



# Visitor Voices Project 2005

## Final Report

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


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# Assessing Interpretive Outcomes in the Intermountain Region

# Abstract

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Since 1996, the National Park Service's (NPS) Interpretive Development Program (IDP) has established standards for effective interpretive performance that emphasize providing opportunities for visitors to form intellectual and emotional connections to the meanings and significance of park resources. However, few studies have examined the outcomes visitors obtain through exposure to interpretive programs at NPS sites. In this study, which represents the first year of a proposed four-year study, visitor interpretive outcomes

were examined with respect to four levels: neither intellectual nor emotional connections, only intellectual connections, only emotional connections, or both intellectual and emotional connections. During the summer of 2005, written questionnaires were distributed at four national parks in the Intermountain Region. Researchers employed purposive sampling to obtain 1526 valid surveys, with an overall response rate of 61.0%. Through the application of stepwise multinomial logistic regression and a post-hoc chi-square analysis, thirteen factors were identified that are significant at the  $\alpha=0.05$  level in explaining observed interpretive outcomes. These factors were divided into six categories related to park interpretive offerings, survey logistics, respondent group composition, reasons for the respondent's park visit, respondent life experiences, and respondent demographics. The report concludes with a summary of research findings, possible applications for research results, and avenues for future research.

# Project Narrative

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## Introduction

This project seeks to answer one key question: *Do visitors benefit from park interpretive offerings in ways that are consistent with the stated goals and objectives of park interpretive programs?* The NPS Interpretive Development Program (IDP) trains and certifies NPS interpretive rangers in 10 benchmark competencies. The IDP establishes national standards for interpretive performance, linking interpretive effectiveness to cohesively developed, audience appropriate interpretive offerings that provide opportunities for visitors to form intellectual and emotional connections to the meanings and significance of park resources. Interpreters invest time and money to provide training, deliver programs, conduct program audits, and establish coaching relationships with the stated intent of helping visitors connect to resource meanings. To date, however, no study has measured visitor interpretive outcomes, defined as "connections," at a broad cross-section of NPS sites, or determined whether significantly different outcomes occur with respect to key socio-demographic variables. To address this knowledge gap, researchers worked with the NPS and NPS partners to launch a 4-year, 16-park visitor survey. During the summer of 2005, the first survey period of the proposed 4-year study, surveys were collected at four NPS sites, including Carlsbad Caverns National Park (CAVE), Lyndon B. Johnson National Historical Park (LYJO), Petrified Forest National Park (PEFO), and Timpanogos Cave National Monument (TICA).

Recently interpreters have proposed ways to define, operationalize and measure onsite interpretive outcomes. These outcomes can be examined with reference to the increasingly important concept of intellectual and emotional *connections* to resource meanings. The concept of connections, however,

though widely used, is still little understood. Interpretive professionals feel confident that “something” happens when visitors connect in a meaningful way with site resources, but that something varies from visitor to visitor and experience to experience. For the purposes of this study, interpretive outcomes (connections) were hypothesized to be a function of visitor onsite experience and “who the visitor is” (i.e., visitor psychographics and demographics).

To identify patterns that exist in the connections visitors make, it is vital to understand how visitor connections are influenced by such variables as age, education, race and ethnicity, income, gender, groups size and composition, previous knowledge and experiences, and motivations. The NPS strives to make its programs accessible and relevant to diverse populations. An NPS report entitled, “*Renewing our Education Mission*,” emphasized the agency’s commitment to “reflecting our diverse society by providing unique opportunities for all people to understand, appreciate, and participate in preserving our natural and cultural heritage” (USDI National Park Service, 2003, p. 5). This study represents an initial effort to assess how successful the NPS is in achieving this stated goal with respect to one program objective: facilitating connections to resource meanings.

## Methods

During the summer 2005 peak use season, a written questionnaire was administered onsite to adults ages 18 and older who visited four Intermountain Region parks during specified sampling periods. Respondents were selected using a purposive sampling method (Miles & Huberman, 1994). The intent was to identify respondents who had participated in four specific interpretive offerings in each park (approximately three-quarters of survey respondents, a.k.a. the treatment group), as well as to obtain baseline information from visitors who may not have had as much exposure to park interpretive offerings (approximately one-quarter of survey respondents, a.k.a. the control group). The interpretive offerings included at each park fulfilled two specific criteria. First, selected interpretive products fulfilled, in the opinion of the park’s Chief of Interpretation, the requirements of the IDP’s core assessment rubric. Second, selected interpretive products included at least one non-personal interpretive offering (e.g., park film, exhibit, or wayside).

