

## The Impact of Environmental Interpretation in Developing a Connection to Nature in Park Visitors

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### Abstract

This static group comparison study examined whether participants in nature-based recreation activities featuring environmental interpretation elicited more connection to nature than those that engaged in nature-based recreation activities without environmental interpretation. Two hundred twenty-one visitors to a state park completed the Multidimensional Connection to Nature Scale after participating in activities with or without environmental interpretation. Analysis using an Independent Sample *t*-Test indicated visitors who participated in activities featuring environmental interpretation had a significantly greater connection to nature than visitors who participated in recreational activities without environmental interpretation. This result supports the contention that participation in nature-based recreation activities featuring environmental interpretation can increase a person's connection to nature. Additionally, frequent park visitors who participated in activities featuring environmental interpretation had a higher connection to nature than frequent park visitors who participated in activities without environmental interpretation. This result supports the contention that frequent park visitors who participate in nature-based recreation activities featuring environmental interpretation can increase their connection to nature. For infrequent park visitors, however, there was no significant difference in connection to nature between participation in activities featuring environmental interpretation and participation in activities without environmental interpretation. This study will help park managers and planners improve visitors' experience and better achieve park objectives. Future studies employing random assignment to treatment and control groups should explore causal relationships.

**Key Words:** Connection to Nature, Nature-based Recreation, Environmental Interpretation, Visitation Frequency, State Park

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## Introduction

Nature-based recreation provides many benefits to society, including economic, public health, and community benefits (Bedimo-Rung, Mowen, & Cohen, 2005; Driver, Brown, & Peterson, 1991; Dustin, Bricker, & Schwab, 2010; Frumkin, 2001; Godbey, Caldwell, Floyd, & Payne, 2005; Germann-Chiari & Seeland, 2004; Heberling & Templeton, 2009; Hemingway, 1999; Stein, Anderson, & Thompson, 1999; White & Hendee, 2000). Nature-based recreation also provides many benefits to individuals, including satisfaction and enjoyment (e.g., Fletcher & Fletcher, 2003). Individual benefits from direct experience with nature may include increased environmental knowledge and/or changed environmental attitudes and behaviors (e.g., Tarrant & Green, 1999; Thapa & Graefe, 2003). A number of researchers have demonstrated psychological benefits such as attention restoration (Hartig, Mang, & Evans, 1991; Kaplan & Kaplan, 1989) and spiritual well-being and development (Fredrickson & Anderson, 1999; Heintzman, 2010; White & Hendee, 2000). Additional individual benefits of participation in nature-based recreation may include improved self-sufficiency, self-worth, and confidence (Pohl, Borrie, & Patterson, 2000).

Another recently studied benefit or outcome of nature-based recreation is an increased connection to nature. Connection to nature has been found to be positively related to environmental attitudes and pro-environmental behavior (Arnocky, Stroink, & De Cicco, 2007; Dutcher, Finley, Luloff, & Johnson, 2007; Nisbet, Zelenski, & Murphy, 2009; Schultz & Tabanico, 2007; Mayer & Frantz, 2004) and physical and psychological well-being (Cervinka, Röderer, & Hefler, 2011; Hinds & Sparks, 2008; Mayer & Frantz, 2004; Mayer, Frantz, Bruehlman-Senecal, & Dolliver, 2009; Nisbet et al., 2009). This connection refers to the degree to which people consider themselves part of nature. The recent research in connection to nature as an outcome

of nature-based recreation has focused primarily on the type of recreational activities involved and not on the frequency of recreational activities nor the impact of environmental interpreters on connection to nature.

The implications are important for park managers if the frequency of park visits and the actions of environmental interpreters influence visitors' connection to nature. If the frequency of visits is important, park managers have another reason to encourage visitors to return to the park and participate in as many activities as possible.

If park environmental interpreters can influence visitors' connection to nature, park managers should consider selecting and training interpreters to influence visitors' connection to nature as well as choosing the park's amenities that interpretation programs might feature. Environmental interpreters should recognize the influence they can have on visitors and develop programs that can increase visitors' connection to nature.

