vs. bicycling knowledge	77
Table 10. Mean perceived fear vs. bicycling frequency	78
Table 11. Mean perceived fear vs. bicycling attitude.....	79
Table 12. Cyclist's perceived interactions on the GTSR.....	79
Table 13. Motorist's perceived interactions on the GTSR	80
Table 14. Mean support for GTSR cycling vs. bicycling attitude.....	81
Table 15. Mean support for GTSR cycling vs. bicycling frequency.....	82
Table 16. Knowledge differences between control and treatment groups.....	84
Table 17. Comparison of restricted and open segment of the Going-to-the-Sun Road.....	85

Figures

Figure 1. Map of Glacier National Park study area.....	38
Figure 2. Signage and brochure used as experimental treatment conditions	50
Figure 3. Dot density map of respondent's residences.....	60
Figure 4. Reasons for cycling.....	61
Figure 5. Percentage of respondents by an alternative measure of bicycling frequency	62
Figure 6. Preferred mobility experience on the GTSR.....	63
Figure 7. Primary mode of transportation respondents used to reach Logan Pass	64
Figure 8. Percentage of respondents who were cyclists vs. non-cyclists.....	64
Figure 9. Percentage of study respondents by bicycling frequency.....	65
Figure 10. Boxplots showing the median bicycling attitude given bicycling frequency	68
Figure 11. Boxplots showing the median motorist behavior score given bicycling frequency ...	70
Figure 12. Boxplots showing the median cyclist behavior score given bicycling frequency	72
Figure 13. Map of restricted and open segments of the Going-to-the-Sun Road cycling route..	86

Chapter One: Introduction

Glacier National Park (GNP) experienced record breaking visitation in 2014/15 and visitors of the Going-to-the-Sun Road (GTSR) are primarily scenic drivers, yet niche groups of cyclists have a stake in sharing the highway. These touring and recreational cyclists come from around the world to experience the GTSR. There is currently a restriction in place prohibiting bicycle mobility from 11 am – 4 pm daily during the peak tourism season and no empirical evidence exists on bicycling in GNP to support whether a restriction is justifiable or not. Bicyclists face many challenges while sharing space with other transportation modes (Rissel, 2002) and bicycle mobility frictions have yet to be explored in GNP. This introductory chapter will begin by unpacking the bicycle – automobile issues associated with the GTSR in GNP, followed by a background on the development of the study, and finishes by discussing the purpose and objectives of the research.

Glacier National Park is one of the most visited places in Montana and a record number of people (roughly 2.3 million) traveled through GNP in 2015 (NPS Stats, 2016). Visitors from around the world are attracted to GNP for a diverse array of reasons with most intending to drive their personal automobile along the scenic GTSR highway. These auto-tourists are seeking to enjoy alpine views of Montana's most iconic landscapes, yet they are contributing to the social and environmental impacts associated with mass motorization. To a large extent, automobile impacts within parks (i.e. air pollution, traffic congestion, noise pollution, wildlife and vegetation disturbance, etc.) are concentrated along scenic driving roads (NPS, 1999). The GTSR was cut through the pristine mountain-scape (est. 1933) in the name of ever-increasing tourism development by way of the automobile (Dilsaver and Wyckoff, 1999). The impacts and

growth in visitation associated with automobile travel on the GTSR were unforeseen when the road was first being built. As the engineering feat came to a rest, a growing accumulation of social, spatial, and ecological impacts proceeded.

The personal automobile has been historically prioritized along the 50 mile stretch of linear tourism space (GTSR) and greatly characterizes the human aspect of the place. Prioritizing the automobile as a 'democratic right' and the only efficient means to access national parks has led to an infrastructure imbalance that caters to the dominance of automobility (Dilsaver and Wyckoff, 1999). Researchers Dilsaver and Wyckoff (1999) suggest that automobiles are dominating the national park landscapes and their transportation infrastructures are prioritized for auto-tourism which is inextricably linked to visitation demands and tourism development. Automobility within GNP is a major barrier to alternative transportation modes and is creating forces and friction that marginalize cycling mobility on the Going-to-the-Sun Road. The cultural geography scholar Cresswell (2010) suggests that the mobility of the past needs research attention and the idea of the past being fixed while the present is increasingly mobile should be viewed with caution; the efficiency that automobiles bring to society is not necessarily a benefit and the historical significance of the bicycle should be considered while planning for alternative transportation within national parks. Cycling as an alternative transportation mode in GNP is lacking empirical observations to date.

The Institute for Tourism and Recreation Research (ITRR) at the University of Montana conducted an analysis on touring bicyclists that attracted considerable attention from Adventure Cycling Association (ACA) and GNP. In the 2013 study "*Analysis of Touring Cyclists: Impacts, Needs, and Opportunities for Montana*", concerns were raised regarding bicyclist – automobile interactions, safety, and the beliefs and attitudes people have towards bicycling

along Montana's roadways. ITRR, following their 2013 study, collaborated with GNP, Montana Tourism Advisory Council, and various tourism organizations in the region to conduct another project to assess visitors' bicyclist-automobile perceptions, attitudes towards bicycling, knowledge of roadway cycling laws, and overall support for cycling along the Going-to-the-Sun Road in Glacier National Park. The 2013 study done by ITRR and the development of a collaborative relationship between ITRR, GNP, and ACA has directly resulted in the design and implementation of this thesis.

The study conducted by Nickerson et al. (2013), found that Glacier National Park received a high number of touring cyclists, which sparked interest in further understanding the spatial and socio-psychological issues related to bicycling within a National Park System confine. Tourism and outdoor recreation social scientists, as well as national park officials and the Federal Highway Administration, will benefit from the empirical evidence presented throughout this thesis project. Conducting a quantitative survey assessment on the bicycling attitudes of visitors produced key findings for determining visitor support for cycling along the Going-to-the-Sun Road. Glacier National Park officials are in a position to evaluate these data on bicycling attitudes for visitor management and transportation decision making along the Going-to-the-Sun Road. The information presented in this thesis has potential to help Glacier National Park decision makers and tourism planners with assessing the opportunities and challenges that exist for managing bicycling as a recreational activity. Additionally, the information may be used to emphasize the positive – negative aspects of cycling the Going-to-the-Sun Road and to improve education and awareness of bicycling on roadways.

Purpose

The primary purpose of this study was to determine how attitudes toward bicycling differ between various categorizations of cyclists and non-cyclists on the Going-to-the-Sun-Road in Glacier National Park. A second purpose was to test for knowledge of roadway bicycling laws between various categorizations of cyclists and non-cyclists. The study produced quantitative empirical data that federal land managers, transportation planners, and cycling advocacy groups will be able to utilize for further understanding the relationships between bicycling frequency, cyclist – non-cyclist attitudes, knowledge of roadway cycling laws, perceived fear, perceptions of bicycle-automobile interactions, and support for cycling on the Going-to-the-Sun Road in Glacier National Park.

Gaining an in-depth understanding of the differing attitudes that exists between cyclists and non-cyclists will help to advance transportation improvements for the diverse visitor groups who utilize the GTSR. Bicycle frequency levels, knowledge of Montana’s roadway bicycling laws, as well as bicycling attitudes were explored for collecting data on bicycling in GNP. The localized study addressed a wide range of tourism transportation issues that are applicable to the overall planning efforts of GNP management, the NPS Federal Lands Transportation Program, urban transportation planners, cycling advocacy groups, and Montana bicycle tourism initiatives.

Thesis Organization

Chapter one provided a description of the significance of bicycle – automobile issues on the Going-to-the-Sun Road within Glacier National Park. Chapter one also included a background on the development of the project and ended with an outline of the primary

purpose of the study. Chapter two includes a literature review to develop a conceptual framework for understanding bicycle mobility on the GTSR, uncovers gaps and research needs related to cycling in society, and explores the literature for theoretical definitions of variables for use in data analysis. Chapter three discusses the methodology that was used, including operationally defining variables, measurement, population, sampling, the statistical methods applied for analyzing the data, and limitations to the study. Chapter four presents the quantitative results found and the relationships amongst variables that were discovered through the statistical data analysis. Chapters five and six summarize the findings of the data analysis and the implications of those results, then critically discuss mobility and automobility within GNP, and finishes with suggestions for future research and concluding remarks.

Chapter Two: Literature Review

Introduction

In this literature review geographical theories on space, place, and tourism are examined. These theoretical underpinnings help to support the empirical quantitative survey assessment for testing attitudes towards cycling, knowledge of roadway cycling laws, and perceptions of bicycling between cyclists and non-cyclists in Glacier National Park (GNP). Secondly, a mobility framework, politics of mobility, and bicycle – automobility is introduced as it relates to Going-to-the-Sun Road (GTSR) tourism space so that a critique of GTSR tourism space productions can be discussed. Third, the relationship of national parks, automobiles, and bicycling transportation is explored. Finally, a review of the literature highlighting the significance of bicycling in society emerges, and urban cycling studies are reviewed for establishing conceptual and theoretical understandings of the variables used in the quantitative data analysis of the study.

Geography and Tourism

Geographical conceptualizations of tourism help address the limitations of the economic approach to tourism that is prevalent across many of the disciplines conducting tourism research. Leiper (1979), attempts to close the gap between two conflicting disciplinary approaches to tourism (the economic development/supply-demand side and the tourism impacts side), and he introduces an encompassing definition for all disciplines. Smith (1988) defined tourism in terms of supply-demand, industry commodities, economic impacts, business productions, and consumer goods or services; the author then critiqued Leiper's (1979) definition for his failure to recognize tourism as an industry. The conceptualization of tourism

discussed by Hall et. al (2004) suggests that tourism definitions such as Smith's (1988) fall short by omitting the social and political implications associated with tourism. Beyond just the social and political, geography approaches the phenomenon of tourism with a perspective on place, space, and the environment (Hall and Page, 1999). Hall (1999) suggests:

“Issues of social, economic, and spatial inequality represent important elements of such debates, yet these issues have only rarely been addressed systematically at the tourism/transport interface”.

Hall et. al's and Hall's (1999, 2004) conceptualizations highlight the shortfalls of tourism studies and establishes the necessary framework for understanding tourism implications in all of its socio-spatial, political, and environmental contexts. By approaching tourism issues under the discipline of geography rather than supply-side economics, it opens up opportunities for applying a conceptual framework to better understand mobility, automobility, and the social relations that construct tourism space along the Going-to-the-Sun Road in Glacier National Park.

Space and Place

The concepts of space and place are fundamental to geography, are closely interwoven, and support the development of a conceptual framework for analyzing tourism space and place along the Going-to-the-Sun Road as a constructed, ordered, and embodied human experience. The human geographer Edward Relph in his historical piece titled *Place and Placelessness* argues that space is not a void or container, rather it is something closely related to place and is a 'human experienced' phenomenon that is lived, spatially experienced, direct or abstract, heterogeneous, and includes various degrees of lived meanings (Relph, 1976). Henri Lefebvre's historical piece titled "*The productions of space*" argues that space is socially produced, deeply

political and economic, where modes of production, social relations, and power relations all constitute space (Lefebvre, 1991). In alignment with Relph's interpretation of space, Thrift (2003) defines relational space as being constructed through objects interacting in the world. Thrift's (2003) account of space also includes empirical constructions of space (standardized time, routines of life), unblocking space (globalization), image space (certain spaces are seen and constructed while others are not), and place space (the embodied, ordered, and lived everyday experience that makes space a 'real' place). Space and place as theorized by Relph (1976), Lefebvre (1991), and Thrift (2003) help advance the conceptual framework and theoretical lens for assessing the social interactions, power relations, and the human-lived experiences that occur between different travelers and their respective transport modes along the Going-to-the-Sun Road; and ultimately the construction of tourism space in Glacier National Park.

Endured Space

History is a foundational component to constructions and productions of space, and Lefebvre (1991) understood this as follows:

“In space, what came earlier continues to underpin what follows. The preconditions of social space have their own particular way of enduring and remaining actual within that space....”

Dilsaver and Wyckoff (1999) argue that automobile use, auto-infrastructure development, and park visitation growth are all inextricably linked, and have historically been uninterrupted in GNP. Thrift's (2003) depiction of empirical constructions of space (i.e. routines of life), and Lefebvre's (1991) aforementioned historical space sheds light on the socio-cultural 'cumulative causation' (Dilsaver and Wyckoff, 1999) associated with long-standing mass motorization on the

Going-to-the-Sun Road. There is a need for data on the transportation modes that GTSR visitors use, the frequency they engage in alternative transportation (specifically bicycling), and their positive or negative associations with automobiles vs. bicycles. These data contribute to the empirical evidence of Glacier National Park's social productions of an enduring auto-space.

Rhythms of Capitalism

Works by Lefebvre (2004) in his book *Rhythmanalysis* draws a connection between rhythms, global capitalism, and constructions of space and place. Lefebvre (2004) begins by clarifying how rhythm can be misused and misunderstood with movement, speed, movement sequences, and mechanical objects. He argues that rhythm must have 'interactions with time, place, and expenditures of energy'. Lefebvre has conceptualized rhythm as the socio-spatial and temporal productions of ordered repetitions within a marketplace. An exploration of the term repetition uncovers that there are cyclical and linear components to repetitions constantly interacting; where the cyclical repetitions present themselves in natural phenomena (i.e. days, tides, seasons) and linear components are composed of human social activity or monotony of movement (Lefebvre, 2004). Linear ticks of clocks give us time; space and time are both comprised of cyclical – linear repetitions that have relationships to the concept of rhythms. Physical flows of tourists over vast spatial-temporal scales contribute to intensifying the rhythms of time, space, and place. The phenomenon of 'time-space compression' (Harvey, 1989; Sheller and Urry, 2004) describes how processes of globalization impact technologies, information, travel, and mobility by reducing spatial-temporal distances, leading to the world feeling distantly smaller. When the bicycle was first introduced it was seen as a material object that contributed to time-space compression, but with the advent of the automobile the bicycle is now seen as a material object that extends time-space. Theoretical conceptualizations of the

rhythms' of capitalism help in contextualizing the relationship between repetitions of the tourism industries, time-space, and auto vs. bicycle mobility within Glacier National Park.

The Mobility Framework

In this section, the concept of mobility is introduced, followed by a discussion of tourism mobility, both of which helps to contextualize the social relations, hierarchy, and the social constructions of GTSR tourism space. This section will also introduce conceptual and theoretical understandings of a politics of mobility (Cresswell, 2010), automobility rise (Urry, 2004; Thrift, 2004; and Aldred, 2013) and the effects that they have in formulating public spaces. The term mobility is a broad conceptual term which encompasses understandings on movements of people, goods, and information (Urry, 2007), and is a societal phenomenon with ideological ties to globalization and modernity (Canzler et al. 2008) (Ohnmacht et al., 2009). The term mobility will sometimes be used in a plural format to allow for a dynamic, fluid, and diverse depiction of the term, rather than a static one.

Mobilities are not evenly distributed amongst objects and phenomena throughout society and the term 'Immobilities' is brought up by Hannam et al. (2006) to express the social exclusions of mobilities. In 2009, Ohnmacht indicated that mobilities are inherently social, spatial, and hierarchical; the hierarchy of mobilities refers to the movements of people being unevenly distributed, for example, certain social groups are treated with a great flexibility to travel to and from destinations while the world's less fortunate are cut off from free flowing mobilities. Hannam et al. (2006) defined mobilities as "both the large-scale movements of people, objects, capital and information across the world, as well as the more local processes of daily transportation, movement through public space, and the flows of material things within everyday life". Hannam's (2006), and Ohnmacht's (2009) conceptualizations of mobilities

uncovers the usefulness of the mobilities framework for assessing the socio-spatial relations, hierarchical ordering, and (un)evenness between cyclists and motorists along the Going-to-the-Sun Road.

Tourism Mobilities

Tourism mobilities involves flows of human movement and capital accumulations that stem from air travel, mass motorization, flows of de-boarding and arriving tourists from place to place, and the economic quantifications of the tourism industry (Urry, 2004). Increased engagement with tourism mobilities (especially air transport and long distance automobile travel) has an association with socio-economic position in society. There are few places in the world that are free from tourism mobilities and government agencies along with capitalist enterprises regularly encourage unimpeded flows of tourists to increase GDP (Urry, 2004; Urry, 2007). In the context of GNP, tourism mobilities and tourism capital accumulation are integrated through a systematic process that involves unimpeded flows of tourists and tourism development to the destination area (Dilsaver and Wyckoff, 1999).

According to Dubois et al. (2011) tourism contributed to 5 percent of all CO₂ emissions in 2005 and roughly 75 percent of those were due to tourism transport; they further discussed recent growth in tourism and the projected tourism growth expected through 2030, thus contributing to greater emissions and intensifying climate change. If the tourism sector intends to meet the request by the Intergovernmental Panel on Climate Change (IPCC) to reduce global CO₂ emissions by 2050 then tourism transport may need to shift to alternative modes, fuels, or simply reduce the flows of tourist arrivals. Despite people's awareness of the association between tourism transport and the degradation of the earth's biosphere, little has been done on the part of the tourist to change travel behaviors. Hibbert et al. (2013) describes

this as the attitude-behavior gap that surrounds environmental awareness and tourism mobility behaviors, and their findings suggest that identity plays a heavy handed role in tourism mobility decision making. Narratives of tourism experiences allow an individual to construct or re-construct their own self-identity, and identity often takes precedent over tourism mobility decision making that may consider the environmental impacts of transport modes.

Articles are routinely published in the local papers every season during GTSR plowing efforts stressing the importance of opening the road for visitor auto-access to Logan Pass and to facilitate economic benefits from steady tourist flows (Devlin, 2014). Once the auto-season is in full swing, any disruption to the free flow of capital may be viewed as a threat by tourism stakeholders. This is evident by recent celebrations of record-breaking visitation in 2015 despite road closures from wildfires, and the ubiquitous reporting by the newspapers on the “openness” of the road. Media, tourism stakeholders, and visitor demands place immense pressure on managers to suppress naturally occurring wildfires so that tourism flows can be re-established. GNP managers in 2015 celebrated the early opening of the road in the spring as an opportunity that made up for lost revenues (Devlin, 2015), however, the west side only spring opening was unprecedented. Historically the road is opened in full and this was the first time the park has opened only the west side. The result of this decision led to auto congestions, and visitors were turned around at the Loop due to traffic conditions, lack of parking, and no tourism mobility overflow onto the east side of the park. It is this type of tourist mobility decision making that may erode the quality of the visitor experience.

Tourism mobility and tourist flows along the Going-to-the-Sun Road do not occur evenly between cyclists and motorists, and it is evident from the bicycle restriction that is in place on the GTSR (NPS, n.d.). Bicycles traveling slowly on the GTSR may disrupt unimpeded

flows of automobiles and bicycling as an activity on GTSR is frequently touted as “unsafe”, often without any direct experience, only perception. It appears there is politicization between bicyclists and motor vehicles who are simultaneously utilizing the GTSR as a tourism mobility space. Further research is needed to understand the social and power relations occurring between cyclists and motorists.

A Politics of Mobility

Politics of mobility and mobility unevenness that prioritize the automobile system have impacts on space and place meanings. The rhythms and embodiment of mass motorization supports a car-dependent culture and hierarchical order of human movement in society. The overall aim of this section is to introduce a politics of mobility for establishing a conceptual framework and theoretical lens; this lens will help to assess how travelers’ attitudes towards bicycling and bicycle-automobile interactions contribute to the way tourism mobility and space is structured in Glacier National Park on the Going-to-the-Sun Road.

The geographer Cresswell (2010), discusses how social relations and notions of power shape human mobilities. Theoretical perspectives on ideas of space and power struggles are highlighted by Lefebvre (1991) and Harvey (1990) in the preceding section, thus providing conceptualizations of “how space is produced by social relations and power relations”. Human mobility often times results in people being excluded from spatial movement while others have access, and it has political implications. It should be clear by now that space, place, and mobility are socially/politically constructed, and are theoretically interconnected.

In an article titled “*Towards a politics of mobility*” by Cresswell (2010), the author builds a geographical theory for a politics of mobility. There are six aspects of the politics of mobility to consider and they include the following as outlined by Cresswell (2010). All six of these

components will be integrated into the discussion section of this thesis for a critical analysis of a politics of mobility along the GTSR.

1. Why humans and objects physically move and the force (both internal and external) that drives them to move.
2. The differing speeds and velocities at which movement occurs.
3. Rhythms at which things and humans move.
4. Routes of mobility are not evenly distributed.
5. How mobility feels, the embodiment or experience
6. Friction of movement and how mobility stops.

An inherent politics of mobility emerges surrounding social relations and the distributions, productions, and hierarchy of human movement. There are those who are 'high up' and those who are 'low down' in theories on the politics of mobility as demonstrated in the works by Cresswell (2010). Those 'high up' have mobility privilege while those 'low down' may be people who are displaced, possibly being forced to move, and experience a less privileged form of human mobility. A politics of mobility helps to theorize about the hierarchy of mobility associated with automobile use and bicycling on the Going-to-the-Sun Road.

Automobility

The author Urry (2000, 2004) gives excerpts on how automobiles have become our 'rightful' way of moving around the environment and the speed and velocity that automobiles travel is affecting our public street space. Urry (2004) defines automobility as a self-expanding cyclical system that has spread around all corners of the globe and the author outlines various components that constitute the 'system of automobility (e.g. standardizations of cars produced

through capitalism/fordism, quasi-private mobility that subordinates walking/bicycling/etc., and social-environmental impacts through manufacturing and use of the automobile). Technological changes and the speed, size, and materials that constitute a 'car-body' today are redefining the embodiment of human movement and prioritizing the automobile in producing the modern definitions and meanings of 'moving in society'. In *Driving in the City* (Thrift, 2004), the author outlines work by de Certeau on the meanings of public street space prior to the automobile. The piece by de Certeau gives a theoretical assessment of the 'language of the city' as defined and spoken by 'walkers' (Thrift, 2004). The romantic definitions of public street space depicted by de Certeau are losing their meaning in an era of mass motorization. Mass motorization has spatial significance and contributes to formulations of the sociology behind local environments (Aldred, 2013). The Going-to-the-Sun Road is manufactured in its visual, ergonomic, and infrastructure to serve a culture of cars, trucks, and busses; affecting the way bicycling is embodied both socially and spatially. Theories on automobility dominance (Urry, 2004; Thrift, 2004; Aldred, 2013) help in highlighting the economic and political forces that impact meanings of space and place along the Going-to-the-Sun Road.

Bicycle Mobility

The purpose of this section is to give meaning to bicycle mobility as a tool for re-producing and re-constructing socio-spatial and place meanings along the Going-to-the-Sun Road. The bicycle has widely been viewed as a social and environmental justice object involved in discourses ranging from the turn of the nineteenth century feminism and socialism to modern day environmentalism (Horton, 2006). Green living, sustainability, and environmental activism, as well as social, cultural, and political life are all intertwined with the meanings attached to the bicycle. Horton (2006) describes the bicycle as an object or symbol of political

and social discourse which contributes to the formulation of environmentalism and green culture. The bicycle's non-motorized design and minimization of steel and petroleum resources greatly reduces natural resource exploitation and has potential as a mechanism for re-producing tourism space along the Going-to-the-Sun Road.

Bicycle culture played a major role in the feminist and socialist movements in the United Kingdom prior to the mass automobility that spiked during the Fordism era (Horton, 2006). According to Horton (2006), the bicycle changed the way women dressed and their social roles were irreversibly changed through the growth and popularity of the bicycle; at the same time, Briton's were riding bicycles into the countryside to demonstrate socialist values. In an attempt to respond to the call for more urban studies and social science critiques of the automobile, Pesses (2010) contributes his work through a focus on bicycle tourism in the United States with a theoretical foundation rooted in the mobilities paradigm. Through empirical readings about bicycling, Pesses attempts to show that there is a growing desire for people to resist the public spatial and social prevalence of automobility by escaping on the bicycle into the American landscape.

