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Whether They Return: Modeling Outdoor Recreation Behaviors, Decision-making, and Intention-to-return in Congressionally Designated Wilderness

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Abstract

Visitation to parks and protected areas (PPAs) has become increasingly widespread in the United States. This increased visitation is especially concerning within congressionally designated wilderness areas where federal agencies are dually tasked with preserving wilderness character while simultaneously providing high-quality outdoor recreation experiences. This study investigated the influence of social, situational, and ecological factors on outdoor recreation visitor behaviors and decision-making within the Lye Brook Wilderness (LBW) area in Vermont, USA. An on-site intercept survey (n=576) was employed to collect data from LBW visitors in the summer of 2021. Multi-variate statistics (e.g., binary logistic regression, structural equation modeling) indicate visitor behaviors (e.g., coping, substitution) and decision-making (e.g., intention-to-return) are significantly influenced by ecological (e.g., trail conditions, weather), situational (e.g., litter, access), and social factors (e.g., conflict). Moreover, the presence of various weather conditions was found to significantly influence the severity of perceived social, situational, and ecological impacts. Study results indicate outdoor recreation experiences are multifaceted, necessitating a suite of social, situational, and ecological considerations, especially when examining the relationship between visitor coping behaviors and intention-to-return. This research advances the coping framework, provides empirical evidence for future examination of social-ecological system (SES) theory, and emphasizes the utility of employing an adaptive systems approach for sustainable PPA management.

Keywords: Outdoor Recreation; Parks and Protected Areas; Visitor Behaviors and Decision-Making; Social-Ecological Systems; Visitor Use Management; Weather Impacts

CHAPTER 1: INTRODUCTION

During the 21st century, outdoor recreation visitation within parks and protected areas (PPAs) in the United States has grown exponentially, with more than half the country participating annually as of 2018 (OFR, 2021). In 2020-2021, outdoor recreation visitation to PPAs reached unprecedented levels due to the COVID-19 pandemic (Ferguson et al., 2022; OFR, 2021). This surge in visitation has become increasingly difficult for PPA resource managers who are presented with the dual mandate of providing both high-quality outdoor recreation experiences while simultaneously protecting these important natural resources. As a result, resource managers are growing increasingly concerned regarding the impacts of social (e.g., crowding, conflict), situational (e.g., litter, access), and ecological (site degradation, weather) factors on visitor behaviors, decision-making, experience quality, and intention-to-return. These impacts are particularly concerning in congressionally designated wilderness areas where the opportunity for solitude (i.e., minimal evidence of human habitation) is a core tenet of the visitor experience (Wilderness Act, 1964). The coping framework suggests that in the presence of impacts, visitors may utilize a variety of behavioral coping mechanisms to preserve their desired outcome (Ferguson et al., 2018; 2021; Miller & McCool, 2003). Yet, assessing the complex interplay between visitor behaviors, decision-making, experience quality, and natural resource quality remains challenging.

A common critique of traditional outdoor recreation research has been a narrow methodological focus upon both scope and scale (Morse, 2020; Perry et al., 2020). For instance, a majority of PPA studies focus solely on *social* issues at *one* specific location (Ferguson et al., 2021; Morse, 2020; Perry et al., 2020). This one-dimensional approach fails to consider both

spatial and contextual variation, thus shortchanging the multifaceted nature of PPAs experiences (Ferguson et al., 2021; Janssen et al., 2007; Morse, 2020; Perry et al., 2020). However, the social-ecological system (SES) conceptual framework suggests the integration and assessment of both social *and* ecological factors, across a broader system-wide spatial scale (i.e., multiple sites and site types), may provide a more holistic and accurate representation of the numerous complex and interconnected systems present within PPAs (Anderies et al., 2004; Colding & Barthel, 2019; Ferguson et al., 2021; Morse, 2020). This study examined the influence of social (e.g., crowding, conflict), situational (e.g., litter, access), *and* ecological factors (e.g., weather, trail degradation) upon visitor coping behaviors, and intention-to-return in the Lye Brook Wilderness (LBW) of the Green Mountain and Finger Lakes National Forests (GMNF). Thus, this study integrated various components of the SES conceptual framework within coping theory in an effort to extend both the scale and applicability of PPA research. Study findings lend themselves to further integration between both SES and visitor use management conceptual frameworks to provide a more comprehensive assessment of the complex human-nature relationship.

CHAPTER 2: LITERATURE REVIEW

2.1 Social-Ecological Systems

A SES refers to a complex system of interdependent social *and* ecological subsystems (Morse, 2020). The SES conceptual framework was originally applied in local ecological contexts, aiding resource managers in assessing complex and adaptive ecological systems and improving their long-term management (Colding & Barthel, 2019; Morse et al., 2020). Although growing recreation visitation has placed unprecedented stress on both social and ecological systems, outdoor recreation research is often criticized for lacking considerations beyond simply the *social* aspects of the visitor experience (Ferguson et al., 2021; Morse, 2020). By incorporating interconnected social and ecological components on a broadened spatial scale, SES serves to more thoroughly address complex visitor use management issues (Anderies et al., 2004; Colding & Barthel, 2019). Moreover, SES and visitor use management frameworks have natural synergies which serve to capitalize on these critical relationships, all in an effort to more comprehensively understand complex human-nature relationships (Cole & Hall, 2010; Marion & Cole, 1996; Outdoor Foundation, 2021).

2.2 Social Factors

Social factors pertain to interactions among humans and the influence of said interaction upon visitor behaviors, experiences, and outcomes (Manning, 2011; Usher & Gómez, 2017). Within the PPA literature, crowding and conflict have emerged as the predominant social factors of study (Manning, 2011). Crowding is typically experienced when visitors perceive there to be too many people in a specific location (Vaske & Shelby, 2008). Conflict often occurs when actions or behaviors of certain visitors interfere with the goals of other visitors (Usher & Gómez,

2017). The relationship between social factors and outdoor recreation experiences has been well documented in the outdoor recreation literature with crowding and conflict demonstrated to influence visitor coping behaviors, intention-to-return, and opportunities for solitude (Arnberger & Brandenburg, 2007; Manning, 2011; Usher & Gómez, 2017).

For instance, research suggests five group encounters per day is the normative standard amongst wilderness visitors before social conditions become unacceptable (Manning, 2011). Li (2018) found a significant negative relationship between levels of perceived crowding and the likelihood of repeat visitation. Tynon and Gómez (2012) found that for coastal recreationists in Hawaii, 71% of visitors experiencing conflict would return, but do so avoiding weekends and holidays, while 66% indicated they would come earlier or later in the day. Arnberger and Brandenburg (2007) found PPA visitors employed temporal, resource, and activity coping behaviors and intended to visit less in the future in response to crowding. Likewise, Schuster et al. (2007) reported 50% of visitors to the Great Gulf Wilderness employed coping behaviors largely due to crowding. In other words, experiencing crowding and conflict often increases visitor coping behaviors and decreases their intention-to-return in PPA settings.

