



Mount Desert Island Climate Change Risk Perception Visitor Survey Results

**By
Nathaniel Burke, Undergraduate Student
Lydia Horne, PhD Student
Sandra De Urioste-Stone, PhD**

2019



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Executive Summary

Acadia National Park and nearby attractions in the Mount Desert Island coastal tourism destination depend mainly on its natural features to attract visitors. These natural features, as well as the perceptions visitors have of them, are being impacted/modified by climate change. This study focuses on visitors' perceptions of climate change and potential resulting changes in visitation behaviors. Being able to gauge potential changes to visitor behavior resulting from climate change will be important to successful visitor management.

Visitors participated in an intercept survey which was followed by a longer, more in-depth online survey instrument. Surveying took place at popular locations within Acadia National Park between June 2018 and October 2018. We surveyed a total of 1,353 visitors on-site, and 480 of those completed the follow-up survey responses, with a response rate of 35.48%. These visitors reported on their demographics, travel behavior, and climate change perceptions.

Visitors reported the most popular activities as sightseeing/driving for pleasure, backpacking/hiking, walking, and eating lobster. Each of these activities are dependent on the natural resources and aesthetics of Acadia National Park. Visitors also reported that they were not very knowledgeable about climate change. These visitors also reported the top threats to tourism in Acadia National Park as increased presence of ticks and mosquitoes, heat waves, and disease outbreaks. Because of the dependency of popular activities in Acadia National Park on the natural environment as well as the perceptions of its visitors, taking preventative measures to mitigate problems caused by changing visitor behavior, like education, dissuading fears, and preparing staff, may be vital.

Acknowledgements

Thanks to Acadia National park for allowing us to conduct research within the park as well as the visitors that participated in the study. We thank the undergraduate and graduate students who were involved in data collection for their enthusiasm and professionalism. This work is supported by the University of Maine as well as the National Oceanic and Atmospheric Administration under Grant No. NA17OAR4310249.

About the Authors

Nathaniel Burke is an undergraduate research assistant in the School of Forest Resources at the University of Maine. He is currently working on a dual B.S. in Parks Recreation and Tourism as well as Ecology and Environmental Science.

Lydia Horne is a graduate student in Ecology and Environmental Sciences at the University of Maine. She is currently pursuing her PhD examining human dimensions of climate change in Maine's tourism industry.

Sandra De Urioste-Stone PhD is an assistant professor of nature-based tourism in the School of Forest Resources at the University of Maine. She earned a BA in ecotourism, a MS in resource recreation and tourism, and a PhD in natural resources with a focus on conservation social sciences.

Acronyms

ANP – Acadia National Park

MDI – Mount Desert Island

UMaine – University of Maine

1. Introduction

1.1. Background and Relevance

A destination's resilience relies on its ability to reorganize and respond to change. However, misconceptions of risk can undermine a destination's capacity to adapt as well as its overall resilience. The reliance on natural assets to attract tourists to coastal areas in Maine makes the tourism industry, and the economies of coastal communities, sensitive to changes in climate and weather conditions. Hence, improved understanding of how climate change will impact the coastal/marine tourism assets in the region, how these changes will impact the consumer base, and how to effectively develop adaptation strategies, becomes crucial to the resilience of these natural-resource dependent coastal tourism destinations.

1.1.1. Climate Change

Since 1895 Maine's average temperature has risen 3°F, seasons have shifted and changed in length, tick abundance and Lyme disease have increased, weather has become more unpredictable, and precipitation has increased (Fernandez et al., 2015). This report names just a few of the changes Maine is experiencing that are predicted to intensify in the future with Maine's Climate Future anticipating further temperature increases up to 3-5°F (Fernandez et al., 2015). When viewed from a tourism industry perspective, these issues present challenges as well as opportunities for future development and have implications to the overall resilience of the tourism destination. Maine's economy depends on its tourism industry, which attracts visitors primarily due to its natural resources, which might make the industry particularly susceptible to the results of a changing climate. With the potential for shortening winter seasons, more rainy days, invasive species, as well as threatened charismatic species like puffins, perceptions of climate change effects on Maine and destination attractiveness to visitors may influence visitation patterns and concerns.

1.1.2. Study Purpose

This study aims to measure visitor climate change risk perceptions and estimate resulting potential behavioral responses (e.g., destination, activity participation, seasonal visitation patterns) to the risk of climate change in coastal destinations, like Mount Desert Island, Maine.

1.2. Description of Study Area

Mount Desert Island (MDI) is the largest island off the coast of Maine with a year-round population of approximately 10,000 (United States Census Bureau, 2010). Acadia National Park is the main attraction on the island, attracting over 3 million visitors annually (National Park Service, 2012). Key attractions in Acadia National Park include scenic coastal and mountain views, nature-based recreational activities such as hiking, biking, boating, swimming, climbing, camping, and many cultural and historical attractions, such as the carriage roads, Park Loop Road, and Jordan Pond House. Peak visitation occurs between May and October, with July and August having the largest number of visitors. MDI is the most visited nature-based tourist attraction in Maine. Though Acadia National Park is one of the National Park Service's smallest parks, it is ranked among the top 10 in visitor numbers. Due to the seasonal influx of tourists, MDI becomes very busy between May and October but remains relatively quiet during the winter months. The communities on the island are very seasonal, with many tourism business owners relying on other sources of income during these off-season months, including working in other tourism destinations in the US and abroad.

2. Methodology

2.1. Study Objectives

The objective of this study was to evaluate what factors determine tourist climate change risk perceptions and predict potential behavioral shifts related to destination selection, seasonal shifts in visitation, and the activities in which tourists participate.