The environmentalist era of the 1960's and 1970's began bringing into focus the rise in automobility and the impacts that cars were having on places, space, the public domain, and the degradation of ecological resources; the bicycle as a social and environmental justice object is re-emerging in the social collective consciousness today. Clear distinctions have been made between bicycling activists who tend to be politically driven by environmental values and other types of bicyclists such as recreational excursionists (i.e. those who put on their lycra prior to riding). Bicycling for the environmentalist is as much about notions of geography (i.e. sprawling

cities due to automobility) as it is about social reproductions of a lifestyle where political and social systems are being challenged.

In *A place of sense: kinesthetic ethnography of cyclists on Mont Ventoux* (Spinney, 2006), the author examines the bodily experience and spatial movements associated with cycling mobility as a process that is definitive of a place. A method of ethnographic research was used to investigate how mobility rhythms and kinesthetic embodiments of being in a place help define and characterize a place. Spinney (2006) tells a detailed narrative of the lived bodily experience of a cycling tour on the historical road-touring site known as Mount Ventoux. The bicycle tour is unique in that it is “a temporary reposition of one’s role in the automobility system” (Pesses, 2010). Small groups of touring bicyclists, who spend days on end sensing and embodying the landscape from the speed and rhythm of a saddle, are challenging the status quo of automobility, while also being at the forefront of reproducing tourism spaces. It is the human lived experience that gives depth in meaning to space and place (Relph, 1976), and touring bicyclists embody or experience mobility along the Going-to-the-Sun Road differently than automobiles (Giordano, 2002). Insights from bicycle touring mobilities (Spinney, 2006; Pesses, 2010) and bicycling social-environmentalism (Horton, 2006) provide understandings into the human experiential facet of bicycling mobility vs. automobility on the GTSR.

Cresswell’s (2010) politics of mobility theory, adaptations of mobility specific to automobility (Urry, 2004), and bicycling mobility research (Spinney, 2006; Horton, 2006; Aldred, 2013) all contribute to the theoretical lens for use in a critical analysis of transportation issues within Glacier National Park. Furthermore, insights from geographical concepts on space, place, and mobility (Lefebvre, 1991; Harvey, 1990; Cresswell, 2004) aid in understanding

the complex mobility processes that structure Going-to-the-Sun Road tourism space within Glacier National Park.

The Significance of Bicycle Tourism

The bicycling boom, as documented in the historical piece by Tobin (1974), exploded throughout the 1890's; and bicycling became extremely popular, fashionable, and dominated as a leading social activity for the United States (Tobin, 1974). Touring bicyclists have a long history and a strong connection to tourism and recreation as demonstrated in this historical account. Bicyclists can arguably be classified as the first modern tourists due to the boom in mass bicycling during the late 1800's. The bicycle tourists of this era created popular demands for building new roads and improving existing road infrastructures for escaping to the countryside by bicycle. Roadway surface improvements were initiated by the League of American Wheelmen which helped pave the way for the national highway system (League of American Bicyclists, 2015) and began laying the foundation for the modern automobile tourism we know today.

Historically, bicycle tourists were welcomed by and catered to by the tourism industries, so much so that the names of some hotel establishments reflected the bicycling clientele. Hotels such as "Wheelman's Rest" ensured that touring cyclists were provided with adequate comfort and even provided bicycling services such as tire pumps and repair kits (Tobin, 1974). Tobin (1974) demonstrates how the League of American Wheelmen (established 1880) organized a system of certification for Inns and Hotels that met certain evaluative standards to support bicycling tourists.

Overall support for bicycle tourism has declined with the rise of auto-tourism and tourism planning efforts no longer prioritize the bicycle the way they did during the heyday of the League of American Wheelmen and the bicycle boom. Nickerson et. al (2013) suggests that touring cyclists in Montana (approximately 1/3) are having difficulty with adequately safe shoulder widths on the state's highways. Aside from the critiques of the road conditions, respondents also reported concerns with hotel and lodging services (Nickerson et al., 2013). The respondents reported that Montana's lodging infrastructure was lacking cyclist/hiker only accommodations, there was only one bicycle specific hostel (Twin Bridges, MT), and healthy food availability was too sporadic. Other transport research (Chataway et. al, 2014) highlights the emotional stimuli that are triggered between cyclists and motorists when an infrastructure imbalance exists and the cyclist or motorist begins to develop a perception of territory. A more balanced tourism infrastructure (esp. roadway conditions) and greater mobility evenness could help to reduce bicycle-automobile conflicts, thus leading to improved safety along the GTSR.

Bicycling has gone through many evolutions over the past century and remains a relevant socio-cultural activity in contemporary society. However, the early bicycling boom has largely been replaced by the era of automobility, which continues to be prioritized, as evident by the fact that over 1 billion cars were produced over the last century (Urry, 2004) and the average U.S. population's bicycle commuter rates are less than 1% today (Pucher and Buehler, 2011). Despite these grim outlooks of automobile use and the prevalence of widespread automobile culture, bicycling popularity is re-emerging and the modern needs of bicycling tourists are an important component to the success of prioritizing bicycle tourism spaces (Ritchie, 1998; Lamont, 2009).

Re-emergence of Bicycling in Society

Society, institutions, and governing bodies recognize cycling as a widespread activity that is relatively acceptable, but despite the social acceptability of cycling and the large number of bikes being sold to consumers, the early 2000's saw a very low bike commuting rate for work trips (0.4% as of the 2000 Census) within the United States (Pucher and Beuhler, 2006). The most recent 2010 census reported a bicycle commute rate of 1 percent for the 50 largest U.S. cities (increasing faster than any other mode) (McKenzie, 2014). According to Horton (2006), the UK experienced a similar trend as the U.S. in high bike sales but low number of bikes on the roads. More recently, cycling is re-gaining popularity throughout society, and people are increasingly participating, as evident through research done by Pucher and Buehler (2011), where the authors document a significant rise in North American bicycling for commuting across U.S. cities.

Bicycle participation today ranges from recreationists, to urban commuters, and the enthusiastic bicycle tourist. The National Highway Traffic Safety Administration reported that 47 percent of Americans would like to see more bicycle facilities in their communities (Royal and Miller-Steiger, 2008). The increased desire Americans have to utilize the bicycle during tourism, recreation, and leisure time creates new management challenges for Glacier National Park and Montana to consider.

Bicycle Tourism

The bicycling industry has been an important contributor to state economics for as long as the bicycle has been around. The League of American Wheelmen noted as early as 1896 that the bicycle economy was valued at \$75,000,000, and the acting League president then estimated that there was around 2.5 million bicycle riders in the United States (Tobin, 1974).

This sentiment is still relevant today as long distance bicycle touring is of increasing interest to travelers, as proven by a study completed by the Institute for Tourism and Recreation Research where a partnering bicycle organization, Adventure Cycling Association (42,000 members), provided over 3,000 emails of touring cyclists who visited Montana in a three-year period (Nickerson et al. 2013). The rise in popularity of bicycle tourism is further supported in research studies done by (Ritchie, 1998; Lamont, 2009; Chang and Chang, 2005), spanning topics ranging from touring bicycling needs, preferences, infrastructure, and safety, to economic supply – demands. However, there is a lack of knowledge on independent touring cyclists. A New Zealand researcher attempted to fill that gap by investigating touring cyclists from a demand side perspective (Ritchie, 1998). Ritchie (1998) demonstrates the need for understanding the touring cyclist’s travel characteristics in order to adequately plan for and create suitable bicycle tourism spaces and places. This type of data is needed for Glacier National Park and throughout Montana.

Defining Bicycle Tourists

Giving bicycle tourists a singular definition is challenging due to the plurality of bicyclists that exist, the multiple surfaces that are cycled, distances traveled, the total nights spent, and motivations for riding, among other factors. Simonsen and Jorgenson (1996) classify a bicycle tourist as someone who uses a bicycle at any stage during vacation and places them on a continuum from Enthusiast to Occasional, however, their definition leaves out local residents who take long day trips outside of their home community or drive to a bicycling destination for the day to recreate. It also does not distinguish between those who use the bicycle as their sole mode of transportation while on vacation and those who use an automobile or other mode, but consider the bicycle a major trip purpose. Lumsdon (1996) provides a more

encompassing definition by including those who are on day trips with their bicycle and perceived the bicycle as an important component to their leisure time. Ritchie (1998) argues that Lumsdon's (1996) broader definition wrongfully classifies a day trip mountain biker as a tourist rather than an 'excursionist'. In Lamont's (2009) review of bicycle tourist definitions, he notes how Ritchie's definition leaves out important day trippers who attend special bicycle events (races, tours, etc.) which contribute a great deal economically as argued by Faulks et al. (2006), and where the bicycle is a primary focus of the day trip purpose.

Ritchie's (1998) bicycle tourism definition shifts from other bicycle tourism researchers (Lumsdon, 1996; Simonsen and Jorgenson, 1996; Faulks et al. 2006; Lamont, 2009) by making the distinction that a bicycle tourist must be away from home for at least one night with the bicycle being a major trip purpose. For this thesis, an adaptation on Ritchie's theoretical definition of a bicycle tourist is used and it includes travelers (resident and non-resident) who spend at least one night away from home. Categorizing travelers into various subgroups (non-cyclist, occasional, frequent, and very frequent) (cyclists and motorists) rather than focusing on the bicycle as a major trip purpose allows for quantitative comparisons of attitudes between groups. Despite which bicycle tourist definitions to use, it is clear that there is agreement on the need to further understand bicycle tourists as it provides a method of travel to, from, and within destinations such as Glacier National Park.

Transportation and National Parks

Bicycle touring to national parks has been of interest to the urban dweller for nearly as long as the establishment of our first national park (Yellowstone Park – est. 1872), and bicycle touring in scenic areas is older than the National Park Service (est. 1916) itself. Articles written by *Outing Magazine* (1890-1905) on bicycle touring to Yellowstone Park (Tobin, 1974)

demonstrate the historical significance of escaping the city by bicycle to experience nature and America's national park system.

The National Park Service (NPS) has recognized the rapid growth in visitation over the past several decades and they have highlighted the importance of addressing transportation impacts associated with the personal automobile (NPS Transportation Planning Guidebook, 1999). The NPS's Alternative Transportation Program has outlined that "the automobile cannot always be the primary mode of transportation" (Daigle, 2008). More research is needed surrounding peoples' perspectives and attitudes on alternative transportation systems within national parks and White (2007) suggests that there is very little research on transportation systems within national parks compared with visitor experiences research. The author (White) proceeds by specifically mentioning gaps in understanding the factors that influence travel behavior and the perspectives that people have towards alternative transportation systems. Various other NPS transportation researchers (Hallo and Manning, 2009; Daigle and Zimmerman, 2004; Dilworth, 2003) have similarly noted the lack of empirical knowledge surrounding driving experiences and alternative modes of transportation within national parks. Empirical evidence of the traveler's transportation experience (e.g. bicyclist-automobile interactions) on the Going-to-the-Sun Road may provide insights to Glacier National Park officials for bicycle tourism planning.

Automobility in Glacier National Park

The congestion and impacts associated with growing automobile use in national parks are apparent in technical and academic reports. Traffic counts conducted in GNP at the West entrance for July and August of 2014 show 113,449 and 108,756 vehicles respectively (NPS Stats, 2015). Park visitors are increasingly being attracted to national parks to engage in

pleasure driving as a park experience (Hallo and Manning, 2009). The NPS is becoming increasingly aware of the automobile-related concerns; park road users are creating road congestion, trail congestion, air pollution, noise pollution, expensive road upkeep, and impacts to the natural and cultural resources (NPS transportation Planning Guidebook, 1999).

Researchers Dilsaver and Wyckoff (1999) argue that tourists and park agency are cemented in a belief and culture of free and uninterrupted access into GNP by prioritizing the automobile as the most efficient mode for park visitation. A peak tourism season observation along the GTSR quickly reveals that the automobile is the dominant transportation mode in GNP, but there is no data on whether visitors are supportive of bicycling on the GTSR.

In GNP, scenic drivers are at risk of contributing to their own physical movement frictions on the GTSR as the park becomes increasingly pressured to address the known congestion and impacts associated with growing numbers of automobile visitors. While data on automobiles in GNP exists (Weinberg, 2014), and some data on shuttle riding in the park is available (Baker 2008; Miller and Freimund, 2015), no clear understanding of the number of bicyclists who ride in GNP has been documented. Bicycle counts have been prevalent for many transportation agencies in establishing a baseline of data on the number of bicyclists in a given study area (Hyde-Wright et al. 2014), but the gap in bicycling data in GNP is evident.

The only study about bicyclists in GNP was a thesis conducted by Giordano (2002) looking at the experience along the GTSR based on mode choice (auto, bus, bicycle). Interviews with ten auto drivers, ten passengers on a bus, ten passengers in an automobile and ten bicyclists showed that the GTSR as a facilitator of movement interfered with the road as a facilitator for experiencing nature. Traffic on the road detracted from the positive experience; Giordano's findings align with at least two other studies (Manning et. al, 2002; Park Studies

Laboratory, 2002), showing national park visitors' quality of experiences being negatively affected by automobile congestions. Furthermore, the author Leiper (2004) argues that an erosion of the tourism experience occurs when travelers are in transit because they are isolated behind glass in a motor vehicle. There are no data available providing GNP park managers with the lived experiential interactions and preferences of cyclists and motorists, the numbers of cyclists, attitudes about bicycling, knowledge of roadway bicycling laws, frequency levels associated with the activity, challenges, or the opportunities of bicycling in GNP to date.

Bicycling Attitudes

According to the famous geographer Yi-Fu Tuan, perceptions, attitudes, world views, and values all overlap in their meanings and definitions (Tuan, 1974). To help set the stage in defining these concepts; Tuan's definition of attitude will be outlined.

Attitude – “primarily a cultural stance, a position one takes vis-à-vis the world.

Perceptions and attitudes are both rooted in culture and share similarities; however, attitudes are sturdier, and are shaped by an accumulation of perceptions over a lengthier temporal experience (Tuan, 1974). Tuan uses the example of an infant to help clarify between these two terms, where infants perceive but are lacking attitude as well as world view (besides biological) due to their lack of experience in the world.

Attitudes about a particular object have been thought to be determined by a person's beliefs about that object (Ajzen and Fishbein, 1980). An attitude can be further defined as a subjective evaluation of the positive vs. negative outcomes of a given behavior (Ajzen, 1991). The Theory of Planned Behavior was developed by Ajzen (1991) with the basic premise that there is more to personal decision making than just personal attitudes; rather, peoples' perceived social norms are also instrumental in effecting their choices – perceived social norms

being the degree to which an individual thinks they can perform a behavior. Davies et. al (1997) conducted one of the earlier studies on attitudes to cycling and found that people associated bicycling as a childhood activity, and many revealed social peer pressure as the reason they stopped bicycling. Heinen et al. (2010) defined an attitude as “people’s expectation of all the outcomes of an activity, and the personal value of these outcomes”. White’s (2007) study of alternative transportation in Yosemite National Park, social-psychological (perceived freedom, environmental values and beliefs, and experience levels of alternative modes of transportation) and situational factors (convenience, park access, and type of group) were crucial in understanding the visitor’s perspectives on modal choice (White, 2007). The relationship between attitudes, perceived social norms, and behavioral decision making (modal choice) are certainly important (and interwoven), however, a focus on Ajzen’s (1991) depiction of an attitude as “subjective evaluations of the positive vs. negative” that are associated with an activity help to begin the development of a theoretical definition of bicycling attitudes.

An attitude related to bicycling on roadways is theoretically defined as “general orientation towards cyclists and the degree to which they are viewed as legitimate road users, as well as the subjective assessment of the characteristics of cyclists as sharers of road space” (Bashford et. al, 2003). Bashford et al. (2003) found that the attitude toward bicycling of motorists who were also bicyclists did not differ greatly from non-bicyclists in a given context. However, other transportation scholars have found that a person’s attitude towards bicycling has a significant effect on their willingness to engage with the activity (Dill and Voros, 2007). Sander’s (2013) dissertation suggests that cyclists have softer attitudes towards bicycling compared with non-cyclists. Examining attitudes in relation to cycling frequency in a recreation and leisure context in Glacier National Park may help to close the gap between the findings of

Bashford and others. In the proceeding sections and chapters, an attitude towards bicycling will simply be referred to as a “bicycling attitude”.

Bicycling Frequency

Recreation specialization theory was developed by Bryan (1977) to better understand a trout angler’s level of specialization in the recreational activity and how the specialization of anglers impacts their preferences and behaviors. Trout anglers were divided into four classified groups (occasional anglers, generalists, technique specialists, and technique-setting specialists) that defined their recreational specialization level (Bryan, 1977). Similarly, Ritchie (1998) describes how a bicyclist’s experience level, background, attitudes, and motivations may help describe where the individual is classified on the definitional continuum (i.e. activity association and recreational value orientations). Research shows that people who drive, yet have some level of experience and frequency in bicycling, are more sensitive in their attitudes towards bicycling (Bashford et al., 2003). Additionally, it has been found that those who participate in bicycling more often also have an improved general support for bicycling (Sanders, 2013). The academic fields focusing on recreation specialization theory (Bryan, 1977), bicycle tourism (Ritche, 1998), and urban bicycle transportation (Dill and Voros, 2007; Dill and McNeil, 2013), uncover the need to categorize bicyclists as to avoid a homogenous understanding of bicycling behaviors and attitudes. It is evident in bicycle literature whether for recreation, tourism, or transportation studies that a frequency of bicycling participation be established before assessing associations with knowledge of roadway bicycling laws, bicycling attitudes, and behavioral perceptions that occur on the Going-to-the-Sun Road.

Scholarly studies conducted on the topic of bicycling typically include some level of adaptation on Dill and Voros’ (2007) model of categorizing individuals based on their cycling

frequency. Some researchers have used bicycling in the last 12 months as the cutoff for establishing the non-cyclist population (Daley and Rissel, 2011); this measurement strategy has been used in both bicycle tourism literature and urban transportation studies. There is some variance on how individual researchers decide to categorize cycling frequency, but they all include non-cyclists and two or three categories of cyclists. The previous work done on cycling frequency is foundational to understanding the relationship between cyclists and non-cyclists along the Going-to-the-Sun Road.

Knowledge of Roadway Bicycling Laws

In a study by Rissel et al. (2002), it was found that drivers who showed lower knowledge pertaining to roadway cycling laws also showed poor attitudes towards bicyclists. Negative attitudes towards bicyclists due to a lack of road rule knowledge has been documented by Rissel et al. (2002), and Sanders (2013); and the importance of educational campaigns to improve driver knowledge of bicycling laws was highlighted. In a study by Bashford et al. (2003), no significant difference was found of attitudes towards cyclists based on cycling experience, indicating that there may be a need for disseminating bi-directional educational information related to the laws, rules, and responsibilities of bicycle-automobile interactions. Further research is needed to determine variances between distinct cyclist groups and non-cyclist's bicycling attitudes, knowledge of roadway cycling laws, and perceptions of other cyclists based on cycling frequency.

Drivers frequently express that bicyclists do not ride properly on the road or according to Rissel et al's (2002) study, that drivers perceived bicyclists as being "not courteous" on the road. There is a lot of ambiguity amongst drivers on what proper cycling behavior is, and drivers may view a bicyclist who utilizes their full lane as being "not courteous". According to

Montana state law, a bicycle (1.) shall ride in the right hand lane and ride to the right side of the lane as judged safe by the bicyclist to facilitate overtaking by other vehicles unless it is necessary to avoid a condition that makes it unsafe to ride in the right-hand lane of the roadway; unsafe conditions include (a.) hazards at the edge of a roadway, including but not limited to fixed or moving objects, parked or moving vehicles, bicycles, pedestrians, animals, surface hazards, or narrow lanes (b.) no reasonable margin of safety on the right side of the roadway. The Montana state bicycling laws ultimately deems it up to the bicyclist to determine where they feel safest in the travel lane.

In a paper by Daigle (2008), the author discusses the need for the NPS to integrate with state departments of transportation in order to engage in the process of transportation policy and decision making. A disconnect exists between GNP transportation policies and the Montana department of transportation's roadway bicycling laws. Knowledge pertaining to roadway bicycling laws in Montana have not been explored along the GTSR in GNP or in other national parks. Research has shown in other context areas that knowledge and experience affect bicycle-automobile interactions and attitudes amongst enthusiastic cyclists (O'Connor and Brown, 2010). The O'Connor and Brown (2010) study falls short in only examining enthusiastic cyclists and a further quantitative examination of knowledge between cyclists with varying degrees of experience and non-cyclists is needed. Further research is needed to determine variances in knowledge of roadway cycling laws and its relationship to both cycling frequency as well as bicycling attitudes.

Informational Messaging and Cycling Signage

A majority (49) of the 50 state's transportation policies across the U.S. recognizes a bicycle as "having all the same rights and duties as a driver" and many states recognize a bicycle

as a legal vehicle (The League of American Bicyclists, 2015). Furthermore, Hess and Peterson (2015) suggest that the 50 states generally permit a bicycle to be in the full travel lane. Hess and Peterson's (2015) study tested the relationship between three informational messages on traffic signs (no sign, share the road, and bicycle may use full lane) and the degree to which respondents recognized bicyclists' rights to use the road; they found the "bicycle may use full lane" sign to be most effective (especially amongst people who bicycled the least frequently) in legitimizing roadway bicycling and no significant differences were found between no sign vs. a share the road sign. Share the road signs contribute to the ambiguity surrounding proper cycling behavior because of the potential to be misused by drivers to claim that bicyclists should move over to the right and stay out of the traffic lane (Bike Delaware, 2014; Hess and Peterson, 2015). The "Bicycles May Use Full Lane" sign is a clearer message that helps to alleviate misunderstandings when a road is too narrow for a bicycle and a motor vehicle to share while overtaking is occurring (especially when there is oncoming traffic). The GTSR fits the description of a narrow road with insufficient space for bicycles and motorists to share a lane and park managers could benefit from an experimental study to test bicycling attitude differences between travelers who read a "Bicycle May Use Full Lane" sign (treatment group) and those who do not (control group).

Motorist Behavior and Cyclist Behavior

Techniques for improving human behaviors within a park and recreation context using educational information and dialog between groups of the correct behaviors that need to be addressed have been highlighted by (Hines et al., 1986; Jackson & Wong, 1982; Kaiser & Fuhrer, 2003). Managers can attempt to mitigate unsafe behaviors and conflicts by providing educational information to those who enter the recreational setting (Hendee & Dawson, 2002;

McCool & Christensen, 1996). There is a potential for implementing an experimental design to disseminate informational messaging pertaining to the Montana laws, rules, and responsibilities of roadway bicycling to reduce conflicts, improve attitudes, and increase safety along the Going-to-the-Sun Road. Furthermore, no data exists on whether park visitors are critical of motorist/cyclist roadway behaviors, and the degree to which they value bilateral courteous behaviors and support for education pertaining to sharing the road between cyclists and motorists.

Perceived Fear of Bicycling

The purpose of this section is to review literature on cycling in society and the perceived fears that influence engagement with bicycling. Determinants that influence bicycle commuting shares has been researched by Pucher and Buehler (2006), where they indicate fear and safety as important factors preventing ridership. In a study conducted by O'Connor and Brown (2008) that included only enthusiastic cyclists, no significant differences were found between cyclists with varying levels of experience when asked "is cycling on the road safe?" Other reports (Horton, 2007; Sanders, 2013) that investigated the emotional side of bicycling within society found that people who ride their bikes more often are less fearful and more positive in their bicycling attitudes. Sander's (2013) found significant differences in perceptions of fear given an individual's level of bicycling frequency. Studying the relationship between perceived fears and bicycling frequency of Glacier National Park travelers will help minimize the discrepancy of results found by O'Connor and Brown vs. Sanders.