## Literature Review

### Connection to Nature

Direct contact with nature during nature-based recreation has long been argued to generate psychological benefits, such as restoration from stress or attentional fatigue (Kaplan & Kaplan, 1989). A growing body of research has targeted the emotional and psychological impact or hard-to-define benefits a park may have on visitors. Encounters with nature can have a strong emotional impact on wilderness visitors (Williams, Patterson, Roggenbuck, & Watson, 1992), including even simulated nature encounters (van den Berg, Koole, & van der Wulp, 2003). Other psychological effects of visits to wilderness can be caring for nature (Borrie & Roggenbuck, 2001), enhanced spirituality benefits (McDonald & Schreyer, 1991), and self-identity (Garst, Williams, &

Roggenbuck, 2010; White & Hendee, 2000). Another possible outcome of nature-based recreation is connection to nature.

Schultz (2000, 2002) considers connection to nature as the degree to which an individual believes he or she is part of the natural environment. The idea of people developing an emotional or psychological connection to nature is not new (e.g., Leopold, 1949; Muir, 1912; Thoreau, 1854). However, studies looking at our emotional attachments to nature and to place have increased in the past 15 years (e.g., Kals & Maes, 2002; Kals, Schumacher, & Montada, 1999; Kollmuss & Agyeman, 2002; Martin, 2004; Mayer & Frantz, 2004; Pohl, Borrie, & Patterson, 2000; Vaske & Kobrin, 2001).

A recent study by Mayer et al. (2009) documented that exposure to nature increases attention, positive emotions, reflection, and connectedness to nature. These results were achieved when participants were exposed to both real and virtual nature, with exposure to real nature having greater psychological benefits. Exposure to nature consisted of a 20-minute bus ride to a natural area, followed by a 10-minute walk for quiet reflection in the natural area. These results were achieved without an interpreter or nature guide.

In a study of visitors to a wild animal park, Schultz & Tabanico (2007) showed that guests leaving the park had higher implicit connections with nature than did guests entering the park. Borrie and Roggenbuck's (2001) study of wilderness experience found that participants' feelings of care for the environment were higher after they exited the wilderness than when they first entered. Weinstein, Przybylski, and Ryan (2009) found that immersion in nature elicited increased feelings of relatedness to nature whereas non-nature immersion thwarted relatedness to nature.

It has been argued that because of industrialization and urbanization in western society a general shift away from close contact with nature and more time spent indoors has taken place (Kellert, 2002; Louv, 2005; Zaradic, Pergams, & Kareiva, 2009). Since connection to nature has been found to be positively associated with environmental concern and behavior (Dutcher, Finley, Luloff, & Johnson, 2007; Mayer & Frantz, 2004; Nisbet, Zelenski, & Murphy, 2009), being able to identify how people can develop a connection to nature may be important to sustainable environmental management. Shultz (2000) states that it should be possible to develop environmental education programs that evoke feelings of empathy that lead to inclusion with nature and biospheric environmental concerns, thereby changing environmental attitudes. His research further suggests that any activity that reduces individuals' perceived separation between nature and themselves will lead to an increase in individuals' biospheric environmental concern. A biospheric environmental concern is based on a concern for all living things. In the case of Schultz's study, the specific effect of the educator, or de facto interpreter, on a person's empathy for nature is not addressed. Neither is the effect of frequency of visits.

Connection to nature may have an important influence on environmentally responsible behavior. Direct experience in nature is the most immediate feedback of human's impact on the environment (Shultz, 2000). Shultz argues that it is important to feel connected to nature, and measuring the public's feeling of connectedness to nature is important for progress to be made in supporting pro-environmental policies.

### **Environmental Interpretation**

There is no uniformly accepted definition of environmental interpretation in a natural setting such as a park. Tilden (1977) defined interpretation as "an educational activity which aims to reveal meaning and relationships through the

use of original objectives, by first-hand experience, and by illustrative media, rather than simply to communicate factual information” (p. 8). Tilden also acknowledged that interpretation could contribute to natural resource management through understanding, appreciation, and protection of the resources. The National Park Service defines environmental interpretation as “a catalyst in creating an opportunity for the audience to form their own intellectual and emotional connections with the meanings and significance inherent in the resource” (U.S. National Park Service, 2012).

