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Contents

A Note from the Editor

This issue of the *Journal* is one of the most diverse in subject matter and continues to represent the wide array of what interpretation is and can be. From night sky interpretation to increasing environmental stewardship, this issue is sure to generate discussion.

As always, there is much to be learned from each submission in helping promote and grow the discipline of interpretation. But the learning and growing does not stop with the *Journal*; in fact, it does not start there either. It starts and ends with our conversations and discussions with each other. When we talk with our colleagues, we refine our questions and our approaches. When we challenge each other's ideas, we can uncover new applications and perspectives.

It is with that spirit that we introduce a new section called "Conversations." The idea for this section grew out of an actual email string between colleagues. It became a conversation that was so interesting, it made me lament how far in between those opportunities are for us to gather or to talk.

The field of interpretation today, whether from the perspective of a student at a university or a superintendent at a state or national park, is feeling the impacts of the current economic crisis. I see that more than ever at conferences. Historically, when budgets were tight, interpretation and other visitor information services were frequently the first to be reduced. But as many of us know all too well, travel costs to conferences and meetings are often the first to go.

When we can, we join our colleagues at conferences, meetings, and webinars. When time allows, we chat with our peers in the vacuums of our offices if we are lucky, or on the phone, but more often than not, by email. Unfortunately, reality often finds us working against our deadlines, within our four walls or in our park, and we rarely get to talk, to debrief, or to consult with our colleagues.

As I have said before, it is important that we continue to ask questions, to challenge, and to try new perspectives. Research serves to link the manager and administrator to the field interpreter, the field interpreter to the visitor, the visitor to the resource, and the resource to overall program goals and objectives. But those questions, answers, and applications are often perfected through our conversations—and so, we must try, in whatever manner we have, to continue our collective conversations.

I look forward to the future developments of our field through your quality submissions to *JIR*.

—C

RESEARCH

Assessing Interest in Sustainable Seafood through Strategically Framed Interpretive Statements

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Abstract
One billion people rely on the ocean for protein. Sustainable seafood initiatives can engage citizens on a consumer level, empowering them to shape our world with food choices. Communication is a useful tool in garnering conservation support. This study conducted at Brookfield Zoo dolphin shows sought to discover whether interest in sustainable seafood initiatives improved with the use of framed interpretive messages versus standard conservation messages. The framed message included a value, metaphor, and offered solutions; while the unframed message offered only a solution without further elaboration. The conservation messages were alternated over the course of 44 dolphin shows, and delivered to a total of 17,157 zoo guests. By measuring the amount of sustainable seafood guides that guests requested, it was discovered that interest in guides increased 2.5% when strategic framing techniques were used over standard messages. This study illuminates the possibilities of inspiring conservation leadership through strategic framing communications.

Keywords
sustainable seafood guides, strategic framing, conservation messages, consumer engagement

Introduction
The bounty of the sea, once thought to be an inexhaustible resource, has shown alarming signs of strain. One hundred years ago the sea contained six times the number of fish than it does today (Koldewey, Atkinson, & Debney, 2009) and was capable of feeding the 1.6 billion people that populated the planet (Vaclav, 1998). Today, 70% of ocean fish stocks are fully exploited or overfished (Pauley *et al.*, 1998) and the challenge of feeding 7 billion

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Figure 1. Jess Reese interprets the behaviors of bottlenose dolphins at Brookfield Zoo.

people has become immense (United Nations, 2011). Scientists warn the consequences of our actions will lead to vast deserts in the ocean devoid of life (Hughes, 2003).

One way to simultaneously educate the public about the over-harvesting of our oceans, alter consumer policy (Iles, 2004), and influence corporate foodservice spending is through the use of sustainable seafood cards (Rohem, 2009). Sustainable seafood is defined by The David Suzuki Foundation as "seafood that is derived from either wild-capture or cultivated fisheries that can be maintained in the long term without detrimental effects to the structure or function of the wider ecosystem" (as cited in Koldewey *et al*., 2009, p. 71). By guiding consumer choices toward healthy fish populations harvested in sustainable ways we can ensure that depleted resources have time to recover, which, in some cases, can take many decades (Pauley *et al*., 1998).

Most people agree that the health of the ocean is crucial to the health of the planet (The Ocean Project, 2009). The unique challenge of conserving our water resources is their lack of salience. For most of us, this enormous amount of the biosphere is out of sight, and therefore out of mind (Kellert, 1996). For the general public, oceans are vast swathes of water with great aesthetic appeal; places for reflection and reverence. But this shallow relationship with our planet's deep waters impedes society's understanding of the complex biological and ecological systems that exist below the surface; systems which are being disrupted through human use (Frameworks Institute, 2011). In order to confront the myriad environmental challenges connected with our world's oceans, Americans must be empowered with knowledge and skills to solve them (Beck & Cable, 2002; The Ocean Project, 2009) and with the scientific literacy to put this new knowledge to use (Llewellyn, 2007).

The vast majority of the American public acquires their science knowledge by engaging in informal learning environments. With only 5% of their lives spent in the classroom, the onus of increasing science literacy of Americans falls, in part, on zoos, aquaria, museums, wildlife parks and nature centers. (Falk & Dierking, 2010). In addition to providing critical preservation to many species, zoos and aquaria enrich us by providing experiential opportunities to 175 million visitors a year (AZA, 2012). One of the ways to influence the knowledge and behaviors of the public is through interpretation (Beck & Cable, 2002) (fig. 1).

The National Association for Interpretation defines interpretation as "a mission-based communication process that forges emotional and intellectual connections between the interests of the audience and the meanings inherent in the resource" (Brochu & Merriman, 2006, p. 8). In a zoo setting, interpreters seek to connect people with animals through messages that are relevant, meaningful, enjoyable, organized, and thematic ways in which to learn about the natural world (Beck & Cable, 2011). Many zoos want their guests to feel empowered with solutions to conservation challenges (Falk *et al*., 2007) and that they have the skills necessary to contribute. The challenge for the interpreter is to deliver all of this in the small time frame in which they have a captive audience.

Zoo interpreters seek to increase visitors' level of knowledge, change attitudes, and shift their behaviors toward sustainability. In this way, interpreters are in the business of manipulation (Ham & Weiler, 2003), or at the very least "managing" guest behavior (Knudson, Cable, & Beck; 2003). Under National Science Foundation grant funding and the leadership of the New England Aquarium, The National Network for Ocean and Climate Change Interpretation study circle was developed in 2011 to create a community of practice among zoos and aquaria. During in-person workshops, webinars, and sharing in an online community, zoo and aquaria educators were taught to communicate ocean and climate change content, while using strategic framing in their communication. The training was conducted by Frameworks Institute (2009), a nonprofit organization that works with nonprofits on building capacity in communications about social problems through the use of research compiled by communication scholars.

Framing involves communicating specific information for the purpose of impacting behavior (Frameworks, 2009). In their workshop *Changing the public conversation on social problems*, Frameworks offers a variety of tools, including value statements that many people can relate to such as ingenuity, innovation, responsible management, interdependence, and stewardship. Values such as these are similar to the interpretive tool called "universal concepts" (Larsen, 2000), which taps into dominant ways of thinking. Next, simplifying models or metaphors are used to illustrate complex concepts. Research shows that applying new information in a context that is relevant and already understood creates a heuristic shortcut for learners (Kempton, Boster & Hartley, 1995). Lastly, specific policy solutions are offered, which provide guests with opportunities to engage in the desired behavior as soon as possible.

Frameworks Institute (2009) stresses that the elements of framing need not occur in this order, *per se*, as every interpretive opportunity is unique. By tuning into specific cultural models and narratives, which are a part of an audience's collective consciousness, interpreters can effectively relate messages. The speaker who utilizes framing should assume that they are facilitating a dialogue with an audience, or at the very least encouraging dialogue to happen after the program. Dialogic discourse is open

to reasonable thought and problem-solving, instead of monologic discourse, which is authoritative and ideological (Tannen, 1999).

Special attention should be paid to tone. Too often the dominant tone in the public arena, is "rhetorical." Rhetorical tones tend to be partisan-based, and heavily stress opinions and ideologies. If the audience's political beliefs of identities do not align with what the messenger has said, then productive thought tends to end there, inviting skepticism in its stead. Even if the identity of the audience aligns with the message, distrust and reluctance may ensue, if the messenger has chosen dramatic and absolute statements. For this reason it is suggested to use a "reasonable" tone. When a reasonable tone is employed, the problems, causes, and solutions are presented in such a way that evokes "can-do" attitudes in audiences. A person who uses a reasonable tone does not blame the people or the politics. Instead, criticism is focused on the actions that were taken to cause the problem, and solutions are swiftly offered to direct thought to constructive actions (Bales, 2009).

Another framing pitfall to steer clear of is "crisis modes," which tend to shut down constructive thinking. When presenting conservation challenges, environmentalists often resemble Chicken Little, warning the barnyard that the sky is falling. This is because many well-meaning conservationists have a deep understanding of the environmental stakes at hand, are passionate about preserving them, and feel that dramatic over-statement is the only way to reach people who appear disengaged. Social science indicates that support for environmental policies drop dramatically when crisis frames are presented. It is also important to connect the dots for audience. It should not be assumed that a person who is told that the oceans are becoming rapidly depleted would understand how a card that is small enough to fit in their wallet could contribute to solving the problem. Communicators who use framing techniques use causal chains, carefully connecting ideas and concepts, in order to address gaps in audience knowledge and arrive at solutions (Bales, 2009).

Research has shown that framing can be effective in creating behavioral change (Frameworks, 2011) and integrating messages that address societal norms is becoming more routinely embraced by conservation agencies (Winter, 2006). For many people, their behaviors may be heavily dictated by a society's subjective norms and "fitting in" or "following the crowd" becomes a powerful reason for change in behavior (Knudson, Cable, & Beck, 2003).

Socio-physical setting for the study.

The Chicago Zoological Society (CZS) at Brookfield Zoo in Brookfield, Illinois, seeks to "inspire conservation leadership by connecting people with wildlife and nature" (CZS). This zoo sees over 2.2 million visitors each year, many of whom attend one of the daily dolphin shows at its Seven Seas dolphinarium. Shows run 365 days a year, twice daily for most of the year and up to four times a day during the summer months. The indoor stadium seats 1,625 people and regularly sells out during the high season. The study occurred during the low season, when there were only two shows a day, and the audience was composed mostly of local residents, as opposed to tourists, who visit more frequently in the summer months.

In the show, a standard conservation message about sustainable seafood has been included in the show's narration for the past three and a half years, along with offers of complimentary copies of Blue Ocean Institute's (2010) Ocean Friendly Seafood guides

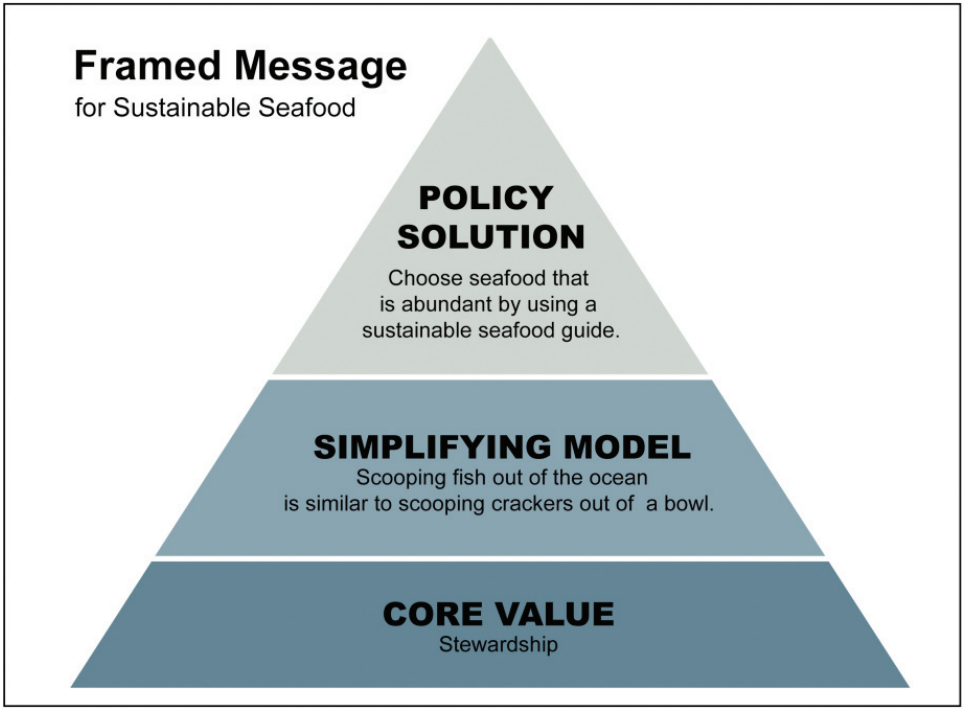

Figure 2. Strategic framing includes values, simplifying models and policy solutions.

to guests (Appendix A). Typically, a very small percentage of guests show interest in the seafood guide, which has caused the author to craft a new message based on strategic framing concepts.

The Study

This study sought to explore whether interest in sustainable seafood initiatives improved from interpretation based on strategic framing techniques compared to using the standard conservation message. The standard message offered the seafood guides as a way to help dolphins, but did not include values or metaphors. Though the project was inspired by the Frameworks Institute's teachings during the NNOCCI study circle, the research approach, hypotheses, metaphors that were tested, and methods were solely the author's construction. The prediction was that the sustainable seafood message framed (fig. 2) to include the values of stewardship, the simplifying model of scooping food out of a bowl and the specific seafood guide solution would engage more participants and inspire them to show an interest in participating in sustainable seafood initiatives by taking a seafood guide (Appendix A), a measurable conservation behavior.

The sample audience group was composed mainly of families, particularly on the weekend shows. During the weekdays, it is common to have large school groups and families of young children accompanied by one parent.

Methods

Prior to the dolphin show, the presenter counted out stacks of cards in bundles of 20. Before beginning the narration, conditions such as the number of guests, weather, overall audience type, and dolphin population group were noted to be used for data log entry later on. At the time of the study the dolphins were separated into two groups; 2 male dolphins and 4 female dolphins. On some days, the group was mixed, featuring both sexes together in the same main pool.

In several instances, the guest numbers were so few that they could be counted, however some shows required that the presenter estimate the number of guests. Since the interpreter at the dolphin show used only one type of sustainable seafood message in any given presentation, one of the messages (below) was chosen. The section in which the card would be introduced was planned. Since the very nature of presenting a dolphin show is improvisational, when and what the interpreter addresses depends heavily on the cooperation of the dolphins.

> A: **Standard sustainable seafood message in dolphin presentation:**
> *If you want to help wild dolphins, come and see me after the show. I'll give you this free guide to ocean-friendly seafood, so you can make seafood choices that are great for your family, great for wild dolphin families, and great for the whole planet.*

> B: **Framed sustainable seafood message in dolphin presentation:**
> *We have more in common with these air-breathing mammals than you might think. How many of you enjoy eating fish? A lot of us—just like dolphins! How many of you enjoy eating those yummy goldfish crackers? Well, then you know that the more crackers that you scoop out of the bowl, the number gets smaller and smaller until nothing remains. This is the challenge that our oceans have, the more fish we take without really thinking about which kinds of fish are abundant, the fewer we have in the ocean. You can join the millions of people who are helping to care for dolphins by choosing the plentiful fish, giving the other fish a chance to return. Come and see me after the show. I'll give you this free guide to ocean-friendly seafood, so you can make choices that ensure that there are "plenty of fish in the sea" for all of us.*

During the project, from October 9 through November 30, 2011, the dolphin shows were running twice daily, once at 11:30 a.m. and once at 2:30 p.m. The narrator aimed to rotate the statements (fig. 3). For instance, during the first show, the presenter used statement A. During the second show, the presenter used statement B. The following day, the presenter began with statement B and then finished with statement A. Alternating the statements, ensured that both messages were tested in the mornings and afternoons, however, the improvisational and adaptive needs of narration sometimes necessitated a change in plans. Message B was longer to deliver (usually around 48 seconds) while message A was shorter (usually around 14 seconds). The message was chosen based on the needs of balancing narration with action and overall dolphin cooperation.

Both messages were delivered in a conversational tone, allowing for seamless flow with the other message points in the show. The framed message contained an explanation of the problem that unsustainable seafood presents, as well as the cause,

and solutions, while the unframed message offered only a solution without further elaboration. When incorporating the problem and cause in the framed message, the narrator employed a "reasonable tone," which does not blame people or politics, but focuses criticism on actions that were taken to cause the problem, followed by constructive alternatives (Bales, 2002).

Prior to the beginning of the project it was decided that the message could be given before or after any section of the dolphin show, as long as the context in which the message was given was recorded on a data sheet (Appendix B). Again, this flexibility insured that the flow of the presentation and guest satisfaction were not impacted by the study. The researcher anticipated that recording the context of the message might help to explain trends and identify variables. Another prediction was that guests might have more questions about the seafood guide when the framed message was used, compared to the standard message.

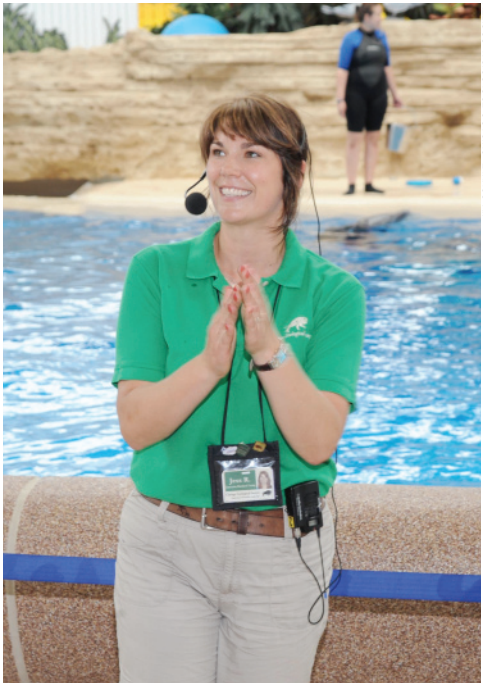

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Figure 3. Interpreter, Jess Reese, delivers sustainable seafood message during the dolphin show at Brookfield Zoo.

After the dolphin show, the narrator positioned herself in front of the main seating section, at the base of the stairs where the majority of guests walk down in order to exit the dolphin stadium. The narrator carried three (or four, depending on the crowd) stacks of 20 pre-counted seafood guides, so if a guest requested one, the guide could be easily dispensed. Two trainers were stationed at the base of the stairs in the north and south sections, to accommodate requests from guests who were not seated in the main section. These trainers also had two stacks of 20 pre-counted seafood guides available to dispense upon guest request. This insured that no matter where the guests were seated, or how they exited, they would pass by an employee that was visibly handing out the seafood guides, which were mentioned in the dolphin show.

Following the show, the remaining seafood guides were counted. From the total that remained, how many guides had been dispensed during that show. These numbers were then recorded in the data log sheet, along with the estimated number of guests in attendance, the amount of cards taken, the message used (A or B), any comments or questions about the guide, and details about the show's dolphin populations. Any comments or any relevant information that the presenter wanted to provide (such as weather or predominant age demographic in attendance) was recorded along with the presenter's name and any other variables that were deemed relevant. It was predicted that more guides would be requested during the dolphin shows where the strategically framed statement was used.

	Cards	*Attended*	**% of guests**
Standard	292	7,174	4.07
Framed	645	9,983	6.46
Total	937	17,157	5.46

Table 1. Only 4.1 % took a seafood guide with the standard message, compared to 6.5% with the framed message, increasing audience interest in seafood guides by nearly 2.5%.

Results

As mentioned above, over the course of 44 dolphin shows, with an estimated total of 17,157 people, 937 sustainable seafood guides were taken by guests regardless of message, representing roughly 5.5% of the audience. During the 22 dolphin shows in which the interpreter presented the standard message, there were an estimated total 7,174 people in attendance and exactly 292 sustainable seafood guides were distributed, representing 4.1% of the audience. During the 22 dolphin shows where the interpreter presented the framed message, there were an estimated total of 9,983 people in the crowd and 645 sustainable seafood guides were asked for, representing 6.5% of the audience (Table 1). The difference between 4.1% of the audience and almost 6.5% of the audience is a significant increase in proportion at the .001 level using a two-tailed test where $z = 6.84$.

Eight out of 937 guests asked a question about the guide. Six questions were asked after the standard message was used, with two coming after the framed message was delivered. All were inquiries about the use of the guide. The context of the message and weather patterns were analyzed, however they were not found to influence the outcome of the research.

Discussion

The findings from this study have shown how strategic framing can enhance interpretation and increase interest and engagement in conservation initiatives. While the overall interest in sustainable seafood guides was relatively small, the difference between 4.1% of the audience and almost 6.5% of the audience was significant, especially given how many people attend the dolphin shows every year. This study was conducted in an indoor dolphin stadium, during the off-season, but there are plenty of opportunities to engage guests during the busier months. According to Jerry Johnston, the CZS Vice President of Guest Relations, during the entire year of 2011, a total of 454,329 people attended the dolphin show, with the bulk, 313,548, attending during the time frame between Memorial Day and Labor Day (personal communication, March 29, 2012). Thus, a 2.5% increase in the number of guests who take a sustainable seafood guide represents 11,358 additional sustainable seafood guides distributed using framing methods in conservation communications. Considering that 2.2 million people visit Brookfield Zoo every year, it becomes clear that implementing strategic framing in all aspects of interpretive messaging might contribute to achieving the institutional mission of creating conservation leaders. Moreover, this project demonstrates how effective communication may inspire interest in sustainable behavior.

Most Americans consider themselves sympathetic to the environmental movement, but admit that they are not actively involved (The Ocean Project, 2009). In this regard, free-choice learning environments are prime venues for communicating information in order to increase involvement. The Ocean Project's survey (2011) shows that the vast majority of the American public is concerned about ocean conservation issues. Far from apathy, the source of their inaction and disengagement with ocean conservation is a lack of urgency, due in part to a gap in understanding why they must act now. During the spring of 2010, when the Deep Water Horizon oil spill occurred in the Gulf of Mexico, the event seemed to explode in the consciousness of the American public, as reflected by the intense media coverage. The spill pervaded conversation and discourse regarding the government's responsibility in protecting the quality of the ocean (The Ocean Project, 2009) and even spurred a flurry of activity on the National Oceanic and Atmospheric Administration's website as the American public sought more in-depth information than the superficial coverage that CNN and MSNBC could provide (Falk & Dierking, 2010). The spill provided a concrete example of the fragility of the ocean and the intense need for advocacy to prevent such catastrophes. However, once the disaster disappeared from the 24-hour media coverage, the public returned to more "front-page" issues such as the sagging U.S. economy and the weak job market (The Ocean Project, 2011).

Part of the problem is the way in which conservation challenges are communicated by well-meaning educators, scientists, and environmentalists. Information about the depletion of the ocean's resources often is delivered in a "crisis" frame, and can stop productive thinking from occurring. Instead of inviting solution-oriented thinking, crisis frames often attract skepticism and suspicion (Bales, 2009), which tends to reduce empowerment and may even induce defensiveness. For example, overharvesting of oceans has been described as one part of an "evil quartet" (Diamond, 1989), along with habitat fragmentation, invasive species, and the increasing rates of extinction. Since these causes for extinction are mainly anthropogenic in nature, what side does that put humans on: "good" or "evil"? The use of the word "evil" is inflammatory and not likely to help sustainability advocates to achieve their goals. Polarizing statements such as these forces people to choose sides. America's increasingly argumentative culture is especially prone to these kinds of representations and does not facilitate constructive communication about conservation issues (Frameworks Institute, 2009; Tannen, 1999).

The challenge is finding ways to communicate environmental concerns that adequately convey the direness of the problems, while not resorting to "crisis" messages. The vast majority of the public do not understand the urgency of ocean conservation issues (The Ocean Project, 2011). Damage to biological and ecological systems need to cease on a broad scale. Habitat fragmentation imperils genetic diversity in the sea (Stockwell, 2003), just as on land, but we seldom hear this in the cultural dialogue. An ocean with adequate response diversity and intact functional groups is crucial for ocean ecosystems when adapting to climatic changes (Bellwood, Hughes, & Hoey, 2006; Brown, Smithers, & Perry, 2009). However, these concerns are not adequately addressed in consumer-based sustainable seafood programs alone.

While the simplifying model used in this study appears to have made a difference in inducing audience interest in sustainable seafood guides, it is unclear whether this was the most effective metaphor to use. One might argue that it illustrates the action of emptying, rather than sustainability. Fish in the ocean and crackers in a bowl are both finite, however, fish reproduce whereas crackers do not. The simplifying model does not

address the complexities of choosing seafood that is derived from abundant populations or procured through sustainable fishing methods. By illustrating depletion, without explaining how targeted extraction contributes to solutions, the narrator may have invoked a "crisis" frame. Brookfield Zoo's dolphin shows provide an ideal setting to test further metaphors.

The duration of the framed message was 48 seconds, and it took three times longer to deliver than the standard message, which was only 14 seconds long. The disparity in the length of the two messages bears consideration. It is possible that the observed increase in interest in the seafood guides could simply be the result of a longer message, and not necessarily the content of the message. Future studies could include methodologies that measure messages that are equal in length, in order to address this uncertainty. It would also be valuable to construct a longitudinal study in order to discover how many guests make use of the seafood guides in their day-to-day lives, and whether the interest shown in the dolphin stadium persisted after their visit to Brookfield Zoo.

For readers who are interested in learning more about the use strategic framing in informal learning centers, it is recommended they visit and register at the website Climate Interpreter, found at www.climateinterpreter.org. There, they will find information about forthcoming study circles and how to apply to become a participant. Exploring the content on Climate Interpreter will reveal ways to connect with a wider community of colleagues who are interested in communicating global scale issues that affect our world's oceans.

As a result of the findings of this study, changes will be made in the training of CZS staff as it pertains to interpretation. Plans are underway to provide training in strategic message framing in a workshop for zoo staff who conducts summer zoo chats. By teaching these techniques to other zoo professionals, further communication research becomes more likely.

Conclusion

In order to end the overexploitation of our oceans we must coax and inspire a vocal and an engaged consumer advocacy to push for broad scale changes in commercial fishing and the inclusion of more MPAs and restricted-use zones with strategic corridors that link the imperiled wildlife. With all of the solutions at hand to solve the problem of our oceans' dwindling resources the questions are not "What, how, or why should we do it?" The questions are "When?" and "Who?" Conserving our blue planet is a communication issue that must be strengthened if we are to have these questions answered and address these challenges in time to save species.

Framing research indicates a need for storytellers who are adept at linking values to the big picture; a picture where common ground is discovered and problems are solved through working together. Masterful storytellers take complex issues, which are usually left for the "experts" to explain, and tell the story in a way that can be understood by ordinary people (Bales, 2005).

We are living in an increasingly information-intensive society. Messages designed to inspire, stir the soul, and spur action should receive ample attention before they are used, and crafted with a clarity that is sharp enough to cut through the din. Strategic framing can orient our communication in a direction that is solutions-based, systemic, and empowering. Instilling hope in interpretive messaging is absolutely critical to the success of our conservation efforts.

Citations

Association of Zoos and Aquariums. (2012). Visitor Demographics page. Retrieved from: http://www.aza.org/visitor-demographics/

Bales, S.N. (2002). *Taking tone seriously as a frame cue*. Washington, DC: FrameWorks Institute.

Bales, S.N. (September, 21, 2005). WANTED: Master Storytellers. *Nonprofit Quarterly*. Retrieved from: http://www.nonprofitquarterly.org/management/666-wanted-master-storytellers.html

Bales, S. N. (2009). *How to talk about climate change and oceans*. Washington, DC: FrameWorks Institute.

Beck, L., & Cable, T. (2002). *Interpretation for the 21st century: Fifteen guiding principles for interpreting nature and culture*. Champaign, IL: Sagamore Pub.

Beck, L. & Cable, T. (2011). *Proceedings from: Zoos, Wildlife Parks, and Aquaria InterpNET conference 2011*. "Expanding our interpretive perspectives."

Bellwood, D. R., Hughes, T. P., & Hoey, A. S. (2006). Sleeping functional group drives coral reef recovery. *Current Biology : Cb, 16, 24,* 2434-9.

Blue Ocean Institute (2010). *Blue Ocean Institute's Ocean Friendly Seafood*. [Brochure]. Cold Spring Harbor, NY.

Brochu, L. & Merriman, T. (2006). *Certified interpretive guide: Training workbook* (2nd ed.). Fort Collins, CO: National Association for Interpretation.

Browne, N. K., Smithers, S. G., & Perry, C. T. (2010). Geomorphology and community structure of Middle Reef, central Great Barrier Reef, Australia: An inner-shelf turbid zone reef subject to episodic mortality events. *Coral Reefs*, 29, 3, 683-689.

Diamond, J.M. (1989) Overview of recent extinctions. In *Conservation for the Twenty-first Century* (Western, D. and Pearl, M.C. eds), pp. 37–41, Oxford University Press.

Falk, J. H., & Dierking, L. D. (2010). The 95 Percent Solution School is not where most Americans learn science. *American Scientist, 98,* 6, 486.

Falk, J. H., Reinhard, E. M., Vernon, C., Bronnenkant, K., Heimlich, J. E., Deans, N. L., Association of Zoos & Aquariums., ... National Science Foundation (U.S.). (2007). *Why zoos & aquariums matter: Assessing the impact of a visit to a zoo or aquarium*. Silver Spring, MD: Association of Zoos & Aquariums.

Falk, J., Storksdieck, M., & Dierking, L. (2007). Investigating public science interest and understanding: evidence for the importance of free-choice learning. *Public Understanding of Science, 16, 4,* 455 469.

Frameworks Institute (2009). *Changing the public conversation on social problems. A beginner's guide to strategic frame analysis*. Available online at: http://sfa.frameworksinstitute.org/

Frameworks Institute (2011). Strategic Framing Analysis for The National Network for Ocean and Climate Change Interpretation study circle. New England Aquarium, Boston, MA. September 26, 2011. Training Seminar.

