Understanding Risk Perceptions and Potential Influences of Climate Change on Communities and Outdoor Recreation in Western Maine

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Executive Summary

The nature-based tourism industry has been growing in the state of Maine for years and currently faces new challenges and potential benefits in the face of climate change. This study is aimed to understand how residents and visitors to the Maine Lakes and Mountains Region perceived their risk to climate change and how those perceptions might influence their recreation behavior. According to our online survey results, residents were avid recreators within western Maine, making them important visitors to the region. Recreationists were primarily concerned with the potential increased presence of ticks and mosquitos resulting from climate change. Because of these concerns, visitor education about appropriate tick and mosquito safety behavior will be important to assuage visitor fears.

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1. Introduction

1.1. Background and Relevance

Tourism in the state of Maine has been growing consistently for decades and continues to serve as one of the top economic drivers in the state. In 2017, Maine saw 36.7 billion visitors representing a 2.5% increase since 2016 (Maine Office of Tourism, 2017). The industry also generated over 6 billion dollars to support nearly 106,000 jobs. (Maine Office of Tourism, 2017). An important component of the tourism industry, specifically for Maine, is nature-based tourism. Maine is 90% forested and has nearly 3,500 miles of coastline (Maine Facts, 2018). These unique features make Maine one of the county's most popular destinations for hunting, fishing, kayaking, canoeing, skiing, snowmobiling and hiking. However, since many of these activities are dependent on localized weather conditions, the impending threat of climate change will impact not only visitors' abilities to engage in these activities but also Maine's economy.

The tourism industry is heavily dependent on certain weather conditions, as these influence the locations people travel to, as well as dictate the type of experience they will have (Becken & Hay, 2007; Becken, 2012; Denstadli & Jacobsen, 2014; Denstadli, Jacobsen, & Lohmann, 2011). While localized weather patterns are generally consistent with, and attributable to overall changes in climate, weather is measured over a smaller period and therefore experiences more noticeable short-term fluctuations than climate. Weather is referred to as the conditions of the atmosphere over a short period of time, and climate is how the atmosphere behaves over relatively long periods of time (NASA, 2017). While the condition of the weather at a given location may affect the length of an individual visitor's stay or the activities they participate in, continued climate change and degradation will eventually reduce the attractiveness of destinations and impact economic opportunities for local communities (UNWTO, 2016); however, climate change also brings opportunities, such as longer shoulder seasons, for tourism destinations that could have positive economic impacts.

1.1.1. Climate Change

Maine's heavy dependence on natural resources to support its tourism industry poses challenges and opportunities to its economy as the climate continues to change. Since the end of the 19th century, the average annual temperature in Maine has increased by 3 ºF, with significant fluctuations, and is expected to increase another 3-5 ºF by 2050 (Fernandez et al, 2015). Additionally, changes in the climate will continue to affect the seasonality of various locations in Maine. In general, the summer season is expected to continue to grow (Fernandez et al, 2015) which could benefit nature-based tourism industries such as boating, kayaking, open water fishing and biking. Conversely this will cause a shorter winter season, with a later fall and an earlier spring. In the state, snowfall has declined by 1 in since 1895 and with rising temperatures, the snow season has decreased by two weeks since 1895 (Fernandez et al., 2015). This change could jeopardize industries focused on skiing and snowmobiling that are primarily concentrated in Western Maine. Additionally, warming global temperatures and variable weather conditions can lead to shifts in ecological behavior of many game species including Maine's waterfowl and fishes. These shifts

also could influence practices of hunters and fishermen in Maine, potentially causing changes in season start and end dates as well as available species.

1.1.2. Study Purpose

With climate change continuing to influence Maine's tourism industry and economy and showing no sign of slowing down or ceasing, this study sought to investigate how visitors view and react to this issue. Specifically, the study aimed to investigate how residents of western Maine, who also serve as an important visitor segment to the tourism industry, perceive their risk to climate change and how that might impact their future recreation behavior. Our hope is that this information helps enhance tourism planning in Western Maine that could facilitate improved regional tourism development and adaptation to climate change.