The purposes of environmental interpretation are numerous. Purposes can include developing emotional and intellectual connections between visitors and the meanings inherent in the resource (Brochu & Merriman, 2008; Knudson, Cable, & Beck, 2003), encouraging protection of the resource (Ham, 2009; Veverka, 1997), increasing targeted behaviors (Orams, 1995; Roggenbuck, Loomis, & D’Agostino, 1990), increasing appreciation for ecosystem services (Pepi, 1994), developing emotional attachments to the site (Knudson, Cable, & Beck, 2003), and increasing social awareness (Atkinson & Mullins, 1998).

The beneficial effects of an individual’s direct experience with nature may be influenced by the particular activities they engage in while visiting a park. Specifically, park activities involving environmental interpretation that are supervised and organized may be more important to developing a connection to nature than nature-based recreation activities that do not involve interpretation in which visitors are left to experience the park on their own. Environmental interpretation is often more dynamic by involving the possibility for the interchange of ideas, including questions and answers. This interaction coupled with the passion of an interpreter for the site may offer a more meaningful and impactful experience (Hughes & Morrison-

Saunders, 2005; Munro, Morrison-Saunders, & Hughes, 2008). Stedman (2003) determined that characteristics of the physical environment influence the meanings people produce from their experiences with the environment; these meanings in turn underpin attachment and satisfaction with the place. During activities without interpretation, such as an unguided nature hike, visitors with limited experience in nature may not understand the relationships of natural systems or functional purposes of the ecosystem around them. Extracting meaning from the resource is left to an inexperienced and unfamiliar recreationist.

Zaradic, Pergams, and Kareiva (2009) hypothesized that people are more likely to invest in what they have personally experienced. Their results suggest that the type and timing of nature experience may determine future conservation investment. Similarly, the results of Bright and Porter’s (2001) research suggest that the meaning of a nature activity to park visitors may influence their concern for the environment. Likewise, the interpreter developing a connection to nature in park visitors may provide the meaning for nature-based recreation.

### **The Role of the Environmental Interpreter**

Nature-based recreation activities featuring personal interpretation involve a guide or interpreter to facilitate the visitors’ experience with the park. Activities involving non-personal interpretation, in contrast, often use media, such as signs, trail guides, and audio programs. Nature-based recreation activities, such as hiking, canoeing, or wildlife watching without a naturalist guide, do not often involve any guidance or interpretation, whether personal or non-personal. For this study, environmental interpreters are defined as employees of parks that provide educational activities that reveal meanings of the phenomena on display and provide opportunities to connect with the park (U.S. National Park Service, 2012; Tilden, 1977). State parks usually

offer interpretive programs and services to enrich visitor experiences (Knudson, Cable, and Beck, 2003). According to Knudson et al. (2003), interpreters should help visitors develop a sense of place. Ballantyne and Packer (2005) argue that an ecotourism interpreter should promote environmentally sustainable attitudes and behaviors in participants. Similarly, Orams (1997) believes environmental education programs can be an effective means of managing tourists' interaction with wildlife and the natural environment.

Research in variables affecting visitor satisfaction (e.g., Fletcher & Fletcher, 2003; Weiler & Ham, 2004) and a preference for park ranger presence by backcountry visitors (Manning, 1999) show that park employees can significantly impact park visitors' experiences. State parks rely on tourism, and tour guides are one of the key components of this industry (Ap & Wong, 2001). Because tour guides and environmental interpreters are in essence the face of the park, their knowledge and interpretation of the park's landscape and history can change tourists' sojourn from a visit into a memorable and rewarding experience (Ap & Wong, 2001).

Quality guides and their environmental interpretation skills are extremely important for ecotourism (Henning 1993). Beaumont's (2001) study on ecotourism in which environmental education occurred in a natural setting with an interpreter found that participants' environmental knowledge increased. The experience also influenced participants' conservation views and behaviors. Weiler and Ham (2004) found that ecotourism's benefits include the promotion of pro-environmental attitudes and behaviors. Overall, the highest-rated services were presentations and explanations by staff. Similarly, in a study by Wight (1996), respondents were asked to rate the importance of various features during a visit to a national park. Quality guides were found to be an important component of

the experience. Additionally, interpreters can influence the overall quality of the visitors' experience through their interpretive programs (Lee, Graefe, & Burns, 2004; Rust & Oliver, 1994).

