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The Role of Tourism Impacts on Cultural Ecosystem Services

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Abstract: Parks and protected areas are recognized for the important ecosystem services, or benefits, they provide society. One emerging but understudied component is the cultural ecosystem services that parks and protected areas provide. These cultural ecosystem services include a variety of benefits, such as cultural heritage, spiritual value, recreation opportunities, and human health and well-being. However, many of these services can only be provided if people visit these parks and protected areas through tourism opportunities. However, with this tourism use comes a variety of inevitable resource impacts. This current research connects potential impacts from tourism in parks and protected areas to the health and well-being aspect of cultural ecosystem services. We used an MTurk sample to record affective responses across a range of resource conditions. Results demonstrate that as tourism-related ecological impacts increased, positive affect decreased. Decreases in positive affect were more severe for park and protected area scenes featuring informal and/or undesignated social trails when compared to scenes with increasing levels of trampling/vegetation loss. Collectively, the results show that managing tourism in parks and protected areas in a manner that reduces impact is essential to providing beneficial cultural ecosystem services related to human health and well-being.

Keywords: cultural ecosystem services; affect; Leave No Trace; impacts; health; well-being

1. Introduction

Parks and protected areas are increasingly being recognized for the human health and well-being benefits they provide [1–7]. These benefits, referred to as ecosystem services, continue to be quantified with regard to their provisioning, regulation, and support [8]. However, cultural ecosystem services are largely unexplored. According to the Millennium Ecosystem Assessment, cultural ecosystem services are "nonmaterial benefits people obtain from ecosystems" and include "cultural diversity, spiritual religious values, knowledge systems, educational values, inspiration, aesthetic values, social relations, sense of place, cultural heritage values, recreation, and ecotourism" [8]. Daniel et al. [9] (2012) and the Millennium Assessment Ecosystems and Human Well-being Synthesis (2005) [10] have highlighted the complexities of measuring cultural ecosystem services that arise from the often intangible or subjective nature of data associated with these functions.

Despite these challenges, researchers from broad disciplines that fit within the purview of cultural services have begun to address this need by defining frameworks and methodologies to quantify these benefits [9,11,12]. This agenda has even been advocated for by the medical and ecological communities, as these disciplines recently united to promote ecosystem health and restoration as a key conduit to human health and well-being [13]. In particular, quantification of the benefits humans may receive from cultural ecosystem services is lacking [7] and research is needed to better inform the relationship between parks and protected areas and human health and well-being.

1.1. Facilitating Cultural Ecosystem Services–Well-Being through Nature Experiences

For many years, researchers and land-use planners have recognized that cultural ecosystem services in the form of environmental aesthetics influence human perceptions [14,15]. For example, participation in nature-based activities is linked to emotional well-being [16,17] and research applying experimental designs demonstrate that experiences in protected area settings can facilitate greater self-perceived happiness than activities in indoor settings [18]. Similarly, simply recalling nature-based experiences can promote positive affective states [19].

These affective states, or core affects, refer to the basic underlying states of neurophysiological being that often comprise the more reflectively labeled and behaviorally connected emotional state [20,21]. For example, core affective states could include valence (e.g., pleasant or unpleasant) as well as activation (e.g., aroused or not aroused) while more specific emotions would be combinations of those states and the associated labels and behaviors [21]. For instance, the emotion of "bored" would be comprised of a mildly negative or neutral state of valence coupled with a low amount of activation, while "excited" would be both high positive valence and high activation. Thus, the measurement of affective state, independent of specific emotional labeling and responses, often involves reporting along two dimensions or through the use of pictographic representations of valence, arousal, or both [22].

Part of the reason that nature-based experiences promote human health and well-being may be due to findings that show that physical natural resources influence affective states at different levels. Settings containing natural conditions that starkly contrast common urban environments have more potential for facilitating cultural ecosystem services in the form of positive affects [3,23,24] and actual natural resource features such as tree shape, size, and densities [25,26] or water characteristics [27] can influence related perceptions of well-being. A recent study found that perceived stress relief was much greater from an acute visit to an urban park or an urban woodland protected area when compared to a city center, but the woodland resulted in the largest restorative effect [28]. The evidence in this body of work shows that elements prevalent in natural environments (i.e., cultural ecosystem services), and specifically parks and protected areas, have demonstrated potential for improved affect, stress reduction, and mental recovery [29–34].