2.3 Situational Factors

Situational factors denote the influence of broad contextual interactions, often with the built environment, upon visitor behaviors, experiences, and outcomes (Ferguson et al., 2021; Koppen et al., 2014; Verlič et al., 2015). Within the outdoor recreation literature, access (e.g., roads, parking, traffic) and litter (e.g., waste, garbage) are commonly studied situational factors. Access can be defined as how easily a resource, destination, or opportunity can be reached (Levine & Garb, 2002). Litter is commonly defined as waste products that have been improperly discarded (Wever et al., 2010). Existing literature has found these situational factors have

significant influences upon visitor coping behaviors and intention-to-return (Hall & Cole, 2007; Schuster et al., 2006).

For example, Taher et al. (2015) found that mountaineers held greater intention-to-return when they perceived an area to be more accessible. Arnberger and Eder (2012) found that visitors to a European PPA were most impacted by litter and vandalism, with 44% of respondents employing coping behaviors and nearly all visitors indicating they would return in the future. Schuster et al. (2006) also found litter to be the most frequently reported undesirable condition when evaluating the coping responses of outdoor recreationists. Similarly, Miller and McCool (2003) found access to facilities to be one of the most frequently reported experiential impacts related to the employment of visitor coping behaviors. More simply, the prevalence of litter and poor accessibility typically leads to coping behaviors amongst PPA visitors.

2.4 Ecological Factors

Ecological factors, commonly referred to as biophysical indicators, consider the influence of the natural environment upon visitor behaviors, experiences, and outcomes (Ferguson et al., 2021; Førland et al., 2013; Marion, 2016). Site degradation (e.g., trail conditions) is a commonly studied ecological factor within the outdoor recreation literature and is broadly defined as recreation use impacts that degrade the quality of a natural resource (Moore et al., 2012). Site degradation has been found to significantly influence visitor coping behaviors and intention-to-return. For instance, Hall and Cole (2007) found that 20% of visitors to wilderness areas in Washington and Oregon employed coping behaviors when encountering heavily impacted trails. Furthermore, when visitors were asked why they would not revisit the area, 25% of respondents listed trail maintenance and site impacts as the main factor preventing their return.

Weather is another important, yet understudied and often overlooked, ecological factor within the outdoor recreation literature (Steiger et al., 2016; Verbos et al., 2018). Weather refers to the day-to-day variation in meteorological conditions within an area (Scott & Jones, 2006). The weather typology primarily used to examine the effect of weather upon outdoor recreation include thermal components (e.g., temperature, humidity), physical components (e.g., precipitation, wind), and aesthetic components (e.g., sky conditions) (Denstadli et al., 2011; Verbos et al., 2018). While the importance of weather upon the recreation experience has been established, limited research has explored the relationship between weather and visitor experiences and behaviors within PPAs (Hewer et al., 2015; 2017; Verbos et al., 2018). This burgeoning area of research suggests weather may significantly influence visitor coping behaviors and intention-to-return. For example, Hübner and Gössling (2012) found that nearly 20% of visitors would not return to their recreation destination due to perceived weather conditions. While McCreary et al. (2019) found that nature-based recreationists often employ various coping behaviors when dealing with weather-related experiential impacts.

2.5 Intention-to-Return

While satisfaction has remained the gold-standard in evaluating the quality of PPA experiences, recent research is driving attention towards other subsequent outcome indicators which may be better suited to predict visitor behaviors (Moore et al., 2015: Rodger et al., 2015). Consequently, post-visit behavioral intentions such as intention-to-return have become an increasingly common measure of experience quality within PPAs (Moore et al., 2015; Pinkus et al., 2016). Intention-to-return can be defined as a visitor's intent to revisit a natural resource where they have previously recreated (Moore et al., 2015; Rodger et al, 2015). Within this growing area of research, findings have been mixed, as some studies find intention-to-return to

be significantly impacted by undesirable conditions, while others report higher levels of intention-to-return despite encountering various impacts (Denstadli et al., 2011, Rodger et al., 2015). These mixed findings may be explained through the coping framework which suggests coping behaviors may be employed in an effort to maintain overall experiences and subsequent intention-to-return, despite the presence of undesirable conditions. While various studies have investigated how social factors influence coping behaviors and intention-to-return, limited research has addressed how social, situational, *and* ecological factors collectively influence coping behaviors and intention-to-return in PPA settings (Ferguson et al., 2021).

2.6 Stress-Coping and Substitution Theories

Visitors to PPAs often employ various coping strategies to minimize the impact presented by social, situational, and/or ecological factors upon their overall recreation experiences (Ferguson et al., 2021; Miller & McCool, 2003). Coping can be defined as behavioral adaptations used to mitigate stressful situations (Folkman & Moskowitz, 2004). The three main components of the stress-coping framework are influencing factors, coping mechanisms, and outcomes (Lazarus & Folkman, 1984). The framework postulates that when a person assesses an environment as stressful, they may utilize various behavioral adaptations (i.e., coping mechanisms) to mediate sub-optimal encounters and ultimately achieve a desired outcome (Ferguson et al., 2018; Lazarus & Folkman, 1984). In the context of PPA research, perceptions of recreation impacts and subsequent coping behaviors are often less pervasive for first-time visitors than repeat visitors, with past on-site experience increasing both perceived impacts and employed coping behaviors (Arnberger & Brandenburg, 2007). Several studies have also modified this framework to include various substitution behaviors germane to outdoor recreation settings (Ferguson, 2016; McCreary et al., 2019; Miller & McCool, 2003).

The four main substitution behaviors are temporal substitution, activity substitution, resource substitution, and displacement (Gentner & Sutton, 2008; Miller & McCool, 2003; Shelby & Vaske, 1991). Temporal, activity, and resource substitution refer to a visitor altering the time, activity, and/or place in which they recreate, respectively (Gentner & Sutton, 2008). Displacement refers to a visitor permanently abandoning their recreation experience altogether (Arnberger & Haider, 2007). Moreover, strategic substitution is an understudied substitution behavior that incorporates alterations to recreation gear and/or equipment (Aas & Onstead, 2013; McCreary et al., 2019). Despite receiving lesser attention in the literature, recent research has integrated strategic substitution for its unique application to natural resource management (Aas & Onstad, 2013; McCreary et al., 2019). Assessing the presence of substitution behaviors in PPAs is an important consideration for the development of sustainable policies as their presence are often indicators of other more severe underlying issues (e.g., intense crowding and/or conflict, profound site degradation).

2.7 Summary and Research Questions

Historically, PPA research has largely assessed issues within a limited scope, often examining a single issue at a specific location, with a primary focus on *social* factors (Manning, 2011; Morse, 2020; Perry et al., 2020). Yet, recent research suggests recreation resources and visitor use management frameworks are complex and adaptive systems, requiring a broader and more comprehensive spatial framework (Ferguson et al., 2021; Morse, 2020; Perry et al., 2020). Limited research, however, has integrated SES concepts within outdoor recreation settings, and even fewer studies have integrated this concept within the coping framework. Similarly, despite the innate relationship between weather conditions and recreation visitation, the influence of weather upon visitor experiences and decision-making remains understudied (Verbos et al.,

2018). This study addressed these gaps by assessing the influence of social, situational, and ecological factors upon coping behaviors across the entire LBW system and builds upon previous research by applying intention-to-return to the coping framework (Ferguson et al., 2021). From a theoretical perspective, parallels were drawn between the SES and coping conceptual frameworks. Further clarity amongst these relationships will assist in developing policies and practices that encourage sustainable PPA management, especially in Congressionally Designated Wilderness Areas where opportunities for solitude are central. To that end, the current study examines the following research questions:

R^1: To what extent are visitors impacted by social, situational, and ecological factors at the LBW?