Without an interpreter, visitors may not become fully engaged with the amenities of a park (Booth, Gaston, & Armswoth, 2009) and thus not develop emotional attachments including a connection to nature. Peak, Innes, and Dyer (2009) found that interpreters can increase effective communication of conservation messages to visitors through framing of information and personal connections with visitors. Environmental interpreters can directly influence park visitors' positive experience with the park (e.g., Powell & Ham, 2008).

Some adult learning theories suggest that adults need social interaction so they can see things from different perspectives, construct knowledge, and acquire knowledge (Mezirow, 1991, 2000; Tweedell, 2000). Engaging learners in active learning methods—that is, methods that involve significant student activity and engagement in the learning process—improves motivation, leads to rich knowledge, and promotes higher levels of engagement with the educational material (e.g., Wlodkowski, 2008). Reviews of empirical research in active learning consistently identify the importance of providing direct and active learning experiences for adult learners (Prince, 2004; Taylor, 2007).

Finally, Dwyer and Edwards (2000) found park visitors increasingly expect high-quality interpretation of natural environments. This finding supports other studies that reported the presence of interpreters positively influenced visitors' program experience (Knapp, 2006; Knapp & Benton, 2005; Morgan, Absher, & Whipple, 2003).

## Frequency of Park Visits

Park visitors may not need to visit a park frequently to develop a connection to nature. Heintzman (2010) offers studies that “consistently identify *being in nature* (emphasis in original), whether in the backyard or in a remote wilderness setting, as an important component that influences the spiritual outcomes of nature-based recreation” (p. 78). He further expounds that nature settings “foster exploration and connect people to a larger world” as well as “allow for soft fascination or attention, which suggests that natural features (e.g., sunsets, clouds, mountain vistas) can be observed effortlessly leaving opportunity for reflection on spiritual matters” (p. 78). If this is true, merely being in nature may influence connection to nature.

However, much research indicates that frequent visitors to parks may develop a stronger connection to nature. Zajonc (1968) demonstrated that repeated exposure is a sufficient condition of attitude enhancement. Past experience in wilderness or frequency of visits to the wilderness has been demonstrated to be significantly related to attachment to place (Hammit, Backlund, & Bixler, 2004; Moore & Graefe, 1994; Moore & Scott, 2003; Williams & Vaske, 2003; Williams et al., 1992). Morgan (2009) found frequent visitors to a naturalist-led cave tour scored higher on place attachment than first-timers. This finding is consistent with other studies that have found frequency of exposure positively related to place attachment (e.g., Eisenhower, Krannich, & Blahna, 2000; Moore & Graefe, 1994; Williams et al., 1992). Morgan (2009) speculated that “despite the fact that interpreters want their programs to have an immediate and lasting impact, it may take participants more than one exposure to develop a sense of place” (p. 55). Ryan (2005) found frequent users of urban natural areas had a significantly higher attachment to their respective area than moderate users. Schultz and Tabanico (2007) found that participants who reported visiting a hiking trail more often had a higher implicit connection to nature.

The purpose of this study was to determine whether environmental interpretation would increase park visitor connection to nature. Additionally, frequency of visitation was also studied to determine whether frequent park visitors experience a significantly greater connection to nature than infrequent park visitors. Specific research questions investigated were: (a) Is there a significant difference in connection to nature between park visitors who participated in activities with an environmental interpreter and park visitors who participated in activities without an environmental interpreter?; (b) Is there a significant difference in connection to nature between infrequent park visitors who participated in activities with an environmental interpreter and infrequent park visitors who participated in activities without an environmental interpreter?; (c) Is there a significant difference in connection to nature between frequent park visitors who participated in activities with an environmental interpreter and frequent park visitors who participated in activities without an environmental interpreter?; and (d) Is there a significant difference in connection to nature between frequent park visitors who participated in activities with an environmental interpreter and infrequent park visitors who participated in activities with an environmental interpreter?

## Methods

### Participants

Subjects in this study were visitors staying at a state park in the Midwest. The surveys were completed voluntarily and subject selection was systematic to ensure a diverse sample. The survey subjects were 19 years of age or older. Surveys were distributed around the visitor center and around the campground. Subjects' identity remained anonymous and all surveys were kept confidential.