1.2. Current Study

Recent increases in visitation to places like US national parks are linked to purposeful or unintentional visitor behaviors that may damage the natural resources that facilitate the cultural ecosystem services connected to well-being [13,35]. Inherently, recreational tourism causes impacts on the natural resources. For instance, recreation behavior is linked to decreases in biodiversity such as wildlife, soil, and vegetation loss [36–40]. Because resource setting and conditions are the conduits to cultural ecosystem services, and therefore vital components of nature-based experiences in parks and protected areas [41], ecological impacts stemming from recreation also negatively impact self-reported experience and preference for recreation setting [42–48]. Although previous research has focused on the role of ecological impacts from recreation on visitor experience and preferences, little research has been conducted on how recreation impacts may affect other cultural ecosystem services like human health and well-being. Therefore, the purpose of this study is to examine the relationship between recreation impacts in parks and protected areas and affective states. Two research questions were developed to address this purpose:

R1. How are affective states (e.g., overall mood, valence, activation) influenced by ecological impacts associated with tourism in a park/protected area?

R2. Do different types of tourism impacts (e.g., social trails, vegetation trampling) impact affective states differently?

2. Method

2.1. Participants

Three hundred and seven adults (n = 307; 118 men, 188 women) participated in an online survey through Amazon's Mechanical Turk worker pool in exchange for a small monetary payment. On average, participants were middle aged (mean = 38.99 years old, SD = 13.51 years; range = 20–88 years old) and all participants were living in the United States. Research has shown that these samples are generally representative of a wide range of educational, racial, and experiential backgrounds and that the responses represent a high degree of fidelity with in-person survey responding [49–51]. Thus, such a sampling strategy provided a broad sample that is more representative than student samples and perhaps more diverse than the average National Park Service (NPS) visitor in terms of experience with, investment in, and attitude toward recreation impacts and protected spaces. Finally, appropriate institutional review board approval was granted for this study.

2.2. Materials and Measures

Two unique sets of photographic stimuli, each containing five different variants of the same scene, were created using commercially available digital photo editing software. One set of photographs contained a forest meadow in Rocky Mountain National Park, with or without increasing frequencies of informal and social undesignated social trails. The experimental manipulation added additional trails to each image in a manner that represented actual impact densities that were observed in the park, providing a range of stimuli in the set, from an absence of social trails to an intersecting network of social trails. All of the trails in the photos were approximately the same condition class. The second set of photographs depict a hillside vista in Rocky Mountain National Park, with increasing amounts of vegetative loss that could be created via visitor trampling, thus creating a visitor-created site. The manipulation altered the percent of vegetation loss along a continuum from an absence of vegetation loss to 80% of the vegetation loss from the site. Thus, a total of ten photographs, five for the hillside visitor-created site and five for the meadow containing social trails, were created to simulate various amounts of resource impact by visitors (Figures 1 and 2). All of the photos were used and validated in a previously published study examining perceptions of ecological conditions in Rocky Mountain National Park [42].

A 15-item scene evaluation survey was created by utilizing items from different sources to briefly capture participants' self-reported affective and perceptual responses to the recreational impacts being viewed. The three primary outcomes were captured in three items focused on affective state in response to the photos shown. The first item captured "overall mood" using an emoji representing a range of five expressions from a very frowny face to a very smiley face. The other two items represented the "valence" and "activation" dimensions, consistent with a circumplex model of core affect [22]. The remaining 12 items required participants to indicate the extent to which different elements of the scene would have added or detracted from a visitor experience in the scene using a 7-point Likert scale. Ratings for scene elements included "the amount of biodiversity" and "the quality of recreation opportunities" as well as several others taken from literature on cultural ecosystem services [8,9]. These other items were outside the scope of this study and were included to partially distract from the primary dependent variables pertaining to affect.