Ham, S. & Weiler, B. (2003). Interpretation is persuasive when themes are compelling. *Interpret Scotland Issue 8* (Autumn 2003): p. 3. Available on-line at: http://www.interpretscotland.org.uk/

Hughes, T. P. (2003). *Climate change, human impacts, and the resilience of coral reefs*. Stockholm: Beijer International Institute of Ecological Economics.

Iles, A. (2004). Making seafood sustainable: Merging consumption and citizenship in the United States. *Science & Public Policy, 31,* 127-138.

Kellert, S.R. (1996). *The Value of Life: Biological Diversity and Human Society.* Washington, D.C.: Island Press.

Kempton, W., Boster, J. S., & Hartley, J. A. (1995). *Environmental values in American culture*. Cambridge, Mass: MIT Press.

Knudson, D. M., Cable, T. T., & Beck, L. (2003). *Interpretation of cultural and natural resources*. State College, Pa: Venture Pub.

Koldewey, H. J., Atkinson, J., & Debney, A. (2009). Threatened species on the menu? Towards sustainable seafood use in zoos and aquariums. *International Zoo Yearbook*, 43, 1, 71-81.

Larsen, D. (2000) *An Interpretive Dialog.* Handout distributed at NPS Interpretive Development Process educational session at 2000 National Interpreters Workshop. Tucson, AZ 20pp.

Larsen, D. (2002). Be relevant or become a relic: Meeting the public where they are. *Journal of Interpretation Research*, *7 (1),* 17-23.

Llewellyn, D. (2007). *Inquire within: Implementing inquiry-based science standards*. Thousand Oaks, Calif: Corwin.

Pauley, D., Christensen, V., Dalsgaard, J., Forese, R., & Torres, J. F. (1998). Fishing Down Marine Food Webs. *Science, 279,* 5352, 860.

Rohem, C. A. (November 25, 2009). An evaluation of sustainable seafood guides: Implications for environmental groups and the seafood industry. *Marine Resource Economics, 24, 3,* 301-310.

Stockwell, C. et al. (February 2003). Contemporary evolution meets conservation biology. *Trends in Ecology and Evolution*, Vol. 18, No. 2, pp. 94-101.

Tannen, D. (1999). *The Argument Culture: Stopping America's War of Words*. New York, NY: Ballantine Books.

The Ocean Project (2009). *America, the ocean, and climate change: New research insights for conservation, awareness, and action*. Retrieved September 29, 2011 from: http://theoceanproject.org/communication-resources/market-research/reports/

The Ocean Project (2011). *America and the Ocean, annual update 2011*. Retrieved September 29, 2011 from: http://www.theoceanproject.org/marketresearch/

Tilden, F. (1957). *Interpreting our heritage*. Chapel Hill, NC: University of North Carolina Press.

United Nations. (2011). *World Population Prospects*. UN, New York. 2011.

Vaclav S. (1998). Global Population: Milestones, Hopes, and Concerns. *Medicine & Global Survival 5(2),* 105-108.

Winter, P. (2006) The impact of normative message types on off-trail hiking. *Journal of Interpretation Research, 11(1)* 35-51.

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Appendix A: Blue Ocean Institute's Sustainable Seafood Guide.

This guide is accessible at: www.blueocean.org/files/July2010SeafoodGuideOnline.pdf
Photo source: Blue Ocean Institute

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This short guide provides just a selection of the 130+ seafoods that Blue Ocean has ranked. Find the complete, and growing, listing at **www.blueocean.org.**

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Albacore (*Bin'naga maguro*), **Bigeye** (*Maguro*), and **Yellowfin** (*Maguro*) **Tuna, pole- and troll-caught**
Albacore, Bigeye and Yellowfin Tunas are fast-growing, prolific breeders, and wide-ranging with many populations at moderate abundance. The low bycatch associated with pole- and troll-caught tuna makes them a better alternative to longline or purse seine-caught tuna. U.S. and Canadian Pacific Albacore that is pole- or troll-caught is sustainably managed according to the Marine Stewardship Council standard.

Clams, wild (*Hokkigai, Mirugai*)
Clams in the U.S. are caught using various techniques from hand rakes for Hard Clams, "stingers" for Geoduck Clams (*Mirugai*) , to hydraulic dredges for Atlantic Surf Clams (*Hokkigai*). Although habitat effects vary, bycatch is generally low. All three species are well-managed, but only Atlantic Surf and Geoduck Clams are abundant. Hard Clams are often referred to by their size, from Button, Littleneck, Topneck, Cherrystone, and Chowder.

Mahimahi, pole- and troll-caught
Mahimahi grow fast, live short lives, and can withstand high fishing pressure. Pole- and troll-fisheries catch Mahimahi with little bycatch compared to longline fisheries.

Mussels and Oysters, farmed
Shellfish filter feed and don't require supplemental food. When farms use suspended bags, nets, or cages—as opposed to dredging shellfish on the seafloor—the operations are more ocean-friendly.

Salmon, Alaska wild (*Sake*,**Salmon roe** *Ikura*)
Salmon caught from Alaska comprise five species: Pink, Sockeye, Chum, Coho and Chinook (a.k.a. King) Salmon. Abundance of salmon, particularly Pink and Sockeye, is high due to good management and healthy habitat. The majority of salmon is caught with purse seines, but gillnets and trolling gear are also used. These fishing methods cause little habitat damage and result in moderate bycatch levels.

Striped Bass (*Suzuki*)
Striped Bass are wild-caught* and hybrids are farmed. Effective fisheries management helped wild Striped Bass recover from severe depletion in the 1980s to high abundance today. Farming Striped Bass results in few escapes and minimal pollution.

Tilapia, U.S. farmed
Not native to the U.S., Tilapia are freshwater fish that are fed moderate amounts of fishmeal. When raised in closed systems in the U.S., they have very low environmental impact.

American ("Maine") Lobster, U.S. and Canada
U.S. and Canadian Lobster populations remain abundant. However, endangered North Atlantic Right Whales still become entangled in lobster fishing gear.

Catfish, U.S. farmed
Southern U.S. fish farmers raise catfish in large earthen ponds. Some water pollution results, but catfish escapes are rare. Catfish require less fishmeal and fish oil in their feed than other farmed fish.

Dungeness, King, and Stone Crabs (*Kani*)
These crab species are fairly abundant thanks to good management. Crab fishers use relatively low-bycatch traps (or pots).

Pacific Cod
Caught using a range of methods including bottom trawls, longlines and pots, Pacific Cod are reasonably abundant. Most are caught from Alaskan waters where good fisheries management protects endangered marine mammals although seabird bycatch is still high.

Pacific Halibut
Although they grow slowly and can live over 50 years, Pacific Halibut remain abundant due to responsible management. Fishers may own shares of the total annual catch, eliminating dangerous incentives to fish competitively.

Shrimp, U.S. farmed and wild (*Ebi*)
Many shrimp species are fished from U.S. waters including Pink, Brown and White Shrimp. Shrimp are caught from Alaska to the Gulf of Mexico, and most populations have a healthy abundance due to good management and fast growth rates. But Shrimp trawling damages the seafloor and can result in large bycatch. Farmed shrimp require high amounts of fishmeal and fish oil in their food compared to other farmed fish. U.S. farmers usually treat discharged water to reduce pollution.

FISH KEY

Species relatively abundant; fishing/farming methods cause little damage to habitat/other wildlife.

Species has medium-high levels of abundance; fishing/farming methods cause some environmental damage.

Some problems exist with species' status or catch/farming methods.

Species abundance is generally low; fishing/farming methods typically have large environmental impact.

Species has combination of problems: overfishing, high bycatch, poor management, or farming has serious environmental impacts.

Seafood with this mark come from a fishery that has been independently certified to the Marine Stewardship Council's standard for well-managed and sustainable fisheries. Learn more at www.msc.org.

These fish contain levels of mercury or PCBs that may pose a health risk. For more details please refer to Environmental Defense Fund's website (www.edf.org/seafood).

* The Health advisory for this group refers to this species.

Sushi names given in *italics* where appropriate.

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Squid (*Ika*)
Many squid species exist worldwide. Squid grow fast and often reproduce before a year old, characteristics that help them withstand high fishing pressure. Most are vulnerable to changes in environmental conditions.

Albacore (*Bin'naga maguro*)*, **Bigeye** (*Maguro*)*, **Yellowfin** (*Maguro*)*, and **Skipjack Tuna** (*Katsuo*), **canned or longline caught**
Although quick to mature and found throughout the world's oceans, some Skipjack, Yellowfin, Bigeye (chunk light) and Albacore (chunk white) populations are declining due to heavy fishing pressure. Most canned tuna is caught by purse seine nets or longlines that also catch large numbers of sharks, sea turtles, marine mammals, and sea birds. Some canned tuna is caught using poles or by trolling, fishing methods that are more ocean-friendly.

Atlantic Flounders (*Hirame*)
Several Flounder species are found along the Atlantic coast. Witch, Windowpane, Winter* and Yellowtail Flounders and American Plaice have very low abundances. Most flounders are caught by bottom trawls, resulting in moderate levels of bycatch and high levels of habitat damage. Summer Flounder have medium abundance and are a more ocean-friendly choice.

Blue*, Snow and Tanner Crabs
Exploited heavily, depletion affects some populations of these crab species. Blue Crabs suffer from habitat loss and pollution. Slower maturity of Snow and Tanner Crabs makes them more vulnerable to fishing pressure. Fishers catch crabs mainly with low-bycatch traps.

Haddock
Found in the Atlantic Ocean, most Haddock are caught using bottom trawls which can damage the seafloor and result in high levels of bycatch including overfished cod. Due to strong management, some populations are now at healthy abundance levels.

Monkfish (*Anko*, **Monkfish liver** *Ankimo*)
Monkfish grow slowly but mature quickly and are typically found in dense aggregations on mud and sand bottoms along the Atlantic coast. Overfished for many years, their abundance is now at moderate levels due to good management. Most are caught in gillnets or by bottom trawling, which can damage the seafloor.

Sea Scallops (*Hotate*)
While no longer overfished, controversial management measures for wild Sea Scallops inadequately address high fishing pressure. Bottom dredges and trawls used to catch Sea Scallops damage habitat, and there is unintended catch of endangered sea turtles, depleted Atlantic Cod, and other groundfish.

Swordfish
Swordfish in the North Atlantic show signs of recovery due to stronger catch regulations. Their abundance appears healthy in the North Pacific, but their status is unclear in other parts of the Pacific. Most Swordfish are longline caught, with high bycatch of albatrosses, sea turtles, and sharks.

Octopus (*Tako*)
Although Octopus are wide-ranging and have short lifespans, some populations are declining due to heavy fishing pressure. Most are caught using bottom trawls, causing habitat damage and bycatch of wildlife.

Skate
Seven skate species are caught along the Atlantic coast and many populations have low abundance. Skates are typically long lived, mature slowly and don't produce many young, making them vulnerable to fishing pressure. Skates are most commonly caught in bottom trawls, which damage the seafloor.

Tilapia, imported, farmed
Tilapia is farmed in Asia, and Central and South America using a variety of methods including net cages and ponds, which can allow fish to escape and compete with native species. Farmed Tilapia are fed moderate amounts of fishmeal and oil.

Atlantic Bluefin Tuna (*Kuro maguro, Hon maguro*)
Atlantic Bluefin Tuna is one of the largest fish in our oceans, but its abundance is at a critically low level due to poor management. Bluefin Tuna are sometimes caught as juveniles and fattened in net pens. This "farming" method prevents the fish from spawning further reducing Bluefin numbers.

Atlantic Cod
Decades of overfishing drove Atlantic Cod populations to historic low levels. Due to management measures that include permits, gear restrictions, and size limits, some populations are slowly recovering. Bottom trawling for Atlantic Cod destroys habitat. Pacific Cod is a more ocean-friendly alternative.

Atlantic Halibut (*Hirame*)
Long-lived and slow to mature, Atlantic Halibut is naturally vulnerable to fishing pressure. Due to many years of overfishing, populations have collapsed. Pacific Halibut is a more ocean-friendly alternative.

Chilean Sea Bass
Really named Patagonian Toothfish, high market demand for this long-lived fish drives depletion and creates an incentive for continued illegal fishing.

Freshwater Eel (*Unagi*)
Freshwater Eels are highly carnivorous and often farmed in net pens and ponds where discharged waste causes serious environmental pollution. Because of their complex life history, farming is dependent on wild-caught juveniles, causing wild populations to decline.

Orange Roughy
Severely depleted, Orange Roughy don't mature until they're at least 20 years old and can live over 100 years. They live in deep waters where habitat-damaging trawls catch them when they gather in groups to feed or spawn. Fishing for Orange Roughy also catches and kills threatened shark species.

Salmon, farmed (*Sake*, **Salmon roe** *Ikura*)
High environmental costs of farming salmon include water pollution, spread of diseases to wild fish, high content of fish in feed, and overuse of antibiotics. In addition to Atlantic Salmon, farmers now raise Chinook and Coho Salmon. All Atlantic Salmon sold in the U.S. are farmed. Wild Alaska Salmon are a more ocean-friendly choice.

Shrimp, imported (*Ebi*)
Bottom trawls used to catch most wild shrimp damage habitat and kill many invertebrates, fish, and sea turtles. Coastal shrimp farming ruins life-supporting ecosystems such as mangroves and causes water pollution. Shrimp fisheries and farms in the U.S. are generally better monitored and regulated.

Appendix B

The data from the study was recorded on data spreadsheet below.

Date of Dolphin show	Day of the week	Exact amount of seafood guides distributed	Estimated number of guests	Standard message	Framed message	Number of questions about the guide	Girls show	Boys show	Mixed Girls and Boys	Split show	AM	PM	Comments	Presenter	Context of message	conversion %	conversion %	message type
10/9/2011	Sunday	43	1400	X		0	X				X		Beautiful weath	JR	transition out of hunting into SPA		0.03071	Standard
10/9/2011	Sunday	95	1800		X	0		X				X	Beautiful weath	JR	transition out of vocalizations in	0.05277		Framed
10/11/2011	Tuesday	48	900		X	0	X				X		Beautiful weath	JR	transition out of vocalizations in	0.05333		Framed
10/12/2011	Wednes	20	400	X		0			X		X		Beautiful weath	JR	transition out of hunting into SPA		0.05	Standard
10/12/2011	Wednes	26	300		X	0			X			X	Beautiful weath	JR	transistion out of vocalizations i	0.08666		Framed
10/13/2011	Thursday	8	200	X		0			X		X		Rainy weather, (	JR	transition out of play into closing		0.04	Standard
10/13/2011	Thursday	5	75		X	0	X					X	Rainy weather,	JR	transition out of vocalizations in	0.06666		Framed
10/14/2011	Friday	16	200		X	0			X		X		Beautiful weath	JR	transisition out of vocalizations	0.08		Framed
10/14/2011	Friday	13	200	X		1	X					X	Heather, one of	JR	transition out of play into trivia		0.065	Standard
10/15/2011	Saturday	34	800	X		0	X				X		Beautiful weath	JR	out of vocs into trivia		0.0425	Standard
10/15/2011	Saturday	56	1100		X	0			X			X	Beautiful weath	JR	out of play into breach	0.0509		Framed
10/17/2011	Monday	14	300		X	0	X				X		Sunny, most gu	JR	out of play into vocalizations	0.046666		Framed
10/17/2011	Monday	14	300	X		0		X				X	Most guests wer	JR	out of trivia into closing		0.04666	Standard
10/19/2011	Wednes	0	5	X		0	X					X	Rainy, only 5 gu	JR	out of training into closing		0	Standard
10/23/2011	Sunday	16	700	X		0	X				X		Beautiful weath	JR	out of trivia into closing		0.02285	Standard
10/23/2011	Sunday	94	1600		X	0				X		X	Beautiful weath	JR	during the gating of boys to girl	0.05875		Framed
10/25/2011	Tuesday	14	300	X		0	X				X		Rainy, lots of sn	JR	out of play into trivia		0.04666	Standard
10/25/2011	Tuesday	16	150		X	0			X			X	Beautiful, narra	JR	out of play into trivia	0.10666		Framed
10/26/2011	Wednes	0	30	X		0	X					X	Rainy and cold	JR	out of trivia into closing		0	Standard
10/27/2011	Thursday	12	50		X	0	X				X		Cold	JR	out of play into trivia	0.24		Framed
10/28/2011	Friday	56	1100		X	0	X				X		Beautiful day, lo	JR	out of waterwork into training	0.0509		Framed
10/28/2011	Friday	11	400	X		0	X					X	Beautiful day	JR	out of waterwork into vocalizations		0.0275	Standard
11/1/2011	Tuesday	4	100	X		0			X		X		2 days after calf	JR	out of trivia into closing		0.04	Standard
11/1/2011	Tuesday	28	200		X	0			X			X	Nice day. LOTS	JR	out of training noelani airspin i	0.14		Framed
11/2/2011	Wednes	5	80	X		0			X		X		cold day	JR	out of play into trivia		0.0625	Standard
11/2/2011	Wednes	14	100		X	0			X			X	cold day, sunny	JR	out of husbandry into trivia	0.14		Framed
11/3/2011	Thursday	3	11	X		2			X			X	cold day	JR	out of trivia into closing		0.27272	Standard
11/5/2011	Saturday	17	650	X		0			X		X		nice day	JR	out of husbandry into trivia		0.02615	Standard
11/5/2011	Saturday	36	1000		X	0			X			X	nice day	JR	out of vocs into trivia	0.036		Framed
11/10/2011	Thursday	7	25		X	0			X		X		sunny, chilly day	JR	out of waterwork into trivia	0.28		Framed
11/10/2011	Thursday	1	45	X		0			X			X	chilly, snowing	JR	out of hunting into three fins		0.02222	Standard
11/11/2011	Friday	15	400	X		0			X		X		chilly, overcast	JR	out of play into vocalizations		0.0375	Standard
11/11/2011	Friday	15	300		X	1			X			X	chilly, sunny	JR	out of training into waterwork	0.05		Framed
11/14/2011	Monday	0	11		X	0			X		X		somewhat warm	JR	out of waterwork, into closing	0		Framed
11/14/2011	Monday	4	30	X		0			X			X	somewhat warm, su	JR	out of slidebeach into SPA		0.13333	Standard
11/15/2011	Tuesday	5	100	X		0			X		X		nice	JR	out waterwork of into closing		0.05	Standard
11/15/2011	Tuesday	15	150		X	0			X			X	nice	JR	out waterworkof into play	0.1		Framed
11/16/2011	Wednes	5	23	X		1			X		X		chilly	JR	out of waterwork into closing		0.217391	Standard
11/16/2011	Wednes	1	17		X	0			X			X	chilly	JR	out of waterwork into training	0.05882		Framed
11/19/2011	Saturday	17	250		X	0			X		X		cool, sunny	JR	out of waterwork into training	0.068		Framed
11/19/2011	Saturday	45	700	X		1			X			X	cold, overcast	JR	out of waterwork into play		0.06428	Standard
11/20/2011	Sunday	15	300	X		1			X		X		cold, overcast	JR	out of trivia into play		0.05	Standard
11/20/2011	Sunday	57	325		X	0			X			X	cold	JR	out of SPA into waterwork	0.17538		Framed
11/22/2011	Tuesday	17	30		X	1			X		X		cold and rainy	JR	out fishwacking into SPA	0.56666		Framed

Factors Influencing Behavioral Intentions for Leave No Trace Behavior in National Parks

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Facts and views expressed in this paper are the responsibility of the authors and do not necessarily reflect the opinions of the Leave No Trace Center for Outdoor Ethics.

Abstract

Resource degradation resulting from visitor behavior continues to be a significant concern for land managers, and effective educational messages such as those promoted through Leave No Trace, which target depreciative behaviors, are imperative. This study examined psychological and knowledge variables that were hypothesized to influence future Leave No Trace behavioral intent of visitors in Rocky Mountain National Park. Data were obtained from an on-site survey administered to individuals (n = 390, response rate 74%) in the Bear Lake corridor of the park. Results of a multiple regression analysis revealed that *perceived effectiveness* of Leave No Trace practices is a significant predictor of future behavioral intent ($\beta > .21$, $p < .001$, in all cases). Frontcountry visitors like those at Bear Lake are more likely to practice Leave No Trace if they perceive the practices to be effective at reducing impacts.

Keywords

Leave No Trace, environmental education, environmental attitudes, frontcountry, recreation impacts, depreciative behavior

Introduction

Public land managers face a myriad of complex challenges. From invasive species to inadequate funding and staffing to increasing recreational use, land managers must strike a balance between resource protection and the provision of recreational opportunities in a manner consistent with the law and agency policies. In many protected areas, including those with a multiple use mandate, resource degradation due to inappropriate visitor behavior continues to be a significant concern for managers (Leung & Marion, 2000; Taff, Newman, Bright, & Vagias, 2011; Vagias & Powell, 2010). Given the fact that even nominal recreational use can cause considerable impacts, particularly since some impacts are cumulative over time, park and protected area managers must utilize a variety of strategies to minimize these impacts (Hammitt & Cole, 1998; Leung & Marion, 2000).

Land managers primarily address visitor use issues through one of two approaches: indirectly through visitor education or directly through enforcement or sanctions (Manning, 2003; Marion & Reid, 2007). Direct management approaches including enforcement of regulations and intensive site management such as fencing or hardening of recreation sites tend to be costly and can limit visitors' sense of freedom (Marion & Reid, 2007). Indirect management approaches such as visitor education have become a primary and effective method used to minimize depreciative behaviors of protected area visitors (Hammitt & Cole, 1998; Hendee & Dawson, 2002; Manning, 1999; 2003; Marion & Reid, 2001). This has led to the development of several educational initiatives aimed at minimizing recreation-related impacts including Codes of Conduct, Leave No Trace, and Guidelines for Tourists (Marion & Reid, 2007). Although there is some variation between the programs, their overarching intent is to raise awareness, reduce depreciative behaviors, increase knowledge, influence attitudes, and enhance the visitor's experience (Vagias, 2009). In many parks and protected areas, managers provide minimum-impact

visitor education in the form of the seven Leave No Trace principles for responsible use of lands. The Leave No Trace concepts and principles have become one of the most frequently used methods for encouraging responsible use of recreational resources (Harmon, 1997; Marion & Reid, 2001; Vagias & Powell, 2010).

In spite of recent advances towards understanding attitudes and behaviors related to Leave No Trace of backcountry recreationists, there is a dearth of information pertaining to the attitudes frontcountry visitors have towards Leave No Trace-related behaviors and recommended practices (Taff, 2012). Frontcountry, as defined by The Leave No Trace Center for Outdoor Ethics (The Center), includes areas that are easily accessed by car and mostly visited by day users as well as developed campsites used for overnight car camping (Leave No Trace Center for Outdoor Ethics, 2012a). In many parks and protected areas, park managers direct most visitors to frontcountry locations (Kuentzel, Laven, Manning, & Valliere, 2008). This study investigated day-use visitor knowledge, behavioral intent, and beliefs concerning recommended Leave No Trace practices in the Bear Lake corridor of Rocky Mountain National Park. The study findings offer insight for improving educational messages targeting depreciative behaviors that could be applied to the Bear Lake corridor and other similar frontcountry, day-use areas in other national parks.

Leave No Trace

Leave No Trace is the most prevalent minimum-impact visitor education program in use in parks and protected areas in the U.S. (Vagias & Powell, 2010). The intent of the Leave No Trace program is to educate recreationists about the nature of their recreational impacts with the goal of resource protection (Leave No Trace Center for Outdoor Ethics, 2013). Leave No Trace is particularly appealing to land managers because it offers a more light-handed approach to visitor management as opposed to more heavy-handed management strategies (Vagias, 2009). The Leave No Trace concept dates back to the 1960s, when the USDA Forest Service began promoting the notion of "pack it in, pack it out" to outdoor enthusiasts (Marion & Reid, 2001). The program was further developed through the 1970s, and began to take shape as a minimum-impact camping message. As recreation increased through the 1980s, the effort gained additional attention as more focus was being placed on recreation impacts by the federal land management agencies. In the early 1990s the USDA Forest Service forged a partnership with the National Outdoor Leadership School (NOLS), to begin jointly promoting a science-based approach to minimum impact recreation. This resulted in the development of numerous publications detailing minimum-impact recreational practices (Hampton & Cole, 2003; Marion & Reid, 2001; McGivney, 2003; Swain, 1996).

In 1993, three of the other primary federal land management agencies (Bureau of Land Management, National Park Service, and the U.S. Fish and Wildlife Service) adopted Leave No Trace as their chief minimum-impact educational program (Marion & Reid, 2001). Soon thereafter, an outdoor recreation summit in Washington D.C. led to the creation of a national 501(c)(3) non-profit Leave No Trace, Inc. Now known as the Leave No Trace Center for Outdoor Ethics, the organization has continued to advance and grow the Leave No Trace program, which has been adopted by most parks and protected areas in the U.S., as well as numerous international land management agencies. The center has the following mission: "To teach people how to enjoy the outdoors responsibly" (Leave No Trace Center for Outdoor Ethics, 2012b). The seven

Leave No Trace principles (Figure 1), which are the foundation of the program, can be seen in many parks and protected areas. These principles are routinely used on signage, in educational and promotional materials, and included in interpretive information and programs.

The center has a variety of education, training, and outreach programs designed to educate the recreating public about enjoying the outdoors responsibly. The center and its partners offer formal Leave No Trace courses ranging from a one-day course to a five-day, intensive field-based course known as the Leave No Trace Master Educator Course (Leave No Trace Center for Outdoor Ethics, 2012d). The organization has a current focus on three key programmatic areas: youth, frontcountry, and local efforts (Leave No Trace Center for Outdoor Ethics, 2013).

Leave No Trace Principles:

1. Plan Ahead and Prepare
2. Travel and Camp on Durable Surfaces
3. Dispose of Waste Properly
4. Leave What You Find
5. Minimize Campfire Impacts
6. Respect Wildlife
7. Be Considerate of Other Visitors

Figure 1. Seven Principles of Leave No Trace (adapted from the Leave No Trace Center for Outdoor Ethics, 2012c)

Previous Research

Two primary scientific disciplines form the foundation of the Leave No Trace literature base: recreation ecology and human dimensions of natural resources. Recreation ecology research, "a field of study that examines, assesses, and monitors visitor impacts, typically to protected natural areas, and their relationships to influential factors" (Leung & Marion, 2000, pg. 23), has provided the foundation for Leave No Trace messaging because of its focus on recreational impacts (Cole, 2004; Hammitt & Cole, 1998; Hampton & Cole, 2003; Leung & Marion, 2000). Recreation ecology has dominated most minimum-impact research, and reviews suggest that there have been more than 1,000 recreation ecology articles published within recent decades (Monz, Cole, Leung, & Marion, 2010). Yet, the behavior of recreationists is perhaps the largest determinant of impact, and human dimensions research, which focuses on the sociological, psychological, cultural, and economic aspects of recreationists (Ewert, 1996), is limited but growing with regard to Leave No Trace-related studies (Taff, 2012).

The majority of human dimensions research related to Leave No Trace has evaluated educational efficacy through various communication strategies in an effort to increase knowledge and influence behavioral change (Marion & Reid, 2007). For example, studies have evaluated communication strategies to mitigate human and wildlife conflict (Hockett & Hall, 2007; Lackey & Ham, 2003), reduce litter (Cialdini, 1996), minimize removal of natural objects (Widner & Roggenbuck, 2000; Widner & Roggenbuck, 2003), or deter off-trail hiking (Winter, 2006). Few studies have addressed Leave No Trace specifically, instead focusing on minimum-impact behaviors, and even fewer studies have evaluated the most common user-group, frontcountry visitors (Taff, 2012). More recently, however, social scientists have explored concepts such as knowledge, attitudes, beliefs, values, and behaviors of outdoor enthusiasts in the context of Leave No Trace practices (Marion & Reid, 2007; Vagias, 2009, Vagias & Powell, 2010), and have begun examining the perceptions of frontcountry visitors (Jones, 1999; Jones & Bruyere, 2004;

Leung & Attarian, 2003; Mertz, 2002; Taff, 2012; Taff et al., 2011). This study adds to this body of social science research by evaluating frontcountry visitor attitudes toward Leave No Trace.

Theoretical Orientation

The Theory of Reasoned Action (TRA) and its successor the Theory of Planned Behavior (TPB), which was used to orient this research, are general theories of social psychology that seek to explain human behavior through an understanding of the determinants of said human behavior (Ajzen, 1991; Fishbein & Ajzen, 1975). Both theories have been applied to investigations into the human dimension of natural resource management science generally (Fishbein & Manfredo, 1992; Manfredo, Teel, & Bright, 2004; Marion & Reid, 2007; Vagias & Powell, 2010) and to Leave No Trace investigations specifically (Taff, 2012; Vagias, 2009). The overarching assertion of these theories is that individuals are rational creatures and that their behavior is largely determined by their intention to engage in a particular behavior (Ajzen, 1991; Fishbein & Ajzen, 1975). Behavioral intentions are determined by attitudes, the influence of others (norms), perceived behavioral control (Ajzen, 1991), and potentially other factors such as values and emotions (Kollmuss & Agyeman, 2002).

Both theory and previous research suggest that while numerous factors can influence behavior, one's specific attitude towards a particular behavior is a determinant factor in governing his or her actions (Ajzen, 1991; Ajzen & Fishbein, 1980; Fishbein & Manfredo, 1992; Ham & Krumpe, 1996). Eagly and Chaiken (1993) described an attitude as an individual's evaluation of a particular object. Once an evaluation has taken place, and a specific attitude has been formed, it is stored in memory and can be drawn on to guide behavior (Ajzen, 1991). Thus, behavior in terms of Leave No Trace is theoretically determined in part by attitudes (positive or negative) towards specific Leave No Trace recommendations and guidelines. Therefore, if attitudes can accurately predict behavioral intention, then to the extent attitudes can be modified, park and protected area managers can alter visitors' behaviors by changing the salient attitude or belief (Vagias, 2009). Thus, in order to create effective visitor education and communication tactics that can minimize overall recreational impact by influencing visitor behavioral intent, understanding visitor attitudes related to Leave No Trace is paramount.