1.2. Description of Study Area

Maine is divided into eight tourism regions, including the Lakes and Mountains Region in western Maine along the New Hampshire border (Figure 1). This region is a four-season destination with over half of tourists visiting the area to engage primarily in outdoor recreation activities (Maine Office of Tourism, 2012). The region is home to Maine's largest ski resorts, Sugarloaf and Sunday River, and includes part of the White Mountain National Forest and the Appalachian Trail. Though a four-season destination, visitation is slightly higher during the winter season (Maine Office of Tourism, 2015).

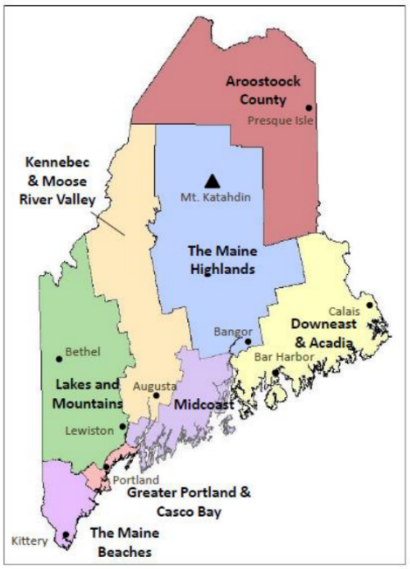

Figure 1. Maine Tourism Regions

2. Methodology

2.1. Study Objectives

The objectives of this study were to answer the following questions: (1) How do nature-based tourism visitors to western Maine perceive their risk to climate change, (2) What factors shape these climate change risk perceptions? and (3) How, if at all, do climate change risk perceptions influence visitor behavioral responses?

2.2. Study Design

We used a quantitative online survey administered to visitors of Western Maine. Survey data were collected from June 2016 to June 2017. Survey questions assessed outdoor recreation behavior, socio-demographics, risk perceptions, and behavioral intention to substitute in reaction to climate change impacts.

2.2.1. Online Questionnaire Design and Implementation

We purchased a random participant sample from InfoUSA of residents in Western Maine. Residents were invited via a mailed letter to complete an online questionnaire. The questionnaire consisted of 3 sections: (1) basic demographic and outdoor recreation behavior information, (2) a randomized video messaging experiment on the effects of climate and (3) climate change beliefs and feelings towards lifestyle changes and the future of Western Maine. The survey received a total of 330 complete and 50 partially completed responses. We use "visitor" and "resident" interchangeably throughout this document.

3. Results

3.1. Online Survey

The survey received 340 complete responses out of the 2000 participants that were randomly selected to participate (a 17% response rate). Respondents provided answers to questions regarding their recreational habits, climate change concerns, and potential lifestyle changes they would consider making as a result.

3.1.1. Demographics

General demographic characteristics from respondents are summarized in Table 1. The majority of respondents were males (59.9%) and the average age of respondents was 55 years. The majority of respondents were well educated with 30.1% possessing a bachelor's and nearly a quarter (22.8%) having earned some type of graduate degree. The lowest observed income category was $25,000 - $34,999 with only 10.4% of respondent's incomes falling within this range. The category that the majority of respondents (19.2%) fell in was $50,000 - $74,999.

Table 1. Demographic characteristics of respondents from Western Maine (N=340)

Demographic Characteristics	N	%	Census Data[1]	ME 2016 Voter Registration[2]
Gender				
Male	187	59.9	49	
Female	123	39.4	51	
Other	1	0.3		
Prefer not to answer	1	0.3		

3.1.2. Recreation History

The most popular recreation destination among survey participants living in western Maine was the Lakes and Mountains Region, with (22.7%) of visitors recreating in this region since July 2016. This is unsurprising given that survey participants were from western Maine. The second and third most popular destinations were the Maine Beaches (18.1%) and Greater Portland & Casco Bay (16.8%) regions, respectively (Figure 2). Of the respondents who visited the Maine Lakes and Mountains Region the three most popular areas of visitation were Auburn (7.9%), Bethel (7.7%), and Rangeley (7.3%) (Figure 3).