At survey administration locations, each adult respondent was given a clipboard, pen and survey instrument. Completion date, time, location, and if appropriate, the specific interpretive offering to which the respondent was exposed, were recorded on each survey. Researchers collected a total of 1,526 valid surveys, obtaining a 61.0% response rate overall, with per park response rates ranging from 55.8% to 66.7%. Non-response bias was analyzed with reference to log sheets completed onsite that recorded the gender, group size, group composition, and participation outcome for each individual or group that was approached to participate in the study. The log sheet also captured the reason for participation refusal, if known. These records indicate that non-respondents closely resembled respondents with the exception that non-respondents were more likely to be accompanied by children and/or were members of an organized group. Further, time constraints were frequently cited as a reason for participation refusal.

To analyze the data, researchers used a statistical procedure called stepwise multinomial logistic regression (Kutner, Nachtsheim, Neter & Li, 2005). This approach goes beyond descriptive statistics, using procedures that examine relationships to build a model that identifies the factors that explain the observed outcomes. The stepwise procedure facilitated data reduction and model building efforts. Subsequently, researchers conducted a chi-square analysis to examine in greater detail those factors that proved to be significant in the regression model. In this study, connections

were the dependent variable. Connection data were obtained through participant self-report via two yes-no questions contained in the survey. The variable took on the following levels: neither intellectual nor emotional connections, only intellectual connections, only emotional connections, or both intellectual and emotional connections.

## Results

Researchers collected 1,526 valid surveys which were distributed across the four study units as follows: Carlsbad Caverns NP (454 completed surveys), Lyndon B. Johnson NHP (224 completed surveys), Petrified Forest NP (416 completed surveys), and Timpanogos Cave NM (432 completed surveys). Visitation levels were lower at Lyndon B. Johnson NHP during the sampling period. This was no doubt due, in part, to the fact that Hurricane Katrina had ravaged the Gulf Coast the week before and gas prices had undergone a temporary spike.

Visitor Voices survey respondents can be characterized with reference to key demographic variables. Respondents were approximately half male (45.3%) and half female (53.3%). Respondents ranged from age 18 to over 75, with most falling into the 35 to 54 age bracket. There were more older visitors at Lyndon B. Johnson NHP (LYJO), fewer at Timpanogos Cave NM (TICA). Thirty-eight percent of respondents at Petrified Forest NP (PEFO) had masters, doctoral or professional degrees; 26% and 23% of respondents held advanced degrees at LYJO and Carlsbad Caverns NP (CAVE) respectively. Only 12% of the sample had not attended college. Approximately 10% of those surveyed were Hispanic. Seven percent of the sample were non-white, and most of those respondents were of Asian (4.0%), American Indian or Alaskan Native (1.3%), or of mixed racial background (1.8%). A small proportion of respondents were of African American (0.6%) or Native Hawaiian or other Pacific Islander (0.3%) descent. Twenty-nine percent of respondents were in the \$40,000-70,000 income bracket for total household annual income, and a roughly equal proportion made over \$100,000 per year. The top six states of residence for respondents were, in rank order: Texas, Utah, California, Arizona, New Mexico and Florida. Approximately 9% of the respondents were international visitors.

With respect to the formation of intellectual and emotional connections, respondents reported the following interpretive outcomes:

	Neither	Intellectual Only	Emotional Only	Both	Total
CAVE	39 (28.3%)	109 (29.1%)	21 (25.6%)	284 (30.6%)	453 (29.7%)
LYJO	16 (11.6%)	51 (13.6%)	12 (14.6%)	145 (15.6%)	224 (14.7%)
PEFO	31 (22.5%)	98 (26.1%)	18 (30.0%)	268 (28.9%)	415 (27.2%)
TICA	52 (37.7%)	117 (31.2%)	31 (37.8%)	231 (24.9%)	431 (28.3%)
<b>Total</b>	<b>138 (9.1%)</b>	<b>375 (24.6%)</b>	<b>82 (5.4%)</b>	<b>928 (60.9%)</b>	<b>1523 (100%)</b>

The Visitor Voices survey helped pinpoint specific factors that explain the interpretive outcomes reported by respondents. Researchers attempted to measure the amount of time respondents spent onsite, the amount and type of interpretive offerings to which the respondents were exposed, which interpretive offering respondents found most meaningful, respondent motivations for visiting the site, the number of similar sites respondents visited each year, respondent experiences with natural and cultural areas as a youth, the meanings respondents attached to the site, group size and composition, as well as respondent age, income, education, race, ethnicity, and place of residence.