2.2. Study Design

We used a mixed-mode survey design to increase the level of visitor participation. We surveyed visitors to Acadia National Park from June 2018 to October 2018. Short on-site surveys were given orally. We approached randomly selected visitor groups at the specified interval and asked them to complete the questionnaire. Once a visitor completed the preliminary survey instrument, we gave them a postcard which included a link to a more comprehensive self-administered online survey instrument. Participants were incentivized with an opportunity to enter a gift card drawing upon completion of the online survey instrument. We also asked participants to provide their email address, which was used to send up to two reminders to take the online survey instrument. Participants could also provide a mailing address if they did not have access to a computer.

2.2.1. Sampling

We used a two stage-cluster probability sampling design to (1) randomly select sampling locations, dates prior to the visit, and (2) visitor groups once on site. We surveyed at popular locations within Acadia National Park including Sand Beach, Hulls Cove Visitor Center, Cadillac Mountain, the shoreline path, Jordan Pond House, Echo Lake, Sieur de Monts, and Wonderland. We chose these locations because of their high visitation rates. Between June 2018 and October 2018, we surveyed for 18 days with a total of 1,353 intercept survey responses and 480 follow-up survey responses, with a response rate of 35.5%. Once on site, the researchers chose an interval to select visitor groups at random to participate in the survey. Depending on the concentration of visitors on given days, an interval typically from 1-3 was chosen at which point researchers approached each group that walked by at said interval and asked if they would like to participate in the survey. One person from each group, whoever had the nearest birthday, was to participate in the study.

2.2.2. Questionnaire Design and Implementation

2.2.2.1. Intercept (instrument, interview process, response rate)

The intercept questionnaire included travel behavior and two climate change related questions. We conducted intercept surveys orally and recorded responses on an iPad using the Qualtrics offline application. The survey typically took under five minutes. After completion, we thanked the visitors and gave them a postcard with a link to the online follow-up survey instrument.

2.2.2.2. Online Survey (instrument, time, follow-up, response rate)

We asked survey participants to take a self-administered online questionnaire via the link supplied on the postcards. If a participant had limited access to the internet, they could instead opt to provide a mailing address and receive a physical copy of the survey instrument. The questionnaire consisted of close-ended questions using modified items from van der Linden's socio-psychological model that measures socio-demographics, cognitive factors, experiential processes, and socio-cultural factors (van der Linden, 2015) to assess climate change risk perceptions among tourists

3. Results

3.1 Intercept Survey

We surveyed 1,315 respondents in Acadia National Park during the summer of 2018. Those who participated in the survey were asked about their demographics, for some basic information about their trip, and how concerned they were about climate change.

3.1.1 Demographics

The demographics of the survey participants are shown in Table 1. Slightly more females were surveyed than males (51.5%). The majority of visitors are between the ages of 46-55 years old. The majority of participants were from out of state (93.8%). The top ten most common places these visitors were travelling from included New York, Pennsylvania, Ohio, Florida, Virginia, New Jersey, Maryland, Michigan, Connecticut, and Massachusetts.

Table 1. General demographics of visitors surveyed on site (intercept survey).

Demographic Characteristics	#	%
Gender		
Male	634	48.5
Female	673	51.5
Age in Years		
Age category	46-55	
Residency		
Maine Resident	82	6.2
Out of State Resident	1233	93.8

3.1.2 Travel Profile

Table 2 shows generic trip characteristics of visitors surveyed in Acadia National Park. Travel parties were primarily made up of families (77.6%) who were more likely to have visited Maine in the past (53.9%). The mean group size was 3.5, and visitors were most often traveling in groups of two. Visitors on average planned to stay a mean of 5.25 days with the most popular length of stay being a week, closely followed by three or four days.

Table 2. Trip characteristics of visitors surveyed on site (intercept survey).

Trip Characteristics	#	%
Party composition		
Self	47	3.6

Family	1019	77.6
Friends	121	9.2
Family and Friends	43	3.3
Co-Workers	8	0.6
Other	75	5.7
<i># of Travelers</i>		
1	47	3.6
2	655	49.8
3-5	452	34.4
6+	160	12.2
Mean	3.54	
<i>First Time in Maine</i>		
Yes	566	46.1
No	662	53.9
<i>First Time in Acadia National Park of <u>those</u> who had previously visited Maine</i>		
Yes	245	37.1
No	417	62.9
<i>Expected Length of Trip</i>		
Day Trip	48	3.6
1	31	2.5
2	123	9.5
3	210	16
4	205	15.5
5	170	12.9
6	120	9.1
7	215	16.3
Over a week	193	14.6
Mean	5.25	

3.1.3 General Climate Change Concern

Almost half of visitors were very concerned about climate change (49.7%), while only 9.6% of visitors were unconcerned or not concerned at all (Figure 1). Over 75% of visitors to Acadia National Park expressed some level of climate change concern.

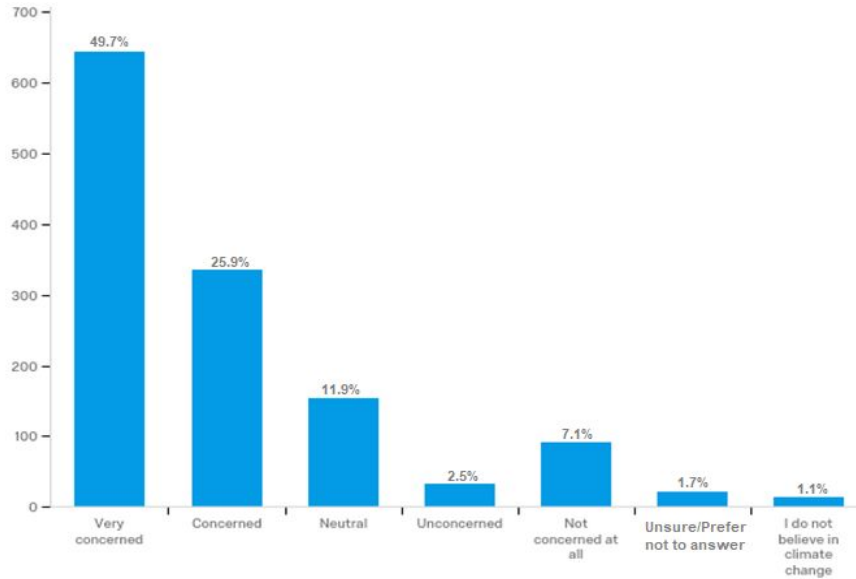


Figure 1. Visitor concern about climate change (in general).