Based on the TPB and previous research, we hypothesized that future Leave No Trace behavioral intent would be influenced by:

- Attitudes towards Leave No Trace
- The perceived effectiveness of Leave No Trace practices
- The perceived difficulty of practicing Leave No Trace
- Self-reported knowledge of Leave No Trace practices

The Theory of Planned Behavior was used to orient this research, but this study did not test the theory directly, nor did it measure either the perceived behavioral control or the influence of norms components of the TPB. It should be noted that some theorists conceptualize perceived behavioral control as multidimensional, consisting of two discrete dimensions: perceived control and perceived difficulty (Traifmow, Sheeran, Conner, & Finlay, 2002). Ajzen (2002) defined perceived behavioral control as "the perceived ease or

difficulty of performing the behavior" (p. 665), which could be interpreted as two separate constructs. Despite the potential differentiation of perceived behavioral control, the variable in this study that measured perceived difficulty of Leave No Trace practices was not operationalized to measure the construct in terms of the TPB.

Therefore, based on previous investigations of Leave No Trace behavioral intentions (see Vagias & Powell, 2010), the primary component of the TBP under investigation in this research was attitude. According to Manfredo, Vaske, and Decker (1995), "It is important to measure attitudes because they are believed to cause human behavior" (p. 19).

Methods

Data were collected between July 15 and August 15, 2009, in the Bear Lake corridor of Rocky Mountain National Park, a heavily visited and predominately day-use area of the park. Respondents were specifically targeted at the Glacier Gorge and Bear Lake trailheads, both of which offer numerous day-use recreational opportunities. These trailheads are two of the most heavily trafficked areas in the Bear Lake corridor due to the availability of parking for personal vehicles and the regular and convenient shuttle service to the area provided by the National Park Service (Park, Lawson, Kaliski, Newman, & Gibson, 2010; Taff, 2012).

The survey instrument explored social psychological and knowledge variables related to six of the seven Leave No Trace Principles. The survey did not address the fifth Leave No Trace Principle Minimize Campfire Impacts due to the park regulations that prohibit fire in the Bear Lake corridor. The researchers used a stratified random sampling procedure and asked visitors if they would be willing to participate in a "visitor opinion study." Data were collected at both trailheads with sampling designed to take place over a 16-day period, segmented equally between weekday and weekend, A.M. and P.M. sampling times. All surveys were completed by a single individual regardless of group size, and were completed on site. Sampling locations at both trailheads were near park interpretive signage that displayed the Leave No Trace principles. For this reason, two methodological adjustments were made. First, the phrase "Leave No Trace" was not seen in the survey form until the last few questions. Second, researchers only approached those individuals or groups exiting trailheads to decrease the likelihood they recently viewed the signage.

A total of 390 completed surveys were collected providing a response rate of 74%. Because of the large sample size and high response rate, non-response bias was deemed to not be a concern. Based on sample size and visitation to these trailheads there is 95% confidence that these findings are accurate to +/- five percentage points (Vaske, 2008). There were no significant differences found between the Glacier Gorge and Bear Lake responses so results have been combined for analysis purposes.

Variable Measurement

The dependent variable was behavioral intent to perform recommended Leave No Trace practices in the future (Table 5), operationalized as how likely or unlikely visitors were to engage in Leave No Trace behavior in the future for each of the following categories: planning ahead; staying on designated trails; packing out all waste; leaving natural objects in place; not feeding, following, or approaching wildlife; and taking breaks away from trails and other visitors.

The independent variables consisted of the following: attitudes towards Leave No Trace practices (how appropriate or inappropriate practices are perceived; Table 1),

Table 1.
Attitudes towards frontcountry Leave No Trace practices

	N	Mean	S.D.	Percentage[a]						
How APPROPRIATE or INAPPROPRIATE do you think the following activities are for a visitor to do in Rocky Mtn. National Park…				Very Inappropriate			Neutral		Very Appropriate	
				1	2	3	4	5	6	7
Experience nature by not preparing for weather/hazards	388	2.51	1.9	46	19	11	7	6	4	8
Travel off trail to experience nature	388	2.62	1.9	43	18	9	11	8	5	6
Carry out all litter, leaving only food scraps	388	4.64	2.7	27	6	5	3	3	5	50
Keep a single item like a rock, plant, stick or feather as a souvenir	388	2.25	1.6	49	17	12	11	5	3	3
Drop food on the ground to provide wildlife a food source	388	1.43	1.2	82	10	2	2	1	1	3
Take a break along the edge of a trail	387	5.48	1.6	3	3	5	15	13	27	34

a. Percentages may not equal exactly 100% due to rounding.

Table 2.
Perceived level of effectiveness of Leave No Trace practices

	N	Mean	S.D.	Percentage[a]						
Participating in the following activities in Rocky Mtn. National Park would reduce impact…				Never			Sometimes		Every time	
				1	2	3	4	5	6	7
Prepare for all types of weather, hazards and emergencies before getting on trail	387	6.02	1.16	1	0	1	13	14	23	48
Stay on designated or established trails	382	6.38	0.97	1	0	1	4	10	22	62
Carry out all littler, even crumbs, peels or cores	386	6.65	0.71	3	0	0	2	3	9	85
Never removing objects from the area, not even a small item like a rock, plant or stick	387	6.05	1.51	3	1	2	10	7	17	60
Never approach, feed or follow wildlife	388	6.19	1.54	5	2	1	6	5	16	66
Take breaks away from the trail and other visitors	387	4.57	1.88	10	8	9	21	15	20	18

a. Percentages may not equal exactly 100% due to rounding.

Table 3.
Perceived difficulty of practicing Leave No Trace

	N	Mean	S.D.	Percentage[a]						
Please indicate how DIFFICULT you think each of the following would be for a visitor to do in Rocky Mtn. National Park…				Not at all Difficult			Moderately Difficult		Extremely Difficult	
				1	2	3	4	5	6	7
Prepare for all types of weather, hazards and emergencies before getting on trail	387	2.65	1.56	33	21	13	22	7	3	2
Stay on designated or established trails	383	1.62	1.14	66	20	8	3	1	2	1
Carry out all littler, even crumbs, peels or cores	386	1.14	0.96	78	12	5	3	1	1	1
Never removing objects from the area, not even a small item like a rock, plant or stick	386	1.52	1.10	74	14	4	5	2	1	1
Never approach, feed or follow wildlife	387	1.61	1.22	71	14	7	4	1	2	1
Take breaks away from the trail and other visitors	386	2.12	1.39	49	19	12	14	4	1	1

a. Percentages may not equal exactly 100% due to rounding.

Table 4.
Level of self-described Leave No Trace knowledge

N	Mean	S.D.	Percentage						
			No Knowledge	Very Limited	Limited	Average	Above Average	Extensive	Expert
			0	1	2	3	4	5	6
383	3.45	1.74	11	7	7	16	27	25	7

Table 5.
Behavioral intentions to practice Leave No Trace in the future

	N	Mean	S.D.	Percentage[a]						
Please indicate how LIKLEY you are to do the following activity in the future…				Not at all Likely			Moderately Likely		Extremely Likely	
				1	2	3	4	5	6	7
Prepare for all types of weather, hazards and emergencies before getting on trail	384	5.95	1.34	1	1	2	15	11	19	51
Stay on designated or established trails	382	6.22	1.18	1	1	1	10	8	21	59
Carry out all littler, even crumbs, peels or cores	378	6.70	0.89	1	0	2	3	2	8	85
Never removing objects from the area, not even a small item like a rock, plant or stick	379	6.09	1.60	4	3	2	10	5	11	66
Never approach, feed or follow wildlife	380	6.00	1.74	7	2	2	6	6	14	63
Take breaks away from the trail and other visitors	380	4.87	1.79	8	5	5	23	18	16	24

a. Percentages may not equal exactly 100% due to rounding.

perceived effectiveness of Leave No Trace practices (Table 2), perceived difficulty of Leave No Trace practices (Table 3) and self-described Leave No Trace knowledge (Table 4). All variables were measured on a 7-point scale.

Results

Descriptive Findings

Attitudinal statements were used to analyze how park visitors felt about the appropriateness of specific Leave No Trace practices. The results (Table 1) indicate that many visitors are either unfamiliar with or simply misunderstand some Leave No Trace practices. In particular, the majority of respondents (55%) felt that it was *very appropriate* ($M = 4.64$) to leave food scraps behind as a food source for animals. Similarly, the majority of respondents (61%) felt that taking breaks along the edge of the trail was *very appropriate* ($M = 5.48$). These results indicate that visitor may not fully understand the Leave No Trace principles *Dispose of Waste Properly* and *Be Considerate of Other Visitors*, which recommend packing out all waste including food scraps and taking breaks away from trails on durable surfaces such as rock, bare ground, gravel, etc. when available to not impact the experience of others. Though limited in number, previous studies have found similar shortcomings in visitors understanding of these Leave No Trace concepts (see Taff et al., 2011; Vagias & Powell, 2010). For all other attitudes measured, mean scores were less than $M = 2.62$ indicating that respondents understood and had attitudes consistent with land manager recommendations towards these practices.

Survey respondents were asked to rate whether certain Leave No Trace practices would reduce impact in the park. The concept of perceived effectiveness of Leave No Trace practices is important because it is possible that practices that are perceived as ineffective are likely to be practiced less than those with a higher perception of effectiveness. The majority of practices (Table 2) were perceived to reduce impact *every time* ($M \geq 6.02$), indicating that respondents felt impact would be reduced by following these practices. One practice, *taking breaks away from the trail and other visitors*, had a lower mean score ($M = 4.57$) indicating that respondents felt that this practice would only be effective at reducing impact sometimes.

Respondents were asked to rate the level of difficulty in performing the same practices asked about previously. None of the practices received a mean score higher than $M = 2.65$ indicating that the practices were not viewed as being *extremely difficult* (Table 3). If specific practices are perceived as being too difficult, there is a greater likelihood that these recommended practices might not be followed.

Survey respondents were asked to rate their knowledge of Leave No Trace on a 7-point scale (0 = no knowledge to 6 = expert). The mean score was 3.45, with nearly 60% reporting above average to expert in terms of their Leave No Trace knowledge (Table 4).

Respondents were asked how likely they were to engage in future Leave No Trace behaviors and practices (Table 5). On all survey items but one, the majority of respondents indicated that they were *extremely likely* to practice Leave No Trace in the future. The one exception was *taking breaks away from the trail and other visitors* ($M = 4.87$), indicating that visitors were only *moderately likely* to follow this recommendation. In all other categories, mean scores ($M \geq 5.95$) indicated that respondents were *moderately* to *extremely likely* to practice Leave No Trace in the future.

Table 6.
Predicting future Leave No Trace behavior[a]

Future Behavior	Appropriateness	Effectiveness	Difficulty	Knowledge	R^2
Preparing for all types of weather, hazards and emergencies	-.11*	.36**	.17	.17	.29
Staying on designated or established trails	-.25**	.40**	-.07	.06	.34
Carrying out all litter, including food scraps	-.07	.33**	-.19*	.01	.18
Not removing natural objects from the area	-.19**	.21**	-.14*	.12*	.17
Not feeding, following or approaching wildlife	-.08	.26**	-.12*	.14*	.15
Taking breaks away from trails and other visitors	-.03	.25**	-.16**	.13*	.12

a. Cell entries are standardized regression coefficients — * $p<.05$, ** $p< .001$

Regression Analysis

Six separate linear regression models were run. For each of the models, one item from Table 5 served as the dependent variable. Consistent with the hypotheses, the analysis revealed that future Leave No Trace behavioral intent was influenced at varying levels by attitudes, perceived effectiveness, perceived difficulty, and self-reported Leave No Trace knowledge (Table 6). The analysis explained the most variance ($R^2 = .34$) in respondent's future likelihood of *staying on designated or established trails*. The next highest level of explained variance ($R^2 = .29$) was respondent's future likelihood of *preparing for all types of weather, hazards, or emergencies*. The smallest amount of variance was explained ($R^2 = .12$) for the variable *taking breaks away from trails and other visitors*. Perceived effectiveness of Leave No Trace practices was the strongest predictor ($\beta > .21$, $p < .001$, in all cases) of future Leave No Trace behavioral intent. Despite the high level of self-reported knowledge of Leave No Trace, it was not shown to be a significant predictor ($\beta < .17$, $p \geq .05$, in all cases) of future Leave No Trace behavioral intent. While attitudes towards Leave No Trace practices and perceived difficulty of Leave No Trace practices were statistically significant in some of the models ($p < .05$, in some cases), they were weaker predictors of future behavioral intent than perceived effectiveness. Taken together, these results indicate a need for park education and interpretation staff to focus messages on the effectiveness of recommended Leave No Trace practices in order to influence future behavioral intent in park visitors.

Discussion

This study examined the influence of attitudes, perceived effectiveness, perceptions related to the difficulty of following practices, and self-reported knowledge on future Leave No Trace behavioral intent in Rocky Mountain National Park. Of particular interest was determining which of these variables has the most influence on future visitor behavioral intent. Across all respondents, the majority indicated that they were *moderately* to *extremely likely* to practice Leave No Trace in the future. However, behavioral intent does not necessarily equate to actual behavior. Therefore, this study

attempted to determine which variables most influence future Leave No Trace behavioral intent in national park visitors. If specific influences can be determined, park managers can effectively message to visitors in Rocky Mountain National Park, as well as in other park and protected areas, about how to minimize their recreation-related impacts. Data from this study indicate that perceived effectiveness of Leave No Trace practices is a significant predictor of future Leave No Trace behavioral intent.

Of particular interest is the level of self-reported Leave No Trace knowledge. Nearly 60% of respondents rated their knowledge as *above average to expert* (Table 4), indicating that park visitors feel they have extensive experience with Leave No Trace skills and ethics. This is consistent with results from previous Leave No Trace-related investigations but in the absence of actually testing knowledge, the accuracy of self-reported knowledge is inconclusive (see Taff et al., 2011; Vagias & Powell, 2010). However, the results of the attitudinal measures (Table 1) suggest that some park visitors are either unfamiliar with or do not clearly understand recommended Leave No Trace practices. It is also plausible that visitors do not agree with certain Leave No Trace practices and therefore have a negative evaluation (attitude) of those practices. Furthermore, visitors may perceive some level of inconsistency among the Leave No Trace practices. This may be particularly likely with respect to recommendations to refrain from traveling off-trail yet at the same time recommending that visitors do travel off-trail to take breaks away from other visitors to minimize social impacts. These seemingly conflicting messages likely warrant further investigation in future studies, and suggest that the center consider providing additional detail concerning the purpose of these recommendations.

In order to minimize depreciative behavior, protected area managers often rely on educational strategies both to inform visitors and attempt to change visitor behavior (Cialdini, 1996; Ham, 2007; Manning, 2003; Marion & Reid, 2007; Vagias, 2009). Heimlich and Ardoin (2008) noted that for some environmental education efforts, "the ultimate purpose…is to affect individuals' behaviors" (p. 215). However, education efforts that focus solely on providing new knowledge do not always result in attitude or behavior change (Hwang, Kim, & Jeng, 2000; Kollmuss & Agyeman, 2002; Petty, McMichael, & Brannon, 1992). Data from this research supports the assertion that knowledge does not necessarily equate to behavioral intent, and suggests that focusing on the effectiveness of Leave No Trace practices at reducing impacts to the landscape may lead to increased Leave No Trace behavior in the future.

Despite robust educational efforts by Rocky Mountain National Park, recreation-related impact continues to be a concern for park managers (National Park Service, 2012). Many park visitors may be unaware of both the nature of their impacts and Leave No Trace practices to reduce those impacts or they simply disagree with the recommended practices. As shown by this study, perceived effectiveness of Leave No Trace practices is a meaningful predictor of future Leave No Trace behavioral intent. Therefore, park managers and the Leave No Trace Center for Outdoor Ethics should consider focusing educational efforts on how effectively Leave No Trace practices minimize impacts to the landscape. While this study found that that knowledge is not a significant predictor of future behavioral intent, park visitors do need to be made aware of the recommended Leave No Trace practices for Rocky Mountain National Park and other similar protected areas. However, and perhaps more importantly, park visitors need to better understand why certain Leave No Trace practices are recommended, and why those practices are effective at reducing impacts.

For the past decade, the Leave No Trace Center for Outdoor Ethics has encouraged its educators to emphasize the effectiveness of recommended Leave No Trace practices in order to bolster understanding and compliance. This recommendation has largely been based on anecdotal evidence and feedback from course and workshop participants (Dana Watts, personal communication, August 10, 2012). However, this research suggest that education efforts specifically focused on the perceived effectiveness of Leave No Trace practices may prove more effective at modifying visitor behavior in order to minimize recreation-related impact in parks.

Study Limitations and Future Research

This study has several limitations that warrant further investigation in future studies. First, this study only examined one component of the TPB—attitudes. It is clear that other factors influence behavioral intent such as norms and perceived behavioral control (Vagias, 2009), neither of which were under investigation in this research. Second, reported behavioral intent was used as a proxy for actual behavioral intent, which has limitations in terms of making valid predictions about future behavioral intent. In the absence of testing of actual behavior through behavioral observation or other methods, it remains unclear in this context how well reported behavioral intent determines actual behavior. Third, anticipating and avoiding biasing effects from particular wording of survey questions is often challenging (Babbie, 2008; Vaske, 2008). Due to the structure of the Leave No Trace principles and how survey questions were crafted to address those principles, there is the possibility of inadvertent research-induced bias. Future studies of this kind should strive to minimize this potential bias to the extent possible. Lastly, this study did not examine other possible mediating variables of behavioral intent such as weather conditions. Despite the limitations of this study, the results confirmed the importance of visitor perceptions of the effectiveness of recommended practices in terms of behavioral intent to practice Leave No Trace in national parks.

Some past Leave No Trace-focused studies have utilized increased knowledge as a measure of efficacy (Daniels & Marion, 2005; Vagias, 2009). While there are issues with these kinds of knowledge evaluations, the primary concern is that an individual's behavior is largely determined more by factors such as attitudes, norms, perceived behavioral control, and perhaps other factors, than by knowledge (Ajzen, 1991). According to Kaiser, Wolfing, and Fuhrer (1999), attitudes are far more important than knowledge in environmental contexts. This study and previous research (Vagias, 2009) indicate a need to undertake studies that address attitudes, norms, perceived behavioral control, values, beliefs, and perceptions about the effectiveness of Leave No Trace behaviors in question rather than knowledge of specific Leave No Trace practices. Studies that focus specifically on Leave No Trace in frontcountry contexts may be most beneficial to both the Leave No Trace Center for Outdoor Ethics and land managers as trend data indicate that a continued increase in frontcountry recreation is likely to occur in the future (Cordell, 2012; Outdoor Industry Foundation, 2012).

Conclusion

Resource impact due to uninformed visitor behavior continues to be a chief concern for land managers, and effective educational messages such as those promoted through Leave No Trace, which target these behaviors, are essential. This study examined how psychological and knowledge variables influence future Leave No Trace behavioral

intent of visitors in Rocky Mountain National Park. The results suggest that perceived effectiveness of Leave No Trace practices is a meaningful predictor of future behavioral intent. Education efforts are likely to be successful at influencing future behavioral intent if they focus on why certain Leave No Trace practices are recommended and why those practices are effective at reducing impacts.

References

Ajzen, I. (1991). The Theory of Planned Behavior. Organizational Behavior and Human *Decision Processes, 50(2),* 179-211.

Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology, 32(4),* 665-683.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior.* Englewood Cliffs, N.J.: Prentice-Hall.

Babbie, E. R. (2008). *The basics of social research*. Wadsworth Publishing Company.

Cialdini, R. B. (1996). Activating and aligning two kinds of norms in persuasive communications. *Journal of Interpretation Research, 1(1),* 3-10.

Cole, D. N. (2004). Environmental impacts of outdoor recreation in wildlands. In M. Manfredo, J. Vaske, B. Bruyere, D. Field & P. Brown (Eds.), *Society and Resource Management: A Summary of Knowledge* (pp. 107-116). Jefferson, MO: Modern Litho.

Cordell, H. K. (2012). *Outdoor recreation trends and futures: a technical document supporting the Forest Service 2010 RPA Assessment:* US Department of Agriculture, Forest Service, Southern Research Station.

Daniels, M. L., & Marion, J. L. (2005). Communicating Leave No Trace ethics and practices: Efficacy of two-day trainer courses. *Journal of Park and Recreation Administration, 23(4),* 1-19.

Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Ft. Worth, TX: Harcourt Brace Jovanovich College Publishers.

Ewert, A. W. (1996). Human dimensions research and natural resource management. In A.W. Ewert, D. J. Chavez, and A.W. Magill (Eds.), *Culture, conflict, and communication in the wildland-urban interface* (pp. 5-12). Boulder, CO: Westview Press.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behaviour: An introduction to theory and research*. Sidney, Australia: Addison-Wesley.

Fishbein, M., & Manfredo, M. J. (1992). A theory of behavior change. In M. J. Manfredo (Ed.), *Influencing human behavior theory and application in recreation, tourism, and natural resources management* (pp. 29-50). Champaign, IL: Sagamore Pub. Inc.

Ham, S. H. (2007). *Can interpretation really make a difference? Answers to four questions from cognitive and behavioral psychology*. Paper presented at the Paper presented at the Interpreting World Heritage Conference, Vancouver, British Columbia Canada.

Ham, S. H., & Krumpe, E. E. (1996). Identifying audiences and messages for nonformal environmental education – A theoretical framework for interpreters. *Journal of Interpretation Research, 1(1),* 11-23.

Hammitt, W. E., & Cole, D. N. (1998). *Wildland recreation ecology and management*. New York: John Wiley & Sons.

Hampton, B., & Cole, D. (2003). *Soft Paths*. Mechanicsburg, PA: Stackpole Books.

Harmon, W. (1997). *Leave No Trace Minimum Impact Outdoor Recreation.* Helena, MT: Falcon Publishing, Inc.

Heimlich, J. E., & Ardoin, N. M. (2008). Understanding behavior to understand behavior change: A literature review. *Environmental Education Research, 14(3),* 215-237.

Hendee, J. C., & Dawson, C. P. (2002). *Wilderness management stewardship and protection of resources and values*. Golden, CO: WILD Foundation and Fulcrum Pub.

Hockett, K. S., & Hall, T. E. (2007). The effect of moral and fear appeals on park visitors' beliefs about feeding wildlife. *Journal of Interpretation Research, 12(1),* 4-26.

Hwang, Y. H., Kim, S. I., & Jeng, J. M. (2000). Examining the causal relationships among selected antecedents of responsible environmental behavior. *The Journal of Environmental Education, 31(4),* 19-25.

Jones, M. (1999). *Leave No Trace: Pilot project report*. Retrieved from http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=3054&Itemid=411

Jones, M., & Bruyere, B. (2004). *Frontcountry Leave No Trace program evaluation, city of Boulder Open Space and Mountain Parks*. Paper presented at the International Symposium on Society and Resource Management Keystone, Colorado, June 5, 2004.

Kaiser, F. G., Wolfing, S., & Fuhrer, U. (1999). Environmental attitude and ecological behaviour. *Journal of Environmental Psychology, 19(1),* 1-19.

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research, 8(3),* 239-260.

Kuentzel, W., Laven, D., Manning, R., & Valliere, W. (2008). When Do Normative Standards Matter Most? Understanding the Role of Norm Strength at Multiple National Park Settings. *Leisure Sciences, 30(2),* 127-142.

Lackey, B. K., & Ham, S. H. (2003). Assessment of communication focused on human-black bear conflict at Yosemite National Park. *Journal of Interpretation Research, 8(1),* 25-40.

Leave No Trace Center for Outdoor Ethics. (2013). *Leave No Trace About Us.* Retrieved April 19, 2013, from http://lnt.org/about

Leave No Trace Center for Outdoor Ethics. (2012a). *Leave No Trace Frontcountry Program*. Retrieved April 16, 2012, from http://lnt.org/programs/frontcountry.php

Leave No Trace Center for Outdoor Ethics. (2012b). *Leave No Trace Mission*. Retrieved April 16, 2012, from http://lnt.org/aboutUs/index.php

Leave No Trace Center for Outdoor Ethics. (2012c). *Leave No Trace Principles*. Retrieved April 16, 2012, from http://lnt.org/programs/principles.php

Leave No Trace Center for Outdoor Ethics. (2012d). *Leave No Trace Training*. Retrieved April 16, 2012, from http://lnt.org/training/index.php

Leung, Y. F., & Attarian, A. (2003). *Evaluating the effectiveness of the Leave No Trace program in the city of Durango, Colorado*. Final report submitted to the Leave No Trace, Inc.

Leung, Y. F., & Marion, J. L. (2000). Recreation impacts and management in wilderness: A state-of-knowledge review. In D. N. Cole, S. F. McCool, W. T. Boorie & J. O'Loughlin (Eds.), *Wilderness science in a time of change conference-Volume 5 Wilderness ecosystems, threats, and management: 1999 May 23-27; Missoula, MT. Proceedings RMSR-P-VOL-5* (pp. 23-48). Ogden, UT: USDA Forest Service, Rocky Mountain Research Station.

Manfredo, M. J., Teel, T. L., & Bright, A. D. (2004). Application of the concepts of values and attitudes in human dimensions of natural resources research. In M. J. Manfredo, J. J. Vaske, B. L. Bruyere, D. R. Field & P. J. Brown (Eds.), *Society and natural resources: A summary of knowledge* (pp. 271-282). Jefferson, MO: Modern Litho.

Manfredo, M. J., Vaske, J. J., & Decker, D. J. (1995). Human dimensions of wildlife management: Basic concepts. In R. L. Knight & K. j. Gutzwiller (Eds.), *Wildlife and recreationists: coexistence through management and research*. Island Press, Washington, DC, USA (pp. 17-31).

Manning, R. E. (1999). *Studies in outdoor recreation search and research for satisfaction*. Corvallis, OR: Oregon State University Press.

Manning, R. E. (2003). Emerging principles for using information/education in wilderness management. *International Journal of Wilderness, 9(1),* 20-27.

Marion, J. L., & Reid, S. E. (2001). Development of the US Leave No Trace program: An Historical Perspective. In M. B. Usher (Ed.), *Enjoyment and Understanding of the National Heritage* (pp. 81-92). Edinburgh, Scotland: Scottish Natural Heritage & the Stationery Office.

Marion, J. L., & Reid, S. E. (2007). Minimising visitor impacts to protected areas: the efficacy of low impact education programmes. *Journal of Sustainable Tourism, 15(1),* 5-27.

McGivney, A. (2003). *Leave no trace: A guide to the new wilderness etiquette*. Seattle, WA: Mountaineers.

Mertz, S. (2002). *Compliance with Leave No Trace frontcountry principles: A preliminary examination of visitor behavior.* City of Boulder Open Space and Mountain Parks. Retrieved from http://joomla.ci.boulder.co.us/files/openspace/pdf_research/obsv-stdy-report.pdf

Monz, C.A., Cole, D.N., Leung, Y.F., & Marion, J.L. (2010). Sustaining visitor use in protected areas: Future opportunities in recreation ecology research based on the USA experience. *Environmental Management, 45,* 551-562.

National Park Service, Rocky Mountain National Park, 2012 *Compendium: 36 CFR 1.7(b).* Retrieved from http://www.nps.gov/romo/parkmgmt/upload/compendium_2012.pdf

Outdoor Industry Foundation. (2012). *Outdoor Recreation Participation Report 2012*. Boulder, CO.

Park, L., Lawson, S., Kaliski, K., Newman, P., & Gibson, A. (2010). Modeling and mapping hikers' exposure to transportation noise in Rocky Mountain National Park. *Park Science 26(3),* 59 – 64.

Petty, R. E., McMichael, S., & Brannon, L. A. (1992). The elaboration likelihood model of persuasion: Applications in recreation and tourism. In M. J. Manfredo (Ed.), *Influencing human behavior theory and application in recreation, tourism, and natural resources management* (pp. 77-101). Champaign, IL: Sagamore Pub. Inc.

Swain, R. (1996). Leave No Trace – Outdoor skills and ethics program. *International Journal of Wilderness, 2(3),* 24-26.

Taff, B. D. (2012). *Messaging and national park visitor attitudes*. Doctoral Dissertation. Colorado State University, Fort Collins, CO.

Taff, D., Newman, P., Bright, A., & Vagias, W. (2011). Day-User Beliefs Regarding Leave No Trace in Rocky Mountain National Park. *Journal of Outdoor Recreation, Education, and Leadership, 3(2),* 112-115.

Traifmow, D., Sheeran, P., Conner, M., & Finlay, K. (2002). Evidence that perceived behavior control is a multidimensional construct: Perceived control and perceived difficulty. *British Journal of Social Psychology, 41,* 101-121.

Vagias, W. M. (2009). *An examination of the Leave No Trace visitor education program in two US National Park Service units*. Ph.D. Dissertation, Clemson University, Clemson, SC.

Vagias, W. M., & Powell, R. B. (2010). Backcountry Visitors Leave No Trace Attitudes. *International Journal of Wilderness, 16(3),* 21-27.

Vaske, J. J. (2008). *Survey research and analysis: Applications in parks, recreation and human dimensions*. State College, PA: Venture Publishing.

Widner, C. J., & Roggenbuck, J. R. (2000). Reducing theft of petrified wood at Petrified Forest National Park. *Journal of Interpretation Research, 5(1),* 1-18.

Widner, C. J., & Roggenbuck, J. R. (2003). Understanding park visitors' response to reduce petrified wood theft. *Journal of Interpretation Research, 8(1),* 67-82.