Stepwise multinomial logistic regression identified a set of 15 factors which were significant at the  $\alpha=0.05$  level. These 15 factors, when combined, form a model that explains patterns in the variability that exists with regards to the observed interpretive outcomes. It is important to note that the model converged; sometimes models fail to converge, indicating that none of the variables measured are statistically significant in explaining observed outcomes. Further, the model has an overall concordance of 69.5%. That is, approximately 70% of the time, the model correctly predicts interpretive outcomes using just the data associated with the 15 factors. Once the 15 factors were identified, a post-hoc analysis was conducted using two-way contingency tables in which each factor was independently analyzed with respect to the response variable (connections). In the post-hoc chi-square analysis, 13 of the 15 factors were significant. These 13 factors are listed below and are examined in greater detail in Table 1 (pages 6-10). Specifically, Table 1 identifies each factor's degrees of freedom and level of significance, summarizes key descriptive statistics for each factor, and discusses how each factor influenced observed interpretive outcomes. The 13 factors that explain observed interpretive outcomes have been divided into six categories:

**Park Interpretation** (*Visitor onsite experience*)

1. Number of interpretive offerings experienced onsite.
2. Interpretive offering experienced immediately prior to completing survey.
3. Most meaningful interpretive offering experienced onsite.

**Survey Logistics** (*Visitor onsite experience*)

4. Survey location.

**Respondent Group Size & Composition** (*Visitor onsite experience*)

5. Visiting park with myself and one or more children.
6. Visiting park with group other than family and friends.

**Why Respondent Visited the Park?** (*Who the visitor is*)

7. Interest in nature.
8. Like visiting national parks.

**Respondent Life Experiences** (*Who the visitor is*)

9. Number of interpretive sites visited each year
10. Exposure during youth to natural and cultural areas

**Respondent Demographics** (*Who the visitor is*)

11. Gender.
12. Race.
13. Hispanic ethnicity.

Several factors were *not* significant in explaining observed interpretive outcomes, including: number of previous visits to the site, amount of time spent at the site, interest in history, interest in outdoor recreation, interest in park educational programs, various group sizes and compositions, community-type during youth, age, education, income, and place of residence. In addition, control versus treatment group, as an independent variable analyzed within the data set, was not significant in explaining observed interpretive outcomes. However, the influence of control versus treatment group assignment was detected in the chi-square analysis of variable #2 above. Finally, there were no significant differences in the amount and type of connections reported by respondents across the four 2005 parks.

Table 2 summarizes data presented in Table 1 and is found on page 10 of the report. The table highlights specific factors that resulted in an increased (or decreased) likelihood of respondents obtaining various interpretive outcomes.

## Conclusion

Research findings are only as useful as the questions that guided the research process. Therefore, it is important to consider whether an understanding of visitor onsite interpretive outcomes examined with respect to the concept of intellectual and emotional connections to resource meanings is critical to improving interpretive practice in the Intermountain Region and within the NPS as a whole. The authors believe an examination of visitor outcomes is necessary for several reasons. First, assessing interpretive outcomes represents a first step toward programmatic and fiscal accountability. Second, if an analysis of interpretive outcomes is tied to specific interpretive programs and media, managers can determine whether these offerings are performing according to stated objectives. Such an analysis is essential to (a) making program-specific improvements, and (b) refining our current articulation of interpretive best practices, leading to the further professionalization of the field. Third, by examining whether significantly different outcomes occur with respect to key socio-demographic variables, the NPS can assess whether existing interpretive programs and services provide opportunities for all visitors to understand park significance and connect with resource meanings. Thus, to ensure public accountability, improve programs, advance professionalism, and promote equity, understanding visitor interpretive outcomes is a critical next step.