3.1.4 Primary Recreational Activities

In Figure 2, visitors were asked to identify their primary leisure activity for their current trip. These activities, in order of popularity, were sightseeing/driving for pleasure, backpacking/hiking, walking, biking, eating lobster, swimming/beach activities, photography, and camping. Other activities included that were less popular included canoeing/kayaking, wildlife viewing, shopping, birdwatching, and fishing, as well as write-ins like reading and motorcycling.

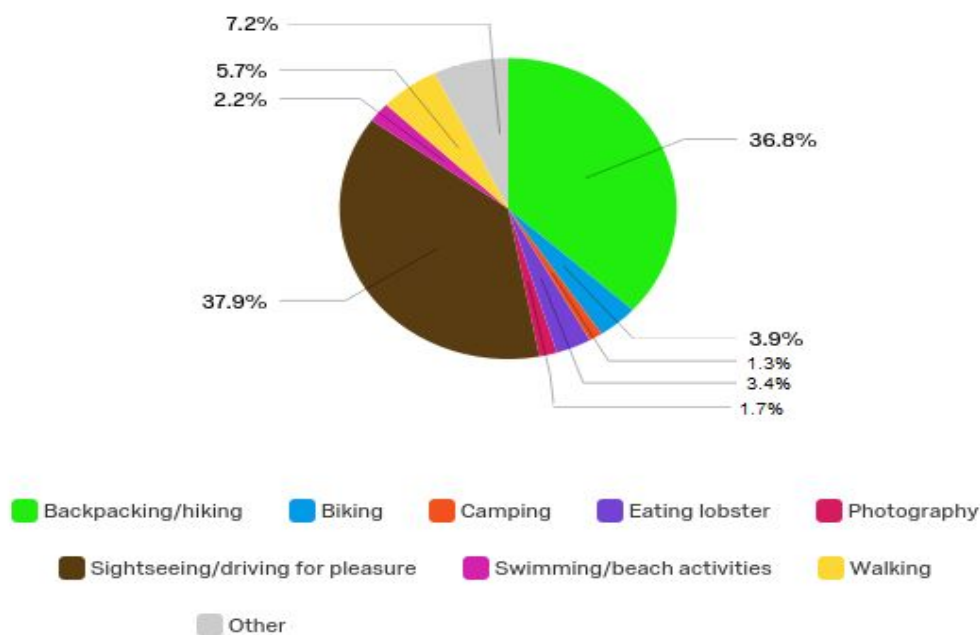


Figure 2. Visitors' primary leisure activity in Acadia National Park.

3.2 Online Survey

Out of the 1,315 Acadia National Park visitors surveyed in the front-end survey, 480 participants completed the online survey. Completion of each individual question on the online survey was not made mandatory so the number of responses in specific figures is often less than 480. Participants were asked to answer further demographic questions as well as questions pertaining to the importance of climate in their travels and travelling decisions, their recreation activities, and their climate change beliefs and behaviors.

3.2.1 Climate Change Perceptions

Participants were asked to identify how much friends, family, and peers cared about climate change. Shown in Figure 3, the majority of participants felt that their friends, family, and

peers were concerned about climate change. It is possible that this high level of concern among trusted individuals influenced personal levels of climate change concern, which were also high (see Figure 1).

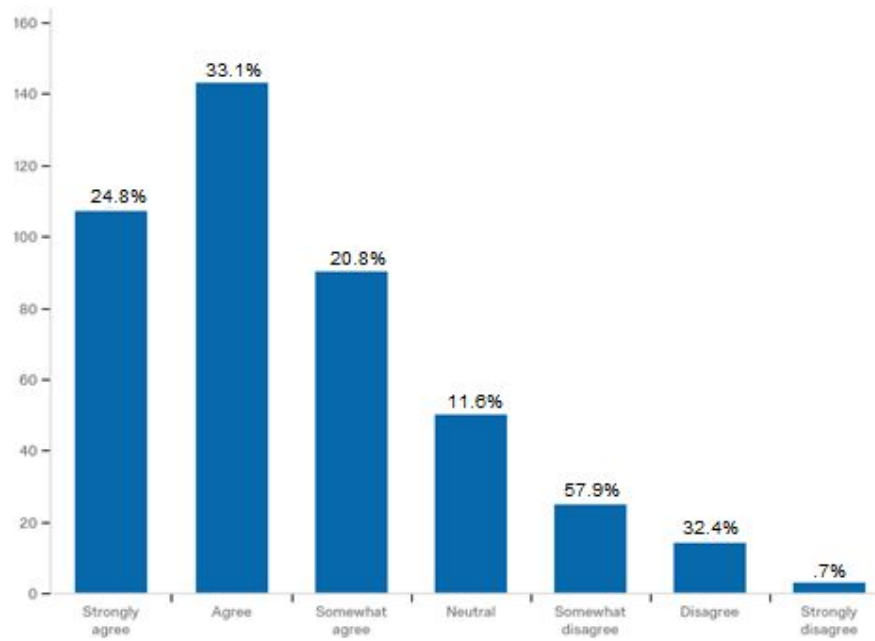


Figure 3. Perceived concern about climate change in peer group.