Researchers commonly indicate that people are not bicycling due to concerns of safety (Pucher et al., 1999; Pucher and Buehler, 2006; Sanders, 2013). Rissel et al. (2002) have shown that many adult drivers do not participate in bicycling on roadways due to their perception of

safety risks, and three quarters believed that they would be hit by a motorist on the roadway. Contrary to the driver's risk perception, the cyclists actually had a higher level of on-road experience and showed lower perceptions of risk and danger (Rissel et al. 2002). Respondents in Rissel's study also over estimated and exaggerated the number of fatalities they believed occurred. Cycling fatality rates in the U.S. (5.74 per 100 million kilometers) are higher than in Canada (2.39) and Denmark (1.03) (Pucher and Buehler, 2006) yet the U.S. has the lowest participation rates in cycling, thus contributing to Jacobsen's (2003) analysis that increased participation in the activity results in safer bicycling conditions. Sander's (2013) study suggests that perceived fear of cycling is related to general support for bicycling but no studies have attempted to measure the relationship between bicycling frequency and perceptions of fear within a national park context, and how those perceptions of fear then correlate with bicycling attitudes and support for GTSR cycling.

Perceived Interaction and Recreation Conflict

In the pivotal recreation conflict study by Jacob and Schreyer (1980) the authors theoretically define recreation conflict as "goal interference attributed to others' behaviors", which can be applied to understanding how cyclists and non-cyclists accept or reject the activity of bicycling on roadways and bicycling on the Going-to-the-Sun Road. Wellman, Roggenbuck, and Smith (1982) used recreation conflict and recreation specialization to measure how attitudes of poor behavior fluctuated between low and highly specialized canoeists, and little differences were found between the two groups. However, a one-way conflict was discovered in a study by Jackson and Wong (1982) when they examined differences between cross-country skiers and snowmobilers in Alberta; the non-motorized skier group had a more negative perception of the motorized snowmobile group, but the snowmobilers were tolerant of the

skiers. Jackson and Wong's study identified recreation orientation (values and beliefs associated with the activity) and the group's motivations for participating in the activity as aspects that contribute to the asymmetrical conflict. Jackson and Wong's study was followed by another study (Adelman, Haberlein, & Bronnicksen, 1986) in the Boundary Waters Canoe Area that confirmed one-way asymmetrical conflict between canoeists and motorized boaters, thus further indicating that the non-motorized group dislikes the motorized group while the motorized group is generally indifferent. Zonneveld (1993) discovered that conflicts between trail hikers and trail bicyclists in Canadian National Parks was more symmetrical; the bicyclists felt that other park users and the park management were prohibiting their opportunities within parks while the hikers generalized stereotypes of urban cyclists to the park cyclists. Contrary to Zonneveld's findings, Watson, Williams, and Daigle (1991) found asymmetrical conflict between hikers and mountain bikers in the Rattlesnake NRA where the bicyclists were happy to encounter hikers but the hikers were dissatisfied with meeting the bicyclists.

Bicycle-Automobile Perceived Interactions

Recreation conflict studies provide a theoretical perspective to understanding bicyclist and motorist perceived interactions, embodiment of mobility (movement preference as a facilitator of quality recreational experience), attachment to the activity (bicycling frequency), and the meanings (subjective positive or negative associations) that different groups attach to the activity of roadway bicycling and cycling the Going-to-the-Sun Road.

A perception can be theoretically defined as "the response of the senses to external stimuli and purposeful activity in which certain phenomena are clearly registered while others recede in the shade or are blocked out" (Tuan, 1974). Researchers (O'Connor and Brown, 2010; Heesch et. al, 2011) found an abundance of cyclists registering incidences of motorists

passing too closely or acting aggressively. Others (Rissel et al, 2002; O'Connor and Brown, 2010) have reported that drivers find cyclists to be aggressive and frustrating to share the road with. Few studies have been conducted thus far to determine the levels of specialization (non-cyclists to very frequent cyclists) and its relationship to recreational conflicts pertaining to roadway bicycling. Furthermore, no evaluations have been made of the perceived interactions between motorized recreation (automobiles) and non-motorized recreation (bicyclists) on the GTSR. By studying perceived interactions and bicycling attitudes on the GTSR an assessment of recreation conflict can be made between the groups (bicycle-auto), and a determination of acceptance/rejection of roadway bicycling will surface.

Summary of Literature

Geographical perspectives (Hall and Page, 1999) were highlighted to set the stage as the disciplinary approach for this project; and a focus on social constructions, power relations, and critical social theory helps create deeper understandings of the tourism mobilities space along Going-to-the-Sun Road. A breadth of mobilities research specific to travel and tourism has previously been conducted (Sheller and Urry, 2004; Urry, 2004; Hannam et. al, 2006).

Contemporary mobility theory was highlighted as a framework and lens for understanding the diverse modes of transportation that tourists engage in during travel, and will help to view the modes according to their material and social significance (Sheller and Urry, 2004). The relevance of tourism mobilities in understanding GTSR bicyclists and automobile groups allows for an analysis of the various aspects of the politics of mobilities (Cresswell, 2010) impacting bicycles in Glacier National Park.

The documented history of support for bicycle touring (Tobin, 1974, Ritchie, 1998; Lamont, 2009; Chang and Chang, 2005) reiterates the need for a continuation of improvements

that will aid in safety and adequacy of bicycle infrastructure, services, and facilities for the current era of bicycle tourists within GNP and throughout Montana. The study conducted by White (2007) focused on a range of psychological and situational factors that influenced park visitor behaviors and transportation modal choices. Yosemite National Park, along with other parks, is beginning to recognize the growing environmental and social impacts that are resulting from auto-dominated accessibility within national parks (White, 2007). Automobility is contributing to the negative social impacts of the visitor experience and to the degradation of fragile alpine ecosystems within GNP and along the GTSR (Dilsaver and Wyckoff, 1999; Giordano, 2002). GNP personnel can assess the attitudes of people toward the behavior of bicycling to help inform alternative transportation planning and management decisions which may help to reduce the automobily impacts on the GTSR.

There is a gap in research on bicycling in GNP and the positive vs. negative attitudes associated with bicycling on the GTSR. Incorporating peoples' perceptions of fear and safety will help in understanding the varying degrees of these perceptions that are correlated with the different categorizations of bicycling frequency levels. Bicycling frequency levels are important in making distinctions between those who bicycle regularly and those who never bicycle, and their relationship with bicycling attitudes. Finally, knowledge pertaining to roadway bicycling laws in Montana, as well as share the road concepts have not been explored as it relates to bicyclists on the GTSR. Research has shown in other context areas that knowledge and bicycling frequency affect bicycle-automobile interactions and attitudes.

A final reiteration of the primary purpose of the study is as follows; to assess bicycling attitudes by three distinct categorizations of cyclists and non-cyclists on the GTSR in GNP and to measure differences in knowledge of roadway cycling laws, perceived bicycle – automobile

interactions, perceived fear associated with roadway cycling and level of support for cycling on the GTSR. An experimental design was included to test for improvements in knowledge of roadway cycling laws between a control group and a treatment group. The project attempts to understand the relationships between complex social processes of human behavior and mobility along the GTSR. The final objective was to develop a critical analysis of the socio-spatial processes that produce and construct bicycle tourism space/place along the Going-to-the-Sun Road.

Research Questions

The following research questions were answered in this study:

1. Do visitors differ in their bicycling attitudes, knowledge of roadway bicycling laws, perceived fear, and level of support for GTSR cycling based on their level of bicycling frequency?
2. Do travelers differ in their bicycling attitudes based on their knowledge of roadway bicycling laws?
3. What is the relationship between perceptions of fear and bicycling attitudes?
4. What is the relationship between support for cycling on the GTSR and bicycling attitudes?
5. Are perceptions of interactions on the GTSR positive or negative between cyclists and motorists?
6. Can knowledge of roadway bicycling laws be improved with signage and an educational brochure as experimental treatments?
7. Is the partial bicycling prohibition that is in place on the GTSR warranted or not?

Chapter Three: Methodology

The methodology used in this study was quantitative survey research. The survey was issued on sampling days in August, 2015 at Logan Pass in Glacier National Park and the Going-to-the-Sun Road was the study area (see Figure 1). Measurements on bicycling frequency, bicycling attitudes, knowledge of roadway bicycling laws, perceptions of fear, and perceived bicycle-automobile interactions was collected and compared between three categorizations of cyclists and a non-cyclist group. The bicycling study helped in developing an understanding of public support (or not) for bicycling use along the Going-to-the-Sun Road. The purpose of this methodology is to clearly establish variables, levels of measurement, population, sampling frame, sampling procedure, and statistical analysis.

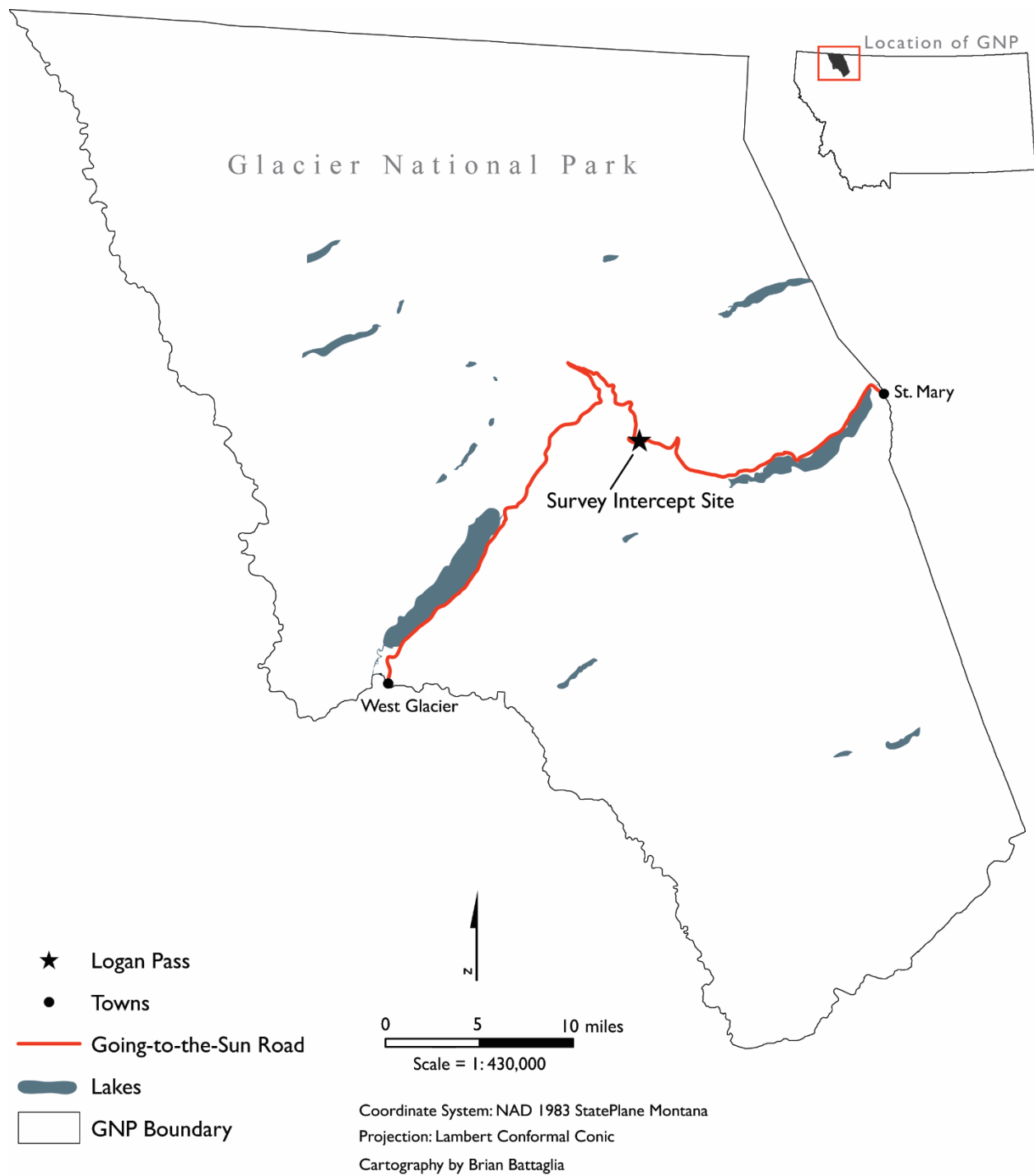


Figure 1. Map of Glacier National Park study area

Operational Definition of Variables

Bicycling Attitudes

An attitude related to bicycling on roadways was theoretically defined as “general orientation towards cyclists and the degree to which they are viewed as legitimate road users, as well as the subjective assessment of the characteristics of cyclists as sharers of road space” (Bashford et. al, 2003). A bicycling attitude was operationally defined as whether or not GTSR travelers legitimize or delegitimize cyclists on roadways, and their positive or negative association with roadway cyclists. Bicycling attitudes were the primary dependent variable.

Measurement and Population

The level of measurement for bicycling attitudes was ordinal and included four statements on a five-point Likert-scale from strongly disagree to strongly agree. Scores closer to 5 represented a more positive bicycling attitude.

Table 1. *Bicycle attitude scale*

Negative				Positive
1 = Strongly Disagree	2 = Disagree	3 = Neutral	4 = Agree	5 = Strongly Agree

The population of interest was GTSR travelers who were asked four questions for determining mean bicycling attitude scores. These questions were modified from Rissel’s (2002) study. In my daily life, I believe that....

1. Bicyclists have just as much right to use the road as motorists.
2. Bicyclists should be able to ride on main roads during high traffic times. ¹
3. While driving, it is not very frustrating sharing the road with bicyclists. ¹
4. Bicyclists should not be restricted to riding on paths or trails that are off-streets. ¹

¹ Denotes statements are reverse coded (see appendix to view the original format of the questions).

The self-report bicycling attitude measurements were reverse-coded to all be positive statements about bicycling, and resulted in an index that captured negative – positive views towards bicycling. Bicycling attitude scores were compared against (1.) the level of roadway bicycling knowledge a respondent reported both for a control group and a treatment group (2). the level of bicycling frequency a respondent reported (3.) correlated with perceived fear (4.) correlated with support for cycling on the GTSR.

Bicycling Frequency

Research on urban bicycle transportation has uncovered the need to categorize bicyclists as to avoid a homogenous understanding of bicycling behaviors and attitudes (Bashford et al, 2003; Dill and Voros, 2007; Dill and McNeil, 2013; Sanders, 2013). Bicycling frequency was the primary independent variable. Bicycling frequency was operationally defined as the categorization of individuals into various cyclist groups which differentiate the degree and scope that a GTSR traveler participates in bicycling in their daily life.

Measurement and Population

The level of measurement was one nominal statement and one ordinal statement that categorized the sample population of GTSR travelers as either cyclists or non-cyclists, and determined the level of frequency they generally engage in the activity in their daily life (non-cyclist, occasional, frequent, and very frequent). Bicycling frequency acts as the primary explanatory/independent variable for the GNP bicycling study, and was analyzed for finding relationships with response variables such as cycling attitudes, perceived fear, and knowledge of roadway cycling laws. Two questions were modeled from questionnaires in other studies (Dill

and McNeil, 2013; Daly and Rissel, 2011; Sanders, 2013) and asked for assessing bicycling frequency. Respondents who have not bicycled in the past 12 months were categorized as non-cyclists and those who answered yes to Q1 were directed to Q2 to further establish the remaining cyclist groups.

1. Have you ridden a bicycle in the past 12 months (Yes or No)
2. I ride a bicycle....(occasionally, frequently, very frequently)

Knowledge of Roadway Bicycling Laws

In a study by Rissel et al. (2002), it was reported that drivers who showed lower knowledge pertaining to the laws of the roadway also showed poor attitudes towards bicyclists, and the importance of educational campaigns to improve driver road rule and share the road knowledge was highlighted. Knowledge of roadway cycling laws was tested for general relationships with bicycling attitudes. Furthermore, knowledge of roadway bicycling was used in the experimental design to understand how roadway signage and roadway cycling laws/information affects an individual's knowledge of roadway bicycling, and whether or not improved knowledge affects bicycling attitudes.

Knowledge of roadway bicycling laws was operationally defined as whether or not survey respondents recognize a bicycle as being legally entitled to ride on the roads and whether a bicycle is considered a vehicle with the same rights and responsibilities on the road as a motor vehicle. Whether bicyclists are allowed use of a full lane of traffic was a standalone knowledge question.

Knowledge of roadway bicycling laws was tested as an independent and dependent variable for analyzing relationships (i.e. independent in relation to attitudes and dependent in

relation to bicycle frequency). Bicycling knowledge was further utilized as an independent variable for the experimental design.

Measurement and Population

The level of measurement for the knowledge variable was dichotomous nominal measurements (yes/no/I don't know questions). The population of interest for the measurement of roadway bicycling knowledge was GTSR travelers. Three questions were modified from Rissel's (2002) study to assess knowledge of roadway bicycling laws. In Montana...

1. A bicyclist is legally entitled to ride on the roads. (Yes, No, I don't know)
2. A bicyclist may use an entire lane. (Yes, No, I don't know)
3. A bicycle is considered a vehicle and has the same rights and responsibilities on the road as a motor vehicle. (Yes, No, I don't know)

All three of the statement's correct answers are 'Yes' according to Montana state law and those who answer 'No' or 'I don't know' were analyzed as not having accurate knowledge of a bicyclists rights. Those who answered 'Yes' were considered knowledgeable of roadway bicycling laws in Montana. The knowledge questions have two dimensions including the legitimacy of bicycling on roadways/recognition of a bicycle as a legal vehicle and whether a cyclist has the right to utilize a full lane. Knowledge was compared against (1.) the level of bicycling frequency a respondent reported (2.) the bicycling attitude score a respondent reported (3.) changes between a control group and a treatment group.

Motorist Behavior and Cyclist Behavior

Motorist behavior was operationally defined as a GTSR respondent's level of critique towards motorist behavior in relation to sharing the road with bicycles. The cyclist behavior variable was operationally defined as the level of critique toward bicyclist behavior in relation to sharing the road with motorists. Motorist behavior and cyclist behavior were both identified as secondary constructs through a factor analysis conducted on 11 original attitude statements.

Measurement and Population

The level of measurement for motorist behavior was ordinal and included four statements on a five-point Likert scale from strongly disagree to strongly agree. Cyclist behavior was also ordinal and included two statements on a five-point Likert scale from strongly disagree to strongly agree. Scores closer to five represent a stronger critique of either cyclist behavior or motorist behavior.

Table 2. *Motorist behavior scale and cyclist behavior scale*

Positive					Negative
1 = Strongly Disagree	2 = Disagree	3 = Neutral	4 = Agree	5 = Strongly Agree	

The population of interest was GTSR travelers who are either (not) critical of behaviors (motorist or cyclist) pertaining to sharing the road in their daily life. Respondents were asked four questions for determining their mean motorist behavior score. In my daily life, I believe that....

1. When possible, motorists should change lanes while passing bicyclists.
2. Many motorists do not look out for bicyclists.
3. Motorists should be more courteous to bicyclists on the road.

4. Motorists should be educated about sharing the road with bicyclists.

Respondents were asked three questions for determining their mean cyclist behavior score. Only questions 1 and 2 were used because a factor analysis indicated that question 3 did not fit in the construct. In my daily life, I believe that....

1. Bicyclists do not ride properly on the road.
2. Bicyclists should be more courteous to motorists on the road.
3. Bicyclists should be educated about sharing the road with motor vehicles.

Perception of Fear

Perception of fear was operationally defined as the degree to which a Going-to-the-Sun Road traveler views cycling along busy roadways as frightening.

Measurement and Population

The level of measurement for perception of fear was ordinal and included one statement on a five-point Likert scale from strongly disagrees to strongly agree (same as Bicycling Attitude scale). The population of interest was GTSR travelers and their level of fear in relation to cycling on busy roads. The question was adapted from Horton et al.'s (2007) book. In my daily life....

1. The idea of bicycling on busy roads frightens me. (Whether or not you are a cyclist).

Perceived Interactions on the GTSR

Perceived interactions that bicyclists and motorists reported regarding safe passing behavior was an additional dependent variable. Given Tuan's (1974) definition of a perception, a perceived interaction between a cyclist and motorist can be defined as their subjective

response and registration of the sensory experience that occurs while either passing or being passed on a roadway. Perceived behavioral bicycle – automobile interactions occur bilaterally and were operationally defined as: (un)safe passing behavior and (un)aggressive behavior occurring between bicycles and motorists on the GTSR. Safe passing behavior for a motorist is generally recognized as providing at least 3 feet of space between their motor vehicle and a bicycle while passing; therefore, safe passing behavior perceived by the motorist was defined as providing 3 feet between their vehicle and the bicyclist, along with their subjective indication of bicyclists appearing to be courteous. In Montana, no specific law on safe passing distances has been established; therefore, the definition for safe passing behavior perceived by the bicyclist was defined as a subjective indication of comfort and respect while being passed.

Measurement and Population

The level of measurement for perceived interactions was ordinal and included statements that captured the level of frequency for various perceived behavioral interactions. The motorists' perceived interaction were measured on a three-point scale with an n/a option (never, sometimes, always, or n/a). The motorist's perceived interaction statements were analyzed individually with percentages (a composite score was reported but it omitted n/a responses). The cyclists' perceived interactions were measured on a seven-point Likert scale from never to always. Scores closer to 7 represent more positive cyclist interactions with motorists. The Likert-scale for bicyclists and drivers differs due to the much greater number of interactions that a bicyclist encountered compared to drivers, as there is an abundance of motor vehicle traffic on the GTSR and much less bicycle travel. Two sub-populations of interest were identified for measuring perceived interactions that occurred on the GTSR, those who physically bicycled to Logan Pass, and those who were drivers in a motor vehicle on their

way to Logan Pass. Cyclists were asked four questions that were adapted from Sander's (2013) dissertation for determining their negative – positive interactions with motorists. Along the GTSR today...

1. Motor vehicles appropriately passed me on the road.
2. Motorists did not honk, yell, or make gestures at me in a negative manner. ¹
3. Motor vehicles passed with a comfortable distance. ¹
4. Motorists were respectful of my space while I was bicycling.

Motorists were asked four questions adapted from Sander's (2013) dissertation for determining their negative – positive interactions with cyclists. Along the GTSR today...

1. I did not encounter bicyclists riding side-by-side in a traffic lane. ¹
2. I encountered bicyclists who appeared to be courteous to motorists.
3. Bicyclists used a pullout when the opportunity arose.
4. When I passed bicyclists, I gave them at least 3 feet of space between my vehicle and their bicycle.

¹ Denotes statements are reverse coded (see appendix to view the original format of the questions).

Support for Cycling on the GTSR

Support for cycling along the Going-to-the-Sun Road was operationally defined as whether or not a bicycle should be allowed to travel along the GTSR any time of day.

Measurement and Population

The level of measurement for support for cycling along the GTSR was ordinal and included one statement on a five-point Likert scale from strongly disagree to strongly agree.

Scores closer to five represented greater support (same as Bicycling Attitude scale) for cycling on the GTSR. The population of interest was GTSR travelers and their level of support for cycling on the GTSR. The question was developed after reading mobility literature pertaining to social ordering and mobility hierarchy but did not come directly from another questionnaire.

1. Bicyclists should be allowed to travel along the GTSR any time of day.

Demographics

Descriptive nominal and ordinal questions were included for capturing demographics of respondents. Four questions were asked to determine gender, age, and residence (see Appendix A).

1. What is your gender? (Female or Male)
2. What is your age? (Open ended)
3. In what state, Canadian province, or other country do you permanently reside? (Open ended)
4. If a Montana resident, in what county do you permanently reside? (Open ended)

Dependent Variable Index

An exploratory factor analysis was conducted on 11 original attitude statements and resulted in the bicycling attitude, motorist behavior, and cyclist behavior constructs. Reliability of the dependent variable scores (bicycling attitude, motorist behavior, cyclist behavior) was increased by using an index for the given dependent variables. An index was also used for perceived interactions but the perceived interaction statements were not included in the factor analysis. Each respondent was given a positive or negative score by adding the individual indicators and dividing by the total number of indicator statements for the given

factor/dimension/variable (bicycling attitude, motorist behavior, cyclist behavior, cyclist perceived interaction). Combining the attitude indicators provided a composite measure and helped to eliminate biases in the individual indicator statements. A single index score for the dependent variables improved the reliability of the analysis and results.

Experimental Design

A static group comparison was carried out for the experimental design component of this study. A true experiment was not implemented; rather, pre-experimental design was used in a natural field setting for applied survey research. True experimental design was not used due to the lack of a laboratory setting, the lack of any control for random assignment, and to achieve greater external validity for generalizing to the population of travelers who utilize the Going-to-the-Sun Road in Glacier National Park.