R^2: To what extent are visitors employing coping behaviors and exhibiting intention-to-return at the LBW?

R^3: What is the relationship between visitor perceptions of weather and social, situational, and ecological impacts and coping behaviors at the LBW?

R^4: What is the relationship between influencing factors, coping behaviors, and intention-to-return at the LBW?

CHAPTER 3: METHODS

3.1 Study Context- The Lye Brook Wilderness

The LBW is the third largest congressionally designated wilderness area within the GMNF (Anderson, 2016). As congressionally designated wilderness, the LBW receives the highest level of resource protection from human impacts (e.g., development and mechanization) to preserve its most natural condition and prioritize opportunities for solitude and undisturbed experiences (Gorte, 2008; Wilderness Act, 1964). As a recreation resource, the LBW encompasses 20 miles of hiking trails, including 4.5 miles of the popular Appalachian/Long Trail, one historic camping shelter, multiple backcountry campsites, two major ponds, and the third largest waterfall in Vermont—the Lye Book Falls (Anderson, 2016). The LBW is also rich in historical, cultural, ecological, and biological value as a landscape recovering from heavy logging and mining (Anderson, 2016). Since recovering, it has become a popular recreation destination for a myriad of local, regional, and international visitors. This is largely because the LBW is located within one day's drive of an estimated 74 million people and surrounded by major roadways on three sides, making it an easily accessible recreation destination (Anderson, 2016). Accordingly, the goal of the GMNF Land and Resource Management Plan is to maintain the LBW for high-quality forest, recreation, community, and economic opportunities for current and future generations (USDA FS, 2006).

3.2 Data Collection

This study employed an on-site exit-use intercept survey of LBW visitors from June to August of 2021. To obtain a diverse and representative sample, researchers established a systematic sampling plan coinciding with peak recreation visitation periods (Vaske, 2008). To

ensure data collection across a broad and diverse spatial scale, multiple survey locations within the LBW were selected for sampling based on conversations with natural resource managers (Morse, 2020; Perry et al., 2020). These survey locations included front-country and back-country trails, thru-hiking and/or long-distance hiking sites, undeveloped campgrounds, and water-based sites. As potential respondents exited the LBW boundary, they were approached by a trained research assistant and asked if they would be willing to participate in a brief 10–15-minute survey regarding their experience *that day*, via a tablet computer using Qualtrics data collection software. Informed consent was obtained from each respondent prior to the beginning of the survey.

To qualify for the study, potential respondents were shown a map of the LBW and asked a prerequisite screen-out question, "Did you specifically enter the LBW during this trip?" If respondents answered 'no' to this question, they were unable to participate in the survey. If respondents answered 'yes' to this question, but were unwilling to participate in the survey, they were asked to complete a separate non-respondent socio-demographic survey. Non-response bias was examined by comparing the socio-demographics between respondents and non-respondents. A lack of non-response bias was determined as a series of chi-square analyses found no significant differences between respondents and non-respondents within any variables. Upon completion of the survey, respondents were thanked for their time. This process resulted in a 93% response rate, with 618 respondents being approached and 576 respondents completing the survey. This survey method response rate was consistent with similar research methods and settings (Ferguson et al., 2018; Tynon & Gómez, 2012).

3.3 Survey Instrumentation

Study respondents were instructed to only consider "this trip to the LBW" while completing the survey. Section one of the survey asked questions regarding visitors' general recreation experience. The next section evaluated visitors' perceptions of various social, situational, and ecological impacts. Respondents were asked "to what extent have the following conditions impacted your recreation experience at the LBW?" Several multi-item survey batteries represented six constructs supported by previously validated literature: 1) crowding (Manning, 2011), 2) conflict (Usher & Gómez, 2017: Ferguson et al., 2021), 3) litter (Moore et al., 2012), 4) accessibility (Dogru-Dastan, 2020; Verlič et al., 2015), 5) weather (Denstadli et al., 2011), and 6) trail conditions, (Moore et al., 2012; Verlič et al., 2015). All impacts were assessed on a seven-point Likert-type scale from one to seven; 1 = no impact and 7 = major impact.

The ensuing survey section evaluated how often visitors employed various coping/substitution behaviors as well as their intention-to-return to the LBW. Respondents were asked to "indicate whether you have done any of the following in response to various conditions at the LBW." The multi-item coping battery represented five previously validated constructs: 1) resource substitution, 2) activity substitution, 3) temporal substitution, 4) strategic substitution, and 5) absolute displacement (Aas & Onstad, 2013; Ferguson et al., 2021; McCreary et al., 2019; Miller & McCool, 2003). Perceptions of substitution behaviors were evaluated on a seven-point Likert-type scale from one to seven; 1 = never and 7 = always. Finally, to evaluate visitors' intention-to-return, respondents were asked to, "Please indicate whether you intend to return to the LBW in the future." This empirically validated single-item

construct was assessed on a seven-point Likert-type scale from one to seven; 1 = definitely not and 7 = without a doubt (Hübner & Gössling, 2012).

3.4 Data Analyses

The data analyses in this study were conducted using the Statistical Package for the Social Sciences (SPSS) version 27.0 and Mplus version 7.11. Frequencies, valid percentages, and measures of central tendency were used to investigate R1 and R2. Binary logistic regression was used to investigate R3. To investigate R4, Structural Equation Modeling (SEM) was used; the model's fit to the data was then assessed via multiple fit indices (Hooper et al., 2008).

CHAPTER 4: RESULTS

4.1 Descriptive Statistics

Among the 576 study respondents, 51% identified as male, 47% as female (see Appendix A - Table A1). Nearly all respondents (91%) indicated their race/ethnicity to be White, while Asian, Spanish/Hispanic/Latino, and African American ethnicities were also reported. Respondents, on average, were 38 years old (median 36 years old). In terms of primary activity, respondents most commonly participated in hiking or walking (52%) with more than one-quarter of the sample (28%) indicating through and/or section hiking the Appalachian/Long trail (see Appendix A – Table A2). Other activities reported included backpacking (10%), dog walking (2%), and nature/wildlife viewing (2%). Approximately 80% of respondents were first-time visitors to the LBW and three-quarters (77%) were day-users. Repeat visitors indicated recreating in the LBW an average of two days per month, 36 days per year, and for 6 total years. Regarding visitor origin, the vast majority of visitors (88%) were from out-of-state, with respondents traveling a median distance of 200 miles from home to access the LBW. The most common out-of-state origins were New York (17%), Massachusetts (11%), and Pennsylvania (7%).