Research results for 2005 suggest that interpretive outcomes are a function of visitor onsite experience and who the visitor is. There are some factors over which managers have no control (e.g., respondent motivations, demographics, and life experiences). However, since these factors can influence interpretive outcomes, managers must ensure that target audiences have access to interpretive offerings that meet their needs and interests. The research also identified factors over which managers can exert tremendous influence. Three significant factors relate directly to park interpretive programs. Results suggest that it is not simply a matter of how many or what type of interpretive offerings visitors are exposed to—though these aspects *do* matter—but that there is a separate and significant effect related to what visitors evaluate as their “most meaningful” onsite interpretive experience. Ranger-led programs far surpassed any other program type as respondents’ most meaningful onsite interpretive experience. Ranger-led programs were also statistically significant in *decreasing* the formation of neither type of interpretive connection and *increasing* the formation of both types of connections. Other types of programs were associated with favorable results as well (e.g., park film). If these results hold up over the 4-year study period, managers may want to consider how they allocate budget dollars to support park interpretive objectives.

Finally, race and ethnicity represent factors that were significant in explaining observed interpretive outcomes. However, results from the first round of data collection should be considered preliminary due to small sample sizes in several key categories. Further, the effect of missing data may be noteworthy with respect to these two variables, since a decision to omit one’s race or ethnicity on a survey may not be a characteristic that is randomly distributed across all survey respondents. Over the proposed 4-year study period, researchers will generate a database with results from more than 6,000 respondents. This should enable researchers to clarify the effects of such variables as gender, race, and ethnicity. Alternately, a parallel study could be launched that examines the effect of these factors at sites that focus on cross-cultural themes and/or that attract diverse audiences.

## Tables & Charts

**Table 1.** Factors Influencing Observed Interpretive Outcomes (2005 Data)

Factor	Factor's Effect on Interpretive Outcomes
<b>Park Interpretation</b>	
<p><b>Number of interpretive offerings experienced onsite</b></p> <p>Df=13<sup>a</sup> P-value&lt;.0001<sup>b</sup></p>	<p>Respondents indicated that they experienced from 0 interpretive offerings onsite (6.7%) to as many as 14 interpretive offerings (0.1%), with a mean experience level of 2.90 offerings (SD <math>\pm</math> 2.112). Chi-square analysis revealed a significant relationship between the total number of interpretive offerings experienced and observed interpretive outcomes (<math>\chi^2=100.897</math>, df=39, p-value &lt;.0001). Specifically:</p> <ul style="list-style-type: none"> <li>• Those exposed to 0 interpretive programs were <i>more</i> likely to form <u>neither</u> type of connection (<math>\chi^2=20.197</math>). They were also <i>more</i> likely to form <u>intellectual only</u> connections (<math>\chi^2=3.922</math>). And, they were <i>less</i> likely to form <u>both</u> types of connections (<math>\chi^2=11.851</math>).</li> <li>• Those exposed to only 1 interpretive offering were <i>more</i> likely to form <u>neither</u> type of connection (<math>\chi^2=4.426</math>).</li> <li>• Those exposed to either 3 or 4 interpretive offerings were <i>less</i> likely to form <u>neither</u> type of connection (<math>\chi^2=7.769</math> and 4.062 respectively).</li> </ul>
<p><b>Interpretive offering experienced immediately prior to completing survey</b></p> <p>Df=7 P-value&lt;.0001</p>	<p>Seventy-nine percent of respondents were exposed to an interpretive offering immediately prior to survey completion. These respondents comprised the treatment group. Interpretive offerings ranged from conducted activities (39.7%), interpretive talks (12.5%), park brochures (6.5%), park film (6.5%), exhibits (5.1%), virtual tours (4.5%), and illustrated programs (3.7%). Approximately 21% percent of respondents completed the survey while they were “at large” in the park (control group). Chi-square analysis revealed a significant relationship between the type of interpretive offering experienced immediately prior to survey completion and observed interpretive outcomes (<math>\chi^2=69.381</math>, df=21, p-value &lt;.0001). Specifically:</p> <ul style="list-style-type: none"> <li>• Those exposed to interpretive talks were <i>less</i> likely to form <u>neither</u> type of connection (<math>\chi^2=4.0619</math>). They were also <i>less</i> likely to form <u>emotional only</u> connections (<math>\chi^2=3.828</math>).</li> <li>• Those exposed to an illustrated program at CAVE<sup>c</sup> were <i>less</i> likely to form <u>neither</u> type of connection (<math>\chi^2=5.195</math>).<sup>d</sup></li> <li>• Those exposed to an interpretive exhibit at TICA were <i>more</i> likely to form <u>neither</u> type of connection (<math>\chi^2=8.757</math>). They were also <i>less</i> likely to form <u>both</u> types of connections (<math>\chi^2=5.067</math>).<sup>e</sup></li> <li>• Those exposed to a park film at PEFO were <i>less</i> likely to form <u>neither</u> type of connection (<math>\chi^2=4.021</math>). They were also <i>less</i> likely to form <u>intellectual only</u> connections (<math>\chi^2=3.587</math>). And, they were <i>more</i> likely to form <u>both</u> types of connections (<math>\chi^2=4.083</math>).<sup>f</sup></li> <li>• Control group respondents were <i>more</i> likely to form <u>neither</u> type of connection (<math>\chi^2=10.056</math>). They were also <i>more</i> likely to form <u>emotional only</u> connections (<math>\chi^2=4.093</math>). And, they were <i>less</i> likely to form <u>both</u> types of connections (<math>\chi^2=4.410</math>).</li> </ul>
<p><b>Most meaningful interpretive offering experienced</b></p>	<p>Respondents were asked to indicate which park programs and/or media they had experienced onsite. They were then asked to identify the “most meaningful” park program or media they had experienced onsite. Most respondents indicated that their most meaningful onsite interpretive experience was a ranger-led program (40.4%). Respondents also identified a variety of other interpretive experiences as most</p>