The following design was used to compare post-treatment knowledge and attitude scores for a control group vs. a treatment group of GTSR travelers.

	O1
X	O2

The letter X denotes the experimental treatment (road signage and brochure) used to affect knowledge of roadway cycling laws and bicycling attitudes. The letter O denotes knowledge responses and bicycling attitude scores. The letter O1 represents the control group who did not receive the experimental treatment. The blank space above the X indicates that the first group did not receive an experimental treatment; therefore, O2 represents the treatment group.

The first step in the design was to measure the roadway bicycling knowledge and bicycling attitudes of a control group (O1). The second step was to introduce an experimental treatment (X) to create a change in the knowledge of roadway cycling laws and attitudes of an experimental treatment group (O2). The final step was to test for significant differences in knowledge and attitudes between the control group and the treatment group.

Treatments

Four signs from the Manual on Uniform Traffic Control Devices (MUTCD) reading “Bicycles May Use Full Lane” were placed on the GTSR (signs placed on both sides of Logan Pass – two on the west side and two on the east side) as a treatment condition to affect the experimental treatment group’s knowledge of roadway bicycling laws (Figure 2). A second treatment for affecting knowledge included disseminating educational brochures at the entrance gates (east and west) of GNP (Figure 2). The educational brochures read “A bicycle is a legal vehicle with the same rights and responsibilities as a motor vehicle” and “Bicyclists May Use a Full Lane”. Brochure wording reflected Montana roadway laws, rules, and the framework of share the road as outlined by the Montana Department of Transportation, as to avoid any liabilities from the project’s influence on changes in peoples’ transportation behaviors. Not all statements on the brochure were tested in this study. A total of 40,000 brochures were printed and assembled into the park information packet, and distributed by the entrance gate attendants during the experimental period. Baseline control conditions omitted the usage of road signage and brochure dissemination.

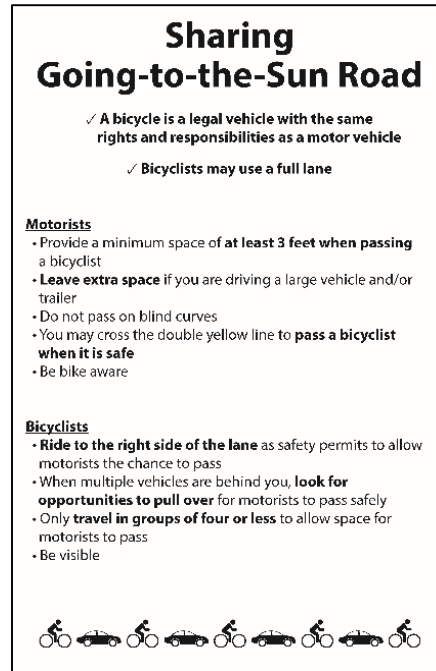


Figure 2. Signage and brochure used as experimental treatment conditions

Manipulation Checks

Manipulation checks were incorporated into the survey for the experimental treatment group. Respondents were asked whether or not they viewed a sign along the GTSR that read “Bicycles May Use Full Lane” (see Appendix A for manipulation check questions). Experimental respondents were also asked if they received a yellow handout with a title reading “Bicyclists and Motorists Share Going-to-the-Sun Road”. If the respondents answered yes to receiving the handout, they were then asked how thoroughly they read the handout (not at all, somewhat, or thoroughly). These manipulation checks helped to determine the sample of people from the experimental group that were influenced by the experimental treatment. The sample that was influenced/treated had their knowledge and attitudes compared against the control group.

Sampling

Sampling Frame

The sampling frame for the measurement of bicycling frequency, knowledge of roadway bicycling laws, perceptions, and bicycle attitudes were travelers in Glacier National Park who utilized the Going-to-the-Sun Road and stopped at Logan Pass. These respondents were intercepted at Logan pass during two separate sampling weeks in August of 2015; and they all had experienced driving or cycling the GTSR. August is the second highest visitor month in the park (NPS Stats, 2015). The sampling frame was chosen so that measurements would be representative of all GNP travelers who utilized the GTSR and a general support for bicycling on the Going-to-the-Sun Road could be determined.

Sampling Procedure

The sampling method used was convenience sampling at the Logan Pass parking area. Logan Pass is the highest point on the roadway and the spot where most travelers will stop to rest and view the scenery. Simple random sampling would have been optimal, however, it is very difficult to implement when studying human subjects in a national park sampling area. The sampling area covers the 50 mile linear stretch of road (GTSR) that bisects the park and it is the only route for travelers to cross within the park from one side to the other. Previous research on human subjects in national parks commonly achieve coverage of the population by surveying national park visitors as they are experiencing the place, either while exiting or entering the park (Dillman, 2014). Surveying at Logan Pass resulted in the greatest coverage of the population because it is the primary destination the vast majority of visitors are coming to experience. Intercepting travelers as they began their descent/exit from Logan Pass ensured

respondents had experienced the GTSR and was as close to a simple random sample that was achievable in a national park setting where no adequate list of visitors is available for a mailback, phone, or email survey technique.

Surveyors intercepted respondents at Logan Pass by approaching as many travelers as was possible. The procedure for intercepting was to approach vehicles in the Logan Pass parking area from 7:30 am until 2:30 pm daily; August 13-18, 2015 (control) and August 21-28, 2015 (treatment). Surveys were conducted by two researchers who each worked half of the parking area. Respondents were intercepted as unbiased as possible as they were preparing to go hiking, returning from hiking, or if they were stopping to rest and use the visitor center facilities. Travelers of the GTSR who stopped at Logan Pass during the two sampling weeks and within the time period had an equal chance of being surveyed, thus ensuring the sampling frame was representative of the population who utilizes the Going-to-the-Sun Road.

Surveyors approached all possible travelers at Logan Pass during sampling times. The following script was used for approaching respondents, “Hello, I’m “Name” from the University of Montana and I’m conducting a study on traveling the Going-to-the-Sun Road. Do you have a few minutes to participate in the study”? If they agreed to be surveyed the surveyors proceeded. If they said ‘No’, respondents were thanked and the surveyors moved on. Consent was implied through the subject’s agreement to fill out a paper survey. Respondents who attempted to glean information about the study were informed that a discussion of the study purpose and hypotheses could occur at the end of the survey. Respondents completed the paper survey independently, and then handed the clipboard and questionnaire back to the surveyor.

The on-site surveys were issued to 1,224 respondents. Approximately 628 respondents were surveyed during the first control sampling week and another 597 were surveyed during the second treatment sampling week. A goal of 384 usable surveys was desired to ensure a 95 percent confidence interval with a 50/50 split. Over sampling allowed for unusable surveys to be discarded. Glacier National Park is experiencing over 2 million annual visitors; therefore 384 usable surveys collected gives a precise estimate of the population value to be determined with a high level of confidence. The sampling size needed for statistical accuracy does not change beyond a population of 1 million (GNP's annual visitor population is roughly 2.3 million), therefore, sample size estimates based on only 1 million were used (in 95 out of 100 times that a random sample of 384 people is selected from a total population of 1 million, the sample estimate will be within 5 percentage points of the true population value).

Survey Instrument

An onsite quantitative questionnaire was developed as the research instrument for collecting data on Going-to-the-Sun Road travelers' bicycling attitudes, knowledge of roadway bicycling laws, perceptions of fear, perceived behavioral interactions, and level of bicycling frequency (see Appendix A) (please note that the survey instrument from the appendix reflects the experimental design version – the experimental version is identical to the control version but Q12 and Q13 were added as manipulation/treatment checks). A few questions from the original survey instrument were not used in the data analysis but are included as standalone variables for basic descriptive statistics (Q3, Q4, Q5 – statement 11 only, and Q6).

Statistical Analysis

The statistical analyses conducted to answer the research questions in this study included frequencies, percentages, factor analysis, analysis of variance (ANOVA), *t*-tests, and Pearson *r* correlation. Frequencies and percentages were provided for all demographic questions and means were used for the questions related to bicycling attitudes, motorist behavior, cyclist behavior, perceived fear, perceived interactions, and support for cycling on the Going-to-the-Sun Road.

The primary dependent variable (bicycling attitudes) was compared with knowledge of roadway bicycling laws using statistical *t*-tests for difference testing of the mean attitude scores of the two groups (those who are knowledgeable of the laws and those who are not). Bicycling attitudes were then compared against levels of bicycling frequency using the statistical ANOVA test for difference testing of the mean attitude scores for the four different categorical groups of cyclists/non-cyclists.

A Chi-Square statistical test was used to test the association between knowledge (those knowledgeable and those not knowledgeable) and the different categorical groups of cyclists/non-cyclists. A Pearson *r* correlation analysis was used to determine the strength of relationship between bicycle attitudes and perception of fear. Pearson *r* correlation was also used to analyze the strength of relationship between perception of fear and levels of bicycling frequency. The final test carried out was a Pearson *r* correlation analysis to determine the strength of relationship between general attitudes and support for cycling along the Going-to-the-Sun Road.

Limitations

Limitations to the study included the overabundance of automobile users on the GTSR which made it difficult to intercept a large sample size of cyclists for the study. The bicyclists were intentionally targeted for testing relationships amongst variables (particularly the bicyclists' perceived interactions of motorists). General bicycling attitudes, motorist/cyclist behavior, general knowledge of roadway bicycling laws, general perceptions of fear associated with roadway cycling, and support for GTSR cycling all used means in their analysis. Therefore, a small simple random sample of 14 of the 137 cyclists was taken and a *t*-test was conducted for comparing mean differences between the small simple random sample of cyclists and the full sample of cyclists (no statistically significant differences were found at the .05 level, therefore, reporting of means is not affected by the number of bicyclists that were sampled and accurate inferences can be made about the various sub-groups).

The bus passengers consisted of GNP shuttle bus passengers rather than the Red "Jammer" Bus passengers. The GNP shuttle passengers were easily approachable because it is operated as a public transportation service. The GNP shuttle passengers were surveyed while awaiting a departing bus or as the passengers arrived near the entrance of Logan Pass. The "Jammer" passengers were not represented due to the private business-client relationship that existed. Surveying the "Jammer" riders was too intrusive and would have interrupted their business operations.

Other limitations included fire weather conditions that demanded alternative dates for issuing the survey and the uncertainty of the park opening due to snow removal progress. Both of these weather limitations made it difficult to establish random sampling timeframes and resulted in all sampling days being conducted in August, 2015. Finally, the experimental

sampling days were dependent on entrance gate personnel distributing the informational brochure which were subsequently only distributed to travelers who requested information. The issuing of the brochure was disappointing and resulted in a low sample size for comparing the treatment (brochure only) group's knowledge/attitudes with the control group.

Extraneous Variables

There are a number of uncontrolled extraneous variables to consider for the experimental design. Familiarity with the park between resident and nonresident travelers was a variable that may have affected the knowledge responses reported by respondents. Residents (or regular park travelers) may have noticed the signage and recognized that it was not per usual for the GTSR road condition. In using a MUTCD approved sign, it should have alleviated the issue, as local residents should not be able to detect that it is not a National Park Service issued sign.

A secondary extraneous variable to consider is the subject's place of residence. The knowledge questions were prefaced with "In Montana...", therefore, those from out of state appeared more reluctant to report a response other than 'I don't know'. Furthermore, bicyclists may have felt a greater obligation and threat in knowing the cycling law answers so the frequent cyclist groups may have opted for 'I don't know' more than the other groups. Rather than have people guess, if they were unaware of the laws, then an 'I don't know' response was available and treated as unknowledgeable for analysis. Due to the universal nature of the cycling laws, the questions may have been improved by prefacing with "In General..." rather than "In Montana..." as to get the respondents to feel accurate in their response choice.

There was a temporal extraneous variable where 7-day pass holders who arrived just prior to the beginning of the experimental phase would not have received a brochure, as they possibly had already entered the park and held a pass. The timing of pass holders receiving brochures was controlled for by recording any changes in the rate at which travelers reported receiving and reading the brochures. If there was an increase in respondents who received the brochure towards the later days of the experimental phase, it would be an indicator that 7-day pass holders were impacting the success of the brochure. No changes in the rate at which travelers reported receiving and reading brochures was found from day 1 through day 6 of the experimental phase.

Internal Validity

Issues of internal validity surfaced for the experimental design, and one source of error in validity to consider is that of testing (the process of measurement validity). The respondents may have been able to anticipate the attitude scale on the questionnaire and they may have reported socially desirable responses or responses aimed at pleasing the experimenter. Testing threats overall were minimal since there was no pre-testing of groups, therefore, groups did not have the opportunity to differ from pre-test to post-test based on the attitude testing.

Another source of internal validity threats to the design was the selection process. It was unrealistic in the particular field setting to achieve random assignment of subjects to control and experimental groups, and there was no way to control for pretreatment differences. The lack of random assignment in selection resulted in a lack of pretreatment measurement for the groups, and there was no definite way to tell if the observed attitude results were caused by the knowledge treatment or by random variation between the two groups. Differences in attitudes between group O_1 and group O_2 may be entirely by chance due

to the lack of pretreatment measurement. Conclusions drawn should use caution inferring a causal relationship between the experimental treatment influencing the observed knowledge and attitudes between the control and experimental groups.

External Validity

External validity was achievable in the field experiment due to it being conducted in a natural field environment rather than a laboratory setting. Respondents in the treatment group were completely unaware that they were a part of an experiment. The road signage and brochures resembled official government signage/language in their design and implementation. A more realistic experimental setting was achieved, thus resulting in a decrease in demand characteristics influencing respondents and greater external validity. The major disadvantage to conducting a field experiment was the lack of control of the independent variable, for example, there was no control of whether or not respondents in the experimental group received, viewed, or read the intended messaging being disseminated; however, over-sampling during the experimental phase and manipulation checks insured a statistically valid sample size for inferring precise estimates of the true population value with a high level of confidence.

Unknown Factors, Contingencies, and Alternatives

Surveying in Glacier National Park and on the Going-to-the-Sun Road brought with it many variations to account for in the study. For 2 and ½ weeks starting on July 23rd, the upper portion of the GTSR was closed to travelers due to a large wildfire on the east side of the highway. Fire weather was the big contingency during the sampling periods and resulted in a shift of all sampling days to be conducted in August, 2015.

Chapter Four: Results

This chapter consists of several sections of data analysis including descriptive statistics and more sophisticated inferential statistics. Descriptive statistics were used for response rate, demographics, transportation mode, bicycling frequency, and the variables from the miscellaneous section. Inferential statistics were utilized to test mean differences between groups and to test relationships amongst variables.

Response Rate

Survey participants at Logan Pass were overwhelmingly interested and willing to participate in the study. A total of 1,224 respondents agreed to participate in the study and they all completed a survey. Of the sample of individuals who were approached at Logan Pass during the two sampling periods (12 days total), it is roughly estimated that less than 240 people refused to participate in the study. An exact number was not recorded due to the difficulty of tracking refusals while issuing a high volume of front end questionnaires. The surveyors are confident that the response rate for the survey was 80 percent or greater on average over the course of the twelve days of surveying and the two sampling periods. Two test days where refusals were tracked revealed a response rate of 84 percent. Even a conservative estimate of a 60 percent response rate would still be a high enough a response rate to ensure a margin of error of 5 percent, revealing high survey accuracy, and statistically reliable results.

Demographics

The average age of the sample was 44 years old. Females made up 44 percent of the sample. Males were 55 percent of the sample. The majority of domestic respondents 152 (12%) reside in Montana, followed by 104 (9%) from Washington, and 79 (7%) from California (Figure 3). Of those from Montana who provided their county ($n = 148$), 79 (53%) were from Flathead County, 14 (9%) were from Missoula County, and 10 (7%) were from Lewis and Clark County. Of all the international respondents ($n = 128$), 67 (52%) reside in Canada, followed by 10 (8%) from Germany, and 12 (9%) from the United Kingdom. A total of 18 different countries were represented in the sample of respondents.

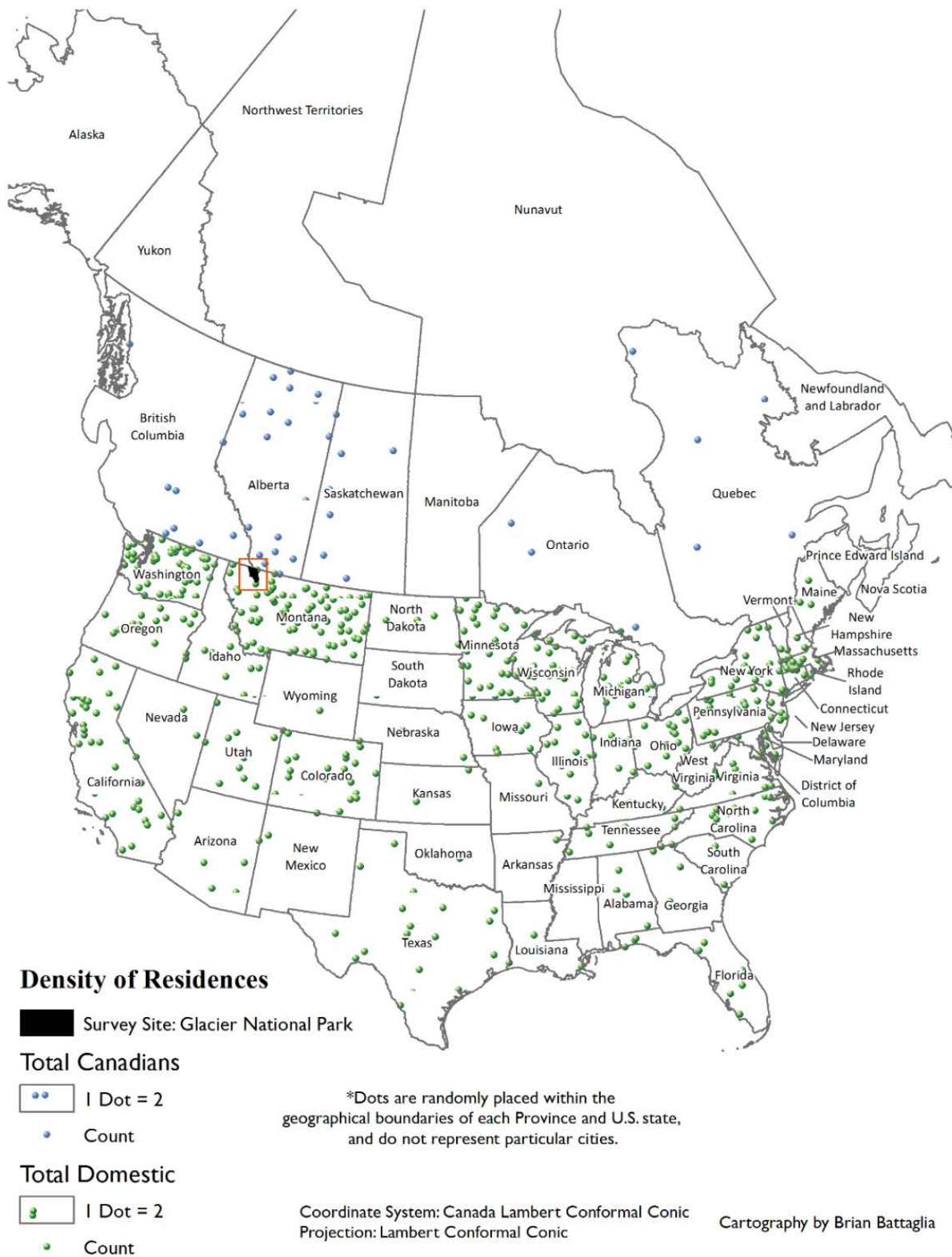


Figure 3. Dot density map of respondent's residences

Miscellaneous Characteristics

A few additional questions were asked of the respondents to gather a little more insight into who these respondents were as it related to bicycling or to Glacier National Park.

Reasons for Cycling: Recreation vs. Commuting

When respondents were asked “For what reasons do you bicycle”, the majority of the sample consisted of recreation only cyclists (54%), followed by recreation and commuting (22%), non-cyclist (18%), and bicycle commute only (5%) (Figure 4).

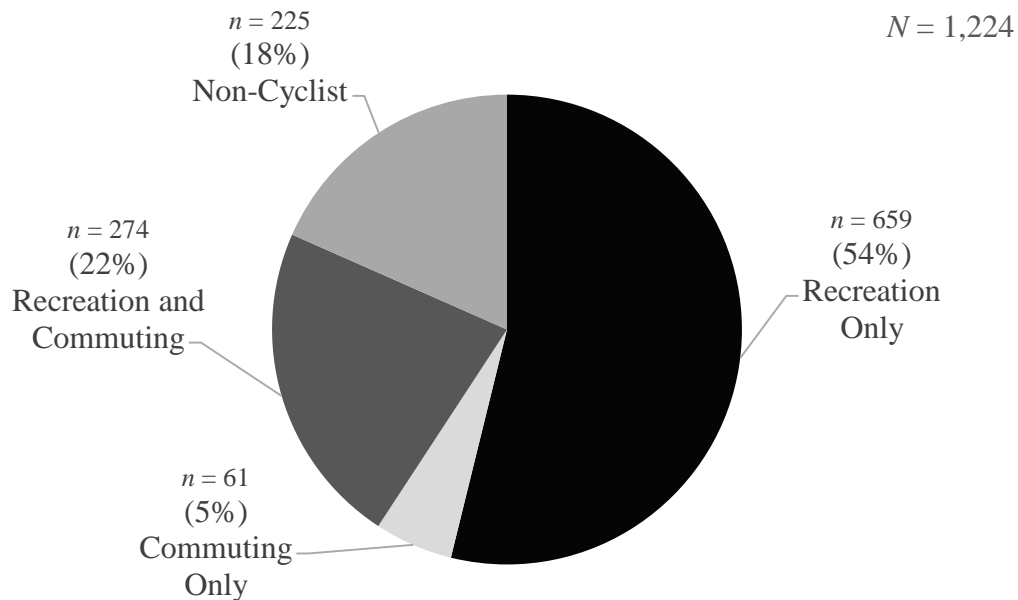


Figure 4. Reasons for cycling

Alternative Measure of Bicycling Frequency

The majority of respondents from the sample (47%) bicycled either 1 time per month or 1-2 days per week in their daily life. It was up to the respondent to self-identify and come up with a personal average with consideration to seasonal fluctuations.

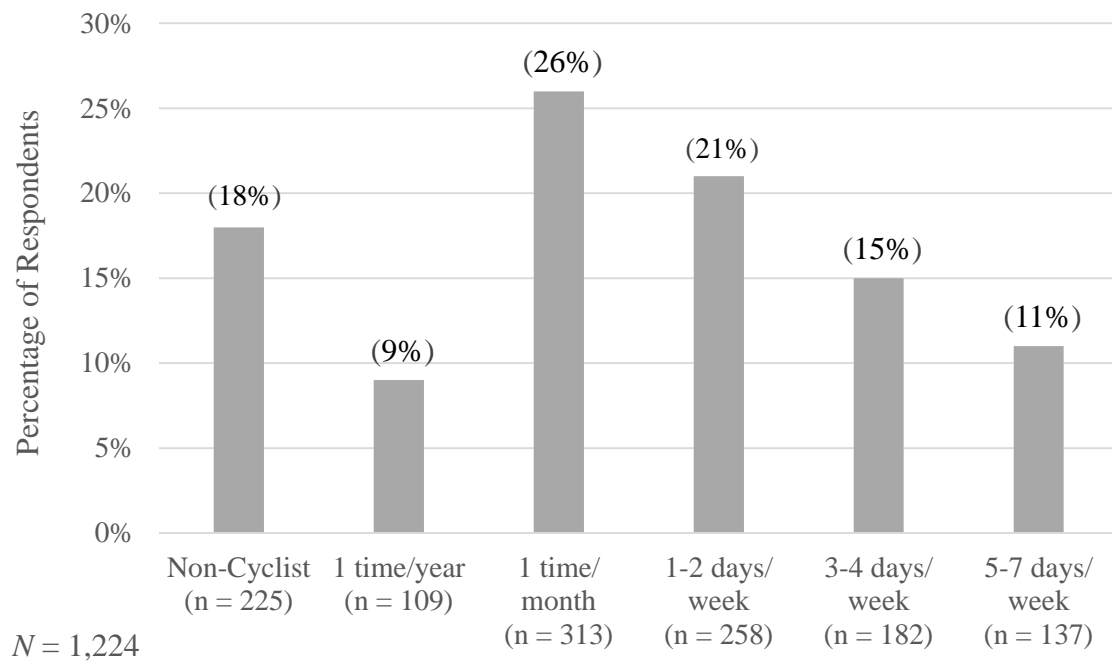


Figure 5. Percentage of respondents by an alternative measure of bicycling frequency

Previous Experience Cycling the GTSR

A total of 938 (79%) of the respondents from the study sample have not bicycled the GTSR during any previous trips, 197 (17%) had bicycled the GTSR with motor vehicles on the road, and 93 (8%) had bicycled the GTSR during the spring without any motor vehicles on the road. The percentage of respondents who indicated they had bicycled the GTSR with motor vehicles on the road is over-represented by the intentional over-sampling of bicyclists and is not representative of the population of GTSR travelers.