4.2 Research Question One

To investigate the extent to which visitors were impacted by social, situational, and ecological factors at the LBW, respondents assessed a series of multi-item Likert-type scales (1 = no impact, 7 = major impact) (Table 1). Overall, reported impacts and associated means amongst visitors to the LBW were quite low. Results indicate that visitors were most impacted by trail conditions (M = 2.49), weather conditions (M = 2.20), and crowding (M = 2.05). Factors like

access (M = 1.73), litter (M = 1.63), and conflict (M = 1.53) were the least impactful. The individual items that visitors perceived to be the most impactful to their experiences were trail muddiness (M = 4.18) and erosion (M = 2.79), followed by rain (M = 2.55), humidity (2.51), and temperature (M = 2.29).

Table 1. LBW Visitors' Perceived Social, Situational, and Ecological Impacts

Item	Item M	Domain M
[a]**Social Factors – Crowding (α = 0.94)**		
Crowding	2.10 (1.51)	2.05 (1.47)
Too many other visitors	2.00 (1.42)	
[a]**Social Factors – Conflict (α = 0.92)**		
Conflict with other visitors	1.40 (1.05)	
The way other visitors are behaving	1.58 (1.30)	1.53 (1.23)
The actions or behaviors of other visitors	1.60 (1.33)	
[a]**Situational Factors – Litter (α = 0.77)**		
Visible litter, garbage, or waste	1.77 (1.43)	1.63 (1.29)
Domestic animal waste	1.48 (1.15)	
[a]**Situational Factors – Access (α = 0.78)**		
Parking Accessibility	1.74 (1.43)	1.73 (1.43)
Trail Accessibility	1.72 (1.42)	
[a]**Ecological Factors – Trail Conditions (α = 0.78)**		
Trail widening	2.11 (1.66)	
Informal trails	1.87 (1.38)	
Trail erosion	2.79 (1.87)	2.49 (1.62)
Trail muddiness	4.18 (2.07)	
Trail litter	1.51 (1.11)	
[a]**Ecological Factors – Weather Conditions (α = 0.84)**		
Temperature	2.29 (1.65)	
Humidity	2.51 (1.78)	
Rain	2.55 (2.17)	2.03 (1.58)
Strong Winds	1.44 (1.11)	
Cloudiness	1.75 (1.38)	
Visibility	1.68 (1.41)	

[a]Note: Social, situational, and ecological factor variable items (1 = no impact, 7 = major impact)

4.3 Research Question Two

To investigate the extent to which visitors employed coping behaviors at the LBW, respondents assessed a fourteen-item seven-point Likert-type scale of coping behaviors (1 = never, 7 = always) (Table 2). Overall, visitors indicated rarely employing coping behaviors (M =

1.66) in response to the conditions they encountered within the LBW. However, when coping behaviors *were* utilized, visitors most often employed strategic (M = 1.79), temporal substitution (M = 1.77), and resource substitution (M = 1.71). The coping behavior employed least often was activity substitution (M = 1.38).

Table 2. LBW Visitors' Employment of Coping Mechanisms

Item	Item M	Domain M
[a]**Resource Substitution (α = 0.85)**		
Avoided certain areas of the LBW	1.63 (1.37)	
Visited different areas of the LBW	1.78 (1.54)	1.71 (1.47)
Visited a different location within the LBW	1.73 (1.49)	
[a]**Activity substitution (α = 0.83)**		
Stopped engaging in my main recreation activity at the	1.33 (0.93)	
Began a new recreation activity at the LBW	1.46 (1.18)	1.38 (1.04)
Changed my Recreation activity at the LBW	1.36 (1.00)	
[a]**Temporal Substitution (α = 0.88)**		
Visited the LBW during a different season	1.62 (1.46)	
Visited the LBW on a different day of the week	1.76 (1.61)	1.77 (1.62)
Visited the LBW earlier or later in the day	1.87 (1.72)	
Avoided visiting the LBW on holidays	1.81 (1.72)	
[a]**Strategic Substitution (α = 0.73)**		
Changed the gear I use while recreating in the LBW	1.66 (1.39)	1.79 (1.53)
Considered purchasing new gear for future trips to the LBW	1.92 (1.67)	
[a]**Absolute Displacement (α = 0.51)**		
Considered visiting a different location outside of the LBW	1.90 (1.72)	1.61 (1.39)
Considered abandoning my recreation experience entirely	1.37 (1.05)	

[a]Note: Resource, Activity, Temporal, and Strategic Substitution, and Absolute Displacement variable items (1= never, 7= always)

To determine the extent to which LBW visitors exhibited intention-to-return at the LBW, respondents evaluated a single-item Likert-type scale of intention-to-return (1 = Definitely not, 7 = Without a doubt) (Table 3). On average, visitors had high intentions to return to the LBW (M = 5.17). Valid percentages indicate that 65% of respondents were likely to return to the LBW and 14% of respondents were unlikely to return. Within that, 31% of respondents indicated they would return to the LBW "without a doubt" and 3% indicated they would "definitely not" return (Table 3).

Table 3. LBW Visitors' Intention-to-return Rating

Mean (SD)	Valid Percentages						
5.17 (1.65)	(1) 3.1%	(2) 4.9%	(3) 5.9%	(4) 20.7%	(5) 19.2%	(6) 15.6%	(7) 30.6%

*Note: Intention-to-return single item (1 = definitely not, 7 = without a doubt)
*Note: Percentages may not equal 100 because of rounding.

4.4 Research Question Three

Multiple binary logistic regression (BLR) analyses were conducted to investigate the relationship between LBW visitors' perceptions of weather conditions and social, situational, and ecological impacts and coping behaviors. Variable selection for the regression models was based upon prominent social, situational, and ecological impacts and coping behaviors identified throughout the literature (see section 2.0). Exploratory factor analysis was then used to create a latent factor variable for each of the multi-item impact factors and coping behaviors based on the measured items in Tables 1 and 2. Next, the seven-point latent impact and coping constructs (1 = no impact, 7 = major impact; 1 = never, 7 = always) were recoded into dichotomous dummy dependent variables: 1 was recoded as 0 (i.e., no impact perceived) and 2-7 were recoded as 1 (i.e., an impact was perceived). Although coping behaviors were initially hypothesized as an outcome variable within the regression analyses, the decision was made to exclude them from the final regression models due to issues with insignificance and poor predictability. The subsequent models determine the likelihood of visitors perceiving social, situational, and/or ecological impacts at the currently reported mean levels for perceived weather impacts (Table 4). When determining the likelihood of perceiving impacts, the mean score for weather factors was held constant to represent the average LBW visitor response.

