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# Assessing Outdoor Recreation Visitor Behaviors and Decision-Making on the White Mountain National Forest: Final Report

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# **Assessing Outdoor Recreation Visitor Behaviors and Decision-Making on the White Mountain National Forest: Final Report**

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## Executive Summary

The overarching goal of the study was to assess White Mountain National Forest (WMNF) outdoor recreation visitors' perceptions, preferences, behaviors, and decision-making. A modified drop-off/pick-up survey method (referred to as a *knock-and-drop* technique in this report) was utilized to collect mail-back and online surveys from WMNF visitors around the New England region. For a guiding framework, this study utilized a systematic sampling plan and a mixed-methods survey methodology, which resulted in 642 completed surveys and a 21.4% response rate. Readers are encouraged to review these findings as reflective of WMNF visitors, and *not* representative of *all* northeastern National Forest visitors. Study results and analyses are further detailed throughout the various sections of this report.

### Key observations and findings:

- The majority of WMNF visitors in the sample noted being middle-aged white males from the local area or the state of New Hampshire who were politically moderate and reported earning high levels of both household income and education (Section 2-1).
- The sample largely consisted of highly experienced and repeat recreation users who participated in a multitude of recreation activities such as *hiking*, *skiing*, and *sightseeing* (Sections 2-1 and 2-2).
- The sample indicated very high levels of satisfaction with their overall WMNF recreation experiences (Section 2-3).
- Perceptions of various undesirable condition impacts encountered on the WMNF varied greatly amongst visitors (Section 2-4).
  - *Parking and/or traffic* was noted to be the most impactful undesirable condition upon visitor experiences, followed closely by *crowding*, *too many other visitors*, *increased tick populations*, and *litter, garbage, and/or vandalism*.
- The majority of respondents utilized some form of behavioral adaptations or substitution behaviors during their visits to the WMNF (Sections 2-5 and 2-6).
  - The most commonly employed substitution behaviors were *resource substitution* (e.g., changing the location in which a visitor recreates *within* the WMNF) and *temporal substitution* (e.g., changing the time in which a visitor recreates).
  - The least commonly employed substitution behaviors were *activity substitution* (e.g., changing the activity in which a visitor recreates) and *displacement* (e.g., a visitor never returning to the WMNF).
  - Approximately 9% of visitors indicated they have been permanently displaced from the WMNF. It should be noted this finding is in line with similar research.
- Visitors have mixed agreement with WMNF designations for site use-level stratification based on the number of people per day encountered (PPD) (Section 2-7).
  - The majority of the sample indicated a preference for *low use site types* (e.g., 2-4 PPD), followed closely by *moderate use site types* (e.g., 12-15 PPD).
  - Approximately 18% of visitors utilize behavioral adaptations and noted they engage in use dispersion, where visitation moves from high-use to low-use areas.

- Respondents indicated varying levels of support for management actions (Section 2-8).
  - *Enforcing regulations against overflow parking* had the highest support, followed closely by *expand public shuttle transportation services at the WMNF*, and *place limitations on the number of people allowed to use the WMNF*.
  - *Implement a permit system via a lottery at the WMNF* had the lowest support.
- Respondents noted strong place attachment with the WMNF and surrounding area (Section 2-9).
  - Respectively, *the WMNF means a lot to me* and *I feel very attached to the WMNF* were the two most highly rated items.
- Overall, WMNF visitors stated they were most motivated by *being close to nature* and *experiencing solitude*, and least motivated by *meeting new people in the area* (Section 2-9).
- Structural equation modeling results indicate visitors are *able* to effectively cope/deal/behaviorally adapt to certain undesirable conditions (e.g., parking and traffic) and *unable* to effectively cope/deal/behaviorally adapt to other various undesirable conditions (e.g., conflict) (Section 3-1).
  - Visitors are effectively *able* to cope/deal/behaviorally adapt with various situational impacts (e.g., parking and traffic) and ecological impacts (e.g., ticks, snowpack).
  - Visitors are only *partially able* to cope/deal/behaviorally adapt with crowding related impacts; with crowding impacts leading indirectly to moderate decreases in overall visitor satisfaction.
  - However, visitors are *unable* to cope/deal/behaviorally adapt with conflict related impacts at all; with conflict related impacts leading directly to significant decreases in overall visitor satisfaction.
  - In other words, WMNF visitors are fully capable of handling situational and ecological impacts, less capable of managing crowding related impacts, and incapable of managing conflict related impacts.
  - These findings suggest visitor conflict, followed closely by crowding, should be a top priority for WMNF resource managers.
- Binary logistic regression models were used to assess the relationship between the current reported mean levels of crowding, situational, and ecological impacts on the WMNF and visitor engagement in various coping/substitution behaviors (Section 3-2).
  - At the current levels of crowding, situational, and ecological impacts on the WMNF:
    - There is a 95% likelihood of visitor engagement in *resource substitution*.
    - There is a 96% likelihood of visitor engagement in *temporal substitution*.
    - There is a 60% likelihood of visitor engagement in *activity substitution*.
    - There is a 13% likelihood of visitor engagement in *displacement*.
  - These findings suggest the pervasive application of both resource and temporal substitution behaviors is likely to impact the visitors, ecosystems, and communities surrounding the WMNF.

## Section 1-0. Introduction

### Section 1-1. Study Background and Objectives

Outdoor recreation has become an increasingly popular leisure activity in the United States with more than 153 million Americans participating annually<sup>1</sup>. Between 2008 and 2019, this number grew by more than 16 million<sup>1</sup>. This trend has been especially pronounced at the White Mountain National Forest (WMNF) of New Hampshire. Between 2005 and 2015, visitation to the WMNF has more than doubled, from 1.5 million annual visitors to 3.4 million annual visitors<sup>2,3</sup>. As more and more visitors recreate in the same finite number of parks and protected areas, resource managers are growing concerned about the impacts upon natural resources, surrounding communities, and visitor experiences. These impacts may be social (e.g., crowding and conflict), situational (e.g., access, litter, parking) and ecological (e.g., ticks, weather, seasonality). In response to these impacts, visitors may alter/substitute their recreation behaviors in an effort to maintain their desired recreation experience and satisfaction, a process referred to as coping<sup>4</sup>. These adaptations are concerning for resource managers as the employment of coping behaviors are often indicative of larger systemic issues; namely, a decline in the overall quality of the outdoor recreation experience. Changes in recreation patterns may also have lasting negative ramifications for factors such as site biodiversity and local economies. Thus, empirical examination of these issues is required to understand the interlinked impacts between visitors, resources, and communities.

This study explored the perceptions, preferences, behaviors, and decision-making of WMNF outdoor recreation visitors. The WMNF is a vital recreation resource for the state of New Hampshire and the New England region. It is an essential part of New Hampshire's economy, supporting more than 5,000 jobs and generating more than \$193 million in labor income<sup>5</sup>. As a recreation resource, the WMNF provides more than 1,200 miles of hiking trails, 160 miles of the Appalachian Trail, 400 miles of snowmobile trails, 23 developed campgrounds, 6 ski touring areas, and 4 alpine ski areas. As an ecological resource, the WMNF is home to numerous federally threatened and endangered plants and animals, zones of delicate alpine, 12,000 acres of wetlands, and 35 watersheds. The WMNF also provides numerous cultural and historic resources, including prehistoric indigenous sites and settlements.

Broadly speaking, the WMNF management plan aims to sustain a healthy forest, restore the land, provide recreation opportunities, and support local economies; all while protecting the natural landscape. The combination of ecological diversity and high-quality natural resource management, in addition to an abundance of public access, has made the WMNF extremely popular amongst a variety of local, regional, and international visitors. To protect these resources, it is essential that the WMNF proactively, continuously, and sustainably manages outdoor recreation visitation and experiences. While coping, and specifically substitution behaviors, have been demonstrated to affect many aspects of the recreation experience, there is little empirical evidence to show the prevalence of substitution behaviors on the WMNF. In response to this gap, the WMNF commissioned the University of New Hampshire to collect data and empirically respond to these questions. This study was conducted from June to August of 2020 and was generously funded by the USDA Forest Service.

The purpose of this study was to collect, analyze, and interpret the following information:

- WMNF visitors' demographic and trip visitation information
- WMNF visitors' satisfaction
- WMNF visitors' perceptions of undesirable conditions
- WMNF visitors' use of substitution behaviors
- WMNF visitors' perception of visitor use levels and site types
- WMNF visitors' management preferences
- WMNF visitors' place attachment and motivations
- WMNF visitors' decision-making process



## Section 1-2. Methods

A modified drop-off/pick-up survey method<sup>8</sup>, referred to in this study as a *knock-and-drop* method, was applied to gather data from WMNF visitors from June to August of 2020. A zip code analysis of 2015 National Visitor Use Monitoring data was used to identify communities with significant percentages of WMNF visitation and populate a sample (Table 1)<sup>2,3</sup>. This methodology was created and selected for multiple reasons. First, this method was employed to comprehensively assess local, state, and regional visitor perceptions from a systems level. Next, the COVID-19 pandemic necessitated the need to veer away from traditional on-site face-to-face intercept surveys in favor of a more socially distanced survey approach. Finally, this technique allowed for sampling of potentially displaced visitors who are not captured with traditional on-site survey modalities.

This knock-and-drop technique entailed trained researchers canvassing and approaching residential homes, hanging survey kits on doorknobs, knocking, briefly speaking to homeowners (if available), and then proceeding to more homes. Each survey kit consisted of a clear plastic bag containing a cover letter, a paper survey, and a postage paid return envelope. Two options for returning the survey were provided: 1) a link to an online survey utilizing Qualtrics software, or 2) a printed survey and a postage-paid return envelope. Approximately two weeks after the first round of survey distribution, researchers returned to non-respondent homes and left a reminder postcard. Only consenting adults (18 years of age or older) were eligible to participate in the study.

The topics within the first portion of the survey had respondents reporting trip visitation characteristics. The next section had respondents assess items related to social, situational, and ecological impacts as well as substitution behaviors. The third section related to perceptions of visitor use levels and site types. The fourth section had respondents assess motivations, place attachment, and management preferences. The topics within the final portion of the survey included sociodemographic characteristics. Upon completion of the survey, respondents were thanked for their time and provided an opportunity to voluntarily enter a prize raffle. In total, 3,000 surveys were distributed, yielding 642 completed surveys and a 21% response rate (Table 1). 65% of surveys were completed via the online modality and 35% were completed via the mail-back modality. This survey method response rate was consistent with similar research methods<sup>9</sup>. Finally, non-response bias was assessed using socio-demographic questions relating to gender, race, income, and education as well as survey modality. A chi-square analysis found no significant differences ( $p < .05$ ) for any variables between respondents and non-respondents. Therefore, a lack of non-response bias was assumed.

**Table 1.** WMNF visitation and survey response information

Community Name	% of WMNF Visitation <sup>1</sup>	Distributed Surveys	Completed Surveys	Response Rate
Conway	5.8%	277	56	20.2%
Concord	5.4%	271	66	24.4%
Littleton	5.4%	278	69	24.8%
North Conway	4.5%	274	63	22.9%
Berlin	3.7%	275	36	13.1%
Gorham	3.7%	277	59	21.3%
Franconia	3.7%	271	53	19.6%
Portsmouth	3.7%	248	62	25.0%
Campton	2.9%	275	70	25.5%
Plymouth	2.5%	279	72	25.8%
Groveton	0.4%	275	36	13.1%
<b>TOTAL</b>	<b>41.7%</b>	<b>3000</b>	<b>642</b>	<b>21.4%</b>

\*Note. Percentages may not equal 100 because of rounding.

Note<sup>1</sup>: 2015 National Visitor Use Monitoring data - White Mountain National Forest

## Section 2-0. Overall Results

### Section 2-1. Respondent Profile

In order to develop a respondent profile, the study sample was asked to identify their gender, age, ethnic background, earned income level, highest education level obtained, political affiliation, and residency status (Table 2). The first column in Table 2 indicates the valid percentages and means for each category.

- Sex/gender within the sample indicated that just under half of the visitors were male (47%) and 46% were female (Table 2).
- The average age of respondents was 56 years with approximately 11% representing the 18-35-year age group, 23% representing the 36-50-year age group, 31% representing the 51-64-year age group, and 36% representing the 65 and older age group.
- A large majority of the visitors surveyed (89%) reported their race/ethnicity as White. Other ethnicities reported included Spanish/Hispanic/Latino, African-American, and Asian.
- Approximately one-fifth (20%) of the visitors surveyed reported earning household incomes of \$100,000 or more, while 41% reported earning household incomes of less than \$75,000.
- Over two-thirds (71%) of the sample reported earning a four-year college or graduate/professional degree, while approximately 29% of the sample earned either a two-year college degree or had some college or high school degree.
- The political ideology distribution within the sample was moderate and slightly liberal leaning, with approximately 47% of respondents identifying as liberal, approximately 29% of respondents identifying as moderate, and approximately 24% of respondents identifying as conservative.
  - The mean for political ideology was 3.62, suggesting the sample was fairly moderate, although leaning toward the liberal side of moderate.
- The majority of respondents (91%) noted they were New Hampshire residents.
- Visitors to the WMNF reported being highly experienced.
  - On average, visitors noted they spent approximately 5 days per month, 36 days per year, and 30 total years engaged in recreation at the WMNF as of 2020.