Winter, P. L. (2006). The impact of normative message types on off-trail hiking. *Journal of Interpretation Research, 11(1),* 34-52.

Visitor Evaluation of Night Sky Interpretation in Bryce Canyon National Park and Cedar Breaks National Monument

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Abstract
Natural lightscapes are an important resource for parks and protected areas, including Bryce Canyon National Park and Cedar Breaks National Monument. Both locations offer night sky interpretive programs, attracting over 27,000 visitors annually, equaling all other interpretive programs combined. Parks need to understand what drives visitor interest and park managers need to assess if night sky interpretation is meeting expectations. A total of 1,179 night and day visitors to Bryce Canyon National Park and Cedar Breaks National Monument served as participants and completed a 36-item survey measuring knowledge, attitudes, benefits, and behaviors related to the night sky. Results show those who attended a night sky interpretive program gained a significant amount of knowledge about night sky issues. Both day and night visitors have strongly held attitudes about light pollution and the protection of the night sky in national parks.

Keywords
night skies, interpretation, visitor studies, national parks, natural resources, evaluation, light pollution, park management

Visitor Evaluation of Night Sky Interpretation in Bryce Canyon National Park and Cedar Breaks National Monument

In a growing number of locations around the planet, observing the Milky Way galaxy amidst a tapestry of stars has become a rarity. Increases in population, urbanization, and suburban sprawl have created a blanket of outdoor lights enshrouding many continents (Cinzano, Falchi, & Elvidge, 2001). Yet within us there are deep historical and cultural connections with the stars and night sky. We try to gain understanding of the universe and contemplate our place within it as we gaze at the vast expanse of the stars above. With a reduction in night sky visibility where the majority of us reside, many are left to seek out the few remaining areas of the planet that are void of anthropogenic lighting to stargaze. In the United States, many of these remaining dark areas are found within parks and other protected areas.

The National Park Service classifies dark night skies as a natural resource, and has taken initiative in documenting levels of light pollution and educating the public about night sky issues. National Parks operate under the visitor experience and resource protection (VERP) framework. As part of the meeting these requirements, parks have educational programs, including exhibits, ranger-led talks, and other interpretive materials and opportunities. Two parks highly involved in night sky interpretation are Bryce Canyon National Park and Cedar Breaks National Monument, both in southern Utah. Because of their high elevations and dry, relatively clean air, Bryce Canyon and Cedar Breaks are ideal locations for stargazing, especially with their proximity away from major cities. This study seeks to gain an understanding about the effectiveness of night sky interpretation by surveying visitors at Bryce Canyon and Cedar Breaks who attended a ranger-led program. Visitor studies of night sky-related issues in national parks are limited, so park managers and interpreters are lacking needed information to help guide their programs. Attitudes about the night sky and light pollution are also compared with a sample of day visitors at both locations. The results of this study will provide insight into the knowledge, attitudes, benefits, and behaviors related to the night sky from day visitors and night sky interpretive program participants.

A great deal of research has documented the environmental impacts of visitors in parks and protected areas (Hammitt & Cole, 1998; Leung & Marion, 2001; Manning, 2011), including harm to the land and wildlife. Anthropogenic impacts to park resources can also be caused by non-visitors hundreds of miles away in such forms as air and light pollution. While the effects of air pollution on parks and protected areas has received substantial research attention (see Mace, Bell, & Loomis, 2004, for a review), the same is not true for light pollution. Research on the effects of light pollution on park natural lightscapes, especially from a social-scientific orientation is just beginning.

Kelly (2003) sought to gain an understanding of night sky behaviors and attitudes in a sample of college students. Forty-five students completed a six-item survey with findings indicating respondents had a slight interest in astronomy, enjoyed observing the night sky, watched the night sky fairly often, and felt the night sky improved their moods and created curiosity.

In a follow-up study, Kelly (2004) explored the link between noctcaelador, or the psychological attachment to the night sky, and personality. Using Saucier's (1994) Big-Five Mini-Markers, which depend on the Five-Factor Model to measure personality, and his Noctcaelador Inventory (developed in the 2003 study), Kelly found that personality and noctcaelador were related, with higher levels of noctcaelador correlated with greater

levels of openness. Kelly's work deserves credit for attempting to find meaning in night sky attitudes and how they relate to personality; however, his Noctcaelador Inventory relied on but six items with a three-point scale (*no, not sure, yes*). His foundation work leaves much on which to build. If park managers are to protect the night sky and provide a quality visitor experience, an understanding of light pollution and how it impacts the night sky is necessary.

Light Pollution

Over the past several decades, anthropogenic lighting has increased around the world in industrialized and developing countries to such an extent that by the turn of the millennium, 99% of the world's skies were deemed light polluted (Cinzano et al., 2001). In the U.S., lighting has increased annually by a magnitude of approximately six percent (Cinzano et al., 2001). Two-thirds of Americans, those living in cities and suburbs, can no longer see the Milky Way from their own backyards, and outdoor lighting is expected to increase in years to come (Cinzano et al., 2001). Light pollution can also impact human health by disrupting melatonin, and can cause sleep disturbances (Chepesiuk, 2009; Clark, 2006). Outdoor lighting wastes energy causing economic detriments (Galloway, 2010) and creates additional issues as light shines on areas where it is unwanted causing light trespass (Brons, Bullough, & Rea, 2008). Light trespass also creates sky glow, where a conglomeration of lights in a developed location cause a sheen of light on the horizon visible up to 250 miles away from the source (Duriscoe, 2001). Light pollution, therefore, can impact distant areas that may have little outdoor lighting of their own, including parks and protected areas.

Night recreation such as camping and stargazing in parks and protected areas can be adversely affected by light pollution (Beeco, Hallo, Baldwin, & McGuire, 2011). Furthermore, nearly half of the species on the planet are nocturnal, relying on the absence of light for survival. Light pollution can result in substantial impacts on nocturnal species (Rich & Longmore, 2006), causing death and disorientation in reptiles (Perry & Fisher, 2006), and amphibians (Wise & Buchanan, 2006). In addition, research examining insect, bird, and fish populations has shown light pollution alters breeding patterns and other behaviors (Chepesiuk, 2009). Light pollution, therefore, causes significant impacts to many species, including humans, and can also affect the quality of the visitor experience in parks and protected areas.

One agency that has attempted to address issues associated with light pollution is the National Park Service (NPS). In 2001 the NPS created the Night Skies Team to develop an inventory of night sky conditions in the parks. Approximately 100 parks have been assessed, with data showing nearly every park affected by light pollution (National Park Service, 2012). Beyond assessing night sky conditions, national parks have begun to realize the need to preserve the black, untainted night sky for future generations of stargazers. These parks understand that a dark sky overhead is a treasure, a unique resource, and the opportunity for a memorable visitor experience. Parks with night sky interpretive programs also provide an economic benefit to local gateway communities by attracting "astrotourism" (National Park Service, 2012). Bryce Canyon National Park and Cedar Breaks National Monument recognize the importance of protecting night skies and providing interpretive programs to educate visitors.

Bryce Canyon National Park was created in 1928, protected as a national park because of its unique geologic formations, including amphitheaters a thousand feet deep

filled with rock spires called "hoodoos." By western national park standards, Bryce is a small park, spanning 56.2 square miles (nearly 36,000 acres), encompassing more length than width in a north-to-south orientation. The park boundaries follow the length of the Paunsaugunt Plateau, offering numerous overlooks along the main road. Visibility on the rim of this plateau can stretch 200 miles on clear days, providing distant vistas of the surrounding terrain. Because of its location and abundance of wilderness (60% of the park), many unique resources are present in the park, including the geology, flora and fauna, clear skies offering distant views and unparalleled night sky visibility, and one of the quietest soundscapes in the United States. Bryce receives around 1.5 million visitors annually.

Cedar Breaks National Monument was preserved in 1933 and encompasses nearly 603,000 acres. Cedar Breaks houses a natural amphitheater spanning three miles with a depth of over 2,000 feet. Visitors frequent the rim of this amphitheater, hiking the western edge of the Markagunt Plateau, peering down at the multicolored hoodoos below. The hoodoos of Cedar Breaks are similar to those found in Bryce Canyon, however there are many features that make Cedar Breaks unique. Much of the monument lies close to or above 10,000 feet, making much of the area inaccessible for much of the year. With the high elevation and distance from major urban areas (Salt Lake City and Las Vegas are over 200 miles away), Cedar Breaks has some of the darkest night skies in the country. Cedar Breaks receives approximately 500,000 visitors annually.

Bryce Canyon National Park began the first night sky interpretive programs in the national park system over four decades ago, and has since become a leader in night sky protection and interpretation. While the expanse of land viewable during the day is quite large (referred to as a viewshed), on a clear dark night visibility can stretch as far as the Andromeda galaxy, 2.2 million light years away, or 527 quadrillion miles (Bryce Canyon National Park, 2012). Both Bryce and Cedar Breaks have a limiting magnitude of seven, which translates into a night panorama of 7,500 stars being visible. By comparison, in most urban areas about 500 stars can be seen and the limiting magnitude is four or less. There are full-time and seasonal rangers who have contributed to the growth of the night sky interpretive programs in Bryce and Cedar Breaks over the past 40 years. Educational lectures, stargazing, eclipse viewing, astronomy festivals, ranger-led telescope viewing, night hikes, and constellation tours are some of the interpretive programs offered from April through October. During these months anywhere from 100 to 300 visitors a day will partake of these interpretive opportunities offered by the "Dark Rangers." The programs have become so popular that Bryce reports having over 27,000 visitors a year engaging in these interpretive programs, essentially equaling the popularity of all other interpretive programs combined (Bryce Canyon National Park, 2012). Furthermore, many visitors anecdotally report that seeing starlit scenery is one of the reasons for choosing their destination. Clearly, night skies are an important resource and part of a quality visitor experience at Bryce and Cedar Breaks.

Problem Under Study

Parks and protected areas need to understand what drives visitor interest and what the expectations are regarding night skies. Furthermore, park managers and interpreters need to assess if their programs are effective in communicating the importance of the resource to the public. Standardized questions related to night skies and light pollution are seldom included on visitor surveys in parks and protected areas. A set of

standards and indicators of quality for night skies does not exist from a social-scientific perspective. This lack of social science information can be frustrating, particularly since groups such as the National Parks Conservation Association have criticized the NPS for not adequately managing this visitor and natural resource. On the other hand an opportunity exists to begin building a database and set of standards to provide useable and informative research for decision makers and stakeholders.

Given the impact of light pollution and projected increase in the future, it is important to better understand the attitudes and recreational activities of nighttime park visitors. Unfortunately, research from a social-scientific perspective on the topic is limited at best. While the majority of visitors to parks and protected areas go to these areas during the day, it is not clearly understood what types of night sky-related activities are desirable to visitors. This research examines the relationship between lightscapes and visitor enjoyment by comparing the responses of day-use visitors with those attending night sky-related interpretive programs at Bryce Canyon National Park and Cedar Breaks National Monument. The primary objectives of the research are to evaluate the effectiveness of night-sky interpretive programs, and identify important night sky-related factors including attitudes, benefits, and behaviors. The findings of this study will benefit park managers and interpretive personnel by providing needed data to help tune interpretive messaging and identify topics of interest to park visitors related to the night sky.

Method

Participants

A total of 1,650 visitors (day-use and night sky program attendees) to Bryce Canyon National Park and Cedar Breaks National Monument were approached and asked to complete a short survey regarding their park experience. Of these 1,650, a total of 1,179 visitors agreed to participate, reflecting a response rate of 71.5%. The majority (67%) of visitors who declined to participate were with family (based on the surveyor's visual assessment or visitors' verbal cues), and did not want to make the rest of their group wait. Others who refused participation also stated they were short on time (21%). Non-response bias was checked by statistically comparing results from the different sampling sessions on several demographic variables. Further descriptive statistics of the sample are presented in the results.

Materials

A 36-item survey was developed with input from a team of social scientists, park personnel from Bryce Canyon, and the National Park Service Night Sky team. The survey went through numerous iterations, with several wording changes based on feedback from experts and pilot tests completed with university students. The final version of the survey was approved by the social science office of the National Park Service and the Office of Management and Budget in Washington D.C. Survey items included forced-choice questions, Likert-type scales (1 to 5 ratings), and open-ended queries used to measure knowledge, attitudes, benefits, and behaviors about night skies. Attitude items assessed light pollution, night sky protection, and the role of gateway communities with these issues. Behavioral-based questions asked visitors whether they recently have engaged in night sky viewing to notice the phases of the moon, view planets and meteor showers, and participate in stargazing. A set of questions also assessed the perceived benefits of the

night skies, including connecting with nature, the universe, and the past, inspiring an interest in science, creativity, and solitude. Visitors were also asked about their activities and time spent in the park, and if night sky programs played into their travel plans. Basic demographic questions such as age, sex, place of residence, and night sky visibility at their place of residence were also included on the survey. The primary motive of this study was to assess the effectiveness of night sky-related interpretive programs in the park by surveying program attendees and comparing their data with day-use visitors. To this end a set of scale items probed visitors' knowledge of five particular night sky issues to see if they gained new information about the night sky as a result of visiting the park. For those who took part in a night sky interpretive programs, this set of questions evaluated the level of awareness conveyed in the ranger-led sessions. Finally, visitors were asked if they would visit another park based on night sky quality and interpretive opportunities.

Procedure

Investigators solicited participation from day-use visitors to Bryce Canyon at the visitor center and two of the most popular viewpoints, Sunrise and Sunset, during weekends in July through early October. Daytime visitors to Cedar Breaks were approached at the visitor center, in front of the monument's main viewpoint, Point Supreme. Additionally, Bryce Canyon visitors attending a night sky interpretive program were asked to complete the survey immediately after the ranger-led program in the Bryce Lodge or following a guided night hike at Sunrise Point. Interpretive program attendees at Cedar Breaks were asked to participate immediately following the night-sky presentation at the visitor center. On a few occasions, researchers approached visitors following an interpretive stargazing program featuring telescope viewing at the visitors center at Bryce Canyon.

Researchers approached every third visitor and solicited participation using a standardized recruitment script authored by researchers and park personnel, and approved by the National Park Service and the Office of Management and Budget. There were no restrictions for participation, so long as visitors had already been in the park and were near the end of their visit (i.e. they had already explored the park and were not just entering). A post-visit-only survey design was employed for day visitors in order to maintain consistency with the post-interpretive program sampling procedure used with night sky session participants. If a visitor declined participation the refusal was recorded on a front-end form and the interviewer approached the next eligible visitor. Survey completion took between four and ten minutes, with some respondents taking up to fifteen minutes by providing extensive open-ended comments. In rare cases, the survey was read to participants by the researcher, who then marked the answer given verbally by the respondent. When visitors completed the survey, researchers thanked them for their participation and answered any further questions.

Results

A total of 1,179 visitors to Bryce Canyon National Park and Cedar Breaks National Monument served as participants. Five-hundred forty-five men (46.1%) and 527 women (44.6%) completed the visitor survey. There were 107 participants who chose not to specify if they were male or female. Visitor respondents ranged in age between 18 and 80 years. Age data was gathered categorically, with those in the 55–64 range accounting for the largest group of respondents, 299 (25.3%). There were 246 visitors between the ages of 45 and 54 (20.8%), 152 visitors 25–34 (12.9%), 151 respondents 35–44 (12.8%), 133

visitors between the ages of 65 and 74 (11.3%), 95 participants 18–24 years of age (8%), and 19 who were 75 and over (1.6%). There were 85 non-responders to the age question in the entire sample of participants. Suburban areas of residence were home for 414 (35%), with 404 urbanites (34.2%), and 183 residing in rural locations (15.5%). A total of 178 participants did not specify an area of residence.

One group of participants from the total sample included visitors taking part in a ranger-led night sky interpretive program. This sample accounted for 143 of the participants and included 76 men (53.1%) and 55 women (38.5%). Twelve night sky interpretive program participants chose not to specify their sex. Forty participants (28%) were between the ages of 55 and 64, with 36 respondents 45–54 years of age (25.2%). Other age groups included 21 participants (14.7%) in the 35–44 category, 19 respondents (13.3%) between 65 and 74, and 8 respondents (5.6%) in each of the 18–24 and 25–34 categories. There were no participants over the age of 75, and 11 respondents chose not to specify their age. Of the 143 visitors in the night sky interpretive program sample, 56 (39.2%) were from suburban areas of residence, while 50 (35%) were from urban areas, and 16 (11.2%) were from rural locations. There were 21 respondents who did not specify their place of residence.

The second group of participants from the total sample was composed of 1,036 day visitors to Bryce and Cedar Breaks. Four-hundred sixty-nine men (45.3%) and 472 women (45.6%) completed the survey. Ninety-five participants chose not to specify their sex. The age groups of 55–64 and 45–54 accounted for the largest percentage of visitors in this sample, with 259 (25%) and 210 (20.3%) respectively. Other age categories included 144 visitors 25–34 years old (13.9%), 130 respondents 35–44 years (12.5%), 113 participants (10.9%) between 65 and 74 years of age, 87 (8.4%) between 18 and 24, and 19 visitors 75 years or older (1.8%). Of the 880 participants who reported their place of residence, 358 (34.6%) said they lived in suburban areas, 354 (34.2%) urban, and 167 (16.1%) rural. Daytime visitors included 526 from Bryce (50.8%), and 510 from Cedar Breaks (49.2%).

Data from night sky interpretive program visitors at Bryce Canyon and Cedar Breaks were combined for the purposes of statistical analysis. The majority of respondents were from the programs at Bryce Canyon ($N = 129$), with only 14 visitors completing the survey at Cedar Breaks. No significant differences were found between the two samples, so data were combined into a single set of night sky program participants for further analyses. Due to the small sample of night sky participants at Cedar Breaks, the results are not generalizable to interpretive program visitors at the monument. Results are presented on the effectiveness of the night sky interpretive programs, followed by comparisons with day use visitors. Differences between respondent populations on the perceived benefits of the night sky, stargazing behaviors, and light pollution attitudes are analyzed. Finally, differences between day visitors at the two parks are presented.

Night Sky Interpretive Program Findings

Knowledge of night sky issues was assessed with a set of Likert-type scale items asking visitors to rate their knowledge of these issues prior to visiting the park and after engaging in a night sky interpretive program. The items ranged on a 1 to 5 scale, with 5 representing "very aware" and 1 being "completely unaware." Specific items assessed knowledge of the impacts of ground lights on wildlife, human health, and visibility, the type of lighting that

Table 1
Comparisons of Self-Reported Night Sky Knowledge Items for Interpretive Program Participants and Day Visitors Before and After Visiting the Parks

	Night Interpretive Program Visitors (N = 143)		Daytime Visitors (N = 1036)	
Knowledge Item	M	SD	M	SD
Ground light impact				
Before	3.69	1.20	3.76	1.23
After	4.76*	0.55	3.99	1.18
Lights that reduce pollution				
Before	2.57	1.13	2.66	1.16
After	4.03*	1.17	2.98	1.21
Human health and wildlife				
Before	2.55	1.04	3.06**	1.19
After	3.95*	1.12	3.41	1.17
Cultural and historical				
Before	3.07	1.09	2.93	1.09
After	3.94*	0.93	3.16	1.12
General astronomy				
Before	3.42	1.10	3.23	1.06
After	4.10*	0.93	3.38	1.04

*denotes interpretive program participants felt more knowledgeable as a result of program attendance (compared to the before means), p<.01; and program attendees acquired more knowledge than day visitors (compared to day visitors after means), p<.01.

**denotes day visitors came to the park more knowledgeable than night program participants, p<.01.

Table note: Reported means are for Likert-type scale items ranging from 1 to 5, with '1' representing "very unaware" and '5' representing "very aware."

contributes to pollution, the cultural and historical components of the night sky, and general astronomy. The mean responses of program participants showed increased knowledge in all five night sky related issues (see Table 1). Mean scores of knowledge before visiting the park ranged from 2.55 to 3.69, corresponding to somewhat unaware to somewhat aware levels of night sky knowledge. The issues which program participants knew the least about prior to the interpretive program was the impact of ground lighting creating sky glow and glare that affects human health and wildlife ($M = 2.55$). Interpretive program participants reported being most aware of the impact of ground lights on night sky visibility ($M = 3.69$).

A multivariate analysis of variance was run on the dependent variables using before and after as the fixed factor, with sex, age, and place of residence as covariates. Results show the interpretive program participants gained a significant amount of night sky knowledge as a result of participating in a ranger-led interpretive program (F (5,204) = 27.297, $p < .001$, $\eta p^2 = .401$). Univariate analyses found the interpretive programs significantly improved visitor knowledge on the types of lighting that help reduce light pollution (F (1,208) = 90.8386 $p < .001$, $\eta p^2 = .304$), the impact light has on human health and wildlife (F (1,208) = 92.598, $p < .001$, $\eta p^2 = .308$), and the effect ground light has on night sky visibility (F (1,208) = 69.488, $p < .001$, $\eta p^2 = .25$). The interpretive program visitors also gained more knowledge about astronomy (F (1,208) = 31.261, $p < .001$, $\eta p^2 = .131$), and the cultural and historical connections with the night sky (F (1,208) = 38.303, $p < .001$, $\eta p^2 = .156$), as a result of their participation in a ranger-led night sky program. Sex was found to be a significant covariate (F (5,204) = 3.78, $p < .001$, $\eta p^2 = .085$), with univariate analyses showing women learning more about astronomy (F (1,208) = 5.999, $p < .05$, $\eta p^2 = .028$), and techniques to reduce light pollution (F (1,208) = 4.113, $p < .05$, $\eta p^2 = .019$), than their male counterparts.

When asked to identify preferred stargazing locations, 99.4% of program participants marked a national park, local park, or wilderness area, 41.3% identified their backyards, and 30% stated an observatory or planetarium. Some program participants (14.7%) said they usually did not stargaze. Program visitors were split when asked to pick one of four descriptions which, assuming a clear sky, best represented night sky visibility where they live. Nearly 30% (29.9%) stated the Milky Way is obvious and the sky is full of stars at their residence. Twenty-five percent replied that the Milky Way cannot be seen, but some stars are visible and there are many ground lights in the area in which they live. Another 23.9% marked the Milky Way can barely be seen and some ground lights are visible. The remaining 21.2% chose the lowest visibility option: few if any stars are visible and the sky is bright from ground lights. Based on univariate analyses of variance, place of residence was a significant covariate, with those in urban locations gaining more knowledge about astronomy (F (1,208) = 5.013, $p < .05$, $\eta p^2 = .024$), and how lighting affects the night sky (F (1,208) = 4.845, $p < .05$, $\eta p^2 = .023$), than those who reside in suburban or rural locations. The majority of program attendees (86%) found the information provided in the interpretive programs to be the most informative park resource on the night sky.

Day Visitors

Those visitors who went to the park during the day and did not participate in a ranger-led night sky interpretive program also gained knowledge about night sky-related issues from other sources in the park (F (5,933) = 5.318, $p < .001$, $\eta p^2 = .028$). Univariate analyses found day visitors improved their knowledge about the effects of light on wildlife and human health (F (1,937) = 22.034, $p < .001$, $\eta p^2 = .023$), lighting that reduces pollution (F (1,937) = 19.39 $p < .001$, $\eta p^2 = .02$), and the impact of ground lights on night visibility (F (1,937) = 8.741, $p < .01$, $\eta p^2 = .009$). Day visitors also became more knowledgeable about cultural and historical connections with the night sky (F (1,937) = 10.291, $p < .001$, $\eta p^2 = .011$), and astronomy (F (1,937) = 5.363, $p < .05$, $\eta p^2 = .006$), as a result of visiting the park. Daytime visitors gained this knowledge primarily through a park brochure, newspaper, or handout (28%), and visitor center exhibits (24.3%). Some daytime visitors (21.2%) indicated they did not encounter any night sky information while visiting the park.

Differences Between Visitors

Statistical comparisons were conducted between night interpretive program attendees and day visitors. Due to the large difference in sample size, Levene's test for homogeneity of variance was run and was found to be non-significant, allowing additional statistical analyses without further corrections. While both types of visitors became more knowledgeable about the night sky while visiting the park, interpretive program respondents gained more knowledge than daytime visitors (F (5,488) = 15.486, $p < .001$, $\eta p^2 = .137$). Specifically, interpretive program participants became more knowledgeable than daytime visitors on how to reduce light pollution (F (1,492) = 54.669, $p < .001$, $\eta p^2 = .10$), how lights impact the night sky (F (1,492) = 39.627, $p < .001$, $\eta p^2 = .075$), cultural and historical aspects of the night sky (F (1,492) = 40.774, $p < .001$, $\eta p^2 = .077$), astronomy (F (1,492) = 38.486, $p < .001$, $\eta p^2 = .073$), and the effects of light on human health and wildlife (F (1,492) = 14.138, $p <.001$, $\eta p^2 = .028$). Age was found to be a significant covariate on two of the night sky issues, with those 45–74 years of age gaining more knowledge about how to reduce light pollution (F (1,492) = 8.076, $p < .01$, $\eta p^2 = .016$), and the effects of light on wildlife and human health (F (1,492) = 4.552, $p < .05$, $\eta p^2 = .009$), than those 18–44 years of age.

Visitors to the parks come with nearly the same level of knowledge about night sky issues, as daytime visitors and interpretive program participants were found to differ on only one knowledge variable. Night sky program attendees knew less about the effects of light on wildlife and human health before visiting the park than daytime visitors (F (1,653) = 21.946, $p < .001$, $\eta p^2 = .033$).

Interpretive program visitors placed more importance on the park's night sky and stargazing programs than day users (t (1147) = 4.70, $p < .01$). In addition, 39.7% of interpretive program participants marked night sky interpretive opportunities were "very important" or "somewhat important" to their travel plans, compared to 23.3% of day visitors. Anecdotal evidence, based on verbal and open-ended comments made by interpretive program attendees, shows that some made the trip to Bryce Canyon specifically for the park's night sky. Yet, many visitors were simply unaware of the night sky and stargazing opportunities at the parks, with 62.5% of day visitors and 41.8% of interpretive program attendees reporting they had no knowledge of these available programs prior to visiting the park. Visitors learned about interpretive program opportunities from the park brochure and newspaper and from the visitor center.

Night Sky-Related Behaviors

To gain an understanding of the frequency which visitors engaged in night sky-related behaviors, a set of six Likert-type five-point scale items (always to never) was used. Visitors were asked to rate the frequency they noticed the phases of the moon, the planets, the night sky, or meteor showers; stargazed with family; and took night walks. A majority of day respondents (57.5%) and program visitors (64.2%) said they always (once a week) or often (once a month) notice the phases of the moon or observe the night sky. Furthermore, 21.2% of day and 32.8% of program users take night walks at least once a month. Means and standard deviations can be found in Table 2. A MANOVA found interpretive program visitors engaged in night sky-related behaviors more frequently than day visitors (F (6,833) = 2.749, $p < .05$, $\eta p^2 = .019$). Univariate analyses found night program attendees notice the phases of the moon (F (1,838) = 10.651, $p < .001$, $\eta p^2 = .013$), and take night walks (F (1,838) = 9.078, $p < .01$, $\eta p^2 = .011$) more often than day visitors. These findings are moderated by the covariates included in the model, with significant

Table 2
Means, Standard Deviations, and ANOVAS for Night Interpretive Program Participants and Day Visitors Behaviors, Benefits, and Attitudes of the Night Sky

	Night Interpretive Participants (N = 143)		Day Visitors (N = 1036)				
Survey Item	M	SD	M	SD	F	p	ηp^2
Behaviors							
Notice moon phases	4.03	1.04	3.60	1.22	10.65	.001*	.013
Take night walks	3.01	1.02	2.70	1.09	9.08	.003*	.011
Benefits							
Create curiosity in science	4.31	0.79	3.65	1.10	30.00	<.001*	.039
Understanding the universe	4.39	0.78	3.80	1.12	28.89	<.001*	.037
Inspire creativity	3.91	0.96	3.50	1.15	16.35	<.001*	.022
Connecting with nature	4.40	0.89	4.04	1.11	14.14	<.001*	.019
Spiritual connection	3.60	1.30	3.25	1.36	11.95	<.001*	.016
Connecting with the past	3.80	1.09	3.44	1.21	11.61	.001*	.015
Attitudes							
Visit other parks for dark skies	4.23	0.93	3.74	1.00	26.15	<.001*	.031
Light pollution inevitable	2.86	1.17	3.48	1.18	23.92	<.001*	.028
Light pollution in urban areas	4.61	0.65	4.21	0.93	20.91	<.001*	.025
Should see stars in backyard	4.25	0.71	3.99	0.83	18.12	<.001*	.022
Parks preserved for dark skies	4.71	0.58	4.40	0.78	15.97	<.001*	.019
Light pollution in rural areas	3.79	0.98	3.47	1.01	12.47	<.001*	.015
Areas around parks should help	4.60	0.55	4.36	0.73	7.62	.006*	.009

Table note: Reported means are for Likert-type scale items ranging from 1 to 5, with '1' representing "never" and '5' representing "always" for the behavior items. For the benefits of the night sky items, '1' represents "very unimportant" and '5' represents "very important." For the attitude items, '1' represents "strongly disagree' while '5' represents "strongly agree."

effects for age (F (6,833) = 10.962, $p < .001$, $\eta p^2 = .073$), sex (F (6,833) = 5.588, $p < .001$, $\eta p^2 = .039$), and place of residence (F (6,833) = 3.712, $p < .001$, $\eta p^2 = .026$).