### Procedure

A post-test only control group design (static

group comparison) was used to survey visitors at the state park. The static group comparison was used, rather than a pre-test/post-test design, because participation in short duration events will likely impact responses and artificially increase scores on the post-test threatening internal validity from a testing effect (Campbell and Stanley, 1963). When given a pre-test, with a post-test within a short period of time, participants can be sensitized to the test, impacting their performance on the post-test. The static group comparison tests a group that has experienced environmental interpretation (the treatment group) against a group that has not (the control group).

A random selection of visitors was surveyed around two visitor centers and at two campsites. Surveys were distributed after participation in at least one full day of visiting the park. The surveys were completed voluntarily. To ensure systematic sampling, every fifth person encountered was asked to fill out a survey. All participants filled out the survey on site before departing the park. Only one member per household was surveyed. For purposes of this study, "infrequent park visitors" were those who visited a state or national park no more than once per year; "frequent park visitors" were those who visited a state or national park more than two times per year. Sampling was conducted over a four-day period in July 2008.

Nature-based recreation activities with environmental interpretation offered at the state park were naturalist/ranger-led education programs, guided hikes, and guided backpacking of at least 90 minutes. Nature-based recreation activities without environmental interpretation at the state park were fishing/hunting, horseback riding, mountain bike riding, canoeing/kayaking, wildlife viewing/birding, geocaching, backpacking, and camping. Only surveys in which visitors indicated exclusive participation in activities

with or without environmental interpretation were used.

### **Instrumentation**

The Multidimensional Connection to Nature Scale (Pennisi, 2007) is a multidimensional scale based on a qualitative investigation into human-nature relationships (Pennisi & Kensinger, 2010, October). The dimensions are awe, spirituality, sorrow, identity, restoration, and fear. The Multidimensional Connection to Nature Scale consists of 26 questions pertaining to the six dimensions. The assessment consists of a 5-point Likert-type scale. The following are example items:

The magnitude of nature is awe inspiring (Awe)  
Feeling part of nature is a spiritual experience (Spirituality)

When people don't think about the long term impacts of their actions on nature it upsets me (Sorrow)

My feelings towards nature form a big part of my identity (Identity)

When I need to relax, I spend time in nature (Restoration)

A lot of nature just scares me (Fear)

Initial reliability analysis by Pennisi (2007) showed the following Cronbach alpha levels: *awe* ( $\alpha = .87$ ), *spirituality* ( $\alpha = .91$ ), *sorrow* ( $\alpha = .86$ ), *identity* ( $\alpha = .89$ ), *restoration* ( $\alpha = .86$ ), and *fear* ( $\alpha = .89$ ).

In addition, the participants were asked to identify from a list of possible activities available at the park which activities they participated in. Participants were asked to provide their age, gender, race, and level of education as well as their frequency of visits to state parks.

Survey responses were entered into the statistical analysis computer program SPSS for data

analysis. Descriptive statistics as well as Pearson Product Moment Correlations were calculated. Independent Sample *t*-Tests were performed to test relationships between connection to nature with environmental interpretation and connection to nature without environmental interpretation, and connection to nature and frequency of visitation.

### Results

Two hundred twenty-one park visitors completed the Multidimensional Connection to Nature Scale. For activities with environmental interpretation there were 81 participants. The aver-

age age was 46.9 years with a range of 24 to 68, and there were 42 males and 39 females. For activities without environmental interpretation there were 140 participants. The average age was 43.6 years with a range of 19 to 81, and there were 68 males and 72 females. Among the participants, 106 were frequent visitors and 115 were infrequent visitors.

The internal consistency reliability of the subscales of the Multidimensional Connection to Nature Scale ranged from .69 to .91 for activities with environmental interpretation and

*(Continued on page 21)*

Table 1  
 Participant Demographic Characteristics

Race	Frequency	Percent (%)
White	219	99.1
Black	2	0.9
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Gender		
Male	111	50.2
Female	110	49.8
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Age (M = 44.79, SD = 13.92)		
19-30	44	19.9
31-40	39	17.6
41-50	62	28.1
51-60	42	19.0
61+	34	15.4
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Education Level		
High School	29	13.1
2 year (AA) or Tech/Prof degree	99	44.8
4 year degree (BA/BS)	70	31.7
Graduate degree (MS/PhD)	23	10.4
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Park Visits per Year		
1	58	26.2
More than 2	163	73.8

□

from .75 to .91 for activities without environmental interpretation.