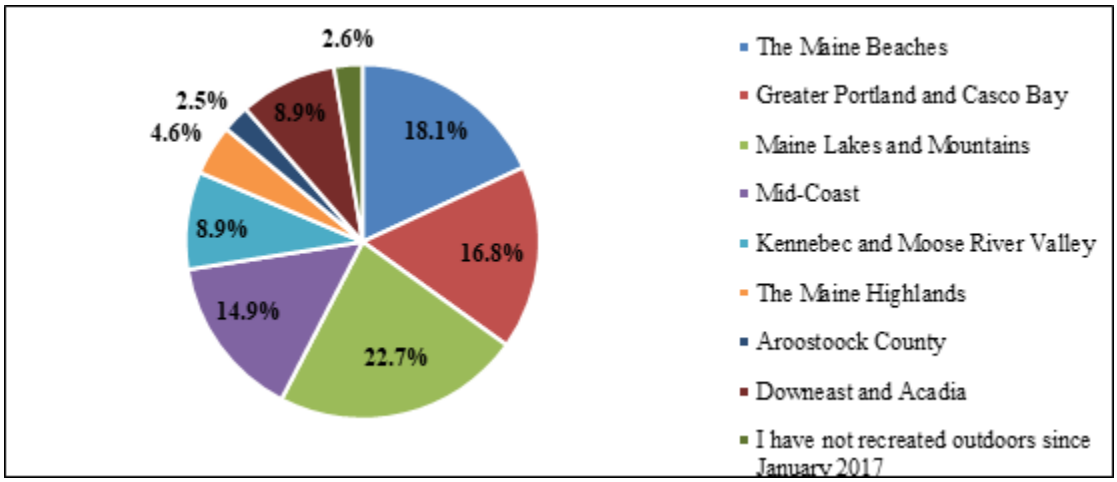

Figure 2. Outdoor recreation destination by Maine region. Data represents respondent's participation in activities after July 2016.

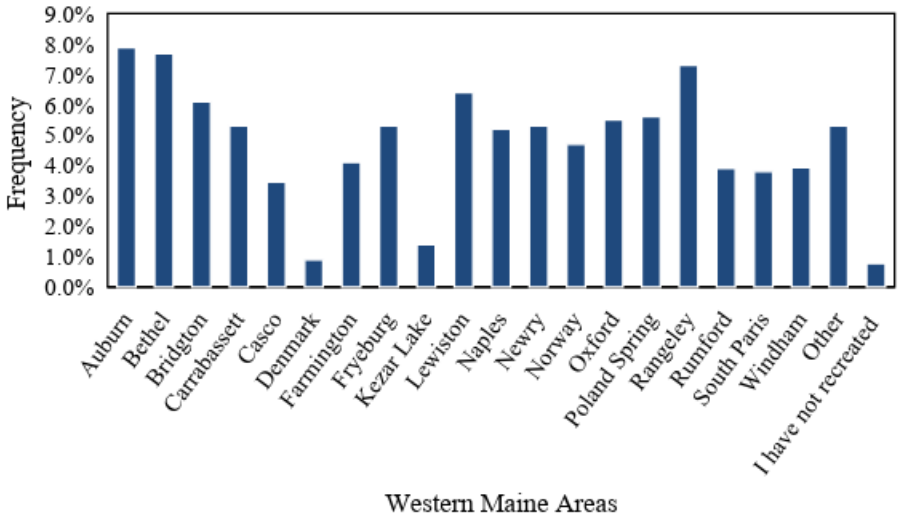

Figure 3. Outdoor recreation destination by area within the western Maine tourism region. Data represents respondent's participation in activities after July 2016.