Figure 4 shows how strongly visitors agree or disagree with several statements about climate change. Responses to many of these statements were spread out; however, there was consensus (90% agreed) on three statements: (1) climate change is currently happening, (2) carbon dioxide emissions contribute to climate change, and (3) humans contribute to climate change. We included several statements to test perceived climate change knowledge as well, such as “The hole in the ozone layer contributes to climate change” and “Climate change is caused by heat trapped in cities.” As you can see, over 50% of visitors agreed with those two statements indicating that perceived knowledge and actual knowledge do not always match up and pointing to the need for further climate change education. It is important to note that the majority of visitors (93.6%) acknowledge that climate change is at least partially caused by human behaviors, though fewer recognize the link between tourism and climate change (58%).

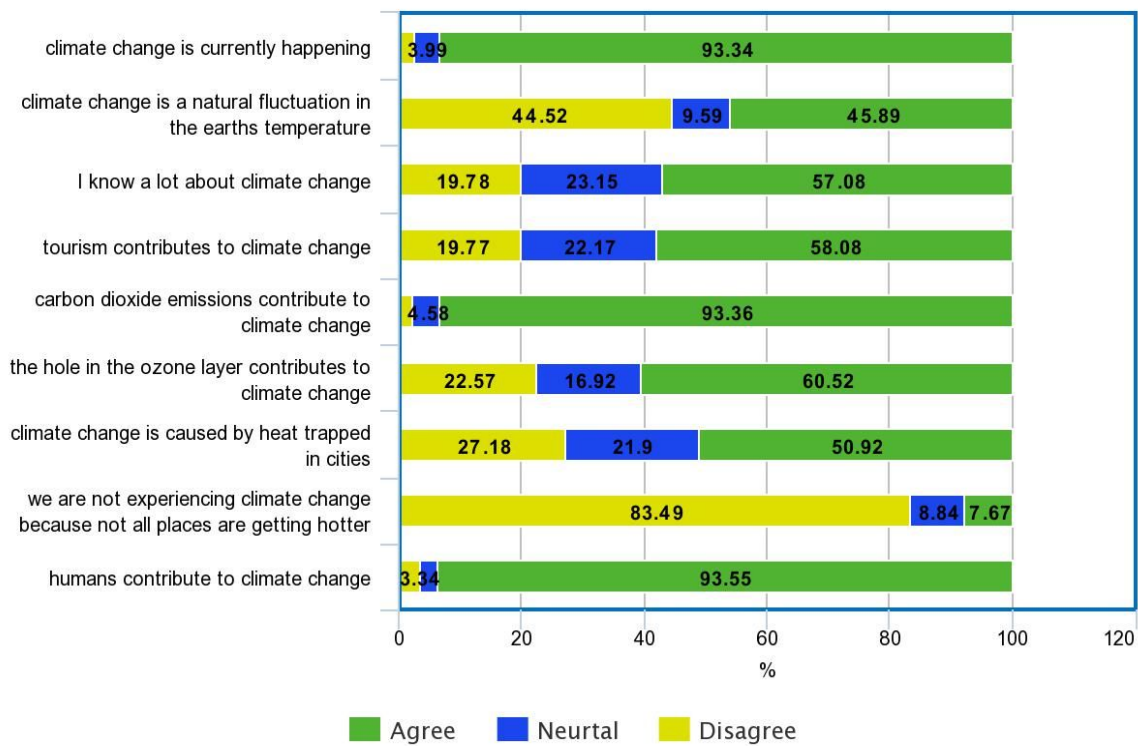


Figure 4. Visitor perceived and actual knowledge about climate change.

3.2.2 Recreational Activities

Figure 5 represents each activity in which visitors participated, and the ten most popular answers (in order) included walking, sightseeing/driving for pleasure, backpacking/hiking, eating lobster, photography, wildlife viewing, shopping, swimming/beach activities, bird watching, and picnicking. This further illustrates the importance of nature-based attractions and activities to the visitors to this coastal tourism destination.