Univariate analyses of variance found those visitors 45 years of age and older notice the phases of the moon (F (1,838) = 28.660, $p < .001$, $\eta p^2 = .033$), and view the planets in the night sky (F (1,838) = 21.860, $p < .001$, $\eta p^2 = .025$), more frequently than those 44 and younger. Those visitors 55 and above view meteor showers more often than those who were younger (F (1,838) = 6.995, $p < .001$, $\eta p^2 = .008$). Women spent more time observing the night sky with family (F (1,838) = 9.729, $p <.01$, $\eta p^2 = .011$, and stargazed more frequently than men (F (1,838) = 7.829, $p < .01$, $\eta p^2 = .009$). Women also noticed the phases of the moon more frequently than men (F (1,838) = 6.210, $p < .05$, $\eta p^2 = .007$). Finally, those visitors from rural and suburban places of residence watched meteor showers more often than those from urban locations (F (1,838) = 12.036, $p < .001$, $\eta p^2 = .014$). Rural and suburban residents also stargazed with family more frequently (F (1,838) = 11.506, $p < .001$, $\eta p^2 = .014$), and took night walks more often than those visitors from urban locations (F (1,838) = 6.586, $p < .01$, $\eta p^2 = .008$).

Benefits of Night Sky Viewing

A series of seven scale items measured the types of benefits associated with viewing the night sky. These items were rated on a five-point scale ranging from very unimportant (1) to very important (5). Day users of the parks rated the night sky as a chance to connect

with nature (75.5%) and to experience solitude (68.5%) as very or somewhat important. Night interpretive program respondents perceive the night sky as very or somewhat important to providing a better understanding of the universe (87.8%) and creating curiosity in science (87.6%). Both user groups reported creativity, a connection to the past, and a spiritual connection as less important than the other potential benefits. Means and standard deviations can be found in Table 2.

A MANOVA found interpretive program visitors to have a greater degree of perceived benefits associated with the night sky (F (7, 736) = 6.121, $p < .001$, $\eta p^2 = .055$). A series of univariate analyses found interpretive program respondents rated all potential night sky benefits, with the exception of solitude, as more important than day visitors. Specifically, night program visitors view the nocturnal cosmos as creating curiosity in science (F (1,742) = 30.001, $p < .001$, $\eta p^2 = .039$), offering more opportunities to understand the universe (F (1,742) = 28.887, $p < .001$, $\eta p^2 = .037$), inspire creativity (F (1,742) = 16.353, $p < .001$, $\eta p^2 = .022$), connect with nature (F (1,742) = 14.136, $p < .001$, $\eta p^2 = .019$), provide spiritual inspiration (F (1,742) = 11.594, $p < .001$, $\eta p^2 = .016$), and connect with the past (F (1,742) = 11.608, $p < .001$, $\eta p2 = .015$), to a greater degree than day visitors. The benefits of viewing the night sky differed based on sex (F (7,736) = 4.344, $p < .001$, $\eta p^2 = .04$). Specifically, women found more spiritual inspiration (F (1,742) = 22.452, $p < .001$, $\eta p2 = .029$), solitude (F (1,742) = 13.416, $p < .001$, $\eta p^2 = .018$), connectedness with nature (F (1,742) = 9.799, $p < .01$, $\eta p^2 = .013$, and the past (F (1,742) = 8.189, $p < .01$, $\eta p^2 = .011$), when gazing at the night sky than men.

Respondents also wrote in other benefits from viewing the night sky. Out of 46 responses, the most common included inspiration or connecting with god or a supreme being (17), beauty (7), practicing some aspect of astronomy (6), or a chance to be with friends or family (4).

Light Pollution Attitudes

Day and night visitors believe that light pollution is a problem, at least in some areas, and that steps should be taken to preserve night visibility, especially in parks. When asked if light pollution is a problem in urban areas, 84.4% of respondents agreed or strongly agreed that it was a problem. Interestingly, 55.6% of those surveyed agreed or strongly agreed that light pollution is a problem in rural and remote areas. A majority of visitors, 79.1%, stated it was important or very important to be able to see stars in their backyards. This percentage is put in perspective when considering 54% of respondents indicated they could see stars at their place of residence. Most respondents, 89.1%, agreed or strongly agreed that places such as national parks should be preserved for their dark skies, and that areas around the parks (especially gateway communities) should help protect night skies (90.3%). More than half, 59.2%, agreed or strongly agreed they would visit other parks because of their dark skies.

Means and standard deviations for seven of the light pollution items are presented in Table 2 for day visitors and night sky program attendees. Based on a multivariate analysis of variance, those attending a night sky interpretive program show more concern for light pollution and night sky preservation than day users (F (7,813) = 8.085, $p < .001$, $\eta p^2 = .065$). Univariate analyses found differences between the two types of user groups on all seven light pollution and dark sky attitude items. Nocturnal program attendees agreed more strongly than day visitors that they would visit other parks because of their dark skies (F (1,819) = 26.149, $p < .001$, $\eta p^2 = .031$). Day visitors felt

more strongly than night visitors that light pollution was an inevitable consequence of economic growth (F (1,819) = 23.922, $p < .001$, $\eta p^2 = .028$). Interpretive program respondents believed more strongly that light pollution is a problem in urban areas (F (1,819) = 20.914, $p < .001$, $\eta p^2 = .025$), as well as rural and remote locations (F (1,819) = 12.467, $p < .001$, $\eta p^2 = .015$), than daytime visitors. Night visitors also felt it was more important to be able to view the stars in their backyard (F (1,819) = 18.119, $p < .001$, $\eta p^2 = .022$). Finally, night program attendees want parks preserved for their night skies (F (1,819) = 15.965, $p < .001$, $\eta p^2 = .019$), and feel areas around the parks should help protect night skies (F (1,819) = 7.616, $p < .01$, $\eta p^2 = .009$), more than day visitors.

The covariates included in the MANOVA model also had an effect, with difference based on place of residence (F (7,813) = 7.478, $p < .001$, $\eta p^2 = .06$), sex (F (7,813) = 3.723, $p < .001$, $\eta p^2 = .031$, and to a lesser extent, age (F (7,813) = 2.132, $p < .05$, $\eta p^2 = .018$). Those who reside in rural locations felt it is more important to be able to view stars in their backyard than urban residents (F (1,819) = 28.579, $p < .001$, $\eta p^2 = .034$). Conversely, urban residents feel more strongly that areas around parks should be involved in the protection of night skies than rural residents (F (1,819) = 4.186, $p < .05$, $\eta p^2 = .005$). Women felt it was more important to be able to view the stars in their backyard than male visitors (F (1,819) = 17.678, $p < .001$, $\eta p^2 = .021$). Women also found light pollution to be more of a problem in urban areas than men (F (1,819) = 11.836, $p < .001$, $\eta p^2 = .014$). Those visitors under the age of 25 felt it to be less important to protect parks for their night skies than older visitors (F (1,819) = 10.426, $p < .001$, $\eta p^2 = .013$). Younger visitors (those below the age of 35) also felt it less important for areas around parks to help protect night skies than older visitors (F (1,819) = 4.850, $p < .05$, $\eta p^2 = .006$).

Park Similarities and Differences

When Bryce respondents were asked how long they stayed at the park on this visit, 26% marked a 1- to 3-hour day visit, 28% a 4- to 10-hour day visit, 14% an 8- to 12-hour overnight visit, and 30% said two or more days. Survey participants at Cedar Breaks, however, overwhelmingly indicated their stay was a short one: 80% circled a 1- to 3-hour day visit, 10% a 4- to 10-hour day visit, 1% an 8- to 12-hour overnight visit, and 8% said they would be at the park for two or more days. Bryce visitors spent more time in the park than visitors to Cedar Breaks ($\chi 2$ (3, N = 1158) = 354.51, $p < .001$).

While visitors differed in the amount of time they spent in each park, visitors partook of nearly the same recreational activities. The top five pursuits visitors engaged in at Bryce were: photography (78.3%), spending time at viewpoints (70.7%), hiking (70.4%), touring the visitor center (58.6%), and wildlife viewing (54%). Cedar Breaks visitors reported the same top five activities: spending time at viewpoints (70.4%), photography (62.8%), hiking (53.7%), touring the visitor center (52.7%), and wildlife viewing (50%). Other interests included stargazing (20.3%), camping (19%), going on a night hike with a ranger (7.4%), horseback riding (6.9%), backpacking (2.7%), and taking a sightseeing flight (1.8%).

Finally, differences were found between Bryce and Cedar Breaks visitors night sky attitudes and behaviors. The night sky programs were more important to the travel plans of visitors to Bryce than Cedar Breaks (t (1146) = 3.628, $p < .01$). Bryce respondents felt more strongly than Cedar Breaks visitors that parks should be preserved for their dark skies, (t (1070) = 2.307, $p < .05$), although visitors to both parks produced high means (4.49 for Bryce to Cedar Breaks 4.28). Cedar Breaks visitors reported a higher frequency

of watching the motions of the planets (t (1063) = 2.636, $p < .01$) than Bryce respondents. Cedar Breaks visitors also found the spiritual benefits (t (1019) = 4.471, $p < .01$), the solitude (t (1037) = 3.433, $p < .01$), and the connection to the past (t (1000) = 2.667, $p < .01$), of the night sky to be more important than did Bryce Canyon visitors.

Discussion

As light pollution increases and dark skies become scarce, more people are coming to national parks to view the night sky. To better serve their visitors, national parks and other protected areas need to understand what expectations and experiences visitors have regarding night skies. The National Park Service is making an effort to restore dark skies, including educating visitors through interpretation and informal outlets. Natural lightscapes are an important resource of Bryce Canyon National Park and Cedar Breaks National Monument. Interpretive programs led by the dark rangers focusing on stargazing, nocturnal wildlife, light pollution, and astronomy are the most popular ranger programs offered, with attendance essentially equaling all other interpretive programs combined. This project assessed the effectiveness of the night sky interpretive programs in terms of the knowledge acquired after participation. Day use visitors were also included in this study to assess the similarities and differences between them and night sky interpretive program attendees. Finally, to obtain a better understanding of night sky related issues, attitude, behavior, and benefit questions were also included to begin to address the many social scientific gaps in the literature.

Visitors to Bryce Canyon and Cedar Breaks view parks and wilderness areas as the most preferred locations for stargazing, with 99.4% of interpretive program visitors and 79.9% of day users marking this choice. Comparatively, 19.4% of day and 30% of night visitors identified a planetarium or observatory as one of the preferred locations for stargazing. This shows parks and other protected areas have inherent night sky resources visitors expect to be able to experience. This may be the case even if visitors are unaware of the night sky-related activities a park has to offer. In this study, 62.5% of day users and 41.8% of program visitors were unaware of existing night sky and stargazing opportunities at the parks prior to visiting. Once in the parks, however, visitors can learn about night sky interpretive resources by frequenting the visitor center or reading the information provided to them when they enter the park. Yet, based on the percentages of visitors who were unaware of night sky opportunities at Bryce and Cedar Breaks, there remains room for improvement. More information about night sky recreational opportunities needs to be imparted to day visitors through other outlets so more become aware of the resource and the available interpretive programs.

While Bryce Canyon and Cedar Breaks make it a priority to communicate the importance of the night sky as a resource and the impact humans are having with their lighting (especially through their interpretive programs), other parks may not recognize that visitors arrive expecting to view and learn about the night sky. Parks and other protected areas need to recognize this expectation and include night sky-related information and opportunities for their visitors, even if they are located in areas that experience light pollution. Moreover, a concerted effort on a national and international level would help to educate potential park visitors and the general public about the importance of the night sky and the impacts of light pollution, as many seem simply unaware.

In order to gauge the effectiveness of the night sky interpretive programs, attendees

were asked a series of knowledge based questions before and after participating in the program. Naturally, how much visitors knew about the night sky played a role in their experiences at the park. The topic program participants said they knew the least about prior to visiting the park was the impact of ground lights (a term also referring to "skyglow" and "glare") on wildlife and human health. In fact, day visitors reported knowing more about this topic than night visitors before coming to the park, although the mean for both groups shows a relatively limited amount of knowledge. This may be due to a general lack of informational focus in society on the health effects of light pollution. The night sky interpretive programs highlight the health effects of light pollution, perhaps making attendees aware of how little they knew about the topic, a result that may be an artifact of the post-program design of the study. Yet, by attending a ranger-led interpretive program, visitors improved their knowledge on several night sky-related issues. For example, the topic that showed the greatest increase in knowledge was the type of lighting that can reduce light pollution. All interpretive programs emphasize this issue, providing information not readily available elsewhere in the park, and visitors are clearly learning from this experience. Eighty-six percent of interpretive program participants reported the program was the most informative park resource on night sky topics. It appears the night sky interpretive programs are doing a good job fulfilling the mandate of providing for the visitor experience while also communicating valuable information about the importance of night sky resource protection.

Results for day visitors are not as striking. Day users come to the park with nearly the same amount of knowledge about night sky topics as interpretive program participants. Daytime visitors, however, gained less knowledge about the night sky than did interpretive program attendees. Day users knew the least about the type of lights that reduce light pollution and the most about the impact of ground lights on night sky visibility. While day users did learn about visibility as a result of visiting the park, the increase in knowledge was not as great as those who took part in an interpretive program. Indeed, the differences between night sky knowledge before and after park visitation is much smaller for day visitors than program participants, indicating that outside the ranger programs, the parks may not be effectively communicating information on night sky subjects to all visitors. It is important to mention that some day-use visitors (28%) did report learning about night sky information from the brochure or newspaper they picked up as they entered the park, and 24% gained some information from exhibits in the visitor center or placards at viewpoints. While there are opportunities for informally learning about elements of the night sky, other outlets should be explored as 21% of daytime visitors indicated they did not encounter any night sky-related information, and consequently did not gain any new knowledge about night skies from visiting the park.

The challenge becomes how to best communicate night sky information to all types of visitors. Bryce and Cedar Breaks emphasize their night skies by offering interpretive programs, displaying times and locations of those programs in the visitor center and in the newspaper distributed when visitors enter the park. In addition, both parks have exhibits and informational placards distributed throughout the park to educate visitors about night sky visibility resources. Still, as indicated by the small amount of knowledge gained by day users, the park needs to find new ways to reach out to this segment—the largest—of their visitors. Given that day users spend less time at the parks (56% marked 1-3 hours for their visit) than program visitors (64% planned to stay 2 days or more),

and with 54% of day visitors indicating they had toured the visitor center, the parks should look first to the visitor centers to help increase night sky awareness. Day users see the night sky as a chance to enjoy nature and solitude, while program participants view the night sky as an opportunity to better understand the universe and create curiosity in science. Furthermore, since 76% of day and 86% of program respondents rated the connection to nature as a very or somewhat important benefit when viewing the night sky, targeting these themes could enable the parks to hone exhibits and programs toward visitor interests. It would also be advantageous for the parks to find other means to spread information on night sky issues, including web-based resources and the development of mobile applications that are available prior to and during visitation. With the increased dependence on technology, this would be a good way to communicate the importance of the night sky to younger visitors who were found to view the protection of the night sky as less important than older visitors. In addition, based on the demographic differences found in this study, educational programming should communicate the importance of protecting the viewshed at night and reducing light pollution, specifically appealing to male urban residents, perhaps through historical and cultural connections.

Results from this study can also prove useful to other parks with night sky interpretive opportunities and those areas seeking to educate their visitors about the importance of the resource. The responses to attitude, behavioral, and night sky benefit questions in this study demonstrate that park guests want to learn more about the night sky. In order to continue educating the public on this resource, parks need to expand their astronomy and night sky interpretive programs, even in parks that are affected by light pollution. Results show that visitors agree that light pollution is a problem, especially in urban areas, and a majority do not believe that light pollution can be avoided. Demonstrations showing how light pollution can be reduced in affected parks would be one way of showing how individuals, businesses, and communities can make a difference with their lighting choices. Nearly 90% of all respondents believe some places need to be preserved solely for their night visibility and that areas near national parks should assist in maintaining dark night skies. Parks affected by skyglow and ground-based light pollution offer an excellent opportunity to illustrate human impact and the degradation of the dark night sky, even in remote areas. The National Park Service could also tailor their programs to the most frequent night sky-related activities reported by respondents in this study (noticing the phases of the moons, observing the night sky, and taking night walks). Increasing ranger-led night hikes, giving frequent astronomy and telescope presentations, and discussing lunar cycles and their effects are possible methods parks can capitalize on their visitors' interests and expectations. National parks are excellent places for informal learning, and if certain areas have a night sky that people cannot view at home, that visibility, as well as the information contained in interpretive programs, will lead to increased knowledge and also positively influence night sky attitudes, intentions, and behaviors.

Limitations

While this study supports the development of the night sky literature, there are several limitations that need to be discussed. The survey was tailored for use in Bryce Canyon and Cedar Breaks to assess their night sky interpretive programs and may not be representative of all parks or relevant variables. We also employed a post-program and

post-visit design to be economical and target the visitor groups and variables of interest, which may have introduced potential biases. For example, those who participated in one of the interpretive programs just viewed or learned about the night sky, possibly inflating their responses to the target questions. Participants in these programs were also there voluntarily, which may have led them to report heightened benefits so their perception remained consistent with their behavior. Ideally it would be advantageous to employ different methodologies, including a pre-post design, in future research to address this issue. A larger sample of interpretive program participants from Cedar Breaks would have allowed direct statistical comparisons with Bryce program attendees, however to obtain a sufficient sample size would have required alterations of the study design, introducing a potential confound, but one future research should address. For example, while there are disadvantages associated with sampling all visitors, a different stategy than the one employed in this study (sampling every third visitor) would have increased the sample size in both Cedar Breaks and Bryce Canyon. One factor that surely played a role in the small number of visitors attending the night sky programs at Cedar Breaks is the limited number of overnight lodging options available in the park. Most visitors, therefore, stay for a shorter period of time than visitors to Bryce, and are not there long enough to participate in the night sky programs. Because of these limitations and the sparse literature on night skies, there are numerous research questions to explore.

Future Directions

The present study extends previous research by broadening the sample from college students to actual park visitors, including both interpretive program participants and day visitors, examining the effectiveness of night sky interpretive information in two nationally protected areas known for their dark night skies. On a practical level, the current research contributes to the literature by analyzing visitor attitudes and behaviors and including several additional measures that have previously not been investigated. Further refinement of variables and additional research could lead to the development of standards and indicators of quality for night skies in parks and protected areas, a perspective that has been very successful in the field of park and outdoor recreation management (Stankey et al., 1985; National Park Service, 1997; Manning, 2001; 2007; 2011). This framework includes visitor perspectives and incorporates them into management policies (Shelby & Heberlein, 1986; Vaske, Donnelley, & Shelby, 1993; Manning, 2011). Indicators and standards have been developed for issues such as carrying capacity (Manning, 2001; 2007), and park soundscapes (Pilcher, Newman, & Manning, 2011), and can be used by park management within the visitor experience and resource protection (VERP) framework (National Park Service, 1997; Manning, 2001).

Indicators of quality are quantifiable and measurable, usually identified through visitor surveys and interviews, and may include other stakeholders, depending on the issue. Social factors and specific natural resources can be indicators of quality, and once identified can lead to the development of management standards. An example of a night sky indicator of quality could be the visibility of the night sky, measured in terms of distance, clarity, and number of stars that can be seen on a clear, dark night, or if the Milky Way is visible. Other potential indicators may include the amount of skyglow, or from a social perspective, the number and type of night sky interpretive opportunities available in a park or protected area, and the quality of the interpretive material as judged by visitors. Standards can then be developed to ensure the minimum acceptable

conditions of indicator variables are being met. Park management can then monitor and enforce the agreed-upon indicators and standards to adhere to the VERP requirements (Manning, 2011). Social scientific research, including quantitative and qualitative designs, like those employed in the present study, should be further refined to aid in the development of a set of indicators and standards for park night skies to protect this important resource while providing for a quality visitor experience.

References

Beeco, J. A., Hallo, J. C., Baldwin, E. D., & McGuire, F. A. (2011). An examination of the guided night hiking experience in parks and protected areas. *Journal of Park and Recreation Administration, 51(4),* 72–88.

Brons, J. A., Bullough, J. D., Rea, M. S. (2008). Outdoor site-lighting performance: A comprehensive and quantitative framework for assessing light pollution. *Lighting Research Technology, 40*, 201–224.

Bryce Canyon National Park. (2012). *Lightscape/Night sky.* Available at: http://www.nps.gov/brca/naturescience/lightscape.htm Downloaded June 10, 2012.

Chepesiuk, R. (2009). Missing the dark. Health effects of light pollution. *Environmental Health Perspectives, 117(1),* A20-A27.

Cinzano, P., Falchi, P. F., & Elvidge, C. D. (2001). The first World Atlas of the artificial night sky brightness. *Monthly Notices of Royal Astronomical Society, 328,* 689–707.

Clark, B. A. (2006). *A rationale for the mandatory limitation of outdoor lighting.* Melbourne, Australia: Astronomical Society of Victoria Inc. Retrieved from http://www.asv.org.au.

Duriscoe, D. (2001). Preserving pristine night skies in national parks and the wilderness ethic. *George Wright Forum, 8(4),* 30-36.

Gallaway, T. (2010). On light pollution, passive pleasures, and the instrumental value of beauty. *Journal of Economic Issues 44(1),* 71–88.

Hammitt, W., Cole, D. (1998). *Wildland recreation: ecology and management*. New York: John Wiley.

Kelly, W. E. (2003). Night-sky watching attitudes among college students: A preliminary investigation. *College Student Journal, 37(2),* 194–196.

Kelly, W. E. (2004). The 'OCEAN' and the night-sky: Relations between the five-factor model of personality and noctcaelador. *College Student Journal, 38(1),* 100-102.

Leung, Y. & Marion, J. (2001). Recreation impacts and management in wilderness: A state-of-knowledge review. *Proceedings: Wilderness Science in a Time of Change*. USDA Forest Service Proceedings, RMRS-P-15-Vol-5.

Mace, B. L., Bell, P .A., & Loomis, R. J. (2004). Visibility and natural quiet in national parks and wilderness areas: Psychological considerations. *Environment and Behavior, 36,* 5–31.

Manning, R. (2001). Visitor experience and resource protection: A framework for managing the carrying capacity of national parks. *Journal of Park and Recreation Administration, 19,* 93–108.

Manning, R. (2007). *Parks and carrying capacity: commons without tragedy*. Washington, D.C: Island Press.

Manning, R. (2011). *Studies in outdoor recreation: Search and research for satisfaction* (3rd ed.). Corvallis, OR: Oregon State University Press.

National Park Service. (1997). *VERP: The Visitor Experience and Resource Protection (VERP) framework—a handbook for planners and managers*. Denver, CO: Denver Service Center.

National Park Service. (2012). *Managing Lightscapes*. Available at: http://nature.nps.gov/night/management.cfm Downloaded June 10, 2012.

National Park Service. (2012). *Night skies as an economic resource*. Available at: http://www.nature.nps.gov/night/economic.cfm Downloaded June 11, 2012.

Perry, G., & Fisher, R. N. (2006). Night lights and reptiles: Observed and potential effects. In C. Rich & T. Longcore (Eds.), *Ecological consequences of artificial night lighting.* Washington, D.C.: Island Press.

Pilcher, E. J., Newman, P., & Manning, R. E. (2009). Understanding and managing experiential aspects of soundscapes at Muir Woods National Monument. *Environmental Management, 43(3),* 425–435.

Rich, C. & Longcore, T. (2006). *Ecological Consequences of Artificial Night Lighting.* Washington D.C: Island Press.

Saucier, G. (1994). Mini-markers:A brief version of Goldberg's unipolar Big-Five markers. *Journal of Personality Assessment, 63(3),* 506-516.

Shelby, B., & Heberlein, T. (1986). *Carrying capacity in recreation settings*. Corvallis, OR: Oregon State University Press.

Stankey, G., Cole, D., Lucas, R., Peterson, M., Frissel, S., & Washburne, R. (1985). *Limits of Acceptable Change (LAC) system for wilderness planning.* USDA Forest Service General Technical Report INT-17.

Vaske, J., Donnelly, M., Shelby, B. (1993). Establishing management standards: selected examples of the normative approach. *Environmental Management, 17,* 629–643.

Wise, S. E., & Buchanan, B. W. (2006). Influence of artificial illumination on the nocturnal behavior and physiology of salamanders. In C. Rich & T. Longcore (Eds.), *Ecological Consequences of Artificial Night Lighting.* Washington, D.C: Island Press.

IN SHORT

Impact of Inquiry Stations on Visitor Time

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Abstract
Children are encouraged to spend more time outdoors and zoos provide a safe natural environment. Interactive opportunities for learning engage zoo visitors. This study seeks to determine whether the presence of four self-led temporary inquiry stations significantly increases the time visitors spend on a loop trail. Group composition, the mixture of adults and children, was also measured, evaluating significance of time spent on the trail. It was found that there was no significant difference in time spent on the inquiry trail, but there was a significant time difference based on group composition for both the inquiry and non-inquiry trail. The addition of permanent or staffed inquiry stations may encourage visitors to spend more time on the trail.

Keywords
keywords: inquiry, visitor time, nature, zoo(s)

Introduction
The concept of Nature Deficit Disorder presented by Richard Louv (2005) is now a familiar one. It is well documented that children spend less time outdoors and more time seated at desks or on sofas interacting with electronic devices, leading to growing adolescent obesity rates. As a result of the media attention surrounding this issue, more focus has been placed on healthy living, with spending time outdoors an integral piece of the solution. Mental acuity and concentration are linked to experience in nature (Louv, 2005). Following activities spent in a natural environment, children with attention deficit disorder are calmer and more relaxed (Taylor, Kuo, & Sullivan, 2001). Formal education requires children to focus and direct attention on assigned tasks and schoolwork. Controlling focus

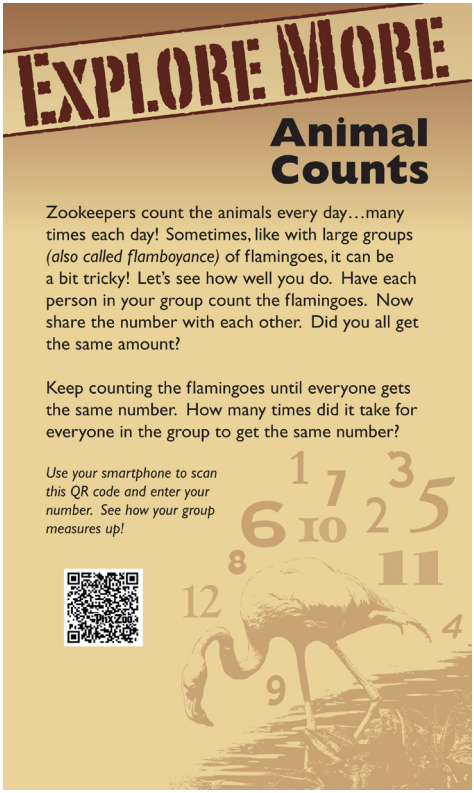

Figure 1
Inquiry sign for counting animals

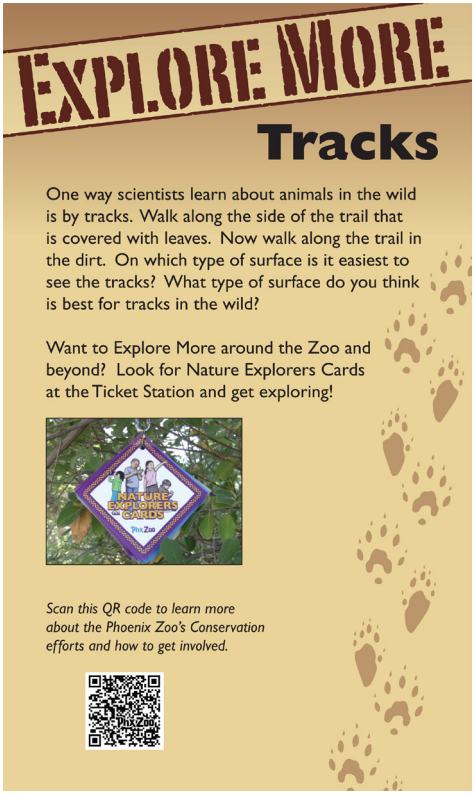

Figure 2
Inquiry sign for creating tracks

and voluntary attention, such as that required in the classroom, may induce fatigue because it takes effort to limit distraction (Kaplan, 1995). Involuntary attention, requiring no effort, is less likely to be fatiguing (Kaplan, 1995).

In the natural environment, attention is captured by the movement of an animal, the feel of a breeze, or even the sound of leaves crunching underfoot. It takes little or no effort to focus on these moments because nature holds an inherent fascination; humans historically relied on involuntary attention to react quickly for survival (Kaplan, 1995). Spending time in natural environments encourages mental recuperation, essentially recharging the brain's ability to concentrate and be effective (Taylor, Kuo, & Sullivan, 2001). Given parents' penchant for fear (Louv, 2005), finding a location that is safe and yet provides a natural experience is important. Institutions such as professionally managed zoos provide that safe environment for children to experience and learn about nature. Accredited zoos offer animals exhibiting natural behaviors, spaces that encourage physical activity and play, and opportunities to discover, along with the feel and look of being in a habitat far removed from cities.