Table 4. Binary Logistic Regression Models - Predicting LBW Visitor Impacts

	Nagelkerke R Square	*β*	*Wald*	*Odds Ratio*
Social factors - Crowding Model[a]				
Weather factors	0.078	0.438	29.463***	1.550
Constant		-0.896	24.873***	0.408
Social factors - Conflict Model[b]				
Weather factors	0.082	0.431	31.398***	1.539
Constant		-1.747	82.227***	0.174
Situational factors - Litter Model[c]				
Weather factors	0.034	0.271	13.902***	1.311
Constant		-1.011	33.545***	0.364
Situational factors - Access Model[d]				
Weather factors	0.028	0.246	11.564***	1.279
Constant		-1.025	34.382***	0.359
Ecological factors - Trail Conditions Model[e]				
Weather factors	0.135	1.235	21.056***	3.437
Constant		0.158	0.168	1.172

*Significant at .05 level, **significant at .01 level, ***significant at .001 level*Note. W = reported mean for latent weather factor

[a] *Ln*(odds) = -0.896 + 0.438(W)
[b] *Ln*(odds) = -1.747 + 0.431(W)
[c] *Ln*(odds) = -1.011 + 0.271(W)
[d] *Ln*(odds) = -1.025 + 0.246(W)
[e] *Ln*(odds) = 0.158 + 1.235(W)

The first model established perceived negative impacts from weather were associated with a higher likelihood that visitors would perceive negative crowding impacts. Perceived negative weather impacts significantly predicted perceived negative crowding impacts, with an odds ratio of 1.55:1. This model suggests that at the reported mean levels for perceived negative weather impacts, there is a 50% likelihood that visitors will perceive negative crowding impacts. Yet, if the mean values for perceived negative weather impacts increased by 1-point, the likelihood that visitors will perceive negative crowding impacts increases to 61% (Table 5). This model correctly classified 60% of respondents into appropriate categories.

In the second model, perceived negative impacts from weather were associated with a higher likelihood that visitors would perceive negative conflict impacts. Perceived negative weather impacts significantly predicted perceived negative conflict impacts, with an odds ratio of 1.54:1. This model suggests that at the reported mean levels for perceived negative weather

impacts, there is a 30% likelihood that visitors will perceive negative conflict impacts. Further, if the mean values for perceived negative weather impacts increased by only 1-point, the likelihood that visitors will perceive negative conflict impacts increases to 39% (Table 5). This model correctly classified 60% of respondents into appropriate categories.

The third model determined perceived negative impacts from weather were associated with a higher likelihood that visitors would perceive negative litter impacts. Perceived negative weather impacts significantly predicted perceived negative litter impacts, with an odds ratio of 1.31:1. This model suggests that at the reported mean levels for perceived negative weather impacts, there is a 39% likelihood that visitors will perceive negative litter impacts. Moreover, if the mean values for perceived negative weather impacts increased by just 1-point, the likelihood that visitors will perceive negative litter impacts increases to 45% (Table 5). This model correctly classified 63% of respondents into appropriate categories.

The fourth model indicated perceived negative impacts from weather were associated with a higher likelihood that visitors would perceive negative access impacts. Perceived negative weather impacts significantly predicted perceived negative access impacts, with an odds ratio of 1.27:1. This model suggests that at the reported mean levels for perceived negative weather impacts, there is a 33% likelihood that visitors will perceive negative access impacts. Additionally, if the mean values for perceived negative weather impacts increased by 1-point, the likelihood that visitors will perceive negative access impacts increases to 43% (Table 5). This model correctly classified 63% of respondents into appropriate categories.

In the fifth model, perceived negative impacts from weather were associated with a higher likelihood that visitors would perceive negative trail impacts. Perceived negative weather impacts significantly predicted perceived negative trail impacts, with an odds ratio of 3.44:1.

This model suggests that at the reported mean levels for perceived negative weather impacts, there is a 94% likelihood that visitors will perceive negative trail impacts. Furthermore, if the mean values for perceived negative weather impacts increased by one singular point, the likelihood that visitors will perceive negative trail impacts increases to 98% (Table 5). This model correctly classified 89% of respondents into appropriate categories.

Table 5. Binary Logistic Regression Models - Extrapolations Predicting LBW Visitor Impacts

	Likelihood of Visitor Impact (%)		
	Reported Mean -1	Reported Mean	Reported Mean +1
Social factors - Crowding Model[a]	39.1%	50.0%	60.7%
Social factors - Conflict Model[b]	21.4%	29.6%	39.2%
Situational factors - Litter Model[c]	32.5%	38.7%	45.3%
Situational factors - Access Model[d]	31.6%	37.2%	43.1%
Ecological factors - Trail Conditions Model[e]	80.8%	93.6%	98.0%

[a-e]Note: Variable model refers to BLR models in Table 3.

4.5 Research Question Four

To evaluate the over-arching relationship between influencing factors, coping behaviors, and intention-to-return at the LBW, Structural Equation Modeling (SEM) was employed. Confirmatory factor analysis (CFA) (Table 6) was used to generate a measurement model for weather, social/situational, trail, and coping factors. The latent variables derived from these CFAs were then connected using theoretically informed structural regression pathways (see section 2.0). Results indicate significant relationships with satisfactory pathway coefficients between influencing factors, coping behaviors, and intention-to-return (Table 6; Figure 1).

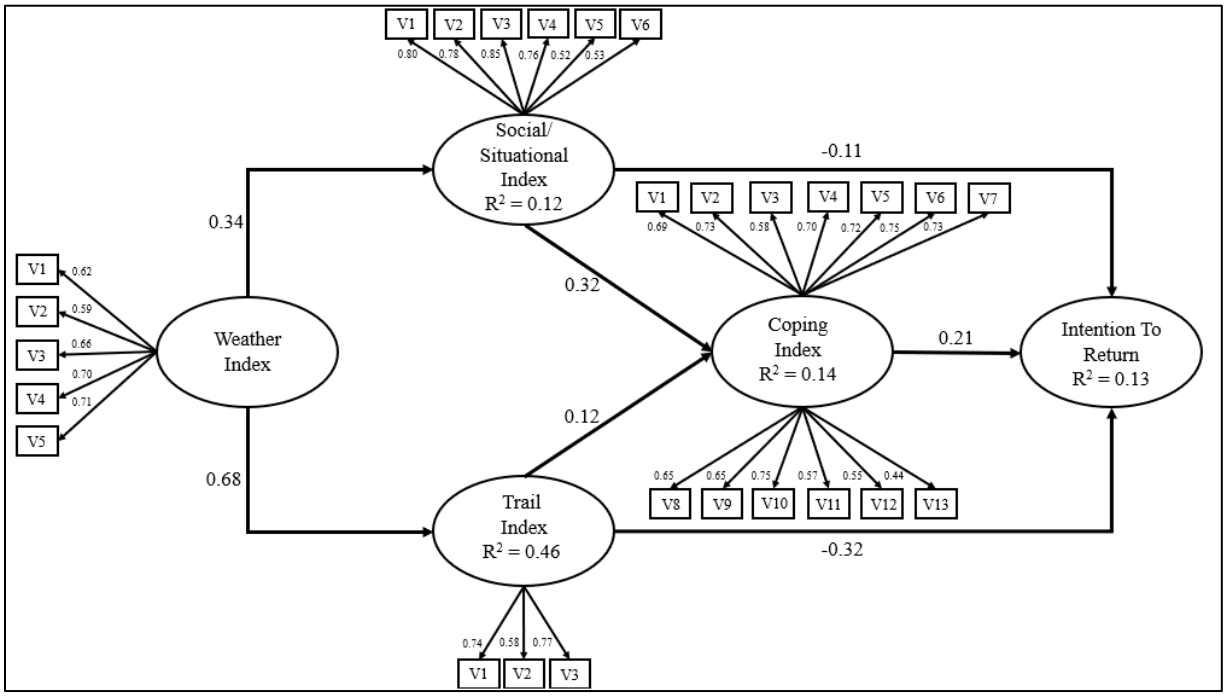
Table 6. LBW Confirmatory Factor Analysis for Structural Equation Model