Pearson’s correlation analyses determined a significant positive relationship between activities with environmental interpretation and connection to nature subscales *spirituality* ( $r = .76, p < .01$ ), *awe* ( $r = .66, p < .01$ ), *sorrow* ( $r = .59, p < .01$ ), *identity* ( $r = .91, p < .01$ ), and *restoration* ( $r = .56, p < .01$ ). There was no significant relationship between participation in activities with environmental interpretation and the subscale fear. There was a significant positive relationship between overall *connection to nature* and *age* ( $r = .24, p < .05$ ) in participants of activities with environmental interpretation. *Age* shared a significant positive relationship with the subscales *spirituality* ( $r = .27, p < .05$ ) and *identity* ( $r = .24, p < .01$ ). *Age* also shared a significant negative relationship with the subscale *fear* ( $r = -.38, p < .01$ ).

Pearson’s correlation analyses determined a significant positive relationship between activities without environmental interpretation and connection to nature subscales *spirituality* ( $r = .75, p < .01$ ), *awe* ( $r = .74, p < .01$ ), *sorrow* ( $r = .62, p < .01$ ), *identity* ( $r = .84, p < .01$ ), and *restoration* ( $r = .80, p < .01$ ). There was no significant relationship between participation in activities without environmental interpretation and the subscale fear. *Gender* shared a significant positive relationship with the subscale *spirituality* ( $r = .19, p < .05$ ) and a significant negative relationship with the subscale *fear* ( $r = -.19, p < .05$ ).

*Age* shared a significant positive relationship with the subscale *awe* ( $r = .30, p < .01$ ). *Education* shared a significant positive relationship with the subscale *identity* ( $r = .24, p < .01$ ) and *age* ( $r = .28, p < .01$ ).

### Data Analyses Using Independent Sample t-Tests

An analysis using an Independent Sample *t*-Test indicated a statistically significant difference between connection to nature for participants in activities with environmental interpretation ( $M = 4.1, SD = 0.4$ ) and connection to nature for participants in activities without environmental interpretation ( $M = 3.9, SD = 0.5; t(219) = 2.79, p < .05, d = .40$ ). Participants in activities with environmental interpretation had a significantly greater connection to nature than participants who engage in activities without environmental interpretation at a state park. Descriptive statistics and the results of the Independent Sample *t*-Test are displayed in Table 2.

An analysis using an Independent Sample *t*-Test indicated no statistically significant difference between connection to nature in infrequent park visitors who participated in activities with environmental interpretation ( $M = 4.0, SD = 0.4$ ) and connection to nature in infrequent park visitors who participated in activities without environmental interpretation ( $M = 3.9, SD = 0.4, t(56) = 1.09, p > .05, d = .24$ ). Infrequent park visitors who participated in activities with environmental interpretation did not have a higher connection to nature. Descriptive statistics and the

Table 2

*Results of an Independent Sample t-Test comparing connection to nature in park visitors who participated in activities with environmental interpretation to park visitors who participated in activities without environmental interpretation*

Park Visitors	N	M	SD	t	df	Sig.	Cohen’s <i>d</i>
Without environmental interpretation	140	3.90	.50	2.79	219	.006*	0.40
With environmental interpretation	81	4.08	.41				

\* $p < .01$ .

results of the Independent Sample *t*-Test are displayed in Table 3.

An Independent Sample *t*-Test indicated a statistically significant difference between connection to nature in frequent park visitors who participated in activities with environmental interpretation ( $M = 4.1, SD = 0.4$ ) and connection to nature in frequent park visitors who participated in activities without environmental interpretation ( $M = 3.9, SD = 0.5; t(161) = 2.97, p < .05, d = .51$ ). Frequent park visitors who participated in activities with environmental interpretation had a higher connection to nature. Descriptive statistics and the results of the Independent Sample *t*-Test are shown in Table 4.