Visitors to zoos are generally interested in being informed about their favorite animals in entertaining and interactive ways (Lindemann-Matthies & Kamer, 2005). In a study measuring learning, limited choice (students received an assignment that allowed them to

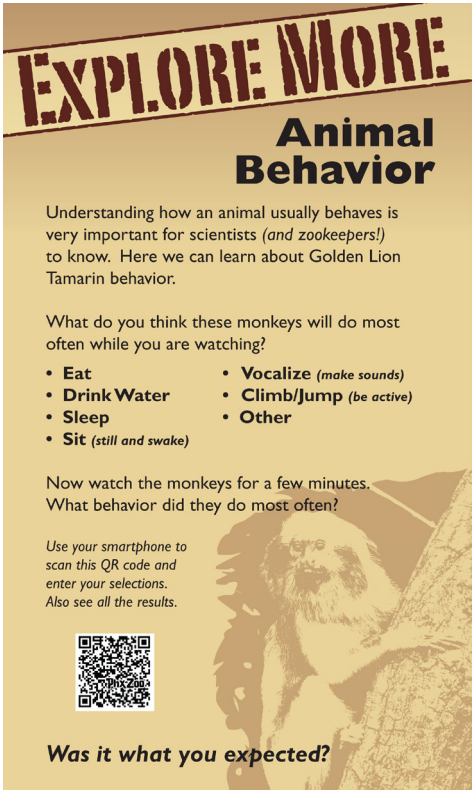

Figure 3
Inquiry sign for animal behavior

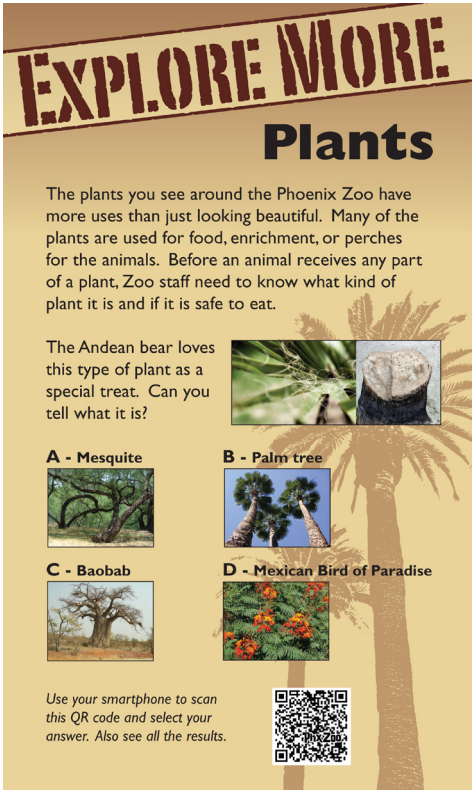

Figure 4
Inquiry sign for plant comparison

freely explore a specific exhibit at a museum) led to highly engaged students (Bamberger & Tal, 2006). The other types of choice learning measured, no choice and free choice, did not lead to the engagement exhibited by limited choice (Bamberger & Tal, 2006). One of the key roles of zoos is education (Broad & Smith, 2004), so it stands to reason that providing learning opportunities in the form of inquiry stations contribute to the education of visitors. According to the National Science Education Standards criteria, "inquiry" refers to learning that emphasizes critical thinking, questioning, and data analysis (Bell, Smetana, & Binns, 2005).

For this study, inquiry stations consisted of printed signs inviting visitors to perform an activity (Figures 1, 2, 3, and 4). Content included counting animals in an exhibit, creating tracks (footprints) in various substrate, hypothesizing what behaviors an animal would exhibit and observing to determine if the hypothesis was correct, and critical thinking to compare photos of an animal's favorite plant treat. Project Dragonfly's QUEST model inspired these activities, with a particular focus on the components "question and observe," "explore predictions," and "start action plan and gather data" (Project Dragonfly, 1998).

Zoos make a difference in the conservation knowledge of visitors and provide visitors ways to be involved in conservation (Falk, Reinhard, Vernon, Bronnenkant, Deans, & Heimlich, 2007). Inquiry stations, which provide limited choice (or may be seen as guided

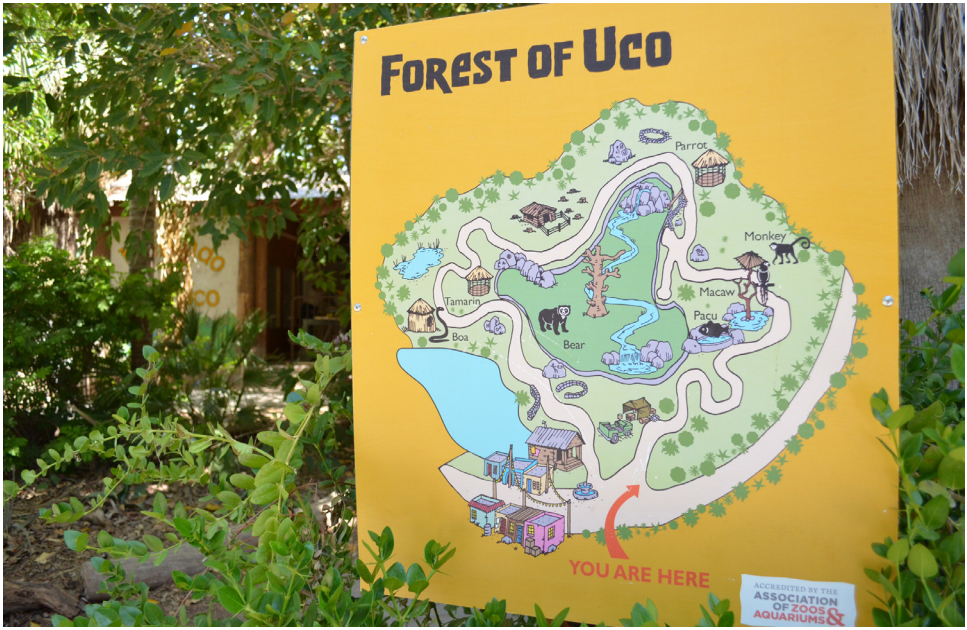

Figure 5. Posted sign illustrating map of loop trail

inquiry as opposed to free choice inquiry), direct the purpose of the visitor's visit, therefore leading to deeper engagement with nature and conservation. Guided inquiry presents children with opportunities to discover inquiry intentionally, rather than exploring without direction. While both have value, the structure provided by guided inquiry allows for the synthesis of necessary skills to complete inquiry by oneself.

This study investigates whether visitor groups will spend significantly more time on a loop trail with self-led inquiry stations than on a trail without inquiry stations. Group composition, the number of adults and children within each group, will also be considered as a factor in time spent on the trail with and without stations; groups containing children are expected to spend more time on the trail with stations than groups without children. The presence of inquiry stations is likely to create a significant difference in time spent on the trail, although a significant difference based on group composition is not.

Methods

A closed-loop trail at the Phoenix Zoo with entrance and exit located geographically close together was selected as the study site (Figure 5). This trail surrounds the zoo's "Forest of Uco" exhibit, which features Andean bears. Other exhibits on the Forest of Uco trail include monkeys, parrots, various invertebrates, and snakes.

Six weekend dates in 2011 were chosen for data collection due to anticipated high attendance based on historical attendance data: October 8 and 22 and November 5, 12, 13, and 20. Content for inquiry signage was inspired by animals present along the trail and guided by Project Dragonfly's QUEST model. Design and production of the inquiry station signs were performed by the Phoenix Zoo's graphics department to assure consistency with other zoo signage. Four large inquiry signs were placed around the loop trail in locations

appropriate to content (Figures 1, 2, 3, and 4). On October 8, November 5, and November 13 guests were surveyed without inquiry stations in place (non-inquiry trail). On October 22, November 12, and November 20 guests were surveyed with inquiry stations in place (inquiry trail). Survey start time, total zoo gate attendance, and high temperature were noted for each survey date (Table 1). Low temperatures in Phoenix were not a concern during the time of year when data were collected for this study.

Initial data collection was completed by video recording the entrance/exit of the trail. The length of survey time was one hour and 45 minutes. Visitors were tracked visually. Camera recording time was noted when the first person in the group entered the trail and when the last person in the group exited the trail. The change in pathway substrate type (asphalt main path to paver Uco trail and vice versa) was used as the line to measure when persons entered and exited. Group composition was noted based on the observer's best visual estimation for age (under 18 = child) (Tables 3, 5, 9, and 11).

To determine significance in differences between the time spent on the non-inquiry trail and the inquiry trail, the mean time spent was calculated. Data was also evaluated with the removal of values of total time spent on the trail less than five minutes, as this amount of time appeared to be too short a period to accurately represent time spent on the trail. Using the (2-tailed and type 3) T-test function in Microsoft Excel the P-value was calculated for both raw and adjusted data. These values were determined for group composition as well. Standard deviation was calculated using the Microsoft Excel standard deviation function.

Results

Date	Survey Start Time	Total Gate Attendance	Temperature High	Type of Trail
10/8/2011	9:45am	8167	78F	Non-Inq
10/22/2011	10:00am	7960	95F	Inq
11/5/2011	1:00pm	5695	61F	Non-Inq
11/12/2011	1:15pm	6807	75F	Inq
11/13/2011	11:10am	2364	72F (rainy)	Non-Inq
11/20/2011	11:15am	4190	75F	Inq

Table 1
Survey specifics, color-coded to show complimentary times for companion type of trail

	Total # of Visitors	Mean Time	P-value
Non-Inquiry Trail	1072	12:20	0.0908199
Inquiry Trail	1503	11:52	

Table 2
P-value for time spent on Non-Inquiry and Inquiry Trails

Non-Inquiry Trail

Group Composition	Total # of Groups	Total # of Visitors	Mean Time	# Adults	# Children
	318	1072	12:20	640	432
Without Children	88	178	10:14	178	0
With Children	230	894	13:09	462	432

Table 3
Numerical representation of group size, composition, and mean time spent on the non-inquiry trail.

Group Composition	Total # of Groups	Mean Time	Standard Deviation	P-value
	318	12:20	0.00419	
Without Children	88	10:14		0.0000251
With Children	230	13:09		

Table 4
Standard Deviation and T-test (comparing group composition) results for Non-Inquiry Trail

Inquiry Trail

Group Composition	Total # of Groups	Total # of Visitors	Mean Time	# Adults	# Children
	404	1503	11:52	870	633
Without Children	93	193	11:09	193	0
With Children	313	1310	12:05	677	633

Table 5
Numerical representation of group size, composition, and mean time spent on the inquiry trail.

Group Composition	Total # of Groups	Mean Time	Standard Deviation	P-value
	404	11:52	0.00434	
Without Children	93	11:09		0.1856480
With Children	313	12:05		

Table 6
Standard Deviation and T-test (comparing group composition) results for Inquiry Trail

Statistical analysis shows results that are not significant for difference in time spent between the Non-Inquiry Trail and the Inquiry Trail (P-value > 0.09) (Table 2). Results for group composition were significant for the Non-Inquiry Trail (P-value < 0.01) but not for the Inquiry Trail (P-value > 0.19). The low standard deviation values (Tables 4 and 6) for both trail types provide confidence in the data.

Date	Total Gate Attendance	Temperature High	Type of Trail	Mean Time	Total Visitors
10/8/2011	8167	78F	Non-Inq	0:13:12	410
10/22/2011	7960	95F	Inq	0:11:46	514
11/5/2011	5695	61F	Non-Inq	0:12:36	431
11/12/2011	6807	75F	Inq	0:12:27	520
11/13/2011	2364	72F (rainy)	Non-Inq	0:11:19	231
11/20/2011	4190	75F	Inq	0:11:50	468

Table 7
Date, total gate attendance, temperature, mean time, and total trail visitors. Color-coded to show complementary times for companion type of trail. Mean time and total visitor values include all data collected.

Adjusted Data Results (non-inclusive of <5 minutes spent on trail data)

	Total # of Visitors	Mean Time	P-value
Non-Inquiry Trail	972	13:44	0.0908199
Inquiry Trail	1192	14:11	

Table 8
P-value for time spent on Non-Inquiry and Inquiry Trails

Non-Inquiry Trail

Group Composition	Total # of Groups	Total # of Visitors	Mean Time	# Adults	# Children
	280	972	13:44	574	398
Without Children	74	156	11:52	156	0
With Children	206	816	14:24	418	398

Table 9
Numerical representation of group size, composition, and mean time spent on the non-inquiry trail with removal of <5 minutes spent on trail data.

Group Composition	Total # of Groups	Mean Time	Standard Deviation	P-value
	280	13:44	0.00402	
Without Children	74	11:52		0.0000081
With Children	206	14:24		

Table 10
Standard Deviation and T-test (comparing group composition) results for Non-Inquiry Trail with removal of <5 minutes spent on trail data.

Inquiry Trail

Group Composition	Total # of Groups	Total # of Visitors	Mean Time	# Adults	# Children
	323	1192	14:11	695	497
Without Children	75	157	13:07	156	0
With Children	248	1036	14:31	539	497

Table 11
Numerical representation of group size, composition, and mean time spent on the inquiry trail with removal of <5 minutes spent on trail data.

Group Composition	Total # of Groups	Mean Time	Standard Deviation	P-value
	323	14:11	0.00452	
Without Children	75	13:07		0.0137626
With Children	248	14:31		

Table 12
Standard Deviation and T-test (comparing group composition) results for Inquiry Trail with removal of <5 minutes spent on trail data.

Statistical analysis of adjusted data shows results that are not significant for difference in time spent between the Non-Inquiry Trail and the Inquiry Trail (P-value > 0.09) (Table 8). Adjusted data results for group composition were significant for the Non-Inquiry Trail (P-value < 0.01) and for the Inquiry Trail (P-value < 0.02). The low standard deviation values (Tables 10 and 12) for both trail types provide confidence in the data.

Discussion

During data collection, the author noted a large number of groups often entered the trail nearest the Andean bear main viewing area and exited from the same location within a few minutes (Figure 5), guiding the conclusion that the entire trail was not traversed. This information led to the removal from analysis of values of total time spent on the trail less than five minutes, as this amount of time was determined to not be a true representation of time spent on the trail. It is assumed that this exclusion means only data from groups that completed the trail are included in final analysis. The P-values measuring time spent on the Inquiry versus Non-Inquiry trails for both data sets are identical (Tables 2 and 8).

Daily high temperatures were noted but not analyzed as a determining factor in the time spent on the trail. Temperature information is tracked by the Phoenix Zoo for overall gate attendance projections. The relationship between the number of visitors and the high temperature of the day is a consideration for future studies to include trail congestion on high attendance days.

The presence of inquiry stations did not appear to have an impact on the time visitors spent on the trail. When viewing the complete data set, there appears to be a correlation between overall gate attendance, temperature, and time spent on the trail (Table 7). For the complementary survey times in this data set, it also appears there is a relationship between total trail visitors and mean time spent on the trail. Mean time was higher for fewer trail visitors, not including the anomaly of a rainy day. Additional surveys will determine if this is a true correlation. More data are needed to determine if fewer visitors on the trail allow for more usage of the inquiry stations. Notation of where the visitors entered and exited will also provide information about use of the entire trail.

The inquiry stations were placed temporarily (leaned along the trail fencing). Permanent, or semi-permanent, signage may increase usage of the stations. Signage that is well designed and eye catching will be read by visitors (Bitgood, 2000), although placement of signs does impact whether or not visitors will stop and read (Thompson & Bitgood, 1988). Objects tend to draw visitor attention, rather than signage (Bitgood, 2000). Pairing the inquiry signage with physical objects for visitors to manipulate is likely to captivate attention more effectively, leading to more time spent on the trail and, consequently, more time engaged in activities outside. Inquiry stations that are staffed by interpretive employees or volunteers would potentially attract visitors; interactive elements and relevant content motivate visitors to invest their time (Arndt, Screven, Benusa, & Bishop, 1993).

Additional studies are necessary to determine if there is a true relationship between number of visitors using the trail and time spent on the trail; results may alter viewpoints on trail design to include rotating or permanent inquiry stations. Surveying visitor time spent at each inquiry station will provide information on interpretive content and design for inquiry activities. Further categorizing child age ranges (such as 0–5, 6–10, 11–14, and 15–18) may also provide more information on trail use by groups.

Conclusions

The study was performed to determine the impact of inquiry stations on the amount of time visitors spent on a trail at the zoo. While the results fail to show that there is a correlation, it is possible that the temporary placement did not draw visitor attention. Additional studies using permanent, or semi-permanent, stations may provide different

results. Inclusion of tactile elements would also be beneficial. The apparent relationship between number of visitors on the trail and mean time could provide motivation for staffed inquiry stations on high attendance days to slow the progression of visitors through the trail.

Bibliography

Arndt, M., Screven, C., Benusa, D., & Bishop, T. (1993). Behavior and Learning in a Zoo Environment Under Different Signage Conditions. *Visitor Studies: Theory, Research, and Practice, 5,* 245–251.

Bamberger, Y., & Tal, T. (2006, August 2). Learning in a Personal Context: Levels of Choice in a Free Choice Learning Environment in Science and Natural History Museums. *Science Learning in Everyday Life*. (L. D. Dierking, & J. H. Falk, Eds.) Wiley Interscience.

Bell, R., Smetana, L., & Binns, I. (2005). Simplifying Inquiry Instruction: Assessing the inquiry level of classroom activities. *The Science Teacher, 7*(72), 30–33.

Bitgood, S. (2000). The Role of Attention in Designing Effective Interpretive Labels. *Journal of Interpretation Research, 5(2),* 31–45.

Broad, S., & Smith, L. (2004). Who Educates the Public about Conservation Issues? Examining the Role of Zoos and the Media. *International Tourism and Media Conference Proceedings* (pp. 15–23). Melbourne: Tourism Research Unit, Monash University.

Falk, J. H., Reinhard, E. M., Vernon, C. L., Bronnenkant, K., Deans, N. L., & Heimlich, J. E. (2007). *Why Zoos & Aquariums Matter: Assessing the Impact of a Visit*. Silver Spring, MD: Association of Zoos & Aquariums.

Kaplan, S. (1995). The Restorative Benefits of Nature: Toward an Integrative Framework. *Journal of Environmental Psychology, 15,* 169-182.

Lindemann-Matthies, P., & Kamer, T. (2005, November 15). The Influence of an Interactive Educational Approach on Visitors' Learning in a Swiss Zoo. *Science Learning in Everyday Life*. (L. D. Dierking, & J. H. Falk, Eds.) Wiley InterScience.

Louv, R. (2005). *Last Child in the Woods*. Chapel Hill: Algonquin Books.

Project Dragonfly. (1998). *Dragonfly QUEST Leader's Guide: Leading Teams of Young Investigators on Astounding Expeditions*. Miami University.

Taylor, A. F., Kuo, F. E., & Sullivan, W. C. (2001). Coping with ADD; The Surprising Connection to Green Play Settings. *Environment and Behavior, 33(1),* 54–77.

Thompson, D., & Bitgood, S. (1988). The Effects of Sign Length, Letter Size, and Proximity on Reading. In S. Bitgood, J. J. Roper, & A. Benefield (Eds.), *Visitor Studies - 1988. Theory, Research, and Practice* (pp. 101–112). Jacksonville, AL: Center for Social Design.

The Role of Intrinsic Motivation in a Science Field Trip

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Abstract
A school principal enlisted state park interpreters to organize a series of science field trips to provide a natural environment for instruction, encourage interest in science, and improve exam scores. Students participated in activities one day a month for six months and took exams. Benchmark scores increased compared with the previous year's fifth graders in science. A non-experimental case study examined the emotional and intellectual impressions resulting from students' experiences of field trip activities. Qualitative data included interviews with school faculty, park interpreters, and 93 students riding to and from the park. Students were asked: what was your favorite activity and why? The study found the elements of novelty, outdoors, touching animals, learning, exploring, (seeing) animals, and personalization to be linked to the factors of play, flow (optimal experience), and free-choice learning. Findings suggest that intrinsic motivation is an important aspect of student enjoyment of field trips.

Keywords
science field trip, play, emotion, intrinsic motivation, nonformal education

Introduction
Several forces are responsible for bringing public schools and heritage interpretation together through the nonformal education method of the field trip. Perhaps the first author to defend the importance of sensory learning was John Amos Comenius at the end of the 16th century. Public schools embraced playgrounds and parks as places for play,

physical education, and progressive education in the late 1800s in works by Jean Jacques Rousseau and Johann Heinrich Pestalozzi (Hammerman, Hammerman, & Hammerman, 2001). The playground movement provided schools with the rationale to allow time on playgrounds and in parks the nature study movement helped convince schools to organize science field trips to museums, zoos, aquaria, and nature centers with the works of Liberty Hyde Bailey, Louis Agassiz, and Anna Botsford Comstock (Kohlstedt, 2010). Educators' desire to use parks as a resource for teaching was a goal for outdoor education with foundational author L. B. Sharp (Hammerman, et al., 2001) and environmental education (Knapp & Benton, 2006) with experiential-based practitioner Van Matre (Hammerman, et al., 2001). Jean Piaget and others examined the cognitive development of children and noted the role of play in the acquisition and practice of a host of skills, knowledge, and abilities. Finally, parks and protected areas embraced the process of heritage interpretation to enhance visitors' experiences beginning in the early 1900s with Enos Mills (1920). Although interpretation began with visitors, the melding of environmental interpretation (Ham, 1992; Sharpe, 1976) and nonformal science instruction has gained the attention of museum docents, tour guides, and park interpreters. In particular, Tilden's sixth principle that interpretation for children cannot be a dilution of adult programs (1957, 2000) is especially important if interpreters are to make science meaningful to school children. These five strands of development all helped link interpreters to public education: schools and playgrounds, play as learning and development, nature study and outdoor education, environmental education, and interpreters as communicators of nature and culture.

The strong relationship forged between public schools and parks has weakened in recent years. Benchmark testing of academic subjects have pushed aside the importance of play and accessible parks. Richard Louv is only one of a long line of authors to consider the plight of education in and for the outdoors (2008). There are contemporary examples of hands-on and engaging field trips emphasizing progressive education practices (Pumpian, Fisher, & Wachowaik, 2006) and cognitive learning (Hurley, 2006) that are being conducted in the face of economic and bureaucratic barriers. The study examined in this paper provides another example of a collaborative field trip conducted by a public school and state park interpreters.

Literature Review

Playgrounds and parks have enjoyed a symbiotic relationship with public schools since the early 1900s with playground movement spearheaded by the "Father of American Recreation" Joseph Lee (Chubb & Chubb, p. 20, 1985). Lee's experiment succeeded because he was able to convince politicians, educators, and reformers that physical education and play serve a vital role in the development of young people. Play scholars have noted the intense engagement that the activity of play produces on the participant (Huizinga, 1950) and that it contributes to development, growth, and socialization (Callois, 2001; Sutton-Smith, 1997). "Education is coming to recognize that playful behavior is often motivated by an intense desire to learn that is accompanied by positive feelings of enjoyment, and much learning" (Ellis, 1973, p. xii). Similarly, educator John Dewey echoed this sentiment from the progressive age: "all peoples at all times have depended upon plays and games for a large part of the education of children, especially young children" (Dewey & Dewey, p. 103, 1915).

Mihayli Csikszentmihalyi (1975) examined the connection between leisure activity, enjoyment and intense psychological engagement and put forth his theory of Flow, or

optimal experience that results when there is a balance between a participant's skill and the challenge presented by a difficult pursuit. According to Csikszentmihalyi and Hermanson, "flow activities lead to personal growth because in order to sustain the flow state, skills must increase along with the increased challenges" (1995, p. 36). The author emphasized the important distinction between extrinsic and intrinsic motivation. Extrinsic motivation is the anticipated rewards from the outside in comparison to the intrinsic motivation arising from rewards for doing an activity for its own sake. Field trip activities that include elements of leisure activity may provide the kind of common experience identified with flow theory.

Providing access to nature as a context for children's learning process began with the nature study movement as it introduced science into public schools (Kohlstedt, 2010). Rachel Carson wrote eloquently about the importance of leading children in nature as well as calling attention to the scientific linkages between human action and environmental consequences (1956). Tilden's fourth principle that interpretation should present a whole is also accomplished better in nature where complete ecosystems and interrelated species are readily accessible to participants (1957, 2000). Richard Louv explored the causes behind what he called the nature-deficit disorder and conveyed the sentiment regarding children and nature that "nature inspires creativity in a child by demanding visualization and the full use of the senses" (p. 7, 2008).

Scholars have examined school field trips from a myriad of angles. The potential for changes in environmental attitude, knowledge, and behavior have been examined (Ernst, 2005; Farmer, Knapp, & Benton, 2007; Knapp & Benton, 2006; Knapp, 2000; O'Brien & Pease, 2004). The importance of the field trip experience being retained in long-term memory and its impact has been documented (Falk & Dierking, 1997; Knapp, 2000, 2007). Cognitive outcomes have been measured (Bamberger & Tal, 2008; Hurley, 2006) and teachers' perspectives explored (Anderson, Kisiel, & Storksdieck, 2006; Rudman, 1994). The role and impact of hands-on activity (Falk, Scott, & Dierking, 2004), learning (Falk & Dierking, 2000; Orion & Hofstein, 1994; Rennie & Johnston, 2004), animals used in zoo interpretation (Fuhrman & Ladewig, 2008), and meaning-making (Benton, 2008; Rahm, 2004; Silverman, 1995) have been explored. Rarely has there been an attempt made to reconcile academic achievement from post-trip benchmark exams with affective experiences during the field trip. The focus of this study is upon the connection between enjoyment, emotion, and motivation.

The importance of measuring affect as it relates to the emotional appeal of informal learning sites has been examined (Meredith, Fortner, & Mullins, 1997; Webb, 2000). Learning theory models from the museum field have provided sets of factors or characteristics in the learning process; personal, sociocultural, physical, and temporal (Falk & Dierking, 2000); personal, contextual, and temporal (Rennie & Johnston, 2004); self-identity, companions, and leisure motivations (Silverman, 1995); and content oriented outcomes, social-oriented outcomes, and interest-oriented outcomes (Bamberger & Tal, 2008). Orion and Hofstein (1994) examined the educational effectiveness of field trips and found psychological factors related to the quality of the field trip itself and the "novelty space" as important determinants of learning. Learning is both a product and a process (Falk & Dierking, 2000). This study is based on the methodology that the process of learning may be described through interviews with students regarding their emotional and intellectual impressions of field trip activities conducted on the school bus riding between school and park.

Method

Site

The field trip activities took place inside and outside the visitor center at Hobbs State Park–Conservation Area (HSPCA). Immediately adjacent to the visitor center is an all-accessible half-mile trail looping through an oak, hickory, and pine forest. Three interpreters conducted the majority of field trip activities. Two teachers from Monitor Elementary School attended all field trips and were occasionally assisted by a parent and another teacher. Field trips took place on two school days each month from November 2010 through April 2011. Park interpreters conducted several pre-visit meetings with classes to prepare and inform students of what to expect to reduce anxiety and improve learning once at the site. Students boarded the bus at Monitor Elementary School and arrived at the visitor center after a 40-minute drive. After a brief orientation students were divided in thirds among the two classrooms (stations one and two) and the atrium (station three) for a rotation through the three learning sessions; including outdoor experiences. Two sessions took place before and one after lunch. A short period for exploration of the visitor center's exhibit hall or journaling took place before the students boarded the busses for the ride back to the school.

Data Collection

This research study represents a single case study (Yin, 2003) of fifth-grade field trips to HSPCA 2010–2011 and gathered primarily qualitative data. This study method was not an experimental design. The purpose of the research study was to examine the phenomena of the field trip activity experience to coincide with the end-of-semester testing of students' knowledge. According to the school principal, one of the explicit goals for the field trips was to improve science exam scores. At the start of the school year in fall 2010, the school planned to conduct state benchmark exams in April 2011. These data were gathered by the school district and represent quantitative measurements of student knowledge of science.

The researcher gathered descriptive qualitative data from school administration and faculty, park interpretive staff, and the students participating in the field trip experience. Open-ended interviews are an appropriate instrument for gathering data from nonformal learning settings (Dohn, 2010; Hammerman, et al., 2001; Rennie, Feher, Dierking, & Falk, 2003; Rennie & Johnston, 2004; Bamberger & Tal, 2008). Interviews were conducted with 93 students pre and post field trip while riding to and from the park on the school bus from December, 2010 through April, 2011. All interviews were audio taped with a digital voice recorder, transcribed verbatim, and analyzed using NVivo 7.0 qualitative coding software (QSR, 2006). On the way from the school to the park students were asked about the previous field trip and then probed for knowledge of the current field trip topics as studied in school and any expectations for the upcoming visit. During the return trip from park to school, a different group of students were asked for their recollection of the field trip experience. Every effort was made to speak with every eligible (assenting) student. Embedded in the data are the following 12 aspects attributed to student activity preference.

Aspects associated with students' favorite activity

1) Touch animals
2) Learning
3) Outdoors
4) Novelty
5) Seeing animals/insects
6) Personalization
7) Explore/investigate
8) Speak to class/social
9) Measurement
10) Fungi, Bacteria, Invertebrate (F.B.I. acronym)
11) Cookie (mining & eating)
12) Clay (playdough, metamorphic stage)

Data Analysis

Student interview responses were analyzed, coded (Creswell, 1995), and organized across three general categories: recall, technique, and "why your favorite activity." The first data category, recall, contained statements about terms, concepts, and processes related to the monthly science topics. Students were probed further for definitions of the terms and meanings of the concepts about which they responded. Recall of subject matter was associated with the cognitive domain (Bloom, 1956). The second data category, technique, was characterized by instructional methods and use of action verbs related to learning exercises undertaken during activities. For example, students described the *interpreter* demonstrating, showing, and presenting; the *students* writing, drawing, listening, and measuring. Data corresponding to technique was associated with the psychomotor domain (Singer, 1972). Students' favorite activity was the third category of data and contained responses (n=93) that gave reasons why students preferred a particular activity. Favorite activities were associated with the affective domain (Ringness, 1975). What students liked least about the field trips is also reported in the findings section.

Findings

Students participated in 18 sessions (three sessions per visit) over the course of six months with a variety of instructional methods and activities chosen by the interpreters. A total of 100 students participated in interviews but 93 answered the question about their favorite activity. Students (n=93) chose the following activities as their favorite in ranking order of frequency: Adopt-A-Tree (25), Cold Blooded Animals (20) and Decomposer Hike (20), Rock Cycle (16), and Cookie Mining (12). The following are learning activity descriptions for the top four ranked session activities.

Adopt-A-Tree

The adopt-a-tree session consistently got the students outside and immersed in nature with a minimum of direction and adult oversight. Adopt-a-tree was adapted from the Project Learning Tree curriculum (American Forest Foundation, 1998). Several instructional exercises took place each month. Students initially chose and named trees with partners, conducted measurements, estimated size, and recorded observations in their field journals (November). December's session included observation of the tree and surrounding area, drawing a map to the tree, and participation in a separate game called Oh Deer; also adapted from the environmental education curriculum Project Wild (Council for Environmental Education, 2000). January's session included examining the ground for evidence of animals, bugs, fossils, and rocks. Subsequent brief visits in February and March were followed by the most dramatic change following the prescribed burn (forest fire) in April 2011.