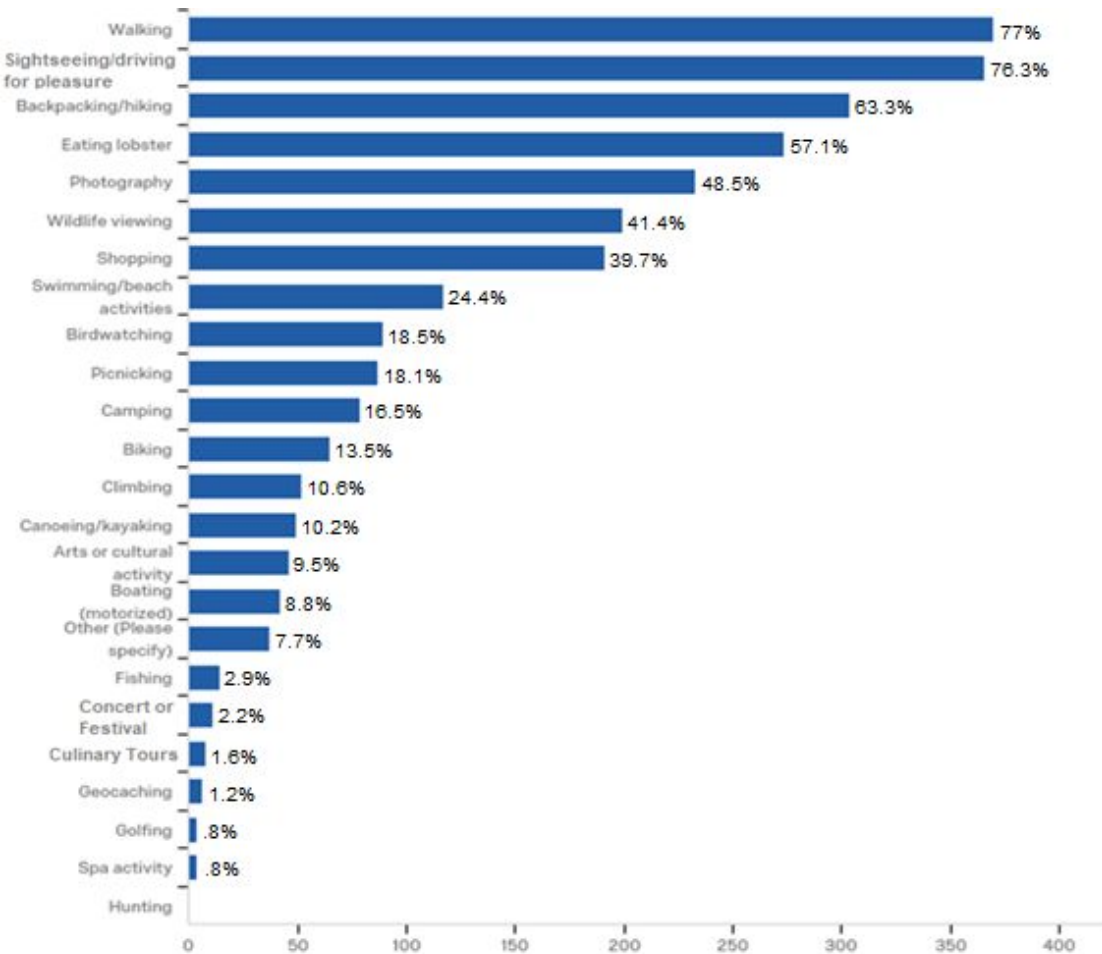


Figure 5. Visitor activity participation (multiple answers could be checked).

Figure 6 represents visitors' primary activity, which was most likely to be backpacking/hiking (35.5%) or driving/sightseeing for pleasure (30.8%). Despite being the most participated in activity, walking was the third most selected as a primary activity (13.9%).

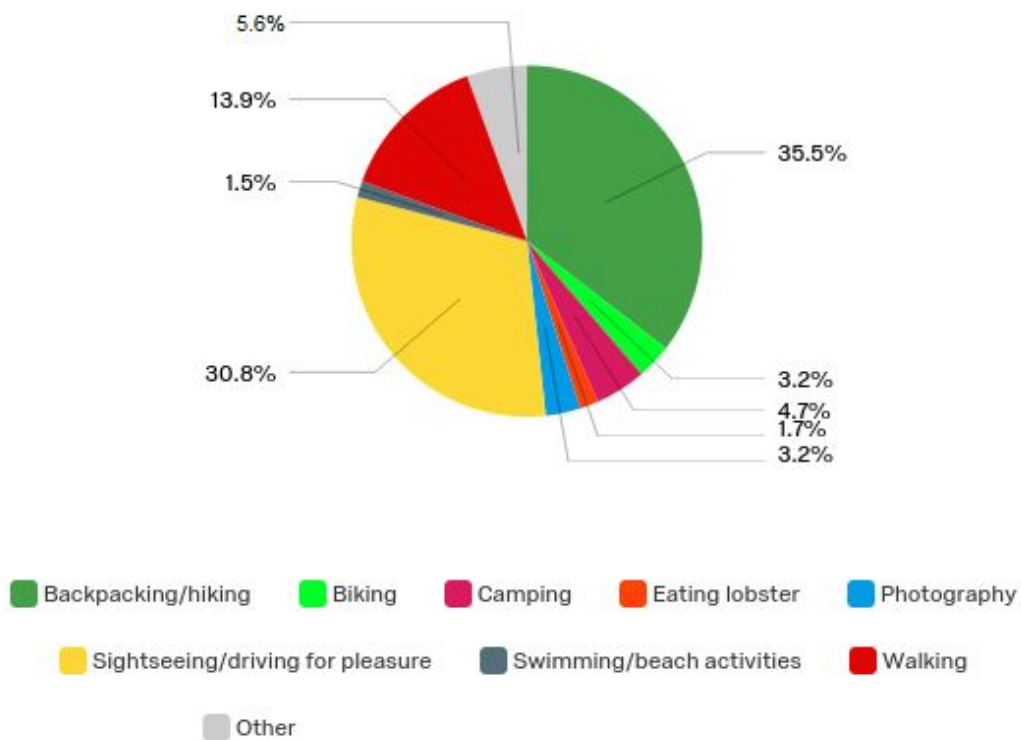


Figure 6. Primary activity participation (only one answer could be checked).

Note: options with less than 1% response were included under other

3.2.3 Climate Change Behavior and Intended Travel Behavior

Figure 7 shows how likely participants believe different climate change impacts are to affect Acadia National Park. Visitors believed that the most likely impacts to Acadia National Park in the next ten years are increased ticks and mosquitoes, increased heat waves and extreme weather events, a longer summer season, and increased visitation to Acadia National Park. Hence, not all of the impacts would necessarily result in reduced visitor numbers or negative consequences to the destination.