An Independent Sample *t*-Test indicated no statistically significant difference between connection to nature in frequent park visitors who participated in activities with environmental interpretation ( $M = 4.1, SD = 0.4$ ) and connection to nature in infrequent park visitors who participated in activities with environmental interpretation ( $M = 4.0, SD = 0.4; t(79) = 0.50, p < .05, d = .12$ ). Frequent park visitors who participated in activities with environmental interpretation did not have a higher connection to nature than infrequent park visitors who participated in activities with environmental interpretation. Descriptive statistics and the results of the Independent Sample *t*-Test are in Table 5.

Table 3

*Results of an Independent Sample t-Test comparing connection to nature in infrequent park visitors who participated in activities with environmental interpretation to infrequent park visitors who participated in activities without environmental interpretation*

Infrequent Park Visitors	N	M	SD	t	df	Sig.	Cohen's <i>d</i>
Without environmental interpretation	36	3.93	.39	1.09	56	.56	0.31
With environmental interpretation	22	4.04	.42				

$p > .05$ .

Table 4

*Results of an Independent Sample t-Test comparing connection to nature in frequent park visitors who participated in activities with environmental interpretation to frequent park visitors who participated in activities without environmental interpretation*

Frequent Park Visitors	N	M	SD	t	df	Sig.	Cohen's <i>d</i>
Without environmental interpretation	104	3.88	.48	2.97	161	.003*	0.51
With environmental interpretation	59	4.10	.40				

\* $p < .05$ .

Table 5

*Results of an Independent Sample t-Test comparing connection to nature in infrequent park visitors who participated in activities with environmental interpretation to frequent park visitors who participated in activities without environmental interpretation*

Environmental Interpretation	N	M	SD	t	df	Sig.	Cohen's <i>d</i>
Infrequent visitors	22	4.04	.42	0.50	79	.621	0.12
Frequent visitors	59	4.10	.40				

$p > .05$ .

## Discussion

In this study a stronger association was found between those who experienced environmental interpretation and connection to nature than those who did not receive environmental interpretation. This effect also held for frequent park visitors who would be more likely to have a higher connection due to their higher level of visitation to parks and nature. Short term gains in connection to nature were also found in studies by Mayer, et al., 2009; Schultz and Tabanico, 2007; and Weinstein, Przybylski, and Ryan, 2009. While this study is limited by only showing an increase in correlation between environmental interpretation and connection to nature, providing evidence that environmental interpretation caused the increase in connection to nature would need to be shown through several studies utilizing an experimental design where extraneous variables are controlled. This would prove difficult in a park in which visitors were exposed to only short term programs and where visitors are self-selected. That is, they chose to come to the park and participate in the activity making them more likely to be connected to nature or at least open to a connection to nature.

Future studies employing random assignment to treatment and control groups (true experimental design) would provide better evidence of causation. Also, using both a longer program (e.g. an entire day or several days) that eliminates testing effects to enable the use of pre-test post-test design while controlling for other activities that could threaten internal validity (such as experiencing another program that could increase connection to nature or experiencing solitude in nature) would also provide stronger evidence that the association with connection to nature is due to environmental interpretation. A strength of this study is that testing frequent and infrequent users does help control for pre-existing connection to nature or atti-

tudes and motivations. Also, the artificial inflation in test scores that using a pre-test and a post-test in such a short time frame has been eliminated thereby reducing internal threats to validity.

The results of this study support the contention that park activities with environmental interpretation have a greater impact on a person's connection to nature than park activities without environmental interpretation. Similarly, Martin's (2004) study on adventure activities performed in natural settings found the process of education in natural environments helped increase students' sense of oneness with and caring for nature.

For infrequent park users, connection to nature and participation in activities with and without environmental interpretation showed no significant difference. This situation is in contrast with the findings of Beaumont (2001) and Eagles and Demare (1999), who concluded that those with the least environmental experience and weakest attitudes initially will be influenced the most by the experience. Future studies should measure an individual's connection to nature before the program and then immediately after to determine specifically whether a park visitor's connection to nature changed after participating in the program. Infrequent park visitors may need more free time and solitude for reflection than was available in structured activities to develop a significant connection to nature (Heintzman, 2010).