<b>onsite</b>	meaningful, including: speaking informally with a park employee or volunteer (9.7%), park films and other audiovisual media (8.3%), park brochures and other printed materials (including Jr. Ranger booklets) (7.2%), exhibits and waysides (6.5%), and other park programs (5.0%). Approximately 23% of respondents did not answer this question, perhaps because it is difficult to assess a most meaningful interpretive experience. Chi-square analysis revealed a significant relationship between the most meaningful program or media respondents experienced onsite and observed interpretive outcomes ( $\chi^2=81.501$ , $df=21$ , $p\text{-value} < .0001$ ). Specifically:
Df=7 P-value=0.0380	<ul style="list-style-type: none"> <li>• Those who identified ranger-led programs as most meaningful were <i>less</i> likely to form <u>neither</u> type of connection (<math>\chi^2=9.292</math>). They were also <i>more</i> likely to form <u>both</u> types of connections (<math>\chi^2=3.739</math>).</li> <li>• Those who identified the park brochure as most meaningful were <i>more</i> likely to form <u>intellectual only</u> connections (<math>\chi^2=5.491</math>).</li> <li>• The significance of this variable is affected to some extent by missing data. That is, respondents who did not answer this question were <i>more</i> likely to form <u>neither</u> type of connection (<math>\chi^2=35.454</math>). They were also <i>less</i> likely to form <u>both</u> types of connections (<math>\chi^2=9.535</math>).</li> </ul>

### Survey Logistics

<b>Survey location</b>	Surveys were administered at a variety of onsite locations, including: visitor centers (44.5%), outdoor seating areas (36.5%), seating areas within a cave (7.3%), amphitheatres (5.8%), trails (3.9%), and parking areas (1.6%). Chi-square analysis revealed a significant relationship between the survey administration location and observed interpretive outcomes ( $\chi^2=28.591$ , $df=18$ , $p\text{-value}=0.0536$ ). Specifically:
Df=6 P-value=0.0104	<ul style="list-style-type: none"> <li>• Those who completed the survey at a seating area within a cave were <i>less</i> likely to form <u>neither</u> type of connection (<math>\chi^2=6.513</math>).</li> </ul> <p><i>Note:</i> The only respondents who completed surveys at seating areas within a cave were those who had just attended the King's Palace cave tour at CAVE. Thus, in this case, "location" effects are likely related to program-specific attributes. This observation forms the basis for how this factor is included in Table 2.</p>