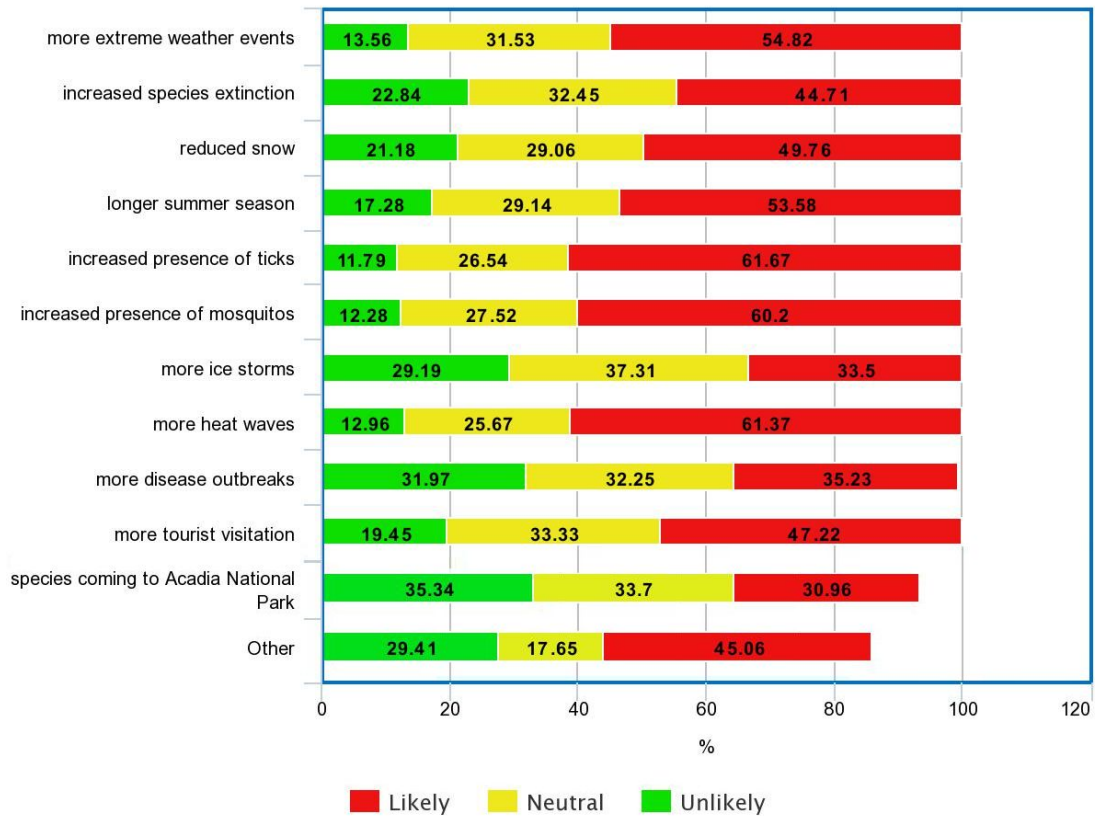


Figure 7. How likely are the following impacts of climate change to affect Acadia National Park in the next 10 years?

When asked which factors posed a threat to tourism in Acadia National Park, visitors responded that the increased presence of ticks was the highest threat, followed closely by an increased presence in mosquitoes (Figure 8). Higher temperatures and increased number of heat waves were also seen as high threat events. Lower temperatures and increase ice storms were among the lowest perceived threats to tourism, likely because of the limited visitation to MDI during winter months.

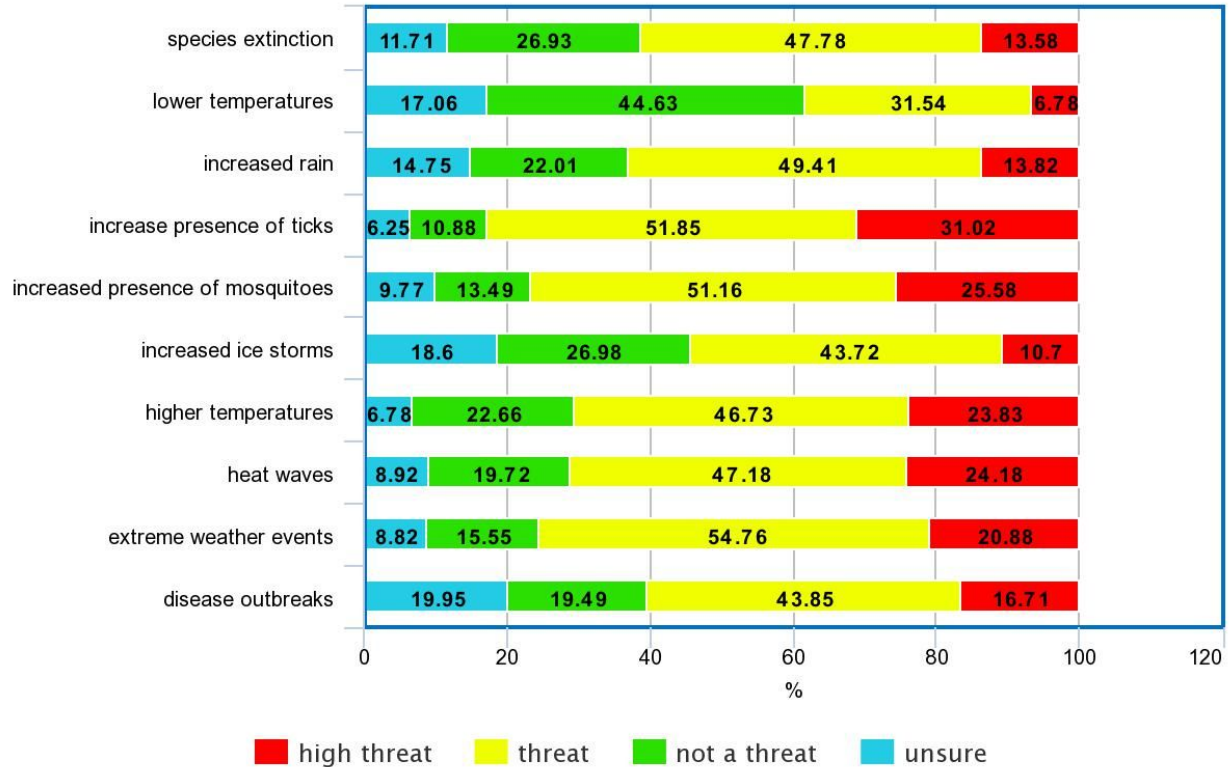


Figure 8. Potential threat of climate change impacts to tourism in Acadia National Park.

Figure 9 shows the likelihood of participants changing their travel behaviors due to different climate change related factors. Participants were most likely to decrease their recreation in response to disease outbreaks and increased mosquitoes. Following those, increased ticks, increased rain, and extreme weather events were likely to influence outdoor recreation decisions. Interestingly, many participants indicated that they would not change their outdoor recreation behavior if these changes were to occur.