3.1.3. Recreation Behavior & Habits

Nearly all of respondents (96.7%) said they pursue recreation opportunities in Western Maine at least once a year. In the winter season, 58.6% of respondents said that they are monthly visitors to Western Maine and 56.2% to the state as a whole. Similarly, in the summer season, 72.7% of respondents said that they are monthly visitors to Western Maine and 85.1% to other tourism regions in the state. Recreation is therefore higher in the summer months, though outdoor recreation remains popular throughout the winter season.

3.1.4. Recreation Activities

Respondents were asked to record any leisure activities they participated in within Maine since July 2016. The most popular activity was sightseeing/driving for pleasure (10.7%). The next most popular activity was shopping (10.2%). Other popular activities included: swimming/beach (8.9%), arts or cultural activity (8.1%), backpacking/hiking (7.3%) and picnicking (6%).

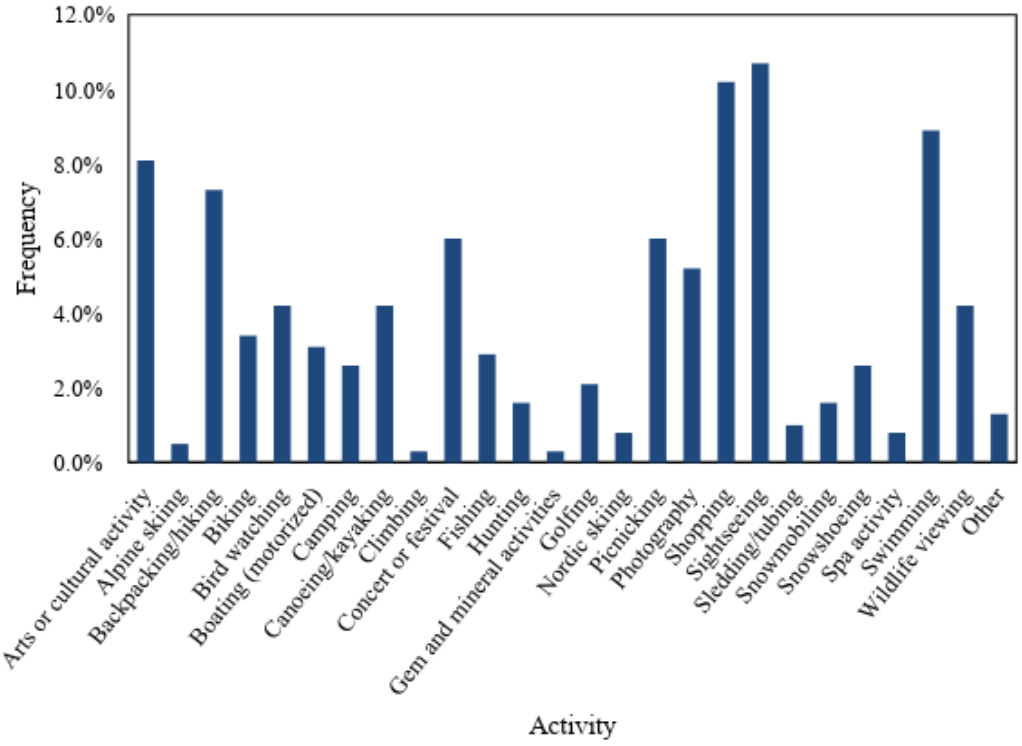

Figure 4. Frequency of recreation activities participated in with the state of Maine. Data represents respondent's participation in activities after July 2016.