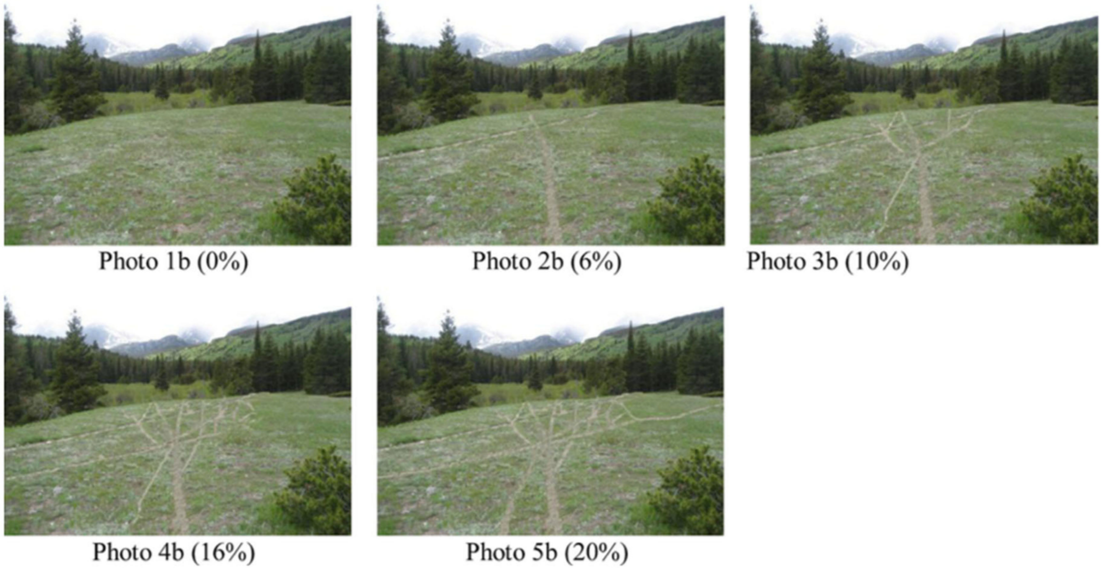


Figure 1. Meadow scenes with increasing visitor-created social trails. Percentiles represent the percent of the area impacted by social trails [42].