Students who chose Adopt-A-Tree to be their favorite activity identified eight factors responsible for their preference. The most frequently mentioned factors were: *personalization* (getting to pick the tree and pick the name), *measuring* (the height and width), *novelty* (seeing something for the first time), and the activity taking place *outdoors*. Sharing the experience with a partner (*social*) was also mentioned.

Cold-Blooded Animals

The interpreter began with a lecture and discussion style presentation using the dry erase board about the differences between amphibians and reptiles. Students had been informed back at school that they would get the opportunity to touch reptiles, specifically snakes. The interpreter walked around the room with a box turtle allowing each student to touch it in an appropriate manner. She followed with a toad and then removed a hog-nosed snake and asked for five students at a time to come to the front and form a line where each would get to carefully caress the snake. This activity was repeated with a speckled king snake; a snake that eats other snakes. The opportunity to touch a living snake was a first-time event for many of the students who may have seen similar animals only in glass cages (e.g. the visitor center exhibit hall and zoos and nature centers).

A majority (74%) of students (n=20) responding about cold blooded animals identified getting to *touch the animals* the reason for liking it the best. Other factors deserving mention were: *learning* about the animals, the *mouse* (although not a cold-blooded animal), *seeing* the animals (without mention of touching), and *novelty* (first-time experience for some). The respondents were no more articulate than this; reporting their enthusiasm based primarily on a novel sensory experience.

Decomposer Hike

The decomposer hike took place outside the visitor center along the same looping trail as adopt-a-tree. The interpreter gave a short introduction and then encouraged students to venture off-trail and locate examples of decomposers. She provided an acronym, "F.B.I.," which stands for Fungi, Bacteria, and Invertebrates, to help the students comprehend and reinforce the school science curriculum. When students found critters they spoke up and other students quickly came over to observe the various animals, usually salamanders, spiders, and insects.

Twenty students gave descriptions and impressions of this activity identified as their favorite. The most frequently mentioned factors were a preference for *looking for*

decomposers (investigating or playing detective), simply *being outside,* and finding lizards and animals. Other factors revealed in their responses included searching for and finding *FBI* (fungi, bacteria, and invertebrates); having *fun* or excitement, and finding a pink fungus (that "explodes" spores when touched).

Rock Cycle

The rock cycle session took place in one of the classrooms. First, the interpreter set up a demonstration using colored melted wax poured over a large rock to simulate a volcano and had a progression of large to small rocks to provide examples of weathering. Second, students were provided with a learning tool, rock cycle plates. Paper plates featured a rock (igneous) and sand (sedimentary) glued in place with partial labeling and an empty space for the metamorphic rock. Each student received a plate and completed their rock cycle plate by squishing three colored balls of Play-Doh brand clay together to simulate the metamorphic processes of heat and pressure. The third stage of the session required students to bring their plates in front of the class and explain the complete cycle to the class, with assistance if required. Although this was a mandatory activity, the interpreter and the teacher increased students' comfort zones by coming up front with them if necessary and providing them with gentle prompts and assistance.

Sixteen students chose this as their favorite activity. The most frequently mentioned factors were: *learning* about the rock cycle, *speaking* in front of class, manipulating the *clay* or Play-Doh, the *volcano*, and *ample stuff* to see and to touch. Speaking in front of class was identified as a social factor that could have improved or challenged students' self esteem and relative comfort level with the performance-based activity. The learning context was observed as being supportive as students watched each other succeed with the mini presentations and were assisted by interpreter and teacher as needed.

Cookie Mining (Minerals)

The interpreter conducted a session about Arkansas state minerals that began with a PowerPoint presentation during which students examined by hand various mineral samples. Then the interpreter gave each student a chocolate chip cookie, which would serve as a representation of the earth with the chips symbolizing diamonds. The students were instructed to remove the chips by hand without destroying the cookie because that is what miners today are expected to do: return the site as much as possible to its original condition. Twelve students identified cookie mining as their favorite activity. The majority of responses indicated that eating the cookie was the reason why it was their favorite. Other factors included description of the actions or mechanics of the activity (with students pretending the chocolate chips were diamonds), and revealing the *number of chips* mined during the activity.

The preceding description of students' favorite activities represents a qualitative description of elements associated with the enjoyment of field trip learning activities. Multisensory experience with living creatures and plants, nonliving animal skins, rock and mineral samples, soil and water; were highly favored by the students. Engaging in actions such as exploring, investigating, speaking (explaining), measuring, manipulating clay, and digging chocolate chips out of cookies were also appealing to the participants. Contextual elements such the novelty or newness of many objects and experiences including the outdoors, the personalization that resulted from students having choices during activities that encouraged intrinsic motivation, and perhaps the action

of "learning" all represent reasons why 11- to 12-year-olds enjoyed the interpretive instruction.

Students were also asked on a regular basis what they liked least about the field trips to illustrate as complete a picture as is possible of their field trip experience. Analysis of student responses (n=55) revealed a range of responses. Some students (n=14) responded that they did not have anything that they disliked. Other students (n=39) expressed several different reasons for *disliking* various aspects of the field trip. The most frequently mentioned factors were: (1) factors similar to school/academic skills, (2) the school bus ride, (3) the cold weather, (4) Adopt-A-Tree, and (5) fear of touching animals. The most frequently identified categories of recall (n=18) were attributed to actions that were most similar to academic skills required during a typical day indoors at school.

Discussion

What emotional and intellectual factors contributed to students' field trip experiences? The 12 aspects gleaned from data analysis were found to share characteristics with play, museum learning theory, and flow. Touching and seeing live animals is playful, educational, and relevant to the person through multiple senses. Engaging in explorations using objects from rocks and minerals to pelts and clay to chocolate chip cookies is likewise instructive, educational, imaginary, and exciting. Students were afforded some degree of choice in their selection of partners, trees, and roles in the simulations and games. Several elements of play introduced during learning activities were among the techniques interpreters used that differentiated field trips activities from traditional classroom instruction. In 1958 Roger Callois produced the classic definition of six characteristics of play founded on the principle that play is not obligatory (2000, p. 9–10). According to Sutton-Smith, play contains qualities of personal experience including intrinsic motivation, fun, relaxation, and escape (1997, p. 7). Interpreters conducted learning activities with the spirit of play, thereby injecting sessions with an element of leisure; although the degree of free choice was considerably less than in a typical museum visit. Packer (2006) identified five propositions related to educational leisure activity; among those that "learning for fun encompasses a mixture of discovery, exploration, mental stimulation, and excitement" (p. 5). Some museums have even gone so far as building their own playgrounds (Chermayeff, Blandford, & Losos, 2001). Falk and Dierking offer a contextual model of learning based on the notion that free-choice learning is driven by emotion and personal motivation to find connection and meaning (2000).

What single element do all 12 aspects have in common? There is evidence that the student aspects can be characterized as producing a state of flow in the students. According to Csikszentmihalyi, "play is the flow experience par excellence" (1975, p. 36–37). The flow model is based upon the distinction between extrinsic reward such as test achievement that may diminish children's desire to learn and intrinsic motivation provided by supportive activities that encourage students to interact (Csikszentmihalyi & Hermanson, 1995, p. 35). When education is viewed as obligatory and extrinsic, it shares qualities with work. The important difference is not between work and play "but between the "flow" experience and the experience of anxiety or boredom" (Csikszentmihalyi, 1975, p. 185). According to findings, interpreters may have successfully transcended this juxtaposition of obligatory education and free play during the field trip sessions.

Conclusion

Examination of students' reasons for choosing particular activities as most enjoyable yielded 12 factors attributed to play (Callois, 2001; Ellis, 1971, 1973; Huizinga, 1950), flow (Csikszentmihalyi, 1975; Csikszentmihalyi & Hermanson, 1995), and intrinsic motivation (Falk & Dierking, 2000; Seidentop, 1983). Interpreters transformed a compulsory public school science field trip into a more intrinsically oriented learning experience through several means. First, they transformed indoor classroom environments into spaces simulating leisure activity by virtue of games, demonstrations, experiments, and hands-on participation. Second, they infused the inherent and prescribed resource of elementary science with relevant student-centered interest by using interpretive communication and instruction techniques to provoke rather than to educate (Braund & Reiss, 2006; Tilden, 1957). Based upon the findings from the interviews, students experienced positive factors in part because a degree of intrinsic motivation was brought into the experience. Elements of play serve as the most direct link to intrinsic factors supporting the notion that emotion is the key to cognition.

> I sincerely believe that for the child, and for the parent seeking to guide him, it is not half so important to *know* as to *feel*. If facts are the seeds that later produce knowledge and wisdom, then the emotions and the impressions of the senses are the fertile soil in which the seeds must grow (Carson, 1956, p. 56).

References

American Forest Foundation (1998). *Project learning tree: Environmental education activity guide* (6th ed.). Washington, DC: American Forest Foundation.

Anderson, D., Kisiel, J., & Storksdieck, M. (2006). Understanding teachers' perspectives on field trips: Discovering common ground in three countries. *Curator, 49, 3,* 365–386.

Bamberger, Y., & Tal, T. (2008). Multiple outcomes of class visits to natural history museums: The students' view. *Journal of Science Education Technology, 17*, 274–284.

Benton, G.M. (2008). Visitor meaning-making at Grand Canyon's Tusayan Museum and Ruin. *Curator, 51,* 3, 297–312.

Bloom, B.S. (Ed.). (1956). *Taxonomy of educational objectives: Handbook I, cognitive domain*. New York: David McKay.

Braund, M. & Reiss, M. (2006). Towards a more authentic science curriculum: The contribution of out-of-school learning. *International Journal of Science Education, 28, 12,* 1373–1388.

Callois, R. (2001). *Men, play and games*. Urbana, IL: University of Illinois Press.

Carson, R. (1956). *The sense of wonder*. New York: Harper Collins.

Chermayeff, J.C., Blandford, R.J., & Losos, C.M. (2001). Working at play: Informal science education on museum playgrounds. *Curator, 44, 1,* 47-60.

Chubb, M. & Chubb, H.R. (1985). *One third of our time? An introduction to recreation behavior and resources*. New York: Macmillan.

Creswell, J.W. 1998. *Qualitative Inquiry And Research Design: Choosing Among Five Traditions*. Thousand Oaks, CA: Sage Publications.

Council for Environmental Education (2000). *Project Wild: K-12 curriculum & activity guide* (Rev. ed.). Houston, TX: Council for Environmental Education.

Csikszentmihalyi, M. (1975). *Beyond boredom and anxiety*. San Francisco: Jossey-Bass.

Csikszentmihalyi, M. & Hermanson, K. (1995). Intrinsic motivation in museums: What makes visitors want to learn? *Museum News, 74*, 34–37, 59–61.

Dewey, J. & Dewey, E. (1915). *Schools of tomorrow;* Chapter 5. New York: E.P. Dutton & Company.

Dohn, N.B. (2011). Situational interest of high school students who visit an aquarium. *Science Education, 95, 2,* 337–357.

Ellis, M.J. (1973). *Why people play*. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Ellis, M.J. (1971). Play and its theories re-examined. *Parks and Recreation*. August, 51–55.

Ernst, J. (2005). Formative evaluation of the Prairie Science Class. *Journal of Interpretation Research, 10, 2*, 9–29.

Falk, J.H., & Dierking, L. D. (1997). School field trips: Assessing their long-term impact. *Curator, 40, 3,* 108–111.

Falk, J.H., & Dierking, L.D. (2000). *Learning from museums: Visitor experiences and the making of meaning*. Walnut Creek, CA: Alta Mira Press.

Falk, J. H., Scott, C., & Dierking, L. (2004). Interactives and visitor learning. *Curator, 47, 2,* 171–198.

Farmer, J., Knapp, D., & Benton, G. M. (2007). An elementary environmental education field trip: Long term effects on ecological/environmental knowledge and attitude development. *Journal of Environmental Education 38, 3,* 33–42.

Fuhrman, N.E. & Ladwig, H. (2008). Characteristics of animals used in zoo interpretation. *Journal of Interpretation Research, 13, 2,* 31–42.

Ham, S. (1992). *Environmental interpretation: A practical guide for people with big ideas and small budgets*. Golden, CO: Fulcrum Publishing.

Hammerman, D.R., Hammerman, W.M., & Hammerman, E.L. (2001). *Teaching in the outdoors* (5th ed.). Danville, IL: Interstate.

Huizinga, J. (1950). *Homo ludens: A study of the play element in culture*. Boston, MA: Beacon Press.

Hurley, M.M. (2006). Field trips as cognitive motivators for high level science learning. *American Biology Teacher, 68, 6,* 62–66.

Knapp, D. (2000). Memorable experiences of a science field trip. *School Science & Mathematics, 100, 2,* 65–73.

Knapp, D. (2007). A longitudinal analysis of an out-of-school science experience. *School Science & Mathematics, 107, 2,* 44–51.

Knapp, D. & Benton, G.M. (2006). Episodic and semantic memories of a residential environmental education program. *Environmental Education Research, 12, 2,* 165–177.

Kohlstedt, S.G. (2010). *Teaching children science: hands-on nature study in North America, 1890–1930*. Chicago: University of Chicago Press.

Louv, R. (2008). *Last child in the woods: Saving our children from nature-deficit disorder.* Chapel Hill, NC: Algonquin Books of Chapel Hill.

Meredith, J.E., Fortner, R.W., & Mullins, G.W. (1997). Model of affective learning for nonformal science education facilities. *Journal of Research in Science Teaching, 34, 8,* 805–818.

Mills, E.A. (1920). *Adventures of a nature guide*. Longs Peak, CO: Temporal Mechanical Press.

Nash, J.B. (1960). *Philosophy of recreation and leisure*. Dubuque, IA: Brown Co. Publishers.

O'Brien, J.P. & Pease, J.L. (2004). The effects of a National Wildlife Refuge's EE Programs on elementary school classes' knowledge and attitudes. *Journal of Interpretation Research, 9, 2,* 27–45.

Orion, N., & Hofstein, A. (1994). Factors that influence learning during a scientific field trip in a natural environment. *Journal of Research in Science Teaching, 31, 10,* 1097–1119.

Packer, J. (2006). Learning for fun: The unique contribution of educational leisure experiences. *Curator, 49, 3,* 329–344.

Pumpian, I., Fisher, D., & Wachowiak, S. (2006). Challenging the classroom standard through museum-based education: School in the park. Mahwah, NJ: Lawrence Erlbaum Associates.

QSR International (2006). *NVivo 7.0: Getting started*. Melbourne, Australia: QSR International.

Rahm, J. (2004). Multiple modes of meaning-making in a science center. *Science Education, 88, 2,* 223–247.

Rennie, L.J., Feher, E., Dierking, L.D., & Falk, J.H. (2003). Toward an agenda for advancing research on science learning in out-of-school settings. *Journal of Research in Science Teaching, 40, 2,* 112–120.

Rennie, L.J., & Johnston, D.J. (2004). The nature of learning and its implications for research on learning from museums. *Science Education, 88,* S1, S4–S16.

Ringness, T.A. (1975). *The affective domain in education*. Boston: Little, Brown & Co.

Rudman, C.L. (1994). A review of the use and implementation of science field trips. *School Science and Mathematics, 94, 3,* 138–141.

Seidentop, D. (1983). *Physical education: Introductory analysis*. Dubuque, IA: Brown Company.

Sharpe, G.W. (Ed.). (1976). *Interpreting the environment*. New York: Wiley.

Silverman, L.H. (1995). Visitor meaning-making in museums for a new age. *Curator: The Museum Journal 38 (3):* 161–170.

Singer, R. N. (Ed.). (1972). *The psychomotor domain; movement behaviors*. Philadelphia: Lea & Febiger.

Sutton-Smith, B. (1997). *The ambiguity of play*. Cambridge, MA: Harvard University Press.

Tilden, F. (2000, 1957). *Interpreting our heritage*. Chapel Hill, NC: University of North Carolina Press.

Webb, R. C. (2000). The nature, role and measurement of affect. *Journal of Interpretation Research, 5, 2,* 15–30.

Yin, R. K. (2003). *Case study research: Design and methods*. (3rd ed.). Thousand Oaks, CA: Sage.

The Understanding and Implementation of Key Best Practices in National Park Service Education Programs

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Abstract
U.S. national parks provide excellent venues for learning experiences in history and the sciences with tangible, primary resources. However, best practices associated with experiential and inquiry-based learning targeted specifically toward students, as opposed to interpretive practices for the general public, must be both well understood and well implemented to be effective. This action research study was undertaken in order to identify where and why gaps in the understanding and implementation of these best practices exist. A survey of 25 NPS educators revealed that they are being implemented approximately half of the time. Significant gaps exist between staff with academic training and/or prior work experience in education and those without this background. Follow-up interviews suggested that changes in the recruitment of new educators and the increased availability of training, networking, and coaching may increase the prevalence of experiential and inquiry based practices. Efforts that leverage education professionals outside the agency, the expertise of more successful park education programs, and the common concepts between education and interpretation may be particularly effective. Other agencies and organizations that conduct both interpretation and education may also benefit from similar actions.

Within the National Park Service (NPS), the functions of interpretation and education often overlap, and their practices are sometimes confounded. The researcher, a former longtime NPS interpreter, undertook this action research study in order to identify where and why gaps in the understanding and implementation of key best practices exist in national park programs and services targeted specifically to students. Since national parks, like many other natural and historical sites, provide excellent venues for learning

experiences in history and the sciences with tangible, primary resources, this study focused solely on best practices associated with experiential and inquiry-based learning.

In order to determine how to frame the survey and interview questions in this study, the literature review identified common areas between the concepts and practices of interpretation and education. Similarities were identified between interpretation's universal concepts and education's essential questions, between tailoring interpretive programs to the interests of visitors and engaging students in inquiry-based learning, and between resource immersion in guided activities and experiential learning. However, key differences also exist between the skills of an interpreter and those of a successful educator focused on experiential and inquiry-based practices. For example, though an interpreter might present public programs that address common interests and understandings about a park site, additional skills are necessary to guide students through a problem-based learning process to answer those questions themselves. The identification of key similarities and differences may prove useful in the ability of the NPS to build upon existing staff expertise in interpretation, as well as and upon existing training and assessment functions such as the Interpretive Development Program. Other organizations with similar interpretive and educational services might also benefit from training built upon such a comparison.

With these interpretive and educational concepts in mind, a quantitative online survey of 25 Park Service educators was undertaken, followed by two qualitative interviews with park educators representing both ends of the spectrum of demographics and expertise. Participants were a stratified random sample of education programs and their employees across the Service. This included a variety of park locations (across regions, and in both urban and rural settings), park sizes, subjects covered (both human and natural history), and the job classifications of staff (from both education and the interpretive park ranger series). Action research by its nature precludes the inclusion of a control group, therefore only a population of NPS educators was studied. However, since the study focused exclusively on practices at national park sites that have crossover with practices in interpretation, this was appropriate. The time and resource constraints of a master's program also precluded travel to national park sites to conduct observations of education programs and verify best practices. However, survey questions were worded and sequenced to limit respondents' ability to discern "right" answers, even if their understanding and practices were not at a proficient level.

Overall, inquiry-based and experiential practices were found to be implemented approximately half of the time at the 25 national park sites surveyed. Fifty-six percent of respondents reported that students spend "most of their time" exploring open-ended questions versus finding answers to specific questions, while 32% said that students spend most of their time answering questions they chose or generated themselves as opposed to those generated by educators. Teaching time spent focused mainly on students (such as in discussion or group work) as opposed to on the ranger or teacher (such as time spent lecturing or explaining) was also reported as a narrow majority at 62%. Experiential learning practices are conducted somewhat less frequently, with only 32% of educators surveyed reporting "students have lots of direct interaction with park resources (e.g. students conduct research on, or collect data about, park resources)." Students have "some" interaction with park resources, such as going on a guided walk with a ranger or teacher, or examining artifacts or data in the classroom, 60% of the time. Finally, NPS educators report that "park resource specialists (e.g. historians or

resource managers) [are] involved in developing curriculum, interacting directly with students, and/or using data that students collect" only 28% of the time, a practice that corresponds with both inquiry-based and experiential learning.

In both the understanding and implementation of experiential and inquiry-based practices, a split emerged between staff with formal education (such as a teaching certificate or undergraduate or graduate study in education) and/or prior work experience in education (such as teaching or managing a curriculum-based education program), and those without this background. The best practices studied were also found to be more prevalent at parks with more FTE devoted to education. In addition, access to training and networking was also found to be a key factor affecting both understanding and implementation. However, training is either not available, or available training is not being attended, by a significant population of NPS education program leaders, with only 20% of respondents reporting that they have received a "significant amount of training." Though the majority of those surveyed have worked in NPS education for more than five years, time on the job does not seem to increase the chance of exposure to the key concepts of this study through agency-sponsored training. Though the NPS-sponsored training that is available is closing some of the gap in the understanding of best practices for employees that had no prior academic background or work experience in education, no statistically significant difference was found between those that received training and those that did not on the implementation of all five best practice questions (open-ended questions, student-generated questions, focus on students, interaction with resources, and involvement of resource specialists). One follow-up interview and several write-in survey responses suggested that, given the lack of widely available NPS-sponsored training and the lack of relationship between that training and the implementation of best practices, seeking training and networking outside the Park Service with other professionals and organizations is a more appropriate and effective way to maintain a high-quality practice.

In addition to the prior backgrounds of NPS educators (in formal education and work experience) and the quantity and quality of training received, other factors identified in interviews that appear to be inhibiting the implementation of best practices included the time interpretive staff have to devote to education programs as a collateral duty, and the ability of such staff to differentiate between the best practices of interpretation and those of education. The existence of education as a separate park program from interpretation was identified as one important factor in overcoming both problems. Finally, the available financial and staffing resources at a park site, the support of management, the quality of relationships with other divisions, and the availability of partnerships were all identified as key administrative factors determining the success of an education program in implementing experiential and inquiry based practices. When administrative challenges are added to existing deficits in staff expertise and training, then, small education programs located in small parks may experience definitive barriers to success.

This action research study, though limited in scope, revealed that changes in the recruitment of new NPS educators with formal training and experience in curriculum based education, and the increased availability of training, networking, and follow-up coaching could have an impact on both the understanding and implementation of best practices in experiential and inquiry-based learning. Internal changes that leverage the resources of education professionals outside the Park Service, the expertise of more

successful programs at larger parks, and the common concepts between education and interpretation, may also prove effective. Making staff time, financial resources, and management support available for education programs versus interpretation, especially at smaller park units, could also help promote more meaningful student experiences in terms of the practices studied. Other agencies and organizations with primary natural and historical resources that conduct similar interpretive and educational functions may also benefit from similar actions.

IN MY OPINION

Preparing to Be an Interpretive Naturalist: Opinions from the Field

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interpretive naturalist, preparation, communications skills, natural history, coursework

Abstract
This study documented the varying importance and availability of content and communication skills and certifications for entry-level interpretive naturalists, based on the perceptions of experienced interpreters. A web-based survey was sent to (n=867) interpreters. Responses were received from 308 interpreters. The five most important content skills were field ecology, field ornithology, conservation biology, field botany, and field mammalogy. The five most important communication skills were improvisational skills, understanding how children of different ages learn, ability to read an audience, good voice, and ability to write lesson plans/program outlines. Desired content skills were readily available in applicant pools for entry-level positions, but less so for communication skills. Results suggested general support for the National Association for Interpretation Certified Interpretive Guide and the National Park Service Interpretive Development Program. College professors advising students and persons wishing to enter the field of nature interpretation should make sure they develop the highly ranked skills, plus other less highly ranked skills that will help distinguish them from other applicants.

Preparing to Be an Interpretive Naturalist: Opinions from the Field

Freeman Tilden coined the term "interpretation" in his 1957 book *Interpreting Our Heritage*. He defined interpretation as being "an educational activity which aims to reveal meanings and relationships through the use of original objects, by firsthand experience, and by illustrative media, rather than simply to communicate factual information" (p. 8). In addition to Tilden's definition and six principles of interpretation elaborated on in his book, specific skills may help increase the effectiveness of an interpretive naturalist. In order to captivate adults and children during programs, interpreters must master content and communication skills. Content skills are reflected in the knowledge an interpreter has about natural, cultural, and/or historical topics (Beck & Cable, 2002; Ward & Wilkinson, 2006). These skills are obtained through much time spent in the field observing nature, with formal educational often providing a foundation. Likewise, communication skills are the methods interpreters use in presenting their programs. These skills include experience in public speaking, graphic arts, writing for the web and newsletters, exhibit production, interpretive talks, theater, music, and art. Many of these skills can take years of study and practice to master. Researchers who have examined many types of professions are converging on a figure of 10,000 hours of practice to achieve expert-level performance (Ericcson & Smith, 1991; Levine, 2007). Given the range of skills and the amount of practice needed to develop professional-level skills, getting a focused start into professional practice is beneficial to both young interpreters and the people, parks, and public lands they serve.

People interested in a career as an interpretive naturalist often seek guidance from agency personnel, college professors, trainers, and others on how to prepare for entry-level positions. There are myriad pathways into the profession and a variety of organizations and sites with different challenges and opportunities, from exotic national parks to local nature centers.

Just like any other profession, there will be some gaps between the skills employers require and the skills the applicants for interpretive positions have mastered (Feuer, 1987). Ideally, job applicants should have the minimum skills and experience required by the desired position. Few studies have attempted to determine the skills sets needed for entry-level interpretive naturalist positions. In 1969, a group of interpreters called the Association of Interpretive Naturalists Task Force put together a list of competencies they felt interpretive naturalists needed. These competencies were grouped into the following four categories:

1. Knowledge and understanding of the natural environment
2. Knowledge and understanding of the effective use of communicative skills
3. Knowledge and understandings related to people
4. Knowledge and understandings related to program planning and administration

Mahaffey (1972) developed a curriculum for a bachelor's degree in environmental interpretation. This curriculum consisted mostly of courses that were regularly available in colleges and universities as opposed to courses designed specifically for interpretive naturalists.

In 1974, Oltremari conducted a study describing the career development of interpretive personnel. The study described the socio-demographic profile, college

education, type of in-service training acquired, and work experience and career development of interpreters. The study population included interpretive employees of the National Parks Service Pacific Northwest Region and interpreters with the U.S. Forest Service. However, in this study specific interpretive skills in content or communication were not addressed. Given the datedness and dearth of research and evaluation on professional development of interpretive naturalists, this study seeks relative ratings of the importance of skills and certifications associated with becoming an interpretive naturalist as perceived by professional interpreters who hire them.

Methods

The study used a structured questionnaire designed by the researchers with assistance from an expert panel (Presser & Blair, 1994) composed of seven interpreters working in federal, state, regional, and not-for-profit sites. The questions consisted of lists of content and communication skills associated with the practice of an interpretive naturalist. Content skills involve knowledge of the natural, cultural and physical environment. Communication skills aid in the design and delivery of interesting and effective messages. Additionally, a section of the questionnaire measured the importance of certifications.

Initial lists of skills were drawn up by the researchers and then critiqued and modified by an expert panel. Two scales, one for content areas the other for communications skills used a rating scale from 1 to 5, where 1=slightly important and 5=extremely important. A second pair of scales with identical items measured the availability of skills in recent pools of applicants and used a scale for 1 to 5 where 1=almost never available to 5=always available. Only respondents who had participated in hiring of interpreters in the last five years completed ratings of the availability of skills scale. Measures of the usefulness of different certifications used a rating scale from 1=not useful to 5=extremely useful. Additional questions requested demographics and details about the agency where each respondent worked.

The study sample consisted of the members list for the Interpretive Naturalist Section of the National Association for Interpretation (NAI). Members of this sub group of NAI have self-identified as being involved with interpreting nature. An additional convenience sample of interpreters working in federal, national, regional, special, and local parks and nature centers, who were not members of NAI were contacted. Potential respondents (N=867) received an email pre-notice that they should be expecting a survey on professional development of interpreters. The pre-notice was followed by an email explaining the study and directing potential respondents to a web-based questionnaire (Dillman, 2007). After two additional reminders, 308 completed questionnaires were received.

The respondents to this study were 28.5% male and 71.5% female compared to gender percentages of 34% male and 66% female for members of NAI (J. King, personal communication, June 15, 2007). The majority of respondents were between the ages of 30 and 59. State park employees were the most prevalent (37.6%) followed by those who work at local parks (18.6%) not-for-profits (11.8%), and federal agencies (11.1%). The majority of respondents had completed at least a four-year bachelor's degree (44.4%) with 30.6% having a master's degree. When asked to write out their occupation title, 27.3% of respondents indicated that they were "Naturalist" followed by "Interpreter" (17.5%) and "Administrator" (15.9%).

Table 1
Ranked mean importance of content skills and availability in applicant pools

Ranking of Content Skills by Importance	Mean Importance Rating[1](N=288)	Mean Skill Availability Rating[2](N=121)
1. Field Ecology	4.24	3.19
2. Field Ornithology	4.19	2.98
3. Conservation Biology	4.16	3.12
4. Field Botany	4.11	3.16
5. Field Mammalogy	3.93	3.01
6. Field Herpetology	3.72	2.49
7. History	3.53	2.58
8.5 Field Entomology	3.42	2.29
8.5 Forestry	3.42	2.49
10. Field Dendrology	3.37	2.37
11. Field Geology (Rocks and minerals)	3.23	2.18
12. Field Ichthyology	3.05	2.13
13. Folklore	2.91	2.01
14. Field limnology	2.87	1.93
15. Field Geology (fossils)	2.82	1.99
16. Field Mycology	2.58	1.48
17. Astronomy	2.52	1.76
18. Native American skills	2.40	1.73
19. European Settlers homestead and craft skills	2.33	1.89
20. Meteorology	2.29	1.50
21.5 Anthropology	2.21	1.68
21.5 Archaeology	2.21	1.66
23. Field Marine Biology[3]	2.19	1.75
24. Field Oceanography[3]	1.98	1.48

[1] Based on a scale from 1 to 5 where 1=slightly important and 5=extremely important.