Frequent park visitors who participated in environmental interpretation activities had a greater connection to nature than frequent park visitors who participated in activities without environmental interpretation. There is a view that visitors to natural areas who engage in ecotours or interpretive programs already have pro-environmental attitudes for the environmental movement (Beaumont, 2001). It could be possi-

ble that frequent park users in this study already had a strong connection to nature prior to participation in the activity with environmental interpretation. Nonetheless, the results of this study provide evidence that environmental interpretation activities can influence the connection to nature in frequent park visitors. This finding is in line with Morgan's (2009) contention that it may take participants more than one exposure to the park with environmental interpreters to have a lasting impact. Additionally, Asfeldt (1992) found that even in cases in which preexisting environmental concern is high, participation in an ecotour strengthened those existing attitudes.

On the other hand, some researchers have found that people who enter nature-based education, interpretive programs, and wilderness experience programs with already strong pro-environment attitudes do not intensify those attitudes significantly as a result of participation in these activities (Eagles & Demare, 1999; Gillett, Thomas, Skok, & McLaughlin, 1991). One specific activity may not shape a person's connection to nature. Frequent park users may engage in many environmental interpretation programs and learn a wide range of information about natural areas. These experiences together can help shape their relationship with nature. Just as a relationship between two people can deepen and become more interconnected, so too can a person's relationship with nature. The specific environmental interpretation activities and the role of the interpreter may be a major factor in determining whether frequent park visitors increase their connection to nature.

### **Implications for Practice**

The results indicate that participating in environmental interpretation activities can raise a person's connection to nature. This study benefits park systems by providing useful information to park personnel. Park managers and planners often have authority over environmen-

tal interpreter programs and activities, and it is important to know that they can positively influence connection to nature in park visitors. Park managers should evaluate the effectiveness of their environmental interpretation programs with an eye toward opportunities to develop visitors' connection to nature and thereby increase the attractiveness of their park. In addition, providing visitors with an experience that increases their connection to nature may also result in visitors more willing to participate in other pro-environmental projects in the future and develop an ecocentric environmental attitude (Ewert, Place, & Sibthorp, 2005).

Women experienced a weaker spiritual experience but a stronger experience with fear in this study. Heintzman (2010) provides evidence that some time for solitude, a variety of social settings, and women-only programs might influence women's spirituality. Environmental interpreters should pay attention to spiritual elements of the visitors' experience as well as assess participants' apprehension with being in wilderness areas and take appropriate measures to minimize participants' fear of the wild.

A significant positive relationship exists between overall connection to nature and age of participants in environmental interpretation activities. In addition, age was also positively correlated with spirituality and identity. Older participants may be a resource for interpreters to draw upon during their programs. As a person spends more time in nature throughout a lifetime, he or she can become more connected and familiar with the natural environment.

For activities without environmental interpretation, age was positively correlated with awe. Even without environmental interpretation, it appears that older park visitors can develop or have developed a sense of wonder when enjoying a park.

In addition, this information is valuable to park visitors. Knowing that participation in a park's environmental interpretation programs may result in a connection to nature may increase visitors' appreciation for parks and increase their frequency of visits to parks.

### Implications for Research

The lack of a pretest limits our ability to draw causal conclusions. As noted above, future studies employing random assignment to treatment and control groups would provide better evidence of causation. Also, future studies controlling for other activities that could threaten internal validity will provide stronger evidence that the association with connection to nature is due to environmental interpretation.

Many state parks offer nature-based education or naturalist programs. This study was performed in one state park, and although the results could apply to other state parks, programs at parks may differ in structure and content. It could be inferred that these types of environmental interpretation programs do have an impact on park visitors, but that does not necessarily imply that all park programs will have such an impact. In addition, state parks have different levels of funding to hire and train interpreters. As a result, programs will differ from park to park as will the effectiveness and expertise of the guides. Controlling for the effects of visitation to multiple parks in the case of frequent visitors would be important. Furthermore, park visitors' motivation to frequently attend parks and/or to participate in activities with environmental interpretation is another area of future study and would be another factor to control in future studies.

This study combined all environmental interpretation activities into one category and activities without environmental interpretation into another. Future studies could determine whether a difference exists in connection to nature

based on the specific environmental interpretation activity visitors engage in as well as the training and preparation of interpreters. This research would provide useful knowledge to park personnel because it would let them know which programs are most effective in connecting visitors to nature and where to focus their training and program development efforts.

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