**Table 2. WMNF visitors' respondent profile**

<b>Variable</b>	<b>Valid Percentage or Mean</b>
<i>Gender</i>	
Male	47.0%
Female	46.6%
<i>Age</i>	
Average age	56 Years
18-35	10.6%
36-50	22.8%
51-64	30.6%
65 and Older	36.0%
<i>Race/Ethnic Background</i>	
White	88.9%
Other	11.1%
<i>Income</i>	
\$25,000 or less	3.4%
\$25,000 to \$49,999	15.7%
\$50,000 to \$74,999	17.8%
\$75,000 to \$99,999	16.8%
\$100,000 to \$149,999	17.9%
\$150,000 or more	15.0%
<i>Education</i>	
Less than High School	>1.0%
Some High School	>1.0%
High School Graduate	9.0%
Some College	9.8%
Two Year College	9.8%
Four Year College	31.6%
Graduate or Professional Degree	39.4%
<i>Political Affiliation</i>	
Mean	3.62
Liberal	46.7%
Moderate	29.4%
Conservative	23.9%
<i>Residency Status</i>	
New Hampshire Resident	91.2%
<i>Level of Experience</i>	
Average days per month recreating	4.9 days
Average days per year recreating	36.1 days
Average total years recreating	30.8 years

\*Note. Percentages may not equal 100 because of rounding.

## Section 2-2. Activity Participation

Due to the abundance of recreation resources available within the WMNF, visitors may participate in a wide variety of recreation activities. In this study, visitors were asked to indicate which one recreation activity was their primary activity on the WMNF (Table 3).

- Of the entire sample, the four most common primary activities were: *hiking/walking* (50%), *downhill skiing/snowboarding* (9%), *sightseeing or viewing natural features/wildlife* (8%), and *driving for pleasure* (7%) (Table 3).
  - The most common primary activity by far was *hiking or walking*, with 50% of visitors noting it as their primary activity.
  - The next most common activity, *downhill skiing/snowboarding*, was significantly less common than *hiking/walking*.
  
- The three least common primary recreation activities were: *non-motorized boating* (1%), *snowmobiling* (1%), and *picnicking or family day gatherings* (>1%).
  - Examples of ‘other’ recreation activities included *swimming, rock climbing, and ice climbing*.

**Table 3.** WMNF visitors’ activity participation

<b>Activity Type</b>	<b>Valid Percentage</b>
Hiking/walking	50.1%
Downhill skiing/snowboarding	9.3%
Sightseeing or viewing natural features/wildlife	8.4%
Driving for pleasure	6.6%
Hunting or fishing	3.7%
Relaxing and hanging out	2.7%
Camping (Developed, underdeveloped, etc.)	2.5%
Cross-country skiing or snowshoeing	2.4%
Mountain biking or bicycling	2.4%
Backpacking	2.2%
Other	2.0%
Non-motorized boating	1.0%
Snowmobiling	1.0%
Picnicking or family day gatherings	>1.0%

\*Note. Percentages may not equal 100 because of rounding.



## Section 2-3. Satisfaction

Overall trip satisfaction is often used as a primary management criterion for evaluating the quality of an outdoor recreation experience. This study asked visitors to evaluate their overall level of satisfaction with the WMNF on both single-item and multi-item overall satisfaction scales (Tables 4 and 5).

- The single-item measurement of overall satisfaction was measured on a seven-point scale where one represented ‘*poor*’ and seven represented ‘*perfect*’ (Table 4).
  - Overall satisfaction was very high amongst respondents; with the majority of visitors (77%) indicating their overall trip that day to the WMNF was either excellent or perfect.

**Table 4.** WMNF visitors’ overall satisfaction rating

Mean	Valid Percentages						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
5.97	>1.0%	>1.0%	>1.0%	5.1%	14.5%	51.7%	24.8%

\*Note. Percentages may not equal 100 because of rounding.

\*Note. Response Code: 1 = Poor and 7 = Perfect

- The multi-item measurement of WMNF visitors’ satisfaction was measured on a seven-point scale where one represented ‘*completely disagree*’ and seven represented ‘*completely agree*’ (Table 5).
  - The vast majority of respondents (96%) agreed they thoroughly enjoyed their trip to the WMNF, with an average of 6.38 on a 7-point scale.
  - 85% of the sample agree that they cannot imagine better trips to the WMNF, with an average of 5.89 on a 7-point scale.
  - Approximately 93% of the sample agreed that their trip was well worth the time and money spent to take it, with an average of 6.33 on a 7-point scale.

**Table 5.** WMNF visitors’ satisfaction rating

Variable	Mean	Disagree (%)	Neutral (%)	Agree (%)
I have thoroughly enjoyed my trips to the WMNF	6.38	1.0%	1.0%	95.6%
My trips to the WMNF have been well worth the money and time I spend to take them	6.33	1.5%	2.2%	93.4%
I cannot imagine better trips to the WMNF	5.89	2.8%	9.5%	84.4%

\*Note. Percentages may not equal 100 because of rounding.

\*Note. Response Code: 1 = Completely Disagree and 7 = Completely Agree

## Section 2-4. Perceptions of Undesirable Conditions

Perceptions towards undesirable conditions can vary greatly among visitors. The term undesirable condition refers to any condition or situation that may negatively impact a visitor’s overall recreation experience. To assess WMNF visitors’ perceptions towards undesirable conditions, respondents were asked to indicate how each of these various conditions impacted their recreation experience. There are three types of undesirable conditions: Social impacts, situational impacts, and ecological impacts (Tables 6).

- The multi-item measurement of visitors’ perception of undesirable conditions was measured on a seven-point scale where one represented ‘no impact’ and seven represented ‘major impact’ (Table 6).
- Of the social impacts, crowding had the highest overall scale mean (4.15), suggesting that the social factor of crowding is most impactful upon the visitor experience at the WMNF.
  - Within the crowding scale, *crowding* (4.17) was the highest rated item followed closely by *too many other visitors* (4.13).
  - Within the conflict scale, *the actions and behaviors of other visitors* (3.13) was the highest rated item followed by *conflict with other visitors* (2.02).
- Situational impacts had the second highest overall scale mean (3.14), suggesting that situational impacts are also quite impactful upon the visitor experience at the WMNF.
  - Within the situational impacts scale, *parking or traffic* (4.22) was by far the highest rated item followed by *visible litter, garbage, or vandalism* (3.15).
  - Within the situational impacts scale, *site access* (2.62) followed by *overall sanitation and cleanliness* (2.86) were the lowest rated items.

**Table 6.** WMNF visitors’ perceptions of social, situational, and ecological impacts

Variable	Item Mean	Scale Mean
<i>“Have any of the following impacted your recreation experience on the WMNF?”</i>		
<b><i>Social Impacts - Crowding</i></b>		
Crowding	4.17	4.15
Too many other visitors	4.13	
<b><i>Social Impacts - Conflict</i></b>		
Conflict with other visitors	2.02	2.57
The actions or behaviors of other visitors	3.13	
<b><i>Situational Impacts</i></b>		
Parking or traffic	4.22	
Visible litter, garbage, or vandalism	3.15	
Availability of restroom facilities	3.04	3.14
Trail degradation	2.95	
Overall sanitation and cleanliness	2.86	
Site access	2.62	
<b><i>Ecological Impacts<sup>a</sup></i></b>		
Increased tick population	3.46	
Changing seasonality	2.77	2.90
Diminished natural snowpack	2.72	
Changing water levels	2.65	

\*Note. Percentages may not equal 100 because of rounding

\*Note. Response Code: 1 = No impact and 7 = Major impact

In addition to the multi-item battery of questions relating to undesirable conditions, the survey instrument included a qualitative follow-up question to better understand the experiences of WMNF visitors in relation to undesirable conditions. Responses to these qualitative questions were used to further assess any additional influencing impacts that may be affecting WMNF visitor behaviors (Table 7 and Figure 1).

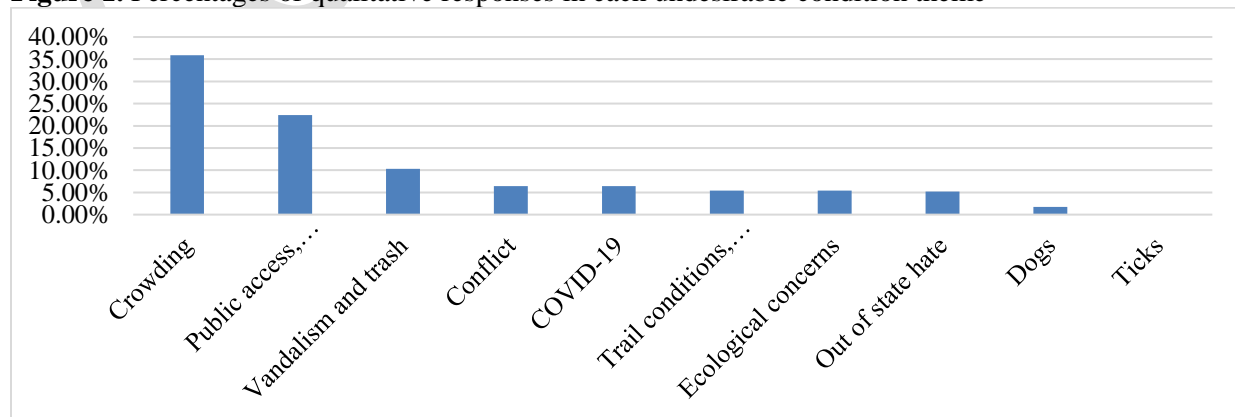
- Open-ended responses to the qualitative question “Please tell us more about any undesirable conditions that changed the way you recreate at the WMNF” were thematically coded to identify recurring themes of undesirable conditions (Table 7).
- Many of the thematic coding themes fit the undesirable conditions found in Table 6.
  - *Crowding* was identified to be the largest concern, with approximately 36% of qualitative responses mentioning crowding.
  - This was followed by the situational impacts of *public access, parking, and traffic* (22%) and *vandalism and trash* (10%).
- Thematic coding also identified three themes that were not present within the multi-item battery.
  - *COVID-19* (6%), *out-of-state hate* (5%), and *dogs* (2%) were identified as somewhat common undesirable conditions.

**Table 7.** WMNF visitors’ thematically coded qualitative responses to undesirable condition

Variable “Please tell us more about any undesirable conditions that changed the way you recreate at the WMNF”	Valid Percentage
<i>Themes</i>	
Crowding	35.9%
Public access, parking, and traffic	22.4%
Vandalism and trash	10.3%
Conflict	6.4%
COVID-19	6.4%
Trail conditions, infrastructure, and maintenance	5.4%
Ecological concerns	5.4%
Out-of-state hate	5.2%
Dogs	1.7%
Ticks	>1.0%

\*Note. Percentages may not equal 100 because of rounding.

**Figure 1.** Percentages of qualitative responses in each undesirable condition theme



## **Samples of qualitative responses for each theme:**

### **Crowding:**

1. *"I think people should search out their own spots in the WMNF. Some areas have been overcrowded and crowds are an issue. Example: Diana's Bath, many trails/trail heads."*
2. *"Avoid certain hiking trails due to lack of parking because there are just too many people on the trail (Lonesome Lake)."*

### **Public access, parking, and traffic:**

1. *"Parking is a huge issue for me. I prefer to hike earlier in the day anyways, but there are some spots with almost no parking for the amount of traffic it sees."*
2. *"No place to park, because of this I went and checked out different areas."*

### **Vandalism and trash:**

1. *"Favorite and easy access places are totally overrun. Garbage and litter has really increased."*
2. *"My family and I have found increased trash, especially at carry-in/carry-out facilities. It's very disappointing that visitors are so selfish."*

### **Conflict:**

1. *"We haven't changed anything but we always hope we don't see, hear or smell snow machines."*
2. *"Mountain bikes have created trails, not authorized by WMNF, then sanctioned later by WMNF with trail names and signs. You can't go far in the woods that you don't come across a bike trail."*

### **COVID-19:**

1. *"Too many people during COVID-19. Will go back at later date, currently use other parks."*
2. *"COVID - staying away from crowds especially from out-of-state."*

### **Trail conditions, infrastructure, and maintenance:**

1. *"This year it was late melt down which left rough trails (post holes). Stayed Home!"*
2. *"Restrooms P-O-Potty cleanliness..."*

### **Ecological concerns:**

1. *"Pondacherry Pond in Jefferson wildlife refuge. No birds! No sound! Something wrong there!"*
2. *"Lack of snow during ski season has pushed us to other states/areas."*

### **Out-of-state hate:**

1. *"Attitude of out-of-staters (most not all) treat it as if they own it."*
2. *"Trailheads were so packed with out-of-state licenses for some of my favorite hikes that I had to move on and change plans. This has happened multiple times."*

### **Dogs:**

1. *"Sometimes there are too many dogs unleashed. I don't dislike dogs, just don't like when they jump up on me or sniff me."*
2. *"Upset at visitors who leave trash and do not curb their animals."*

### **Ticks:**

1. *"Tick increased presence... Avoid hiking trails during height of tick season. Use bug/tick-repellant when necessary, if out and concerned about ticks."*
2. *"Have had 3 different tick bites and became very ill because of this!"*



## Section 2-5. Substitution Behaviors

Visitors have the ability to cope/alter/adapt with undesirable conditions that negatively impact them by changing or altering their behaviors and decision-making. Substitution behaviors involve changing where one recreates, at what time one recreates, the activity that one engages in, or simply deciding to not return to the WMNF. To assess visitors' substitution behaviors, respondents were asked to report the frequency in which they utilize various substitution behaviors (Table 8).