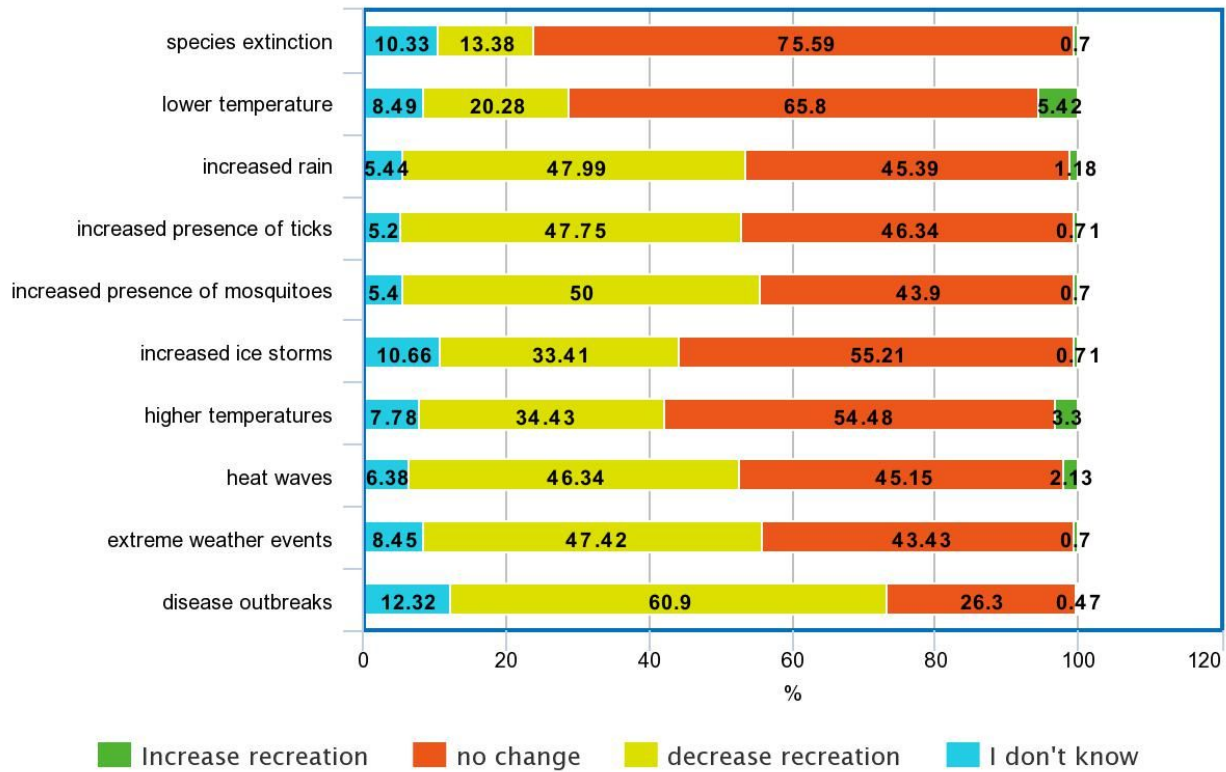


Figure 9. How likely are the following factors to influence your decision to recreate outdoors in Acadia National Park?

Figure 10 asks which substitution behaviors participants are most likely to adopt in the event of unfavorable outdoor recreation conditions. The two actions participants were most likely to take were visiting Acadia National Park during another time of year or visiting another location in the U.S. The rest of the alternative actions in order of popularity are pursuing other recreational activities, visiting another place in the northeast, visiting another place outside of the U.S., and visiting another place in Maine.