3.1.5. Climate Change Beliefs & Risk Perceptions

The majority of respondents (88.5%) said they at least somewhat agree that climate change is happening. Additionally, 81.1% of respondents somewhat agree that human activities are the cause of climate change, but only 57.8% of respondents said that tourism contributes to climate change. Over three-quarters (76.4%) of respondents are concerned that climate change is affecting outdoor recreation opportunities. In Figure 5, we see that many respondents believe that ticks and mosquitoes are increasing, as are extreme weather events and temperatures and ice storms. The majority of respondents (78.2%) said that climate change is a threat to Western Maine. The top three potential threats that could affect Western Maine in the future were: increased tick presence (84.5% viewed as a threat), increased presence of mosquitos (78.8% viewed as a threat) and reduced snow cover (63.4% viewed as threat). The least popular potential threat was lower temperatures (29.2% viewed as a threat).

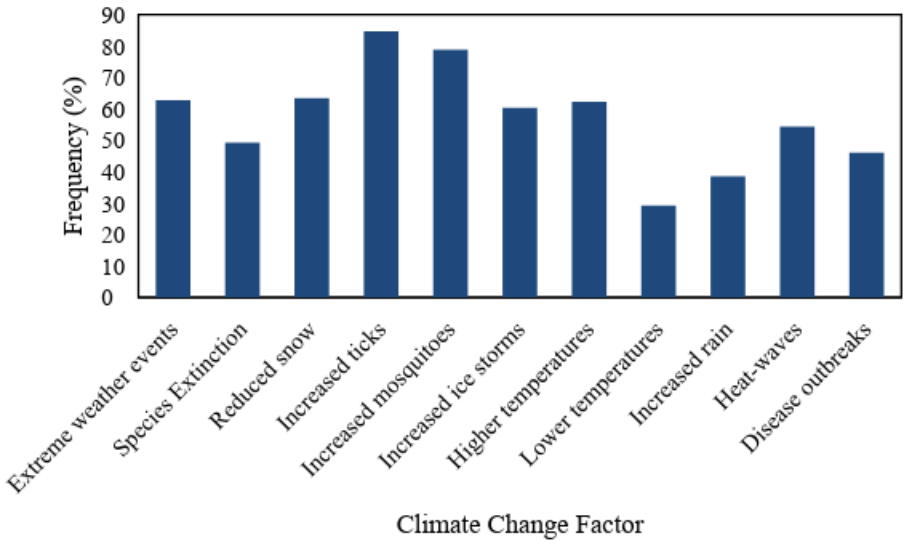

Figure 5. Frequency of respondents who believe that certain climate change factors are "likely" to pose a threat to western Maine in the future.

Table 2. Likelihood of visitors substituting recreation behaviors if weather conditions become poor in western Maine.

	Likely	Neutral	Unlikely
Visit another place in Maine	60%	13%	17%
Visit another place in the Northeast	47%	18%	24%
Visit another place in the US	45%	20%	35%
Visit another place outside the US	24%	16%	58%
Visit western Maine another time of year	59%	23%	18%
Pursue other tourism/recreation activity	55%	26%	19%

3.1.6. Climate Change Behavioral Changes

Respondents described varying degrees of influence that certain climate change related consequences would potentially have on their recreation practices in Western Maine. The three most likely changes that would influence recreation practices in western Maine were: increased presence of ticks (51.6% said likely to alter recreation behavior), increased presence of mosquitoes (46.9% said likely to alter recreation behavior), and increased extreme weather events (45.1% said likely to alter recreation behavior) (Figure 6). The least influential change to affect recreation in Western Maine was species extinction. In the event of poor weather conditions in western Maine, 70.2 % of respondents intend to visit somewhere else in Maine and 52.5% were likely to visit somewhere else in the Northeast (Table 2). Additionally, under the same poor weather conditions 5.95% of respondents were likely to visit western Maine another time of year and 54.7% were likely to pursue other outdoor recreation activities within wastern Maine.