Mobility Experience

When respondents were asked “I prefer traveling on the GTSR slowly for a better experience”, 920 (76%) indicated that they agreed or strongly agreed with the statement. Results showed that 219 (18%) of respondents reported neutral while 71 (6%) disagreed or strongly disagreed. Based on the descriptive statistics presented in Figure 6, the majority of visitors who utilize the GTSR appear to prefer traveling slowly for an improved mobility experience.

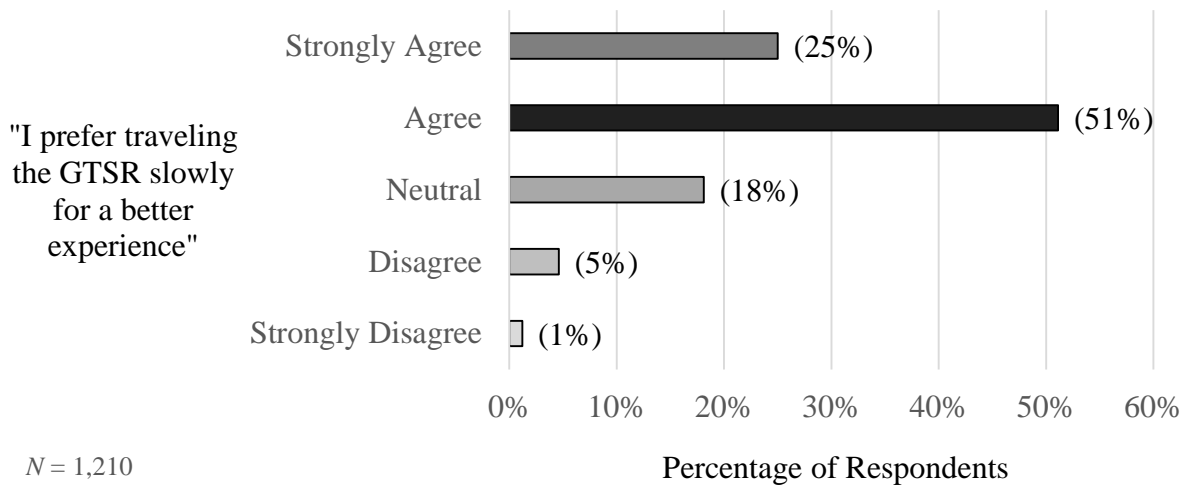


Figure 6. Preferred mobility experience on the GTSR

Transportation Mode

The sample population was asked “On your way to Logan Pass today, were you primarily a... (1.) Bicyclist (2.) Driver (3.) Auto Passenger (4.) Bus Passenger”. The largest share of the sample population consisted of auto passengers (44%), followed by drivers (39%), and then bicyclists (11%). Bus passengers (6%) were the least represented transportation mode.

It is important to note that these percentages are in no way representative of the mode type for the population of Going-to-the-Sun Road travelers. The bicyclist group (11%) was intentionally overrepresented for analyzing the perceived interactions occurring between cyclists and motorists (see Methods – Limitations section).

The bus passengers consisted of GNP shuttle bus passengers rather than the Red “Jammer” Bus or Sun Tours passengers. The GNP shuttle passengers were easily approachable because it is operated as a public transportation service.

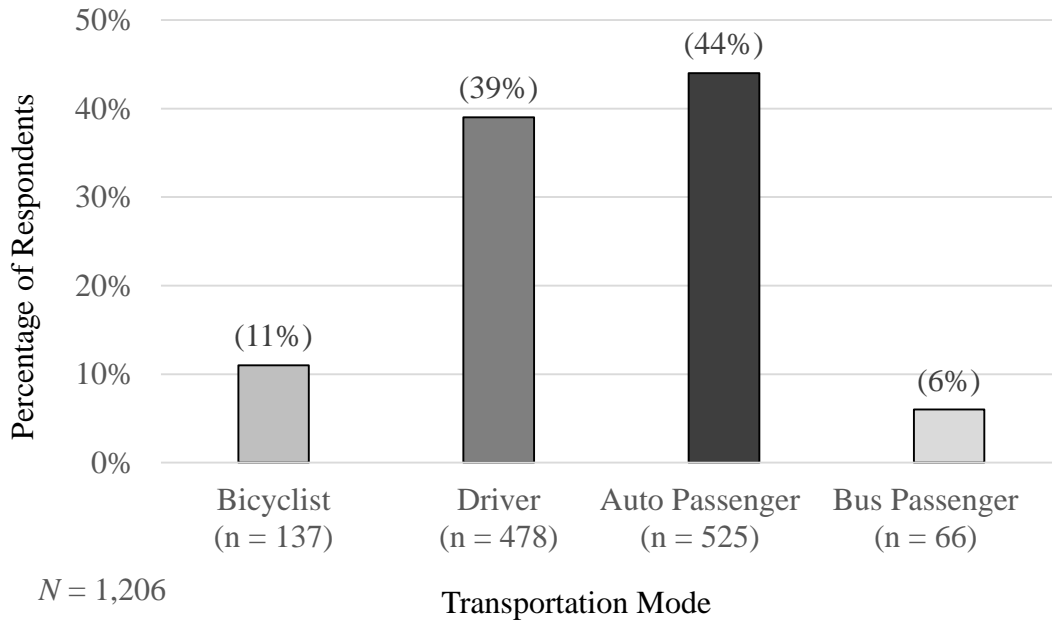


Figure 7. Primary mode of transportation respondents used to reach Logan Pass

Cyclist vs. Non-Cyclist

Of all those surveyed during the sampling periods, 999 (82%) of the respondents were identified as a cyclist and 225 (18%) were identified as a non-cyclist (a non-cyclist was anyone who had not bicycled in the last 12 months) (Figure 8).

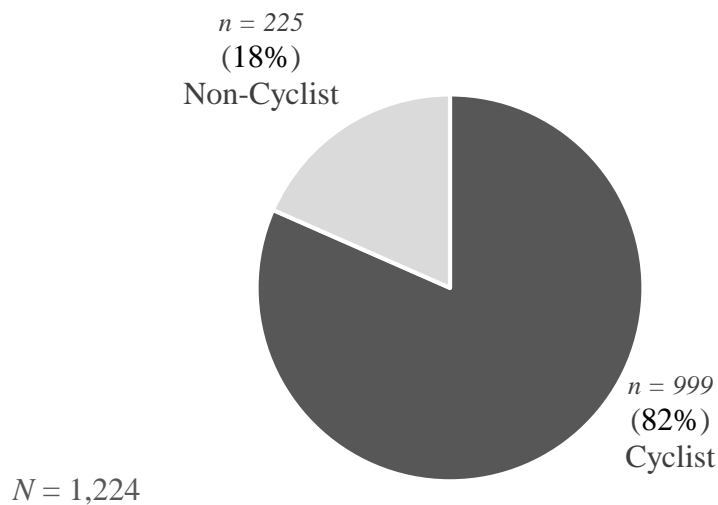


Figure 8. Percentage of respondents who were cyclists vs. non-cyclists

Bicycling Frequency

The majority of survey respondents were identified as occasional cyclist (39%), followed by very frequent cyclists (22%), frequent (21%), and non-cyclist (18%). In figure 9, it is important to consider the over-representation of survey respondents who physically bicycled to Logan Pass, as they made up 38 percent of the very frequent cyclists while drivers made up 31 percent of very frequent cyclists. Roughly 9 percent of the frequent cyclists were respondents who reached Logan Pass by bicycle, compared with 43 percent of frequent cyclists who were drivers on their way to Logan Pass. Figure 9 simply represents the sample population for understanding general relationships between the independent variable of bicycle frequency and the numerous other dependent variables (i.e. bicycling attitudes, knowledge of roadway cycling laws, perceived fear of bicycling on roadways, and support for cycling the GTSR), but it is not representative of the population of Going-to-the-Sun Road travelers (i.e. it would be incorrect to say 22 percent of GTSR travelers are very frequent cyclists).

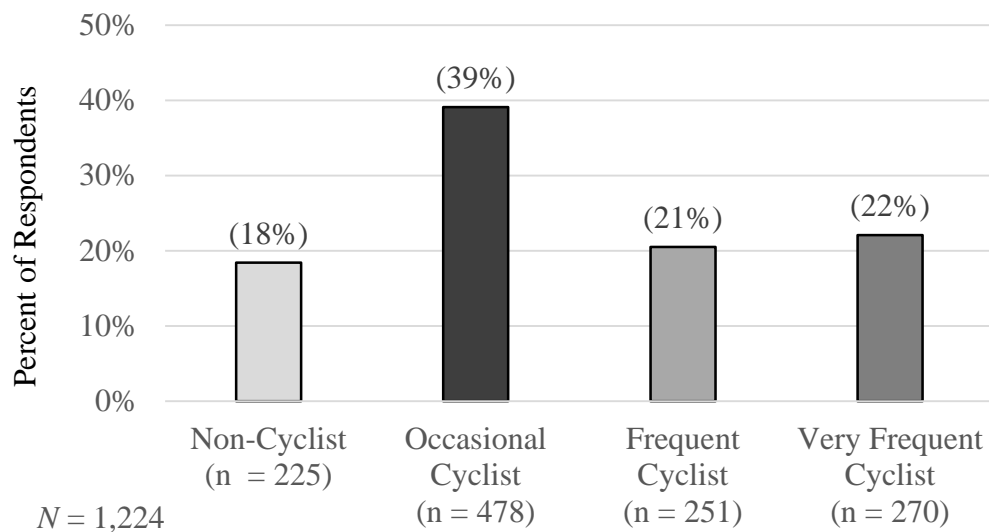


Figure 9. Percentage of study respondents by bicycling frequency

Factor Analysis of Attitude Statements

Three constructs were identified through an exploratory factor analysis conducted on 11 original attitude statements. Theoretical support for the statements can be reviewed in the methods and literature

review sections for each respective construct (see bicycling attitude, motorist behavior, and cyclist behavior sections in Methods and Literature Review). The first four statements in Table 3 constitute the bicycling attitude construct and resulted in the highest eigenvalue (3.43). The four bicycling attitude statements each show a factor loading of $>.60$, and the statements are reflective of Bashford's (2003) theoretical definition of a bicycling attitude as "general orientation towards cyclists and the degree to which they are viewed as legitimate road users, as well as the subjective assessment of the characteristics of cyclists as sharers of road space". The motorist behavior construct consisted of four statements with an eigenvalue of 1.76, and the statements all showed a factor loading of $>.50$. Lastly, the cyclist behavior construct consisted of two statements with an eigenvalue of 1.08, and the statements showed a factor loading of $>.70$. The motorist behavior and cyclist behavior constructs were not anticipated when developing the study but proved effective at analyzing respondent's level of critique of either cyclist behavior or motorist behavior.

Table 3. *Exploratory factor analysis for attitude statements using KMO and Bartlett's Test*

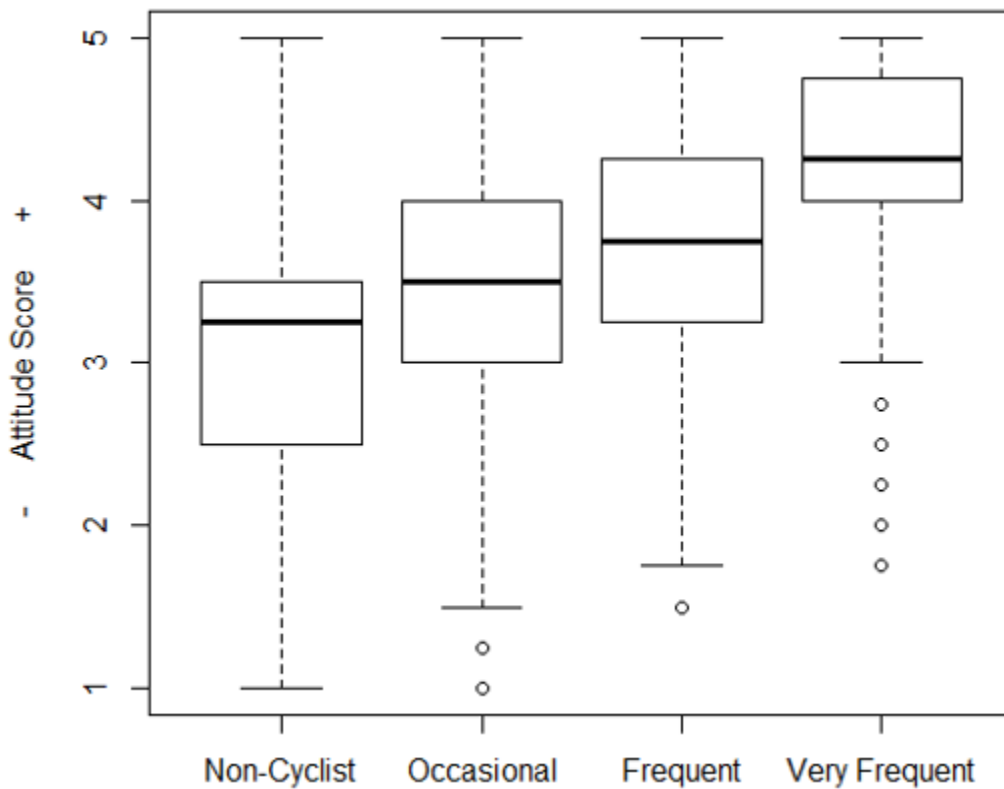
Item	Factor Loadings		
	Bicycling Attitude	Motorist Behavior	Cyclist Behavior
Bicyclists have just as much right to use the road as motorists.	.684	.329	.185
Bicyclists should be able to ride on main roads during high traffic times. ¹	.738	.085	.015
Bicyclists should not be restricted to riding on paths or trails that are off streets. ¹	.806	.140	.047
While driving, it's not very frustrating sharing the road with bicyclists. ¹	.756	.058	.294
When possible, motorists should change lanes while passing bicyclists.	.035	.541	.343
Many motorists do not look out for bicyclists.	.149	.521	-.195
Motorists should be more courteous to bicyclists on the road.	.302	.713	.062
Motorists should be educated about sharing the road with bicyclists.	.250	.735	.156
Bicyclists ride properly on the road. ¹	.248	.047	.758
Bicyclists should not be more courteous to motorists on the road. ¹	.061	-.032	.801
Bicyclists should not be educated about sharing the road with motor vehicles. ¹	.183	-.587	.370
Eigenvalues	3.43	1.76	1.08
% of Variance	31.145	15.994	9.828

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization a. 3 components extracted.

Note: Factor loadings over .50 appear in bold and constitute the factor dimensions. ¹These statements were reverse coded for the factor analysis, the marked statements ⁽¹⁾ in the table reflect the reverse of how the statement was asked in the survey.

Bicycling Attitude and Bicycling Frequency

The distribution of bicycling attitude scores increased steadily as bicycling frequency increased. The median bicycle attitude score was 3.25 for non-cyclists, 3.5 for occasional cyclists, 3.75 for frequent cyclists, and 4.25 for the very frequent cyclists. Eight outliers were present in the three cyclist groups but were not eliminated because of the large enough samples. There is evidence of a relationship between bicycling attitude scores and bicycling frequency.



Notes: ° Denotes outliers

Figure 10. Boxplots showing the median bicycling attitude given bicycling frequency

A one-way analysis of variance (ANOVA) test was conducted for determining mean bicycling attitude score differences between the three groups of cyclists and the non-cyclists.

The very frequent cyclists ($M = 4.21$, $SD = .63$) reported more positive bicycling attitudes than the remaining groups, frequent cyclists ($M = 3.77$, $SD = .73$), occasional cyclists ($M = 3.37$, $SD = .76$), and non-cyclist ($M = 3.08$, $SD = .85$). The one-way analysis of variance revealed significant differences between all combinations of groups, $F(3, 1196) = 114$, $p < .001$. The means are presented in Table 4. A Bonferroni post-hoc test revealed evidence that differences in mean bicycling attitude scores between all combinations of the groups are significantly different at the .05 level.

Table 4. Mean bicycle attitude vs. bicycling frequency

	Group Means				<i>p</i> value
	Non-Cyclist (<i>n</i> = 219)	Occasional (<i>n</i> = 468)	Frequent (<i>n</i> = 245)	Very Frequent (<i>n</i> = 268)	
Bicycle Attitude	3.08 a	3.37 b	3.77 c	4.21 d	< .001

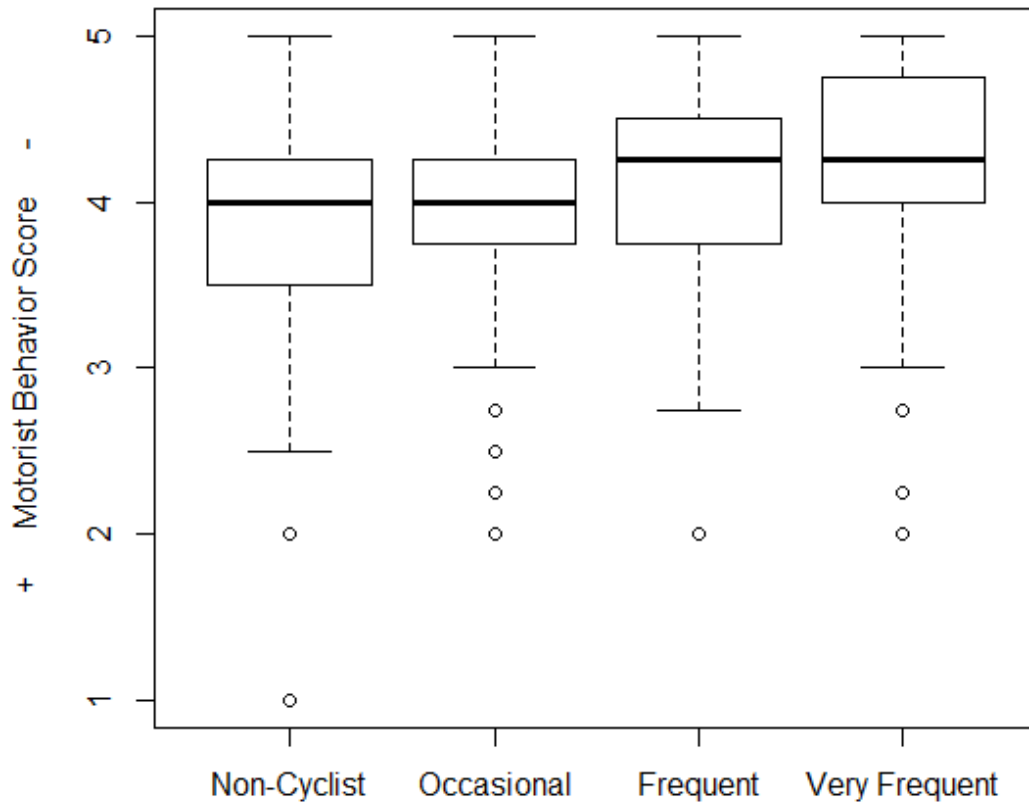
Notes: Each subscript letter denotes a subset of grouping categories whose column means do not differ significantly from each other at the .05 level. (Total $N = 1,200$).

A Pearson r correlation test was conducted to determine the strength of relationship between bicycling attitudes and bicycling frequency. Respondent's bicycle attitudes and their bicycling frequency showed a moderately strong positive relationship $r(1,198) = .470$, $p < .001$. Bicycling attitudes and bicycling frequency were significantly correlated at the .05 level and bicycling attitudes increased as bicycling frequency increased.

Motorist Behavior and Bicycling Frequency

The distribution of motorist behavior scores increased slightly as bicycling frequency increased (Figure 11). The median motorist behavior score was 4.0 for non-cyclists, 4.0 for occasional cyclists, 4.25 for frequent cyclists, and 4.25 for the very frequent cyclists. Ten

outliers were present throughout the groups but were not eliminated because of the large enough samples. There is evidence of a relationship between motorist behavior scores and bicycling frequency.



Notes: ° Denotes outliers

Figure 11. Boxplots showing the median motorist behavior score given bicycling frequency

A one-way analysis of variance (ANOVA) test was conducted for determining mean motorist behavior score differences between the three groups of cyclists and the non-cyclists. The very frequent cyclists ($M = 4.25, SD = .62$) and frequent cyclists ($M = 4.13, SD = .51$) were

more critical of motorists than the other two groups, occasional cyclists ($M = 3.37$, $SD = .76$), and non-cyclist ($M = 3.08$, $SD = .85$). The one-way analysis of variance revealed significant differences between three subgroups, $F(3, 1206) = 21$, $p < .001$. The means are presented in Table 5. A Bonferroni post-hoc test showed evidence that differences in mean motorist behavior scores between the very frequent/frequent cyclists and the other two groups are significantly different at the .05 level. The non-cyclists were significantly different than the occasional cyclists.

Table 5. Mean motorist behavior vs. bicycling frequency

	Group Means				<i>p</i> value
	Non-Cyclist (<i>n</i> = 218)	Occasional (<i>n</i> = 473)	Frequent (<i>n</i> = 251)	Very Frequent (<i>n</i> = 268)	
Motorist Behavior	3.88 a	4.01 b	4.13 c	4.25 c	< .001

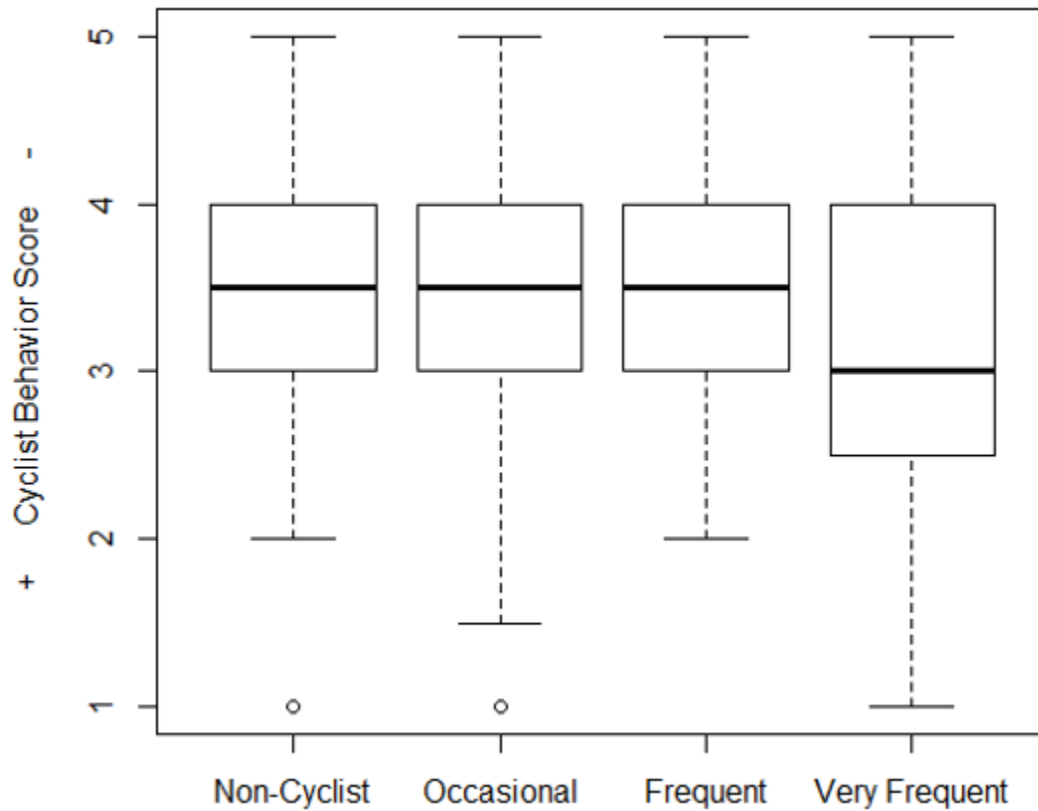
Notes: Each subscript letter denotes a subset of grouping categories whose column means do not differ significantly from each other at the .05 level. (Total $N = 1,210$).