- The multi-item measurement of visitors' substitution behaviors was measured on a seven-point scale where one represented '*never*' and seven represented '*always*' (Table 8).
- Respondents indicated the most utilized form of substitution behavior at the WMNF was *resource substitution* (4.35).
  - Within resource substitution, the most common behavior was *visited different areas of the WMNF* (4.40), followed closely by *visited a different location within the WMNF* (4.31).
- The second most frequently employed form of substitution was *temporal substitution* (4.14).
  - Within temporal substitution, the most common behavior was *avoided visiting the WMNF on holidays* (5.13). The least common temporal substitution behavior was *visited the WMNF during a different season* (3.27).
- The least common substitution behaviors on the WMNF were *displacement* (1.31) and *activity substitution* (2.23).

**Table 8.** WMNF visitors' substitution responses

Variable	Item Mean	Scale Mean
<i>"In response to undesirable conditions at the WMNF, I have..."</i>		
<b>Resource Substitution</b>		
Visited different areas of the WMNF	4.40	4.35
Visited a different location within the WMNF	4.31	
<b>Temporal Substitution</b>		
Avoided visiting the WMNF on holidays	5.13	4.14
Visited the WMNF during a different day of the week	4.20	
Visited the WMNF earlier or later in the day	3.92	
Visited the WMNF during a different season	3.27	
<b>Activity Substitution</b>		
Changed my recreation activity at the WMNF	2.29	2.23
Began a new recreation activity at the WMNF	2.18	
<b>Displacement</b>		
Stopped visiting the WMNF entirely	1.47	1.31
Abandoned my recreation experience at the WMNF entirely	1.30	
Never visited the WMNF again	1.16	

\*Note. Percentages may not equal 100 because of rounding.

\*Note. Response Code: 1 = Never and 7 = Always

## Section 2-6. Displacement Behaviors

Displacement is a unique substitution behavior in that a visitor may decide to permanently abandon their recreation on the WMNF altogether. As identifying true instances of visitor displacement was an important component of this study, visitors were asked about displacement behaviors in three different ways to triangulate data in an effort to provide concise, accurate, and reliable results. To assess visitors' displacement behaviors, a multi-item displacement battery was included in the survey (Table 8).

Next, visitors were provided a formal definition of displacement and asked to report if they had been displaced in a dichotomous (e.g., yes/no) format. The displacement definition read as follows, "*the term displacement refers to permanently discontinuing your use of the WMNF due to undesirable conditions (e.g., stopped visiting, abandoned the activity, etc.)*." If visitors responded *yes* to this question, they were then asked to qualitatively describe their experience with displacement. The qualitative responses were then thematically coded into categories of "has been displaced" or "has not been displaced".

Once all quantitative and qualitative responses had been coded and analyzed, all three measures were triangulated and integrated to determine the overall percentage of displaced visitors on the WMNF. Findings indicate that approximately 9% of visitors have been permanently displaced from the WMNF. In other words, 9% of respondents in this sample indicated they no longer participate in outdoor recreation activities on the WMNF due to various negative impacts. It should be noted that this finding is in line with similar research related to displacement in parks and protected areas.

- First, visitors were asked to answer a three-item displacement quantitative battery (Table 8).
  - The overall mean for the displacement scale was very low (1.31).
  - The lowest mean within the three-item battery was *never visited the WMNF again* (1.16).
- Next, a definition of displacement was provided to the visitors, and they were asked to indicate whether they had been displaced in a *yes/no* format.
  - Approximately 20% of visitors indicated they had been displaced.
- Finally, visitors who answered "yes" to having been displaced were asked to provide more information about their displacement behavior in the form of a qualitative question. These answers were thematically coded to ensure that visitors were accurately reporting their displacement behaviors and truly engaging in displacement; and not another similar substitution behavior such as resources substitution.
  - Qualitative data analysis suggested that approximately 9% of visitors have been truly displaced from their use of the WMNF.
- Taken together, overall displacement on the WMNF is quite low. Moreover, this low level of displacement (e.g., 9%) is in-line with displacement data from other similar displacement studies within parks and protected areas.



## Section 2-7. Perceptions of Visitor Use Levels and Site Types

WMNF visitors have the opportunity to enjoy a diverse range of use-levels and site types. As National Forest visitation continues to grow, there is a need to assess whether forest definitions of low, moderate, high, and very high-use site types match the visitor perceptions of these same metrics. Additionally, it is important to understand visitor preferences for these site types. This study asked WMNF visitors to report the number of people per day (PPD) they would prefer to encounter at each site type (Tables 9 and 10 and Figure 2). They were also asked which site type they preferred overall (Figure 3)

**Table 9.** WMNF definitions of site use levels by the number of people per day (PPD)

Site Type	Number of PPD by Site Type (Range)	Number of PPD by Site Type (Average)
Low	2-4 PPD	3 PPD
Moderate	12-15 PPD	13.5 PPD
High	29-36 PPD	32.5 PPD
Very High	70-90 PPD	80 PPD

\*Note. Percentages may not equal 100 because of rounding.

**Table 10.** WMNF visitors' overall preferred number of people per day by site use levels

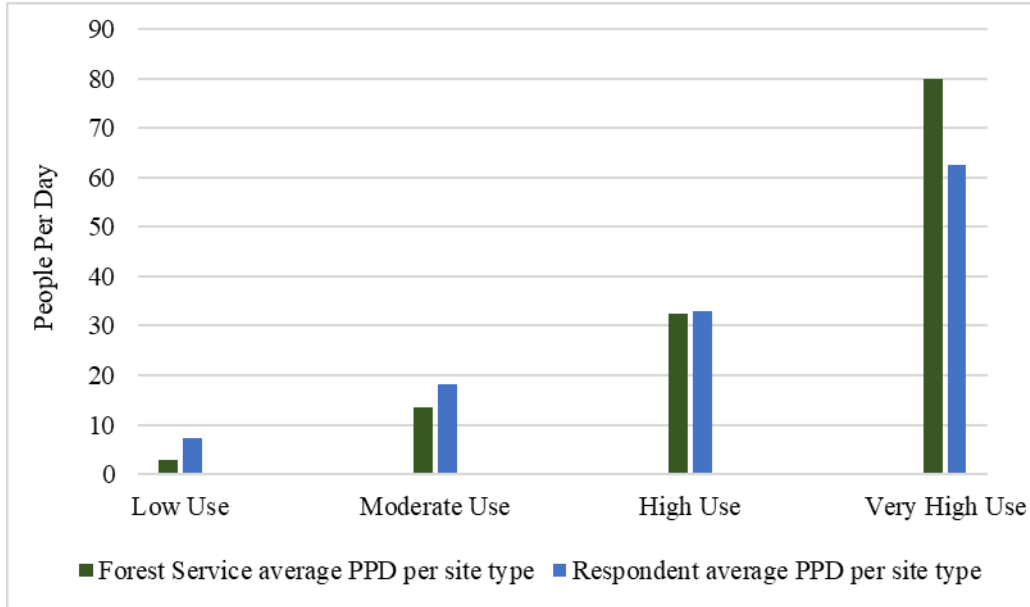
Site Type	Preferred Number of PPD by Site Type (Range)	Preferred Number of PPD by Site Type (Average)
Low	0-50 PPD	7.4
Moderate	0-100 PPD	18.3
High	2-150 PPD	33.1
Very High	2-500 PPD	62.5

\*Note. Percentages may not equal 100 because of rounding.

- The WMNF defines low-use as encountering 2-4 PPD, for an average of 3 PPD (Table 9).
  - For low use sites, visitors reported preferring to encounter an average of 7 PPD, more than double the average of the WMNF definition of low-use sites (Table 10).
- The WMNF defines moderate-use as encountering 12-15 PPD, for an average of 13 PPD.
  - For moderate use sites, visitors reported preferring to encounter an average of 18 PPD, significantly higher than the WMNF definition of moderate-use sites.
- The WMNF defines high use as 29-36 PPD, for an average of 32 PPD.
  - For high-use sites, visitors reported preferring to encounter an average of 33 PPD. This matches the WMNF definition of high-use sites almost exactly.
- The WMNF defines very high-use as 70-90 PPD, for an average of 80 PPD.
  - For very high-use sites, visitors reported preferring to encounter an average of 62 PPD. This is significantly lower than the WMNF definition of a very high-use sites.

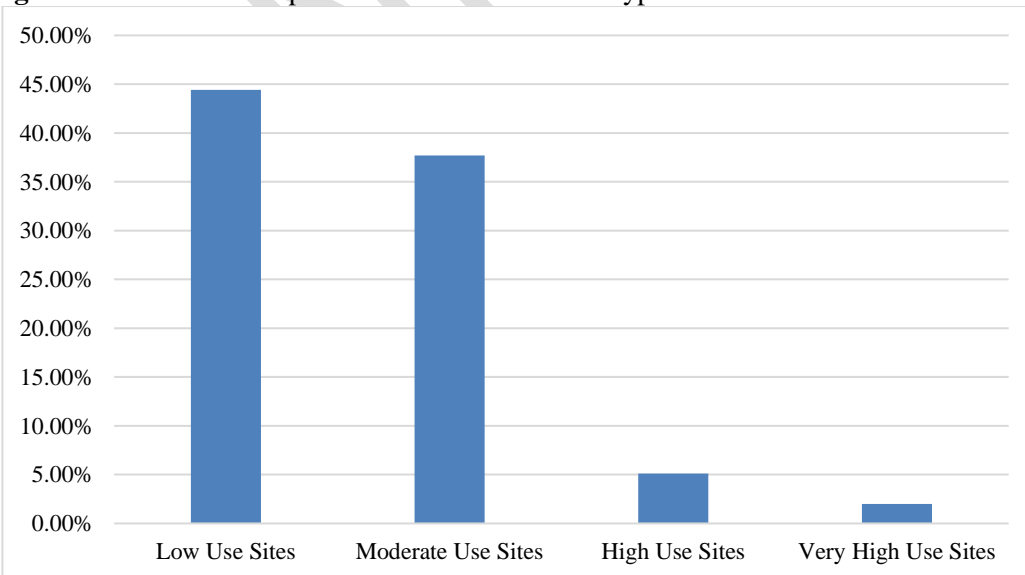
- In conclusion, the WMNF’s current definition of PPD for high-use sites is in-line with visitor perceptions.
- However, the WMNF’s current definition of PPD for low-, moderate-, and very high-use sites *is not* consistent with visitor perceptions (Figure 2).

**Figure 2.** Comparison between Forest Service and visitor perceptions of average PPD by site type



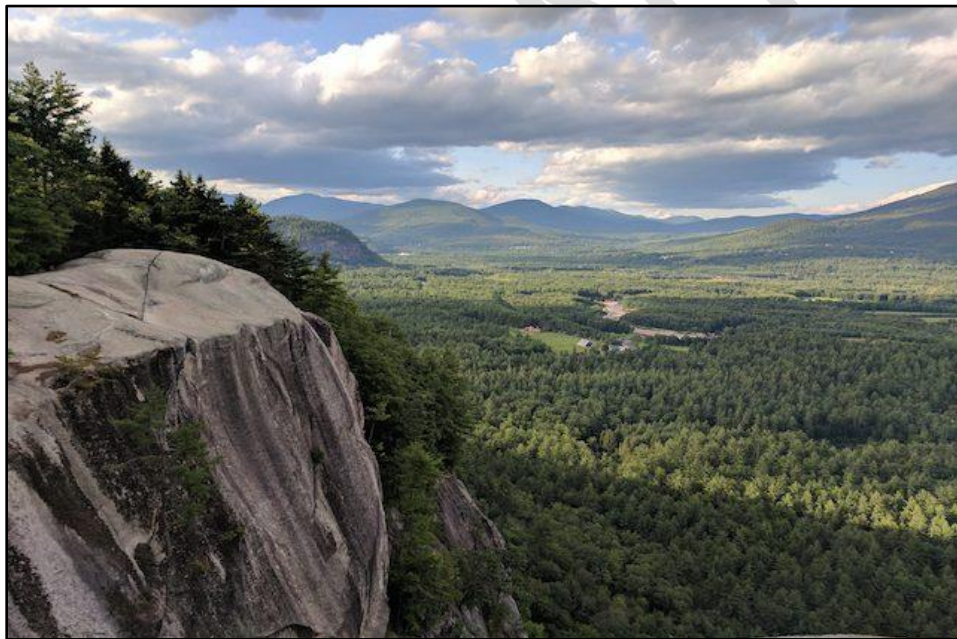
- WMNF visitors were also asked to select which *one site type* was their preference regarding visitor use levels at the WMNF (Figure 3).
  - The majority of visitors preferred *low-use site types* (44%), followed closely for a preference towards *moderate-use site types* (38%).