### Respondent Group Size & Composition

<b>Visiting park with myself and one or more children</b>	Respondents recorded their group size and whether they visited the site alone, with a spouse, with family, with friends, with or without children, as part of an organized group, or some combination of the above. Approximately 9.6% of the respondents visited the site as the only adult accompanied by one or more children. Chi-square analysis revealed a significant relationship between those who visited the site as the only adult accompanied by one or more children and observed interpretive outcomes ( $\chi^2=30.778$ , $df=6$ , $p\text{-value} < .0001$ ). Specifically:
Df=1 P-value=0.0427	<ul style="list-style-type: none"> <li>• Those who visited the site as an adult accompanied by one or more children were <i>more</i> likely to form <u>intellectual only</u> connections (<math>\chi^2=5.309</math>).</li> <li>• The significance of this variable is affected to some extent by missing data. That is, although only 14 people did not answer this question, they were shown statistically to be <i>more</i> likely to form <u>neither</u> type of connection (<math>\chi^2=10.868</math>).</li> </ul> <p>Regression analysis, however, suggests that <u>not</u> visiting the park as the only adult with one or more children contributed to explaining interpretive outcomes (<math>p=0.0745</math>). Thus, this factor is complex and may require additional data to make conclusive determinations.</p>

<b>Visiting park</b>	Some respondents (2.3%) indicated that they visited the site with a group that did not
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<p><b>with group other than family and friends</b></p> <p>Df=2 P-value=0.0438</p>	<p>primarily include family and friends. Frequently such respondents identified their group as a boy scout group, church group, elderhostel group, or tour group. Chi-square analysis revealed a significant relationship between those who visited the site with a group other than family and friends and observed interpretive outcomes (<math>\chi^2=27.242</math>, <math>df=6</math>, <math>p\text{-value}=0.0001</math>). <u>However</u>:</p> <ul style="list-style-type: none"> <li>The significance of this variable may be strongly influenced by missing data. That is, although only 14 people did not answer this question, they were shown to be statistically <i>more</i> likely to form <u>neither</u> type of connection (<math>\chi^2=10.868</math>).</li> </ul> <p>On the other hand, regression analysis suggests that <u>not</u> visiting the park with a group other than family and friends contributed significantly to explaining interpretive outcomes (<math>p=0.0125</math>). Thus, this factor is complex and may require additional data to make conclusive determinations.</p>
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### Why Respondent Visited the Park?

<p><b>Interest in nature</b></p> <p>Df=1 P-value&lt;.0001</p>	<p>Respondents were asked why they visited the park and were instructed to check all the reasons that applied from a list of possible choices. Two-thirds of respondents (65.2%) indicated that an interest in nature influenced their decision to visit the park compared to one-third (34.8%) for whom an interest in nature was not one of the reasons they visited the park. Chi-square analysis revealed a significant relationship between an interest in nature and observed interpretive outcomes (<math>\chi^2=19.391</math>, <math>df=3</math>, <math>p\text{-value}=0.0002</math>). Specifically:</p> <ul style="list-style-type: none"> <li>Those for whom an interest in nature was not a reason why they visited the park were <i>more</i> likely to form <u>neither</u> type of connection (<math>\chi^2=5.029</math>). They were also <i>more</i> likely to form <u>intellectual only</u> connections (<math>\chi^2=3.195</math>). And, they were <i>less</i> likely to form <u>both</u> types of connections (<math>\chi^2=4.342</math>).</li> </ul>
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<p><b>Like visiting national parks</b></p> <p>Df=1 P-value=0.0324</p>	<p>Respondents were asked why they visited the park and were instructed to check all the reasons that applied from a list of possible choices. Most respondents (62.0%) indicated that one of the reasons for their visit was that they like visiting national parks. Thirty-eight percent of the respondents indicated that their decision to visit the park was not based upon the fact that they like to visit national parks. Chi-square analysis revealed a significant relationship between whether or not a respondent likes to visit national parks and observed interpretive outcomes (<math>\chi^2=18.655</math>, <math>df=3</math>, <math>p\text{-value}=0.0003</math>). Specifically:</p> <ul style="list-style-type: none"> <li>Those who did not visit the park because they like visiting national parks were <i>more</i> likely to form <u>intellectual only</u> connections (<math>\chi^2=4.878</math>). They were also <i>less</i> likely to form <u>both</u> types of connections (<math>\chi^2=3.335</math>).</li> </ul>
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### Respondent Life Experiences