A Pearson r correlation test was conducted to determine the strength of relationship between motorist behavior and bicycling frequency. Respondent's motorist behavior and their bicycling frequency showed a weak positive relationship $r(1,208) = .221$, $p < .001$. Motorist behavior and bicycling frequency were significantly correlated at the .05 level but critiques of motorist behavior increased only slightly as bicycling frequency increased.

Cyclist Behavior and Bicycling Frequency

The distribution of cyclist behavior scores decreased slightly as bicycling frequency increased. The median cyclist behavior score was 3.5 for non-cyclists, 3.5 for occasional cyclists, 3.5 for frequent cyclists, and 3.0 for the very frequent cyclists. Two outliers were

present, one in the non-cyclist and one in the occasional cyclist groups, but were not eliminated because of the large enough samples. There is evidence of a relationship between cyclist behavior scores and bicycling frequency.



Notes: ° Denotes outliers

Figure 12. Boxplots showing the median cyclist behavior score given bicycling frequency

A one-way analysis of variance (ANOVA) test was conducted for determining mean cyclist behavior score differences between the three groups of cyclists and the non-cyclists. The very frequent cyclists ($M = 3.21$, $SD = .82$) were less critical of cyclists than the frequent cyclists ($M = 3.36$, $SD = .68$), occasional cyclists ($M = 3.33$, $SD = .75$), and non-cyclists ($M = 3.45$, $SD = .79$). The one-way analysis of variance revealed significant differences between two

subgroups, $F(3, 1204) = 4, p = .008$. The means are presented in Table 6. A Bonferroni post-hoc test revealed evidence that differences in mean cyclist behavior scores between the very frequent group and the non-cyclist group was significantly different at the .05 level. The occasional and frequent groups did not differ from the non-cyclist group, and they also did not differ from the very frequent group.

Table 6. Mean cyclist behavior vs. bicycling frequency

	Group Means				<i>p</i> value
	Non-Cyclist (<i>n</i> = 218)	Occasional (<i>n</i> = 474)	Frequent (<i>n</i> = 249)	Very Frequent (<i>n</i> = 267)	
Cyclist Behavior	3.45 a	3.33 a, b	3.36 a, b	3.21 b	.008

Notes: Each subscript letter denotes a subset of grouping categories whose column means do not differ significantly from each other at the .05 level. (Total *N* = 1,208).

A Pearson *r* correlation test was conducted to determine the strength of relationship between cyclist behavior and bicycling frequency. Respondent's cyclist behavior and their bicycling frequency showed a weak inverse relationship $r(1,206) = -.086, p = .003$. Cyclist behavior and bicycling frequency were significantly correlated at the .05 level but critiques of cyclist behavior decreased only slightly as bicycling frequency increased.

Bicycling Knowledge and Bicycling Frequency

Legal on Road, Considered a Vehicle with Same Rights/Responsibilities

A chi-square test for goodness of fit was performed to determine whether knowledge of roadway bicycling laws was different between the three groups of cyclists and the non-cyclists. The occasional cyclists (34%) were the most knowledgeable of the laws compared with the remaining groups; very frequent cyclists (31%), frequent cyclists (24%), and non-cyclist

(11%). The chi-square test revealed that the percentage of respondents who were knowledgeable of roadway bicycling laws was not equally distributed amongst the bicycling frequency groups, $\chi^2(3, N = 1,124) = 50.6, p < .001$. The percentages are presented in Table 7. There is evidence of an association between knowledge of roadway cycling laws and bicycling frequency. Statistically significant differences were found between three sub-groups at the .05 level. The very frequent and frequent groups were significantly different than the non-cyclist group. The occasional group was significantly different from the very frequent group but not the frequent group and the non-cyclist group.

Table 7. *Percentage knowledgeable vs. bicycling frequency*

	Groups				<i>p</i> value
	Non-Cyclist (<i>n</i> = 198)	Occasional (<i>n</i> = 441)	Frequent (<i>n</i> = 238)	Very Frequent (<i>n</i> = 247)	
Knowledgeable (Legal on Road/Considered a Vehicle)	(11%) a	(34%) a, b	(24%) b, c	(31%) c	< .001

Notes: Each subscript letter denotes a subset of grouping categories whose column means do not differ significantly from each other at the .05 level. (Total *N* = 1,124). Knowledge question Q7 – statements 1 and 3 were combined for this analysis (see survey instrument in Appendix A, and variable definition in Methods). Respondents who read the brochure were controlled for in this sample.

May Use Full Lane

A chi-square test for goodness of fit was performed to determine whether knowledge (bicycles may use full lane) was different between the three groups of cyclists and the non-cyclists. The occasional cyclists (33%) were the most knowledgeable of using a full lane compared with the remaining groups; very frequent cyclists (32%), frequent cyclists (25%), and non-cyclists (10%). The chi-square test revealed that the percentage of respondents who were

knowledgeable of bicyclists using a full lane was not equally distributed amongst the bicycling frequency groups, $\chi^2(3, N = 841) = 17.4, p = .001$. The percentages are presented in Table 8. There is evidence of an association between knowledge (may use full lane) and bicycling frequency. Statistically significant differences were found between two sub-groups at the .05 level. The very frequent group was significantly different than the non-cyclist group. The occasional and frequent groups did not differ from the very frequent group, and they did not differ from the non-cyclist group.

Table 8. Percentage knowledgeable (full lane) vs. bicycling frequency

	Group				<i>p</i> value
	Non-Cyclist (<i>n</i> = 143)	Occasional (<i>n</i> = 341)	Frequent (<i>n</i> = 184)	Very Frequent (<i>n</i> = 173)	
A bicyclist may use an entire lane?	(10%) a	(33%) a, b	(25%) a, b	(32%) b	.001

Notes: Each subscript letter denotes a subset of grouping categories whose column means do not differ significantly from each other at the .05 level. (Total *N* = 841). Knowledge question Q7 – statement 2 was a standalone variable for analysis (see survey instrument Appendix A, and variable definition in Methods). Respondents who read the brochure and the sign were controlled for in this sample.

Bicycle Attitude and Bicycling Knowledge

This analysis compares bicycle attitude score differences between respondents who had correct knowledge in each of the three knowledge statements against those who did not have correct knowledge.

Legally Entitled on Roads

An independent sample *t*-test showed that the difference in bicycling attitude scores between the knowledgeable (legal on road) group (*M* = 3.72, *SD* = .83) and the

unknowledgeable group ($M = 3.46$, $SD = .86$) revealed a statistically significant difference between the groups $t(1085) = 5.13$, $p < .001$. The average bicycling attitude score for the knowledgeable group was .27 points higher than the unknowledgeable group, indicating that respondents who are knowledgeable (legal on road) tend to be more positive in their bicycling attitudes. There is evidence of an association between bicycling attitudes and knowledge (legal on road). The means are presented in Table 9.

Considered Vehicle with Same Rights/Responsibilities

An independent sample t -test showed that the difference in bicycling attitude scores between the knowledgeable (veh. w/same rights/resp.) group ($M = 3.75$, $SD = .81$) and the unknowledgeable group ($M = 3.44$, $SD = .86$) revealed a statistically significant difference between the groups $t(1083) = 6.02$, $p < .001$. The average bicycling attitude score for the knowledgeable group was .31 points higher than the unknowledgeable group, indicating that respondents who are knowledgeable (veh. w/same rights/resp.) tend to be more positive in their bicycling attitudes. There is evidence of an association between bicycling attitudes and knowledge (veh. w/same rights/resp.). The means are presented in Table 9.

May Use Full Lane

An independent sample t -test showed that the difference in bicycling attitude scores between the knowledgeable (may use full lane) group ($M = 3.84$, $SD = .79$) and the unknowledgeable group ($M = 3.53$, $SD = .86$) revealed a statistically significant difference between the groups $t(823) = 3.93$, $p < .001$. The average bicycling attitude score for the knowledgeable group was .31 points higher than the unknowledgeable group, indicating that respondents who are knowledgeable (may use full lane) tend to be more positive in their

bicycling attitudes. There is evidence of an association between bicycling attitudes and knowledge (full lane). The means are presented in Table 9.

Table 9. Mean bicycle attitude vs. bicycling knowledge

	<i>N</i>	Mean Bicycle Attitude Scores		<i>p</i> value
		Unknowledgeable	Knowledgeable	
A bicyclist is legally entitled on the road?	1,087	3.46	3.72	<.001
A bicyclist is considered a vehicle and has the same rights and responsibilities on the road as a motor vehicle?	1,085	3.44	3.75	<.001
A bicyclist may use an entire lane?	825	3.53	3.84	<.001

Notes: Scores closer to five are more positive (See Table 1 in Methods – Bicycle Attitude section for a discussion of the scale).

Perceived Fear and Bicycling Frequency

A one-way analysis of variance (ANOVA) test was conducted for determining mean perceived fear score differences between the three groups of cyclists and the non-cyclists. The very frequent cyclists ($M = 3.06$, $SD = 1.27$) reported less perceived fear of bicycling than the remaining groups; frequent cyclists ($M = 3.46$, $SD = 1.21$), occasional cyclists ($M = 3.85$, $SD = 1.02$), and non-cyclist ($M = 4.06$, $SD = .93$). The one-way analysis of variance revealed statistically significant differences between all combinations of groups except the non-cyclist/occasional, $F(3, 1217) = 43.68$, $p < .001$. The means are presented in Table 10.

A Pearson r correlation test was conducted to determine the strength of relationship between perceived fear and bicycling frequency. Respondent's level of perceived fear and their

bicycling frequency showed a moderately strong inverse relationship $r(1,219) = -.308, p < .001$.

Perceived fear and bicycling frequency were significantly correlated at the .05 level and as perceptions of fear decreased bicycling frequency increased.

Table 10. Mean perceived fear vs. bicycling frequency

	Group Means				<i>p</i> value
	Non-Cyclist (<i>n</i> = 225)	Occasional (<i>n</i> = 477)	Frequent (<i>n</i> = 251)	Very Frequent (<i>n</i> = 268)	
Perceived Fear	4.06 a	3.85 a	3.46 b	3.06 c	<.001

Notes: Each subscript letter denotes a subset of grouping categories whose column means do not differ significantly from each other at the .05 level. (Total *N* = 1,221).

Perceived Fear and Bicycling Attitude

A Pearson *r* correlation test was conducted to determine the strength of relationship between perceived fear and bicycling attitudes. Respondent's level of perceived fear and their bicycling attitudes showed a moderately strong inverse relationship $r(1,195) = -.377, p < .001$. Perceived fear and bicycling attitudes were significantly correlated at the .05 level and as perceptions of fear decreased bicycling attitudes increased. The overall mean score respondents reported when asked "The idea of bicycling on busy roads frightens me. (Whether or not you are a cyclist)" was neutral to slightly fearful (*N* = 1,221, *M* = 3.64).

Table 11. Mean perceived fear vs. bicycling attitude

Perceived Fear	Bicycle Attitude				
	Strongly Disagree (Negative)	Disagree	Neutral	Agree	Strongly Agree (Positive)
	<i>n, (%)</i>	10 (1%)	103 (9%)	334 (28%)	516 (43%)
\bar{x}	4.71	4.42	4.00	3.46	3.02

Notes: Perceived fear is on a 5 point Likert scale with scores close to 5 representing greater fear. (See Methods – Bicycle Attitude and Perceived Fear sections for a discussion of the scale).

Perceived Interactions on the GTSR

When cyclists were asked “motorists appropriately passed me on the road”, the majority indicated very frequently (44%) or always (20%). When cyclists were asked “motorists did not honk, yell, or gesture at me in a negative manner” (reverse coded), the majority indicated either always (77%) or very frequently (13%). When cyclists were asked “motorists passed with a comfortable distance”, the majority indicated very frequently (34%) or frequently (30%). When cyclists were asked “motorists were respectful of my space”, the majority indicated very frequently (38%) or frequently (32%).

Table 12. Cyclist’s perceived interactions on the GTSR

Statements	<i>n</i>	\bar{x}
Motorists appropriately passed me	135	5.78
Motorists did not honk, yell, or gesture negatively ¹	136	6.63
Motorists passed with comfortable distance ¹	136	5.58
Motorists were respectful of my space	136	5.69
Overall		5.92

Notes: Means are on a seven-point scale. ¹ Indicates statements are reverse coded, see Appendix A for original statements.

When motorists were asked “bicyclists did not ride two abreast” (reverse coded), the majority indicated always (45%) or sometimes (42%). When motorists were asked “bicyclists

appeared to be courteous to motorists” (reverse coded), the majority indicated either always (52%) or sometimes (39%). When motorists were asked “bicyclists used a pullout when the opportunity arose”, the majority indicated N/A (43%), sometimes (25%), never (17%), or always (15%). When motorists were asked “when I passed bicyclists, I gave them at least three feet of space”, the majority indicated always (86%).

Based on the descriptive statistics presented in Tables 12 and 13, the majority of cyclists and motorists who utilize the GTSR appear to perceive their mobility interactions as positive.

Table 13. *Motorist’s perceived interactions on the GTSR*

Statements	<i>n</i>	\bar{x}
Bicyclists did not ride two abreast ¹	324	2.38
Bicyclists appeared courteous	324	2.50
Bicyclists used a pullout	194	1.95
I provided 3 ft. while passing	327	2.88
Overall		2.42

Notes: Means are on a three-point scale and do not include N/A. The reported in-text percentages may be more appropriate for inferring about motorist perceived interactions. ¹ Indicates statements are reverse coded, see Appendix A for original statements.

Support for GTSR Cycling and Bicycle Attitude

A Pearson *r* correlation test was conducted to determine the strength of relationship between support for GTSR cycling and bicycling attitudes. Respondent’s level of support for GTSR cycling and their bicycling attitudes showed a moderately strong positive relationship $r(1,181) = .417, p < .001$. Support for GTSR cycling and bicycling attitudes were significantly correlated at the .05 level and support for GTSR cycling increased as bicycling attitudes increased.

Table 14. Mean support for GTSR cycling vs. bicycling attitude

		Bicycle Attitude				
		Strongly Disagree (Negative)	Disagree	Neutral	Agree	Strongly Agree (Positive)
Support for GTSR Cycling	<i>n</i> , (%)	10 (1%)	103 (9%)	334 (28%)	516 (43%)	234 (20%)
	\bar{x}	1.92	2.36	2.76	3.31	3.99

Notes: Support for GTSR cycling is on a 5 point Likert scale with scores close to 5 representing greater support for cycling. (See Methods – Bicycle Attitude and Support for GTSR Cycling sections for a discussion of the scale).

Support for GTSR Cycling and Bicycling Frequency

A one-way analysis of variance (ANOVA) test was conducted for determining mean support for GTSR cycling differences between the three groups of cyclists and the non-cyclists. The very frequent cyclists ($M = 3.58$, $SD = 1.21$) reported more support for GTSR cycling than the remaining groups, frequent cyclists ($M = 3.17$, $SD = 1.26$), occasional cyclists ($M = 3.01$, $SD = 1.16$), and non-cyclist ($M = 3.01$, $SD = 1.19$). The one-way analysis of variance revealed significant differences between two sub-groups, $F(3, 1202) = 13.6$, $p < .001$. The means are presented in Table 15. A Bonferroni post-hoc test revealed evidence that the very frequent group was significantly different than the other three groups at the .05 level. The overall mean score respondents reported when asked “Bicyclists should be allowed to travel along the GTSR any time of day” was neutral to slightly positive ($N = 1206$, $M = 3.18$).

Table 15. Mean support for GTSR cycling vs. bicycling frequency

	Group Means				<i>p</i> value
	Non-Cyclist (<i>n</i> = 224)	Occasional (<i>n</i> = 469)	Frequent (<i>n</i> = 246)	Very Frequent (<i>n</i> = 267)	
Support for GTSR Cycling	3.01 a	3.04 a	3.17 a	3.58 b	<.001

Notes: Each subscript letter denotes a subset of grouping categories whose column means do not differ significantly from each other at the .05 level. (Total *N* = 1,206). Scores closer to 5 represent greater support for GTSR cycling.

A Pearson *r* correlation test was conducted to determine the strength of relationship between support for GTSR cycling and bicycling frequency. Respondent's level of support for GTSR cycling and their bicycling frequency showed a weak positive relationship $r(1,204) = .165$, $p < .001$. Support for GTSR cycling and bicycling frequency were significantly correlated at the .05 level but support for GTSR cycling increased only slightly as bicycling frequency increased.

Experimental Results

Manipulation Checks

The brochure was not a great success and only 133 (22%) of the total treatment sample (*N* = 597) received the brochure. Of the 133 respondents who received it, 100 (75%) indicated they read the brochure. Therefore, of the total treatment sample, 100 (17%) read the brochure. In other words, if respondents received the brochure, a high percentage (75%) of them read it.

The sign was more successful as a treatment and 349 (58%) respondents from the total sample (*N* = 597) indicated they read the sign. Two groups emerged after controlling for those who were treated, a control group *N* = 850 (69%) and a treatment group *N* = 374 (31%).

Knowledge Differences – Control vs. Treatment

A chi-square test for goodness of fit was performed to determine whether knowledge (bicycles may use full lane) was different between the control and treatment groups. The chi-square results showed that 135 (16%) of the respondents from the control group were knowledgeable that a bicycle may use a full lane and 129 (35%) of the treatment group were knowledgeable a bicycle may use a full lane. The chi-square test revealed that the percentage of respondents who were knowledgeable of bicyclists using a full lane was not equally distributed between the control and treatment groups, $\chi^2(1, N = 1206) = 55.39, p < .001$. The percentages are presented in Table 16. The testing showed evidence that there is an association between the signage treatment and knowledge (may use full lane). Statistically significant differences were found between the control group and those in the treatment group at the .05 level.

A chi-square test for goodness of fit was performed to determine whether knowledge (veh. w/same rights/resp.) was different between the control and treatment groups. The chi-square results showed that 515 (47%) of the respondents from the control group were knowledgeable that a bicycle is considered a vehicle with the same rights/resp. and 57 (59%) of the treatment group were knowledgeable that a bicycle is considered a vehicle with the same rights/resp. The chi-square test revealed that the percentage of respondents who were knowledgeable of bicyclists being considered a veh. w/ same rights/resp. was not equally distributed amongst the control and treatment groups, $\chi^2(3, N = 841) = 17.4, p = .001$. The percentages are presented in Table 16. There is evidence of an association between the brochure treatment and knowledge (veh. w/ same rights/resp.). Statistically significant

differences were found between the control group and those in the treatment group at the .05 level.

Table 16. Knowledge differences between control and treatment groups

	Control	Treatment	<i>p</i> value
A bicyclist may use an entire lane?	<i>N</i> = 841 135 (16%)	<i>N</i> = 365 129 (35%)	<.05
A bicyclist is considered a legal vehicle with the same rights and responsibilities as a motor vehicle?	<i>N</i> = 1,106 515 (47%)	<i>N</i> = 97 57 (59%)	<.05

Bicycling Restrictions on the Going-to-the-Sun Road

In addition to the survey results presented above, the purpose of this study was to objectively look at the current GNP bicycle restrictions. There are various requirements for bicyclists in terms of times allowed on the road and what sections of the road bicyclists can and cannot ride on during certain times. As indicated in Table 17 and Figure 13, the section between Apgar and Sprague Creek has the restriction. The Sprague Creek to Logan Creek segment is unrestricted yet has a greater elevation change (11.7%) and average slope (2%) if traveling east than the restricted segment of Apgar to Sprague Creek, which has a 0% elevation change and an average slope of 1.6%. The Sprague Creek to Logan Creek segment has a sinuosity of .889 whereas the Apgar to Logan Creek segment has a sinuosity of .943. Sinuosity closer to 1 indicates that the road is closer to a straight line and values closer to 0 suggest greater deviation from the shortest path.

Table 17. Comparison of restricted and open segment of the Going-to-the-Sun Road

Road Characteristics (west to east)	Roadway Segments	
	Apgar to Sprague Creek (Restricted 11am – 4 pm)	Sprague Creek to Logan Creek (Open all day)
Distance	8.02 miles	10.9 miles
Elevation Gain	400 feet	755 feet
Elevation Loss	-400 feet	-382 feet
Elevation Change	0%	11.7%
Max Slope	12.3%, -17%	20.4%, -17%
Average Slope	1.6%, -1.9%	2.0%, -1.5%
Sinuosity	.943	.889
Speed Limit	40 mph	40 mph
Road Width	24 feet	24 feet

Notes: Speed limits decrease in pedestrian areas to 25-35 mph. Sinuosity measures the deviation of a line from the shortest path, dividing total length by the shortest path possible. Distance, elevation, and slope characteristics were measured from west to east.

Chapter Five: Summary, Discussion, and Implications

Chapter five will begin by reiterating the seven research questions covered in the data analysis and the significance of the findings will be covered. An explanation of the results for each of the variable relationships tested will be covered in this section. Noteworthy comparisons of the study results to the literature will be described. Unexpected results will be explained along with any limitations to the study. Finally, chapter five summarizes any study implications and finishes with a critical discussion of bicycle mobility within Glacier National Park.

Reiteration of Research Questions and Basic Findings:

- I. a. Do travelers differ in bicycling attitudes based on bicycling frequency?

Answer: Yes, bicycling attitudes were more positive as bicycling frequency increased.

- b. Do travelers differ in their critique of motorist and cyclist behavior based on their level of bicycling frequency?

Answer: Yes, the frequent and very frequent cyclists were more critical of motorists than the occasional and non-cyclists. The very frequent cyclists were less critical of cyclist behavior than the remaining groups. Overall, travelers were more critical of motorist behavior than they were of cyclist behavior.

- c. Do travelers differ in their knowledge of roadway bicycling laws based on their level of bicycling frequency?

Answer: Yes, the non-cyclist group reported less knowledge of roadway cycling laws than the three cyclist groups.

d. Do travelers differ in their perceived fear based on their level of bicycling frequency?

Answer: Yes, perceived fear decreased as bicycling frequency increased.

e. Do travelers differ in their level of support for GTSR cycling based on their level of bicycling frequency?

Answer: Yes, the very frequent cyclists had more support for GTSR cycling than the remaining groups.

2. Do travelers differ in their bicycling attitudes based on their knowledge of roadway bicycling laws?

Answer: Yes, bicycling attitudes were more positive when respondents were knowledgeable of the roadway cycling laws.

3. What is the relationship between perceptions of fear and bicycling attitudes?

Answer: As perceptions of fear decreased, bicycling attitudes became more positive.

4. What is the relationship between support for cycling on the GTSR and bicycling attitudes?

Answer: Support for GTSR cycling increased as travelers' bicycling attitudes became more positive.

5. Are perceptions of interactions on the GTSR positive or negative between cyclists and motorists?

Answer: Both cyclists and motorists perceived their interactions with one another as positive.

6. Can knowledge of roadway bicycling laws be improved with signage and an educational brochure as experimental treatments?

Answer: Yes, knowledge of roadway bicycling laws improved when travelers were treated with the sign and brochure. The sign proved to be more effective than the brochure at improving knowledge.

7. Is the partial bicycling prohibition that is in place on the GTSR warranted or not?

Answer: No, the western restriction is unwarranted based on the comparison of the characteristics of the roadway segments, and based on the travelers' positive attitudes, perceived interactions, and support for GTSR cycling.