**Figure 3.** WMNF visitor preferences for various site types



\*Note. Percentages may not equal 100 because of rounding.

- Additionally, a qualitative question was included in the survey to identify instances of use dispersion, where visitors change their recreation behaviors from high-use areas to low-use areas.
  - Approximately 18% of respondents who engaged in substitution behaviors noted they have changed their use from high- to low-use areas.
  - The following are examples of responses indicating use dispersion:
    1. *“Specific popular hiking trailheads, activities (tubing the Saco), and roads (center Conway and N. Conway) seem to be increasingly crowded. However, the WMNF is large enough to avoid the crowds, even on the busiest weekends. We have ventured into less visited areas and discovered other areas, which has been great.”*
    2. *“I enjoy the natural world because there is still an abundance of nature compared to human activity. The amount of people visiting the WMNF has increased so much that often, hikes I used to enjoy I now avoid because I know they will be swamped. Instead of going on well-known hikes, I go bushwhacking or explore old skid roads in more rural sections of the WMNF to fully explore the wildlife (flora & fauna).”*



## Section 2-8. Management Preferences of WMNF Visitors

WMNF visitors have varying levels of support for management actions. In this study, visitors were asked to indicate their level of support or opposition to a variety of management actions. These management actions had to do with parking, traffic, and overall use level restrictions (Table 11).

- Management preferences were measured on a seven-point scale, with one representing ‘*strongly oppose*’ and seven representing ‘*strongly support*’ (Table 11).
- The most supported management action was *enforce regulations against overflow parking at the WMNF*, with approximately 70% of respondents indicating they supported this management action.
- *Expand public shuttle transportation services, place limitations on the number of people allowed to use the WMNF, and expand parking availability* were also moderately supported.
- *Implement a permit system via a first come, first serve basis and implement a forest wide entrance fee at the WMNF* both had more opposition than support.
- The least popular management action was *implement a permit system via a lottery at the WMNF*, with approximately 58% of respondents indicating they were opposed to that action.

**Table 11.** WMNF visitors’ support or opposition for management actions

Variable “The WMNF should...”	Mean	Disagree (%)	Neutral (%)	Agree (%)
Enforce regulations against overflow parking	5.53	12.5%	12.0%	69.6%
Expand public shuttle transportation services	4.77	19.3%	20.7%	54.1%
Place limitations on the number of people allowed	4.49	26.6%	22.6%	48.0%
Expand parking availability	4.32	29.9%	19.5%	44.3%
Require visitors to use public shuttle transportation services	3.90	35.0%	25.4%	32.8%
Implement a forest wide entrance fee	3.51	43.3%	20.4%	29.8%
Implement a permit system via a first come, first-serve basis	3.39	45.2%	20.6%	27.7%
Implement a permit system via a lottery	2.84	57.8%	18.1%	17.5%

\*Note. Percentages may not equal 100 because of rounding.

\*Note. Response Code: 1 = Strongly Oppose and 7 = Strongly Support



In addition to the multi-item battery of questions relating to management actions, the survey instrument included a qualitative question to better understand the management preferences of WMNF visitors. Responses to these qualitative questions were used to identify any thematic categories of managerial actions that were widely supported by respondents (Table 12 and Figure 4).

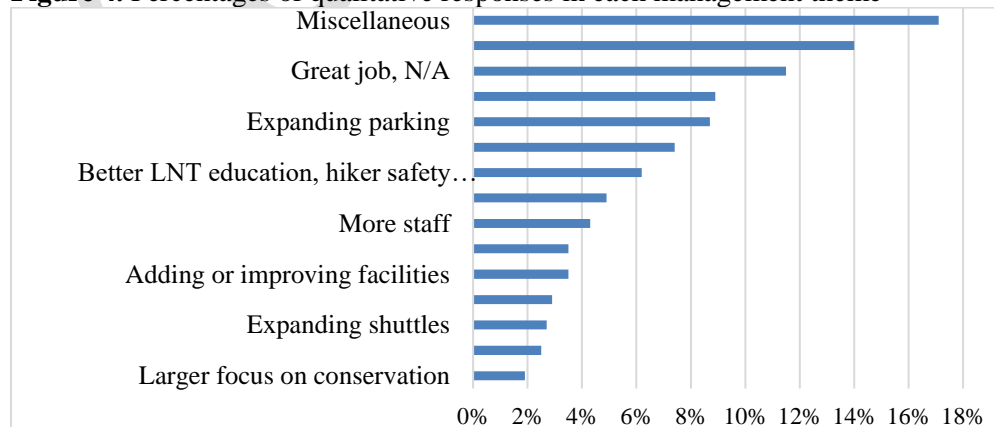
- The most prevalent response theme was categorized as *miscellaneous* (17%).
  - The miscellaneous category included the addition of a lecture series, as well as increasing accessibility for individuals with disabilities (Table 12).
- The second most common response theme was in support of *limiting access* (14%), and the third most common theme was to say *the forest was doing a great job/had no input* (12%).
- The least common open-ended themes were *larger focus on conservation* (2%), *charge more money/implement forest wide entrance fee* (2%), and *expanding shuttles* (3%).

**Table 12.** WMNF visitors’ input to management themes

Variable	Valid Percentage
<i>“If you could ask management to improve the operation of the WMNF, what might you ask them to do?”</i>	
<b>Themes</b>	
Miscellaneous	17.1%
Limit access	14.0%
Great job, N/A	11.5%
Stronger enforcement of rules	8.9%
Expanding parking	8.7%
Charging or limiting out-of-staters more/perks for in-staters	7.4%
Better LNT education and hiker safety education	6.2%
Better trail maintenance or more trails	4.9%
More staff	4.3%
Larger fines for littering/reduction of littering	3.5%
Adding or improving facilities	3.5%
Maintaining or increasing access	2.9%
Expanding shuttles	2.7%
Charge more money or implement forest wide entrance fee	2.5%
Larger focus on conservation	1.9%

\*Note. Percentages may not equal 100 because of rounding.

**Figure 4.** Percentages of qualitative responses in each management theme



## **Samples of qualitative responses within each theme:**

### **Miscellaneous:**

1. *"A lecture series. I did a senior art class and really enjoyed it."*
2. *"To make some areas more handicapped accessible. I use a cane now, in my old age."*

### **Limit Access:**

1. *"I wouldn't like a permit system on the whole WMNF but it could be helpful for the most-used areas."*
2. *"I wouldn't be opposed to periodic temporary closing of sites that are extremely high use, high volume such as Diana's bath, to give the ground and water a break from the impact of excessive use."*

### **Great Job, N/A:**

1. *"Nothing really. I think that the WMNF's operations are a good mix of forest/visitor management and hands off outdoor recreation. Probably a reason for its popularity in the region."*
2. *"Thank you for thoughtful care and management!"*

### **Stronger Enforcement of Rules:**

1. *"More fines for people that don't follow the rules."*
2. *"Continue to enforce rules, particularly at camp sites."*

### **Expanding Parking:**

1. *"Increase parking substantially."*
2. *"Parking!!"*

### **Charging or limiting out-of-staters more/Perks for in-staters:**

1. *"Institute a use fee for out-of-staters and use that money to clean up after them. My understanding is that the out-of-staters are causing all of the mess."*
2. *"As a local I'd like more allowances for us and also cut back on the amount of tourists. The notches are horrible!"*

### **Better LNT Education, Hiker Safety Education:**

1. *"Improve education and outreach to reduce visitor caused degradation (litter, noise population, fire wood transport, parking...)"*
2. *"Public awareness, school education, best use of resources as able, outdoor education."*

### **Better trail maintenance or more trails:**

1. *"I don't know you can't ask people not to come, they need nature too. Some" people are just rude and don't care, guess you can't change that. Maybe more trails?"*
2. *"Better upkeep of remote trails; remove dead or damaged trees that endanger hikers and parked cars."*

### **More Staff:**

1. *"Increase law enforcement presence - two officers is not enough."*
2. *"Have their budgets increased so they can hire the necessary staff they need to manage the forest."*



**Larger fines for littering/reduction of littering:**

1. *"Litter - people are not taking it with them when they go."*
2. *"Litter is one of my main concerns. Mirror Lake has littering issues. Visitors should also, pick up after their pets."*

**Adding or Improving Facilities:**

1. *"More restrooms."*
2. *"Increase attention to restrooms."*

**Maintaining or Increasing Access:**

1. *"Increase the number of access points for fishing and open earlier on gated sites."*
2. *"Keep access to parks open for all users. The desire to mitigate population density is tempting but I don't think permits and fees are the answer; if anything, these measures might disproportionately impact low income visitors or drive them away."*

**Expanding Shuttles:**

1. *"Increased/year-round shuttle services"*
2. *"Create a shuttle for Diana's bath, stop the cars from waiting along the road to get in."*

**Charge more money or implement a Forest Wide Entrance Fee:**

1. *"There's no single idea I feel very strongly about but charging WMNF usage fees and providing that money to environmental causes would make sense."*
2. *"Preserving the WMNF is important for everyone's future. A fee for enjoyment of this environment is key as it is being overused. Same as charging for rescues which is starting to happen now. Long overdue."*

**Larger Focus on Conservation**

1. *"Everything possible to protect the land and waters"*
2. *"This is such a hard question. I wonder about creating low impact centers for less serious hikers and families to contain their impact on the environment. As a resident of the area, I value the forest so much and am concerned about overuse, yet I also feel that contact with the environment in a positive way is so important for everyone to increase environmental advocacy."*

## Section 2-9. Place Attachment and Motivations

WMNF visitors have varying levels of place attachment to natural resources. In this study, visitors were asked to indicate their level of attachment to the WMNF. Three domains of place attachment were measured: 1) place identity, 2) community and social attachment, and 3) place dependence (Table 13). Additionally, visitors have numerous motivations as to why they visit the WMNF. Three motivation domains were measured: 1) tranquility, 2) general nature experience, 3) skill development, and 4) meeting new people (Table 14.)

- The three place attachment assessments were measured on a seven-point scale, with one representing ‘*strongly disagree*’ and seven representing ‘*strongly agree*’ (Table 13).
  - Respondents strongly identified with the WMNF, with nearly the entire sample agreeing that the *area meant a lot to them* (90%) and that they were *very attached to the area* (81%).
  - The sample indicated they were not as attached to the community and social elements associated with the WMNF.
    - Approximately one-half of the sample agreed *the people in WMNF area are important to me* (54%) and that *I have many ties to the people in the WMNF area* (50%).
  - Visitors were moderately dependent on the WMNF to engage in their primary outdoor recreation pursuits. More than two-thirds of respondents (64%) agreed that *no other place can compare to the WMNF for the types of recreation activities I do here*.

**Table 13.** WMNF visitors’ place attachment

Variable	Mean	Disagree (%)	Neutral (%)	Agree (%)
<i>Place Identity</i>				
The WMNF means a lot to me	6.53	1.0%	2.8%	90.2%
I feel very attached to the WMNF	6.22	1.4%	7.6%	81.4%
<i>Community and Social Attachment</i>				
The people in the WMNF area are important to me	4.89	17.3%	23.1%	53.6%
I have many ties to the people in the WMNF area	4.73	23.3%	20.6%	49.9%
<i>Place Dependence</i>				
No other place can compare to the WMNF for the types of recreation I do here	5.24	10.9%	18.8%	63.9%
I wouldn’t substitute any other area for doing the types of [primary activity] that I do here	5.13	14.9%	19.9%	65.2%

\*Note. Percentages may not equal 100 because of rounding.