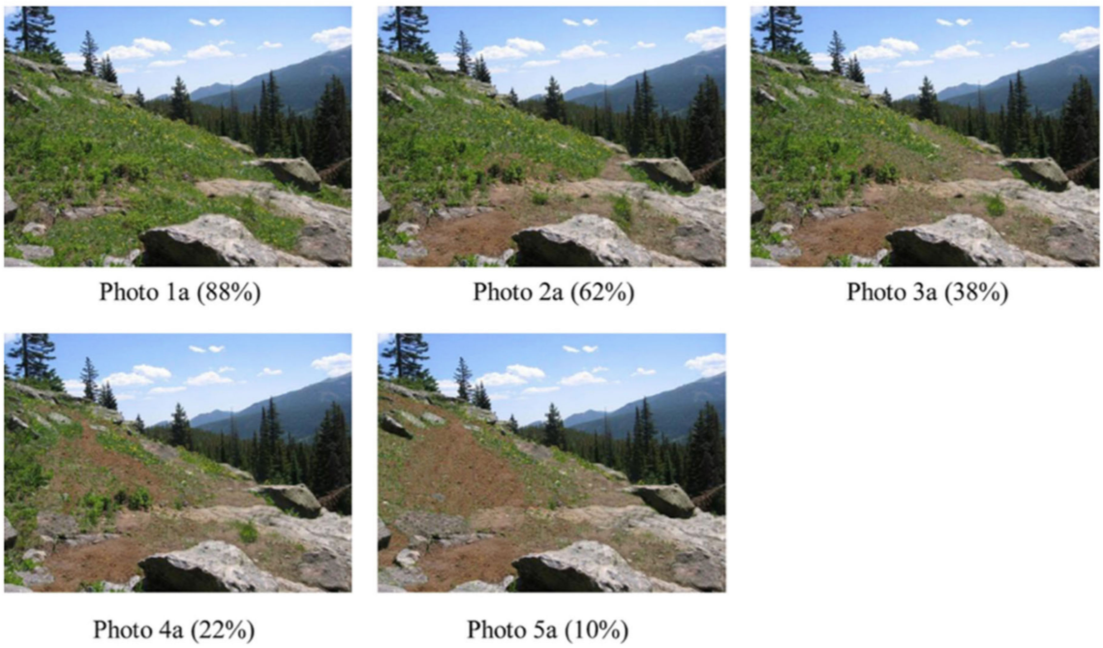


Figure 2. Hillside scenes with increasing vegetation loss/development of a visitor-created site. Percentiles represent vegetation cover [42].

2.3. Procedure

Participants were recruited via an online worker pool in which surveys and other tasks are posted into a forum. Upon accessing the survey, participants were provided with an informed consent screen outlining the basic procedures and expectations for the research study. Following consent procedures, participants were presented with both sets of photographic stimuli in a randomized order to prevent order or practice effects for locations or levels of impact. When the photos were presented, respondents were asked to “imagine you are visiting this location for a hike.” Following each photograph, participants completed the scenic impact evaluation survey for that specific stimuli and were then presented with the next randomly chosen photo for evaluation.

Following all scenic impact evaluations, participants completed an additional page of questionnaires and potential control variables and were then debriefed with regard to the overall purpose and focus of the study. Participants completing the questionnaire within pre-established timeframes in a conscientious manner were given a small monetary payment for their responses.

3. Results

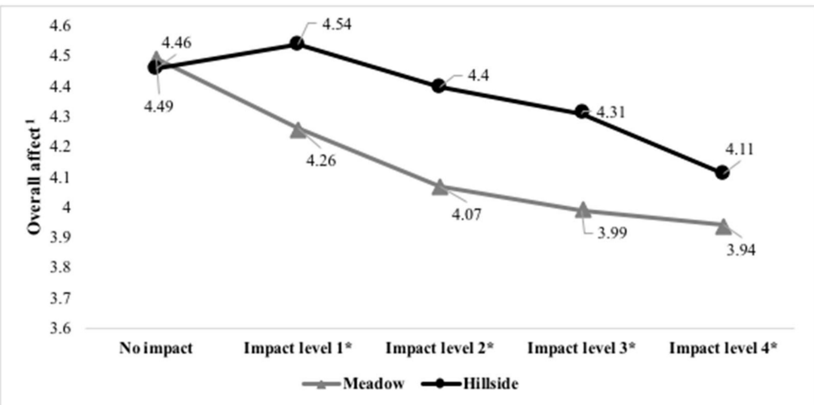
We conducted three separate 2 (impact scene—meadow with social trails and hillside with visitor-created site levels) by 5 (impact level—no impact, impact level 1, impact level 2, impact level 3, and impact level 4) Repeated Measures Analysis of Variance (R-ANOVAs) models, each with different dependent variables: Overall affect, activation level, and positive–negative valence. As predicted, all three R-ANOVAs showed a main effect for environmental impact. As environmental impact became more severe, participants reported a lower overall affective state (Figure 3a), lower overall activation (Figure 3b), and less positive valence (Figure 3c). Additionally, all three analyses indicated a main effect for impact scene type, as well as a significant interaction between impact scene type and impact level (see Table 1).

Table 1. Repeated measures ANOVA for overall affect, activation, and positive–negative valence [1].