Code[a]	Item	Loading[b]	Item M (SD)	Domain M (SD)
Weather Factors[c]				
V1	Temperature	0.62	2.29 (1.65)	
V2	Humidity	0.59	2.51 (1.78)	
V3	Rain	0.66	2.55 (2.17)	2.20 (1.68)
V4	Cloudiness	0.70	1.75 (1.38)	
V5	Visibility	0.71	1.68 (1.41)	
Social/Situational Factors[c] ($\alpha = 0.87$; $R^2 = 0.12$)				
V1	The way other visitors are behaving	0.80	1.58 (1.30)	
V2	The actions or behaviors of other visitors	0.78	1.60 (1.33)	
V3	Visible litter, garbage, or waste	0.85	1.77 (1.43)	1.64 (1.34)
V4	Domestic animal waste	0.76	1.48 (1.15)	
V5	Parking accessibility	0.52	1.74 (1.43)	
V6	Trail Accessibility	0.53	1.72 (1.42)	
Trail Factors[c] ($\alpha = 0.83$; $R^2 = 0.46$)				
V1	Trail widening (e.g., excessive width)	0.74	2.11 (1.66)	
V2	Informal trails (e.g., social trails)	0.56	1.87 (1.38)	2.26 (1.64)
V3	Trail erosion (e.g., bare soil)	0.77	2.79 (1.87)	
Coping[d] ($\alpha = 0.91$; $R^2 = .14$)				
V1	Visited different areas of the LBW	0.69	1.78 (1.54)	
V2	Visited a different location within the LBW	0.73	1.73 (1.49)	
V3	Stopped engaging in my main recreation activity at the LBW	0.58	1.33 (0.93)	
V4	Began a new recreation activity at the LBW	0.70	1.46 (1.18)	
V5	Changed my Recreation activity at the LBW	0.72	1.36 (1.00)	
V6	Visited the LBW during a different season	0.75	1.62 (1.46)	
V7	Visited the LBW on a different day of the week	0.73	1.76 (1.61)	
V8	Visited the LBW earlier or later in the day	0.65	1.87 (1.72)	1.66 (1.01)
V9	Avoided visiting the LBW on holidays	0.65	1.81 (1.72)	
V10	Changed the gear I use while recreating in the LBW	0.75	1.66 (1.39)	
V11	Considered purchasing new gear for future trips to the LBW	0.57	1.92 (1.67)	
V12	Considered visiting a different location outside of the LBW	0.55	1.90 (1.72)	
V13	Considered abandoning my recreation experience entirely	0.44	1.37 (1.05)	
Intention-to-return[e] ($R^2 = 0.13$)		---	5.17 (1.65)	

[a]Note: Variable code refers to SEM model, see Figure 1.
[b]Note: Standardized factor loadings. All loadings were significant at $p<.005$.
[c]Note: Weather, social/situational, and trail impacts latent variable items (1 = no impact, 7 = major impact)
[d]Note: Coping latent variable (1 = never, 7 = always)
[e]Note: Intention-to-return single item (1 = definitely not, 7 = without a doubt)

The final SEM, using maximum likelihood estimation, with all CFAs and structural regression pathways, is displayed in Figure 1. The SEM showed good fit to the data (χ^2:494.3; *df*=327; p<.001; CFI=0.97; TLI=0.96; RMSEA=0.03; SRMR=.05). Model pathways suggest weather factors accounted for a substantial portion of the variance in influencing factors (social/situational factor R^2 = 0.117; trail factor R^2 = 0.463) but were not significantly related to coping behaviors. However, influencing factors accounted for notable variance in coping behaviors employed by visitors (R^2= 0.135). Furthermore, coping behaviors partially mediated the effects of social/situational and ecological factors on intention-to-return. The latent variable for social/situational had a direct positive relationship with coping behaviors and a direct negative relationship with intention-to-return (standardized parameter estimates of 0.319 and -0.110 respectively). The trail index latent variable had a direct positive relationship with coping behaviors and a direct negative relationship with intention-to-return (standardized parameter estimates of 0.124 and -0.321 respectively).

Figure 1. Structural Equation Model for LBW Visitors[a]



[a]Note: χ^2:494.3; *df*=327; p<.001; CFI=0.97; TLI=0.96; RMSEA=0.03; SRMR=.05

[*]Note: All relationships and error covariances were significant at p<.05

*Note[1]: SEM included several error covariances between measured variables based on theoretical constructs: CopingV4 with V5 and V6; CopingV5 with V6; CopingV2 with V3; CopingV9 with V8 and V7; CopingV13 with V14; CopingV12 with V14; CopingV10 with V9 and V8; CopingV8 with V7; WeatherV1 with V2; WeatherV5 with V3 and V6; Social/Situational V3 with V4; Social/SituationalV4 with V5; TrailV1 with V2

CHAPTER 5: DISCUSSION

Visitation to PPAs across the country has surged in recent years. This dramatic increase in visitation has raised concerns over the outdoor recreation visitor experience as well as the overall longevity and resilience of natural resources. Such concerns are even more pronounced in congressionally designated wilderness areas that are managed for primal experiences and opportunities for solitude. The current study assessed the influence of social, situational, and ecological factors upon coping behaviors and visitors' intention-to-return across multiple spatial sites within the LBW. Findings suggest various social, situational, and ecological factors had a significant influence upon visitor behaviors and future decision-making. Study results extend the SES and coping frameworks and emphasize the value of assessing not only social factors, but also ecological and situational factors within the visitor experience.

5.1 Theoretical Implications

Study findings have several implications relative to the SES concepts, coping theory, and weather. Assessing both social *and* ecological aspects of PPAs on a broader spatial scale was central to this study. This approach determined that not only social, but also situational *and* ecological factors significantly influenced visitors' behaviors and experiences at multiple sites within the LBW (Ferguson et al., 2020). Results validate the existing literature regarding social factors (Morse, 2020; Perry et al., 2020) and extend the outdoor recreation literature by evaluating and comparing the influence of multiple classes of impacts (e.g., social, situational, *and* ecological factors) on coping behaviors and intention-to-return at several spatial locations within the LBW. Results further suggest that visitors are currently adapting their behaviors (e.g.,

coping) to mitigate various impacts (e.g., social, situational, and ecological) within the LBW system, spreading their use of the resource both spatially and temporally (Anderies et al., 2004; Janssen et al., 2007). For example, as increasing use-levels cause perceptions of undesirable conditions to become more severe, visitors reported avoiding certain locations within the LBW as well as changing where they recreated within the LBW (i.e., spatial adaptations). Visitors also reported changing the time of day and day of week they recreate (i.e., temporal adaptations). The presence of these pervasive impacts and subsequent coping mechanisms alludes to the LBW system's ability to adapt to increasing visitation, further emphasizing the robustness and resiliency of both the LBW visitor and system (Anderies et al., 2004; Janssen et al., 2007).