\*Note. Response Code: 1 = Strongly Disagree and 7 = Strongly Agree

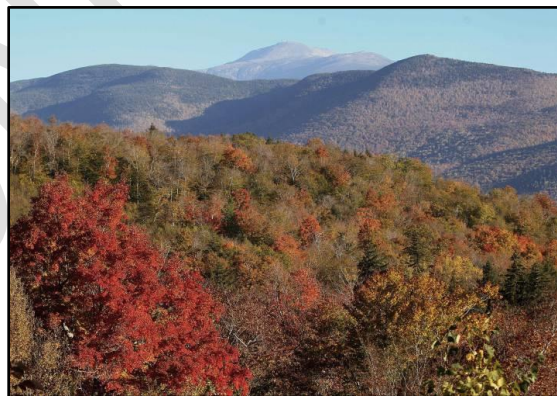
- The highest rated recreation motivations and experience preferences for WMNF visitors were: 1) *to be close to nature*, 2) *to enjoy the sounds of nature*, 3) *to experience tranquility*, and 4) *to experience solitude* (Table 14).
  - Approximately 90% of respondents agreed that *to be close to nature* was a primary motivation.
- The lowest rated recreation motivations amongst WMNF visitors were: 1) *to meet other people in the area*, 2) *to talk to new and varied people*, 3) *to develop your skills and abilities*, and 4) *to become better at my recreation activity*.
  - Approximately 22% of respondents stated that a motivation for recreation at the WMNF was *to meet other people in the area*.

**Table 14.** WMNF visitors’ perceptions of motivations

Variable “I visit the WMNF...”	Mean	Completely Disagree (%)	Neither (%)	Completely Agree (%)
To be close to nature	6.45	2.0%	3.1%	89.4%
To enjoy the sounds of nature	6.31	3.2%	4.5%	85.5%
To experience tranquility	6.15	3.1%	5.9%	85.1%
To experience solitude	5.61	6.9%	13.2%	73.4%
To become better at my recreation activity	5.28	11.5%	17.6%	64.8%
To develop your skills and abilities	4.93	16.7%	19.5%	57.3%
To talk to new and varied people	3.26	52.1%	18.7%	24.4%
To meet other people in the area	3.05	57.5%	15.1%	21.7%

\*Note. Percentages may not equal 100 because of rounding.

\*Note. Response Code: 1 = Completely Disagree and 7 = Completely Agree



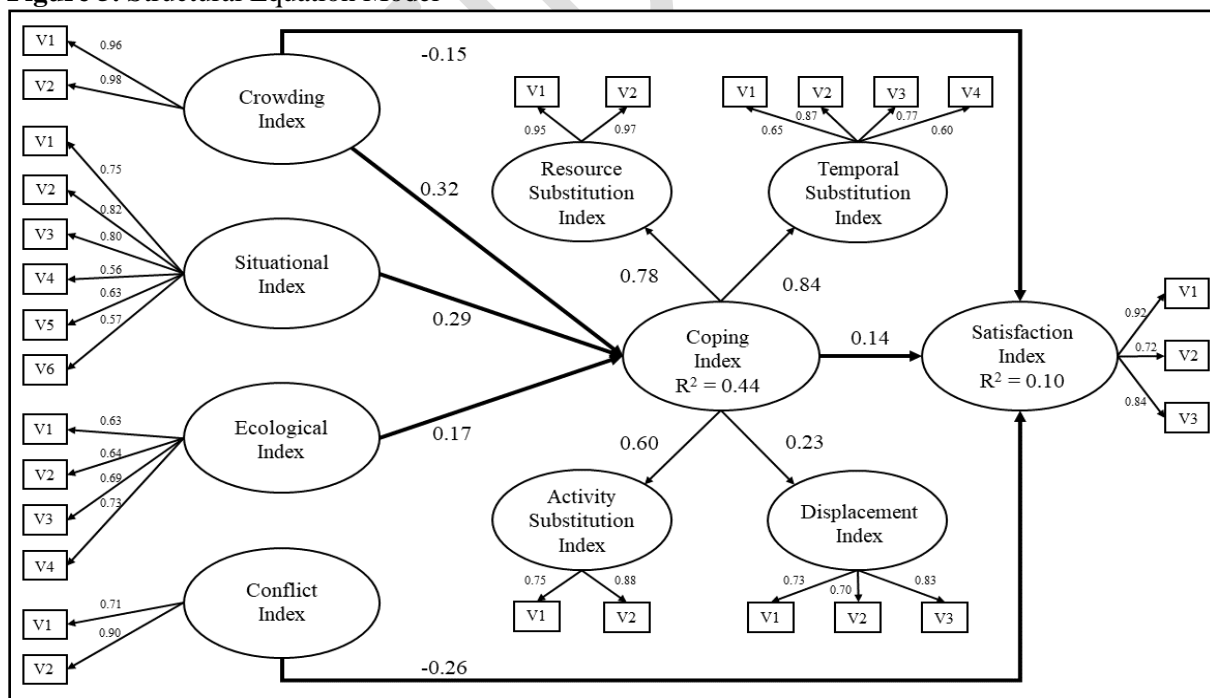
## Section 3-0. Advanced Statistical Data Analyses

### Section 3-1. Structural Equation Modeling

To better understand the interactions between impacts, substitution behaviors, and satisfaction, structural equation modeling (SEM) procedures were utilized. SEM was selected as it is the gold standard in predictive modeling (Figure 5).

- Results indicate that the impacts examined in this study explain a significant amount of the variance in substitution behaviors among visitors ( $R^2 = 43.7\%$ ) as well as overall visitor satisfaction ( $R^2 = 10\%$ ) (Figure 5).
- Visitors are able to cope/deal/behaviorally adapt to certain undesirable condition impacts yet unable to cope/deal/behaviorally adapt to other various undesirable condition impacts.
  - Visitors *are able* to cope/deal/behaviorally adapt with various situational impacts (e.g., parking and traffic) and ecological impacts (e.g., ticks, snowpack).
  - Visitors are only *partially able* to cope/deal/behaviorally adapt with crowding related impacts; with crowding impacts leading indirectly to moderate decreases in visitor satisfaction.
  - However, visitors are *unable* to cope/deal/behaviorally adapt with conflict related impacts; with conflict related impacts leading directly to significant decreases in visitor satisfaction.
- In other words, WMNF visitors are fully capable of handling situational and ecological impacts, less capable of managing crowding related impacts, and incapable of managing conflict related impacts.

Figure 5. Structural Equation Model<sup>a</sup>



<sup>a</sup>Note:  $\chi^2:751.6$ ;  $df=328$ ;  $p<.001$ ;  $CFI=0.957$ ;  $TLI=0.950$ ;  $RMSEA=0.045$ ;  $SRMR=.054$

\*Note: All relationships and error covariances were significant at  $p<.05$

## Section 3-2. Binary Logistic Regression

Binary logistic regression analyses were utilized to better understand which specific impacts were driving various substitution behaviors. Binary logistic regression was selected as it shows, at the individual level, which impacts are influencing engagement in specific substitution behaviors. It is also a powerful statistic for resource managers, as it produces an odds ratio, or the likelihood of engagement in a behavior. Four separate binary logistic regression analyses were conducted to examine the influence of crowding, situational, and ecological impacts upon WMNF visitor decisions to engage in specific substitution behaviors (Table 15).

- In the first model, crowding, situational, and ecological impacts were associated with a higher likelihood of visitor engagement in *resource substitution*. Situational impacts were the strongest predictor (Table 15).
  - This model suggests that at the reported mean levels for all three impacts, there is 95% likelihood of visitor engagement in *resource substitution*.
- The second model determined crowding and situational impacts were associated with a higher likelihood of visitor engagement in *temporal substitution*. Situational impacts were the strongest predictor.
  - This model indicates that at the reported mean levels for all three impacts, there is 96% likelihood of visitor engagement in *temporal substitution*.
- In the third model, situational and ecological impacts were associated with a higher likelihood of visitor engagement in *activity substitution*. Situational impacts were the strongest predictor.
  - This model suggests that at the reported mean levels for all three impacts, there is 60% likelihood of visitor engagement in *activity substitution*.
- In the final model, only situational impacts were associated with a higher likelihood of visitor engagement in *displacement*.
  - This model indicates that at the reported mean levels for all three impacts, there is 13% likelihood of visitor engagement in *displacement*.
- These findings suggest the pervasive application of both resource and temporal substitution behaviors is likely to impact the visitors, ecosystems, and communities surrounding the WMNF.

**Table 15.** Logistic regression models predicting WMNF visitor substitution behaviors

	<i>Nagelkerke R Square</i>	$\beta$	<i>Wald</i>	<i>Odds Ratio</i>
<b>Resource Substitution Model<sup>a</sup></b>				
Situational impacts		0.684	13.284***	1.982
Crowding impacts	0.319	0.368	14.798***	1.444
Ecological impacts		0.297	4.180*	1.346
<i>Constant</i>		-1.649	17.548***	0.192
<b>Temporal Substitution Model<sup>b</sup></b>				
Situational impacts		0.611	8.933**	1.842
Crowding impacts	0.272	0.405	13.775***	1.499
Ecological impacts		0.176	1.266	1.193
<i>Constant</i>		-1.042	6.393*	0.353
<b>Activity Substitution Model<sup>c</sup></b>				
Situational impacts		0.418	19.388***	1.519
Crowding impacts	0.220	-0.013	0.047	0.987
Ecological impacts		0.365	22.302***	1.440
<i>Constant</i>		-1.947	51.102***	0.143
<b>Displacement Model<sup>d</sup></b>				
Situational impacts		0.241	4.433*	1.273
Crowding impacts	0.095	0.125	2.258	1.133
Ecological impacts		0.162	3.272	1.176
<i>Constant</i>		-3.592	81.546***	0.028

\*Note. Percentages may not equal 100 because of rounding.

\*Significant at .05 level, \*\*significant at .01 level, \*\*\*significant at .001 level

\*C=level of crowding impacts, S=level of situational impacts, and E=level of ecological impacts.

<sup>a</sup> $Ln(odds) = -1.649 + 0.368(C) + 0.684(S) + 0.297(E)$

<sup>b</sup> $Ln(odds) = -1.042 + 0.405(C) + 0.611(S) + 0.176(E)$

<sup>c</sup> $Ln(odds) = -1.947 + -0.013(C) + 0.418(S) + 0.365(E)$

<sup>d</sup> $Ln(odds) = -3.592 + 0.125(C) + 0.241(S) + 0.162(E)$

## Section 4-0. Summary and Conclusions

The overarching goal of the study was to assess WMNF outdoor recreation visitors' perceptions, preferences, behaviors, and decision-making. A modified drop-off/pick-up survey method (referred to as a *knock-and-drop* technique in this report) was utilized to collect mail-back and online surveys from WMNF visitors around the state of New Hampshire. For a guiding framework, this study utilized a systematic sampling plan and a mixed-methods survey methodology, which resulted in 642 completed surveys and a 21.4% response rate. Readers are encouraged to review these findings as reflective of WMNF visitors, and *not* representative of *all* northeastern National Forest visitors. A detailed account of WMNF visitors' characteristics, behaviors, attitudes, and perceptions was provided in the main body of this report. This summary and conclusion section provides a brief highlight of key findings that may be of interest to natural resource managers, partner organizations, and stakeholders.

### Section 4-1. Contextual Variables Summary and Conclusions

In terms of the visitor profile, data suggests WMNF visitors were likely to be middle-aged, white (89%), males (47%), who reported earning high levels of education and household income. The average age across all visitors was 56 years old; while 67% of respondents indicated they were over 50+ years old. When combining the household income categories, approximately half of visitors (50%) reported household incomes greater than \$75,000, while 19% reported household incomes less than \$49,999. More than two-thirds of the sample (71%) indicated earning either a four-year college or professional degree. The political ideology distribution demonstrated approximately 47% of respondents identified as liberal, 29% as moderate, and 24% as conservative. The mean for political ideology was 3.62 (out of 7.0), suggesting the sample was fairly moderate, although leaning toward the liberal side of moderate.

When evaluating trip visitation patterns, the vast majority of WMNF visitors in the study indicated they were from the state of New Hampshire (91%). The town of Littleton had the highest percentage of WMNF visitation out of towns sampled (11%), while Groveton and Berlin both had the lowest percentage of WMNF visitation (5%). Experience use history and visitation frequency was very high amongst the sample, with respondents noting an average of 5 days per month, 36 days per year, and 31 total years engaged in recreation on the WMNF. The visitors in this study indicated various forms of recreation as their primary recreation activities within the WMNF. The top primary recreation activities on the WMNF were: hiking/walking (50%), downhill skiing/snowboarding (9%), and sightseeing or viewing natural features/wildlife (8%).

The recreation experience questions provided data and insights regarding trip satisfaction, place attachment, and motivation. Overall satisfaction was very high among respondents, with approximately 76% of visitors indicating their trips to the WMNF was either excellent or perfect. Moreover, nearly all of the respondents in the sample agreed that they thoroughly enjoyed their trips to the WMNF (96%) and that their trip was well worth the time and money spent to take it (93%). The data also clearly showed that WMNF visitors strongly identified with and were moderately dependent upon the WMNF and the community and social attachment elements of the WMNF for their recreation activities. Finally, study findings suggest visitors' primary motivation for recreating on the WMNF were to be around nature and to experience tranquility and/or solitude.