Dependent Variable	Test	*F*	df_1	df_2	*p*-Value	Partial η^2
Overall Affect	Impact Scene	22.685	1	209	<0.001	0.098
	Impact Level	45.994	3.18	665.38	<0.001	0.180
	Scene * Impact Level	10.347	3.06	638.46	<0.001	0.047
Activation	Impact Scene	32.012	1	292	<0.001	0.099
	Impact Level	47.744	3.19	931.82	<0.001	0.141
	Scene * Impact Level	8.932	2.93	856.33	<0.001	0.030
Positive–Negative Valence	Impact Scene	23.632	1	288	<0.001	0.076
	Impact Level	63.587	3.11	896.25	<0.001	0.181
	Scene * Impact Level	10.406	2.96	852.54	<0.001	0.035

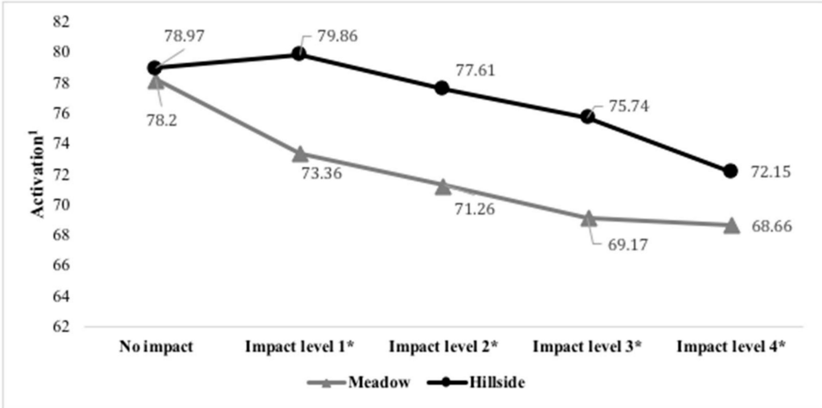
[1] All tests were corrected for violating the assumption of sphericity using Greenhouse–Geisser.

The main effects and interactions showed a consistent pattern across all three affective outcomes. Specifically, the affect ratings in the social trail meadow scene were more severely impacted by the manipulation overall. The social trail meadow scene was also more sensitive to environmental impact with decreases from the no impact baseline, occurring at lower levels of impact when compared to the hillside visitor-created site scene. The hillside visitor-created site scene scored higher at most levels of impact and required a greater impact to change from the no impact baseline (see Table 2 and Figure 3a–c).

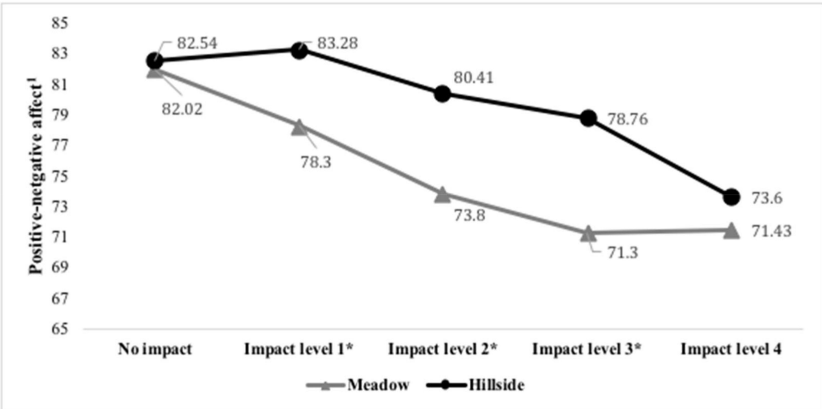


(a)

Figure 3. *Cont.*



(b)



(c)

Figure 3. (**a**) Graphical display of relationship between impact scene (meadow with social trails and hillside with visitor-created site levels), impact level, and overall affect. [1] Measured on a scale from 1 "very frowny face" to 5 "very smiley face." * Denotes that means from different scenes with same impact level are significantly different ($p < 0.05$) using Bonferonni post-hoc comparisons. (**b**) Graphical display of relationship between impact scene (meadow with social trails and hillside with visitor-created site levels), impact level, and activation. [1] Measured on a scale from 0 "not at all" to 100 "very much so." * Denotes that means from different scenes with same impacr level are significantly different ($p < 0.05$) using Bonferonni post-hoc comparisons. (**c**) Graphical display of relationship between scene (meadow with social trails and hillside with visitor-created site levels), impacts level, and positive-negative affect. [1] Measured on a scale from 0 "not at all" to 100 "very much so." * Denotes that means from different scenes with same impact level are significantly different ($p < 0.05$) using Bonferonni post-hoc comparisons.