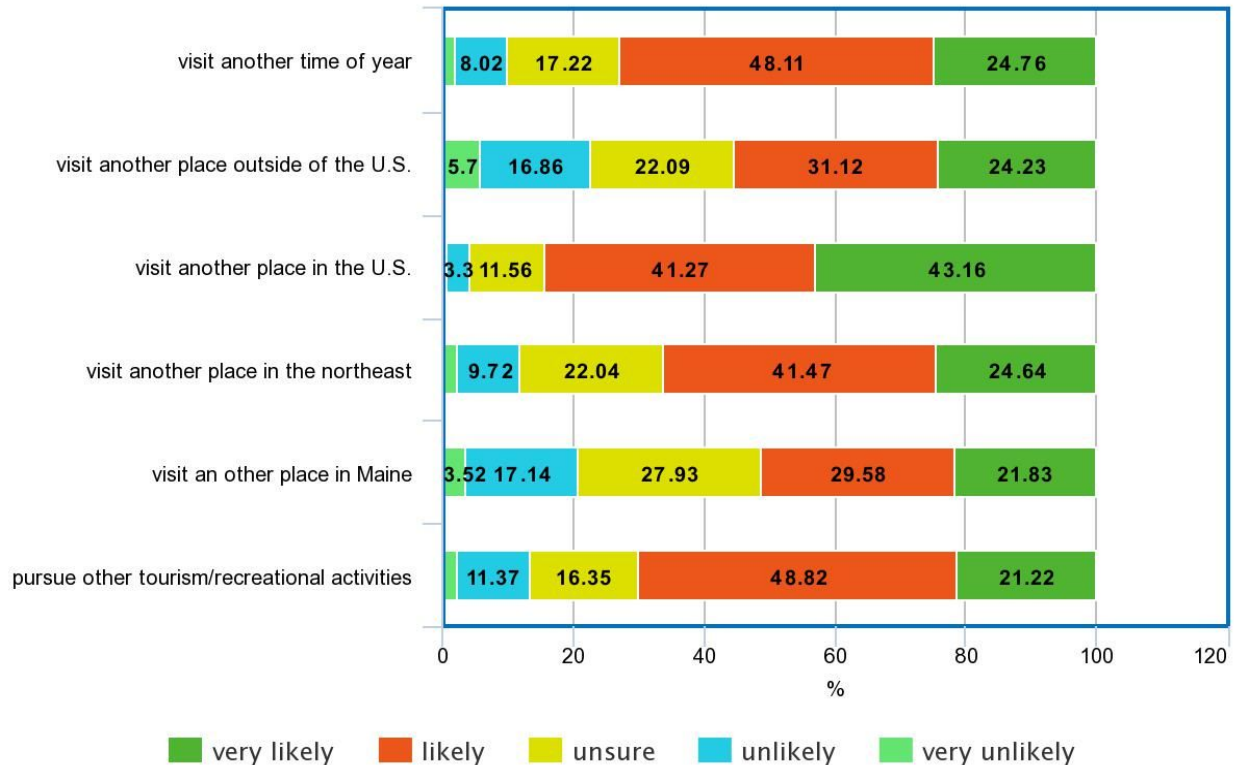


Figure 10. Visitor intended substitution behavior if outdoor recreation activities were no longer suitable in Acadia National Park.

3.2.4 Visitor Demographics

Table 3 shows the demographics of visitors who completed the online survey instrument. These visitors were primarily women (59.4%) with a mean age of 51.9. Almost eighty-one percent of those who completed the questionnaire had a four-year degree or higher. Most visitors were U.S. residents (92.8%) and just over half of participants (51.8%) considered themselves politically liberal.

Table 3. Trip Characteristics of Surveyed Visitors
 N ≤ 480 (Questions did not require an answer)

Demographic Characteristics	#	%
<i>Gender</i>		
Male	173	40.3
Female	255	59.4
<i>Age</i>		
18-29	43	10.2
30's	50	11.9
40's	86	20.5
50's	84	20.3
60's	111	26.5
70+	45	10.6
Mean	51.9	
<i>Education</i>		
Less than High School	3	0.7
High School Graduate	13	3
Some College	41	9.6
2 Year Degree	25	5.9
4 Year Degree	128	30.1
Master's	150	35.2
Doctorate	40	9.4
Professional Degree	22	5.2
Vocational Degree	4	0.9
<i>Annual Household Income</i>		
\$0-\$25,000	4	1
\$25,001-\$50,000	38	9.4
\$50,001-\$75,000	52	12.9
\$75,001-\$100,000	62	15.4
\$100,000-\$125,000	72	17.9
\$125,001-\$150,000	52	12.9
\$150,001-\$175,000	37	9.2
\$175,001-\$200,000	22	5.5
\$200,001 +	64	15.8
<i>U.S. Residency</i>		
Resident	397	92.8
Non-resident	31	7.2

Table 3 Continued
 N ≤ 480 (Questions did not require an answer)

Demographic Characteristics	#	%
<i>Political Leaning</i>		
Very Conservative	10	2.4
Conservative	94	22.2
Neutral	100	23.6
Liberal	150	35.5
Very Liberal	69	16.3

4. Conclusions and Recommendations

We surveyed more women than men, and the mean participant age was older (51.9). The majority of visitors were not Maine residents. Just over 50% of our participants self-identified as politically liberal, which could explain the high levels of belief and concern about climate change. The most popular primary leisure activities were backpacking/hiking and sightseeing/driving for pleasure, followed by walking. Visitors reported a mean trip length of 5.25 days in groups with a mean size of 3.54. These most popular activities, such as hiking, walking, and sightseeing, are some of the most likely to be impacted by climate change. Protecting these activities by doing things such as reinforcing roads, protecting low-elevation points on the island against possible sea level rise, and educating visitors about unpredictable weather, such as hotter or colder than expected temperatures, will be important for maintaining the most attractive activities in the park.

The intercept survey focused mainly on demographics and visitor trip characteristics; however, it did ask participants to identify how concerned they were in general about climate change. Over 75% of participants reported they were either concerned or very concerned about climate change. In the online survey, participants were asked more in-depth questions about their climate change concerns. While nearly 95% at least agreed that climate change was happening and 94% at least agreed humans contribute to climate change, only 27% could strongly or somewhat agree they knew a lot about climate change. The high percentage of visitors who are not confident in their climate change knowledge represent an educational opportunity for Acadia National Park. These opportunities could include expansion on the Sieur de Monts climate change exhibit, more information in the other information centers, or even new exhibits and interpretative signage.

Participants reported increased presence of ticks, increased presence of mosquitoes, and extreme weather events as the highest potential threats to Acadia National Park. Of these threats, visitors reported that they would be most likely to decrease recreation if disease outbreaks, extreme weather events, and increased presence of mosquitoes occurred in Acadia National Park. With worries over spreading disease, as well as increased disease spreading vectors such as

mosquitoes and ticks, increasing visitor education for preventative measures as well as quelling unnecessary worries would likely benefit efforts to manage visitor behavioral changes resulting from climate change.

If outdoor recreation conditions were no longer suitable in Acadia National Park, the most likely course of action visitors considered taking was to visit another place in the U.S. The next two most likely courses of action include visiting Acadia National Park during another time of year followed by pursuing other tourism/recreational activities. The other options included visiting another place in Maine, visiting another place in the northeast, and visiting another place outside the U.S. and still received at least 50% of participants responding with either very likely or likely to take that action. This information suggests that a changing climate is most likely to lead to changes in peak visitation times, demand for different types of recreation, and increased concern over disease outbreaks and about mosquitoes and ticks, especially among those concerned with climate change. Important actions to reduce the negative effects while taking advantage of emerging opportunities from changing visitation patterns might include working with local business owners, as well as park staff, to manage resources in order to meet changing expectations and needs.

In the future, this research could be enhanced by surveying visitors during shoulder seasons (winter and spring); this strategy would capture more Maine residents, and it is expected that perceptions and travel behavioral intent might be different. However, we recognize the difficulty of conducting intercept surveys in the area during shoulder seasons.

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