The primary purpose of this study was to assess visitor behaviors and decision-making in response to various impacts on the WMNF. Findings indicate that visitors perceive moderate to high levels of impact from social and situational factors and low to moderate levels of impacts from ecological factors. Of the social impacts, crowding was perceived to have the largest impact upon the visitor experience (4.17/7.0). Of the situational impacts, parking and/or traffic was perceived to have the largest impact upon the visitor experience (4.22/7.0). Of the ecological impacts, increased tick populations had

the largest impact upon the visitor experience (3.46/7.0). Of conflict, the actions or behaviors of other visitors had the largest impact upon the visitor experience (3.13/7.0).

Further, visitors were most likely to employ either resource substitution (4.35/7.0) and/or temporal substitution (4.14/7.0) when faced with undesirable conditions. Visitors had moderate engagement in activity substitution (2.23/7.0) and the lowest engagement in displacement behaviors (1.31/7.0). After triangulating and analyzing three form of displacement data, finding suggest approximately 9% of study respondents have been permanently displaced from the WMNF. This displacement finding is consistent with the levels of displacement reported in similar parks and protected areas research. For example, recent research in both National Forest and National Park settings found approximately 13% and 7% of visitors has been permanently displaced, respectively<sup>6,7</sup>. Together, these findings suggest WMNF visitors are changing their use patterns in order to avoid conditions they perceive as being undesirable or negative. Additionally, there is evidence which suggests these substitution behaviors are contributing to visitor use dispersion. For instance, approximately 18% of study respondents noted altering their recreation from higher-use and more crowded areas to lower-use and less crowded areas.

This study also assessed visitors' perceptions of use levels and site stratification. Visitors' preferences for people per day for use levels were overall different, yet still within the approximate range of Forest Service definitions of people per day for site use levels. The Forest Service defines low use as encountering an average of 3 PPD, with study respondents preferring to encounter an average of approximately 7 PPD. The Forest Service defines moderate use as encountering an average of 13.5 PPD, with study respondents preferring to encounter an average of approximately 18 PPD. The Forest Service defines high use as an average of 32.5 PPD, and with study respondents preferring to encounter an average of approximately 33 PPD. The Forest Service defines very high use as an average of 80 PPD, and with study respondents preferring to encounter an average of 62 PPD. Additionally, visitors were asked to select which one site stratum was their preference regarding visitor use levels at the WMNF. Visitors largely preferred low use site types (44%), closely followed by moderate use site types (38%).

Visitors were also asked about their levels of support or opposition towards a variety of management actions. The most popular management action was to enforce regulations against overflow parking, with approximately 70% of respondents indicating they agreed. Expanding public shuttle transportation services, placing limitations on the number of people allowed to use the WMNF, and expanding parking availability were also largely supported. The least popular management action was implementing a permit system via a lottery at the WMNF, with approximately 58% of respondents indicating opposition to that action. Finally, implementing a first-come, first-serve permit system and implement a forest wide entrance fee both had more opposition than support.



## Section 4-2. Overall Summary and Conclusions

The overarching goal of the study was to assess WMNF outdoor recreation visitors' perceptions, preferences, behaviors, and decision-making. This report offers data and insights concerning WMNF visitors' socio-demographic characteristics, trip visitation and activity patterns, overall satisfaction, perceptions of undesirable conditions, behaviors and decision-making, perceptions of visitor use levels and site stratum, management preferences, and place attachment and motivations. Additional advanced statistical data analyses in the forms of structural equation modeling, binary logistic regression, and qualitative thematic coding were provided for context and further examination. Study results determined the majority of WMNF visitors in the sample noted being middle-aged white males, from the state of New Hampshire, who were politically moderate but slightly liberal leaning, and reported earning high levels of education and household income. The sample consisted of highly experienced and repeat recreation users who participated in a multitude of outdoor recreation activities including hiking and walking, skiing and snowboarding, and sightseeing. The overall sample indicated very high levels of overall satisfaction with their experiences at the WMNF and noted strong attachment with the forest.

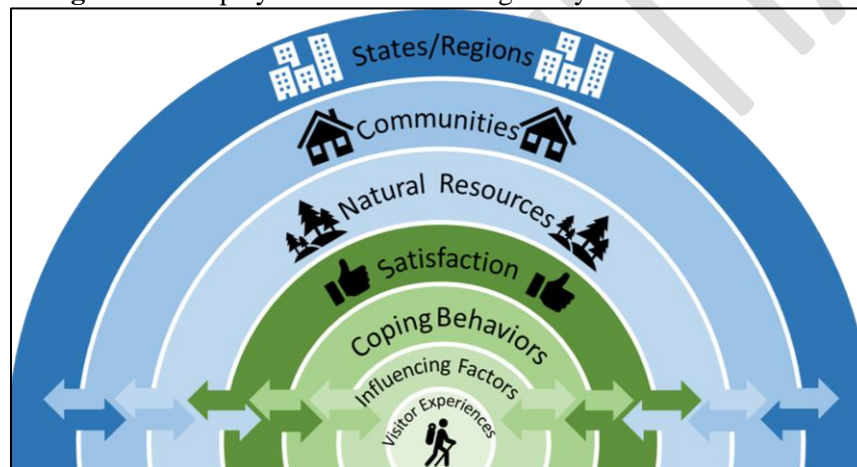
Study results suggest WMNF visitors were moderately to highly impacted by various undesirable conditions experienced while recreation on the WMNF. Overall, the social factor of crowding had the largest impact on the visitor experience. Situational impacts (e.g., parking, traffic, site access) had a moderate impact. Ecological impacts (e.g., tick populations) and the social factor of conflict had the smallest overall impacts on the visitor experience; yet conflict had directly and negatively impacted the overall WMNF visitor experience. Moreover, study results suggest that when faced with various sub-optimal conditions, WMNF visitors are most likely to employ resource and temporal substitution behaviors in an effort to adapt/preserve and/or increase overall experience quality. For instance, binary logistic regression analyses demonstrate that at the current reported levels of social, situational, and ecological impacts on the WMNF, there is an approximate 95% likelihood of visitor engagement in both resource and/or temporal substitution. However, it should be noted that instances of visitor displacement were found to be rare, with approximately 9% of respondents noting they had been permanently displaced from the WMNF. The level of displacement is similar to levels reported in other parks and protected areas studies<sup>6,7</sup>.

Additionally, qualitative analyses suggest that the employment of substitution behaviors, specifically resource substitution, are leading to moderate levels of visitor use dispersion from high- to low- use areas. Thus, the pervasive application of both resource and temporal substitution behaviors is likely to impact the visitors, ecosystems, and communities both within and surrounding the WMNF. As a result of resource substitution, visitation often spreads from high- to low-use areas, leading to significant social and ecological impacts. With temporal substitution, visitation may shift to different times of the day, week, month, or year; potentially alleviating conventional high-use periods (e.g., summers, holiday weekends), while increasing overall visitation, especially during off-peak periods (e.g., shoulder seasons, weekdays).

Findings also demonstrate visitors are effectively *able* to cope/deal/behaviorally adapt with both situational and ecological impacts. This is helpful for resource managers as ecological and situational impacts can be particularly difficult to manage and control. However, results also indicate visitors are *unable* to cope/deal/behaviorally adapt with conflict related impacts, and only partially able to cope/deal/behaviorally adapt with crowding related impacts; both of which lead to significant decreases in satisfaction. In other words, WMNF visitors are fully capable of handling situational and ecological impacts, less capable of managing crowding impacts, and *unable* to handle conflict related impacts. These findings suggest visitor conflict, followed closely by crowding and situational impacts, should be a top priority for resource managers. This implication is even more important when considering the dramatic increases in visitation to parks and protected areas due to the COVID-19 pandemic as well as management trends towards multiple use recreation areas and diversifying recreation opportunities.

Lastly, findings suggest the possible presence of a positive feedback loop which may serve to increase the magnitude of impacts and further destabilize the overall system. For example, visitors may encounter undesirable conditions which force them to employ coping strategies to preserve their overall recreation experience. As a result of coping strategies, visitors may choose to recreate within lower-use areas (e.g., resource substitution) or during shoulder seasons (e.g., temporal substitution); both of which increase the potential for significant social, situational, or ecological site and community impacts. In other words, as visitors alter their behaviors in response to undesirable conditions, various other downstream and interconnected impacts may arise. For instance, behavioral adaptations can significantly influence social systems (e.g., other visitors, proximate communities, stakeholders) and ecological systems (e.g., site biodiversity and resource quality) (Figure 6). These impacts may serve to further intensify sub-optimal conditions, with the cycle repeating itself with increased intensity each time. Resource managers are encouraged to proactively work to reduce impacts that may feed into this feedback loop, in order to prevent this cycle from intensifying. Thus, resource managers should consider and account for the potential impacts of behavioral adaptations from system-wide perspective to facilitate the ideal outcomes for recreation visitors, natural resources, and surrounding communities, states, and regions.

**Figure 6.** Interplay of social and ecological systems on the WMNF



## Section 5-0. Management Recommendations

### Section 5-1. Specific Management Recommendations

This section provides recommendations for management policies and facility/natural resource investments on the WMNF. These recommendations are based upon insights from the data gathered throughout this project as well as the most up-to-date peer-reviewed parks and protected areas management research. Each management recommendation is broken down into two categories: 1) *primary recommendations* and 2) *secondary recommendations*.

Primary management recommendations largely revolve around indirect management techniques (e.g., educating the visitor). Secondary management recommendations largely revolve around direct management techniques (e.g., law enforcement). It should be noted that indirect management techniques have been empirically demonstrated to be more effective and preferred by visitors in parks and protected areas settings, over direct management techniques; especially in dispersed recreation settings.

Some management recommendations are ambitious and long-term, while others represent minor adjustments to policies/procedures. Further, the WMNF is encouraged to work cooperatively with local stakeholder groups to consider these recommendations and develop potential alternatives for implementation as various direct and indirect visitor management approaches may have distinct downstream influences upon the broader social-ecological system.



➤ **Issue: Crowding**

- **Resource management plan:** “Use will not be allowed to increase indefinitely in high use areas” (WMNF, 2005, p. 1-13). “Use should be managed to prevent negative impacts to natural and cultural resources, and to the recreation experience” (WMNF, 2005, p. 2-19).
- **Survey respondent preferences:** Respondents perceived crowding to have a large and significant negative impact upon the recreation experience. Respondents were largely supportive of placing limitations on the number of visitors allowed to use the WMNF. Moreover, respondents were moderately supportive of a forest wide entrance fee and somewhat opposed to various forms of permitting systems. Additionally, advanced data analyses suggest WMNF visitors are only able to partially cope/deal/behaviorally adapt with issues related to crowding; and that the presence of crowding is leading to the pervasive employment of substitution behaviors and indirectly decreasing visitor satisfaction.
- **Primary Recommendations:** We recommend resource managers consider a two-tiered communication approach to engage stakeholders and visitor, particularly in areas of intensive crowding. The first aspect of messaging could focus on how crowding impacts specific recreation behaviors and experiences. The second aspect of messaging could focus on how crowding impacts the broader natural resources, communities, states, and regions which rely upon high-quality outdoor recreation opportunities. For example, informational campaigns (e.g., press releases, signage, websites, and social media) could convey specific times and locations where crowding is prevalent, encourage and incentivize alternative recreation locations and activities (e.g., work with stakeholders to provide discounts and promote non-traditional recreation activities), and promote temporal alternatives (e.g., promotion of late-fall, winter, or springtime recreation usage) to lessen crowding during traditional peak visitation seasons (e.g., summer and early fall).
- **Secondary Recommendations:** Additionally, resource managers may consider restricting the number of individuals allowed to use the WMNF. There are several management actions which can be employed to limit overall recreation usage including, but not limited to: visitor education, messaging, and signage (e.g., LNT), permitting systems (e.g., lottery permits, first-come first-serve permits, individual site access permits), keeping parking lots at their current capacities, enforcing and restricting overflow parking, high-use corridor reservation systems (e.g., the Kancamagus Highway), alternative transportation systems (e.g., shuttles), or fee implementation (e.g., forest wide entrance fee, raising fees in certain areas and/or at certain sites).