Table 2. Comparisons for overall affect, activation level, and positive–negative valence.

Dependent Variable	Impact SCENE	Impact Level	Mean	Std. Error	95% Confidence Interval Lower Bound	Upper Bound
Overall Affect	Meadow (Social Trails)	No impact	4.49	0.051	4.391	4.590
		1	4.26	0.057	4.150	4.373
		2	4.07	0.060	3.954	4.189
		3	3.99	0.067	3.854	4.117
		4	3.94	0.071	3.798	4.078
	Hillside (Visitor-Created Site)	No impact	4.46	0.057	4.345	4.569
		1	4.54	0.047	4.451	4.635
		2	4.40	0.054	4.293	4.507
		3	4.31	0.057	4.202	4.426
		4	4.11	0.064	3.982	4.237

Table 2. *Cont.*

Dependent Variable	Impact SCENE	Impact Level	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Activation	Meadow (Social Trails)	No impact	78.20	1.271	75.700	80.703
		1	73.36	1.288	70.828	75.896
		2	71.26	1.352	68.601	73.925
		3	69.17	1.392	66.431	71.910
		4	68.66	1.409	65.885	71.432
	Hillside (Visitor-Created Site)	No impact	78.97	1.328	76.353	81.579
		1	79.86	1.228	77.442	82.278
		2	77.61	1.272	75.105	80.110
		3	75.74	1.332	73.116	78.358
		4	72.15	1.395	69.402	74.891
Positive–Negative Valence	Meadow (Social Trails)	No impact	82.02	1.100	79.852	84.813
		1	78.30	1.184	75.971	80.631
		2	73.80	1.330	71.178	76.414
		3	71.30	1.349	68.642	73.952
		4	71.43	1.356	68.757	74.094
	Hillside (Visitor-Created Site)	No impact	82.54	1.192	80.194	84.885
		1	83.28	1.061	81.192	85.369
		2	80.41	1.207	78.036	82.788
		3	78.75	1.215	76.357	81.138
		4	73.60	1.378	70.887	76.310

4. Discussion

With regard to differences in overall affect, activation, and positive–negative valence, there was a significant difference between the impacted meadow with varying levels of social trails and hillside scenes depicting visitor-created site levels for nearly all levels of impact (except no impact). Interestingly, for the hillside visitor-created site scene, the photo that resulted in the highest levels of affect, activation, and positive valence were those that had minor (the photo with 66% natural vegetation remaining) levels of recreational impact. This indicates that some level of impact in the setting shown (i.e., vista points) can be perceived as an amenity. This is congruent with previous literature on recreation impacts [52–54]. However, as impact levels increased beyond that level, affect, activation, and valence decreased. Any level of recreational impact stemming from informal/undesignated social trails on the meadow scene resulted in negative trends in affect, activation, and valence.

The results of this paper highlight the importance of understanding visitor perceptions of cultural ecosystem services to inform human health [55–57]. Specifically, this paper adds to the growing body of literature aiming to understand and inform the potential health benefits that humans receive from ecosystem services in protected area settings, while also informing the management of those natural resources that produce these services. These results broaden understanding of protected area features that may promote well-being and the state at which environmental impact stemming from recreation may negate this positive effect. These findings suggest that informal/undesignated social trails have significantly more potential for negative influences on human well-being than vegetation trampling. Interestingly, D'Antonio et al. (2013) [42] found that respondents in Rocky Mountain National Park felt that two average-sized social trails were unacceptable (approximately representing Photo 2b in Figure 1). Despite this MTurk-based sample, respondents in this study also rated these series of photos stringently, as Photo 2b in Figure 1 resulted in substantial decreases in the affective states measured.