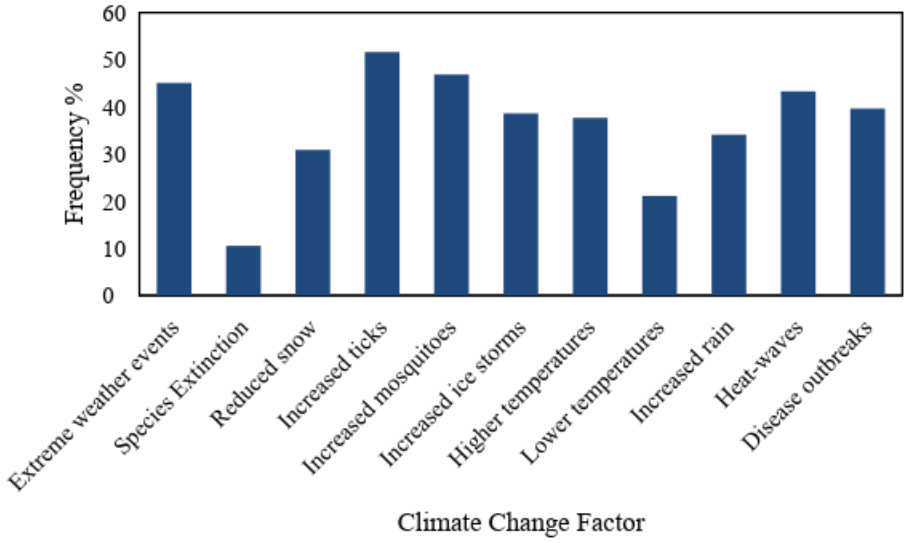

Figure 6. Frequency of respondents who believe that certain climate change factors are "likely" to influence their decision to recreate in Western Maine in the future.

4. Conclusions and Recommendations

When drawing conclusions about the presented data, it is important to consider the several limitations and parameters of this study. Primarily, it should be noted that of the 2000 residents invited to participate in the online survey, only 330 responses were recorded (17% response rate). However, the majority of questions received a high response rate (greater than 75%), especially questions related to the location individuals recreated in as well as their behaviors in the context of climate change.

The most popular recreation destination among respondents was the Maine Lakes and Mountains region (22.7%). Within this region the most popular destination was Auburn and followed by Bethel and Rangeley (Figure 2, 3). Therefore, it is evident that among its residents

the Maine Lakes and Mountains region is a popular recreation location, with certain popular areas receiving an expected high number of recreators. Potentially due to the scenery and the large amount of undeveloped regions of forest, it is no surprise that sightseeing and scenic driving is the most popular recreation activity (Figure 4). This is indicative of the value that respondents place on the untouched forest of the region.

Visitors associate several expected changes and concerns with climate change. The two most concerning and threatening changes that may afflict western Maine are increases in both ticks and mosquitos. Similarly, these two changes were most likely to dissuade visitors from recreating in the region. Therefore, industries and recreation opportunities that can mitigate these potential changes or provide the recreationist with the greatest peace of mind will be most likely to persist. The peace of mind may come simply through providing accurate and easy to understand information regarding these threats and their relation to that specific activity.

In the context of poor weather as a result of a changing climate, respondents were likely to either visit other locations or seek out a new activity. Respondents were more likely to seek out the same recreation opportunities in the state (70.2%) than in the Northeast Region (52.5%). This increased likelihood to choose Maine over the Northeast could depend on a variety of factors such as: knowledge of the area, cost of travel, or the expected quality of the experience. However, it should still be recognized that if western Maine is to experience consistent poor weather conditions, such that the recreation experience of the visitor would be worsened, then more than half of these respondents would leave the state. Also, in the context of poor or unfavorable weather conditions, 54.7% of visitors are likely to seek out a different type of recreation activity within the region. Therefore, activities that are independent of poor weather conditions such as shopping, arts/cultural activities, and spa activities could experience an increase. Another potential method of resistance for certain activities within the industry would be to adapt and make more accessible/enjoyable their offered activity in potential poor conditions.

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