Significance and Discussion of Data Analysis

Results showed that travelers of the Going-to-the-Sun Road (GTSR) have a range of backgrounds with bicycling in their daily lives, both in terms of frequency and reasons for bicycling. The majority of visitors self-identified as recreational occasional cyclists. Precisely 82 percent of the sample identified themselves as cyclists, however, if the over-represented cyclists who physically bicycled the GTSR were eliminated from the sample then 79 percent of the remaining sample would still be classified as cyclists. Glacier National Park (GNP) and other bicycle tourism planners should feel pretty confident in knowing that the majority of general park travelers are cyclists to some degree and that a cyclist vs. motorist (us vs. them) scenario does not really exist. The reality is that many drivers, motorists, and auto passengers are also occasional, frequent, and very frequent cyclists.

Bicycling attitudes proved to be most strongly correlated to bicycling frequency; and bicycling attitudes improved as respondents reported greater frequency of bicycling. These

results are consistent with Sander's (2013) study, and indicate to GNP and bicycle tourism planners the importance of avoiding homogenous understandings of bicycling attitudes. More importantly, it clearly depicts how GTSR travelers, even those who do not bicycle in their daily life, are neutral to positive in the way they legitimize cyclists on the roadway. Glacier National Park is in a position to create opportunities for travelers to engage in bicycling as an activity and the more they begin to engage in bicycling, the more positive their attitudes towards bicycling will become. The softer their bicycling attitudes become, the more supportive they will be towards GTSR cyclists and the activity will ultimately become safer.

It should be re-iterated that support for GTSR cycling given bicycling frequency were weakly correlated, whereas support for GTSR cycling given bicycling attitudes were more strongly correlated. Increased bicycling frequency may not necessarily result in an increase of support for GTSR cycling because the very frequent cyclists were the only group who showed statistically significant differences of support for GTSR cycling. It is likely that the other three groups are perceiving the uppermost alpine section of the GTSR as too winding, narrow, precipitous, and too heavily trafficked by motor vehicles to allow bicycles to travel freely any time of day. It is also a possibility that if capable bicyclists experienced firsthand pedaling the uppermost alpine section, their perceptions may shift along with their level of support for unrestricted GTSR cycling. Overall, the majority of travelers were neutral to positive in their support for unrestricted GTSR roadway cycling. Support for GTSR cycling was measured with only one statement so a further investigation may be warranted.

Very frequent and frequent cyclists have slightly more support for courteous motorist behavior and educating motorists about sharing the road with cyclists than the other two groups (non-cyclist and occasional). Overall, GTSR travelers are supportive of encouraging

more courteous motorist behavior and education about sharing the road with cyclists. To summarize the motorist behavior and cyclist behavior variables, the data suggests there is bilateral support for increasing education on sharing the road and encouraging more courteous behaviors between respective transportation modes.

Perceptions of fear emerged as an important dependent variable when analyzing GTSR travelers subjective association with roadway bicycling. Perceived fear was inversely correlated to bicycling frequency and bicycling attitudes, both with moderate strength. If Glacier National Park wants visitors to legitimize cyclists on the roadway then they have to create opportunities for engaging the public with the activity. The more people are involved with cycling in their daily life, the less perceived fear they will have, and the softer their attitudes will be towards the roadway cyclists they interact with. As travelers begin to bicycle more, they might even decide at some point that they are ready and willing to ride the GTSR. It is important to highlight that even the very frequent cyclists were neutral in their perceived fear of cycling on busy roads, thus supporting the notion that even the most strong and fearless cyclists are at least somewhat concerned about bicycling on busy roads. Separated facilities and opportunities to ride without motor vehicle traffic (scheduled car free days) are one way that GNP and other bicycle tourism planners can begin to engage visitors in bicycling.

Results showed evidence of an association between knowledge of roadway bicycling and bicycling frequency. The percentage of non-cyclists that were knowledgeable (a bicycle being a legal vehicle, with the same rights and responsibilities as motor vehicles, and allowed to use a full lane) was lower than the other three cyclist groups. Overall knowledge of roadway cycling laws was lower than expected and it is partly attributed to a measurement error. Respondents who answered the knowledge questions were 85 percent nonresident. The questions were

prefaced with “In Montana” rather than “In General” which resulted in a respondent motivation to gravitate towards “I don’t know” more frequently. For all three of the knowledge question’s “I don’t know” option, nonresidents consisted of 54 percent vs. 15 percent residents (considered a veh. w/ same rights/resp.), 56 percent nonresident vs. 13 percent resident (legal on road), and 63 percent nonresident vs. 30 percent resident (may use full lane). These high percentages of nonresident “I don’t know” responses contributed to 73 percent of the sample being categorized as unknowledgeable (for both legal veh. w/ same rights/resp. and bicycle may use full lane). The knowledge questions are universally recognized in state laws so “In general” and an omission of “I don’t know” would likely uncover more precise estimates of GTSR travelers’ knowledge of bicycle laws. Hess and Peterson (2015) found that 92 percent of their respondents agreed (when provided a dichotomous disagree or agree) that a bicycle may be in the center of a traffic lane after seeing a bicycle may use full lane sign. This GNP study showed that 16 percent of a control group was knowledgeable that a bicycle may use a full lane and 35 percent were knowledgeable after seeing the signage. Despite any possible measurement errors, it is still clear that GTSR travelers who cycle at least occasionally are going to have greater knowledge of roadway bicycling laws which legitimize cyclists’ rights to use the road, and exposure to signage will help to increase traveler awareness of a bicycle as a legitimate road user.

The sign and brochure were effective at improving knowledge of roadway bicycling laws, however, the signage/brochure were not developed or used to manipulate bicycling attitudes. Tuan (1974) depicts that attitudes, beliefs, and perceptions are all closely intertwined; and that attitudes are a sturdier accumulation of perceptions over time. This suggests people are deeply rooted in their attitudes and it may take time for accurate messaging of roadway bicycling laws

before a shift in attitudes occurs. The study results did indicate that the control respondents who were knowledgeable had significant improvements in their bicycling attitude scores given the three knowledge questions. If GNP can create a cycling environment that legitimizes cyclists rather than prohibits them, then a change in accumulated perceptions can begin to occur. The hope then is that more positive attitudes will follow as travelers become more accustomed to seeing supportive signage rather than prohibitive signage. It is also imperative that the cyclists ride courteously to add to the shift in perceptions that motorists carry towards cyclists.

Cyclists riding to Logan Pass perceive their interactions with motorists as mostly positive, and the motorists also indicated relatively positive interactions with cyclists. Cyclists who ride the GTSR with motor vehicles are doing it for the novelty and they are few and far between in comparison to the bulk of auto-tourists on the GTSR. These novelty riders are reporting highly positive interactions and the fact that the majority of respondents were neutral to positive in their bicycling attitudes and their support for GTSR cycling, indicates that there is tolerance for GTSR roadway cycling. In light of the responses from motorists, GNP may want to consider a further investigation of cyclists riding two abreast as 42 percent of motorists indicated that happened sometimes. They also may want to encourage cyclists to utilize pullouts as a courteous behavior to further soften the relations between cyclists and motorists.

Travelers of the GTSR (76%) overwhelmingly reported that they prefer traveling slowly on the GTSR for an improved experience. This data suggests travelers are OK going slowly. With neutral bicycling attitudes and a preference to travel slowly, the occasional encountering of a GTSR cyclist should be tolerable. Dan Rather once stated that “Americans will tolerate a lot until you start blocking traffic” (Furness, 2010), and this appears to be more true in an urban

environment where people are in a greater hurry to meet the demands of a time-compressed life. The GTSR is predominantly a leisure space so travelers may have a greater tolerance for slower moving cyclists.

The Glacier National Park website (NPS, 2016) encourages visitors to get to the pass early because Logan Pass parking area fills as early as 9:30 am during the summer months. This suggests there is a steady flow of traffic on the GTSR at 9:00 or 9:30 am during the peak season. Informal observations during this study confirm that steady flows of automobile traffic begins much earlier than 11:00 am. Several cyclists who were very close to reaching Logan Pass by the 11:00 am cutoff shared their stories of being interrogated by rangers and asked to turn around rather than continue to the pass. In this circumstance, both the GTSR and Logan Pass would likely be at capacity for automobile use, and traffic congestion would be similar from 9:00 am to 11:00 am or later. If steady traffic begins as early as 9:00 am, then there is no reason to turn cyclists (those few who underestimate the time it takes to ascend and are arriving shortly after 11:00 am) around just before reaching Logan Pass. Another consideration is that higher density auto traffic in the 25 mph alpine section may actually be safer for bicyclists because the automobile speeds will be slower as the GTSR approaches a maximum roadway capacity. The 11:00 am restriction is fairly arbitrary, not rooted in any empirical evidence, or is simply outdated.

A visual graphic was created (see Figure 13 and Table 17 in Results) of the Going-to-the-Sun Road bicycling route to depict the road-segments that are restricted vs. unrestricted in relation to percentage of elevation change, average slope, and sinuosity (road length/divided by the shortest path). The restricted segment is closer to a straight path than the open section, and from a birds eye view, does not appear to have greater curvature which may result in blind

corners. Speed limits and road width are consistent through both of the segments that are in question, most often 40 mph and slowing to 25-35 mph in pedestrian areas. Road widths are a standard 24 feet and none have shoulders > 1ft. The upper alpine section above/east of Logan Creek is most often 25 mph. No data to date existed on why the western most road-segment is restricted. The map graphic along with attitudes, perceived interactions, and support for GTSR cycling provides socio-spatial evidence that the western most restriction is unwarranted.

A brief roadway scenario to consider – a cyclist who is traveling uphill/east from Sprague Creek to Logan Creek (no restriction) at 11:00 am (11 miles of 11.7 percent elevation change, 2 percent average slope, 755 ft. elevation gain, and .889 sinuosity) is going to be moving slower, thus more of a hindrance to motor vehicle traffic than a touring cyclist who descends downhill/west from Logan Pass and arrives at Sprague Creek at 11:00 am needing to cycle out of the park to Apgar (restricted) (8 miles of 0 percent elevation change, 1.6 percent avg. slope, 400 ft. elevation gain, and .943 sinuosity). Another scenario to consider – a cyclist enjoys a leisurely morning and begins pedaling uphill from Sprague Creek towards Logan Creek at 11:00 am, meanwhile, there is a cyclist who arrives at Apgar at 11:00 am and they are forced to wait until 4 pm to pedal the flat 8 miles into their campsite at Sprague Creek. In both of the previously described scenarios, a cyclist could be restricted on either side of the flat Apgar to Sprague Creek section from 11:00 am to 4:00 pm while other cyclists are being permitted to bicycle uphill from Sprague Creek to Logan Creek. Or even more confusing is that cyclists are also permitted to ascend the precipitous east side of the GTSR from St. Mary to Logan Pass all day while the flat Apgar to Sprague Creek section is faced with restrictions.

The aforementioned scenarios prove that the regulations are perplexing and will apparently leave GNP visitors confused. There are two solutions to alleviate the confusing

restrictions, (1) is to fully open the western portion of the GTSR to bicyclists from Apgar to Sprague Creek or (2) is to further restrict the road to bicyclists by restricting the Sprague Creek to Logan Creek section. The first solution is advisable based on the data findings from this study. If the second solution were to be implemented, it may be worth re-evaluating the timeframe to better reflect actual motor vehicle flows. One alternate solution to consider is to leave the restrictions as is. The status quo would likely continue to leave visitors confused about the restrictions and could ultimately discourage them from engaging with cycling while visiting Glacier National Park. Glacier National Park should not want to leave their visitors perplexed so it is advisable that there needs to be a change to foster simpler and more consistent regulations.

After speaking directly to many cyclists who utilized the GTSR in 2015, the majority prefer to cycle in the morning hours rather than the heat of the day, so it is unlikely that there would be a major spike in bicycle travel if all the restrictions were lifted. If an occasional touring cyclist needs to descend from Logan Pass and arrives at Sprague Creek around 11:00 am traveling west, then they should not have to wait 4 hours to exit the park. Similarly, a touring cyclist who arrives to Apgar on their bicycle and needs to enter the park, should not have to wait and have their mobility cutoff. Glacier National Park and Montana are fortunate to be situated on one of the nation's premiere trans-national bicycle routes. Touring cyclists passing through on the GTSR should not be faced with restricted mobility so that preference can be given to unimpeded auto-tourists. Glacier National Park is faced with the decision of catering to and celebrating bicycle tourists, or continuing on with prohibitive policies which create mobility unevenness and confusion.

Bicycle Mobility on the Going-to-the-Sun Road

Social Constructions of GTSR Space and Place

Let's briefly apply Lefebvre's work on space, repetitions, and history to a discussion of the Going-to-the-Sun Road. It can be argued that the social construction of the GTSR as a tourism space is locked into a cycle of what came earlier (i.e. the dominance of automobility). As understood by Lefebvre, "the preconditions of social space have their own particular way of enduring and remaining within that space..." Lefebvre's accounts on the preconditions of social space support the critique that a perpetual endurance of a GTSR 'auto-space' exists. Results from the study suggest that GTSR cyclists are a small fraction of 1 percent of all recreational visitors, further indicating that GNP is prioritizing an endured auto space on the Going-to-the-Sun Road. NPS stats also show a roughly 3,000 percent increase in recreational visits since 1930 (roughly the time the GTSR road was completed), and the majority of these visitor increases have endured as auto-tourists.

Works on rhythm analysis as demonstrated by Lefebvre (2004) can be applied to touring cyclists' rhythms in and around Glacier National Park (GNP). Cycling rhythms are inhibited by a restriction that was arbitrarily put in place in the 1980's. Rhythm preferences are being given to automobiles to reflect the pulses of the GNP and statewide Montana tourism marketplace. Ordered repetitions are producing the GTSR space, and bicycle rhythms do not keep pace with the pulses of the tourism marketplace surrounding GNP. Furthermore, rhythm preferences and restrictions of cyclists raise the issue of power relations in the construction of the GTSR tourism space. According to Lefebvre's conceptualizations of rhythm as the socio-spatial and temporal productions of ordered repetitions within a marketplace, the GTSR acts as a flow

network that supports cyclical and linear repetitions of automobility and capitalism within Glacier National Park. Rhythmanalysis critiques of the GTSR uncover how the tourism industry and national park agency impacts constructions of space and place, and issues of power in tourism are inextricably linked with the rhythm and repetitions of the tourism industry.

Conceptualizations of Placelessness as presented by Relph (1976) argue that places are becoming less authentic gradually over time and Edward Relph defines placelessness as “the causal eradication of distinctive places and making of standardized landscapes that results from an insensitivity to the significance of place” (Relph, 1976). Relph’s placelessness concept coupled with Thrifts (2003) theorization of empirical space (‘routines of life’), unblocked space (circulating flows of objects/globalization), and image space (images of what space ought to be) can be applied to the human experience of space and place along the GTSR in GNP, where motorized vehicles are creating the standardization of transportation throughout the park. Mass automobility culture and linear rhythms of tourist flows are creating a homogenous mass culture of mobility along the GTSR landscape. It is the ‘*kitsch*’, a term Relph (1976) used to describe the mass value forces and mass culture, which leads to placelessness. It may be unfair to term the GTSR as placeless, but it is evident that relational space and human interactions are contributing to a routine, imagined, and embodied flow of automobility space and place on the Going-to-the-Sun Road. Glacier National Park and the NPS takes pride in both promoting the spirit of places and their role in preserving the character of a place, therefore, they should aim to reduce the impacts of mass culture forces such as auto-tourism.

Tourism Mobilities of the GTSR

Tourism flows along the GTSR do not always occur evenly and social relations exist between bicyclists and motor vehicles who are simultaneously utilizing the GTSR as a tourism

mobility space. Precedence has been awarded to motor vehicles along the GTSR, whereas bicycles have been marginalized as a legitimate form of mobility within GNP's tourism space by way of prohibitive signage and a temporary restriction. Results from the study suggest that social relations between motorists and cyclists are positive and that other external power relations may be having a greater influence on GTSR tourism mobilities (i.e. GNP agency personnel or possibly business stakeholders with an interest in keeping the GTSR as a scenic driving destination).

Claims are far too frequently made that bicycling is too dangerous along the GTSR and safety is used as a scapegoat for restricting bicycle mobility, however, it can be argued that these claims are rooted in limited perceptions of fear associated with bicycling and minimal lived-experience of the activity. As supported in the data analysis, travelers who had less engagement with bicycling were the ones who perceived it as more frightening and subsequently delegitimize cyclists on roadways. The claim that a bicycle is too dangerous is misguided; consider this, how many bicyclists have ever killed motor vehicle drivers? On the contrary, many deaths of cyclists are attributed to motor vehicles, 726 bicyclist fatalities in the United States in 2012 (NHTSA, 2014). Bicycle fatalities made up less than 2% of all traffic fatalities. In 2013, there was a total of 32,850 motor vehicle traffic fatalities reported by NHTSA (persons in motor vehicles killed by persons in motor vehicles). If safety is the concern of GNP officials, then restricting automobiles (a far more dangerous object than a bicycle) along the GTSR would be the safest solution. Rather, social relations and power relations that use safety as a scapegoat for constructing automobility tourism space prevail to ensure unimpeded flows of auto-tourists and tourist spending.

The mobilities paradigm is applicable to travel and tourism space construction (Sheller & Urry, 2004), and helps in addressing tourism mobilities on the Going-to-the-Sun Road. The previous two sections on social productions and constructions of space/place, as well as tourism mobilities has led to the emergence of economic and political forces that impact meanings of space and place on the GTSR. Theories on the politics of mobility (Cresswell, 2010) and automobility dominance (Urry, 2004; Thrift, 2004) will now be explored for deeper examinations of tourism mobilities issues within GNP and on the GTSR.

A Politics of GTSR Mobility

There is a movement hierarchy in mobilities (Cresswell, 2010) and it is applicable to understanding the many aspects of a politics of mobility and automobility dominance (Urry, 2004) occurring on the GTSR. Tourists make the choice to move as they desire from home origin to destination, and this is true for both bicycling tourists and automobile tourists. However, automobile tourists have a speed advantage over cyclists and associations of exclusivity surface when humans have speed advantages (Cresswell, 2010). Bicyclists are the fringe group in GNP and are socially excluded (Aldred, 2013) and subordinated by the 'system of automobility' (Urry, 2004), all the while, motor vehicles enjoy embodied freedom, flexibility, and infrastructural preferences from the anonymous and 'quasi-private' car-body (Urry, 2004; Thrift, 2004). Speed and velocity are major factors in the embodiment of movement on the GTSR, either by way of car-body, or cycle-body. Cycling alongside automobiles brings up concerns of safety surrounding the velocity at which automobiles move while sharing space with cyclists. There is an uneven distribution of influences on place meanings attributed to speed and velocity that marginalize bicycling on the Going-to-the-Sun Road.

Friction, as outlined in the politics of mobility by Cresswell (2010) exists in GNP where a prohibition of bicyclists is in place during the peak tourism season. Cycling as a human form of mobility is being forced to stop. The friction component of mobilities theory presents relevance to a hierarchical system of mobilities that is leading to the forces of capitalism creating uneven distributions in mobility rhythms and routes along the GTSR. Standardizations of time (Thrift, 2003) are prevalent in the power relations behind the GTSR mobility friction. The prohibition against bicycles was arbitrarily put in place by GNP based solely on the 'routines of life' and capitalist standardizations of time (11am-4pm from June 15th – Labor Day) during the highest flow of tourist consumption. This timeframe is now outdated as steady flows of auto-tourists begin much earlier than 11 am. The routes of touring cyclists are being arbitrarily restricted along the GTSR during peak tourism flows, possibly resulting in alternative route choices being forced upon touring bicyclists in the region.

Bicycle Mobility on the GTSR

Touring bicyclists embody or experience mobility on the GTSR differently than automobiles. Insights from bicycle touring mobilities (Pesses, 2010) and the kinesthetic embodiment of road-cycling (Spinney, 2006) provide understandings into the experiential facet of Cresswell's (2010) politics of mobility theory in relation to bicycling and automobiles on the GTSR. It is the embodiment of mobility and human experience that moves the GTSR from tourism space to a 'real', lived, and ordered place, as evident in Thrift's (2003) component of 'Place Space'.

Bicycling as a form of mobilities requires a historical contextualization and relational understanding of the bicycle to broader societal forces and space. This historical, spatial, and temporal context can then reveal significance in time periods (i.e. Fordism) when roads were

being built for greater efficiency and mass production. The bicycle tour is unique in that it is “a temporary reposition of one’s role in the automobility system” (Pesses, 2010), and it repositions one’s role in the fordist or post-fordist system. The small group of touring bicyclists, who are sensing and embodying the landscape of the GTSR from the speed and rhythm of a saddle, are challenging the status quo of automobility. They are also at the forefront of reproducing GTSR tourism spaces. The bicycle is an iconic symbol with historical ties to environmentalism, activism, and social justice (Horton, 2006), and plays an important role in challenging the mobility rhythms associated with the Going-to-the-Sun Road tourism space.

Chapter Six: Conclusion

The proceeding sections offer future research recommendations and concluding remarks to develop improved bicycle travel in GNP based on the literature, data, and critical discussion from this thesis.

Future Recommendations

To date there are no counts on a precise number of cyclists who utilize the GTSR. Findings from this project showed a total of 137 cyclists were intercepted in August over 12 days, roughly equating to 11.4 bicyclists at Logan Pass per day. Nearly every bicyclist who made it to Logan Pass was intercepted during the sampling timeframe, excluding any small number of evening cyclists. Extrapolating 11.4 daily cyclists x 30 days = 342 cyclists per month, then taking 342 monthly cyclists x 4 months (June, July, August, and September) = 1,368 bicyclists during the bulk of the tourism season. Even if an over-estimation of 2,000 or even a doubling to 4,000 bicyclists was used, it still equates to less than 1% of all other auto-tourists. To further put it into perspective, recreational vehicle traffic counts during those same 4 months at the east and west entrance approached 492,204 in 2015 (NPS Stats, 2016). An attempt to conduct random counts of cyclists and recreational vehicles carrying bicycles at the east and west entrance did occur in 2015 but the data fell short in producing an exhaustive examination of bicycle traffic in GNP. Glacier National Park can benefit from a more thorough investigation of bicycle use in the park by using pneumatic tube counters or randomized counts over a longer duration of the season, thus allowing for a precise estimation of bicycle traffic on the GTSR.

The bicycling frequency variable was a simplified adaptation from other researchers (Dill and Voros, 2007). A more extensive typology to categorize level of bicycle frequency may

prove useful to future researchers. This project measured commuting vs. recreational riding, as well as the alternative measure of bicycle frequency by week/day/month but did not use it in the data analysis. This is because each of the measurements used were ordinal rather than continuous values and issues of mutual exclusiveness were present. A cyclist who rides for utilitarian purposes on roadways utilizing shared lane markings and bike lanes is going to be different than those who ride recreationally on trails or paths that are off streets. It is advisable that others who attempt to understand bicycling frequency use an index on a consistent Likert scale that better accounts for seasonality, surfaces, and purposes of riding.

There is a lack of evidence on the roadway capacity along the GTSR during the different restricted and unrestricted times. What specific times are experiencing greater levels of service or traffic capacity according to the Highway Capacity Manual? This type of data could help in pinpointing when the upper alpine section of the GTSR is reaching greater capacity and what times it approaches 80 – 90 percent vehicle capacity or gridlock, where speeds are reduced due to high densities of motor vehicles. Furthermore, an experimental design or observational study could be implemented to assess the degree to which bicyclists are impeding traffic.

Results from this study have proved that travelers do prefer slower mobility for an improved GTSR experience and that their experience interacting with other mode types on the highway is largely positive. Despite these findings, there may be a need for an ethnographic and qualitative interview approach to further understand the cycling embodiment on the GTSR, especially since the GTSR has less of a cultural cycling acceptance surrounding the place compared to other famous cycling destinations around the world.