These findings highlight the importance of proper resource management to mitigate impacts while preserving the resources that maximize cultural ecosystem services. To mitigate impacts, managers employ direct management, through regulations and restrictions, and indirect management, most commonly in the form of communication and education [33,58–60]. Applying these strategies in tandem yields the best results, although indirect management is often preferred because it allows recreationists to make their own decisions regarding their behaviors with the natural environment [59]. These results provide support for the significance of direct and indirect management actions to encourage appropriate use of natural resources while recreating. The most prominent form of educational messaging to minimize recreational impacts is Leave No Trace, developed through the Leave No Trace Center for Outdoor Ethics and administered through the federal land managing agencies, as well as many state and urban park organizations [61]. The results of this study highlight the importance of Leave No Trace strategies and similar minimum impact ethics programs to not only protect the ecological resources [62–68], but also promote positive affect. This study suggests that when visiting park and protected area settings where visitors are more compliant with management strategies, including indirect approaches such as those promoted by the Leave No Trace Center and similar minimum-impact ethics programs, visitors may experience higher levels of positive affect, and therefore greater achievement of cultural ecosystem services.

These findings also suggest the value of design, development, and maintenance of sustainable trail systems and other natural resource features that are resistant to impacts and less prone to the creation of social trails stemming from/leading to points of interest/destinations [69]. Additionally, this study demonstrates the importance of developing monitoring strategies to evaluate trends in ecological impacts [70], while also continuing to evaluate the specific resource features and conditions of those features for promoting or detracting from cultural ecosystem services. As monitoring informs adaptive management, such as the implementation of Leave No Trace programming or rehabilitation of a heavily impacted site, it will be particularly important for land managers to pair efforts with the perceptions of visiting tourists to evaluate how potential resource changes influence visitor experiences and associated well-being over time.

Limitations and Future Research

There are several limitations that should be noted regarding this research. An MTurk sample was used to obtain the data and some studies indicate that these groups are somewhat self-selective and differ in demographic compositions than the general U.S. population [49,71]. However, MTurk samples are generally more diverse than a sample of college students, which are often used in studies similar to this one [71]. Interestingly, some of the findings from this MTurk sample mimicked the results that D'Antonio et al. (2013) [42] found from field samples of visitors in Rocky Mountain National Park. In this study, we only tested two series of photos and it is possible that other scenes, settings, and impacts may have different affective responses. Likewise, we only assessed three types of affect and it is possible that ecological impacts may not produce changes in other types of affect. Furthermore, affect, measured through self-reported measures, is only one measure of well-being. We recommend that other objective measures, such as physiological response to resource conditions, be paired with additional self-reported measures to further understand the role of tourism-related impacts on cultural ecosystem services.

The results from this research also provide a variety of new avenues for laboratory and field-based research. For instance, recent research shows that international visitors to US national parks have different perceptions about natural resource conditions [72]. Investigating if there are similar differences in affect related to other types of visitor impacts may provide interesting results. Another area of investigation is how other types of ecological impacts (e.g., human recreation behaviors impacting wildlife, improper disposal of waste) beyond vegetation loss and social trails relate to affect [73]. Lastly, although we measured self-reported affective responses, examining physiological response in situ through ambulatory measures may further help define the cultural ecosystem services provided by protected areas [74–76].

5. Conclusions

This study examined the connection between tourism-related impacts in parks and protected areas and the possible interference of these features on cultural ecosystem services, specifically aspects of health and well-being. The tourism-related impacts used in this study included two common resource occurrences in parks and protected areas and contained scenes featuring informal and/or undesignated social trails and site trampling/vegetation loss. Well-being was examined using affective responses across a range of these resource conditions. Results indicated that as tourism-related ecological impacts increased, positive affect decreased and decreases were more severe for scenes featuring informal and/or undesignated social trails when compared to scenes with increasing levels of trampling/vegetation loss. These results demonstrate the importance of managing tourism in parks and protected areas in a manner that reduces impact. The promotion of Leave No Trace and associated minimum impact practices are imperative in parks and protected areas, as pristine resource conditions have the opportunity to promote cultural ecosystem services related to human health, while impacted resources may significantly reduce these benefits.

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Conflicts of Interest: The authors declare no conflicts of interest.

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