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Research Note

How Do Outdoor Recreationists Perceive the State of the Environment and Do Interpretive Programs Make a Difference?

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Abstract

Environmental interpretation provides visitors with positive experiences in nature while managing their impacts. Existing research has concentrated on the influence of interpretive programs on visitor knowledge, attitudes, and behaviours. Little empirical research exists on how visitors perceive their environment. In this research we examine the effect of environmental interpretation on visitors' perceptions of the environment. The study took place in the Niagara Glen Nature Reserve, Canada. A survey is administered to visitors on self-guided experiences and visitors receiving two different interpretive programs. Perceptions are compared to ecological data. Visitors rated conditions higher than ecological data, regardless of participation in an interpretive program. There was no significant influence of an interpretive program on perceptions. Findings from this pilot study highlight the need for interpretive programs to examine their effectiveness of achieving its outcomes as well as the benefits of using a reference such as ecological data.

KEYWORDS: *Influences of interpretation, protected areas, outdoor recreation, ecological integrity, Niagara Glen Nature Reserve (NGNR)*

Introduction

In many parks and protected areas (PAs), there is an increasing emphasis to conserve, protect, and maintain the integrity of natural land for future generations (Groulx et al., 2017). At the same time, PAs are valued places for outdoor recreation, attracting visitors and affording meaningful and often educative experience in nature (Groulx et al., 2017; Shultis & Way, 2006). The question of fostering a culture of sustainability, as this special issue is framed, is a perennial matter for PAs.

Environmental education is considered an approach to mediate and reduce visitor impacts on the environment while also providing meaningful experiences (Knapp, 1996; Orams, 1996a). Environmental interpretation shares similar goals with the broader category of environmental education, though it is distinct as informal education that aims to reveal meanings and foster appreciation (Knapp, 1996; Kohl, 2008). Environmental interpretation has garnered longstanding attention in PAs for the purposes of fostering nature connectedness, enriching the visitor experience, and providing opportunities to learn about nature (Jones et al., 2017; Skibins et al., 2012).

Scholarly literature has examined the extent to which interpretation can achieve the dual goals related to sustainability. Interpretive programs have consistently been found to increase satisfaction, enjoyment, and sense of identity, as well as increase knowledge (Hill et al., 2007; Io, 2013; Madin & Fenton, 2004; Munro et al., 2008; Sharp et al., 2016; Tubb, 2003). Studies have revealed positive influences of interpretation on environmental attitudes and pro-environmental behaviours (Alazaizeh et al., 2019; Kim et al., 2011; Marion & Reid, 2007; McNamara et al., 2010). However, other empirical studies are unclear about the effectiveness of interpretive programs, with some reporting mixed findings (Powell & Ham, 2008; Roberts et al., 2014; Skibins et al., 2012), or minimal (Tubb, 2003) to no effect (Boon et al., 2008). These mixed results have raised questions about the effectiveness of interpretation, and whether there has been an underrepresentation of findings of ineffective interpretive programs (e.g., Moscardo, 2014; Roberts et al., 2014). Much more research on the influence of interpretive programs is required (Munro et al., 2008), especially in relation to sustainability.

Further, research on the influences of interpretive programs on how people perceive ecological integrity is largely absent. Perceptions form the basis of how we come to understand our surroundings, and this is an antecedent to other factors such as values, beliefs, and attitudes (Bruno & Pavani, 2018; Orams, 1996b). Understanding environmental perceptions is particularly relevant when considering sustainability because visitor behaviours are a consequence of how visitors perceive the state of the environment (Alessa et al., 2003; Clayton et al., 2013; Shultis & Way, 2006).

The purpose of this study is to examine the influence of an interpretive program on how visitors perceive the state of the environment. We surveyed three groups of visitors (a self-guided hike; a guided hike with interpretive program, and a guided hike with an interpretive program designed around the principles of ecological integrity) on their perceptions of ecological integrity in the Niagara Glen Nature Reserve (NGNR), Canada. We implement a novel approach to measure effects by using an ecological measurement of integrity as a benchmark. This pilot study was conducted as an initial exploration of the aims and methods, with due acknowledgement of limitations associated with the small number of participants. The results of this pilot study are thus intended to offer preliminary insights and provide a foundation for future work.

Methods

Study Site

The NGNR (UTM zone 17N, 658068 mE, 4777297 mN) is a natural area intended for outdoor recreation and tourism, managed by the Niagara Parks Commission (NPC). It is an ecologically important Carolinian forest ecosystem and a popular destination for tourists. A network of recreational trails and a nature centre that offers guided tours provide excellent opportunities for hikers and those wishing to participate in an interpretive program.