Results also extend the limited existing research examining the relationship between weather and outdoor recreation behaviors and decision-making. In the presence of undesirable weather conditions (e.g., temperature, rain, humidity, cloudiness, visibility), LBW visitors are very likely to be impacted by ecological factors such as physical trail conditions and somewhat likely to be impacted by social and situational factors such as crowding, conflict, litter, and access. Findings further suggest that when undesirable weather conditions are low (i.e., nice weather), social impacts may become more pronounced. These results corroborate the literature regarding weather's general influence upon outdoor recreation experiences and extends the literature by empirically validating the direct relationship between weather and perceived social, situational, and ecological impacts (Verbos et al., 2018). (Denstadli et al., 2011; McCreary et al., 2019; Verbos et al., 2018). These findings also extend the literature by examining *in-situ* the influence of not only temperature, but also other weather conditions such as rain, humidity, cloudiness, and visibility (Denstadli et al., 2011; Hewer et al., 2017; McCreary et al., 2019: Steiger et al., 2016; Verbos et al., 2018). Also, while weather factors *were not* found to directly

influence visitor coping behaviors, they *were* found to be moderate predictors of social/situational factors (e.g., conflict, accessibility) and strong predictors of trail conditions (e.g., trail widening and erosion), both of which predict visitor coping behaviors. These findings further extend the literature by detailing *how* PPAs visitors interact with weather (Verbos et al., 2018) to better understand their weather-based decision making.

Study results also suggest several insights for the coping literature. Findings determined that strategic substitution (i.e., changing the gear used while recreating), along with temporal (i.e., changing the time of day and/or day of week one recreates) and resource substitution (i.e., changing the site recreated on within an area), were the most frequently employed behavioral adaptations. These findings validate the coping literature suggesting visitors most often employ temporal and resource substitution behaviors to mitigate experiential impacts (McCreary et al., 2019). Results further indicate social factors (e.g., conflict), situational factors (e.g., litter, access), and ecological factors (e.g., trail conditions) significantly influenced coping behaviors. The extent to which coping behaviors mediate the effect of influencing factors upon intention-to-return is much higher for social/situational factors than ecological factors. In other words, it is much easier for visitors to cope with undesirable social/situational factors than it is ecological factors to maintain their intention-to-return. Taken together, study results reaffirm the literature by suggesting visitors are able to successfully employ coping mechanisms to mediate the relationship between social impacts and experience quality (Ferguson et al., 2021; Getner & Sutton, 2008; Miller & McCool, 2003). Study findings extend the coping literature by empirically demonstrating visitor abilities to successfully mediate the influence of both situational and ecological impacts upon outcomes *beyond* experience quality and satisfaction (e.g., intention-to-return) (Ferguson et al., 2018; 2021).

5.2 Management Implications

Study results suggest several challenges and opportunities that may also be of interest for PPA managers, particularly those managing congressionally designated wilderness areas where opportunities for solitude and minimal human impacts are integral components of the visitor experience. For instance, the study sample largely consisted of first-time, out-of-state visitors traveling a median 200 miles to the LBW. This not only suggests that LBW is a *destination wilderness* location, but also that reported impacts and coping behaviors may be artificially low as first-time visitors often do not perceive impacts nor cope as much as repeat visitors (Arnberger & Brandenburg, 2007). Still, research question one found that visitors were most impacted by trail conditions (e.g., trail muddiness, erosion, widening) followed by weather (e.g., rain, humidity, temperature). Outside of ecological factors, visitor experiences were also impacted by social factors such as crowding; however, these impacts were generally less pervasive. These findings are critical for resource managers in an SES context, indicating that ecological factors are just as important, if not more important to consider when managing outdoor recreation resources (Colding & Barthel, 2019).

Moreover, as is evidenced in research question three, the presence of undesirable weather conditions contributed to a much higher likelihood that visitors would perceive additional social, situational, and/or ecological impacts. Recognizing recreation managers cannot control the weather, findings indicate the importance of proactive management strategies and communication when mitigating the effects of weather on visitor experiences and natural resources. Findings also suggest that a one-point increase in weather severity further increases the likelihood of visitors experiencing other social, situational, and/or ecological impacts by up to 10% (Table 6). This relationship is critical for managers to consider as weather-dependent

outdoor recreationists are becoming subject to increasingly atypical and adverse weather conditions due to climate change (Verbos & Brownlee, 2017; Verbos et al., 2018).

Results further indicate that as LBW visitors encounter undesirable conditions, they typically use strategic, temporal, and resource substitution behaviors to maintain their experiences. In these instances, visitors' coping behaviors may generate additional impacts on other LBW visitors, the resource itself, as well as adjacent communities and economies. For example, shifting visitation away from high-use areas, as is common with resource substitution, can cause low-use areas with fragile ecosystems to become significantly impacted. Visitors requiring additional gear, consistent with strategic substitution, may also continue to recreate under circumstances they normally would not (e.g., during inclement weather) which may lead to further resource degradation. Since these types of behavioral adaptations inherently alter the demand placed on recreation resources, and are indicative of larger underlying issues, proactively addressing them should be a top priority for managers.

Despite the employment of various coping behaviors, SEM results indicate LBW visitors, through coping behaviors, are only able to *partially* mediate the impacts associated with social/situational and ecological factors (Figure 1). The model also suggests that visitors can more effectively cope with social/situational factors than ecological factors, with ecological factors resulting in more extensive impacts to visitor return intentions. Said another way, visitors are largely unable to cope with ecological impacts, and the presence of these ecological impacts are decreasing future intentions-to-return for recreation more than social/situational factors. However, these findings are advantageous for resource managers as social impacts can be more difficult and resource intensive to address (e.g., ranger patrol to combat instances of crowding and conflict), whereas ecological impacts are comparatively simple, time, and cost efficient to fix

(e.g., installing water-bars and trail communication). Similarly, results further help resource managers justify infrastructure upgrades. These findings are also *vital* to wilderness managers entrusted with maintaining natural resources in their *most natural* state to fulfill visitor expectations of solitude. Thus, from a management perspective, ecological impacts should be a primary focus as they more severely detract from visitor experiences, especially as use-levels and associated impacts intensify amidst the COVID-19 pandemic (Beery et al., 2021; Derks et al., 2020).

Accordingly, wilderness managers may find value in adopting policies to specifically address impacts from weather, trail conditions, and crowding, reducing the need for visitor coping behaviors and ultimately protecting both visitor experiences and natural resources. For example, indirect management strategies are well suited for addressing uncontrollable weather-associated impacts. These might include signage and/or educational campaigns around desired behaviors (e.g., Leave No Trace) and the susceptibility of natural resources to human impacts during and/or after inclement weather. Managers might also consider enforcing more direct management policies to address the prevalence of crowding and worsening trail conditions. These may involve policies regarding limiting group-sizes, reservation systems, requiring visitors to stay on designated trails, and/or modifying existing infrastructure to guide visitor behaviors. While these more direct management approaches are typically less favored by visitors in wilderness settings, they are often more effective and receive support when implemented specifically to combat worsening conditions (Hall et al., 2010; Manning, 2011). Together, coupling direct and indirect management strategies to address social, situational, *and* ecological factors may aid resource managers in reducing negative experiential impacts to wilderness visitors and support the sustainable management of recreation resources.