One obvious assumption regarding fear might be that people are fearful of being hit by motorists and that they aren't necessarily fearful of bicycling. Despite this assumption, fear and cycling is a potential research area that GNP and bicycle planners may want to consider further investigating. The results from this study have limitations as only one statement was asked to gauge how travelers perceive riding on busy roads. The results did not uncover any specifics of roadway conditions such as what speeds they are fearful of. For example, some individuals might feel uncomfortable when automobile speeds exceed 30 mph while others may feel comfortable with speeds up to 50 mph. It also did not determine whether they would be less fearful with a bike lane or a certain width shoulder. An experiment to assess first time GTSR cyclists (both novice cyclists and more experienced road cyclists) fear both before and after their experience might reveal interesting results about how people perceive fear prior to riding vs. how they perceive fear following their lived mobility experience along the Going-to-the-Sun Road.

Glacier National Park could benefit from further studying a sample of GTSR cyclists and their views of the restriction. It is unknown whether the restriction is causing lived mobility friction and it could prove useful to interview cyclists on what effect the restriction had on their movement through GNP. It is not known whether touring cyclists were forced to wait or were inhibited by the restriction. It is also unknown whether travelers refrained from bicycling in GNP because of the logistics in navigating the restriction. Including cycling tour operator's perspectives on the restriction is another area of this study that was not addressed. The restriction may or may not be impacting the number of trips the tour operators can run, or the way individual cyclists' mobility patterns may be influenced.

Concluding Remarks

Glacier National Park at a minimum should consider unrestricted bicycle travel on the western portion of the GTSR based on the analysis of the different segments' road characteristics. Restricting bicycles does not align with the 49 of 50 state laws across the country that recognize a bicycle as "having all the same rights and duties as a driver", nor the majority of states that recognize a bicycle as a legal vehicle. Furthermore, neutral to positive bicycling attitudes, neutral support for GTSR cycling, slow travel preferences, and the overwhelmingly positive interactions that are occurring between cyclists and motorists suggests that a restriction against cycling is not warranted.

Travelers of the GTSR, despite what transport mode they used within the park, proved to have a diverse background in bicycling. The vast majority of GTSR travelers are bicyclists to some degree, have experienced being a bicyclist, and are generally empathetic to other bicyclists. When these travelers encountered GTSR cyclists they overwhelmingly had a positive experience. The cyclists who were riding the GTSR reported very positive interactions with motorists. As Glacier National Park managers plan for bicycle use they should keep in mind that the perceived political friction between cyclists and motorists does not exist (particularly in Glacier), and only a small minority of their visitors are "anti-cycling". Instead, motorists and cyclists are behaving in a civil manner along the GTSR with primarily positive social relations.

With positive social relations occurring, it may be the ideal time for the NPS and GNP to begin embracing alternative transportation modes on the GTSR, especially as visitation numbers continue to put pressure on park resources. Despite the apparent impacts (i.e. air pollution, traffic congestion and lack of parking, noise pollution, wildlife and vegetation disturbance, etc.) associated with a perpetual endurance of a GTSR auto-tourism space, the

NPS is behind the curve with implementing progressive transportation policies that have a meaningful effect on reducing automobile use impacts. It is difficult to break the status quo of automobility and its relationship to the NPS, especially considering the longstanding tradition that began around 100 years ago when Stephen Mather (first NPS director) cozied up to the booming automotive industry (PBS, 2009). Regardless of whether that partnership was intentional or inadvertent, it has contributed to the automobile being the dominant form of transportation prioritized by GNP and the NPS. Even though unimpeded automobile access into our national parks has been hammered into the national psyche as a “democratic right”, other parks such as Zion, Yosemite, and Denali have successfully implemented a mandatory shuttle bus system and restricted automobile use because visitor numbers hit a threshold that demanded it. Glacier National Park has broken visitation records the past couple years and is not far behind these other parks in needing to limit or restrict personal automobile use on the GTSR to reduce congestion and promote the protection of the commons. The NPS is well aware that auto-congestion erodes the park experience, and it is not too late for GNP to fully embrace mandatory public transportation and non-motorized transport to foster a new type of park experience. These new visitor experiences will simultaneously promote more social interaction in the park (less individualized transport), opportunities for improving public health (walking, bicycling, etc.), and will ultimately help minimize the effects of anthropogenic climate change.

Glacier National Park has a tremendous opportunity to celebrate the longstanding tradition of bicycle travel in America, and to be at the forefront of reducing the effects of climate change by promoting non-motorized mobility and public transportation. By engaging travelers with bicycling as a form of mobility, one can effectively re-define places and re-

produce mobility feelings and socio-spatial processes. There are an increasing number of people in society who are taking interest in bicycling and it could lead to new social relations in GNP. As society shifts towards more of a non-motorized mobility acceptance, Glacier National Park may see a re-produced and re-constructed tourism space and lived mobility experience, thus resulting in new mobility meanings along the Going-to-the-Sun Road.

References

- Adelman, B. J. E., Heberlein, T. A., & Bonnicksen, T. M. (1982). Social psychological explanations for the persistence of a conflict between paddling canoeists and motorcraft users in the boundary waters canoe area. *Leisure Sciences*, 5(1), 45-61. doi:10.1080/01490408209512989
- Ajzen, I., and Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.
- Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211
- Aldred, R. (2013). Incompetent or too competent? Negotiating everyday cycling identities in a motor dominated society. *Mobilities*, 8:2, 252-271.
- Baker, M. L., (2008). *An Evaluation of Visitor Decisions Regarding Alternative Transportation in Glacier National Park*. Theses, Dissertations, Professional Papers: University of Montana ScholarWorks. Paper 128.
- Basford, L., Reid, S., Lester, T., Thomson, J. and Tolmie, A. (2003). *Drivers' Perceptions of Cyclists*. Crowthorne, England: Transport Research Laboratory
- Bike Delaware. (2014). Why "Share the Road" is gone in Delaware. Available: <http://www.bikede.org/2014/04/07/why-share-the-road-is-gone/>. Accessed 21 March 2016.
- Bryan, H. (1977). Leisure value systems and recreation specialization: The case of trout fishermen. *Journal of Leisure Research*, 9, 174-187.
- Canzler W, Kaufmann V, & Kesselring S., (eds). (2008). *Tracing mobilities: towards a cosmopolitan perspective*. Aldershot: Ashgate.

- Chang, H.W. & Chang, H.L. (2005). A Strategic Study of Bicycle Tourism in Taiwan. *Journal of the Eastern Asia Society for Transportation Studies*, 5(1), 1675-1684.
- Chataway, E. S., Kaplan, S., Nielsen, T. A. S., & Prato, C. G. (2014). Safety perceptions and reported behavior related to cycling in mixed traffic: A comparison between Brisbane and Copenhagen. *Transportation research part F: traffic psychology and behaviour*, 23, 32-43.
- Cresswell, T. (2004). *Place: A Short Introduction*. London, England: Blackwell
- Creswell, T. (2010). Towards a politics of mobility. *Environment and Planning D: Society and Space*, 28(1), 17-31.
- Daigle J. J., C. A. Zimmerman. (2004). The Convergence of Transportation, Information Technology, and Visitor Experience at Acadia National Park. *Journal of Travel Research*, 43:151–160.
- Daigle, J. J. (2008). Transportation research needs in national parks: A summary and exploration of future trends. *George Wright Forum*, 25(1), 57–64.
- Daley, M., & Rissel, C. (2011). Perspectives and images of cycling as a barrier or facilitator of cycling. *Transport policy*, 18(1), 211-216.
- Davies, D. G. et al. (1997). Attitudes to cycling - a qualitative study and conceptual framework. *Transport Research Laboratory*, 266.
- Devlin, V. (2014, July 1). Opening of Glacier's Going-to-the-Sun Road expected this weekend. The Missoulian, retrieved 4/5/2016 from http://missoulian.com/news/local/opening-of-glacier-s-going-to-the-sun-road-expected/article_c8279d84-00b2-11e4-943b-0019bb2963f4.html
- Devlin, V. (2015, Dec. 3). 2,352,699 and counting: Glacier Park sets visitation record again. The Missoulian, retrieved 4/5/2016 from http://missoulian.com/news/local/and-counting-glacier-park-sets-visitation-record-again/article_441300dc-3ca4-5f1a-8944-618f80c86819.html

- Devlin, V. (2015, Aug. 6). Despite wildfire, Glacier on track to set another visitation record. The Missoulian, retrieved 4/5/2016 from http://missoulian.com/news/local/despite-wildfire-glacier-on-track-to-set-another-visitation-record/article_0ef682a1-b8bc-5855-b7ef-ffcfa1533969.html
- Dill, J., and Voros, K. (2007). Factors affecting bicycling demand: Initial survey findings from the Portland, Oregon, Region. *Transportation Research Record*, 2031, 9–17.
- Dill, J., and McNeil, N. (2013). Four types of cyclists? Examining a typology to better understand bicycling behavior & potential. Paper presented at the 92nd annual meeting of the Transportation Research Board, Washington, DC.
- Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: the tailored design method*. John Wiley & Sons.
- Dilsaver L. M., and Wyckoff, W. (1999). Agency culture, cumulative causation and development in Glacier National Park, Montana. *Journal of Historical Geography*, 25:75–92
- Dilworth, V.A., (2003). *Visitor Perceptions of Alternative Transportation Systems and Intelligent Transportation Systems in National Parks*. Unpublished Doctoral Dissertation, Texas A&M University, College Station.
- Dubois, G., Peeters, P., Ceron, J-P., and Gossling, S. (2011). The future tourism mobility of the world population: emission growth versus climate policy. *Transportation research, part A, policy and practice*. New York: Pergamon. Retrieved from NDL-OPAC database.
- Faulks, P., Ritchie, B.W., & Fluker, M. (2006). Cycle tourism in Australia: an investigation into its size and scope. Cooperative Research Centre for Sustainable Tourism. Retrieved 3 March, 2006, from <http://www.bikesa.asn.au/cycletourism/pdf/CRC%20Report%201.pdf>
- Furness, Z. (2010). *One Less Car: Bicycling and the Politics of Automobility*. Philadelphia, Pennsylvania: Temple University Press.

- Giordano, R. N. (2002). *Exploring Visitor experiences on Going-to-the-Sun Road in Glacier National Park*. Theses, Dissertations, Professional Papers: University of Montana ScholarWorks. Thesis 117.
- Hall, D.R. (1999). Conceptualizing tourism transport: inequality and externality issues. *Journal of Transport Geography*, 7, 181-188.
- Hall, C. and Page, S. (1999). Progress in Tourism Management: From the geography of tourism to geographies of tourism – A review. *Tourism Management*, 30: 3-15.
- Hannam, K., Sheller, M., Urry J. (2006). Mobilities, Immobilities and Moorings. *Mobilities*, 1(1), 1, 22.
- Hall, M. C., Williams, A. M., and Lew, A. A. (2004). *A Companion to Tourism*. Oxford, UK: Blackwell Publishing.
- Hallo, J. C., and Manning, R. E. (2009). Transportation and recreation: a case study of visitors driving for pleasure at Acadia National Park. *Journal of Transport Geography*, 17(6), 491e499.
- Harvey, D. (1989). From managerialism to entrepreneurialism: the transformation of urban governance in late capitalism. *Geografiska Annaler*. 71, 3-17.
- Harvey, D. 1990. Between space and time: Reflections on the geographical imagination. *Annals of the Association of American Geographers*, 80(3): 418-434.
- Heesch, K.C., Sahlqvist, S., and Garrard, J. (2011). Cyclists' experiences of harassment from motorists: findings from a survey of cyclists in Queensland, Australia. *Preventative Medicine*, 53(2011), 417-420.
- Heinen, E., van Wee, B., Maat, K. (2010). Commuting by bicycle, an overview of literature. *Transport Reviews*, 30, 59–96.

- Hendee, J., and C. P. Dawson. (2002). *Wilderness Management: Stewardship and protection of resources and values, 3rd ed.* Golden, Colorado: Fulcrum Publishing.
- Hess, G., & Peterson, M. N. (2015). "Bicycles may use full lane" signage communicates U.S. roadway rules and increases perception of safety. *PLoS One*, *10*(8), e0136973.
doi:10.1371/journal.pone.0136973
- Hibbert, J. F., Dickinson, J. E., Gössling, S., & Curtin, S. (2013). Identity and tourism mobility: an exploration of the attitude–behavior gap. *Journal of Sustainable Tourism*, *21*(7), 999-1016.
- Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1986/87). Analysis and synthesis of research on responsible environmental behaviour: A metaanalysis. *Journal of Environmental Education*, *18*, 1–8.
- Horton, D. (2006). Environmentalism and the bicycle. *Environmental Politics*, *15*, pp. 41–58.
- Horton, D., Rosen, P., and Cox, P. (2007). *Cycling and Society*. Burlington, Vermont: Ashgate Publishing Company.
- Hyde-Wright, A., Graham, B., Nordback, K. (2014). Counting Bicyclists with Pneumatic Tube Counters on Shared Roadways. *ITC Journal*.
- Jackson, E. L., and Wong, R. (1982). Perceived conflict between urban cross-country skiers and snowmobilers in Alberta. *Journal of Leisure Research*, *14*.1, 47.
- Jacob, G. R., and Schreyer, R. (1980). Conflict in outdoor recreation: a theoretical perspective. *Journal of Leisure Research*, *12*.4, 368.
- Kaiser, F. G., and Fuhrer, U. (2003). Ecological behavior's dependency on different forms of knowledge. *Applied Psychology: An International Review*, *52*, 598–613.

- Lamont, M. (2009). Reinventing the wheel: a definitional discussion of bicycle tourism. *Journal of Sport and Tourism*, 14(1), 5-23.
- The League of American Bicyclists. (2015). About the League – Mission and History, Stats. Retrieved 4/5/2016 from <https://irma.nps.gov/Stats/Reports/Park>
- Lefebvre, H. (1991). *The Production of Space*. Oxford, UK: Blackwell Publishing.
- Lefebvre, H. (2004). *Rhythmanalysis: space, time and everyday life*. London and New York: Continuum.
- Leiper, N. (1979). The framework of tourism: Towards a definition of tourism, tourist, and the tourist industry. *Annals of tourism research*, 6(4), 390-407.
- Leiper, N. (2004). *Tourism management* (Vol. 455). Frenchs Forest: Pearson Education Australia.
- Lumsdon, L. (1996). Cycle tourism in Britain. *Insights*, 3, 27-32.
- Manning, R., Lawson, S., Valliere, W., Bacon, J., Laven, D. (2002). Schoodic Peninsula, Acadia National Park Visitor Study 2000–2001. University of Vermont, Parks Studies Laboratory, Burlington, Vermont.
- McCool, S. F., & Christensen, N. A. (1996). Alleviating congestion in parks and recreation areas through direct management of visitor behavior. *Congestion and crowding in the National Park System: Guidelines for management and research*.
- McKenzie, B. (2014). Bicycling and walking to work in the United States: 2008-2012. Washington D.C, p.18, retrieved April 5, 2016 from www.census.gov/prod/2014pubs/acs-25.pdf
- Miller, Z. D. and Freimund, W. (2015). 2014 Going-to-the-Sun Road Corridor Visitor Experience and Support for Management Actions Survey Report. Department of Society and Conservation, University of Montana, Missoula, MT. 154 pages.

- National Park Service. (1999). *Transportation Planning Guidebook*. National Park Service, Park Facility Management, Washington, D.C.
- Nickerson, N.; Jorgenson, J.; Berry, M.; Kwenye, J.; Kozel, D.; and Schultz, J. (2013). Analysis of Touring Cyclists: Impacts, Needs and Opportunities for Montana. *Institute for Tourism and Recreation Research*, 17, 1-136.
- National Highway Traffic Safety Administration. (2014). *Traffic Safety Facts (Crash-Stats)*. U.S. Department of Transportation.
- National Park Service. (2016). Retrieved April 4, 2016, from <https://www.nps.gov/glac/faqs.htm>
- NPS Stats. (2015/16). National Park Service Visitor Use Statistics. IRMA Data System. Stats. Retrieved 4/5/2016 from <https://irma.nps.gov/Stats/Reports/Park>
- O'Connor, J.P., and Brown, T.D. (2010). Riding with the sharks: serious leisure cyclist's perceptions of sharing the road with motorists. *Journal of Science and Medicine in Sport*, 13, 53-58.
- Ohnmacht, T., Makisim, H., & Bergman, M. (2009). *Mobilities and Inequality*. Burlington, VT: Ashgate Publishing Company.
- PBS. (2009). People – National Park Service - Mather. Retrieved 6/7/2016 from <http://www.pbs.org/nationalparks/people/nps/mather/>
- Pesses, M. (2010). Automobility, vélomobility, American mobility: An exploration of the bicycle tour. *Mobilities*, 5(1), pp. 1–24.
- Pucher, J., Komanoff, C., Schimek, P. (1999). Bicycling Renaissance in North America? Recent trends and alternative policies to promote bicycling. *Transportation Research, Part A*, 33, 625–654.

- Pucher, J. and Buehler, R. (2006). Why Canadians cycle more than Americans: a comparative analysis of bicycling trends and policies. *Transport Policy*, 13(3): 265–279.
- Pucher, J., Buehler, R., and Seinen, M. (2011). Bicycling Renaissance in North America? An Update and Re-appraisal of Cycling Trends and Policies. *Transportation Research, Part A*, 45 (1), 451-475.
- Relph, E. (1976). *Place and placelessness* (Vol. 67). London: Pion.
- Rissel C., Campbell F., Ashley B., et al. (2002). Driver road rule knowledge and attitudes towards cyclists. *Australian Journal of Primary Health*, 8(2):66–69.
- Ritchie, B. (1998). Bicycle tourism in the South Island of New Zealand: planning and management issues. *Tourism Management*, 19(6), 567-582.
- Royal, D., and Miller-Steiger, D. (2008). National survey of bicyclist and pedestrian attitudes and behavior. *Transportation Research Board*, Volume 3, 125.
- Sanders, R. L. (2013). *Examining the cycle: How perceived and Actual Bicycling Risk Influence Cycling Frequency, Roadway Design Preferences, and Support for Cycling among Bay area Residents*. University of California Transportation Center, Dissertation eScholarship: <https://escholarship.org/uc/item/6ct7x8hp>
- Sheller, M., and Urry, J. (Eds.). (2004). *Tourism Mobilities: Places to play, places in play*. London, England: Routledge.
- Simonsen, P. & Jorgenson, B. (1996). Cycling tourism: Environmental and economic sustainability? Unpublished report, Bornholm Research Centre, Denmark.

- Spinney, J. (2006). A place of sense: A kinaesthetic ethnography of cyclists on Mont Ventoux
Environment and Planning D: Society and Space, 24, pp. 709–732.
- Thrift, N. (2003). Space: The fundamental stuff of human geography (Ch-5) in Holloway, S.,
Rice, S. and Valentine, G eds. *Key Concepts in Geography*. London: Sage.
- Thrift, N. (2004). Driving in the city, *Theory, Culture, and Society*, 21(4/5), pp. 41–59.
- Tobin, G. (1974). The bicycle boom of the 1890s: the development of private transportation and the
birth of the modern tourist. *Journal of Popular Culture*, 8(Spring), 838–849.
- Tuan, Yi-Fu. (1974). *Topophilia: A Study of Environmental Perceptions, Attitudes, and Values*. (Ch-1). New
York: Columbia University Press
- Urry, J. (2004). The System of Automobility. *Theory, Culture and Society*, 21(4/5) 25 ^ 39
- Urry, J. (2007). *Mobilities*. Cambridge: Polity
- Watson, A. E., Williams, D. R., & Daigle, J. J. (1991). Sources of conflict between hikers and mountain
bike riders in the Rattlesnake NRA. *Journal of Park and Recreation Administration*, 9(3), 59-71.
- Weinberg, A. (2014). An Empirical Test of the Effectiveness of an Indirect Management Tool in
Increasing Optional Shuttle Use at Glacier National Park. Master's Thesis, pg. 7.
- Wellman, J. D., Roggenbuck, J. W., and Smith, A. C. (1982). Recreation specialization and norms of
depreciative behavior among canoeists. *Journal of Leisure Research*, 14.4, 323.
- White, D.D. (2007). An interpretive study of Yosemite National Park visitors' perspectives toward
alternative transportation in Yosemite Valley. *Environmental Management*, 39:50-62.
- Zonneveld, R. T. (1993). Trail bicycling: A study of recreation conflict in national parks. University of
Alberta.

Appendix A

Traveling Along the Going-to-the-Sun Road

Instructions: We are interested in your attitudes about bicycling and interactions that occur between bicyclists and motor vehicles. Please answer the following questions.

- Q1 Have you ridden a bicycle in the past 12 months? Yes No (if no, skip to Q5)
- Q2 I ride a bicycle... Occasionally Frequently Very frequently
- Q3 For what reasons do you bicycle? (Please "X" all that apply.) Commuting/ Transportation Recreation
- Q4 Generally, I bicycle about: 1 time/year 1 time/month 1-2 days/week 3-4 days/week 5-7 days/week

Q5 In my daily life, I believe that:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Bicyclists have just as much right to use the road as motorists.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bicyclists should not be able to ride on main roads during high traffic times.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
When possible, motorists should change lanes while passing bicyclists.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Many motorists do not look out for bicyclists.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bicyclists should be more courteous to motorists on the road.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bicyclists do not ride properly on the road.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Motorists should be educated about sharing the road with bicyclists.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
While driving, it is very frustrating sharing the road with bicyclists.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bicyclists should be restricted to riding on paths or trails that are off-streets.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Motorists should be more courteous to bicyclists on the road.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bicyclists should be educated about sharing the road with motor vehicles.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
The idea of bicycling on busy roads frightens me. (Whether or not you are a cyclist.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please rate your level of agreement with the following statements:

I prefer traveling the GTTSR slowly for a better experience.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bicyclists should be allowed to travel along the GTTSR any time of day.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q6 I have bicycled the Going-to-the-Sun Road... (Think of all trips and please "X" all that apply.)

- N/A - I have not bicycled the Going-to-the-Sun Road. with motor vehicles on the road. without motor vehicles on the road.

Q7 In Montana...

	Yes	No	I don't know
A bicyclist is legally entitled to ride on the roads.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A bicyclist may use an entire lane.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A bicycle is considered a vehicle and has the same rights and responsibilities on the road as a motor vehicle.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q8 On your way to Logan Pass today, were you primarily a... (Please "X" only one.)

- Bicyclist (go to Q9)
 Driver (skip to Q10)
 Auto passenger (skip to Q12)
 Bus passenger (skip to Q12)

Bicyclists Only

Q9 Along the Going-to-the-Sun Road today:

	Never	Very infrequently	Infrequently	Neutral	Frequently	Very frequently	Always
Motor vehicles appropriately passed me on the road.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Motorists honked, yelled, or made a gesture at me in a negative manner.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Motor vehicles passed uncomfortably close to me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Motorists were respectful of my space while I was bicycling. <i>(Now, please proceed to Q12.)</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Drivers Only

Q10 I encountered bicyclists riding along the Going-to-the-Sun Road today. Yes No (if no, skip to Q12)

Q11 Along the Going-to-the-Sun Road today:

	Never	Sometimes	Always	N/A
I encountered bicyclists riding side-by-side in a traffic lane.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
I encountered bicyclists who appeared to be courteous to motorists.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bicyclists used a pullout when the opportunity arose.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
When I passed bicyclists, I gave them at least three feet of space between my vehicle and their bicycle.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q12 Did you receive the following handout at the entrance gate? "Bicyclists and Motorists share Going-to-the-Sun Road"

- Yes
 No
 I don't know

Q12a If yes to Q12, how thoroughly did you read the handout?

- Not at all
 Somewhat
 Thoroughly

Q13 Did you notice the following sign along the Going-to-the-Sun Road? A white, rectangular road sign that said: "Bicycles May Use Full Lane, Pass 3ft Min"

- Yes
 No
 I don't know

Q14 What is your gender? Female Male

Q15 What is your age?

Q16 In what state, Canadian province, or other country do you permanently reside?

Q17 If a Montana resident, in what county do you permanently reside?

Thank You!

Figure 1. Survey Instrument