Study Groups and Interpretive Programs

Three distinct groups were the focus for this pilot study. The first group, referred to as the unguided experience, acted as the control group and were defined as visitors that did not receive any direct interpretive experience. The second group included individuals subject to an interpretive experience (i.e., guided tour program) with a general script focused on the natural/cultural heritage of the site. This group is referred to as 'Experience 1' or 'E1'. The final group, referred to as 'Experience 2' or 'E2', included individuals subject to an 'experimental' interpretive experience. This version of the interpretive program included additional content on ecological integrity and was designed to specifically direct participants' attention to particular aspects of their surroundings (e.g., invasive plant species, evidence of vegetation trampling, or examples of biodiversity). Interpretive programs ran twice daily, lasted approximately ninety minutes, and were guided by a trained naturalist. A survey was administered to participants from each group upon completion of their experience. Participants were not aware of the survey as they hiked the trails. Surveys were conducted in person from July 1, 2018 to September 30, 2018. The participants for both interpretive program groups were recruited on a convenience sampling basis due to the low number of visitors that registered for an interpretive experience. The two interpretive programs were performed on a randomly preselected schedule.

In addition to demographic-type items and questions on participant experience in the park, survey questions were designed in such a way that participants would recall the sights, sounds, and smells of their hike, and subsequently rate how they perceive a particular aspect of the ecosystem on a scale from "poor" condition to "very good" condition, which had corresponding numerical values of 1 to 4.

Ecological Data Collection

To compare the perceptions to an ecologically collected rating, physical ecological data was also collected from July 1, 2018 to September 30, 2018. A suite of ecological indicators was measured at 10 sites across the NGNR. Ecological indicators were selected to collect information on ecosystem composition, structure, and function, consistent with the three components of ecological integrity assessments (Gordon et al., 2005). Examples of indicators included soil chemistry, species diversity, and invasive species cover. In a manner similar to many ecological integrity assessments (Gordon et al., 2005), ecological measurements were subsequently rated on a scale of 1 to 4, based on the measured value in relation to its acceptable range identified for management objectives.

Data Transformation and Analysis

Both the survey responses and the ecological measures collected information on the same attributes of ecological integrity (although they differed in the specific indicators used to measure these attributes) on scales from 1 to 4. Indicator ratings were averaged (weighted equally) to create a value for the corresponding attribute. Values for composition, structure, and function were calculated using a non-weighted average of corresponding attributes (Andreasen et al., 2001).

The categorical data from the survey responses and the transformation of the ecological data to categorical data requires the use of nonparametric tests. A one-sample Wilcoxon signed rank t-test was used in order to compare the perceptions of a group to a single known value (the ecological rating) (Tarannum et al., 2018). Overall ratings for the perceived state of the environment were compared between groups using Mann-Whitney U tests and Kruskal-Wallis tests.

Results

Ecological Results

Ecological results showed some indicators of vegetation composition, such as invasive species cover and ecosystem stressors were in poor condition, whereas other indicators such as tree health were found to be in very good condition. The overall ecological integrity value was found to be 2.75 on the scale of 1 to 4.

Visitor Perceptions

A total of 130 respondents completed the survey; 110 visitors in the unguided experience group, 10 visitors participating in E1, and 10 visitors participating in E2. It is recognized that the data is asymmetric. The number of participants for the treatment groups was much lower than the unguided experience group due to the lack of registration for the interpretive experiences.

Table 1 shows the median values for respondent ratings on each component of ecological integrity.

Table 1
Median Values for the Components of Ecological Integrity

Ecosystem Component	Unguided (IQR)	E1 (IQR)	E2 (IQR)
Composition	3.00 (.750)	3.50 (.750)	3.38 (.375)
Structure	3.50 (.750)	3.75 (.500)	3.75 (.625)
Function	3.13 (1.00)	3.13 (.438)	3.38 (.500)
Ecological Integrity	3.17 (.667)	3.46 (.479)	3.50 (.292)

Comparing Perceptions to Ecological Reference

One-sample Wilcoxon signed rank *t*-tests were performed to compare the perceptions of overall ecological integrity for each experience group to the ecological measurement. The perceptions of the unguided experience group differed significantly from the ecological value, such that the unguided experience group had overall higher ratings of ecological integrity (Mdn = 3.17), than the measured value of 2.75, $Z = 6.53$, $p < .000$. Perceptions of ecological integrity for E1 (Mdn = 3.46) and E2 (Mdn = 3.50), also differed significantly from the objectively collected value of 2.75, such that both E1 and E2 had overall higher ratings of the state of ecological integrity from the measured value (2.75); $Z = 2.20$, $p = .028$, and $Z = 2.71$, $p = .007$, respectively. Results from one-sample Wilcoxon signed rank *t*-tests on the more specific components are displayed in Table 2.

Comparing Groups in Overall Perceptions

A Kruskal-Wallis was performed to examine the effect of two different interpretive programs on overall perceptions of ecological integrity. There was no significant main effect of an interpretive program, $\chi^2(2) = 5.30$ $p = .071$, with a mean rank perceived rating score of 62.31 for the unguided experience, 79.85 for E1, and 86.25 for E2.