<p><b>Number of interpretive sites visited each year</b></p> <p>Df=5 P-value=0.0124</p>	<p>Respondents were asked how many interpretive sites they visit each year, including other parks, zoos, aquaria, forests, wildlife refuges, nature centers, museums, historic homes, etc. Respondent annual interpretive site visitation rates can be summarized as follows: 1-2 sites per year (32.7%), 3-4 sites per year (29.3%), 5-6 sites per year (18.5%), 7-10 sites per year (9.4%), and more than 10 sites per year (10.1%). Chi-square analysis revealed a significant relationship between the number of interpretive sites visited annually and observed interpretive outcomes (<math>\chi^2=32.392</math>, <math>df=15</math>, <math>p\text{-value}=0.0078</math>). Specifically:</p> <ul style="list-style-type: none"> <li>Those who visit 1-2 sites per year were <i>more</i> likely to form <u>neither</u> type of connection (<math>\chi^2=3.560</math>). They were also <i>more</i> likely to form <u>intellectual only</u> connections (<math>\chi^2=4.630</math>).</li> <li>Those who visit 3-4 sites per year were <i>less</i> likely to form <u>intellectual only</u> connections (<math>\chi^2=5.807</math>).</li> </ul>
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<b>Exposure during youth to natural and cultural areas</b>	<p>Respondents indicated whether they had frequent contact with natural areas (19.4%), cultural areas (7.0%), both natural and cultural areas (56.7%), or neither natural nor cultural areas (15.4%) during their youth. Chi-square analysis revealed a significant relationship between exposure during youth to natural and/or cultural areas and observed interpretive outcomes (<math>\chi^2=39.932</math>, <math>df=12</math>, <math>p\text{-value} &lt; .0001</math>). <u>However:</u></p>
Df=4 P-value=0.0003	<ul style="list-style-type: none"> <li>The significance of this variable may be strongly influenced by missing data. That is, although only 22 people did not answer this question, they were shown to be <i>more</i> likely to form <u>neither</u> type of connection (<math>\chi^2=24.399</math>). They were also <i>less</i> likely to form <u>both</u> types of connections (<math>\chi^2=5.267</math>).</li> </ul> <p>On the other hand, regression analysis suggests that frequent exposure to (a) cultural areas or to (b) both natural and cultural areas during youth contributed significantly to explaining interpretive outcomes (<math>p=0.0180</math> and <math>p=0.0007</math> respectively). Thus, this factor is complex and may require additional data to make conclusive determinations.</p>

### Respondent Demographics

<b>Gender</b>	<p>Respondents were approximately half male (45.3%) and half female (53.3%). Chi-square analysis revealed a significant relationship between gender and observed interpretive outcomes (<math>\chi^2=19.719</math>, <math>df=6</math>, <math>p\text{-value}=0.0031</math>). Specifically:</p>
Df=2 P-value=0.0011	<ul style="list-style-type: none"> <li>Men were <i>less</i> likely to form <u>both</u> types of connections (<math>\chi^2=3.242</math>).</li> <li>Women were <i>more</i> likely to form <u>both</u> types of connections (<math>\chi^2=3.188</math>).</li> </ul> <p>The reported chi-square values are of borderline significance; however, nothing else within the regression analysis or the chi-square analysis begins to explain the significance of this variable. Thus, this factor is complex and may require additional data to make conclusive determinations.</p>

<b>Race</b>	<p>Respondents were asked to indicate their racial background, checking all (OMB approved) categories that applied. Respondents were distributed across six racial categories as follows: Native American or Alaskan Native (1.3%), Asian (4.0%), Black or African American (0.6%), White (88.5%), Native Hawaiian or Pacific Islander (0.3%), or Mixed (1.8%). Chi-square analysis revealed a significant relationship between race and observed interpretive outcomes (<math>\chi^2=29.633</math>, <math>df=18</math>, <math>p\text{-value}=0.0412</math>). <u>However:</u></p>
Df=6 P-value=0.0140	<ul style="list-style-type: none"> <li>The significance of this variable may be strongly influenced by missing data. That is, although only 55 people did not answer this question, they were shown to be <i>more</i> likely to form <u>neither</u> type of connection (<math>\chi^2=4.961</math>). They were also <i>less</i> likely to form <u>both</u> types of connections (<math>\chi^2=5.444</math>).</li> </ul> <p>On the other hand, despite the small sample sizes in two categories, regression analysis suggests that being of (a) Black or African American or (b) Native Hawaiian or other Pacific Islander descent contributed significantly to explaining interpretive outcomes (<math>p=0.0546</math> and <math>p=0.0424</math> respectively). Thus, this factor is complex and may require additional data to make conclusive determinations.</p>