[2] Based on a scale from 1 to 5 where 1=almost never available to 5=always available.

[3] Segmentation analysis identified a subgroup of interpreters working on the coast who were distinguished by higher mean importance for marine biology (3.36) and field oceanography (3.01).

Table 2
Ranked mean importance of communication skills and availability in applicant pools

Communication skill	Mean Importance Rating[1](N=288)	Mean Skill Availability Rating[2](N=121)
1. Improvisational skills (fast on feet)	4.57	2.91
2. Understanding how children of different ages learn	4.54	2.69
3. Ability to read the audience	4.52	2.93
4. Good voice (ability to project, inflection)	4.45	3.25
5.5 Ability to write lesson plans/program outlines	3.92	2.65
5.5 Understanding disabilities	3.92	2.30
7. Visual communication	3.91	2.43
8. Understanding of ethnic and racial groups	3.88	2.31
9. Interpretive writing	3.81	2.18
10. Conflict resolution skills	3.79	2.25
11. Interpretive planning	3.65	2.05
12. Knowledge of state curriculum standards	3.55	2.12
13. Audio-visual equipment operation	3.39	2.85
14. Storytelling	3.34	2.21
15. Understanding international visitors	3.15	1.81
16. Marketing	3.06	1.79
17. Outdoor skills (canoeing, camping, etc.)	3.05	3.18
18. Graphical communication	2.92	1.92
19. Supervisory skills	2.82	1.94
20.5 Animal handling/husbandry	2.69	2.33
20.5 Photography	2.69	2.69
22. Exhibit construction	2.67	1.65
23. Digital photo editing	2.49	2.34
24. Mechanical skills	2.48	2.10
25. Foreign language	2.36	1.81
26. Interpretive theater	2.35	1.49
27. Art (drawing,painting, etc.)	2.21	2.21
28. Web page design	2.08	1.95
29. Costuming	2.04	1.52
30. Music (performance)	1.98	1.81
31. Woodworking skills	1.91	1.56
32. Video editing	1.80	1.48
33. Music/audio editing	1.64	1.41

[1] Based on a scale from 1 to 5 where 1=slightly important and 5=extremely important.

[2] Based on a scale from 1 to 5 where 1=almost never available to 5=always available.

Results

Results for importance of content skills are presented in Table I. Nine of the 10 top-ranked skills deal with ecological or organismic biology. Other natural history skills such as geology, astronomy, and human culture appear in the middle third of the rankings. The importance ranking of content skills was similar in order to the ranking of the availability of these skills in application pools.

Ranked results for the importance of communication skills are presented in Table 2. Half of the top 10-ranked skills address being responsive to the diversity within and between audiences for programs led by interpretive naturalists. These items are mixed in with skills associated with generic professional communication such as voice, writing, and use of visuals.

As a field with a myriad of paths into the profession, there are several certification programs available for entry-level professionals. Respondents were asked to rate the usefulness to entry-level employees of these certifications. Not surprisingly, certifications in First Aid, typically required by employers, were top ranked. Although some respondents supplied open-ended statements critical of certifications, the National Association for Interpretation's Certified Interpretive Guide was ranked third. The National Parks Interpretive Development Program was ranked sixth, but when the mean calculation was made with only federal employees its mean was 3.04/5 (n=34) instead of 2.76/5.

Table 3
Mean Usefulness of Certifications for Entry-Level Interpretive Naturalists

Certification	Mean Usefulness (N=273)
1. First Aid	4.08
2. CPR	4.05
3. NAI Certified Interpretive Guide	3.66
4. Master Naturalist or similar	3.28
5. NAI Certified Heritage Interpreter	2.80
6. Interpretive Development Program (NPS)[2]	2.76
7. Wilderness First Responder or similar	2.70
8. NAI Certified Interpretive Host	2.68
9. NAI Certified Interpretive Trainer	2.49
10. NAI Certified Interpretive Planner	2.45
11. First Responder	2.42
12. ACA (American Canoe Association)	2.10
13. EMT	2.09
14. Life guard	1.52
15. Black Powder Certification	1.31
16. SCUBA	1.29

[1] Based on a scale from 1 to 5 where 1=not useful and 5=extremely useful.

[2] This training series is specific to the National Park Service although some training modules are available to others through the Web . When non-federal employees are removed from the calculations, its mean increased to 3.04/5.

Discussion

First, the results provide lists of skills that at least one person on an expert panel or the researchers perceived as being useful skills for an interpretive naturalist. For students in college or universities, the results provide suggestions for desirable types of course work. Likewise, persons interested in making themselves competitive for positions should pay attention to the skill sets and rankings. Rankings of the importance of content skills and

availability of those same skills in pools of applicants tended to be similar. This suggests that the top-ranked skills sets are important to have to even be competitive. Given that these skill sets were also readily available in application pools, having additional skills that were lower ranked may be what distinguishes the successful job applicant. Because means are not always meaningful with data that are non-normally distributed, segmentation (cluster) analysis was used to search for subgroups. One subgroup was found in the content importance data. The lowest-ranked marine biology and oceanography content areas in Table 1 were more highly rated by interpreters, we suppose, who worked in coastal areas.

While colleges may use these data in advising students, the study did not specifically address university course work, only skills. There are many resource professionals who are competent ornithologists, mycologists, and herpetologists who never took a formal university course. Their competence is a function of much field work, use of written resources, and interactions with peers with similar interests (James, Bixler, & Vadala, 2010). But, formal classes with a field component, can provide an efficient and systematic understanding of natural history content areas.

The results of the ranking of communication skills provide challenges for textbook authors, college professors, and interpretive managers and trainers. While the second rank skill, child development, can be formally taught referencing theoretical and applied literatures in psychology, education, and marketing, the other two top-ranked and interrelated items have not received as much attention.

This study is an example of one of several types of studies that should be conducted at regular intervals that, in combination, can help inform and update our understanding of how to provide adequate education, training, and socialization to persons seeking entry-level work as interpreters. While structured surveys provide insights, the structure itself limits some types of understanding and may even reify issues of little or no importance to the field (Bishop, 2005). For instance, we doubt that in any job interview situation, all the skill sets listed in the questionnaire are formally assessed of all applicants. Other research could be done with open-ended questioning with opinion leaders in the field. Likewise, these retrospective methods, should be complemented by groups of interpreters doing futuristic thinking about desirable skill sets. Lastly, since professional development is an ongoing process, interpreters a year or two into their work should be sought out and ask to reflect on their preparation, and identify in what areas they want additional training.

This study provides a snapshot of the relative importance of skills needed for applicants for entry-level interpretive naturalist positions to be taken seriously as a job applicant. As addressed in the literature review, research suggests that people achieving expert status in many fields often have spent 10,000 hours developing their skills. To the extent that this study helps students and entry-level interpreters begin or continue accumulating training and informal experiences responsive to the needs of the profession, then it has served its purpose.

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References

Association of Interpretive Naturalists Task Force. (1969). The preparation of interpretive naturalists. *Environmental Education, 1(2),* 33-34.

Beck. L. & Cable T.T. (2002). *Interpretation for the 21st century: Fifteen guiding principles for interpreting nature and culture*, Champagne IL: Sagamore

Bishop, (2005). *The illusion of public opinion*. Lanham MD: Rowman & Littlefield.

Dillman, D.A. (2007). *Mail and internet surveys*. Hoboken, NJ: John Wiley & Sons, Inc.

Ericcson, K.A. & Smith, J. (1991). *Toward a general theory of expertise*. New York: Cambridge University Press.

Feuer, D. (1987). The skill gap: America's crisis of competence. *Training: The Magazine of Human Resources Development, 24(12),* 27-35.

James, J.J., Bixler, R.D. & Vadala, C.E. (2010). From play to recreation then vocation: A developmental model of natural history-oriented professionals. *Children, Youth, & Environment, 20(1)* 231-256.

Johnson, W.C. (1989). The identification of desirable knowledge and skills in outdoor leaders of outdoor pursuits, resident camping, and outdoor education and environmental interpretation programs in the United State (unpublished Doctoral Dissertation) University of Oregon, Oregon.

J. King, personal communication, June 15, 2007.

Levine, D.J. (2007). *This is your brain on music: The science of a human obsession*. New York: Plume.

Mahaffey, B.D. (1972). A study of professional recommendations for curricular guidelines of environmental interpreters (unpublished Doctoral Dissertation). Texas A&M University, College Station TX.

Oltremari, J.V. (1974). A survey on desirable preparation and career development of interpretive personnel (unpublished Doctoral Dissertation). University of Washington, Seattle.

Presser, S., & Blair, J. (1994). Survey pre-testing: Do different methods produce different results? *Sociological Methodology, 24,* 73-104.

Tilden, F. (1957). *Interpreting our heritage*. Chapel Hill: University of North Carolina Press.

Ward, C.W. & Wilkinson, A. (2006). *Conducting meaningful interpretation: A field guide for success*, Fulcrum Press.

Conversations: Tilden's Fifth Principle

In our field, "interpretation" is everything, so it should be no surprise that we often "interpret" guiding principles differently. The following will begin a series of articles in the In My Opinion section of the Journal titled "Conversations."

—Carolyn Ward, Editor

"What did Tilden mean in his fifth principle about "presenting a whole"?

—Pam Scaggs, Lead Domestic Interpreter
Barrington Living History Farm

Response by Sam Ham

You've asked a great question. What did Tilden mean in his fifth principle about "presenting a whole"? I don't claim to have any definitive answers, but I do have an opinion that I hope is somewhere in the ballpark of reason.

You know, interpreting Tilden himself has been not only a task (since I taught interpretation courses for decades) but also a scholarly avocation. Despite the inevitable impossibility of 100% success, I've tried over 30 years to try to put myself between his ears in order to (try to) understand what he was thinking, and therefore, what he probably *meant* when he wrote *Interpreting Our Heritage*.

I say "probably meant" because all we can do is rely on the whole of his writings (including not only *Interpreting Our Heritage*, but the *Fifth Essence* and the many other publications he produced). So that's what I've tried to do over the years. But I am fully aware that I (like anybody) could be just plain wrong since I never had the pleasure of asking him directly.

This is different from simply reading Tilden's words in 2013 context and subjectively deciding for ourselves what he "meant." Rather I think what we have to do to get closest to the "truth" about Tilden's views is to look for consistencies in the full body of his writings about interpretation, and not just read the words in his passages and attempt some sort of current-day literal interpretation of them. Obviously, this is much easier said than done!

So anyway...with this long-winded preface, let me just say at the outset that it seems to me that a lot of us probably haven't read Tilden's works with sufficient critical thought

to offer more than a literal interpretation of what he might have meant. Indeed, I think some key parts of his genius have possibly been lost in misunderstanding, and it's people like you who stand the greatest chance of regaining some of what interpreters in the 1950s and 1960s might have understood with more precision.

Of all six of Tilden's principles, the one that I think is most misunderstood (meaning, the one that most current day interpreters tend to ignore or misinterpret) is the one you've asked about—his fifth principle. But I also think there might be widespread misunderstanding of his definition of interpretation, itself. So even though you didn't ask about the definition, I want to comment on it briefly because how we interpret Tilden's fifth principle depends in part on our understanding of what he meant when he defined interpretation, itself.

Tilden's Definition of Interpretation

According to what I take from Tilden's works, the biggest and most obvious error many current-day readers make when explaining this definition is that they think Tilden was saying that it's the interpreter who does the revealing of meanings and relationships. I believe this is not only untrue, I think the full record shows that it's exactly the opposite of what Tilden meant.

If you read Chapter 5 carefully ("Not Instruction but Provocation"), and then and only then, go back and read his definition of interpretation, I think you have to conclude that he couldn't possibly have been talking about "interpreters" revealing anything. Indeed, Chapter 5 makes so clear that Tilden was a constructivist. He believed that the "meanings and relationships" he referred to in his definition didn't get "put" there by some interpreter. Rather he believed they were the result of the visitor's own thinking (provocation that a skilled interpreter caused to happen). In Chapter 5 he's saying that if instead of trying to instruct visitors in her/his own "facts," the interpreter instead focused her/his work on provoking visitors to do their own thinking, then personal "meanings and relationships" would naturally result from the thinking—that is, the meanings and relationships would be "revealed' in the visitor's own mind. From these meanings and relationships, of course, would spring the visitor's subjective (personal) understanding of the thing, place, or concept being interpreted. It was this personal subjective understanding that Tilden referred to on page 38 when he offered the famous quotation from the anonymous ranger:

> Through interpretation, *understanding*; through *understanding*, appreciation; through appreciation, protection.

If you were to do as I suggested (read Chapter 5 first, and then go back and read the definition he finally and reluctantly offers on page 8), I think you too will conclude that what he was trying to say in defining interpretation was that the thing (the "function") called "interpretation" should be "aimed" at the "result" of meanings and relationships being "revealed" in the visitor's mind. But he doesn't say anywhere in the book that it's the interpreter who provides—or who decides—what the meanings and relationships should be. I think it's pretty clear in Chapter 5 that what he must have meant is that the meanings and relationships are the result of the visitor's own thinking, and that the interpreter's job is to provoke the visitor to think, and to discover for her/himself what Tilden called "greater truths." This is almost exactly what he wrote on page 33:

> In the field of Interpretation…the activity is not instruction so much as what we may call provocation…the purpose of interpretation is to stimulate the reader or hearer… to gain an *understanding of the greater truths* that lie behind any statements of fact.

And three pages later he adds (p. 36):

> Thus, in so many cases…the provocation to the visitor to search out meanings for himself…was sometimes submerged in a high tide of facts, perfectly accurate, perfectly ineffectual.

I hope you're able to follow this thinking, since it's difficult to outline succinctly in an email. But assuming you're with me, let's now go back to your great question about what Tilden meant in his fifth principle:

> Interpretation should aim to present a whole rather than a part, and must address itself to the whole man [sic] rather than any phase.

Note that his presentation of this principle in Chapter 6 immediately follows his principle about "provocation, not instruction." I think this is because he saw the two as interrelated. In reading Chapter 6, I've often gone back to earlier parts of the book in search for consistency of meaning. Nowhere is there a more consistent presaging of his fifth principle than this passage way back on page 7. In it Tilden relates a story about a day he spent at 7,000-feet elevation in the Jimez Mountains of New Mexico. His story is about how he'd been shown a lot of different kinds of petrified marine shells at that elevation. He says the discovery of the shells didn't surprise him at all, but that it:

> …did make me wonder what the prehistoric Americans who must have seen such shells had thought about them. I knew that I was standing somewhere near the shoreline of a shallow sea that occupied this spot at a time before the land had been slowly upraised. How did I know this? The story had been interpreted for me; seemingly unrelated facts had been reasoned into a whole picture….

The "whole" Tilden refers to is his recognition (i.e., the "meaning" he extracted, the "relationship" that was revealed to him) is that…

> The ground I'm standing on was at sea level in ancient times; and it has risen over a mile and a half since prehistoric Americans looked at these very same shellfish with their own eyes.

Although Tilden or someone else might phrase the connection he made with different words, I'm sure you can see that the "whole" he referred to was, in fact, what we today would call a "theme"—a whole idea that answers the question "so what?"—a moral to the story a visitor extracts even when the subordinate details (all those fascinating smaller factoids) are forgotten.

Jump ahead now to Chapter 6 ("Toward a Perfect Whole") where he offers his fifth principle about the "whole." From my reading of this principle, Tilden gets very close to saying that interpretation ought to be thematic. In fact, he might as well have been

saying that interpretation should always attempt to develop strongly relevant themes for visitors (i.e., from principle #1, a theme that "touches something within the personality or experience of the visitor"). If you read Chapter 6 closely, you'll see that Tilden is recognizing that there are small facts and bigger ones. He's equated a "whole" to big important ones. And elsewhere in the chapter he gives examples about the relationship between small and fascinating factoids and the big and more visceral morals of the story a visitor might extract from an interpretive encounter. What he means by a "whole" is what current-day interpreters would recognize as a "theme."

And you'll find a similar explanation on page 41:

> It is exactly when…the interpretation tends to deal with a collection of discrete facts that both the audience and the interpreter himself become bored and listless. We all view with horror the possibility of what we call a stereotyped performance. [But] such a cliché is almost impossible when the interpreter has, either by intuition or by plan, managed to convey a dramatic whole.

I believe Tilden is again referring to what happens when interpretation leads a person to extract an overall moral of the story or overarching conclusion or impression from the assemblage of factoids presented. He's saying that when all the little bits come together to form an important "whole" (whether by plan or accident), interpretation presents a whole and addresses the whole person.

And a paragraph later he summarizes his fifth principle this way:

> …and the principle is this: It is far better that the visitor to a preserved area, natural, historic or prehistoric, should leave with one or more whole pictures in his mind, than with the melange of information that leaves him in doubt as to the essence of the place, and even in doubt as to why the area has been preserved at all.

So if you ask me what Tilden means in his fifth principle (which, of course, you have, my opinion (and yes, I could be wrong) is that he's saying in 1950's vernacular that interpreters ought to select and develop the small discrete factoids with an eye toward a whole idea that matters to the audience. This is tantamount to saying that good interpretation is driven by a strongly relevant theme. And when interpretation has this quality, visitors (or audiences) will be provoked to think for themselves and to take away their own whole ideas. We can call these whole ideas various things—personal "morals of the story;" what Tilden calls in this chapter "indelible impressions," or "meanings and relationships" (from Tilden's definition). I call them "personal themes" in my new book. But regardless of the semantics we use, each of these outcomes contributes to an individual's subjective personal understanding of why the place or thing being interpreted is even important. This is what I think Tilden was saying. Thanks for asking!

Dare I end with:

> Through interpretation, understanding; through understanding, appreciation; through appreciation, protection.

That's my take on it anyway.

Sam H. Ham is Professor Emeritus at the University Idaho. He is the author of *Environmental Interpretation* and a new book published in 2013, *Interpretation: Making a Difference on Purpose*.

Response by James Carter

I'm with Sam in thinking that a lot of what Tilden was driving at with this principle was the importance of planning interpretation around what we'd call a clear theme. All the examples he gives of "presenting a whole" are based on anecdotes about how facts are only useful in so far as they help to illustrate or reveal an idea, a concept that is for him of deeper significance than any one fact or group of facts.

This is a common thread throughout the book. In chapter 4, "The Story's the Thing," he concentrates on the need to use language and other communication tools creatively. He also says the interpreter must understand "that form is the essence, and that pedagogical miscellany is a bore to the man on holiday." "Pedagogical miscellany" is what I'd describe as "telling people a lot of disconnected stuff in the hope that they'll learn something." A wonderful turn of phrase: I must remember to work it into a training session sometime! Chapter 3, "Raw Material and Its Product," looks at the relationship between information and interpretation, and closes with "…true Interpretation deals not with parts, but with a historical—and I would say spiritual—whole."

Tilden's use of the word "spiritual" is interesting here, and I think points towards another aspect of what he meant by "a whole." I've always been struck, and inspired, by Tilden's sense of spiritual mission in interpretation: my favourite definition of interpretation is not the one Tilden gives as "an educational activity," but his description of it in the fourth paragraph of the book as "…the work of revealing, to such visitors as desire the service, something of the beauty and wonder, the inspiration and spiritual meaning that lie behind what the visitor can with his senses perceive." I like this because it's so passionate, and it seems to me to say that interpretation is about sharing enthusiasm and love for whatever you're interpreting. It also suggests that the meanings visitors take away are their own.

But the idea of interpretation as mission is sensitive territory. It could so easily become messianic, absolutist—interpreters as priests at the altar of heritage orthodoxy. That's fine if we're all comfortable with the particular orthodoxy being peddled: "we should work together to save the planet," perhaps. But there are plenty of other big ideas out there that could be supported by a selection of facts. The history—and the present—of totalitarian politics are littered with people telling stories in ways that suit their agenda. I like to think that another aspect of what Tilden meant by "presenting a whole" was that interpretation should encourage its audience to recognize the connections between us all, and between us and our environment. The stories we choose should be ones that lead to harmony rather than strife, even if they need to acknowledge injustices and tragedy along the way.

I confess that last bit is going off on one somewhat; it's not directly supported by Tilden in so many words.

The other aspect of the "presenting a whole" chapter that I've been thinking about is the "address the whole man rather than any phase" bit. I don't think this as clear-cut as his emphasis on ideas rather than facts, but I think Tilden is appealing for what my

colleague Aaron Lawton calls "a generous approach" to visitors' experiences. Tilden describes how visitors might sometimes want simply to "lie under a tree and look up through the green into blue"—in other words, just to be there. If we offer stories and ideas, no matter how interesting, at every opportunity we are doing the visitor a disservice. Good interpretation needs to allow space for simple experience, and it's interesting that in the United Kingdom an increasing number of organizations are planning interpretation as part of "visitor experience plans." In this context, I was heartened to find Tilden saying you should make your target "…a whole man who seeks new experience, relaxation, adventure, imitation of friends who have told him 'you mustn't miss it,' curiosity, information, affirmation, and one-thousand odd other motives …." Notice how experience is first, and information well down the list of priorities!

Lastly, I can't resist a little bit of mischief. The poet T.S. Eliot was once asked what he meant by the opening lines of his piece "Ash Wednesday":

> Lady, three white leopards sat under a juniper-tree
> In the cool of the day, having fed to satiety
> On my legs my heart my liver and that which had been contained
> In the hollow round of my skull.

He replied, "I mean:

> Lady, three white leopards sat under a juniper-tree
> In the cool of the day, having fed to satiety
> On my legs my heart my liver and that which had been contained
> In the hollow round of my skull."

I think that's an invitation to take the words and make from them meanings that work for you. Trying to define and insist on absolute meaning in any text—or any piece of heritage, come to that—is what leads to fundamentalism, and its brutal inhumanity in whatever creed. So what did Tilden mean when he wrote, "Interpretation should aim to present a whole rather than a part, and must address itself to the whole man rather than any phase"? He meant, "Interpretation should aim to present a whole rather than part, and must address itself to the whole man rather than any phase.'

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Response by Larry Beck and Ted Cable

What did Freeman Tilden mean when he wrote his fifth principle about interpretation presenting a whole rather than a part, and addressing itself to the whole person? Like Sam Ham, we have struggled over 30 years trying to understand what Tilden was saying and how his wisdom, and that of Enos Mills as well, can be applied in the 21st century.

As we have detailed in what is now *The Gifts of Interpretation*, much of Tilden's work is timeless. Yet some elements of his philosophy can benefit from a current translation. This is most obvious in his discussion of "gadgetry," which, of course, contains no mention of today's advancing technologies, their applications in interpretive venues, and

the challenges they are posing to firsthand experiences. But, again, the root philosophy of what Tilden offered tends to ring true and it is our challenge to decipher his meanings in today's context.

In addressing a "whole" we believe that Tilden was actually referring to three different things: a whole message, a whole person, and a whole place. We will discuss each of these separately, although all are intertwined.

A Whole Message

In presenting a whole message Tilden is not suggesting that nothing should be left out. If an attempt were made to tell everything known about a topic we would find ourselves, and our visitors, lost in an infinite web of information. Therefore, interpreters must be selective in order to present a manageable and focused whole. The key to this focus, as Sam Ham pointed out, lies in theme-based interpretation. So in the context of this principle, a theme embraces a "whole" message.

Thematic interpretation eliminates the tendency to present a collection of unrelated facts. According to Tilden, at any given site, "there are thousands of interesting facts that can be told." And he continues by asking, of all such possibilities, what might stir the imagination and passions of the visitor? What makes up the "big picture" that ignites visitors' minds and spirits? It is this "big picture" or "whole" that people will remember, not a series of unrelated facts.

A Whole Person

To be most effective in addressing a whole person, interpreters must know their audiences. This is reinforcement of Tilden's first principle in which he states we must relate to the visitor's chief interest: "whatever touches his personality, his experiences, and his ideals." Tilden elaborates on his fifth principle and notes that the interpreter "whether in wilderness places or in historic houses or in the museum, must always make his appeal to the whole man that the visitor represents."

We have written elsewhere that application of addressing a whole person can be facilitated by focusing on the various needs of the visitor. Abraham Maslow suggested that this begins with addressing physiological needs. This explains why the first questions many visitors ask have to do with finding the nearest soda machine or restroom. After this, visitors may have needs associated with safety, belonging, and esteem. At the highest level, visitors seek self-actualization. And this, too, is within the realm of the interpreter's craft.

Tilden alludes to this level of impact on the visitor as follows: "He may be there for the explicit hope that you will reveal to him why he is there." It isn't exactly what the interpreter does, of course, but rather the visitor's response to the interpreter who creates an atmosphere in which inspiration and deep meaning may occur. This can be accomplished by presenting a whole message and by addressing the whole person.

One other dimension of addressing the whole person is to engage as many of the visitor's senses as possible. Touching, seeing, smelling, tasting, and listening all work together to communicate a whole. This approach can be accomplished creatively in both natural and cultural settings, and demands only the imagination of the dedicated interpreter.

A Whole Place

Tilden also refers to the "essence of the place" and "why the area has been preserved at all." At historic sites, to present a whole, it might be necessary to give an overview of an entire trail, such as the Oregon Trail of westward expansion. At natural history sites, to present a whole place may require going beyond park boundaries that were set using economic or political criteria rather than ecological or historical criteria.

On a larger scale, still, interpretive sites may involve migratory species, international trade in plants and animals, and issues dealing with the earth's atmosphere. Many global environmental concerns permeate various aspects of the local interpretive site. Consequently, interpreters should strive to weave pertinent information that reflects a "whole" place.

The dictionary offers the words healed and restored as synonyms of whole. Interpretation should focus on presenting a whole message through a thematic approach. Interpretation toward a whole also seeks to encompass the whole person. Finally, interpretation should encompass the whole place, both in its immediate and larger context. As Tilden concluded, "Of all the words in our English language, none is more beautiful and significant than the word 'whole.'"

Authors' Note: Some of the content of this discussion is derived from a chapter titled "The Gift of Wholeness" in The Gifts of Interpretation: Fifteen Guiding Principles for Interpreting Nature and Culture *(2011).*

Editor's Note

As professionals dedicated to the field of interpretation, we gather when we can, at conferences, meetings, and across coffee tables. For many of us, those times of conversation serve to reignite our flame, feed our creative spirit, and refresh our passion for the field. The reality, however, is that many of us are unable to make those linkages and have those conversations as much as we would like and as much as we need. This new section of the "In My Opinion" submissions of the *Journal* may help serve to keep the conversations alive in between those times of personal reconnection. If you are interested in participating, submit your questions to me at cward@brpfoundation.org to be considered for future "Conversations."

—Carolyn Ward, Editor

Manuscript Submission

Instructions to Authors

Purpose

The purposes of the *Journal of Interpretation Research* are to communicate original empirical research dealing with heritage interpretation and to provide a forum for scholarly discourse about issues facing the profession of interpretation. The *Journal* strives to link research with practice. The *Journal of Interpretation Research* is published by the National Association for Interpretation, the preeminent professional association representing the heritage interpretation profession.

General Information

The primary function of the *Journal* is to disseminate original empirical research regarding interpretation. However, the *Journal of Interpretation Research* takes a broad view of the field of interpretation and publishes manuscripts from a wide-range of academic disciplines. The primary criteria for deeming a manuscript appropriate for the *Journal* are whether it adds to the current state-of-knowledge for practitioners, researchers, academics, or administrators who work in the field of interpretation.

In recognition of how diverse the relevant literature is, the *Journal* will also publish reviews of recent books, government publications, original literature reviews, and bibliographies dealing with interpretation. Abstracts from dissertations, private consultant materials, and reports from public agencies will be published in the *Journal* in a section called "In Short: Reports and Reviews." This section will also provide an outlet for summaries of research studies with limited scope. Interpretation research often consists of small "in-house" program evaluations and basic visitor studies. The purpose of this section is to communicate current research activities, allow readers to identify colleagues with similar interests, and provide practitioners and administrators with useful information and direction for conducting their own mini-research projects. Submissions for the "In Short: Reports and Reviews" section should be limited to 800 to 1,000 words and will be reviewed by the editor and two associate editors.

Additionally, the *Journal* will publish thought pieces that exhibit excellence and offer original or relevant philosophical discourse on the state of heritage interpretation. The "In My Opinion" section of the *Journal* encourages the development of the profession and the practice of interpretation by fostering

discussion and debate. Submissions for the "In My Opinion" section should be limited to 1,000 to 1,200 words and will be reviewed by the editor and two associate editors.

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All research manuscripts will be reviewed anonymously by an associate editor and by at least two other reviewers. Based on the nature of the manuscript, special efforts will be made to identify well-qualified associate editors and reviewers to evaluate the manuscripts. From the recommendations of the associate editor, the editor will make the final decision of the manuscript's disposition and communicate this information to the author.

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Manuscripts will be accepted with the understanding that their content is unpublished and not being submitted elsewhere for publication.

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Examples of references:

McCool, S. & Braithwaite, A. (1992). Persuasive Messages and Safety Hazards in Dispersed and Natural Recreation Settings. In M. Manfredo (Ed.), *Influencing Human Behavior*. Champaign, IL: Sagamore Publishing.

Ryan, C. & Dewar, K. (1995). Evaluating the Communication Process Between Interpreter and Visitor. *Tourism Management, 16*(4): 295-303.

Tilden, F. (1977). *Interpreting Our Heritage* (2nd ed.). Chapel Hill: University of North Carolina Press.

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Please submit a either a digital file (PDF or Microsoft Word) or an original hard copy and three copies of your manuscript to Carolyn J. Ward at the address below. Authors whose manuscripts are accepted for publication must submit final manuscripts electronically or on computer disk.

Contact

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