➤ **Issue: Conflict**

- **Resource management plan:** “Seasonal road restrictions should be considered when...it is necessary to resolve conflicts between users” (WMNF, 2005, p.2-29). “Forest Supervisor’s Orders or other means may be used to restrict or close activities, uses, or areas in order to prevent, mitigate, or correct existing or potential resource impacts, trail development, health and safety issues, user conflicts, or other management concerns” (WMNF, 2005, p. 2-3).
- **Survey respondent preference:** Respondents perceived conflict to have a significant negative impact upon the recreation experience; particularly the actions and behaviors of other visitors. Respondents suggest the majority of perceived conflict is asymmetrical or one-way and is most prevalent amongst snowmobiles, mountain bikers, out-of-state visitors (e.g., Massachusetts residents), and individuals who engage in disruptive behaviors (e.g., loud music, shouting, swearing). Additionally, advanced data analyses suggest WMNF visitors are *unable* to cope/deal/behaviorally adapt with issues related to conflict; and that the presence of conflict is leading to the pervasive employment of substitution behaviors and *directly* decreasing visitor satisfaction.
- **Primary Recommendations:** We recommend resource managers consider a two-tiered communication approach to engage stakeholders and visitor, particularly in areas of intensive conflict. The first aspect of messaging could focus on how conflict impacts specific recreation behaviors and experiences. The second aspect of messaging could focus on how conflict impacts the broader natural resources, communities, states, and regions which rely upon high-quality outdoor recreation opportunities. For example, informational campaigns (e.g., press releases, signage, websites, and social media) could convey and encourage specifically zoned recreation locations for certain user types, promote a “share the trails” program in which the needs and perspectives of various user groups are emphasized (e.g., providing hikers a buffer, informing hikers of intent to pass, listening for mountain bike or snowmobile activity), and working with communities to increase education amongst traditionally oppositional user segments (e.g., trail etiquette, social norms, understanding one-way conflict).
- **Secondary Recommendations:** Additionally, resource managers may consider implementing a zoned management approach, or segregating recreation activities, on the WMNF to decrease conflict and limit physical interactions while providing recreation opportunities for all user groups. Resource managers might consider zoning certain areas or trails exclusively for a limited number of recreation activities (e.g., mountain biking, snowmobiling, extended quiet hours) to encourage and concentrate similar recreation activities and separate traditionally oppositional user groups. Resource managers might also consider implementing a temporally zoned management approach (e.g., segregating various user groups by time-of-day, day-of-week, month, or season).

➤ **Issue: Parking or Traffic**

- **Resource management plan:** “The Forest Roads Program will provide a safe, efficient, and seamless transportation and parking network that allows for current, continued, and projected management, use, and enjoyment of the Forest with a variety of challenge levels” (WMNF, 2005, p. 1-16). “The Forest Service will also continue to look for and analyze alternative transportation opportunities to deal with projected increases in parking and traffic volumes” (WMNF, 2005, p. 1-17). “Trailhead parking lots should not be constructed, improved, or expanded solely to accommodate increased recreation use” (WMNF, 2005, p. 2-18).
- **Survey respondent preference:** Respondents perceived parking and/or traffic to have a large and significant negative impact upon the recreation experience. Respondents were very supportive of enforcing regulations against overflow parking and moderately supportive of requiring visitors to use an alternative transportation system and expanding overall parking availability at the WMNF. Additionally, advanced data analyses suggest WMNF visitors can cope/deal/behaviorally adapt with issues related to parking or traffic; and that the presence of traffic and a lack of parking is leading to the pervasive employment of substitution behaviors.
- **Primary Recommendations:** We recommend resource managers consider a two-tiered communication approach to engage stakeholders and visitor, particularly in areas prone to pervasive parking and traffic issues (e.g., Kancamagus Highway, Dianna’s Bath, Lincoln Woods). The first aspect of messaging could focus on how traffic and a lack of parking impacts specific recreation behaviors and experiences. The second aspect of messaging could focus on how traffic and a lack of parking impacts the broader natural resources, communities, states, and regions which rely upon high-quality outdoor recreation opportunities. For example, informational campaigns (e.g., press releases, signage, websites, and social media) could convey specific times and locations where traffic and a lack of parking is prevalent, encourage and incentivize programs for utilizing alternative transportation systems (e.g., priority permitting, local business discounts, frequent rider miles), and work with communities to develop action plans to curb overflow parking (especially on private property).
- **Secondary Recommendations:** Additionally, resource managers may consider implementing an aggressive campaign to combat overflow parking (e.g., ticketing, fines, towing, three-strike rule), especially during traditional peak visitation seasons (e.g., summer and early fall). We suggest resource managers consider working with stakeholders and adjacent communities to implement an alternative transportation (e.g., shuttle) system. We also suggest resource managers do not increase parking infrastructure beyond what is currently available, as the current parking infrastructure serves as a primary means to limit overall visitor capacity.

➤ **Issue: Use Dispersion and Substitution Behaviors**

- **Resource management plan:** “The Forest Service will implement recreation management approaches to provide Forest recreation managers a more complete framework within which to consider management actions. Their purpose is to minimize increased development levels in the backcountry and to protect and manage both high- and low-use areas and facilities” (WMNF, 2005, p. 1-10). “The Forest Service will emphasize concentrating use at specific sites or locations rather than dispersing use within the area or to other areas” (WMNF, 2005, p. 1-13).
- **Survey respondent preference:** Respondents perceived use levels to have a moderate and significant impact upon the recreation experience. Respondents indicated the pervasive need to employ both resource substitution and temporal substitution behaviors; but *not* activity substitution or displacement behaviors. Moreover, advanced statistical analyses suggest that at current levels of impacts for crowding, situational, and ecological impacts on the WMNF, there is an approximately 95% likelihood that visitors will engage in resource and temporal substitution behaviors. Findings suggest the presence of crowding and traffic/parking are the primary impacts leading visitors to engage in use dispersion and substitution behaviors.
- **Primary Recommendations:** We recommend resource managers consider a two-tiered communication approach to engage stakeholders and visitor, particularly in areas of intensive use dispersion and substitution behaviors. The first aspect of messaging could focus on how use dispersion and substitution behaviors influence specific recreation behaviors and experiences. For instance, as a result of resource substitution, visitation often spreads from high- to low-use areas, leading to significant social and ecological impacts. With temporal substitution, visitation may shift to different times of the day, week, month, or year; potentially alleviating conventional high-use periods (e.g., summers, holiday weekends), while increasing overall visitation, especially during off-peak periods (e.g., shoulder seasons, weekdays). The second aspect of messaging could focus on how use dispersion and substitution behaviors impact the broader natural resources, communities, states, and regions which rely upon high-quality outdoor recreation opportunities. For example, informational campaigns (e.g., press releases, signage, websites, and social media) could convey the importance of specific visitation use levels as a mechanism to provide important recreation opportunities (e.g., solitude).
- **Secondary Recommendations:** Additionally, resource managers may consider readjusting and updating the current definitions of people per day at various site stratum. For instance, at both low and moderate use stratum sites, visitors prefer to see significantly more visitors than the current definition, while at very-high use stratum sites, visitors prefer to see significant less visitors than the current definition. Further, resource managers should also consider addressing the primary social and situational impacts (e.g., crowding and parking/traffic) which are driving the employment of resource and temporal substitution behaviors at the WMNF. This implication is even more pronounced when considering management trends towards multiple use recreation areas and diversifying recreation opportunities.

➤ **Issue: Litter, Garbage, Vandalism**

- **Resource management plan:** “Management actions should emphasize education over law enforcement” (WMNF, 2005, p. 2-4). “Education messages should emphasize programs such as “hikesafe” and “Leave No Trace” to foster personal responsibility for safety and to promote low impact in backcountry locations” (WMNF, 2005, p. 2-15).
- **Survey respondent preference:** Respondents perceived visible litter, garbage, and/or vandalism to have a moderate and significant negative impact upon the recreation experience. Respondents are moderately supportive of increased enforcement and regulations against litter, garbage, and/or vandalism at the WMNF.
- **Primary Recommendations:** We recommend resource managers consider a two-tiered communication approach to engage stakeholders and visitor, particularly in areas prone to intensive litter, garbage, and/or vandalism (e.g., Dianna’s Bath, Lincoln Woods, Mirror Lake). The first aspect of messaging could focus on how litter, garbage, and/or vandalism impacts specific recreation behaviors and experiences. The second aspect of messaging could focus on how litter, garbage, and/or vandalism impacts the broader natural resources, communities, states, and regions which rely upon high-quality outdoor recreation opportunities. For example, informational campaigns (e.g., press releases, signage, websites, and social media) could focus on educating visitors and communities regarding the seven primary principles of LNT. These LNT principles could be integrated and applied not only at trailheads, but also reiterated to visitors via stakeholders and partners repeatedly throughout the visitor experience (e.g., hotels, restaurants, attractions).
- **Secondary Recommendations:** Additionally, resource managers may consider implementing greater enforcement towards the presence of litter, garbage, and/or vandalism (e.g., ticketing, fines, three-strike rule), especially during traditional peak visitation seasons (e.g., summer and early fall). We also recommend resource managers consider further educating visitors regarding Leave No Trace (LNT) principles and increasing the presence of volunteers throughout the National Forest to simultaneously educate visitors and serve as informal and indirect authority figures.



## Section 5-2. Management Recommendations Conclusions

The study researchers and authors acknowledge that many of these management preferences and recommendations may be related, overlapping, and/or conflicting. For example, in order to improve parking and traffic conditions, it is suggested that an alternative transportation system be further developed and implemented. However, this may increase crowding at certain locations, as large numbers of visitors are introduced to a finite area within a small window of time. The researchers suggest WMNF resource managers view each of these recommendations and suggestions from a holistic, interconnected, and triage lens in order to assure the most pressing management concerns are met first.

The overarching theme of this section is the suggested implementation of recreation use level limitations, in one form or another. Management strategies that may be effective in controlling visitor use level limitations include, but are not limited to: visitor education, messaging, and signage (e.g., LNT, reiterating proper etiquette/social norms), permitting systems (e.g., lottery permits, first-come first-serve permits, individual site access permits), keeping parking lots at their current capacities, enforcing and restricting overflow parking, high-use corridor reservation systems (e.g., the Kancamagus Highway), alternative transportation systems (e.g., shuttles), fee implementation (e.g., forest wide entrance fee, raising fees in certain areas and/or at certain sites), and/or an overall cap on visitor capacity.

This concept of limiting overall visitor capacity within a parks and protected areas is not novel, and precedent has already been set by numerous parks and protected areas in the United States. For example, after a successful pilot test in 2020, Rocky Mountain National Park has reinstated a timed entry system<sup>11</sup>. In this system, entry permit reservations are released in “waves,” where visitors must register for an entry permit to the park, approximately one month in advance<sup>11</sup>. Visitors are presented two permitting options: 1) full park access and 2) full park access with the exclusion of access to the highest-use corridor<sup>11</sup>. Moreover, the Arapaho and Roosevelt National Forests are now also requiring visitors to make reservations prior to their arrival in order to access certain high-use recreation sites and hiking trails<sup>12</sup>.

In conclusion, the WMNF is an invaluable resource. A unique combination of ecological diversity and high-quality natural resource management, in addition to an abundance of public access, has made the WMNF extremely popular amongst a variety of local, regional, and international visitors. As a social-ecological system, the visitor experience is intimately interconnected with the ecological functioning of the natural resource as well as local and regional economies and workforces. It is imperative that management actions are considered and implemented from a holistic perspective, and that these pervasive social and situational impacts are addressed, in order for the WMNF to ensure the best outcomes for not only recreation visitors, but to preserve and sustain the long-term social, ecological, cultural, and economic integrity of the entire system.

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## Appendix A. Staff, Students Supported, and Outreach/Extension

One undergraduate and one graduate student were employed on this project. Major tasks completed by the undergraduate student included survey data collection and data input. Major tasks completed by the graduate student included survey data collection, and assistance with the data analysis and preparation of project reports and outreach materials. Study results informed the development of the graduate student research, scholarship, and thesis. The following is a description of the staff, support, and outreach.

### a. Students Supported

- i. Number of Undergraduate Students = 1
- ii. Number of Graduate Students = 1
  - Ms. Georgia Giles
- iii. Degrees Awarded = 1

### b. Staff

- i. Number of full-time faculty = 3
  - Dr. Michael Ferguson
  - Dr. Robert Barcelona
  - Dr. Lauren Ferguson
- ii. Number of full-time employees = 0

### c. Publications

- i. Total publication = 1

### d. Volunteer Hours

- i. Total volunteer hours = 0

### e. Outreach/Extension

- i. Number of meetings, workshops, or conferences, and number of attendees = 4; 400 attendees
- ii. Number of public or professional presentations, and number of attendees = 4; 400 attendees

# Appendix B. Survey Cover Letter

## A Survey of White Mountain National Forest Visitors



University of New Hampshire



White Mountain National Forest

Dear White Mountain National Forest visitor,

**We need your help!** The University of New Hampshire and White Mountain National Forest are requesting your participation in a brief survey regarding the outdoor recreation visitor experience at the White Mountain National Forest. You are one of a small group of visitors who are being asked to provide information.

This study is being conducted to better understand the views and perspectives of the outdoor recreation visitors who use the White Mountain National Forest. **The information you provide in this survey is very important**, as it will help inform management actions associated with outdoor recreation visitation at the White Mountain National Forest.