5.3 Implications for Future Research

Considering the findings and scope of the current study, there are multiple implications for future research. While this study focused on the influence of specific social, situational, and ecological factors on visitor coping behaviors, these factors only explained *some* of the variance in coping, suggesting the presence of other unknown factors is contributing to coping behaviors. Future studies might consider further examining additional elements within this typology of factors (e.g., ecosystem services) as well as other types of influencing factors (e.g., motivational factors) and their roles in the coping process. Moreover, this study operationalized an extended substitution typology that found strategic coping mechanisms to be favorable. As a comparatively understudied coping mechanism, future studies should further develop the construct used to measure strategic coping behaviors. This study used a single-item intention-to-return construct as an outcome in the coping process. Recognizing the complex nature of determining the behavioral intentions of PPAs visitors, future studies should consider a more robust, multi-item measure coupled with intention-to-return, such as visitor loyalty (Rodger et al., 2015). In pursuit of further broadening the applicability of the coping framework, future research might also consider assessing other suitable variables as outcomes in the coping process such as support for management actions and/or health benefits derived from recreating.

Although this study also incorporated several SES concepts by evaluating a broadened spatial scale as well as social, situational, *and* ecological factors within PPAs, it did not explicitly test SES theory. Future research might consider applying and evaluating SES theory to more intricately examine the interdependent social systems (e.g., resource users, public infrastructure providers) and ecological systems (e.g., the resource, public infrastructure) within PPA experiences (Anderies et al., 2004). Additionally, future research should consider evaluating

activity-specific influencing factors and subsequent coping behaviors amongst PPAs visitors. Broadening the approach of future research in such ways may positively impact the diversity of collected samples and further increase the generalizability and applicability of future findings. Moreover, this study collected cross-sectional perception data related to weather conditions as they influenced wilderness visitors over a three-month period in the summer. Future studies should not only consider collecting weather data longitudinally across multiple seasons, but also across various climates and in a variety of PPAs settings and activities to better understand weather's influence on visitor experiences. Future studies might also consider integrating components of the weather dependency framework (Verbos & Brownlee, 2017) to more comprehensively examine the relationship between weather and PPA experiences.

CHAPTER 6: CONCLUSION

Increasing outdoor recreation visitation has strained PPAs managers' ability to preserve both high-quality visitor experiences and natural resources. This dual mandate is particularly challenging in congressionally designated wilderness areas where resource managers must provide visitors with opportunities for solitude. To extend the scope and applicability of outdoor recreation research, this study incorporated concepts from the SES and coping frameworks to evaluate visitor behaviors, experiences, and intention-to-return in the LBW. Study results indicate that not only social factors, but also situational *and* ecological factors significantly influenced visitor experiences, coping behaviors, and intention-to-return to the LBW. Results further demonstrate that undesirable weather conditions increase the prevalence of perceived impacts. Results also indicate that LBW visitors can more effectively cope with social and situational impacts, as opposed to ecological impacts, in wilderness settings. These findings suggest PPAs experiences are multifaceted, requiring social, situational, *and* ecological considerations for proactive sustainable visitor use management to be successful. This research provides empirical evidence to support both the coping and SES theory frameworks and emphasizes the prominence and utility of employing an adaptive systems approach for sustainable PPA management. Further clarity amongst these relationships will assist in developing policies and practices that encourage sustainable PPA management, especially in congressionally designated wilderness where opportunities for solitude are central.

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APPENDICES

Appendix A: LBW Visitor's Descriptive Characteristics

Table A1. LBW Visitor's Sociodemographic Information

Variable	**% or Mean**	***n***
Gender		
Male	50.6%	280
Female	47.0%	260
Non-binary	1.4%	8
Age		
Average age	38 years	
18-35	48.4%	248
36-50	28.0%	143
51-63	23.6%	121
Race/Ethnic Background		
White	90.6%	503
Other	9.4%	59
Education		
Less than High School	>1.0%	2
Some High School	>1.0%	3
High School Graduate	5.1%	28
Some College	9.9%	54
Two Year College	5.3%	29
Four Year College	37.1%	202
Graduate or Professional Degree	41.5%	226
Political Ideology[a]		
Mean	3.34	549
Liberal	58.1%	319
Moderate	21.7%	119
Conservative	20.2%	111

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

[a]Note. Political Ideology (1= extreme liberal, 4= moderate, 7= extreme conservative)

Table A2. LBW Visitor's Trip Visitation Characteristics

Variable	% or Mean	*n*
Primary Activity Type		
Hiking or walking	52.4%	294
Backpacking	10.2%	57
Through hiking the Appalachian/Long trail	22.8%	128
Section hiking the Appalachian/Long trail	5%	28
Dog walking	2.1%	12
Trail running	>1%	5
Sightseeing or viewing natural features and/or wildlife	2.3%	13
Picnicking or family day gatherings	>1%	1
Relaxing and hanging out	>1%	5
Camping	2.0%	11
Fishing	>1%	1
Canoeing or kayaking	>1%	1
Swimming	>1%	1
Other	>1%	4
Experience Use History		
First-time visitors	80.1%	552
Returning visitors - average days in the last month	1.47 days	107
Returning visitors - average days in the last year	3.07 days	107
Returning visitors - average total years recreating	6.43 years	99
Trip Characteristics		
Day users	76.5%	421
Overnight Users	23.1%	129

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

Appendix B: IRB Approval Letter

University *of* New Hampshire

Research Integrity Services, Service Building
51 College Road, Durham, NH 03824-3585
Fax: 603-862-3564

12-Apr-2021

Ferguson, Michael D

IRB #: 8501
Study: Assessing Visitor Use Management in the Lye Brook Wilderness Area of the Green Mountain National Forest
Approval Date: 06-Apr-2021

The Institutional Review Board for the Protection of Human Subjects in Research (IRB) has reviewed and approved the protocol for your study as Exempt as described in Title 45, Code of Federal Regulations (CFR), Part 46, Subsection 104(d). Approval is granted to conduct your study as described in your protocol.

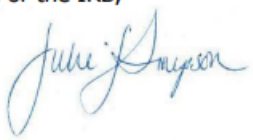
Researchers who conduct studies involving human subjects have responsibilities as outlined in the attached document, *Responsibilities of Directors of Research Studies Involving Human Subjects.* (This document is also available at http://unh.edu/research/irb-application-resources.) Please read this document carefully before commencing your work involving human subjects.

Note: IRB approval is separate from UNH Purchasing approval of any proposed methods of paying study participants. Before making any payments to study participants, researchers should consult with their BSC or UNH Purchasing to ensure they are complying with institutional requirements. If such institutional requirements are not consistent with the confidentiality or anonymity assurances in the IRB-approved protocol and consent documents, the researcher may need to request a modification from the IRB.

Upon completion of your study, please complete the enclosed Exempt Study Final Report form and return it to this office along with a report of your findings.

If you have questions or concerns about your study or this approval, please feel free to contact Melissa McGee at 603-862-2005 or melissa.mcgee@unh.edu. Please refer to the IRB # above in all correspondence related to this study. The IRB wishes you success with your research.

For the IRB,



Julie F. Simpson
Director

cc: File