A Mann-Whitney test showed that there was no significant difference in perceptions of ecological integrity between E1(Mdn = 3.46) and the unguided experience group (Mdn = 3.17), $U = 398.5$, $p = .149$, $r = .132$. Similarly, a Mann-Whitney test showed there was no

Table 2
One-Sample Wilcoxon Signed Rank T-Tests Comparing Perceptions to Ecological Value

Component	Ratings			N	Standardized test statistic	*p value*
	Hypothetical median	Observed median				
		Unguided	3.00	110	7.16	.000*
Composition	2.50	E1	3.50	10	2.67	.008*
		E2	3.38	10	2.45	.014*
		Unguided	3.50	110	5.32	.000*
Structure	3.00	E1	3.75	10	2.27	.024*
		E2	3.75	10	2.74	.006*
		Unguided	3.12	110	4.14	.000*
Function	2.75	E1	3.12	10	1.28	.201
		E2	3.38	10	2.47	.014*

** Differs significantly ($p < .05$) from the test value*

significant difference in the perceptions of ecological integrity between E2 (*Mdn* = 3.50) and the unguided experience group (*Mdn* = 3.17), $U = 350$, $p = .058$, $r = .173$.

Discussion

The perceptions of overall ecological integrity of all three groups differed significantly from the ecological value for overall ecological integrity as well as the more specific components of ecological integrity (ecosystem composition and structure) with the exception of the perceptions of ecosystem function in E1, which did not statistically differ from the measured value. Regardless of participation in an interpretive program, respondents generally overestimate the overall integrity of the system, as well as overestimate the more specific components. Such overestimation may be due to an interpretation of green plant life as healthy, regardless of low diversity or invasive species (Cook et al., 2010; Mallette et al., 2021; Patel et al., 1999). As well, visitors tend to have preconceptions of PAs as 'natural' areas and may be relating their perceptions to this notion (Mallette et al., 2021; Shultis & Way, 2006).

There was no significant difference between E1 and the unguided experience visitors; suggesting that simply the act of participating in an interpretive program is not sufficient to alter perceptions. There was also no significant difference in the perceptions of E2 and unguided visitors, suggesting that a specifically designed interpretive program may also be insufficient to alter perceptions. However, there are observable trends in the perceptions between groups that should be noted. Perceptions of ecological integrity were generally lowest for the unguided experience and higher for interpretive experience participants, with E2 participants tending to have the highest ratings. While participation in an interpretive program and interacting with an interpreter may not have an effect in aligning perceptions with ecological data, it could have had some marginal influence on perceptions, albeit counter to the anticipated direction of influence. A possible explanation for the greater overestimation of ecosystem integrity by E2 participants could be the fact that participants' attention was directed to features that would not have been noticed otherwise. For example, interpreters might have made participants more aware of animal noises, or special plants, ultimately leaving them with an overall impression of increased diversity. A final point for grounded speculation is that the affective benefits of participating in an interpretive experience including visitor satisfaction, experience, and emotions might be influencing the overall impression of the PA and could in some way be related to their positive responses (Hill et al., 2007).

The findings from this pilot study emphasize the need to better understand the relationship between interpretation and environmental perceptions, and the implications for sustainability. Interpretive programs have been previously suggested as a means to address differences and close the gap between perceptions and ecological data (Burger, 2003; Patel et al., 1999). However, observations from this study indicate a guided interpretive program might not be always be effective in closing the gap. Additionally, there was no significant effect of participation in an interpretive program on the perceptions of ecological integrity. These findings contradict popular discourse in interpretation scholarship and the praise that interpretive programs often receive (Kim et al., 2011; Munro et al., 2008; Ren & Folta, 2016). In fact, the findings coincide with other studies that have concluded little to no effect (Powell & Ham, 2008; Roberts et al., 2014) and question the effectiveness of interpretive efforts in achieving their goals (Moscardo, 2014).

Conclusion

This study examined the influence of an interpretive program on how visitors perceive the state of the environment in the NGNR, Canada. The effectiveness of interpretation in shaping perceptions of ecological integrity was found to be unclear. The very small sample sizes of the interpretive program groups due to lower than anticipated registration, and low statistical power in combination with the lack of significant results found in the study, suggest that the findings should be interpreted with caution. Several avenues for future research emerge from building upon the experiences gained through this pilot study. First, in reference to the noteworthy limitations of very small sample sizes and low statistical power, replication of study is required to address the likelihood of a Type II error. Second, research is needed to fully understand the reasons for the general overestimation of ecosystem condition as well as the observed trend in the opposite direction intended by the interpretive programs. Third, research could compare the influences of more diverse forms of interpretive programs (Ren & Folta, 2016; Roberts et al., 2014) and how each might influence perceptions of the state of the environment as well as other aspect pertinent to sustainability.

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