<b>Hispanic ethnicity</b>	<p>Respondents were asked whether or not they were Hispanic—9.8% of respondents indicated that they were Hispanic, 87.9% of respondents indicated that they were non-Hispanic. Chi-square analysis revealed a significant relationship between Hispanic ethnicity and observed interpretive outcomes (<math>\chi^2=19.702</math>, <math>df=6</math>, <math>p\text{-value}=0.0031</math>). <u>However:</u></p>
Df=2 P-value=0.0250	<ul style="list-style-type: none"> <li>The significance of this variable may be strongly influenced by missing data. That is, although only 35 people did not answer this question, they were shown to be <i>more</i> likely to form <u>neither</u> type of connection (<math>\chi^2=10.581</math>). They were also <i>less</i> likely to</li> </ul>

form both types of connections ( $\chi^2=3.248$ ).

On the other hand, regression analysis suggests that Hispanic ethnicity contributed to explaining interpretive outcomes both for those who identified themselves as Hispanic and for those who did not ( $p=0.0272$  and  $p=0.0961$  respectively). Thus, this factor is complex and may require additional data to make conclusive determinations.

<sup>a</sup>Degrees of Freedom; <sup>b</sup>Overall P-values reported for each factor were obtained via stepwise multinomial logistic regression; <sup>c</sup> Park abbreviations are as follows: Carlsbad Caverns NP = CAVE, Lyndon B. Johnson NHP = LYJO, Petrified Forest NP = PEFO, and Timpanogos Cave NM = TICA; <sup>d</sup>The only illustrated program in the 2005 study was the “Geology 101” program at Carlsbad Caverns NP; <sup>e</sup>The only exhibit included in the 2005 study was at Timpanogos Cave NM; <sup>f</sup>The only park film included in the 2005 study was a film shown at Petrified Forest NP.

**Table 2.** Summary of Factor Effects (2005 Data).

	Neither Type of Connection	Intellectual Only Connections	Emotional Only Connections	Both Types of Connection
More Likely to Form...	<ul style="list-style-type: none"> <li>☐ Attended 0-1 Interp Programs Onsite</li> <li>☐ Visit 1-2 Interp Sites/Year</li> <li>☐ Control Group Respondent</li> <li>☐ Exposed to TICA Exhibit</li> <li>☐ Didn't Visit because of an Interest in Nature</li> <li>☐ Didn't Answer Questions regarding: Most Meaningful Interp Offering, Group Composition—Two questions, Youth Experiences, Race, Ethnicity</li> </ul>	<ul style="list-style-type: none"> <li>☐ Attended 0 Interp Programs Onsite</li> <li>☐ Visit 1-2 Interp Sites/Year</li> <li>☐ Group Composition: Only Adult with One or More Children</li> <li>☐ Didn't Visit because of an Interest in Nature</li> <li>☐ Didn't Visit because He/She Likes Visiting National Parks</li> <li>☐ Most Meaningful Interp Offering = Park Brochure</li> </ul>	<ul style="list-style-type: none"> <li>☐ Control Group Respondent</li> </ul>	<ul style="list-style-type: none"> <li>☐ Exposure to: Park Film @ PEFO</li> <li>☐ Female</li> <li>☐ Most Meaningful Interp Offering = Ranger-led Program</li> </ul>
Less Likely to Form...	<ul style="list-style-type: none"> <li>☐ Attended 3-4 Interp Programs Onsite</li> <li>☐ Exposure to: Interp Talks Geology 101 @ CAVE Park Film @ PEFO Cave Tour @ CAVE</li> <li>☐ Most Meaningful Interp Offering = Ranger-led Program</li> </ul>	<ul style="list-style-type: none"> <li>☐ Attended 3-4 Interp Programs Onsite</li> <li>☐ Exposure to: Park Film @ PEFO</li> </ul>	<ul style="list-style-type: none"> <li>☐ Exposure to: Interp Talks</li> </ul>	<ul style="list-style-type: none"> <li>☐ Attended 0 Interp Programs Onsite</li> <li>☐ Control Group Respondent</li> <li>☐ Exposure to: TICA Exhibit</li> <li>☐ Didn't Visit because of an Interest in Nature</li> <li>☐ Didn't Visit because He/She Likes Visiting National Parks</li> <li>☐ Male</li> <li>☐ Didn't Answer Questions regarding: Most Meaningful Interp Offering, Youth Experiences, Race, Ethnicity</li> </ul>

## References

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