Please note that your participation in this survey is completely voluntary and you may decide to quit at any time. Additionally, all information collected in this survey will be kept confidential. No personal identifying information will be collected in the survey. The survey should take about 10-15 minutes to complete.

**\*\*You do not need to open this package to complete the survey-  
Simply visit the link below to take the survey online.\*\***

**You have two options for completing the survey:**

1. **If you would like to take the survey online**, please go to:  
Online Survey Link: [mypages.unh.edu/wmnfsurvey](http://mypages.unh.edu/wmnfsurvey)
2. **If you would like to take the paper survey**, please complete the enclosed printed survey, and then mail it back in the postage-paid return envelope provided.

If you have any questions or would like any more information about this study, please feel free to contact Dr. Michael Ferguson at the University of New Hampshire. Your cooperation is important and greatly appreciated. Thank you.

Sincerely,

A handwritten signature in cursive script that reads 'Michael Ferguson'.

Michael Ferguson, Ph.D.  
Principal Investigator  
The University of New Hampshire  
Department of Recreation Management and Policy  
[Michael.Ferguson@unh.edu](mailto:Michael.Ferguson@unh.edu)

## Appendix C. Survey Instrument

CONFIDENTIAL

# A Survey of White Mountain National Forest Visitors



University of  
New Hampshire



White Mountain  
National Forest

The University of New Hampshire and White Mountain National Forest are requesting your participation in a brief survey regarding the outdoor recreation visitor experience at the White Mountain National Forest. The information you provide in this survey is important, as it will help inform management actions associated with outdoor recreation visitation at the White Mountain National Forest.

Your participation in this survey is completely voluntary, but very important. You may decide to quit at any time. Rest assured all information collected in this survey will be kept confidential and no personal identifying information will be collected. The survey should take about 10-15 minutes to complete.

**You have two options for completing the survey:**

**If you would like to take the survey online, please go to:**

[mypages.unh.edu/wmnsurvey](http://mypages.unh.edu/wmnsurvey)

**If you would like to take the paper survey, please complete this survey and then mail it back in the postage-paid return envelope provided.**

THANK YOU FOR YOUR COOPERATION!

If you have any questions, comments, or concerns please contact:

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The University of New Hampshire  
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**\*This survey should be taken by the person in the household who has had the most recent birthday and is at least 18 years of age.\***

**Section 1: The Recreation Experience at the White Mountain National Forest**

Please tell us about your recreation experience at the White Mountain National Forest (WMNF).

Please report all answers referring only to your personal experiences.

1. Have you visited the WMNF? \_\_\_ Yes \_\_\_ No [**If NO**- please skip ahead to **Question 17**].

2. Which **one** of those activities was your *primary activity* at the WMNF? [Select **ONE**].

Q2 Answer [Select <b>ONE</b> option].	
	Hiking/walking
	Backpacking
	Mountain biking or bicycling
	Non-motorized boating (canoeing, kayaking, rafting, tubing, etc.)
	Hunting or fishing
	Downhill skiing/snowboarding
	Cross-country skiing or snowshoeing
	Snowmobiling
	Sightseeing or viewing natural features/wildlife
	Picnicking or family day gatherings
	Driving for pleasure
	Relaxing and hanging out
	Camping (developed, undeveloped, primitive, etc.)
	Other: _____

3. Please indicate how satisfied you have been with your overall recreation experiences at the WMNF on a scale from 1-7; 1= *poor* and 7= *perfect*. [Select **ONE** option].

Poor	Fair	Good	Excellent	Perfect
(1)	(2)	(3)	(5)	(7)

4. Please indicate the extent to which you agree or disagree with each of the following statements on a scale from 1-7; 1= *completely disagree* and 7= *completely agree*. [Select **ONE** option for each row].

	Completely Disagree	← Neither →			Completely Agree		
I have thoroughly enjoyed my trips to the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
I cannot imagine better trips to the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
My trips to the WMNF have been well worth the money and time I spend to take them	(1)	(2)	(3)	(4)	(5)	(6)	(7)

5. Please indicate the level of crowding you have experienced while recreating at the WMNF on a scale from 1-9; 1= *not at all crowded* and 9= *extremely crowded*. [Select **ONE** option].

Not at All Crowded	Slightly Crowded	Moderately Crowded	Extremely Crowded
(1)	(2)	(3)	(4)
(5)	(6)	(7)	(8)
(9)			

**Section 2: Perceptions of Undesirable Conditions at the White Mountain National Forest**

The purpose of these next questions is to understand your perceptions of *undesirable conditions* at the WMNF. The term *undesirable conditions* refer to any condition or situation that may negatively impact your overall recreation experience. Please refer to this information when answering the following questions.

6. To what extent have the following *undesirable conditions* impacted your recreation experience at the WMNF on a scale of 1-7; 1= *no impact* and 7= *major impact*. [Select **ONE** option for each row].

"Have any of the following impacted your recreation experience at the WMNF?"	No Impact  Major Impact						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Crowding	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Too many other visitors	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Conflict with other visitors	(1)	(2)	(3)	(4)	(5)	(6)	(7)
The actions or behaviors of other visitors	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Trail degradation (mud, social trails, erosion)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Visible litter, garbage, or vandalism	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Overall sanitation and cleanliness	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Availability of restroom facilities	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Parking or traffic	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Site access (road conditions, road closures, site closures)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Diminished natural snowpack	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Increased tick population	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Changing seasonality (shorter winters, longer summers)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Changing water levels (streams, rivers, lakes)	(1)	(2)	(3)	(4)	(5)	(6)	(7)

7. The following are some strategies people use to deal with *undesirable conditions*. Please indicate whether you have ever done any of the following in response to *undesirable conditions* at the WMNF on a scale of 1-7; 1= *never* and 7= *always*. [Select **ONE** option for each row].

"In response to undesirable conditions at the WMNF, I have..."	Never  Always						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Avoided certain areas of the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Visited different areas of the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Visited a different location <i>within</i> the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Stopped doing my main recreation activity at the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Began a new recreation activity at the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Changed my recreation activity at the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Visited the WMNF during a different season	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Visited the WMNF on a different day of the week	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Visited the WMNF earlier or later in the day	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Avoided visiting the WMNF on holidays	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Stopped visiting the WMNF entirely	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Never visited the WMNF again	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Abandoned my recreation experience on the WMNF entirely	(1)	(2)	(3)	(4)	(5)	(6)	(7)

8. Please tell us more about any *undesirable conditions* that changed the way you recreate at the WMNF (e.g., what happened, when/why it occurred, what/why you changed, where you went instead, etc.)



9. The term *displacement* refers to discontinuing your use of the WMNF due to *undesirable conditions* (e.g., stopped visiting, abandoned the activity, etc.). Have you **ever** been displaced from the WMNF?  
 \_\_\_ No \_\_\_ Yes [**IF YES**] Please tell us more about that experience (e.g., what happened, where/when it happened, when/why it occurred, what/why you changed, where you went instead, etc.)

**Section 3: Perceptions of Visitor Use Levels and Site Types at the White Mountain National Forest**

The WMNF defines visitor use levels for various site types. Visitor use levels refer to the **total number of people per day** (PPD) encountered **at any one site**. These site types are: *Low*, *Moderate*, *High*, and *Very High*. Please refer to this information when answering the following questions.

10. For each of the following site types at the WMNF, what is the **total number of people per day** you would prefer to encounter **at any one site**? [Report **ONE NUMBER FOR EACH** of the following site types].

_____ # of visitors at a <i>low use</i> site	_____ # of visitors at a <i>high use</i> site
_____ # of visitors at a <i>moderate use</i> site	_____ # of visitors at a <i>very high use</i> site

11. The WMNF defines visitor use levels by site types: *Low* (2-4 PPD), *Moderate* (12-15 PPD), *High* (29-36 PPD), and *Very High* (70-90 PPD). Which **one** site type do you prefer while recreating at the WMNF? [Select only **ONE** option].

_____ <i>Low use</i> site (2-4 PPD)	_____ <i>High use</i> site (29-36 PPD)
_____ <i>Moderate use</i> site (12-15 PPD)	_____ <i>Very high use</i> site (70-90 PPD)

**Section 4: Motivations, Place Attachment, and Management Preferences at the WMNF**

The purpose of these next questions is to understand your motivations, feeling of attachment, and management preferences.

12. Please indicate the extent to which you agree or disagree with each of the following statements about the reasons you visit the WMNF on a scale from 1-7; 1= *completely disagree* and 7= *completely agree* [Select **ONE** option for each row].

<i>"I visit the WMNF..."</i>	Completely Disagree	←	Neither	→	Completely Agree		
To experience tranquility	(1)	(2)	(3)	(4)	(5)	(6)	(7)
To experience solitude	(1)	(2)	(3)	(4)	(5)	(6)	(7)
To be close to nature	(1)	(2)	(3)	(4)	(5)	(6)	(7)
To enjoy the sounds of nature	(1)	(2)	(3)	(4)	(5)	(6)	(7)
To become better at my recreation activity (hiking, camping, etc.)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
To develop my skills and abilities	(1)	(2)	(3)	(4)	(5)	(6)	(7)
To talk with new and varied people	(1)	(2)	(3)	(4)	(5)	(6)	(7)
To meet other people in the area	(1)	(2)	(3)	(4)	(5)	(6)	(7)

13. Please indicate the extent to which you agree or disagree with each of the following statements about the WMNF on a scale from 1-7; 1= *completely disagree* and 7= *completely agree* [Select **ONE** option for each row].

	Completely Disagree	←	Neither	→	Completely Agree		
The WMNF means a lot to me	(1)	(2)	(3)	(4)	(5)	(6)	(7)
I feel very attached to the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
No other place can compare to the WMNF for the types of recreation I do here	(1)	(2)	(3)	(4)	(5)	(6)	(7)
I wouldn't substitute any other area for the types of recreation that I do here	(1)	(2)	(3)	(4)	(5)	(6)	(7)
The people in the WMNF area are important to me	(1)	(2)	(3)	(4)	(5)	(6)	(7)
I have many ties to the people in the WMNF area	(1)	(2)	(3)	(4)	(5)	(6)	(7)

14. Please indicate the extent to which you support or oppose each of the following management actions at the WMNF on a scale from 1-7; 1= *strongly oppose* and 7= *strongly support* [Select **ONE** option for each row].

“The WMNF should...”	Strongly Oppose ← Neutral → Strongly Support						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Place limitations on the number of people allowed to use the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Expand parking availability at the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Enforce regulations against overflow parking at the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Expand public shuttle transportation services at the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Require visitors to use public shuttle transportation services at the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Implement a permit system via a lottery at the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Implement a permit system via a first come, first-serve basis at the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Implement a forest wide entrance fee at the WMNF	(1)	(2)	(3)	(4)	(5)	(6)	(7)

**Section 6: Background and Demographic Information**

The survey is almost finished - thank you for sticking with us!

Please tell us a little bit about yourself and keep in mind that all responses are kept confidential.

15. How many **days in the last month** (30 days) have you used the WMNF for outdoor recreation activities? \_\_\_\_\_ days

16. How many **days in the last year** (12 months) have you used the WMNF for outdoor recreation activities? \_\_\_\_\_ days

17. How many **total years** have you used the WMNF for outdoor recreation activities? \_\_\_\_\_ years

18. What is your home ZIP code? \_\_\_\_\_ Visitor is from another country

19. What is your age? \_\_\_\_\_

20. What is your gender? \_\_\_\_\_ Male \_\_\_\_\_ Female \_\_\_\_\_ Non-binary

21. Which of the following best describes your political orientation? [Select **ONE** option].

Extreme Liberal	Very Liberal	Slightly Liberal	Moderate	Slightly Conservative	Very Conservative	Extreme Conservative
(1)	(2)	(3)	(4)	(5)	(6)	(7)

22. With which racial group do you most closely identify? [Select **ONE** option].

- White                       American Indian/ Alaskan Native                       Asian  
 Black/African American                       Native Hawaiian/ Other Pacific Islander                       Other  
 Spanish/Hispanic/Latino                       Middle Eastern/North African

Further detail about race: \_\_\_\_\_

23. In what income category does your household fall? [Select **ONE** option].

- Under \$25,000                       \$75,000-\$99,999                       Don't Know  
 \$25,000-\$49,999                       \$100,000-\$149,999  
 \$50,000-\$74,999                       \$150,000 or more

24. What is the highest level of formal schooling you have completed? [Select **ONE** option].

- Less than high school                       High school graduate                       2-year college                       Graduate/professional degree  
 Some high school                       Some college                       4-year college

25. If you could ask management to improve the operation of the WMNF, what might you ask them to do?

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**Thank you for taking the time to complete this survey.  
This information will be used to improve the management of the WMNF and the overall visitor experience.  
Please send it back to us in the postage-paid envelope provided.**

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